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(56)參考文獻：

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(54)名稱

雜環化合物及含有其的有機發光元件

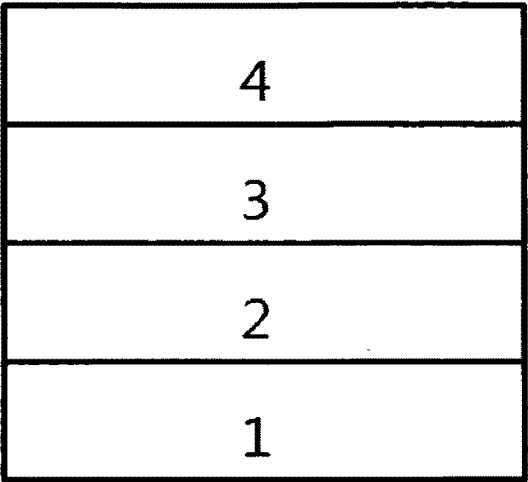
HETERO-CYCLIC COMPOUND AND ORGANIC LIGHT EMITTING DEVICE COMPRISING THE SAME

(57)摘要

本發明提供雜環化合物及含有其的有機發光元件。

The present specification provides a hetero-cyclic compound and an organic light emitting device comprising the same.

指定代表圖：

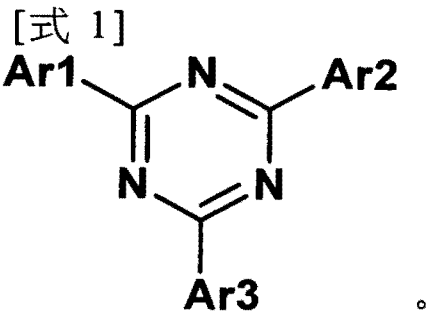


符號簡單說明：

- 1 . . . 基板
- 2 . . . 陽極
- 3 . . . 發光層
- 4 . . . 陰極

【圖1】

特徵化學式：



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C07D251/24(2006.01)

C09K11/06(2006.01)

H01L51/50(2006.01)

公告本**【發明摘要】****【中文發明名稱】**

雜環化合物及含有其的有機發光元件

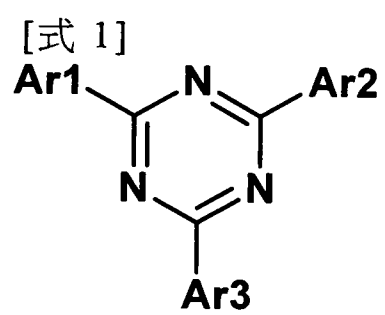
【英文發明名稱】HETERO-CYCLIC COMPOUND AND ORGANIC LIGHT
EMITTING DEVICE COMPRISING THE SAME**【中文】**

本發明提供雜環化合物及含有其的有機發光元件。

【英文】The present specification provides a hetero-cyclic compound and an organic
light emitting device comprising the same.**【指定代表圖】 圖1。****【代表圖之符號簡單說明】**

- 1：基板
- 2：陽極
- 3：發光層
- 4：陰極

【特徵化學式】



【發明說明書】

【中文發明名稱】

雜環化合物及含有其的有機發光元件

【英文發明名稱】

HETERO-CYCLIC COMPOUND AND ORGANIC LIGHT
EMITTING DEVICE COMPRISING THE SAME

【技術領域】

【0001】 本發明主張 2014 年 4 月 4 日申請之韓國專利申請案第 10-2014-0040818 號及 2015 年 1 月 23 日申請之韓國專利申請案第 10-2015-0011540 號之優先權，其揭露內容併入本文供參考。

【0002】 本發明是關於雜環化合物及含有其的有機發光元件。

【先前技術】

【0003】 一般來說，有機發光現象是指其中藉由使用有機材料將電能轉換成光能之現象。使用有機發光現象之有機發光元件通常具有一種包含正電極、負電極以及插入其間之有機材料層的結構。此處，有機材料層可具有由不同材料組成之多層結構以在許多情況下改良有機發光元件之功效及穩定性，且例如可由電洞注入層、電洞傳輸層、發光層、電子傳輸層、電子注入層以及其類似物組成。在有機發光元件之結構中，若在兩個電極之間施加電壓，則電洞自正電極注入有機材料層中且電子自負電極注入有機材料層

中，且當注入之電洞及電子彼此相遇時，形成激子，且在激子再次降低至基態時發出光。

【0004】 不斷地需要開發用於前述有機發光元件之新型材料。

[引用清單]

[專利文獻]

【0005】 韓國專利申請案特許公開第 2000-0051826 號之官方公報

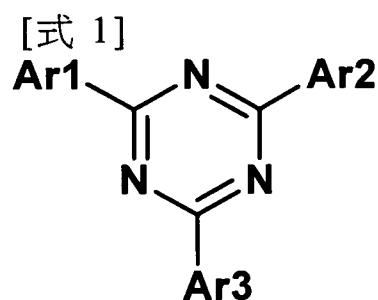
【發明內容】

[技術問題]

【0006】 本發明描述雜環化合物及含有其的有機發光元件。

[技術解決方案]

【0007】 本發明之例示性實施例提供由以下式 1 表示之化合物：



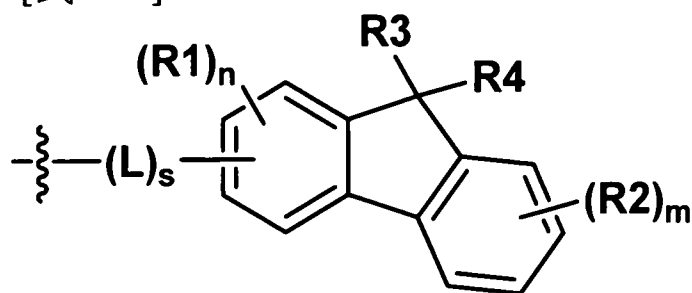
在式 1 中，

Ar1 至 Ar3 彼此不同，

Ar1 及 Ar2 各自獨立地為經取代或未經取代之芳基，

Ar3 由以下式 1-1 表示，

[式 1-1]



在式 1-1 中，

R1 及 R2 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；腓基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基（alkylthioxy）；經取代或未經取代之芳基硫氧基（arylthioxy）；經取代或未經取代之烷基磺酸氧基（alkylsulfoxy）；經取代或未經取代之芳基磺酸氧基（arylsulfoxy）；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或與相鄰基團組合以形成經取代或未經取代之環，

R3 及 R4 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或彼此組合以形成經取代或未經取代之脂族環，

L 為直接鍵；經取代或未經取代之伸芳基；或經取代或未經取代之伸雜芳基，

n 為整數 0 至 3，

m 為整數 0 至 4，

s 為整數 1 至 5，及

當 n 為 2 或大於 2 時，R1 彼此相同或不同，及

當 m 為 2 或大於 2 時，R2 彼此相同或不同，及

當 s 為 2 或大於 2 時，L 彼此相同或不同。

【0008】此外，本發明之例示性實施例提供有機發光元件，其包括：陽極；以面向陽極之方式提供之陰極；以及提供在陽極與陰極之間的一或多個有機材料層，其中有機材料層中之一或多個層包括式 1 化合物。

[有利作用]

【0009】本發明中所描述之化合物可用作用於有機發光元件之有機材料層的材料。根據至少一個例示性實施例之化合物可改良有機發光元件之功效以及改良低驅動電壓及/或使用壽命特徵。特定言之，本發明中所描述之化合物可用作用於電洞注入、電洞傳輸、電洞注入及傳輸、發光、電子傳輸或電子注入之材料，及較佳可用作電子傳輸材料。

【圖式簡單說明】

【0010】

圖 1 說明有機發光元件之實例，其由基板 1、正電極 2、發光

層 3 以及負電極 4 組成。

圖 2 說明有機發光元件之實例，其由基板 1、正電極 2、電洞注入層 5、電洞傳輸層 6、發光層 7、電子傳輸層 8 以及負電極 4 組成。

圖 3 說明實例中製備之化合物 1-6 之 MS 資料結果。

圖 4 說明實例中製備之化合物 1-8 之 MS 資料結果。

圖 5 說明實例中製備之化合物 1-10 之 MS 資料結果。

圖 6 說明實例中製備之化合物 1-18 之 MS 資料結果。

圖 7 說明實例中製備之化合物 1-30 之 MS 資料結果。

圖 8 說明實例中製備之化合物 1-138 之 MS 資料結果。

圖 9 說明實例中製備之化合物 2-5 之 MS 資料結果。

圖 10 說明化合物 1-6 之 HOMO (AC3) 能級之量測資料之結果。

圖 11 說明化合物 1-8 之 HOMO (AC3) 能級之量測資料之結果。

圖 12 說明化合物 1-30 之 HOMO (AC3) 能級之量測資料之結果。

圖 13 說明化合物 1-138 之 HOMO (AC3) 能級之量測資料之結果。

圖 14 說明化合物 2-5 之 HOMO (AC3) 能級之量測資料之結果。

【實施方式】

【0011】 在下文中，將更詳細地描述本發明。

【0012】 本發明之例示性實施例提供由式 1 表示之式 1 化合物。

【0013】 下文將描述取代基之實例，但不限於此。

【0014】 在本發明中，術語「經取代或未經取代」意謂基團未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬；鹵素基團；腈基團；硝基；羥基；羰基；酯基團；鹽亞胺基團；胺基；氧化膦基團；烷氧基；芳氧基；烷基硫氧基；芳基硫氧基；烷基磺酸氧基；芳基磺酸氧基；矽烷基；硼基團；烷基；環烷基；烯基；芳基；芳烷基；芳烯基；烷基芳基；烷基胺基團；芳烷基胺基團；雜芳基胺基；芳基胺基團；芳基膦基團；以及雜環基，或與以上例示之取代基中之兩個或大於兩個取代基連接之取代基經取代或未經取代。舉例而言，「與兩個或大於兩個取代基連接之取代基」可為聯苯基。亦即，聯苯基亦可為芳基，且可解釋為與兩個苯基連接之取代基。

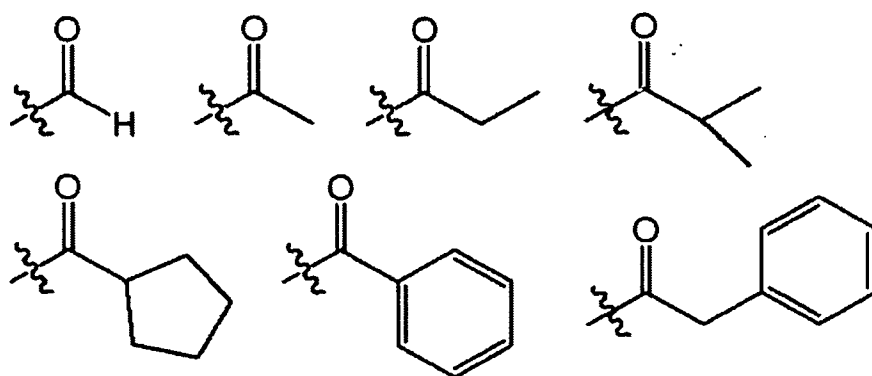
【0015】 根據本發明之例示性實施例，表述「經取代或未經取代」較佳意謂基團未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬；鹵素基團；腈基團；羥基基團；羰基；酯基團；烷氧基；芳氧基；烷基硫氧基；芳基硫氧基；烷基磺酸氧基；芳基磺酸氧基；矽烷基；烷基；環烷基；烯基；芳基；芳烷基；芳烯基；以及烷基芳基。

【0016】 根據本發明之例示性實施例，表述「經取代或未經取代」較佳意謂基團未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬；烷基；以及芳基。

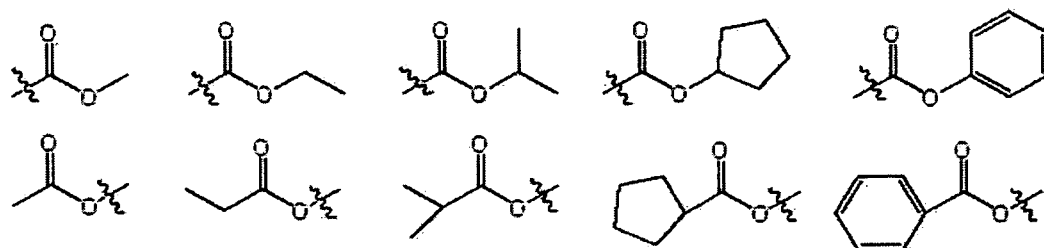
【0017】 根據本發明之例示性實施例，由式 1 表示之化合物可經至少一個氬取代。此外，由式 1 表示之化合物之取代基可經至少一個氬取代。

【0018】 在本發明中，「相鄰」基團可意謂經直接連接於其中相應取代基進行取代之原子之原子取代之取代基、取代基在空間上與相應取代基緊密地安置或另一個經其中相應取代基進行取代之原子取代之取代基。舉例而言，在苯環中之鄰位經取代之兩個取代基及在脂族環中經同一個碳取代之兩個取代基可解釋為彼此「相鄰」基團。

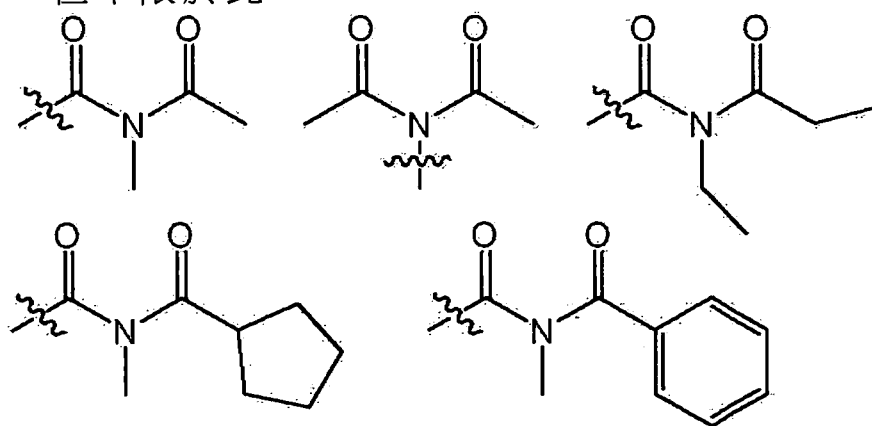
【0019】 在本發明中，羰基之碳原子之數目不受特定限制，但較佳為 1 至 40。具體而言，羰基可為具有以下結構之化合物，但不限於此。



【0020】 在本發明中，在酯基團中，酯基團之氧可經具有 1 個至 25 個碳原子之直鏈、分支鏈或環烷基取代，或經具有 6 個至 25 個碳原子之芳基取代。具體而言，酯基團可為具有以下結構之化合物，但不限於此。



【0021】 在本發明中，醯亞胺基團之碳原子之數目不受特定限制，但較佳為 1 至 25。具體而言，醯亞胺基團可為具有以下結構之化合物，但不限於此。



【0022】 在本發明中，矽烷基可由式-SiRR'R''表示，且 R、R'以及 R''可各自為氫；經取代或未經取代之烷基；或經取代或未經取代之芳基。矽烷基之特定實例包含三甲基矽烷基、三乙基矽烷基、第三丁基二甲基矽烷基、乙烯基二甲基矽烷基、丙基二甲基矽烷基、三苯基矽烷基、二苯基矽烷基、苯基矽烷基以及其類似基團，但不限於此。

【0023】 在本發明中，硼基團可由式-BRR'R''表示，且 R、R'以及 R''可各自為氫；經取代或未經取代之烷基；或經取代或未經取代之芳基。硼基團之特定實例包含三甲基硼基團、三乙基硼基團、第三丁基二甲基硼、三苯基硼基團、苯基硼基團以及其類似基團，但不限於此。

【0024】 在本發明中，鹵素基團之實例包含氟、氯、溴或碘。

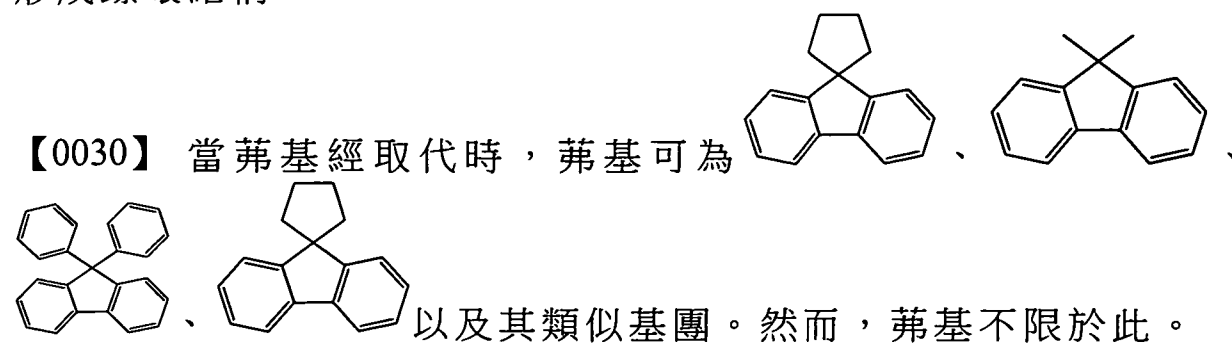
【0025】 在本發明中，烷基可為直鏈或分支鏈，且其碳原子之數目不受特定限制，但較佳為 1 至 40。根據例示性實施例，烷基之碳原子之數目為 1 至 20。根據另一例示性實施例，烷基之碳原子之數目為 1 至 10。根據另一例示性實施例，烷基之碳原子之數目為 1 至 6。烷基之特定實例包含甲基、乙基、丙基、正丙基、異丙基、丁基、正丁基、異丁基、第三丁基、第二丁基、1-甲基-丁基、1-乙基-丁基、戊基、正戊基、異戊基、新戊基、第三戊基、己基、正己基、1-甲基戊基、2-甲基戊基、4-甲基-2-戊基、3,3-二甲基丁基、2-乙基丁基、庚基、正庚基、1-甲基己基、環戊基甲基、環己基甲基、辛基、正辛基、第三辛基、1-甲基庚基、2-乙基己基、2-丙基戊基、正壬基、2,2-二甲基庚基、1-乙基-丙基、1,1-二甲基-丙基、異己基、2-甲基戊基、4-甲基己基、5-甲基己基以及其類似基團，但不限於此。

【0026】 在本發明中，烯基可為直鏈或分支鏈，且其碳原子之數目不受特定限制，但較佳為 2 至 40。根據例示性實施例，烯基之碳原子之數目為 2 至 20。根據另一例示性實施例，烯基之碳原子之數目為 2 至 10。根據另一例示性實施例，烯基之碳原子之數目為 2 至 6。其特定實例包含乙烯基、1-丙烯基、異丙烯基、1-丁烯基、2-丁烯基、3-丁烯基、1-戊烯基、2-戊烯基、3-戊烯基、3-甲基-1-丁烯基、1,3-丁二烯基、烯丙基、1-苯基乙烯基-1-基、2-苯基乙烯基-1-基、2,2-二苯基乙烯基-1-基、2-苯基-2-(萘基-1-基)乙烯基-1-基、2,2-雙(二苯基-1-基)乙烯基-1-基、芪基 (stilbenyl group)、苯乙烯基 (styrenyl group) 以及其類似基團，但不限於此。

【0027】 在本發明中，環烷基不受特定限制，但較佳具有 3 個至 60 個碳原子，且根據例示性實施例，環烷基之碳原子之數目為 3 至 30。根據另一例示性實施例，環烷基之碳原子之數目為 3 至 20。根據另一例示性實施例，環烷基之碳原子之數目為 3 至 6。其特定實例包含環丙基、環丁基、環戊基、3-甲基環戊基、2,3-二甲基環戊基、環己基、3-甲基環己基、4-甲基環己基、2,3-二甲基環己基、3,4,5-三甲環己基、4-第三丁基環己基、環庚基、環辛基以及其類似基團，但不限於此。

【0028】 在本發明中，芳基不受特定限制，但較佳具有 6 個至 60 個碳原子，且可為單環芳基或多環芳基。根據例示性實施例，芳基之碳原子之數目為 6 至 30。根據例示性實施例，芳基之碳原子之數目為 6 至 20。當芳基為單環芳基時，單環芳基之實例包含苯基、聯苯基、聯三苯基以及其類似基團，但不限於此。多環芳基之實例包含萘基 (naphthyl group)、蒽基 (anthracenyl group)、菲基 (phenanthryl)、芘基 (pyrenyl group)、芘基 (perylene group)、屈基 (chrysenyl group)、茚基 (fluorenyl group) 以及其類似基團，但不限於此。

【0029】 在本發明中，茚基可經取代，且兩個取代基可彼此組合以形成螺環結構。



【0031】 在本發明中，雜環基為包含 O、N、S、SI 以及 Se 中之一或多者作為雜元素之雜環基，且其碳原子之數目不受特定限制，但較佳為 2 至 60。雜環基之實例包含噻吩基 (thiophene group)、呋喃基 (furan group)、吡咯基 (pyrrole group)、咪唑基 (imidazole group)、噻唑基 (thiazole group)、噁唑基 (oxazol group)、噁二唑基 (oxadiazol group)、三唑基 (triazol group)、吡啶基 (pyridyl group)、聯吡啶基 (bipyridyl group)、嘧啶基 (pyrimidyl group)、三嗪基 (triazine group)、三唑基 (triazole group)、吡啶基 (acridyl group)、噁嗪基 (pyridazine group)、吡嗪基 (pyrazinyl group)、喹啉基 (quinolinyl group)、喹唑啉基 (quinazoline group)、喹啶基 (quinoxalinyl group)、酞嗪基 (phthalazinyl group)、吡啶并嘧啶基 (pyridopyrimidinyl group)、吡啶并吡嗪基 (pyridopyrazinyl group)、吡嗪並吡嗪基 (pyrazinopyrazinyl group)、異喹啉基 (isoquinoline group)、吲哚基 (indole group)、咔唑基 (carbazole group)、苯并噁唑基 (benzoxazole group)、苯并咪唑基 (benzimidazole group)、苯并噻唑基 (benzothiazol group)、苯并咔唑基 (benzocarbazole group)、苯并噻吩基 (benzothiophene group)、二苯并噻吩基 (dibenzothiophene group)、苯并呋喃基 (benzofuranyl group)、菲啉基 (phenanthroline group)、噻唑基 (thiazolyl group)、異噁唑基 (isoxazolyl group)、噁二唑基 (oxadiazolyl group)、噻二唑基 (thiadiazolyl group)、苯并噻唑基 (benzothiazolyl group)、啡噻嗪基 (phenothiazinyl group)、二苯并呋喃基 (dibenzofuranyl group) 以及其類似基團，但不限於此。

【0032】 在本發明中，關於上述芳基之說明可適用於芳氧基、芳基硫氧基以芳基磺酸氧基中之芳基。

【0033】 在本發明中，關於上述烷基之說明可適用於烷基硫氧基及烷基磺酸氧基中之烷基。

【0034】 在本發明中，關於上述芳基之說明可適用於除二價伸芳基以外的伸芳基。

【0035】 在本發明中，關於上述雜環基之說明可適用於除二價伸雜芳基以外的伸雜芳基。

【0036】 在本發明中，關於上述雜環基之說明可適用於除芳族基以外的雜芳基。

【0037】 在本發明中，包含 O 及 S 原子中之一或多者之雜環基可在環中進一步包含除 O 及 S 原子以外的雜原子。

【0038】 在本發明中，與相鄰基團組合以形成環之含義意謂與相鄰基團組合以形成經取代或未經取代之脂族烴環；經取代或未經取代之芳族烴環；經取代或未經取代之脂族雜環；經取代或未經取代之芳族雜環；以及其稠環。

【0039】 在本發明中，脂族烴環意謂僅由碳及氫原子以環形式組成之環，其不為芳族基。

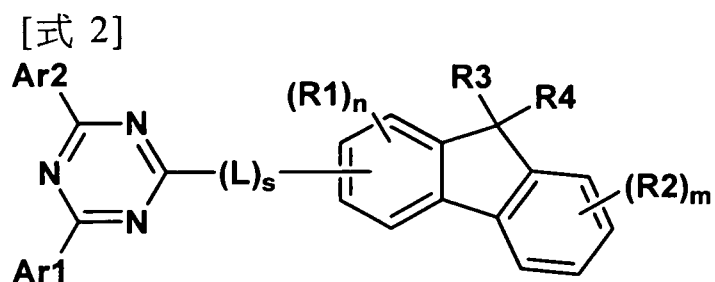
【0040】 在本發明中，芳族烴環之實例包含苯基、萘基、蒽基以及其類似基團，但不限於此。

【0041】 在本發明中，脂族雜環意謂包含一或多個雜原子之脂族環。

【0042】 在本發明中，芳族雜環意謂包含一或多個雜原子之芳環。

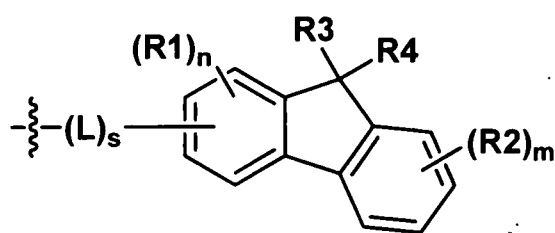
【0043】 在本發明中，脂族烴環、芳族烴環、脂族雜環以及芳族雜環可為單環或多環。

【0044】 根據本發明之例示性實施例，式 1 可由以下式 2 表示。



在式 2 中，

Ar1、Ar2、R1 至 R4、L、s、m 以及 n 之定義與式 1 中之定義相同，及

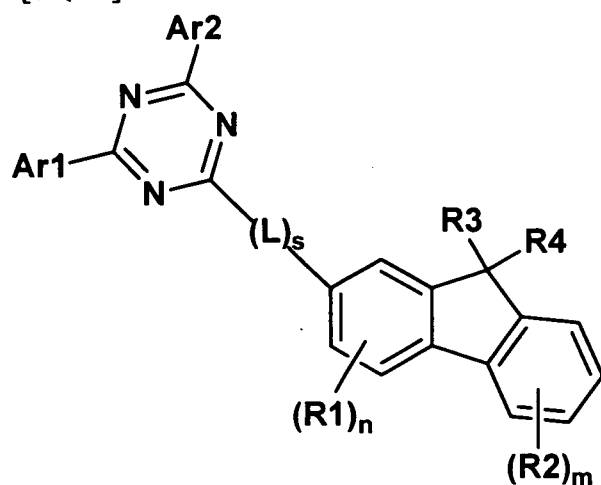


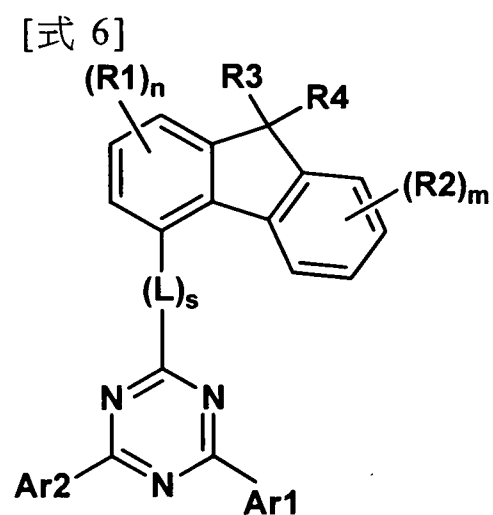
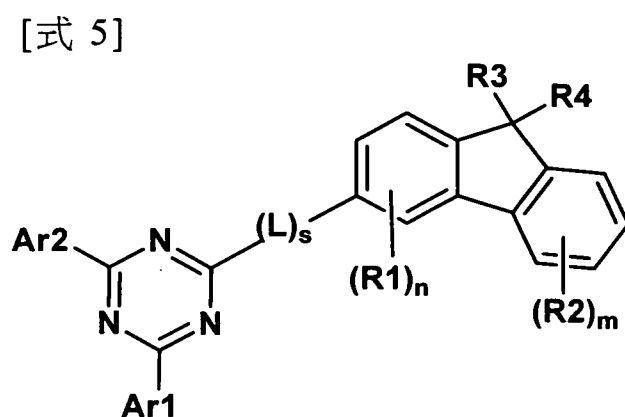
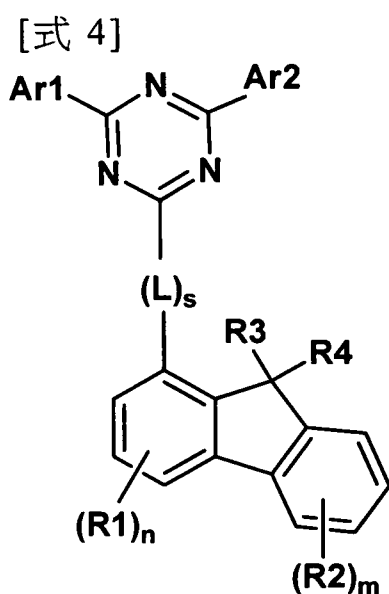
Ar1、Ar2 及

彼此不同。

【0045】 根據本發明之例示性實施例，式 1 可由以下式 3 至式 6 中之任一者表示。

[式 3]



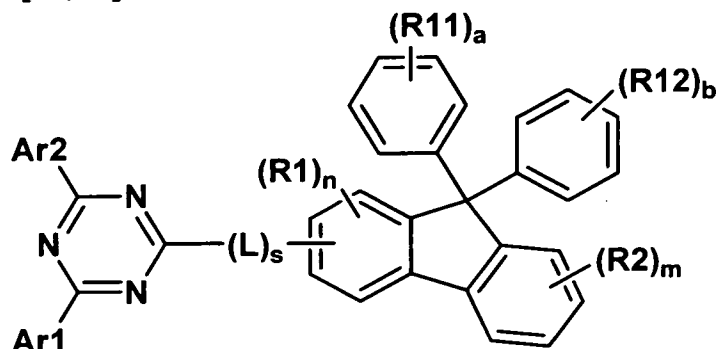


【0046】 在式 3 至式 6 中，

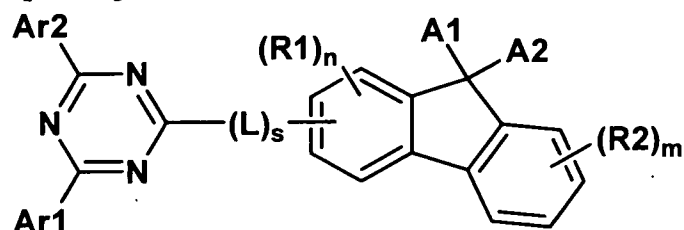
Ar1、Ar2、R1 至 R4、L、s、m 以及 n 之定義與式 1 中之定義相同。

【0047】 根據本發明之例示性實施例，式 1 可由以下式 7 或式 8 表示。

[式 7]



[式 8]



【0048】 在式 7 及式 8 中，

Ar1、Ar2、R1、R2、L、s、n 以及 m 之定義與式 1 中之定義相同，

R11 及 R12 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或兩個或大於兩個相鄰基團彼此組合以形成經取代或未經取代之環，

A1 及 A2 彼此相同或不同，且各自獨立地為氫；或經取代或未經取代之烷基，或彼此組合以形成經取代或未經取代之脂族環，

a 及 b 彼此相同或不同，且各自獨立地為整數 0 至 5，及

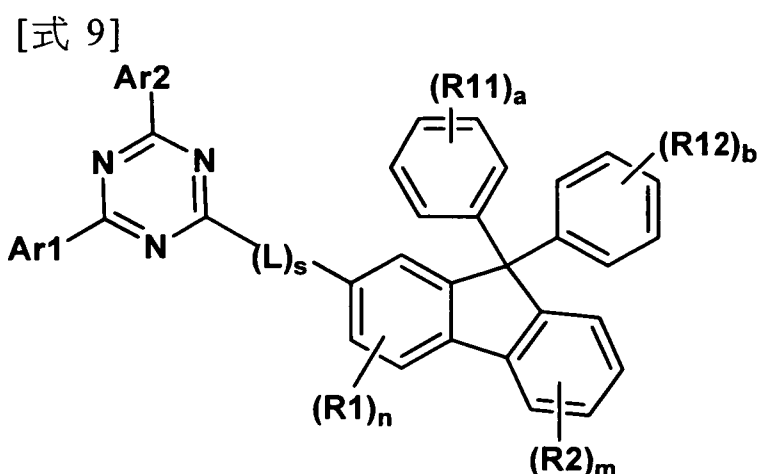
當 a 及 b 各自為 2 或大於 2 時，括弧中之結構彼此相同或不同。

【0049】 根據本發明之例示性實施例，A1 及 A2 彼此相同或不同，且各自獨立地為氫；或經取代或未經取代之烷基。

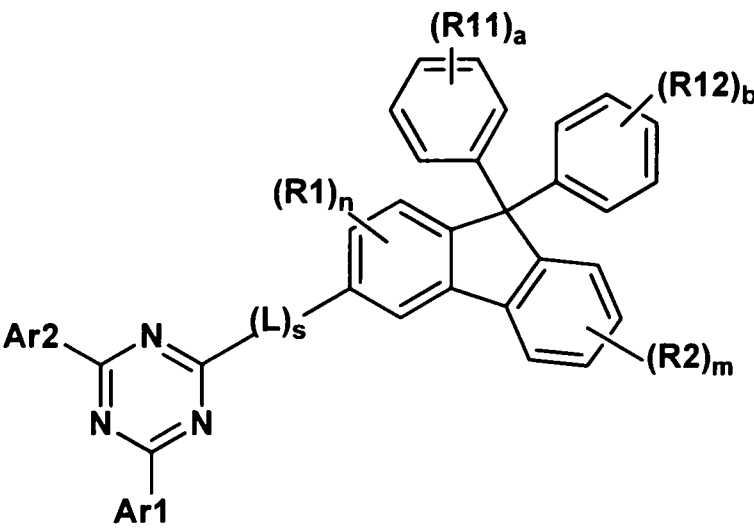
【0050】 根據本發明之例示性實施例，A1 及 A2 彼此相同或不同，且各自獨立地為氫；烷基。

【0051】 根據本發明之例示性實施例，A1 及 A2 彼此相同或不同，且各自獨立地為氫；或甲基。

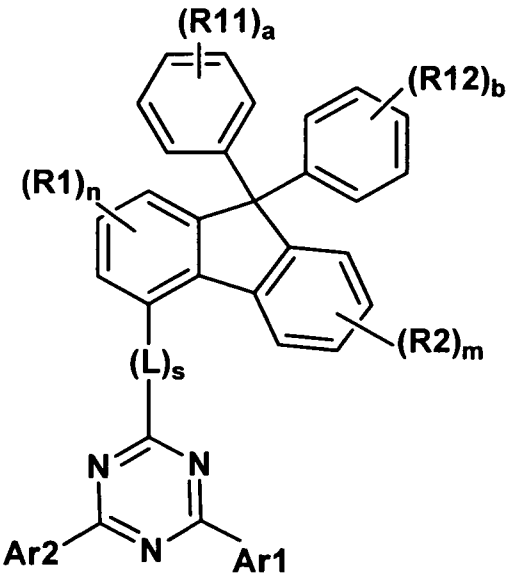
【0052】 根據本發明之例示性實施例，式 7 可由以下式 9 至式 12 中之任一者表示。



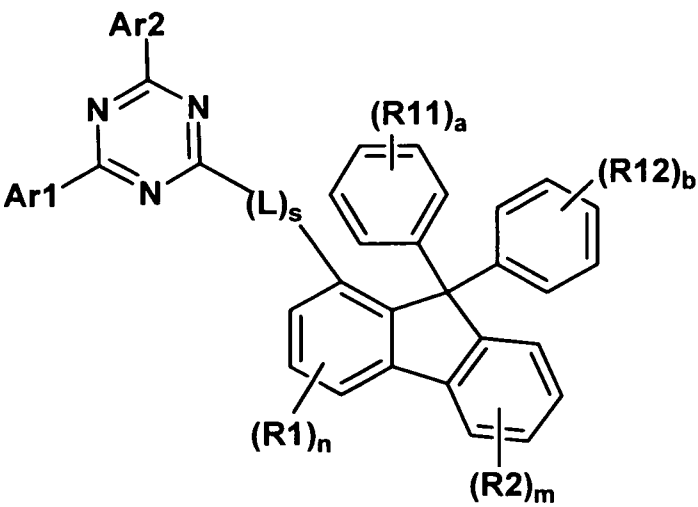
[式 10]



[式 11]



[式 12]



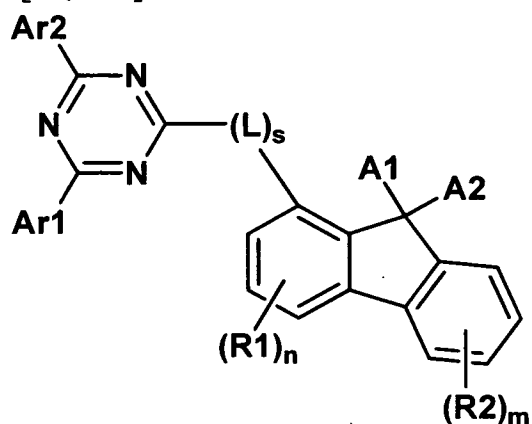
【0053】 在式 9 至式 12 中，

Ar1、Ar2、R1、R2、L、s、n 以及 m 之定義與式 1 中之定義相同，及

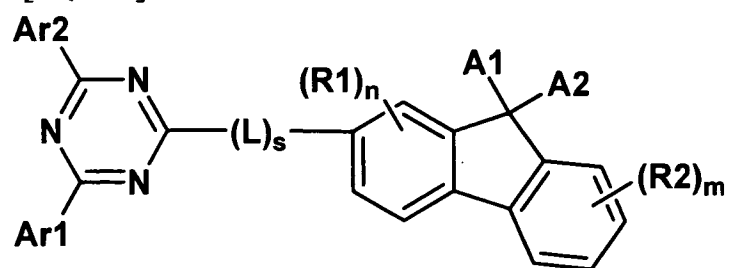
R11、R12、a 以及 b 之定義與式 7 中之定義相同。

【0054】 根據本發明之例示性實施例，式 8 可由以下式 13 至式 16 中之任一者表示。

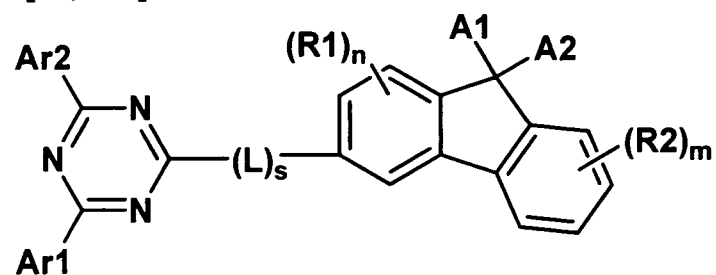
[式 13]



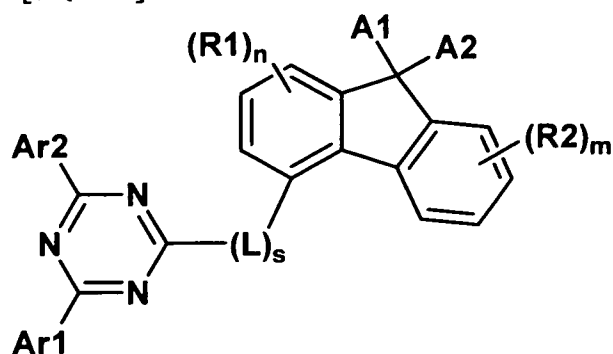
[式 14]



[式 15]



[式 16]



【0055】 在式 13 至式 16 中，

Ar1、Ar2、R1、R2、L、s、n 以及 m 之定義與式 1 中之定義相同，及

A1 及 A2 之定義與式 8 中之定義相同。

【0056】 根據本發明之例示性實施例，L 為直接鍵；或經取代或未經取代之伸芳基。

【0057】 根據本發明之例示性實施例，L 為直接鍵；或未經取代或經一或多個由以下各者所組成之群中選出之取代基取代的伸芳基：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基。

【0058】 根據本發明之例示性實施例，L 為直接鍵；或未經取代或經一或多個由以下各者所組成之群中選出之取代基取代的伸芳基：氬、烷基以及芳基。

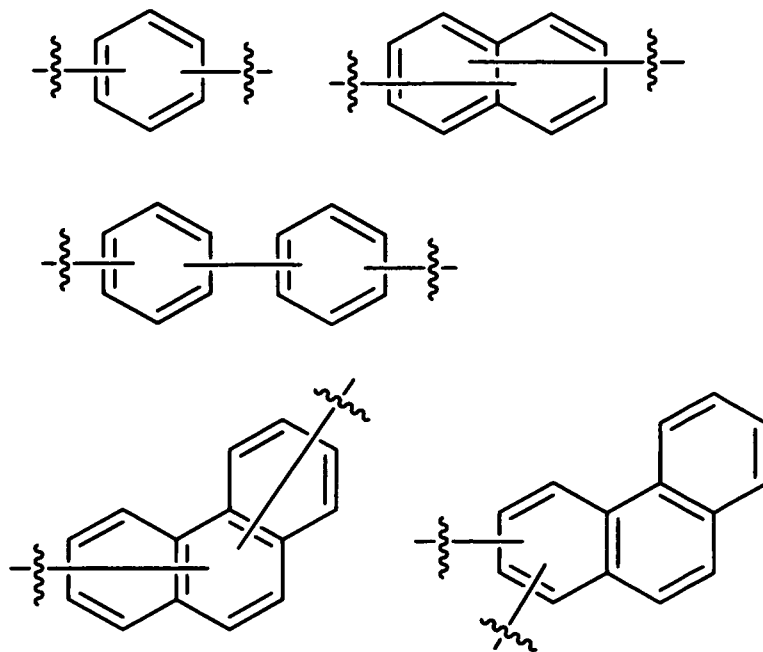
【0059】 根據本發明之例示性實施例，L 為直接鍵；或經取代或未經取代之單環至四環伸芳基。

【0060】 根據本發明之例示性實施例，L 為直接鍵；或經取代或未經取代之單環至三環伸芳基。

【0061】 根據本發明之例示性實施例，L 為經取代或未經取代之具有 6 個至 30 個碳原子之伸芳基。

【0062】 根據本發明之例示性實施例，L 為經取代或未經取代之具有 6 個至 20 個碳原子之伸芳基。

【0063】 根據本發明之例示性實施例，L 為直接鍵；或由以下結構中選出之任一者。



【0064】 結構可未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬；鹵素基團；腈基團；硝基；羥基；羰基；酯基團；醯亞胺基團；胺基；氧化膦基團、烷氧基；芳氧基；烷基硫氧基；芳基硫氧基；烷基磺酸氧基；芳基磺酸氧基；矽烷基；硼基團；烷基；環烷基；烯基；芳基；芳烷基；芳烯基；烷基芳基；烷基胺基團；芳烷基胺基團；雜芳基胺基；芳基胺基團；芳基膦基團；以及雜環基。

【0065】 根據本發明之例示性實施例，L 為直接鍵；經取代或未經取代之伸苯基；經取代或未經取代之聯伸苯基；經取代或未經取代之伸萘基；或經取代或未經取代之伸菲基。

【0066】 根據本發明之例示性實施例，L 為直接鍵；伸苯基；聯伸苯基；伸萘基；或伸菲基。

【0067】 根據本發明之例示性實施例，L 為直接鍵；或經取代或未經取代之伸苯基。

【0068】 根據本發明之例示性實施例，L 為直接鍵；或伸苯基。

【0069】 根據本發明之例示性實施例，L 為經取代或未經取代之伸苯基。

【0070】 根據本發明之例示性實施例，L 為伸苯基。

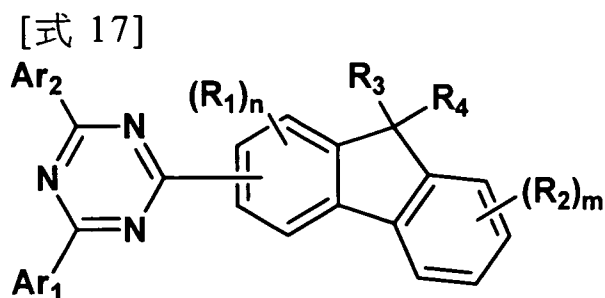
【0071】 根據本發明之例示性實施例，L 為直接鍵。

【0072】 根據本發明之例示性實施例，s 為 0 或 1。

【0073】 根據本發明之例示性實施例，s 為 0。

【0074】 根據本發明之例示性實施例，s 為 1。

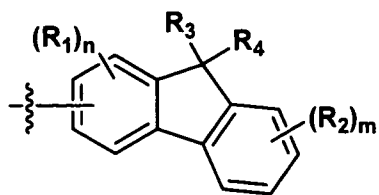
【0075】 根據本發明之例示性實施例，式 1 可由以下式 17 表示。



在式 17 中，

Ar1、Ar2、R1 至 R4、n 以及 m 之定義與式 1 中之定義相同，

及

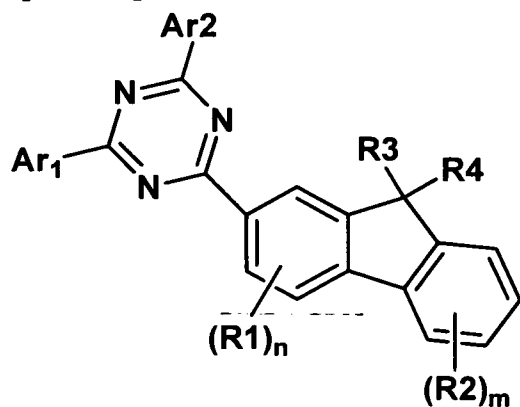


Ar1、Ar2 及

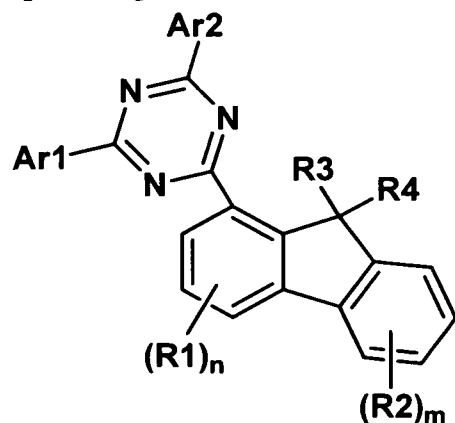
彼此不同。

【0076】 根據本發明之例示性實施例，式 1 可由以下式 18 至式 21 中之任一者表示。

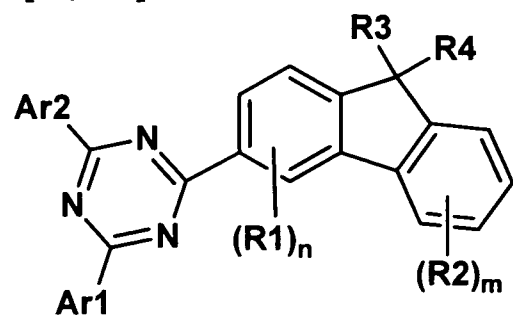
[式 18]



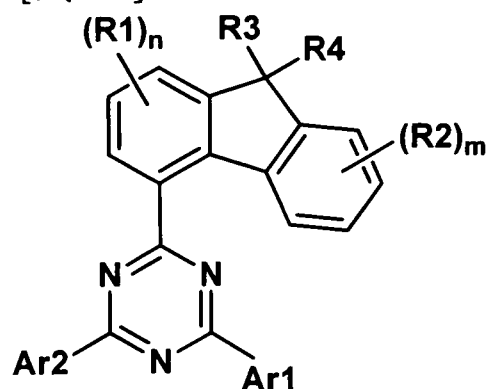
[式 19]



[式 20]



[式 21]

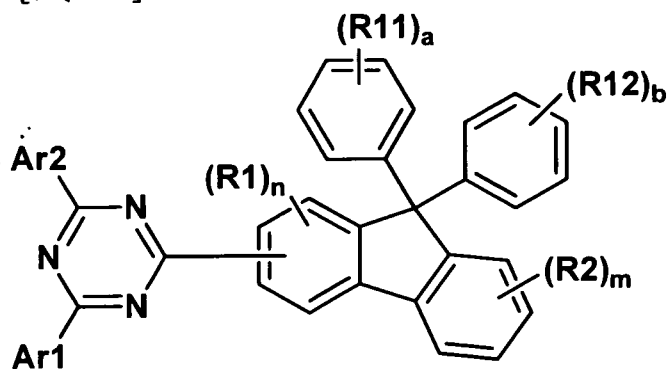


【0077】 在式 18 至式 21 中，

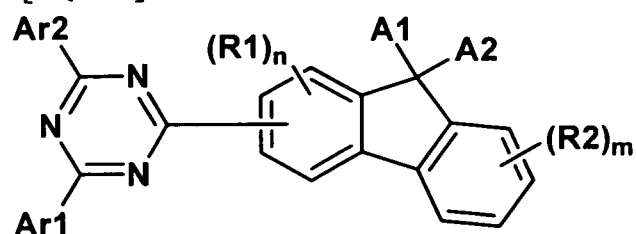
Ar1、Ar2、R1 至 R4、n 以及 m 之定義與式 1 中之定義相同。

【0078】 根據本發明之例示性實施例，式 1 可由以下式 22 或式 23 表示。

[式 22]



[式 23]



【0079】 在式 22 及式 23 中，

Ar1、Ar2、R1、R2、n 以及 m 之定義與式 1 中之定義相同，

R11 及 R12 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或

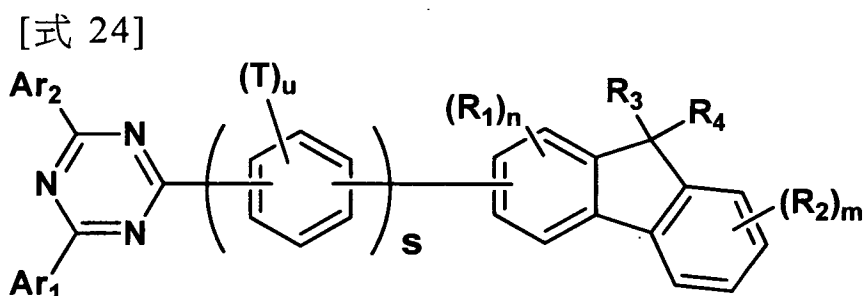
未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或兩個或大於兩個相鄰基團彼此組合以形成經取代或未經取代之環，

A1 及 A2 彼此相同或不同，且各自獨立地為經取代或未經取代之烷基，或彼此組合以形成經取代或未經取代之脂族環，

a 及 b 彼此相同或不同，且各自獨立地為整數 0 至 5，及

當 a 及 b 各自為 2 或大於 2 時，括弧中之結構彼此相同或不同。

【0080】 根據本發明之例示性實施例，式 1 可由以下式 24 表示。



在式 24 中，

Ar_1 、 Ar_2 、 R_1 至 R_4 、 s 、 n 以及 m 之定義與式 1 中之定義相同，

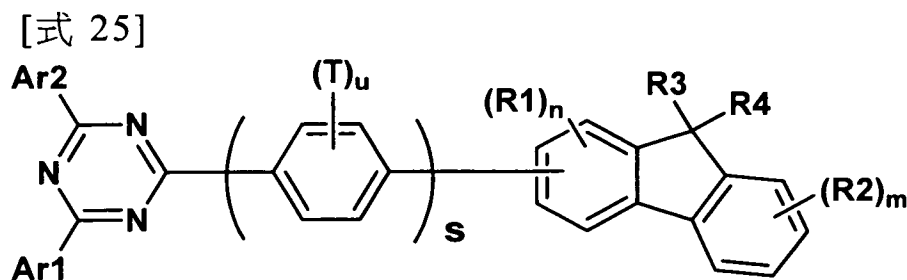
T 為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧

基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或兩個或大於兩個相鄰 T 彼此組合以形成經取代或未經取代之環，

u 為整數 0 至 4，及

當 u 為 2 或大於 2 時，T 彼此相同或不同。

【0081】 根據本發明之例示性實施例，式 1 可由以下式 25 表示。



在式 25 中，

Ar1、Ar2、R1 至 R4、s、n 以及 m 之定義與式 1 中之定義相同，

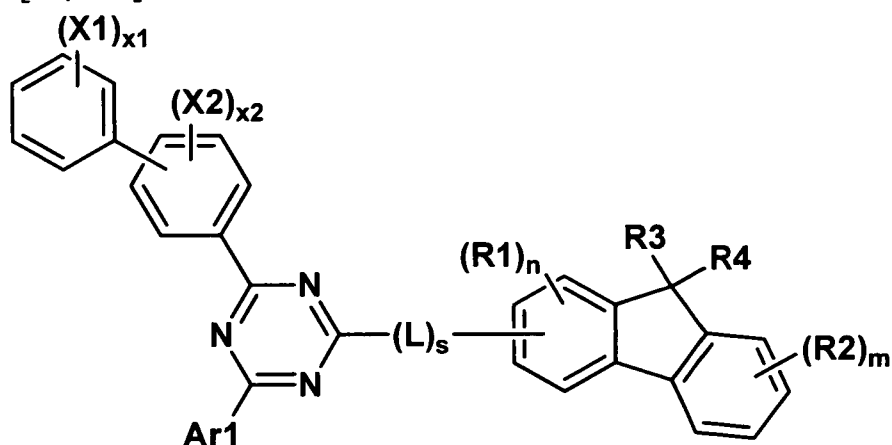
T 為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或兩個或大於兩個相鄰 T 彼此組合以形成經取代或未經取代之環，

u 為整數 0 至 4，及

當 u 為 2 或大於 2 時，T 彼此相同或不同。

【0082】 根據本發明之例示性實施例，式 1 可由以下式 26 表示。

[式 26]



在式 26 中，

R1 至 R4、Ar1、L、s、m 以及 n 之定義與式 1 中之定義相同，

X1 及 X2 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或兩個或大於兩個相鄰基團彼此組合以形成經取代或未經取代之環，

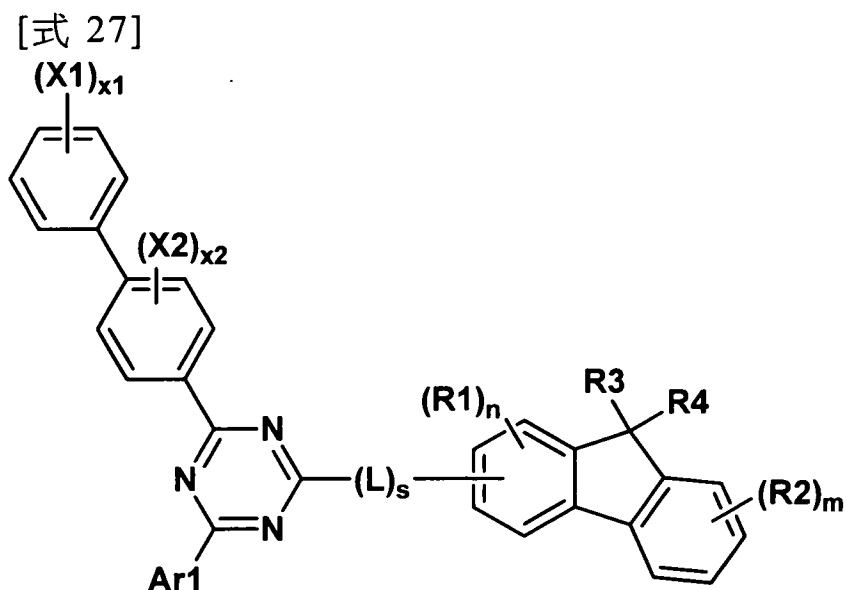
x1 為整數 0 至 5，及

x2 為整數 0 至 4，及

當 x1 為 2 或大於 2 時，X1 彼此相同或不同，及

當 x_2 為 2 或大於 2 時， X_2 彼此相同或不同。

【0083】 根據本發明之例示性實施例，式 26 可由以下式 27 表示。



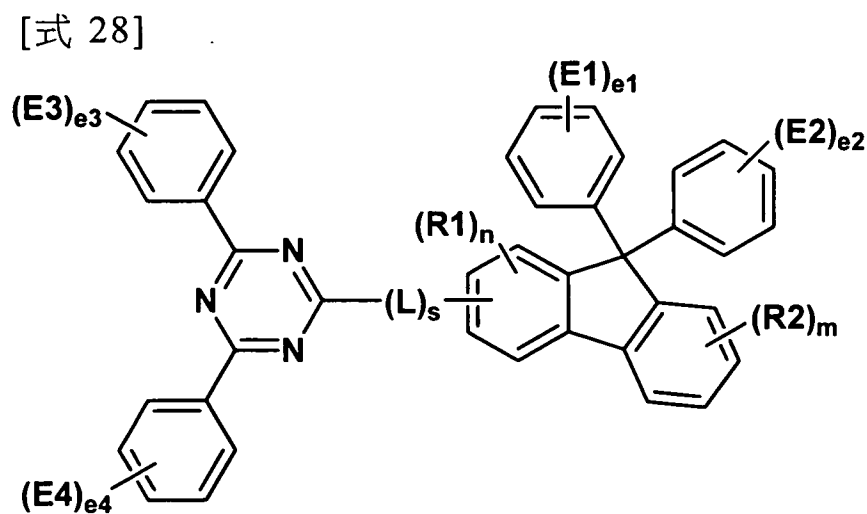
在式 27 中，

R_1 至 R_4 、 Ar_1 、 L 、 s 、 m 以及 n 之定義與式 1 中之定義相同，

及

X_1 、 X_2 、 x_1 及 x_2 之定義與式 26 中之定義相同。

【0084】 根據本發明之例示性實施例，式 1 可由以下式 28 表示。



在式 28 中，

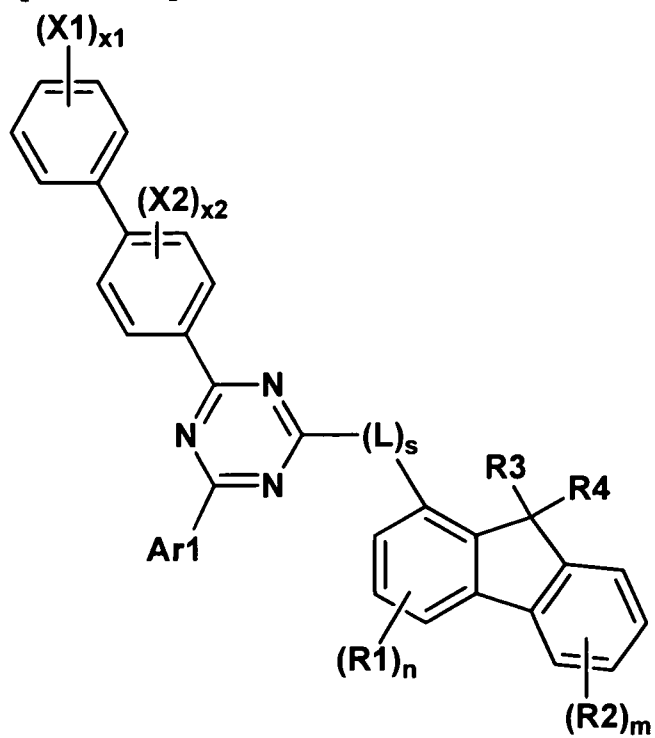
L 、 s 、 R_1 、 R_2 、 m 以及 n 之定義與式 1 中之定義相同，

E1 至 E4 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或與相鄰基團組合以形成經取代或未經取代之環，

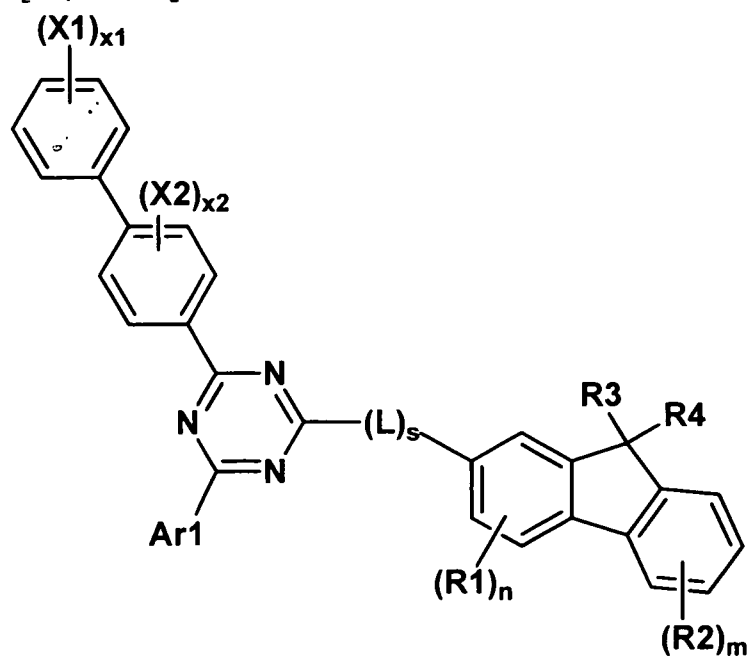
e1 至 e4 彼此相同或不同，且各自獨立地為整數 0 至 5，及當 e1 至 e4 各自為 2 或大於 2 時，括弧中之結構彼此相同或不同。

【0085】 根據本發明之例示性實施例，式 27 可由以下式 27-1 至式 27-4 中之任一者表示。

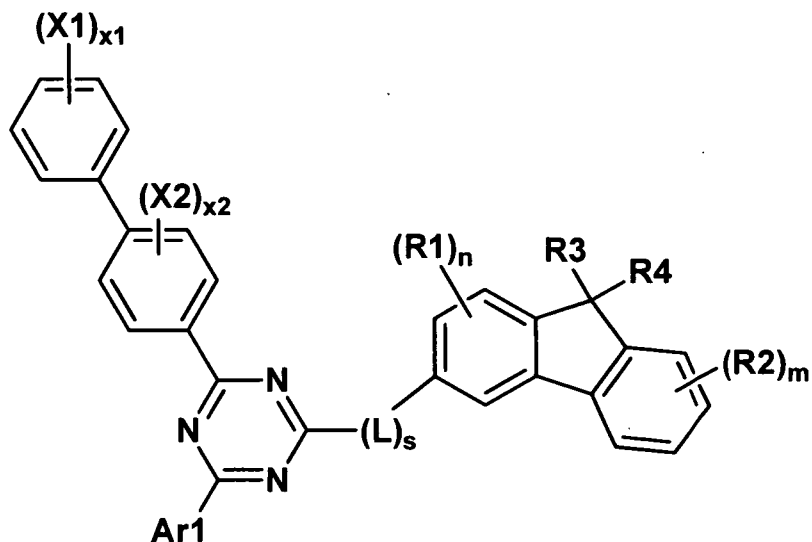
[式 27-1]



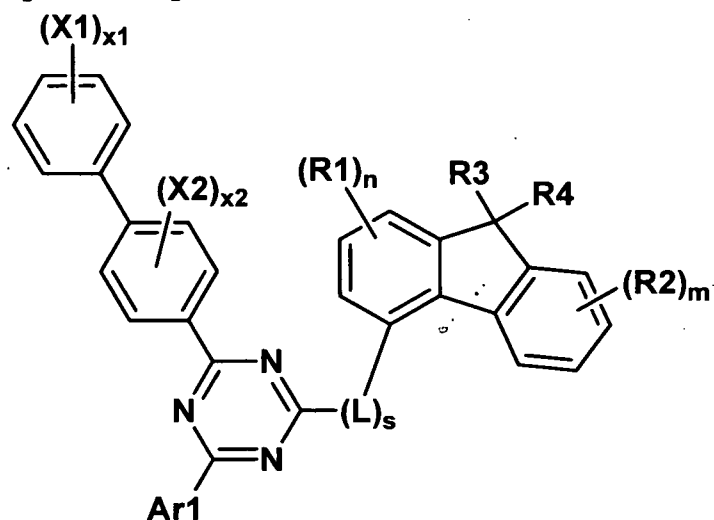
[式 27-2]



[式 27-3]



[式 27-4]



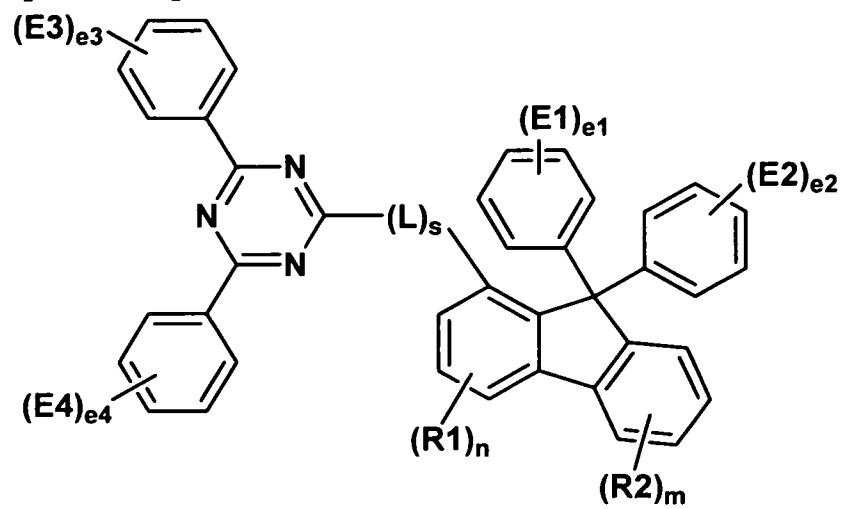
【0086】 在式 27-1 至式 27-4 中，

R1 至 R4、Ar1、L、s、m 以及 n 之定義與式 1 中之定義相同，
及

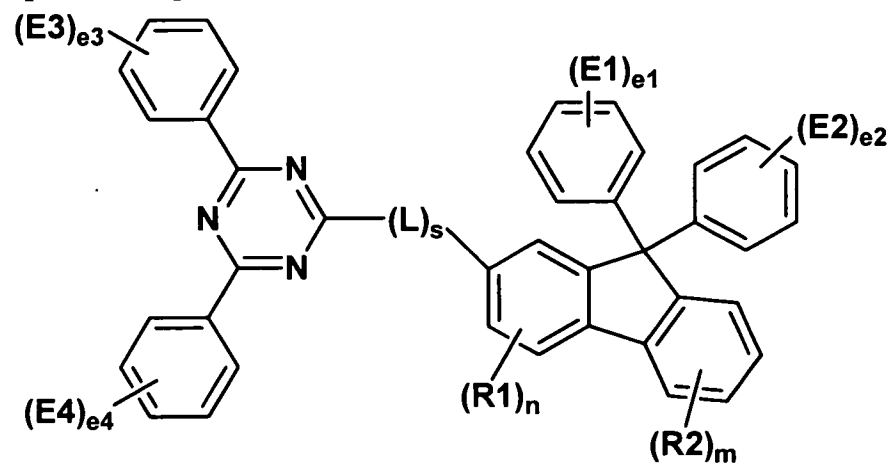
X1、X2、x1 及 x2 之定義與式 27 中之定義相同。

【0087】 根據本發明之例示性實施例，式 28 可由下式 28-1 至式 28-4 中之任一者表示。

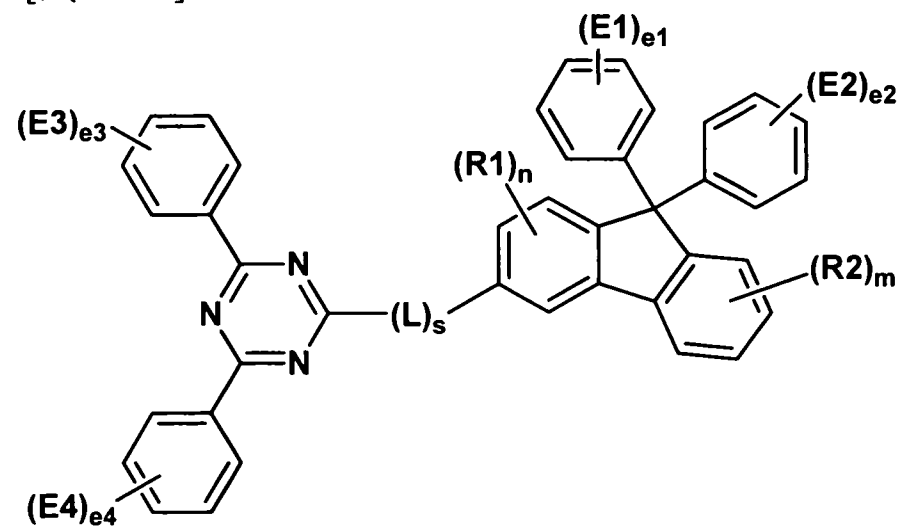
[式 28-1]



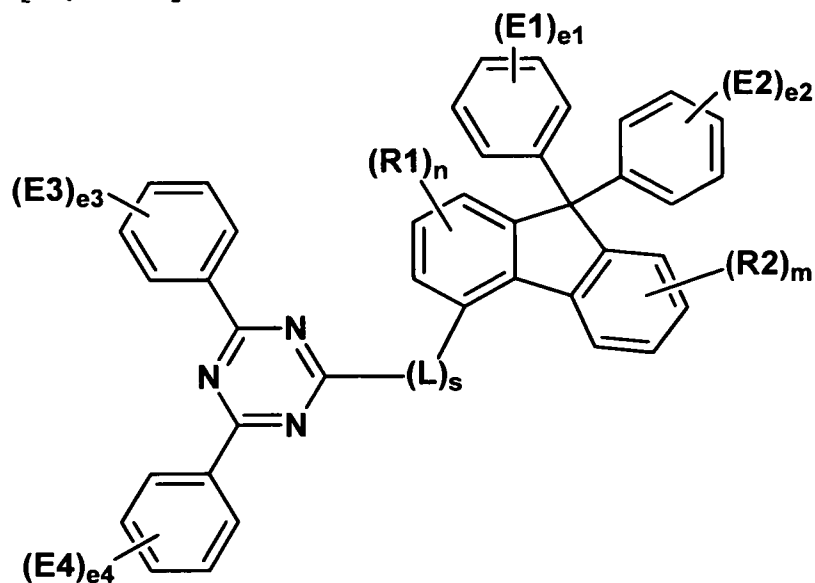
[式 28-2]



[式 28-3]



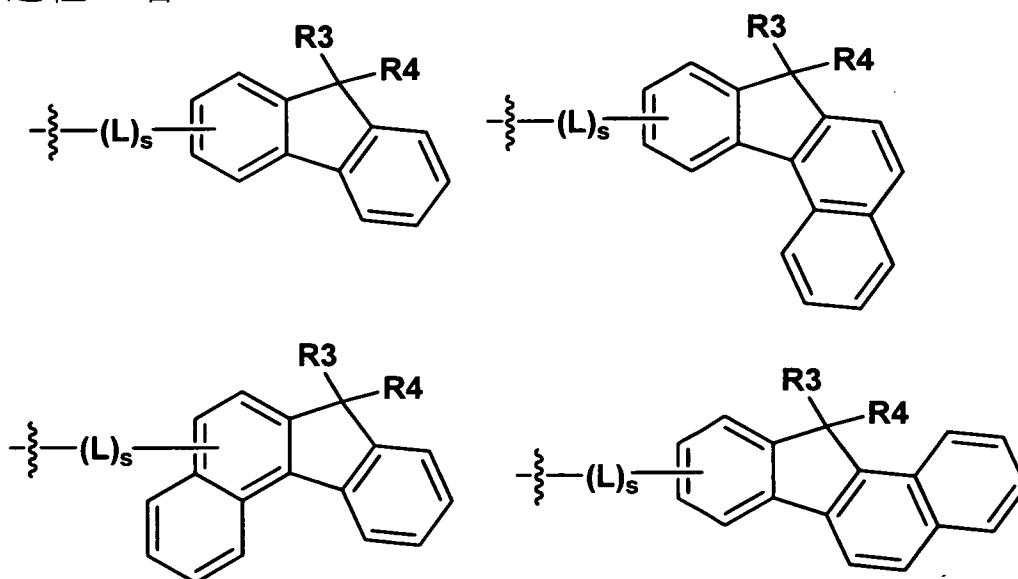
[式 28-4]

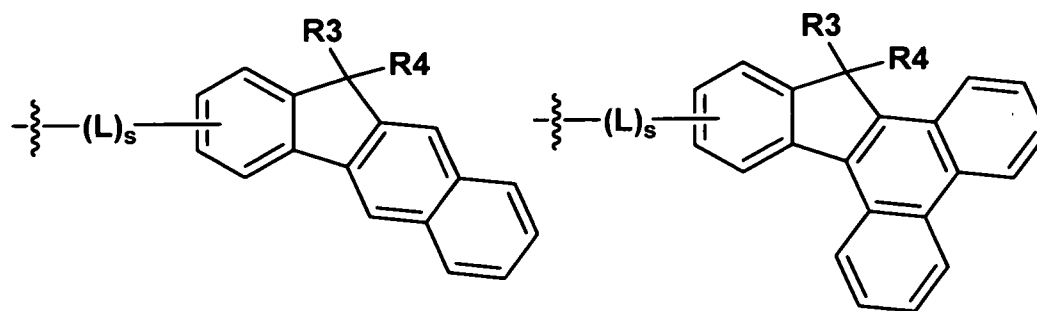


【0088】 在式 28-1 至式 28-4 中，

L、s、R1、R2、m 以及 n 之定義與式 1 中之定義相同，及
E1 至 E4 及 e1 至 e4 之定義與式 28 中之定義相同。

【0089】 根據本發明之例示性實施例，式 1-1 可為由以下結構中
選出之任一者。



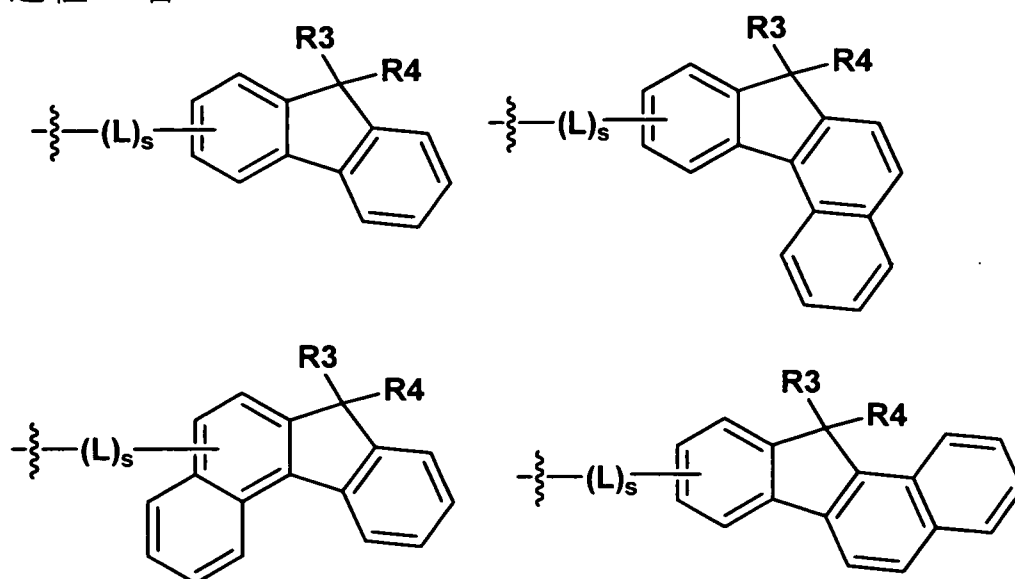


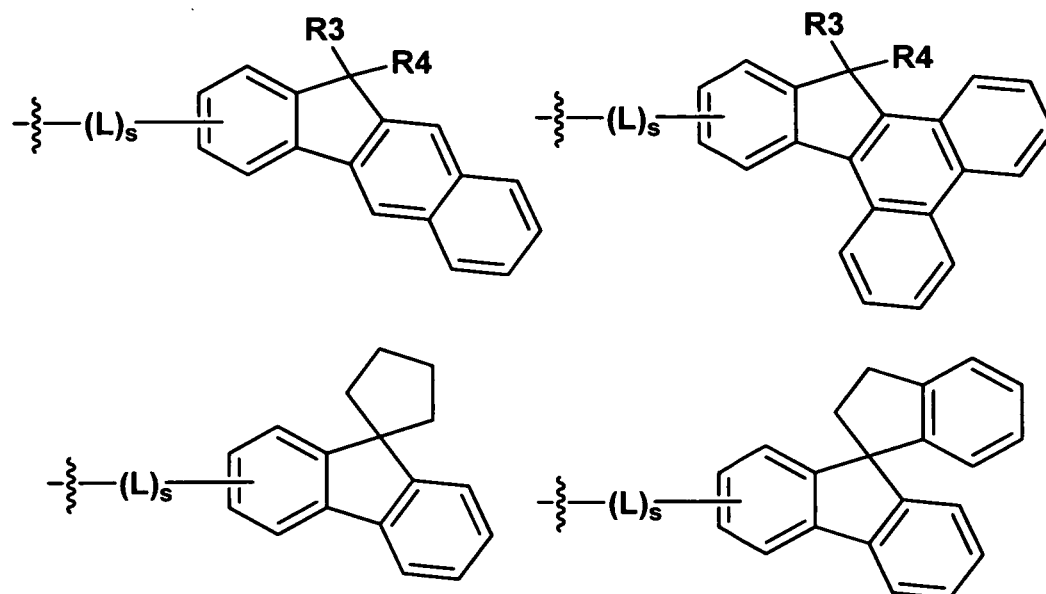
【0090】 在結構式中，

R3 及 R4 之定義與式 1 中之定義相同，且 L 及 s 之定義與式 1-1 中之定義相同，及

結構可未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬；鹵素基團；腈基團；硝基；羥基；羰基；酯基團；醯亞胺基團；胺基；氧化磷基團、烷氧基；芳氧基；烷基硫氧基；芳基硫氧基；烷基磺酸氧基；芳基磺酸氧基；矽烷基；硼基團；烷基；環烷基；烯基；芳基；芳烷基；芳烯基；烷基芳基；烷基胺基團；芳烷基胺基團；雜芳基胺基；芳基胺基團；芳基磷基團；以及雜環基。

【0091】 根據本發明之例示性實施例，式 1-1 可為由以下結構中選出之任一者。





【0092】 在結構式中，

R_3 及 R_4 之定義與式 1 中之定義相同，且 L 及 s 之定義與式 1-1 中之定義相同，及

結構可未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氫；鹵素基團；腈基團；硝基；羥基；羰基；酯基團；醯亞胺基團；胺基；氧化膦基團、烷氧基；芳氧基；烷基硫氧基；芳基硫氧基；烷基磺酸氧基；芳基磺酸氧基；矽烷基；硼基團；烷基；環烷基；烯基；芳基；芳烷基；芳烯基；烷基芳基；烷基胺基團；芳烷基胺基團；雜芳基胺基；芳基胺基團；芳基膦基團；以及雜環基。

【0093】 根據本發明之例示性實施例， R_1 及 R_2 彼此相同或不同，且各自獨立地為氫；鹵素基團；腈基團；硝基；羥基基團；烷基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氫、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷

基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；環烷基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；烷氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；芳氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；烷基硫氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、

芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；芳基硫氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；烷基磺酸氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；芳基磺酸氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；烯基，其未經取代或經一或多個由以下各者所組成之群中選

出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；矽烷基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；硼基團，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；芳基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基

團以及雜環基；或雜環基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氫、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基，或與相鄰基團組合以形成經取代或未經取代之環。

【0094】根據本發明之例示性實施例，R1 為氫；氫；經取代或未經取代之烷基；或經取代或未經取代之芳基，或兩個或大於兩個相鄰 R1 彼此組合以形成經取代或未經取代之環。

【0095】根據本發明之例示性實施例，R1 為氫；氫；經取代或未經取代之具有 1 個至 30 個碳原子之烷基；經取代或未經取代之具有 6 個至 40 個碳原子之芳基，或兩個或大於兩個相鄰 R1 彼此組合以形成經取代或未經取代之環。

【0096】根據本發明之例示性實施例，R1 為氫；氫；經取代或未經取代之具有 1 個至 6 個碳原子之烷基；或經取代或未經取代之具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R1 彼此組合以形成經取代或未經取代之環。

【0097】根據本發明之例示性實施例，R1 為氫；氫；具有 1 個至 6 個碳原子之烷基；或具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R1 彼此組合以形成經取代或未經取代之環。

【0098】根據本發明之例示性實施例，R1 為氫；氫；或烷基，或

兩個或大於兩個相鄰 R1 彼此組合以形成經取代或未經取代之環。

【0099】 根據本發明之例示性實施例，R1 為氫；或氘。

【0100】 根據本發明之例示性實施例，R1 為氫，或兩個或大於兩個相鄰 R1 彼此組合以形成經取代或未經取代之環。

【0101】 根據本發明之例示性實施例，R1 為氫，或兩個或大於兩個相鄰 R1 彼此組合以形成環。

【0102】 根據本發明之例示性實施例，兩個或大於兩個相鄰 R1 彼此組合以形成經取代或未經取代之環。

【0103】 根據本發明之例示性實施例，兩個或大於兩個相鄰 R1 彼此組合以形成環。

【0104】 根據本發明之例示性實施例，R1 為氫。

【0105】 根據本發明之例示性實施例，R2 為氫；氘；鹵素基團；腓基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；經取代或未經取代之包含 O 及 S 原子中之一或多者之單環或雙環雜環基；經取代或未經取代之吡咯基；經取代或未經取代之咪唑基；經取代或未經取代三唑基；經取代或未經取代之吡啶基；經取代或未經取代之二吡啶基；經取代或未經取代之嘧啶基；經取代或未經取代之三唑基；經取代或未經取代之吡啶基；經取代或未經取代之

噻嗪基；經取代或未經取代之吡嗪基；經取代或未經取代之喹啉基；經取代或未經取代之喹唑啉基；經取代或未經取代之喹啉基；經取代或未經取代之酞嗪基；經取代或未經取代之吡啶并嘧啶基；經取代或未經取代之吡啶并吡嗪基；經取代或未經取代之吡嗪並吡嗪基；經取代或未經取代之異喹啉基；經取代或未經取代之吡啶基；經取代或未經取代之苯并咪唑基；或經取代或未經取代之啡啉基，或兩個或大於兩個相鄰 R2 彼此組合以形成經取代或未經取代之環。

【0106】 根據本發明之例示性實施例，R2 為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之包含 O 及 S 原子中之一或多者之單環或雙環雜環基，或兩個或大於兩個相鄰 R2 彼此組合以形成經取代或未經取代之環。

【0107】 根據本發明之例示性實施例，R2 為氫；氘；或經取代或未經取代之芳基；或經取代或未經取代之包含 O 及 S 原子中之一或多者之單環或雙環雜環基，或兩個或大於兩個相鄰 R2 彼此組合以形成經取代或未經取代之環。

【0108】 根據本發明之例示性實施例，R2 為氫；氘；或經取代或

未經取代之芳基，或兩個或大於兩個相鄰 R2 彼此組合以形成經取代或未經取代之環。

【0109】 根據本發明之例示性實施例，R2 為氫；氖；或經取代或未經取代之具有 6 個至 40 個碳原子之芳基，或兩個或大於兩個相鄰 R2 彼此組合以形成經取代或未經取代之環。

【0110】 根據本發明之例示性實施例，R2 為氫；氖；或經取代或未經取代之具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R2 彼此組合以形成經取代或未經取代之環。

【0111】 根據本發明之例示性實施例，R2 為氫；氖；或具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R2 彼此組合以形成經取代或未經取代之環。

【0112】 根據本發明之例示性實施例，R2 為氫；氖；經取代或未經取代之烷基；或經取代或未經取代之芳基，或兩個或大於兩個相鄰 R2 彼此組合以形成經取代或未經取代之環。

【0113】 根據本發明之例示性實施例，R2 為氫；氖；烷基；或芳基，或兩個或大於兩個相鄰 R2 彼此組合以形成環。

【0114】 根據本發明之例示性實施例，R2 為氫；氖；烷基；苯基；或萘基，或兩個或大於兩個相鄰 R2 彼此組合以形成經取代或未經取代之環。

【0115】 根據本發明之例示性實施例，R2 為氫；氖；經取代或未經取代之烷基；經取代或未經取代之苯基；或經取代或未經取代之萘基。

【0116】 根據本發明之例示性實施例，R2 為氫；氖；烷基；苯基；

或萘基。

【0117】 根據本發明之例示性實施例，R2 為氫；氘；經取代或未經取代之烷基；或經取代或未經取代之苯基。

【0118】 根據本發明之例示性實施例，R2 為氫；氘；烷基；或苯基。

【0119】 根據本發明之例示性實施例，R2 為氫；氘；或經取代或未經取代之烷基。

【0120】 根據本發明之例示性實施例，R2 為氫；氘；或烷基。

【0121】 根據本發明之例示性實施例，R2 為氫；或氘。

【0122】 根據本發明之例示性實施例，R2 為氫。

【0123】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；烷基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氘、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；環烷基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氘、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、

雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；烷氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；

● 芳氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；

● 烷基硫氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；

● 芳基硫氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；

矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；烷基磺酸氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；芳基磺酸氧基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；烯基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基；矽烷基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、鹽亞

胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基
 硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、
 環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、
 芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環
 基；硼基團，其未經取代或經一或多個由以下各者所組成之群中選
 出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯
 基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫
 氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基
 團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷
 基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團
 以及雜環基；芳基，其未經取代或經一或多個由以下各者所組成之
 群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰
 基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、
 烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、
 硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、
 烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基
 團以及雜環基；或雜環基，其未經取代或經一或多個由以下各者所
 組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥
 基、羰基、酯基團、鹽亞胺基團、胺基、氧化膦基團、烷氧基、芳
 氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、
 矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、
 烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、
 芳基膦基團以及雜環基，或彼此組合以形成脂族環，其未經取代或

經一或多個由以下各者所組成之群中選出之取代基取代：氬、鹵素基團、腈基團、硝基、羥基、羰基、酯基團、醯亞胺基團、胺基、氧化膦基團、烷氧基、芳氧基、烷基硫氧基、芳基硫氧基、烷基磺酸氧基、芳基磺酸氧基、矽烷基、硼基團、烷基、環烷基、烯基、芳基、芳烷基、芳烯基、烷基芳基、烷基胺基團、芳烷基胺基團、雜芳基胺基、芳基胺基團、芳基膦基團以及雜環基。

【0124】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；氬；鹵素基團；烷基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、烷基以及芳基；芳基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、烷基以及芳基；或雜環基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、烷基以及芳基。

【0125】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；氬；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之烷氧基；經取代或未經取代之硫烷氧基；經取代或未經取代之環烷基；經取代或未經取代之烯基；經取代或未經取代之芳基；經取代或未經取代之雜環基；經取代或未經取代之芳氧基；或經取代或未經取代之雜芳氧基。

【0126】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；氬；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之烷氧基；經取代或未經取代之硫烷氧基；經取代或未經取代之環烷基；經取代或未經取代之烯基；經取代或未經取

代之芳基；經取代或未經取代之雜環基；經取代或未經取代之芳氧基；或經取代或未經取代之雜芳氧基，或彼此組合以形成 5 員經取代或未經取代之脂族環。

【0127】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之烷氧基；經取代或未經取代之硫烷氧基；經取代或未經取代之環烷基；經取代或未經取代之烯基；經取代或未經取代之芳基；經取代或未經取代之雜環基；經取代或未經取代之芳氧基；或經取代或未經取代之雜芳氧基，或彼此組合以形成經取代或未經取代之單環或雙環脂族環。

【0128】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之具有 1 個至 40 個碳原子之直鏈烷基；經取代或未經取代之具有 1 個至 40 個碳原子之直鏈烷氧基；經取代或未經取代之具有 1 個至 40 個碳原子之直鏈硫烷氧基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈單環或多環烷基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈烯基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈烷氧基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈硫烷氧基；6 員至 40 員經取代或未經取代之芳基；5 員至 40 員經取代或未經取代之雜環基；5 員至 40 員經取代或未經取代之芳氧基；或 5 員至 40 員經取代或未經取代之雜芳氧基。

【0129】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；經取代或未經取代之烷基；經取代或未經取代

之芳基；或經取代或未經取代之雜環基。

【0130】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；經取代或未經取代之烷基；經取代或未經取代之芳基。

【0131】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；經取代或未經取代之烷基；經取代或未經取代之具有 6 個至 20 個碳原子之芳基；或經取代或未經取代之雜環基。

【0132】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；烷基；具有 6 個至 20 個碳原子之芳基，其未經取代或經烷基取代；或雜環基。

【0133】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；烷基；經取代或未經取代之苯基；經取代或未經取代之聯苯基；或經取代或未經取代之萘基，或彼此組合以形成 5 員脂族環。

【0134】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；烷基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成經取代或未經取代之單環或雙環。

【0135】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；烷基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成脂族環。

【0136】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；甲基；經取代或未經取代之苯基；經取代或未

經取代之聯苯基；或經取代或未經取代之萘基，或彼此組合以形成 5 員脂族環。

【0137】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；甲基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成脂族環。

【0138】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；甲基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成經取代或未經取代之單環或雙環。

【0139】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；甲基；苯基；經甲基取代之苯基；聯苯基；或萘基，或彼此組合以形成脂族環。

【0140】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為氫；甲基；苯基；經甲基取代之苯基；聯苯基；或萘基，或彼此組合以形成 5 員脂族環。

【0141】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為經取代或未經取代之烷基；或經取代或未經取代之芳基。

【0142】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為烷基；經取代或未經取代之苯基。

【0143】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為烷基；苯基；或經甲基取代之苯基。

【0144】 根據本發明之例示性實施例，R3 及 R4 彼此相同或不同，且各自獨立地為甲基；苯基；或經甲基取代之苯基。

【0145】 根據本發明之例示性實施例，R3 及 R4 彼此相同，且為經取代或未經取代之烷基；或經取代或未經取代之芳基。

【0146】 根據本發明之例示性實施例，R3 及 R4 彼此相同，且為經取代或未經取代之烷基；或經取代或未經取代之苯基。

【0147】 根據本發明之例示性實施例，R3 及 R4 彼此相同，且為烷基；或經取代或未經取代之苯基。

【0148】 根據本發明之例示性實施例，R3 及 R4 彼此相同，且為烷基；苯基；或經甲基取代之苯基。

【0149】 根據本發明之例示性實施例，R3 及 R4 彼此相同，且為甲基；苯基；或經甲基取代之苯基。

【0150】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為經取代或未經取代之芳基。

【0151】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為芳基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬；鹵素基團；腈基團；硝基；羥基；羰基；酯基團；醯亞胺基團；胺基；氧化膦基團、烷氧基；芳氧基；烷基硫氧基；芳基硫氧基；烷基磺酸氧基；芳基磺酸氧基；矽烷基；硼基團；烷基；環烷基；烯基；芳基；芳烷基；芳烯基；烷基芳基；烷基胺基團；芳烷基胺基團；雜芳基胺基基團；芳基胺基團；芳基膦基團；以及雜環基。

【0152】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為芳基，其未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬、烷基以及芳基。

【0153】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此相同，且各自獨立地為經取代或未經取代之芳基，且 Ar1 及 Ar2 中之至少一者為芳基，其未經取代或經氘取代。

【0154】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為芳基，其未經取代或經氘取代。

【0155】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為經取代或未經取代之單環至四環芳基。

【0156】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為芳基，其未經取代或經芳基取代。

【0157】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為單環至四環芳基，其未經取代或經芳基取代。

【0158】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為經取代或未經取代之苯基；經取代或未經取代之萘基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯基團；經取代或未經取代之聯四苯基；經取代或未經取代之菲基；經取代或未經取代之屈基；或經取代或未經取代之萘基。

【0159】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為苯基；萘基；聯苯基；聯三苯；聯四苯；菲基；屈基；或萘基，其未經取代或經烷基或芳基取代。

【0160】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為苯基，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；聯三苯，其未經取代或經芳基取代；聯四苯，其未經取代或經芳基取代；菲基，其

未經取代或經芳基取代；或屈基，其未經取代或經芳基取代。

【0161】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為經取代或未經取代之苯基；經取代或未經取代之萘基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之菲基；或經取代或未經取代之屈基。

【0162】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為苯基；萘基；聯苯基；聯三苯；聯四苯；菲基；或屈基。根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0163】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為苯基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；聯三苯，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代。

【0164】 根據本發明之例示性實施例，Ar1 及 Ar2 彼此不同，且各自獨立地為苯基；聯苯基；聯三苯；經苯基取代之聯三苯；萘基；菲基；經萘基取代之苯基；或經苯基取代之聯苯基。

【0165】 根據本發明之例示性實施例，Ar1 為芳基。

【0166】 根據本發明之例示性實施例，Ar1 為單環至三環芳基。

【0167】 根據本發明之例示性實施例，Ar1 為經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之萘基；或

經取代或未經取代之菲基。

【0168】 根據本發明之例示性實施例，Ar1 為苯基；聯苯基；萘基；或菲基。

【0169】 根據本發明之例示性實施例，Ar1 為經取代或未經取代之苯基。

【0170】 根據本發明之例示性實施例，Ar1 為經取代或未經取代之聯苯基。

【0171】 根據本發明之例示性實施例，Ar1 為經取代或未經取代之萘基。

【0172】 根據本發明之例示性實施例，Ar1 為經取代或未經取代之菲基。

【0173】 根據本發明之例示性實施例，當 Ar1 為經取代或未經取代之苯基時，Ar2 為經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之萘基；經取代或未經取代之菲基；或經取代之苯基。

【0174】 根據本發明之例示性實施例，當 Ar1 為苯基時，Ar2 為聯苯基；聯三苯；經苯基取代之聯三苯；聯四苯；萘基；菲基；或經萘基取代之苯基。

【0175】 根據本發明之例示性實施例，當 Ar1 為經取代或未經取代之聯苯基時，Ar2 為經取代或未經取代之聯三苯；經取代或未經取代之聯苯基；經取代之苯基；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0176】 根據本發明之例示性實施例，當 Ar1 為聯苯基時，Ar2 為

聯三苯；聯苯基；經萘基取代之苯基；經菲基取代之苯基；經萘基取代之聯苯基；萘基；經苯基取代之萘基；或菲基。

【0177】 根據本發明之例示性實施例，當 Ar1 為經取代或未經取代之萘基時，Ar2 為經取代或未經取代之聯苯基；經取代之苯基；經取代或未經取代之聯三苯；經取代或未經取代之菲基；或經取代或未經取代之聯四苯。

【0178】 根據本發明之例示性實施例，當 Ar1 為萘基時，Ar2 為聯苯基；經萘基取代之苯基；經菲基取代之苯基；聯三苯；經萘基取代之聯苯基；經苯基取代之菲基；菲基；聯四苯；或經苯基取代之聯三苯。

【0179】 根據本發明之例示性實施例，當 Ar1 為經取代或未經取代之菲基時，Ar2 為經取代或未經取代之聯苯基；經取代之苯基；經取代或未經取代之聯三苯；或經取代或未經取代之聯四苯。

【0180】 根據本發明之例示性實施例，當 Ar1 為菲基時，Ar2 為聯苯基；經菲基取代之苯基；經萘基取代之苯基；聯三苯；聯四苯；或經苯基取代之聯三苯。

【0181】 根據本發明之例示性實施例，Ar2 為經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0182】 根據本發明之例示性實施例，Ar2 為苯基；聯苯基；聯三苯；聯四苯；萘基；或菲基。

【0183】 根據本發明之例示性實施例，Ar1 及 Ar2 中之至少一者

為經取代或未經取代之聯苯基。

【0184】 根據本發明之例示性實施例，Ar1 為苯基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代，且 Ar2 為苯基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；聯三苯，其未經取代或經芳基取代；聯四苯，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代。

【0185】 根據本發明之例示性實施例，Ar1 為苯基，且 Ar2 為聯苯基。

【0186】 根據本發明之例示性實施例，由式 1 至式 28 中之任一者表示之化合物之玻璃轉化溫度較佳為 80°C 或大於 80°C，且更佳為 100°C 或大於 100°C。

【0187】 根據本發明之例示性實施例，由式 1 至式 28 中之任一者表示之化合物可用於有機發光元件之電子傳輸層。此外，根據本發明之例示性實施例，由式 1 至式 28 中之任一者表示之化合物可用於有機發光元件之電子控制層。

【0188】 根據本發明之例示性實施例，由式 1 至式 28 中之任一者表示之化合物之 HOMO 能級為 6.0 eV 或大於 6.0 eV，且更佳為 6.0 eV 至 7.0 eV。

【0189】 在本發明之實驗性實例中，已證實由式 1 至式 28 中之任一者表示之化合物之 HOMO 能級為 6.0 eV 或大於 6.0 eV，其為深 HOMO 能級，且結果展示於表 1 中。

【0190】 在本發明中，能級意謂能量之大小。因此，即使當能級自真空能階以負(-)方向表示時，其解釋為能級意謂相應能量值之絕對值。舉例而言，HOMO 能級意謂自真空能階至最高佔用分子軌域之距離。

【0191】 在本發明之例示性實施例中，HOMO 能級可使用大氣壓光電子光譜儀 AC3（由理研有限公司（Riken Keiki Co., Ltd.）製造）量測。具體而言，可藉由將光照射至材料上，且量測此時由於電荷之分離而產生之電子量來量測 HOMO 能級。

【0192】 根據本發明之例示性實施例，由式 1 至式 28 中之任一者表示之化合物之三重態能量為 2.2 eV 或大於 2.2 eV。

【0193】 在本發明之實驗性實例中，已證實由式 1 至式 28 中之任一者表示之化合物之三重態能量為 2.2 eV 或大於 2.2 eV，且結果展示於表 1 中。

【0194】 在本發明之例示性實施例中，可使用低溫光致發光方法量測三重態能量（ E_T ）。可藉由量測 λ 邊緣值且使用以下轉化式來獲得三重態能量。

$$E_T(\text{eV}) = 1239.85 / (\text{邊緣 } \lambda)$$

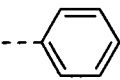
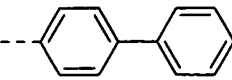
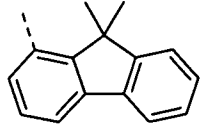
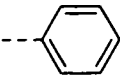
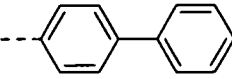
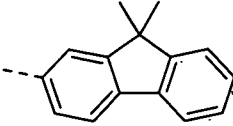
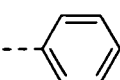
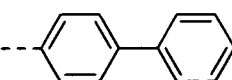
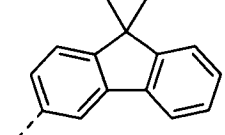
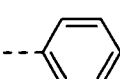
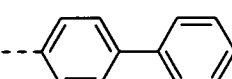
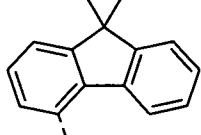
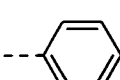
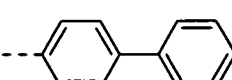
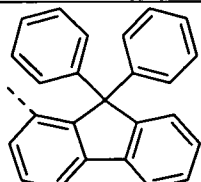
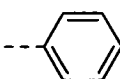
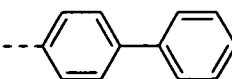
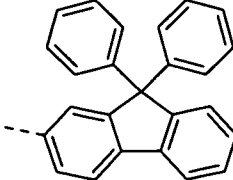
【0195】 當藉由在縱軸上顯示磷光強度且在橫軸上顯示波長表示磷光譜時，相對於磷光譜之短波長側處之增量描繪切線，轉化式中之術語「邊緣 λ 」意謂切線及橫軸之橫截面之波長值（單位為 nm）。

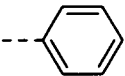
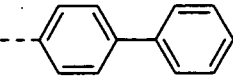
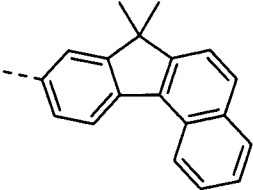
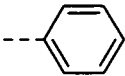
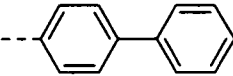
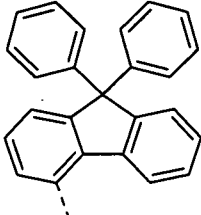
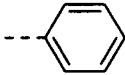
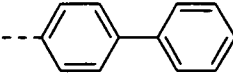
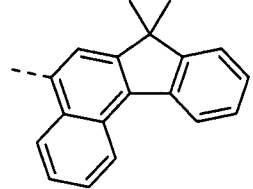
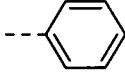
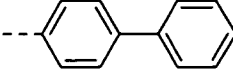
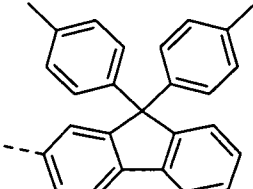
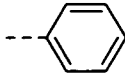
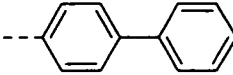
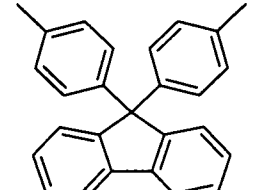
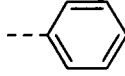
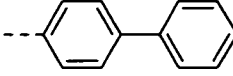
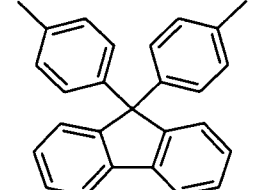
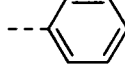
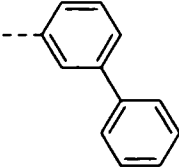
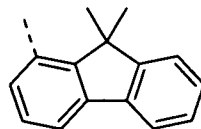
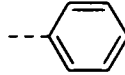
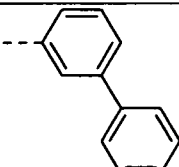
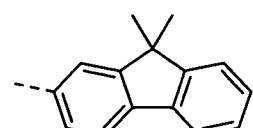
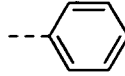
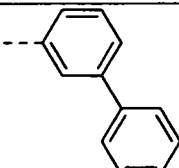
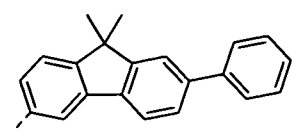
【0196】 在本發明之另一個例示性實施例中，亦可藉由量子化學計算來獲得三重態能量（ E_T ）。可使用由美國高斯公司（U.S. Gaussian Corporation）製造之量子化學計算程式高斯 03（Gaussian

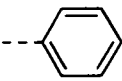
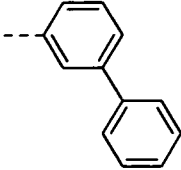
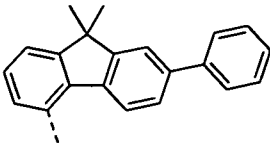
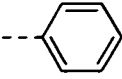
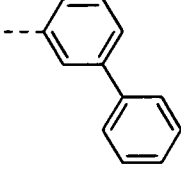
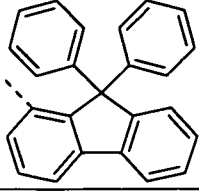
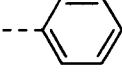
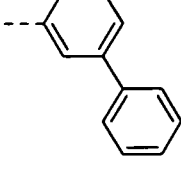
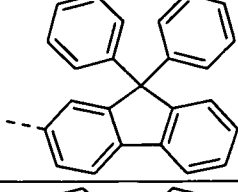
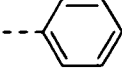
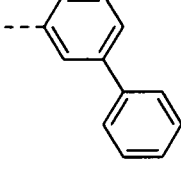
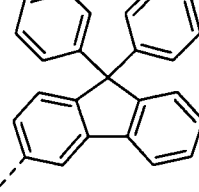
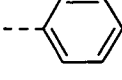
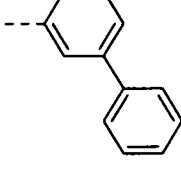
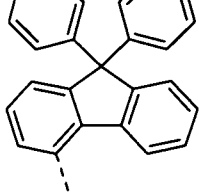
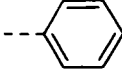
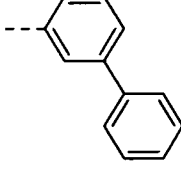
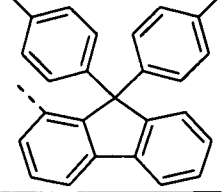
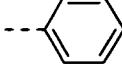
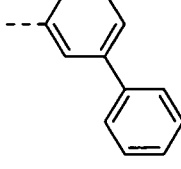
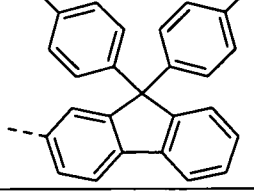
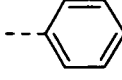
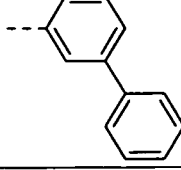
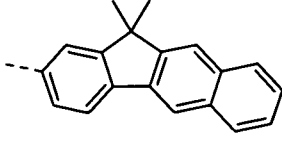
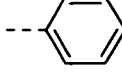
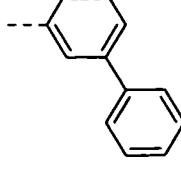
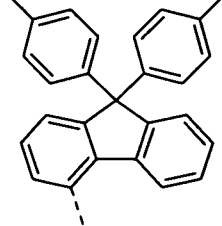
03) 進行量子化學計算。在計算中，使用密度泛函理論 (DFT)，且可相對於使用 B3LYP 作為泛函及 6-31G*作為基底函數而經優化之結構，藉由時間依賴性密度泛函理論 (TD-DFT) 獲得所計算之三重態能量值。

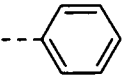
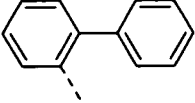
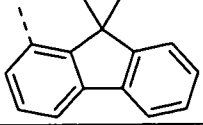
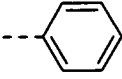
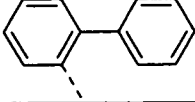
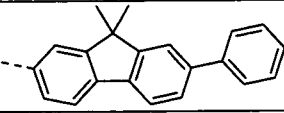
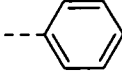
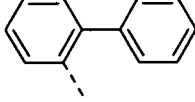
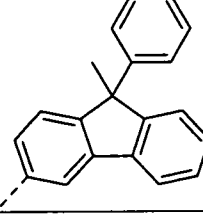
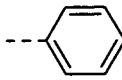
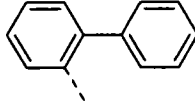
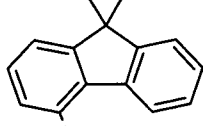
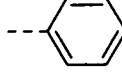
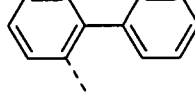
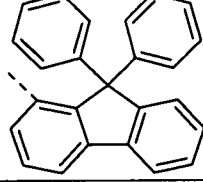
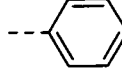
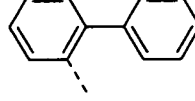
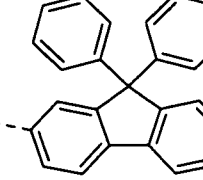
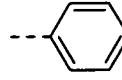
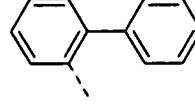
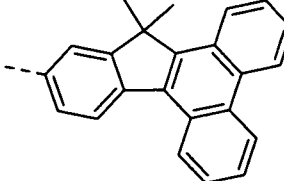
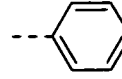
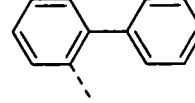
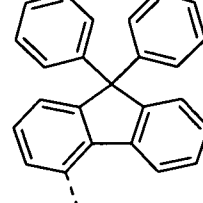
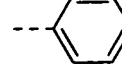
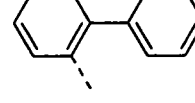
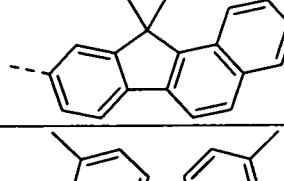
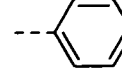
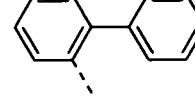
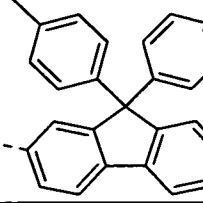
【0197】 在本發明之另一個例示性實施例中，在一些情況下，未觀測特定有機化合物中之磷光譜，且在有機化合物中，可假設及使用藉由使用如上文所示之量子化學計算而獲得之三重態能量 (E_T)。

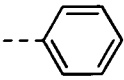
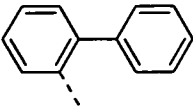
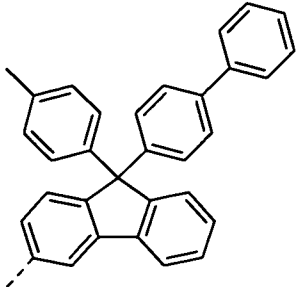
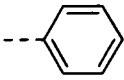
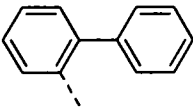
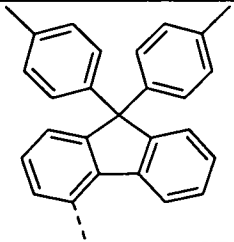
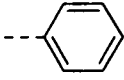
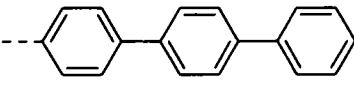
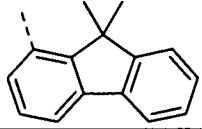
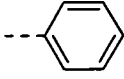
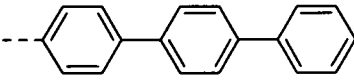
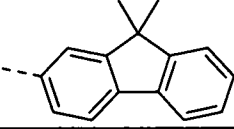
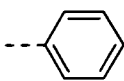
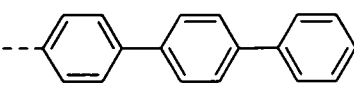
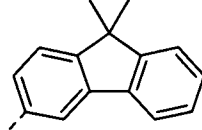
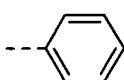
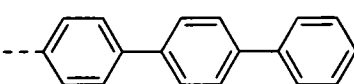
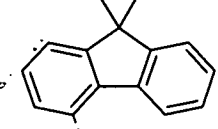
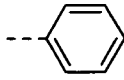
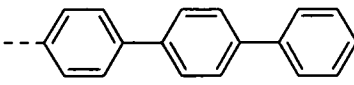
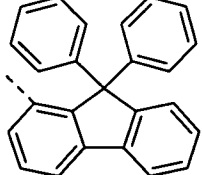
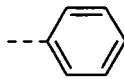
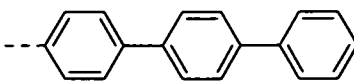
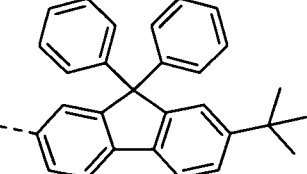
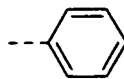
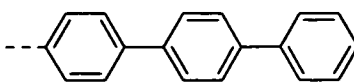
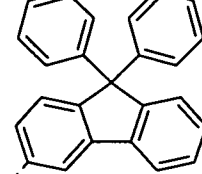
【0198】 根據本發明之例示性實施例，式 1 化合物可為由以下化合物 1-1 至化合物 1-627 中選出之任一者。

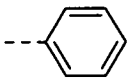
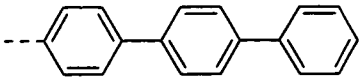
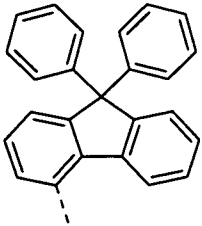
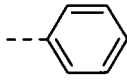
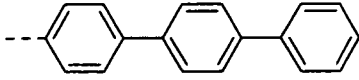
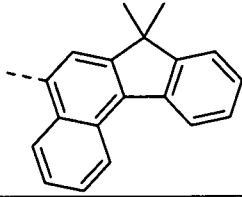
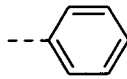
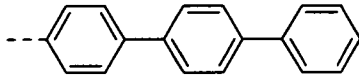
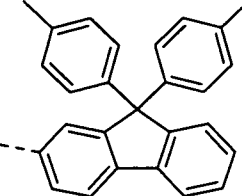
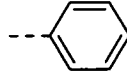
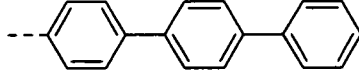
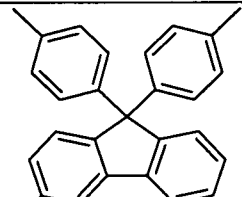
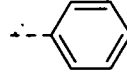
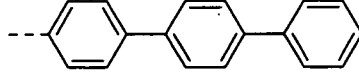
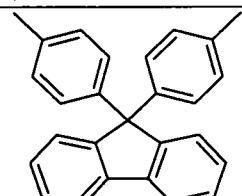
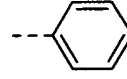
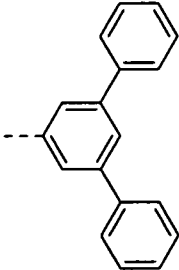
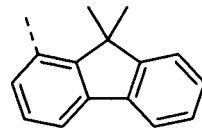
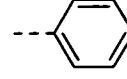
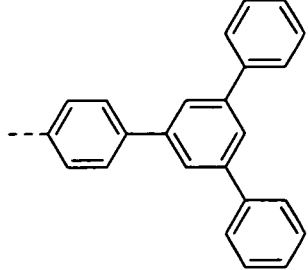
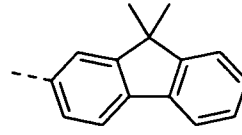
化合物	---Ar1	---Ar2	---Ar3
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1-2			
1-3			
1-4			
1-5			
1-6			

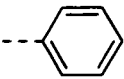
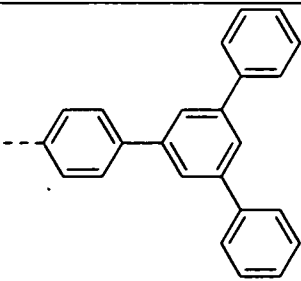
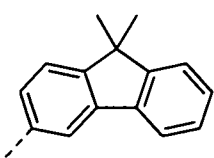
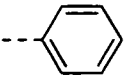
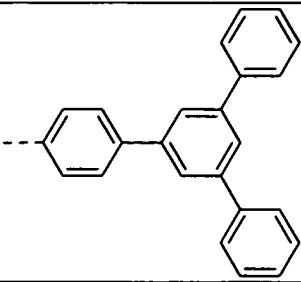
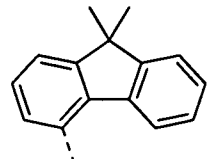
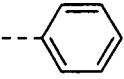
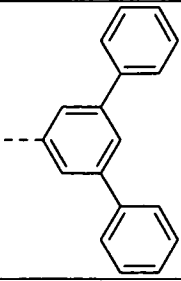
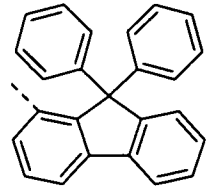
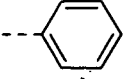
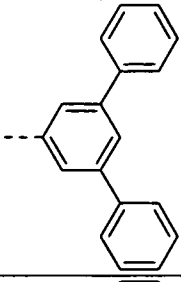
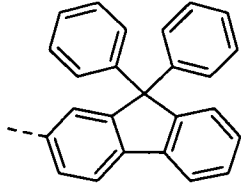
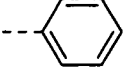
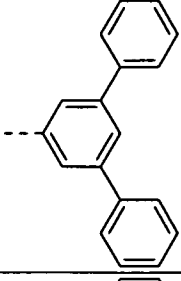
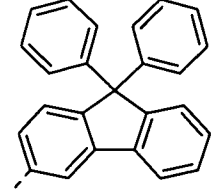
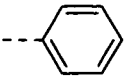
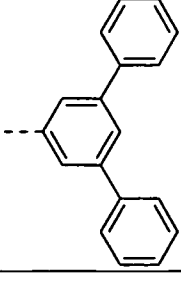
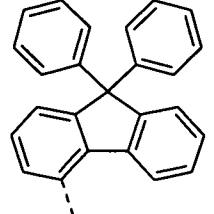
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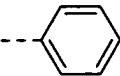
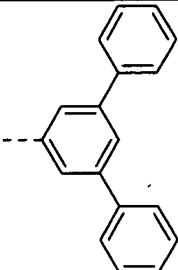
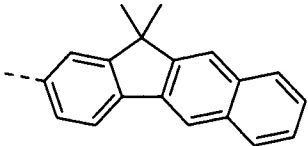
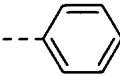
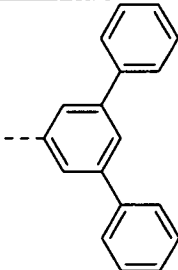
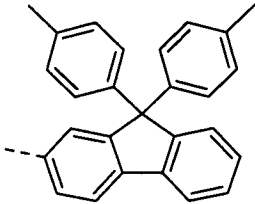
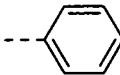
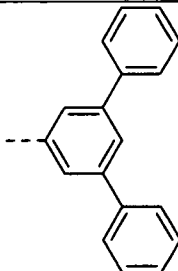
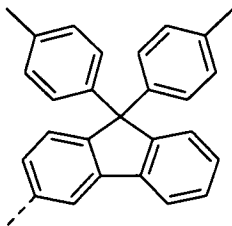
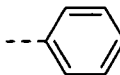
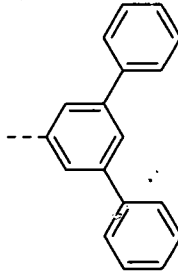
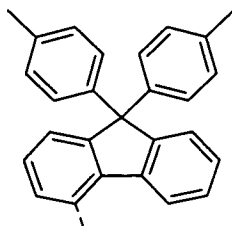
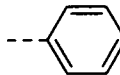
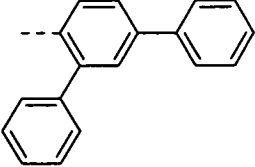
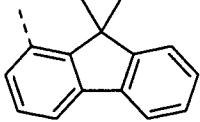
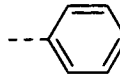
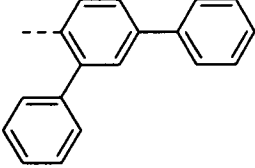
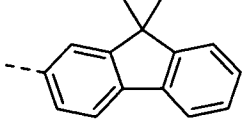
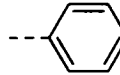
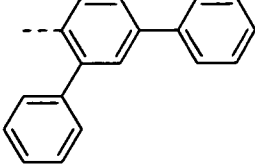
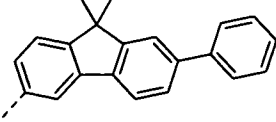
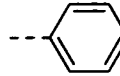
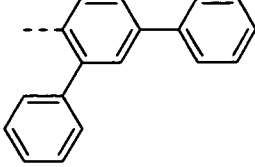
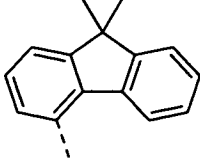
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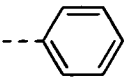
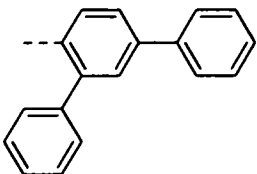
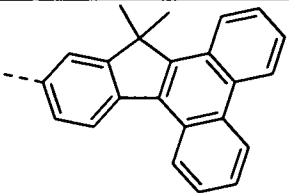
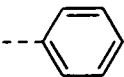
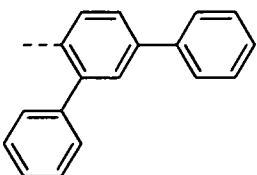
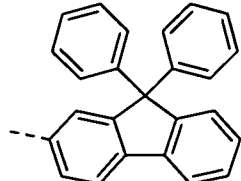
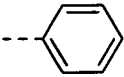
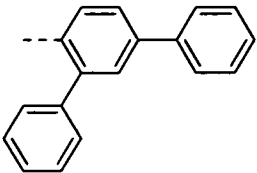
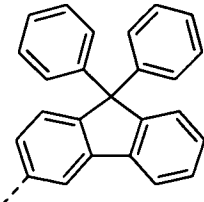
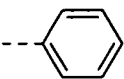
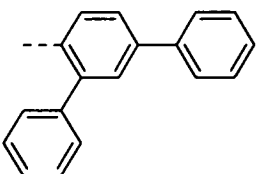
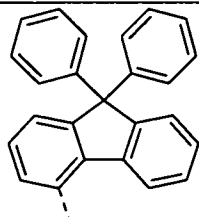
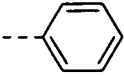
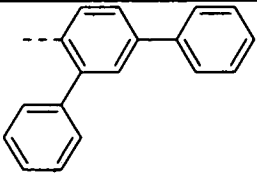
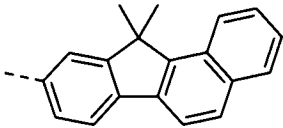
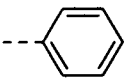
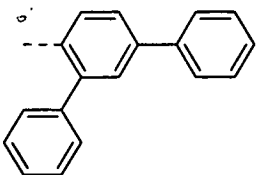
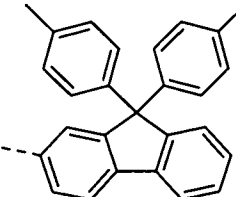
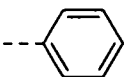
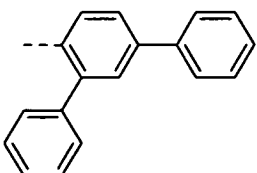
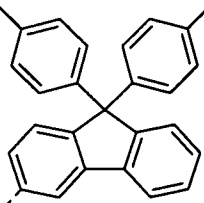
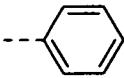
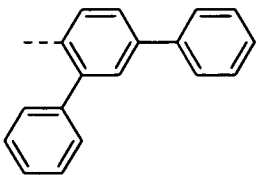
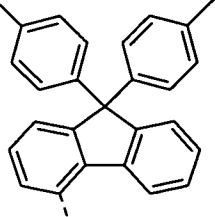
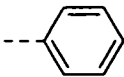
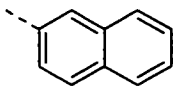
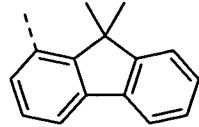
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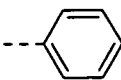
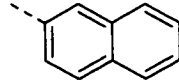
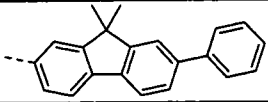
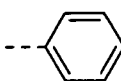
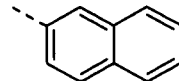
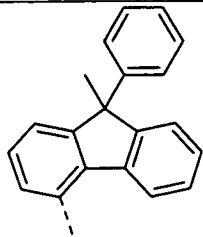
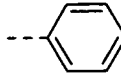
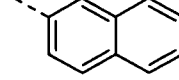
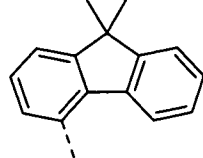
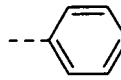
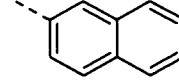
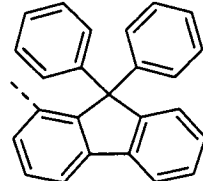
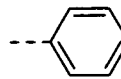
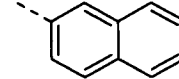
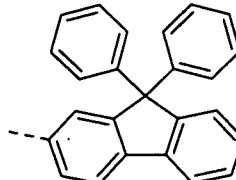
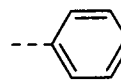
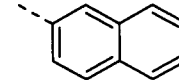
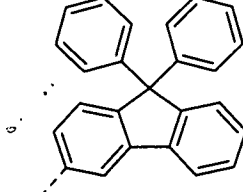
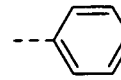
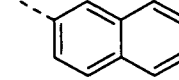
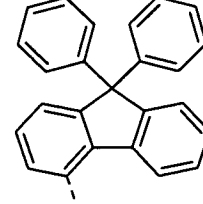
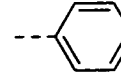
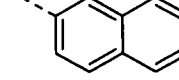
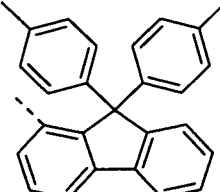
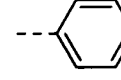
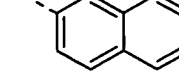
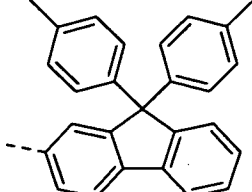
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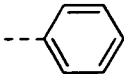
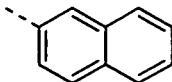
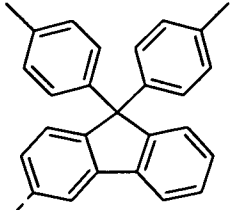
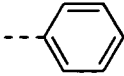
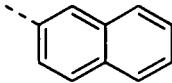
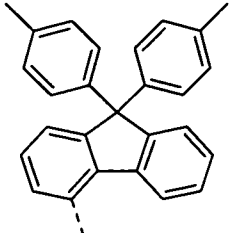
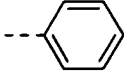
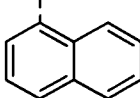
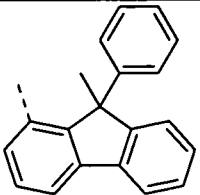
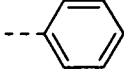
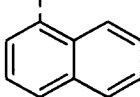
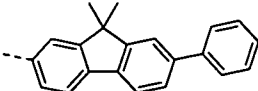
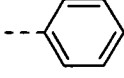
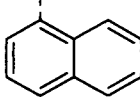
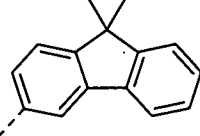
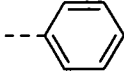
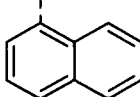
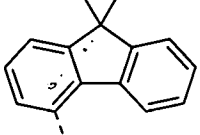
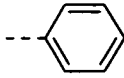
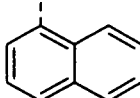
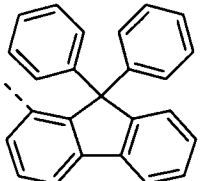
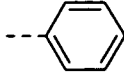
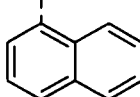
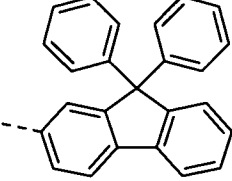
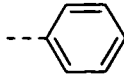
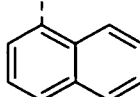
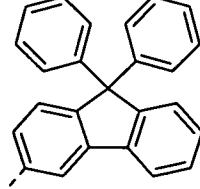
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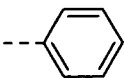
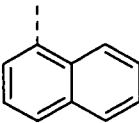
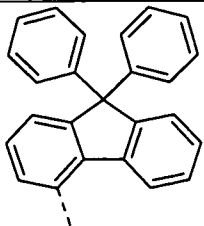
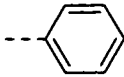
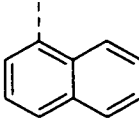
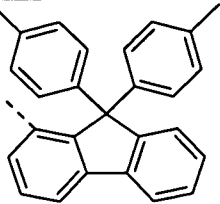
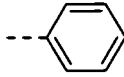
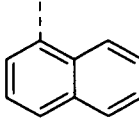
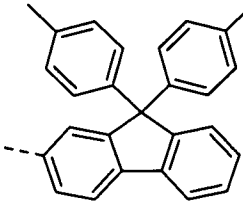
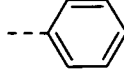
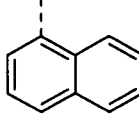
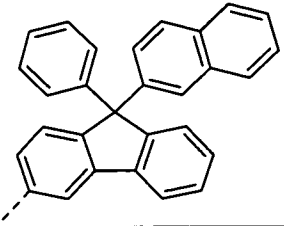
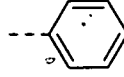
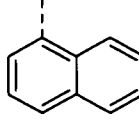
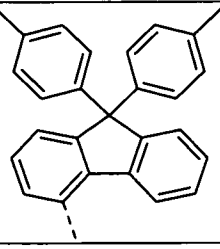
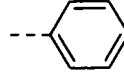
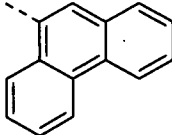
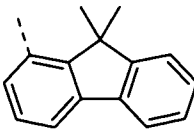
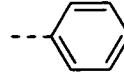
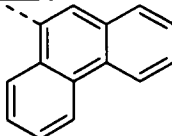
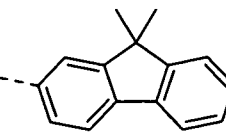
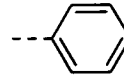
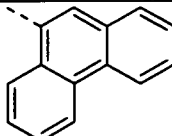
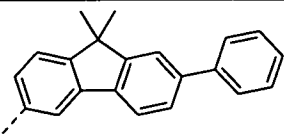
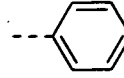
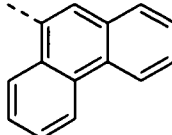
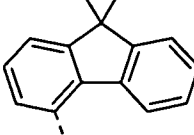
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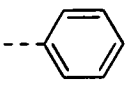
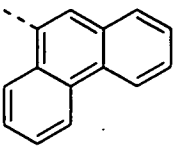
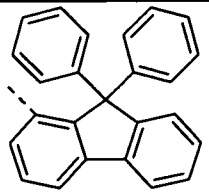
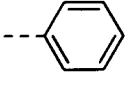
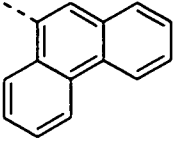
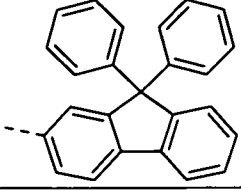
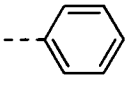
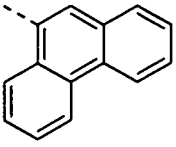
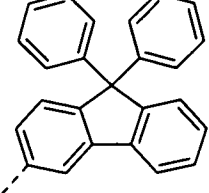
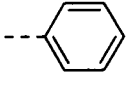
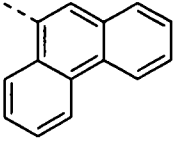
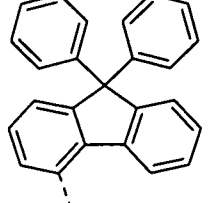
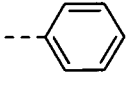
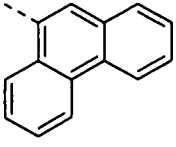
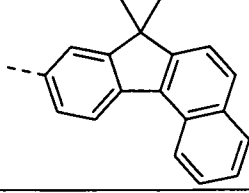
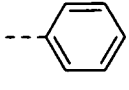
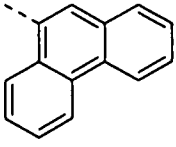
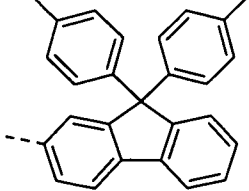
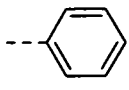
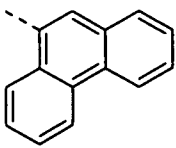
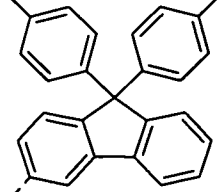
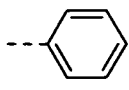
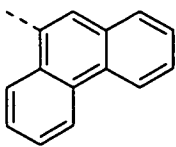
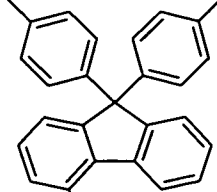
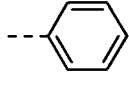
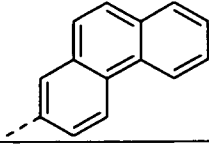
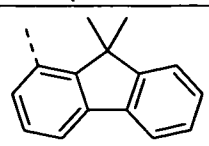
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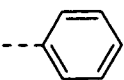
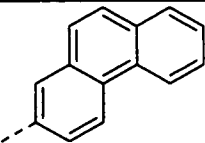
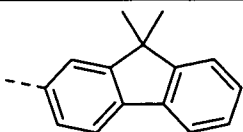
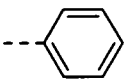
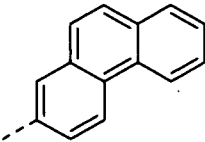
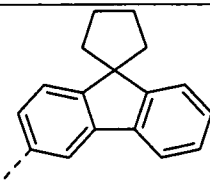
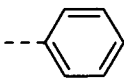
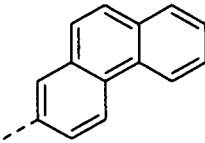
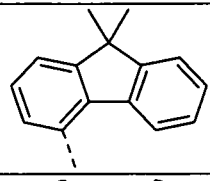
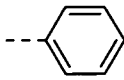
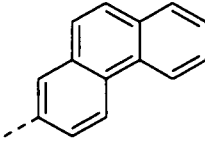
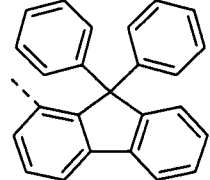
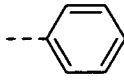
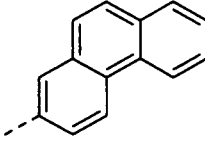
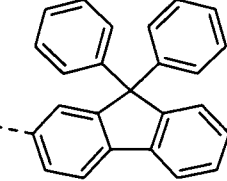
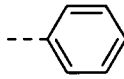
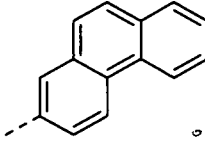
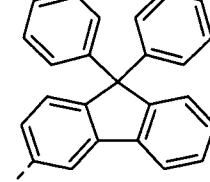
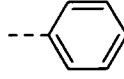
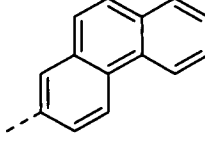
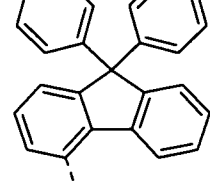
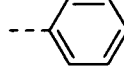
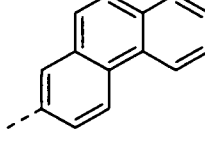
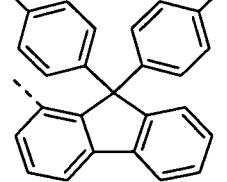
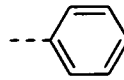
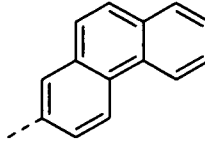
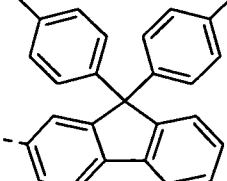
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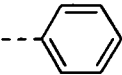
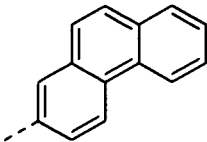
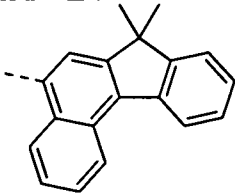
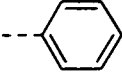
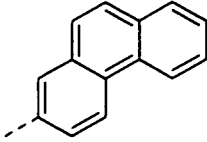
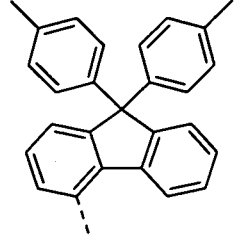
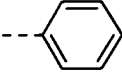
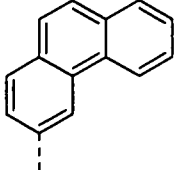
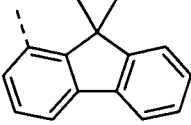
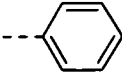
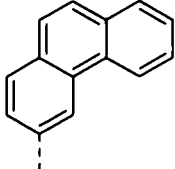
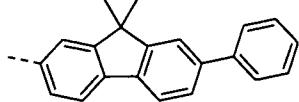
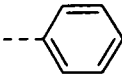
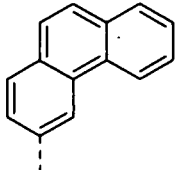
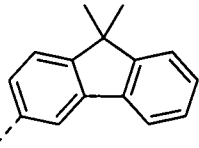
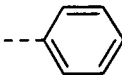
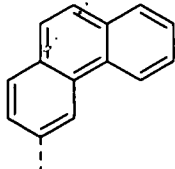
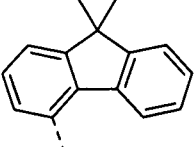
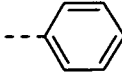
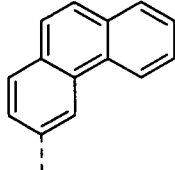
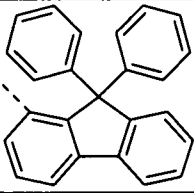
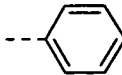
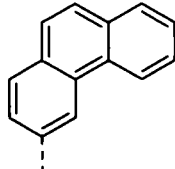
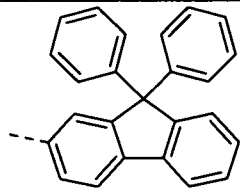
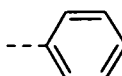
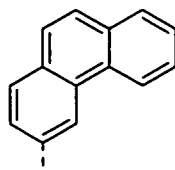
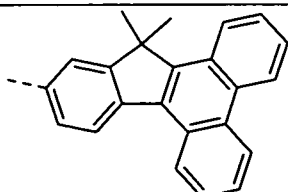
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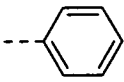
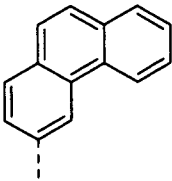
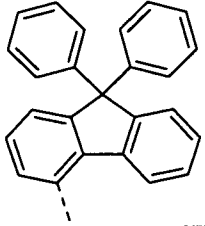
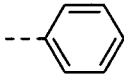
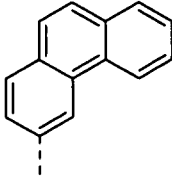
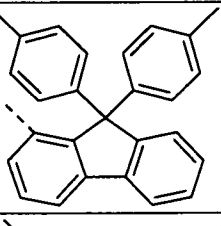
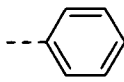
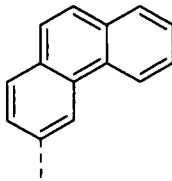
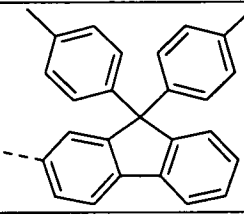
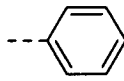
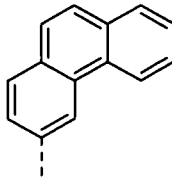
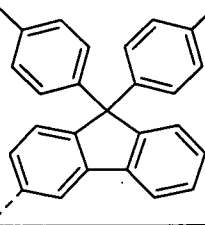
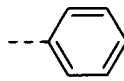
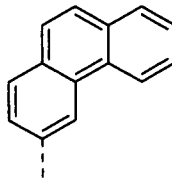
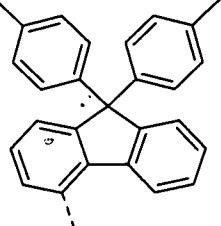
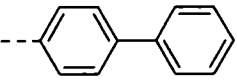
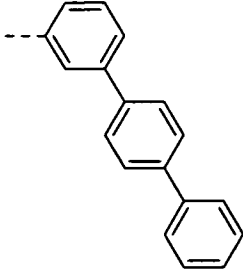
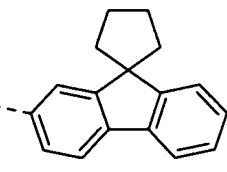
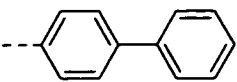
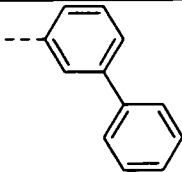
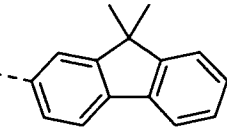
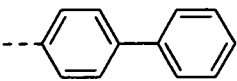
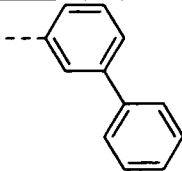
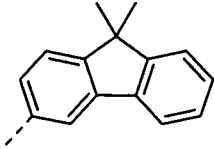
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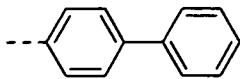
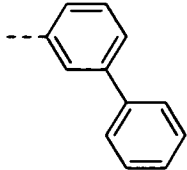
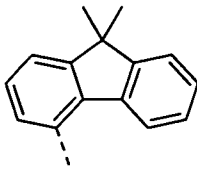
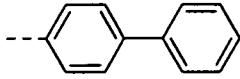
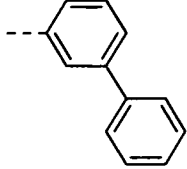
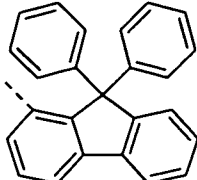
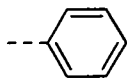
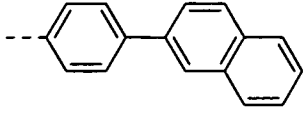
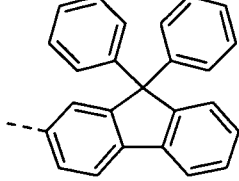
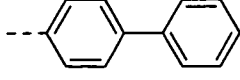
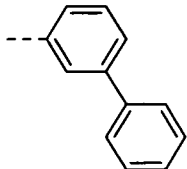
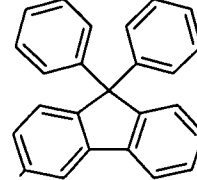
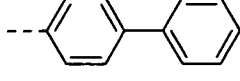
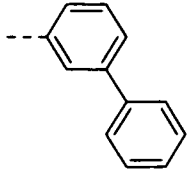
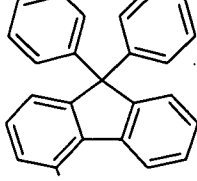
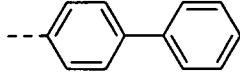
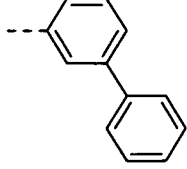
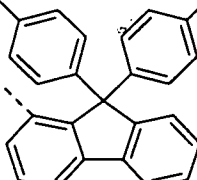
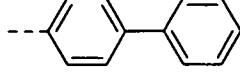
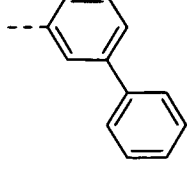
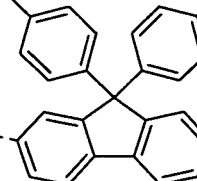
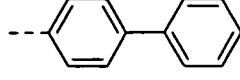
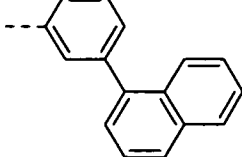
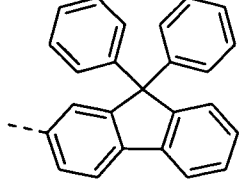
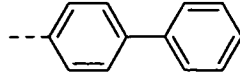
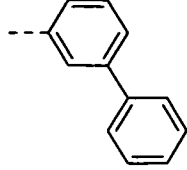
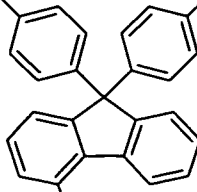
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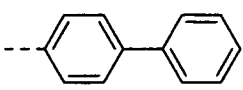
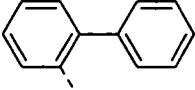
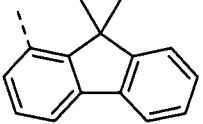
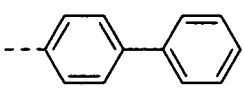
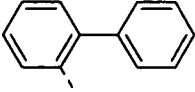
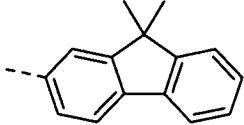
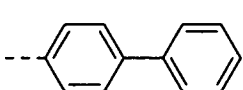
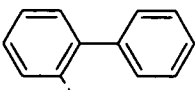
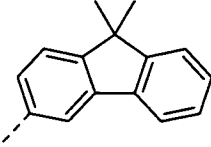
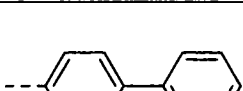
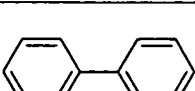
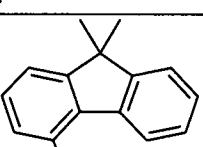
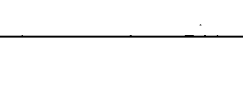
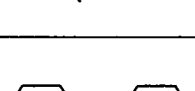
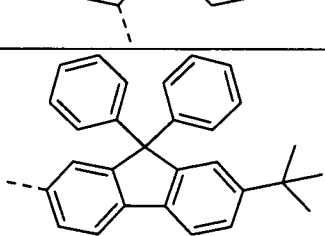
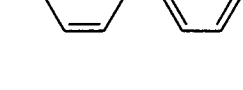
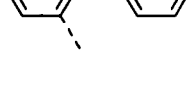
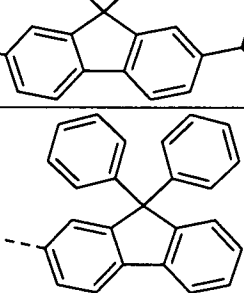
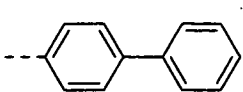
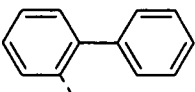
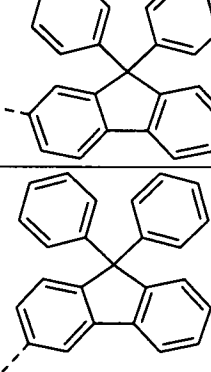
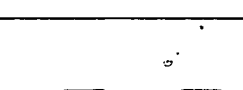
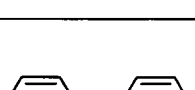
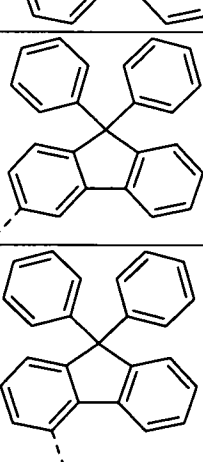
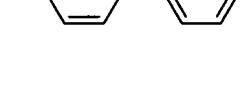
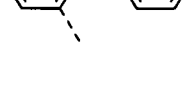
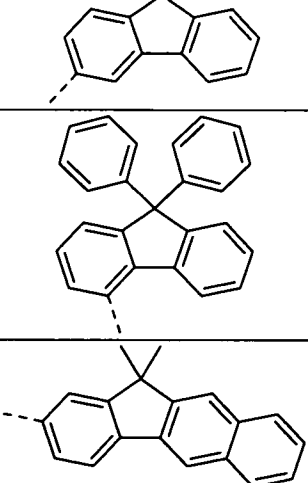
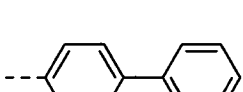
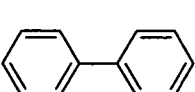
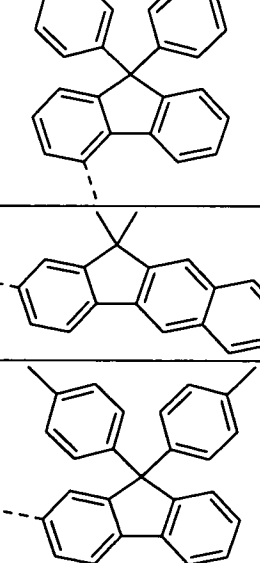
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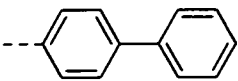
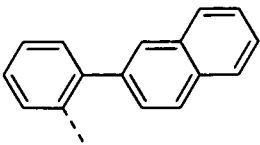
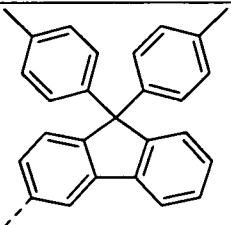
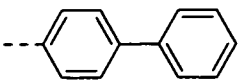
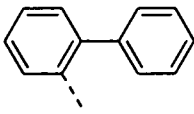
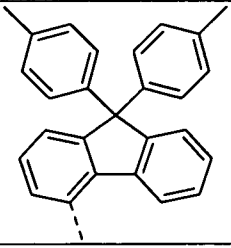
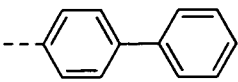
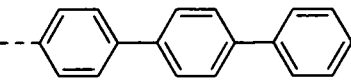
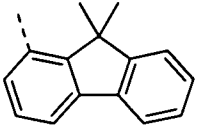
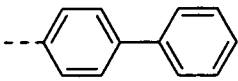
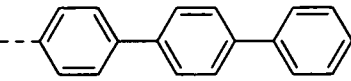
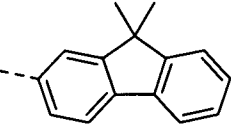
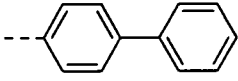
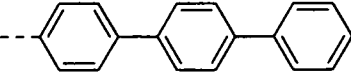
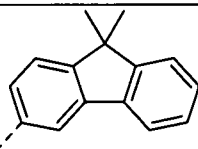
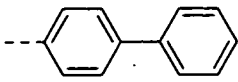
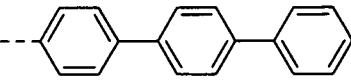
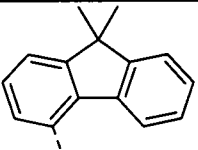
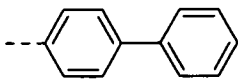
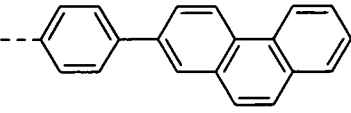
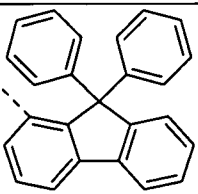
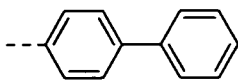
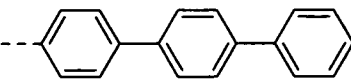
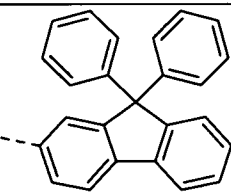
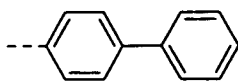
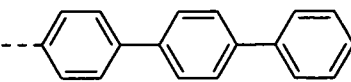
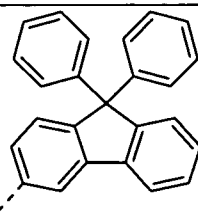
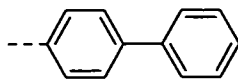
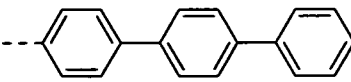
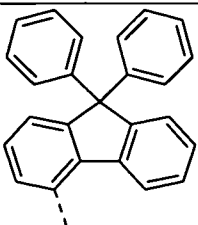
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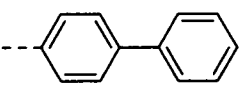
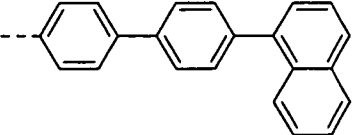
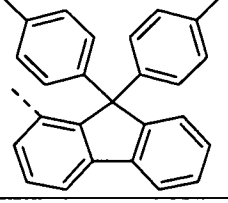
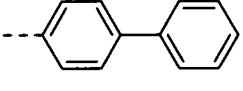
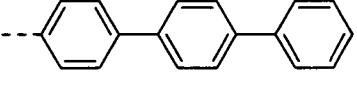
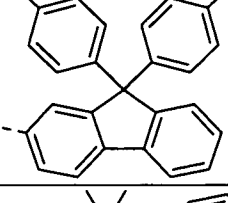
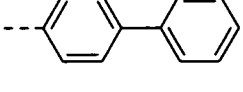
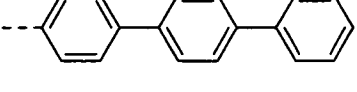
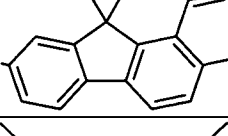
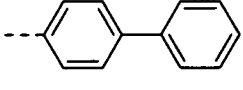
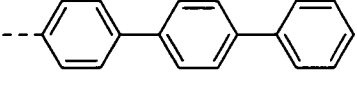
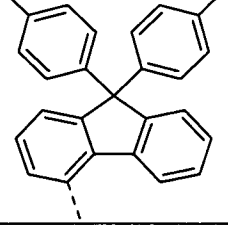
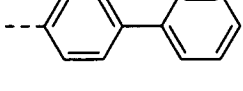
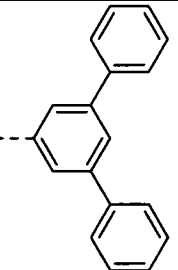
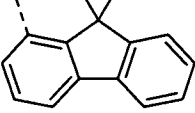
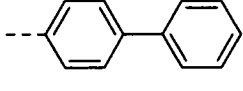
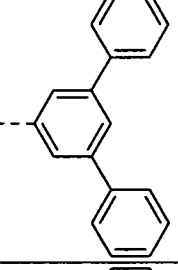
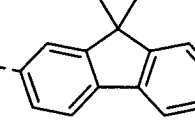
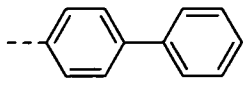
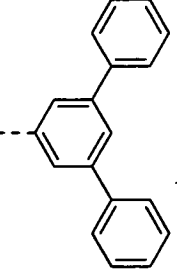
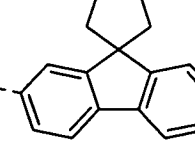
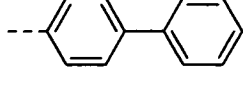
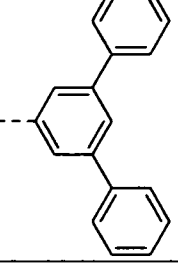
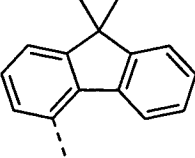
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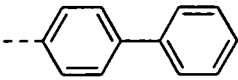
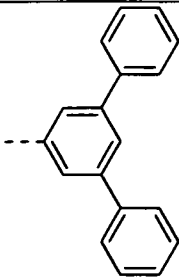
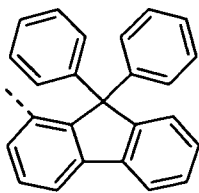
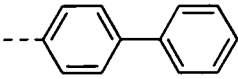
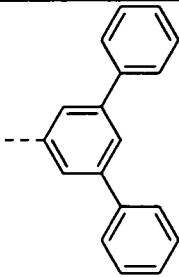
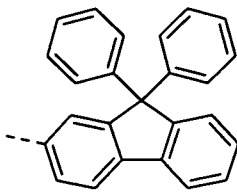
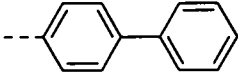
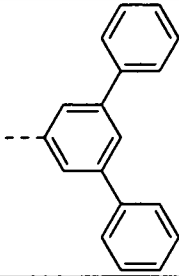
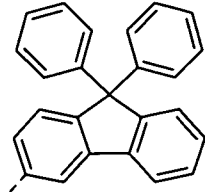
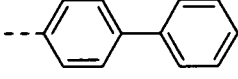
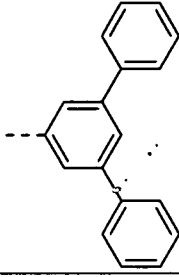
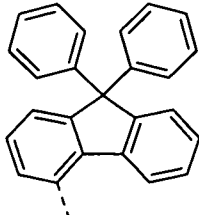
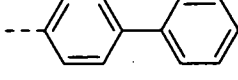
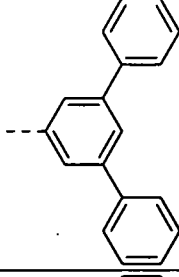
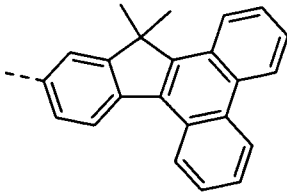
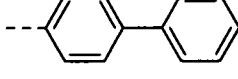
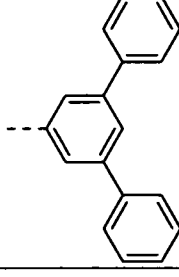
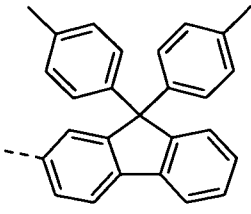
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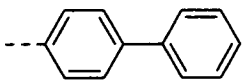
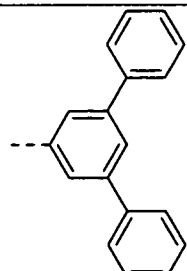
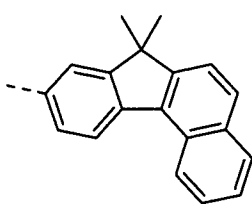
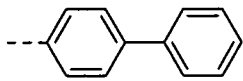
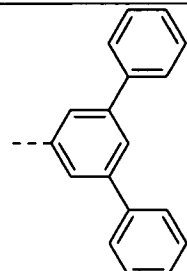
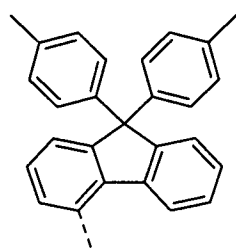
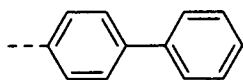
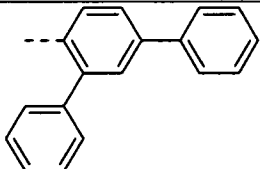
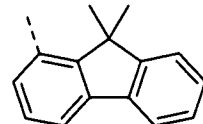
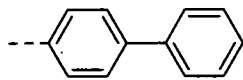
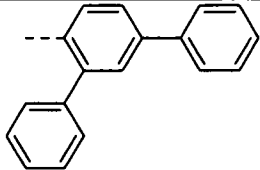
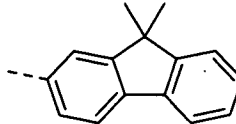
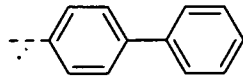
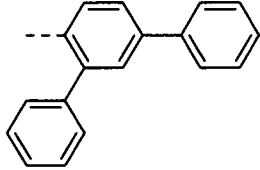
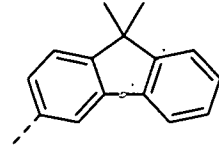
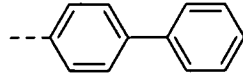
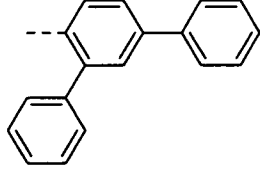
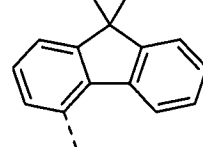
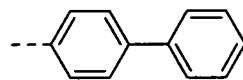
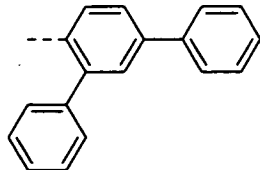
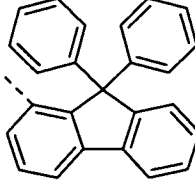
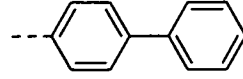
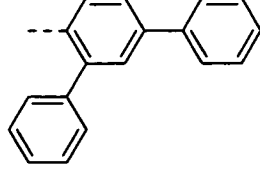
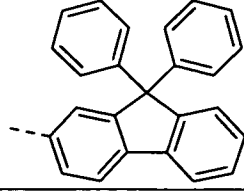
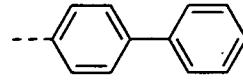
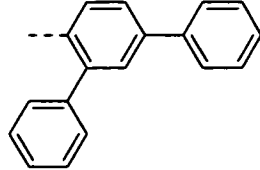
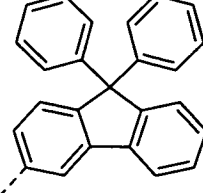
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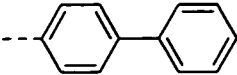
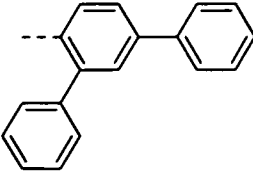
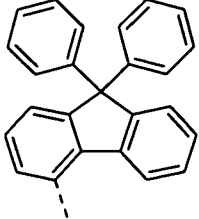
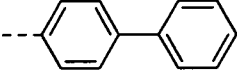
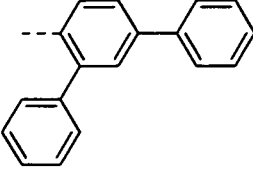
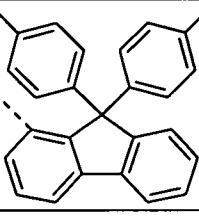
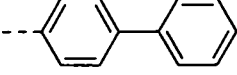
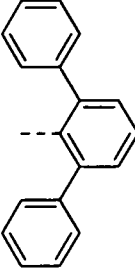
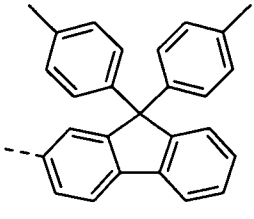
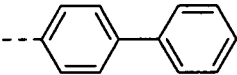
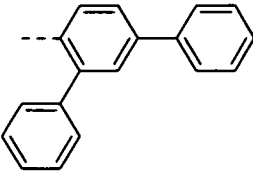
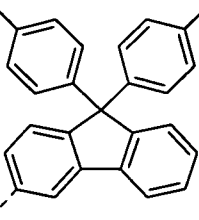
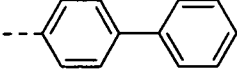
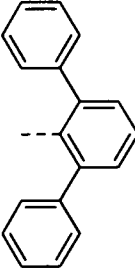
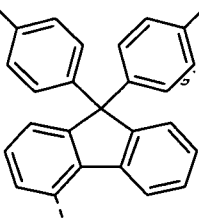
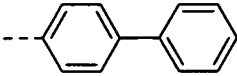
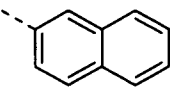
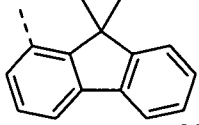
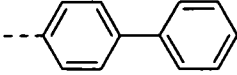
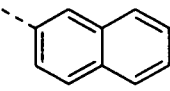
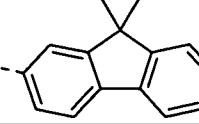
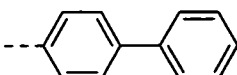
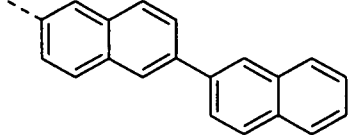
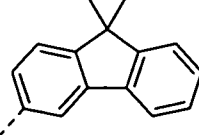
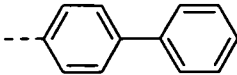
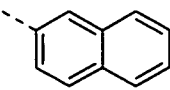
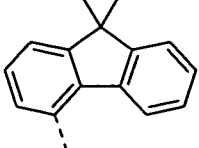
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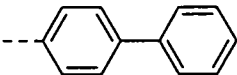
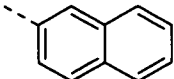
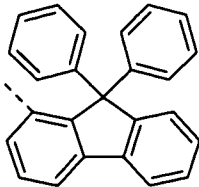
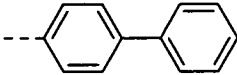
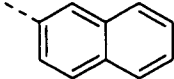
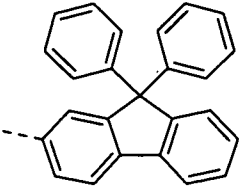
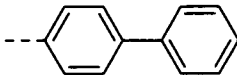
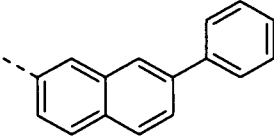
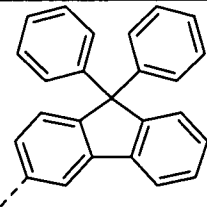
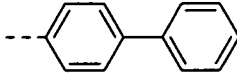
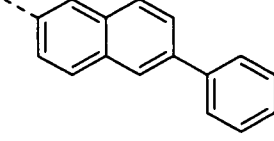
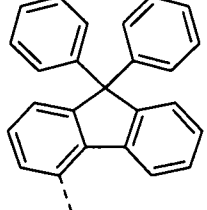
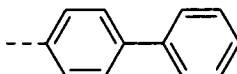
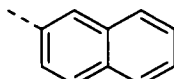
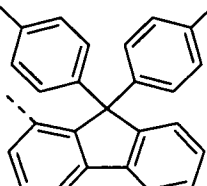
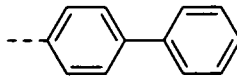
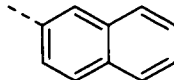
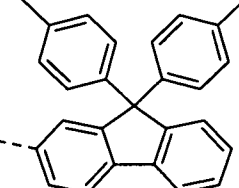
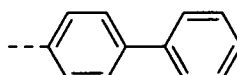
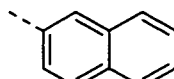
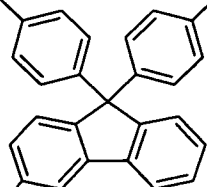
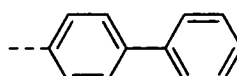
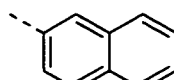
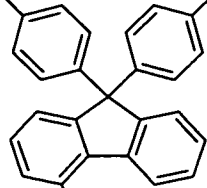
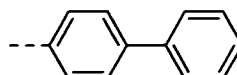
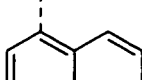
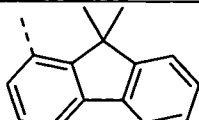
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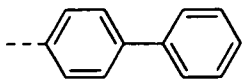
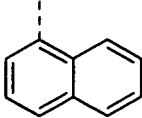
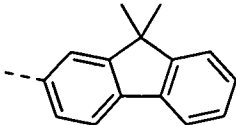
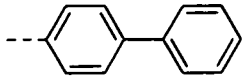
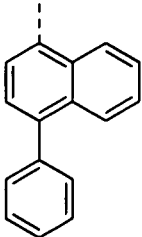
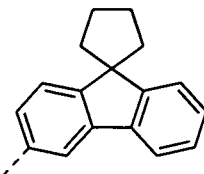
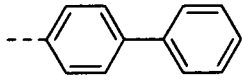
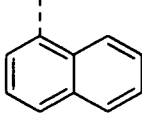
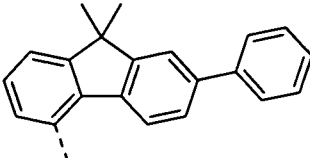
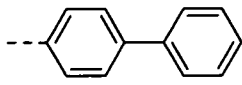
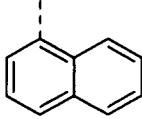
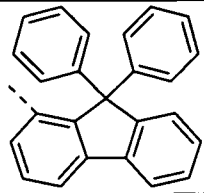
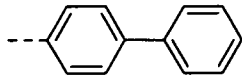
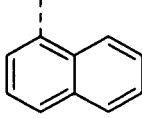
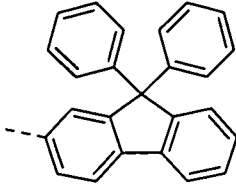
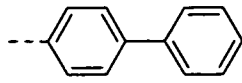
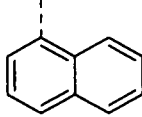
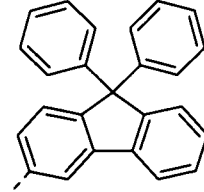
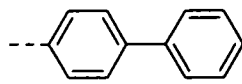
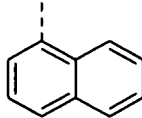
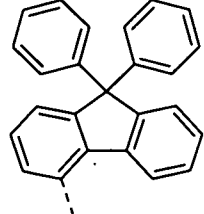
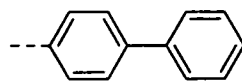
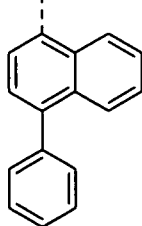
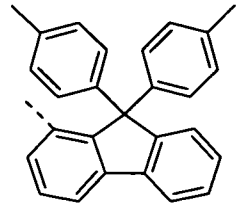
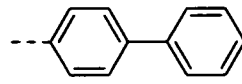
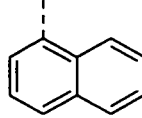
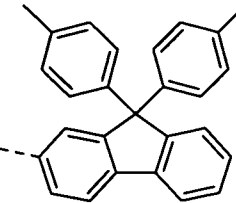
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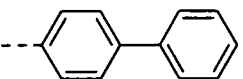
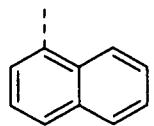
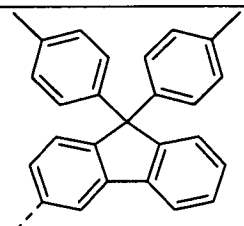
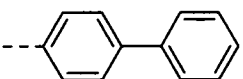
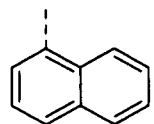
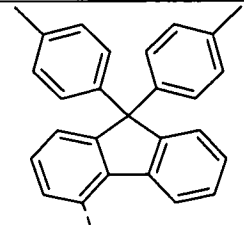
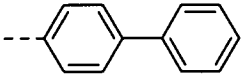
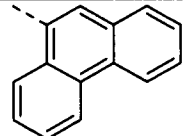
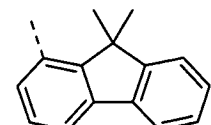
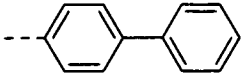
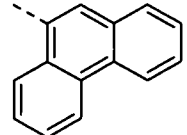
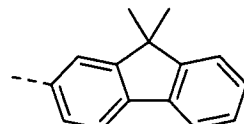
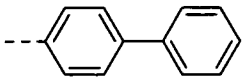
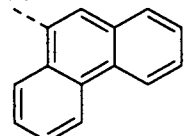
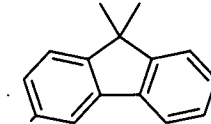
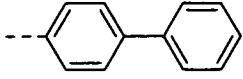
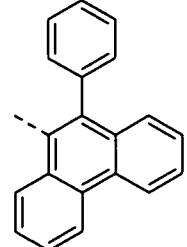
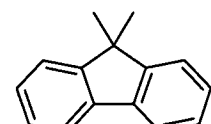
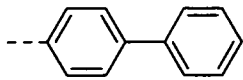
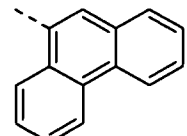
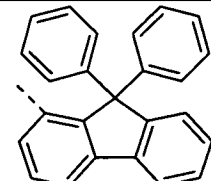
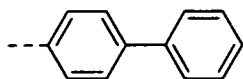
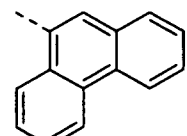
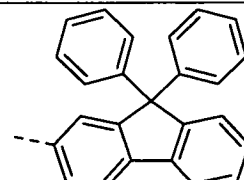
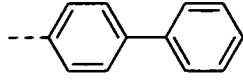
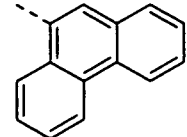
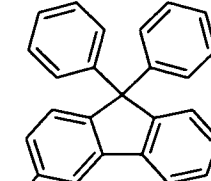
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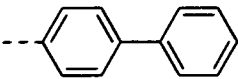
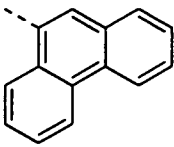
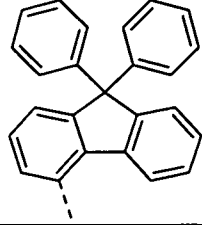
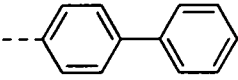
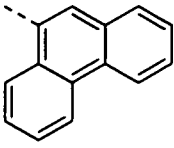
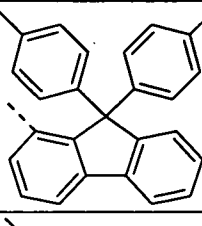
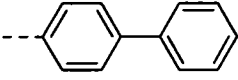
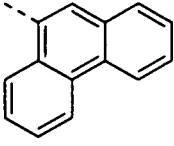
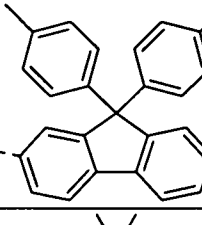
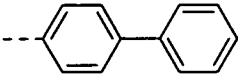
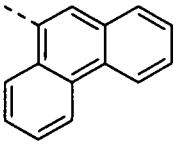
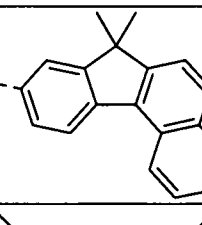
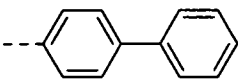
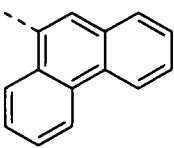
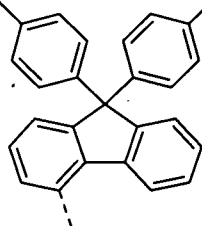
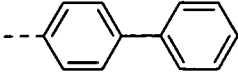
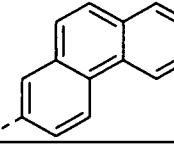
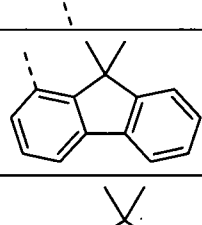
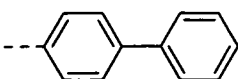
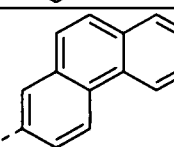
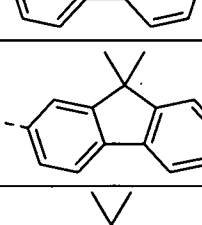
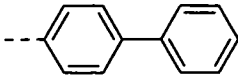
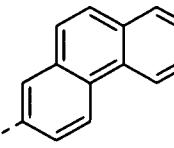
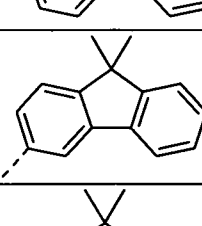
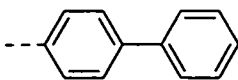
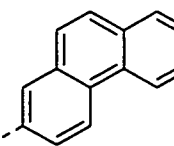
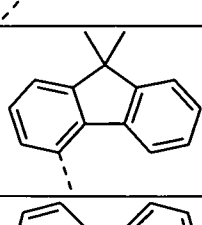
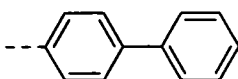
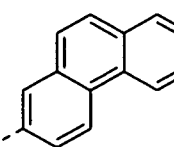
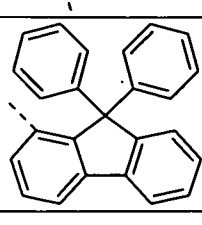
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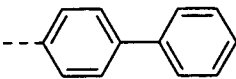
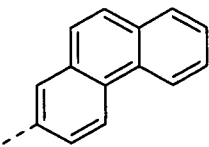
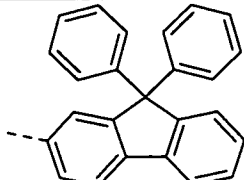
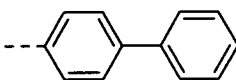
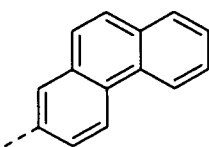
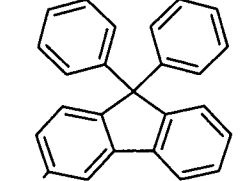
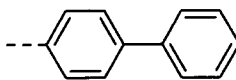
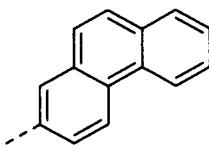
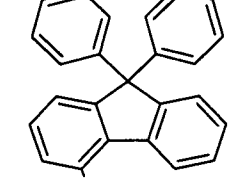
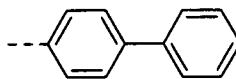
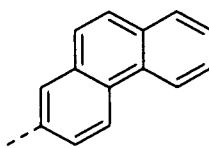
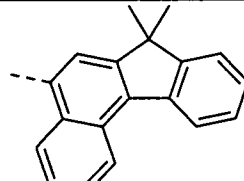
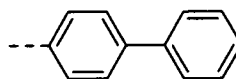
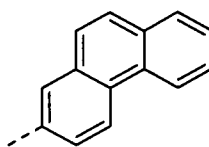
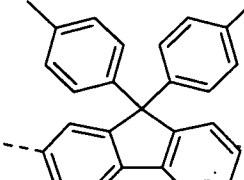
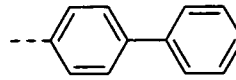
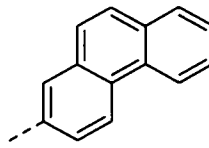
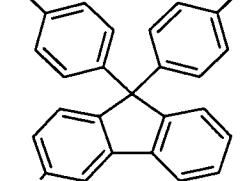
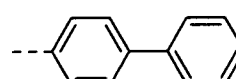
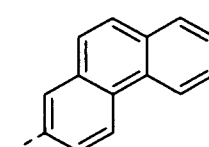
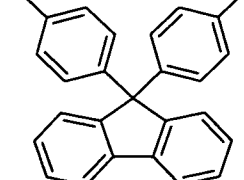
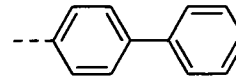
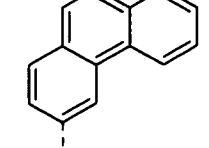
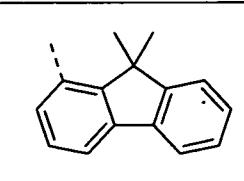
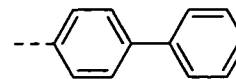
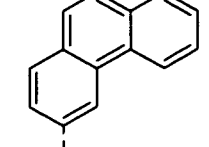
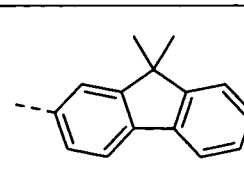
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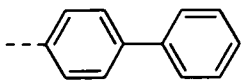
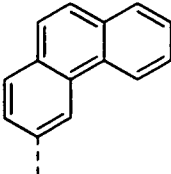
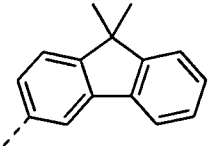
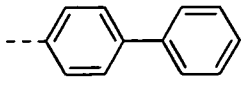
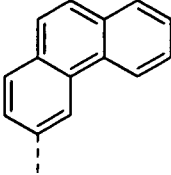
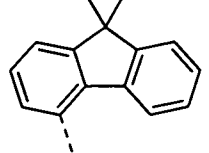
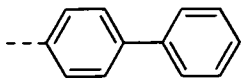
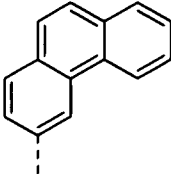
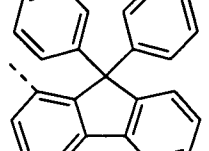
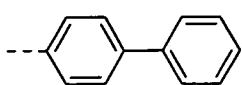
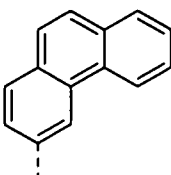
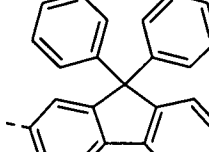
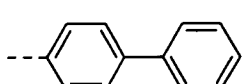
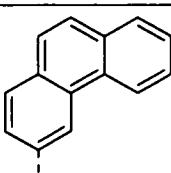
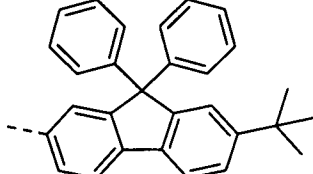
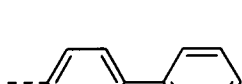
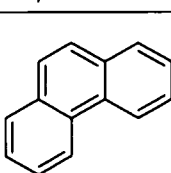
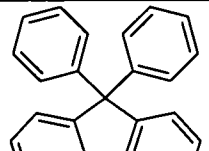
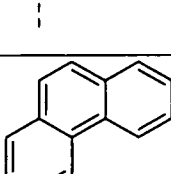
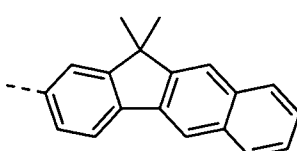
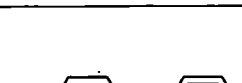
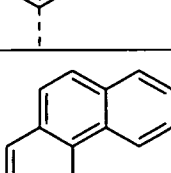
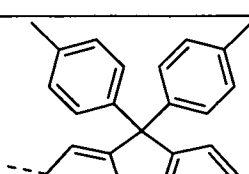
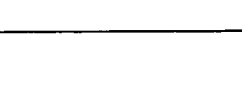
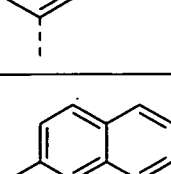
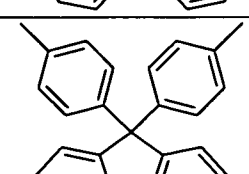
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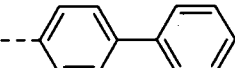
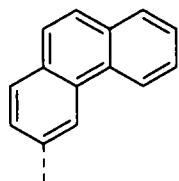
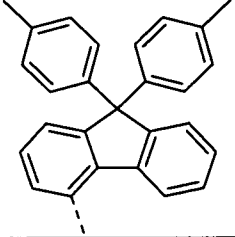
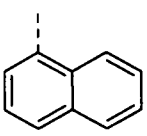
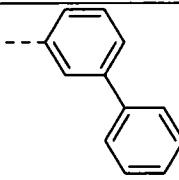
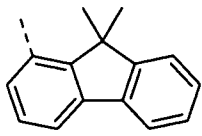
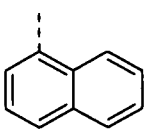
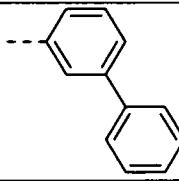
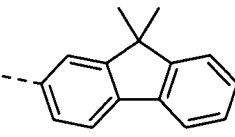
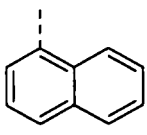
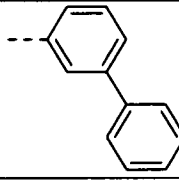
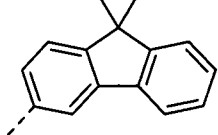
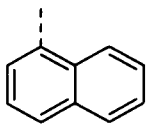
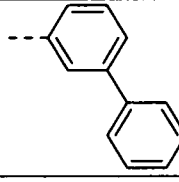
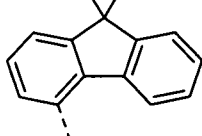
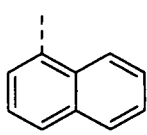
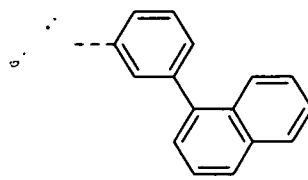
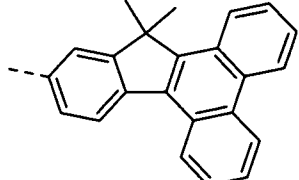
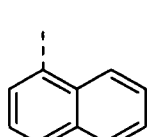
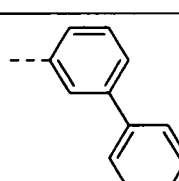
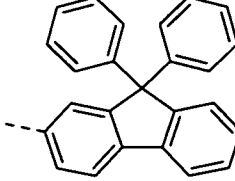
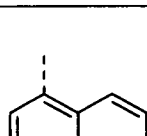
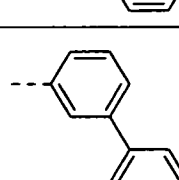
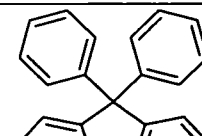
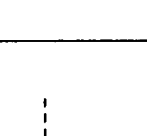
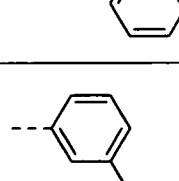
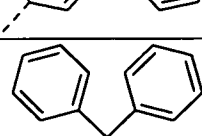
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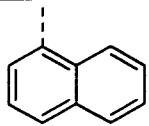
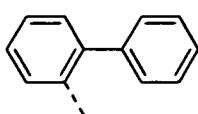
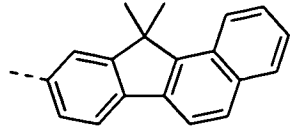
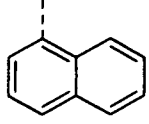
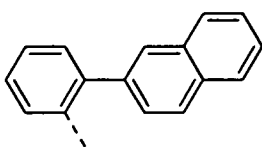
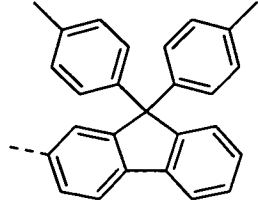
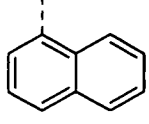
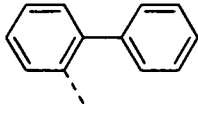
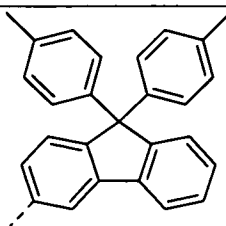
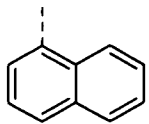
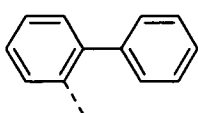
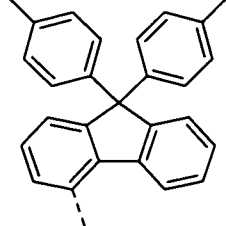
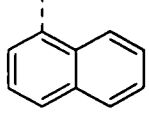
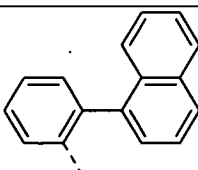
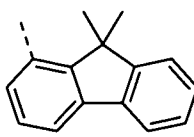
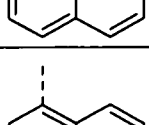
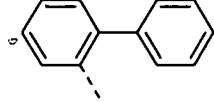
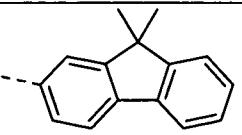
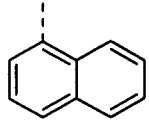
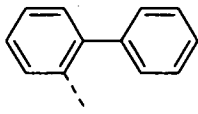
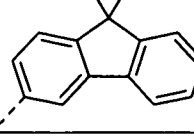
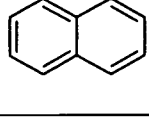
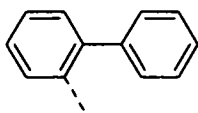
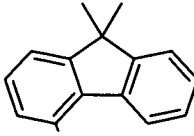
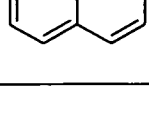
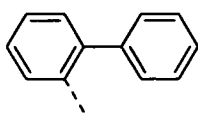
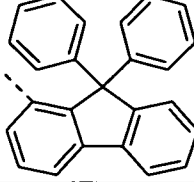
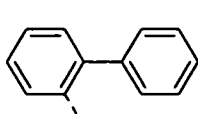
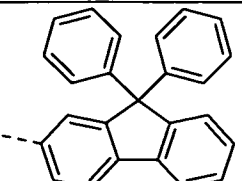
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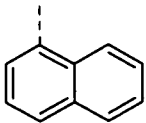
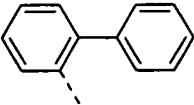
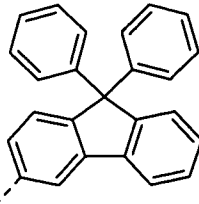
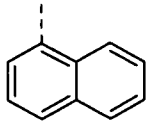
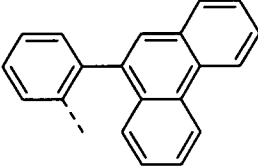
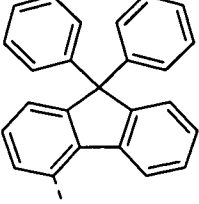
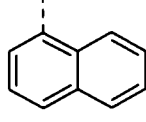
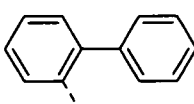
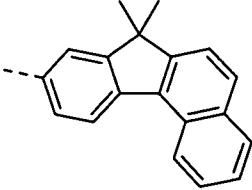
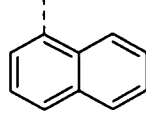
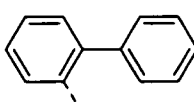
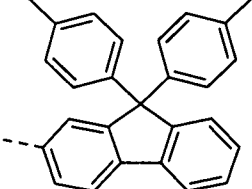
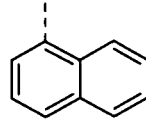
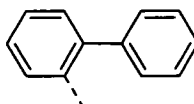
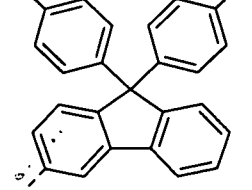
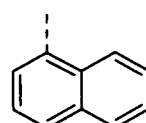
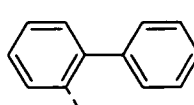
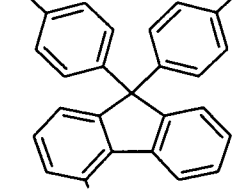
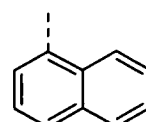
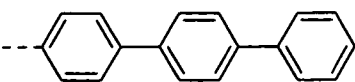
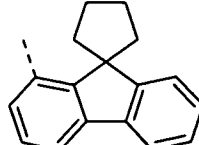
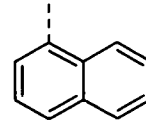
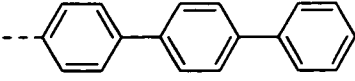
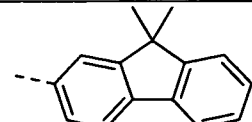
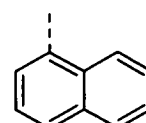
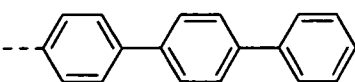
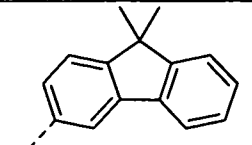
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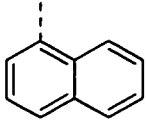
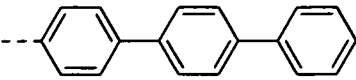
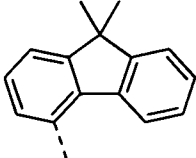
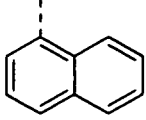
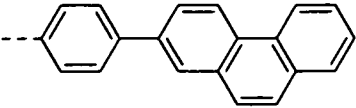
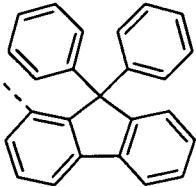
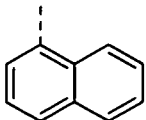
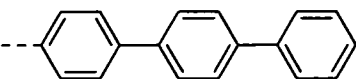
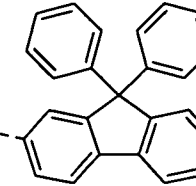
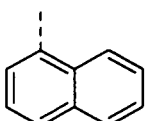
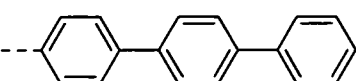
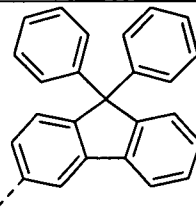
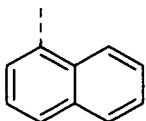
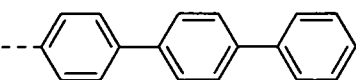
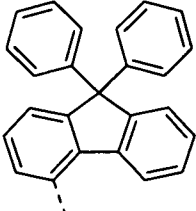
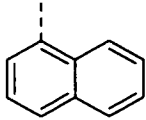
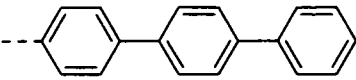
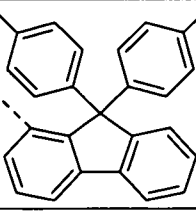
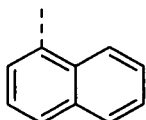
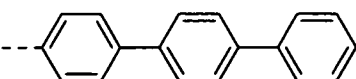
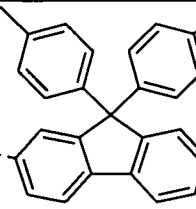
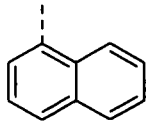
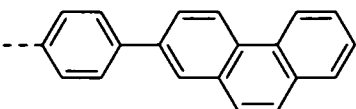
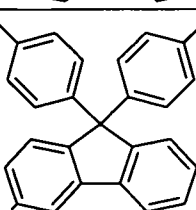
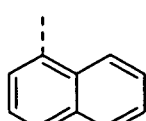
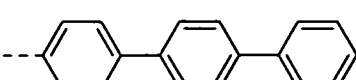
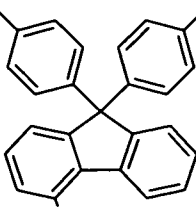
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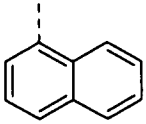
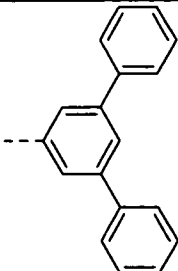
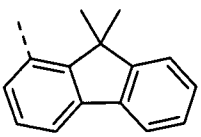
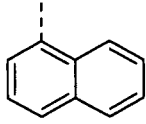
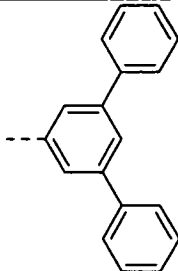
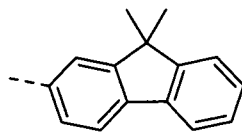
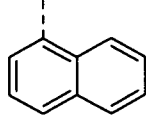
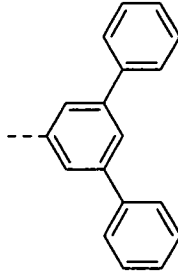
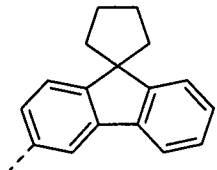
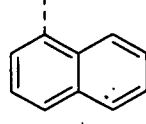
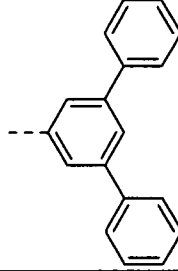
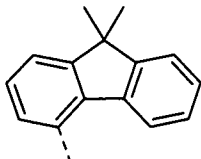
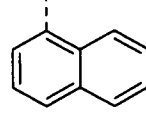
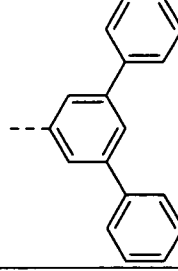
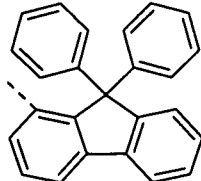
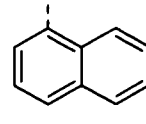
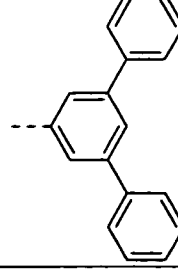
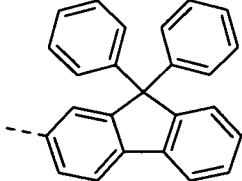
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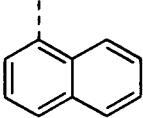
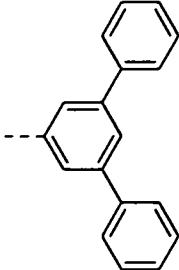
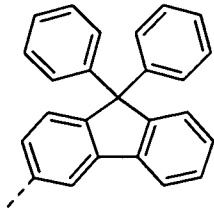
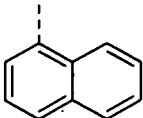
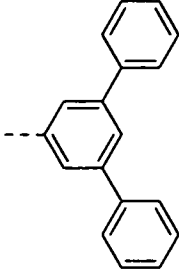
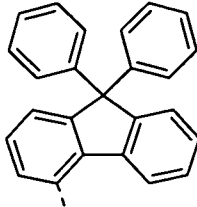
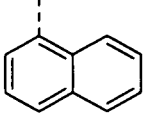
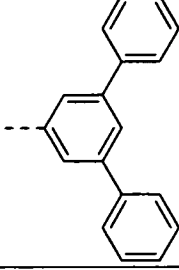
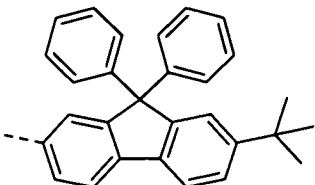
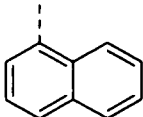
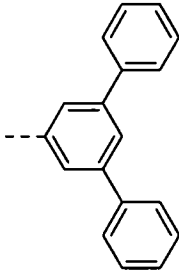
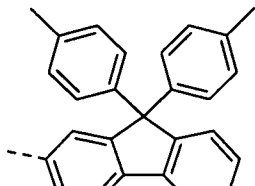
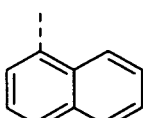
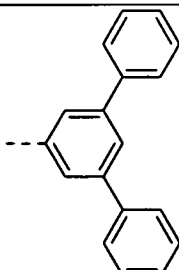
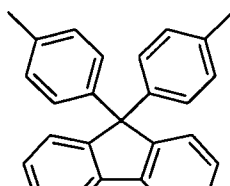
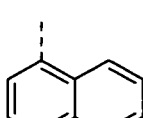
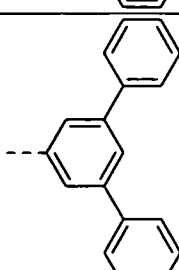
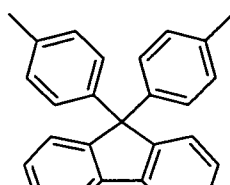
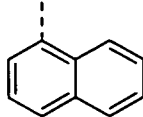
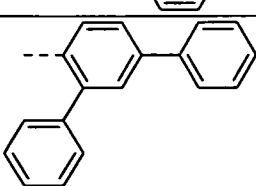
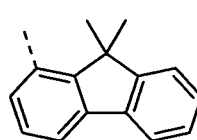
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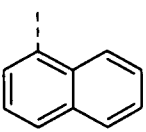
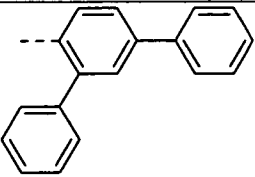
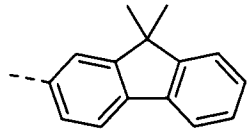
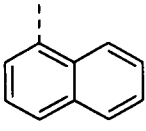
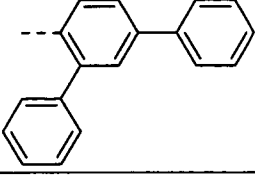
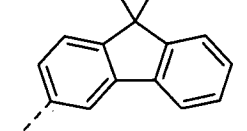
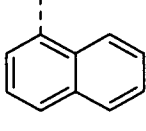
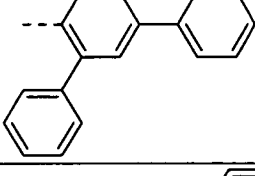
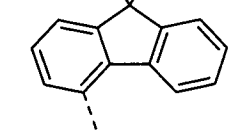
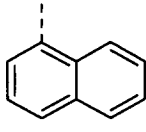
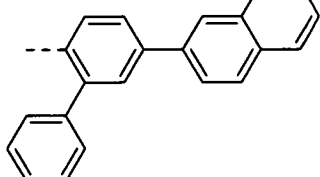
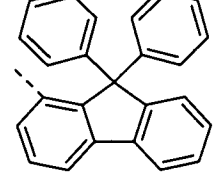
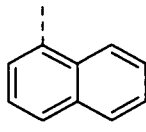
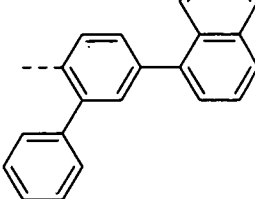
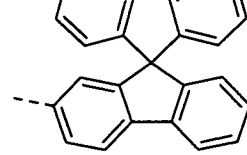
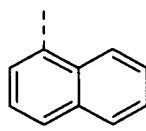
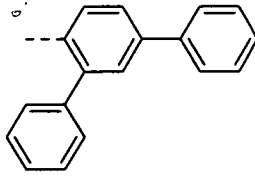
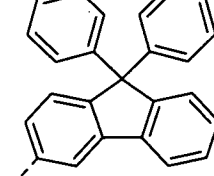
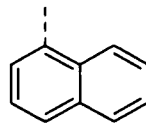
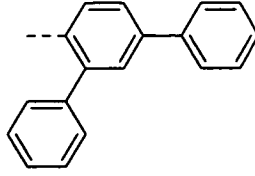
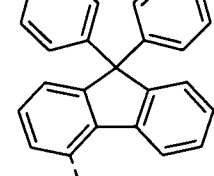
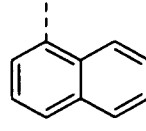
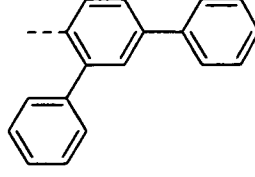
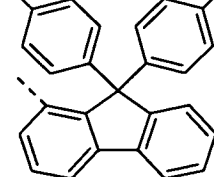
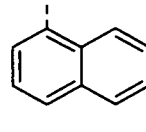
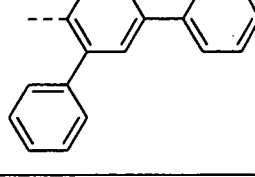
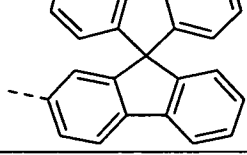
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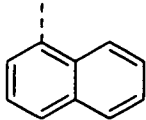
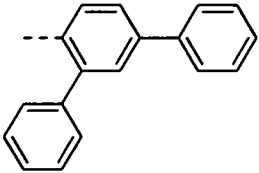
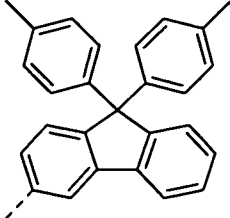
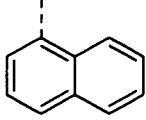
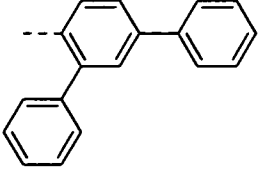
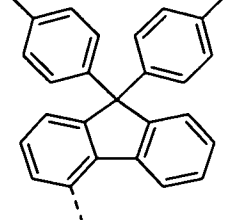
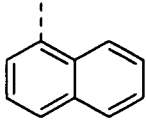
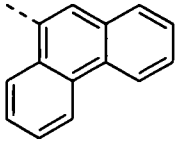
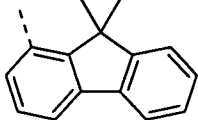
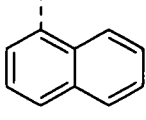
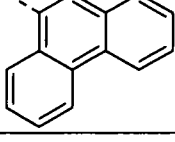
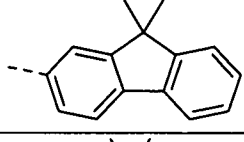
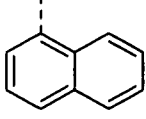
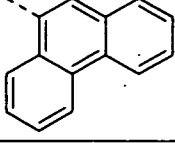
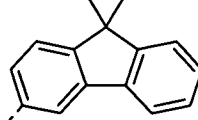
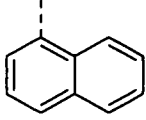
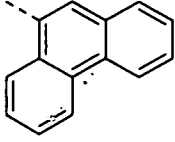
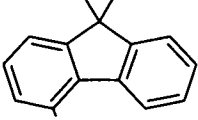
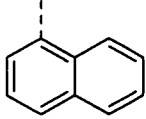
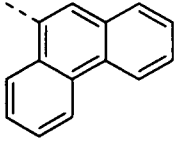
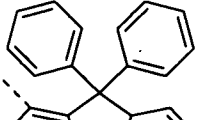
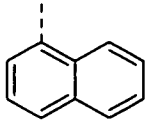
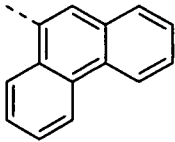
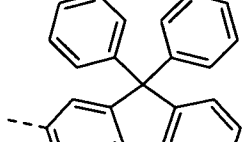
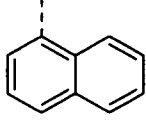
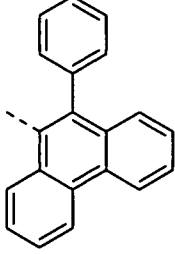
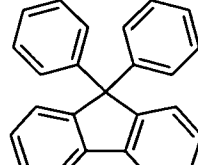
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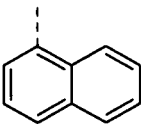
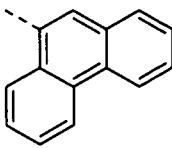
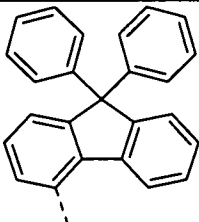
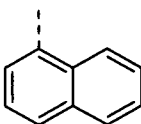
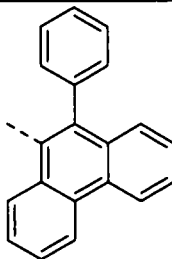
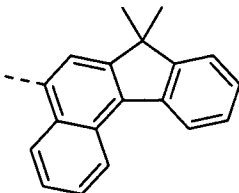
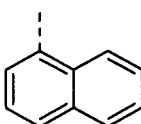
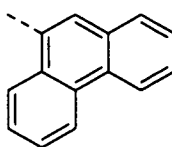
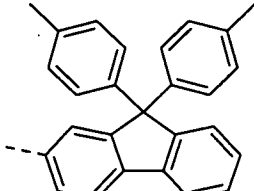
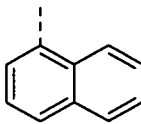
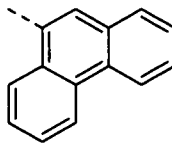
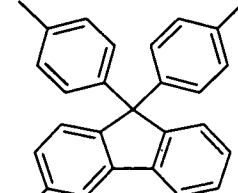
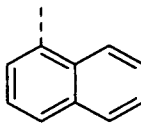
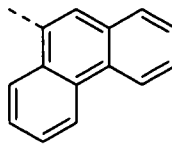
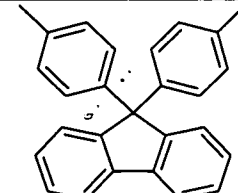
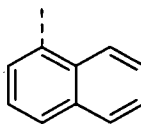
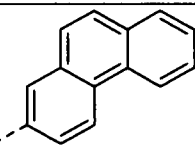
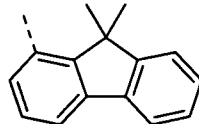
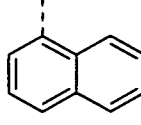
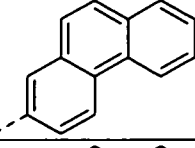
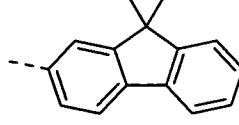
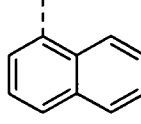
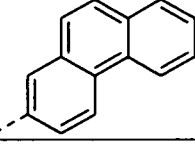
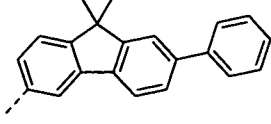
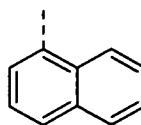
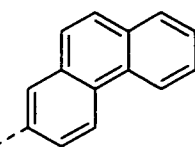
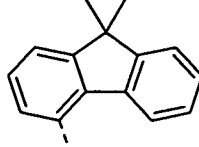
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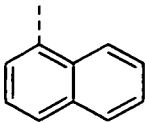
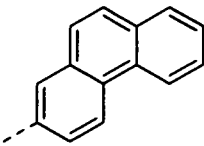
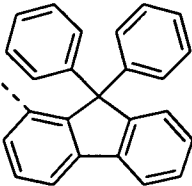
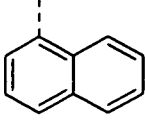
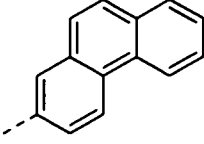
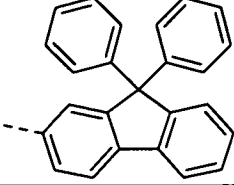
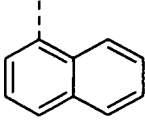
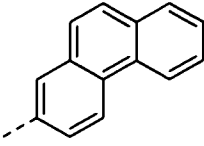
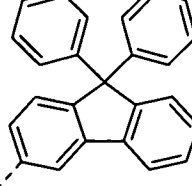
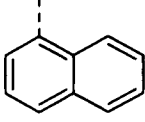
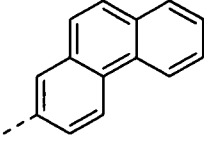
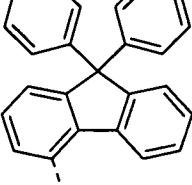
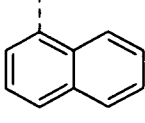
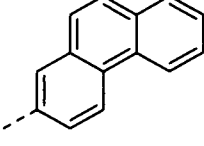
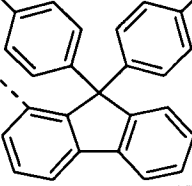
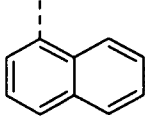
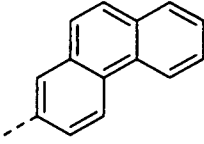
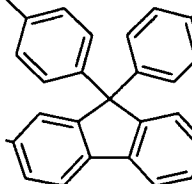
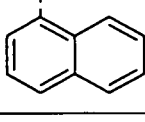
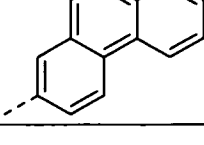
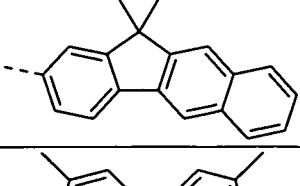
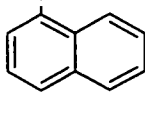
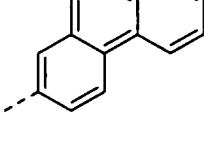
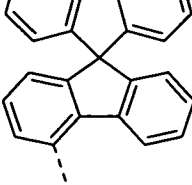
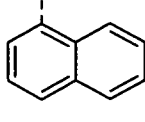
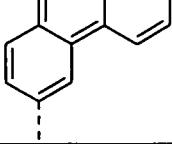
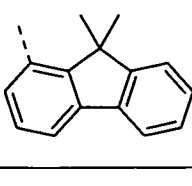
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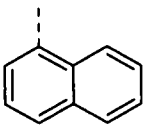
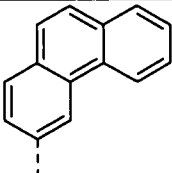
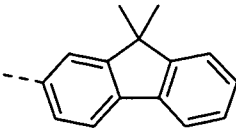
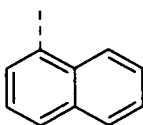
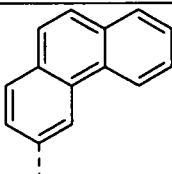
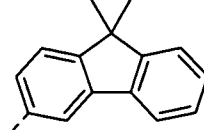
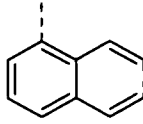
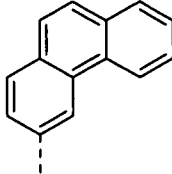
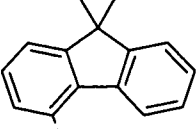
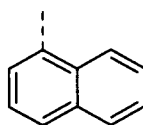
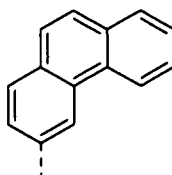
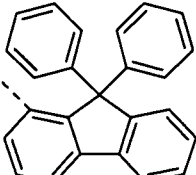
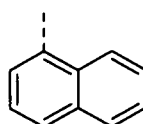
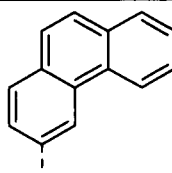
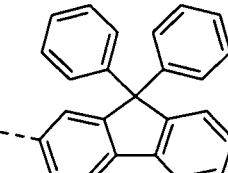
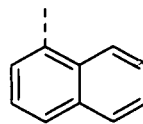
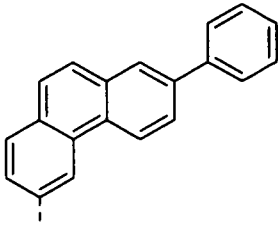
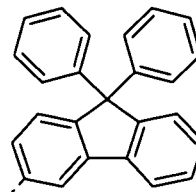
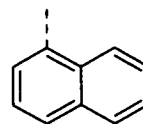
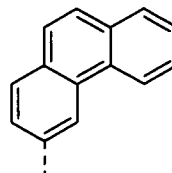
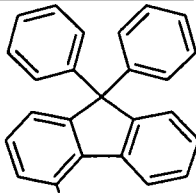
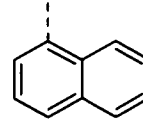
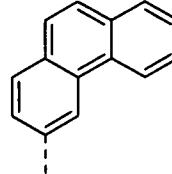
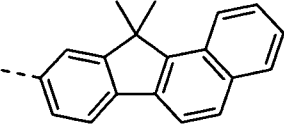
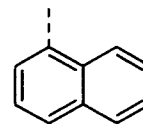
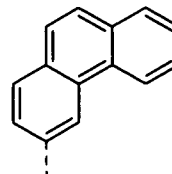
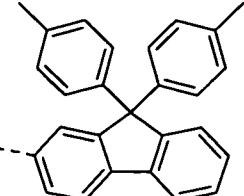
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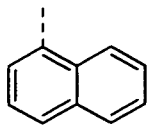
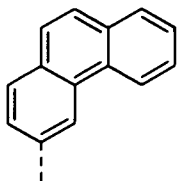
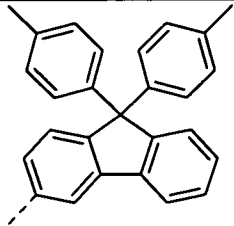
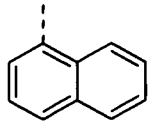
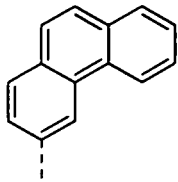
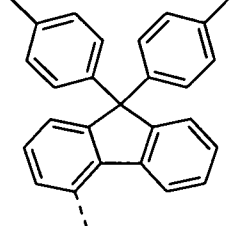
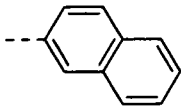
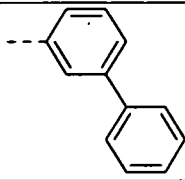
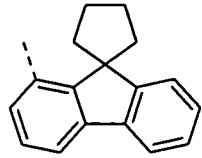
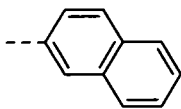
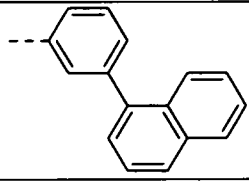
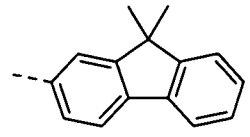
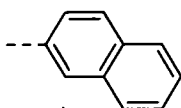
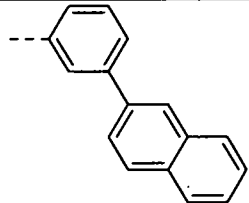
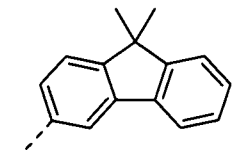
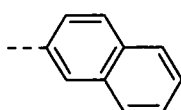
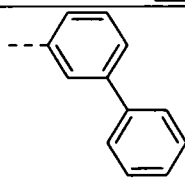
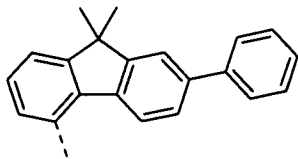
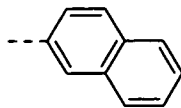
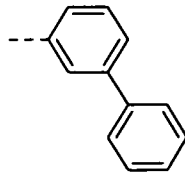
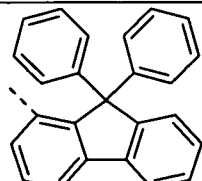
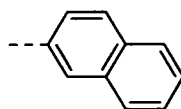
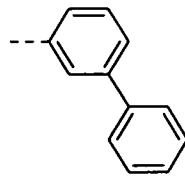
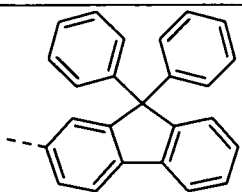
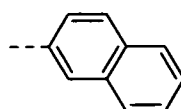
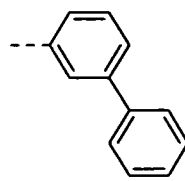
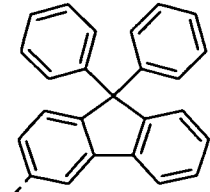
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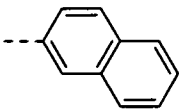
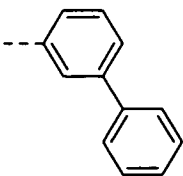
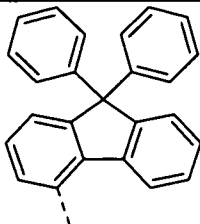
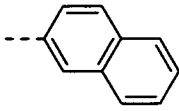
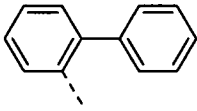
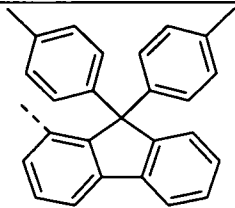
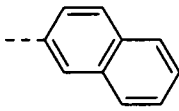
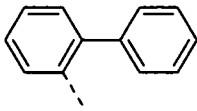
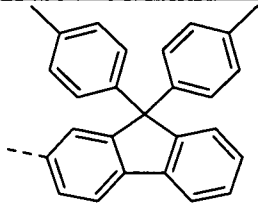
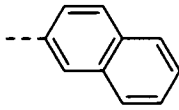
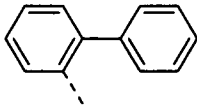
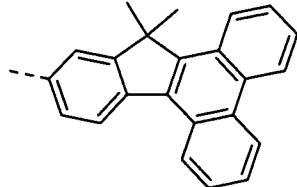
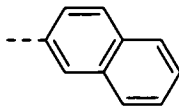
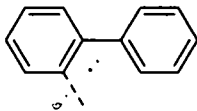
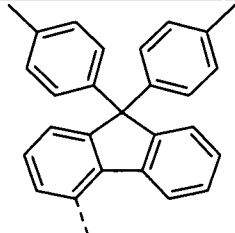
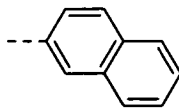
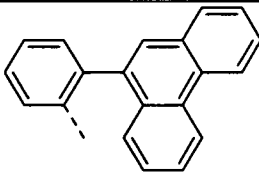
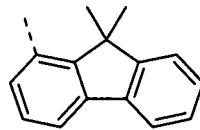
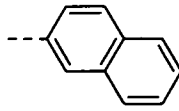
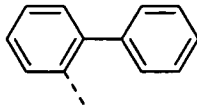
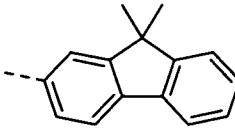
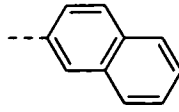
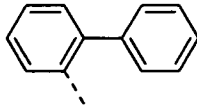
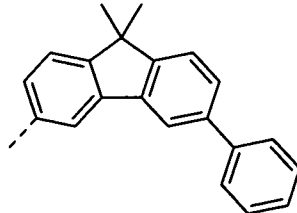
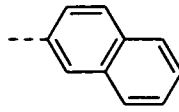
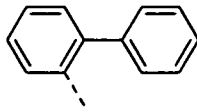
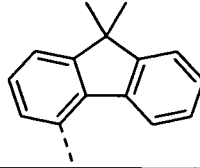
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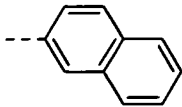
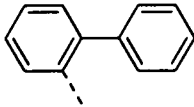
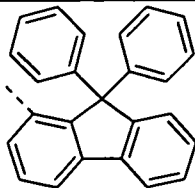
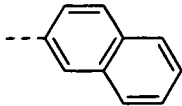
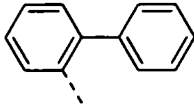
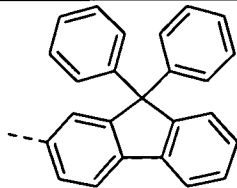
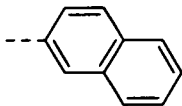
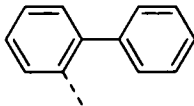
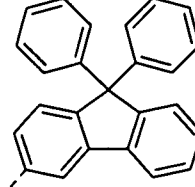
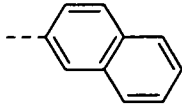
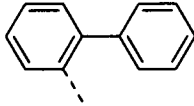
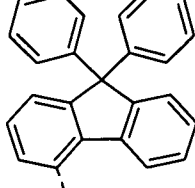
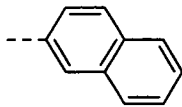
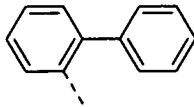
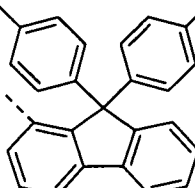
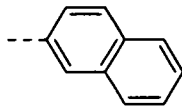
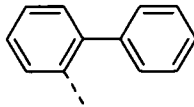
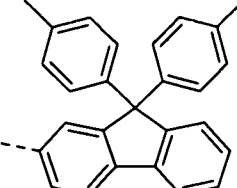
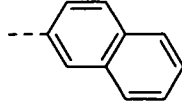
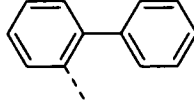
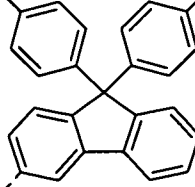
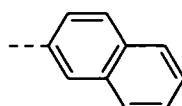
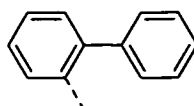
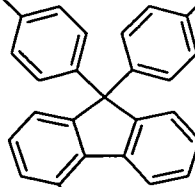
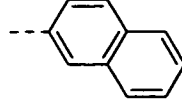
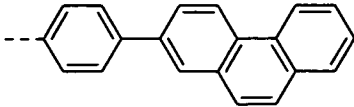
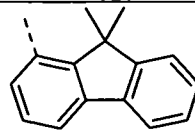
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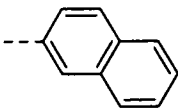
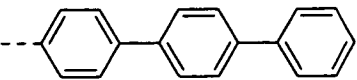
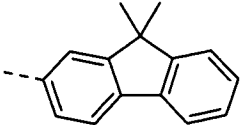
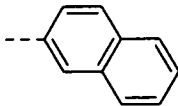
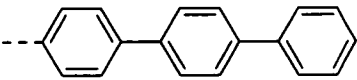
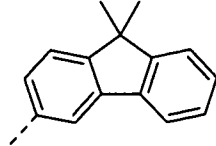
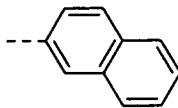
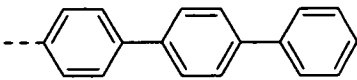
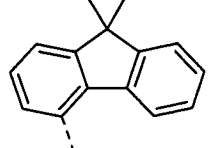
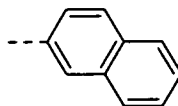
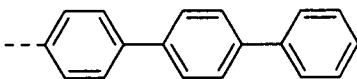
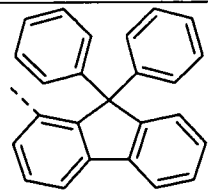
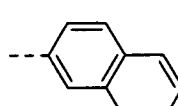
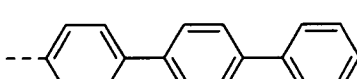
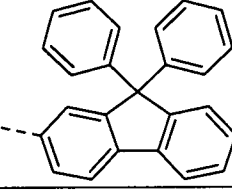
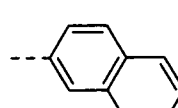
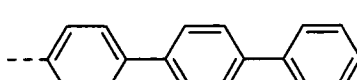
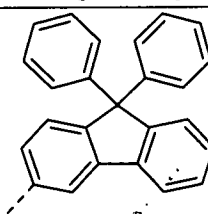
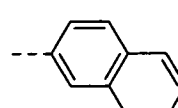
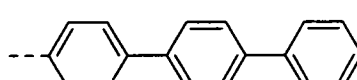
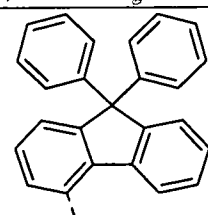
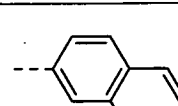
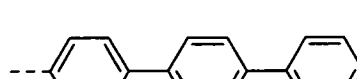
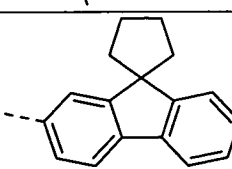
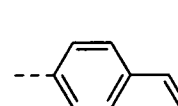
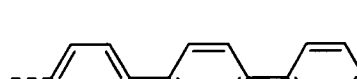
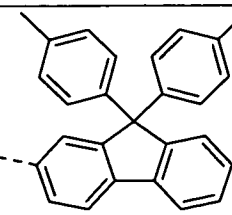
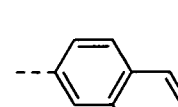
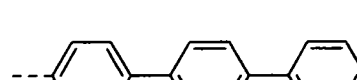
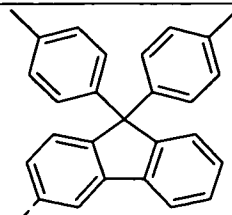
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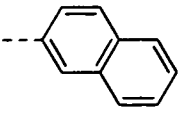
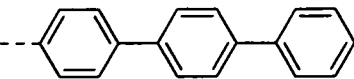
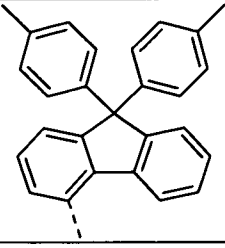
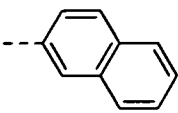
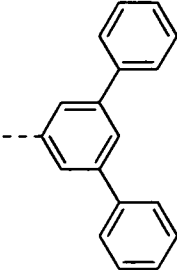
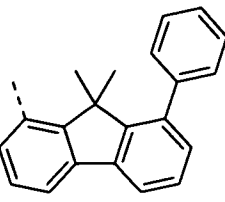
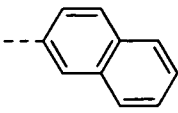
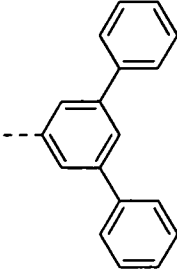
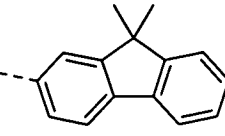
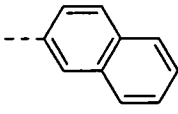
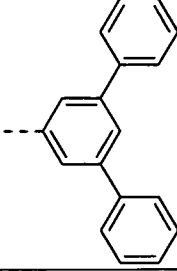
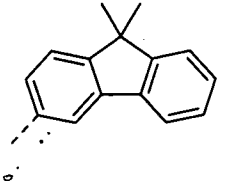
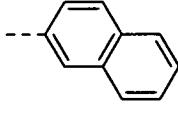
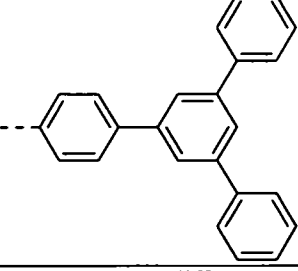
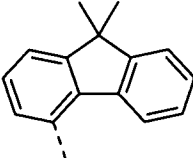
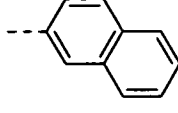
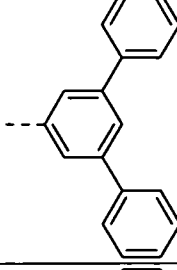
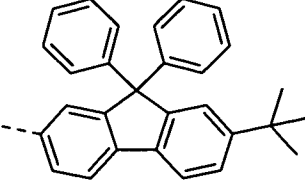
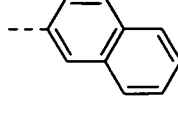
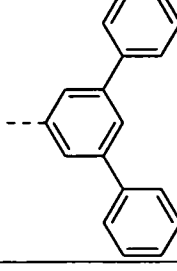
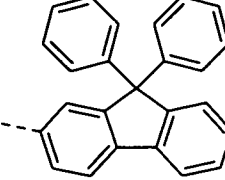
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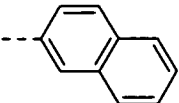
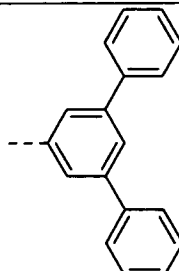
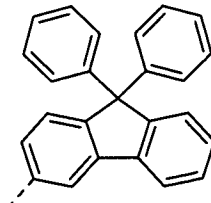
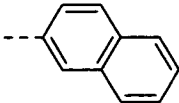
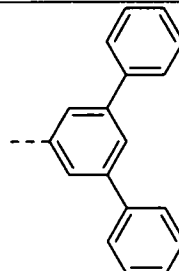
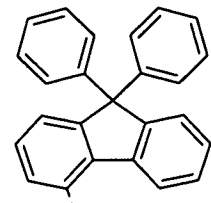
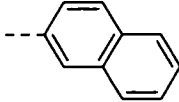
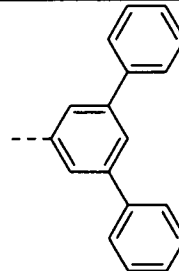
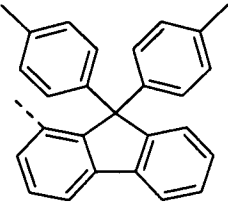
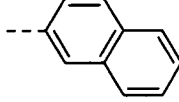
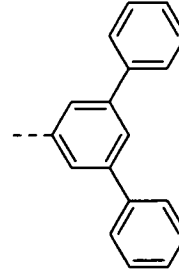
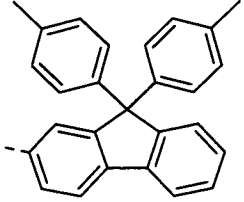
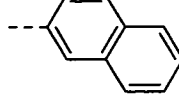
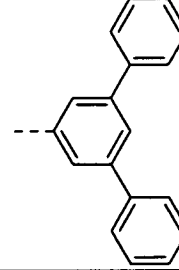
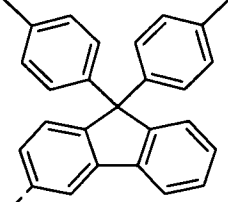
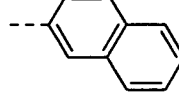
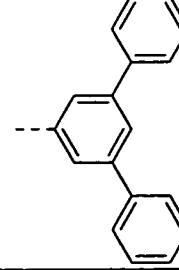
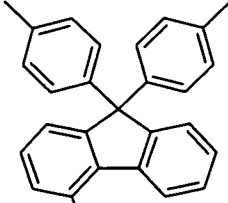
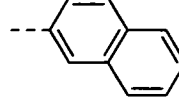
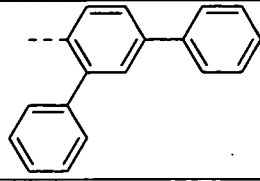
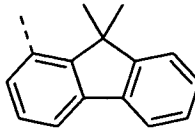
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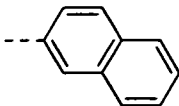
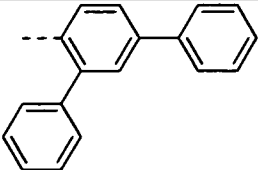
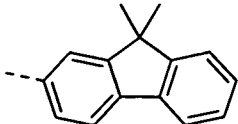
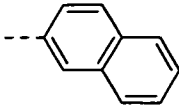
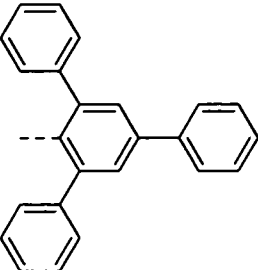
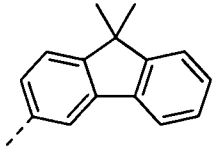
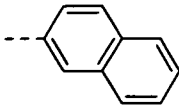
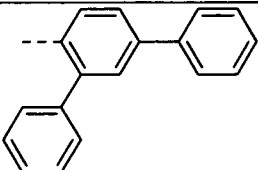
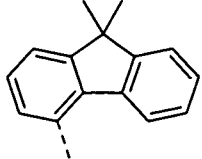
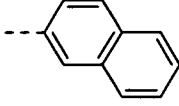
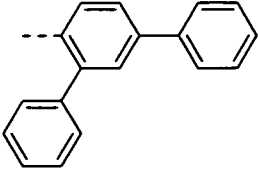
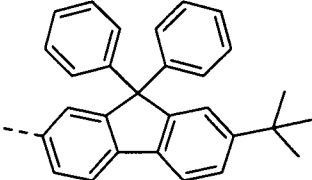
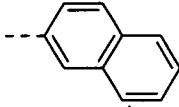
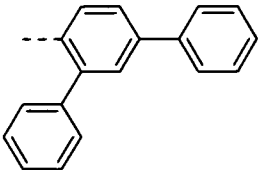
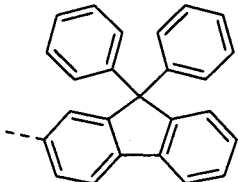
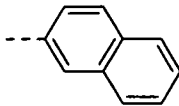
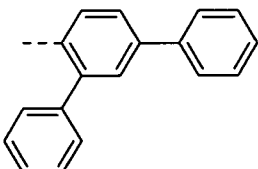
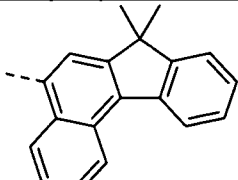
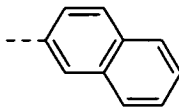
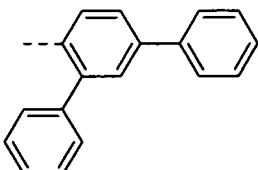
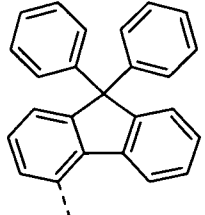
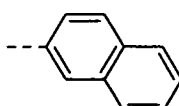
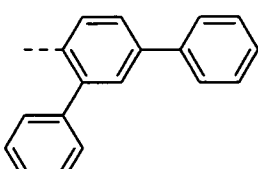
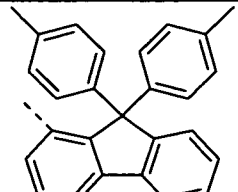
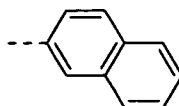
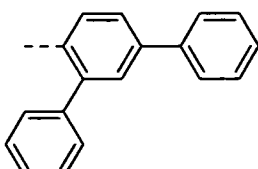
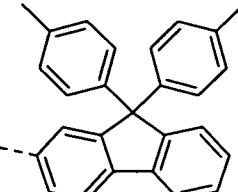
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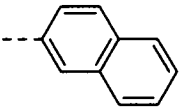
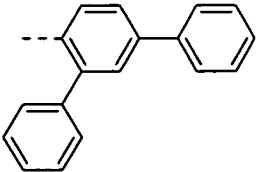
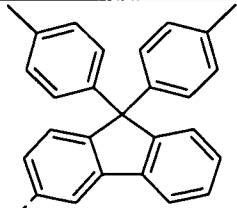
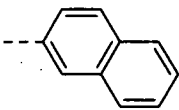
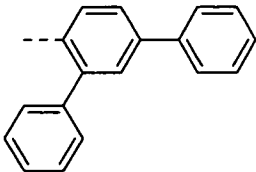
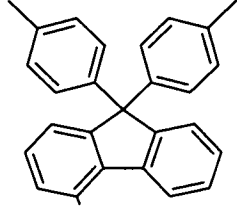
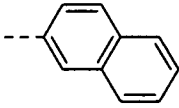
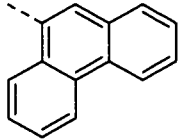
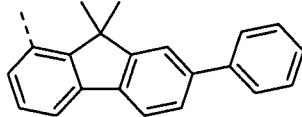
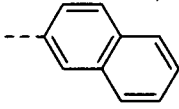
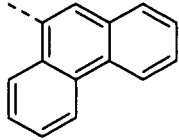
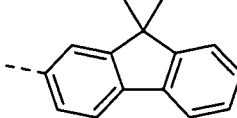
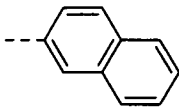
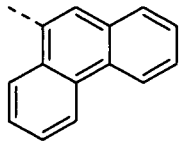
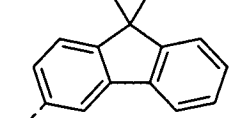
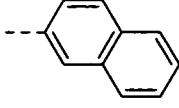
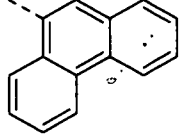
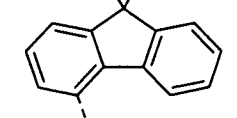
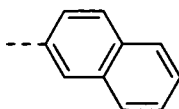
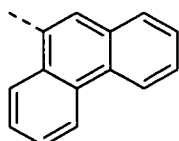
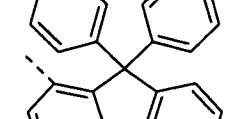
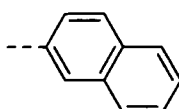
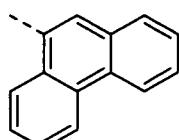
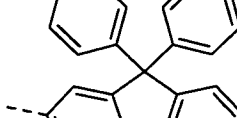
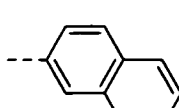
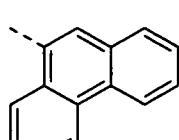
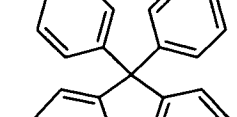
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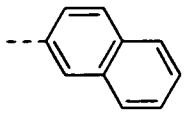
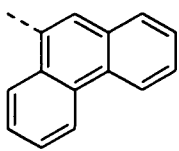
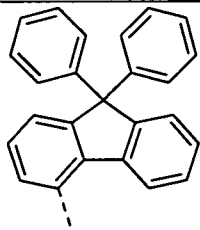
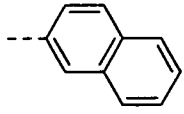
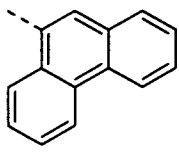
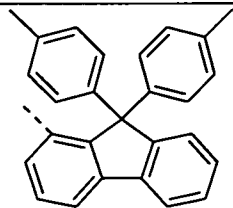
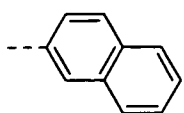
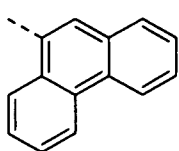
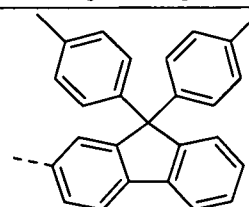
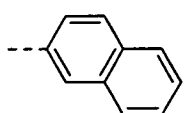
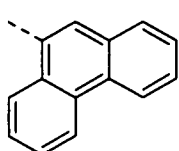
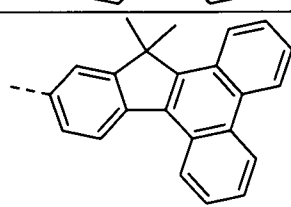
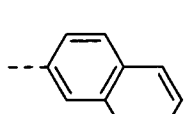
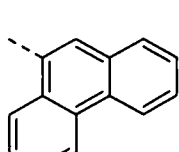
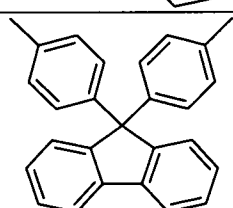
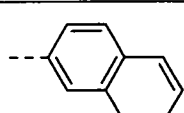
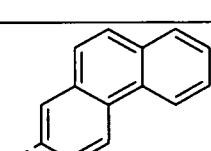
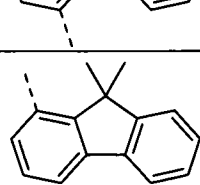
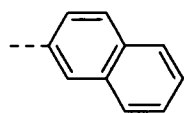
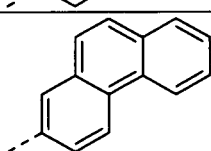
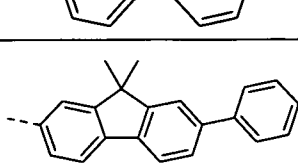
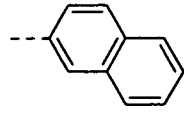
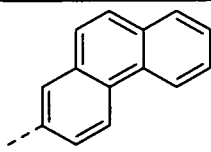
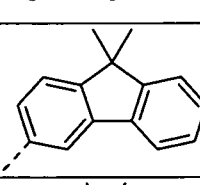
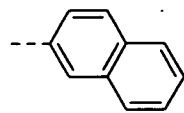
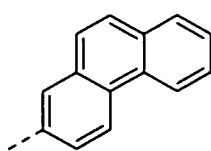
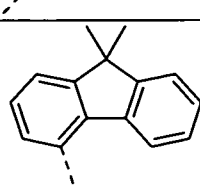
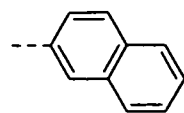
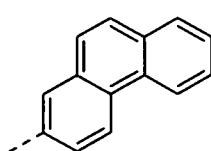
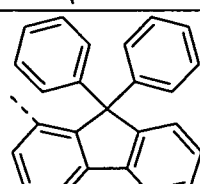
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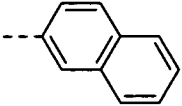
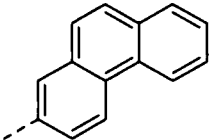
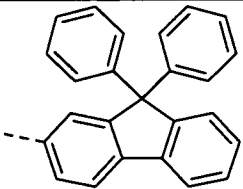
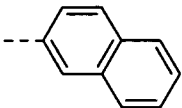
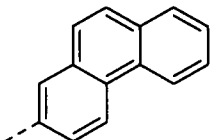
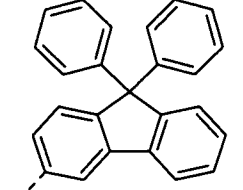
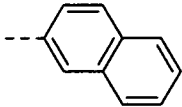
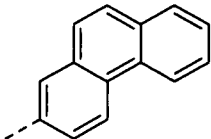
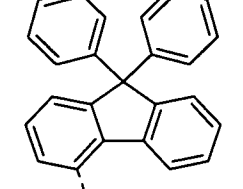
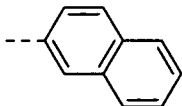
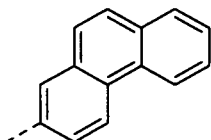
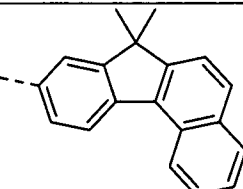
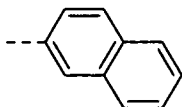
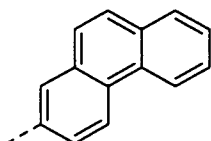
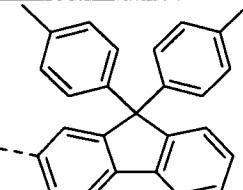
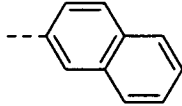
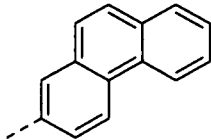
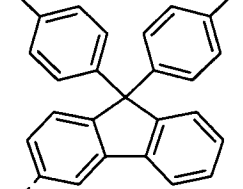
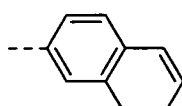
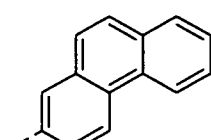
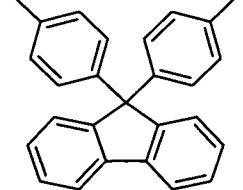
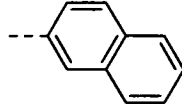
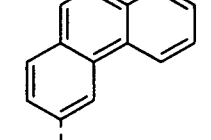
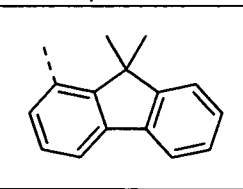
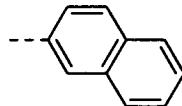
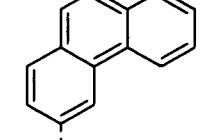
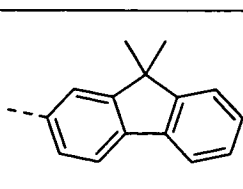
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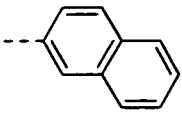
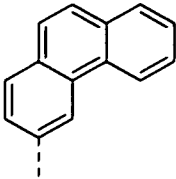
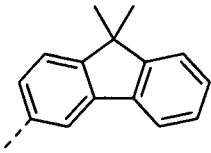
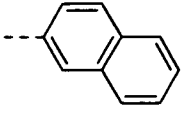
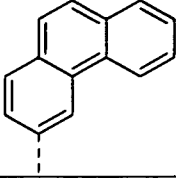
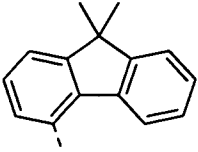
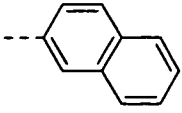
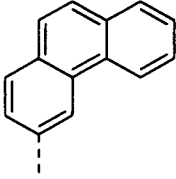
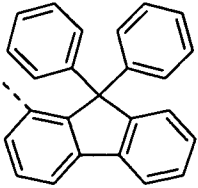
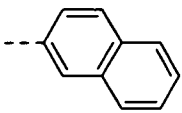
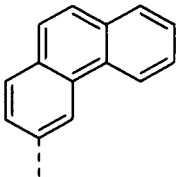
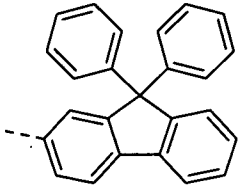
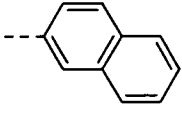
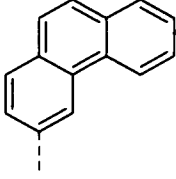
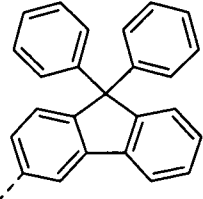
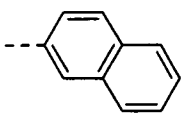
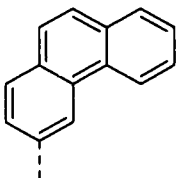
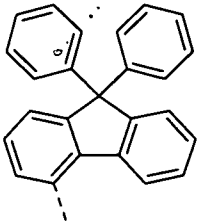
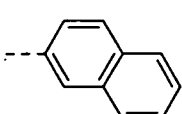
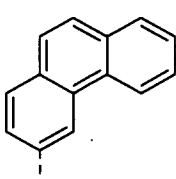
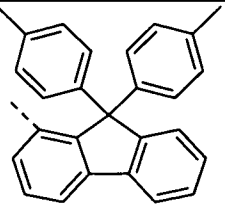
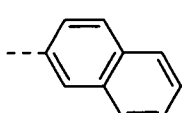
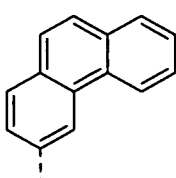
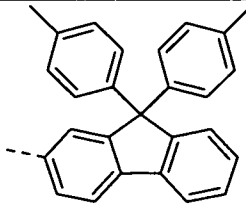
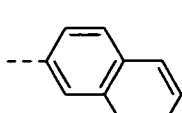
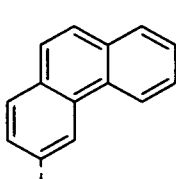
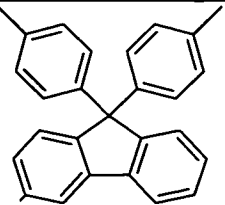
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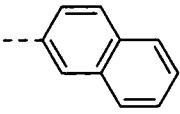
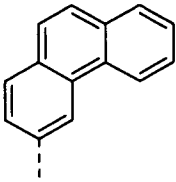
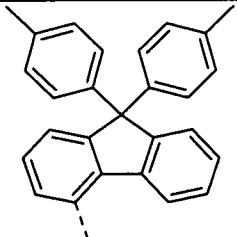
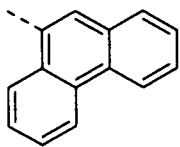
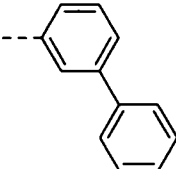
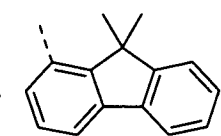
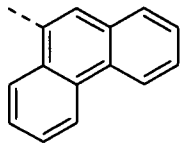
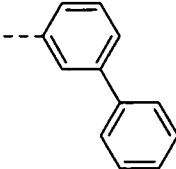
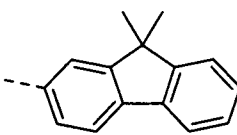
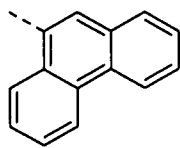
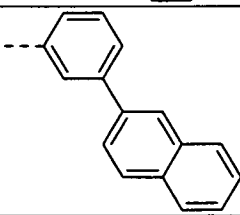
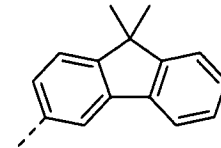
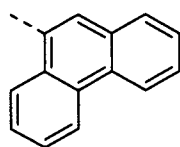
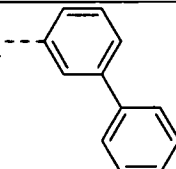
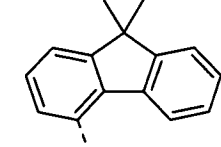
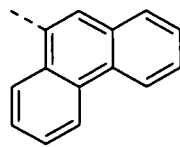
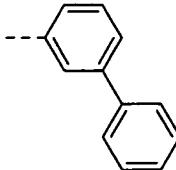
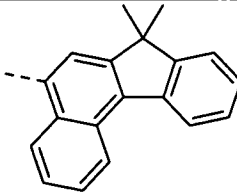
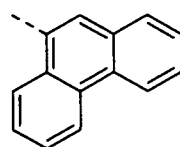
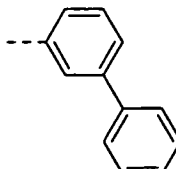
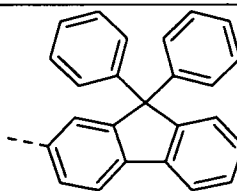
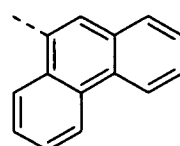
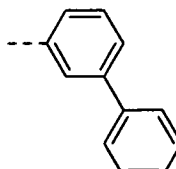
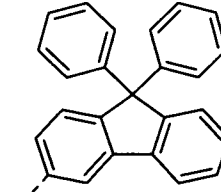
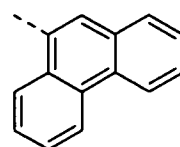
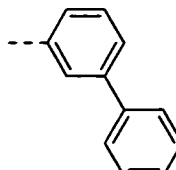
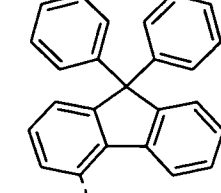
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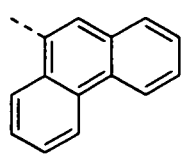
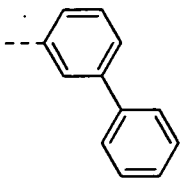
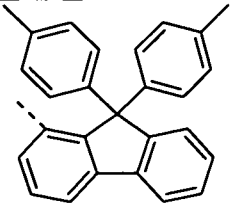
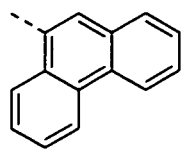
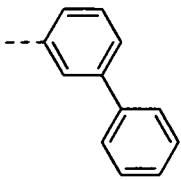
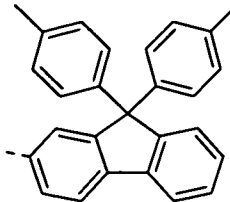
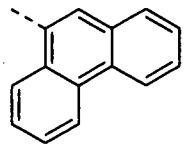
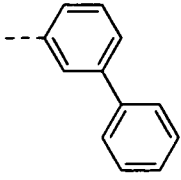
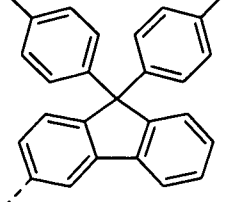
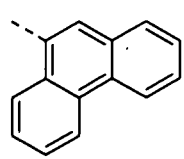
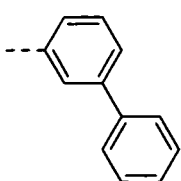
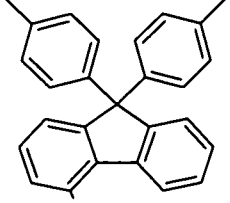
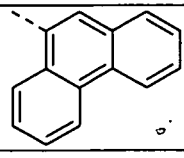
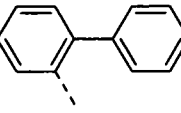
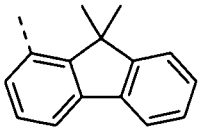
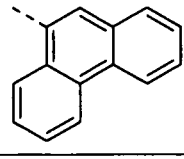
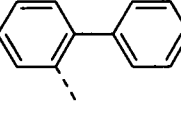
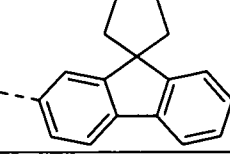
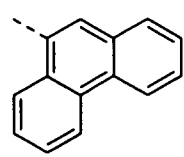
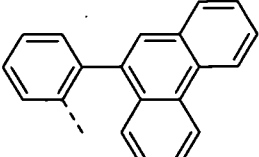
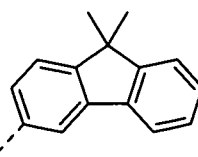
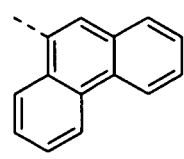
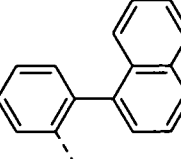
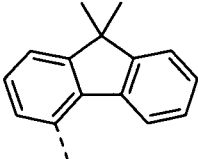
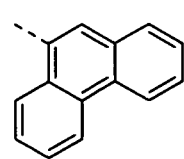
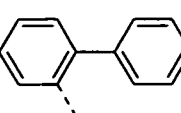
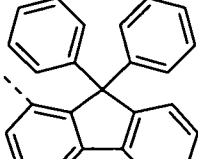
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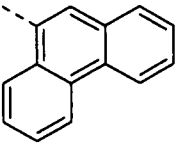
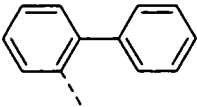
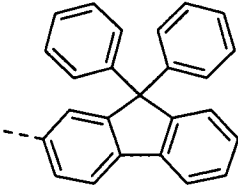
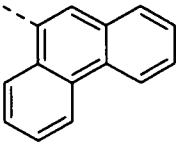
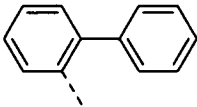
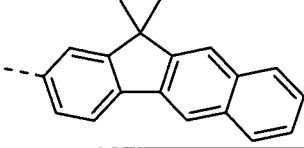
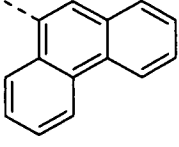
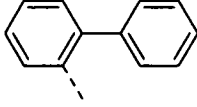
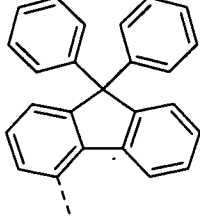
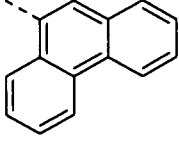
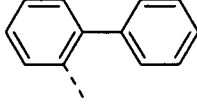
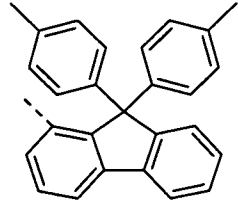
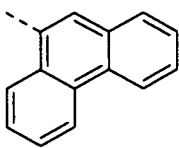
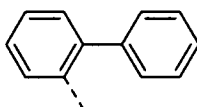
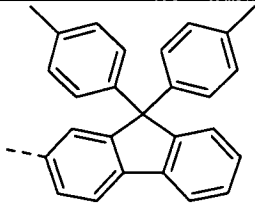
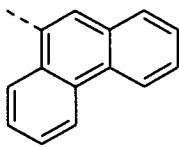
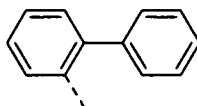
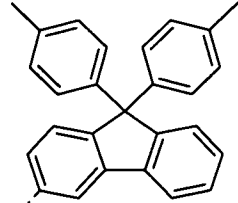
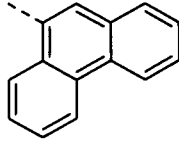
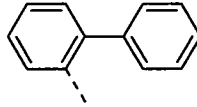
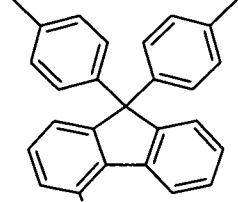
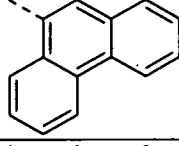
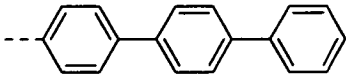
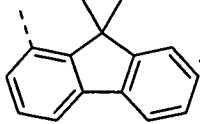
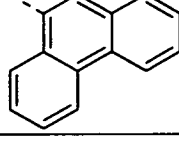
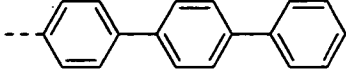
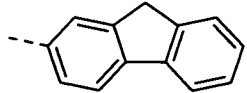
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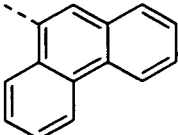
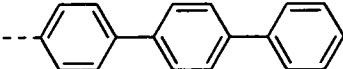
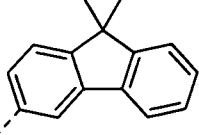
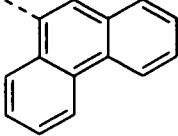
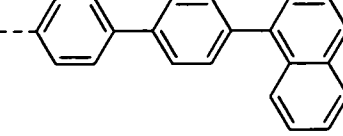
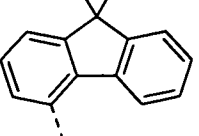
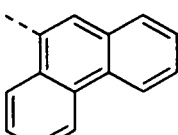
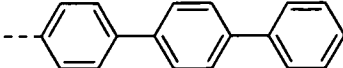
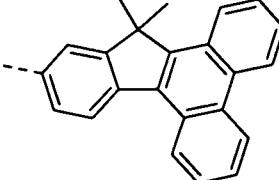
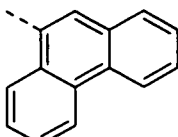
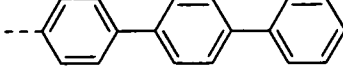
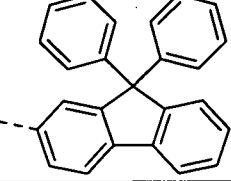
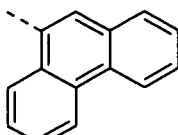
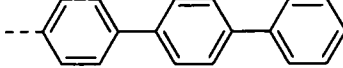
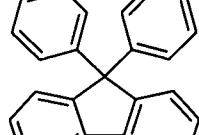
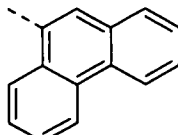
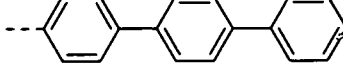
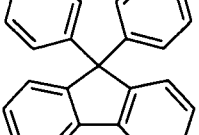
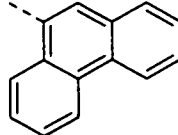
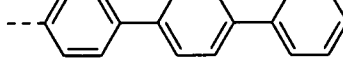
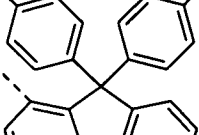
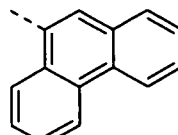
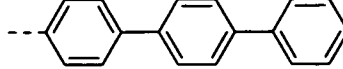
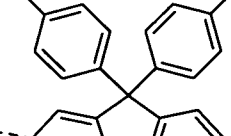
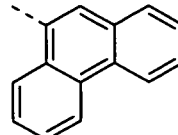
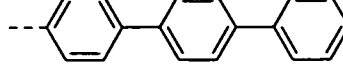
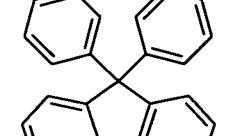
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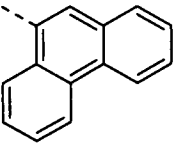
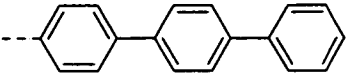
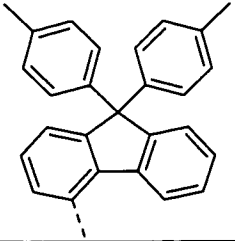
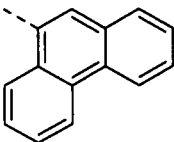
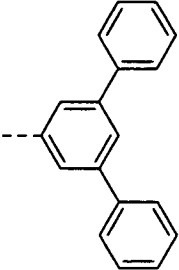
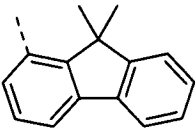
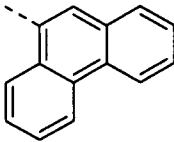
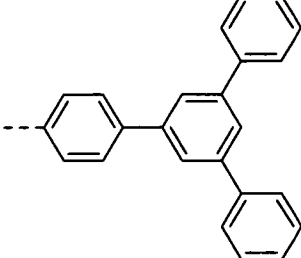
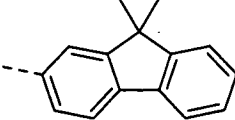
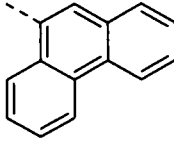
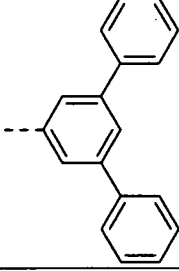
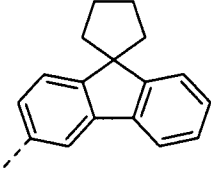
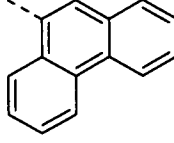
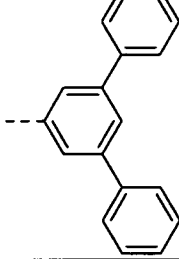
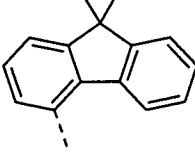
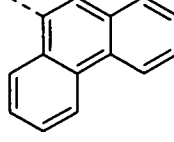
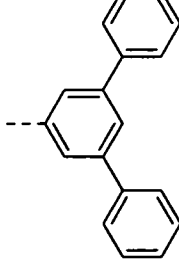
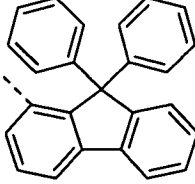
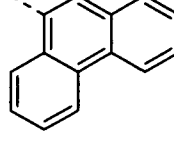
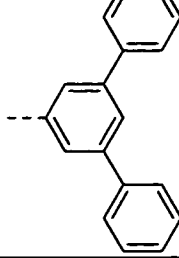
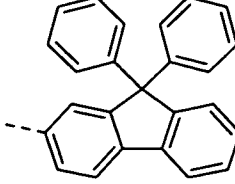
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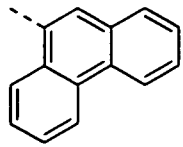
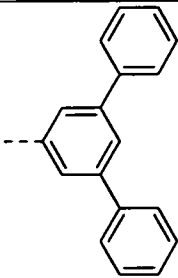
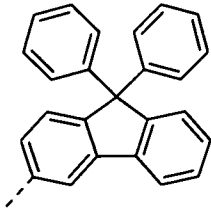
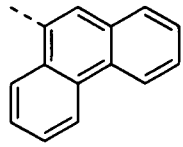
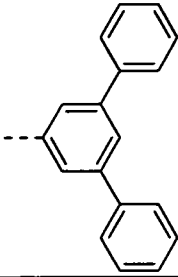
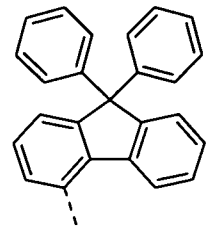
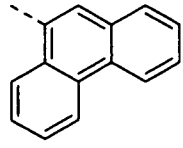
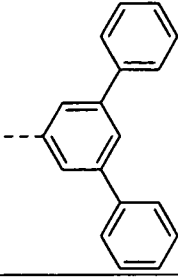
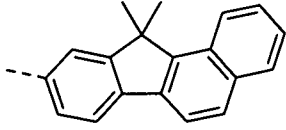
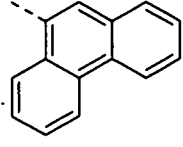
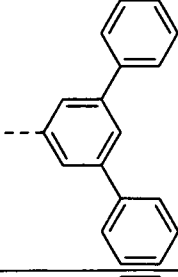
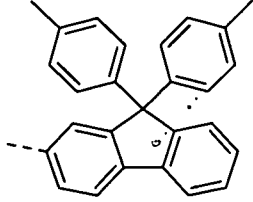
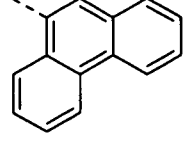
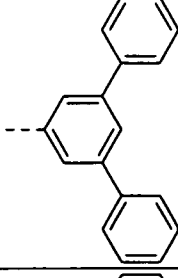
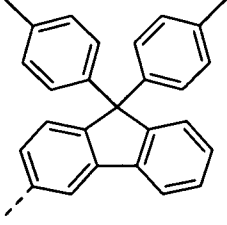
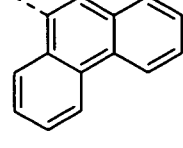
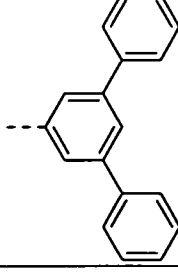
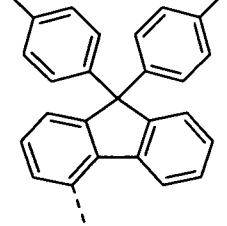
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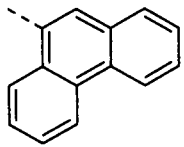
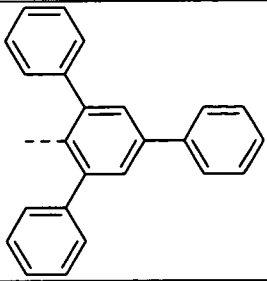
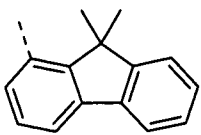
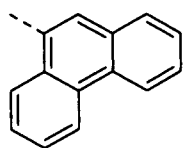
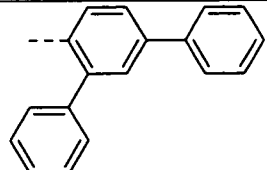
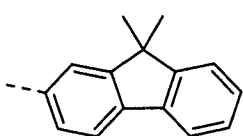
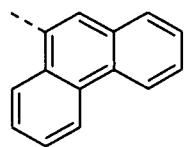
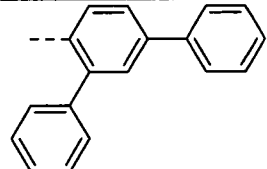
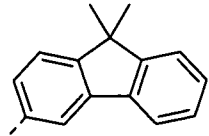
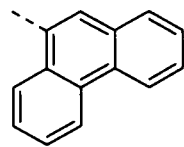
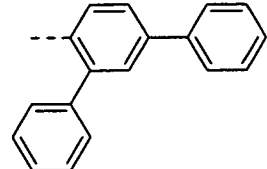
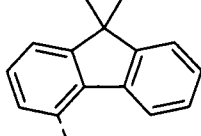
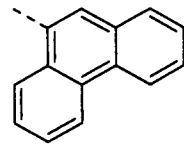
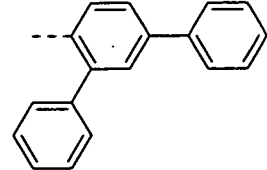
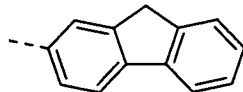
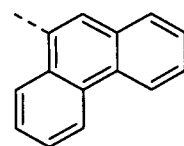
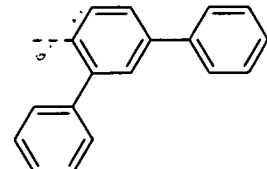
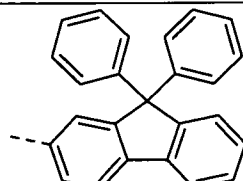
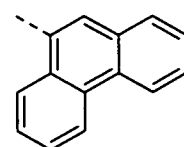
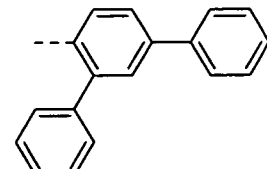
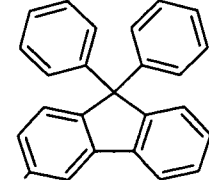
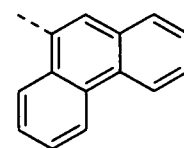
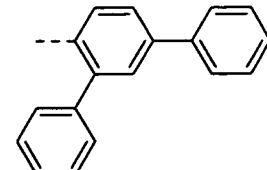
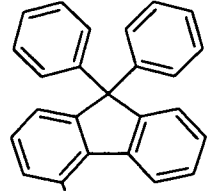
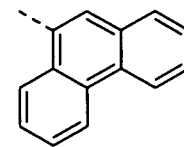
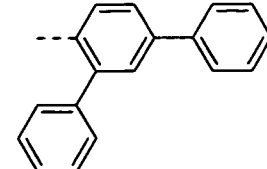
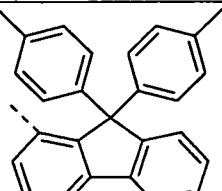
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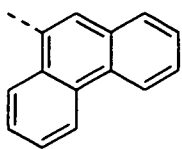
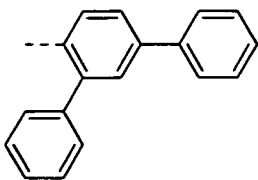
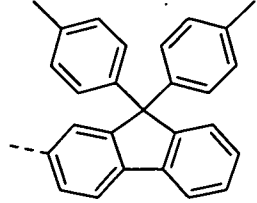
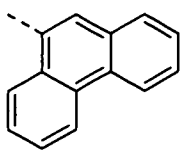
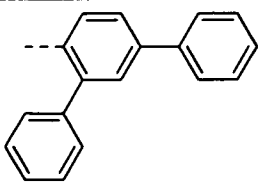
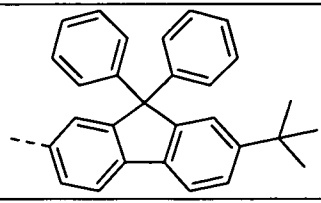
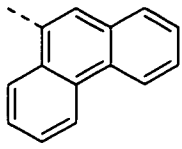
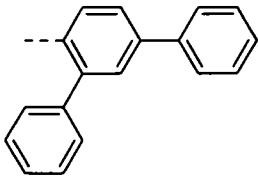
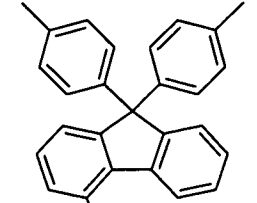
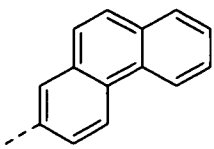
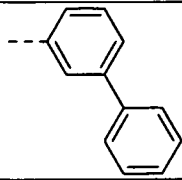
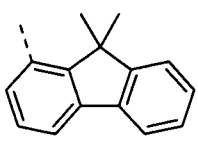
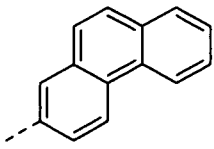
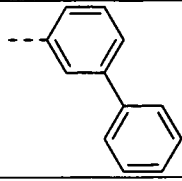
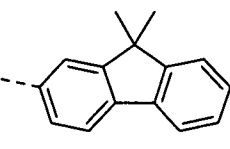
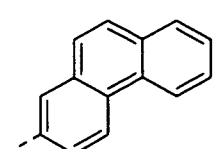
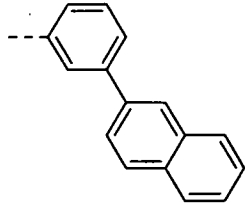
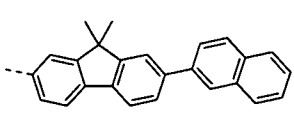
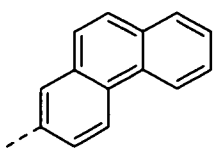
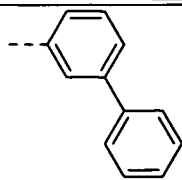
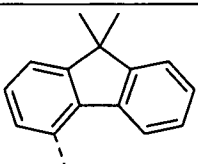
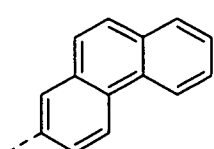
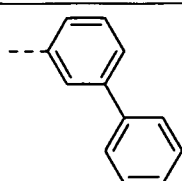
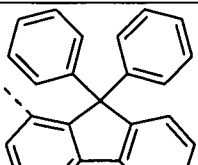
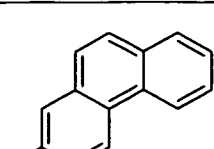
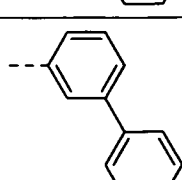
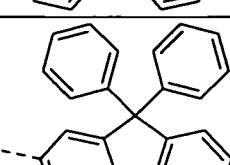
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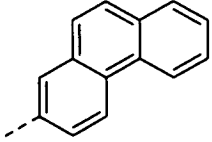
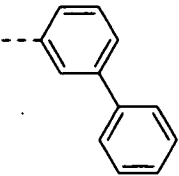
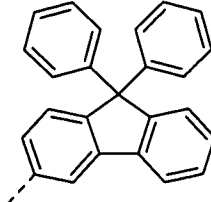
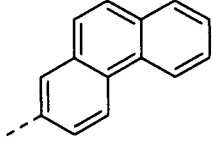
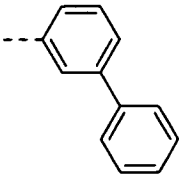
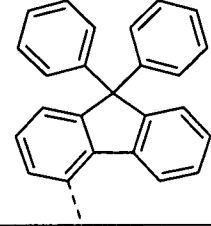
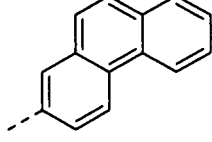
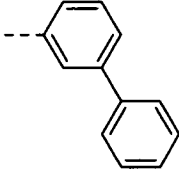
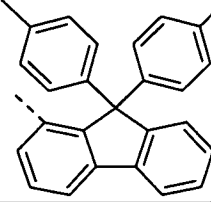
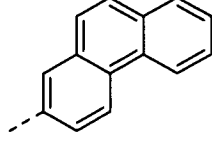
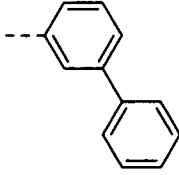
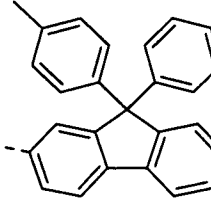
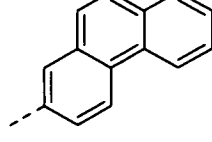
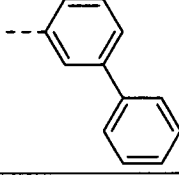
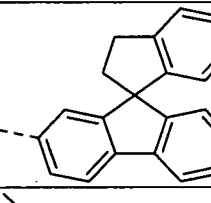
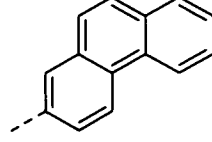
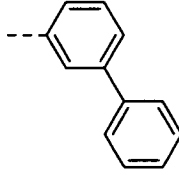
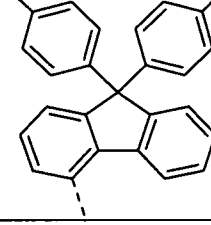
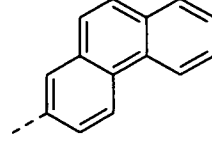
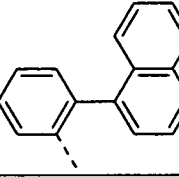
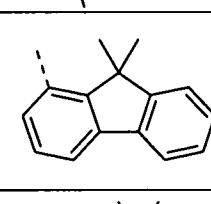
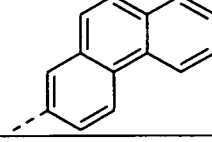
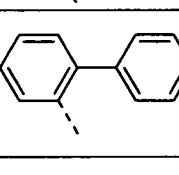
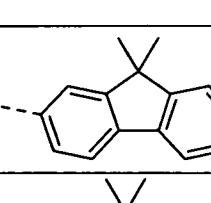
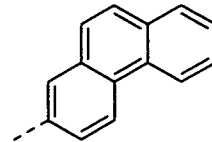
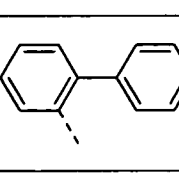
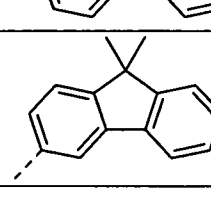
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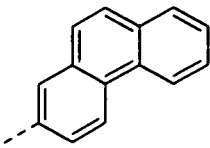
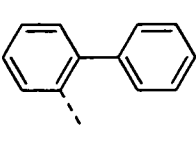
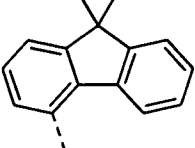
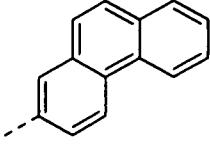
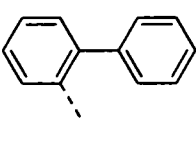
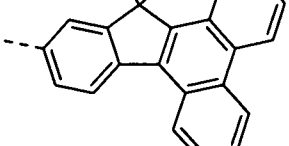
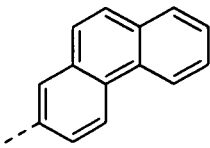
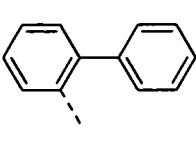
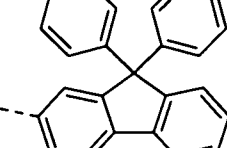
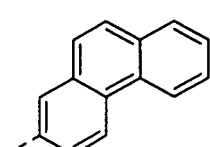
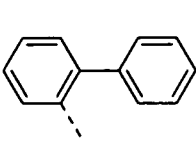
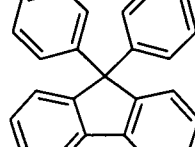
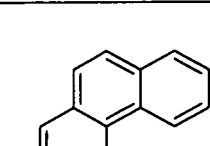
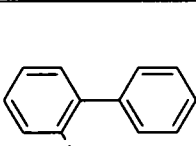
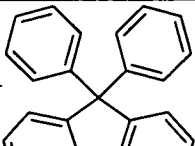
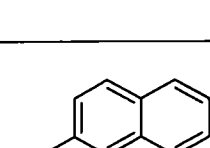
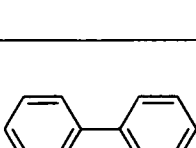
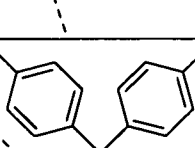
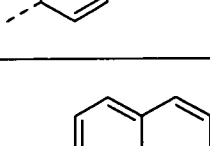
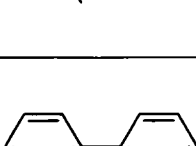
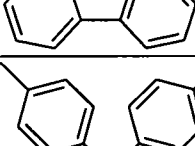
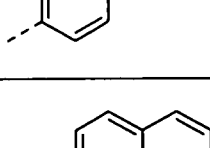
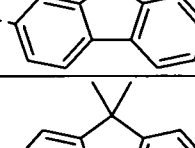
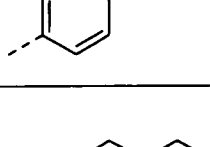
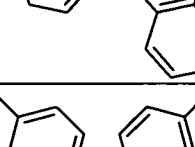
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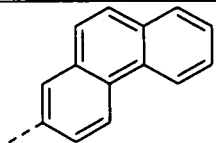
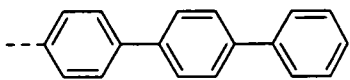
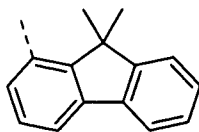
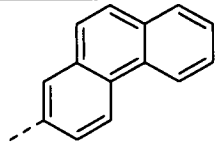
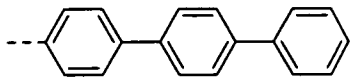
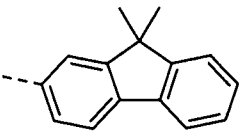
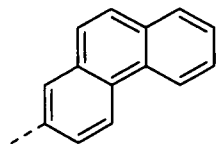
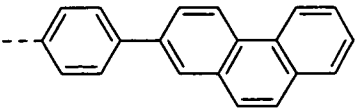
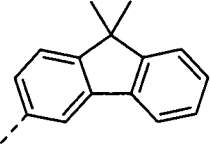
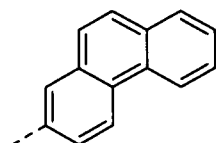
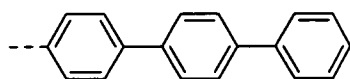
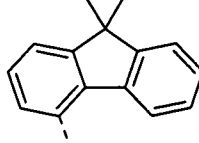
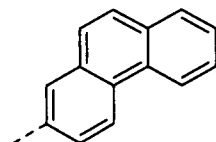
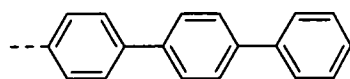
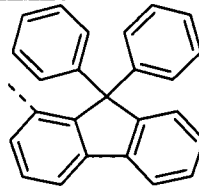
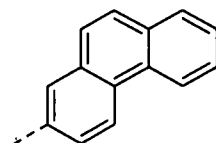
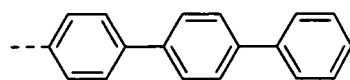
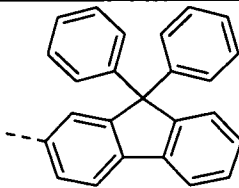
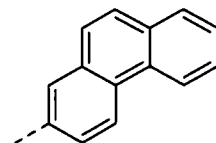
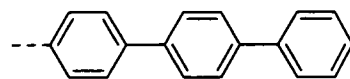
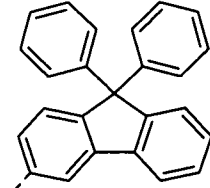
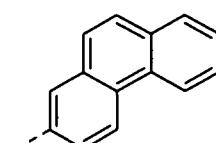
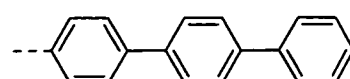
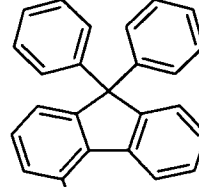
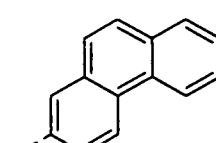
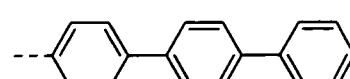
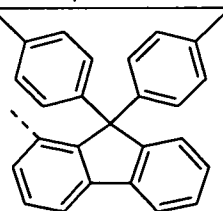
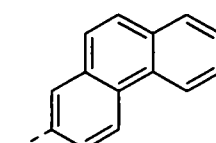
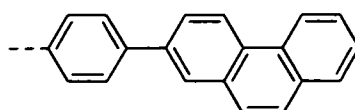
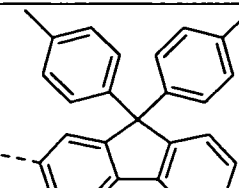
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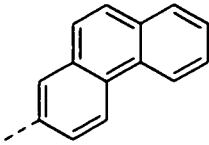
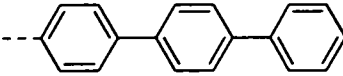
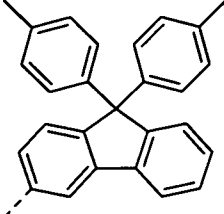
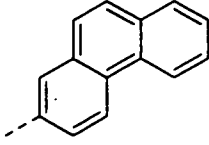
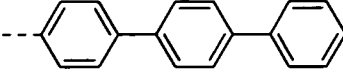
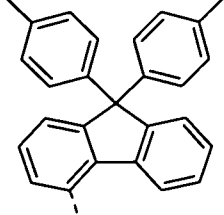
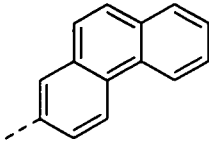
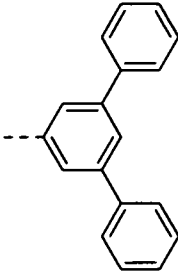
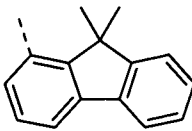
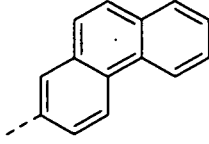
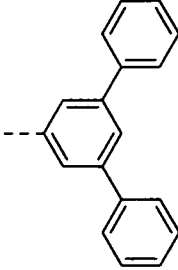
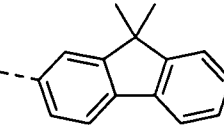
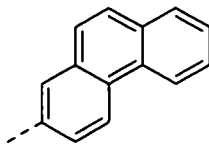
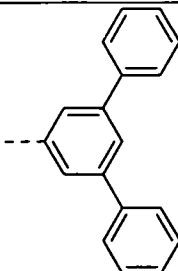
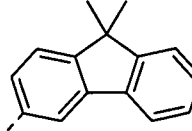
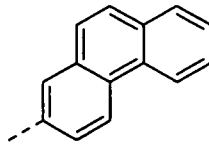
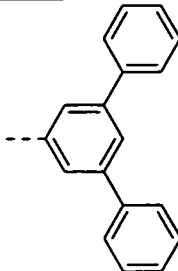
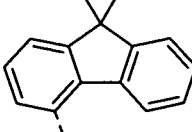
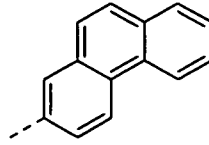
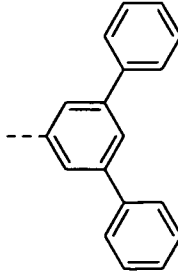
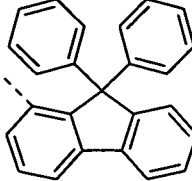
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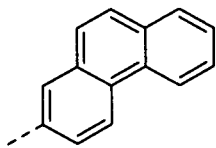
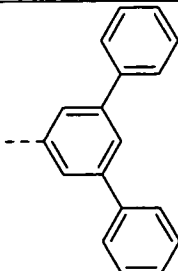
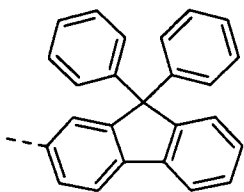
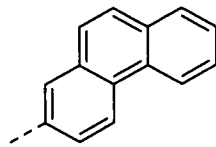
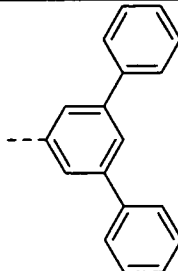
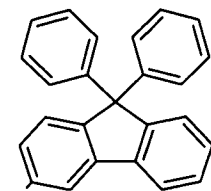
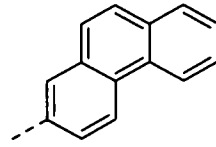
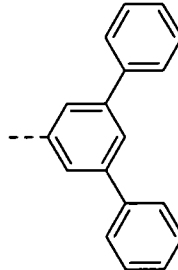
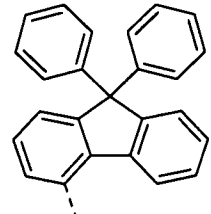
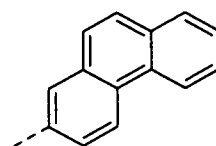
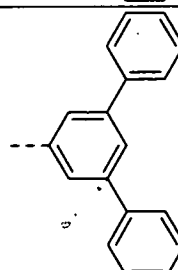
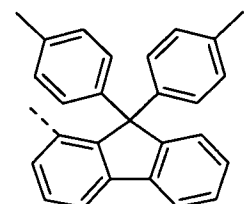
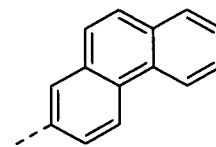
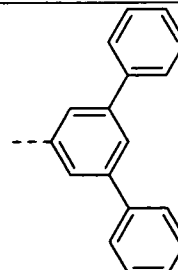
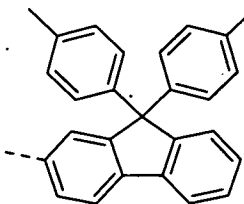
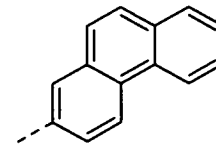
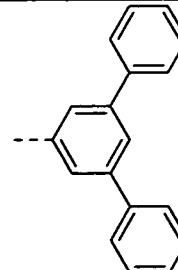
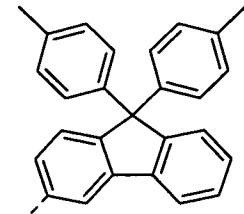
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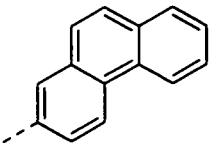
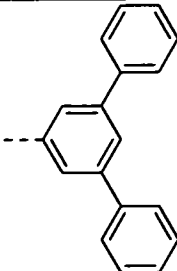
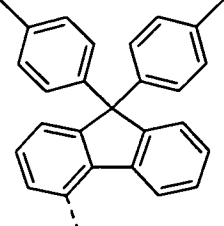
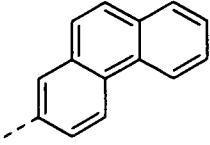
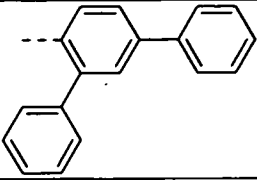
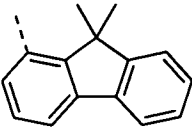
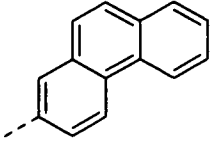
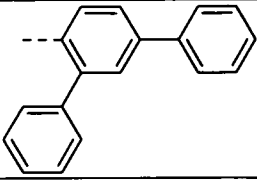
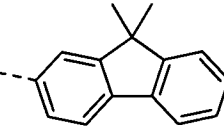
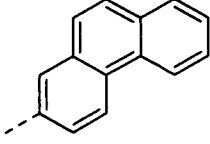
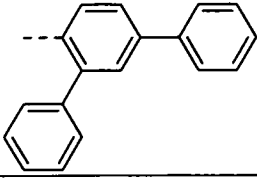
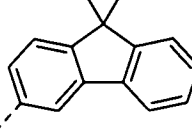
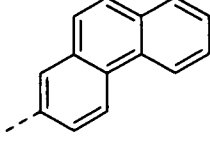
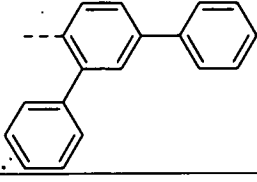
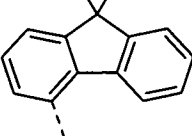
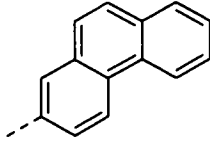
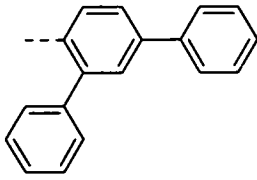
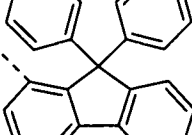
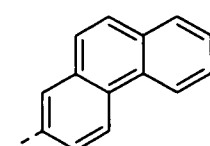
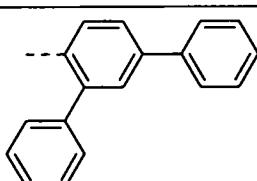
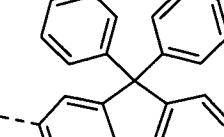
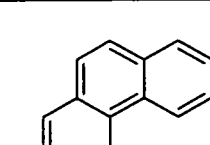
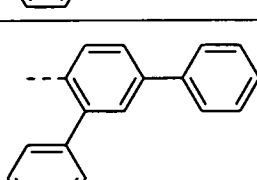
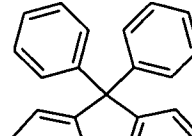
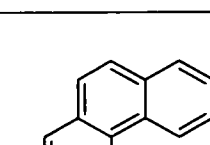
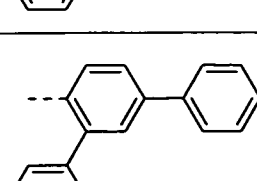
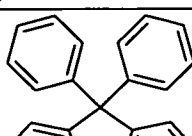
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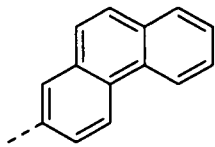
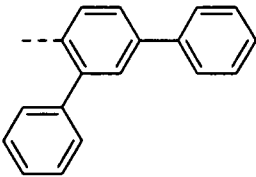
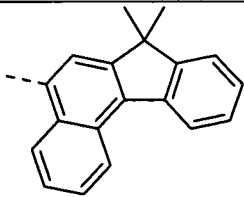
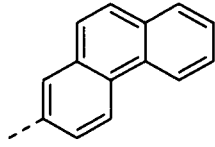
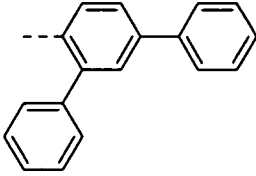
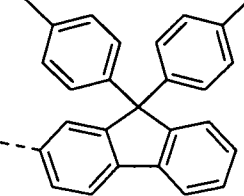
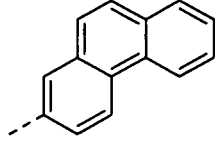
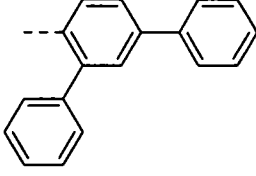
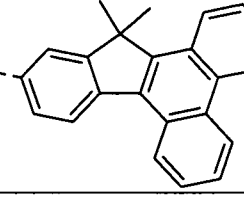
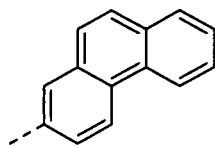
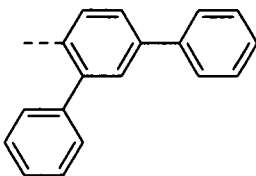
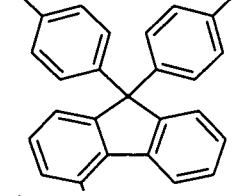
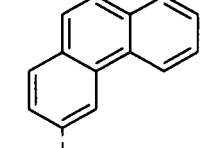
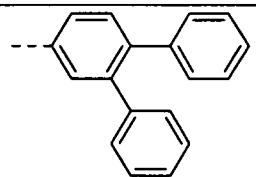
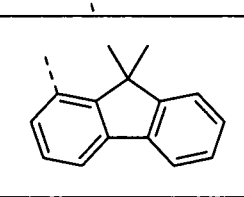
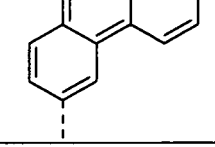
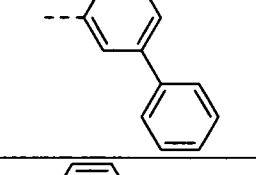
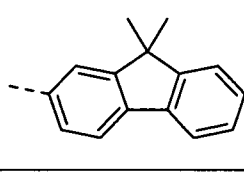
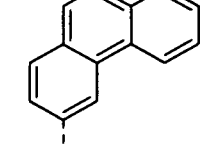
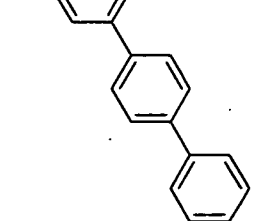
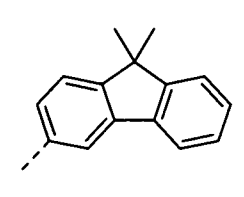
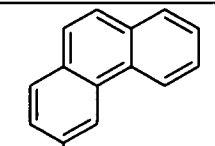
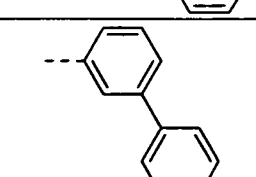
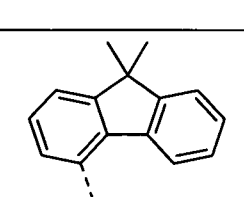
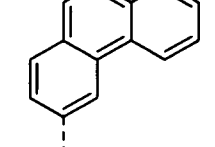
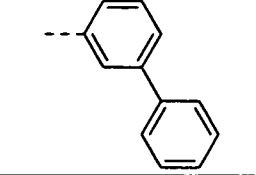
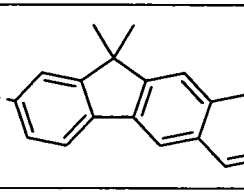
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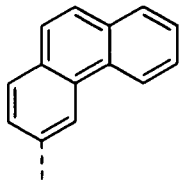
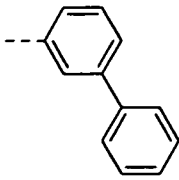
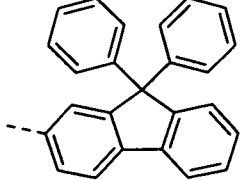
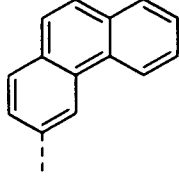
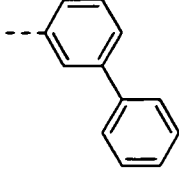
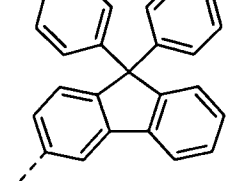
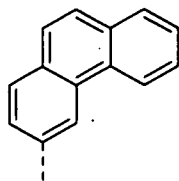
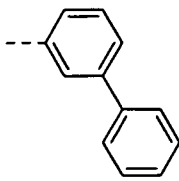
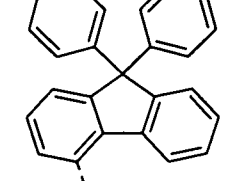
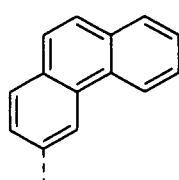
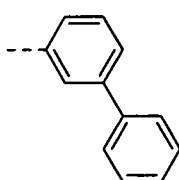
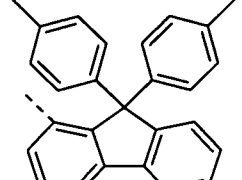
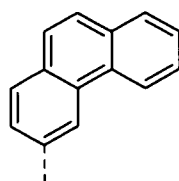
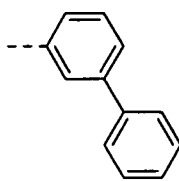
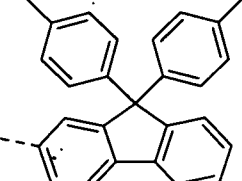
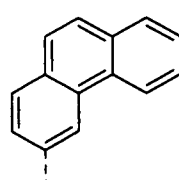
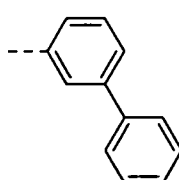
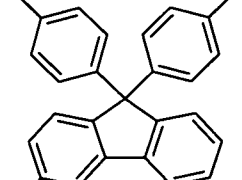
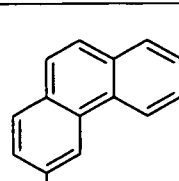
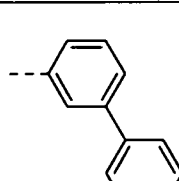
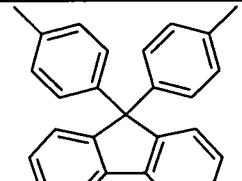
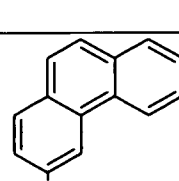
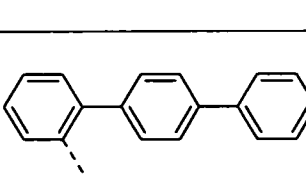
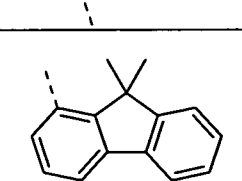
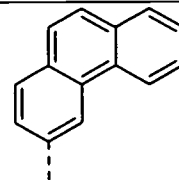
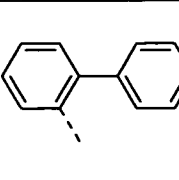
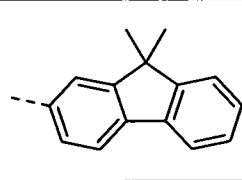
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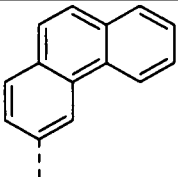
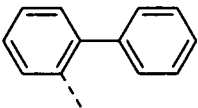
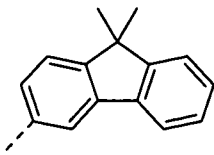
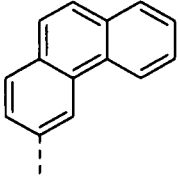
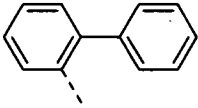
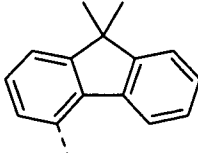
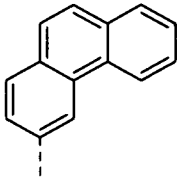
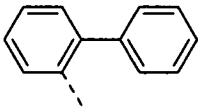
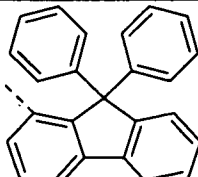
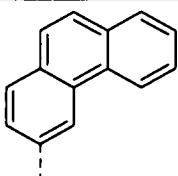
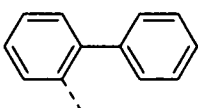
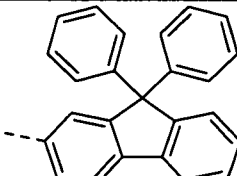
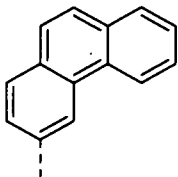
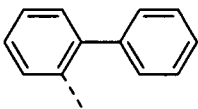
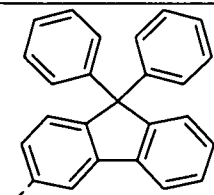
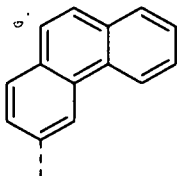
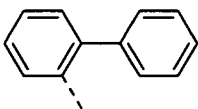
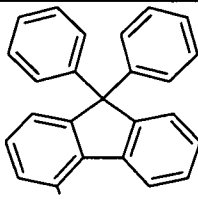
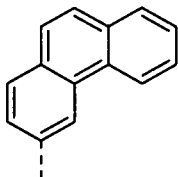
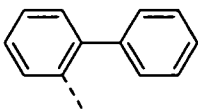
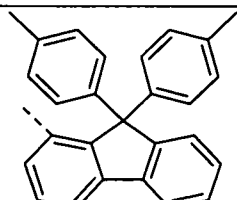
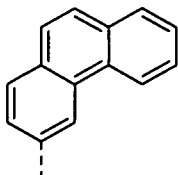
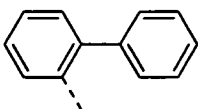
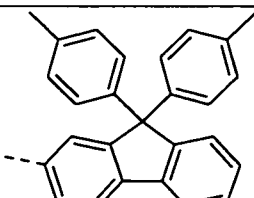
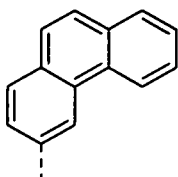
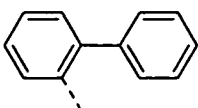
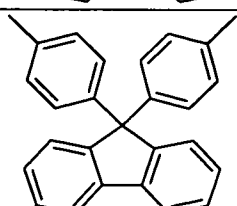
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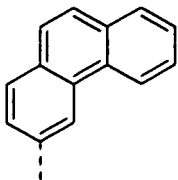
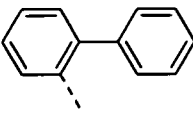
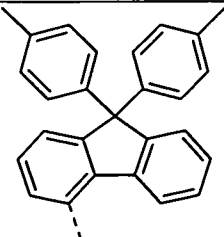
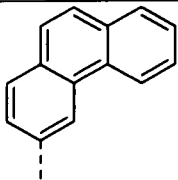
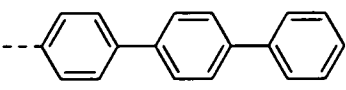
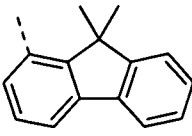
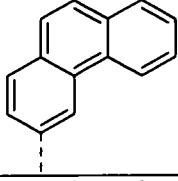
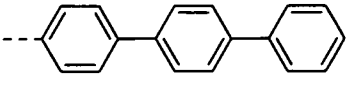
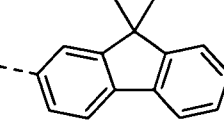
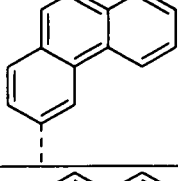
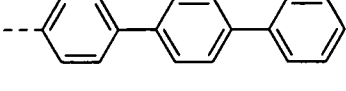
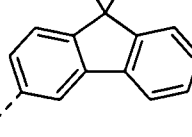
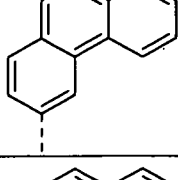
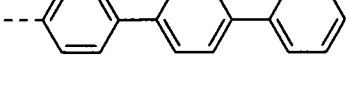
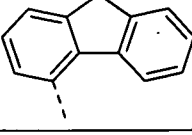
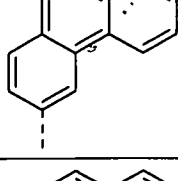
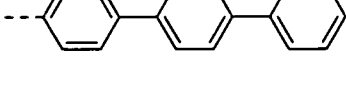
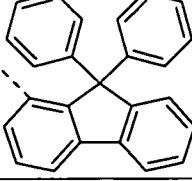
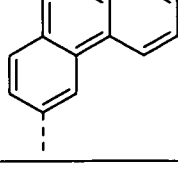
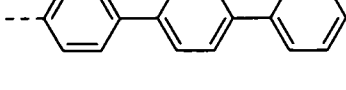
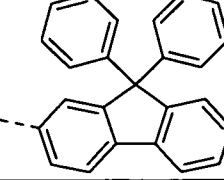
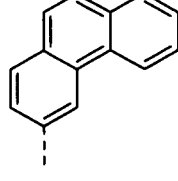
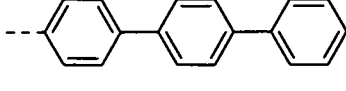
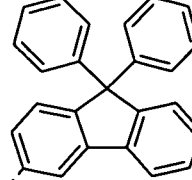
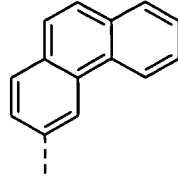
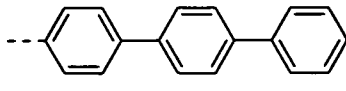
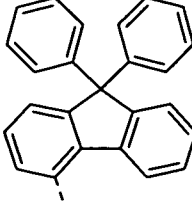
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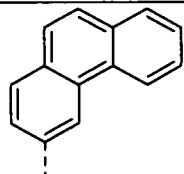
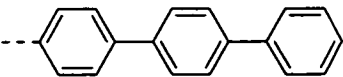
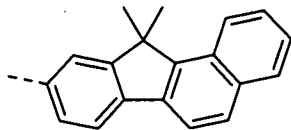
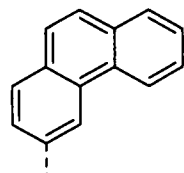
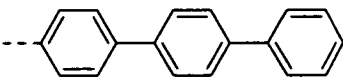
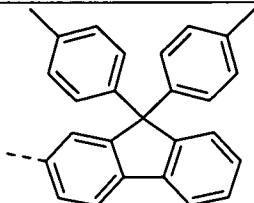
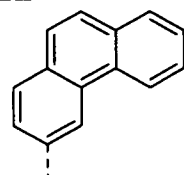
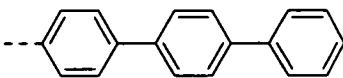
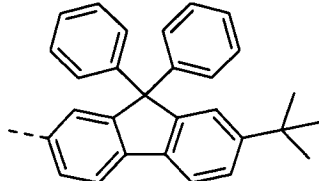
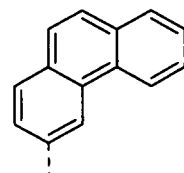
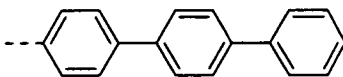
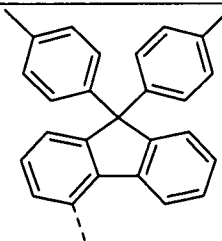
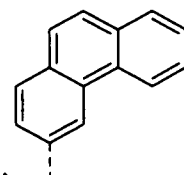
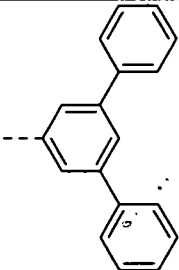
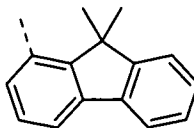
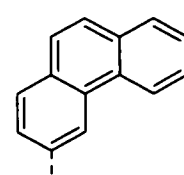
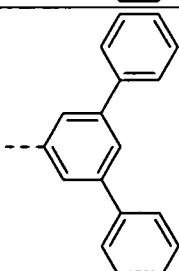
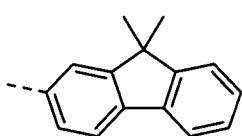
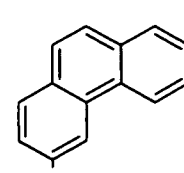
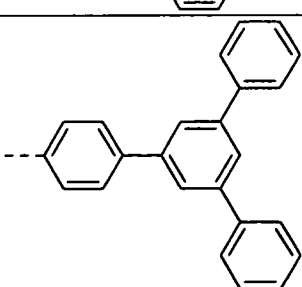
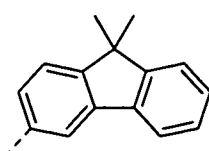
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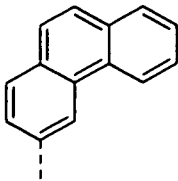
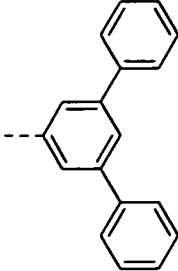
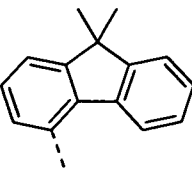
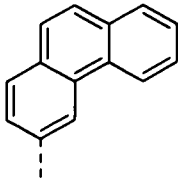
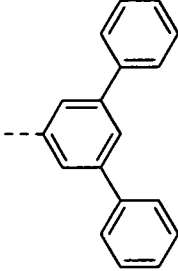
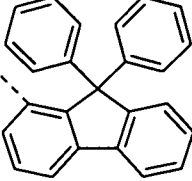
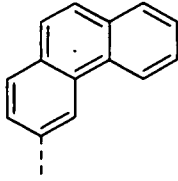
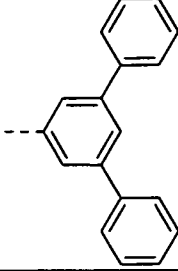
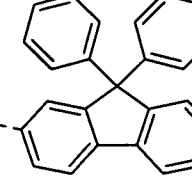
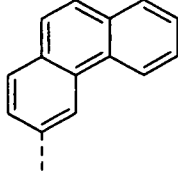
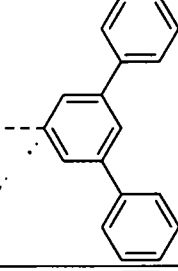
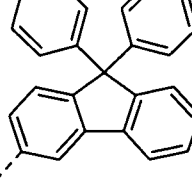
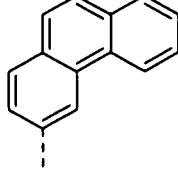
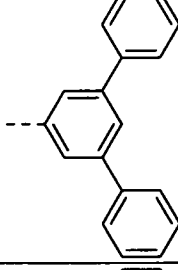
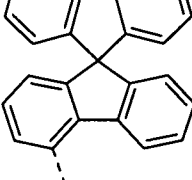
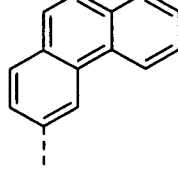
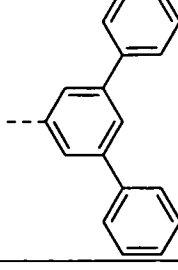
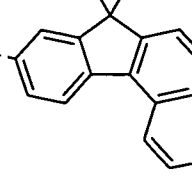
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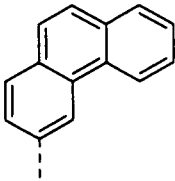
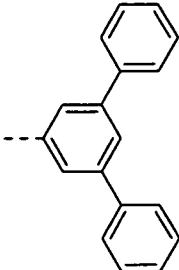
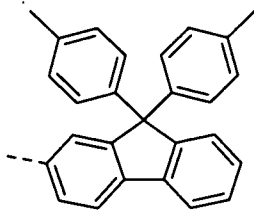
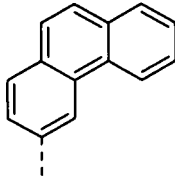
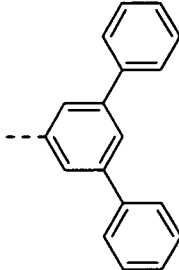
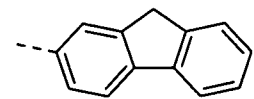
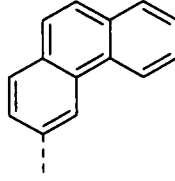
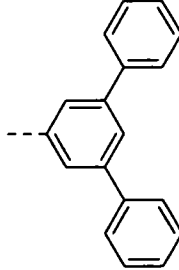
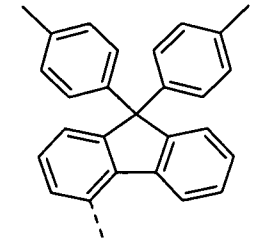
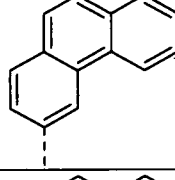
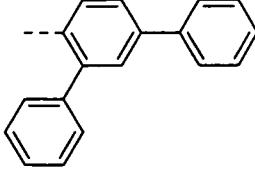
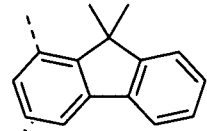
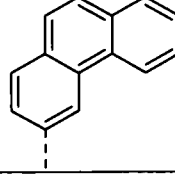
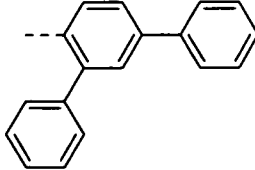
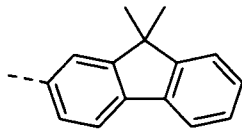
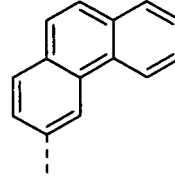
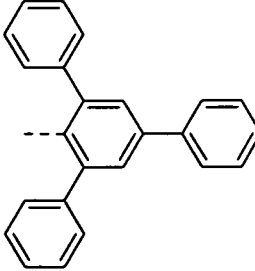
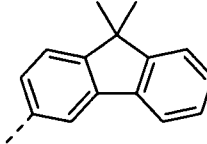
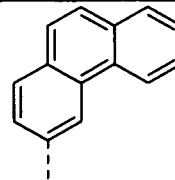
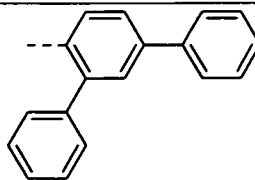
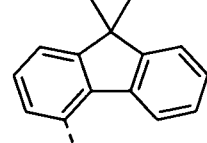
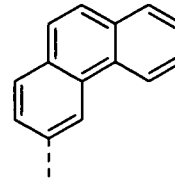
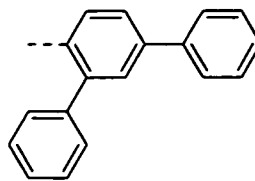
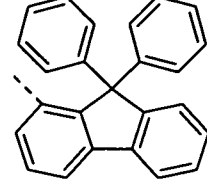
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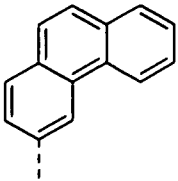
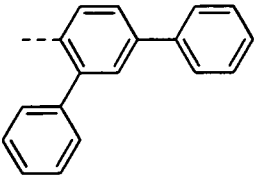
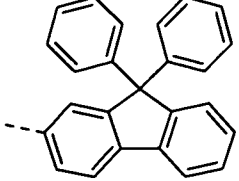
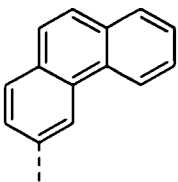
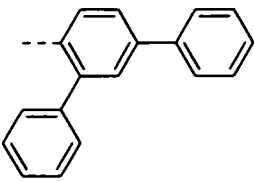
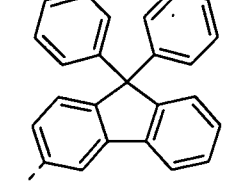
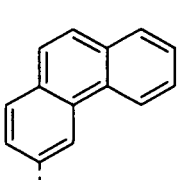
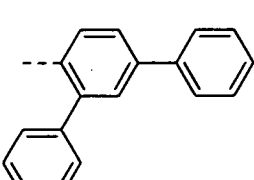
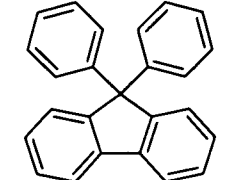
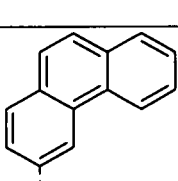
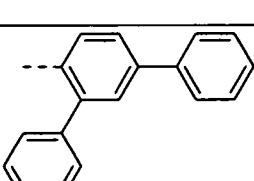
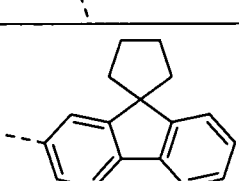
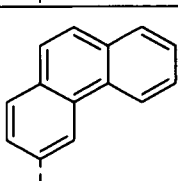
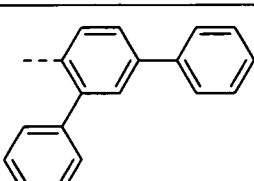
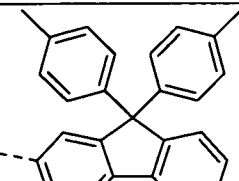
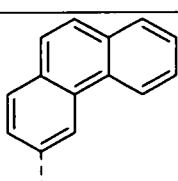
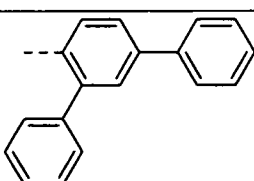
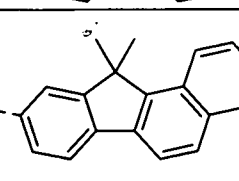
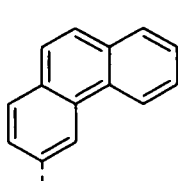
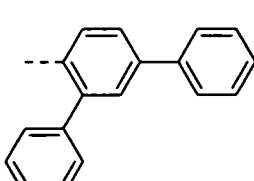
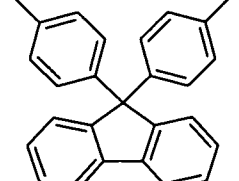
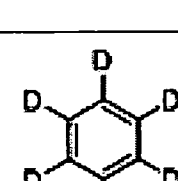
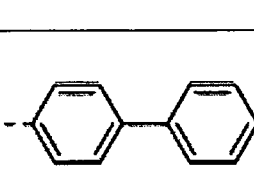
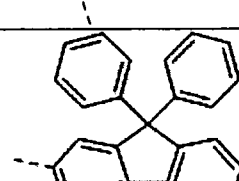
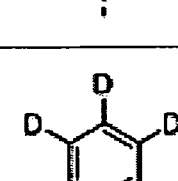
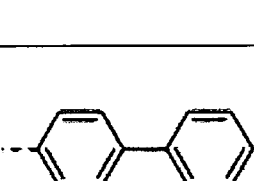
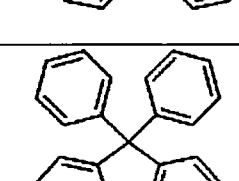
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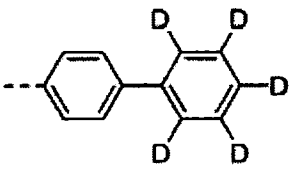
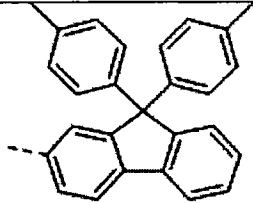
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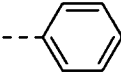
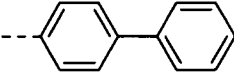
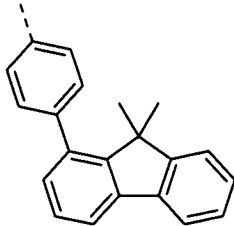
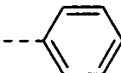
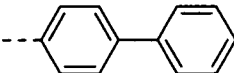
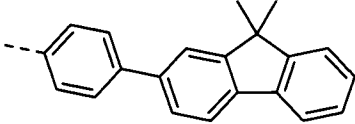
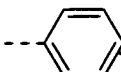
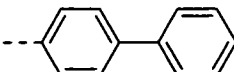
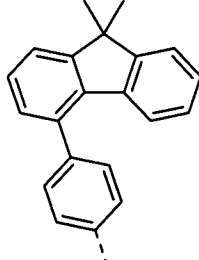
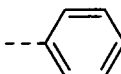
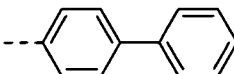
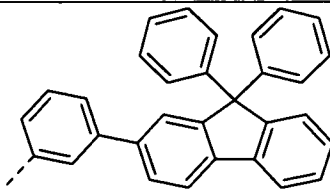
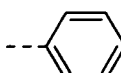
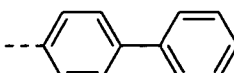
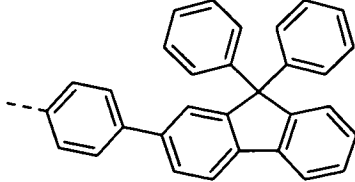
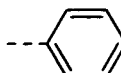
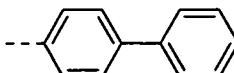
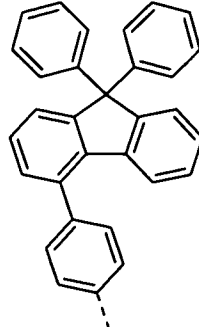
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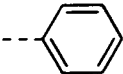
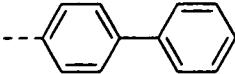
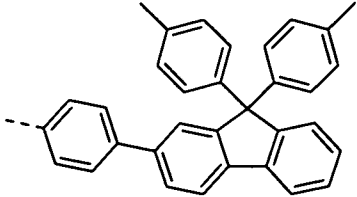
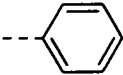
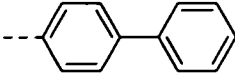
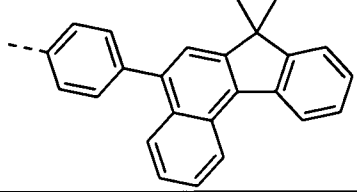
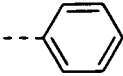
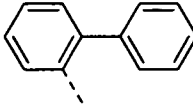
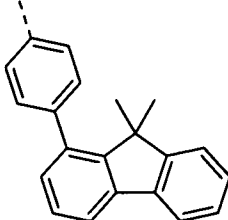
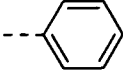
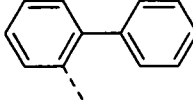
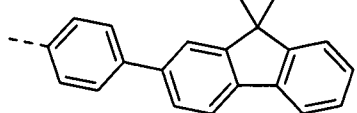
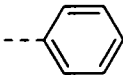
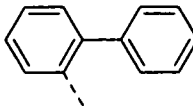
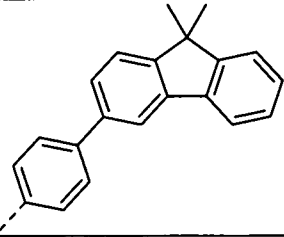
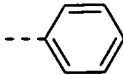
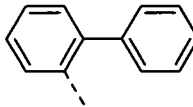
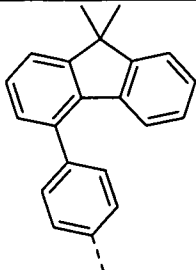
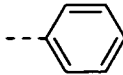
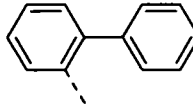
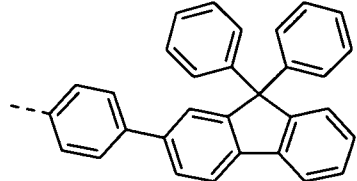
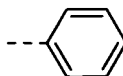
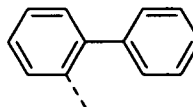
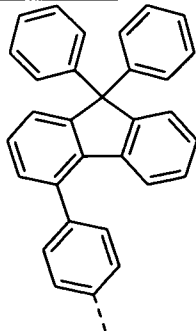
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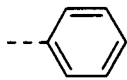
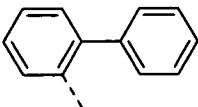
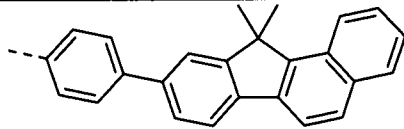
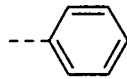
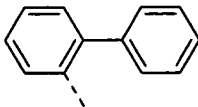
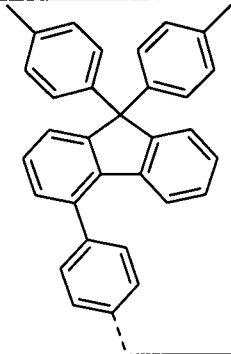
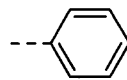
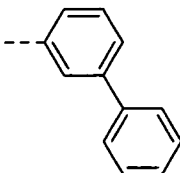
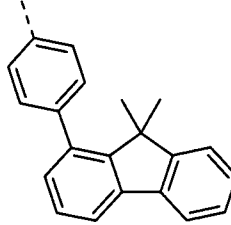
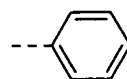
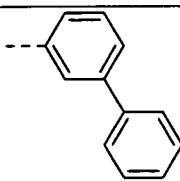
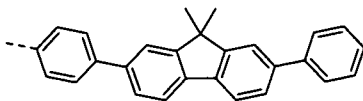
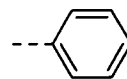
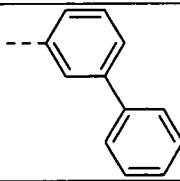
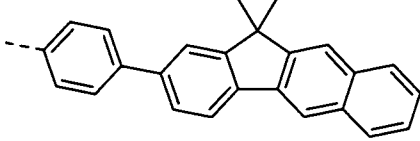
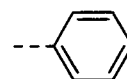
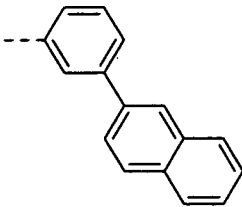
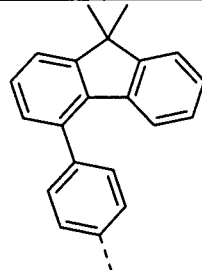
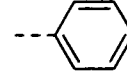
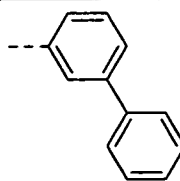
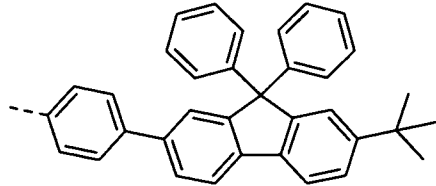
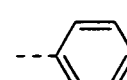
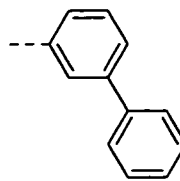
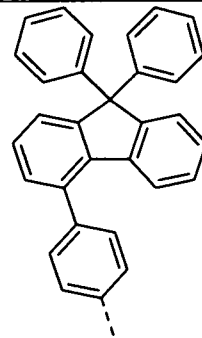
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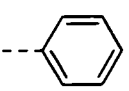
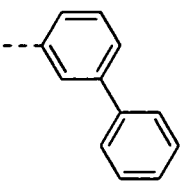
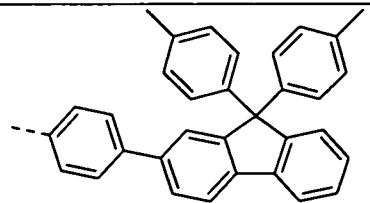
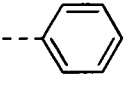
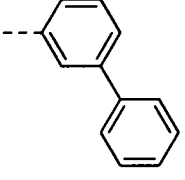
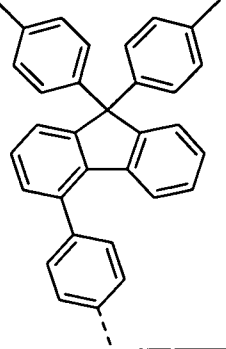
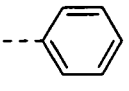
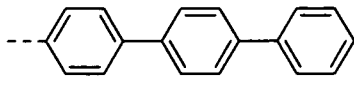
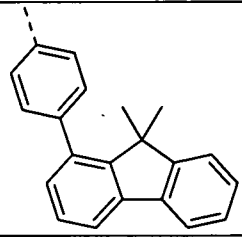
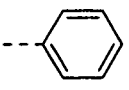
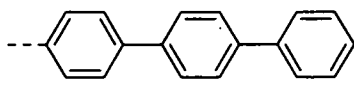
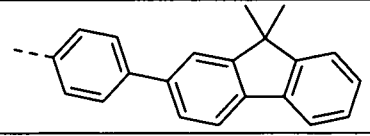
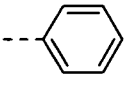
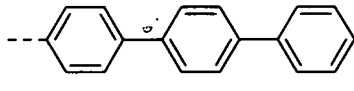
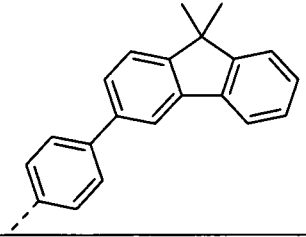
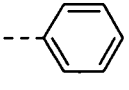
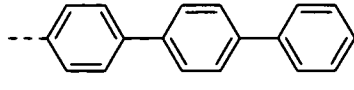
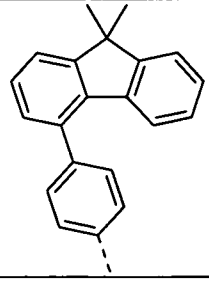
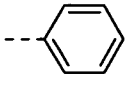
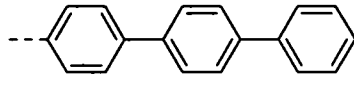
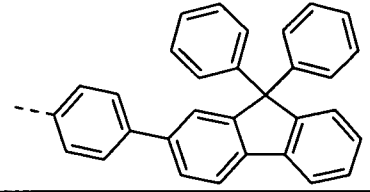
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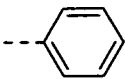
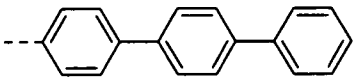
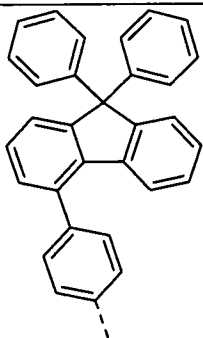
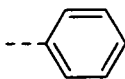
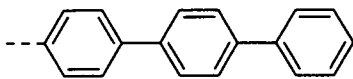
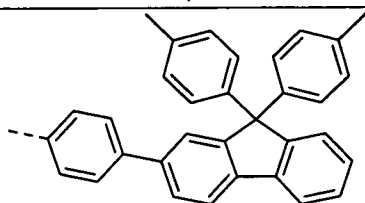
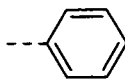
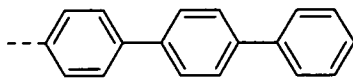
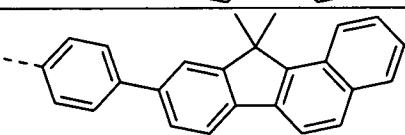
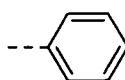
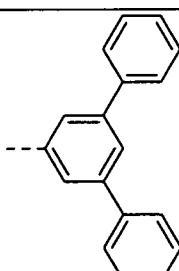
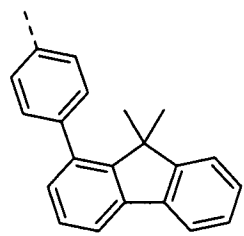
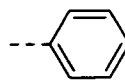
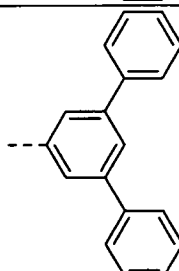
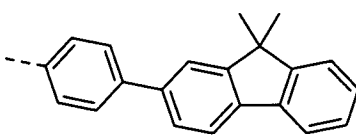
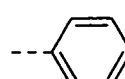
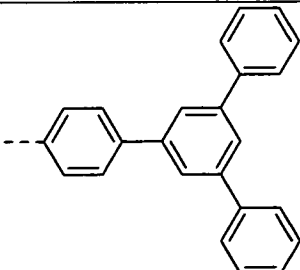
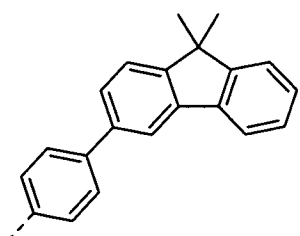
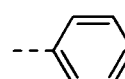
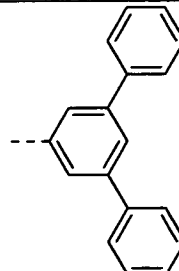
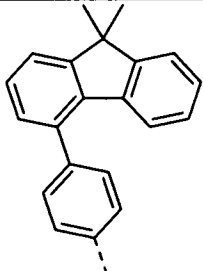
【0199】 根據本發明之例示性實施例，式 1 化合物可為由以下化合物 2-1 至化合物 2-363 中選出之任一者。

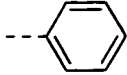
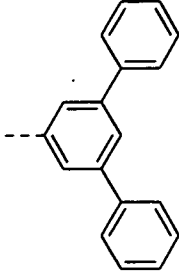
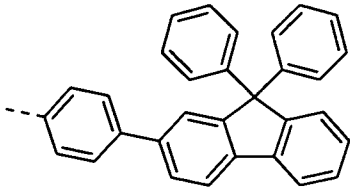
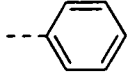
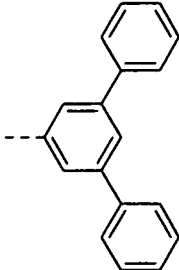
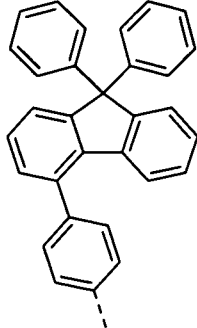
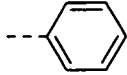
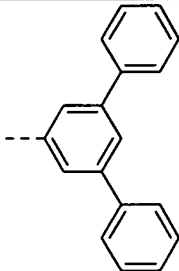
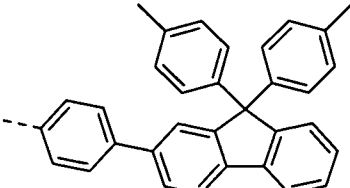
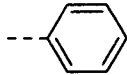
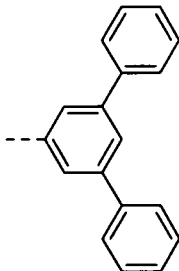
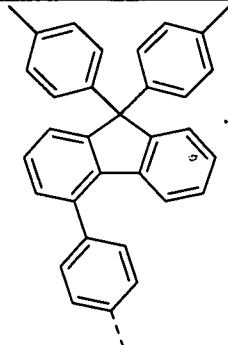
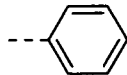
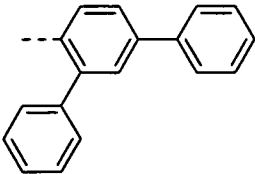
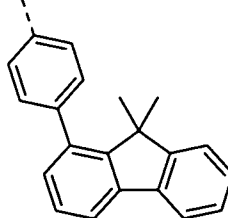
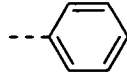
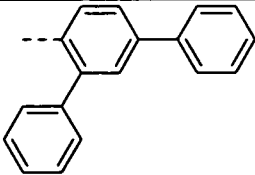
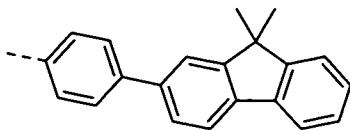
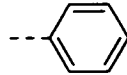
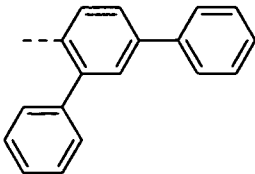
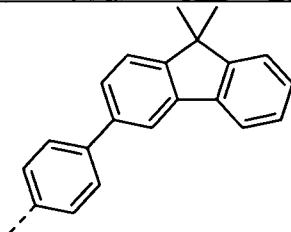
化合物	---Ar1	---Ar2	---Ar3
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2-2			
2-3			
2-4			
2-5			
2-6			

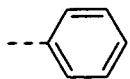
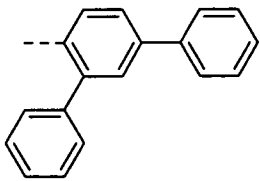
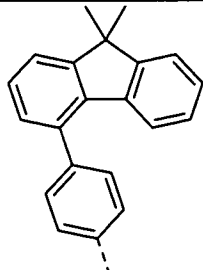
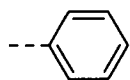
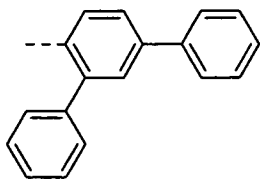
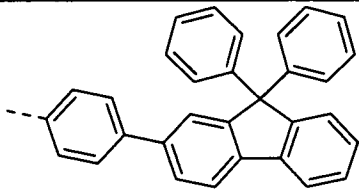
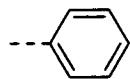
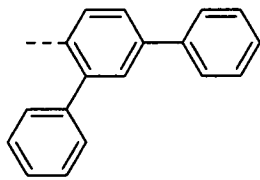
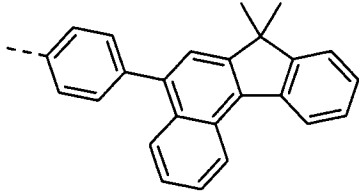
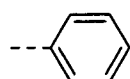
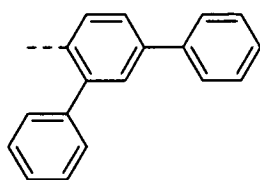
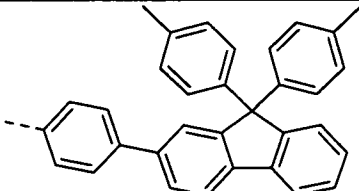
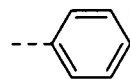
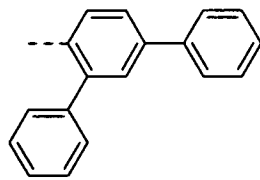
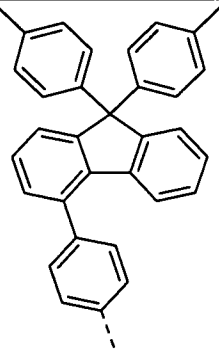
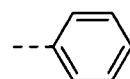
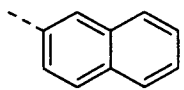
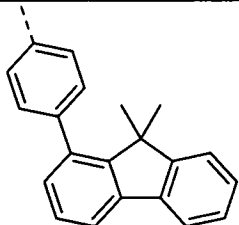
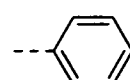
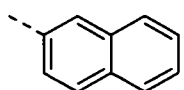
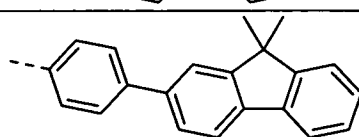
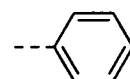
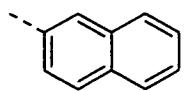
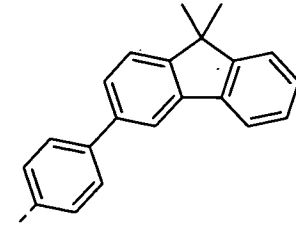
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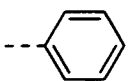
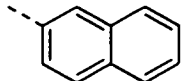
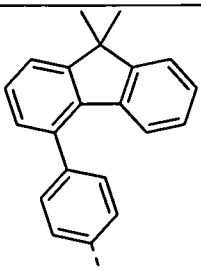
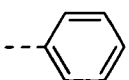
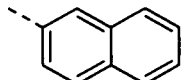
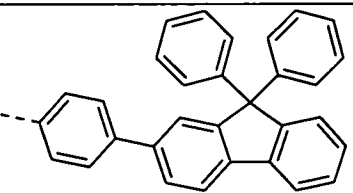
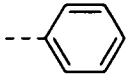
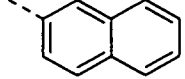
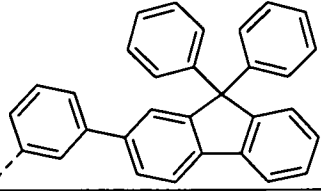
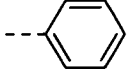
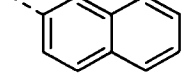
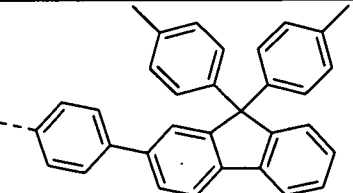
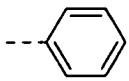
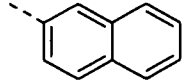
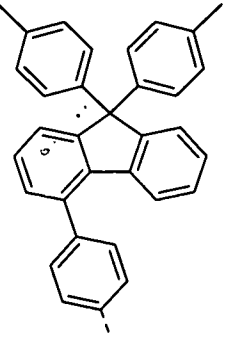
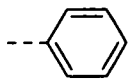
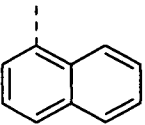
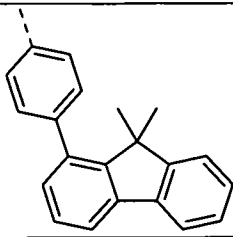
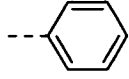
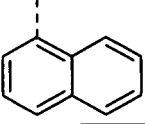
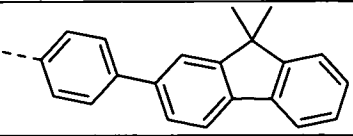
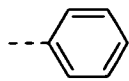
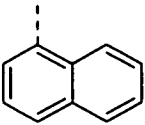
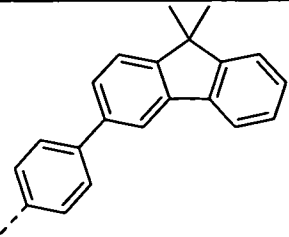
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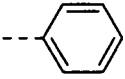
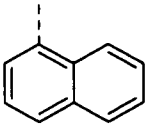
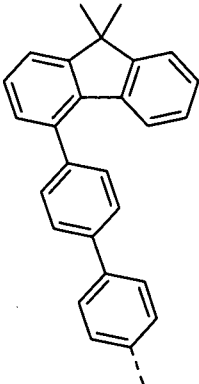
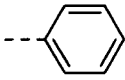
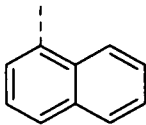
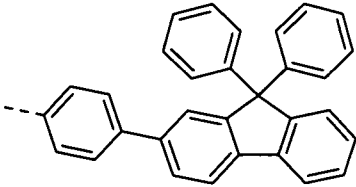
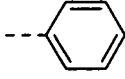
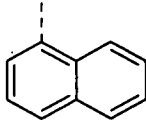
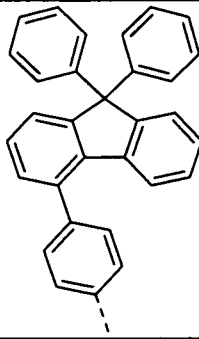
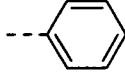
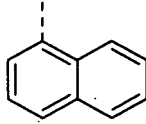
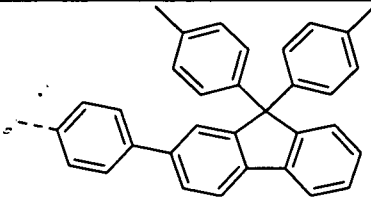
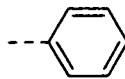
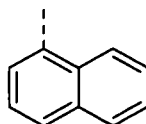
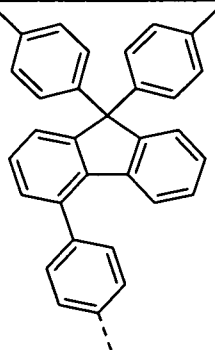
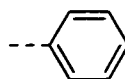
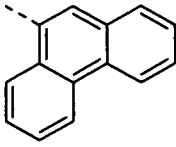
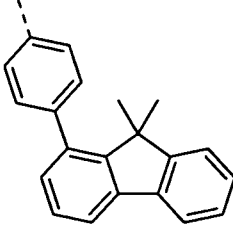
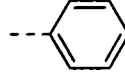
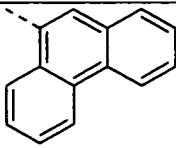
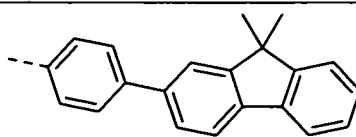
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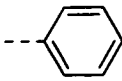
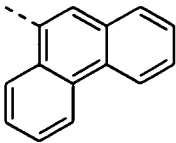
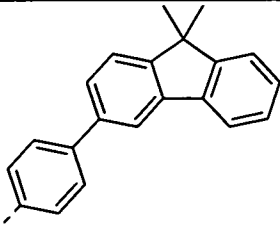
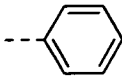
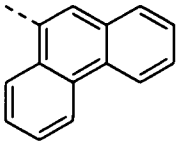
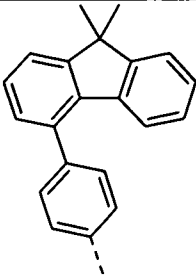
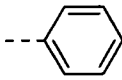
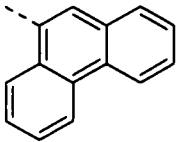
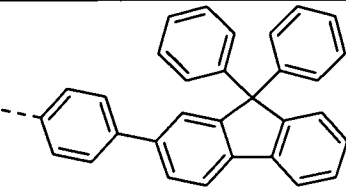
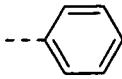
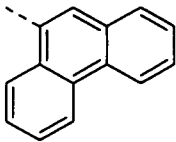
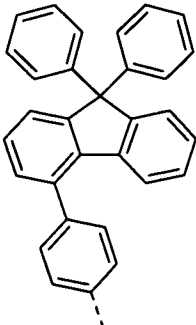
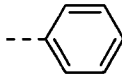
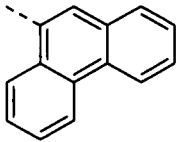
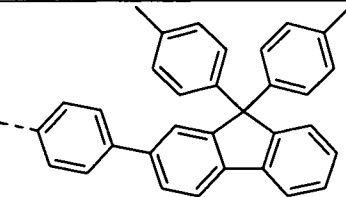
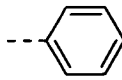
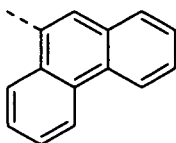
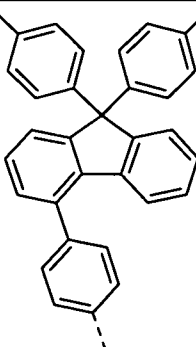
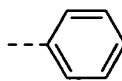
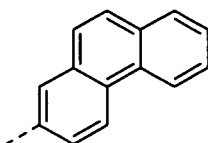
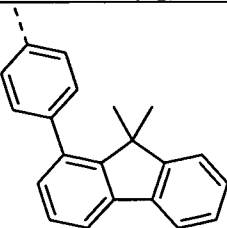
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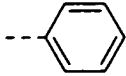
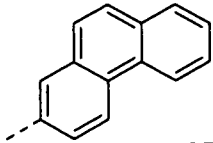
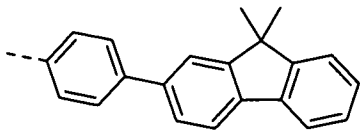
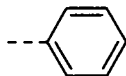
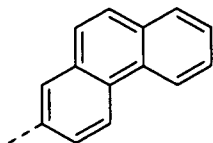
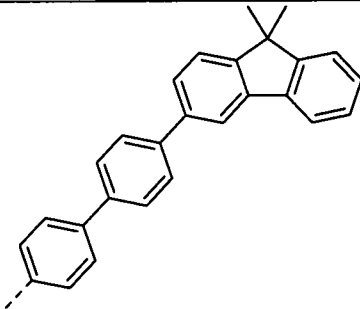
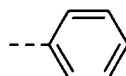
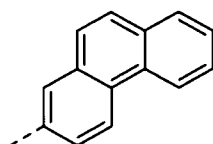
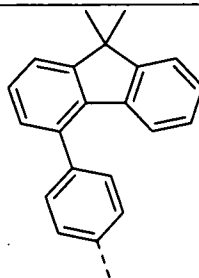
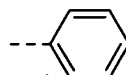
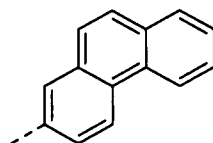
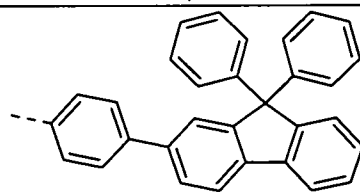
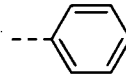
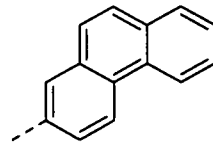
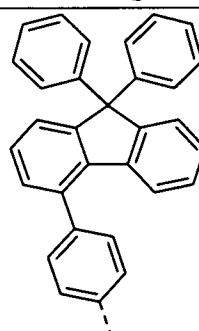
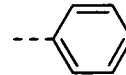
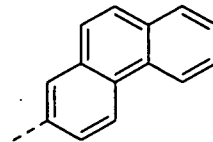
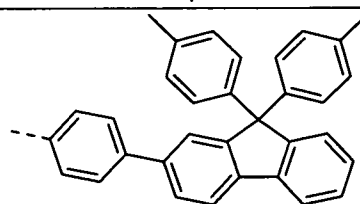
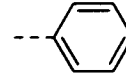
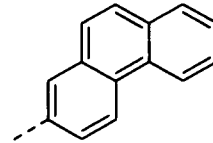
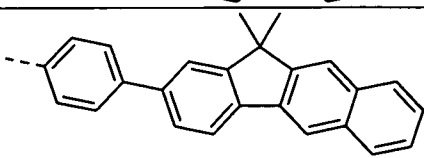
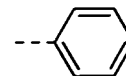
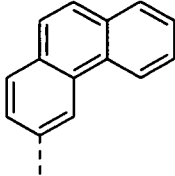
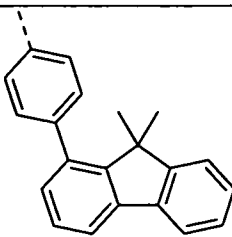
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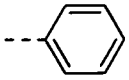
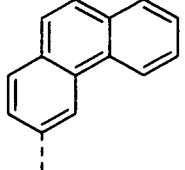
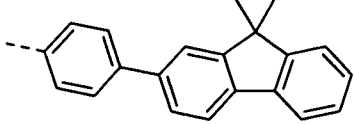
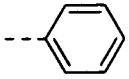
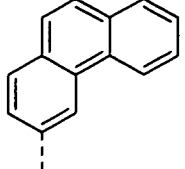
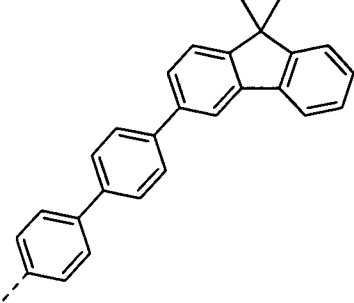
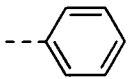
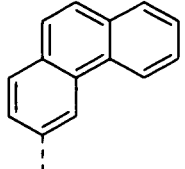
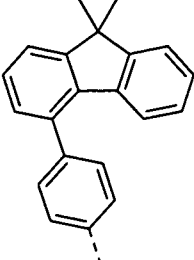
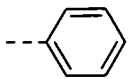
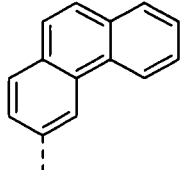
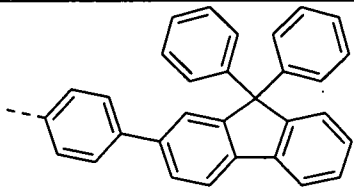
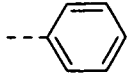
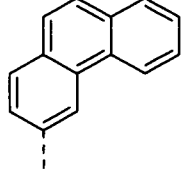
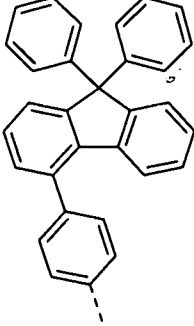
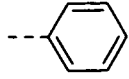
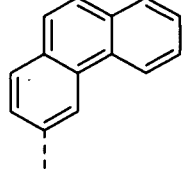
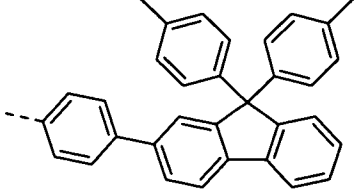
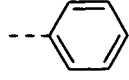
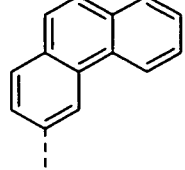
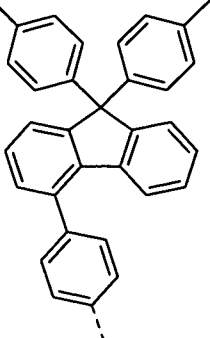
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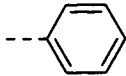
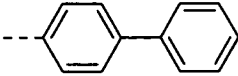
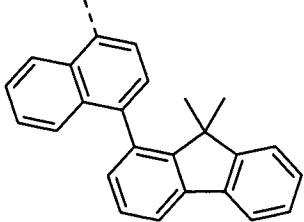
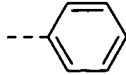
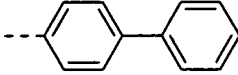
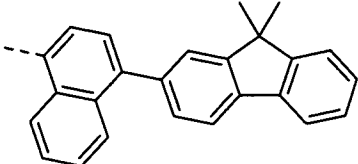
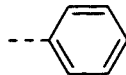
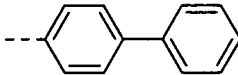
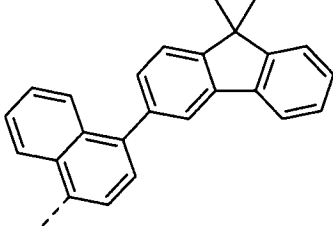
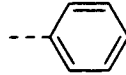
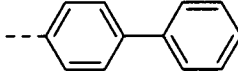
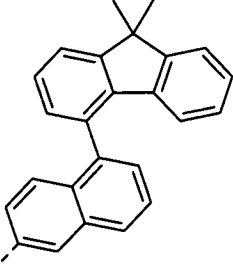
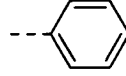
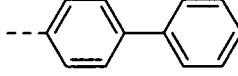
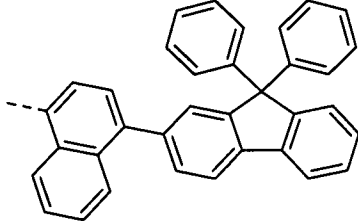
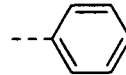
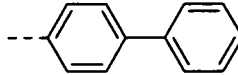
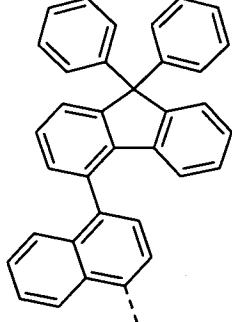
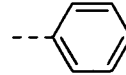
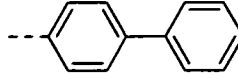
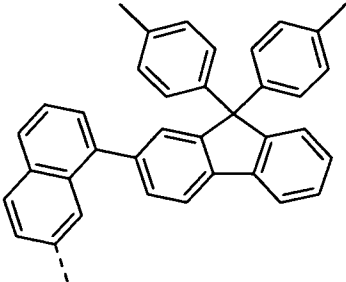
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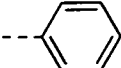
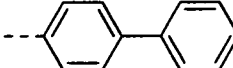
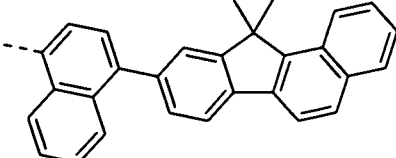
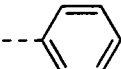
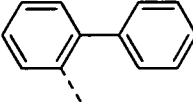
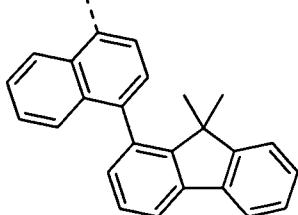
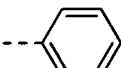
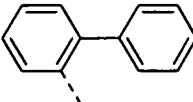
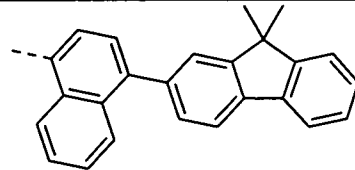
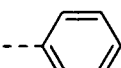
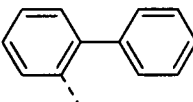
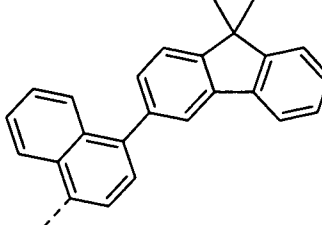
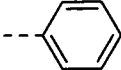
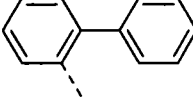
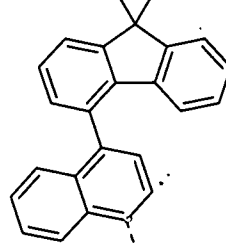
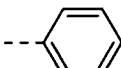
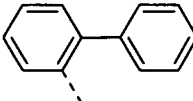
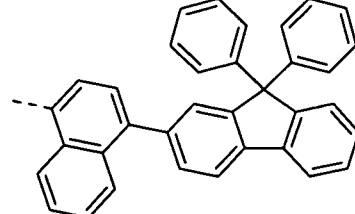
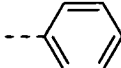
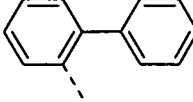
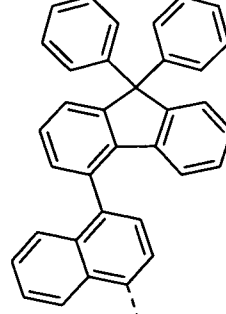
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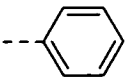
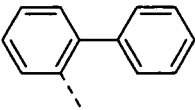
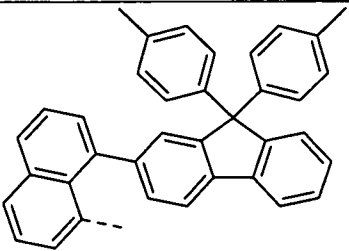
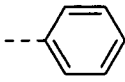
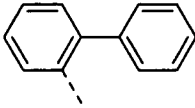
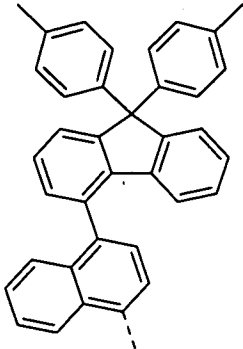
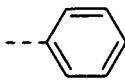
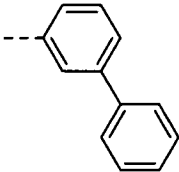
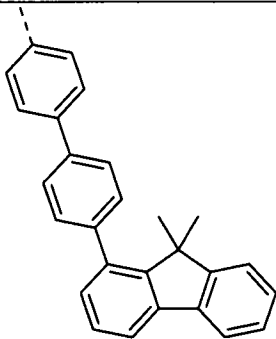
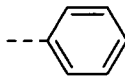
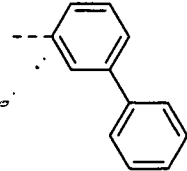
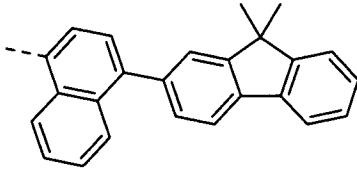
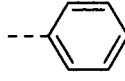
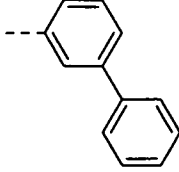
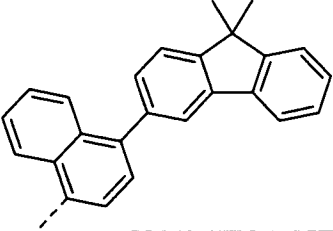
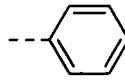
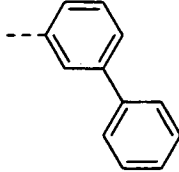
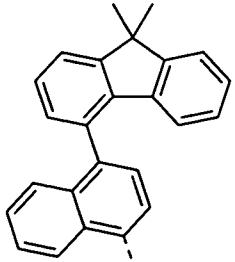
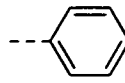
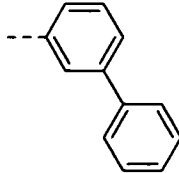
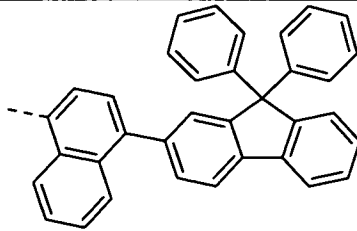
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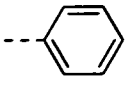
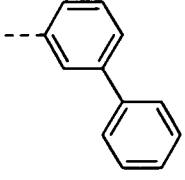
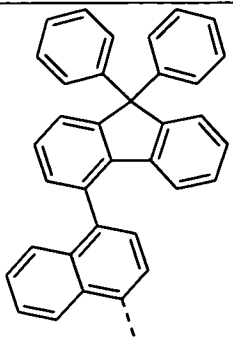
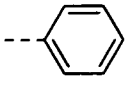
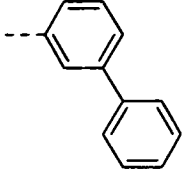
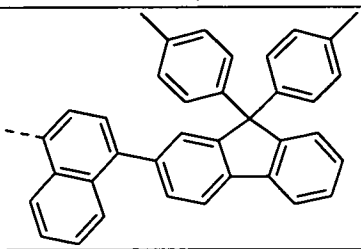
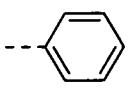
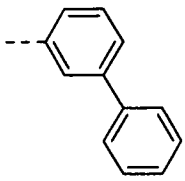
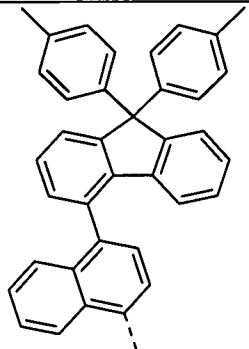
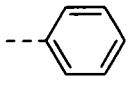
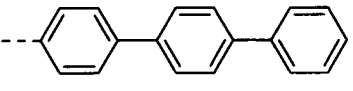
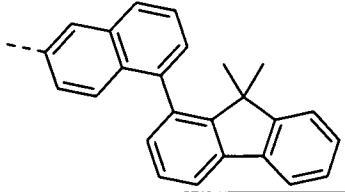
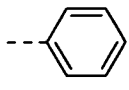
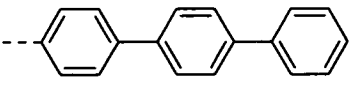
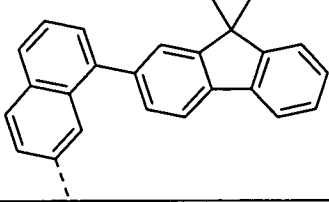
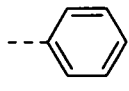
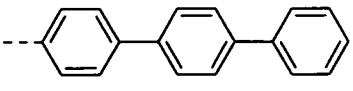
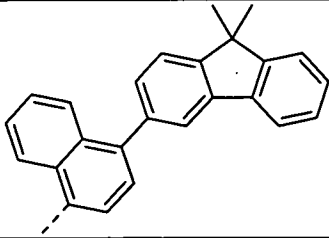
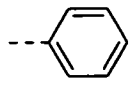
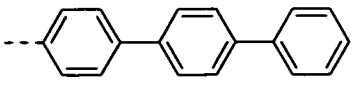
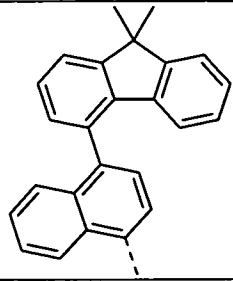
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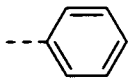
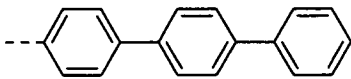
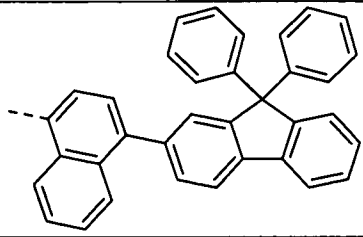
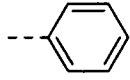
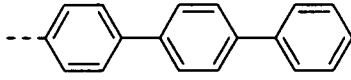
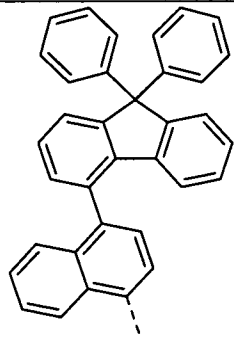
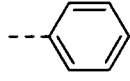
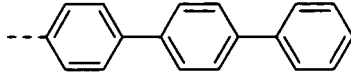
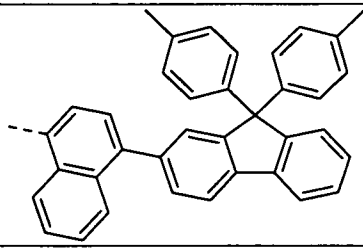
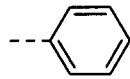
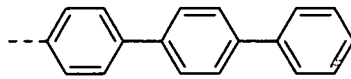
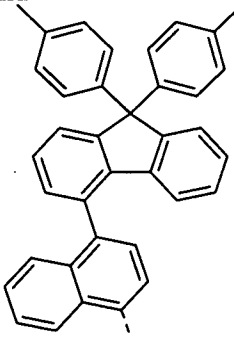
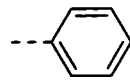
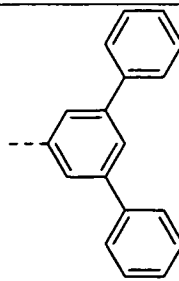
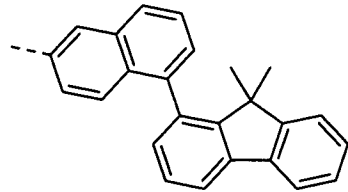
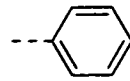
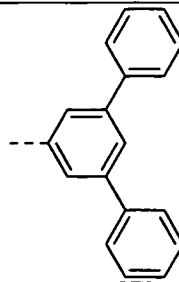
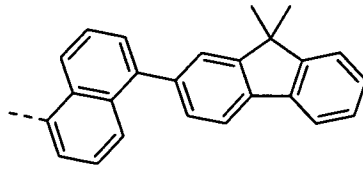
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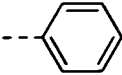
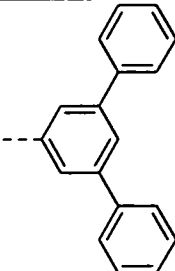
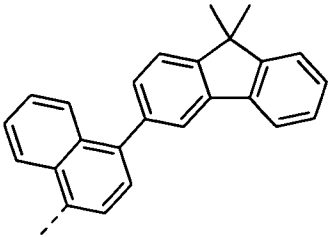
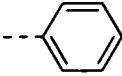
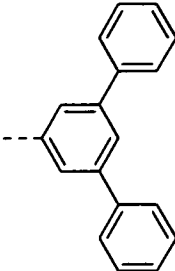
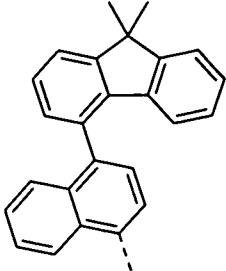
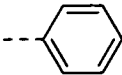
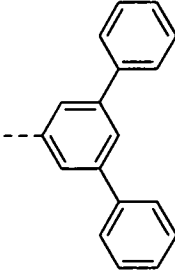
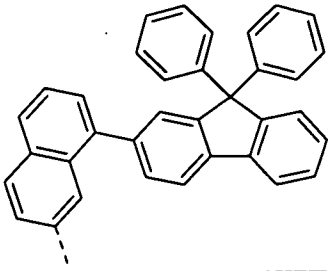
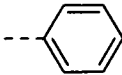
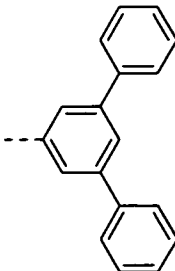
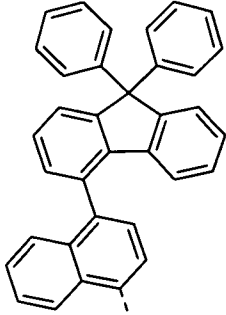
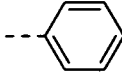
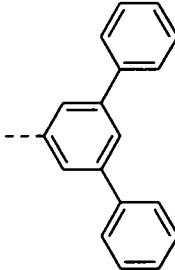
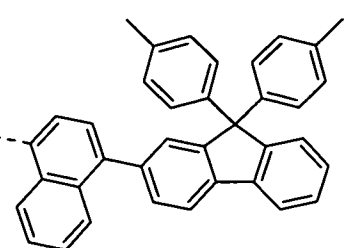
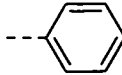
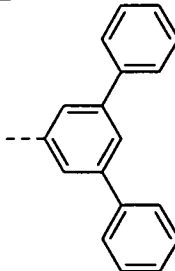
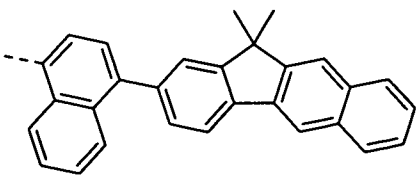
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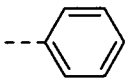
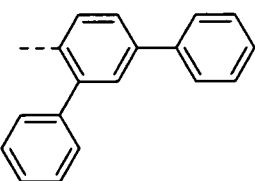
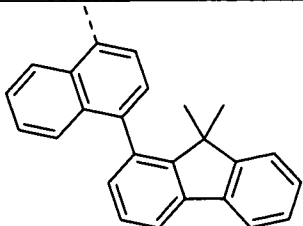
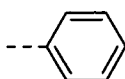
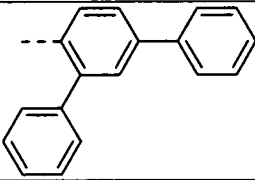
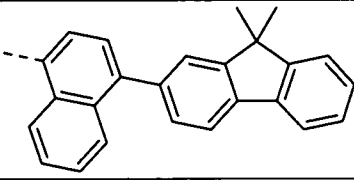
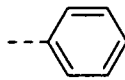
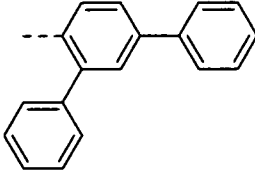
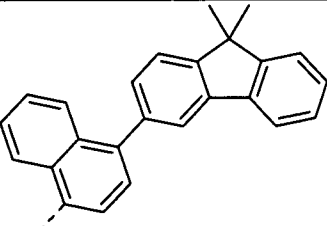
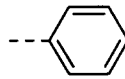
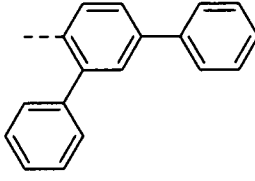
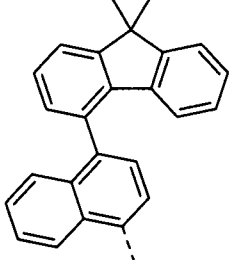
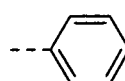
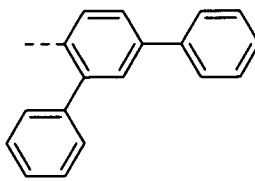
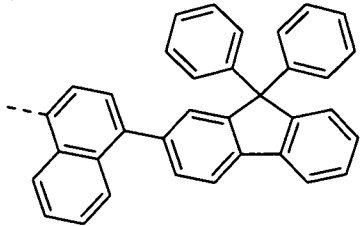
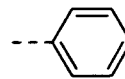
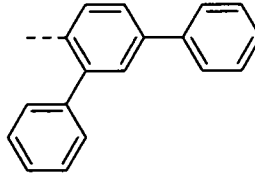
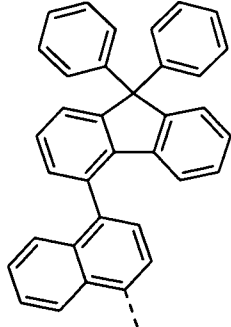
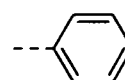
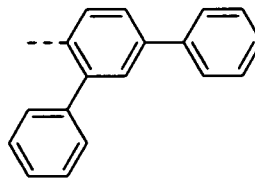
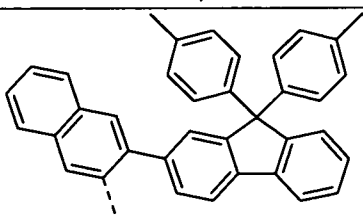
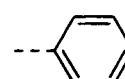
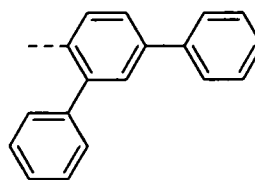
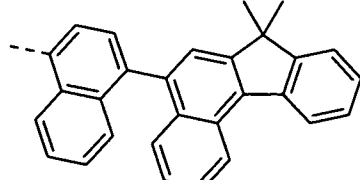
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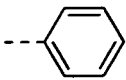
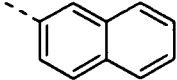
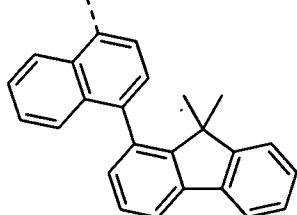
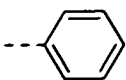
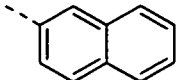
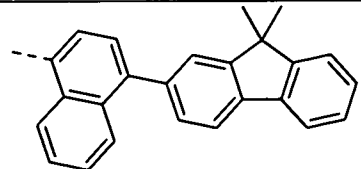
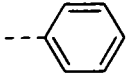
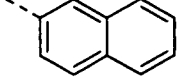
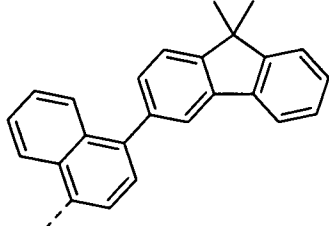
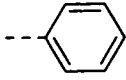
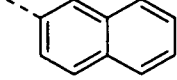
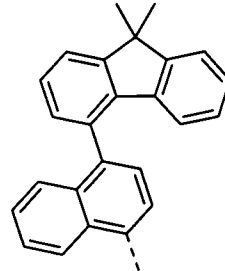
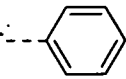
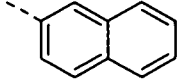
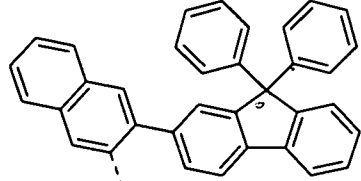
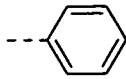
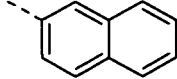
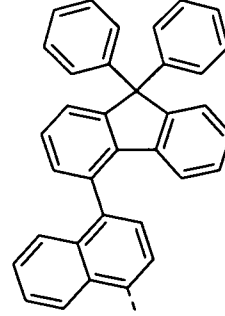
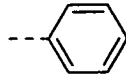
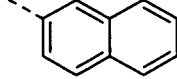
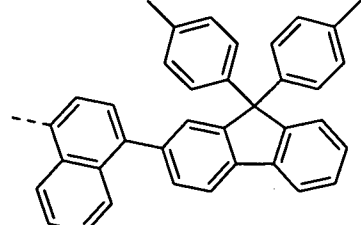
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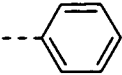
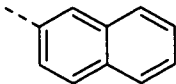
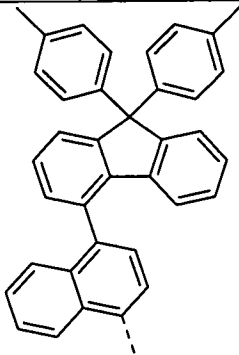
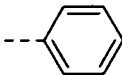
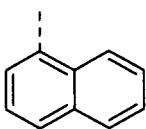
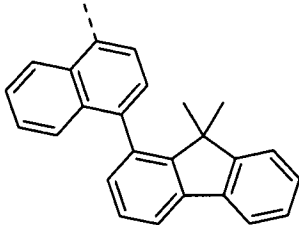
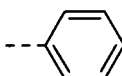
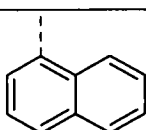
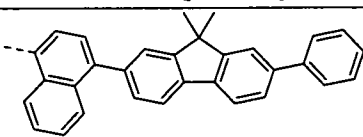
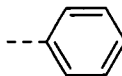
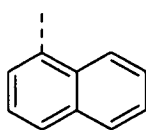
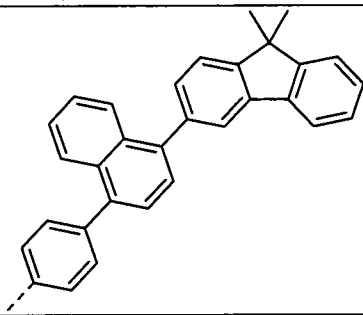
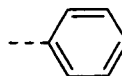
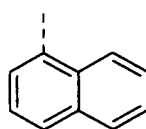
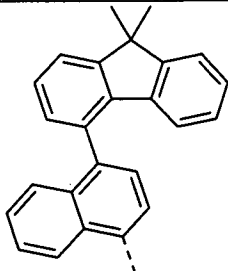
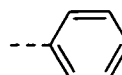
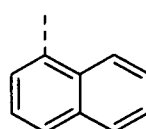
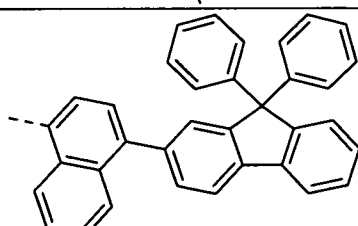
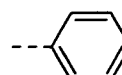
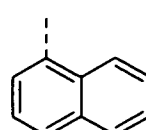
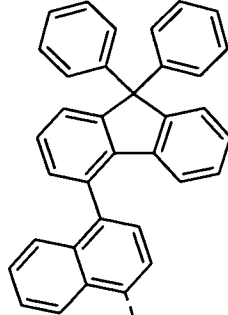
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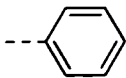
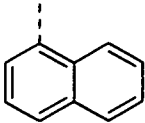
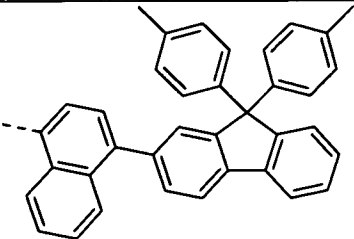
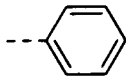
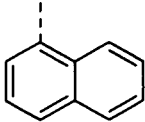
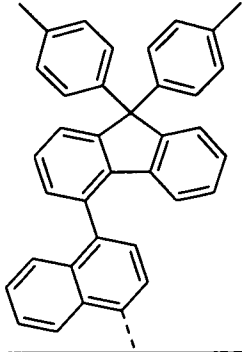
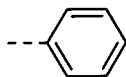
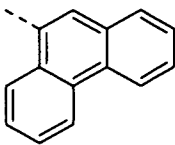
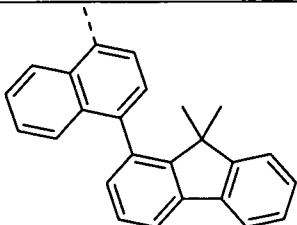
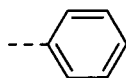
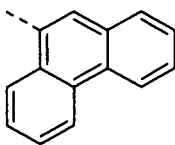
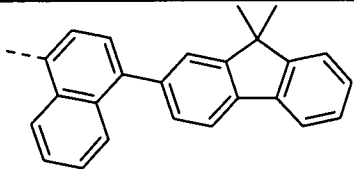
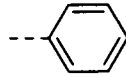
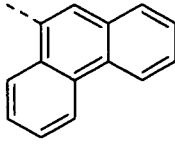
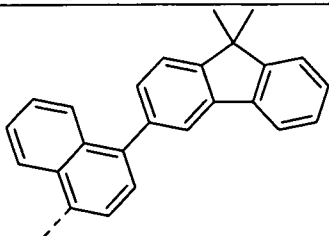
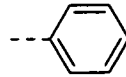
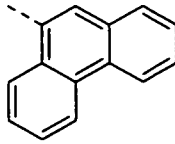
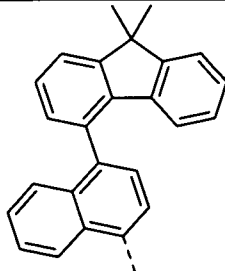
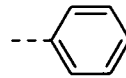
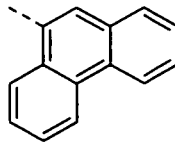
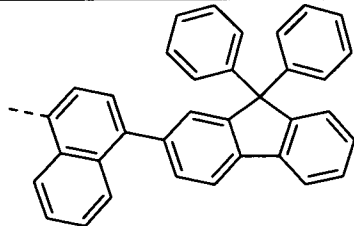
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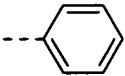
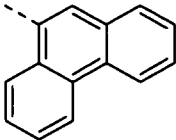
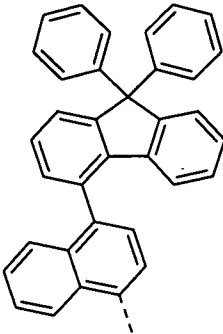
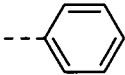
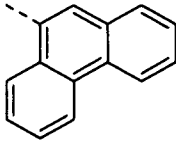
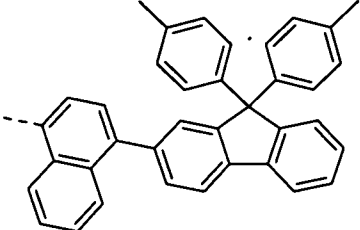
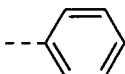
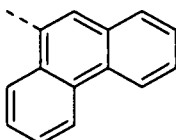
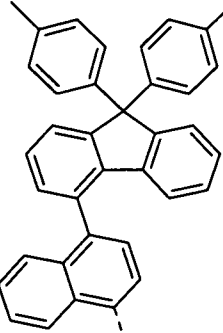
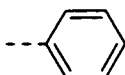
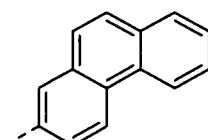
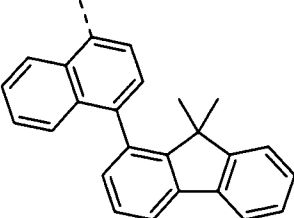
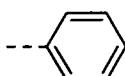
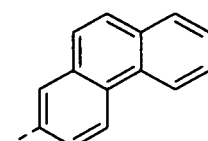
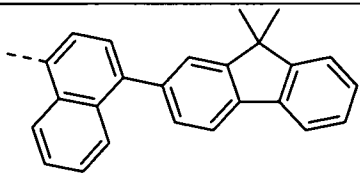
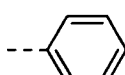
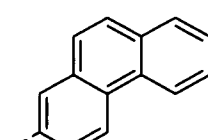
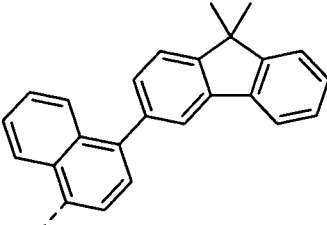
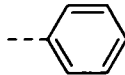
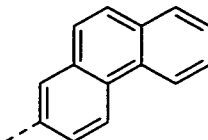
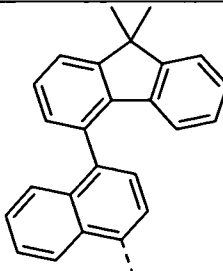
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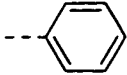
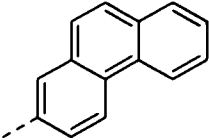
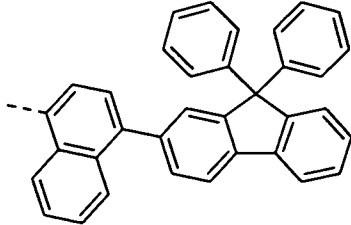
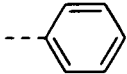
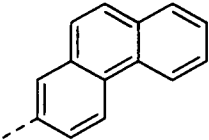
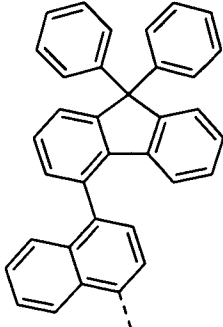
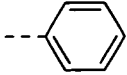
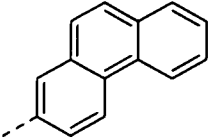
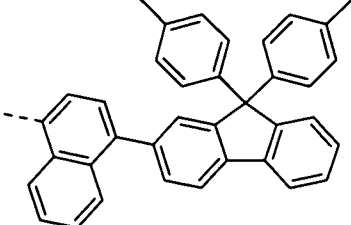
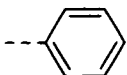
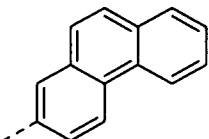
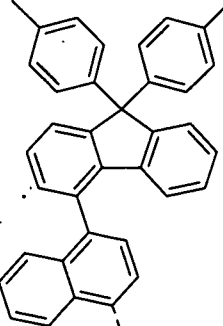
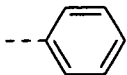
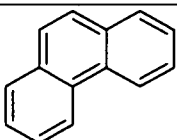
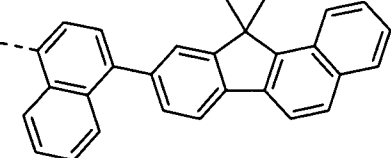
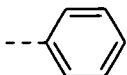
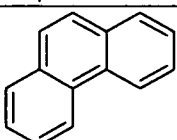
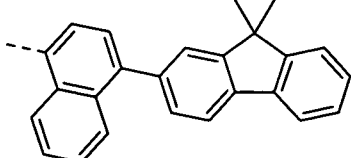
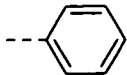
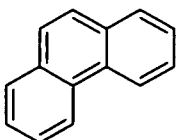
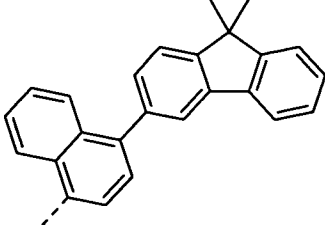
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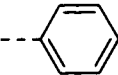
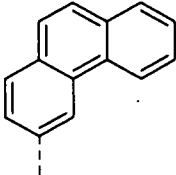
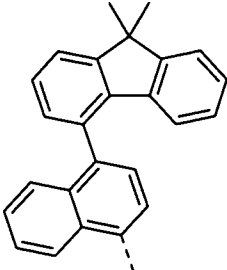
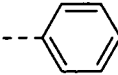
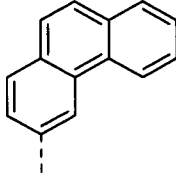
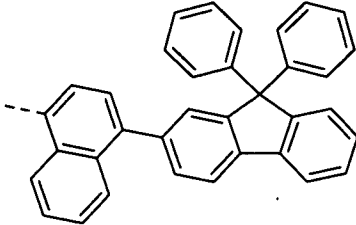
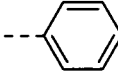
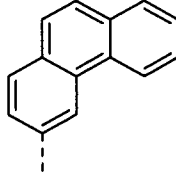
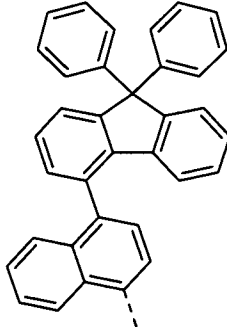
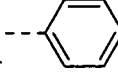
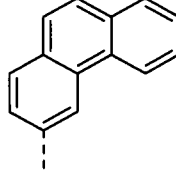
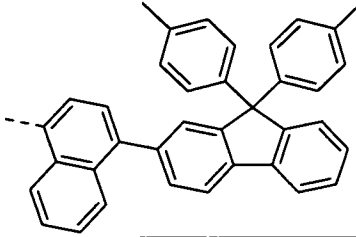
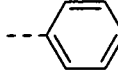
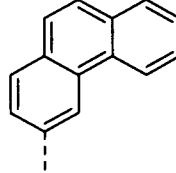
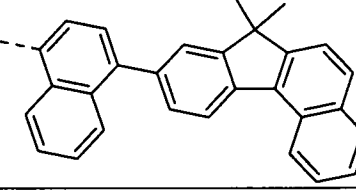
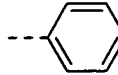
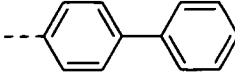
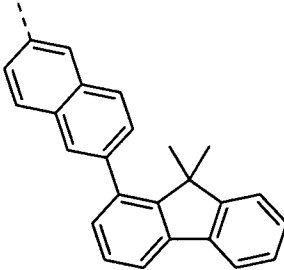
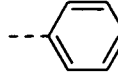
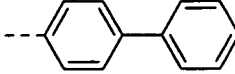
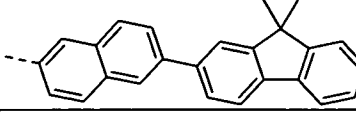
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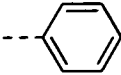
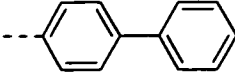
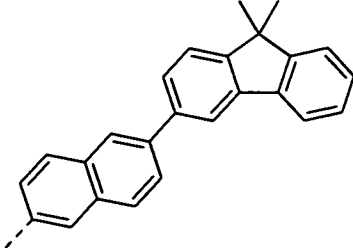
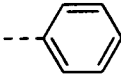
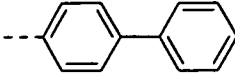
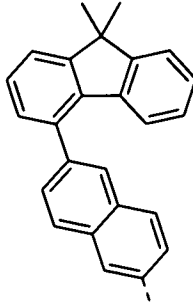
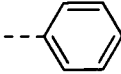
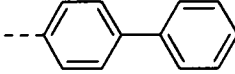
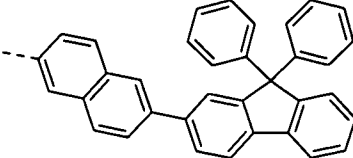
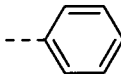
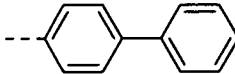
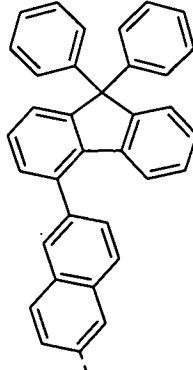
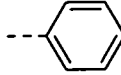
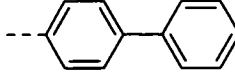
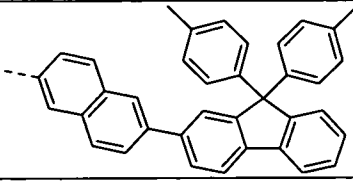
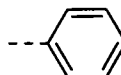
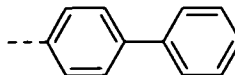
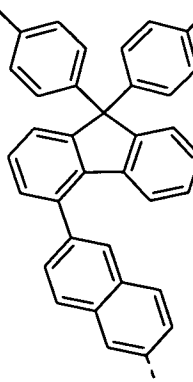
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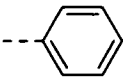
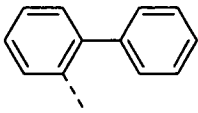
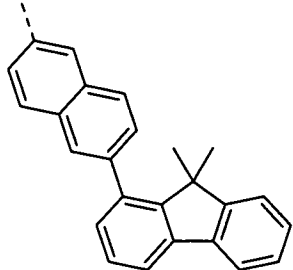
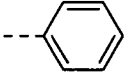
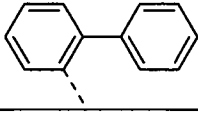
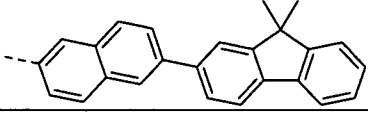
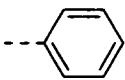
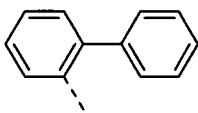
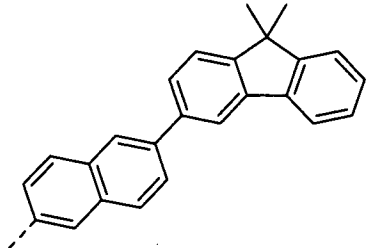
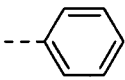
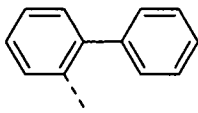
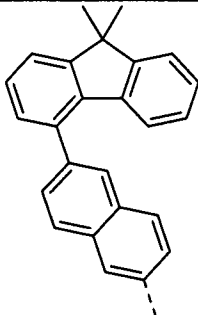
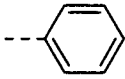
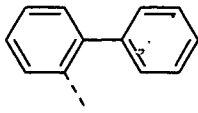
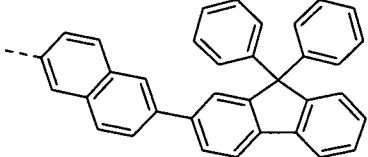
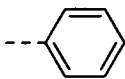
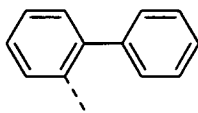
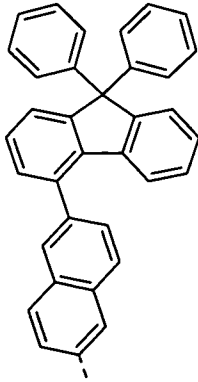
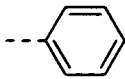
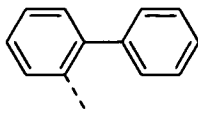
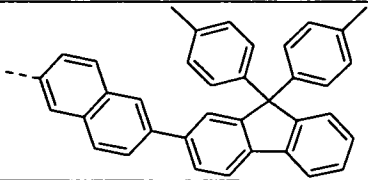
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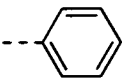
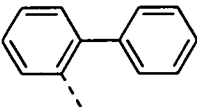
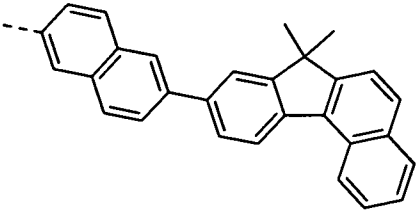
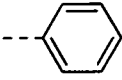
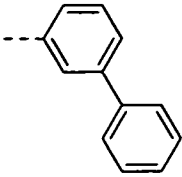
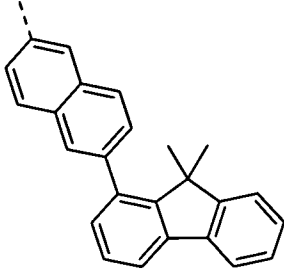
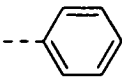
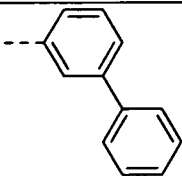
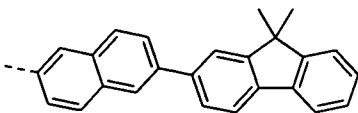
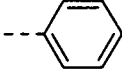
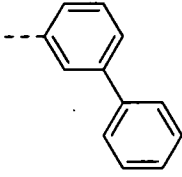
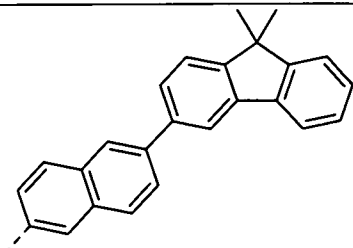
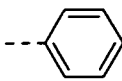
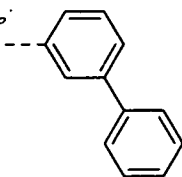
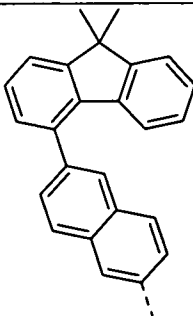
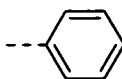
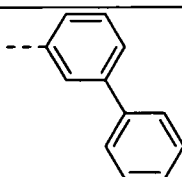
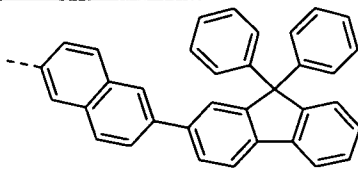
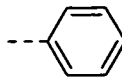
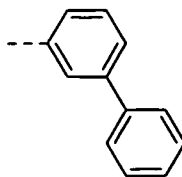
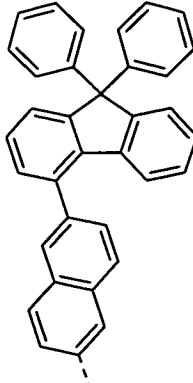
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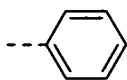
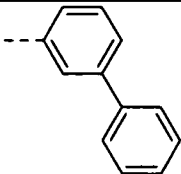
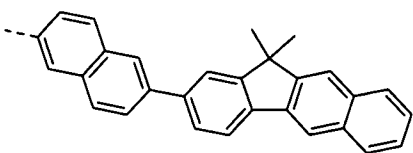
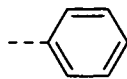
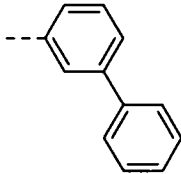
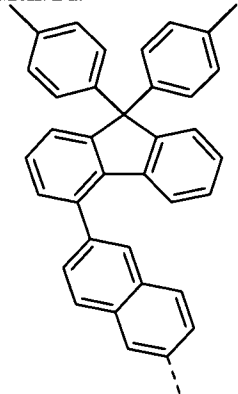
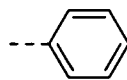
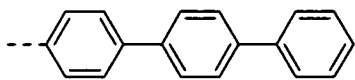
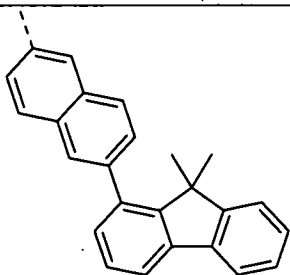
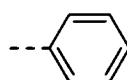
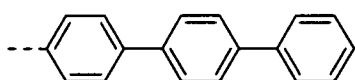
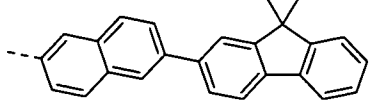
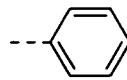
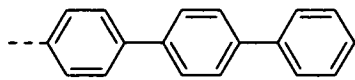
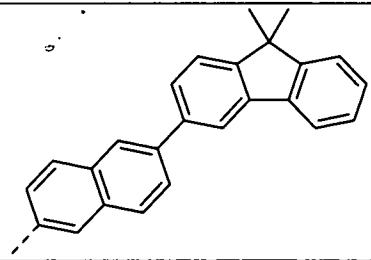
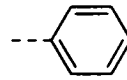
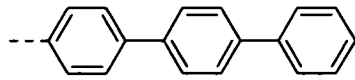
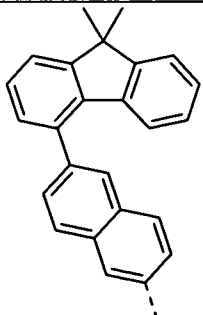
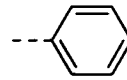
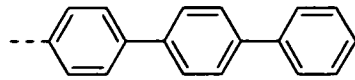
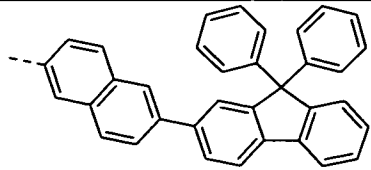
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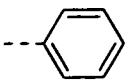
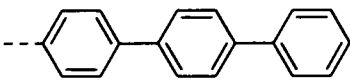
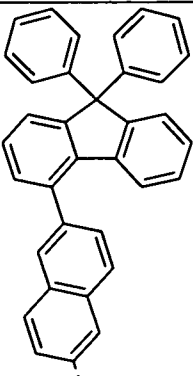
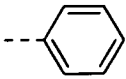
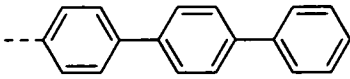
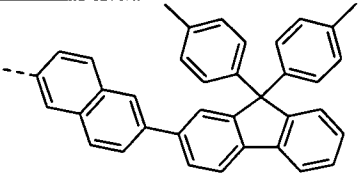
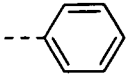
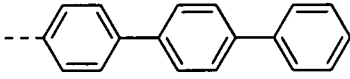
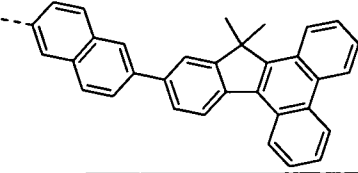
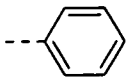
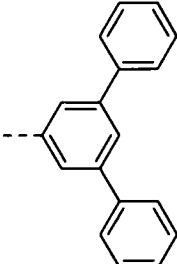
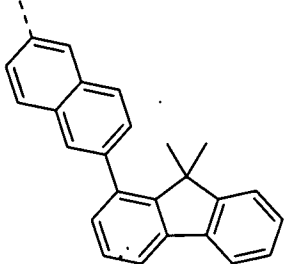
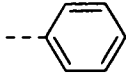
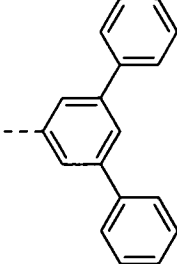
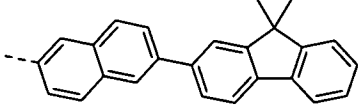
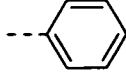
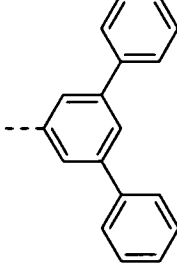
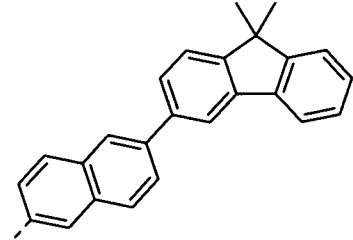
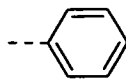
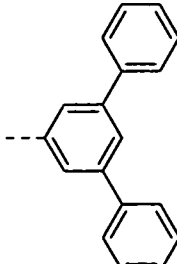
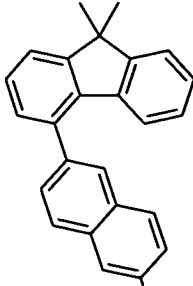
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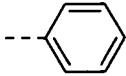
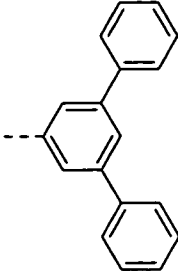
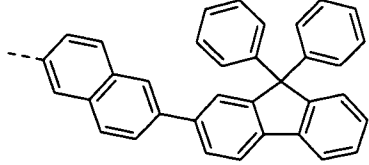
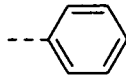
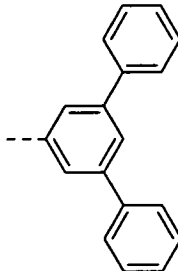
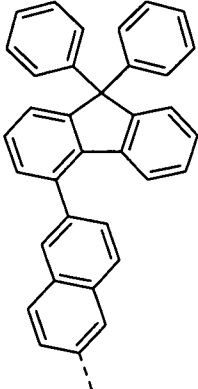
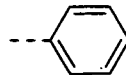
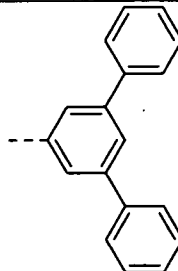
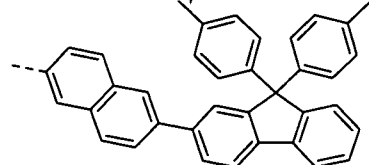
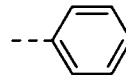
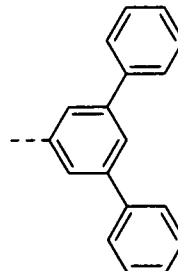
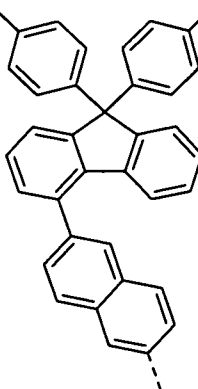
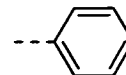
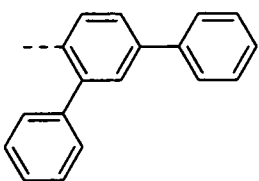
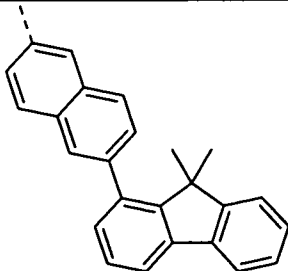
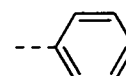
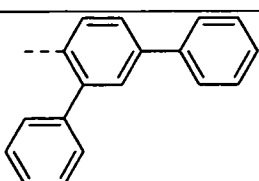
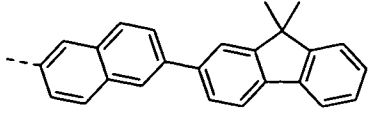
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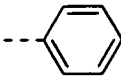
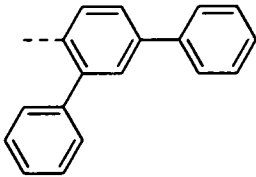
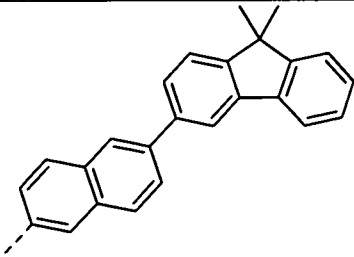
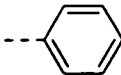
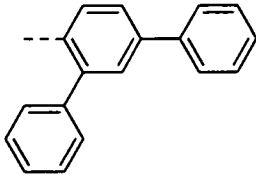
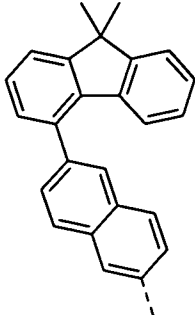
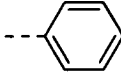
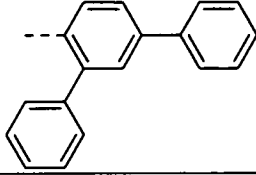
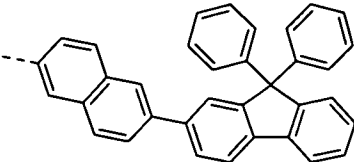
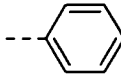
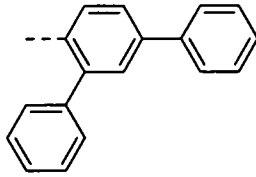
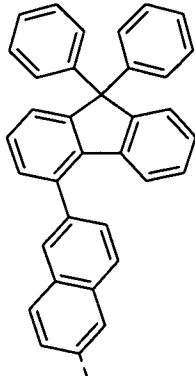
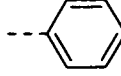
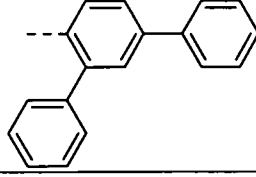
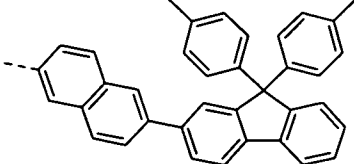
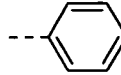
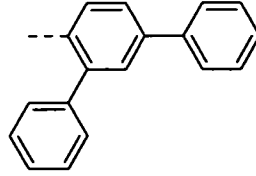
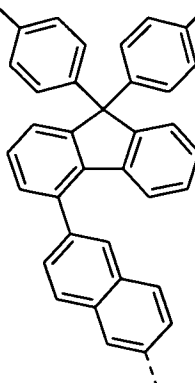
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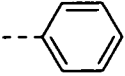
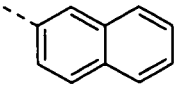
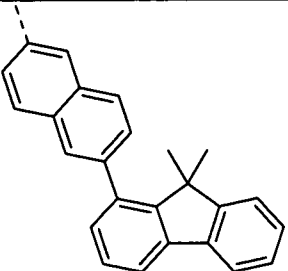
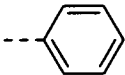
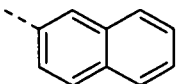
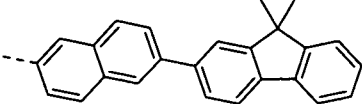
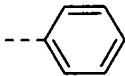
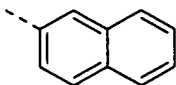
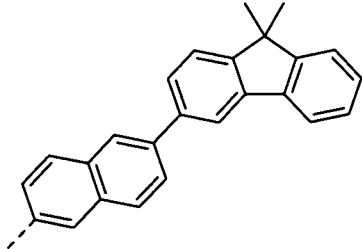
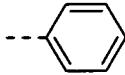
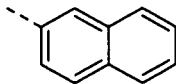
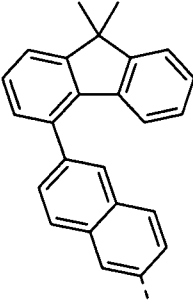
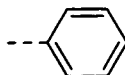
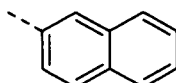
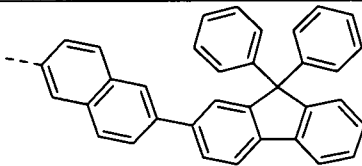
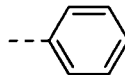
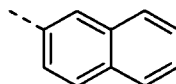
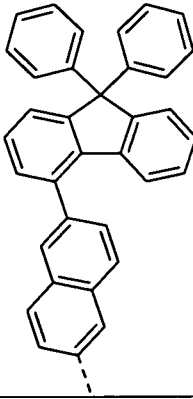
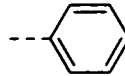
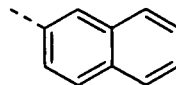
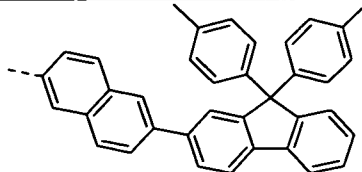
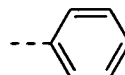
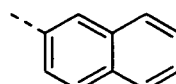
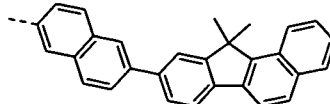
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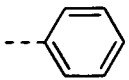
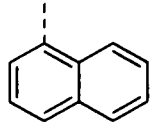
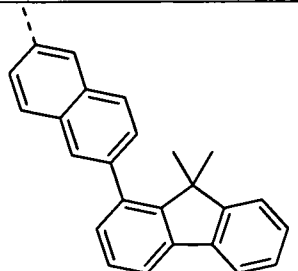
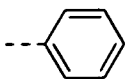
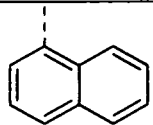
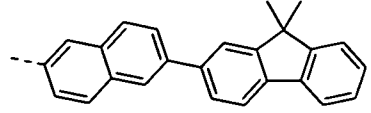
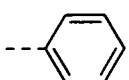
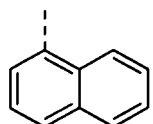
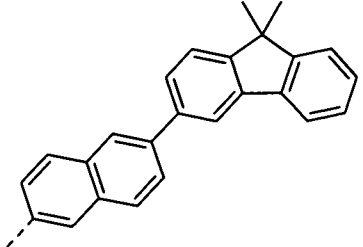
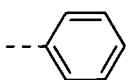
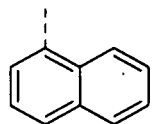
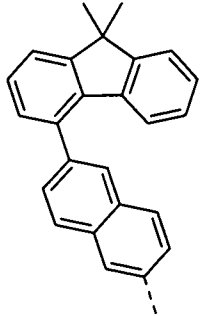
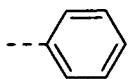
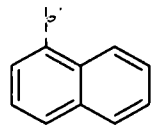
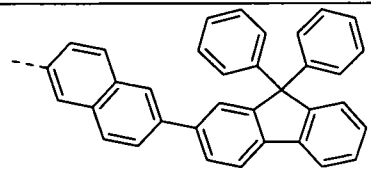
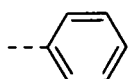
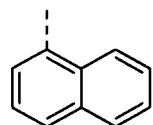
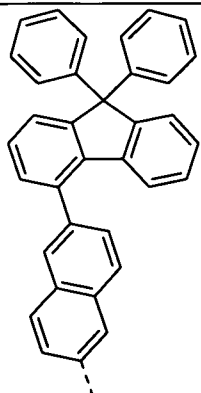
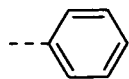
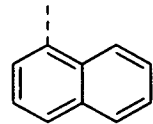
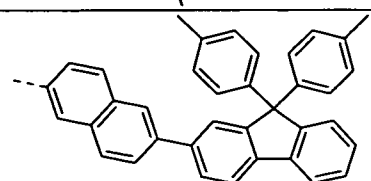
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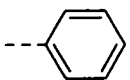
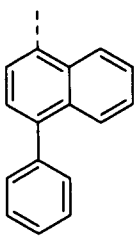
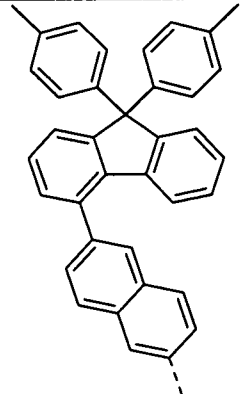
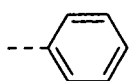
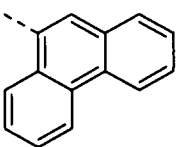
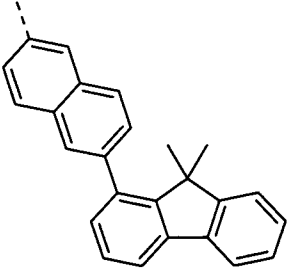
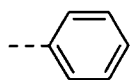
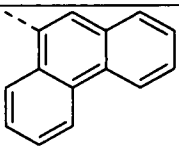
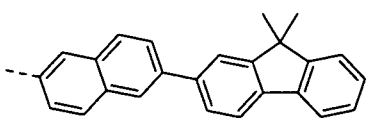
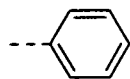
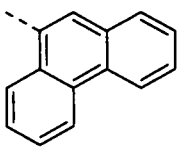
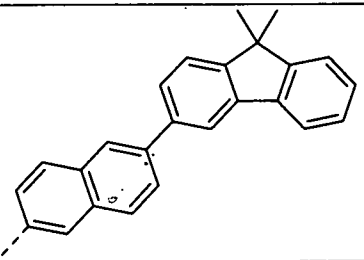
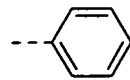
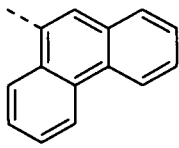
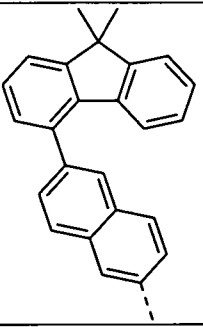
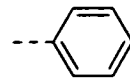
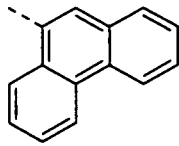
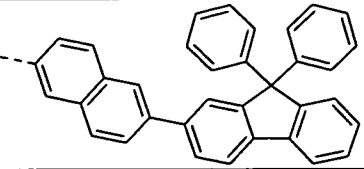
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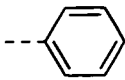
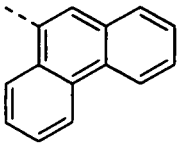
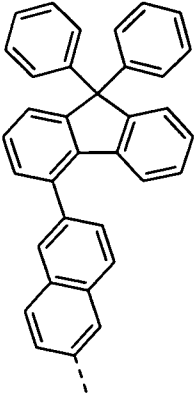
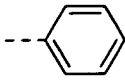
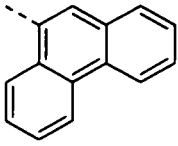
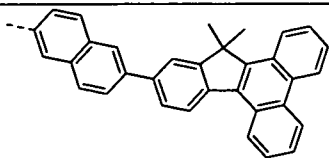
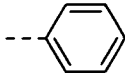
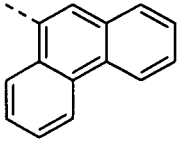
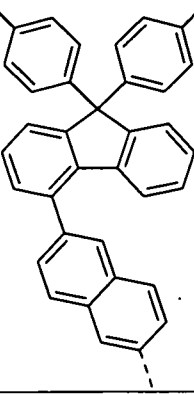
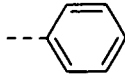
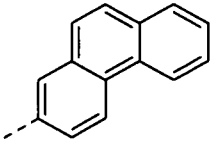
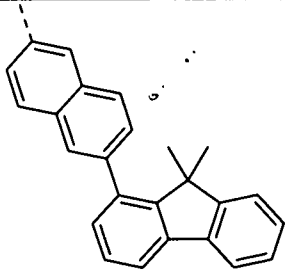
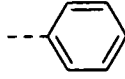
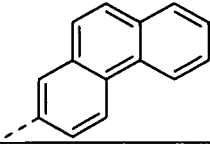
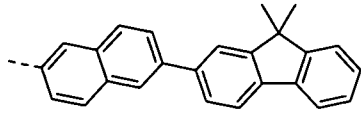
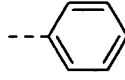
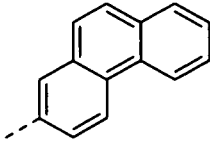
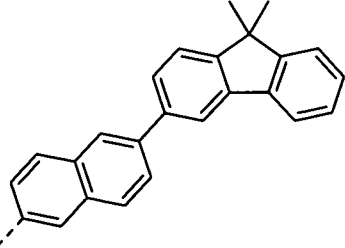
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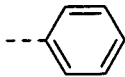
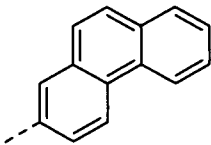
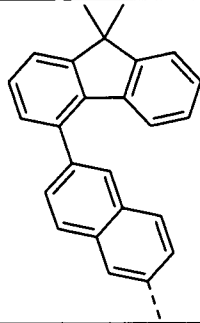
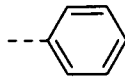
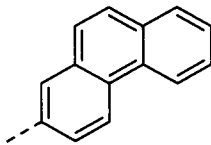
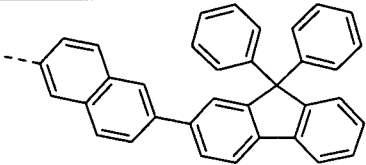
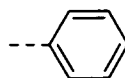
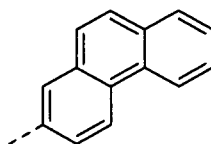
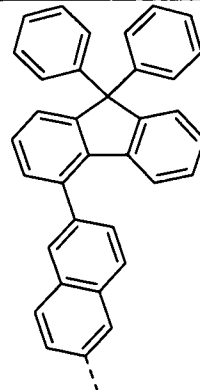
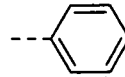
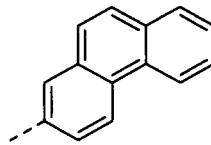
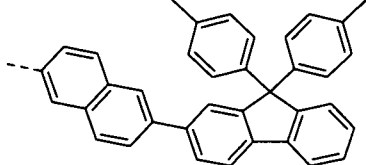
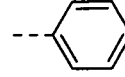
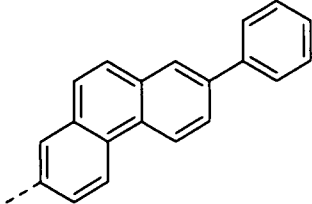
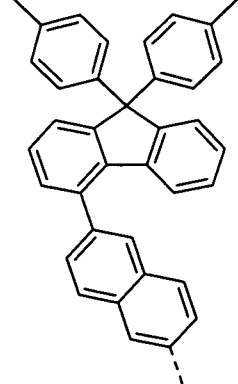
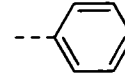
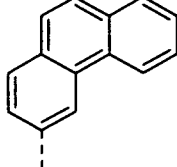
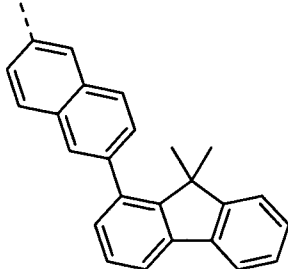
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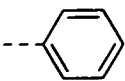
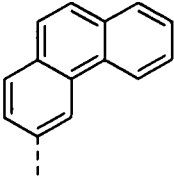
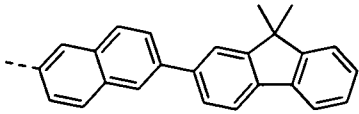
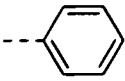
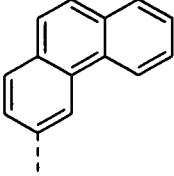
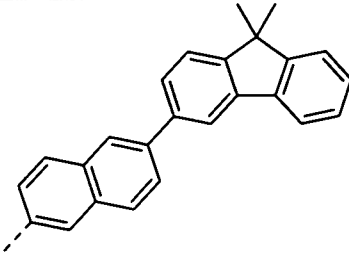
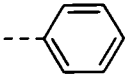
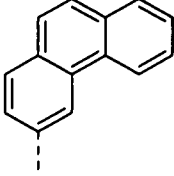
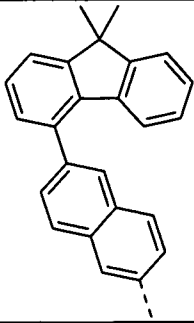
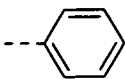
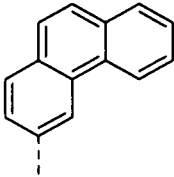
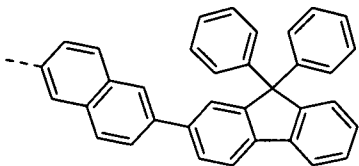
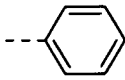
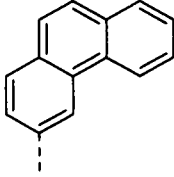
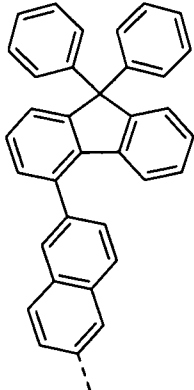
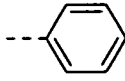
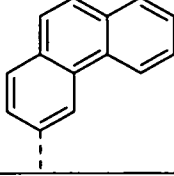
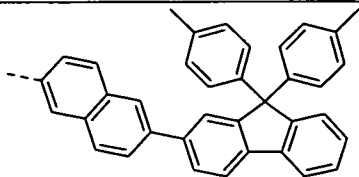
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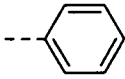
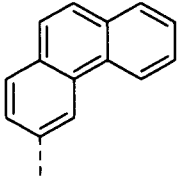
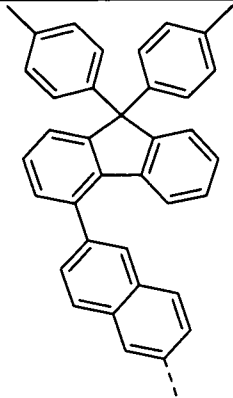
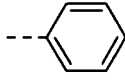
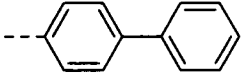
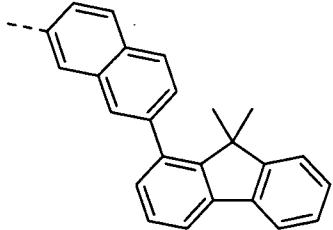
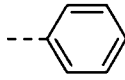
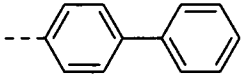
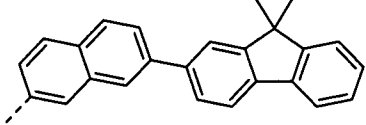
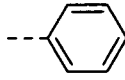
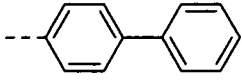
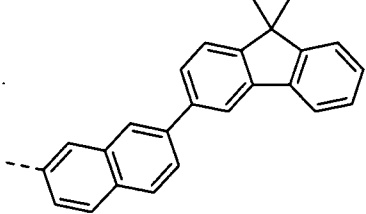
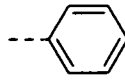
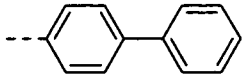
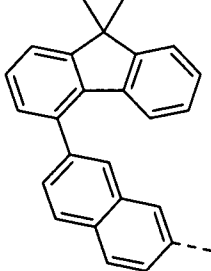
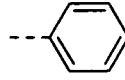
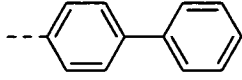
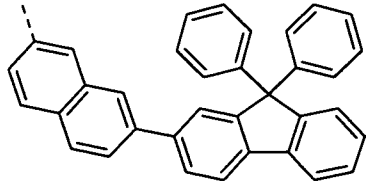
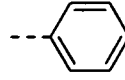
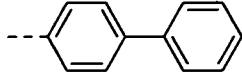
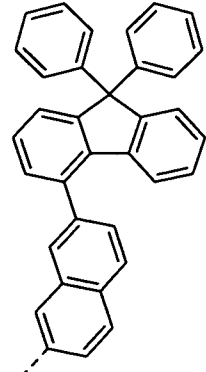
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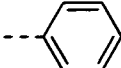
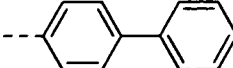
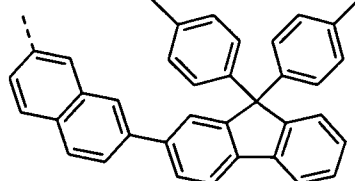
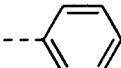
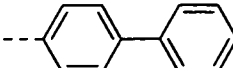
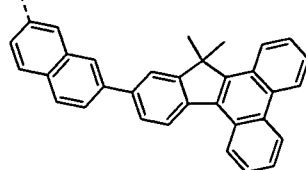
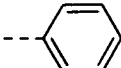
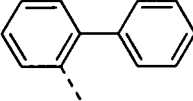
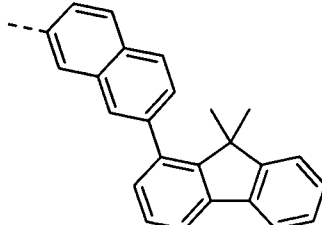
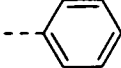
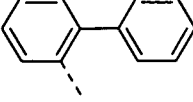
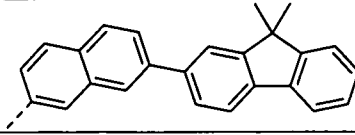
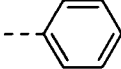
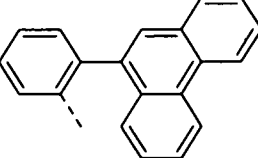
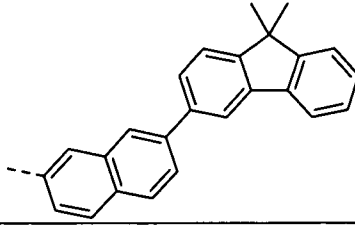
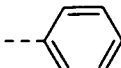
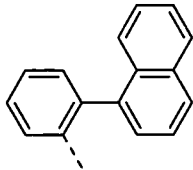
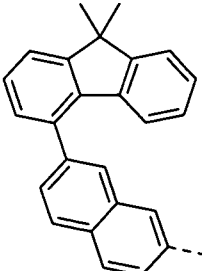
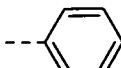
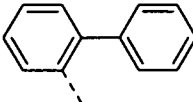
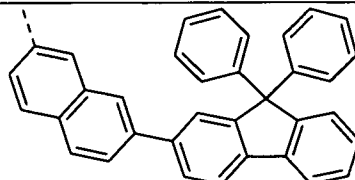
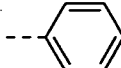
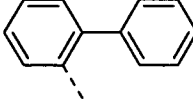
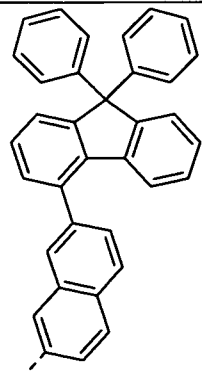
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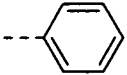
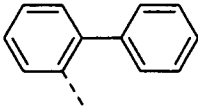
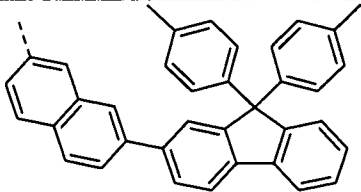
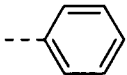
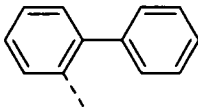
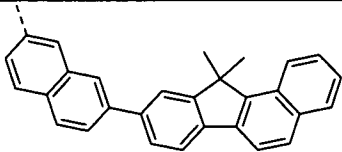
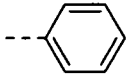
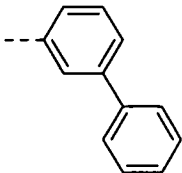
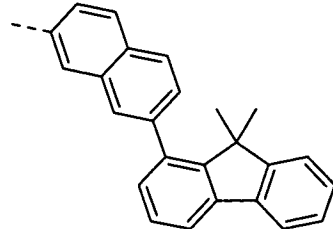
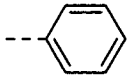
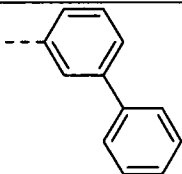
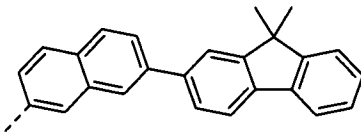
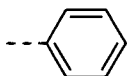
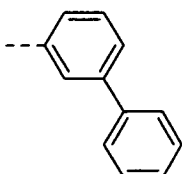
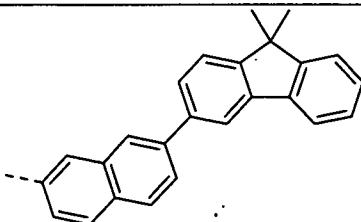
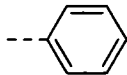
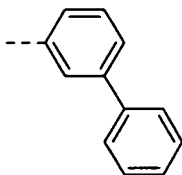
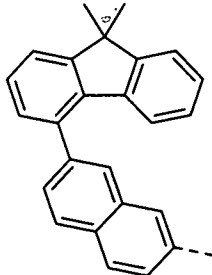
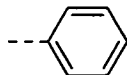
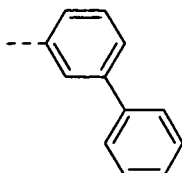
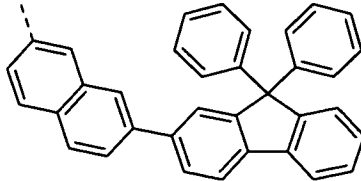
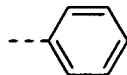
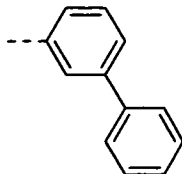
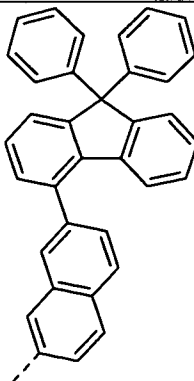
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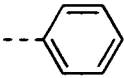
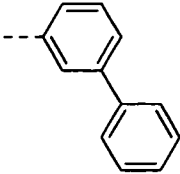
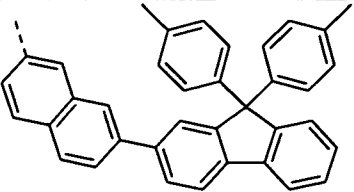
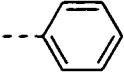
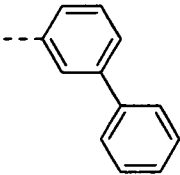
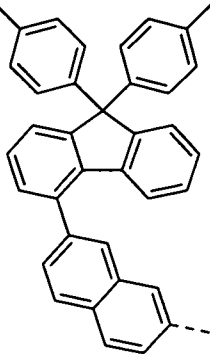
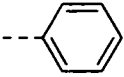
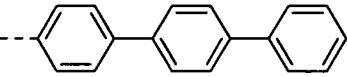
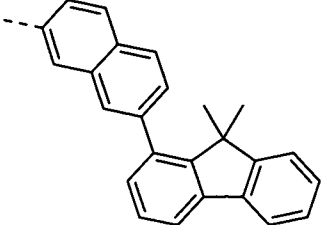
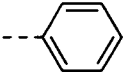
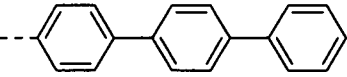
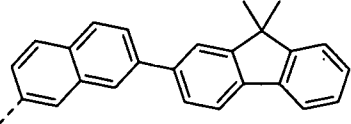
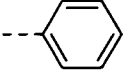
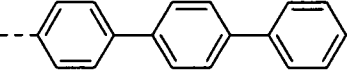
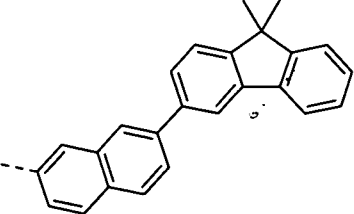
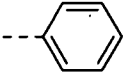
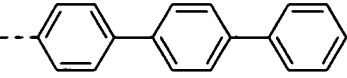
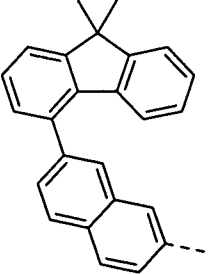
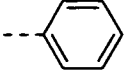
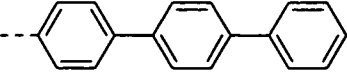
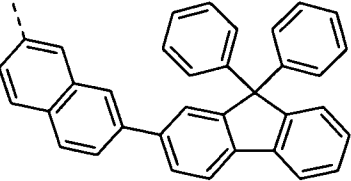
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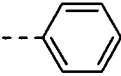
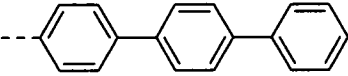
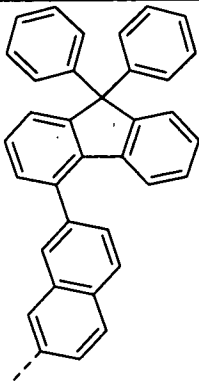
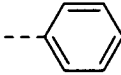
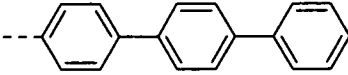
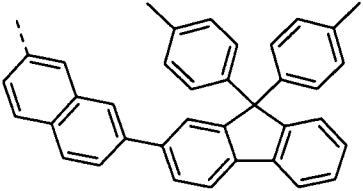
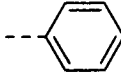
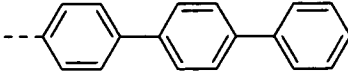
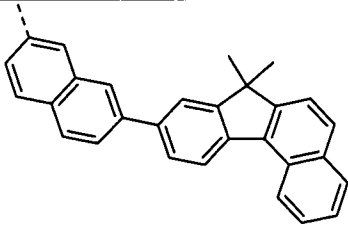
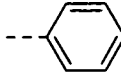
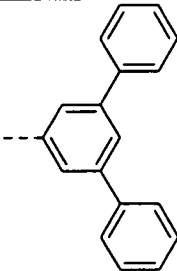
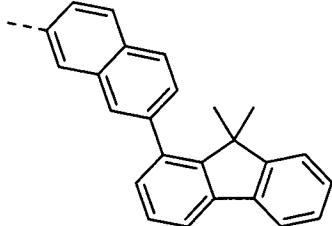
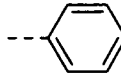
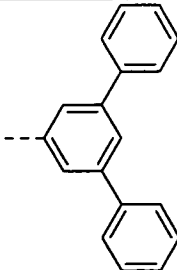
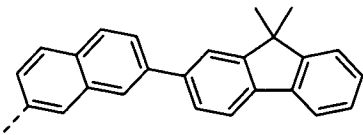
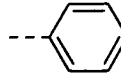
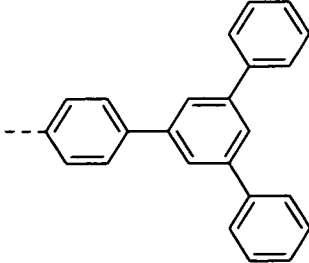
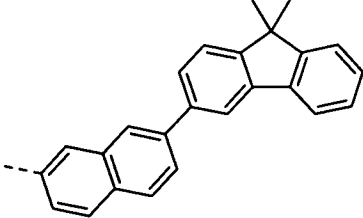
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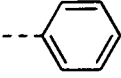
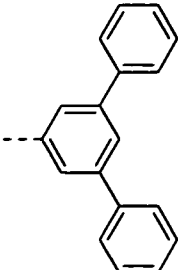
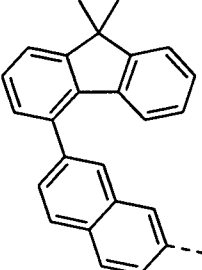
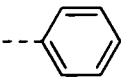
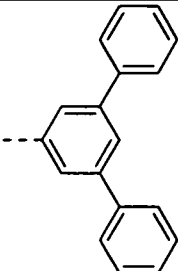
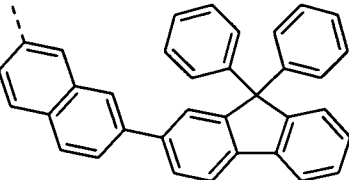
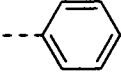
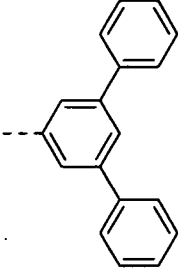
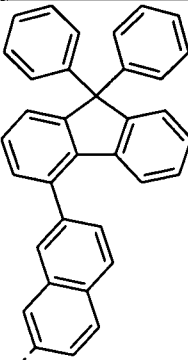
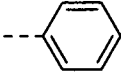
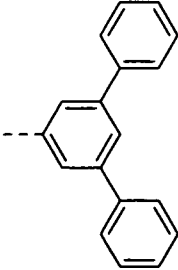
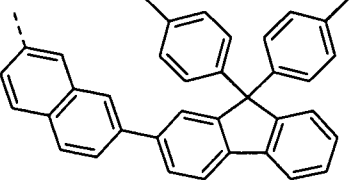
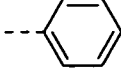
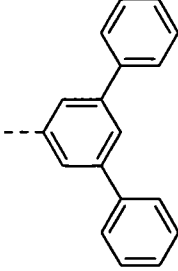
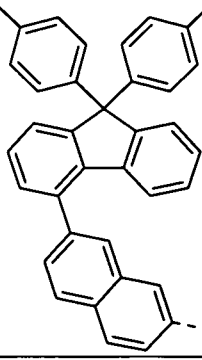
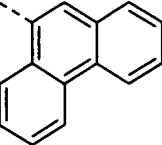
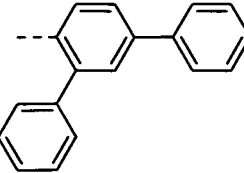
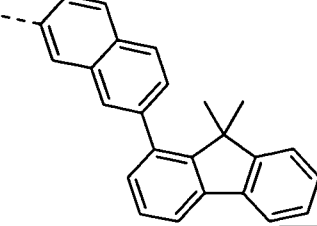
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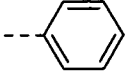
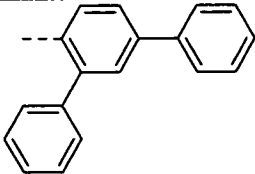
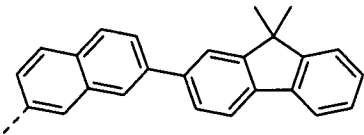
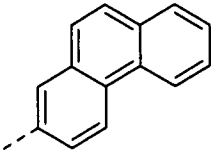
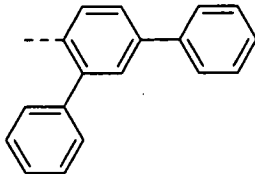
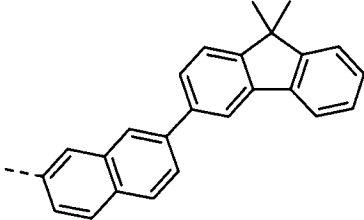
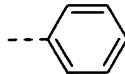
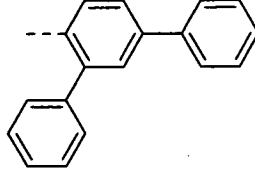
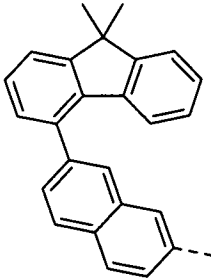
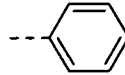
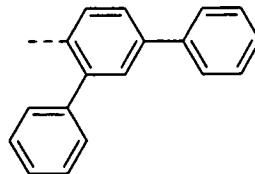
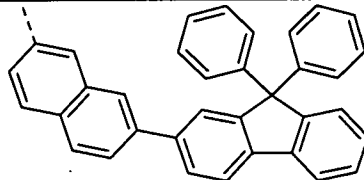
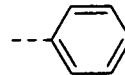
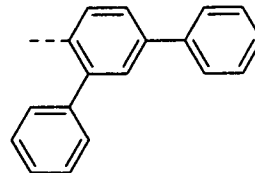
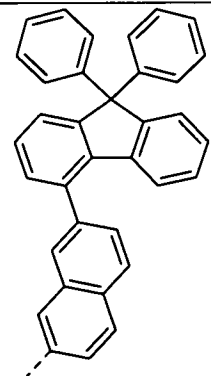
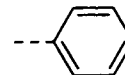
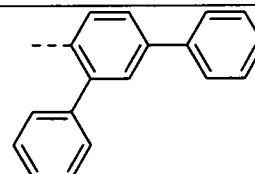
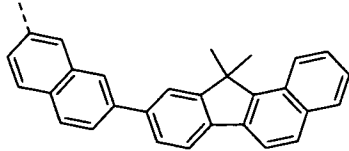
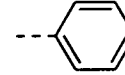
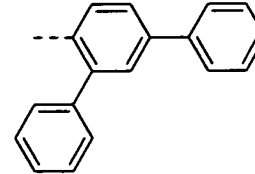
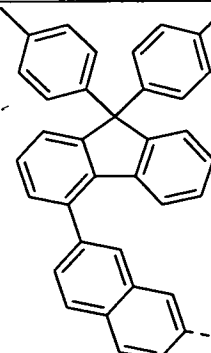
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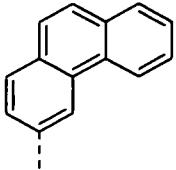
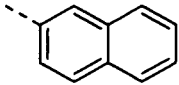
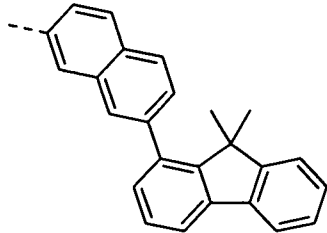
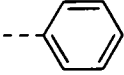
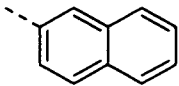
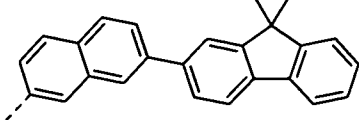
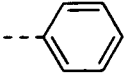
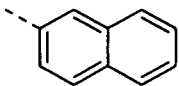
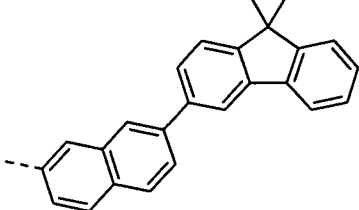
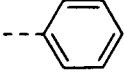
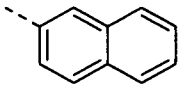
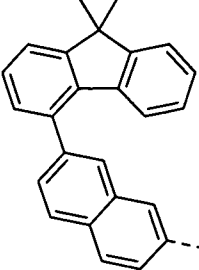
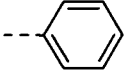
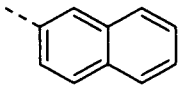
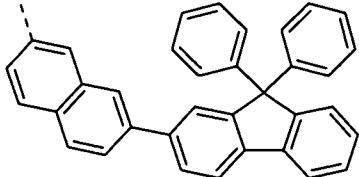
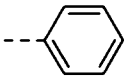
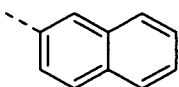
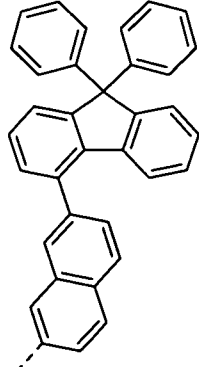
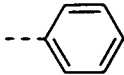
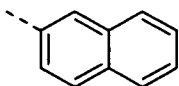
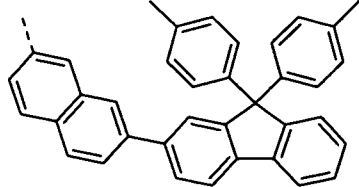
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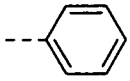
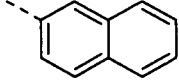
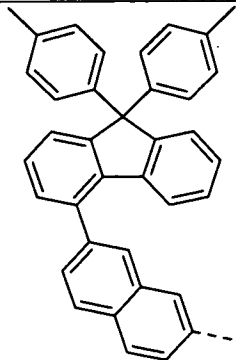
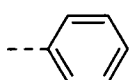
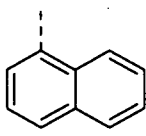
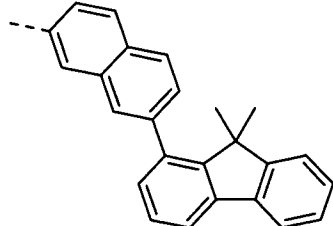
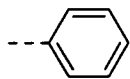
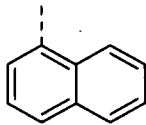
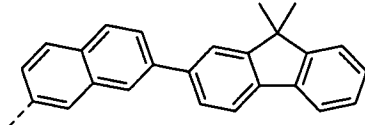
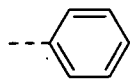
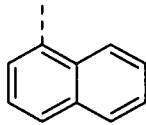
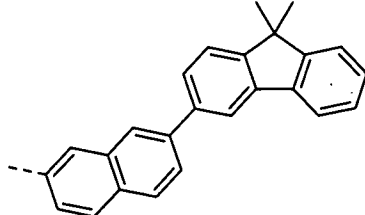
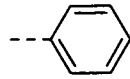
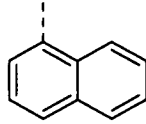
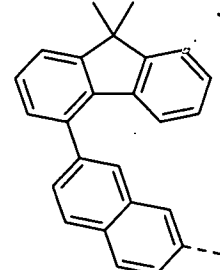
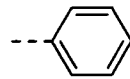
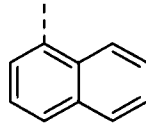
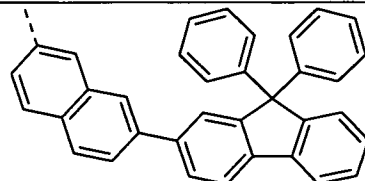
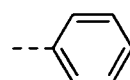
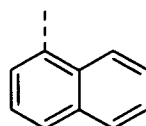
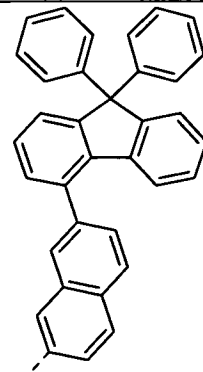
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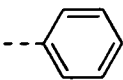
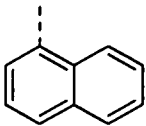
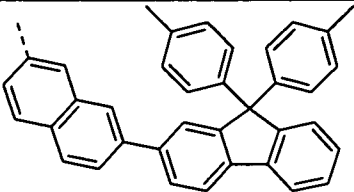
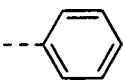
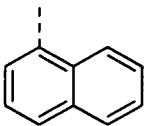
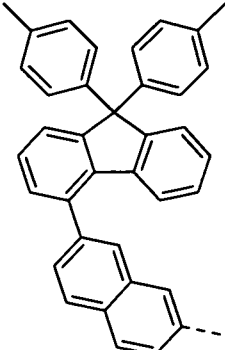
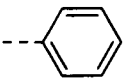
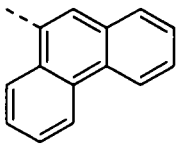
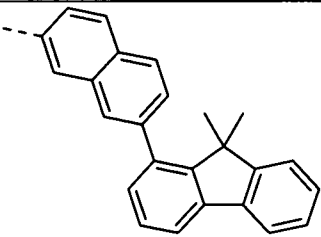
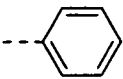
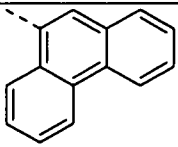
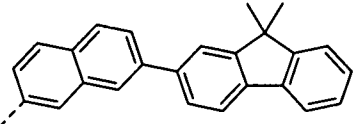
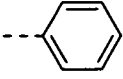
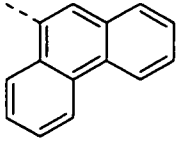
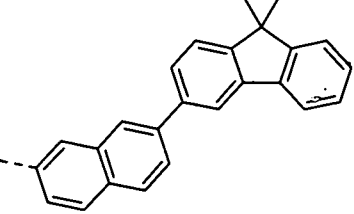
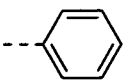
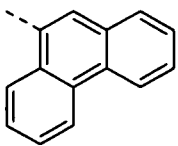
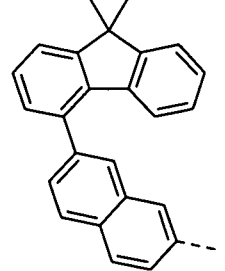
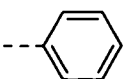
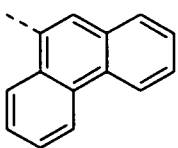
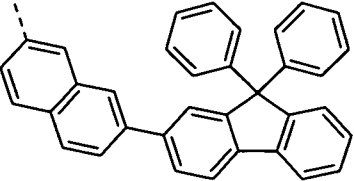
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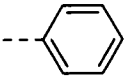
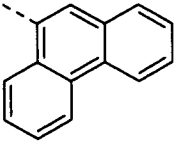
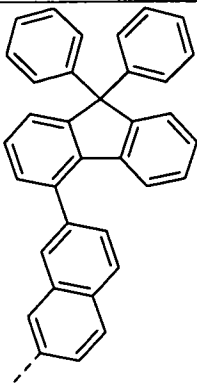
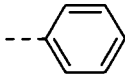
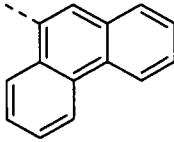
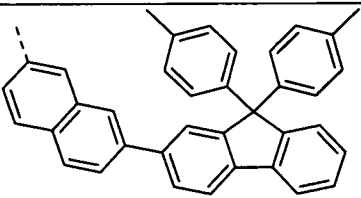
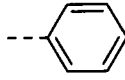
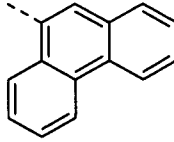
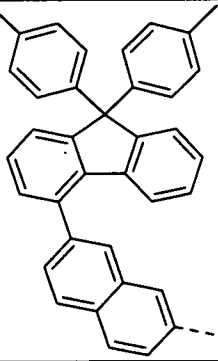
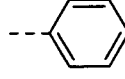
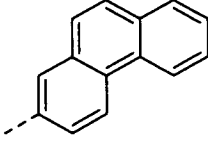
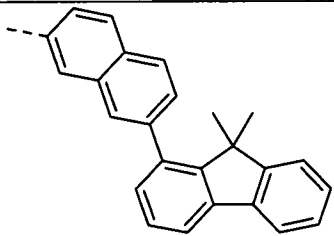
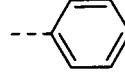
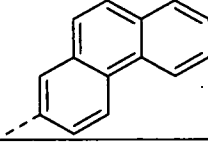
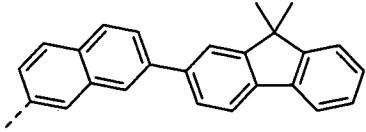
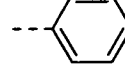
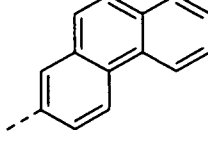
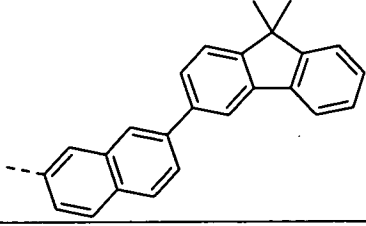
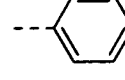
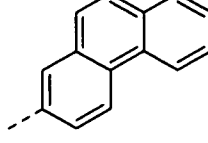
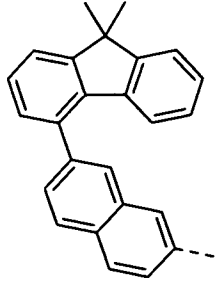
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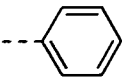
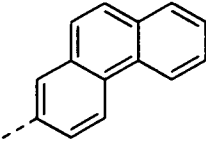
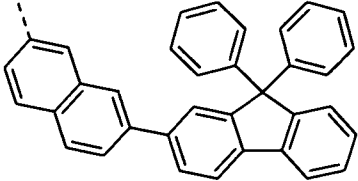
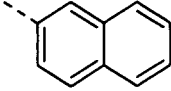
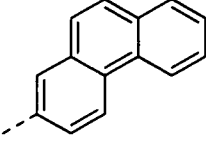
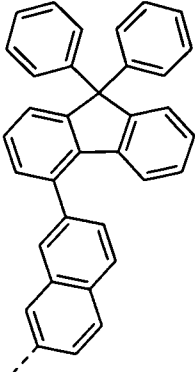
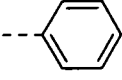
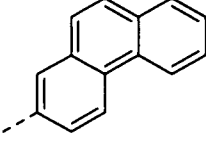
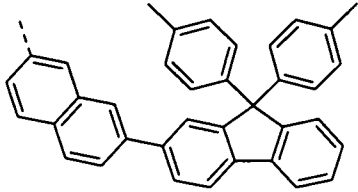
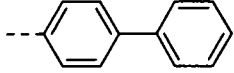
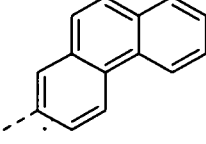
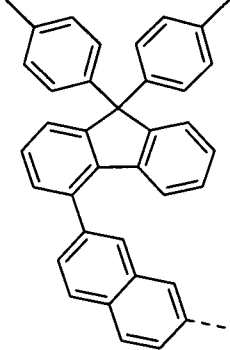
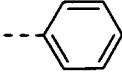
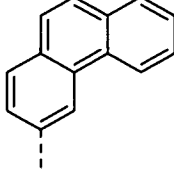
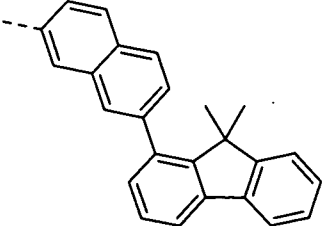
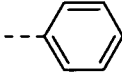
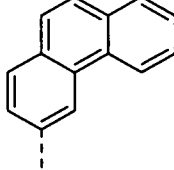
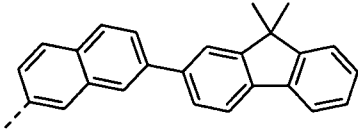
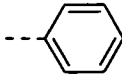
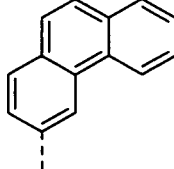
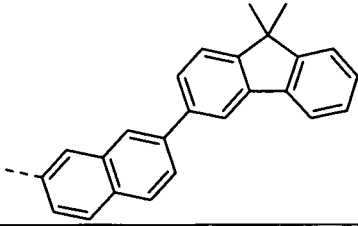
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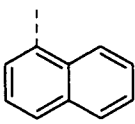
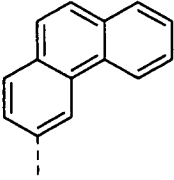
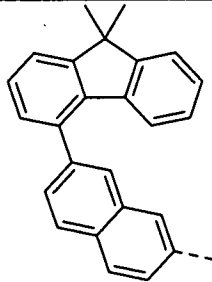
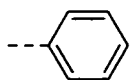
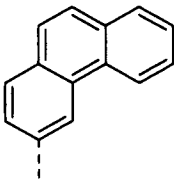
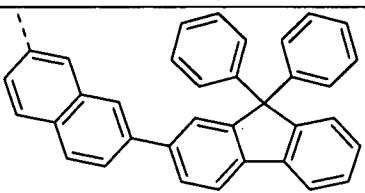
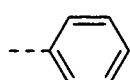
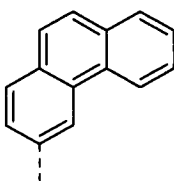
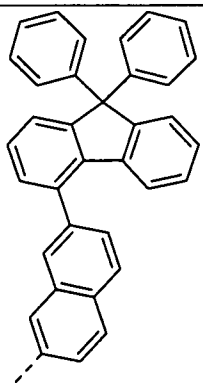
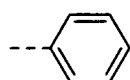
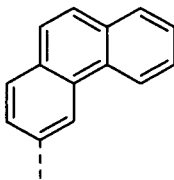
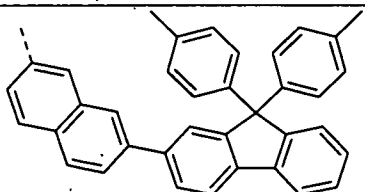
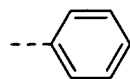
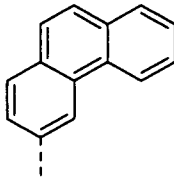
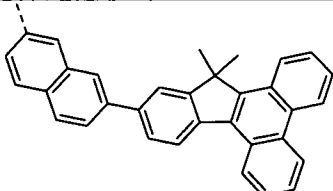
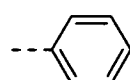
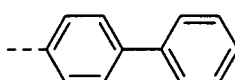
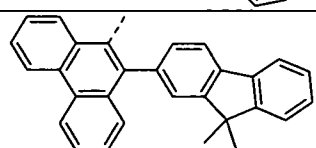
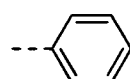
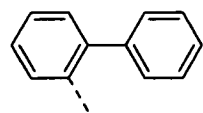
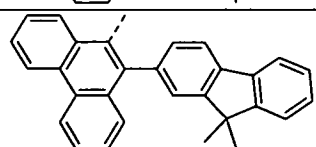
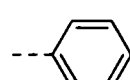
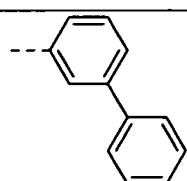
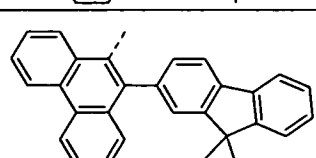
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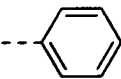
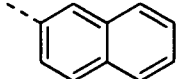
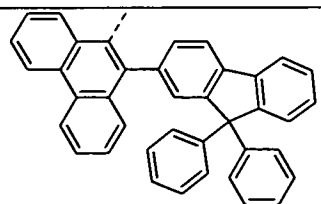
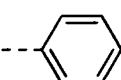
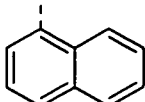
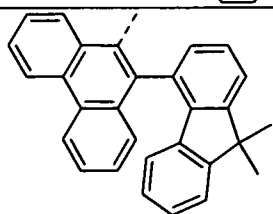
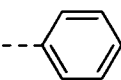
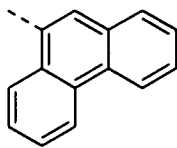
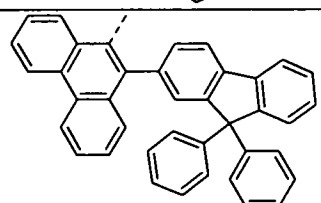
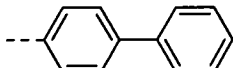
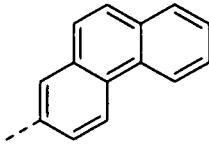
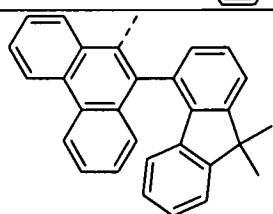
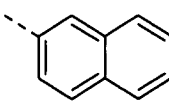
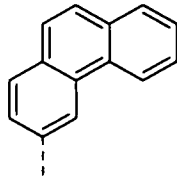
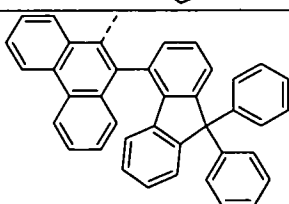
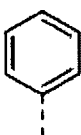
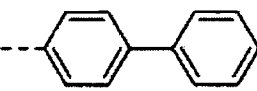
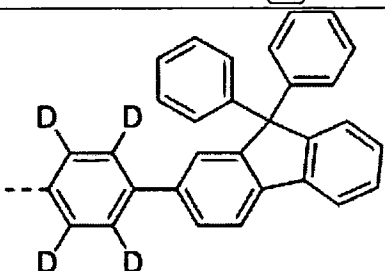
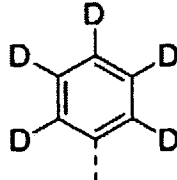
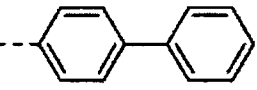
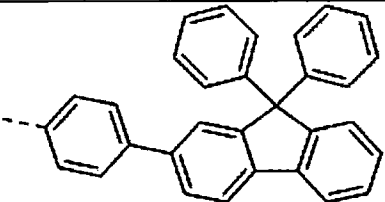
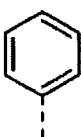
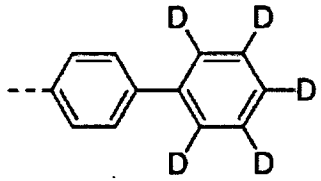
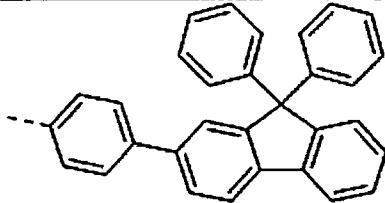
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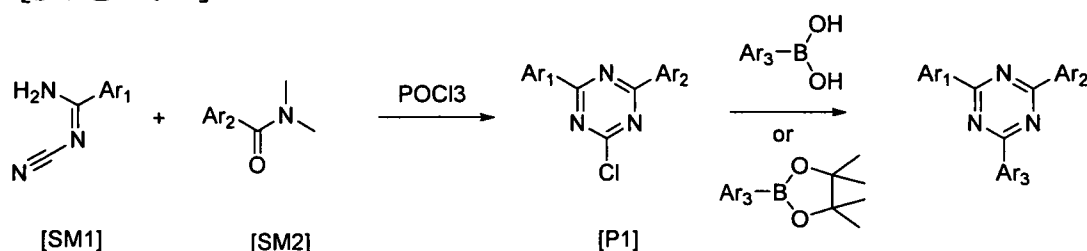
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【0200】 由式 1 表示之化合物可基於下文所描述之製備實例來製

備。根據例示性實施例，可藉由諸如以下反應式 1 之方法製備化合物。

[反應式 1]



【0201】 在反應式中，Ar1 至 Ar3 之定義與式 1 中相同。

【0202】 具體而言，根據本發明之例示性實施例，[P1]之化合物可藉由使化合物[SM1]及化合物[SM2]與等量的氧氯化磷在 70℃ 或大於 70℃ 之溫度下反應來製備。隨後，可使用鈹催化劑反應以使經硼酸取代之芳族化合物或硼酸衍生物與[P1]之化合物偶合來製備其中式 1 之 Ar1 至 Ar3 彼此不對稱之化合物。

【0203】 有機發光元件中使用之有機材料之重要特徵之一為需要形成非晶形沈積膜。具有高結晶度之有機材料之缺點在於薄膜在沈積期間為非均勻沈積，且因此，當驅動元件時，驅動電壓顯著提高，且二極體之使用壽命降低，且因此二極體快速劣化。為了緩解所述缺點，需要形成非晶形膜。

【0204】 因此，本發明人證實呈三嗪衍生物結構形式之不對稱材料不呈現結晶性。根據本發明之例示性實施例，證實由式 1 至式 28 中之任一者表示之化合物具有不對稱結構，其中 Ar1 至 Ar3 彼此不同，且在包含其之有機發光元件之情況下，元件被穩定驅動。

【0205】 此外，本發明提供包含式 1 至式 28 中之任一者之化合物的有機發光元件。

【0206】 本發明之例示性實施例提供

有機發光元件，其包含：陽極；陰極；以及在陽極與陰極之間提供的一或多個有機材料層，

所述有機材料層中之一或多個層包含式 1 至式 28 中之任一者之化合物。

【0207】 本發明之有機發光元件之有機材料層亦可由單層結構組成，但可由其中兩個或大於兩個有機材料層堆疊之多層結構組成。舉例而言，本發明之有機發光元件可具有包含以下各者作為有機材料層之結構：電洞注入層、電洞傳輸層、發光層、電子傳輸層、電子注入層、電子控制層以及其類似物。然而，有機發光元件之結構不限於此。

【0208】 根據本發明之例示性實施例，有機材料層包含電子傳輸層或電子注入層，且電子傳輸層或電子注入層包含式 1 至式 28 中之任一者之化合物。

【0209】 根據本發明之例示性實施例，有機材料層包含電子傳輸層、電子注入層或同時傳輸及注入電子之層，且所述電子傳輸層、電子注入層及同時傳輸及注入電子之層中之一或多者包含式 1 至式 28 中之任一者之化合物。

【0210】 根據本發明之例示性實施例，有機材料層包含一個或兩個或大於兩個由以下各者所組成之群中選出之層：電子傳輸層；電子注入層；同時注入及傳輸電子之層；以及電子控制層，且所述電子傳輸層、電子注入層、同時注入及傳輸電子之層以及電子控制層中之一或多個層包含式 1 至式 28 中之任一者之化合物。

【0211】 根據本發明之例示性實施例，有機材料層可進一步包含由以下各者所組成之群中選出之一或多者：電子注入層、電子傳輸層以及在發光層與陽極之間的或在發光層與陰極之間的同時注入及傳輸電子之層。

【0212】 根據本發明之例示性實施例，在有機發光元件中包含：陽極；以面向陽極之方式提供之陰極；在陽極與陰極之間提供之發光層；以及在發光層與陽極之間或在發光層與陰極之間提供的兩個或大於兩個有機材料，所述兩個或大於兩個有機材料層中之至少一者包含式 1 至式 28 中之任一者之化合物。

【0213】 在本發明之例示性實施例中，作為兩個或大於兩個有機材料層，兩者或大於兩者可由以下各者所組成之群中選出：電子傳輸層、電子注入層、同時傳輸及注入電子之層以及電子控制層。

【0214】 在本發明之例示性實施例中，有機材料層包含兩個或大於兩個電子傳輸層，且所述兩個或大於兩個電子傳輸層中之至少一者包含式 1 至式 28 中之任一者之化合物。具體而言，在本發明之例示性實施例中，式 1 至式 28 中之任一者之化合物亦可包含於所述兩個或大於兩個電子傳輸層中之一個層中，且可包含於所述兩個或大於兩個電子傳輸層中之每一者中。

【0215】 此外，在本發明之例示性實施例中，當兩個或大於兩個電子傳輸層中之每一者包含式 1 至式 28 中之任一者之化合物時，除式 1 至 28 中之任一者之化合物以外的其他材料可彼此相同或不同。

【0216】 在另一個例示性實施例中，有機材料層包含發光層及電

子傳輸層，且電子傳輸層包含式 1 至式 28 中之任一者之化合物。

【0217】 根據本發明之例示性實施例，有機發光元件包含在發光層與陰極之間提供的電子傳輸層，且電子傳輸層包含式 1 至式 28 中之任一者之化合物。

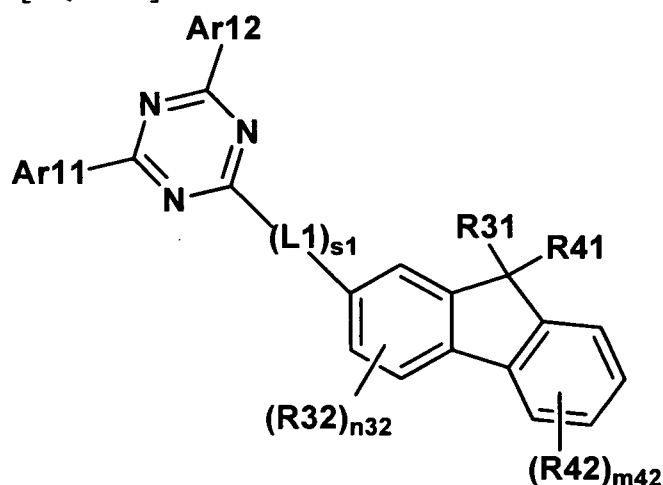
【0218】 根據本發明之例示性實施例，有機發光元件包含：在陽極與陰極之間提供的發光層；在發光層與陰極之間提供的電子傳輸層；以及在電子傳輸層與發光層之間提供的電子控制層，且電子控制層包含式 1 至式 28 中之任一者之化合物。

【0219】 根據本發明之例示性實施例，以與發光層接觸之方式提供電子控制層，且電子控制層包含式 1 至式 28 中之任一者之化合物。

【0220】 根據本發明之例示性實施例，有機發光元件包含：在陽極與陰極之間提供的發光層；在發光層與陰極之間提供的電子傳輸層；以及在電子傳輸層與發光層之間提供的電子控制層，且電子控制層包含式 3 化合物。

【0221】 根據本發明之例示性實施例，有機發光元件包含：在陽極與陰極之間提供的發光層；在發光層與陰極之間提供的電子傳輸層；以及在電子傳輸層與發光層之間提供的電子控制層，且電子控制層包含以下式 3-1 之化合物。

[式 3-1]



在式 3-1 中，

Ar11 及 Ar12 彼此不同，且各自獨立地為經取代或未經取代之芳基，

L1 為直接鍵；經取代或未經取代之伸芳基；或經取代或未經取代之伸雜芳基，

R32 及 R42 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或與相鄰基團組合以形成經取代或未經取代之環，

R31 及 R41 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之環烷基；經

取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或彼此組合以形成經取代或未經取代之脂族環，

n_{32} 為整數 0 至 3 且 n_{42} 為整數 0 至 4，及

s_1 為整數 1 至 5，及

當 n_{32} 、 n_{42} 以及 s_1 各自為 2 或大於 2 時，括弧中之結構彼此相同或不同。

【0222】 根據本發明之例示性實施例，L1 為直接鍵；或經取代或未經取代之伸芳基。

【0223】 根據本發明之例示性實施例，L1 為直接鍵；或經取代或未經取代之單環至四環伸芳基。

【0224】 根據本發明之例示性實施例，L1 為直接鍵；或經取代或未經取代之單環至三環伸芳基。

【0225】 根據本發明之例示性實施例，L1 為經取代或未經取代之具有 6 個至 30 個碳原子之伸芳基。

【0226】 根據本發明之例示性實施例，L1 為經取代或未經取代之具有 6 個至 20 個碳原子之伸芳基。

【0227】 根據本發明之例示性實施例，L1 為直接鍵；經取代或未經取代之伸苯基；經取代或未經取代之聯伸苯基；經取代或未經取代之伸萘基；或經取代或未經取代之伸菲基。

【0228】 根據本發明之例示性實施例，L1 為直接鍵；伸苯基；聯伸苯基；伸萘基；或伸菲基。

【0229】 根據本發明之例示性實施例，L1 為直接鍵；或經取代或未經取代之伸苯基。

【0230】 根據本發明之例示性實施例，L1 為直接鍵；或伸苯基。

【0231】 根據本發明之例示性實施例，L1 為經取代或未經取代之伸苯基。

【0232】 根據本發明之例示性實施例，L1 為伸苯基。

【0233】 根據本發明之例示性實施例，L1 為直接鍵。

【0234】 根據本發明之例示性實施例，R32 為氫；氘；經取代或未經取代之烷基；或經取代或未經取代之芳基，或兩個或大於兩個相鄰 R32 彼此組合以形成經取代或未經取代之環。

【0235】 根據本發明之例示性實施例，R32 為氫；氘；經取代或未經取代之具有 1 個至 30 個碳原子之烷基；經取代或未經取代之具有 6 個至 40 個碳原子之芳基，或兩個或大於兩個相鄰 R32 彼此組合以形成經取代或未經取代之環。

【0236】 根據本發明之例示性實施例，R32 為氫；氘；經取代或未經取代之具有 1 個至 6 個碳原子之烷基；或經取代或未經取代之具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R32 彼此組合以形成經取代或未經取代之環。

【0237】 根據本發明之例示性實施例，R32 為氫；氘；具有 1 個至 6 個碳原子之烷基；或具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R32 彼此組合以形成經取代或未經取代之環。

【0238】 根據本發明之例示性實施例，R32 為氫；氘；或烷基，或兩個或大於兩個相鄰 R32 彼此組合以形成經取代或未經取代之環。

【0239】 根據本發明之例示性實施例，R32 為氫；或氘。

【0240】 根據本發明之例示性實施例，R32 為氫，或兩個或大於兩個相鄰 R32 彼此組合以形成經取代或未經取代之環。

【0241】 根據本發明之例示性實施例，R32 為氫，或兩個或大於兩個相鄰 R32 彼此組合以形成環。

【0242】 根據本發明之例示性實施例，兩個或大於兩個相鄰 R32 彼此組合以形成經取代或未經取代之環。

【0243】 根據本發明之例示性實施例，兩個或大於兩個相鄰 R32 彼此組合以形成環。

【0244】 根據本發明之例示性實施例，R32 為氫。

【0245】 根據本發明之例示性實施例，R42 為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；經取代或未經取代之包含 O 及 S 原子中之一或多者之單環或雙環雜環基；經取代或未經取代之吡咯基；經取代或未經取代之咪唑基；經取代或未經取代三唑基；經取代或未經取代之吡啶基；經取代或

合以形成經取代或未經取代之環。

【0248】 根據本發明之例示性實施例，R42 為氫；氖；或經取代或未經取代之芳基，或兩個或大於兩個相鄰 R42 彼此組合以形成經取代或未經取代之環。

【0249】 根據本發明之例示性實施例，R42 為氫；氖；或經取代或未經取代之具有 6 個至 40 個碳原子之芳基，或兩個或大於兩個相鄰 R42 彼此組合以形成經取代或未經取代之環。

【0250】 根據本發明之例示性實施例，R42 為氫；氖；或經取代或未經取代之具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R42 彼此組合以形成經取代或未經取代之環。

【0251】 根據本發明之例示性實施例，R42 為氫；氖；或具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R42 彼此組合以形成經取代或未經取代之環。

【0252】 根據本發明之例示性實施例，R42 為氫；氖；經取代或未經取代之烷基；或經取代或未經取代之芳基，或兩個或大於兩個相鄰 R42 彼此組合以形成經取代或未經取代之環。

【0253】 根據本發明之例示性實施例，R42 為氫；氖；烷基；或芳基，或兩個或大於兩個相鄰 R42 彼此組合以形成環。

【0254】 根據本發明之例示性實施例，R42 為氫；氖；烷基；苯基；或萘基，或兩個或大於兩個相鄰 R42 彼此組合以形成經取代或未經取代之環。

【0255】 根據本發明之例示性實施例，R42 為氫；氖；經取代或未經取代之烷基；經取代或未經取代之苯基；或經取代或未經取代之

萘基。

【0256】 根據本發明之例示性實施例，R42 為氫；氘；烷基；苯基；或萘基。

【0257】 根據本發明之例示性實施例，R42 為氫；氘；經取代或未經取代之烷基；或經取代或未經取代之苯基。

【0258】 根據本發明之例示性實施例，R42 為氫；氘；烷基；或苯基。

【0259】 根據本發明之例示性實施例，R42 為氫；氘；或經取代或未經取代之烷基。

【0260】 根據本發明之例示性實施例，R42 為氫；氘；或烷基。

【0261】 根據本發明之例示性實施例，R42 為氫；或氘。

【0262】 根據本發明之例示性實施例，R42 為氫。

【0263】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之烷氧基；經取代或未經取代之硫烷氧基；經取代或未經取代之環烷基；經取代或未經取代之烯基；經取代或未經取代之芳基；經取代或未經取代之雜環基；經取代或未經取代之芳氧基；或經取代或未經取代之雜芳氧基。

【0264】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之烷氧基；經取代或未經取代之硫烷氧基；經取代或未經取代之環烷基；經取代或未經取代之烯基；經取代或未經取代之芳基；經取代或未經取代之雜環基；經取代或未經取代之芳

氧基；或經取代或未經取代之雜芳氧基，或彼此組合以形成 5 員經取代或未經取代之脂族環。

【0265】根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之烷氧基；經取代或未經取代之硫烷氧基；經取代或未經取代之環烷基；經取代或未經取代之烯基；經取代或未經取代之芳基；經取代或未經取代之雜環基；經取代或未經取代之芳氧基；或經取代或未經取代之雜芳氧基，或彼此組合以形成經取代或未經取代之單環或雙環脂族環。

【0266】根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之具有 1 個至 40 個碳原子之直鏈烷基；經取代或未經取代之具有 1 個至 40 個碳原子之直鏈烷氧基；經取代或未經取代之具有 1 個至 40 個碳原子之直鏈硫烷氧基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈單環或多環烷基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈烯基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈烷氧基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈硫烷氧基；6 員至 40 員經取代或未經取代之芳基；5 員至 40 員經取代或未經取代之雜環基；5 員至 40 員經取代或未經取代之芳氧基；或 5 員至 40 員經取代或未經取代之雜芳氧基。根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；經取代或未經取代之烷基；經取代或未經取代之芳基；或經取代或未經取代之雜環基。

【0267】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；經取代或未經取代之烷基；或經取代或未經取代之芳基。

【0268】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；經取代或未經取代之烷基；經取代或未經取代之具有 6 個至 20 個碳原子之芳基；或經取代或未經取代之雜環基。

【0269】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；烷基；具有 6 個至 20 個碳原子之芳基，其未經取代或經烷基取代；或雜環基。

【0270】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；烷基；經取代或未經取代之苯基；經取代或未經取代之聯苯基；或經取代或未經取代之萘基，或彼此組合以形成 5 員脂族環。

【0271】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；烷基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成經取代或未經取代之單環或雙環。

【0272】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；烷基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成脂族環。

【0273】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；甲基；經取代或未經取代之苯基；經取代

或未經取代之聯苯基；或經取代或未經取代之萘基，或彼此組合以形成 5 員脂族環。

【0274】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；甲基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成脂族環。

【0275】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；甲基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成經取代或未經取代之單環或雙環。

【0276】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；甲基；苯基；經甲基取代之苯基；聯苯基；或萘基，或彼此組合以形成脂族環。

【0277】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為氫；甲基；苯基；經甲基取代之苯基；聯苯基；或萘基，或彼此組合以形成 5 員脂族環。

【0278】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為經取代或未經取代之烷基；或經取代或未經取代之芳基。

【0279】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為烷基；或經取代或未經取代之苯基。

【0280】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不同，且各自獨立地為烷基；苯基；或經甲基取代之苯基。

【0281】 根據本發明之例示性實施例，R31 及 R41 彼此相同或不

同，且各自獨立地為甲基；苯基；或經甲基取代之苯基。

【0282】 根據本發明之例示性實施例，R31 及 R41 彼此相同，且為經取代或未經取代之烷基；或經取代或未經取代之芳基。

【0283】 根據本發明之例示性實施例，R31 及 R41 彼此相同，且為經取代或未經取代之烷基；或經取代或未經取代之苯基。

【0284】 根據本發明之例示性實施例，R31 及 R41 彼此相同，且為烷基；或經取代或未經取代之苯基。

【0285】 根據本發明之例示性實施例，R31 及 R41 彼此相同，且為烷基；苯基；或經甲基取代之苯基。

【0286】 根據本發明之例示性實施例，R31 及 R41 彼此相同，且為甲基；苯基；或經甲基取代之苯基。

【0287】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為經取代或未經取代之芳基。

【0288】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為經取代或未經取代之單環至四環芳基。

【0289】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為芳基，其未經取代或經芳基取代。

【0290】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為經取代或未經取代之單環至四環芳基。

【0291】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為經取代或未經取代之苯基；經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之菲基；經取代或未

經取代之屈基；或經取代或未經取代之萑基。

【0292】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為苯基；萘基；聯苯基；聯三苯；聯四苯；菲基；屈基；或萑基，其未經取代或經烷基或芳基取代。

【0293】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為苯基，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；聯三苯，其未經取代或經芳基取代；聯四苯，其未經取代或經芳基取代；菲基，其未經取代或經芳基取代或屈基，其未經取代或經芳基取代。

【0294】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為經取代或未經取代之苯基；經取代或未經取代之萘基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之菲基；或經取代或未經取代之屈基。

【0295】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為苯基；萘基；聯苯基；聯三苯；聯四苯；菲基；或屈基。

【0296】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0297】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為苯基，其未經取代或經芳基取代；聯苯基，其未經取

代或經芳基取代；聯三苯，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代。

【0298】 根據本發明之例示性實施例，Ar11 及 Ar12 彼此不同，且各自獨立地為苯基；聯苯基；聯三苯；經苯基取代之聯三苯；萘基；菲基；經萘基取代之苯基；或經苯基取代之聯苯基。

【0299】 根據本發明之例示性實施例，Ar11 為芳基。

【0300】 根據本發明之例示性實施例，Ar11 為單環至三環芳基。

【0301】 根據本發明之例示性實施例，Ar11 為經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0302】 根據本發明之例示性實施例，Ar11 為苯基；聯苯基；萘基；或菲基。

【0303】 根據本發明之例示性實施例，Ar11 為經取代或未經取代之苯基。

【0304】 根據本發明之例示性實施例，Ar11 為經取代或未經取代之聯苯基。

【0305】 根據本發明之例示性實施例，Ar11 為經取代或未經取代之萘基。

【0306】 根據本發明之例示性實施例，Ar11 為經取代或未經取代之菲基。

【0307】 根據本發明之例示性實施例，當 Ar11 為經取代或未經取代之苯基，Ar12 為經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之萘

基；經取代或未經取代之菲基；或經取代之苯基。

【0308】根據本發明之例示性實施例，當 Ar11 為苯基時，Ar12 為聯苯基；聯三苯；經苯基取代之聯三苯；聯四苯；萘基；菲基；或經萘基之取代苯基。

【0309】根據本發明之例示性實施例，當 Ar11 為經取代或未經取代之聯苯基時，Ar12 為經取代或未經取代之聯三苯；經取代或未經取代之聯苯基；經取代之苯基；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0310】根據本發明之例示性實施例，當 Ar11 為聯苯基時，Ar12 為聯三苯；聯苯基；經萘基取代之苯基；經菲基取代之苯基；經萘基取代之聯苯基；萘基；經苯基取代之萘基；或菲基。

【0311】根據本發明之例示性實施例，當 Ar11 為經取代或未經取代之萘基時，Ar12 為經取代或未經取代之聯苯基；經取代之苯基；經取代或未經取代之聯三苯；經取代或未經取代之菲基；或經取代或未經取代之聯四苯。

【0312】根據本發明之例示性實施例，當 Ar11 為萘基時，Ar12 為聯苯基；經萘基取代之苯基；經菲基取代之苯基；聯三苯；經萘基取代之聯苯基；經苯基取代之菲基；菲基；聯四苯；或經苯基取代之聯三苯。

【0313】根據本發明之例示性實施例，當 Ar11 為經取代或未經取代之菲基時，Ar12 為經取代或未經取代之聯苯基；經取代之苯基；經取代或未經取代之聯三苯；或經取代或未經取代之聯四苯。

【0314】根據本發明之例示性實施例，當 Ar11 為菲基時，Ar12 為

聯苯基；經菲基取代之苯基；經萘基取代之苯基；聯三苯；聯四苯；或經苯基取代之聯三苯。

【0315】 根據本發明之例示性實施例，Ar12 為經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0316】 根據本發明之例示性實施例，Ar12 為苯基；聯苯基；聯三苯；聯四苯；萘基；或菲基。

【0317】 根據本發明之例示性實施例，Ar11 及 Ar12 中之至少一者為經取代或未經取代之聯苯基。

【0318】 根據本發明之例示性實施例，Ar11 為苯基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代，且 Ar12 為苯基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；聯三苯，其未經取代或經芳基取代；聯四苯，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代。

【0319】 根據本發明之例示性實施例，Ar11 為苯基且 Ar12 為聯苯基。

【0320】 根據本發明之例示性實施例，以與發光層接觸之方式提供電子控制層，且所述電子控制層包含式 3-1 之化合物。

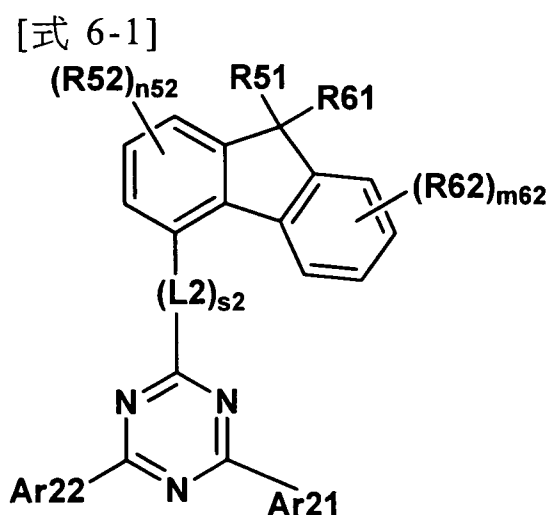
【0321】 根據本發明之例示性實施例，有機發光元件包含在陽極與陰極之間提供的發光層；在發光層與陰極之間提供的電子傳輸

層；以及在電子傳輸層與發光層之間提供的電子控制層，且電子傳輸層包含式 1 至式 28 中之任一者之化合物。

【0322】 根據本發明之例示性實施例，以與發光層接觸之方式提供電子控制層，且電子傳輸層包含式 1 至式 28 中之任一者之化合物。

【0323】 根據本發明之例示性實施例，有機發光元件包含：在陽極與陰極之間提供的發光層；在發光層與陰極之間提供的電子傳輸層；以及在電子傳輸層與發光層之間提供的電子控制層，且電子控制層包含式 6 化合物。

【0324】 根據本發明之例示性實施例，有機發光元件包含在陽極與陰極之間提供的發光層；在發光層與陰極之間提供的電子傳輸層；以及在電子傳輸層與發光層之間提供的電子控制層，且電子傳輸層包含以下式 6-1 之化合物。



在式 6-1 中，

Ar21 及 Ar22 彼此不同，且各自獨立地為經取代或未經取代之芳基，

L2 為直接鍵；經取代或未經取代之伸芳基；或經取代或未經

取代之伸雜芳基，

R52 及 R62 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或與相鄰基團組合以形成經取代或未經取代之環，

R51 及 R61 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或彼此組合以形成經取代或未經取代之脂族環，

n_{52} 為整數 0 至 3 且 n_{62} 為整數 0 至 4，及

s_2 為整數 1 至 5，及

當 n_{52} 、 n_{62} 及 s_2 各自為 2 或大於 2 時，括弧中之結構彼此相同或不同。

【0325】 根據本發明之例示性實施例，L2 為直接鍵；或經取代或

未經取代之伸芳基。

【0326】 根據本發明之例示性實施例，L2 為直接鍵；或經取代或未經取代之單環至四環伸芳基。

【0327】 根據本發明之例示性實施例，L2 為直接鍵；或經取代或未經取代之單環至三環伸芳基。

【0328】 根據本發明之例示性實施例，L2 為經取代或未經取代之具有 6 個至 30 個碳原子之伸芳基。

【0329】 根據本發明之例示性實施例，L2 為經取代或未經取代之具有 6 個至 20 個碳原子之伸芳基。

【0330】 根據本發明之例示性實施例，L2 為直接鍵；經取代或未經取代之伸苯基；經取代或未經取代之聯伸苯基；經取代或未經取代之伸萘基；或經取代或未經取代之伸菲基。

【0331】 根據本發明之例示性實施例，L2 為直接鍵；伸苯基；聯伸苯基；伸萘基；或伸菲基。

【0332】 根據本發明之例示性實施例，L2 為直接鍵；或經取代或未經取代之伸苯基。

【0333】 根據本發明之例示性實施例，L2 為直接鍵；或伸苯基。

【0334】 根據本發明之例示性實施例，L2 為經取代或未經取代之伸苯基。

【0335】 根據本發明之例示性實施例，L2 為伸苯基。

【0336】 根據本發明之例示性實施例，L2 為直接鍵。

【0337】 根據本發明之例示性實施例，R52 為氫；氘；經取代或未經取代之烷基；或經取代或未經取代之芳基，或兩個或大於兩個相

鄰 R52 彼此組合以形成經取代或未經取代之環。

【0338】 根據本發明之例示性實施例，R52 為氫；氬；經取代或未經取代之具有 1 個至 30 個碳原子之烷基；經取代或未經取代之具有 6 個至 40 個碳原子之芳基，或兩個或大於兩個相鄰 R52 彼此組合以形成經取代或未經取代之環。

【0339】 根據本發明之例示性實施例，R52 為氫；氬；經取代或未經取代之具有 1 個至 6 個碳原子之烷基；或經取代或未經取代之具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R52 彼此組合以形成經取代或未經取代之環。

【0340】 根據本發明之例示性實施例，R52 為氫；氬；具有 1 個至 6 個碳原子之烷基；或具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R52 彼此組合以形成經取代或未經取代之環。

【0341】 根據本發明之例示性實施例，R52 為氫；氬；或烷基，或兩個或大於兩個相鄰 R52 彼此組合以形成經取代或未經取代之環。

【0342】 根據本發明之例示性實施例，R52 為氫；或氬。

【0343】 根據本發明之例示性實施例，R52 為氫，或兩個或大於兩個相鄰 R52 彼此組合以形成經取代或未經取代之環。

【0344】 根據本發明之例示性實施例，R52 為氫，或兩個或大於兩個相鄰 R52 彼此組合以形成環。

【0345】 根據本發明之例示性實施例，兩個或大於兩個相鄰 R52 彼此組合以形成經取代或未經取代之環。

【0346】 根據本發明之例示性實施例，兩個或大於兩個相鄰 R52

彼此組合以形成環。

【0347】 根據本發明之例示性實施例，R52 為氫。

【0348】 根據本發明之例示性實施例，R62 為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；經取代或未經取代之包含 O 及 S 原子中之一或多者之單環或雙環雜環基；經取代或未經取代之吡咯基；經取代或未經取代之咪唑基；經取代或未經取代之三唑基；經取代或未經取代之吡啶基；經取代或未經取代之二吡啶基；經取代或未經取代之嘧啶基；經取代或未經取代之三唑基；經取代或未經取代之吡啶基；經取代或未經取代之噻吩基；經取代或未經取代之吡嗪基；經取代或未經取代之喹啉基；經取代或未經取代之喹唑啉基；經取代或未經取代之喹啉基；經取代或未經取代之酞嗪基；經取代或未經取代之吡啶并嘧啶基；經取代或未經取代之吡啶并吡嗪基；經取代或未經取代之吡嗪并吡嗪基；經取代或未經取代之異喹啉基；經取代或未經取代之吡啶基；經取代或未經取代之苯并咪唑基；或經取代或未經取代之啡啉基，或兩個或大於兩個相鄰 R62 彼此組合以形成經取代或未經取代之環。

【0349】 根據本發明之例示性實施例，R62 為氫；氘；鹵素基團；

腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之包含 O 及 S 原子中之一或多者之單環或雙環雜環基，或兩個或大於兩個相鄰 R62 彼此組合以形成經取代或未經取代之環。

【0350】 根據本發明之例示性實施例，R62 為氫；氖；或經取代或未經取代之芳基；或經取代或未經取代之包含 O 及 S 原子中之一或多者之單環或雙環雜環基，或兩個或大於兩個相鄰 R62 彼此組合以形成經取代或未經取代之環。

【0351】 根據本發明之例示性實施例，R62 為氫；氖；或經取代或未經取代之芳基，或兩個或大於兩個相鄰 R62 彼此組合以形成經取代或未經取代之環。

【0352】 根據本發明之例示性實施例，R62 為氫；氖；或經取代或未經取代之具有 6 個至 40 個碳原子之芳基，或兩個或大於兩個相鄰 R62 彼此組合以形成經取代或未經取代之環。

【0353】 根據本發明之例示性實施例，R62 為氫；氖；或經取代或未經取代之具有 6 個至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R62 彼此組合以形成經取代或未經取代之環。

【0354】 根據本發明之例示性實施例，R62 為氫；氖；或具有 6 個

至 20 個碳原子之芳基，或兩個或大於兩個相鄰 R62 彼此組合以形成經取代或未經取代之環。

【0355】 根據本發明之例示性實施例，R62 為氫；氖；經取代或未經取代之烷基；或經取代或未經取代之芳基，或兩個或大於兩個相鄰 R62 彼此組合以形成經取代或未經取代之環。

【0356】 根據本發明之例示性實施例，R62 為氫；氖；烷基；或芳基，或兩個或大於兩個相鄰 R62 彼此組合以形成環。

【0357】 根據本發明之例示性實施例，R62 為氫；氖；烷基；苯基；或萘基，或兩個或大於兩個相鄰 R62 彼此組合以形成經取代或未經取代之環。

【0358】 根據本發明之例示性實施例，R62 為氫；氖；經取代或未經取代之烷基；經取代或未經取代之苯基；或經取代或未經取代之萘基。

【0359】 根據本發明之例示性實施例，R62 為氫；氖；烷基；苯基；或萘基。

【0360】 根據本發明之例示性實施例，R62 為氫；氖；經取代或未經取代之烷基；或經取代或未經取代之苯基。

【0361】 根據本發明之例示性實施例，R62 為氫；氖；烷基；或苯基。

【0362】 根據本發明之例示性實施例，R62 為氫；氖；或經取代或未經取代之烷基。

【0363】 根據本發明之例示性實施例，R62 為氫；氖；或烷基。

【0364】 根據本發明之例示性實施例，R62 為氫；或氖。

【0365】 根據本發明之例示性實施例，R62 為氫。

【0366】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之烷氧基；經取代或未經取代之硫烷氧基；經取代或未經取代之環烷基；經取代或未經取代之烯基；經取代或未經取代之芳基；經取代或未經取代之雜環基；經取代或未經取代之芳氧基；或經取代或未經取代之雜芳氧基。

【0367】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之烷氧基；經取代或未經取代之硫烷氧基；經取代或未經取代之環烷基；經取代或未經取代之烯基；經取代或未經取代之芳基；經取代或未經取代之雜環基；經取代或未經取代之芳氧基；或經取代或未經取代之雜芳氧基，或彼此組合以形成 5 員經取代或未經取代之脂族環。

【0368】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之烷氧基；經取代或未經取代之硫烷氧基；經取代或未經取代之環烷基；經取代或未經取代之烯基；經取代或未經取代之芳基；經取代或未經取代之雜環基；經取代或未經取代之芳氧基；或經取代或未經取代之雜芳氧基，或彼此組合以形成經取代或未經取代之單環或雙環脂族環。

【0369】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之具有

1 個至 40 個碳原子之直鏈烷基；經取代或未經取代之具有 1 個至 40 個碳原子之直鏈烷氧基；經取代或未經取代之具有 1 個至 40 個碳原子之直鏈硫烷氧基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈單環或多環烷基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈烯基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈烷氧基；經取代或未經取代之具有 3 個至 40 個碳原子之分支鏈硫烷氧基；6 員至 40 員經取代或未經取代之芳基；5 員至 40 員經取代或未經取代之雜環基；5 員至 40 員經取代或未經取代之芳氧基；或 5 員至 40 員經取代或未經取代之雜芳氧基。

【0370】根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；經取代或未經取代之烷基；經取代或未經取代之芳基；或經取代或未經取代之雜環基。

【0371】根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；經取代或未經取代之烷基；或經取代或未經取代之芳基。

【0372】根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；經取代或未經取代之烷基；經取代或未經取代之具有 6 個至 20 個碳原子之芳基；或經取代或未經取代之雜環基。

【0373】根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；烷基；具有 6 個至 20 個碳原子之芳基，其未經取代或經烷基取代；或雜環基。

【0374】根據本發明之例示性實施例，R51 及 R61 彼此相同或不

同，且各自獨立地為氫；烷基；經取代或未經取代之苯基；經取代或未經取代之聯苯基；或經取代或未經取代之萘基，或彼此組合以形成 5 員脂族環。

【0375】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；烷基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成經取代或未經取代之單環或雙環。

【0376】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；烷基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成脂族環。

【0377】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；甲基；經取代或未經取代之苯基；經取代或未經取代之聯苯基；或經取代或未經取代之萘基，或彼此組合以形成 5 員脂族環。

【0378】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；甲基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成脂族環。

【0379】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；甲基；苯基，其未經取代或經烷基取代；聯苯基；或萘基，或彼此組合以形成經取代或未經取代之單環或雙環。

【0380】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；甲基；苯基；經甲基取代之苯基；聯苯基；

或萘基，或彼此組合以形成脂族環。

【0381】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為氫；甲基；苯基；經甲基取代之苯基；聯苯基；或萘基，或彼此組合以形成 5 員脂族環。

【0382】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為經取代或未經取代之烷基；或經取代或未經取代之芳基。

【0383】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為烷基；或經取代或未經取代之苯基。

【0384】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為烷基；苯基；或經甲基取代之苯基。

【0385】 根據本發明之例示性實施例，R51 及 R61 彼此相同或不同，且各自獨立地為甲基；苯基；或經甲基取代之苯基。

【0386】 根據本發明之例示性實施例，R51 及 R61 彼此相同，且為經取代或未經取代之烷基；或經取代或未經取代之芳基。

【0387】 根據本發明之例示性實施例，R51 及 R61 彼此相同，且為經取代或未經取代之烷基；或經取代或未經取代之苯基。

【0388】 根據本發明之例示性實施例，R51 及 R61 彼此相同，且為烷基；或經取代或未經取代之苯基。

【0389】 根據本發明之例示性實施例，R51 及 R61 彼此相同，且為烷基；苯基；或經甲基取代之苯基。

【0390】 根據本發明之例示性實施例，R51 及 R61 彼此相同，且為甲基；苯基；或經甲基取代之苯基。

【0391】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為經取代或未經取代之芳基。

【0392】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為經取代或未經取代之單環至四環芳基。

【0393】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為芳基，其未經取代或經芳基取代。

【0394】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為單環至四環芳基，其未經取代或經芳基取代。

【0395】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為經取代或未經取代之苯基；經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之菲基；經取代或未經取代之屈基；或經取代或未經取代之萘基。

【0396】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為苯基；萘基；聯苯基；聯三苯；聯四苯；菲基；屈基；或萘基，其未經取代或經烷基或芳基取代。

【0397】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為苯基，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；聯三苯，其未經取代或經芳基取代；聯四苯，其未經取代或經芳基取代；菲基，其未經取代或經芳基取代或屈基，其未經取代或經芳基取代。

【0398】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為經取代或未經取代之苯基；經取代或未經取代之萘

基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之菲基；或經取代或未經取代之屈基。

【0399】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為苯基；萘基；聯苯基；聯三苯；聯四苯；菲基；或屈基。

【0400】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0401】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為苯基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；聯三苯，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代。

【0402】 根據本發明之例示性實施例，Ar21 及 Ar22 彼此不同，且各自獨立地為苯基；聯苯基；聯三苯；經苯基取代之聯三苯；萘基；菲基；經萘基取代之苯基；或經苯基取代之聯苯基。

【0403】 根據本發明之例示性實施例，Ar21 為芳基。

【0404】 根據本發明之例示性實施例，Ar21 為單環至三環芳基。

【0405】 根據本發明之例示性實施例，Ar21 為經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0406】 根據本發明之例示性實施例，Ar21 為苯基；聯苯基；萘

基；或菲基。

【0407】 根據本發明之例示性實施例，Ar21 為經取代或未經取代之苯基。

【0408】 根據本發明之例示性實施例，Ar21 為經取代或未經取代之聯苯基。

【0409】 根據本發明之例示性實施例，Ar21 為經取代或未經取代之萘基。

【0410】 根據本發明之例示性實施例，Ar21 為經取代或未經取代之菲基。

【0411】 根據本發明之例示性實施例，當 Ar21 為經取代或未經取代之苯基，Ar22 為經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之萘基；經取代或未經取代之菲基；或經取代之苯基。

【0412】 據本發明之例示性實施例，當 Ar21 為苯基時，Ar22 為聯苯基；聯三苯；經苯基取代之聯三苯；聯四苯；萘基；菲基；或經萘基之取代苯基。

【0413】 根據本發明之例示性實施例，當 Ar21 為經取代或未經取代之聯苯基時，Ar22 為經取代或未經取代之聯三苯；經取代或未經取代之聯苯基；經取代之苯基；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0414】 根據本發明之例示性實施例，當 Ar21 為聯苯基時，Ar22 為聯三苯；聯苯基；經萘基取代之苯基；經菲基取代之苯基；經萘基取代之聯苯基；萘基；經苯基取代之萘基；或菲基。

【0415】 根據本發明之例示性實施例，當 Ar21 為經取代或未經取代之萘基時，Ar22 為經取代或未經取代之聯苯基；經取代之苯基；經取代或未經取代之聯三苯；經取代或未經取代之菲基；或經取代或未經取代之聯四苯。

【0416】 根據本發明之例示性實施例，當 Ar21 為萘基時，Ar22 為聯苯基；經萘基取代之苯基；經菲基取代之苯基；聯三苯；經萘基取代之聯苯基；經苯基取代之菲基；菲基；聯四苯；或經苯基取代之聯三苯。

【0417】 根據本發明之例示性實施例，當 Ar21 為經取代或未經取代之菲基時，Ar22 為經取代或未經取代之聯苯基；經取代之苯基；經取代或未經取代之聯三苯；或經取代或未經取代之聯四苯。

【0418】 根據本發明之例示性實施例，當 Ar21 為菲基時，Ar22 為聯苯基；經菲基取代之苯基；經萘基取代之苯基；聯三苯；聯四苯；或經苯基取代之聯三苯。

【0419】 根據本發明之例示性實施例，Ar22 為經取代或未經取代之苯基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯；經取代或未經取代之聯四苯；經取代或未經取代之萘基；或經取代或未經取代之菲基。

【0420】 根據本發明之例示性實施例，Ar22 為苯基；聯苯基；聯三苯；聯四苯；萘基；或菲基。

【0421】 根據本發明之例示性實施例，Ar21 及 Ar22 中之至少一者為經取代或未經取代之聯苯基。

【0422】 根據本發明之例示性實施例，Ar21 為苯基，其未經取代

或經芳基取代；聯苯基，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代，且 Ar22 為苯基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；聯三苯，其未經取代或經芳基取代；聯四苯，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代。

【0423】 根據本發明之例示性實施例，Ar21 為苯基且 Ar22 為聯苯基。

【0424】 根據本發明之例示性實施例，以與發光層接觸之方式提供電子控制層，且電子傳輸層包含式 6-1 之化合物。

【0425】 根據本發明之例示性實施例，有機發光元件包含在陽極與陰極之間提供的發光層；在發光層與陰極之間提供的電子傳輸層；以及在電子傳輸層與發光層之間提供的電子控制層，所述電子傳輸層包含式 1 至式 28 中之任一者之化合物，且所述電子控制層包含式 1 至式 28 中之任一者之化合物。在此情況下，各層中所包含之化合物可彼此相同或不同。

【0426】 在本發明之另一個例示性實施例中，有機材料層包含電子傳輸層及電子控制層，且電子傳輸層及電子控制層中之至少一者包含式 1 至式 28 中之任一者之化合物。具體而言，在本發明之例示性實施例中，式 1 至式 28 中之任一者之化合物亦可包含於電子傳輸層及電子控制層中之一個層中，且亦可包含於電子傳輸層及電子控制層中之每一者中。在此情況下，各層中所包含之化合物可彼此相同或不同。

【0427】 具體而言，根據本發明之例示性實施例，有機材料層包含電子傳輸層及電子控制層，所述電子控制層是以與發光層接觸之方式提供，所述電子控制層包含式 3-1 之化合物，且所述電子傳輸層包含式 6-1 之化合物。

【0428】 根據本發明之例示性實施例，有機發光元件包含在發光層與陰極之間的兩個或大於兩個有機材料層，及

所述兩個或大於兩個有機材料層中之至少一者包含式 1 至式 28 中之任一者之化合物。

【0429】 根據本發明之例示性實施例，作為有機材料層，兩個層或兩個或大於兩個層可由以下各者所組成之群中選出：電子傳輸層、電子注入層、同時傳輸及注入電子之層，以及電子控制層，及

當式 1 至式 28 中之任一者之化合物各自包含於兩個層或兩個或大於兩個層中時，除式 1 至式 28 中之任一者之化合物以外的其他材料可彼此相同或不同。

【0430】 在本發明之例示性實施例中，有機材料層包含兩個或大於兩個電子傳輸層，且所述兩個或大於兩個電子傳輸層中之至少一者包含式 1 至式 28 中之任一者之化合物。具體而言，在本發明之例示性實施例中，式 1 至式 28 中之任一者之化合物亦可包含於兩個或大於兩個電子傳輸層中之一個層中，且可包含於兩個或大於兩個電子傳輸層中之每一者中。在此情況下，各層中所包含之化合物可彼此相同或不同。

【0431】 根據本發明之另一個例示性實施例之有機發光元件包含：陽極；陰極；以及在陽極與陰極之間提供的一或多個有機材料

層，

其中有機材料層中之一或多個層包含式 1 至式 28 中之任一者之化合物，其 HOMO 能級為 6 eV 至 7 eV。

【0432】根據本發明之另一個例示性實施例之有機發光元件包含：陽極；陰極；在陽極與陰極之間提供的發光層；以及在發光層與陰極之間提供的電子傳輸層，

發光層包含主體，及

電子傳輸層包含式 1 至式 28 中之任一者之化合物，其與主體不同且 HOMO 能級為 6 eV 至 7 eV。

【0433】根據另一個例示性實施例之有機發光元件包含：陽極；陰極；在陽極與陰極之間提供的發光層；以及在發光層與陰極之間提供的電子控制層，

發光層包含主體，及

電子控制層包含式 1 至式 28 中之任一者之化合物，其與主體不同且 HOMO 能級為 6 eV 至 7 eV。

【0434】在本發明之實驗性實例中，已證實式 1 至式 28 中之任一者之化合物之 HOMO 能級為 6 eV 或大於 6 eV，其為深 HOMO 能級。證實此類深 HOMO 能級藉由有效地阻擋來自發光層之電洞而呈現高效率。證實此類電洞阻擋作用促進元件之穩定性且因此亦增加使用壽命。

【0435】根據本發明之例示性實施例，發光層包含主體及摻雜劑，且式 1 至式 28 中之任一者之化合物之 HOMO 能級大於主體之 HOMO 能級。

【0436】 根據本發明之例示性實施例，發光層包含主體及摻雜劑，且主體之高能級與由式 1 表示之雜環化合物之 HOMO 能級之間的差異為 0.2 eV 或大於 0.2 eV。如上文所描述，當發光層之主體材料與由式 1 表示之雜環化合物之間的 HOMO 能級之差異為 0.2 eV 或大於 0.2 eV 時，可進一步有效地阻擋來自發光層之電洞，且因此可提供具有高發光功效及長使用壽命之有機發光元件。

【0437】 即使在本發明之實驗性實例中，已證實當式 1 至式 28 中之任一者之化合物與發光層一起使用時，藉由具有比發光層之主體化合物之 HOMO 能級更深的 HOMO 能級來有效地阻擋電洞。舉例而言，在藍色螢光主體之情況下，通常使用蔥衍生物，且此等蔥衍生物通常具有小於 6 eV 之 HOMO 能級。在此情況下，證實當式 1 至式 28 中之任一者之化合物，其具有 6 eV 或大於 6 eV 之 HOMO 能級，用於有機發光元件作為電子控制層時，電洞阻擋作用較高。此外，證實即使通常使用之呋啉-雜芳基之組合之磷光主體具有小於 5.9 eV 之 HOMO 能級，且當具有 eV 或大於 6 eV 之 HOMO 能級之式 1 至式 28 中之任一者之化合物用作有機發光元件中之電子控制層時，電洞阻擋作用較高，其中所述有機發光元件使用所述材料作為發光層之主體。證實所有以下化合物[ET-1-A]、[ET-1-B]、[ET-2-A]、[ET-2-B]以及[ET-3-F]，其為如比較實例提出之蔥衍生物，具有小於 6 eV 之 HOMO 能級，且此等具有低 HOMO 能級之化合物具有低元件功效。

【0438】 根據本發明之另一個例示性實施例之有機發光元件包含：陽極；陰極；以及在陽極與陰極之間提供的一或多個有機材料

層，

其中有機材料層中之一或多個層包含式 1 至式 28 中之任一者之化合物，其三重態能量 (E_T) 為 2.2 eV 或大於 2.2 eV。

【0439】根據本發明之另一個例示性實施例之有機發光元件包含：陽極；陰極；在陽極與陰極之間提供的發光層；以及在發光層與陰極之間提供的電子傳輸層，

發光層包含主體，及

電子傳輸層包含式 1 至式 28 中之任一者之化合物，其與主體不同且具有 2.2 eV 或大於 2.2 eV 之三重態能量 (E_T)。

【0440】根據本發明之另一個例示性實施例之有機發光元件包含：陽極；陰極；在陽極與陰極之間提供的發光層；以及在發光層與陰極之間提供的電子控制層，

發光層包含主體，及

電子控制層包含式 1 至式 28 中之任一者之化合物，其與主體不同且具有 2.2 eV 或大於 2.2 eV 之三重態能量 (E_T)。

【0441】在本發明之實驗性實例中，證實式 1 至式 28 中之任一者之化合物之三重態能量為 2.2 eV 或大於 2.2 eV。具有此等不同範圍內之三重態能量之式 1 至式 28 中之任一者之化合物在有機發光元件(諸如藍色螢光發光元件、紅色磷光發光元件以及綠色磷光發光元件)中以有效方式有效阻擋發光層之三重態激子，從而呈現高效率。此外，三重態激子阻擋作用可增強元件之穩定性且因此亦增加其使用壽命。

【0442】根據本發明之例示性實施例，發光層包含主體及摻雜劑，

且由式 1 至式 28 中之任一者之表示之化合物之三重態能量大於主體之三重態能量。

【0443】 根據本發明之例示性實施例，當由式 1 至式 28 中之任一者之表示之化合物之三重態能量大於發光層之主體化合物之三重態能量時，可有效阻擋發光層之三重態激子。

【0444】 即使在本發明之實驗性實例中，證實當式 1 至式 28 中之任一者之化合物與發光層一起使用時，藉由具有大於發光層之主體化合物之三重態能量的三重態能量來有效阻擋發光層之三重態激子。舉例而言，在藍色螢光主體之情況下，通常使用蔥衍生物。證實此等蔥衍生物通常具有小於 1.9 eV 之三重態能級，且當具有 2.2 eV 或大於 2.2 eV 之三重態能級之式 1 至式 28 中之任一者之化合物用於有機發光元件作為電子控制層時，三重態激子阻擋作用極高使得元件功效得到改良。證實所有以下化合物[ET-1-A]、[ET-1-B]、[ET-2-A]、[ET-2-B]以及[ET-3-F]（其為如比較實例提出之蔥衍生物）具有小於 1.9 eV 之三重態能量，且當具有此類低三重態能量之化合物用於有機發光元件時，元件功效較低。

【0445】 根據本發明之例示性實施例，包含式 1 至式 28 中之任一者之化合物之電子傳輸層可摻雜有供體，且所述供體是指 n 型摻雜劑。

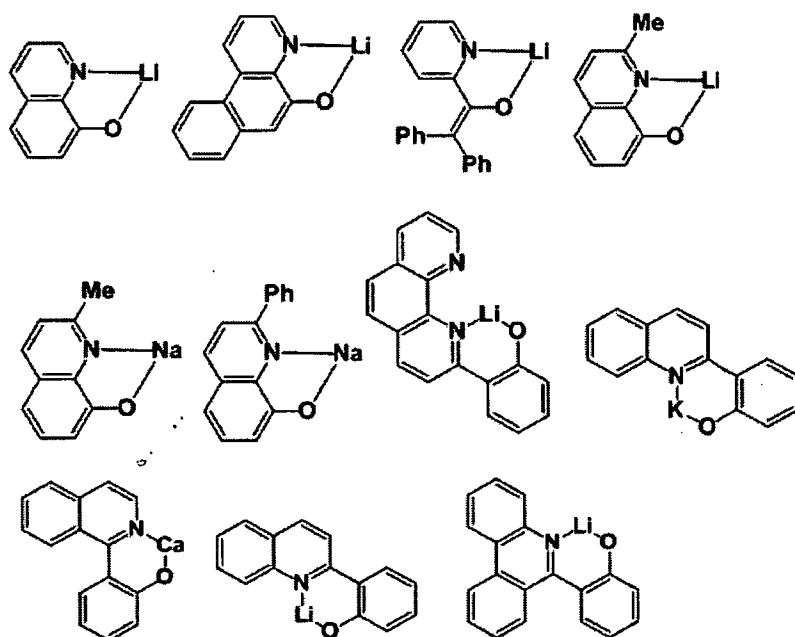
【0446】 在本發明中，供體摻雜是用於促進藉由用供體金屬化合物或供體複合物摻雜電子傳輸層來自負電極提取電子。

【0447】 根據本發明之例示性實施例，電子傳輸層；電子注入層；同時傳輸及注入電子之層；或電子控制層可包含式 1 至式 28 中之

任一者之化合物作為主體，且包含 n 型摻雜劑作為摻雜劑。

【0448】根據本發明之例示性實施例，n 型摻雜劑包含鹼金屬、鹼金屬化合物、鹼土金屬、鹼土金屬化合物或其組合。

【0449】此外，根據本發明之例示性實施例，作為 n 型摻雜劑，一者或兩者或大於兩者可由以下各者所組成之群中選出：Li、Na、K、Rb、Cs、Mg、Ca、Sr、Ba、La、Nd、Sm、Eu、Tb、Yb、LiF、Li₂O、CsF 或以下化合物，但 n 型摻雜劑不限於此。



【0450】根據本發明之例示性實施例，由式 1 至式 28 中之任一者之表示之化合物及 n 型摻雜劑可以 9:1 至 1:9 之重量比堆疊在有機發光元件上。

【0451】根據本發明之例示性實施例，n 型摻雜劑可為單獨的或呈其中兩者或大於兩者之組合的形式。

【0452】本發明之例示性實施例提供有機發光元件，其包含：陽極；陰極；以及在陽極與陰極之間提供的兩個或大於兩個有機材料層，其中有機材料層包含電子傳輸層及電子控制層，且電子傳輸層

包含式 1 至式 28 中之任一者之化合物作為主體及 n 型摻雜劑作為摻雜劑，且電子控制層與電子傳輸層不同。

【0453】 本發明之例示性實施例提供有機發光元件，其包含：陽極；陰極；以及在陽極與陰極之間提供的兩個或大於兩個有機材料層，其中有機材料層包含電子傳輸層及電子控制層，電子控制層包含式 1 至式 28 中之任一者之化合物作為主體及 n 型摻雜劑作為摻雜劑，且電子傳輸層與電子控制層不同。

● 【0454】 根據另一個例示性實施例，有機發光元件可為具有以下結構（正常類型）之有機發光元件：其中正電極、一或多個有機材料層以及負電極依序堆疊在基板上。

【0455】 根據另一個例示性實施例，有機發光元件可為具有逆向結構（顛倒類型）之有機發光元件，其中負電極、一或多個有機材料層以及正電極依序堆疊在基板上。

● 【0456】 舉例而言，根據本發明之例示性實施例之有機發光元件之結構說明於圖 1 及圖 2 中。

● 【0457】 圖 1 說明有機發光元件之實例，其由基板 1、陽極 2、發光層 3 以及陰極 4 組成。在所述結構中，化合物可包含於發光層中。

【0458】 圖 2 說明有機發光元件之實例，其由基板 1、陽極 2、電洞注入層 5、電洞傳輸層 6、發光層 7、電子傳輸層 8 以及陰極 4 組成。在所述結構中，化合物可包含於電洞注入層、電洞傳輸層、發光層以及電子傳輸層中之一或多個層中。

【0459】 除了有機材料層中之一或多個層包含本發明之化合物，

亦即式 1 至式 28 中之任一者之化合物以外，本發明之有機發光元件可藉由此項技術中已知之材料及方法製造。

【0460】 當有機發光元件包含多個有機材料層時，有機材料層可由相同材料或不同材料形成。

【0461】 除了有機材料層中之一或多個層包含式 1 至式 28 中之任一者之化合物，亦即由式 1 至式 28 中之任一者之表示之化合物以外，本發明之有機發光元件可藉由此項技術中已知之材料及方法製造。

【0462】 舉例而言，本發明之有機發光元件可藉由在基板上依序堆疊陽極、有機材料層以及陰極來製造。在此情況下，可藉由使用物理氣相沈積（PVD）方法（諸如濺鍍或電子束蒸發）在基板上沈積具有導電性之金屬或金屬氧化物或其合金以形成正電極，在其上形成包含電洞注入層、電洞傳輸層、發光層以及電子傳輸層之有機材料層，且接著在其上沈積可用作負電極之材料來製造有機發光元件。除上述方法以外，可藉由在基板上依序沈積負電極材料、有機材料層以及正電極材料來製造有機發光元件。

【0463】 此外，當製造有機發光元件時，不僅藉由真空沈積方法，亦可藉由溶液塗覆方法將式 1 至式 28 中之任一者之化合物形成為有機材料層。此處，溶液塗覆方法意謂旋塗、浸塗、刀片刮抹、噴墨印刷、絲網印刷、噴霧方法、滾塗以及其類似方法，但不限於此。

【0464】 除如上文所描述之方法以外，亦可藉由在基板上依序堆疊負電極材料、有機材料層以及正電極材料來製造有機發光元件（國際公開案第 2003/012890 號）。然而，製造方法不限於此。

【0465】 在本發明之一個例示性實施例中，陽極為正電極，且陰極為負電極。

【0466】 在另一個例示性實施例中，陽極為負電極，且陰極為正電極。

【0467】 作為正電極材料，具有較大功函數之材料通常較佳，以便將電洞平穩地噴射至有機材料層中。可用於本發明中的正電極材料之特定實例包含：金屬，諸如鈇、鉻、銅、鋅以及金，或其合金；金屬氧化物，諸如氧化鋅、氧化銦、氧化銦錫（ITO）以及氧化銦鋅（IZO）；金屬與氧化物之組合，諸如 ZnO:Al 或 $\text{SnO}_2\text{:Sb}$ ；導電聚合物，諸如聚(3-甲基噻吩)、聚[3,4-(伸乙基-1,2-二氧基)噻吩]（PEDOT）、聚吡咯及聚苯胺以及其類似物，但不限於此。

【0468】 作為負電極材料，具有較小功函數之材料通常較佳，以便將電子平穩地噴射至有機材料層中。負電極材料之特定實例包含：金屬，諸如鎂、鈣、鈉、鉀、鈦、銦、釷、鋰、鈳、鋁、銀、錫以及鉛，或其合金；多層結構材料，諸如 LiF/Al 或 $\text{LiO}_2\text{/Al}$ ，及其類似物，但不限於此。

【0469】 電洞注入材料為電極之電洞所注入之層，且較佳為具有傳輸電洞之能力的化合物，且因此具有注入正電極之電洞之作用及注入電洞用於發光層或發光材料的極佳作用，阻止由發光層產生之激子移動至電子注入層或電子注入材料，且在形成薄膜方面為極佳的。電洞注入材料之最高佔用分子軌域較佳在正電極材料之功函數與相鄰有機材料層之 HOMO 之間。電洞注入材料之特定實例包含金屬卟啉、寡聚噻吩、芳基胺類有機材料、己腈六氫雜聯

伸三苯類有機材料、喹吡啶酮類有機材料、芴類有機材料、蔥醌、聚苯胺類及聚噻吩類導電聚合物以及其類似物，但不限於此。

【0470】電子傳輸層為接收來自電洞注入層之電洞且將電洞傳輸至發光層之層，且電洞傳輸材料宜為可接收來自正電極或電洞注入層之電洞以將電洞轉移至發光層的材料，且具有電洞之大遷移率。其特定實例包含芳基胺類有機材料、導電聚合物、其中共軛部分及非共軛部分共同存在之嵌段共聚物以及其類似物，但不限於此。

【0471】根據本發明之例示性實施例，有機發光元件進行磷光發光或螢光發光，且發光材料為可接收分別來自電洞傳輸層及電子傳輸層之電洞及電子，且將電洞及電子組合以發射可見光區域中之光的材料，且較佳為對螢光或磷光具有良好量子效率之材料。其特定實例包含：8-羥基-喹啉鋁錯合物 (Alq_3)；咔唑類化合物；二聚苯乙烯基化合物； BAlq ；10-羥基苯并喹啉-金屬化合物；苯并噁唑類、苯并噻唑類以及苯并咪唑類化合物；聚(對伸苯基伸乙烯基) ($p\text{-phenylenevinylene}$ ；PPV) 類聚合物；螺環化合物；聚芴、紅螢烯 (rubrene) 以及其類似物，但不限於此。

【0472】發光層可包含主體材料及摻雜劑材料。主體材料之實例包含稠合芳環衍生物，或含由雜環之化合物，以及其類似物。具體而言，稠合芳環衍生物之實例包含蔥衍生物、芴衍生物、蒽衍生物、稠五苯 (pentacene) 衍生物、菲化合物、丙二烯合芴 (fluoranthene) 化合物及其類似物，且含有雜環之化合物之實例包含咔唑衍生物、二苯并呋喃衍生物、梯型呋喃 (ladder-type furan)

化合物、嘧啶衍生物及其類似物，但其實例不限於此。

【0473】 摻雜劑材料之實例包含芳族胺衍生物、苯乙烯基胺化合物、硼複合物、丙二烯合萸化合物、金屬錯合物以及其類似物。具體而言，芳族胺衍生物為具有經取代或未經取代之芳基胺基之稠合芳環衍生物，且其實例包含芘、蒽、屈、二茛并芘以及其具有芳基胺基之類似物，且苯乙烯基胺化合物為其中經取代或未經取代之芳基胺經至少一個芳基乙烯基取代之化合物，且一個或兩個或大於兩個取代基由以下各者所組成之群中選出：芳基、矽烷基、烷基、環烷基以及經取代或未經取代之芳基胺基。其特定實例包含苯乙烯基胺、苯乙烯基二胺、苯乙烯基三胺、苯乙烯基四胺以及其類似物，但不限於此。此外，金屬錯合物之實例包含銨錯合物、鉑錯合物以及其類似物，但不限於此。

【0474】 電子傳輸層為接收來自電子注入層之電子且將電子傳輸至發光層之層，且電子傳輸材料為可良好地接收來自負電極之電子且可將電子轉移至發光層之材料，且宜為具有用於電子之大遷移率之材料。其特定實例包含：8-羥基喹啉之 Al 錯合物；包含 Alq₃ 之錯合物；有機基團化合物；以及羥基黃酮-金屬錯合物，但不限於此。電子傳輸層可與任何所需陰極材料一起使用，如根據相關技術使用。特定言之，適合的陰極材料之實例為以下典型材料：其具有低功函數，後接有鋁層或銀層。其特定實例包含銨、鋇、鈣、鎵以及鈣，在各種情況下，後接有鋁層或銀層。

【0475】 根據本發明之例示性實施例，電子控制層用於有效接收來自電子傳輸層之電子，且控制電子遷移率，藉此用於控制轉移至

發光層之電子之量。此外，電子控制層可同時充當電洞障壁，其使得由發光層供應之電洞不會轉移至電子傳輸層。此可使發光層中之電洞與電子之間的平衡最大化，且因此可增加發光功效，且可經由電子控制層之電洞穩定性而增強元件之使用壽命。

【0476】 電子注入層為注入來自電極之電子之層，且較佳為具有傳輸電子之能力的化合物，且具有注入來自負電極之電子之作用及將電子注入發光層或發光材料之極佳作用，阻止由發光層產生之激子移動至電洞注入層，且亦在形成薄膜方面為極佳的。其特定實例包含芴酮 (fluorenone)、蒽醌二甲烷 (anthraquinodimethane)、聯苯醌 (diphenoquinone)、硫代吡喃二氧化物 (thiopyran dioxide)、噁唑、噁二唑、三唑、咪唑、芘四甲酸 (perylene tetracarboxylic)、亞芴基甲烷 (fluorenylidene methane)、蒽酮 (anthrone) 及其衍生物，金屬錯合物化合物、含氮 5 員環衍生物及其類似物，但不限於此。

【0477】 金屬錯合物化合物之實例包含 8-羥基喹啉根基鋰、雙(8-羥基喹啉根基)鋅、雙(8-羥基喹啉根基)銅、雙(8-羥基喹啉根基)錳、參(8-羥基喹啉根基)鋁、參(2-甲基-8-羥基喹啉根基)鋁、參(8-羥基喹啉根基)鎳、雙(10-羥基苯并[h]喹啉根基)鉍、雙(10-羥基苯并[h]喹啉根基)鋅、雙(2-甲基-8-喹啉根基)鎳、雙(2-甲基-8-喹啉根基)(鄰甲酚根基)鎳、雙(2-甲基-8-喹啉根基)(1-萘根基)鋁、雙(2-甲基-8-喹啉根基)(2-萘根基)鎳以及其類似物，但不限於此。

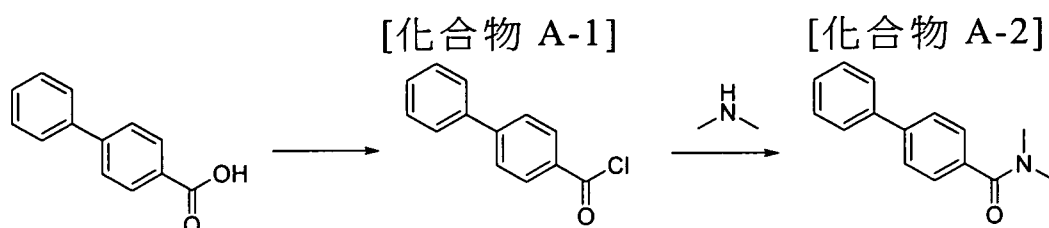
【0478】 根據所使用之材料，根據本發明之有機發光元件可為頂部發射型、底部發射型或雙重發射型。

【0479】 在本發明之一個例示性實施例中，除有機發光元件以外，式 1 化合物可包含於有機太陽能電池或有機電晶體中。

【0480】 由式 1 表示之化合物及包含其之有機發光元件之製備特定描述於以下實例中。然而，提供以下實例以用於說明本發明，且本發明之範圍不限於此。

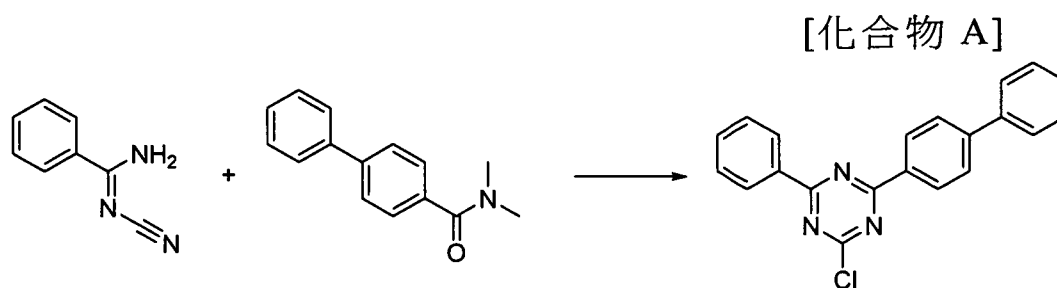
<製備實例>

<製備實例 1-1> 製備[化合物 1-1]



【0481】 將[1,1'-聯二苯]-4-甲酸（30 g，151 mmol）放入亞硫醯二氯（400 mL）中，且接著回流及攪拌所得混合物 2 小時。在混合物冷卻至正常溫度之後，用乙醚洗滌藉由蒸餾混合物而產生之固體，且接著乾燥，藉此製備[化合物 A-1]（29.4 g，產率 90%，MS: $[M+H]^+ = 217$ ）。

【0482】 在將 2.0 M 二乙胺（74.8 mL，150 mmol）及三乙胺（37.9 mL，272 mmol）之溶液放入 500 mL 乙醚之後，向其中緩慢地逐滴添加[化合物 A-1]（29.4 g，136 mmol），且攪拌所得混合物 30 分鐘。過濾所產生之固體，且接著蒸餾濾液，藉此製備[化合物 A-2]（26 g，產率 85%，MS: $[M+H]^+ = 226$ ）。



【0483】 將 N'-氰基苯甲脒 (16.8 g, 116 mmol)、[化合物 A-2] (26 g, 116 mmol) 以及氧氯化磷 (12 mL, 128) 放入 500 mL 乙腈，且接著攪拌及回流所得混合物 1 小時。在混合物冷卻至正常溫度之後，過濾所產生之固體且用水及乙醇洗滌，且接著乾燥，藉此製備[化合物 A] (32.7 g, 產率 82%，MS: $[M+H]^+ = 344$)。

【0484】 將[化合物 A] (10 g, 29 mmol) 及(9,9-二甲基-9H-蒽-1-基)硼酸 (7.6 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 7 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-1] (12.5 g, 產率 86%，MS: $[M+H]^+ = 502$)。

<製備實例 1-2> 製備[化合物 1-2]

【0485】 將[化合物 A] (10 g, 29 mmol) 及(9,9-二甲基-9H-蒽-2-基)硼酸 (7.6 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 5 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-2] (12.5 g, 產率 81%，MS: $[M+H]^+ = 502$)。

<製備實例 1-3> 製備[化合物 1-3]

【0486】 將[化合物 A] (10 g, 29 mmol) 及(9,9-二甲基-9H-蒽-3-基))硼酸 (7.6 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 6 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-3] (11.2 g, 產率 77%，MS: $[M+H]^+ = 502$)。

<製備實例 1-4> 製備[化合物 1-4]

【0487】 將[化合物 A] (10 g, 29 mmol) 及(9,9-二甲基-9H-蒽-4-基))硼酸 (7.6 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 5 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-4] (10.9 g, 產率 75%，MS: $[M+H]^+ = 502$)。

<製備實例 1-5> 製備[化合物 1-6]

【0488】 將[化合物 A] (10 g, 29 mmol) 及(9,9-二苯基-9H-蒽-2-基))硼酸 (11.6 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 7 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-6] (16.0 g, 產率 88%，MS: $[M+H]^+ = 626$)。

<製備實例 1-6> 製備[化合物 1-8]

【0489】 將[化合物 A] (10 g, 29 mmol) 及(9,9-二苯基-9H-蒽-4-基))硼酸 (11.6 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL

2 M K_2CO_3 及 0.7 g $\text{Pd}(\text{PPh}_3)_4$ ，且接著攪拌及回流所得混合物 8 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-8] (15.2 g，產率 84%，MS: $[\text{M}+\text{H}]^+ = 626$)。

<製備實例 1-7> 製備[化合物 1-10]

【0490】 將[化合物 A] (10 g，29 mmol) 及(9,9-二-對甲苯基-9H-芴-2-基))硼酸 (12.5 g，32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $\text{Pd}(\text{PPh}_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-10] (14.2 g，產率 75%，MS: $[\text{M}+\text{H}]^+ = 654$)。

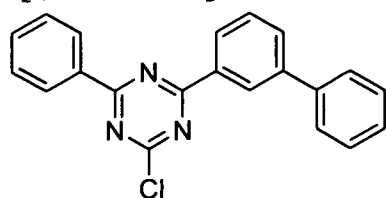
<製備實例 1-8> 製備[化合物 1-12]

【0491】 將[化合物 A] (10 g，29 mmol) 及(9,9-二-對甲苯基-9H-芴-2-基))硼酸 (12.5 g，32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $\text{Pd}(\text{PPh}_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-12] (13.8 g，產率 73%，MS: $[\text{M}+\text{H}]^+ = 654$)。

<製備實例 1-9> 製備[化合物 1-18]

【0492】 使用[1,1'-聯二苯]-3-甲酸，以與<製備實例 1>中相同之方式製備[化合物 B] (MS: $[\text{M}+\text{H}]^+ = 344$)

[化合物 B]



【0493】 將[化合物 B] (10 g, 29 mmol) 及(9,9-二苯基-9H-芴-2-基))硼酸 (11.6 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 8 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-18] (14.9 g, 產率 82%，MS: $[M+H]^+ = 626$)。

<製備實例 1-10> 製備[化合物 1-20]

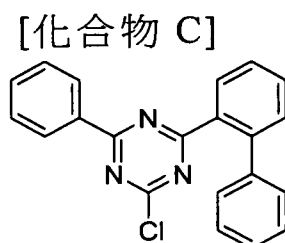
【0494】 將[化合物 B] (10 g, 29 mmol) 及(9,9-二苯基-9H-芴-4-基))硼酸 (11.6 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-20] (13.8 g, 產率 76%，MS: $[M+H]^+ = 626$)。

<製備實例 1-11> 製備[化合物 1-22]

【0495】 將[化合物 B] (10 g, 29 mmol) 及(9,9-二-對甲苯基-9H-芴-2-基))硼酸 (12.5 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 11 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-22] (13.8 g, 產率 73%，MS: $[M+H]^+ = 654$)。

<製備實例 1-12> 製備[化合物 1-26]

[0496] 使用[1,1'-聯二苯]-2-甲酸，以與<製備實例 1>中相同之方式製備[化合物 C]。(MS: $[M+H]^+ = 344$)



[0497] 將[化合物 C] (10 g, 29 mmol) 及(9,9-二甲基-7-苯基-9H-蒽-2-基)硼酸 (10.1 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 11 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-26] (12.4 g, 產率 74%, MS: $[M+H]^+ = 578$)。

<製備實例 1-13> 製備[化合物 1-30]

[0498] 將[化合物 C] (10 g, 29 mmol) 及(9,9-二苯基-9H-蒽-2-基)硼酸 (10.5 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 8 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-30] (14.2 g, 產率 78%, MS: $[M+H]^+ = 626$)。

<製備實例 1-14> 製備[化合物 1-32]

[0499] 將[化合物 C] (10 g, 29 mmol) 及(9,9-二苯基-9H-蒽-4-基)硼酸 (10.5 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10

小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-32] (12.9 g，產率 71%，MS: $[M+H]^+ = 626$)。

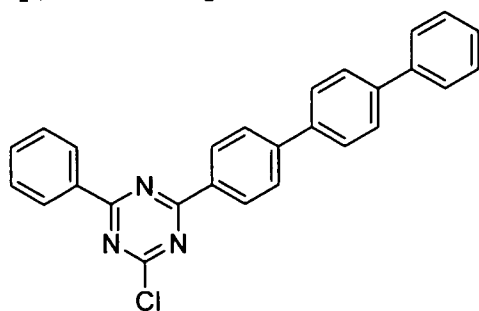
<製備實例 1-15> 製備[化合物 1-34]

【0500】 將[化合物 C] (10 g，29 mmol) 及(9,9-二-對甲苯基-9H-芴-2-基)硼酸 (12.5 g，32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 12 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-34] (13.3 g，產率 70%，MS: $[M+H]^+ = 654$)。

<製備實例 1-16> 製備[化合物 1-40]

【0501】 使用[1,1':4',1''-聯三苯]-4-甲酸，以與<製備實例 1>中相同之方式製備[化合物 D]。(MS: $[M+H]^+ = 420$)

[化合物 D]



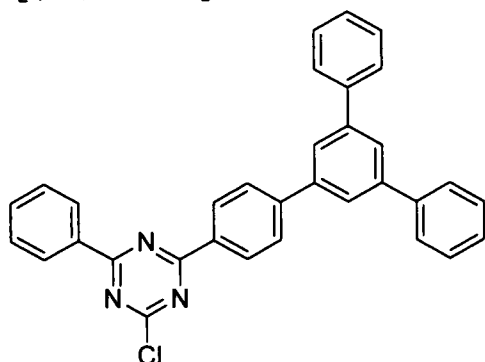
【0502】 將[化合物 D] (10 g，24 mmol) 及(9,9-二甲基-9H-芴-4-基)硼酸 (6.2 g，26 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 7 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-40] (10.7 g，產

率 77%，MS: $[M+H]^+ = 578$)。

<製備實例 1-17> 製備[化合物 1-50]

【0503】 使用 5'-苯基-[1,1':3',1''-聯三苯]-4-甲酸，以與<製備實例 1>中相同之方式製備[化合物 E]。(MS: $[M+H]^+ = 496$)

[化合物 E]

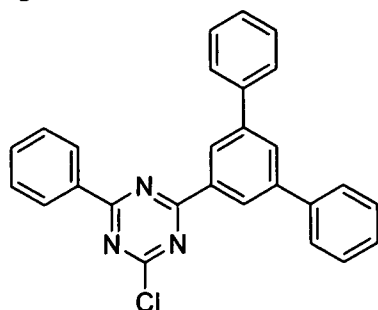


【0504】 將[化合物 E] (10 g, 20 mmol) 及(9,9-二甲基-9H-蒽-2-基)硼酸 (5.2 g, 22 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.5 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-50] (9.2 g，產率 70%，MS: $[M+H]^+ = 654$)。

<製備實例 1-18> 製備[化合物 1-54]

【0505】 使用[1,1':3',1''-聯三苯]-5'-甲酸，以與<製備實例 1>中相同之方式製備[化合物 F]。(MS: $[M+H]^+ = 420$)

[化合物 F]



【0506】 將[化合物 F] (10 g, 24 mmol) 及(9,9-二苯基-9H-蒽-2-基)硼酸 (9.4 g, 26 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 12 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-54] (13.0 g，產率 77%，MS: $[M+H]^+ = 702$)。

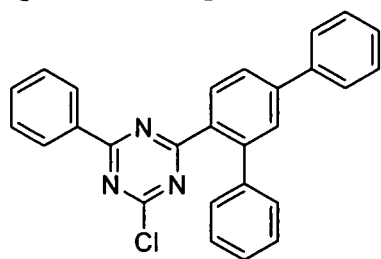
<製備實例 1-19> 製備[化合物 1-56]

【0507】 將[化合物 F] (10 g, 24 mmol) 及(9,9-二苯基-9H-蒽-4-基)硼酸 (9.4 g, 26 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 14 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-56] (13.3 g，產率 79%，MS: $[M+H]^+ = 702$)。

<製備實例 1-20> 製備[化合物 1-67]

【0508】 使用[1,1':3',1''-聯三苯]-4'-甲酸，以與<製備實例 1>中相同之方式製備[化合物 G]。(MS: $[M+H]^+ = 420$)

[化合物 G]



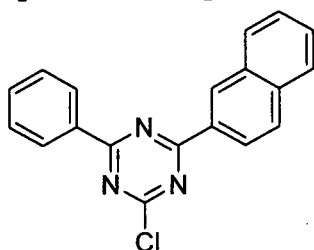
【0509】 將[化合物 G] (10 g, 24 mmol) 及(9,9-二苯基-9H-蒽-3-基)硼酸 (9.4 g, 26 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 12

小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-67] (12.6 g，產率 75%，MS: $[M+H]^+ = 702$)。

<製備實例 1-21> 製備[化合物 1-82]

【0510】 使用 2-萘甲酸，以與<製備實例 1>中相同之方式製備[化合物 H]。(MS: $[M+H]^+ = 318$)

[化合物 H]

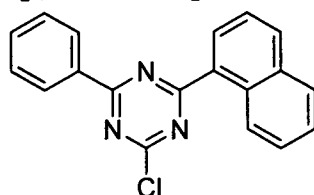


【0511】 將[化合物 H] (10 g, 31 mmol) 及(9,9-二-對甲苯基-9H-蒽-2-基)硼酸 (13.3 g, 34 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 6 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-82] (15.8 g，產率 81%，MS: $[M+H]^+ = 628$)。

<製備實例 1-22> 製備[化合物 1-90]

【0512】 使用 1-萘甲酸，以與<製備實例 1>中相同之方式製備[化合物 I]。(MS: $[M+H]^+ = 318$)

[化合物 I]



【0513】 將[化合物 I] (10 g, 31 mmol) 及(9,9-二苯基-9H-蒽-2-基)

硼酸 (12.3 g, 34 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 7 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-90] (13.0 g，產率 70%，MS: $[M+H]^+ = 600$)。

<製備實例 1-23> 製備[化合物 1-92]

【0514】 將[化合物 H] (10 g, 31 mmol) 及(9,9-二苯基-9H-蒽-4-基)硼酸 (12.3 g, 34 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 7 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-92] (14.7 g，產率 79%，MS: $[M+H]^+ = 600$)。

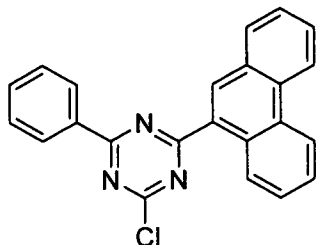
<製備實例 1-24> 製備[化合物 1-94]

【0515】 將[化合物 H] (10 g, 31 mmol) 及(9,9-二-對甲苯基-9H-蒽-2-基)硼酸 (13.3 g, 34 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-94] (13.2 g，產率 68%，MS: $[M+H]^+ = 628$)。

<製備實例 1-25> 製備[化合物 1-102]

【0516】 使用菲-9-甲酸，以與<製備實例 1>中相同之方式製備[化合物 J]。(MS: $[M+H]^+ = 368$)

[化合物 J]

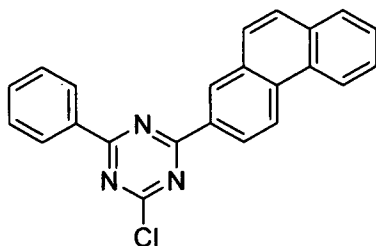


【0517】 將[化合物 J] (10 g, 27 mmol) 及(9,9-二苯基-9H-芴-2-基)硼酸 (10.9 g, 30 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-102] (13.2 g，產率 75%，MS: $[M+H]^+ = 650$)。

<製備實例 1-26> 製備[化合物 1-116]

【0518】 使用菲-2-甲酸，以與<製備實例 1>中相同之方式製備[化合物 K]。(MS: $[M+H]^+ = 368$)

[化合物 K]

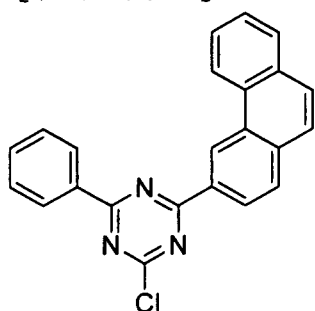


【0519】 將[化合物 K] (10 g, 27 mmol) 及(9,9-二苯基-9H-芴-4-基)硼酸 (10.9 g, 30 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-116] (13.7 g，產率 78%，MS: $[M+H]^+ = 650$)。

<製備實例 1-27> 製備[化合物 1-122]

【0520】 使用菲-2-甲酸，以與<製備實例 1>中相同之方式製備[化合物 L]。(MS: $[M+H]^+ = 368$)

[化合物 L]



【0521】 將[化合物 L] (10 g, 27 mmol) 及(9,9-二甲基-7-苯基-9H-蒽-2-基)硼酸 (9.4 g, 30 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-122] (12.8 g, 產率 79%, MS: $[M+H]^+ = 602$)。

<製備實例 1-28> 製備[化合物 1-126]

【0522】 將[化合物 L] (10 g, 27 mmol) 及(9,9-二苯基-9H-蒽-2-基)硼酸 (10.9 g, 30 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-126] (13.3 g, 產率 76%, MS: $[M+H]^+ = 650$)。

<製備實例 1-29> 製備[化合物 1-128]

【0523】 將[化合物 L] (10 g, 27 mmol) 及(9,9-二苯基-9H-蒽-4-

基)硼酸 (10.9 g, 30 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 12 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-128] (12.3 g, 產率 70%, MS: $[M+H]^+ = 650$)。

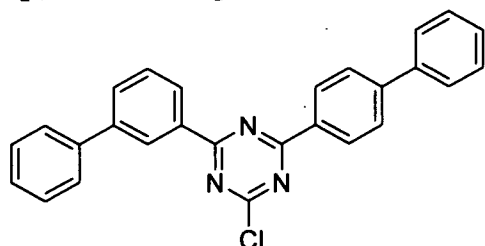
<製備實例 1-30> 製備[化合物 1-130]

【0524】 將[化合物 L] (10 g, 27 mmol) 及(9,9-二-對甲苯基-9H-蒽-2-基)硼酸 (11.7 g, 30 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 14 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-130] (12.3 g, 產率 67%, MS: $[M+H]^+ = 678$)。

<製備實例 1-31> 製備[化合物 1-134]

【0525】 使用 N'-氰基-[1,1'-聯二苯]-4-甲脒及[1,1'-聯二苯]-3-甲酸，以與<製備實例 1>中相同之方式製備[化合物 M]。(MS: $[M+H]^+ = 420$)

[化合物 M]



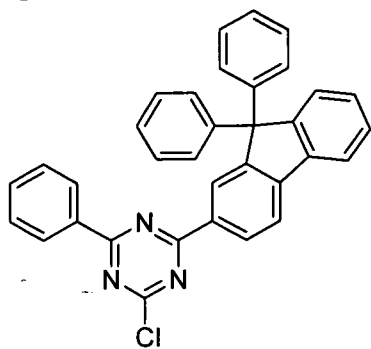
【0526】 將[化合物 M] (10 g, 24 mmol) 及(9,9-二甲基-9H-蒽-2-基)硼酸 (6.4 g, 27 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 7 小

時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-134] (10.1 g，產率 73%，MS: $[M+H]^+ = 578$)。

<製備實例 1-32> 製備[化合物 1-138]

【0527】 使用(9,9-二苯基-9H-芴-2-基)甲酸，以與<製備實例 1>中相同之方式製備[化合物 V]。(MS: $[M+H]^+ = 509$)

[化合物 V]

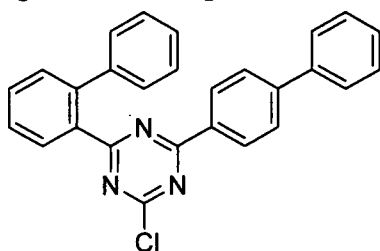


【0528】 將[化合物 V] (10 g，20 mmol) 及(4-(萘-2-基)苯基)硼酸 (5.5 g，22 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.5 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 7 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-138] (10.3 g，產率 76%，MS: $[M+H]^+ = 676$)。

<製備實例 1-33> 製備[化合物 1-154]

【0529】 使用 N'-氰基-[1,1'-聯二苯]-4-甲脒及[1,1'-聯二苯]-2-甲酸，以與<製備實例 1>中相同之方式製備[化合物 N]。(MS: $[M+H]^+ = 420$)

[化合物 N]

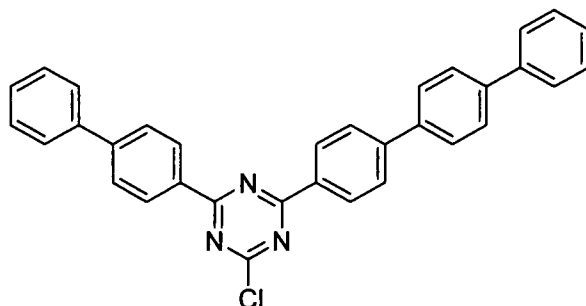


【0530】 將[化合物 N] (10 g, 24 mmol) 及(9,9-二-對甲苯基-9H-蒽-2-基)硼酸 (10.5 g, 27 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 6 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-154] (12.3 g, 產率 70%, MS: $[M+H]^+ = 730$)。

<製備實例 1-34> 製備[化合物 1-160]

【0531】 使用 N'-氰基-[1,1'-聯二苯]-4-甲脒及[1,1':4',1''-聯三苯]-4-甲酸，以與<製備實例 1>中相同之方式製備[化合物 O]。(MS: $[M+H]^+ = 496$)

[化合物 O]



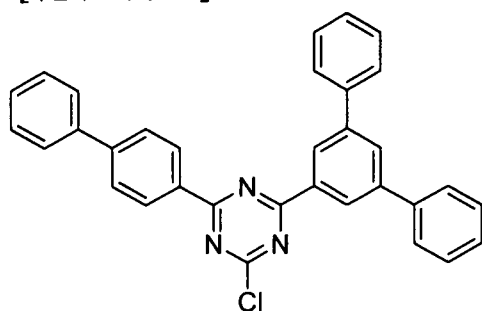
【0532】 將[化合物 O] (10 g, 20 mmol) 及(9,9-二甲基-9H-蒽-4-基)硼酸 (5.2 g, 22 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.5 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 5 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固

體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-160] (8.6 g，產率 66%，MS: $[M+H]^+ = 654$)。

<製備實例 1-35> 製備[化合物 1-170]

【0533】 使用 N'-氰基-[1,1'-聯二苯]-4-甲脒及[1,1':3',1''-聯三苯]-5'-甲酸，以與<製備實例 1>中相同之方式製備[化合物 P]。(MS: $[M+H]^+ = 496$)

[化合物 P]

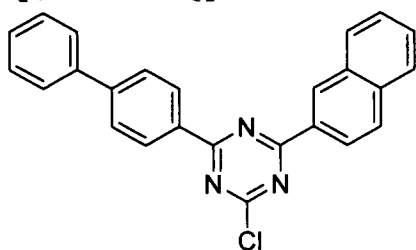


【0534】 將[化合物 P] (10 g，20 mmol) 及(9,9-二甲基-9H-蒽-2-基)硼酸 (5.2 g，22 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.5 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 5 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-170] (9.2 g，產率 70%，MS: $[M+H]^+ = 654$)。

<製備實例 1-36> 製備[化合物 1-198]

【0535】 使用 N'-氰基-[1,1'-聯二苯]-4-甲脒及 2-萘甲酸，以與<製備實例 1>中相同之方式製備[化合物 Q]。(MS: $[M+H]^+ = 394$)

[化合物 Q]

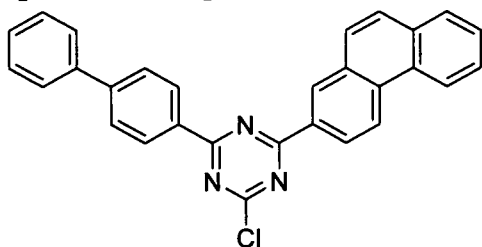


【0536】 將[化合物 Q] (10 g, 25 mmol) 及(9,9-二苯基-9H-芴-2-基)硼酸 (10.1 g, 28 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 6 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-198] (12.7 g, 產率 75%，MS: $[M+H]^+ = 676$)。

<製備實例 1-37> 製備[化合物 1-229]

【0537】 使用 N'-氰基-[1,1'-聯二苯]-4-甲脒及菲-2-甲酸，以與<製備實例 1>中相同之方式製備[化合物 R]。(MS: $[M+H]^+ = 444$)

[化合物 R]



【0538】 將[化合物 R] (10 g, 23 mmol) 及(9,9-二甲基-9H-芴-1-基)硼酸 (6.0 g, 25 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.5 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 8 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-229] (10.8 g, 產率 78%，MS: $[M+H]^+ = 602$)。

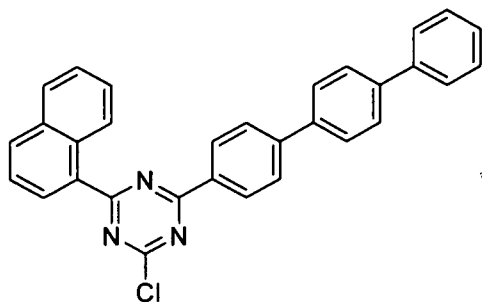
<製備實例 1-38> 製備[化合物 1-237]

【0539】 將[化合物 R] (10 g, 23 mmol) 及(7,7-二甲基-7H-苯并[c]第-5-基)硼酸 (7.2 g, 25 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.5 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-237] (10.5 g, 產率 70%, MS: $[M+H]^+ = 652$)。

<製備實例 1-39> 製備[化合物 1-279]

【0540】 使用 N'-氰基-1-萘甲脒及[1,1':4',1''-聯三苯]-4-甲酸，以與<製備實例 1>中相同之方式製備[化合物 S]。(MS: $[M+H]^+ = 470$)

[化合物 S]

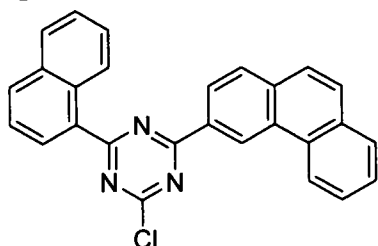


【0541】 將[化合物 S] (10 g, 21 mmol) 及(9,9-二甲基-9H-第-3-基)硼酸 (5.5 g, 23 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.5 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-279] (10.4 g, 產率 79%, MS: $[M+H]^+ = 628$)。

<製備實例 1-40> 製備[化合物 1-341]

【0542】 使用 N'-氰基-1-萘甲脒及菲-3-甲酸，以與<製備實例 1>中相同之方式製備[化合物 T]。(MS: $[M+H]^+ = 418$)

[化合物 T]



【0543】 將[化合物 T] (10 g, 24 mmol) 及(9,9-二苯基-9H-芴-1-基)硼酸 (8.7 g, 23 mmol) 放入 150 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 8 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-341] (13.6 g，產率 81%，MS: $[M+H]^+ = 700$)。

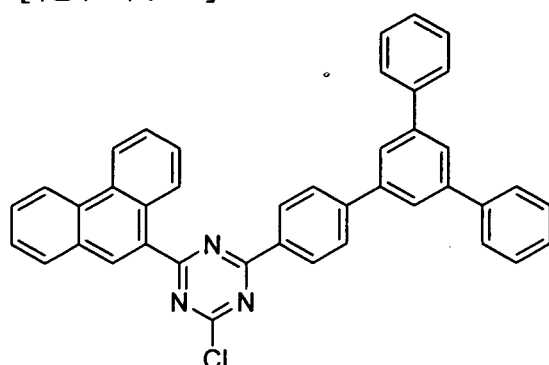
<製備實例 1-41> 製備[化合物 1-345]

【0544】 將[化合物 T] (10 g, 24 mmol) 及(11,11-二甲基-11H-苯并[a]芴-9-基)硼酸 (7.5 g, 26 mmol) 放入 150 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 11 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-345] (10.1 g，產率 67%，MS: $[M+H]^+ = 626$)。

<製備實例 1-42> 製備[化合物 1-482]

【0545】 使用 N'-氰基菲-9-甲脒及 5'-苯基-[1,1':3',1''-聯三苯]-4-甲酸，以與<製備實例 1>中相同之方式製備[化合物 U]。(MS: $[M+H]^+ = 597$)

[化合物 U]

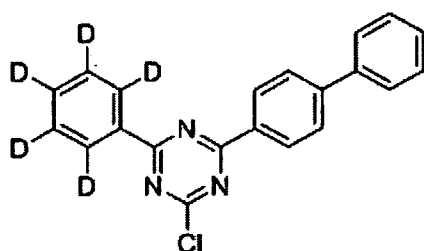


【0546】 將[化合物 U] (15 g, 25 mmol) 及(9,9-二甲基-9H-芴-2-基)硼酸 (6.7 g, 28 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 8 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-482] (12.8 g, 產率 68%，MS: $[M+H]^+ = 753$)。

<製備實例 1-43> 製備[化合物 1-625]

【0547】 使用 N'-氘基苯甲脒-2,3,4,5,6-d5 及[1,1'-聯二苯]-4-甲酸，以與<製備實例 1>中相同之方式製備[化合物 V]。(MS: $[M+H]^+ = 349$)

[化合物 V]



【0548】 將[化合物 T] (10 g, 29 mmol) 及(9,9-二苯基-9H-芴-2-基)硼酸 (10.4 g, 29 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 6 小

時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 1-625] (12.2 g，產率 69%，MS: $[M+H]^+ = 631$)。

<製備實例 2-1> 製備[化合物 2-2]

【0549】 將[化合物 A] (10 g，29 mmol) 及(4-(9,9-二甲基-9H-芴-2-基)苯基)硼酸 (9.1 g，31 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 7 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-2] (12.7 g，產率 76%，MS: $[M+H]^+ = 578$)。

<製備實例 2-2> 製備[化合物 2-4]

【0550】 將[化合物 A] (10 g，29 mmol) 及(3-(9,9-二甲基-9H-芴-2-基)苯基)硼酸 (13.6 g，31 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-2] (14.5 g，產率 71%，MS: $[M+H]^+ = 702$)。

<製備實例 2-3> 製備[化合物 2-5]

【0551】 將[化合物 A] (10 g，29 mmol) 及(4-(9,9-二甲基-9H-芴-2-基)苯基)硼酸 (13.6 g，31 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 8 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-5]

(14.9 g, 產率 73%, MS: $[M+H]^+ = 702$)。

<製備實例 2-4> 製備[化合物 2-6]

【0552】 將[化合物 A] (10 g, 29 mmol) 及(4-(9,9-二甲基-9H-芴-4-基)苯基)硼酸 (13.6 g, 31 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$, 且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度, 且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶, 藉此製備[化合物 2-6] (14.0 g, 產率 69%, MS: $[M+H]^+ = 702$)。

<製備實例 2-5> 製備[化合物 2-8]

【0553】 將[化合物 A] (10 g, 29 mmol) 及(4-(7,7-二甲基-7H-苯并[c]芴-5-基)苯基)硼酸 (11.3 g, 31 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$, 且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度, 且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶, 藉此製備[化合物 2-8] (11.2 g, 產率 66%, MS: $[M+H]^+ = 628$)。

<製備實例 2-6> 製備[化合物 2-11]

【0554】 將[化合物 C] (10 g, 29 mmol) 及(4-(9,9-二甲基-9H-芴-3-基)苯基)硼酸 (9.1 g, 31 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$, 且接著攪拌及回流所得混合物 7 小時。混合物冷卻至正常溫度, 且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶, 藉此製備[化合物 2-11] (12.4 g, 產率 74%, MS: $[M+H]^+ = 578$)。

<製備實例 2-7> 製備[化合物 2-28]

【0555】 將[化合物 D] (10 g, 24 mmol) 及(4-(9,9-二甲基-9H-芴-4-基)苯基)硼酸 (8.2 g, 26 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-28] (12.4 g, 產率 74%, MS: $[M+H]^+ = 654$)。

<製備實例 2-8> 製備[化合物 2-38]

【0556】 將[化合物 F] (10 g, 24 mmol) 及(4-(9,9-二苯基-9H-芴-4-基)苯基)硼酸 (11.4 g, 26 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-38] (13 g, 產率 70%, MS: $[M+H]^+ = 778$)。

<製備實例 2-9> 製備[化合物 2-55]

【0557】 將[化合物 H] (10 g, 32 mmol) 及(4-(9,9-二-對甲苯基-9H-芴-2-基)苯基)硼酸 (16.3 g, 35 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-55] (17.3 g, 產率 77%, MS: $[M+H]^+ = 704$)。

<製備實例 2-10> 製備[化合物 2-70]

【0558】 將[化合物 J] (10 g, 27 mmol) 及(4-(9,9-二苯基-9H-芴-4-基)苯基)硼酸 (13.1 g, 30 mmol) 放入 100 mL THF。向其中放

入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-70] (15.7 g，產率 80%，MS: $[M+H]^+ = 726$)。

<製備實例 2-11> 製備[化合物 2-90]

【0559】 將[化合物 A] (10 g，29 mmol) 及(4-(9,9-二甲基-9H-芴-2-基)萘-1-基)硼酸 (11.7 g，32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-90] (17.2 g，產率 76%，MS: $[M+H]^+ = 780$)。

<製備實例 2-12> 製備[化合物 2-99]

【0560】 將[化合物 C] (10 g，29 mmol) 及(4-(9,9-二甲基-9H-芴-3-基)萘-1-基)硼酸 (11.7 g，32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-99] (16 g，產率 71%，MS: $[M+H]^+ = 780$)。

<製備實例 2-13> 製備[化合物 2-106]

【0561】 將[化合物 B] (10 g，29 mmol) 及(4-(9,9-二甲基-9H-芴-2-基)萘-1-基)硼酸 (11.7 g，32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合

物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-106] (17.9 g，產率 79%，MS: $[M+H]^+ = 780$)。

<製備實例 2-14> 製備[化合物 2-113]

【0562】 將[化合物 D] (10 g，24 mmol) 及(5-(9,9-二甲基-9H-芴-1-基)萘-2-基)硼酸 (9.5 g，26 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 11 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-113] (11.8 g，產率 70%，MS: $[M+H]^+ = 704$)。

<製備實例 2-15> 製備[化合物 2-122]

【0563】 將[化合物 F] (10 g，24 mmol) 及(5-(9,9-二甲基-9H-芴-1-基)萘-2-基)硼酸 (9.5 g，26 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.6 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-122] (11.2 g，產率 66%，MS: $[M+H]^+ = 704$)。

<製備實例 2-16> 製備[化合物 2-141]

【0564】 將[化合物 H] (10 g，32 mmol) 及(3-(9,9-二-對甲苯基-9H-芴-2-基)萘-2-基)硼酸 (17 g，35 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 11 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-141] (16.7 g，產率 72%，MS: $[M+H]^+ = 726$)。

<製備實例 2-17> 製備[化合物 2-146]

【0565】 將[化合物 I] (10 g, 32 mmol) 及(4-(9,9-二甲基-7-苯基-9H-芴-2-基)萘-1-基)硼酸 (15.4 g, 35 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 11 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-146] (17.1 g, 產率 79%, MS: $[M+H]^+ = 678$)。

<製備實例 2-18> 製備[化合物 2-178]

【0566】 將[化合物 A] (10 g, 29 mmol) 及(6-(9,9-二甲基-9H-芴-2-基)萘-2-基)硼酸 (11.7 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-178] (14 g, 產率 77%, MS: $[M+H]^+ = 628$)。

<製備實例 2-19> 製備[化合物 2-227]

【0567】 將[化合物 H] (10 g, 32 mmol) 及(6-(9,9-二-對甲苯基-9H-芴-2-基)萘-3-基)硼酸 (12.7 g, 35 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 9 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-227] (14.0 g, 產率 73%, MS: $[M+H]^+ = 602$)。

<製備實例 2-20> 製備[化合物 2-269]

【0568】 將[化合物 A] (10 g, 29 mmol) 及(7-(9,9-二苯基-9H-芴-

2-基)萘-2-基)硼酸 (14.2 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-269] (17.2 g, 產率 79%, MS: $[M+H]^+ = 752$)。

<製備實例 2-21> 製備[化合物 2-282]

【0569】 將[化合物 B] (10 g, 29 mmol) 及(7-(9,9-二甲基-9H-芴-2-基)萘-2-基)硼酸 (11.7 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 10 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-282] (13.7 g, 產率 75%, MS: $[M+H]^+ = 628$)。

<製備實例 2-22> 製備[化合物 2-353]

【0570】 將[化合物 A] (10 g, 29 mmol) 及(10-(9,9-二甲基-9H-芴-2-基)菲-9-基)硼酸 (13.3 g, 32 mmol) 放入 100 mL THF。向其中放入 50 mL 2 M K_2CO_3 及 0.7 g $Pd(PPh_3)_4$ ，且接著攪拌及回流所得混合物 13 小時。混合物冷卻至正常溫度，且接著使藉由過濾混合物而產生之固體與氯仿及乙醇一起再結晶，藉此製備[化合物 2-353] (13.8 g, 產率 70%, MS: $[M+H]^+ = 678$)。

【0571】 經由本發明之實驗性實例量測之化合物之 HOMO 能級及三重態能量 (E_T) 展示於以下表 1 中。

[表 1]

化合物	HOMO (eV)	E_T (eV)
1-1	6.45	2.80
1-2	6.43	2.64

1-3	6.45	2.79
1-6	6.37	2.62
1-8	6.38	2.78
1-10	6.33	2.62
1-12	6.39	2.78
1-18	6.37	2.62
1-20	6.41	2.78
1-22	6.35	2.61
1-26	6.30	2.60
1-30	6.44	2.62
1-32	6.43	2.78
1-34	6.40	2.61
1-40	6.35	2.79
1-50	6.39	2.63
1-54	6.35	2.62
1-56	6.37	2.78
1-67	6.38	2.57
1-82	6.27	2.43
1-90	6.29	2.46
1-92	6.30	2.46
1-94	6.27	2.46
1-102	6.27	2.46
1-116	6.29	2.57
1-122	6.32	2.47
1-126	6.31	2.46
1-128	6.32	2.47
1-130	6.29	2.46
1-134	6.35	2.61
1-138	6.29	2.47
1-154	6.33	2.63
1-160	6.37	2.79
1-170	6.36	2.64
1-198	6.30	2.46
1-229	6.32	2.57
1-237	6.28	2.46
1-279	6.31	2.46
1-341	6.27	2.43
1-345	6.20	2.43
1-482	6.31	2.46
1-625	6.38	2.61
2-2	6.28	2.60
2-4	6.29	2.63
2-5	6.22	2.62
2-6	6.25	2.70
2-8	6.24	2.70
2-11	6.20	2.46
2-28	6.32	2.71
2-38	6.30	2.70
2-55	6.18	2.43

2-70	6.22	2.46
2-90	6.20	2.46
2-99	6.23	2.46
2-106	6.20	2.45
2-113	6.25	2.44
2-122	6.24	2.45
2-141	6.15	2.43
2-146	6.12	2.44
2-178	6.20	2.43
2-227	6.17	2.44
2-269	6.13	2.44
2-282	6.19	2.45
2-353	6.15	2.44

<實例>

[實例 1-1]

【0572】 將塗有 500 Å 之厚度之薄氧化銦錫 (ITO) 的玻璃基板放入蒸餾水中，其中清潔劑溶解且進行超音波洗滌。在此情況下，使用由費歇爾公司 (Fischer Co.) 製造之產品作為清潔劑，且將使用由密理博公司 (Millipore Co.) 製造之過濾器過濾兩次之蒸餾水用作蒸餾水。在洗滌 ITO 30 分鐘之後，使用蒸餾水歷時 10 分鐘進行兩次超音波洗滌。在使用蒸餾水之洗滌完成之後，使用異丙醇、丙酮以及甲醇溶劑進行超音波洗滌，且進行乾燥，且接著將產物傳輸至電漿洗滌器。此外，使用氧電漿洗滌基板 5 分鐘，且接著傳輸至真空蒸發器。

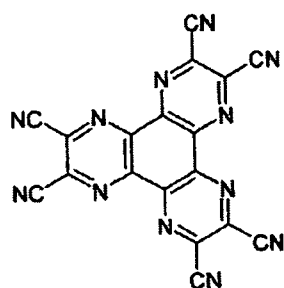
【0573】 在如上文所描述製備之透明 ITO 電極上將以下化合物 [HAT] 熱真空沈積至 50 Å 之厚度，藉此形成電洞注入層。在電洞注入層上依序真空沈積以下化合物 [NPB] (1,000 Å) 及 [HT-A] (400 Å)，藉此形成電洞傳輸層。

【0574】 接著，在電洞傳輸層上將以下化合物 [RH] 及 [RD] 以 30:1 之重量比真空沈積至具有 350 Å 之薄膜厚度，藉此形成發光層。

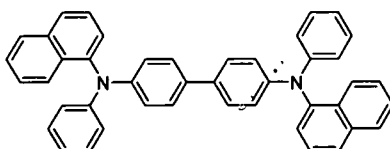
【0575】 在發光層上真空沈積[化合物 1-1]，藉此形成具有 200 Å 之厚度的電子控制層。在電子控制層上以 1:1 之重量比真空沈積化合物[ET-1-A]及[LiQ]，藉此形成具有 150 Å 之厚度的電子傳輸層。接著在電子傳輸層上沈積氟化鋰 (LiF) 及鋁達到分別具有 10 Å 及 1,000 Å 之厚度，藉此形成負電極。

【0576】 在前述程序中，保持有機材料之沈積速率為 0.4 Å/sec 至 0.9 Å/sec，且保持負電極之氟化鋰及鋁之沈積速率分別為 0.3 Å/sec 及 2 Å/sec，且保持沈積期間之真空度為 1×10^{-7} 托至 5×10^{-8} 托，藉此製造有機發光元件。

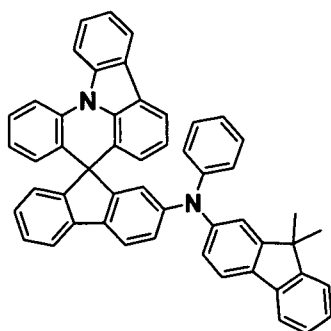
[HAT]



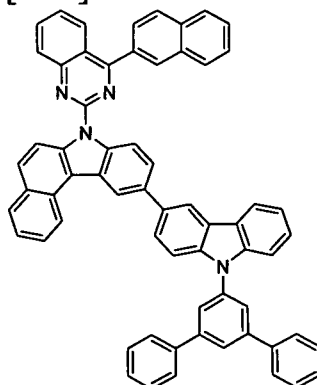
[NPB]



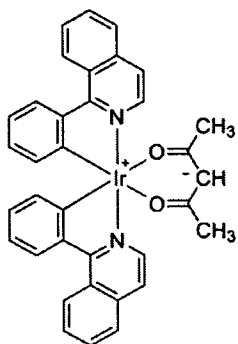
[HT-A]



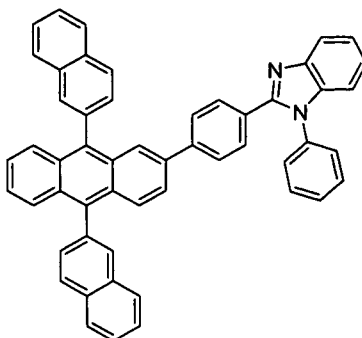
[RH]



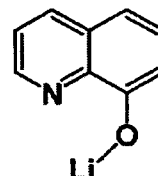
[RD]



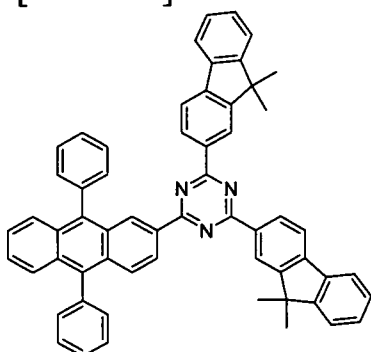
[ET-1-A]



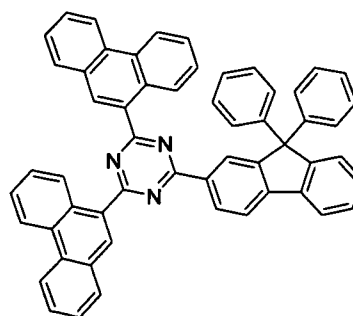
[LiQ]



[ET-1-B]



[ET-1-C]

**[實例 1-2]**

【0577】 除了使用[化合物 1-3]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-3]

【0578】 除了使用[化合物 1-82]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-4]

【0579】 使用[化合物 1-122]代替[實例 1-1]之[化合物 1-1]，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-5]

【0580】 除了使用[化合物 1-229]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-6]

【0581】 除了使用[化合物 1-237]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-7]

【0582】 除了使用[化合物 1-279]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-8]

【0583】 除了使用[化合物 1-345]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-9]

【0584】 除了使用[化合物 1-482]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-10]

【0585】 除了使用[化合物 2-8]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-11]

【0586】 除了使用[化合物 2-11]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-12]

【0587】 除了使用[化合物 2-99]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-13]

【0588】 除了使用[化合物 2-113]代替[實例 1-1]之[化合物 1-1]以

外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-14]

【0589】 除了使用[化合物 2-141]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-15]

【0590】 除了使用[化合物 2-146]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-16]

【0591】 除了使用[化合物 2-178]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-17]

【0592】 除了使用[化合物 2-227]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-18]

【0593】 除了使用[化合物 2-282]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-19]

【0594】 除了分別使用[化合物 1-6]及[化合物 1-8]代替[實例 1-1]之[化合物 1-1]及[ET-1-A]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[實例 1-20]

【0595】 除了分別使用[化合物 1-6]及[化合物 1-6]代替[實例 1-1]之[化合物 1-1]及[ET-1-A]以外，以與[實例 1-1]中相同之方式製造

有機發光元件。

[實例 1-21]

【0596】 除了分別使用[化合物 1-54]及[化合物 1-116]代替[實例 1-1]之[化合物 1-1]及[ET-1-A]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[比較實例 1-1]

【0597】 除了使用[ET-1-A]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[比較實例 1-2]

【0598】 除了使用[ET-1-B]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

[比較實例 1-3]

【0599】 除了使用[ET-1-C]代替[實例 1-1]之[化合物 1-1]以外，以與[實例 1-1]中相同之方式製造有機發光元件。

【0600】 對於藉由上述方法製造之有機發光元件，在 10 毫安/平方公分之電流密度下量測驅動電壓及發光功效，且在 20 毫安/平方公分之電流密度下量測達到與初始亮度相比之 95%值所需的時間 (T₉₅)。結果展示於以下表 2 中。

[表 2]

	電壓 (伏特)	功效 (Cd/A)	色彩座標 (x , y)	使用壽命 (小時) 20 毫安/平方公分下之 T ₉₅
實例 1-1	5.62	22.1	(0.675 , 0.319)	232
實例 1-2	5.65	22.6	(0.675 , 0.318)	220
實例 1-3	5.34	23.2	(0.675 , 0.317)	255
實例 1-4	5.43	23.7	(0.675 , 0.318)	253
實例 1-5	5.71	21.1	(0.675 , 0.319)	232
實例 1-6	5.35	22.9	(0.675 , 0.318)	254
實例 1-7	5.63	19.8	(0.675 , 0.320)	242

實例 1-8	5.43	22.7	(0.675, 0.319)	261
實例 1-9	5.32	23.3	(0.675, 0.319)	260
實例 1-10	5.45	24.0	(0.675, 0.318)	271
實例 1-11	5.81	22.5	(0.675, 0.320)	226
實例 1-12	5.73	22.8	(0.675, 0.319)	218
實例 1-13	5.66	20.5	(0.675, 0.320)	221
實例 1-14	5.35	22.9	(0.675, 0.319)	244
實例 1-15	5.45	23.3	(0.675, 0.318)	252
實例 1-16	5.31	24.5	(0.675, 0.317)	272
實例 1-17	5.87	21.0	(0.675, 0.319)	232
實例 1-18	5.42	23.5	(0.675, 0.317)	249
實例 1-19	4.82	27.4	(0.675, 0.317)	277
實例 1-20	5.02	25.1	(0.675, 0.316)	265
實例 1-21	5.11	24.8	(0.675, 0.316)	241
比較實例 1-1	6.57	17.5	(0.675, 0.321)	187
比較實例 1-2	6.45	18.5	(0.675, 0.321)	152
比較實例 1-3	6.38	18.7	(0.675, 0.319)	168

【0601】由表中之結果，可證實根據本發明之例示性實施例之由式 1 表示之化合物可用於有機磷光發光元件中之電子控制層。可證實與其中將對稱三嗪化合物用於電子控制層之情況相比，使用由式 1 表示之化合物之有機磷光發光元件具有較高功效、較低驅動電壓以及較長使用壽命。此外，可證實即使在將由式 1 表示之化合物用於電子控制層及電子傳輸層之情況下，仍具有高效率、低驅動電壓以及長使用壽命。特定言之，根據本發明之由式 1 表示之化合物之熱穩定性極佳，且具有 6.0 eV 或大於 6.0 eV 之深 HOMO 能級，以及高三重態能量 (E_T) 及電洞穩定性，藉此呈現極佳特徵。

【0602】特定言之，根據本發明之例示性實施例，與由式 4 至式 6 表示之化合物用於電子控制層之情況相比，在由式 3 表示之化合物用於電子控制層之情況下具有較高功效、較低驅動電壓以及較長使用壽命。

[實例 2-1]

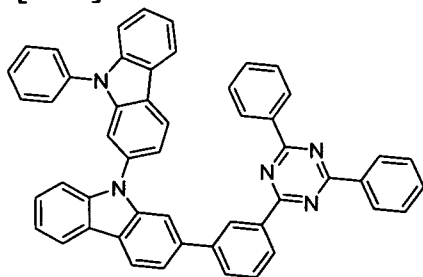
【0603】 在如[實例 1-1]中製備之透明 ITO 電極上熱真空沈積式[HAT]達到 50 Å 之厚度，藉此形成電洞注入層。在電洞注入層上依序真空沈積化合物[NPB] (1,000 Å) 及[HT-A] (200 Å)，藉此形成電洞傳輸層。

【0604】 接著，在電洞傳輸層上以 10:1 之重量比真空沈積以下化合物[GH]及[GD]達到具有 300 Å 之薄膜厚度，藉此形成發光層。

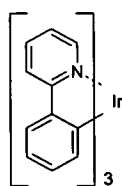
【0605】 在發光層上真空沈積[化合物 1-2]，藉此形成具有 200 Å 之厚度的電子控制層。在電子控制層上以 1:1 之重量比真空沈積以下化合物[ET-2-A]及[LiQ]，藉此形成具有 150 Å 之厚度的電子傳輸層。接著在電子傳輸層上沈積氟化鋰 (LiF) 及鋁達到分別具有 10 Å 及 1,000 Å 之厚度，藉此形成負電極。

【0606】 在前述程序中有機材料之沈積速率及真空度方面，以與[實例 1-1]中相同之方式製造有機發光元件。

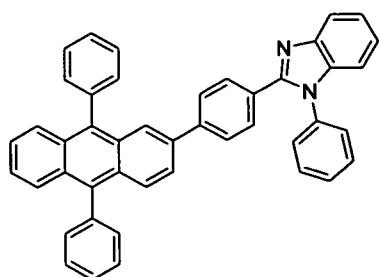
[GH]



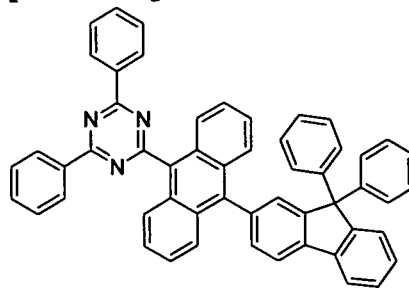
[GD]



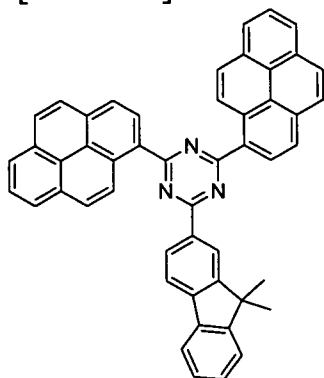
[ET-2-A]



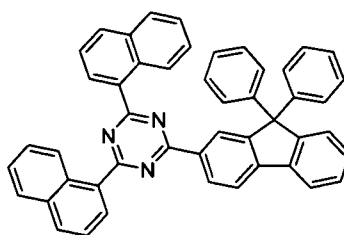
[ET-2-B]



[ET-2-C]



[ET-2-D]

**[實例 2-2]**

【0607】 除了使用[化合物 1-26]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-3]

【0608】 除了使用[化合物 1-40]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-4]

【0609】 除了使用[化合物 1-50]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-5]

【0610】 除了使用[化合物 1-67]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-6]

【0611】 除了使用[化合物 1-160]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-7]

【0612】 除了使用[化合物 1-170]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-8]

【0613】 除了使用[化合物 2-2]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-9]

【0614】 除了使用[化合物 2-4]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-10]

● 【0615】 除了使用[化合物 2-5]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-11]

【0616】 除了使用[化合物 2-6]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-12]

● 【0617】 除了使用[化合物 2-28]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-13]

● 【0618】 除了使用[化合物 2-38]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-14]

【0619】 除了代替[實例 2-1]中之[化合物 1-2]之[化合物 1-6]及化合物[LiQ]（喹啉鋰）經真空沈積且以 1:1 之重量比使用以外，以與[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-15]

【0620】 除了代替[實例 2-1]中之[化合物 1-2]之[化合物 1-8]及化合物[LiQ]（喹啉鋰）經真空沈積且以 1:1 之重量比使用以外，以與[實例 2-1]中相同之方式製造有機發光元件。

[實例 2-16]

【0621】 除了使用[化合物 1-6]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[比較實例 2-1]

【0622】 除了使用[ET-2-A]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[比較實例 2-2]

【0623】 除了使用[ET-2-B]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[比較實例 2-3]

【0624】 除了使用[ET-2-C]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

[比較實例 2-4]

【0625】 除了使用[ET-2-D]代替[實例 2-1]之[化合物 1-2]以外，以於[實例 2-1]中相同之方式製造有機發光元件。

【0626】 對於藉由上述方法製造之有機發光元件，在 10 毫安/平方公分之電流密度下量測驅動電壓及發光功效，且在 20 毫安/平方公分之電流密度下量測達到與初始亮度相比之 95%值所需的時間（ T_{95} ）。結果展示於以下表 3 中。

[表 3]

	電壓 (伏特)	功效 (Cd/A)	色彩座標 (x , y)	使用壽命 (小時) 20 毫安/平方公分下之 T ₉₅
實例 2-1	4.42	38.2	(0.322 , 0.613)	46.2
實例 2-2	4.63	37.9	(0.322 , 0.612)	38.9
實例 2-3	4.71	34.8	(0.322 , 0.615)	35.7
實例 2-4	4.69	36.9	(0.322 , 0.612)	50.1
實例 2-5	4.75	35.1	(0.322 , 0.613)	39.2
實例 2-6	4.85	34.5	(0.322 , 0.614)	41.9
實例 2-7	4.65	37.3	(0.322 , 0.612)	47.5
實例 2-8	4.37	38.1	(0.322 , 0.611)	51.7
實例 2-9	4.59	37.8	(0.322 , 0.612)	45.8
實例 2-10	4.32	38.8	(0.322 , 0.611)	52.9
實例 2-11	4.61	35.5	(0.322 , 0.613)	42.7
實例 2-12	4.68	34.1	(0.322 , 0.614)	40.8
實例 2-13	4.73	33.9	(0.322 , 0.615)	44.5
實例 2-14	4.13	42.9	(0.322 , 0.612)	72.1
實例 2-15	4.27	40.2	(0.322 , 0.612)	61.5
實例 2-16	4.30	39.8	(0.322 , 0.612)	55.7
比較實例 2-1	5.21	28.5	(0.322 , 0.614)	33.8
比較實例 2-2	5.82	21.2	(0.322 , 0.615)	27.1
比較實例 2-3	5.45	26.4	(0.322 , 0.614)	30.1
比較實例 2-4	4.97	30.8	(0.322 , 0.613)	31.8

【0627】 由表中之結果，可證實根據本發明之例示性實施例之由式 1 表示之化合物可用於有機磷光發光元件中之電子控制層。可證實與其中將對稱三嗪化合物用於電子控制層之情況相比，使用由式 1 表示之化合物之有機磷光發光元件具有較高功效、較低驅動電壓以及較長使用壽命。特定言之，根據本發明之由式 1 表示之化合物之熱穩定性極佳，且具有 6.0 eV 或大於 6.0 eV 之深 HOMO 能級，以及高三重態能量 (E_T) 及電洞穩定性，藉此呈現極佳特徵。

【0628】 此外，由表中之結果，根據本發明之由式 1 表示之化合物可與 n 型摻雜劑一起以混合物形式用於有機綠色磷光發光元件中之電子控制層中，且因此，由式 1 表示之化合物具有低驅動電

壓及高效率，且可藉由化合物之電洞穩定性而改良元件之穩定性。

【0629】 特定言之，根據本發明之例示性實施例，與由式 4 至式 6 表示之化合物用於電子控制層之情況相比，在由式 3 表示之化合物用於電子控制層之情況下具有較高功效、較低驅動電壓以及較長使用壽命。

[實例 3-1]

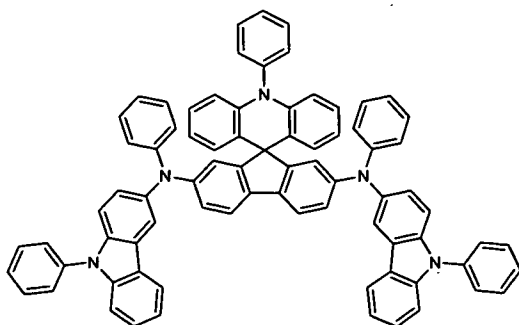
【0630】 在如[實例 1-1]中製備之透明 ITO 電極上熱真空沈積以下化合物式[HI-A]達到 600 Å 之厚度，藉此形成電洞注入層。在電洞注入層上依序真空沈積化合物[HAT] (50 Å) 及以下化合物[HT-B] (600 Å)，藉此形成電洞傳輸層。

【0631】 接著，在電洞傳輸層上以 25:1 之重量比真空沈積以下化合物[BH]及[BD]達到 200 Å 之薄膜厚度，藉此形成發光層。

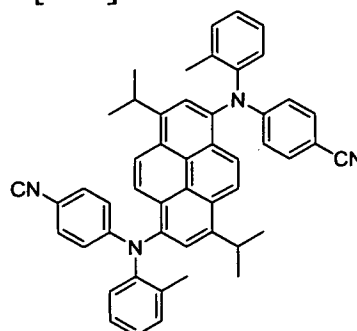
【0632】 在發光層上以 1:1 之重量比真空沈積化合物[式 1-6]及化合物[LiQ] (喹啉鋰)，藉此形成具有 350 Å 之厚度之電子注入及傳輸層。接著在電子注入及傳輸層上沈積氟化鋰 (LiF) 及鋁分別達到 10 Å 及 1,000 Å 之厚度，藉此形成負電極。

【0633】 在前述程序中有機材料之沈積速率及真空度方面，以與[實例 1-1]中相同之方式製造有機發光元件。

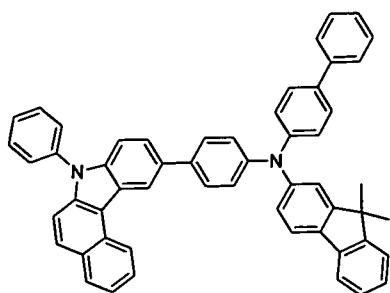
[HT-A]



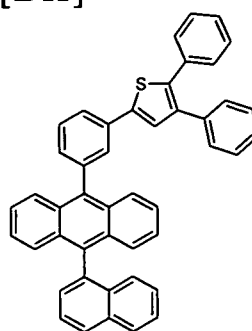
[BD]



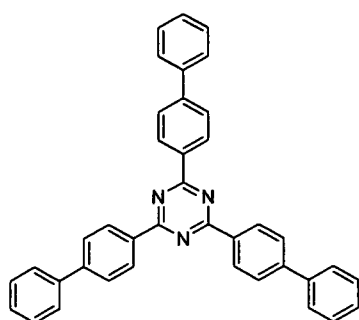
[HT-B]



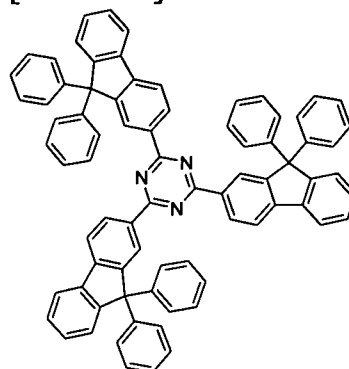
[BH]



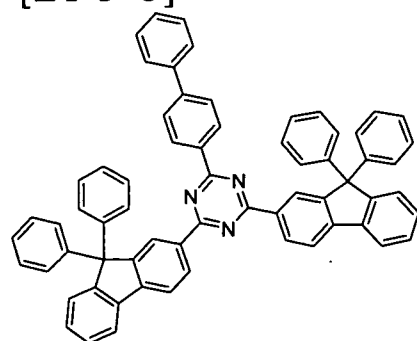
[ET-3-A]



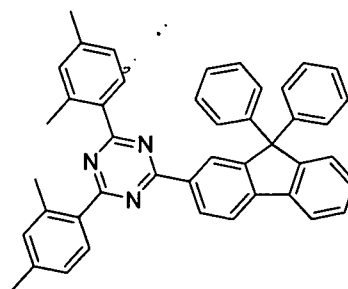
[ET-3-B]



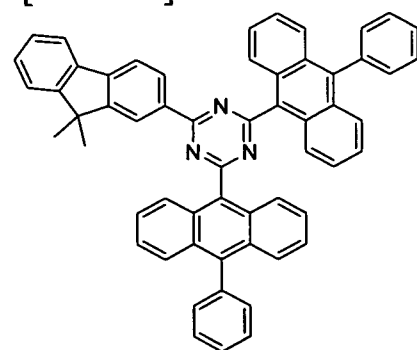
[ET-3-C]



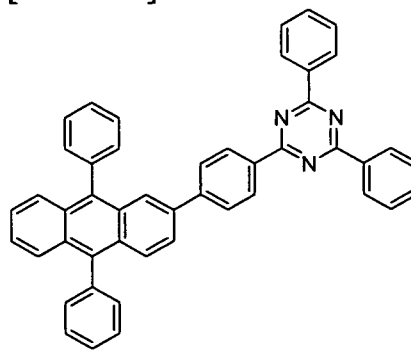
[ET-3-D]



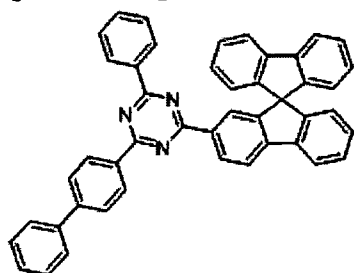
[ET-3-E]



[ET-3-F]



[ET-3-G]

**[實例 3-2]**

【0634】 除了使用[化合物 1-8]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-3]

【0635】 除了使用[化合物 1-10]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-4]

【0636】 除了使用[化合物 1-12]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-5]

【0637】 除了使用[化合物 1-20]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-6]

【0638】 除了使用[化合物 1-22]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-7]

【0639】 除了使用[化合物 1-32]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-8]

【0640】 除了使用[化合物 1-34]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-9]

【0641】 除了使用[化合物 1-54]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-10]

【0642】 除了使用[化合物 1-90]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-11]

【0643】 除了使用[化合物 1-92]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-13]

【0644】 除了使用[化合物 1-102]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-14]

【0645】 除了使用[化合物 1-128]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-15]

【0646】 除了使用[化合物 1-130]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-16]

【0647】 除了使用[化合物 1-154]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-17]

【0648】 除了使用[化合物 1-198]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-18]

【0649】 除了使用[化合物 1-341]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-19]

【0650】 除了使用[化合物 2-55]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-20]

【0651】 除了使用[化合物 2-70]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-21]

【0652】 除了使用[化合物 2-90]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-22]

【0653】 除了使用[化合物 2-353]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[實例 3-23]

【0654】 除了使用[化合物 1-625]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[比較實例 3-1]

【0655】 除了使用[ET-3-A]代替[實例 3-1]之[化合物 1-6]以外，以

於[實例 3-1]中相同之方式製造有機發光元件。

[比較實例 3-2]

【0656】 除了使用[ET-3-B]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[比較實例 3-3]

【0657】 除了使用[ET-3-C]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[比較實例 3-4]

【0658】 除了使用[ET-3-D]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[比較實例 3-5]

【0659】 除了使用[ET-3-E]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[比較實例 3-6]

【0660】 除了使用[ET-3-F]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[比較實例 3-7]

【0661】 除了使用[ET-1-A]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

[比較實例 3-8]

【0662】 除了使用[ET-3-G]代替[實例 3-1]之[化合物 1-6]以外，以於[實例 3-1]中相同之方式製造有機發光元件。

【0663】 對於藉由上述方法製造之有機發光元件，在 10 毫安/平方

公分之電流密度下量測驅動電壓及發光功效，且在 20 毫安/平方公分之電流密度下量測達到與初始亮度相比之 90%值所需的時間 (T_{90})。結果展示於以下表 4 中。

[表 4]

	電壓 (伏特)	功效 (Cd/A)	色彩座標 (x, y)	使用壽命 (小時) 20 毫安/平方公分下之 T_{90}
實例 3-1	4.50	5.45	(0.142, 0.097)	167
實例 3-2	4.30	5.79	(0.142, 0.096)	180
實例 3-3	4.49	5.40	(0.142, 0.098)	143
實例 3-4	4.35	5.61	(0.142, 0.096)	154
實例 3-5	4.52	5.68	(0.142, 0.096)	152
實例 3-6	4.59	5.32	(0.142, 0.098)	142
實例 3-7	4.55	5.66	(0.142, 0.096)	145
實例 3-8	4.65	5.45	(0.142, 0.097)	153
實例 3-9	4.69	5.36	(0.142, 0.099)	169
實例 3-10	4.62	5.39	(0.142, 0.097)	150
實例 3-11	4.48	5.52	(0.142, 0.096)	168
實例 3-13	4.72	5.35	(0.142, 0.097)	143
實例 3-14	4.55	5.47	(0.142, 0.097)	141
實例 3-15	4.69	5.38	(0.142, 0.096)	156
實例 3-16	4.66	5.41	(0.142, 0.097)	148
實例 3-17	4.52	5.32	(0.142, 0.099)	138
實例 3-18	4.75	5.45	(0.142, 0.097)	165
實例 3-19	4.61	5.39	(0.142, 0.098)	155
實例 3-20	4.52	5.65	(0.142, 0.096)	177
實例 3-21	4.55	5.41	(0.142, 0.097)	156
實例 3-22	4.59	5.29	(0.142, 0.097)	175
實例 3-23	4.51	5.43	(0.142, 0.097)	170
比較實例 3-1	5.55	4.52	(0.142, 0.098)	92
比較實例 3-2	5.75	4.32	(0.142, 0.100)	101
比較實例 3-3	5.42	4.77	(0.142, 0.099)	110
比較實例 3-4	4.81	5.02	(0.142, 0.097)	85
比較實例 3-5	6.25	3.55	(0.142, 0.098)	88
比較實例 3-6	5.94	3.80	(0.142, 0.102)	65
比較實例 3-7	5.01	4.58	(0.142, 0.098)	133
比較實例 3-8	4.88	5.11	(0.142, 0.097)	105

【0664】由表中之結果，可證實根據本發明之例示性實施例之由式 1 表示之化合物可用於有機發光元件中之可同時注入及傳遞電

子之有機層。可證實與對稱三嗪化合物用於可同時注入及傳遞電子之有機層之情況相比，使用由式 1 表示之化合物之有機發光元件具有較高功效、較低驅動電壓以及較長使用壽命。特定言之，根據本發明之由式 1 表示之化合物之熱穩定性極佳，且具有 6.0 eV 或大於 6.0 eV 之深 HOMO 能級，以及高三重態能量 (E_T) 及電洞穩定性，藉此呈現極佳特徵。當化合物用於同時注入及傳輸電子之有機層時，化合物可與 n 型摻雜劑一起以混合物形式使用。因此，由式 1 表示之化合物具有低驅動電壓及高效率，且可藉由化合物之電洞穩定性改良元件之穩定性。

【0665】此外，根據文獻（美國化學會志（J. AM. CHEM. SOC.）2003，125，3710-3711），可證實經雙取代之萘基與螺聯萘基團相比具有較高電子遷移率。因此，可證實[化合物 1-8]及[化合物 1-10]比比比較實例 3-8 中所使用之[ET-3-G]之化合物更有效地傳遞電子且因此呈現高效率，且其使用壽命亦得到改良。

[實例 4-1]

【0666】在如[實例 1-1]中製備之透明 ITO 電極上熱真空沈積化合物[HI-A]達到 600 Å 之厚度，藉此形成電洞注入層。在電洞注入層上依序真空沈積化合物[HAT]（50 Å）及化合物[HT-B]（600 Å），藉此形成電洞傳輸層。

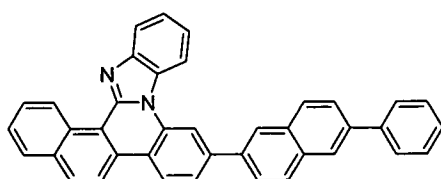
【0667】接著，在電洞傳輸層上以 25:1 之重量比真空沈積以下化合物[BH]及[BD]達到 200 Å 之薄膜厚度，藉此形成發光層。

【0668】在發光層上真空沈積以下化合物[ET-A]達到 50 Å 之厚度，藉此形成電子控制層。在電子控制層上以 1:1 之重量比真空沈

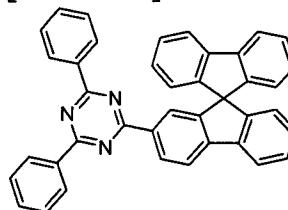
積化合物[式 1-6]及化合物[LiQ]（喹啉鋰），藉此形成具有 300 Å 之厚度之電子傳輸及注入層。接著在電子傳輸及注入層上沈積氟化鋰（LiF）及鋁分別達到 10 Å 及 1,000 Å 之厚度，藉此形成負電極。

【0669】 在前述程序中有機材料之沈積速率及真空度方面，以與[實例 1-1]中相同之方式製造有機發光元件。

[ET-A]



[ET-4-A]



[實例 4-2]

【0670】 除了使用[化合物 1-8]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[實例 4-3]

【0671】 除了使用[化合物 1-18]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[實例 4-4]

【0672】 除了使用[化合物 1-30]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[實例 4-5]

【0673】 除了使用[化合物 1-56]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[實例 4-6]

【0674】 除了使用[化合物 1-116]代替[實例 4-1]之[化合物 1-6]以

外，以於[實例 4-1]中相同之方式製造有機發光元件。

[實例 4-7]

【0675】 除了使用[化合物 1-126]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[實例 4-8]

【0676】 除了使用[化合物 1-138]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[實例 4-9]

【0677】 除了使用[化合物 1-170]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[實例 4-10]

【0678】 除了使用[化合物 2-5]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[實例 4-11]

【0679】 除了使用[化合物 2-269]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[比較實例 4-1]

【0680】 除了使用[ET-1-A]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[比較實例 4-2]

【0681】 除了使用[ET-1-C]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[比較實例 4-3]

【0682】 除了使用[ET-2-C]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[比較實例 4-4]

【0683】 除了使用[ET-3-B]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[比較實例 4-5]

【0684】 除了使用[ET-3-F]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

[比較實例 4-6]

【0685】 除了使用[ET-4-A]代替[實例 4-1]之[化合物 1-6]以外，以於[實例 4-1]中相同之方式製造有機發光元件。

【0686】 對於藉由上述方法製造之有機發光元件，在 10 毫安/平方公分之電流密度下量測驅動電壓及發光功效，且在 20 毫安/平方公分之電流密度下量測達到與初始亮度相比之 90%值所需的時間 (T₉₀)。結果展示於以下表 5 中。

[表 5]

	電壓 (伏特)	功效 (Cd/A)	色彩座標 (x , y)	使用壽命 (小時) 20 毫安/平方公分下之 T ₉₀
實例 4-1	4.61	6.75	(0.142 , 0.098)	190
實例 4-2	4.40	6.98	(0.142 , 0.096)	202
實例 4-3	4.81	6.50	(0.142 , 0.097)	178
實例 4-4	4.65	6.62	(0.142 , 0.097)	169
實例 4-5	4.59	6.57	(0.142 , 0.096)	205
實例 4-6	4.62	6.54	(0.142 , 0.096)	215

實例 4-7	4.85	6.27	(0.142 , 0.098)	180
實例 4-8	4.70	6.40	(0.142 , 0.097)	179
實例 4-9	4.80	6.35	(0.142 , 0.099)	165
實例 4-10	4.65	6.36	(0.142 , 0.097)	187
實例 4-11	4.71	6.30	(0.142 , 0.099)	193
比較實例 4-1	5.28	5.51	(0.142 , 0.099)	122
比較實例 4-2	5.15	5.62	(0.142 , 0.099)	147
比較實例 4-3	5.51	5.30	(0.142 , 0.098)	101
比較實例 4-4	5.42	5.21	(0.142 , 0.100)	128
比較實例 4-5	5.81	4.22	(0.142 , 0.101)	152
比較實例 4-6	4.88	6.49	(0.142 , 0.097)	90

【0687】 由表中之結果，可證實根據本發明之例示性實施例之由式 1 至式 28 中之任一者之表示之化合物可用於有機發光元件之電子控制層與負電極之間的同時注入及傳輸電子之層。可證實與對稱三嗪化合物用於電子控制層之情況相比，根據本發明之例示性實施例之有機發光元件具有較高功效、較低驅動電壓以及較長使用壽命。特定言之，根據本發明之例示性實施例之式 1 至式 28 中之任一者之化合物在熱量穩定性方面極佳，且具有 6 eV 或大於 6 eV 之深 HOMO 能級，以及高三重態能量（E_T）及電洞穩定性，藉此呈現極佳特徵。

【0688】 亦即，用於有機發光元件之有機材料之重要特徵之一為需要形成非晶形沈積膜，且具有高結晶度之有機材料之缺點在於薄膜在沈積期間非均勻地沈積，且因此在驅動元件時，驅動電壓顯

著提高，且元件之使用壽命降低，且因此元件快速劣化。為了緩解所述缺點，需要形成非晶形膜，且本發明人發現呈三嗪衍生物結構形式之不對稱材料不呈現結晶度，且證實根據本發明之例示性實施例，式 1 至式 28 中之任一者之化合物具有不對稱結構，其中 Ar1 至 Ar3 彼此不同，且含有其之有機發光元件可穩定驅動。

【0689】此外，根據本發明之例示性實施例，所述由式 1 至式 28 中之任一者之表示之化合物用於電子傳輸層時，化合物可與 n 型摻雜劑一起以混合物形式使用。因此，式 1 至式 28 中之任一者之化合物具有改良之電子注入特徵且因此具有低驅動電壓及高效率，且可改良元件之穩定性。

【0690】特定言之，根據本發明之例示性實施例，與由式 3 至式 5 表示之化合物用於電子傳輸層之情況相比，在由式 6 表示之化合物用於電子傳輸層之情況下具有較高功效、較低驅動電壓以及較長使用壽命。

【符號說明】

【0691】

- 1：基板
- 2：陽極
- 3：發光層
- 4：陰極
- 5：電洞注入層
- 6：電洞傳輸層

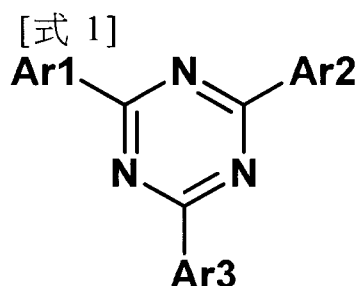
105年 1月 13日 修正
劃線(頁本)

7：發光層

8：電子傳輸層

【發明申請專利範圍】

【第1項】一種雜環化合物，其由以下式 1 表示：

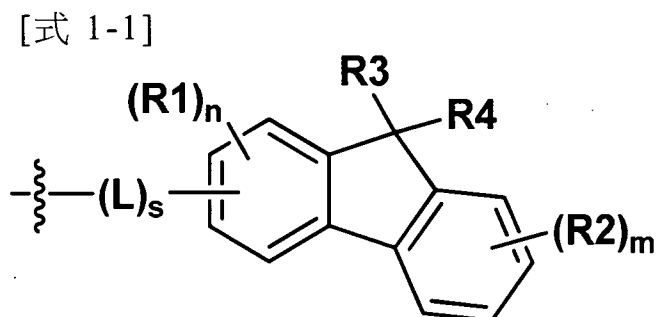


在式 1 中，

Ar1 至 Ar3 彼此不同，

Ar1 及 Ar2 各自獨立地為經取代或未經取代之苯基；經取代或未經取代之萘基；經取代或未經取代之聯苯基；經取代或未經取代之聯三苯基；經取代或未經取代之聯四苯基；經取代或未經取代之菲基；或經取代或未經取代之屈基，

Ar3 由以下式 1-1 表示，



在式 1-1 中，

R1 及 R2 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取

代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或與相鄰基團組合以形成經取代或未經取代之環，

R3 及 R4 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或彼此組合以形成經取代或未經取代之脂族環，

L 為直接鍵；經取代或未經取代之伸芳基；或經取代或未經取代之伸雜芳基，

n 為 0 至 3 的整數，

m 為 0 至 4 的整數，

s 為 1 至 5 的整數，及

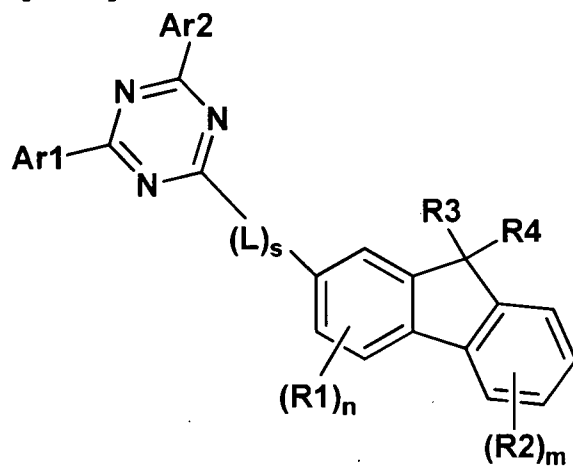
當 n 為 2 或大於 2 時，R1 彼此相同或不同，及

當 m 為 2 或大於 2 時，R2 彼此相同或不同，及

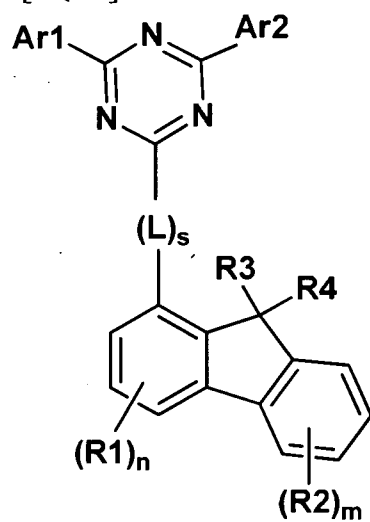
當 s 為 2 或大於 2 時，L 彼此相同或不同。

【第2項】如申請專利範圍第 1 項所述的雜環化合物，其中式 1 由以下式 3 至式 6 中之任一者表示：

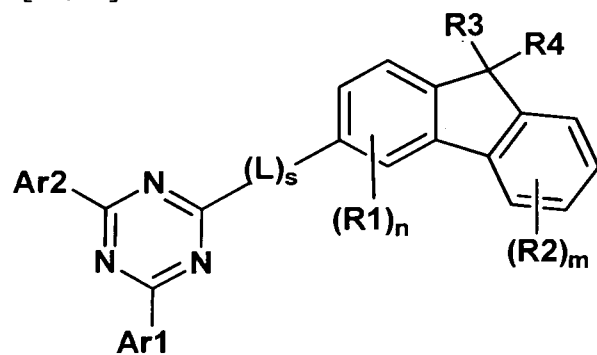
[式 3]



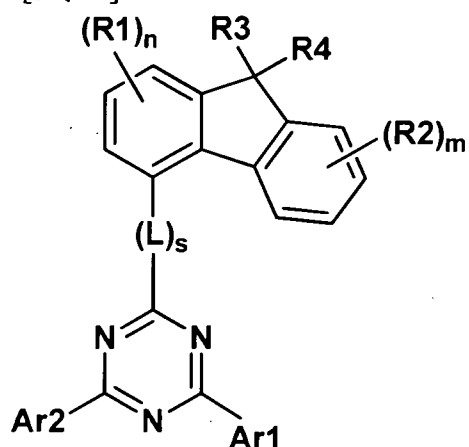
[式 4]



[式 5]



[式 6]

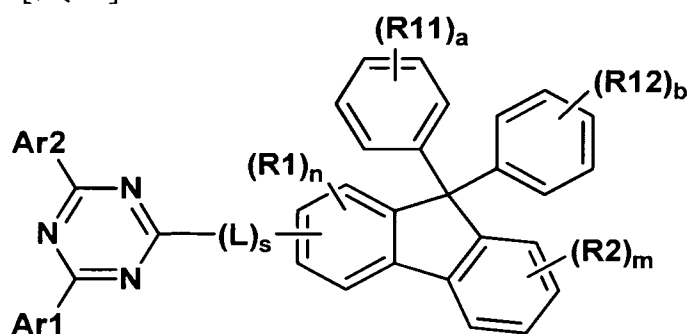


在式 3 至式 6 中，

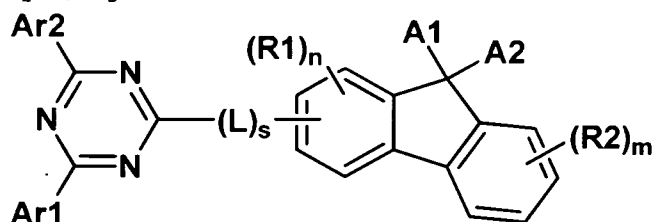
Ar1、Ar2、R1 至 R4、L、s、m 以及 n 之定義與式 1 中之定義相同。

【第3項】如申請專利範圍第 1 項所述的雜環化合物，其中式 1 由以下式 7 或式 8 表示：

[式 7]



[式 8]



在式 7 及式 8 中，

Ar1、Ar2、R1、R2、L、s、n 以及 m 之定義與式 1 中之定義

相同，

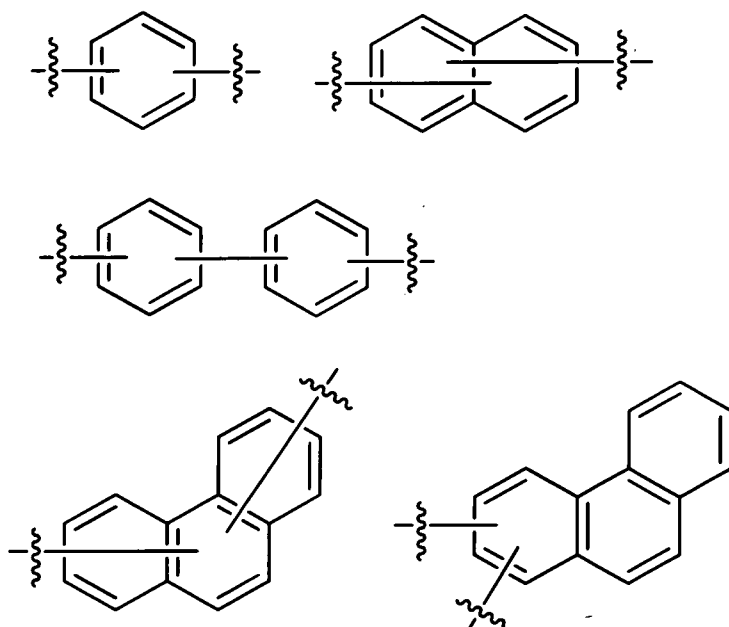
R11 及 R12 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或兩個或大於兩個相鄰基團彼此組合以形成經取代或未經取代之環，

A1 及 A2 彼此相同或不同，且各自獨立地為氫；或經取代或未經取代之烷基，或彼此組合以形成經取代或未經取代之脂族環，

a 及 b 彼此相同或不同，且各自獨立地為 0 至 5 的整數，及

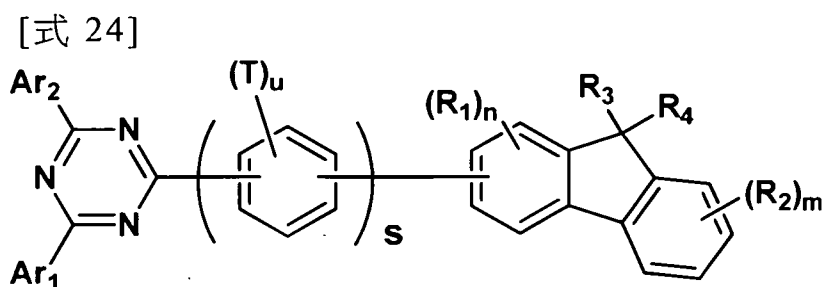
當 a 及 b 各自為 2 或大於 2 時，括弧中之結構彼此相同或不同。

【第4項】如申請專利範圍第 1 項所述的雜環化合物，其中 L 為直接鍵；或由以下結構中選出之任一者：



所述結構視情況未經取代或經一或多個由以下各者所組成之群中選出之取代基取代：氬；鹵素基團；腈基團；硝基；羥基；羰基；酯基團；醯亞胺基團；胺基；氧化膦基團、烷氧基；芳氧基；烷基硫氧基；芳基硫氧基；烷基磺酸氧基；芳基磺酸氧基；矽烷基；硼基團；烷基；環烷基；烯基；芳基；芳烷基；芳烯基；烷基芳基；烷基胺基團；芳烷基胺基團；雜芳基胺基；芳基胺基團；芳基膦基團；以及雜環基。

【第5項】如申請專利範圍第 1 項所述的雜環化合物，其中式 1 由以下式 24 表示：



在式 24 中，

Ar1、Ar2、R1 至 R4、s、n 以及 m 之定義與式 1 中之定義相

同，

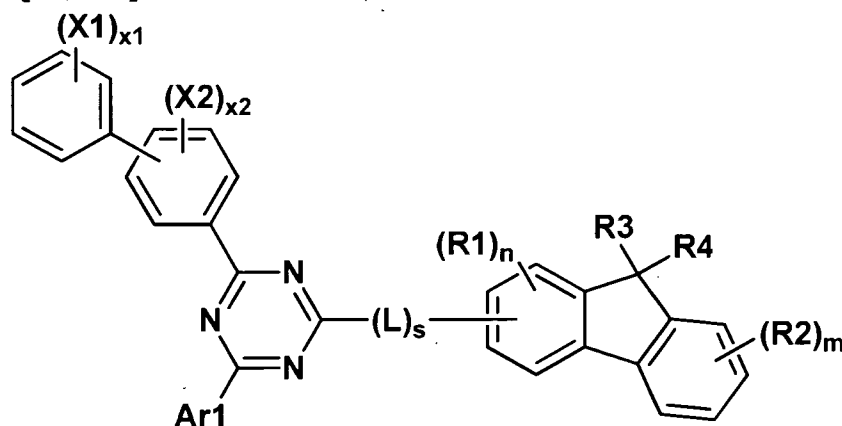
T 為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或兩個或大於兩個相鄰 T 彼此組合以形成經取代或未經取代之環，

u 為 0 至 4 的整數，及

當 u 為 2 或大於 2 時，T 彼此相同或不同。

【第6項】如申請專利範圍第 1 項所述的雜環化合物，其中式 1 由以下式 26 表示：

[式 26]



在式 26 中，

R1 至 R4、Ar1、L、s、m 以及 n 之定義與式 1 中之定義相同，

X1 及 X2 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未

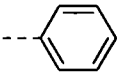
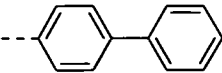
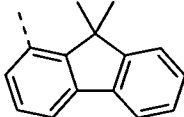
經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或兩個或大於兩個相鄰基團彼此組合以形成經取代或未經取代之環，

- x1 為 0 至 5 的整數，及
- x2 為 0 至 4 的整數，及
- 當 x1 為 2 或大於 2 時，X1 彼此相同或不同，及
- 當 x2 為 2 或大於 2 時，X2 彼此相同或不同。

【第7項】 如申請專利範圍第 1 項所述的雜環化合物，其中 Ar1 為苯基，其未經取代或經芳基取代；聯苯基，其未經取代或經芳基取代；萘基，其未經取代或經芳基取代；或菲基，其未經取代或經芳基取代，及

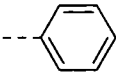
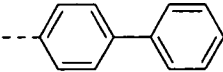
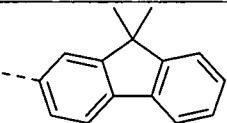
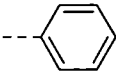
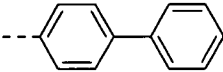
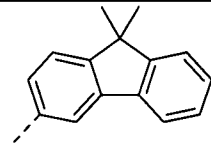
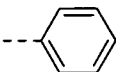
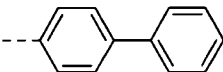
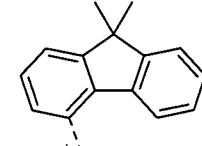
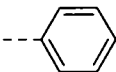
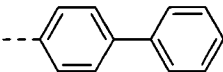
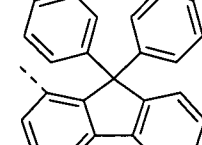
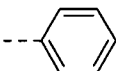
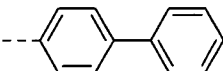
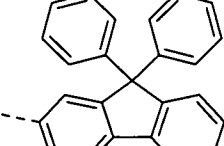
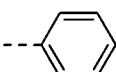
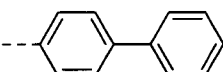
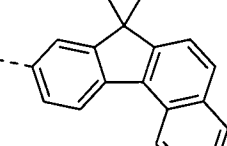
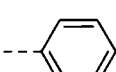
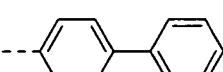
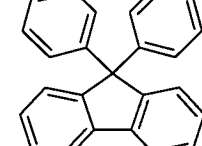
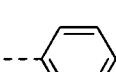
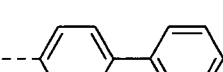
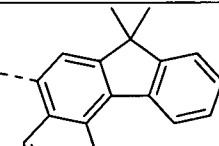
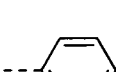
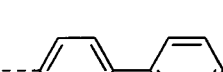
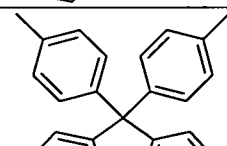
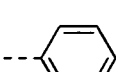
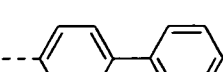
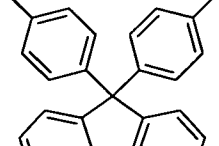
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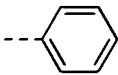
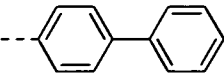
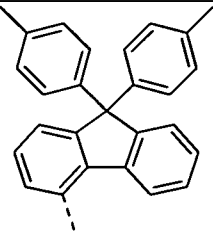
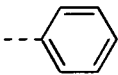
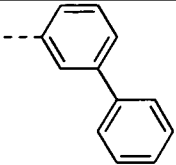
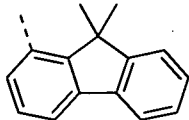
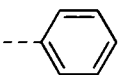
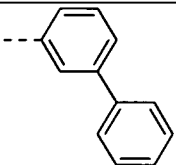
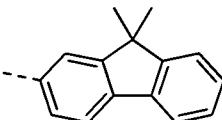
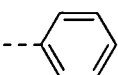
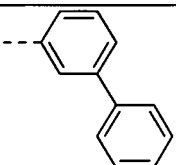
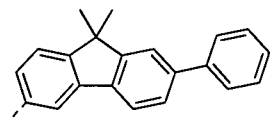
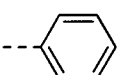
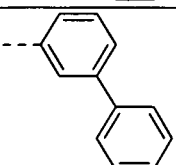
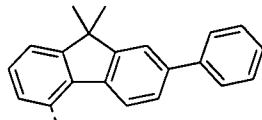
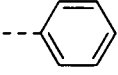
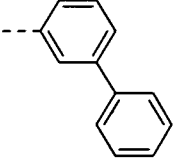
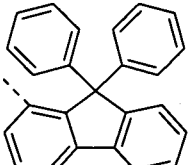
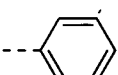
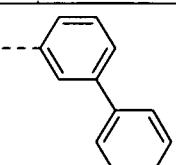
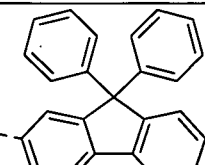
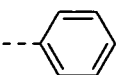
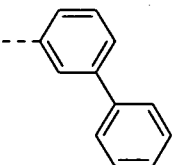
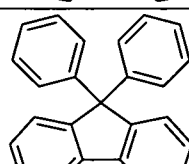
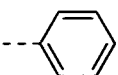
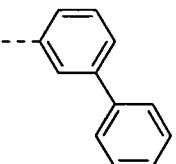
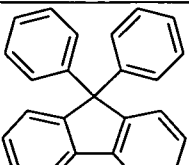
【第8項】 如申請專利範圍第 1 項所述的雜環化合物，其中所述式 1 化合物為由以下化合物 1-1 至化合物 1-627 中選出之任一者：

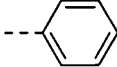
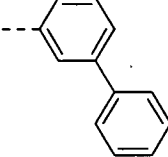
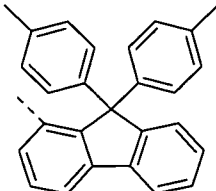
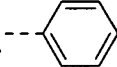
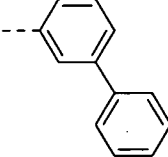
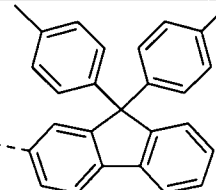
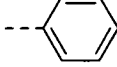
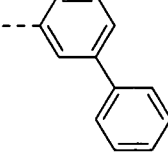
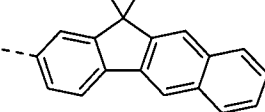
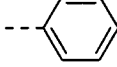
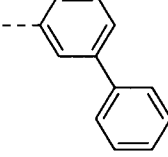
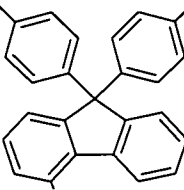
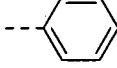
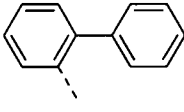
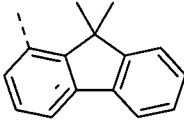
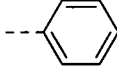
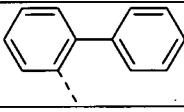
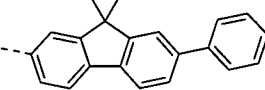
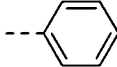
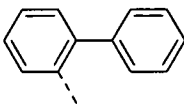
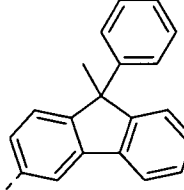
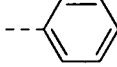
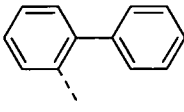
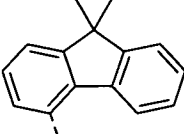
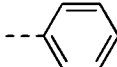
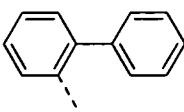
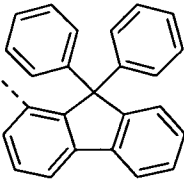
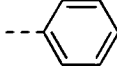
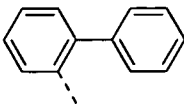
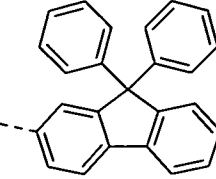
化合物	---Ar1	---Ar2	---Ar3
1-1			

第 104110794 號中文專利範圍無劃線修正本

修正日期:105 年 1 月 13 日

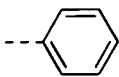
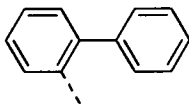
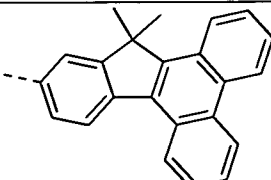
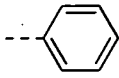
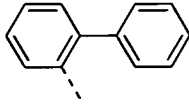
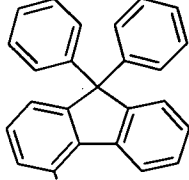
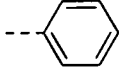
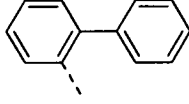
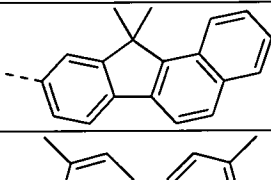
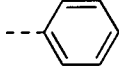
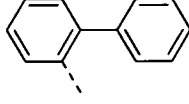
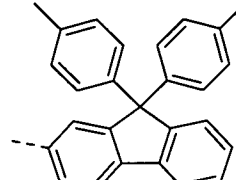
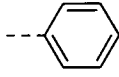
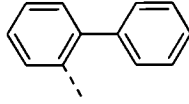
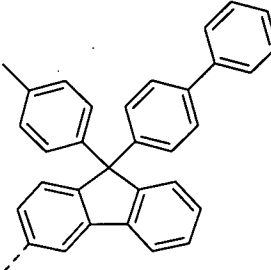
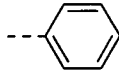
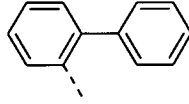
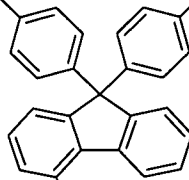
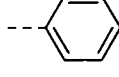
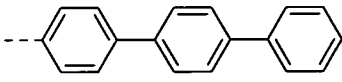
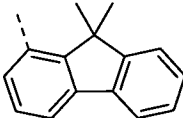
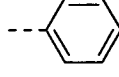
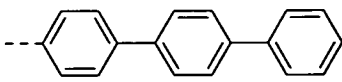
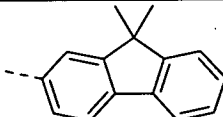
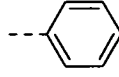
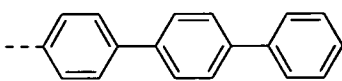
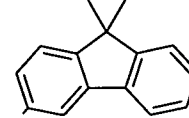
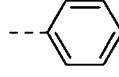
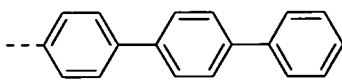
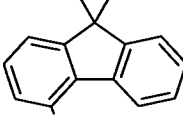
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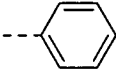
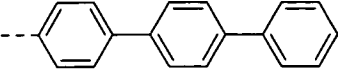
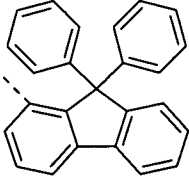
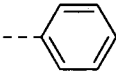
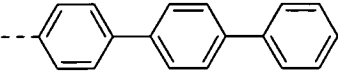
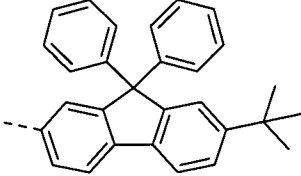
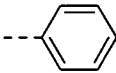
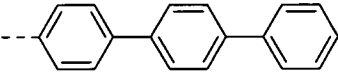
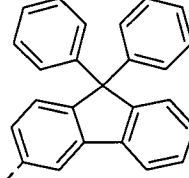
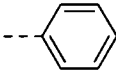
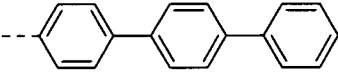
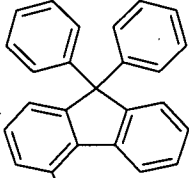
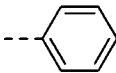
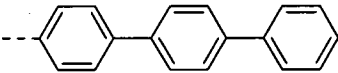
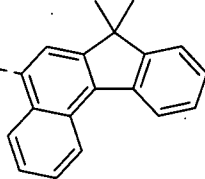
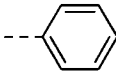
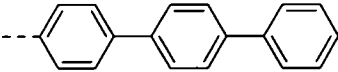
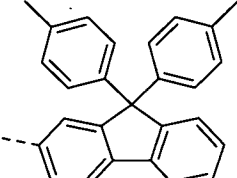
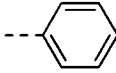
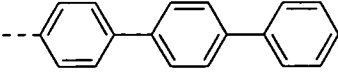
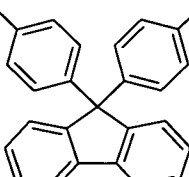
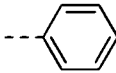
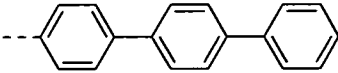
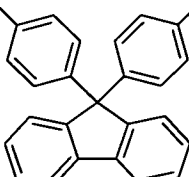
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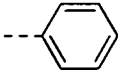
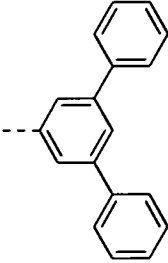
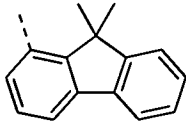
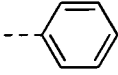
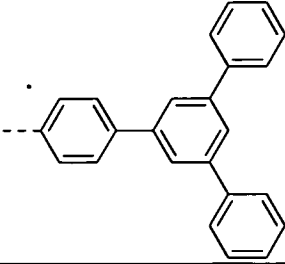
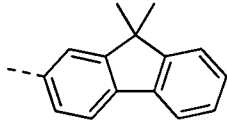
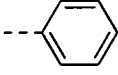
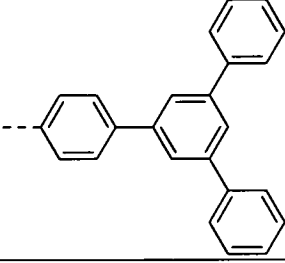
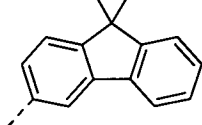
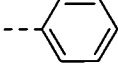
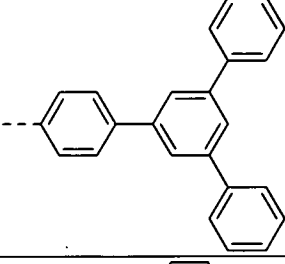
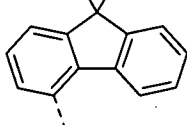
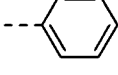
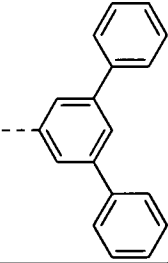
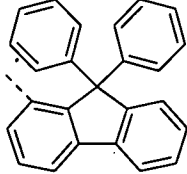
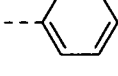
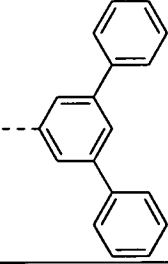
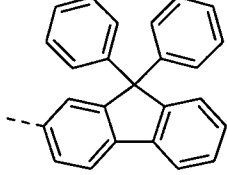
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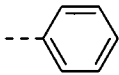
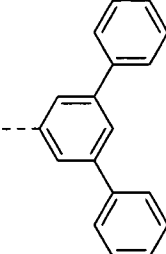
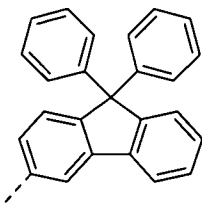
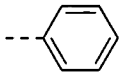
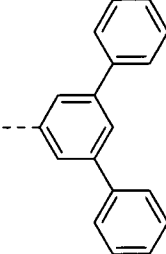
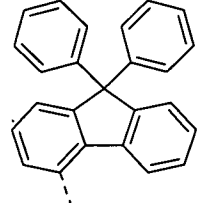
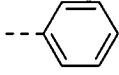
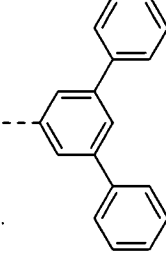
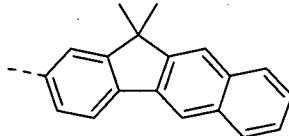
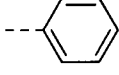
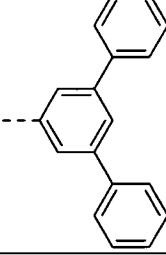
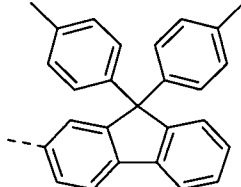
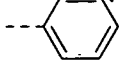
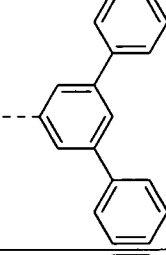
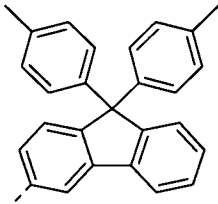
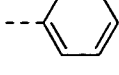
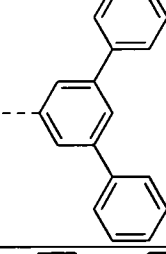
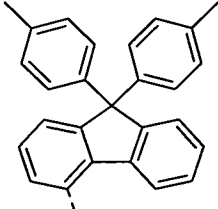
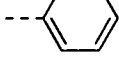
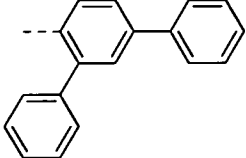
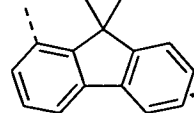
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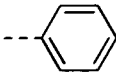
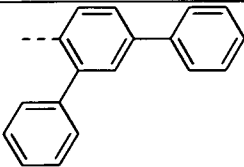
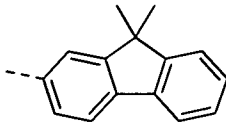
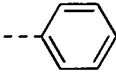
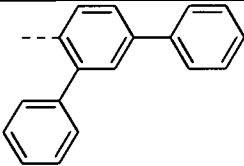
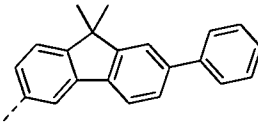
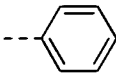
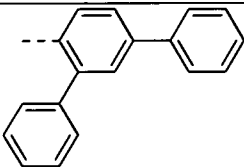
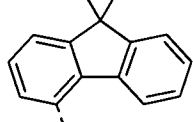
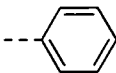
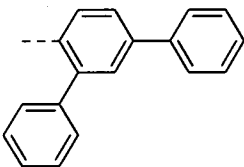
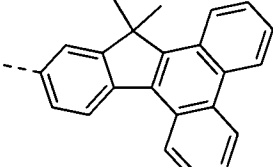
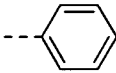
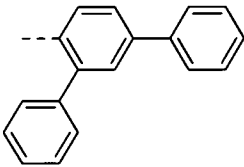
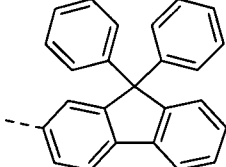
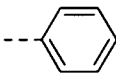
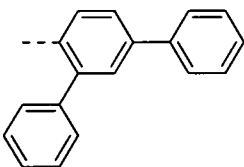
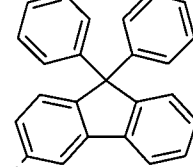
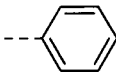
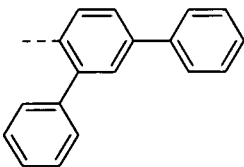
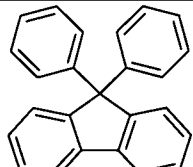
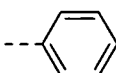
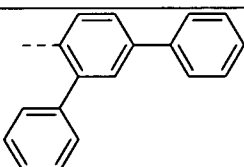
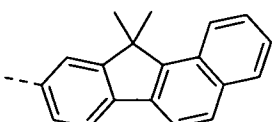
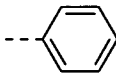
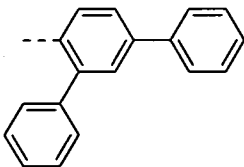
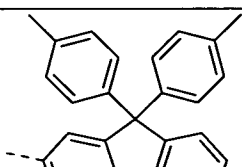
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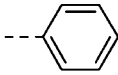
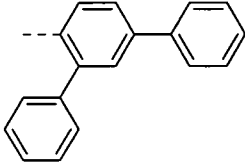
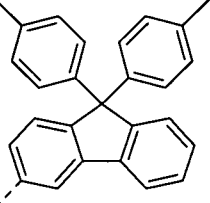
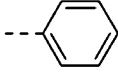
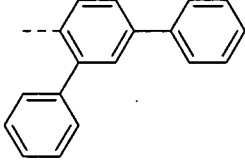
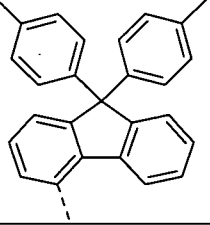
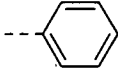
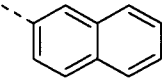
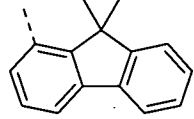
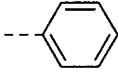
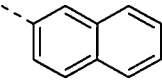
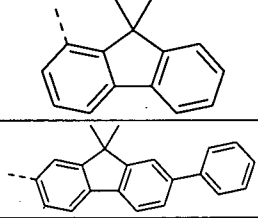
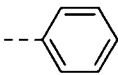
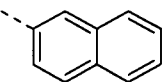
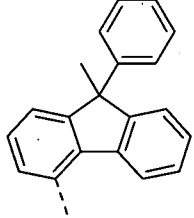
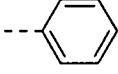
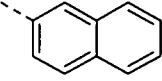
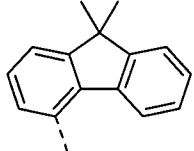
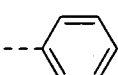
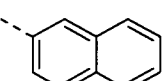
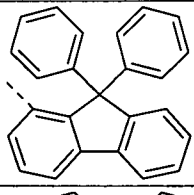
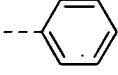
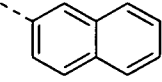
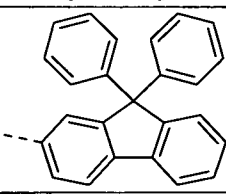
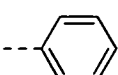
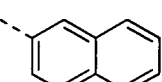
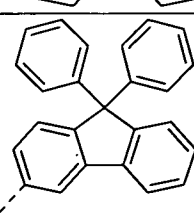
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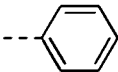
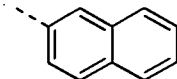
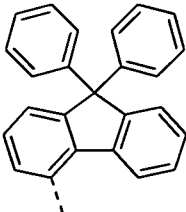
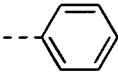
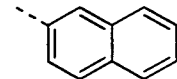
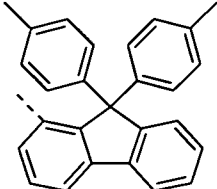
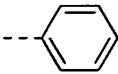
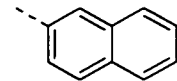
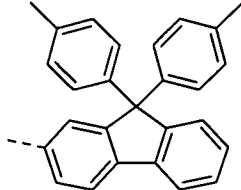
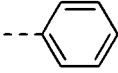
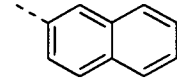
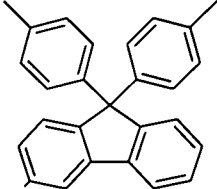
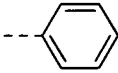
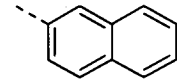
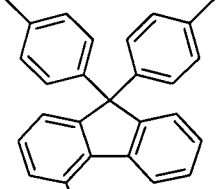
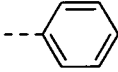
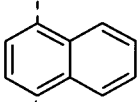
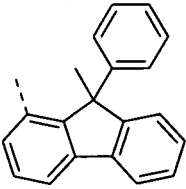
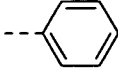
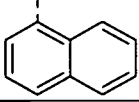
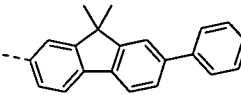
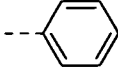
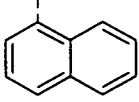
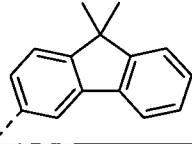
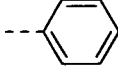
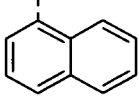
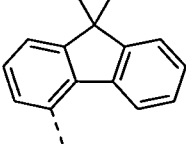
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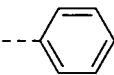
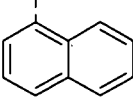
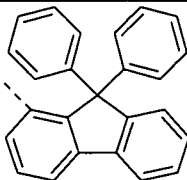
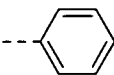
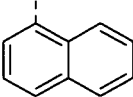
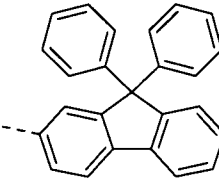
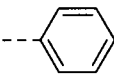
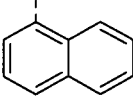
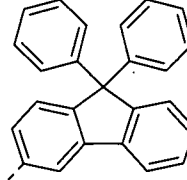
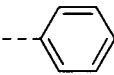
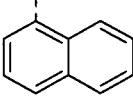
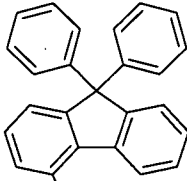
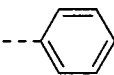
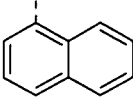
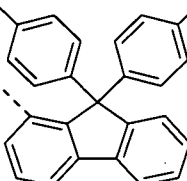
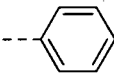
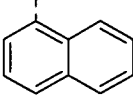
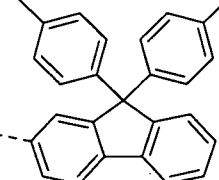
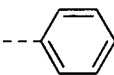
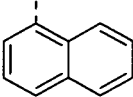
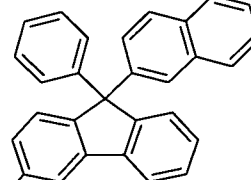
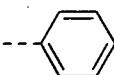
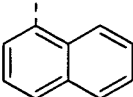
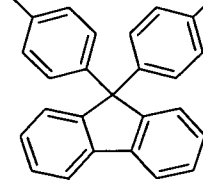
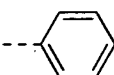
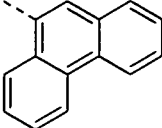
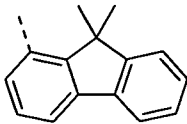
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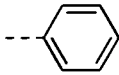
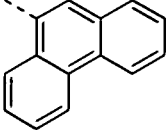
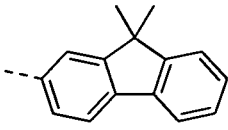
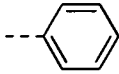
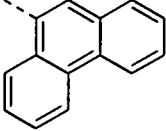
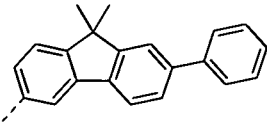
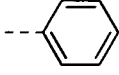
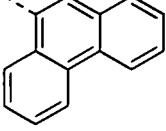
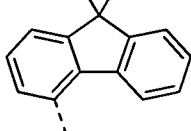
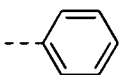
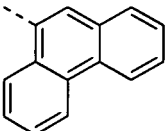
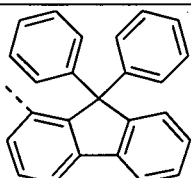
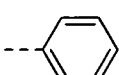
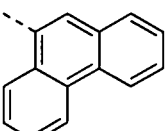
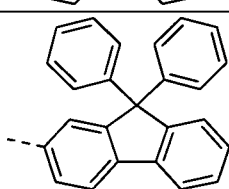
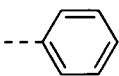
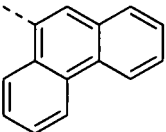
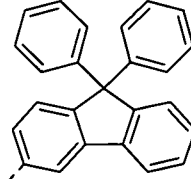
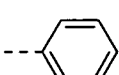
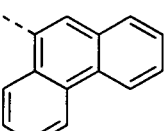
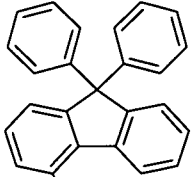
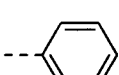
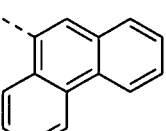
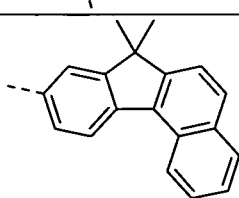
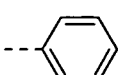
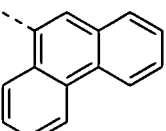
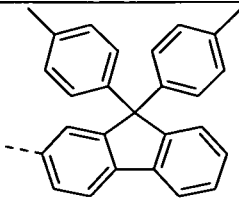
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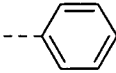
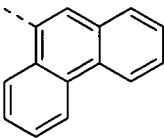
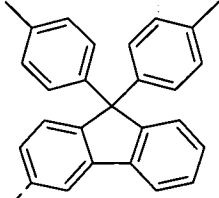
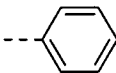
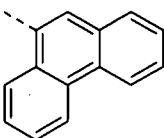
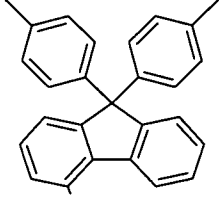
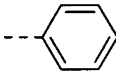
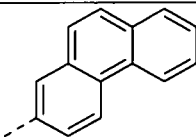
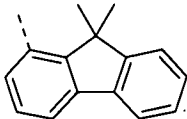
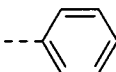
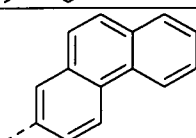
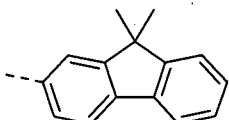
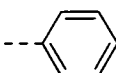
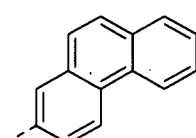
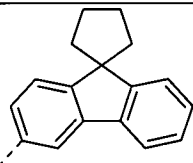
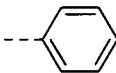
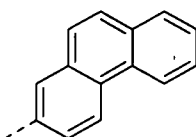
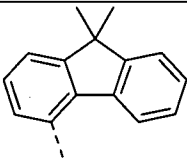
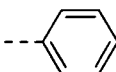
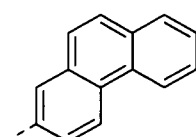
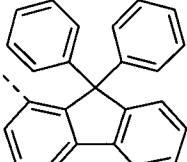
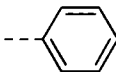
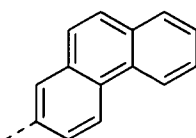
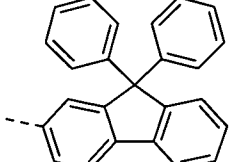
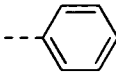
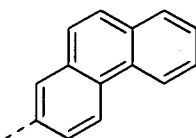
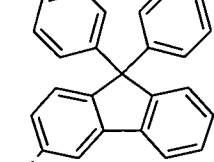
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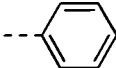
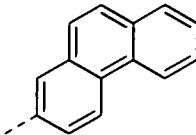
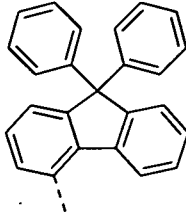
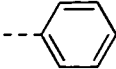
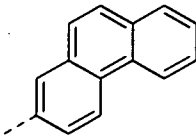
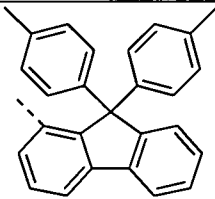
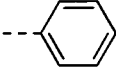
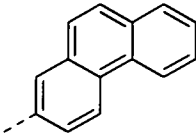
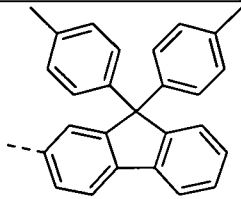
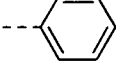
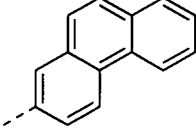
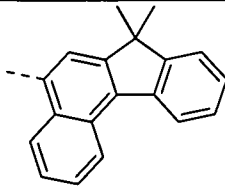
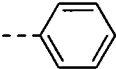
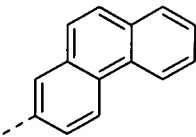
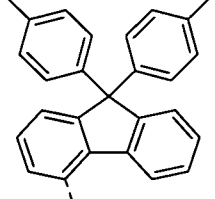
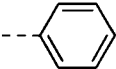
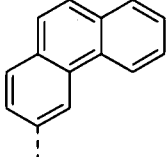
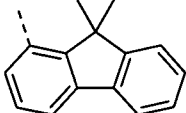
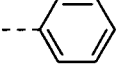
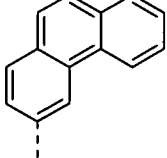
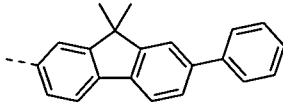
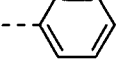
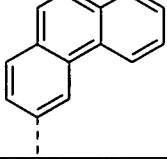
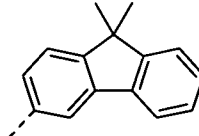
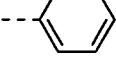
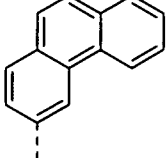
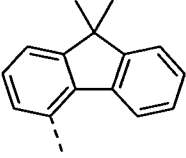
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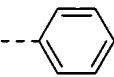
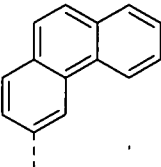
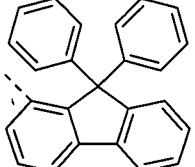
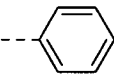
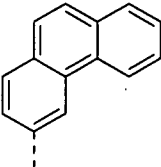
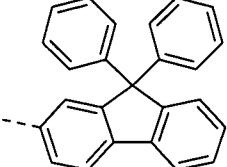
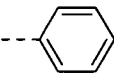
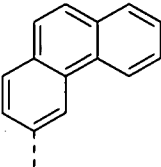
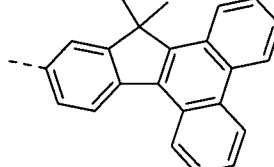
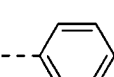
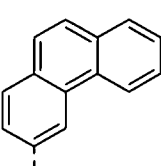
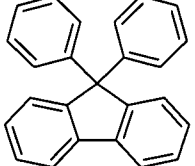
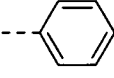
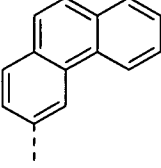
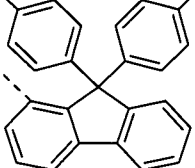
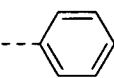
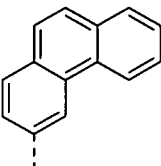
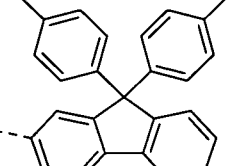
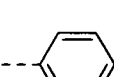
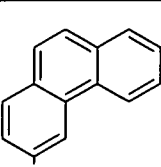
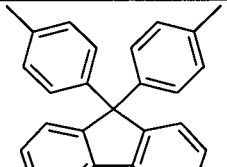
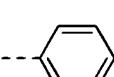
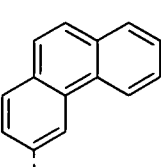
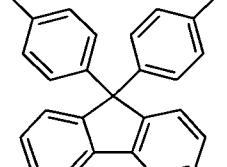
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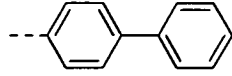
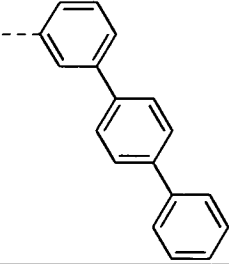
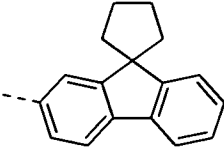
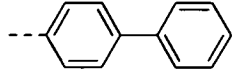
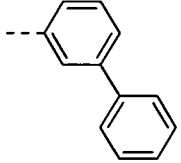
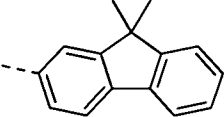
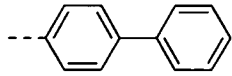
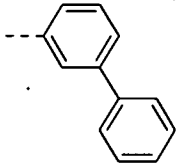
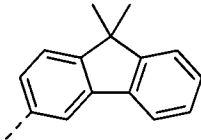
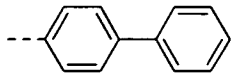
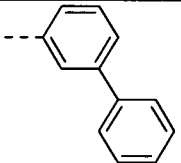
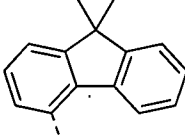
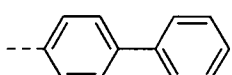
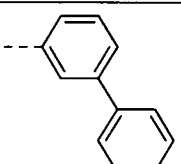
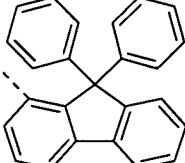
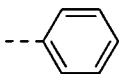
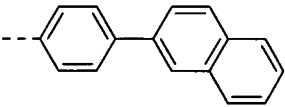
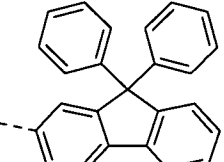
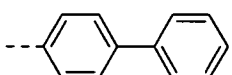
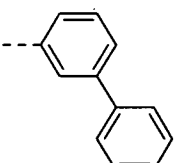
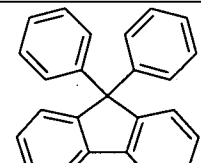
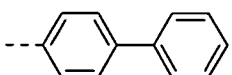
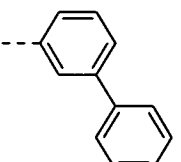
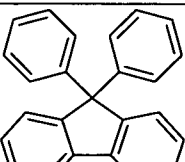
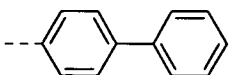
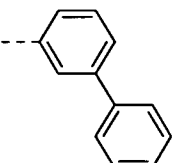
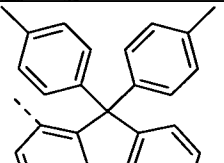
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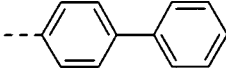
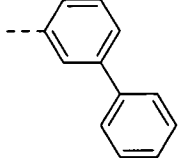
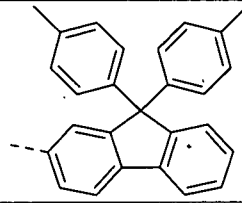
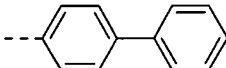
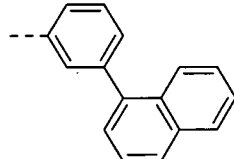
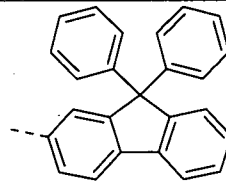
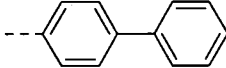
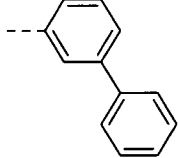
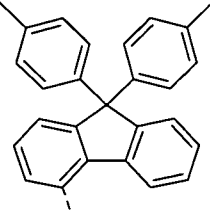
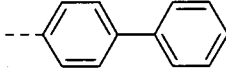
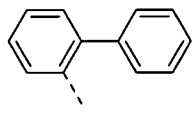
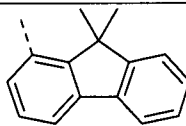
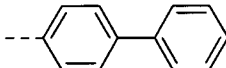
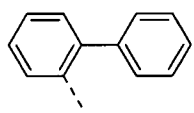
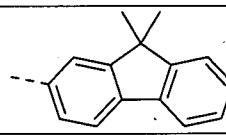
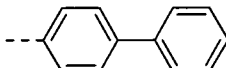
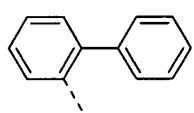
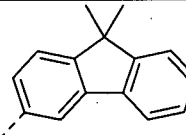
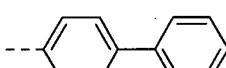
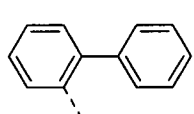
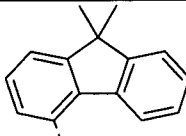
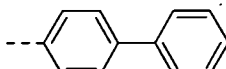
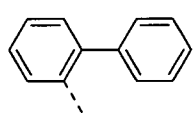
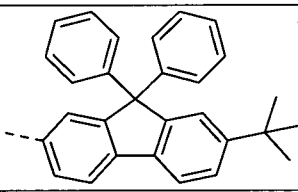
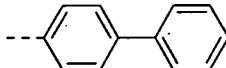
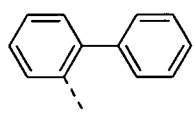
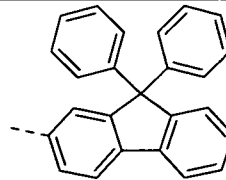
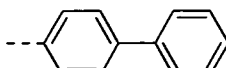
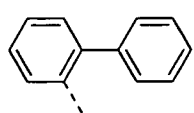
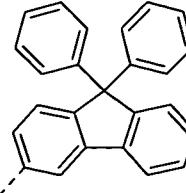
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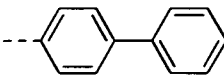
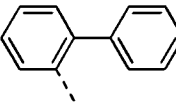
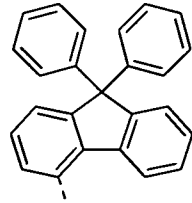
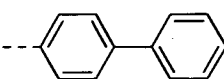
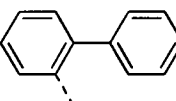
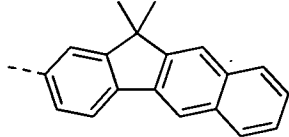
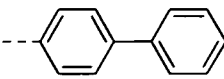
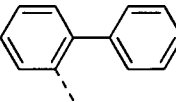
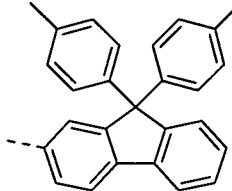
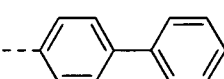
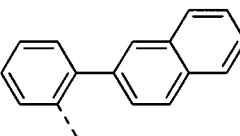
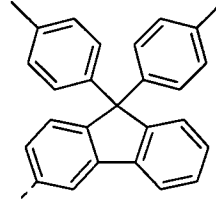
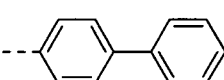
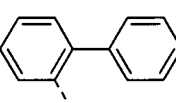
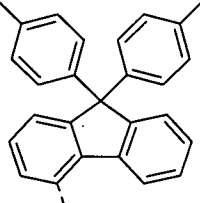
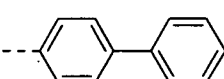
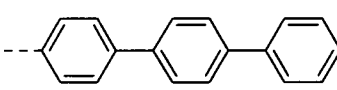
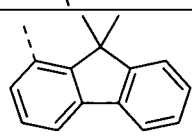
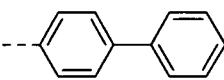
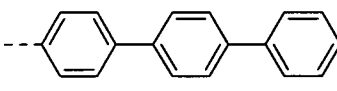
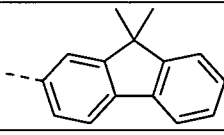
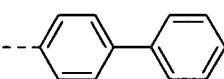
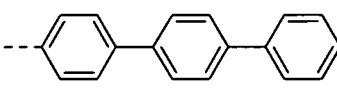
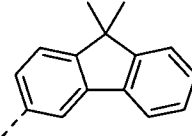
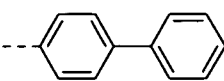
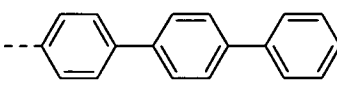
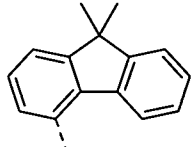
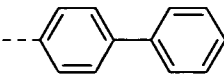
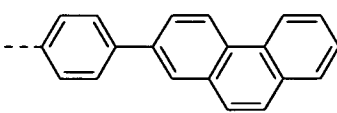
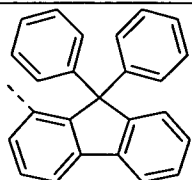
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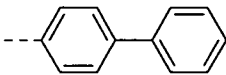
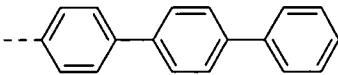
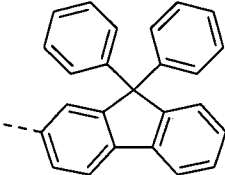
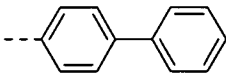
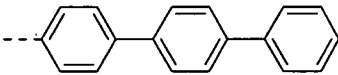
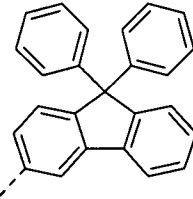
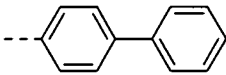
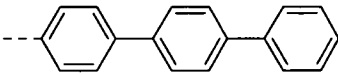
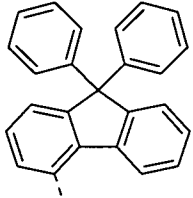
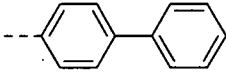
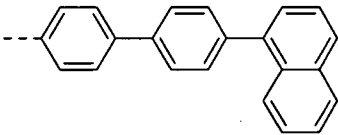
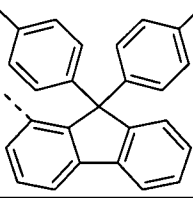
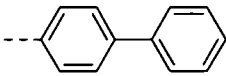
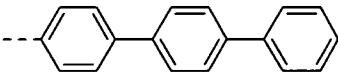
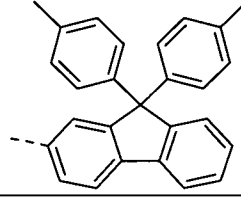
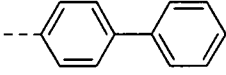
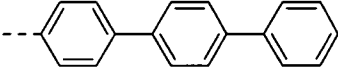
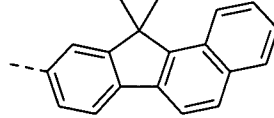
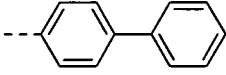
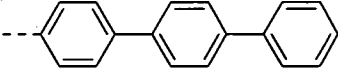
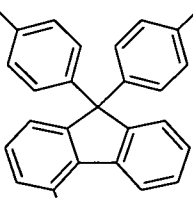
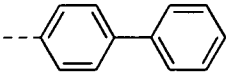
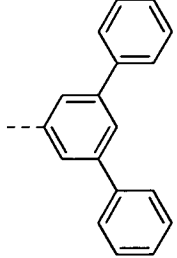
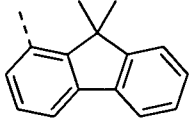
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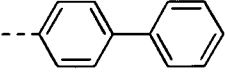
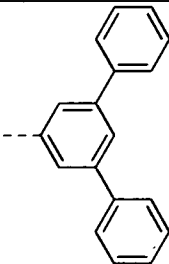
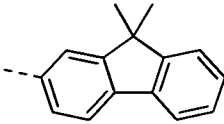
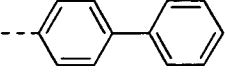
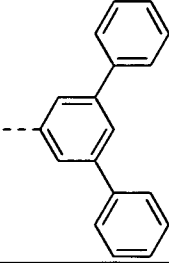
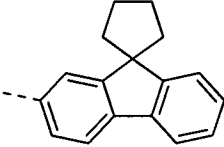
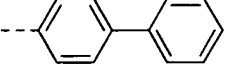
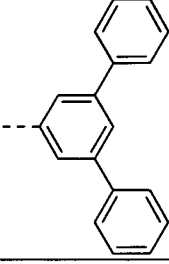
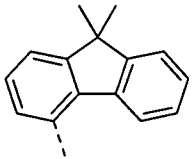
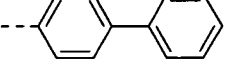
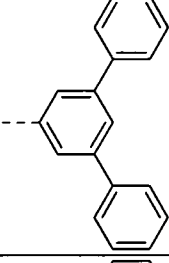
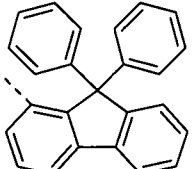
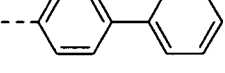
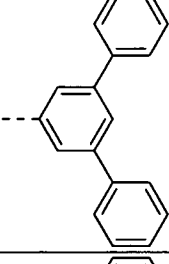
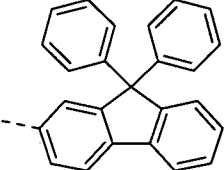
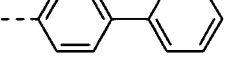
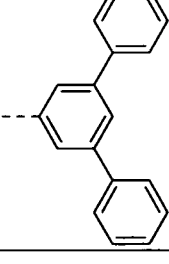
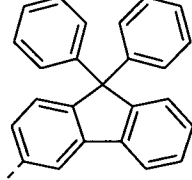
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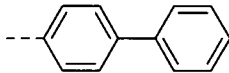
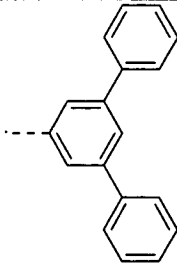
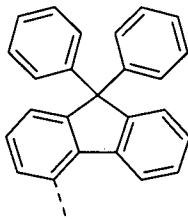
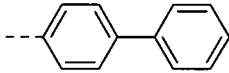
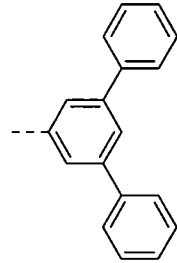
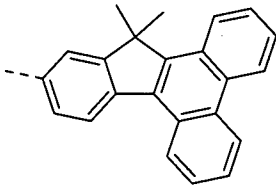
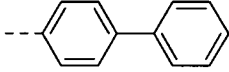
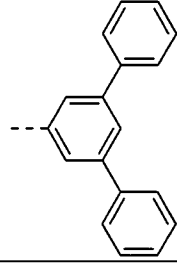
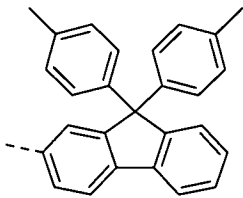
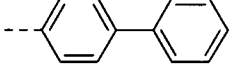
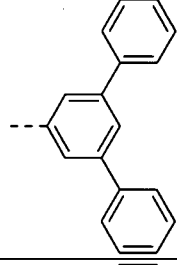
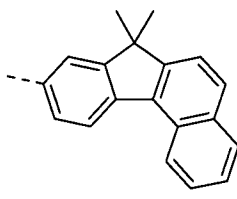
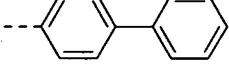
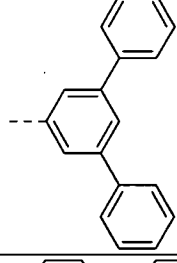
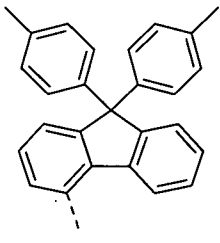
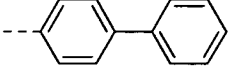
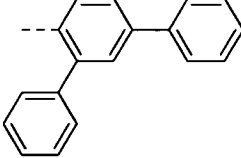
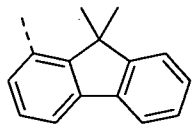
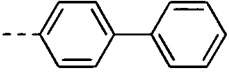
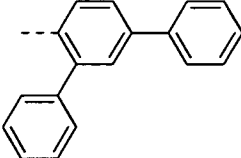
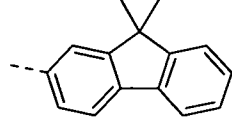
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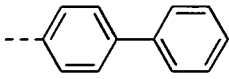
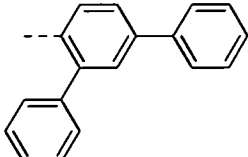
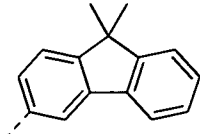
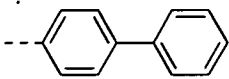
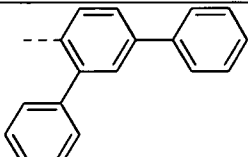
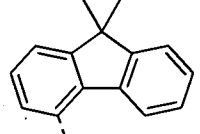
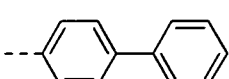
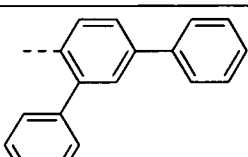
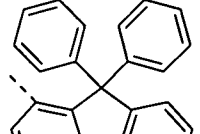
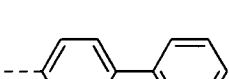
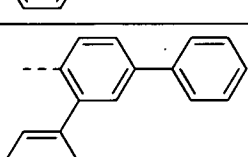
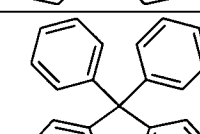
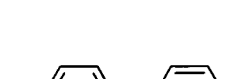
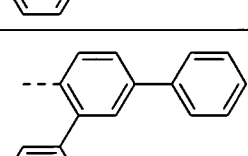
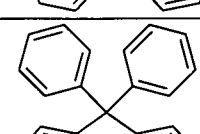
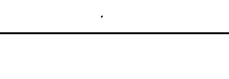
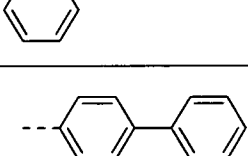
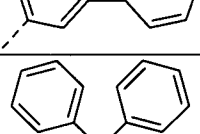
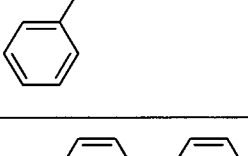
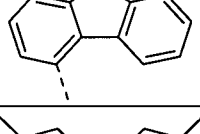
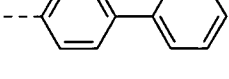
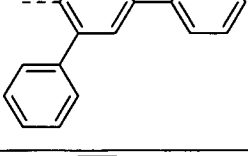
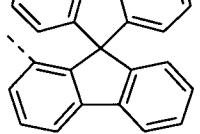
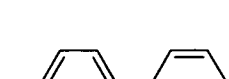
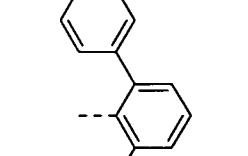
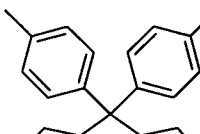
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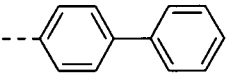
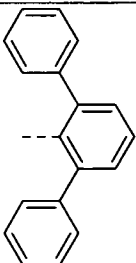
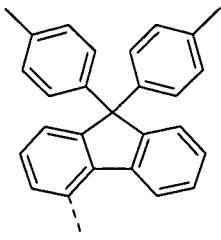
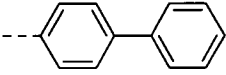
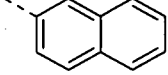
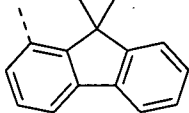
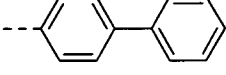
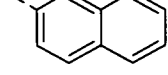
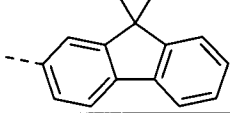
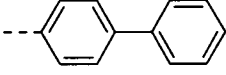
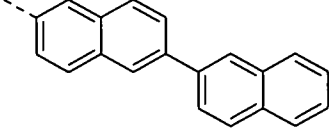
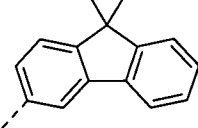
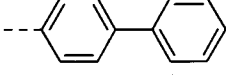
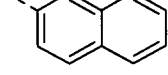
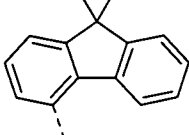
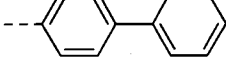
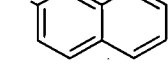
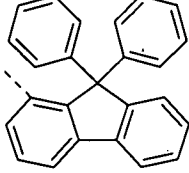
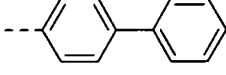
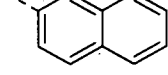
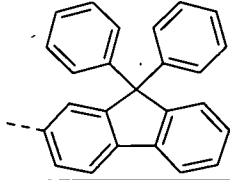
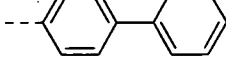
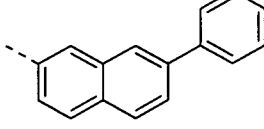
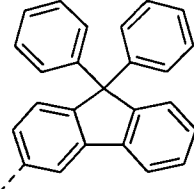
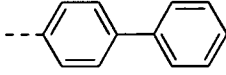
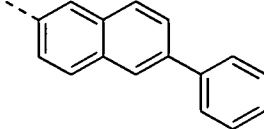
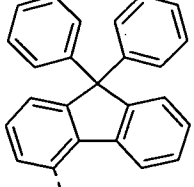
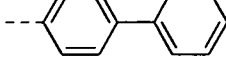
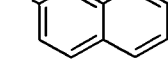
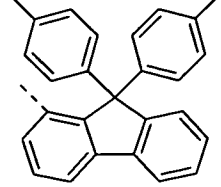
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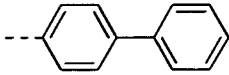
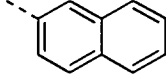
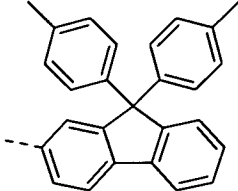
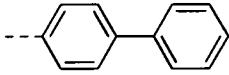
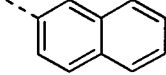
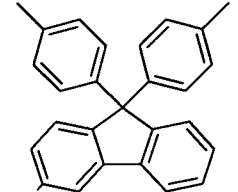
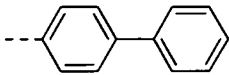
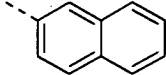
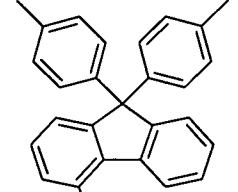
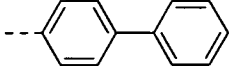
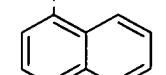
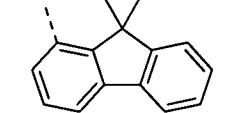
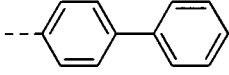
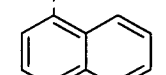
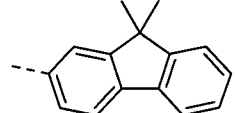
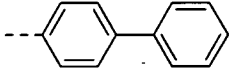
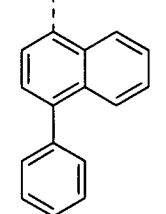
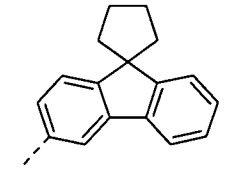
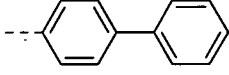
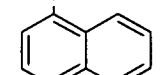
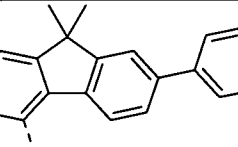
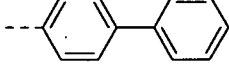
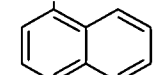
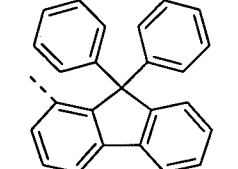
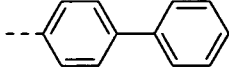
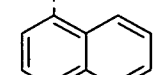
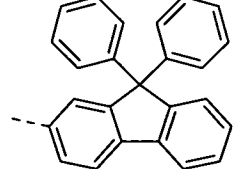
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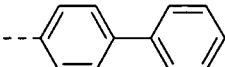
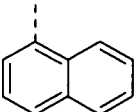
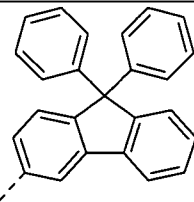
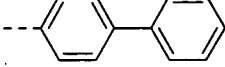
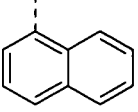
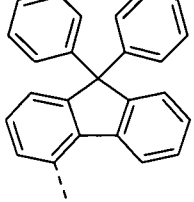
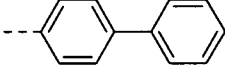
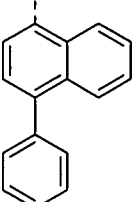
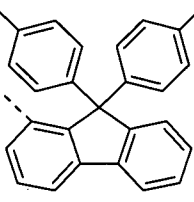
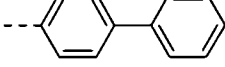
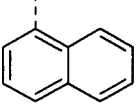
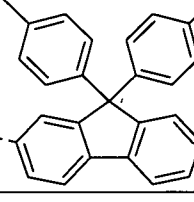
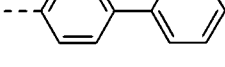
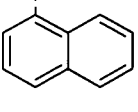
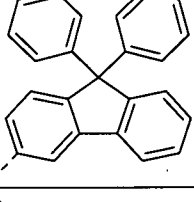
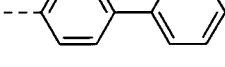
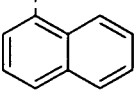
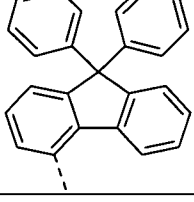
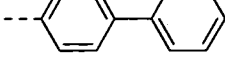
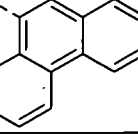
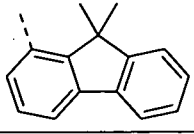
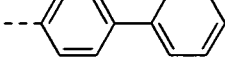
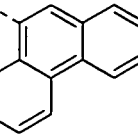
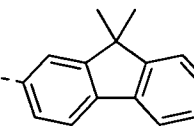
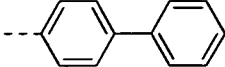
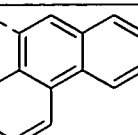
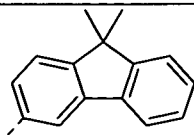
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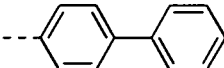
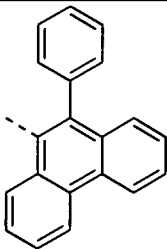
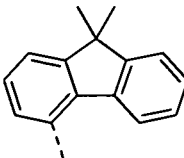
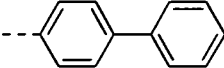
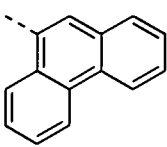
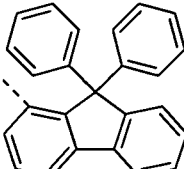
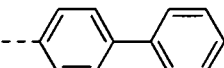
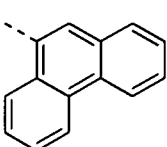
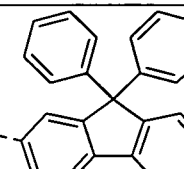
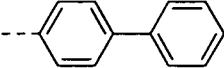
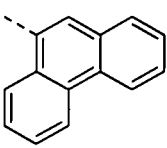
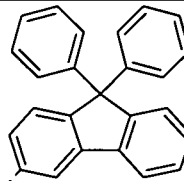
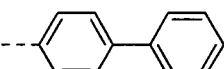
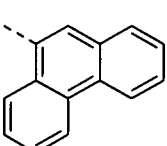
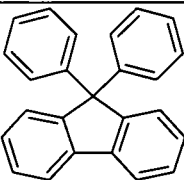
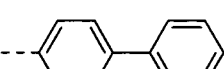
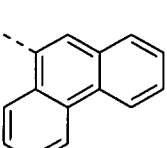
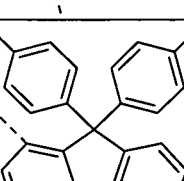
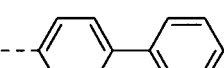
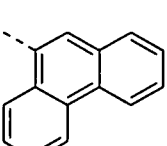
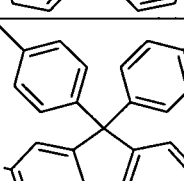
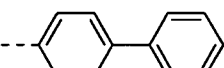
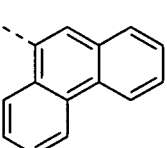
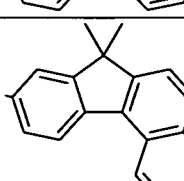
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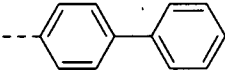
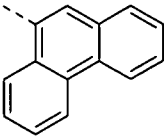
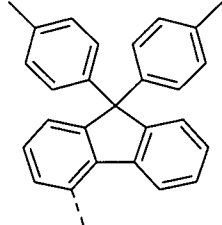
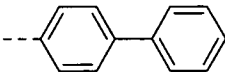
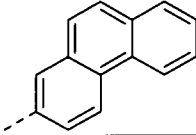
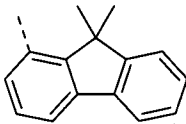
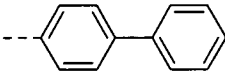
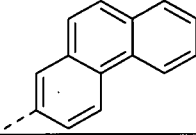
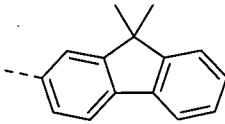
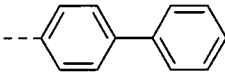
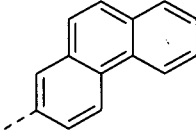
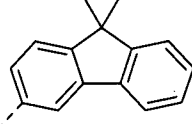
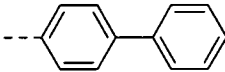
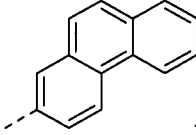
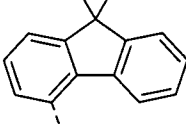
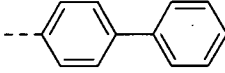
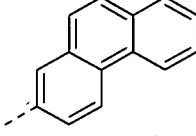
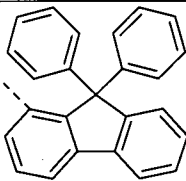
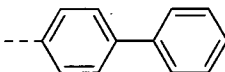
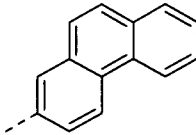
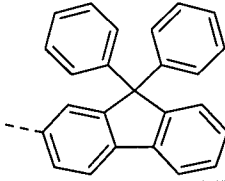
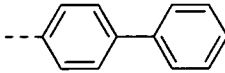
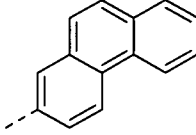
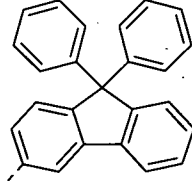
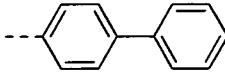
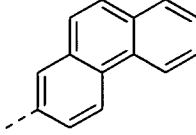
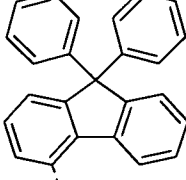
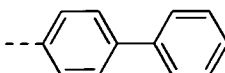
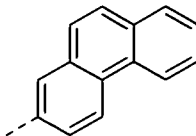
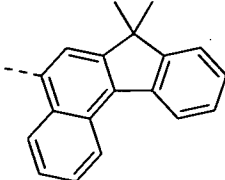
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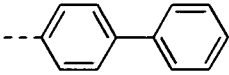
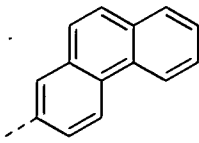
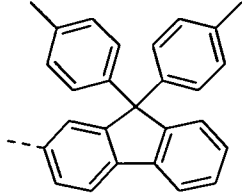
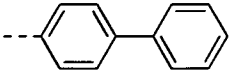
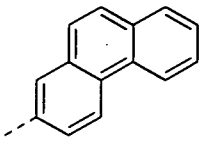
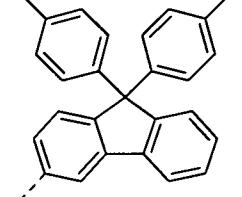
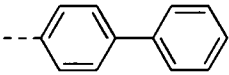
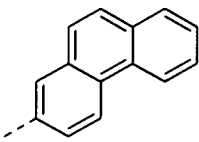
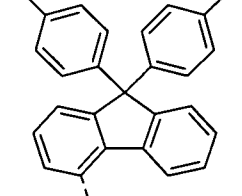
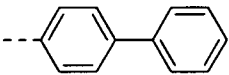
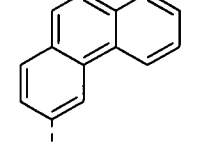
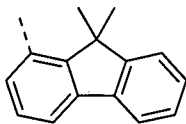
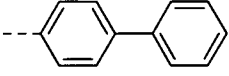
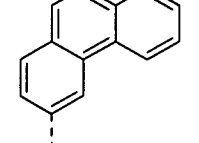
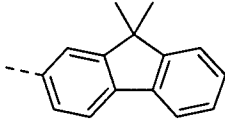
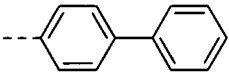
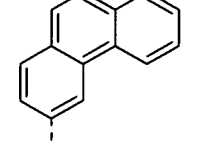
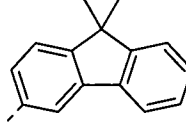
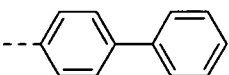
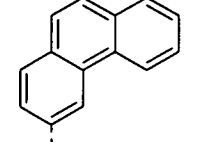
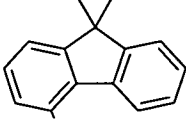
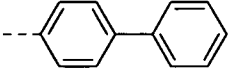
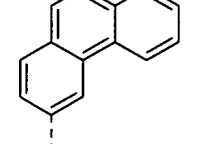
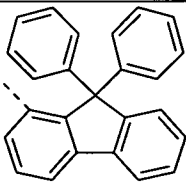
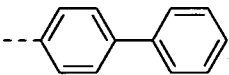
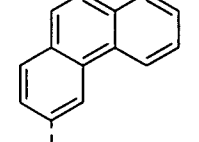
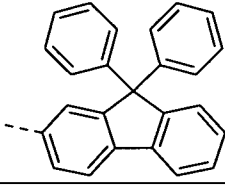
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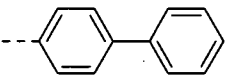
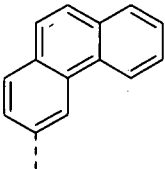
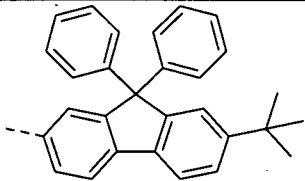
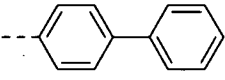
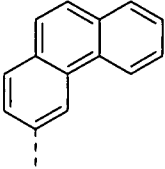
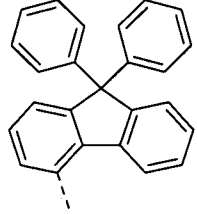
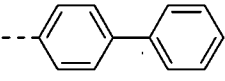
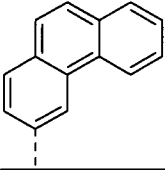
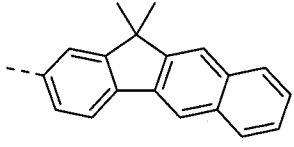
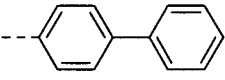
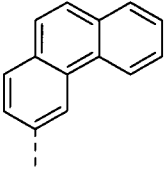
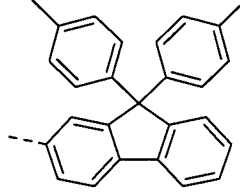
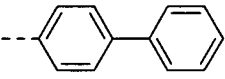
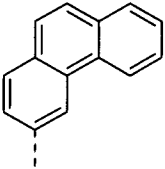
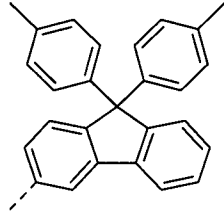
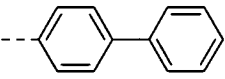
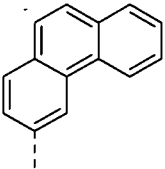
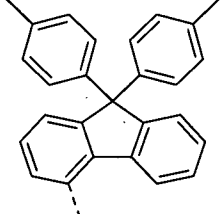
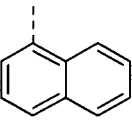
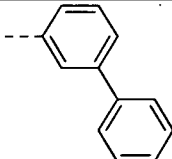
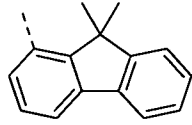
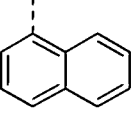
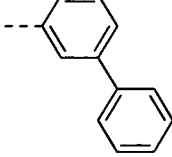
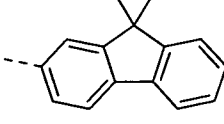
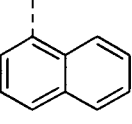
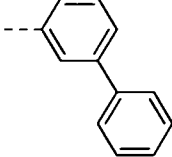
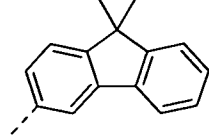
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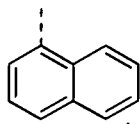
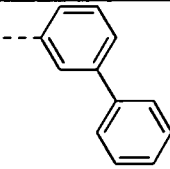
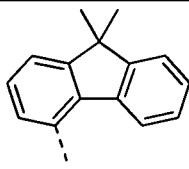
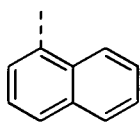
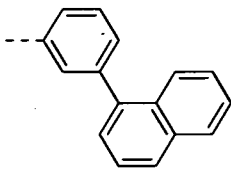
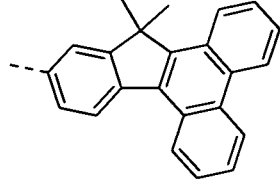
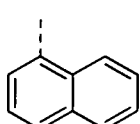
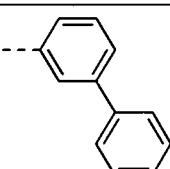
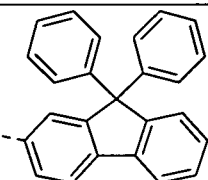
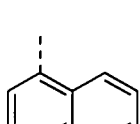
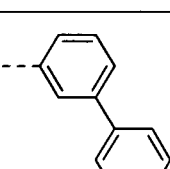
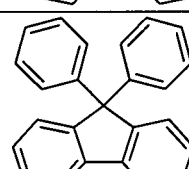
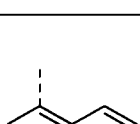
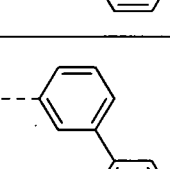
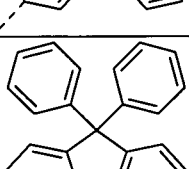
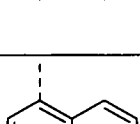
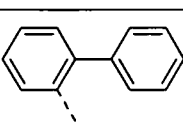
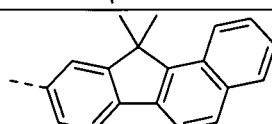
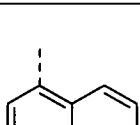
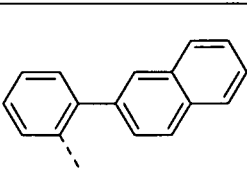
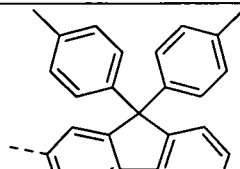
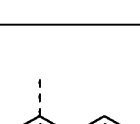
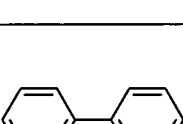
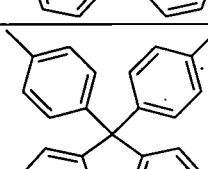
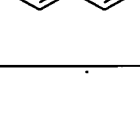
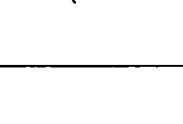
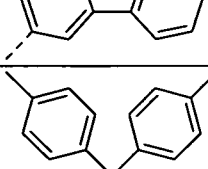
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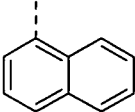
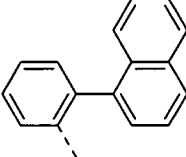
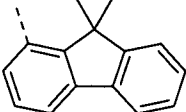
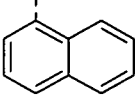
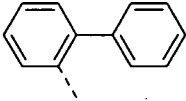
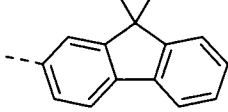
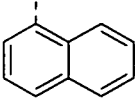
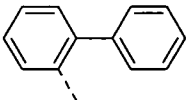
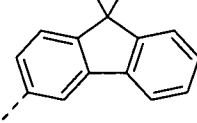
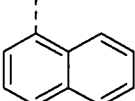
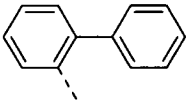
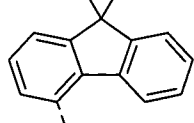
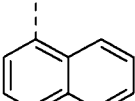
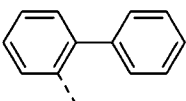
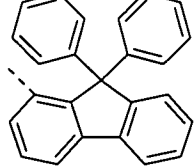
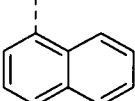
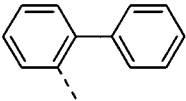
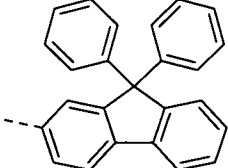
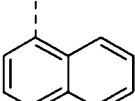
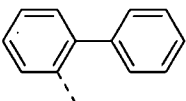
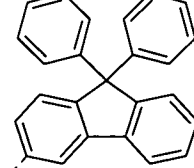
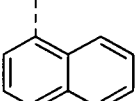
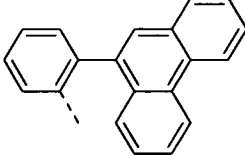
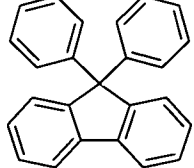
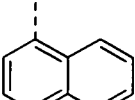
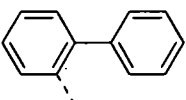
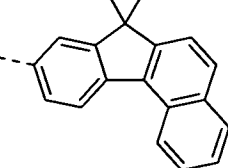
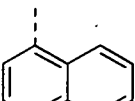
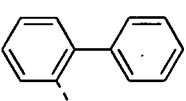
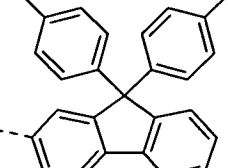
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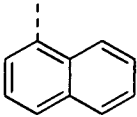
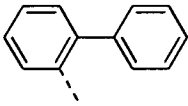
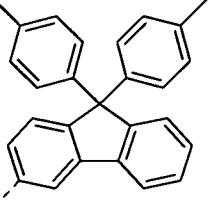
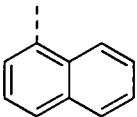
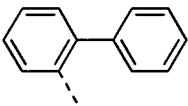
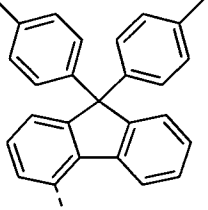
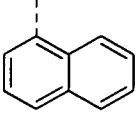
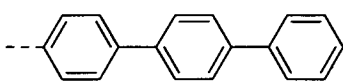
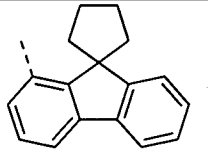
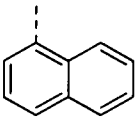
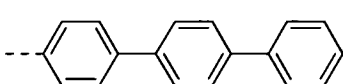
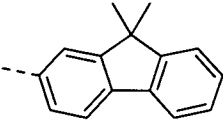
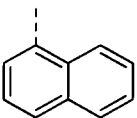
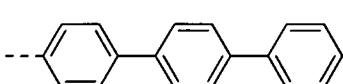
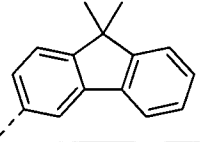
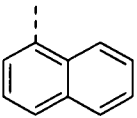
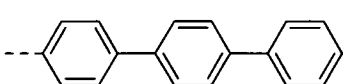
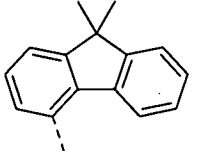
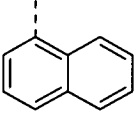
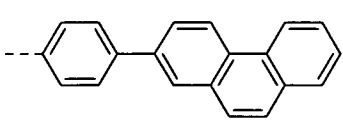
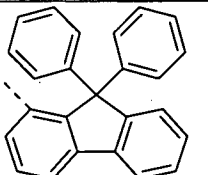
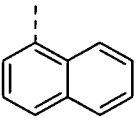
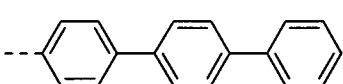
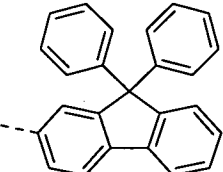
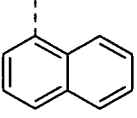
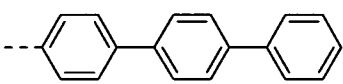
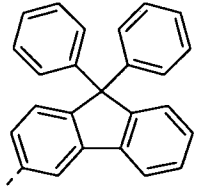
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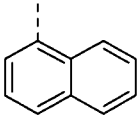
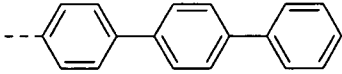
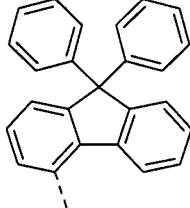
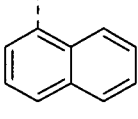
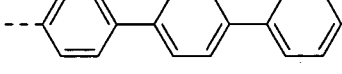
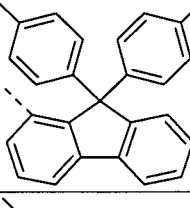
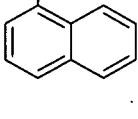
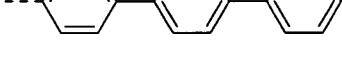
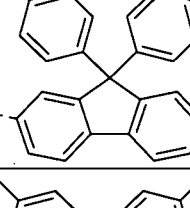
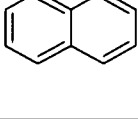
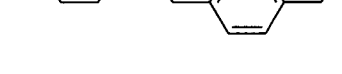
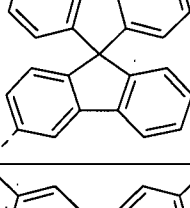
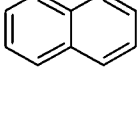
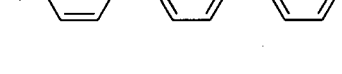
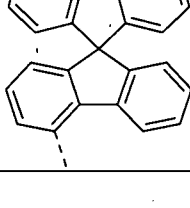
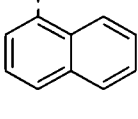
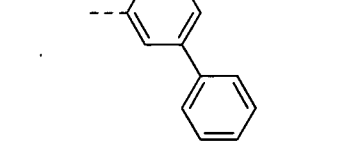
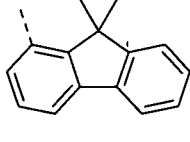
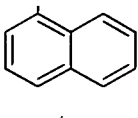
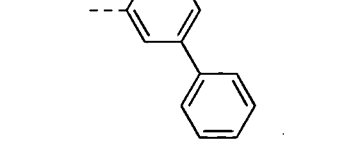
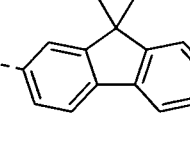
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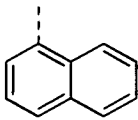
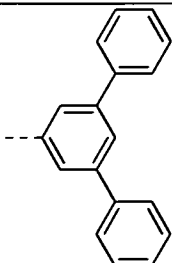
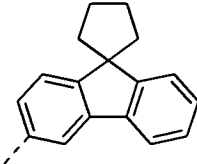
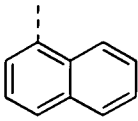
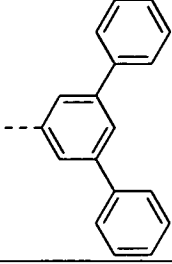
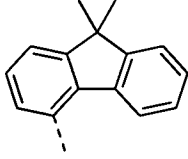
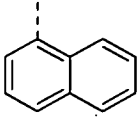
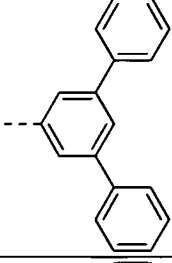
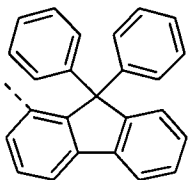
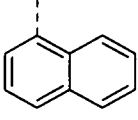
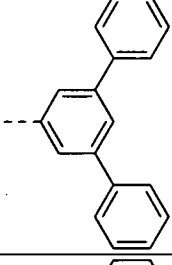
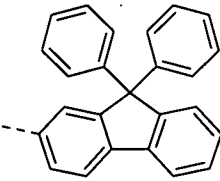
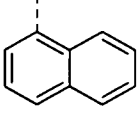
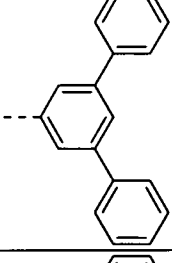
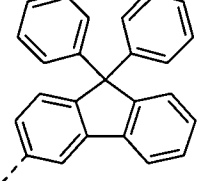
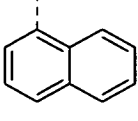
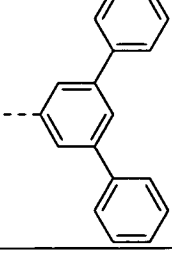
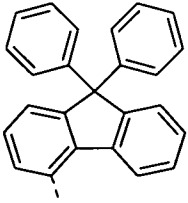
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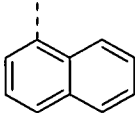
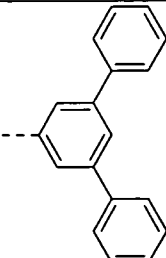
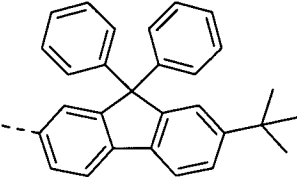
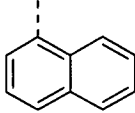
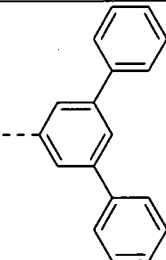
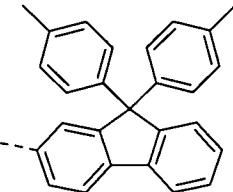
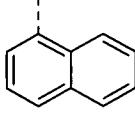
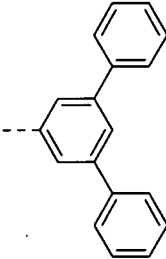
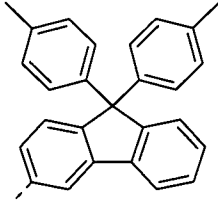
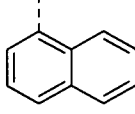
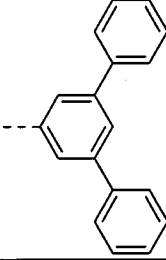
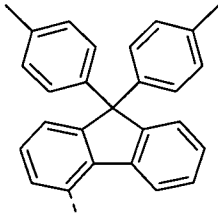
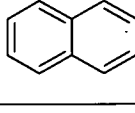
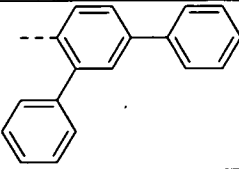
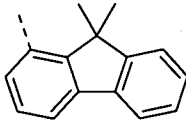
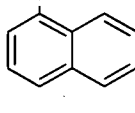
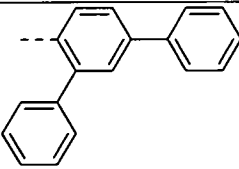
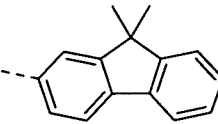
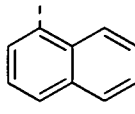
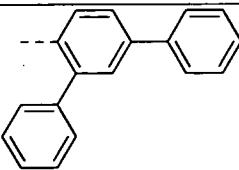
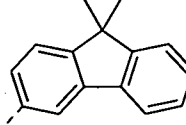
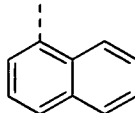
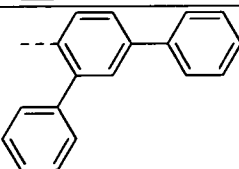
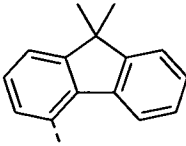
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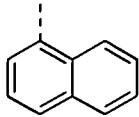
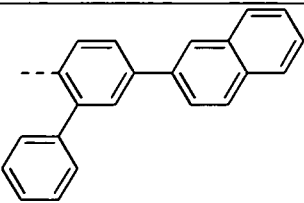
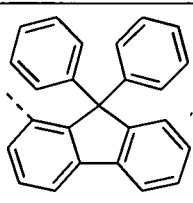
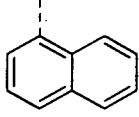
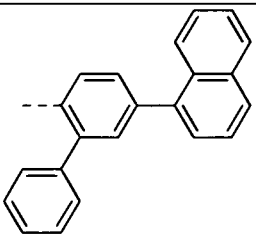
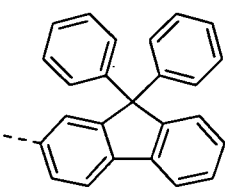
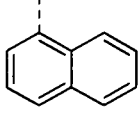
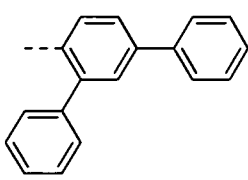
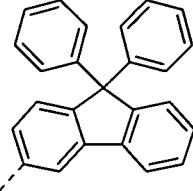
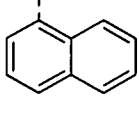
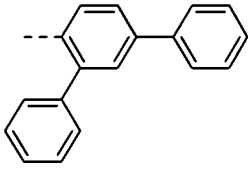
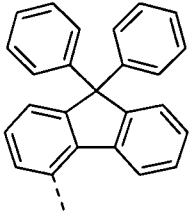
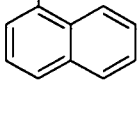
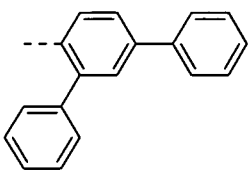
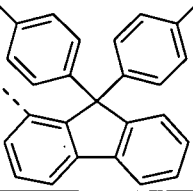
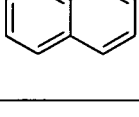
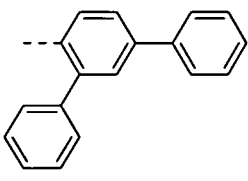
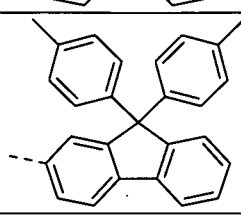
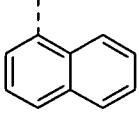
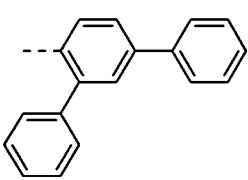
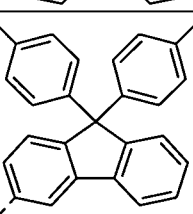
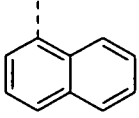
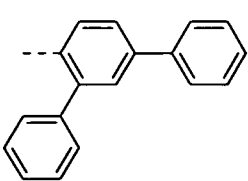
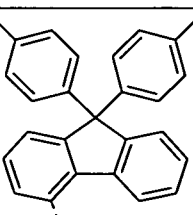
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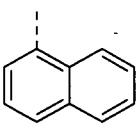
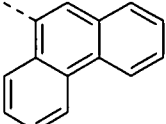
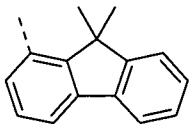
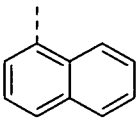
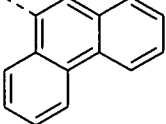
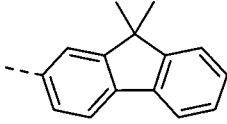
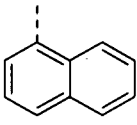
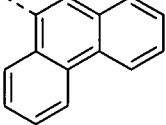
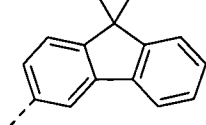
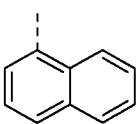
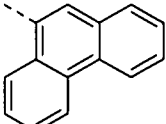
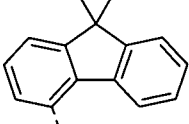
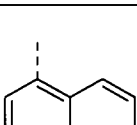
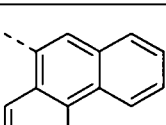
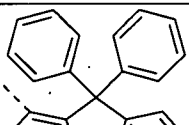
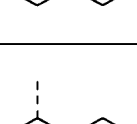
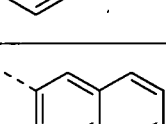
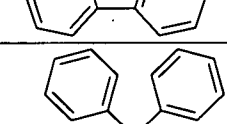
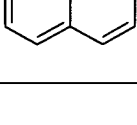
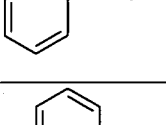
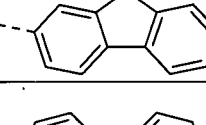
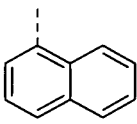
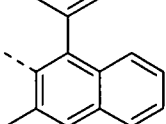
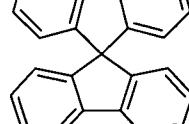
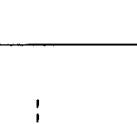
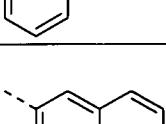
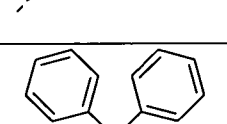
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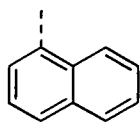
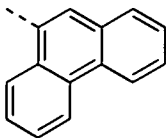
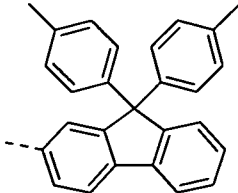
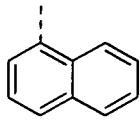
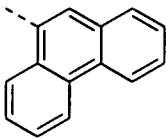
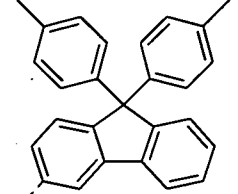
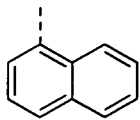
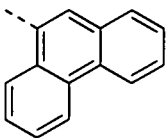
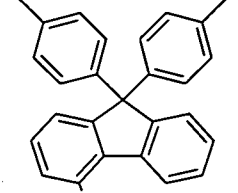
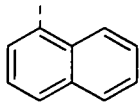
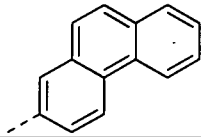
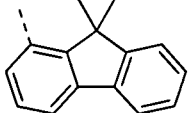
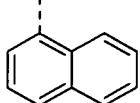
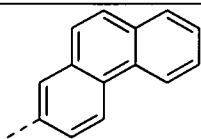
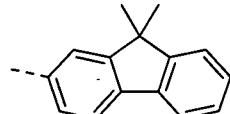
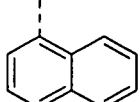
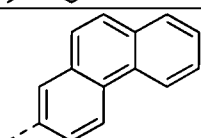
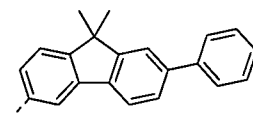
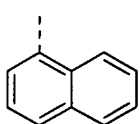
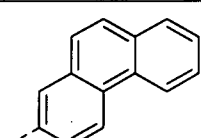
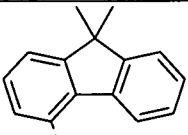
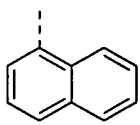
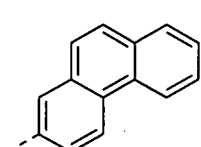
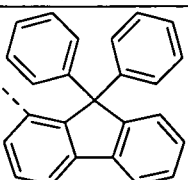
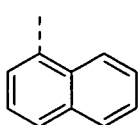
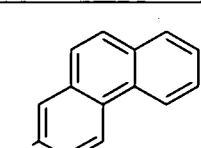
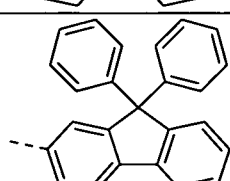
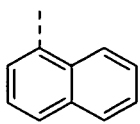
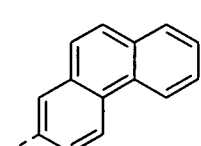
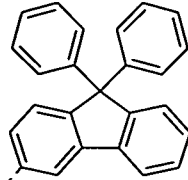
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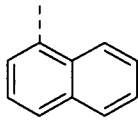
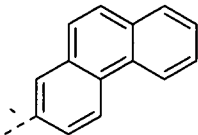
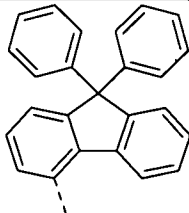
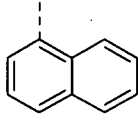
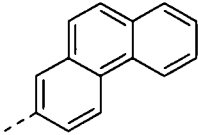
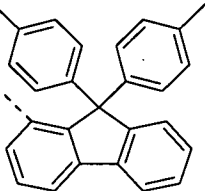
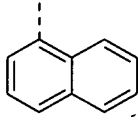
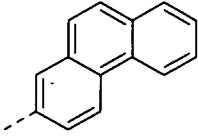
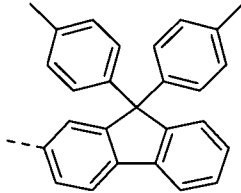
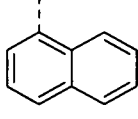
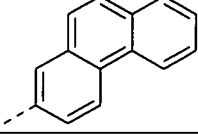
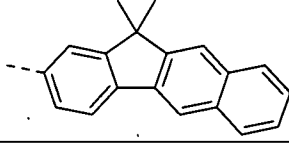
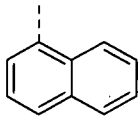
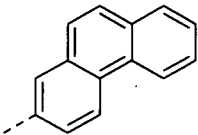
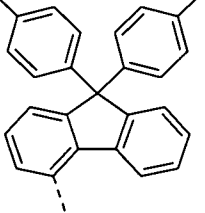
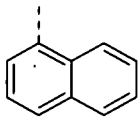
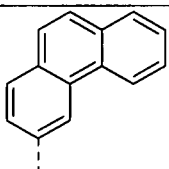
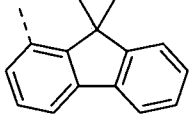
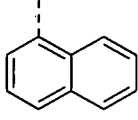
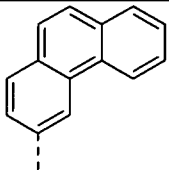
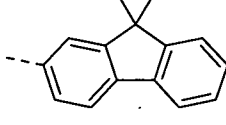
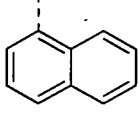
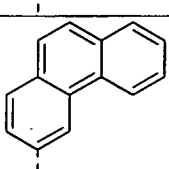
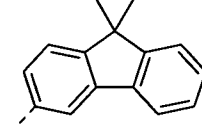
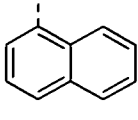
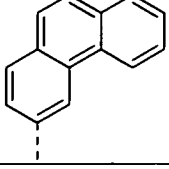
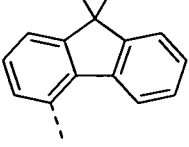
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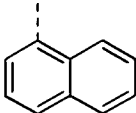
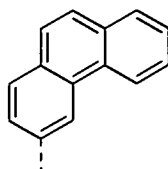
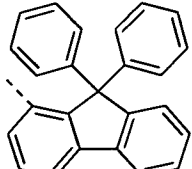
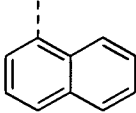
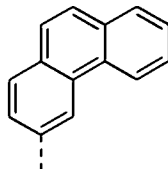
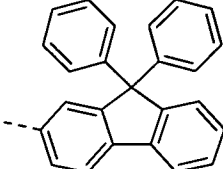
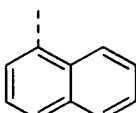
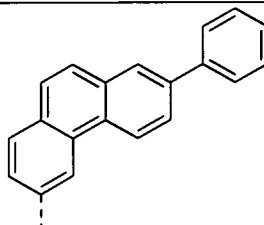
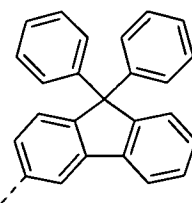
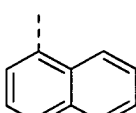
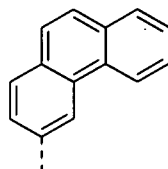
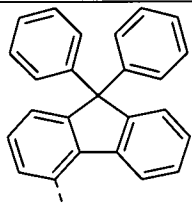
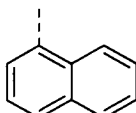
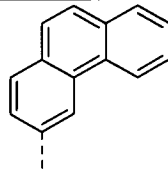
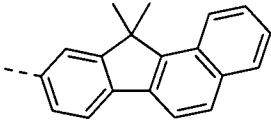
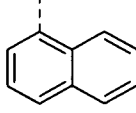
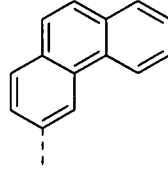
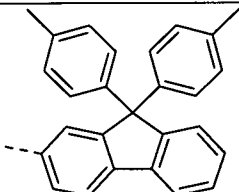
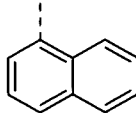
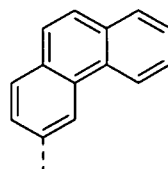
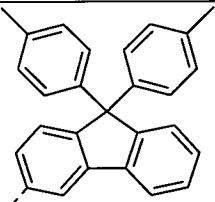
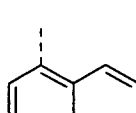
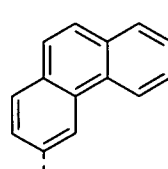
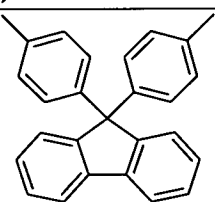
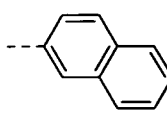
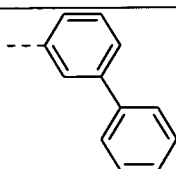
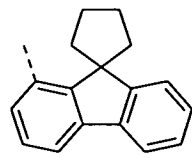
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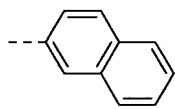
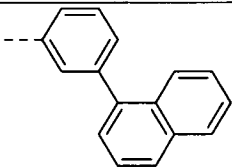
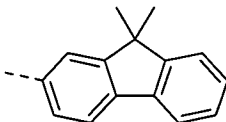
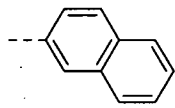
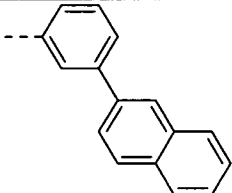
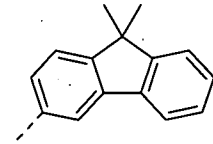
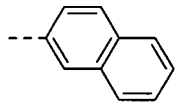
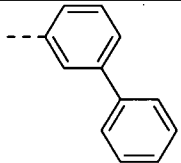
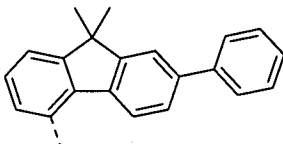
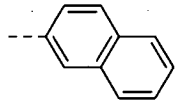
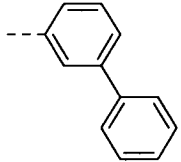
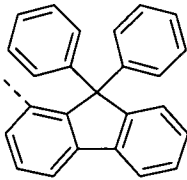
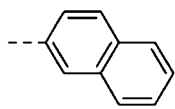
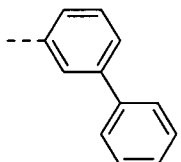
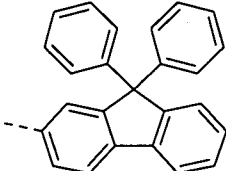
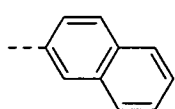
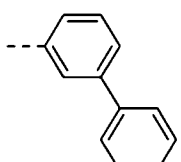
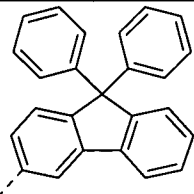
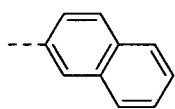
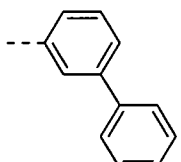
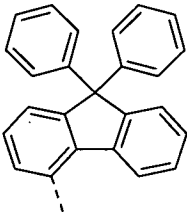
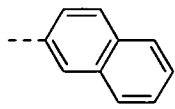
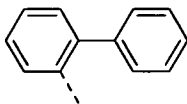
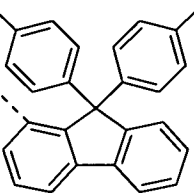
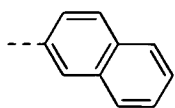
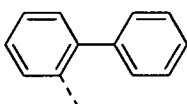
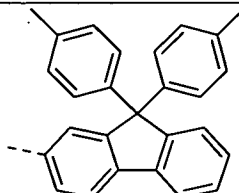
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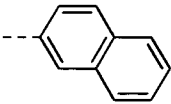
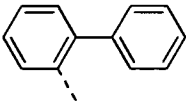
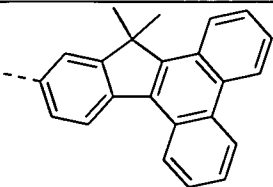
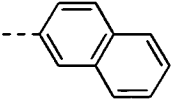
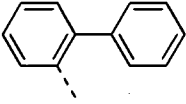
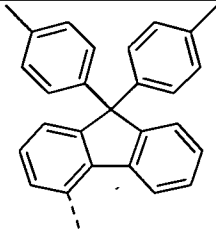
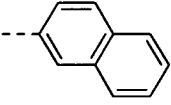
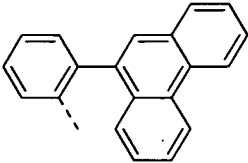
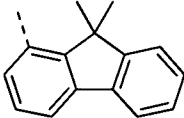
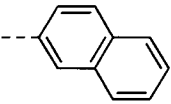
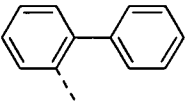
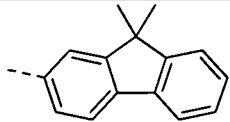
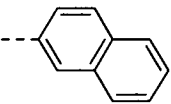
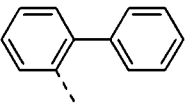
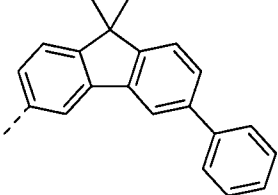
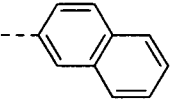
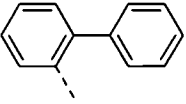
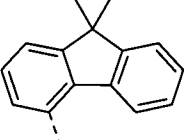
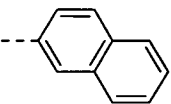
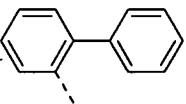
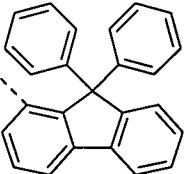
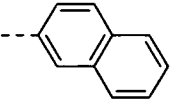
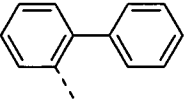
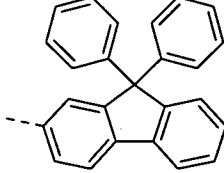
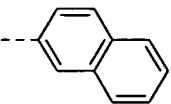
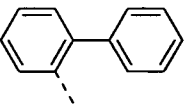
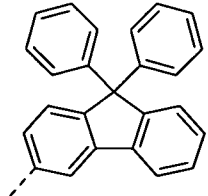
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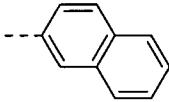
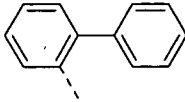
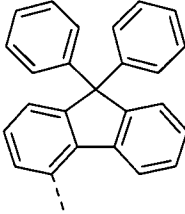
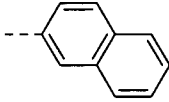
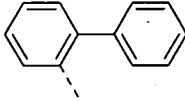
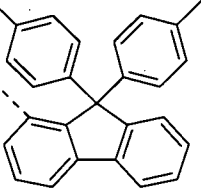
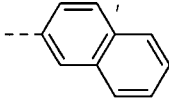
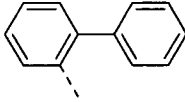
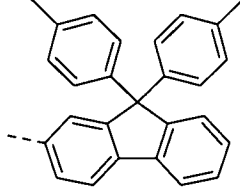
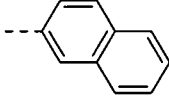
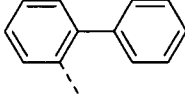
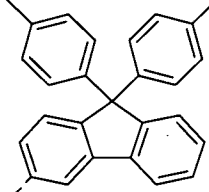
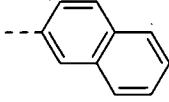
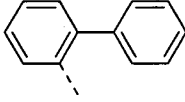
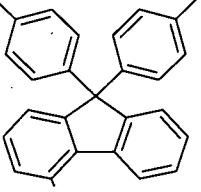
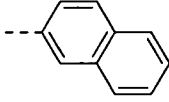
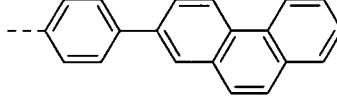
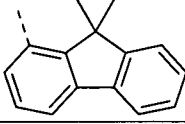
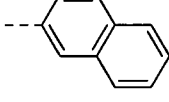
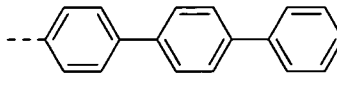
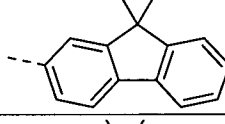
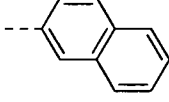
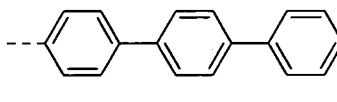
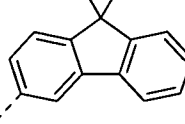
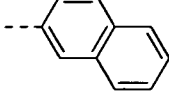
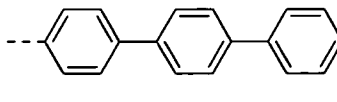
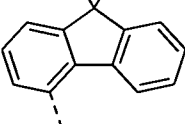
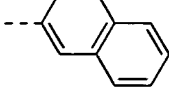
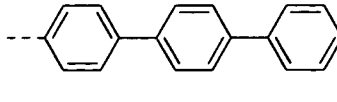
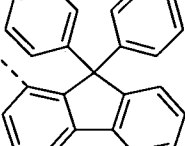
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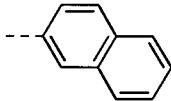
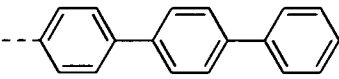
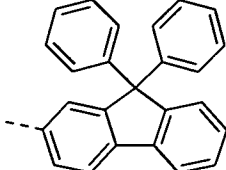
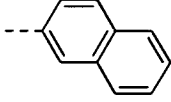
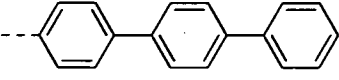
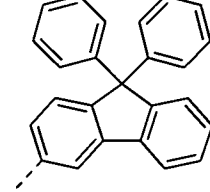
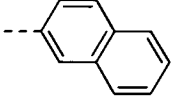
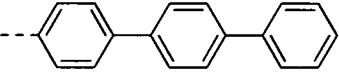
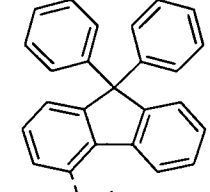
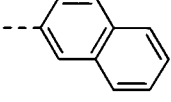
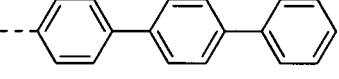
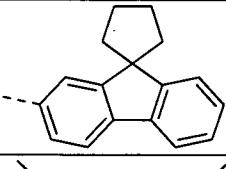
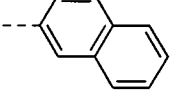
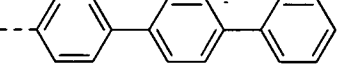
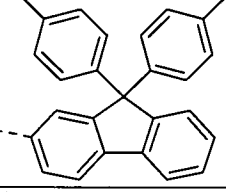
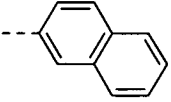
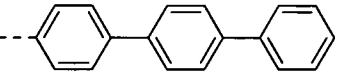
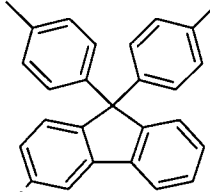
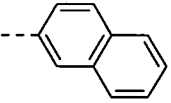
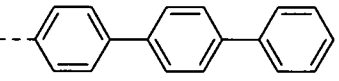
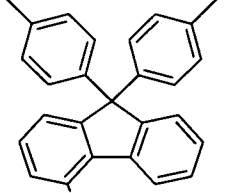
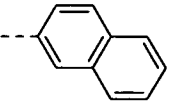
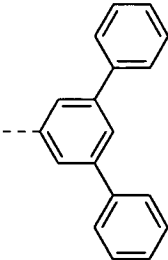
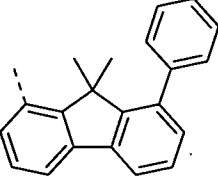
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修正日期:105 年 1 月 13 日

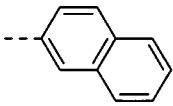
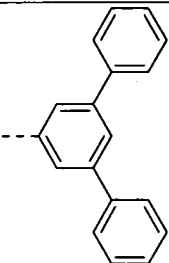
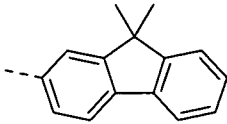
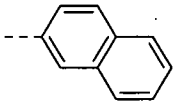
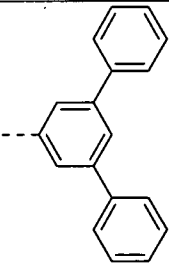
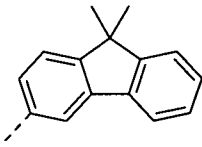
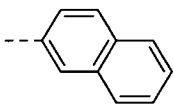
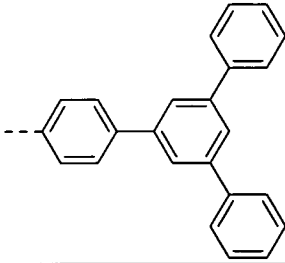
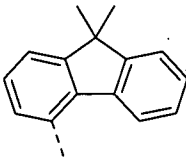
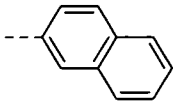
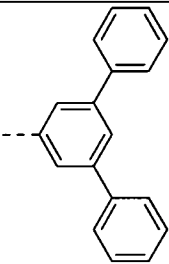
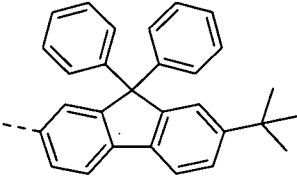
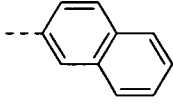
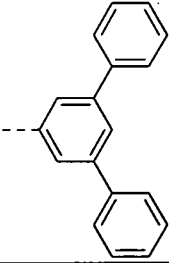
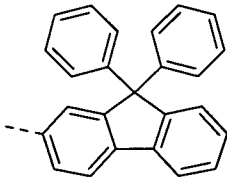
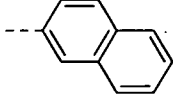
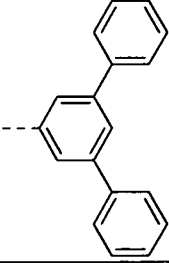
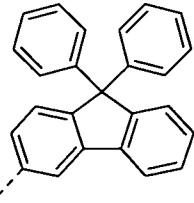
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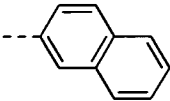
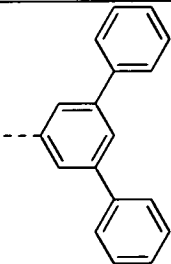
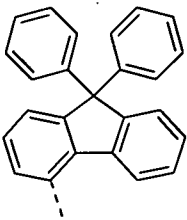
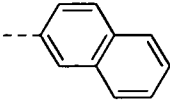
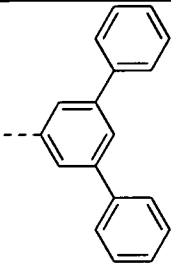
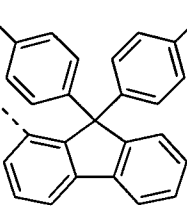
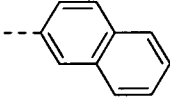
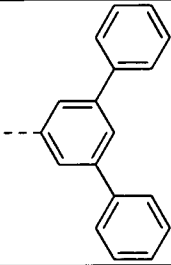
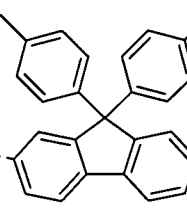
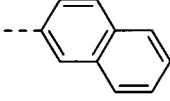
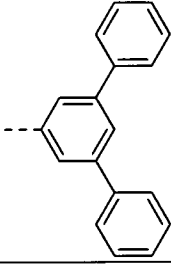
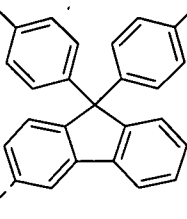
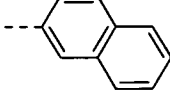
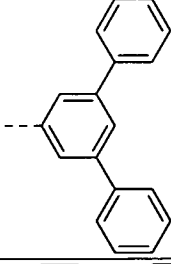
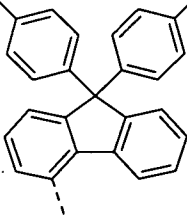
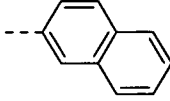
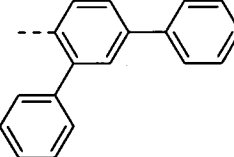
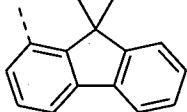
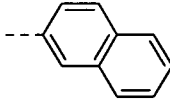
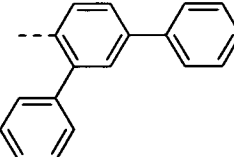
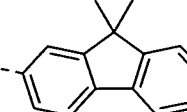
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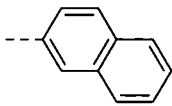
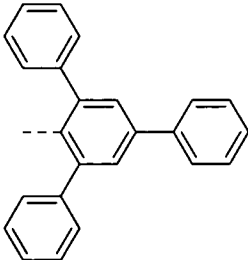
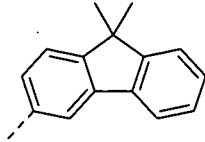
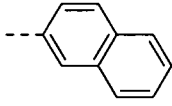
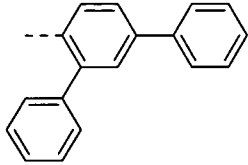
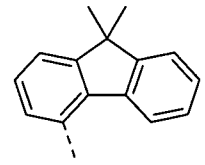
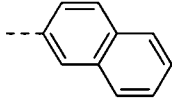
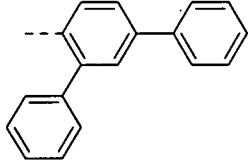
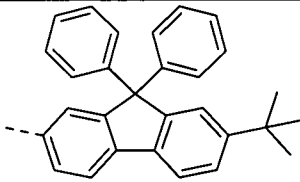
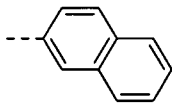
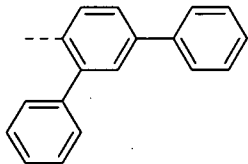
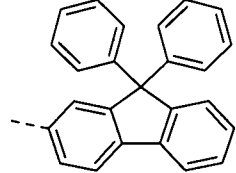
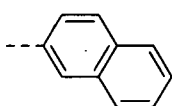
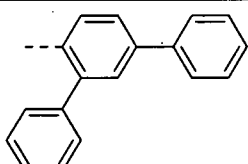
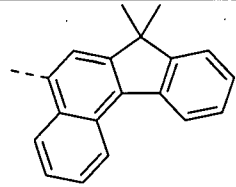
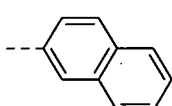
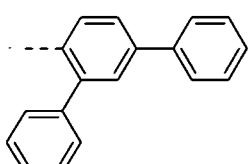
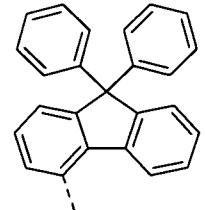
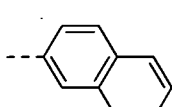
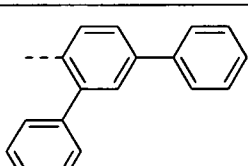
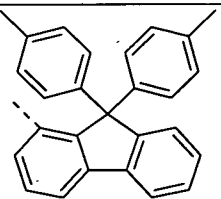
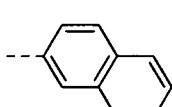
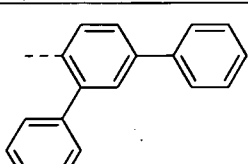
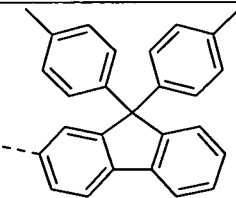
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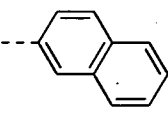
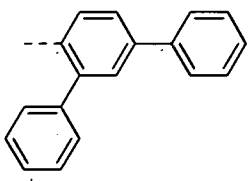
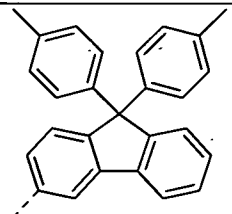
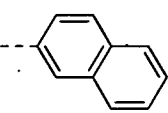
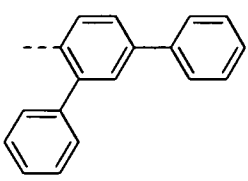
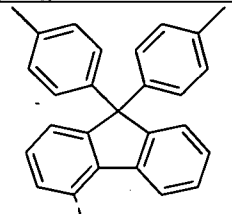
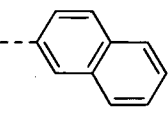
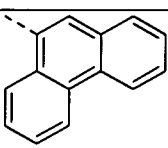
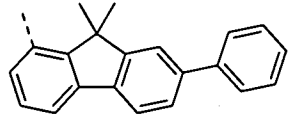
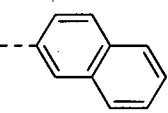
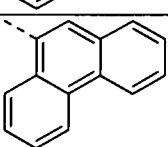
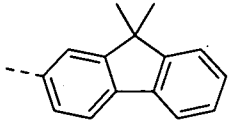
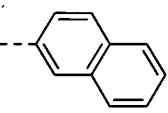
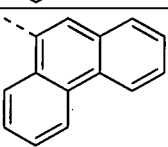
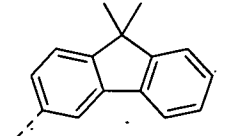
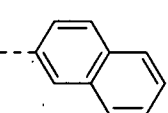
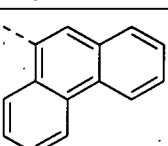
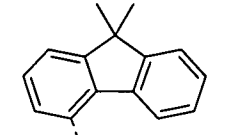
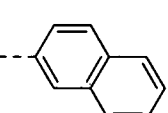
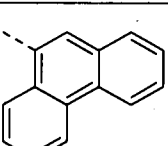
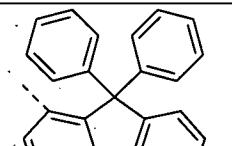
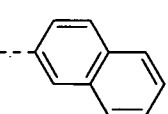
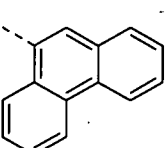
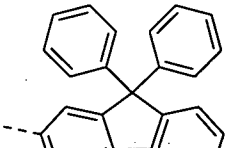
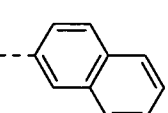
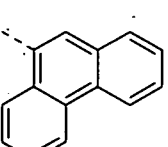
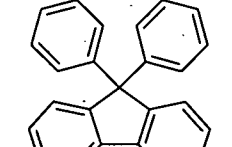
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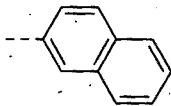
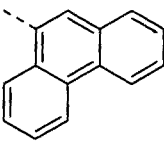
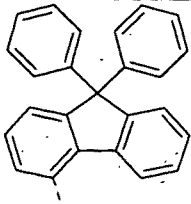
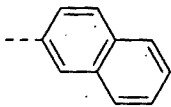
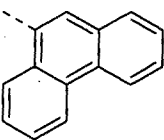
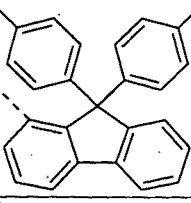
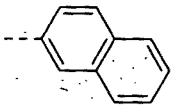
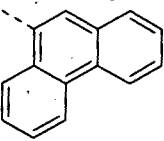
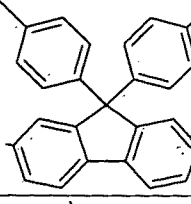
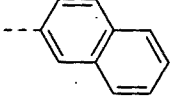
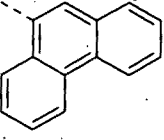
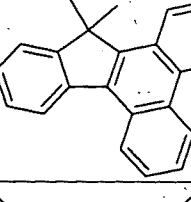
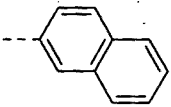
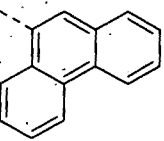
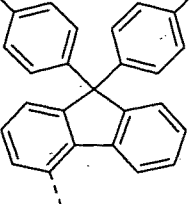
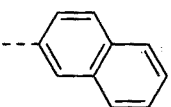
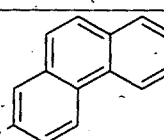
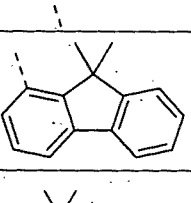
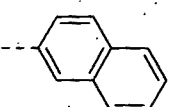
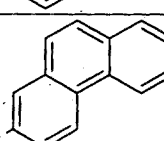
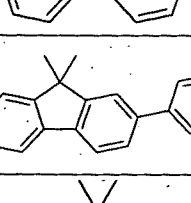
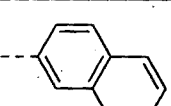
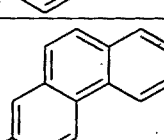
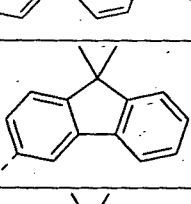
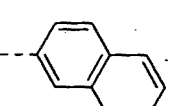
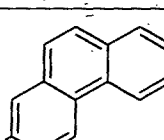
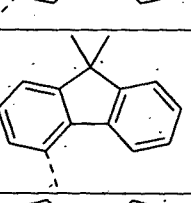
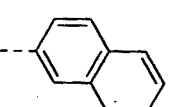
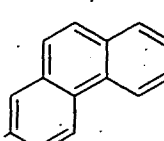
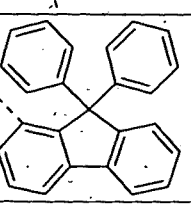
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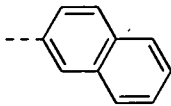
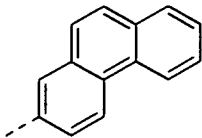
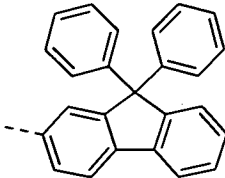
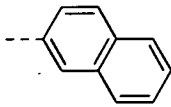
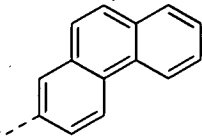
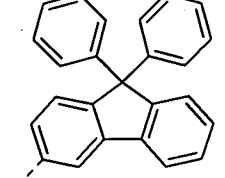
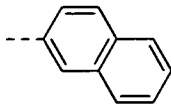
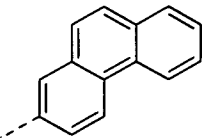
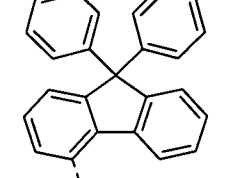
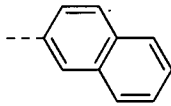
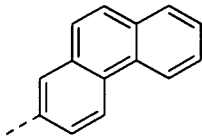
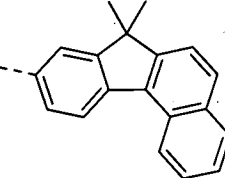
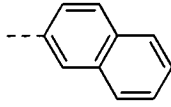
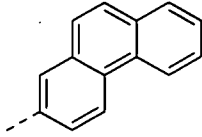
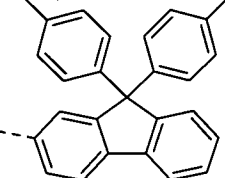
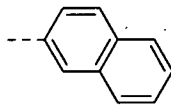
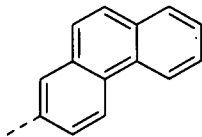
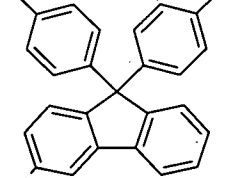
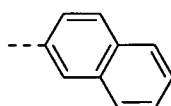
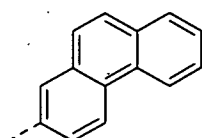
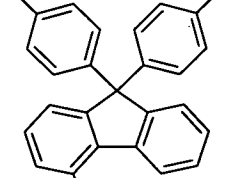
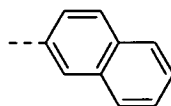
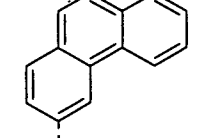
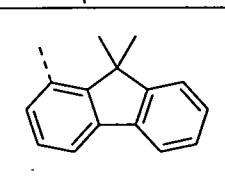
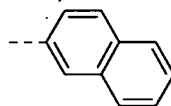
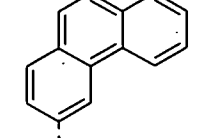
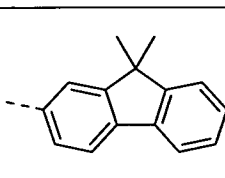
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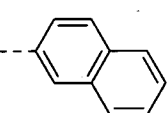
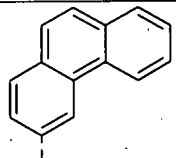
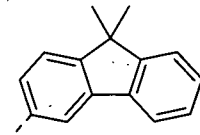
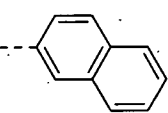
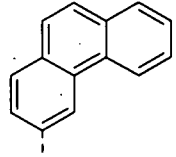
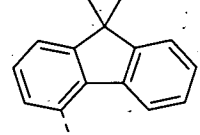
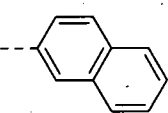
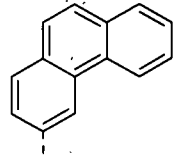
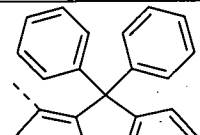
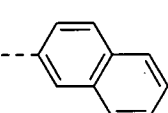
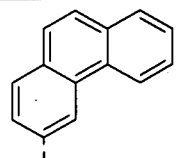
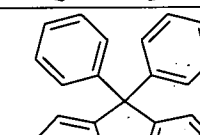
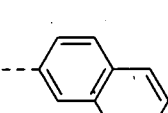
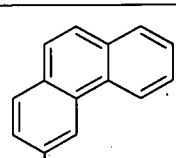
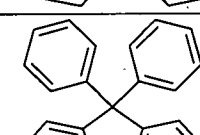
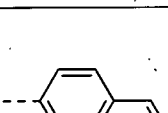
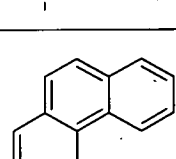
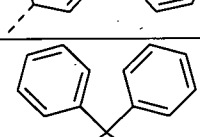
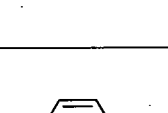
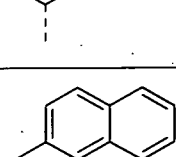
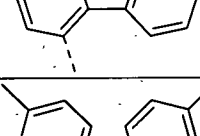
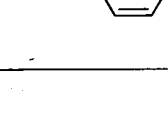
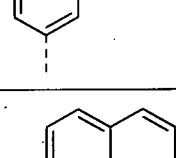
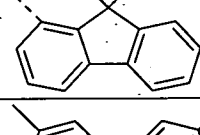
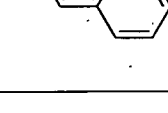
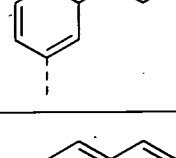
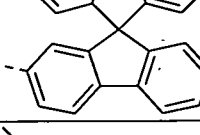
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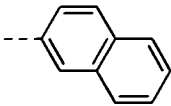
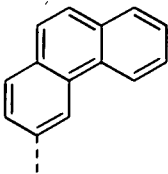
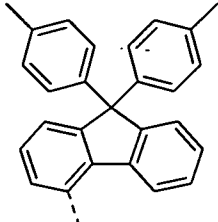
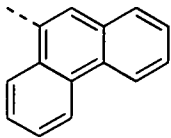
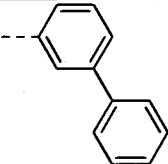
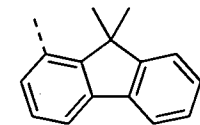
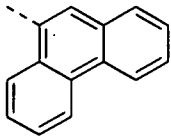
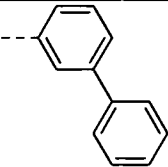
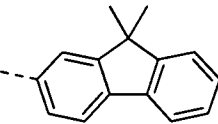
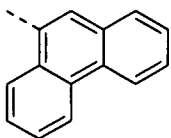
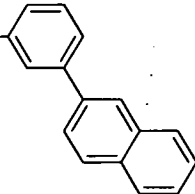
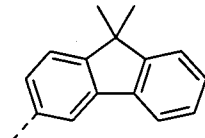
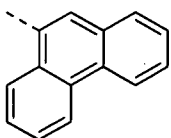
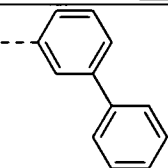
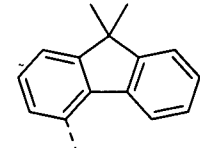
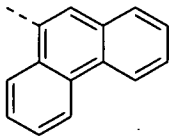
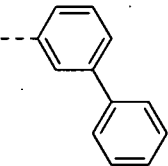
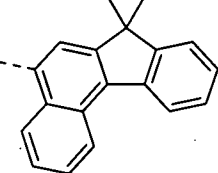
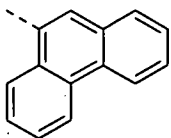
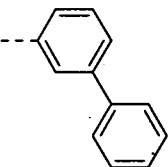
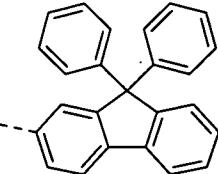
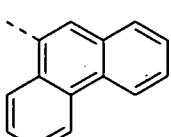
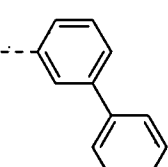
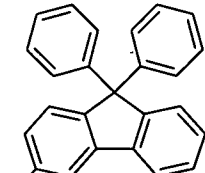
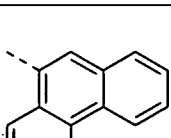
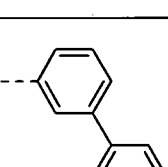
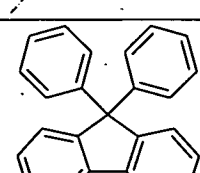
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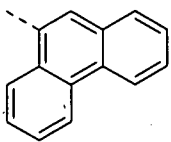
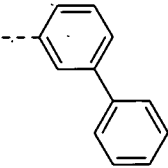
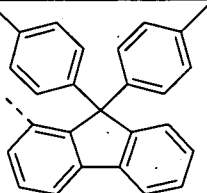
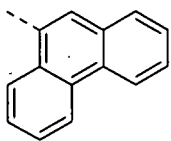
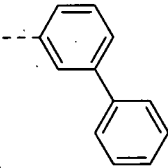
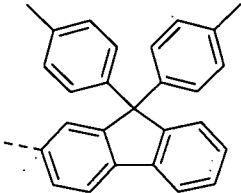
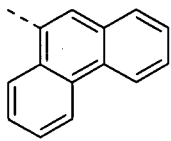
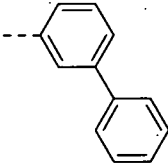
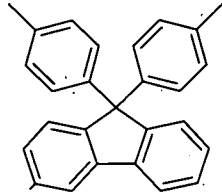
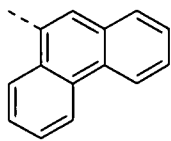
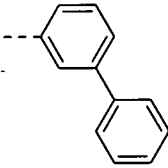
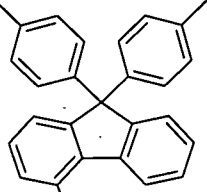
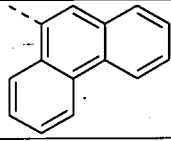
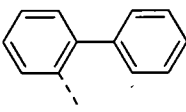
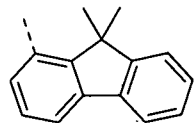
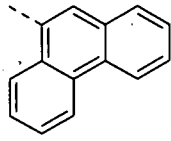
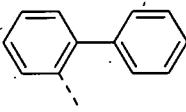
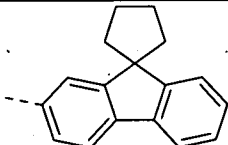
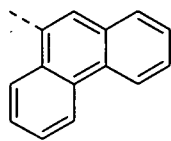
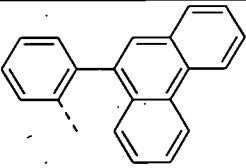
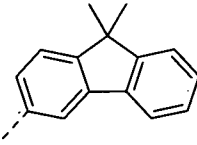
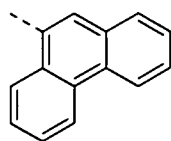
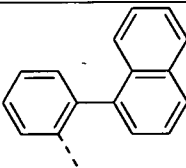
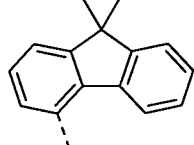
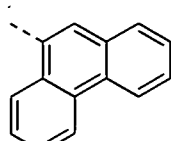
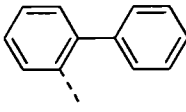
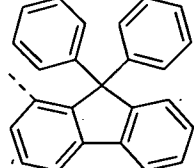
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修正日期:105 年 1 月 13 日

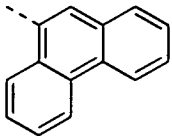
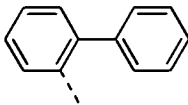
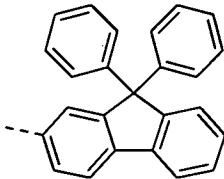
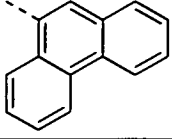
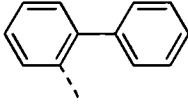
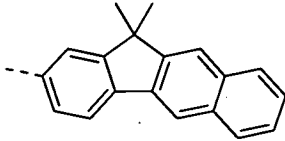
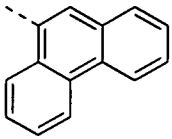
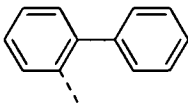
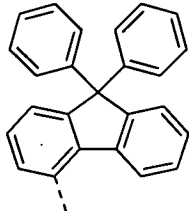
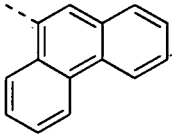
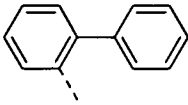
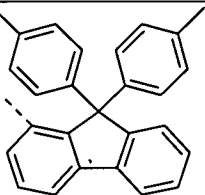
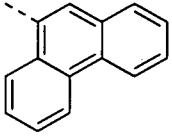
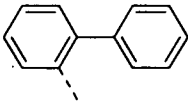
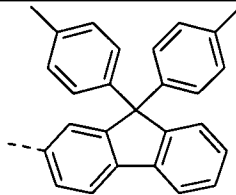
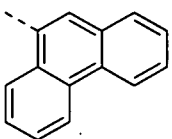
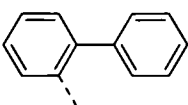
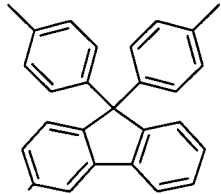
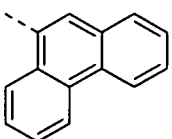
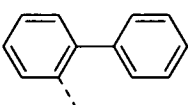
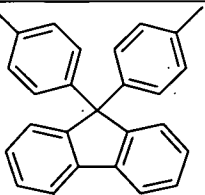
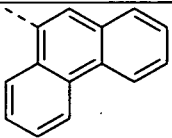
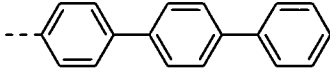
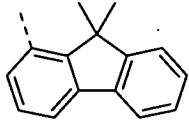
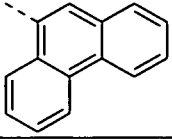
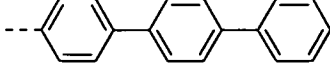
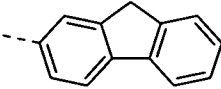
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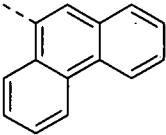
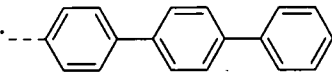
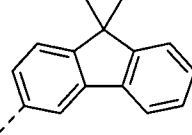
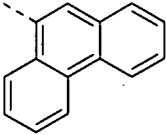
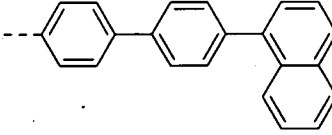
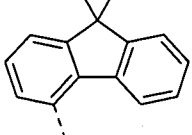
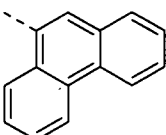
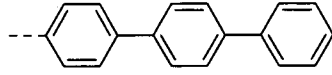
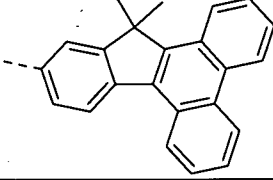
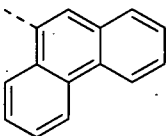
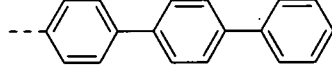
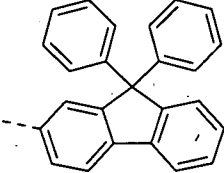
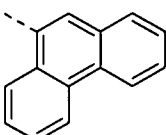
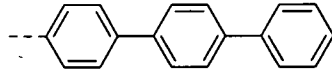
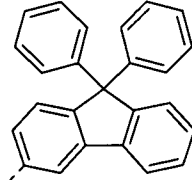
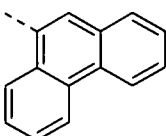
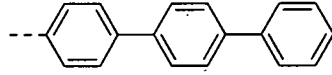
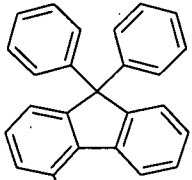
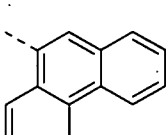
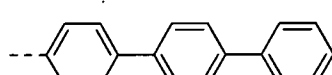
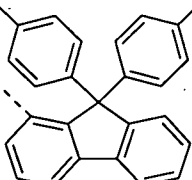
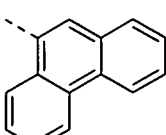
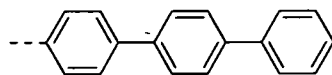
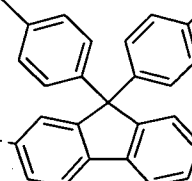
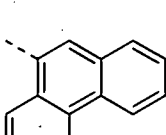
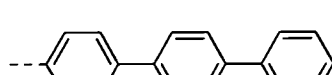
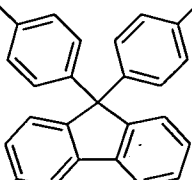
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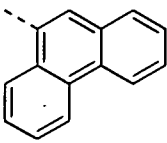
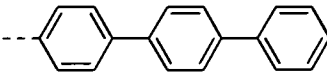
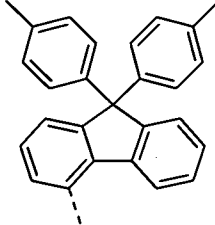
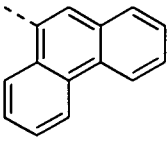
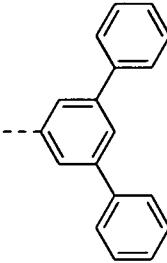
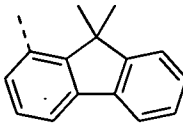
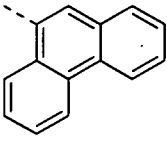
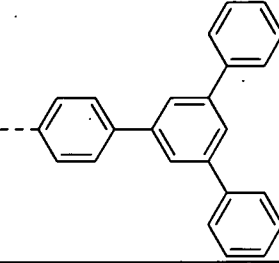
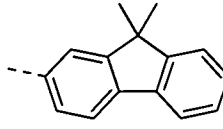
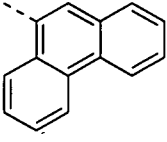
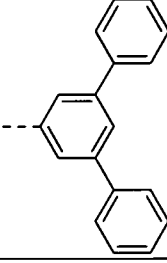
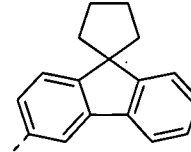
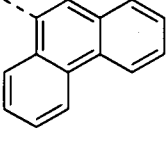
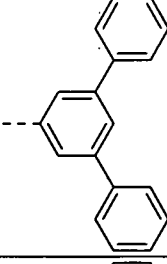
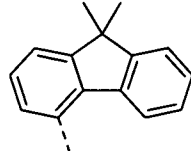
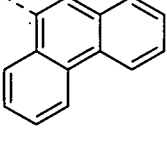
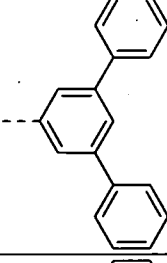
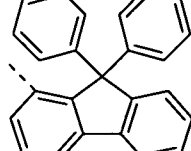
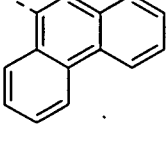
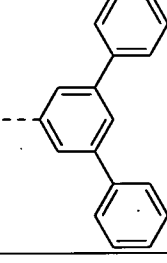
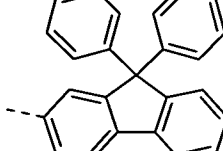
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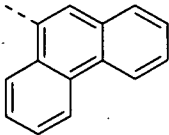
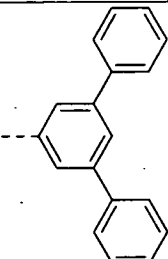
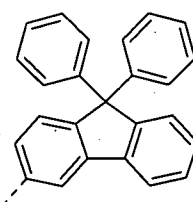
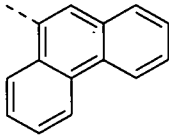
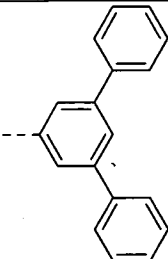
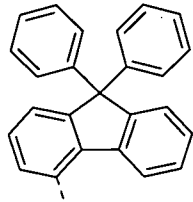
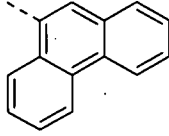
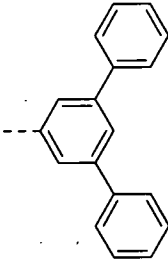
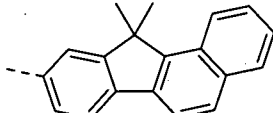
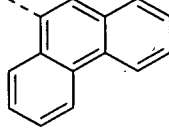
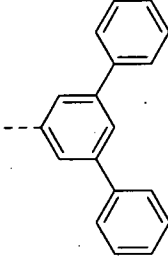
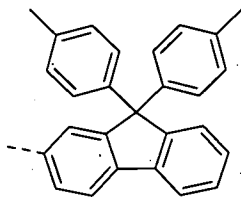
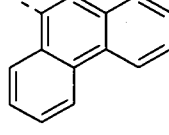
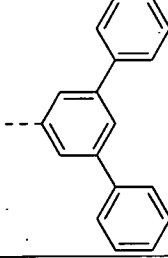
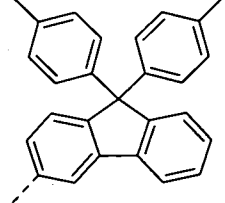
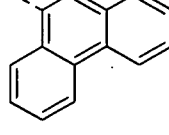
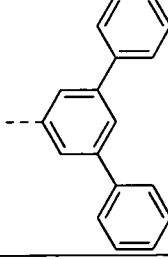
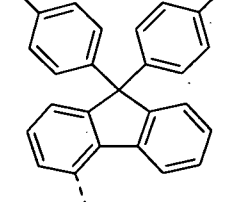
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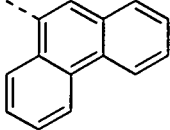
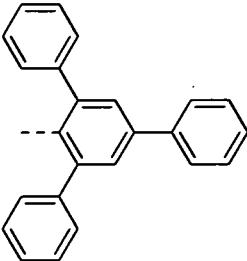
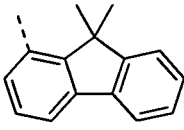
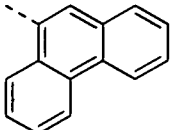
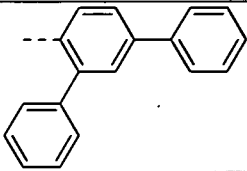
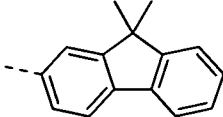
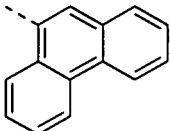
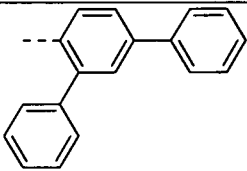
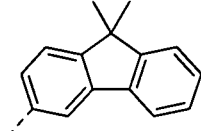
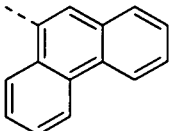
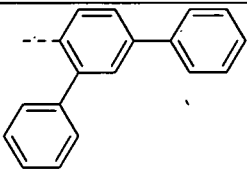
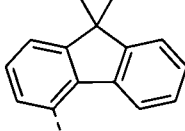
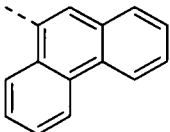
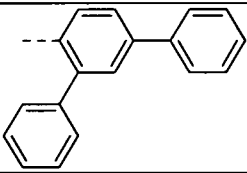
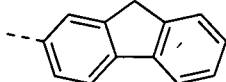
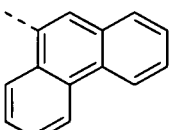
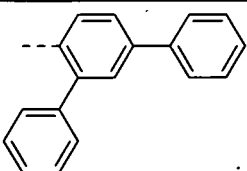
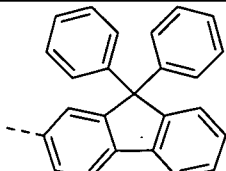
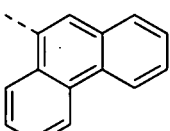
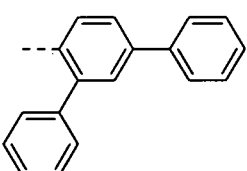
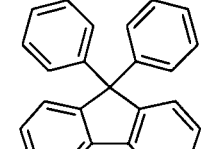
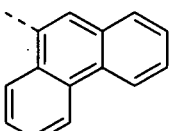
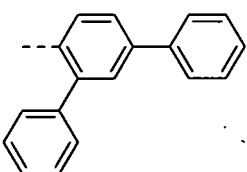
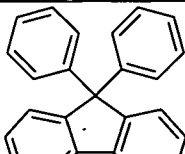
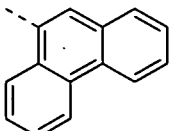
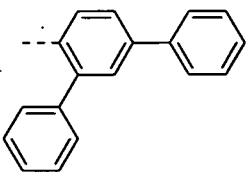
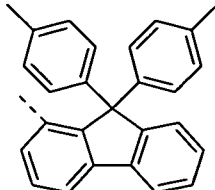
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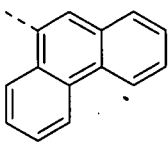
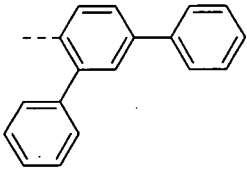
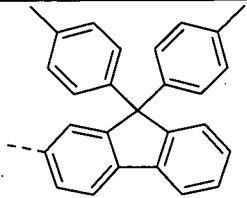
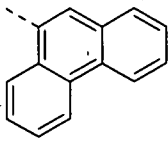
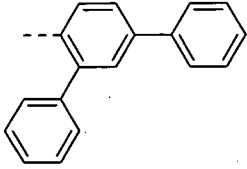
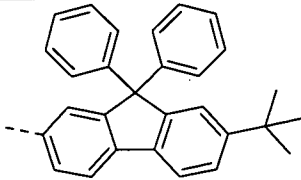
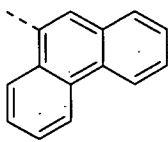
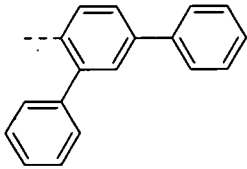
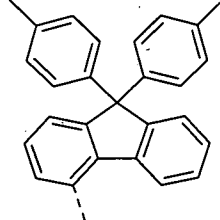
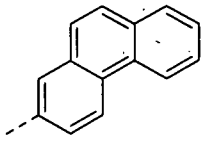
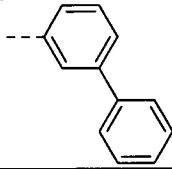
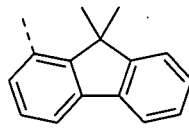
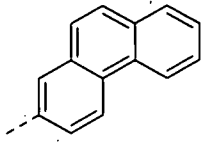
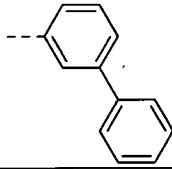
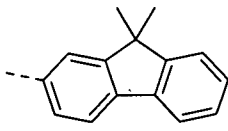
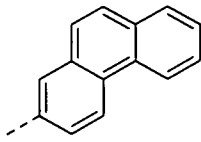
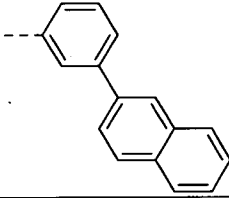
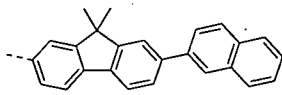
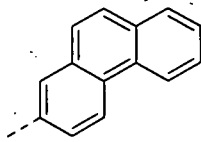
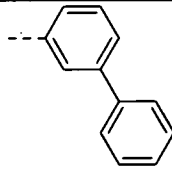
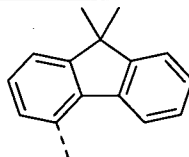
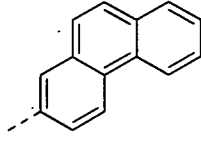
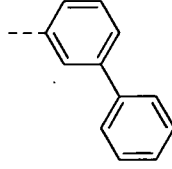
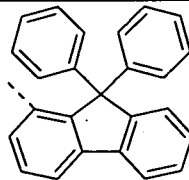
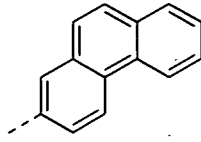
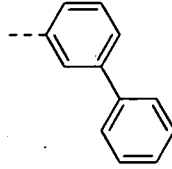
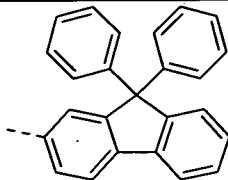
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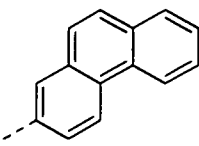
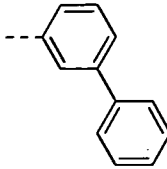
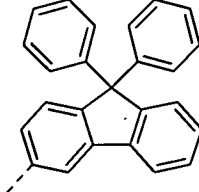
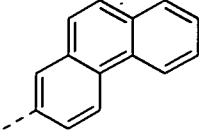
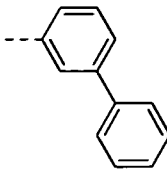
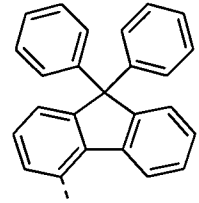
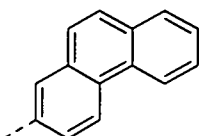
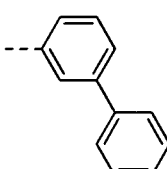
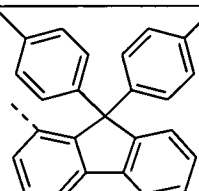
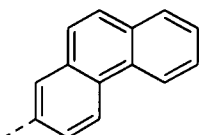
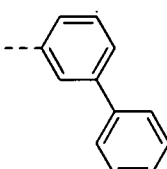
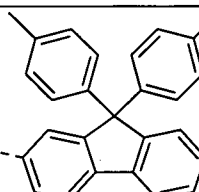
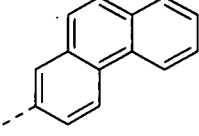
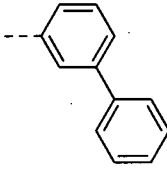
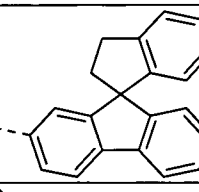
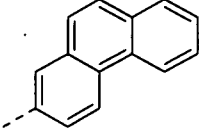
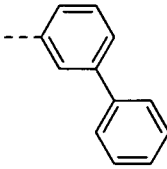
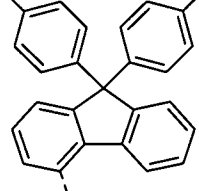
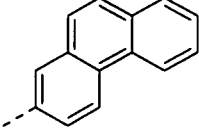
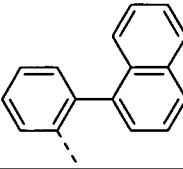
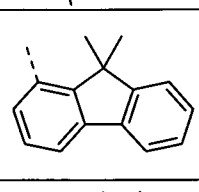
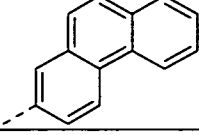
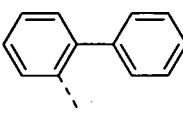
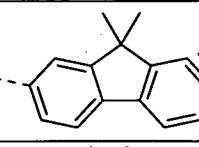
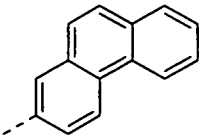
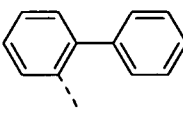
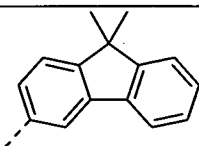
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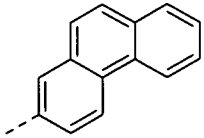
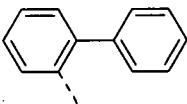
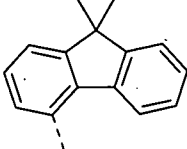
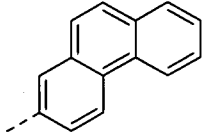
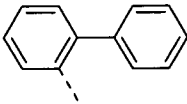
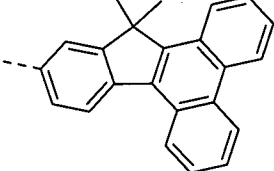
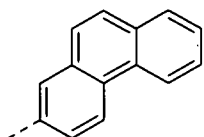
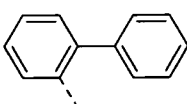
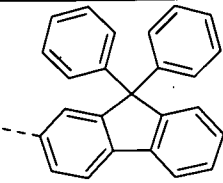
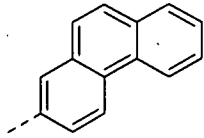
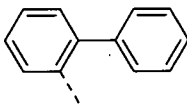
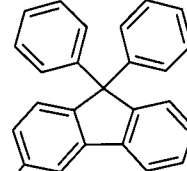
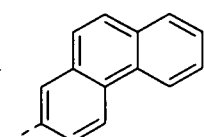
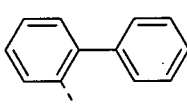
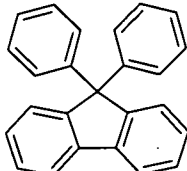
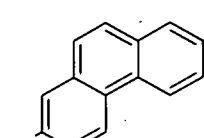
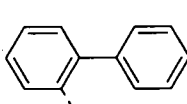
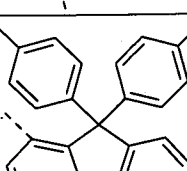
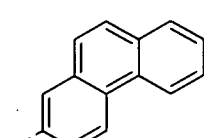
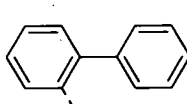
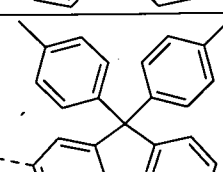
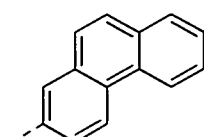
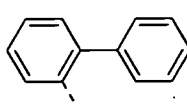
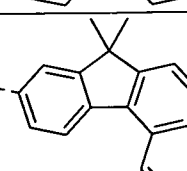
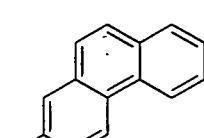
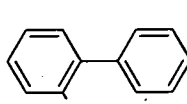
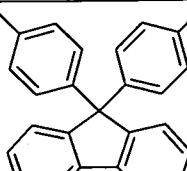
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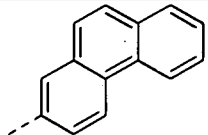
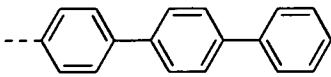
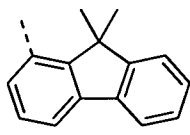
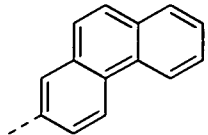
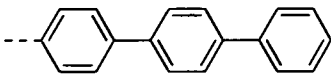
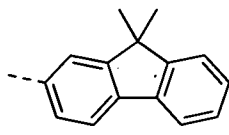
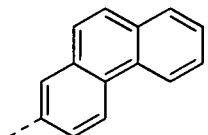
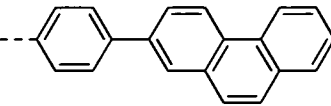
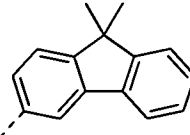
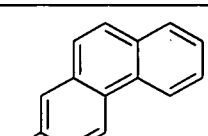
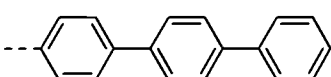
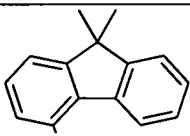
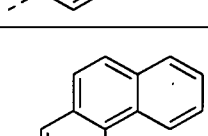
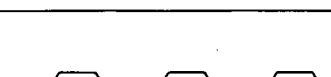
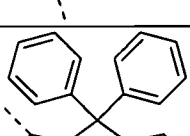
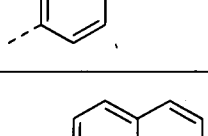
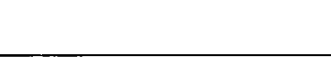
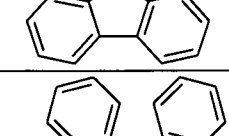
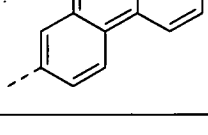
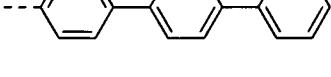
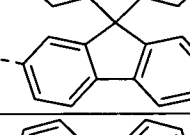
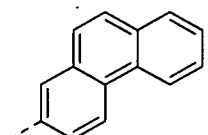
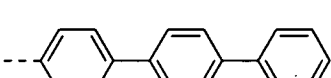
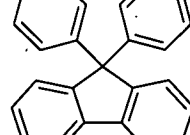
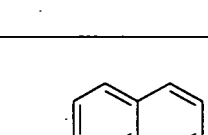
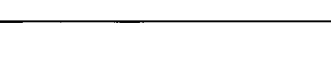
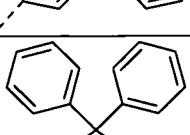
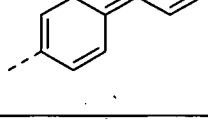
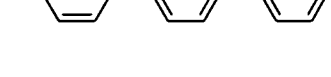
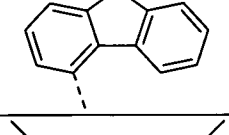
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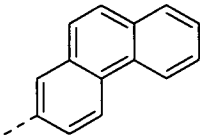
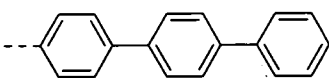
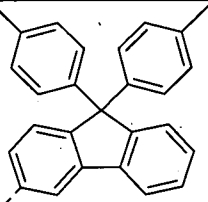
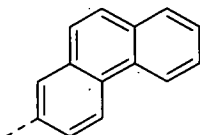
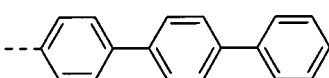
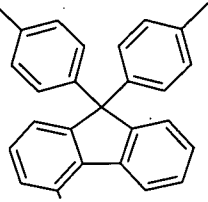
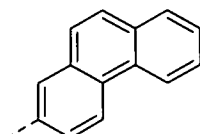
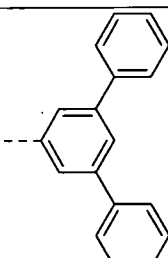
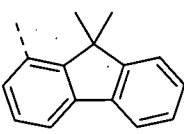
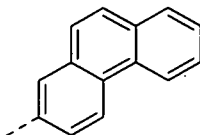
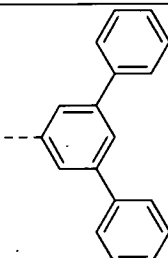
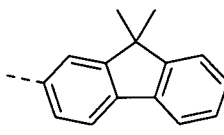
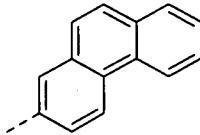
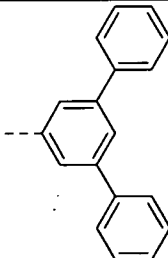
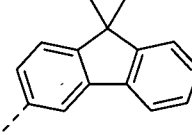
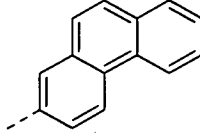
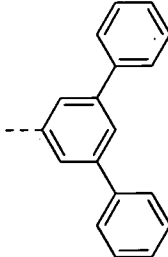
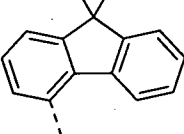
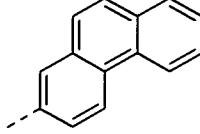
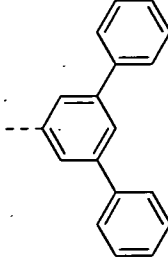
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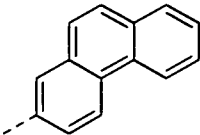
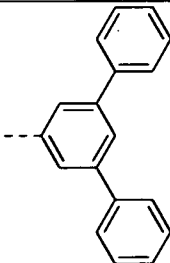
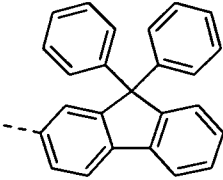
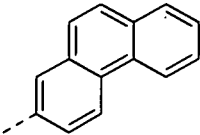
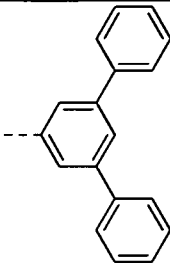
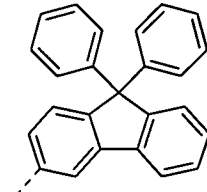
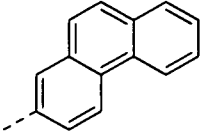
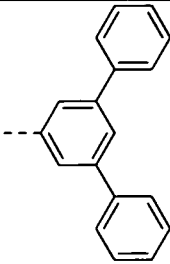
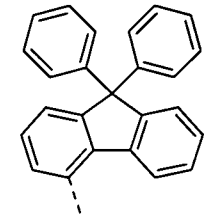
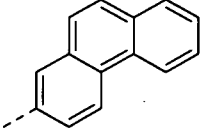
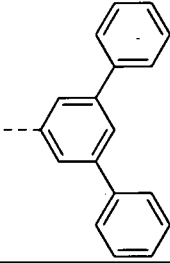
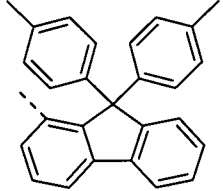
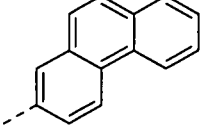
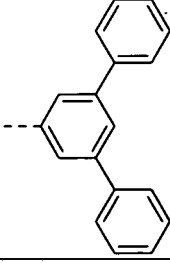
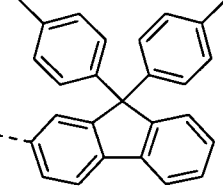
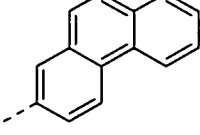
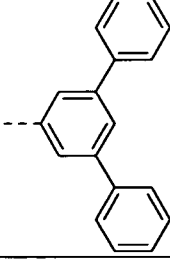
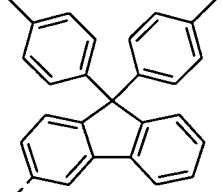
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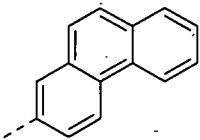
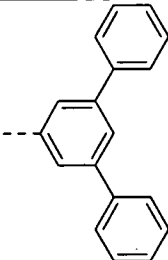
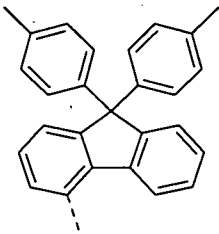
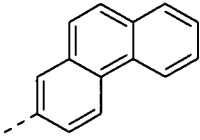
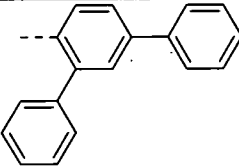
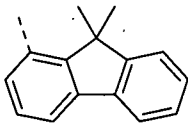
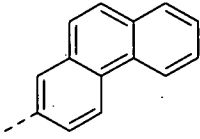
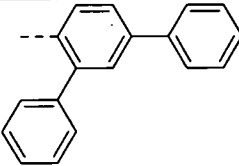
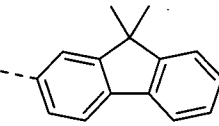
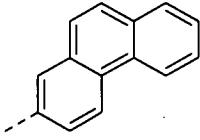
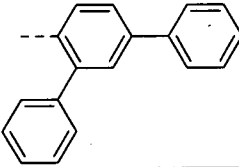
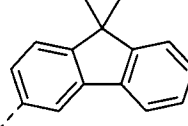
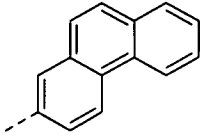
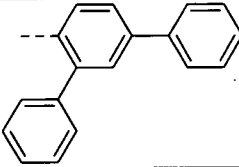
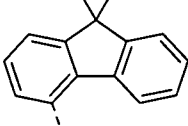
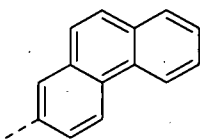
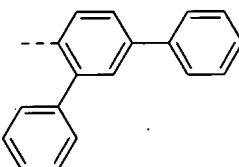
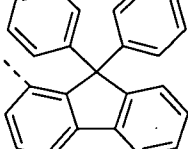
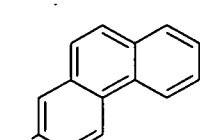
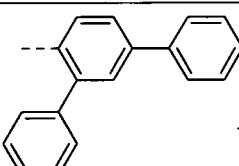
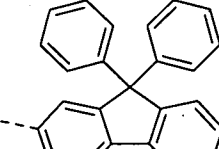
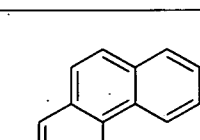
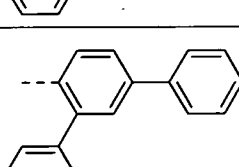
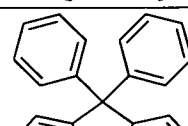
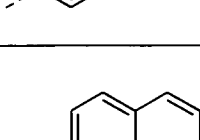
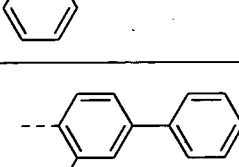
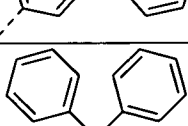
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第 104110794 號中文專利範圍無劃線修正本

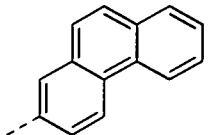
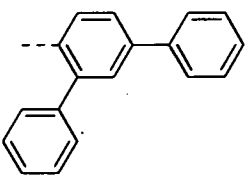
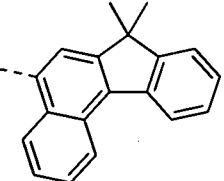
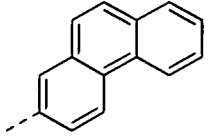
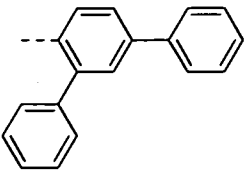
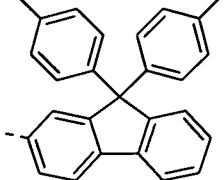
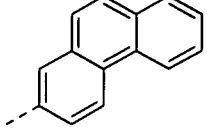
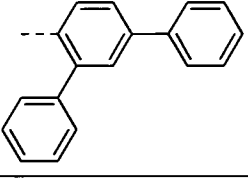
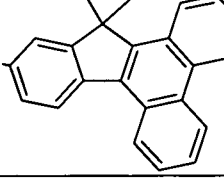
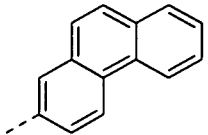
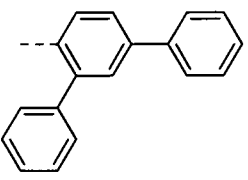
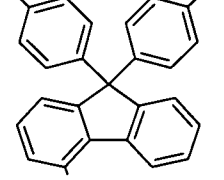
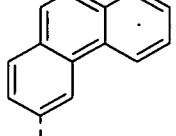
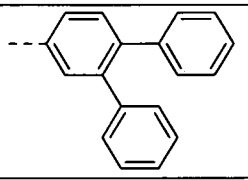
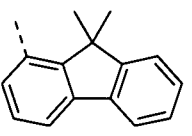
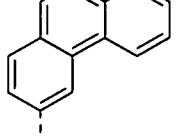
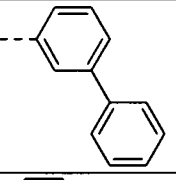
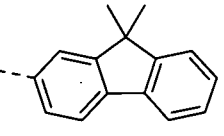
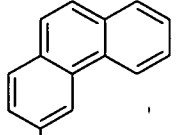
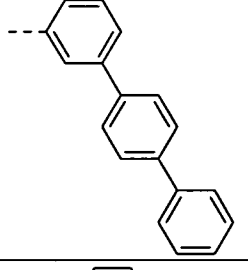
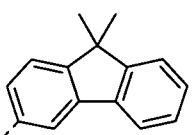
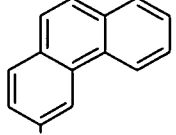
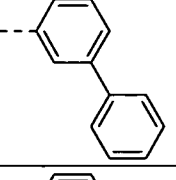
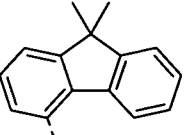
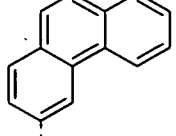
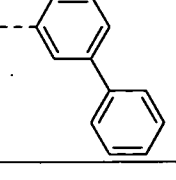
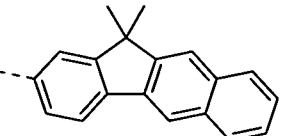
修正日期:105 年 1 月 13 日

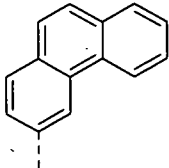
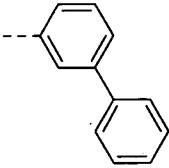
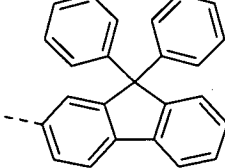
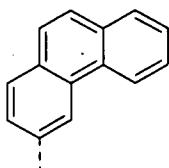
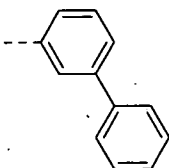
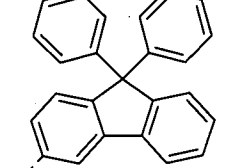
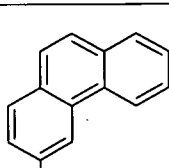
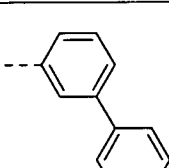
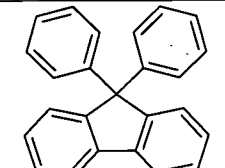
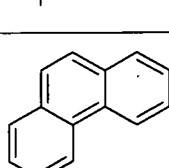
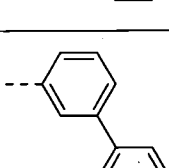
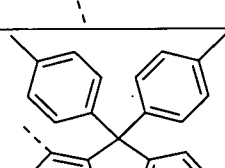
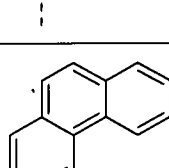
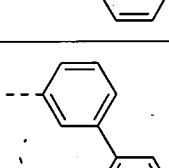
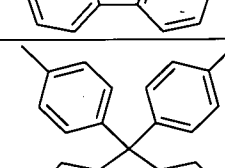
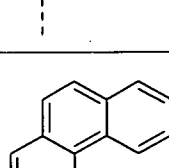
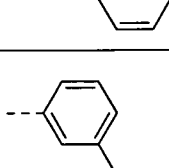
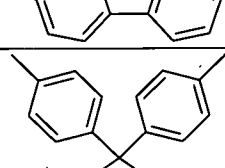
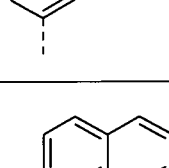
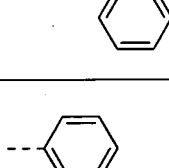
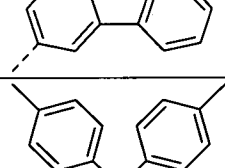
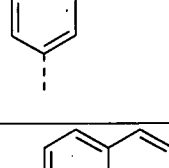
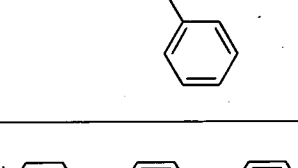
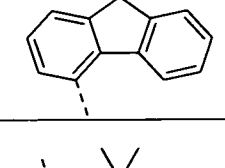
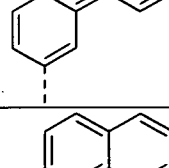
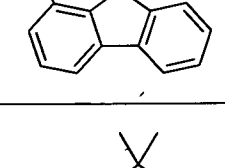
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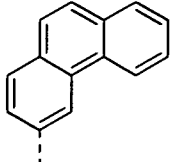
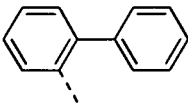
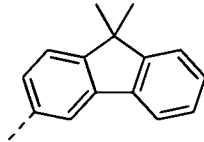
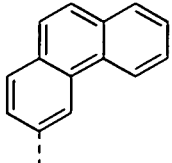
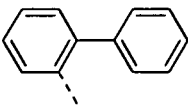
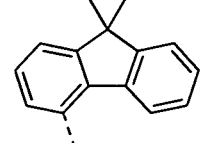
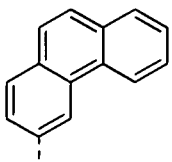
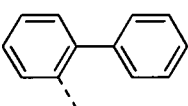
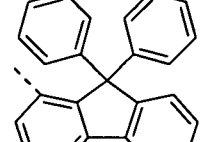
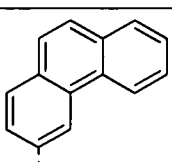
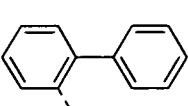
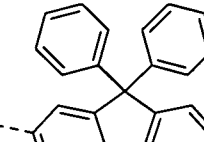
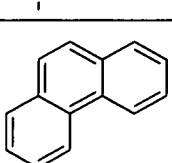
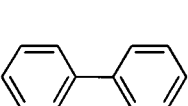
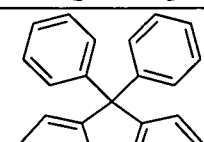
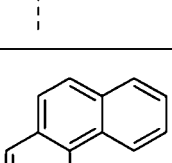
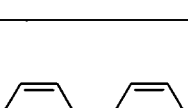
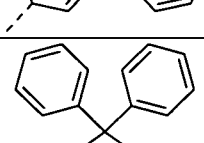
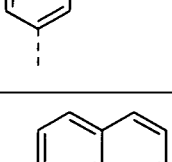
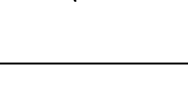
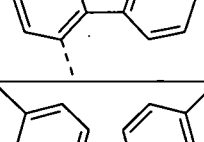
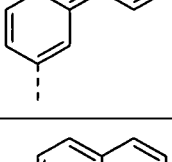
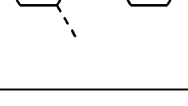
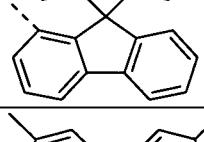
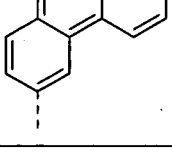
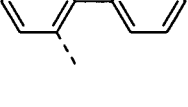
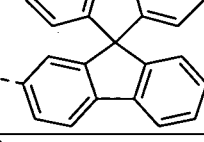
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第 104110794 號中文專利範圍無劃線修正本

修正日期:105 年 1 月 13 日

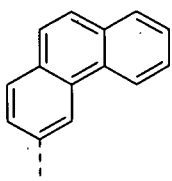
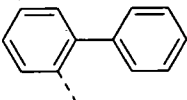
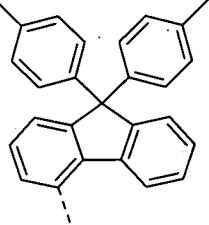
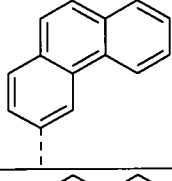
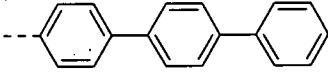
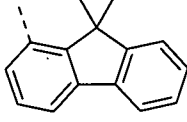
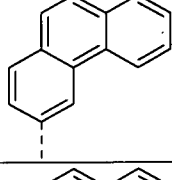
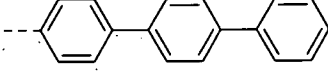
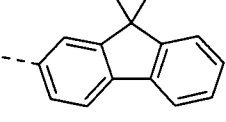
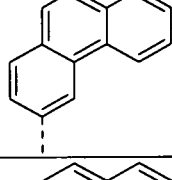
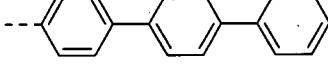
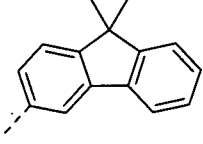
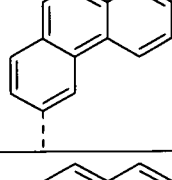
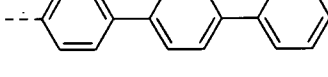
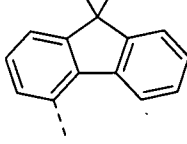
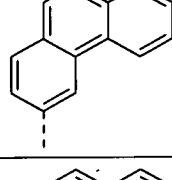
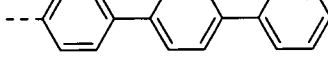
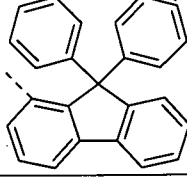
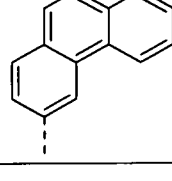
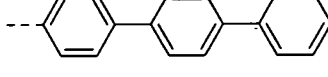
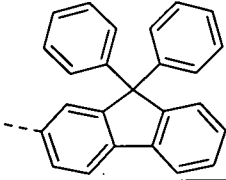
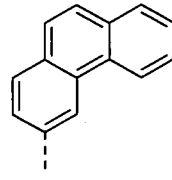
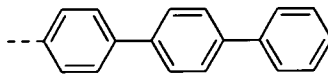
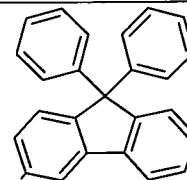
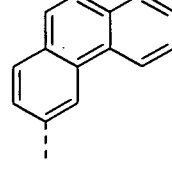
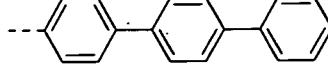
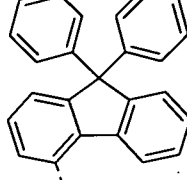
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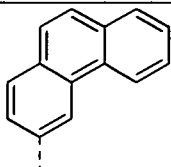
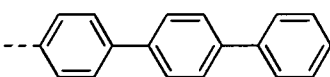
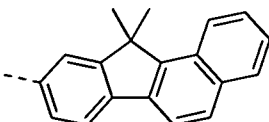
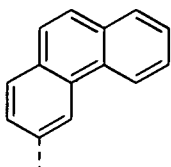
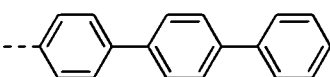
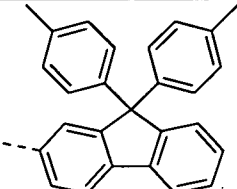
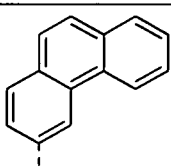
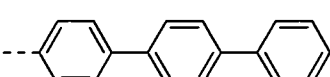
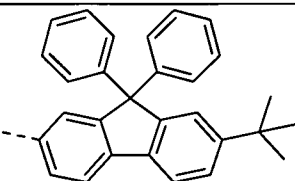
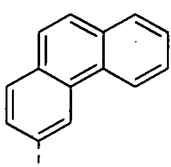
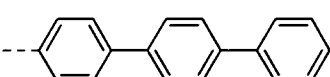
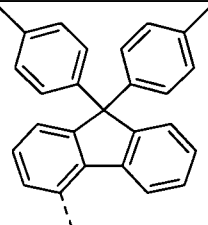
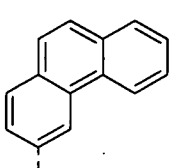
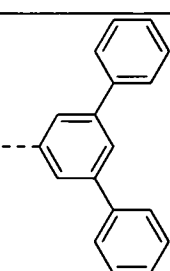
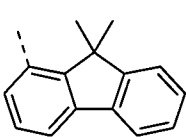
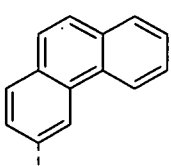
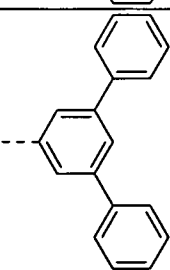
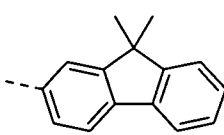
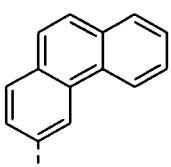
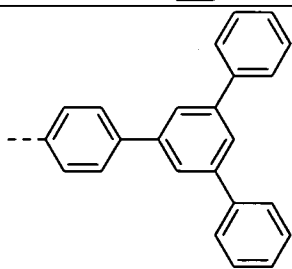
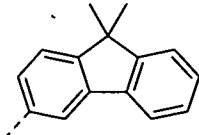
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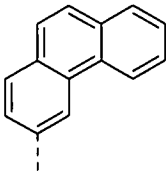
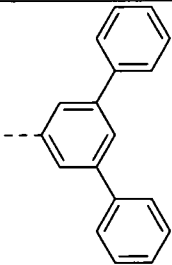
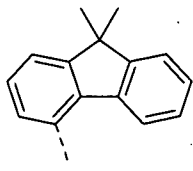
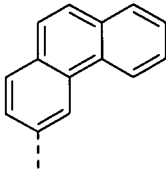
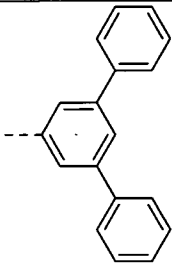
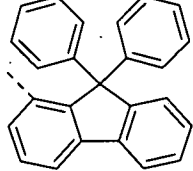
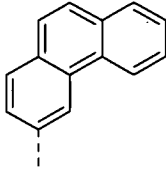
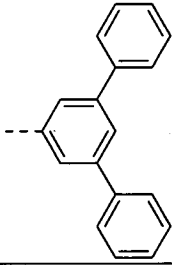
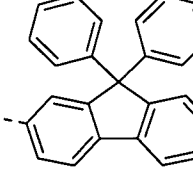
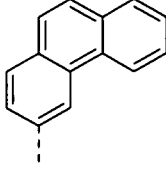
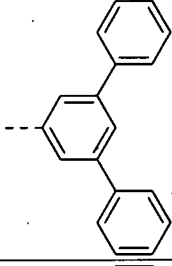
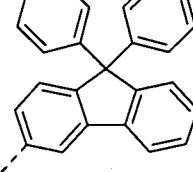
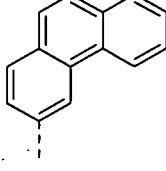
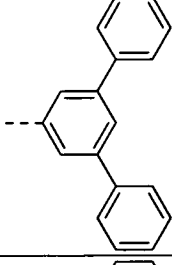
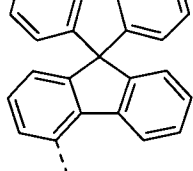
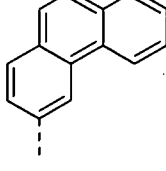
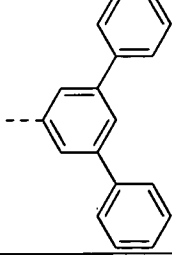
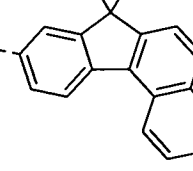
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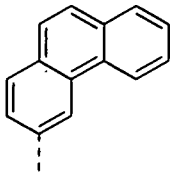
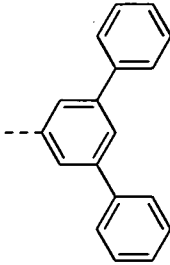
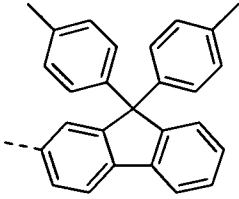
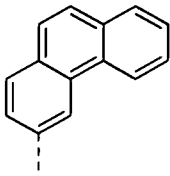
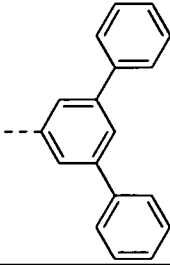
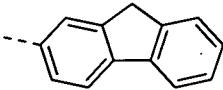
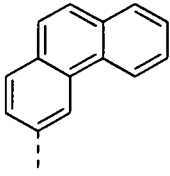
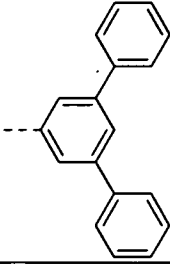
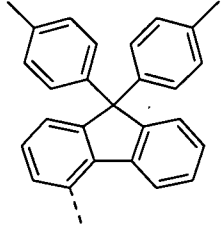
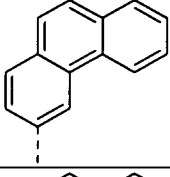
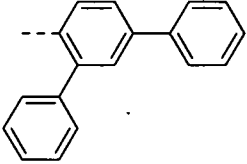
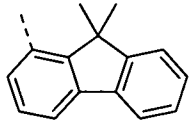
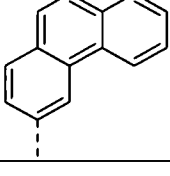
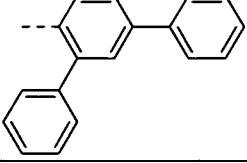
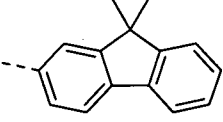
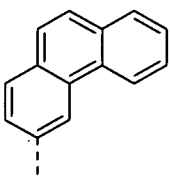
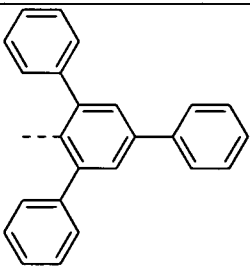
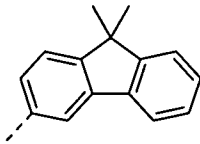
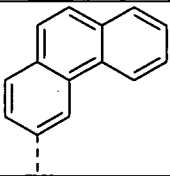
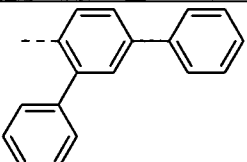
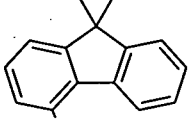
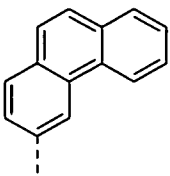
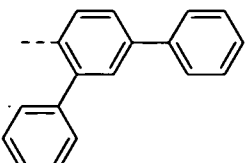
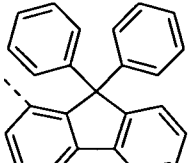
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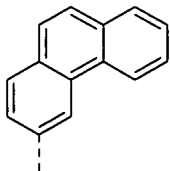
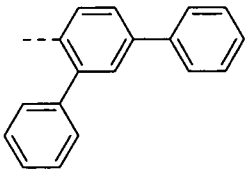
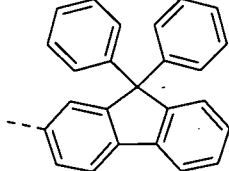
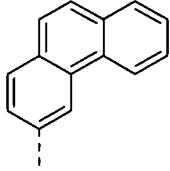
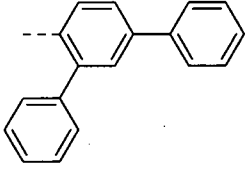
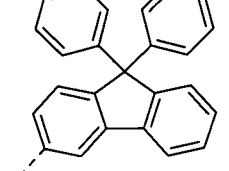
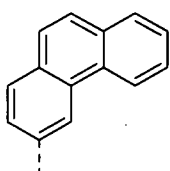
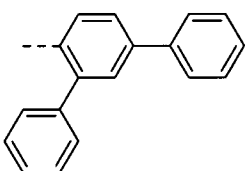
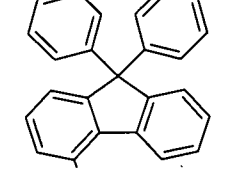
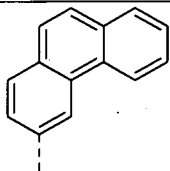
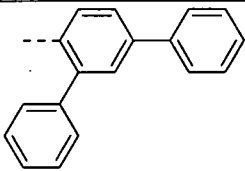
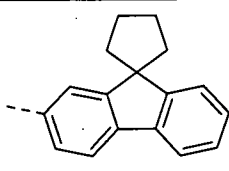
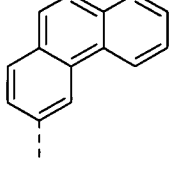
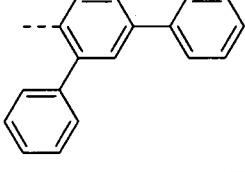
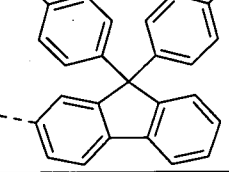
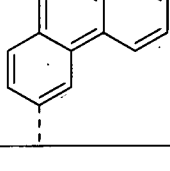
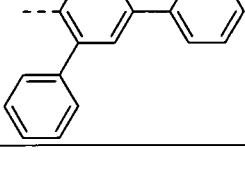
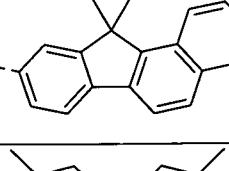
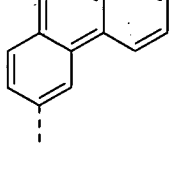
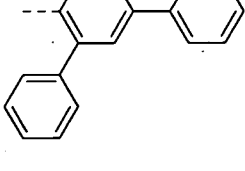
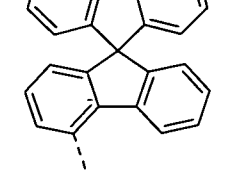
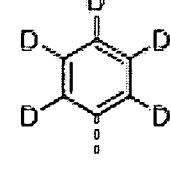
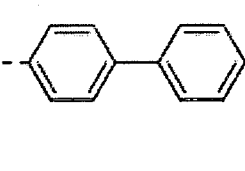
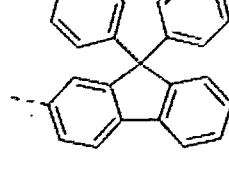
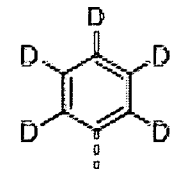
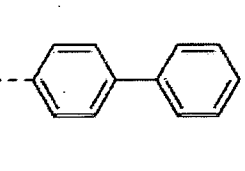
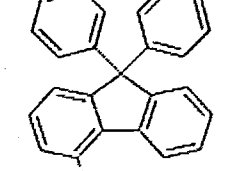
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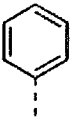
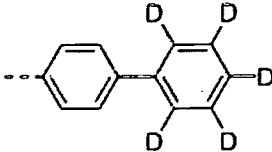
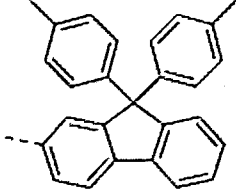
第 104110794 號中文專利範圍無劃線修正本

修正日期:105 年 1 月 13 日

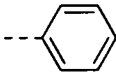
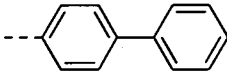
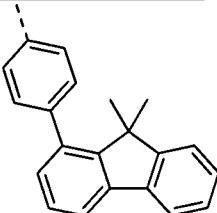
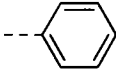
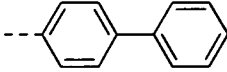
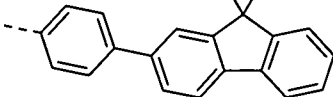
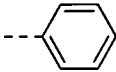
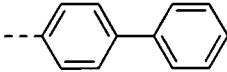
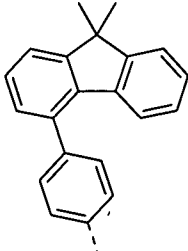
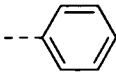
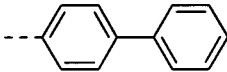
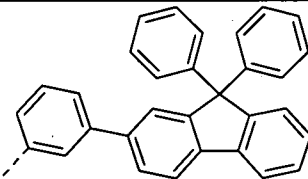
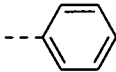
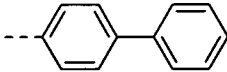
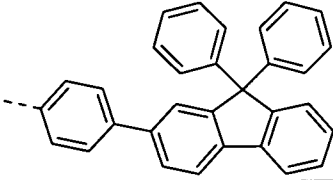
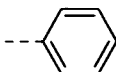
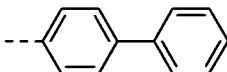
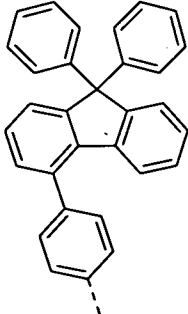
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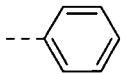
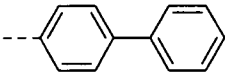
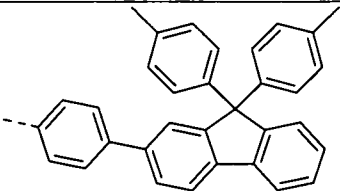
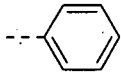
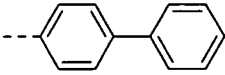
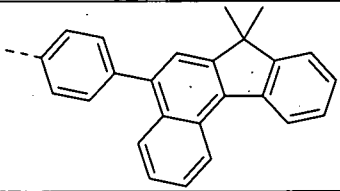
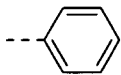
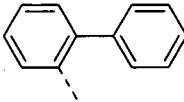
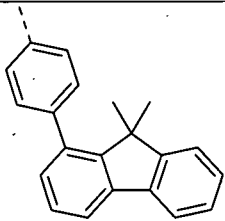
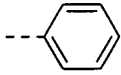
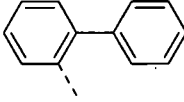
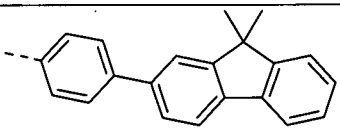
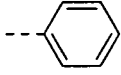
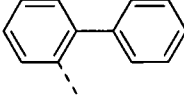
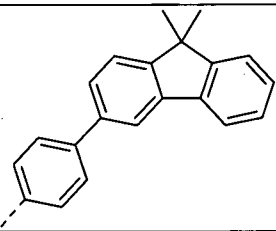
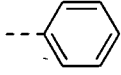
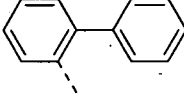
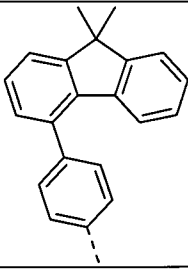
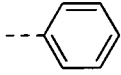
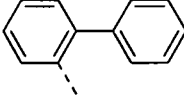
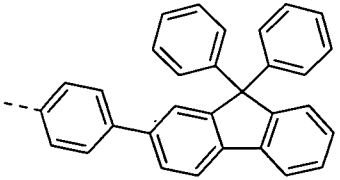
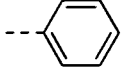
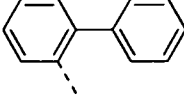
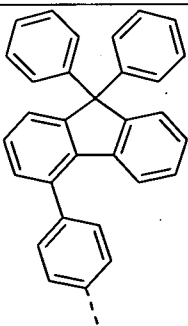
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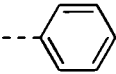
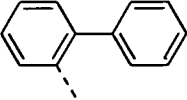
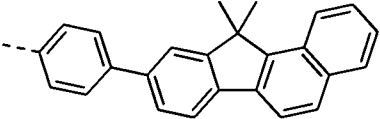
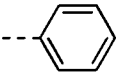
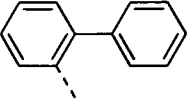
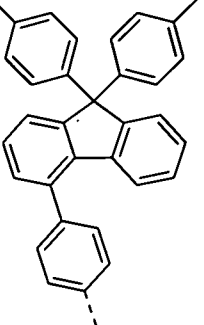
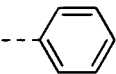
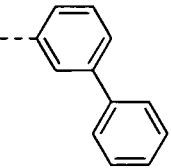
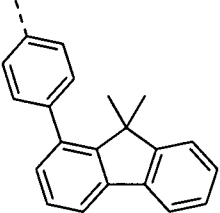
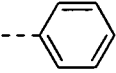
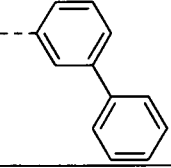
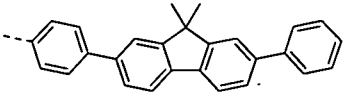
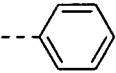
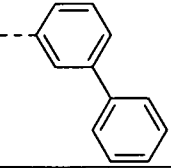
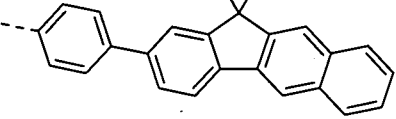
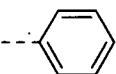
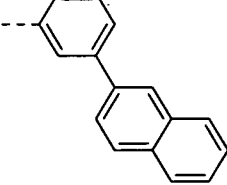
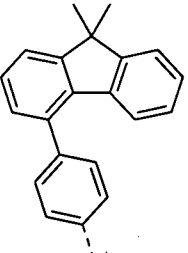
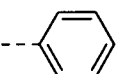
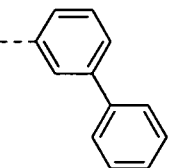
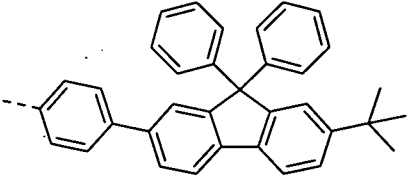
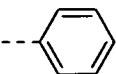
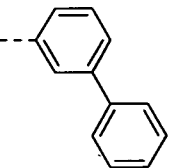
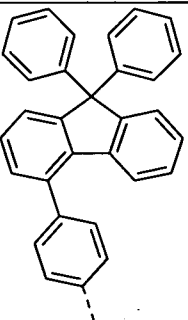
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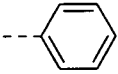
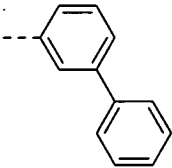
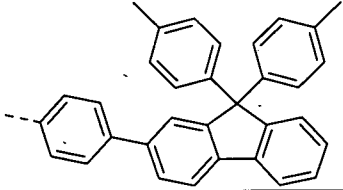
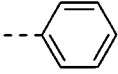
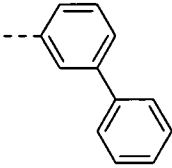
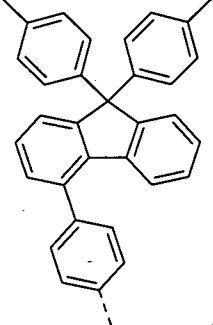
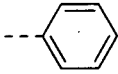
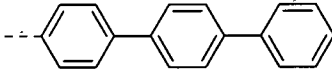
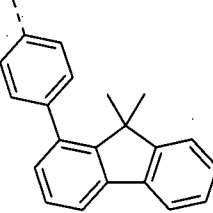
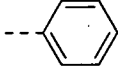
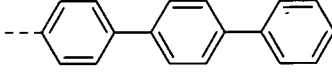
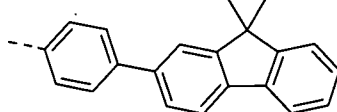
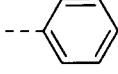
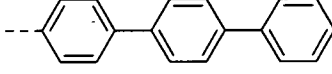
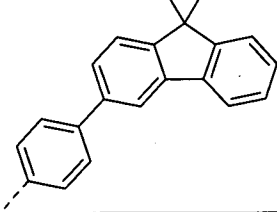
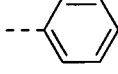
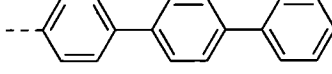
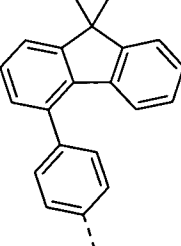
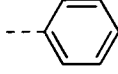
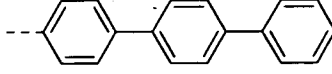
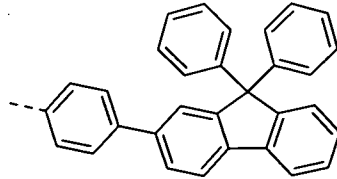
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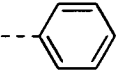
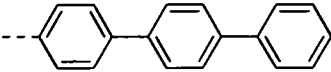
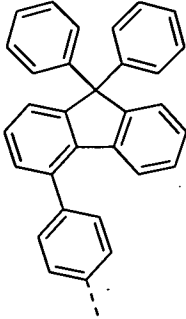
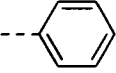
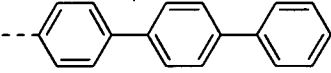
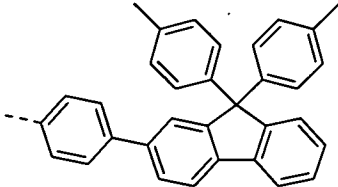
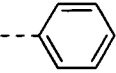
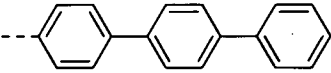
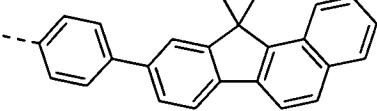
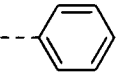
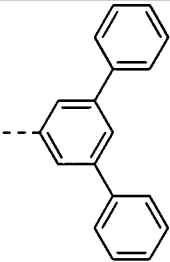
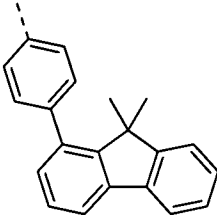
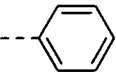
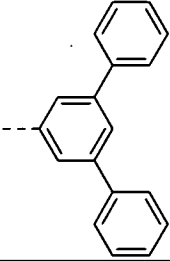
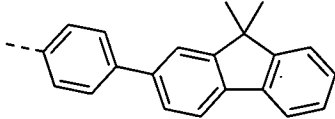
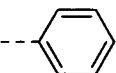
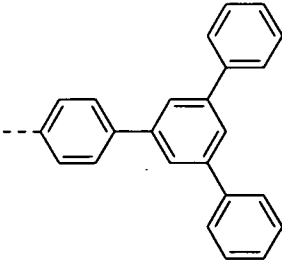
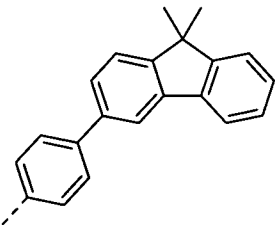
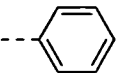
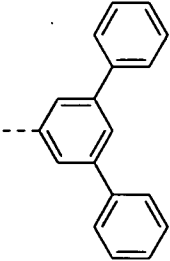
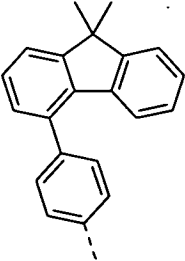
【第9項】 如申請專利範圍第 1 項所述的雜環化合物，其中所述式 1 化合物為由以下化合物 2-1 至化合物 2-363 中選出之任一者：

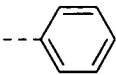
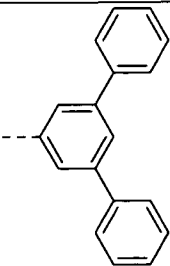
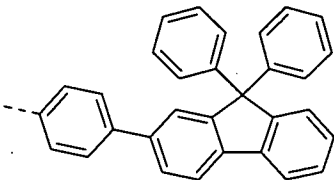
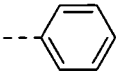
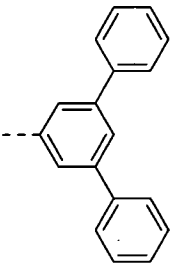
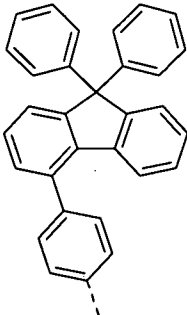
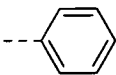
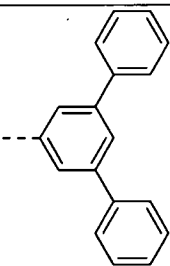
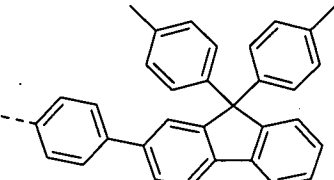
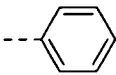
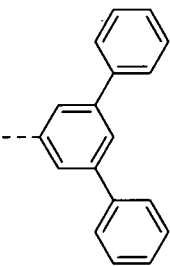
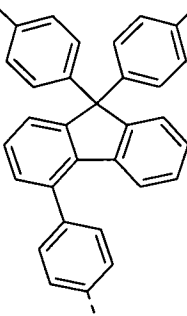
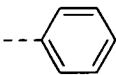
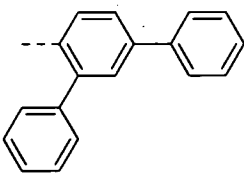
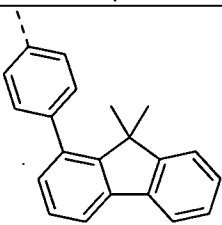
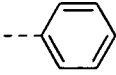
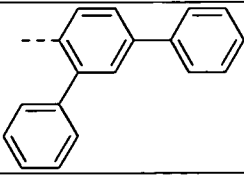
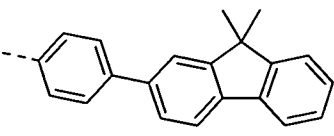
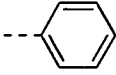
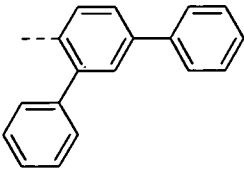
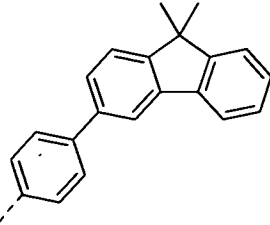
化合物	---Ar1	---Ar2	---Ar3
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2-2			
2-3			
2-4			
2-5			
2-6			

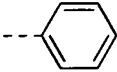
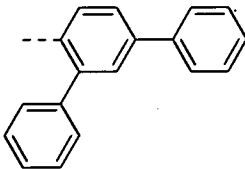
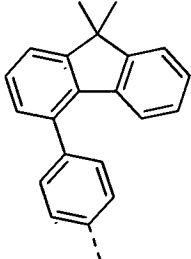
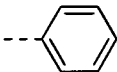
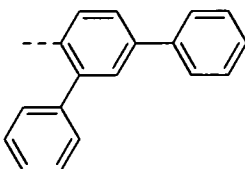
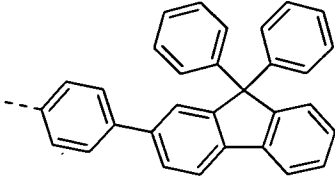
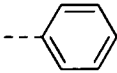
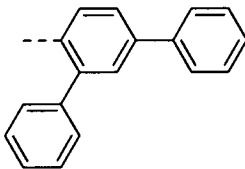
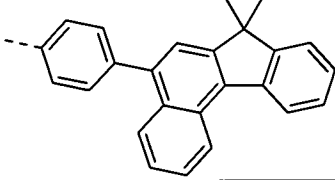
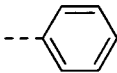
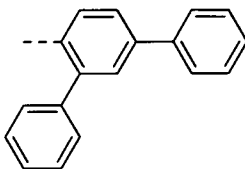
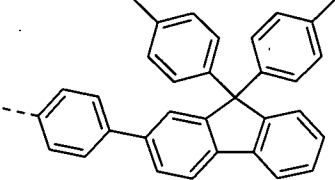
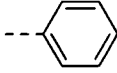
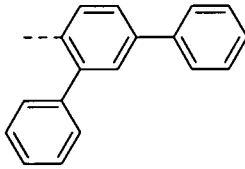
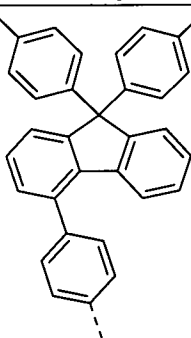
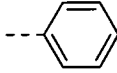
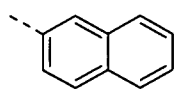
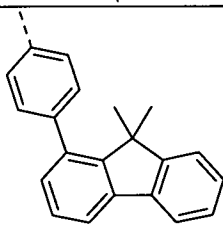
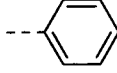
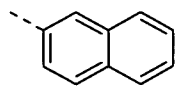
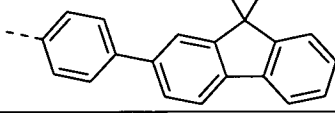
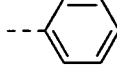
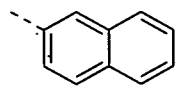
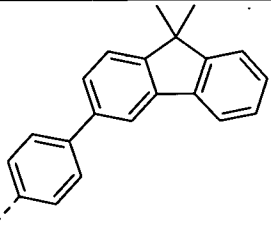
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2-14			

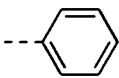
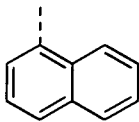
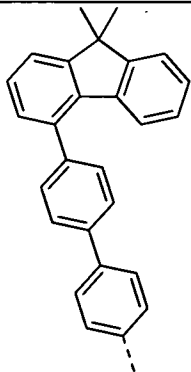
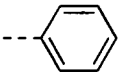
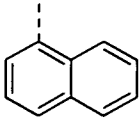
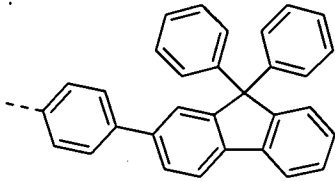
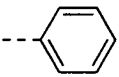
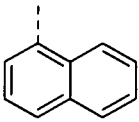
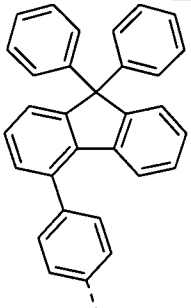
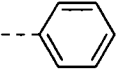
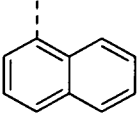
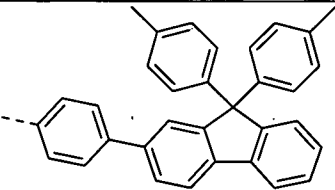
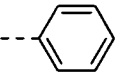
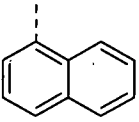
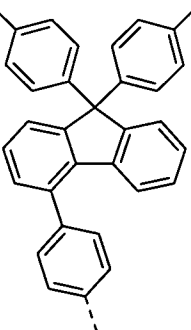
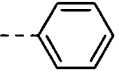
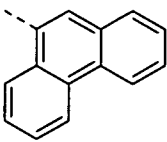
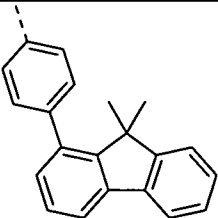
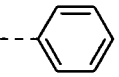
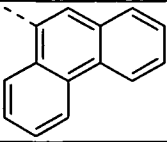
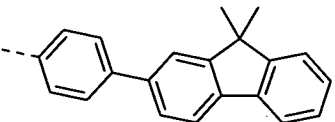
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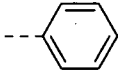
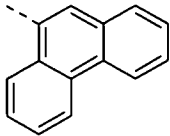
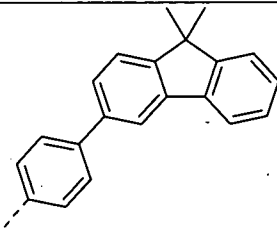
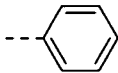
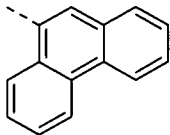
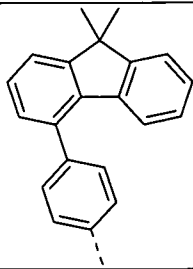
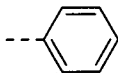
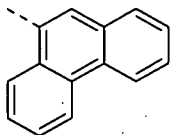
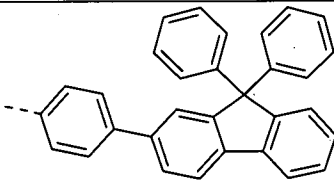
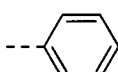
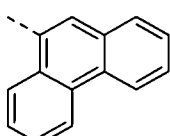
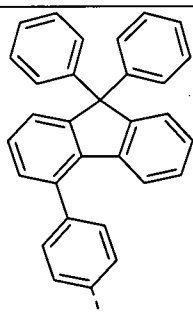
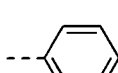
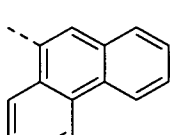
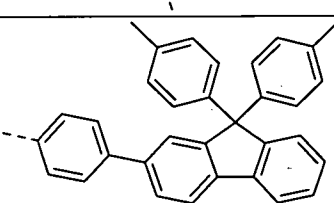
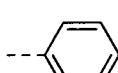
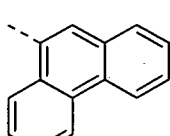
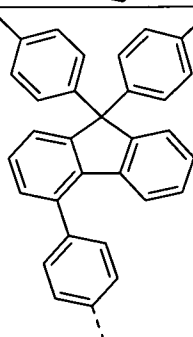
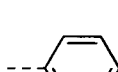
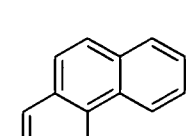
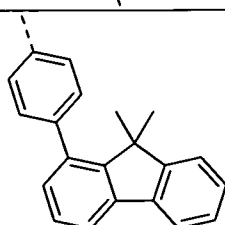
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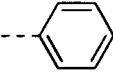
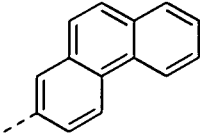
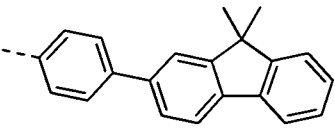
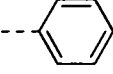
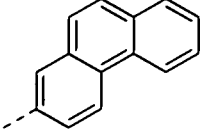
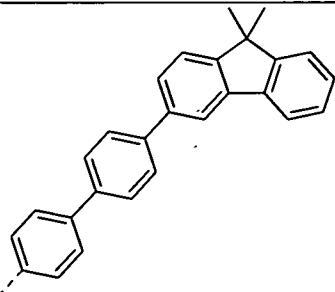
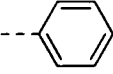
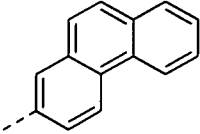
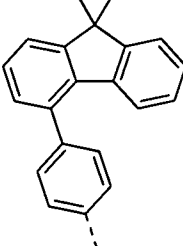
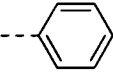
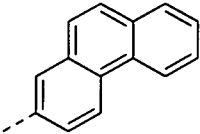
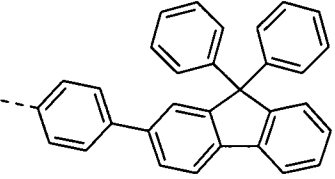
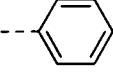
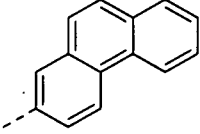
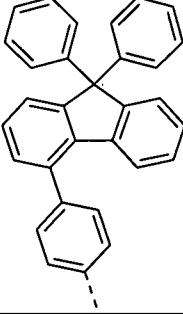
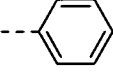
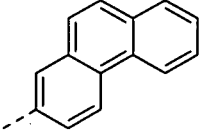
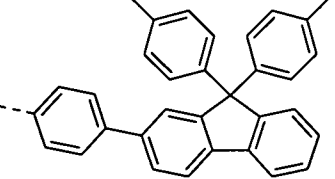
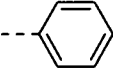
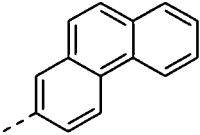
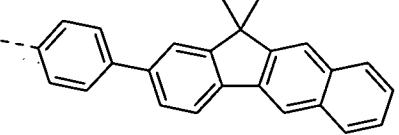
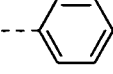
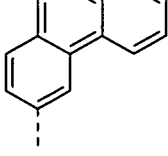
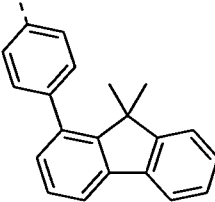
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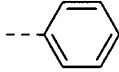
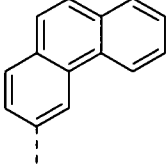
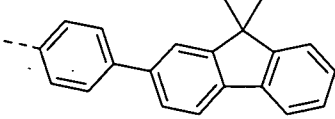
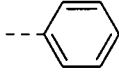
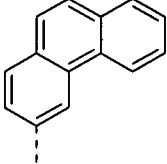
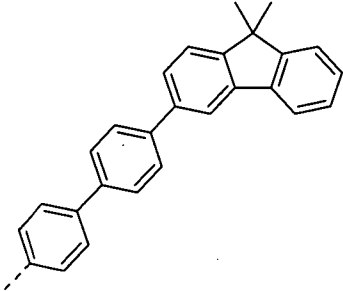
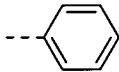
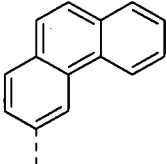
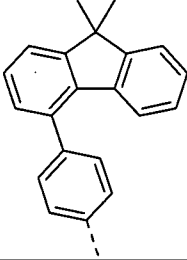
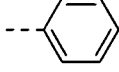
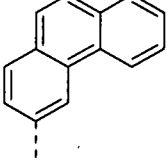
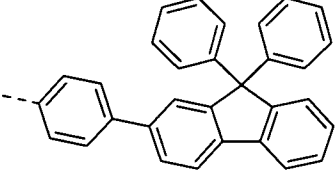
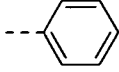
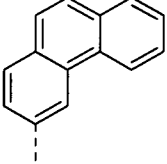
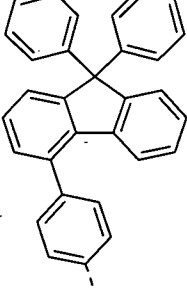
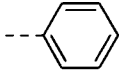
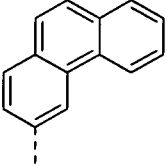
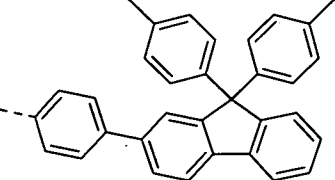
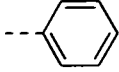
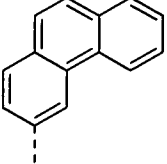
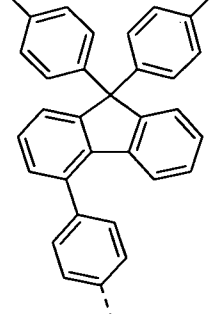
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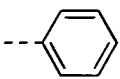
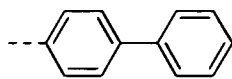
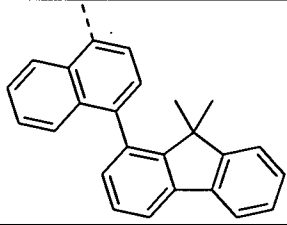
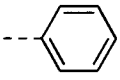
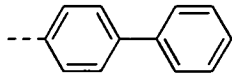
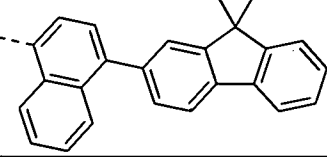
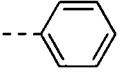
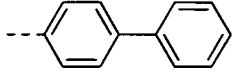
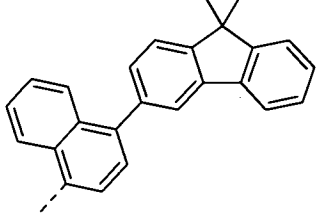
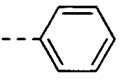
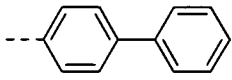
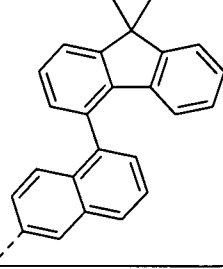
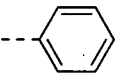
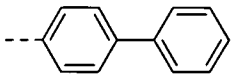
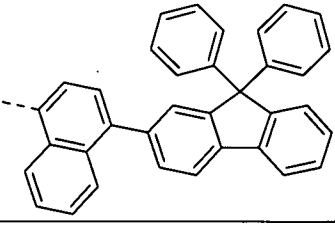
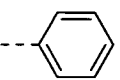
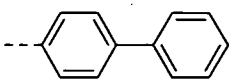
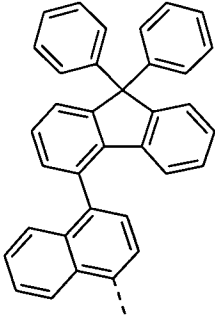
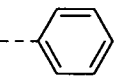
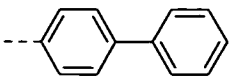
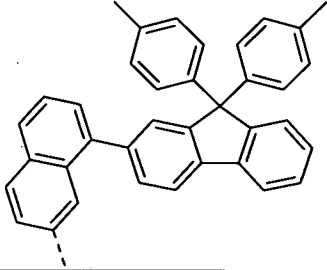
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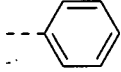
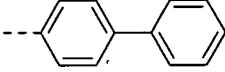
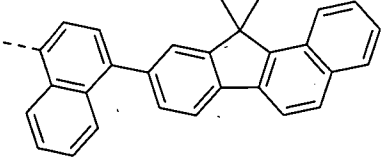
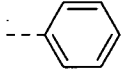
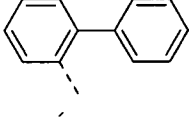
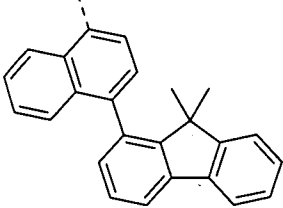
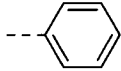
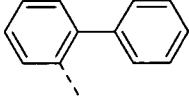
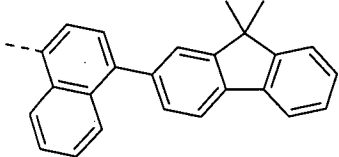
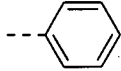
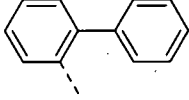
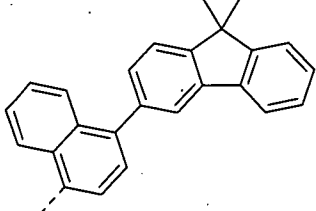
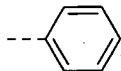
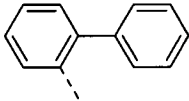
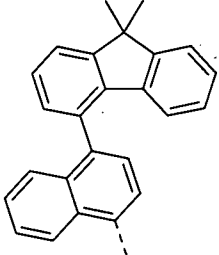
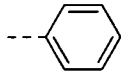
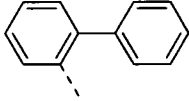
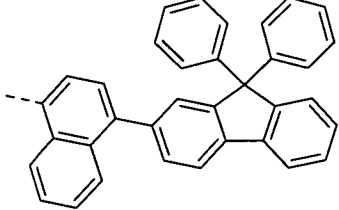
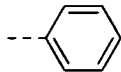
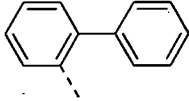
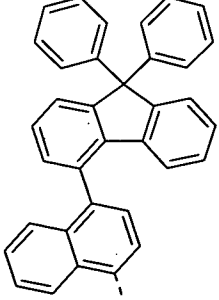
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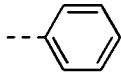
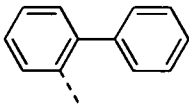
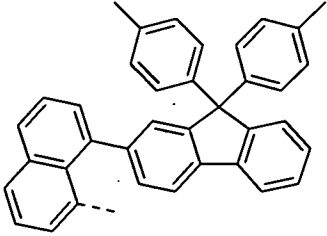
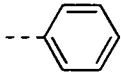
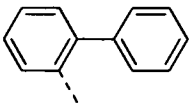
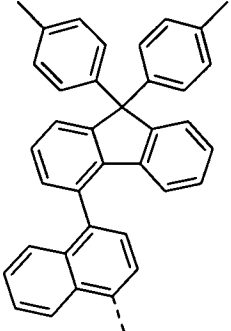
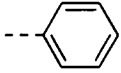
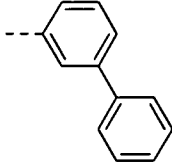
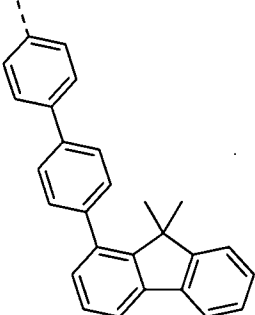
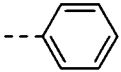
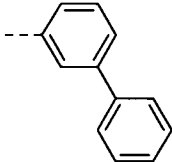
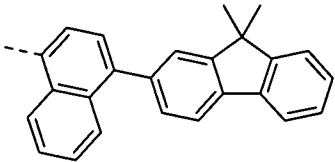
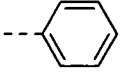
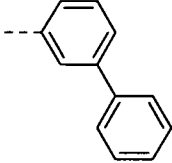
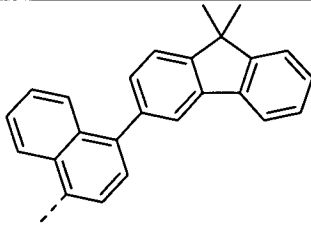
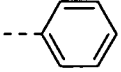
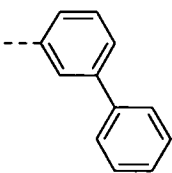
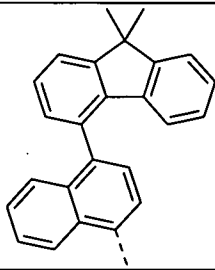
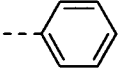
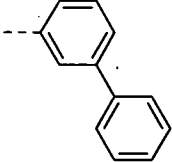
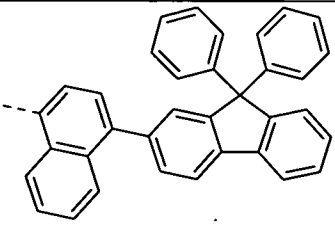
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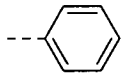
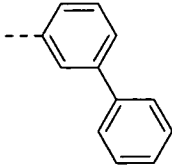
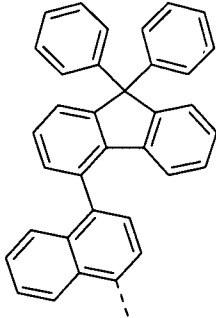
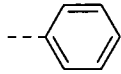
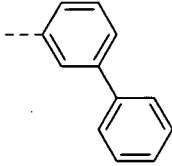
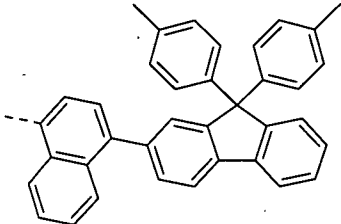
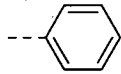
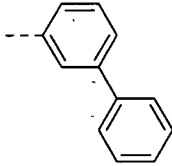
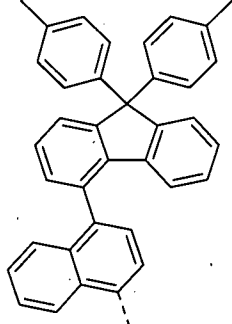
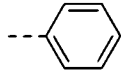
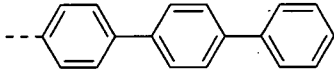
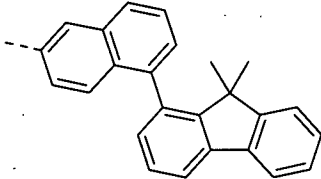
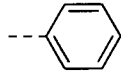
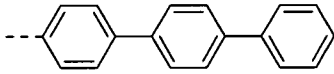
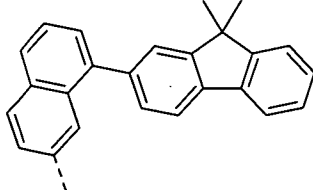
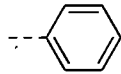
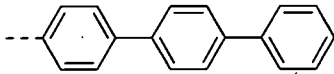
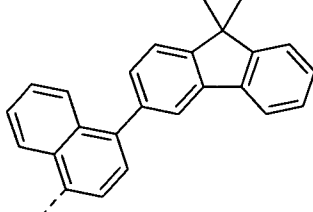
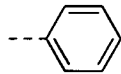
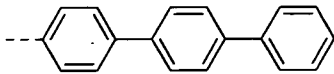
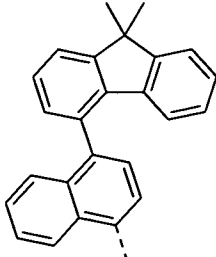
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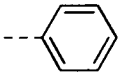
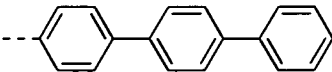
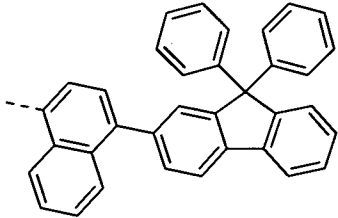
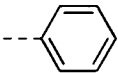
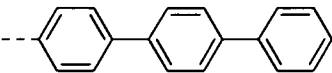
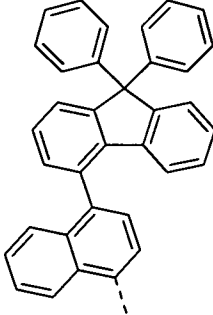
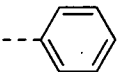
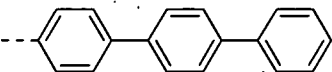
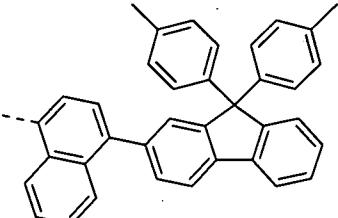
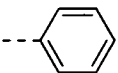
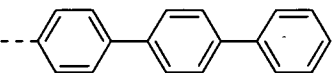
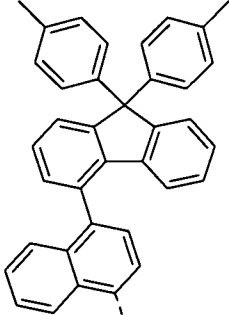
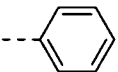
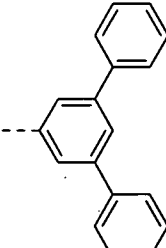
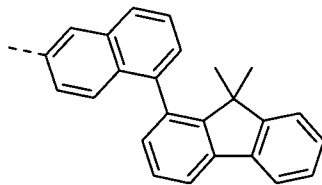
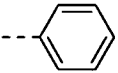
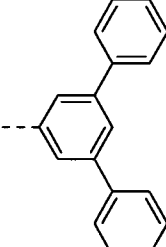
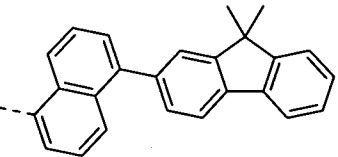
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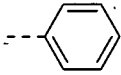
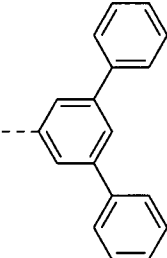
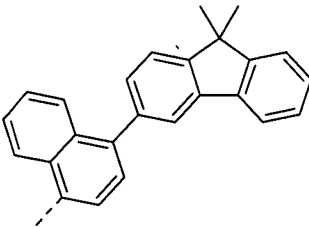
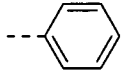
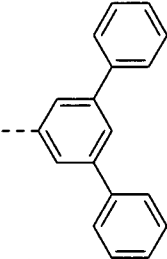
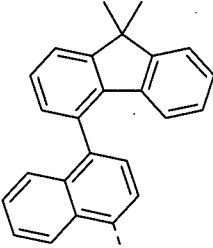
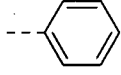
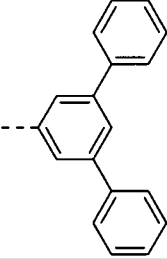
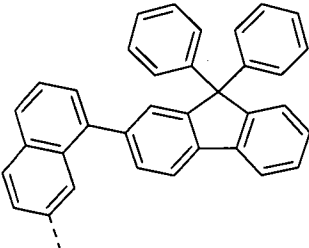
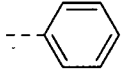
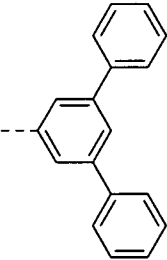
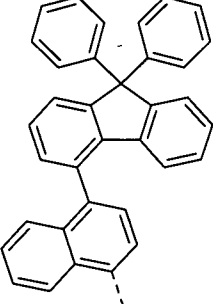
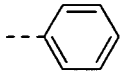
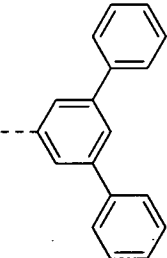
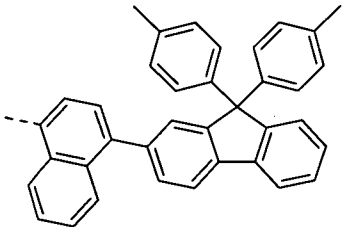
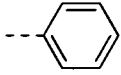
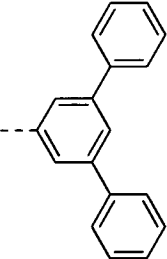
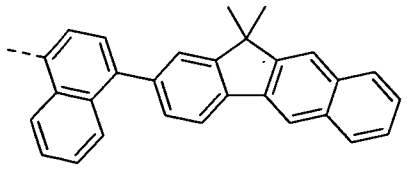
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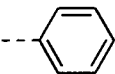
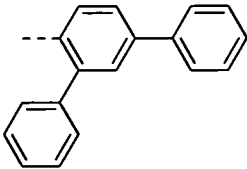
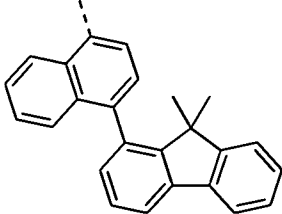
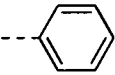
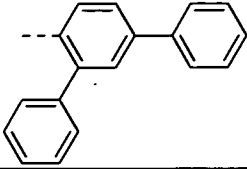
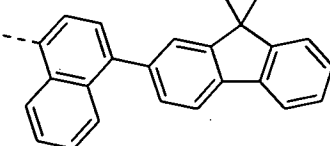
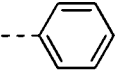
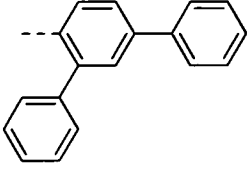
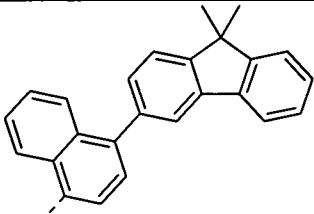
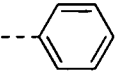
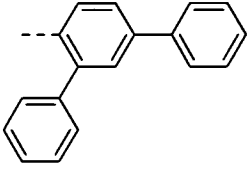
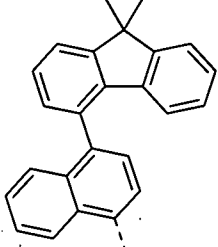
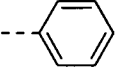
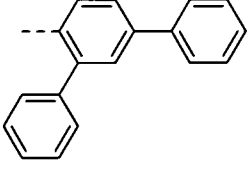
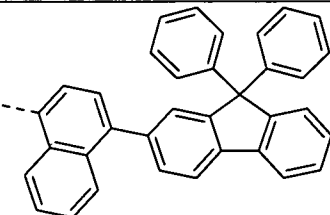
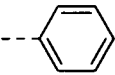
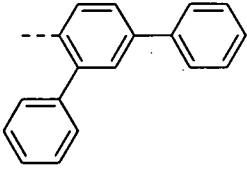
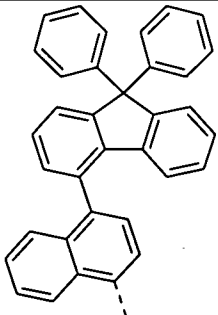
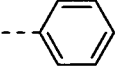
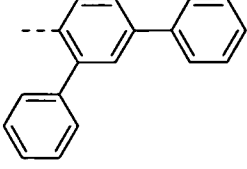
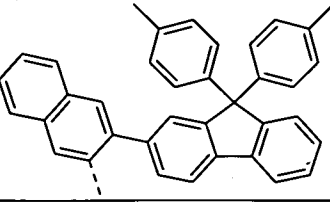
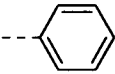
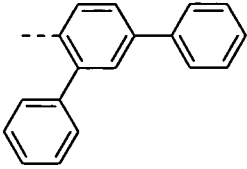
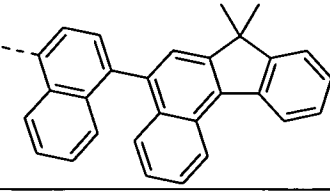
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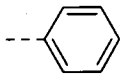
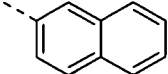
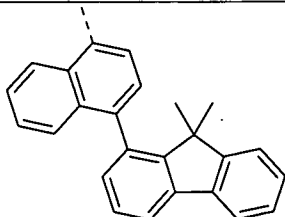
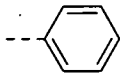
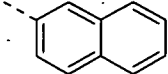
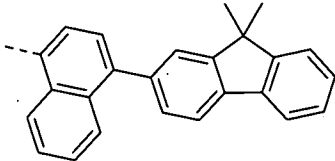
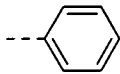
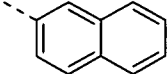
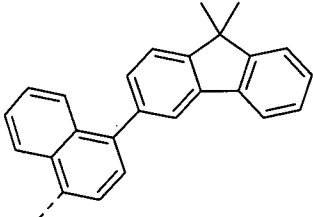
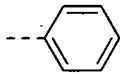
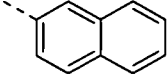
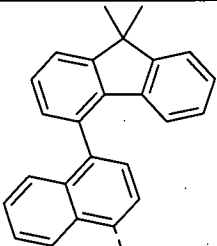
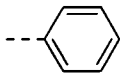
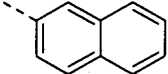
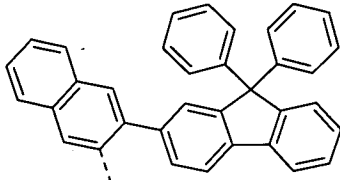
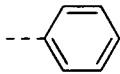
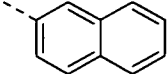
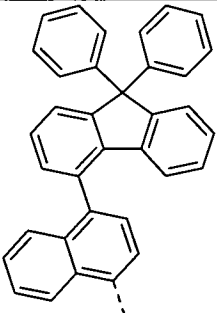
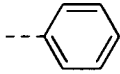
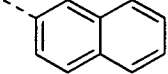
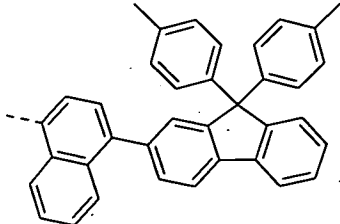
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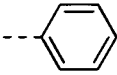
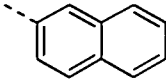
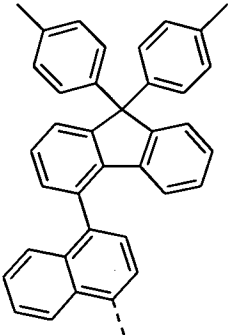
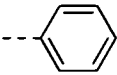
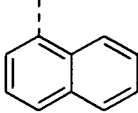
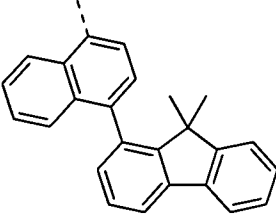
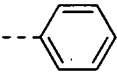
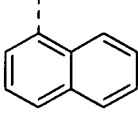
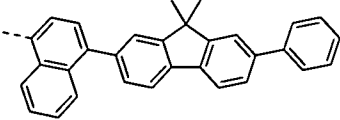
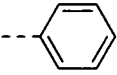
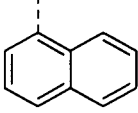
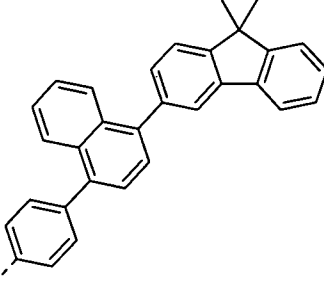
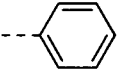
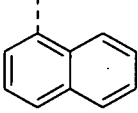
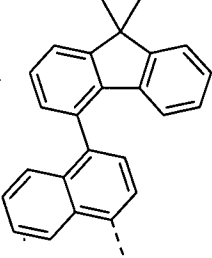
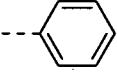
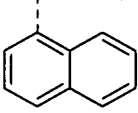
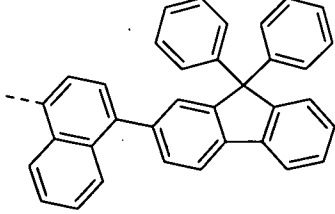
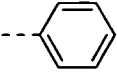
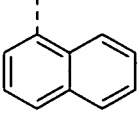
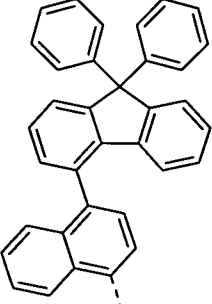
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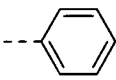
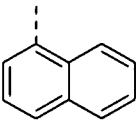
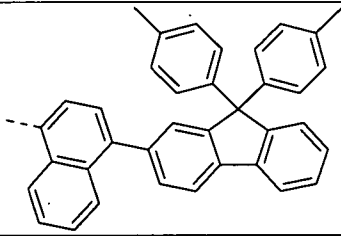
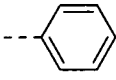
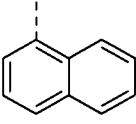
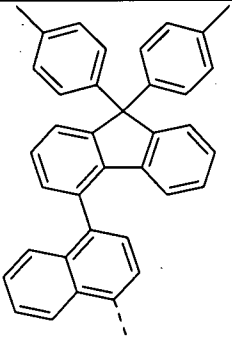
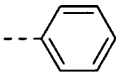
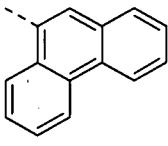
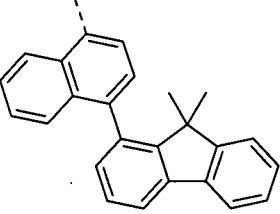
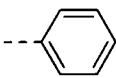
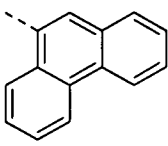
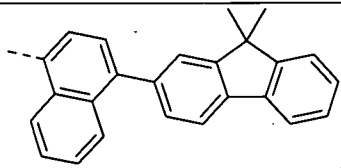
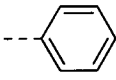
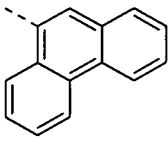
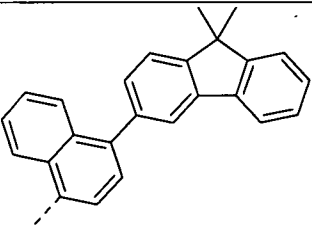
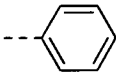
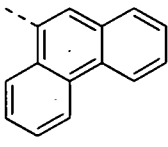
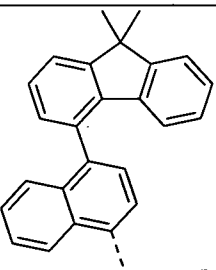
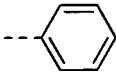
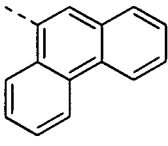
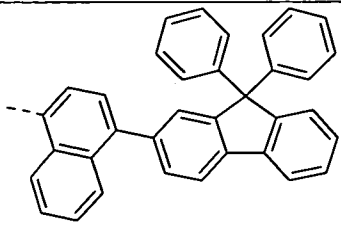
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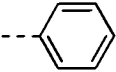
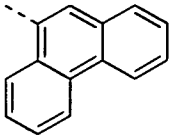
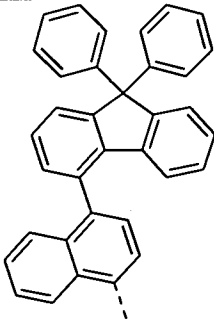
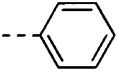
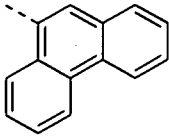
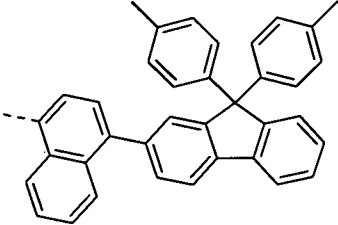
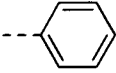
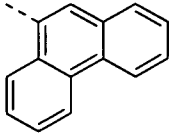
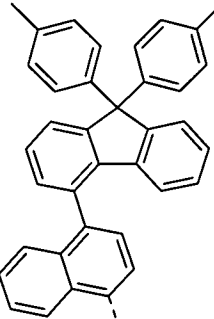
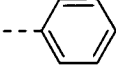
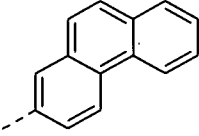
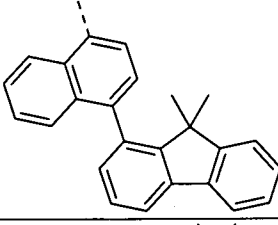
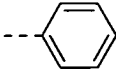
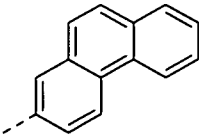
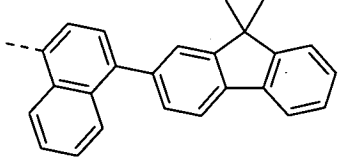
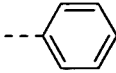
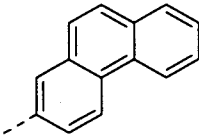
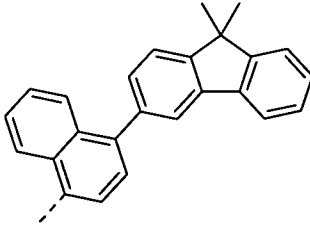
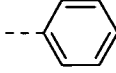
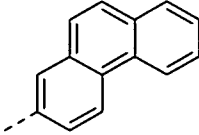
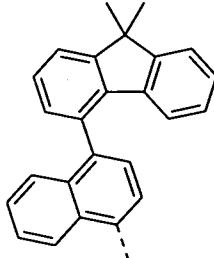
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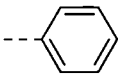
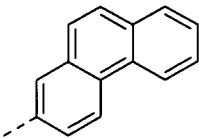
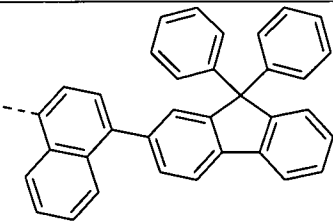
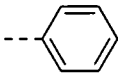
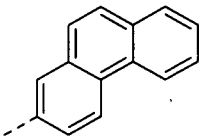
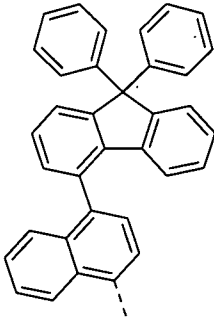
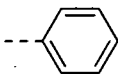
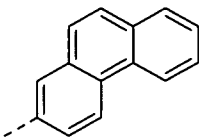
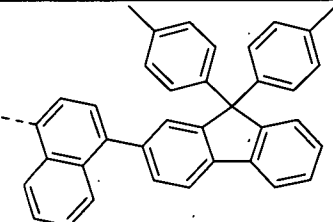
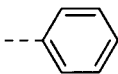
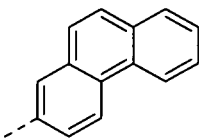
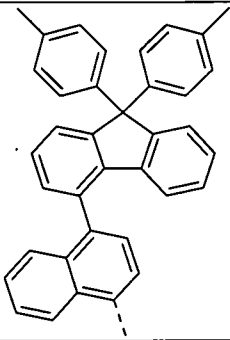
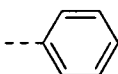
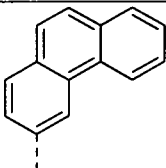
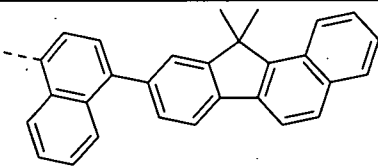
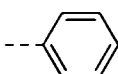
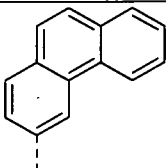
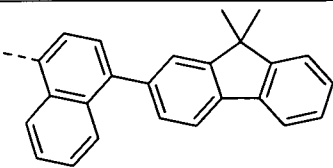
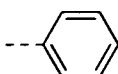
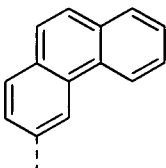
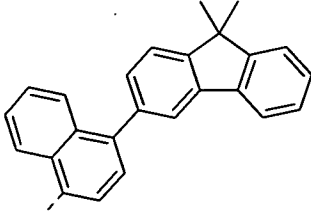
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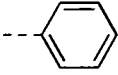
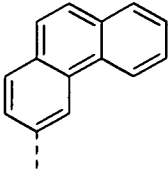
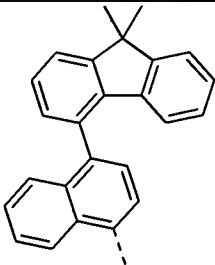
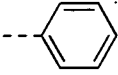
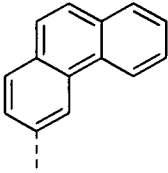
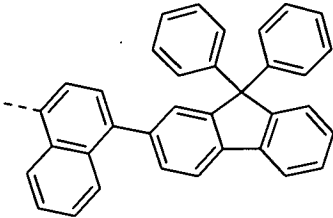
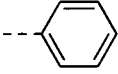
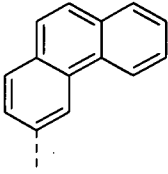
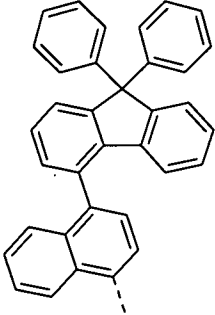
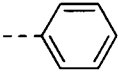
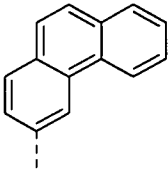
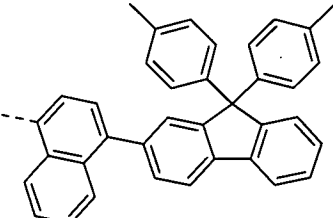
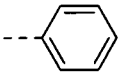
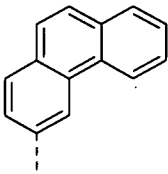
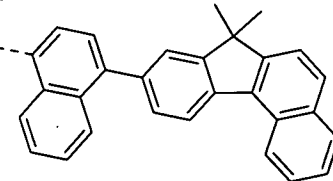
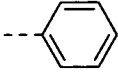
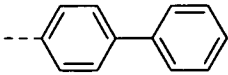
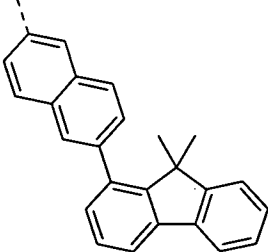
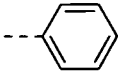
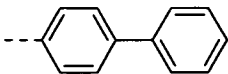
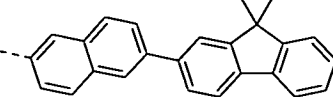
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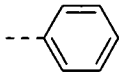
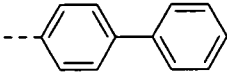
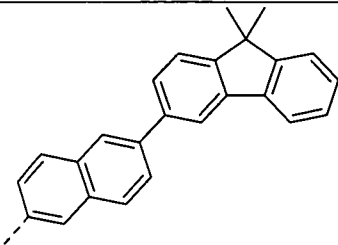
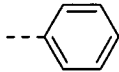
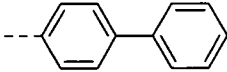
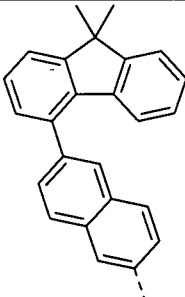
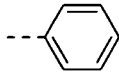
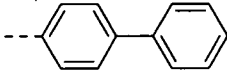
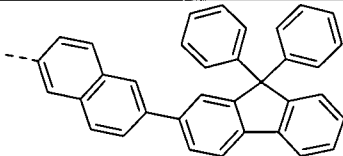
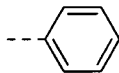
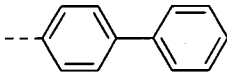
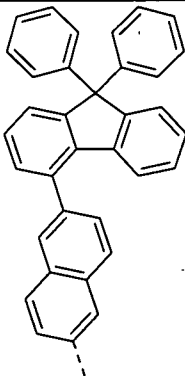
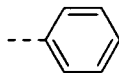
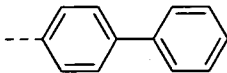
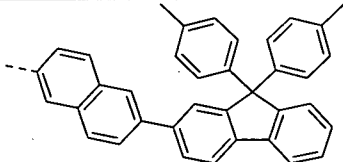
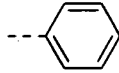
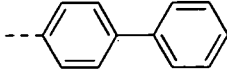
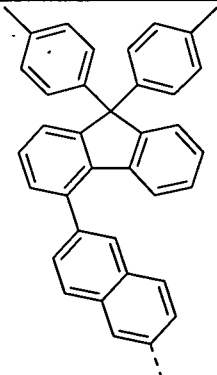
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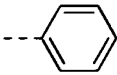
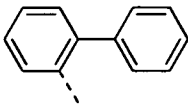
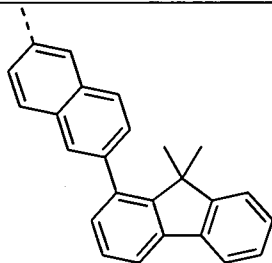
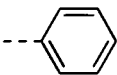
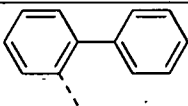
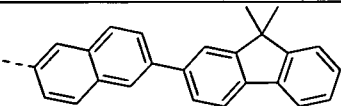
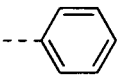
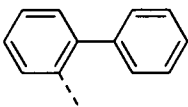
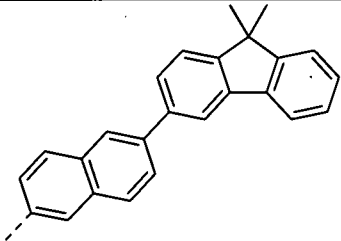
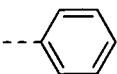
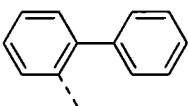
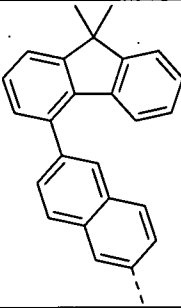
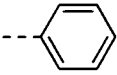
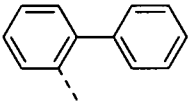
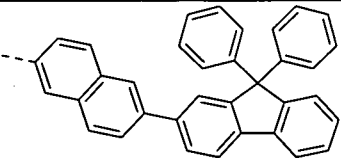
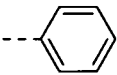
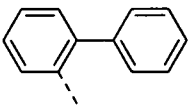
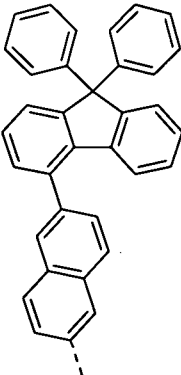
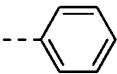
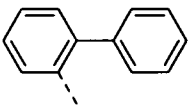
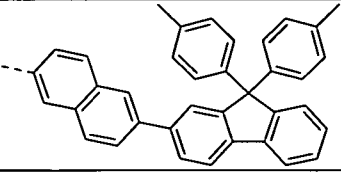
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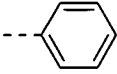
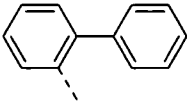
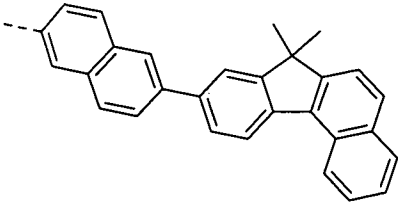
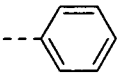
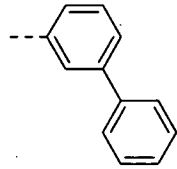
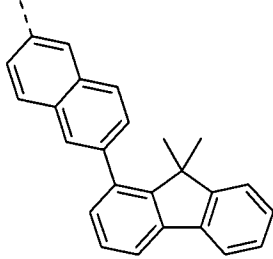
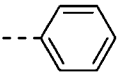
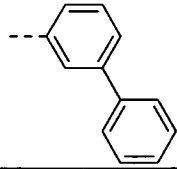
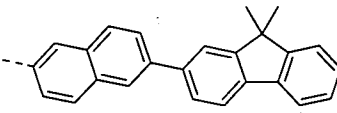
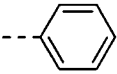
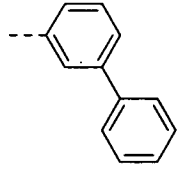
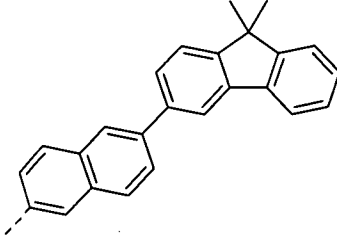
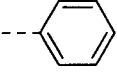
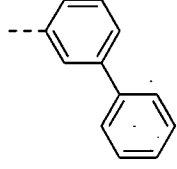
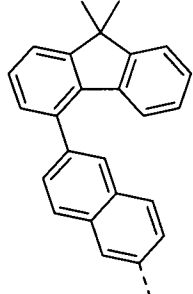
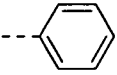
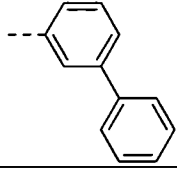
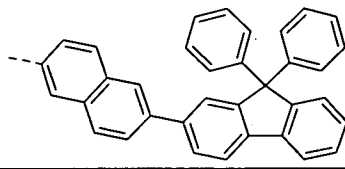
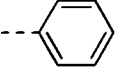
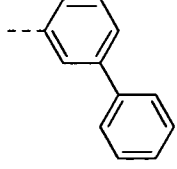
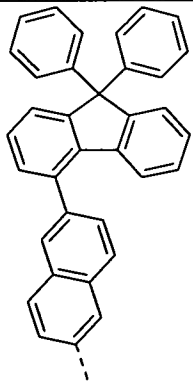
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第 104110794 號中文專利範圍無劃線修正本

修正日期:105 年 1 月 13 日

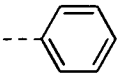
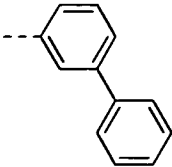
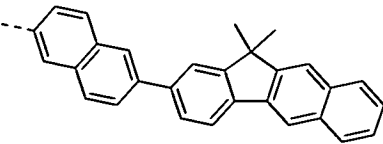
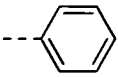
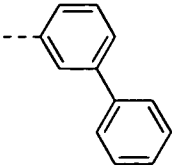
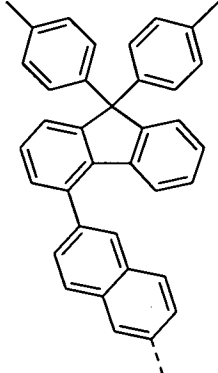
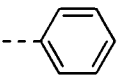
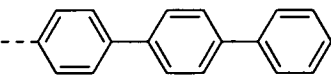
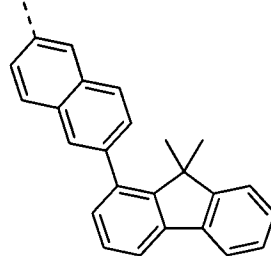
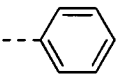
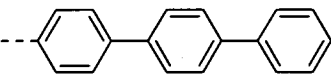
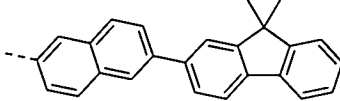
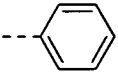
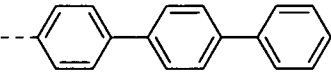
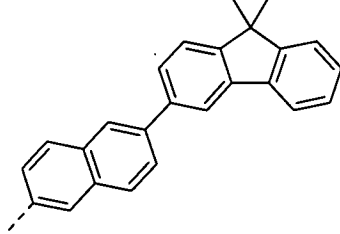
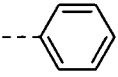
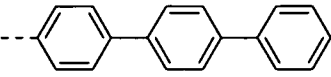
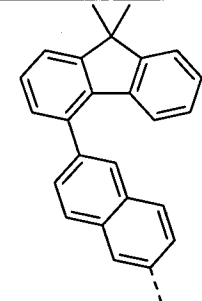
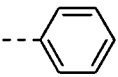
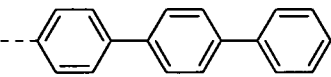
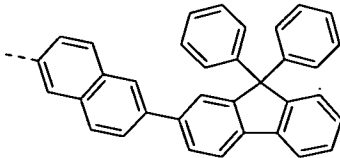
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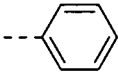
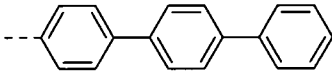
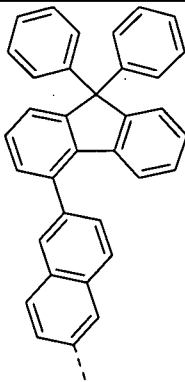
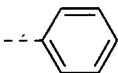
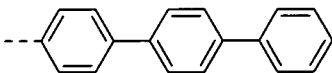
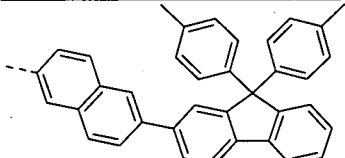
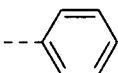
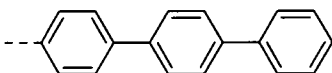
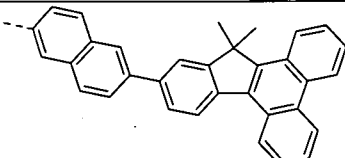
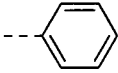
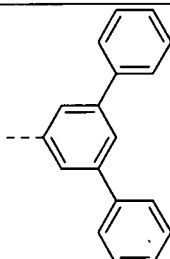
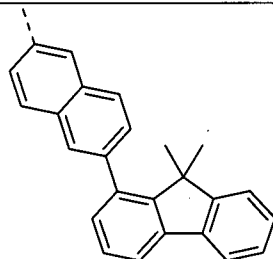
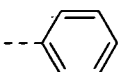
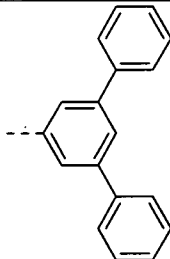
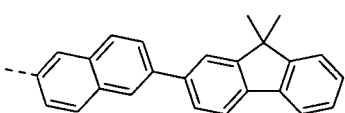
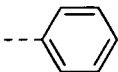
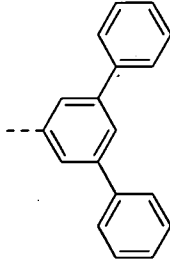
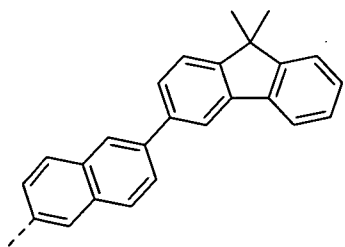
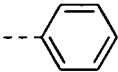
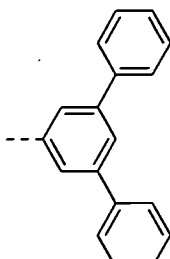
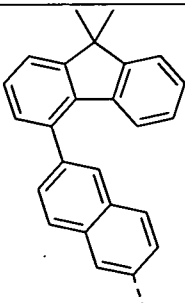
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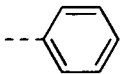
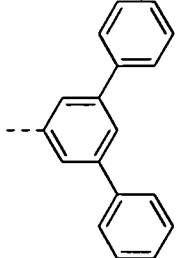
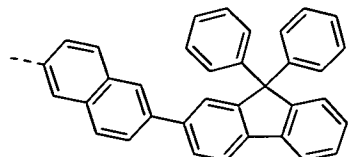
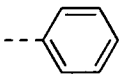
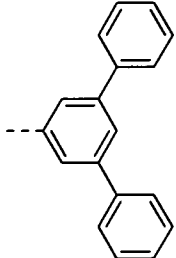
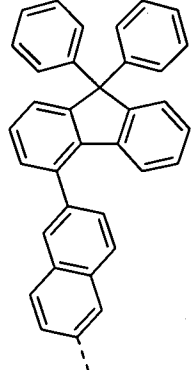
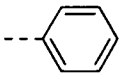
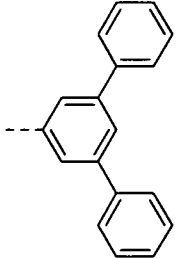
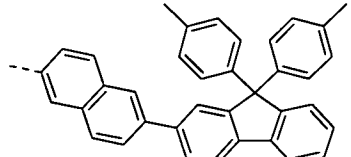
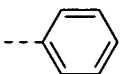
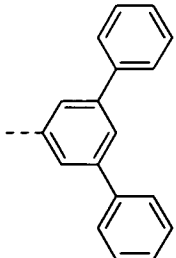
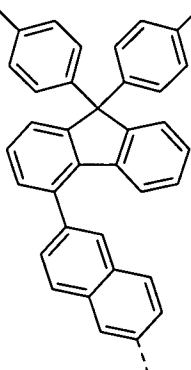
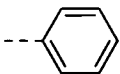
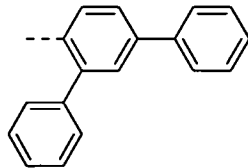
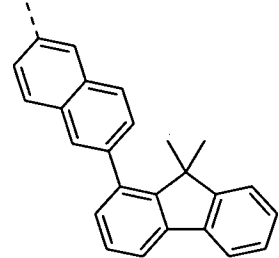
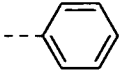
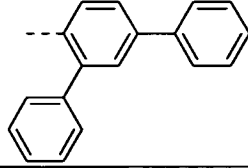
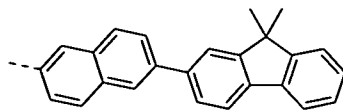
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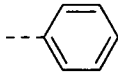
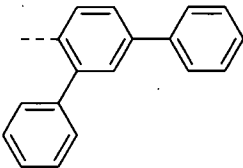
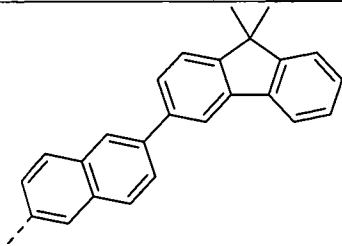
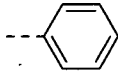
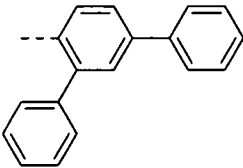
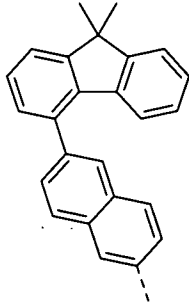
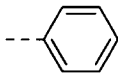
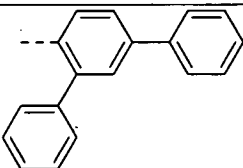
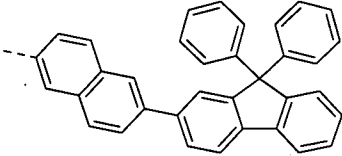
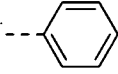
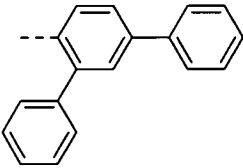
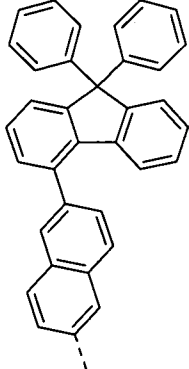
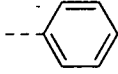
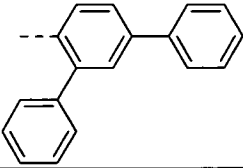
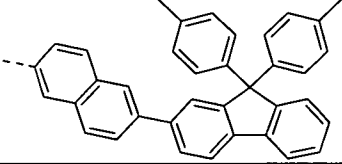
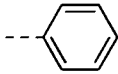
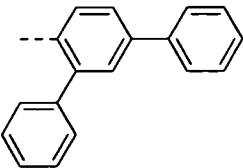
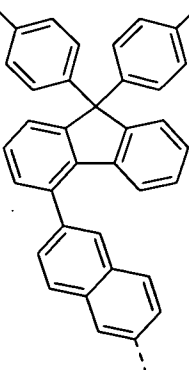
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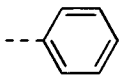
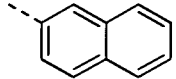
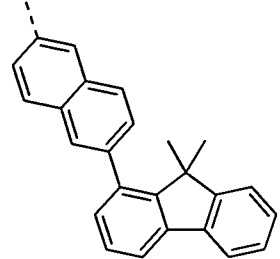
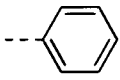
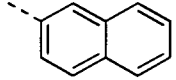
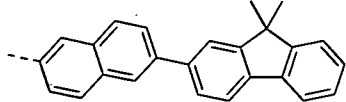
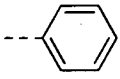
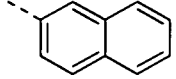
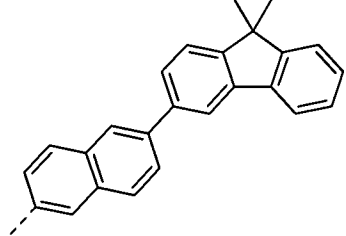
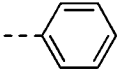
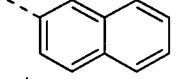
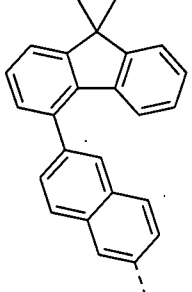
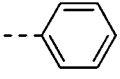
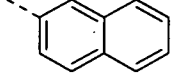
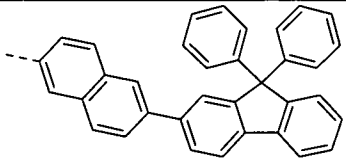
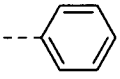
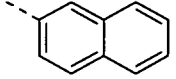
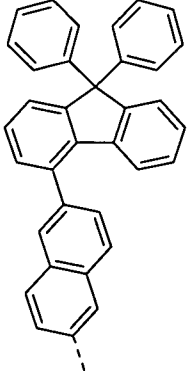
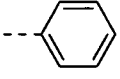
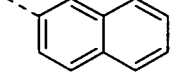
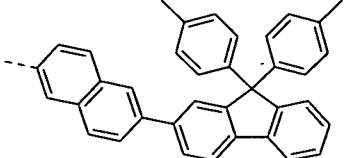
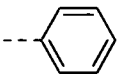
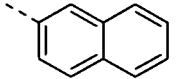
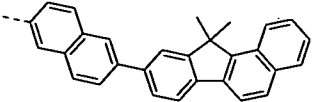
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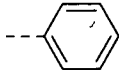
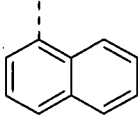
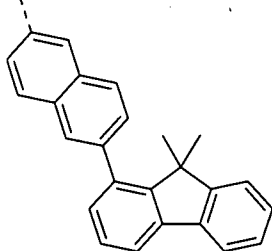
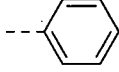
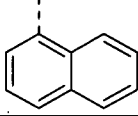
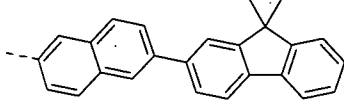
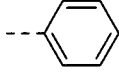
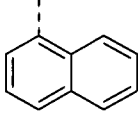
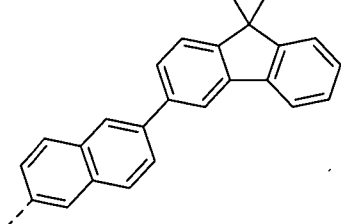
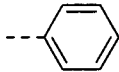
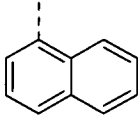
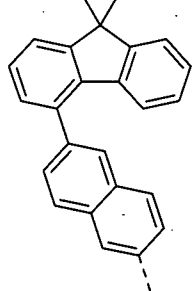
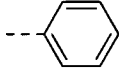
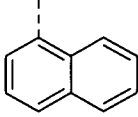
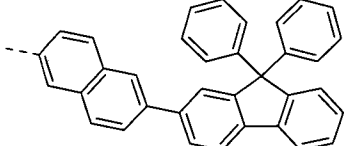
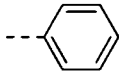
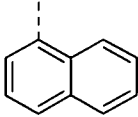
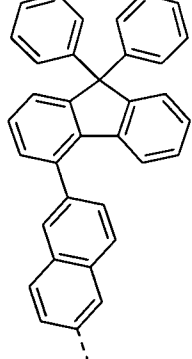
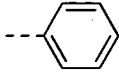
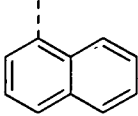
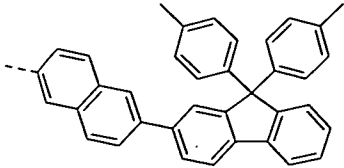
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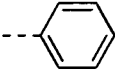
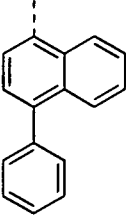
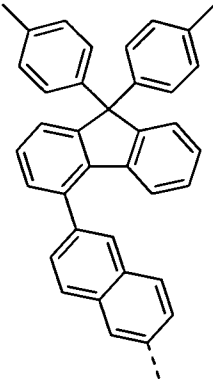
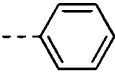
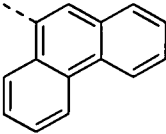
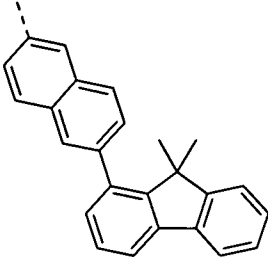
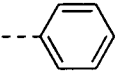
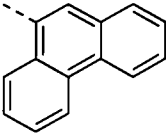
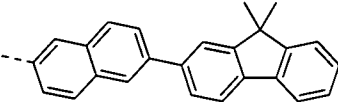
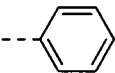
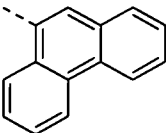
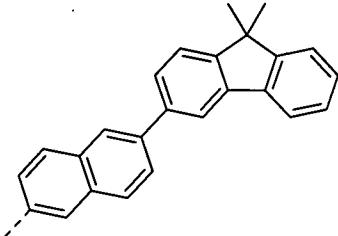
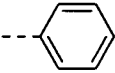
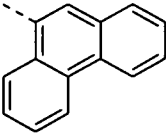
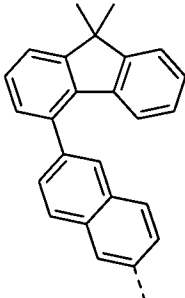
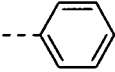
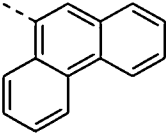
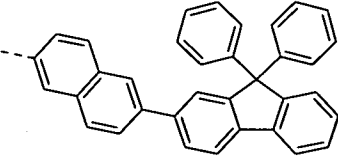
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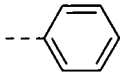
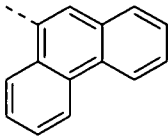
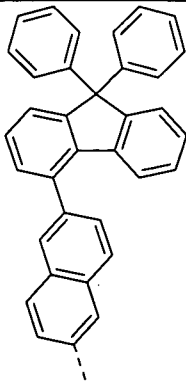
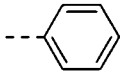
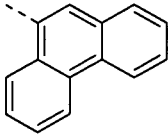
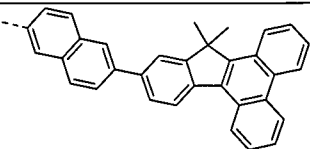
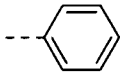
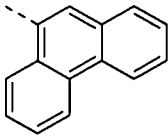
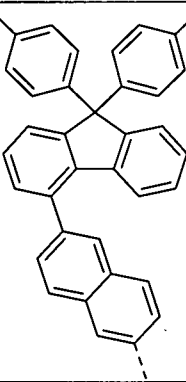
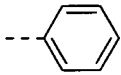
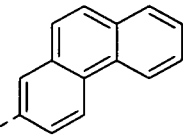
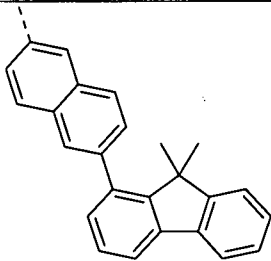
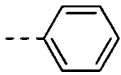
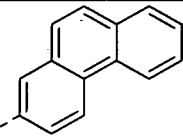
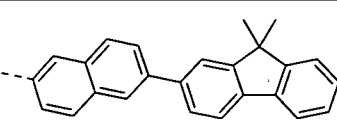
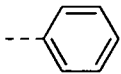
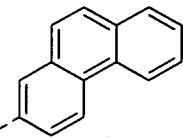
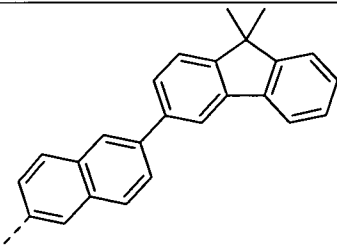
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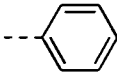
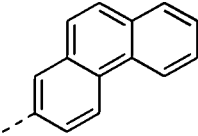
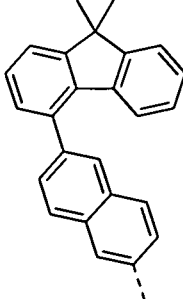
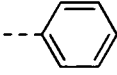
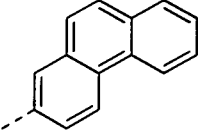
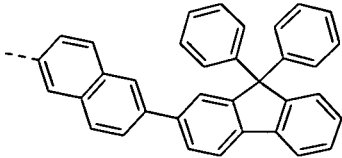
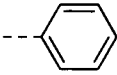
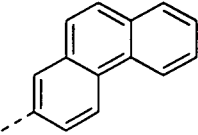
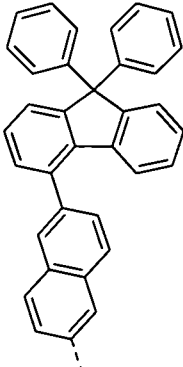
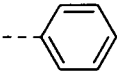
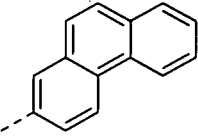
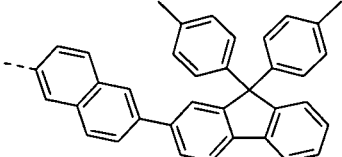
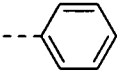
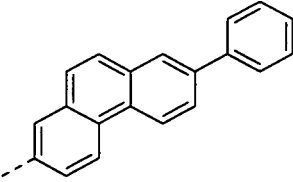
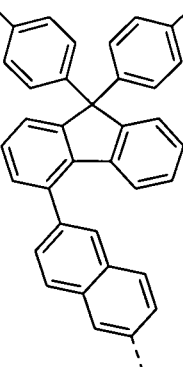
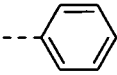
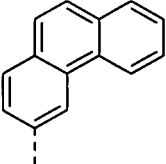
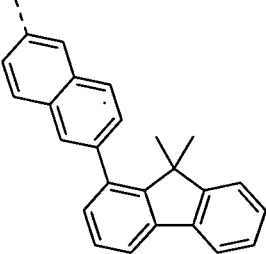
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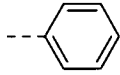
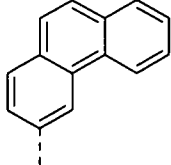
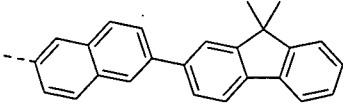
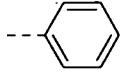
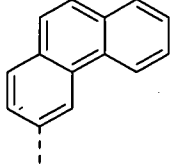
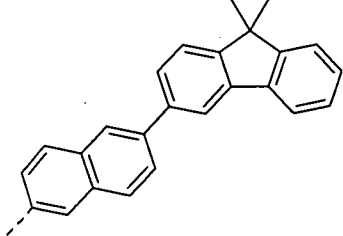
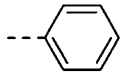
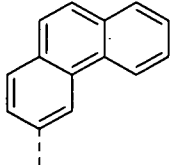
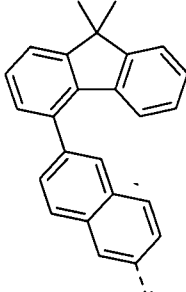
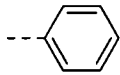
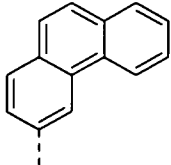
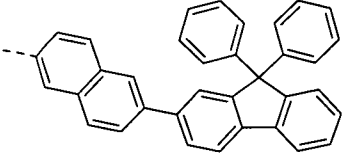
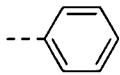
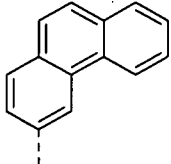
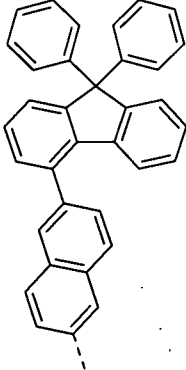
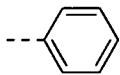
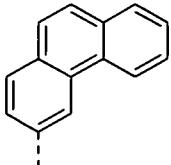
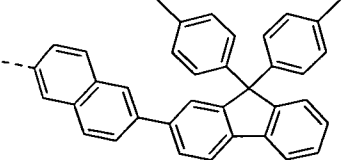
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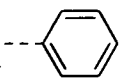
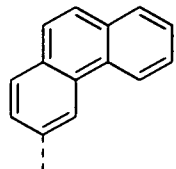
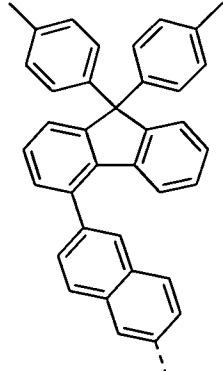
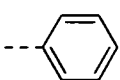
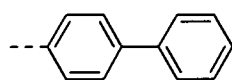
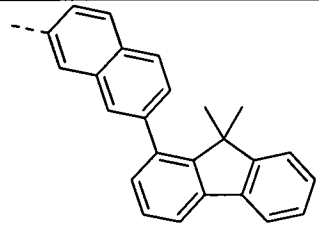
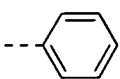
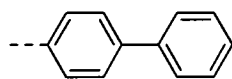
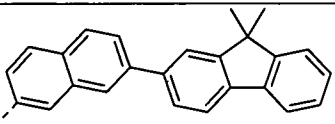
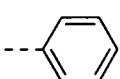
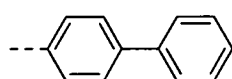
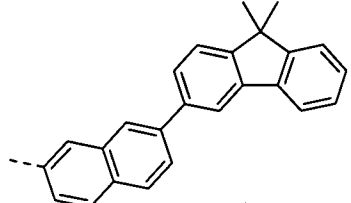
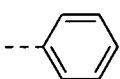
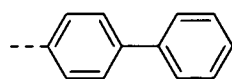
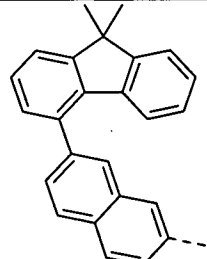
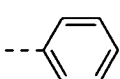
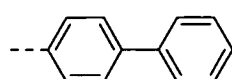
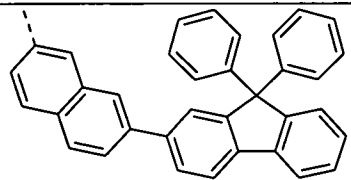
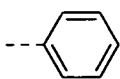
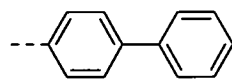
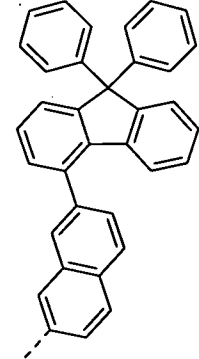
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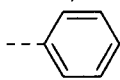
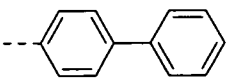
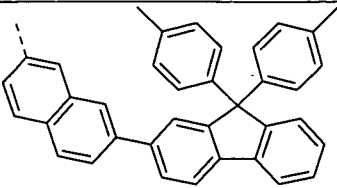
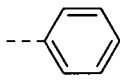
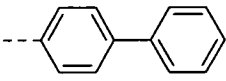
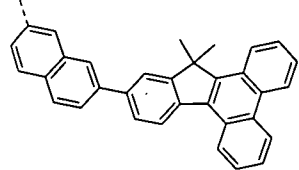
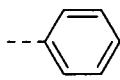
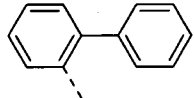
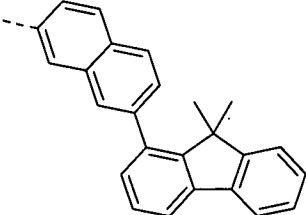
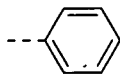
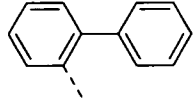
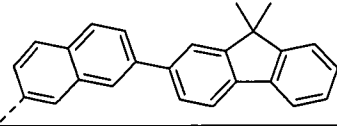
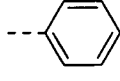
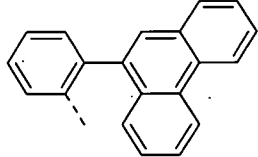
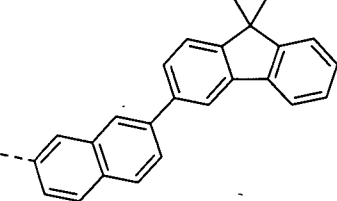
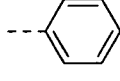
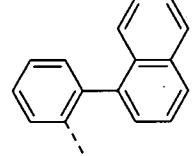
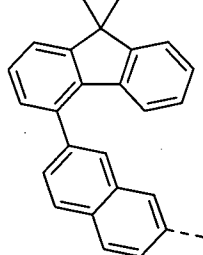
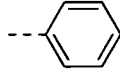
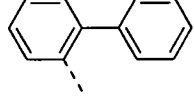
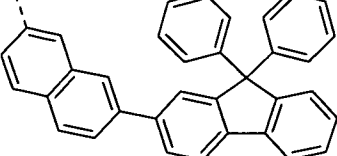
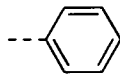
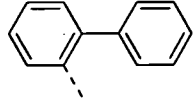
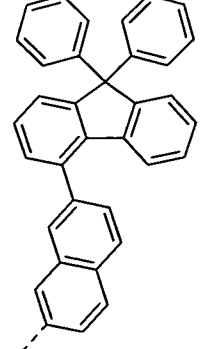
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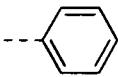
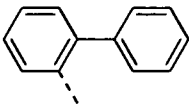
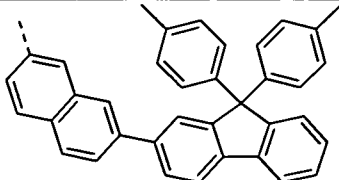
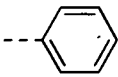
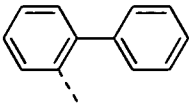
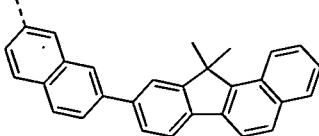
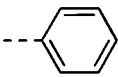
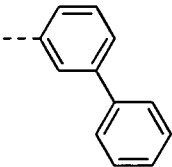
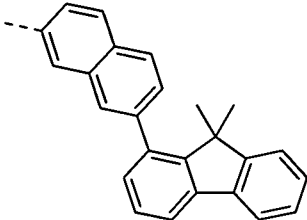
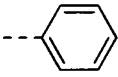
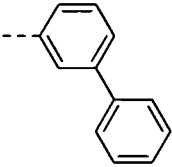
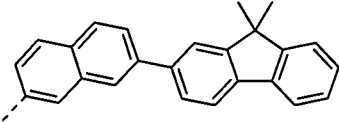
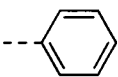
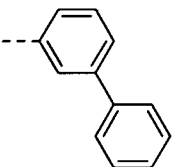
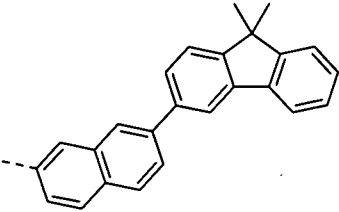
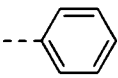
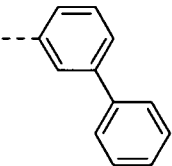
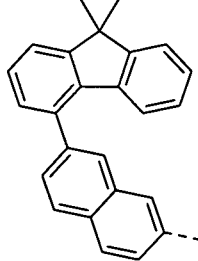
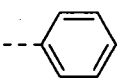
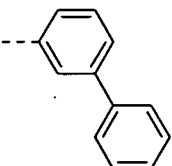
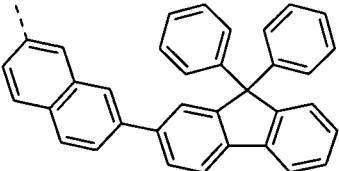
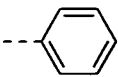
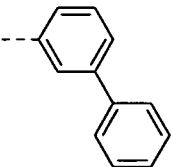
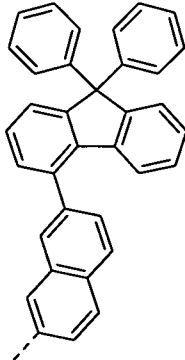
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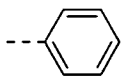
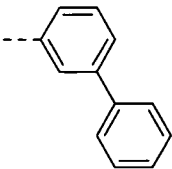
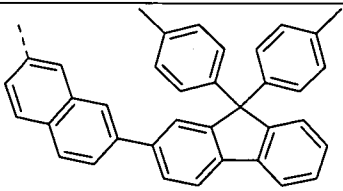
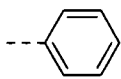
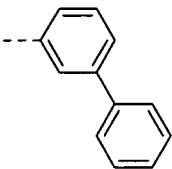
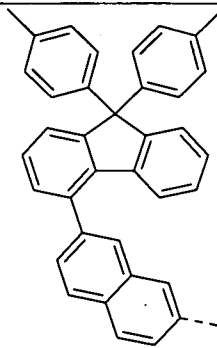
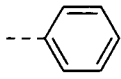
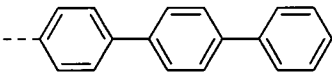
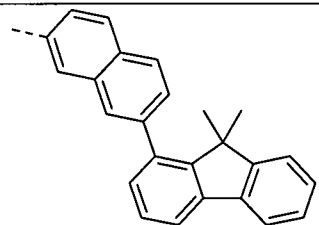
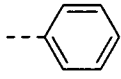
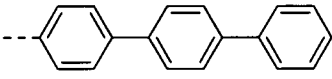
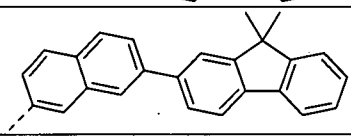
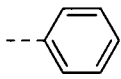
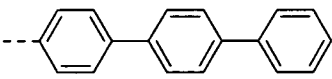
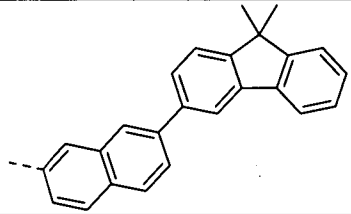
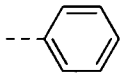
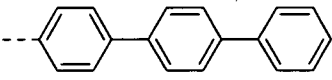
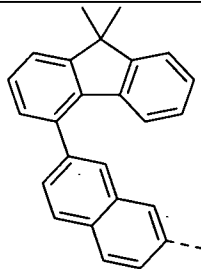
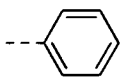
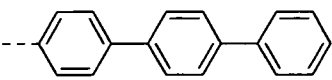
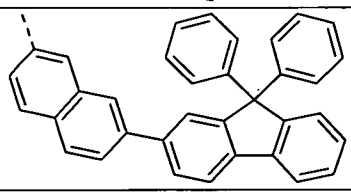
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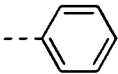
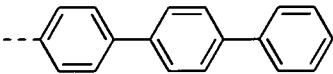
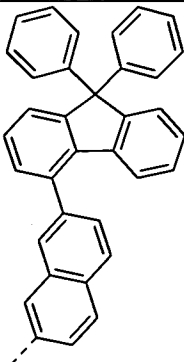
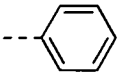
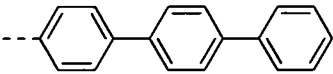
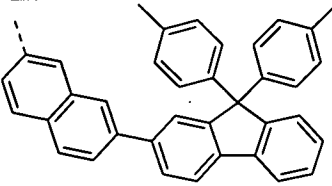
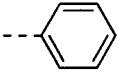
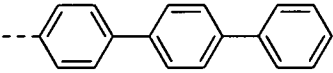
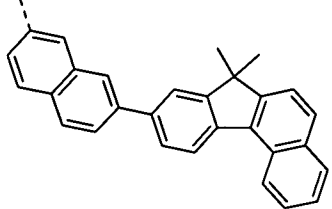
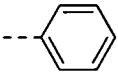
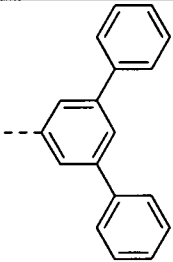
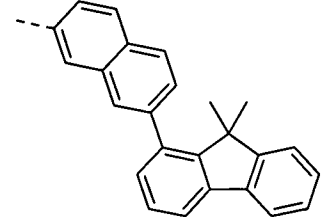
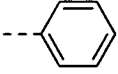
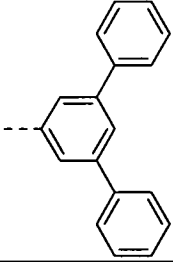
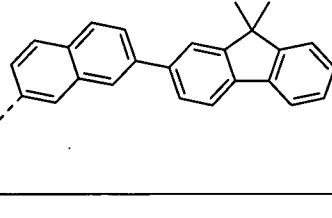
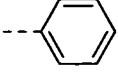
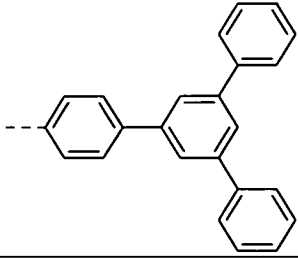
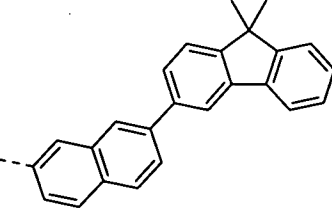
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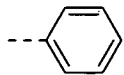
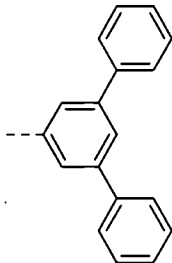
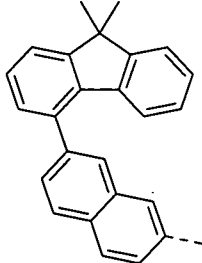
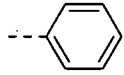
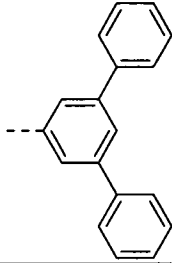
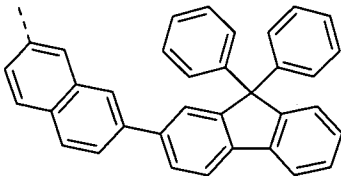
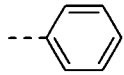
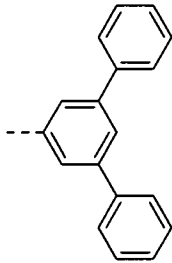
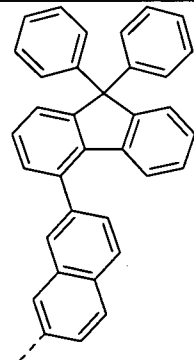
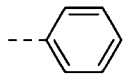
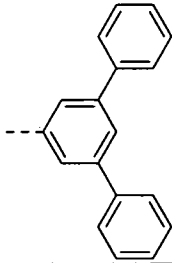
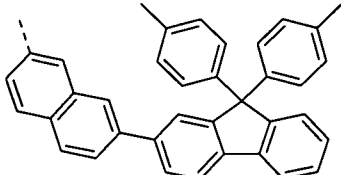
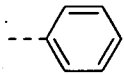
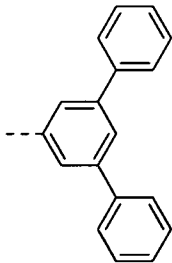
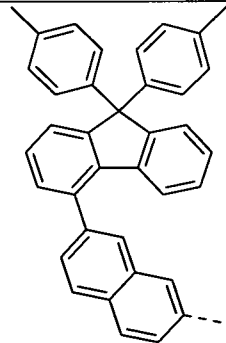
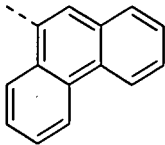
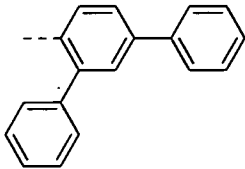
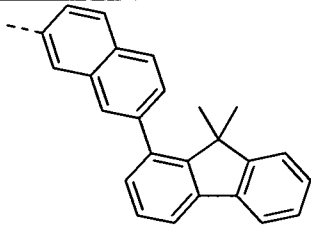
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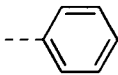
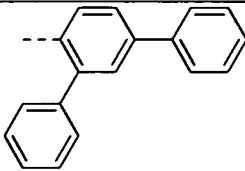
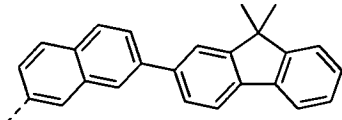
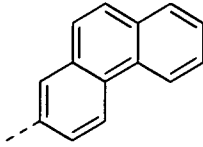
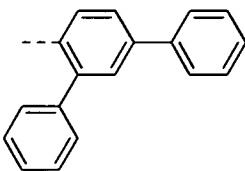
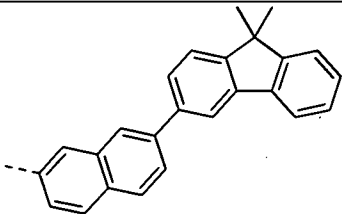
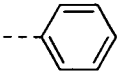
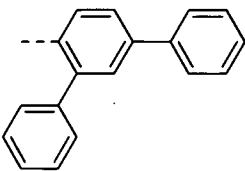
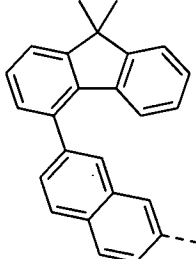
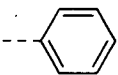
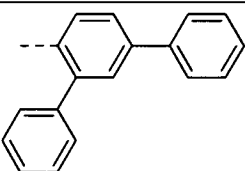
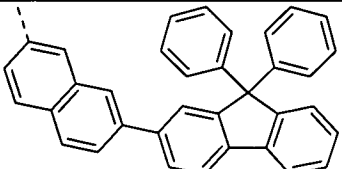
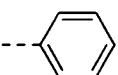
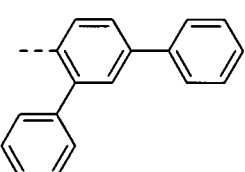
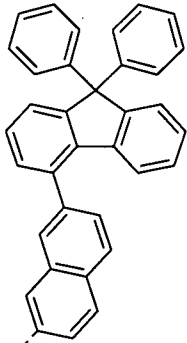
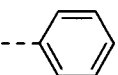
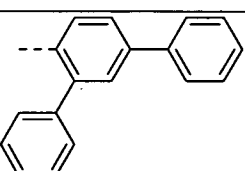
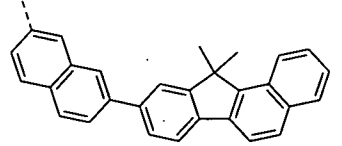
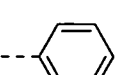
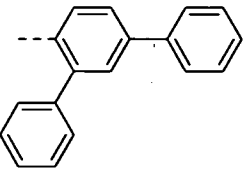
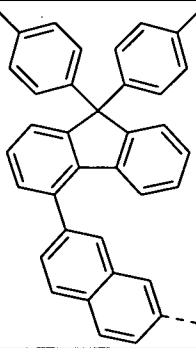
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修正日期:105 年 1 月 13 日

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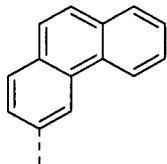
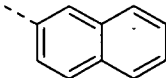
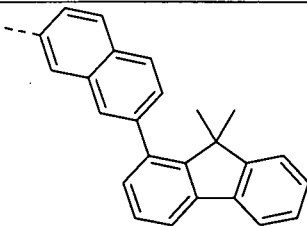
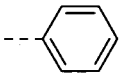
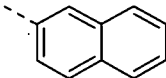
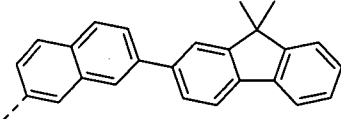
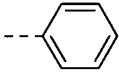
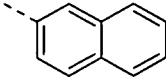
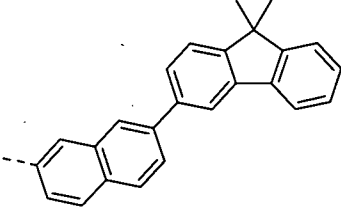
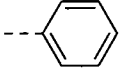
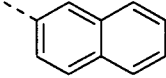
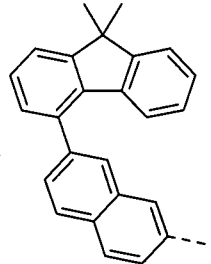
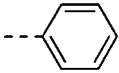
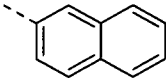
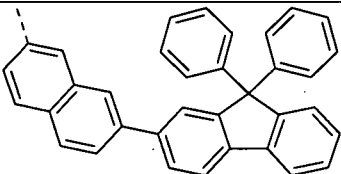
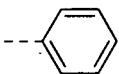
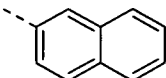
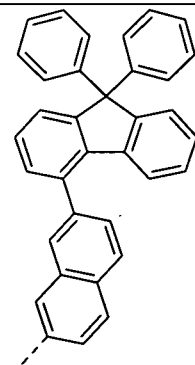
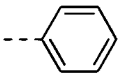
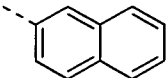
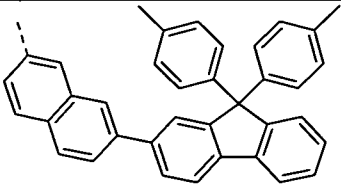
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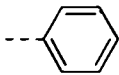
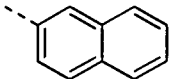
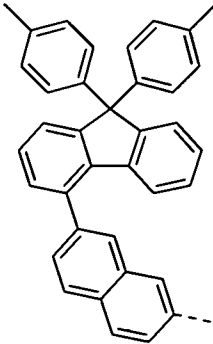
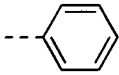
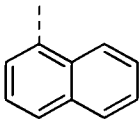
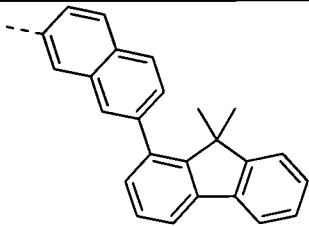
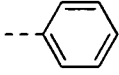
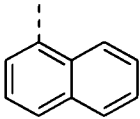
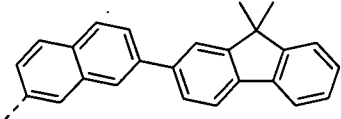
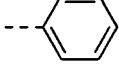
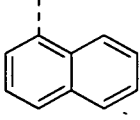
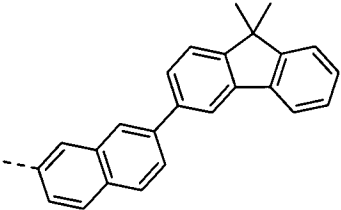
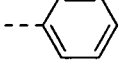
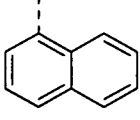
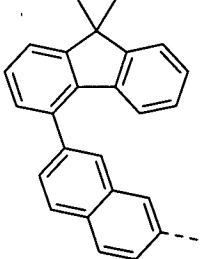
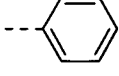
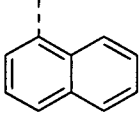
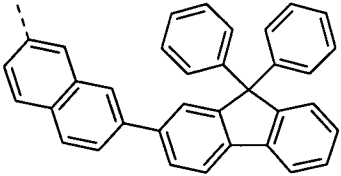
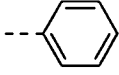
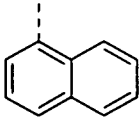
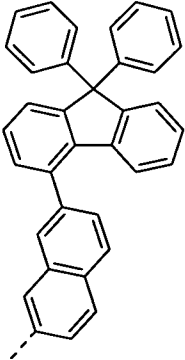
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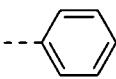
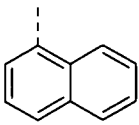
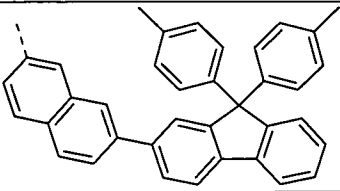
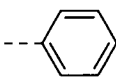
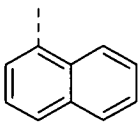
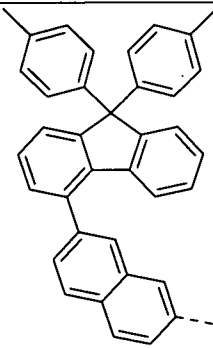
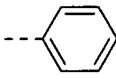
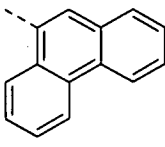
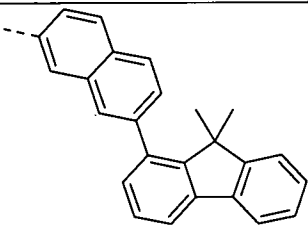
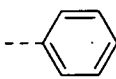
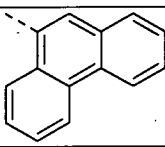
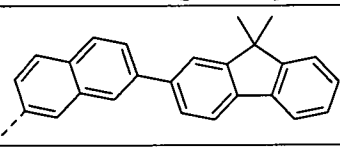
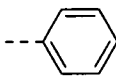
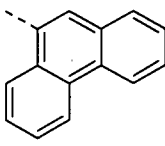
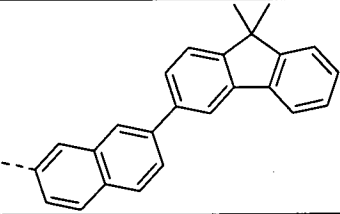
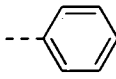
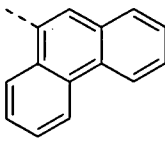
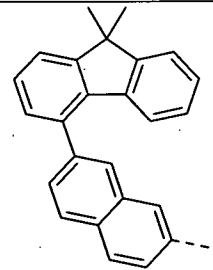
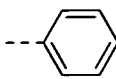
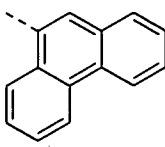
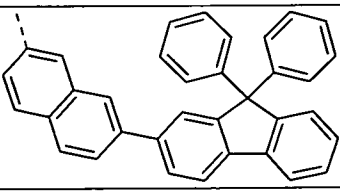
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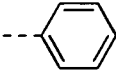
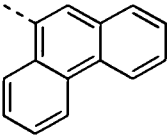
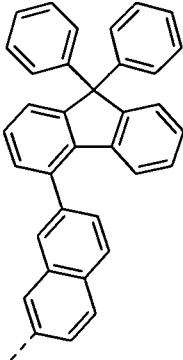
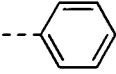
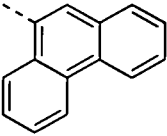
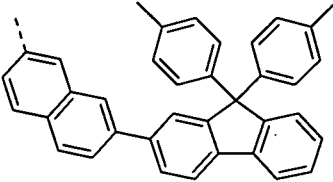
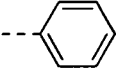
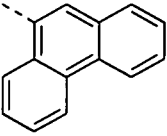
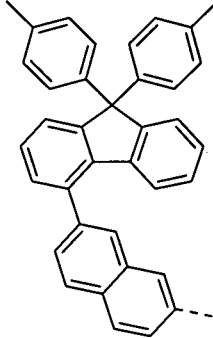
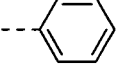
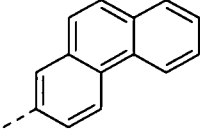
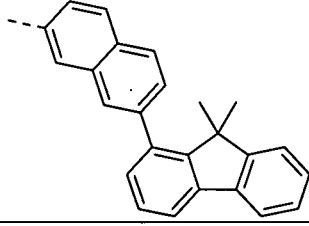
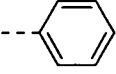
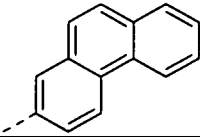
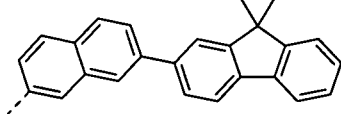
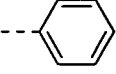
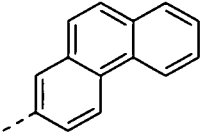
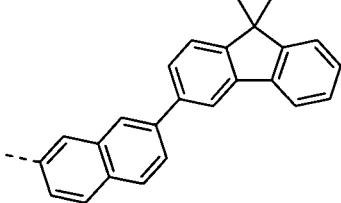
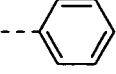
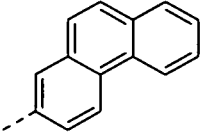
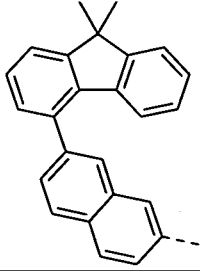
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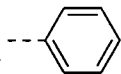
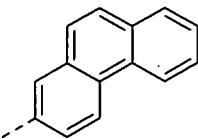
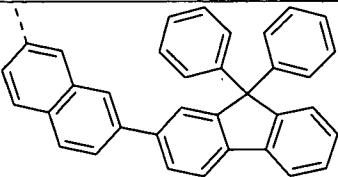
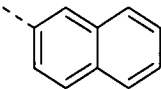
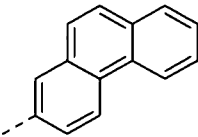
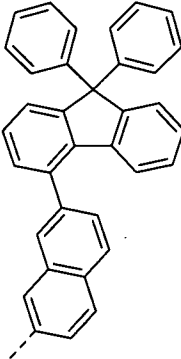
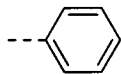
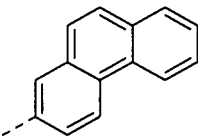
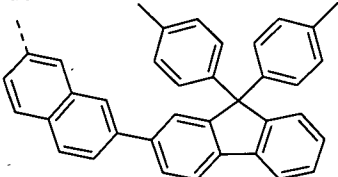
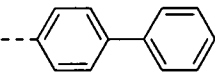
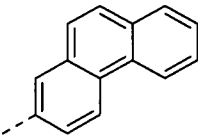
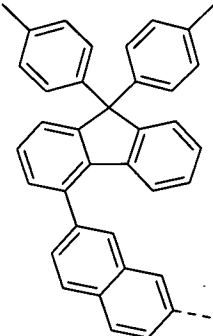
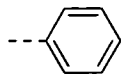
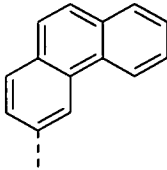
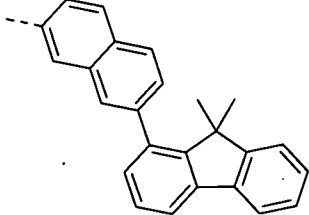
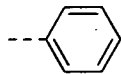
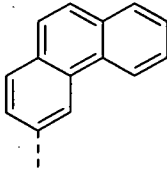
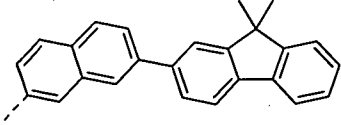
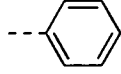
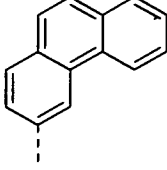
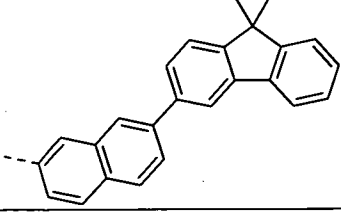
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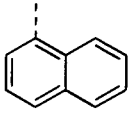
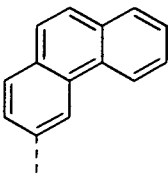
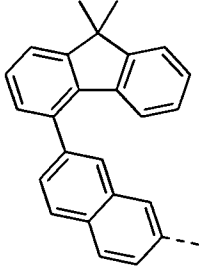
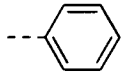
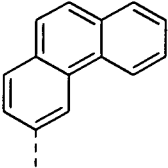
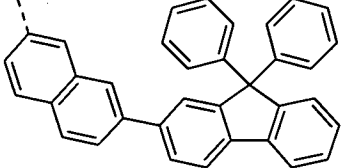
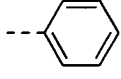
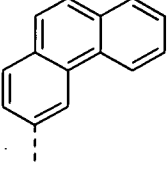
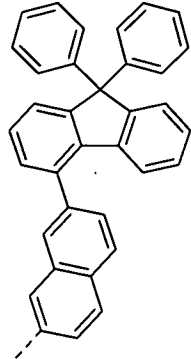
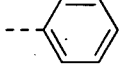
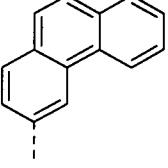
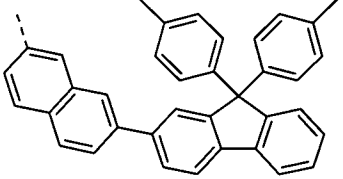
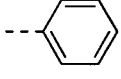
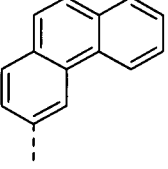
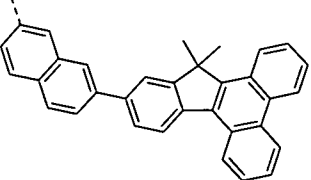
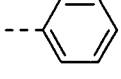
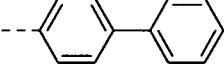
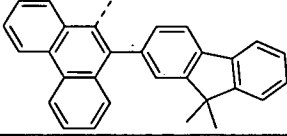
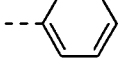
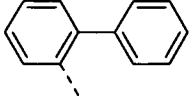
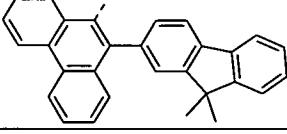
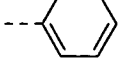
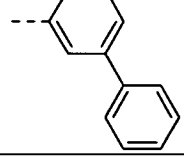
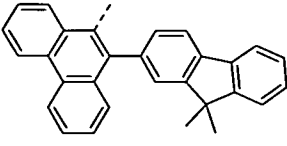
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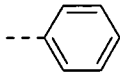
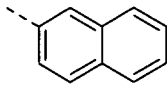
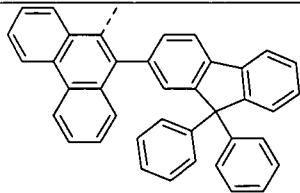
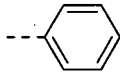
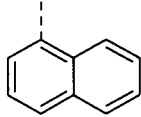
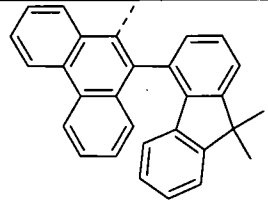
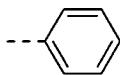
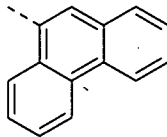
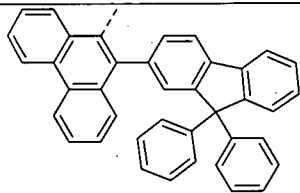
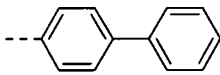
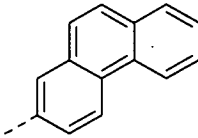
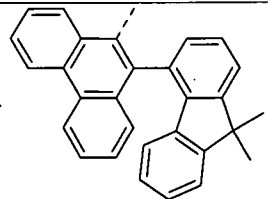
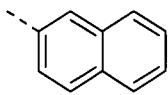
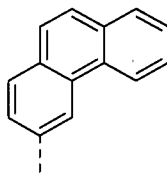
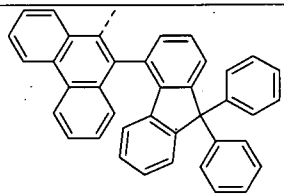
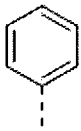
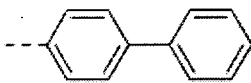
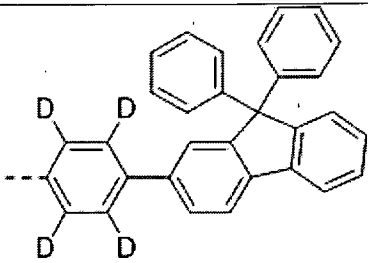
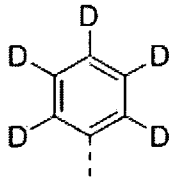
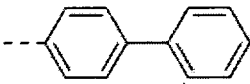
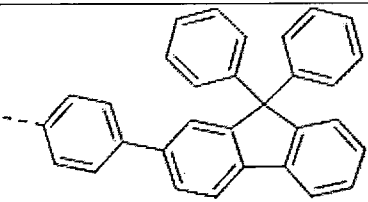
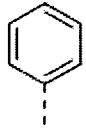
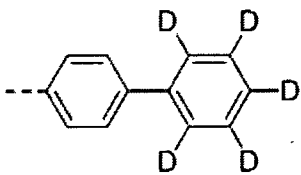
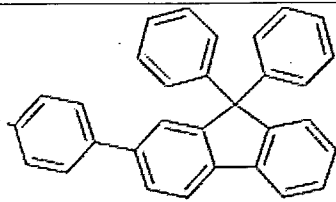
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【第10項】 一種有機發光元件，包括：

陽極；

陰極；及

在所述陽極與所述陰極之間提供的一或多個有機材料層，

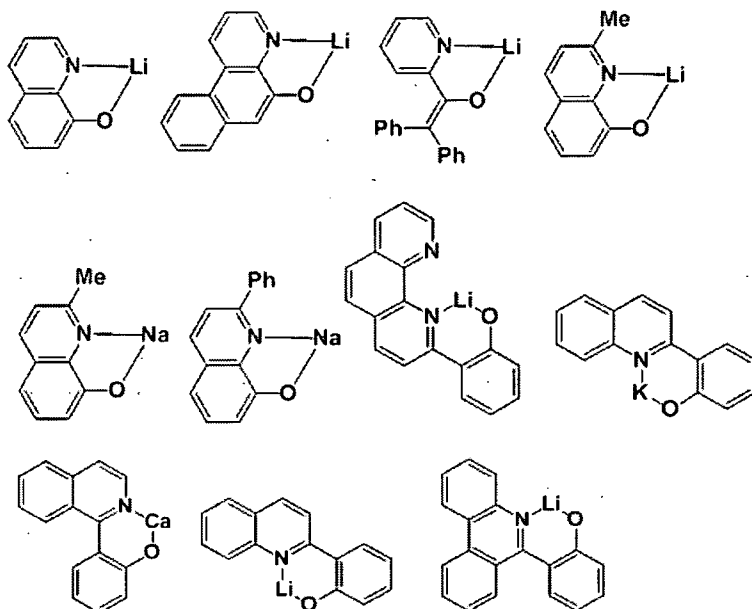
其中所述有機材料層中之一或多個層包括式 1 至式 9 中之任一者之化合物。

【第11項】 如申請專利範圍第 10 項所述的有機發光元件，其中包括所述化合物之所述有機材料層為由以下各者所組成之群中選出之一個或兩個或大於兩個的有機材料層：電子傳輸層、電子注入層、同時注入或傳輸電子之層以及電子控制層。

【第12項】 如申請專利範圍第 10 項所述的有機發光元件，其中包括所述化合物之所述有機材料層包括所述化合物作為主體及 n 型摻雜劑作為摻雜劑。

【第13項】 如申請專利範圍第 12 項所述的有機發光元件，其中所述 n 型摻雜劑包括鹼金屬、鹼金屬化合物、鹼土金屬、鹼土金屬化合物或其組合。

【第14項】 如申請專利範圍第 12 項所述的有機發光元件，其中由以下各者組成之群中選出一者或兩者或大於兩者作為所述 n 型摻雜劑：Li、Na、K、Rb、Cs、Mg、Ca、Sr、Ba、La、Nd、Sm、Eu、Tb、Yb、LiF、Li₂O、CsF，或以下化合物：



【第15項】一種有機發光元件，包括：

陽極；

陰極；及

在所述陽極與所述陰極之間提供的兩個或大於兩個有機材料層，

其中所述有機材料層包括電子傳輸層及電子控制層，

所述電子傳輸層包括如請求項 1 至 9 中任一項所述之雜環化合物作為主體及 n 型摻雜劑作為摻雜劑，及

所述電子控制層與所述電子傳輸層不同。

【第16項】一種有機發光元件，包括：

陽極；

陰極；及

在所述陽極與所述陰極之間提供的兩個或大於兩個有機材料層，

其中所述有機材料層包括電子傳輸層及電子控制層，

所述電子控制層包括如請求項 1 至 9 中任一項所述之雜環化合物作為主體及 n 型摻雜劑作為摻雜劑，及

所述電子傳輸層與所述電子控制層不同。

【第17項】如申請專利範圍第 10 項所述的有機發光元件，其中所述有機發光元件包括：

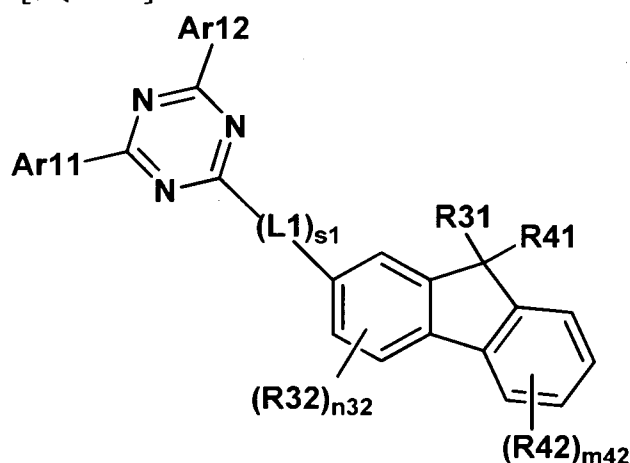
在所述陽極與所述陰極之間提供的發光層；

在所述發光層與所述陰極之間提供的電子傳輸層；及

在所述電子傳輸層與所述發光層之間提供的電子控制層，及

所述電子控制層包括以下式 3-1 之化合物：

[式 3-1]



在式 3-1 中，

Ar11 及 Ar12 彼此不同，且各自獨立地為經取代或未經取代之芳基，

L1 為直接鍵；經取代或未經取代之伸芳基；或經取代或未經取代之伸雜芳基，

R32 及 R42 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或

未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或與相鄰基團組合以形成經取代或未經取代之環，

R31 及 R41 彼此相同或不同，且各自獨立地為氫；氖；鹵素基團；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或彼此組合以形成經取代或未經取代之脂族環，

n_{32} 為 0 至 3 的整數且 m_{42} 為 0 至 4 的整數，及

s_1 為 1 至 5 的整數，及

當 n_{32} 、 m_{42} 以及 s_1 各自為 2 或大於 2 時，括弧中之結構彼此相同或不同。

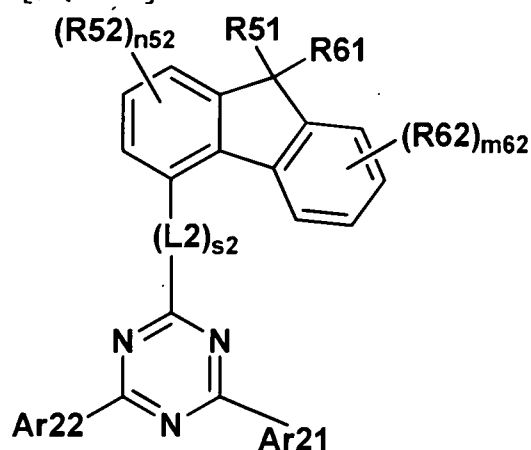
【第18項】如申請專利範圍第 10 項所述的有機發光元件，其中所述有機發光元件包括：

在所述陽極與所述陰極之間提供的發光層；

在所述發光層與所述陰極之間提供的電子傳輸層；及

在所述電子傳輸層與所述發光層之間提供的電子控制層，及
所述電子傳輸層包括以下式 6-1 之化合物：

[式 6-1]



在式 6-1 中，

Ar21 及 Ar22 彼此不同，且各自獨立地為經取代或未經取代之芳基，

L2 為直接鍵；經取代或未經取代之伸芳基；或經取代或未經取代之伸雜芳基，

R52 及 R62 彼此相同或不同，且各自獨立地為氫；氘；鹵素基團；腈基團；硝基；羥基；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或與相鄰基團組合以形成經取代或未經取代之環，

R51 及 R61 彼此相同或不同，且各自獨立地為氫；氘；鹵素

基團；經取代或未經取代之烷基；經取代或未經取代之環烷基；經取代或未經取代之烷氧基；經取代或未經取代之芳氧基；經取代或未經取代之烷基硫氧基；經取代或未經取代之芳基硫氧基；經取代或未經取代之烷基磺酸氧基；經取代或未經取代之芳基磺酸氧基；經取代或未經取代之烯基；經取代或未經取代之矽烷基；經取代或未經取代之硼基團；經取代或未經取代之芳基；或經取代或未經取代之雜環基，或彼此組合以形成經取代或未經取代之脂族環，

n_{52} 為 0 至 3 的整數且 m_{62} 為 0 至 4 的整數，及

s_2 為 1 至 5 的整數，及

當 n_{52} 、 m_{62} 及 s_2 各自為 2 或大於 2 時，括弧中之結構彼此相同或不同。

【第19項】一種有機發光元件，包括：

陽極；

陰極；

在所述陽極與所述陰極之間提供的發光層；及

在所述發光層與所述陰極之間提供的電子傳輸層，

其中所述發光層包括主體，及

所述電子傳輸層包括如請求項 1 至 9 中任一項所述之雜環化合物，其與所述主體不同且具有 6 eV 至 7 eV 之 HOMO 能級。

【第20項】一種有機發光元件，包括：

陽極；

陰極；

在所述陽極與所述陰極之間提供的發光層；及

在所述發光層與所述陰極之間提供的電子傳輸層，
其中所述發光層包括主體，及
所述電子傳輸層包括如請求項 1 至 9 中任一項所述之雜環化合物，其與所述主體不同且具有 2.2 eV 或大於 2.2 eV 之三重態能量 (E_T)。

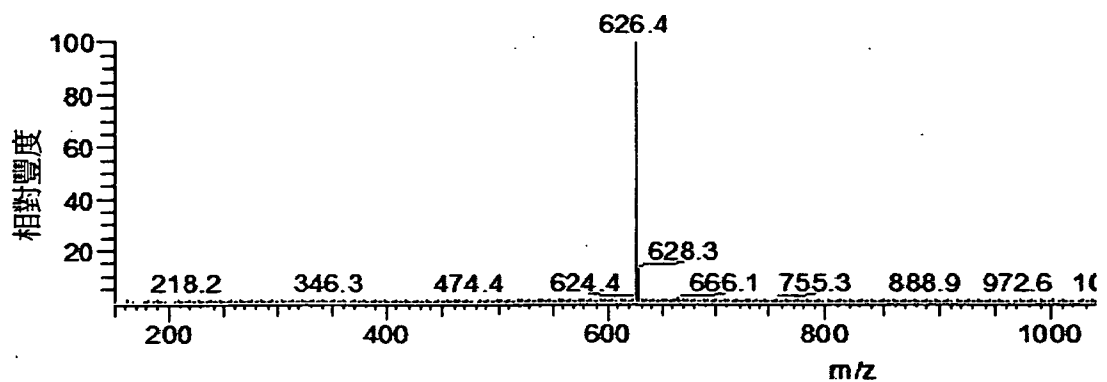
【發明圖式】

4
3
2
1

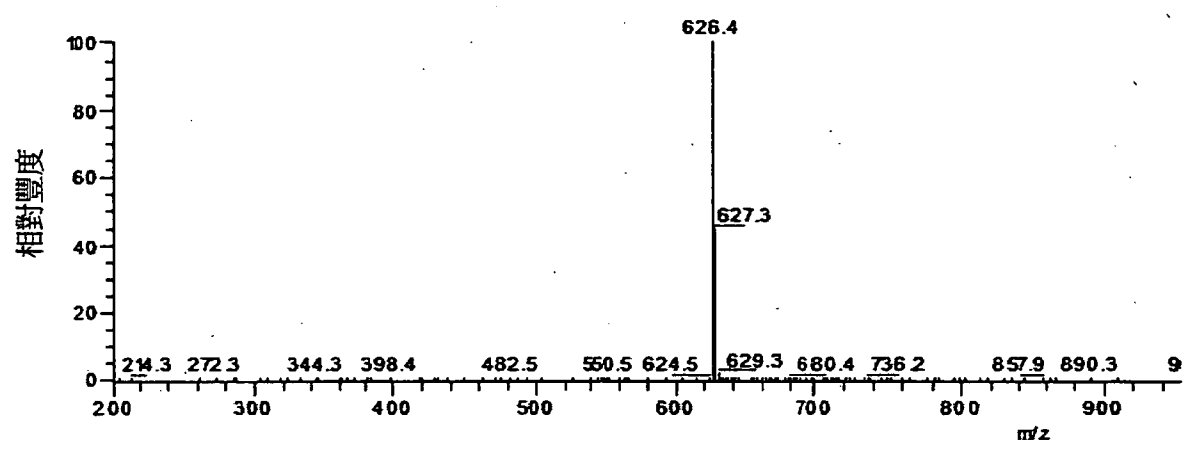
【圖1】

4
8
7
6
5
2
1

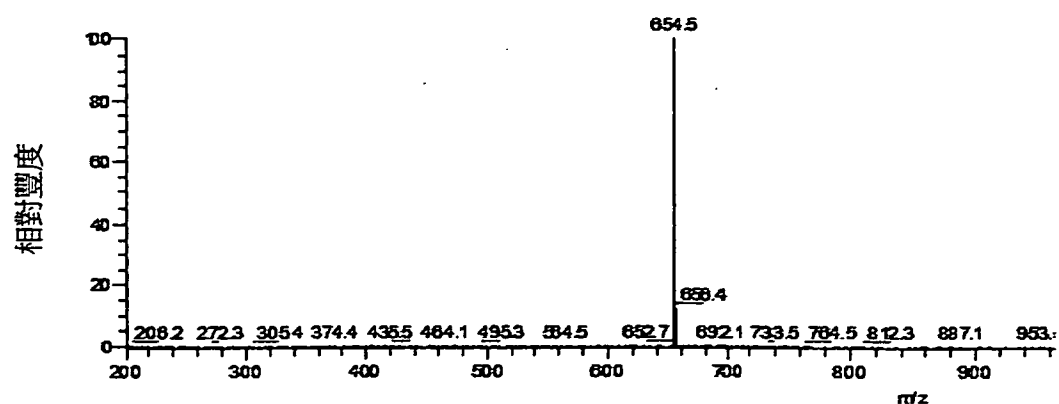
【圖2】



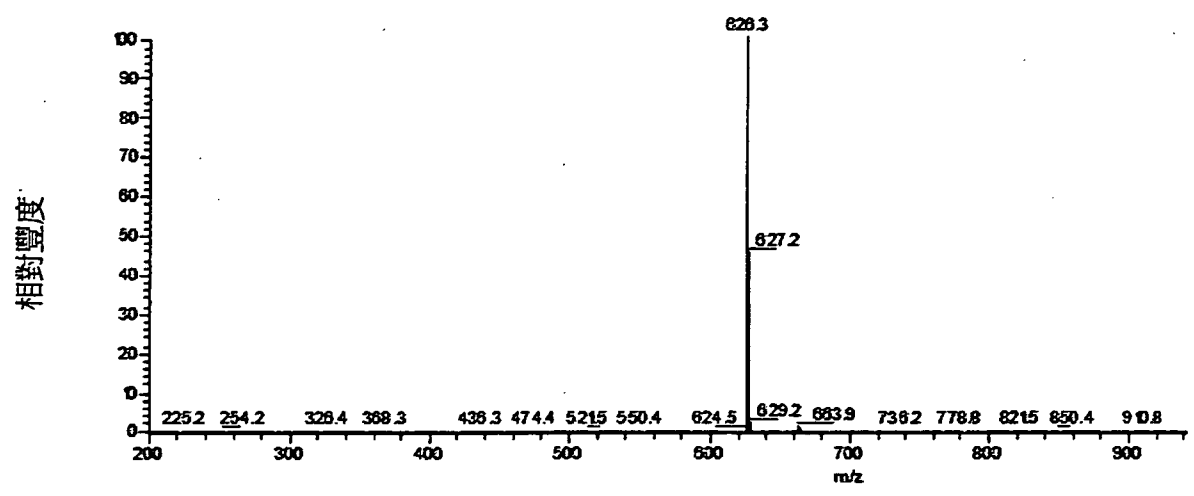
【圖3】



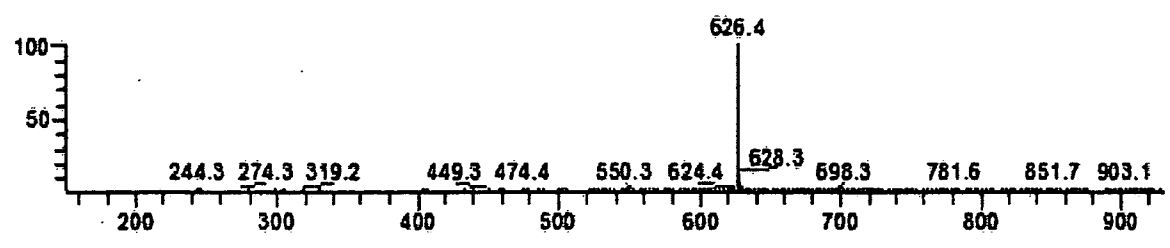
【圖4】



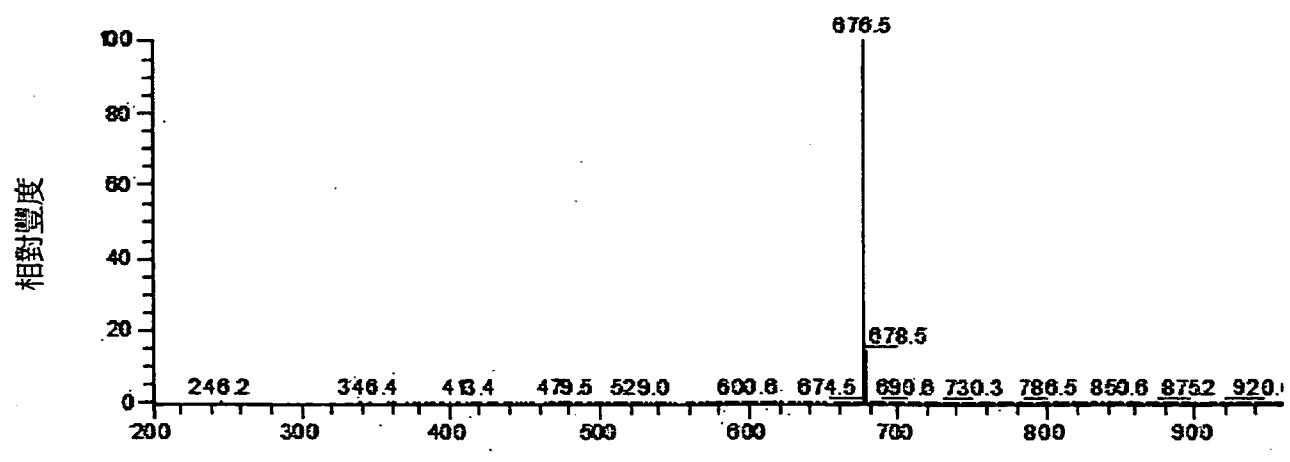
【圖5】



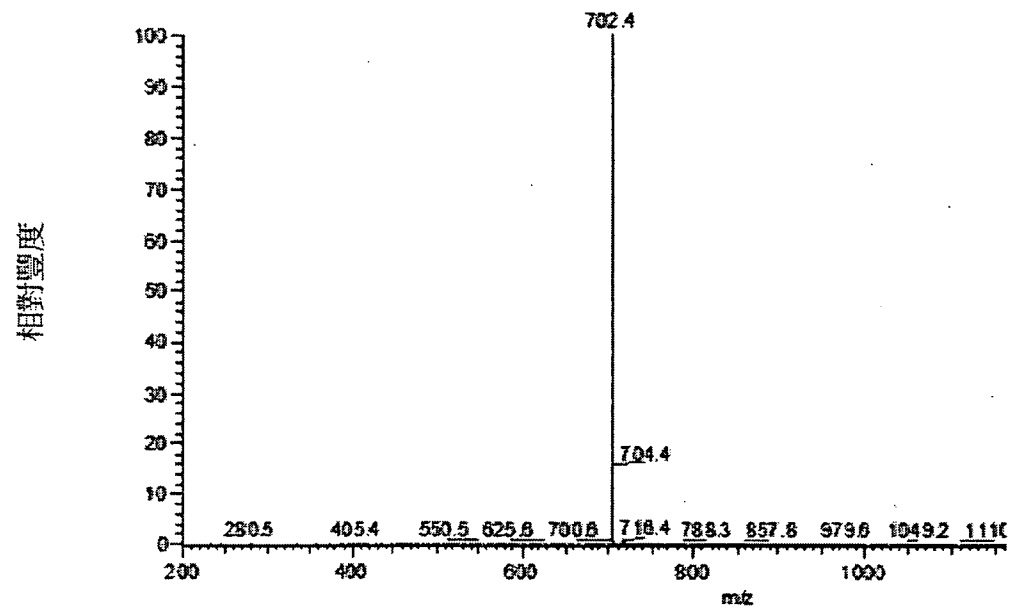
【圖6】



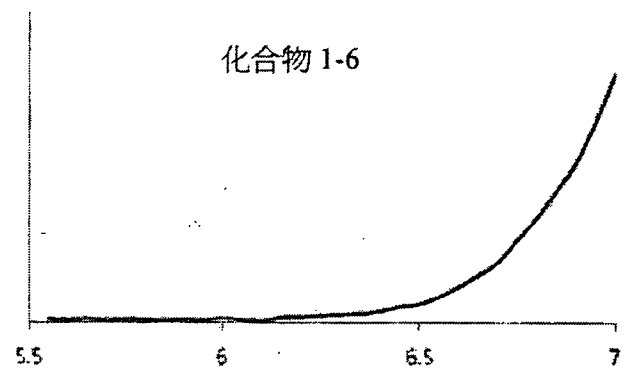
【圖7】



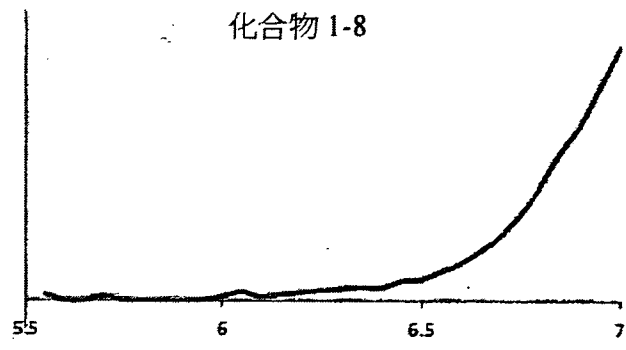
【圖8】



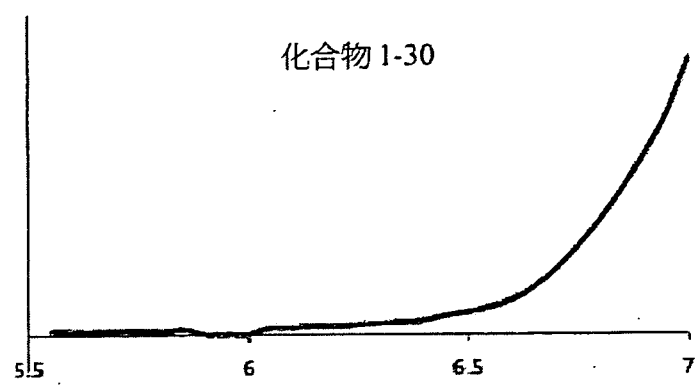
【圖9】



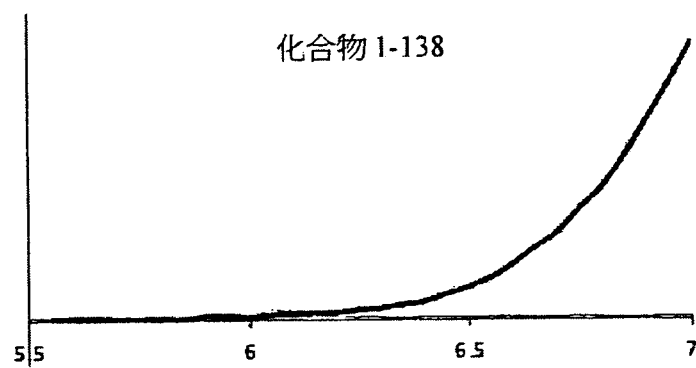
【圖10】



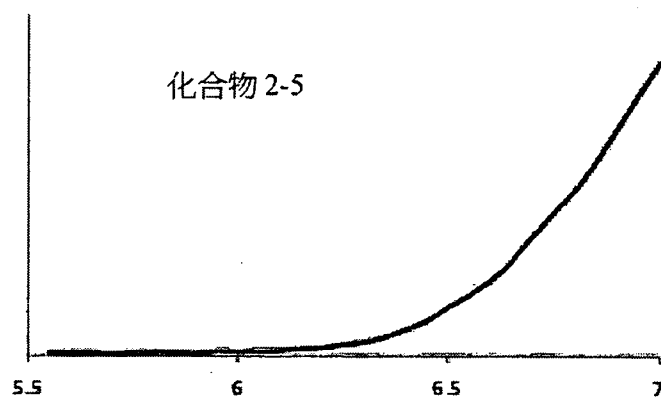
【圖11】



【圖12】



【圖13】



【圖14】