

(12) 특허협력조약에 의하여 공개된 국제출원

(19) 세계지식재산권기구

국제사무국

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(81) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 국내 권리의 보호를 위하여): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 국내 권리의 보호를 위하여): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM,

(54) Title: ORGANIC LIGHT-EMITTING ELEMENT

(54) 발명의 명칭: 유기 발광 소자

5
4
3
2
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(57) Abstract: Provided is an organic light-emitting element of which the driving voltage, the efficiency, and the lifespan are improved.

(57) 요약서: 본 발명은 구동 전압, 효율 및 수명이 개선된 유기 발광 소자를 제공한다.



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명세서

발명의 명칭: 유기 발광 소자

기술분야

- [1] 관련 출원(들)과의 상호 인용
- [2] 본 출원은 2020년 7월 15일자 한국 특허 출원 제10-2020-0087740호 및 2021년 7월 15일자 한국 특허 출원 제10-2021-0092665호에 기초한 우선권의 이익을 주장하며, 해당 한국 특허 출원들의 문헌에 개시된 모든 내용은 본 명세서의 일부로서 포함된다.
- [3]
- [4] 본 발명은 구동 전압, 효율 및 수명이 개선된 유기 발광 소자에 관한 것이다.

배경기술

- [5] 일반적으로 유기 발광 현상이란 유기 물질을 이용하여 전기 에너지를 빛 에너지로 전환시켜주는 현상을 말한다. 유기 발광 현상을 이용하는 유기 발광 소자는 넓은 시야각, 우수한 콘트라스트, 빠른 응답 시간을 가지며, 휘도, 구동 전압 및 응답 속도 특성이 우수하여 많은 연구가 진행되고 있다.
- [6]
- [7] 유기 발광 소자는 일반적으로 양극과 음극 및 상기 양극과 음극 사이에 유기물층을 포함하는 구조를 가진다. 상기 유기물층은 유기 발광 소자의 효율과 안정성을 높이기 위하여 각기 다른 물질로 구성된 다층의 구조로 이루어진 경우가 많으며, 예컨대 정공주입층, 정공수송층, 발광층, 전자수송층, 전자주입층 등으로 이루어질 수 있다. 이러한 유기 발광 소자의 구조에서 두 전극 사이에 전압을 걸어주게 되면 양극에서는 정공이, 음극에서는 전자가 유기물층에 주입되게 되고, 주입된 정공과 전자가 만났을 때 엑시톤(exciton)이 형성되며, 이 엑시톤이 다시 바닥상태로 떨어질 때 빛이 나게 된다.
- [8]
- [9] 상기와 같은 유기 발광 소자에서, 구동 전압, 효율 및 수명이 개선된 유기 발광 소자의 개발이 지속적으로 요구되고 있다.
- [10] [선행기술문헌]
- [11] [특허문헌]
- [12] (특허문헌 1) 한국특허 공개번호 제10-2000-0051826호

발명의 상세한 설명

기술적 과제

- [13] 본 발명은 구동 전압, 효율 및 수명이 개선된 유기 발광 소자에 관한 것이다.

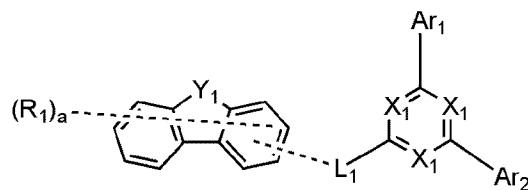
과제 해결 수단

- [14] 본 발명은 하기의 유기 발광 소자를 제공한다:
- [15] 양극,

- [16] 음극,
 [17] 상기 양극과 음극 사이의 발광층,
 [18] 상기 양극과 발광층 사이의 전자억제층, 및
 [19] 상기 전자억제층과 양극 사이에 정공수송층을 포함하는, 유기 발광 소자에
 있어서,
 [20] 상기 발광층은 하기 화학식 1로 표시되는 화합물, 하기 화학식 2로 표시되는
 화합물, 및 하기 화학식 3으로 표시되는 화합물을 포함하는,
 [21] 유기 발광 소자:

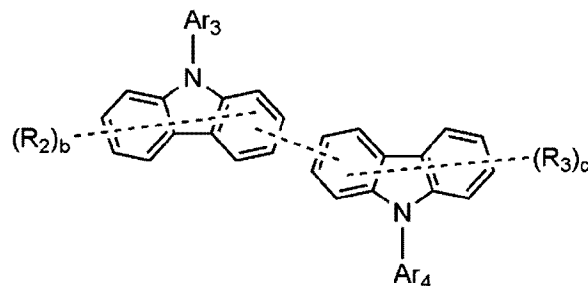
[22] [화학식 1]

[23]



- [24] 상기 화학식 1에서,
 [25] Y_1 은 O 또는 S이고,
 [26] X_1 는 각각 독립적으로 CH 또는 N이되, X_1 중 적어도 하나는 N이고,
 [27] L_1 은 직접 결합, 치환 또는 비치환된 C_{6-60} 아릴렌, 또는 치환 또는 비치환된 N, O
 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60}
 헤테로아릴렌이고,
 [28] Ar_1 및 Ar_2 는 각각 독립적으로, 치환 또는 비치환된 C_{6-60} 아릴, 또는 치환 또는
 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을
 포함하는 C_{2-60} 헤테로아릴이고,
 [29] R_1 은 수소, 중수소, 치환 또는 비치환된 C_{6-60} 알킬, 치환 또는 비치환된 C_{6-60}
 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느
 하나 이상을 포함하는 C_{2-60} 헤테로아릴이고,
 [30] a 는 1 내지 7의 정수이고,
 [31] [화학식 2]

[32]



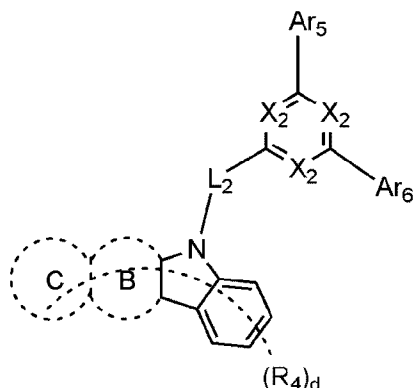
- [33] 상기 화학식 2에서,
 [34] Ar_3 및 Ar_4 는 각각 독립적으로, 치환 또는 비치환된 C_{6-60} 아릴, 또는 치환 또는
 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을
 포함하는 C_{2-60} 헤테로아릴이고,

[35] R_3 및 R_4 는 각각 독립적으로, 수소, 중수소, 치환 또는 비치환된 C_{6-60} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴이고,

[36] b 및 c 는 각각 독립적으로, 1 내지 7의 정수이고,

[37] [화학식 3]

[38]



[39] 상기 화학식 3에서,

[40] B는 인접한 두 개의 오각 고리와 축합된 벤젠 고리이고,

[41] X_2 는 각각 독립적으로 CH 또는 N이되, X_2 중 적어도 하나는 N이고,

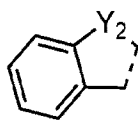
[42] L_2 는 직접 결합, 치환 또는 비치환된 C_{6-60} 아릴렌, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴렌이고,

[43] Ar_5 및 Ar_6 은 각각 독립적으로, 치환 또는 비치환된 C_{6-60} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴이고,

[44] C는 하기 화학식 4-1 또는 4-2이고,

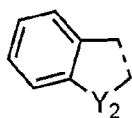
[45] [화학식 4-1]

[46]



[47] [화학식 4-2]

[48]



[49] 상기 화학식 4-1 및 4-2에서,

[50] 점선은 상기 B와 축합되는 결합이고,

[51] Y_2 는 CRR' , O, S, 또는 $N(Ar_7)$ 이고,

[52] 여기서, R 및 R'은 각각 독립적으로, 치환 또는 비치환된 C_{6-60} 알킬, 또는 치환 또는 비치환된 C_{6-60} 아릴이고,

[53] Ar_7 은 치환 또는 비치환된 C_{6-60} 아릴, 또는 치환 또는 비치환된 N, O 및 S로

구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴이고,

[54] R_4 는 수소, 중수소, 치환 또는 비치환된 C_{6-60} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴이고,

[55] d 는 1 내지 10의 정수이다.

발명의 효과

[56] 상술한 유기 발광 소자는, 구동 전압, 효율 및 수명이 우수하다.

도면의 간단한 설명

[57] 도 1은, 기관(1), 양극(2), 전자억제층(3), 발광층(4), 및 음극(5)으로 이루어진 유기 발광 소자의 예를 도시한 것이다.

[58] 도 2는, 기관(1), 양극(2), 정공수송층(6), 전자억제층(3), 발광층(4), 전자수송층(7) 및 음극(5)으로 이루어진 유기 발광 소자의 예를 도시한 것이다.

발명의 실시를 위한 형태

[59] 이하, 본 발명의 이해를 돕기 위하여 보다 상세히 설명한다.

[60]

[61] 본 명세서에서, $\begin{smallmatrix} \{ \\ \hline \} \end{smallmatrix}$ 또는 $\begin{smallmatrix} * \\ | \end{smallmatrix}$ 는 다른 치환기에 연결되는 결합을 의미한다.

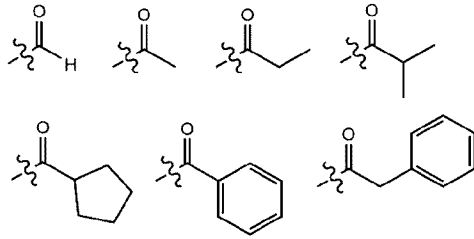
[62]

[63] 본 명세서에서 "치환 또는 비치환된"이라는 용어는 중수소; 할로젠기; 니트릴기; 니트로기; 히드록시기; 카보닐기; 에스테르기; 이미드기; 아미노기; 포스핀옥사이드기; 알콕시기; 아릴옥시기; 알킬티옥시기; 아릴티옥시기; 알킬술폰시기; 아릴술폰시기; 실릴기; 붕소기; 알킬기; 사이클로알킬기; 알케닐기; 아릴기; 아르알킬기; 아르알케닐기; 알킬아릴기; 알킬아민기; 아랄킬아민기; 헤테로아릴아민기; 아릴아민기; 아릴포스핀기; 또는 N, O 및 S 원자 중 1개 이상을 포함하는 헤테로고리기로 이루어진 군에서 선택된 1개 이상의 치환기로 치환 또는 비치환되거나, 상기 예시된 치환기 중 2 이상의 치환기가 연결된 치환 또는 비치환된 것을 의미한다. 예컨대, "2 이상의 치환기가 연결된 치환기"는 비페닐기일 수 있다. 즉, 비페닐기는 아릴기일 수도 있고, 2개의 페닐기가 연결된 치환기로 해석될 수 있다.

[64]

[65] 본 명세서에서 카보닐기의 탄소수는 특별히 한정되지 않으나, 탄소수 1 내지 40인 것이 바람직하다. 구체적으로 하기와 같은 구조의 화합물이 될 수 있으나, 이에 한정되는 것은 아니다.

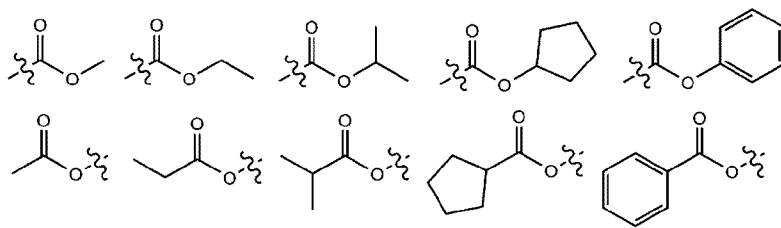
[66]



[67]

[68] 본 명세서에 있어서, 에스테르기는 에스테르기의 산소가 탄소수 1 내지 25의 직쇄, 분지쇄 또는 고리쇄 알킬기 또는 탄소수 6 내지 25의 아릴기로 치환될 수 있다. 구체적으로, 하기 구조식의 화합물이 될 수 있으나, 이에 한정되는 것은 아니다.

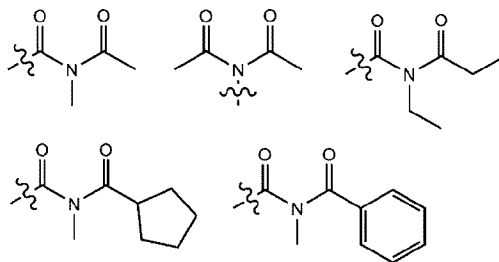
[69]



[70]

[71] 본 명세서에 있어서, 이미드기의 탄소수는 특별히 한정되지 않으나, 탄소수 1 내지 25인 것이 바람직하다. 구체적으로 하기와 같은 구조의 화합물이 될 수 있으나, 이에 한정되는 것은 아니다.

[72]



[73]

[74] 본 명세서에 있어서, 실릴기는 구체적으로 트리메틸실릴기, 트리에틸실릴기, t-부틸디메틸실릴기, 비닐디메틸실릴기, 프로필디메틸실릴기, 트리페닐실릴기, 디페닐실릴기, 페닐실릴기 등이 있으나 이에 한정되지 않는다.

[75]

[76] 본 명세서에 있어서, 붕소기는 구체적으로 트리메틸붕소기, 트리에틸붕소기, t-부틸디메틸붕소기, 트리페닐붕소기, 페닐붕소기 등이 있으나 이에 한정되지 않는다.

[77]

[78] 본 명세서에 있어서, 할로젠기의 예로는 불소, 염소, 브롬 또는 요오드가 있다.

[79]

[80] 본 명세서에 있어서, 상기 알킬기는 직쇄 또는 분지쇄일 수 있고, 탄소수는

특별히 한정되지 않으나 1 내지 40인 것이 바람직하다. 일 실시상태에 따르면, 상기 알킬기의 탄소수는 1 내지 20이다. 또 하나의 실시상태에 따르면, 상기 알킬기의 탄소수는 1 내지 10이다. 또 하나의 실시상태에 따르면, 상기 알킬기의 탄소수는 1 내지 6이다. 알킬기의 구체적인 예로는 메틸, 에틸, 프로필, n-프로필, 이소프로필, 부틸, n-부틸, 이소부틸, tert-부틸, sec-부틸, 1-메틸-부틸, 1-에틸-부틸, 펜틸, n-펜틸, 이소펜틸, 네오펜틸, tert-펜틸, 헥실, n-헥실, 1-메틸펜틸, 2-메틸펜틸, 4-메틸-2-펜틸, 3,3-디메틸부틸, 2-에틸부틸, 헵틸, n-헵틸, 1-메틸헥실, 사이클로펜틸메틸, 사이클로헥틸메틸, 옥틸, n-옥틸, tert-옥틸, 1-메틸헵틸, 2-에틸헥실, 2-프로필펜틸, n-노닐, 2,2-디메틸헵틸, 1-에틸-프로필, 1,1-디메틸-프로필, 이소헥실, 2-메틸펜틸, 4-메틸헥실, 5-메틸헥실 등이 있으나, 이들에 한정되지 않는다.

[81]

[82] 본 명세서에 있어서, 상기 알케닐기는 직쇄 또는 분지쇄일 수 있고, 탄소수는 특별히 한정되지 않으나, 2 내지 40인 것이 바람직하다. 일 실시상태에 따르면, 상기 알케닐기의 탄소수는 2 내지 20이다. 또 하나의 실시상태에 따르면, 상기 알케닐기의 탄소수는 2 내지 10이다. 또 하나의 실시상태에 따르면, 상기 알케닐기의 탄소수는 2 내지 6이다. 구체적인 예로는 비닐, 1-프로페닐, 이소프로페닐, 1-부테닐, 2-부테닐, 3-부테닐, 1-펜테닐, 2-펜테닐, 3-펜테닐, 3-메틸-1-부테닐, 1,3-부타디에닐, 아릴, 1-페닐비닐-1-일, 2-페닐비닐-1-일, 2,2-디페닐비닐-1-일, 2-페닐-2-(나프틸-1-일)비닐-1-일, 2,2-비스(디페닐-1-일)비닐-1-일, 스틸베닐기, 스티레닐기 등이 있으나 이들에 한정되지 않는다.

[83]

[84] 본 명세서에 있어서, 사이클로알킬기는 특별히 한정되지 않으나, 탄소수 3 내지 60인 것이 바람직하며, 일 실시상태에 따르면, 상기 사이클로알킬기의 탄소수는 3 내지 30이다. 또 하나의 실시상태에 따르면, 상기 사이클로알킬기의 탄소수는 3 내지 20이다. 또 하나의 실시상태에 따르면, 상기 사이클로알킬기의 탄소수는 3 내지 6이다. 구체적으로 사이클로프로필, 사이클로부틸, 사이클로펜틸, 3-메틸사이클로펜틸, 2,3-디메틸사이클로펜틸, 사이클로헥실, 3-메틸사이클로헥실, 4-메틸사이클로헥실, 2,3-디메틸사이클로헥실, 3,4,5-트리메틸사이클로헥실, 4-tert-부틸사이클로헥실, 사이클로헵틸, 사이클로옥틸 등이 있으나, 이에 한정되지 않는다.

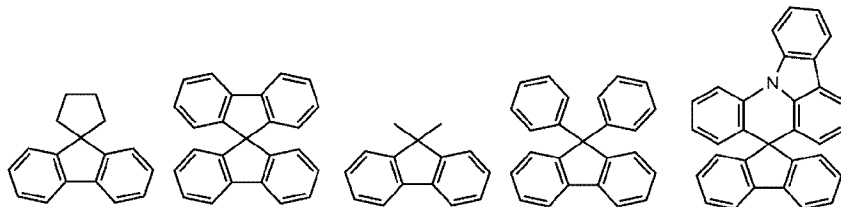
[85]

[86] 본 명세서에 있어서, 아릴기는 특별히 한정되지 않으나 탄소수 6 내지 60인 것이 바람직하며, 단환식 아릴기 또는 다환식 아릴기일 수 있다. 일 실시상태에 따르면, 상기 아릴기의 탄소수는 6 내지 30이다. 일 실시상태에 따르면, 상기 아릴기의 탄소수는 6 내지 20이다. 상기 아릴기가 단환식 아릴기로는 페닐기, 바이페닐기, 터페닐기 등이 될 수 있으나, 이에 한정되는 것은 아니다. 상기

다환식 아릴기로는 나프틸기, 안트라세닐기, 페난트릴기, 파이레닐기, 페릴레닐기, 크라이세닐기, 플루오레닐기 등이 될 수 있으나, 이에 한정되는 것은 아니다.

[87]

[88] 본 명세서에 있어서, 플루오레닐기는 치환될 수 있고, 치환기 2개가 서로 결합하여 스피로 구조를 형성할 수 있다. 상기 플루오레닐기가 치환되는 경우, 등이 될 수 있다.



다만, 이에 한정되는 것은 아니다.

[89]

[90] 본 명세서에 있어서, 헤테로고리기는 이종 원소로 O, N, Si 및 S 중 1개 이상을 포함하는 헤테로고리기로서, 탄소수는 특별히 한정되지 않으나, 탄소수 2 내지 60인 것이 바람직하다. 헤테로고리기의 예로는 티오펜기, 퓨란기, 피롤기, 이미다졸기, 티아졸기, 옥사졸기, 옥사디아졸기, 트리아졸기, 피리딜기, 비피리딜기, 피리미딜기, 트리아진기, 트리아졸기, 아크리딜기, 피리다진기, 피라지닐기, 퀴놀리닐기, 퀴나졸린기, 퀴녹살리닐기, 프탈라지닐기, 피리도 피리미디닐기, 피리도 피라지닐기, 피라지노 피라지닐기, 이소퀴놀린기, 인돌기, 카바졸기, 벤조옥사졸기, 벤조이미다졸기, 벤조티아졸기, 벤조카바졸기, 벤조티오펜기, 디벤조티오펜기, 벤조퓨라닐기, 페난쓰롤린기(phenanthroline), 티아졸릴기, 이소옥사졸릴기, 옥사디아졸릴기, 티아디아졸릴기, 벤조티아졸릴기, 페노티아지닐기 및 디벤조퓨라닐기 등이 있으나, 이들에만 한정되는 것은 아니다.

[91]

[92] 본 명세서에 있어서, 아르알킬기, 아르알케닐기, 알킬아릴기, 아릴아민기 중의 아릴기는 전술한 아릴기의 예시와 같다. 본 명세서에 있어서, 아르알킬기, 알킬아릴기, 알킬아민기 중 알킬기는 전술한 알킬기의 예시와 같다. 본 명세서에 있어서, 헤테로아릴아민 중 헤테로아릴은 전술한 헤테로고리기에 관한 설명이 적용될 수 있다. 본 명세서에 있어서, 아르알케닐기 중 알케닐기는 전술한 알케닐기의 예시와 같다. 본 명세서에 있어서, 아릴렌은 2가기인 것을 제외하고는 전술한 아릴기에 관한 설명이 적용될 수 있다. 본 명세서에 있어서, 헤테로아릴렌은 2가기인 것을 제외하고는 전술한 헤테로고리기에 관한 설명이 적용될 수 있다. 본 명세서에 있어서, 탄화수소 고리는 1가기가 아니고, 2개의 치환기가 결합하여 형성한 것을 제외하고는 전술한 아릴기 또는 사이클로알킬기에 관한 설명이 적용될 수 있다. 본 명세서에 있어서, 헤테로고리는 1가기가 아니고, 2개의 치환기가 결합하여 형성한 것을

제외하고는 전술한 헤테로고리기에 관한 설명이 적용될 수 있다.

[93]

[94] 이하, 각 구성 별로 본 발명을 상세히 설명한다.

[95]

[96] 양극 및 음극

[97] 본 발명에서 사용되는 양극 및 음극은, 유기 발광 소자에서 사용되는 전극을 의미한다.

[98]

[99] 상기 양극 물질로는 통상 유기물 층으로 정공 주입이 원활할 수 있도록 일함수가 큰 물질이 바람직하다. 상기 양극 물질의 구체적인 예로는 바나듐, 크롬, 구리, 아연, 금과 같은 금속 또는 이들의 합금; 아연 산화물, 인듐 산화물, 인듐주석 산화물(ITO), 인듐아연 산화물(IZO)과 같은 금속 산화물; ZnO:Al 또는 SNO₂:Sb와 같은 금속과 산화물의 조합; 폴리(3-메틸티오펜), 폴리[3,4-(에틸렌-1,2-디옥시)티오펜](PEDOT), 폴리피롤 및 폴리아닐린과 같은 전도성 고분자 등이 있으나, 이들에만 한정되는 것은 아니다.

[100]

[101] 상기 음극 물질로는 통상 유기물 층으로 전자 주입이 용이하도록 일함수가 작은 물질인 것이 바람직하다. 상기 음극 물질의 구체적인 예로는 마그네슘, 칼슘, 나트륨, 칼륨, 티타늄, 인듐, 이트륨, 리튬, 가돌리늄, 알루미늄, 은, 주석 및 납과 같은 금속 또는 이들의 합금; LiF/Al 또는 LiO₂/Al과 같은 다층 구조 물질 등이 있으나, 이들에만 한정되는 것은 아니다.

[102]

[103] 발광층

[104] 본 발명에서 사용되는 발광층은, 양극과 음극으로부터 전달받은 정공과 전자를 결합시킴으로써 가시광선 영역의 빛을 낼 수 있는 층을 의미한다. 일반적으로, 발광층은 호스트 재료와 도펀트 재료를 포함한다.

[105]

[106] 상기 호스트 재료는 축합 방향족화 유도체 또는 헤테로환 함유 화합물 등을 더 포함할 수 있다. 본 발명에서는 상기 호스트 재료로서 하기 화학식 1로 표시되는 화합물, 하기 화학식 2로 표시되는 화합물, 및 하기 화학식 3으로 표시되는 화합물을 혼합하여 사용한다.

[107]

[108] 구체적으로, 피리딘, 피리미딘, 또는 트리아진이 링커를 매개로 디벤조퓨란 또는 디벤조티오펜과 결합된 화학식 1; 비스카바졸 계열의 화학식 2; 그리고, 인돌로카바졸 계열의 화학식 3을 포함하는 호스트 재료는, 발광층의 Green Host로 적용 가능하다.

[109]

[110] 나아가, 상기 3종의 화합물을 발광층의 호스트 재료로 적용한 유기 발광

소자는, 상기 3종과 전혀 다른 3종의 화합물들을 혼합하여 호스트 재료로 사용하는 경우(호스트 3종 적용)는 물론, 상기 3종의 화합물 중 어느 하나 또는 두 개의 화합물을 다른 화합물로 변경한 경우(호스트 3종 적용), 상기 3종의 화합물 중 어느 하나 또는 두 개의 화합물만 발광층의 호스트 재료로 사용하는 경우(호스트 1종 또는 2종 적용) 등에 대비하여, 구동 전압이 개선되고(저전압), 고효율 및 장수명의 특성을 발현할 수 있다.

[111]

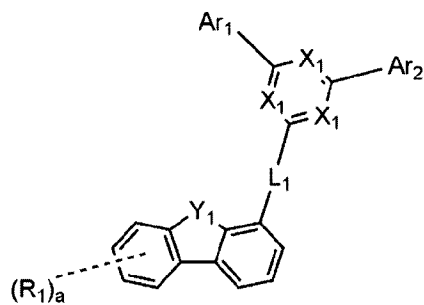
[112] 이하, 상기 3종의 화합물을 상세히 설명한다.

[113]

[114] 상기 화학식 1은 하기 화학식 1-1 내지 1-4 중 어느 하나일 수 있다:

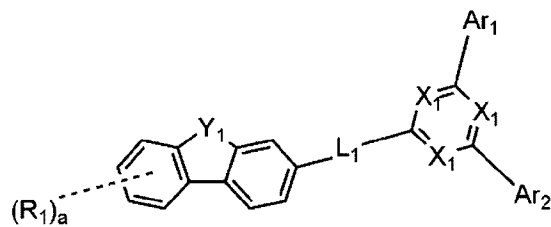
[115] [화학식 1-1]

[116]



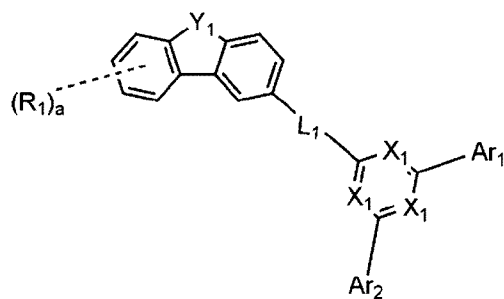
[117] [화학식 1-2]

[118]



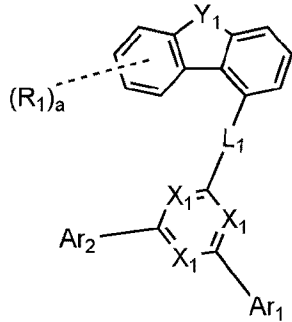
[119] [화학식 1-3]

[120]



[121] [화학식 1-4]

[122]



[123] 상기 화학식 1-1 내지 1-4에서, Y_1 , X_1 , L_1 , Ar_1 , Ar_2 , R_1 , 및 a 의 정의는 전술한 바와 같다.

[124]

[125] Y_1 은 O 또는 S이다.

[126]

[127] X_1 는 각각 독립적으로 CH 또는 N이되, X_1 중 적어도 하나는 N이다. 예컨대, X_1 중 2개가 N이고 나머지는 CH이거나; X_1 가 모두 N일 수 있다.

[128]

[129] 상기 L_1 은 직접 결합, 치환 또는 비치환된 C_{6-30} 아릴렌, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-30} 헤테로아릴렌일 수 있다. 예컨대, L_1 은 직접 결합일 수 있다.

[130]

[131] Ar_1 및 Ar_2 는 각각 독립적으로, 치환 또는 비치환된 C_{6-30} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-30} 헤테로아릴일 수 있다. 예컨대, Ar_1 및 Ar_2 는 각각 독립적으로, Ar_1 및 Ar_2 는 각각 독립적으로, 페닐, 비페닐릴, 디벤조플라닐, 디벤조티오펜, 카바졸-9-일, 또는 (페닐)카바졸-9-일이고; 상기 Ar_1 및 Ar_2 는 각각 독립적으로, 비치환되거나, 적어도 하나 이상의 중수소로 치환된 것일 수 있다.

[132]

[133] R_1 은 수소, 중수소, 치환 또는 비치환된 C_{6-30} 알킬, 치환 또는 비치환된 C_{6-30} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-30} 헤테로아릴일 수 있다. 예컨대, R_1 은 페닐, 비페닐릴, (페닐)비페닐릴, 터페닐릴, 나프틸, 페난쓰레닐, 트리페닐레닐, 디메틸플루오레닐, 스피로비플루오레닐, 디벤조플라닐, 디벤조티오펜, 카바졸-9-일, (페닐)카바졸-9-일, (디페닐)카바졸-9-일, 9-페닐-9H-카바졸릴, 12-페닐-11,12-디히드로인돌로[2,3-a]카바졸-11-일, 또는 1,1-디메틸-1,3-디히드로인덴노[2,1-b]카바졸-3-일이고; 상기 R_1 은 비치환되거나, 적어도 하나 이상의 중수소로 치환된 것일 수 있다.

[134]

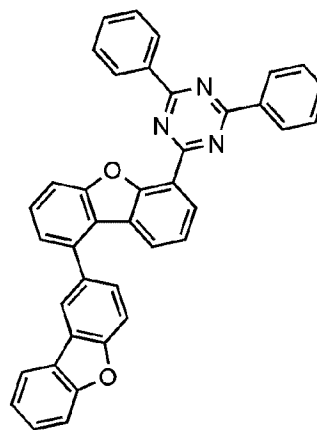
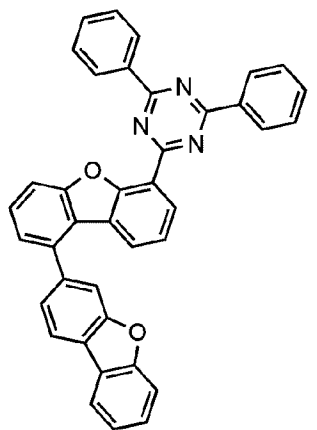
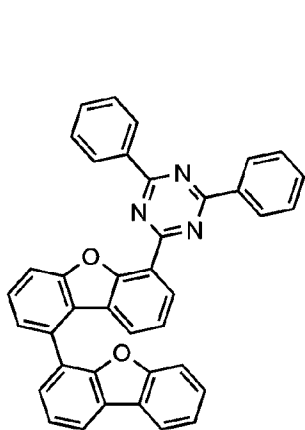
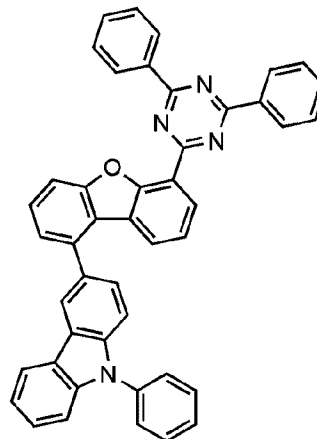
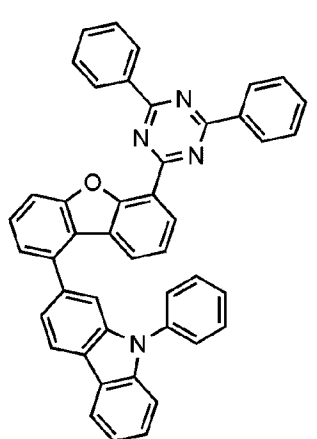
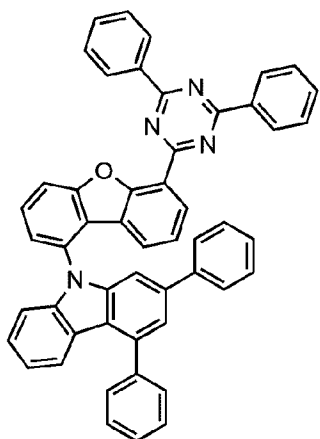
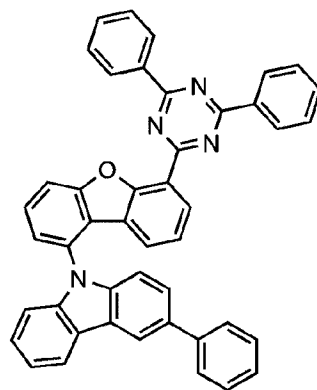
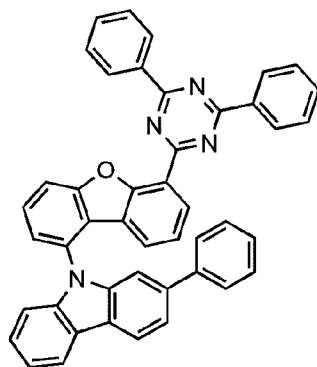
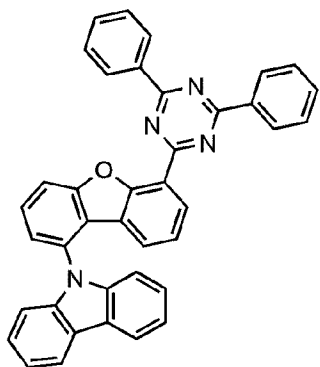
[135] a 는 1 내지 7의 정수이고, 예컨대 1일 수 있다.

[136]

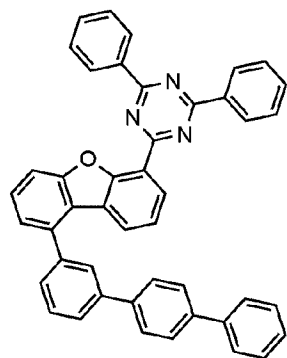
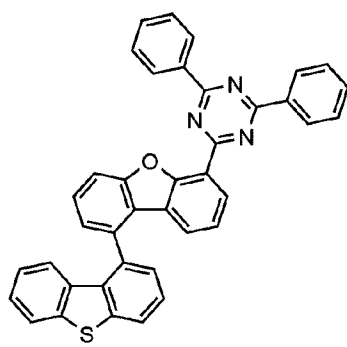
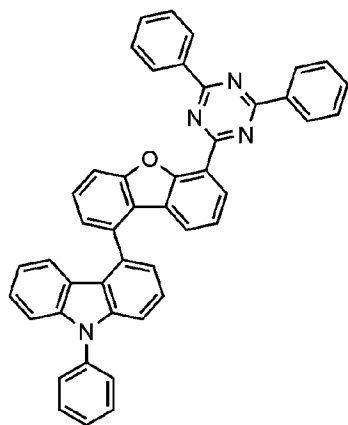
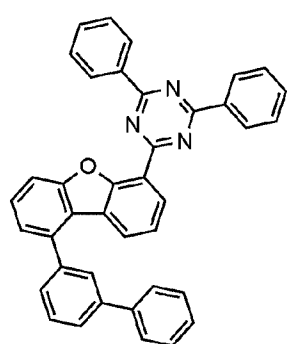
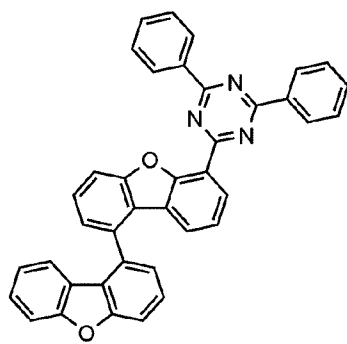
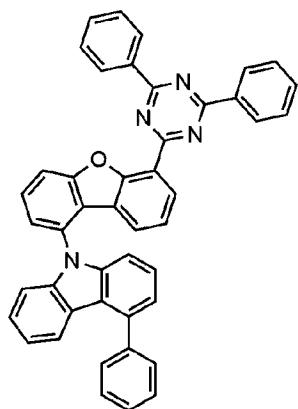
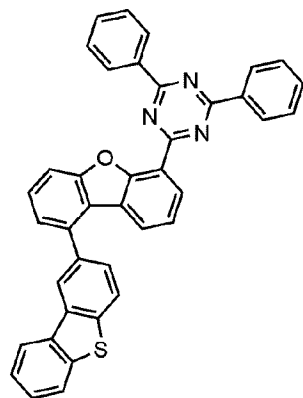
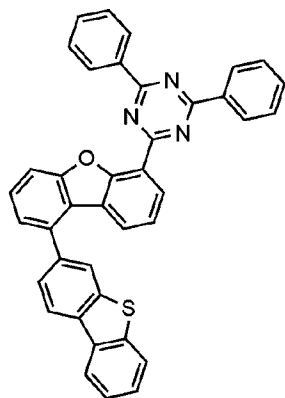
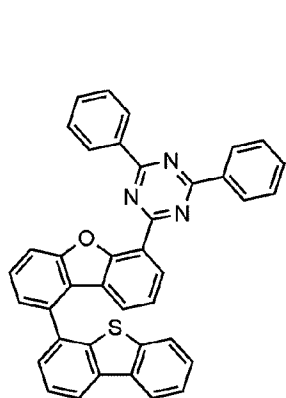
[137]

상기 화학식 1로 표시되는 화합물의 대표적인 예는 다음과 같다:

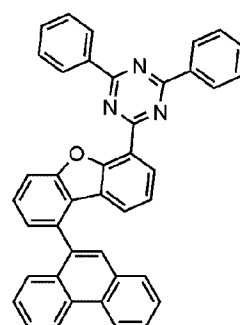
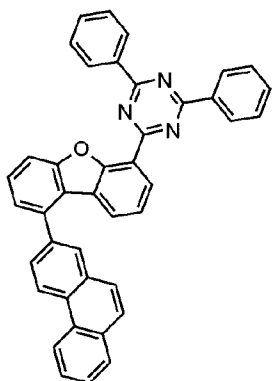
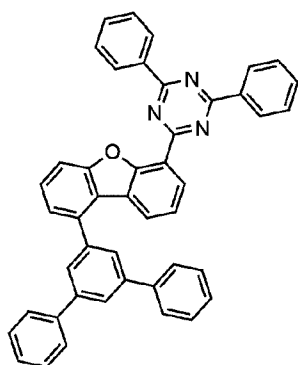
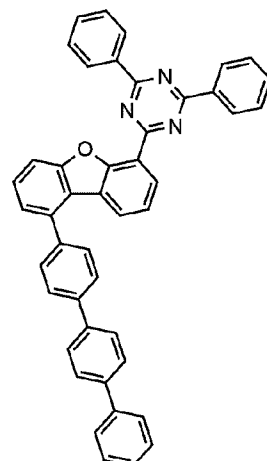
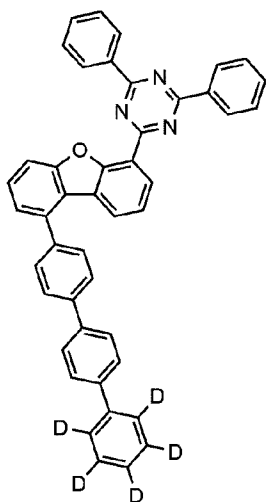
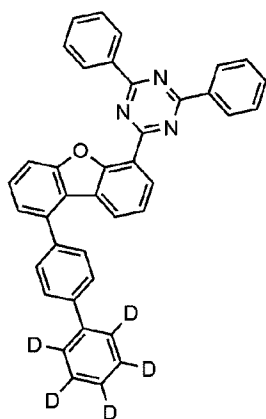
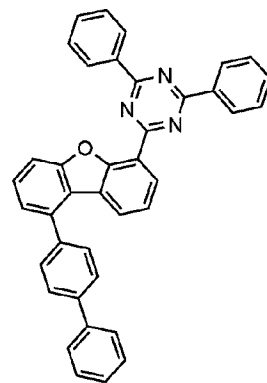
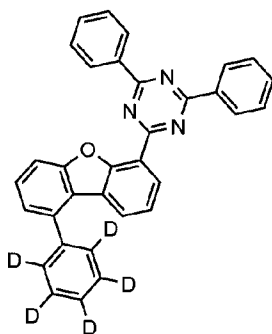
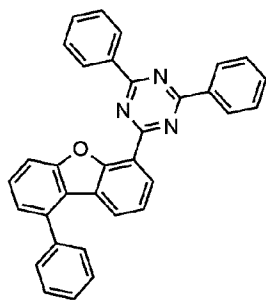
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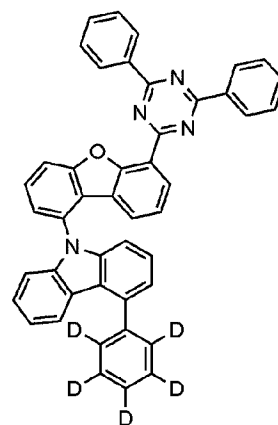
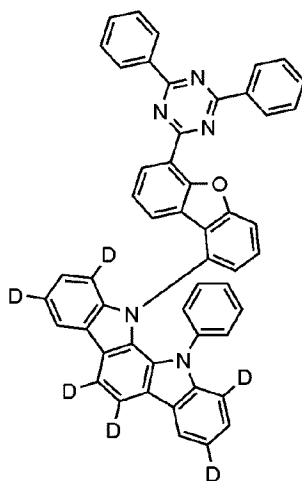
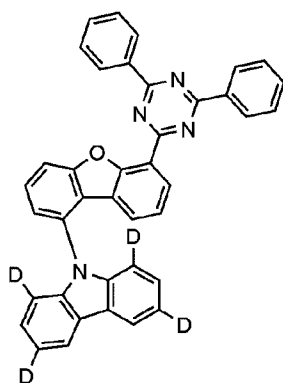
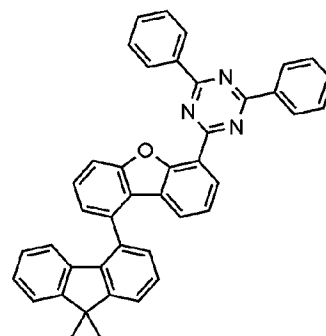
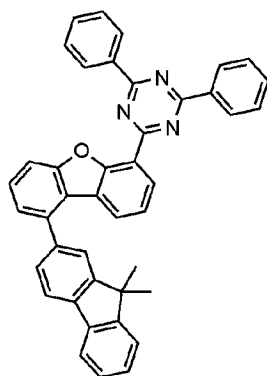
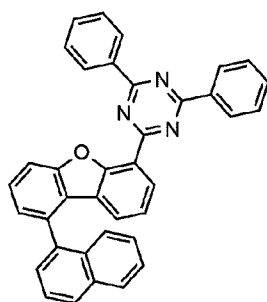
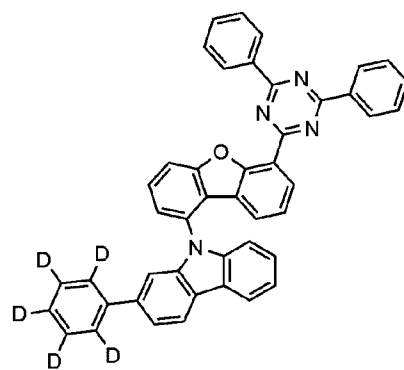
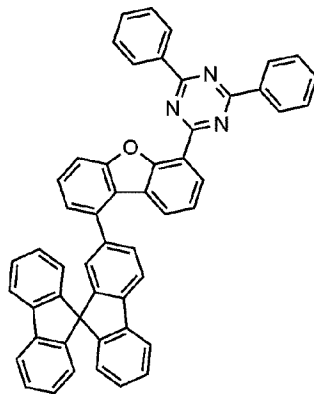
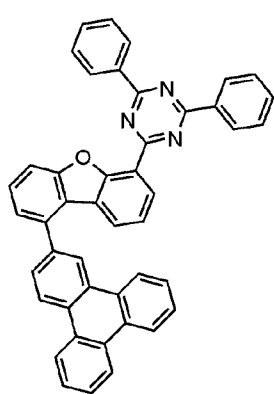
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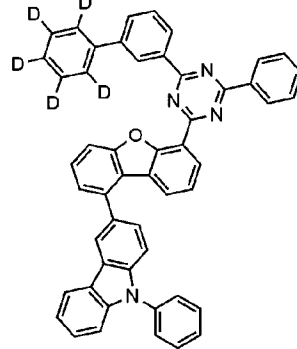
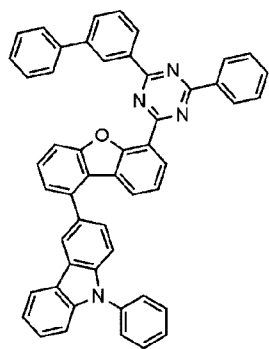
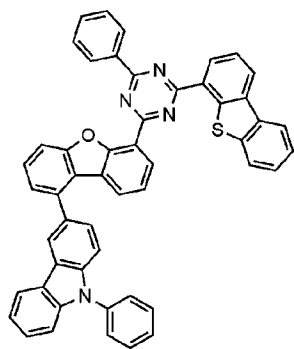
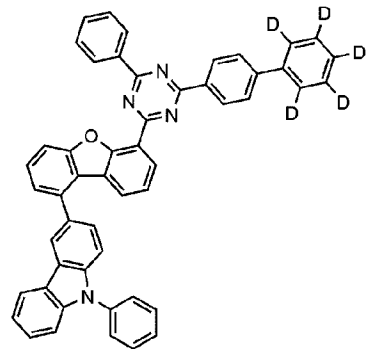
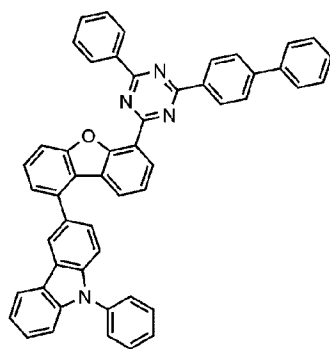
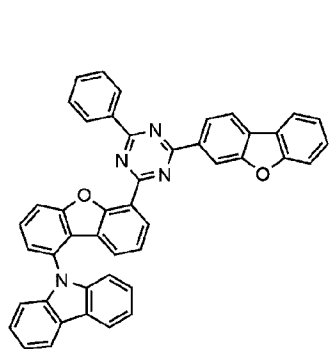
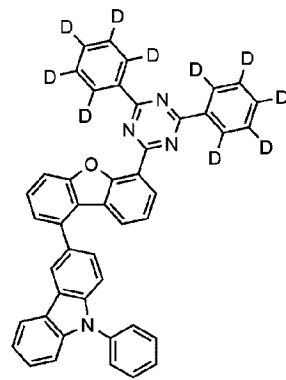
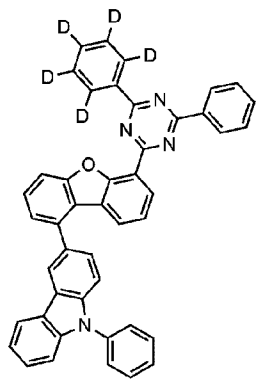
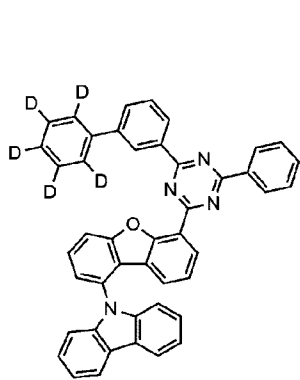
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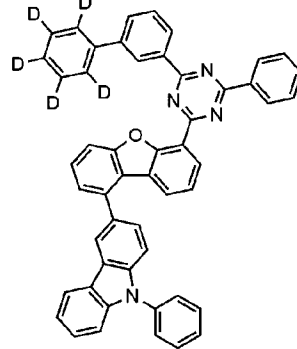
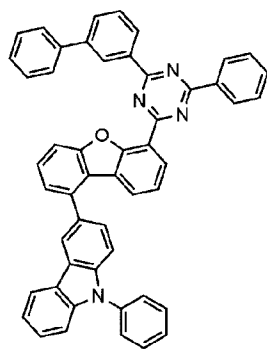
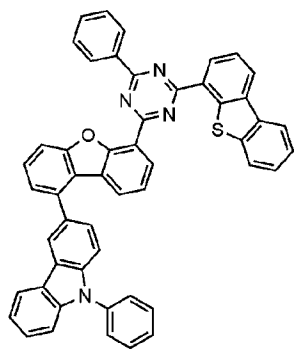
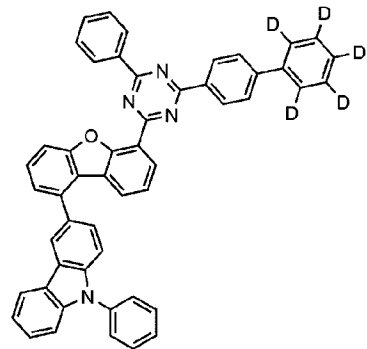
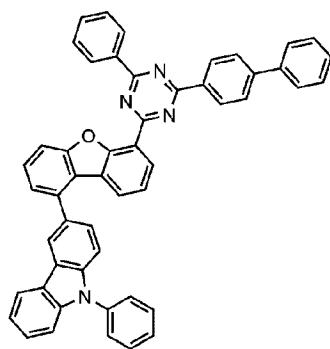
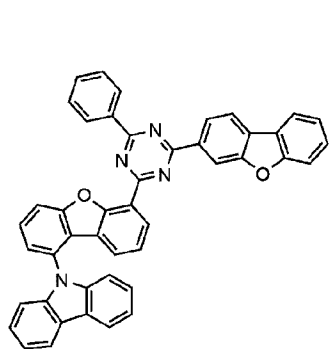
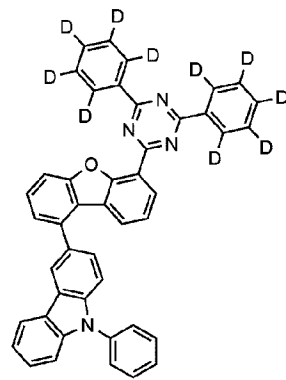
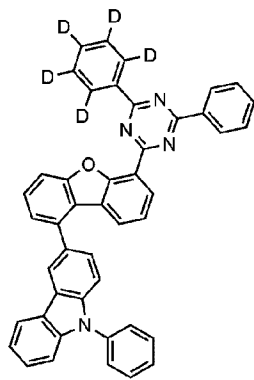
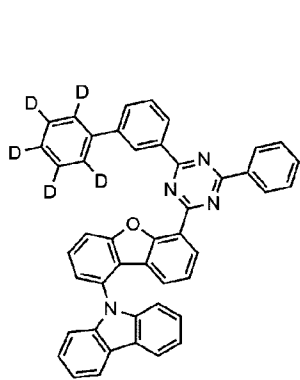
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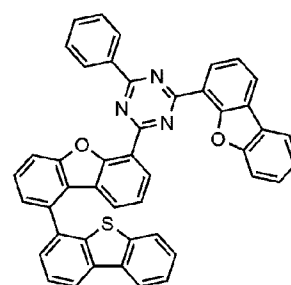
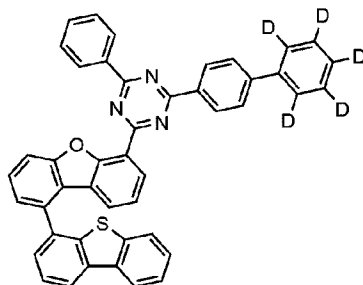
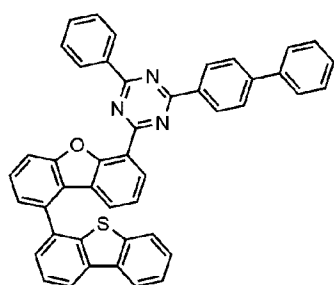
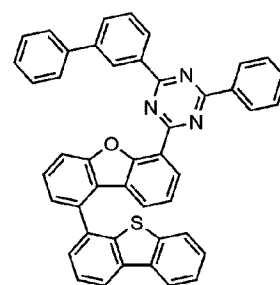
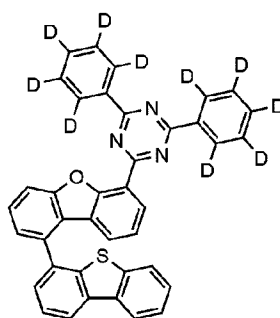
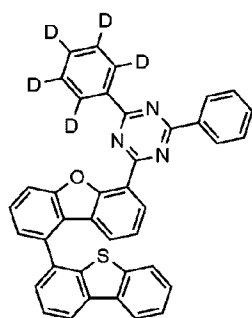
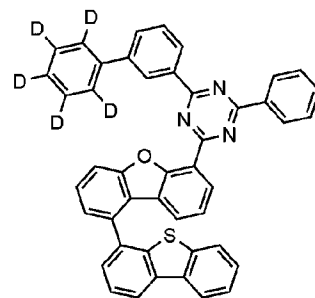
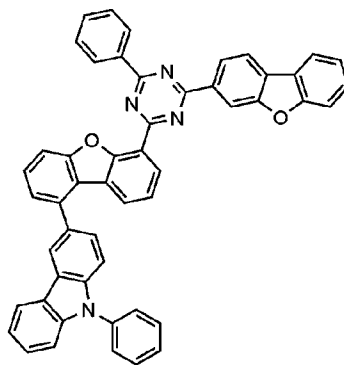
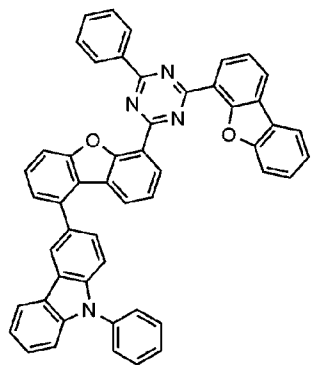
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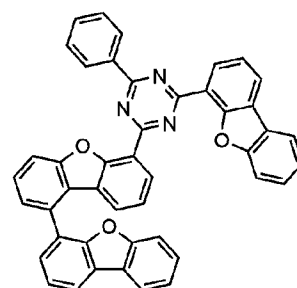
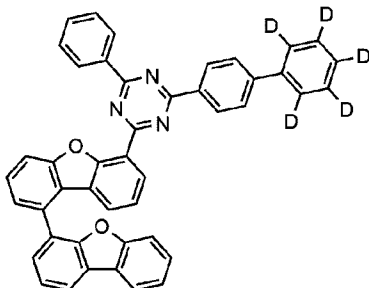
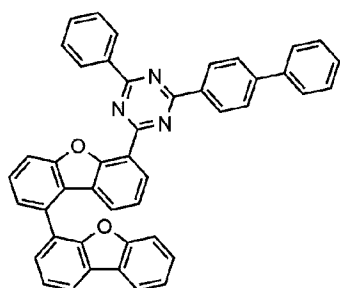
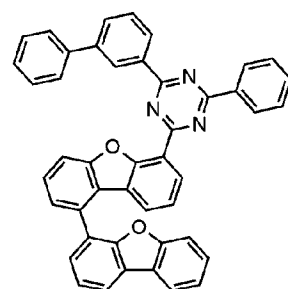
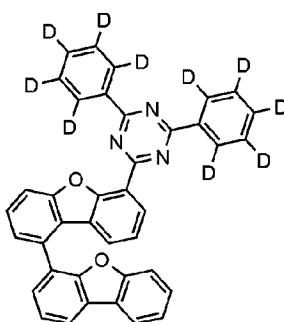
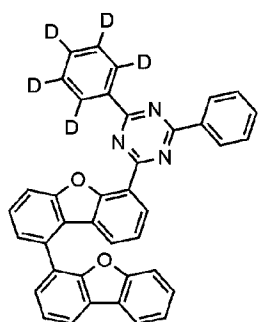
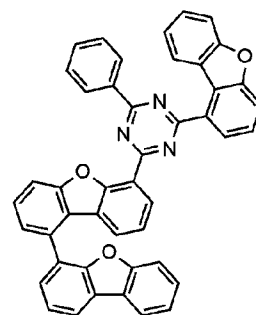
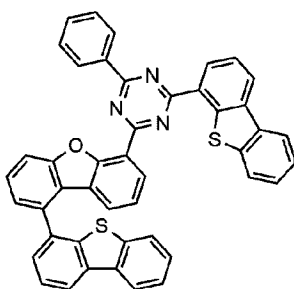
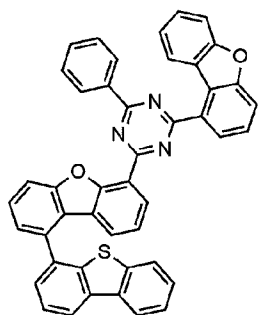
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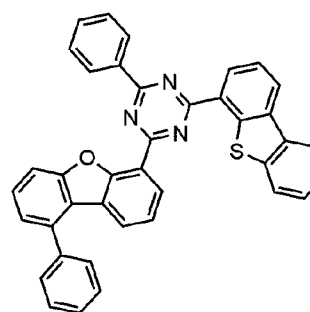
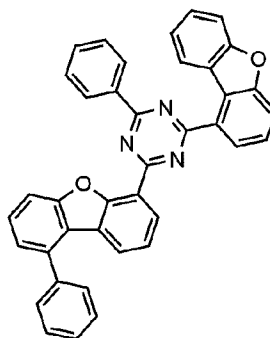
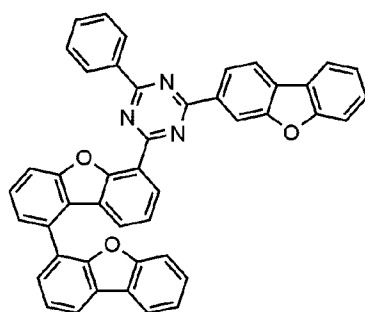
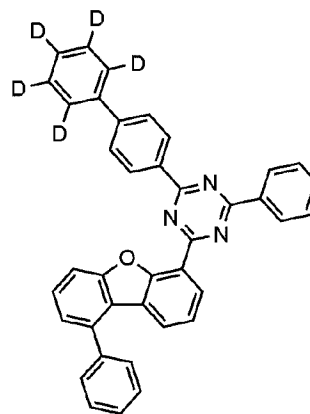
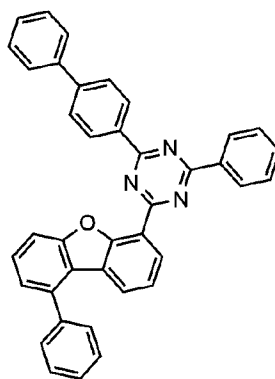
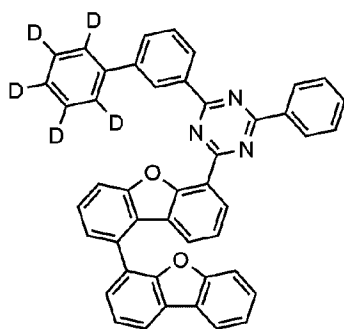
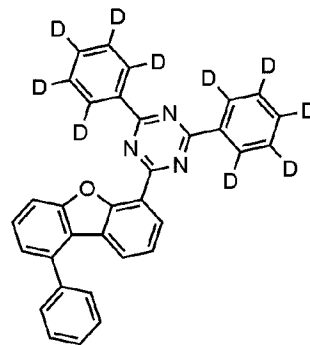
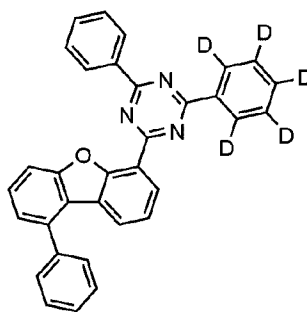
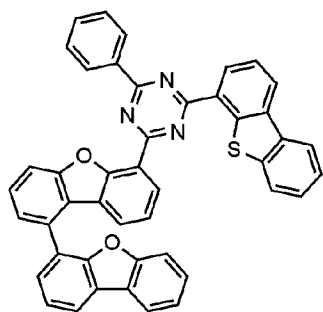
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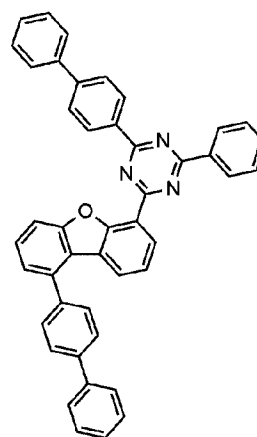
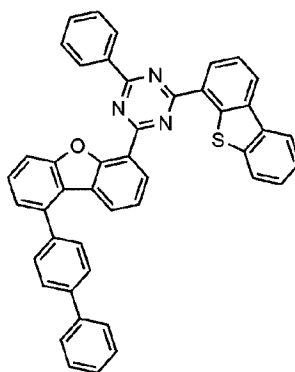
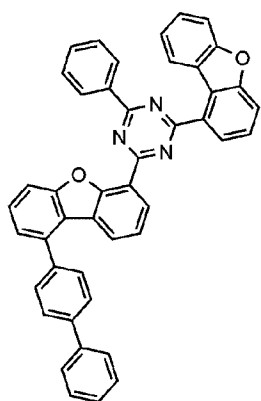
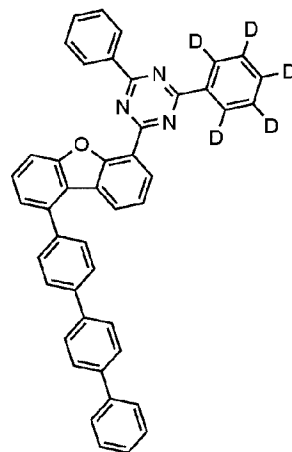
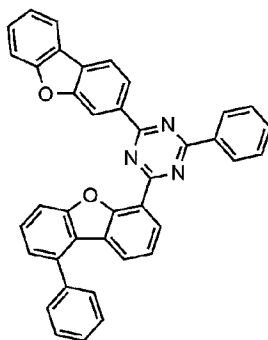
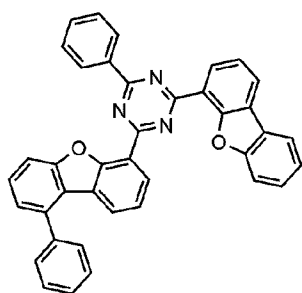
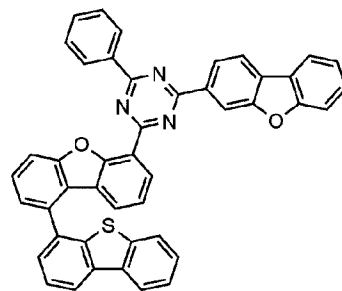
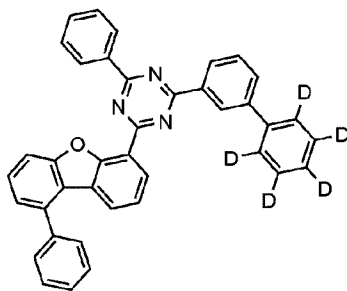
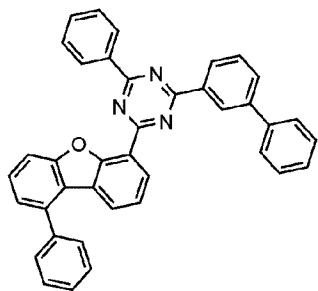
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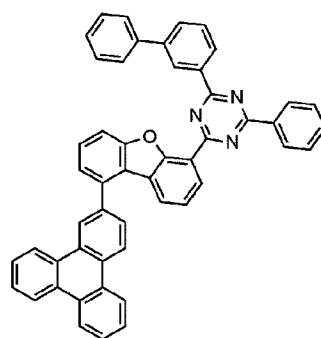
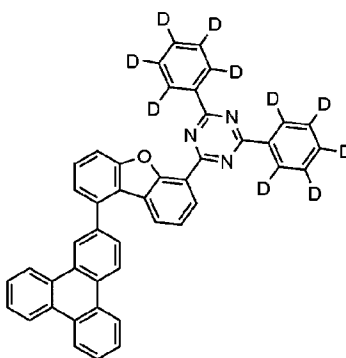
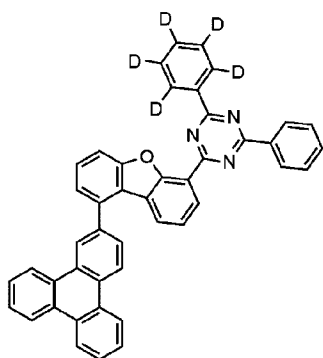
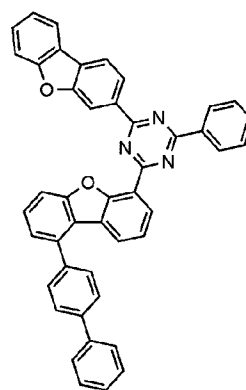
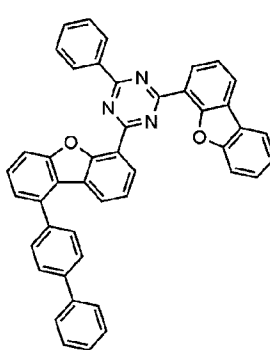
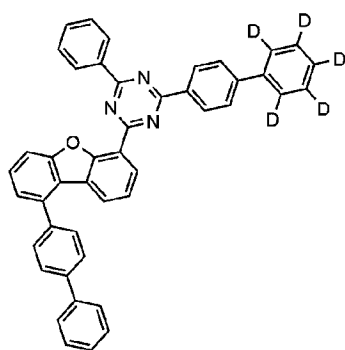
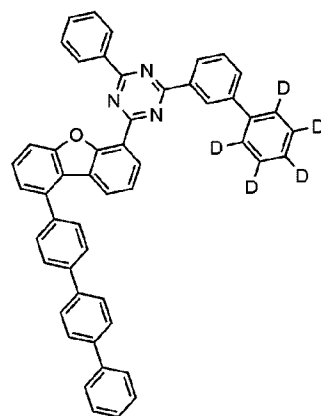
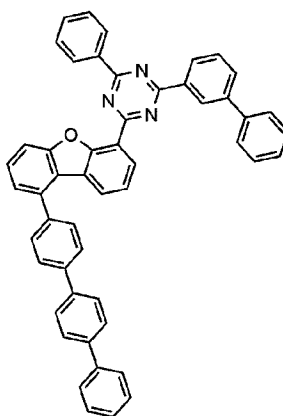
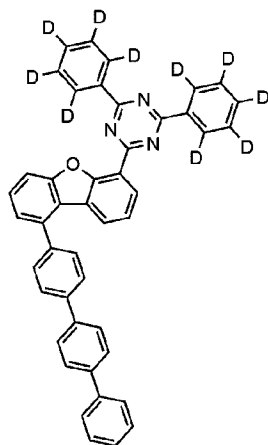
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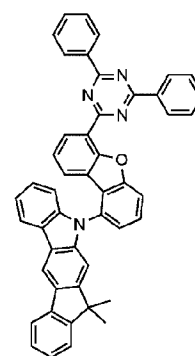
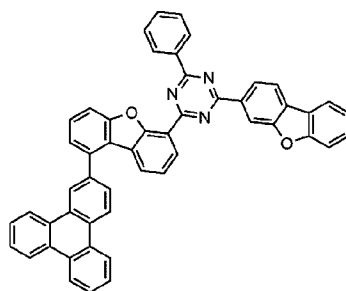
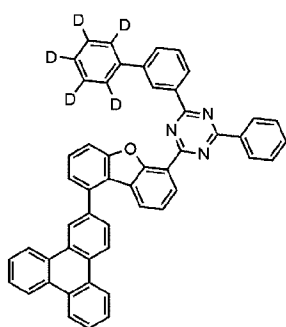
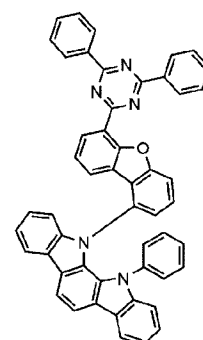
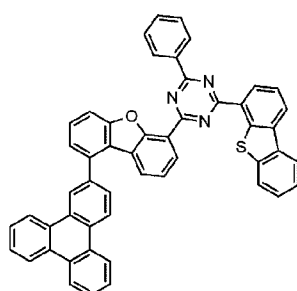
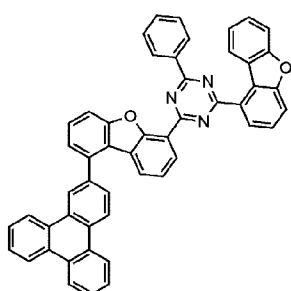
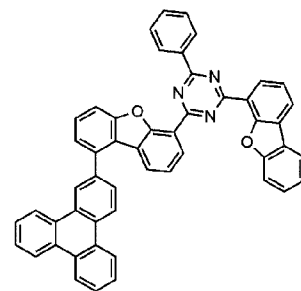
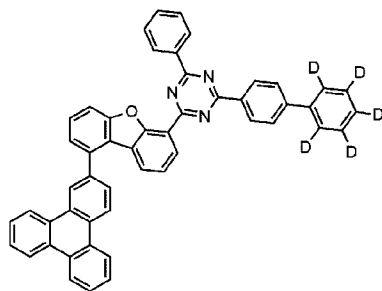
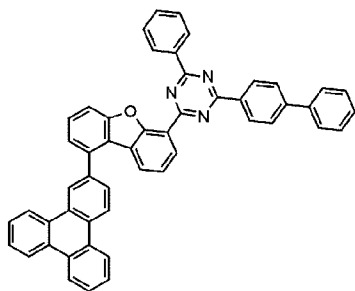
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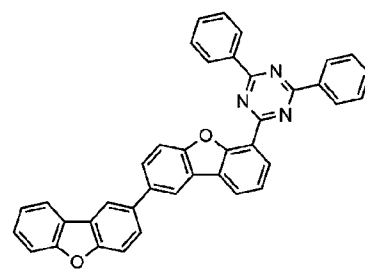
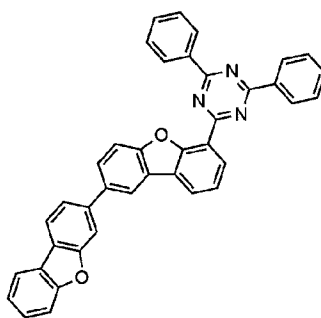
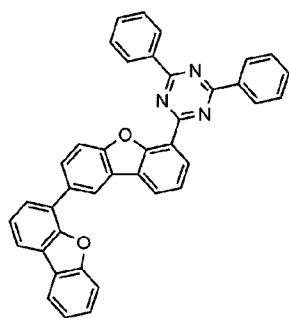
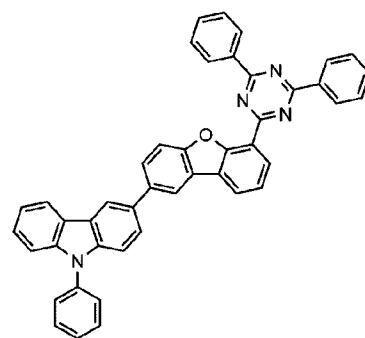
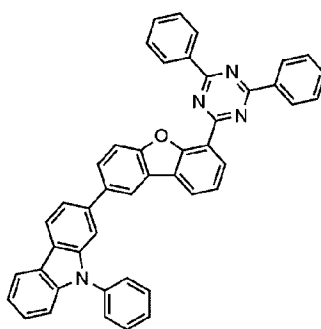
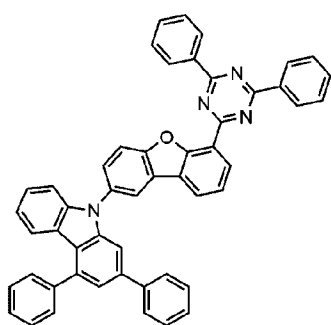
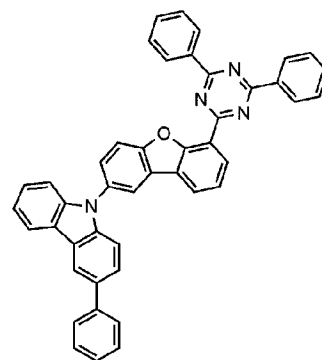
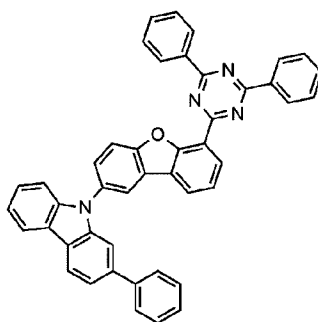
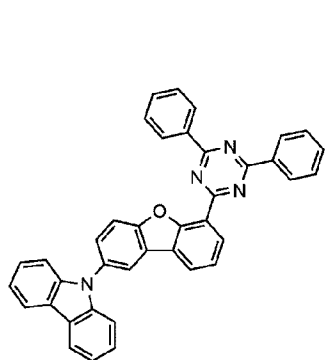
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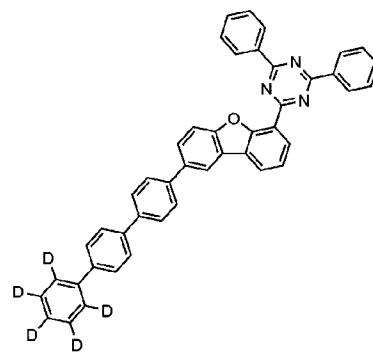
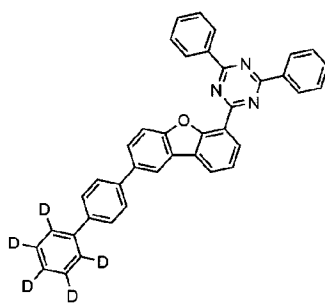
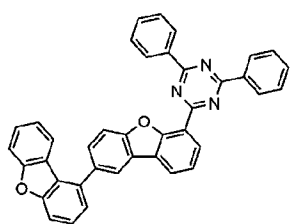
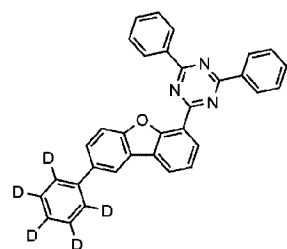
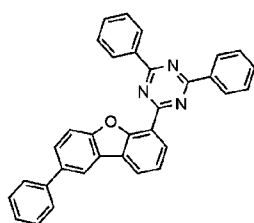
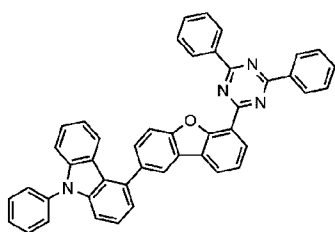
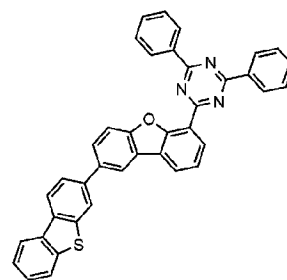
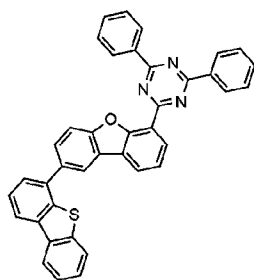
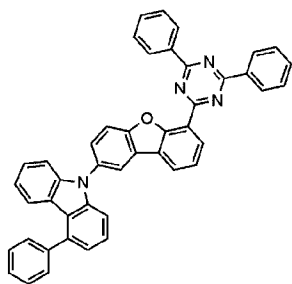
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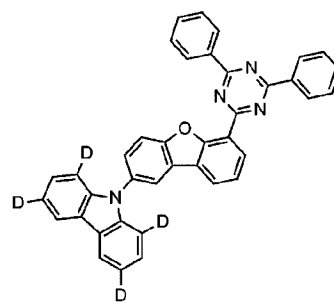
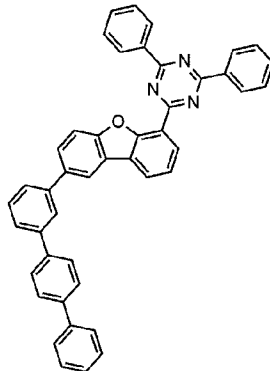
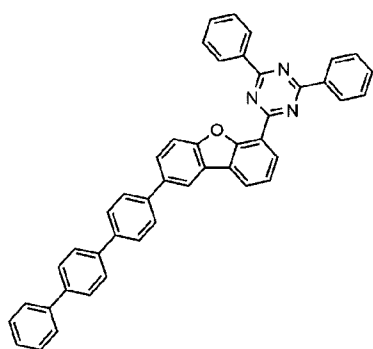
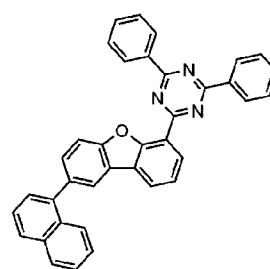
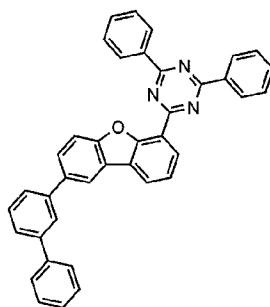
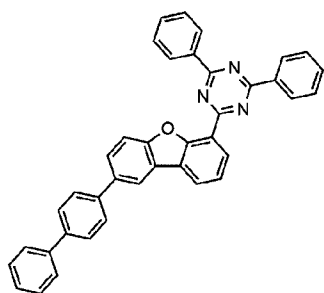
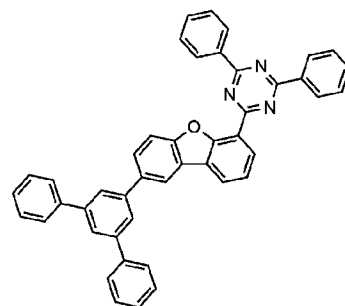
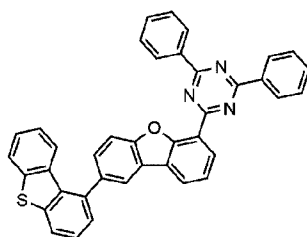
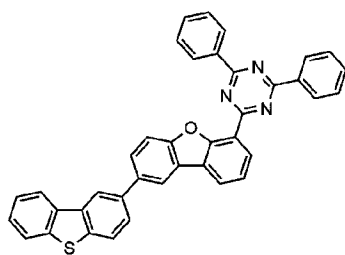
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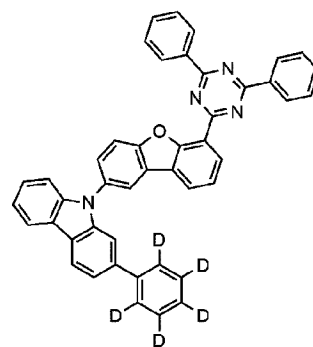
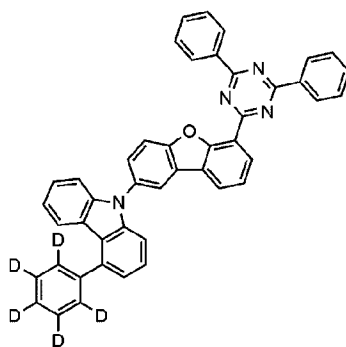
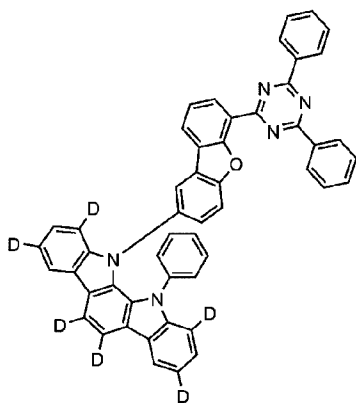
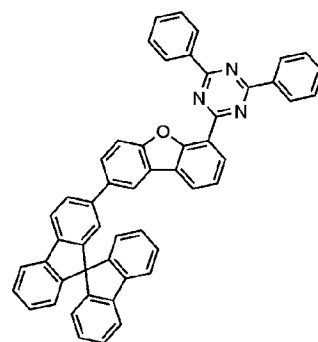
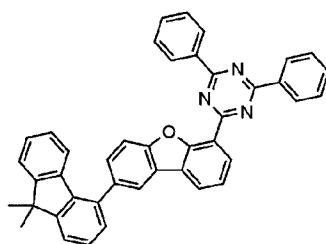
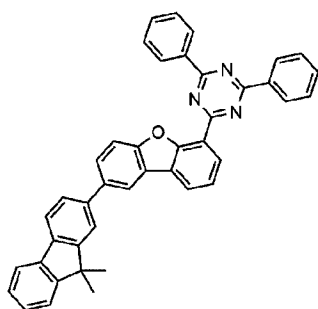
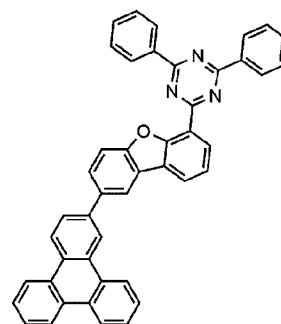
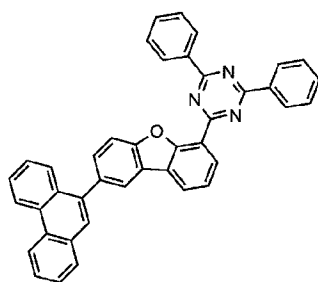
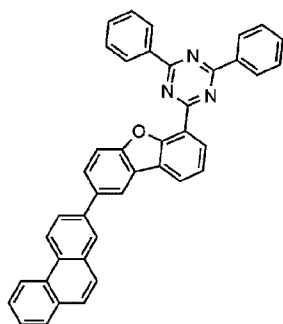
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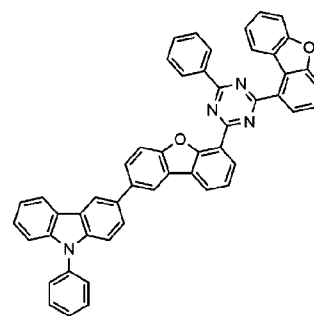
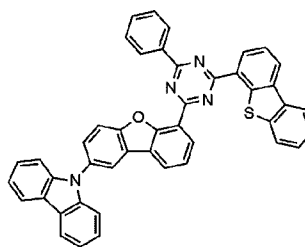
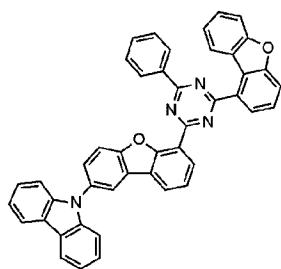
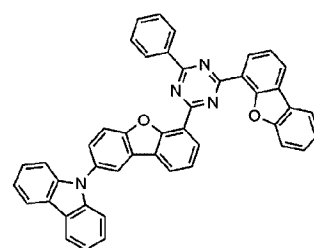
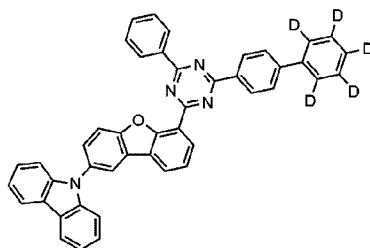
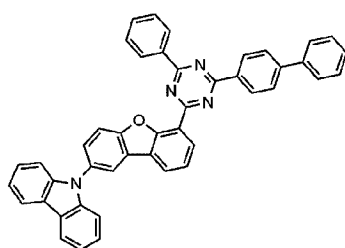
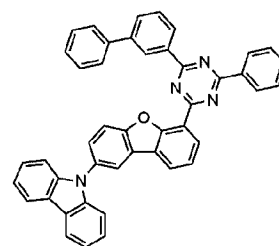
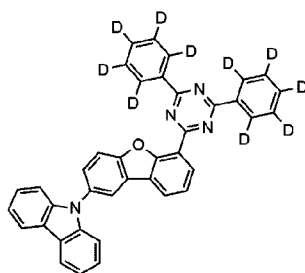
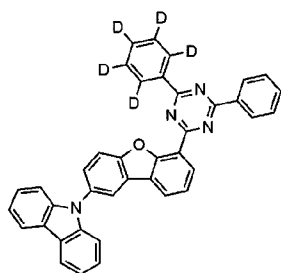
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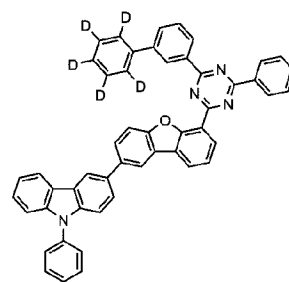
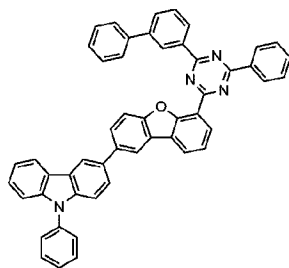
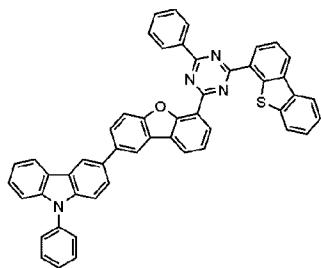
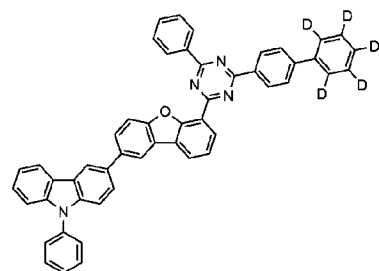
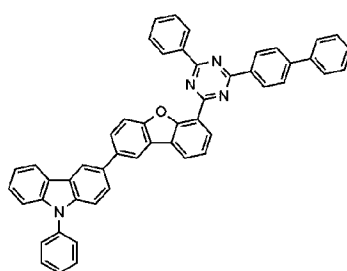
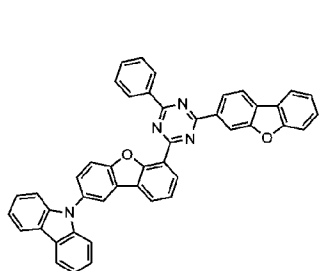
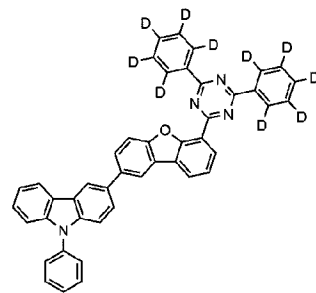
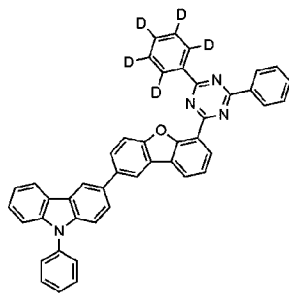
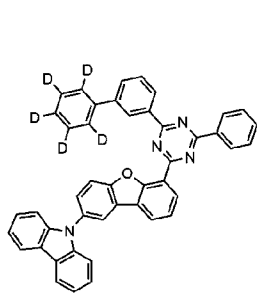
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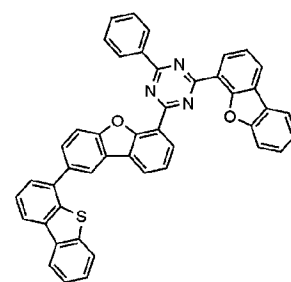
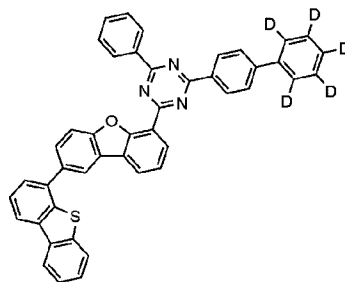
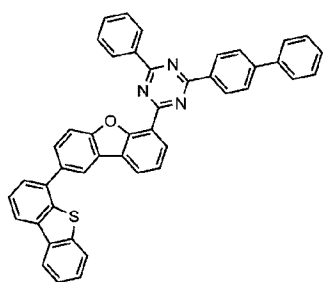
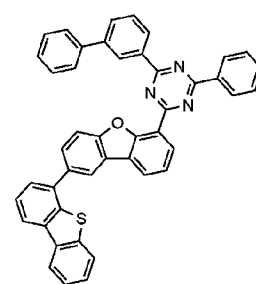
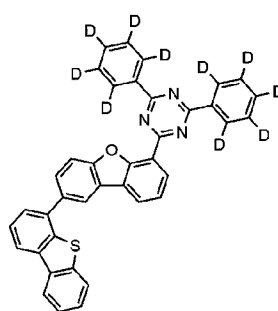
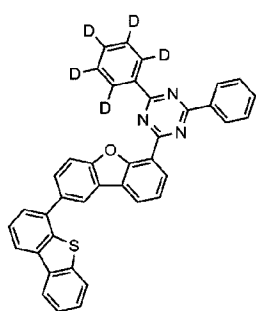
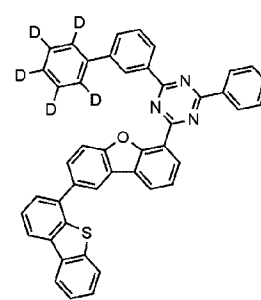
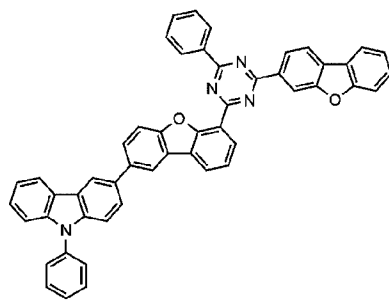
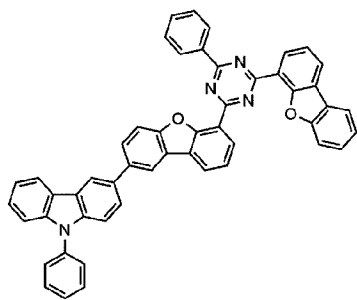
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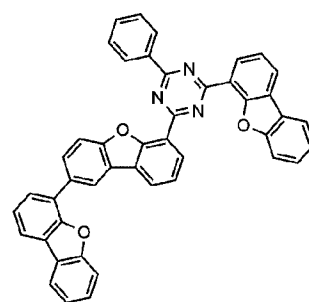
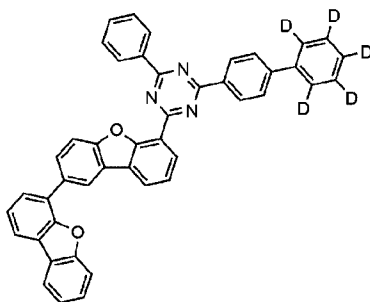
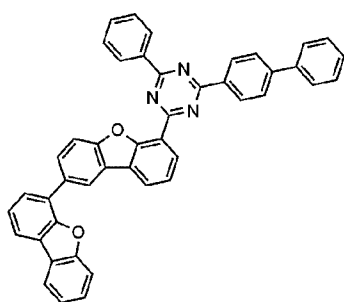
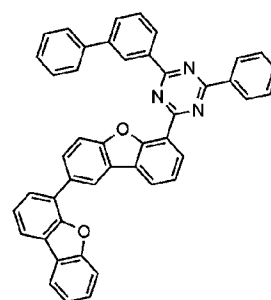
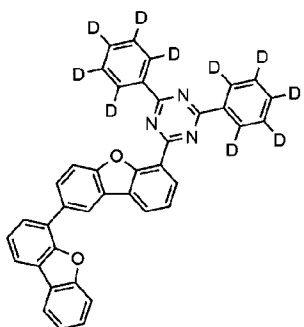
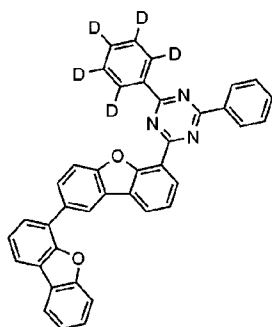
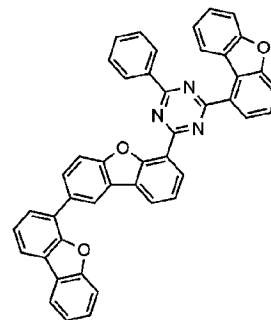
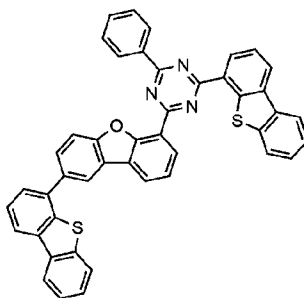
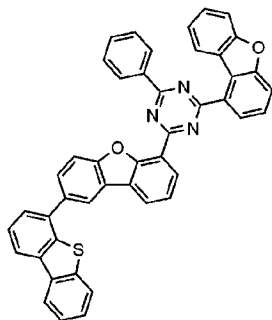
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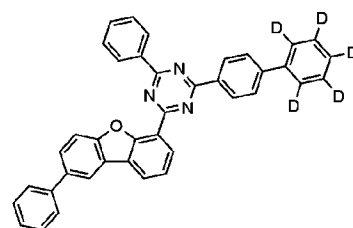
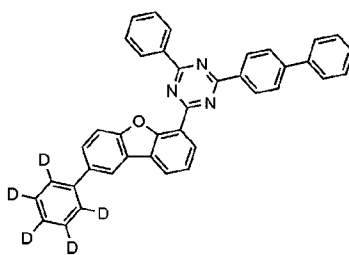
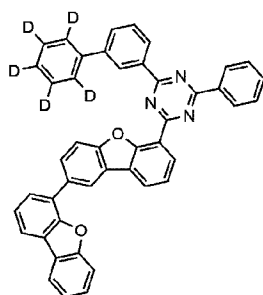
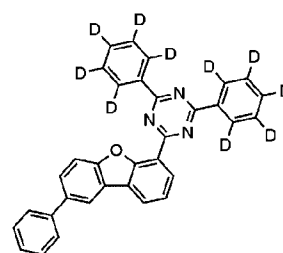
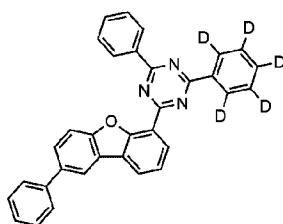
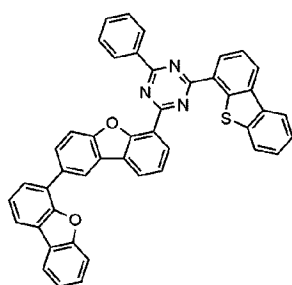
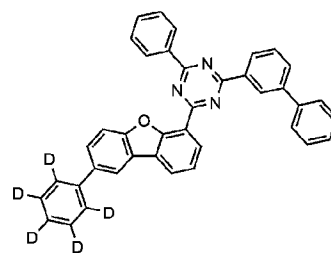
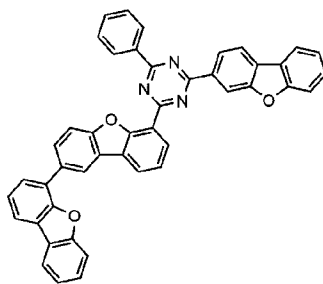
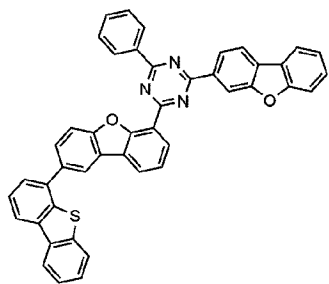
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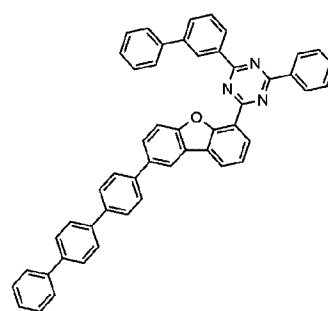
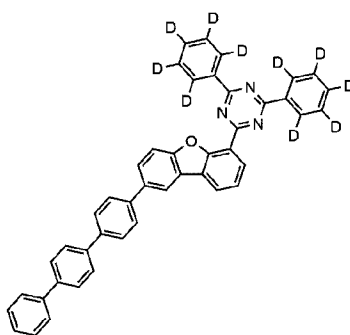
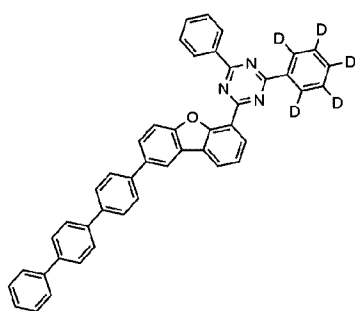
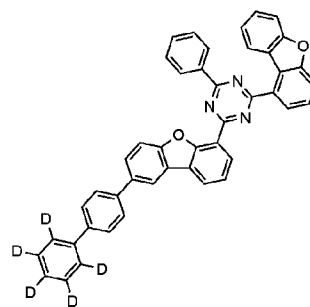
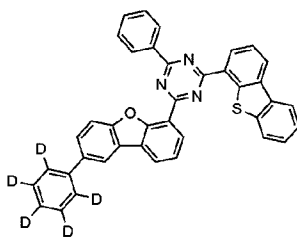
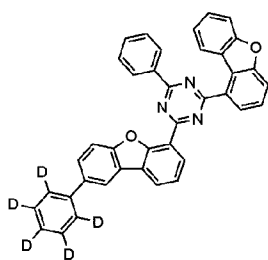
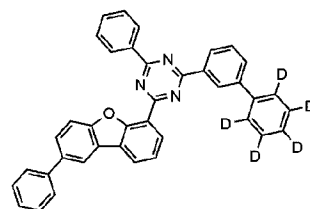
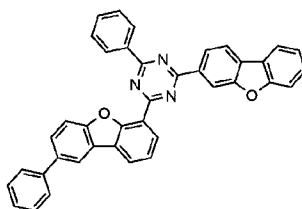
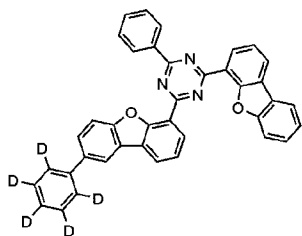
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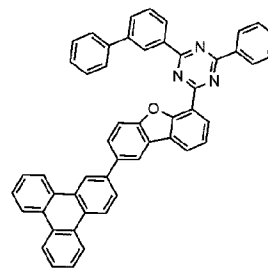
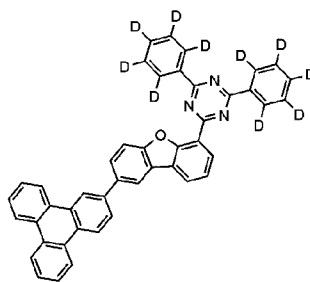
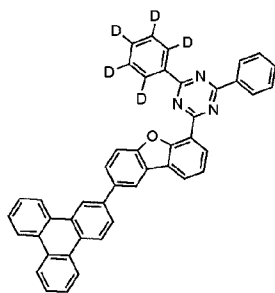
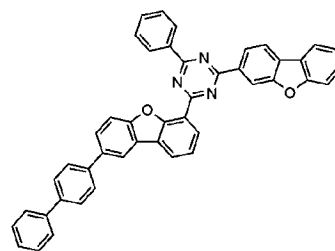
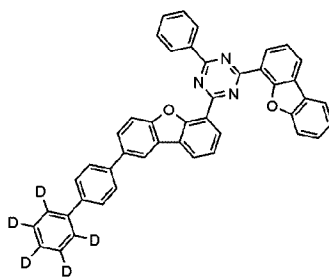
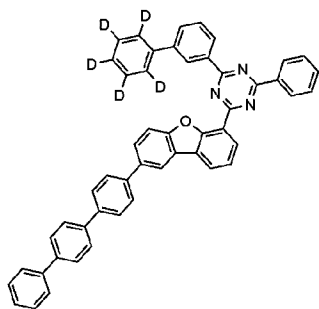
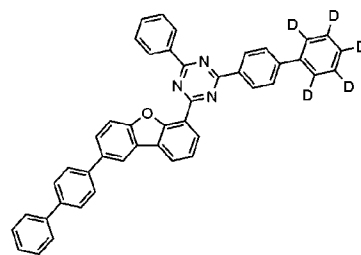
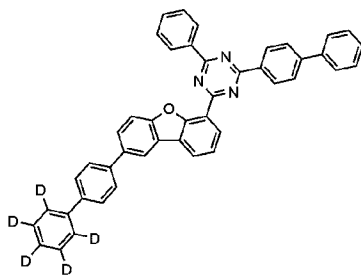
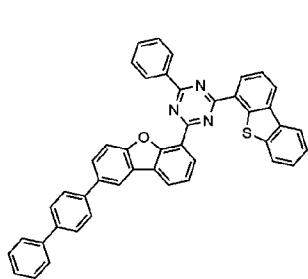
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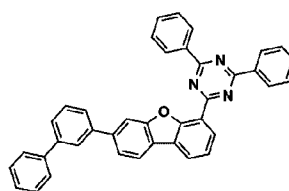
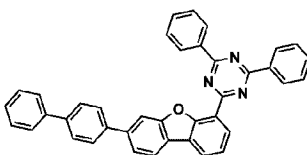
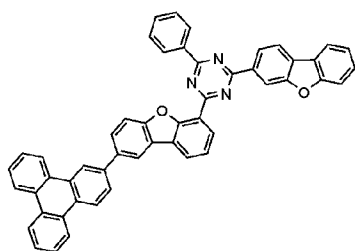
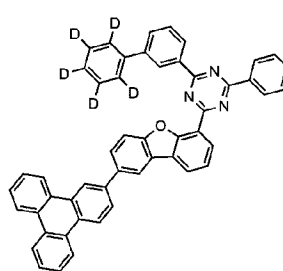
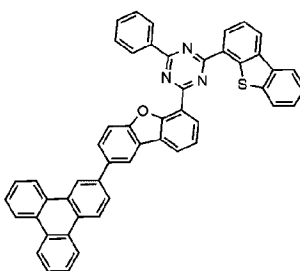
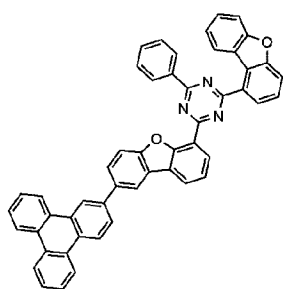
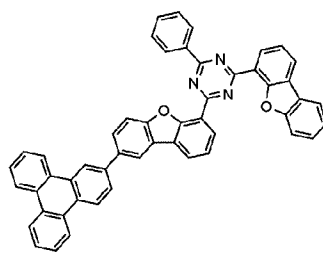
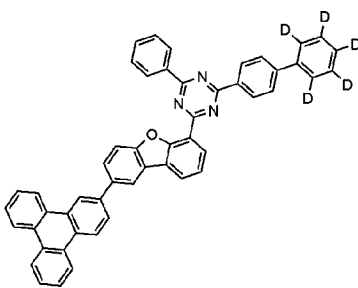
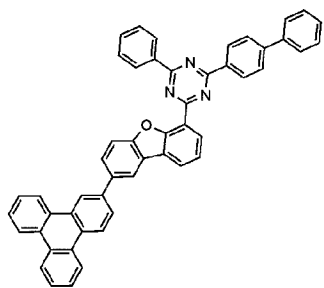
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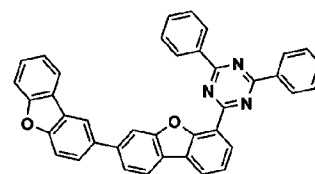
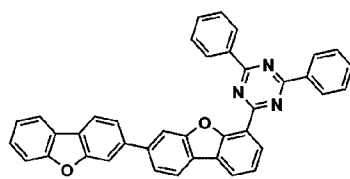
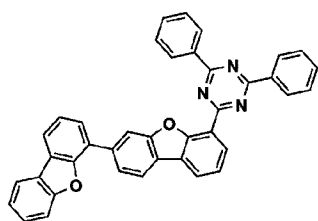
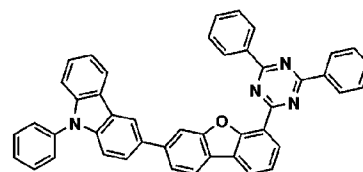
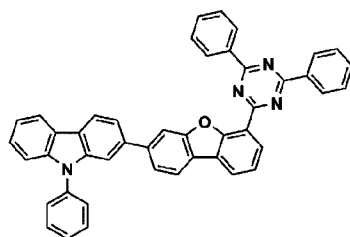
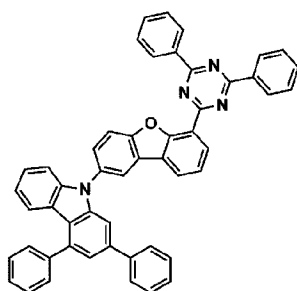
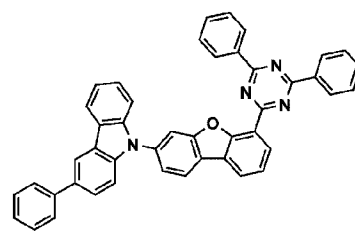
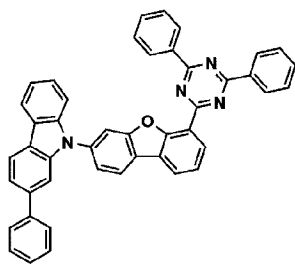
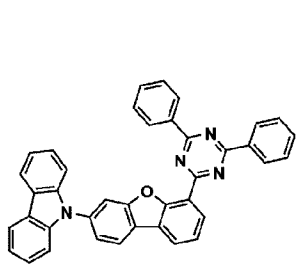
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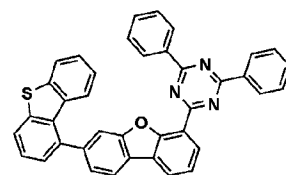
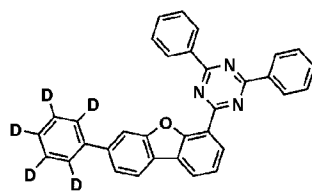
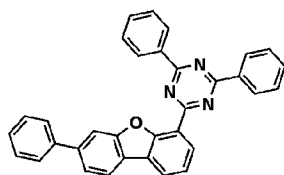
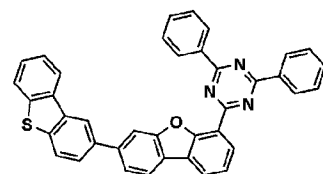
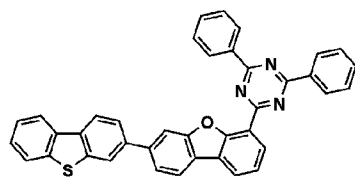
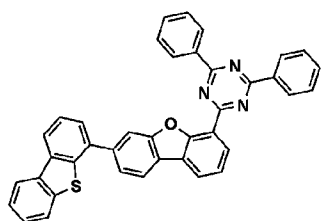
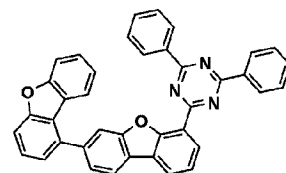
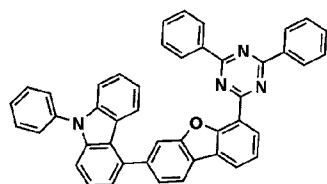
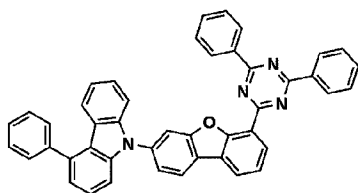
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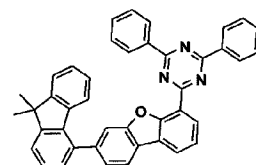
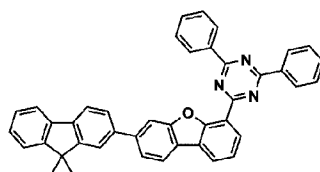
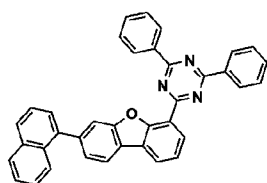
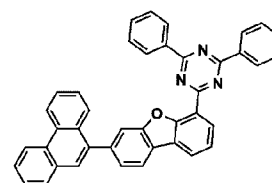
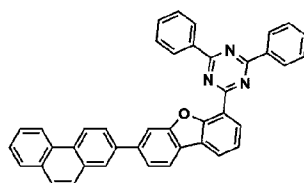
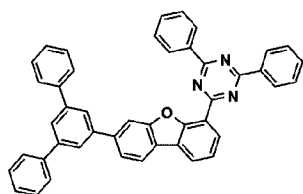
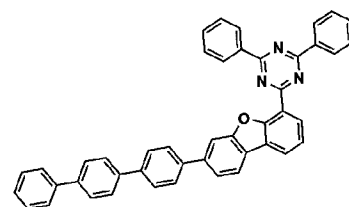
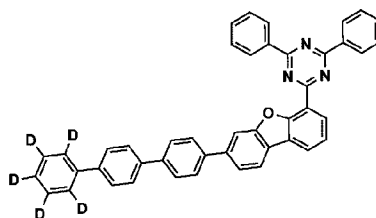
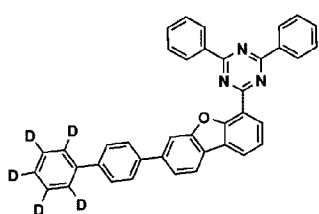
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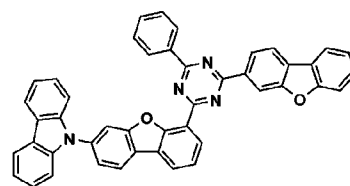
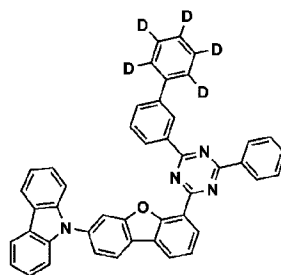
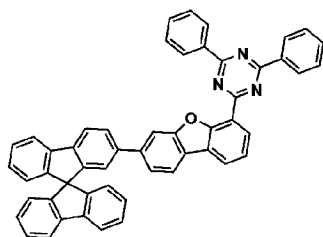
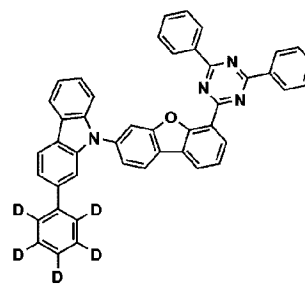
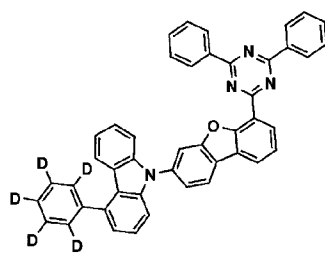
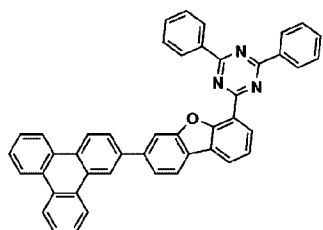
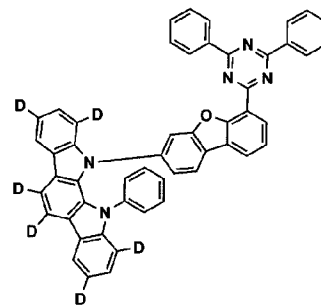
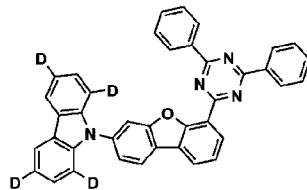
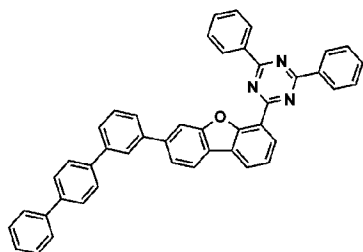
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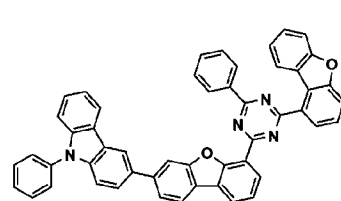
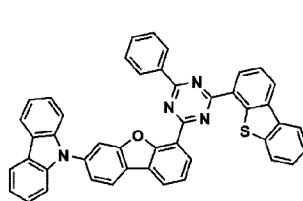
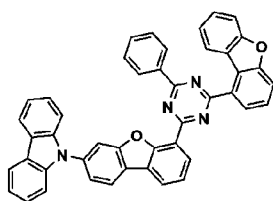
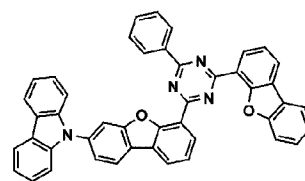
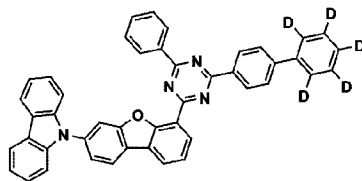
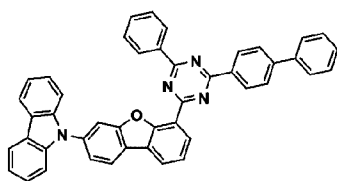
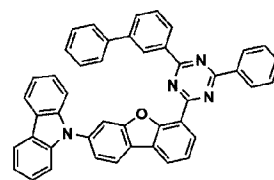
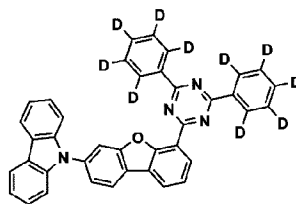
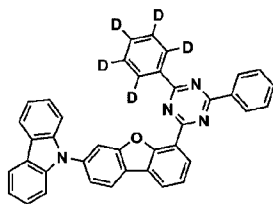
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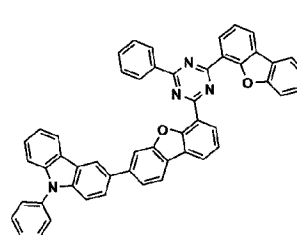
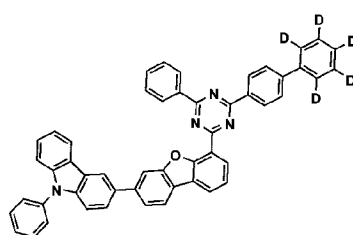
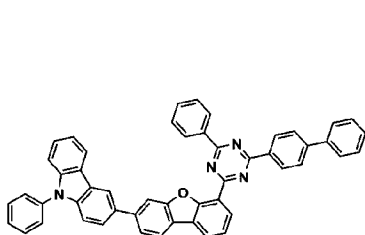
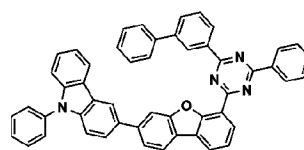
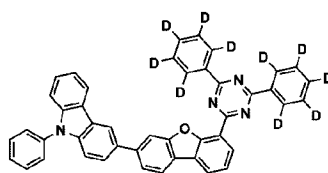
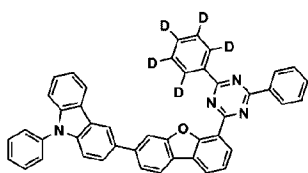
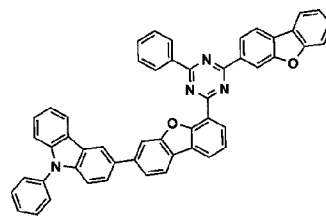
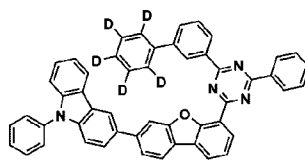
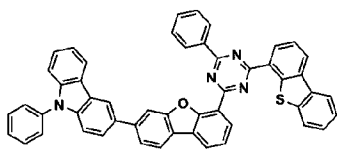
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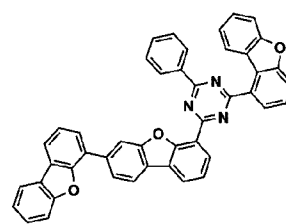
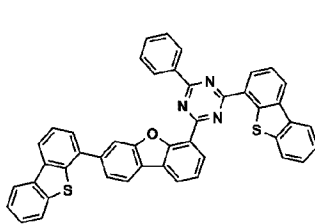
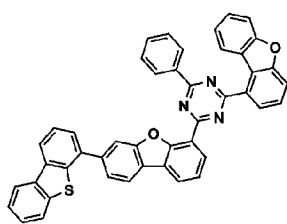
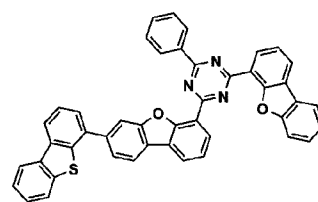
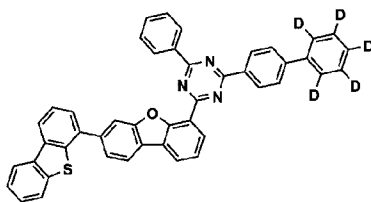
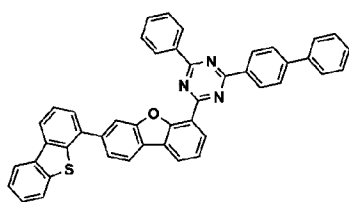
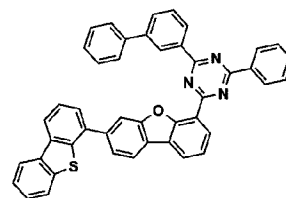
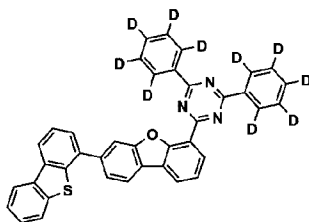
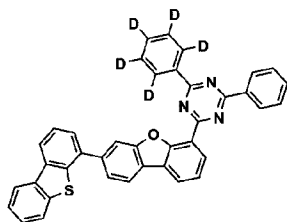
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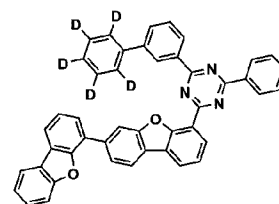
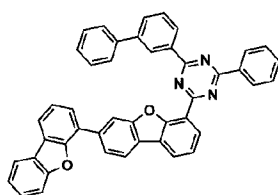
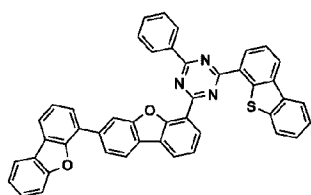
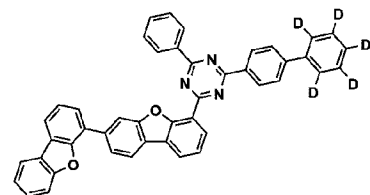
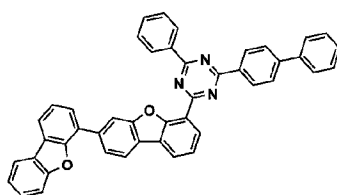
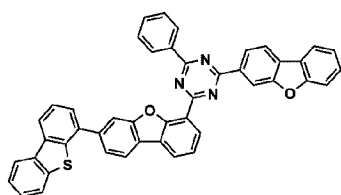
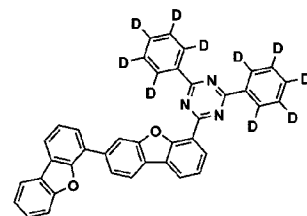
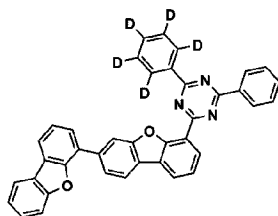
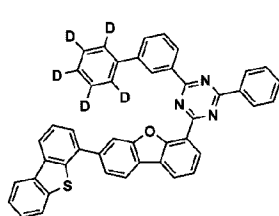
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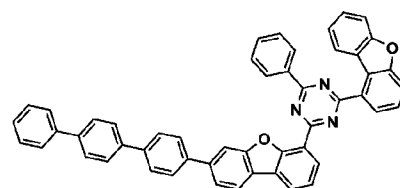
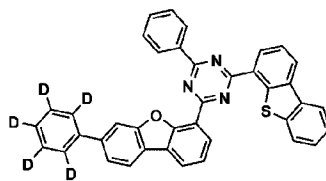
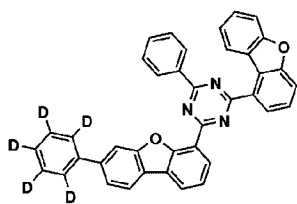
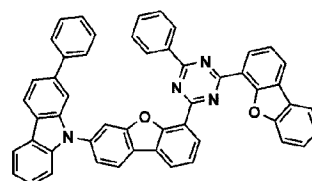
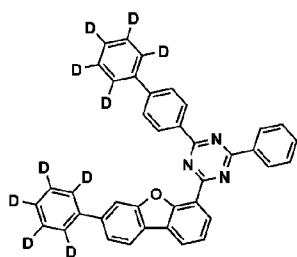
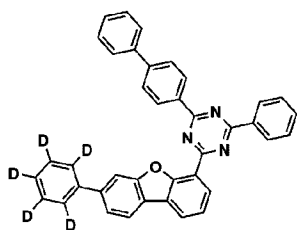
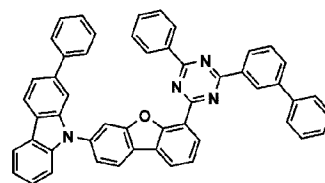
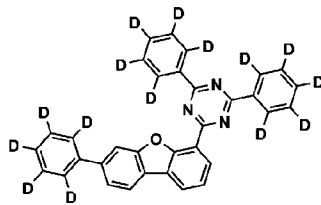
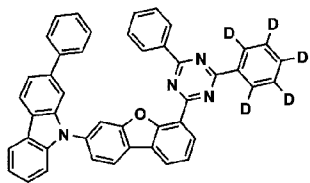
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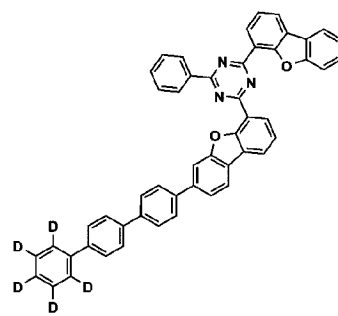
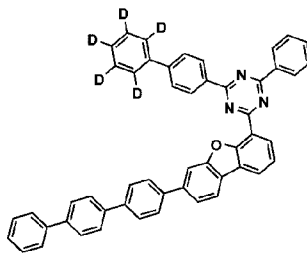
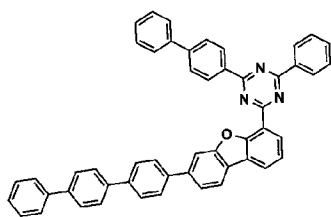
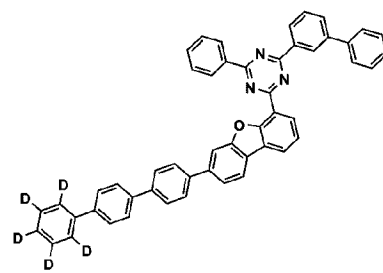
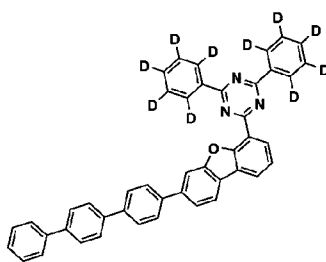
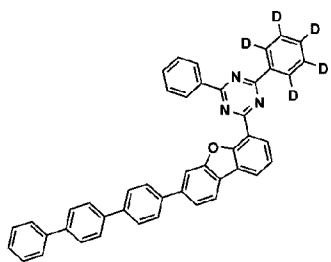
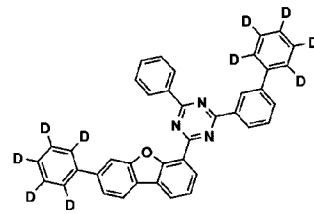
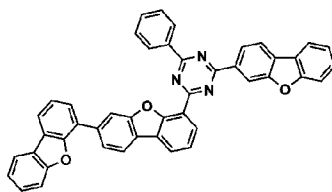
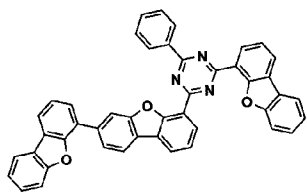
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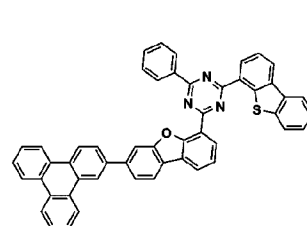
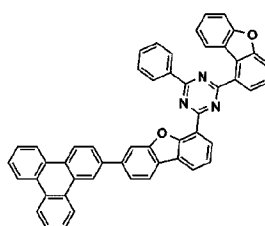
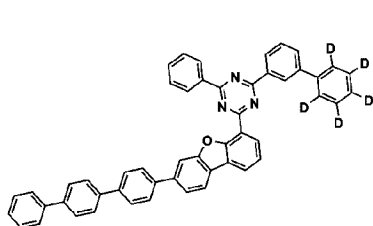
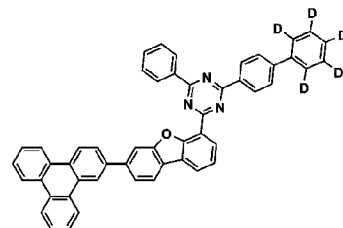
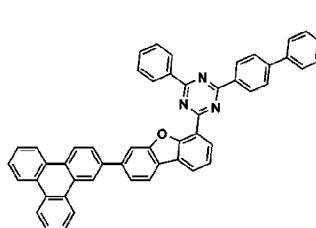
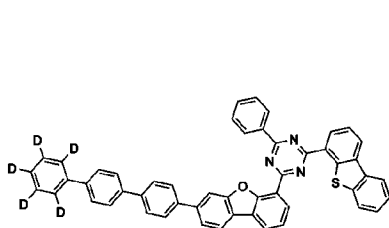
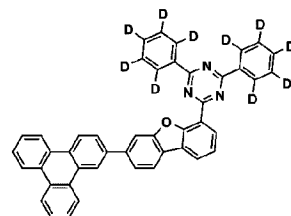
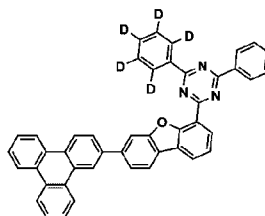
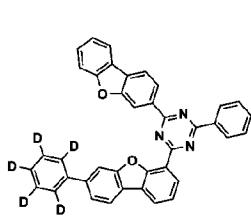
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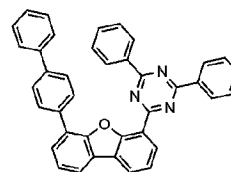
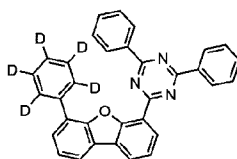
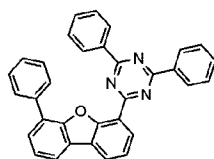
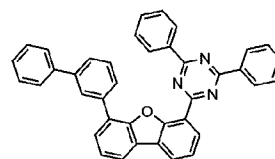
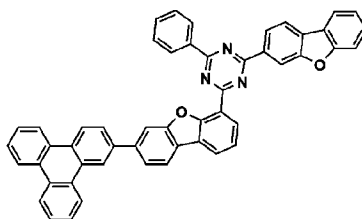
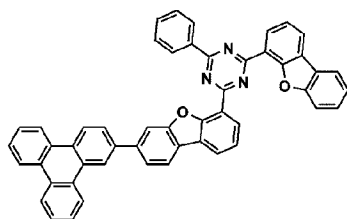
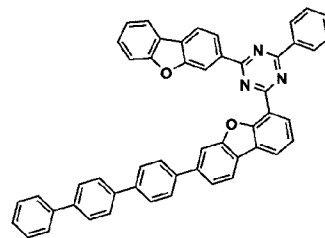
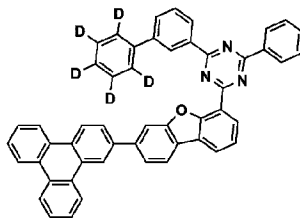
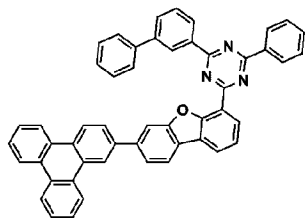
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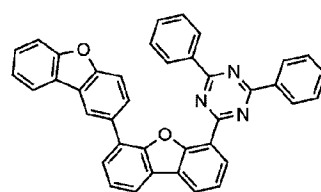
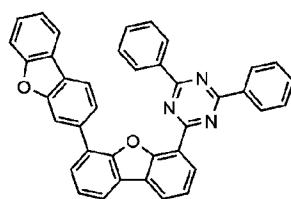
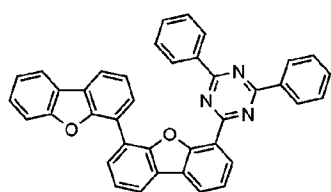
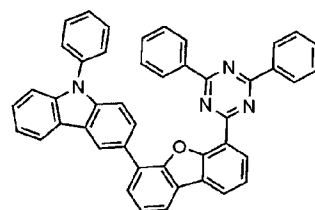
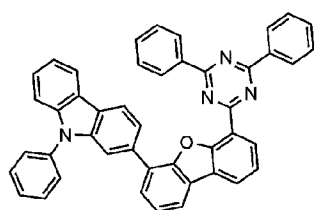
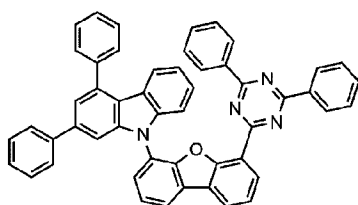
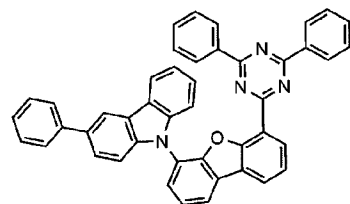
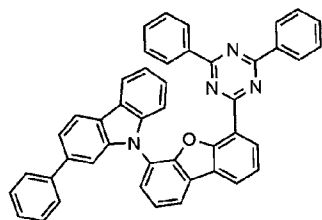
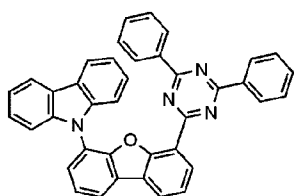
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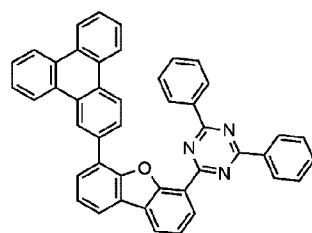
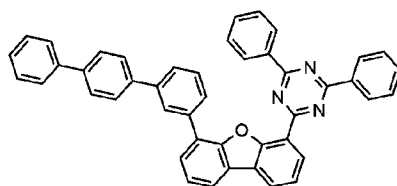
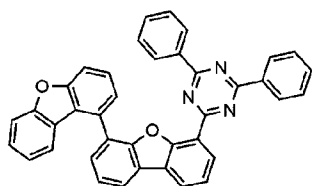
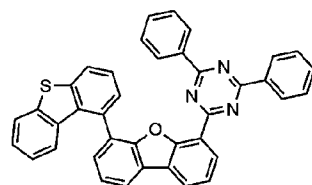
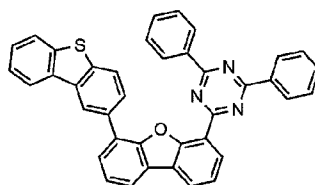
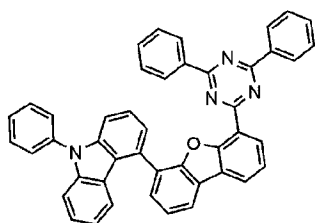
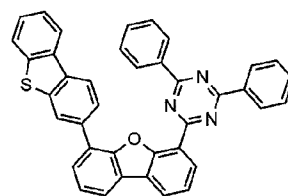
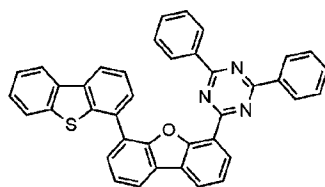
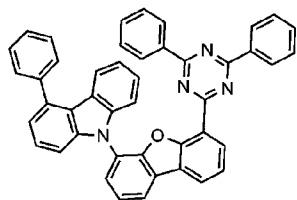
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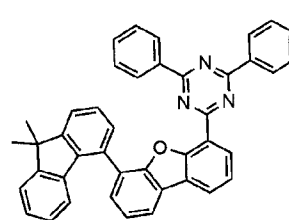
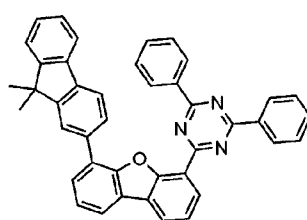
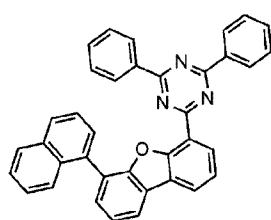
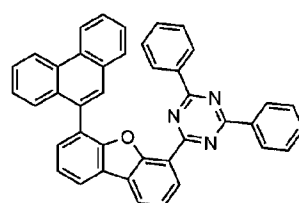
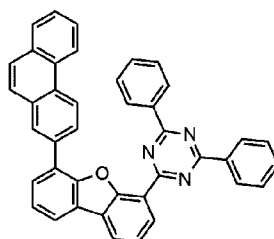
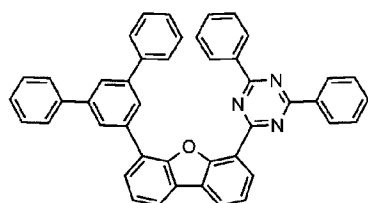
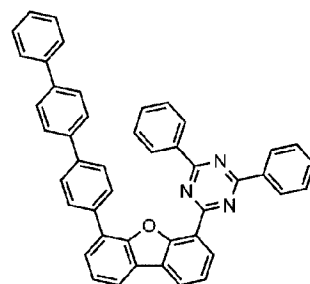
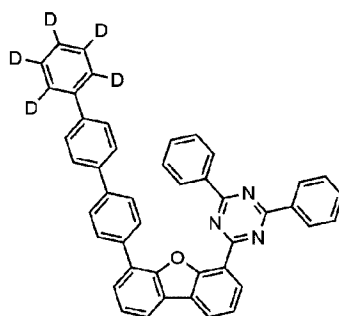
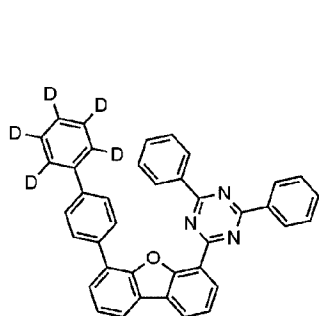
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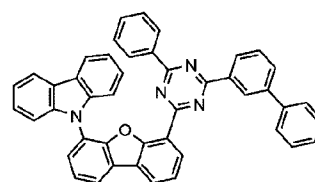
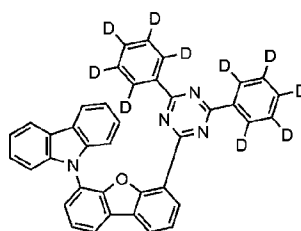
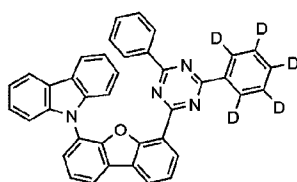
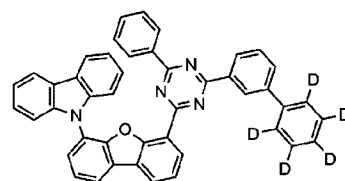
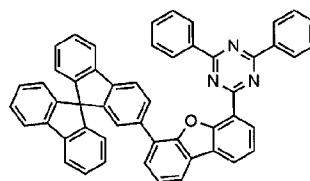
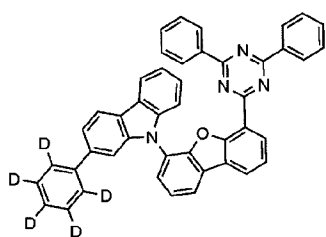
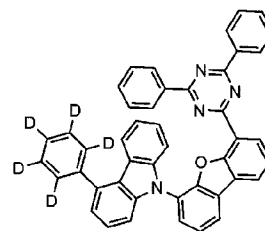
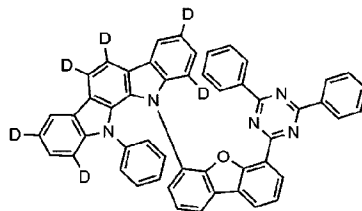
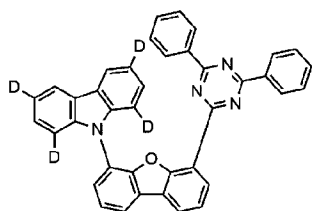
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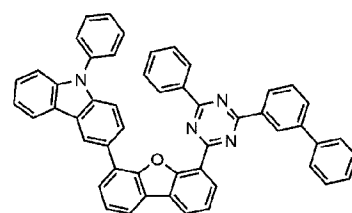
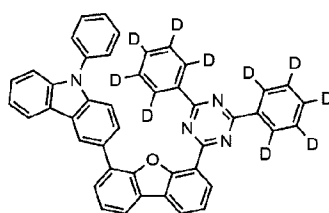
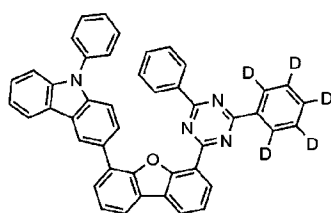
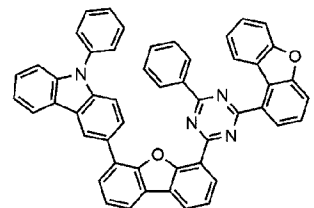
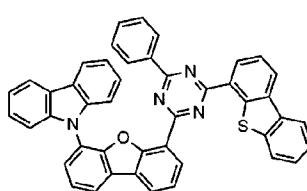
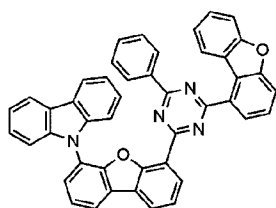
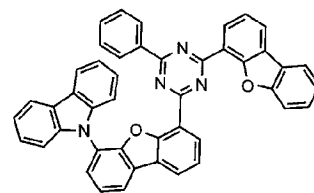
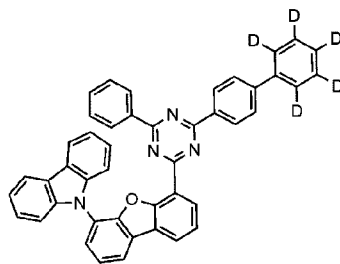
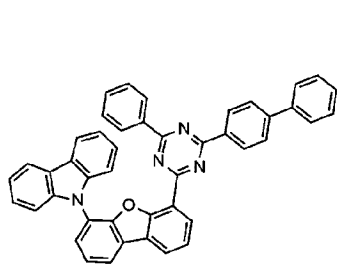
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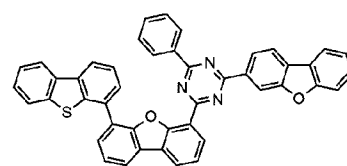
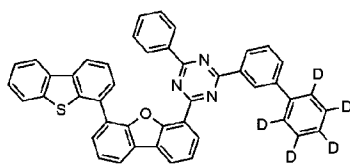
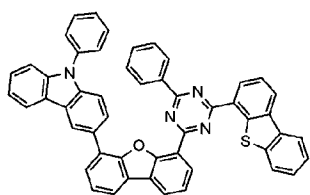
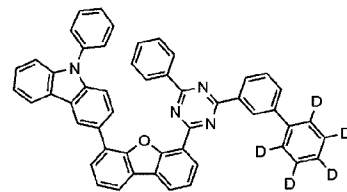
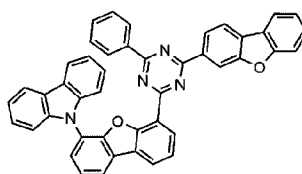
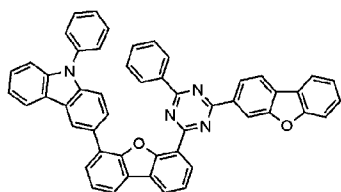
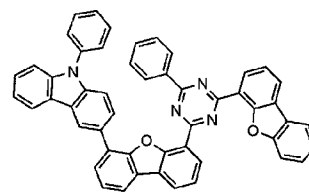
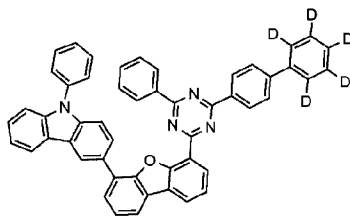
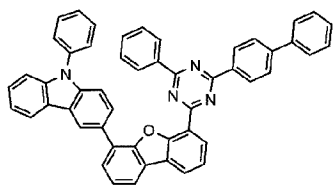
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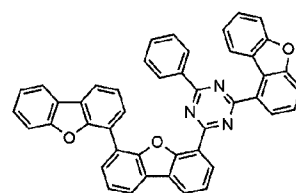
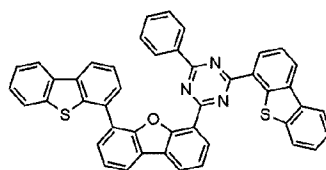
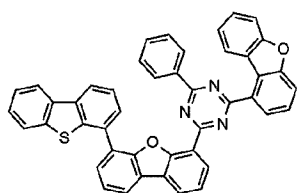
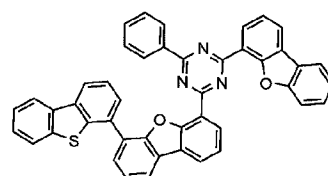
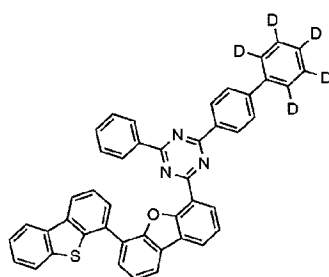
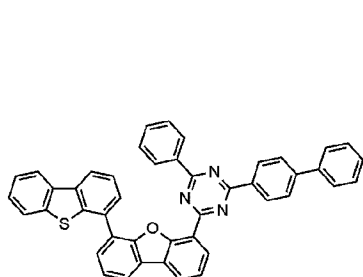
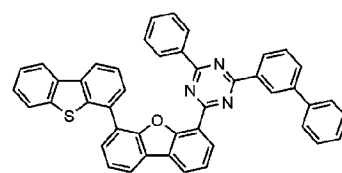
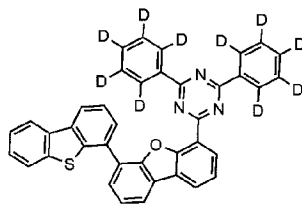
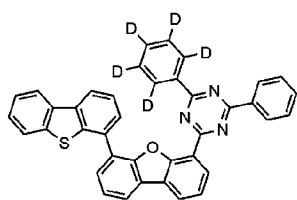
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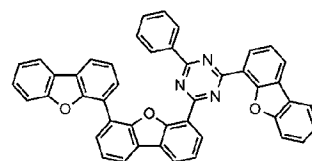
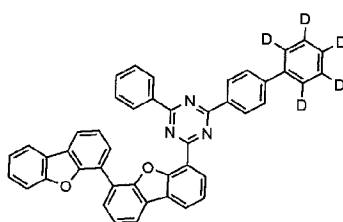
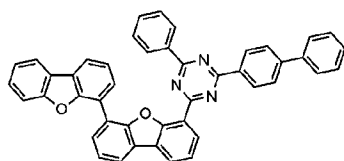
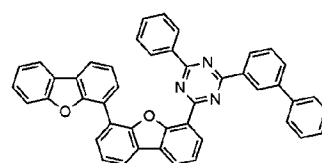
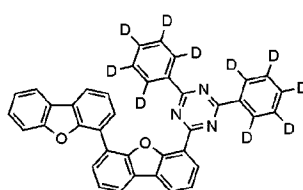
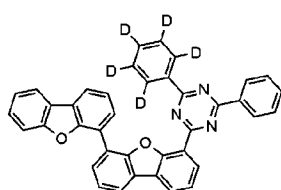
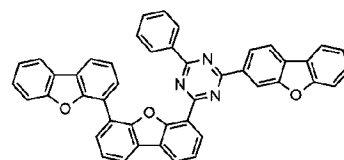
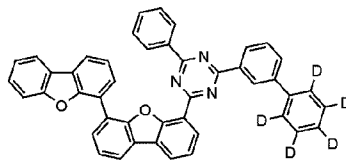
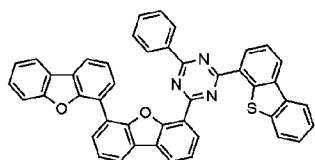
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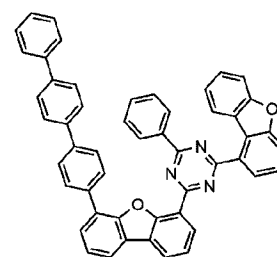
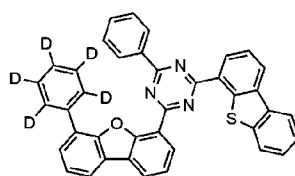
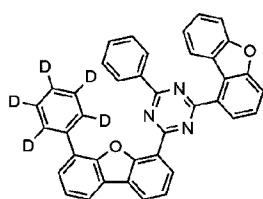
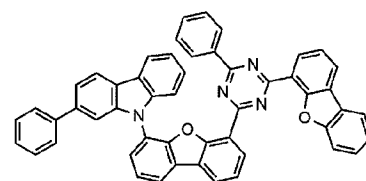
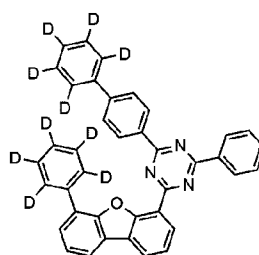
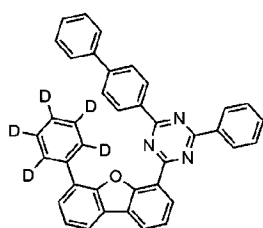
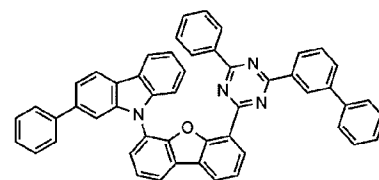
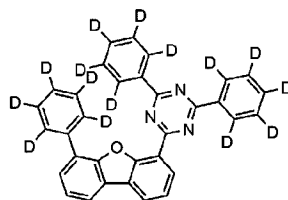
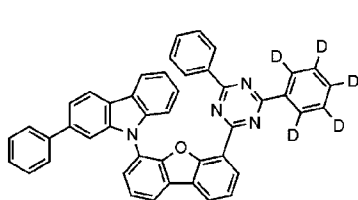
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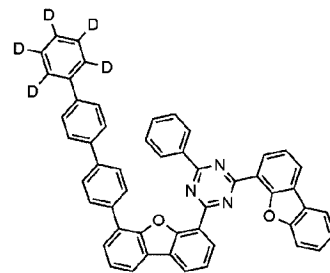
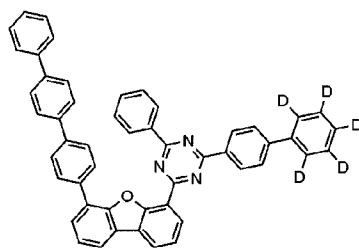
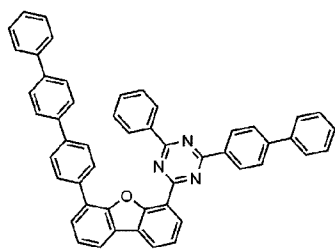
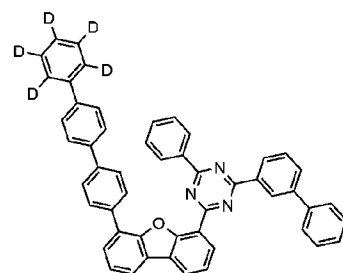
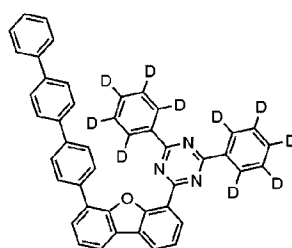
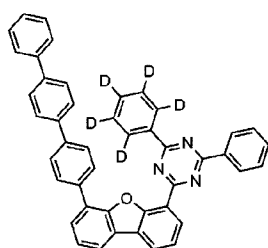
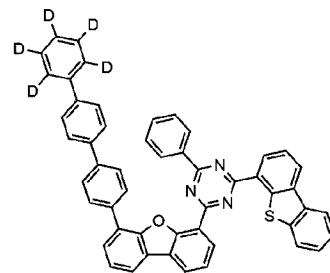
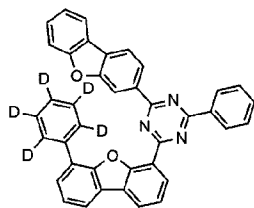
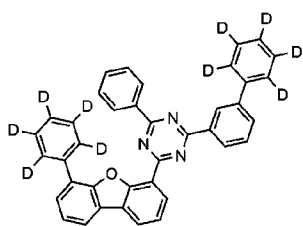
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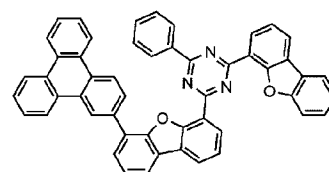
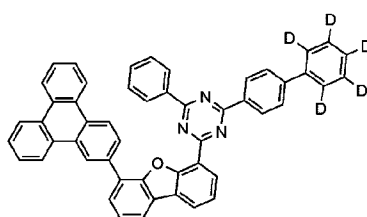
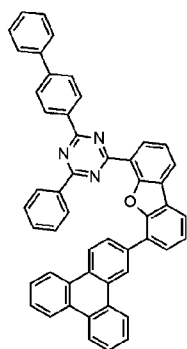
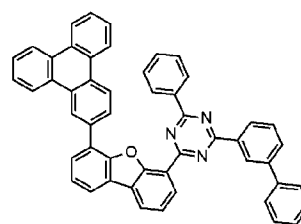
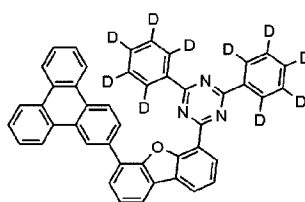
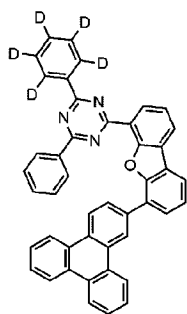
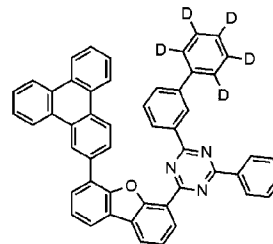
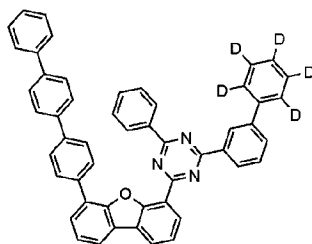
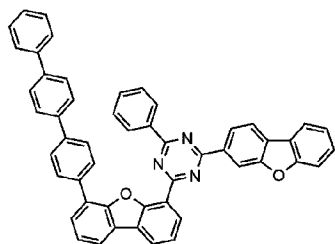
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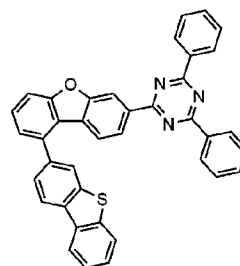
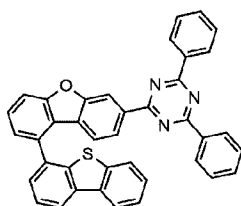
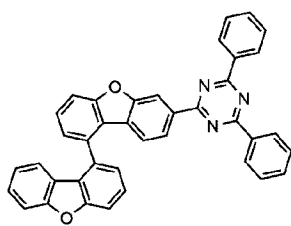
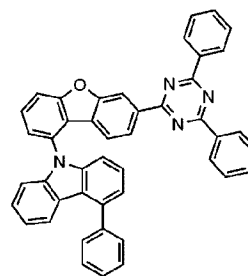
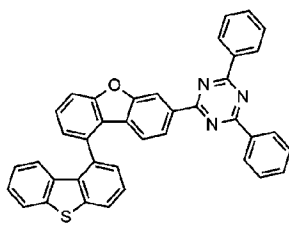
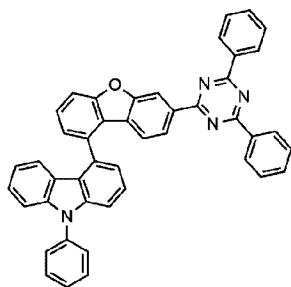
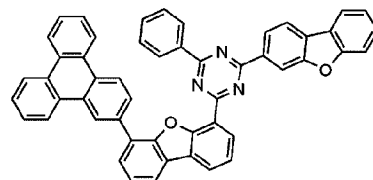
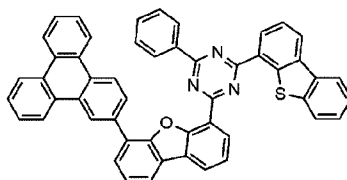
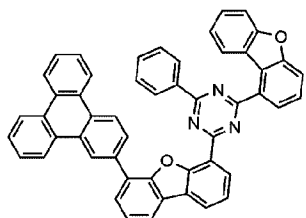
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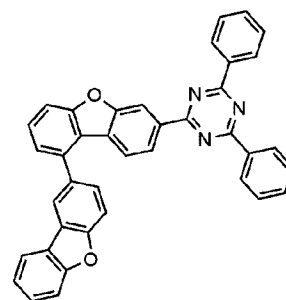
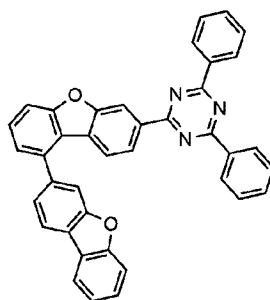
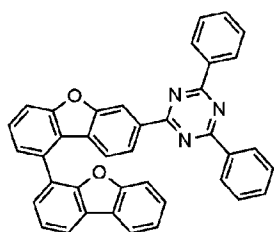
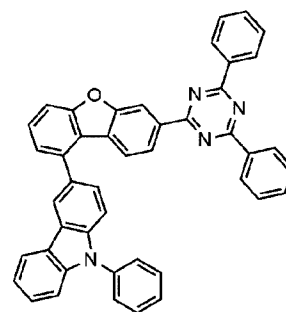
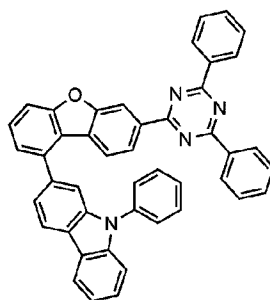
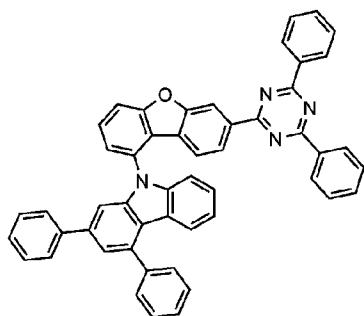
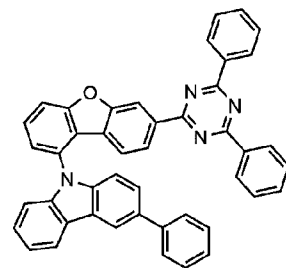
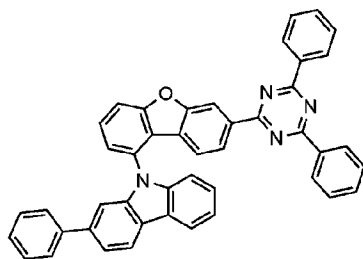
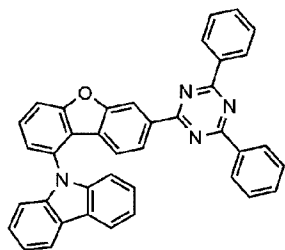
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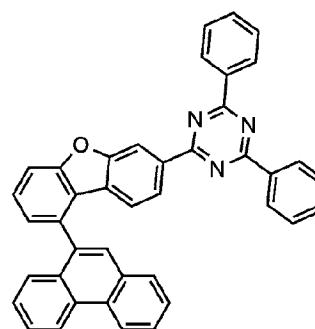
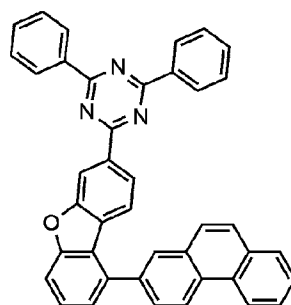
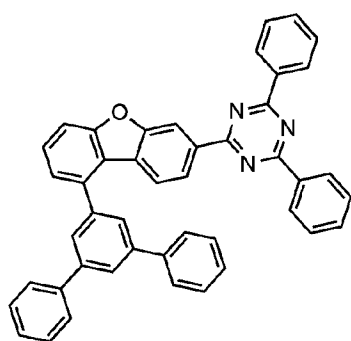
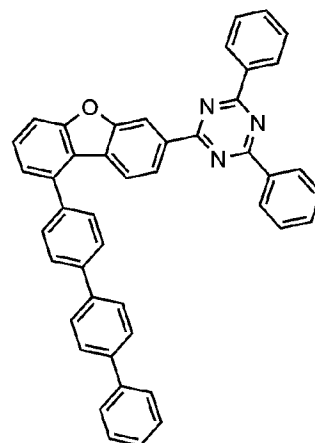
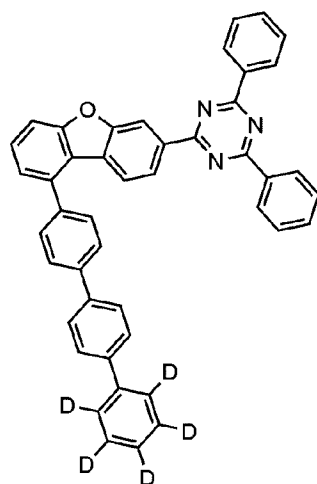
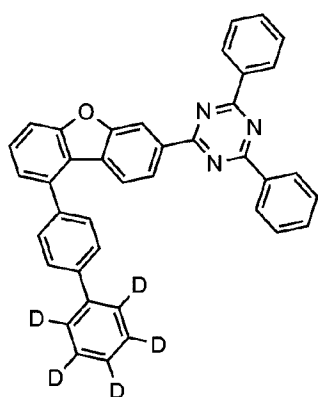
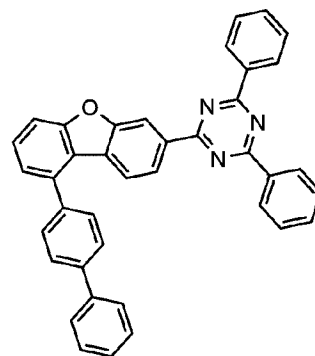
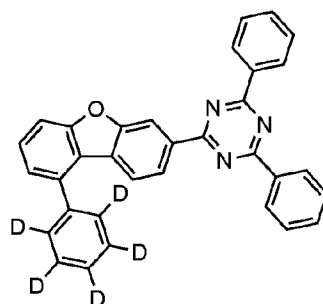
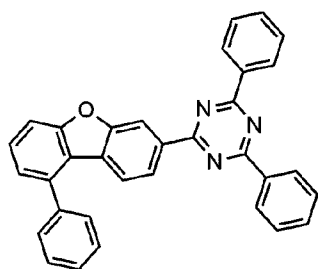
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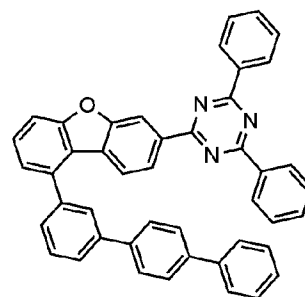
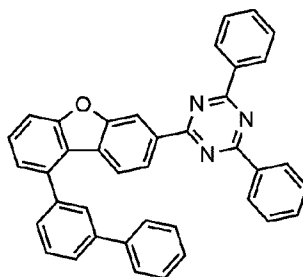
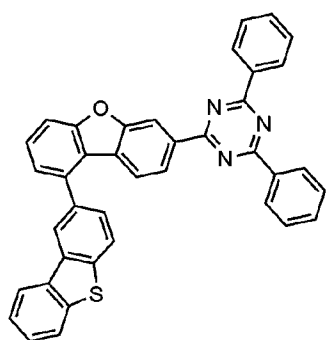
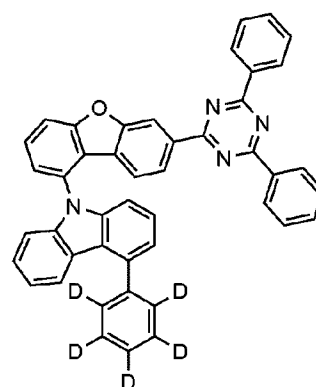
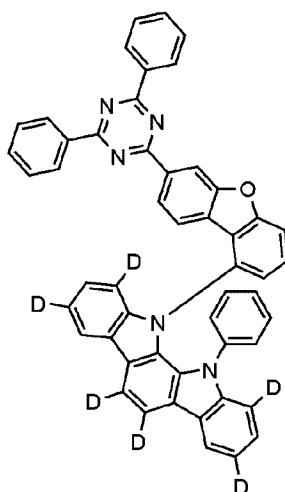
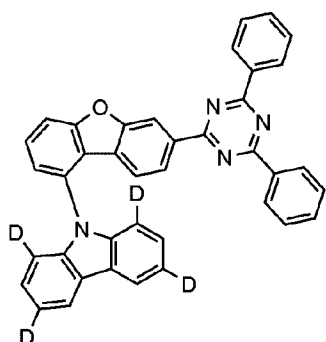
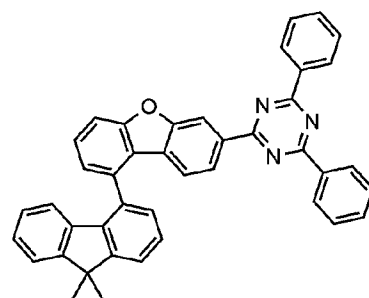
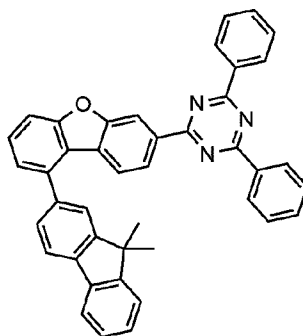
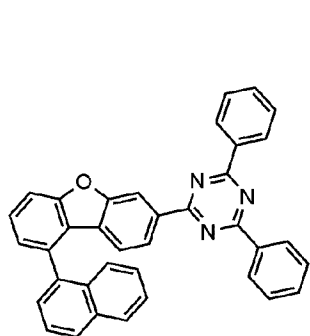
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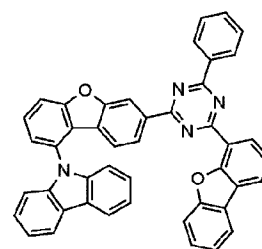
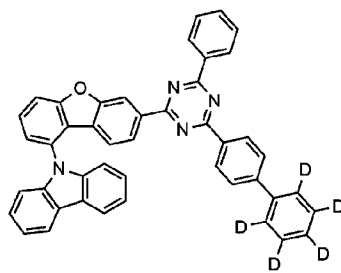
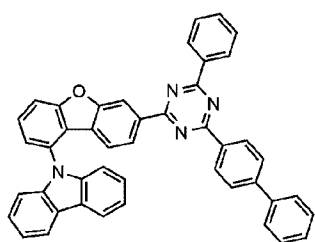
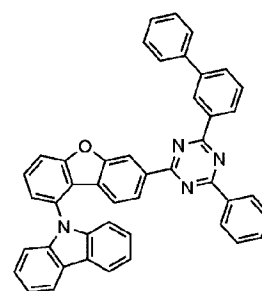
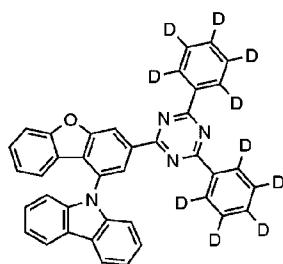
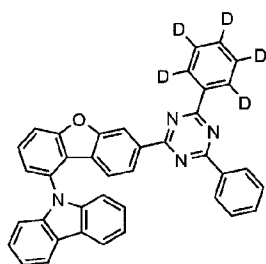
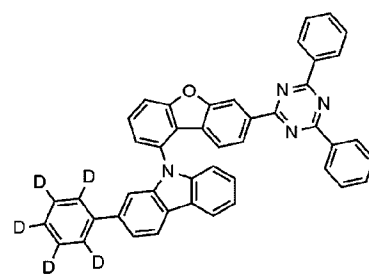
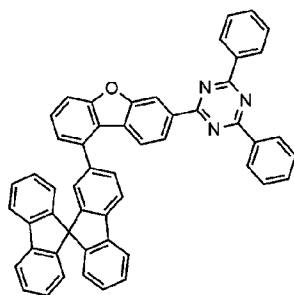
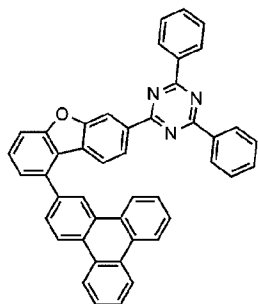
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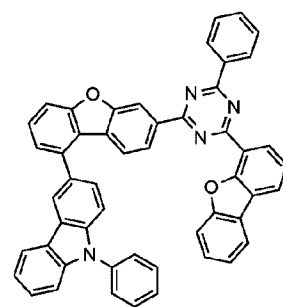
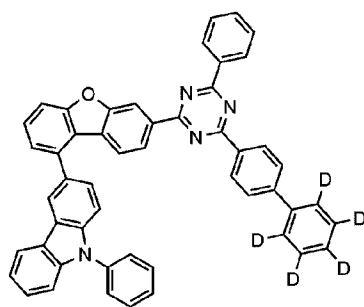
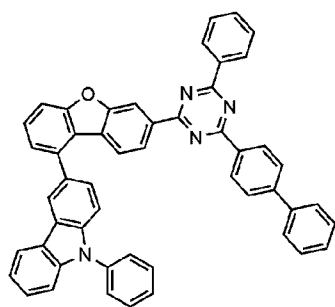
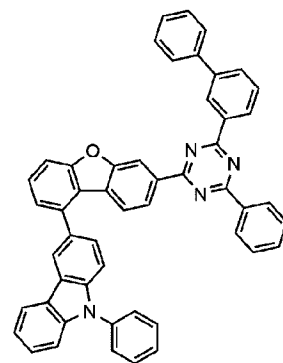
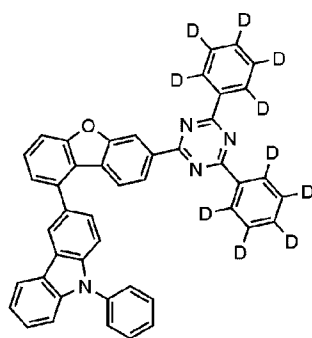
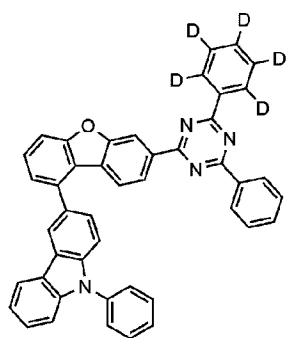
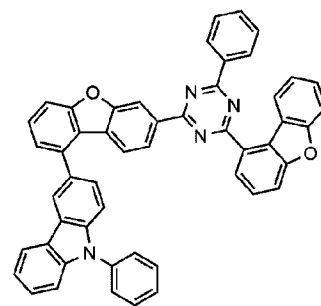
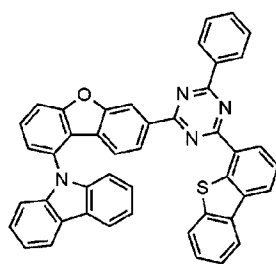
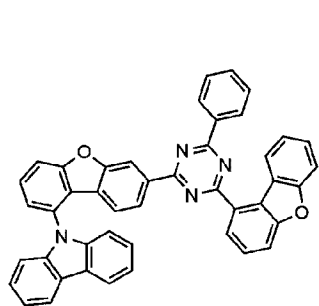
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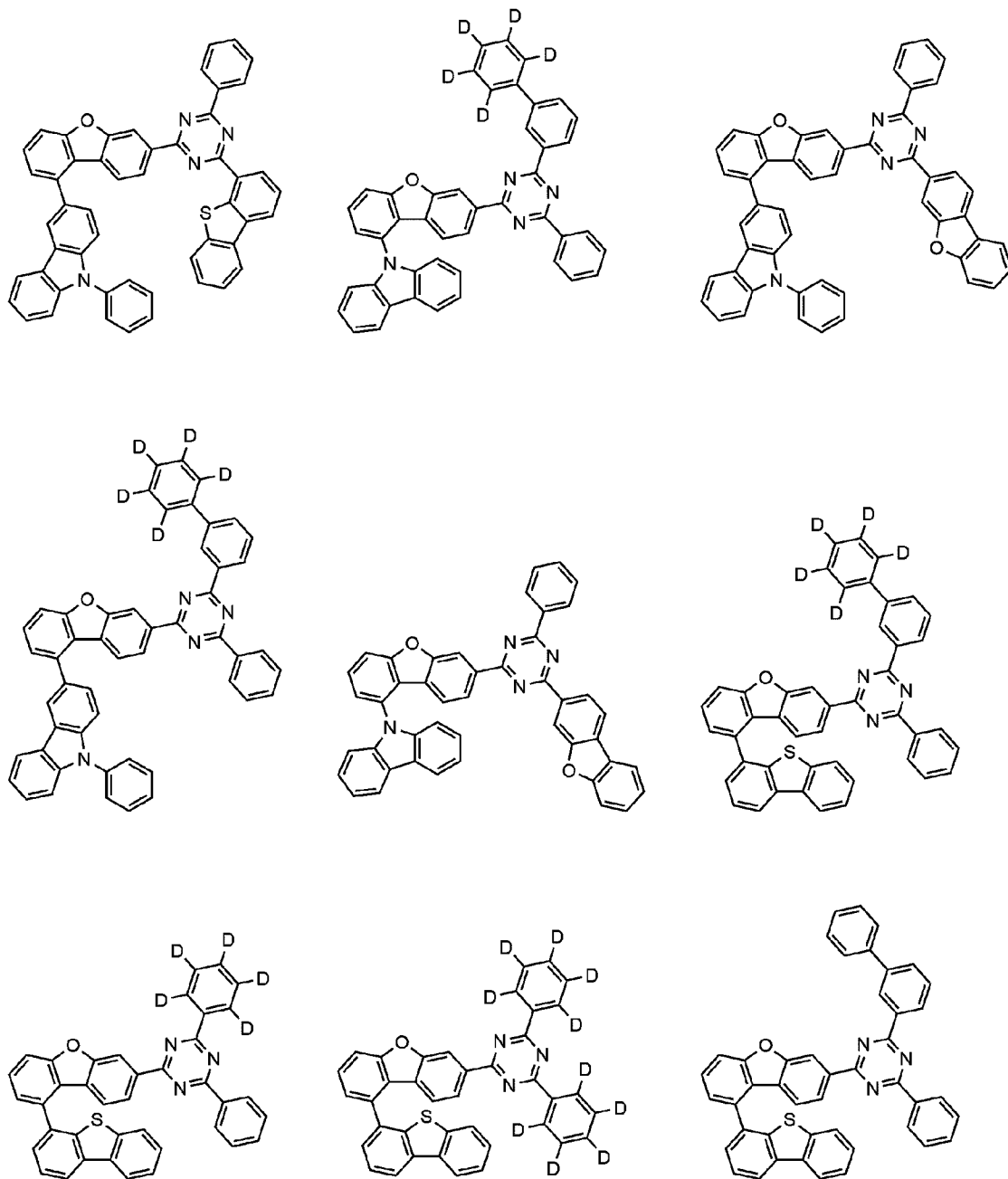
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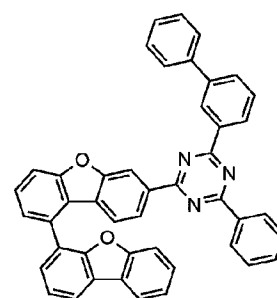
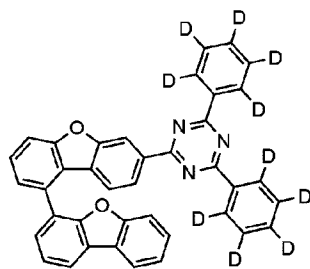
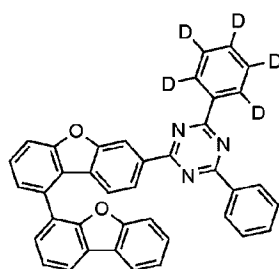
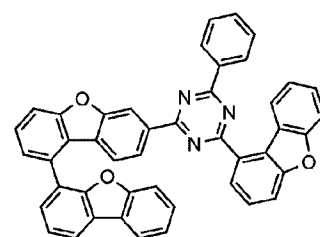
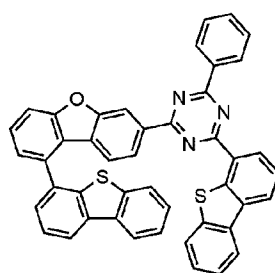
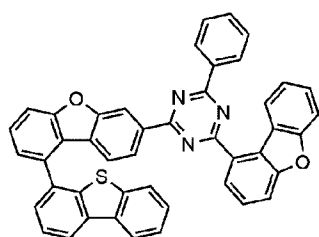
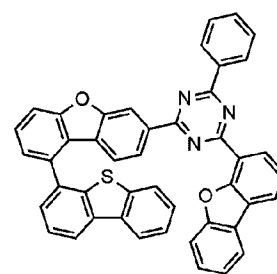
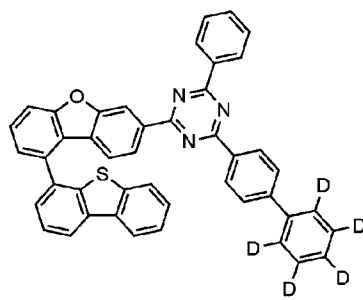
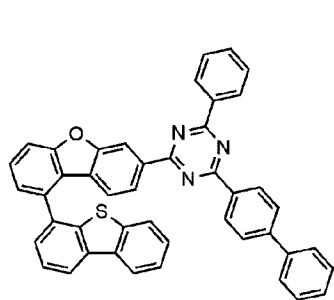
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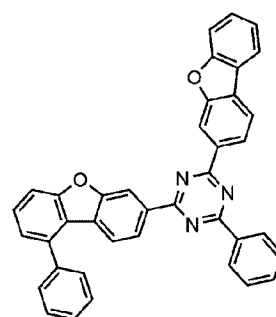
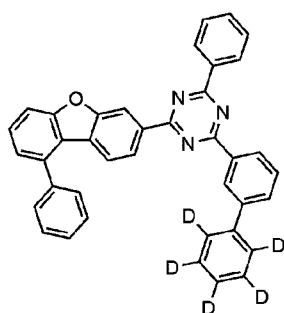
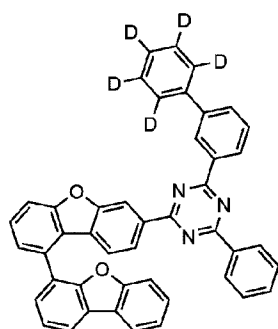
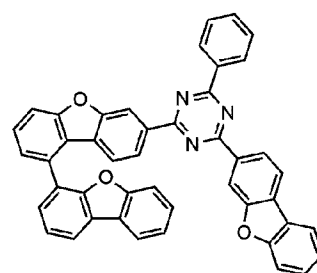
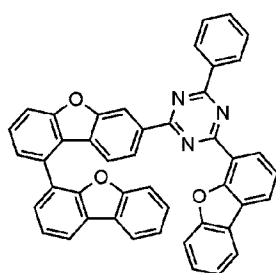
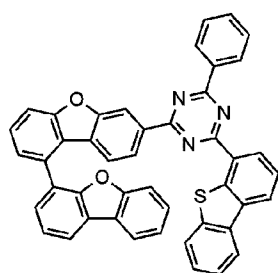
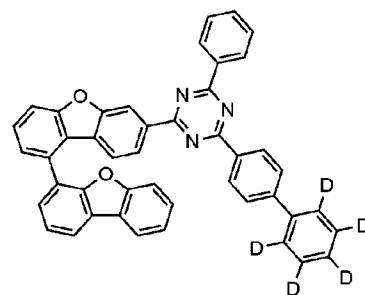
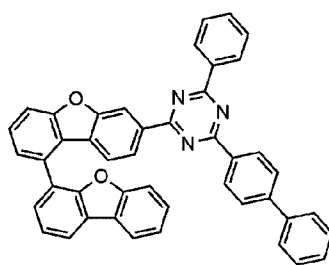
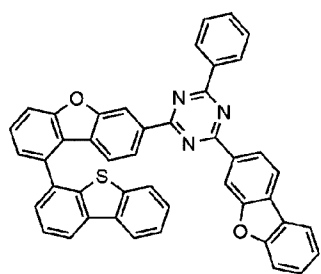
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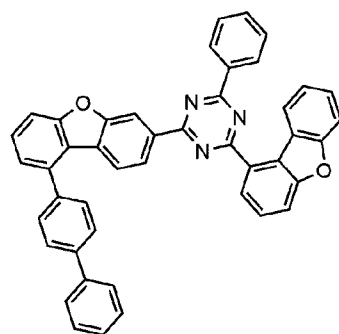
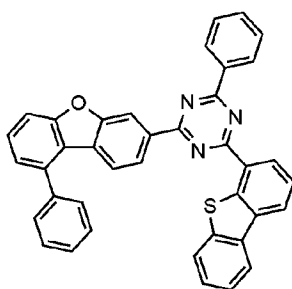
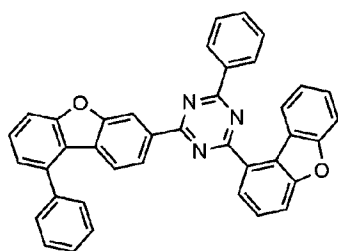
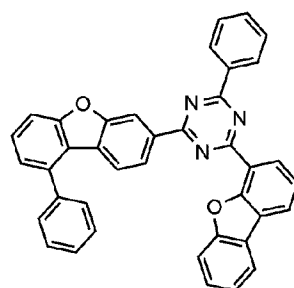
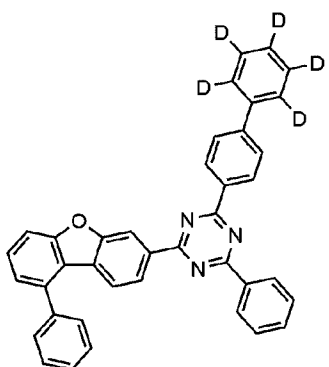
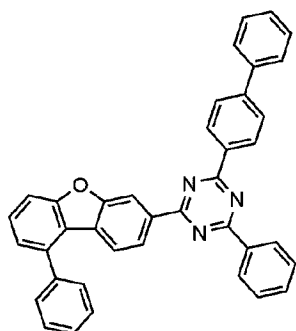
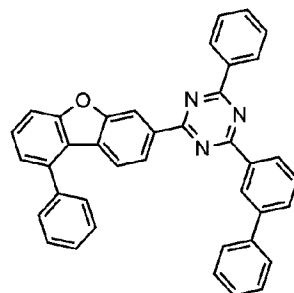
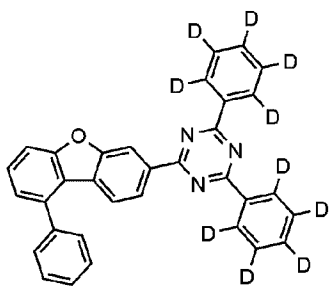
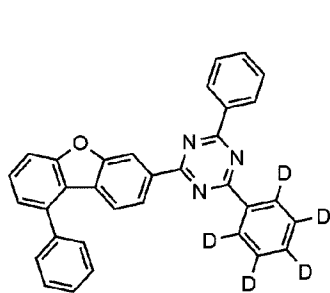
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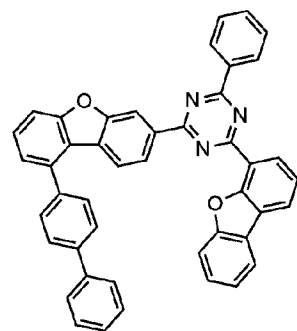
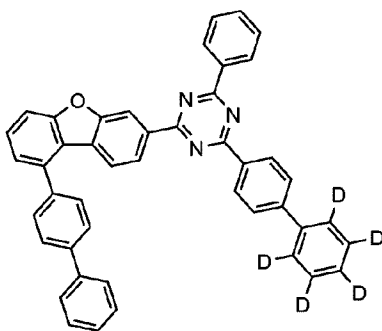
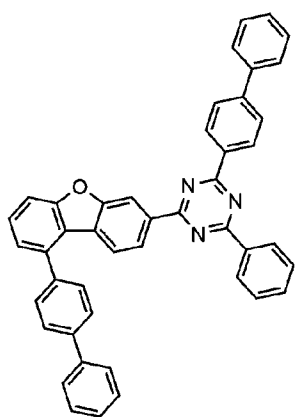
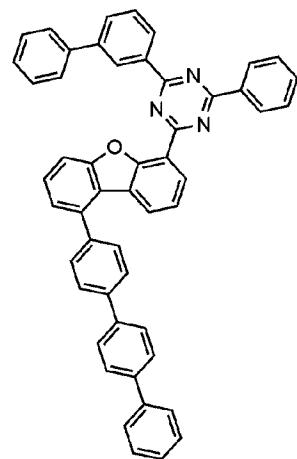
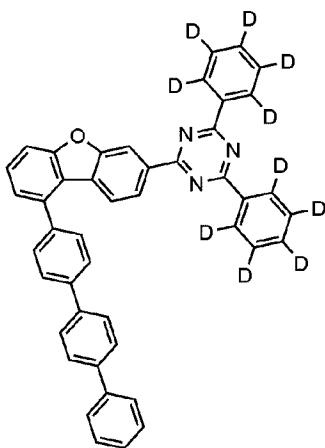
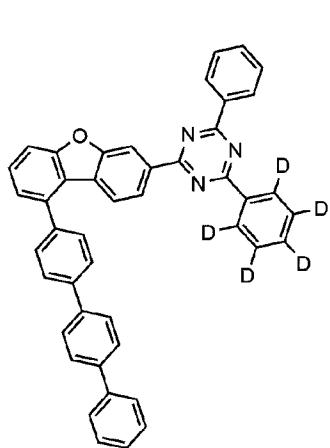
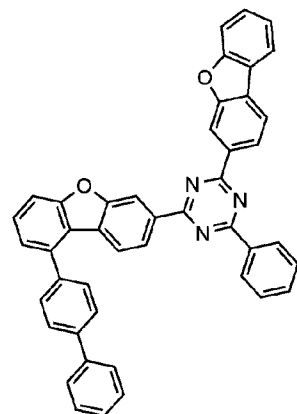
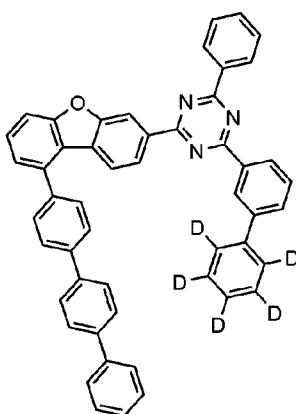
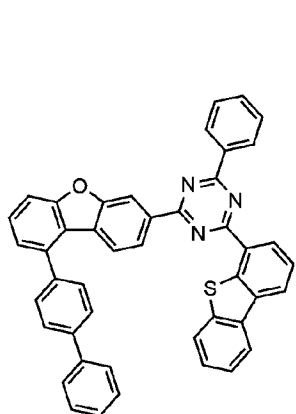
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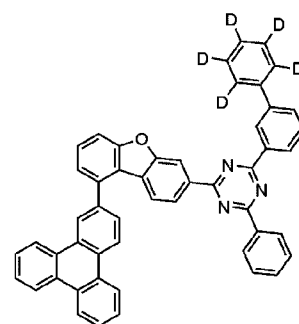
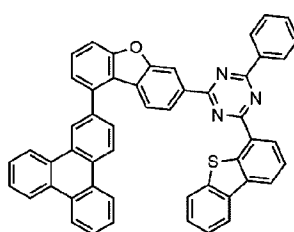
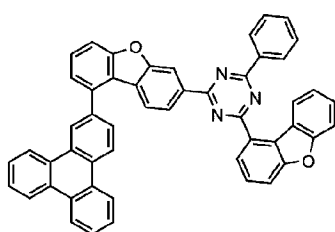
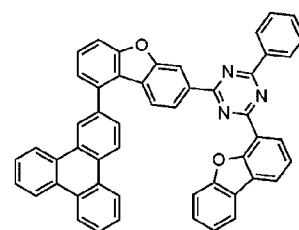
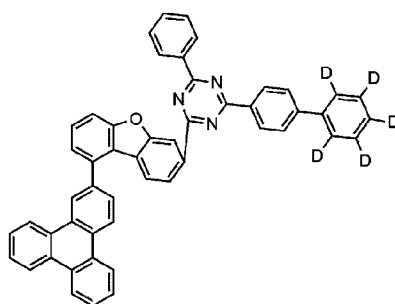
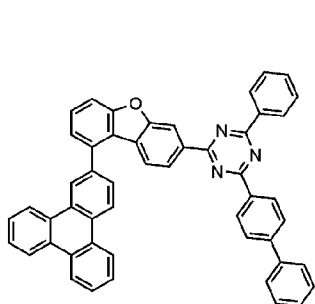
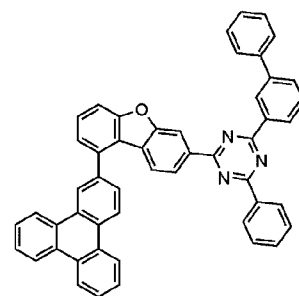
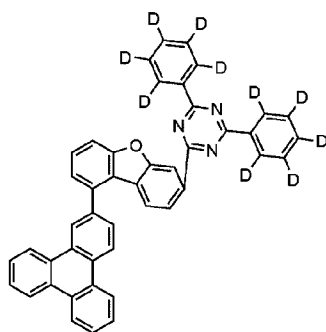
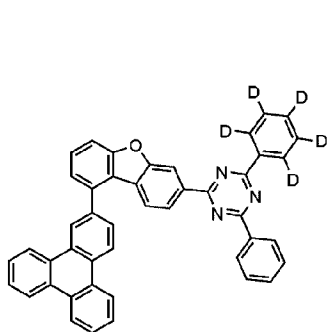
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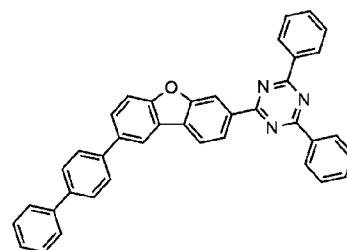
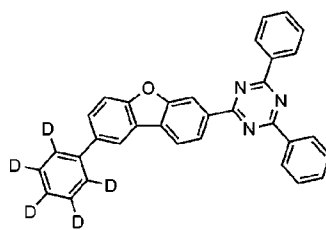
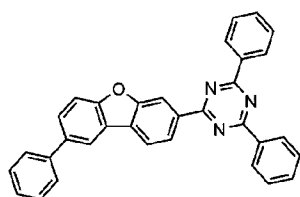
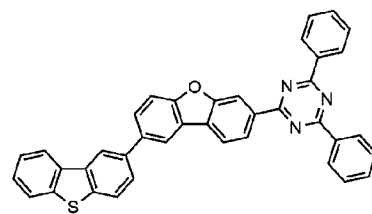
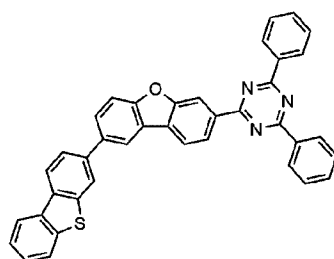
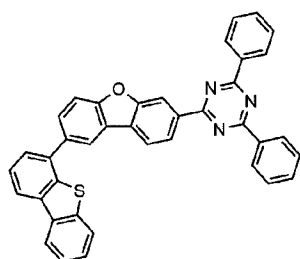
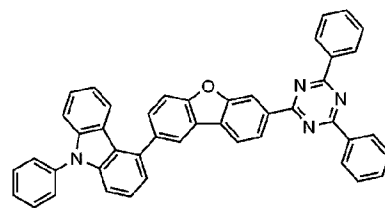
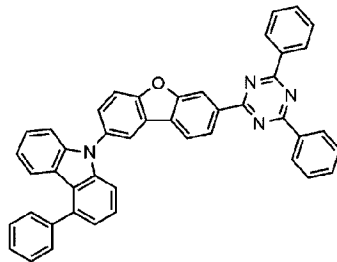
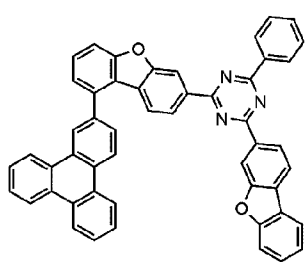
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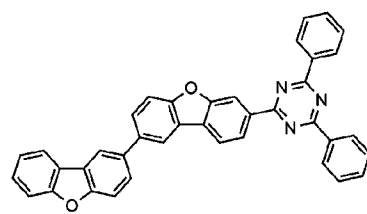
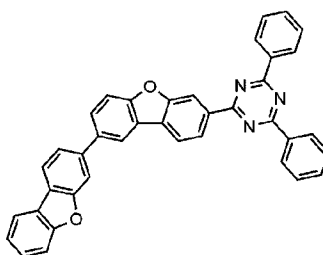
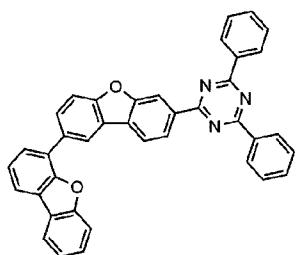
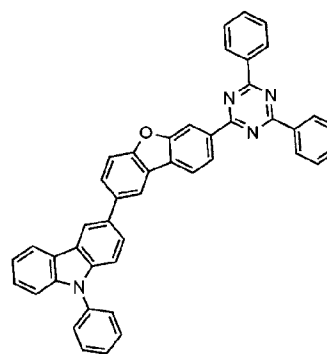
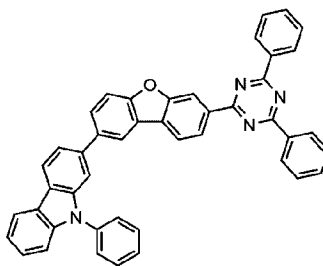
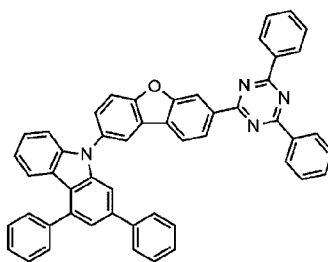
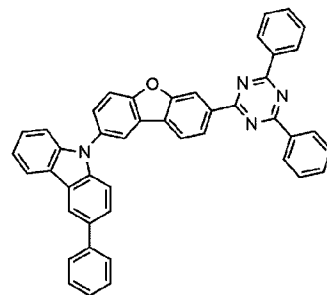
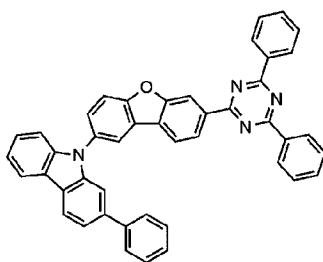
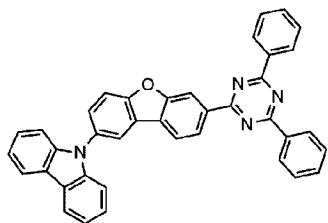
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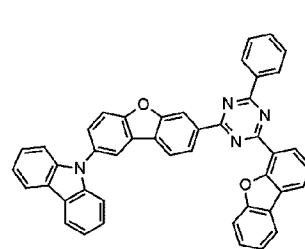
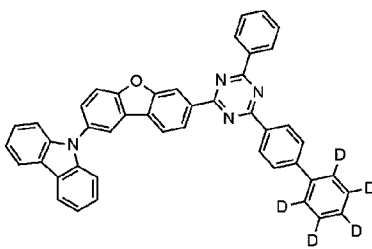
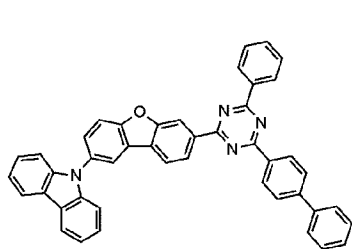
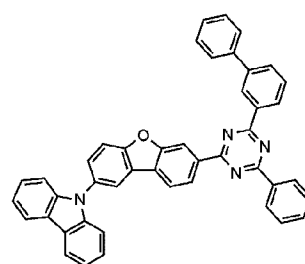
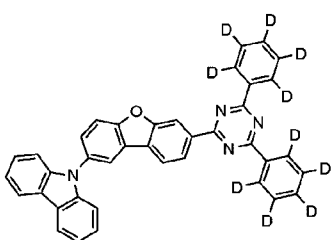
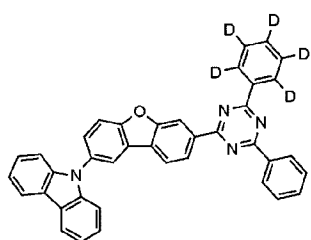
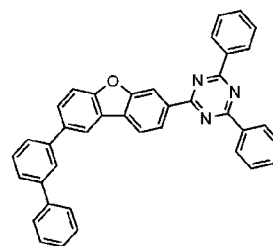
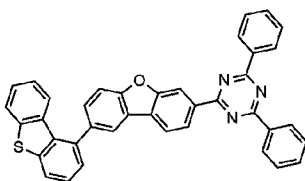
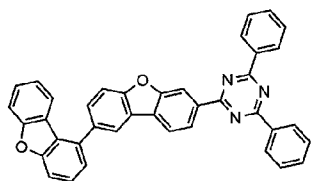
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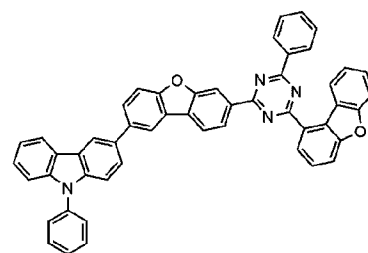
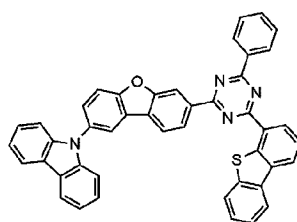
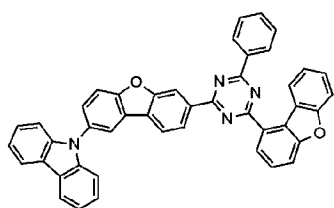
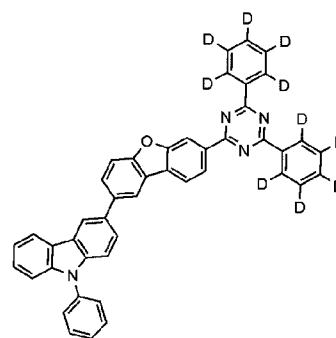
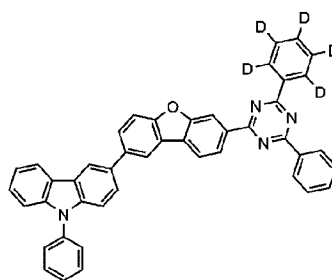
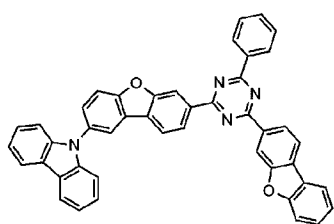
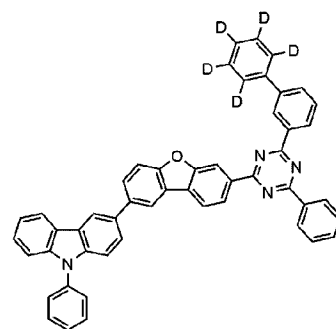
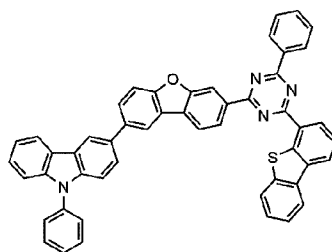
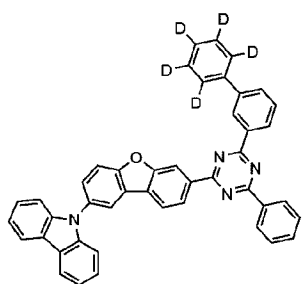
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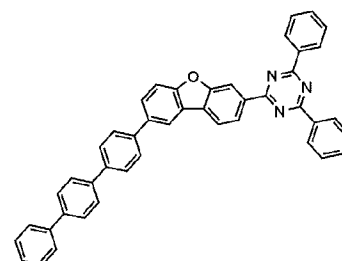
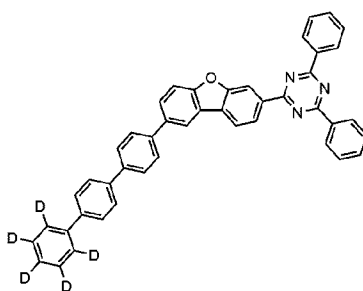
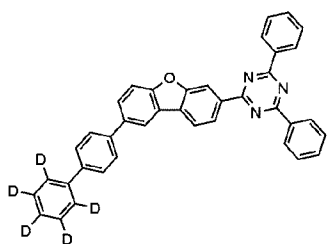
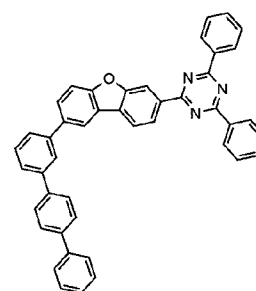
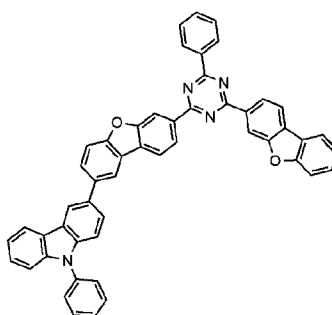
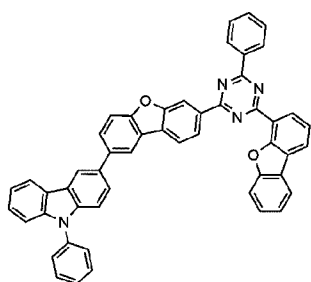
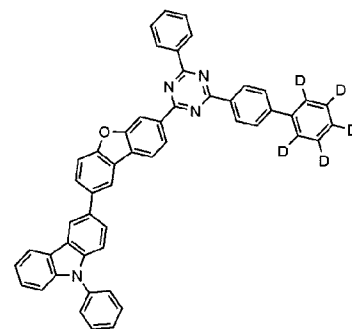
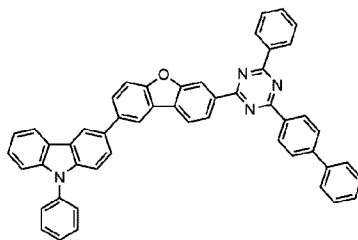
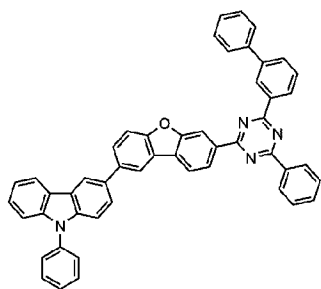
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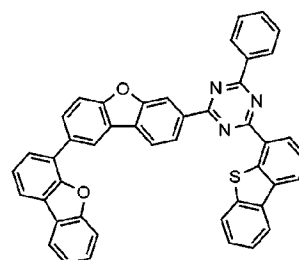
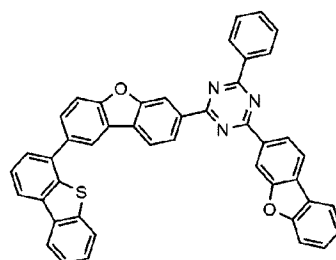
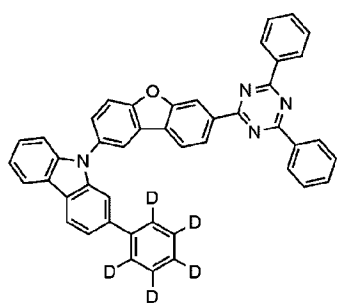
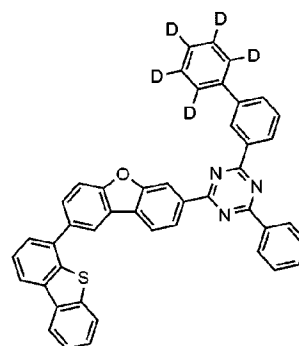
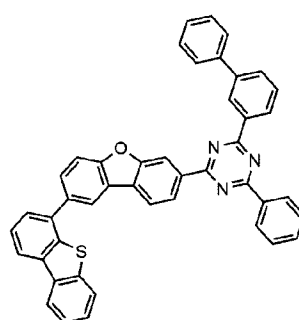
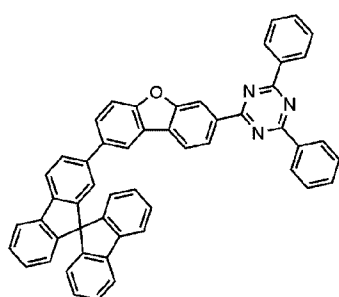
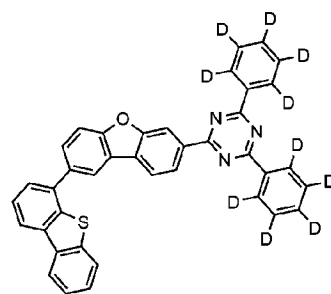
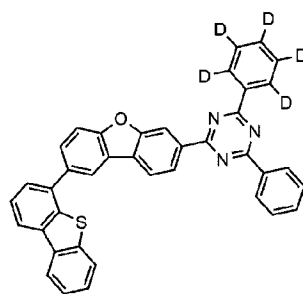
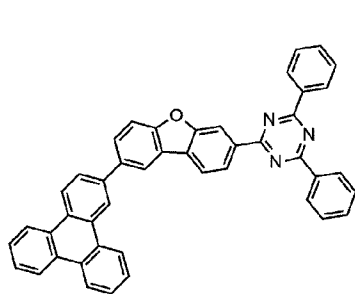
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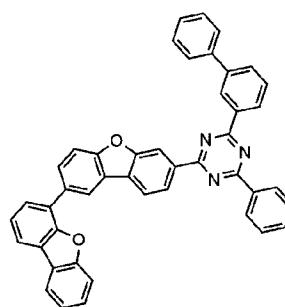
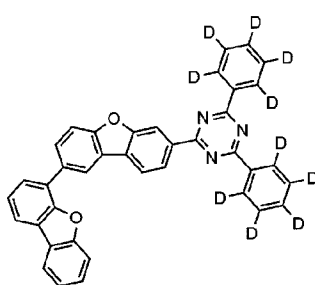
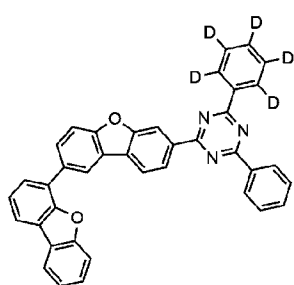
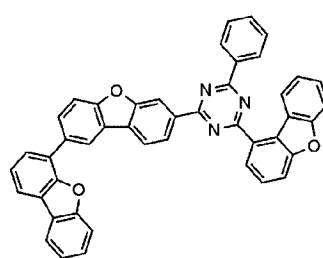
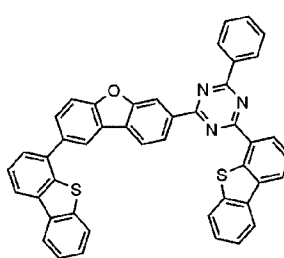
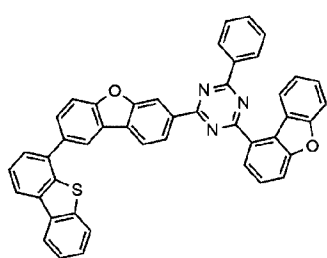
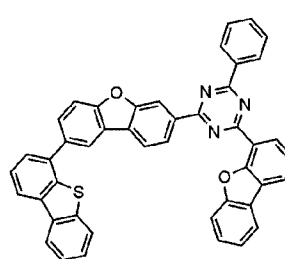
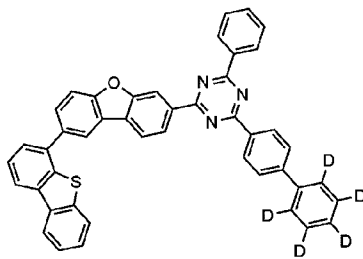
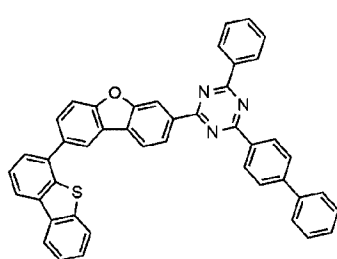
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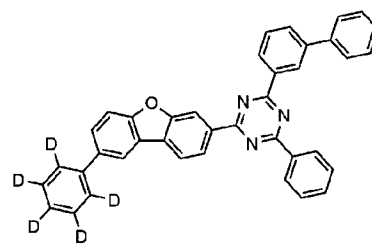
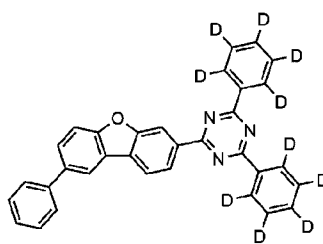
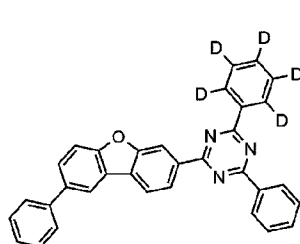
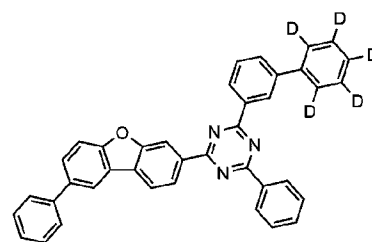
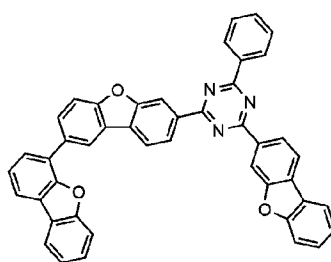
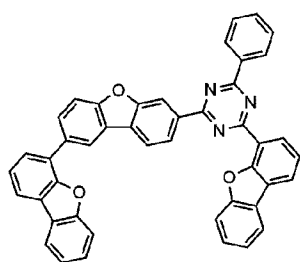
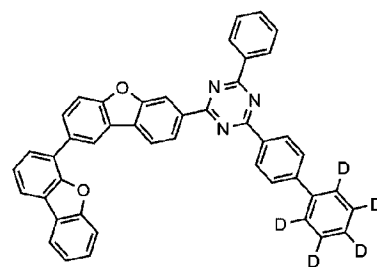
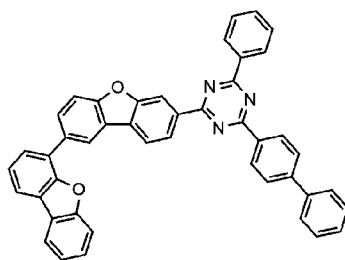
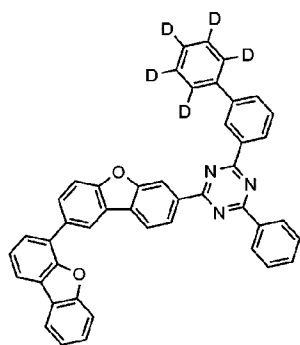
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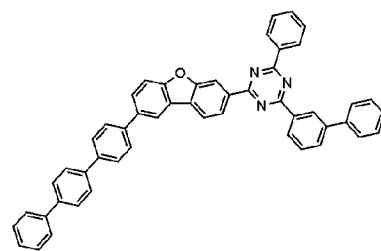
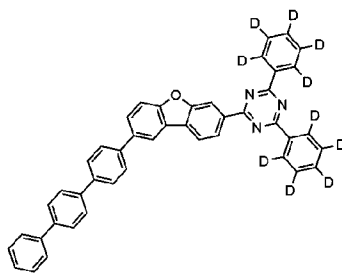
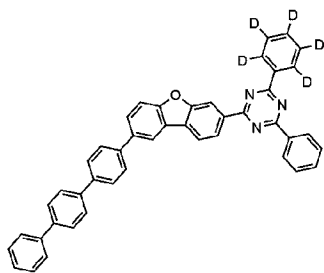
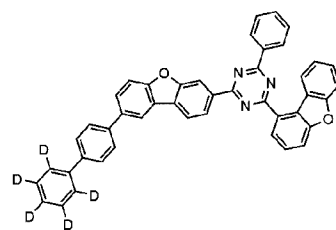
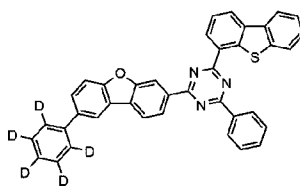
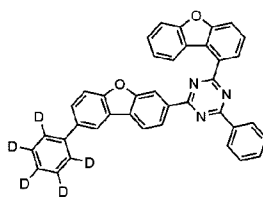
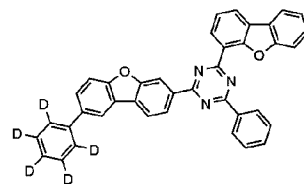
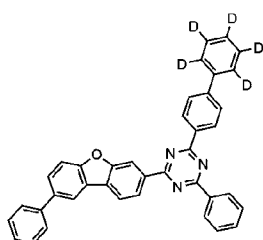
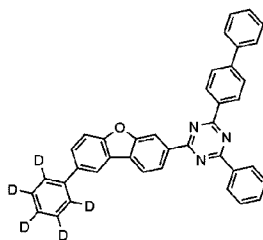
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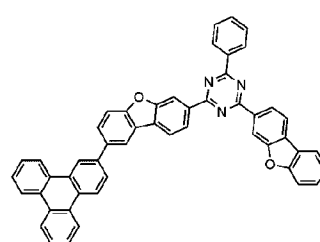
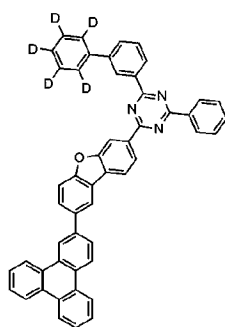
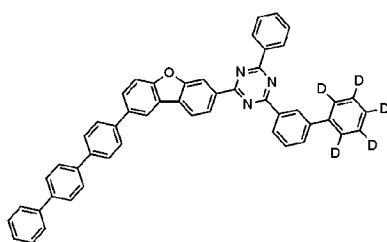
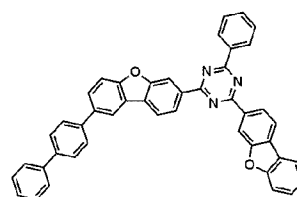
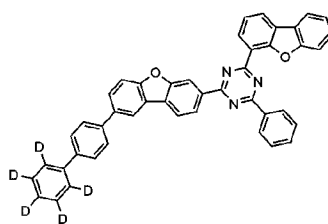
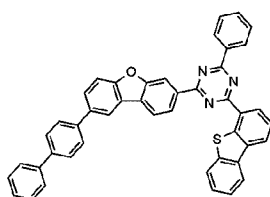
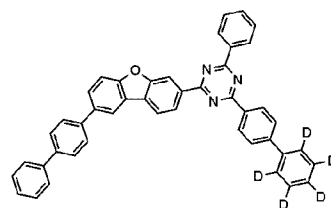
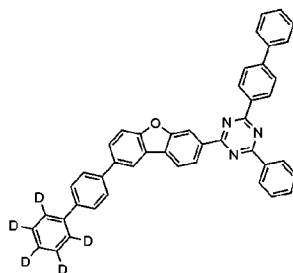
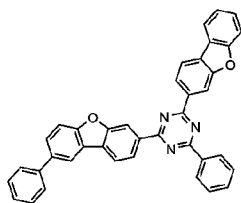
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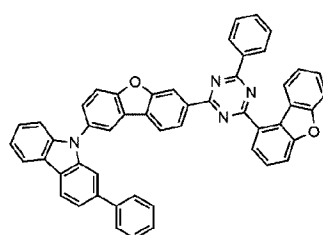
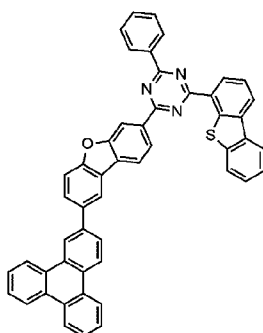
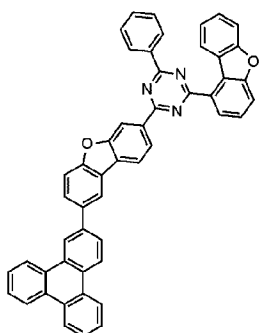
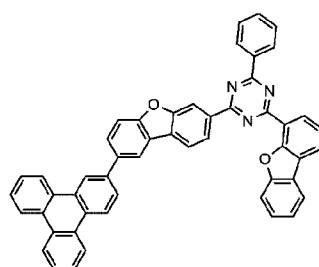
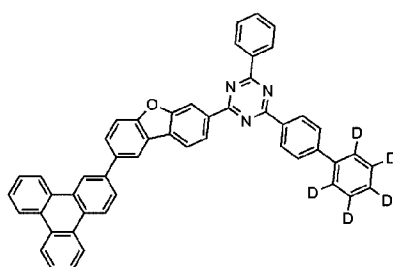
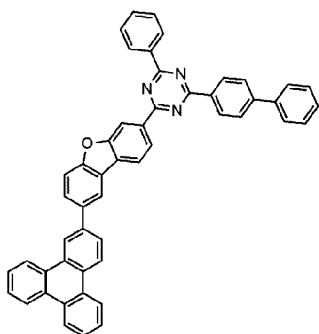
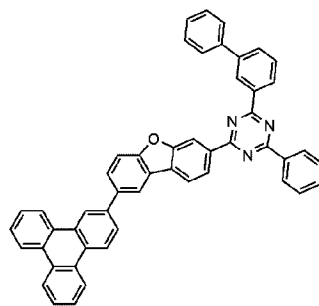
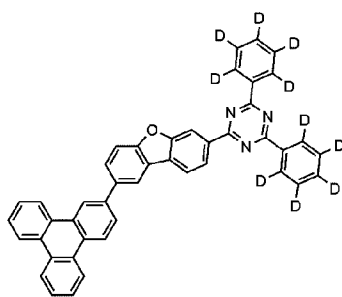
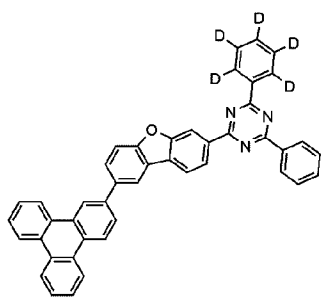
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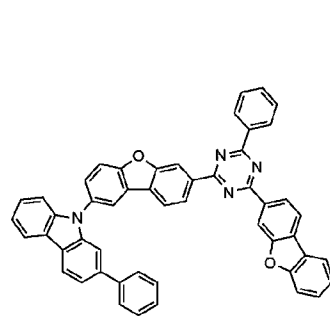
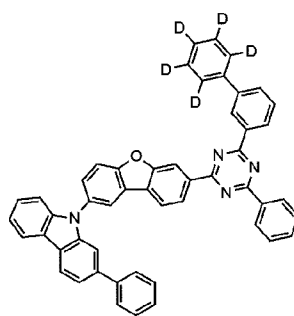
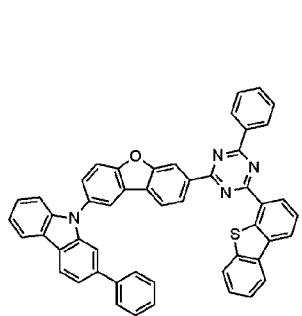
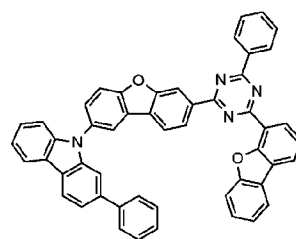
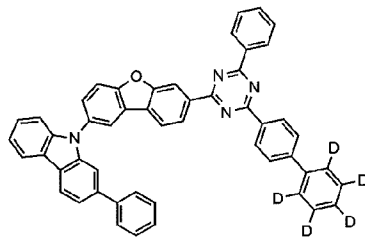
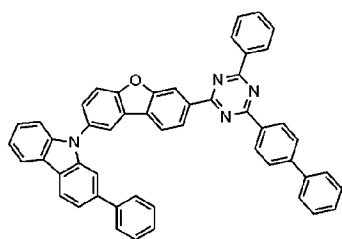
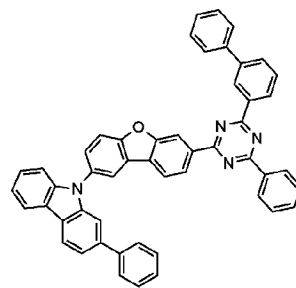
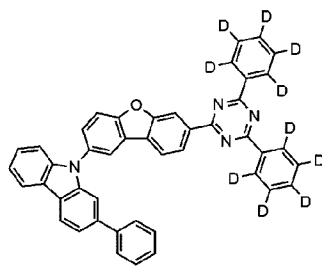
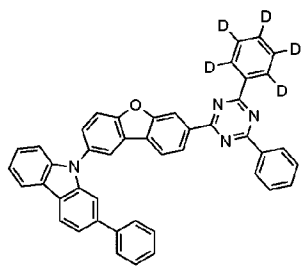
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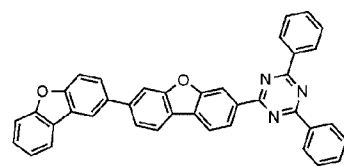
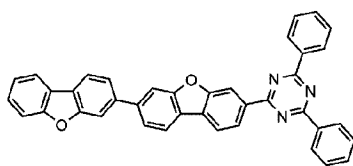
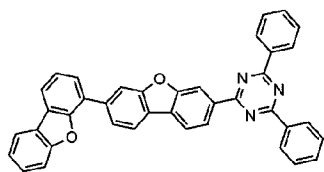
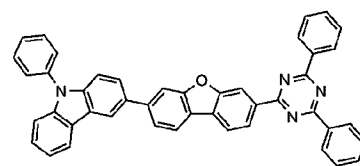
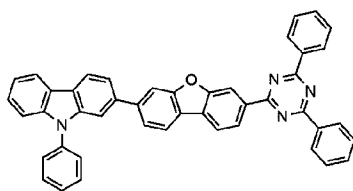
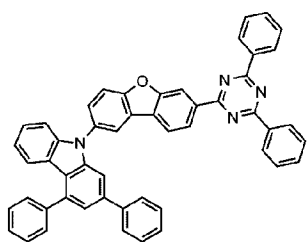
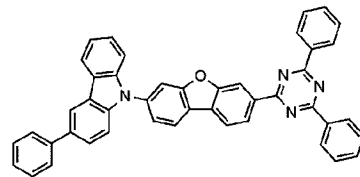
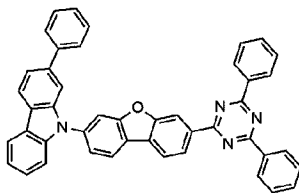
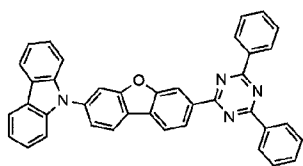
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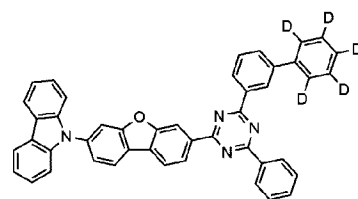
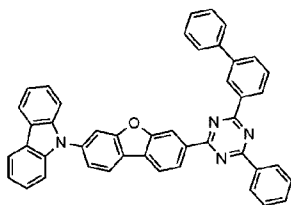
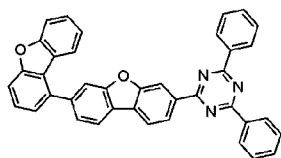
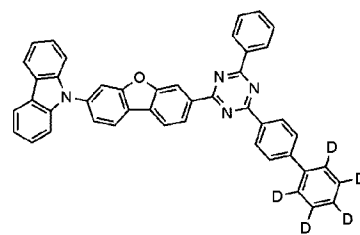
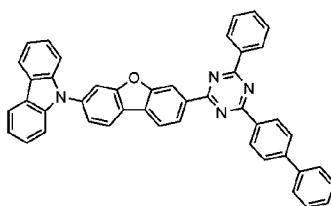
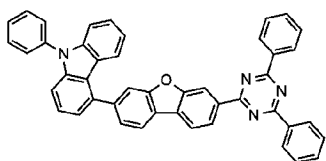
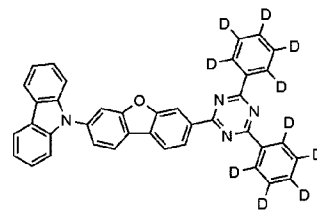
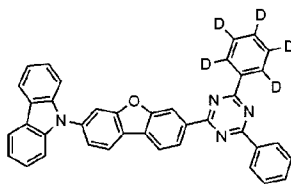
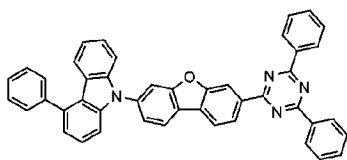
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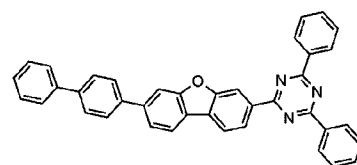
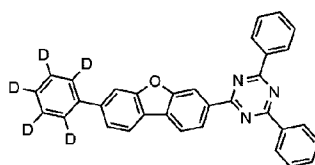
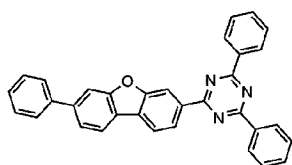
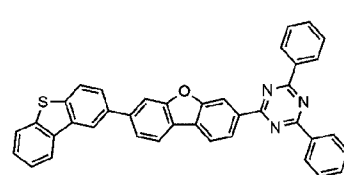
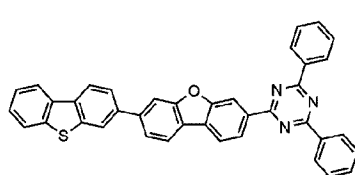
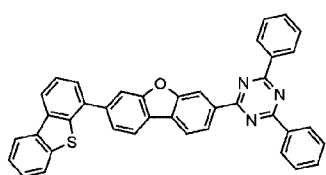
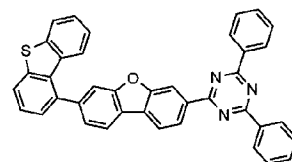
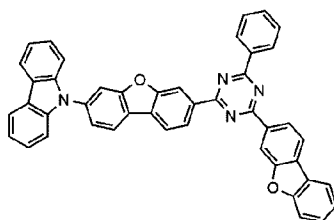
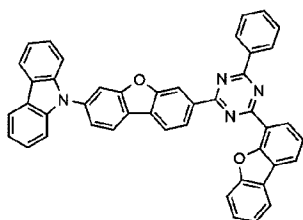
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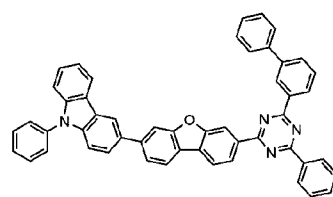
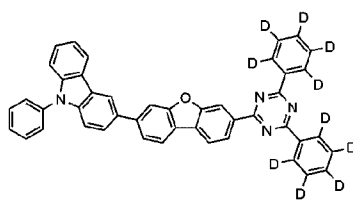
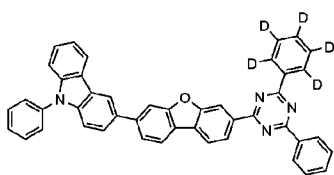
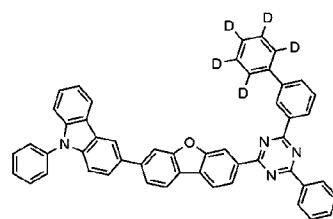
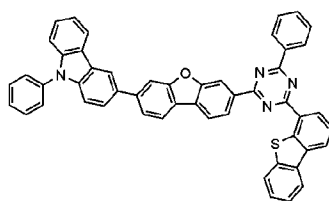
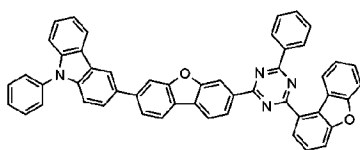
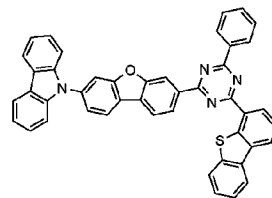
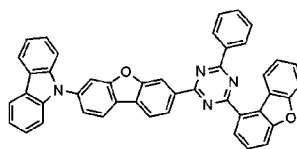
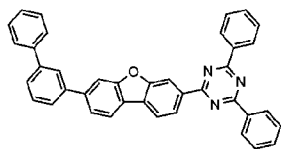
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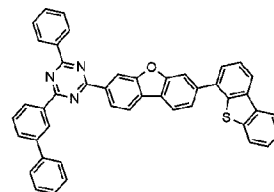
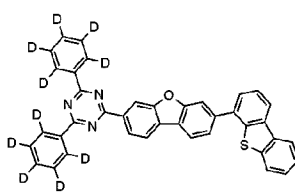
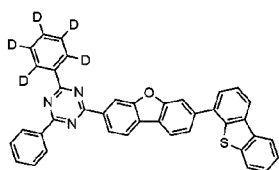
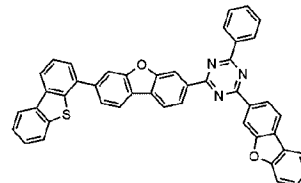
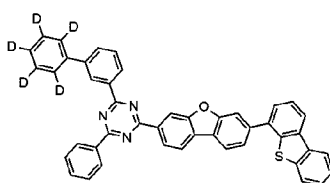
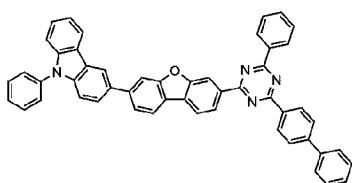
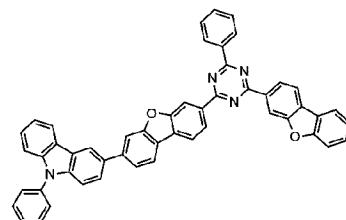
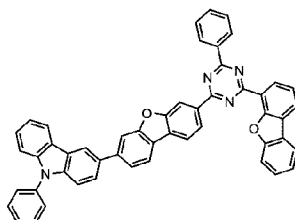
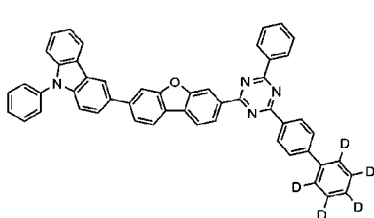
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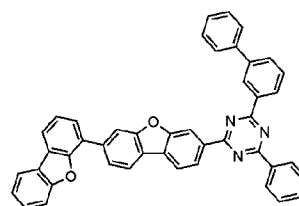
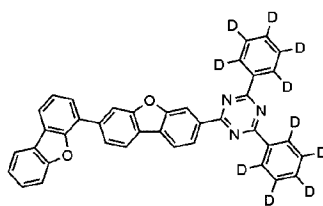
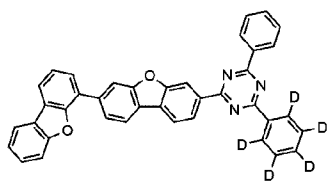
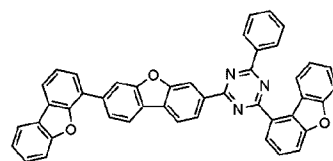
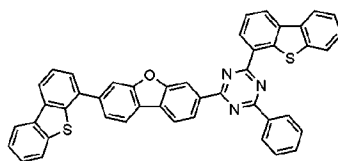
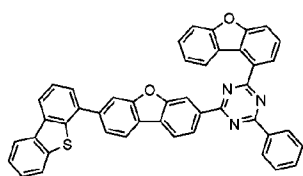
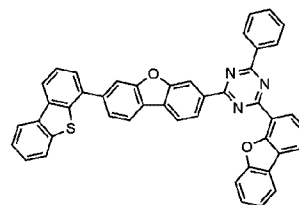
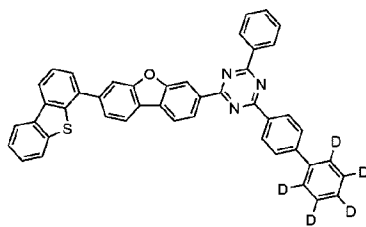
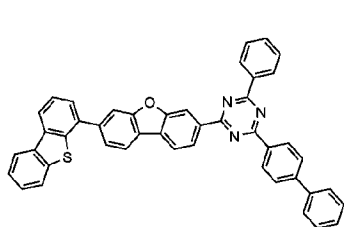
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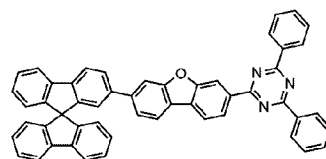
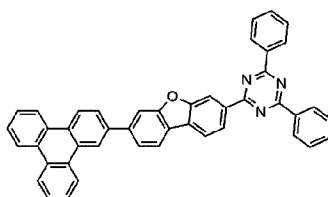
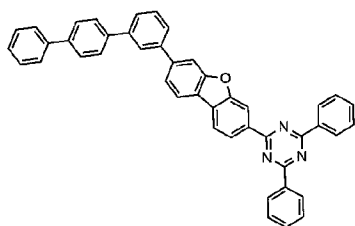
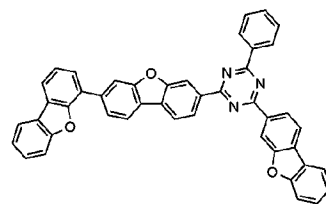
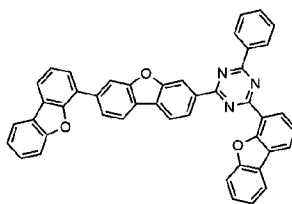
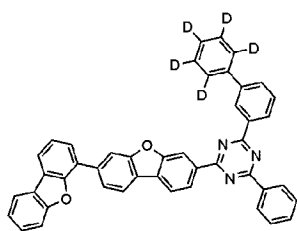
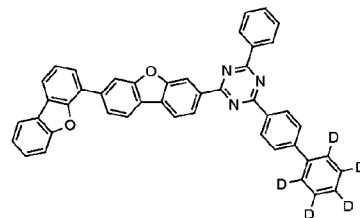
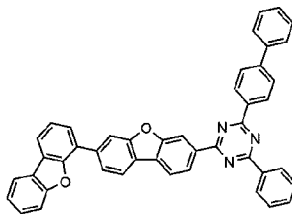
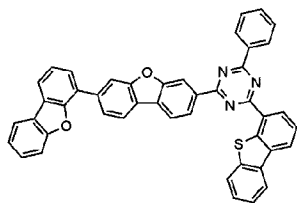
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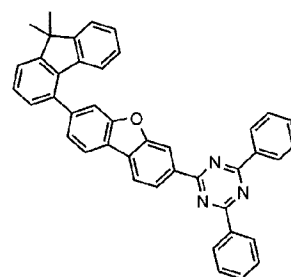
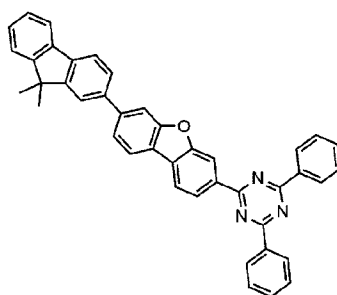
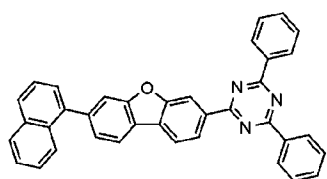
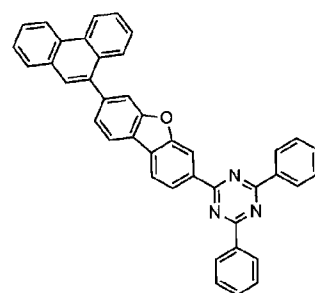
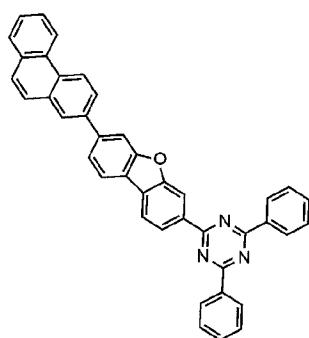
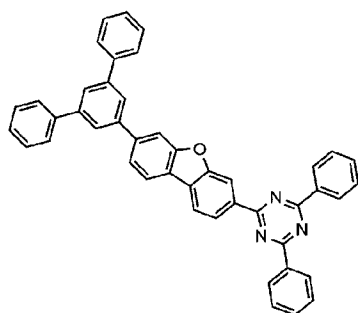
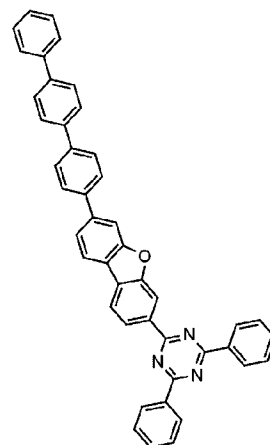
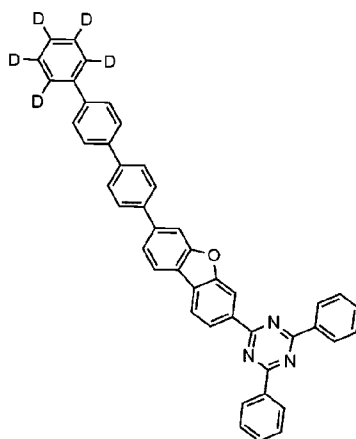
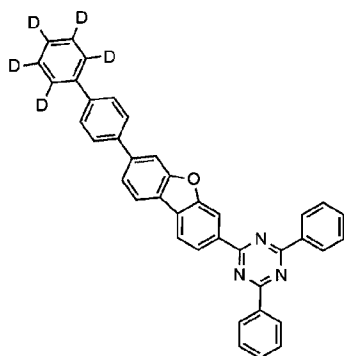
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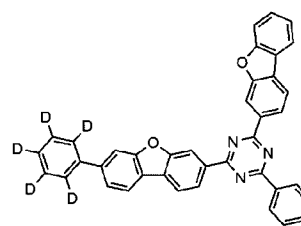
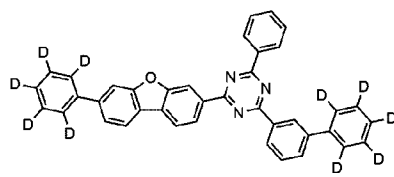
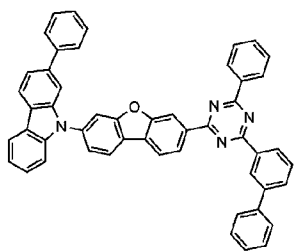
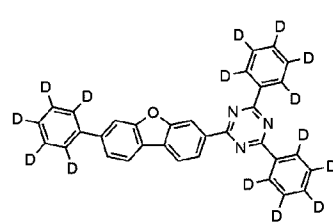
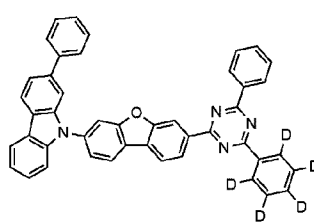
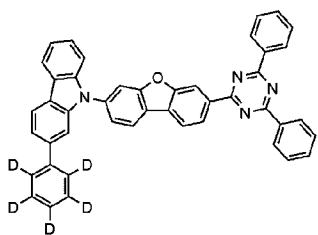
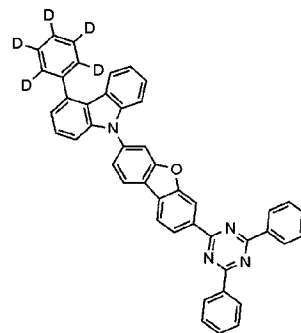
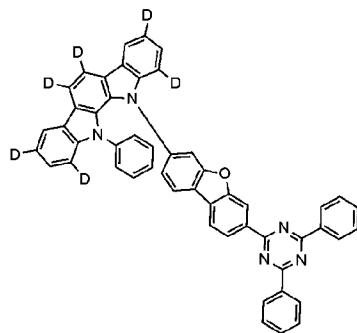
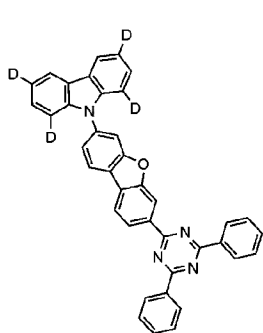
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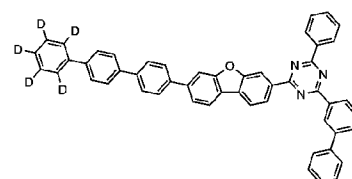
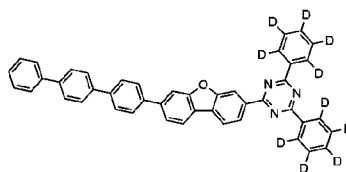
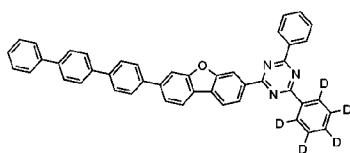
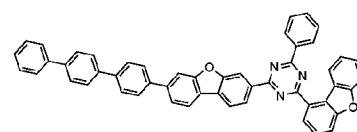
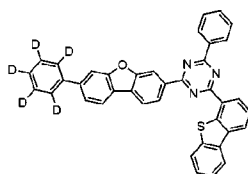
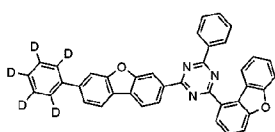
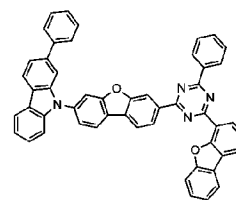
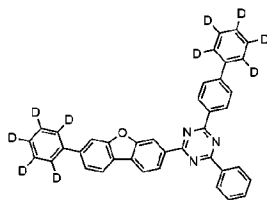
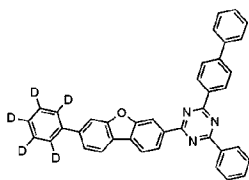
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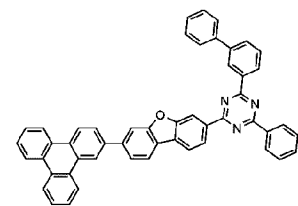
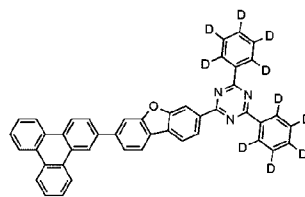
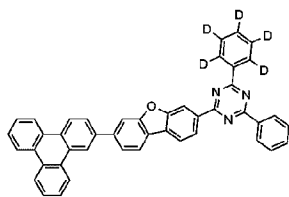
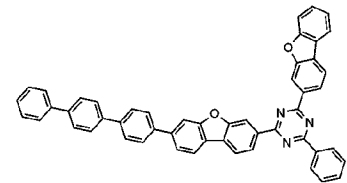
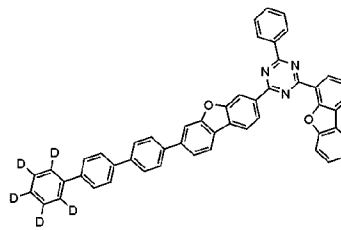
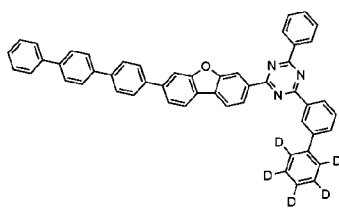
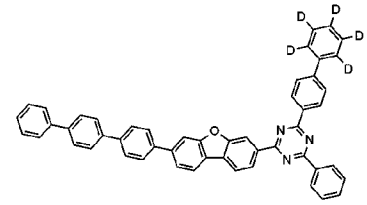
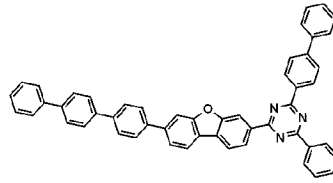
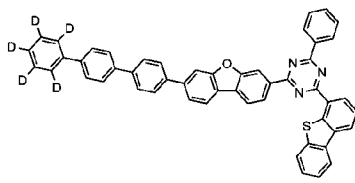
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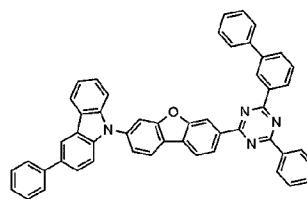
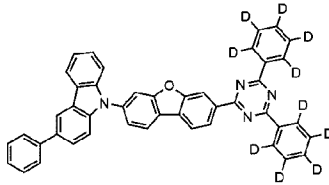
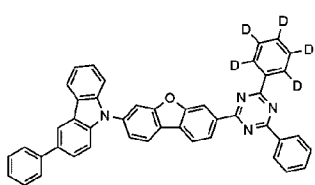
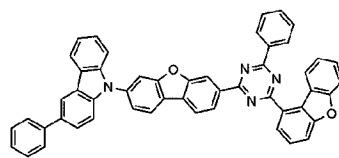
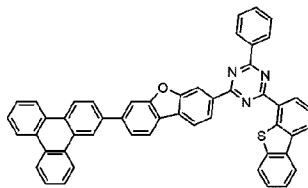
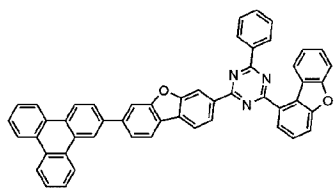
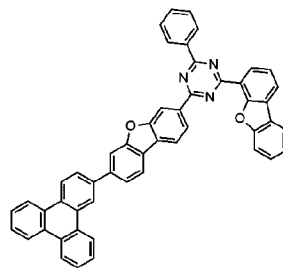
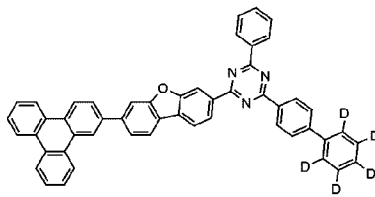
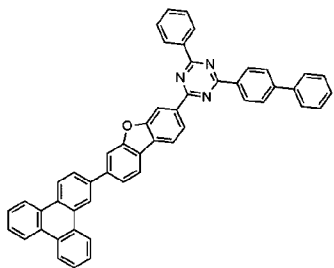
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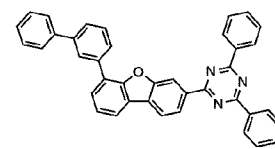
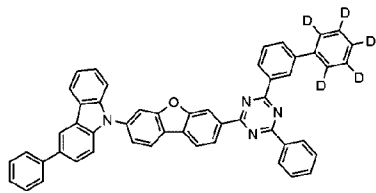
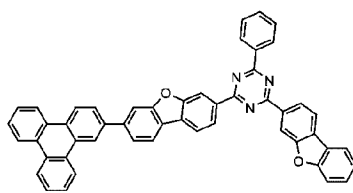
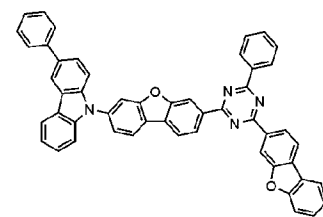
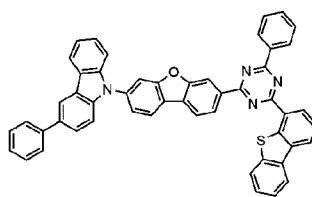
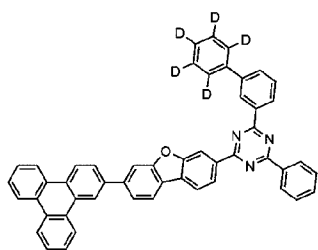
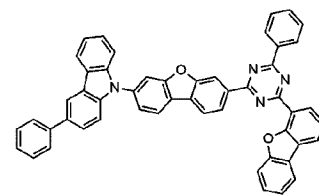
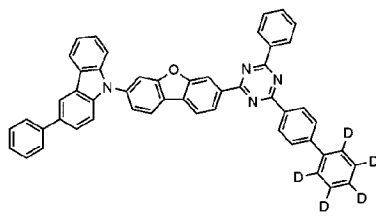
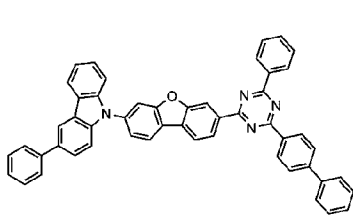
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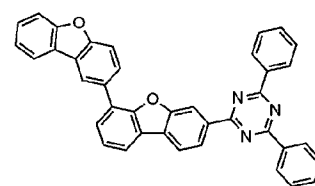
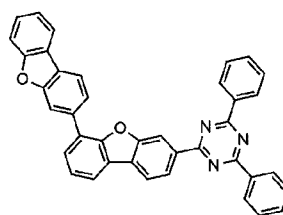
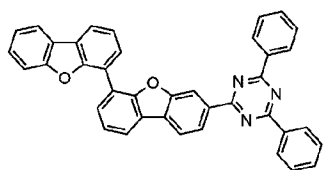
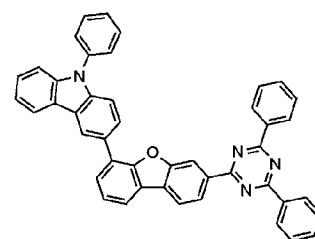
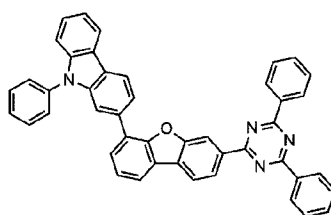
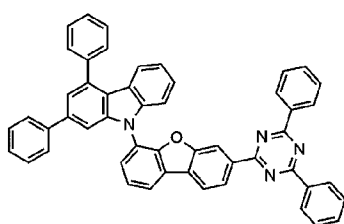
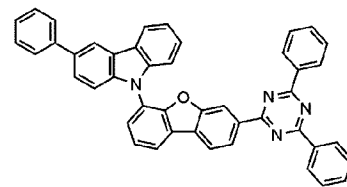
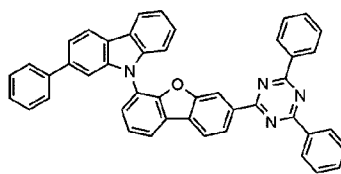
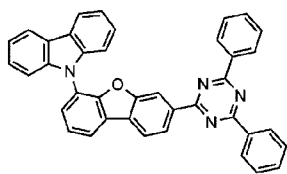
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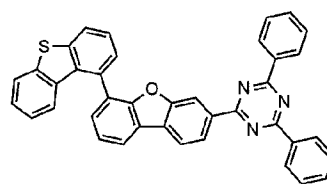
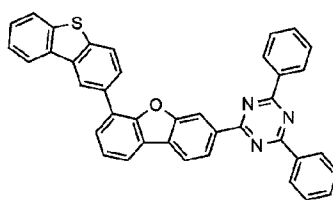
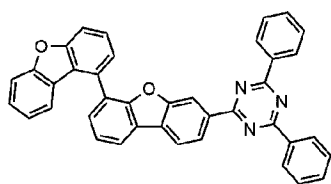
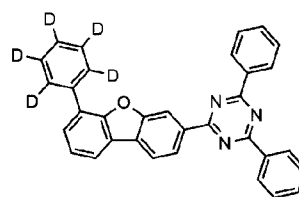
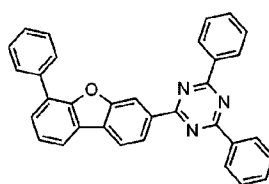
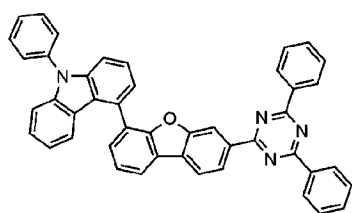
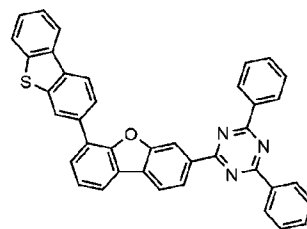
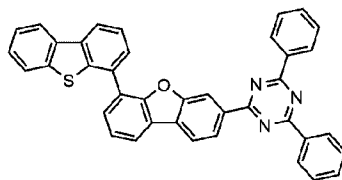
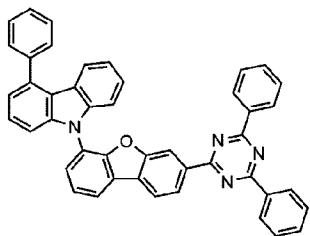
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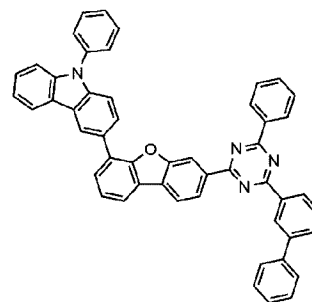
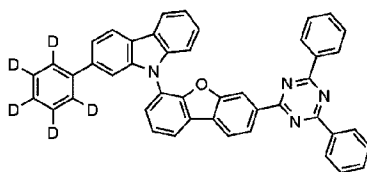
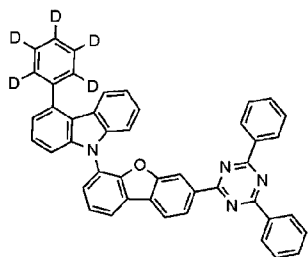
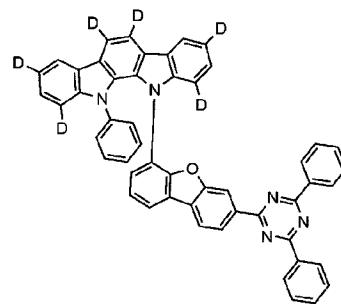
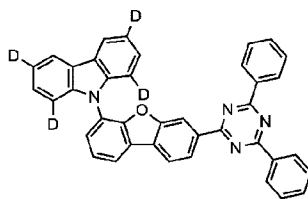
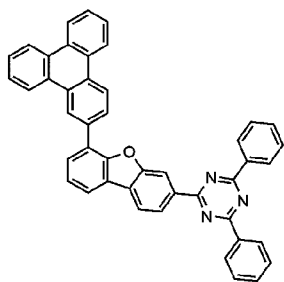
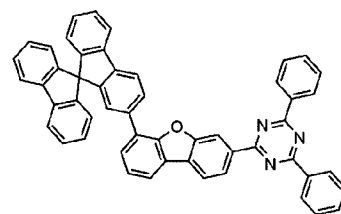
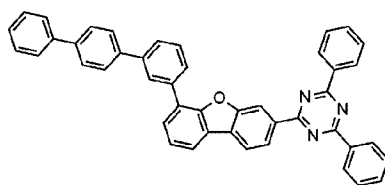
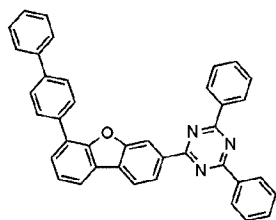
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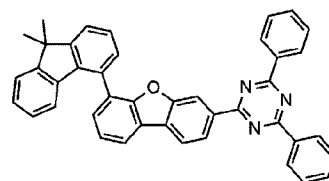
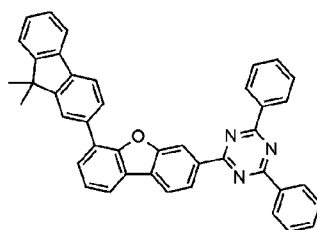
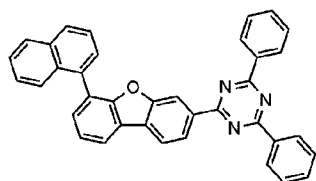
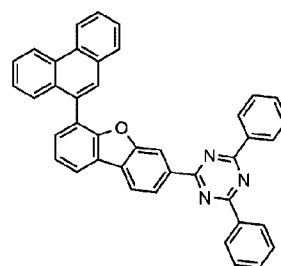
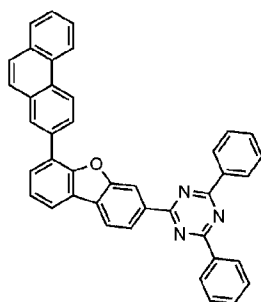
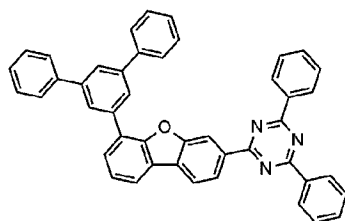
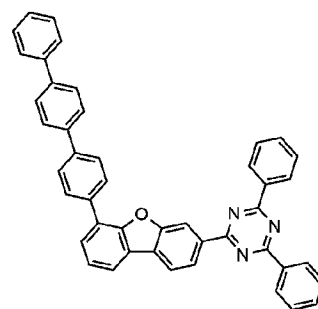
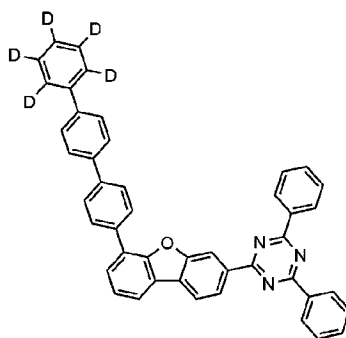
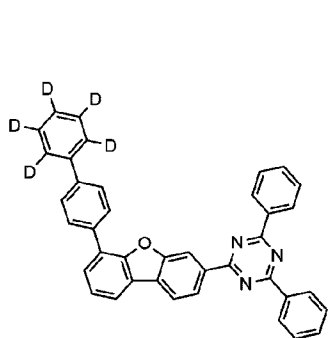
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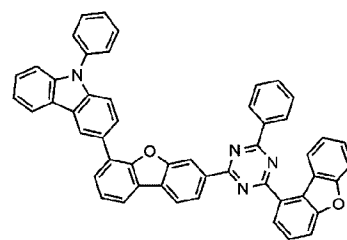
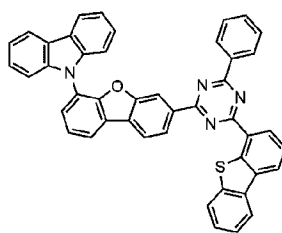
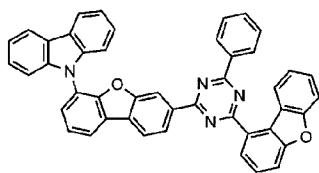
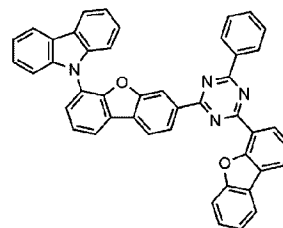
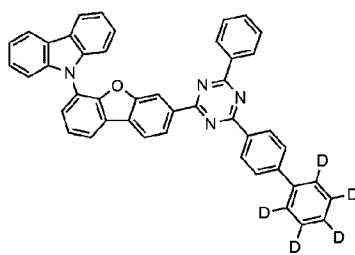
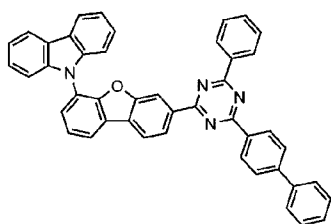
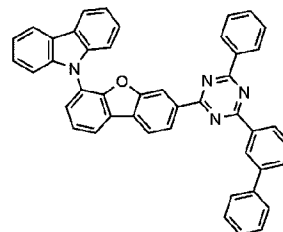
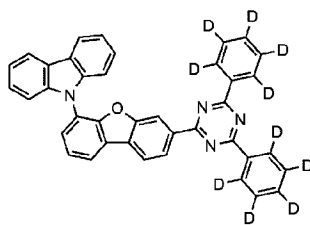
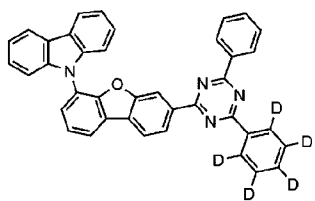
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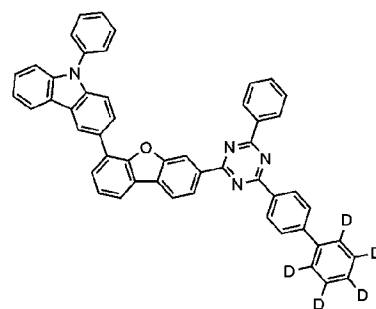
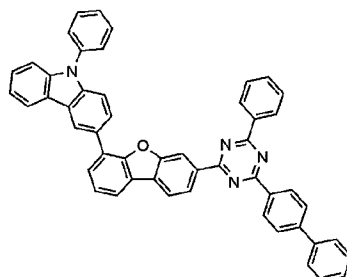
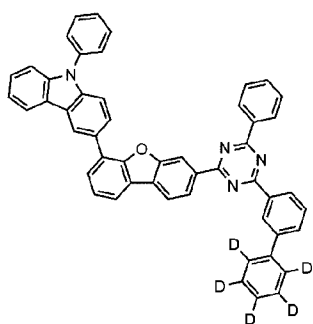
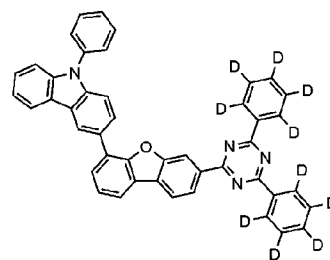
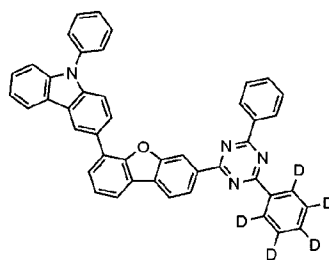
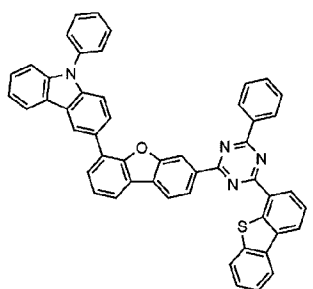
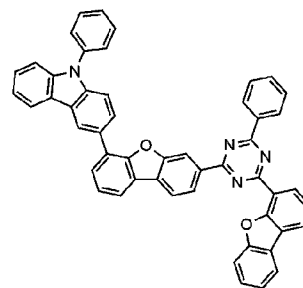
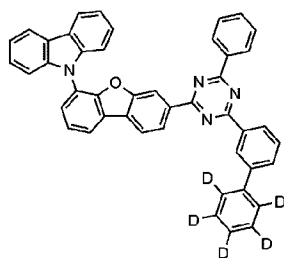
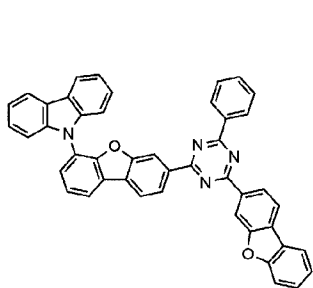
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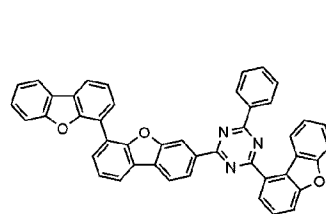
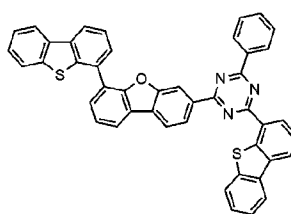
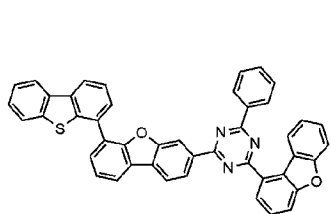
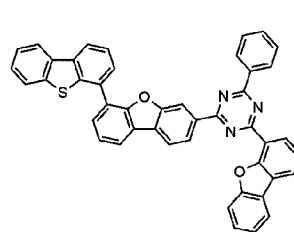
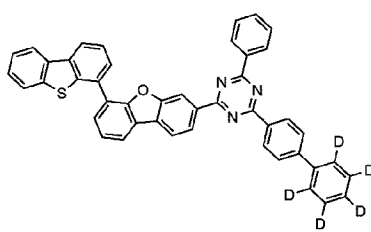
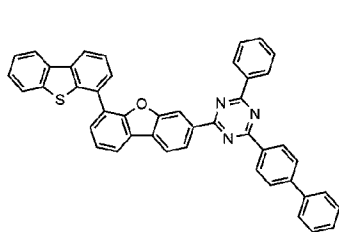
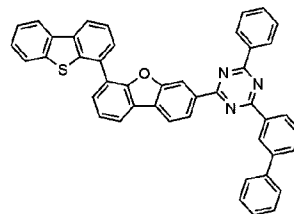
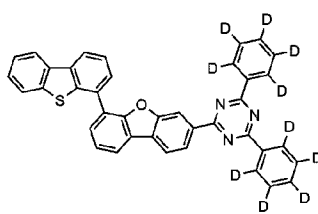
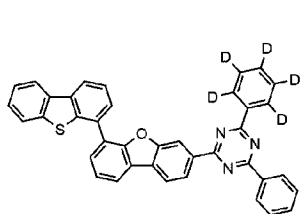
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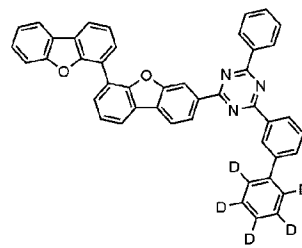
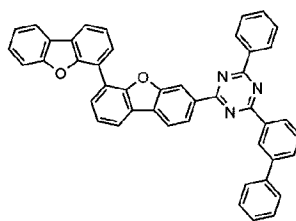
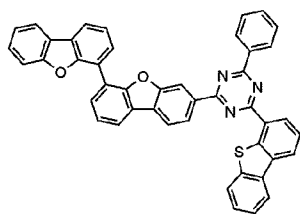
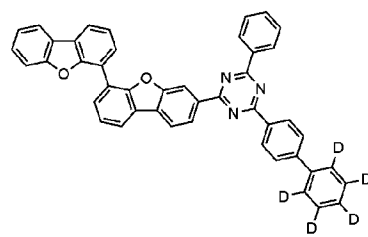
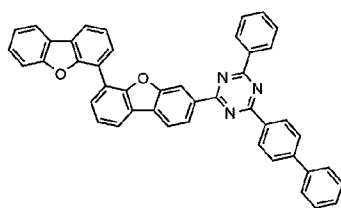
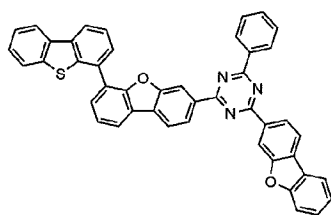
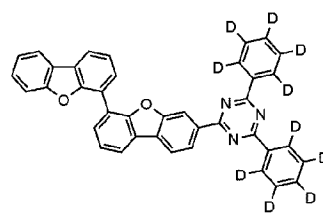
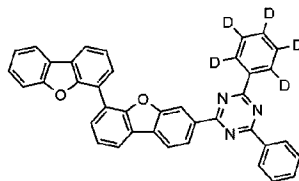
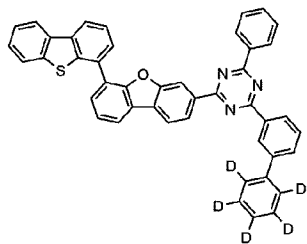
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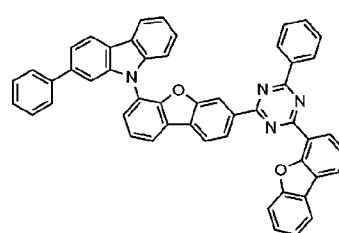
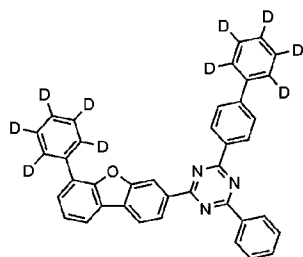
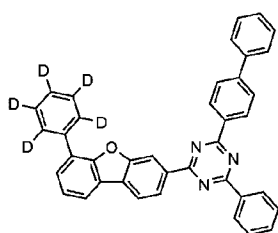
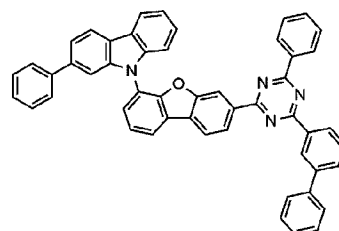
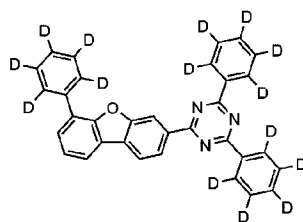
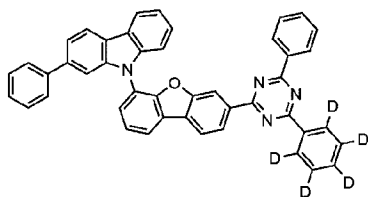
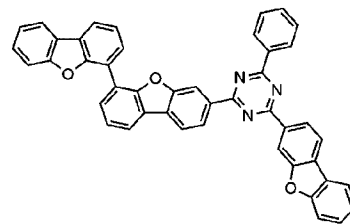
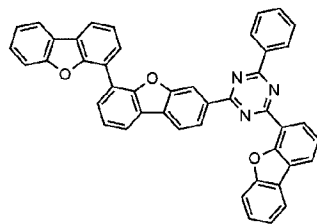
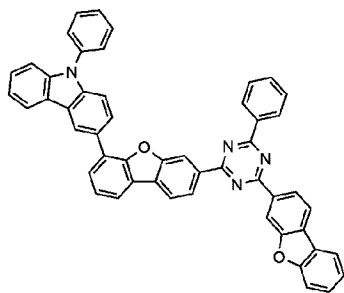
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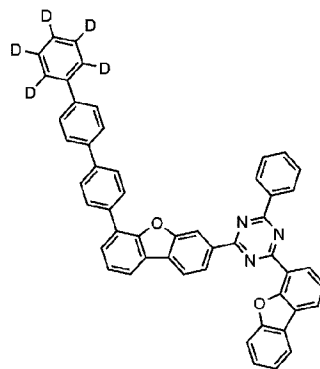
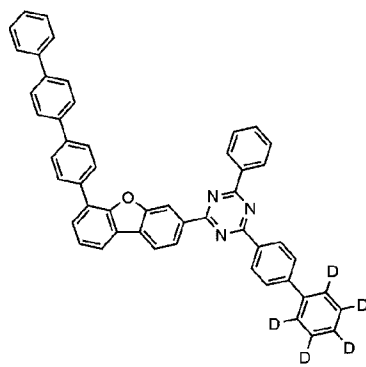
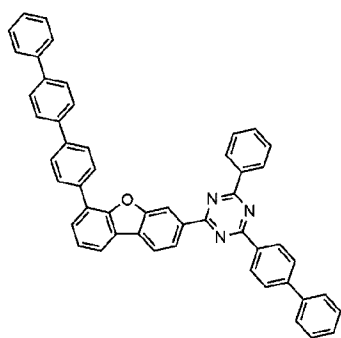
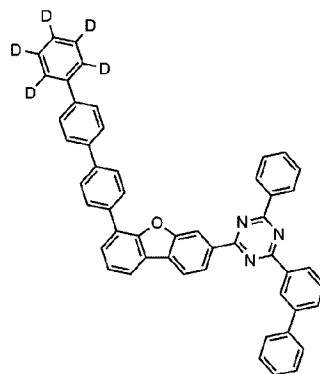
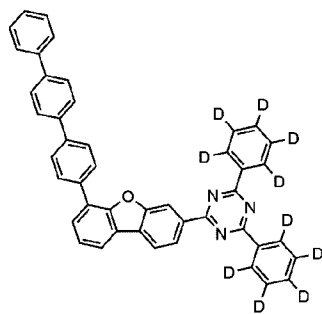
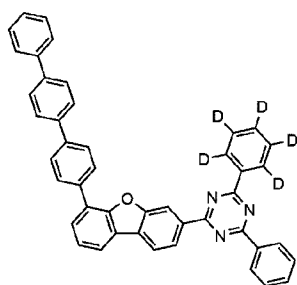
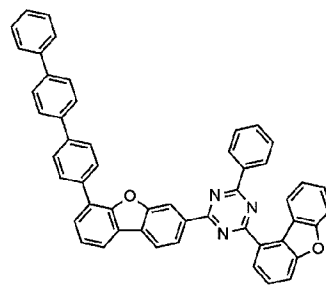
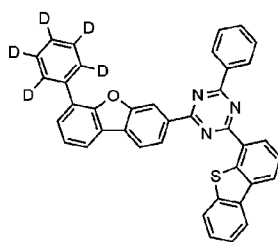
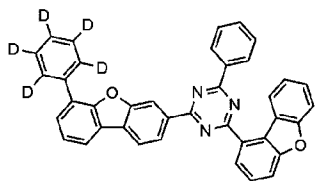
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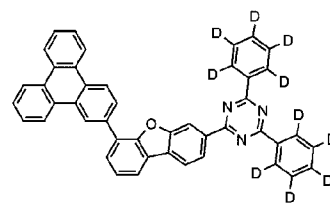
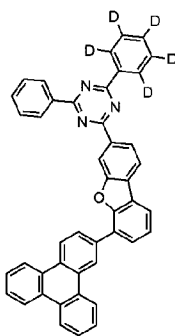
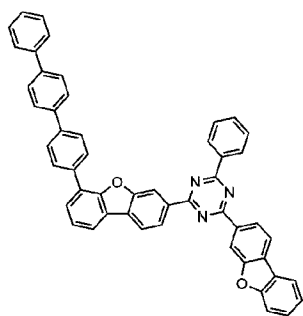
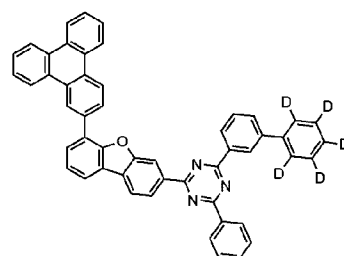
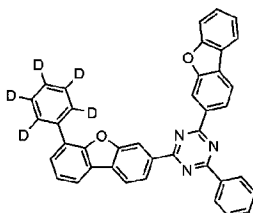
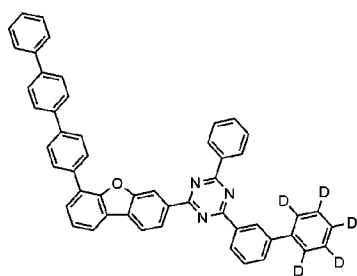
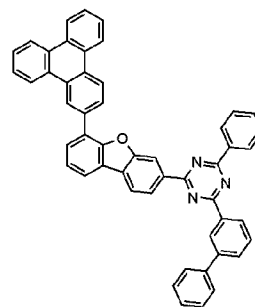
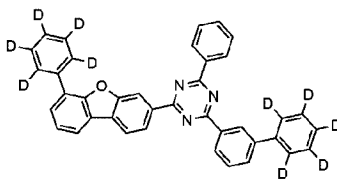
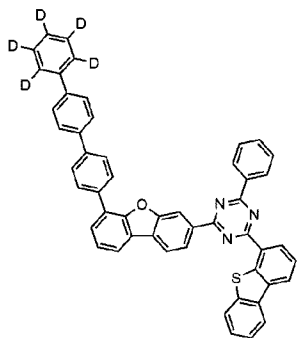
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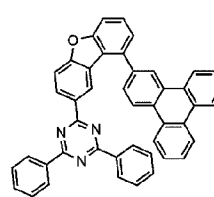
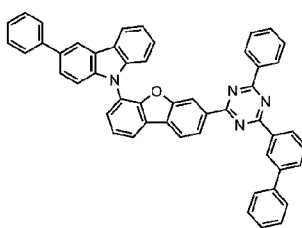
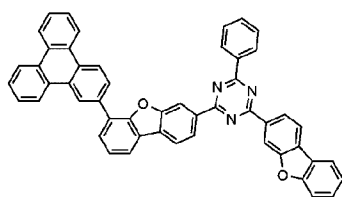
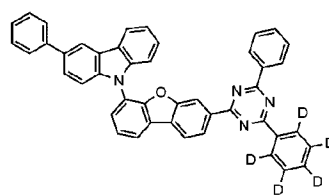
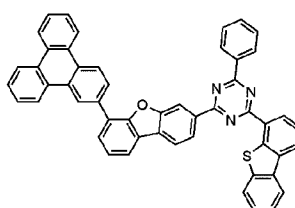
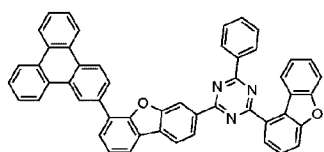
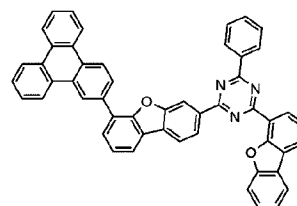
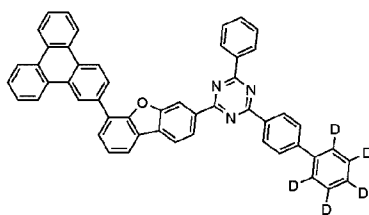
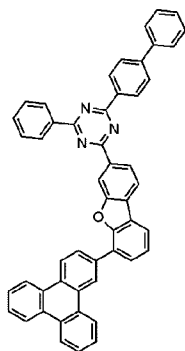
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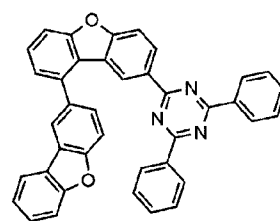
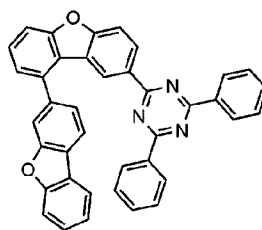
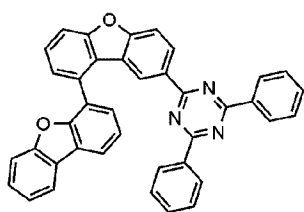
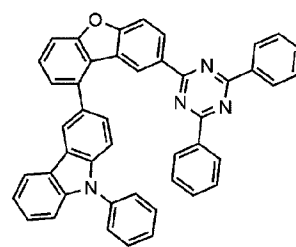
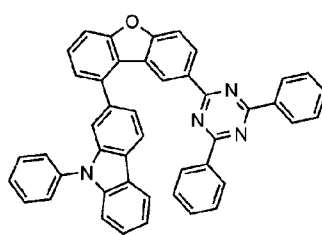
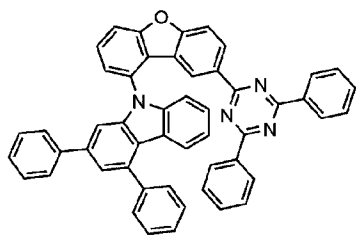
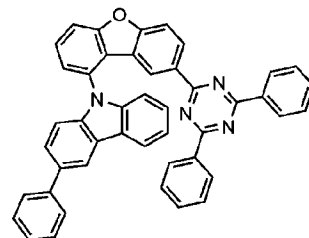
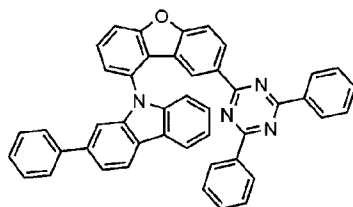
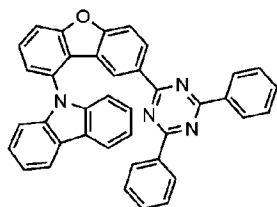
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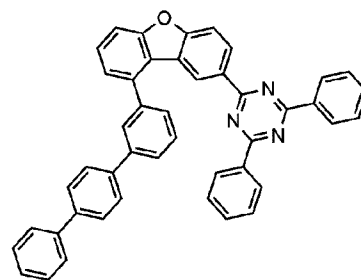
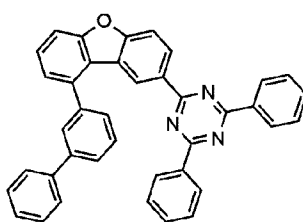
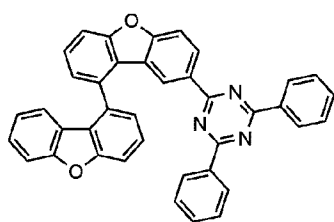
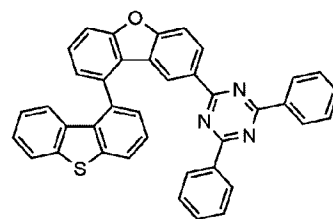
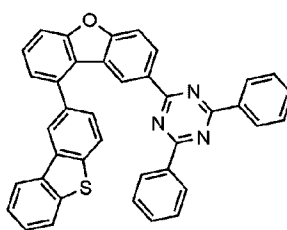
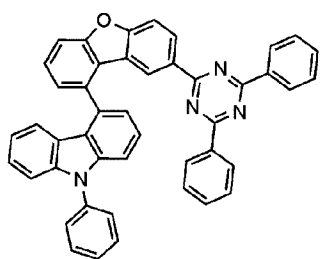
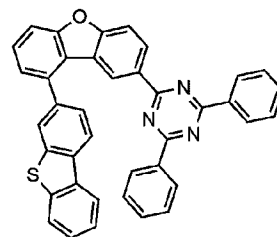
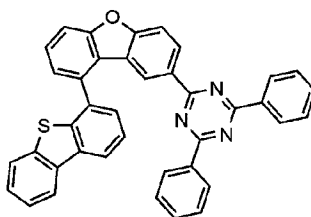
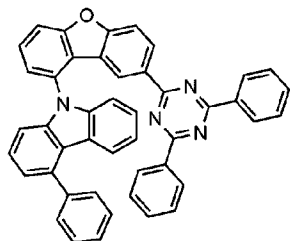
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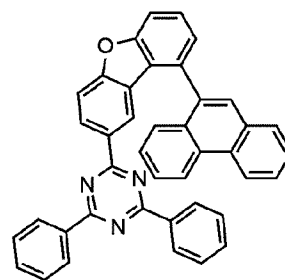
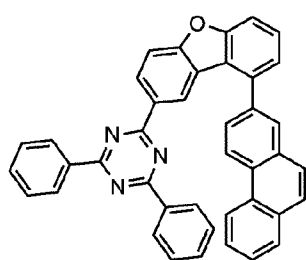
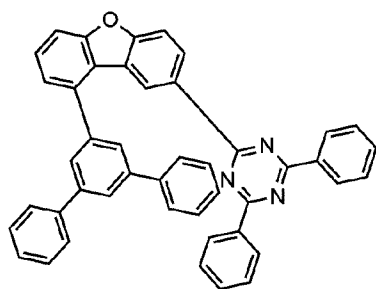
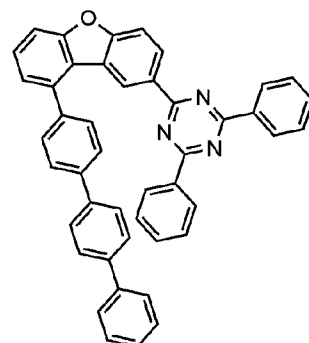
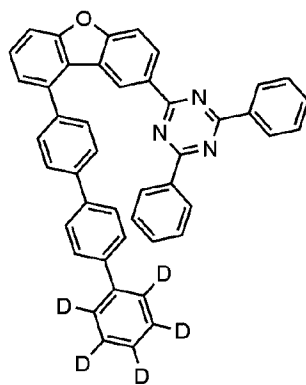
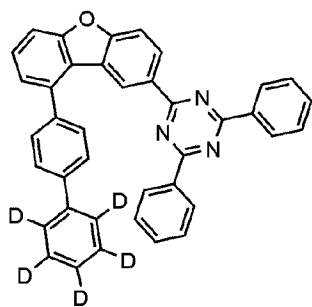
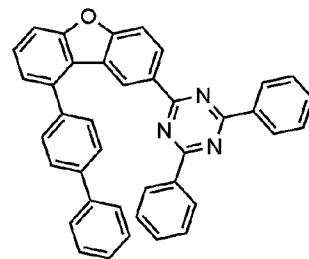
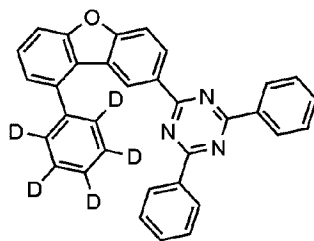
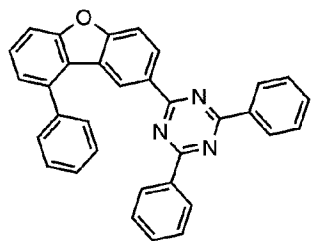
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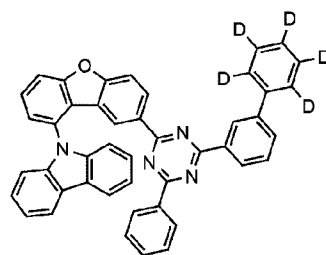
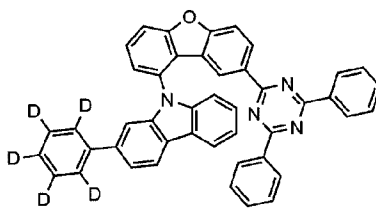
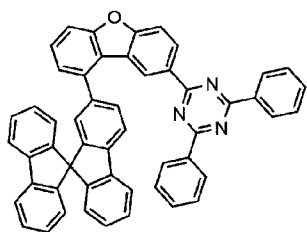
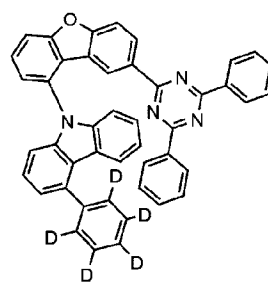
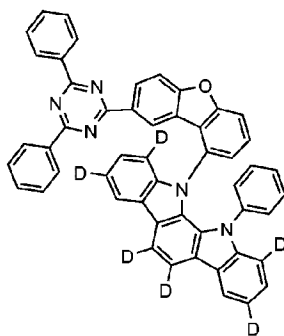
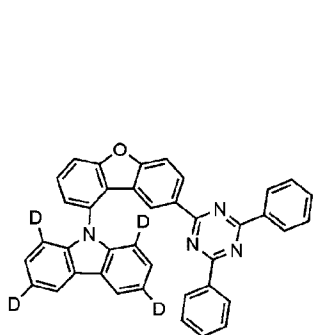
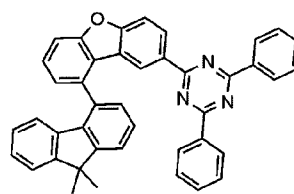
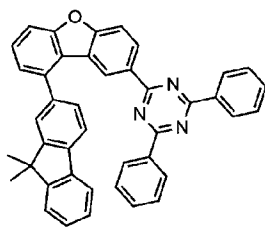
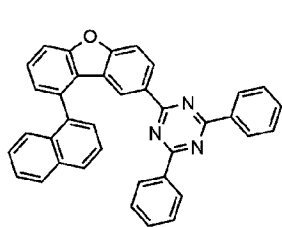
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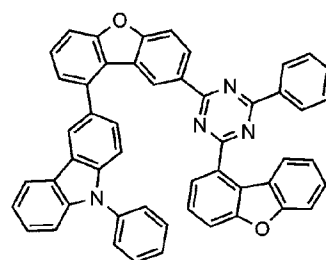
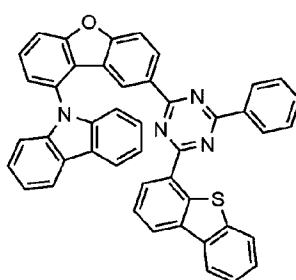
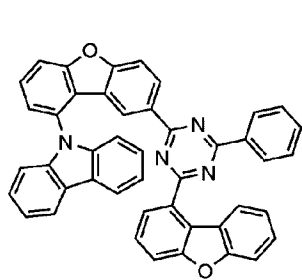
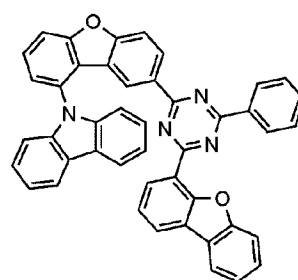
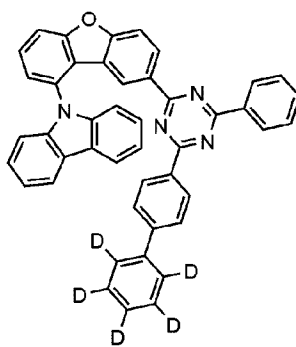
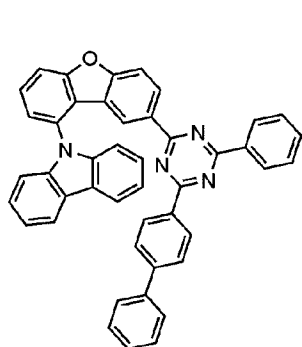
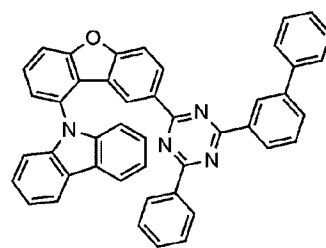
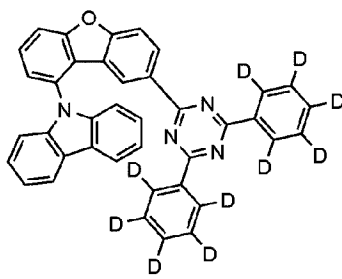
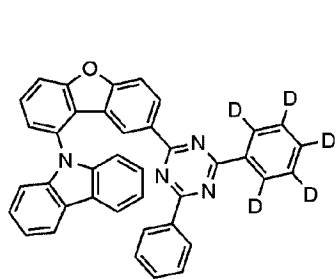
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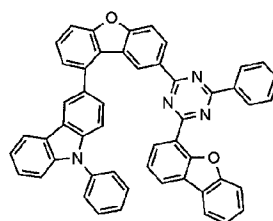
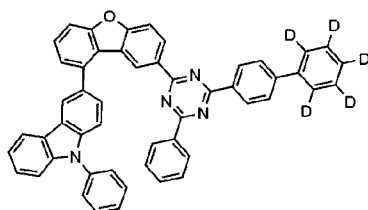
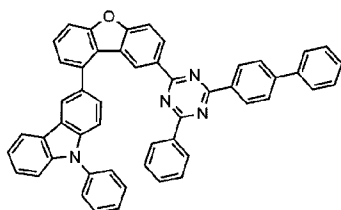
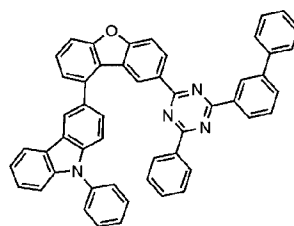
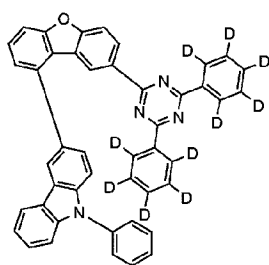
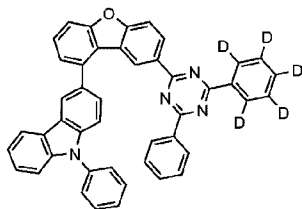
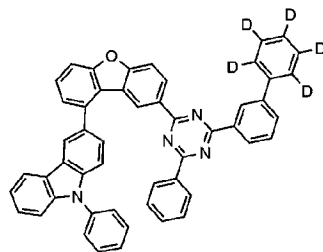
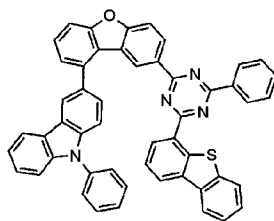
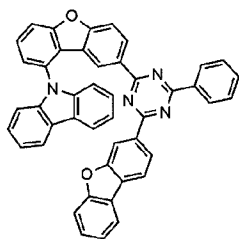
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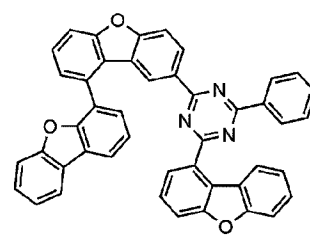
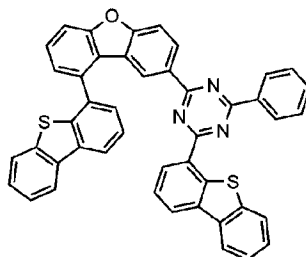
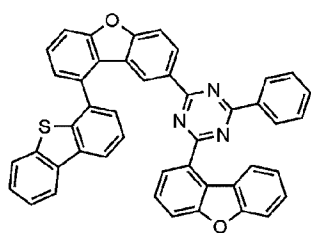
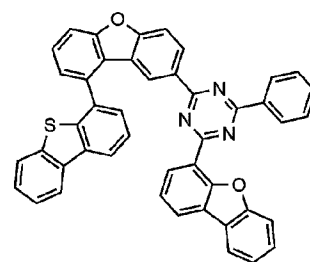
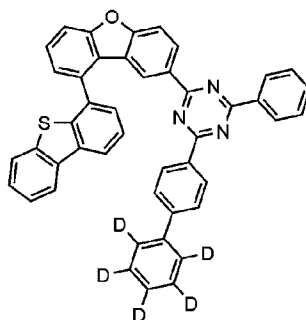
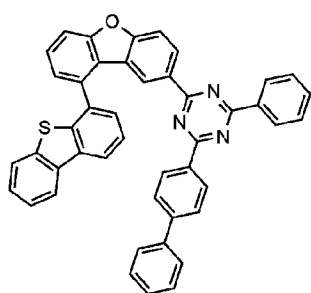
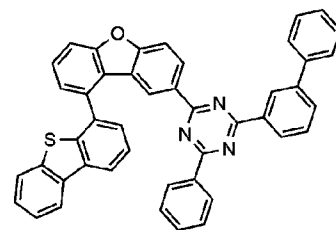
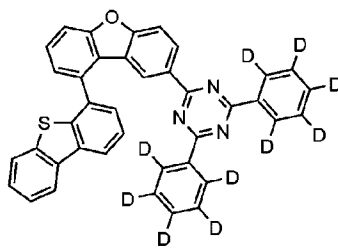
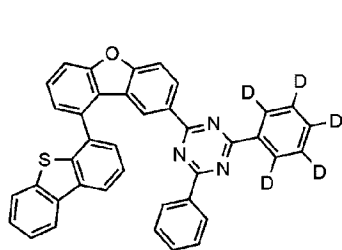
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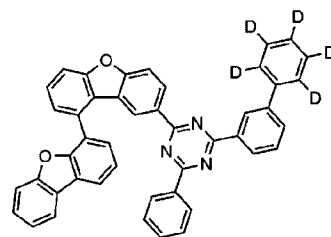
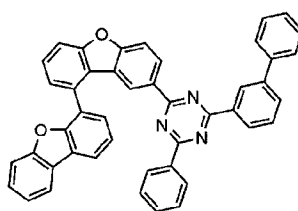
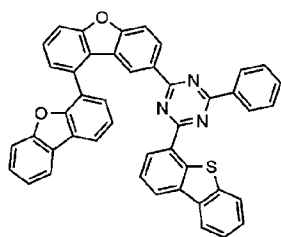
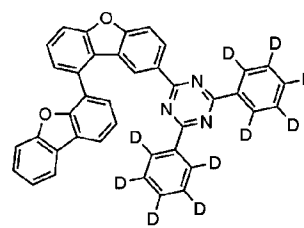
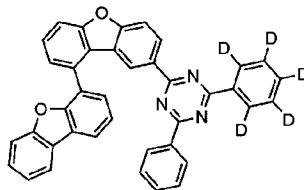
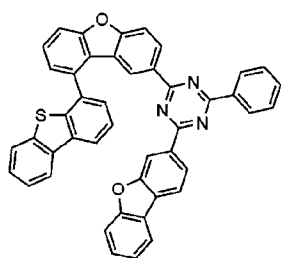
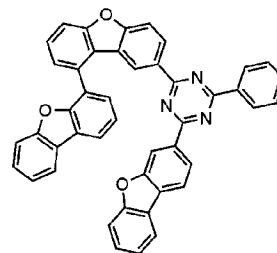
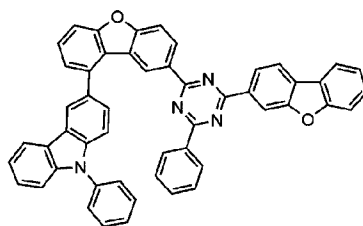
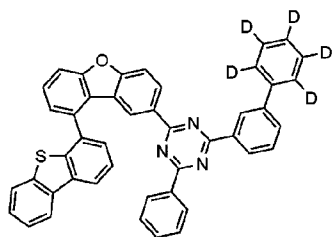
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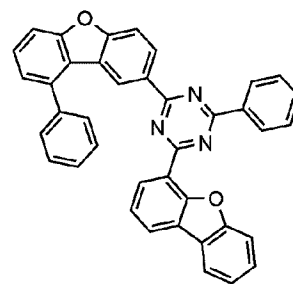
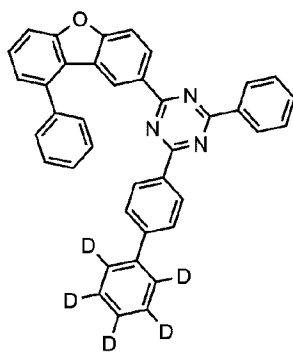
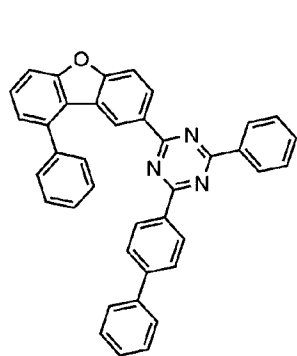
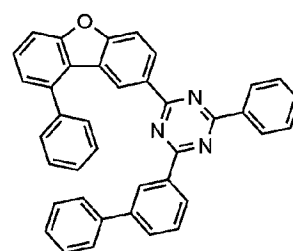
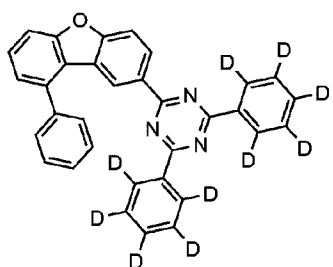
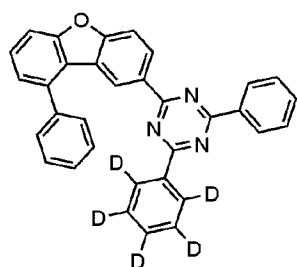
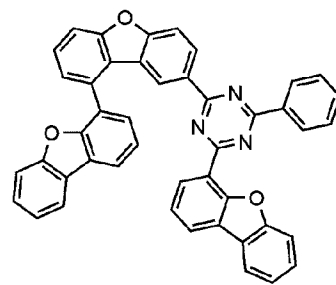
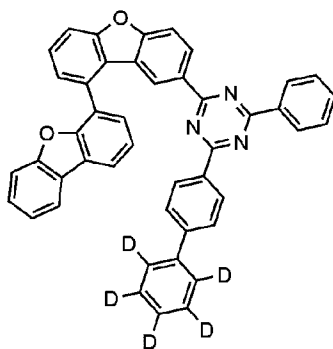
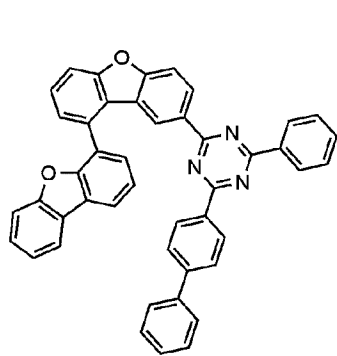
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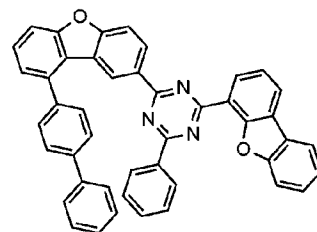
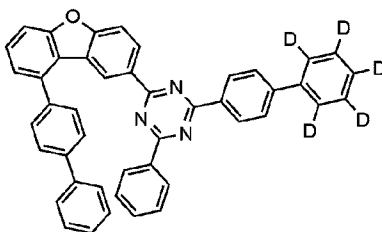
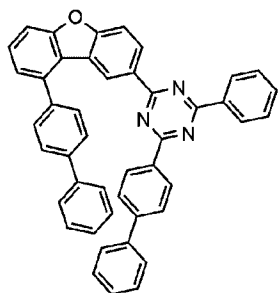
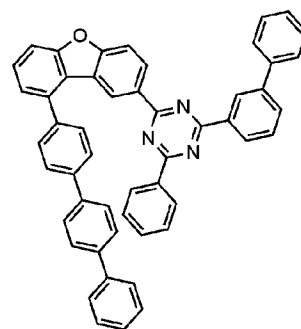
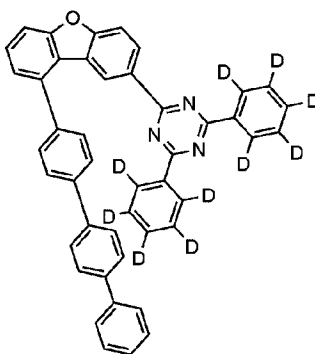
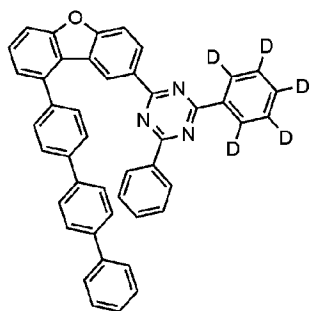
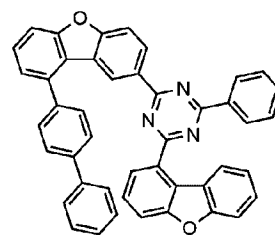
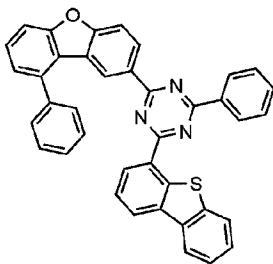
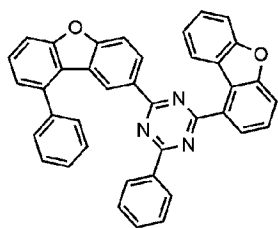
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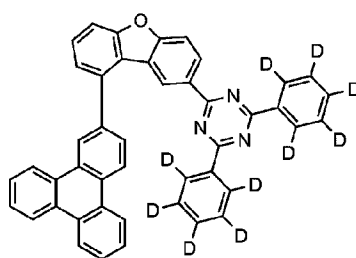
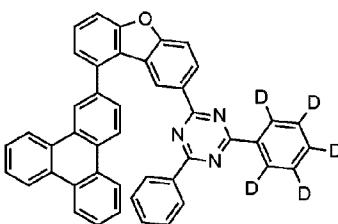
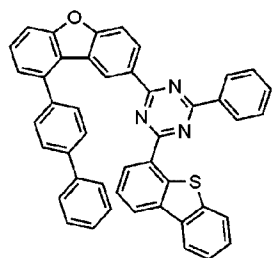
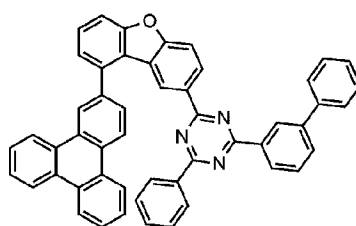
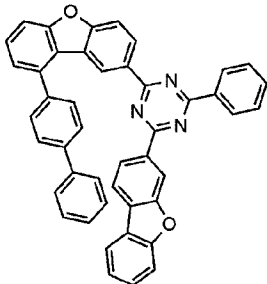
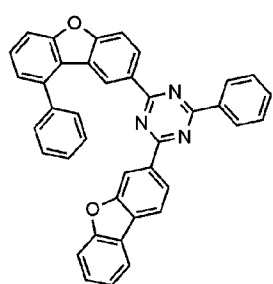
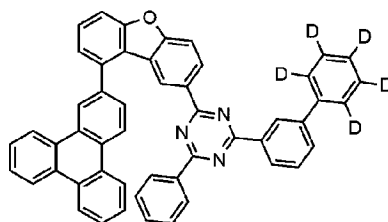
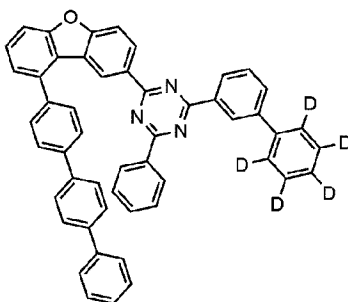
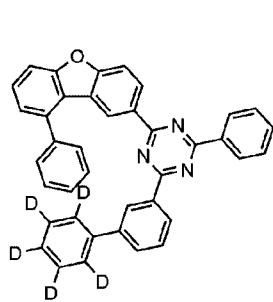
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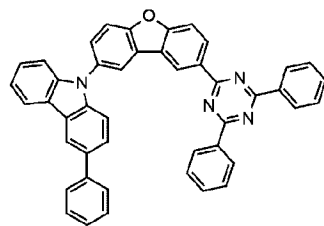
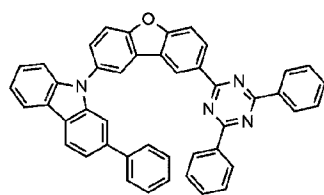
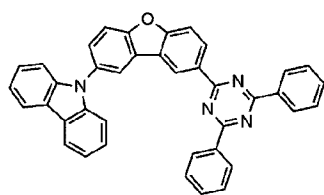
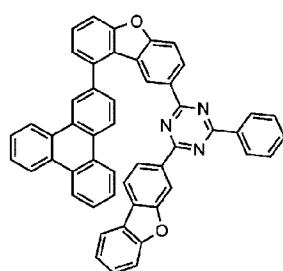
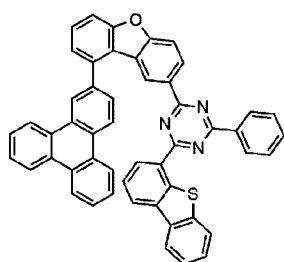
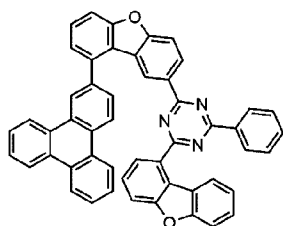
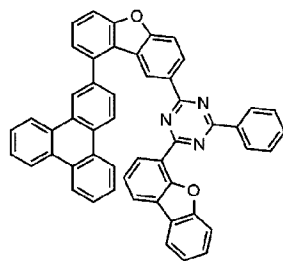
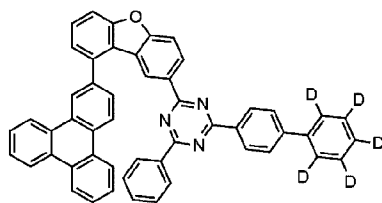
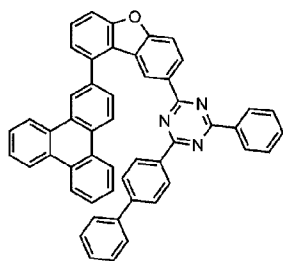
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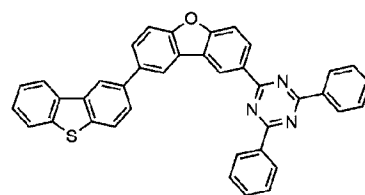
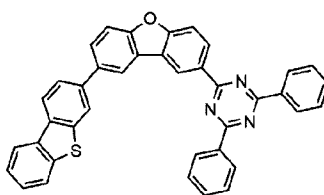
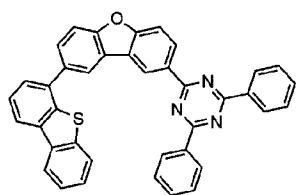
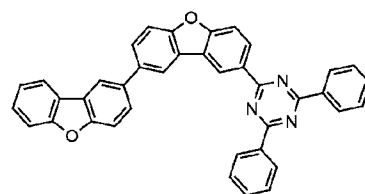
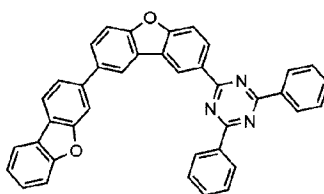
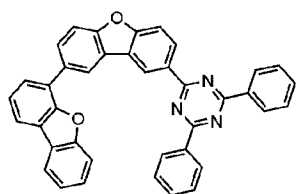
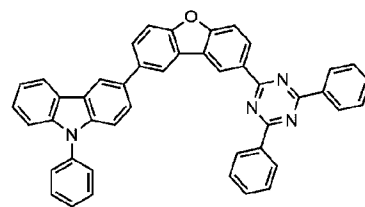
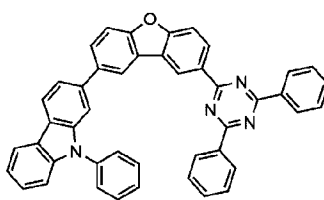
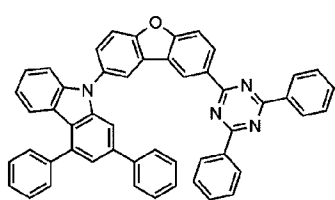
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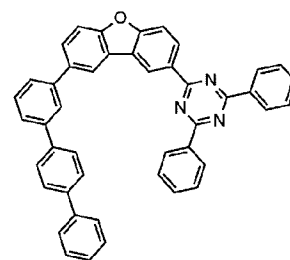
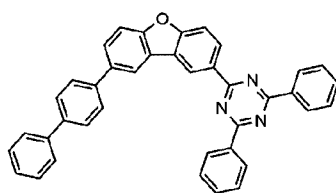
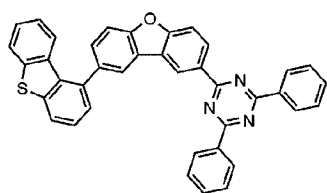
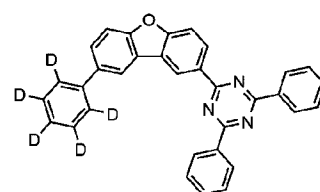
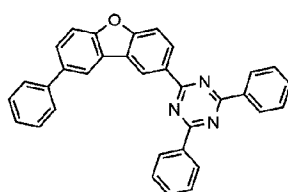
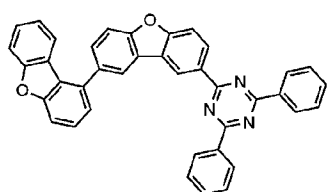
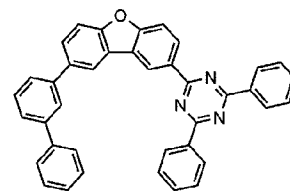
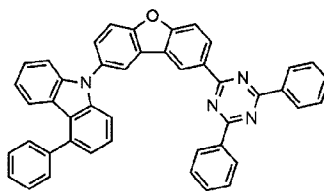
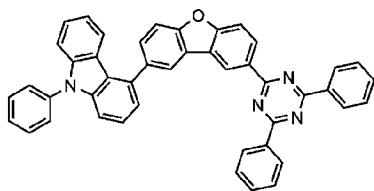
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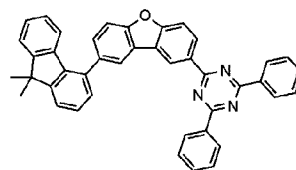
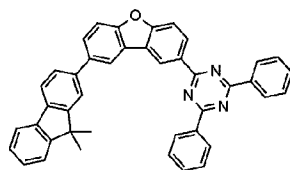
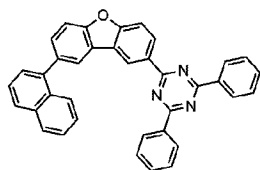
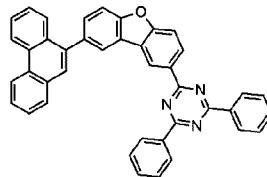
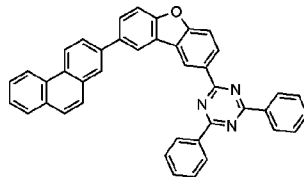
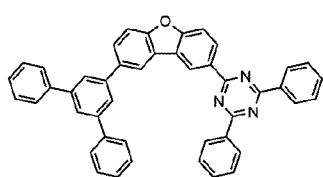
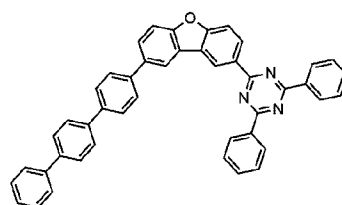
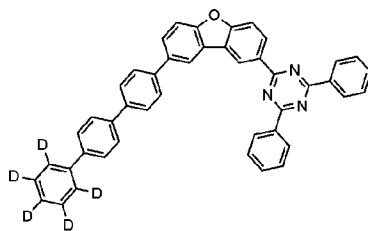
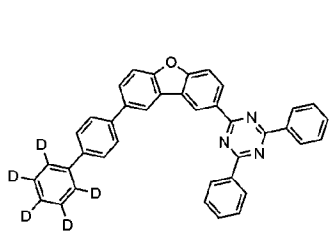
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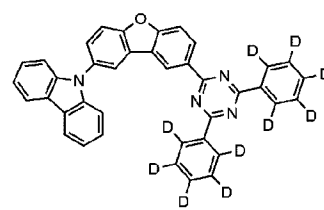
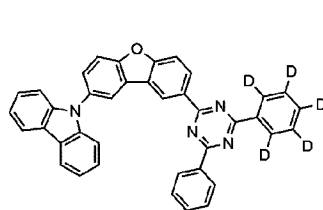
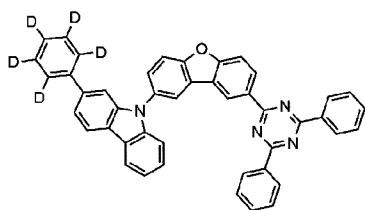
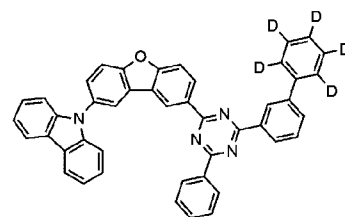
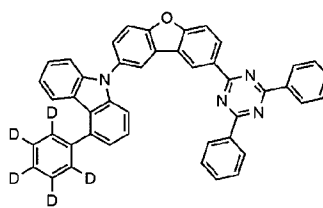
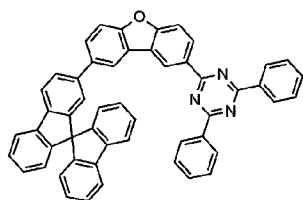
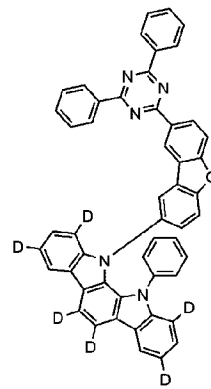
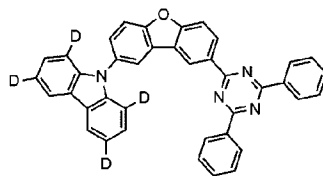
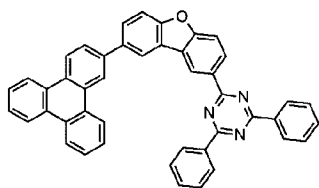
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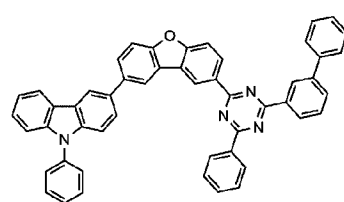
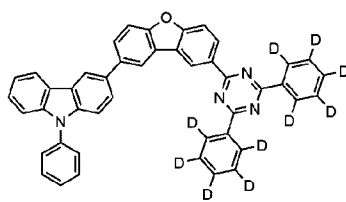
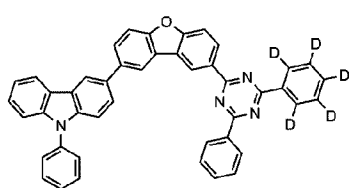
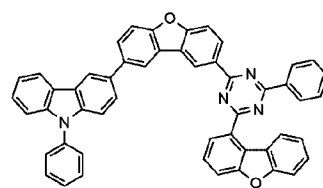
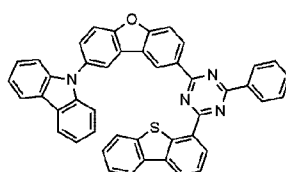
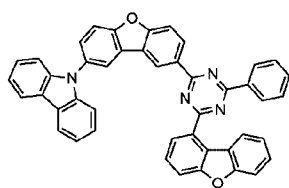
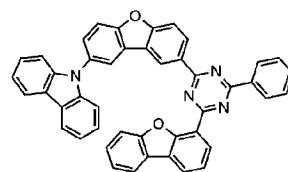
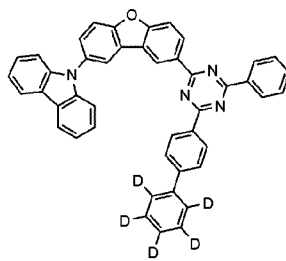
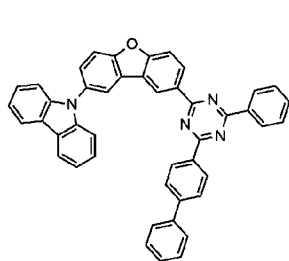
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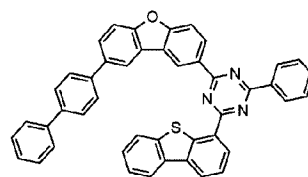
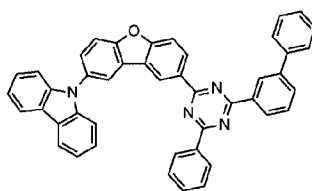
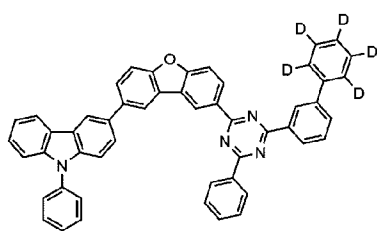
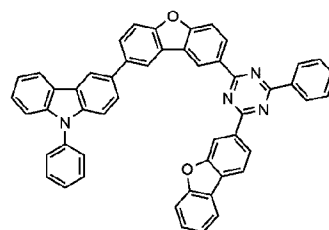
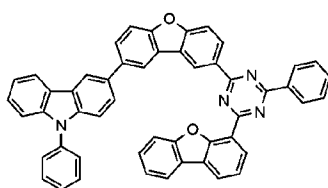
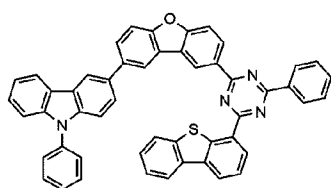
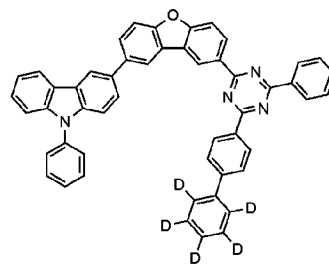
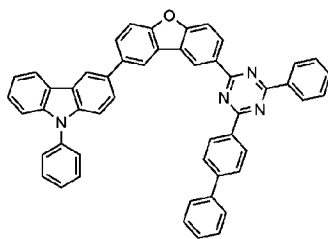
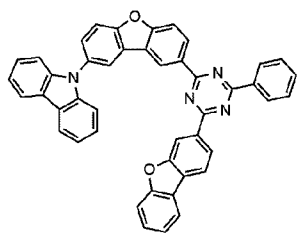
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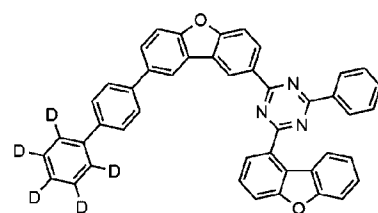
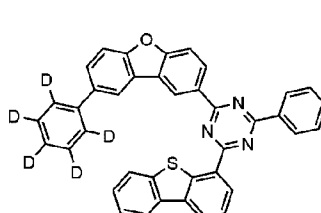
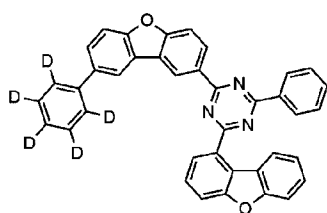
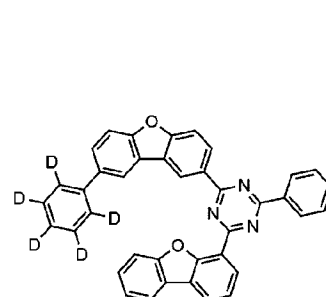
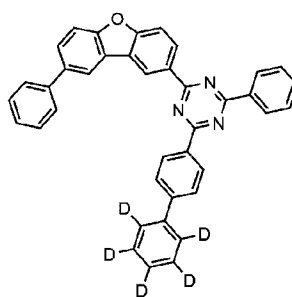
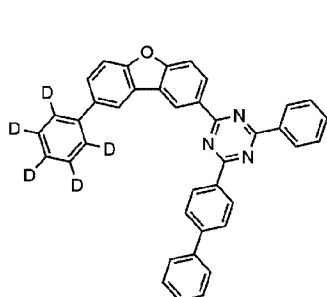
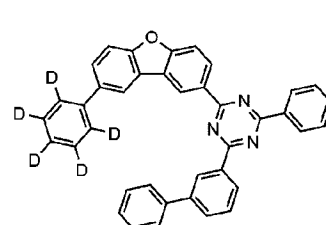
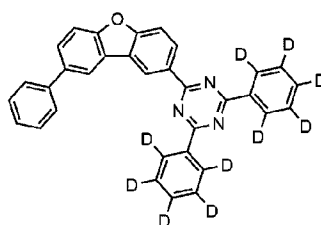
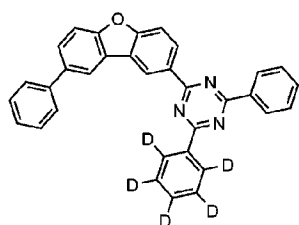
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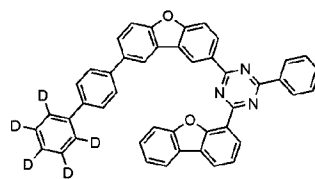
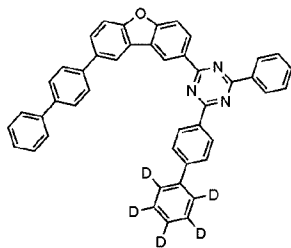
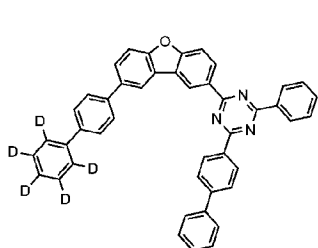
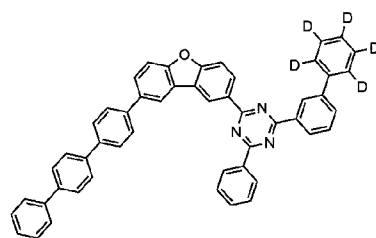
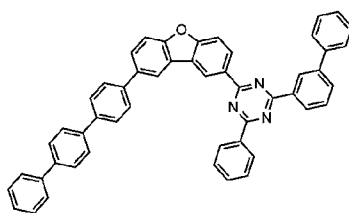
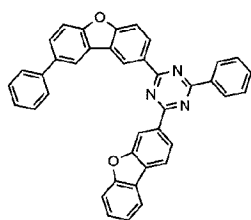
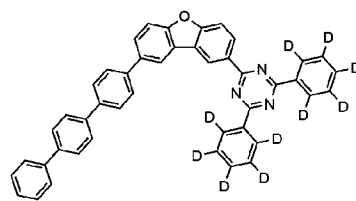
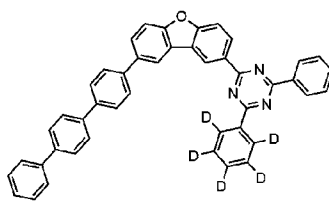
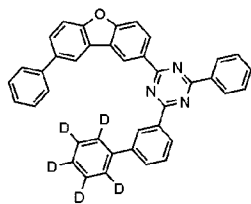
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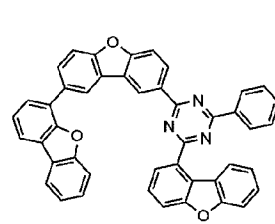
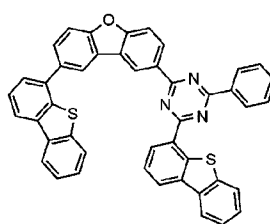
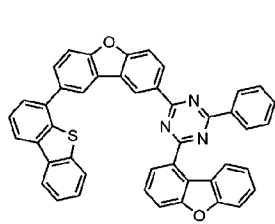
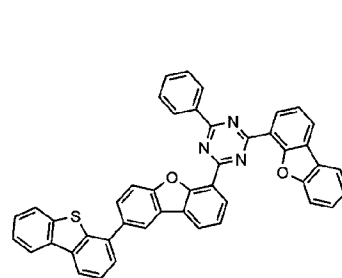
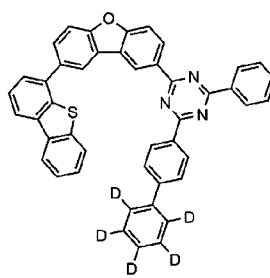
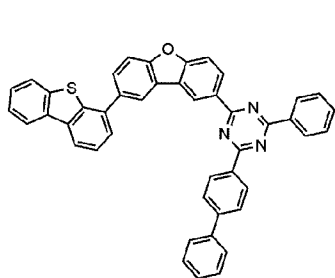
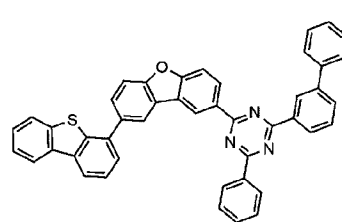
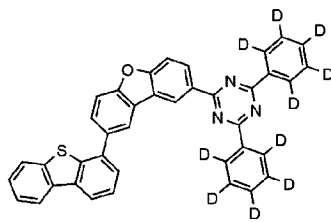
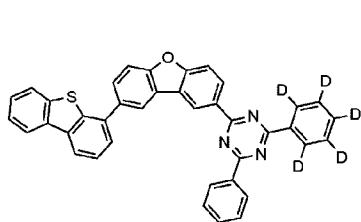
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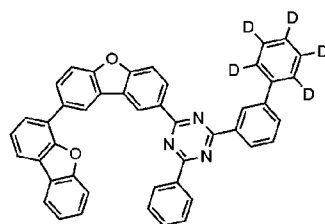
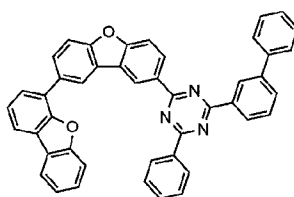
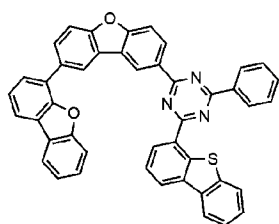
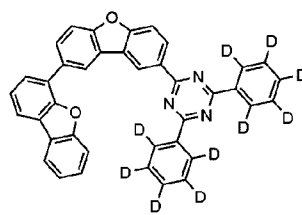
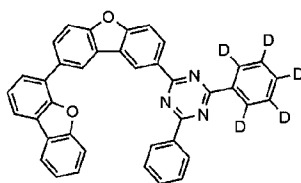
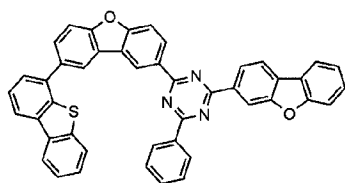
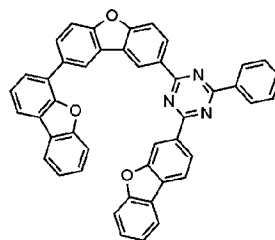
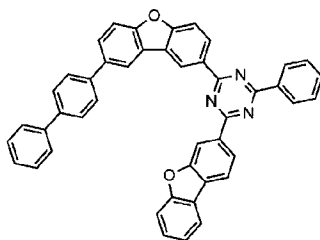
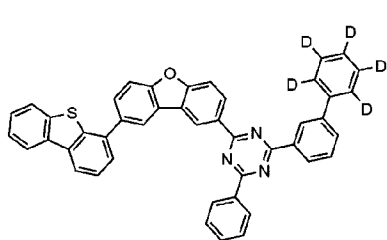
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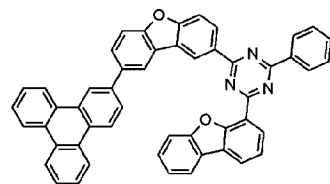
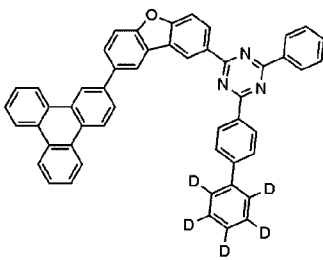
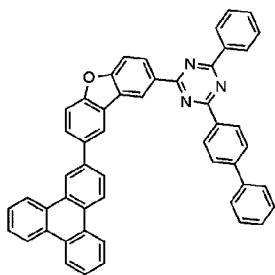
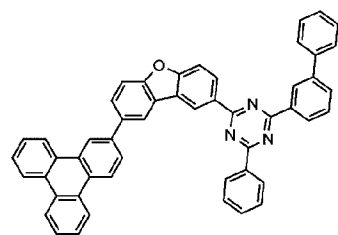
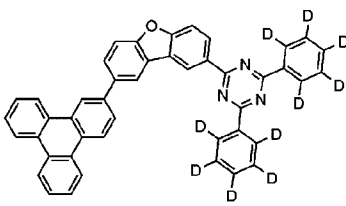
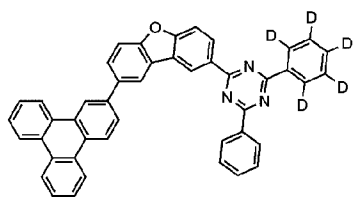
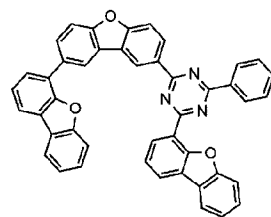
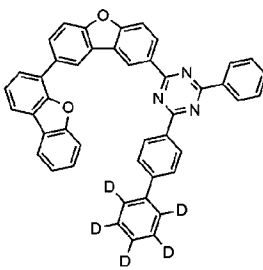
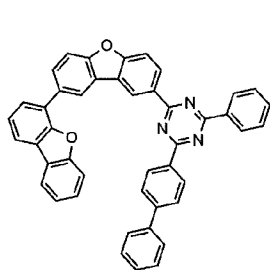
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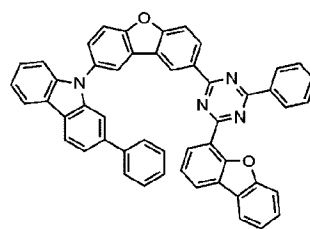
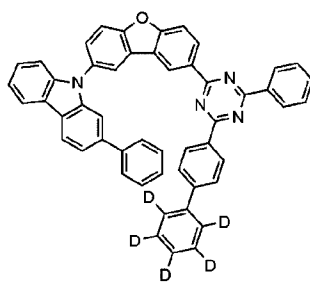
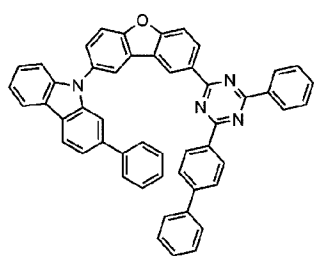
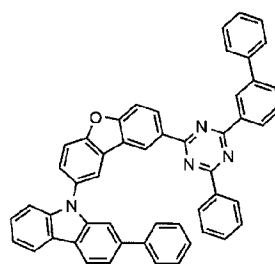
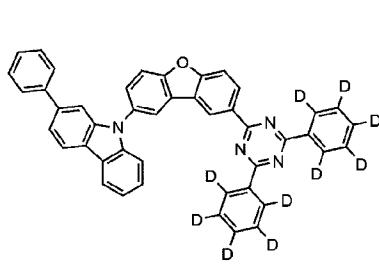
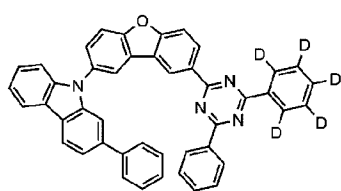
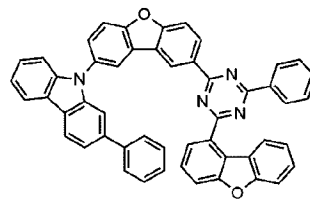
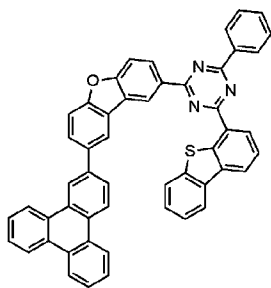
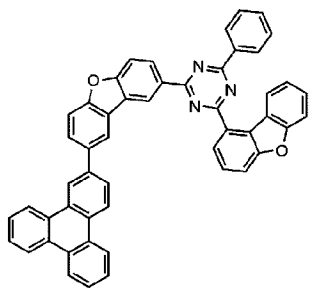
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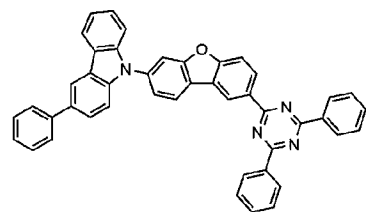
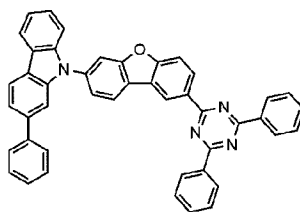
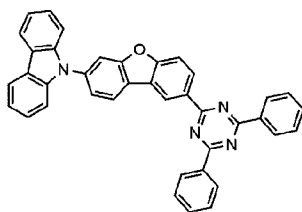
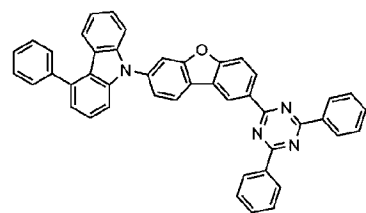
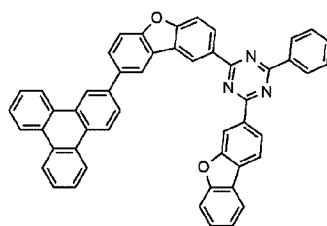
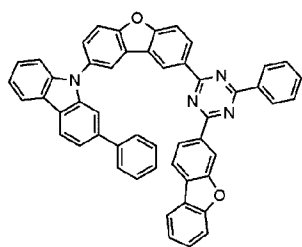
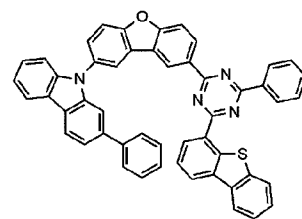
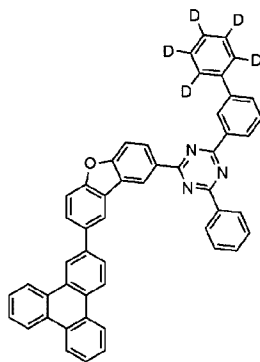
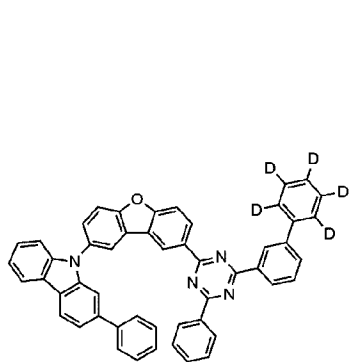
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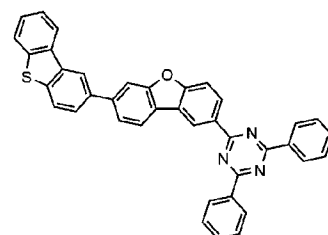
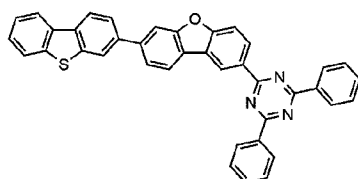
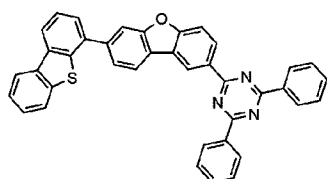
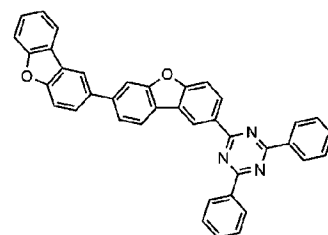
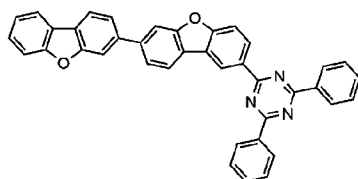
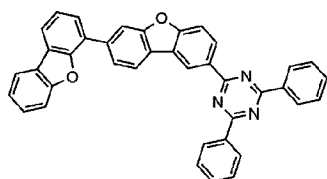
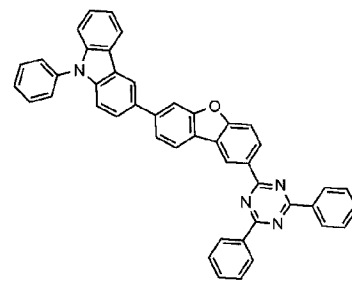
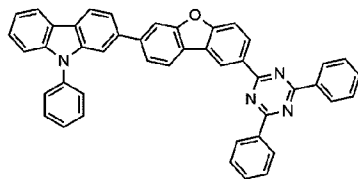
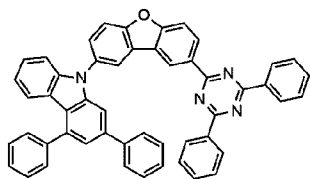
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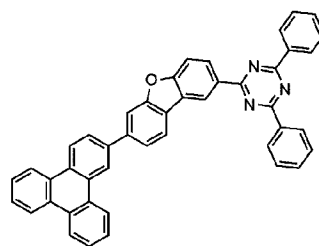
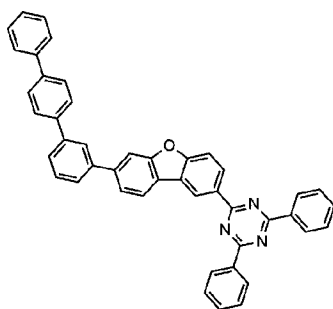
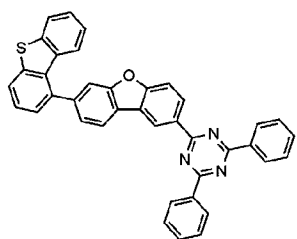
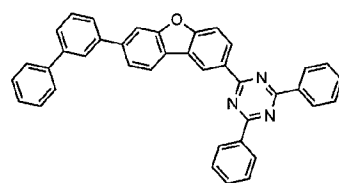
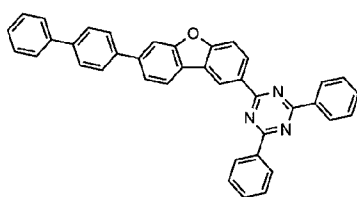
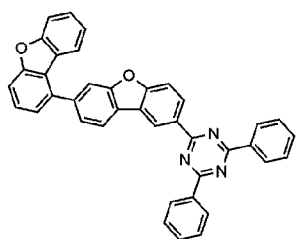
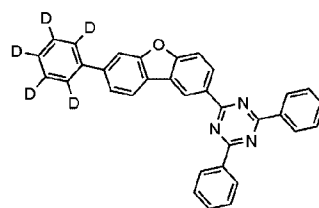
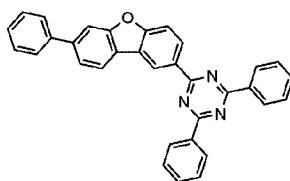
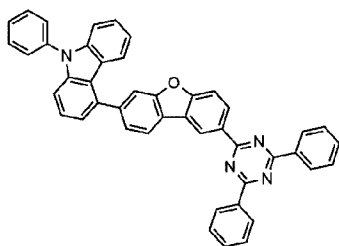
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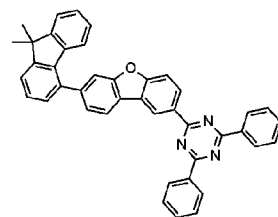
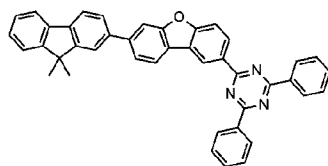
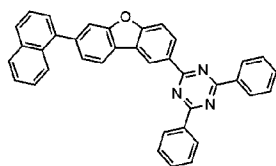
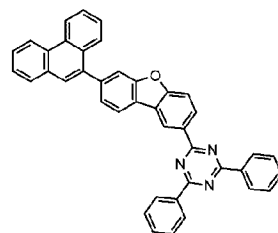
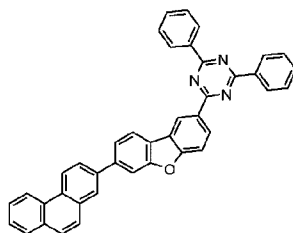
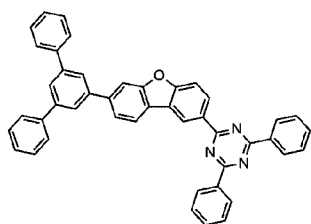
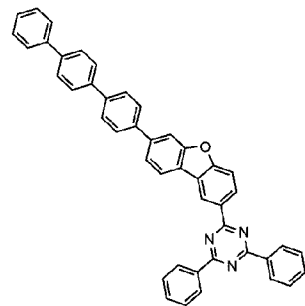
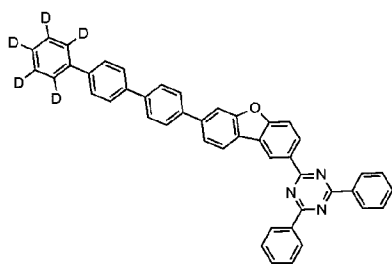
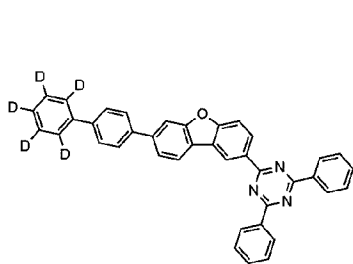
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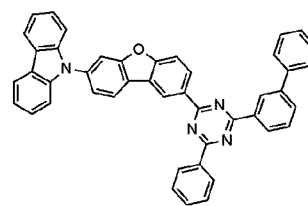
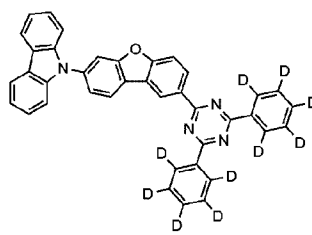
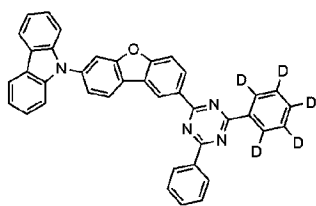
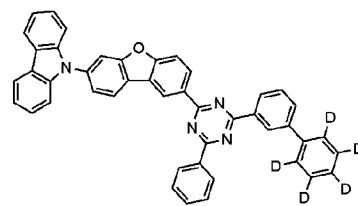
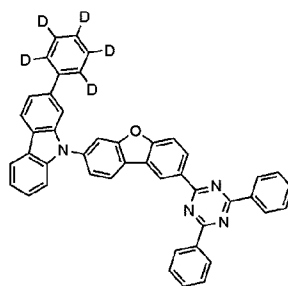
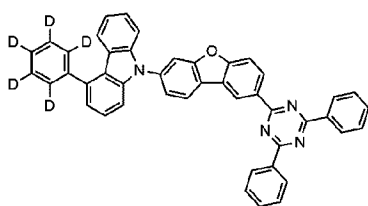
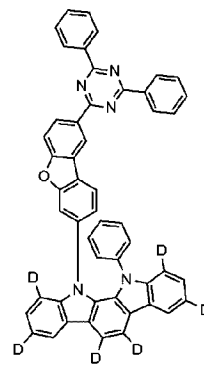
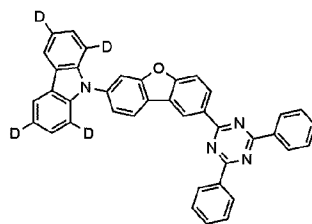
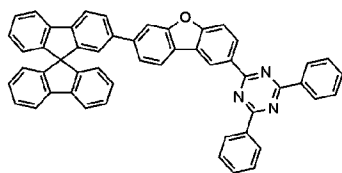
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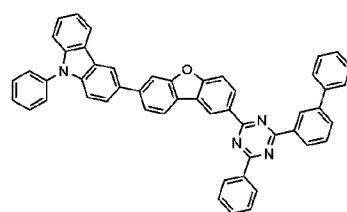
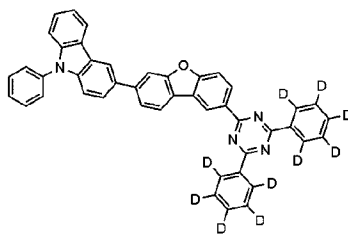
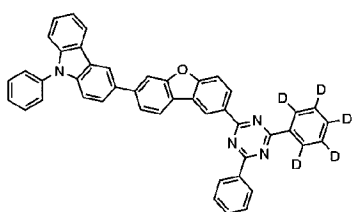
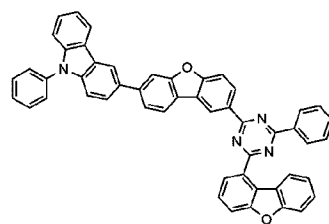
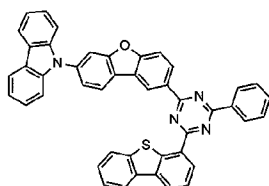
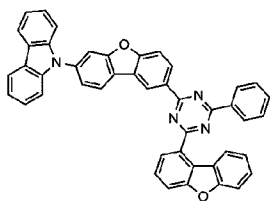
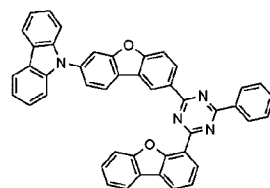
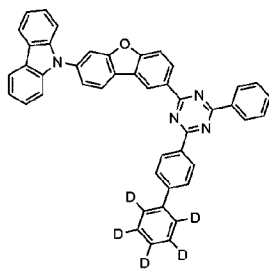
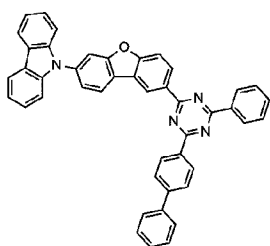
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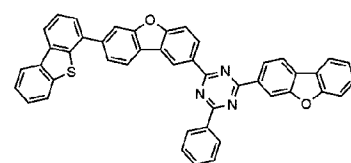
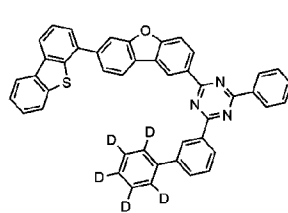
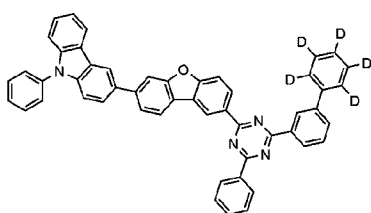
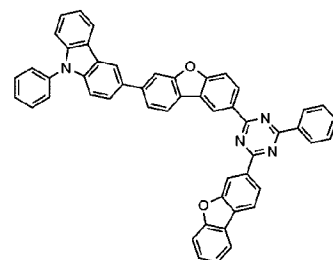
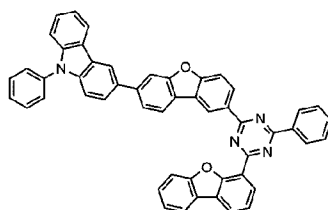
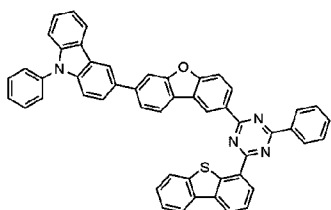
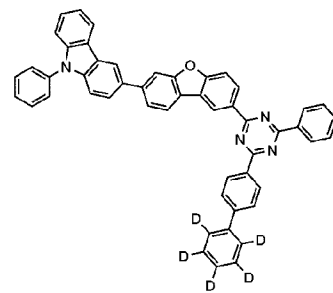
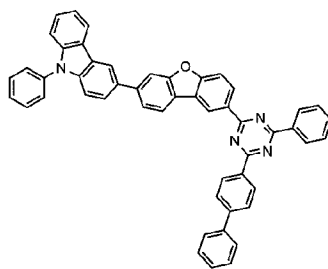
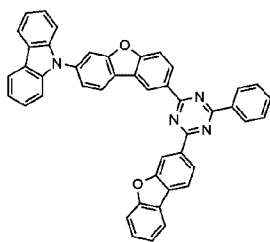
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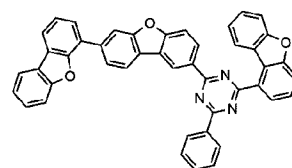
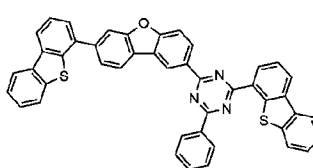
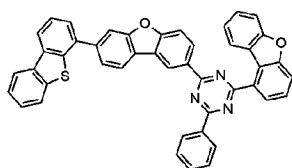
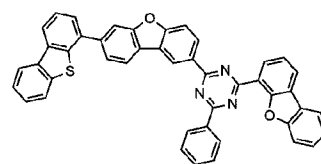
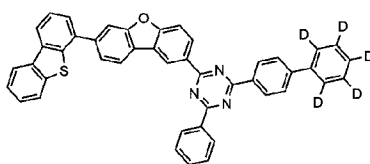
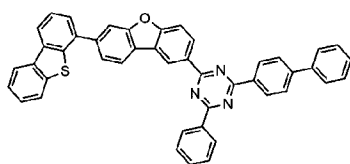
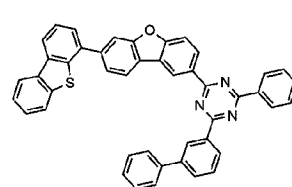
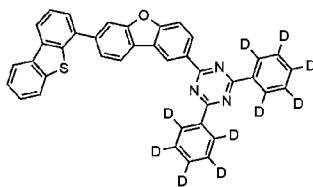
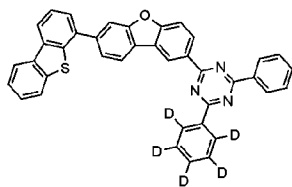
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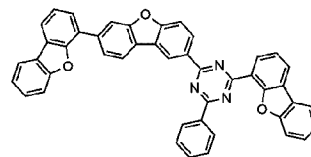
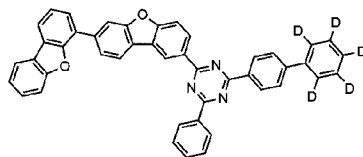
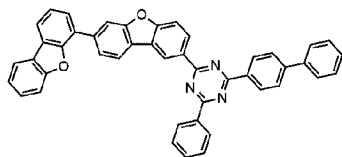
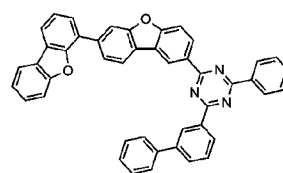
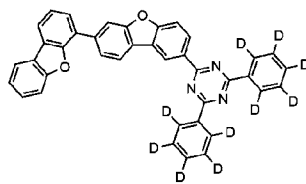
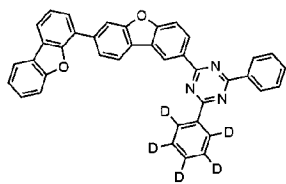
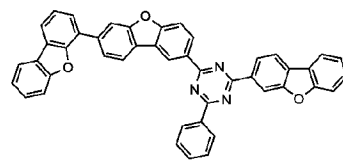
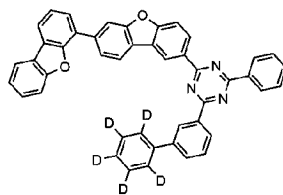
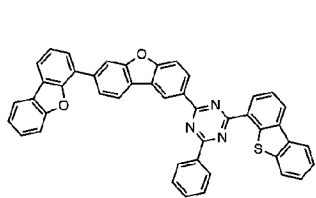
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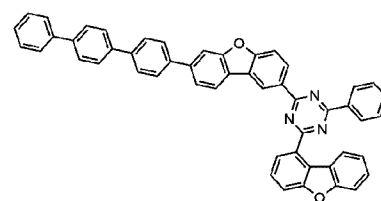
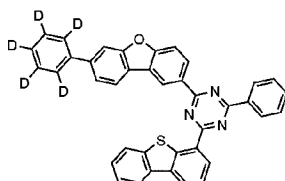
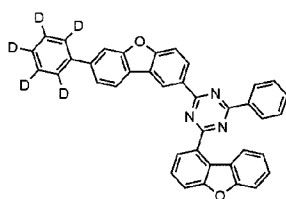
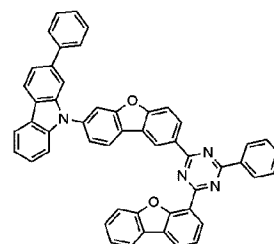
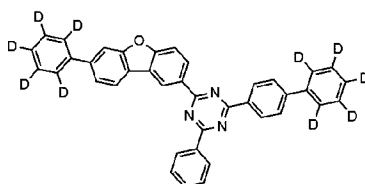
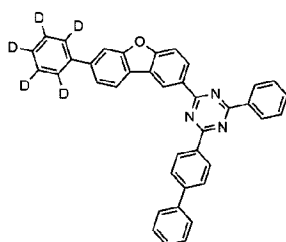
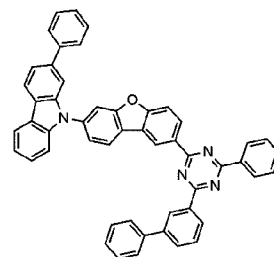
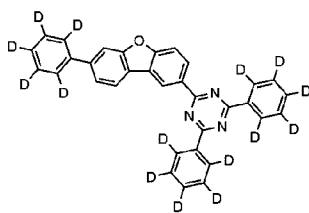
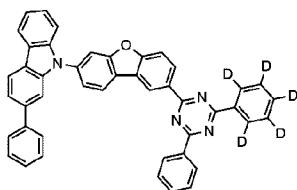
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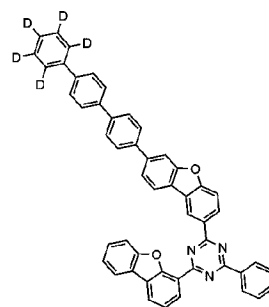
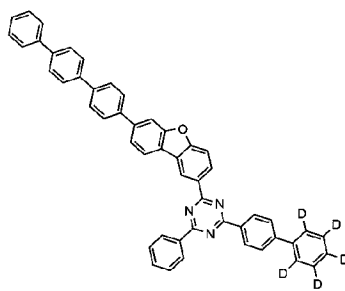
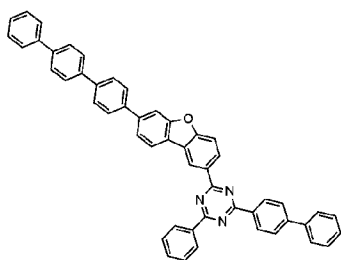
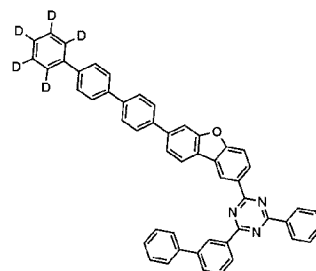
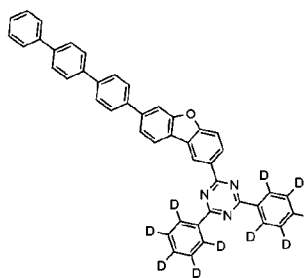
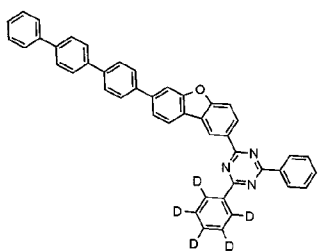
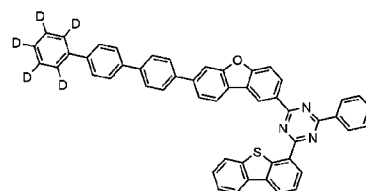
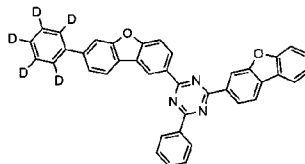
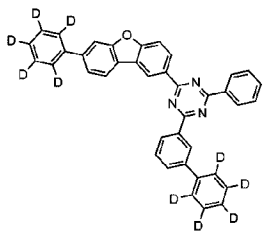
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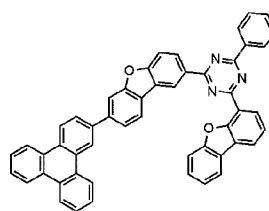
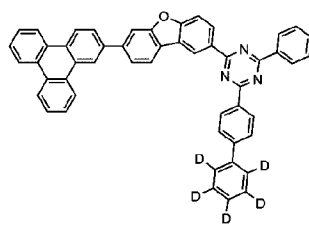
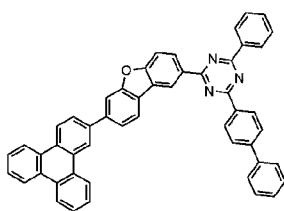
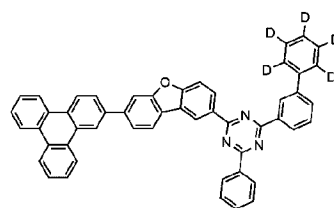
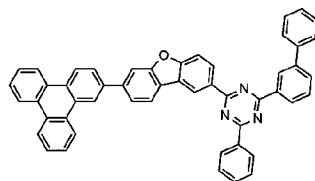
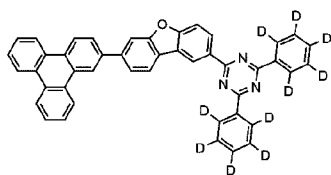
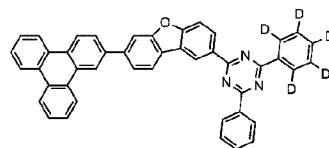
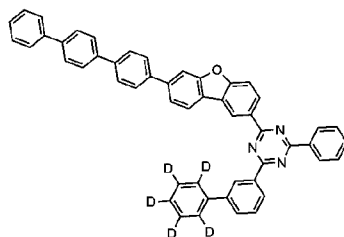
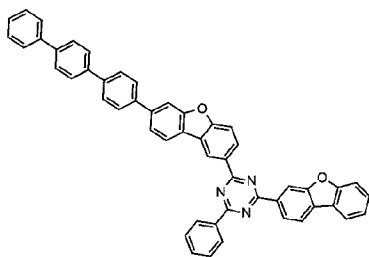
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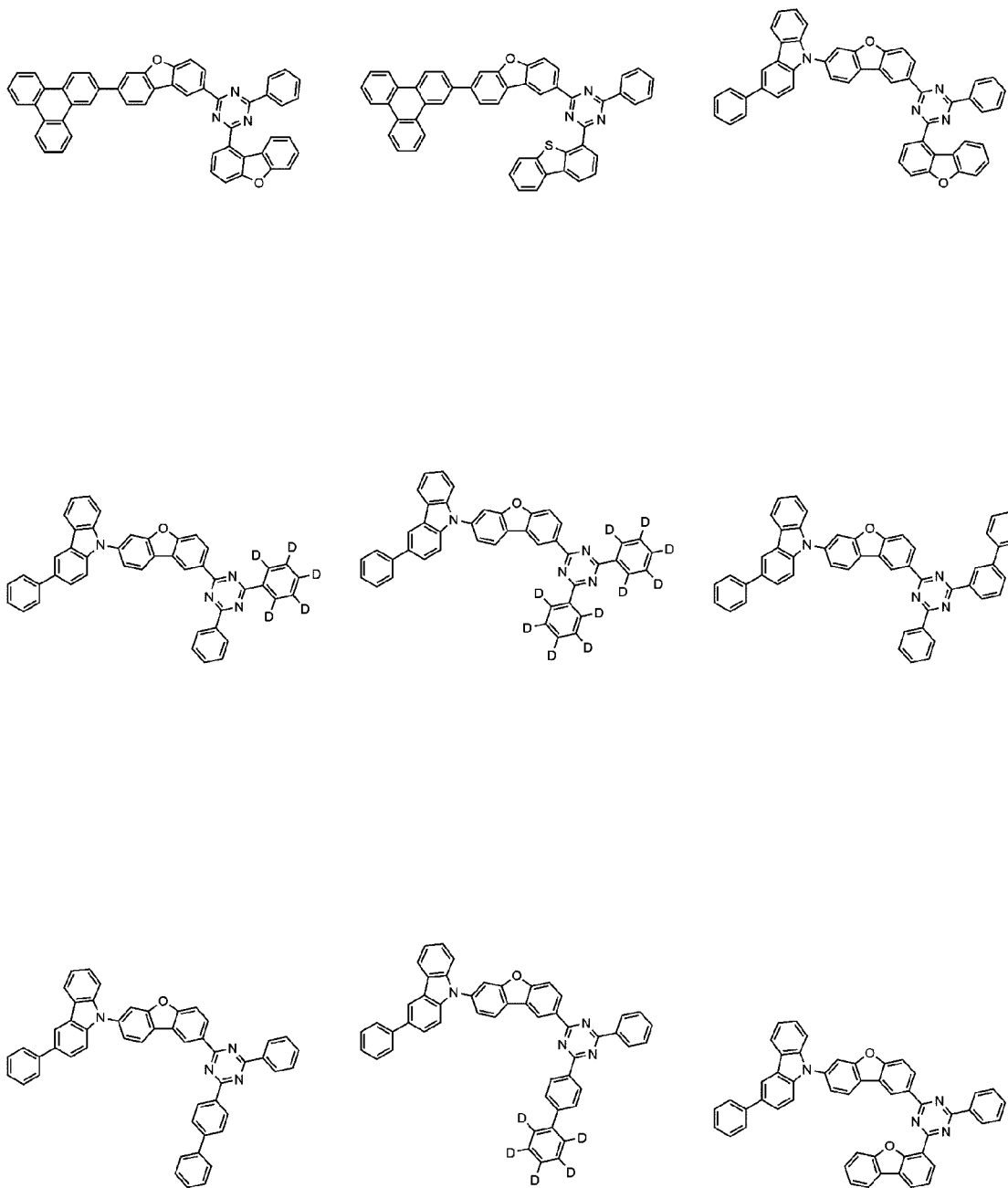
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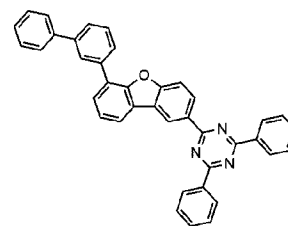
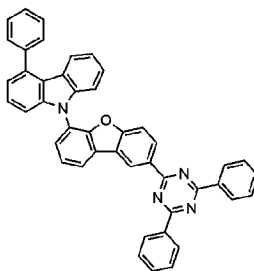
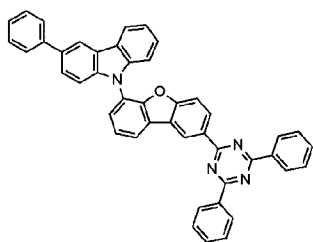
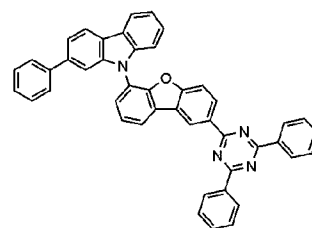
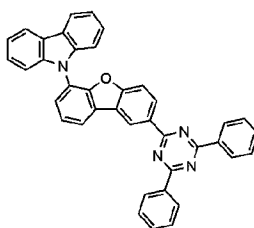
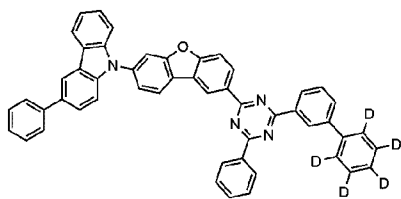
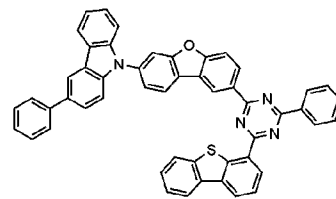
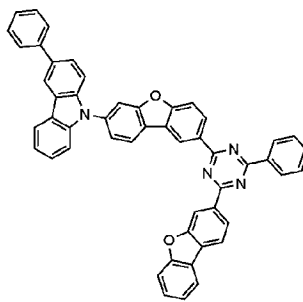
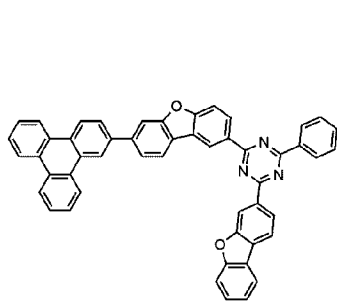
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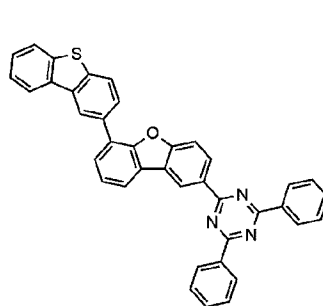
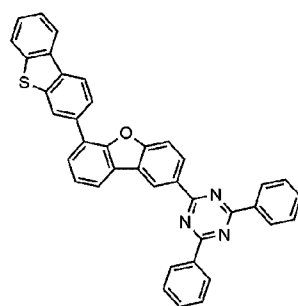
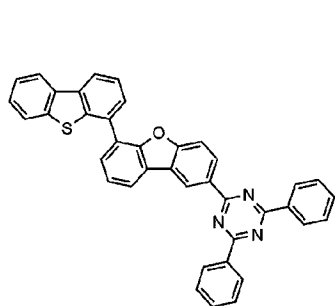
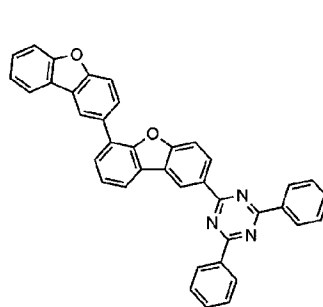
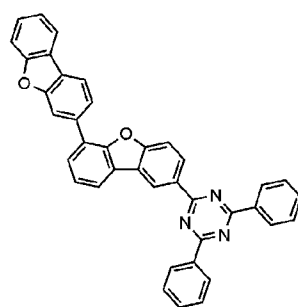
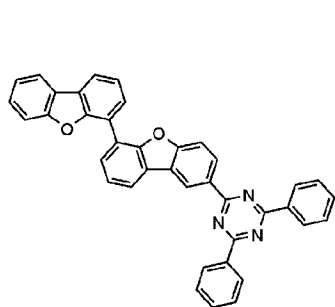
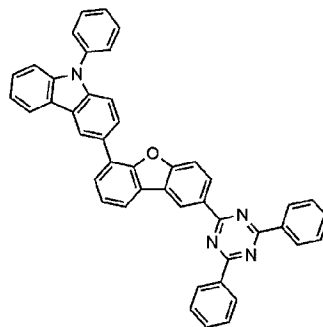
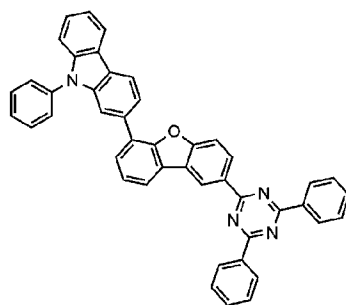
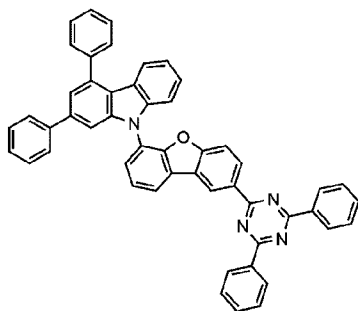
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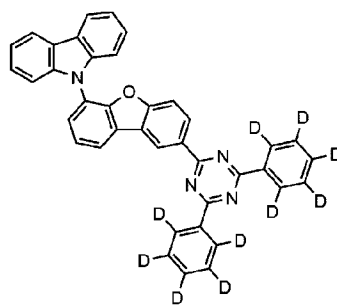
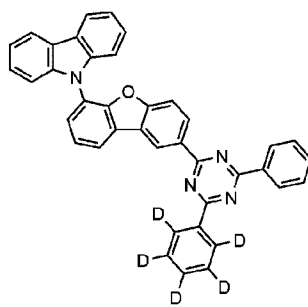
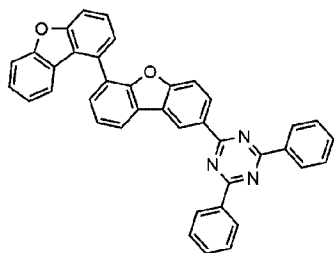
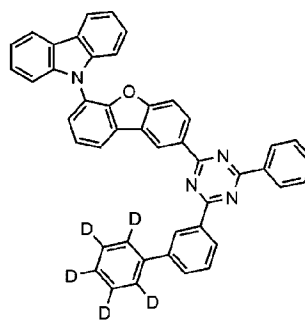
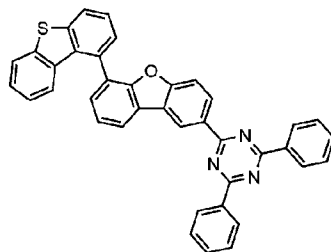
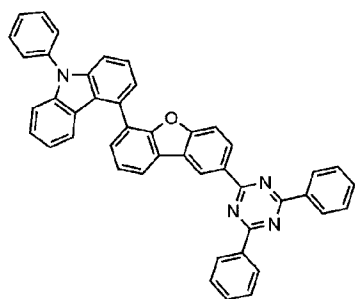
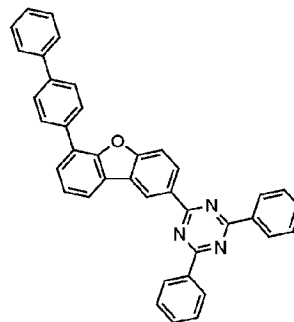
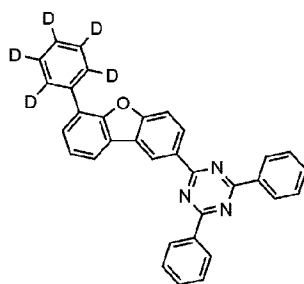
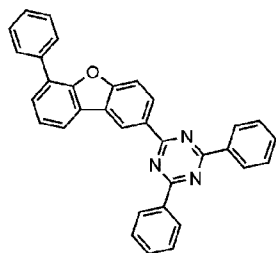
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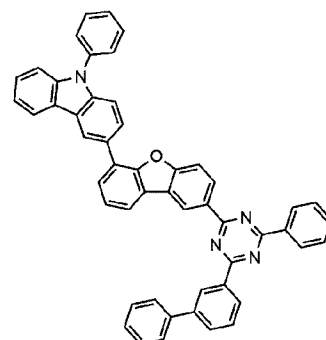
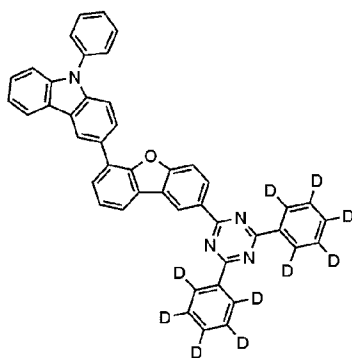
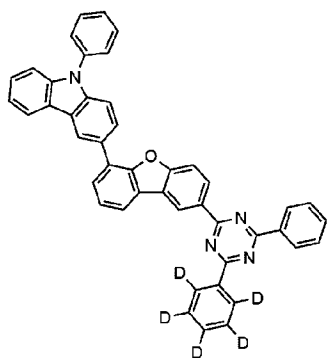
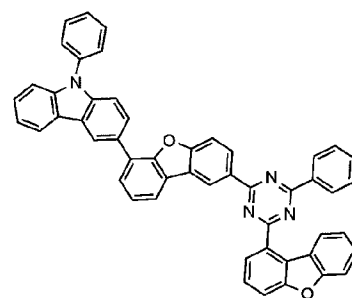
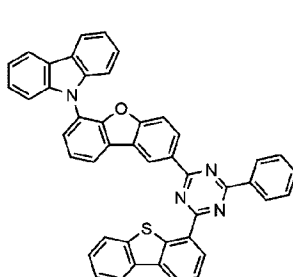
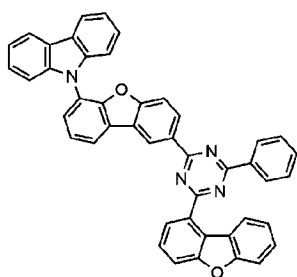
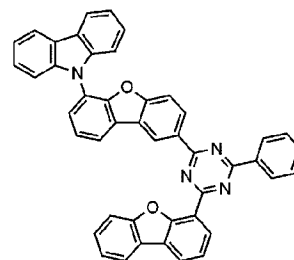
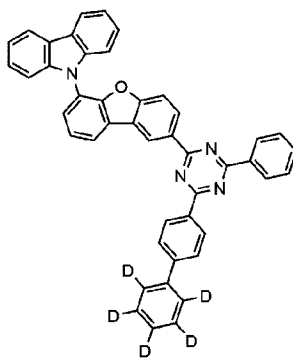
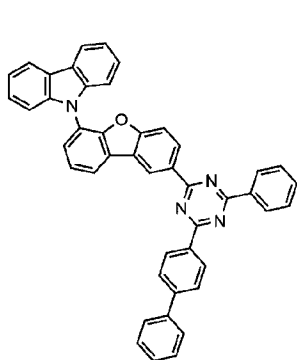
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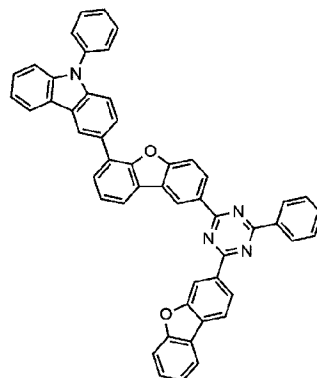
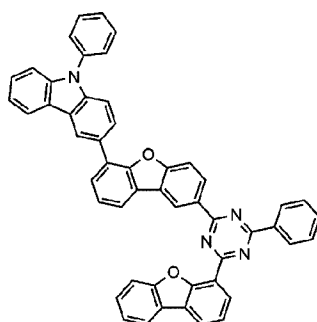
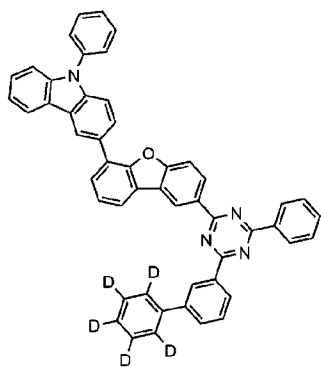
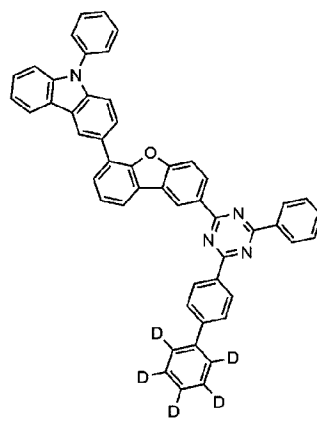
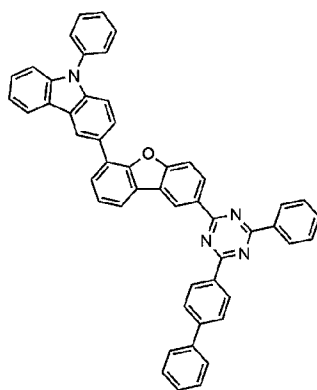
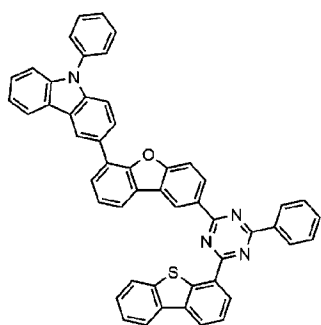
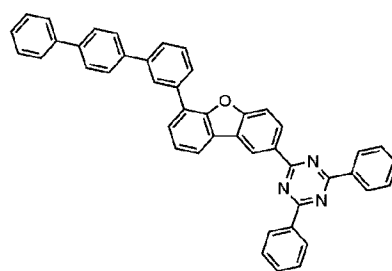
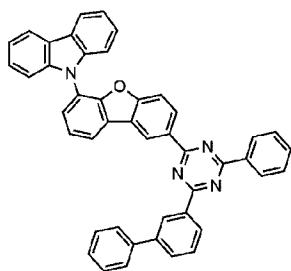
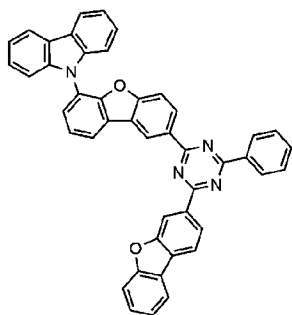
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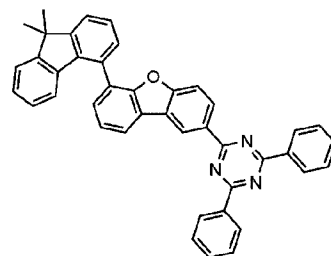
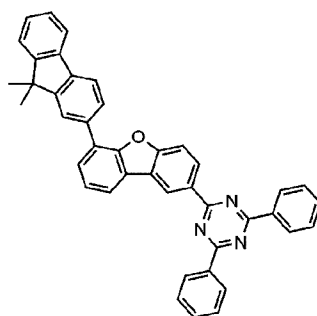
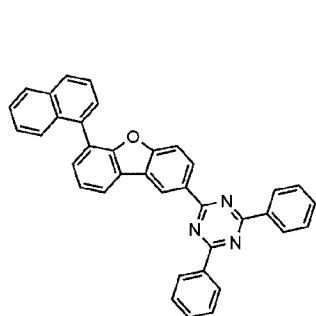
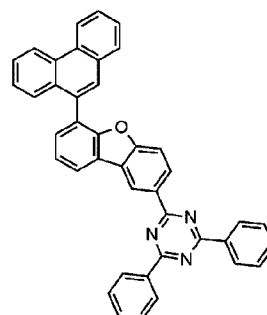
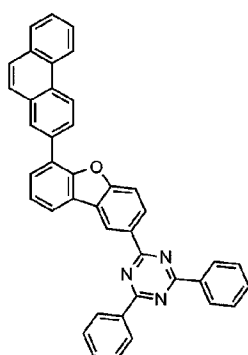
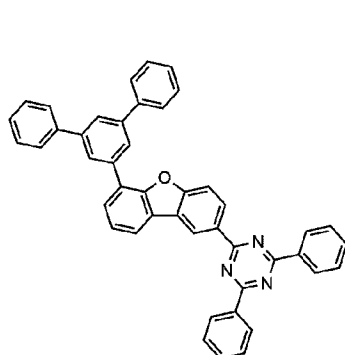
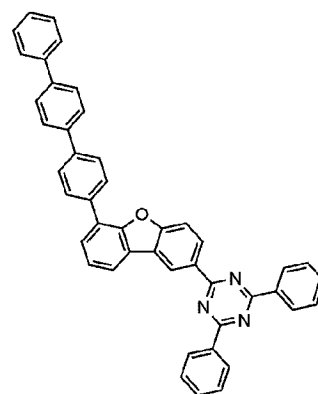
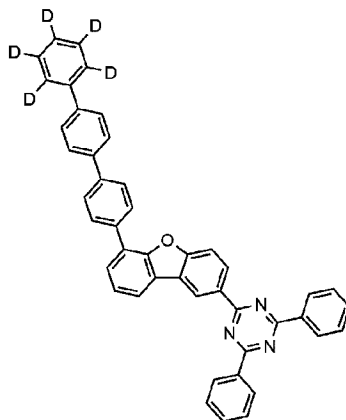
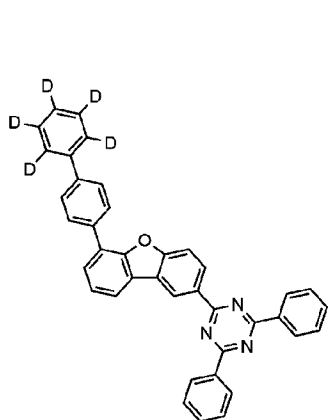
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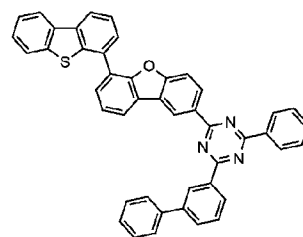
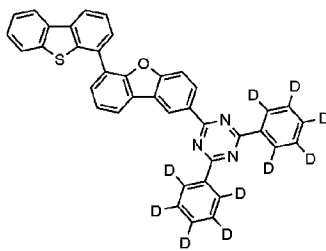
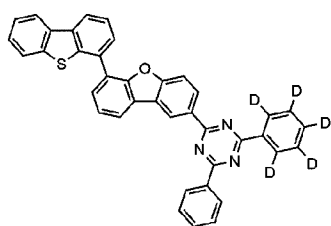
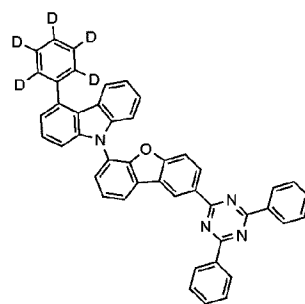
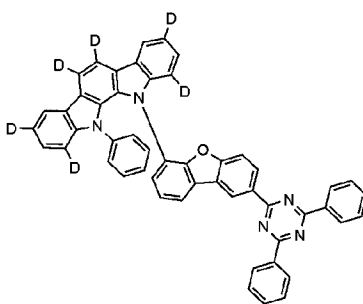
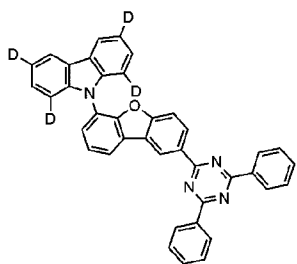
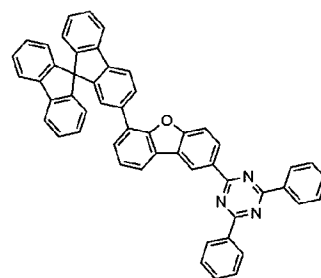
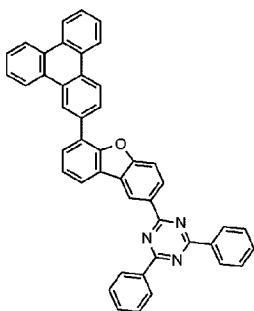
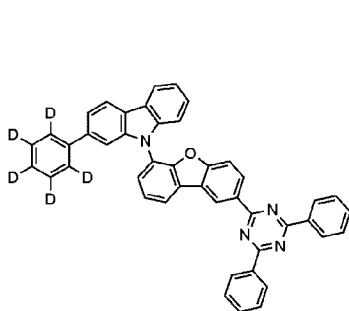
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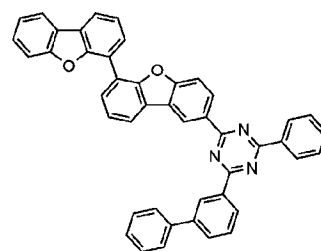
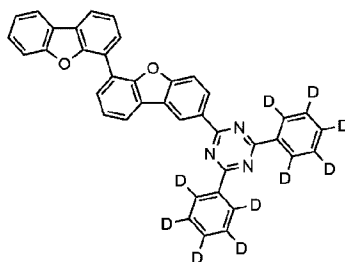
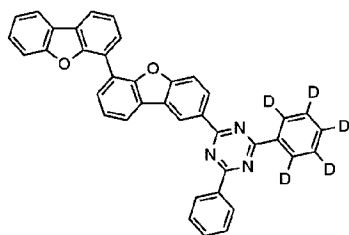
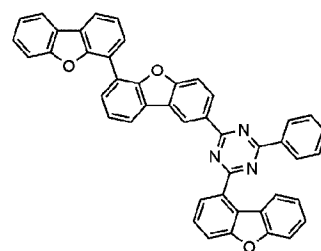
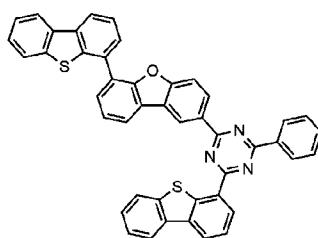
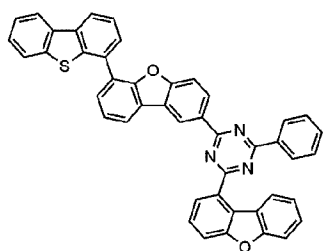
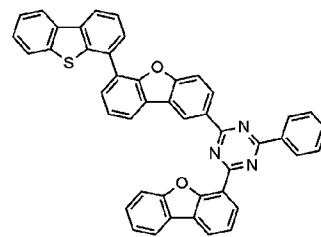
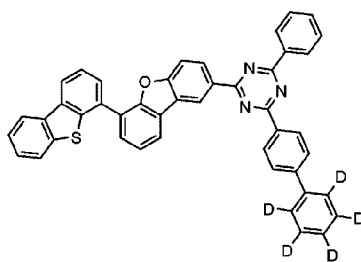
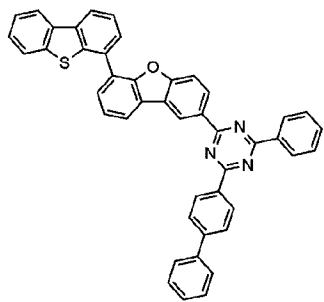
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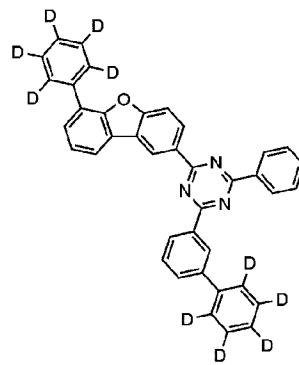
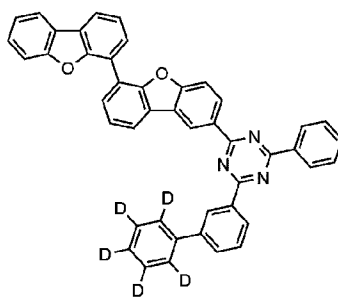
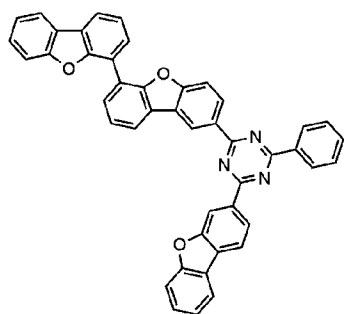
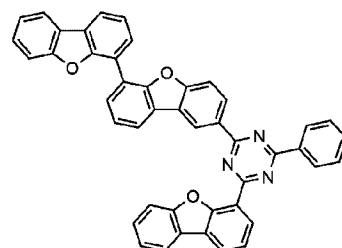
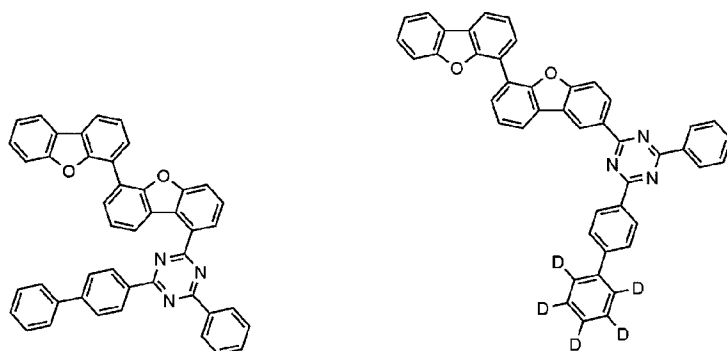
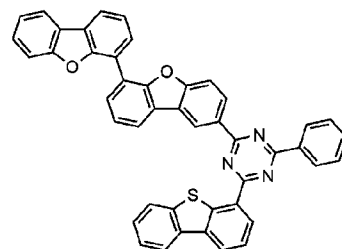
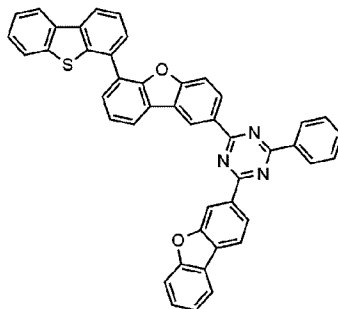
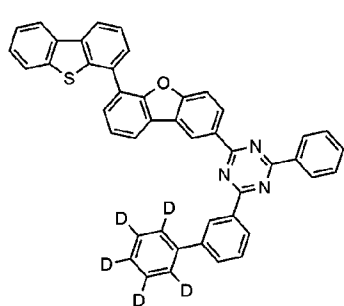
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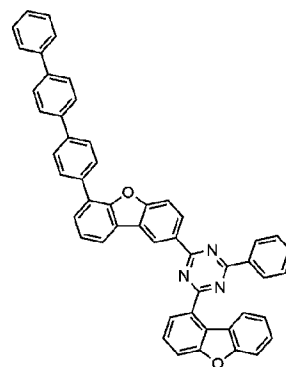
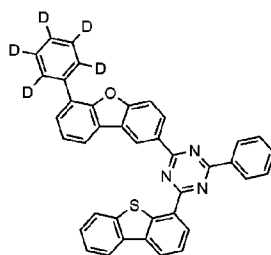
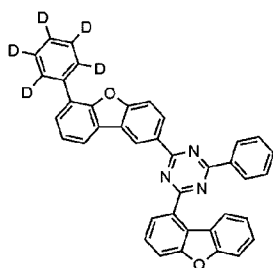
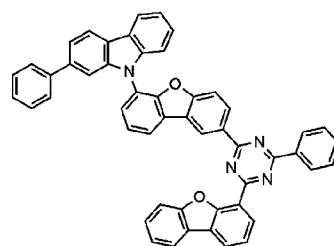
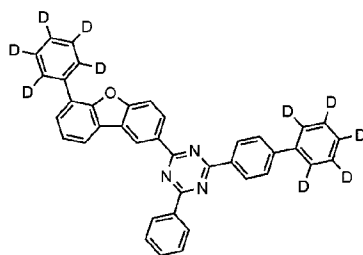
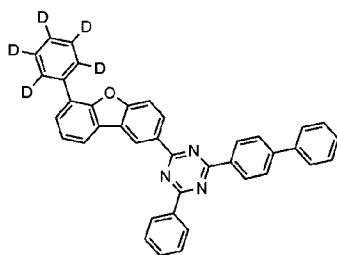
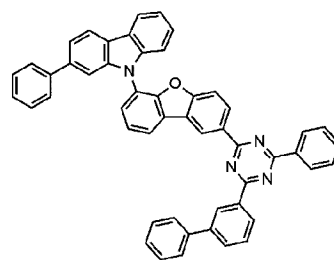
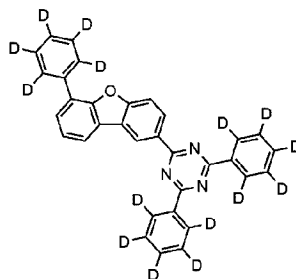
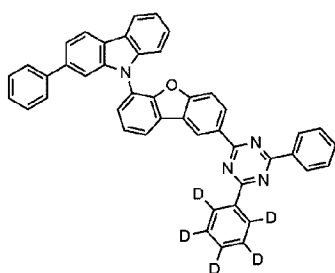
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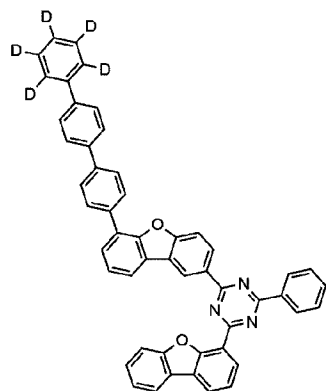
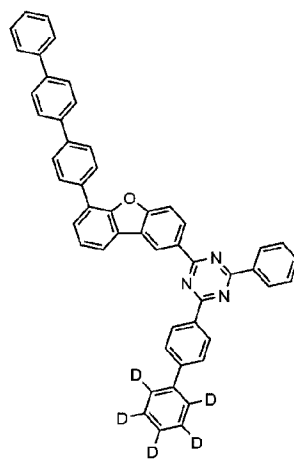
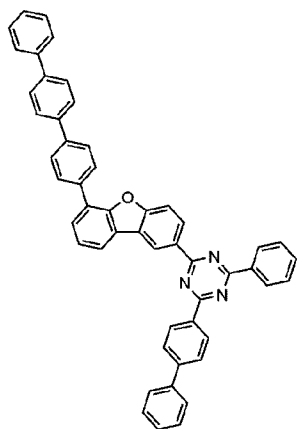
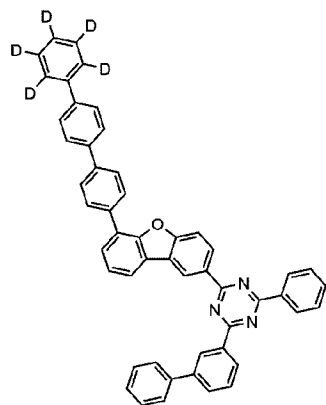
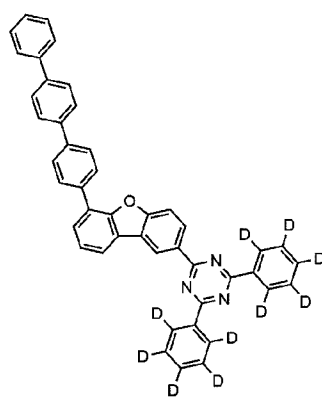
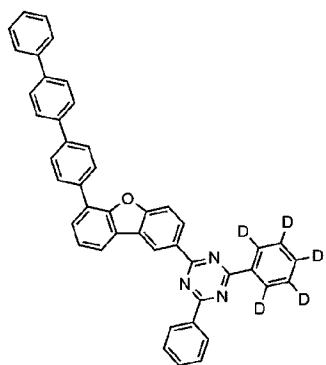
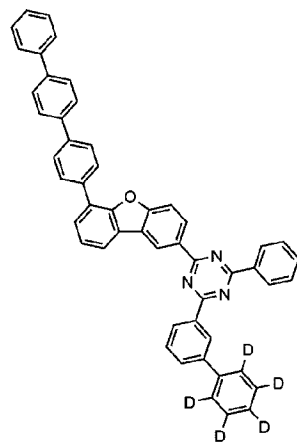
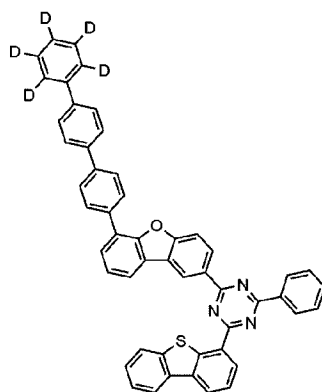
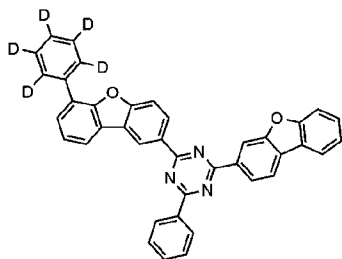
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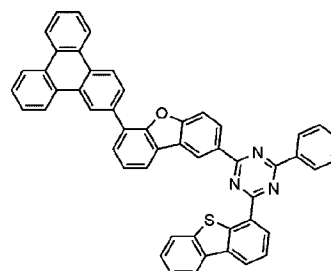
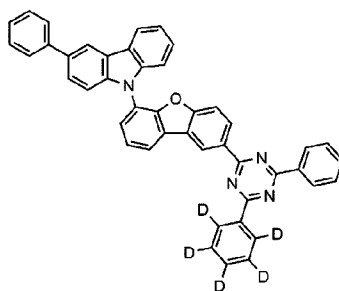
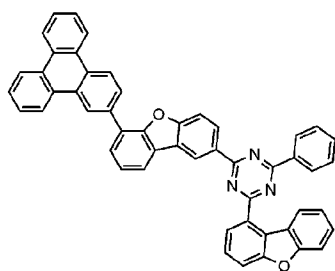
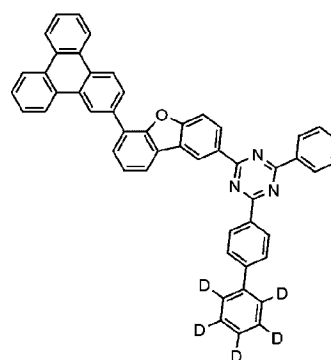
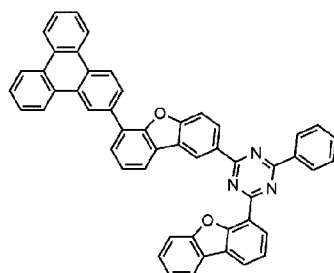
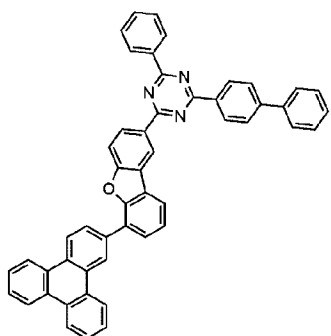
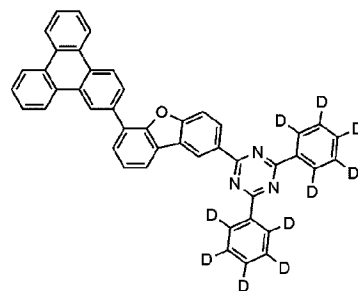
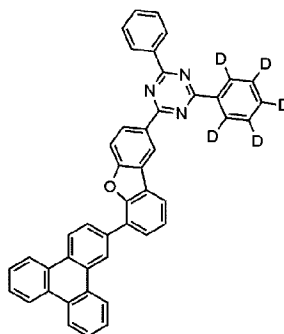
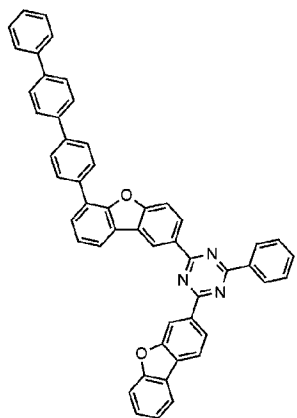
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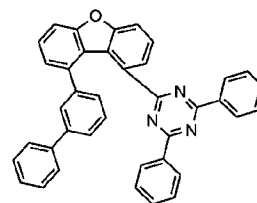
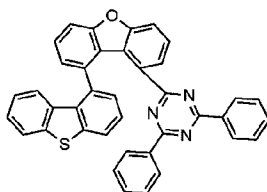
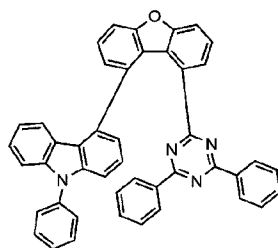
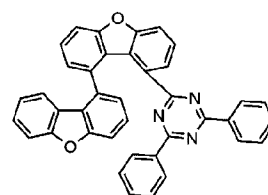
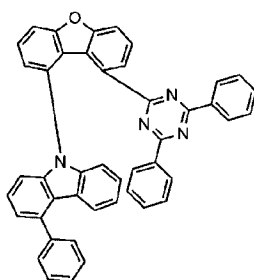
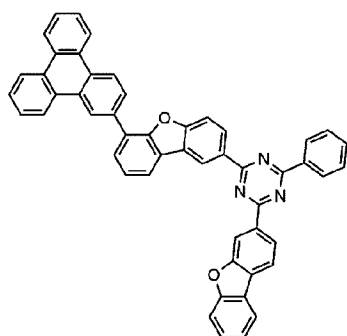
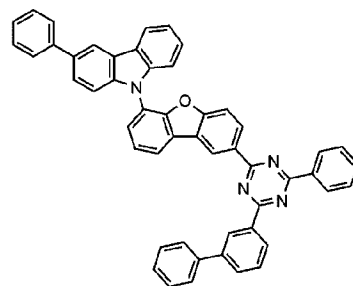
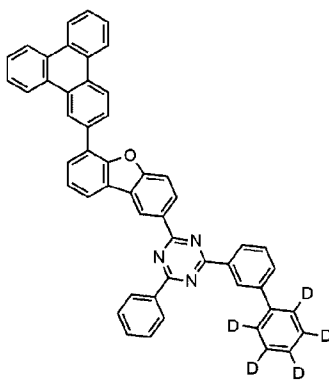
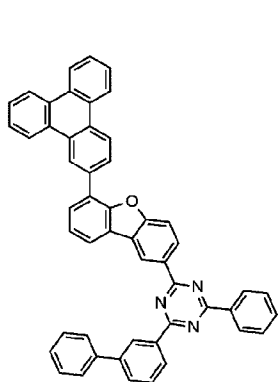
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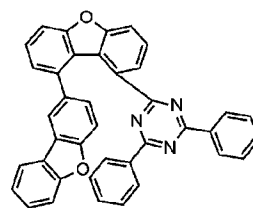
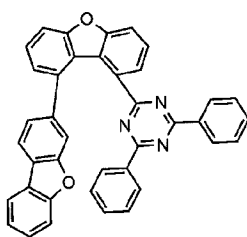
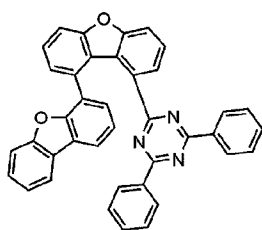
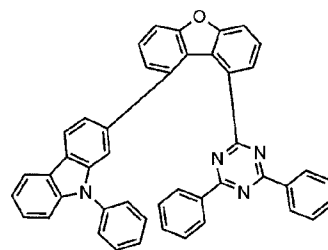
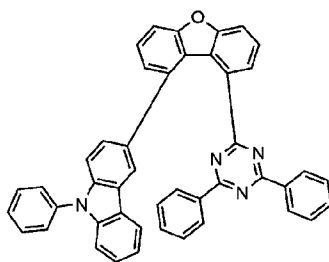
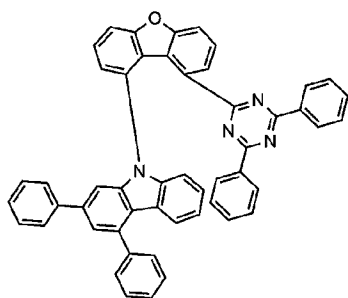
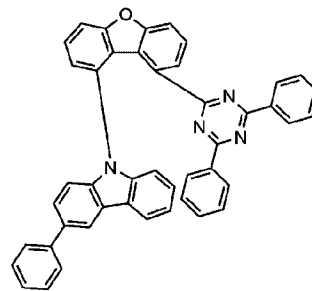
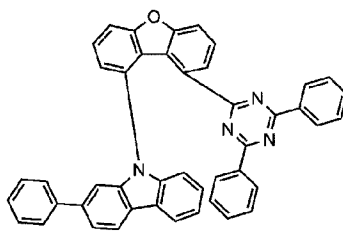
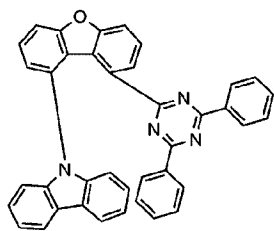
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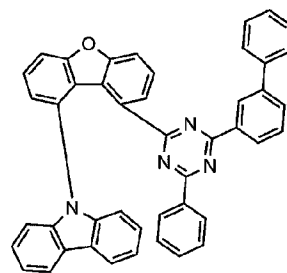
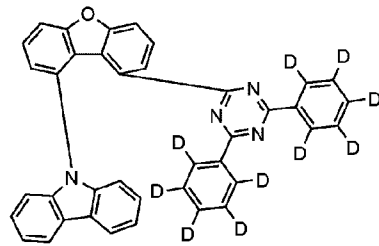
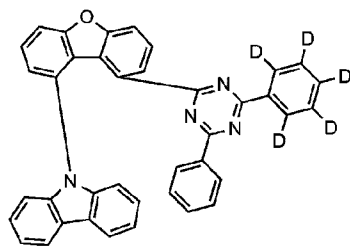
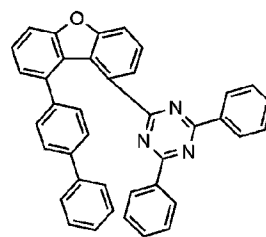
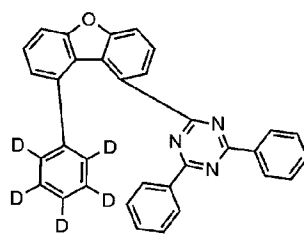
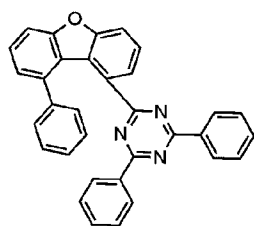
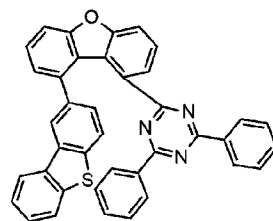
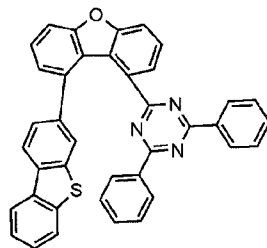
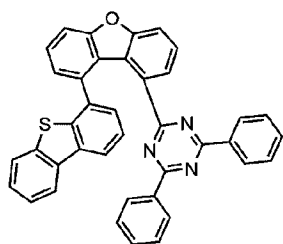
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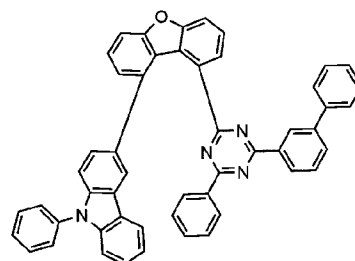
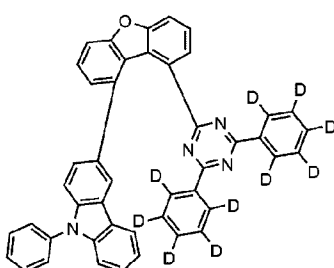
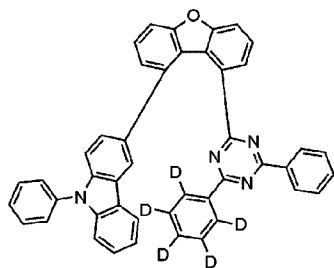
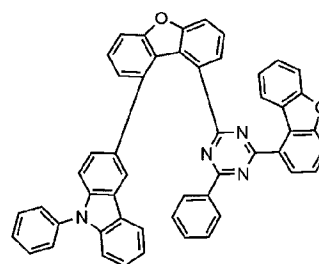
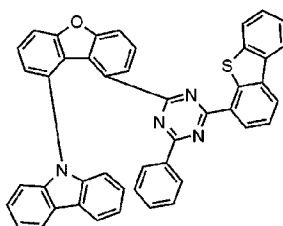
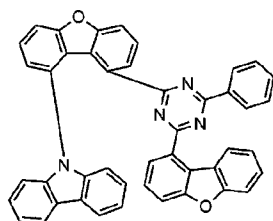
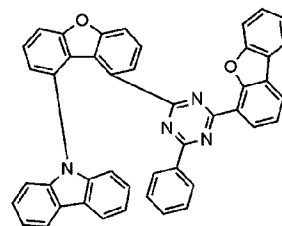
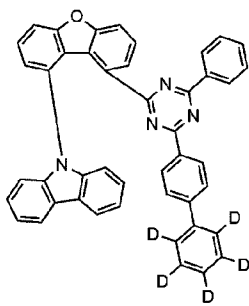
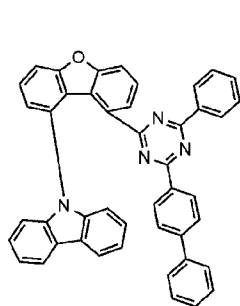
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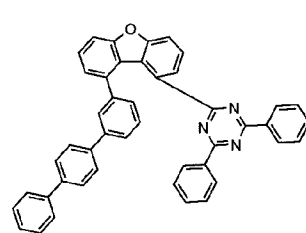
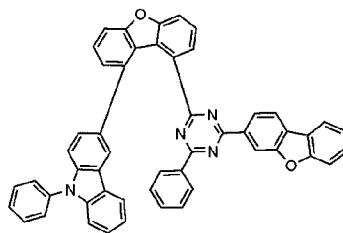
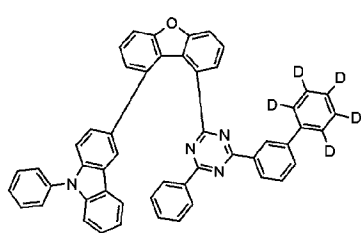
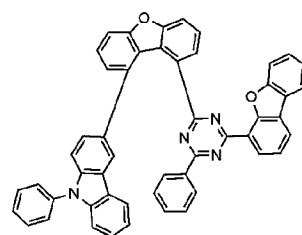
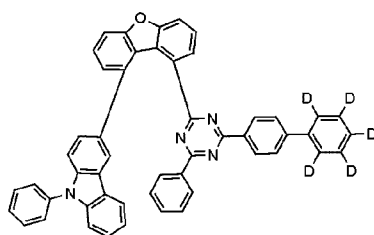
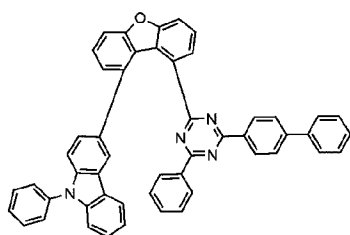
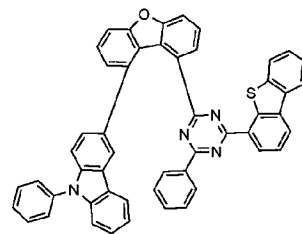
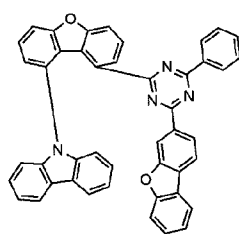
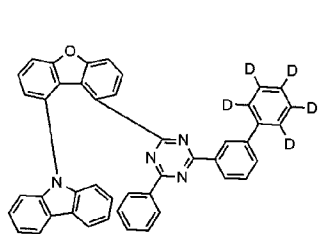
[286]



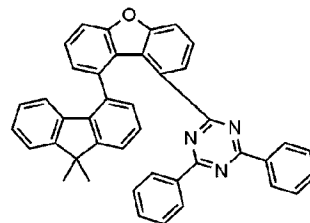
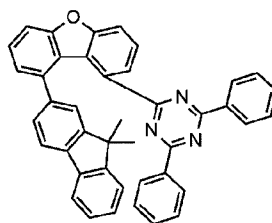
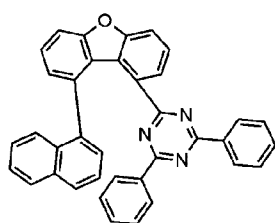
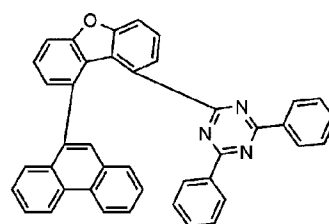
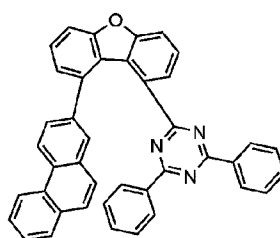
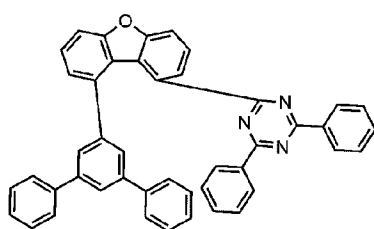
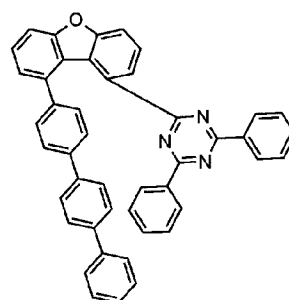
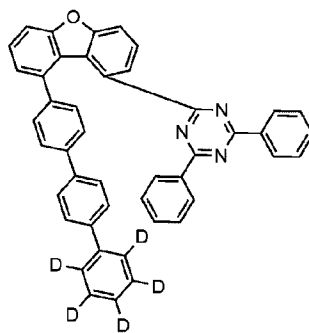
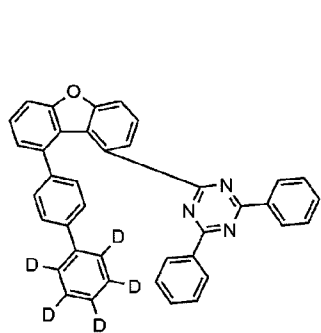
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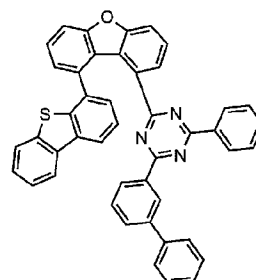
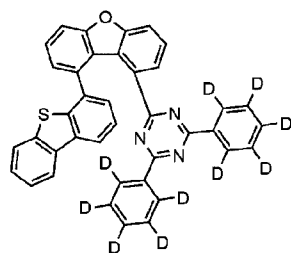
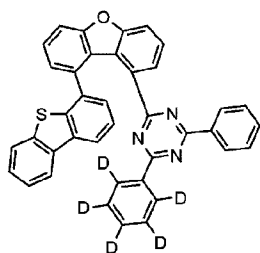
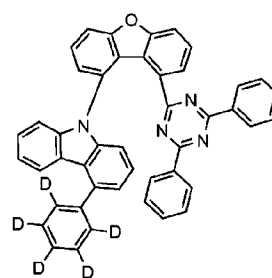
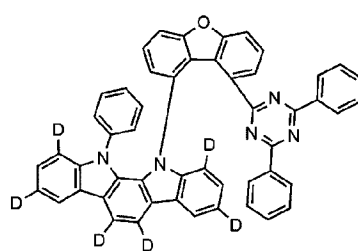
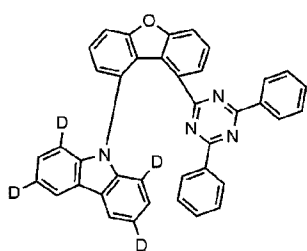
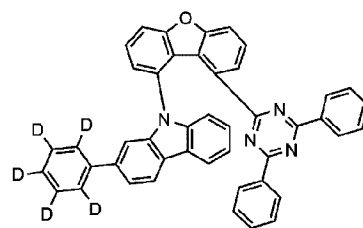
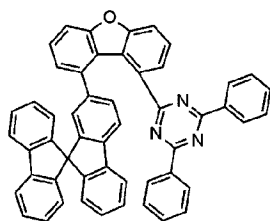
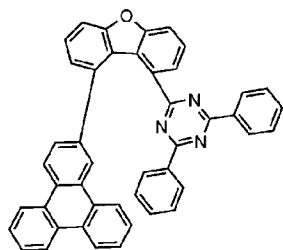
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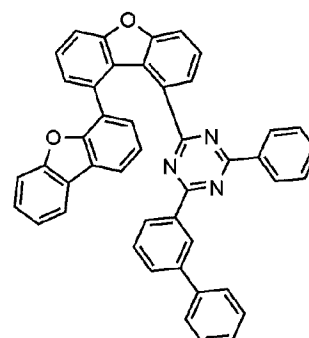
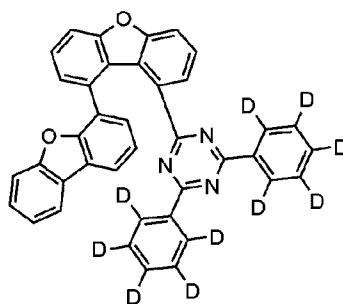
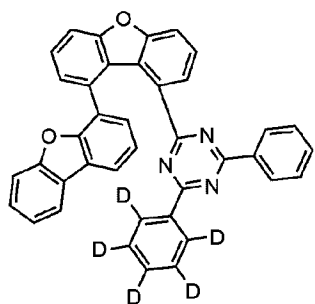
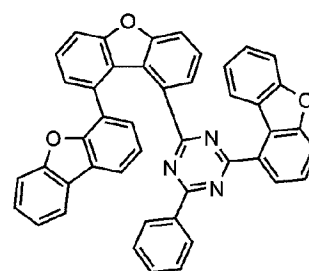
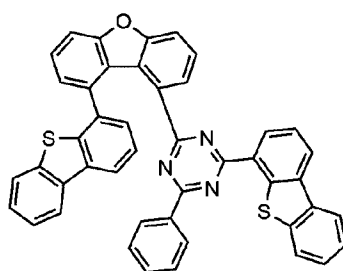
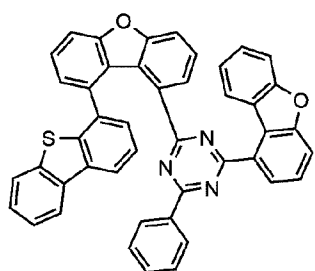
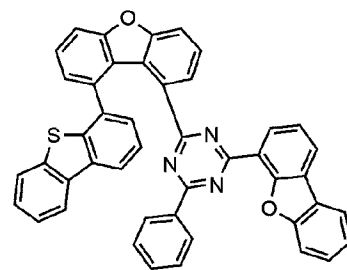
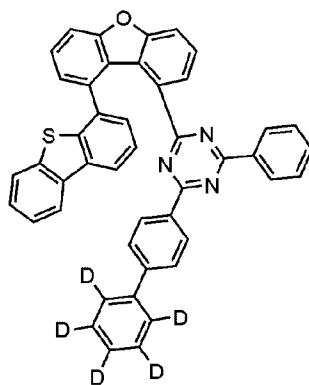
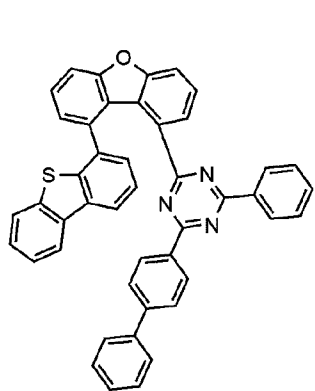
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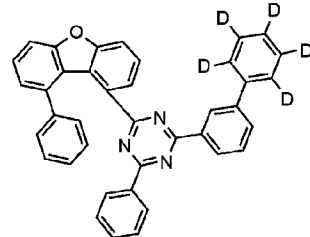
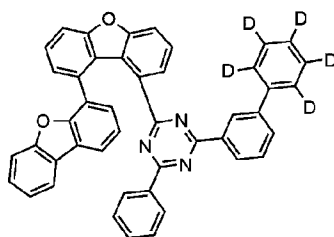
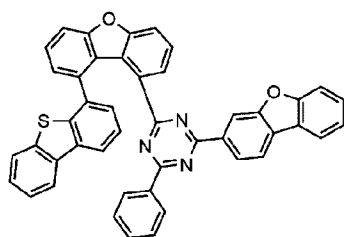
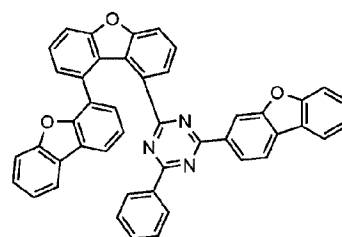
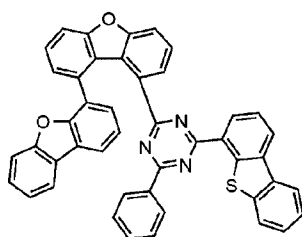
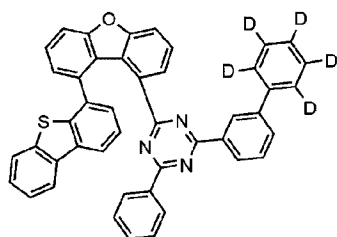
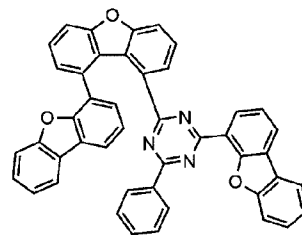
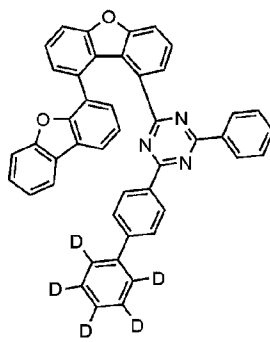
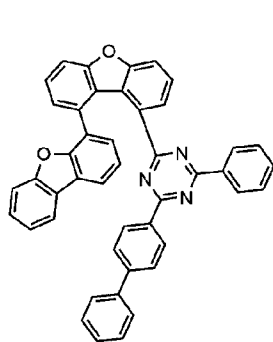
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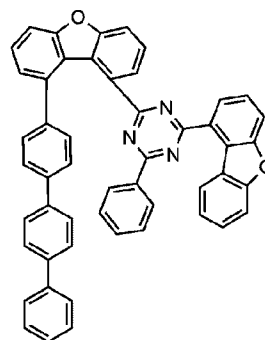
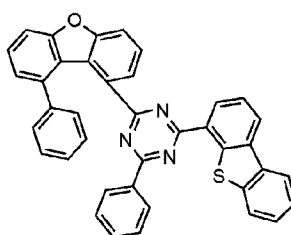
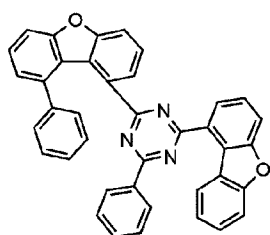
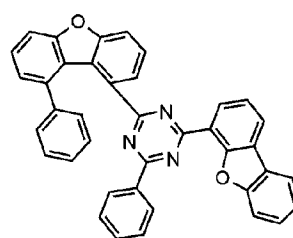
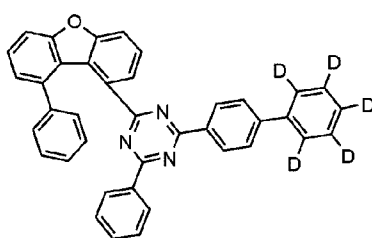
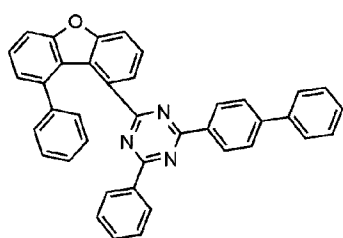
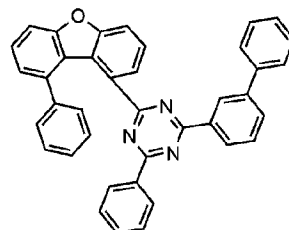
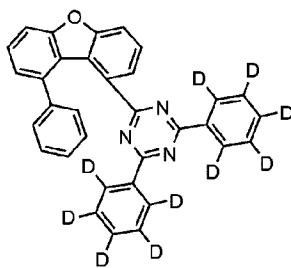
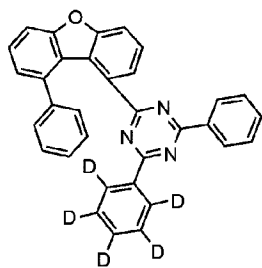
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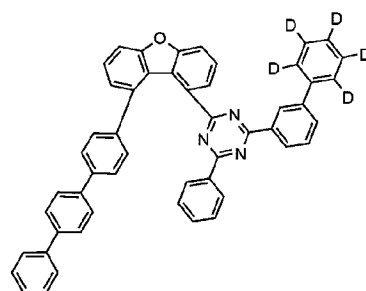
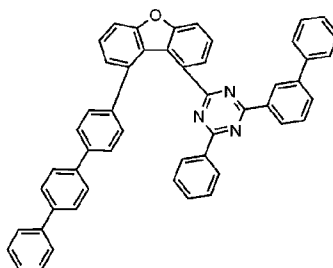
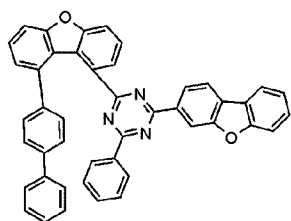
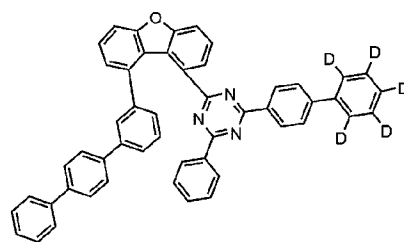
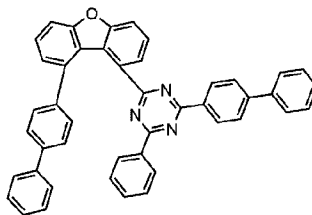
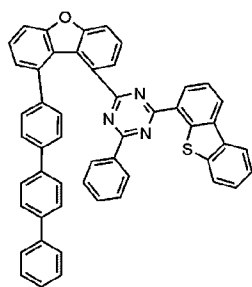
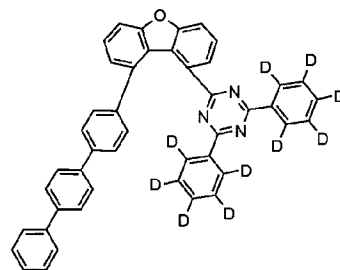
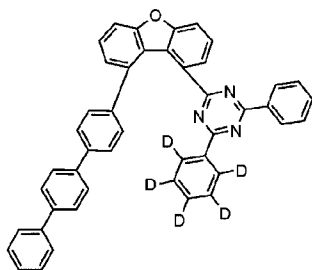
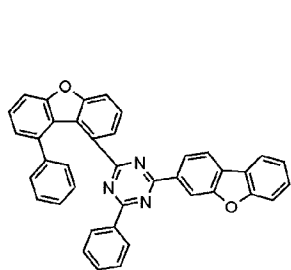
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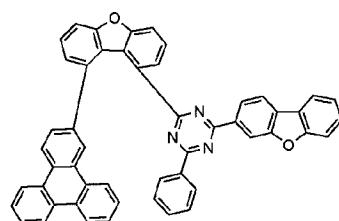
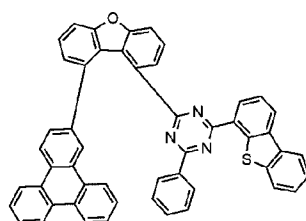
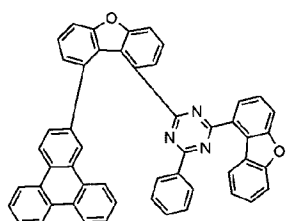
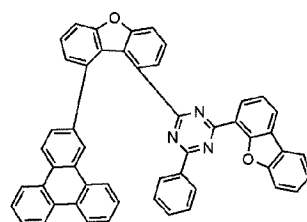
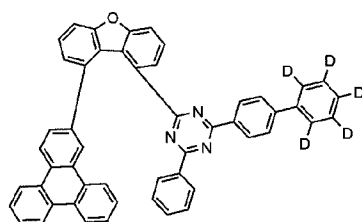
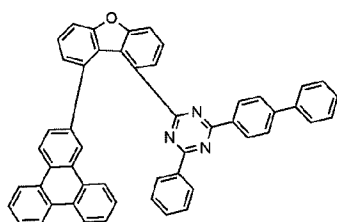
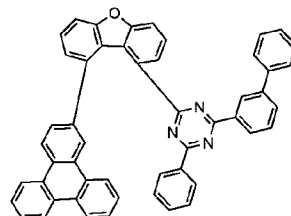
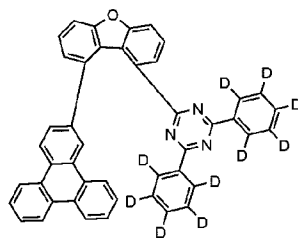
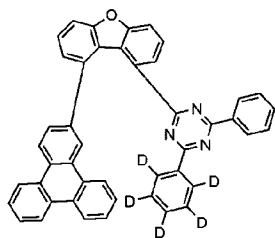
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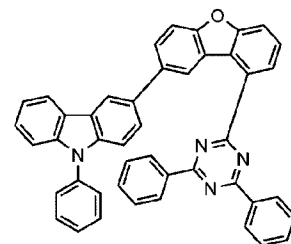
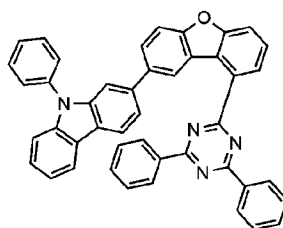
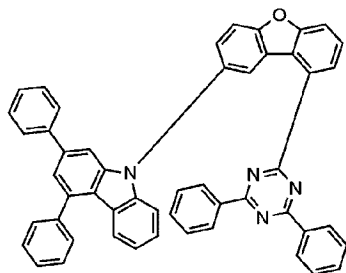
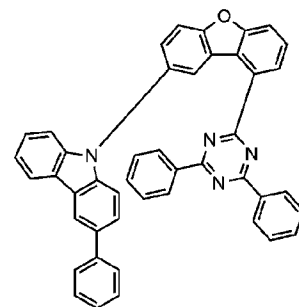
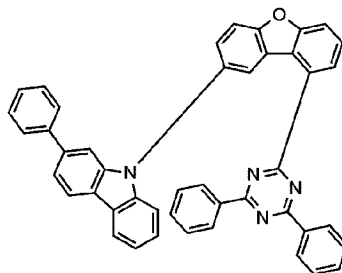
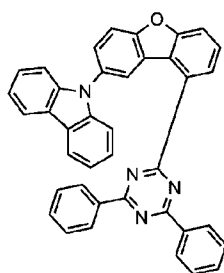
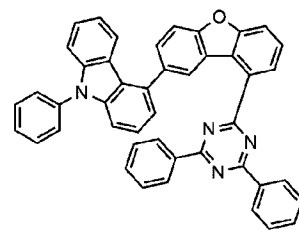
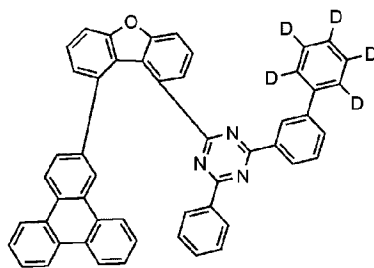
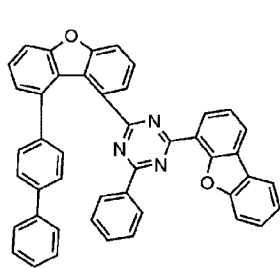
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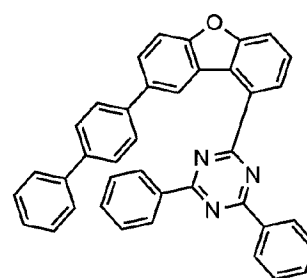
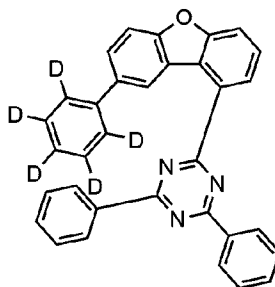
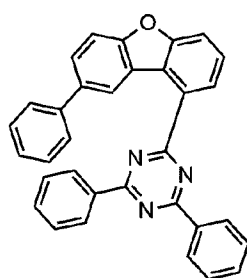
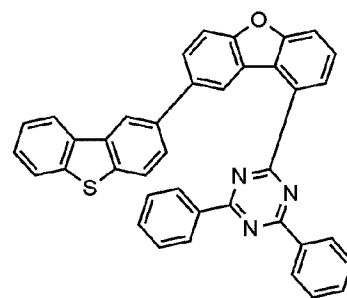
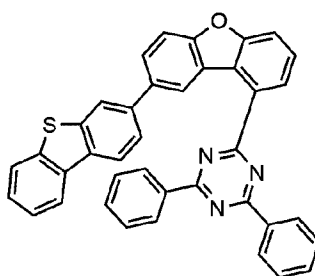
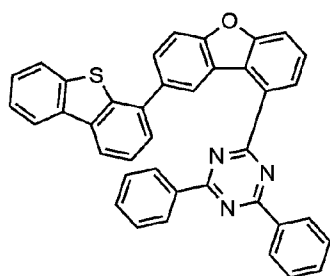
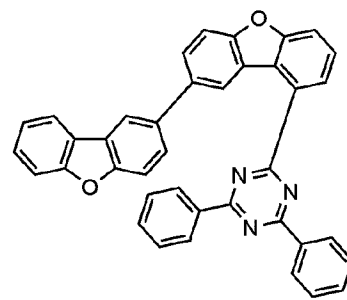
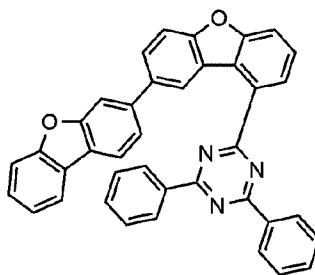
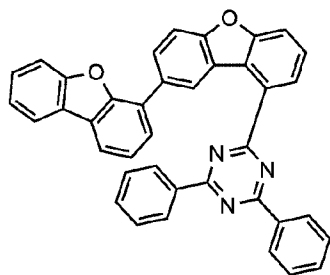
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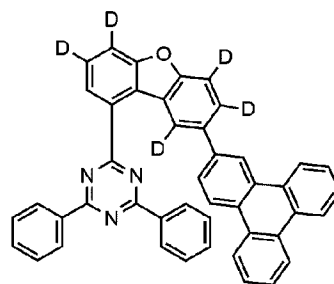
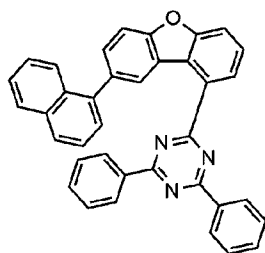
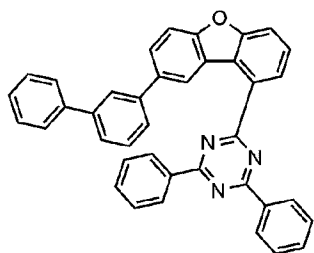
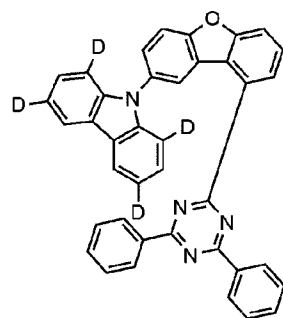
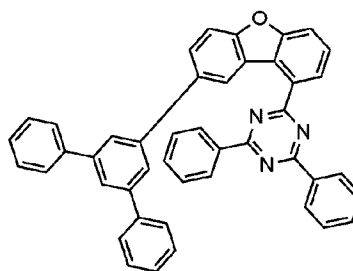
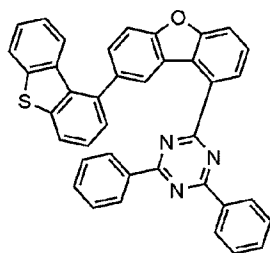
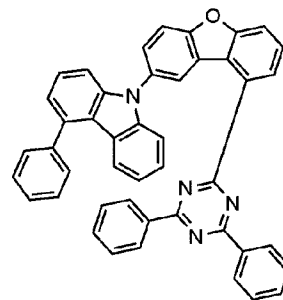
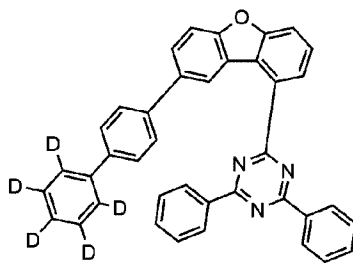
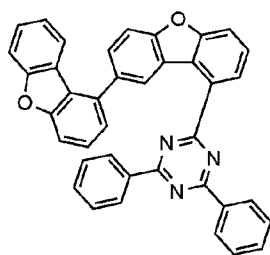
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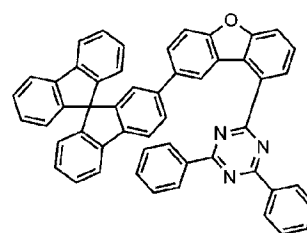
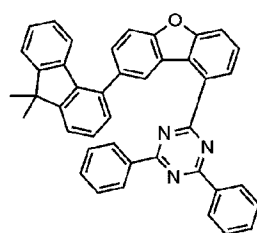
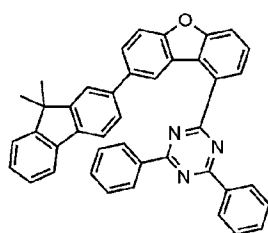
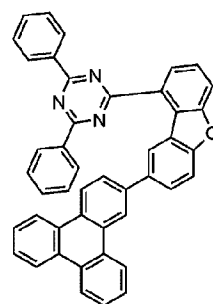
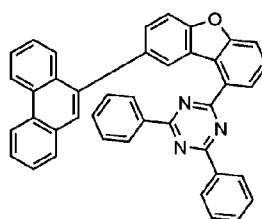
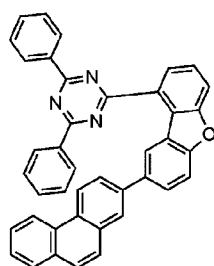
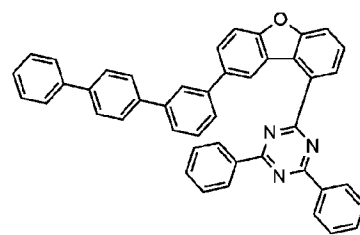
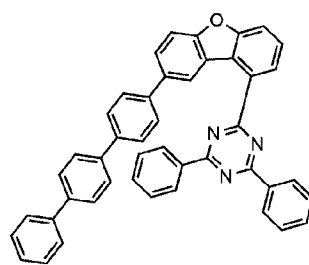
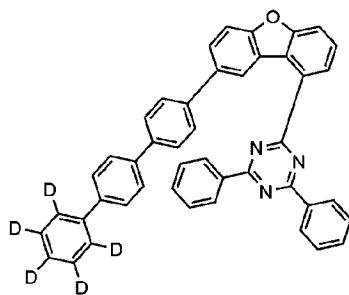
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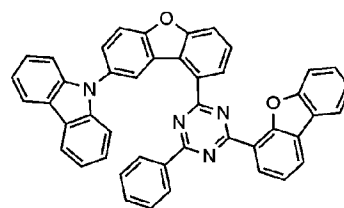
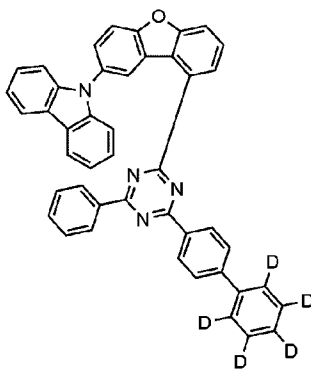
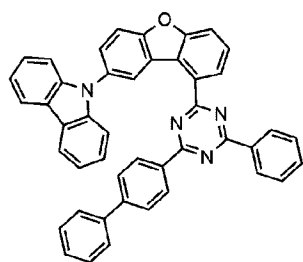
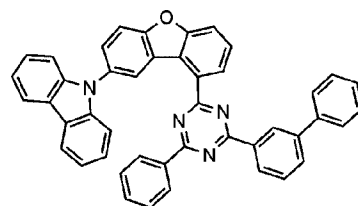
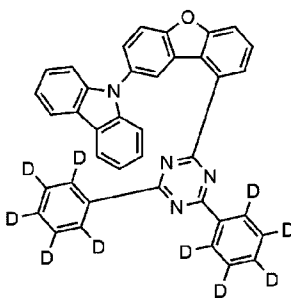
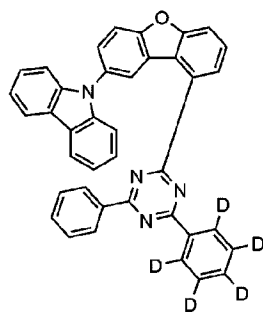
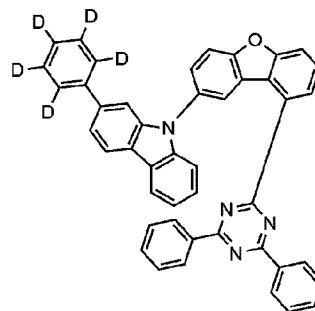
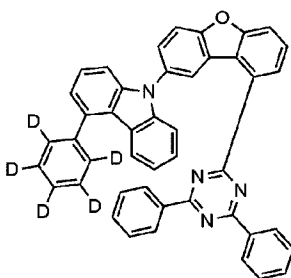
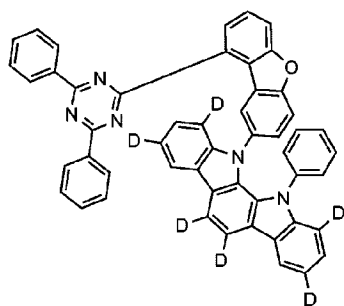
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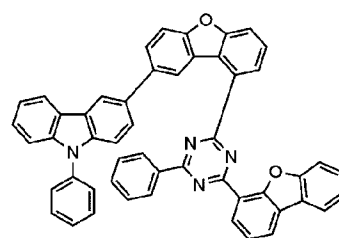
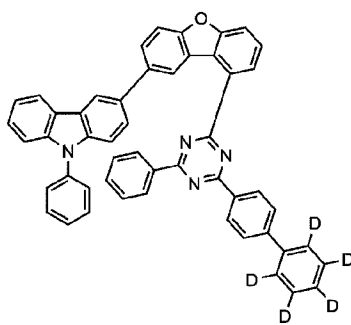
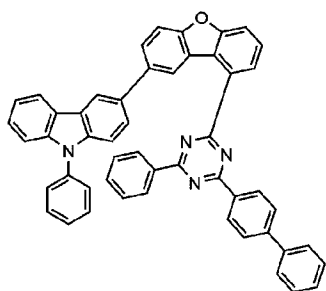
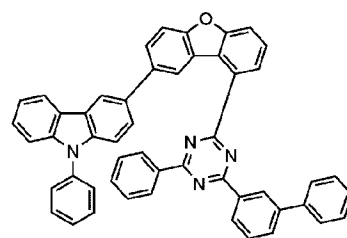
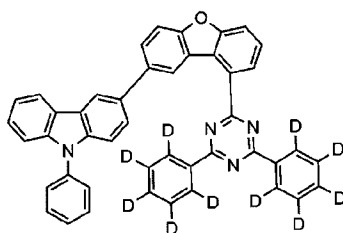
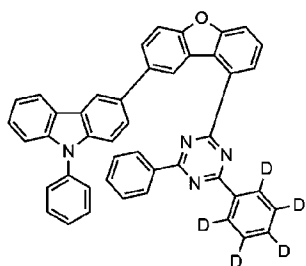
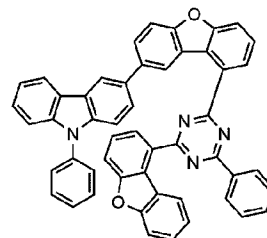
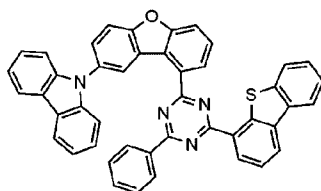
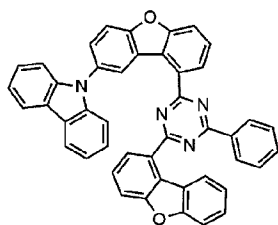
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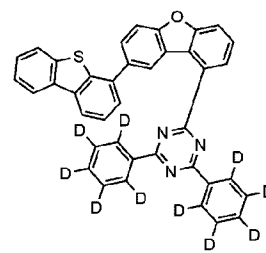
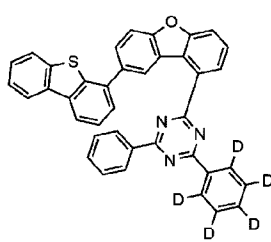
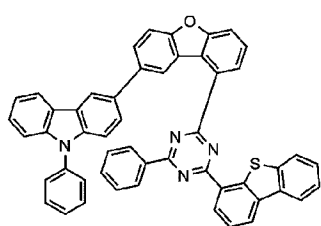
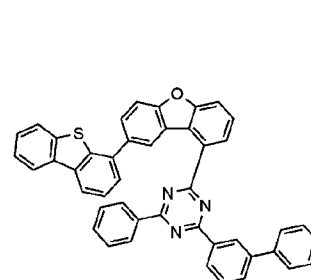
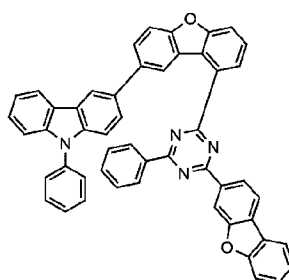
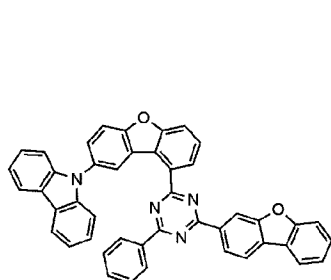
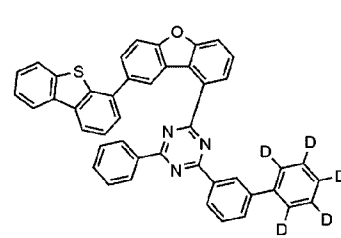
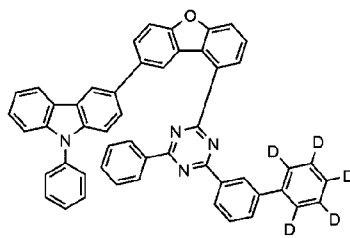
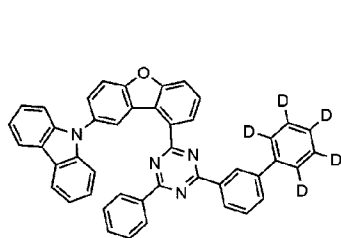
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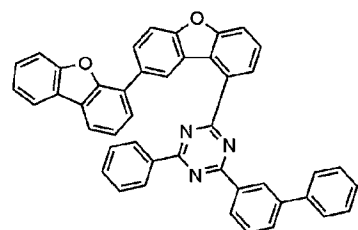
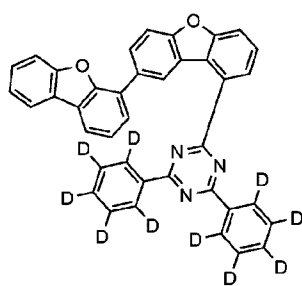
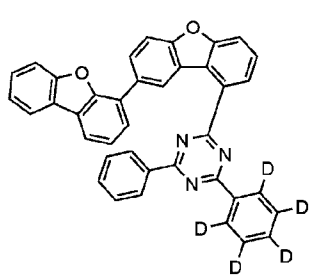
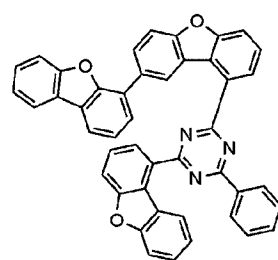
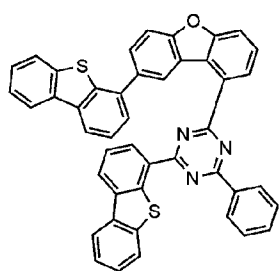
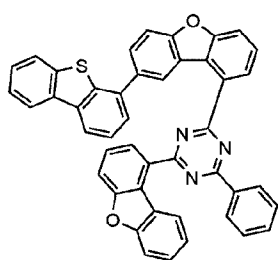
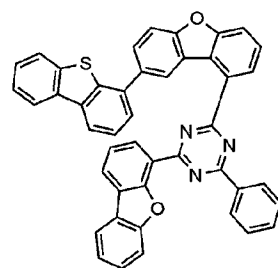
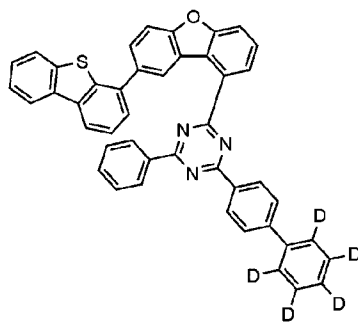
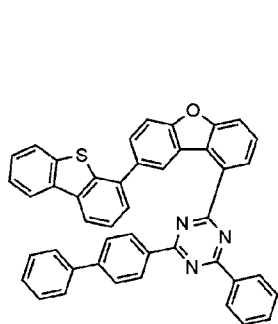
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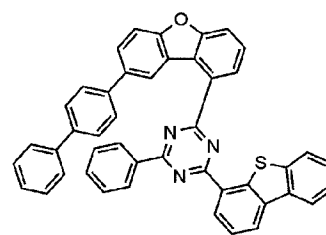
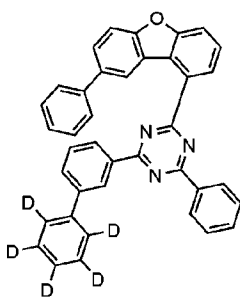
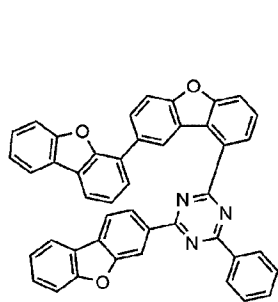
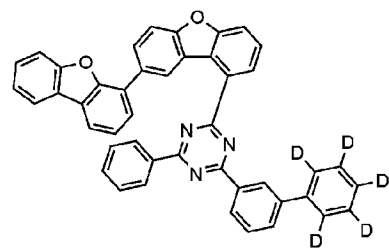
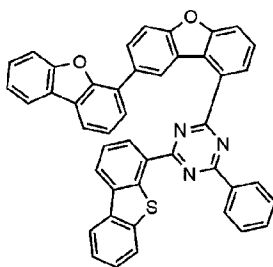
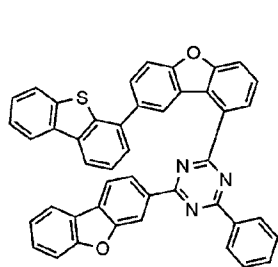
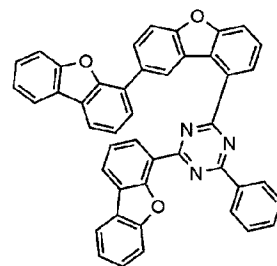
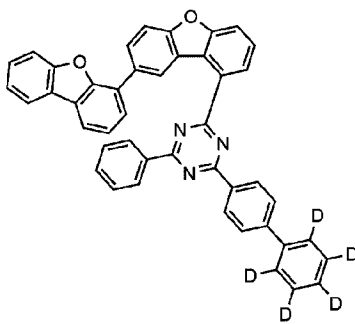
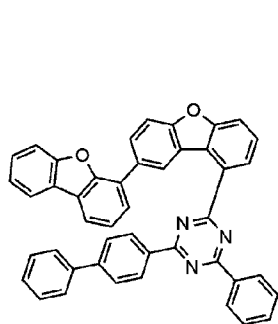
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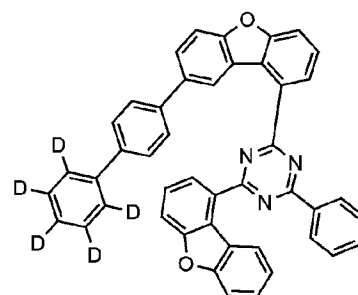
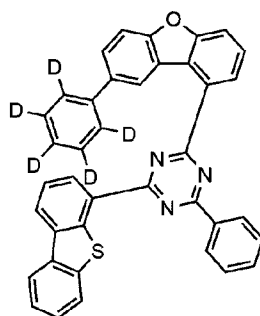
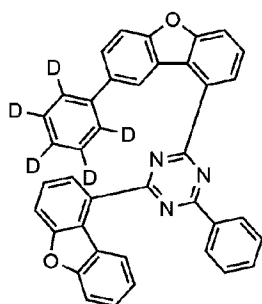
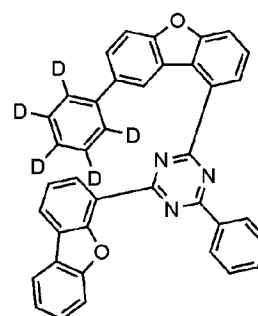
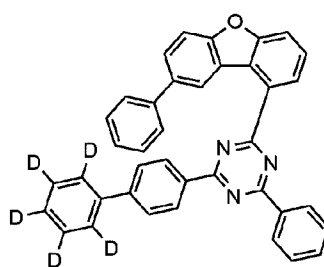
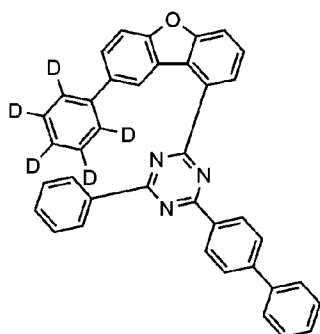
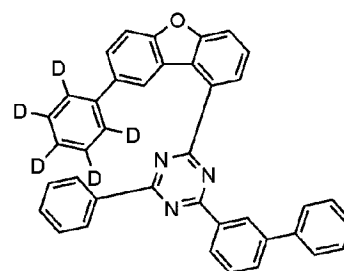
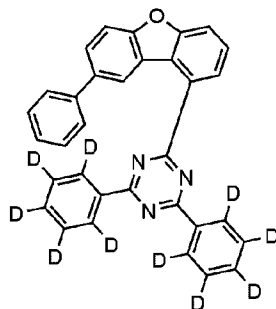
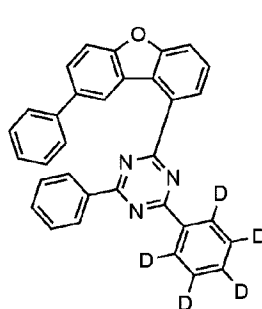
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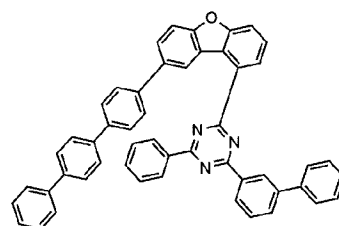
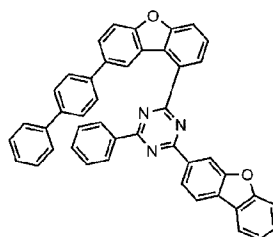
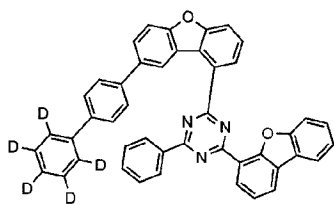
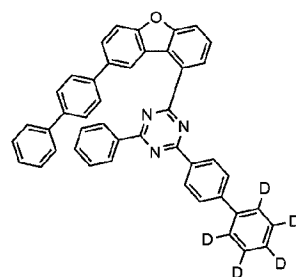
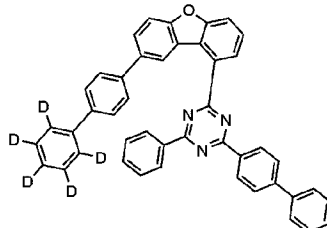
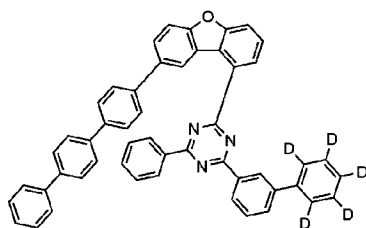
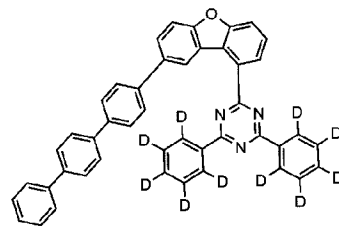
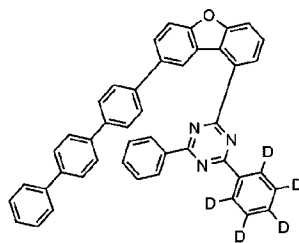
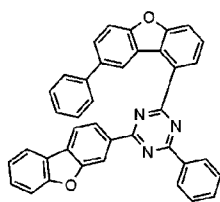
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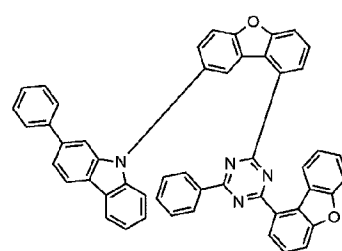
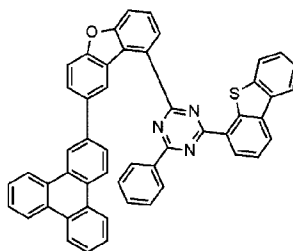
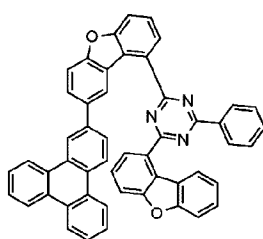
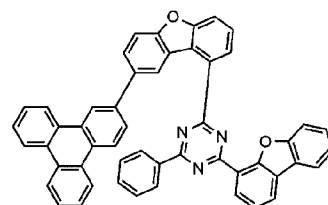
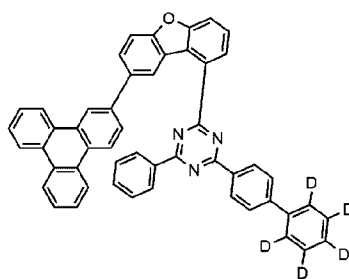
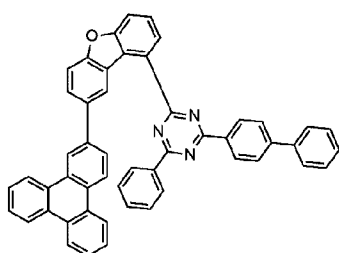
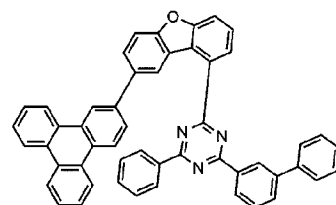
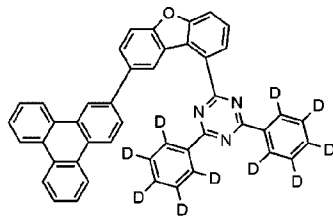
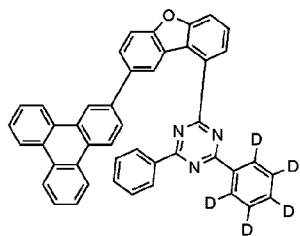
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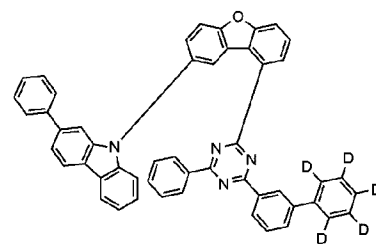
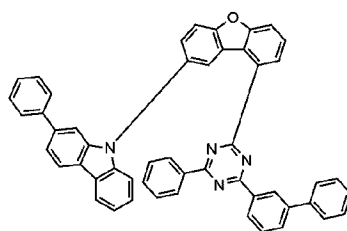
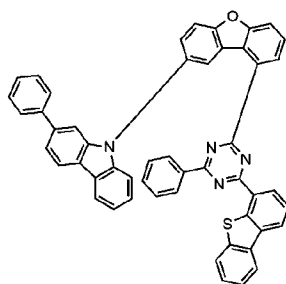
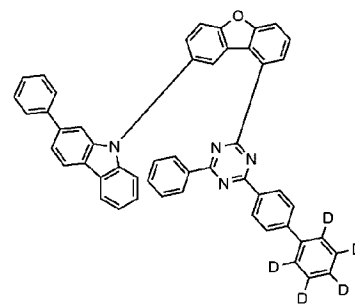
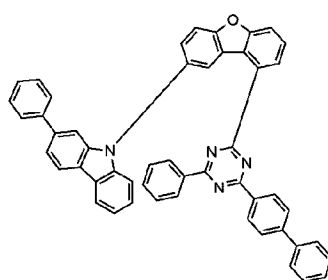
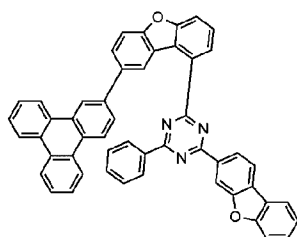
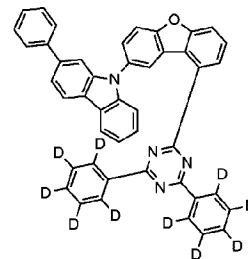
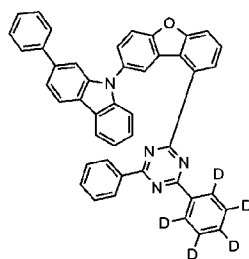
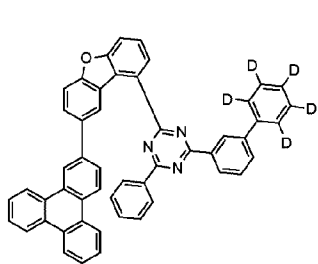
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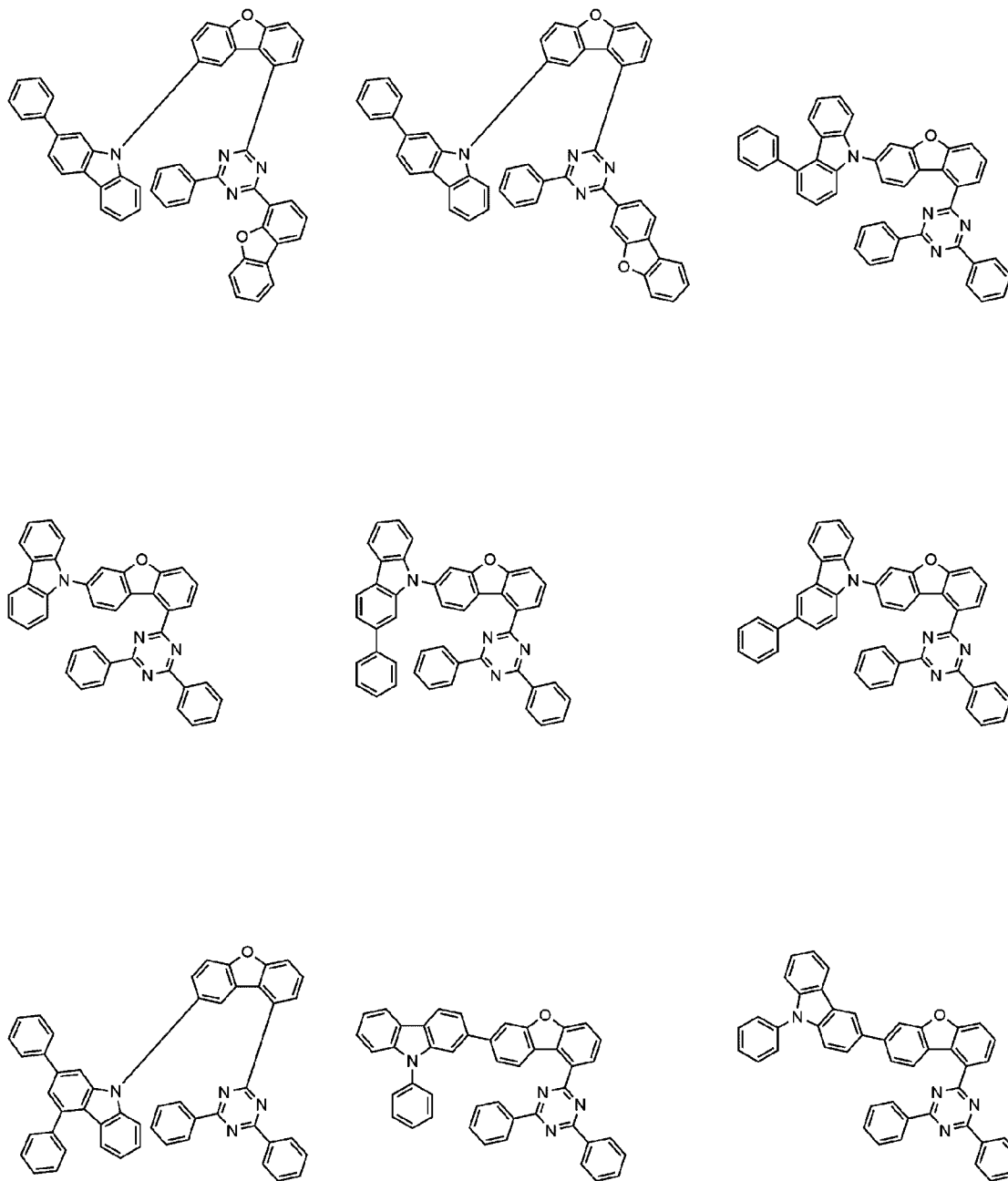
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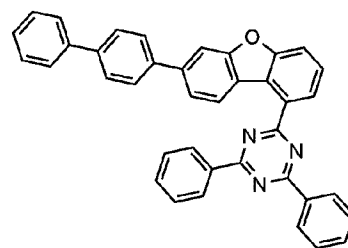
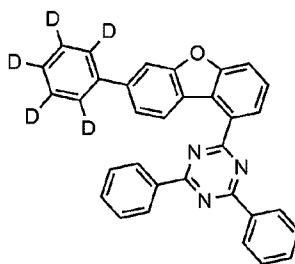
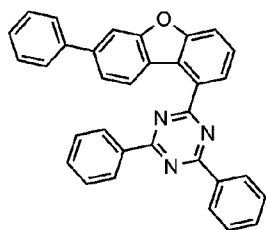
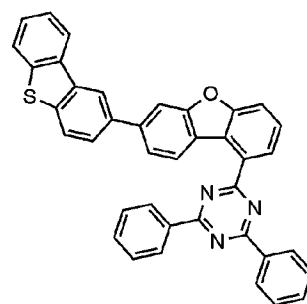
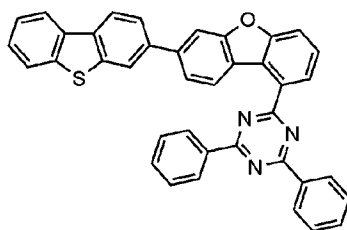
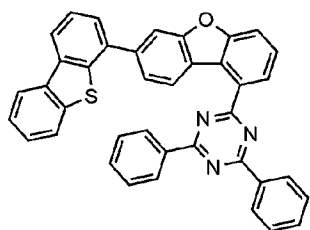
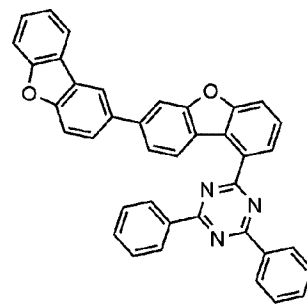
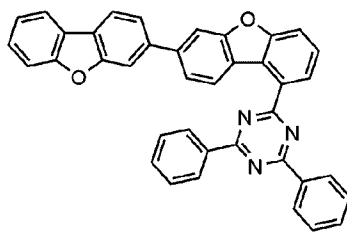
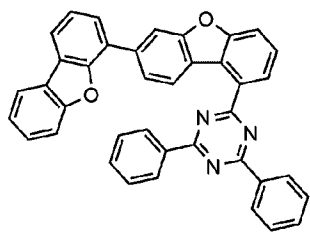
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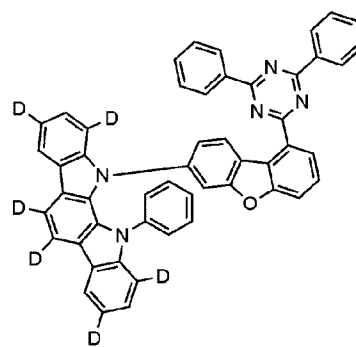
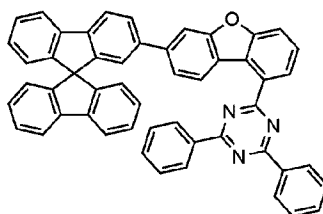
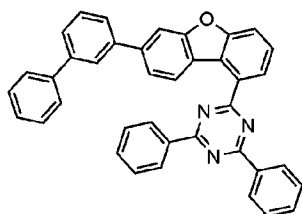
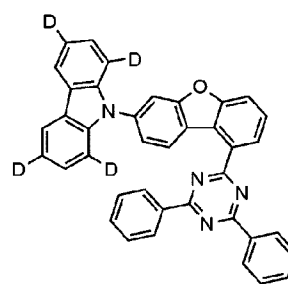
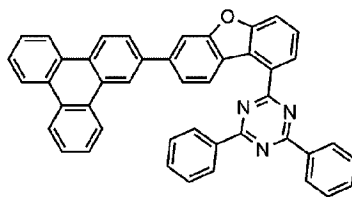
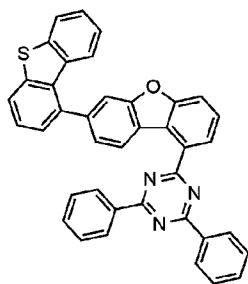
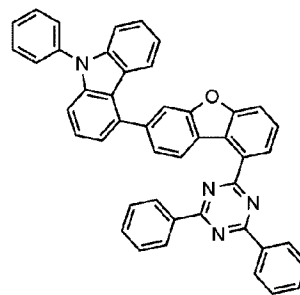
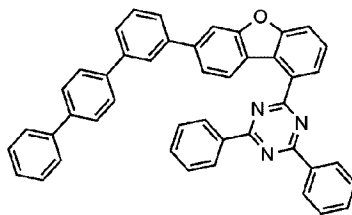
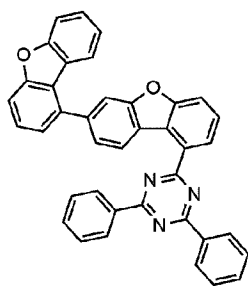
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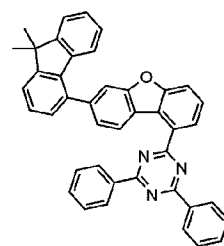
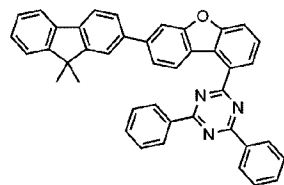
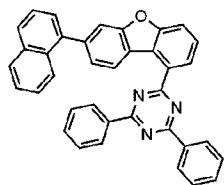
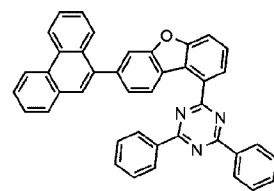
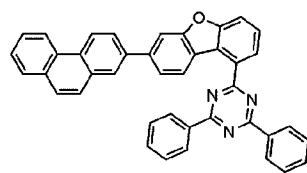
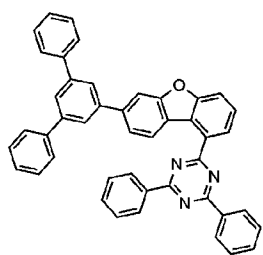
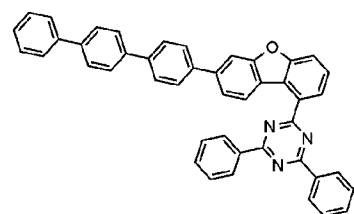
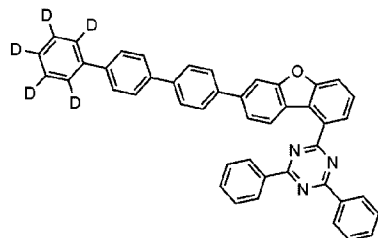
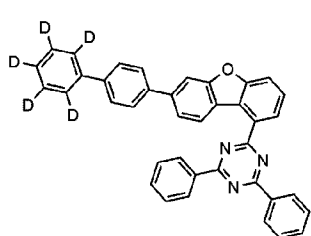
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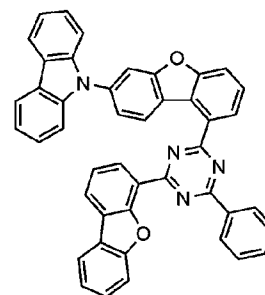
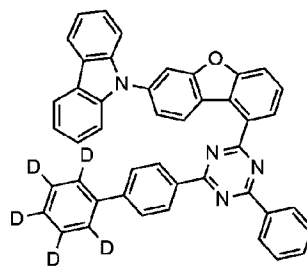
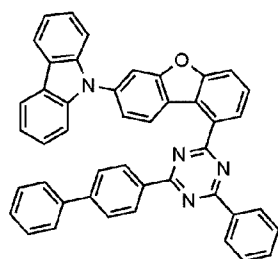
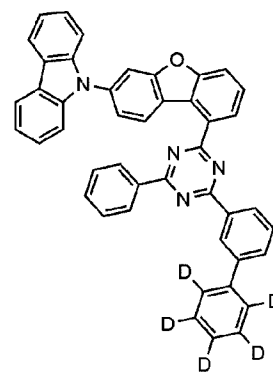
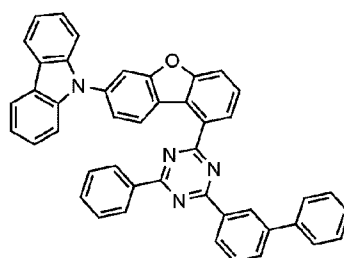
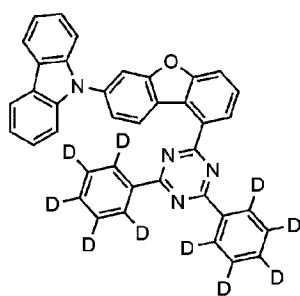
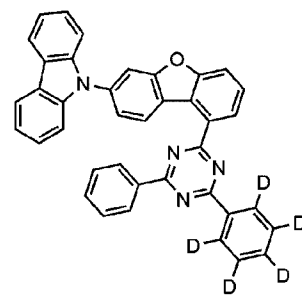
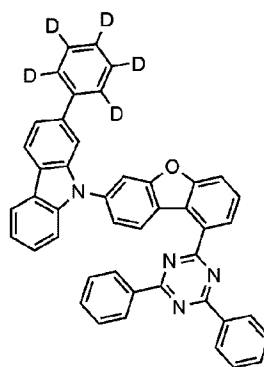
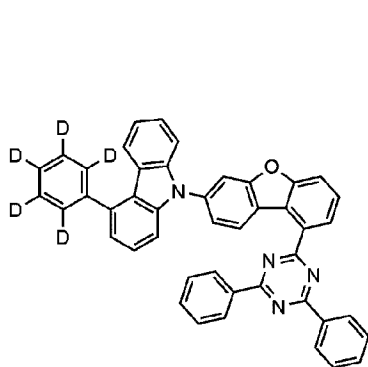
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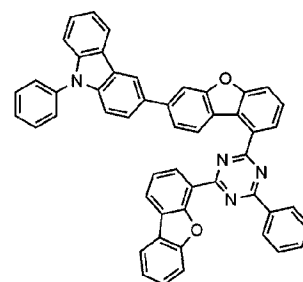
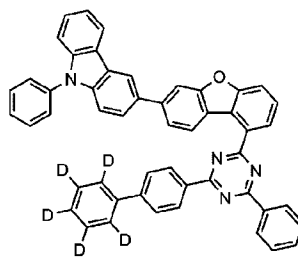
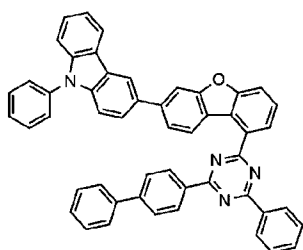
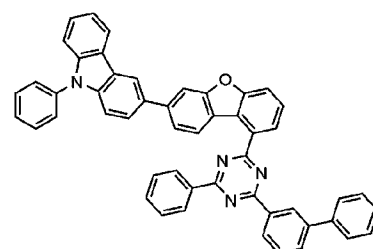
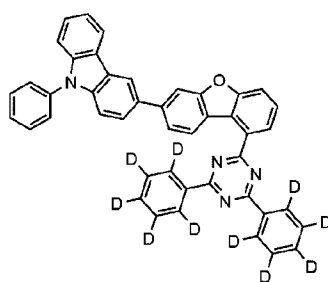
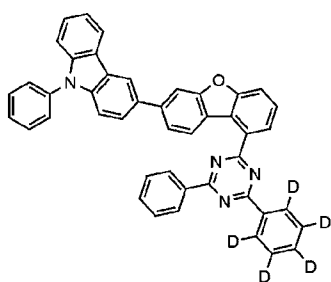
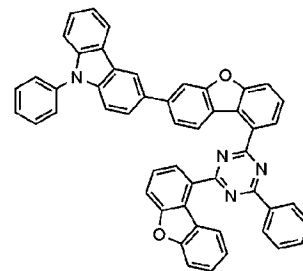
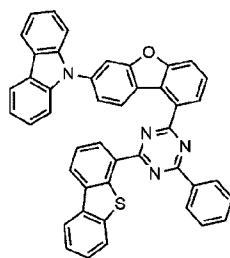
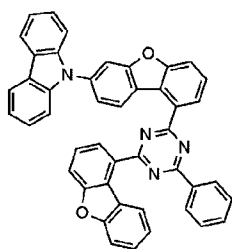
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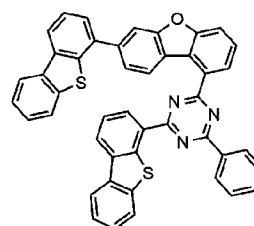
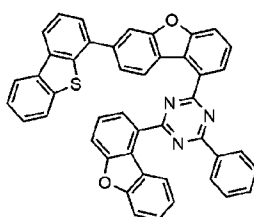
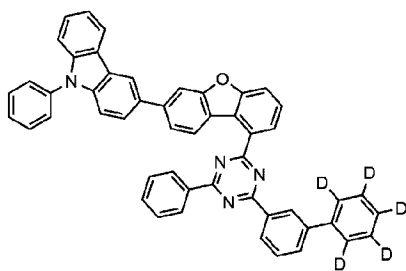
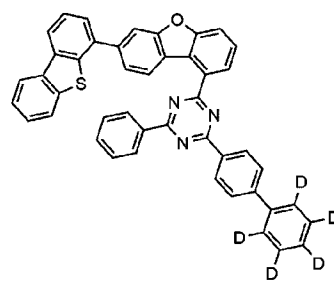
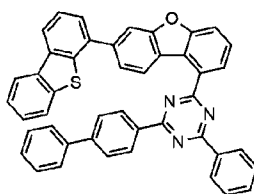
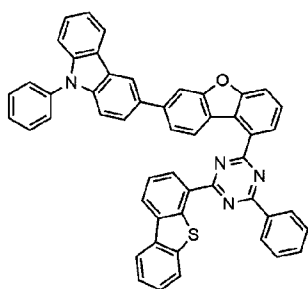
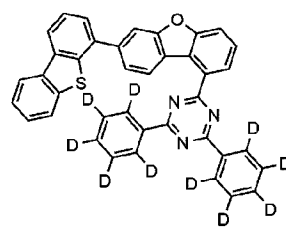
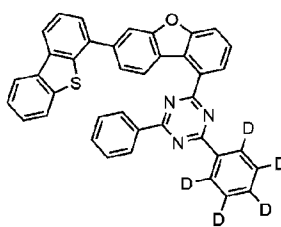
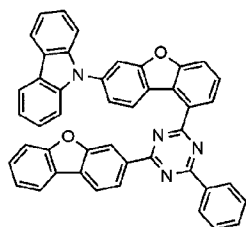
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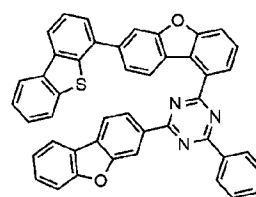
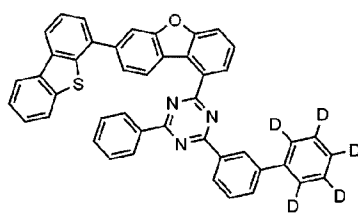
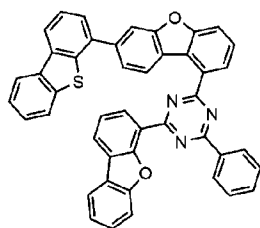
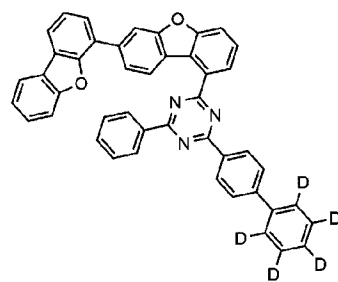
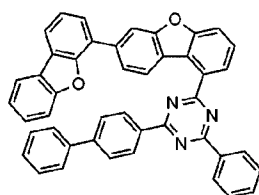
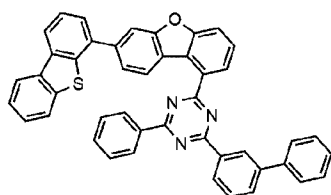
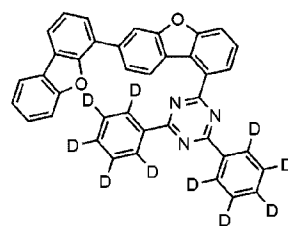
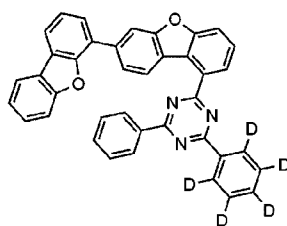
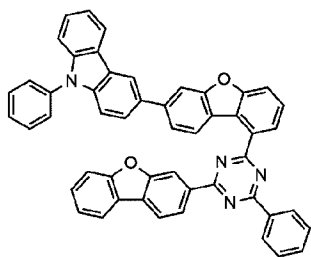
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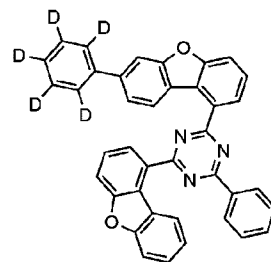
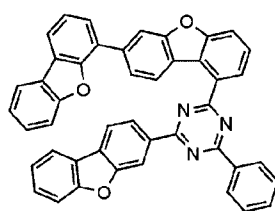
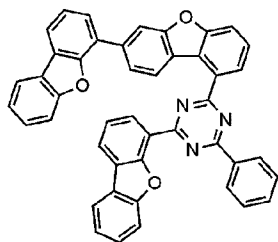
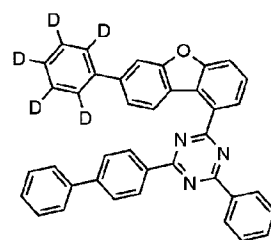
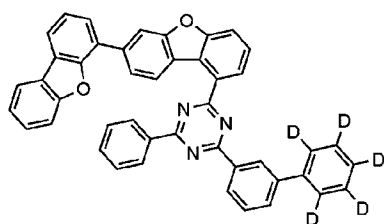
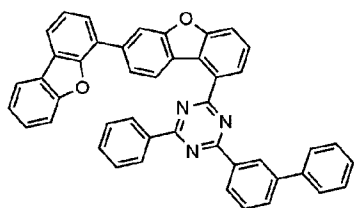
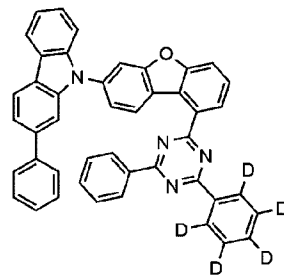
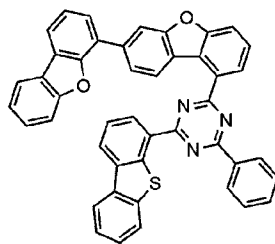
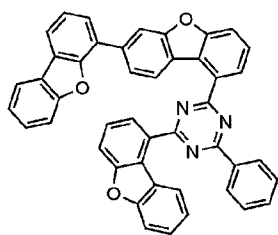
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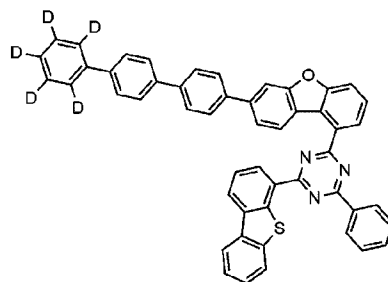
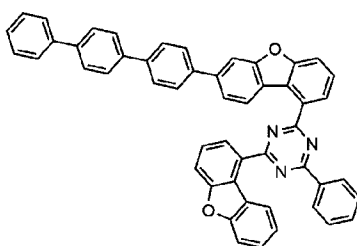
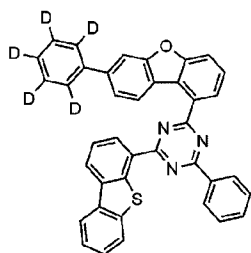
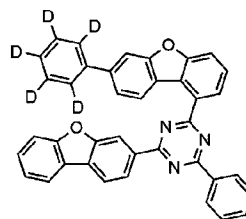
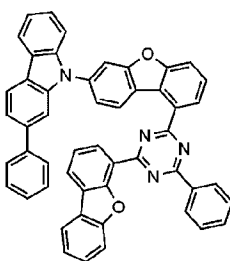
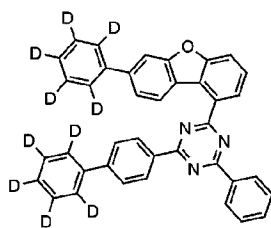
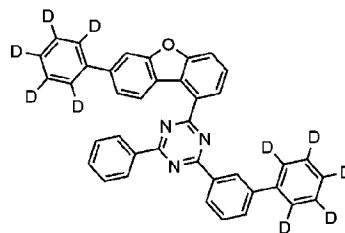
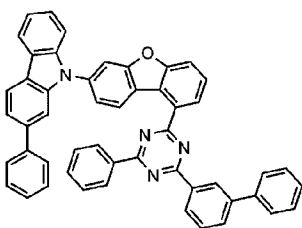
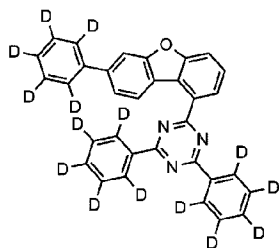
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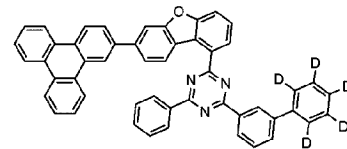
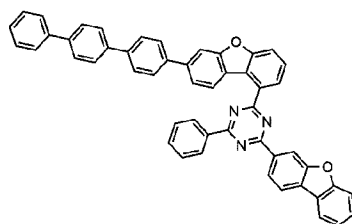
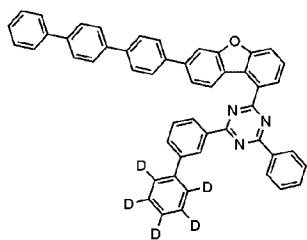
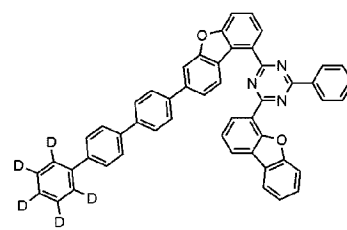
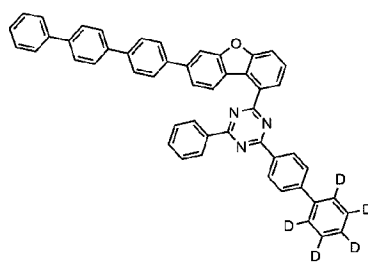
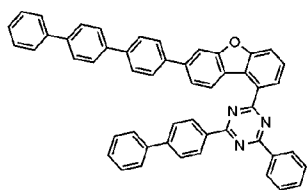
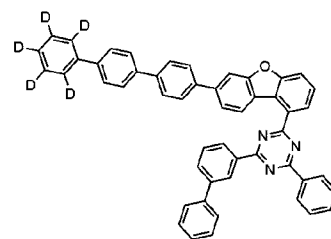
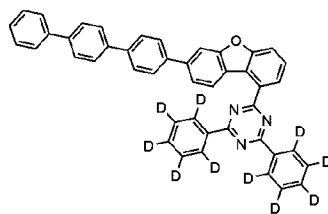
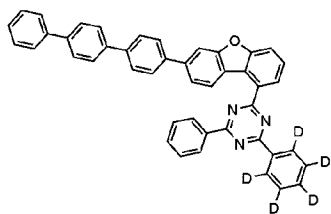
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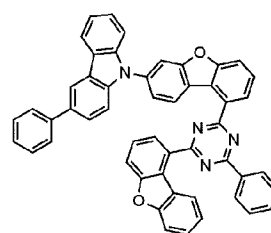
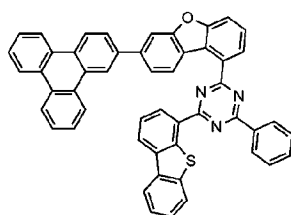
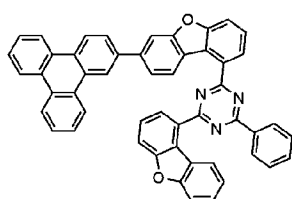
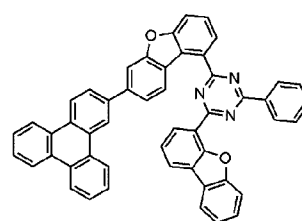
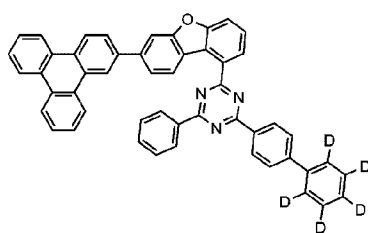
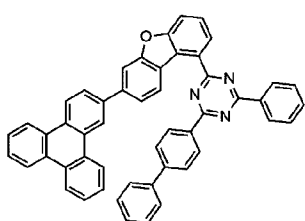
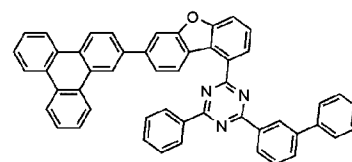
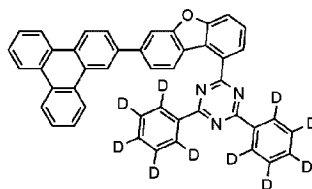
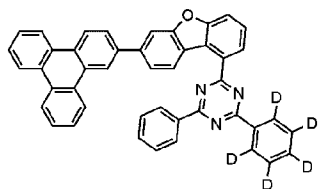
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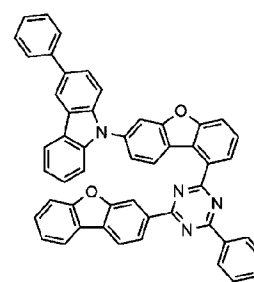
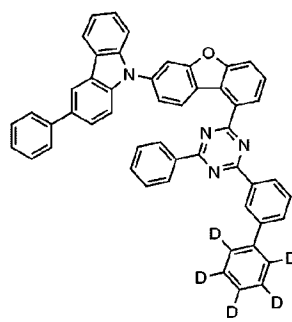
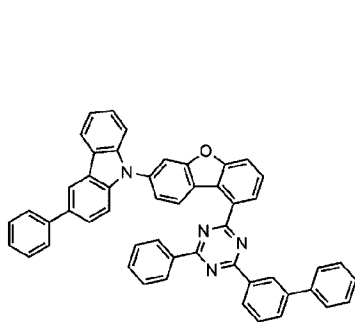
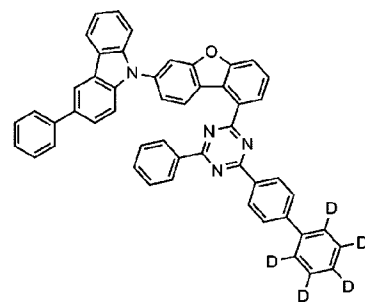
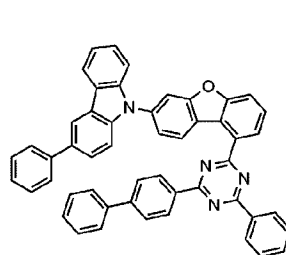
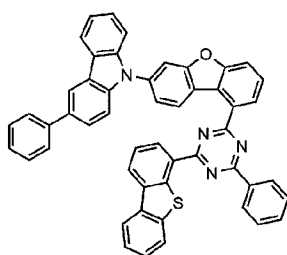
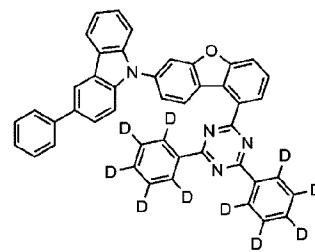
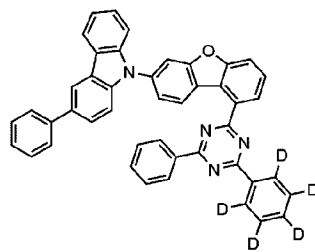
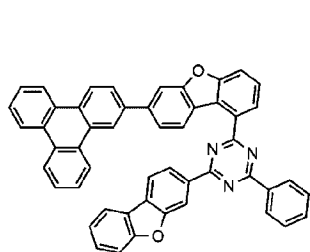
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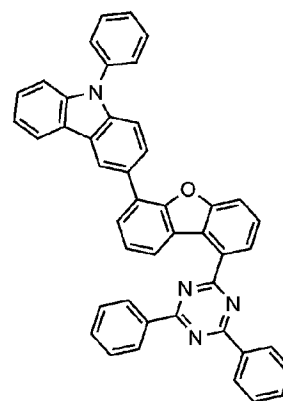
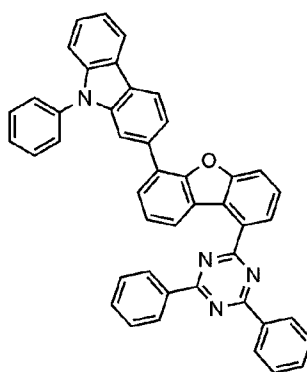
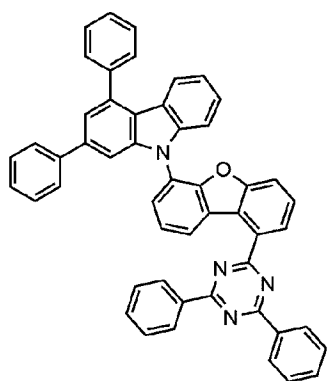
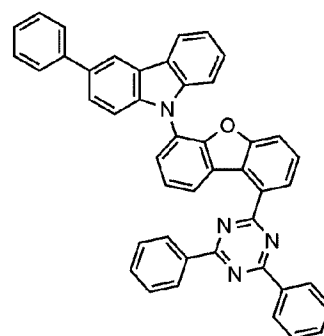
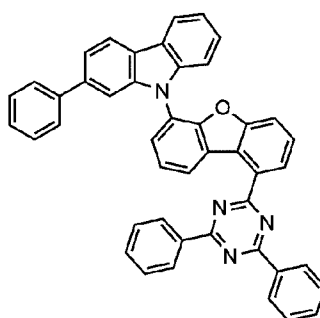
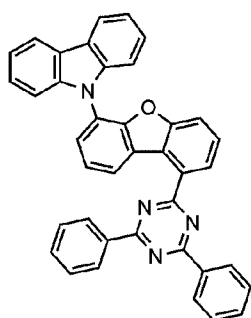
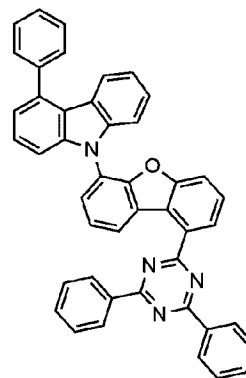
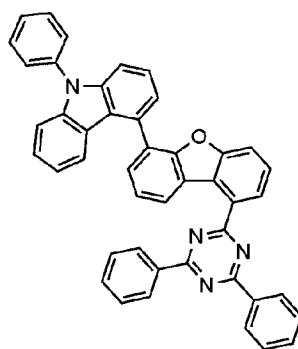
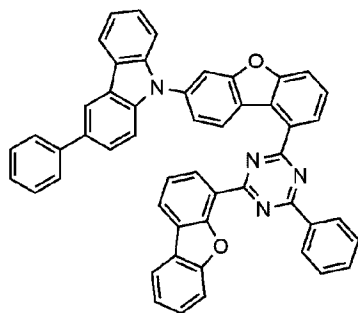
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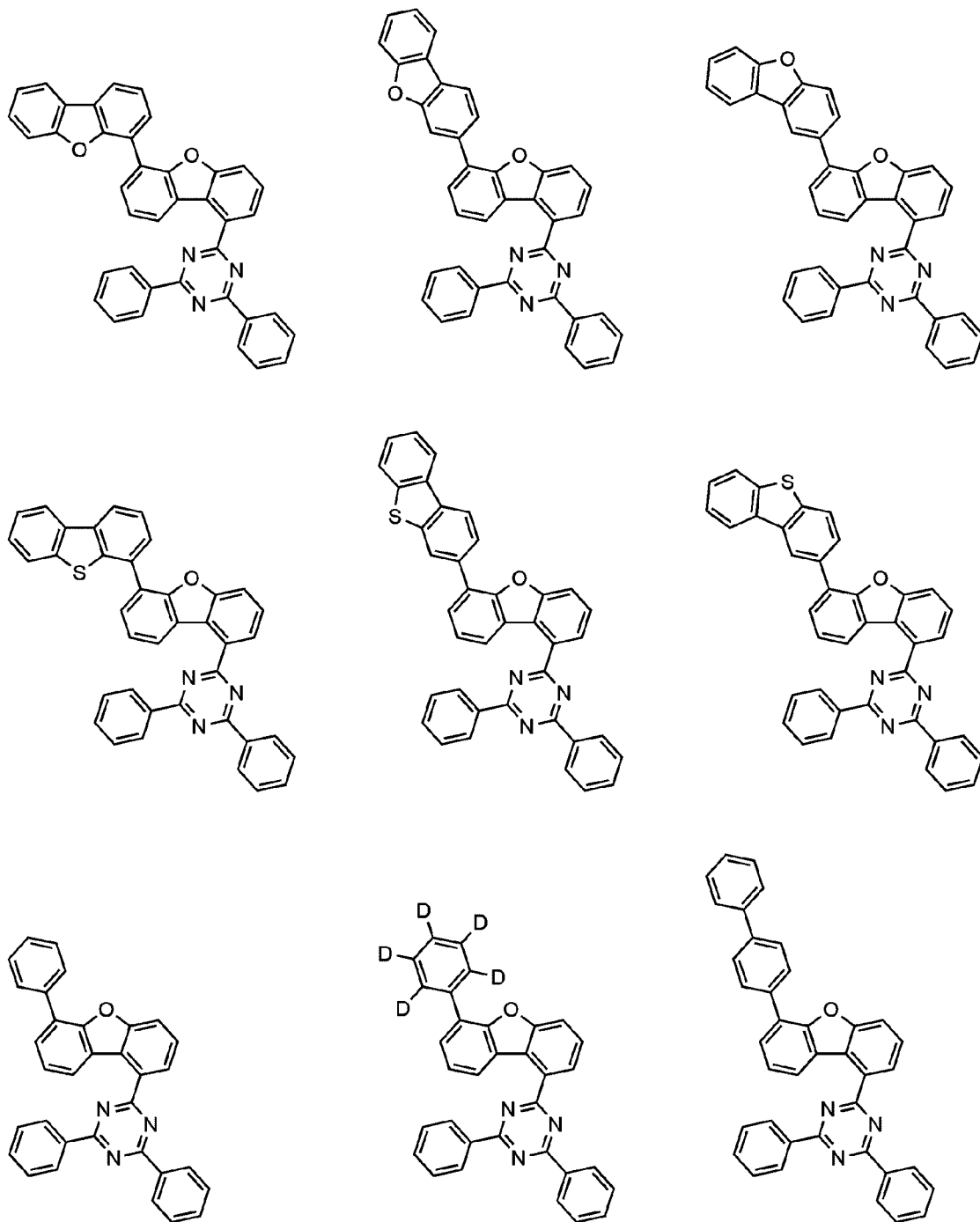
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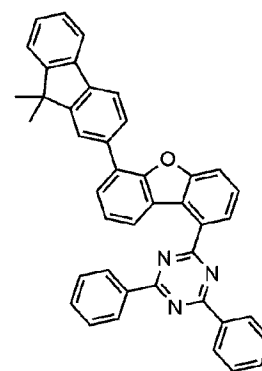
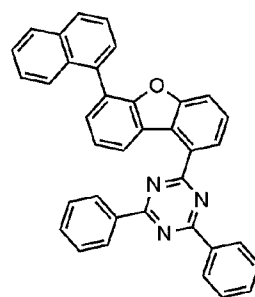
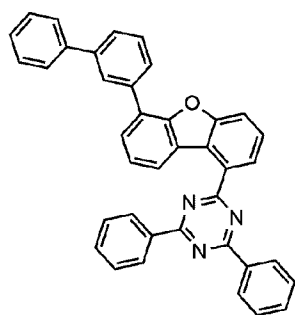
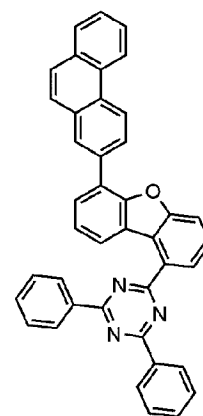
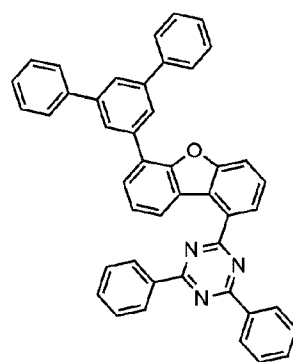
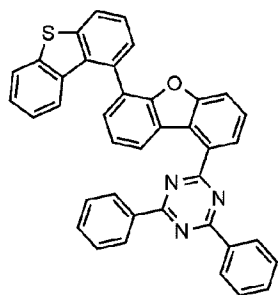
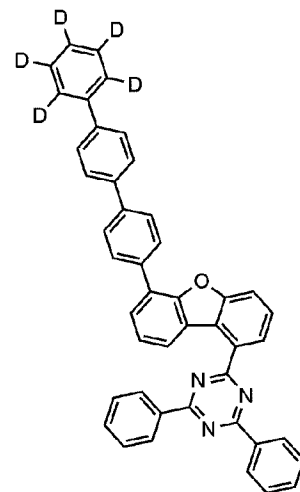
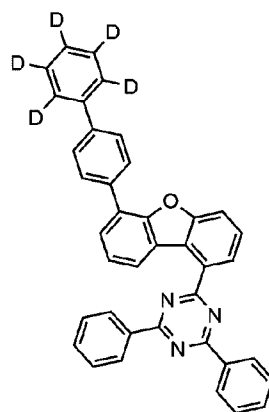
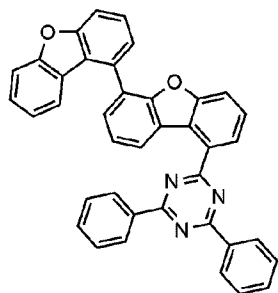
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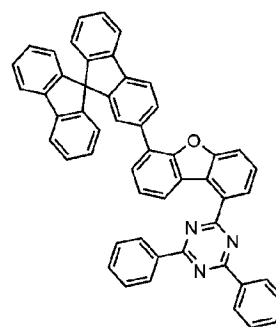
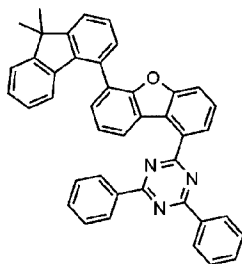
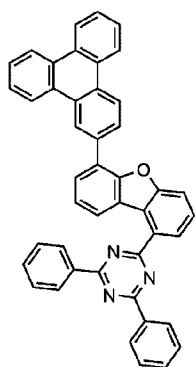
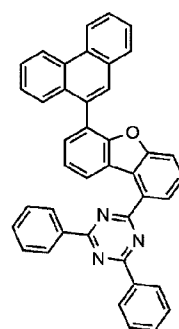
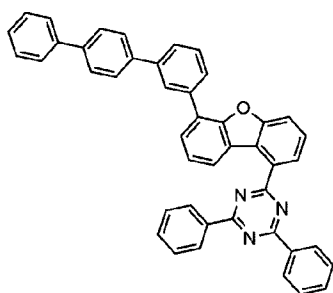
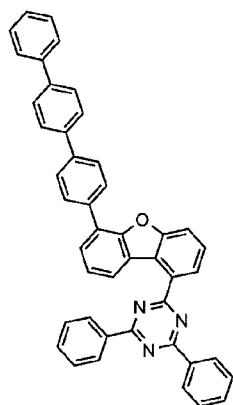
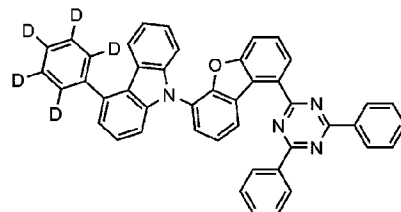
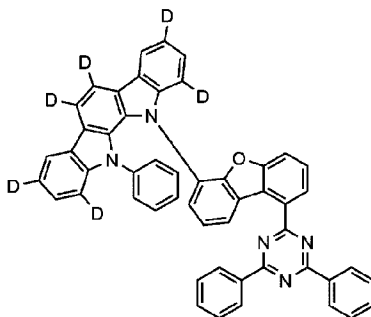
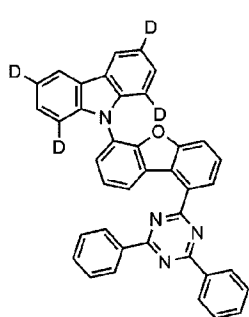
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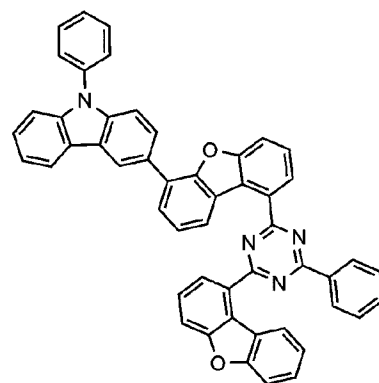
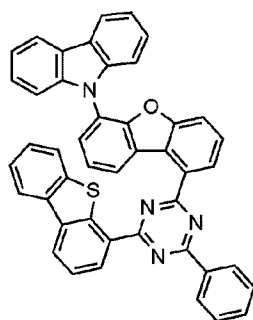
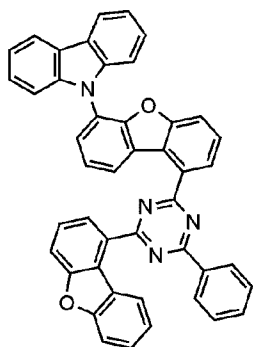
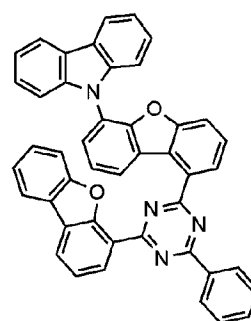
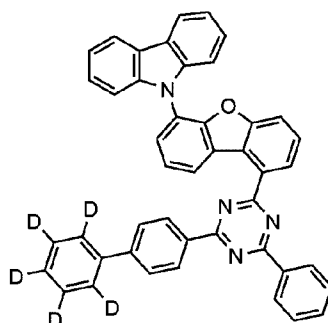
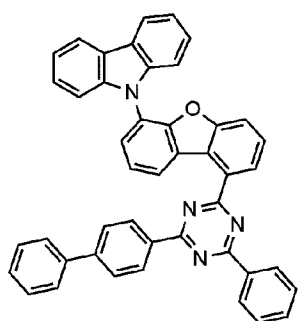
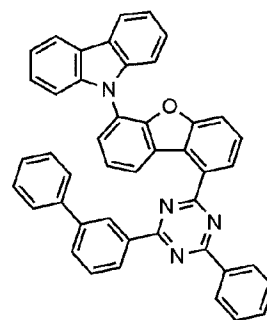
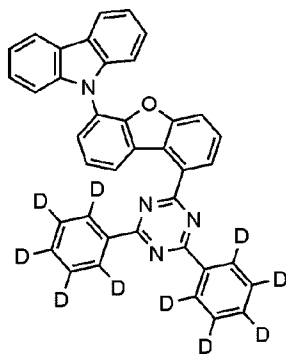
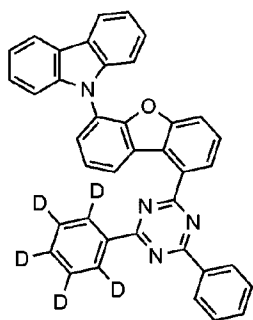
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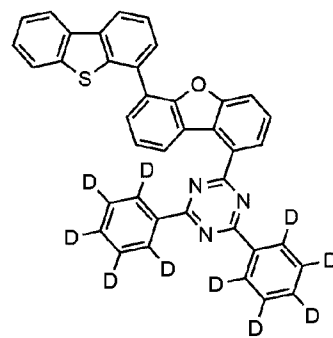
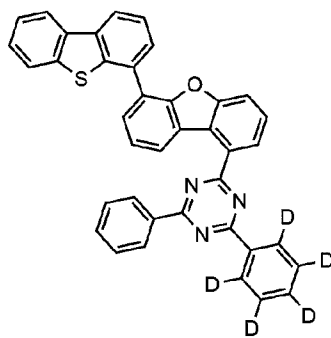
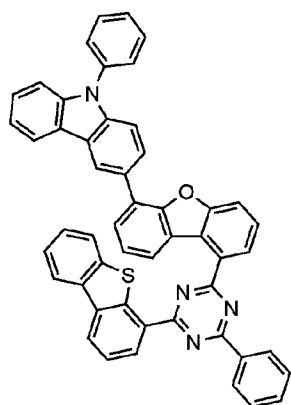
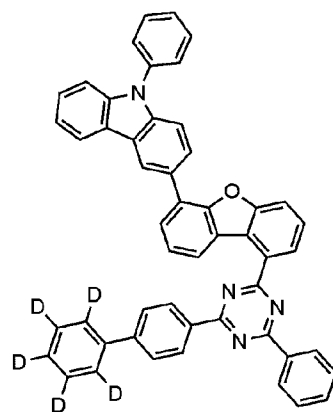
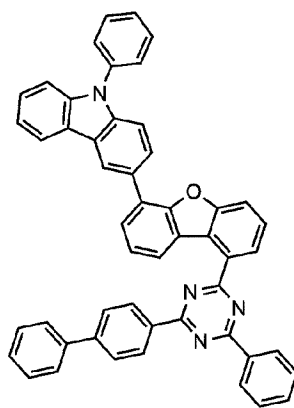
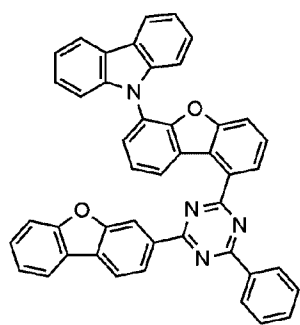
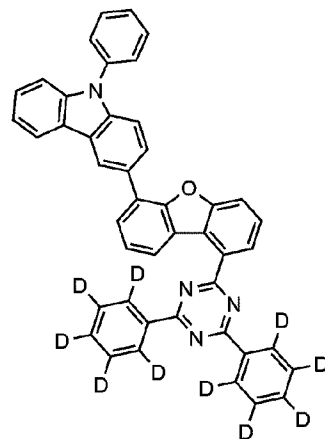
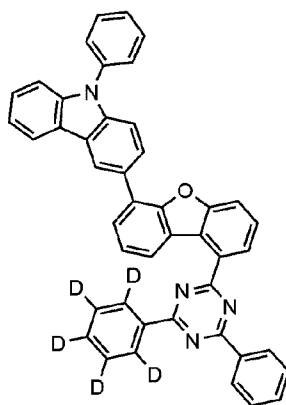
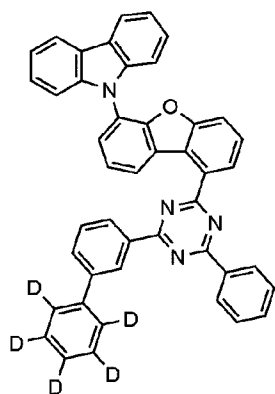
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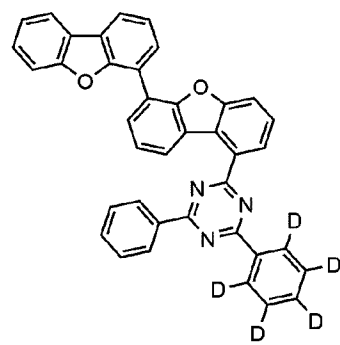
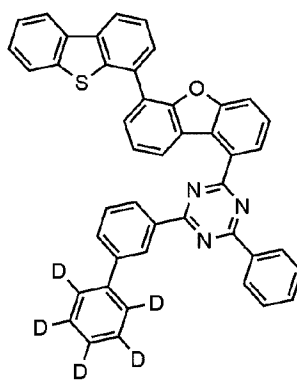
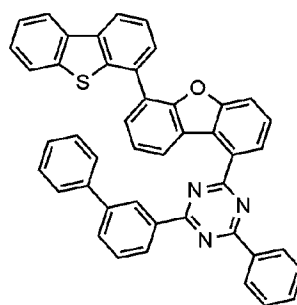
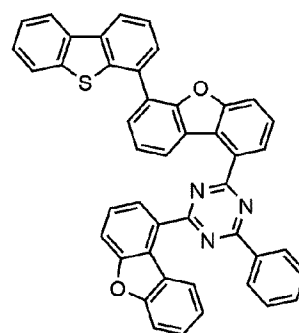
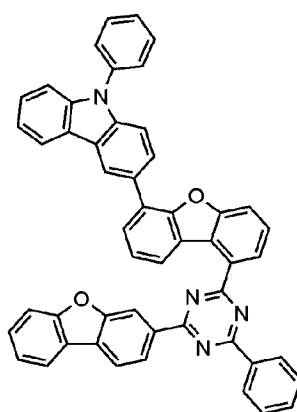
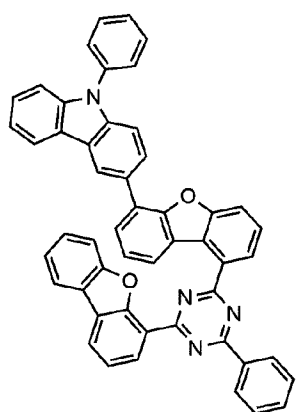
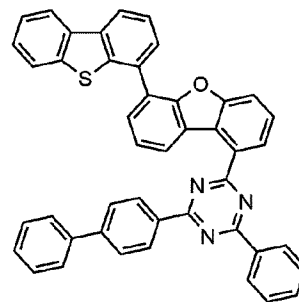
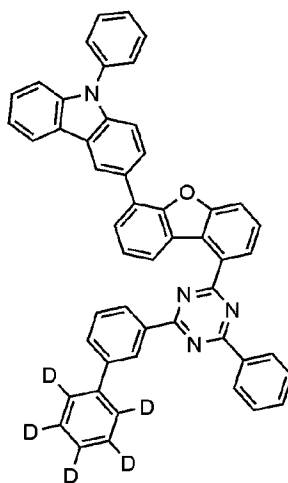
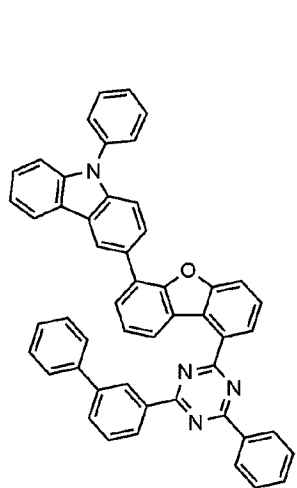
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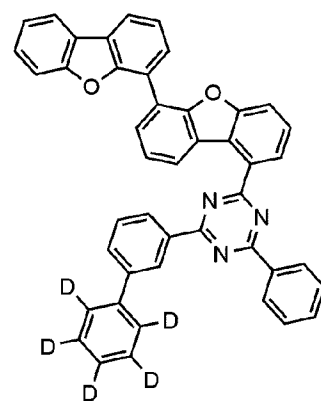
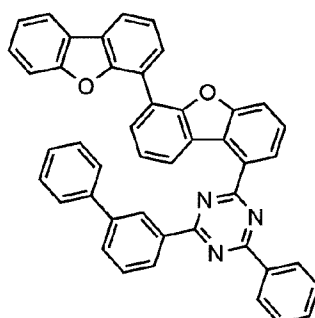
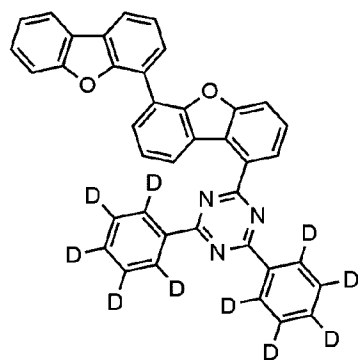
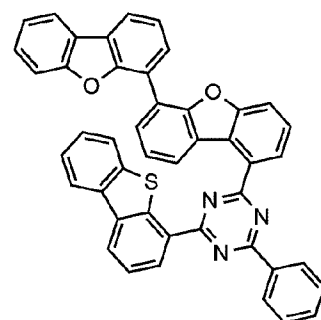
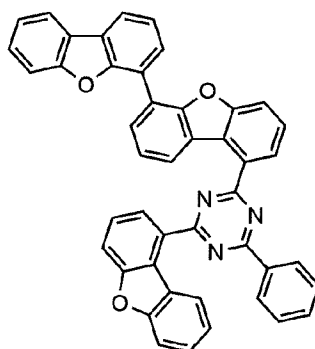
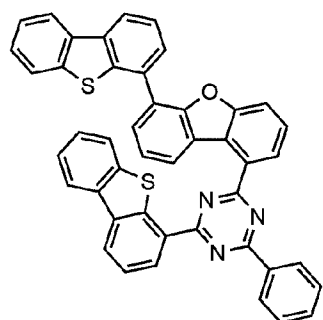
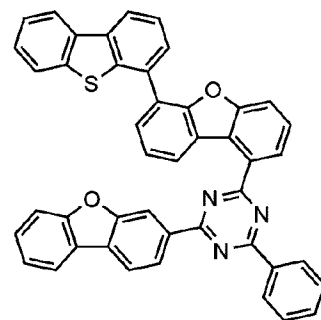
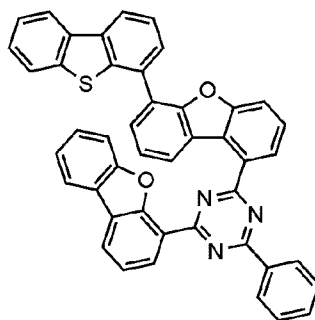
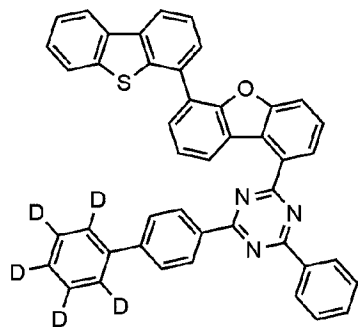
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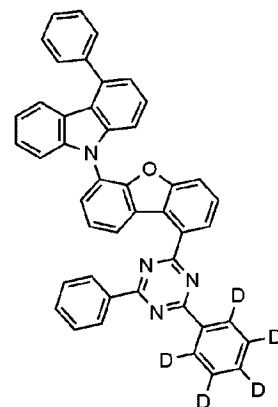
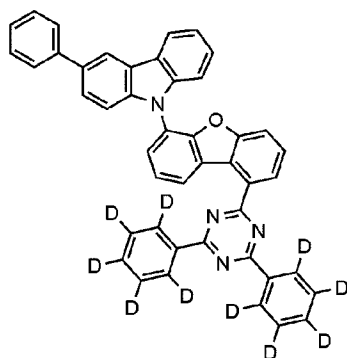
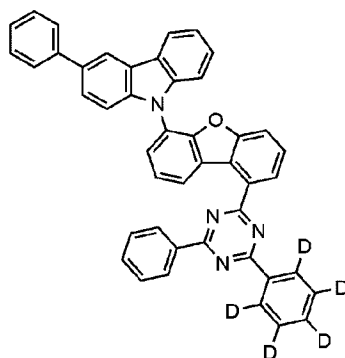
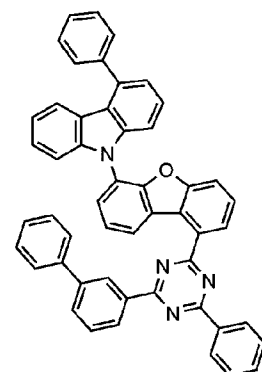
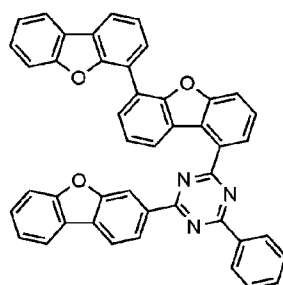
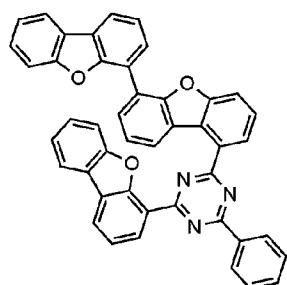
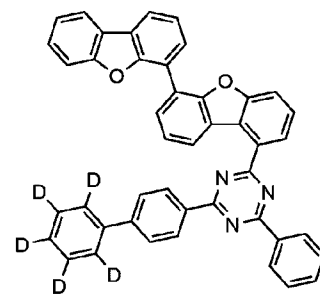
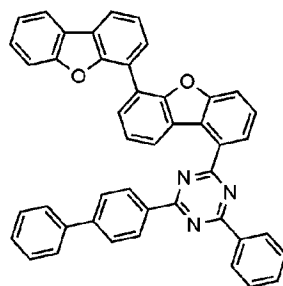
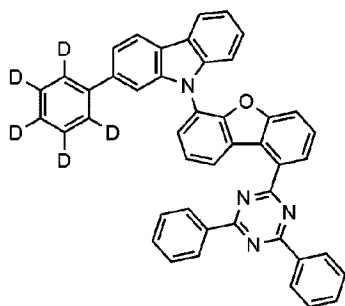
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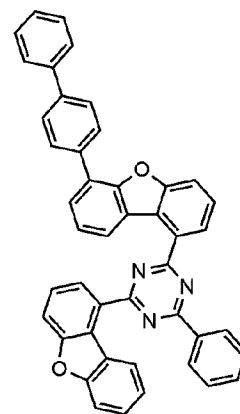
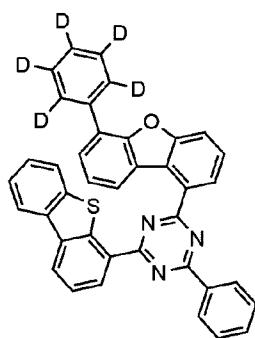
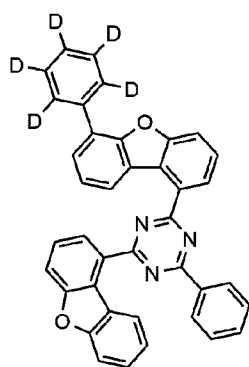
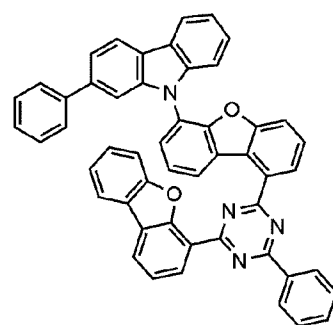
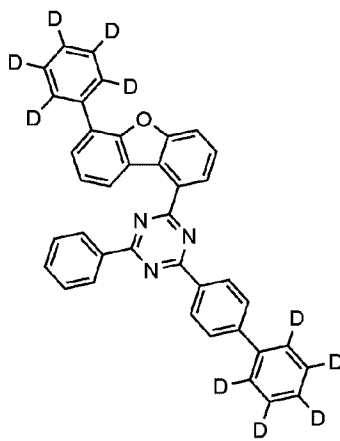
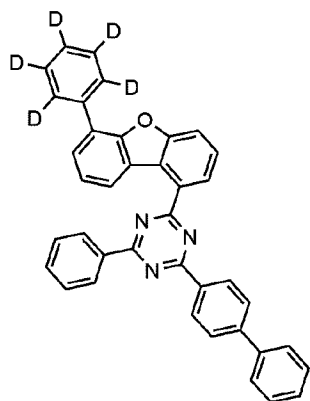
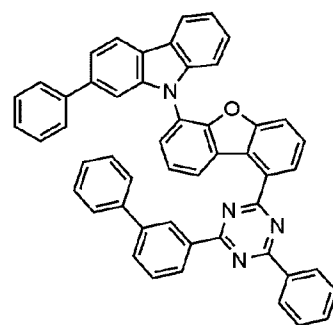
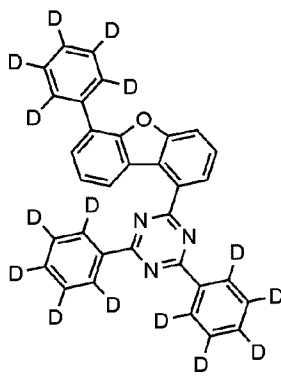
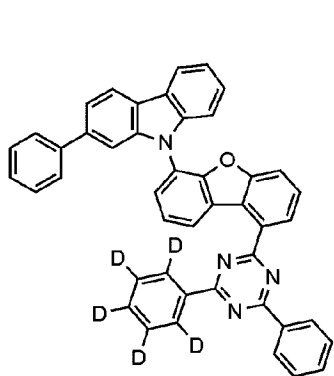
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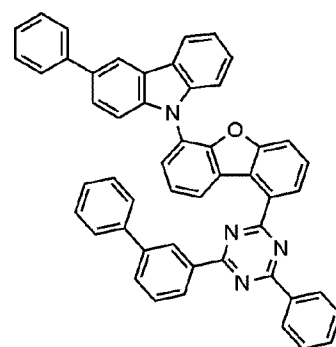
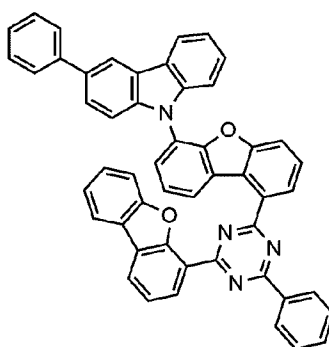
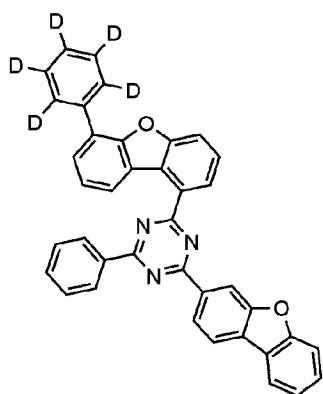
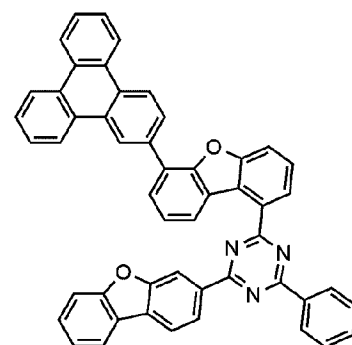
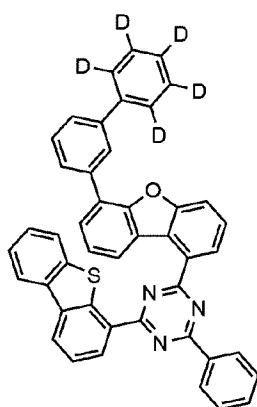
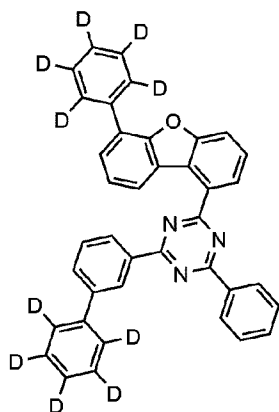
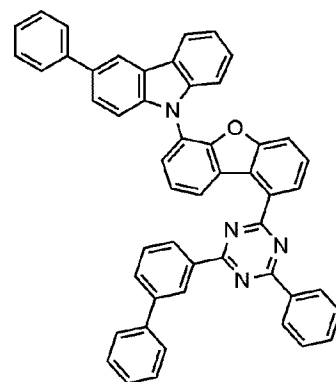
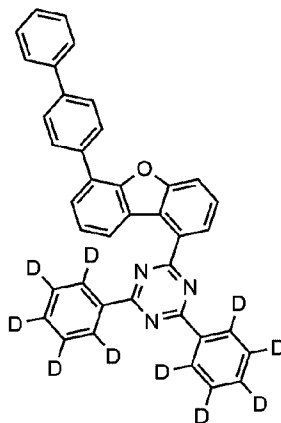
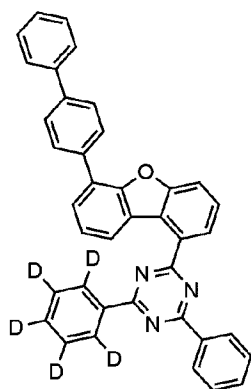
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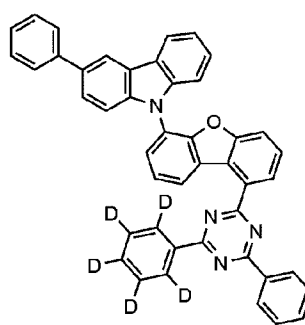
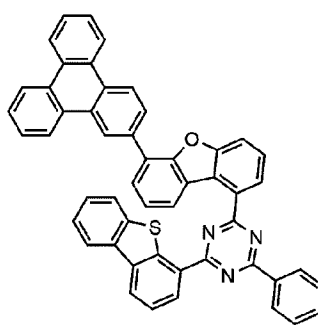
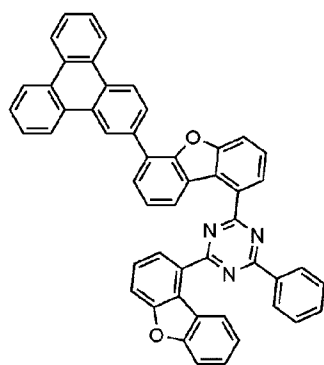
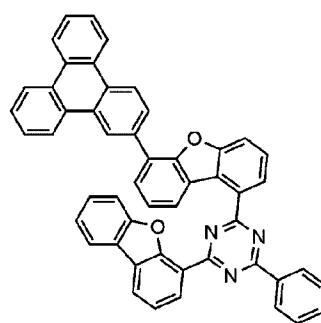
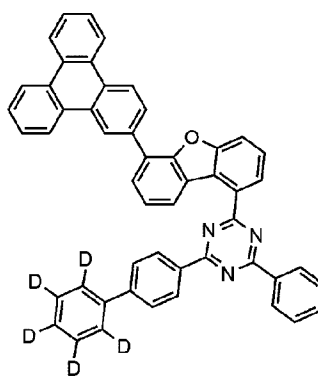
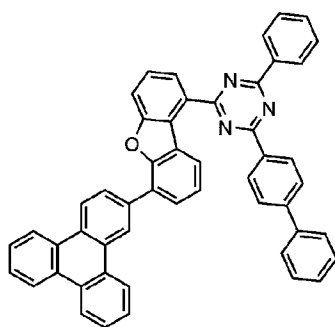
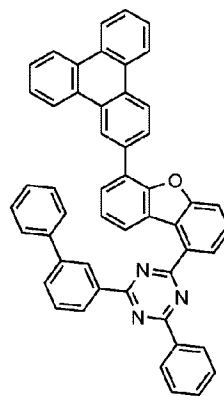
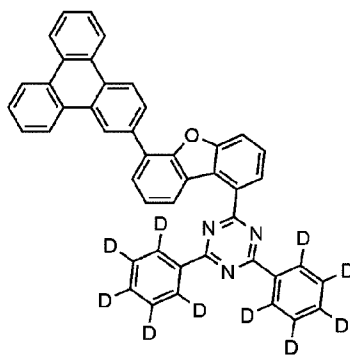
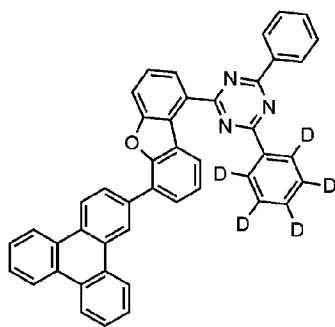
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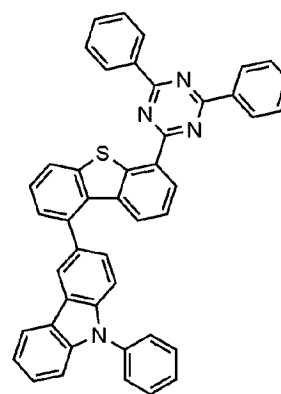
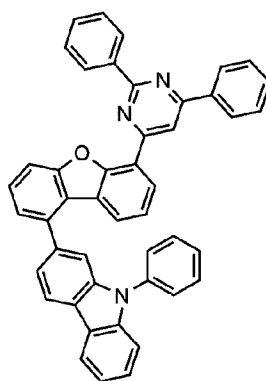
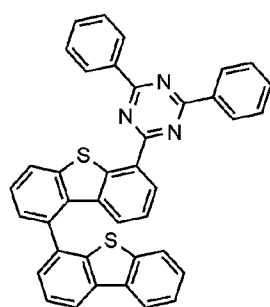
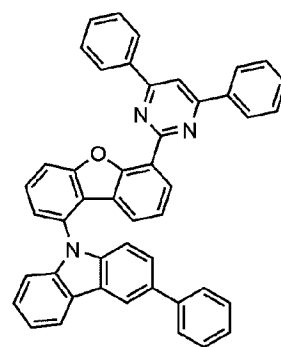
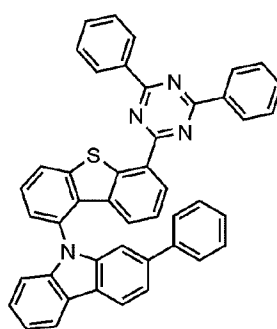
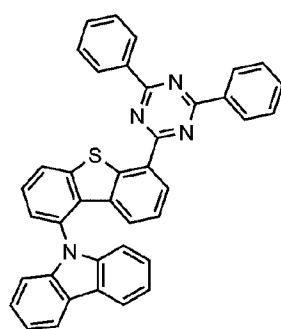
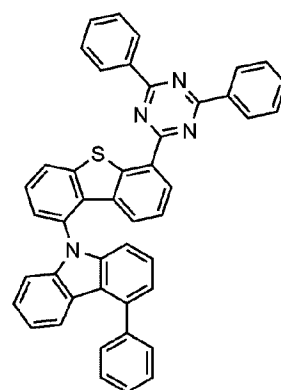
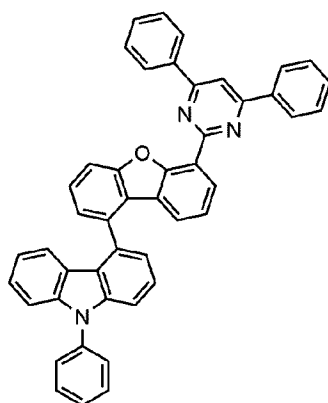
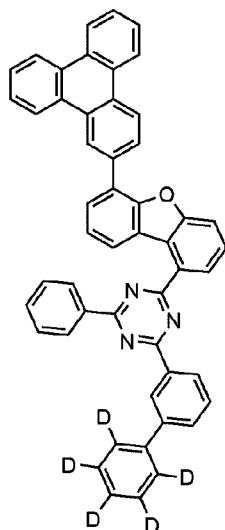
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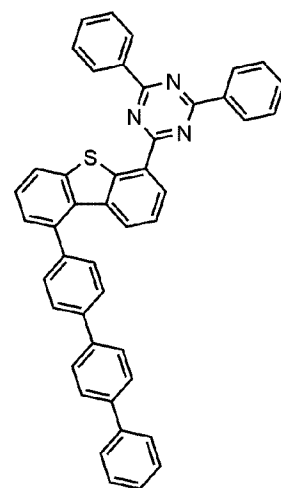
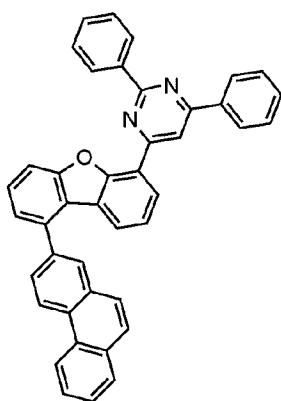
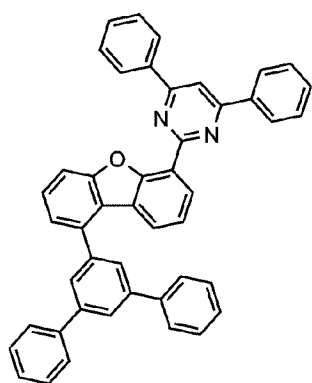
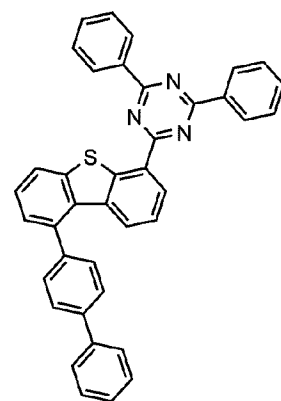
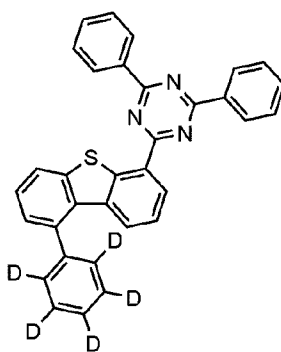
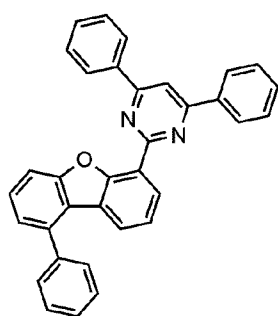
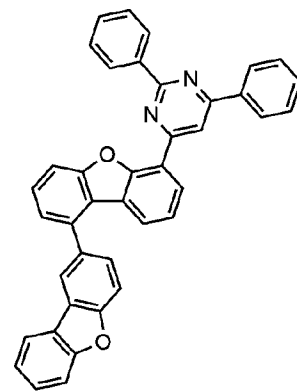
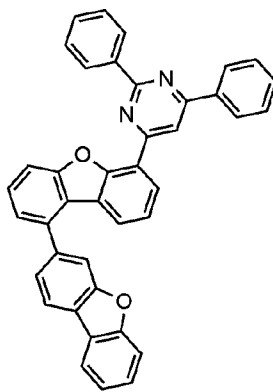
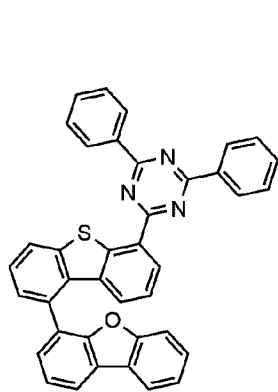
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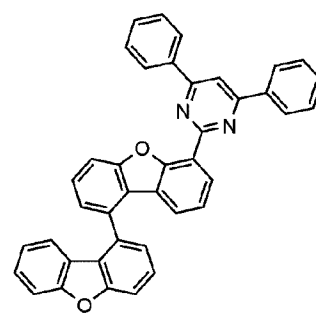
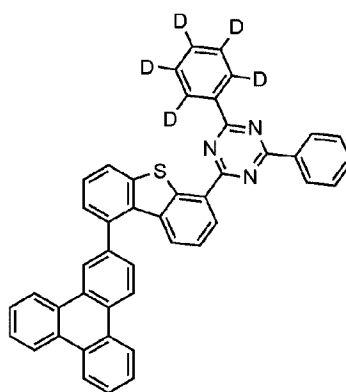
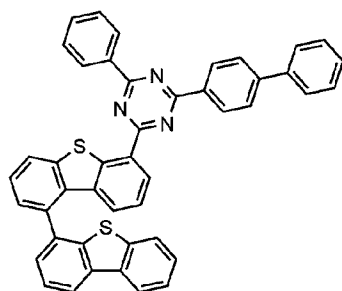
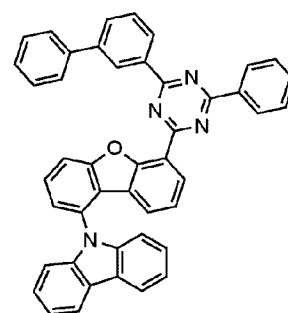
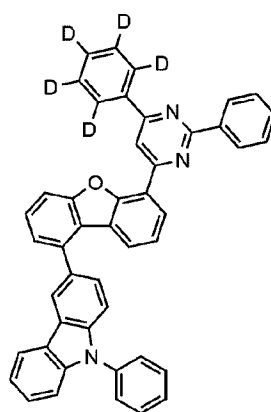
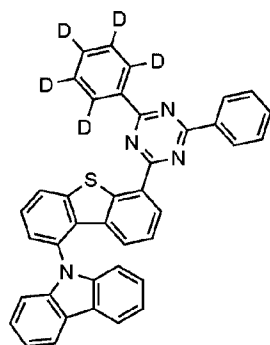
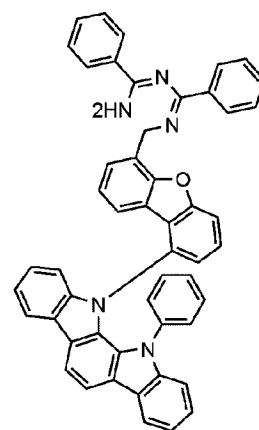
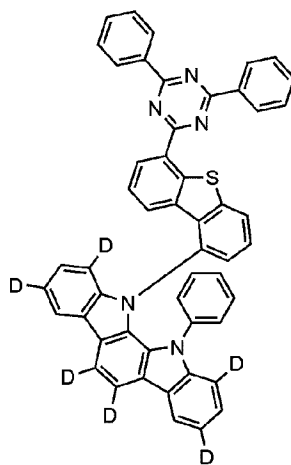
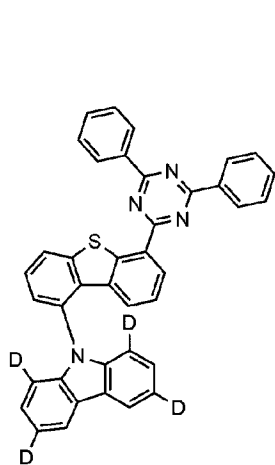
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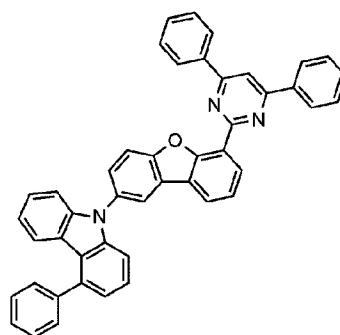
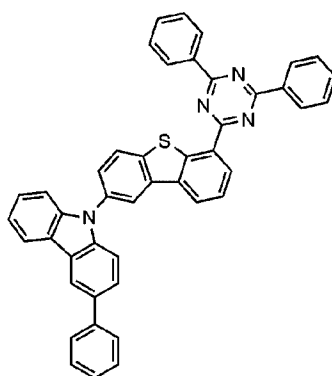
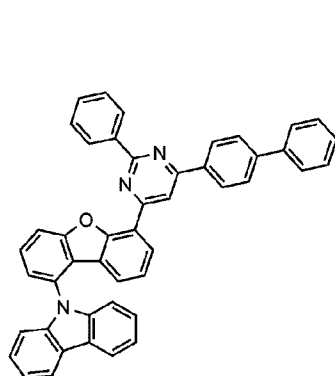
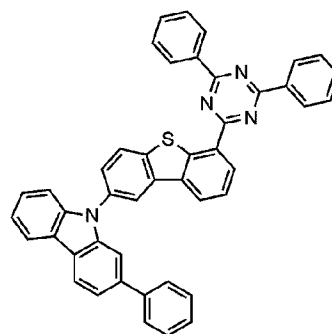
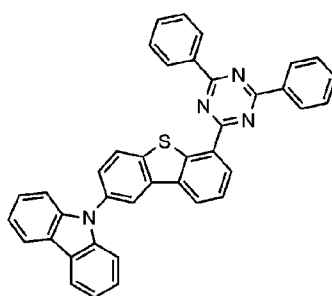
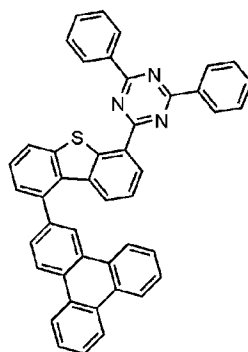
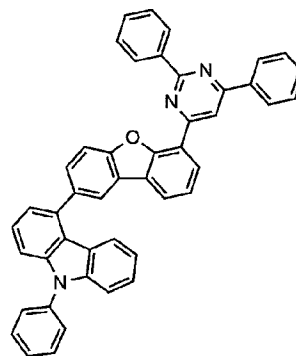
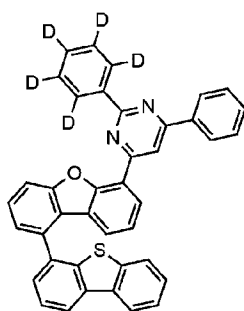
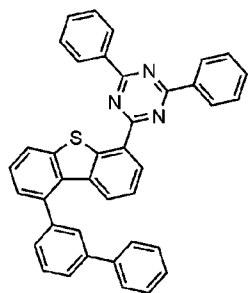
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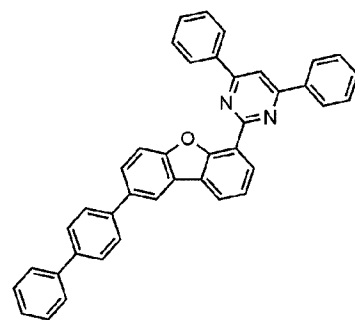
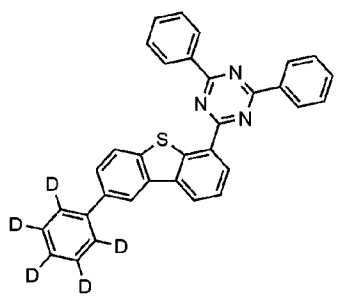
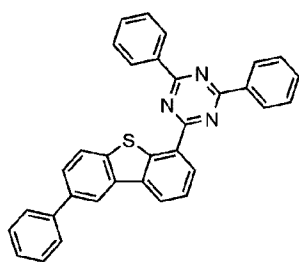
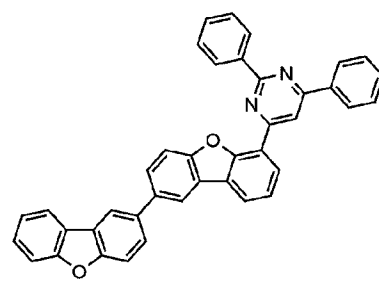
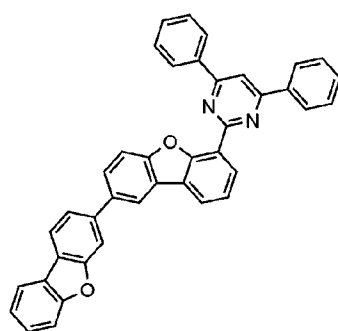
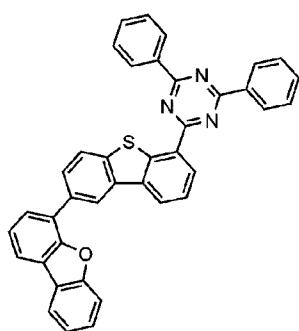
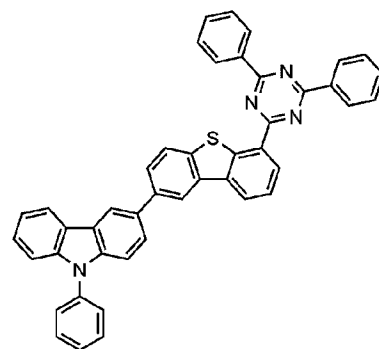
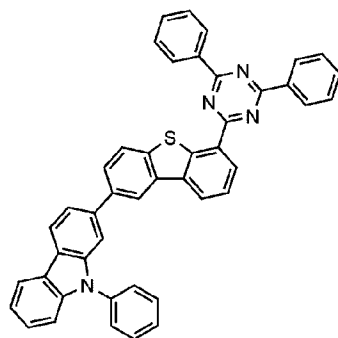
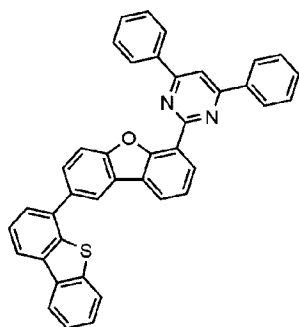
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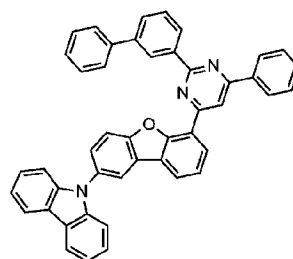
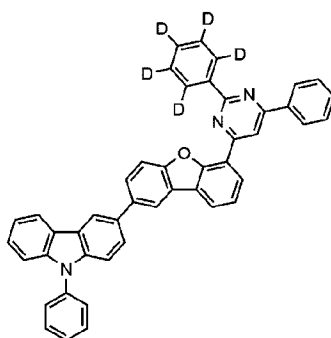
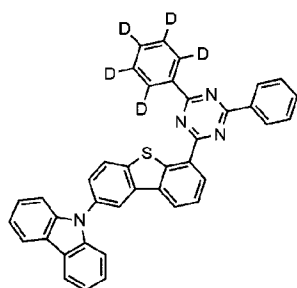
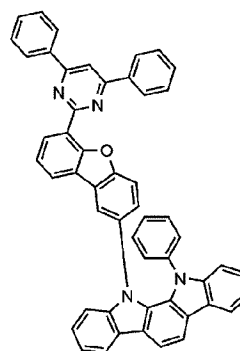
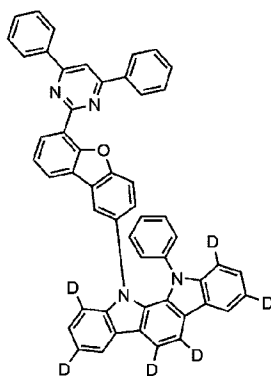
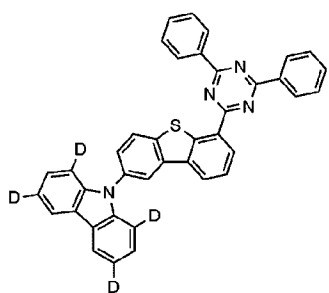
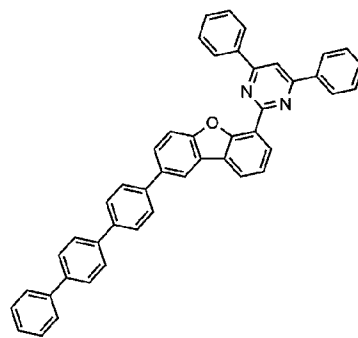
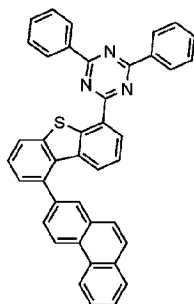
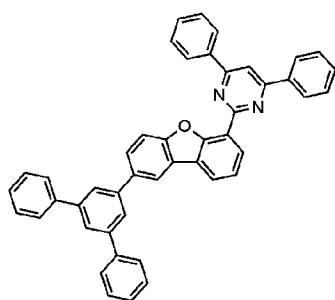
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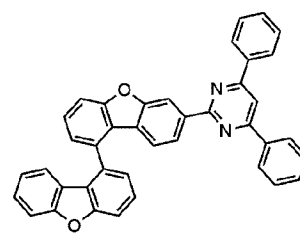
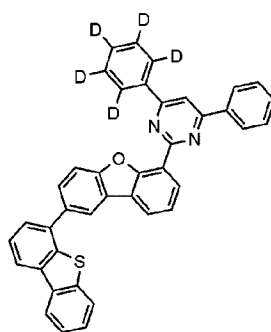
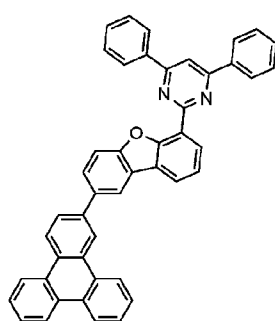
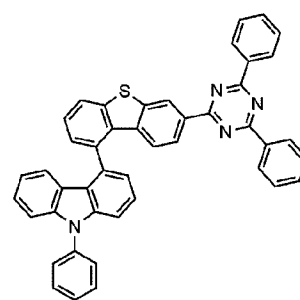
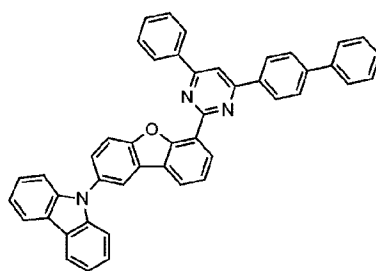
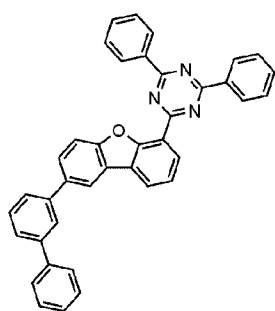
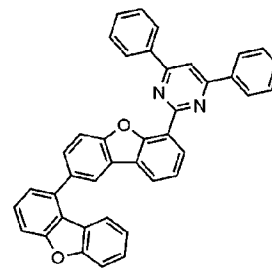
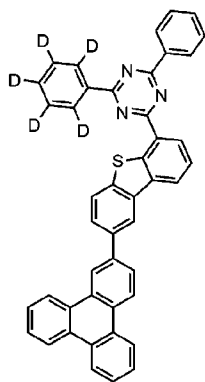
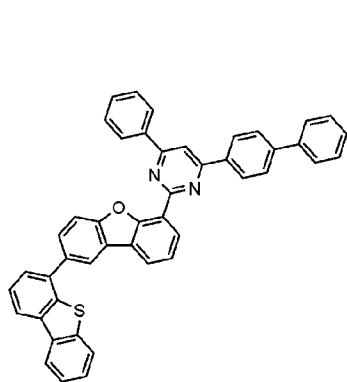
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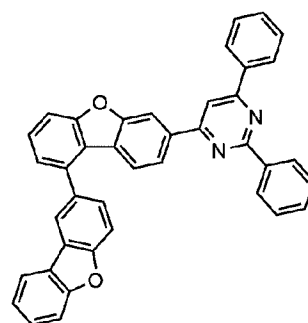
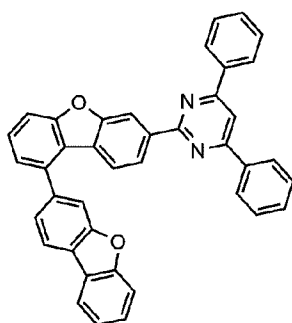
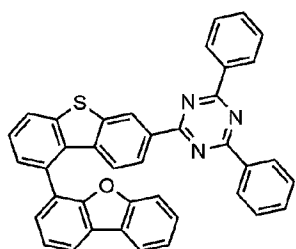
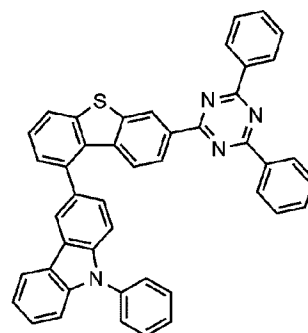
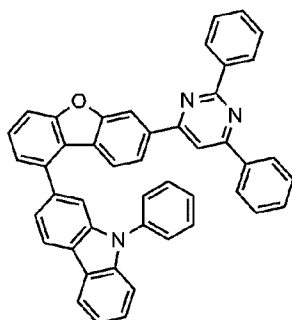
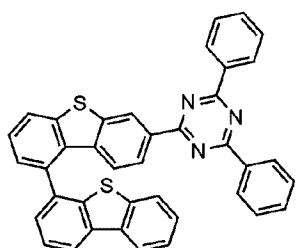
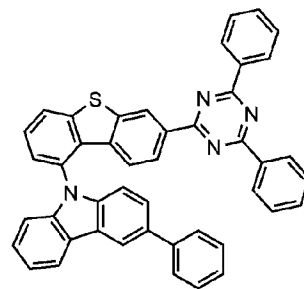
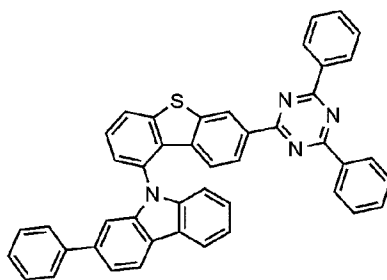
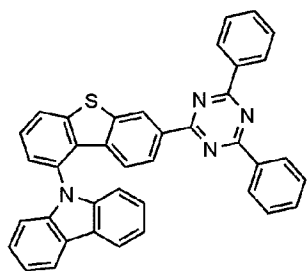
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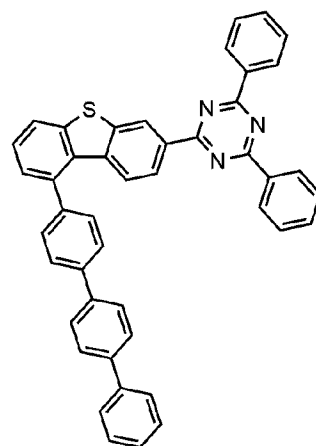
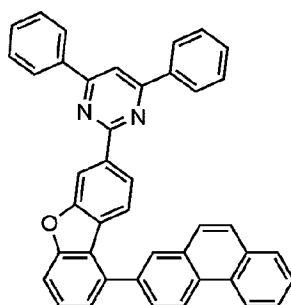
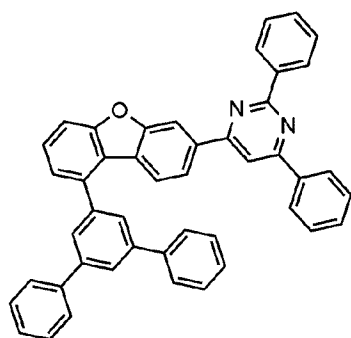
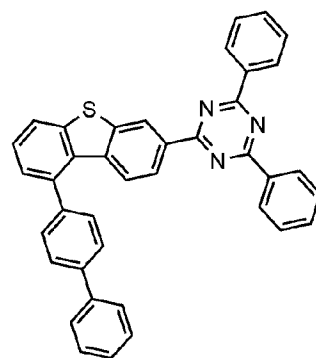
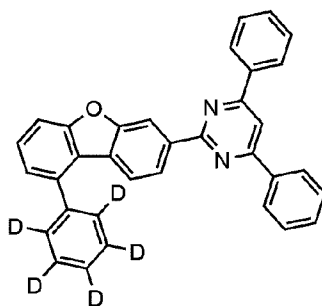
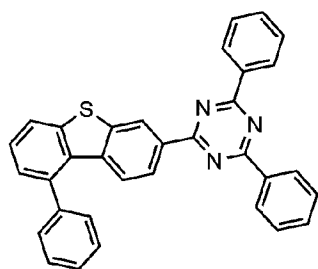
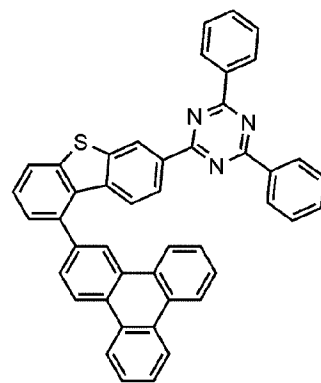
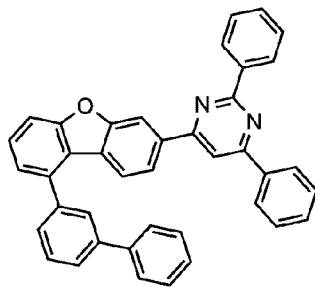
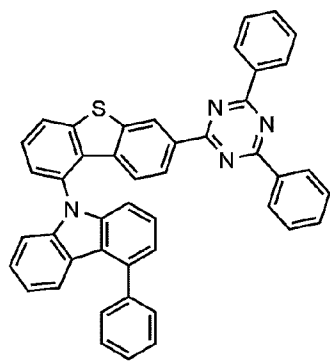
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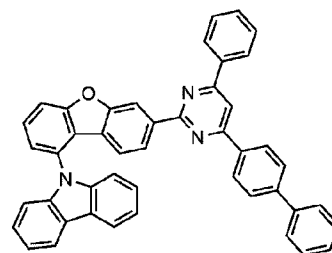
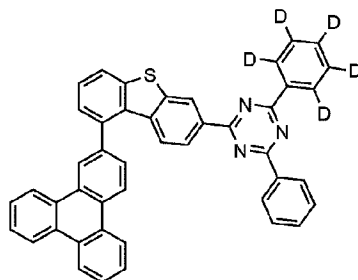
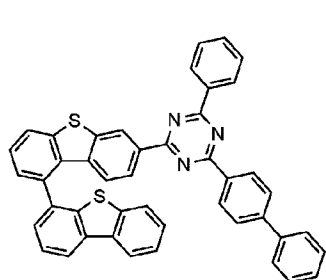
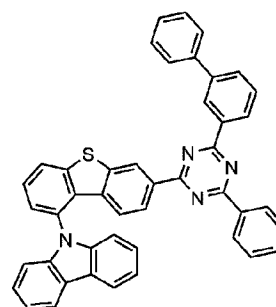
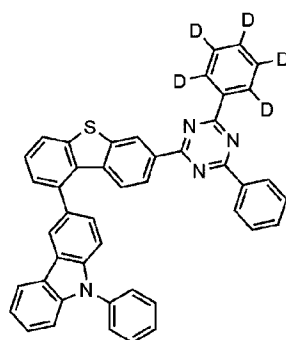
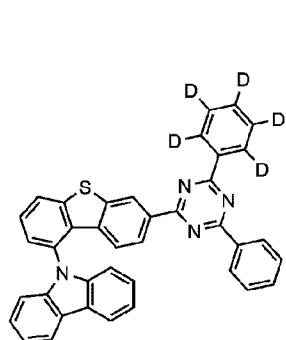
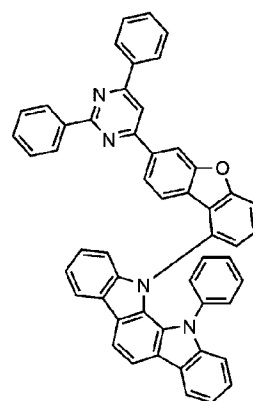
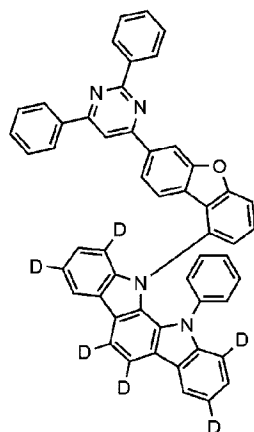
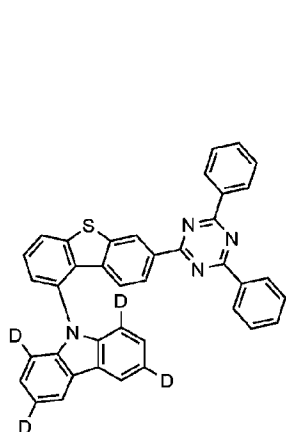
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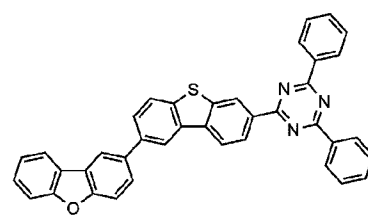
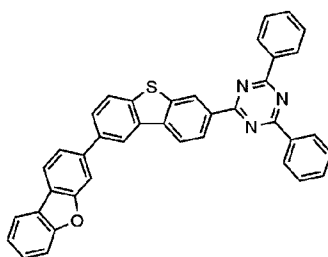
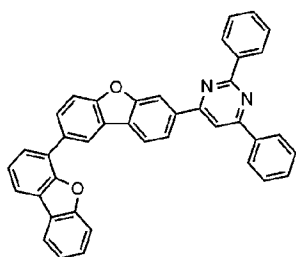
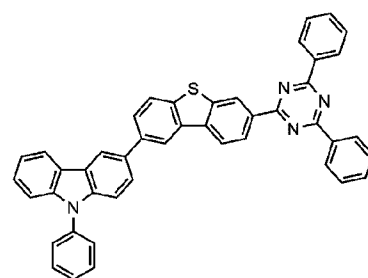
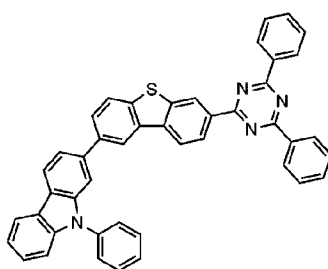
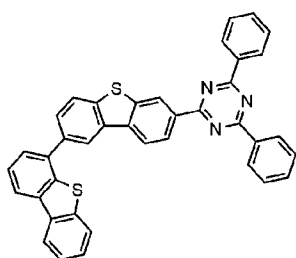
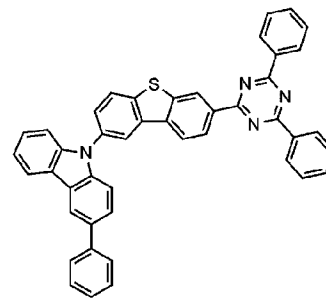
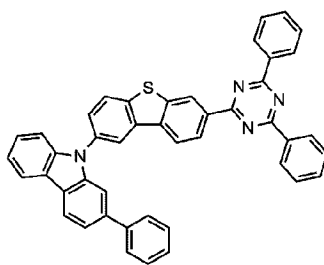
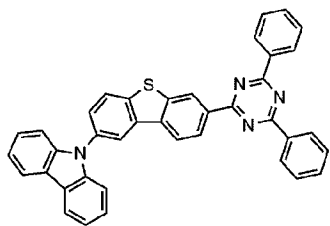
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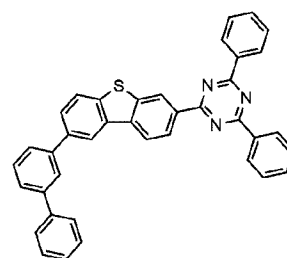
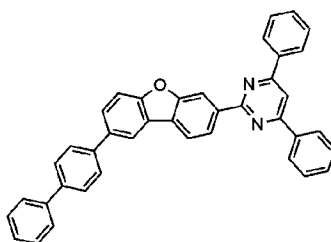
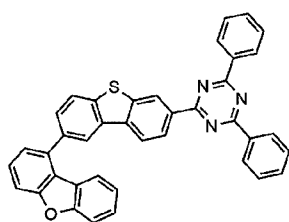
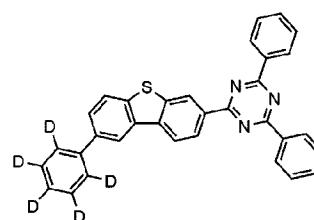
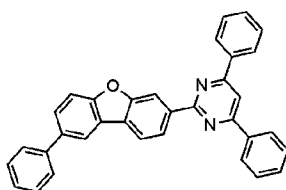
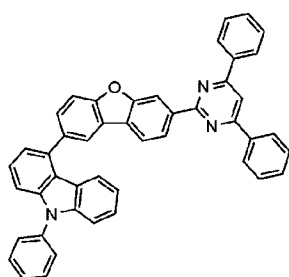
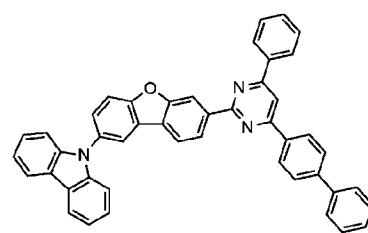
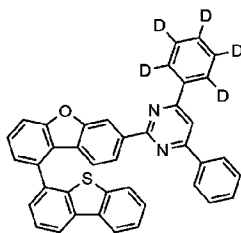
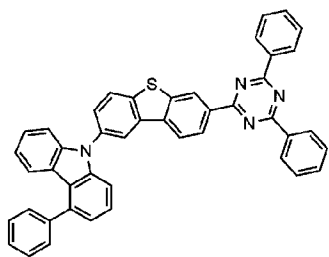
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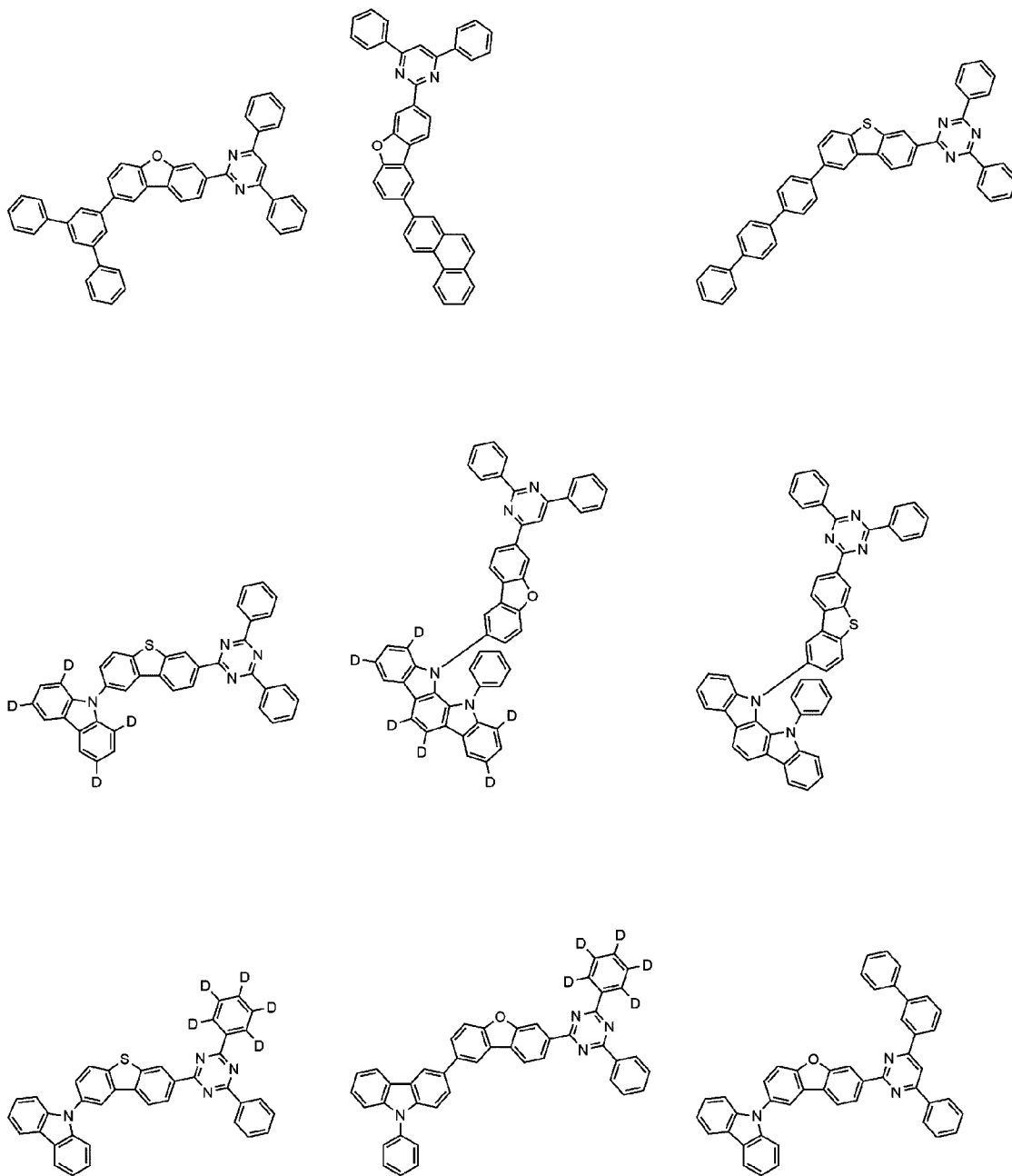
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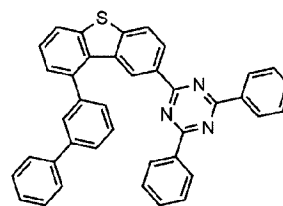
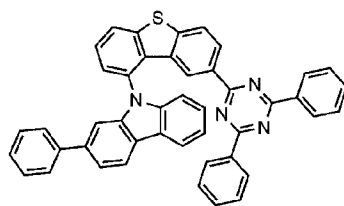
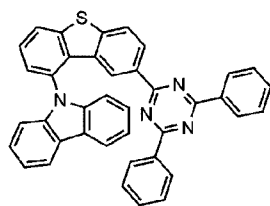
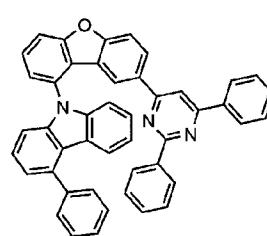
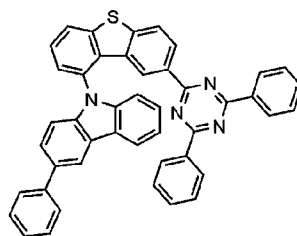
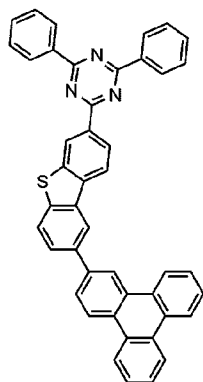
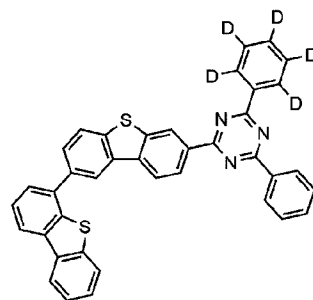
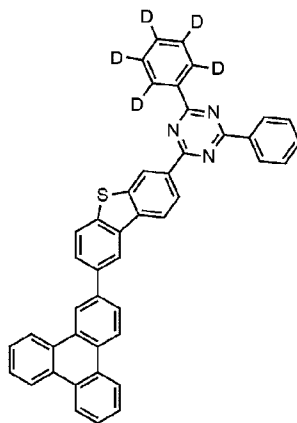
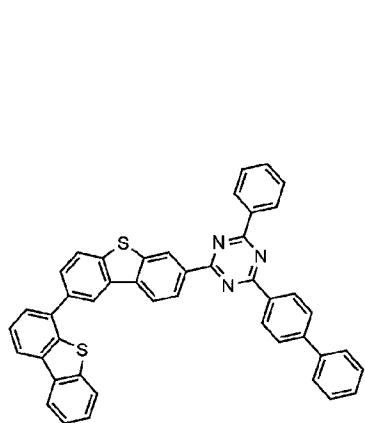
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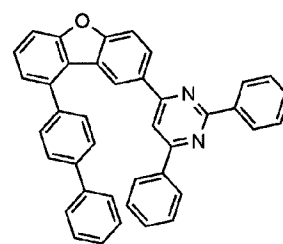
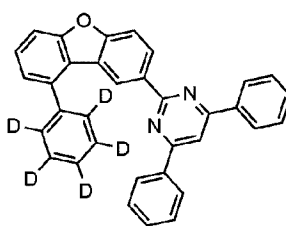
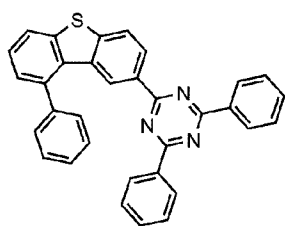
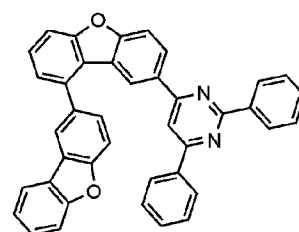
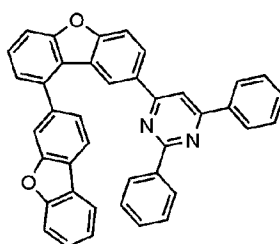
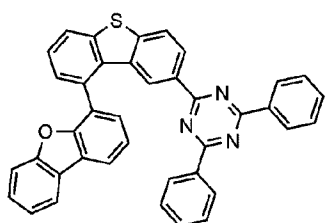
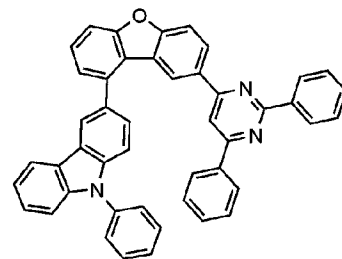
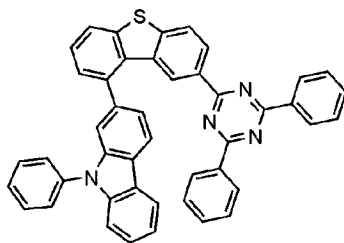
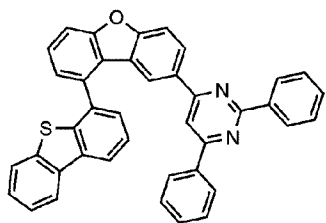
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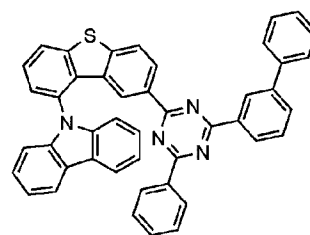
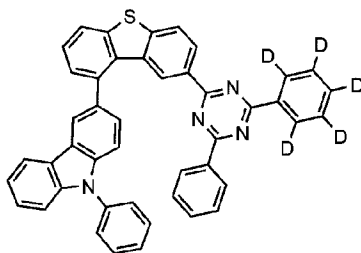
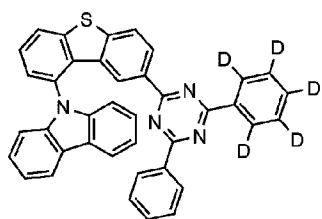
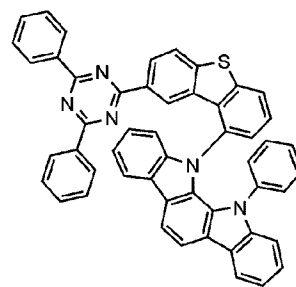
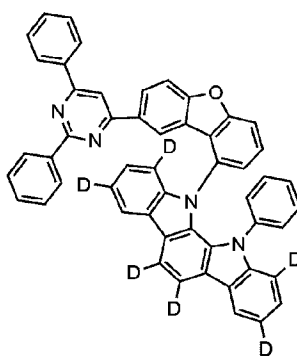
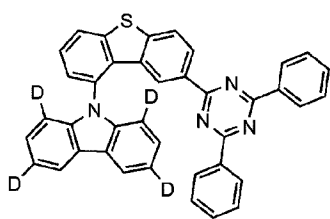
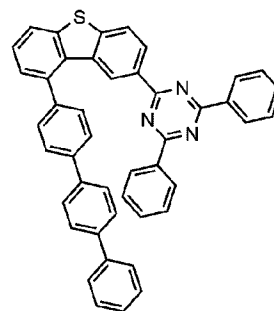
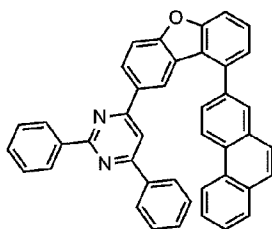
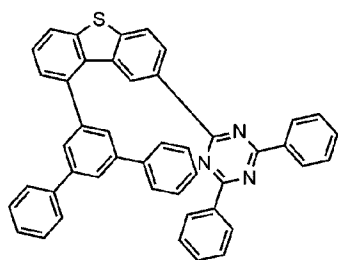
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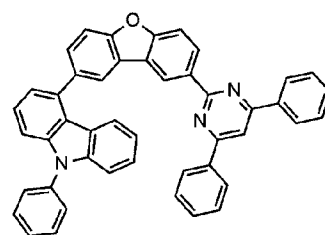
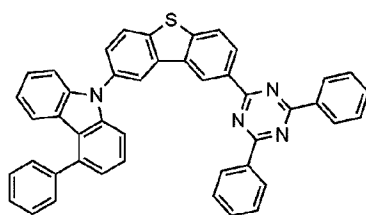
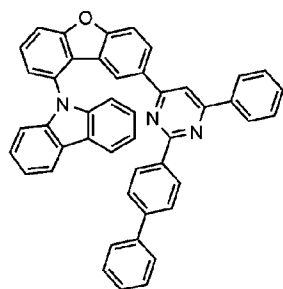
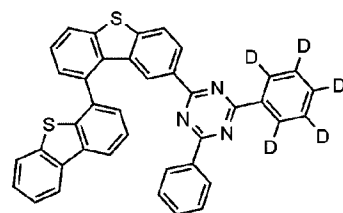
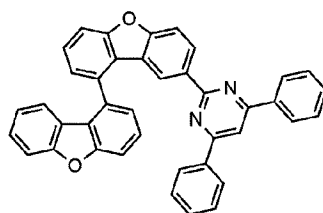
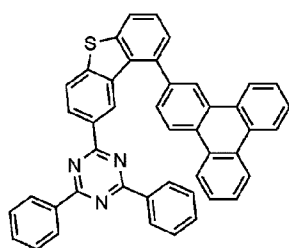
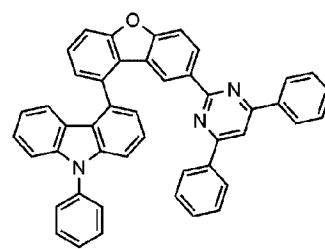
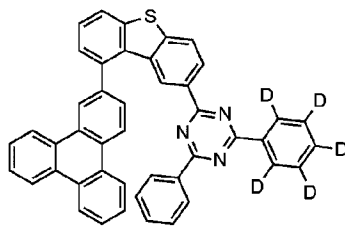
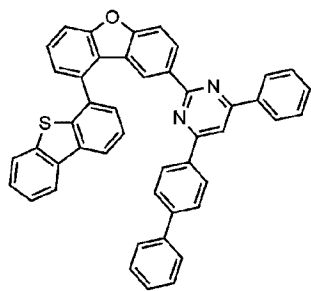
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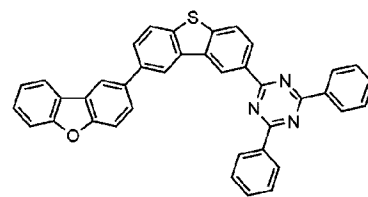
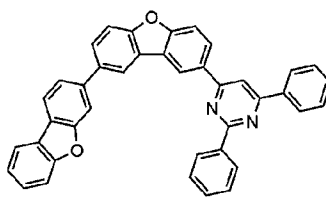
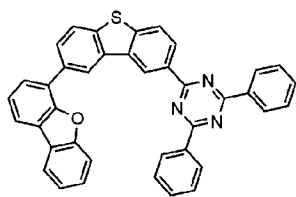
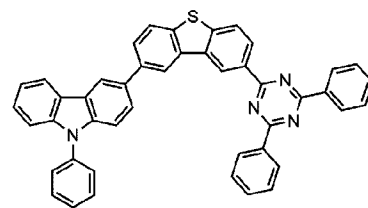
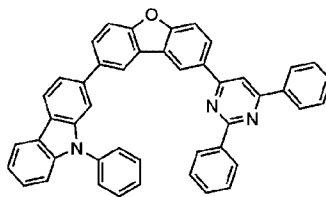
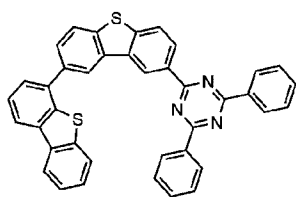
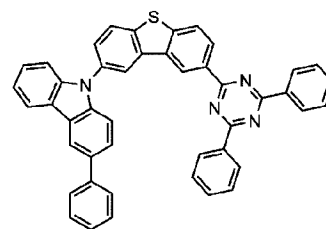
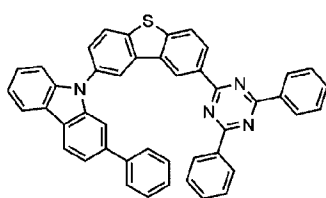
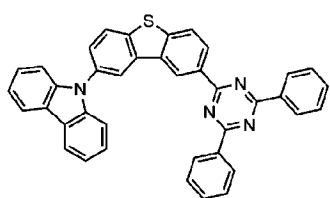
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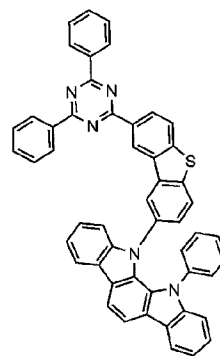
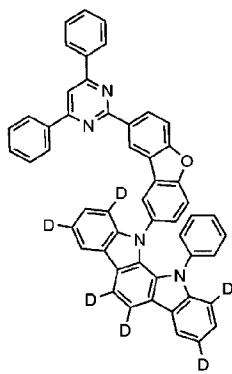
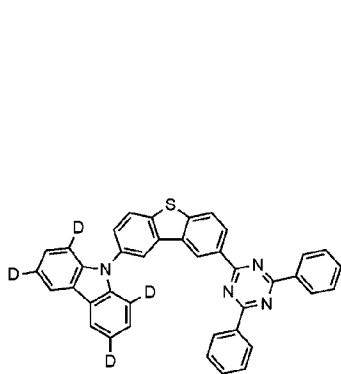
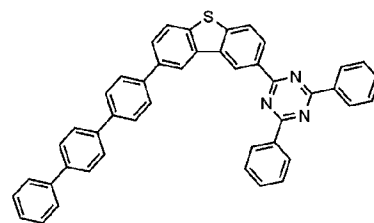
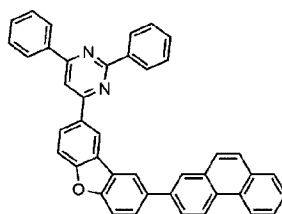
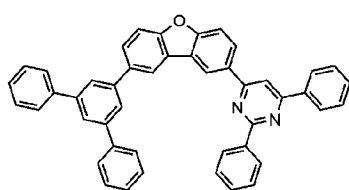
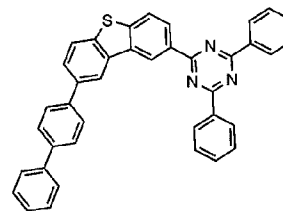
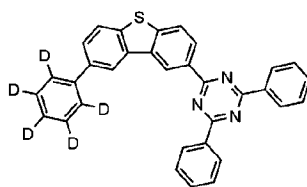
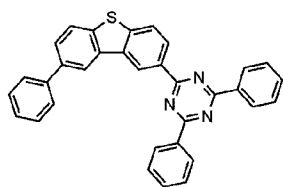
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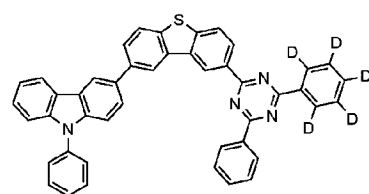
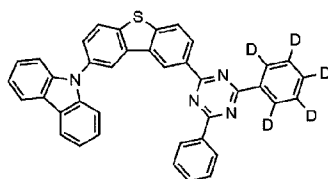
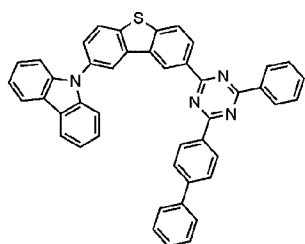
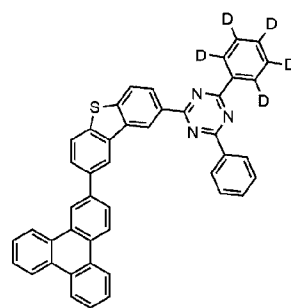
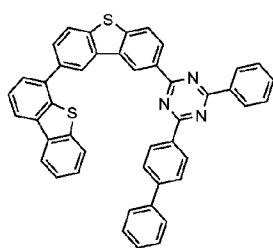
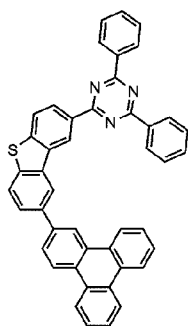
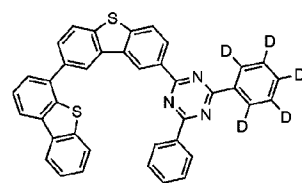
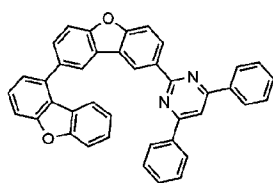
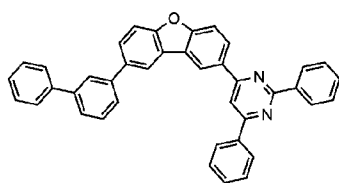
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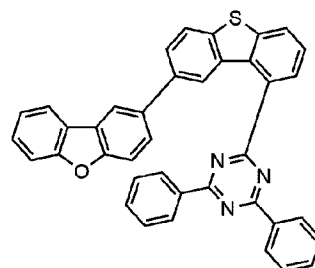
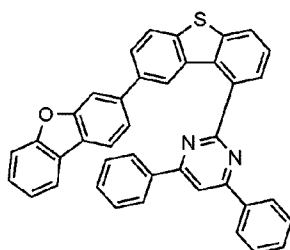
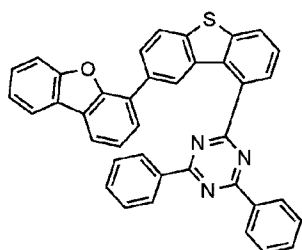
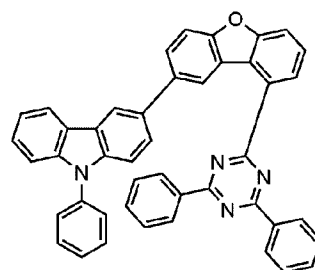
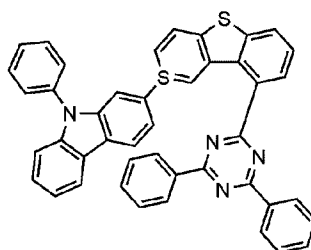
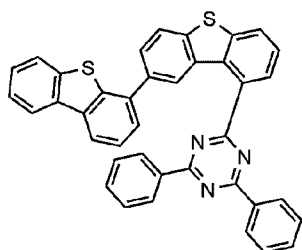
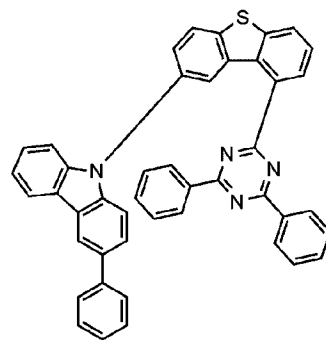
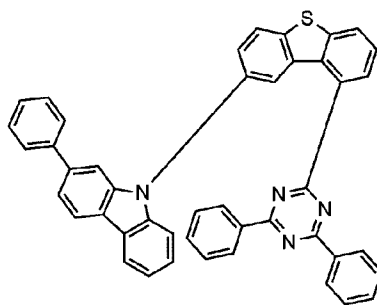
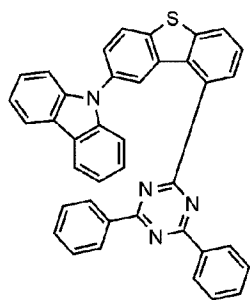
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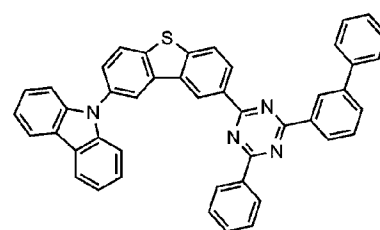
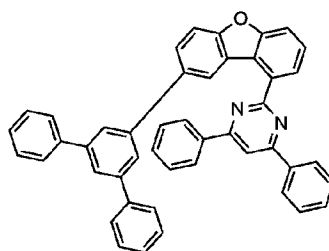
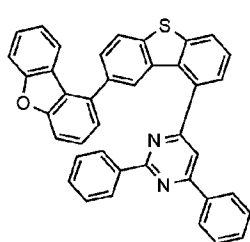
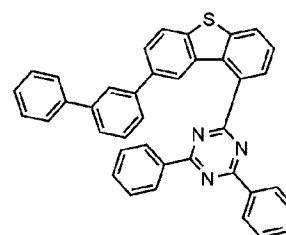
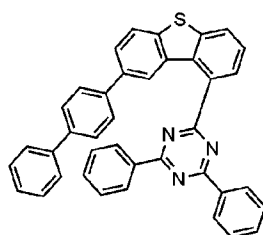
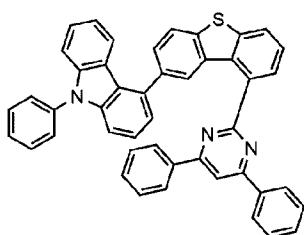
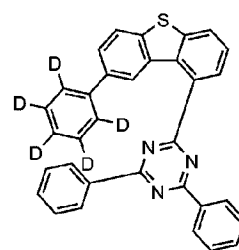
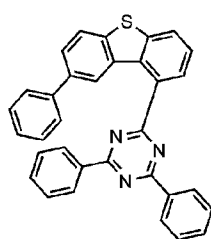
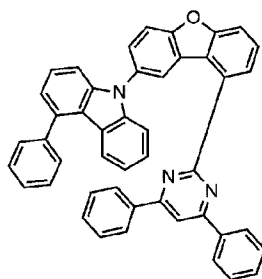
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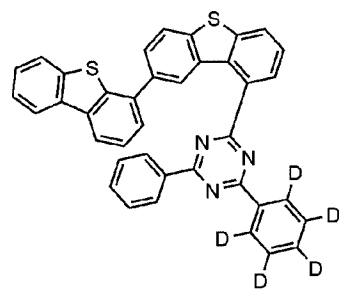
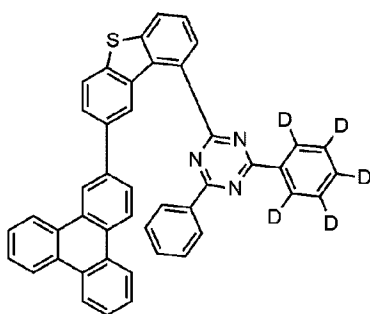
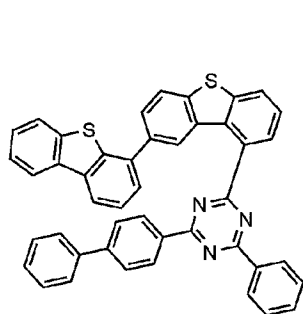
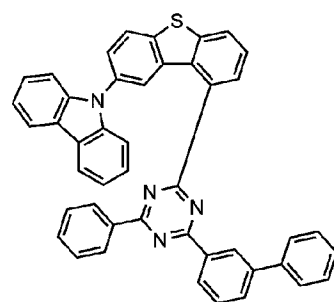
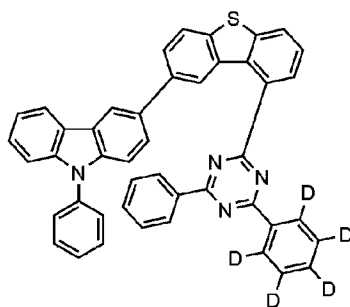
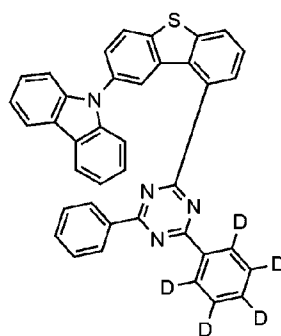
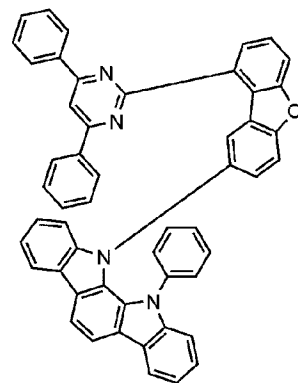
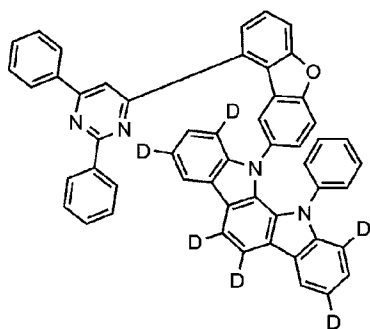
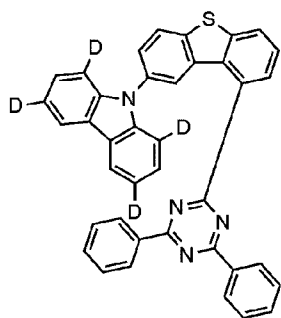
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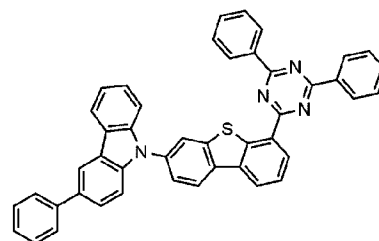
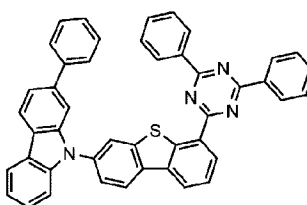
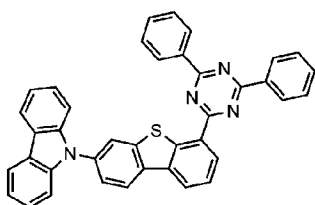
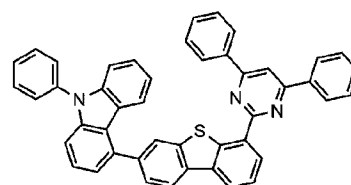
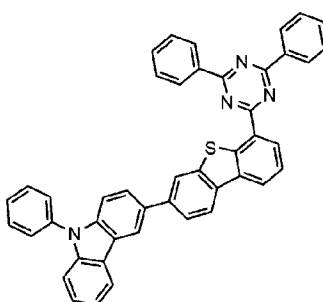
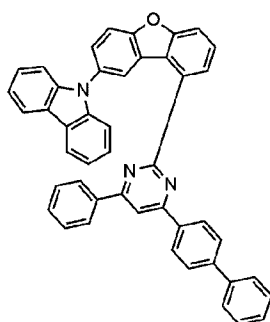
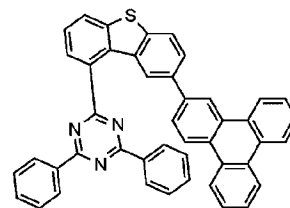
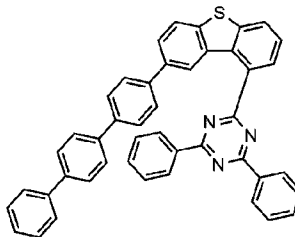
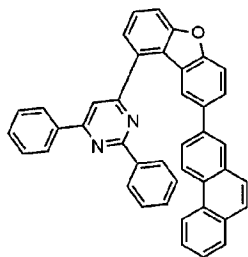
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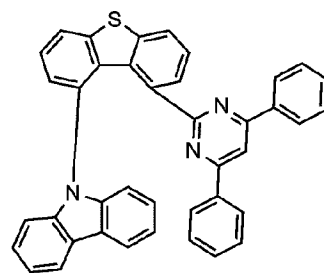
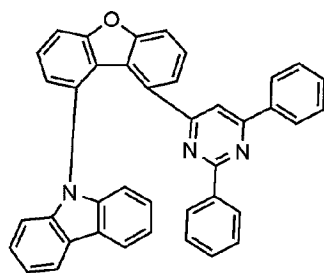
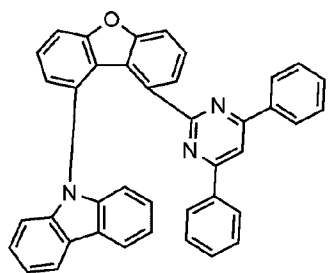
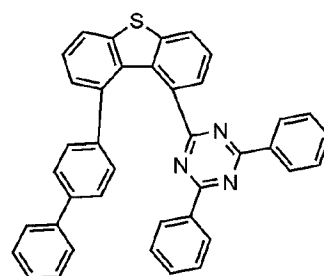
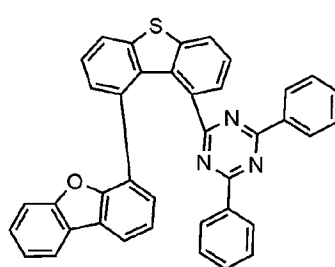
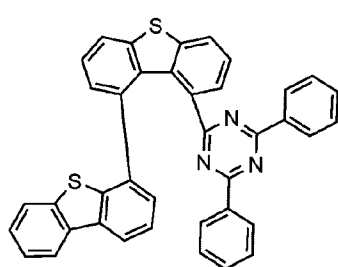
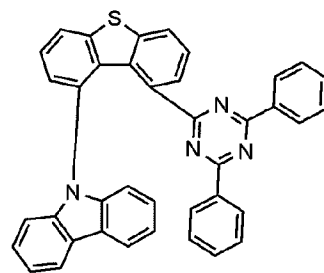
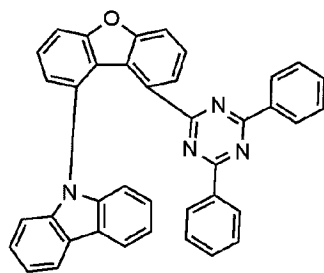
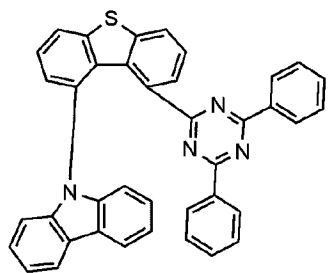
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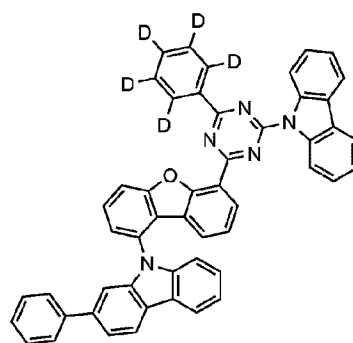
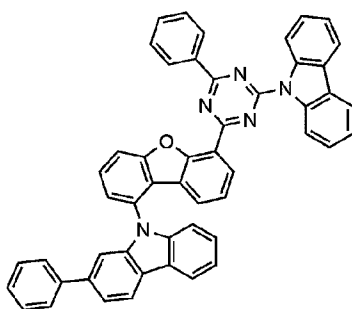
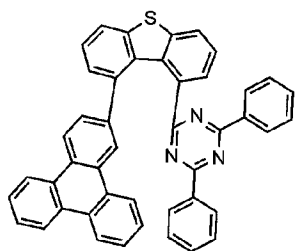
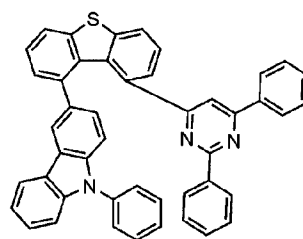
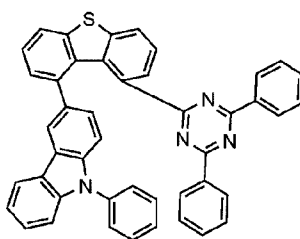
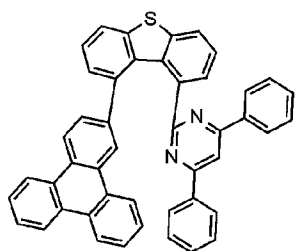
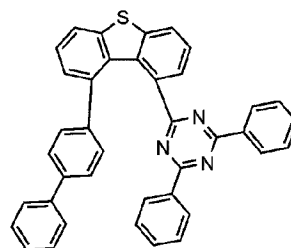
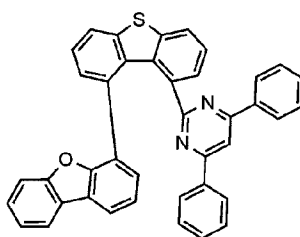
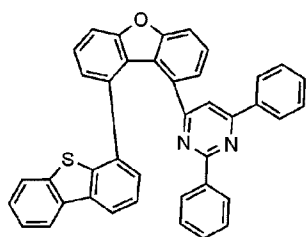
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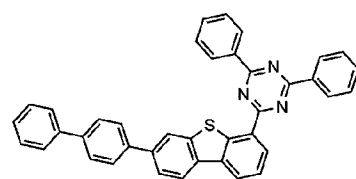
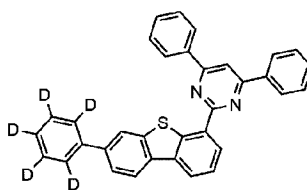
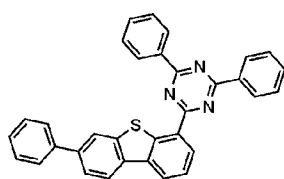
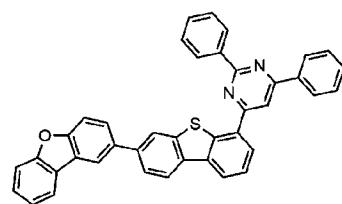
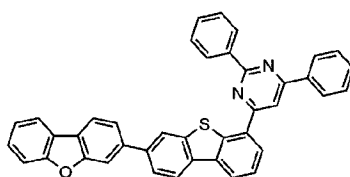
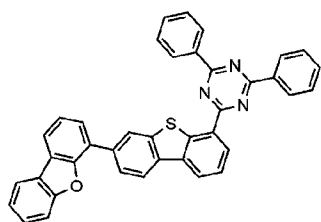
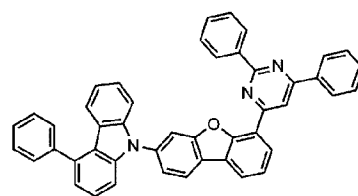
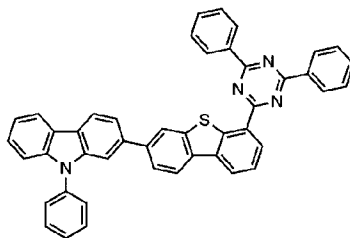
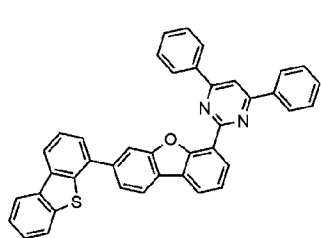
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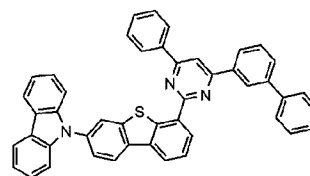
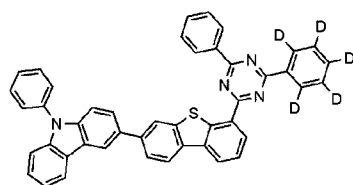
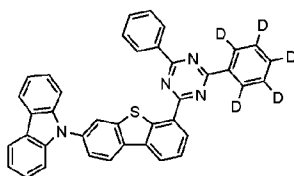
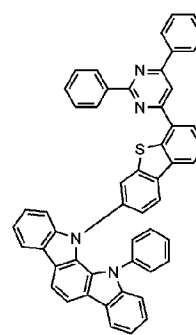
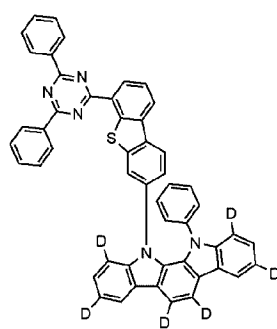
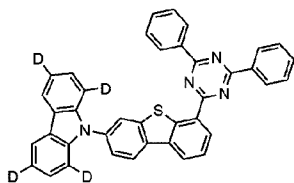
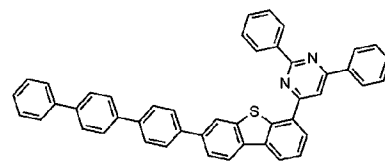
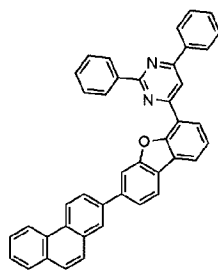
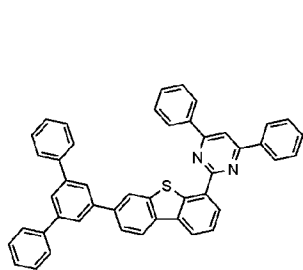
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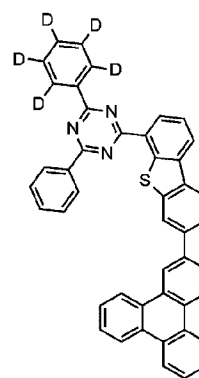
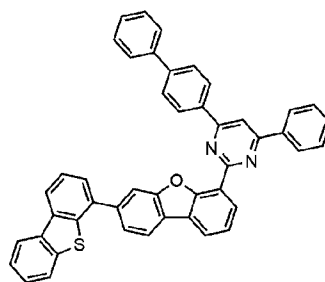
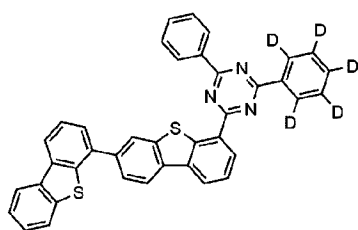
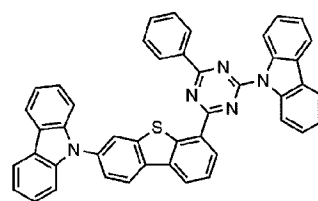
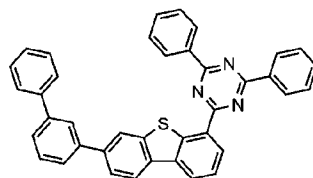
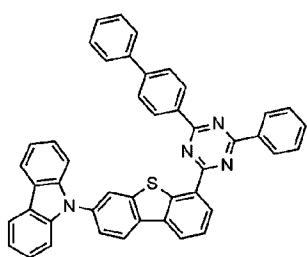
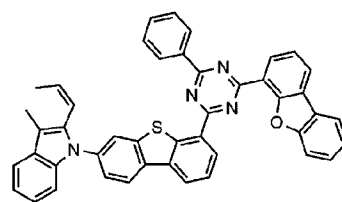
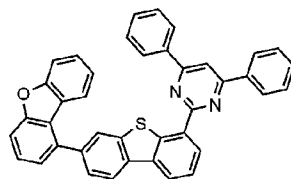
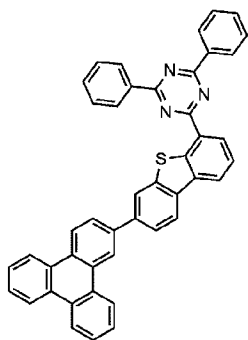
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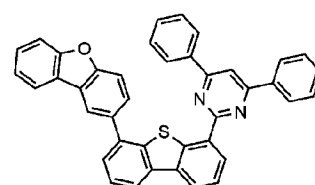
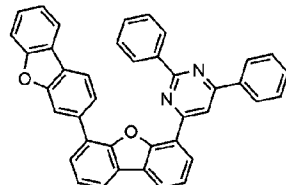
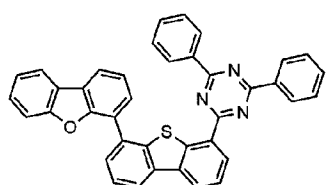
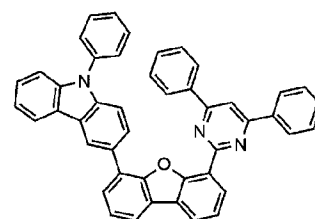
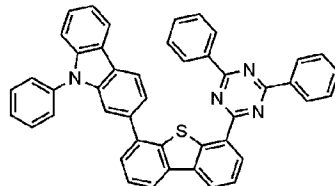
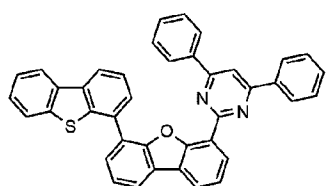
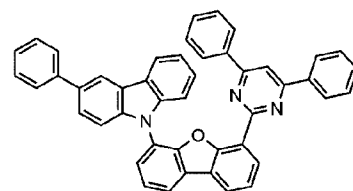
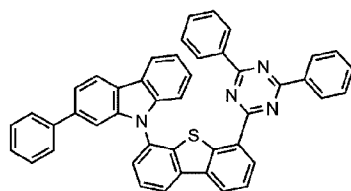
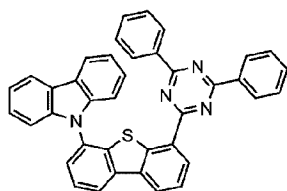
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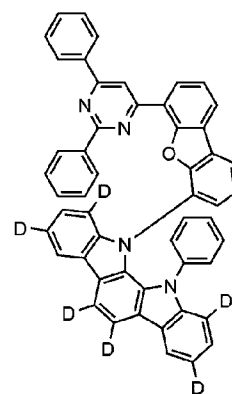
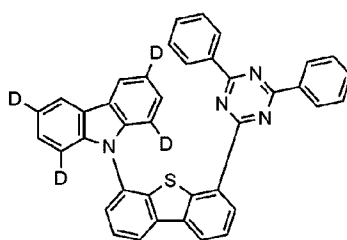
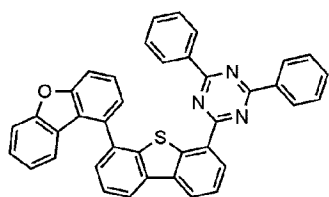
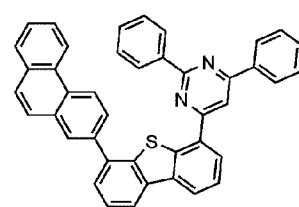
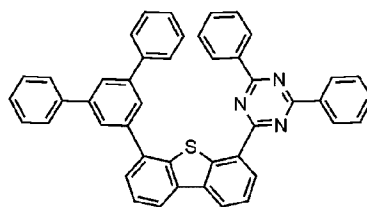
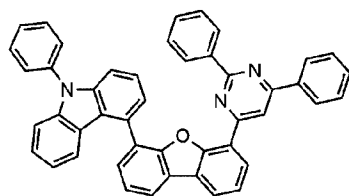
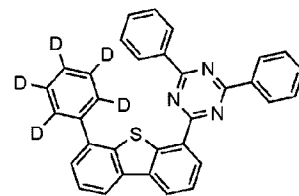
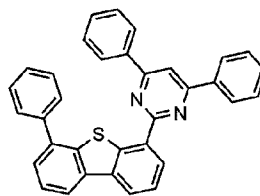
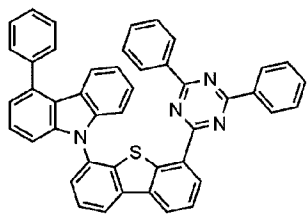
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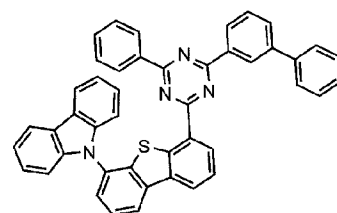
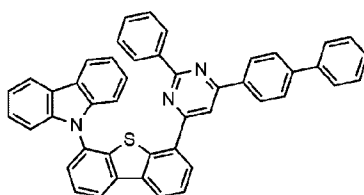
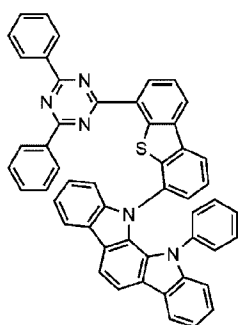
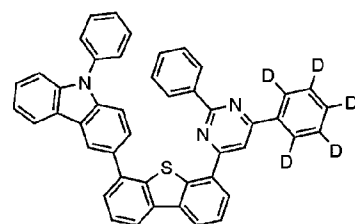
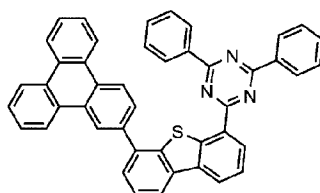
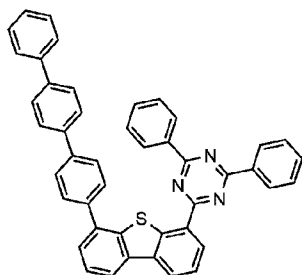
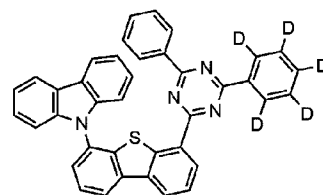
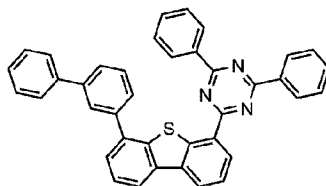
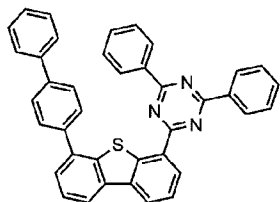
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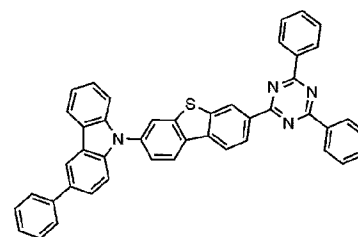
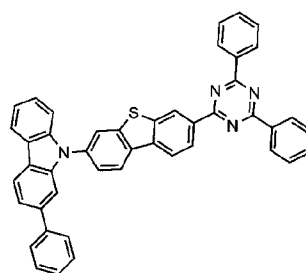
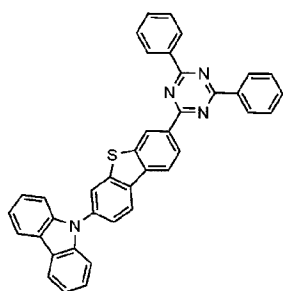
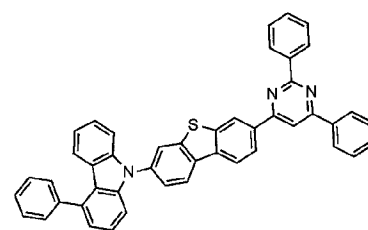
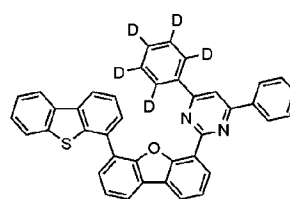
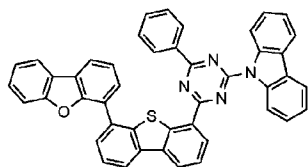
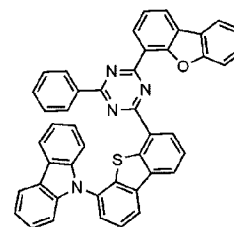
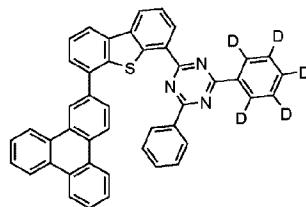
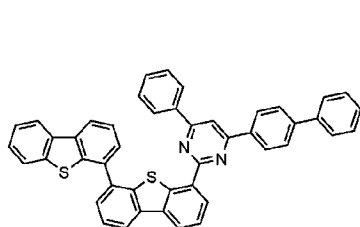
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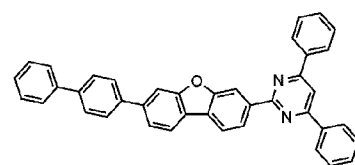
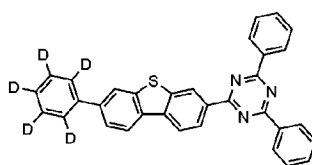
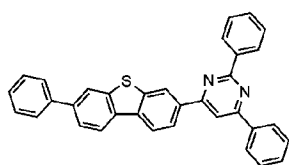
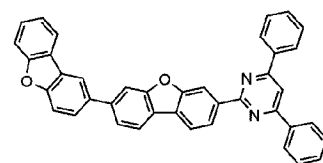
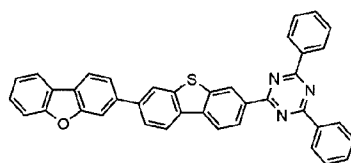
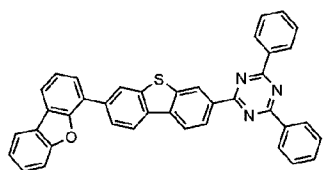
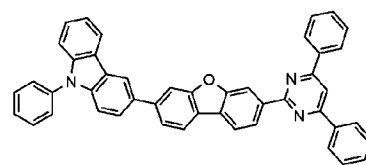
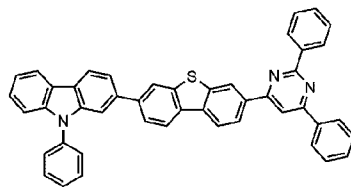
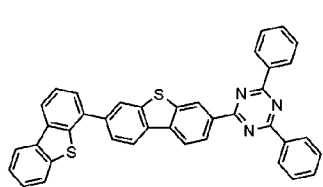
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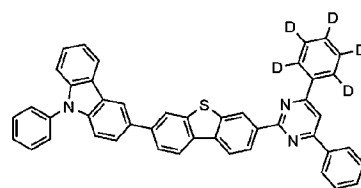
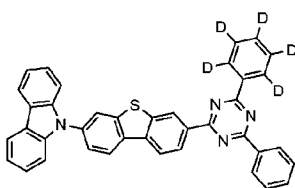
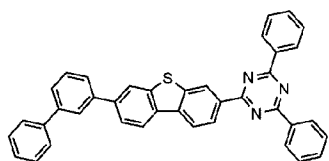
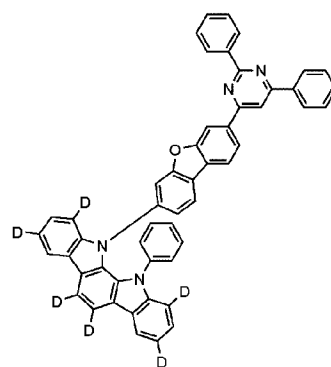
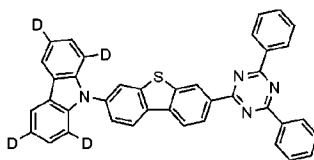
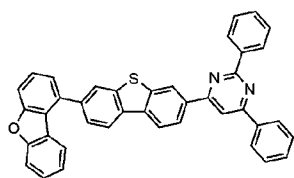
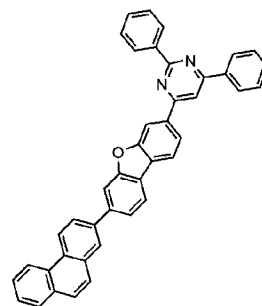
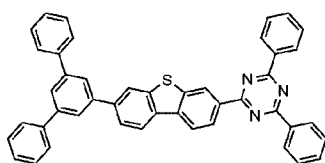
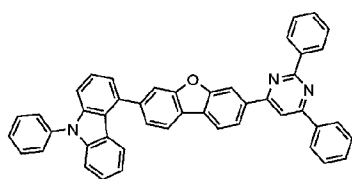
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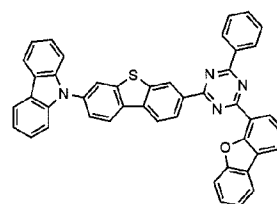
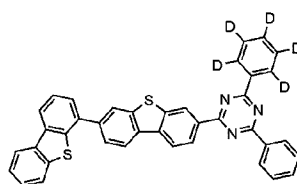
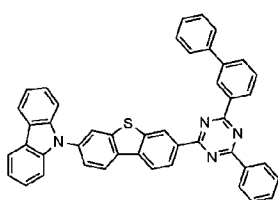
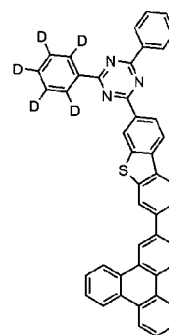
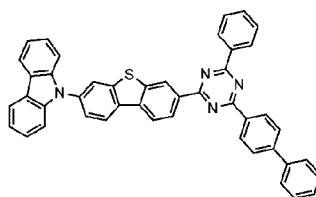
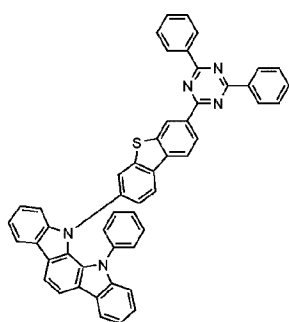
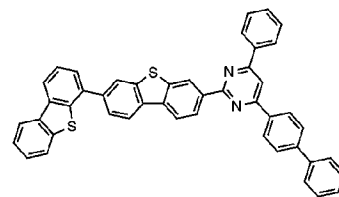
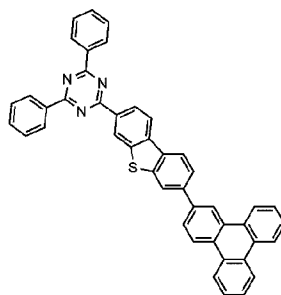
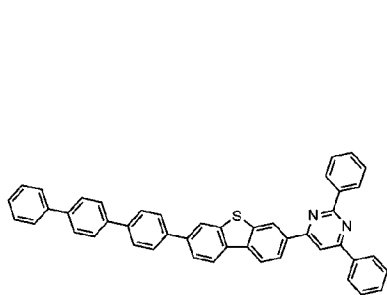
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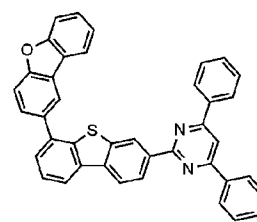
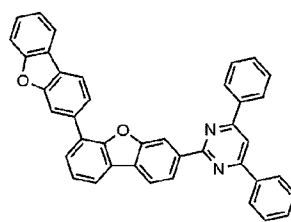
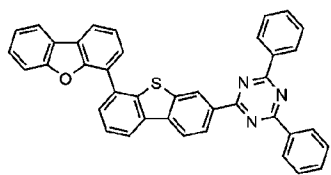
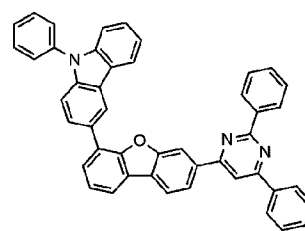
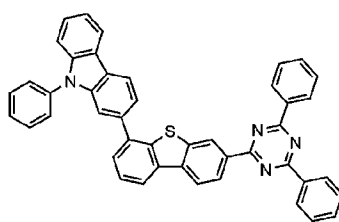
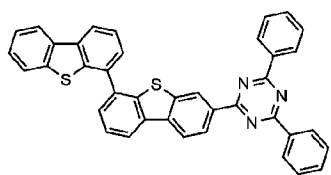
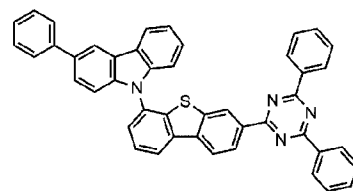
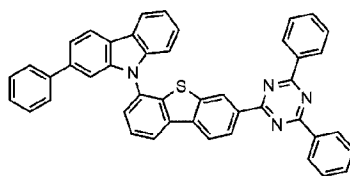
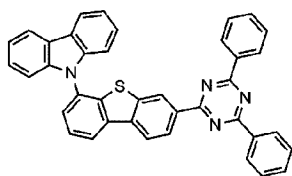
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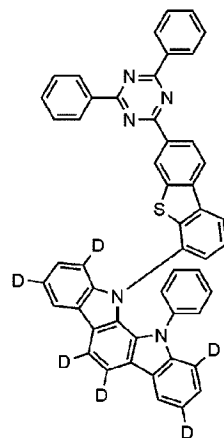
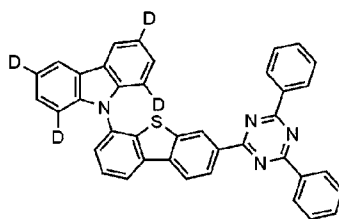
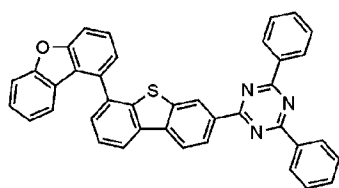
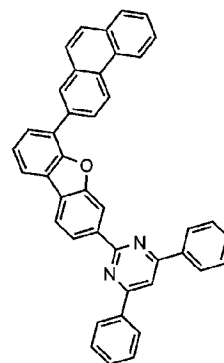
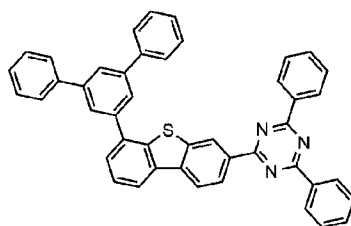
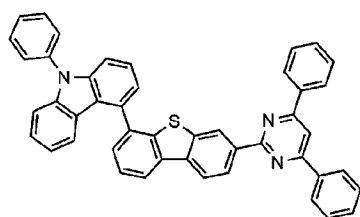
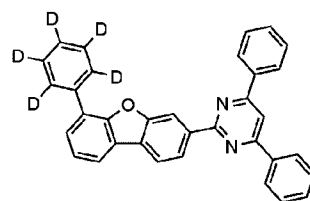
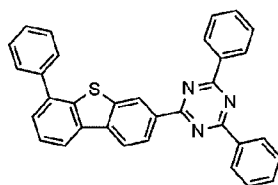
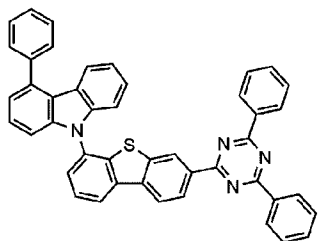
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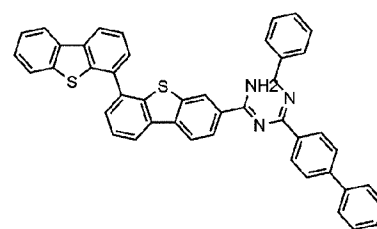
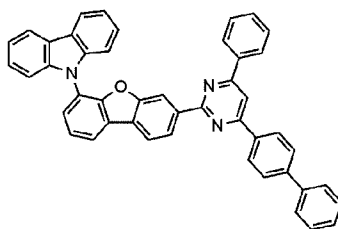
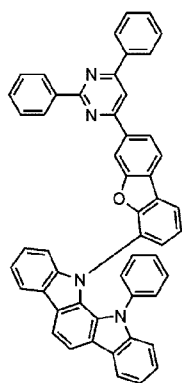
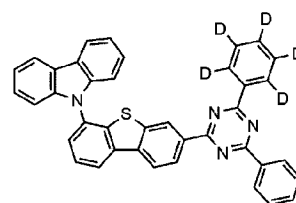
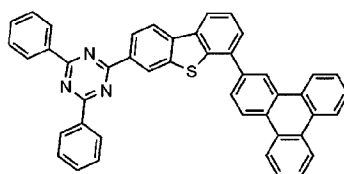
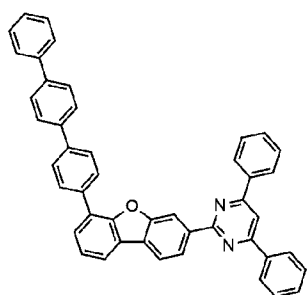
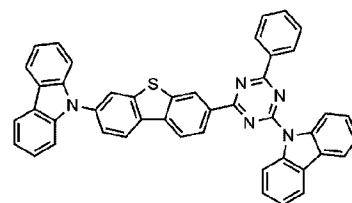
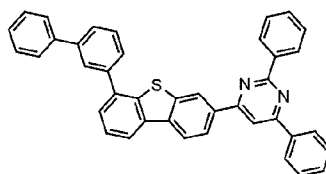
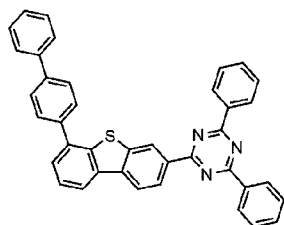
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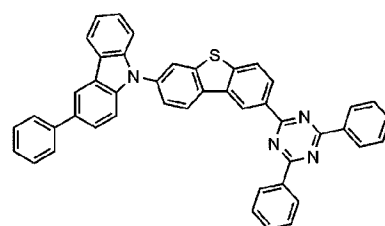
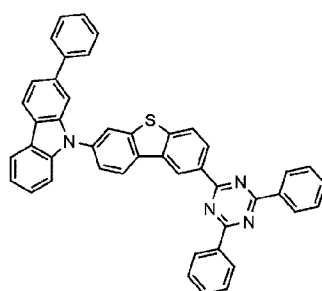
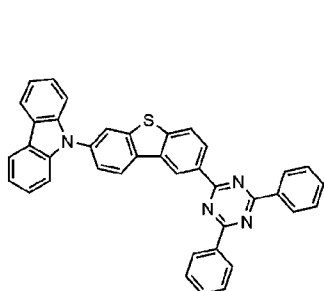
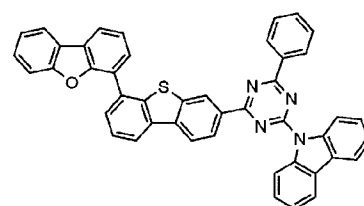
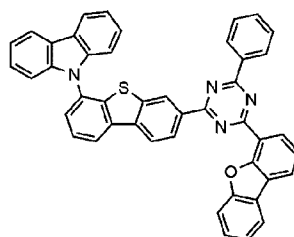
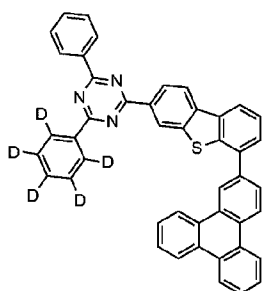
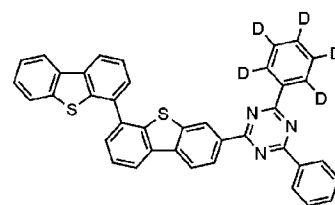
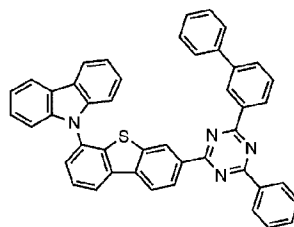
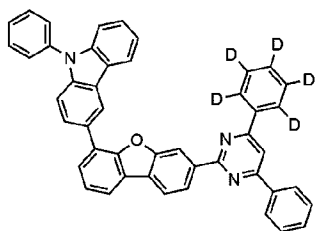
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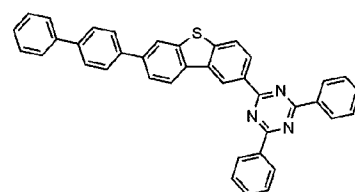
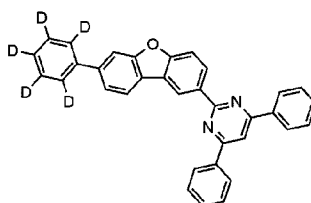
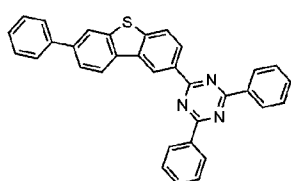
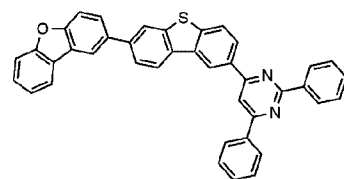
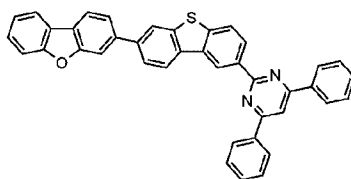
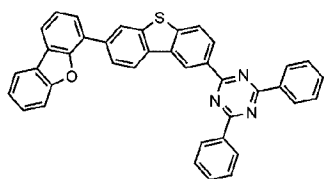
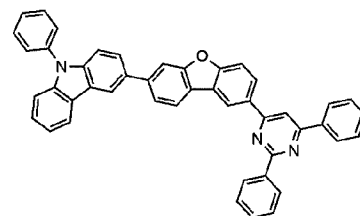
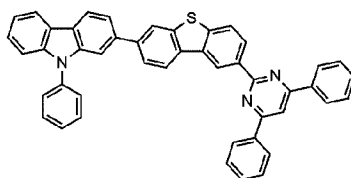
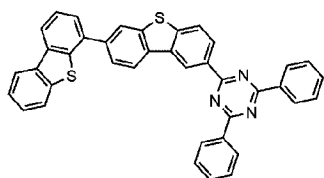
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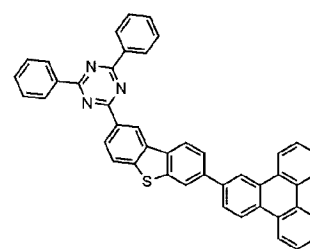
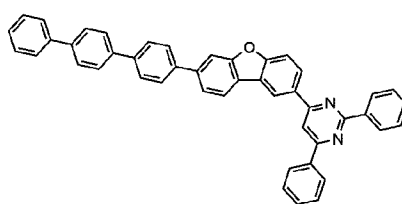
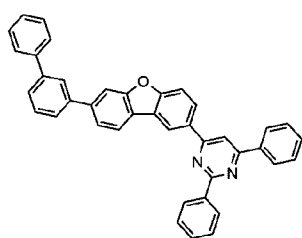
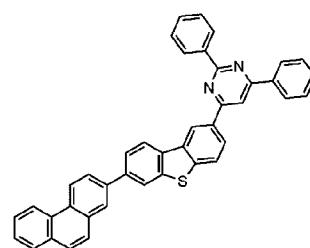
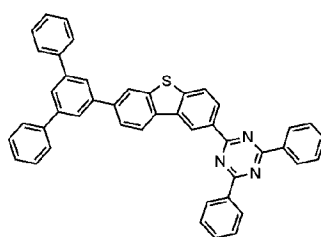
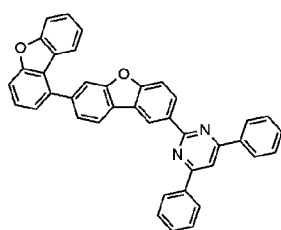
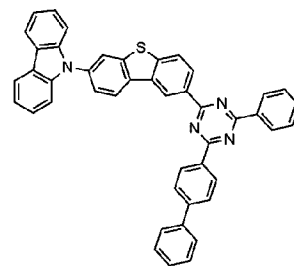
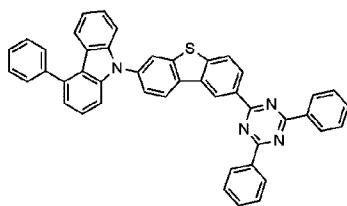
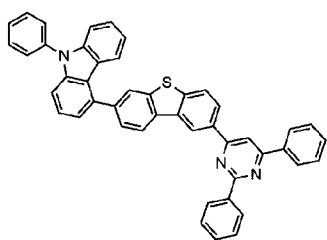
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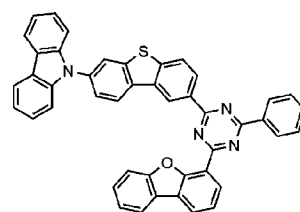
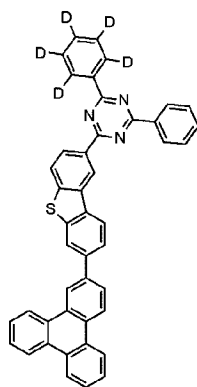
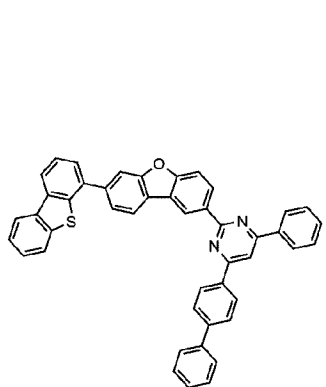
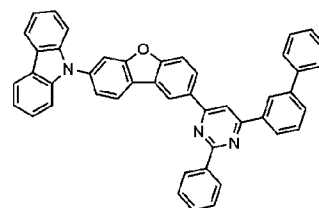
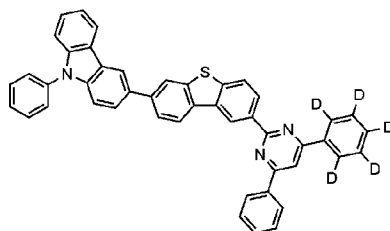
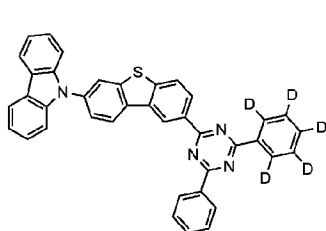
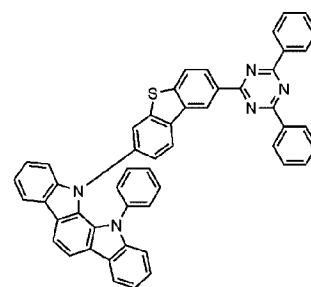
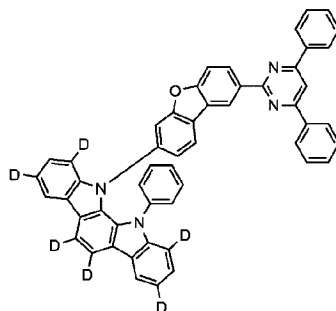
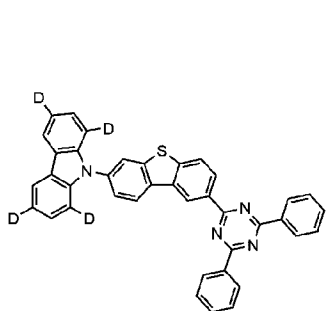
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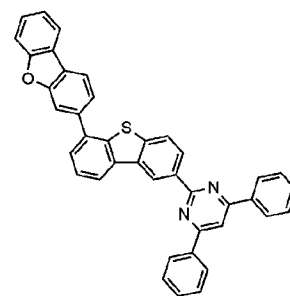
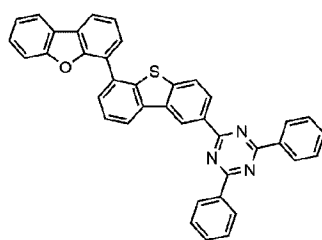
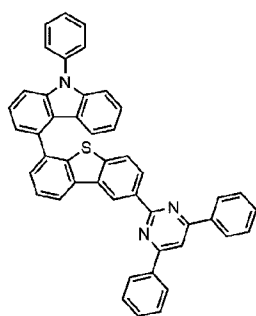
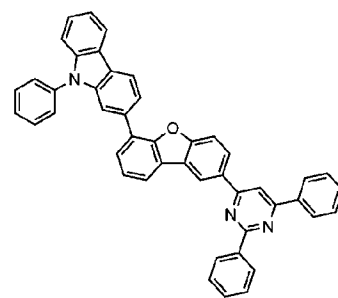
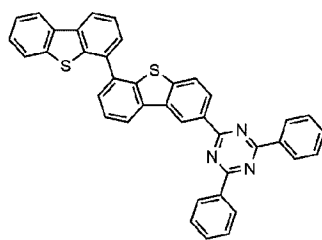
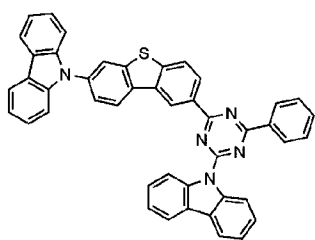
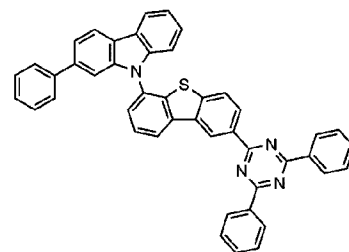
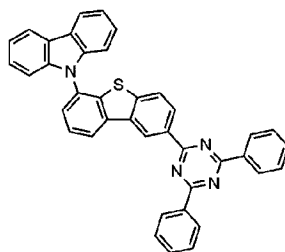
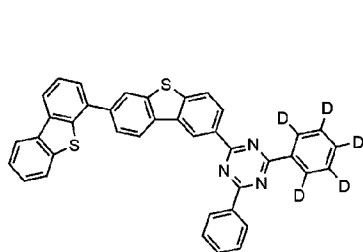
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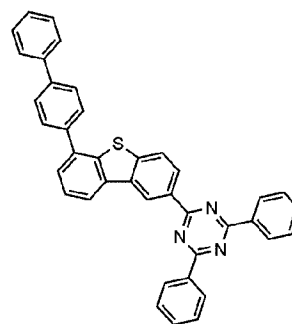
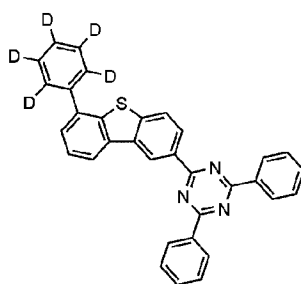
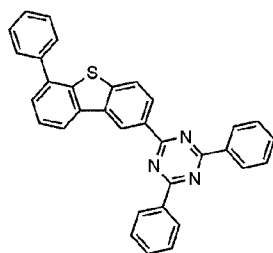
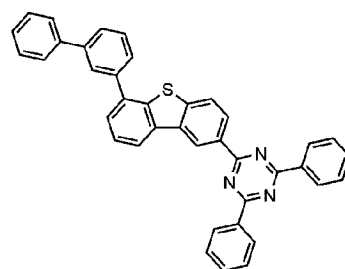
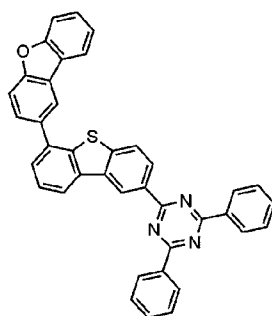
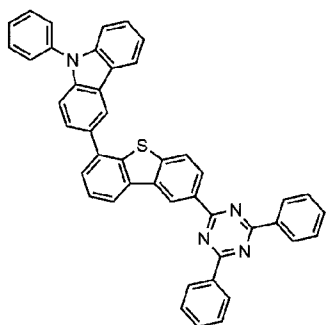
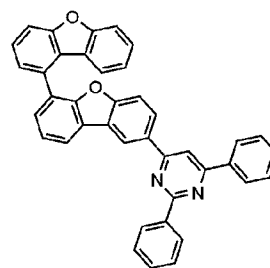
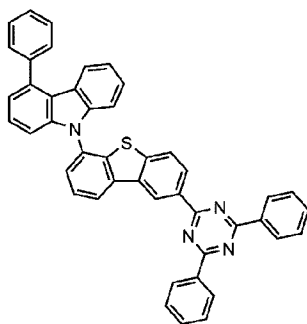
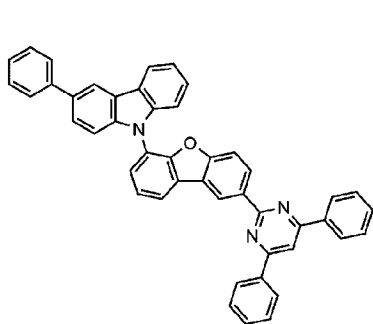
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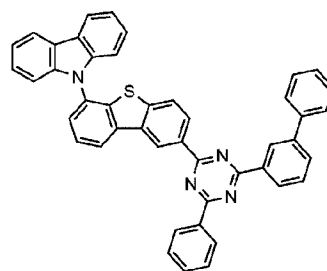
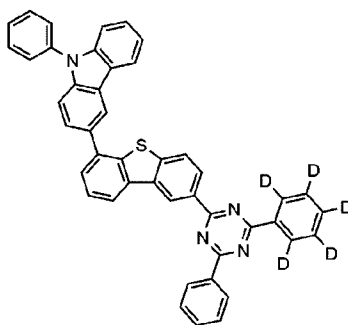
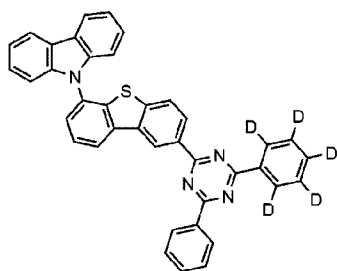
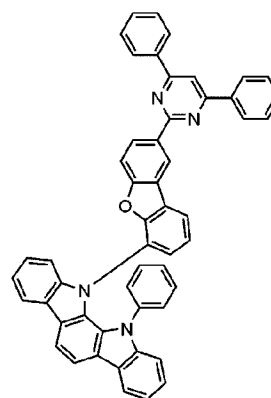
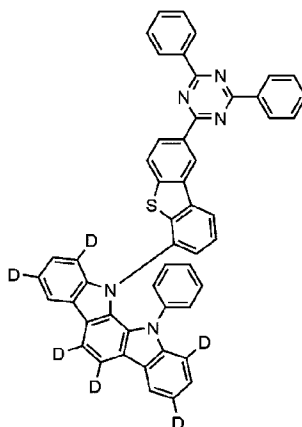
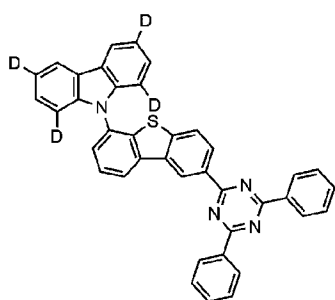
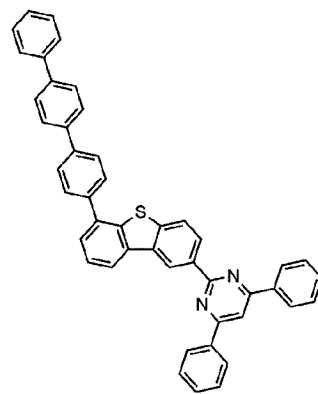
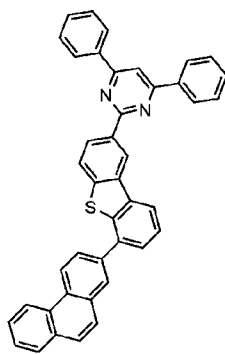
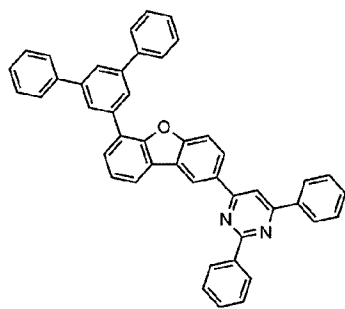
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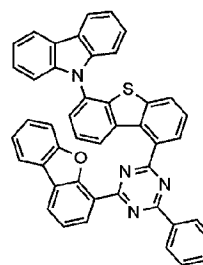
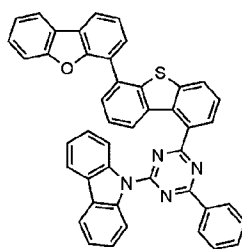
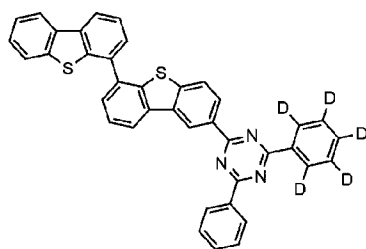
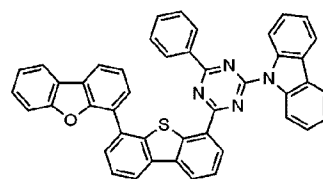
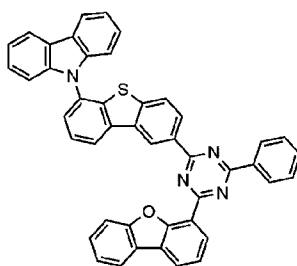
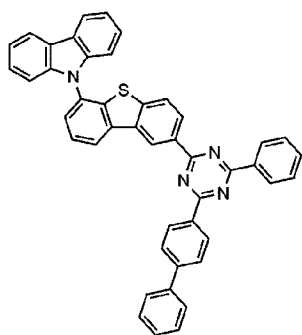
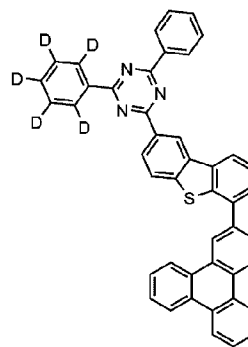
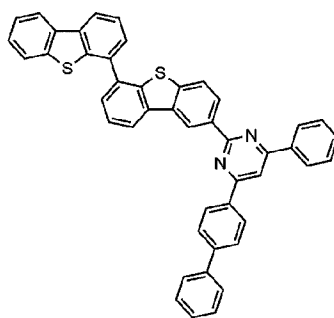
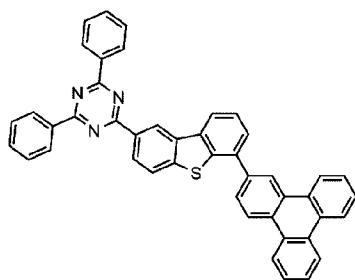
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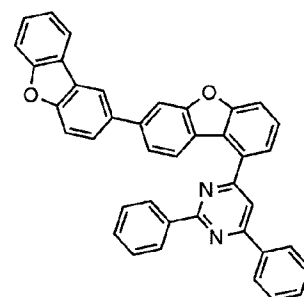
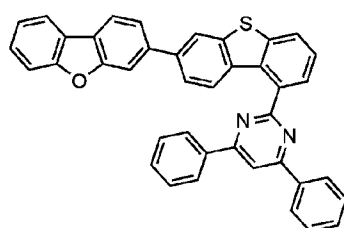
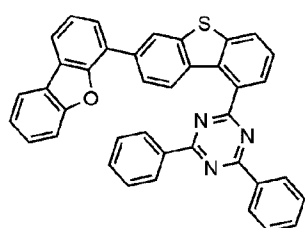
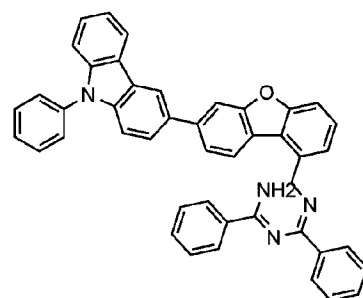
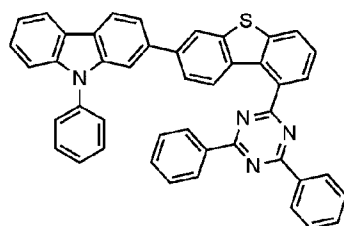
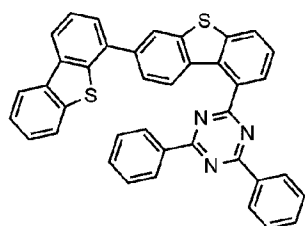
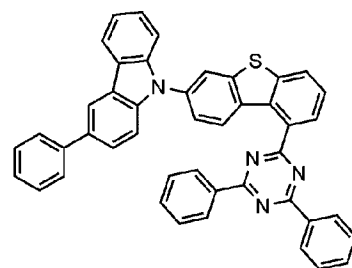
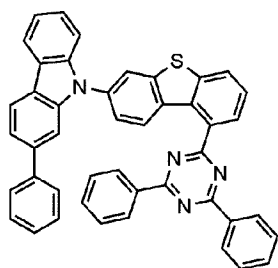
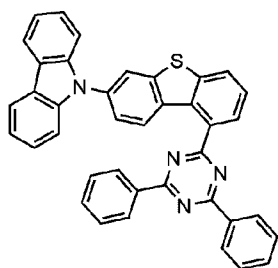
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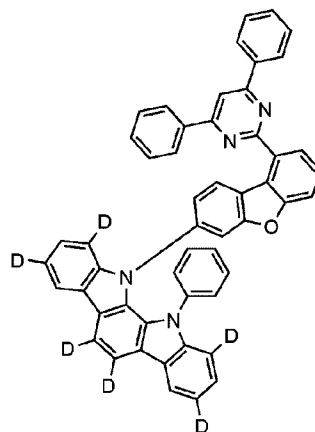
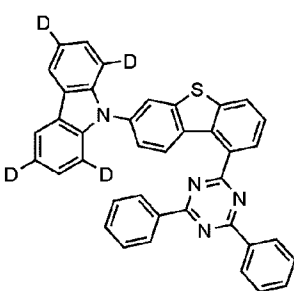
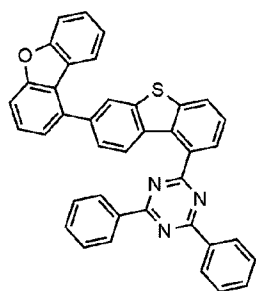
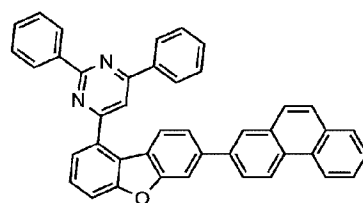
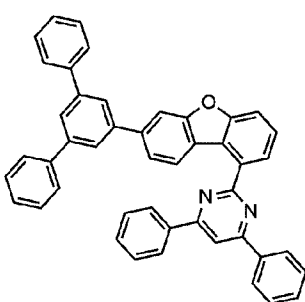
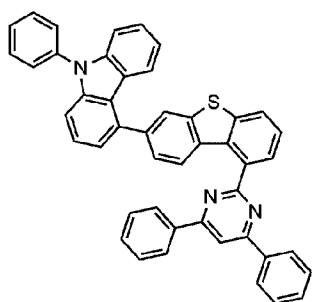
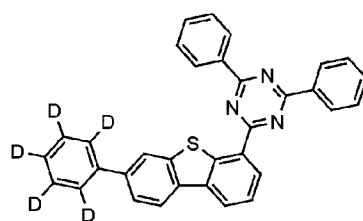
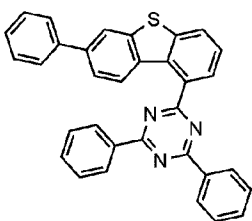
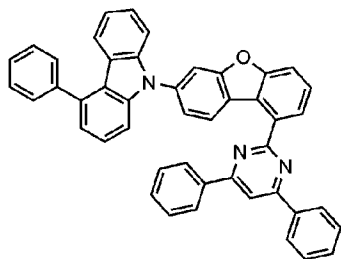
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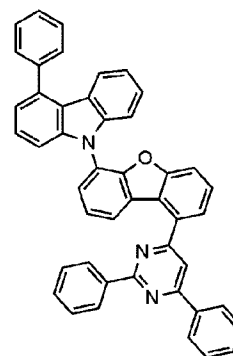
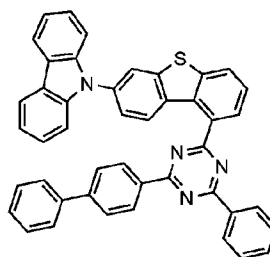
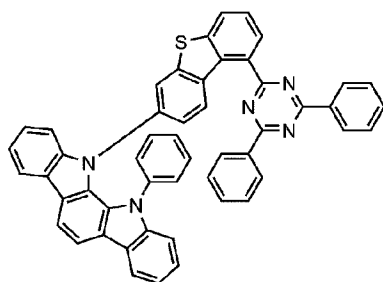
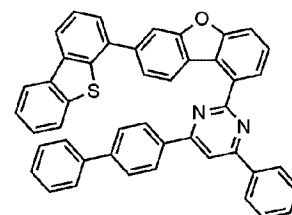
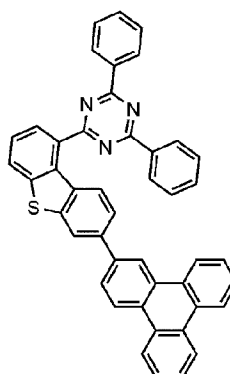
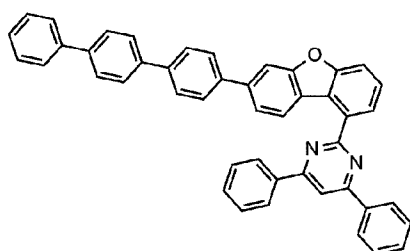
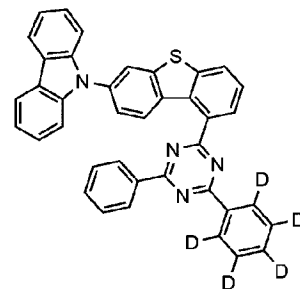
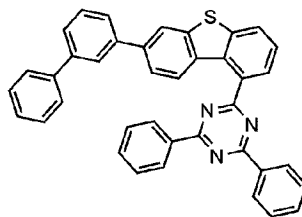
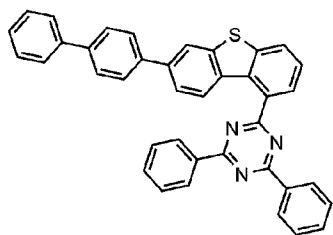
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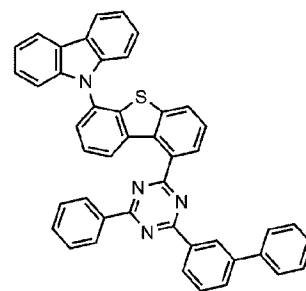
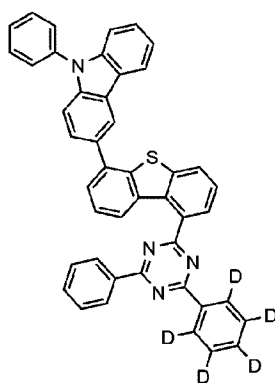
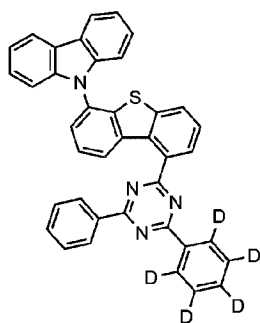
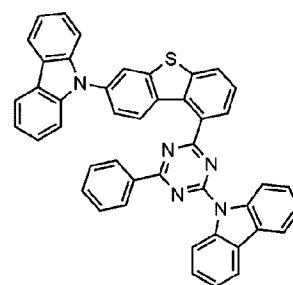
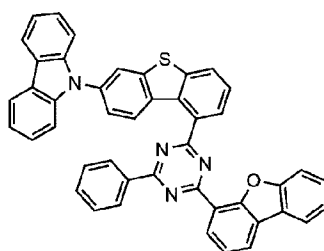
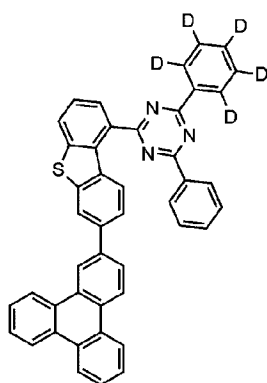
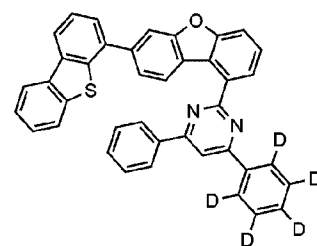
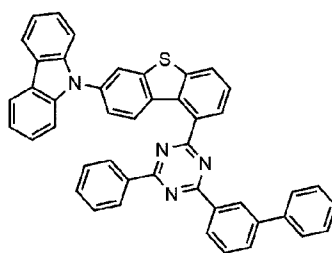
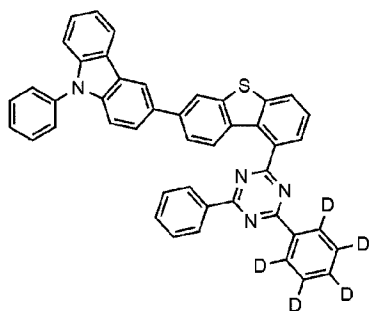
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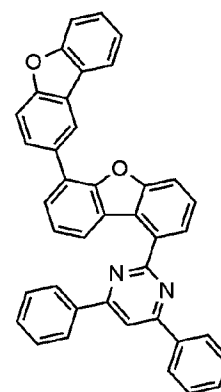
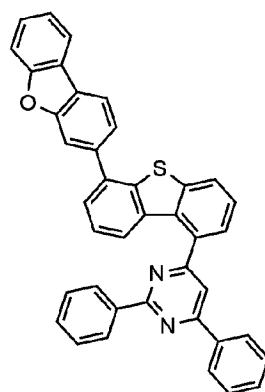
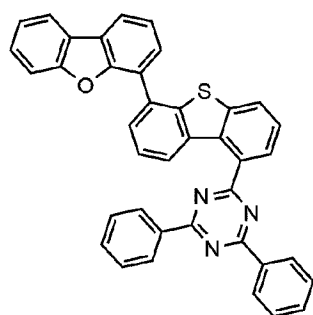
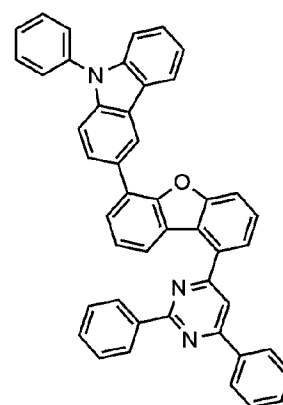
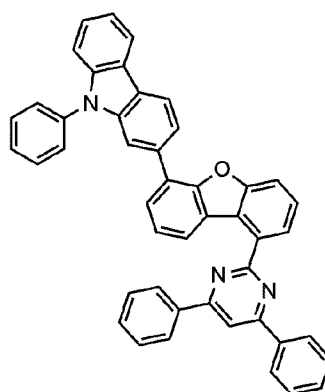
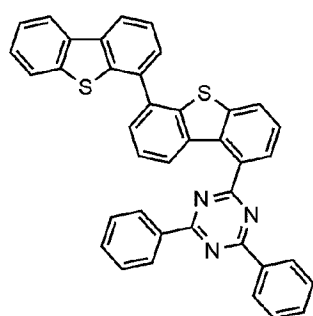
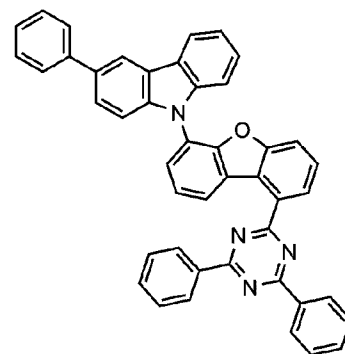
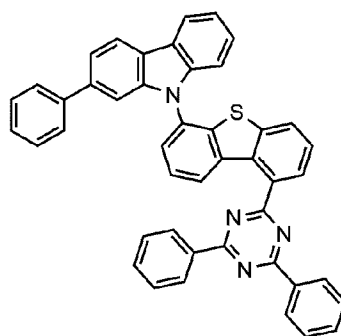
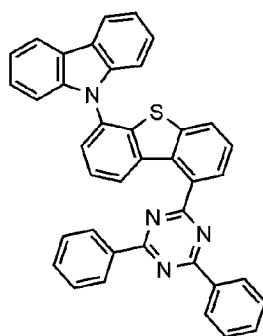
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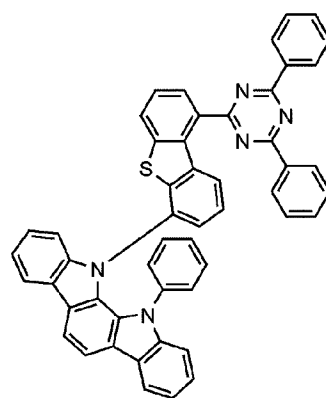
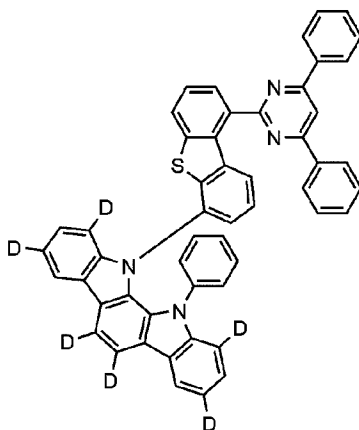
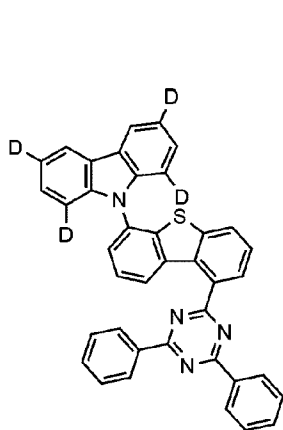
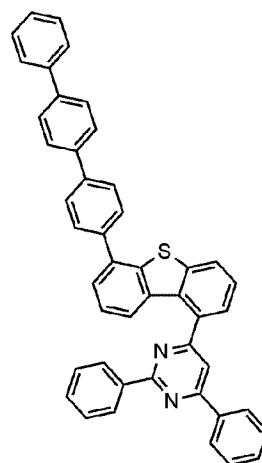
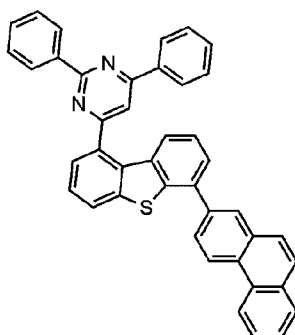
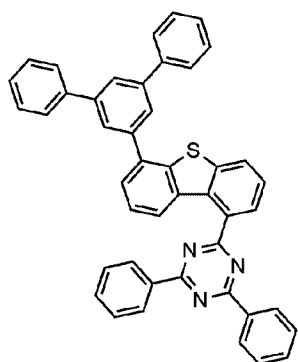
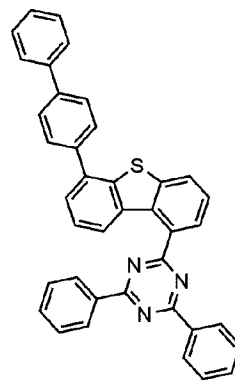
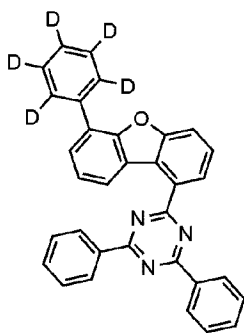
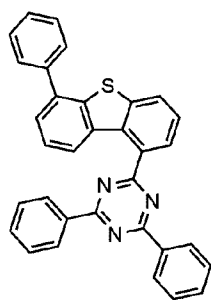
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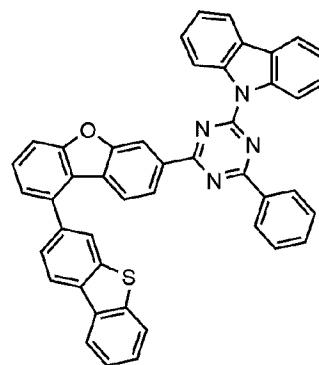
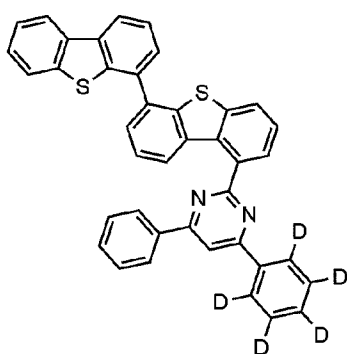
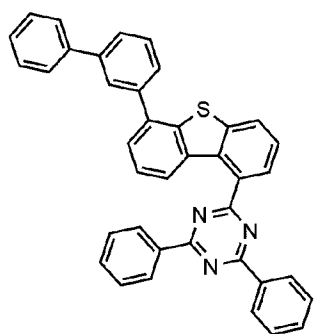
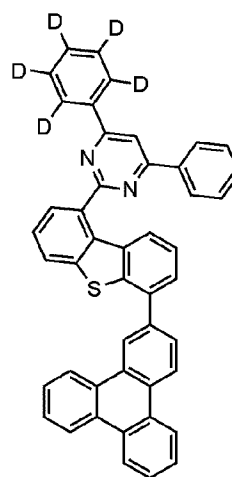
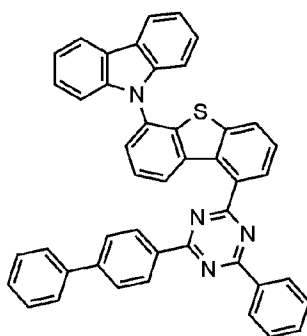
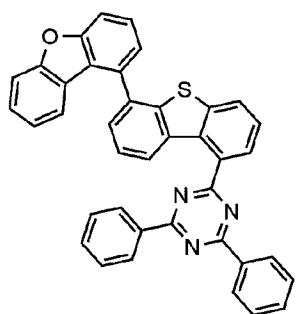
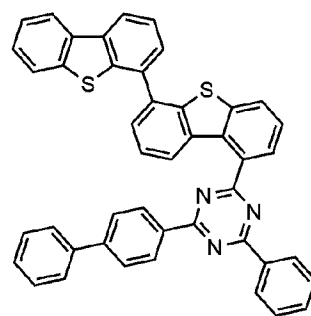
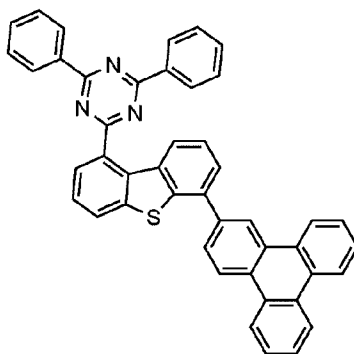
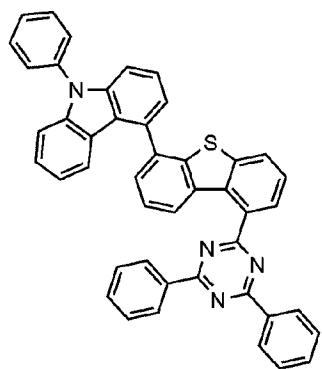
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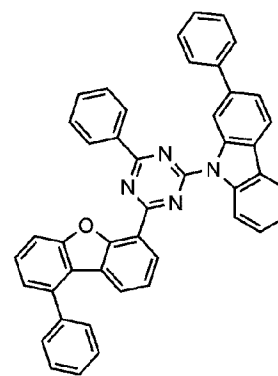
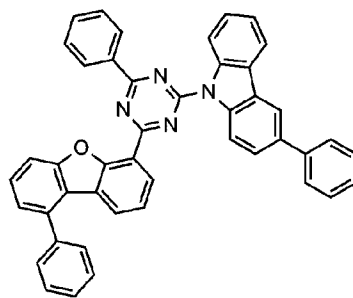
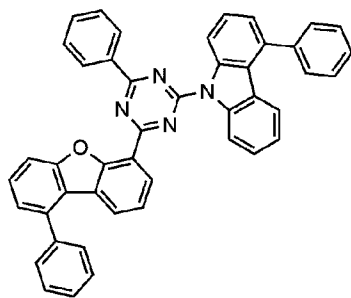
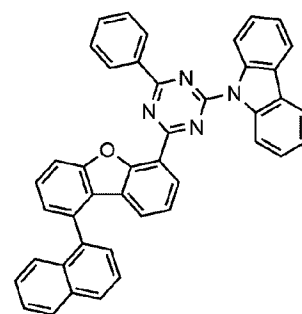
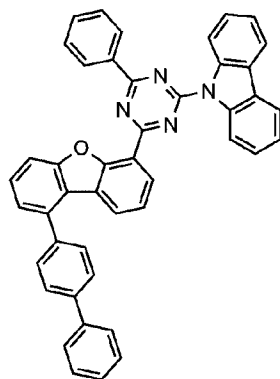
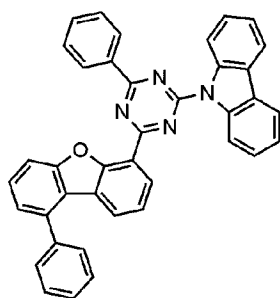
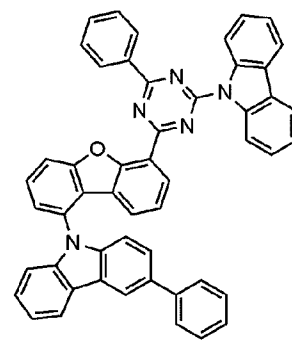
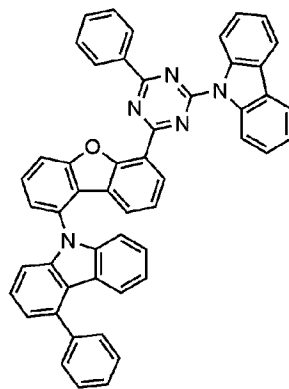
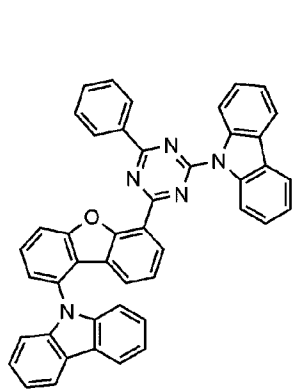
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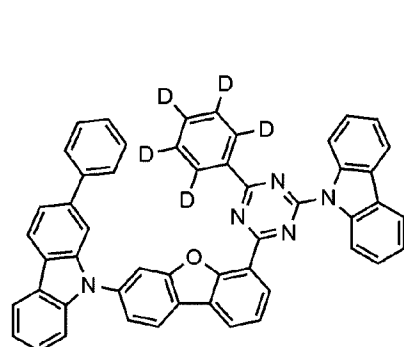
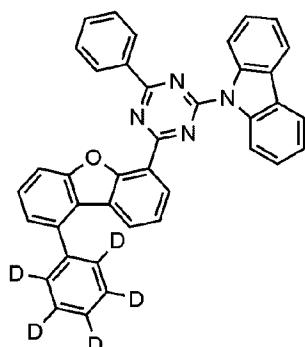
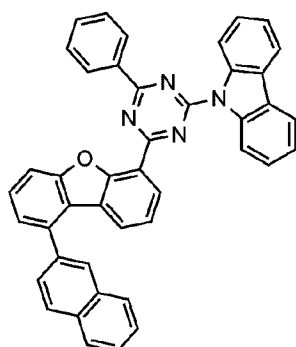
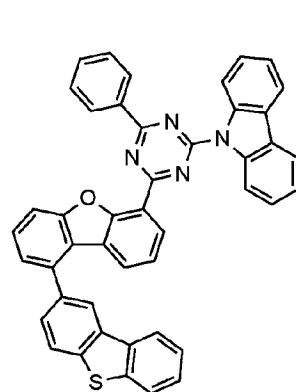
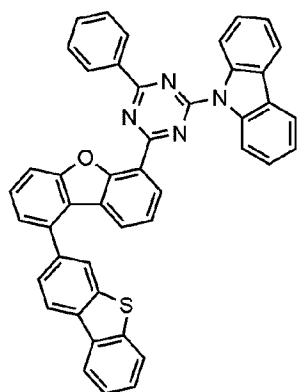
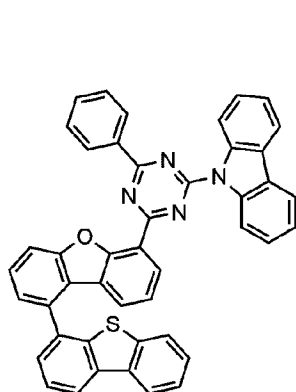
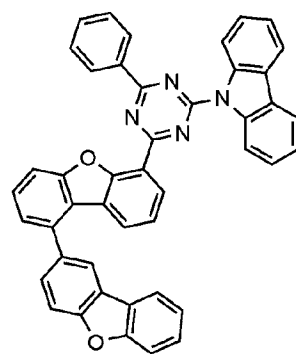
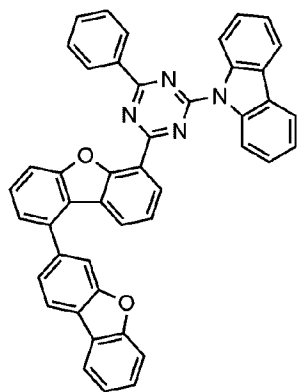
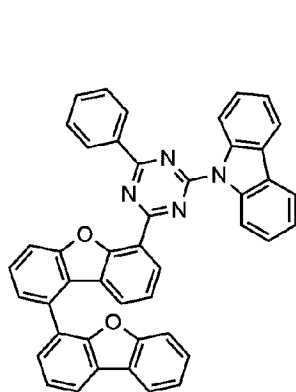
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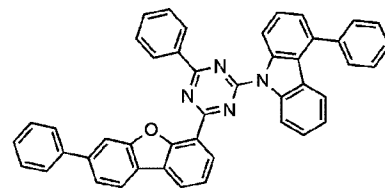
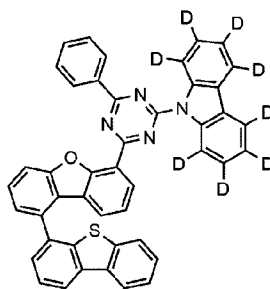
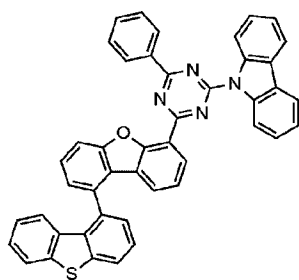
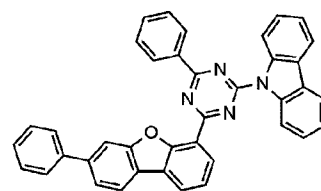
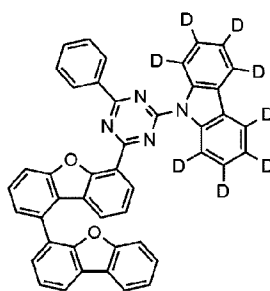
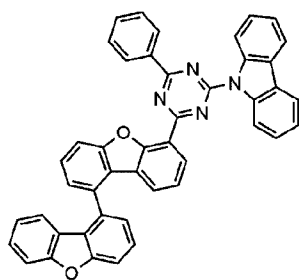
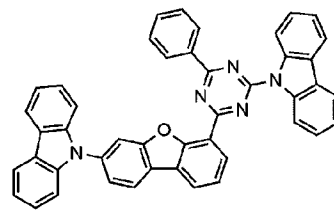
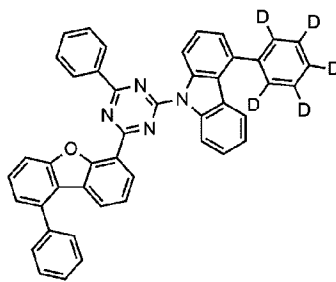
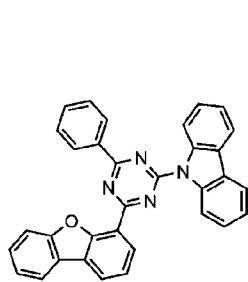
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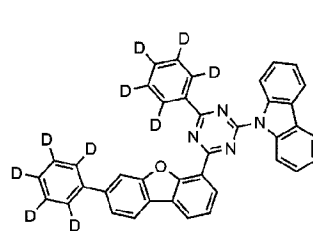
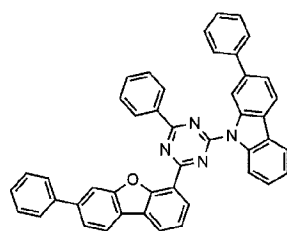
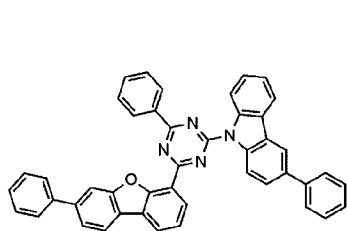
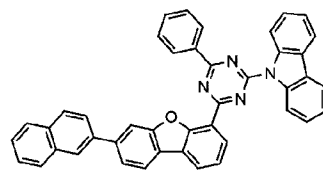
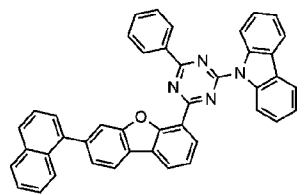
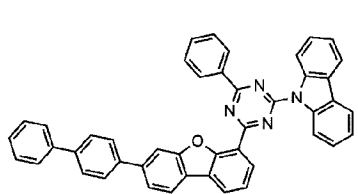
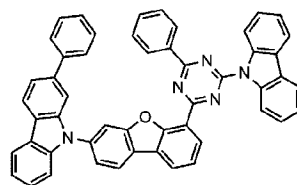
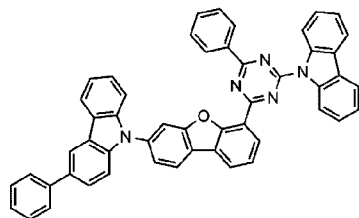
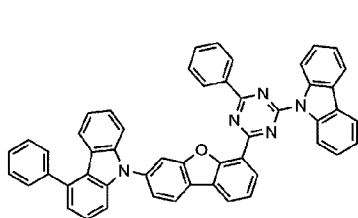
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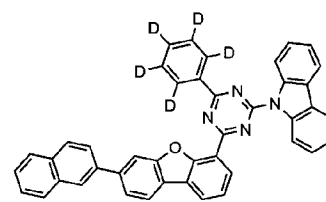
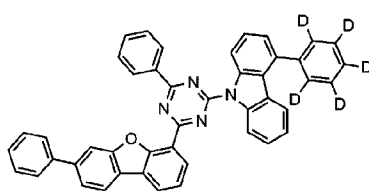
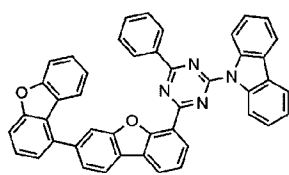
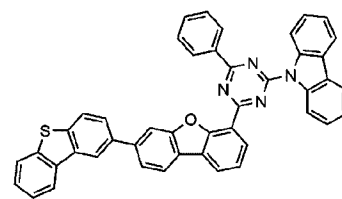
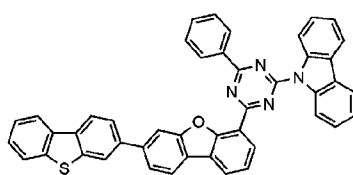
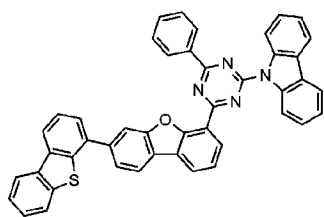
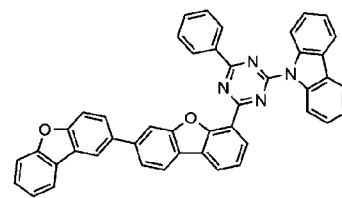
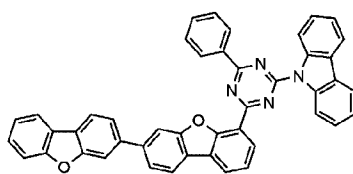
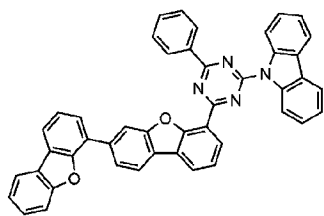
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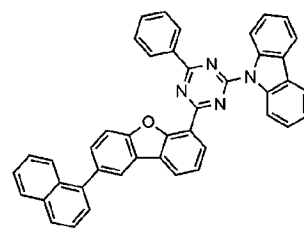
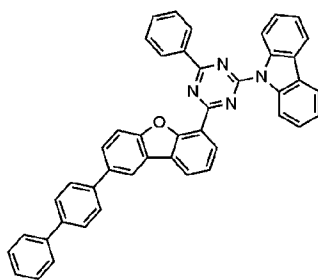
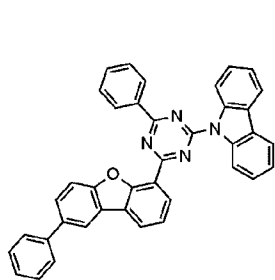
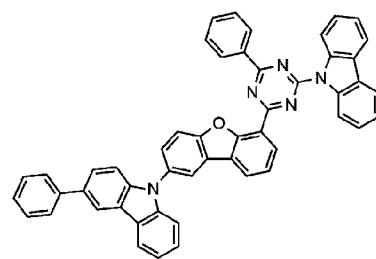
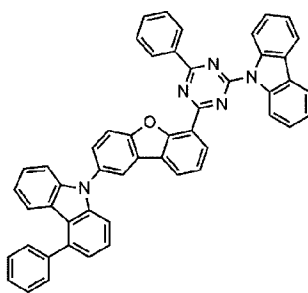
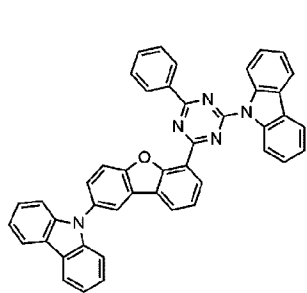
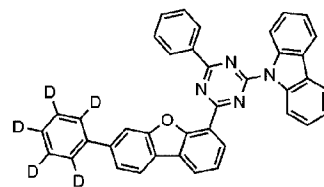
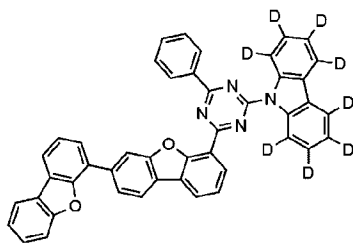
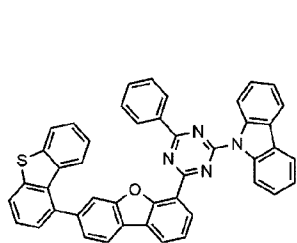
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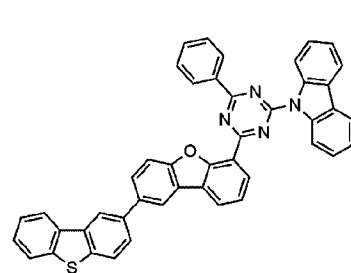
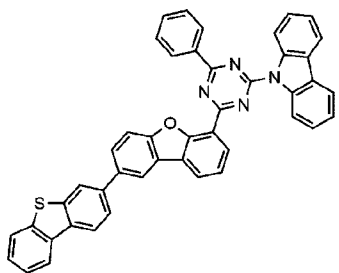
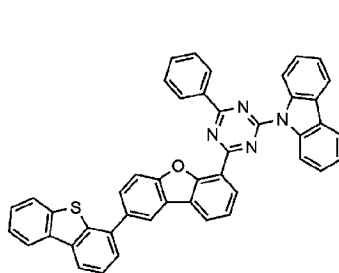
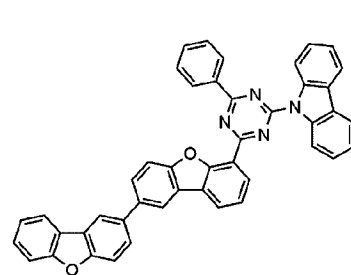
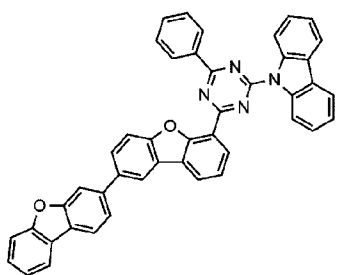
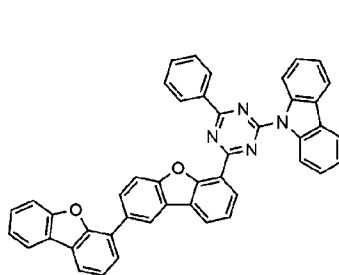
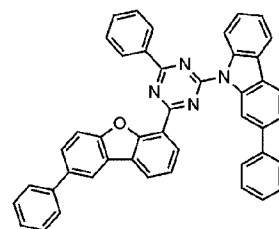
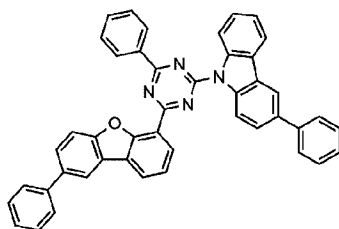
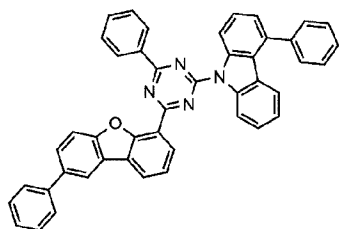
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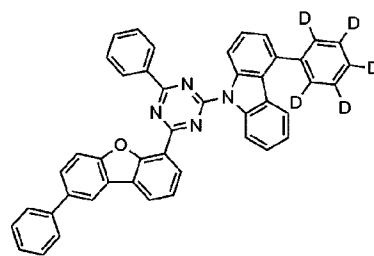
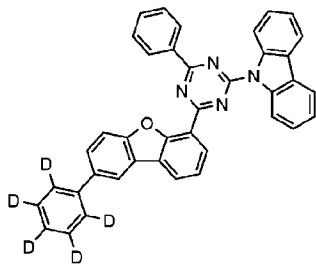
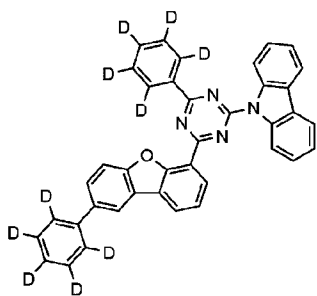
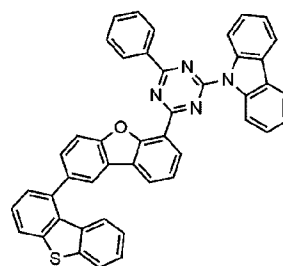
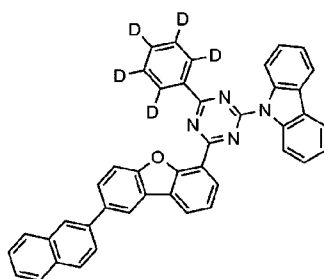
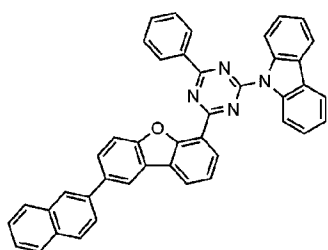
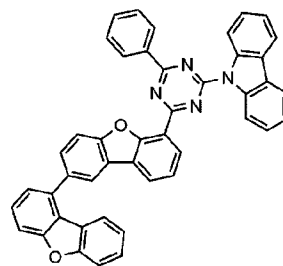
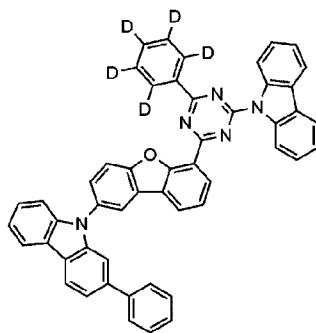
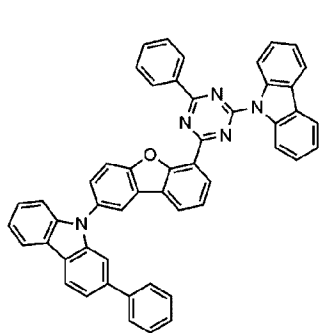
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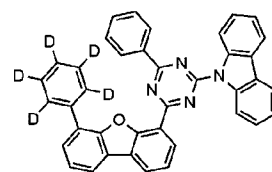
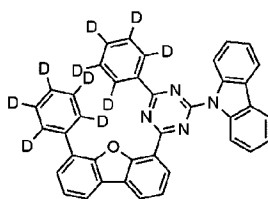
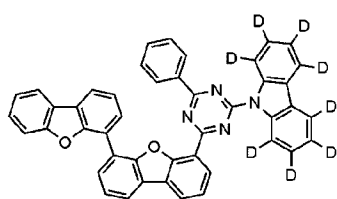
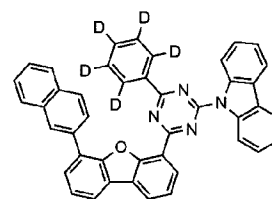
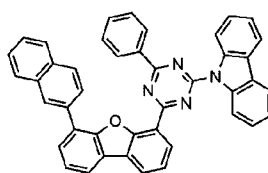
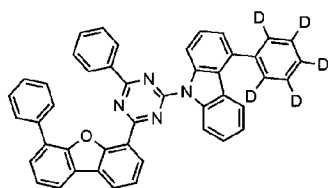
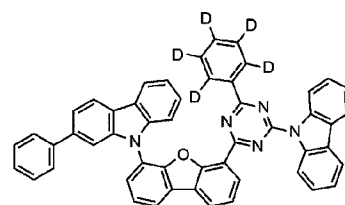
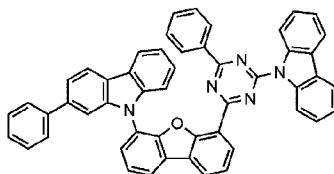
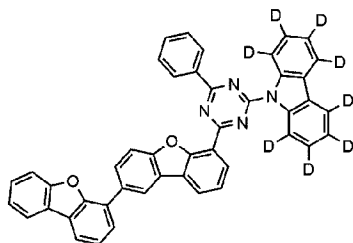
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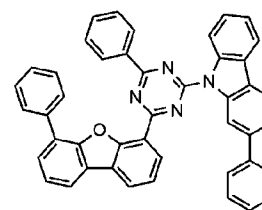
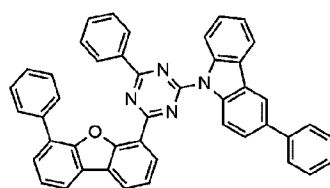
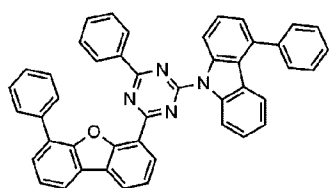
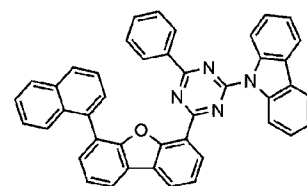
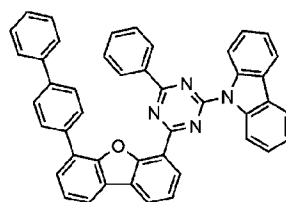
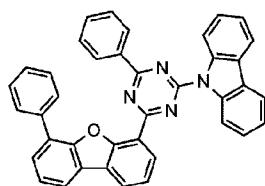
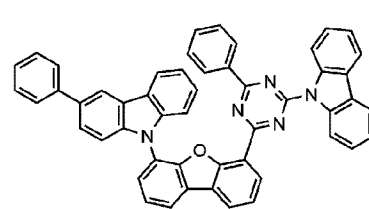
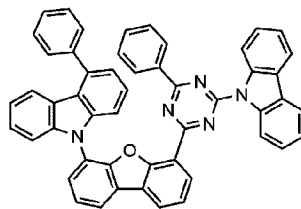
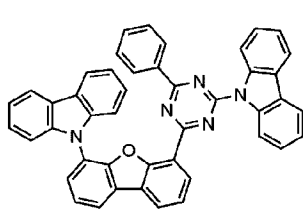
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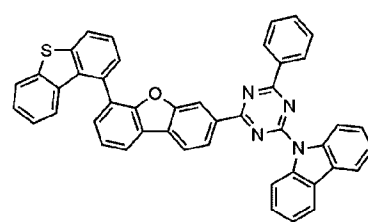
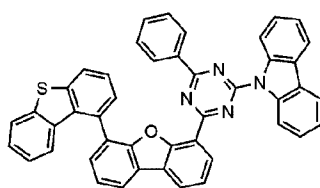
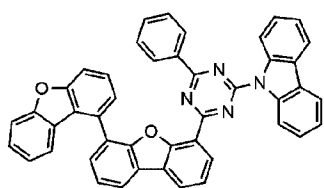
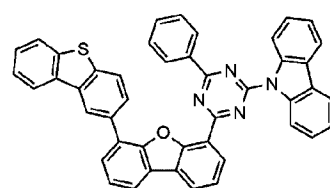
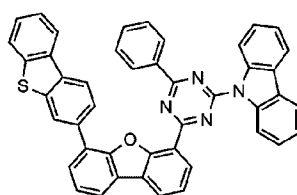
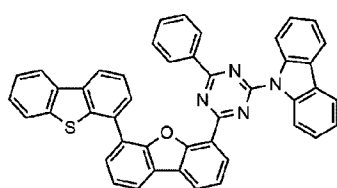
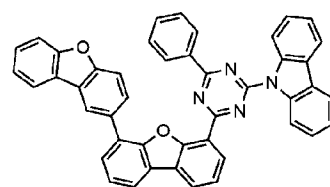
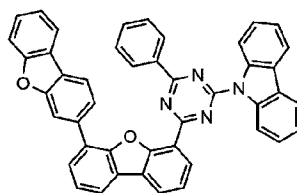
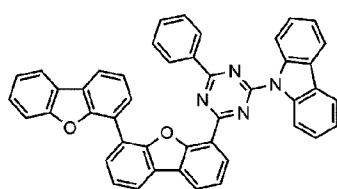
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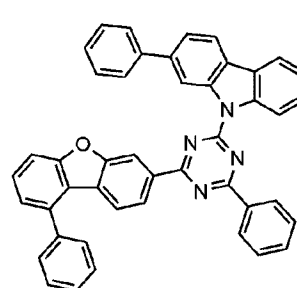
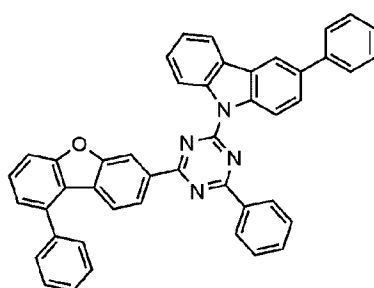
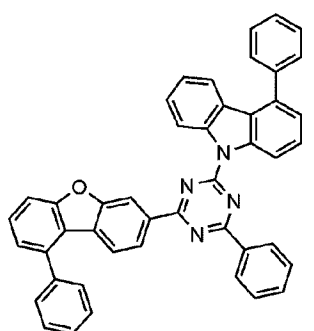
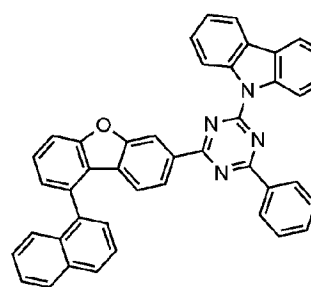
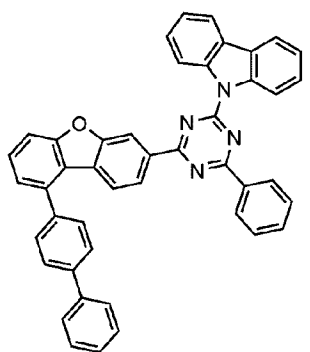
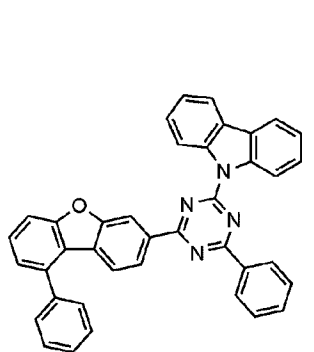
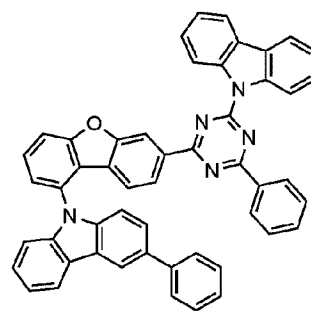
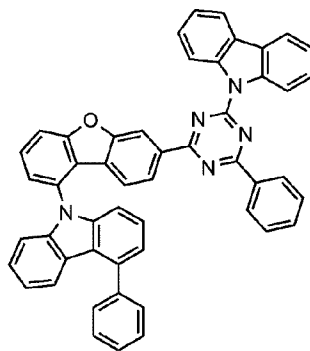
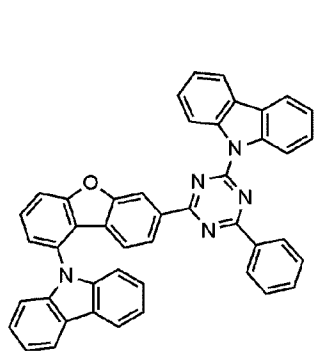
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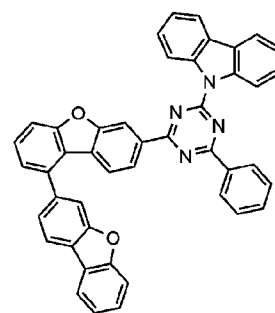
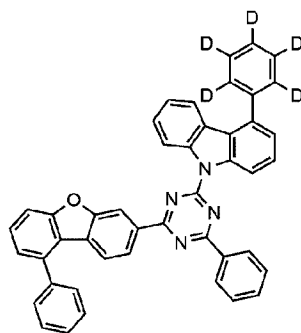
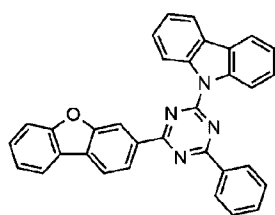
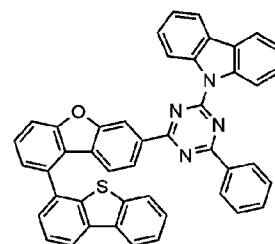
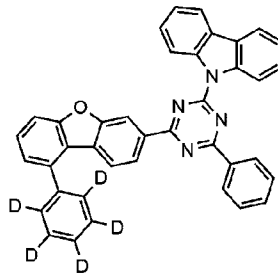
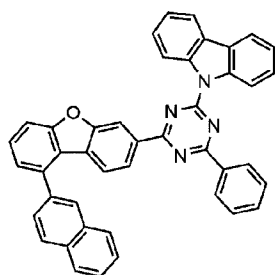
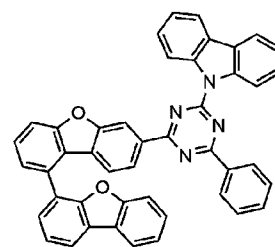
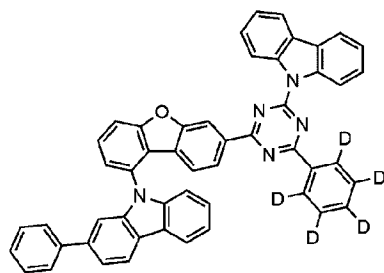
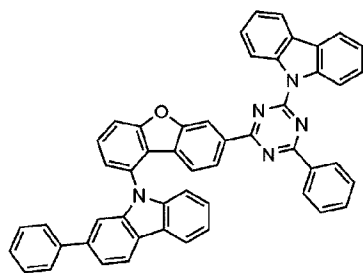
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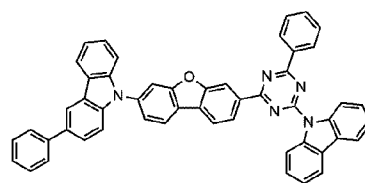
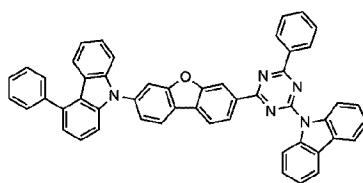
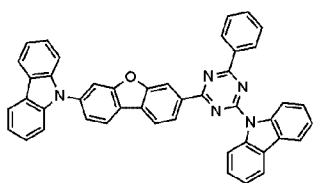
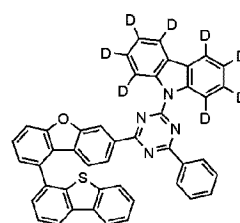
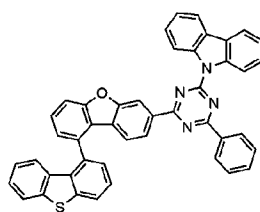
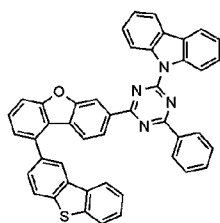
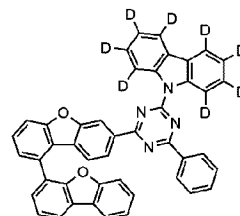
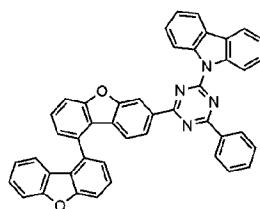
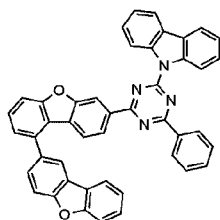
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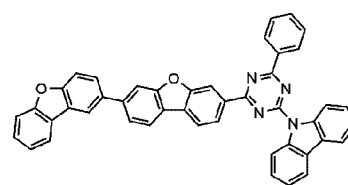
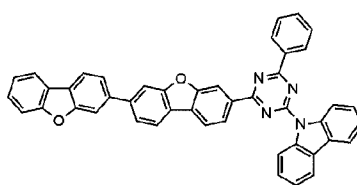
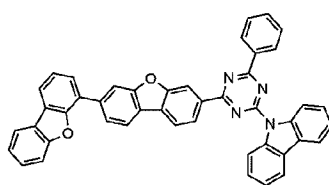
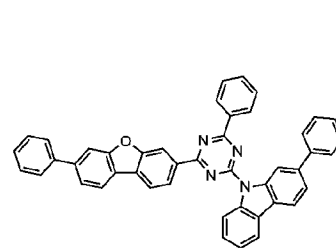
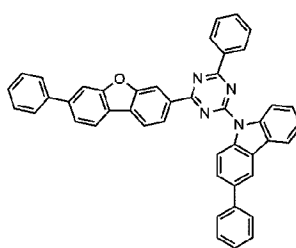
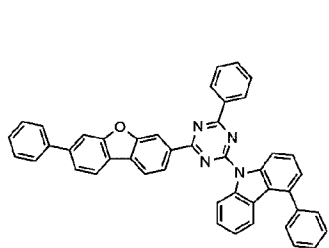
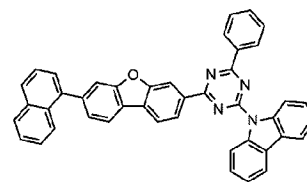
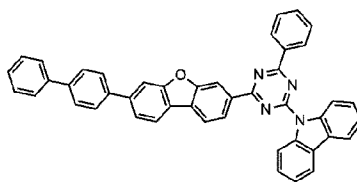
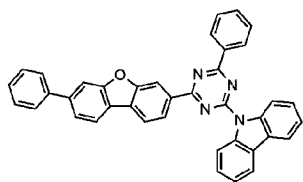
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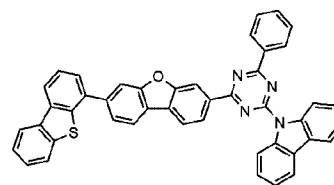
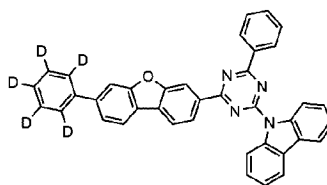
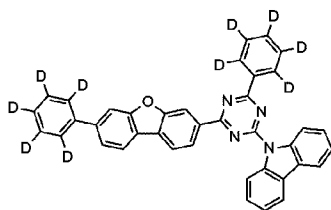
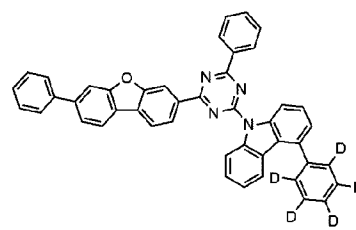
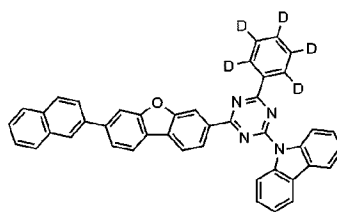
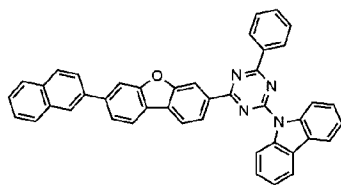
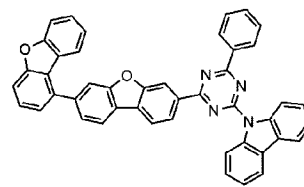
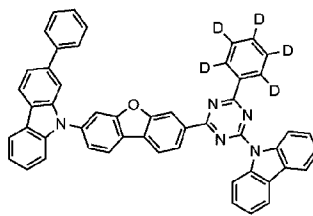
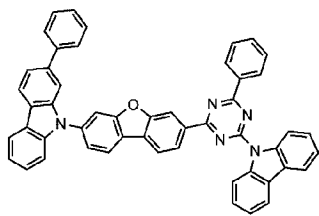
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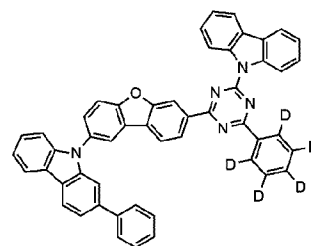
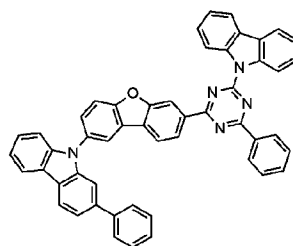
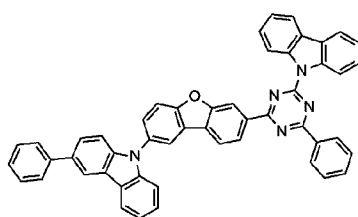
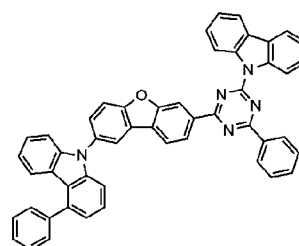
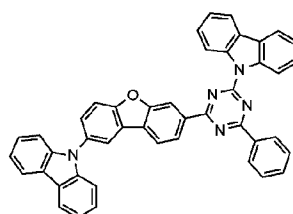
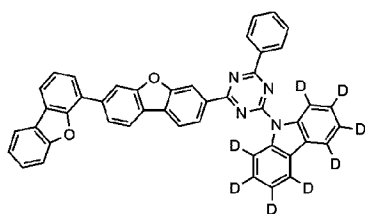
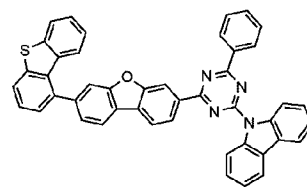
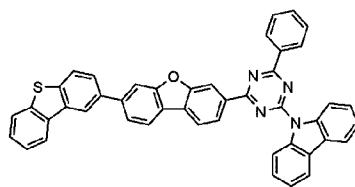
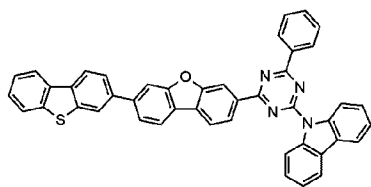
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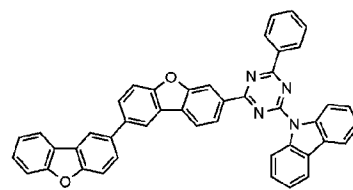
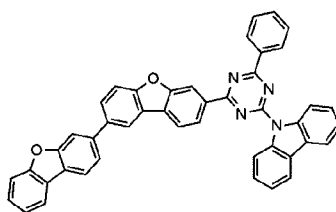
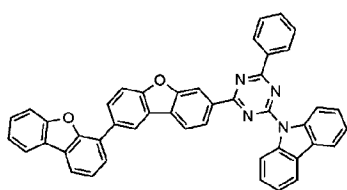
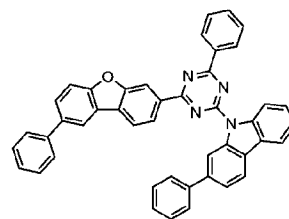
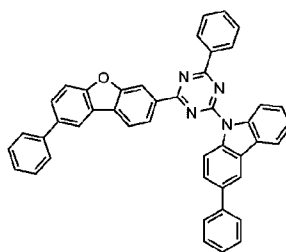
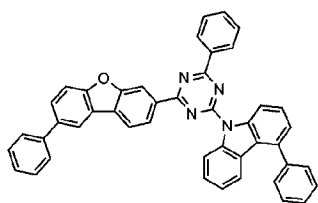
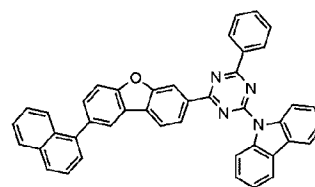
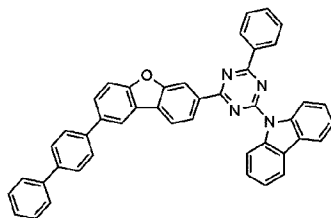
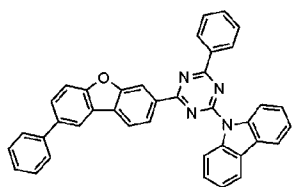
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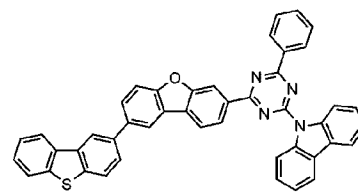
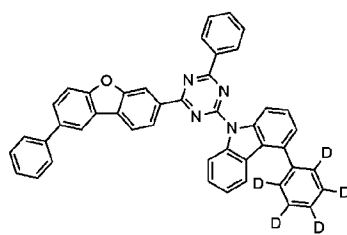
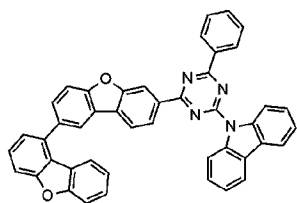
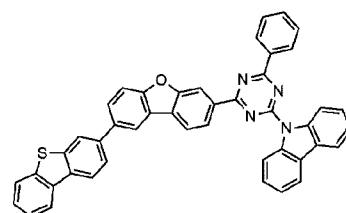
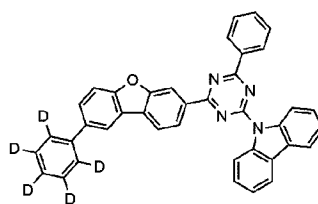
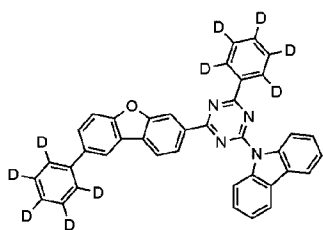
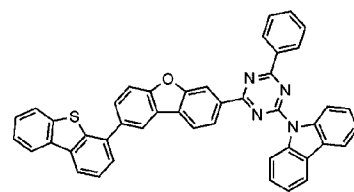
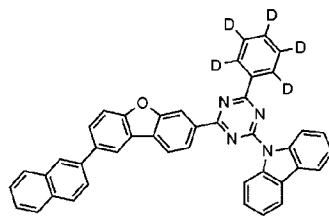
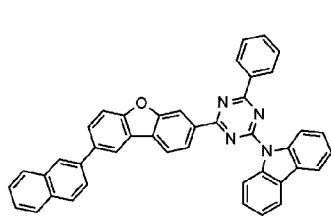
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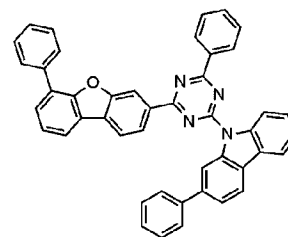
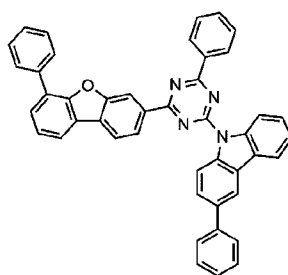
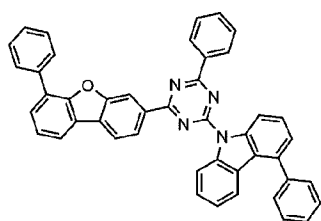
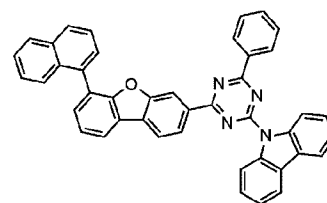
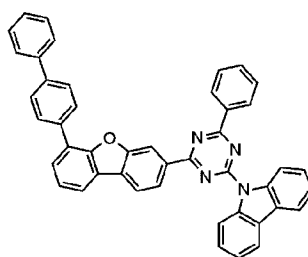
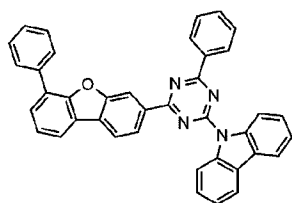
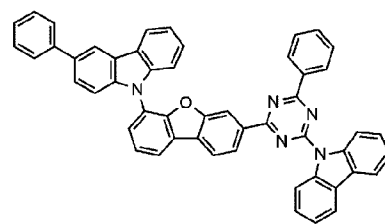
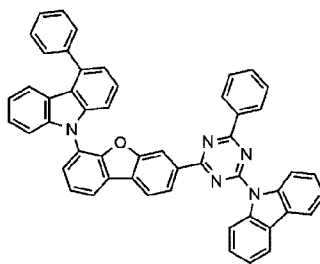
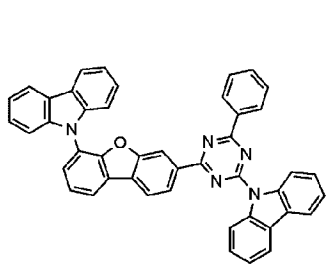
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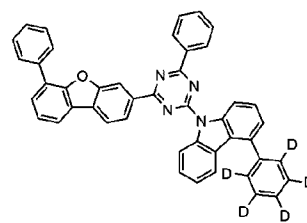
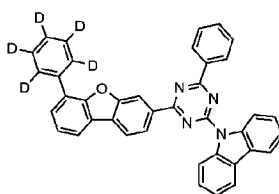
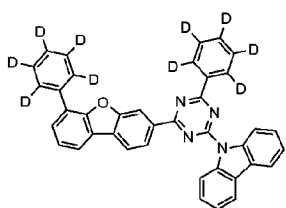
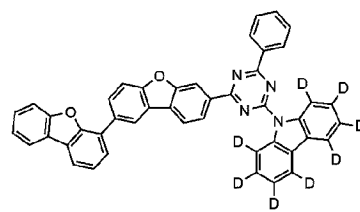
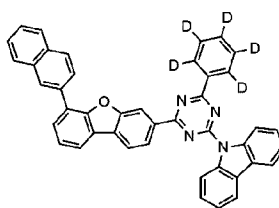
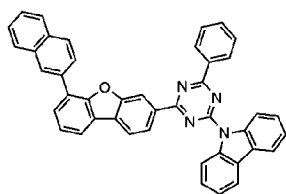
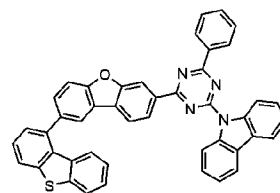
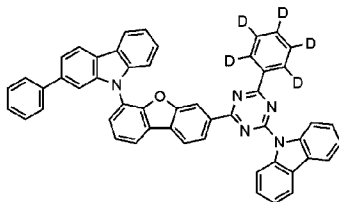
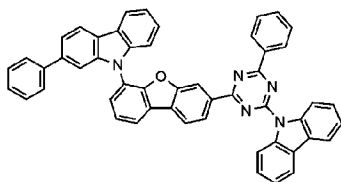
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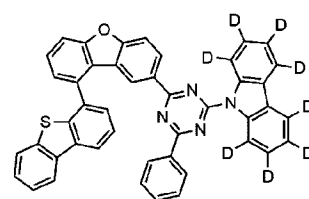
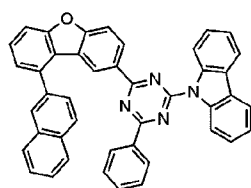
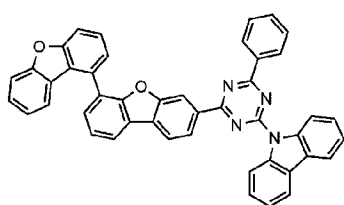
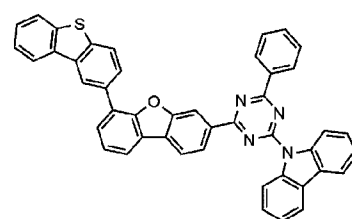
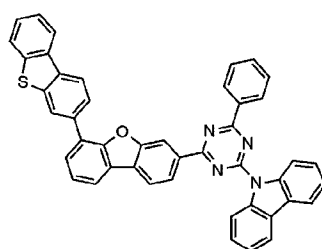
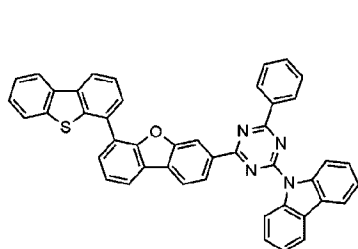
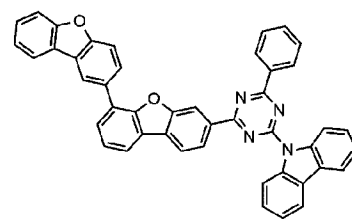
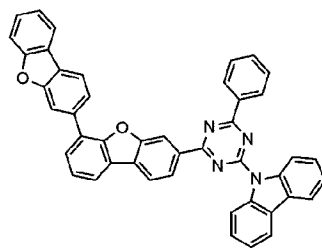
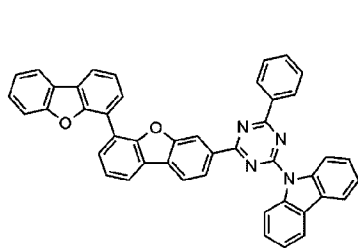
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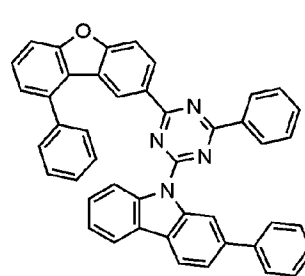
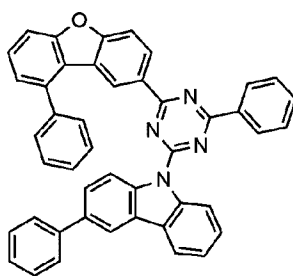
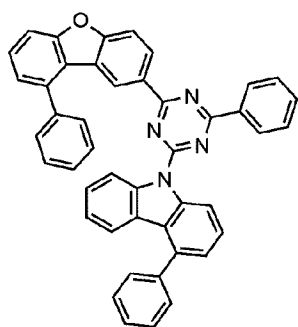
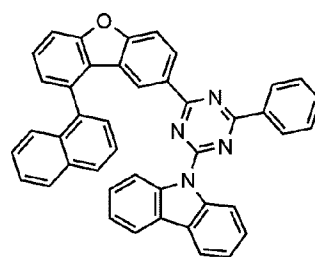
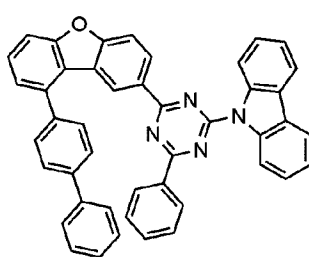
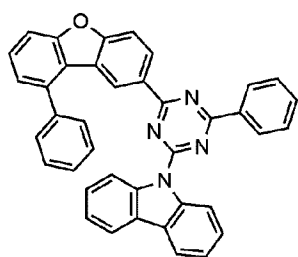
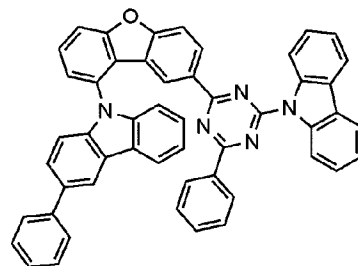
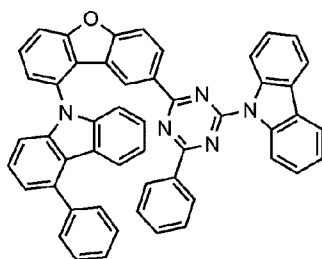
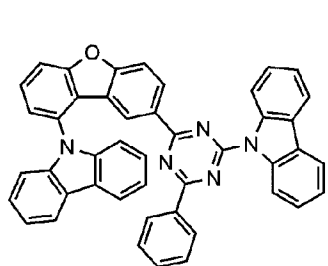
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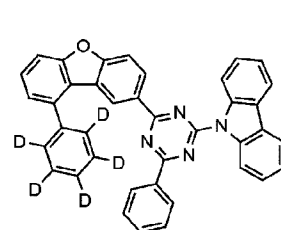
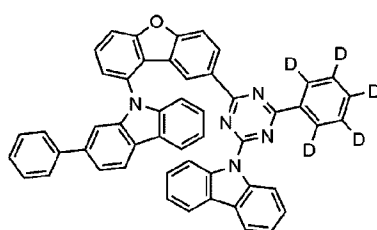
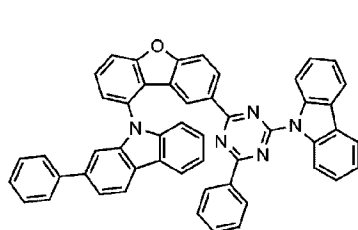
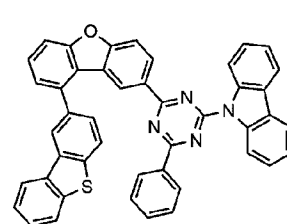
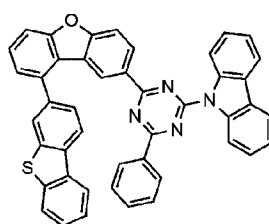
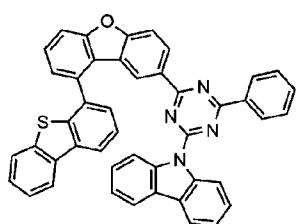
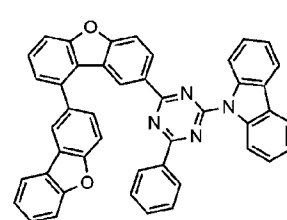
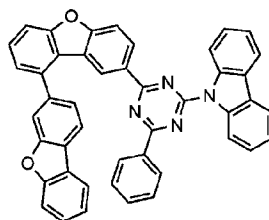
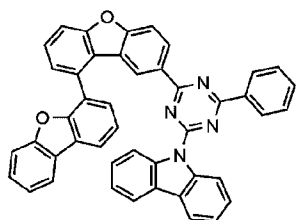
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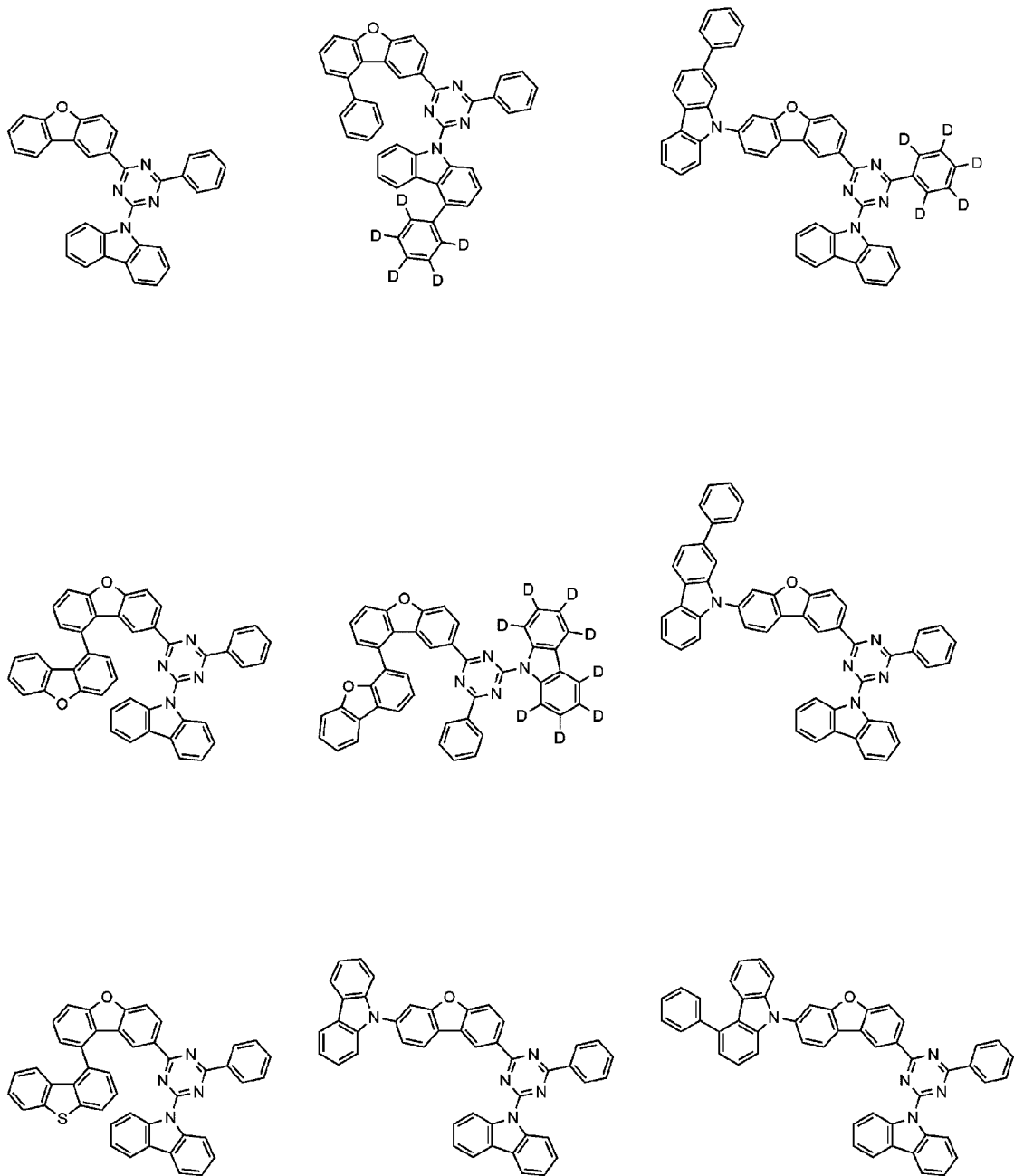
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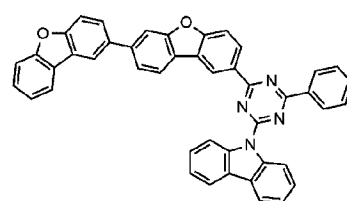
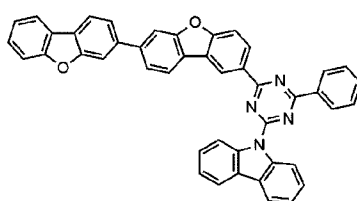
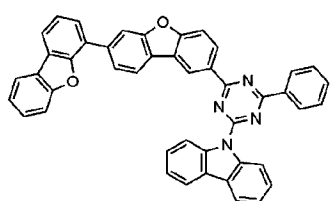
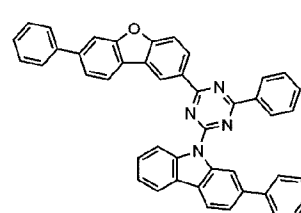
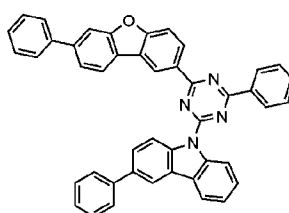
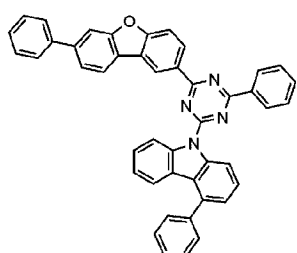
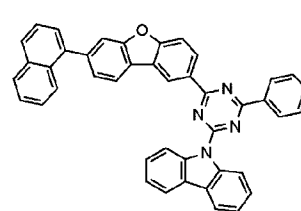
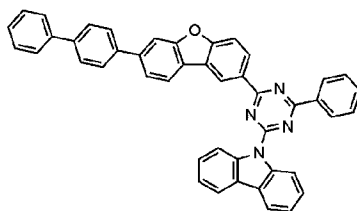
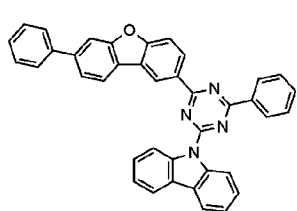
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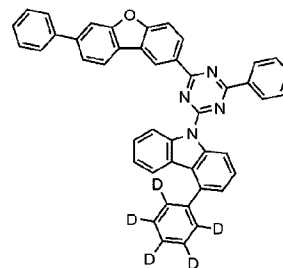
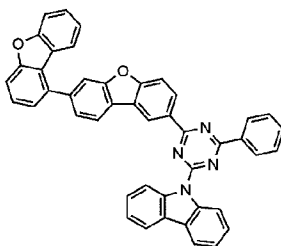
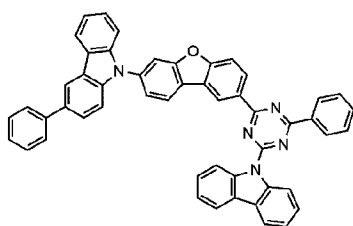
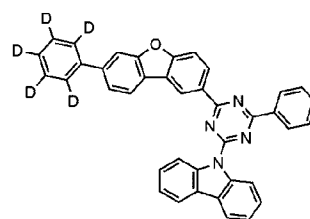
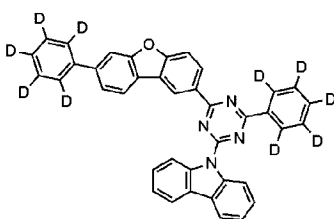
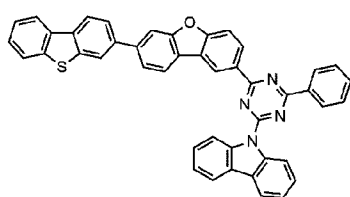
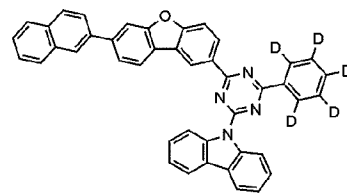
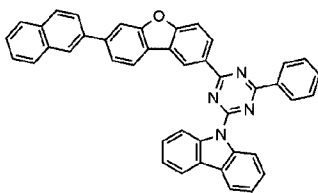
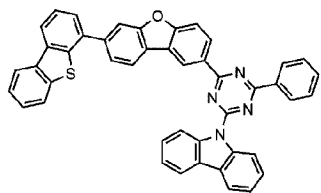
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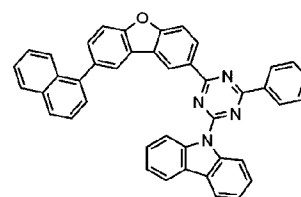
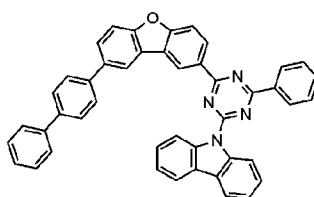
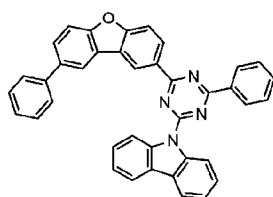
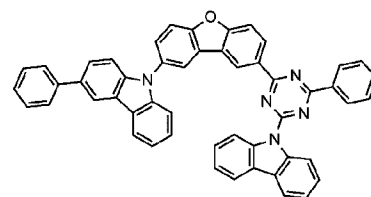
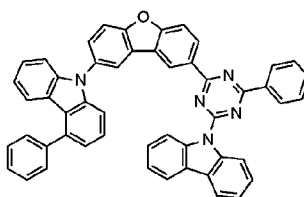
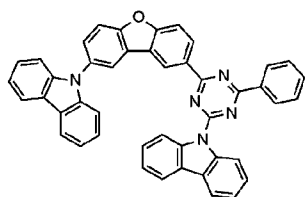
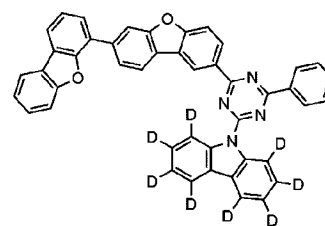
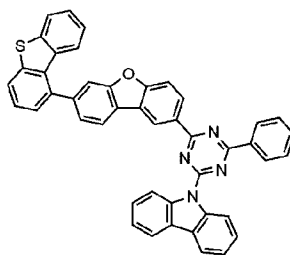
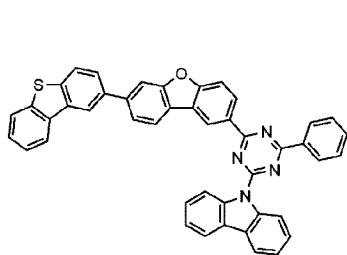
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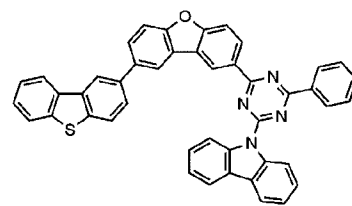
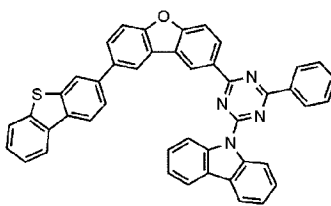
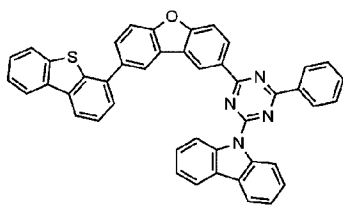
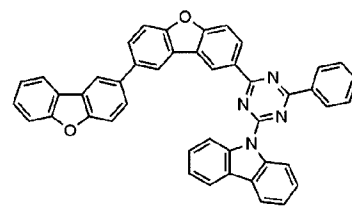
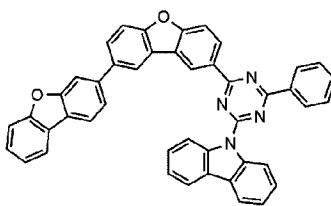
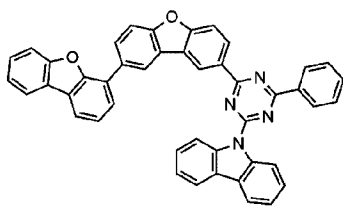
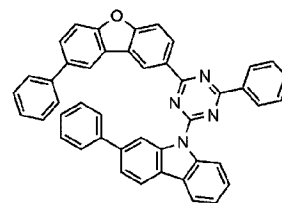
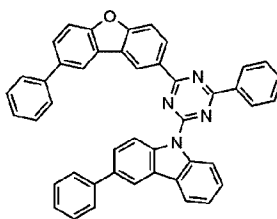
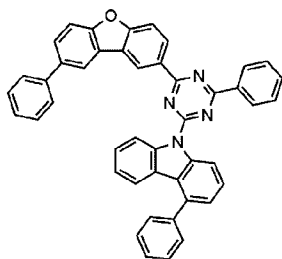
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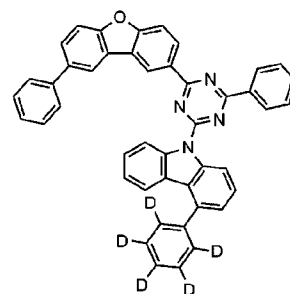
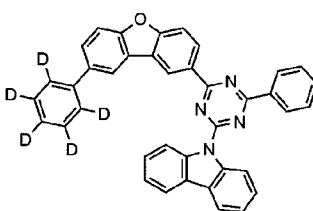
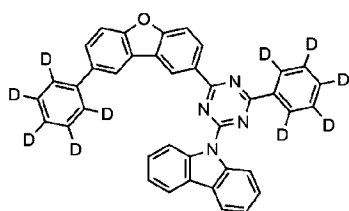
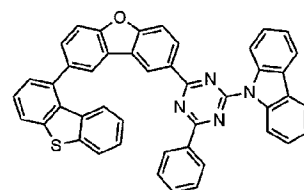
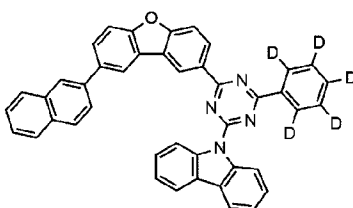
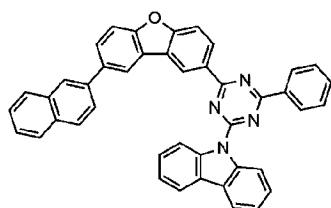
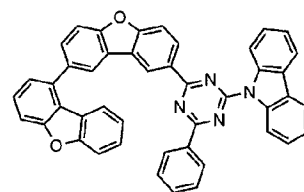
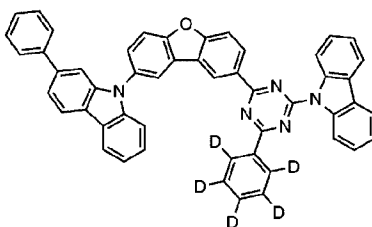
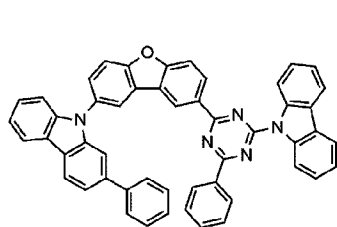
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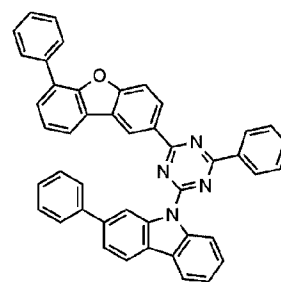
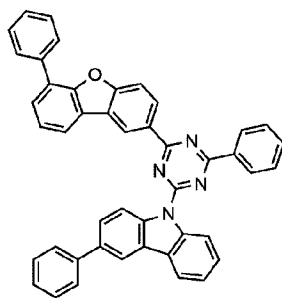
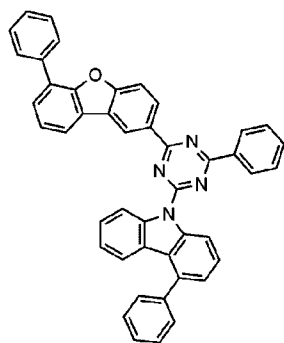
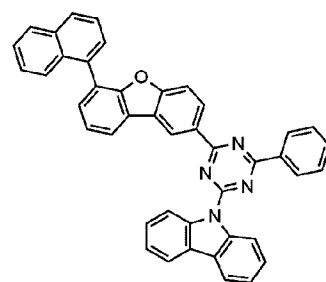
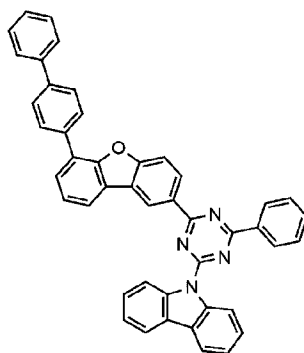
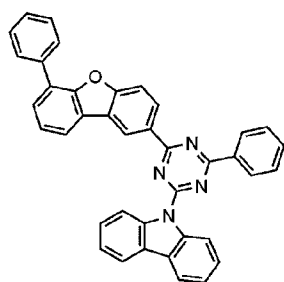
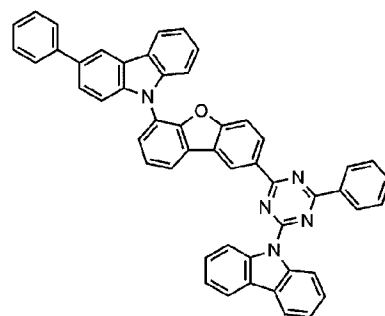
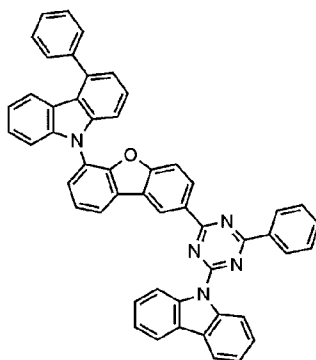
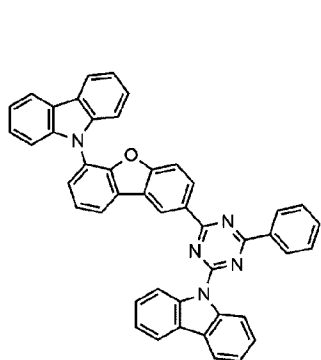
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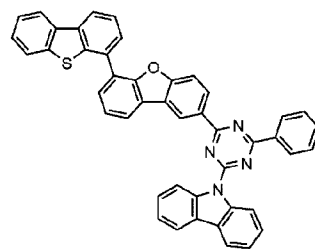
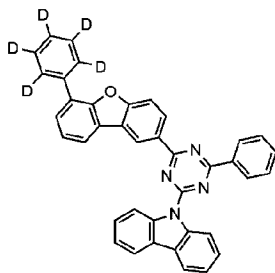
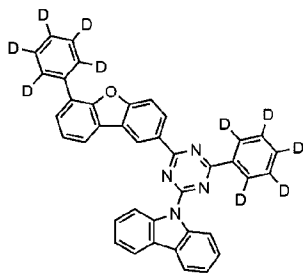
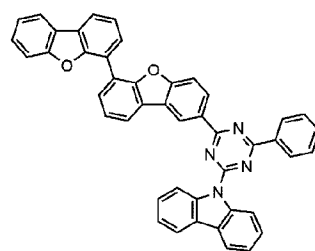
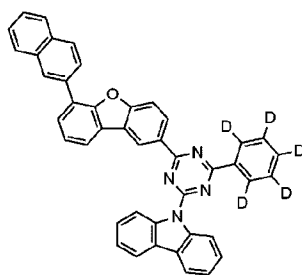
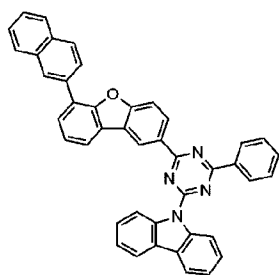
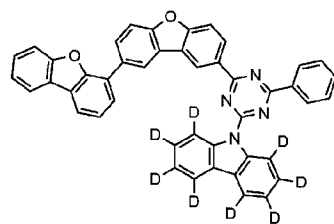
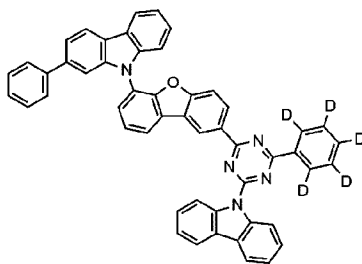
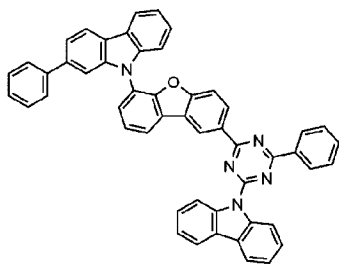
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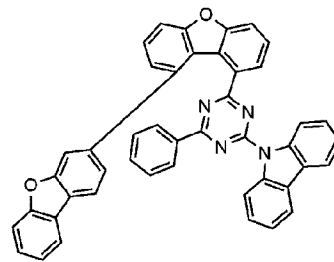
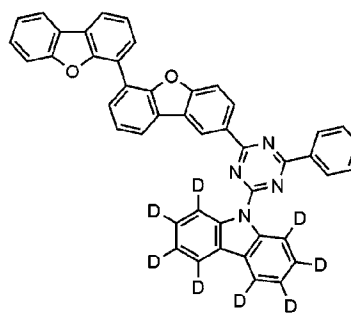
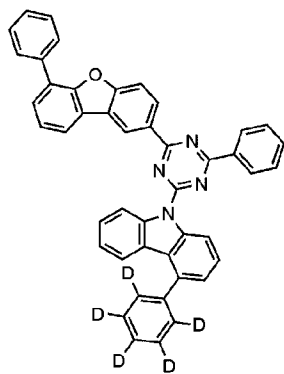
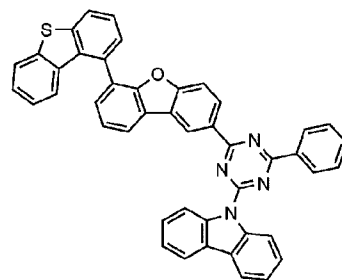
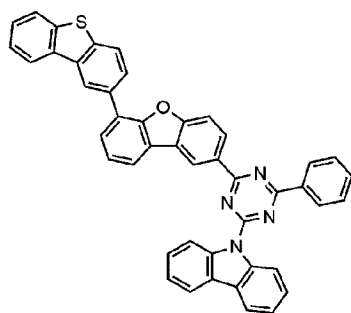
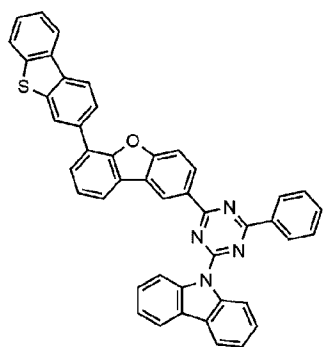
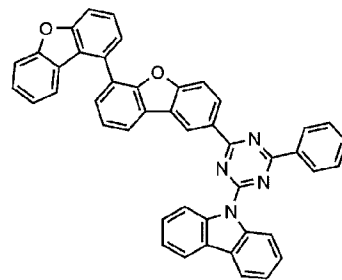
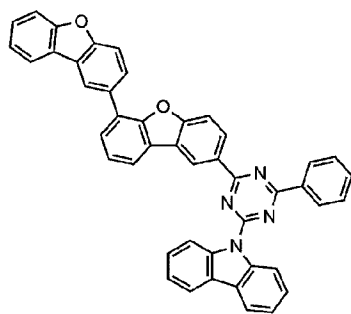
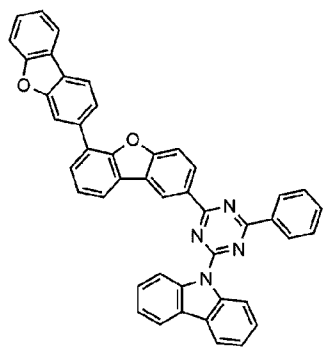
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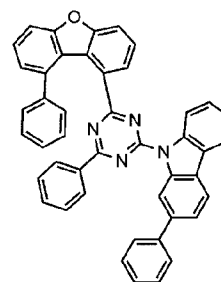
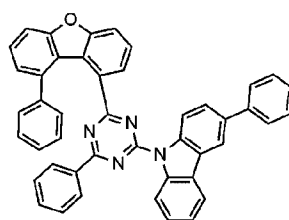
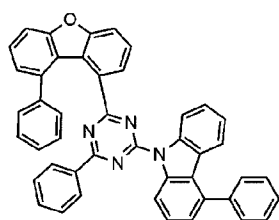
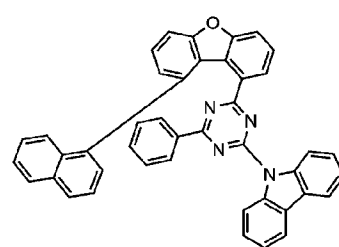
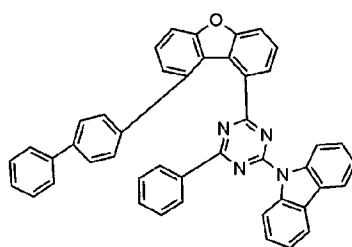
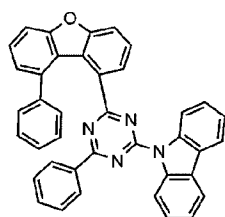
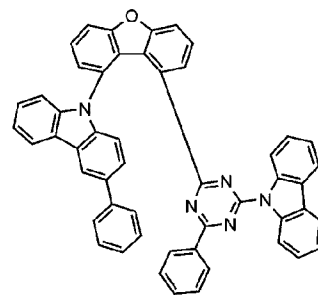
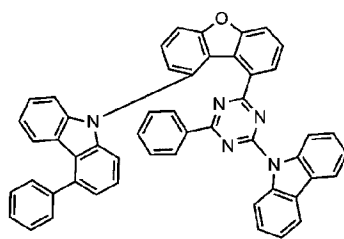
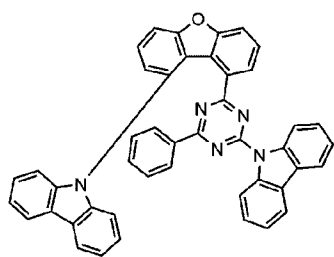
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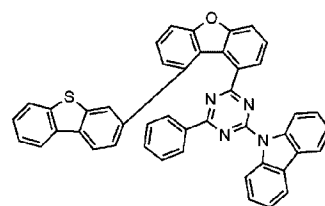
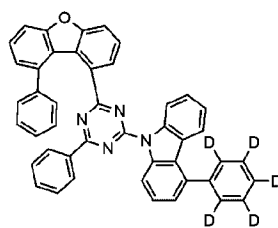
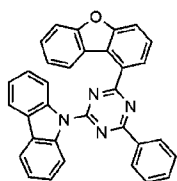
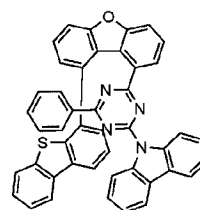
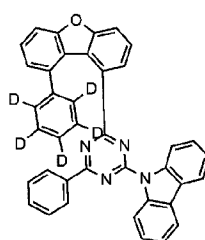
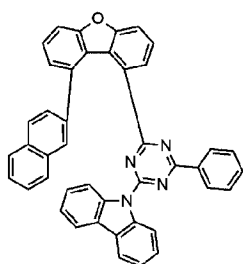
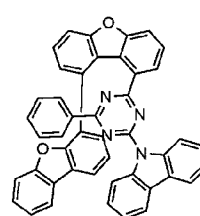
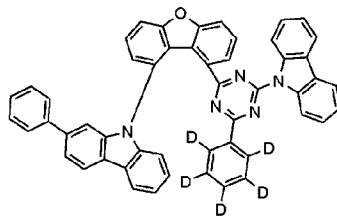
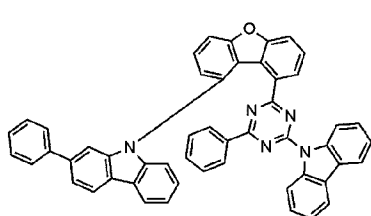
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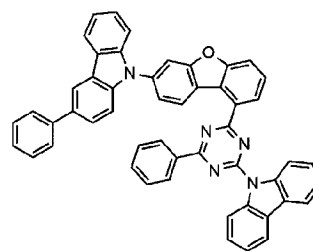
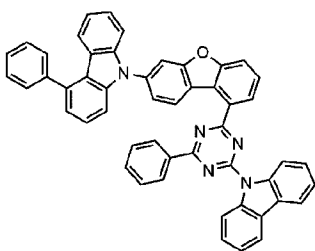
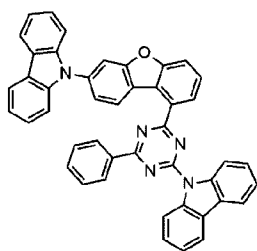
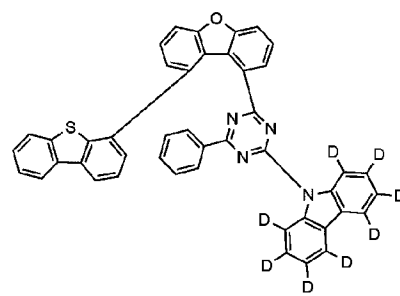
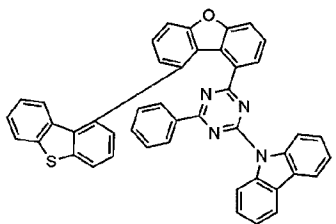
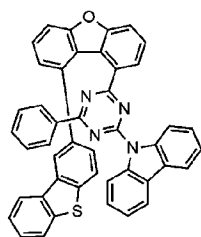
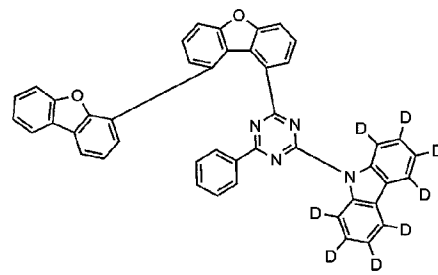
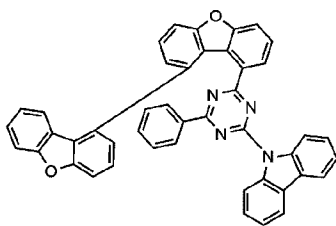
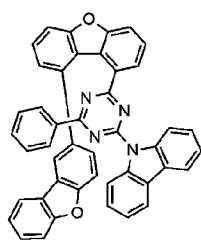
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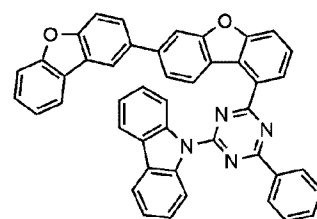
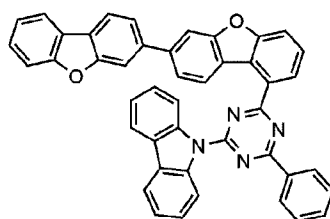
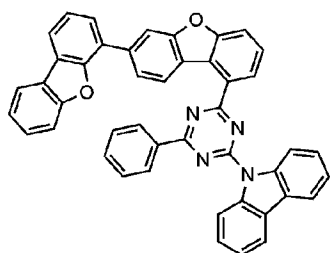
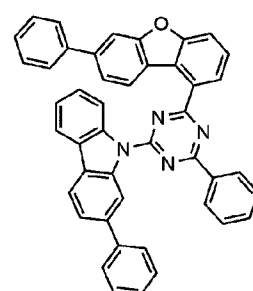
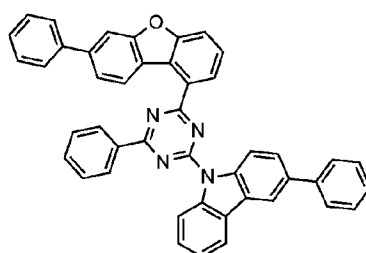
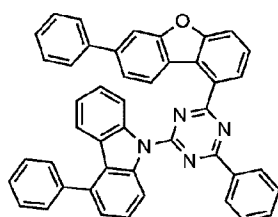
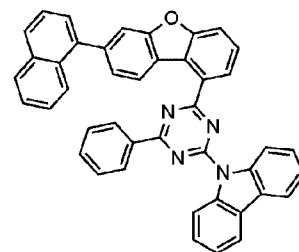
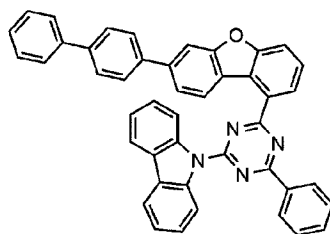
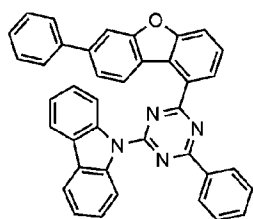
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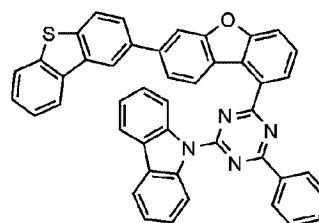
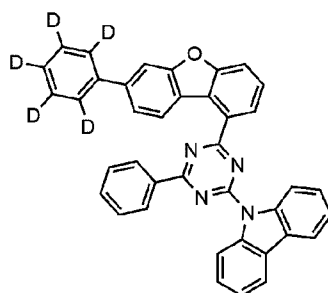
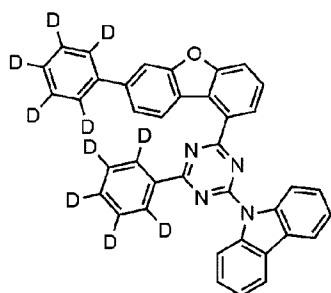
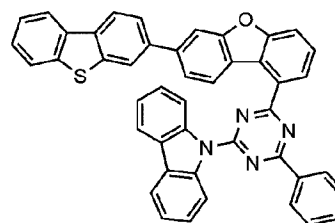
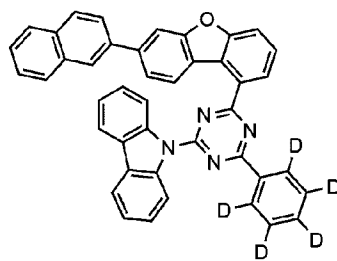
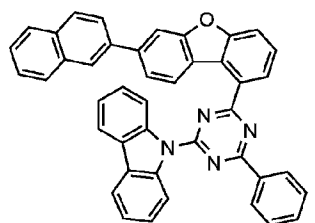
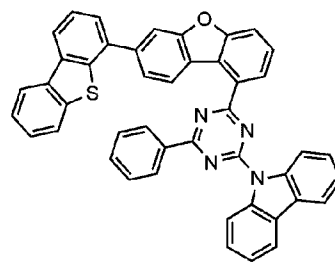
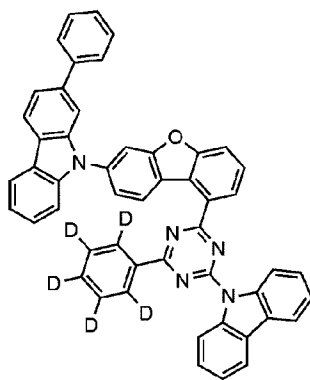
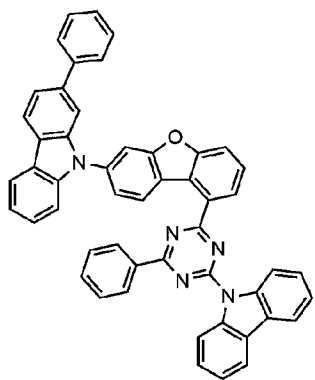
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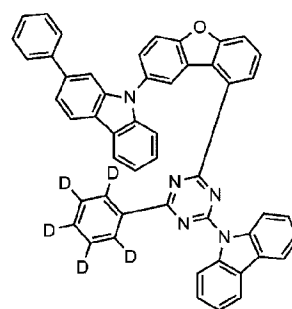
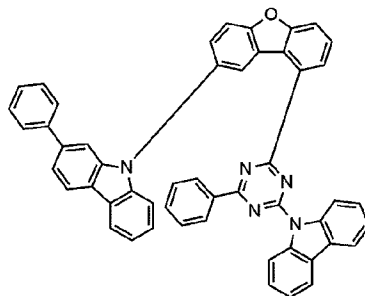
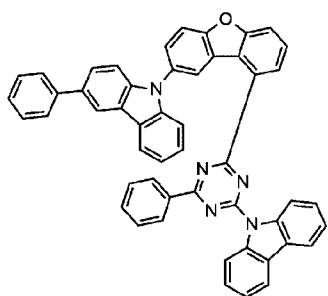
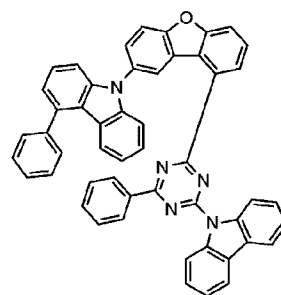
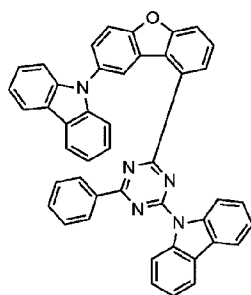
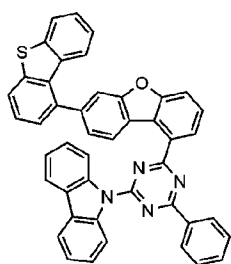
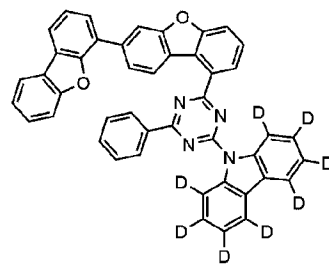
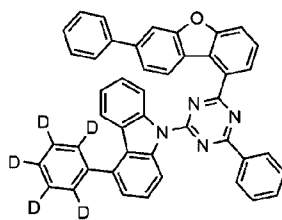
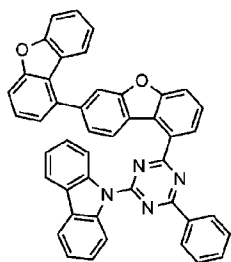
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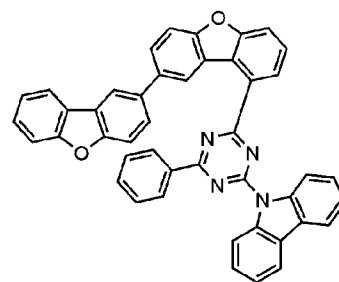
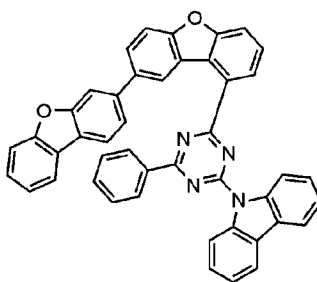
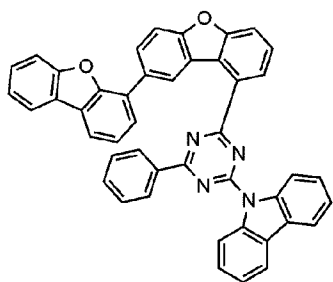
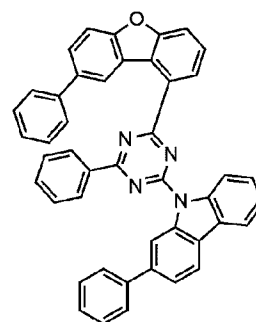
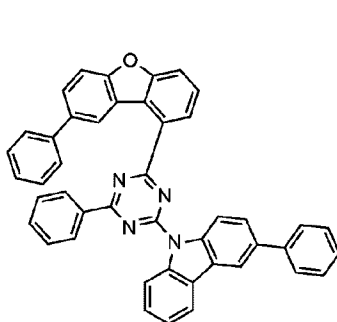
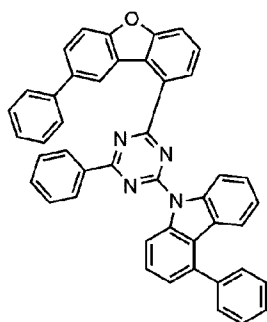
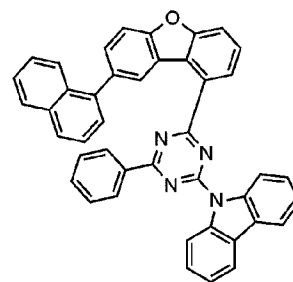
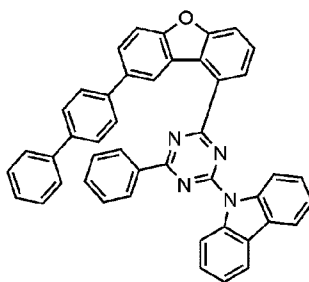
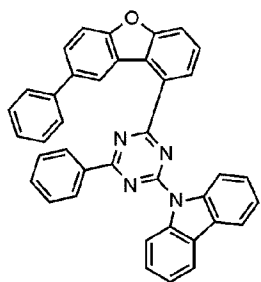
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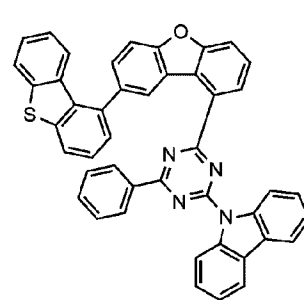
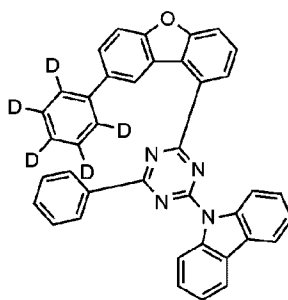
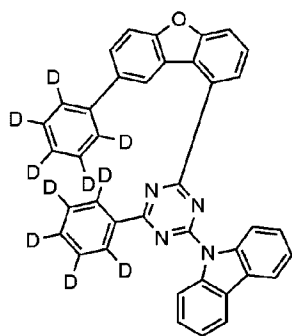
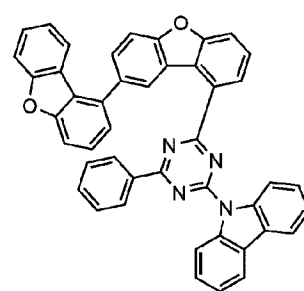
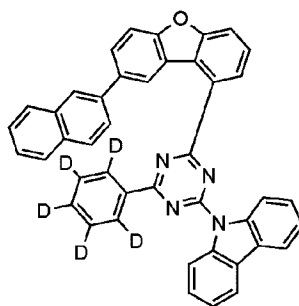
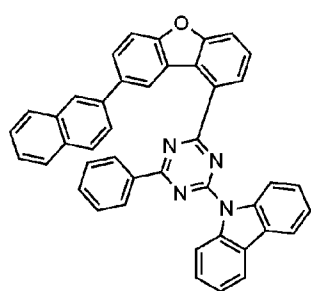
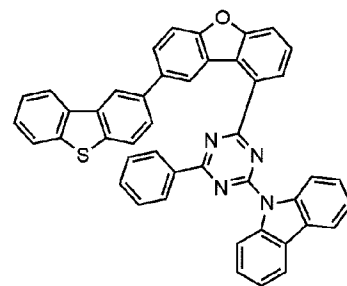
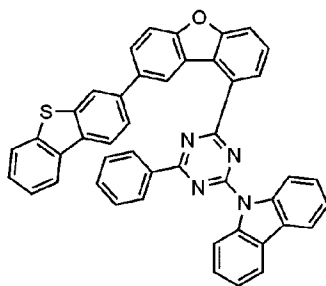
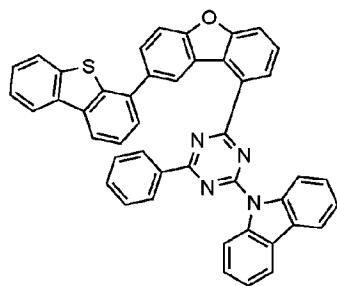
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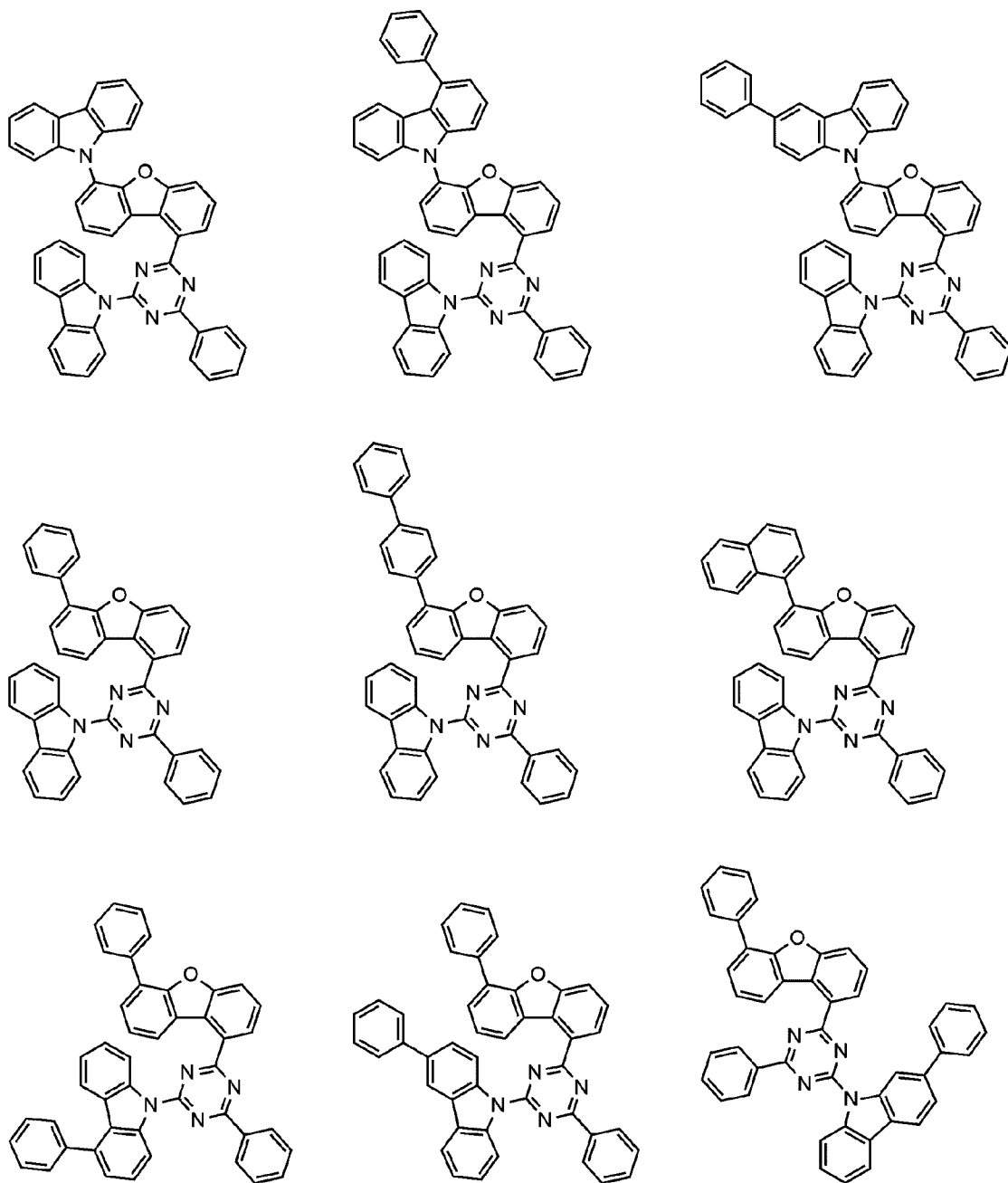
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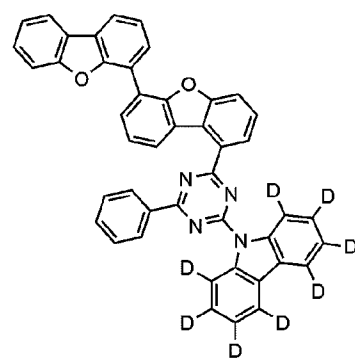
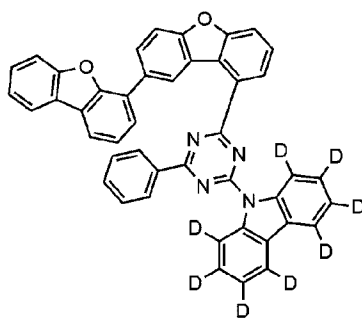
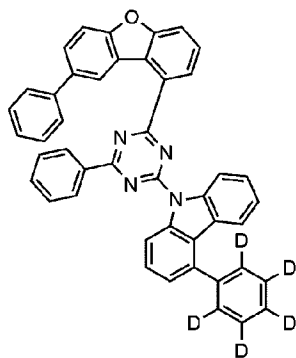
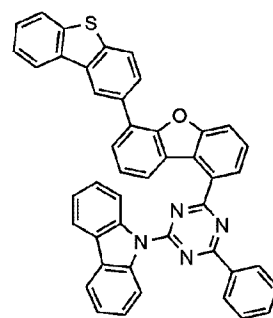
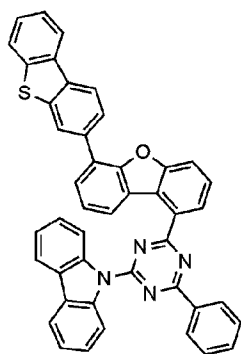
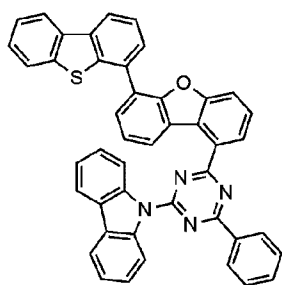
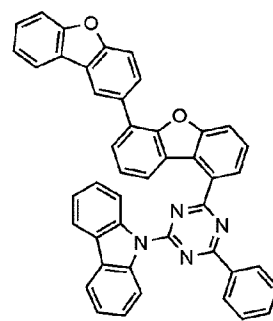
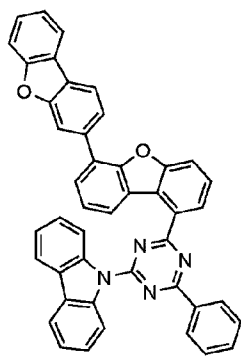
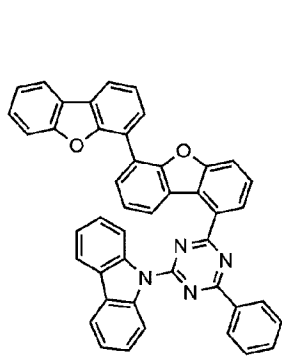
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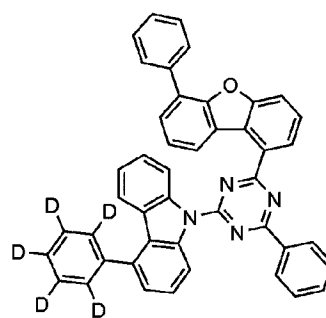
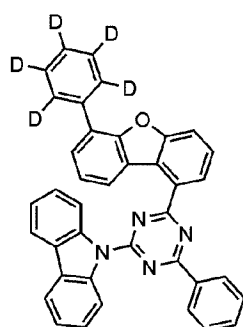
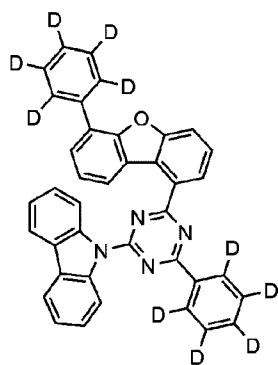
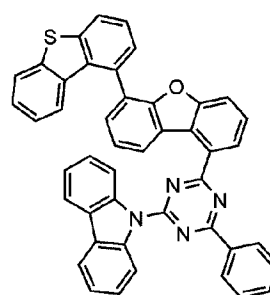
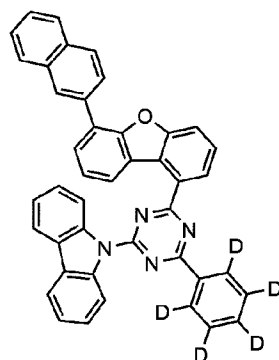
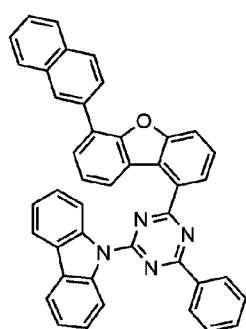
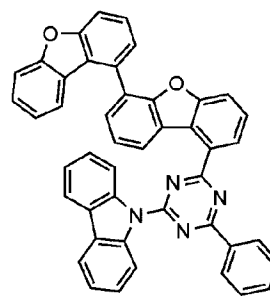
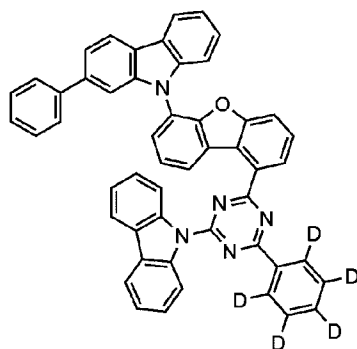
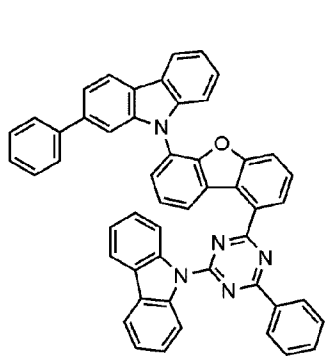
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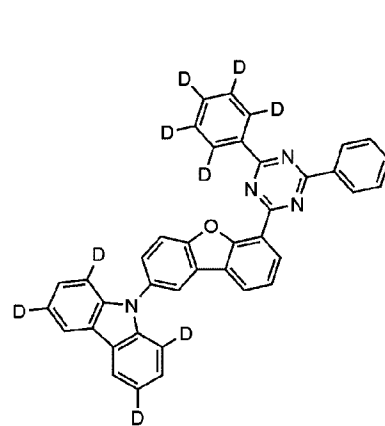
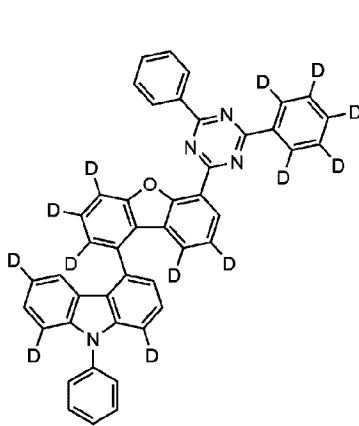
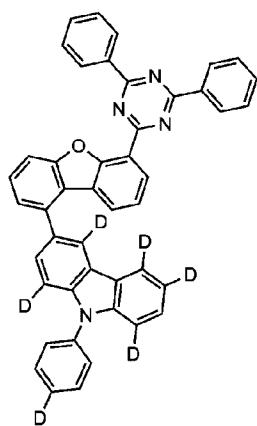
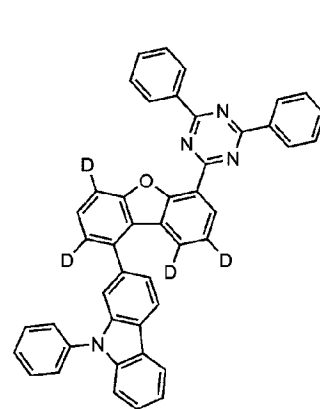
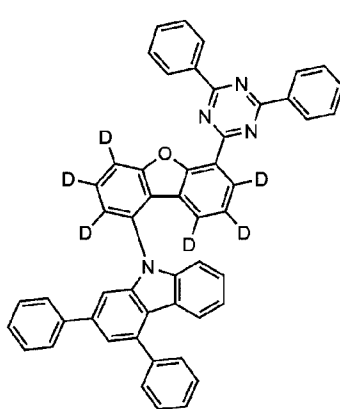
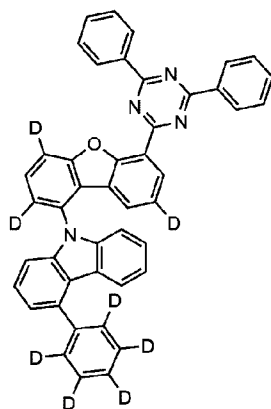
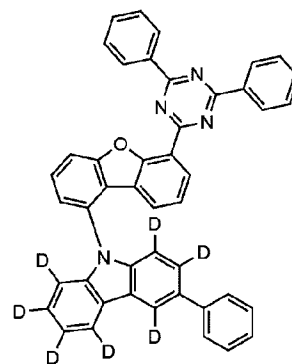
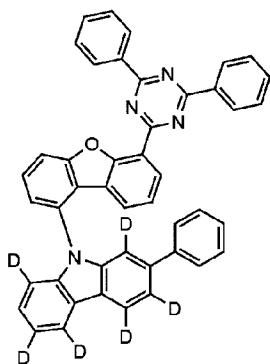
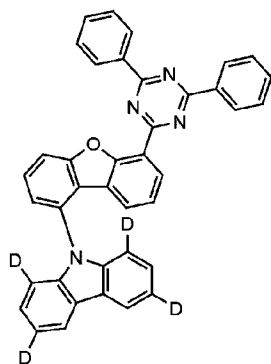
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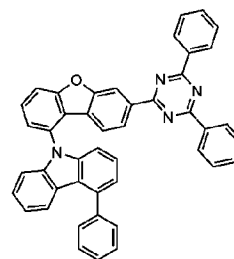
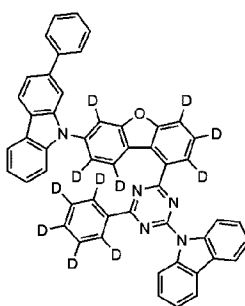
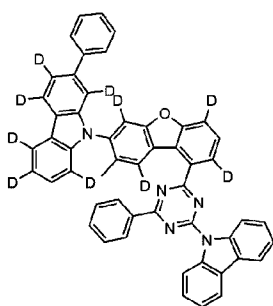
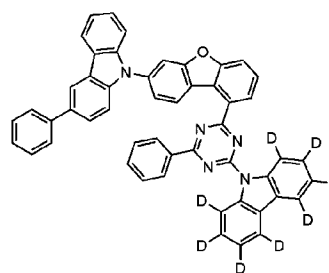
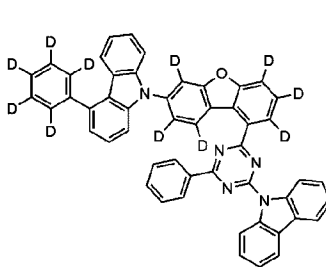
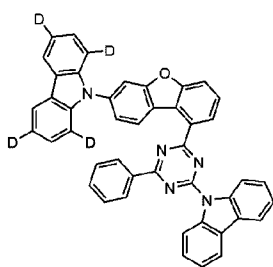
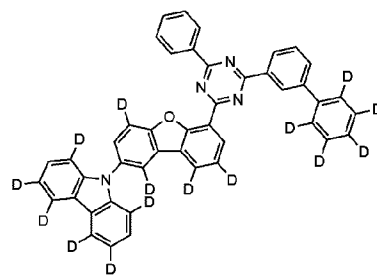
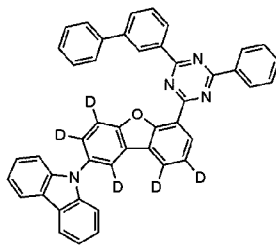
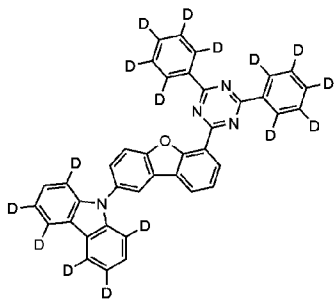
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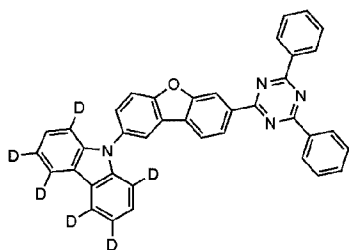
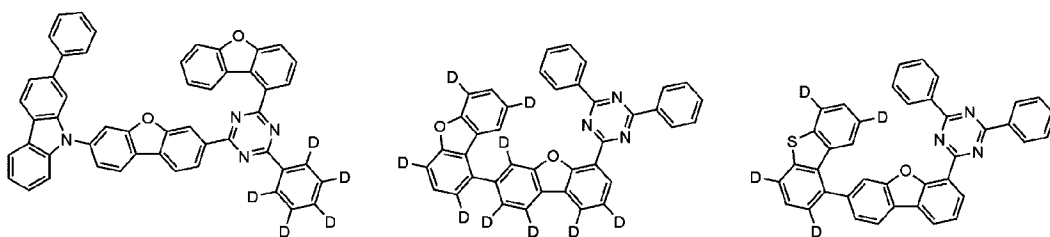
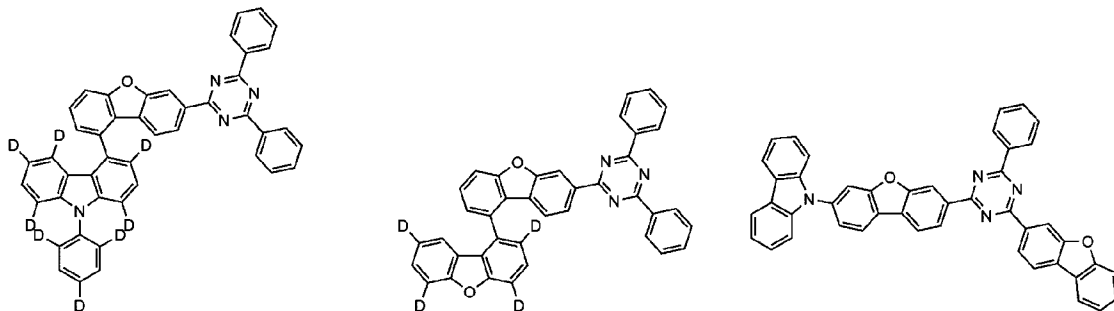
[432]



[433]



[434]



[435]

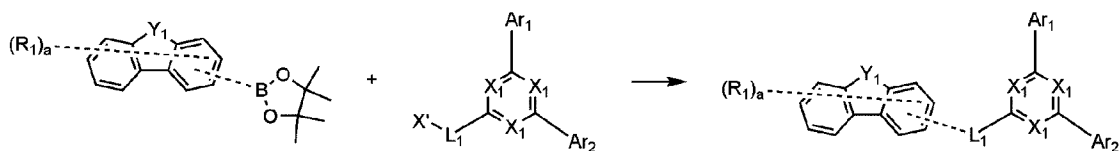
[436]

[437]

[438] 또한, 본 발명은 하기 반응식 1과 같은 상기 화학식 1로 표시되는 화합물의 제조 방법을 제공한다.

[439] [반응식 1]

[440]



[441] 상기 반응식 1에서, X'를 제외한 나머지 정의는 앞서 정의한 바와 같으며, X'는

할로젠이고 보다 바람직하게는 플루오로, 클로로, 또는 브로모이다.

[442]

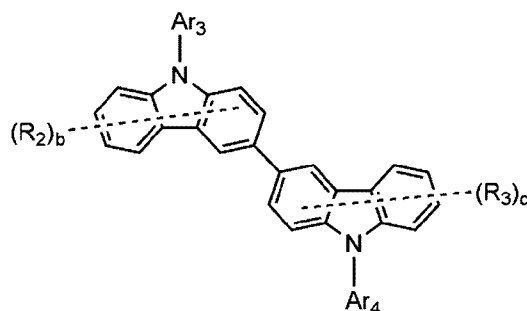
[443] 상기 반응은 스즈키 커플링 반응으로서, 팔라듐 촉매와 염기 존재하에 수행하는 것이 바람직하며, 스즈키 커플링 반응을 위한 반응기는 당업계에 알려진 바에 따라 변경이 가능하다. 상기 제조 방법은 후술할 제조예에서 보다 구체화될 수 있다.

[444]

[445] 한편, 상기 화학식 2는 하기 화학식 2-1일 수 있다.

[446] [화학식 2-1]

[447]



[448] 상기 화학식 2-1에서, Ar_3 , Ar_4 , R_3 , R_4 , b 및 c 의 정의는 제1항과 같다.

[449]

[450] Ar_3 및 Ar_4 는 각각 독립적으로, 치환 또는 비치환된 C_{6-30} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-30} 헤테로아릴일 수 있다. 구체적으로, Ar_3 및 Ar_4 는 각각 독립적으로, 페닐, 비페닐릴, 터페닐릴, 나프틸, 디메틸플루오레닐, 디벤조플라닐, 또는 디벤조티오페닐일 수 있다.

[451]

[452] R_2 및 R_3 는 각각 독립적으로, 수소, 중수소, 치환 또는 비치환된 C_{6-30} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-30} 헤테로아릴일 수 있다. 구체적으로, R_2 및 R_3 는 각각 독립적으로, 수소 또는 페닐일 수 있다. 예컨대, R_2 및 R_3 중 어느 하나는 페닐이고 나머지 하나는 수소이거나, R_2 및 R_3 모두 수소일 수 있다.

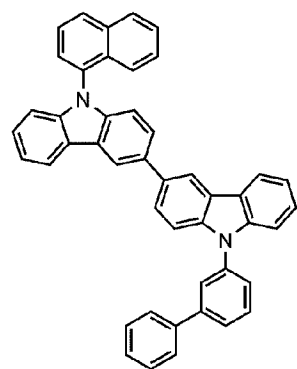
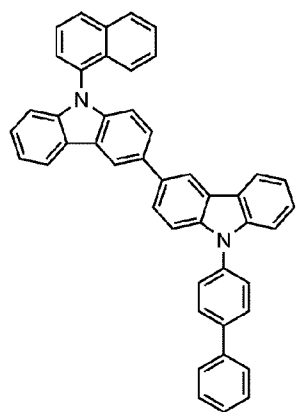
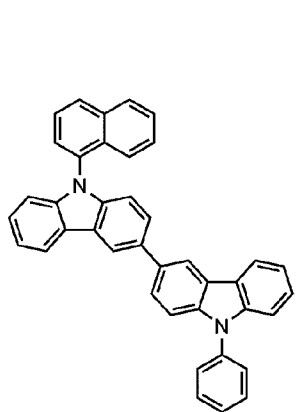
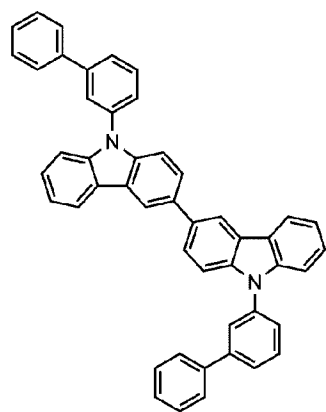
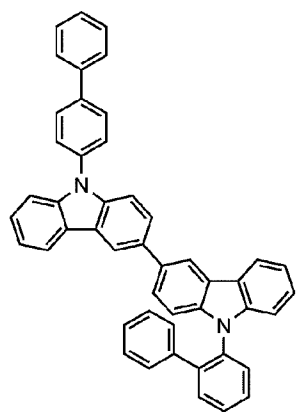
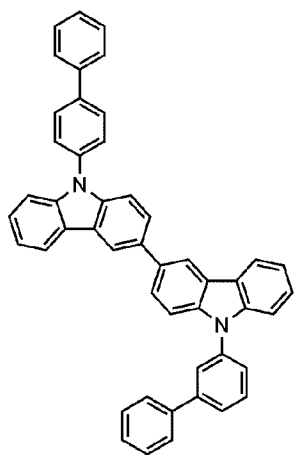
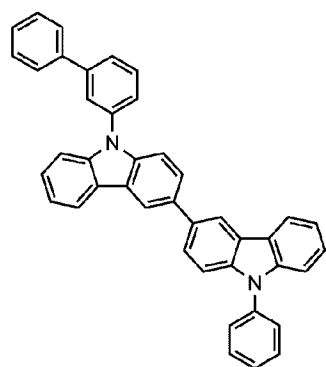
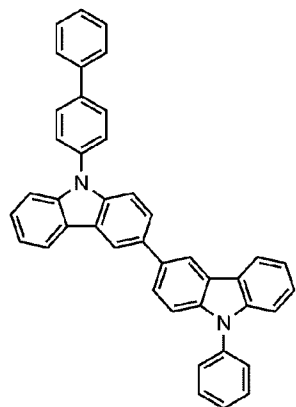
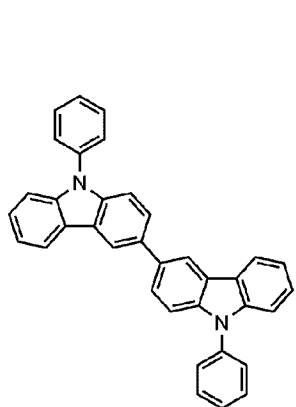
[453]

[454] b 및 c 는 각각 독립적으로 1 내지 7의 정수이고, 예컨대 각각 1일 수 있다.

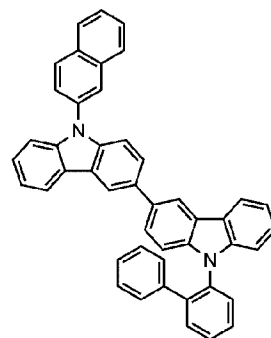
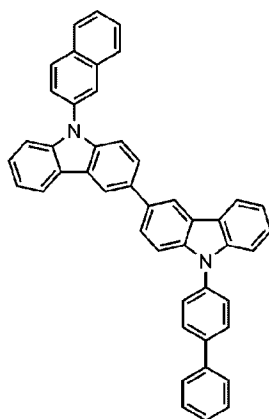
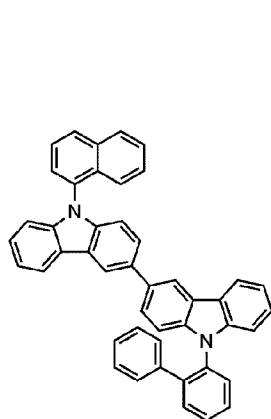
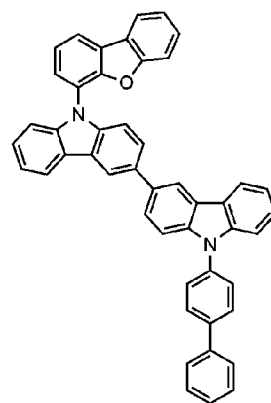
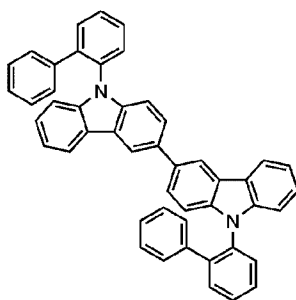
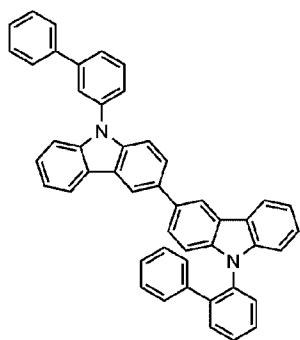
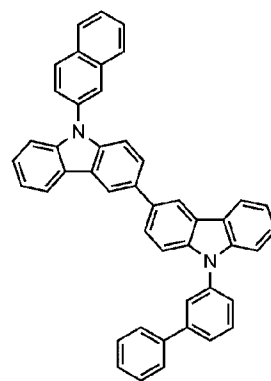
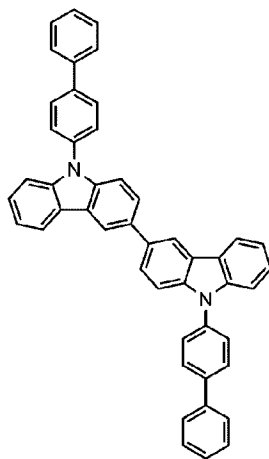
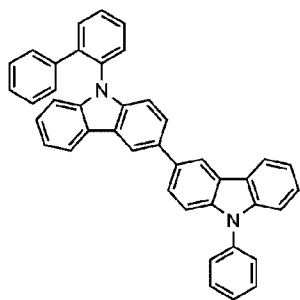
[455]

[456] 상기 화학식 2로 표시되는 화합물의 대표적인 예는 다음과 같다:

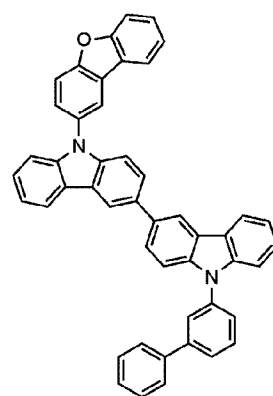
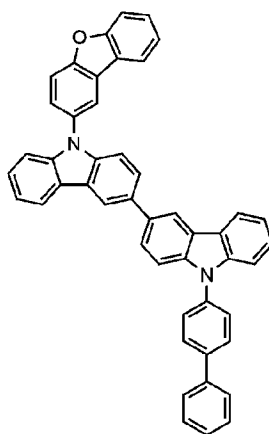
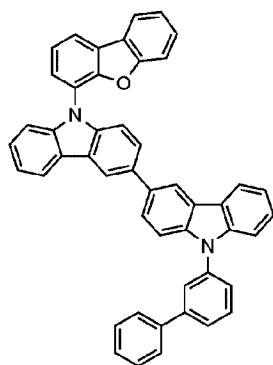
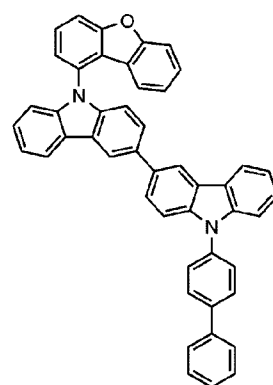
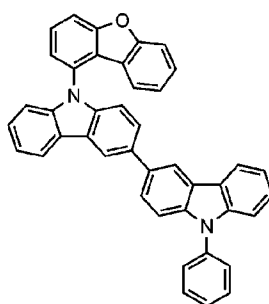
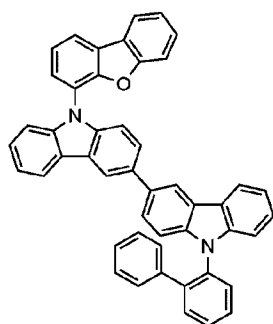
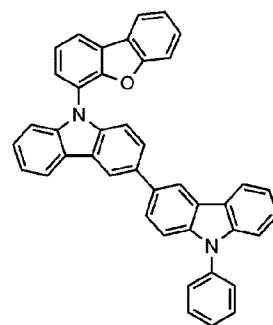
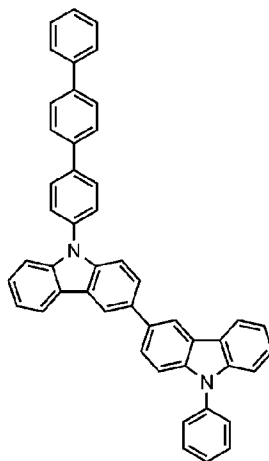
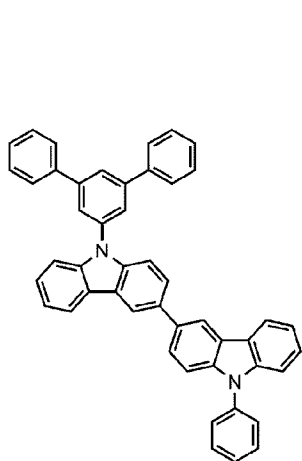
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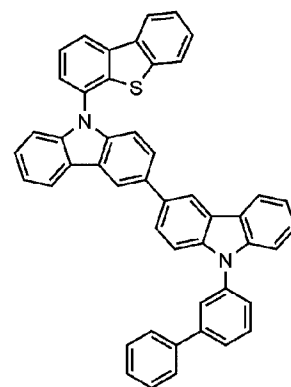
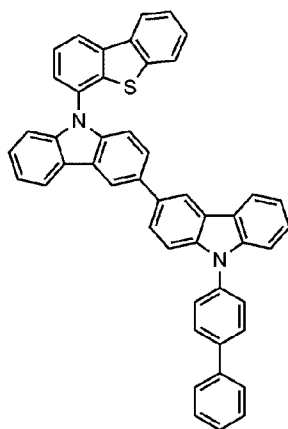
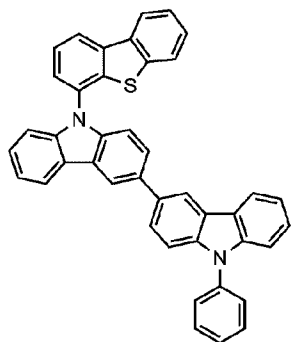
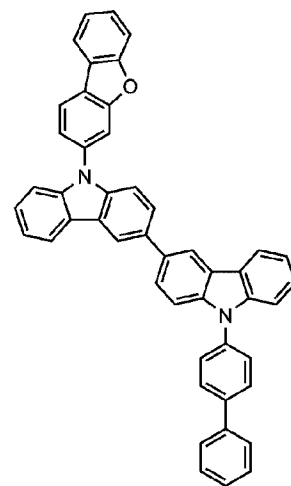
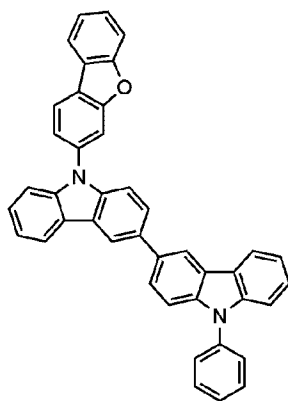
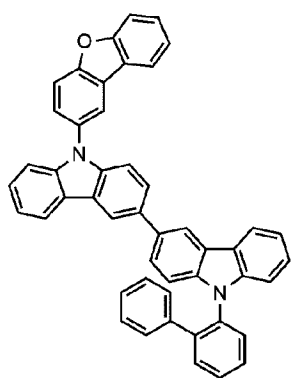
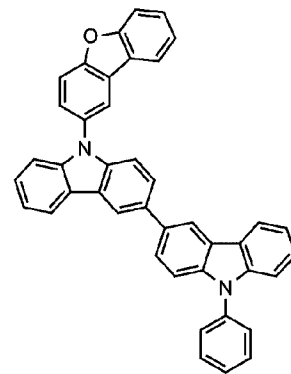
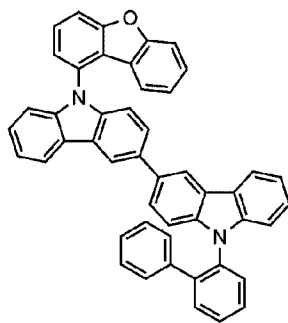
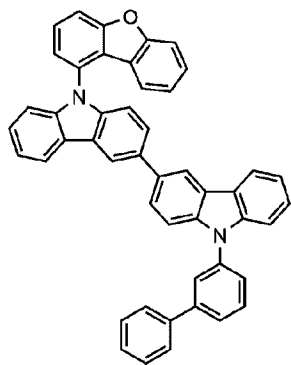
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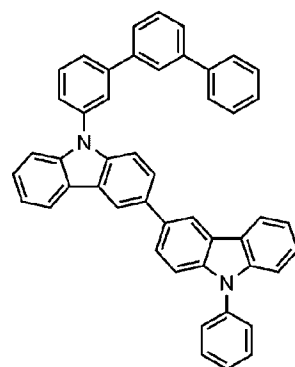
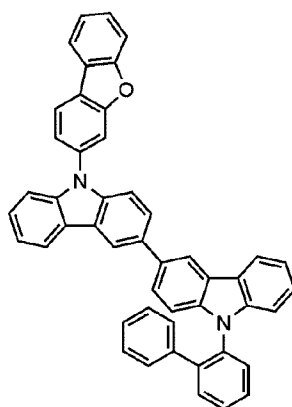
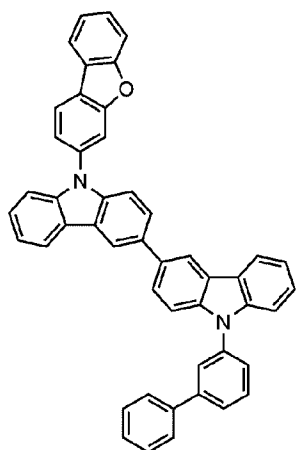
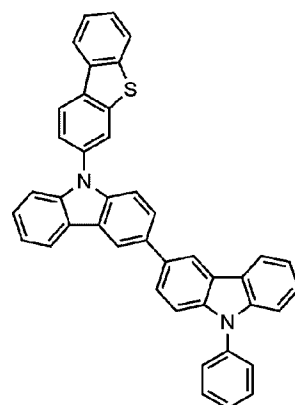
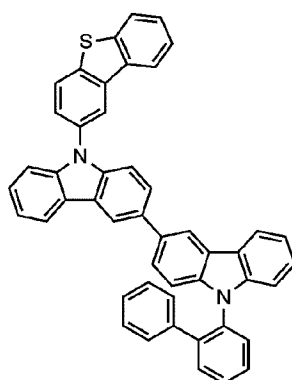
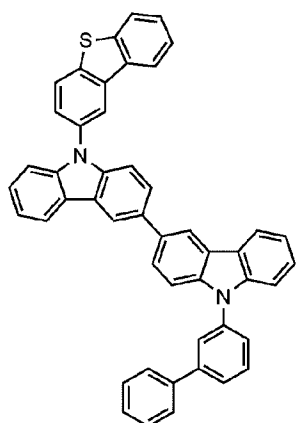
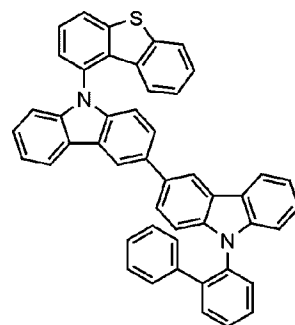
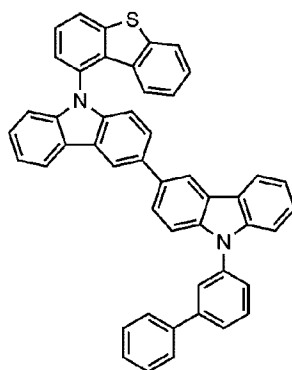
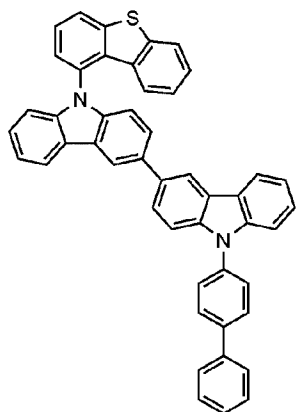
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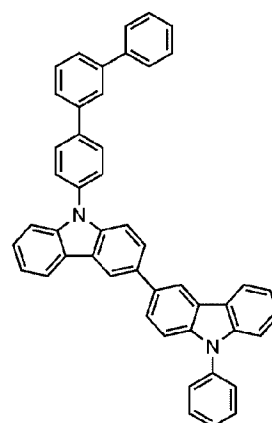
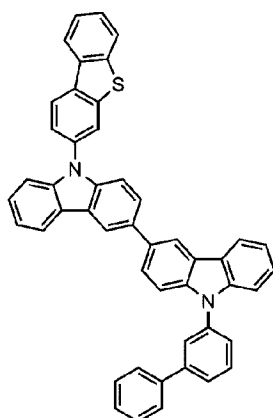
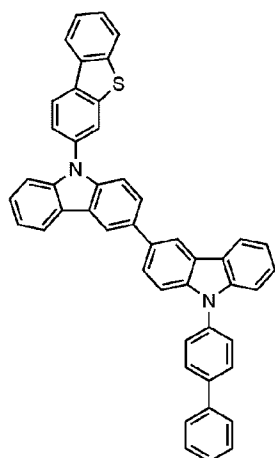
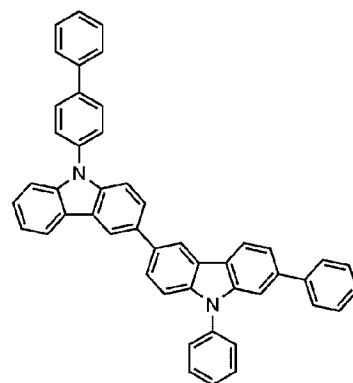
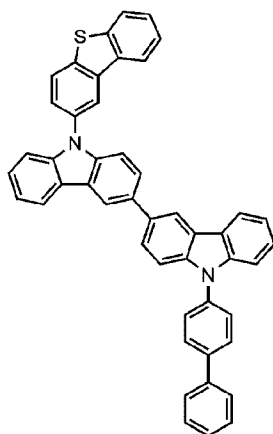
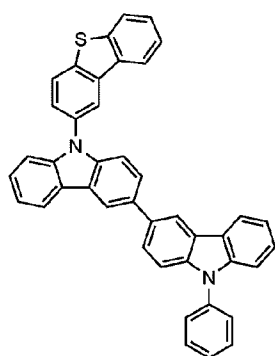
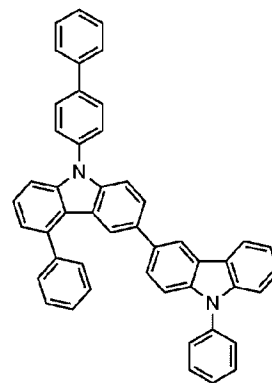
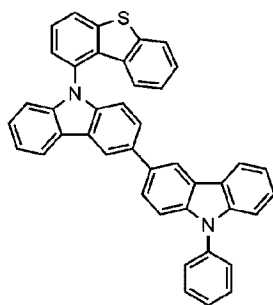
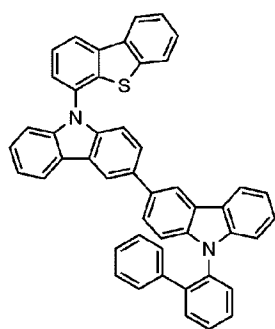
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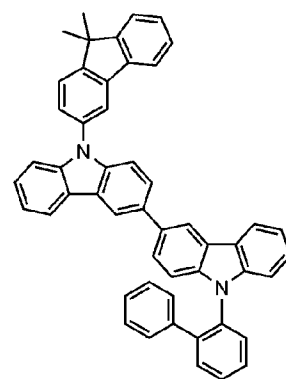
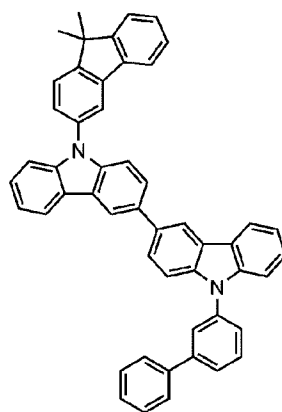
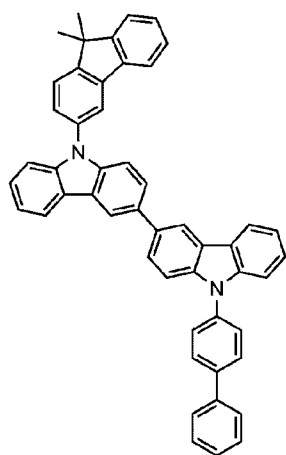
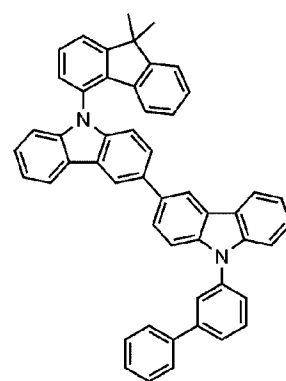
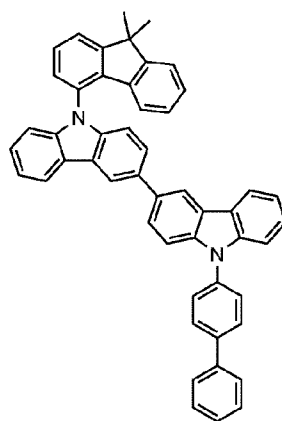
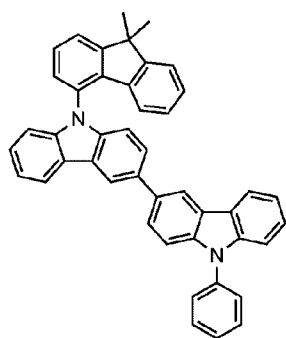
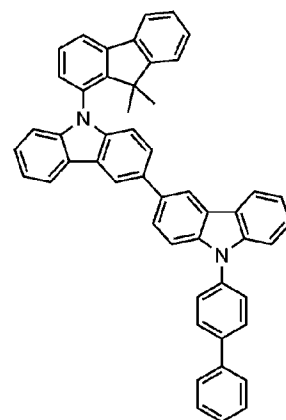
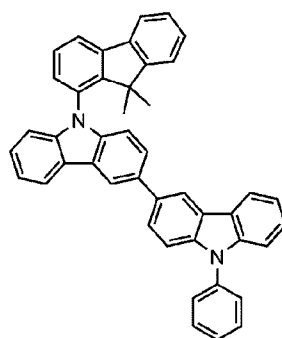
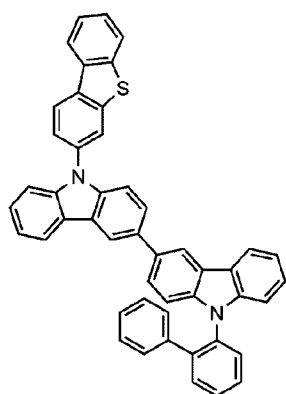
[461]



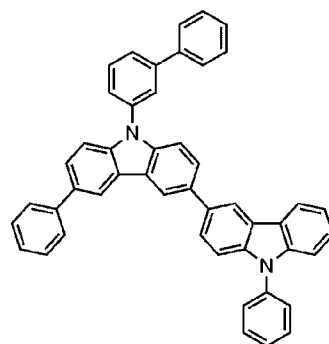
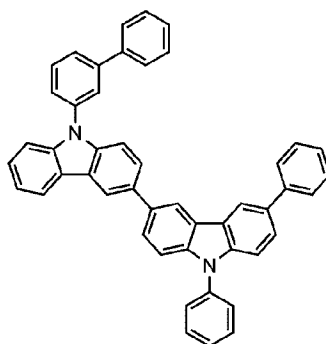
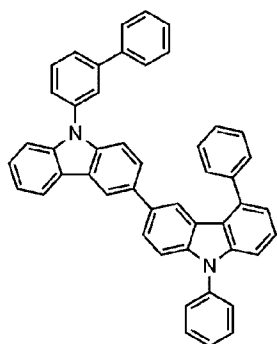
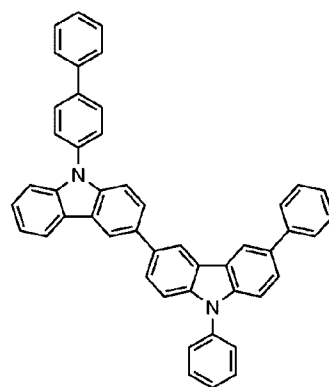
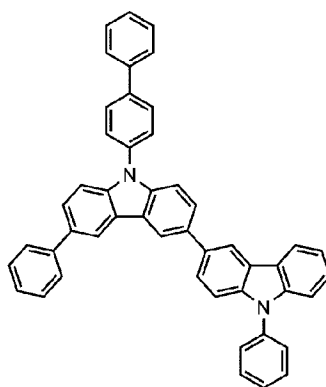
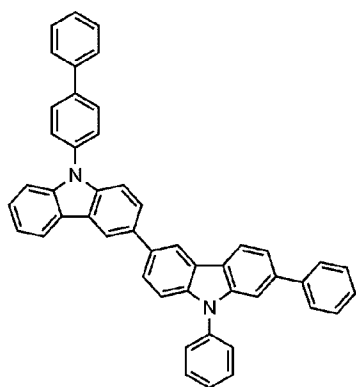
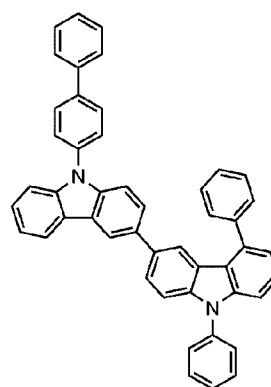
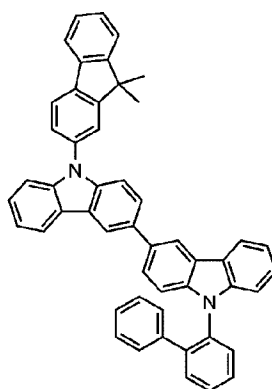
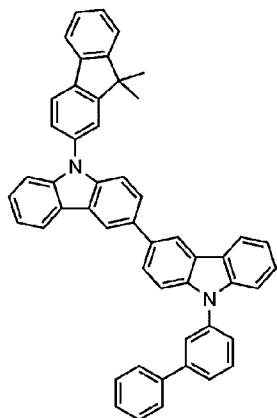
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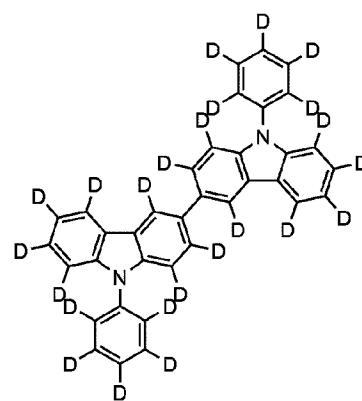
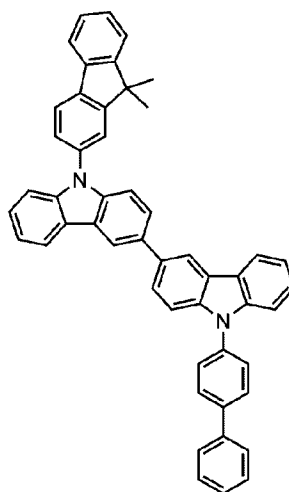
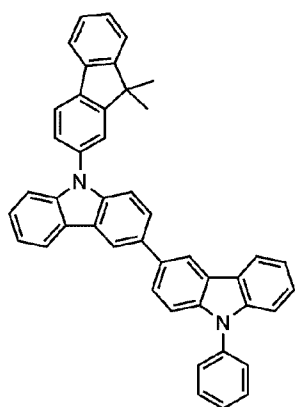
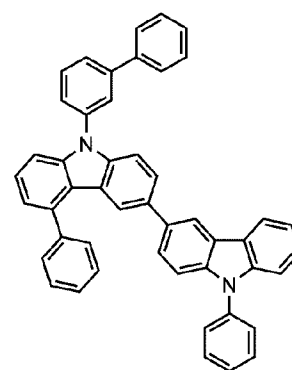
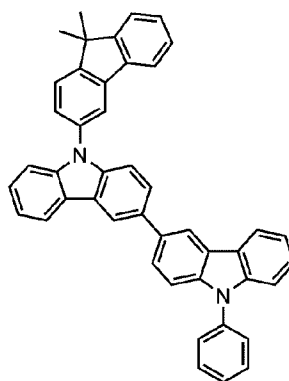
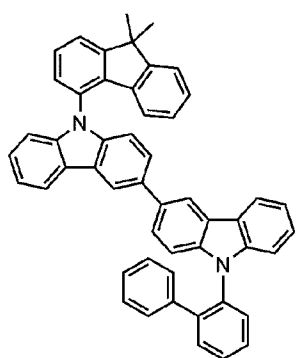
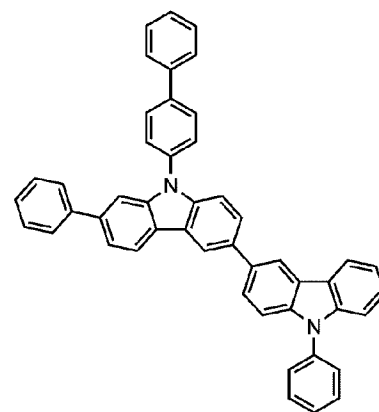
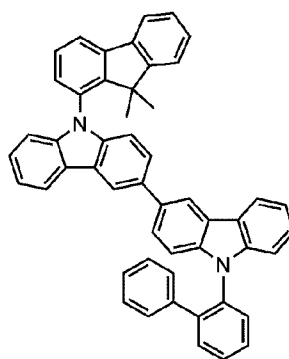
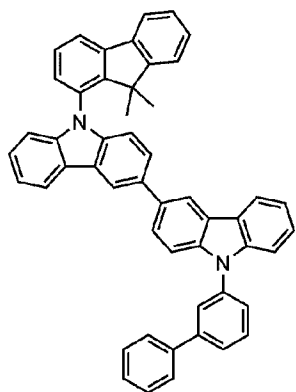
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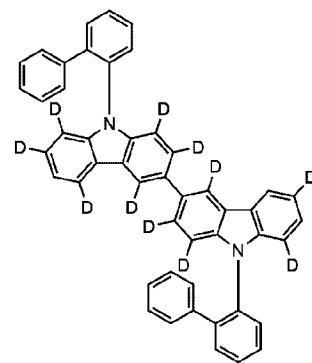
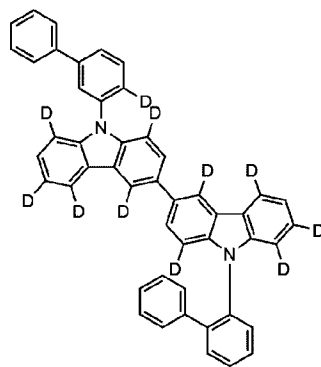
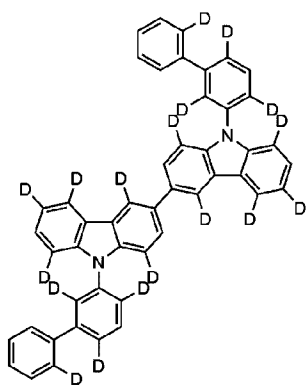
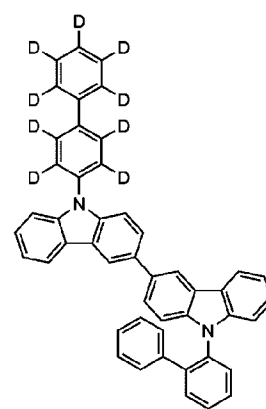
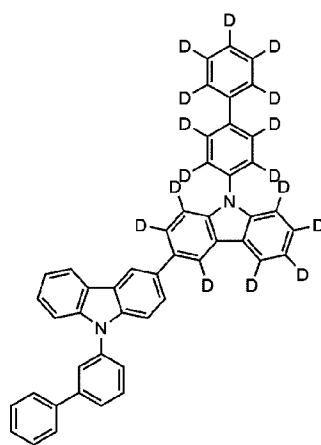
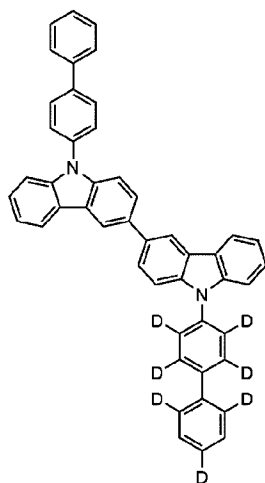
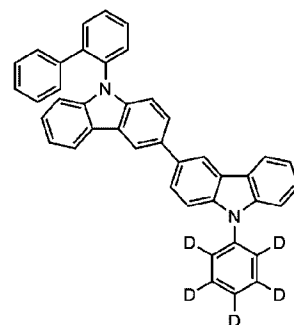
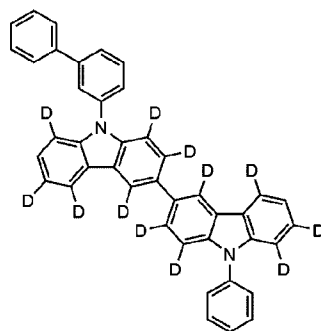
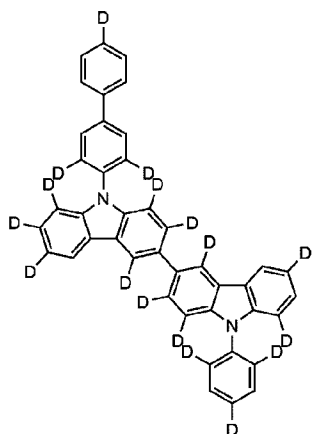
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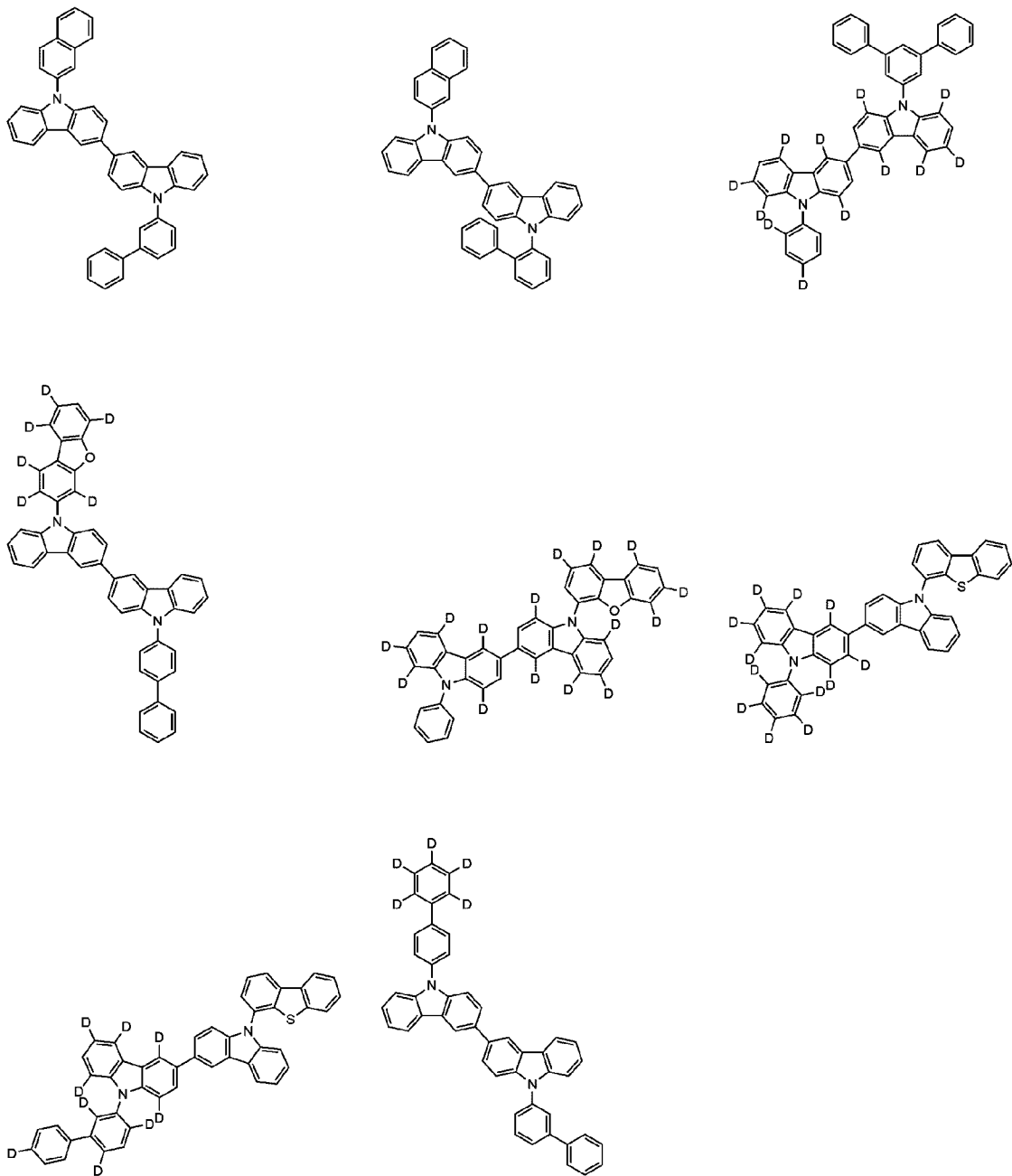
[465]



[466]



[467]

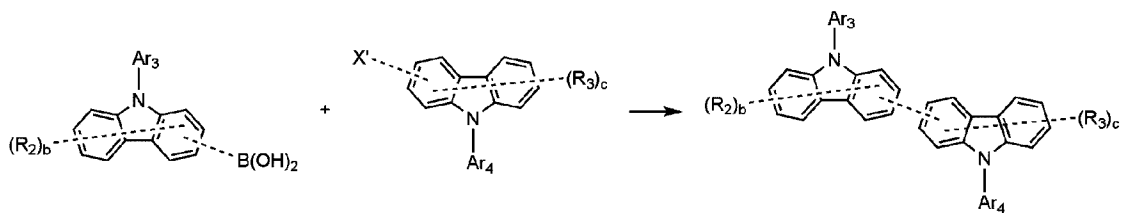


[468]

[469] 또한, 본 발명은 하기 반응식 2와 같은 상기 화학식 2로 표시되는 화합물의 제조 방법을 제공한다.

[470] [반응식 2]

[471]



[472] 상기 반응식 2에서, X'를 제외한 나머지 정의는 앞서 정의한 바와 같으며, X'는

할로젠이고 보다 바람직하게는 플루오로, 클로로, 또는 브로모이다.

[473]

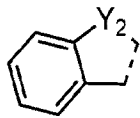
[474] 상기 반응은 스즈키 커플링 반응으로서, 팔라듐 촉매와 염기 존재하에 수행하는 것이 바람직하며, 스즈키 커플링 반응을 위한 반응기는 당업계에 알려진 바에 따라 변경이 가능하다. 상기 제조 방법은 후술할 제조예에서 보다 구체화될 수 있다.

[475]

[476] 상기 화학식 3에서, B는 인접한 두 개의 오각 고리와 축합된 벤젠 고리이고, C는 하기 화학식 4-1 또는 4-2이다:

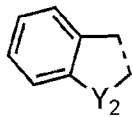
[477] [화학식 4-1]

[478]



[479] [화학식 4-2]

[480]



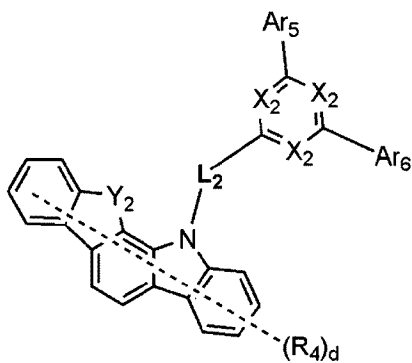
[481] 상기 화학식 4-1 및 4-2에서, 점선은 상기 B와 축합된 것이다.

[482]

[483] B 및 C의 축합 형태에 따라, 상기 화학식 3은 하기 화학식 3-1 내지 3-6 중 어느 하나의 구조일 수 있다:

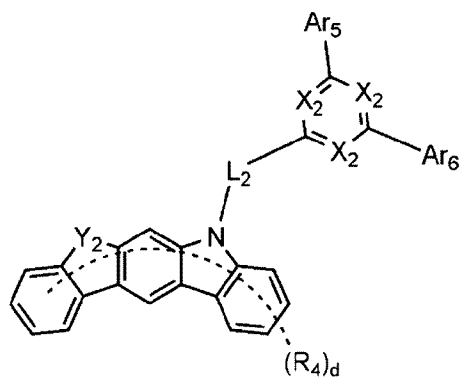
[484] [화학식 3-1]

[485]



[486] [화학식 3-2]

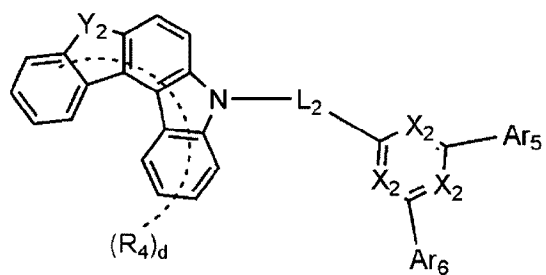
[487]



[488]

[화학식 3-3]

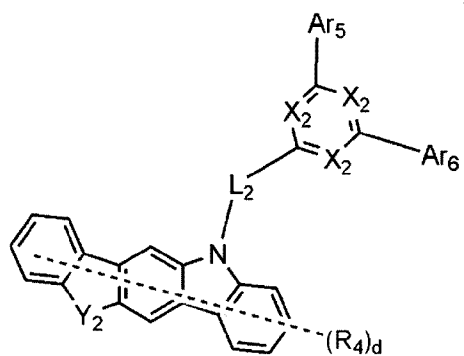
[489]



[490]

[화학식 3-4]

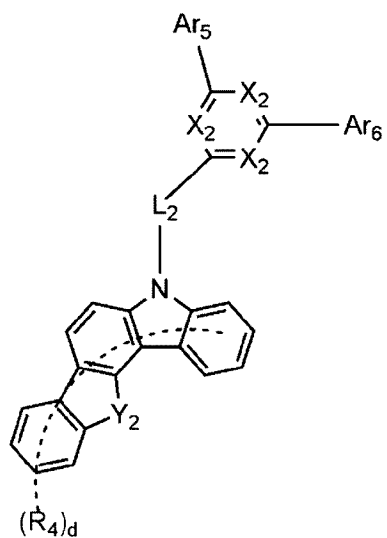
[491]



[492]

[화학식 3-5]

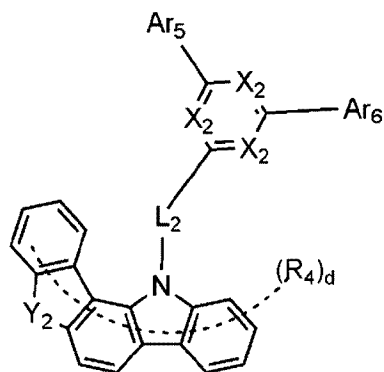
[493]



[494]

[화학식 3-6]

[495]



[496] 상기 화학식 3-1 내지 3-6에서, X_2 , L_2 , Ar_5 , Ar_6 , R_4 , Y_2 , 및 d 의 정의는 전술한 바와 같다.

[497]

[498] X_1 내지 X_3 는 각각 독립적으로 CH 또는 N이되, X_1 내지 X_3 중 적어도 하나는 N이다.

[499]

[500] L_2 는 직접 결합, 치환 또는 비치환된 C_{6-30} 아릴렌, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-30} 헤테로아릴렌일 수 있다. 구체적으로, L_2 는 직접 결합 또는 페닐렌이고; 상기 L_2 가 페닐렌인 경우, 비치환되거나, 하나 이상의 중수소로 치환된 것일 수 있다.

[501]

[502] Ar_5 및 Ar_6 은 각각 독립적으로, 치환 또는 비치환된 C_{6-30} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-30} 헤테로아릴일 수 있다. 구체적으로 Ar_5 및 Ar_6 은 각각 독립적으로, 페닐, 비페닐릴, (페닐)비페닐릴, 트리페닐레닐, 디메틸플루오레닐, 디벤조플라닐, 디벤조티오펜일, 카바졸-9-일, 또는 9-페닐-9H-카바졸릴이고; 상기 Ar_5 및 Ar_6 은 각각 독립적으로, 비치환되거나, 적어도 하나 이상의 중수소로 치환된 것일 수 있다.

[503]

[504] Y_2 는 $C(CH_3)_2$, $C(C_6C_5)_2$, O, S, 또는 $N(Ar_7)$ 이고, 여기서, Ar_7 은 치환 또는 비치환된 C_{6-30} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-30} 헤테로아릴일 수 있다. 구체적으로, Ar_7 은, 디벤조플라닐, 또는 디벤조티오펜일이고; 상기 Ar_7 은 비치환되거나, 적어도 하나 이상의 중수소로 치환된 것일 수 있다.

[505]

[506] R_4 는 수소, 중수소, 치환 또는 비치환된 C_{6-30} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-30} 헤테로아릴일 수 있다. 구체적으로, R_4 는 수소 또는 중수소일 수 있다.

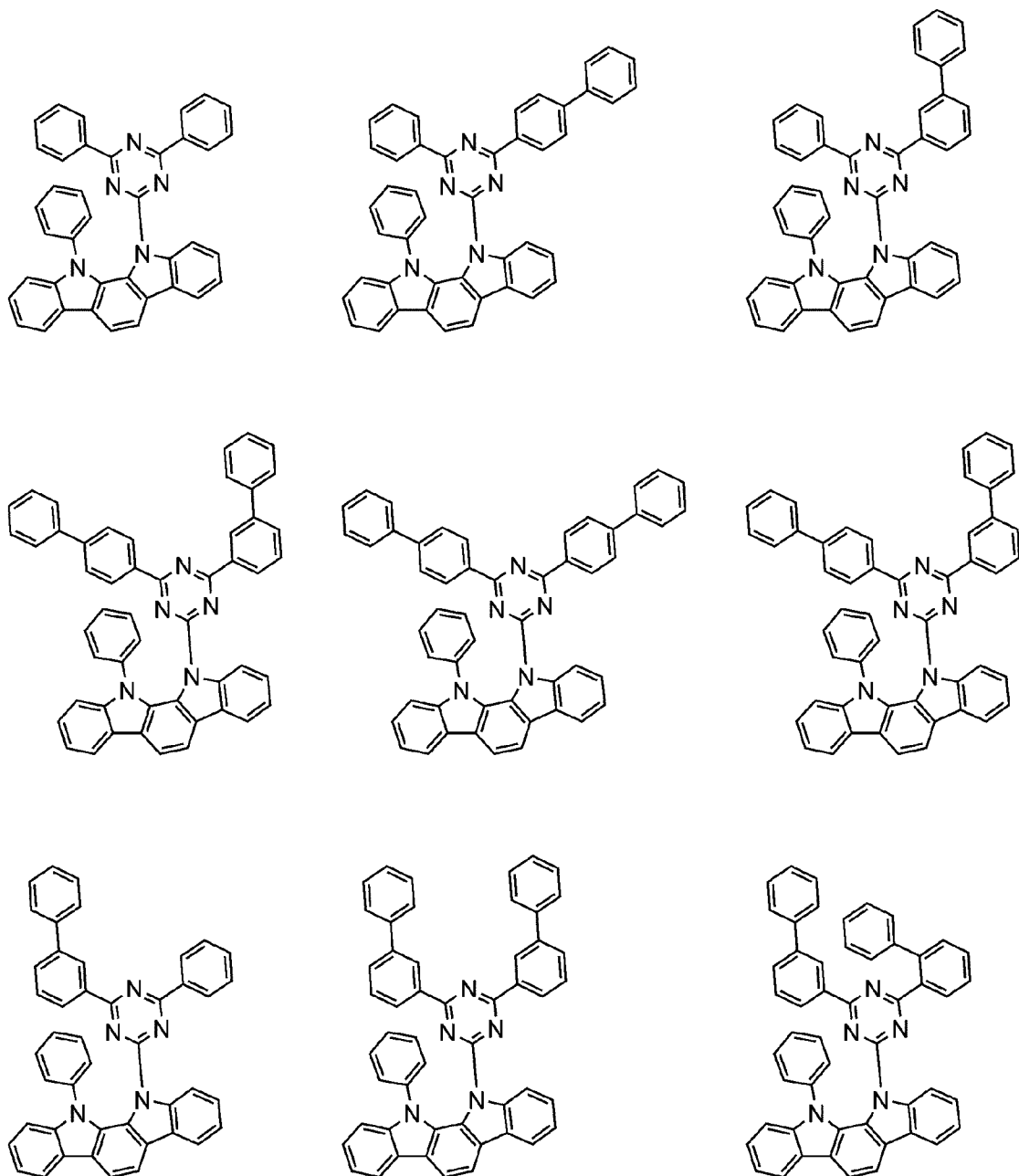
[507]

[508] d는 1 내지 10의 정수이다.

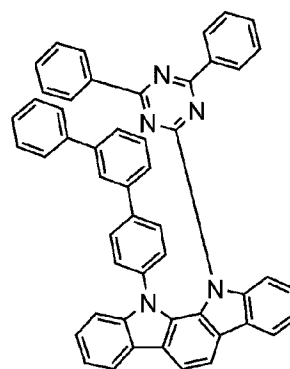
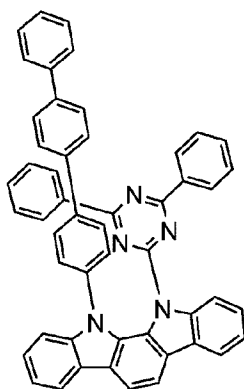
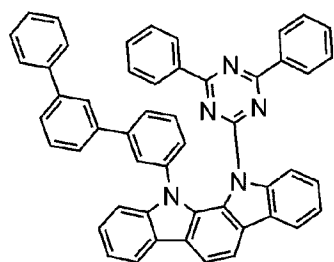
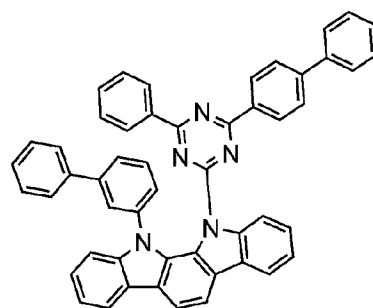
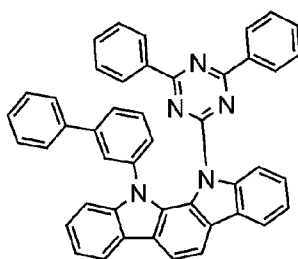
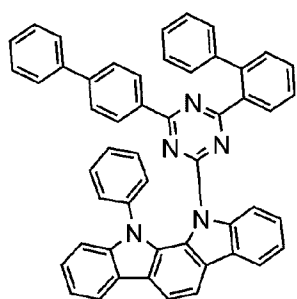
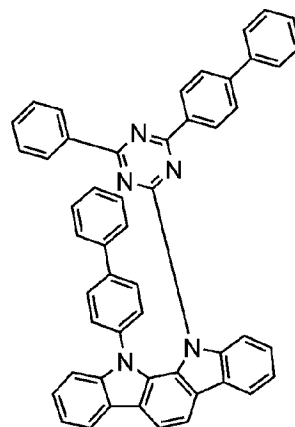
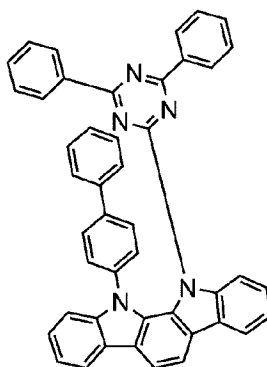
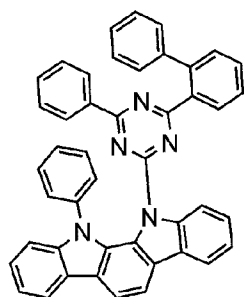
[509]

[510] 상기 화학식 3으로 표시되는 화합물의 대표적인 예는 다음과 같다:

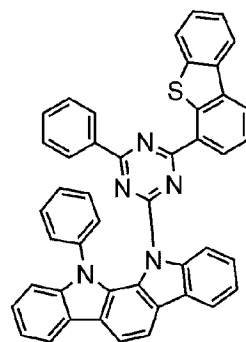
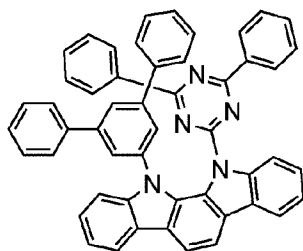
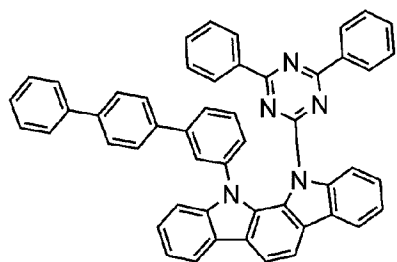
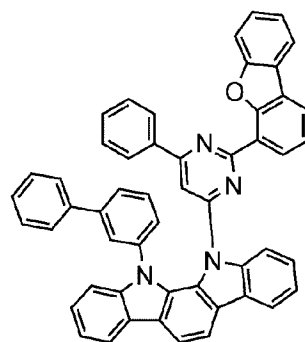
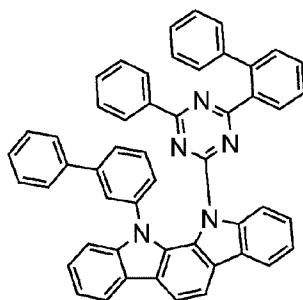
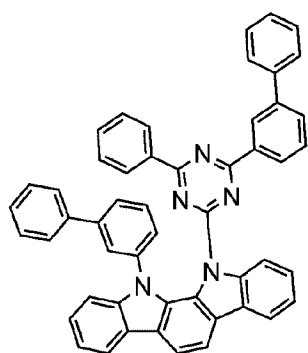
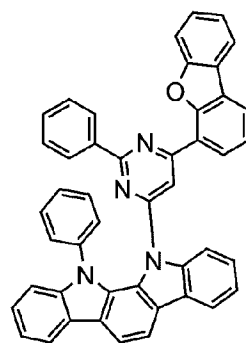
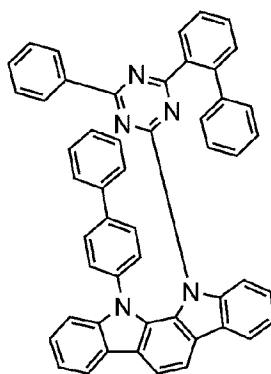
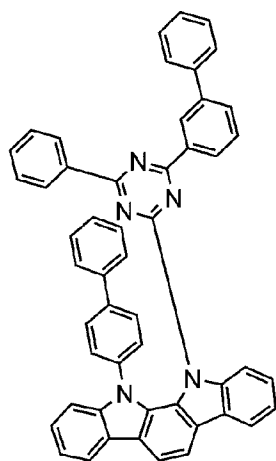
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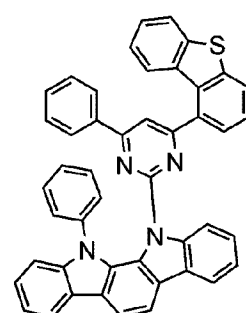
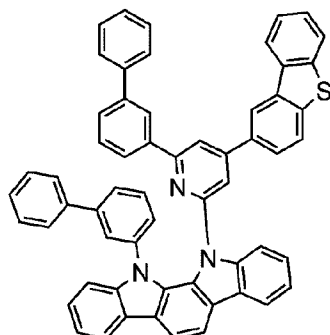
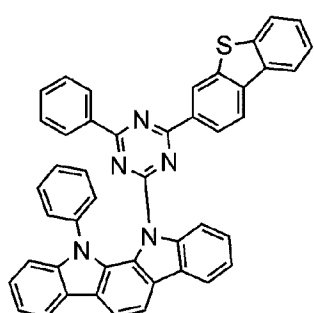
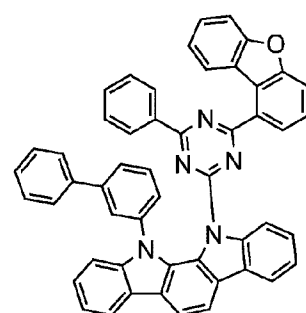
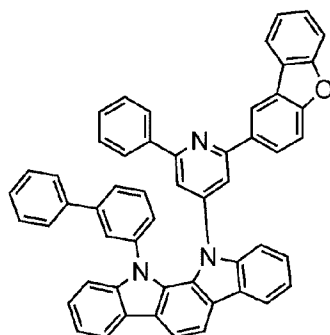
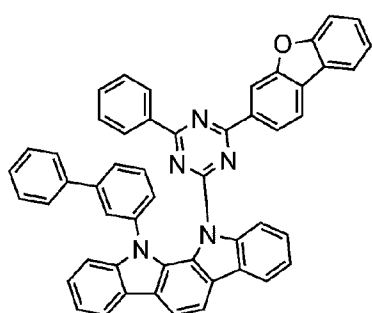
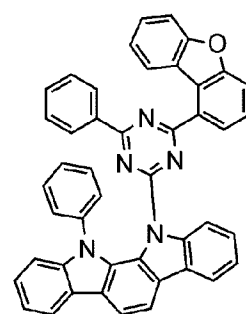
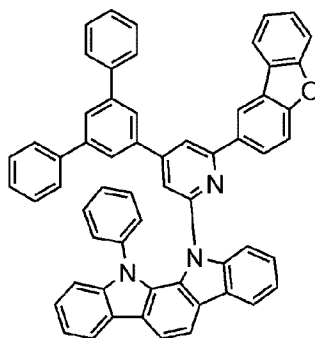
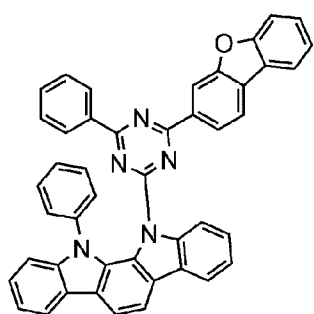
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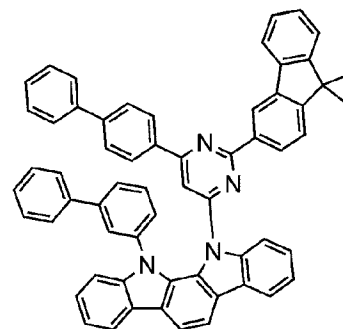
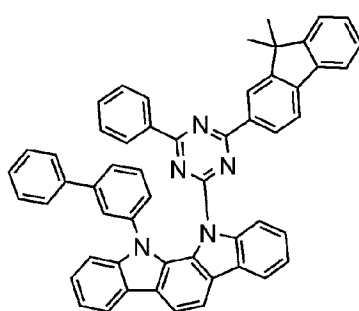
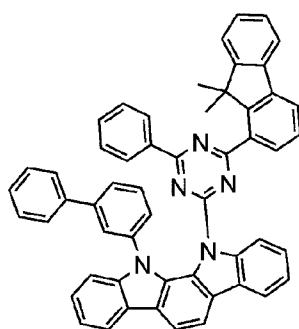
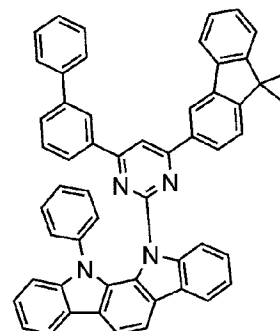
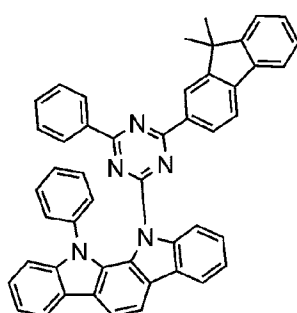
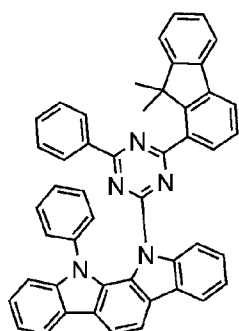
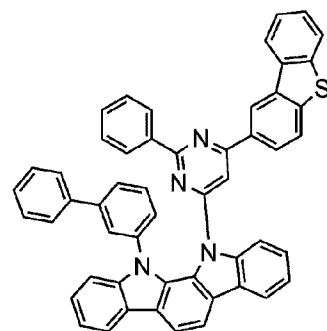
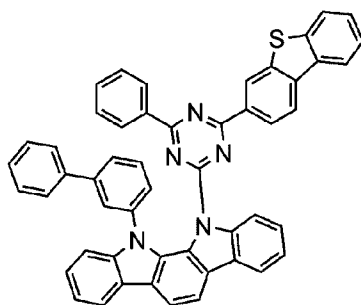
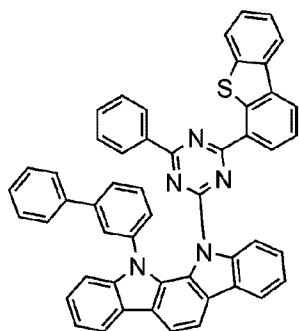
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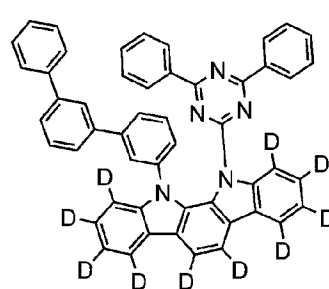
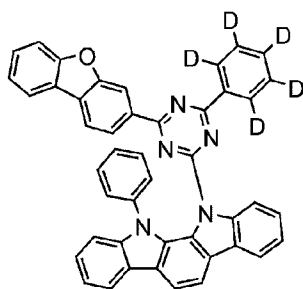
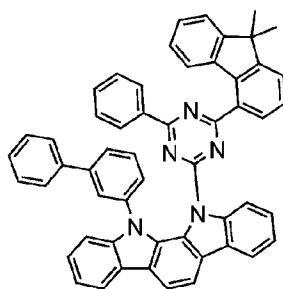
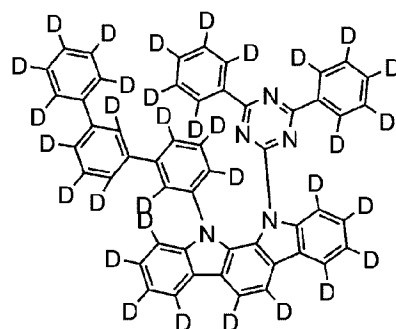
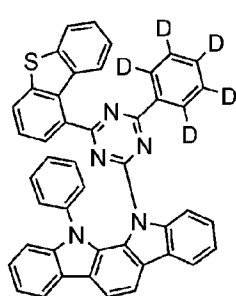
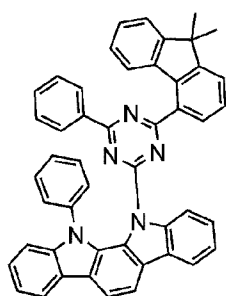
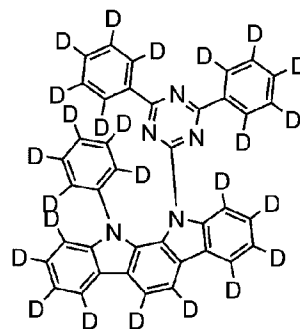
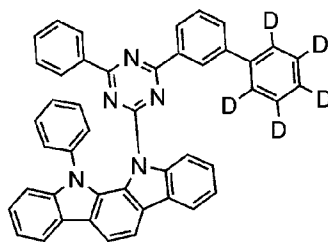
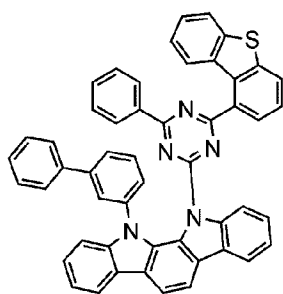
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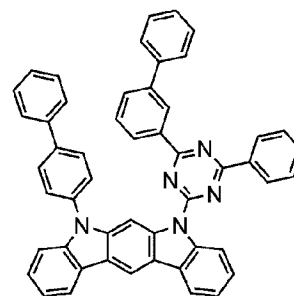
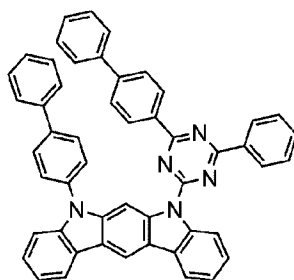
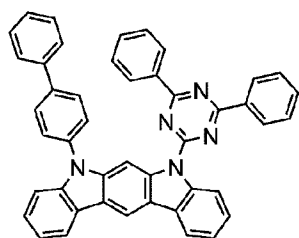
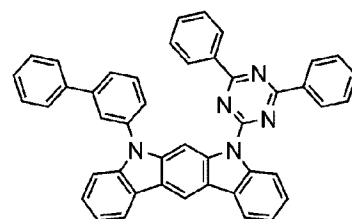
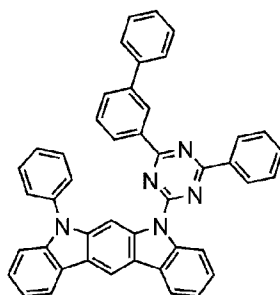
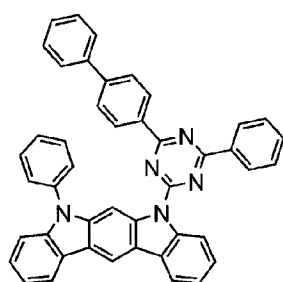
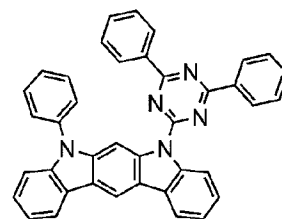
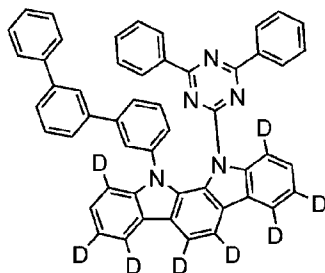
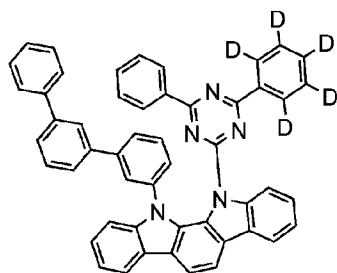
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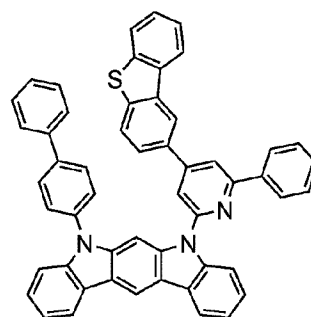
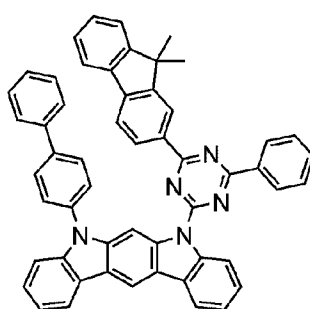
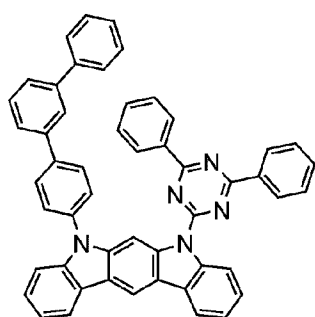
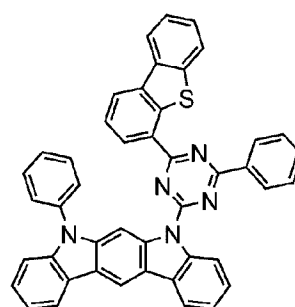
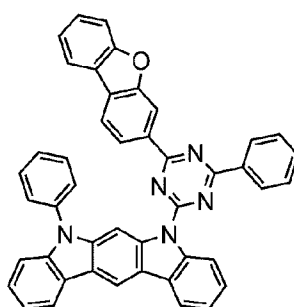
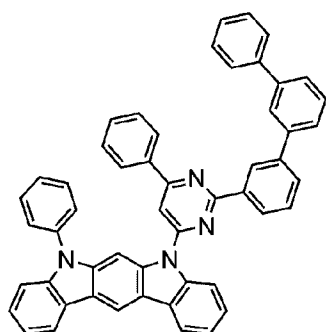
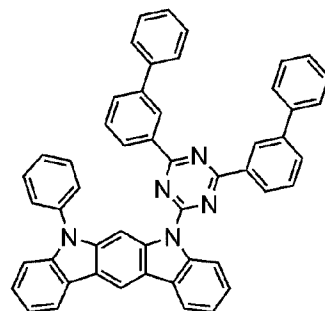
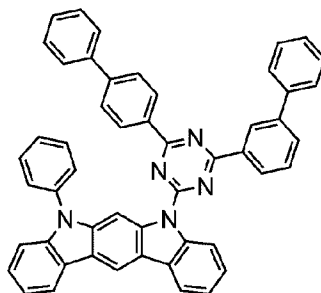
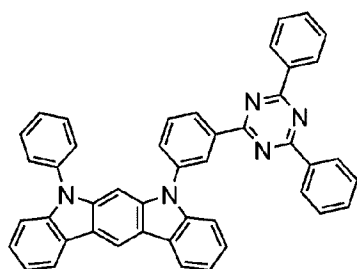
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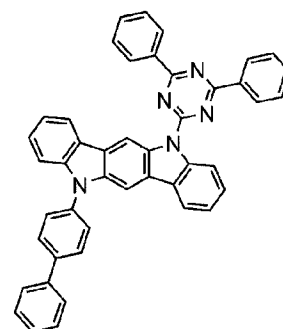
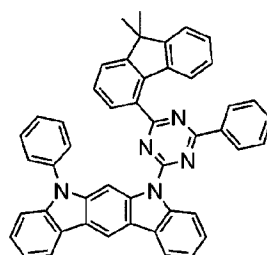
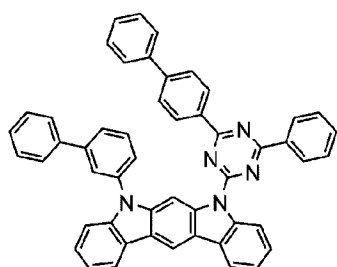
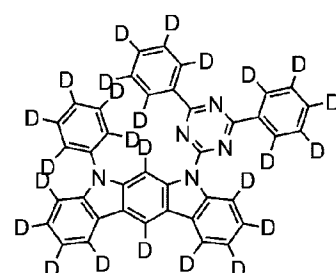
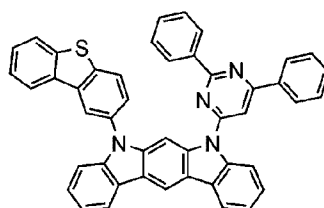
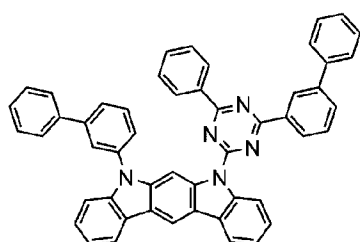
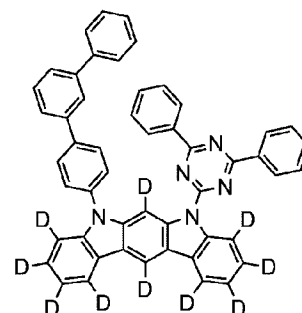
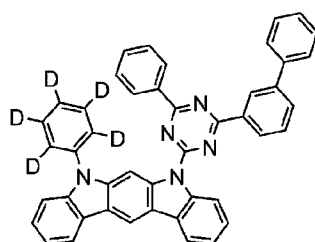
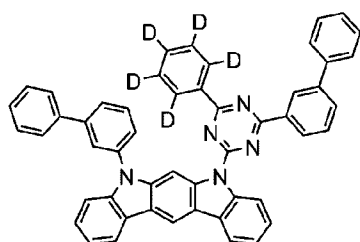
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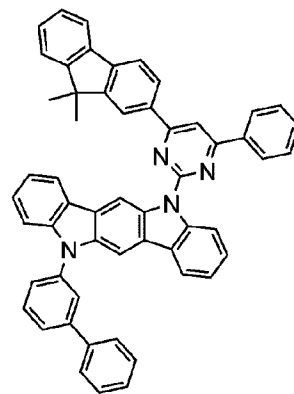
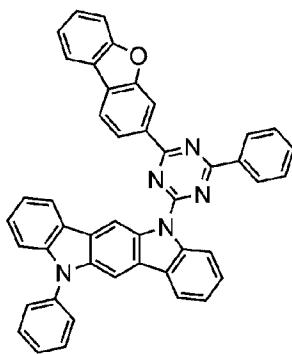
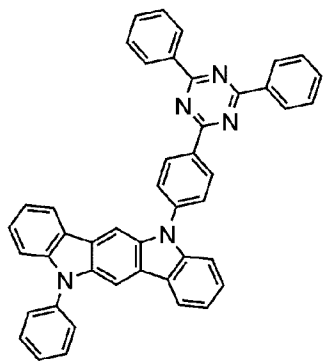
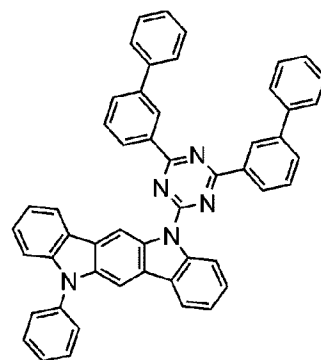
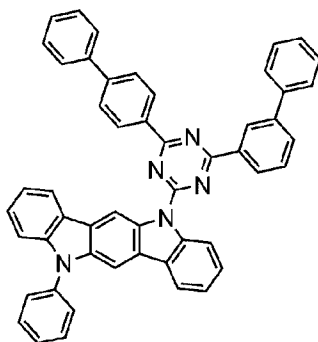
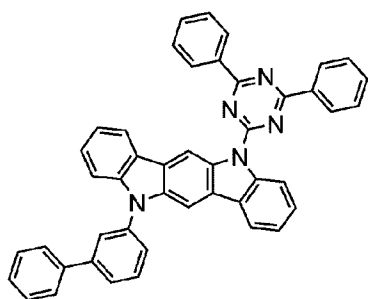
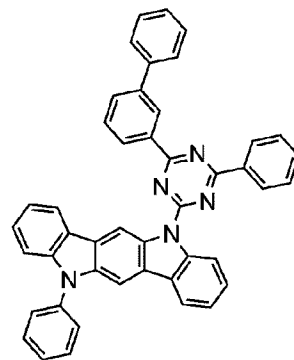
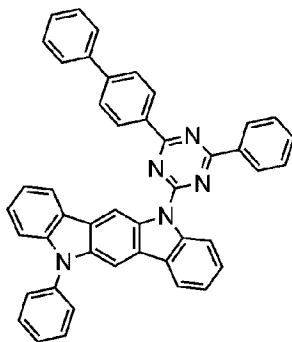
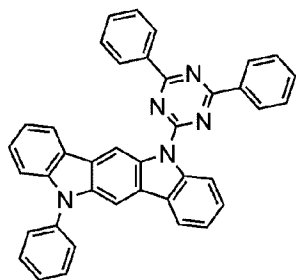
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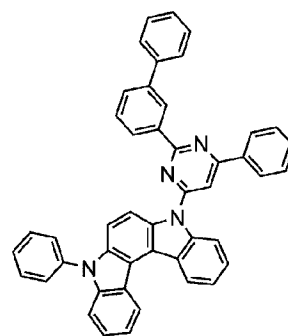
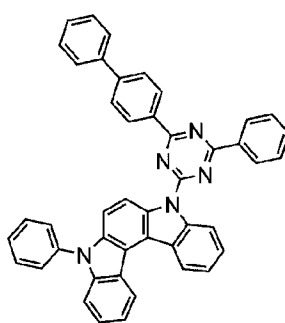
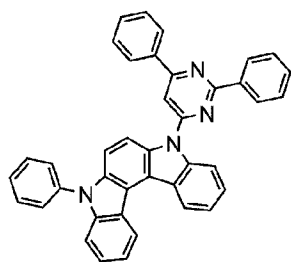
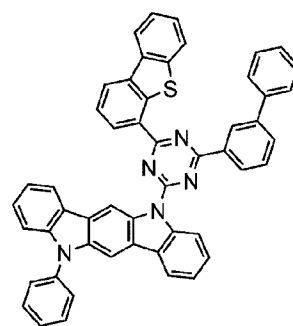
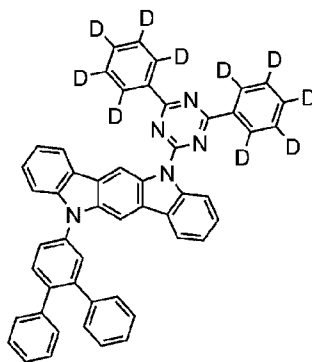
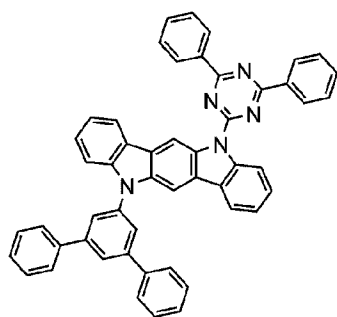
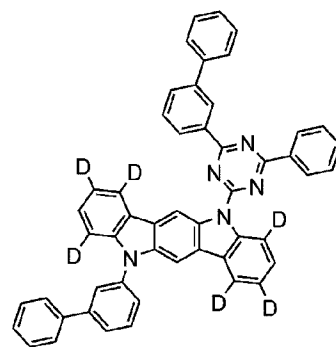
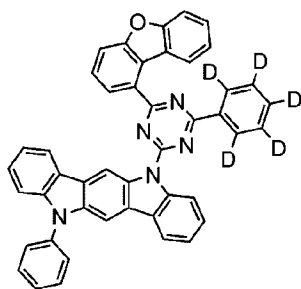
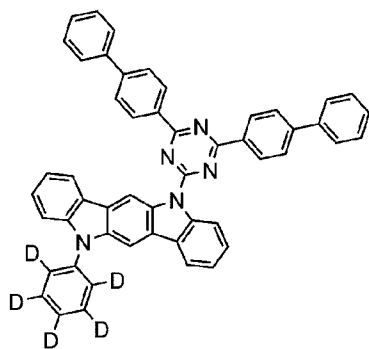
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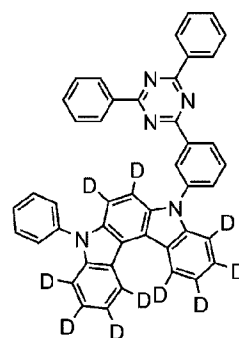
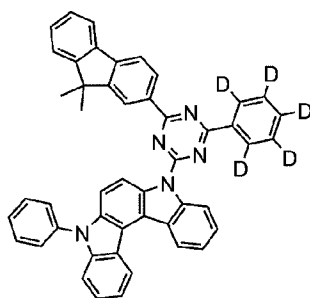
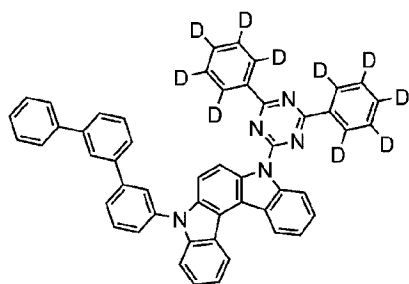
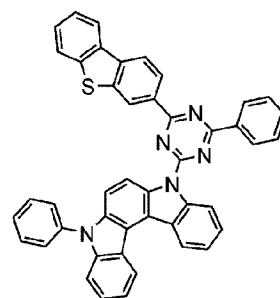
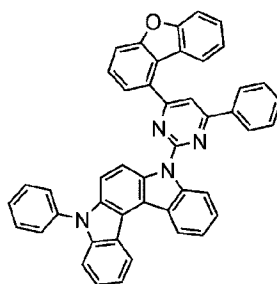
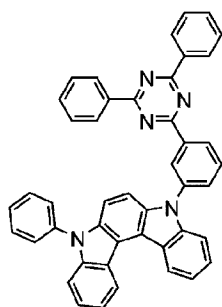
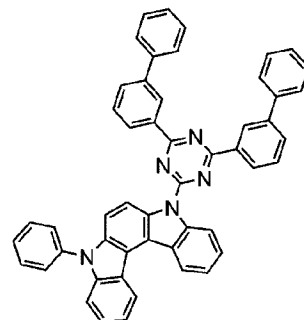
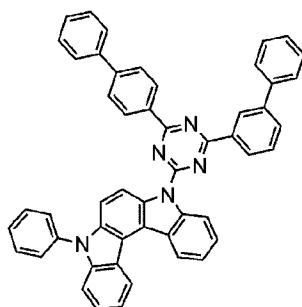
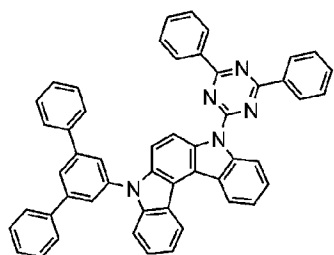
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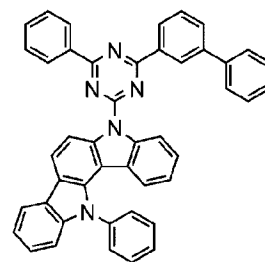
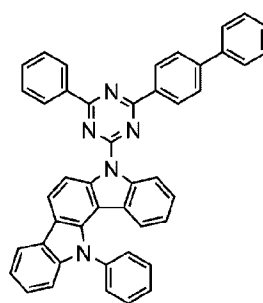
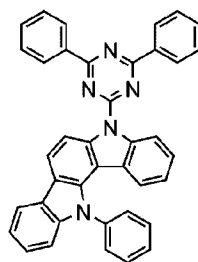
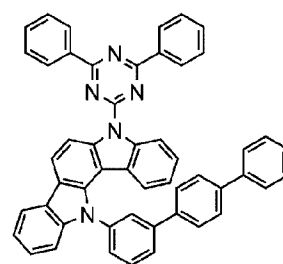
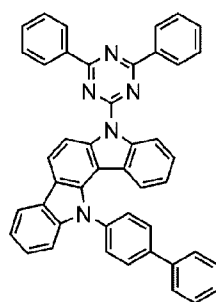
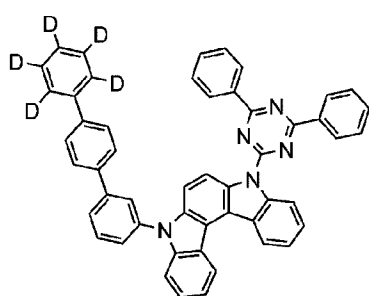
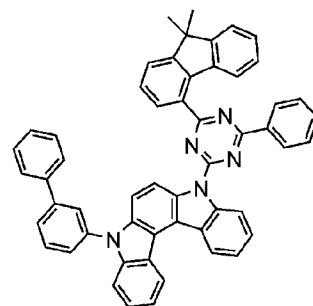
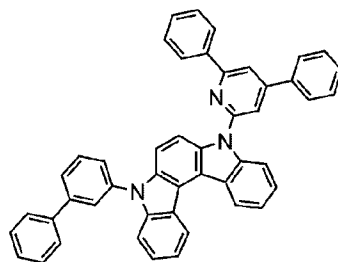
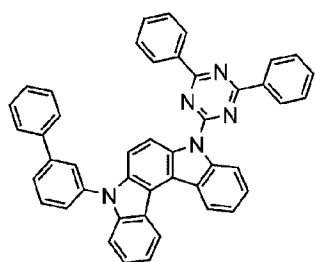
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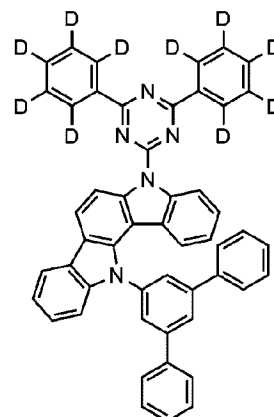
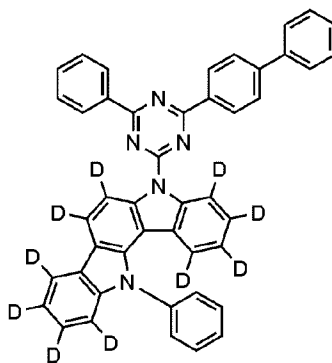
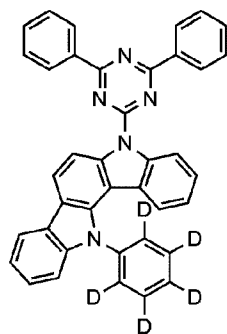
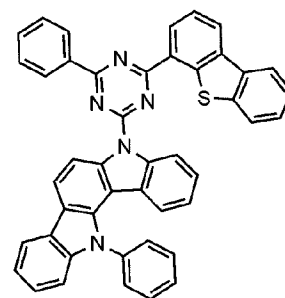
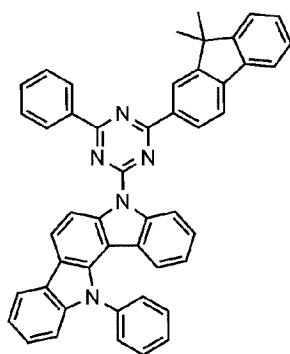
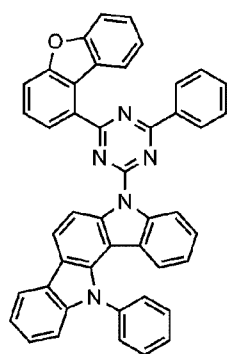
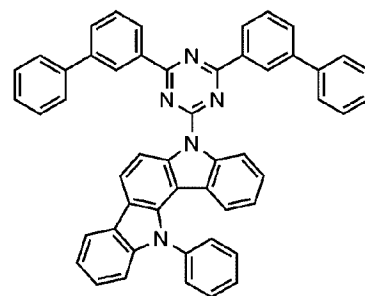
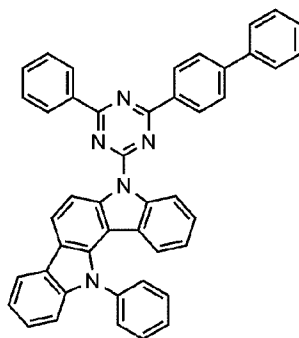
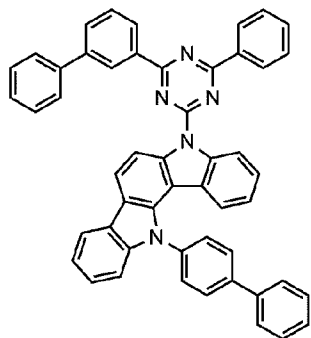
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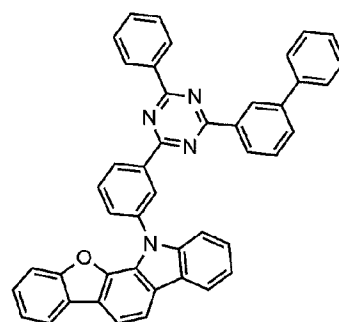
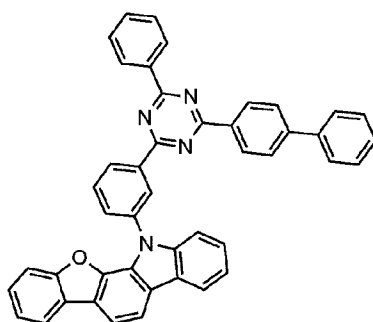
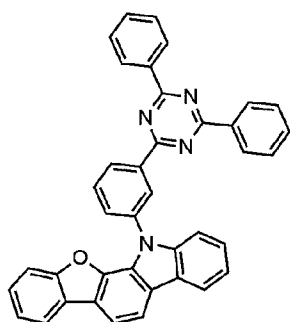
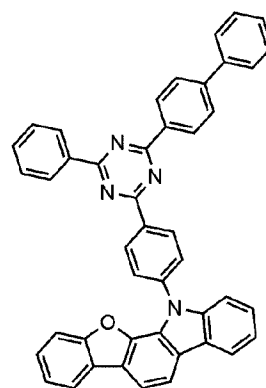
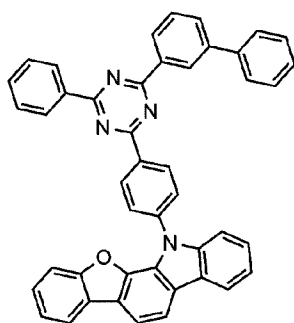
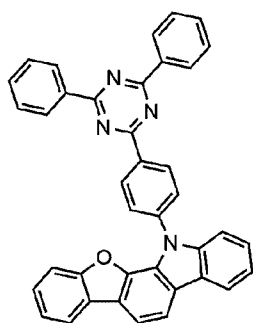
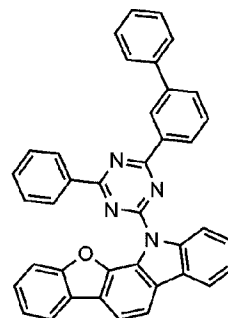
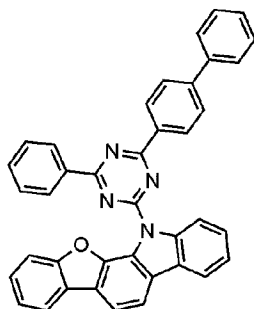
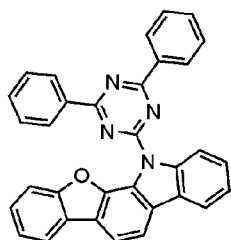
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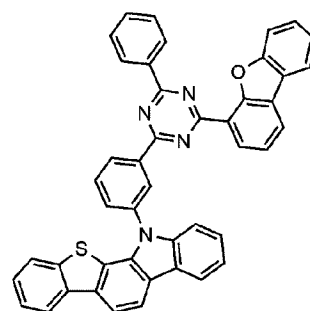
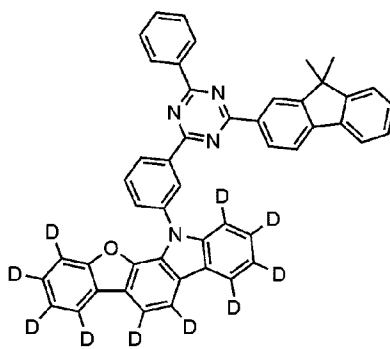
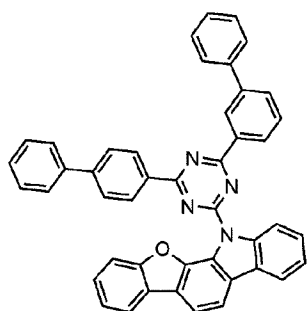
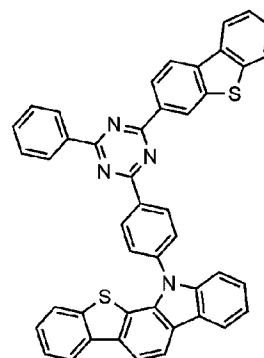
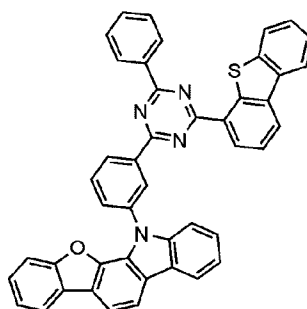
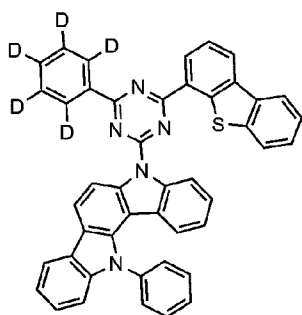
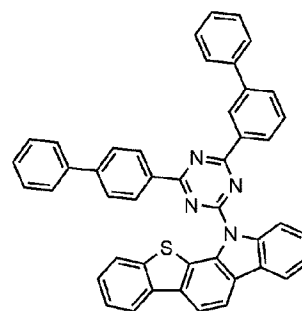
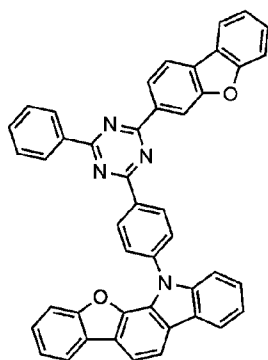
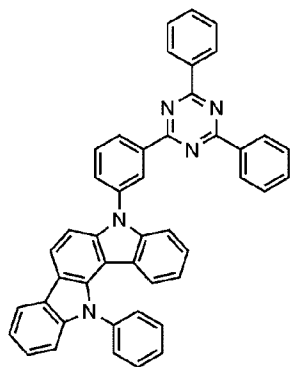
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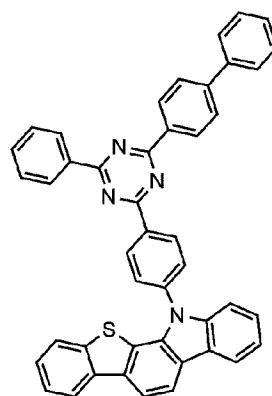
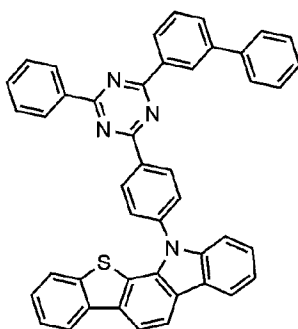
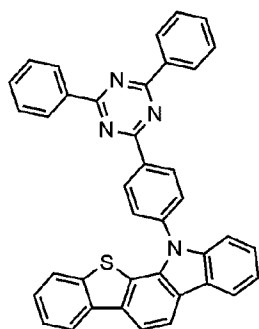
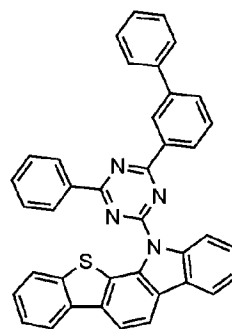
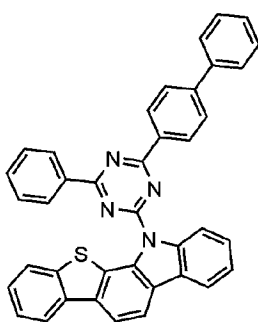
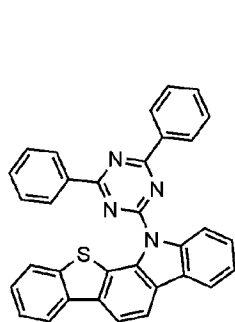
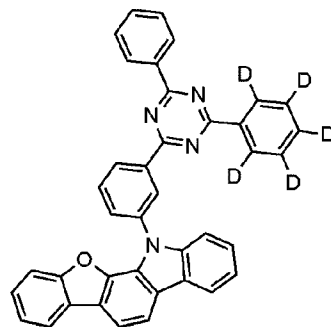
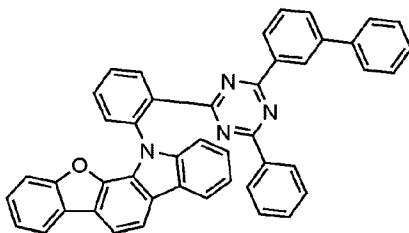
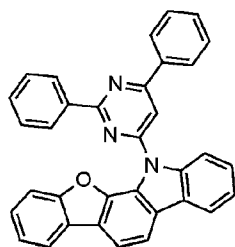
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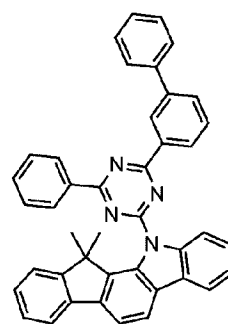
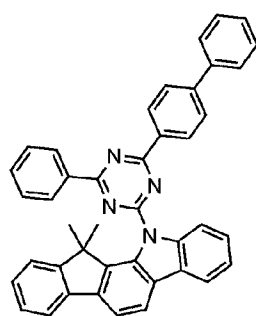
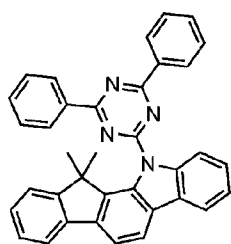
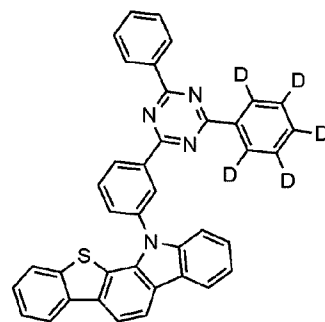
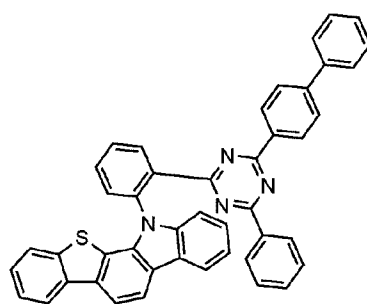
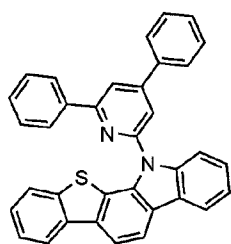
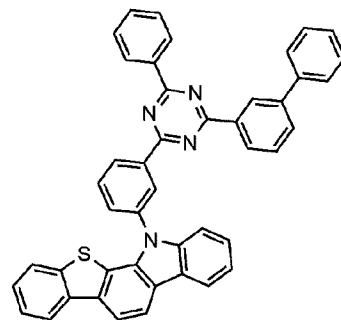
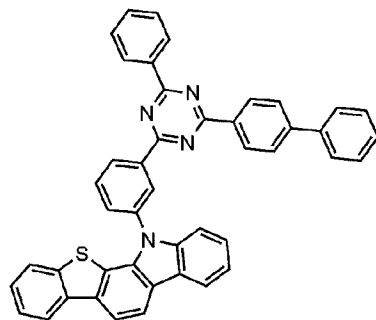
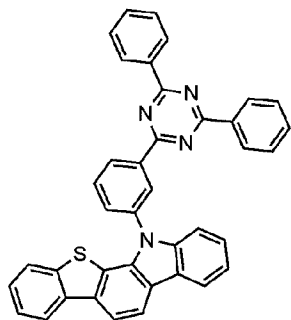
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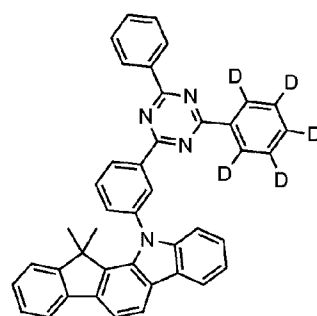
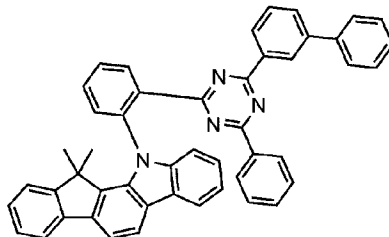
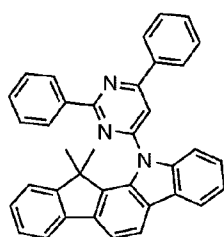
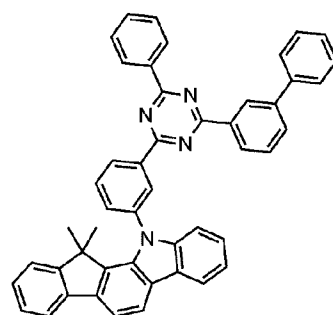
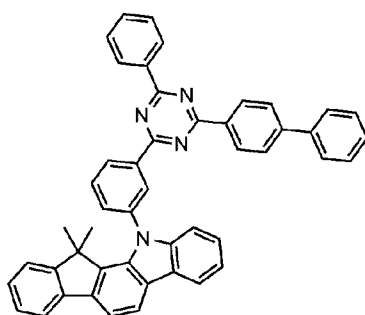
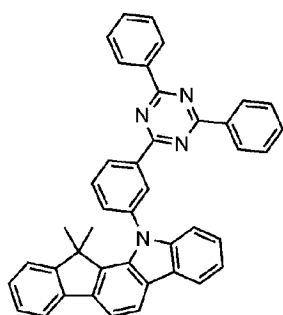
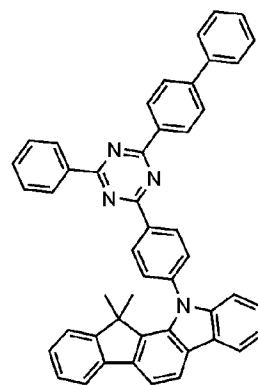
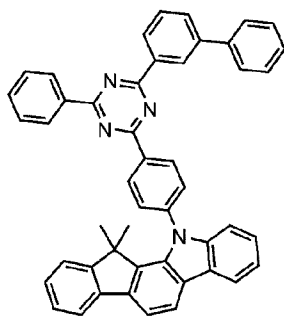
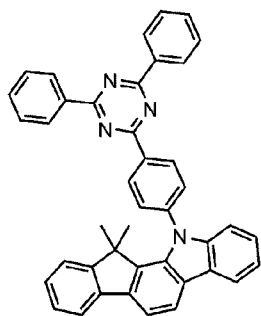
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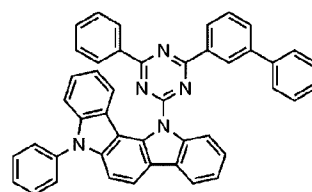
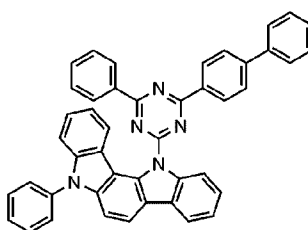
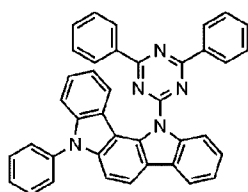
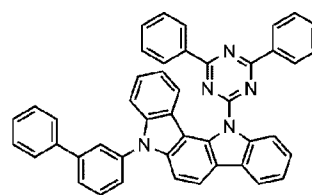
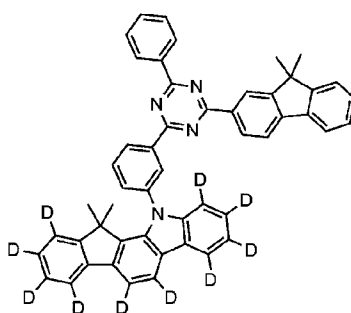
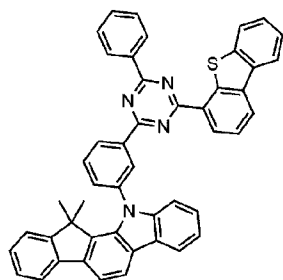
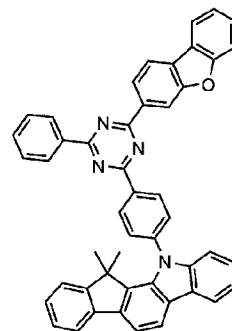
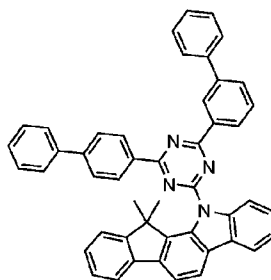
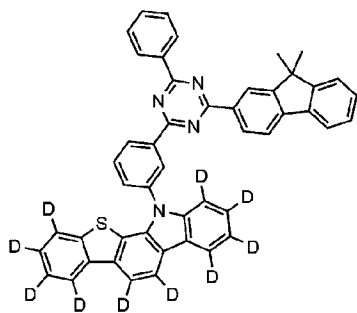
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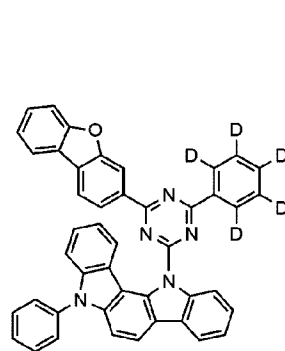
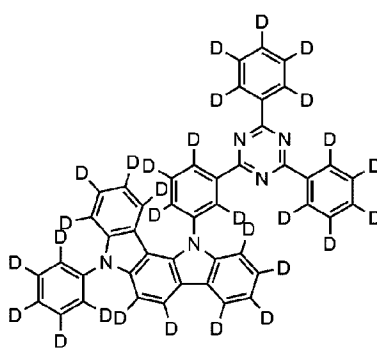
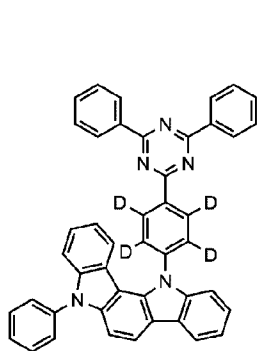
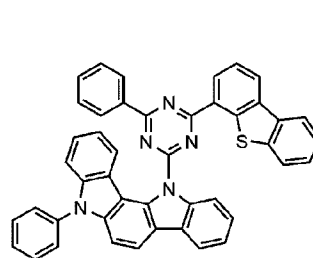
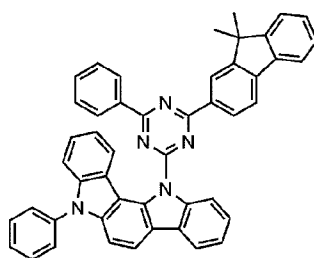
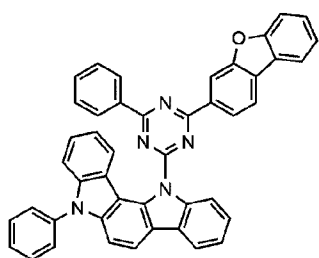
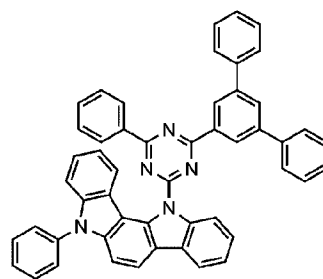
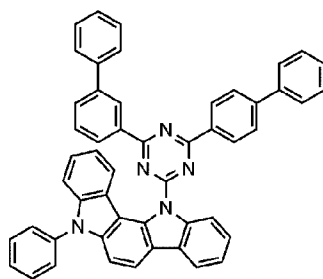
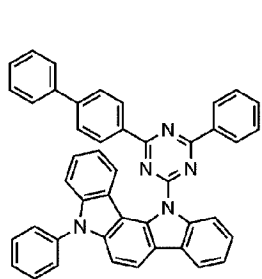
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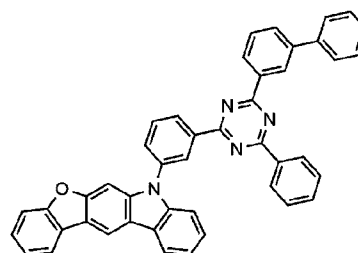
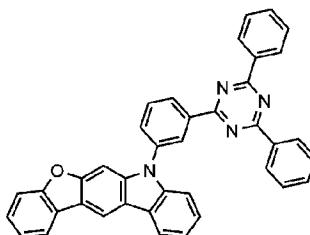
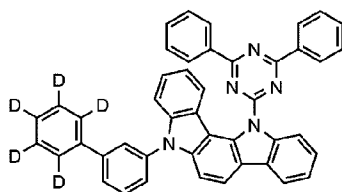
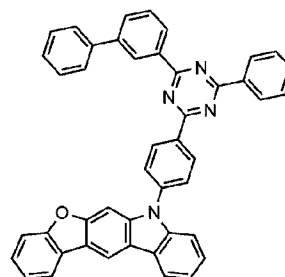
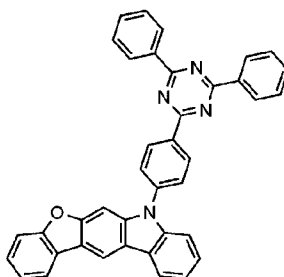
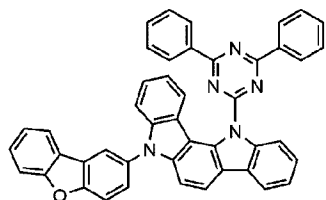
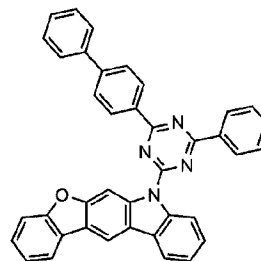
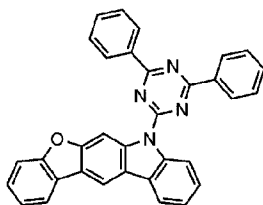
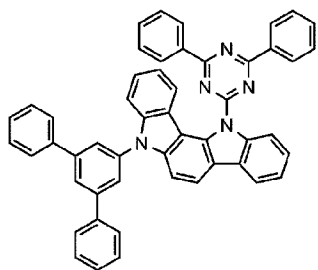
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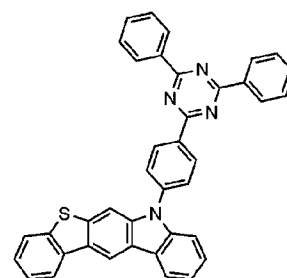
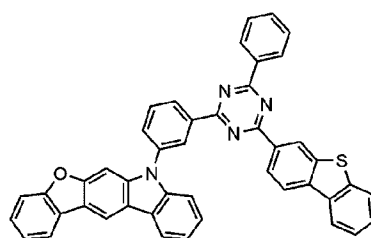
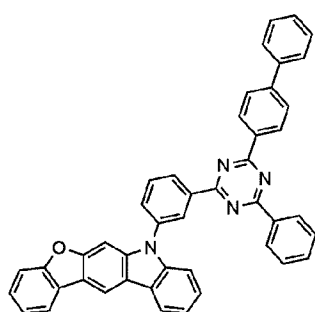
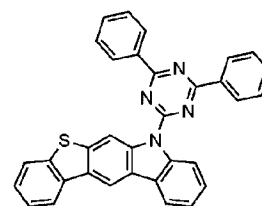
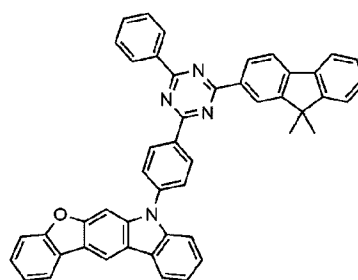
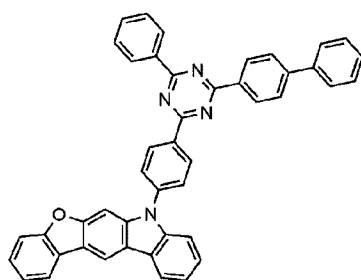
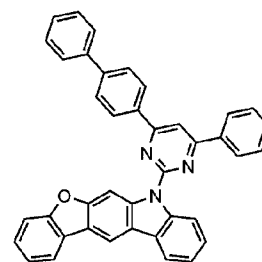
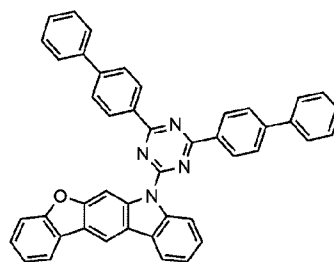
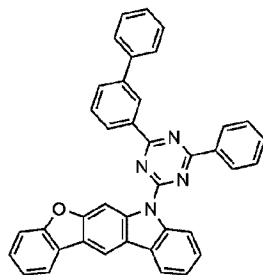
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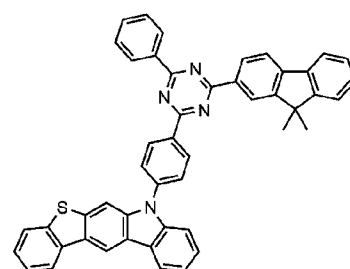
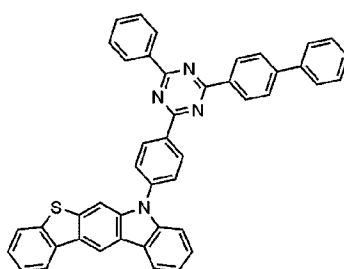
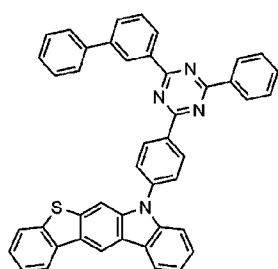
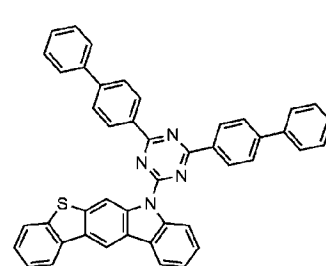
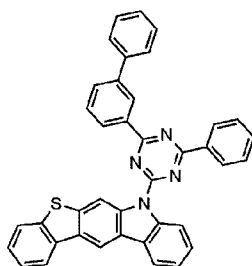
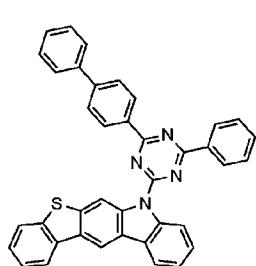
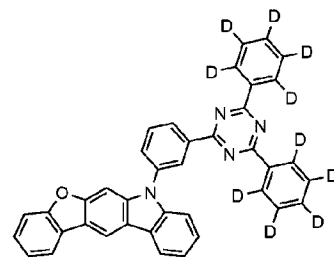
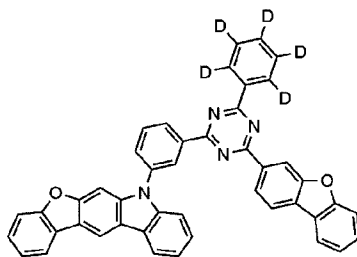
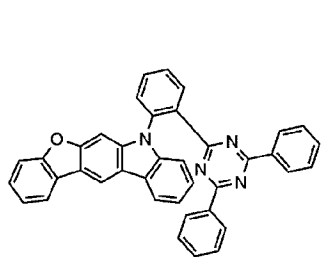
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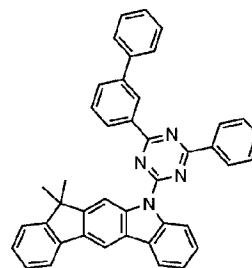
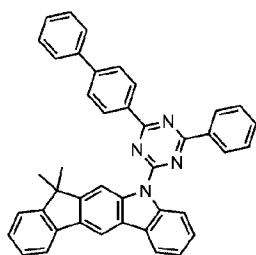
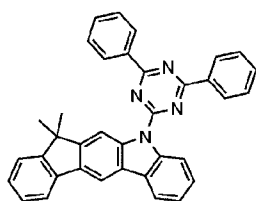
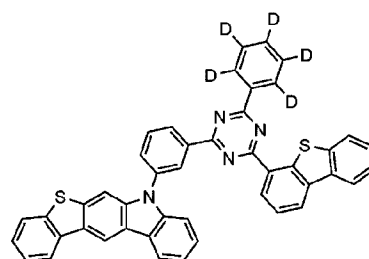
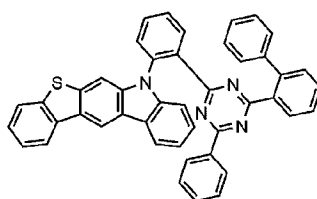
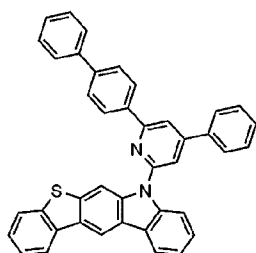
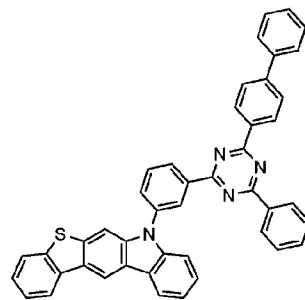
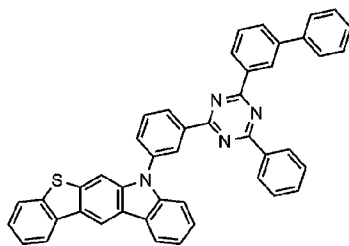
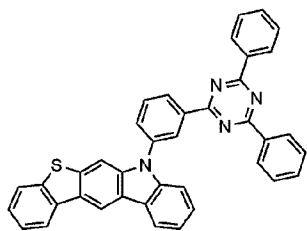
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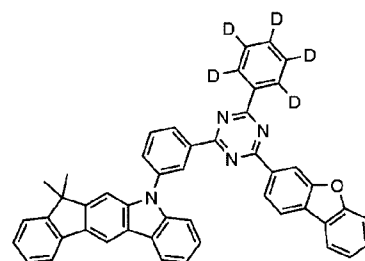
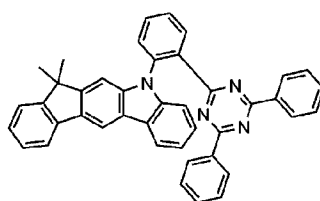
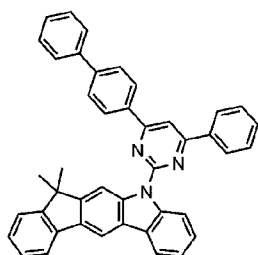
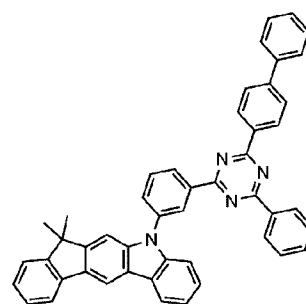
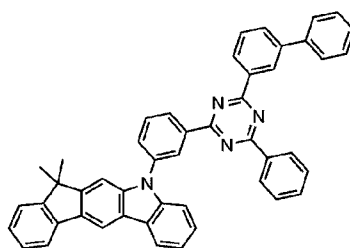
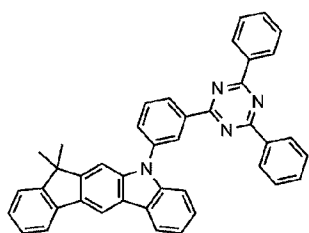
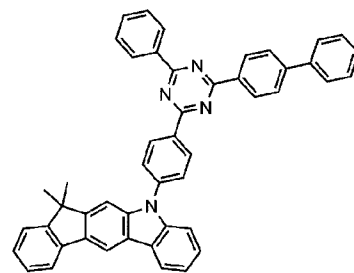
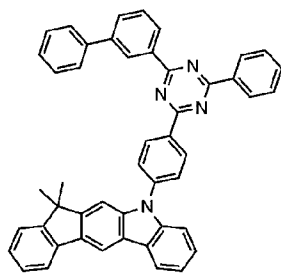
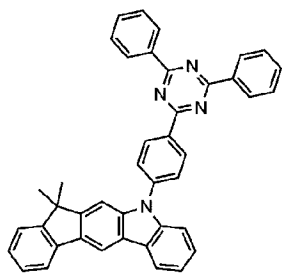
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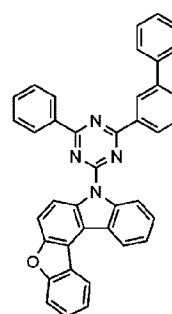
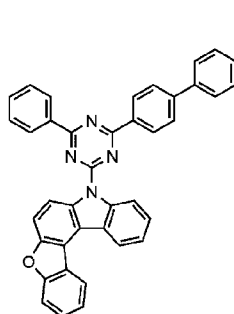
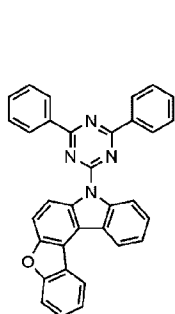
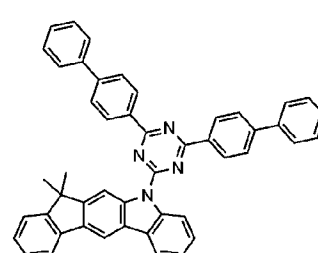
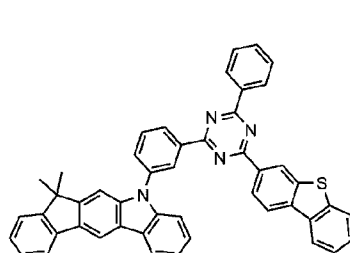
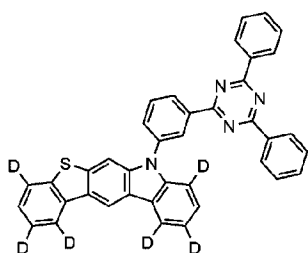
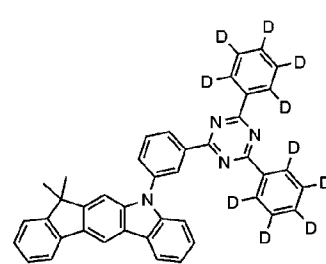
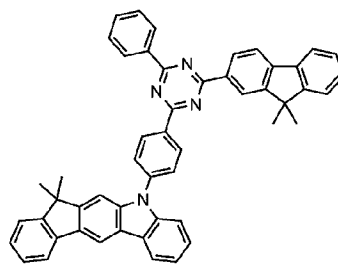
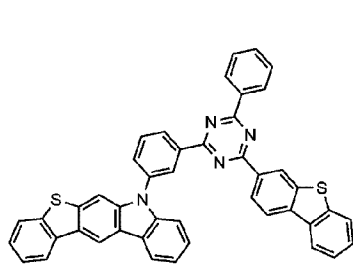
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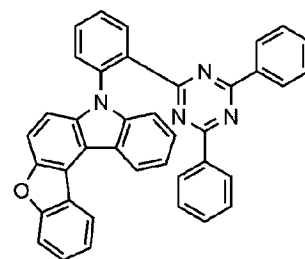
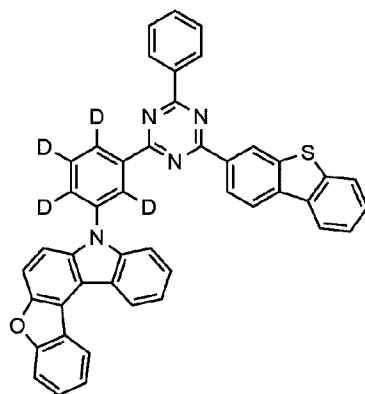
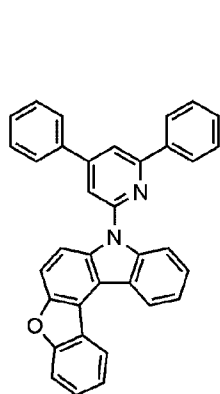
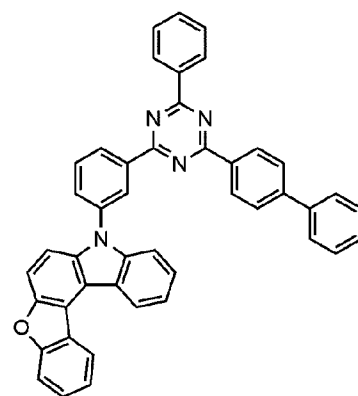
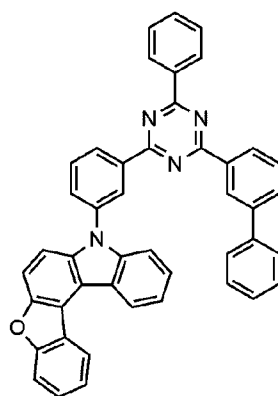
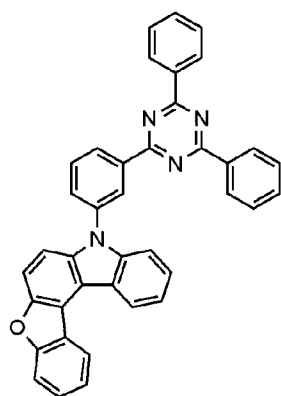
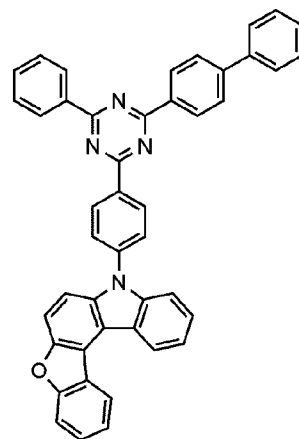
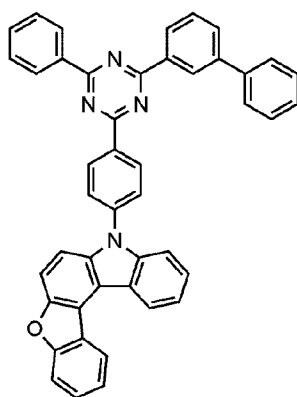
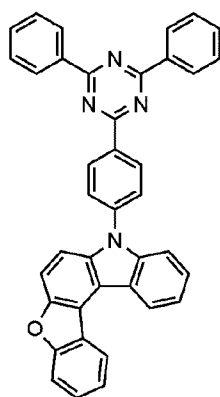
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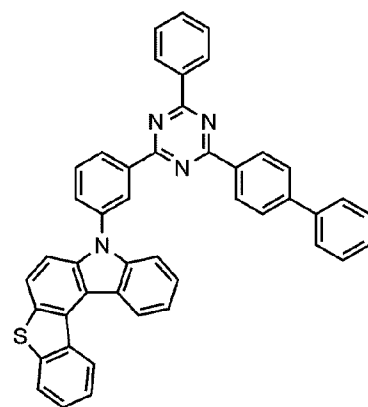
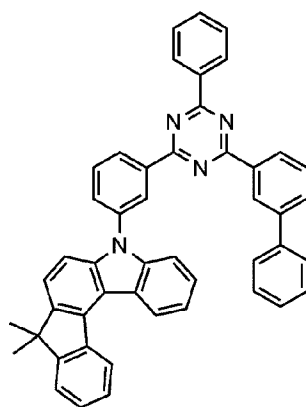
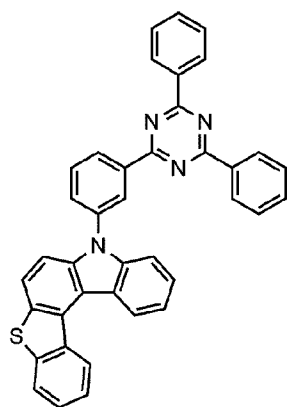
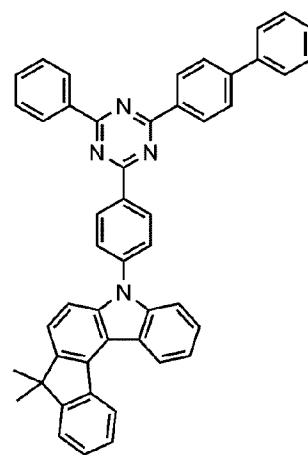
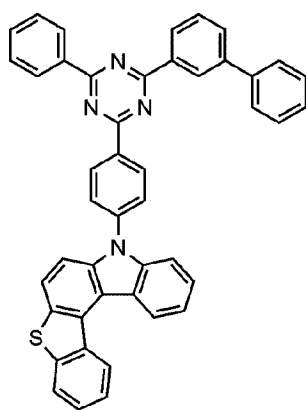
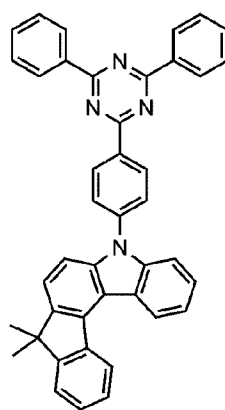
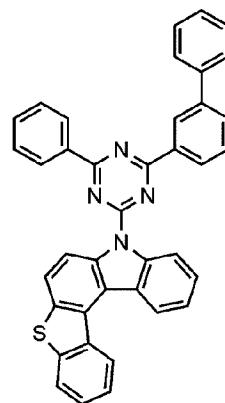
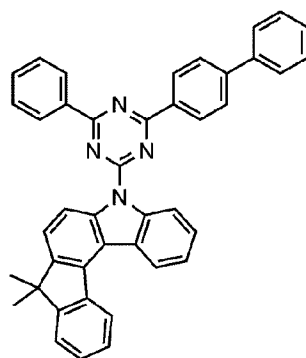
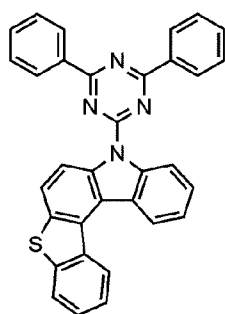
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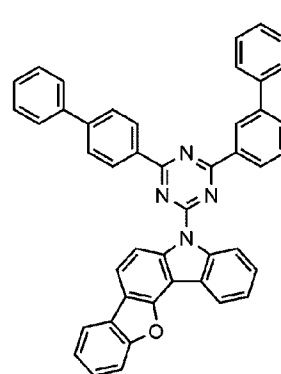
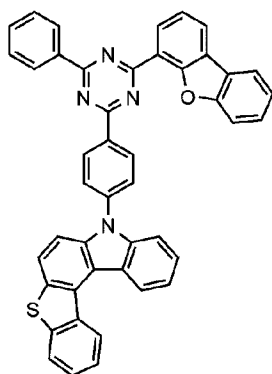
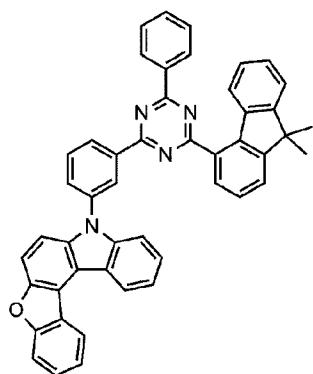
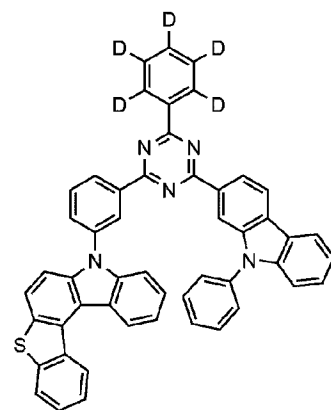
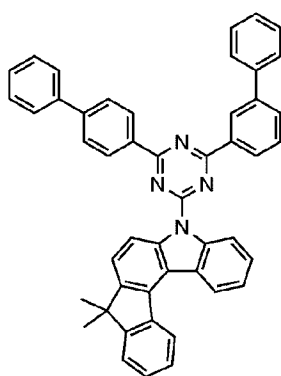
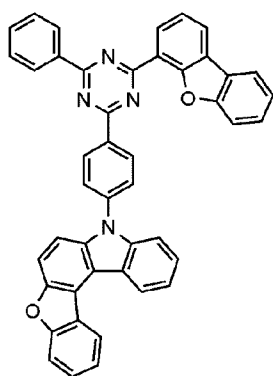
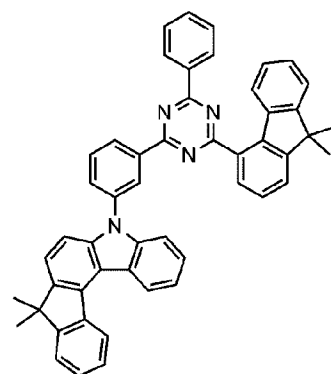
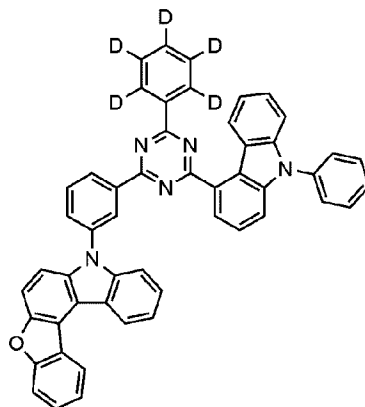
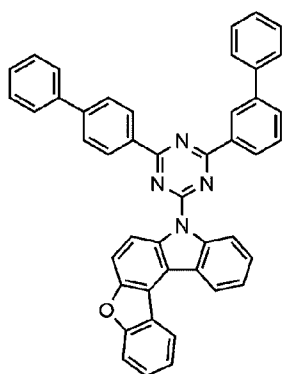
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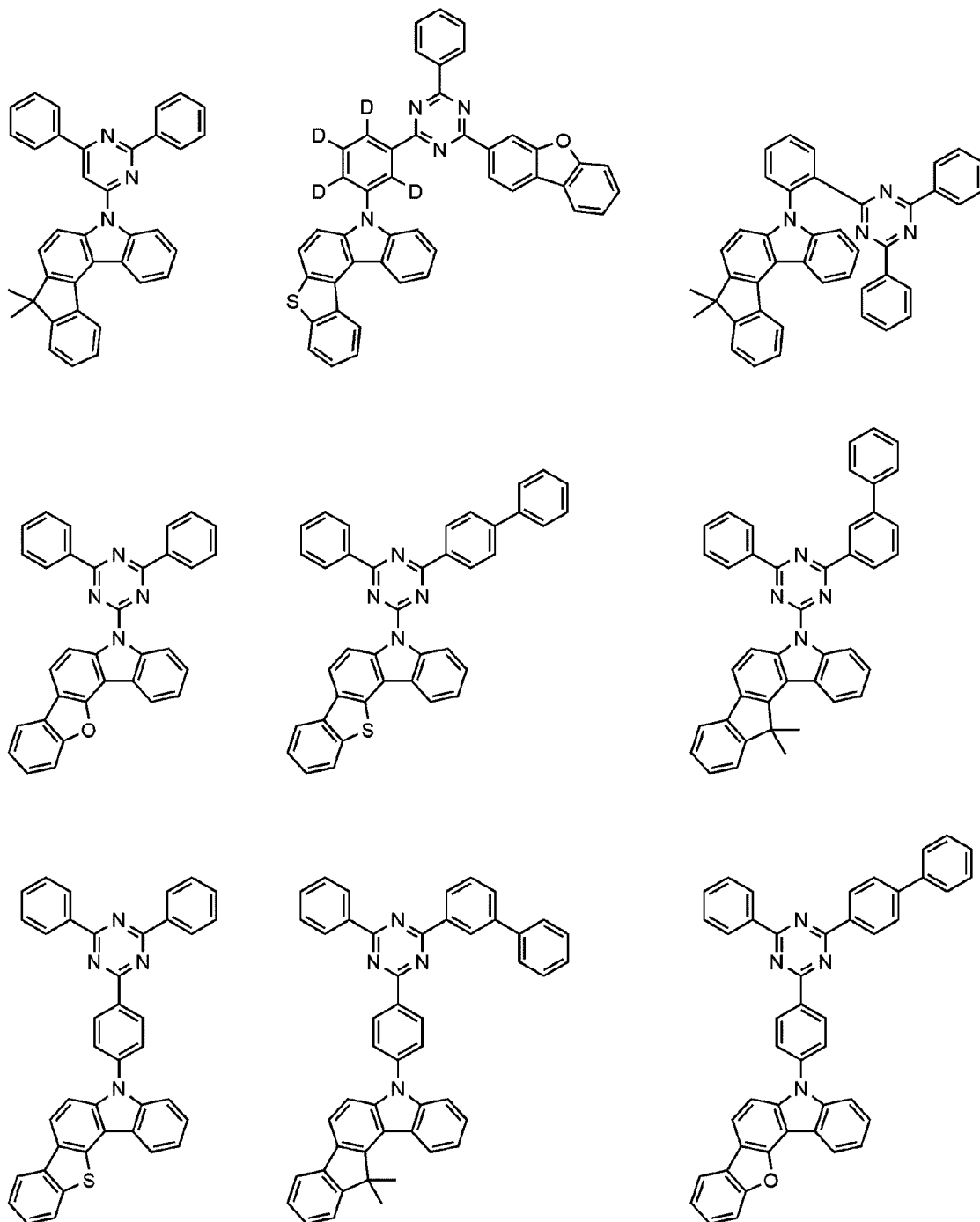
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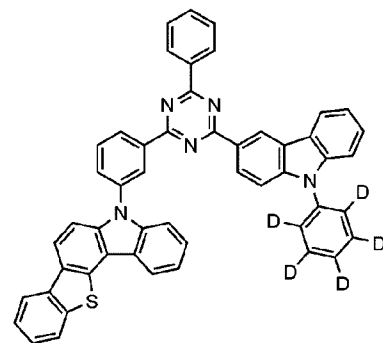
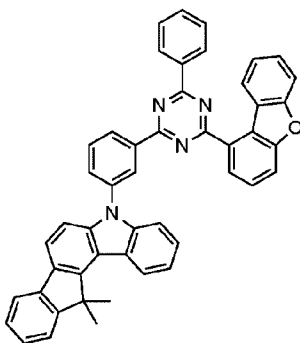
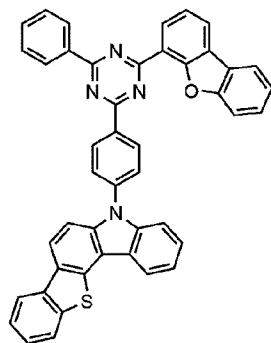
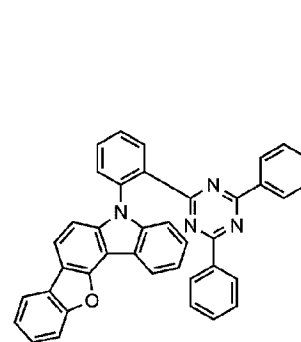
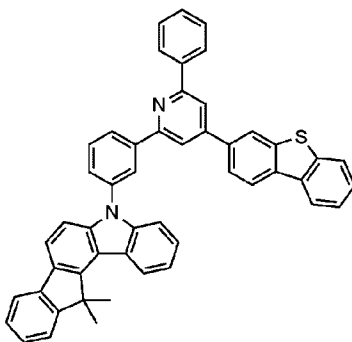
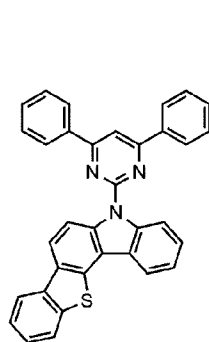
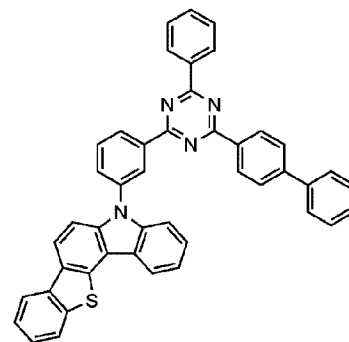
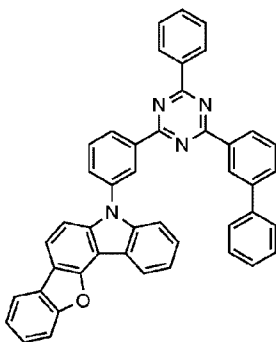
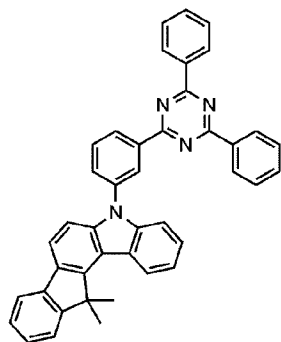
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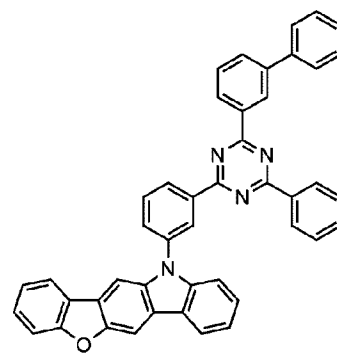
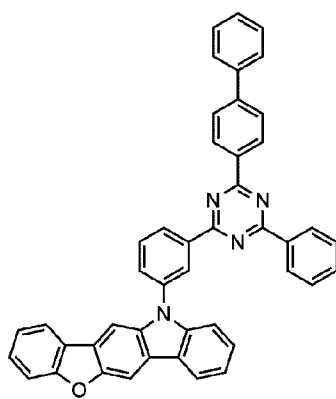
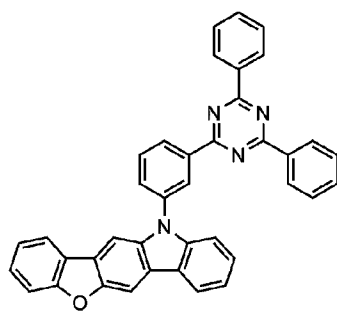
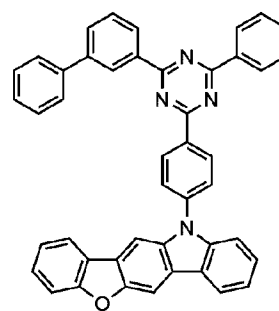
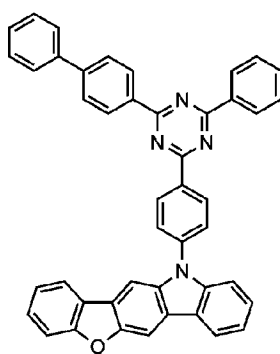
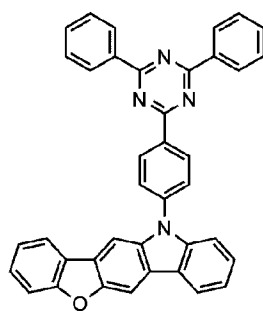
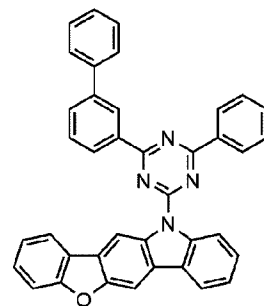
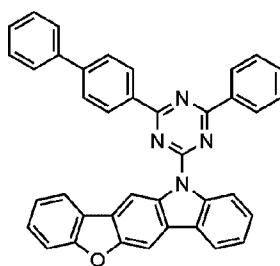
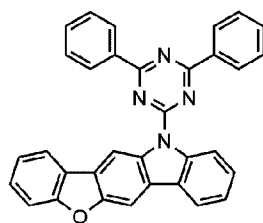
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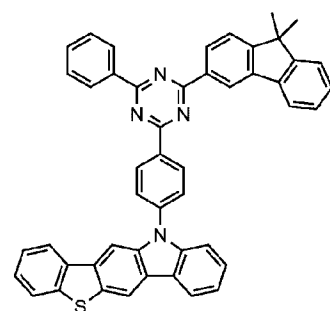
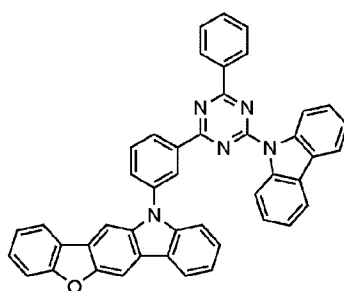
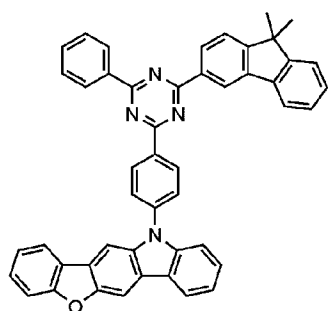
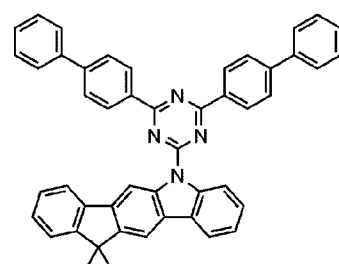
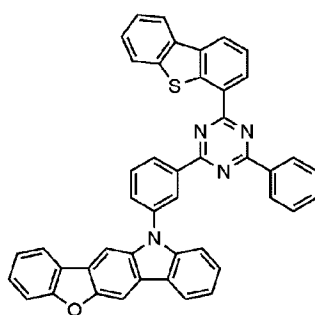
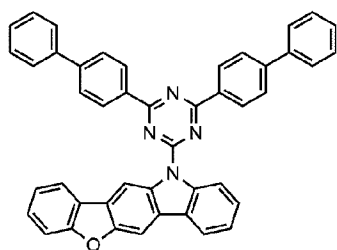
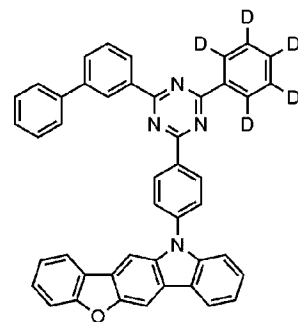
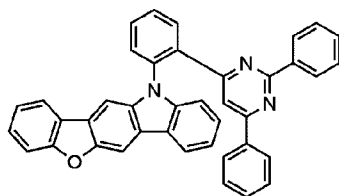
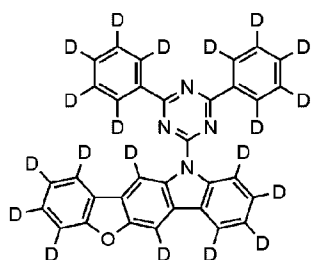
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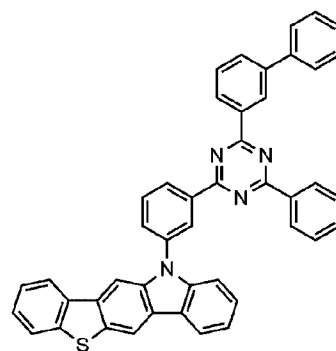
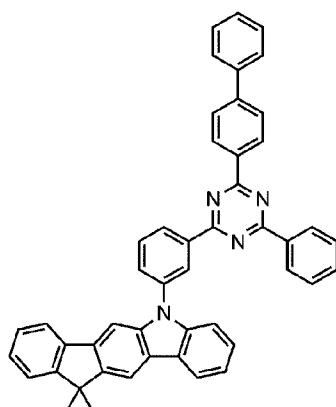
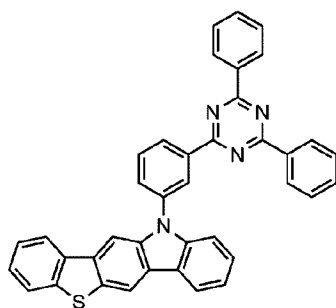
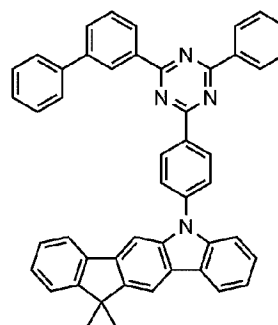
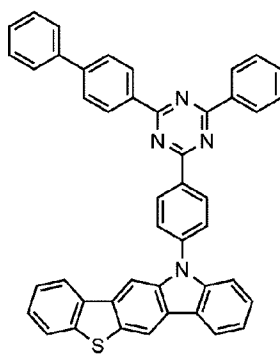
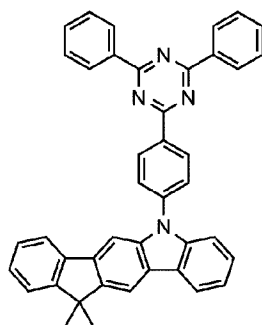
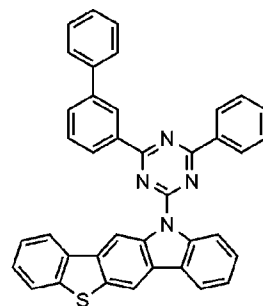
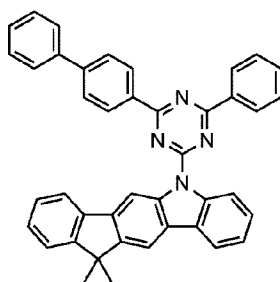
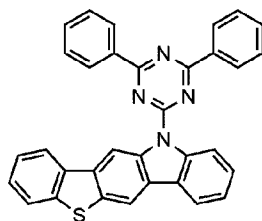
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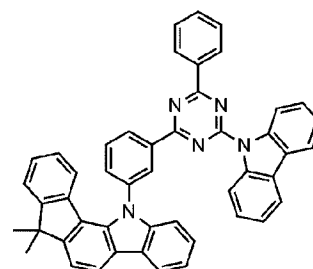
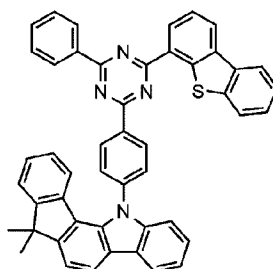
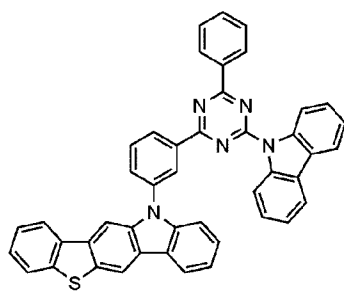
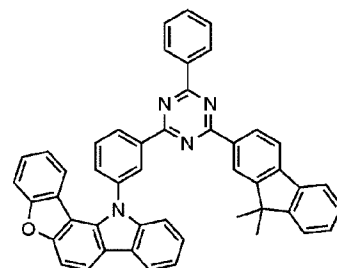
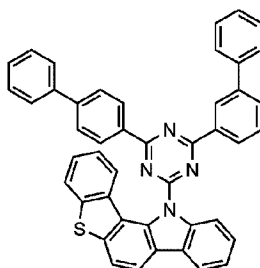
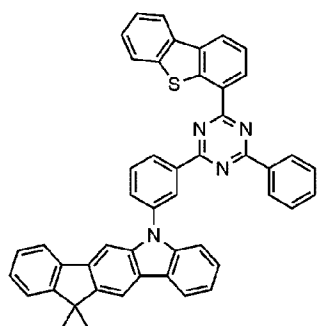
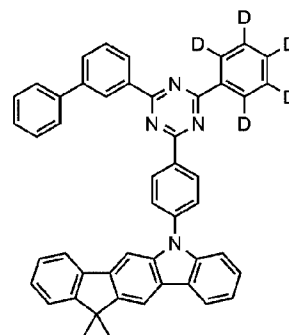
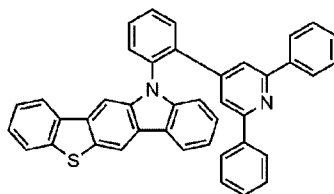
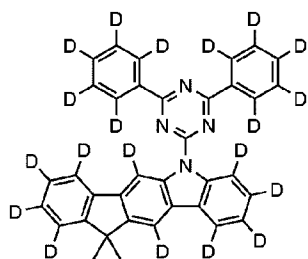
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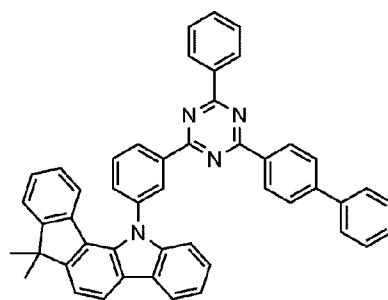
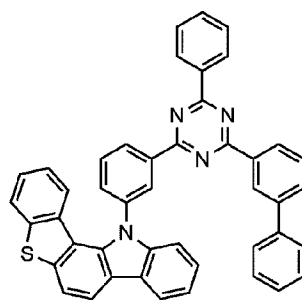
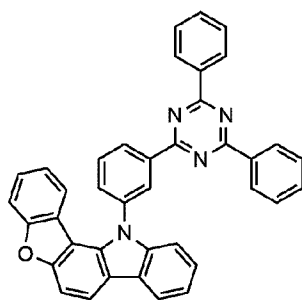
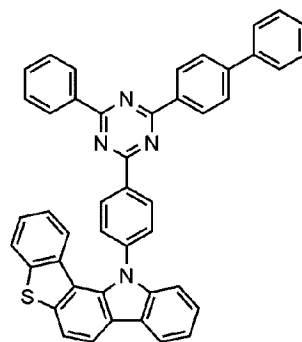
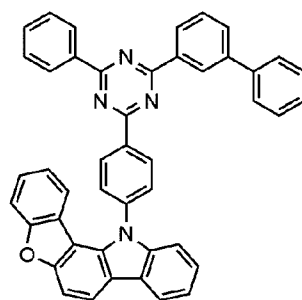
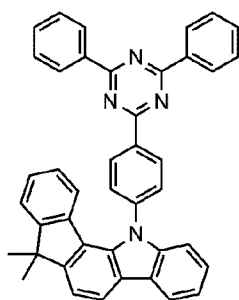
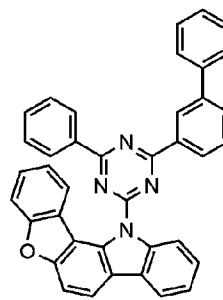
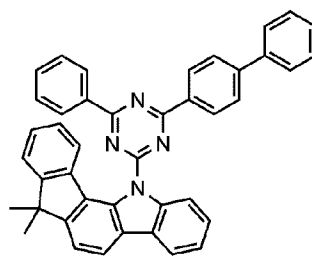
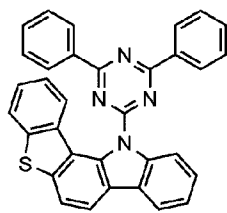
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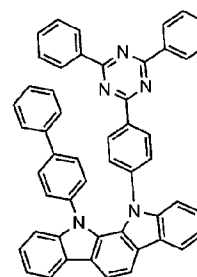
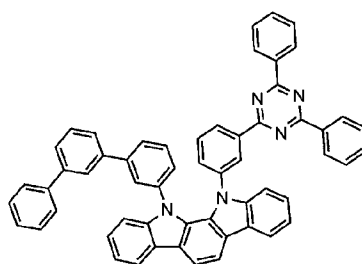
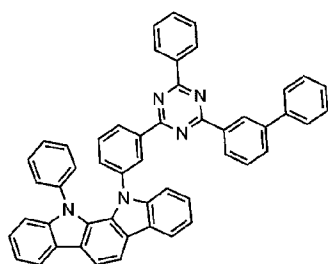
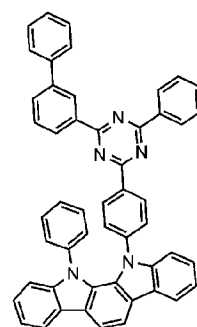
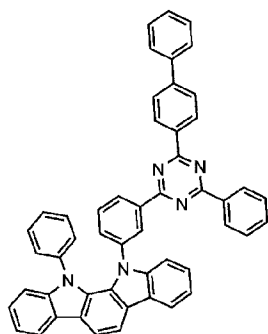
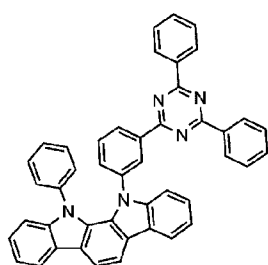
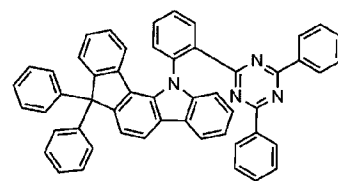
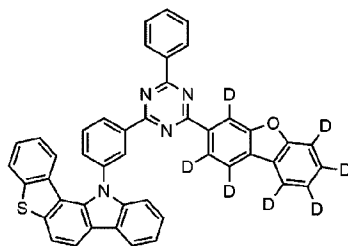
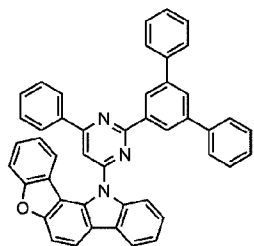
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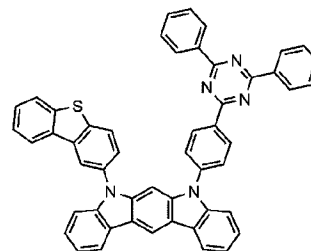
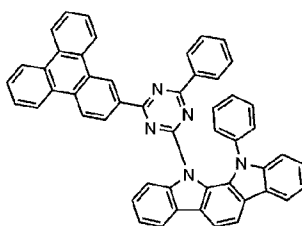
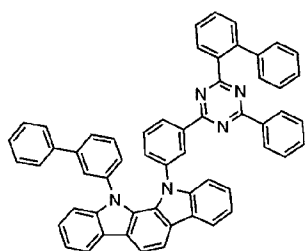
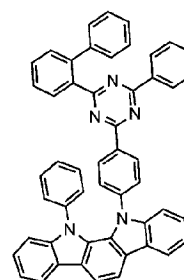
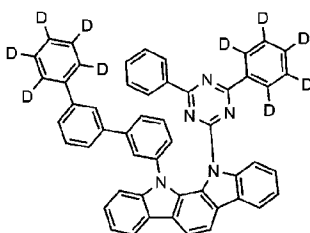
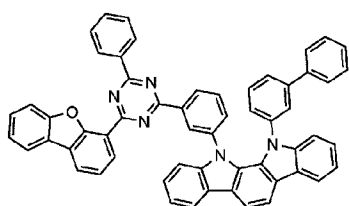
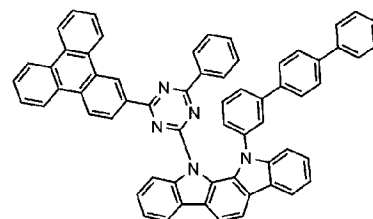
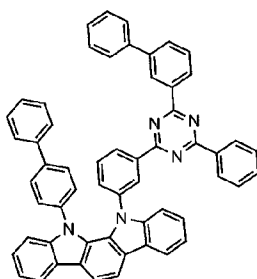
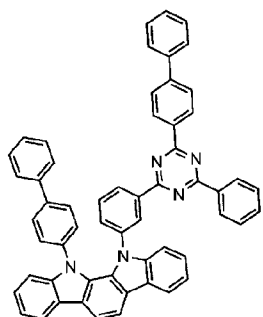
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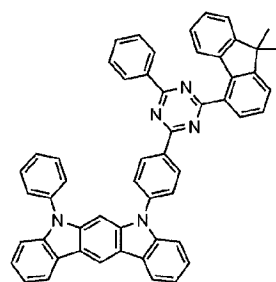
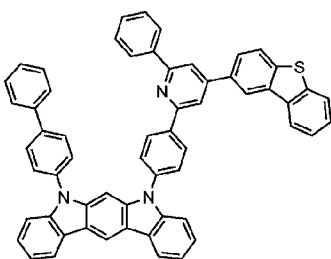
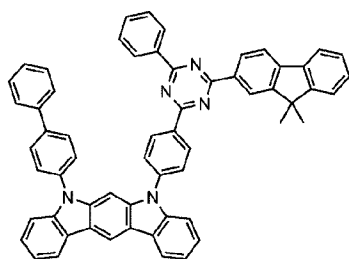
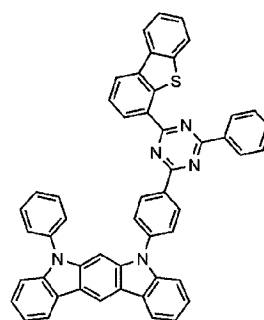
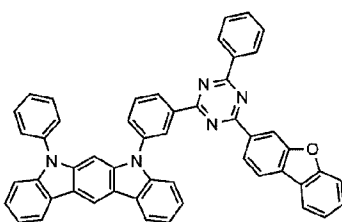
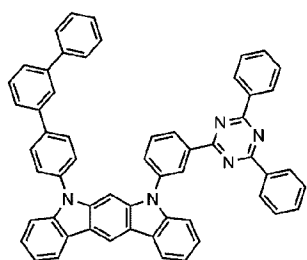
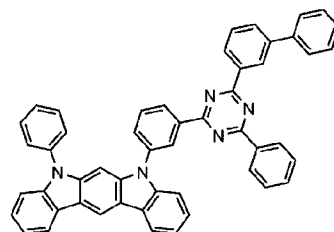
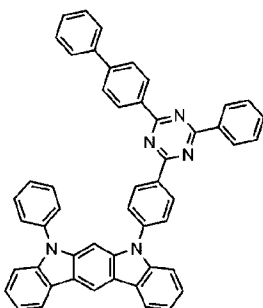
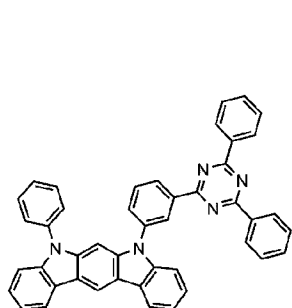
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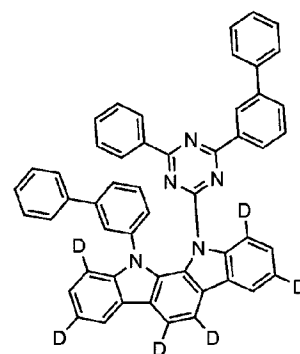
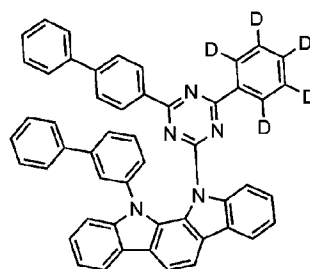
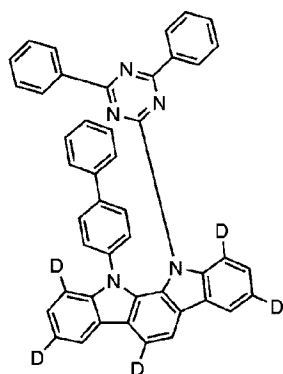
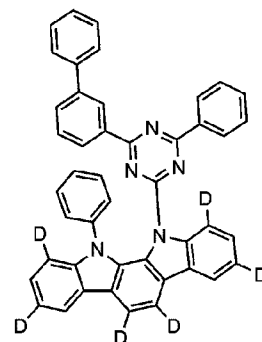
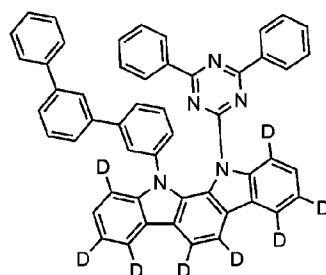
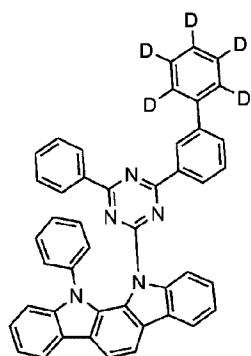
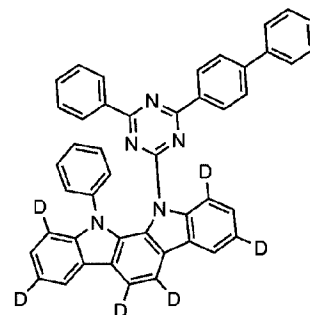
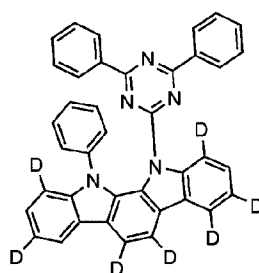
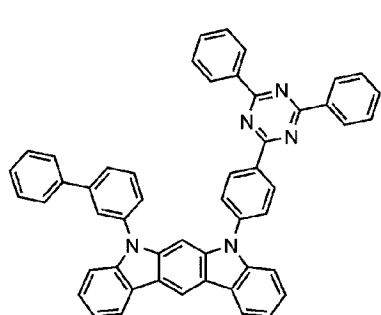
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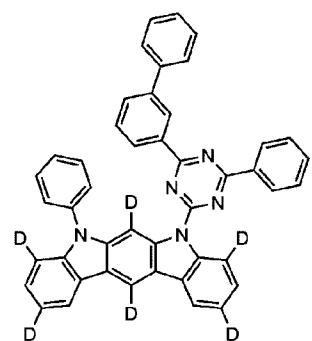
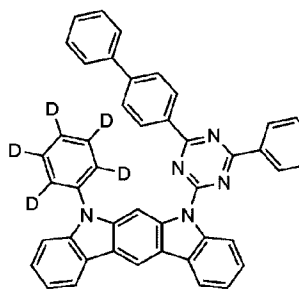
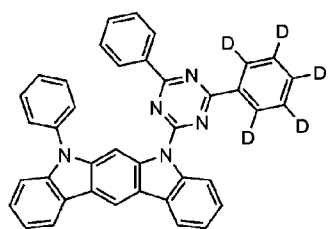
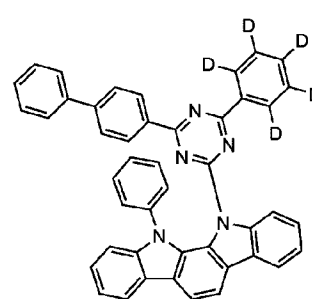
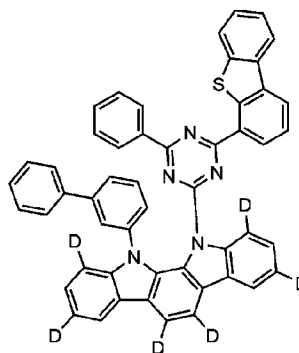
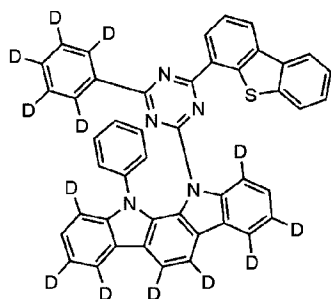
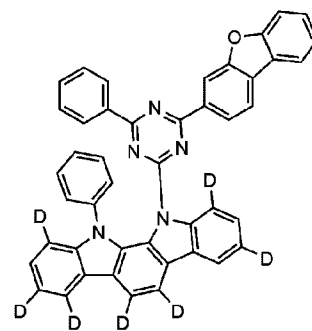
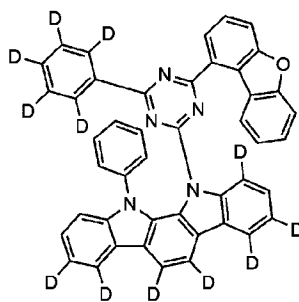
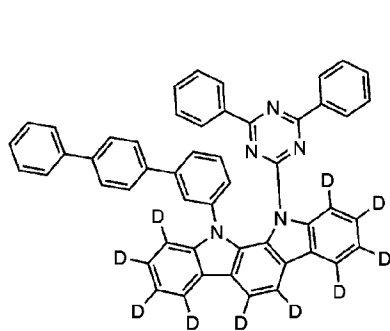
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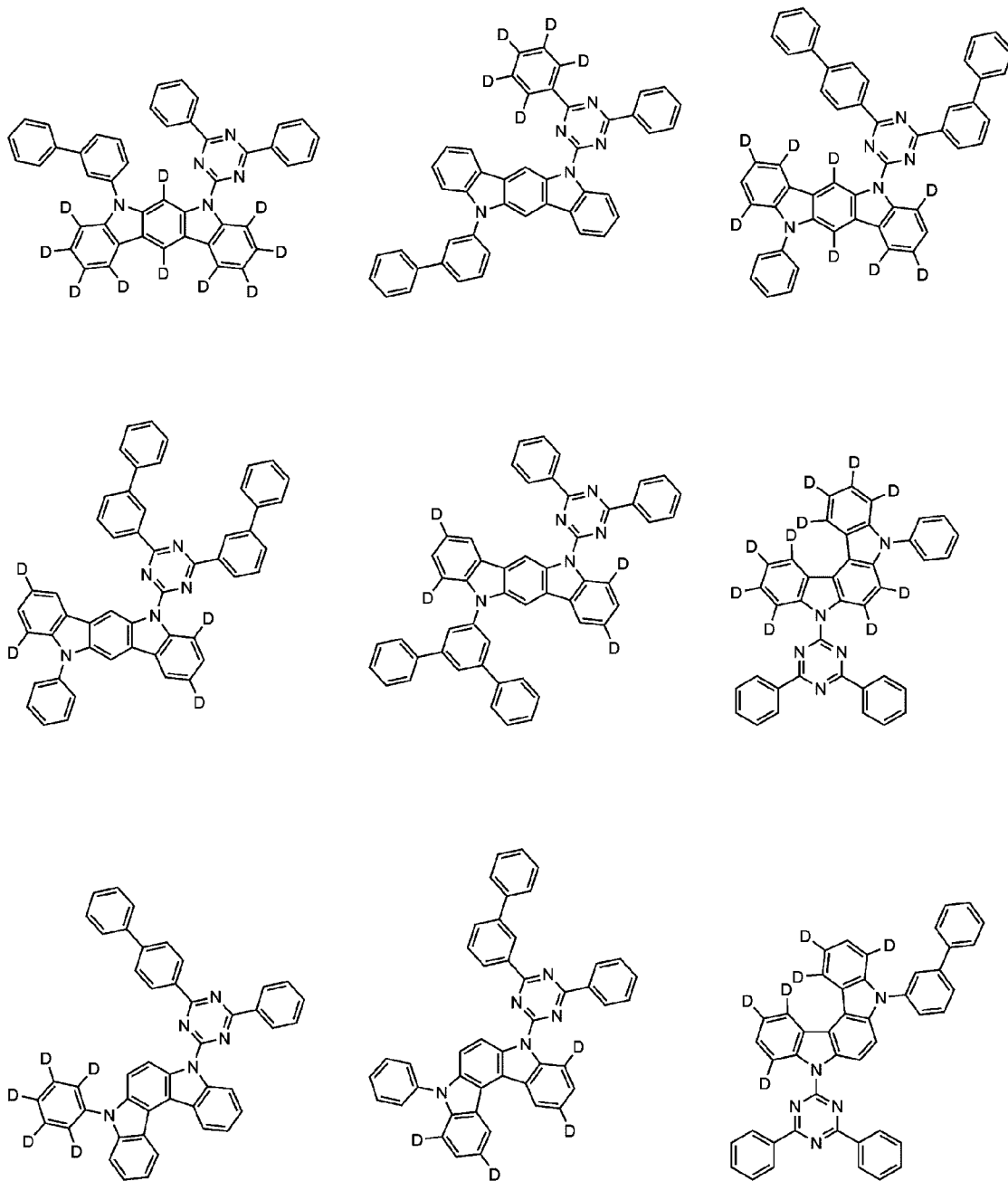
[551]



[552]



[553]

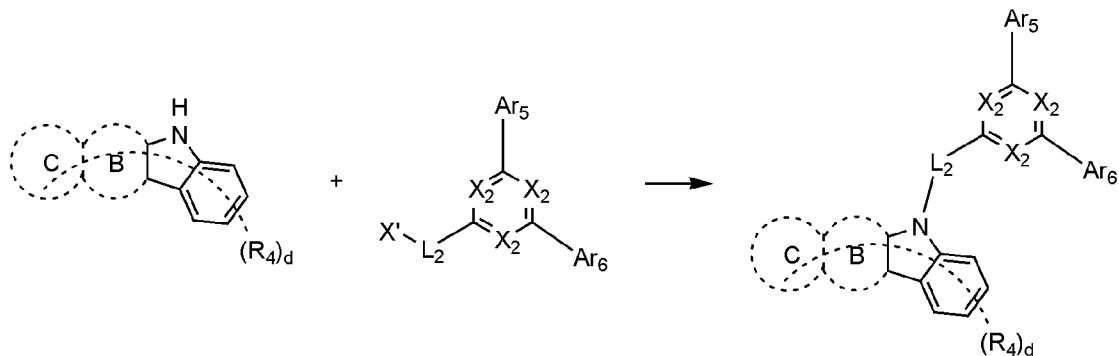


[554]

[555] 또한, 본 발명은 하기 반응식 3과 같은 상기 화학식 3으로 표시되는 화합물의 제조 방법을 제공한다.

[556] [반응식 3]

[557]



[558] 상기 반응식 3에서, X'를 제외한 나머지 정의는 앞서 정의한 바와 같으며, X'는 할로젠이고 보다 바람직하게는 플루오로, 클로로, 또는 브로모이다.

[559]

[560] 상기 반응은 아민 치환 반응으로서, 팔라듐 촉매와 염기 존재하에 수행하는 것이 바람직하며, 아민 치환 반응을 위한 반응기는 당업계에 알려진 바에 따라 변경이 가능하다. 상기 제조 방법은 후술할 제조예에서 보다 구체화될 수 있다.

[561]

[562] 한편, 상기 도펀트 재료로는 유기 발광 소자에 사용되는 물질이면 특별히 제한되지 않는다. 일례로, 방향족 아민 유도체, 스티릴아민 화합물, 붕소 착체, 플루오란텐 화합물, 금속 착체 등이 있다. 구체적으로 방향족 아민 유도체로는 치환 또는 비치환된 아릴아미노기를 갖는 축합 방향족환 유도체로서, 아릴아미노기를 갖는 피렌, 안트라센, 크리센, 페리플란텐 등이 있으며, 스티릴아민 화합물로는 치환 또는 비치환된 아릴아민에 적어도 1개의 아릴비닐기가 치환되어 있는 화합물로, 아릴기, 실릴기, 알킬기, 사이클로알킬기 및 아릴아미노기로 이루어진 군에서 1 또는 2 이상 선택되는 치환기가 치환 또는 비치환된다. 구체적으로 스티릴아민, 스티릴디아민, 스티릴트리아민, 스티릴테트라아민 등이 있으나, 이에 한정되지 않는다. 또한, 금속 착체로는 이리듐 착체, 백금 착체 등이 있으나, 이에 한정되지 않는다.

[563]

[564] 정공수송층

[565] 본 발명에 따른 유기 발광 소자는, 상기 전자억제층과 양극 사이에 정공수송층을 포함할 수 있다.

[566]

[567] 상기 정공수송층은 정공주입층으로부터 정공을 수취하여 발광층까지 정공을 수송하는 층으로, 정공 수송 물질로 양극이나 정공 주입층으로부터 정공을 수송받아 발광층으로 옮겨줄 수 있는 물질로 정공에 대한 이동성이 큰 물질이 적합하다.

[568]

[569] 상기 정공 수송 물질로 아릴아민 계열의 유기물, 전도성 고분자, 및 공액 부분과 비공액 부분이 함께 있는 블록 공중합체 등을 사용할 수 있으나, 이에 한정되는

것은 아니다.

[570]

[571] 전자억제층

[572] 본 발명에 따른 유기 발광 소자는, 상기 양극과 발광층 사이에 전자억제층을 포함한다. 바람직하게는, 상기 전자억제층은 상기 발광층의 양극 쪽에 접하여 포함된다.

[573]

[574] 상기 전자억제층은, 음극에서 주입된 전자가 발광층에서 재결합하지 않고 양극 쪽으로 전달되는 것을 억제하여 유기 발광 소자의 효율을 향상시키는 역할을 한다.

[575]

[576] 상기 전자억제층은 전자저지물질을 포함하고, 이러한 전자저지물질의 예로 아릴아민 계열의 유기물 등을 사용할 수 있으나, 이에 한정되는 것은 아니다.

[577]

[578] 정공주입층

[579] 본 발명에 따른 유기 발광 소자는, 필요에 따라 상기 양극과 정공수송층 사이에 정공주입층을 추가로 포함할 수 있다.

[580]

[581] 상기 정공주입층은 전극으로부터 정공을 주입하는 층으로, 정공 주입 물질로는 정공을 수송하는 능력을 가져 양극에서의 정공 주입효과, 발광층 또는 발광재료에 대하여 우수한 정공 주입 효과를 갖고, 발광층에서 생성된 여기자의 전자주입층 또는 전자주입재료에의 이동을 방지하며, 또한, 박막 형성 능력이 우수한 화합물이 바람직하다. 또한, 정공 주입 물질의 HOMO(highest occupied molecular orbital)가 양극 물질의 일함수와 주변 유기물 층의 HOMO 사이인 것이 바람직하다.

[582]

[583] 정공 주입 물질의 구체적인 예로는 금속 포피린(porphyrin), 올리고티오펜, 아릴아민 계열의 유기물, 헥사니트릴헥사아자트리페닐렌 계열의 유기물, 퀴나크리돈(quinacridone)계열의 유기물, 페릴렌(perylene) 계열의 유기물, 안트라퀴논 및 폴리아닐린과 폴리티오펜 계열의 전도성 고분자 등이 있으나, 이들에만 한정되는 것은 아니다.

[584]

[585] 전자수송층

[586] 본 발명에 따른 유기 발광 소자는, 상기 발광층과 음극 사이에 전자수송층을 포함할 수 있다.

[587]

[588] 상기 전자수송층은, 음극 또는 음극 상에 형성된 전자주입층으로부터 전자를 수취하여 발광층까지 전자를 수송하고, 또한 발광층에서 정공이 전달되는 것을

억제하는 층으로, 전자 수송 물질로는 음극으로부터 전자를 잘 주입 받아 발광층으로 옮겨줄 수 있는 물질로서, 전자에 대한 이동성이 큰 물질이 적합하다.

[589]

[590] 상기 전자 수송 물질의 구체적인 예로는 8-히드록시퀴놀린의 Al 착물; Alq₃를 포함한 착물; 유기 라디칼 화합물; 히드록시플라본-금속 착물 등이 있으나, 이들에만 한정되는 것은 아니다. 전자 수송층은 종래기술에 따라 사용된 바와 같이 임의의 원하는 캐소드 물질과 함께 사용할 수 있다. 특히, 적절한 캐소드 물질의 예는 낮은 일함수를 가지고 알루미늄층 또는 실버층이 뒤따르는 통상적인 물질이다. 구체적으로 세슘, 바륨, 칼슘, 이테르븀 및 사마륨이고, 각 경우 알루미늄 층 또는 실버층이 뒤따른다.

[591]

[592] 전자주입층

[593] 본 발명에 따른 유기 발광 소자는 필요에 따라 상기 전자수송층과 음극 사이에 전자주입층을 추가로 포함할 수 있다.

[594]

[595] 상기 전자주입층은 전극으로부터 전자를 주입하는 층으로, 전자를 수송하는 능력을 갖고, 음극으로부터의 전자 주입 효과, 발광층 또는 발광 재료에 대하여 우수한 전자주입 효과를 가지며, 발광층에서 생성된 여기자의 정공주입층에의 이동을 방지하고, 또한, 박막형성능력이 우수한 화합물을 사용하는 것이 바람직하다.

[596]

[597] 상기 전자주입층으로 사용될 수 있는 물질의 구체적인 예로는, 플루오레논, 안트라퀴노다이메탄, 다이페노퀴논, 티오피란 다이옥사이드, 옥사졸, 옥사다이하졸, 트리아졸, 이미다졸, 페릴렌테트라카복실산, 프레오레닐리덴 메탄, 안트론 등과 그들의 유도체, 금속 착체 화합물 및 질소 함유 5원환 유도체 등이 있으나, 이에 한정되지 않는다.

[598]

[599] 상기 금속 착체 화합물로서는 8-하이드록시퀴놀리나토 리튬, 비스(8-하이드록시퀴놀리나토)아연, 비스(8-하이드록시퀴놀리나토)구리, 비스(8-하이드록시퀴놀리나토)망간, 트리스(8-하이드록시퀴놀리나토)알루미늄, 트리스(2-메틸-8-하이드록시퀴놀리나토)알루미늄, 트리스(8-하이드록시퀴놀리나토)갈륨, 비스(10-하이드록시벤조[h]퀴놀리나토)베릴륨, 비스(10-하이드록시벤조[h]퀴놀리나토)아연, 비스(2-메틸-8-퀴놀리나토)클로로갈륨, 비스(2-메틸-8-퀴놀리나토)(o-크레졸라토)갈륨, 비스(2-메틸-8-퀴놀리나토)(1-나프톨라토)알루미늄,

비스(2-메틸-8-퀴놀리나토)(2-나프톨라토)갈륨 등이 있으나, 이에 한정되지 않는다.

[600]

[601] 유기 발광 소자

[602] 본 발명에 따른 유기 발광 소자의 구조를 도 1에 예시하였다. 도 1은, 기판(1), 양극(2), 전자억제층(3), 발광층(4), 및 음극(5)으로 이루어진 유기 발광 소자의 예를 도시한 것이다. 또한, 정공수송층(6) 및 전자수송층(7)을 포함하는 경우의 유기 발광 소자의 구조를 도 2에 예시하였다.

[603]

[604] 본 발명에 따른 유기 발광 소자는 상술한 구성을 순차적으로 적층시켜 제조할 수 있다. 이때, 스퍼터링법(sputtering)이나 전자빔 증발법(e-beam evaporation)과 같은 PVD(physical Vapor Deposition)방법을 이용하여, 기판 상에 금속 또는 전도성을 가지는 금속 산화물 또는 이들의 합금을 증착시켜 양극을 형성하고, 그 위에 상술한 각 층을 형성한 후, 그 위에 음극으로 사용할 수 있는 물질을 증착시켜 제조할 수 있다. 이와 같은 방법 외에도, 기판 상에 음극 물질부터 상술한 구성의 역순으로 양극 물질까지 차례로 증착시켜 유기 발광 소자를 만들 수 있다(WO 2003/012890). 또한, 발광층은 호스트 및 도펀트를 진공 증착법 뿐만 아니라 용액 도포법에 의하여 형성될 수 있다. 여기서, 용액 도포법이라 함은 스핀 코팅, 딥코팅, 닥터 블레이딩, 잉크젯 프린팅, 스크린 프린팅, 스프레이법, 롤 코팅 등을 의미하지만, 이들만으로 한정되는 것은 아니다.

[605]

[606] 한편, 본 발명에 따른 유기 발광 소자는 사용되는 재료에 따라 전면 발광형, 후면 발광형 또는 양면 발광형일 수 있다.

[607]

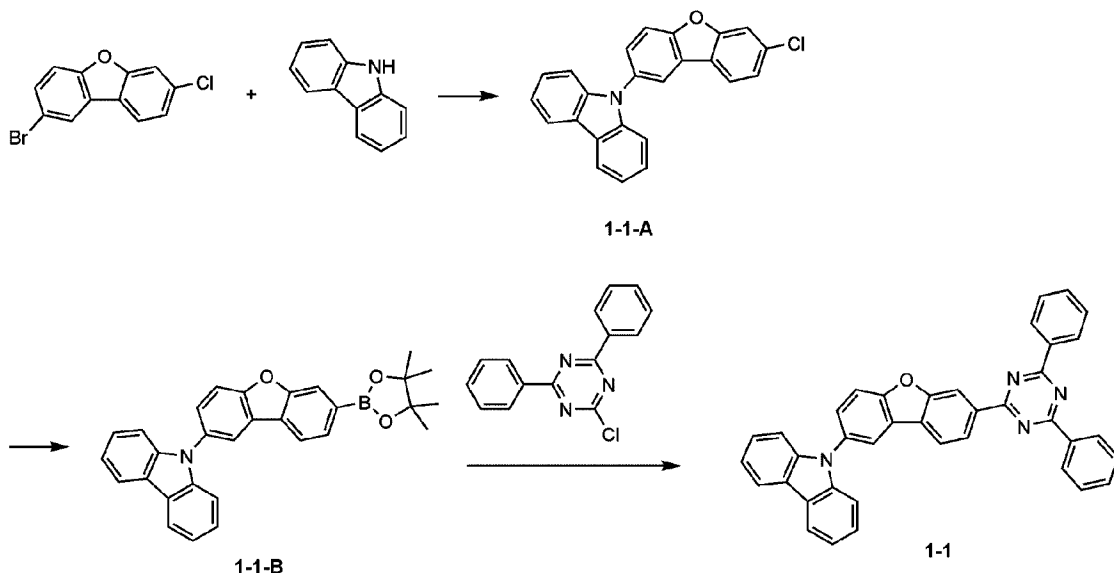
[608] 본 발명에 따른 유기 발광 소자의 제조는 이하 실시예에서 구체적으로 설명한다. 그러나 하기 실시예는 본 발명을 예시하기 위한 것이며, 본 발명의 범위가 이들에 의하여 한정되는 것은 아니다.

[609]

[610] [제조예 1]

[611] 제조예 1-1: 화합물 1-1의 제조

[612]



[613] 단계 1) 화합물 1-1-A의 제조

[614] 질소 분위기에서 2-브로모-7-클로로디벤조[b,d]퓨란(20 g, 71 mmol)과 9H-카바졸(11.9 g, 71 mmol)을 자일렌(400 ml)에 넣고 교반 및 환류하였다. 이 후 K_3PO_4 (20.5 g, 213.1 mmol)를 투입하고 충분히 교반한 후 비스(트리-tert-부틸포스핀)팔라듐(0)(1.1 g, 2.1 mmol)을 투입하였다. 3시간 반응 후 상온으로 식인 후 유기층을 여과하여 염을 제거한 후 걸러진 유기층을 증류하였다. 이를 다시 클로로포름(261 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에탄올을 사용한 재결정을 통해 베이지색 고체 화합물 1-1-A(17.8 g, 수율 68%)을 제조하였다.

[615] MS: $[M+H]^+ = 368.8$

[616]

[617] 단계 2) 화합물 1-1-B의 제조

[618] 질소 분위기에서 화합물 1-1-A(30 g, 81.6 mmol)와 비스(피나콜라토)디보론(20.7 g, 81.6 mmol)를 다이옥산(600 ml)에 넣고 교반 및 환류하였다. 이 후 아세트산칼륨(24 g, 244.7 mmol)를 투입하고 충분히 교반한 후 비스(디벤질리덴아세톤)팔라듐(0)(1.4 g, 2.4 mmol) 및 트리시클로헥실포스핀(1.4 g, 4.9 mmol)을 투입하였다. 5시간 반응 후 상온으로 식인 후 유기층을 여과하여 염을 제거한 후 걸러진 유기층을 증류하였다. 이를 다시 클로로포름(375 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에탄올을 사용한 재결정을 통해 흰색 고체 화합물 1-1-B(19.5 g, 수율 52%)을 제조하였다.

[619] MS: $[M+H]^+ = 460.4$

[620]

[621] 단계 3) 화합물 1-1의 제조

[622] 질소 분위기에서 화합물 1-1-B(20 g, 43.5 mmol)와

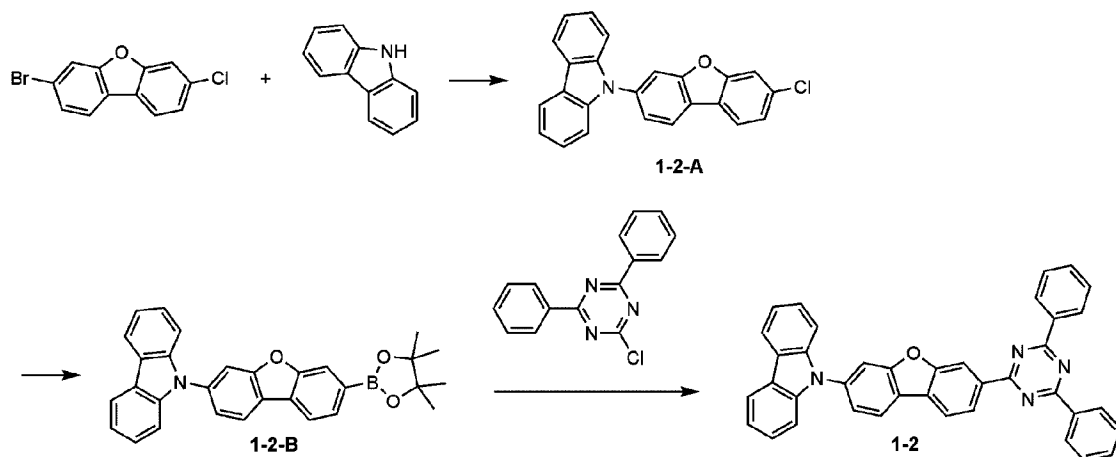
2-클로로-4,6-디페닐-1,3,5-트리아진(11.7 g, 43.5 mmol)을 THF(400 ml)에 넣고 교반 및 환류하였다. 이 후 탄산 칼륨(18.1 g, 130.6 mmol)를 물(54 ml)에 녹여 투입하고 충분히 교반한 후 비스(트리-tert-부틸포스핀)팔라듐(0)(0.7 g, 1.3 mmol)을 투입하였다. 5시간 반응 후 상온으로 식인 후 유기층과 물층을 분리 후 유기층을 증류하였다. 이를 다시 클로로포름(1229 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에틸아세테이트를 사용한 재결정 과정으로 형광색의 고체 화합물 1-1(17.5 g, 수율 71%)을 제조하였다.

[623] MS: $[M+H]^+ = 565.7$

[624]

[625] 제조예 1-2: 화합물 1-2의 제조

[626]



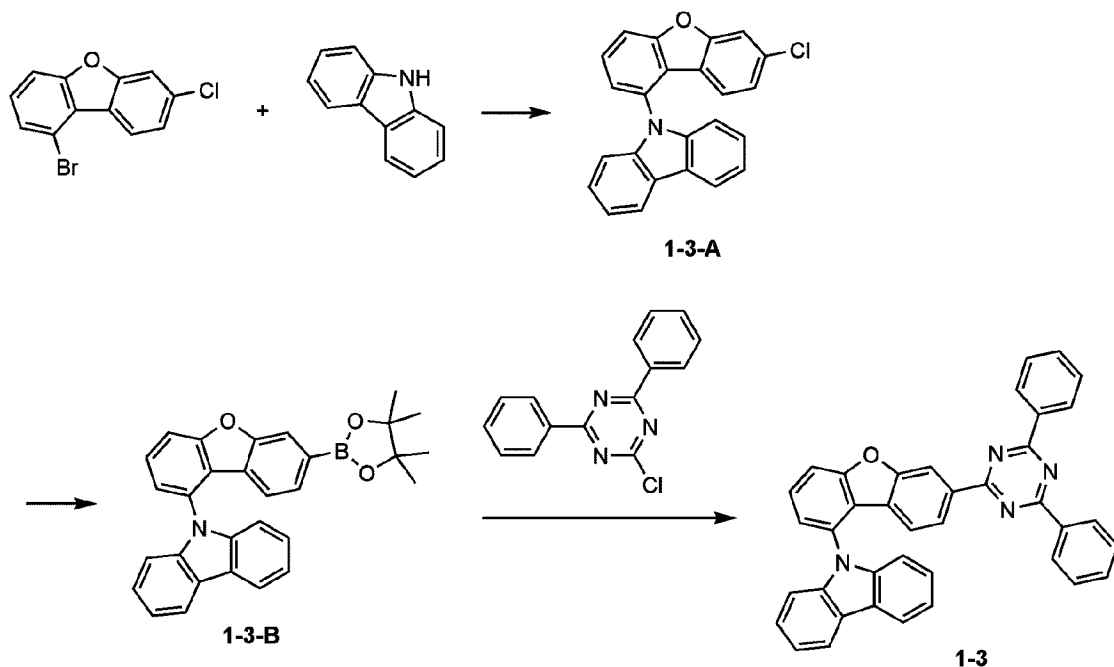
[627] 2-브로모-7-클로로디벤조[b,d]퓨란 대신 3-브로모-7-클로로디벤조[b,d]퓨란을 사용한 것을 제외하고, 화합물 1-1의 제조 방법과 동일한 방법으로 화합물 1-2(16.7 g, 수율 68%)을 제조하였다.

[628] MS: $[M+H]^+ = 565.7$

[629]

[630] 제조예 1-3: 화합물 1-3의 제조

[631]



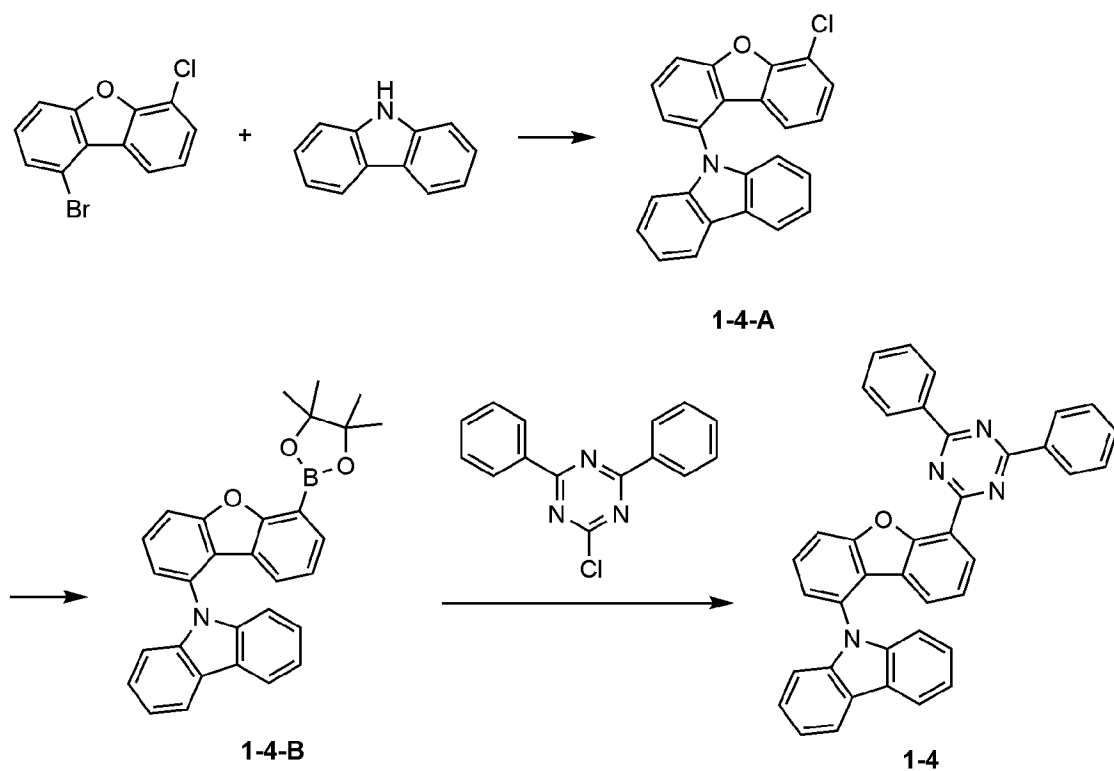
[632] 2-브로모-7-클로로디벤조[b,d]퓨란 대신 1-브로모-7-클로로디벤조[b,d]퓨란을 사용한 것을 제외하고, 화합물 1-1의 제조 방법과 동일한 방법으로 화합물 1-3(12.8 g, 수율 52%)을 제조하였다.

[633] MS: $[M+H]^+ = 565.7$

[634]

[635] 제조예 1-4: 화합물 1-4의 제조

[636]



[637] 2-브로모-7-클로로디벤조[b,d]퓨란 대신 1-브로모-6-클로로디벤조[b,d]퓨란을

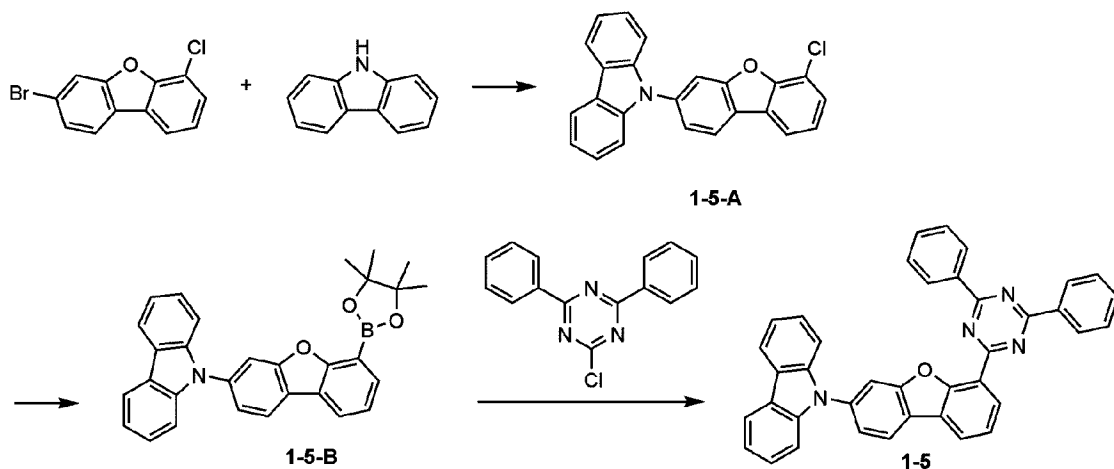
사용한 것을 제외하고, 화합물 1-1의 제조 방법과 동일한 방법으로 화합물 1-4(17.9 g, 수율 73%)을 제조하였다.

[638] MS: $[M+H]^+ = 565.7$

[639]

[640] 제조예 1-5: 화합물 1-5의 제조

[641]



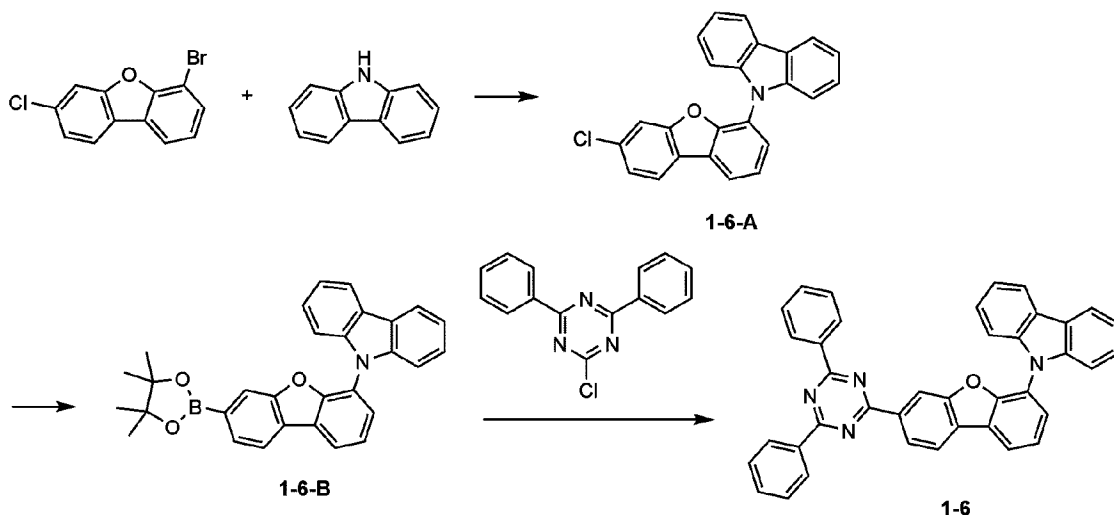
[642] 2-브로모-7-클로로디벤조[b,d]퓨란 대신 3-브로모-6-클로로디벤조[b,d]퓨란을 사용한 것을 제외하고, 화합물 1-1의 제조 방법과 동일한 방법으로 화합물 1-5(13.8 g, 수율 56%)을 제조하였다.

[643] MS: $[M+H]^+ = 565.7$

[644]

[645] 제조예 1-6: 화합물 1-6의 제조

[646]



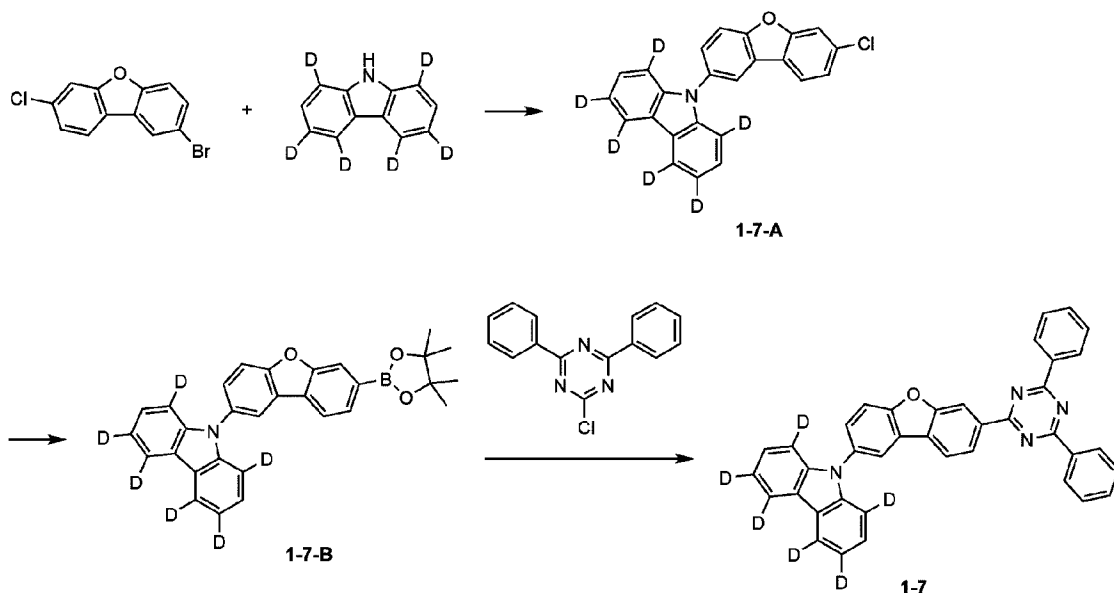
[647] 2-브로모-7-클로로디벤조[b,d]퓨란 대신 6-브로모-3-클로로디벤조[b,d]퓨란을 사용한 것을 제외하고, 화합물 1-1의 제조 방법과 동일한 방법으로 화합물 1-6(15.7 g, 수율 64%)을 제조하였다.

[648] MS: $[M+H]^+ = 565.7$

[649]

[650] 제조예 1-7: 화합물 1-7의 제조

[651]



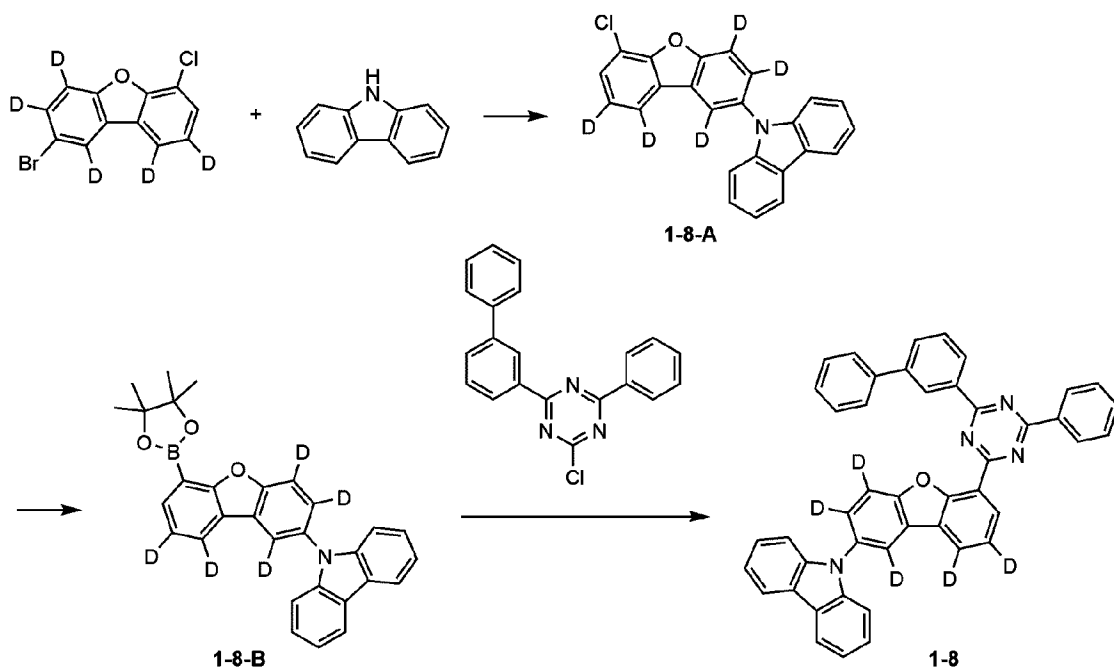
[652] 9H-카바졸 대신 9H-카바졸-1,3,4,5,6,8-d6를 사용한 것을 제외하고, 화합물 1-1의 제조 방법과 동일한 방법으로 화합물 1-7(16.4 g, 수율 66%)을 제조하였다.

[653] MS: $[M+H]^+ = 571.7$

[654]

[655] 제조예 1-8: 화합물 1-8의 제조

[656]



[657] 화합물 1-1의 제조 과정의 단계 1에서 2-브로모-7-클로로디벤조[b,d]퓨란 대신 2-브로모-6-클로로디벤조[b,d]퓨란-1,3,4,8,9-d5를 사용하고, 단계 3에서 2-클로로-4,6-디페닐-1,3,5-트리아진 대신 2-([1,1'-비페닐]-3-일)-4-클로로-6-페닐-1,3,5-트리아진을 사용한 것을 제외하고, 화합물 1-1의 제조 방법과 동일한 방법으로 화합물 1-8(16.9 g, 수율 60%)을

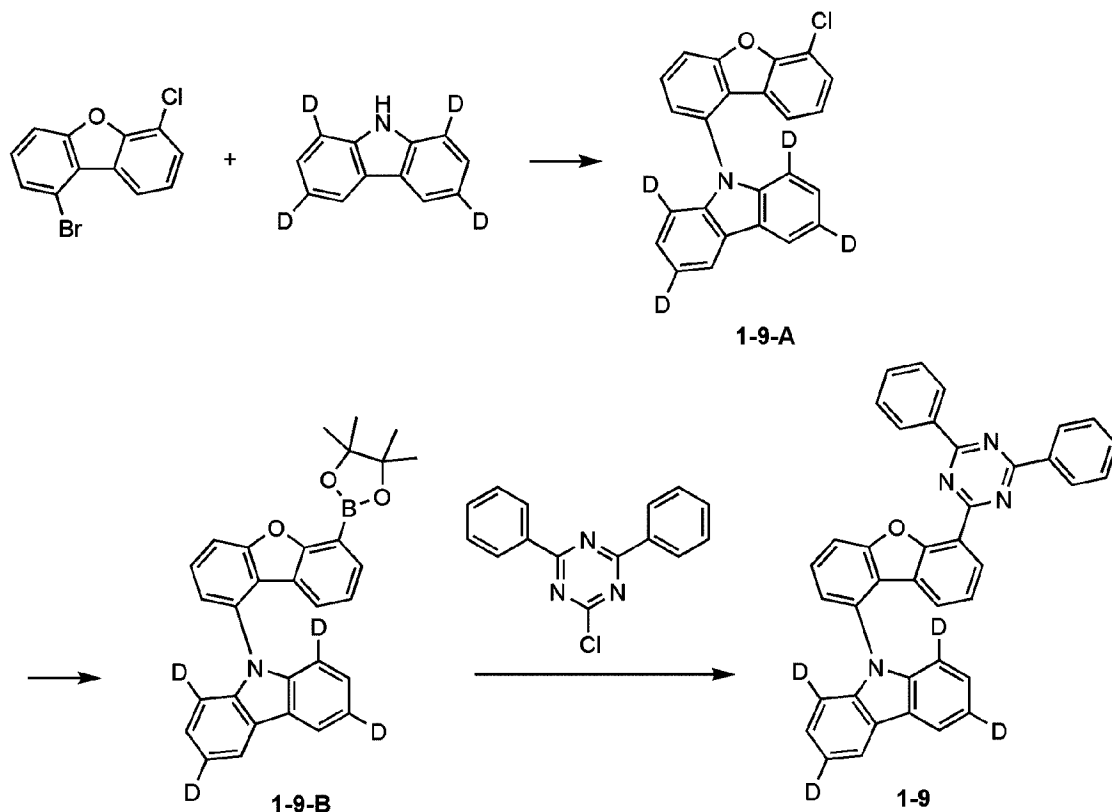
제조하였다.

[658] MS: $[M+H]^+ = 646.8$

[659]

[660] 제조예 1-9: 화합물 1-9의 제조

[661]



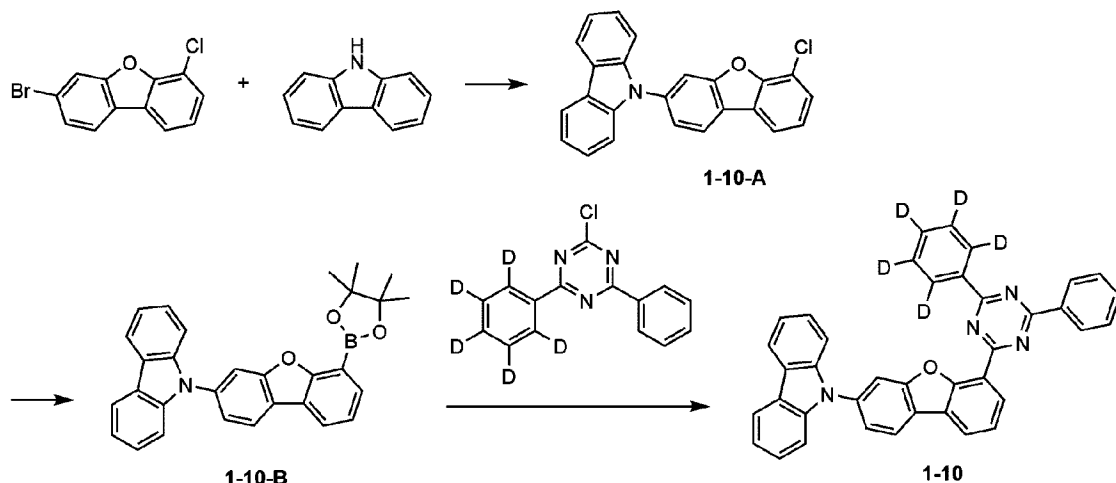
[662] 화합물 1-1의 제조 과정의 단계 1에서 2-브로모-7-클로로디벤조[b,d]퓨란 대신 1-브로모-6-클로로디벤조[b,d]퓨란을 사용하고, 9H-카바졸 대신 9H-카바졸-1,3,6,8-d4을 사용한 것을 제외하고, 화합물 1-1의 제조 방법과 동일한 방법으로 화합물 1-9(19.3 g, 수율 78%)을 제조하였다.

[663] MS: $[M+H]^+ = 569.7$

[664]

[665] 제조예 1-10: 화합물 1-10의 제조

[666]



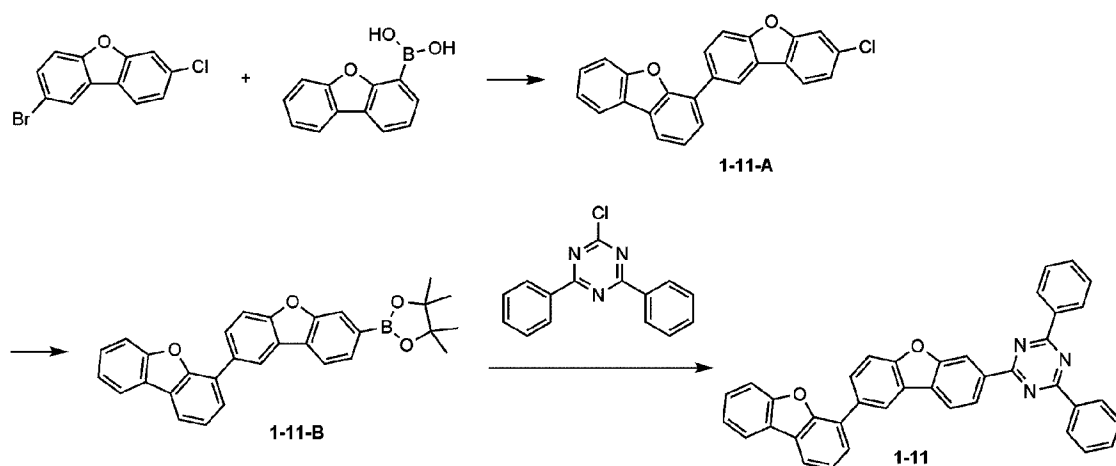
[667] 화합물 1-1의 제조 과정의 단계 1에서 2-브로모-7-클로로디벤조[b,d]퓨란 대신 3-브로모-6-클로로디벤조[b,d]퓨란을 사용하고, 단계 3에서 2-클로로-4,6-디페닐-1,3,5-트리아진 대신 2-클로로-4-페닐-6-(페닐-d5)-1,3,5-트리아진을 사용한 것을 제외하고, 화합물 1-1의 제조 방법과 동일한 방법으로 화합물 1-10(18.6 g, 수율 75%)을 제조하였다.

[668] MS: $[M+H]^+ = 570.7$

[669]

[670] 제조예 1-11: 화합물 1-11의 제조

[671]



[672] 단계 1) 화합물 1-11-A의 제조

[673] 질소 분위기에서 2-브로모-7-클로로디벤조[b,d]퓨란(20 g, 71 mmol)과 디벤조[b,d]퓨란-4-일보론산(15.1 g, 71 mmol)을 THF(400 ml)에 넣고 교반 및 환류하였다. 이 후 탄산 칼륨(29.5 g, 213.1 mmol)를 물(88 ml)에 녹여 투입하고 충분히 교반한 후 테트라키스(트리페닐포스핀)팔라듐(0)(1.1 g, 2.1 mmol)을 투입하였다. 4시간 반응 후 상온으로 식인 후 유기층과 물층을 분리 후 유기층을 증류하였다. 이를 다시 클로로포름(1310 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에탄올을 사용한 재결정을

통해 흰색의 고체 화합물 1-11-A(14.1 g, 수율 54%)을 제조하였다.

[674] MS: $[M+H]^+ = 369.8$

[675]

[676] 단계 2) 화합물 1-11-B의 제조

[677] 질소 분위기에서 화합물 1-11-A(30 g, 81.3 mmol)와

비스(피나콜라토)디보론(20.7 g, 81.3 mmol)를 다이옥산(600 ml)에 넣고 교반 및 환류하였다. 이 후 아세트산칼륨(24 g, 244 mmol)을 투입하고 충분히 교반한 후 비스(디벤질리덴아세톤)팔라듐(0)(1.4 g, 2.4 mmol) 및 트리시클로헥실포스핀(1.4 g, 4.9 mmol)을 투입하였다. 8시간 반응 후 상온으로 식인 후 유기층을 여과하여 염을 제거한 후 걸러진 유기층을 증류하였다. 이를 다시 클로로포름(374 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에탄올을 사용한 재결정을 통해 베이지색 고체 화합물 1-11-B(26.6 g, 수율 71%)을 제조하였다.

[678] MS: $[M+H]^+ = 461.3$

[679]

[680] 단계 3) 화합물 1-11의 제조

[681] 질소 분위기에서 화합물 1-11-B(20 g, 43.4 mmol)와

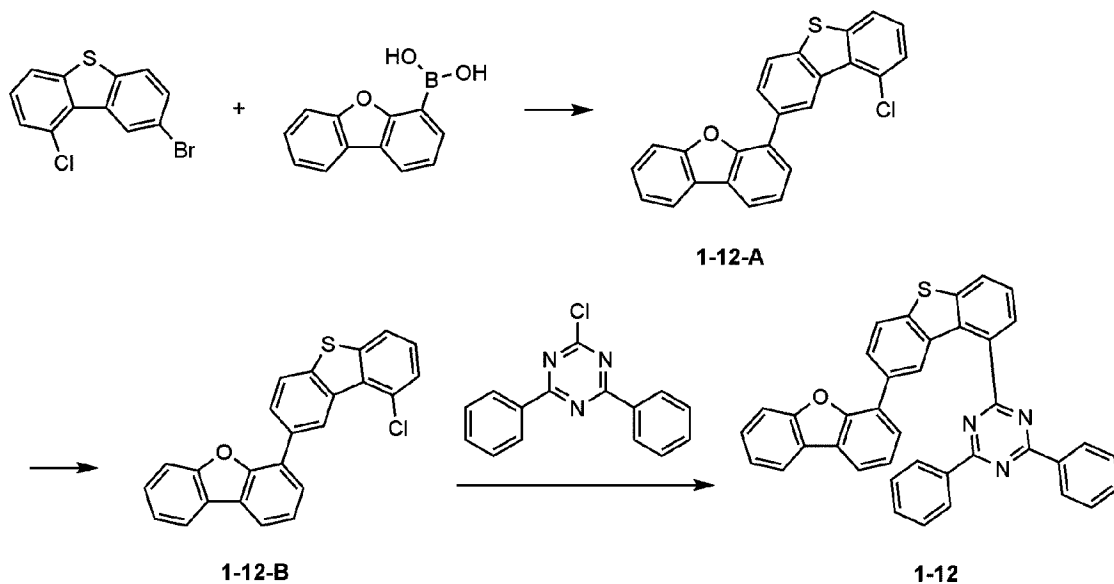
2-클로로-4,6-디페닐-1,3,5-트리아진(11.6 g, 43.4 mmol)을 THF(400 ml)에 넣고 교반 및 환류하였다. 이 후 탄산 칼륨(18 g, 130.3 mmol)를 물(54 ml)에 녹여 투입하고 충분히 교반한 후 비스(트리-터트-부틸포스핀)팔라듐(0)(0.7 g, 1.3 mmol)을 투입하였다. 5시간 반응 후 상온으로 식인 후 유기층과 물층을 분리 후 유기층을 증류하였다. 이를 다시 클로로포름(1229 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에틸아세테이트를 사용한 재결정 과정으로 흰색의 고체 화합물 1-11(17 g, 수율 69%)을 제조하였다.

[682] MS: $[M+H]^+ = 566.6$

[683]

[684] 제조예 1-12: 화합물 1-12의 제조

[685]



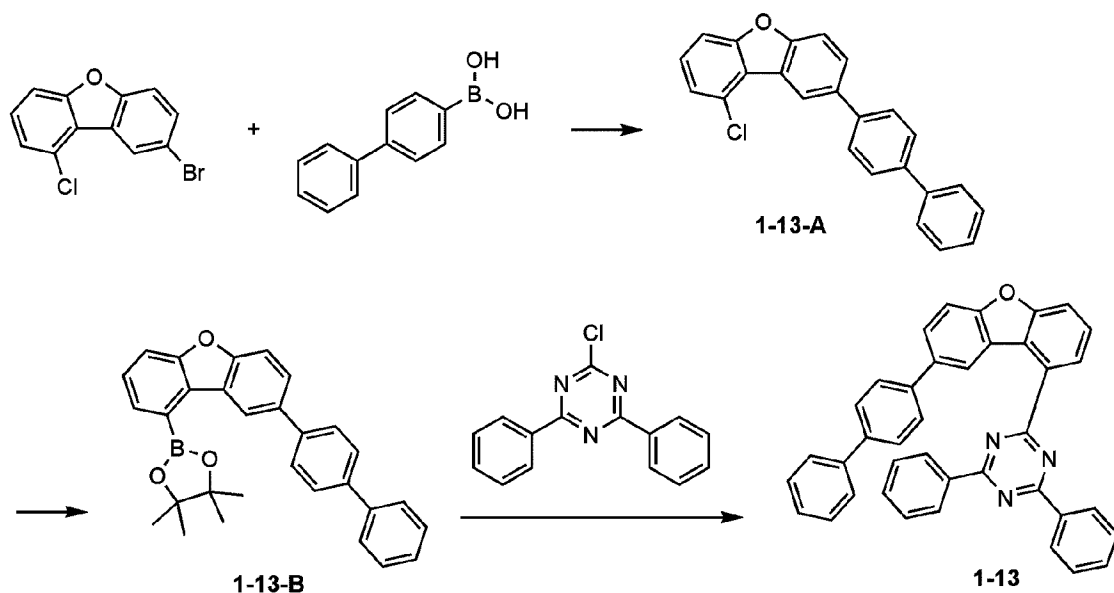
[686] 화합물 1-11 제조 과정의 단계 1에서 2-브로모-7-클로로디벤조[b,d]퓨란 대신 8-브로모-1-클로로디벤조[b,d]티오펜을 사용한 것을 제외하고, 화합물 1-11의 제조 방법과 동일한 방법으로 화합물 1-12(16.9 g, 수율 67%)을 제조하였다.

[687] MS: $[M+H]^+ = 582.7$

[688]

[689] 제조예 1-13: 화합물 1-13의 제조

[690]



[691] 화합물 1-11 제조 과정의 단계 1에서 2-브로모-7-클로로디벤조[b,d]퓨란 대신 8-브로모-1-클로로디벤조[b,d]티오펜을 사용하고, 디벤조[b,d]퓨란-4-일보론산 대신 [1,1'-비페닐]-4-일보론산을 사용한 것을 제외하고, 화합물 1-11의 제조 방법과 동일한 방법으로 화합물 1-13(12.9 g, 수율 54%)을 제조하였다.

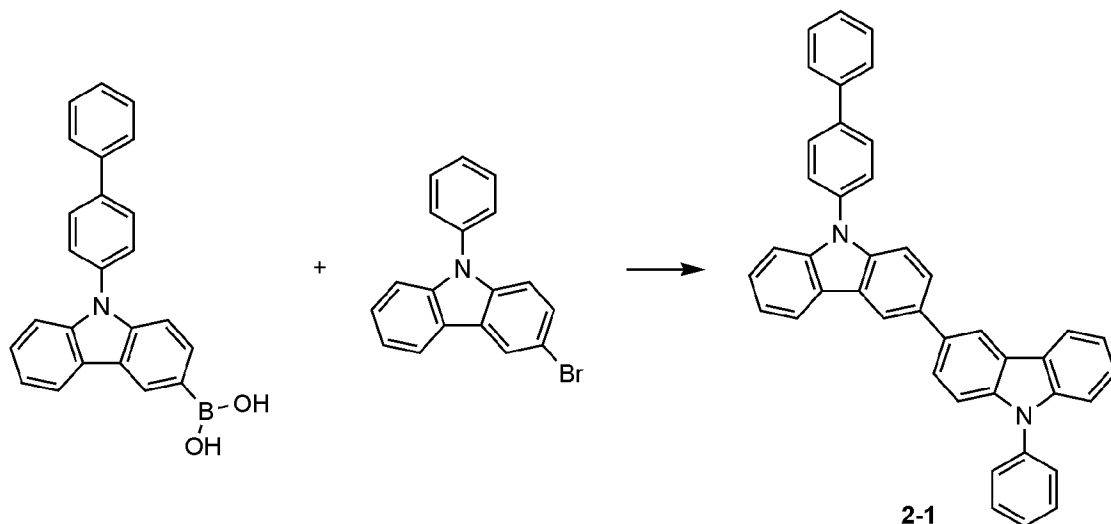
[692] MS: $[M+H]^+ = 552.7$

[693]

[694] [제조예 2]

[695] 제조예 2-1: 화합물 2-1의 제조

[696]



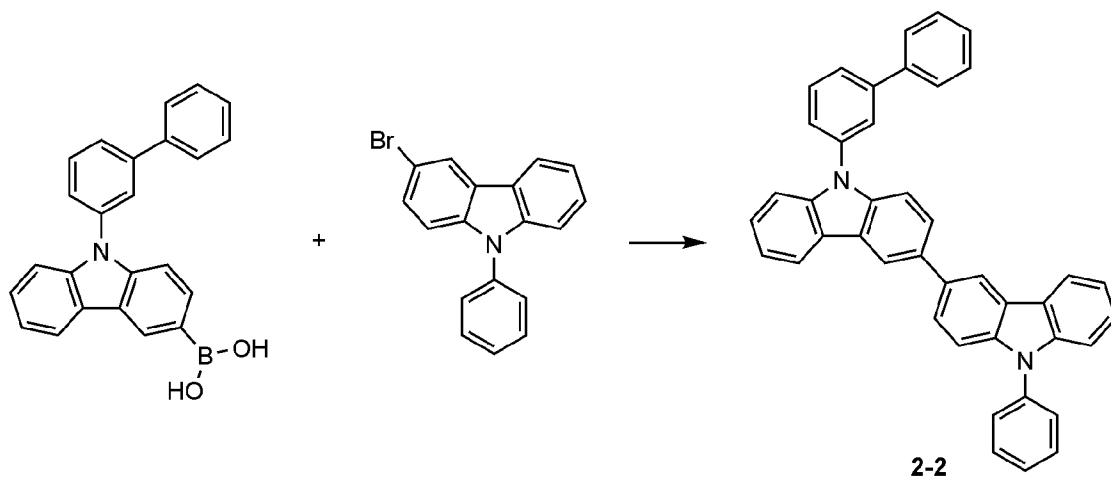
[697] 질소 분위기에서 (9-([1,1'-비페닐]-4-일)-9H-카바졸-3-일)보론산(15 g, 41.3 mmol)와 3-브로모-9-페닐-9H-카바졸(13.3 g, 41.3 mmol)를 THF(300 ml)에 넣고 교반 및 환류하였다. 이 후 포타슘 카보네이트(17.1 g, 123.9 mmol)를 물(51 ml)에 녹여 투입하고 충분히 교반한 후 비스(트리-tert-부틸포스핀)팔라듐(0.6 g, 1.2 mmol)을 투입하였다. 3시간 반응 후 상온으로 식인 후 유기층과 물층을 분리 후 유기층을 증류하였다. 이를 다시 클로로포름(1158 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에틸아세테이트를 사용한 재결정 과정으로 흰색의 고체 화합물 화합물 2-1(16.2 g, 수율 70%)을 제조하였다.

[698] MS: $[M+H]^+ = 561.7$

[699]

[700] 제조예 2-2: 화합물 2-2의 제조

[701]



[702] 질소 분위기에서 (9-([1,1'-비페닐]-3-일)-9H-카바졸-3-일)보론산(15 g, 41.3

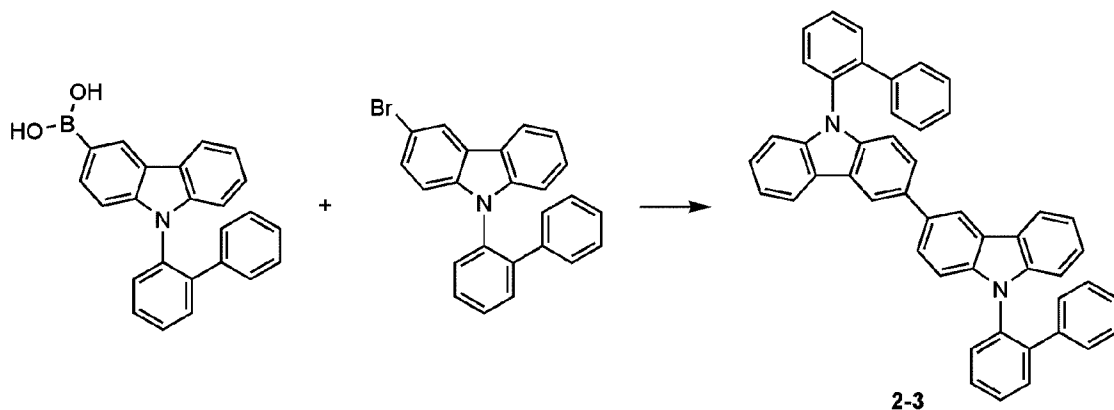
mmol)와 3-브로모-9-페닐-9H-카바졸(13.3 g, 41.3 mmol)를 THF(300 ml)에 넣고 교반 및 환류하였다. 이 후 포타슘 카보네이트(17.1 g, 123.9 mmol)를 물(51 ml)에 녹여 투입하고 충분히 교반한 후 비스(트리-tert-부틸포스핀)팔라듐(0.6 g, 1.2 mmol)을 투입하였다. 3시간 반응 후 상온으로 식인 후 유기층과 물층을 분리 후 유기층을 증류하였다. 이를 다시 클로로포름(1158 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에틸아세테이트를 사용한 재결정 과정으로 흰색의 고체 화합물 2-2(18.1 g, 수율 78%)을 제조하였다.

[703] MS: $[M+H]^+ = 561.7$

[704]

[705] 제조예 2-3: 화합물 2-3의 제조

[706]



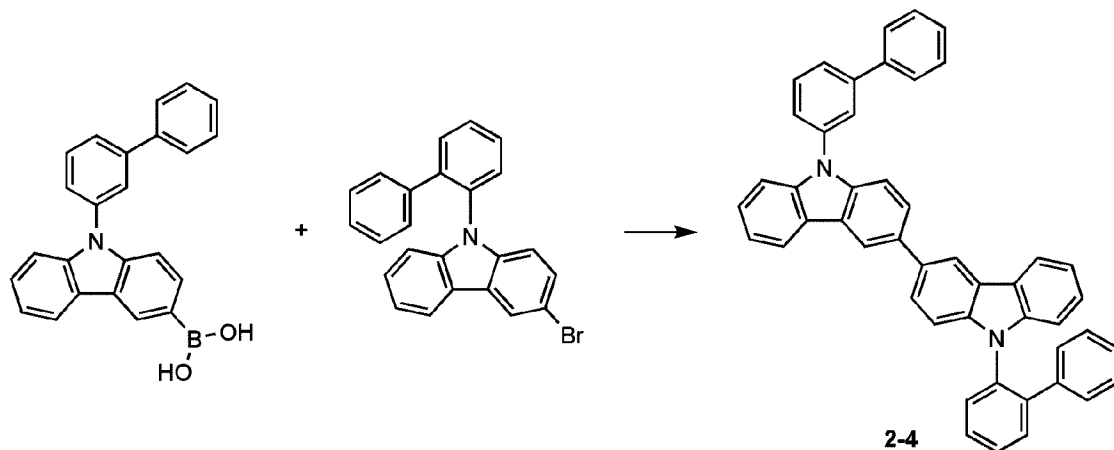
[707] 질소 분위기에서 (9-([1,1'-비페닐]-2-일)-9H-카바졸-3-일)보론산(15 g, 41.3 mmol)와 9-([1,1'-비페닐]-2-일)-3-브로모-9H-카바졸(16.4 g, 41.3 mmol)를 THF(300 ml)에 넣고 교반 및 환류하였다. 이 후 포타슘 카보네이트(17.1 g, 123.9 mmol)를 물(51 ml)에 녹여 투입하고 충분히 교반한 후 비스(트리-tert-부틸포스핀)팔라듐(0.6 g, 1.2 mmol)을 투입하였다. 4시간 반응 후 상온으로 식인 후 유기층과 물층을 분리 후 유기층을 증류하였다. 이를 다시 클로로포름(1315 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에틸아세테이트를 사용한 재결정 과정으로 흰색의 고체 화합물 화합물 2-3(15.3 g, 수율 58%)을 제조하였다.

[708] MS: $[M+H]^+ = 637.8$

[709]

[710] 제조예 2-4: 화합물 2-4의 제조

[711]



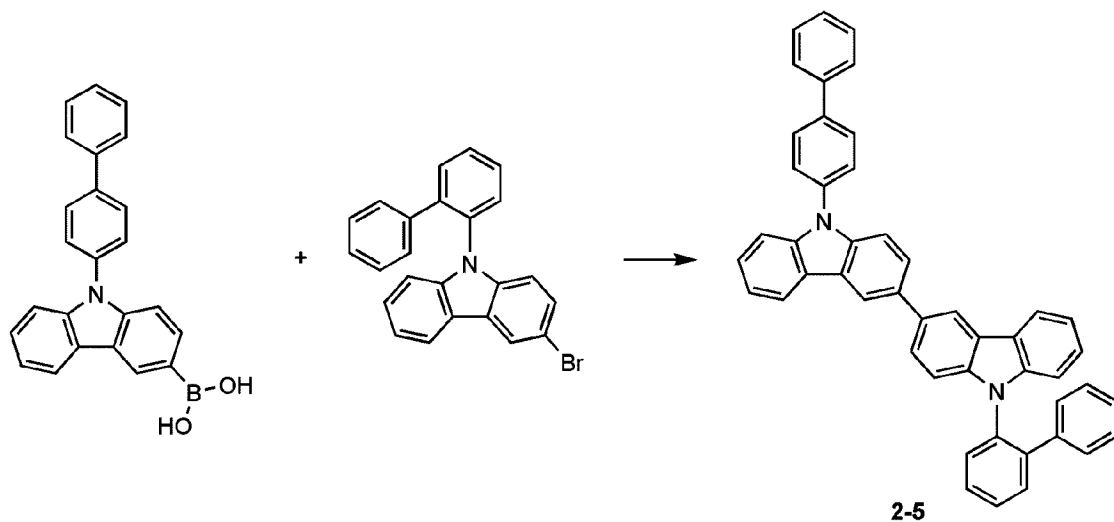
[712] (9-([1,1'-비페닐]-4-일)-9H-카바졸-3-일)보론산 대신 (9-([1,1'-비페닐]-3-일)-9H-카바졸-3-일)보론산을 사용하고, 3-브로모-9-페닐-9H-카바졸 대신 9-([1,1'-비페닐]-2-일)-3-브로모-9H-카바졸을 사용한 것을 제외하고, 화합물 2-1의 제조 방법과 동일한 방법으로 흰색의 고체 화합물 2-4(17.1 g, 수율 65%)를 제조하였다.

[713] MS: $[M+H]^+ = 637.8$

[714]

[715] 제조예 2-5: 화합물 2-5의 제조

[716]



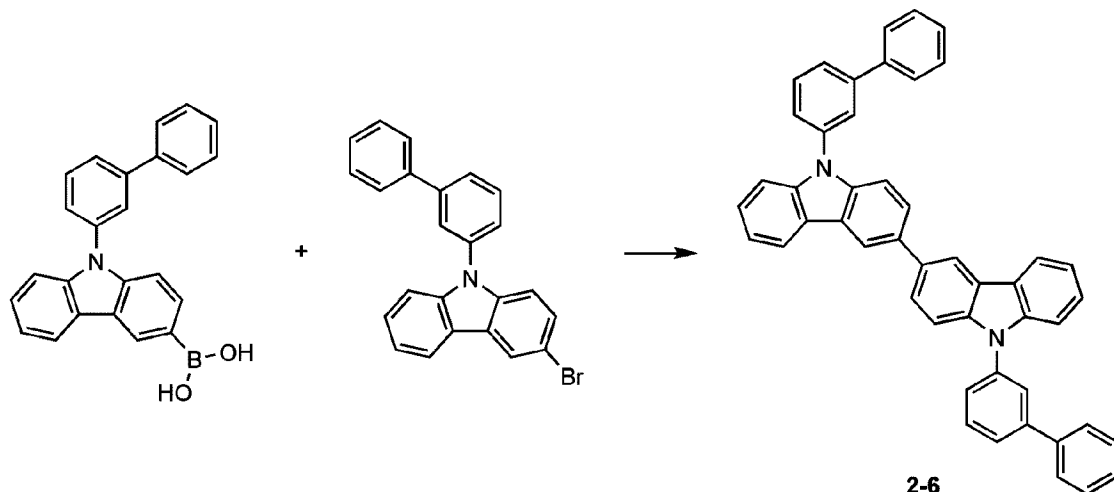
[717] 3-브로모-9-페닐-9H-카바졸 대신 9-([1,1'-비페닐]-2-일)-3-브로모-9H-카바졸을 사용한 것을 제외하고, 화합물 2-1의 제조 방법과 동일한 방법으로 흰색의 고체 화합물 2-5(16 g, 수율 61%)를 제조하였다.

[718] MS: $[M+H]^+ = 637.8$

[719]

[720] 제조예 2-6: 화합물 2-6의 제조

[721]



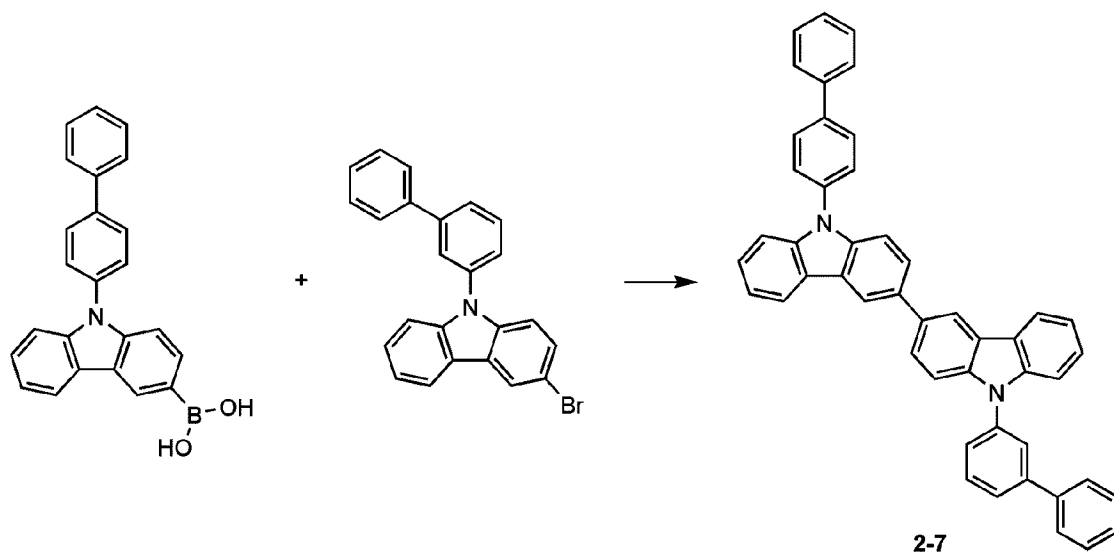
[722] (9-([1,1'-비페닐]-4-일)-9H-카바졸-3-일)보론산 대신 (9-([1,1'-비페닐]-3-일)-9H-카바졸-3-일)보론산을 사용하고, 3-브로모-9-페닐-9H-카바졸 대신 9-([1,1'-비페닐]-3-일)-3-브로모-9H-카바졸을 사용한 것을 제외하고, 화합물 2-1의 제조 방법과 동일한 방법으로 흰색의 고체 화합물 2-6(15.3 g, 수율 58%)을 제조하였다.

[723] MS: $[M+H]^+ = 637.8$

[724]

[725] 제조예 2-7: 화합물 2-7의 제조

[726]



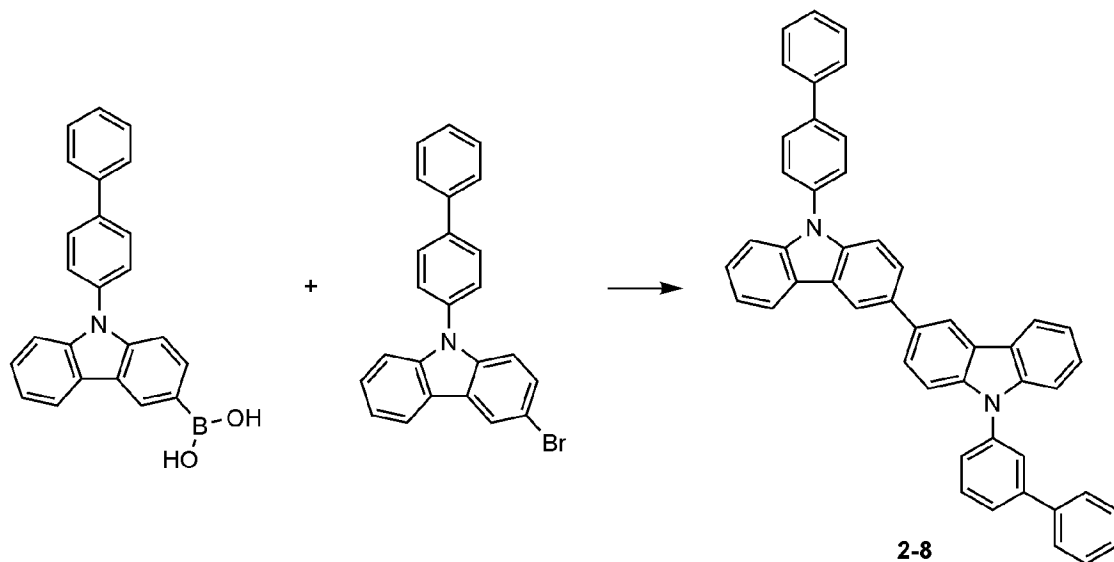
[727] 3-브로모-9-페닐-9H-카바졸 대신 9-([1,1'-비페닐]-3-일)-3-브로모-9H-카바졸을 사용한 것을 제외하고, 화합물 2-1의 제조 방법과 동일한 방법으로 흰색의 고체 화합물 2-7(17.5 g, 수율 50%)을 제조하였다.

[728] MS: $[M+H]^+ = 637.8$

[729]

[730] 제조예 2-8: 화합물 2-8의 제조

[731]



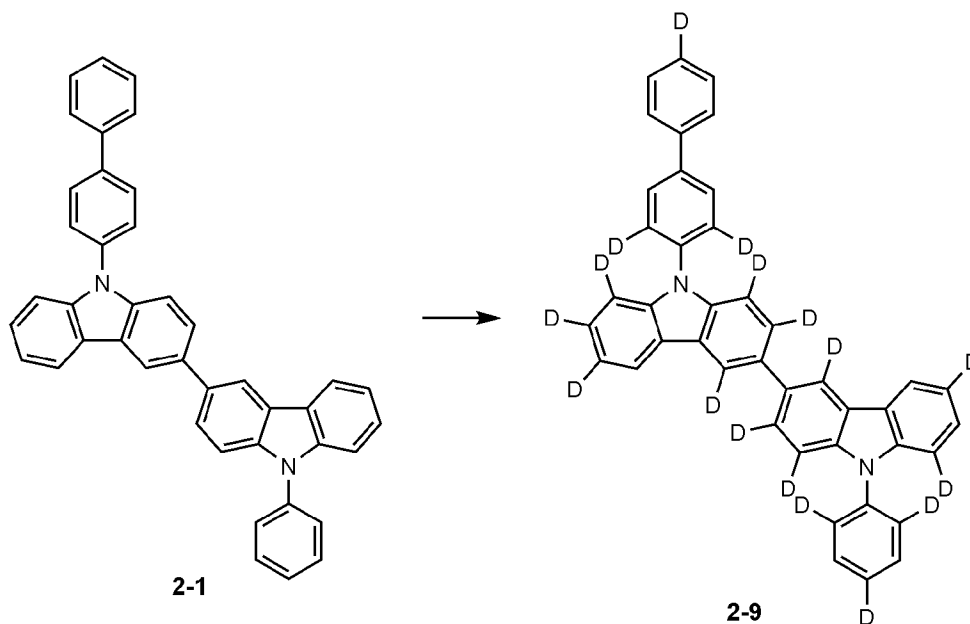
[732] 3-브로모-9-페닐-9H-카바졸 대신 9-([1,1'-비페닐]-4-일)-3-브로모-9H-카바졸을 사용한 것을 제외하고, 화합물 2-1의 제조 방법과 동일한 방법으로 흰색의 고체 화합물 2-8(24.2 g, 수율 69%)을 제조하였다.

[733] MS: $[M+H]^+ = 637.8$

[734]

[735] 제조예 2-9: 화합물 2-9의 제조

[736]



[737] 질소 분위기에서 화합물 2-1(20 g, 31.41 mmol)을 벤젠-D₆(200 ml)에 넣고 교반하였다. 이 후 트리플릭산(3.4 g, 22.65 mmol)을 넣고 가운뎃 교반하였다. 4시간 반응 후 상온으로 식힌 후 에탄올을 넣고 생성된 고체를 여과하였다. 고체를 클로로포름(886 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에틸아세테이트를 이용하여 실리카

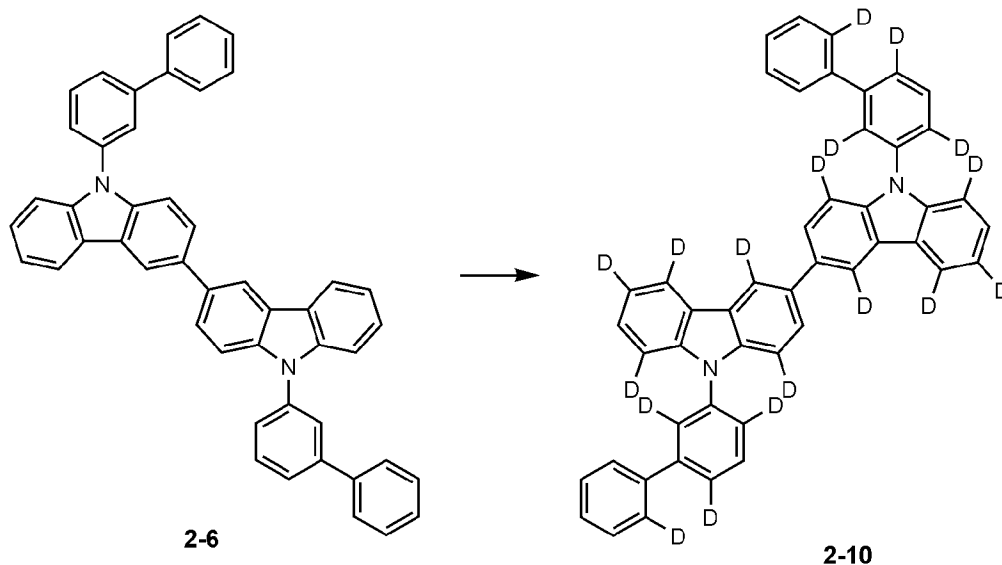
컬럼을 통해 정제하여 흰색의 고체 화합물 2-9(13.2 g, 수율 64%)을 제조하였다.

[738] MS: $[M+H]^+ = 578.8$

[739]

[740] 제조예 2-10: 화합물 2-10의 제조

[741]



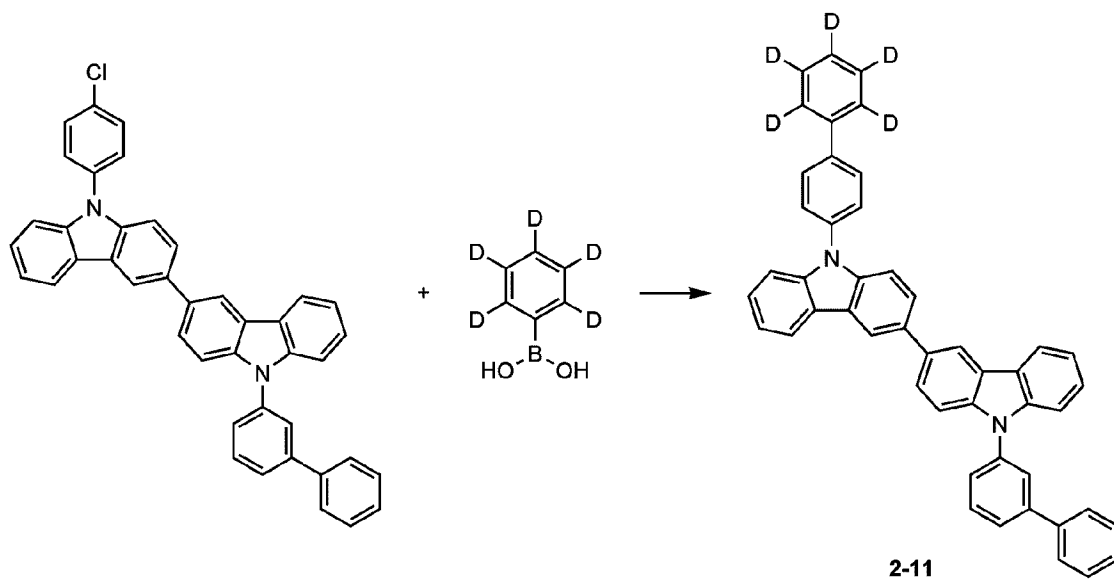
[742] 화합물 2-1 대신 화합물 2-6을 사용한 것을 제외하고는, 화합물 2-9의 제조 방법과 동일한 방법으로 화합물 2-10(12.6 g, 수율 61%)을 제조하였다.

[743] MS: $[M+H]^+ = 655.9$

[744]

[745] 제조예 2-11: 화합물 2-11의 제조

[746]



[747] 질소 분위기에서

9-([1,1'-비페닐]-3-일)-9'-(4-클로로페닐)-9H,9'H-3,3'-비카바졸(15 g, 25.2 mmol)과 (페닐-d5)보론산(3.2 g, 25.2 mmol)를 다이옥산(300 ml)에 넣고 교반 및 환류하였다. 이 후 K_3PO_4 (16.1 g, 75.6 mmol)를 물(16 ml)에 녹여 투입하고 충분히

교반한 후 비스(디벤질리덴아세톤)팔라듐(0)(0.4 g, 0.8 mmol) 및 트리시클로헥실포스핀 (0.4 g, 1.5 mmol)을 투입하였다. 9시간 반응 후 상온으로 식인 후 생성된 고체를 여과하였다. 고체를 디클로로벤젠(485 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 디클로로벤젠과 에틸아세테이트를 사용한 재결정을 통해 흰색의 고체 화합물 2-11(9.9 g, 수율 61%)을 제조하였다.

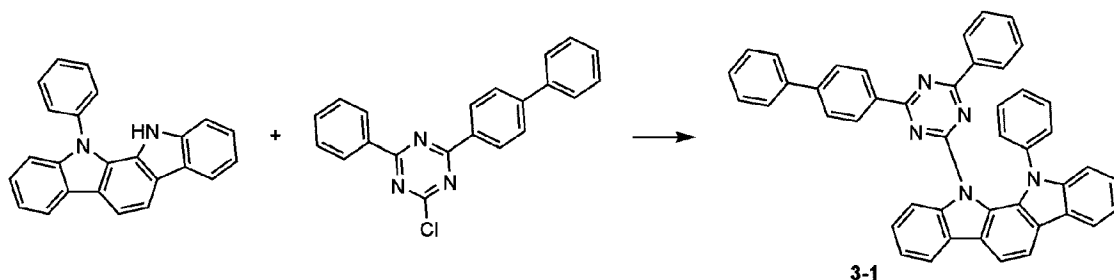
[748] MS: $[M+H]^+ = 642.8$

[749]

[750] [제조예 3]

[751] 제조예 3-1: 화합물 3-1의 제조

[752]



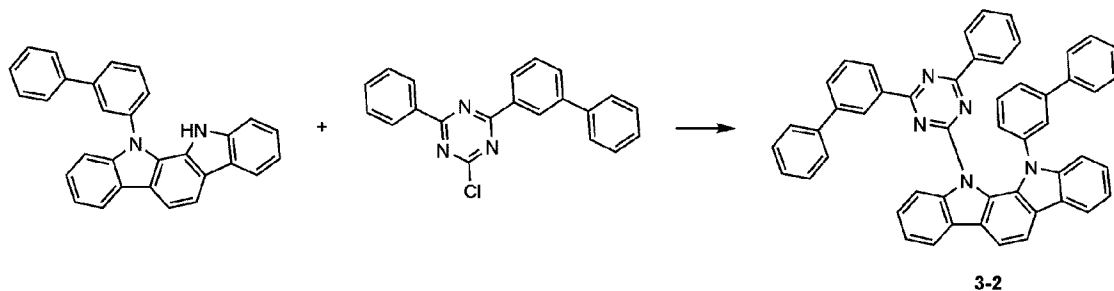
[753] 질소 분위기에서 11-페닐-11,12-디하이드로인돌로[2,3-a]카바졸(20 g, 60.2 mmol)와 2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진(20.7 g, 60.2 mmol)를 DMF(400 ml)에 넣고 교반 및 환류하였다. 이 후 소듐 터트부톡사이드(17.4 g, 180.5 mmol)를 투입하고 가온 및 교반하였다. 3시간 반응 후 상온으로 식인 후 생성된 고체를 여과하였다. 고체를 클로로포름(1155 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에틸아세테이트를 이용하여 실리카 컬럼을 통해 정제하여 노란색 고체 화합물 3-1(23.1 g, 수율 60%)을 제조하였다.

[754] MS: $[M+H]^+ = 640.8$

[755]

[756] 제조예 3-2: 화합물 3-2의 제조

[757]



[758] 11-페닐-11,12-디하이드로인돌로[2,3-a]카바졸 대신 11-([1,1'-비페닐]-3-일)-11,12-디하이드로인돌로[2,3-a]카바졸을 사용하고,

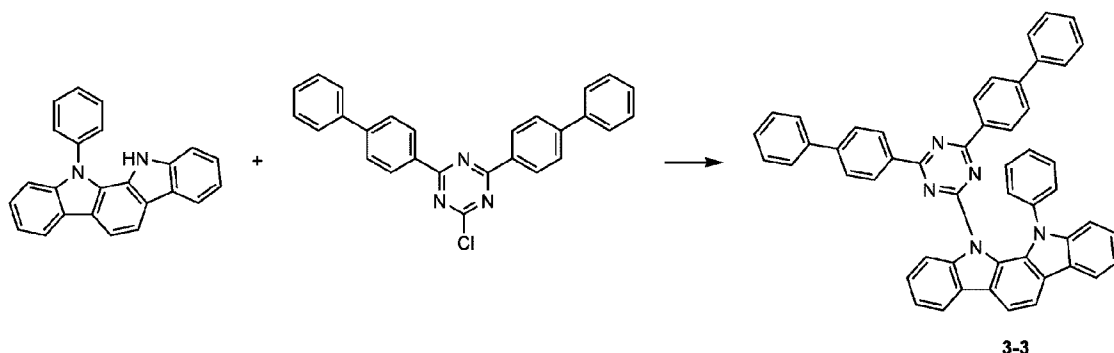
2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신
2-([1,1'-비페닐]-3-일)-4-클로로-6-페닐-1,3,5-트리아진을 사용한 것을 제외하고,
화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-2(19.3 g, 수율 55%)을
제조하였다.

[759] MS: $[M+H]^+ = 716.9$

[760]

[761] 제조예 3-3: 화합물 3-3의 제조

[762]



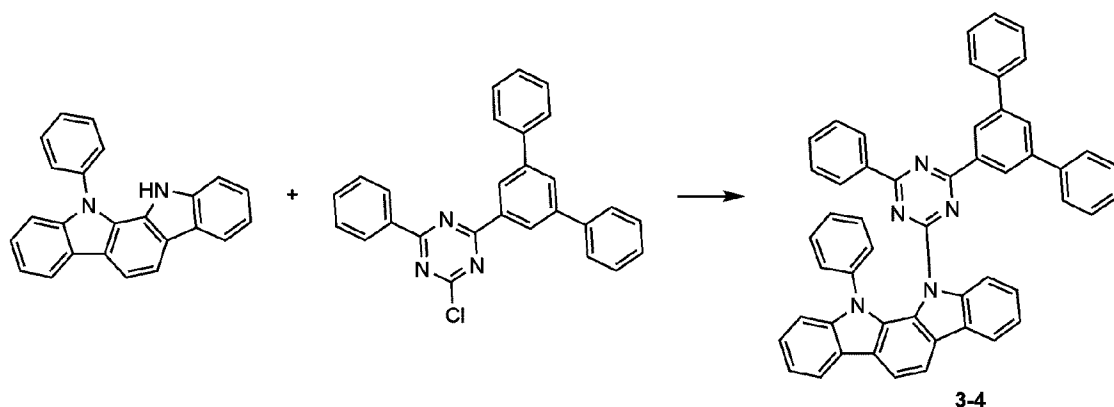
[763] 2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신
2,4-디([1,1'-비페닐]-4-일)-6-클로로-1,3,5-트리아진을 사용한 것을 제외하고,
화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-3(22.4 g, 수율 52%)을
제조하였다.

[764] MS: $[M+H]^+ = 716.9$

[765]

[766] 제조예 3-4: 화합물 3-4의 제조

[767]



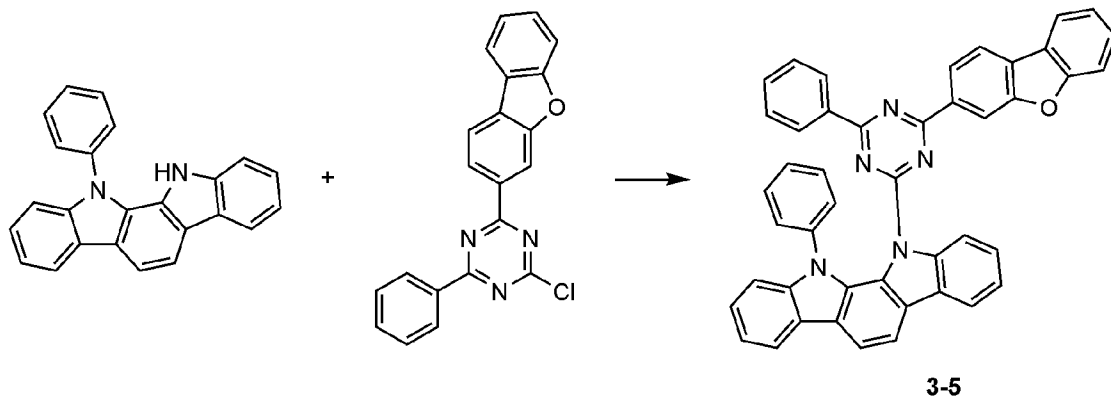
[768] 2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신
2-([1,1':3',1''-터페닐]-5'-일)-4-클로로-6-페닐-1,3,5-트리아진을 사용한 것을
제외하고, 화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-4(28.4 g, 수율
66%)을 제조하였다.

[769] MS: $[M+H]^+ = 716.9$

[770]

[771] 제조예 3-5: 화합물 3-5의 제조

[772]



[773]

2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신 2-클로로-4-(디벤조[b,d]푸란-3-일)-6-페닐-1,3,5-트리아진을 사용한 것을 제외하고, 화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-5(24.4 g, 수율 62%)을 제조하였다.

[774]

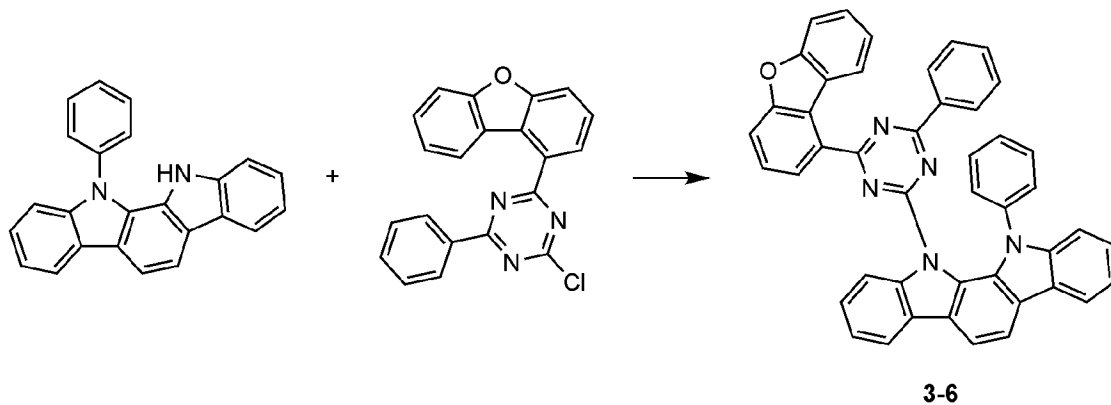
MS: $[M+H]^+ = 654.8$

[775]

[776]

제조예 3-6: 화합물 3-6의 제조

[777]



[778]

2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신 2-클로로-4-(디벤조[b,d]푸란-3-일)-6-페닐-1,3,5-트리아진을 사용한 것을 제외하고, 화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-6(23.2 g, 수율 59%)을 제조하였다.

[779]

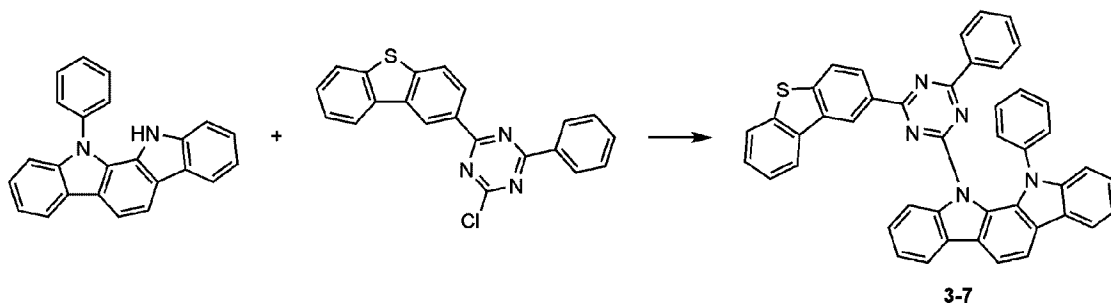
MS: $[M+H]^+ = 654.8$

[780]

[781]

제조예 3-7: 화합물 3-7의 제조

[782]



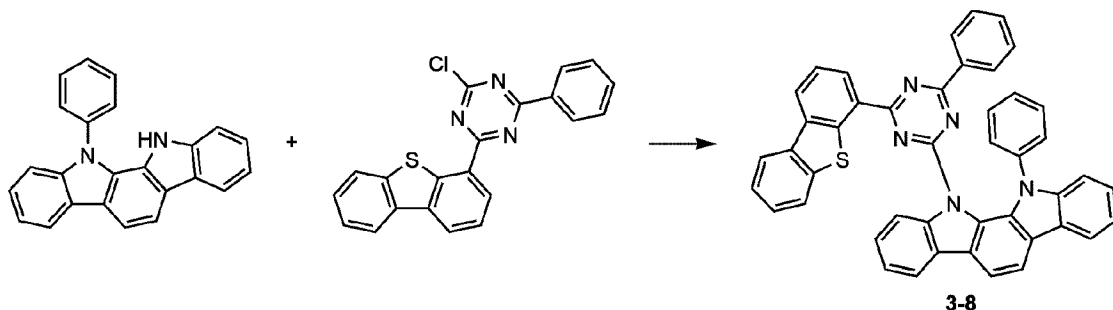
[783] 2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신
2-클로로-4-(디벤조[b,d]티오펜-2-일)-6-페닐-1,3,5-트리아진을 사용한 것을
제외하고, 화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-7(25 g, 수율
62%)를 제조하였다.

[784] MS: $[M+H]^+ = 670.8$

[785]

[786] 제조예 3-8: 화합물 3-8의 제조

[787]



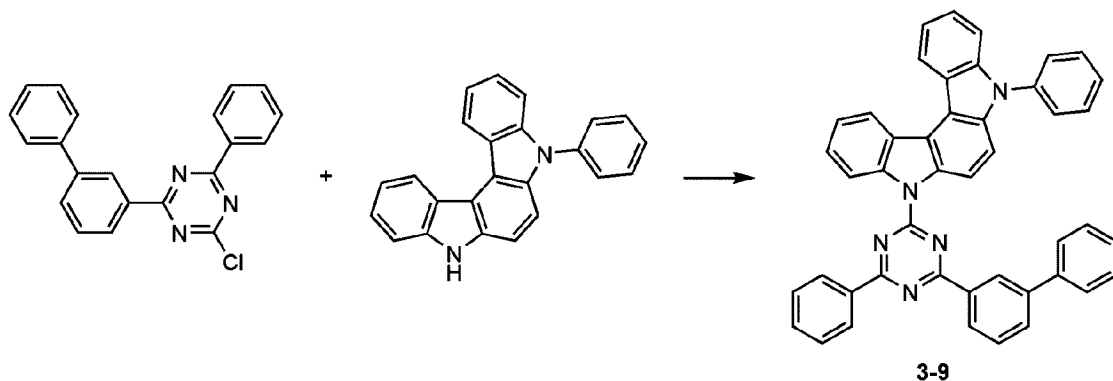
[788] 2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신
2-클로로-4-(디벤조[b,d]티오펜-4-일)-6-페닐-1,3,5-트리아진을 사용한 것을
제외하고, 화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-8(22.6 g, 수율
56%)을 제조하였다.

[789] MS: $[M+H]^+ = 670.8$

[790]

[791] 제조예 3-9: 화합물 3-9의 제조

[792]



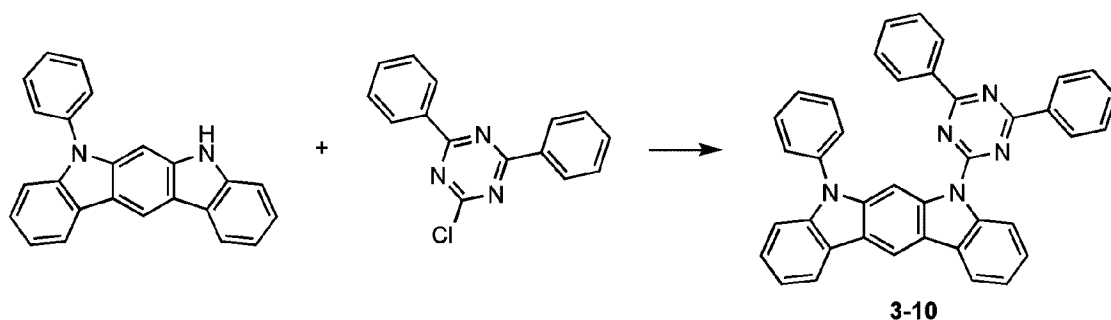
[793] 11-페닐-11,12-디하이드로인돌로[2,3-a]카바졸 대신
5-페닐-5,8-디하이드로인돌로[2,3-c]카바졸을 사용하고,
2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신
2-([1,1'-비페닐]-3-일)-4-클로로-6-페닐-1,3,5-트리아진을 사용한 것을 제외하고,
화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-9(28.5 g, 수율 74%)을
제조하였다.

[794] MS: $[M+H]^+ = 640.8$

[795]

[796] 제조예 3-10: 화합물 3-10의 제조

[797]



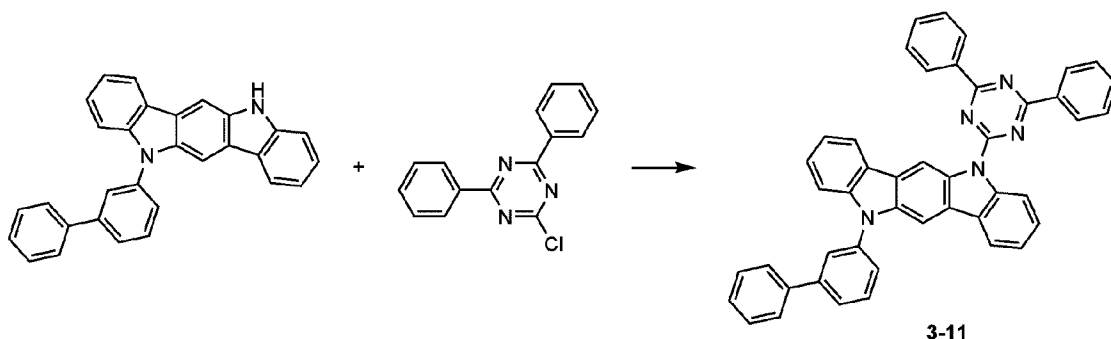
[798] 11-페닐-11,12-디하이드로인돌로[2,3-a]카바졸 대신
5-페닐-5,7-디하이드로인돌로[2,3-b]카바졸을 사용하고,
2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신
2-클로로-4,6-디페닐-1,3,5-트리아진을 사용한 것을 제외하고, 화합물 3-1의 제조
방법과 동일한 방법으로 화합물 3-10(20 g, 수율 59%)을 제조하였다.

[799] MS: $[M+H]^+ = 564.7$

[800]

[801] 제조예 3-11: 화합물 3-11의 제조

[802]



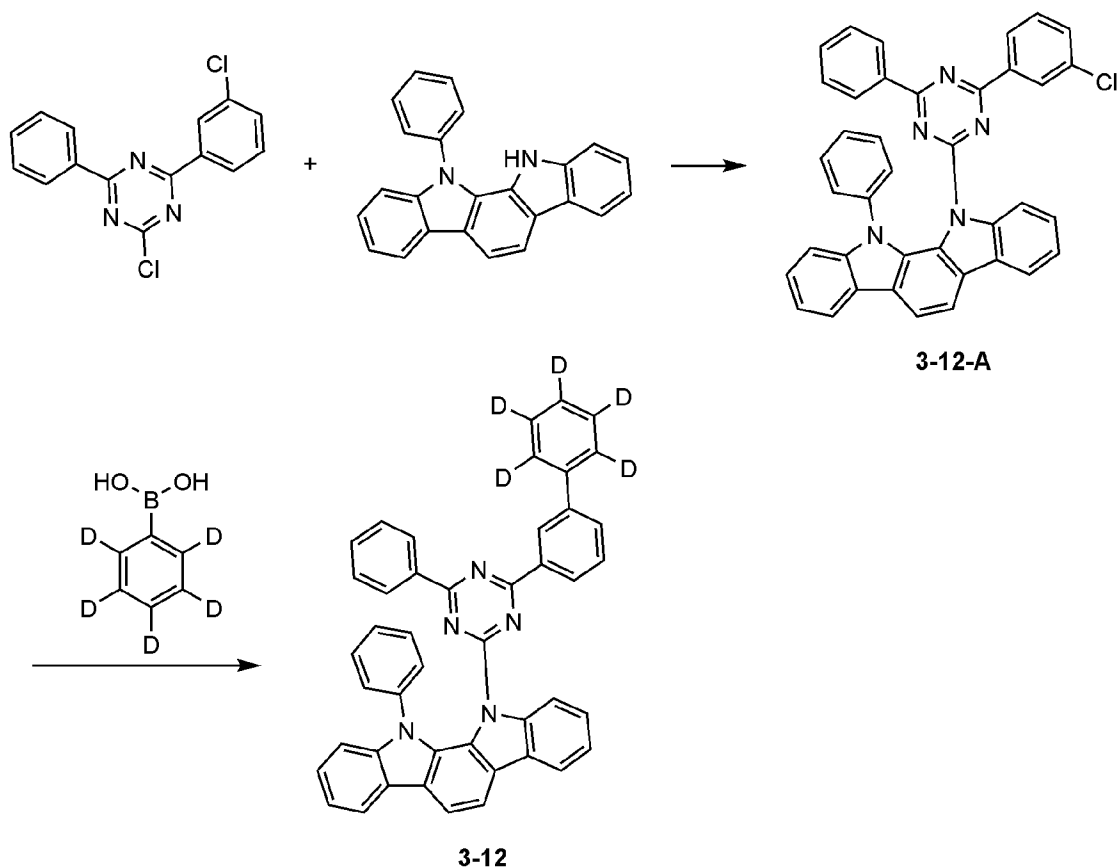
[803] 11-페닐-11,12-디하이드로인돌로[2,3-a]카바졸 대신
5-([1,1'-비페닐]-3-일)-5,11-디하이드로인돌로[3,2-b]카바졸을 사용하고,
2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신
2-클로로-4,6-디페닐-1,3,5-트리아진을 사용한 것을 제외하고, 화합물 3-1의 제조
방법과 동일한 방법으로 화합물 3-11(23.5 g, 수율 61%)을 제조하였다.

[804] MS: $[M+H]^+ = 640.8$

[805]

[806] 제조예 3-12: 화합물 3-12의 제조

[807]



[808] 단계 1) 화합물 3-12-A의 제조

[809] 질소 분위기에서 11-페닐-11,12-디하이드로인돌로[2,3-a]카바졸(20 g, 60.2 mmol)와 2-클로로-4-(3-클로로페닐)-6-페닐-1,3,5-트리아진(18.2 g, 60.2 mmol)를 다이메틸아세트아마이드(200 ml)에 넣고 교반 및 환류하였다. 이 후 K_3PO_4 (38.3 g, 180.5 mmol)를 투입하고 가온 및 교반하였다. 3시간 반응 후 상온으로 식인 후 생성된 고체를 여과하였다. 고체를 클로로포름(1080 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에틸아세테이트를 이용하여 실리카 컬럼을 통해 정제하여 노란색 고체 화합물 3-12-A(21.2 g, 수율 59%)을 제조하였다.

[810] MS: $[M+H]^+ = 599.1$

[811]

[812] 단계 2) 화합물 3-12의 제조

[813] 질소 분위기에서 화합물 20-A(15 g, 25.1 mmol)와 (페닐-d5)보론산(3.2 g, 25.1 mmol)를 다이옥산(300 ml)에 넣고 교반 및 환류하였다. 이 후 K_3PO_4 (16 g, 75.2 mmol)를 물(16 ml)에 녹여 투입하고 충분히 교반한 후 비스(디벤질리덴아세톤)팔라듐(0)(0.4 g, 0.8 mmol) 및 트리시클로헥실포스핀(0.4 g, 1.5 mmol)을 투입하였다. 6시간 반응 후 상온으로 식인 후 생성된 고체를 여과하였다. 고체를 디클로로벤젠(485 ml)에 투입하여 녹이고, 물로 2회 세척

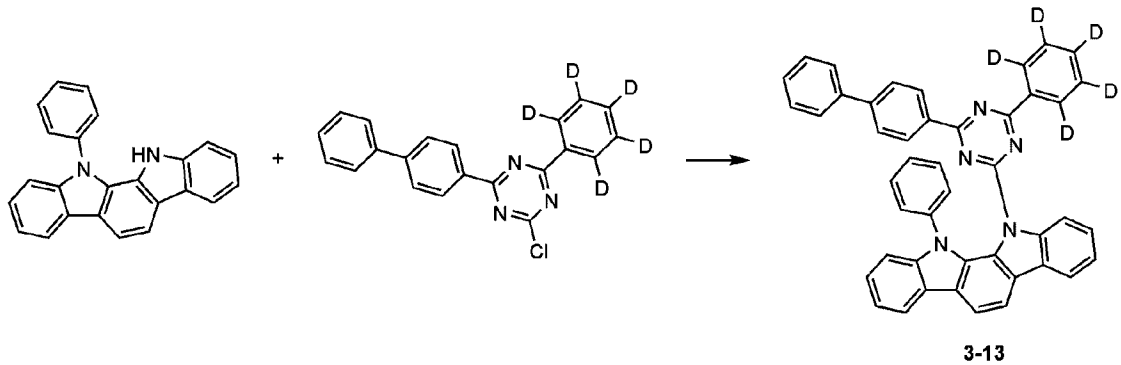
후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 디클로로벤젠과 에틸 아세테이트를 사용하여 재결정하여 노란색의 고체 화합물 3-12(10.5 g, 수율 65%)을 제조하였다.

[814] MS: $[M+H]^+ = 645.8$

[815]

[816] 제조예 3-13: 화합물 3-13의 제조

[817]



[818] 2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신

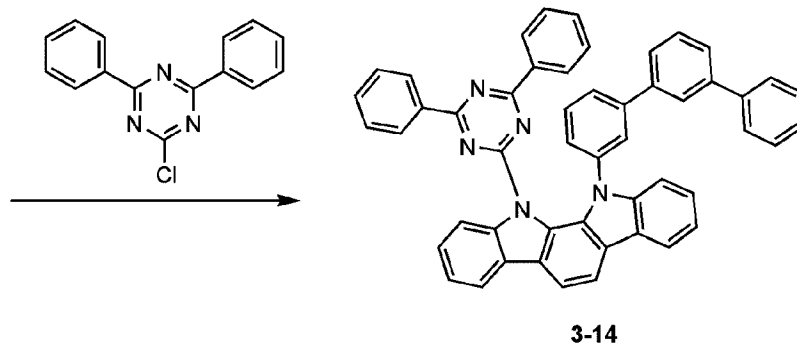
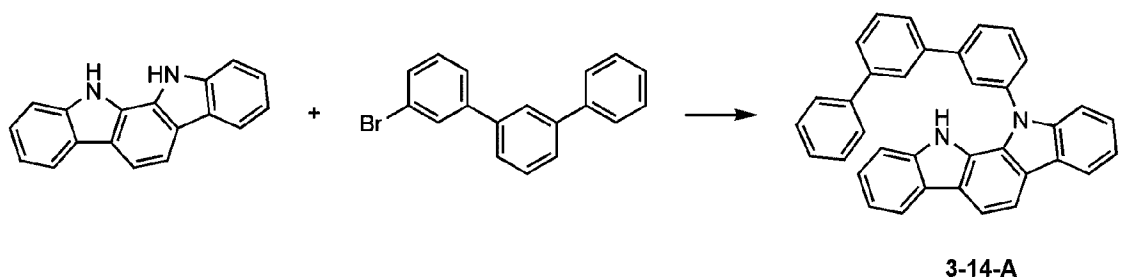
2-([1,1'-비페닐]-4-일)-4-클로로-6-(페닐-d5)-1,3,5-트리아진을 사용한 것을 제외하고, 화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-13(9.5 g, 수율 59%)을 제조하였다.

[819] MS: $[M+H]^+ = 645.8$

[820]

[821] 제조예 3-14: 화합물 3-14의 제조

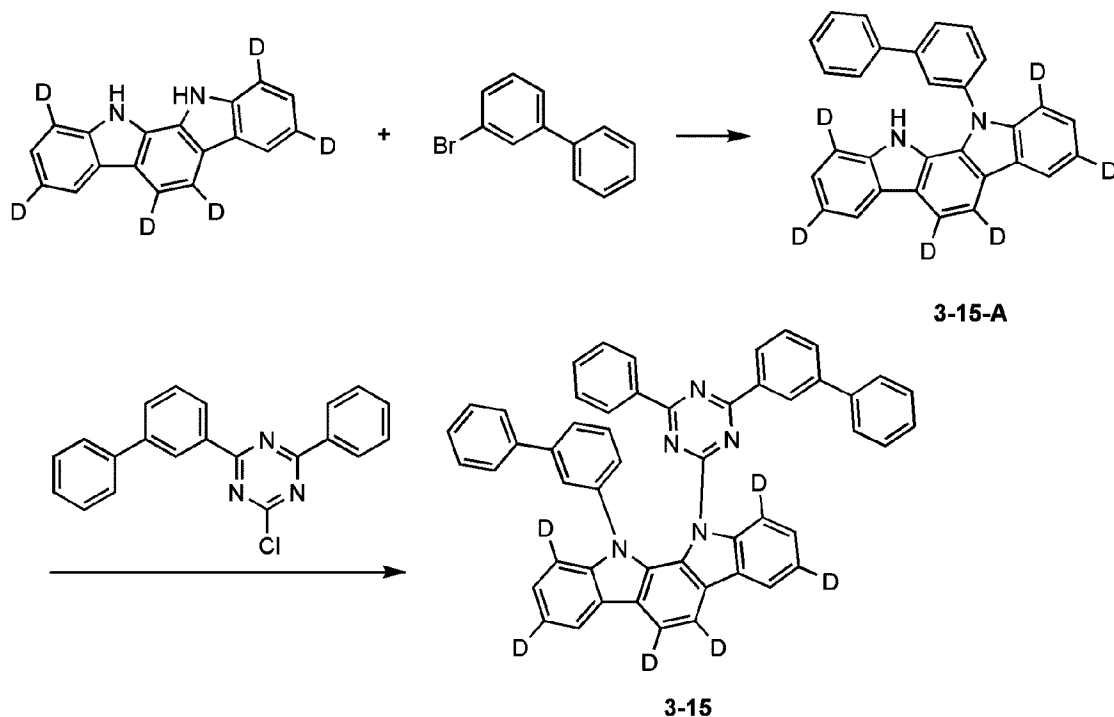
[822]



[823] 단계 1) 화합물 3-14-A의 제조

- [824] 질소 분위기에서 11,12-디하이드로인돌로[2,3-a]카바졸(20 g, 78 mmol)와 3-브로모-1,1':3',1''-터페닐(24.1 g, 78 mmol)를 자일렌(400 ml)에 넣고 교반 및 환류하였다. 이 후 K_3PO_4 (22.5 g, 234.1 mmol)를 투입하고 충분히 교반한 후 비스(트리-터트-부틸포스핀)팔라듐(0)(1.2 g, 2.3 mmol)을 투입하였다. 3시간 반응 후 상온으로 식인 후 유기층을 여과하여 염을 제거한 후 걸러진 유기층을 증류하였다. 이를 다시 클로로포름(378 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에탄올을 사용하여 결정화하여 베이지색 고체 화합물 3-14-A(25.3 g, 수율 67%)을 제조하였다.
- [825] MS: $[M+H]^+ = 485.6$
- [826]
- [827] 단계 2) 화합물 3-14의 제조
- [828] 질소 분위기에서 화합물 3-14-A(20 g, 41.3 mmol)와 2-클로로-4,6-디페닐-1,3,5-트리아진(11 g, 41.3 mmol)를 다이메틸아세트아마이드(200 ml)에 넣고 교반 및 환류하였다. 이 후 K_3PO_4 (26.3 g, 123.8 mmol)를 투입하고 가온 및 교반하였다. 1시간 반응 후 상온으로 식인 후 생성된 고체를 여과하였다. 고체를 클로로포름(886 ml)에 투입하여 녹이고, 물로 2회 세척 후에 유기층을 분리하여, 무수 황산 마그네슘을 넣고 교반한 후 여과하여 여액을 감압 증류하였다. 농축한 화합물을 클로로포름과 에틸아세테이트를 이용하여 실리카 컬럼을 통해 정제하여 노란색 고체 화합물 3-14(15.1 g, 수율 51%)을 제조하였다.
- [829] MS: $[M+H]^+ = 716.9$
- [830]
- [831] 제조예 3-15: 화합물 3-15의 제조

[832]



[833] 단계 1) 화합물 3-15-A의 제조

[834] 11,12-디하이드로인돌로[2,3-a]카바졸 대신

11,12-디하이드로인돌로[2,3-a]카바졸-1,3,5,6,8,10-d6를 사용하고,

3-브로모-1,1':3',1''-터페닐 대신 3-브로모-1,1'-비페닐을 사용한 것을 제외하고,

화합물 3-15의 단계 1의 제조 방법과 동일한 방법으로 화합물 3-15-A(20.2 g, 수율 64%)를 제조하였다.

[835] MS: $[M+H]^+ = 415.5$

[836]

[837] 단계 2) 화합물 3-15의 제조

[838] 11-페닐-11,12-디하이드로인돌로[2,3-a]카바졸 대신

11-([1,1'-비페닐]-3-일)-11,12-디하이드로인돌로[2,3-a]카바졸-1,3,5,6,8,10-d6를

사용하고, 2-([1,1'-비페닐]-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신

2-([1,1'-비페닐]-3-일)-4-클로로-6-페닐-1,3,5-트리아진을 사용한 것을 제외하고,

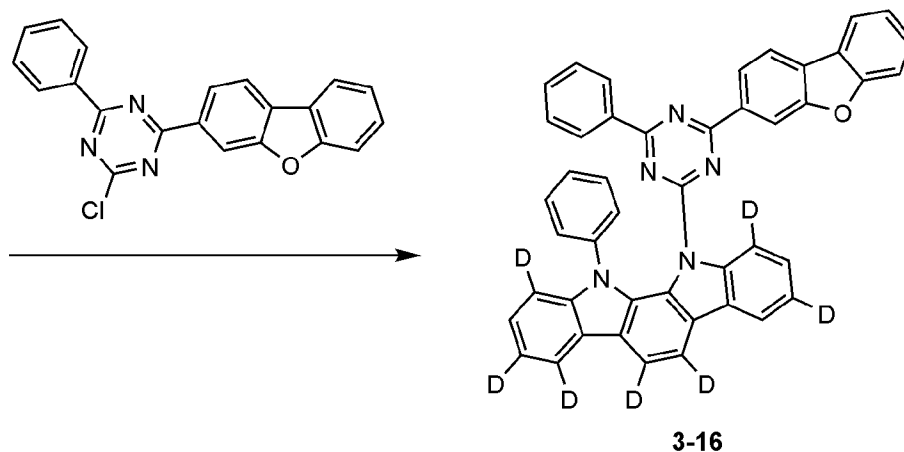
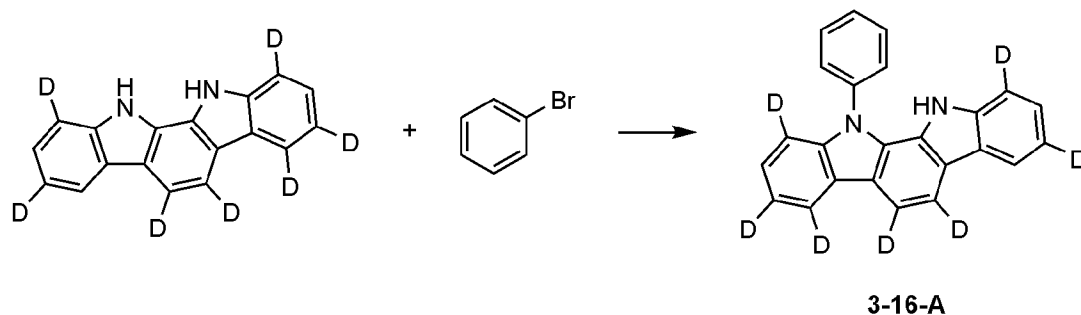
화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-15(29.7 g, 수율 54%)을 제조하였다.

[839] MS: $[M+H]^+ = 722.9$

[840]

[841] 제조예 3-16: 화합물 3-16의 제조

[842]



[843] 단계 1) 화합물 3-16-A의 제조

[844] 11,12-디하이드로인돌로[2,3-a]카바졸 대신

11,12-디하이드로인돌로[2,3-a]카바졸-1,3,5,6,8,10-d6를 사용하고,
3-브로모-1,1':3',1''-터페닐 대신 브로모벤젠을 사용한 것을 제외하고, 화합물
3-14의 단계 1과 동일한 방법으로 화합물 3-16-A(14 g, 수율 54%)를 제조하였다.

[845] MS: $[M+H]^+ = 340.5$

[846]

[847] 단계 2) 화합물 3-16의 제조

[848] 11-페닐-11,12-디하이드로인돌로[2,3-a]카바졸 대신

11-페닐-11,12-디하이드로인돌로[2,3-a]카바졸-1,3,5,6,7,8,10-d7를 사용하고,
2-((1,1'-비페닐)-4-일)-4-클로로-6-페닐-1,3,5-트리아진 대신
2-클로로-4-(디벤조[b,d]퓨란-3-일)-6-페닐-1,3,5-트리아진을 사용한 것을
제외하고, 화합물 3-1의 제조 방법과 동일한 방법으로 화합물 3-16(14.9 g, 수율
59%)를 제조하였다.

[849] MS: $[M+H]^+ = 661.8$

[850]

[851] [실시예]

[852] 실시예 1: 유기 발광 소자의 제조

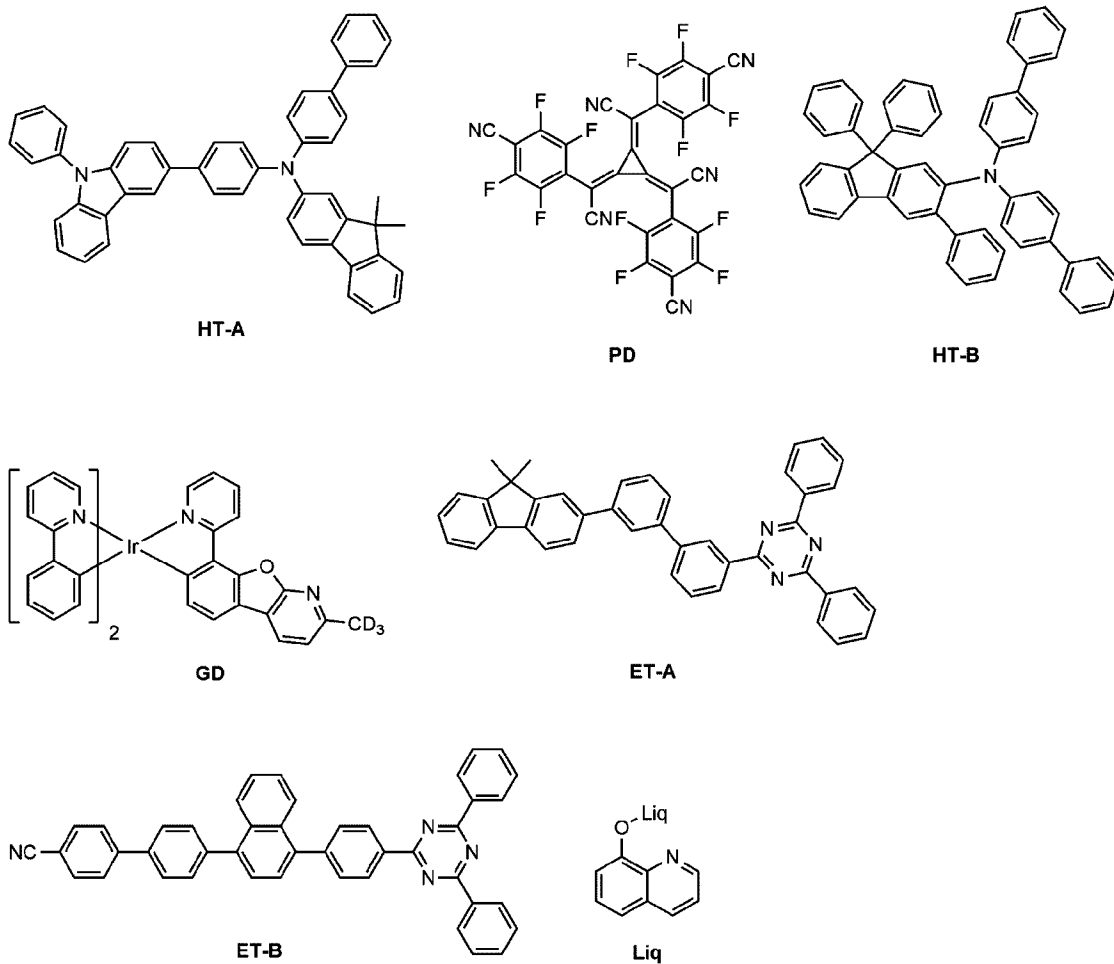
[853] ITO(Indium Tin Oxide)가 1400 Å의 두께로 박막 코팅된 유리 기판을 세제를
녹인 증류수에 넣고 초음파로 세척하였다. 이때, 세제로는 피셔사(Fischer Co.)

제품을 사용하였으며, 증류수로는 밀러포어사(Millipore Co.) 제품의 필터(Filter)로 2차로 걸러진 증류수를 사용하였다. ITO를 30분간 세척한 후 증류수로 2회 반복하여 초음파 세척을 10분간 진행하였다. 증류수 세척이 끝난 후, 이소프로필알콜, 아세톤, 메탄올의 용제로 초음파 세척을 하고 건조시킨 후 플라즈마 세정기로 수송시켰다. 또한, 산소 플라즈마를 이용하여 상기 기판을 5분간 세정한 후 진공 증착기로 기판을 수송시켰다.

[854]

[855] 이렇게 준비된 ITO 투명 전극 위에, 하기 화합물 HT-A와 하기 화합물 PD를 95:5의 중량비로 100 Å의 두께로 열 진공 증착하여 정공주입층을 형성하고, 이어서 하기 화합물 HT-A만 1150 Å의 두께로 증착하여 정공수송층을 형성하였다. 상기 정공수송층 위에, 하기 HT-B 화합물을 450 Å 두께로 열 진공 증착하여 전자저지층을 형성하였다. 상기 전자저지층 위에, 제1 호스트로 앞서 제조한 화합물 1-1, 제2 호스트로 앞서 제조한 화합물 2-1, 및 제3 호스트로 앞서 제조한 화합물 3-1을 30:35:35의 중량비로 혼합한 92 중량%의 호스트와, 8 중량%의 하기 GD 화합물을 350 Å의 두께로 진공 증착하여, 발광층을 형성하였다. 상기 발광층 위에, 하기 ET-A 화합물을 50 Å의 두께로 진공 증착하여 정공저지층을 형성하였다. 상기 정공저지층 위에, 하기 ET-B 화합물과 하기 Liq 화합물을 1:1의 중량비로 300 Å의 두께로 열 진공 증착하여 전자수송층을 형성하고, 상기 전자수송층 위에 Yb(ytterbium)를 10 Å의 두께로 진공 증착하여 전자주입층을 형성하였다. 상기 전자주입층 위에, 마그네슘과 은을 1:4의 중량비로 150 Å의 두께로 증착하여 음극을 형성하여, 유기 발광 소자를 제조하였다.

[856]



[857]

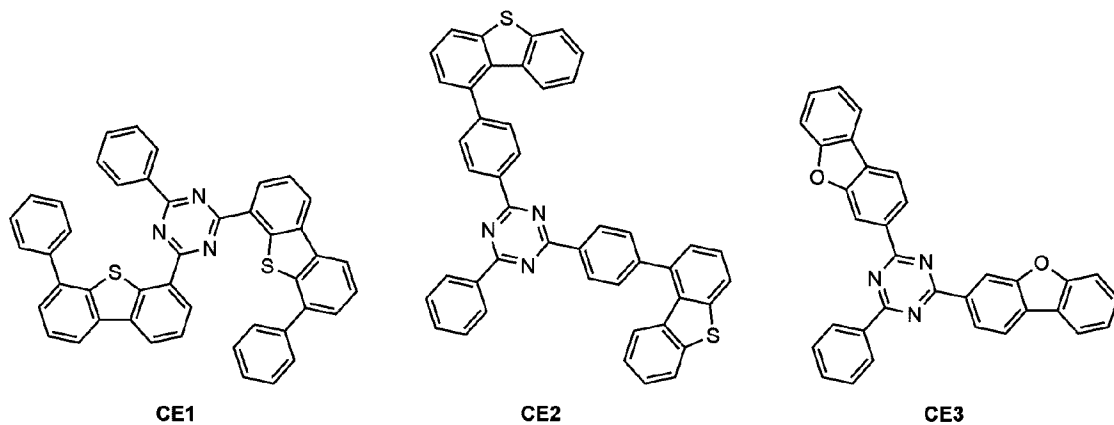
[858] 상기의 과정에서 유기물의 증착 속도는 0.4 ~ 0.7 Å/sec를 유지하였고, 이터븀, 마그네슘과 은의 증착 속도는 2 Å/sec를 유지하였으며, 증착시 진공도는 $2 \times 10^{-7} \sim 5 \times 10^{-6}$ torr를 유지하여, 유기 발광 소자를 제작하였다.

[859]

[860] 실시예 2 내지 18, 및 비교예 1 내지 10

[861] 호스트 물질을 하기 표 1과 같이 변경하였다는 점을 제외하고는, 상기 실시예 1과 동일한 방법으로 각각 유기 발광 소자를 제조하였다. 이때, 비율은 제1 호스트, 제2 호스트 및 제3 호스트의 중량비를 의미한다. 또한, 하기 표 1에 기재된 CE1, CE2, CE3 화합물은 각각 하기와 같다.

[862]



[863]

[864] 상기 실시예 및 비교예에서 제조한 유기 발광 소자를 120°C 오븐에서 30분간 열처리한 후 꺼내어, 전류를 인가하여 전압, 효율, 수명(T95)을 측정하고 그 결과를 하기 표 1에 나타내었다. 이때, 구동 전압 및 발광 효율은 10 mA/cm²의 전류 밀도를 인가하여 측정하였고, 수명(T95)은 전류 밀도 20 mA/cm²에서 초기 휘도가 95%로 저하할 때까지의 시간(hr)을 의미한다.

[865] [Table 1]

	호스트				@10mA/cm ²		@20mA/ cm ²
	제1 호스트	제2 호스트	제3 호스트	호스트 비율(중량 비)	전압 (V)	효율 (cd/A)	수명(T95) (hr)
실시예 1	화합물 1-1	화합물 2-1	화합물 3-1	30:35:35	3.88	79.3	183
실시예 2	화합물 1-9	화합물 2-1	화합물 3-12	30:35:35	4.61	75.1	213
실시예 3	화합물 1-3	화합물 2-2	화합물 3-2	30:35:35	3.71	75.3	210
실시예 4	화합물 1-3	화합물 2-2	화합물 3-15	30:35:35	3.70	75.3	235
실시예 5	화합물 1-4	화합물 2-3	화합물 3-3	30:35:35	3.67	75.2	196
실시예 6	화합물 1-5	화합물 2-4	화합물 3-4	30:35:35	3.62	70.7	208
실시예 7	화합물 1-6	화합물 2-4	화합물 3-13	30:35:35	4.40	75.9	167
실시예 8	화합물 1-7	화합물 2-5	화합물 3-5	30:35:35	3.68	79.5	172
실시예 9	화합물 1-8	화합물 2-6	화합물 3-6	30:35:35	4.19	70.2	162
실시예 10	화합물 1-9	화합물 2-6	화합물 3-14	30:35:35	4.08	73.1	224
실시예 11	화합물 1-10	화합물 2-7	화합물 3-7	30:35:35	4.16	72.0	161
실시예 12	화합물 1-11	화합물 2-8	화합물 3-8	30:35:35	4.03	74.7	162
실시예 13	화합물 1-12	화합물 2-9	화합물 3-9	30:35:35	3.89	79.5	225
실시예 14	화합물 1-1	화합물 2-9	화합물 3-1	30:35:35	3.68	72.6	234

실시예 15	화합물 1-7	화합물 2-9	화합물 3-10	30:35:35	3.65	75.9	175
실시예 16	화합물 1-13	화합물 2-10	화합물 3-15	30:35:35	3.77	70.4	215
실시예 17	화합물 1-2	화합물 2-10	화합물 3-16	30:35:35	3.81	73.5	239
실시예 18	화합물 1-6	화합물 2-11	화합물 3-11	30:35:35	3.76	80.3	183
비교예 1	-	화합물 2-1	-	0:100:0	7.01	8.9	16
비교예 2	-	-	화합물 3-1	0:0:100	7.52	9.0	13
비교예 3	화합물 1-1	-	-	100:0:0	7.21	14.1	21
비교예 4	-	화합물 2-1	화합물 3-1	0:50:50	4.41	56.3	116
비교예 5	화합물 1-1	화합물 2-1	-	30:70:0	4.23	66.7	103
비교예 6	화합물 1-3	-	화합물 3-5	30:0:70	7.31	23.5	34
비교예 7	CE-1	화합물 2-1	-	30:70:0	4.35	66.5	103
비교예 8	CE-1	화합물 2-2	화합물 3-2	30:35:35	4.11	67.2	143
비교예 9	CE-2	화합물 2-3	-	30:70:0	4.85	60.3	85
비교예 10	CE-3	화합물 2-4	-	30:70:0	4.97	62.5	117

[866]

[867] 상기 표 1에 나타난 바와 같이, 실시예 1 내지 18의 유기 발광 소자는, 비교예 1 내지 10의 유기 발광 소자에 비하여, 구동 전압이 낮고, 효율 및 수명이 개선됨을 확인할 수 있었다.

[868]

[869] 본 발명에 따른 화학식 2로 표시되는 화합물은 정공 수송 능력이 뛰어나 P형

호스트의 역할을 하고, 본 발명에 따른 화학식 1로 표시되는 화합물 및 화학식 3으로 표시되는 화합물은 N형 호스트의 역할을 한다. 일반적으로, P형 호스트와 N형 호스트를 혼합하여 발광층의 호스트로 적용하면 exciplex를 형성하므로, P형 호스트와 N형 호스트 중 어느 하나 만을 적용할 경우에 대비하여, 소자의 특성이 개선될 수 있다. 상기 표 1에 나타난 바와 같이, P형 호스트와 N형 호스트를 혼합하여 발광층의 호스트로 적용한 실시예 1 내지 18은, P형 호스트와 N형 호스트 중 어느 하나 만을 적용한 비교예 1, 2, 3 및 6에 비하여, 소자의 구동 전압이 현저히 낮아지고, 효율 및 수명은 현저히 개선되었다.

[870]

[871] 특히, 본 발명에 따른 화학식 2의 P형 호스트를 본 발명에 따른 화학식 1 및 3의 N형 호스트를 혼합하여 사용하는 경우(화학식 1 + 화학식 2 + 화학식 3), N형 호스트 1종만 혼합하여 사용하는 경우(화학식 2 + 화학식 1; 또는 화학식 2 + 화학식 3)에 대비하여, 소자의 특성이 개선될 수 있다. 상기 표 1에 나타난 바와 같이, 실시예 1 내지 18의 유기 발광 소자는, N형 호스트 1종만 혼합하여 사용한 비교예 4, 5, 7, 9 및 10에 대비하여, 전압, 효율, 및 수명 특성이 개선되었다.

[872] [부호의 설명]

[873] 1: 기판 2: 양극

[874] 3: 전자억제층 4: 발광층

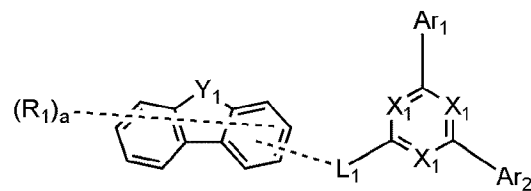
[875] 5: 음극 6: 정공수송층

[876] 7: 전자수송층

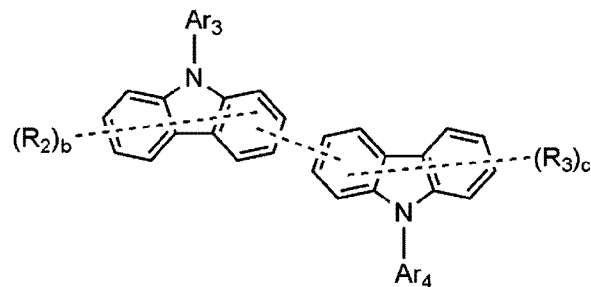
청구범위

[청구항 1]

양극,
음극,
상기 양극과 음극 사이의 발광층,
상기 양극과 발광층 사이의 전자억제층, 및
상기 전자억제층과 양극 사이에 정공수송층을 포함하는, 유기
발광 소자에 있어서,
상기 발광층은 하기 화학식 1로 표시되는 화합물, 하기 화학식 2로
표시되는 화합물, 및 하기 화학식 3으로 표시되는 화합물을
포함하는,
유기 발광 소자:
[화학식 1]



상기 화학식 1에서,
 Y_1 은 O 또는 S이고,
 X_1 는 각각 독립적으로 CH 또는 N이되, X_1 중 적어도 하나는
N이고,
 L_1 은 직접 결합, 치환 또는 비치환된 C_{6-60} 아릴렌, 또는 치환 또는
비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나
이상을 포함하는 C_{2-60} 헤테로아릴렌이고,
 Ar_1 및 Ar_2 는 각각 독립적으로, 치환 또는 비치환된 C_{6-60} 아릴, 또는
치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는
어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴이고,
 R_1 은 수소, 중수소, 치환 또는 비치환된 C_{6-60} 알킬, 치환 또는
비치환된 C_{6-60} 아릴, 또는 치환 또는 비치환된 N, O 및 S로
구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60}
헤테로아릴이고,
 a 는 1 내지 7의 정수이고,
[화학식 2]



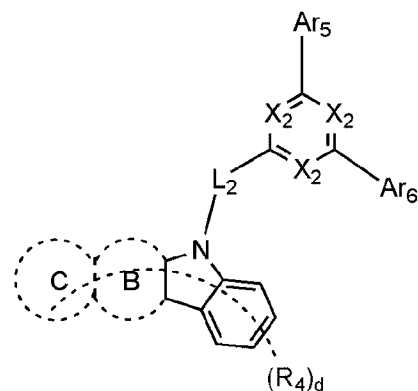
상기 화학식 2에서,

Ar_3 및 Ar_4 는 각각 독립적으로, 치환 또는 비치환된 C_{6-60} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴이고,

R_3 및 R_4 는 각각 독립적으로, 수소, 중수소, 치환 또는 비치환된 C_{6-60} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴이고,

b 및 c 는 각각 독립적으로, 1 내지 7의 정수이고,

[화학식 3]



상기 화학식 3에서,

B는 인접한 두 개의 오각 고리와 축합된 벤젠 고리이고,

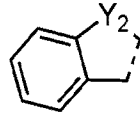
X_2 는 각각 독립적으로 CH 또는 N이 되, X_2 중 적어도 하나는 N이고,

L_2 는 직접 결합, 치환 또는 비치환된 C_{6-60} 아릴렌, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴렌이고,

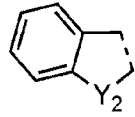
Ar_5 및 Ar_6 는 각각 독립적으로, 치환 또는 비치환된 C_{6-60} 아릴, 또는 치환 또는 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는 C_{2-60} 헤테로아릴이고,

C는 하기 화학식 4-1 또는 4-2이고,

[화학식 4-1]



[화학식 4-2]

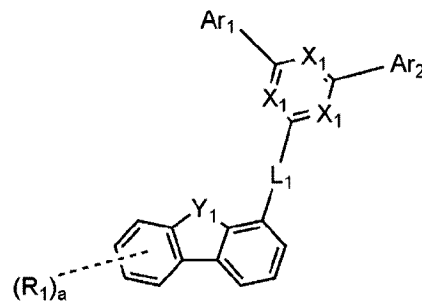


상기 화학식 4-1 및 4-2에서,
 점선은 상기 B와 축합되는 결합이고,
 Y_2 는 CRR', O, S, 또는 N(Ar₇)이고,
 여기서, R 및 R'은 각각 독립적으로, 치환 또는 비치환된 C₆₋₆₀ 알킬,
 또는 치환 또는 비치환된 C₆₋₆₀ 아릴이고,
 Ar₇은 치환 또는 비치환된 C₆₋₆₀ 아릴, 또는 치환 또는 비치환된 N, O
 및 S로 구성되는 군으로부터 선택되는 어느 하나 이상을 포함하는
 C₂₋₆₀ 헤테로아릴이고,
 R₄는 수소, 중수소, 치환 또는 비치환된 C₆₋₆₀ 아릴, 또는 치환 또는
 비치환된 N, O 및 S로 구성되는 군으로부터 선택되는 어느 하나
 이상을 포함하는 C₂₋₆₀ 헤테로아릴이고,
 d는 1 내지 10의 정수이다.

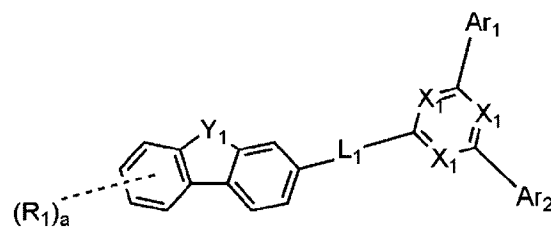
[청구항 2]

제1항에 있어서,
 상기 화학식 1은 하기 화학식 1-1 내지 1-4 중 어느 하나로
 표시되는,
 유기 발광 소자:

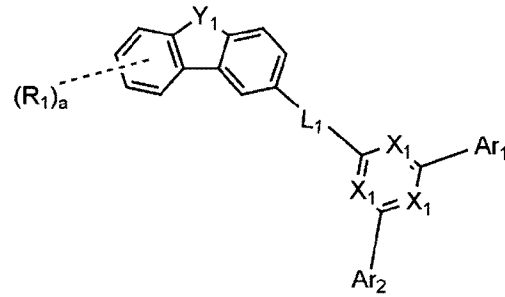
[화학식 1-1]



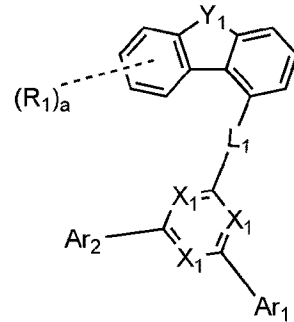
[화학식 1-2]



[화학식 1-3]



[화학식 1-4]



상기 화학식 1-1 내지 1-4에서,

Y_1 , X_1 , L_1 , Ar_1 , Ar_2 , R_1 , 및 a 의 정의는 제1항과 같다.

[청구항 3]

제1항에 있어서,

X_1 중 2개 또는 3개는 N인,

유기 발광 소자.

[청구항 4]

제1항에 있어서,

L_1 은 직접 결합인,

유기 발광 소자.

[청구항 5]

제1항에 있어서,

Ar_1 및 Ar_2 는 각각 독립적으로, 페닐, 비페닐릴, 디벤조퓨라닐,

디벤조티오펜, 카바졸-9-일, 또는 (페닐)카바졸-9-일이고,

상기 Ar_1 및 Ar_2 는 각각 독립적으로, 비치환되거나, 적어도 하나 이상의 중수소로 치환된,

유기 발광 소자.

[청구항 6]

제1항에 있어서,

R_1 은 페닐, 비페닐릴, (페닐)비페닐릴, 터페닐릴, 나프틸,

페난쓰레닐, 트리페닐레닐, 디메틸플루오레닐,

스피로비플루오레닐, 디벤조퓨라닐, 디벤조티오펜,

카바졸-9-일, (페닐)카바졸-9-일, (디페닐)카바졸-9-일,

9-페닐-9H-카바졸릴,

12-페닐-11,12-디히드로인돌로[2,3-a]카바졸-11-일, 또는

1,1-디메틸-1,3-디히드로인덴노[2,1-b]카바졸-3-일이고,

상기 R_1 은 비치환되거나, 적어도 하나 이상의 중수소로 치환된,

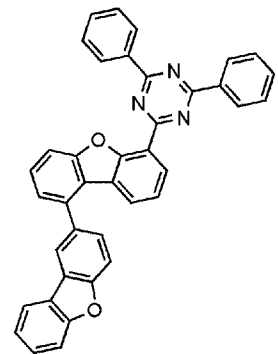
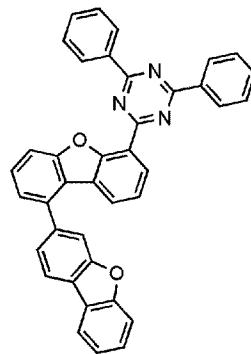
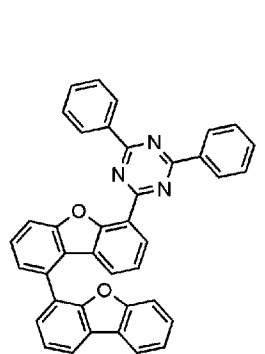
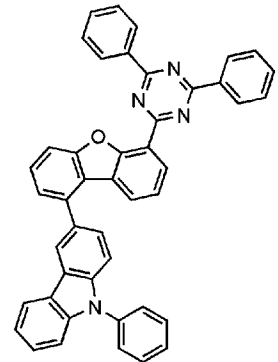
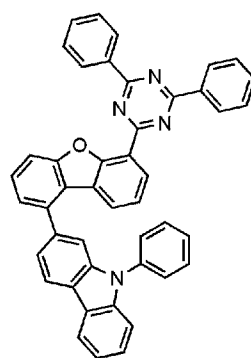
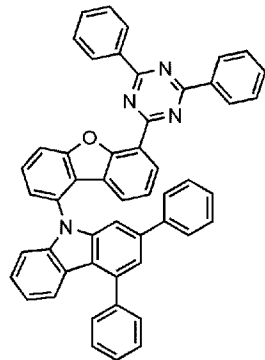
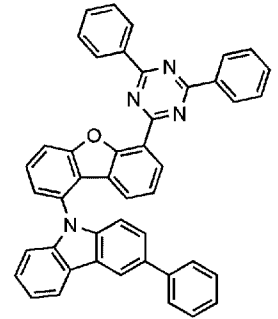
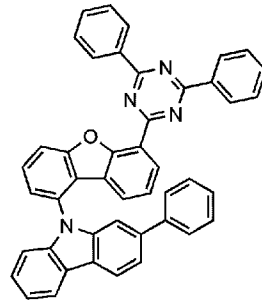
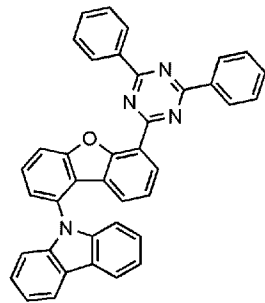
[청구항 7]

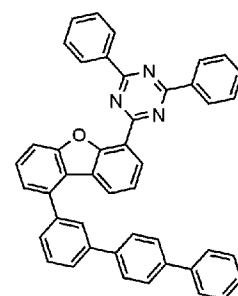
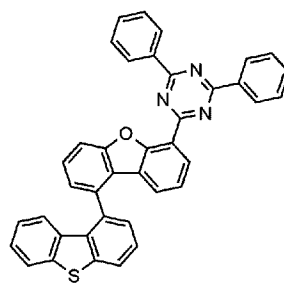
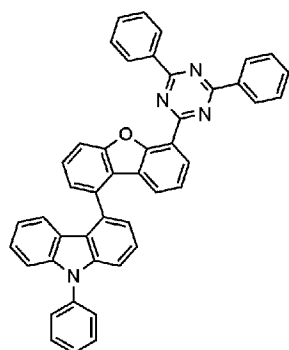
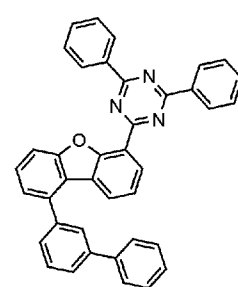
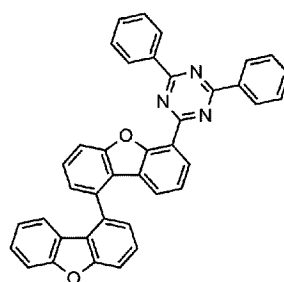
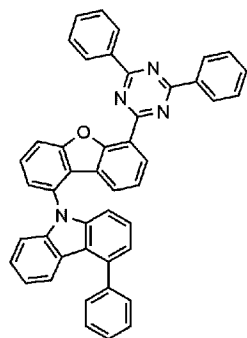
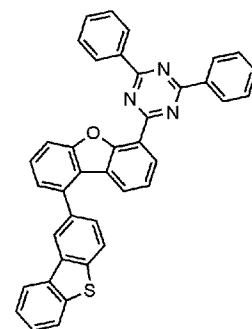
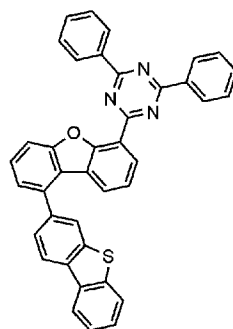
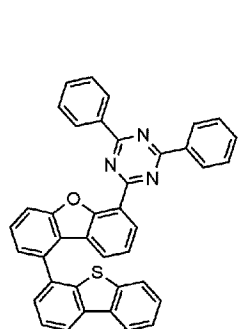
유기 발광 소자.

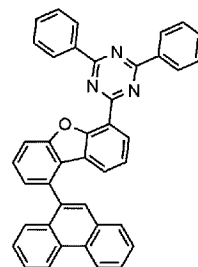
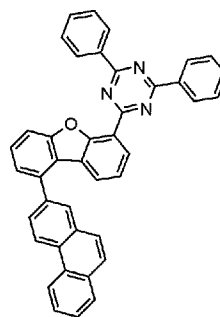
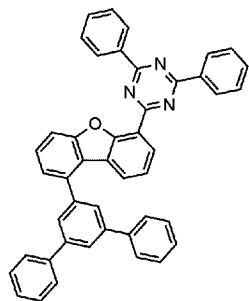
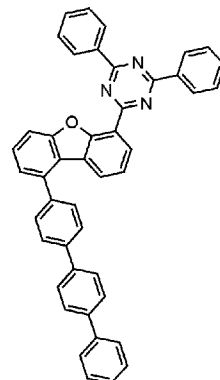
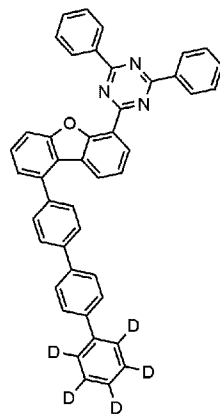
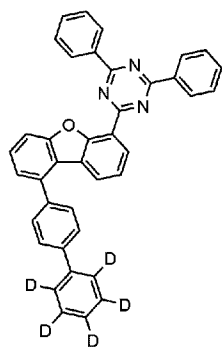
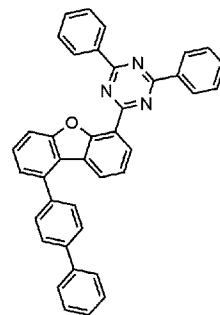
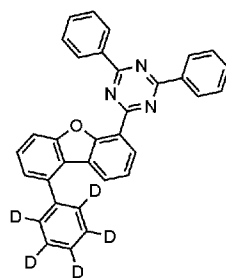
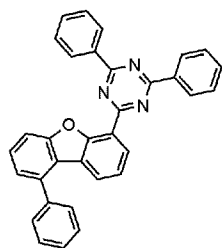
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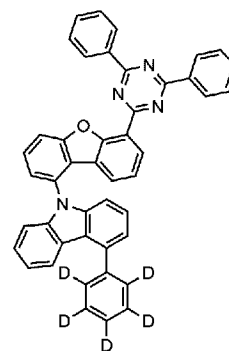
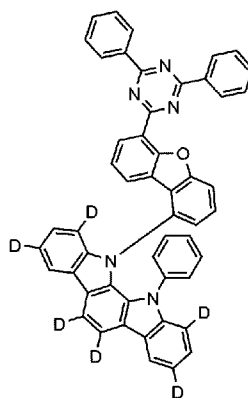
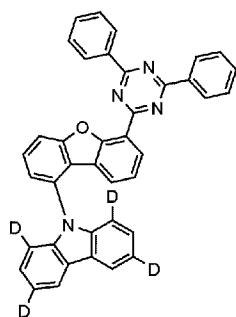
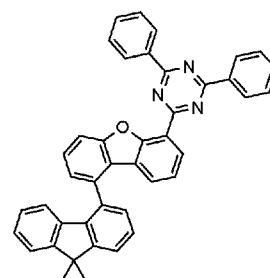
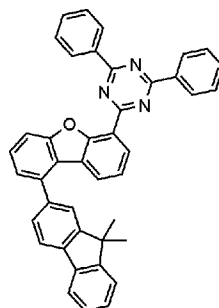
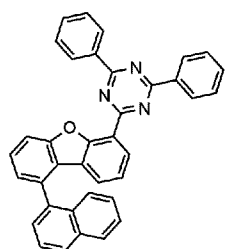
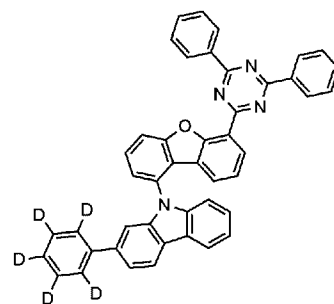
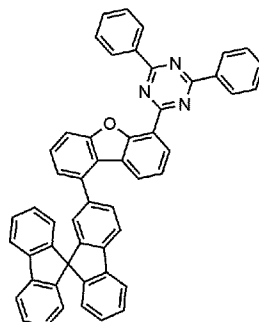
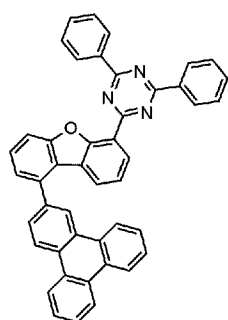
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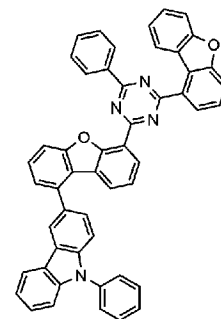
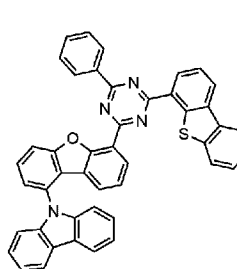
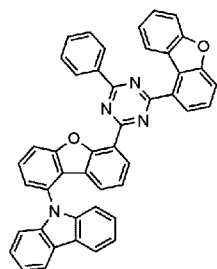
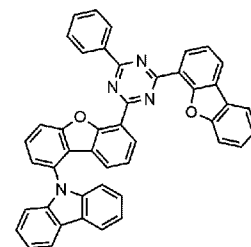
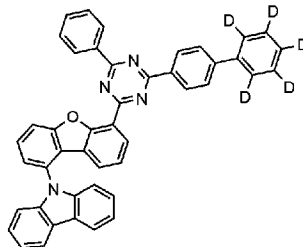
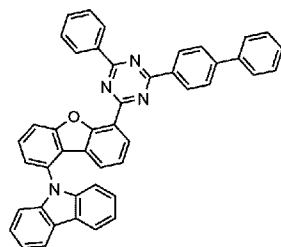
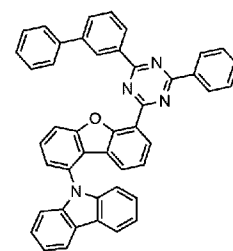
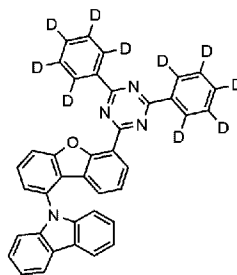
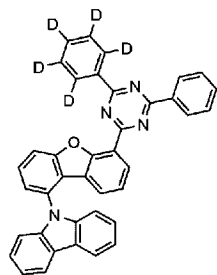
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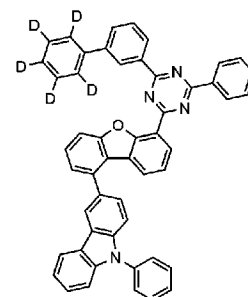
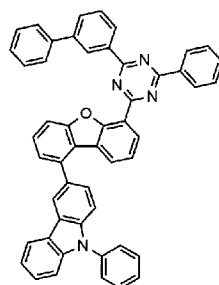
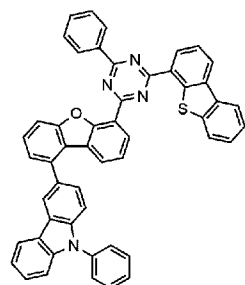
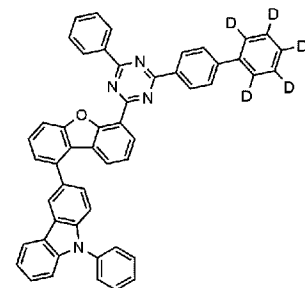
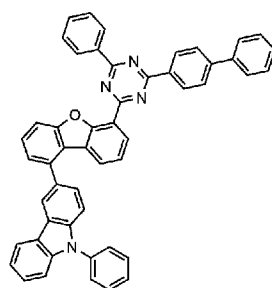
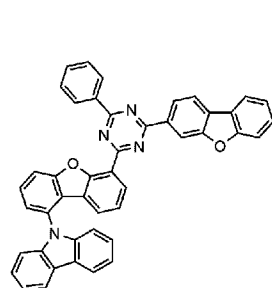
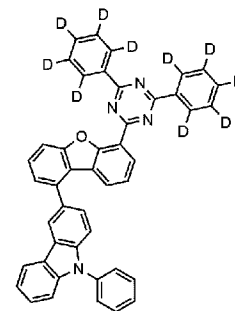
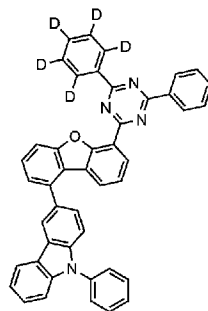
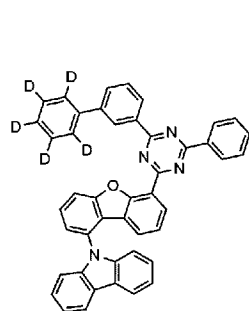


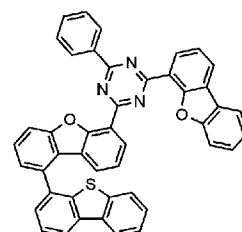
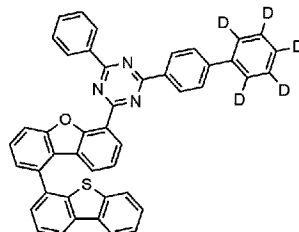
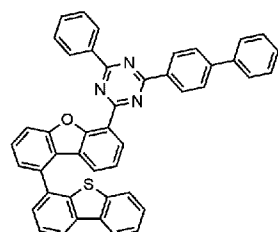
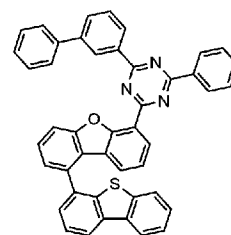
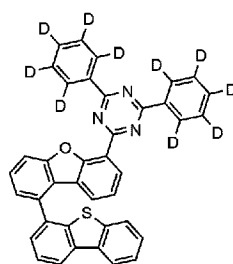
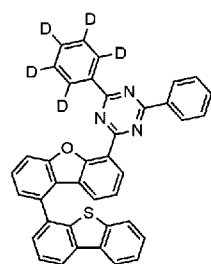
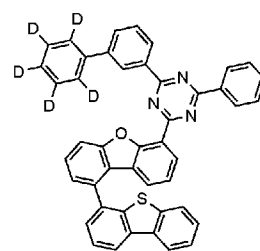
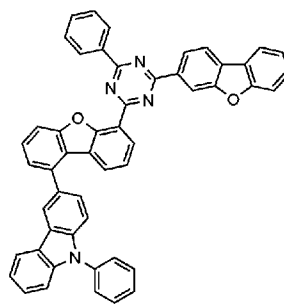
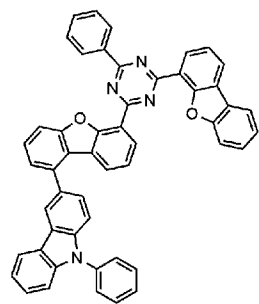


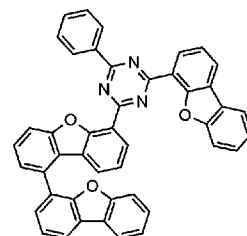
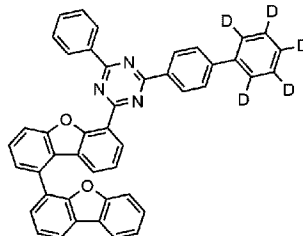
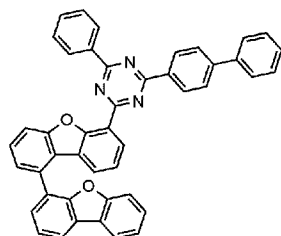
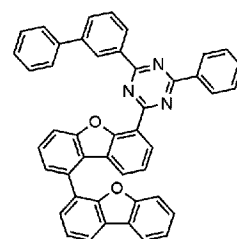
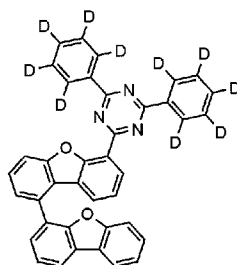
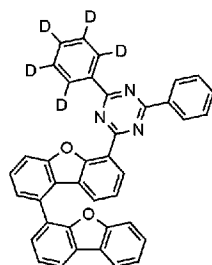
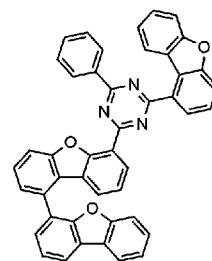
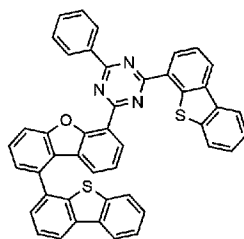
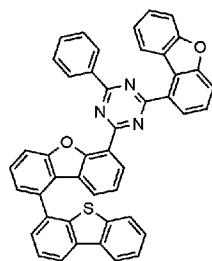


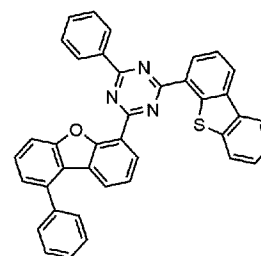
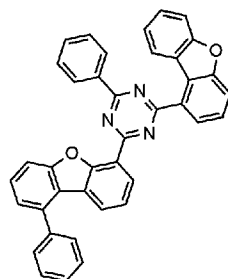
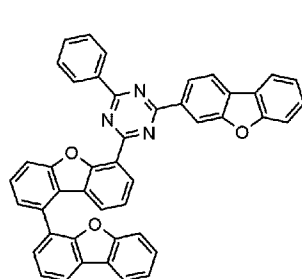
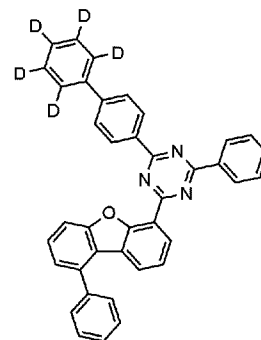
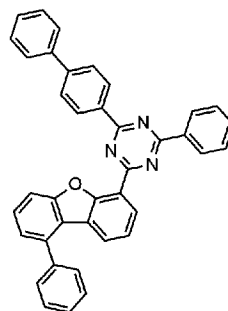
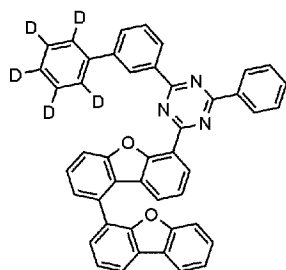
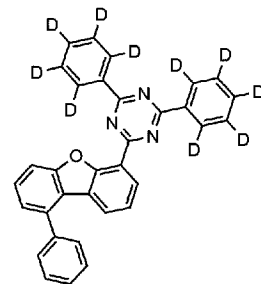
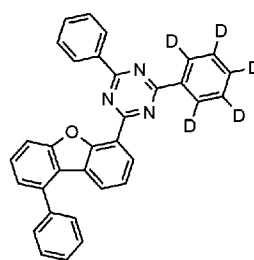
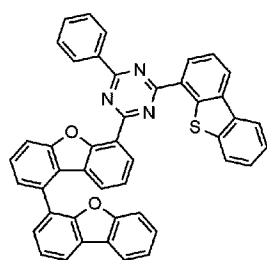


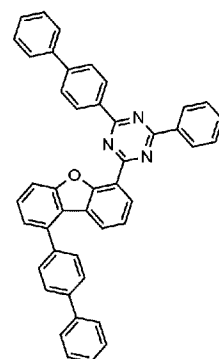
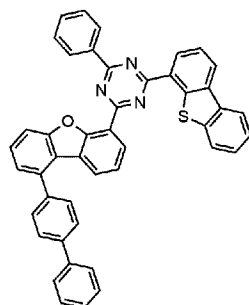
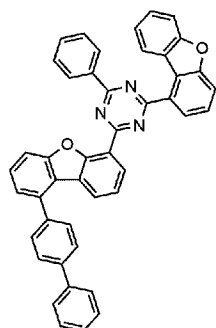
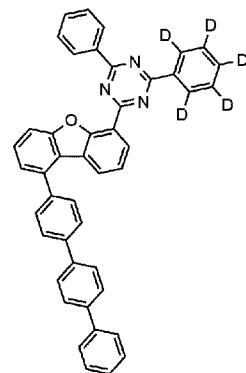
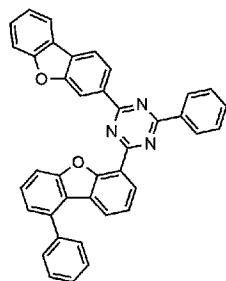
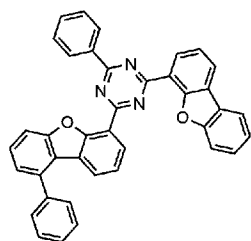
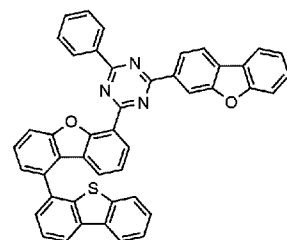
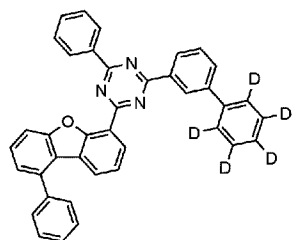
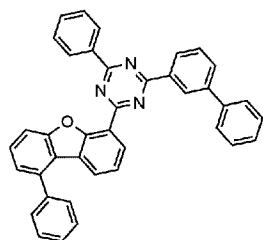


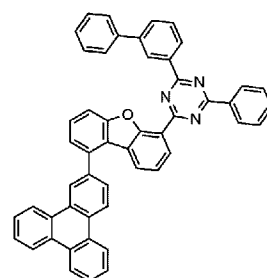
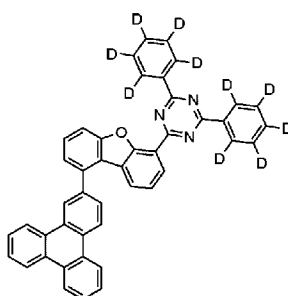
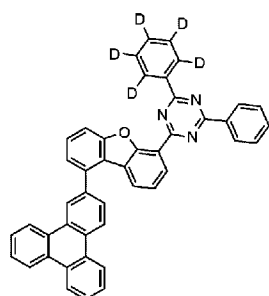
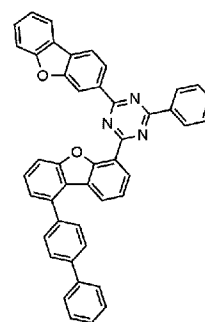
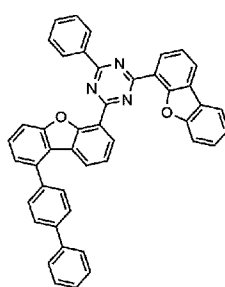
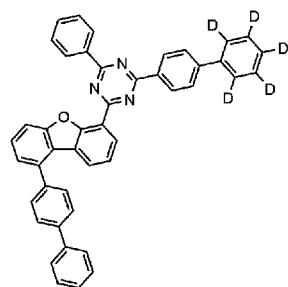
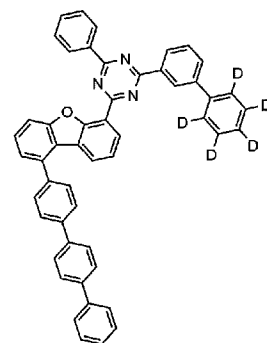
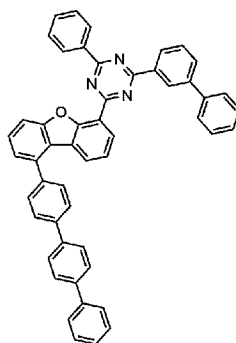
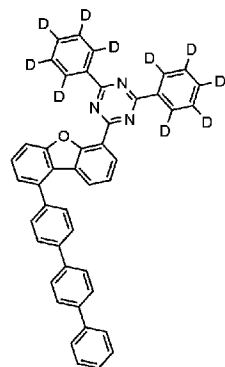


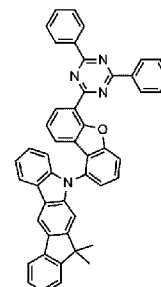
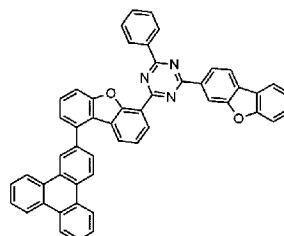
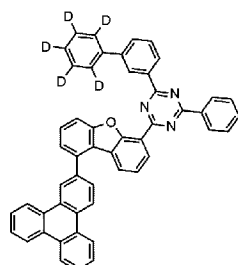
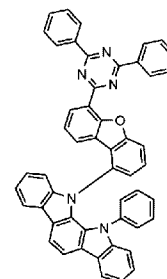
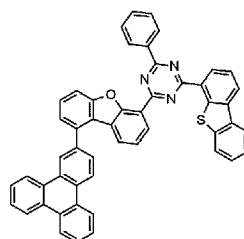
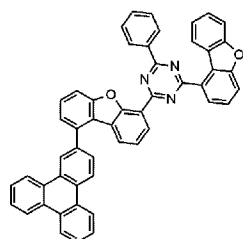
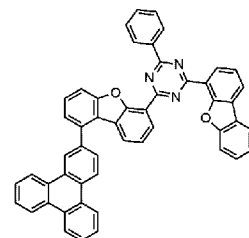
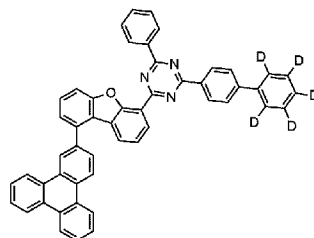
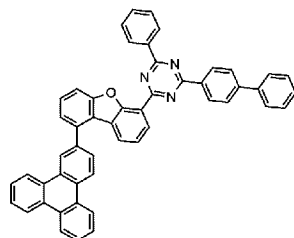


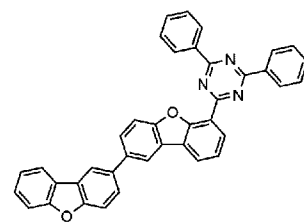
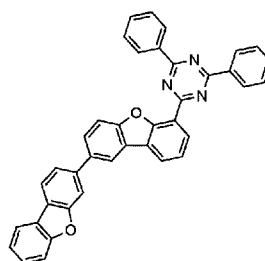
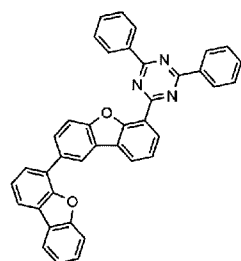
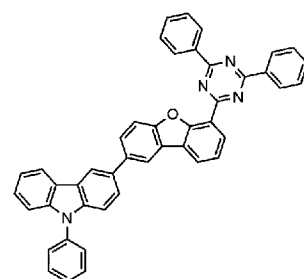
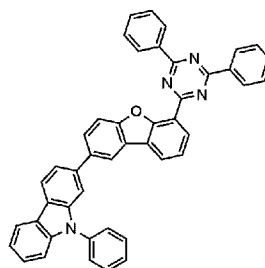
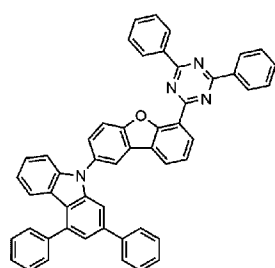
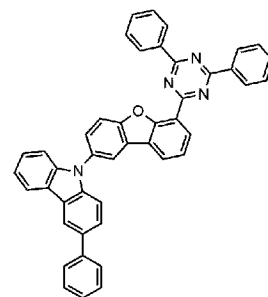
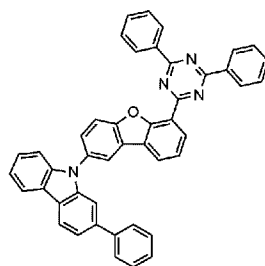
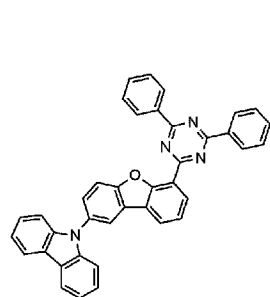


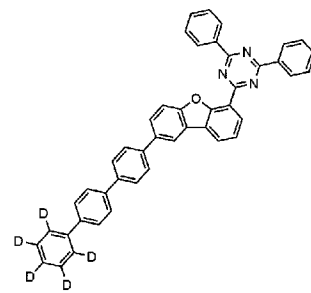
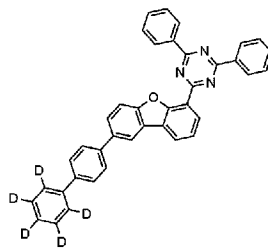
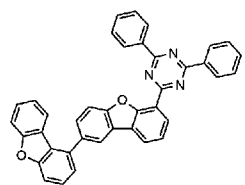
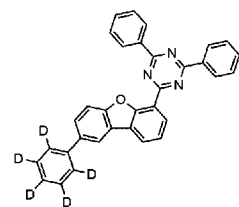
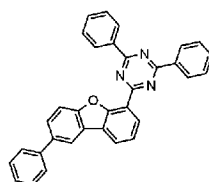
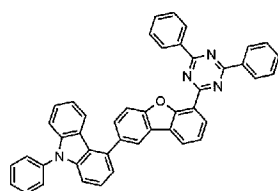
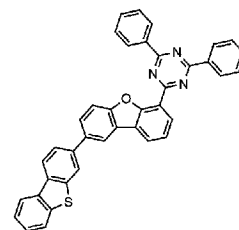
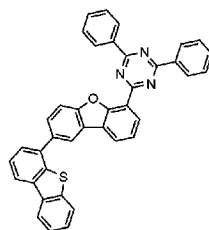
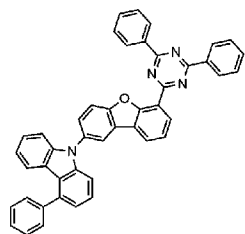


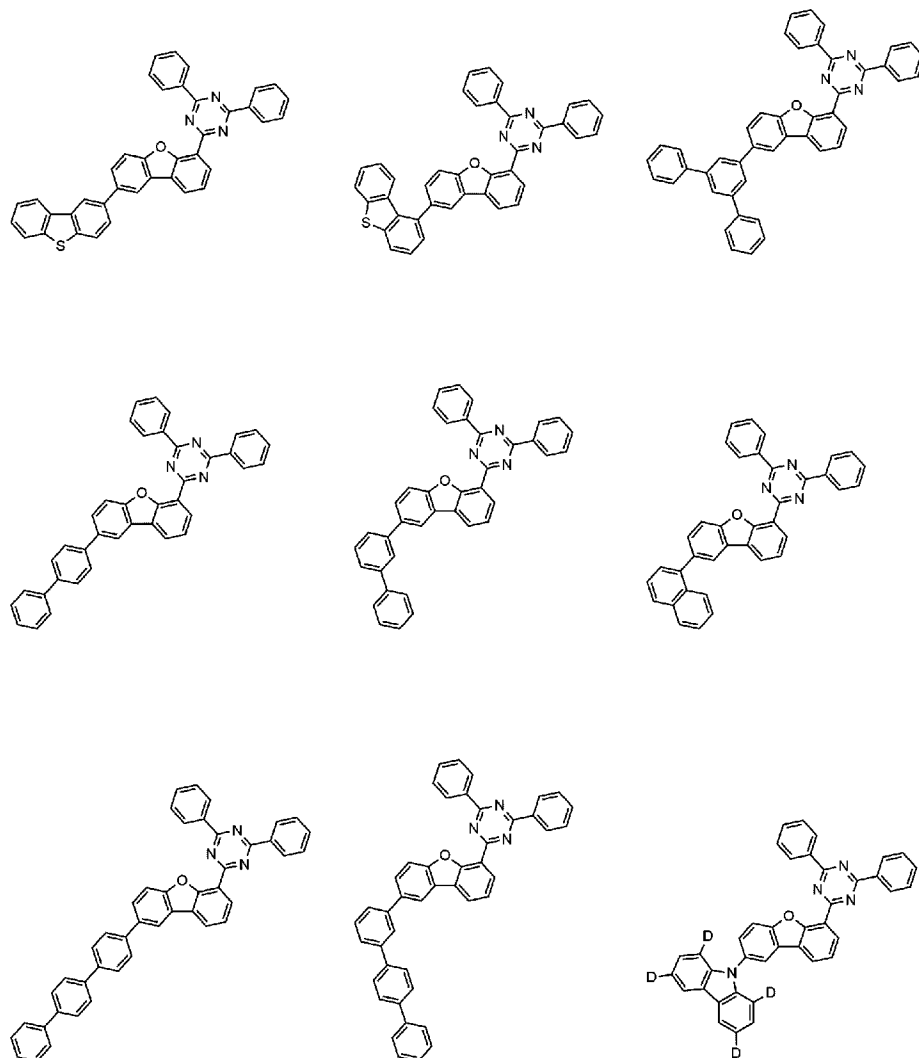


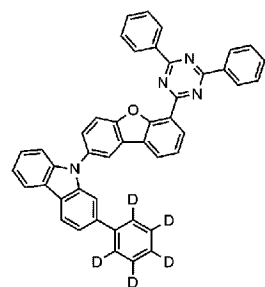
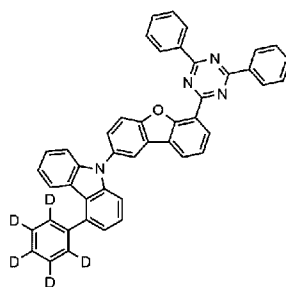
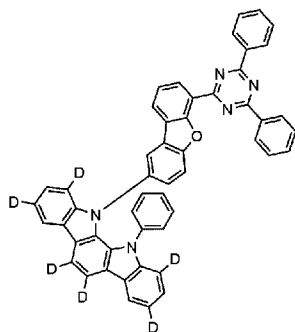
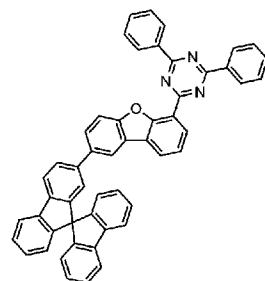
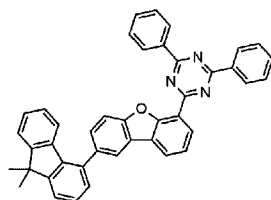
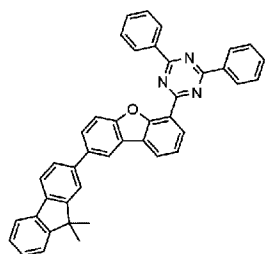
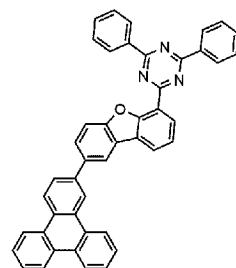
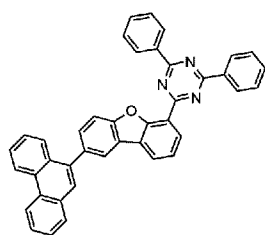
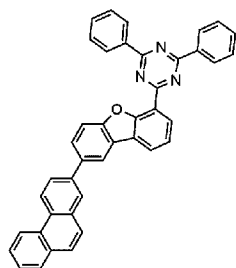


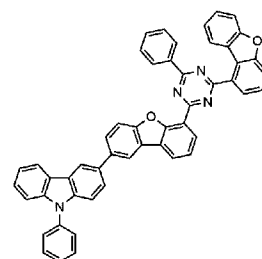
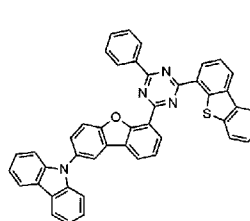
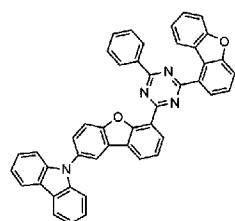
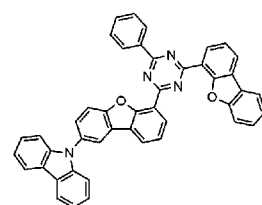
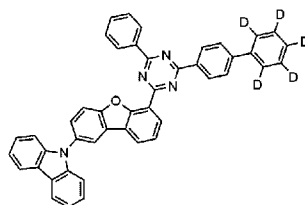
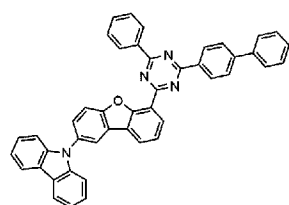
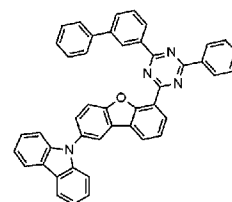
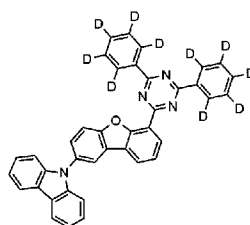
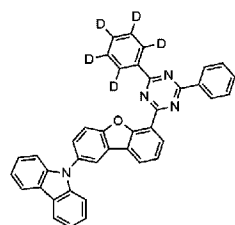


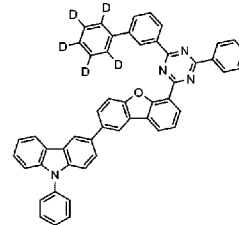
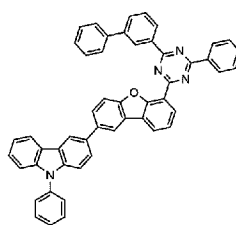
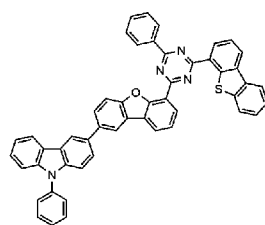
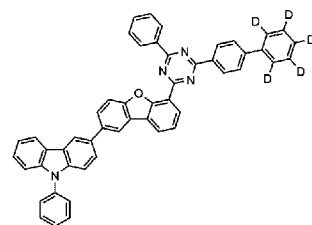
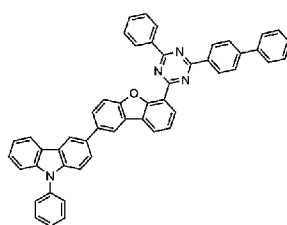
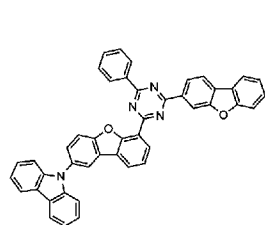
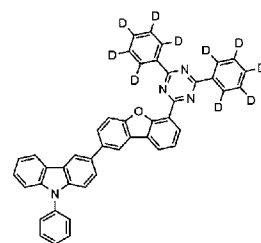
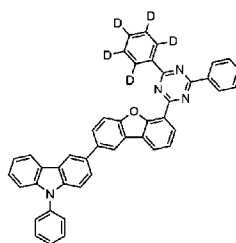
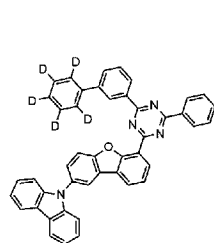


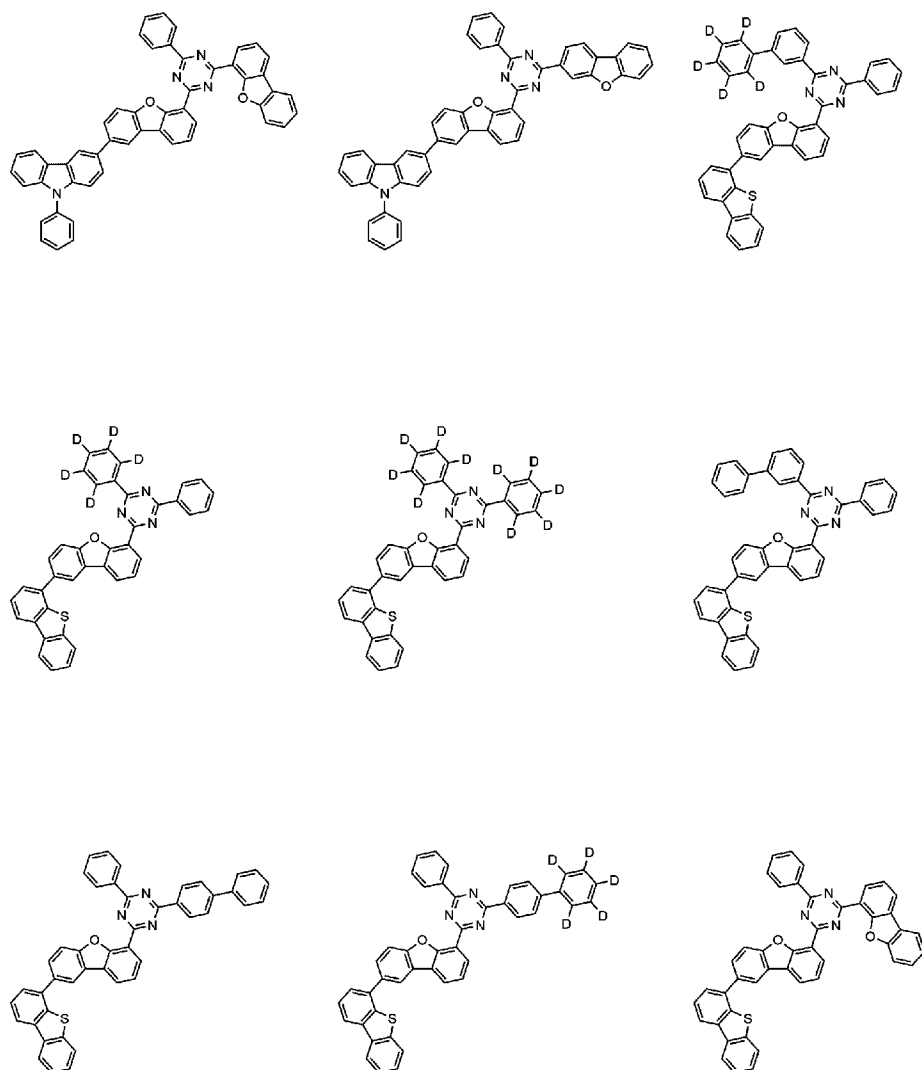


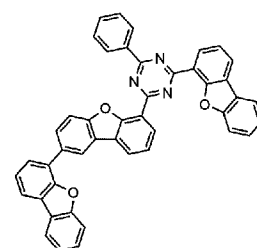
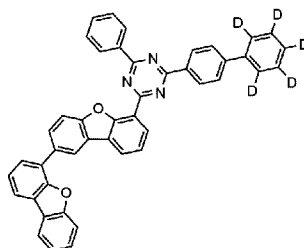
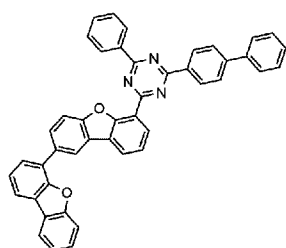
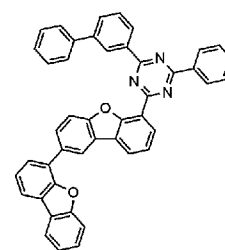
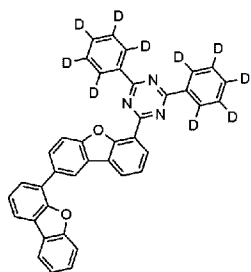
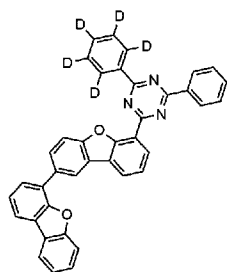
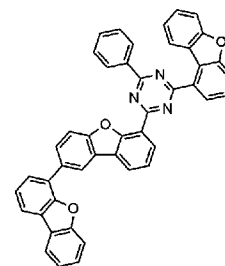
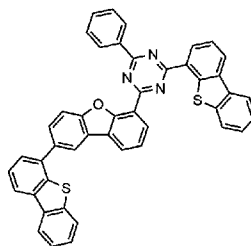
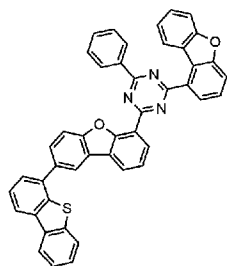


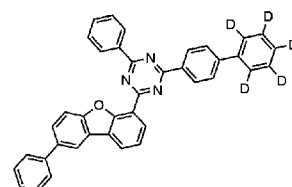
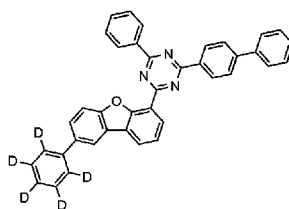
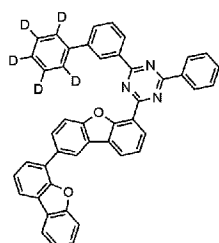
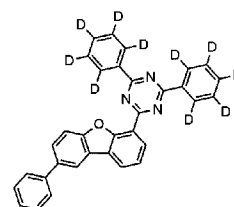
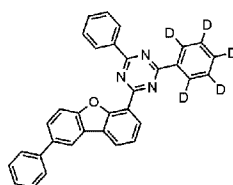
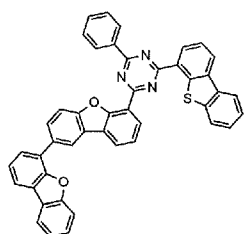
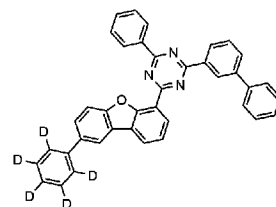
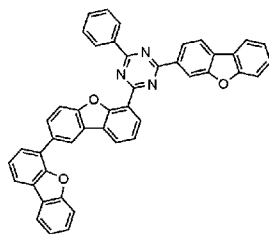
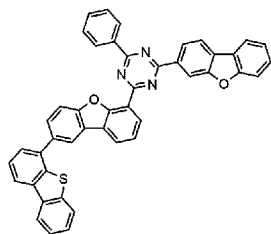


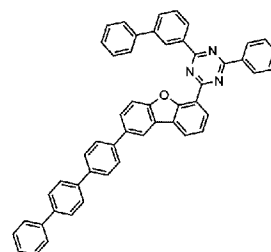
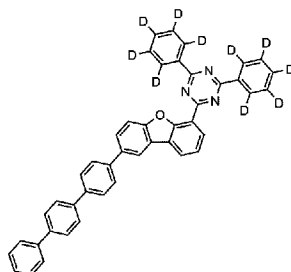
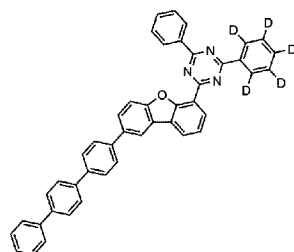
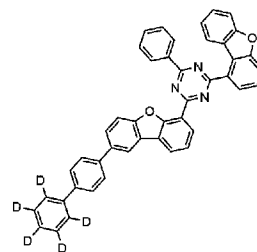
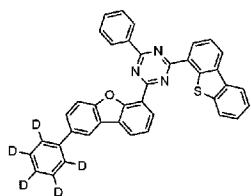
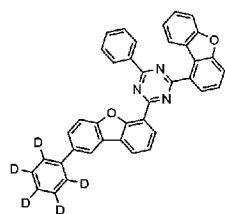
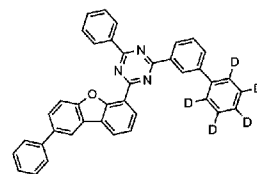
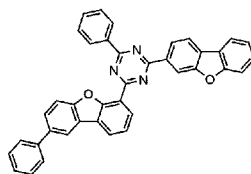
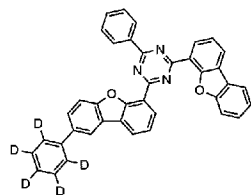


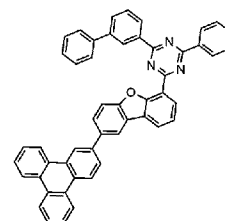
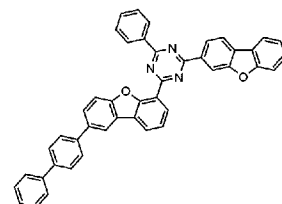
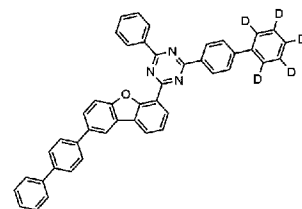


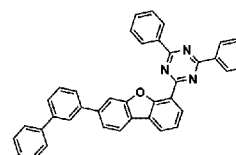
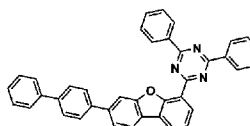
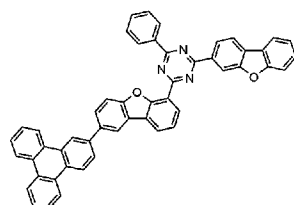
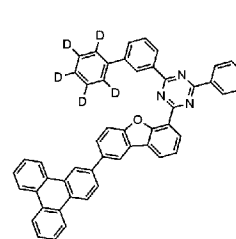
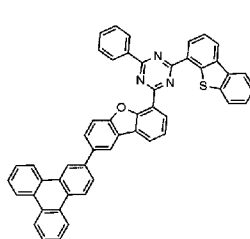
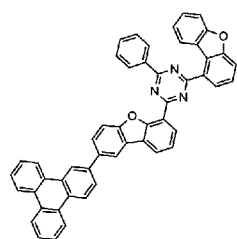
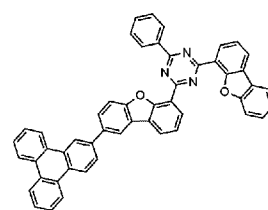
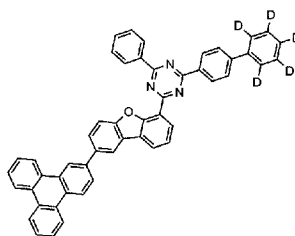
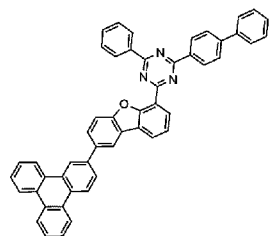


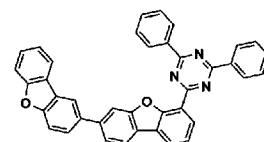
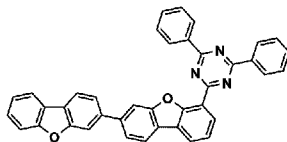
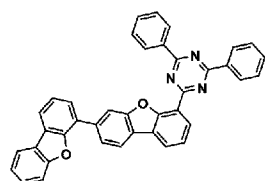
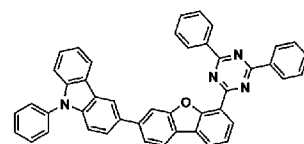
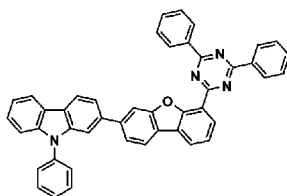
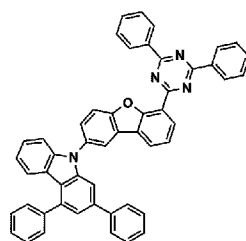
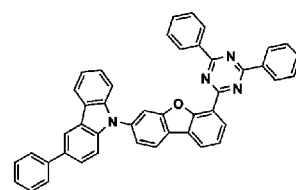
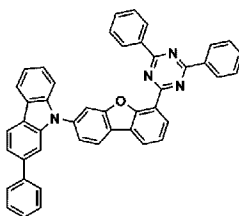
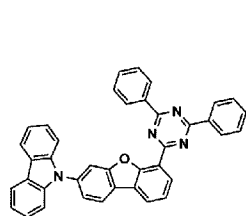


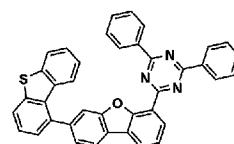
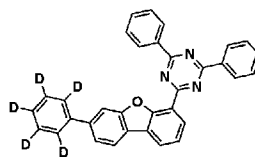
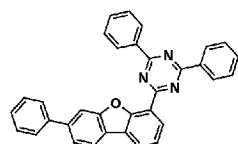
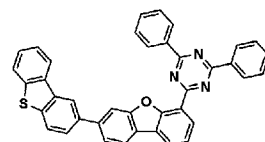
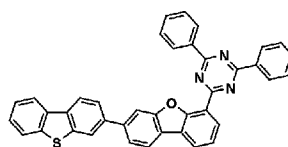
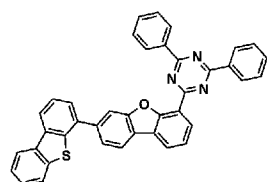
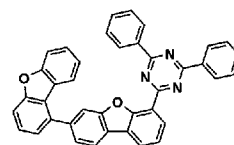
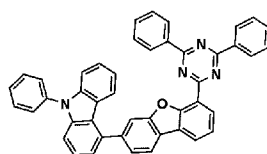
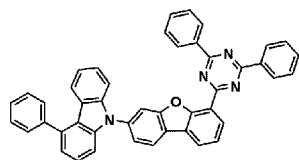


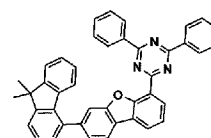
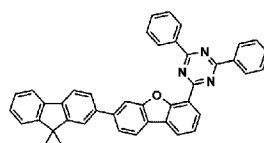
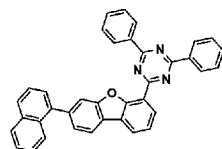
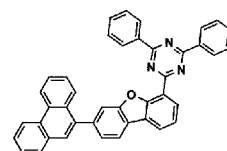
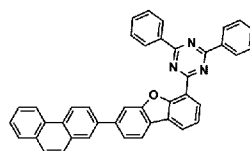
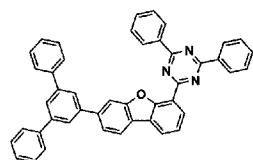
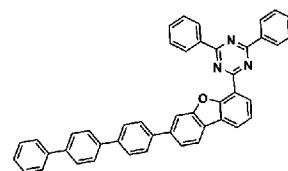
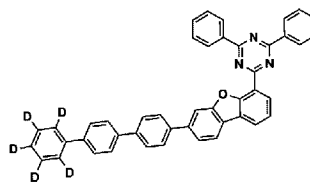
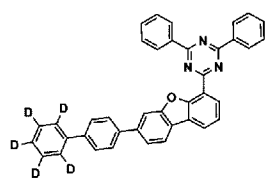


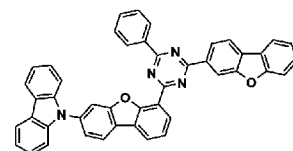
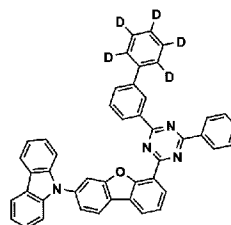
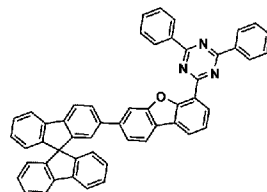
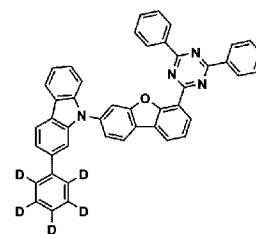
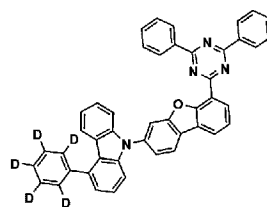
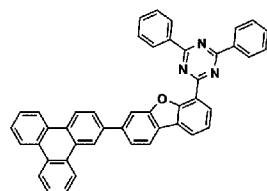
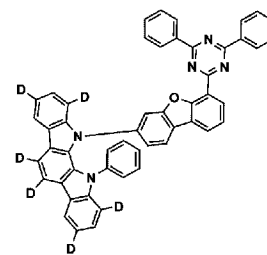
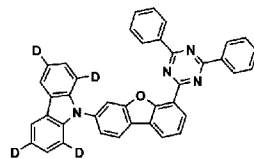
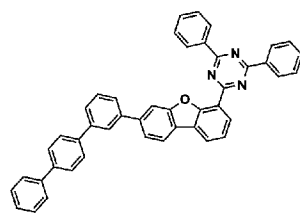


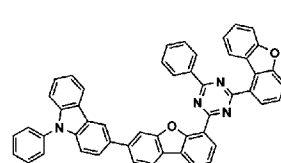
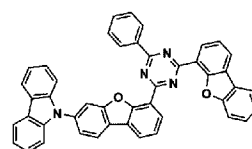
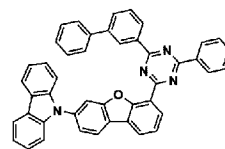


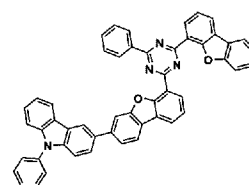
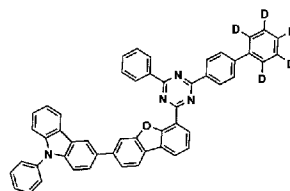
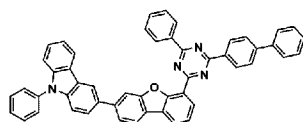
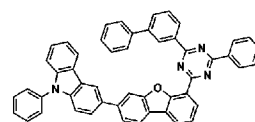
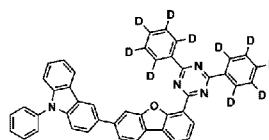
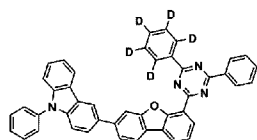
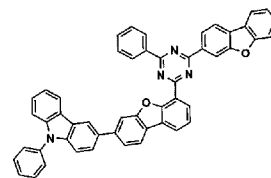
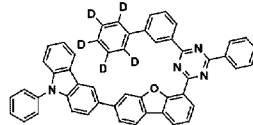
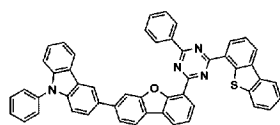


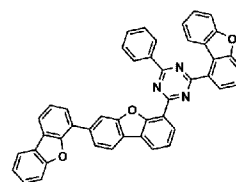
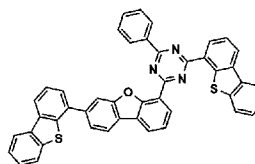
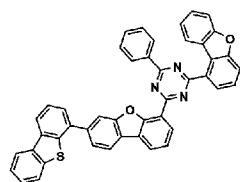
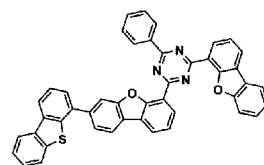
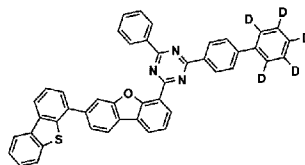
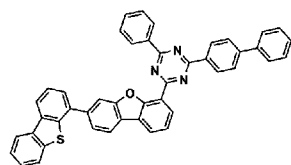
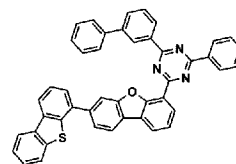
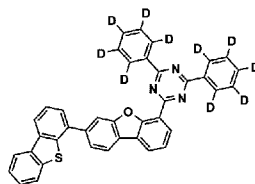
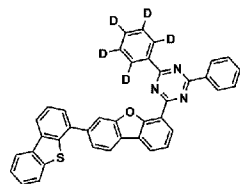


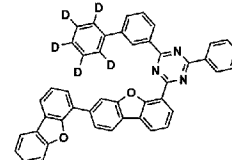
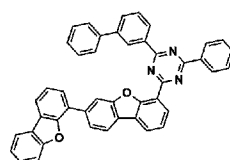
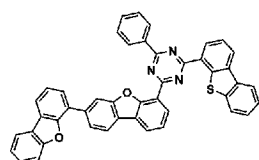
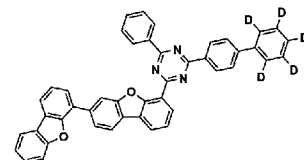
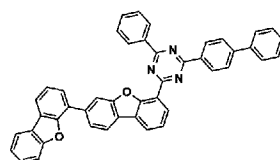
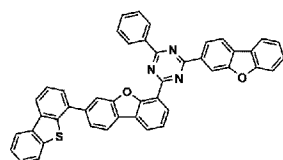
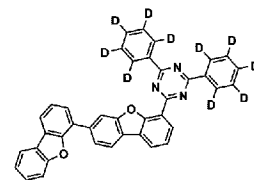
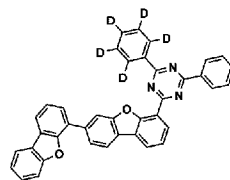
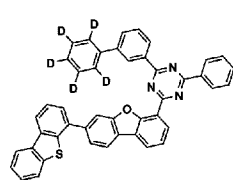


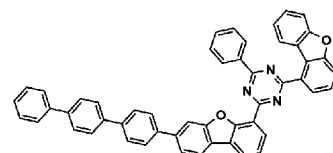
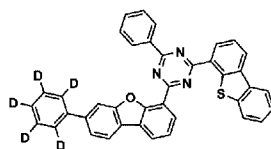
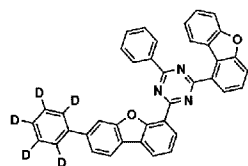
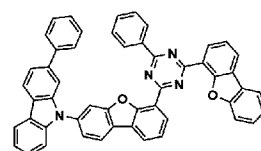
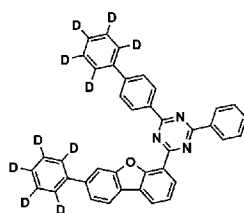
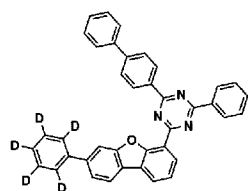
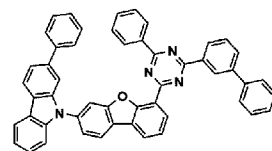
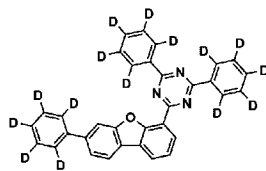
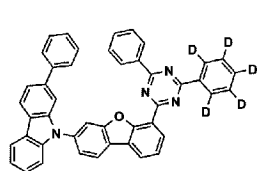


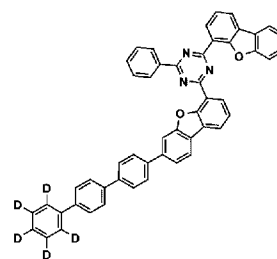
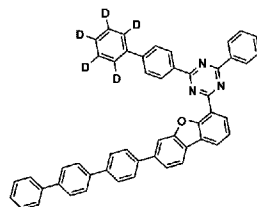
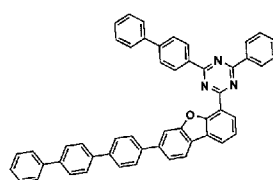
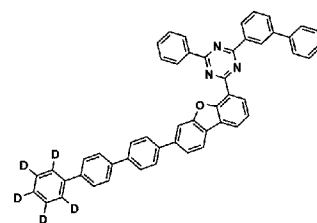
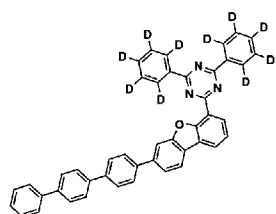
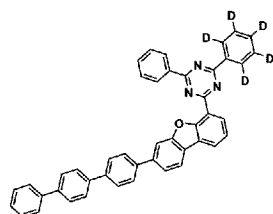
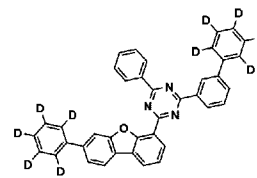
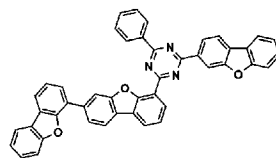
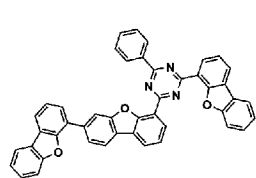


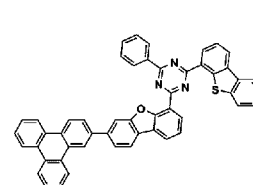
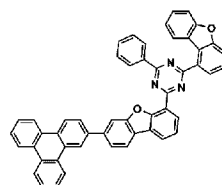
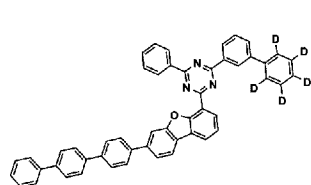
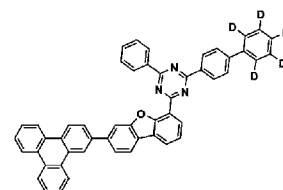
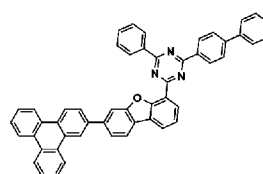
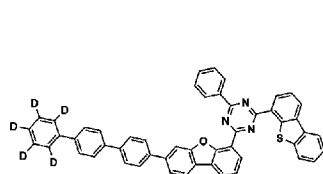
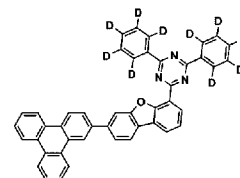
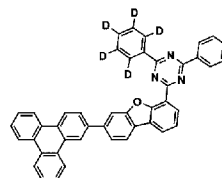
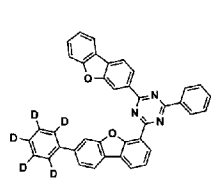


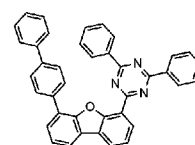
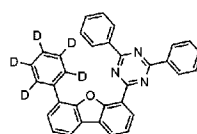
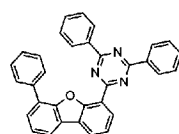
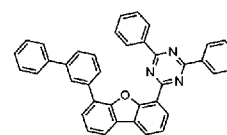
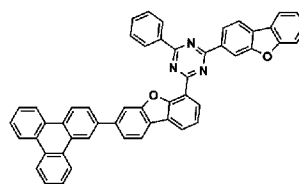
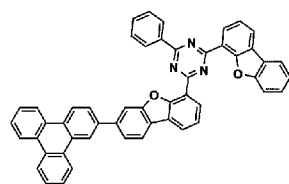
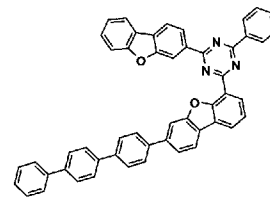
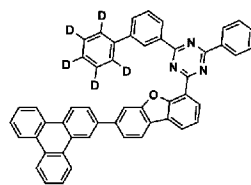
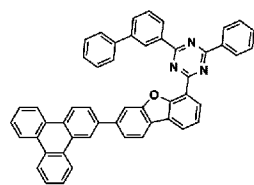


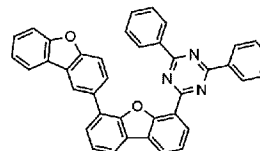
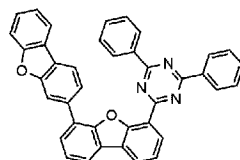
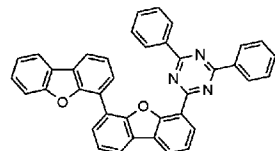
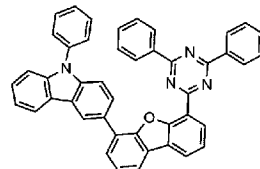
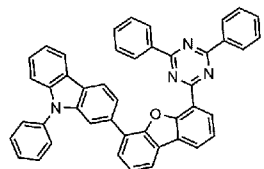
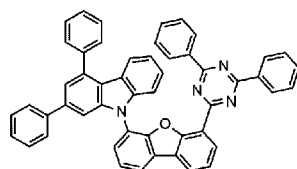
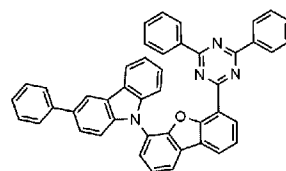
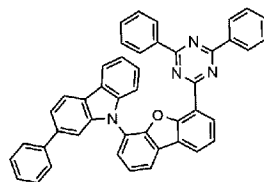
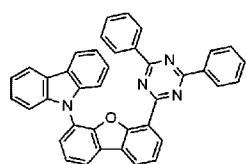


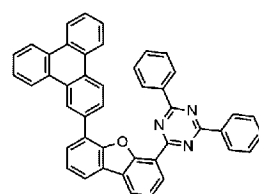
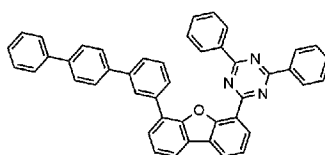
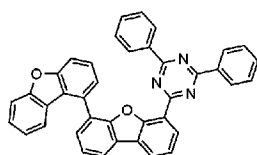
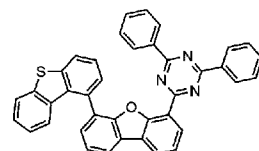
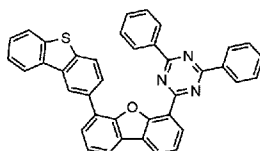
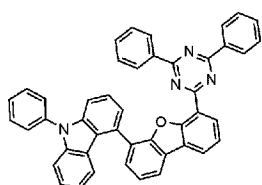
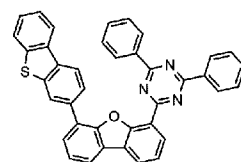
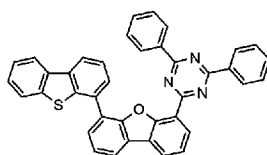
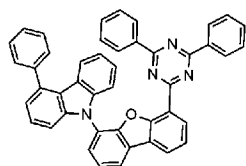


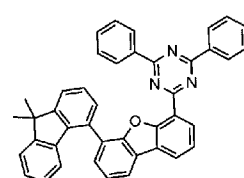
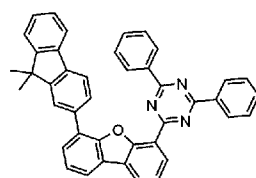
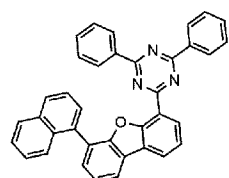
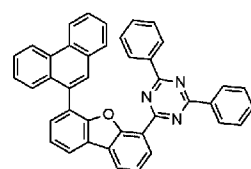
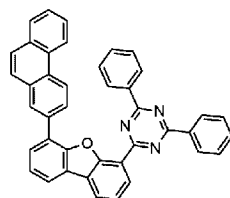
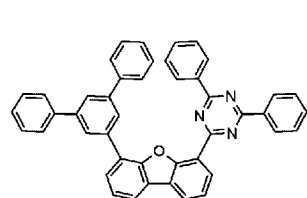
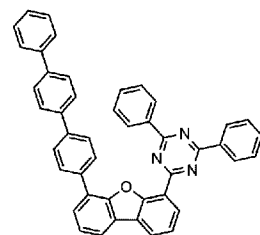
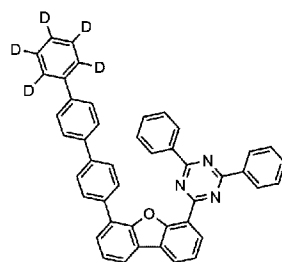
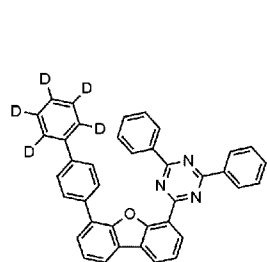


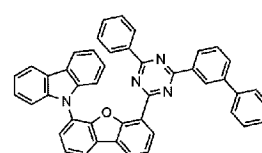
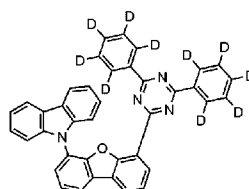
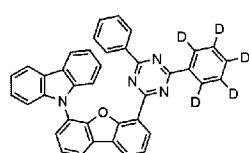
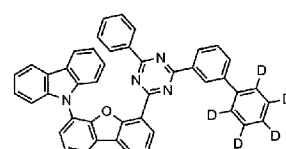
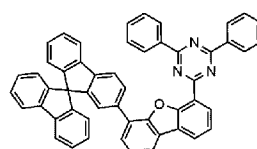
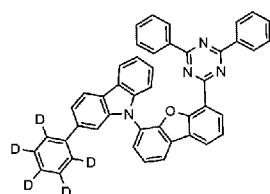
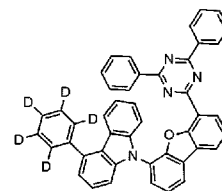
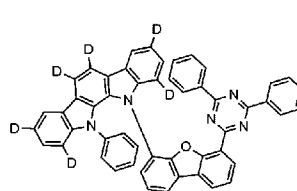
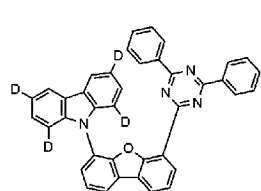


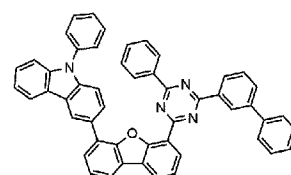
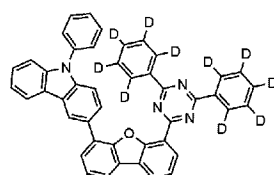
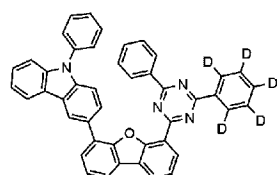
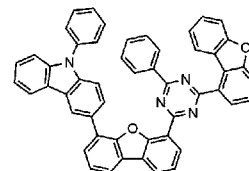
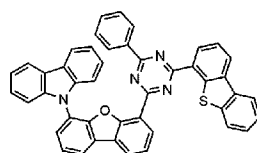
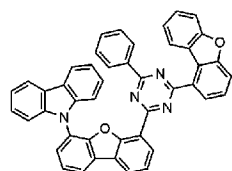
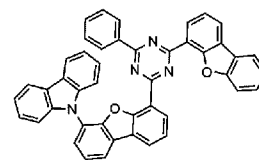
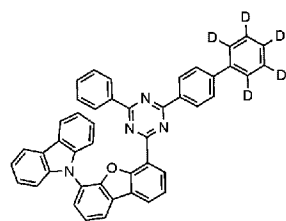
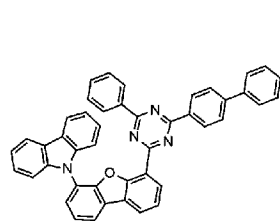


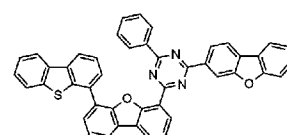
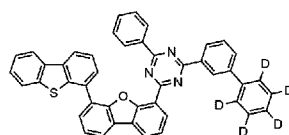
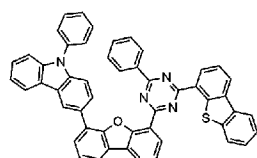
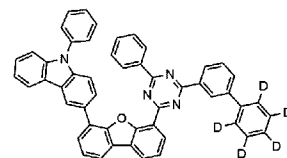
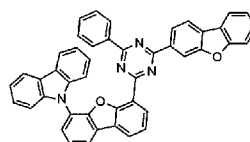
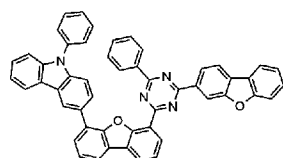
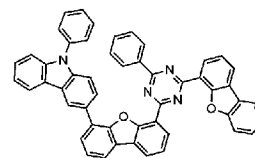
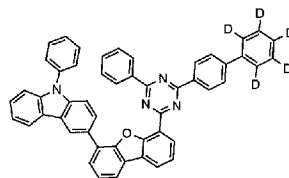
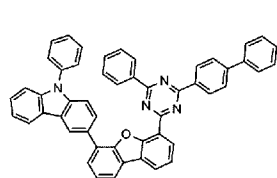


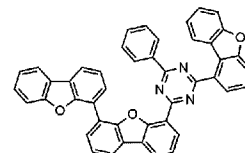
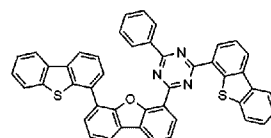
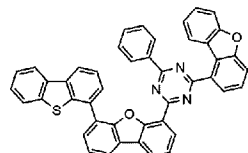
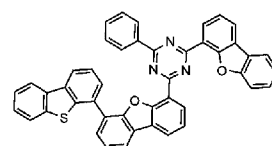
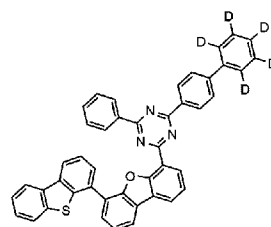
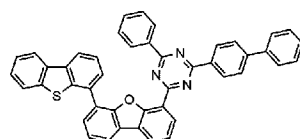
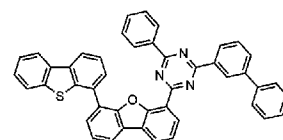
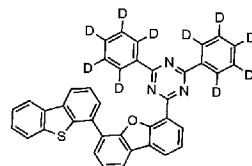
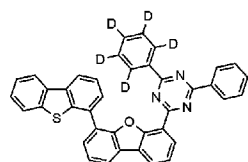


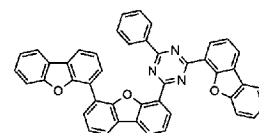
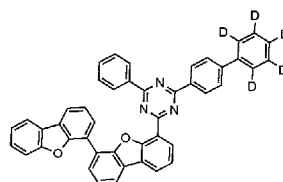
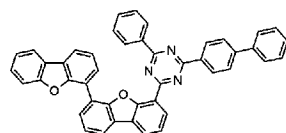
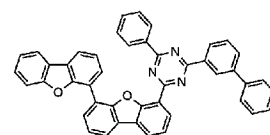
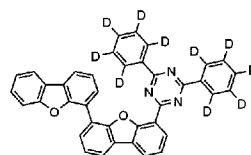
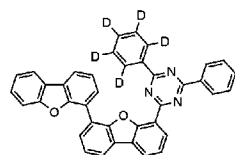
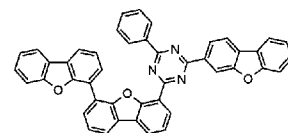
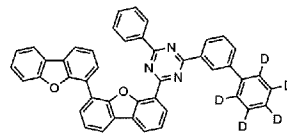
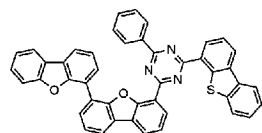


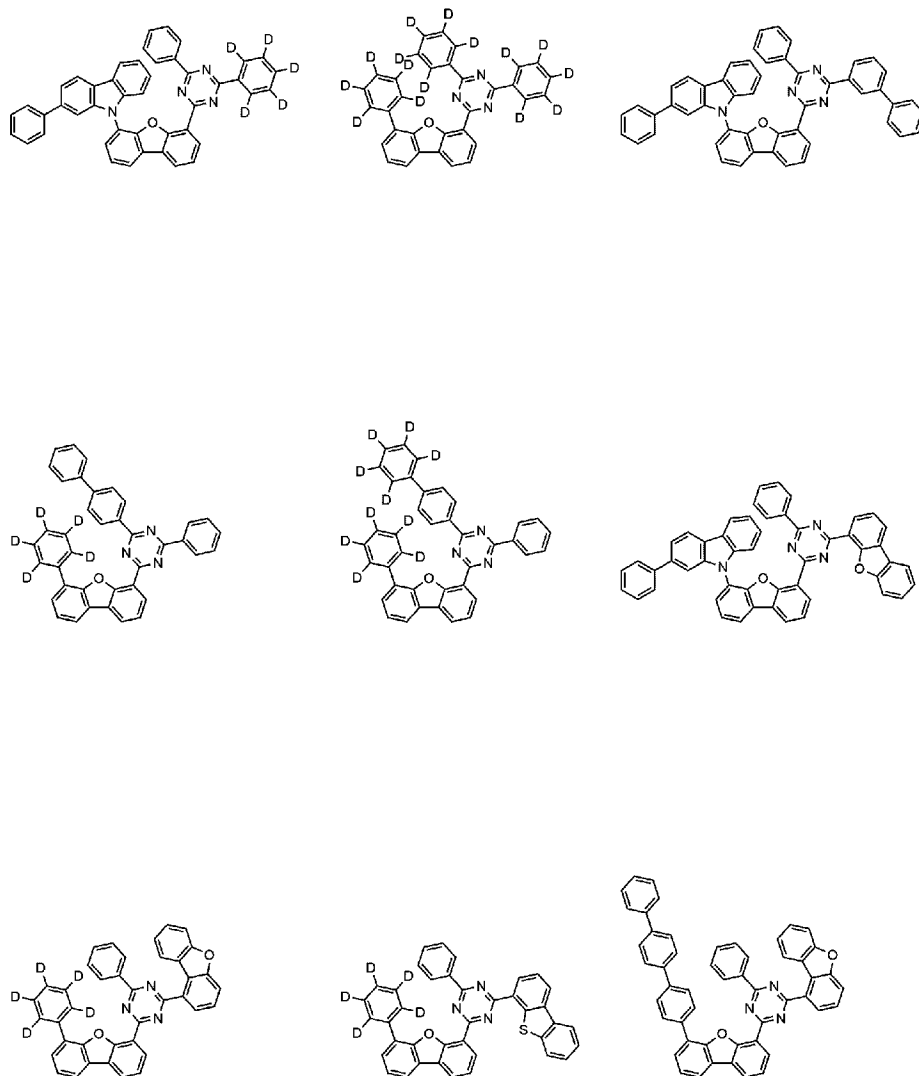


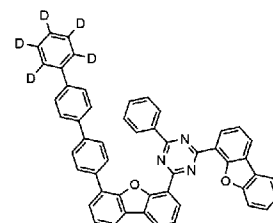
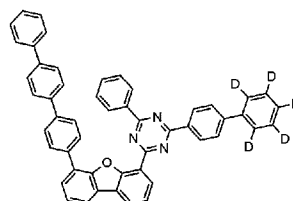
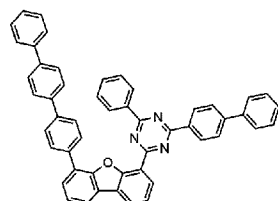
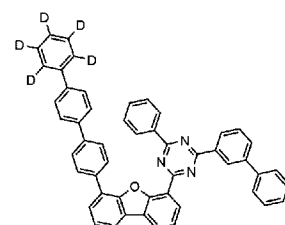
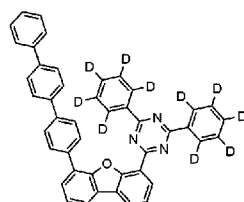
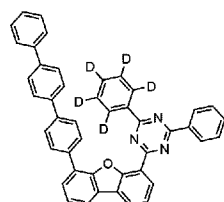
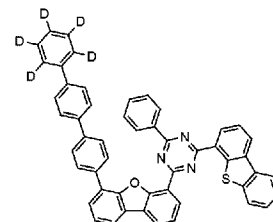
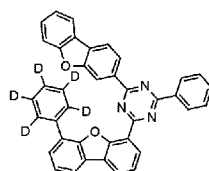
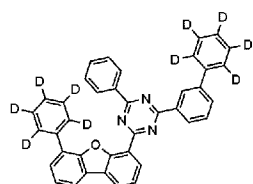


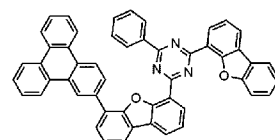
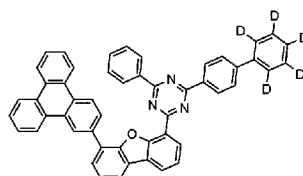
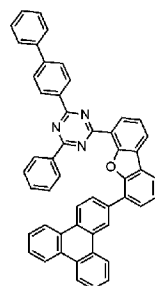
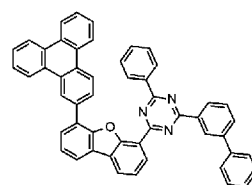
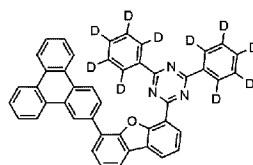
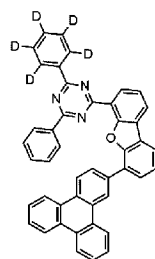
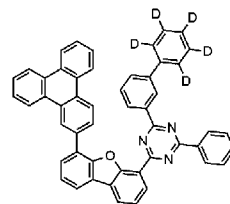
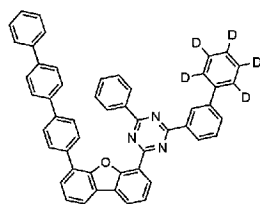
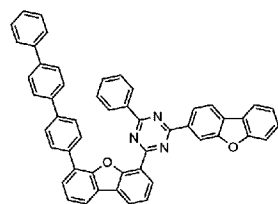


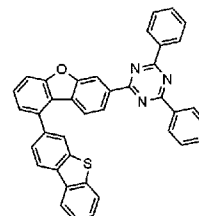
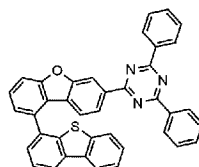
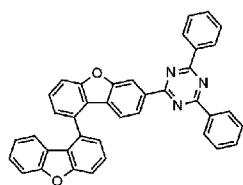
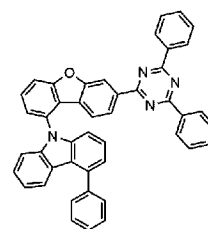
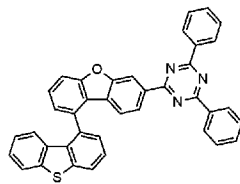
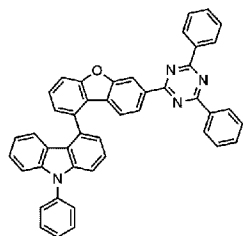
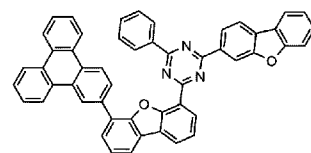
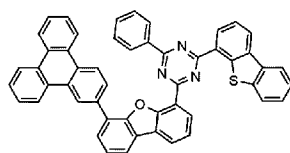
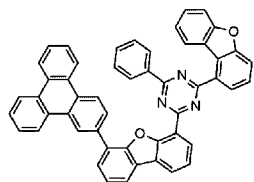


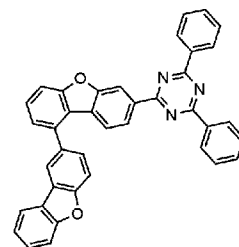
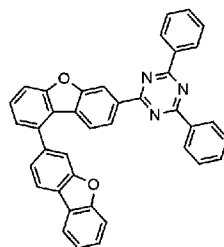
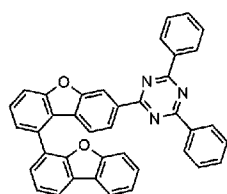
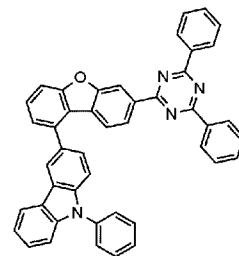
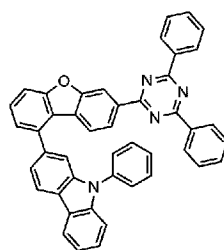
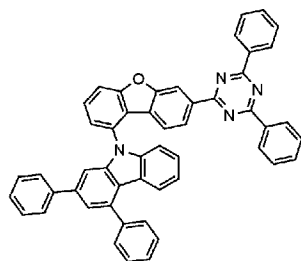
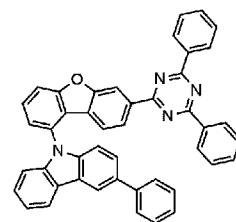
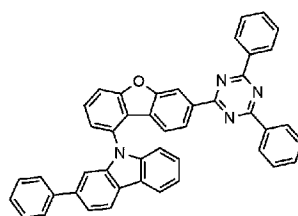
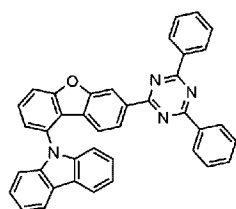


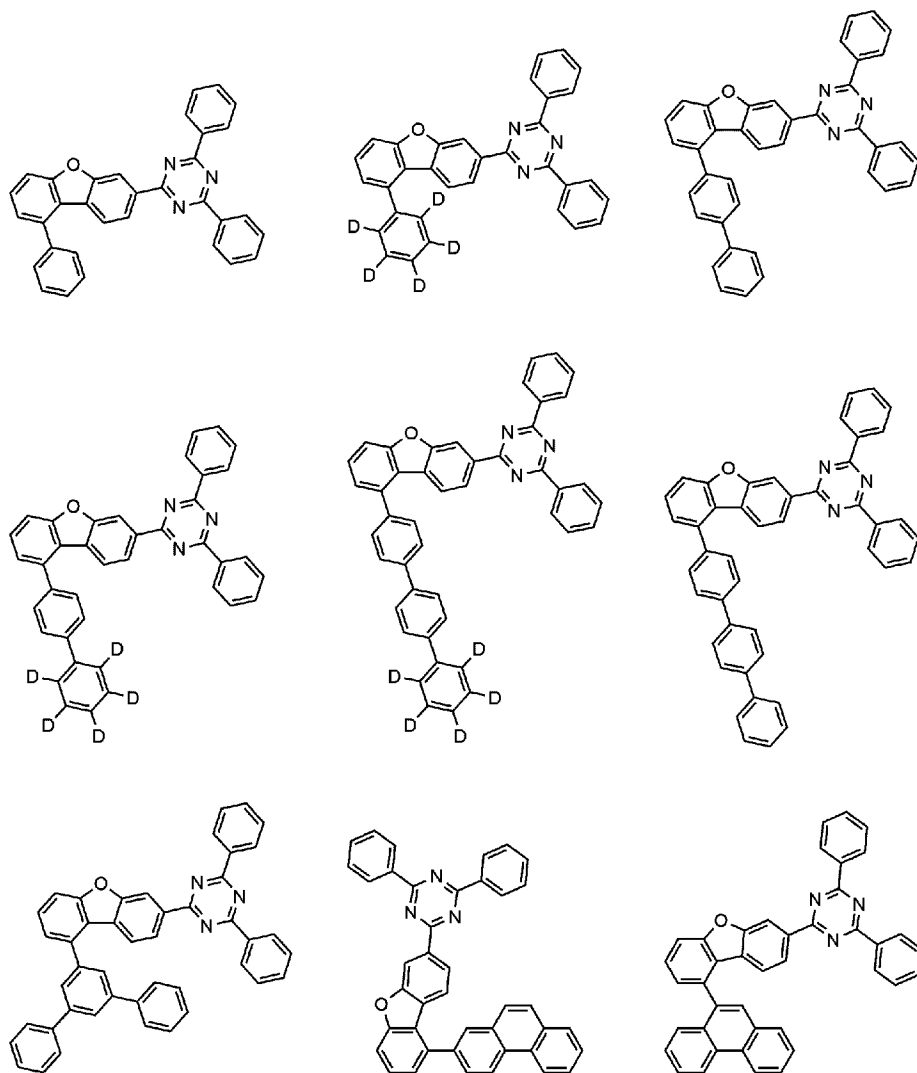


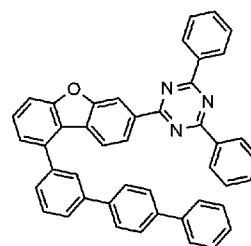
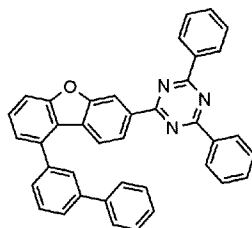
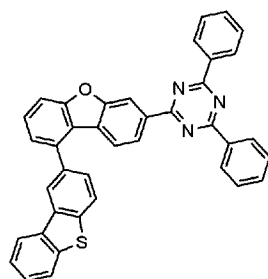
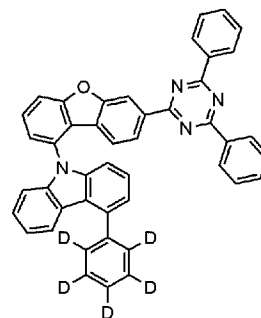
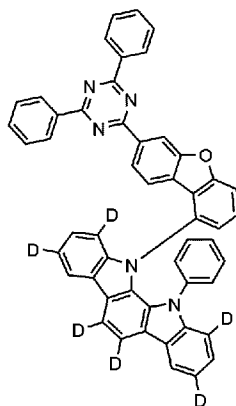
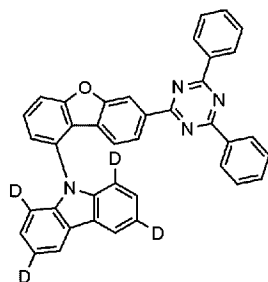
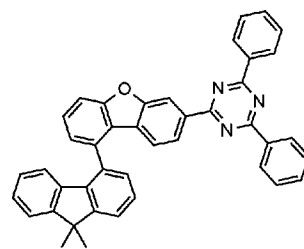
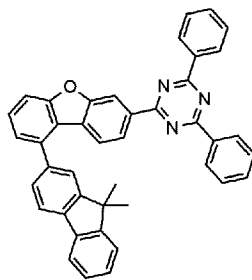
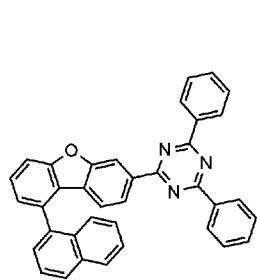


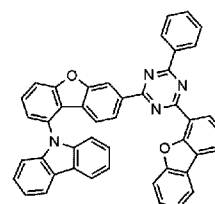
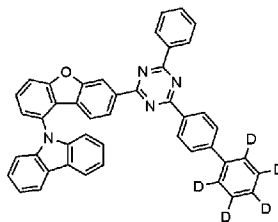
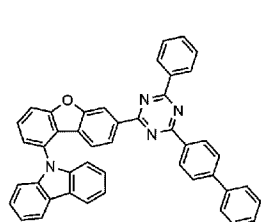
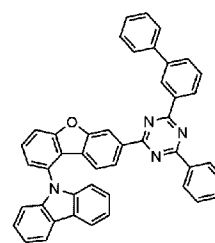
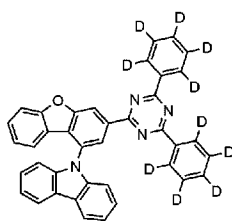
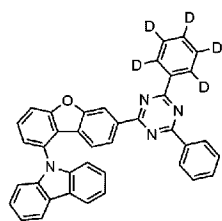
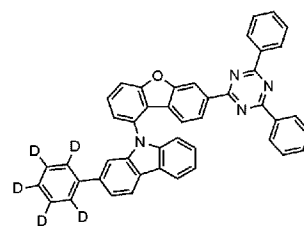
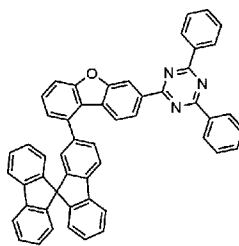
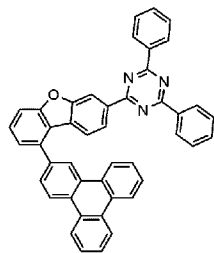


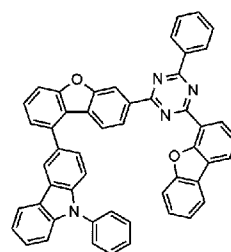
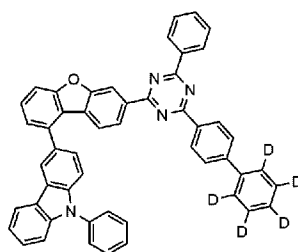
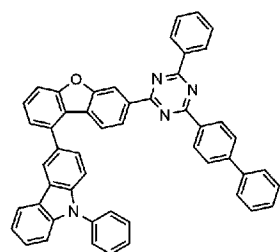
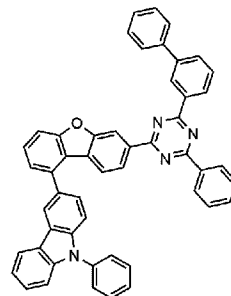
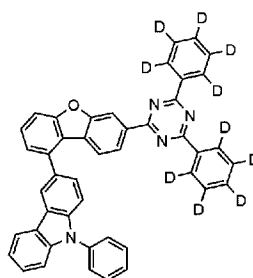
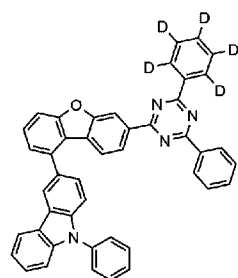
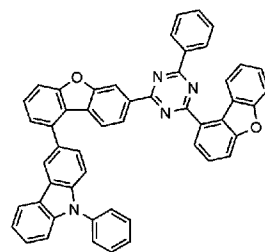
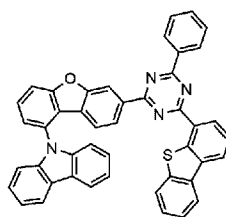
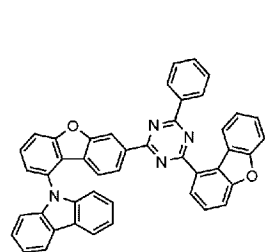


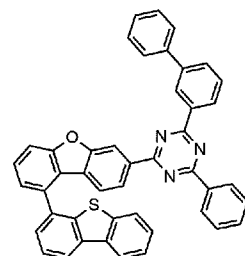
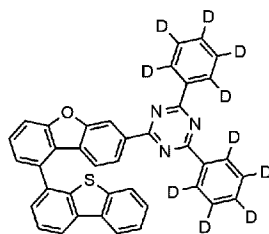
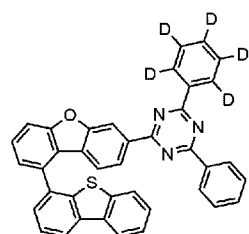
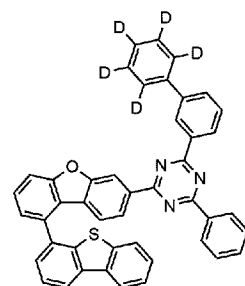
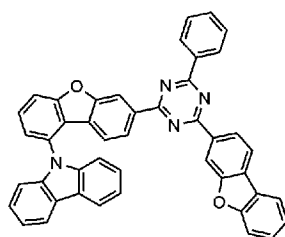
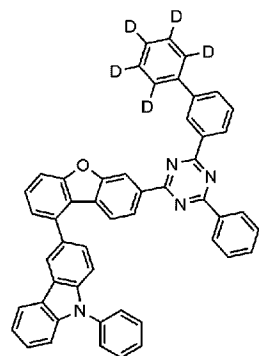
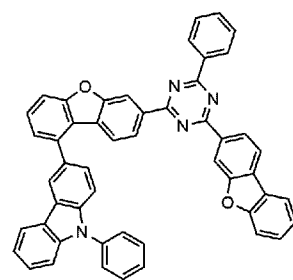
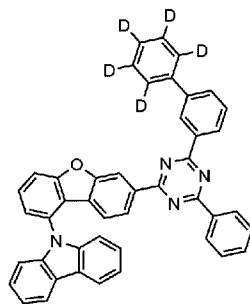
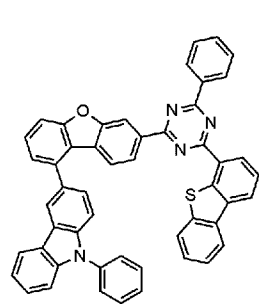


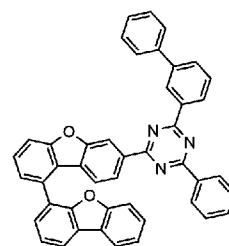
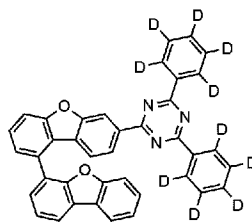
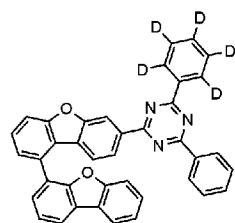
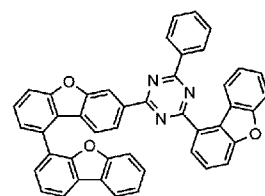
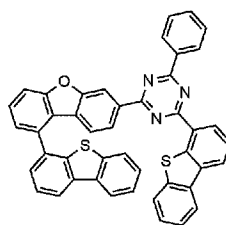
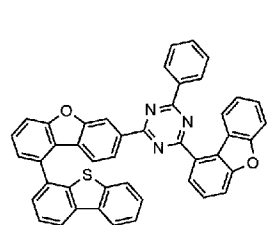
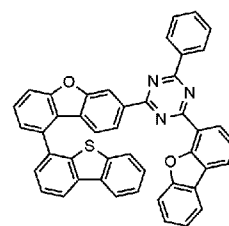
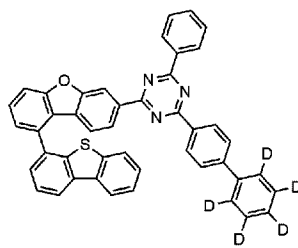
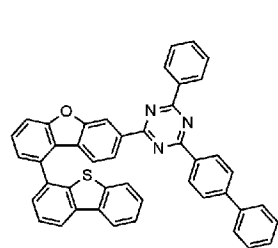


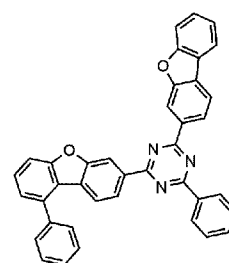
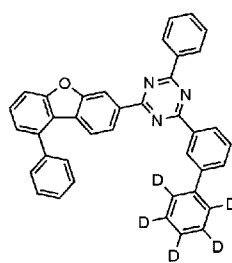
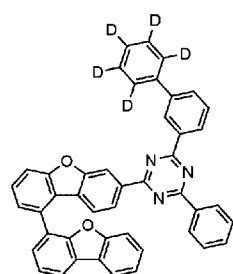
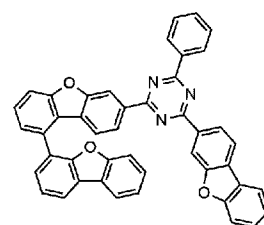
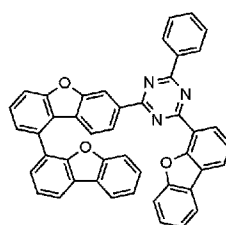
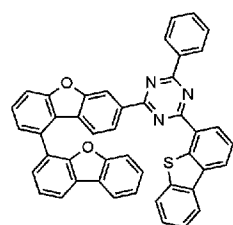
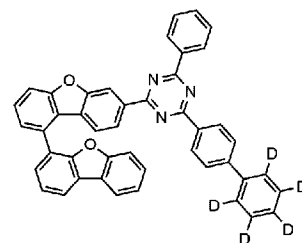
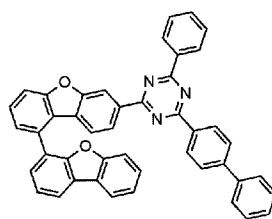
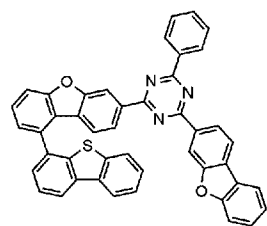


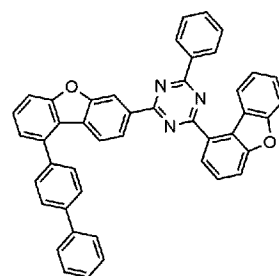
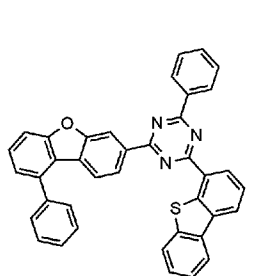
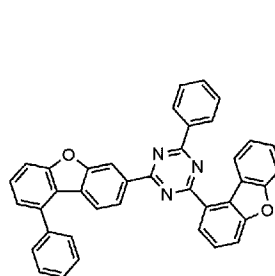
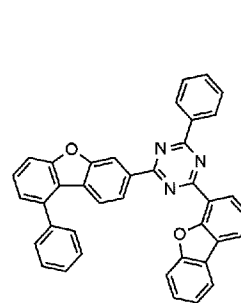
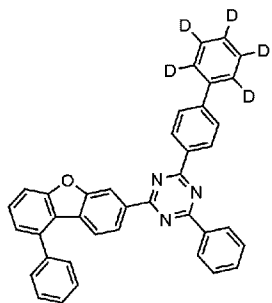
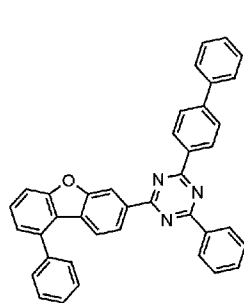
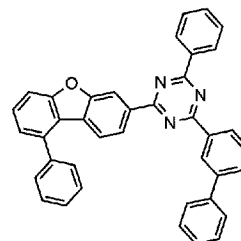
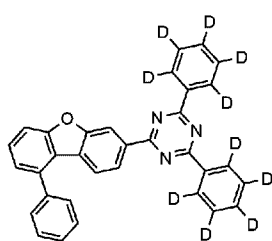
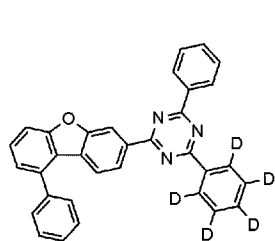


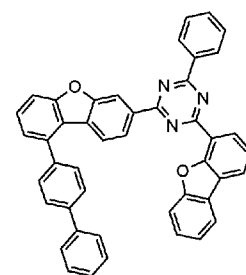
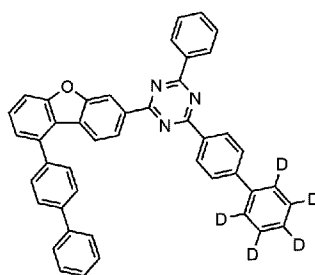
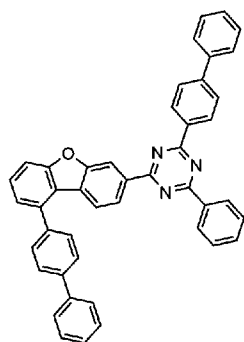
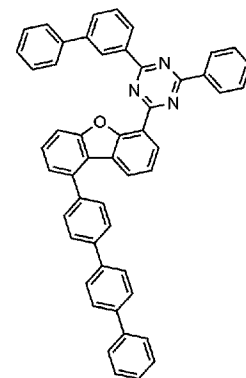
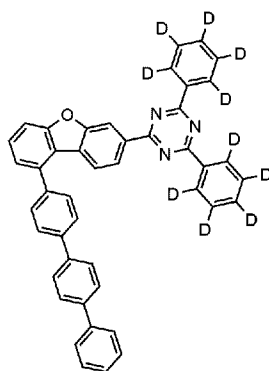
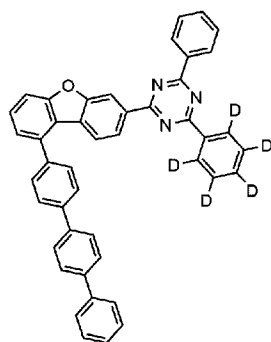
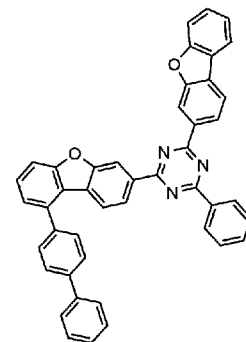
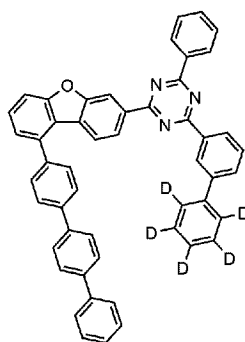
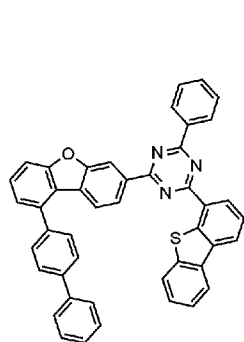


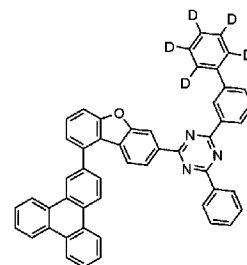
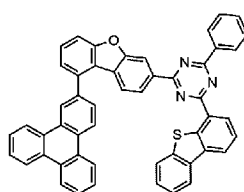
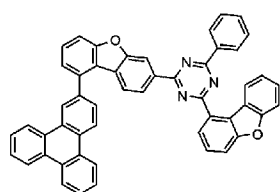
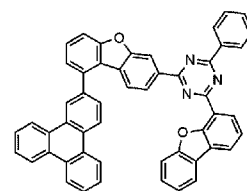
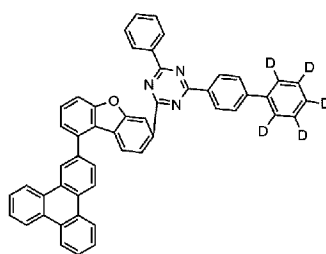
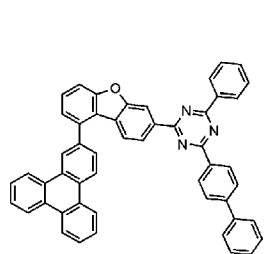
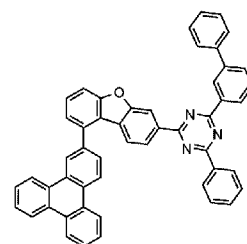
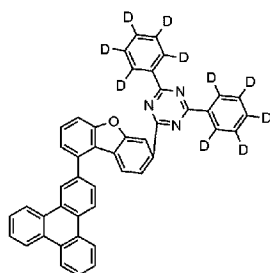
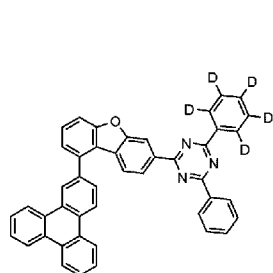


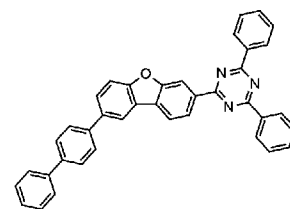
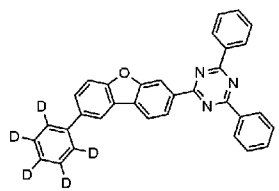
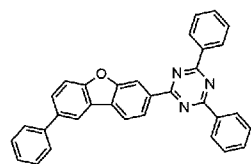
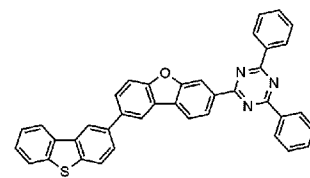
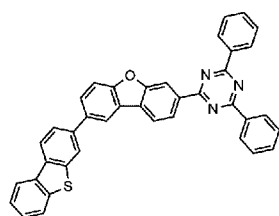
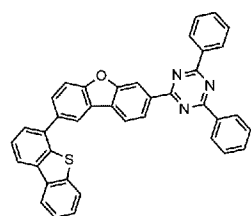
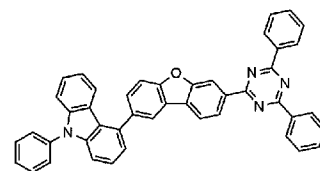
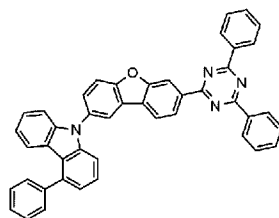
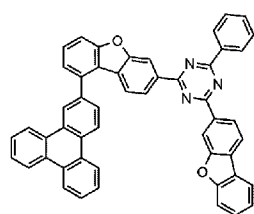


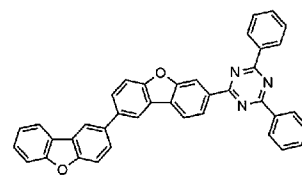
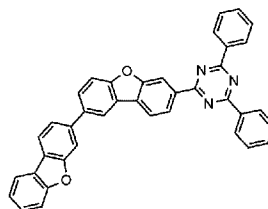
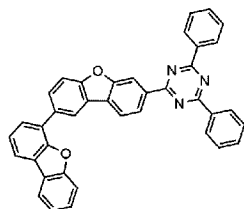
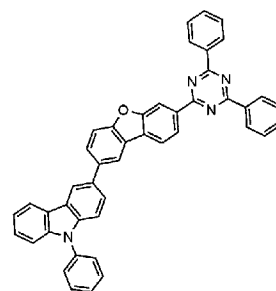
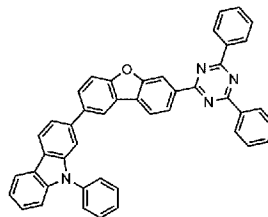
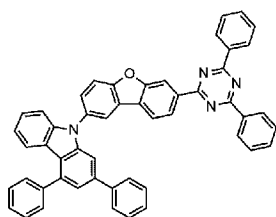
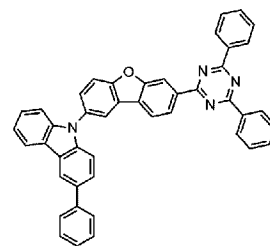
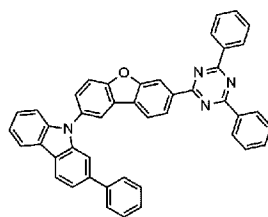
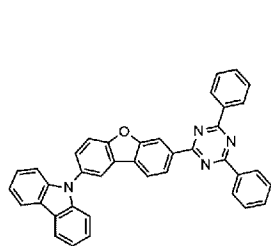


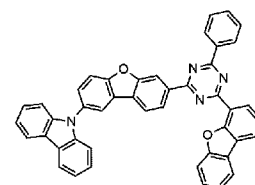
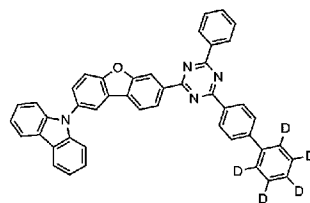
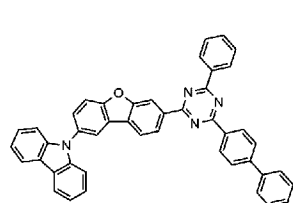
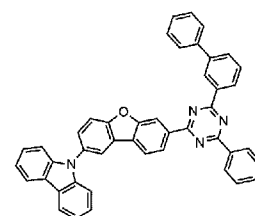
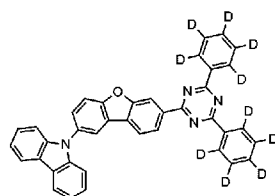
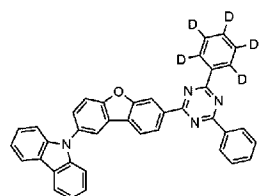
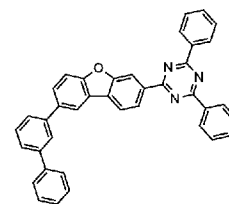
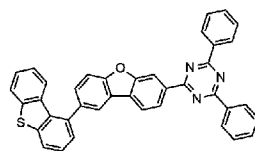
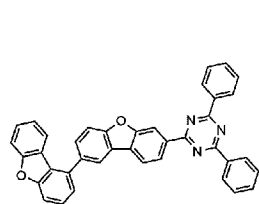


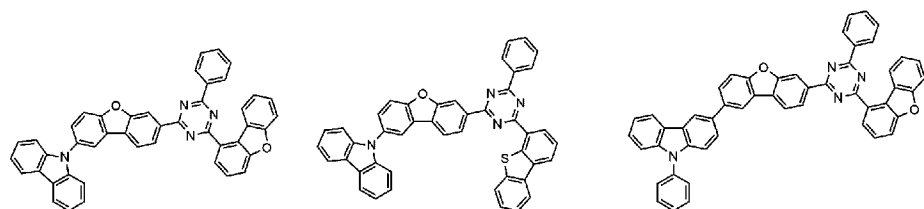
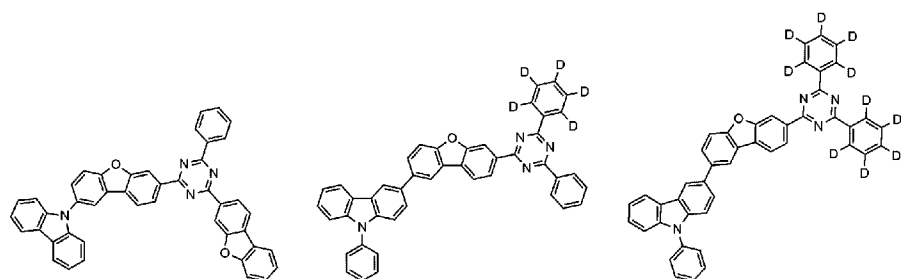
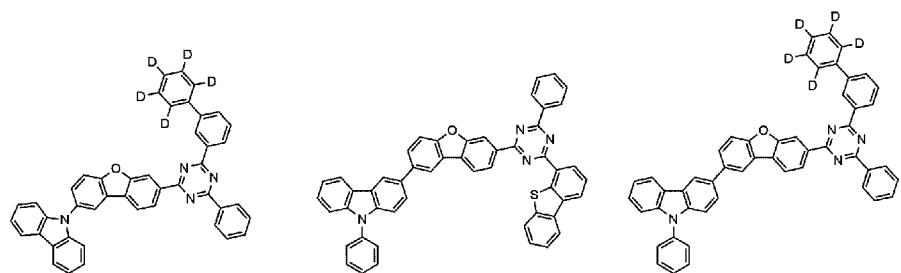


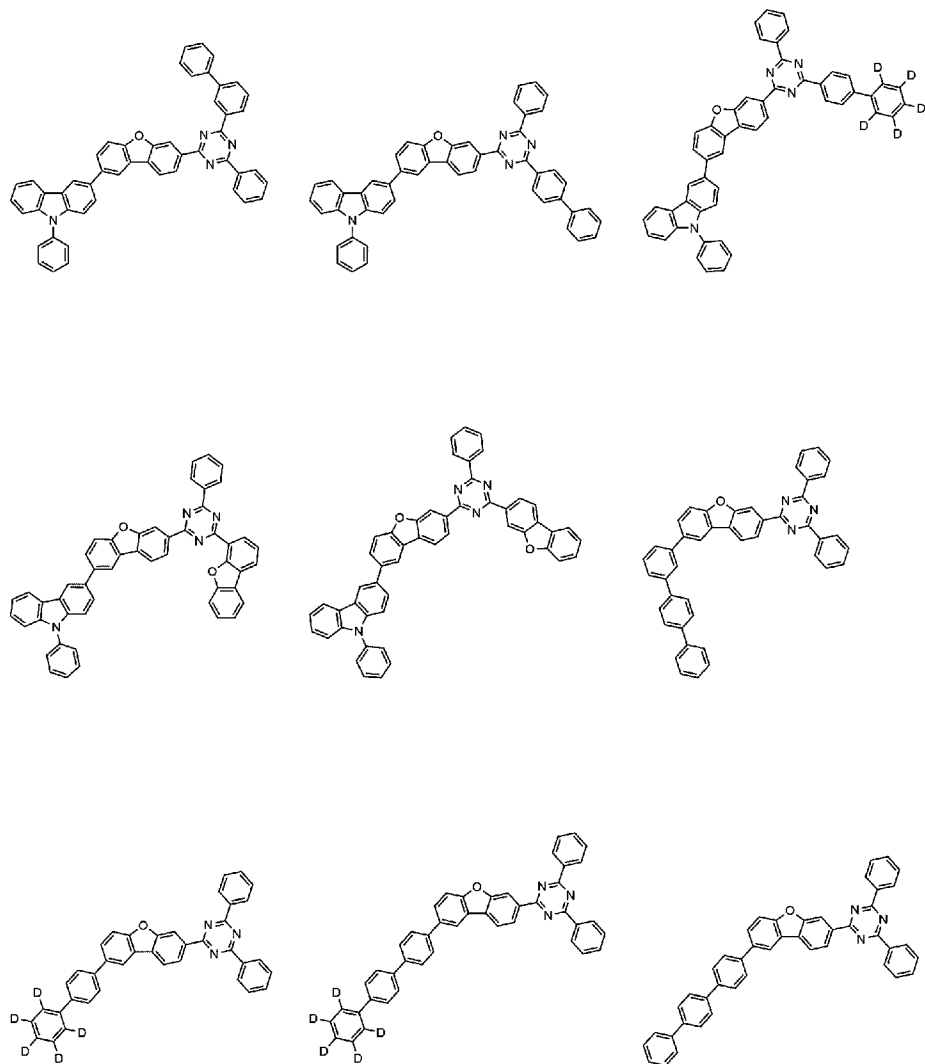


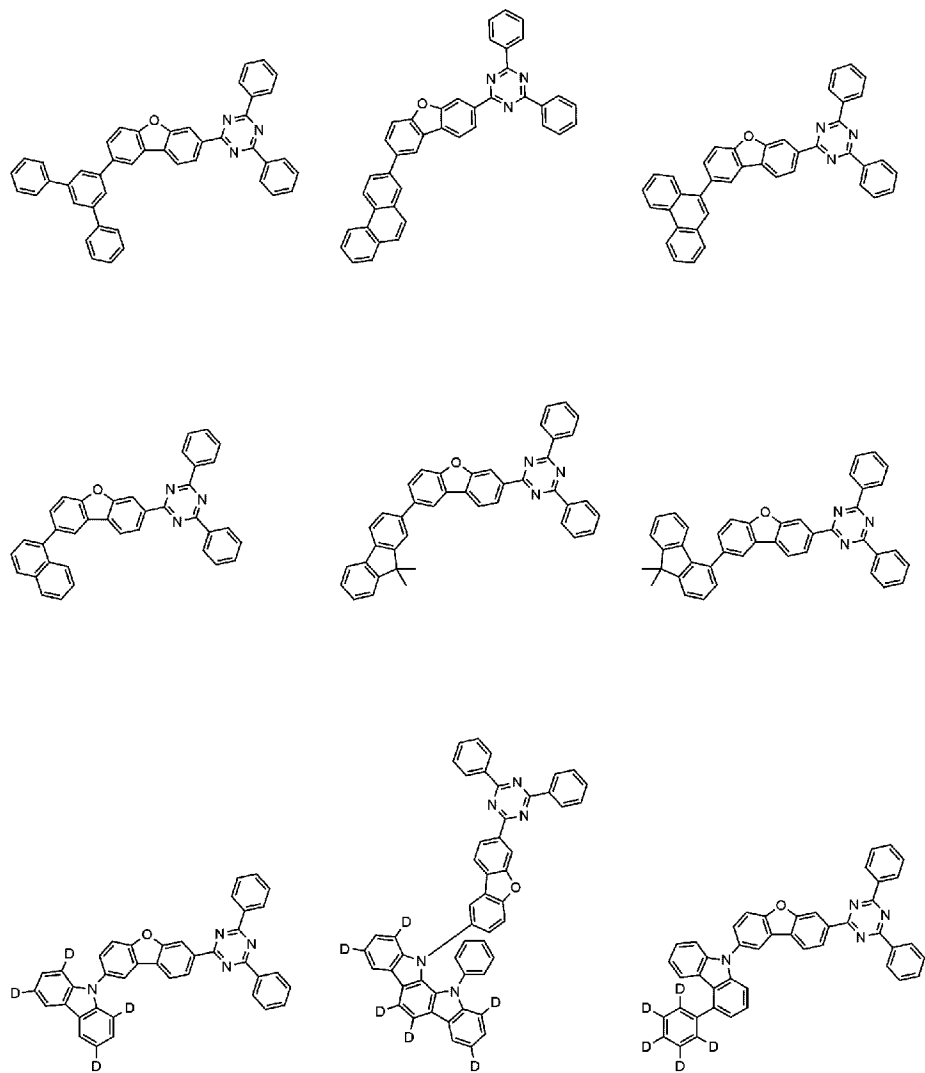


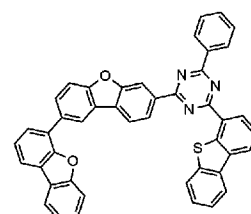
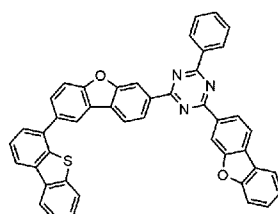
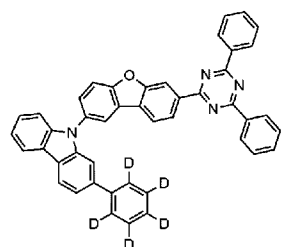
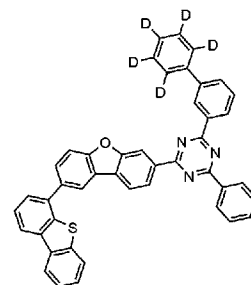
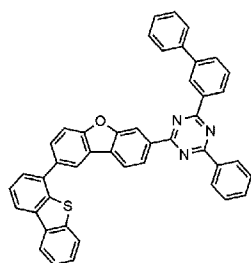
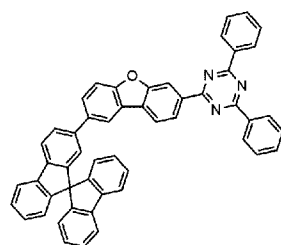
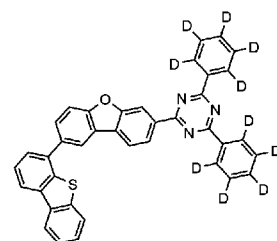
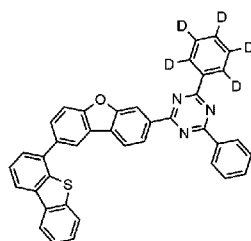
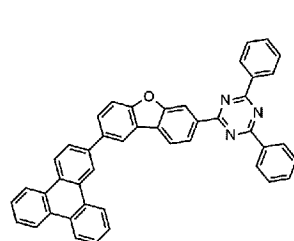


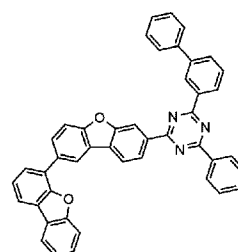
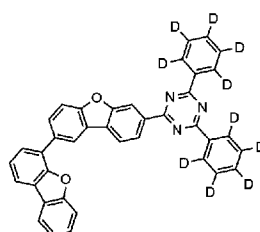
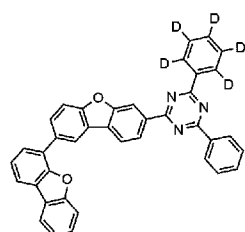
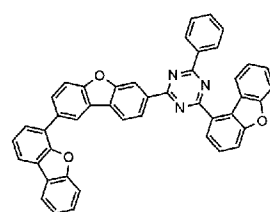
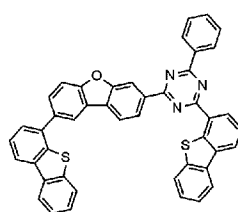
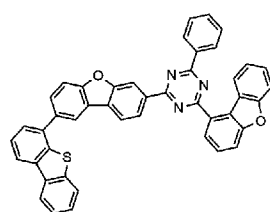
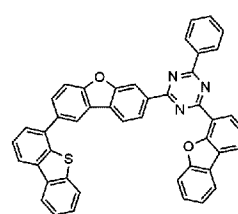
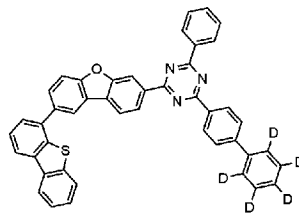
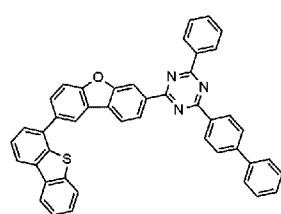


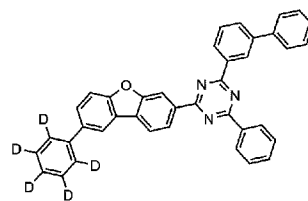
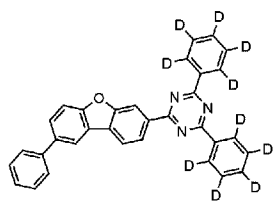
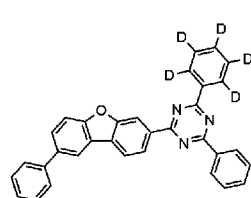
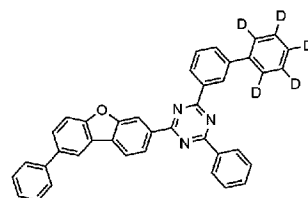
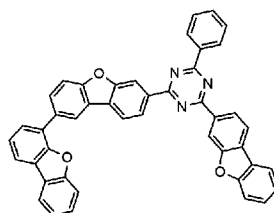
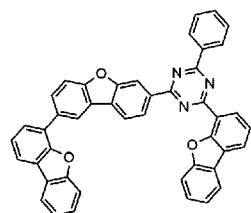
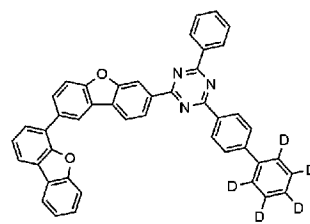
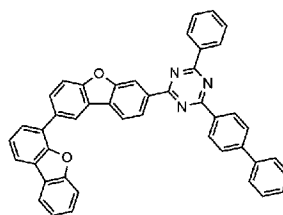
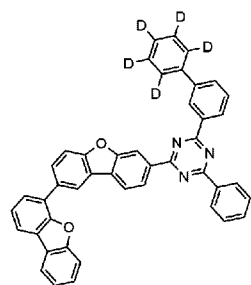


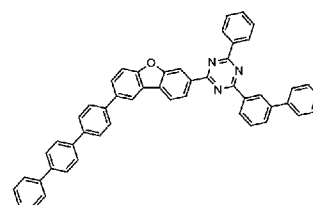
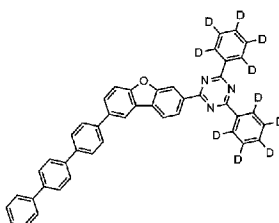
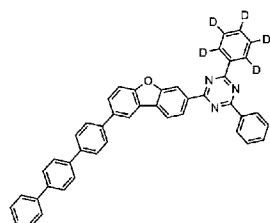
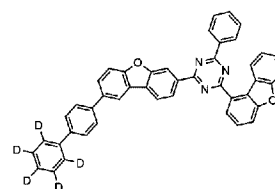
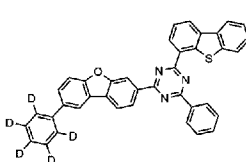
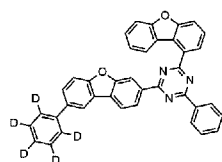
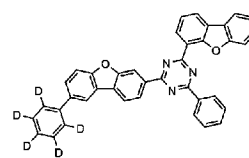
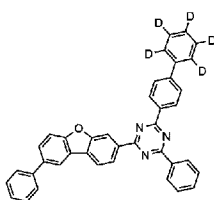
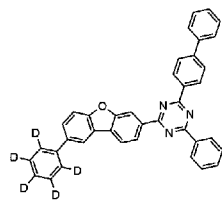


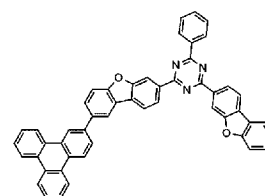
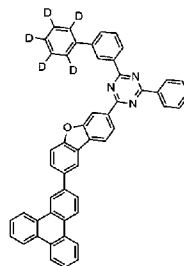
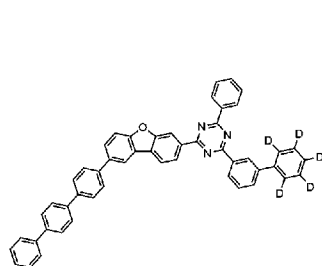
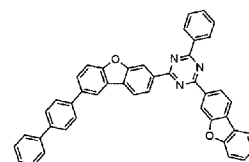
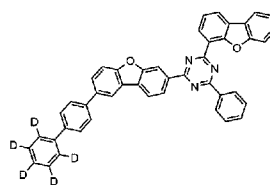
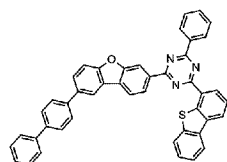
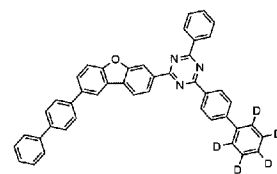
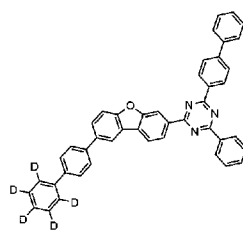
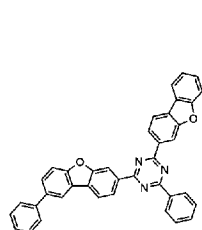


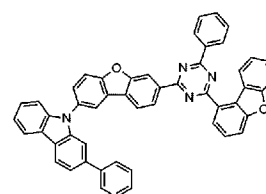
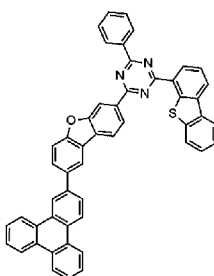
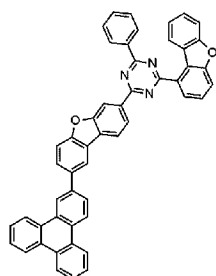
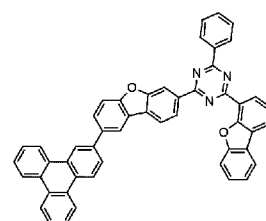
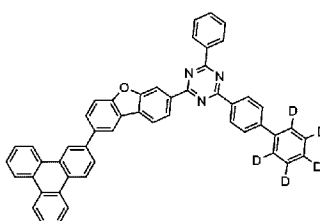
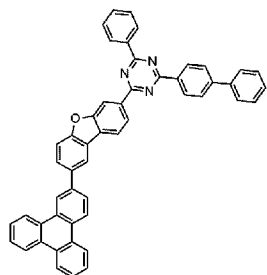
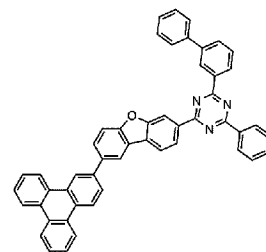
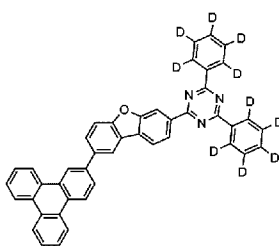
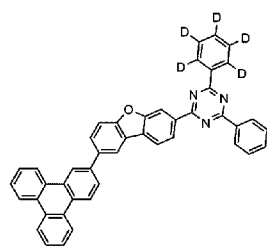


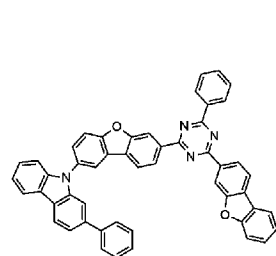
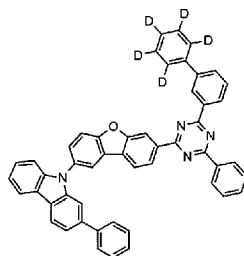
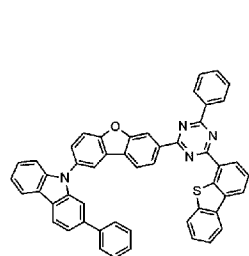
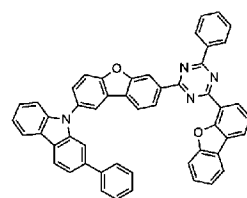
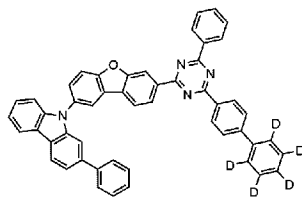
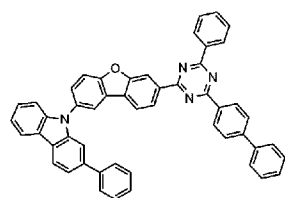
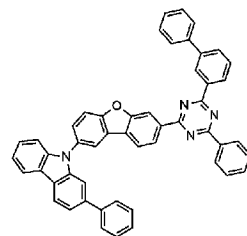
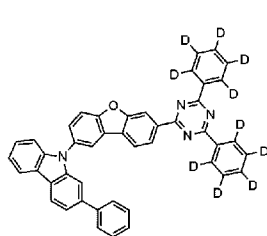
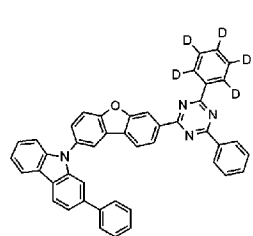


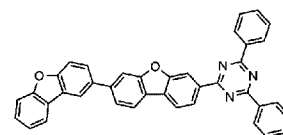
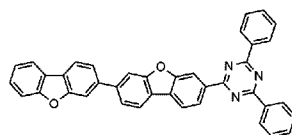
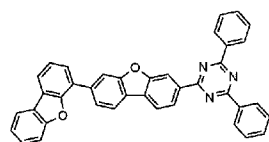
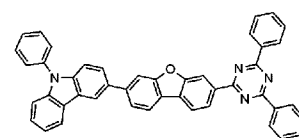
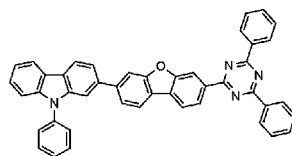
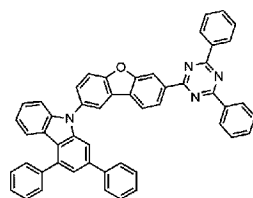
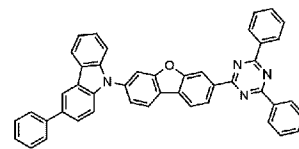
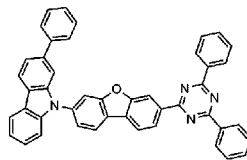
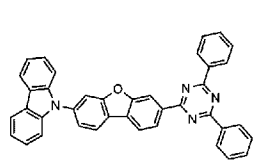


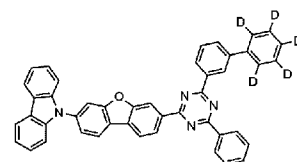
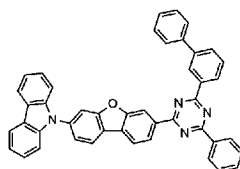
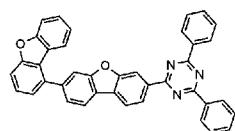
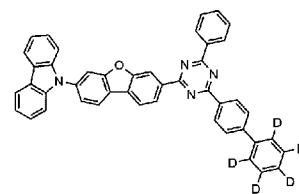
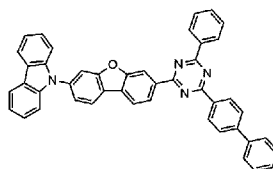
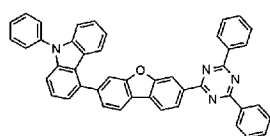
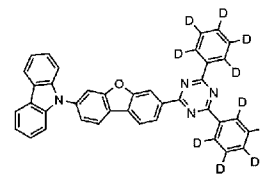
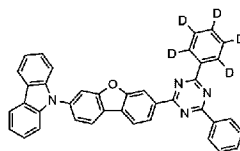
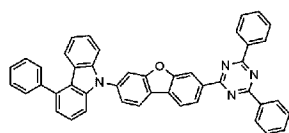


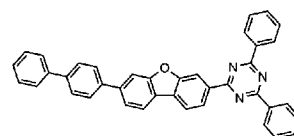
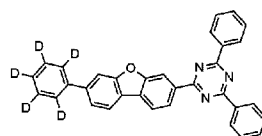
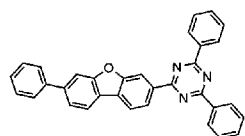
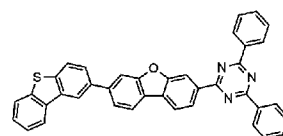
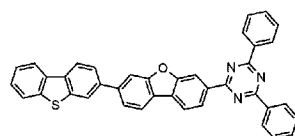
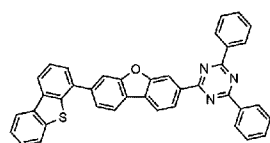
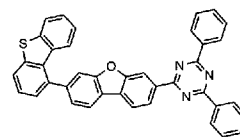
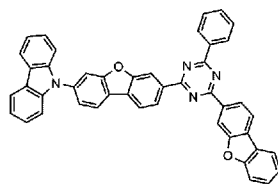
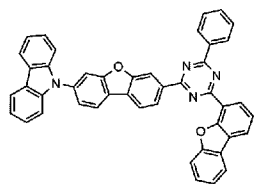


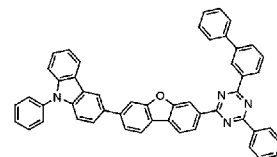
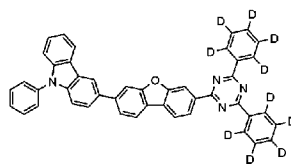
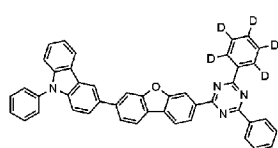
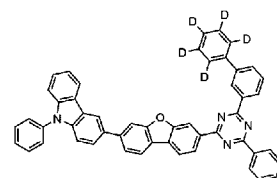
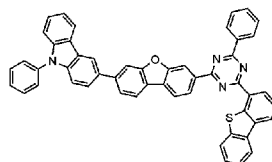
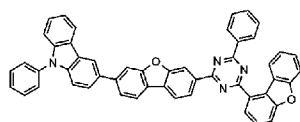
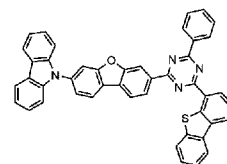
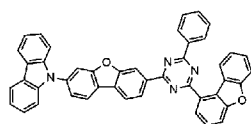
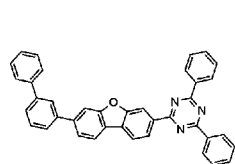


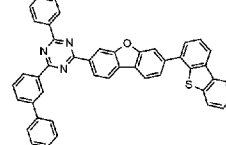
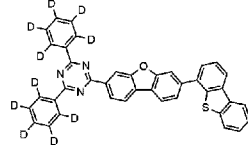
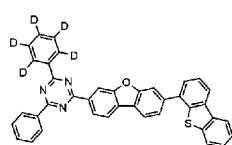
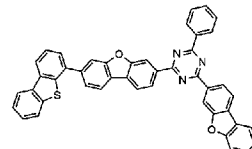
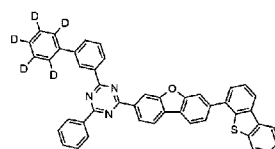
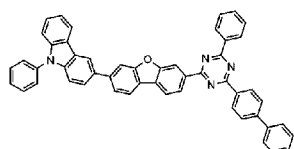
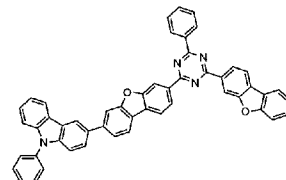
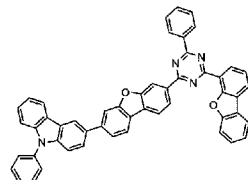
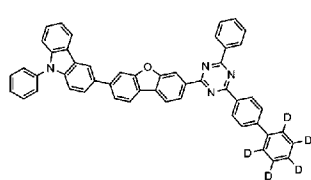


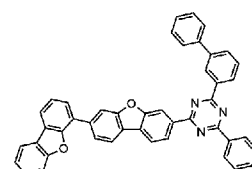
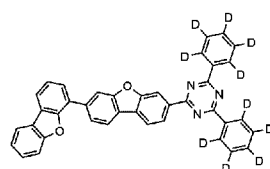
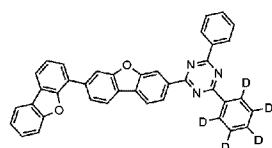
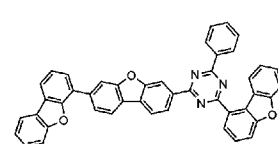
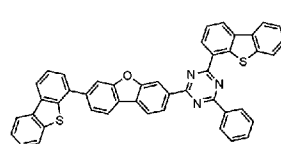
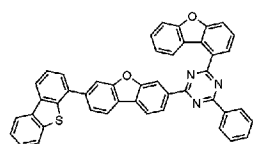
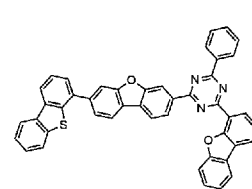
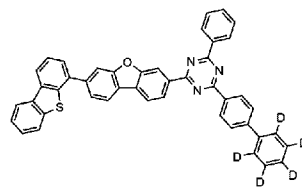
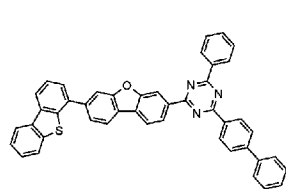


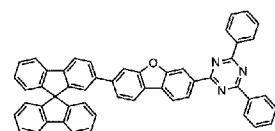
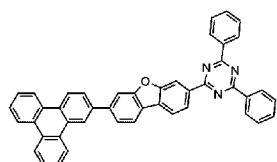
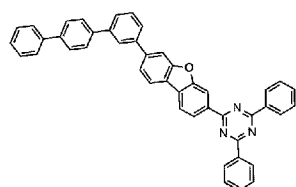
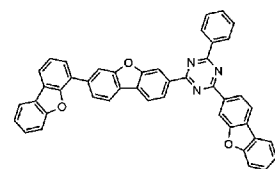
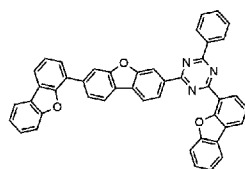
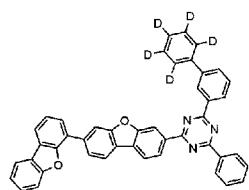
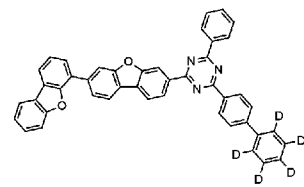
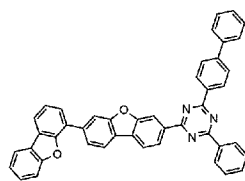
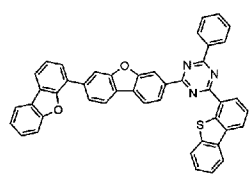


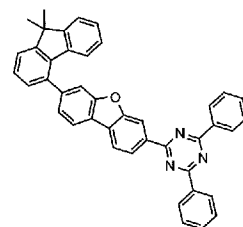
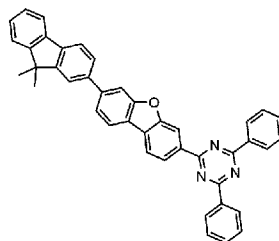
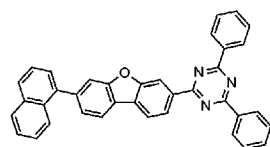
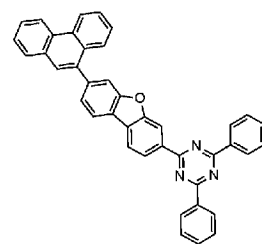
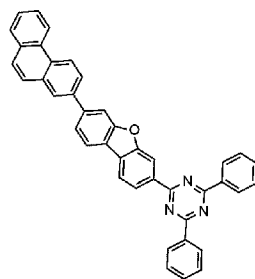
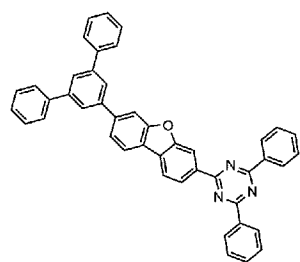
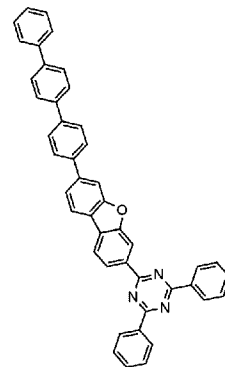
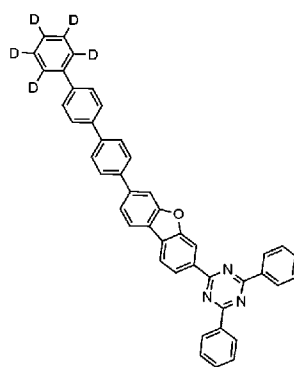
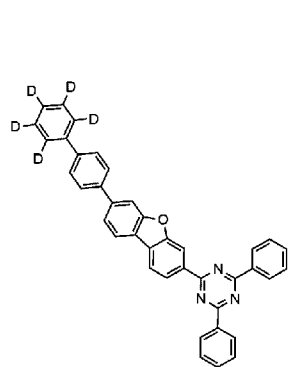


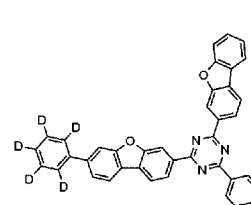
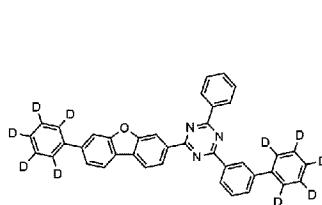
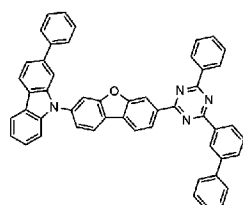
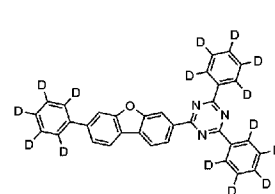
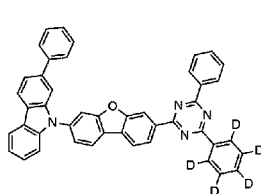
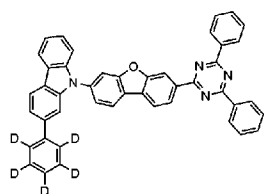
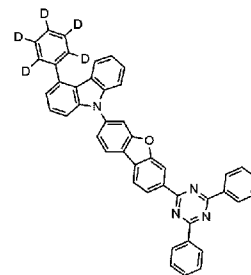
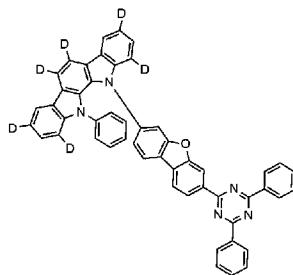
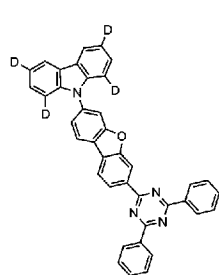


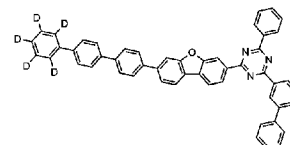
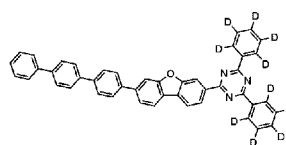
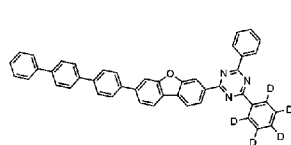
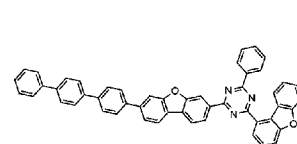
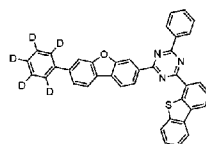
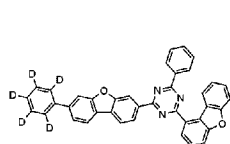
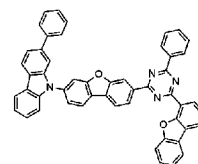
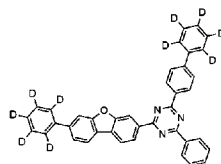
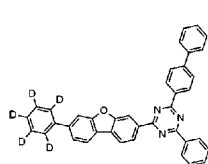


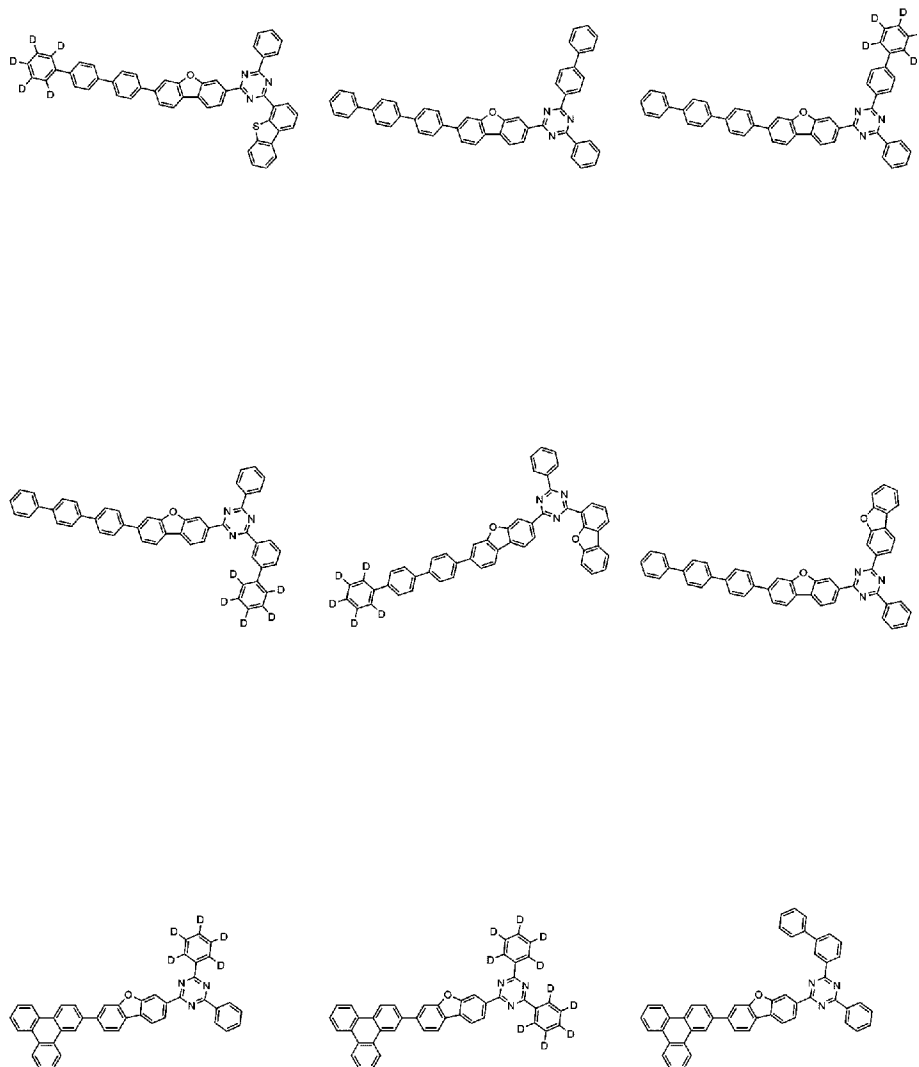


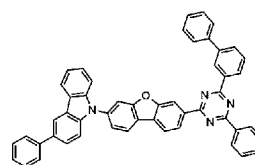
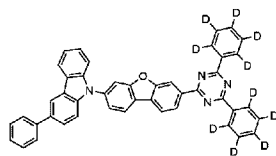
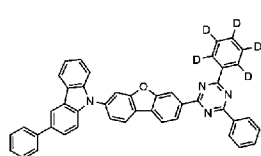
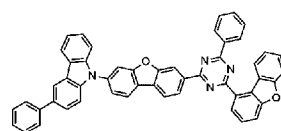
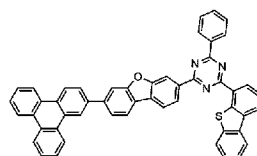
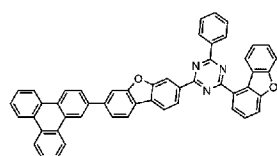
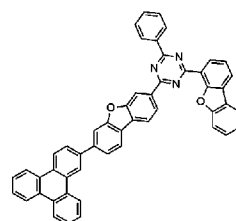
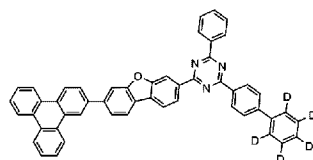
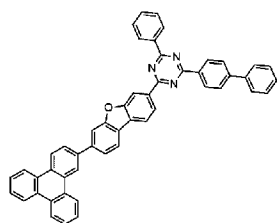


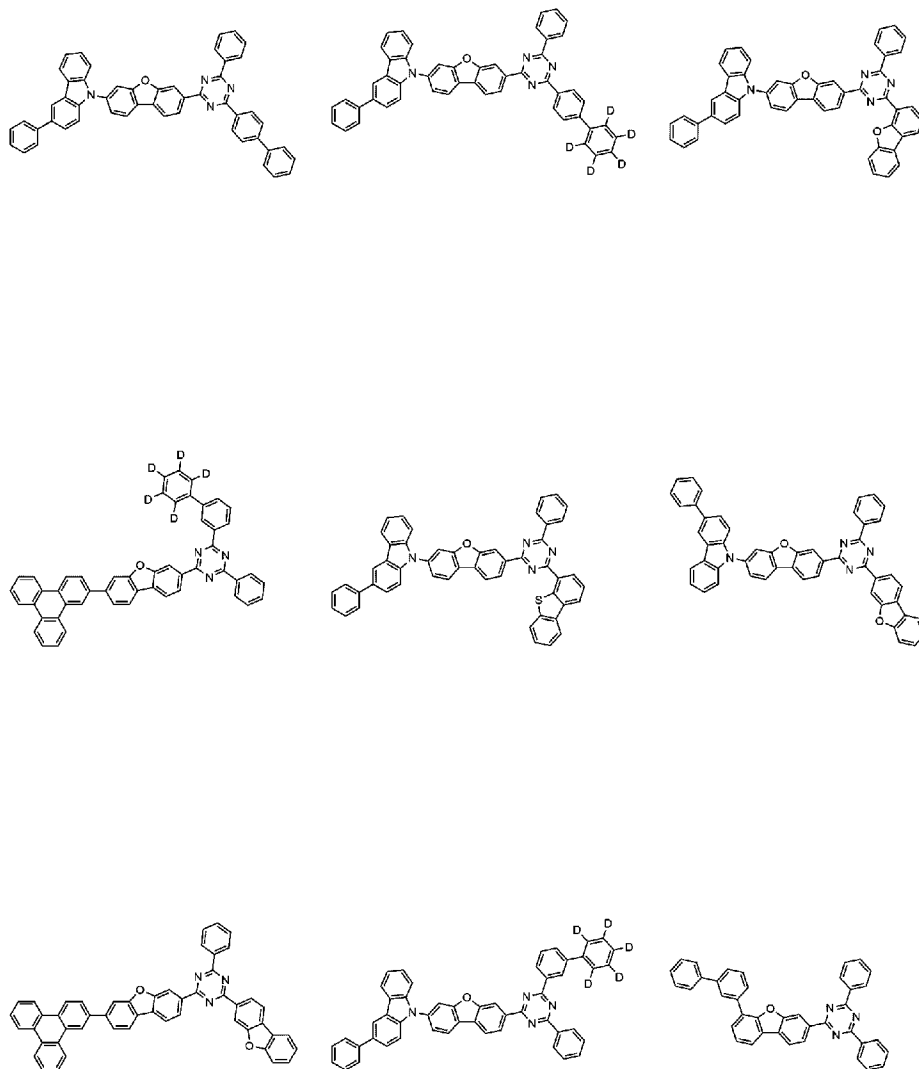


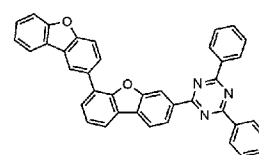
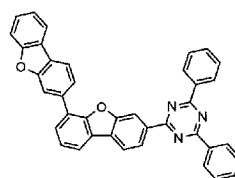
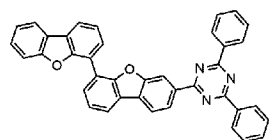
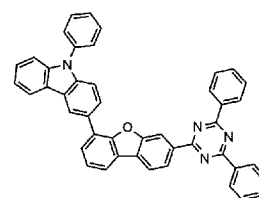
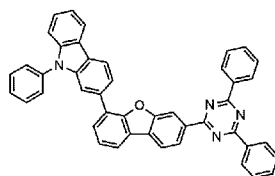
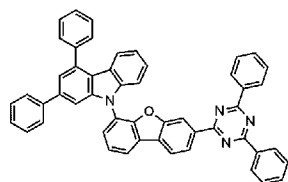
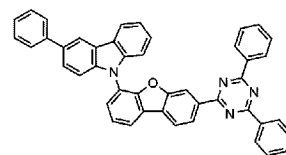
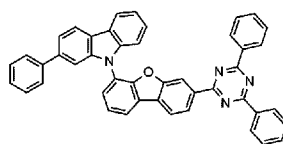
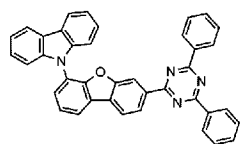


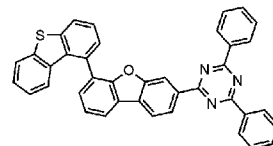
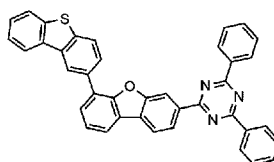
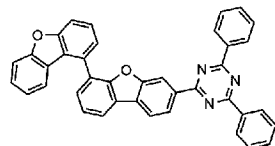
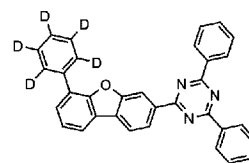
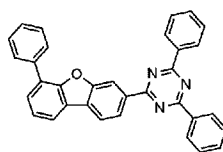
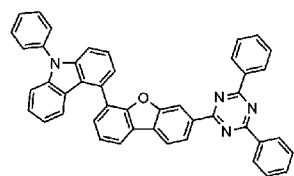
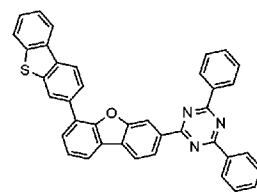
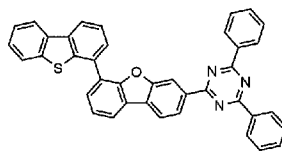
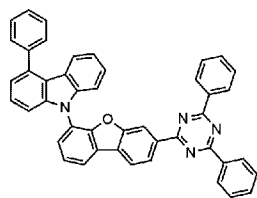


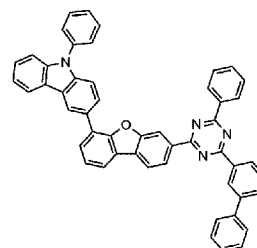
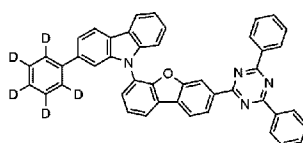
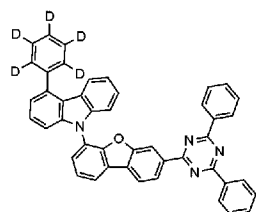
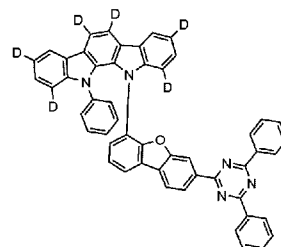
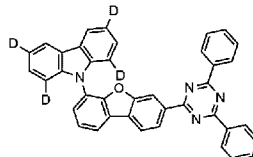
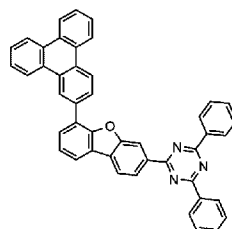
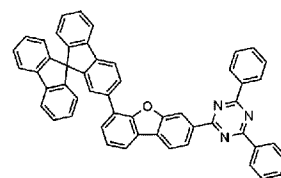
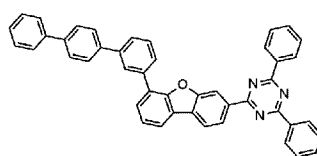
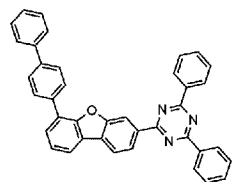


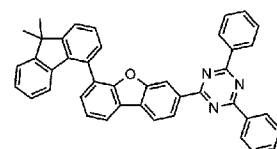
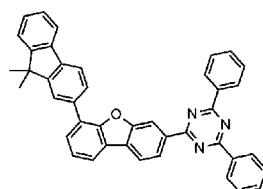
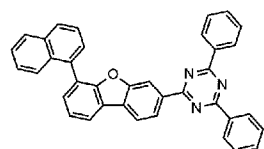
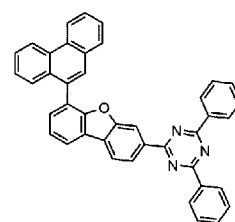
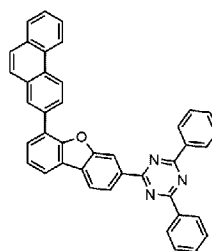
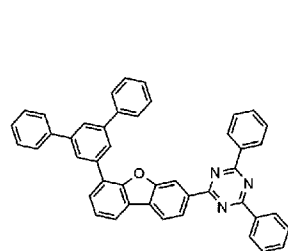
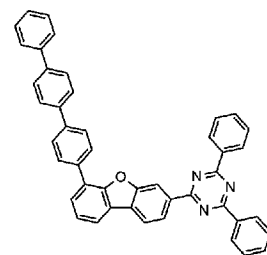
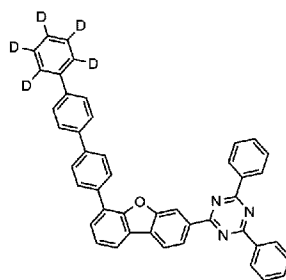
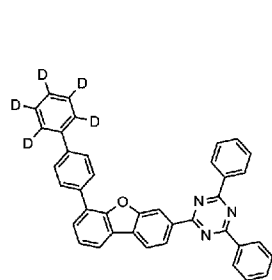


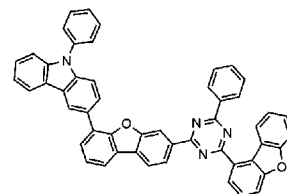
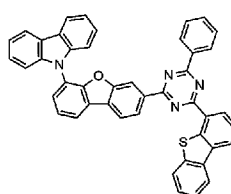
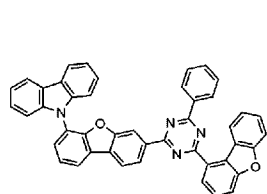
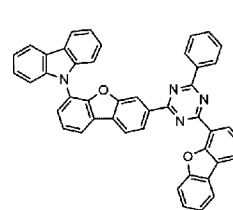
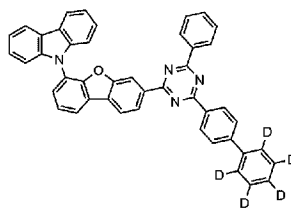
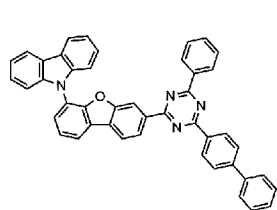
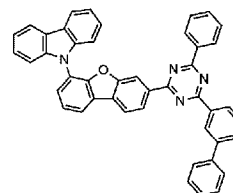
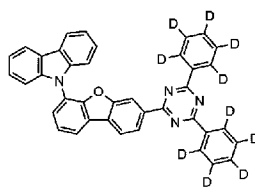
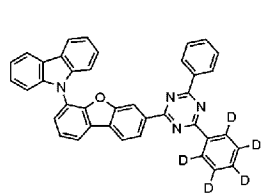


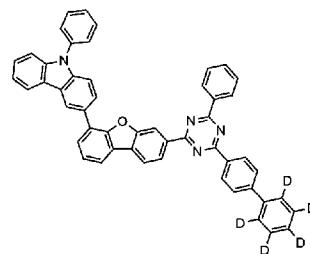
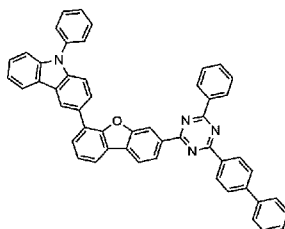
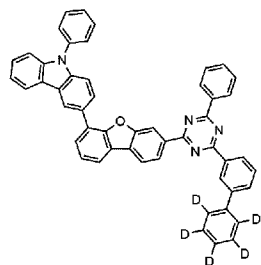
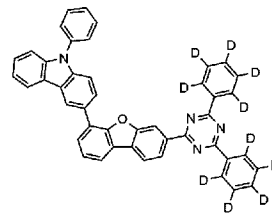
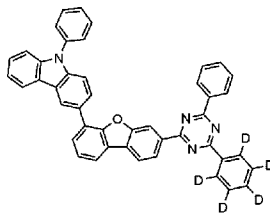
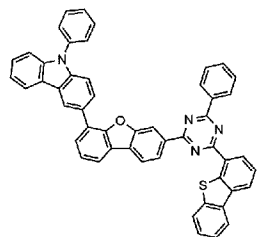
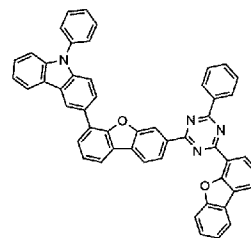
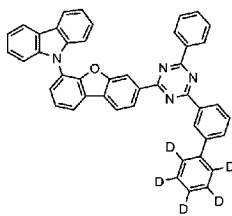
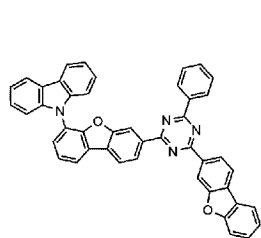


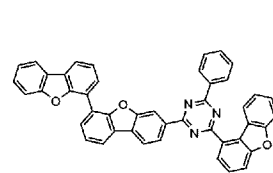
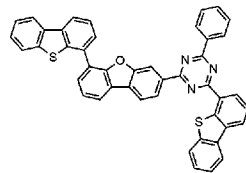
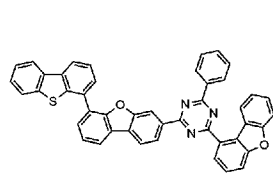
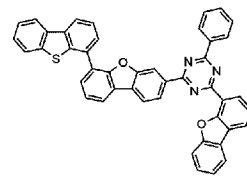
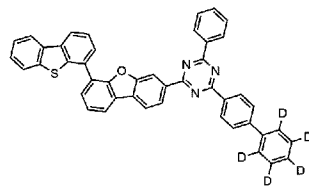
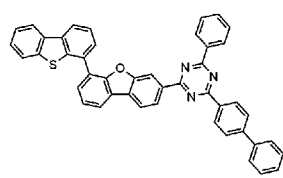
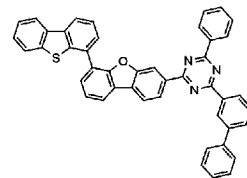
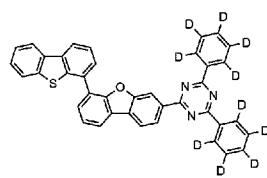
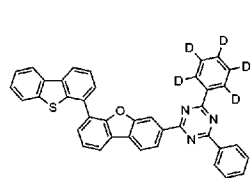


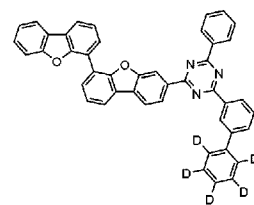
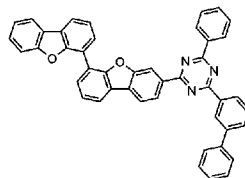
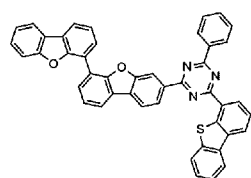
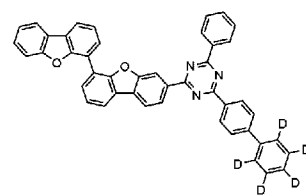
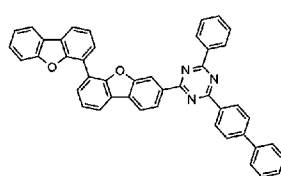
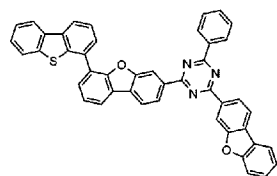
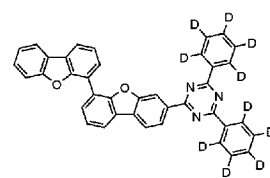
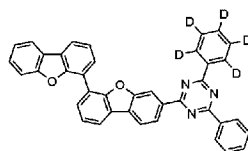
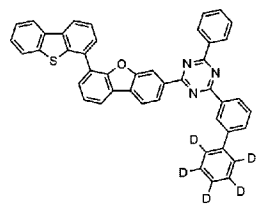


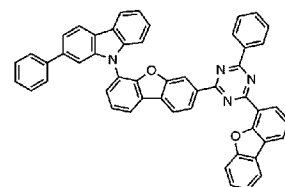
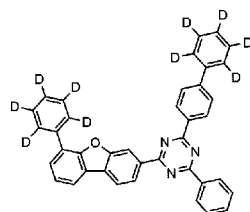
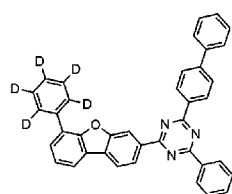
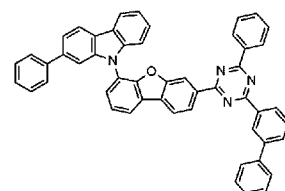
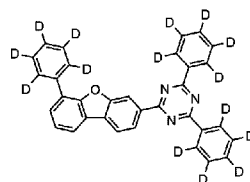
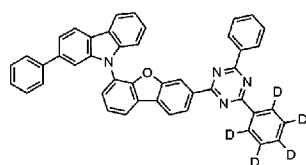
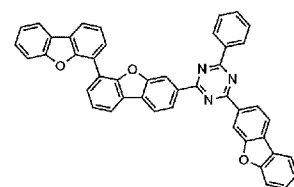
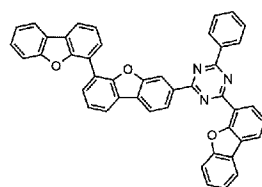
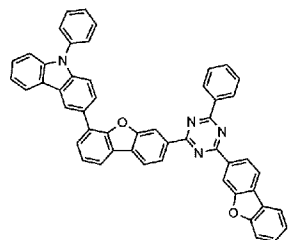


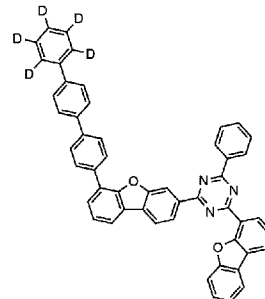
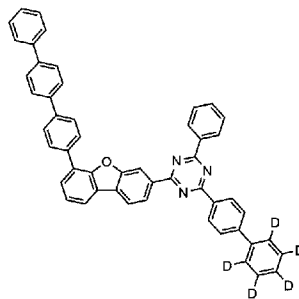
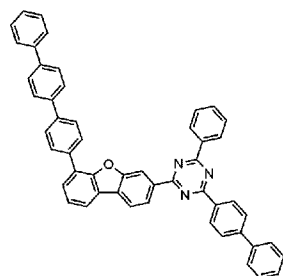
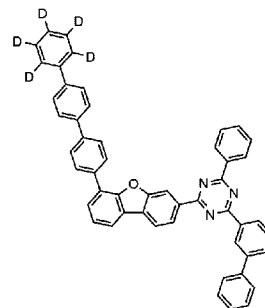
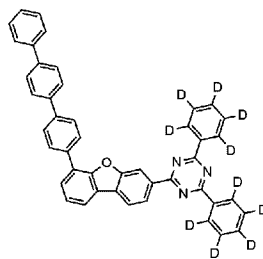
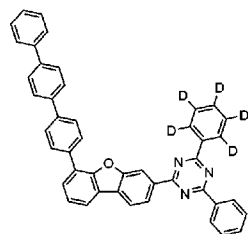
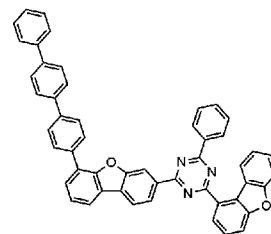
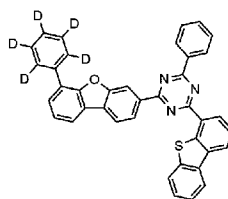
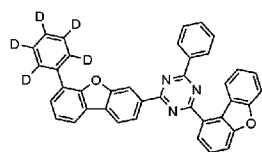


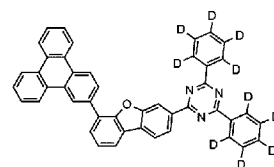
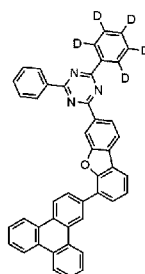
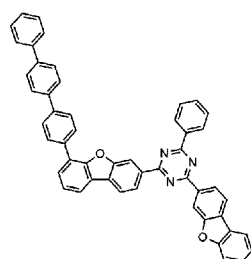
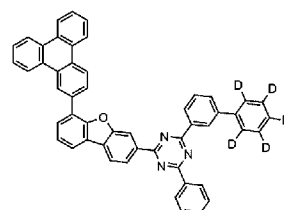
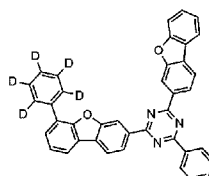
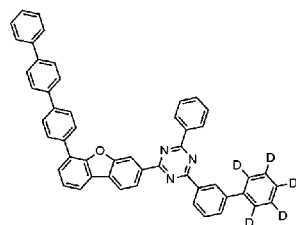
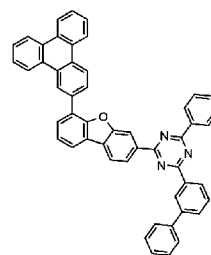
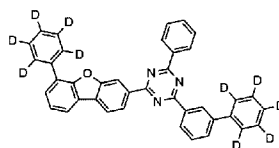
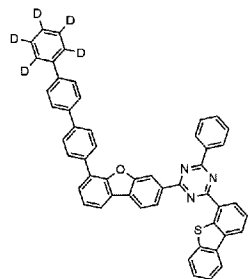


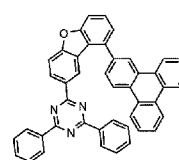
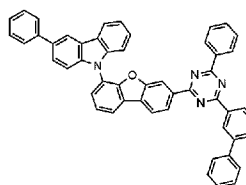
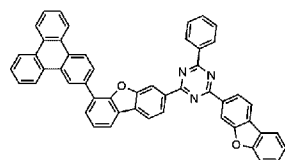
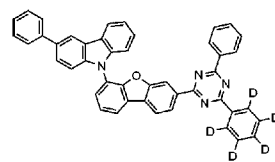
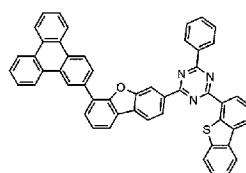
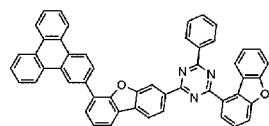
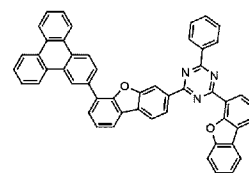
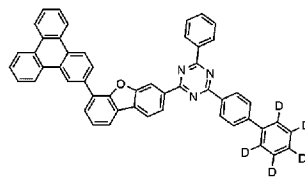
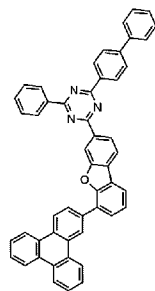


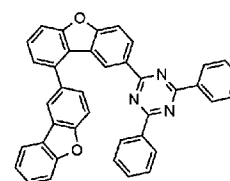
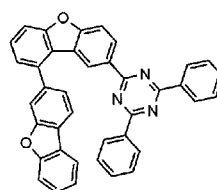
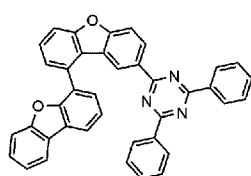
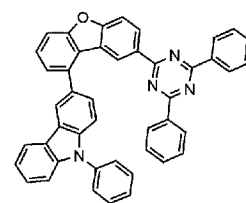
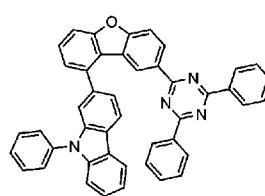
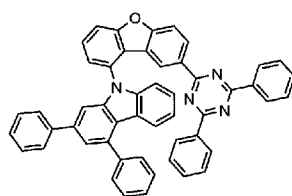
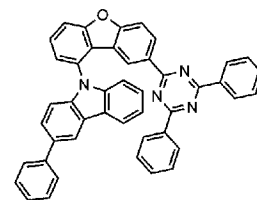
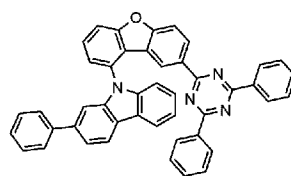
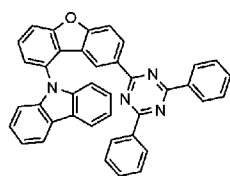


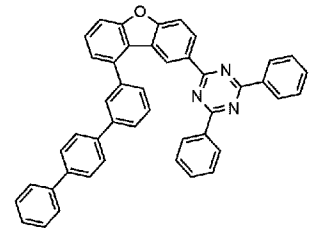
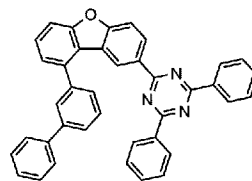
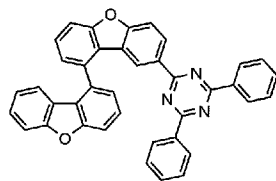
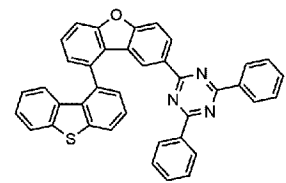
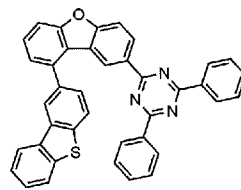
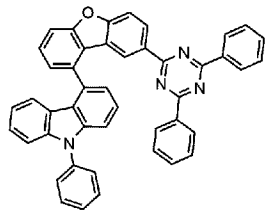
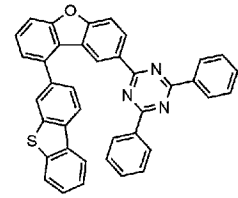
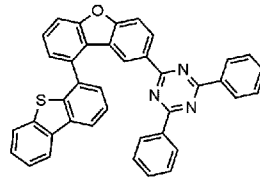
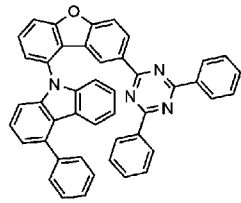


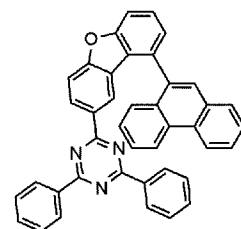
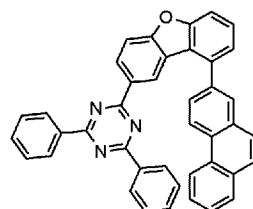
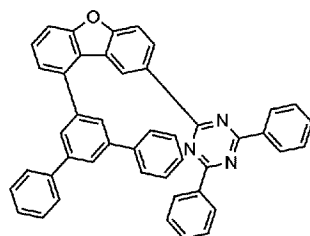
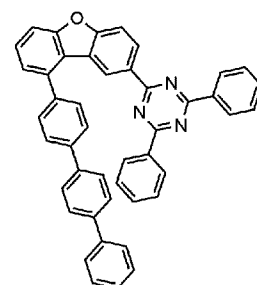
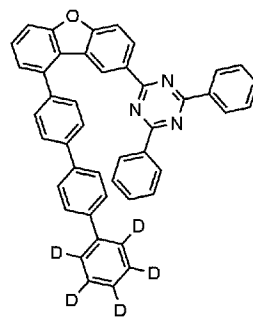
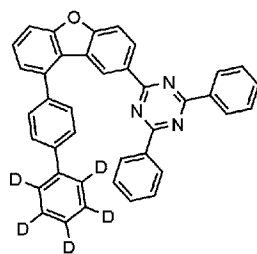
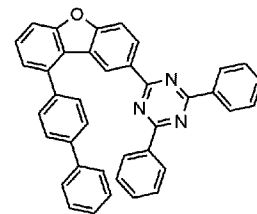
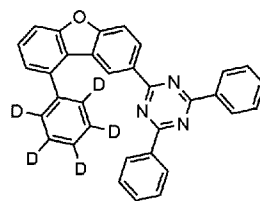
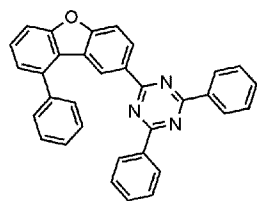


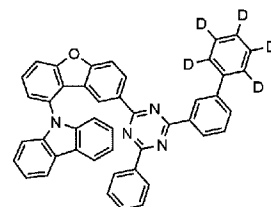
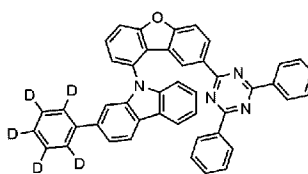
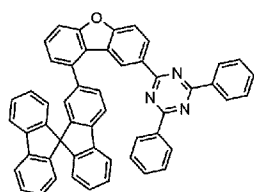
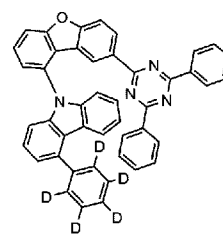
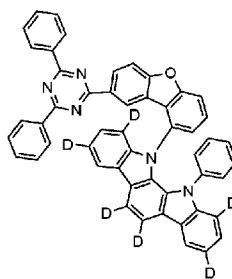
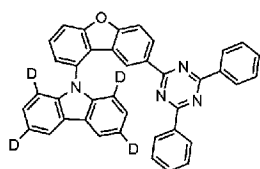
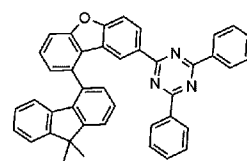
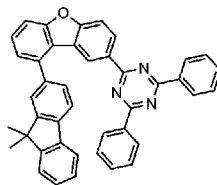
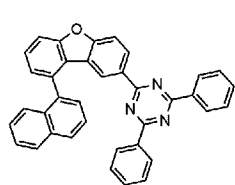


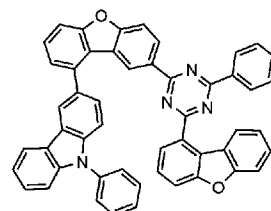
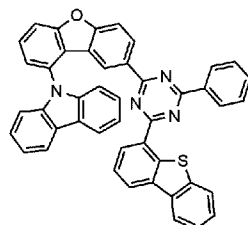
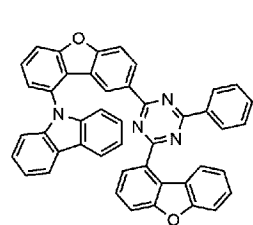
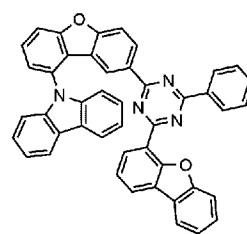
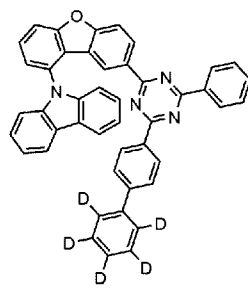
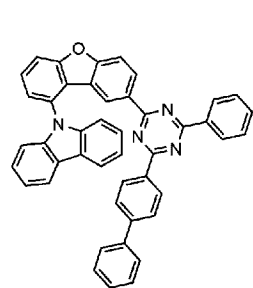
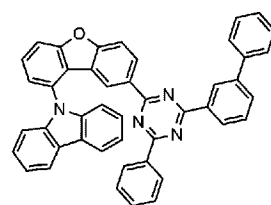
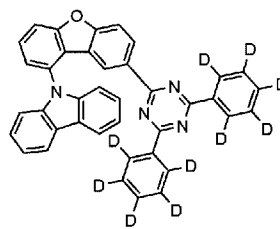
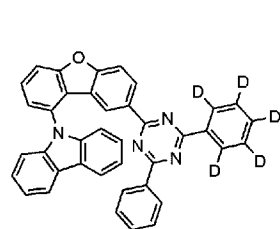


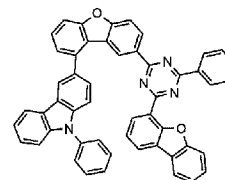
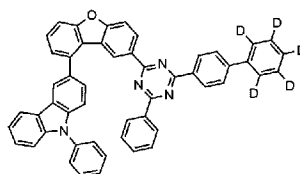
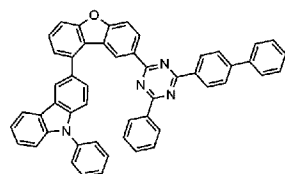
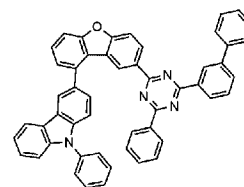
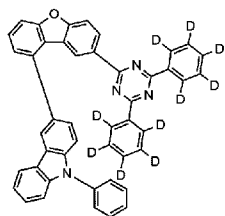
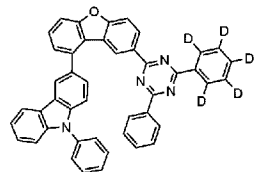
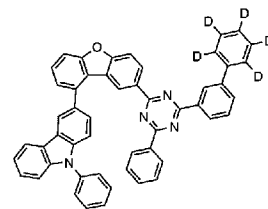
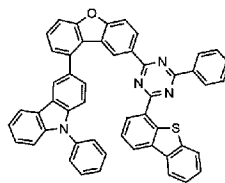
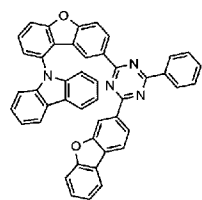


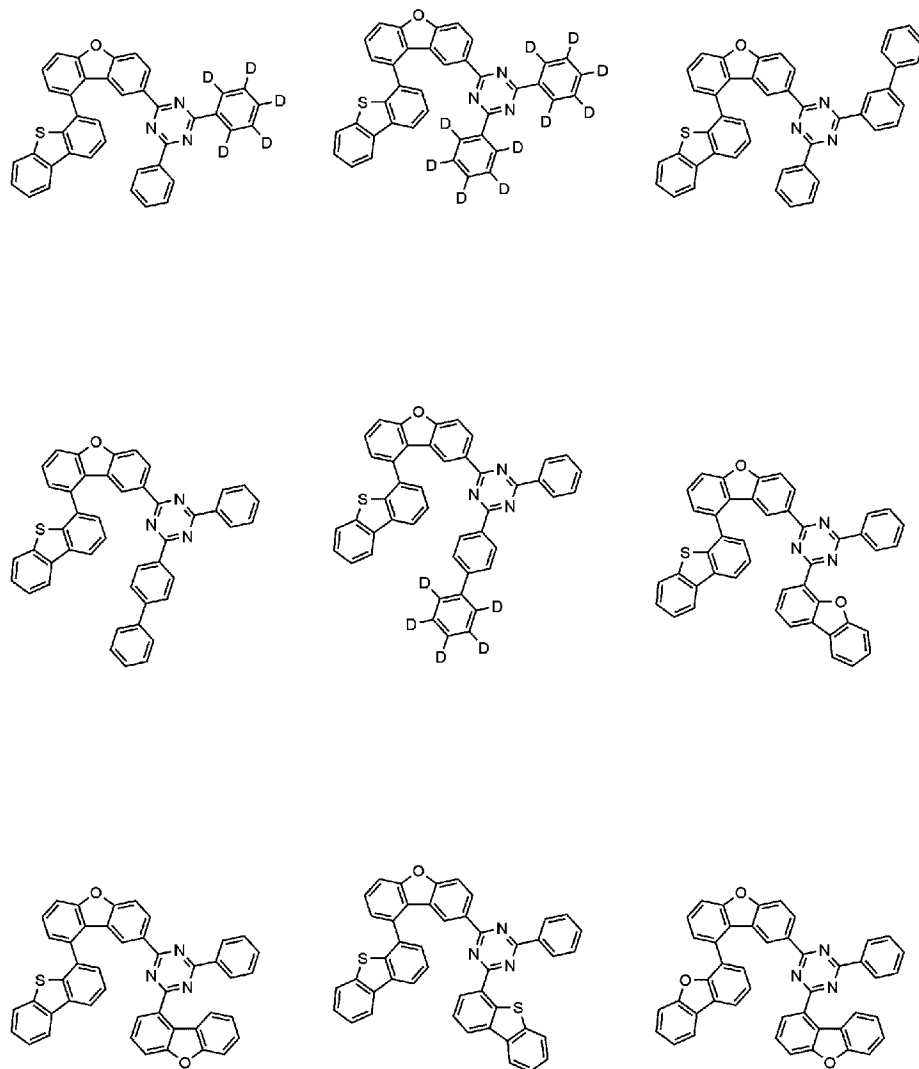


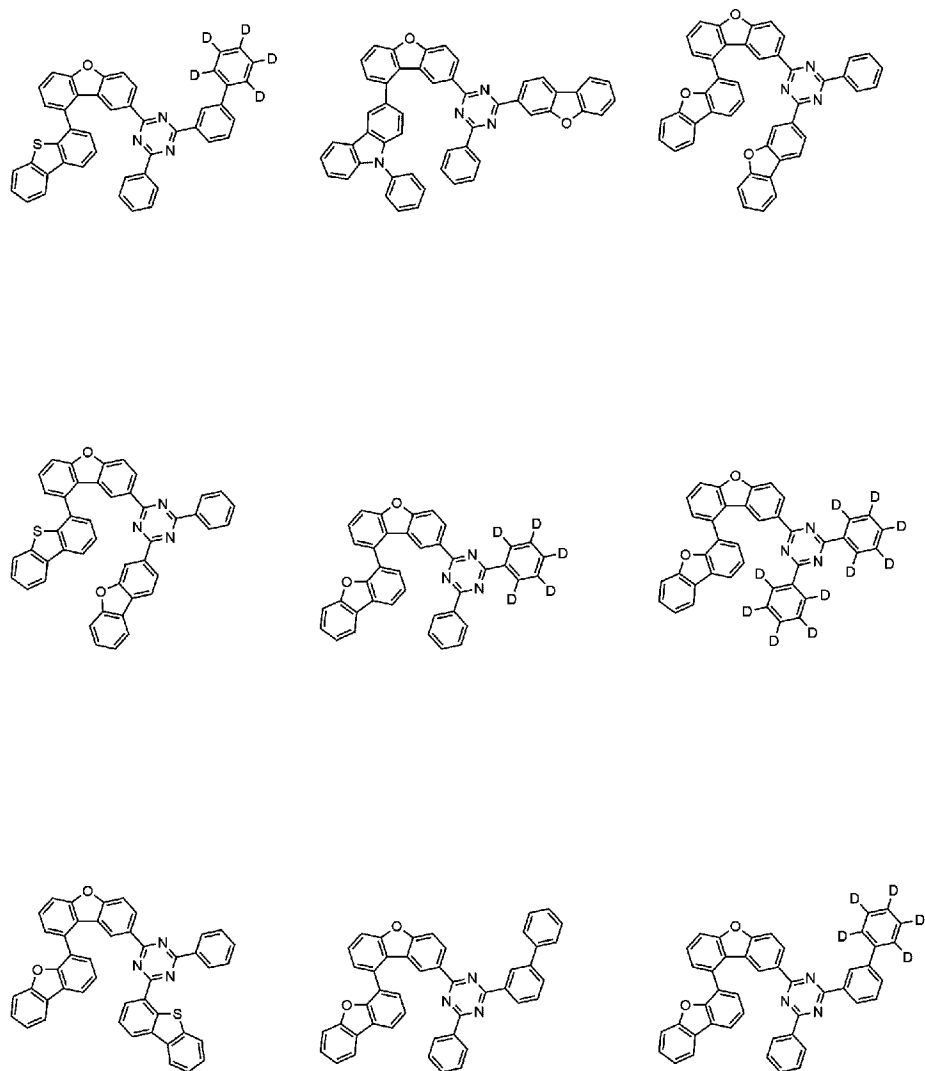


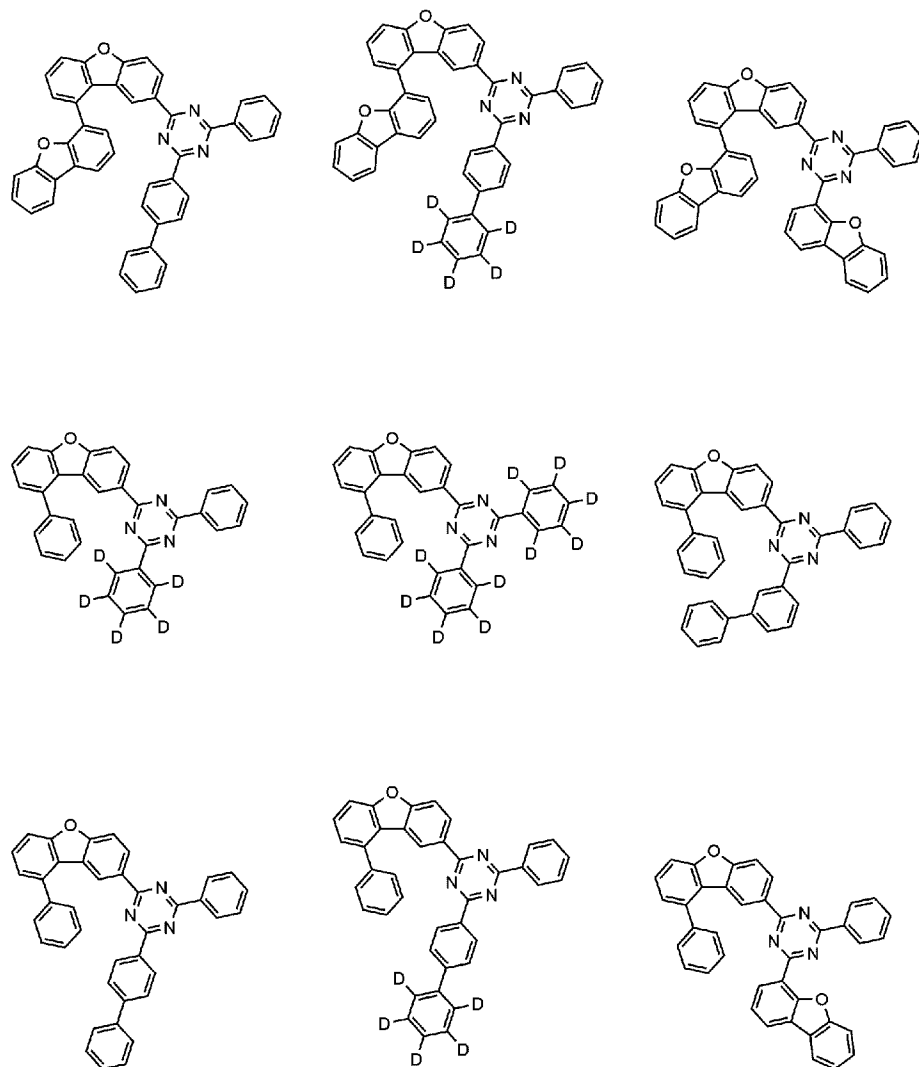


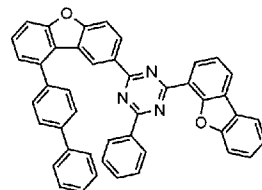
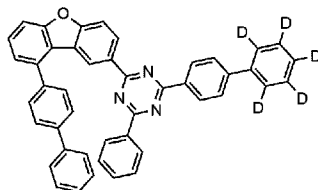
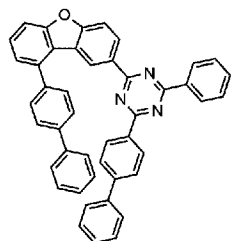
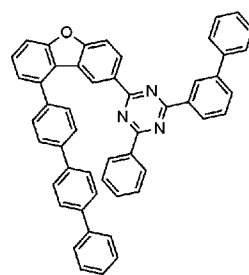
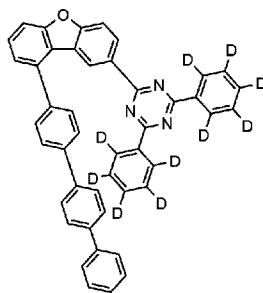
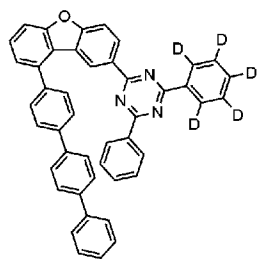
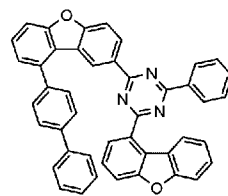
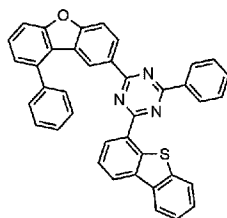
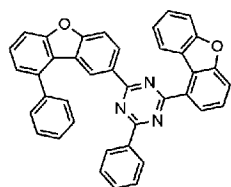


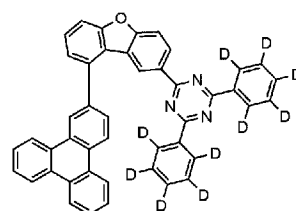
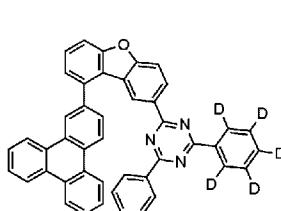
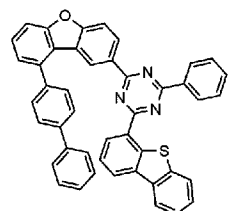
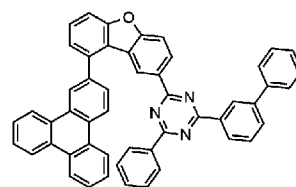
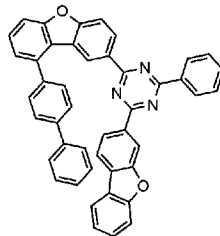
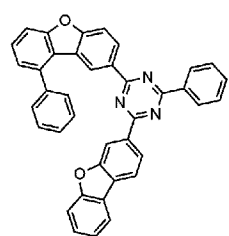
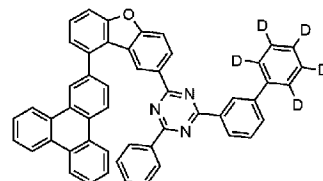
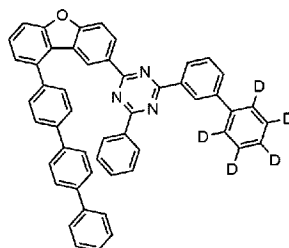
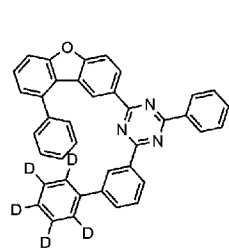


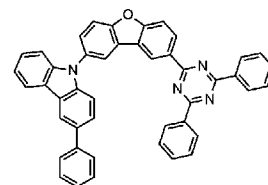
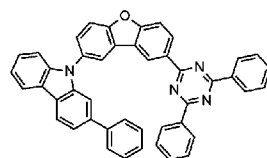
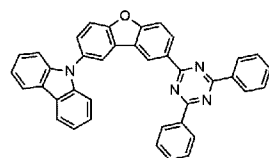
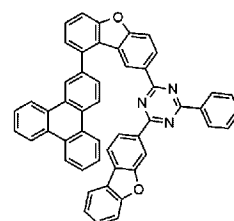
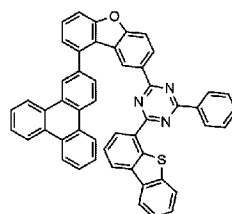
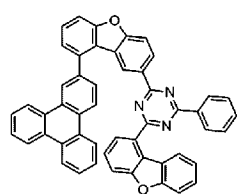
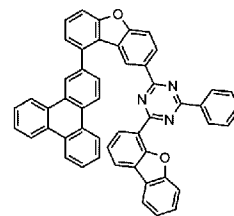
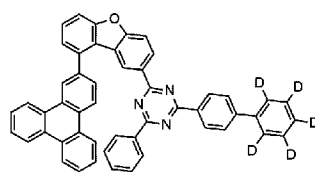
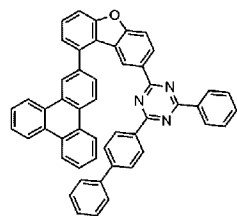


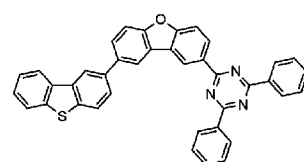
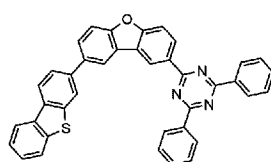
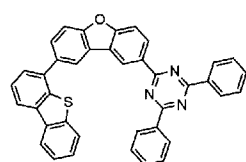
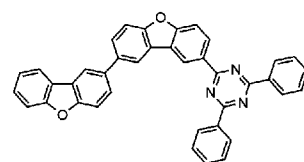
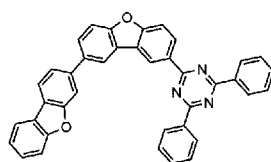
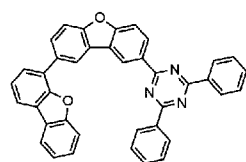
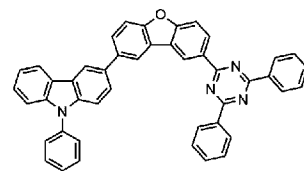
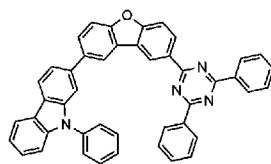
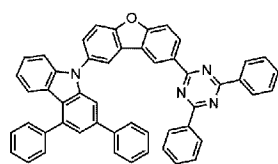


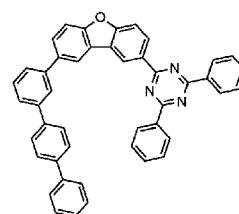
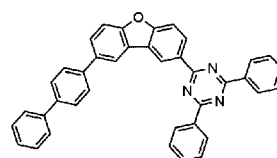
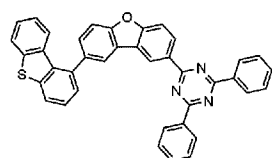
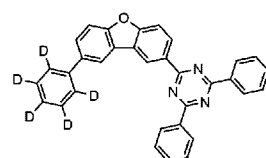
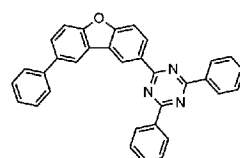
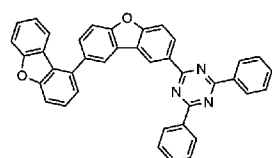
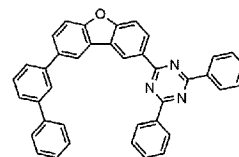
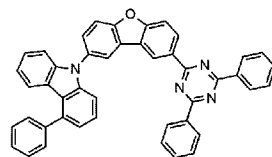
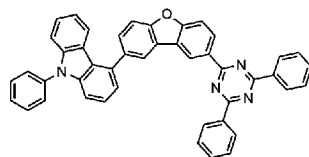


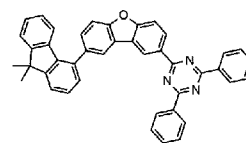
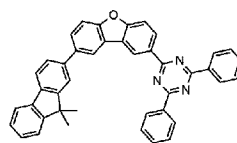
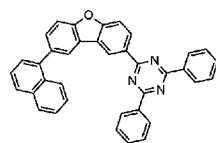
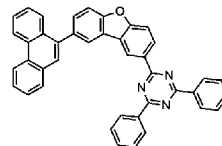
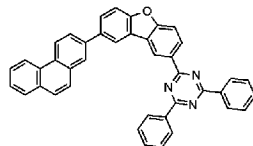
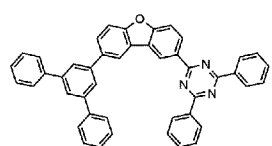
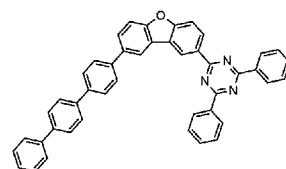
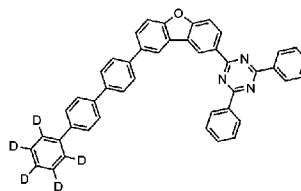
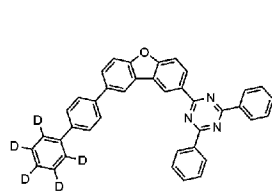


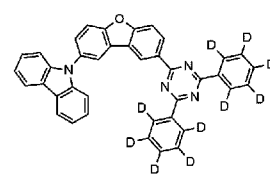
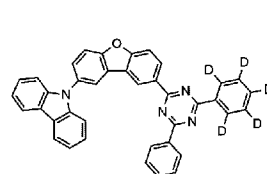
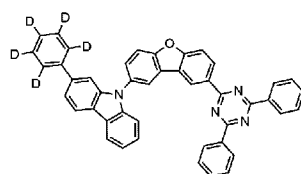
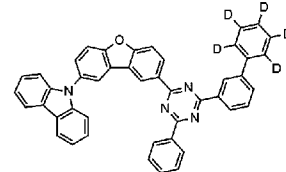
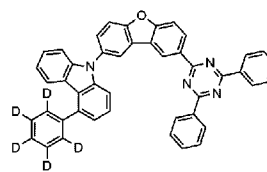
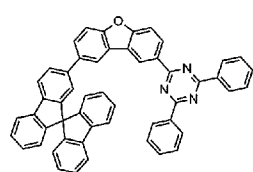
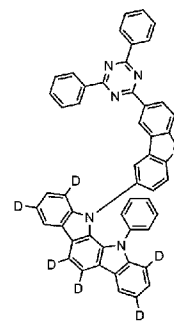
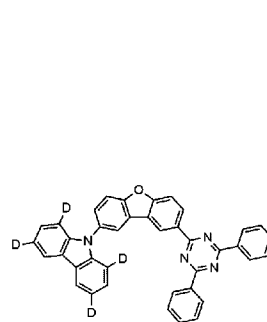
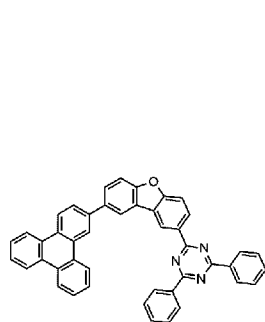


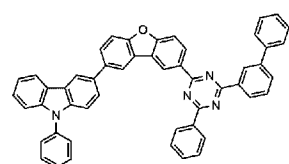
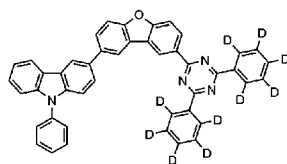
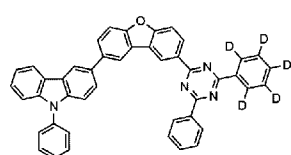
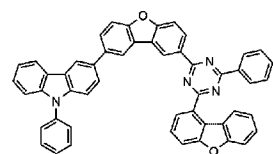
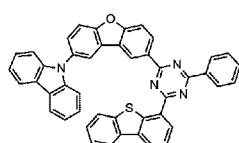
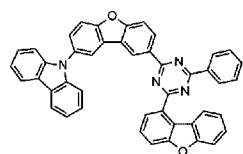
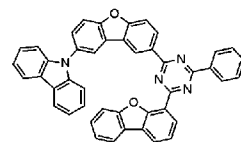
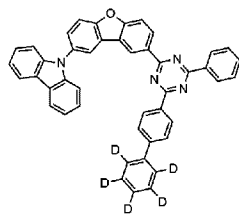
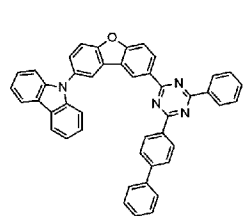


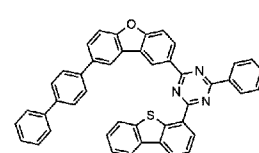
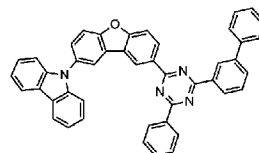
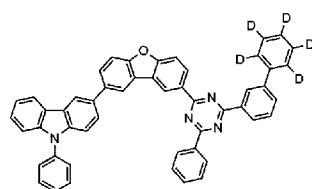
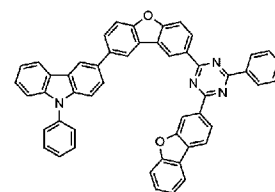
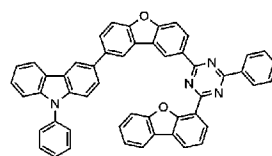
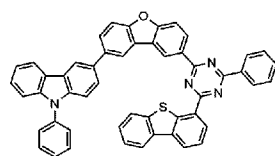
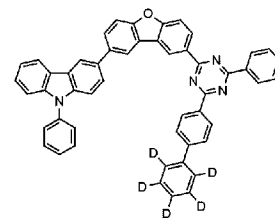
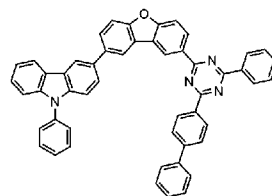
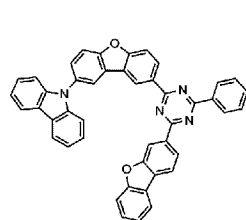


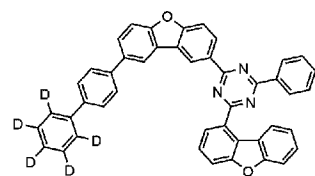
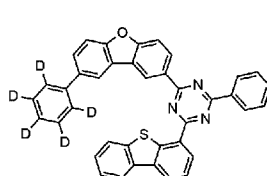
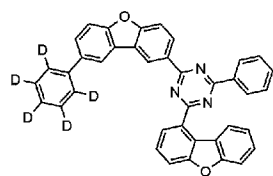
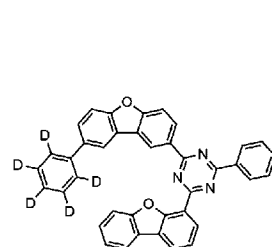
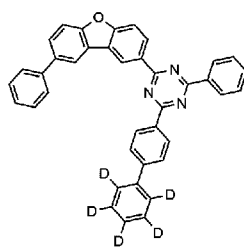
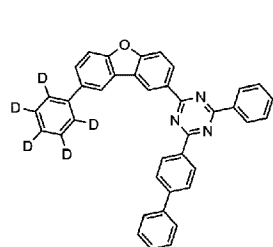
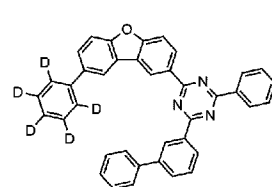
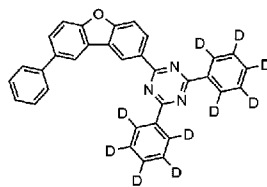
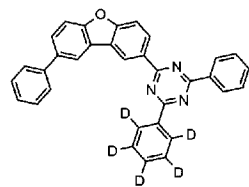


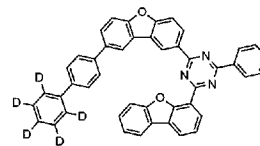
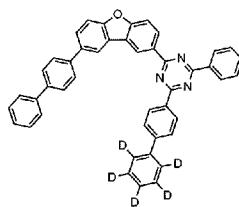
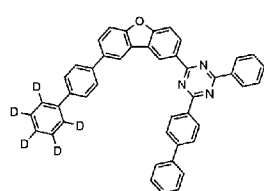
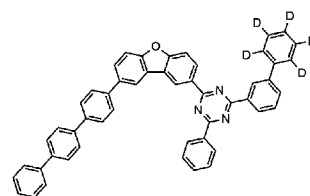
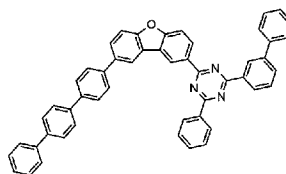
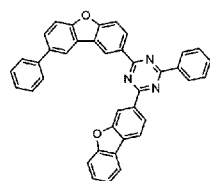
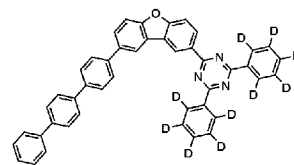
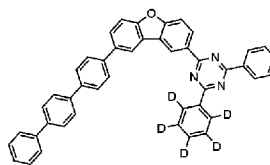
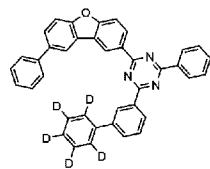


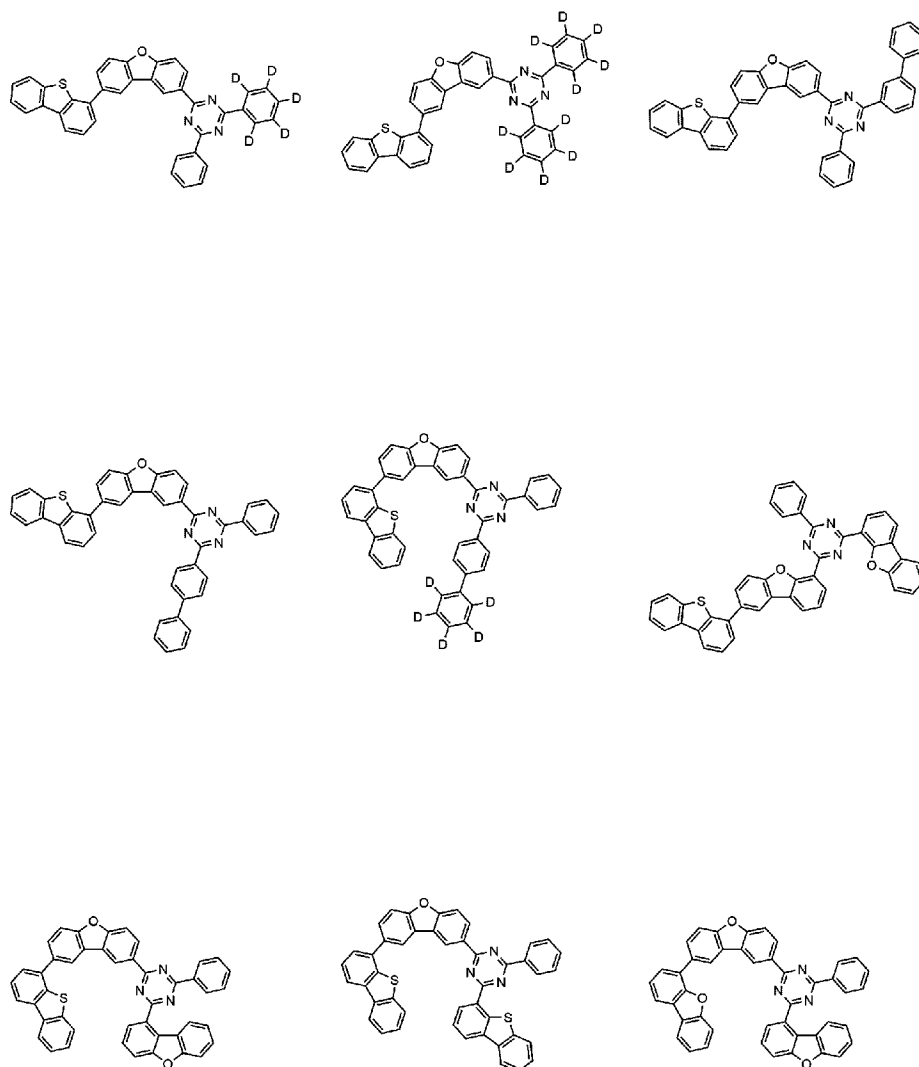


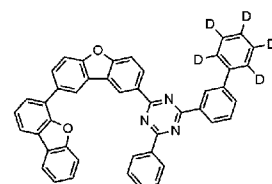
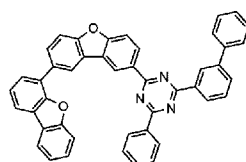
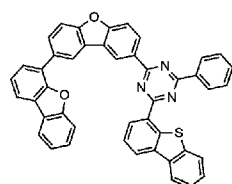
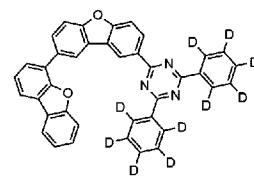
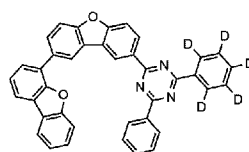
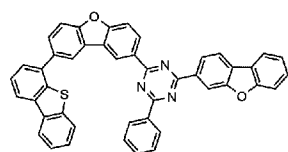
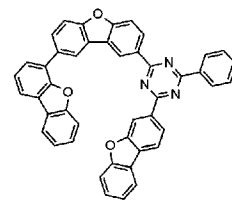
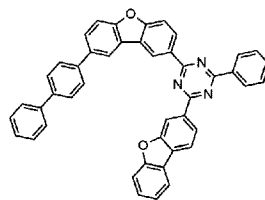
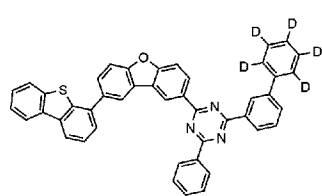


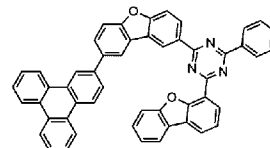
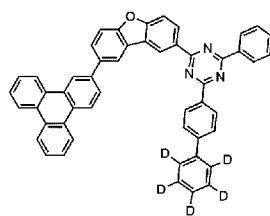
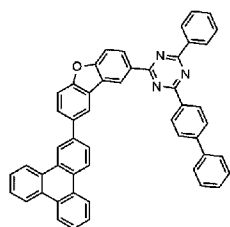
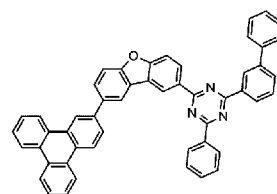
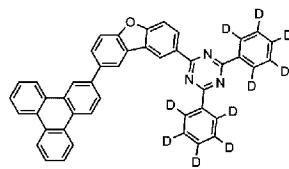
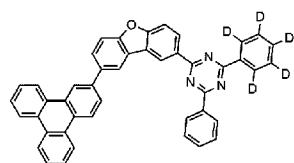
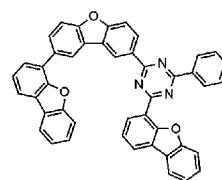
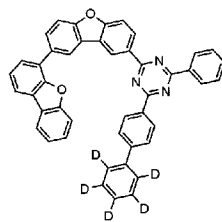
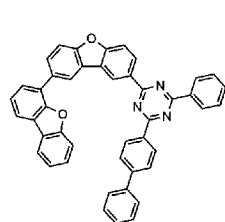


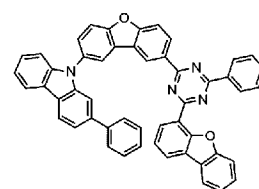
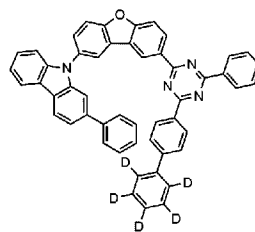
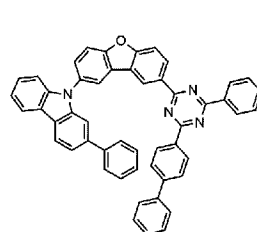
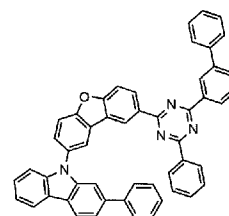
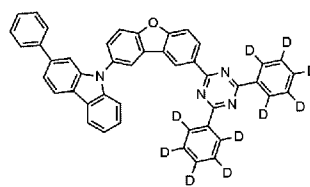
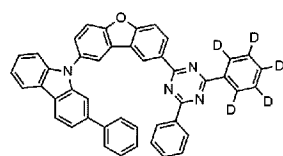
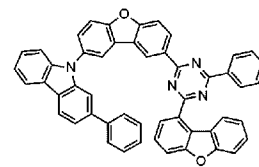
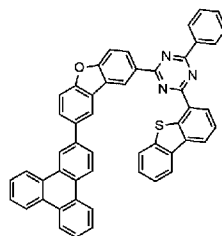
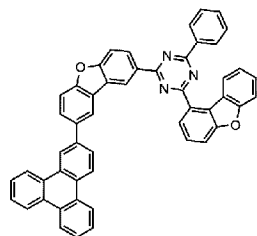


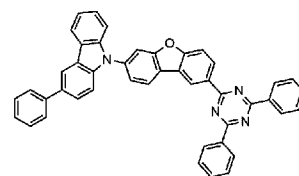
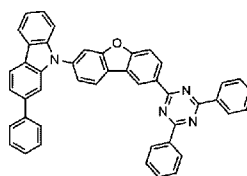
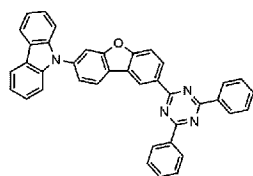
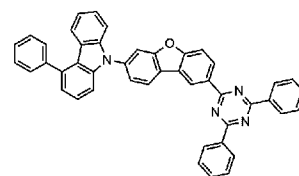
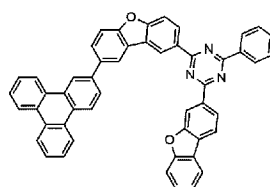
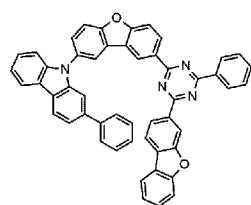
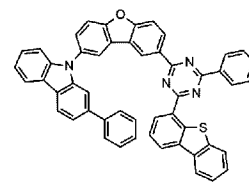
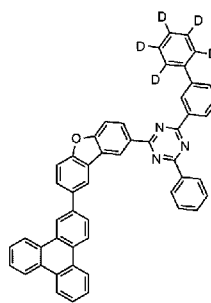
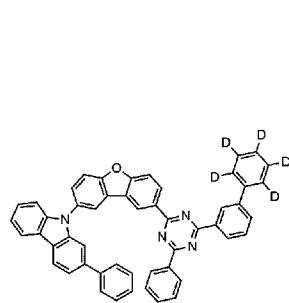


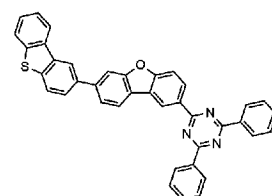
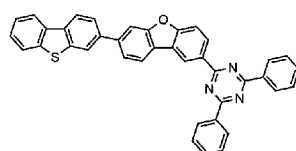
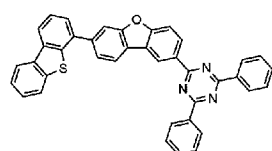
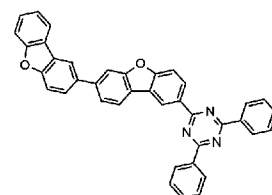
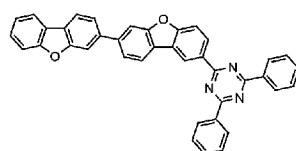
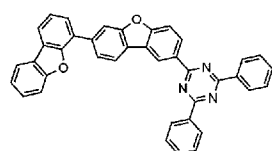
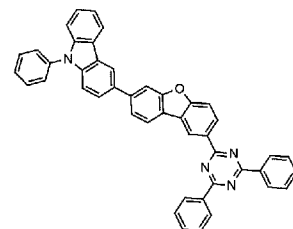
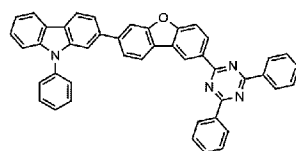
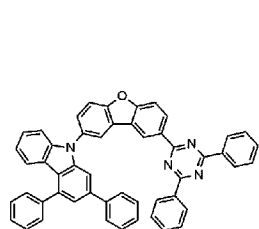


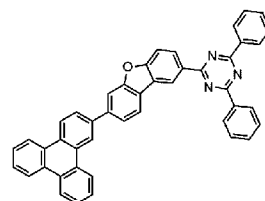
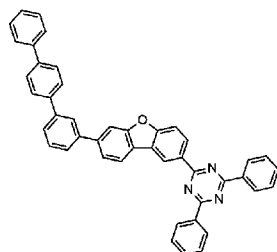
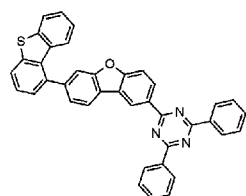
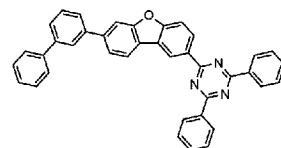
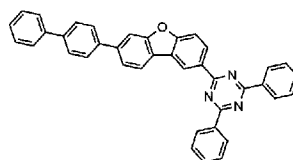
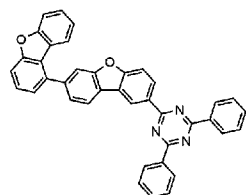
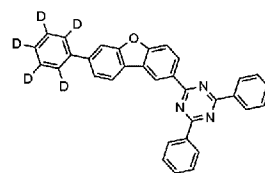
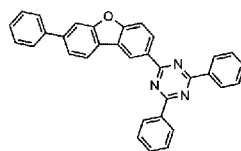
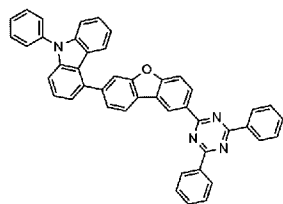


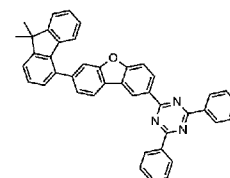
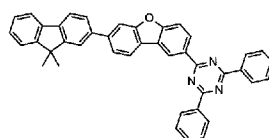
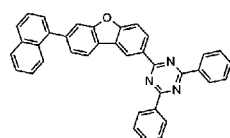
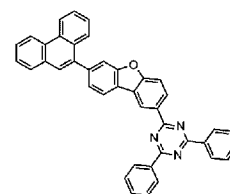
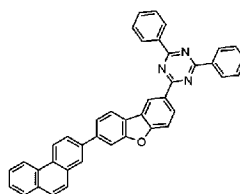
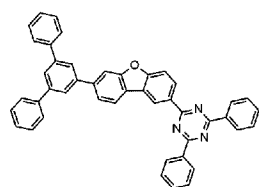
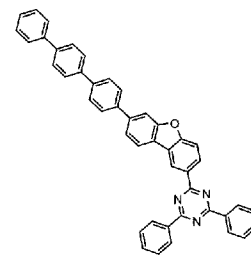
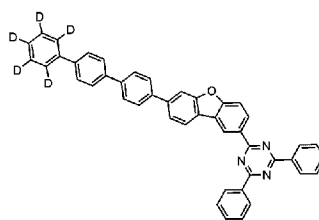
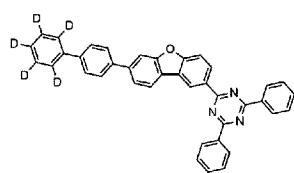


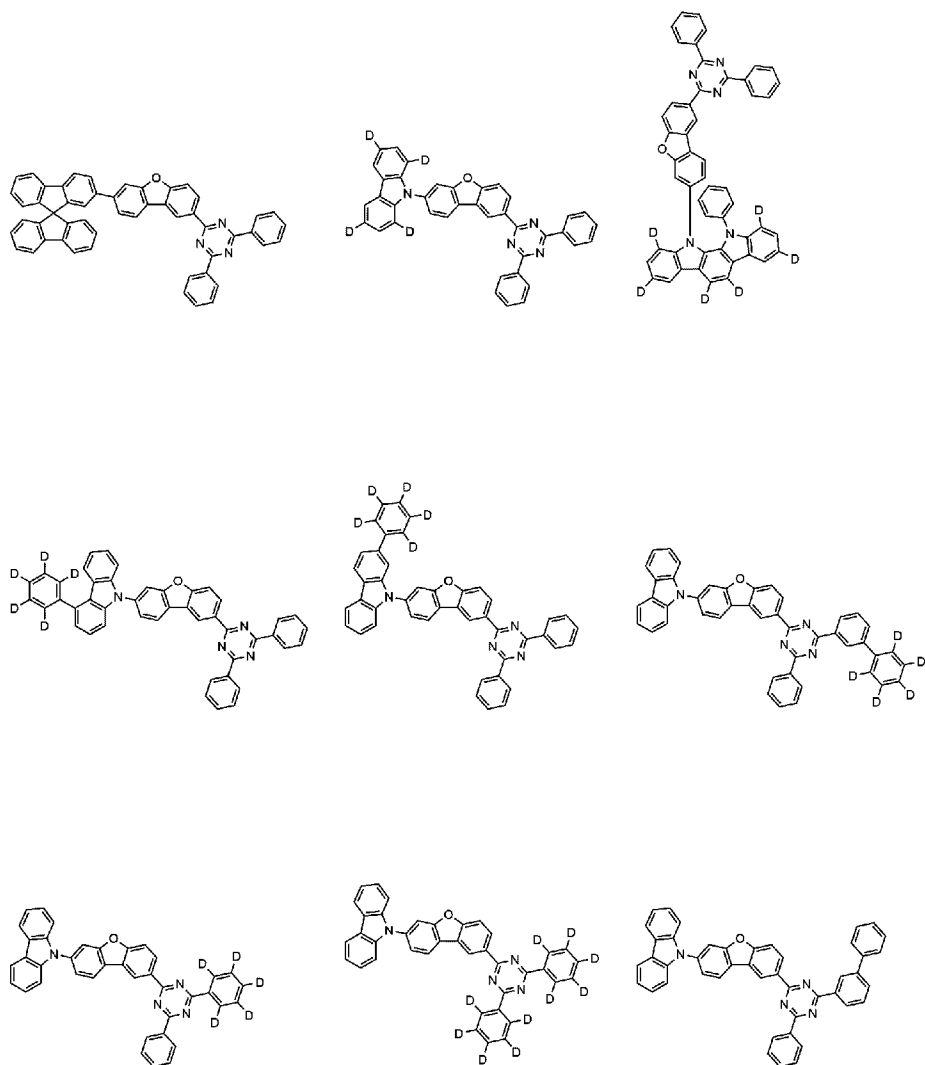


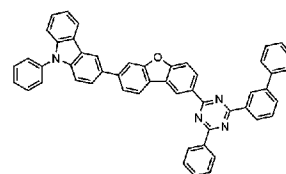
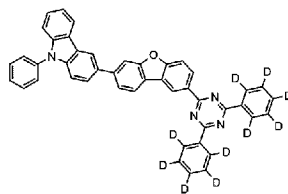
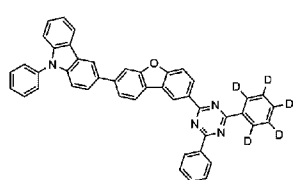
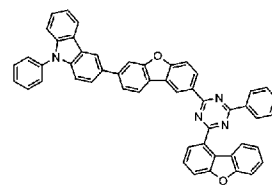
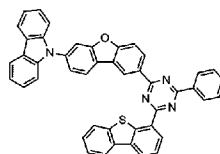
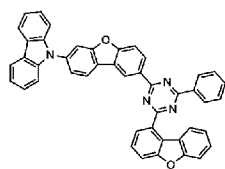
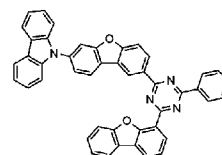
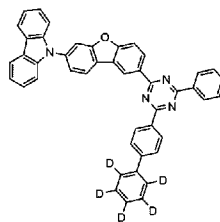
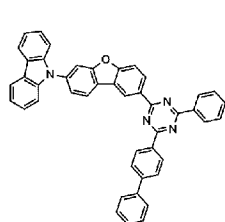


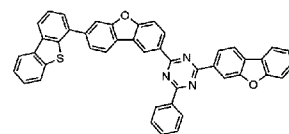
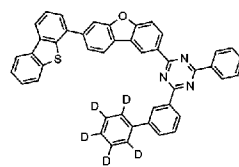
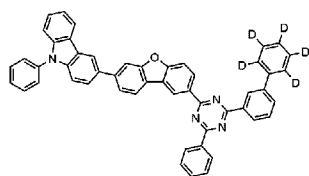
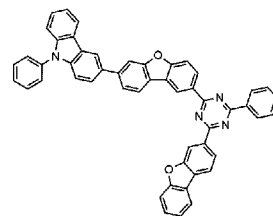
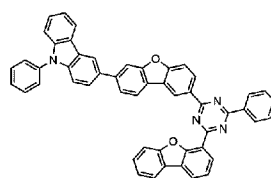
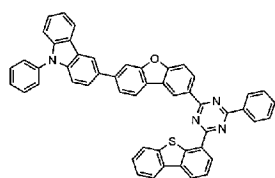
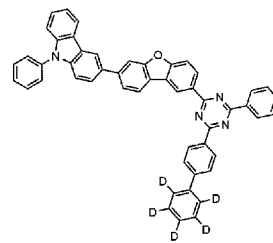
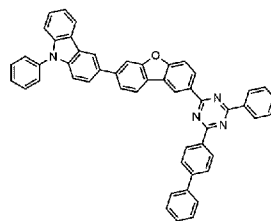
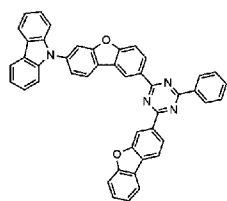


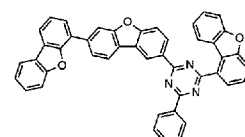
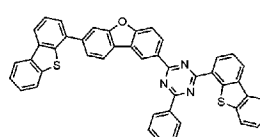
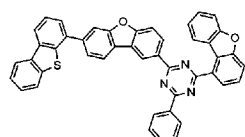
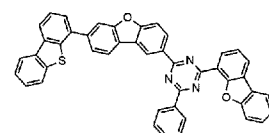
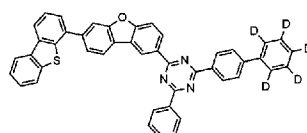
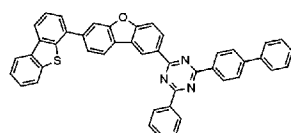
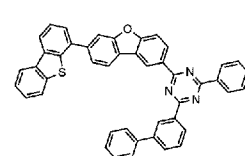
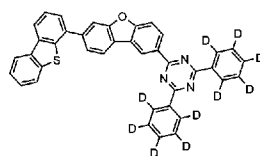
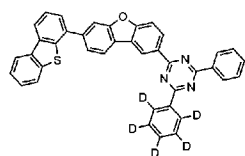


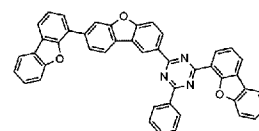
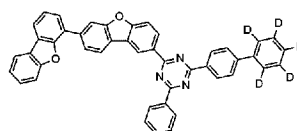
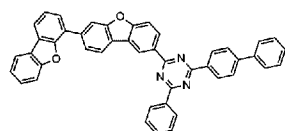
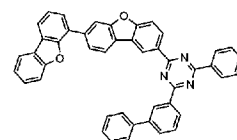
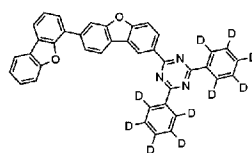
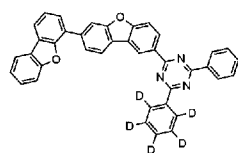
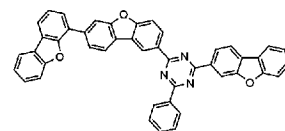
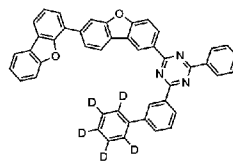
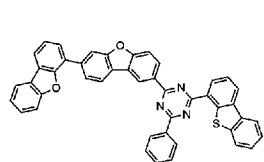


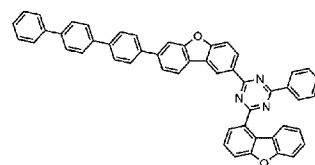
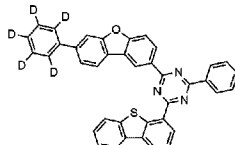
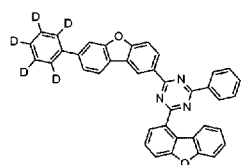
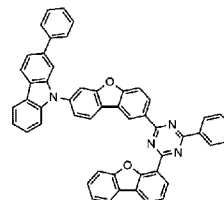
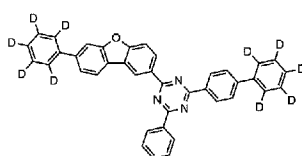
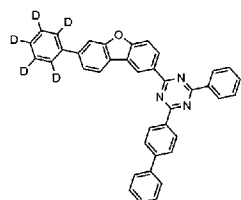
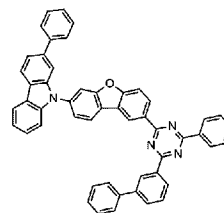
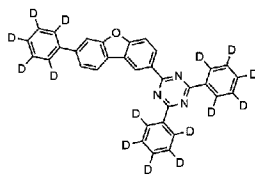
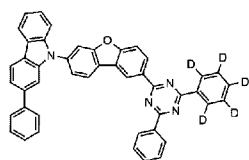


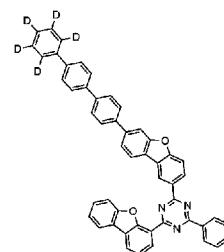
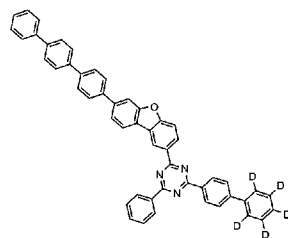
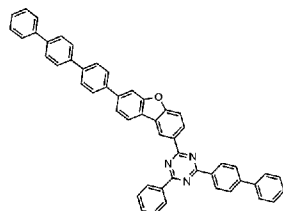
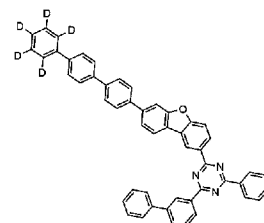
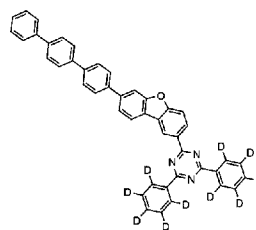
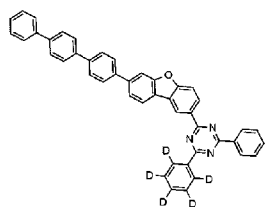
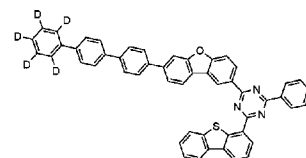
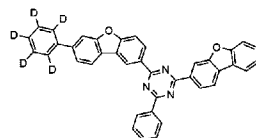
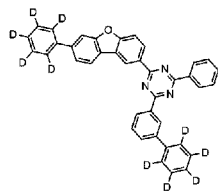


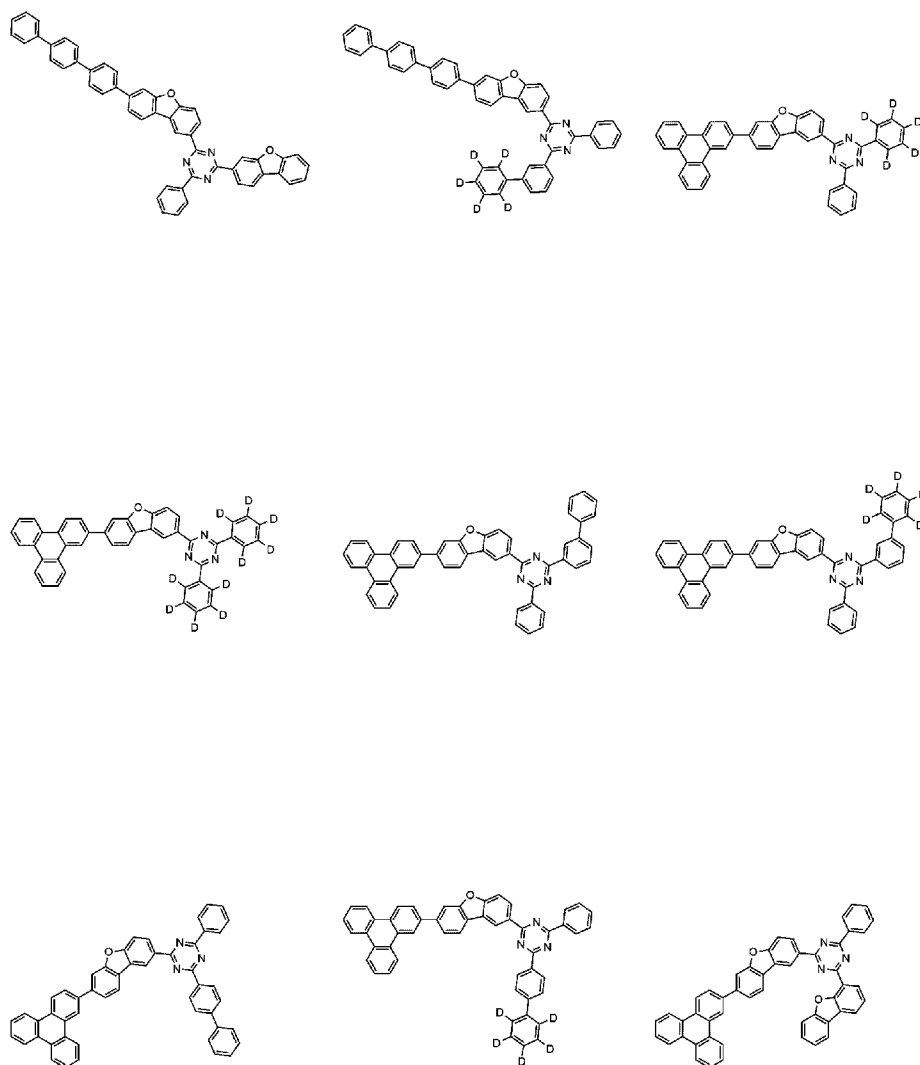


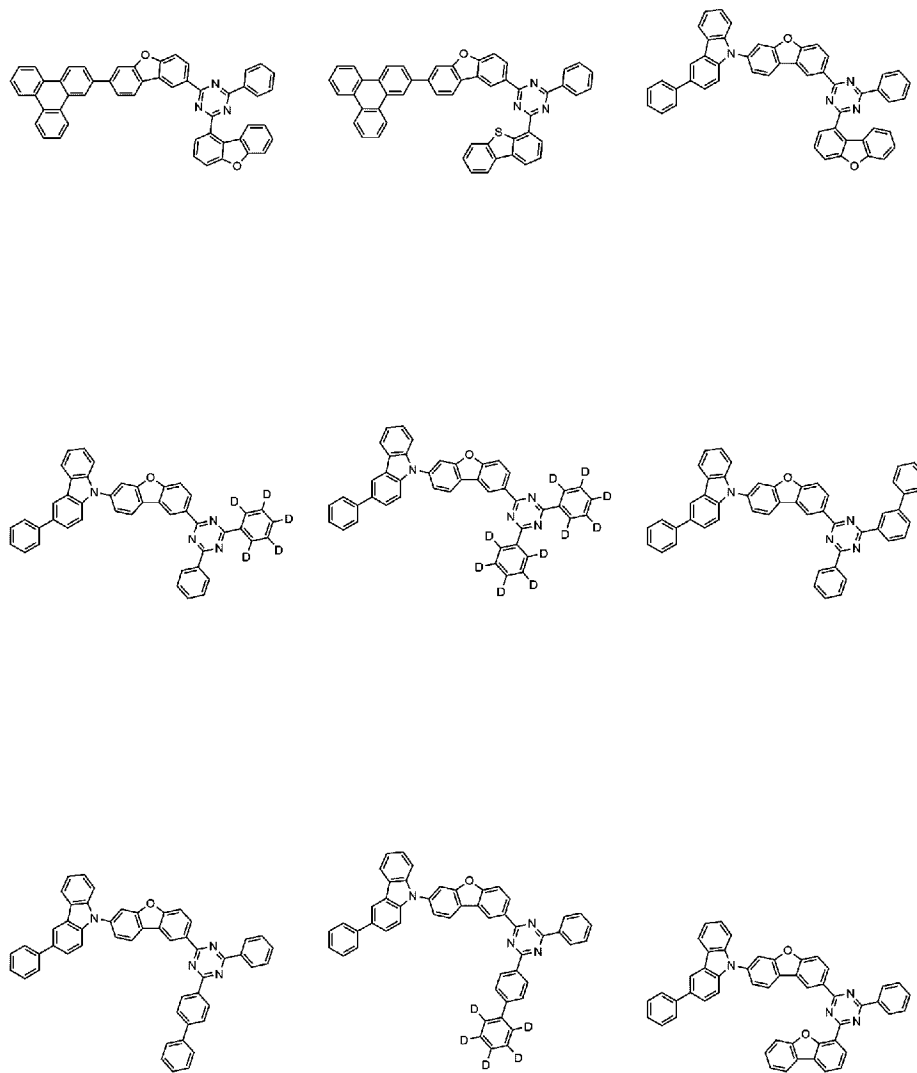


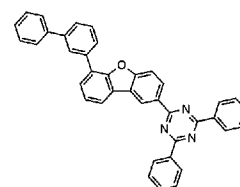
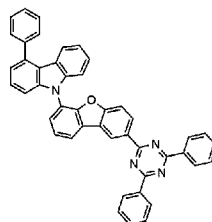
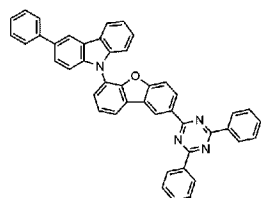
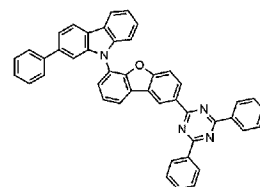
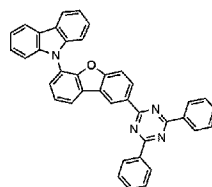
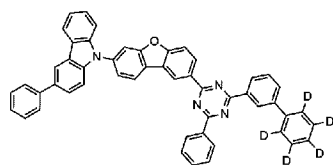
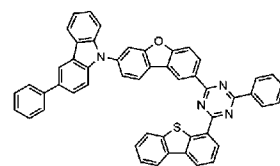
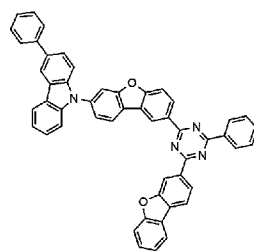
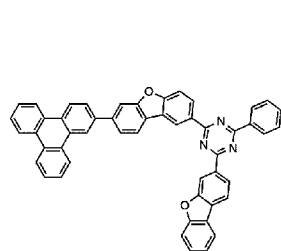


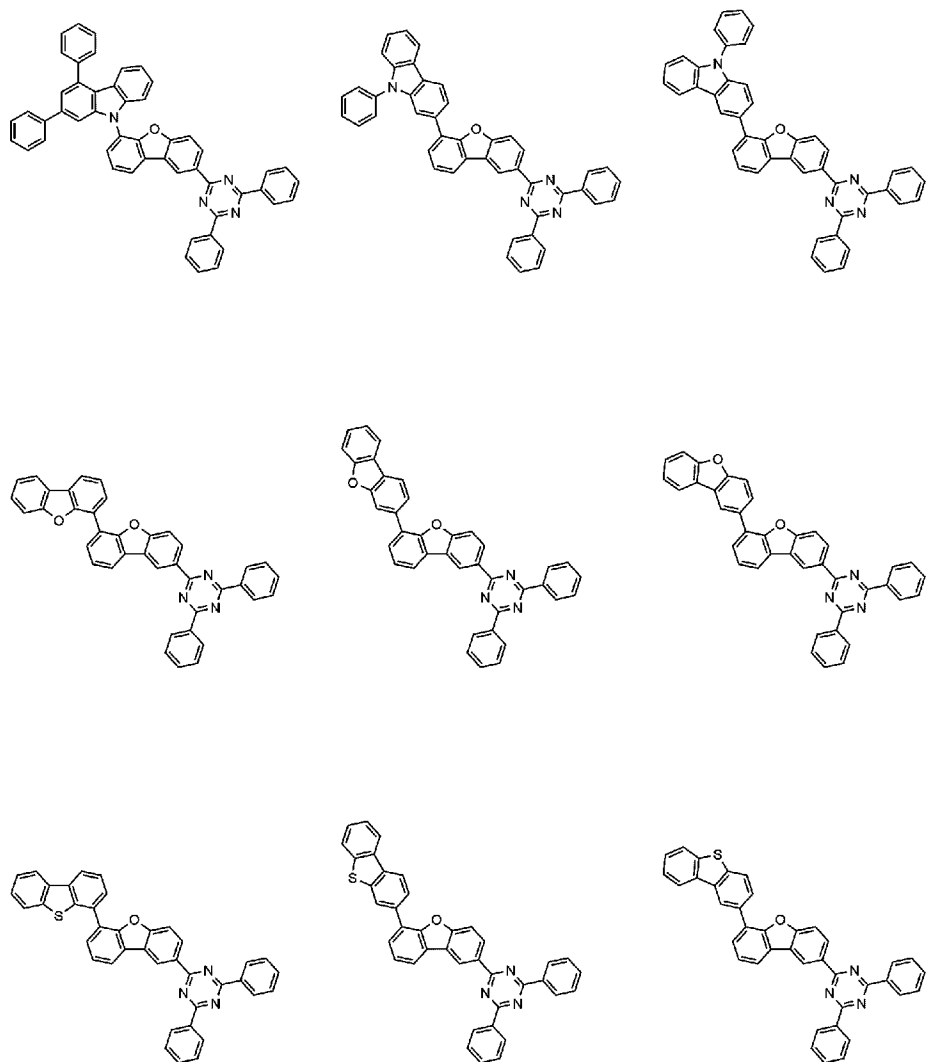


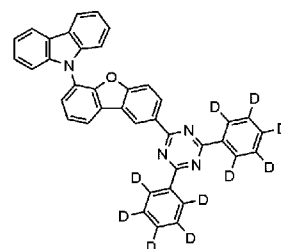
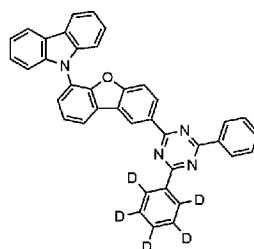
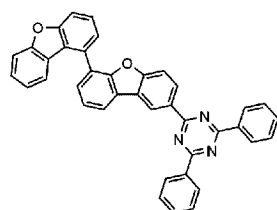
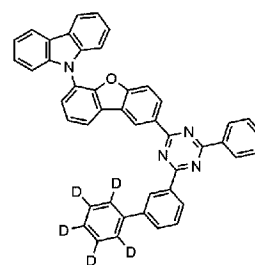
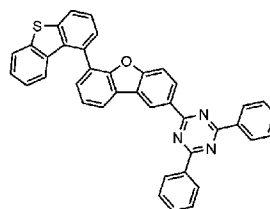
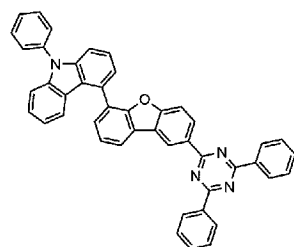
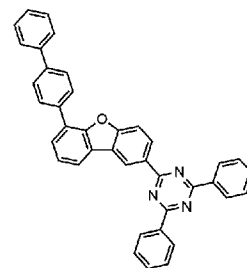
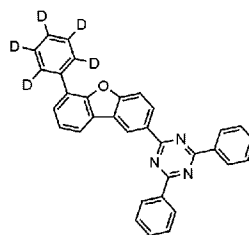
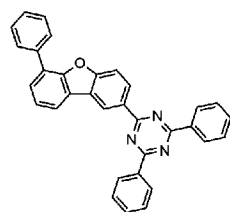


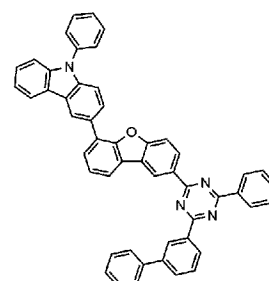
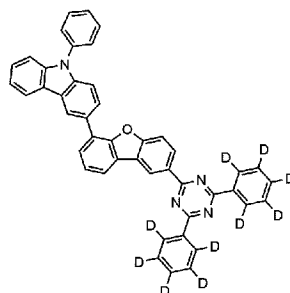
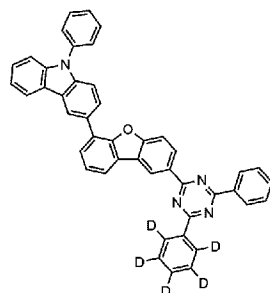
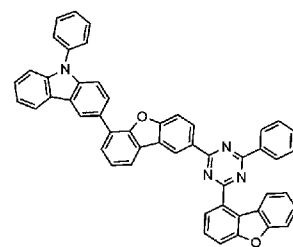
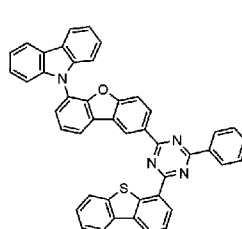
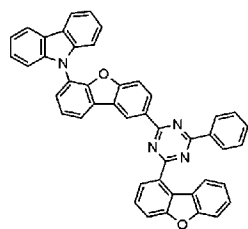
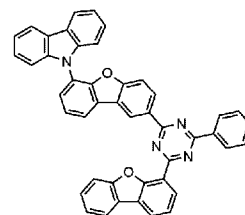
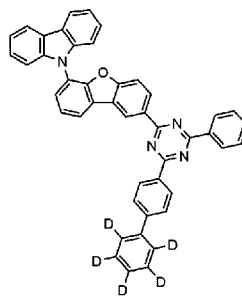
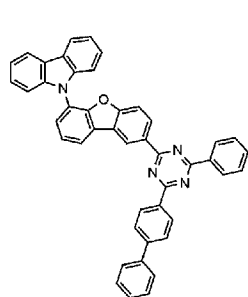


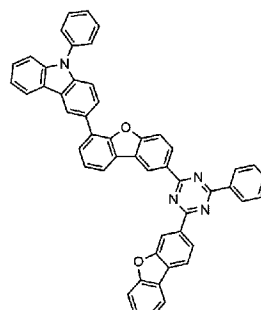
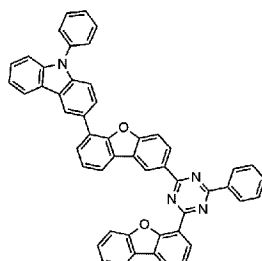
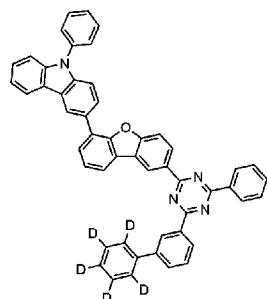
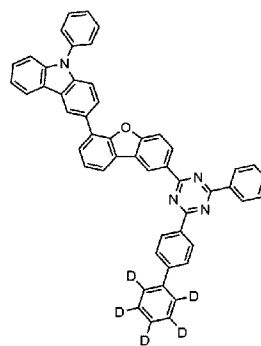
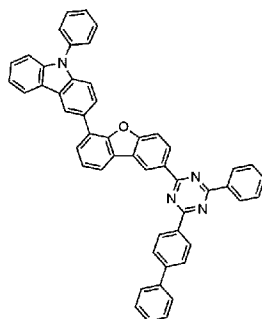
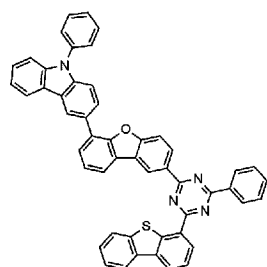
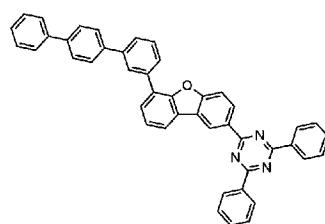
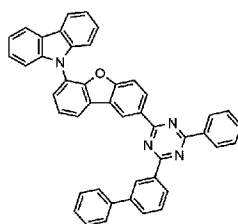
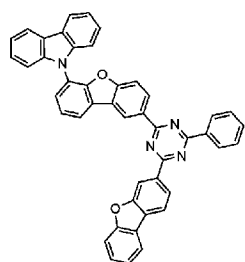


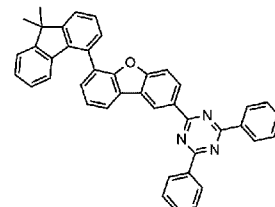
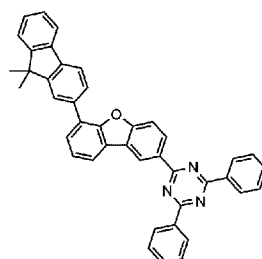
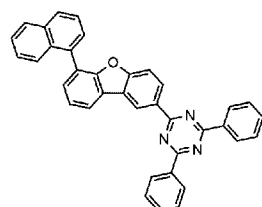
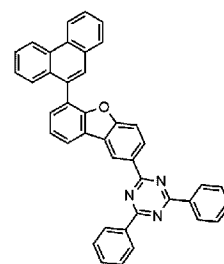
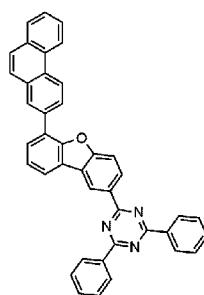
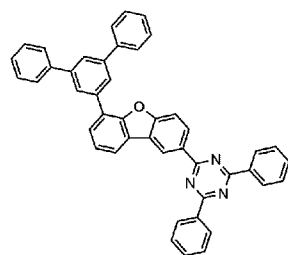
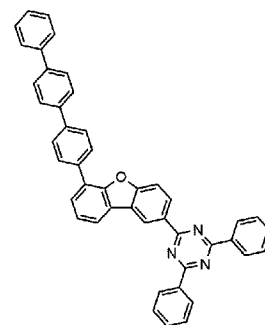
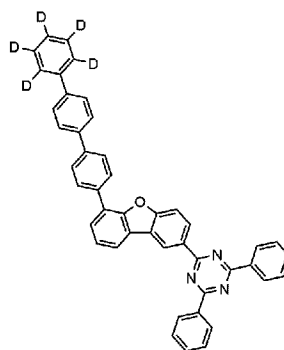
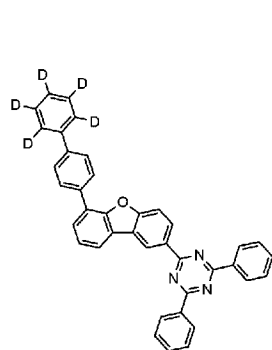


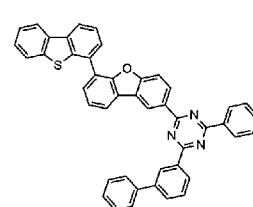
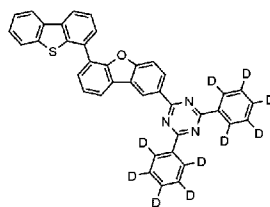
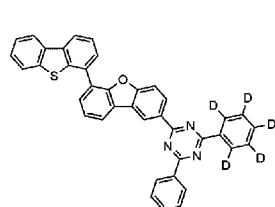
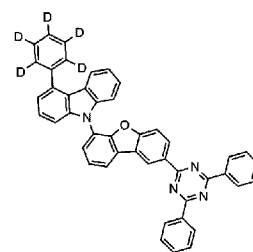
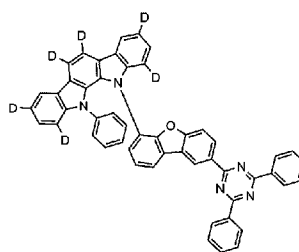
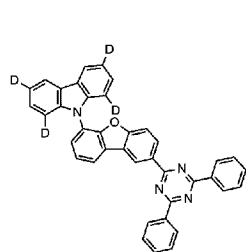
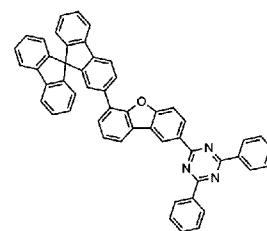
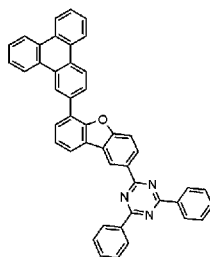
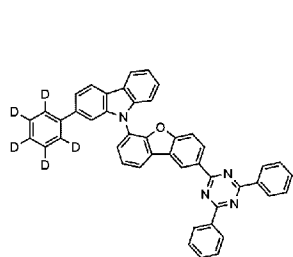


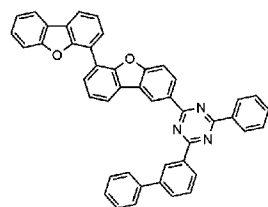
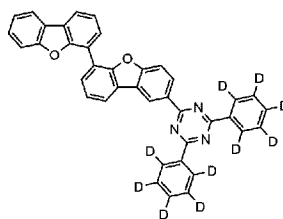
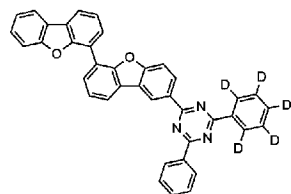
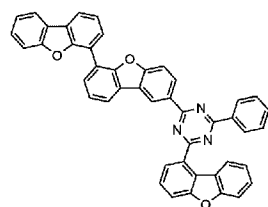
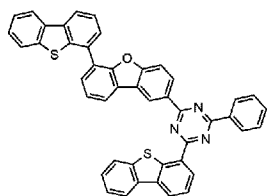
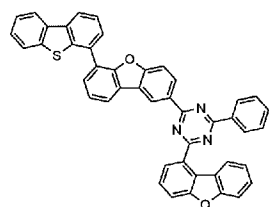
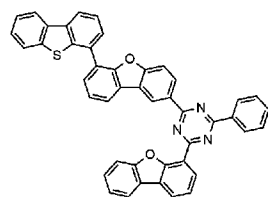
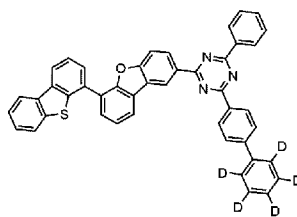
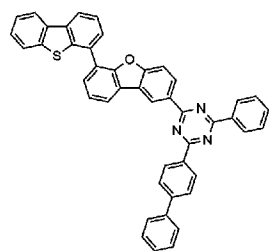


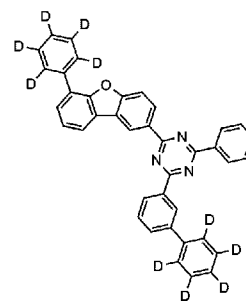
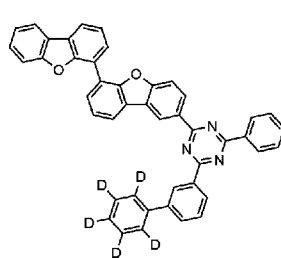
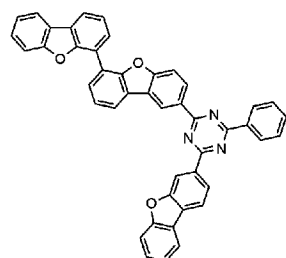
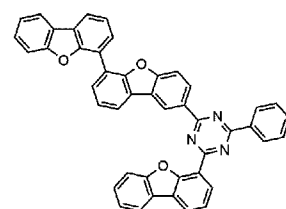
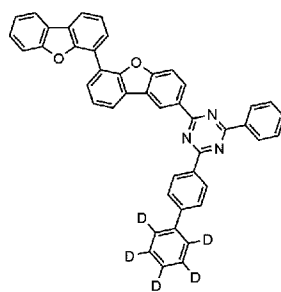
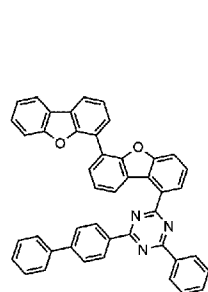
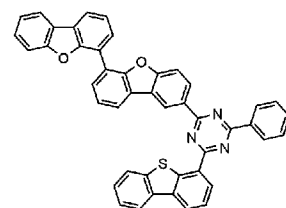
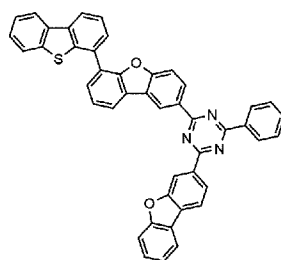
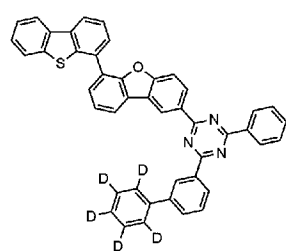


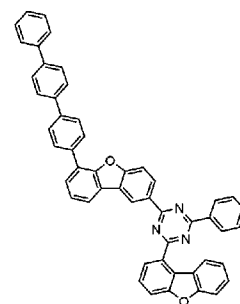
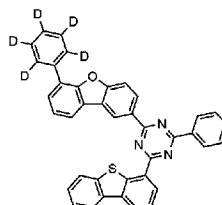
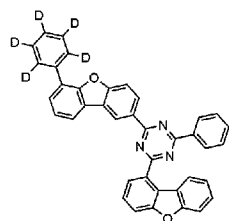
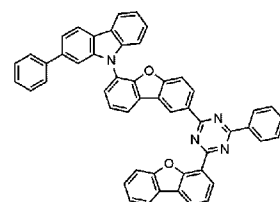
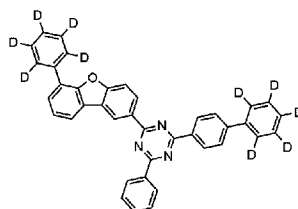
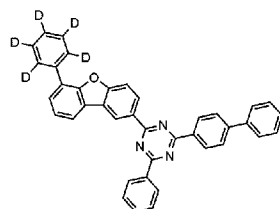
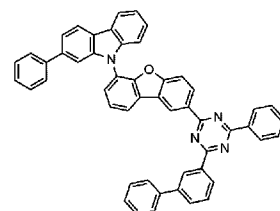
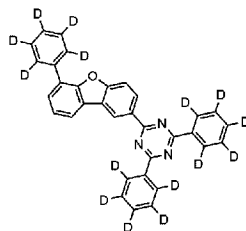
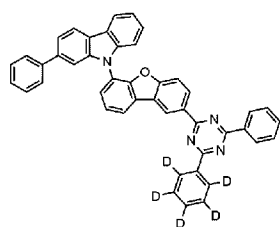


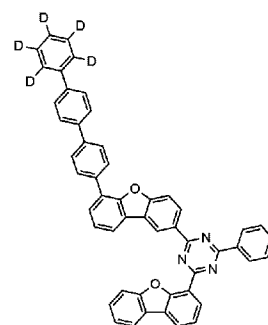
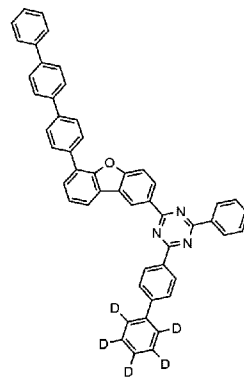
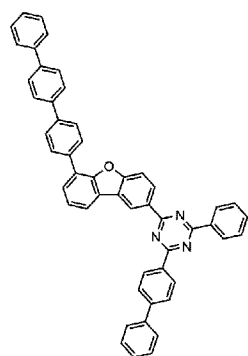
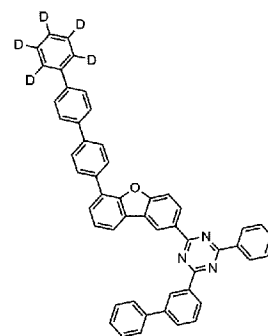
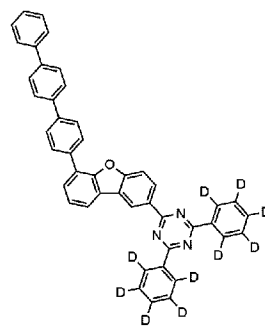
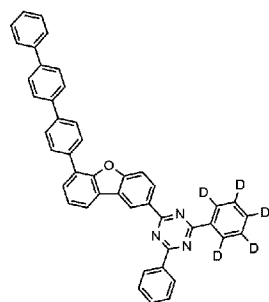
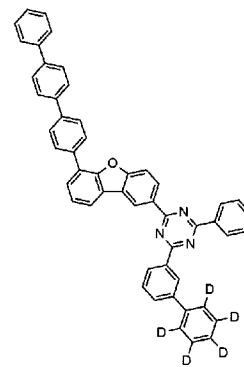
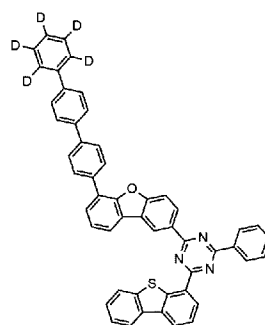
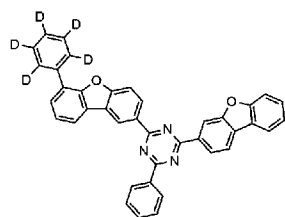


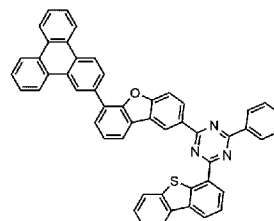
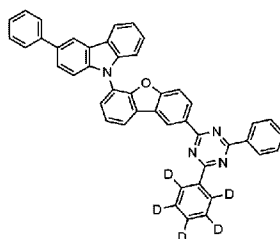
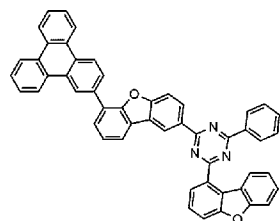
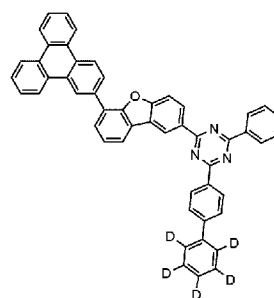
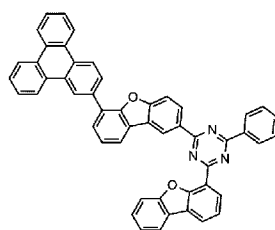
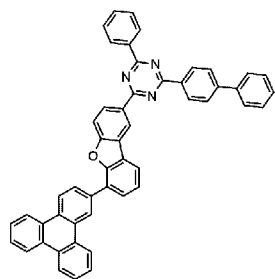
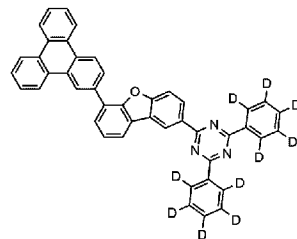
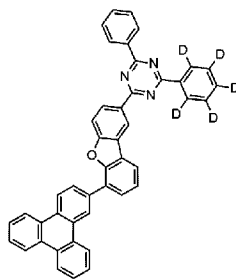
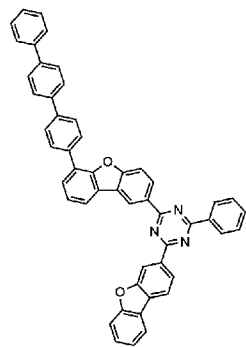


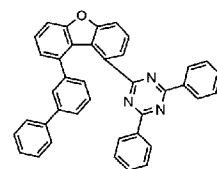
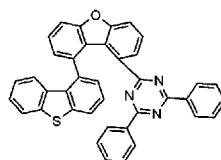
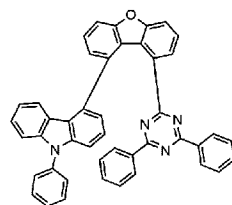
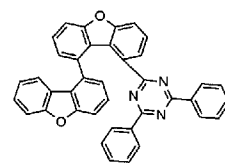
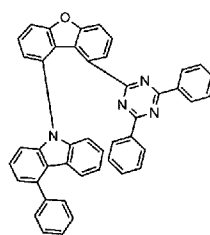
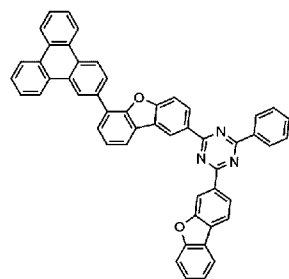
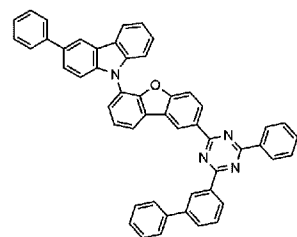
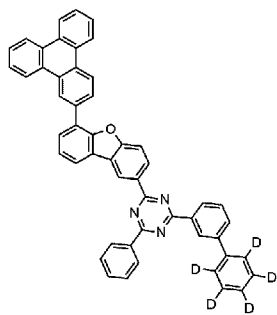
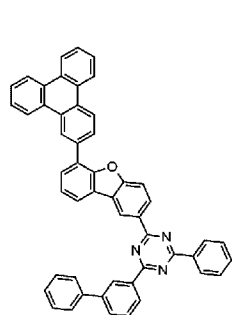


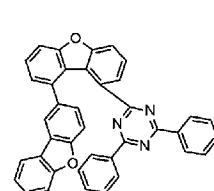
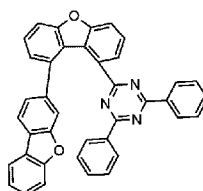
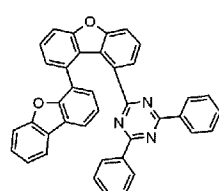
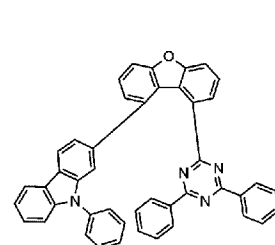
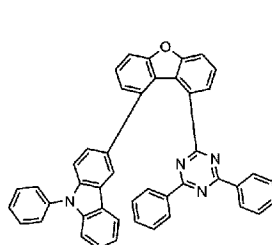
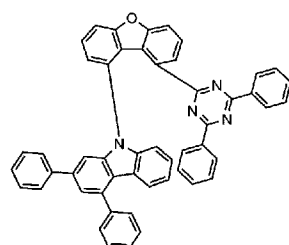
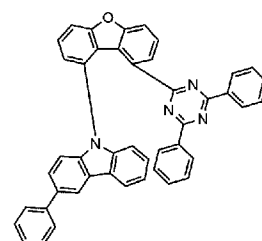
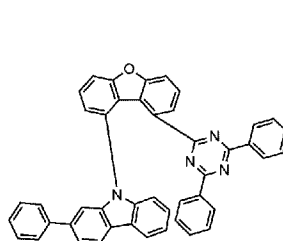
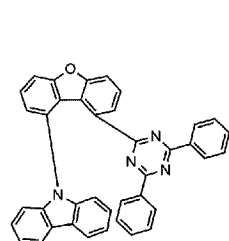


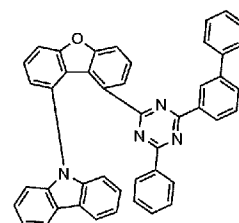
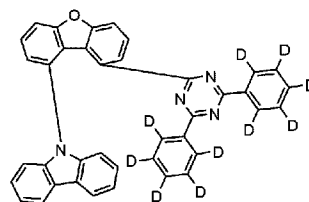
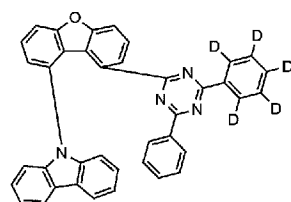
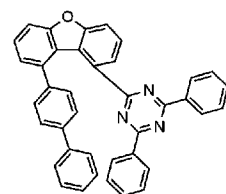
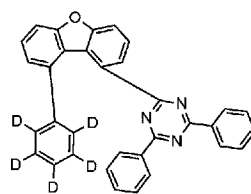
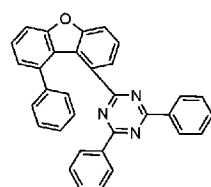
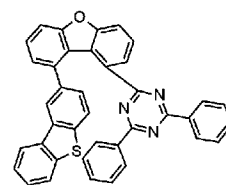
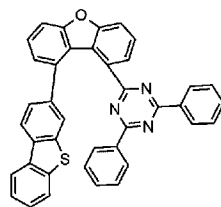
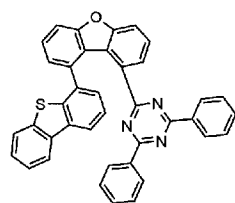


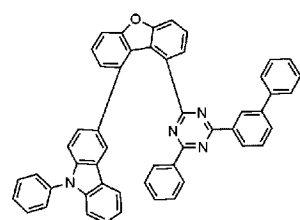
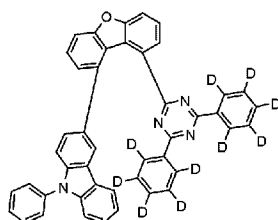
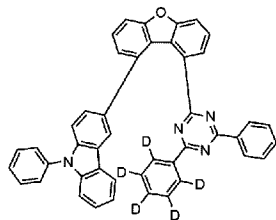
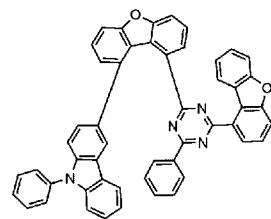
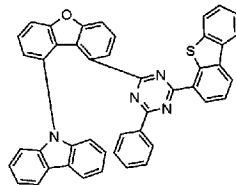
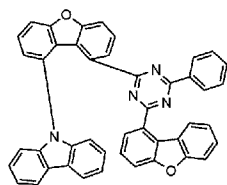
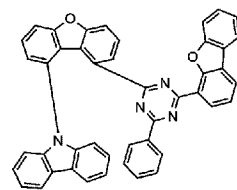
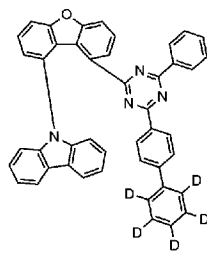
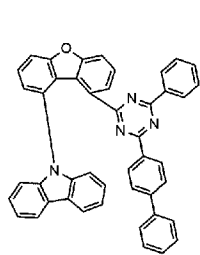


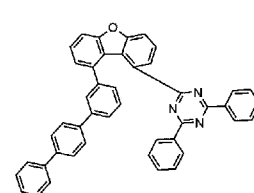
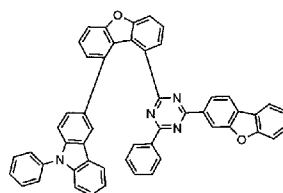
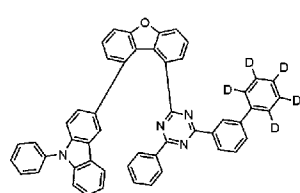
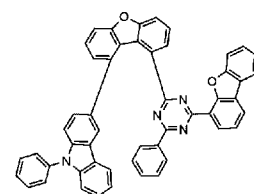
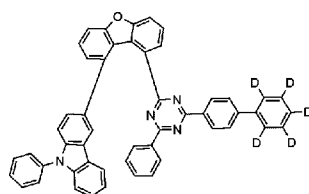
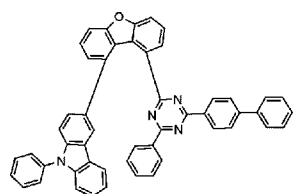
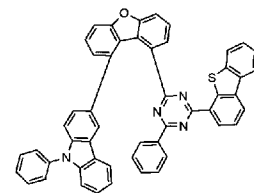
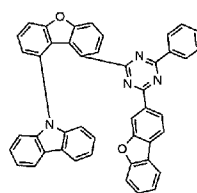
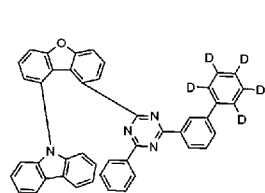


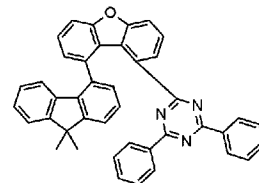
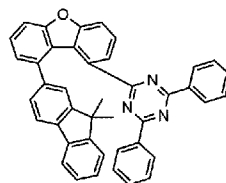
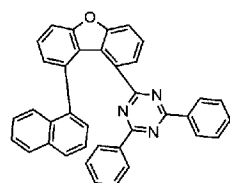
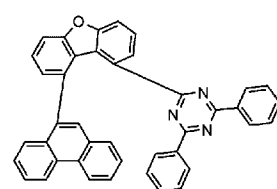
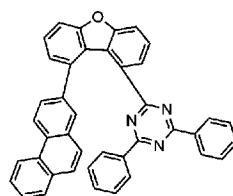
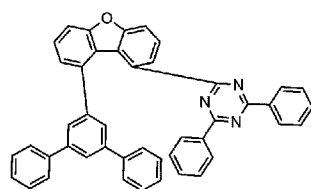
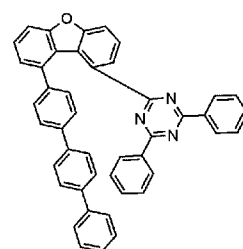
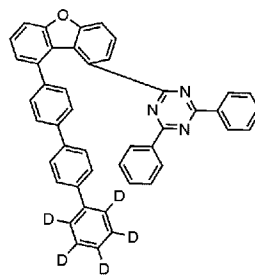
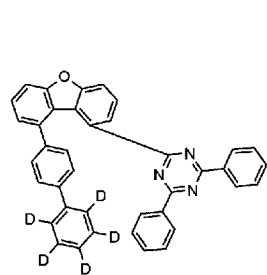


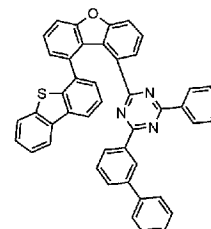
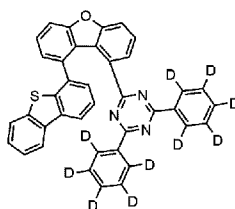
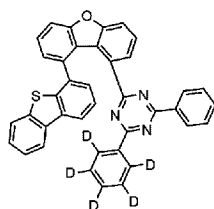
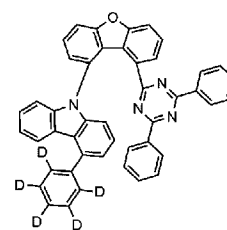
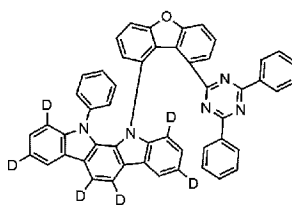
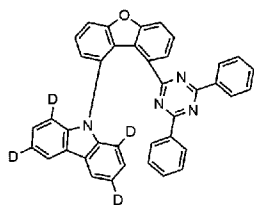
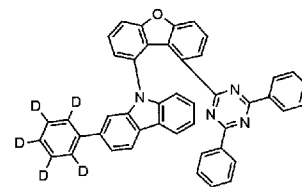
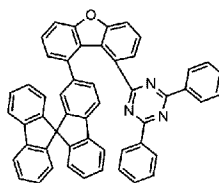
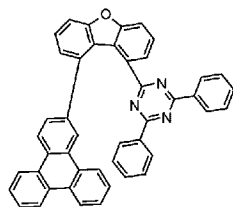


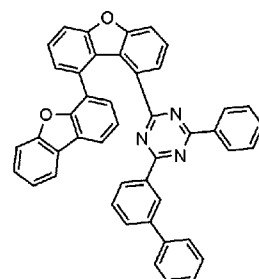
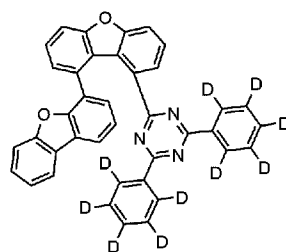
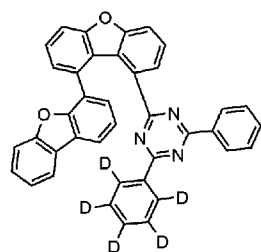
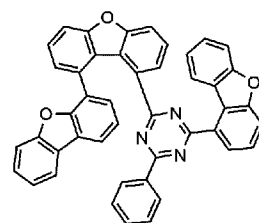
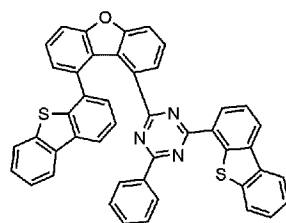
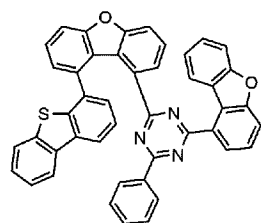
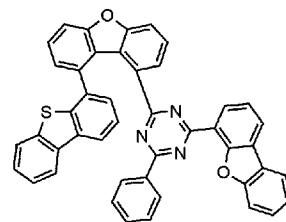
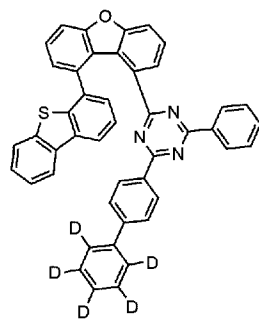
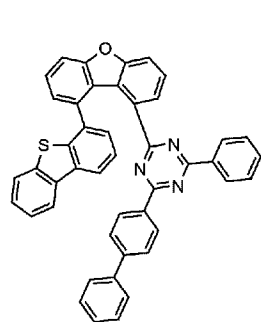


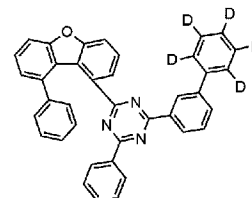
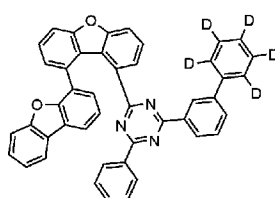
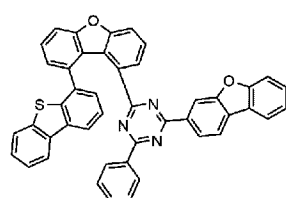
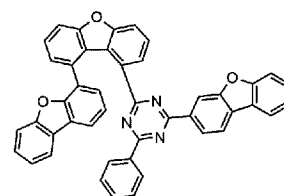
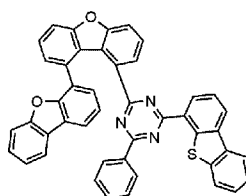
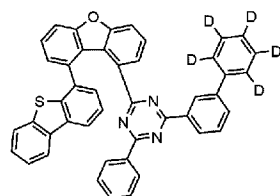
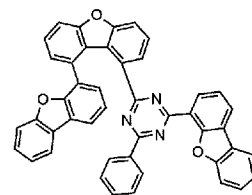
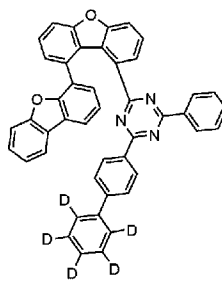
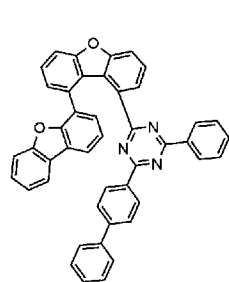


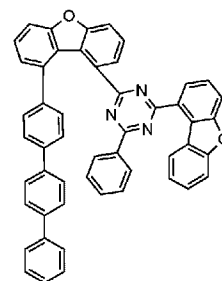
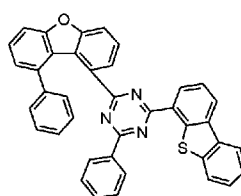
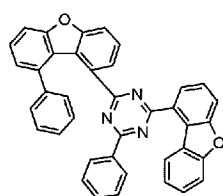
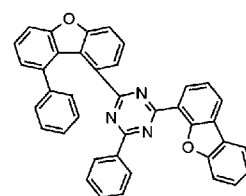
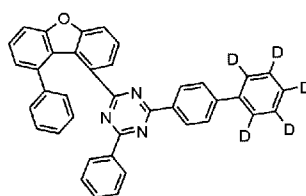
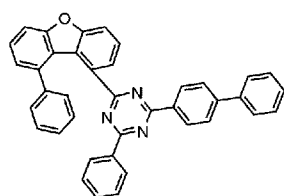
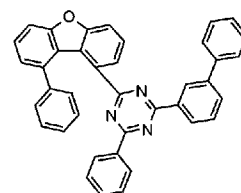
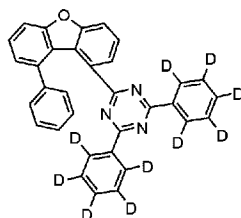
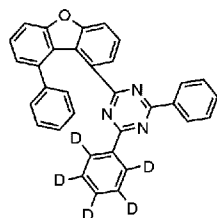


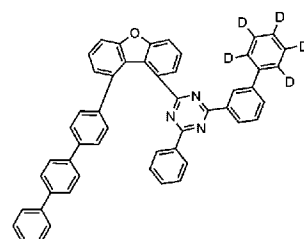
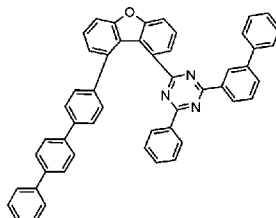
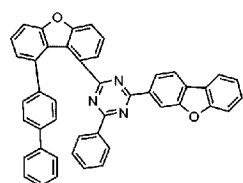
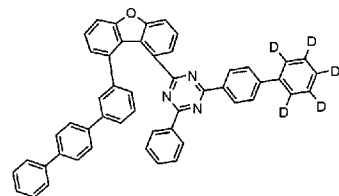
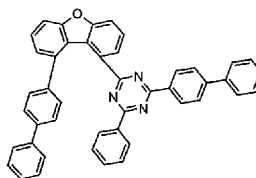
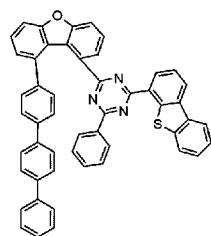
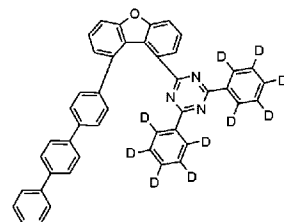
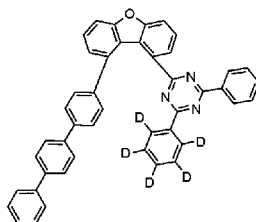
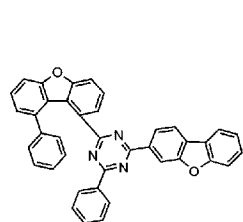


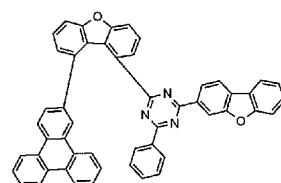
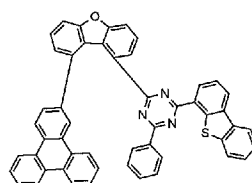
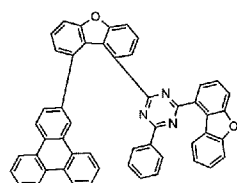
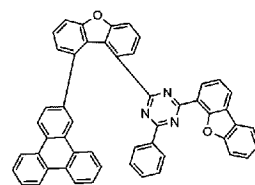
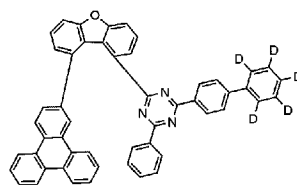
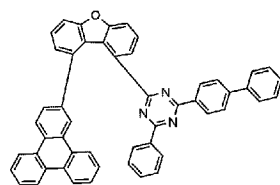
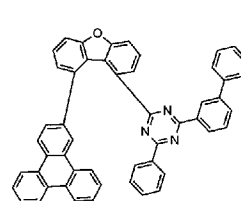
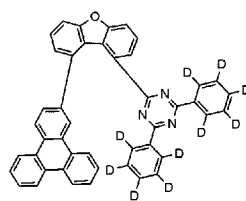
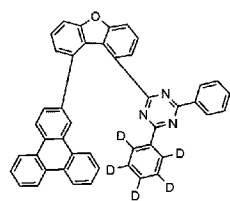


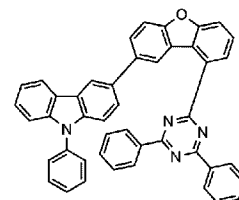
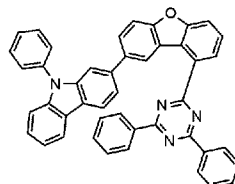
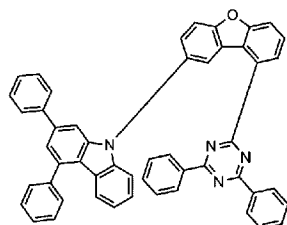
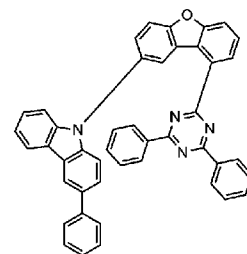
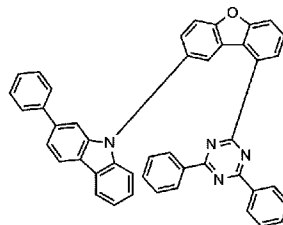
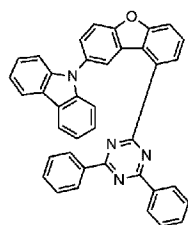
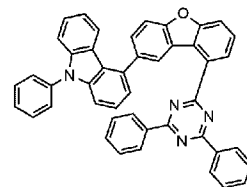
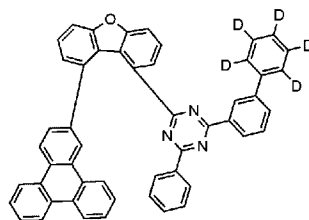
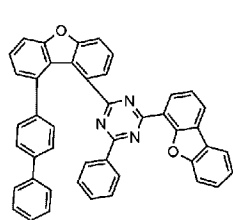


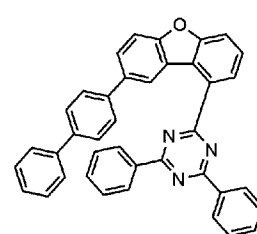
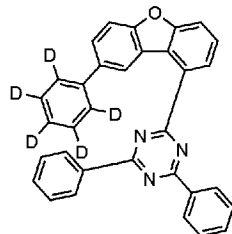
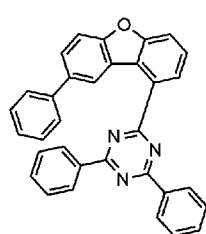
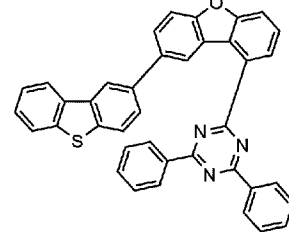
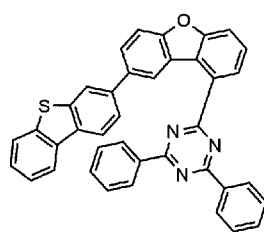
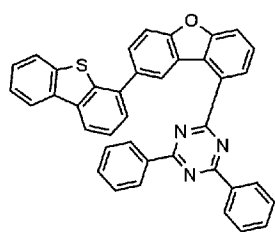
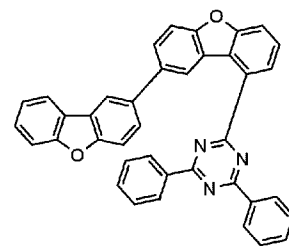
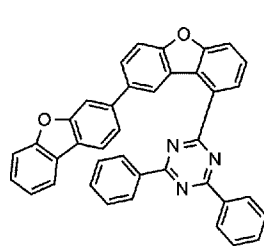
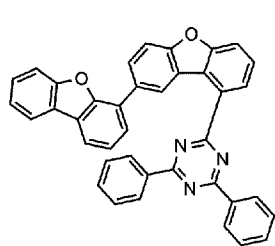


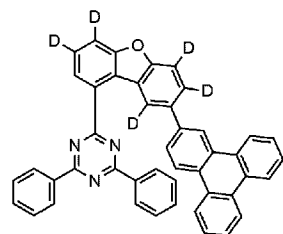
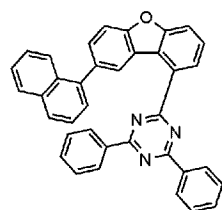
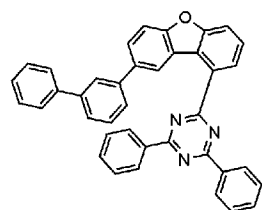
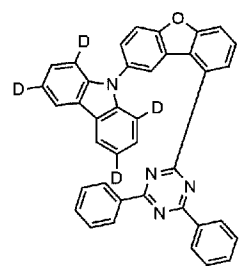
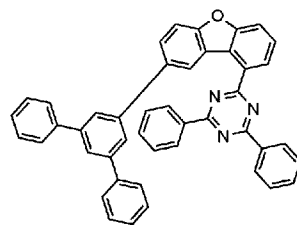
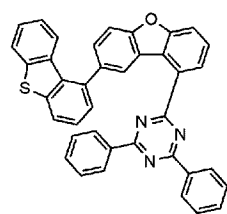
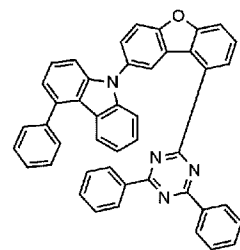
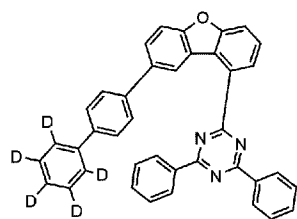
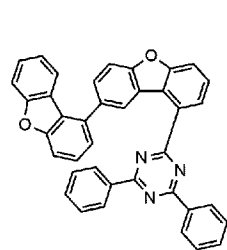


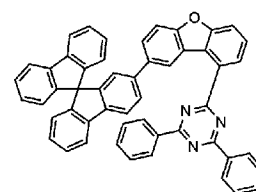
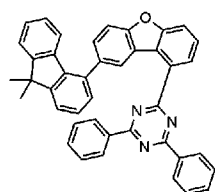
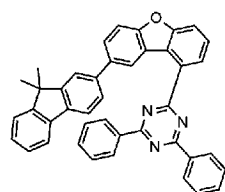
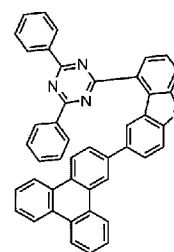
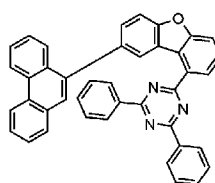
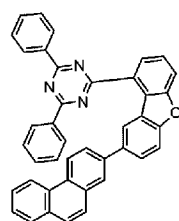
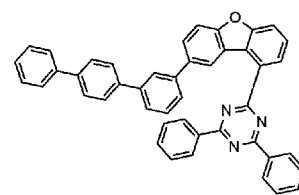
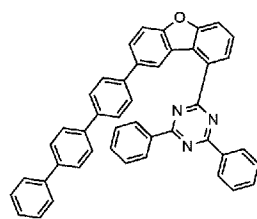
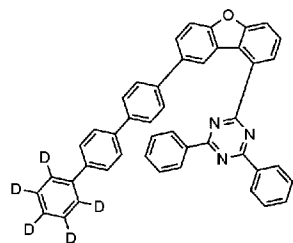


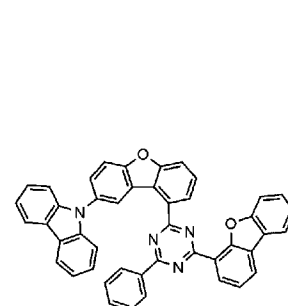
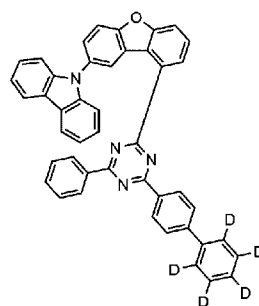
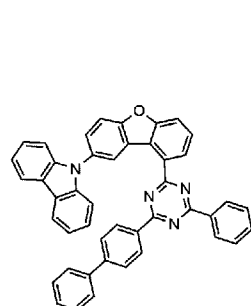
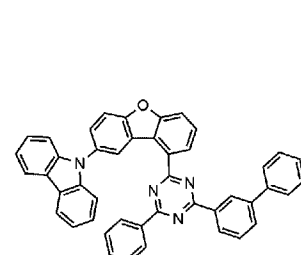
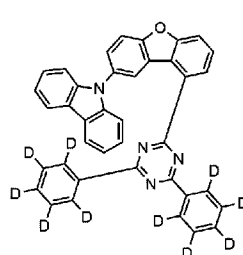
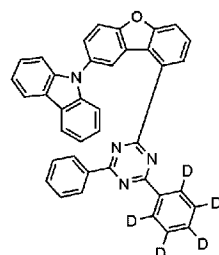
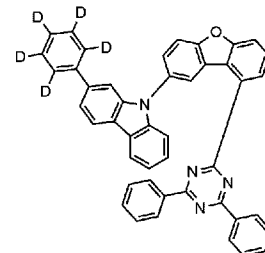
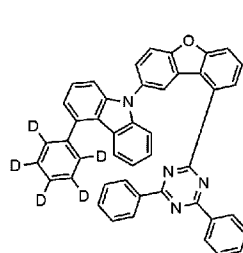
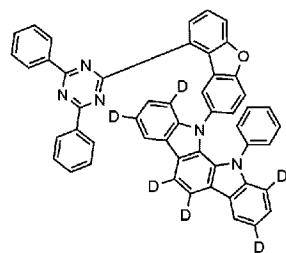


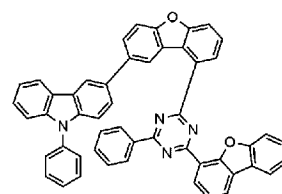
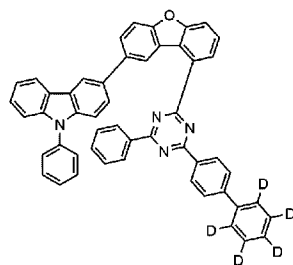
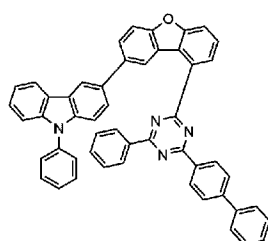
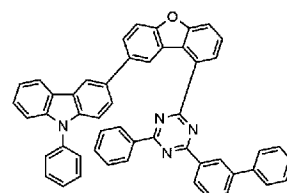
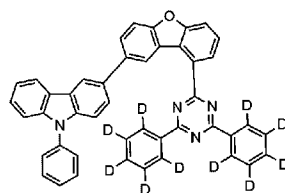
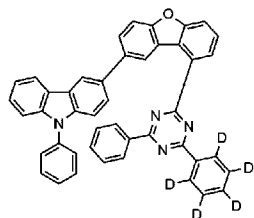
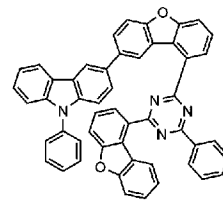
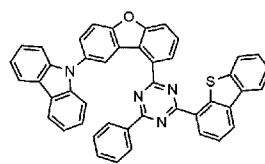
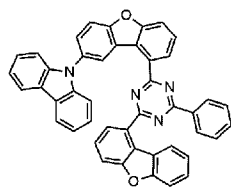


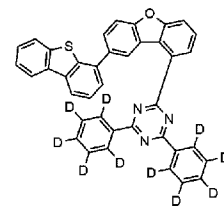
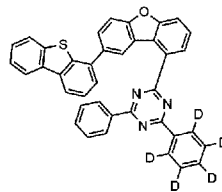
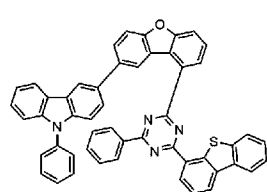
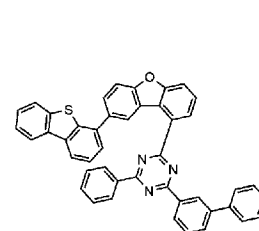
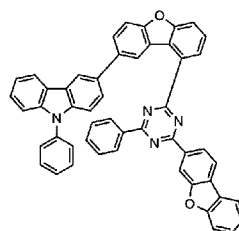
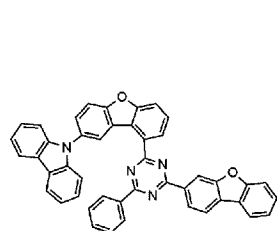
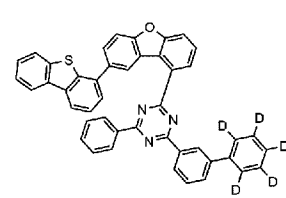
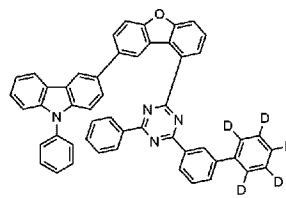
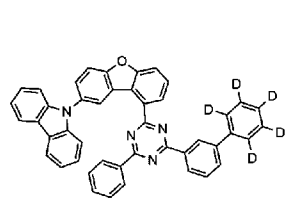


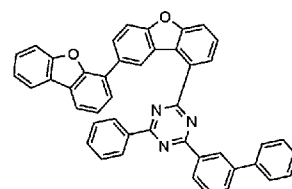
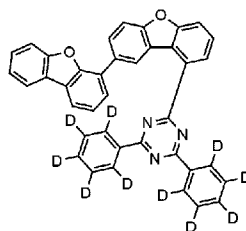
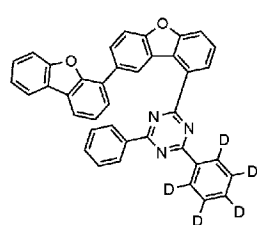
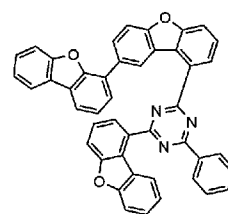
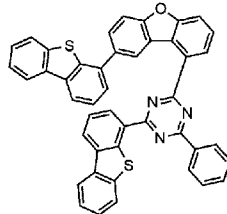
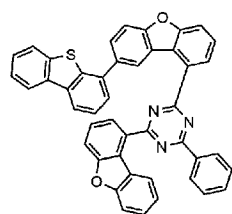
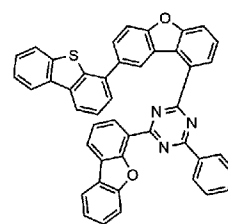
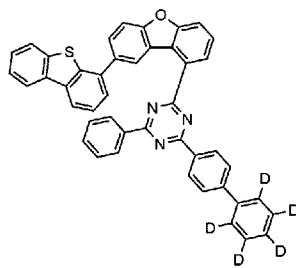
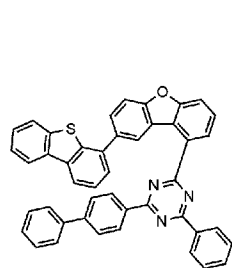


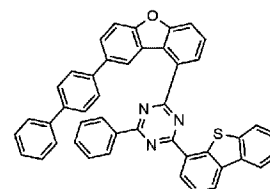
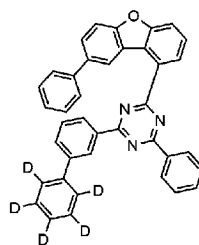
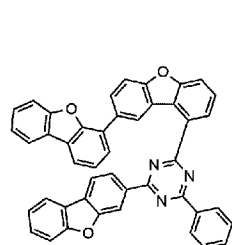
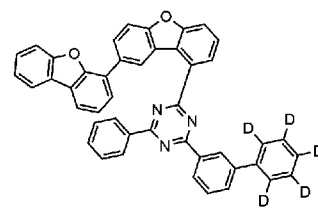
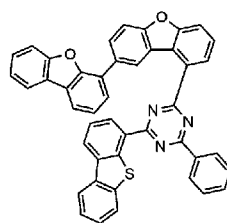
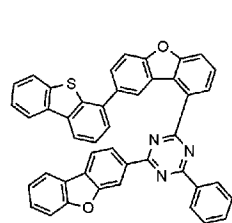
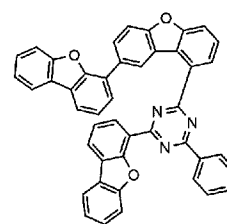
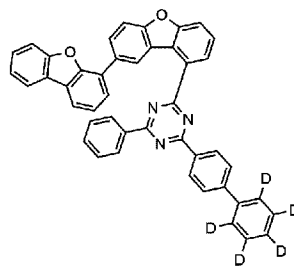
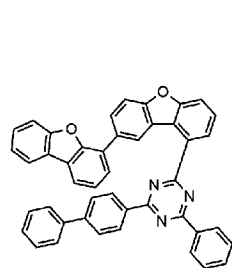


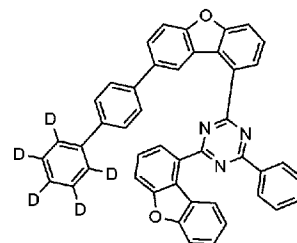
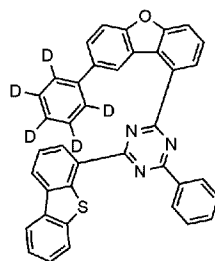
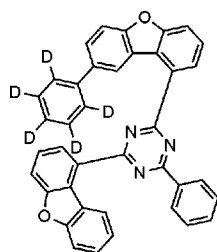
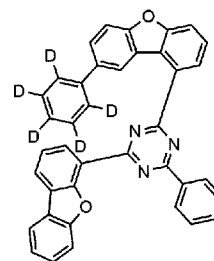
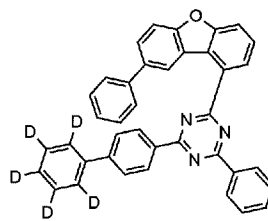
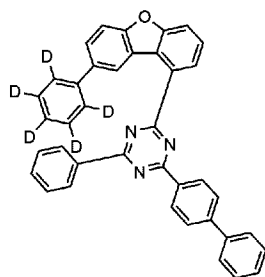
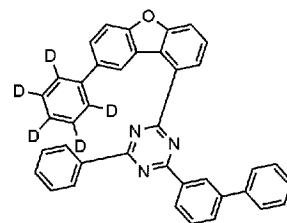
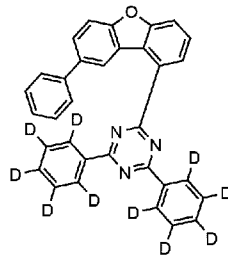
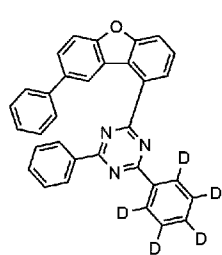


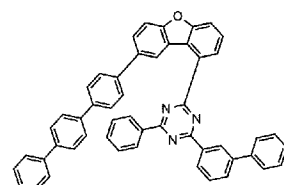
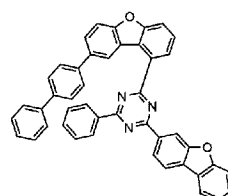
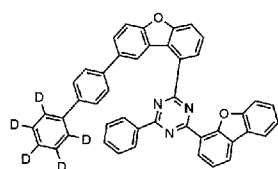
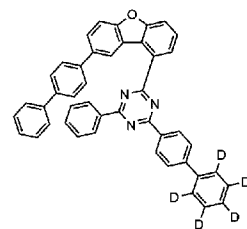
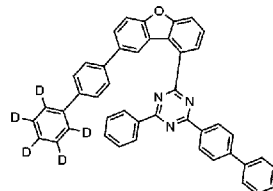
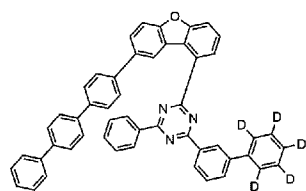
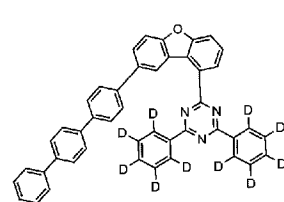
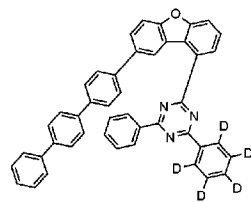
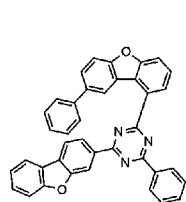


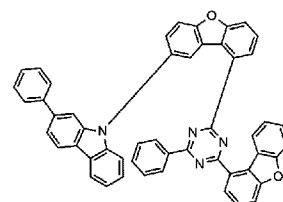
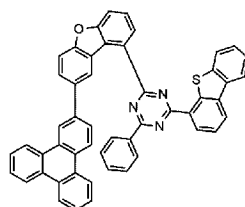
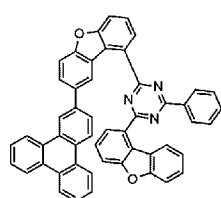
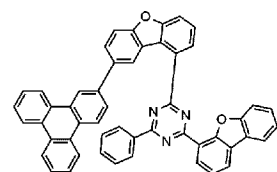
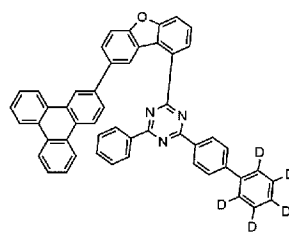
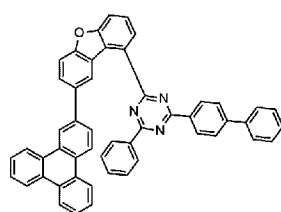
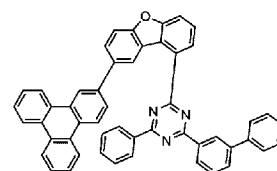
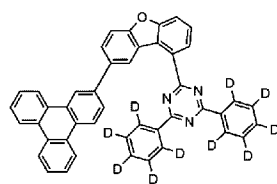
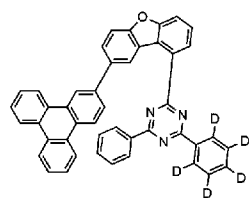


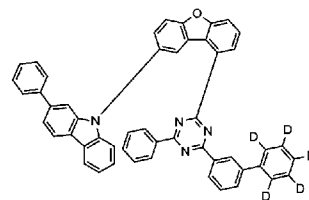
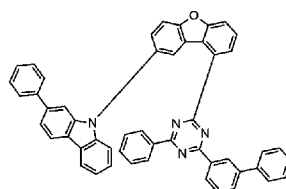
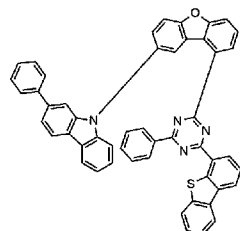
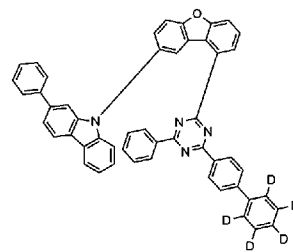
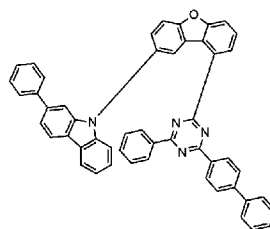
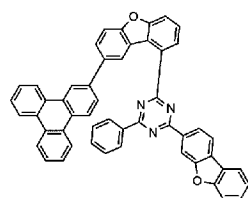
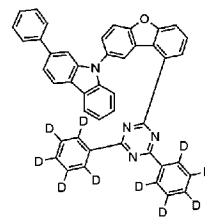
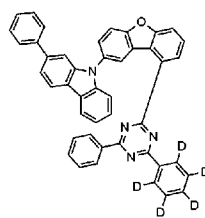
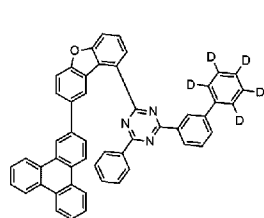


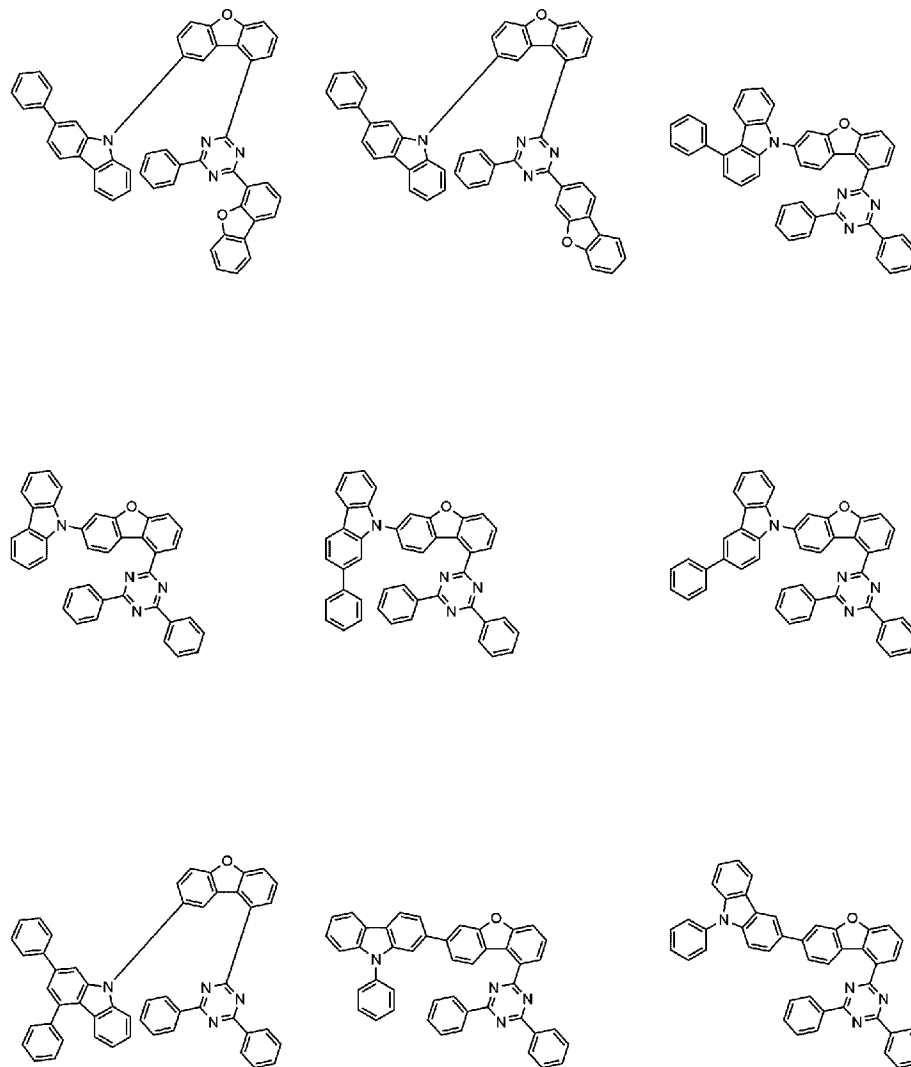


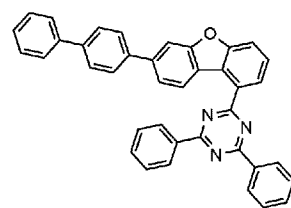
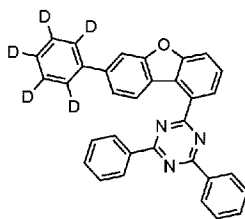
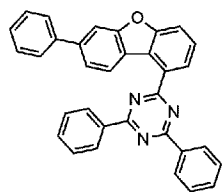
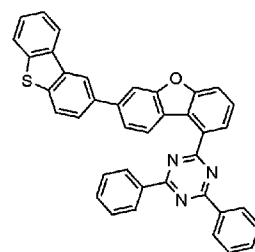
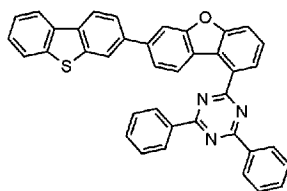
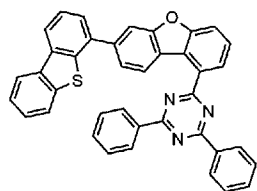
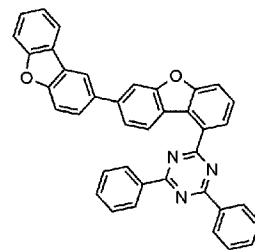
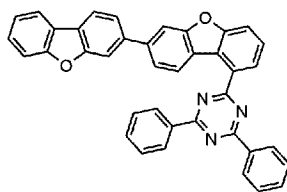
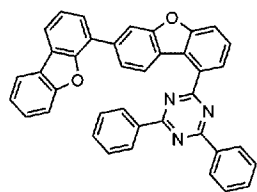


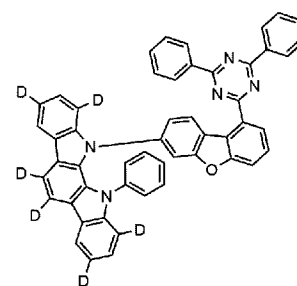
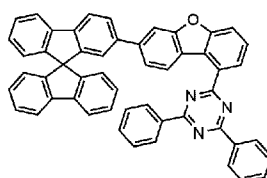
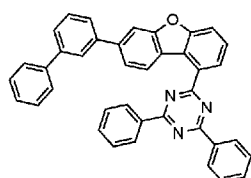
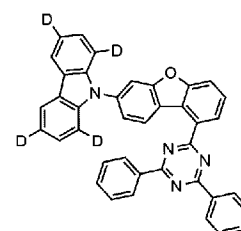
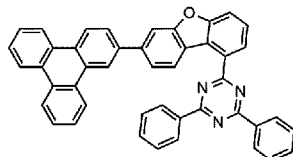
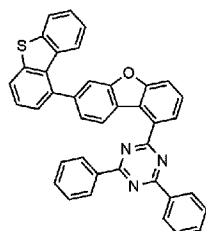
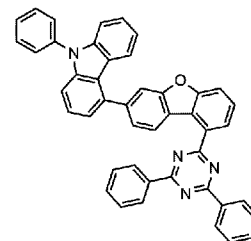
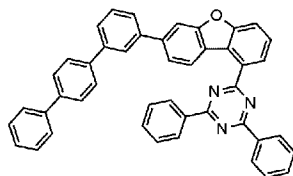
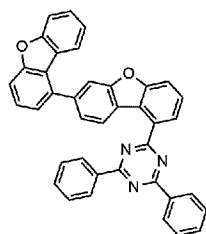


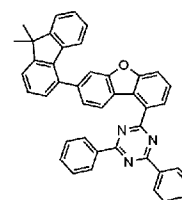
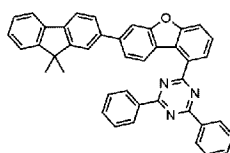
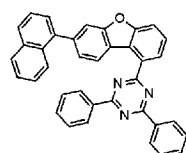
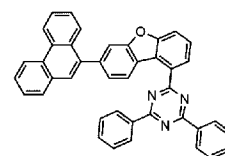
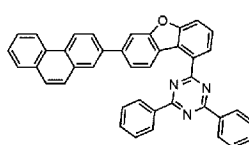
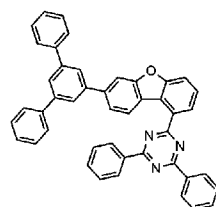
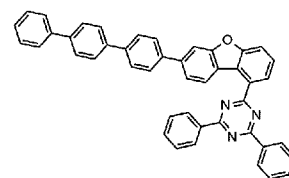
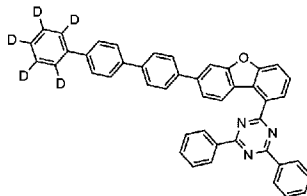
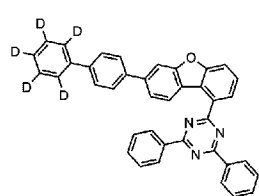


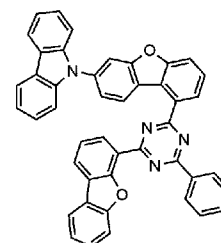
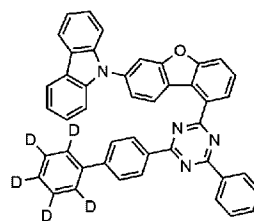
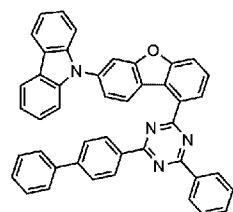
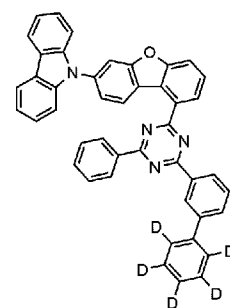
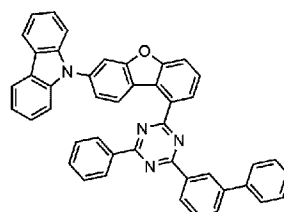
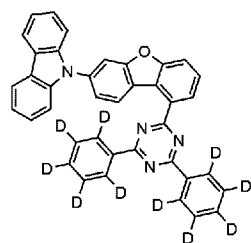
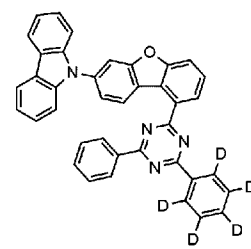
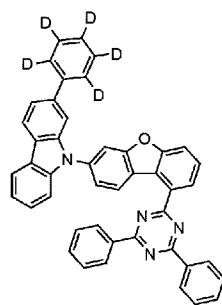
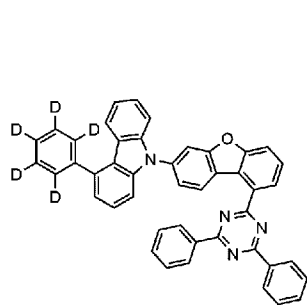


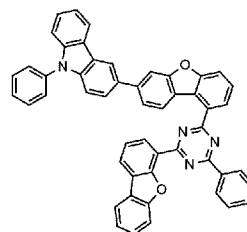
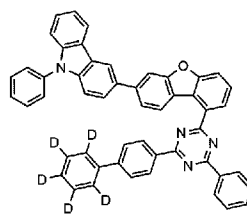
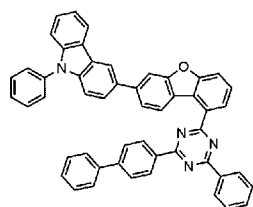
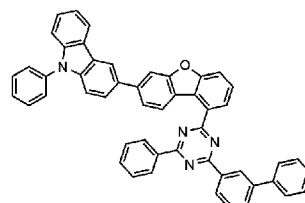
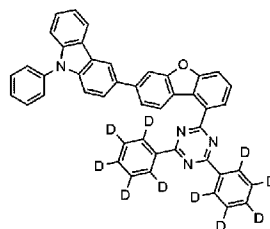
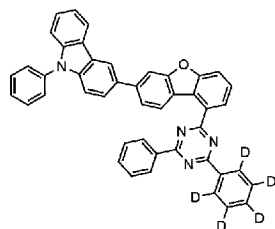
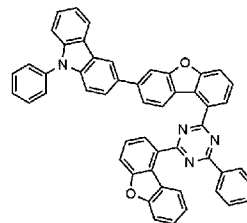
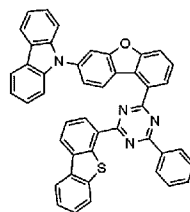
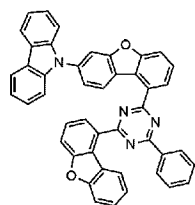


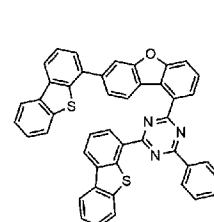
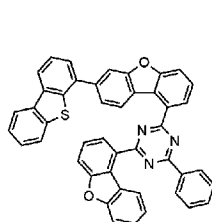
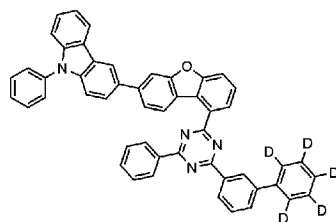
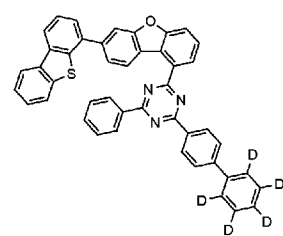
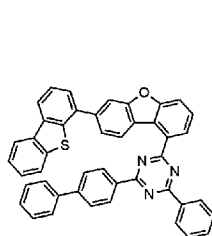
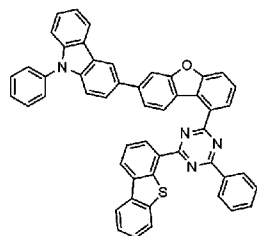
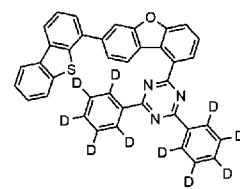
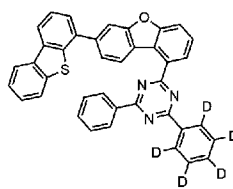
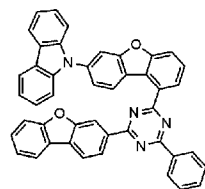


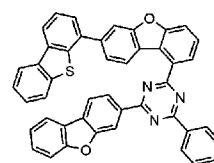
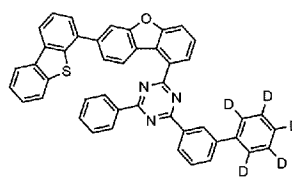
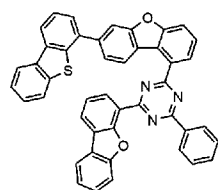
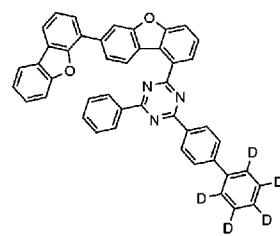
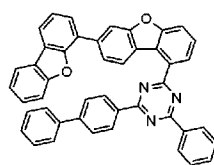
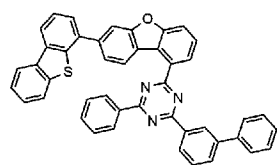
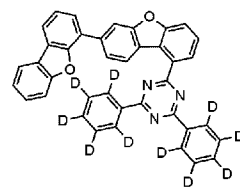
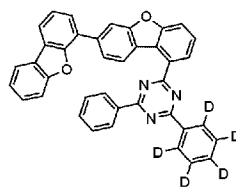
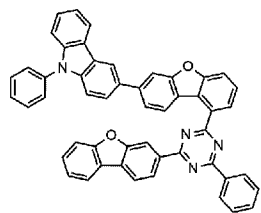


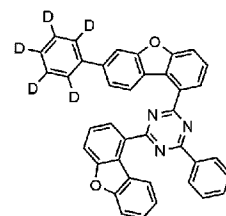
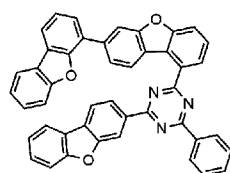
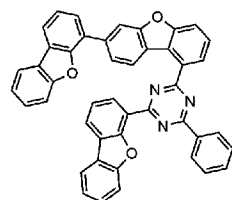
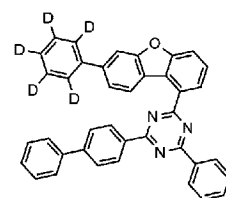
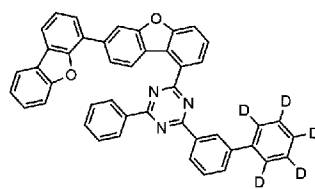
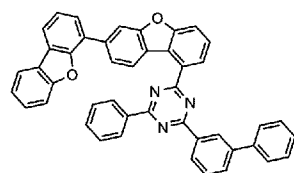
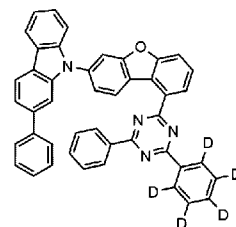
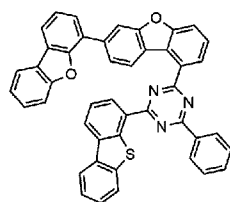
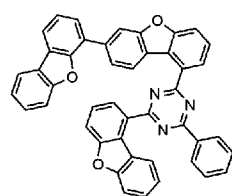


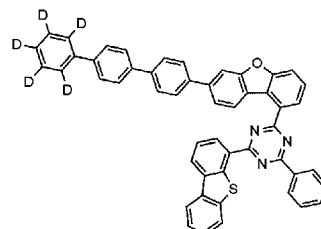
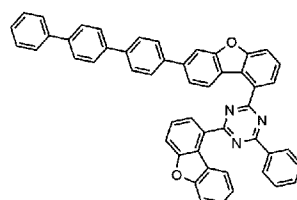
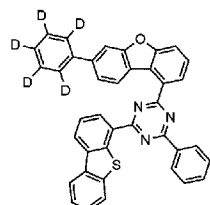
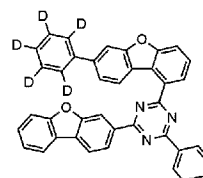
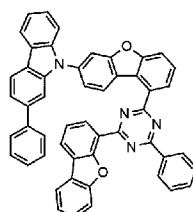
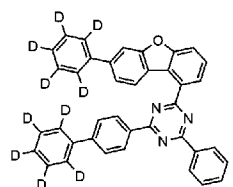
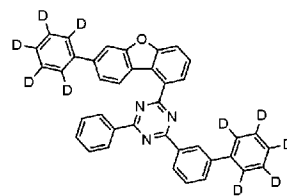
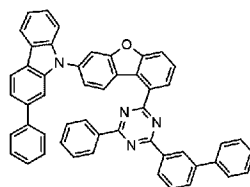
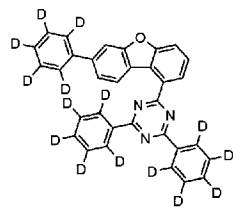


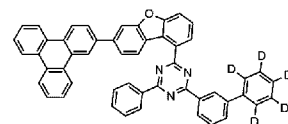
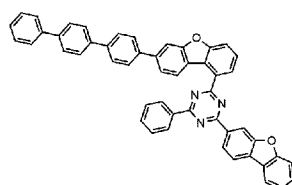
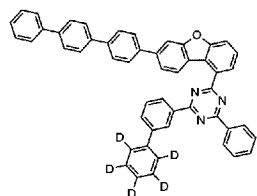
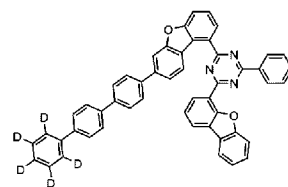
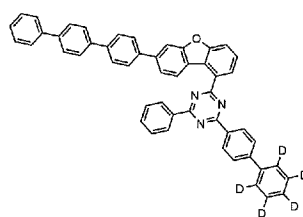
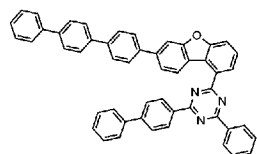
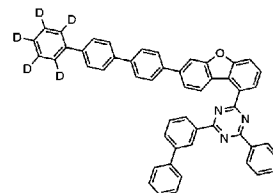
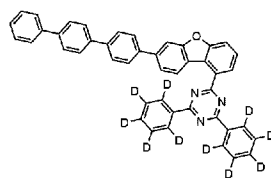
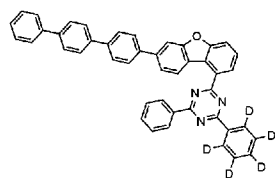


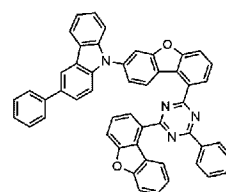
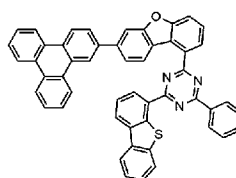
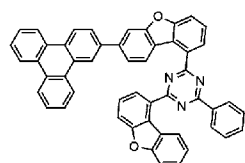
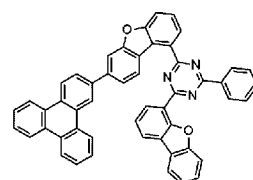
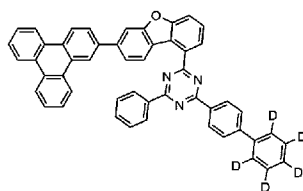
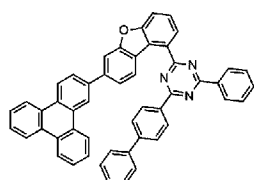
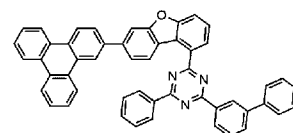
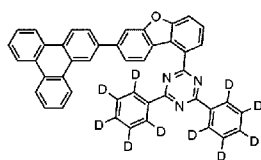
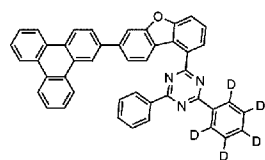


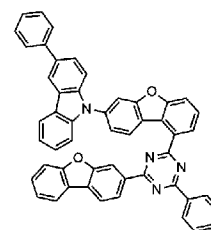
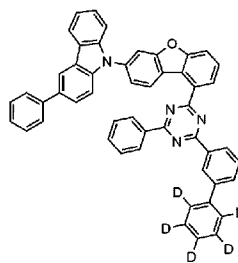
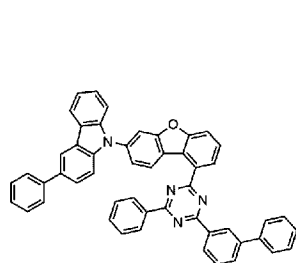
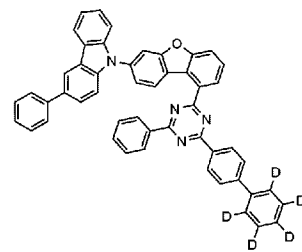
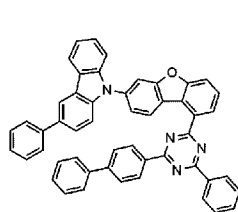
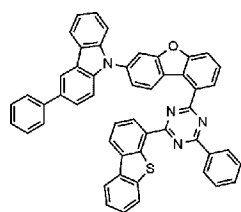
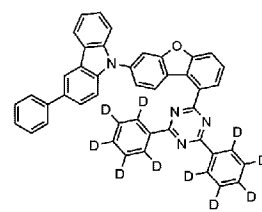
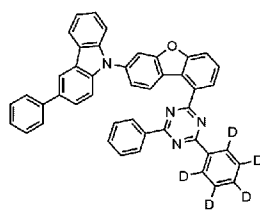
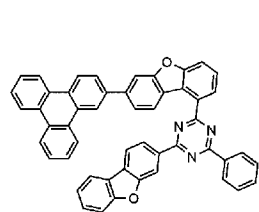


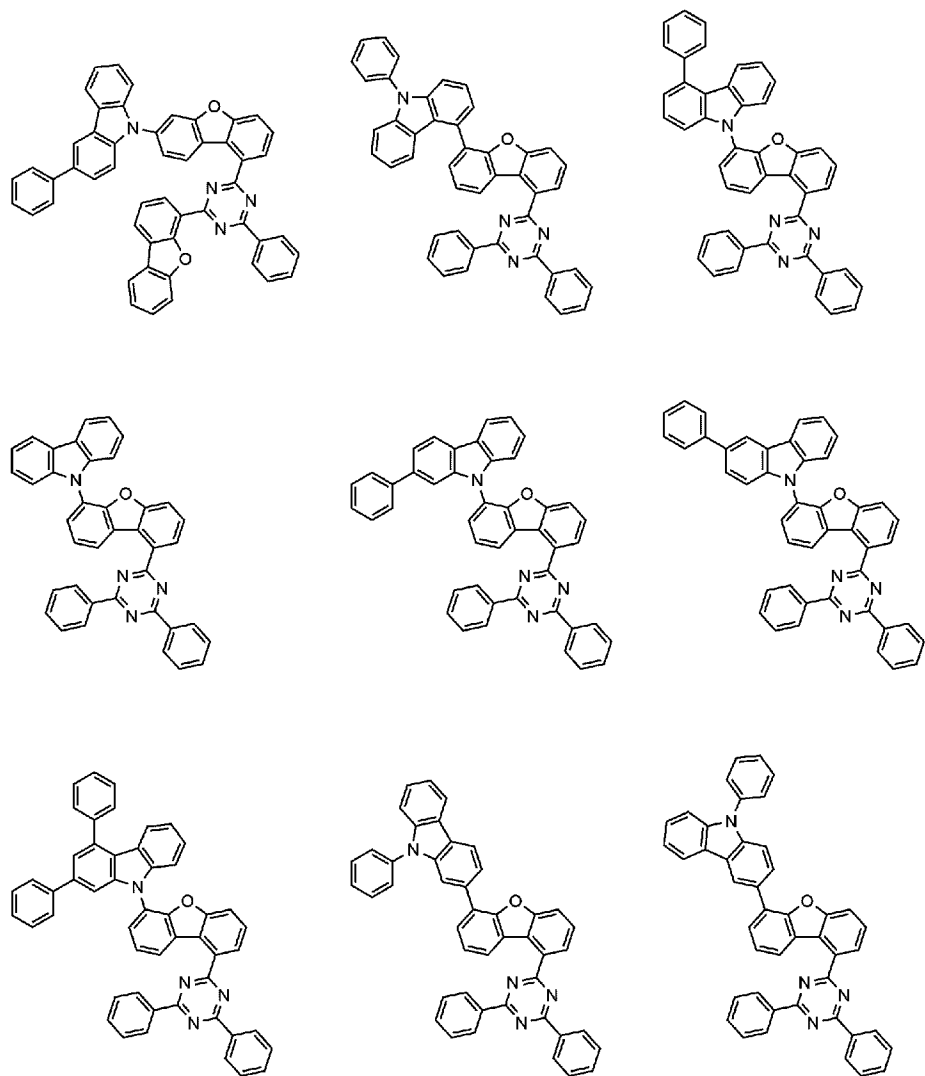


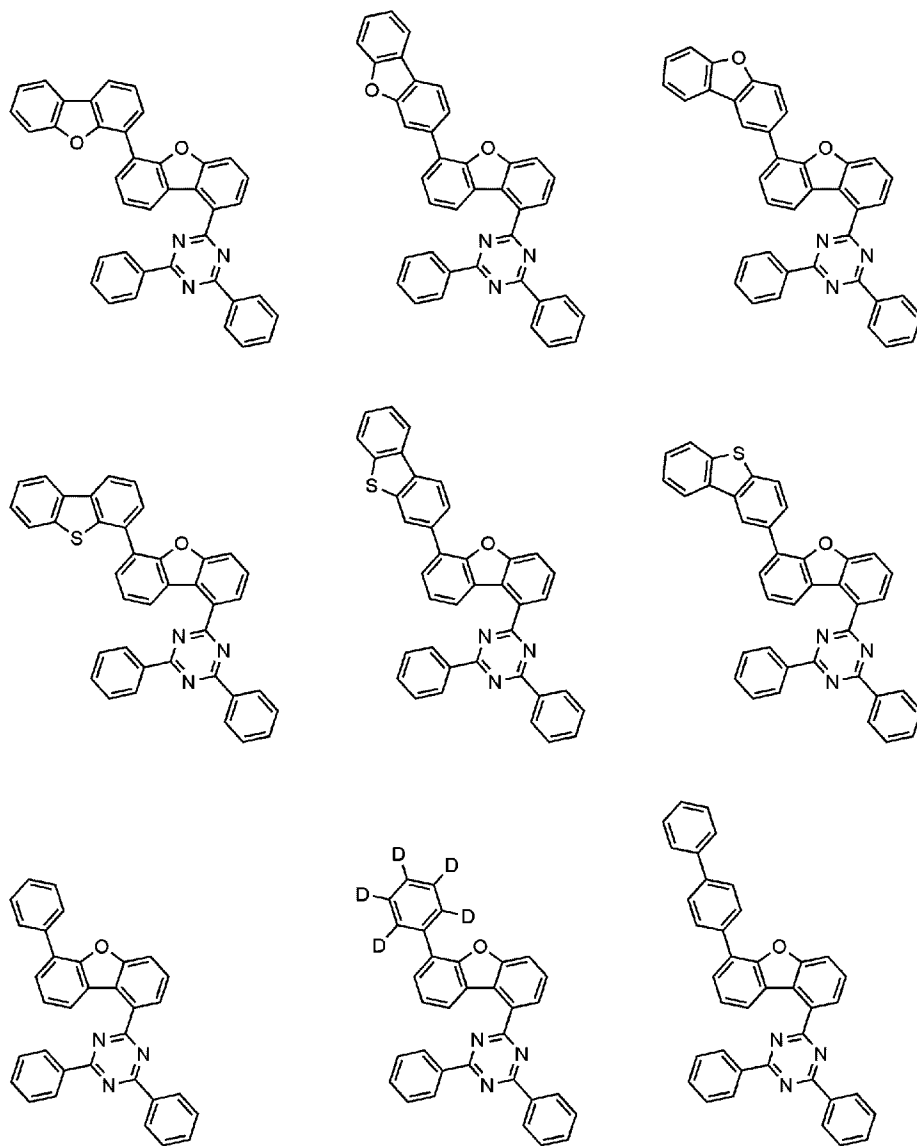


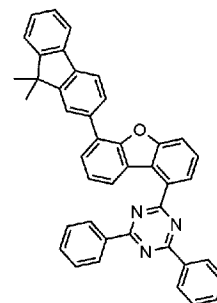
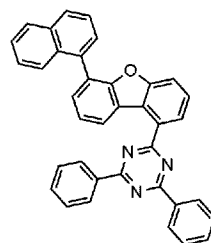
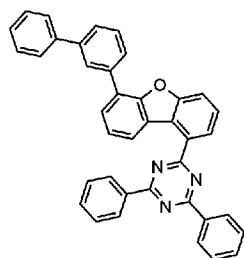
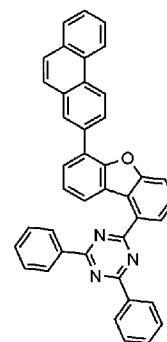
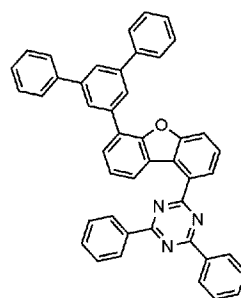
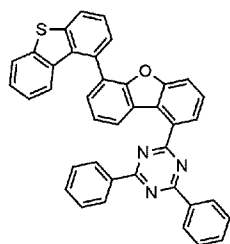
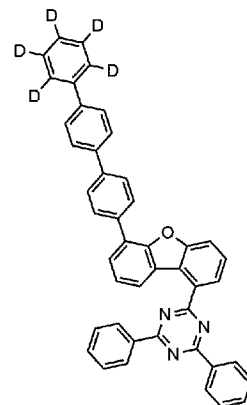
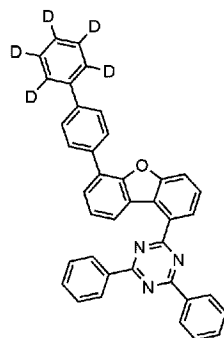
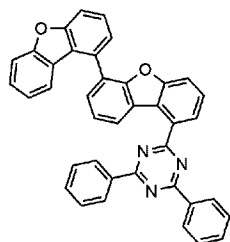


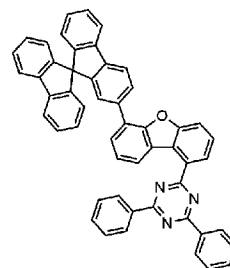
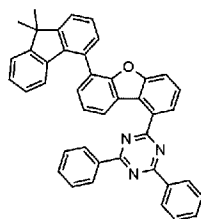
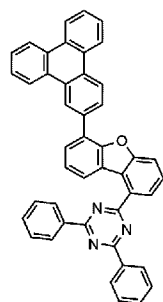
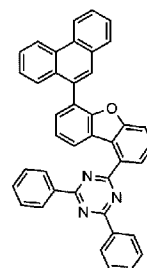
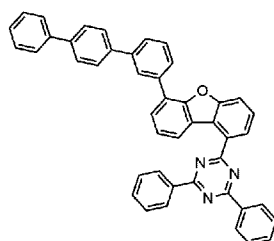
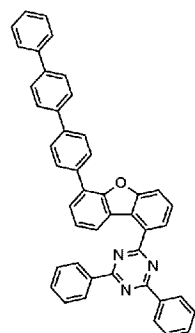
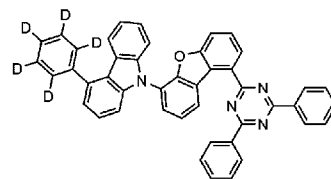
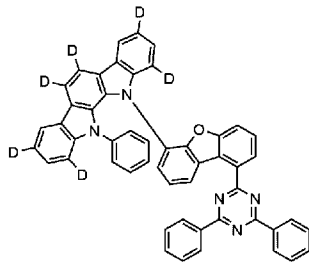
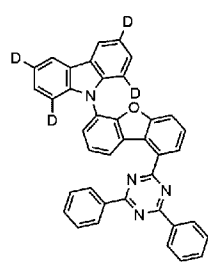


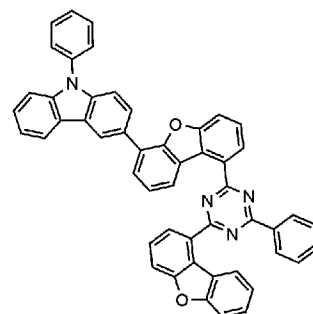
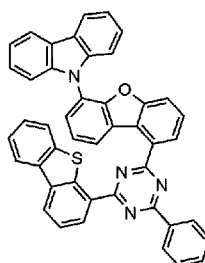
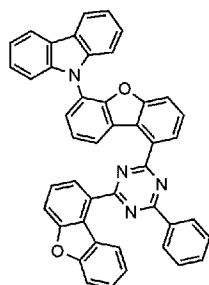
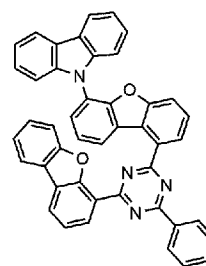
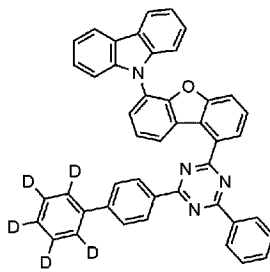
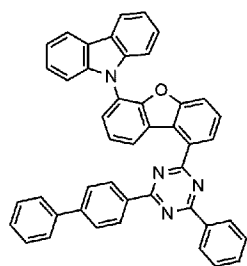
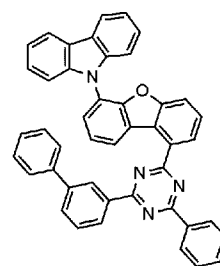
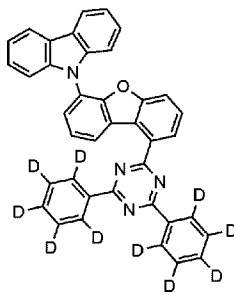
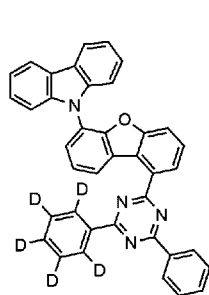


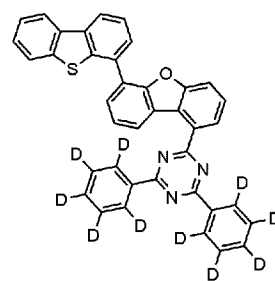
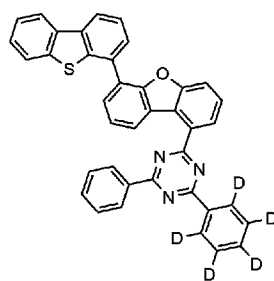
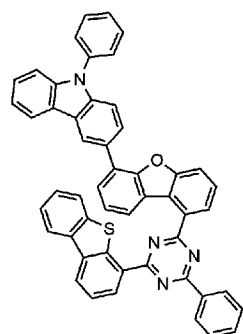
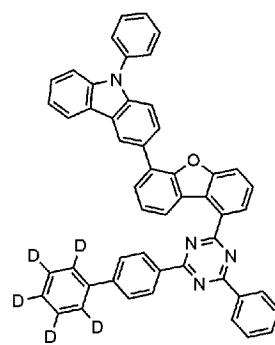
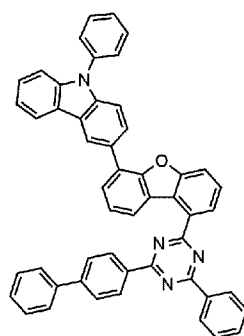
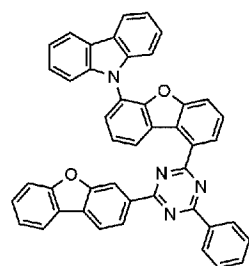
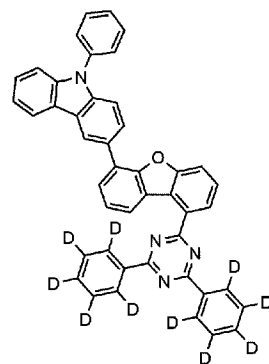
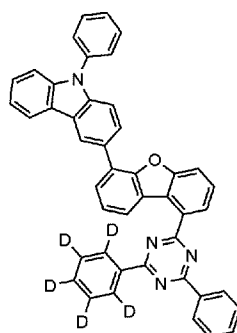
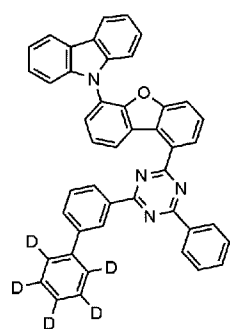


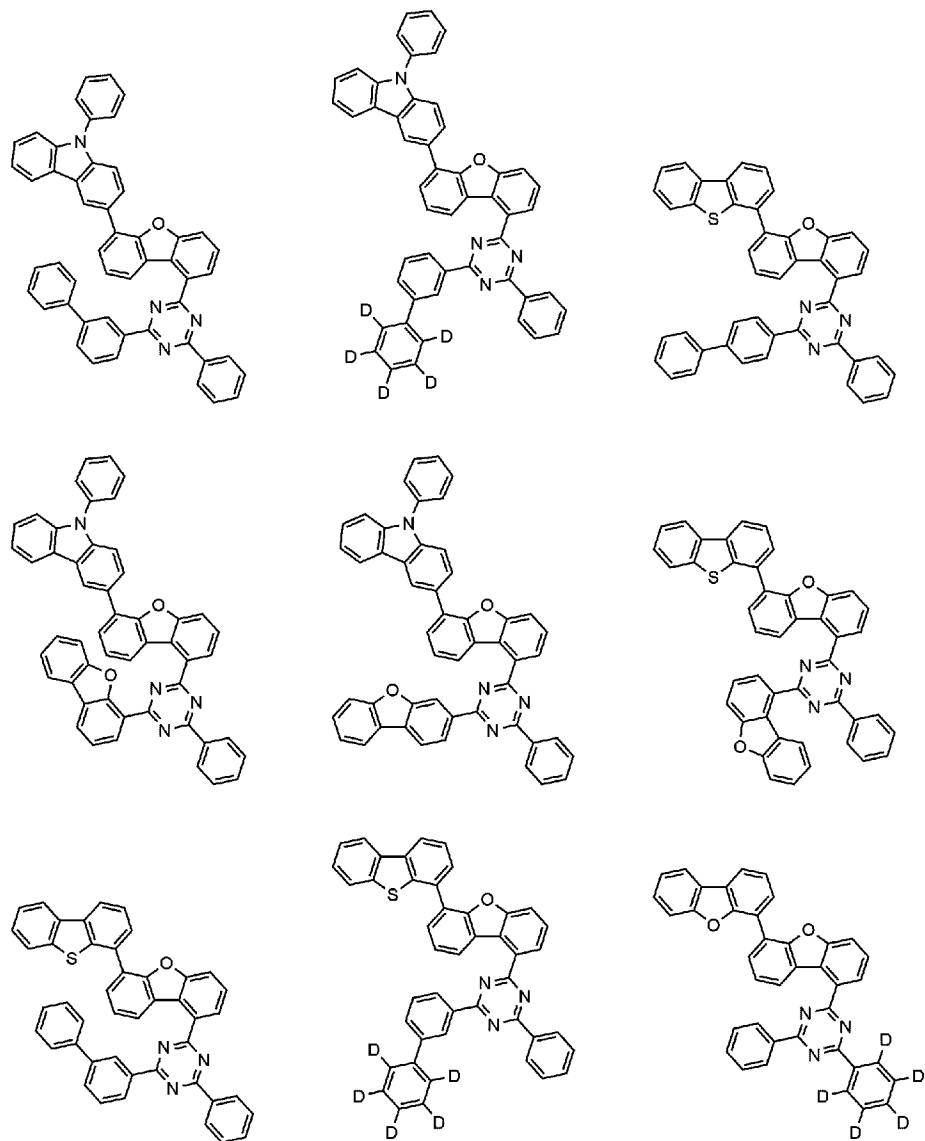


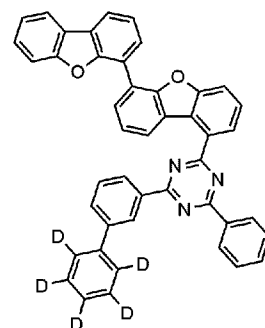
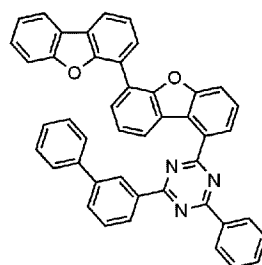
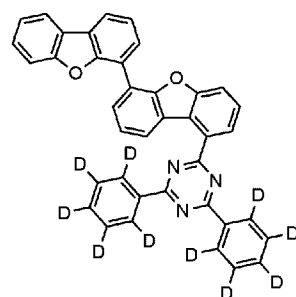
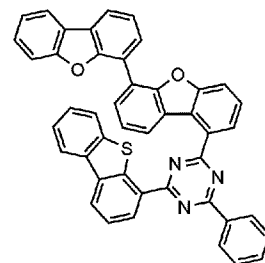
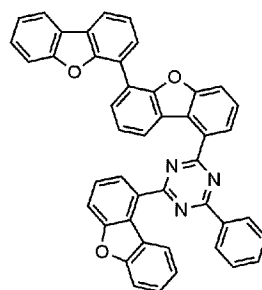
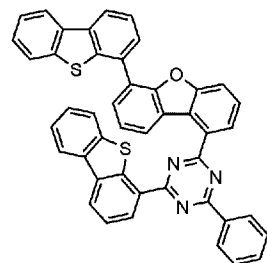
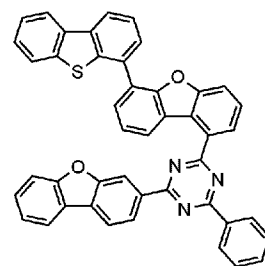
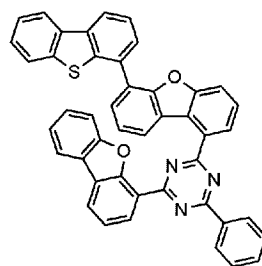
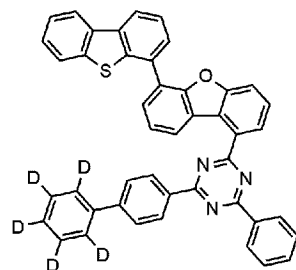


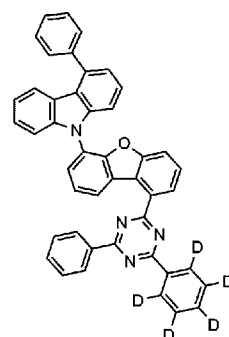
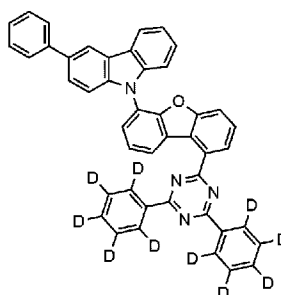
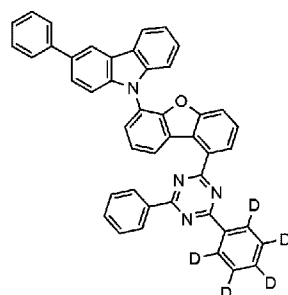
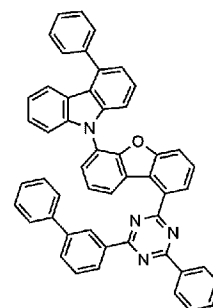
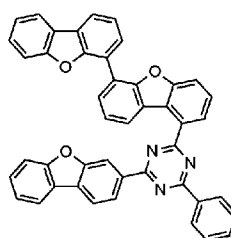
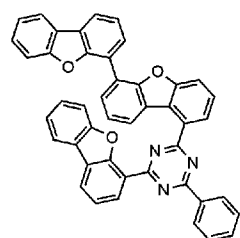
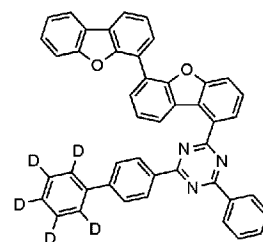
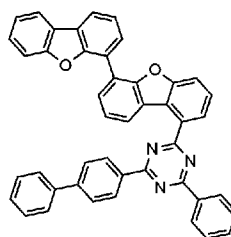
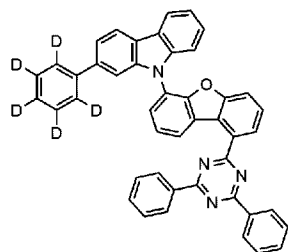


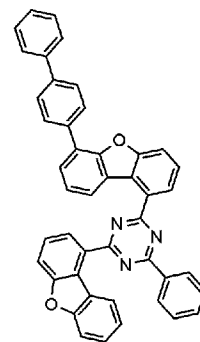
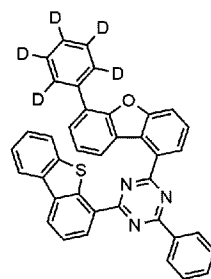
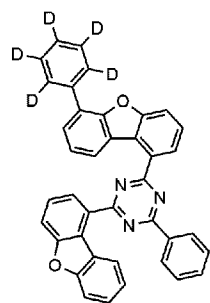
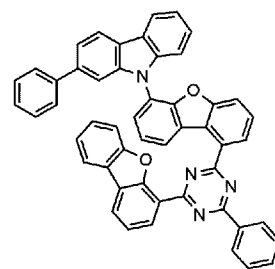
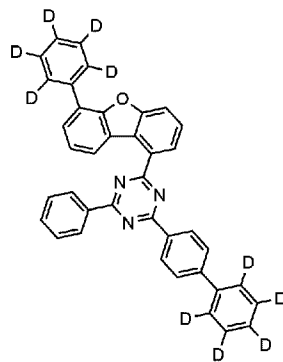
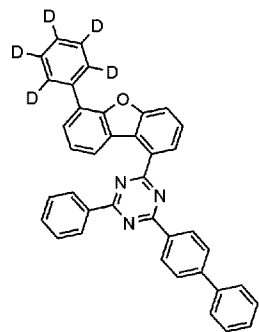
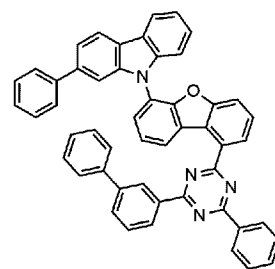
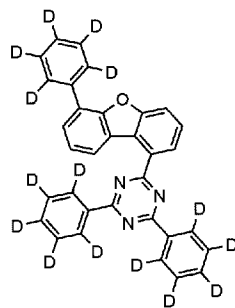
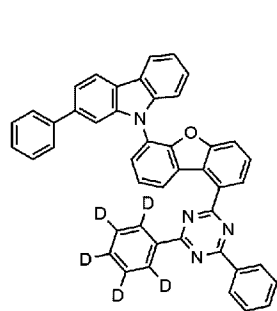


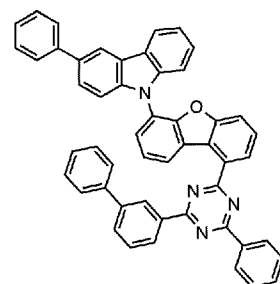
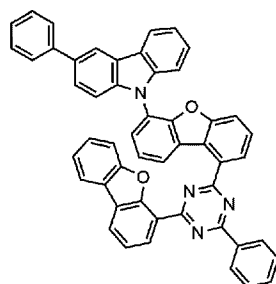
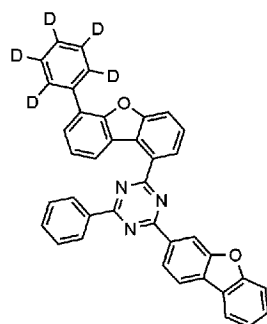
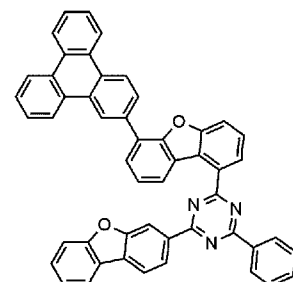
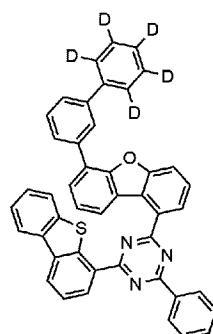
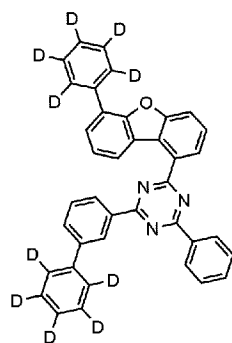
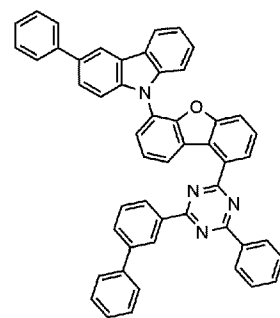
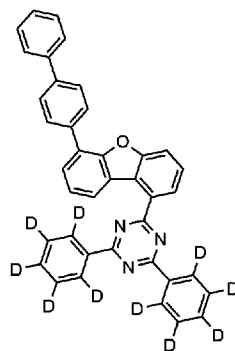
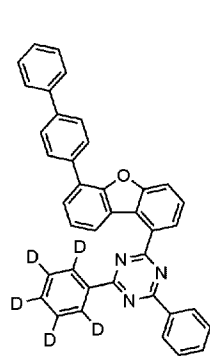


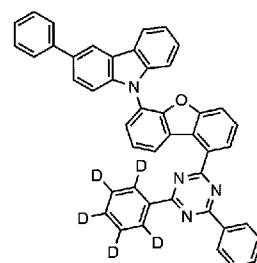
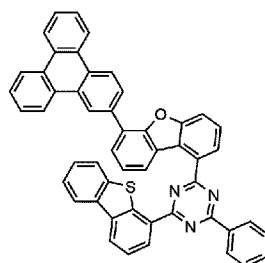
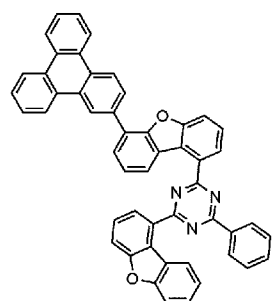
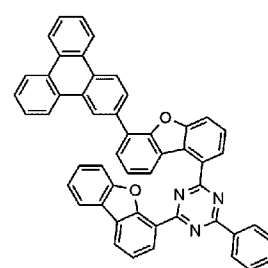
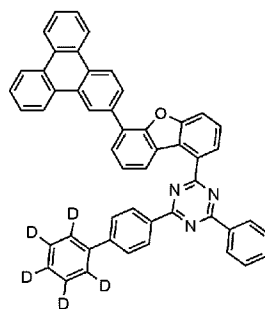
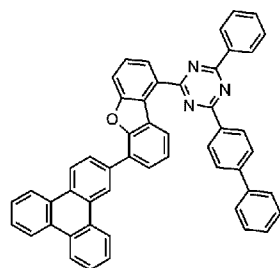
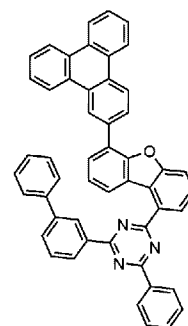
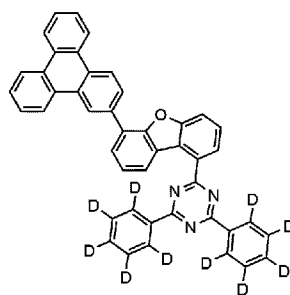
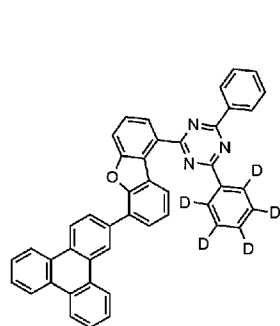


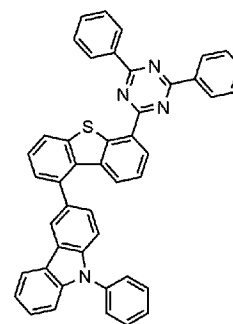
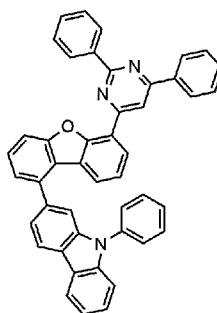
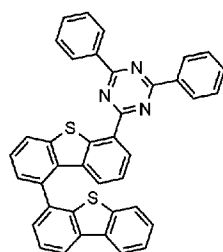
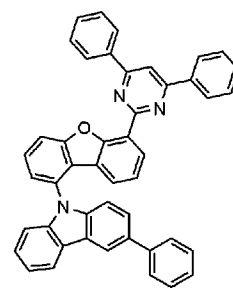
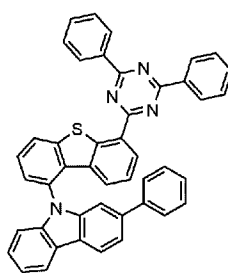
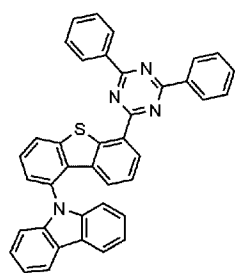
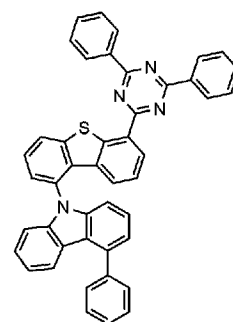
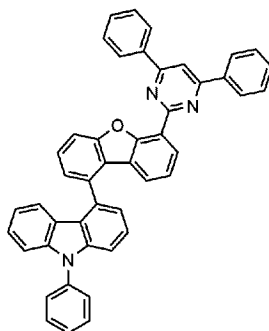
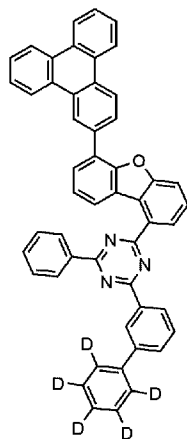


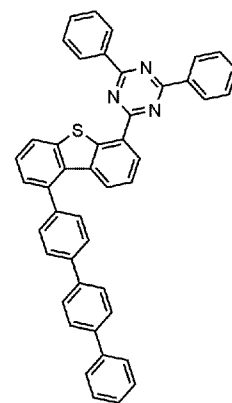
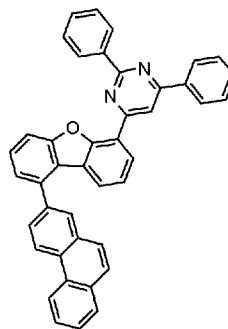
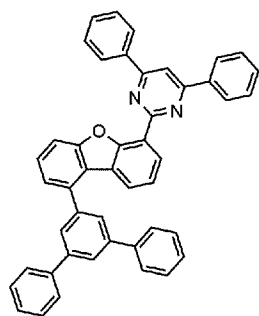
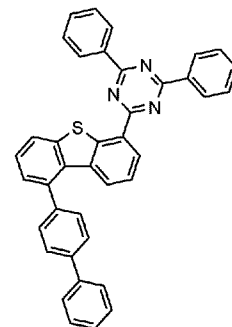
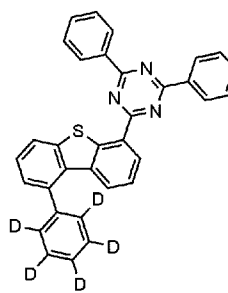
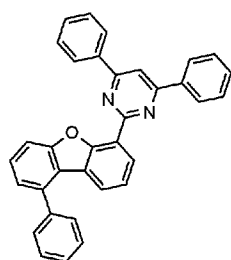
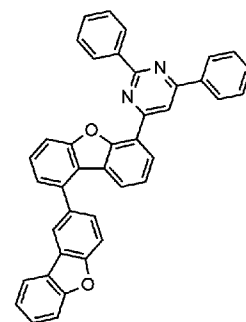
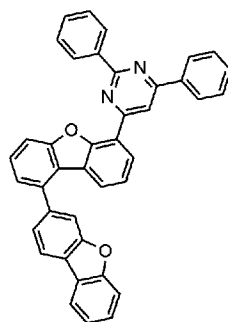
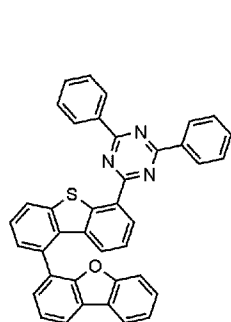


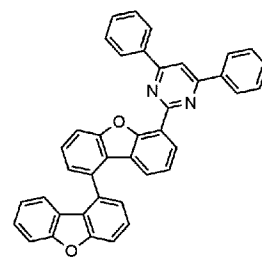
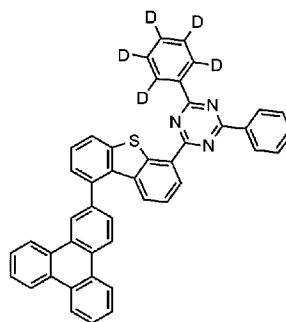
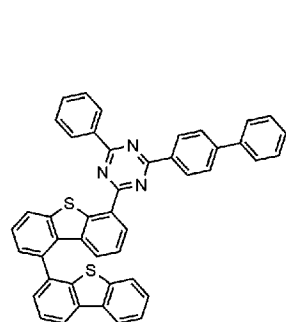
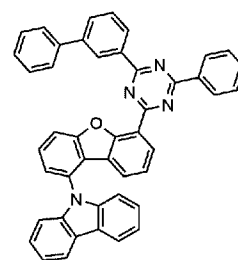
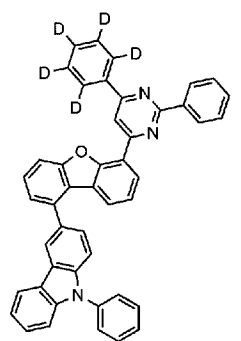
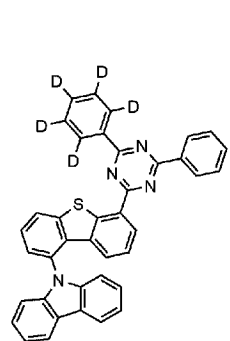
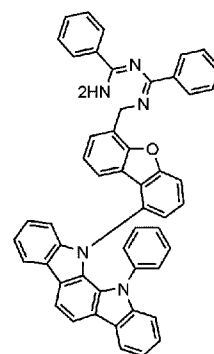
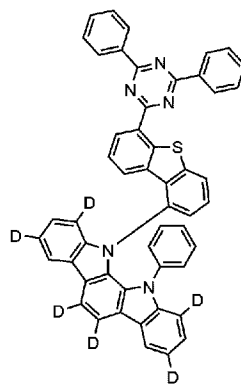
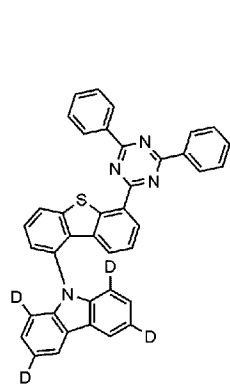


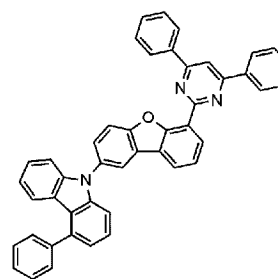
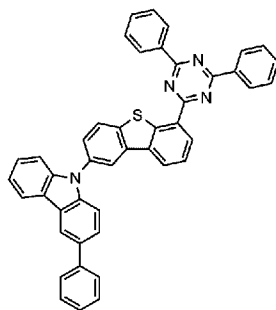
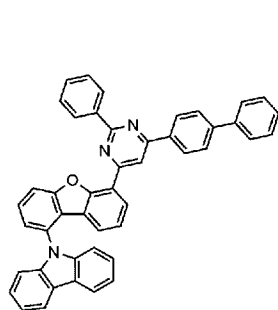
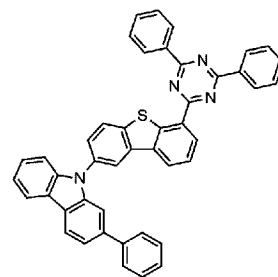
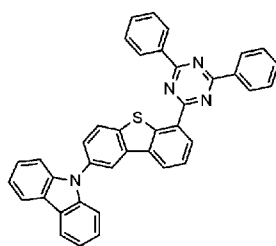
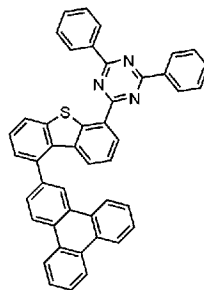
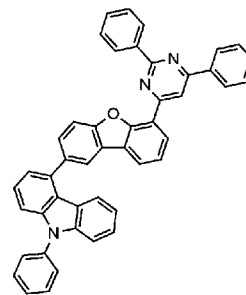
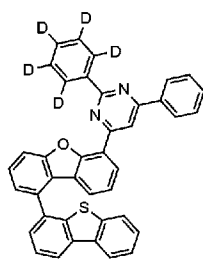
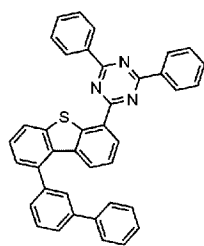


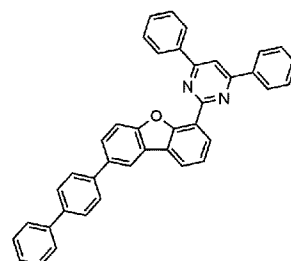
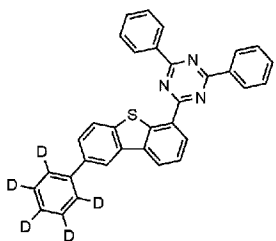
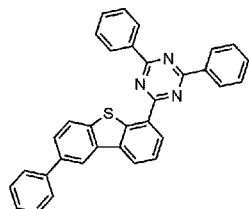
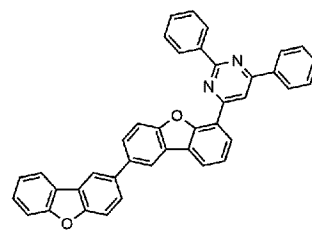
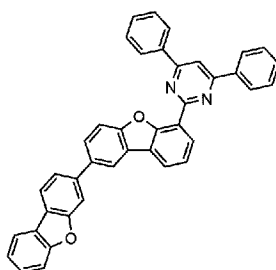
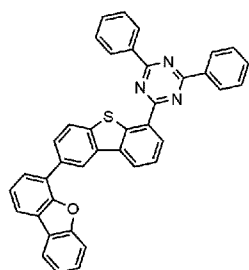
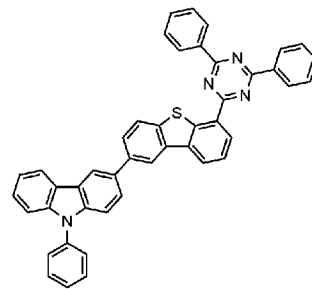
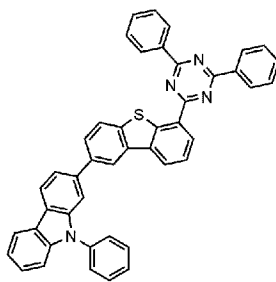
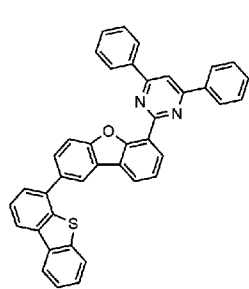


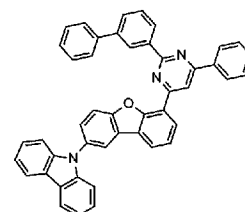
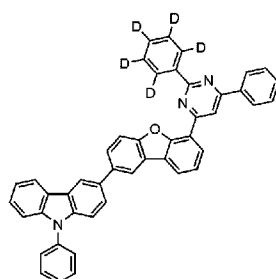
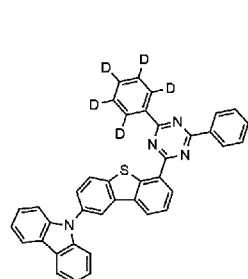
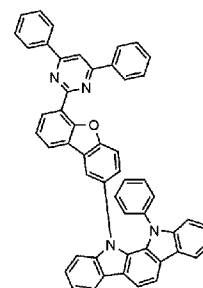
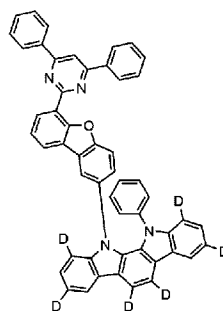
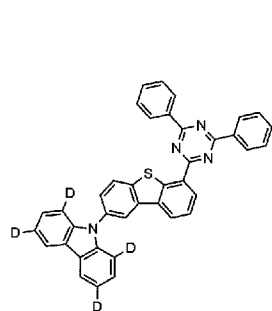
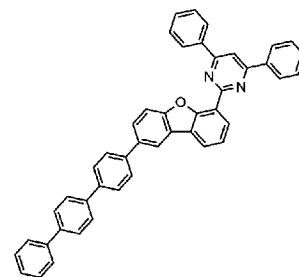
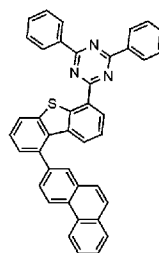
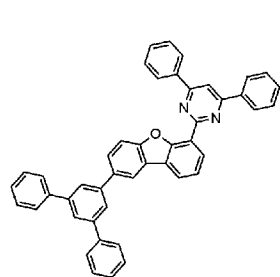


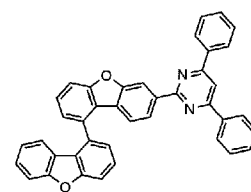
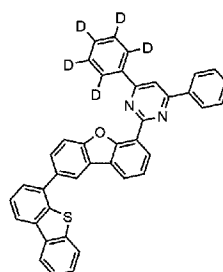
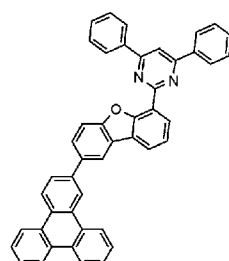
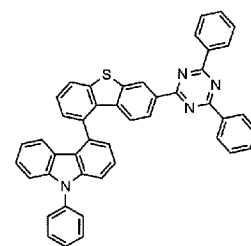
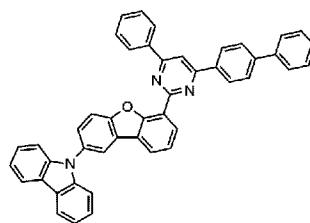
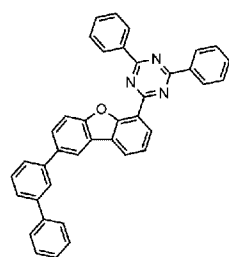
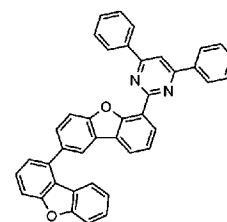
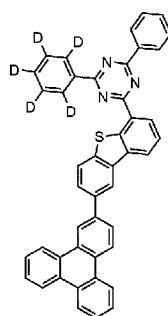
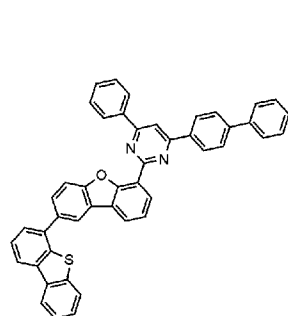


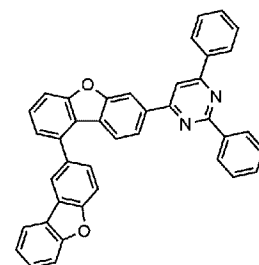
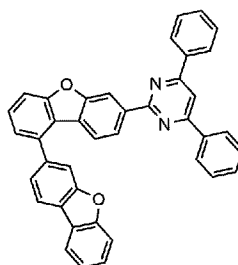
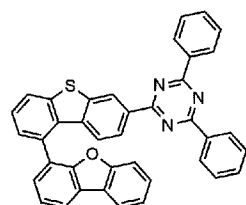
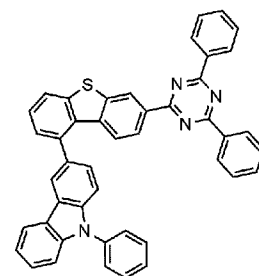
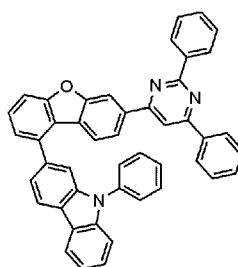
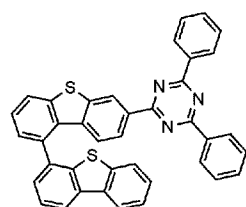
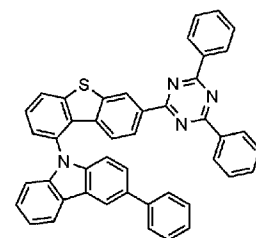
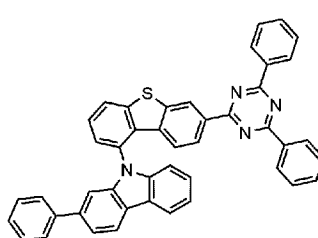
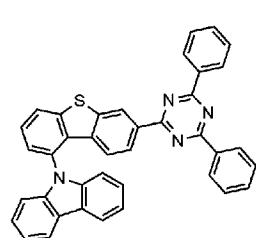


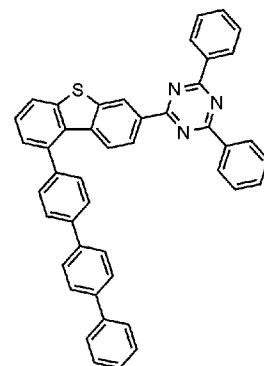
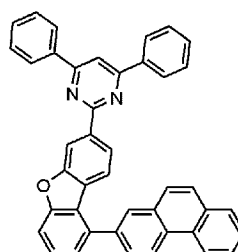
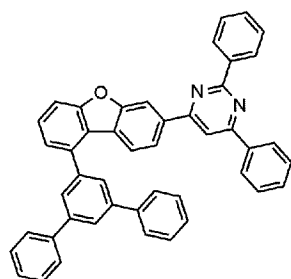
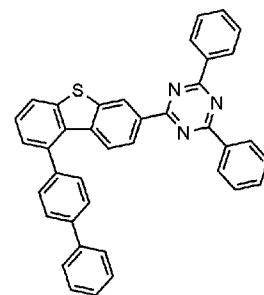
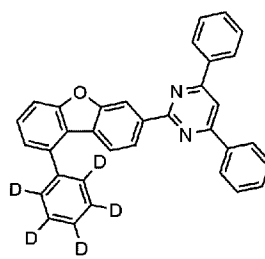
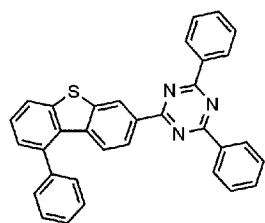
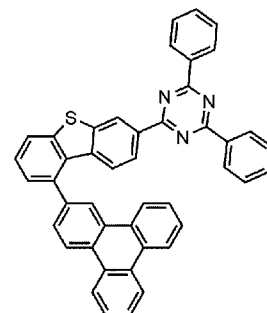
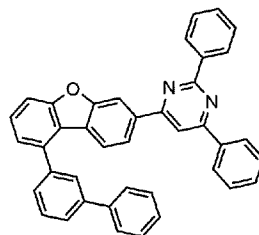
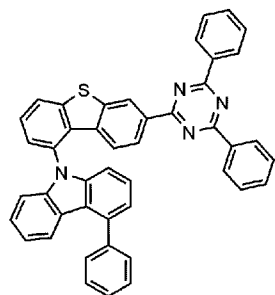


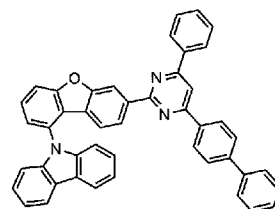
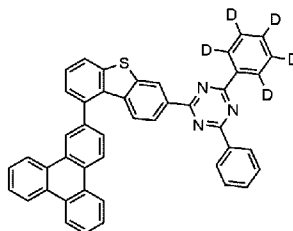
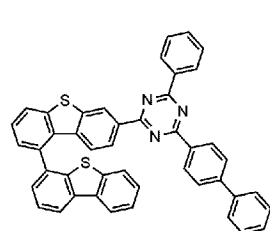
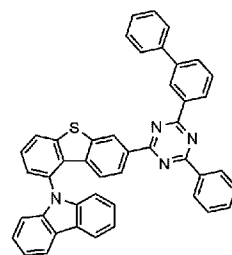
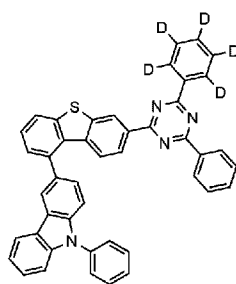
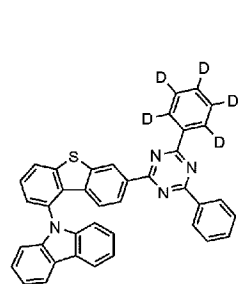
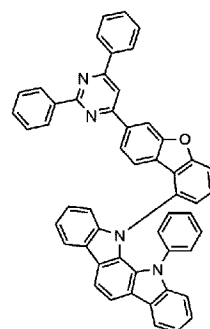
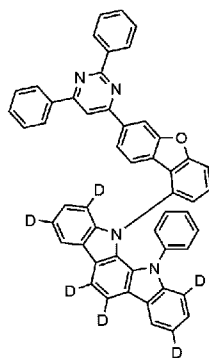
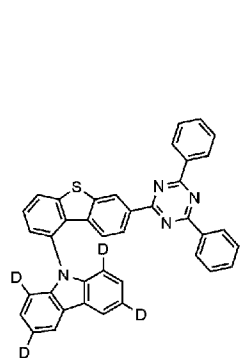


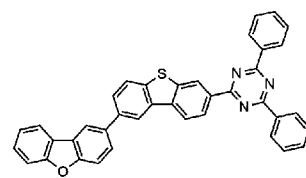
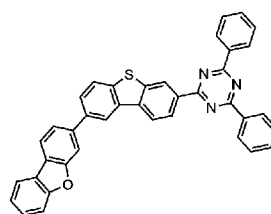
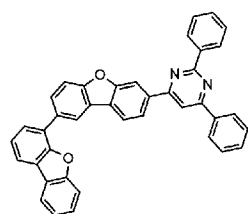
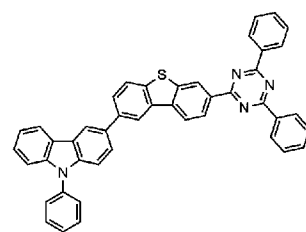
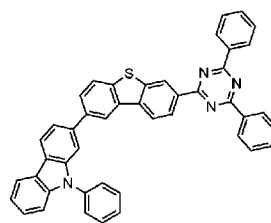
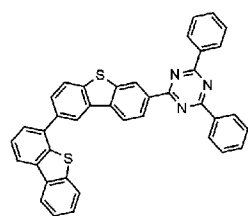
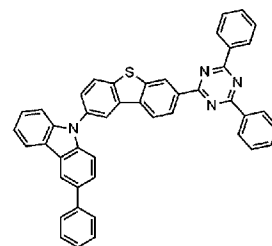
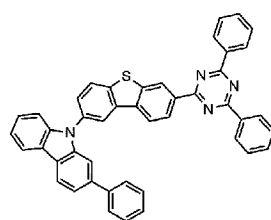
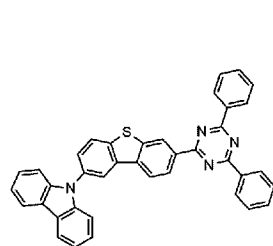


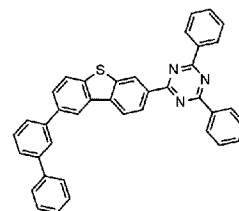
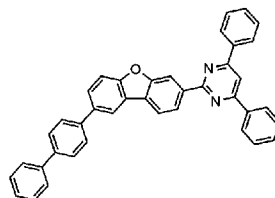
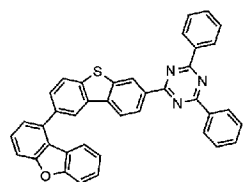
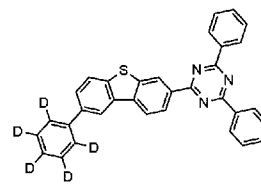
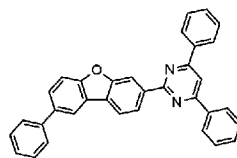
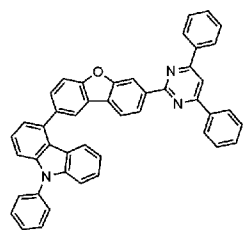
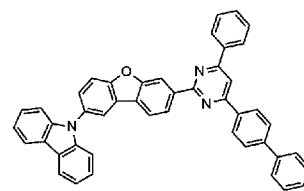
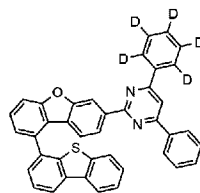
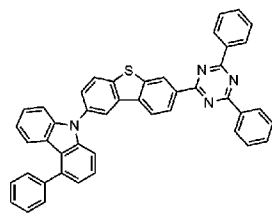


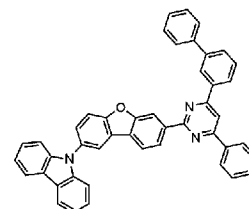
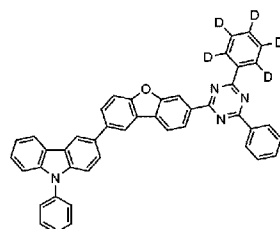
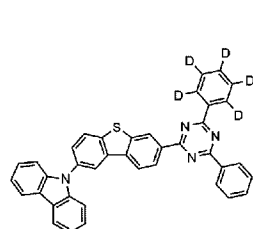
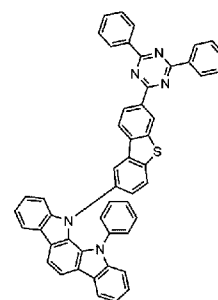
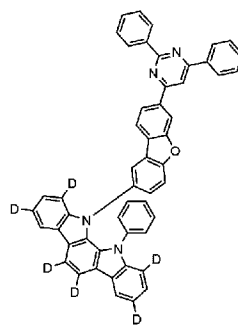
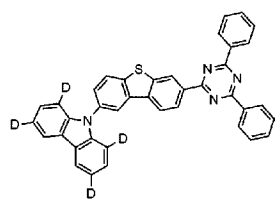
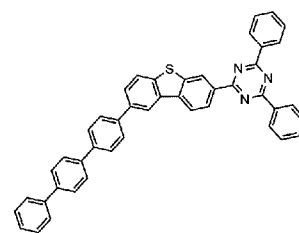
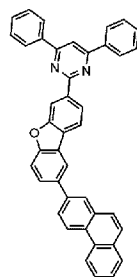
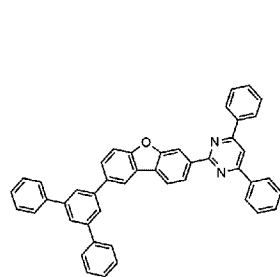


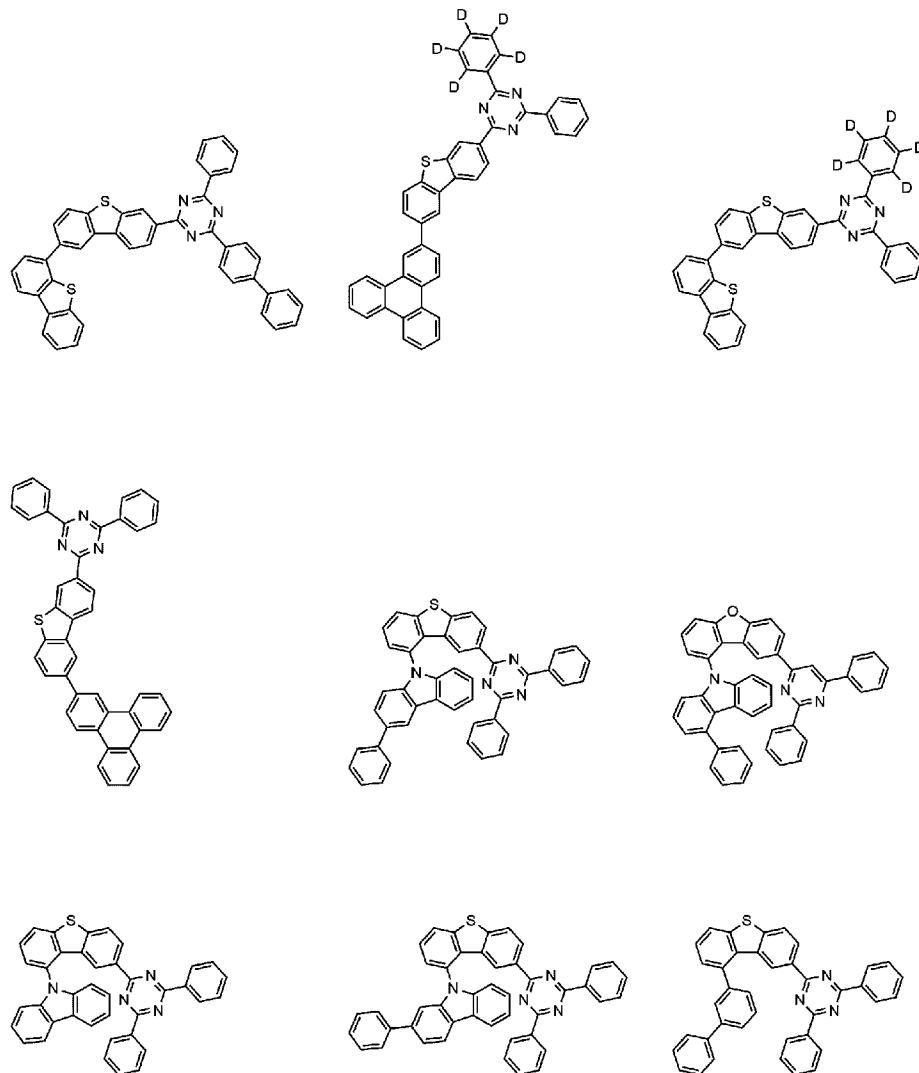


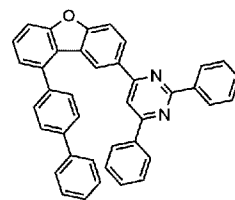
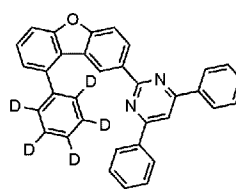
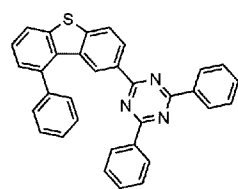
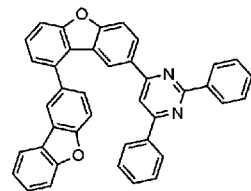
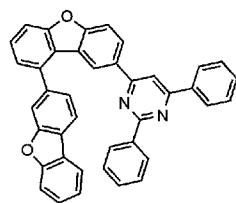
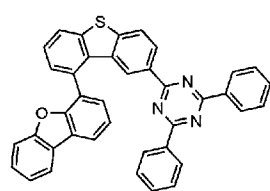
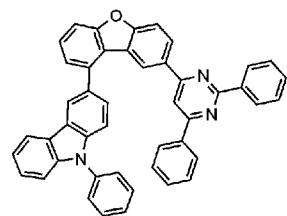
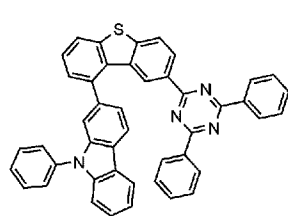
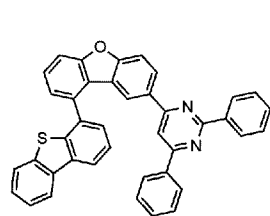


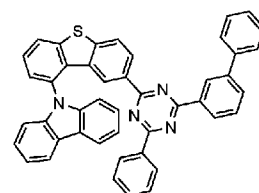
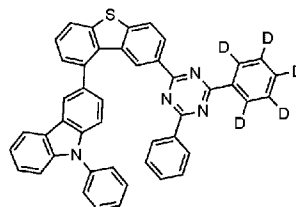
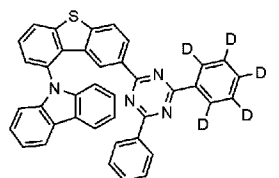
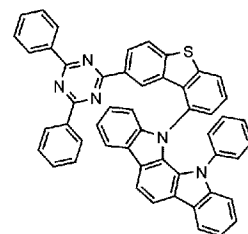
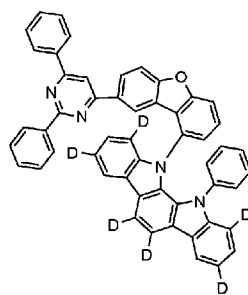
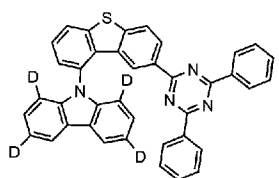
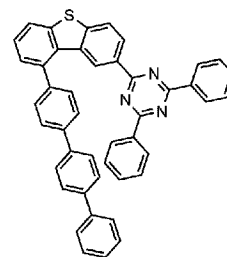
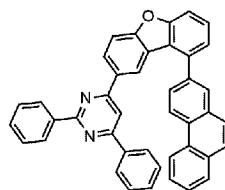
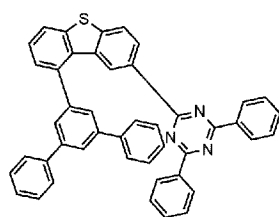


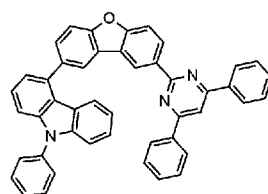
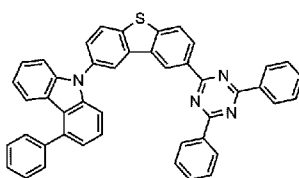
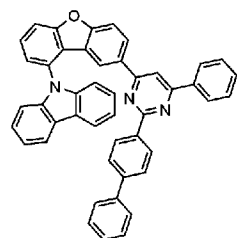
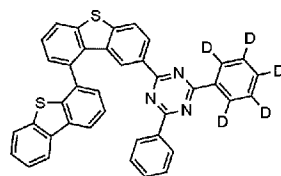
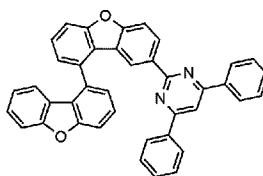
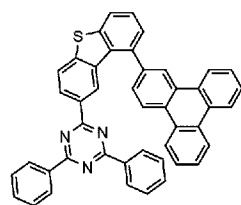
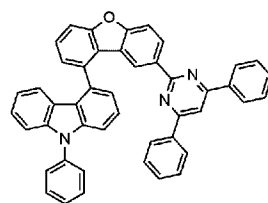
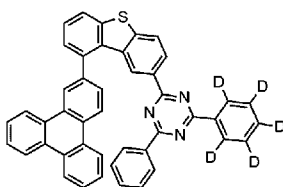
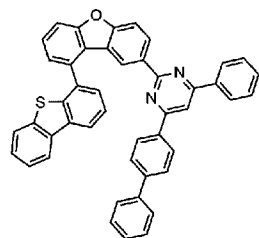


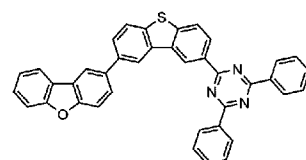
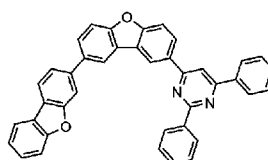
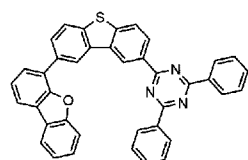
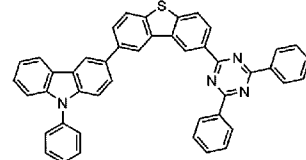
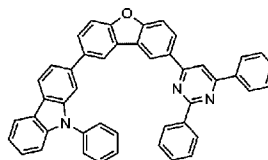
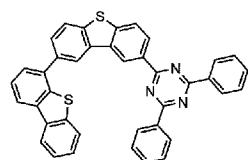
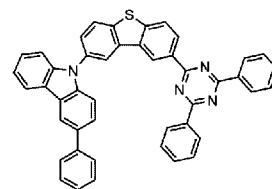
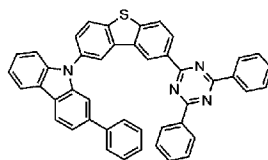
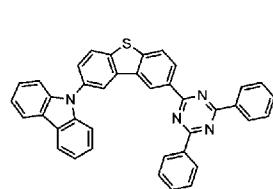


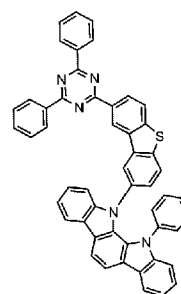
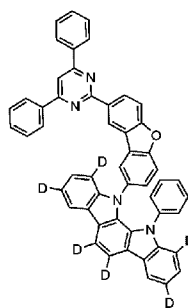
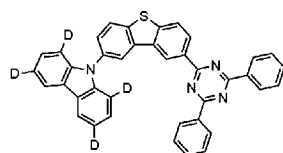
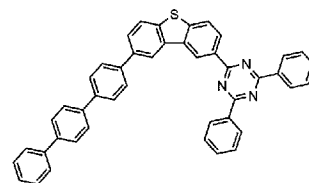
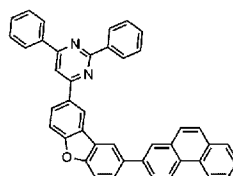
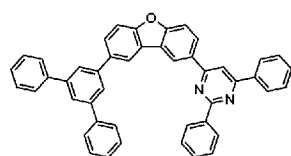
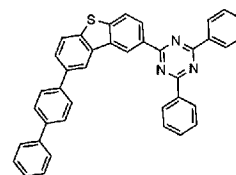
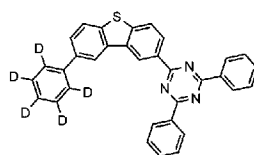
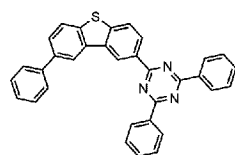


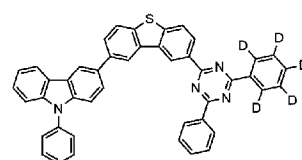
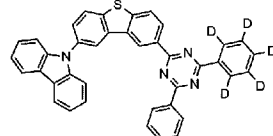
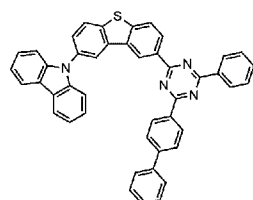
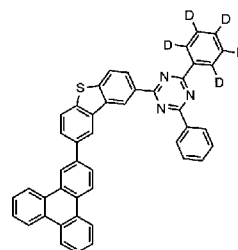
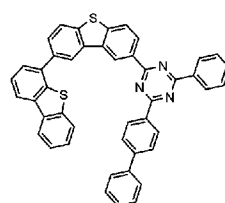
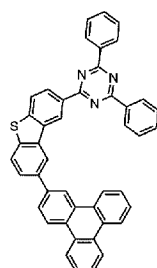
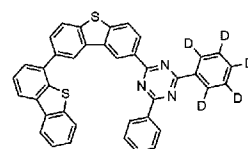
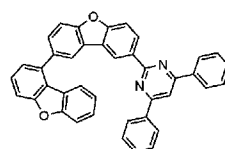
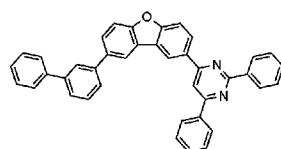


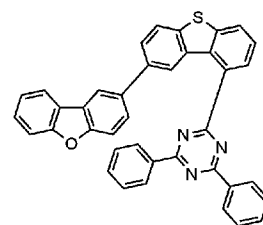
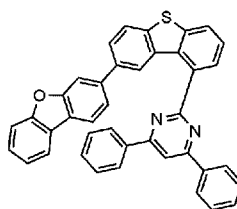
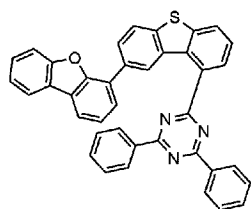
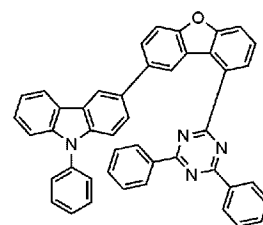
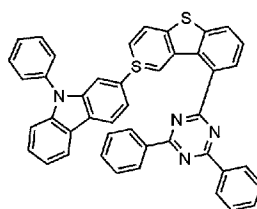
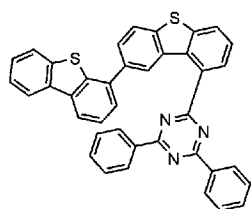
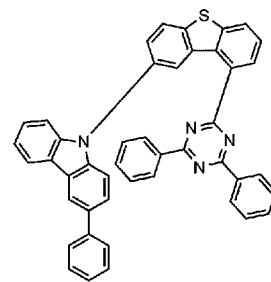
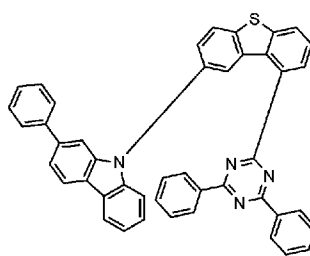
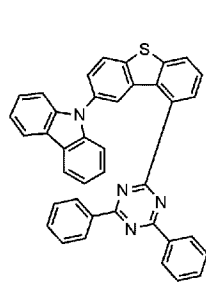


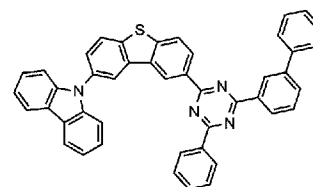
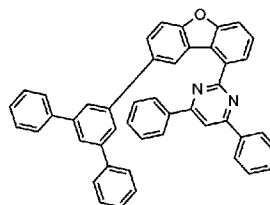
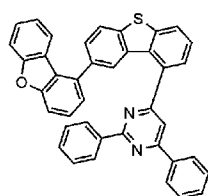
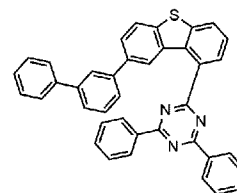
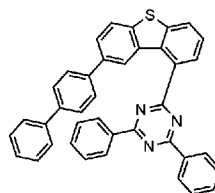
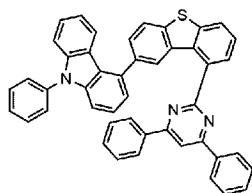
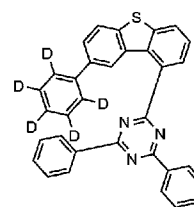
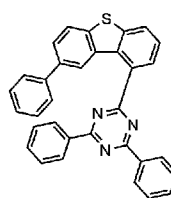
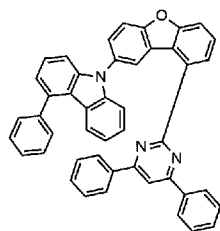


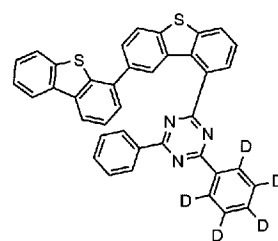
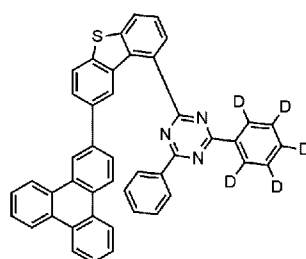
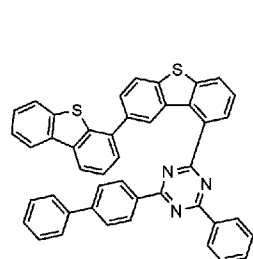
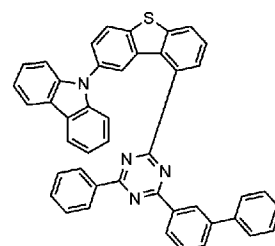
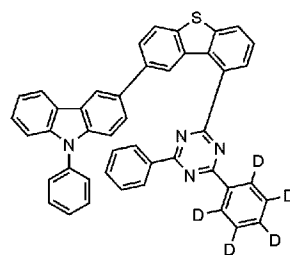
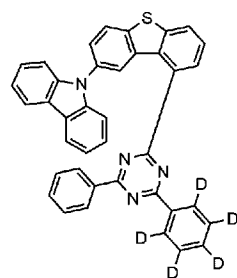
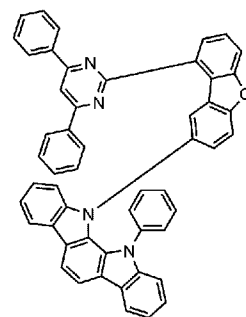
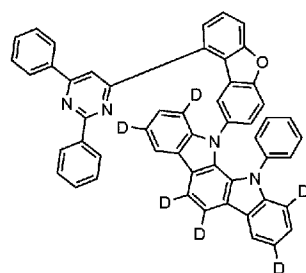
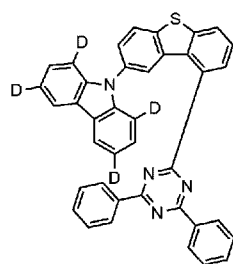


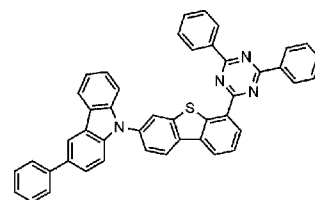
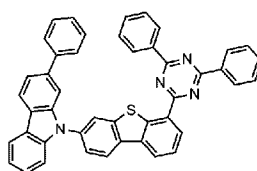
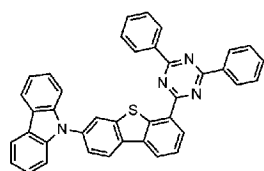
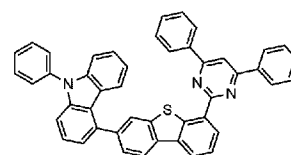
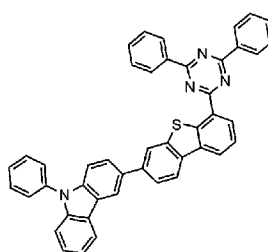
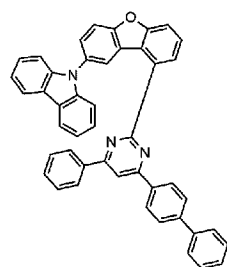
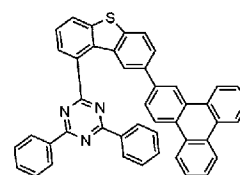
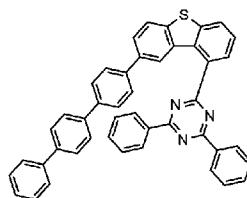
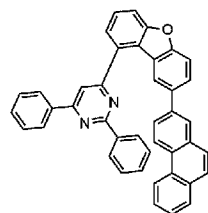


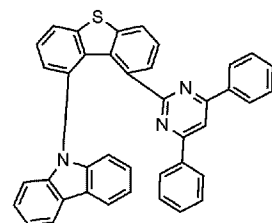
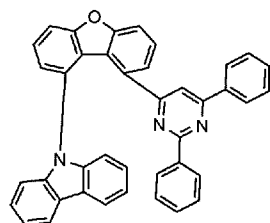
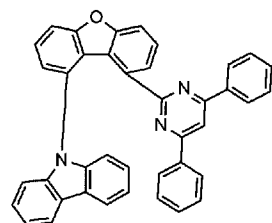
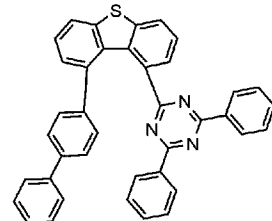
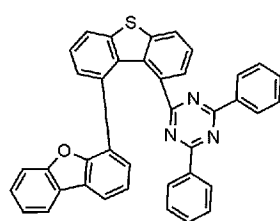
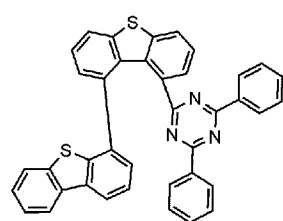
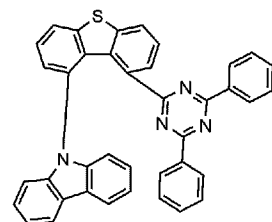
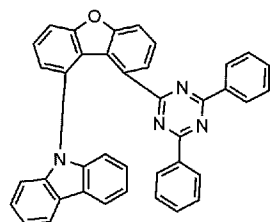
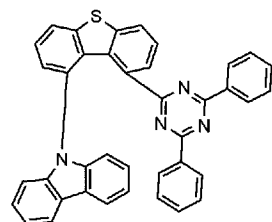


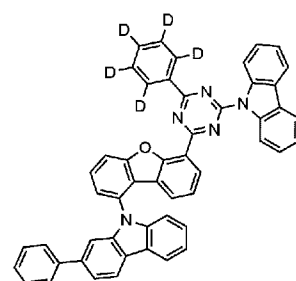
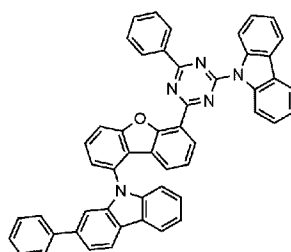
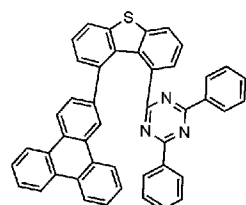
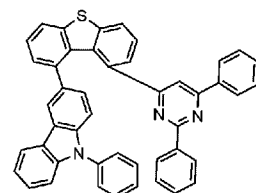
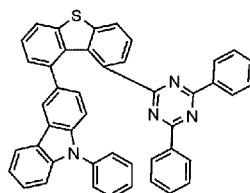
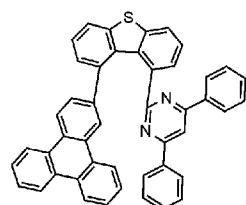
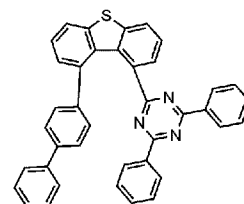
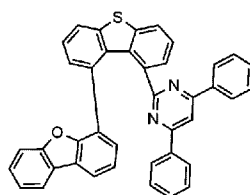
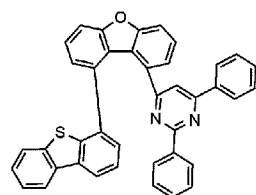


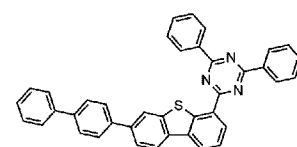
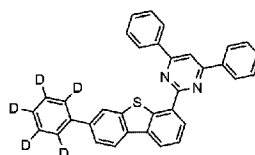
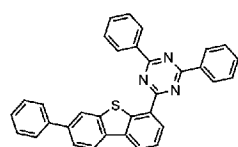
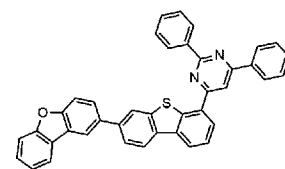
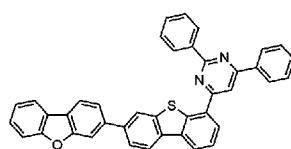
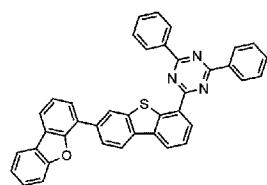
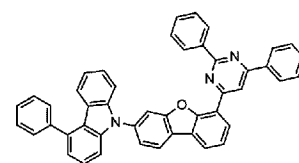
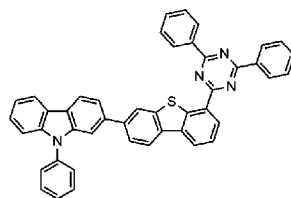
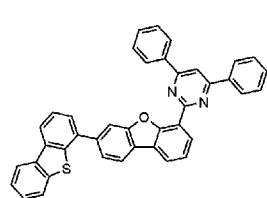


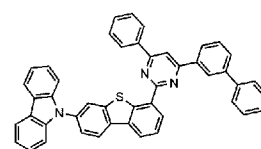
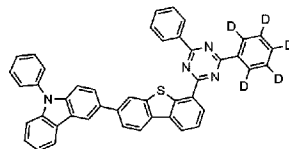
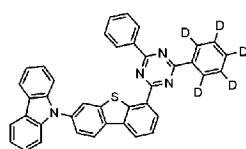
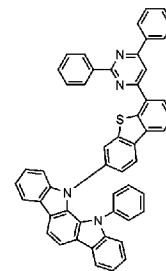
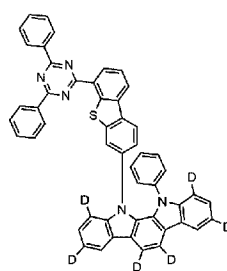
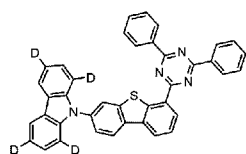
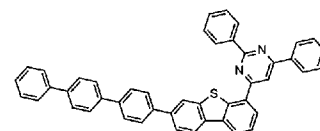
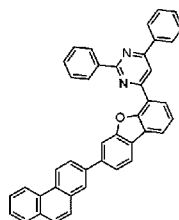
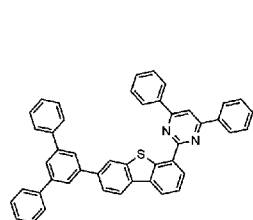


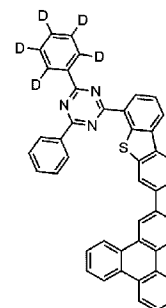
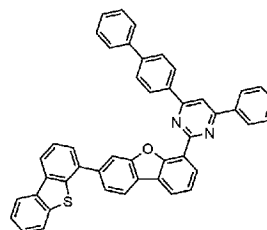
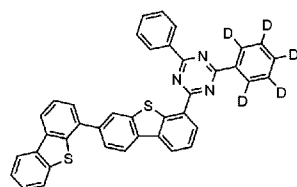
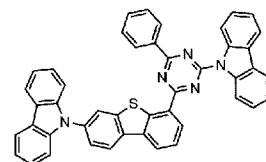
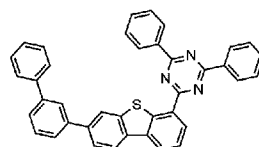
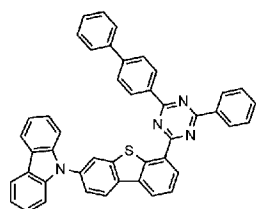
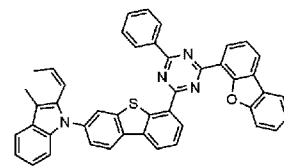
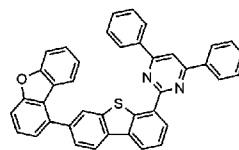
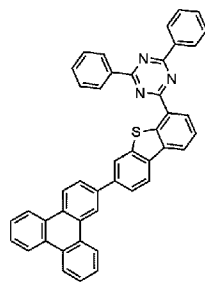


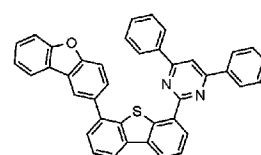
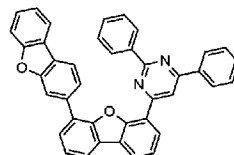
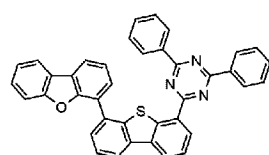
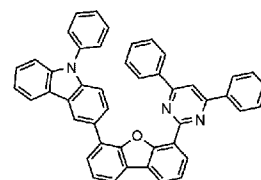
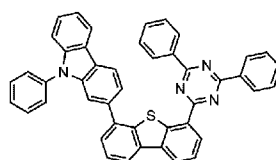
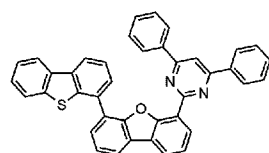
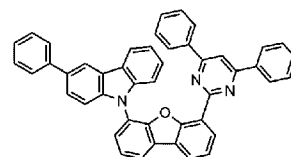
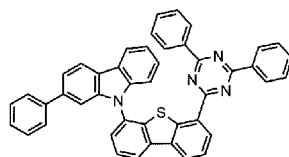
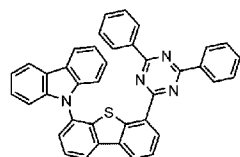


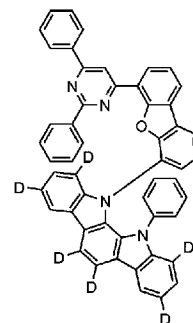
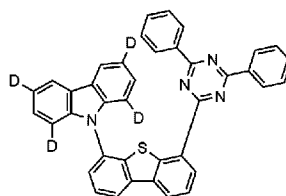
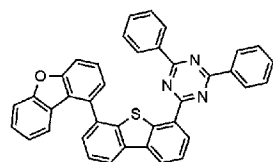
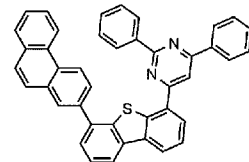
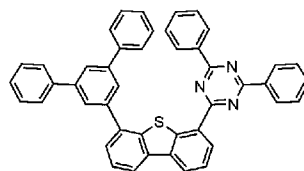
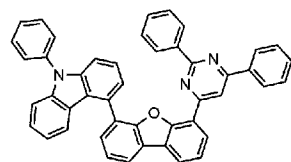
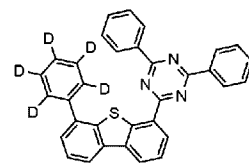
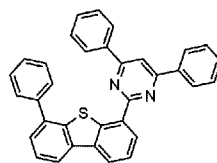
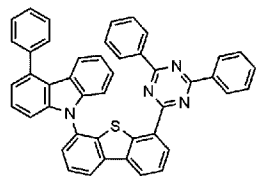


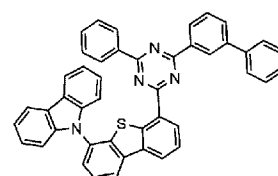
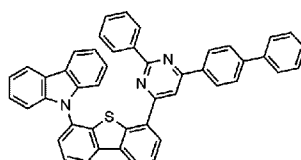
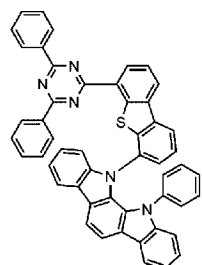
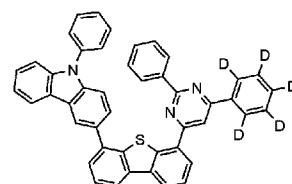
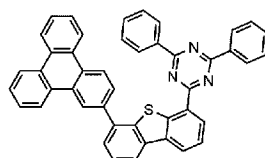
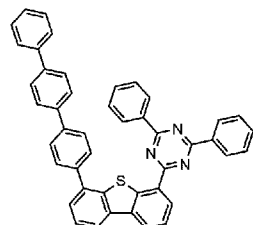
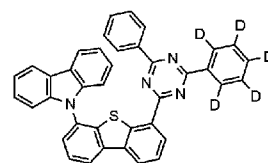
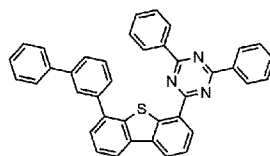
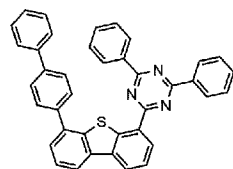


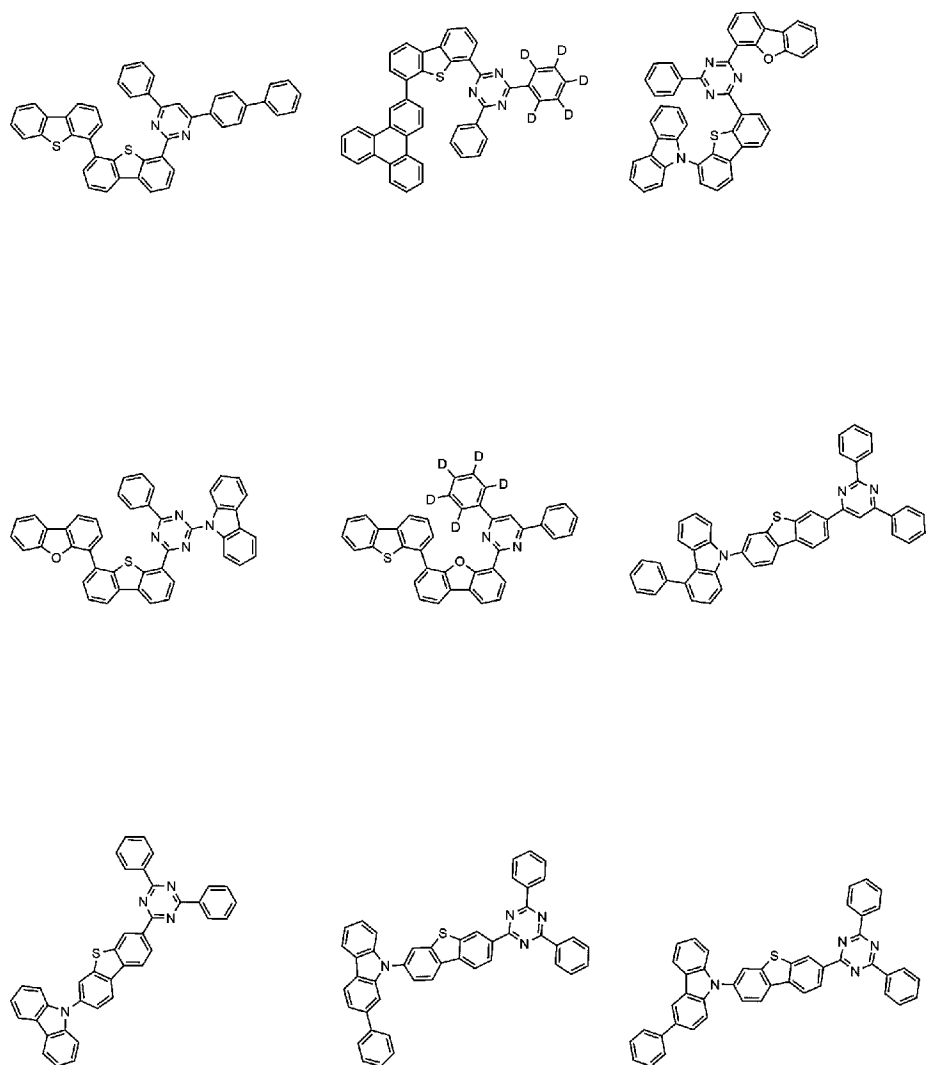


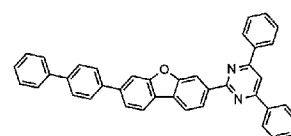
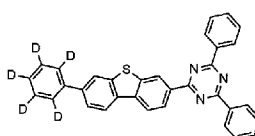
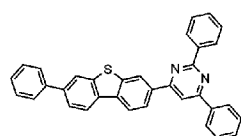
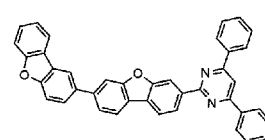
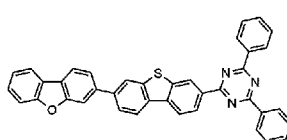
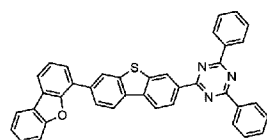
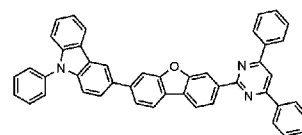
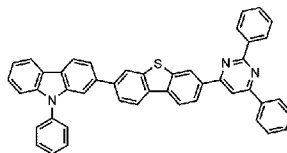
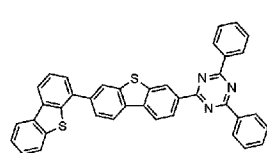


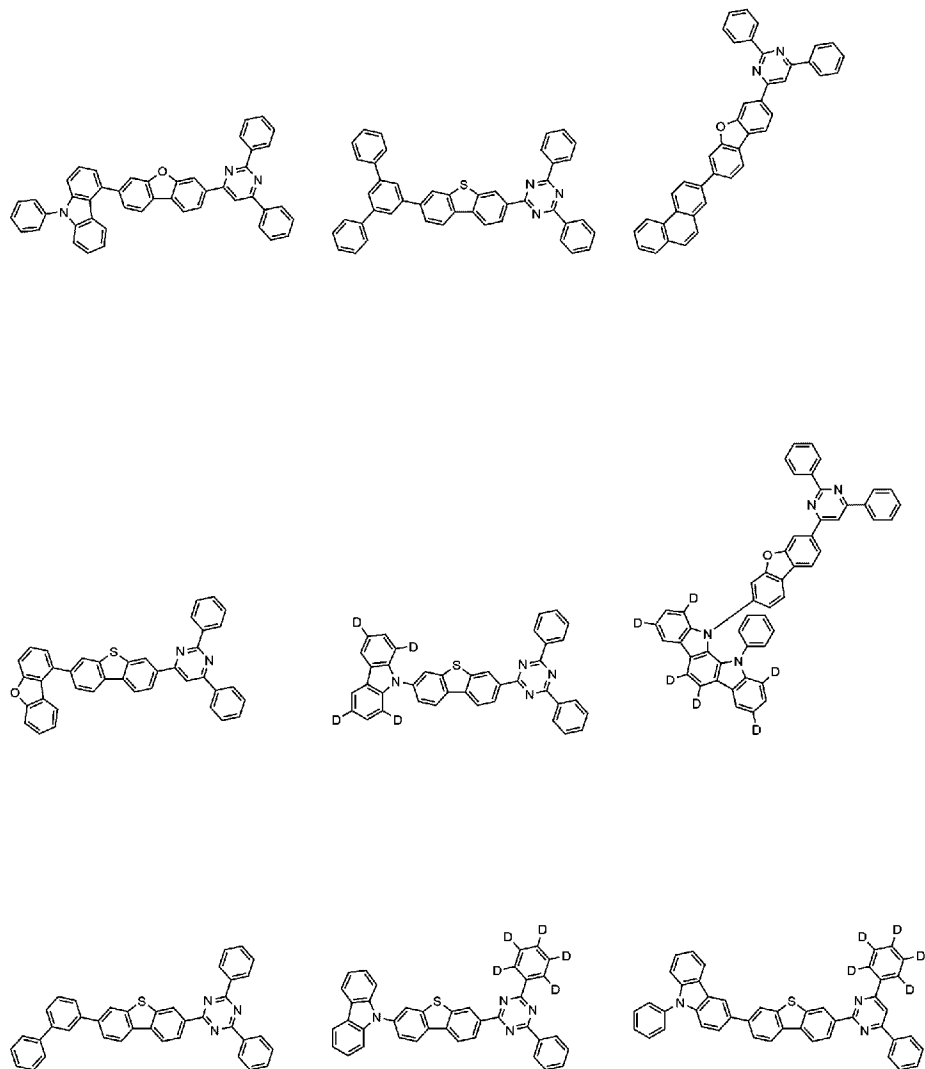


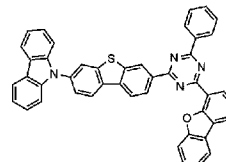
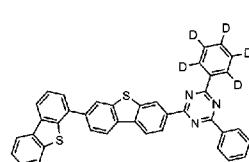
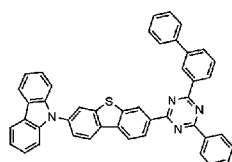
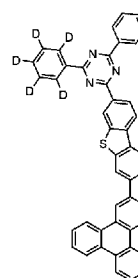
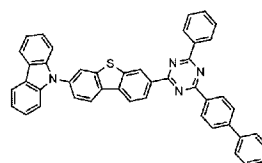
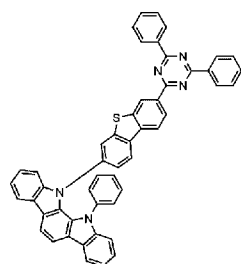
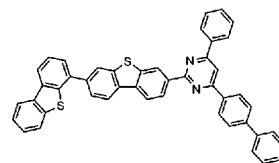
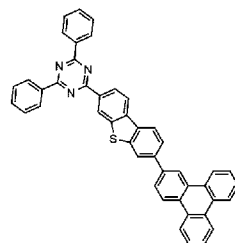
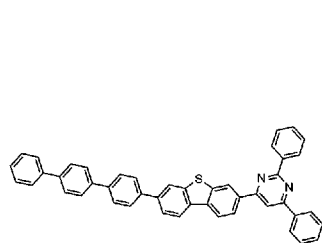


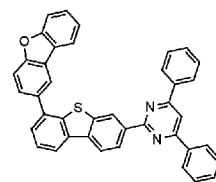
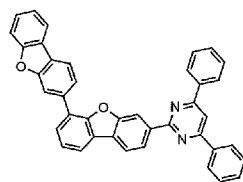
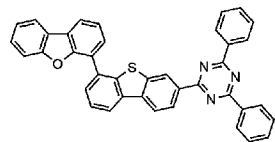
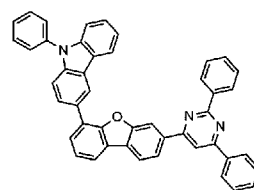
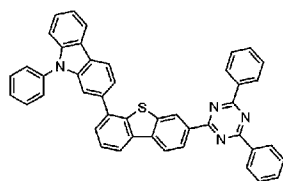
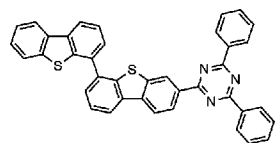
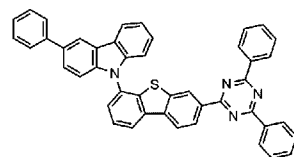
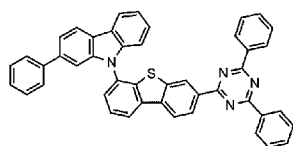
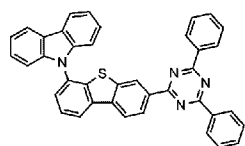


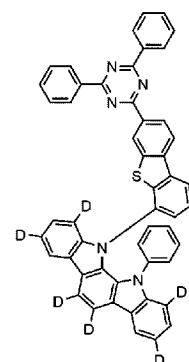
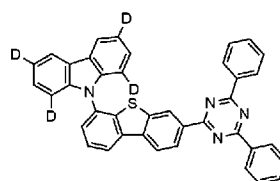
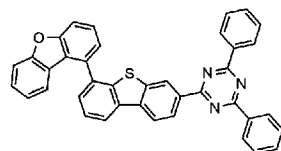
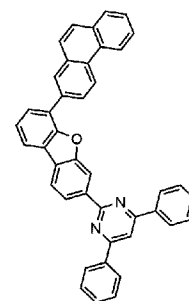
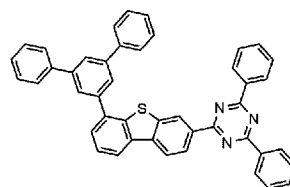
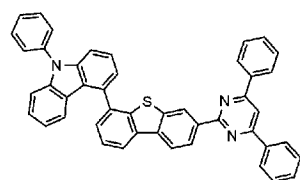
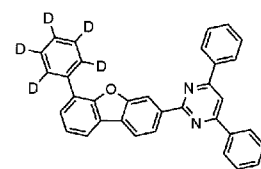
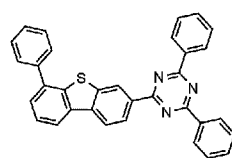
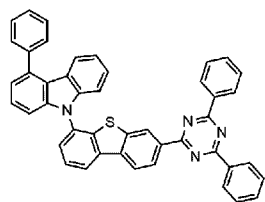


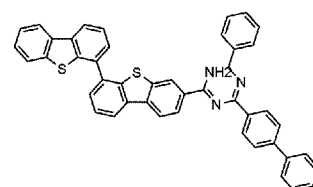
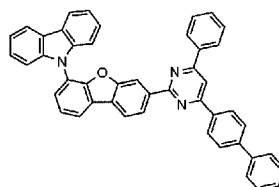
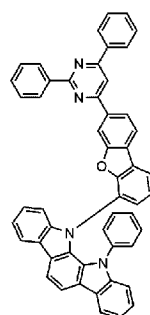
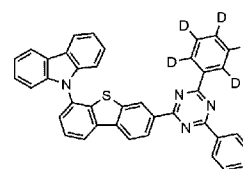
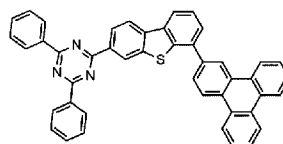
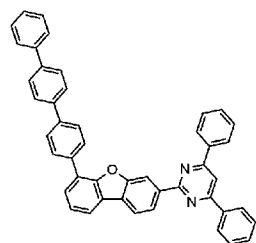
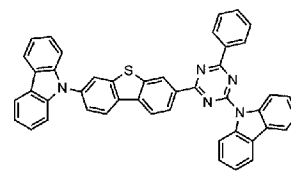
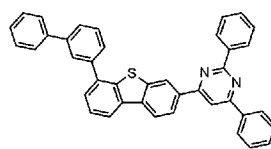
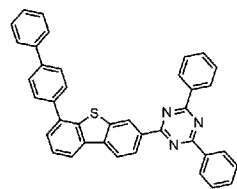


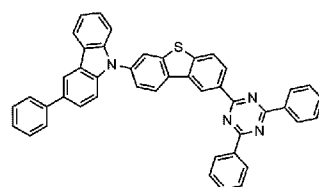
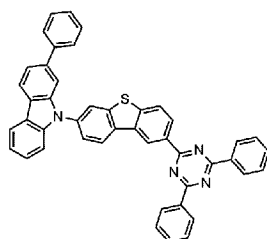
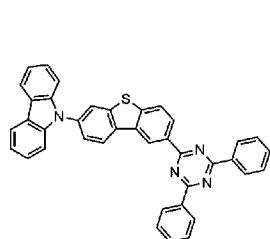
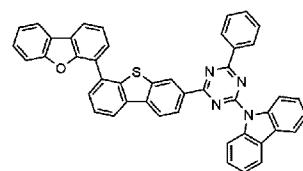
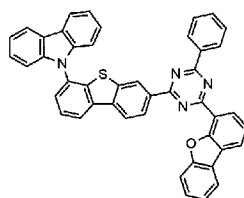
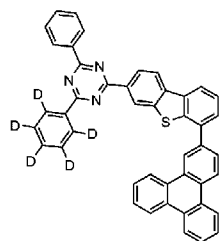
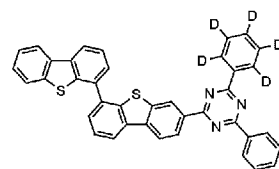
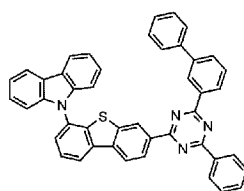
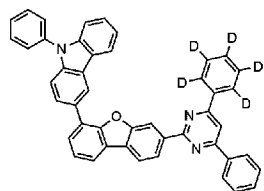


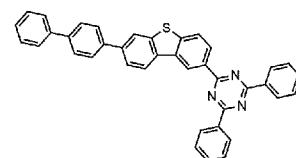
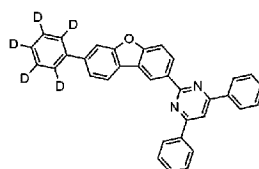
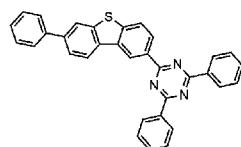
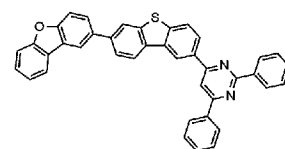
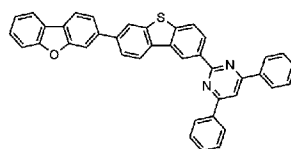
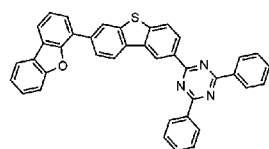
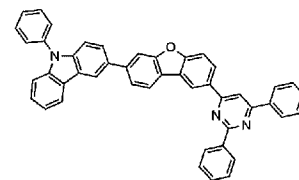
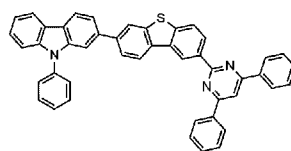
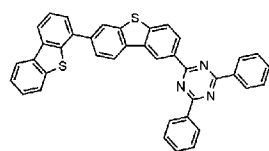


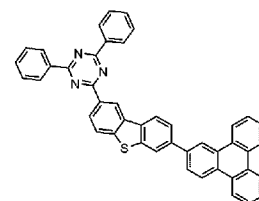
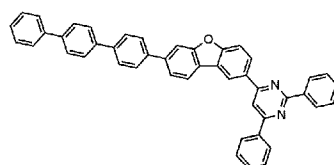
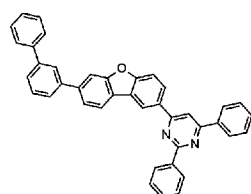
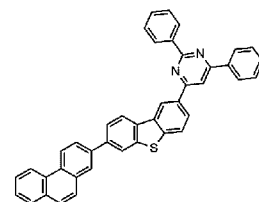
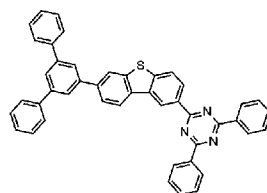
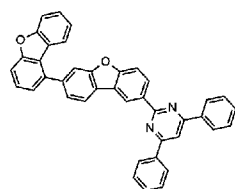
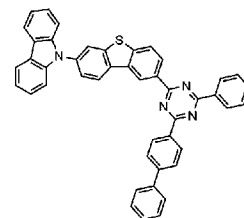
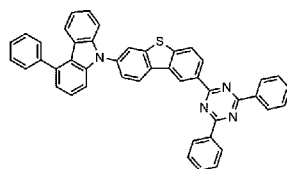
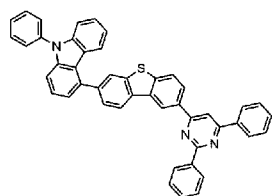


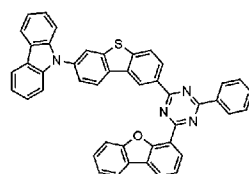
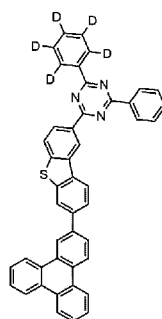
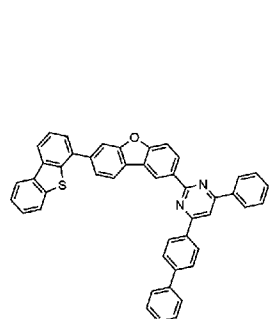
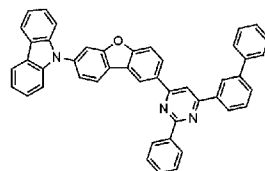
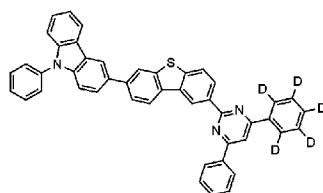
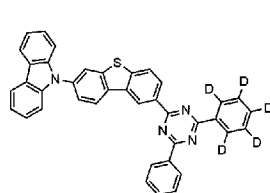
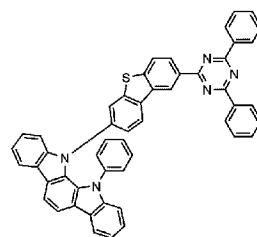
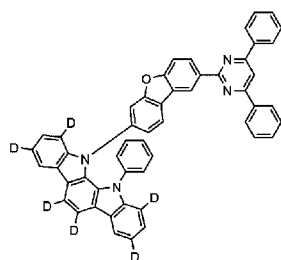
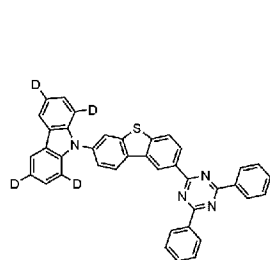


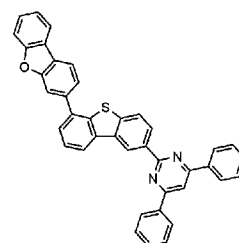
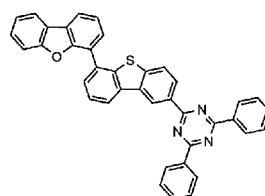
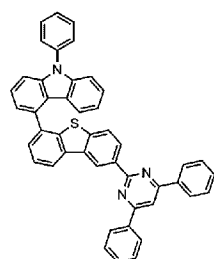
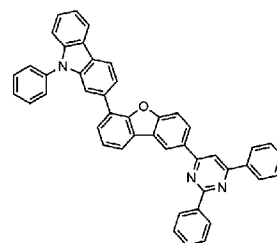
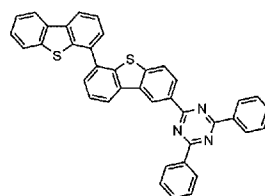
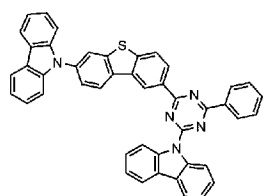
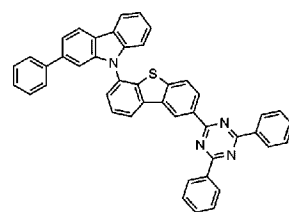
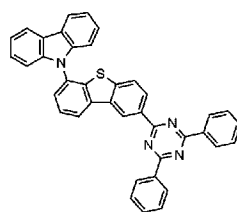
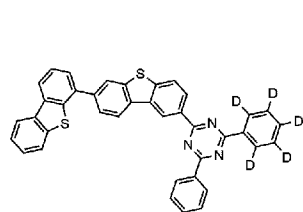


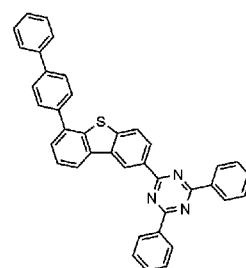
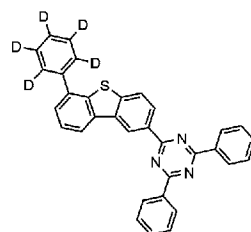
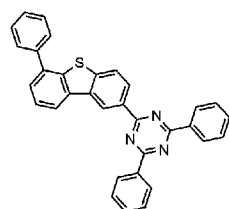
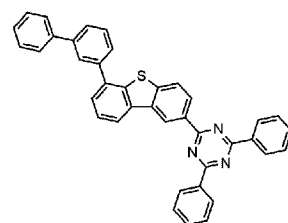
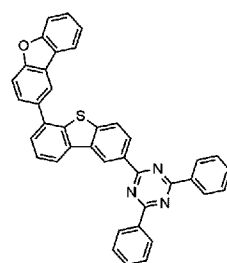
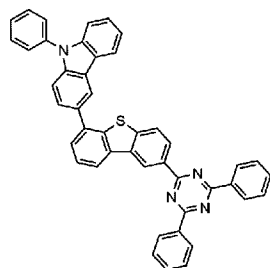
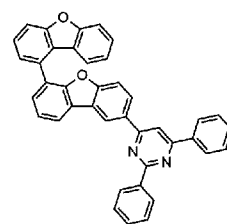
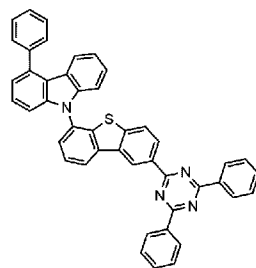
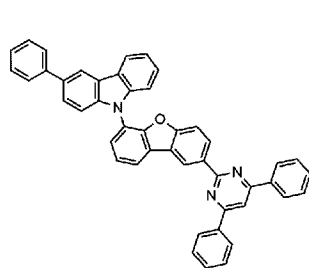


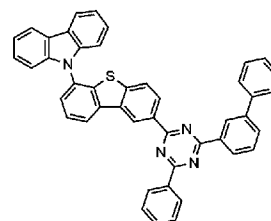
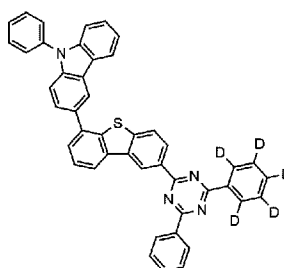
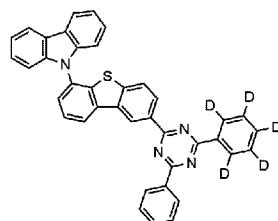
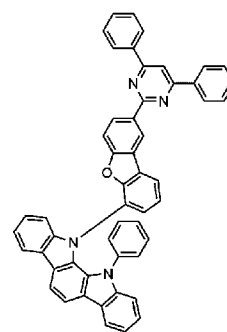
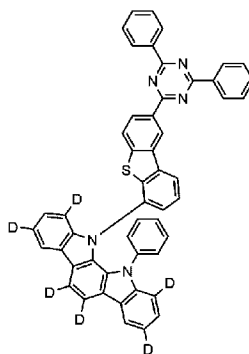
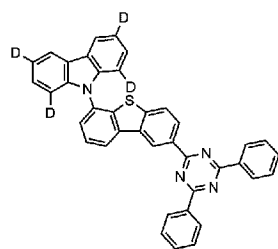
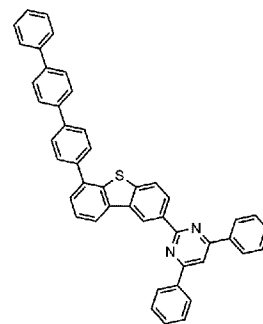
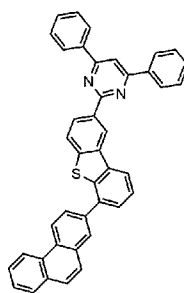
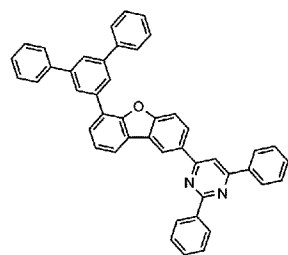


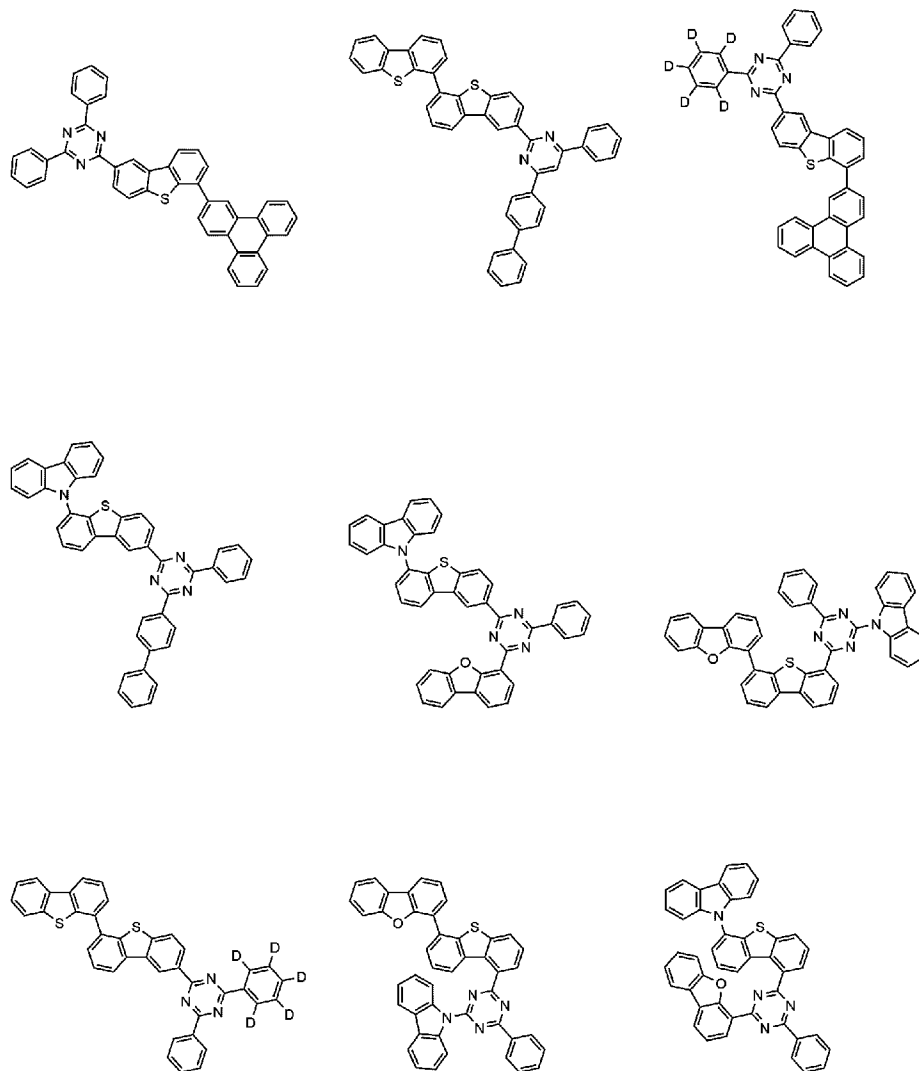


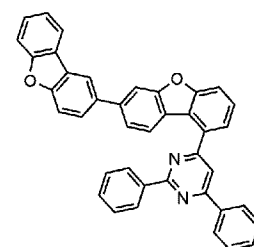
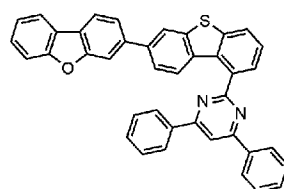
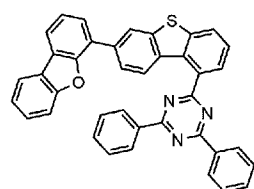
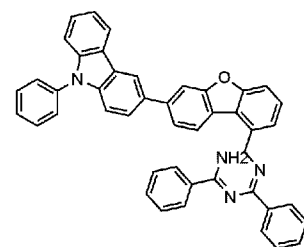
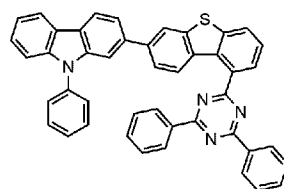
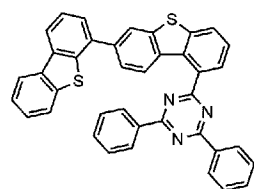
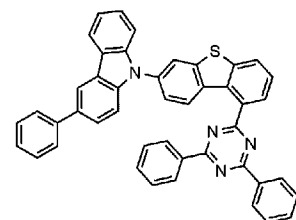
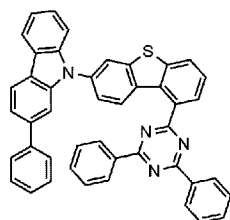
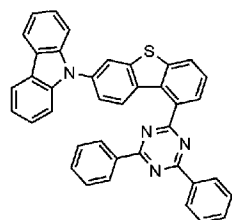


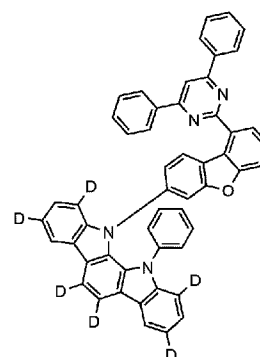
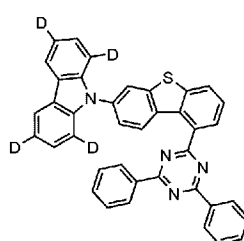
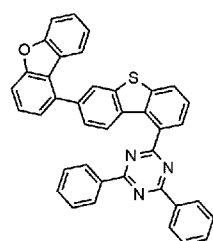
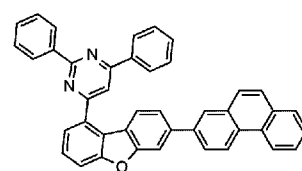
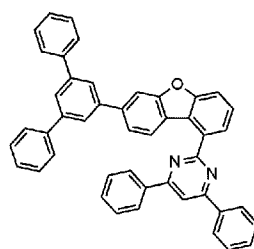
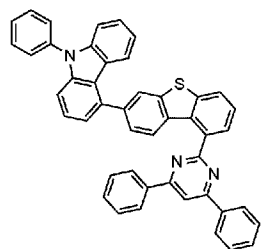
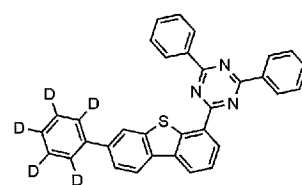
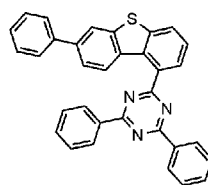
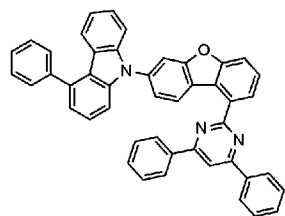


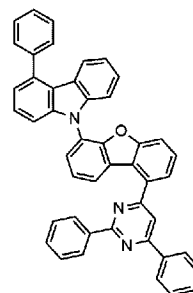
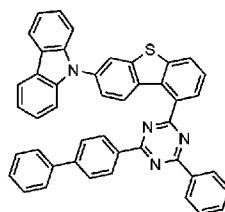
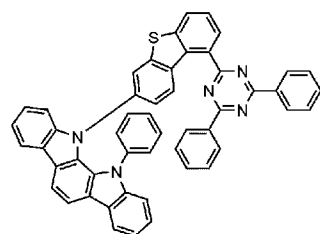
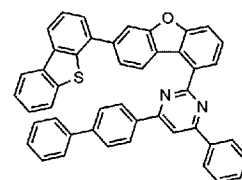
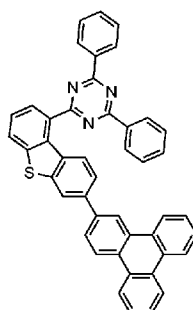
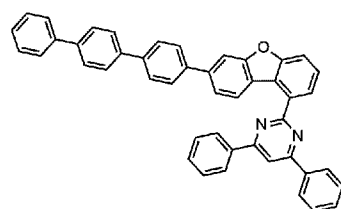
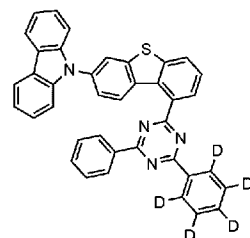
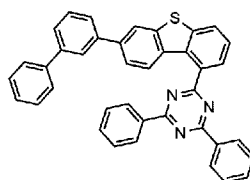
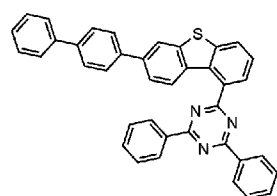


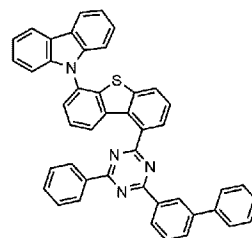
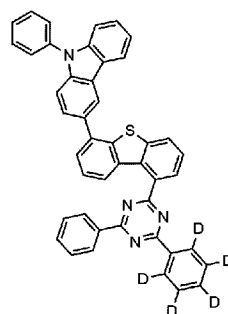
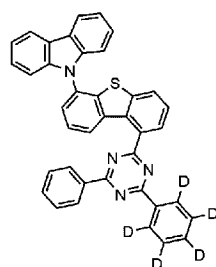
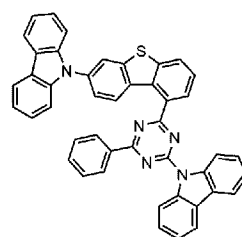
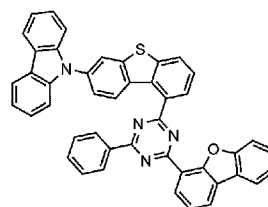
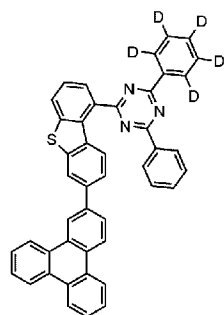
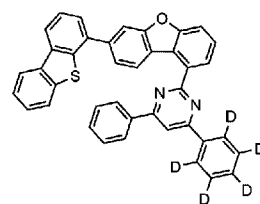
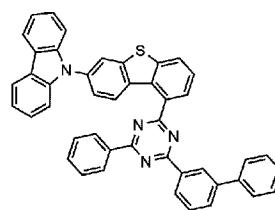
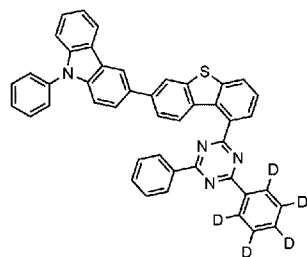


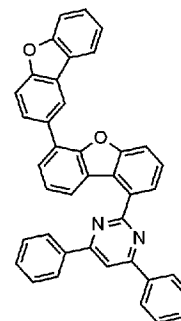
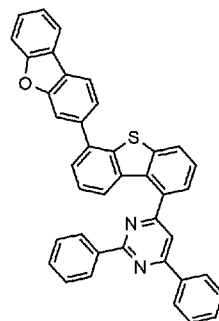
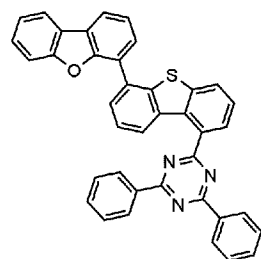
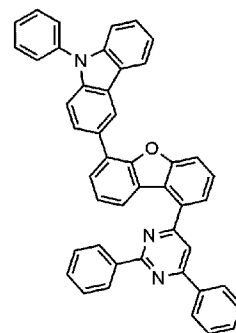
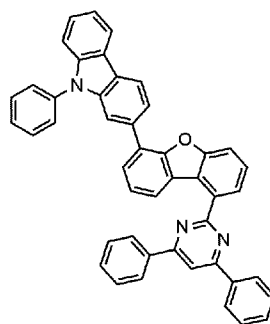
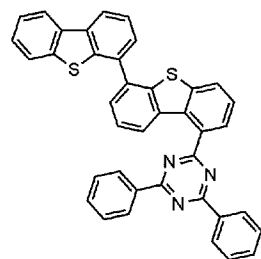
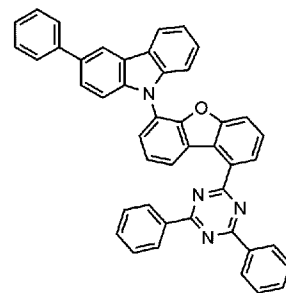
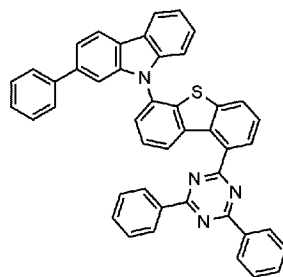
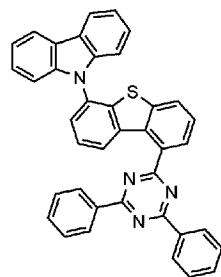


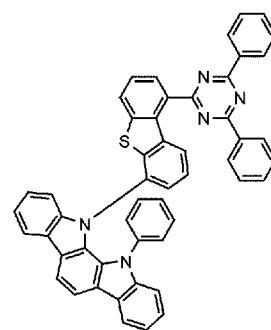
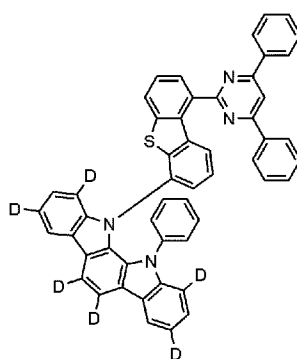
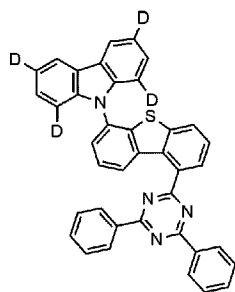
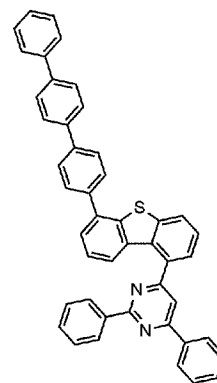
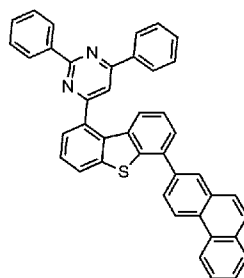
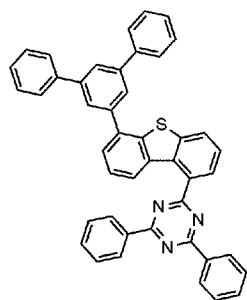
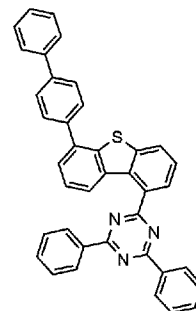
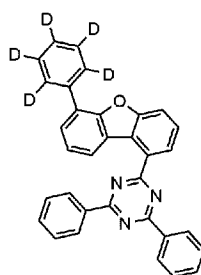
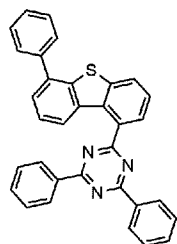


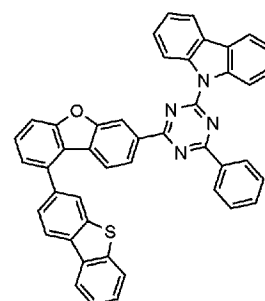
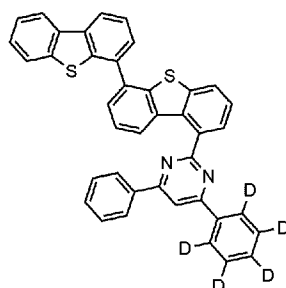
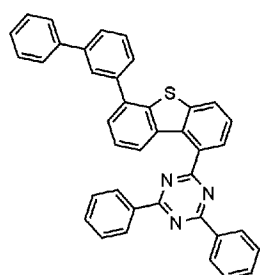
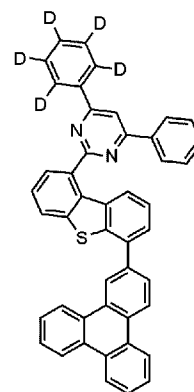
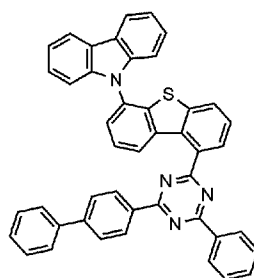
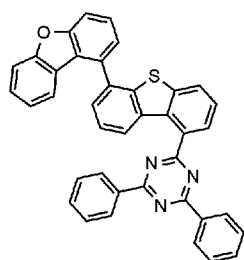
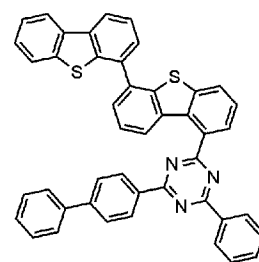
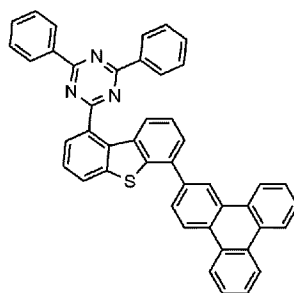
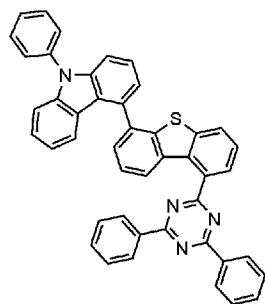


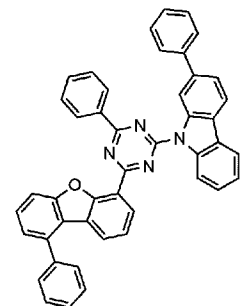
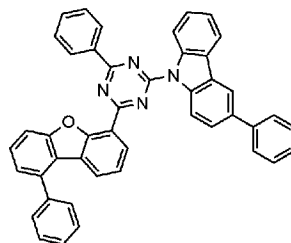
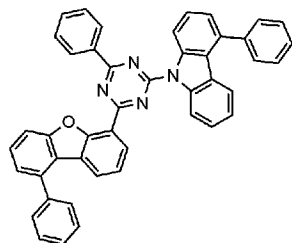
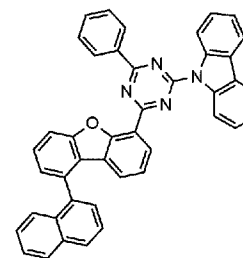
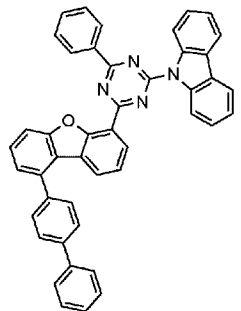
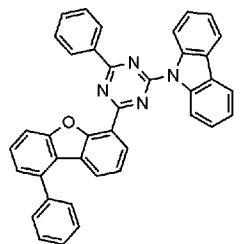
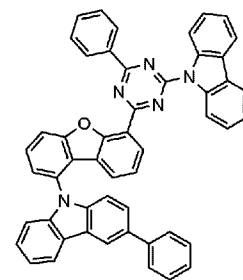
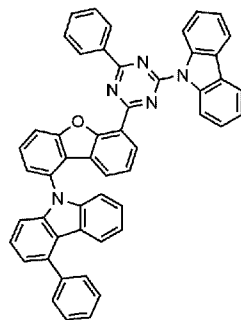
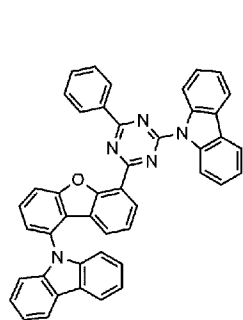


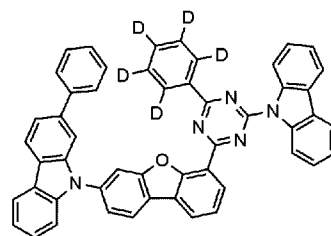
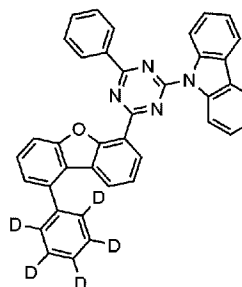
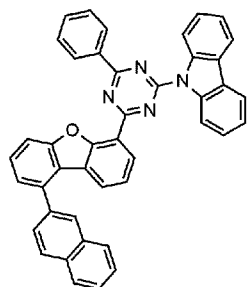
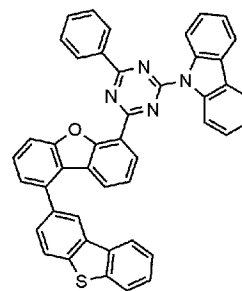
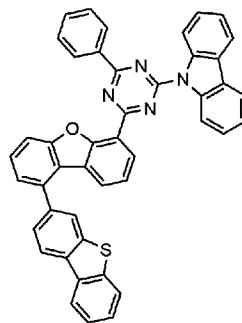
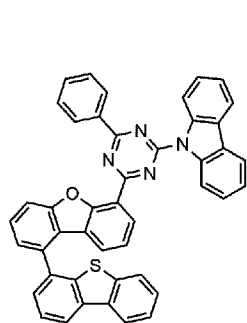
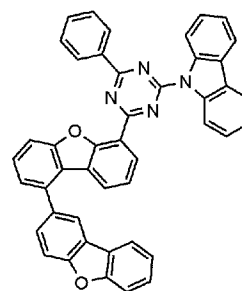
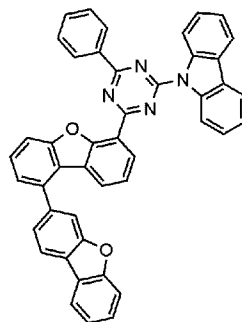
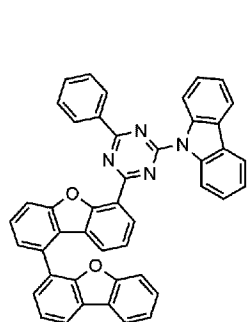


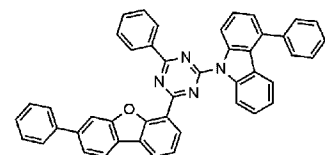
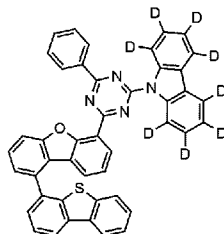
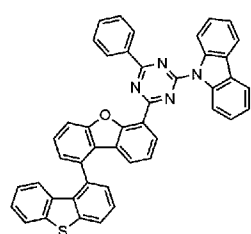
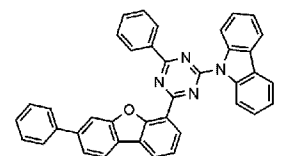
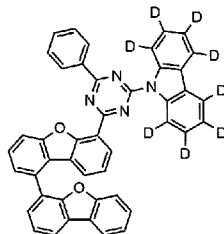
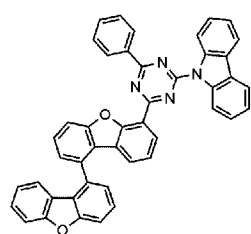
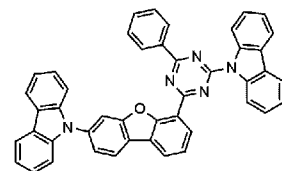
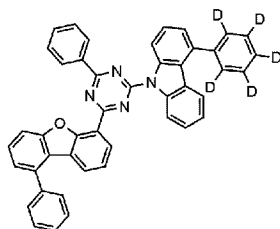
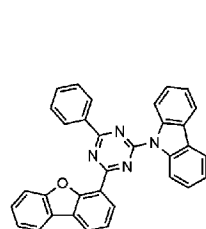


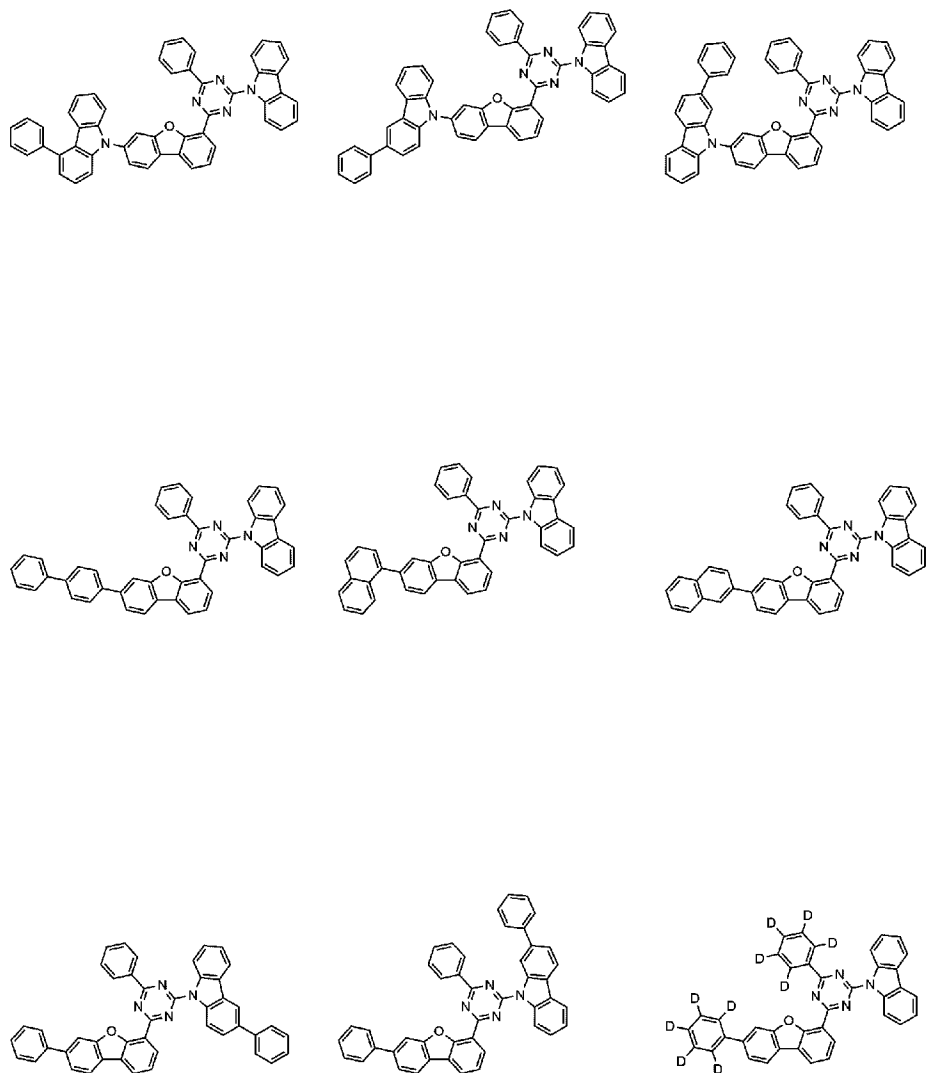


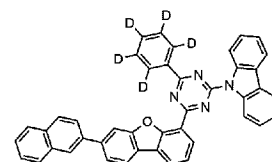
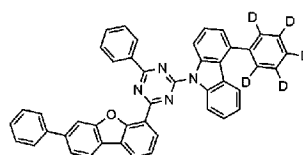
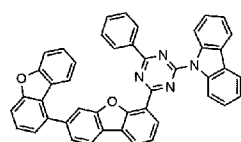
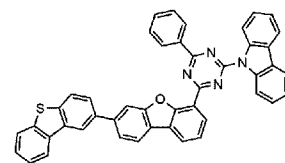
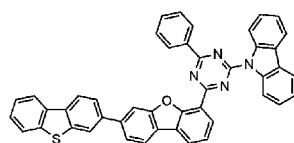
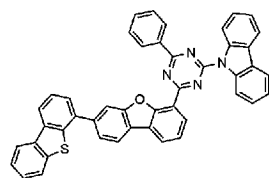
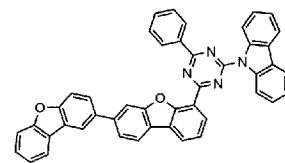
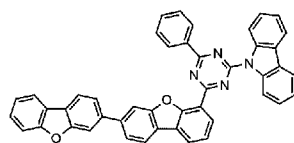
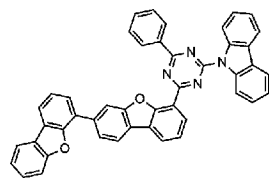


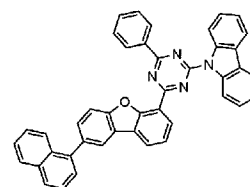
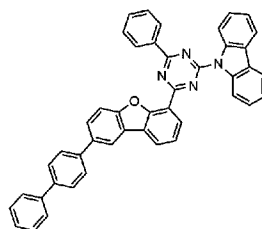
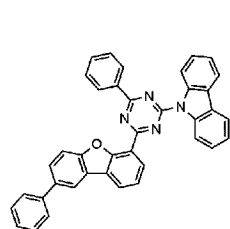
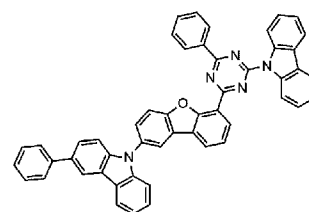
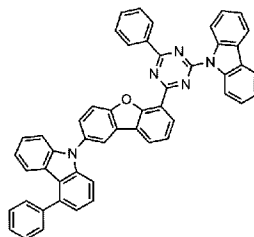
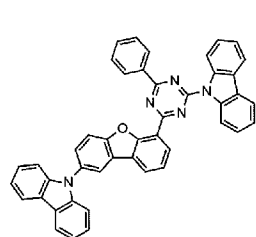
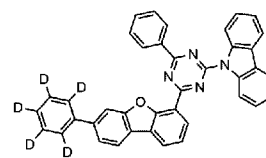
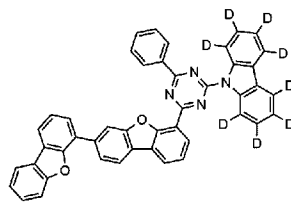
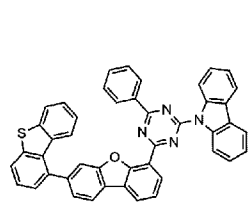


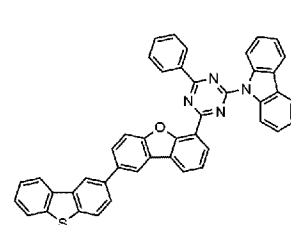
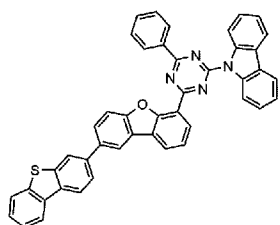
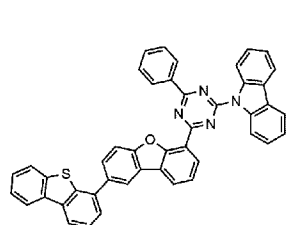
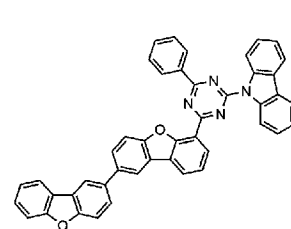
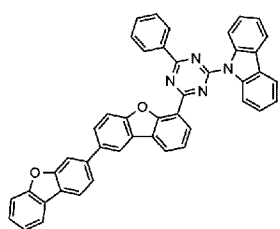
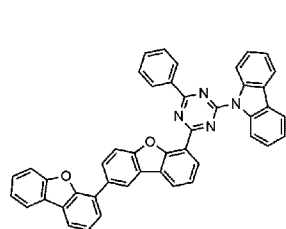
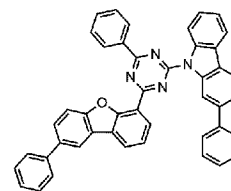
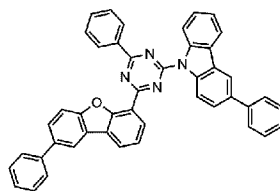
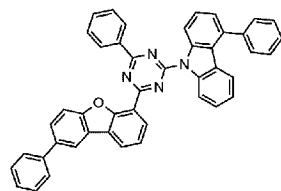


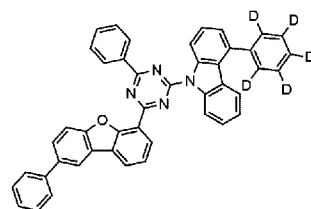
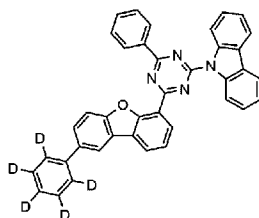
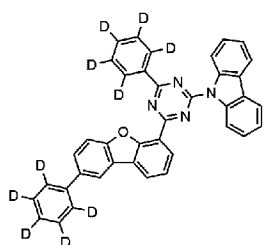
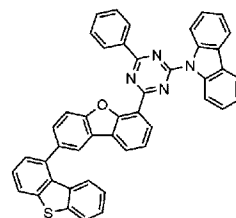
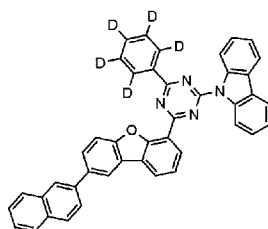
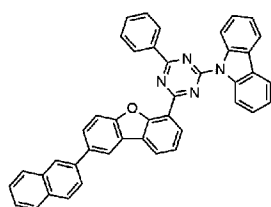
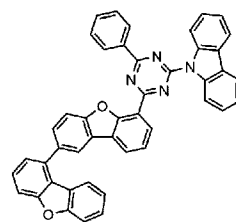
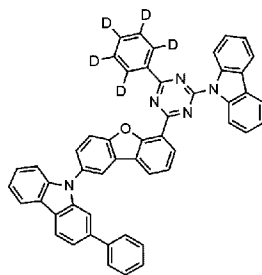
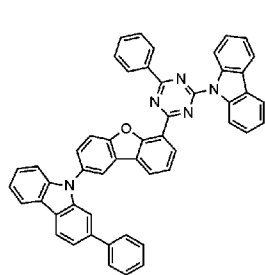


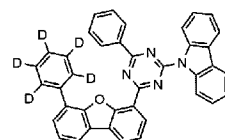
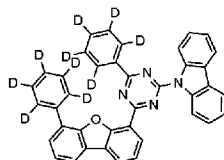
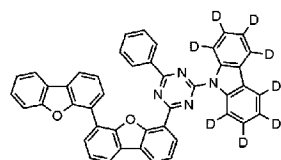
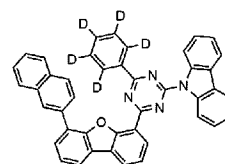
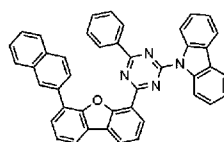
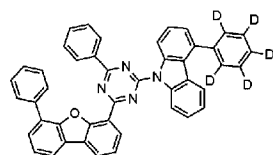
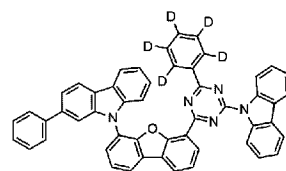
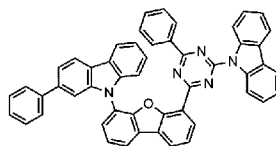
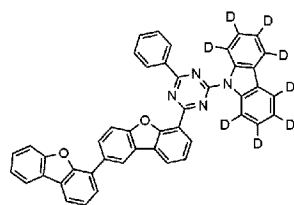


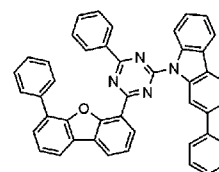
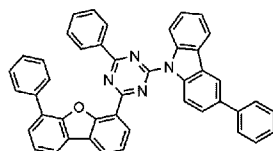
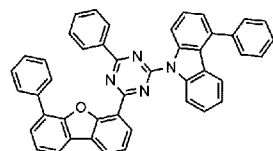
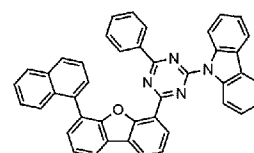
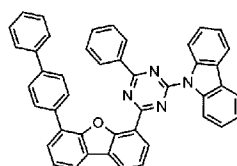
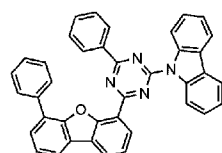
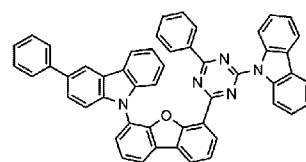
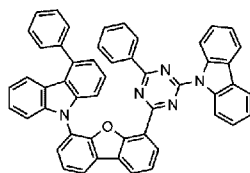
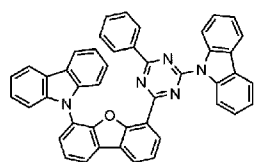


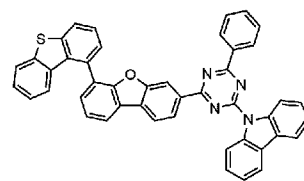
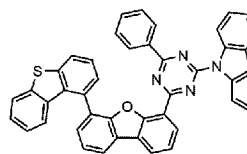
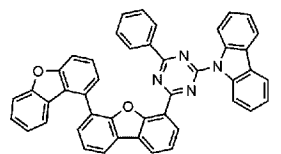
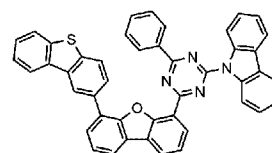
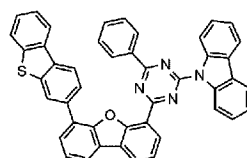
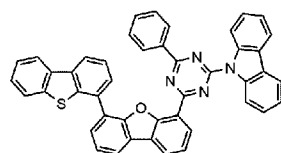
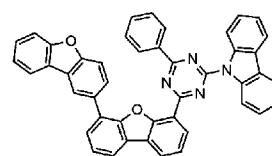
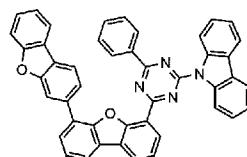
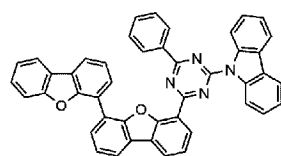


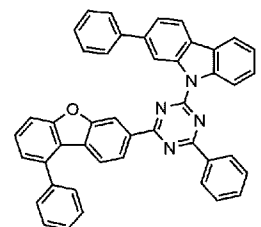
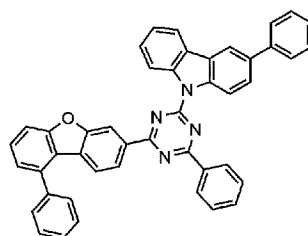
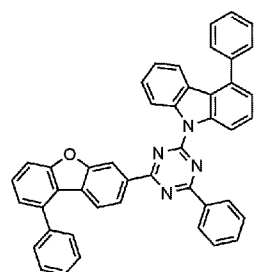
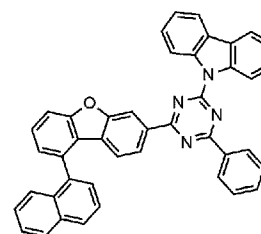
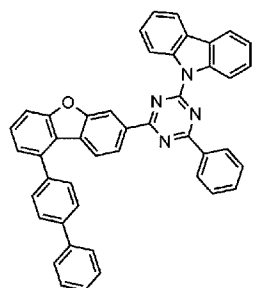
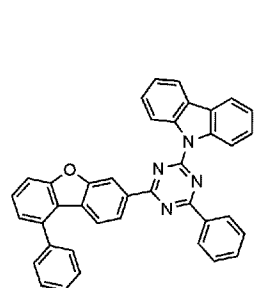
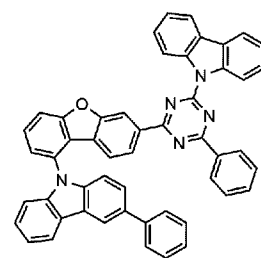
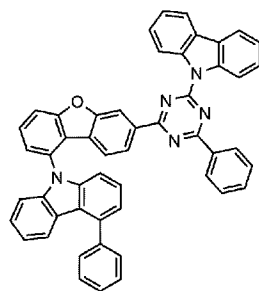
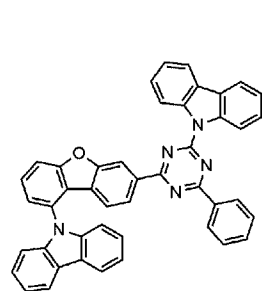


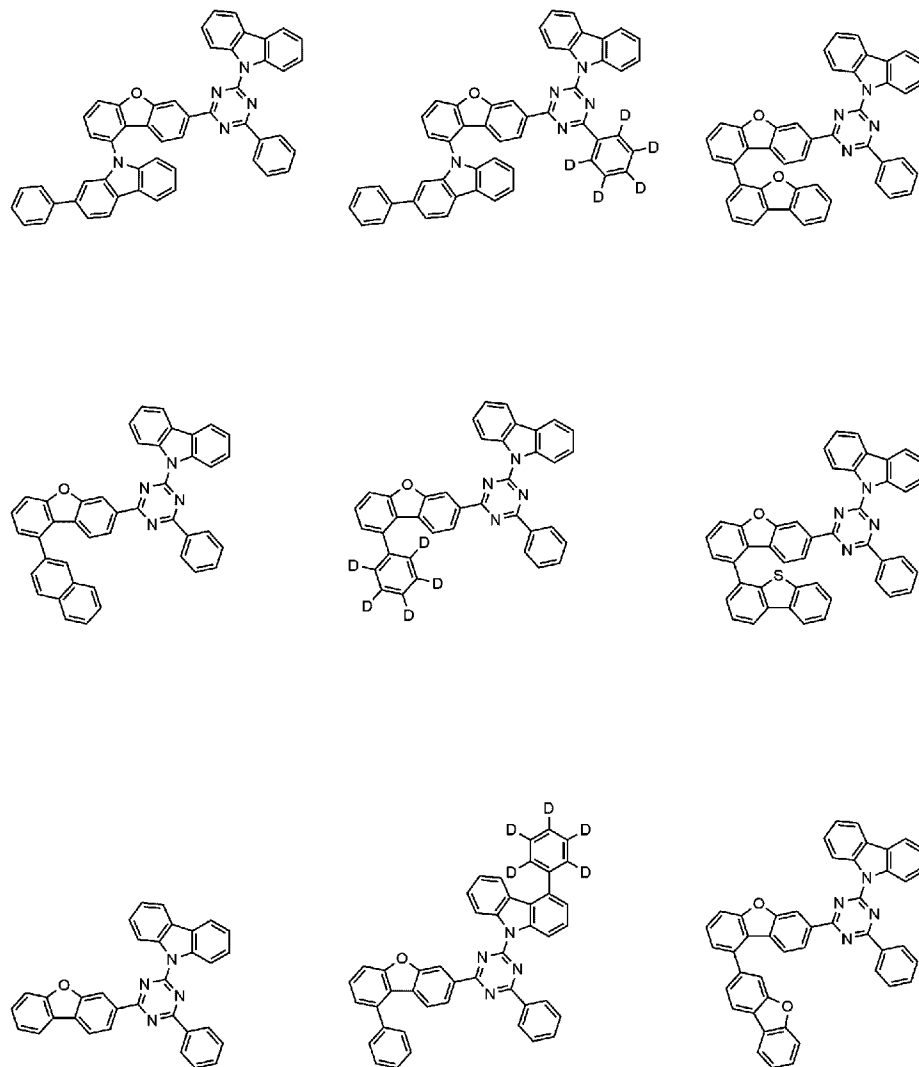


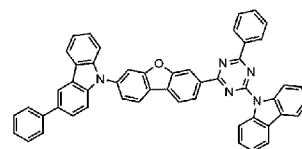
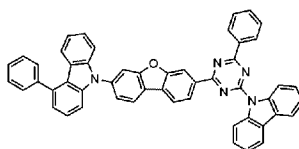
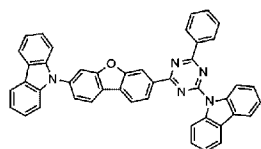
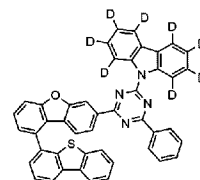
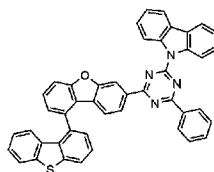
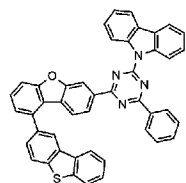
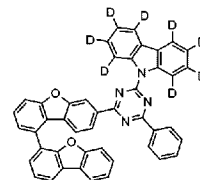
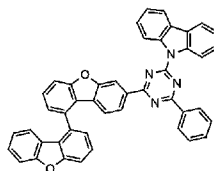
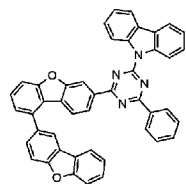


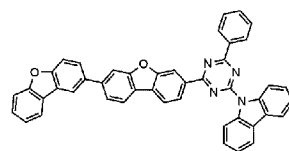
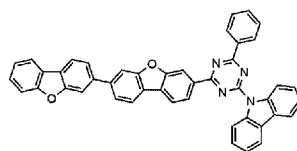
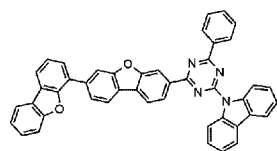
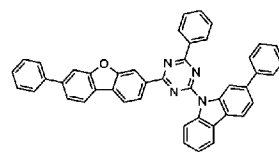
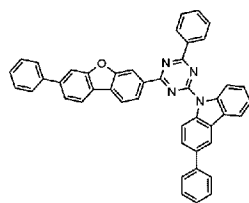
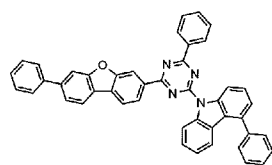
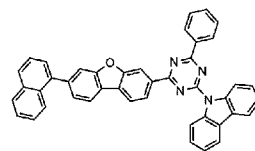
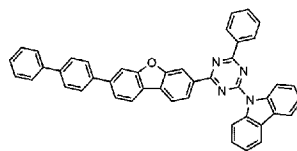
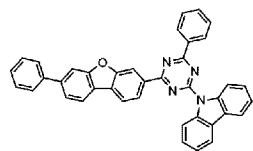


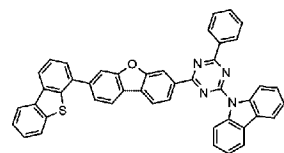
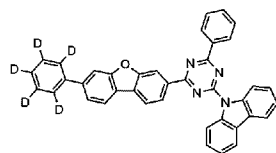
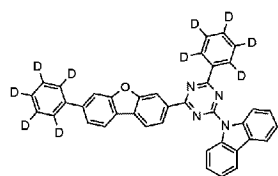
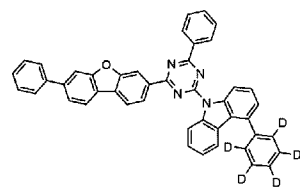
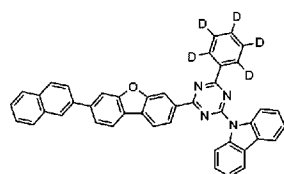
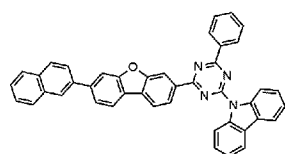
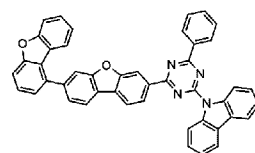
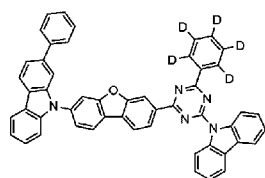
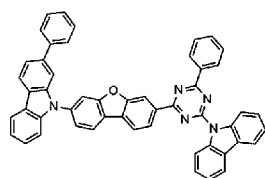


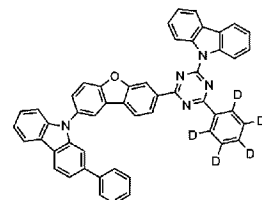
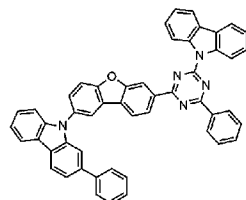
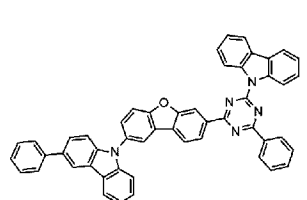
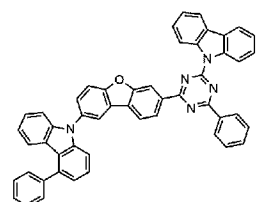
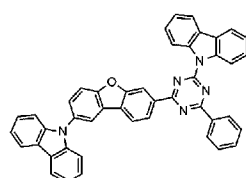
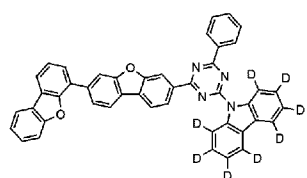
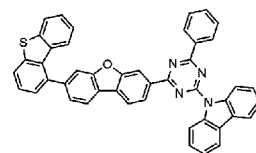
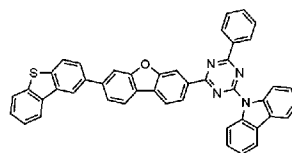
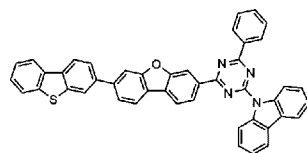


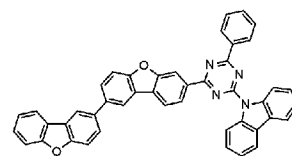
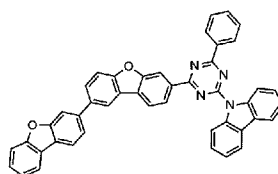
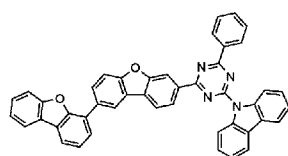
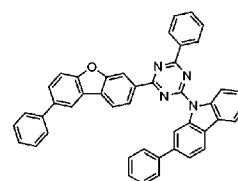
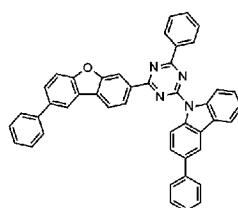
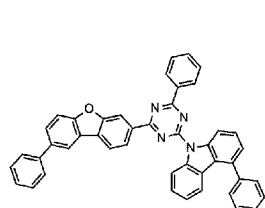
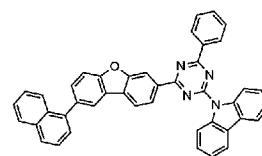
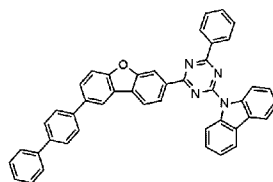
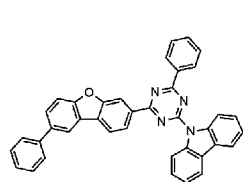


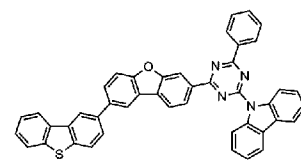
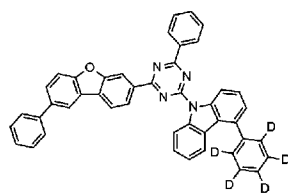
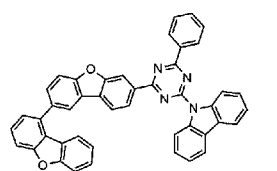
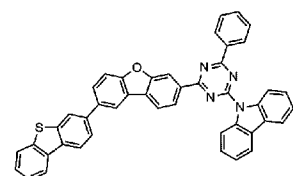
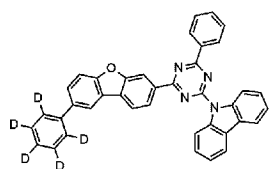
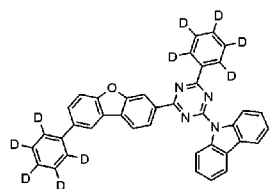
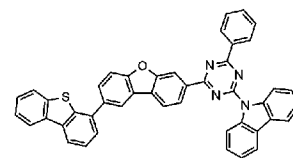
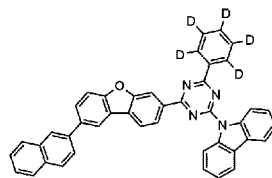
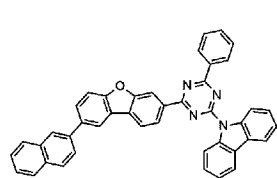


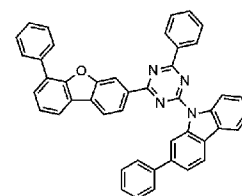
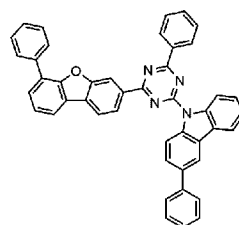
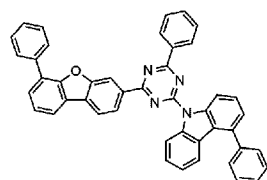
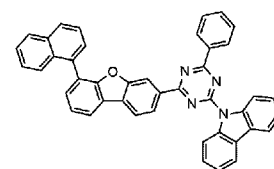
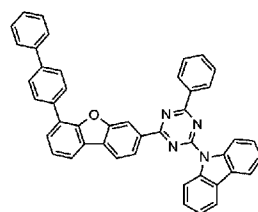
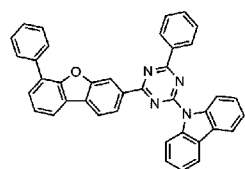
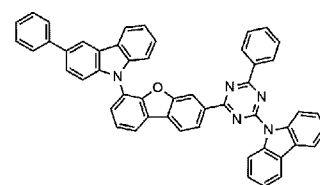
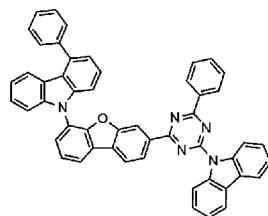
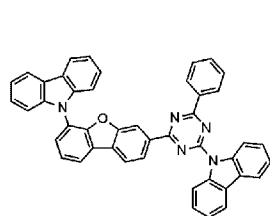


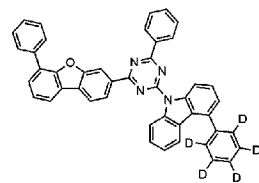
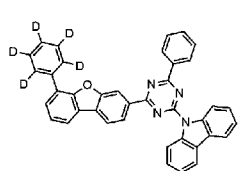
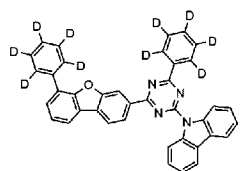
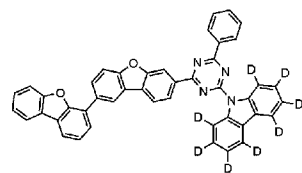
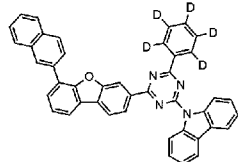
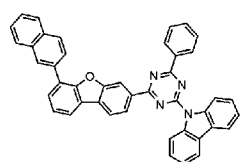
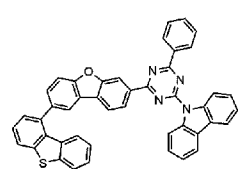
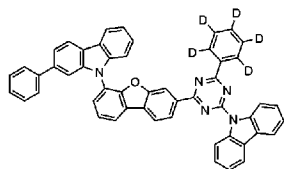
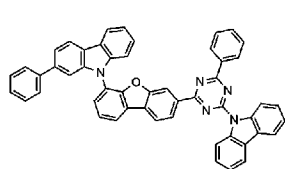


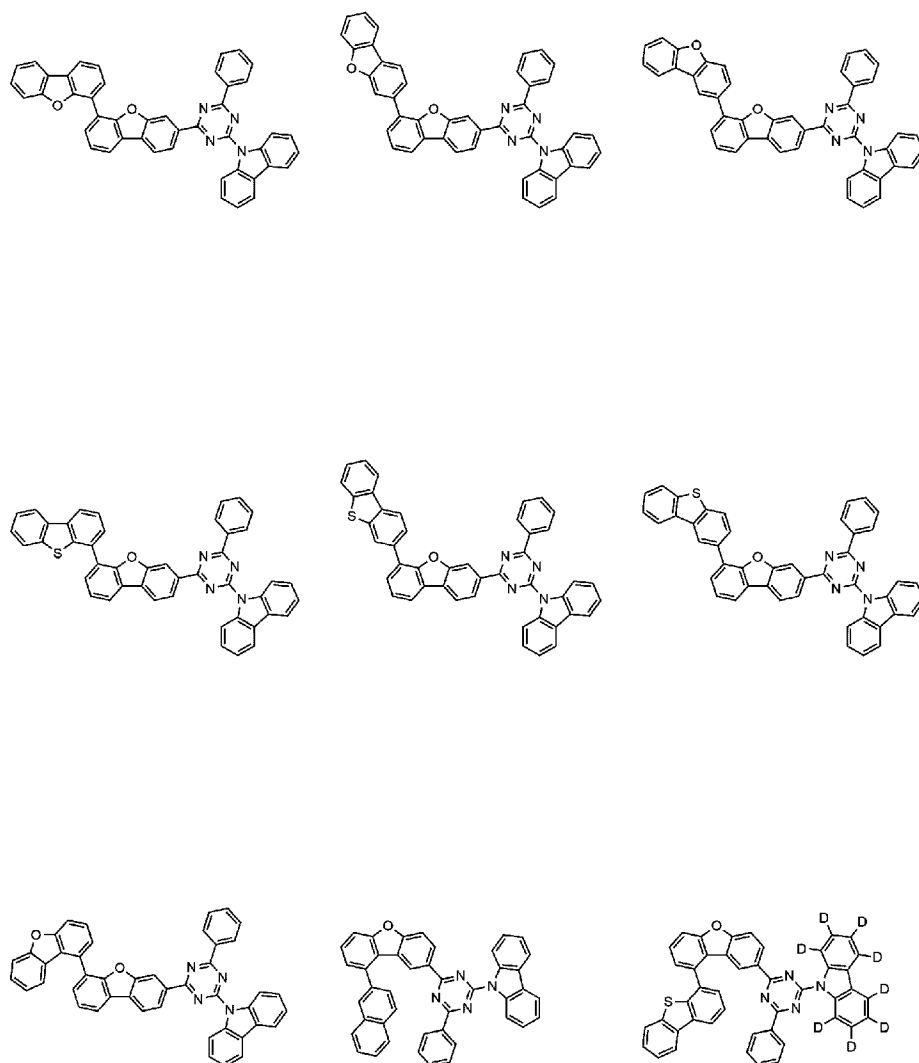


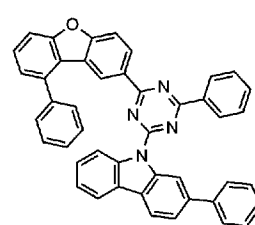
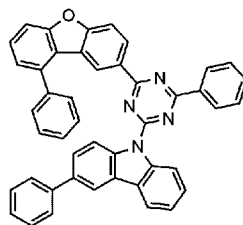
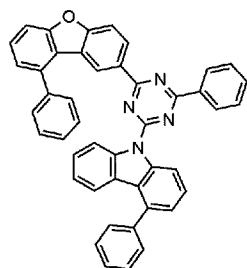
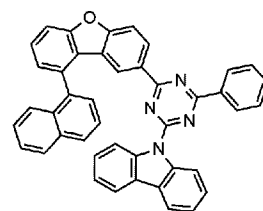
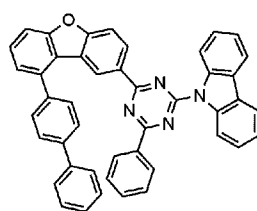
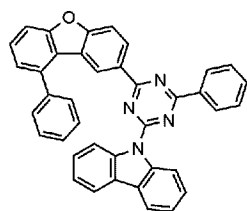
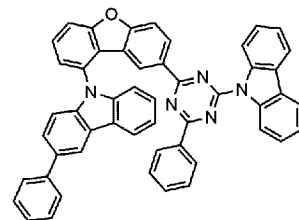
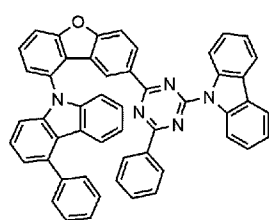
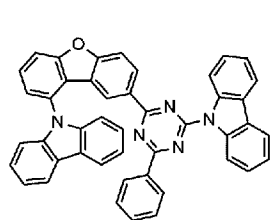


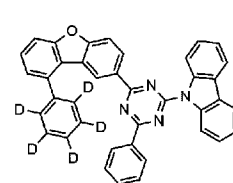
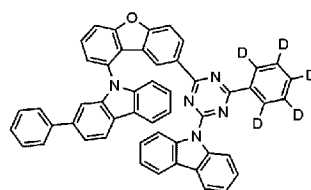
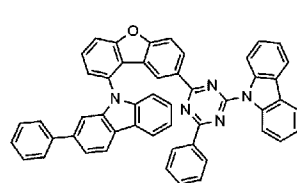
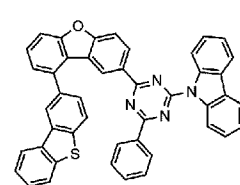
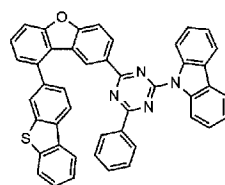
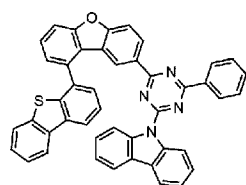
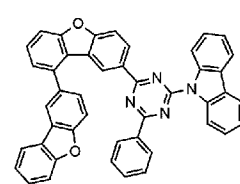
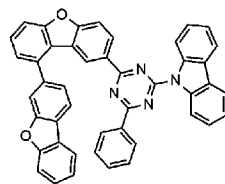
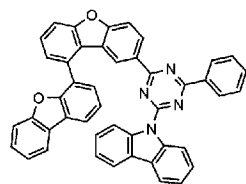


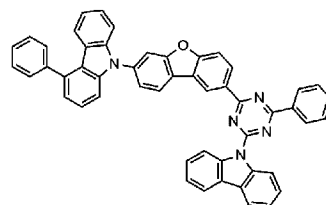
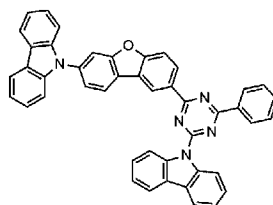
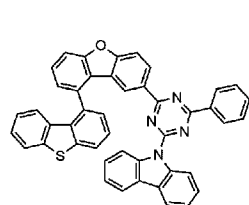
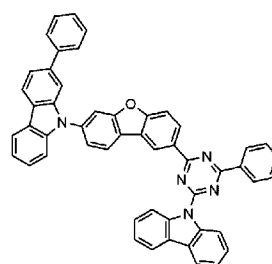
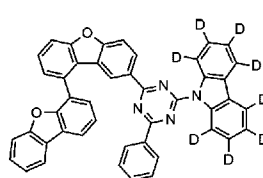
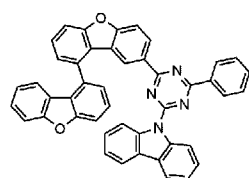
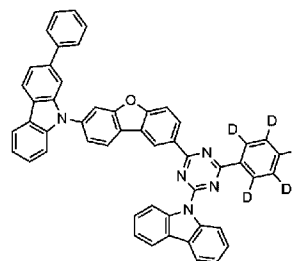
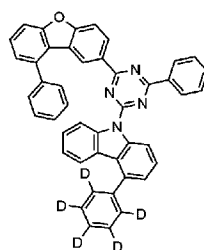
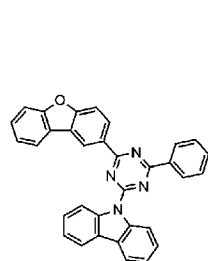


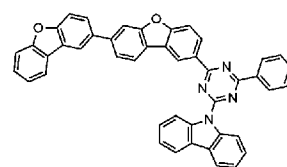
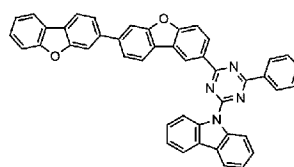
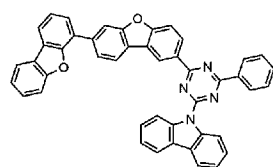
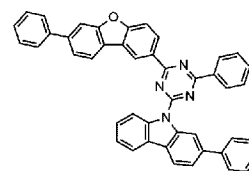
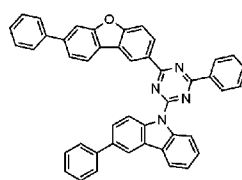
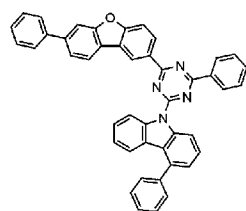
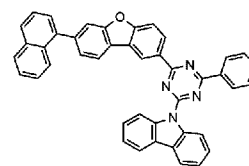
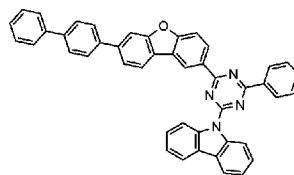
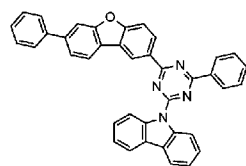


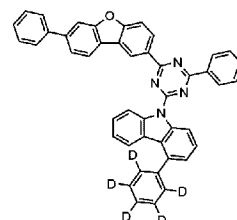
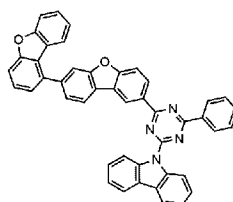
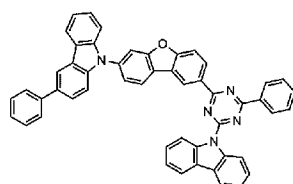
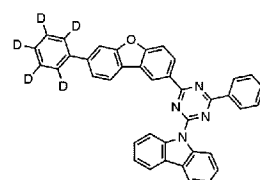
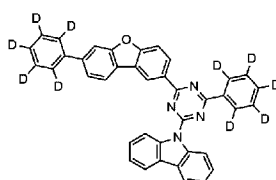
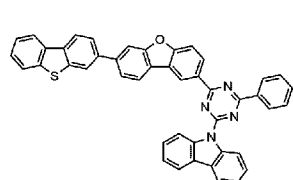
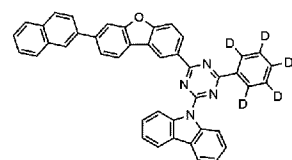
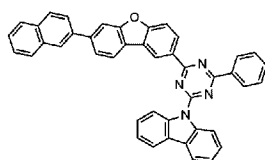
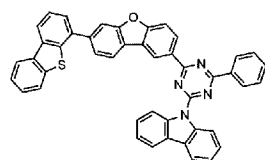


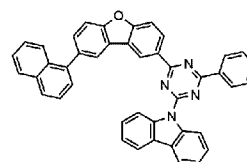
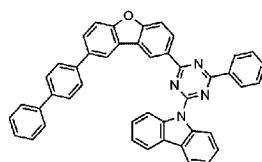
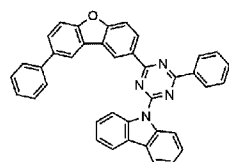
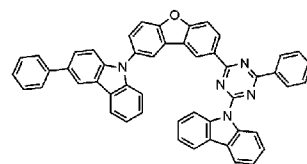
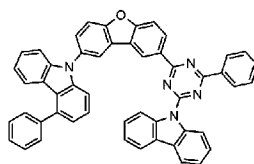
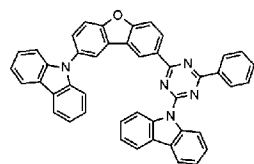
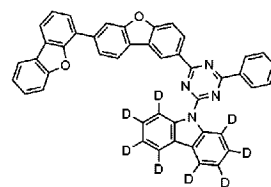
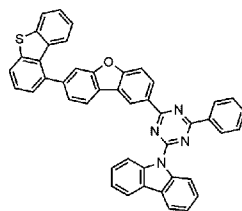
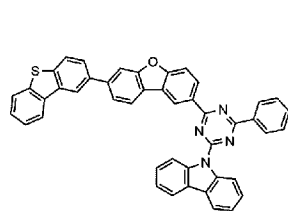


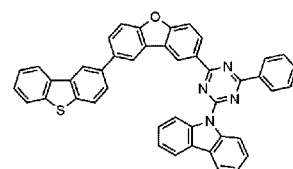
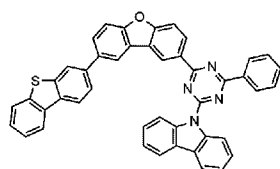
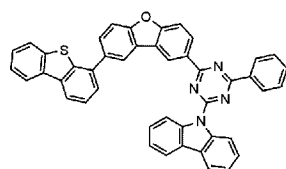
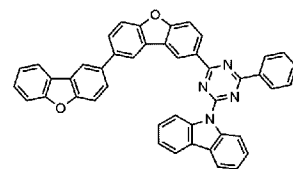
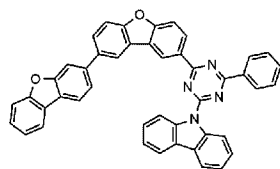
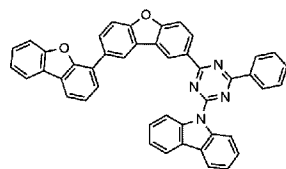
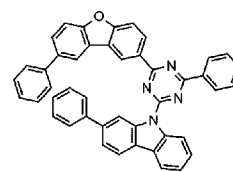
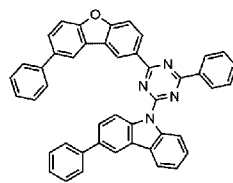
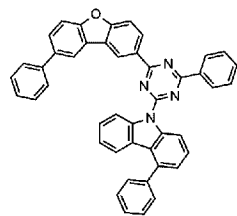


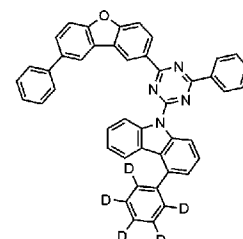
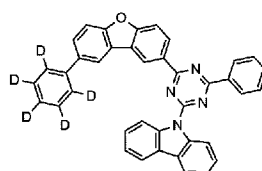
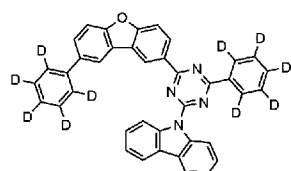
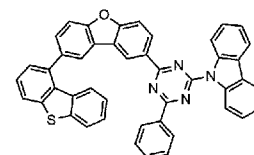
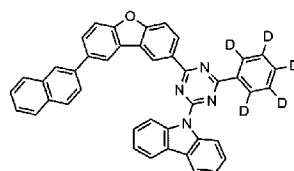
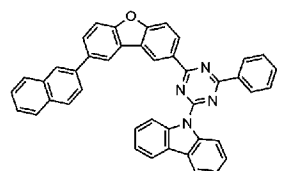
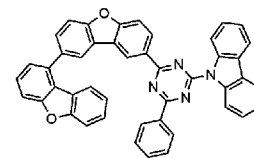
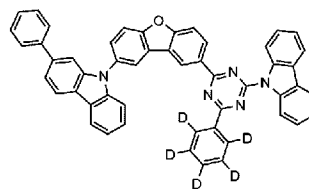
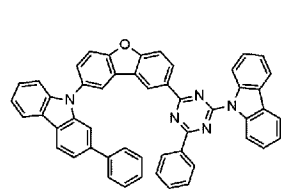


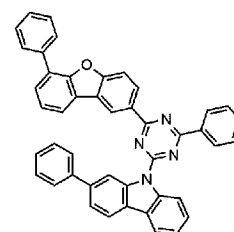
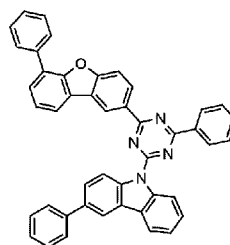
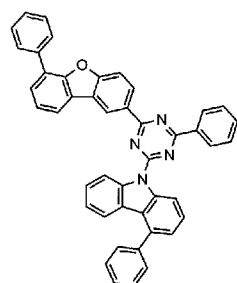
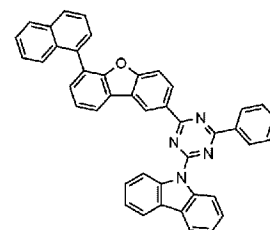
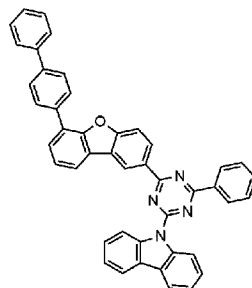
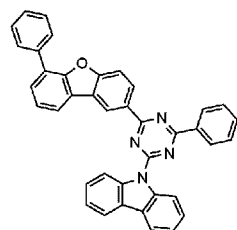
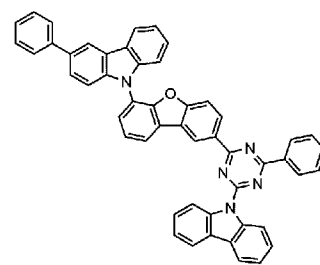
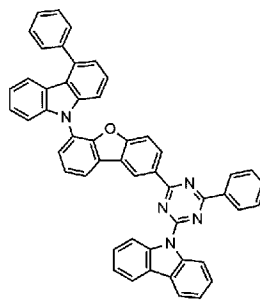
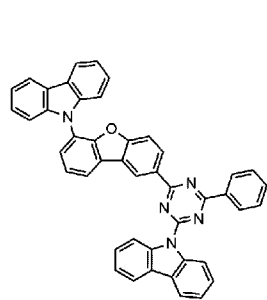


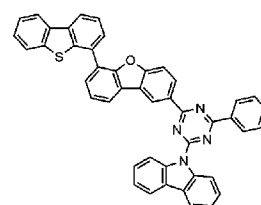
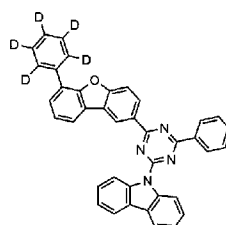
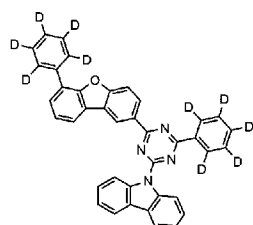
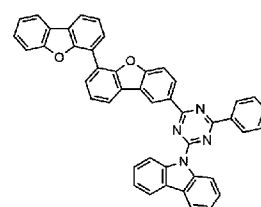
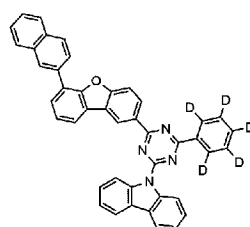
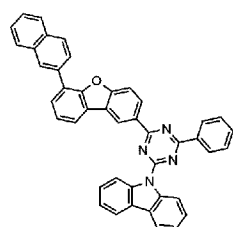
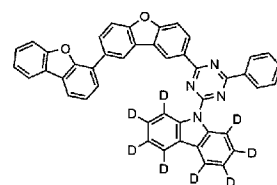
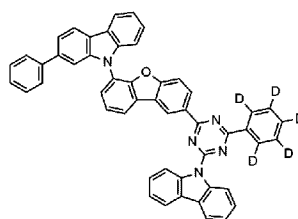
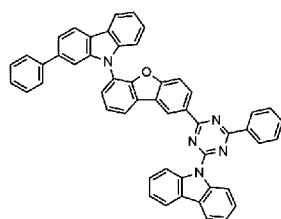


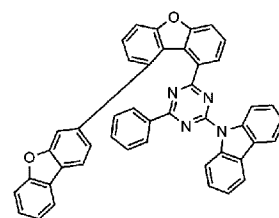
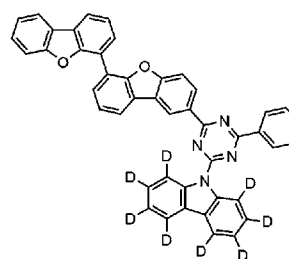
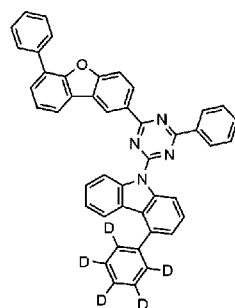
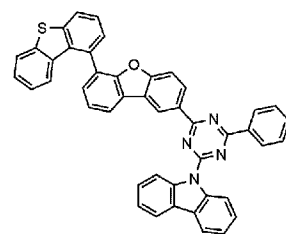
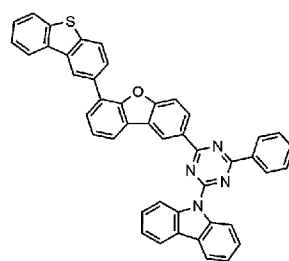
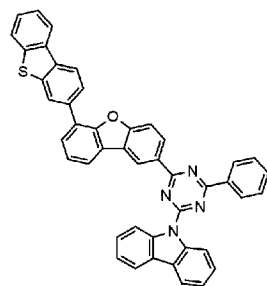
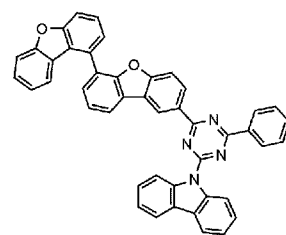
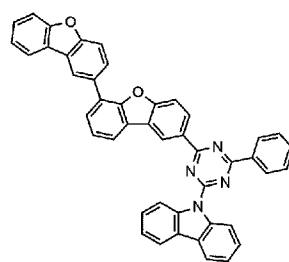
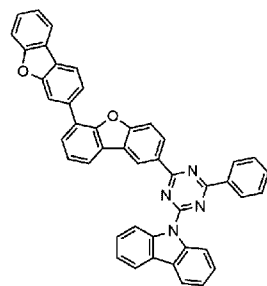


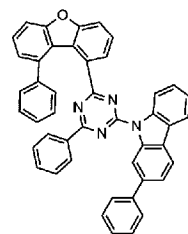
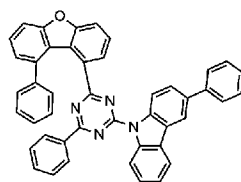
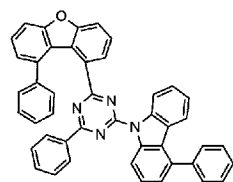
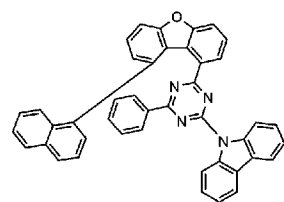
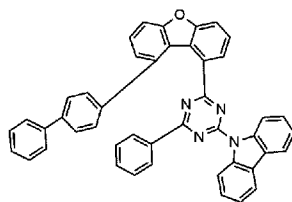
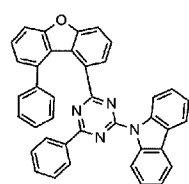
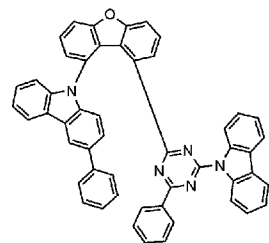
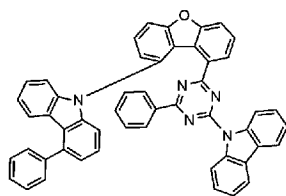
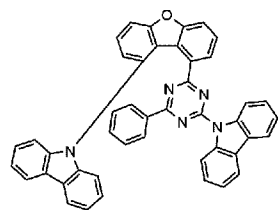


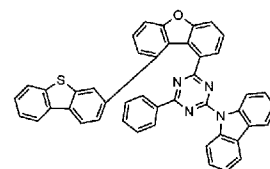
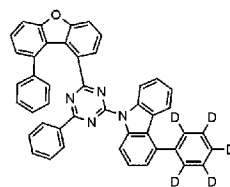
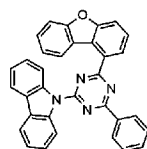
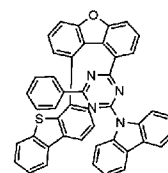
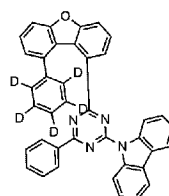
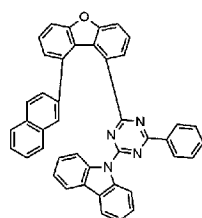
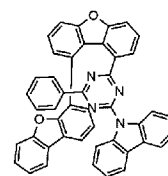
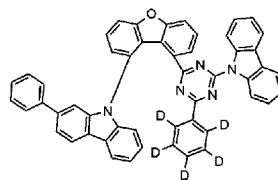
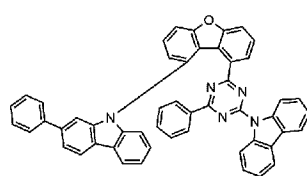


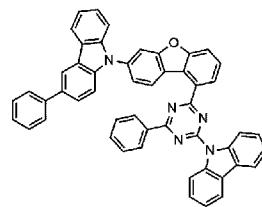
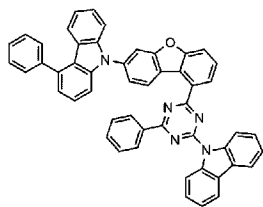
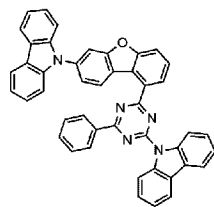
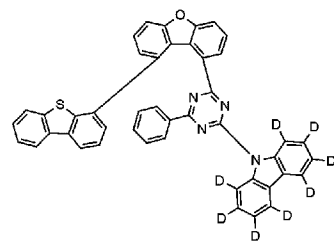
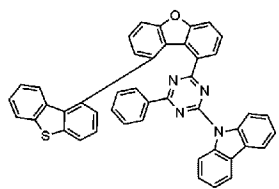
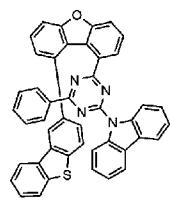
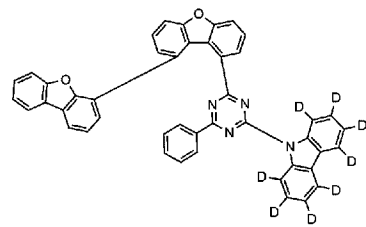
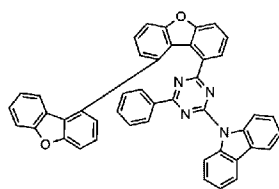
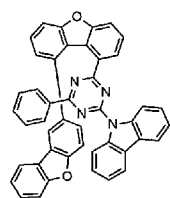


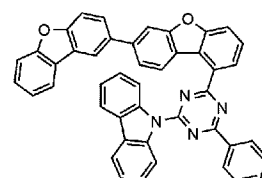
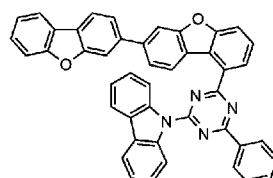
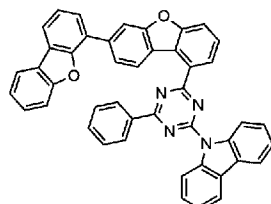
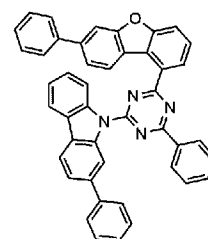
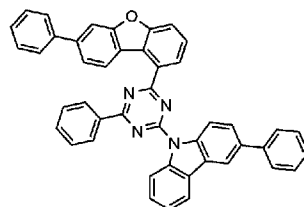
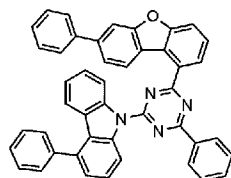
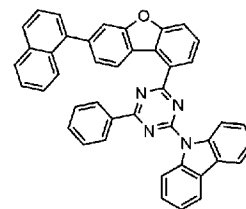
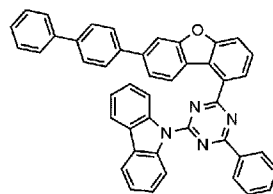
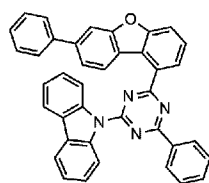


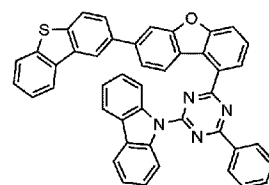
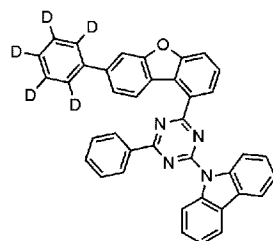
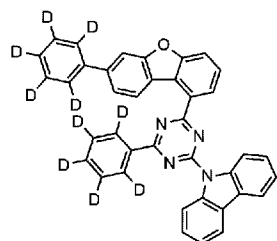
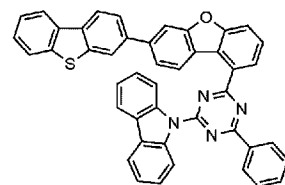
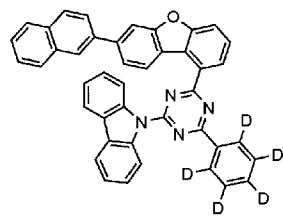
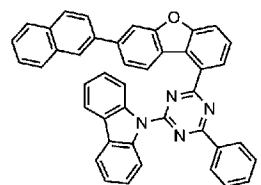
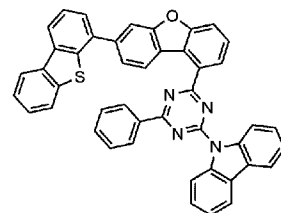
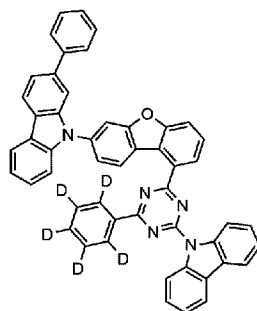
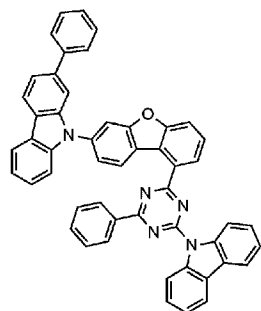


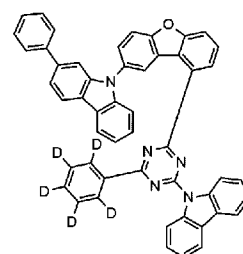
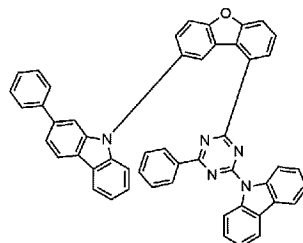
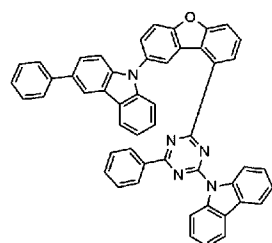
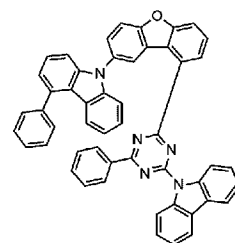
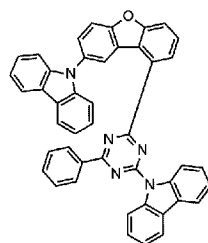
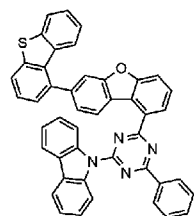
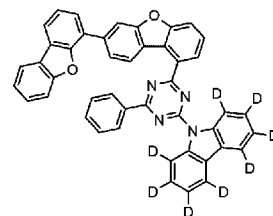
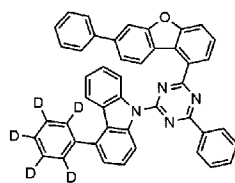
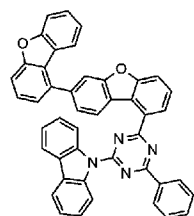


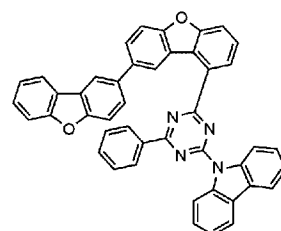
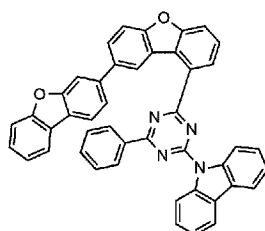
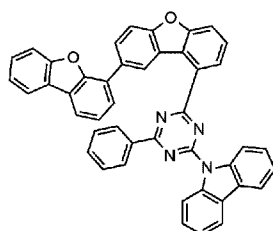
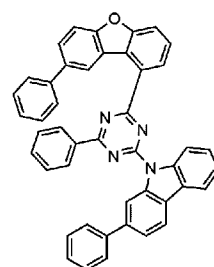
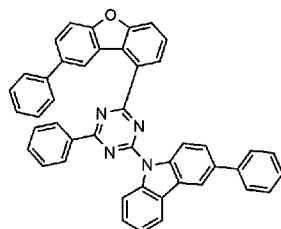
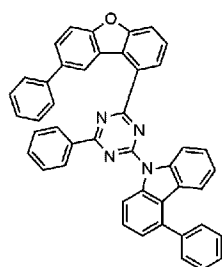
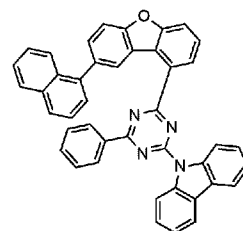
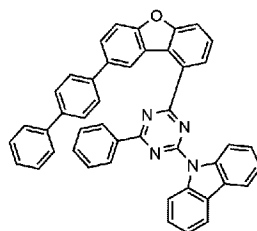
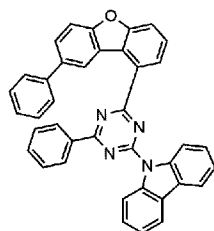


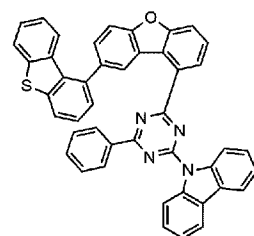
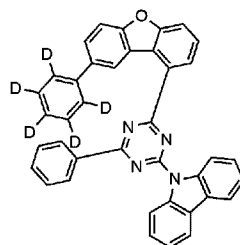
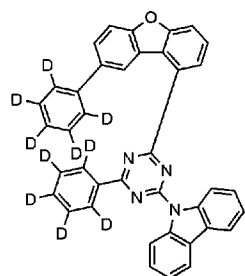
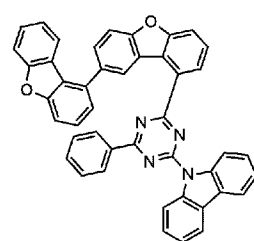
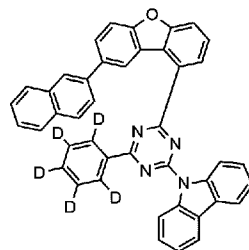
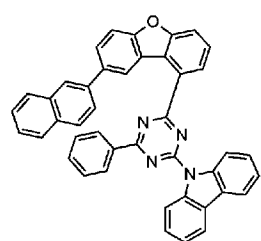
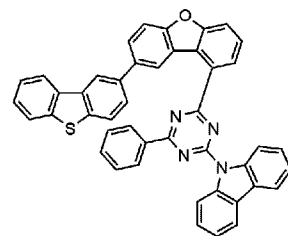
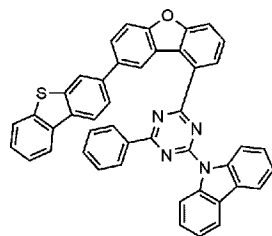
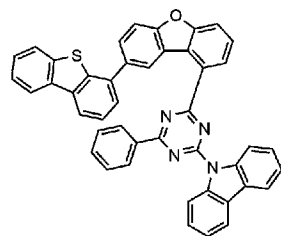


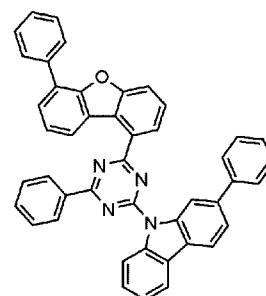
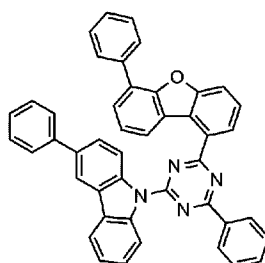
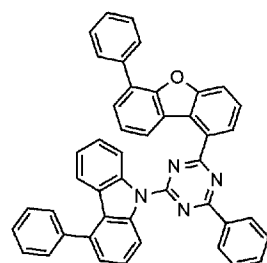
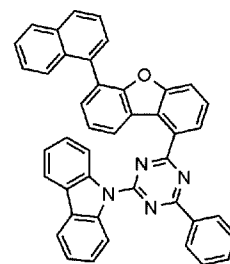
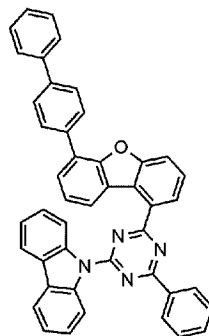
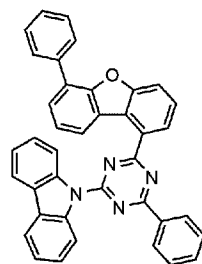
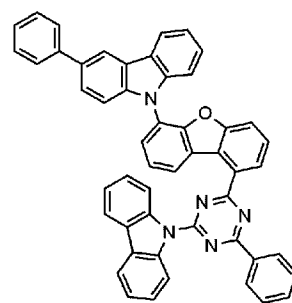
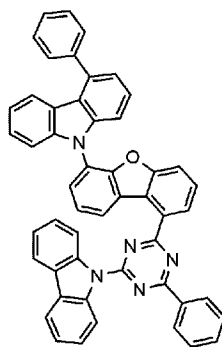
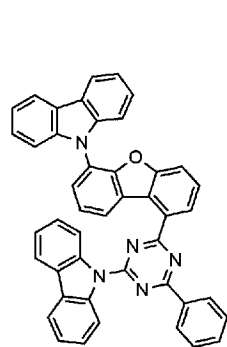


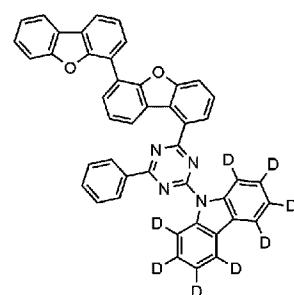
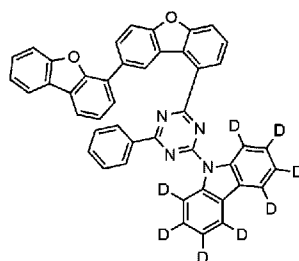
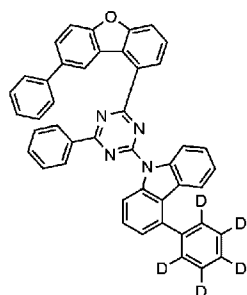
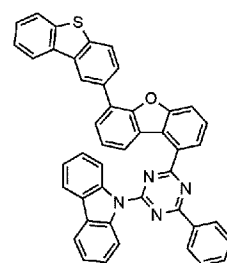
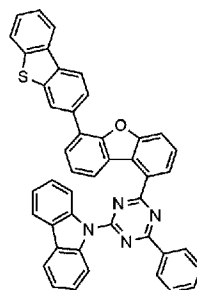
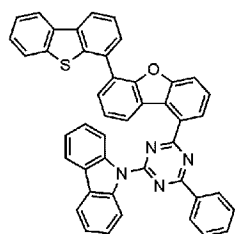
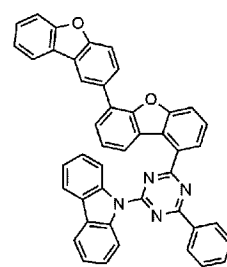
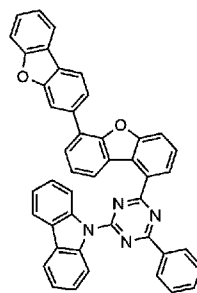
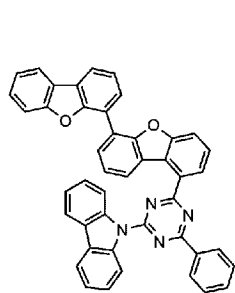


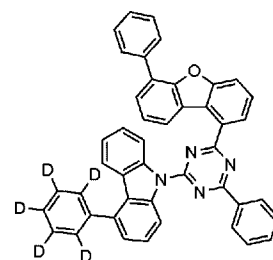
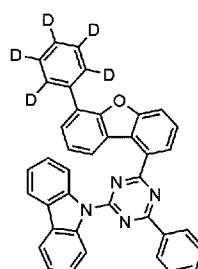
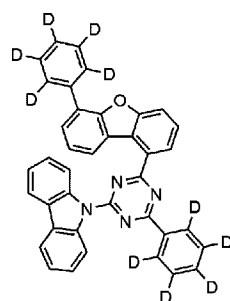
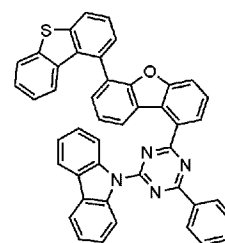
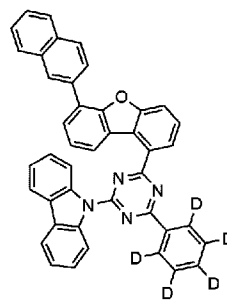
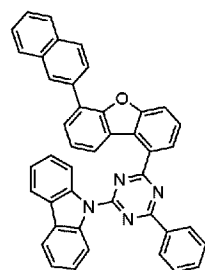
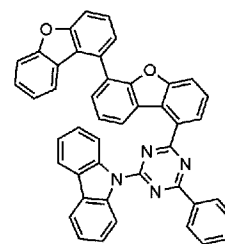
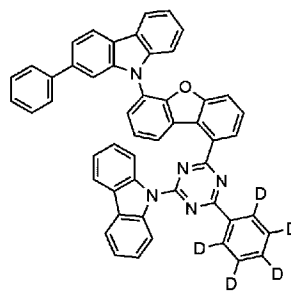
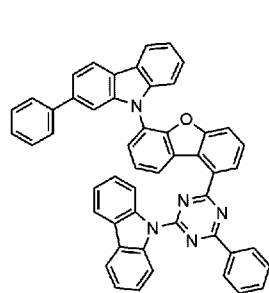


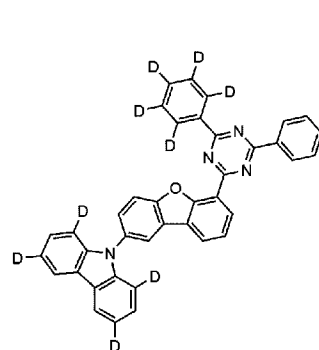
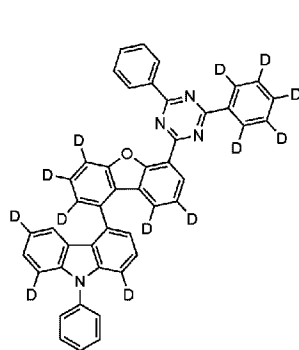
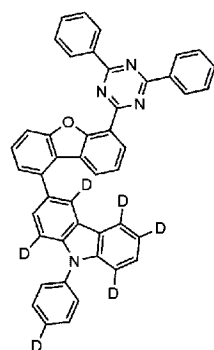
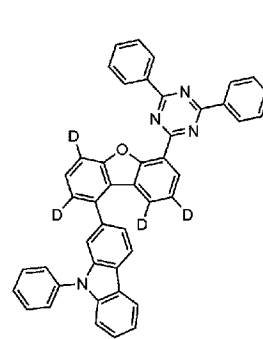
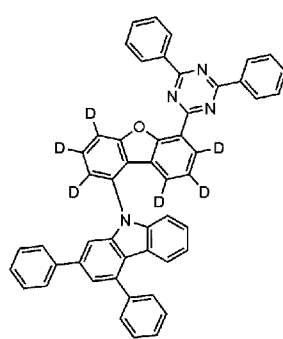
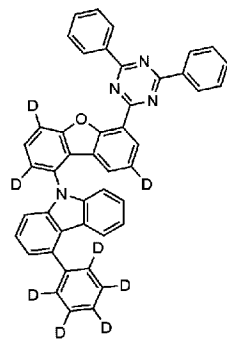
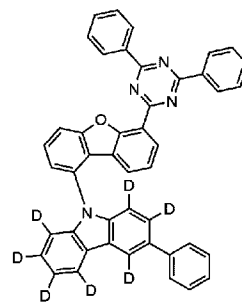
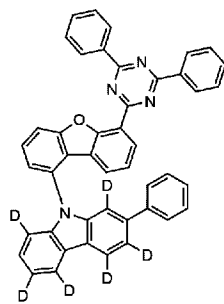
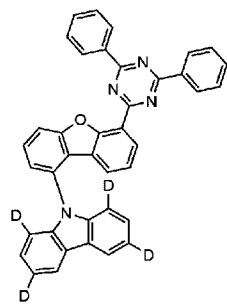


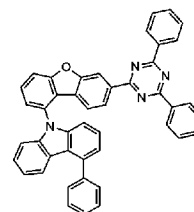
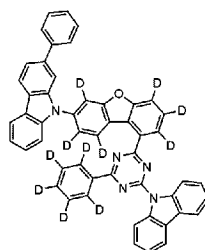
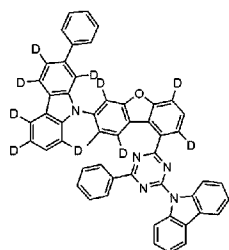
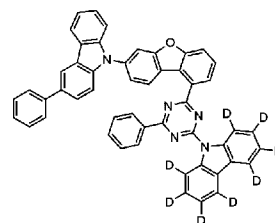
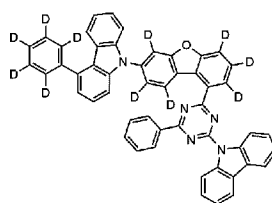
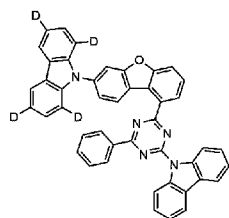
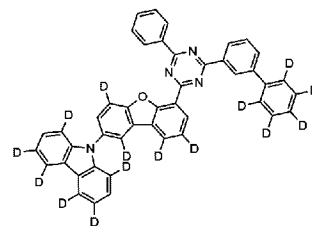
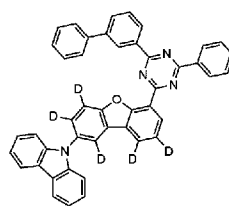
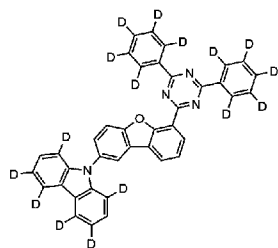


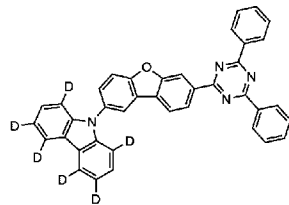
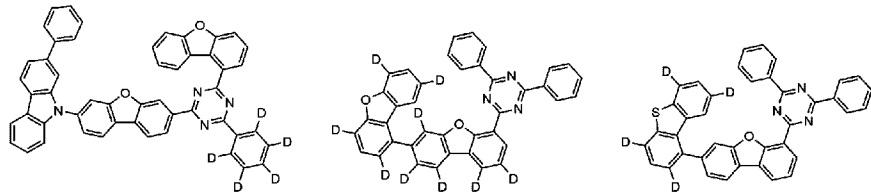
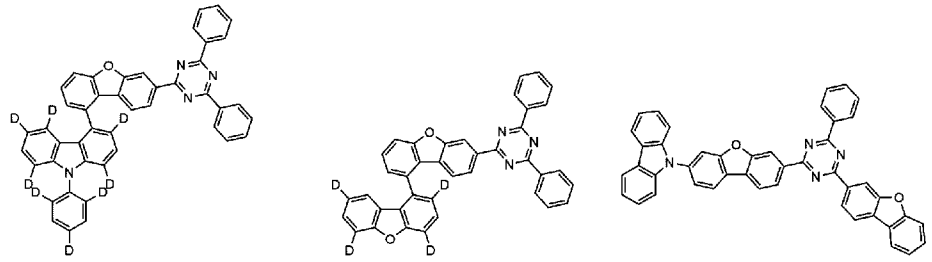






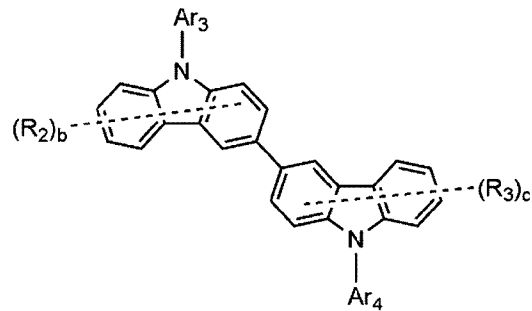






[청구항 8]

제1항에 있어서,
 상기 화학식 2는 하기 화학식 2-1로 표시되는,
 유기 발광 소자:
 [화학식 2-1]



[청구항 9]

상기 화학식 2-1에서,
 Ar₃, Ar₄, R₃, R₄, b 및 c의 정의는 제1항과 같다.
 제1항에 있어서,
 Ar₃ 및 Ar₄는 각각 독립적으로, 페닐, 비페닐릴, 테페닐릴, 나프틸,

디메틸플루오레닐, 디벤조푸라닐, 또는 디벤조티오펜일인,
유기 발광 소자.

[청구항 10]

제1항에 있어서,

R_2 및 R_3 는 각각 독립적으로, 수소 또는 페닐인,
유기 발광 소자.

[청구항 11]

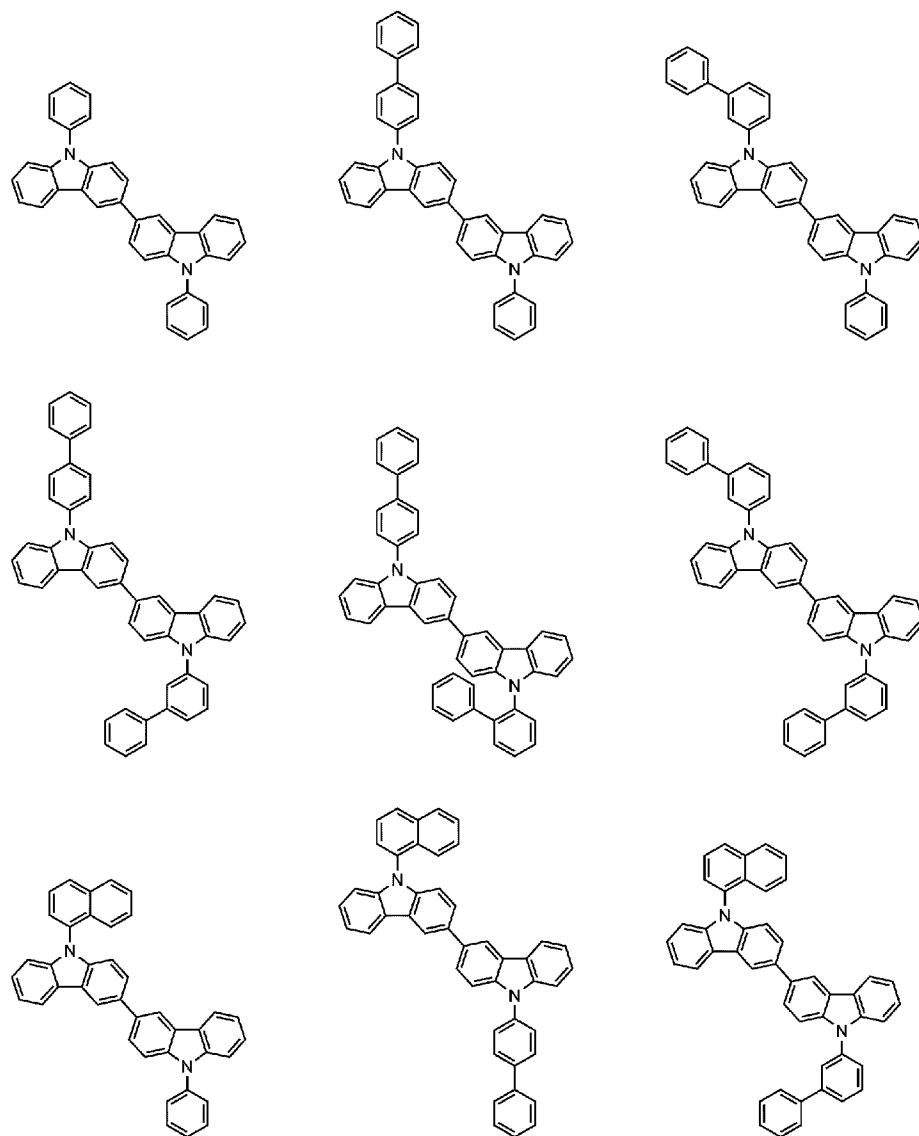
제10항에 있어서,

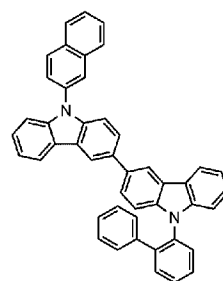
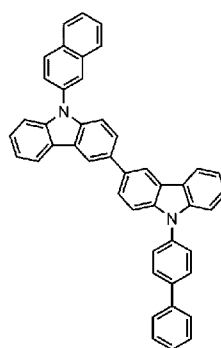
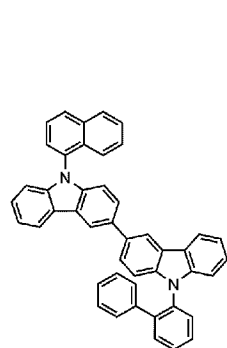
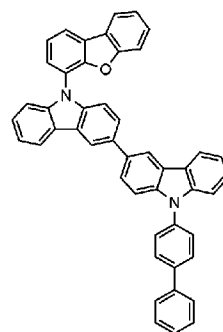
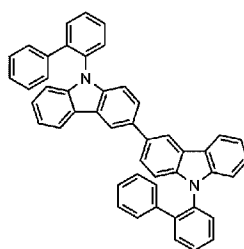
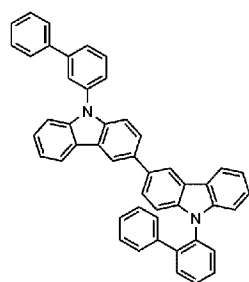
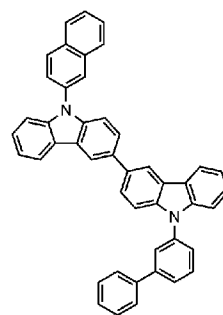
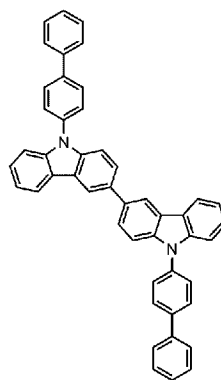
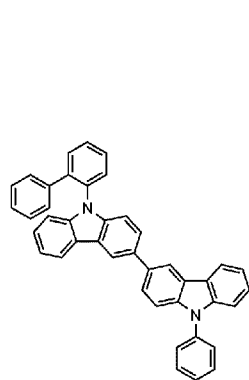
R_2 및 R_3 중 어느 하나는 페닐이고 나머지 하나는 수소이거나, R_2 및 R_3 모두 수소인,
유기 발광 소자.

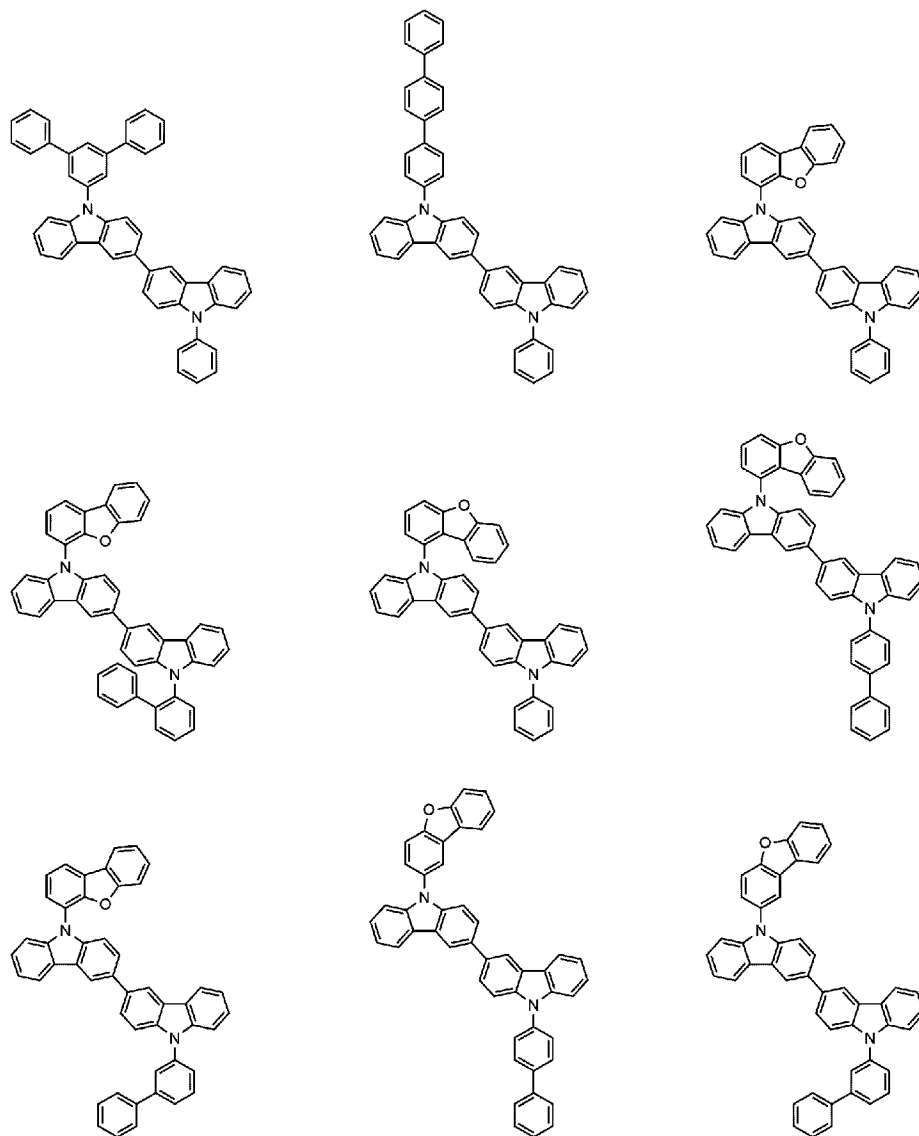
[청구항 12]

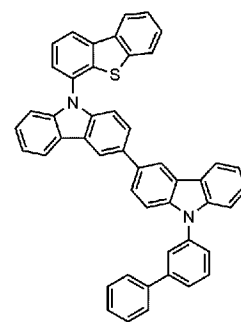
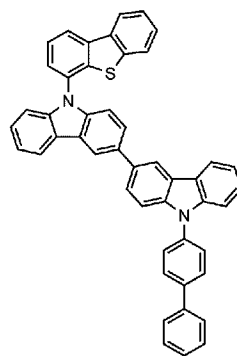
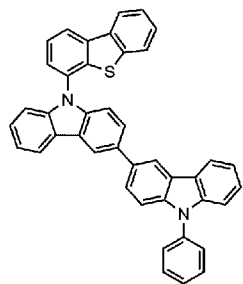
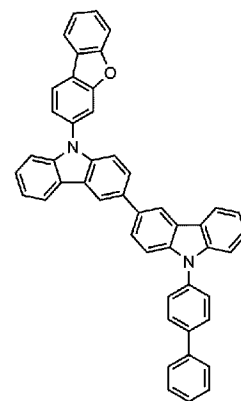
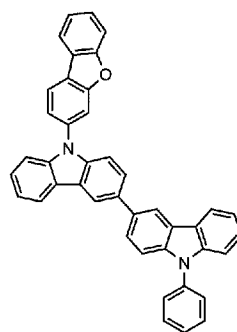
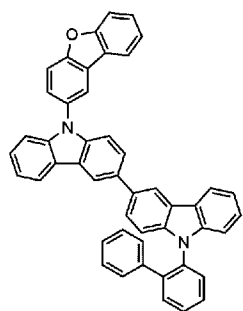
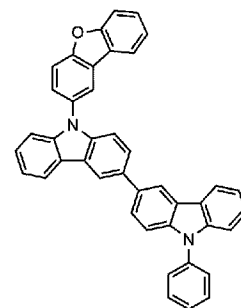
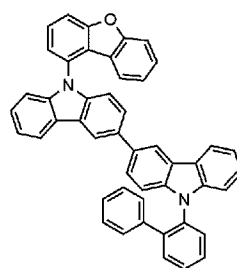
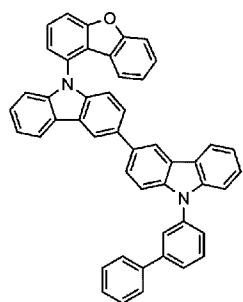
제1항에 있어서,

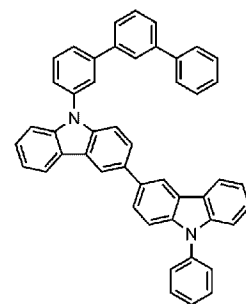
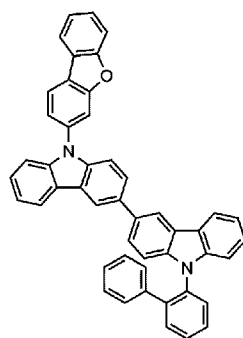
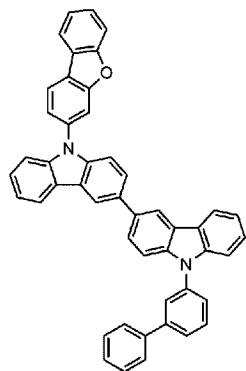
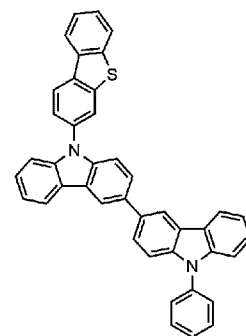
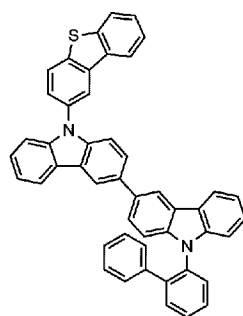
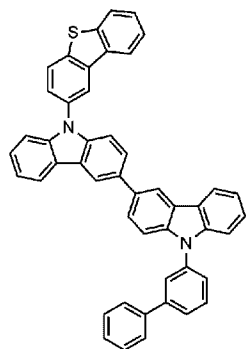
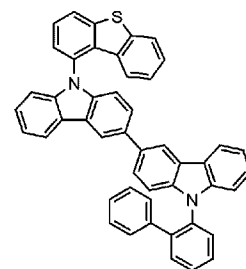
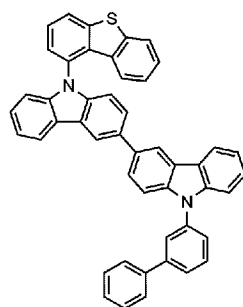
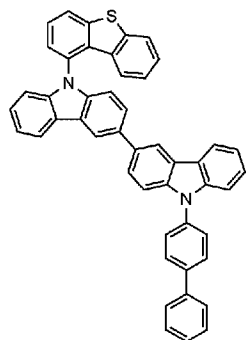
상기 화학식 2로 표시되는 화합물은 하기 화합물로 구성되는
군으로부터 선택되는 어느 하나인,
유기 발광 소자:

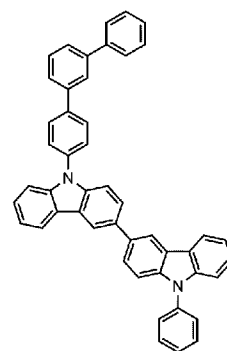
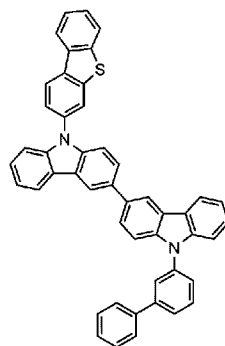
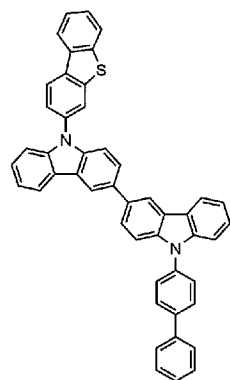
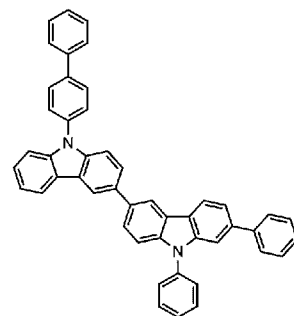
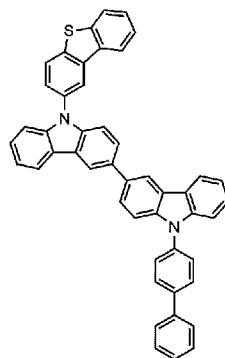
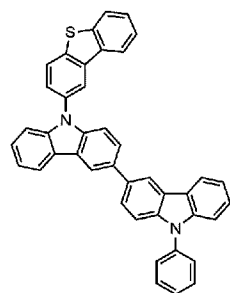
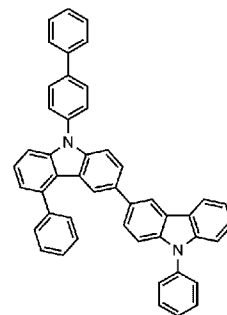
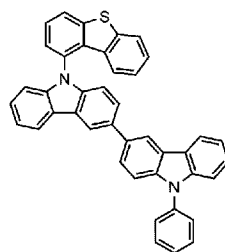
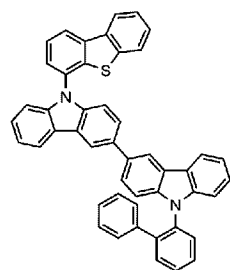


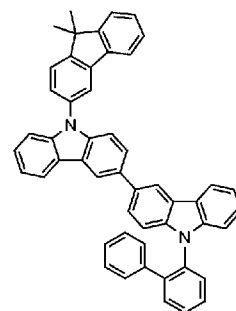
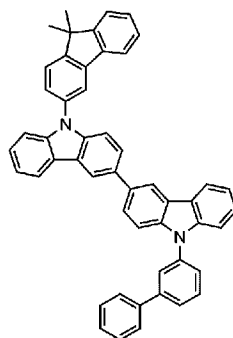
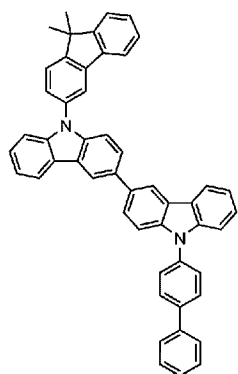
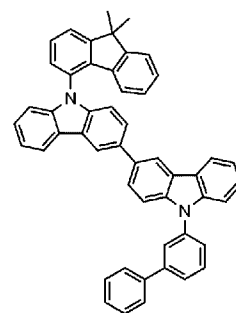
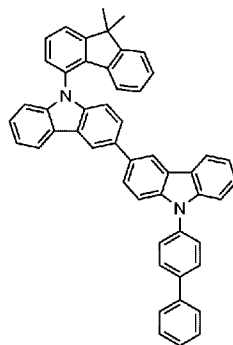
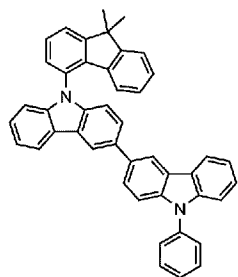
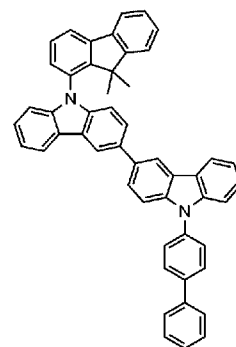
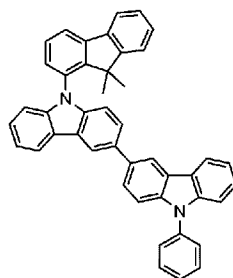
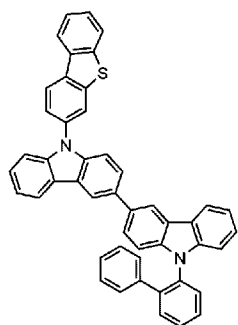


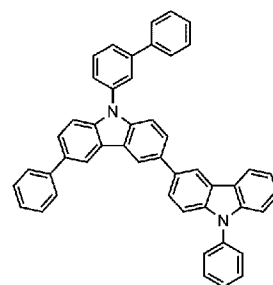
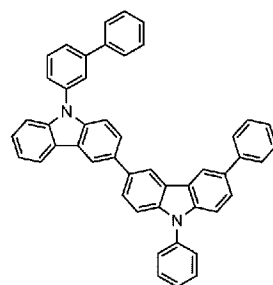
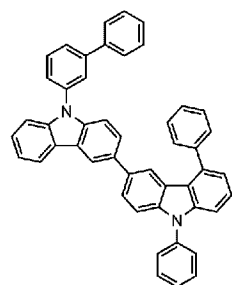
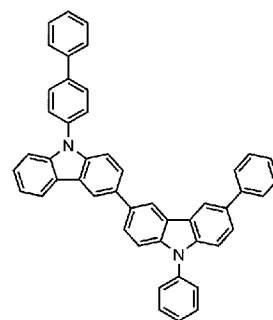
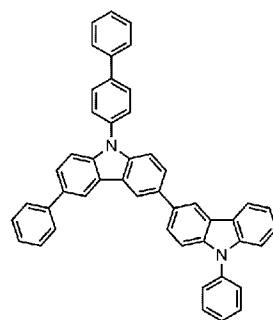
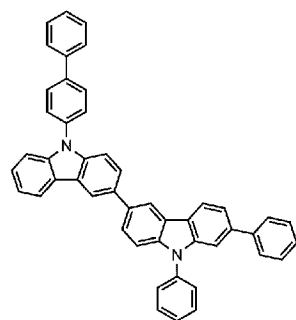
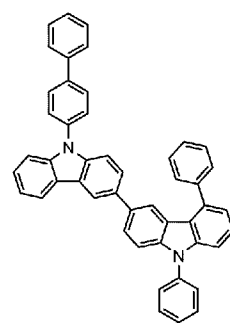
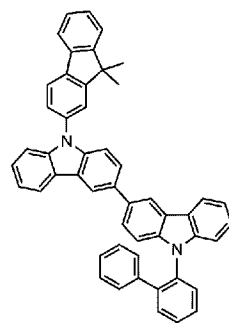
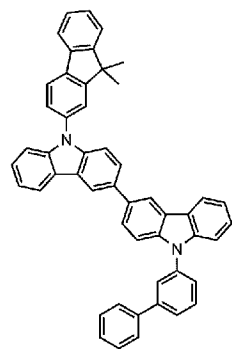


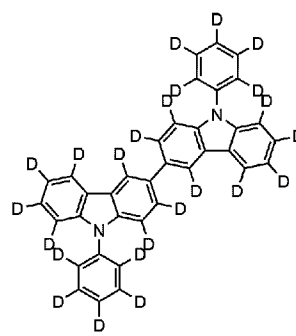
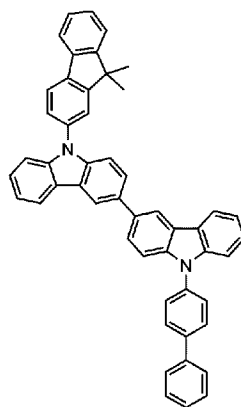
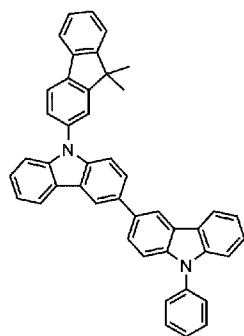
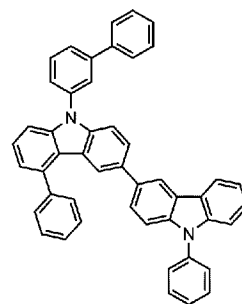
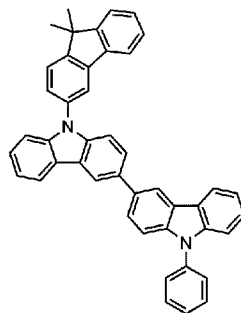
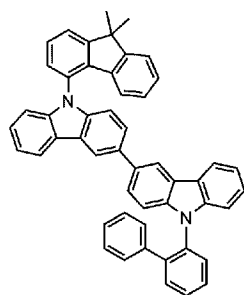
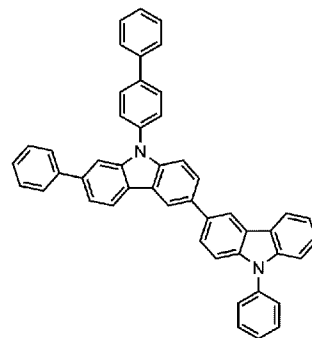
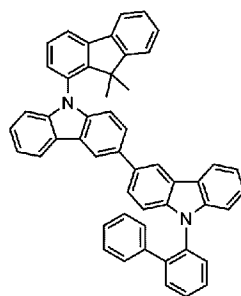
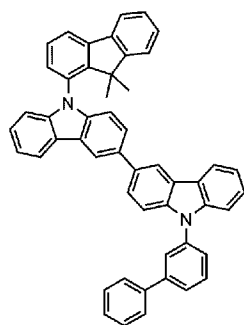


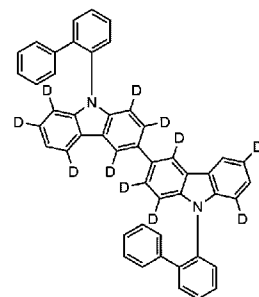
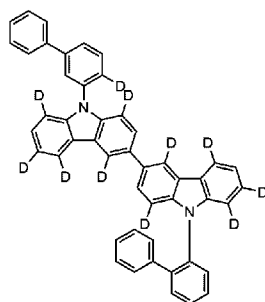
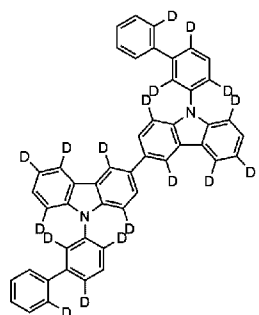
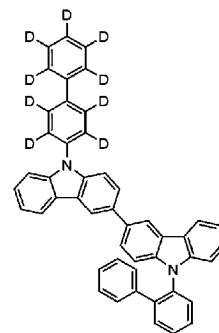
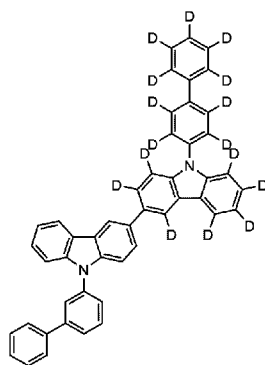
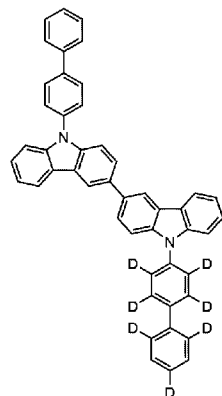
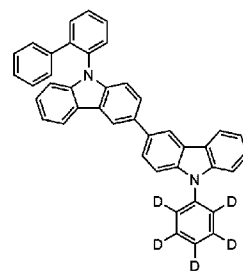
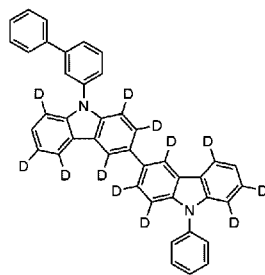
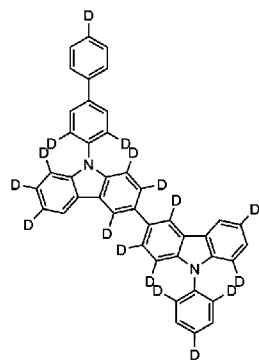


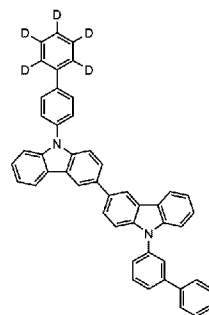
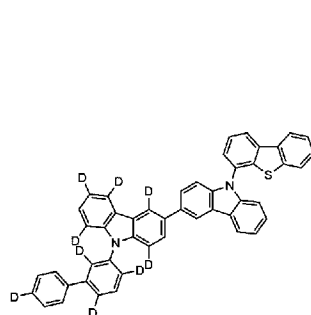
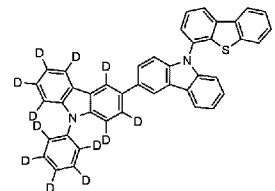
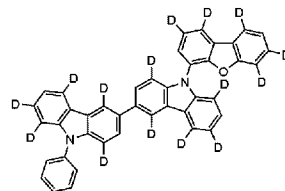
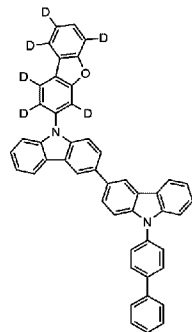
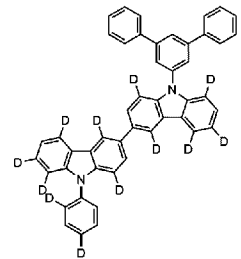
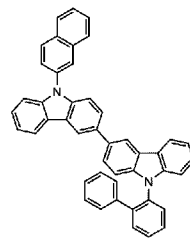
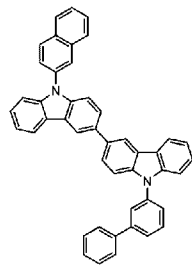








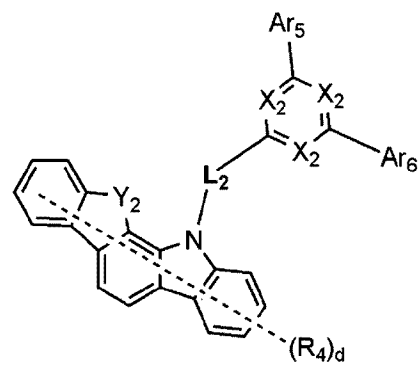




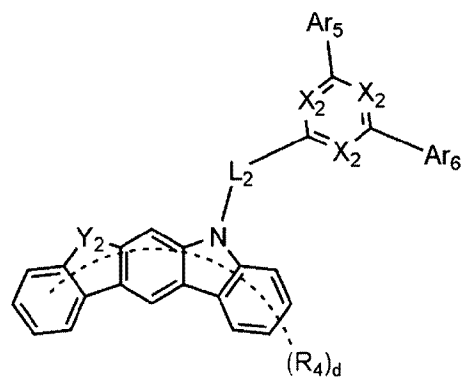
[청구항 13]

제1항에 있어서,
 상기 화학식 3은 하기 화학식 3-1 내지 3-6 중 어느 하나로
 표시되는,
 유기 발광 소자:

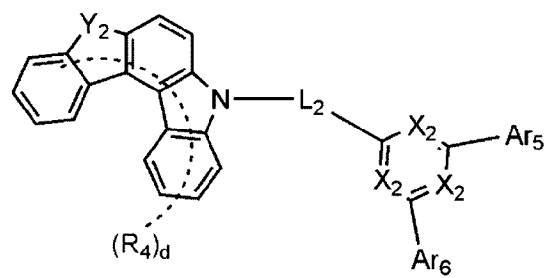
[화학식 3-1]



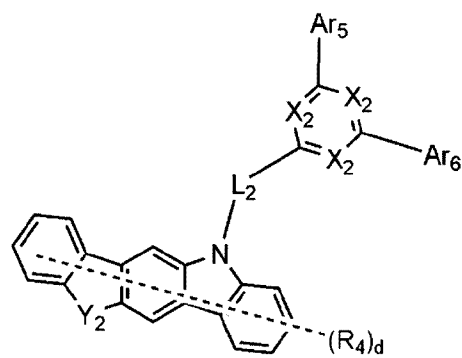
[화학식 3-2]



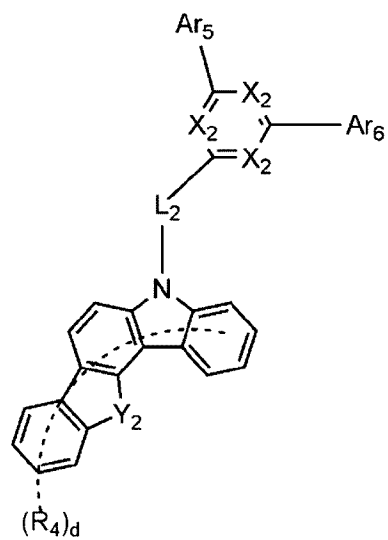
[화학식 3-3]



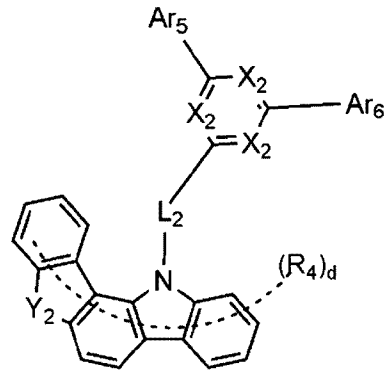
[화학식 3-4]



[화학식 3-5]



[화학식 3-6]



상기 화학식 3-1 내지 3-6에서, X_2 , L_2 , Ar_5 , Ar_6 , R_4 , Y_2 , 및 d 의 정의는 제1항과 같다.

[청구항 14]

제1항에 있어서,

L_2 는 직접 결합 또는 페닐렌이고,

상기 L_2 가 페닐렌인 경우, 비치환되거나, 하나 이상의 중수소로 치환된,

유기 발광 소자.

[청구항 15]

제1항에 있어서,

Ar_5 및 Ar_6 은 각각 독립적으로, 페닐, 비페닐릴, (페닐)비페닐릴, 트리페닐레닐, 디메틸플루오레닐, 디벤조푸라닐, 디벤조티오펜, 카바졸-9-일, 또는 9-페닐-9H-카바졸릴이고,

상기 Ar_5 및 Ar_6 은 각각 독립적으로, 비치환되거나, 적어도 하나 이상의 중수소로 치환된,

유기 발광 소자.

[청구항 16]

제1항에 있어서,

Y_2 는 $C(CH_3)_2$, $C(C_6H_5)_2$, O, S, 또는 $N(Ar_7)$ 이고,

여기서 Ar_7 은 페닐, 비페닐릴, 터페닐릴, 디벤조푸라닐, 또는 디벤조티오펜이고, 상기 Ar_7 은 비치환되거나, 적어도 하나 이상의 중수소로 치환된,

유기 발광 소자.

[청구항 17]

제1항에 있어서,

R_4 는 수소 또는 중수소인,

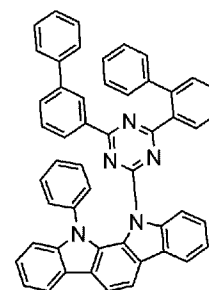
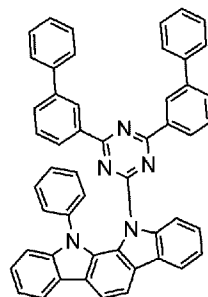
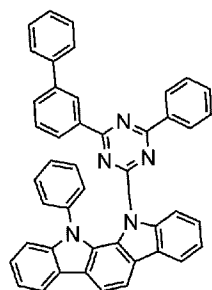
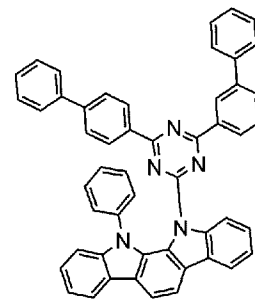
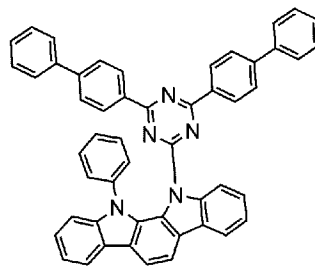
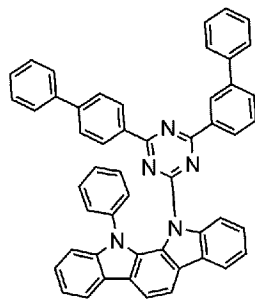
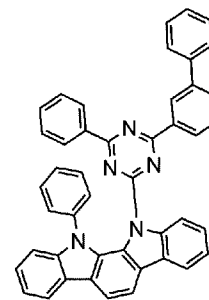
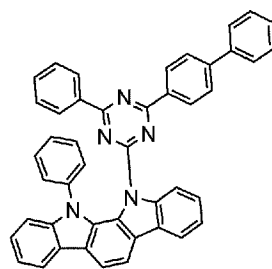
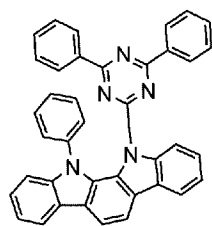
유기 발광 소자.

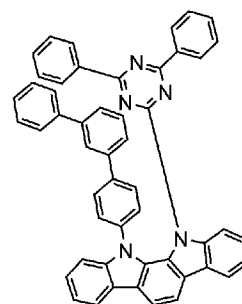
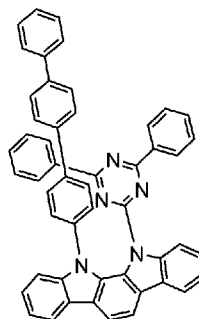
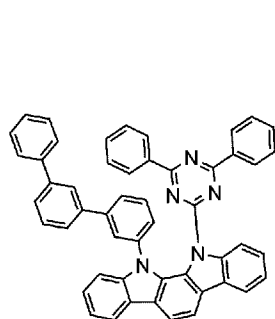
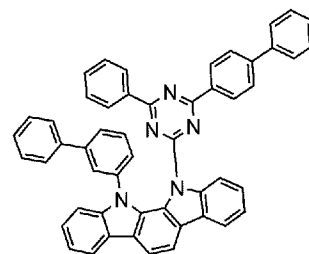
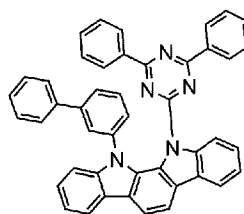
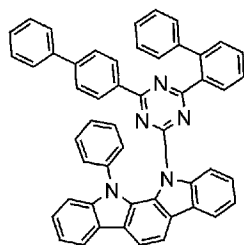
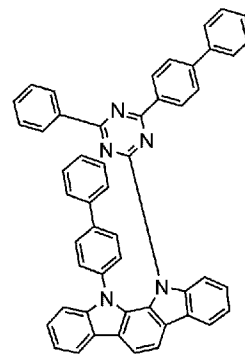
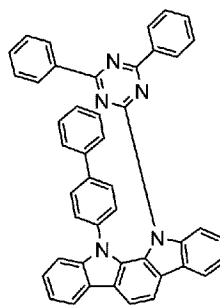
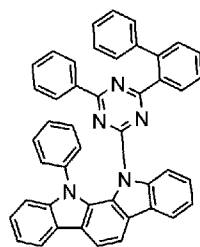
[청구항 18]

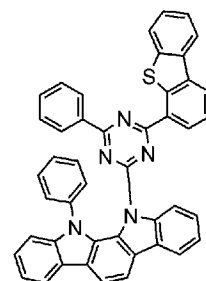
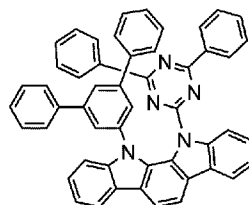
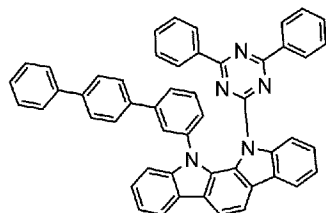
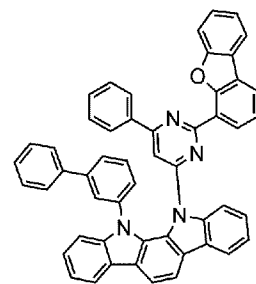
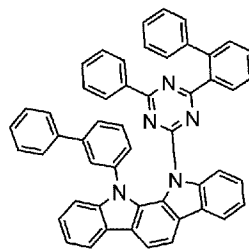
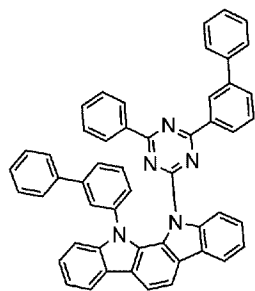
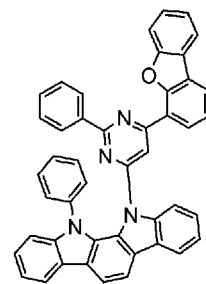
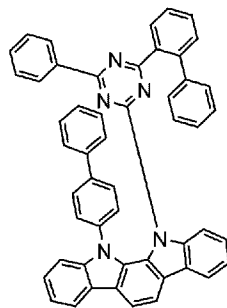
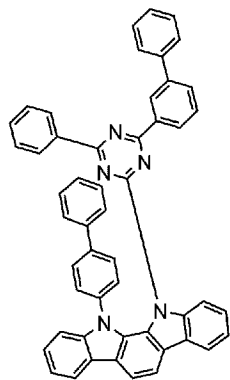
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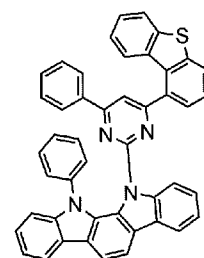
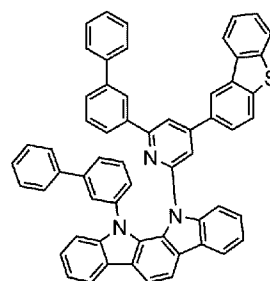
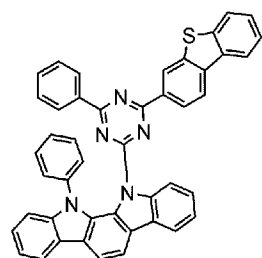
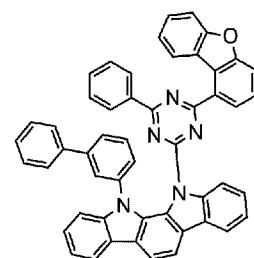
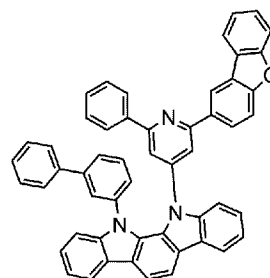
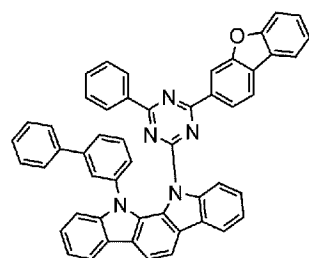
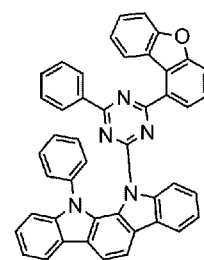
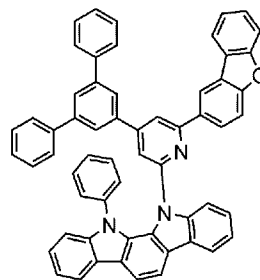
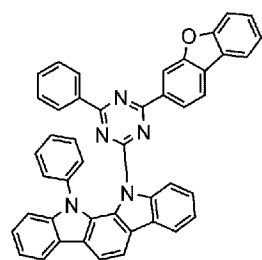
상기 화학식 3으로 표시되는 화합물은 하기 화합물로 구성되는 군으로부터 선택되는 어느 하나인,

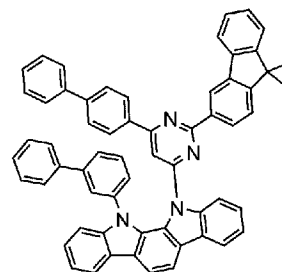
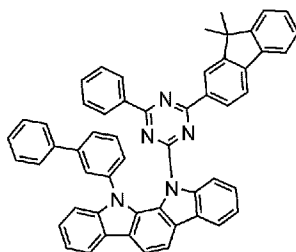
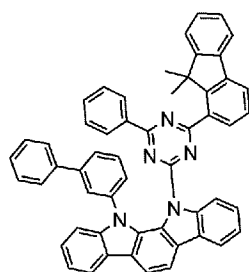
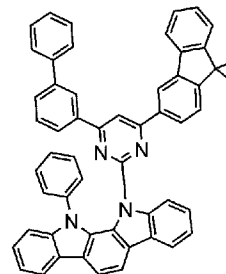
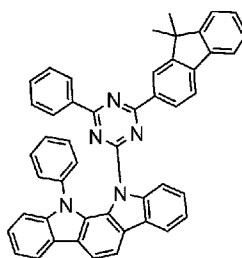
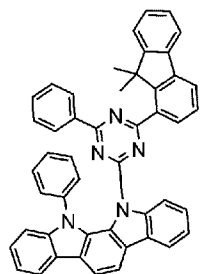
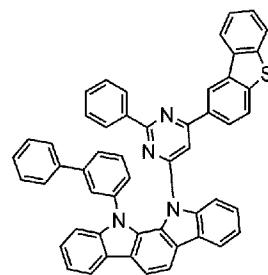
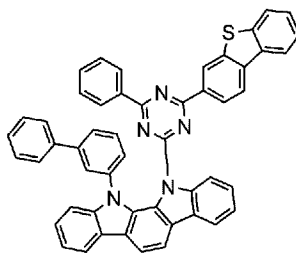
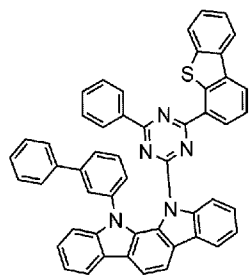
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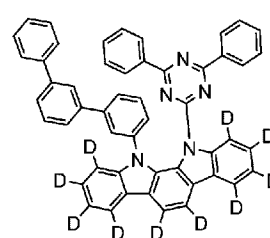
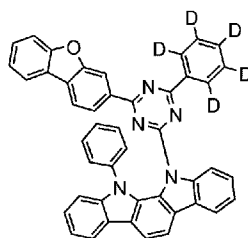
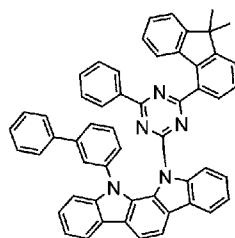
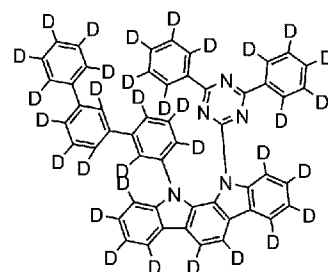
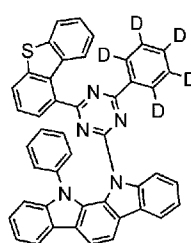
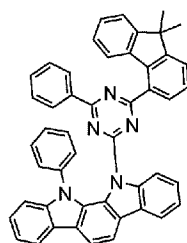
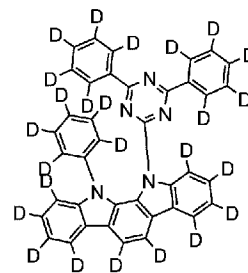
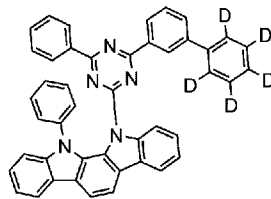
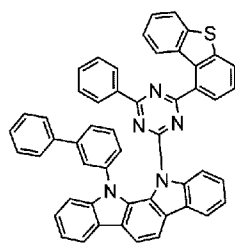


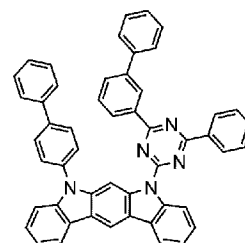
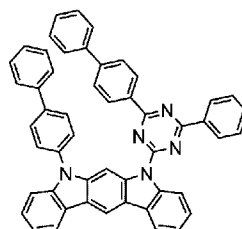
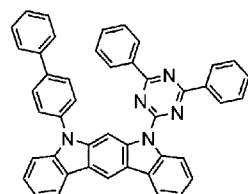
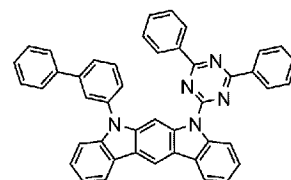
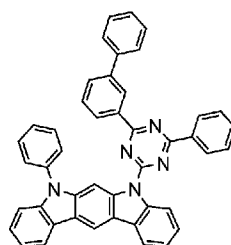
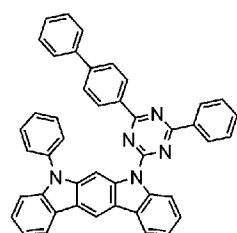
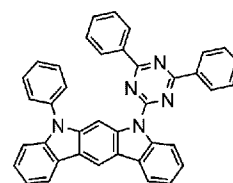
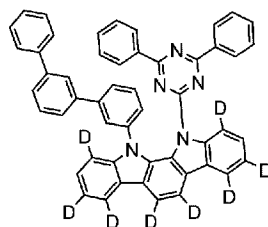
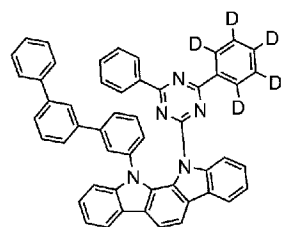


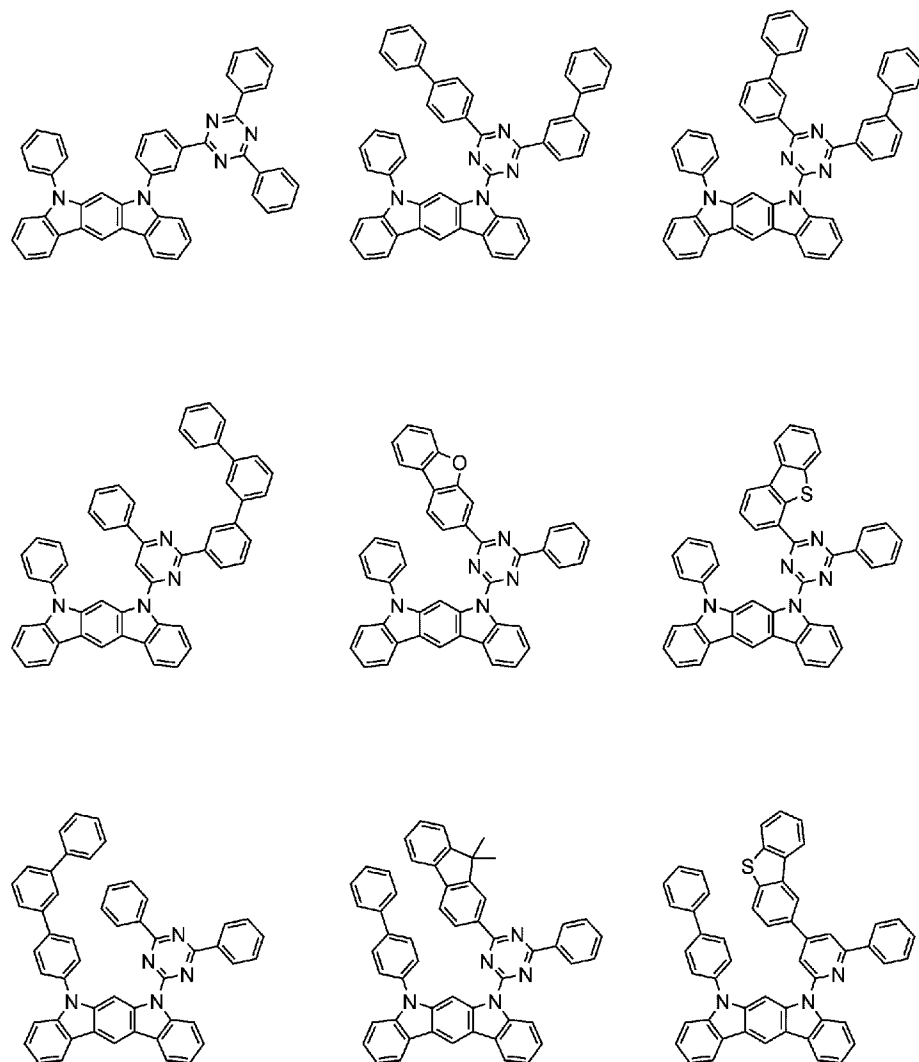


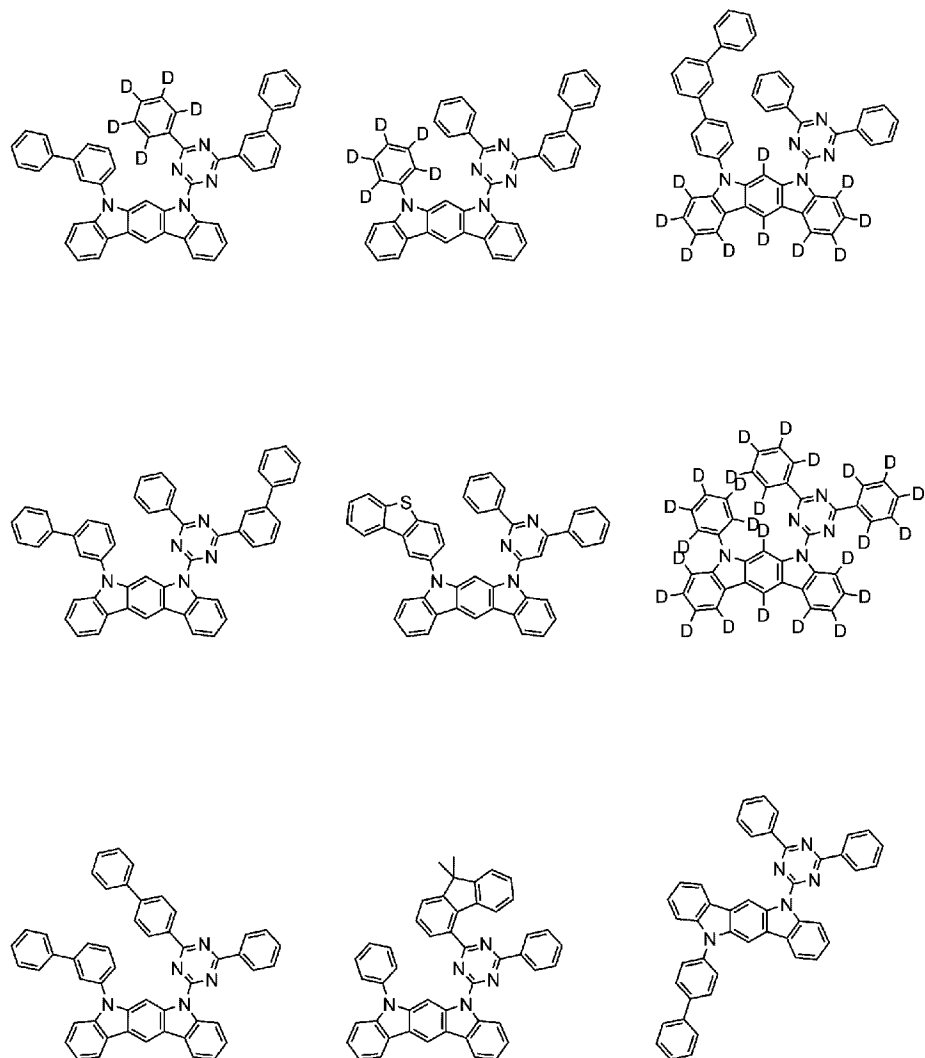


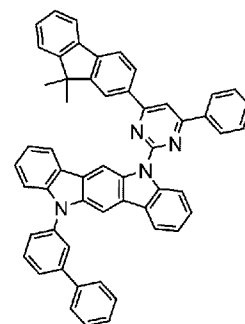
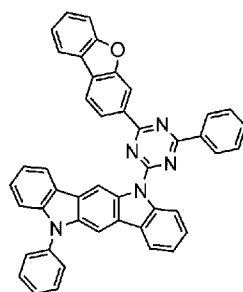
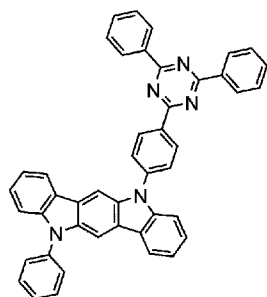
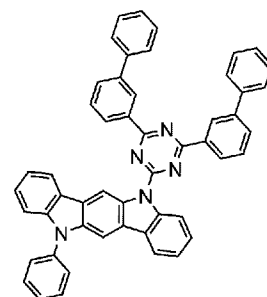
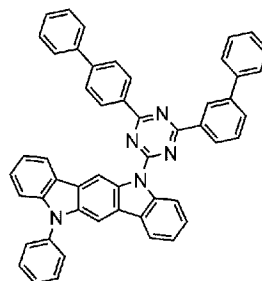
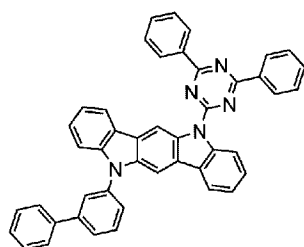
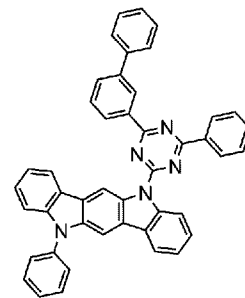
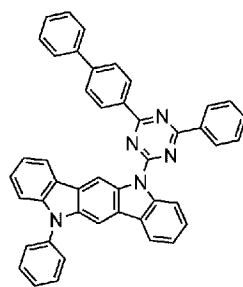
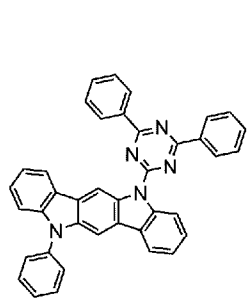


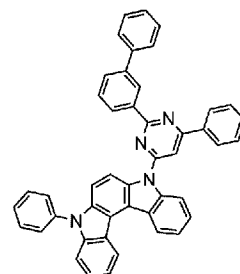
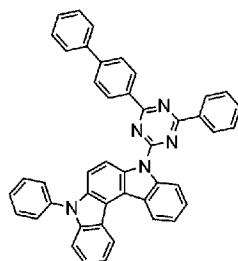
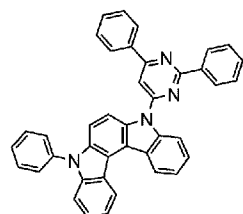
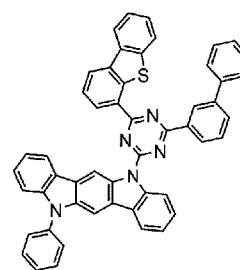
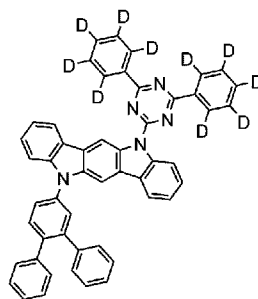
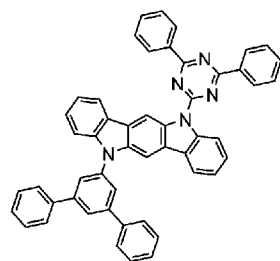
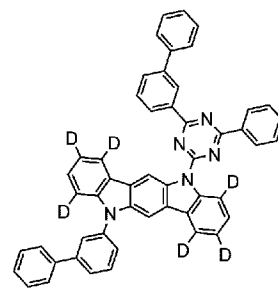
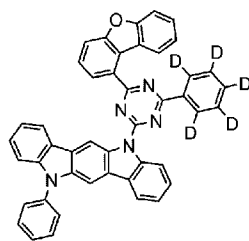
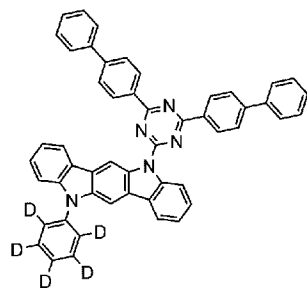


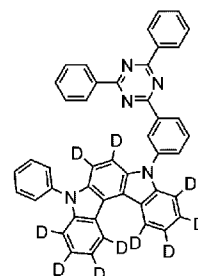
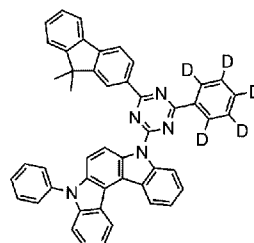
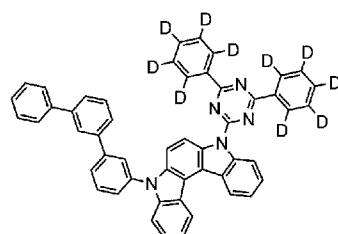
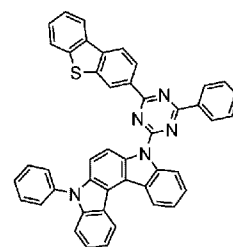
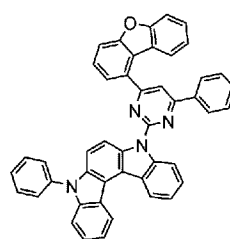
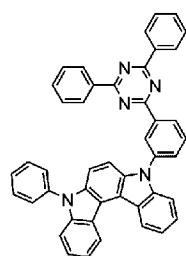
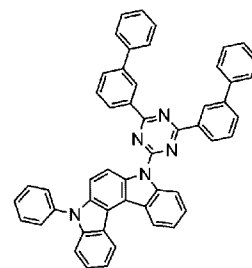
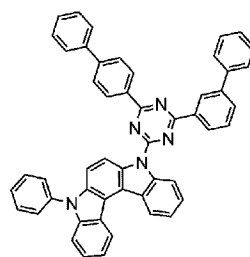
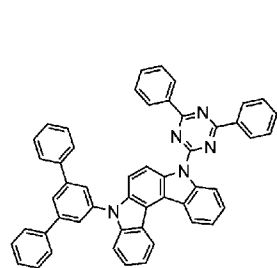


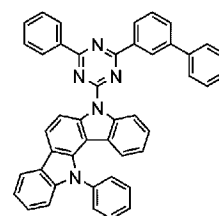
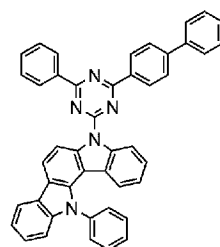
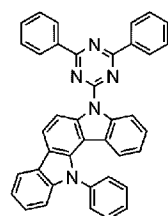
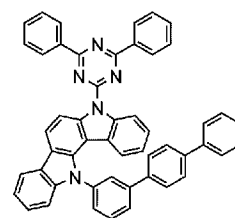
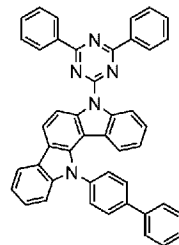
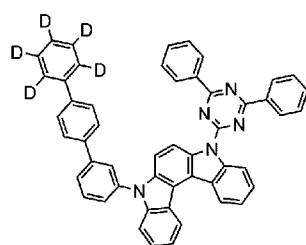
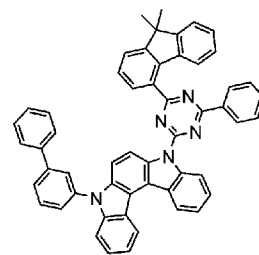
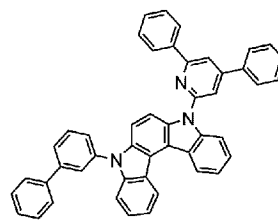
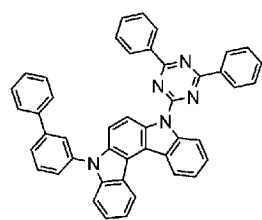


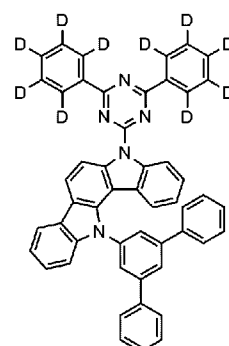
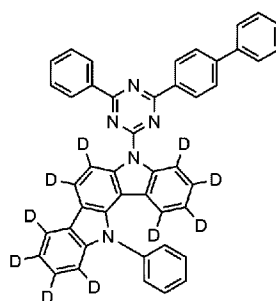
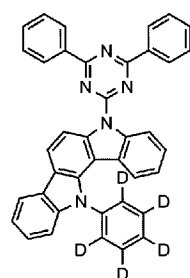
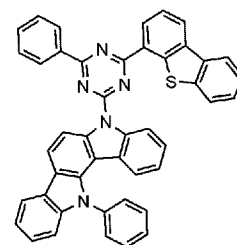
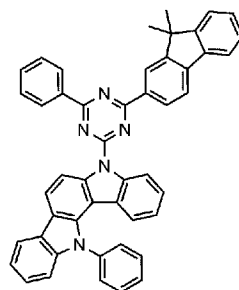
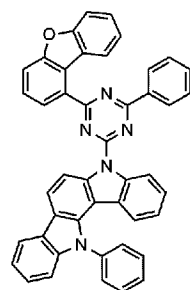
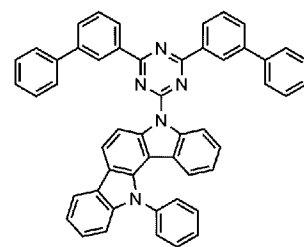
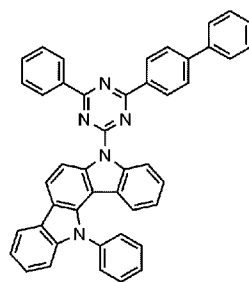
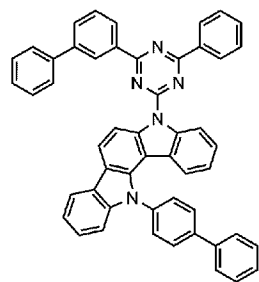


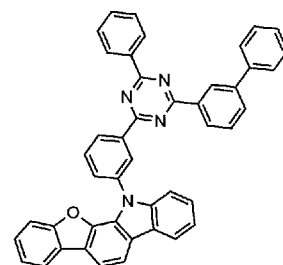
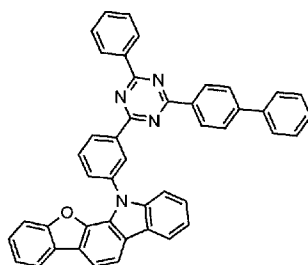
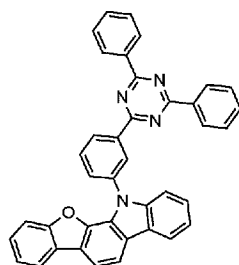
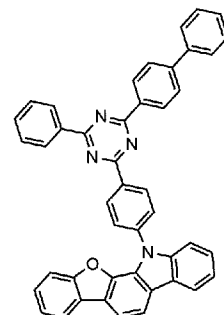
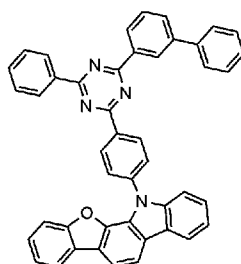
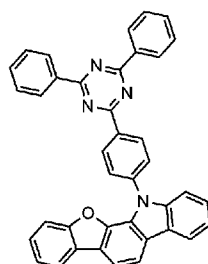
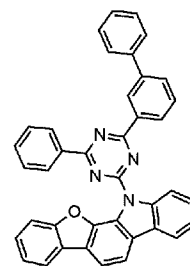
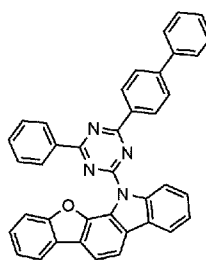
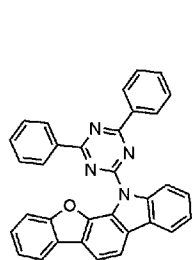


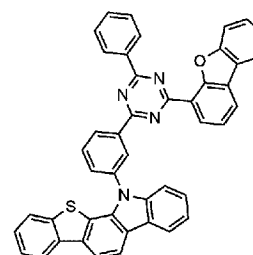
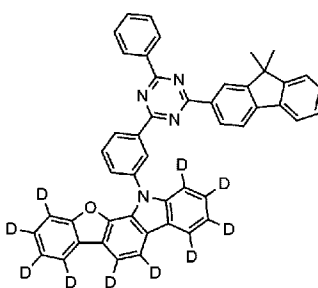
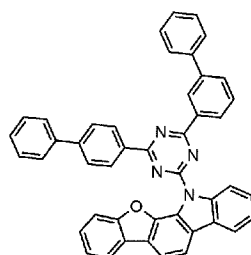
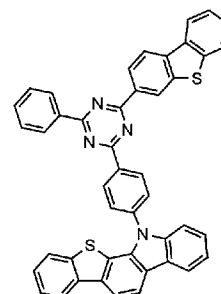
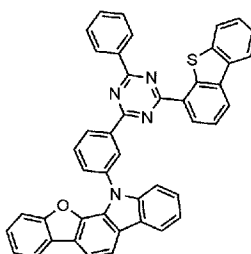
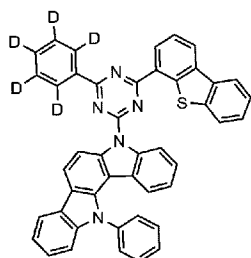
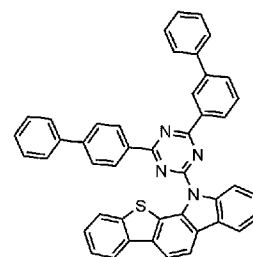
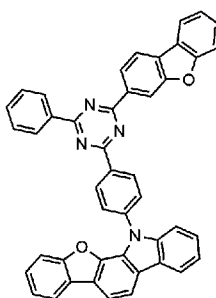
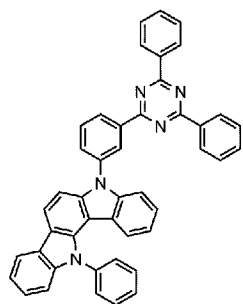


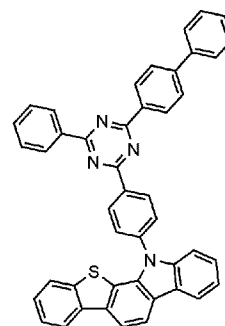
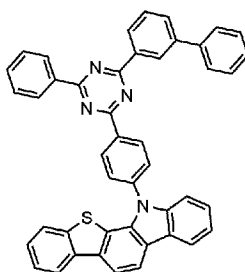
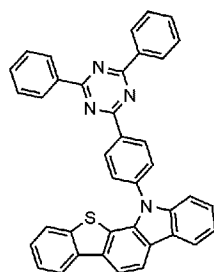
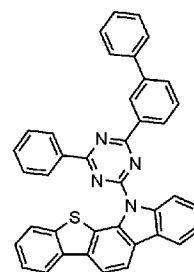
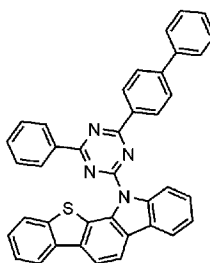
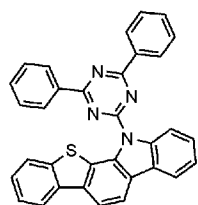
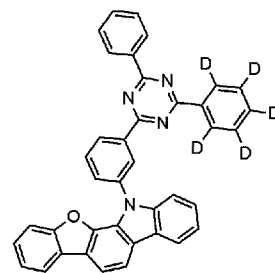
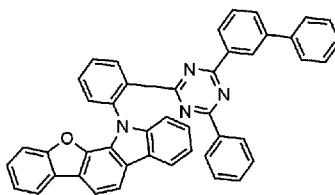
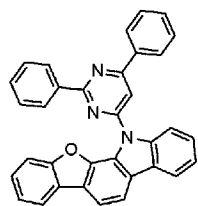


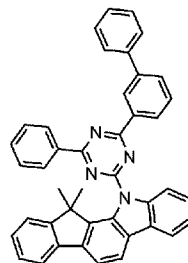
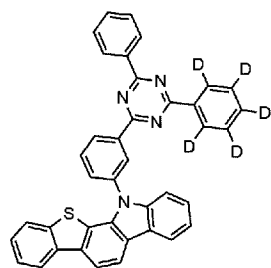
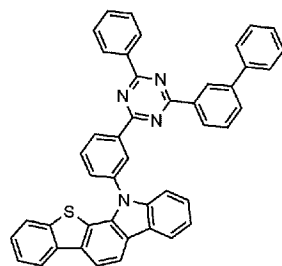


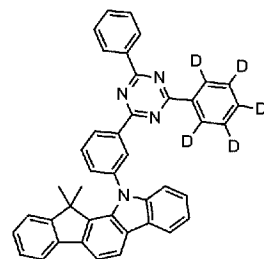
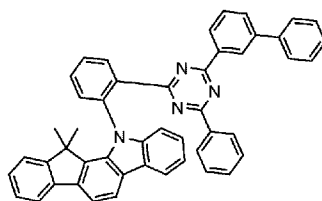
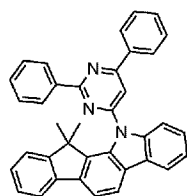
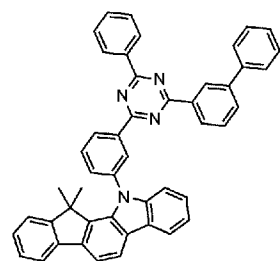
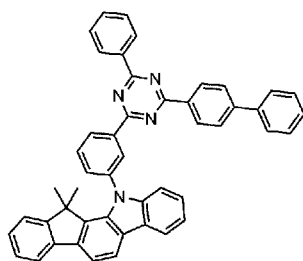
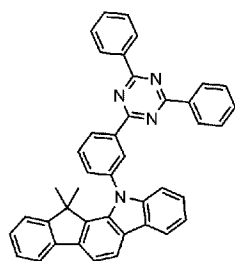
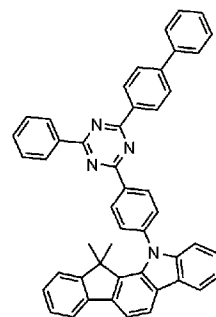
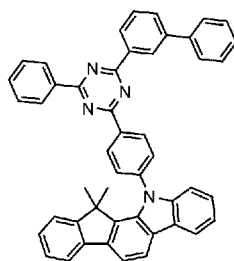
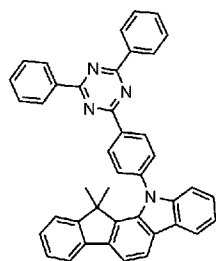


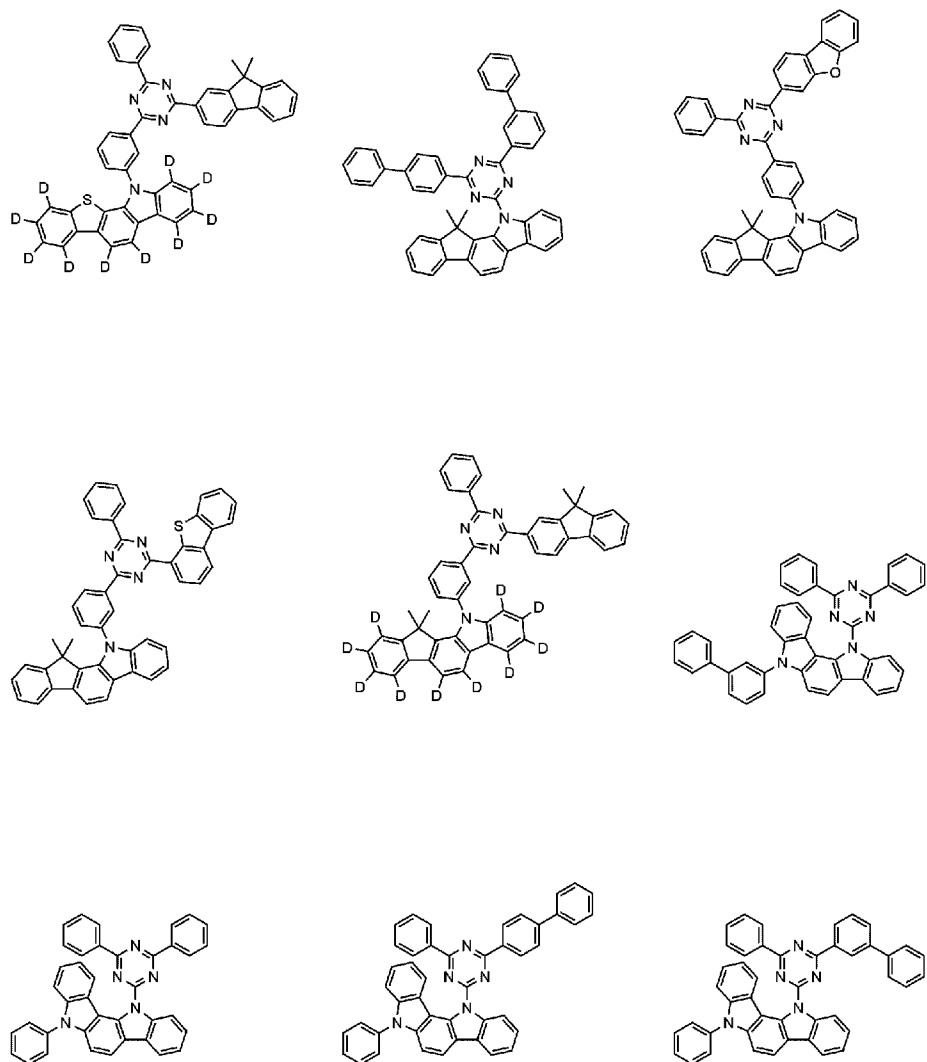


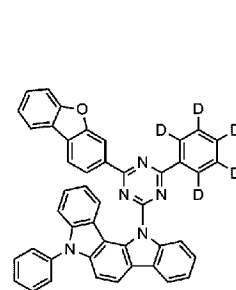
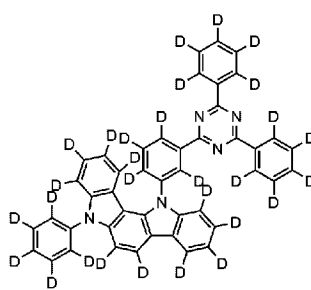
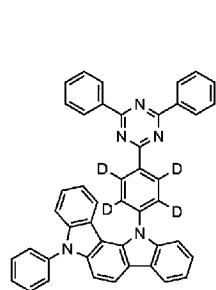
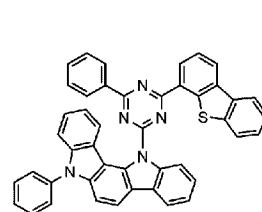
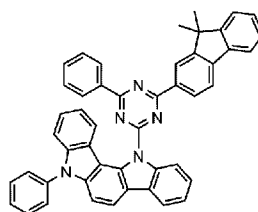
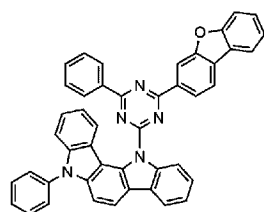
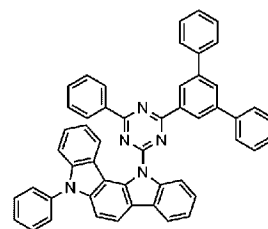
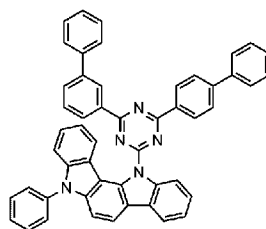
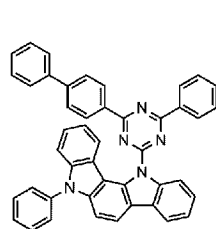


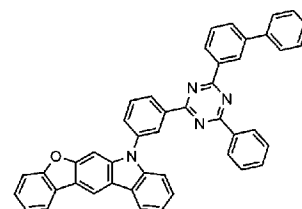
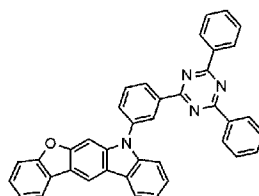
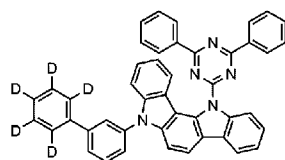
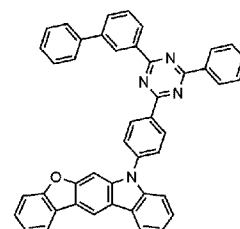
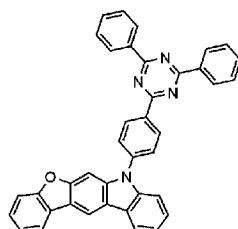
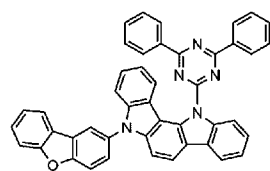
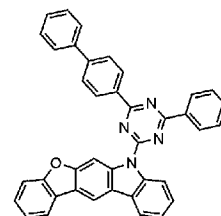
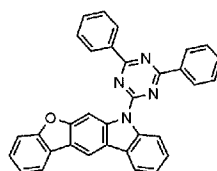
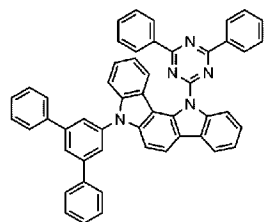


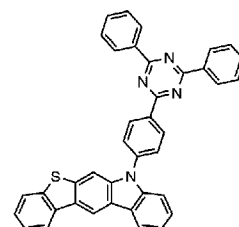
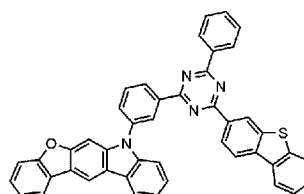
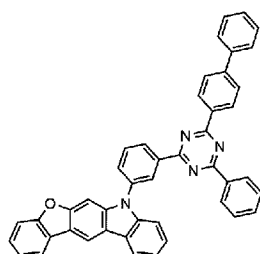
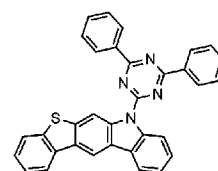
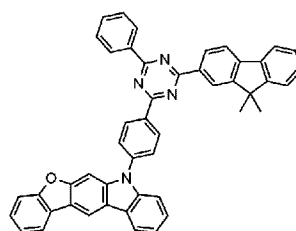
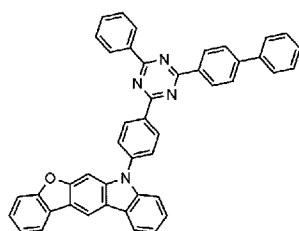
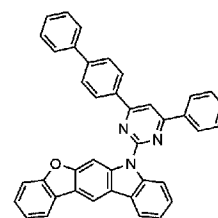
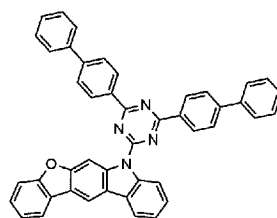
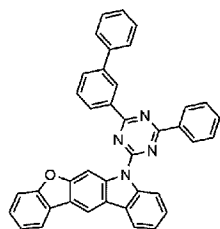


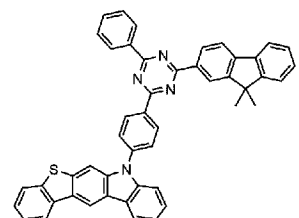
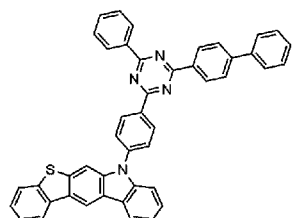
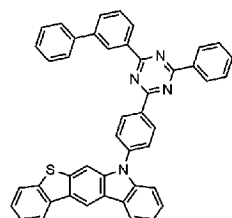
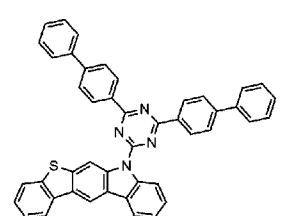
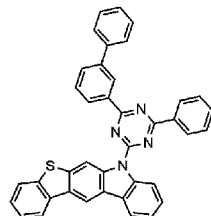
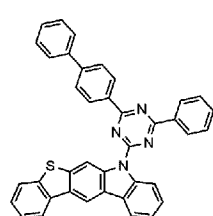
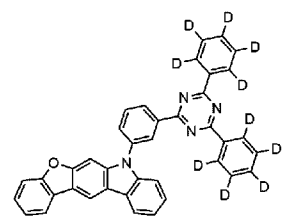
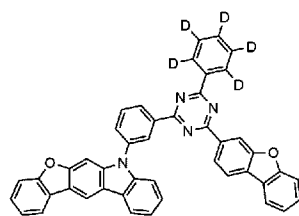
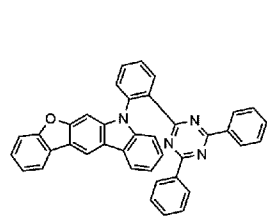


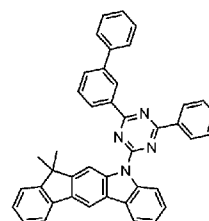
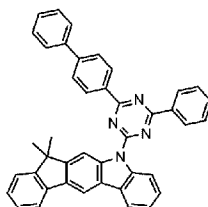
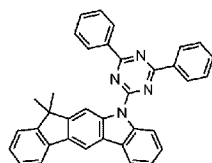
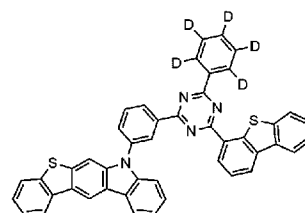
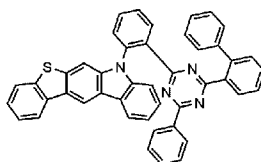
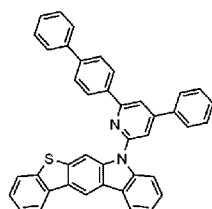
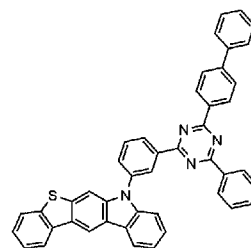
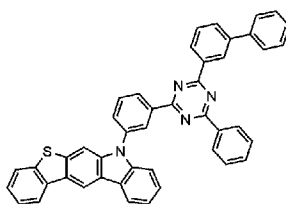
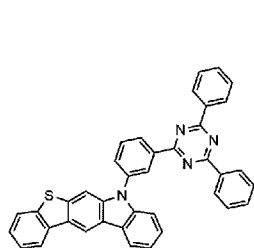


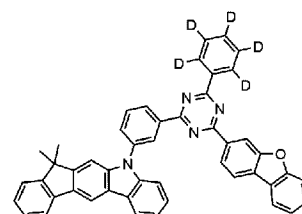
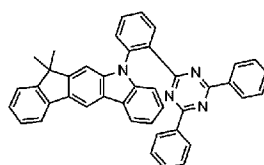
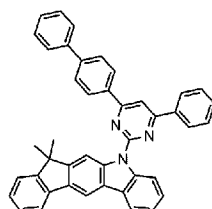
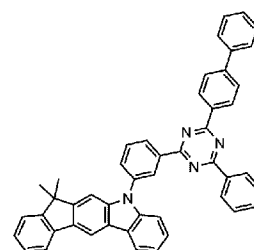
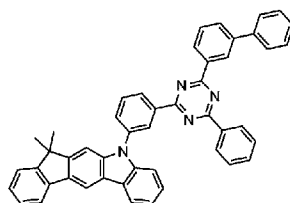
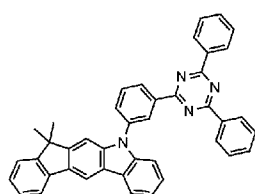
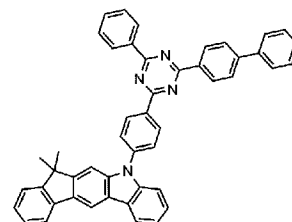
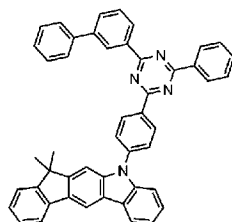
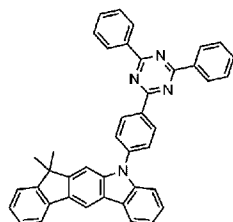


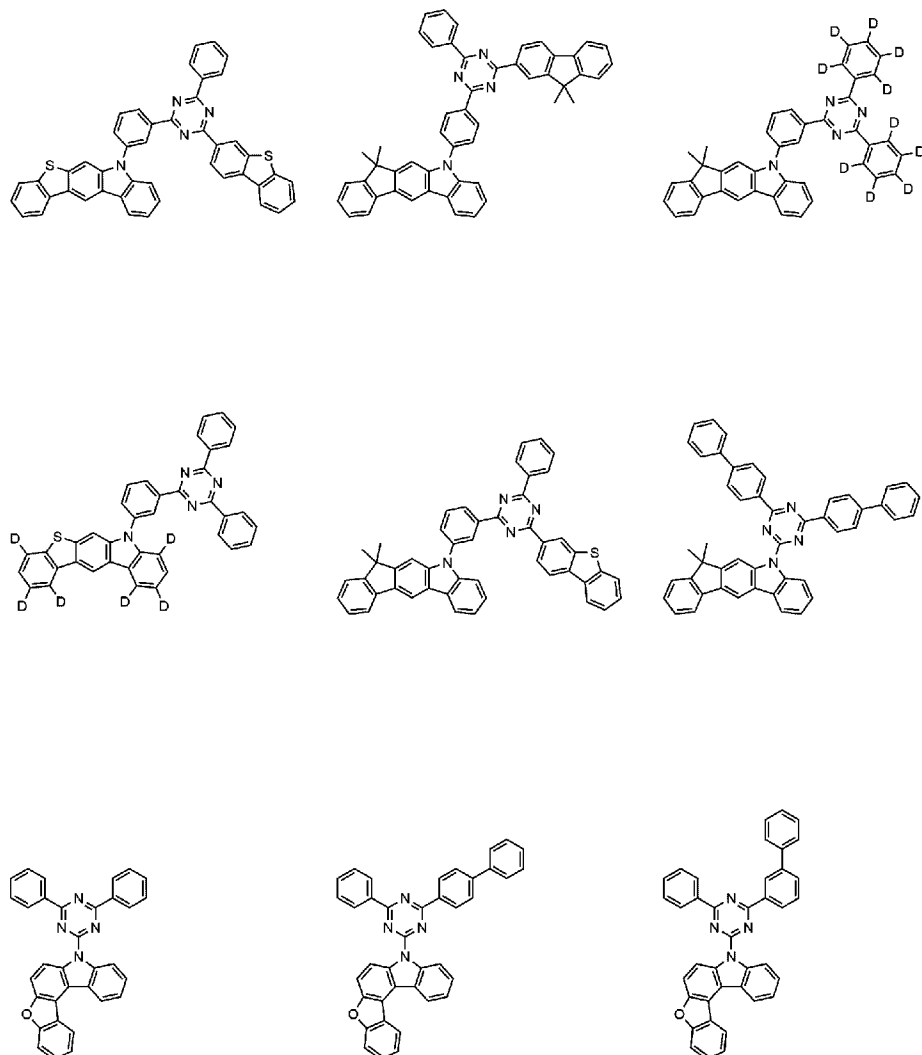


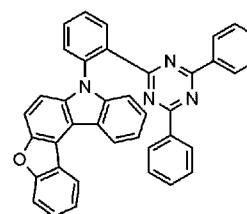
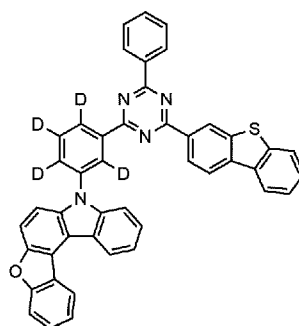
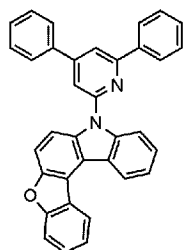
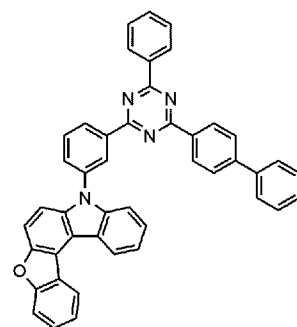
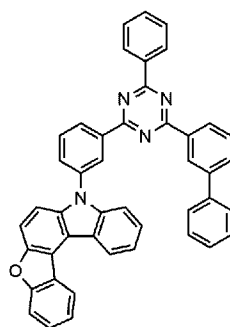
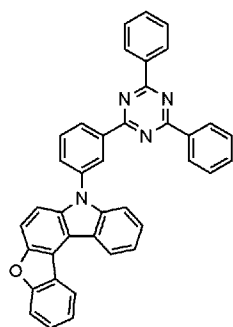
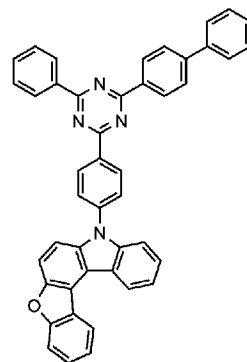
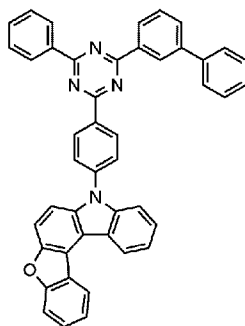
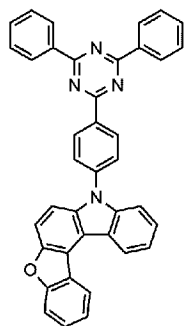


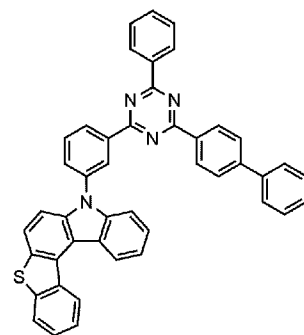
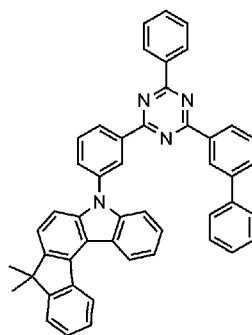
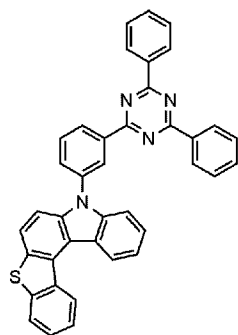
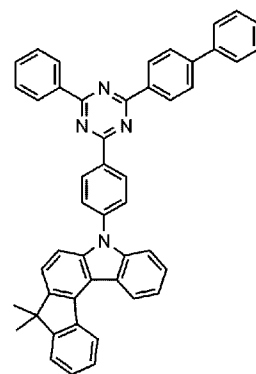
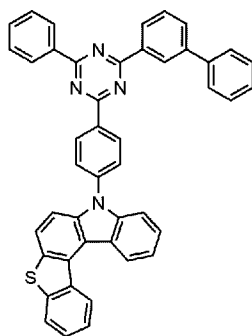
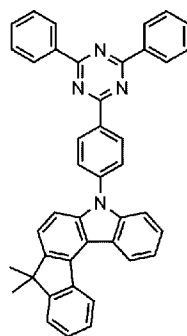
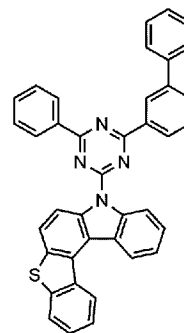
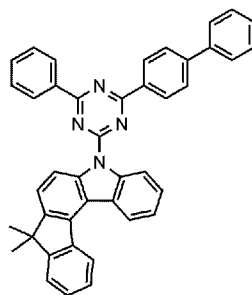
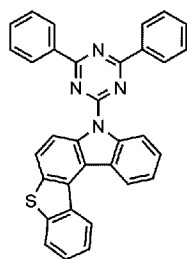


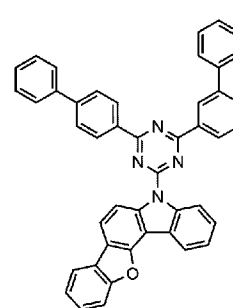
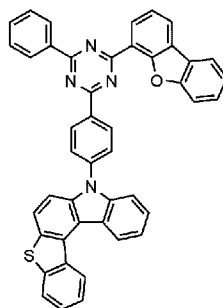
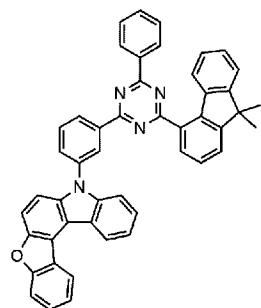
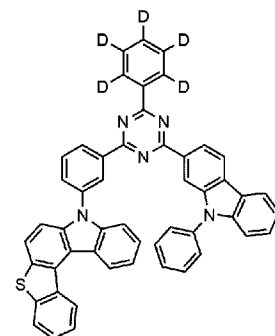
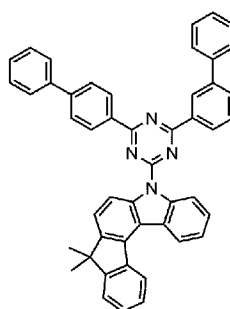
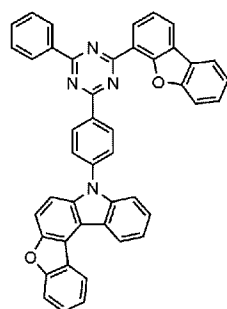
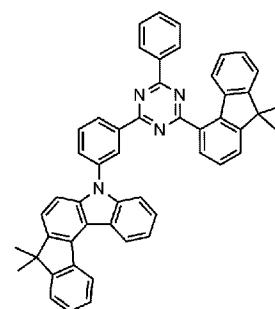
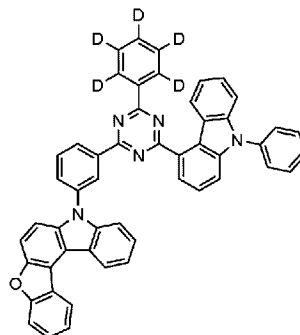
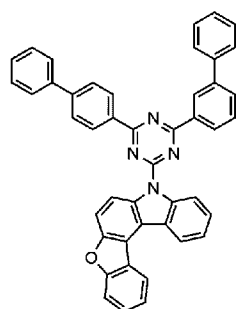


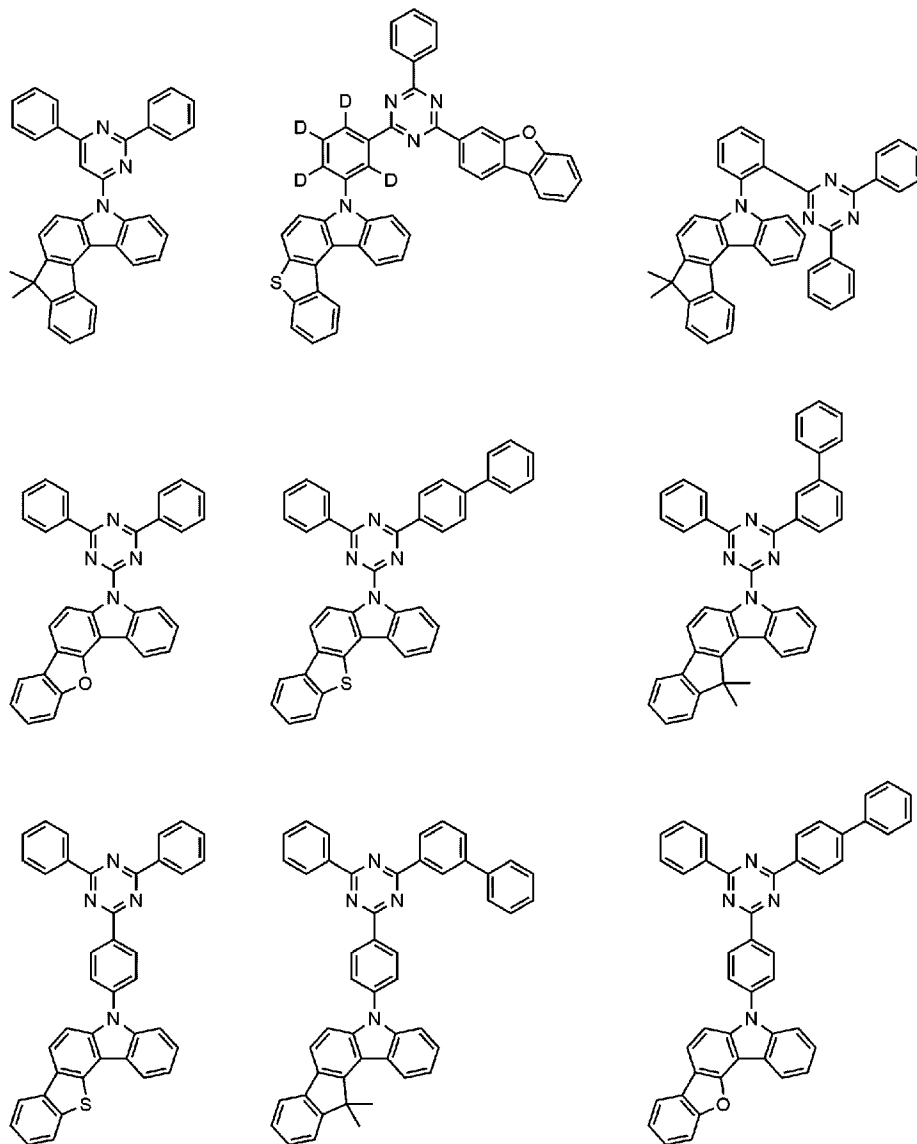


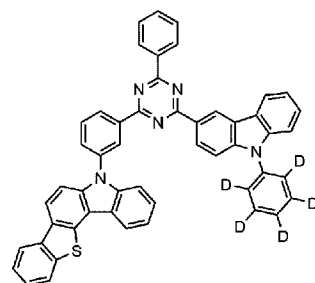
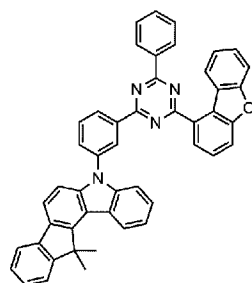
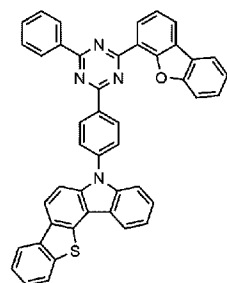
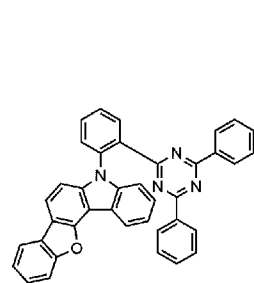
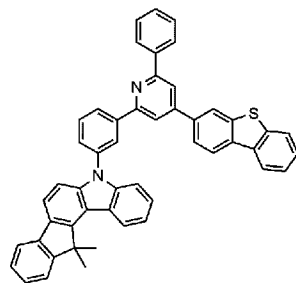
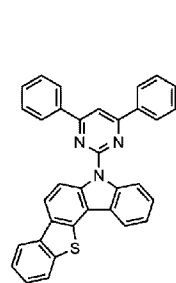
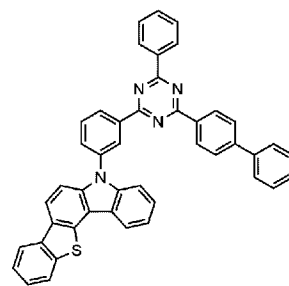
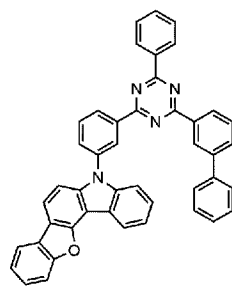
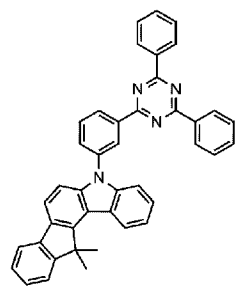


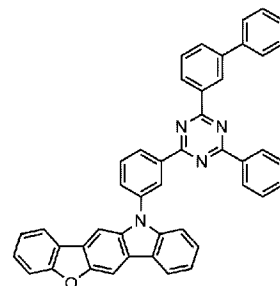
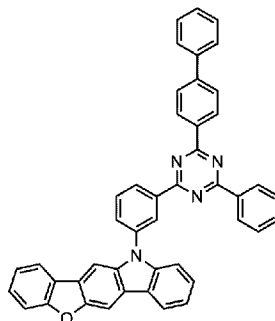
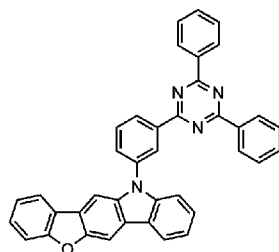
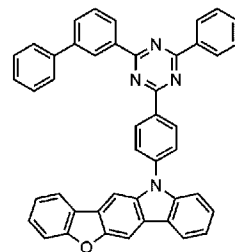
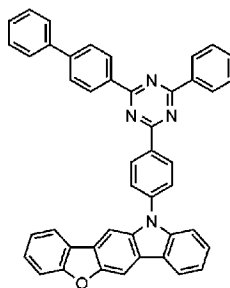
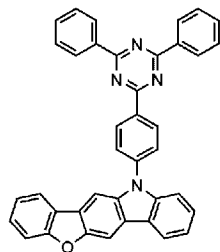
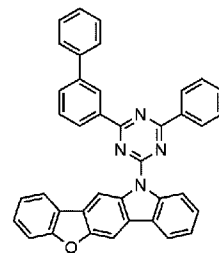
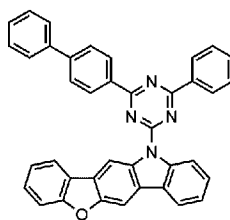
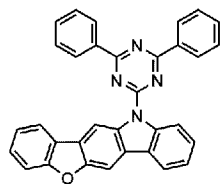


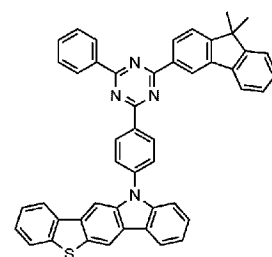
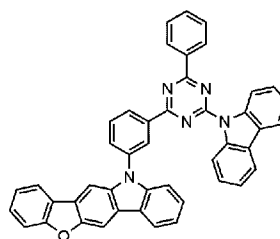
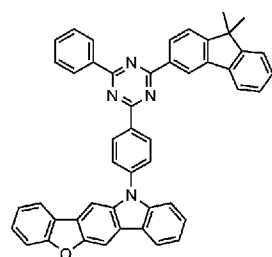
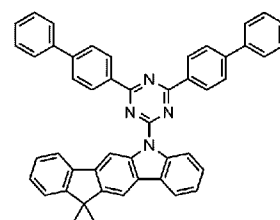
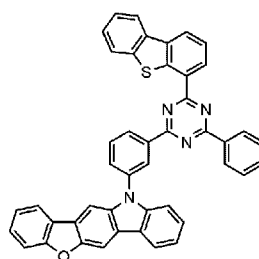
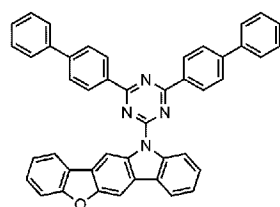
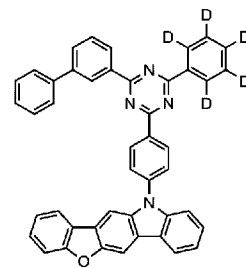
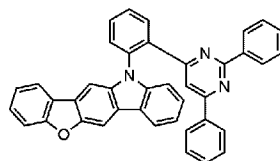
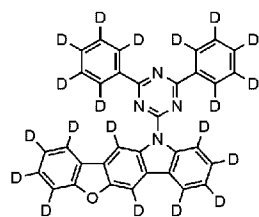


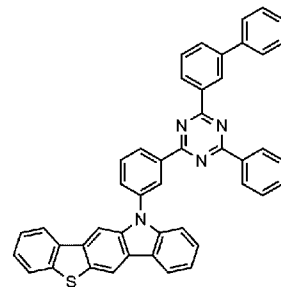
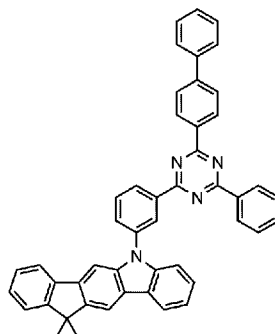
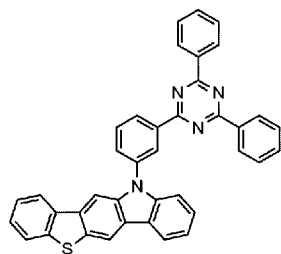
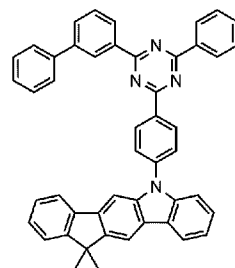
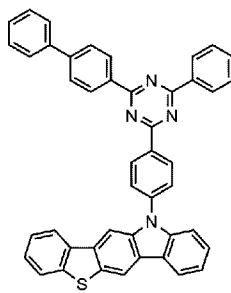
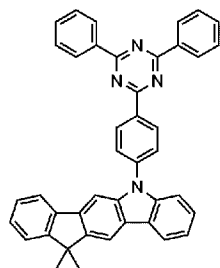
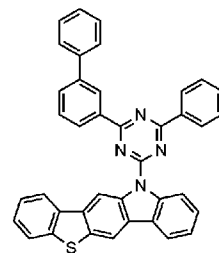
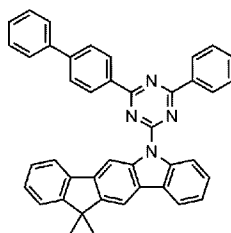
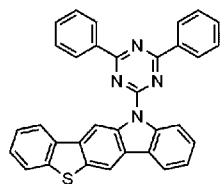


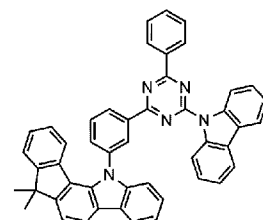
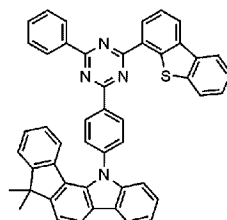
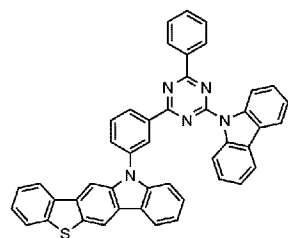
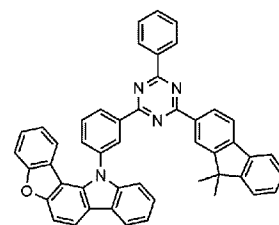
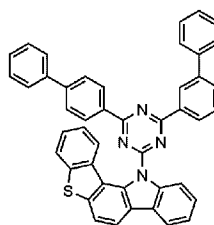
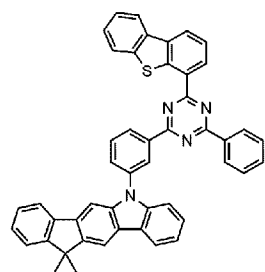
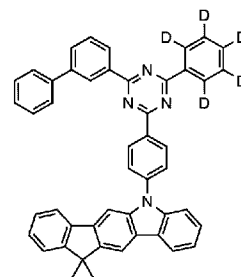
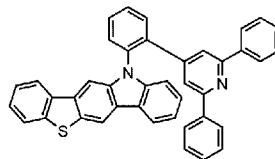
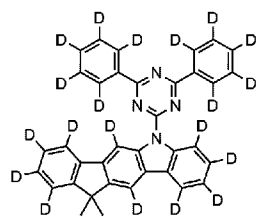


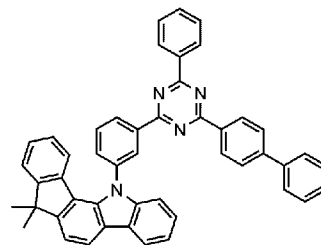
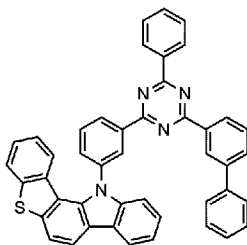
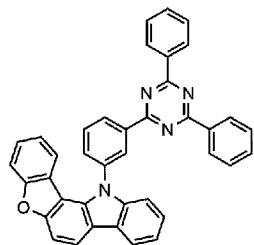
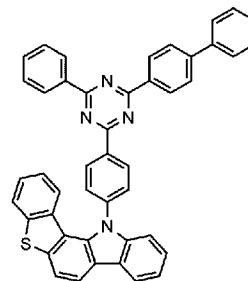
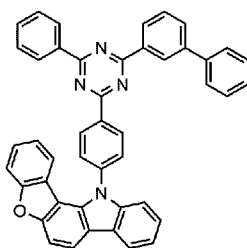
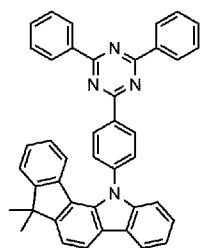
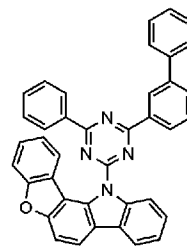
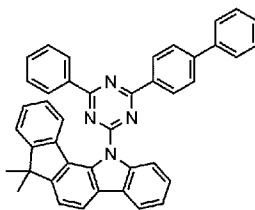
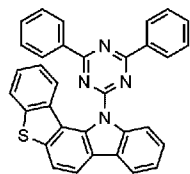


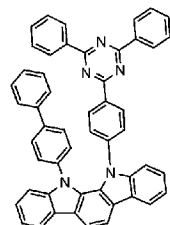
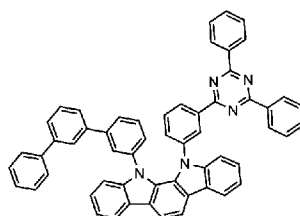
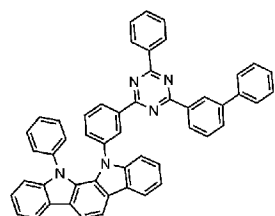
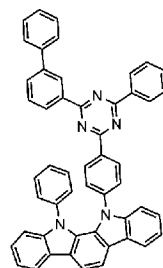
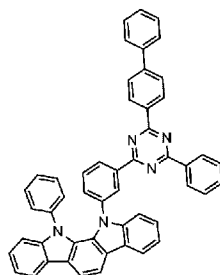
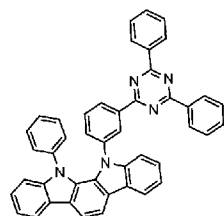
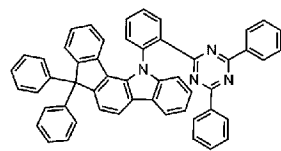
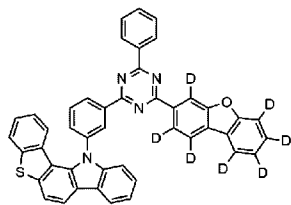
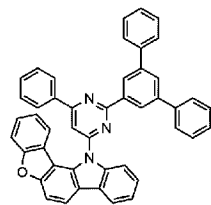


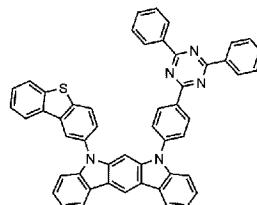
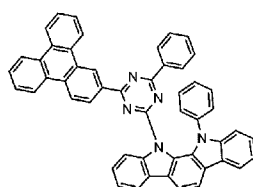
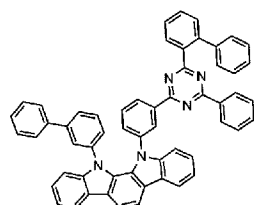
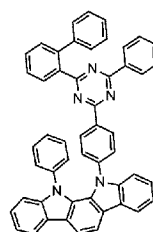
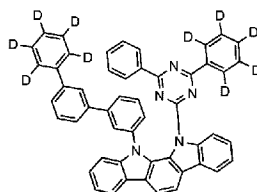
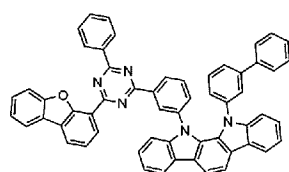
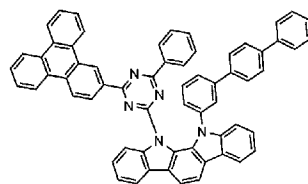
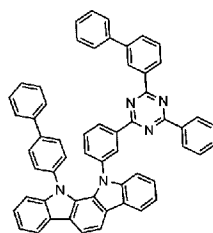
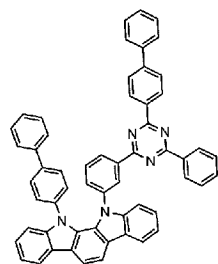


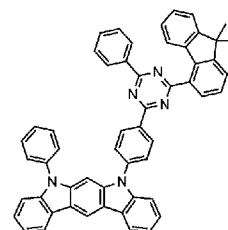
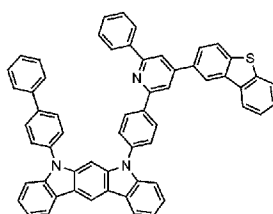
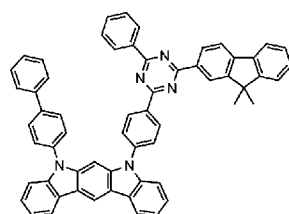
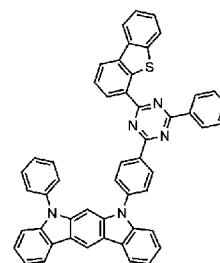
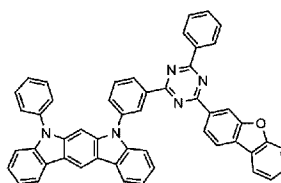
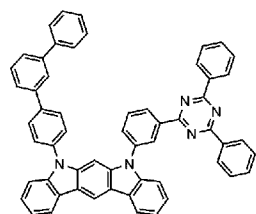
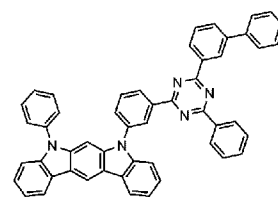
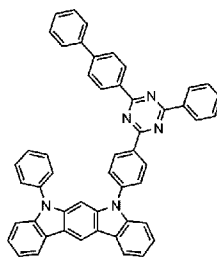
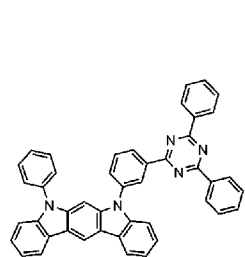


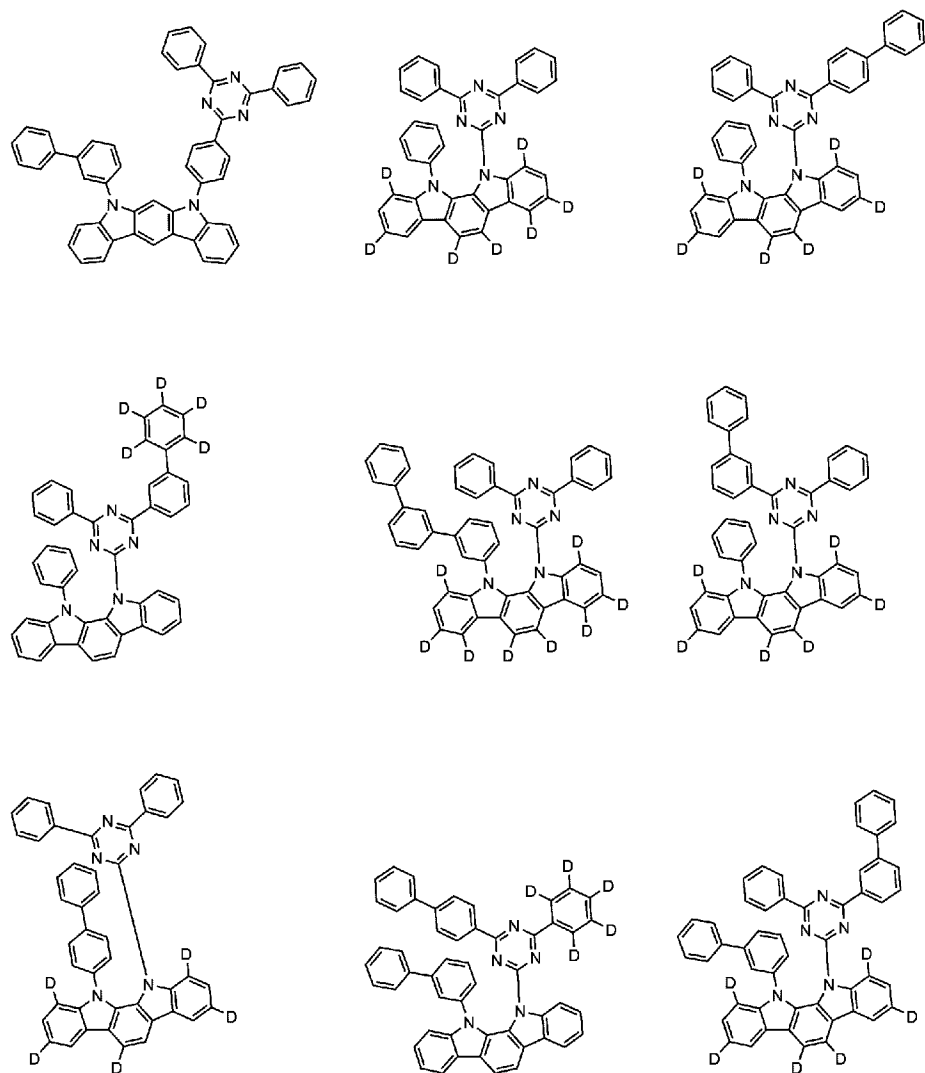


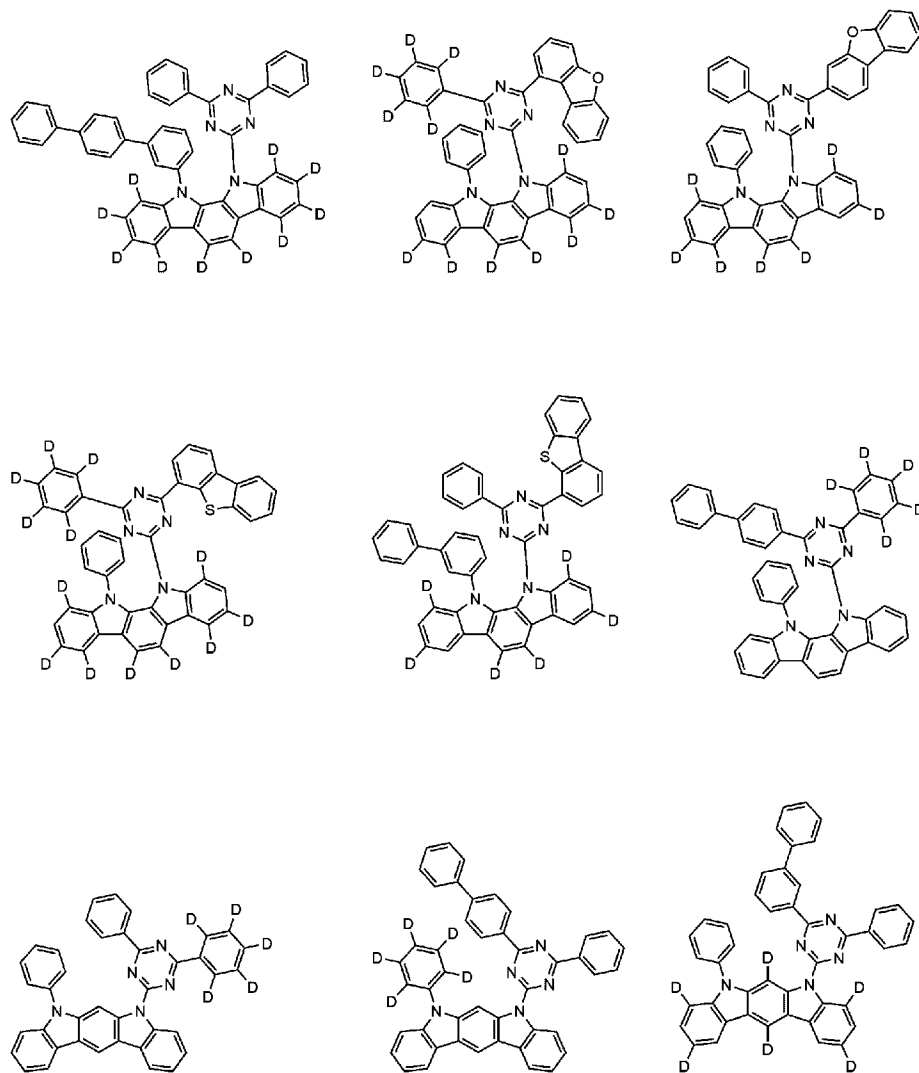


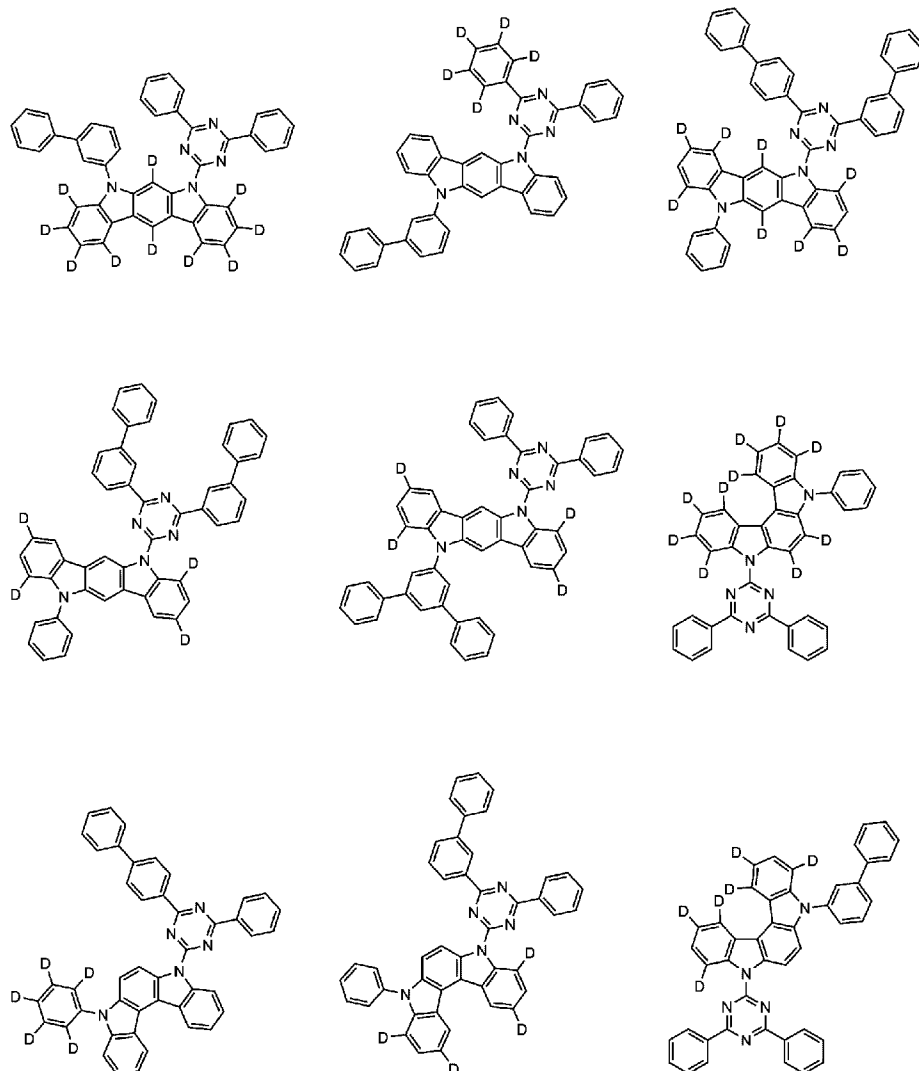












[Fig. 1]

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[Fig. 2]

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2021/009129

A. CLASSIFICATION OF SUBJECT MATTER**H01L 51/00**(2006.01)i; **H01L 51/50**(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01L 51/00(2006.01); C07D 209/86(2006.01); C07D 405/14(2006.01); C07D 491/048(2006.01); C07D 495/04(2006.01);
H01L 51/50(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal), STN (Registry, Caplus), Pubchem, google & keywords: 유기발광소자 (organic light-emitting diode), 발광층 (light emitting layer), 양극 (anode), 음극 (cathode)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2019-0007789 A (SFC CO., LTD.) 23 January 2019 (2019-01-23) See claims 1, 11, 12 and 15.	1-18
A	KR 10-2020-0072227 A (LT MATERIALS CO., LTD.) 22 June 2020 (2020-06-22) See entire document.	1-18
A	US 2020-0203631 A1 (BEIJING SUMMER SPROUT TECHNOLOGY CO., LTD.) 25 June 2020 (2020-06-25) See entire document.	1-18
A	CN 110734446 A (YANTAI XIANHUA CHEM-TECH CO., LTD.) 31 January 2020 (2020-01-31) See entire document.	1-18
A	KR 10-2019-0010693 A (LT MATERIALS CO., LTD.) 30 January 2019 (2019-01-30) See entire document.	1-18

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“D” document cited by the applicant in the international application

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

28 October 2021

Date of mailing of the international search report

28 October 2021

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208

Facsimile No. +82-42-481-8578

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2021/009129

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
KR	10-2019-0007789	A	23 January 2019	None			
KR	10-2020-0072227	A	22 June 2020	KR	10-2271960	B1	02 July 2021
				TW	202035393	A	01 October 2020
				WO	2020-122622	A1	18 June 2020
US	2020-0203631	A1	25 June 2020	CN	111354853	A	30 June 2020
CN	110734446	A	31 January 2020	None			
KR	10-2019-0010693	A	30 January 2019	CN	110520420	A	29 November 2019
				CN	110573506	A	13 December 2019
				EP	3604297	A1	05 February 2020
				EP	3604297	A4	25 November 2020
				EP	3611173	A1	19 February 2020
				EP	3611173	A4	02 December 2020
				EP	3611173	B1	28 July 2021
				JP	2020-514385	A	21 May 2020
				KR	10-1915712	B1	06 November 2018
				KR	10-2018-0108425	A	04 October 2018
				KR	10-2018-0108427	A	04 October 2018
				TW	201840815	A	16 November 2018
				TW	201840817	A	16 November 2018
				TW	I703201	B	01 September 2020
				US	2020-0119285	A1	16 April 2020
				US	2020-0381629	A1	03 December 2020
				WO	2018-174681	A1	27 September 2018
				WO	2018-174682	A1	27 September 2018

A. 발명이 속하는 기술분류(국제특허분류(IPC)) H01L 51/00(2006.01)i; H01L 51/50(2006.01)i		
B. 조사된 분야 조사된 최소문헌(국제특허분류를 기재) H01L 51/00(2006.01); C07D 209/86(2006.01); C07D 405/14(2006.01); C07D 491/048(2006.01); C07D 495/04(2006.01); H01L 51/50(2006.01) 조사된 기술분야에 속하는 최소문헌 이외의 문헌 한국등록실용신안공보 및 한국공개실용신안공보: 조사된 최소문헌란에 기재된 IPC 일본등록실용신안공보 및 일본공개실용신안공보: 조사된 최소문헌란에 기재된 IPC 국제조사에 이용된 전산 데이터베이스(데이터베이스의 명칭 및 검색어(해당하는 경우)) eKOMPASS(특허청 내부 검색시스템), STN (Registry, Caplus), Pubchem, google & keyword: 유기발광소자 (organic light-emitting diode), 발광층 (light emitting layer), 양극 (anode), 음극 (cathode)		
C. 관련 문헌		
카테고리*	인용문헌명 및 관련 구절(해당하는 경우)의 기재	관련 청구항
X	KR 10-2019-0007789 A (에스에프씨 주식회사) 2019.01.23 청구항 1, 11, 12, 15	1-18
A	KR 10-2020-0072227 A (엘티소재주식회사) 2020.06.22 전체 문헌	1-18
A	US 2020-0203631 A1 (BEIJING SUMMER SPROUT TECHNOLOGY CO., LTD.) 2020.06.25 전체 문헌	1-18
A	CN 110734446 A (YANTAI XIANHUA CHEM-TECH CO.,LTD.) 2020.01.31 전체 문헌	1-18
A	KR 10-2019-0010693 A (엘티소재주식회사) 2019.01.30 전체 문헌	1-18
☐ 추가 문헌이 C(계속)에 기재되어 있습니다. ☒ 대응특허에 관한 별지를 참조하십시오.		
* 인용된 문헌의 특별 카테고리: “A” 특별히 관련이 없는 것으로 보이는 일반적인 기술수준을 정의한 문헌 “D” 본 국제출원에서 출원인이 인용한 문헌 “E” 국제출원일보다 빠른 출원일 또는 우선일을 가지나 국제출원일 이후에 공개된 선출원 또는 특허 문헌 “L” 우선권 주장에 의문을 제기하는 문헌 또는 다른 인용문헌의 공개일 또는 다른 특별한 이유(이유를 명시)를 밝히기 위하여 인용된 문헌 “O” 구두 개시, 사용, 전시 또는 기타 수단을 언급하고 있는 문헌 “P” 우선일 이후에 공개되었으나 국제출원일 이전에 공개된 문헌 “T” 국제출원일 또는 우선일 후에 공개된 문헌으로, 출원과 상충하지 않으며 발명의 기초가 되는 원리나 이론을 이해하기 위해 인용된 문헌 “X” 특별한 관련이 있는 문헌. 해당 문헌 하나만으로 청구된 발명의 신규성 또는 진보성이 없는 것으로 본다. “Y” 특별한 관련이 있는 문헌. 해당 문헌이 하나 이상의 다른 문헌과 조합하는 경우로 그 조합이 당업자에게 자명한 경우 청구된 발명은 진보성이 없는 것으로 본다. “&” 동일한 대응특허문헌에 속하는 문헌		
국제조사의 실제 완료일 2021년10월28일(28.10.2021)		국제조사보고서 발송일 2021년10월28일(28.10.2021)
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국 제 조 사 보 고 서
대응특허에 관한 정보

국제출원번호

PCT/KR2021/009129

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