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(81) 指定国(除另有指明, 要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU,

(54) Title: ORGANIC ELECTROLUMINESCENT DEVICE, DISPLAY PANEL AND DISPLAY DEVICE

(54) 发明名称: 一种有机电致发光器件、显示面板及显示装置

CPL 650Å
Mg:Ag(1:9) 130Å
Yb 10Å
ETL 280Å
HBL 50Å
EML 420Å
EBL 350Å
HTL 1100 Å
HTL:HIL 3% 100Å
ITO/Ag/ITO

图 1

(57) Abstract: The present application relates to an organic electroluminescent device, a display panel and a display device. The organic electroluminescent device comprises a first electrode, a second electrode and an organic layer located between the first electrode and the second electrode, the organic layer comprising a light-emitting layer, the light-emitting layer containing a host material, a thermally activated delayed fluorescence sensitizer and a green fluorescent dye, and the green fluorescent dye having a structure as shown in formula I. The present application uses a thermally activated sensitized fluorescence technique, and uses the green fluorescent dye of a specific structure in combination with the sensitizer and the host material, so as to achieve the effects of narrowing the spectrum of a device and improving the green color purity. The efficiency of the device is equivalent to that of a phosphorescent green light device, so that a display panel containing the device has a large display color gamut area.

(57) 摘要: 本申请涉及一种有机电致发光器件、显示面板及显示装置, 所述有机电致发光器件包括第一电极、第二电极以及位于所述第一电极和第二电极之间的有机层; 所述有机层包括发光层, 所述发光层中含有主体材料、热活化延迟荧光敏化剂和绿色荧光染料, 所述绿色荧光染料具有式I所示的结构。本申请使用热活化敏化荧光技术, 选用特定结构的绿色荧光染料与敏化剂、主体材料搭配使用, 实现了窄化器件光谱、提高绿光色纯度的效果, 且器件具有与磷光绿光器件相当的效率, 使包含其的显示面板具有较高的显示色域面积。



CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW。

(84) 指定国 (除另有指明， 要求每一种可提供的地区保护)：ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 欧洲 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG)。

本国际公布：
— 包括国际检索报告 (条约第21条(3))。

一种有机电致发光器件、显示面板及显示装置

技术领域

本申请涉及有机电致发光技术领域，尤其涉及一种有机电致发光器件、显示面板及显示装置。

背景技术

在热活化敏化荧光发光（TASF，Thermally Activated Sensitized Fluorescence）体系中，当热活化延迟荧光（TADF）材料作为敏化剂使用时，主体材料能量传递给 TADF 材料，然后其三线态能量通过反向系间窜越（RISC）过程回到单线态，进而将能量传递给掺杂荧光染料发光，这样可以实现主体向染料分子完全的能量传递，使传统荧光掺杂染料也可以突破 25% 的内量子效率限制。

目前，绿光有机电致发光器件的染料大多为磷光材料，其半峰宽较宽，一般大于 50 nm，这样使得磷光材料的器件色纯度低，导致屏体的显示色域面积较小。

因此，本领域亟待开发一种窄光谱、高色纯度、高效率的绿光 TASF 器件以及具有较高色域显示面积的显示面板。

发明内容

本申请在于提供一种有机电致发光器件，特别涉及一种热活化延迟荧光绿光器件。所述有机电致发光器件使用 TASF 发光机制，搭配特定的荧光染料，实现了窄光谱、高色纯度的绿光发射，且器件效率较高。

一方面，本申请提供了一种有机电致发光器件，所述有机电致发光器件包括第一电极、第二电极以及位于所述第一电极和第二电极之间的有机层；

所述有机层包括发光层，所述发光层中含有主体材料、热活化延迟荧光敏化剂和绿色荧光染料，且所述绿色荧光染料具有式 I 所示的结构。

优选地，所述绿色荧光染料选自如下 C-1 至 C-204 所示的化合物中的任意一种。

优选地，所述热活化延迟荧光敏化剂的单线态和三线态能级差 ≤ 0.3 eV。

优选地，所述热活化延迟荧光敏化剂包括如下 T-1 至 T-99 所示的化合物中的任意一种或至少两种组合，所述 T-71、T-72 和 T-73 中，n 各自独立地为 1、2 或 3。

优选地，所述主体材料包括如下 GPH-1 至 GPH-80 所述的化合物中的任意一种或至少两种组合。

优选地，所述绿色荧光染料占发光层材料的质量比为 0.1~30%；

和/或，所述热活化延迟荧光敏化剂占发光层材料的质量比为 1~99%。

优选地，所述热活化延迟荧光敏化剂占发光层材料的质量比为 10~50%。

优选地，所述有机层还包括空穴注入层、空穴传输层、电子阻挡层、空穴阻挡层、电子传输层和电子注入层中的任意一种或至少两种组合。

第二方面，本申请提供了一种显示面板，所述显示面板中包含第一方面所述的有机电致发光器件。

第三方面，本申请提供了一种显示装置，所述显示装置中含有第二方面所述的显示面板。

本申请具有如下有益效果：

本申请提供了一种新型的有机电致发光器件，使用热活化敏化荧光技术，利用其敏化荧光材料的特性，同时选用具有式 I 结构的荧光染料与敏化剂和主体材料搭配。式 I 结构的荧光染料为一类硼氮共振材料，这类材料自身无 D-A（供体-给体）结构，且斯托克斯位移较小，发射光谱窄。本申请使用这类染料、主体、敏化剂的搭配组合，最终实现了窄化器件光谱、

提高器件色纯度的效果，且器件具有与磷光器件相当的效率，具有较高的电流效率。

本申请提供的包含上述有机电致发光器件的显示面板具有较大的显示色域面积。

附图说明

图 1 是实施例 1 提供的有机电致发光器件的结构示意图。

图 2 是应用例 1 提供的显示面板的结构示意图。

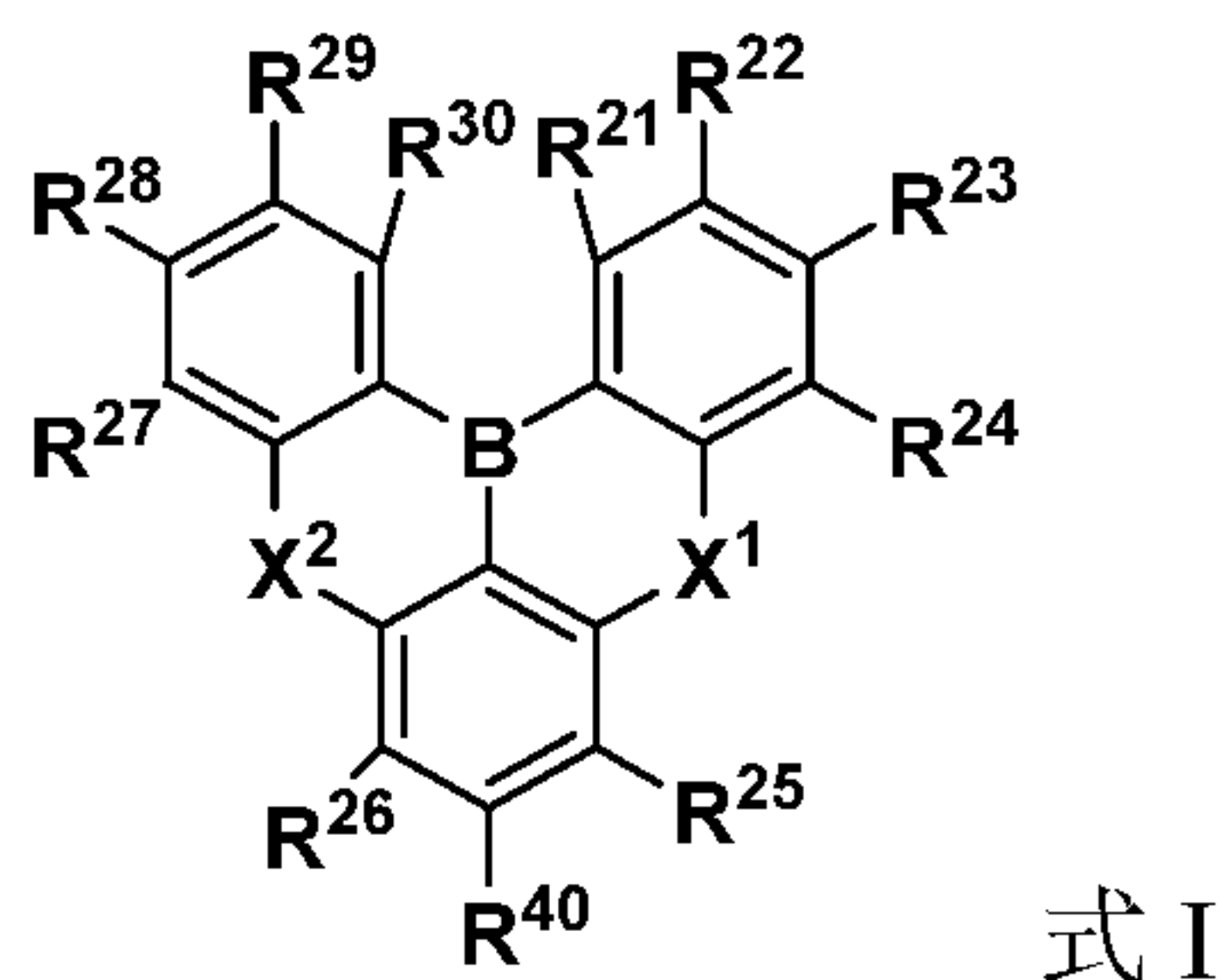
具体实施方式

为便于理解本申请，本申请列举实施例如下。本领域技术人员应该明了，所述实施例仅仅是帮助理解本申请，不应视为对本申请的具体限制。

目前，绿光有机电致发光器件的染料多为磷光染料，由于磷光材料自身的重原子效应，产生旋轨耦合，这样磷光材料通过系间穿越使得单重态能量传递到自身的三线态能量，再由三线态能量回到基态发光进而达成 100% 的内量子效应，从而使器件具有优异的器件效率。但是由于磷光材料自身重原子与相邻配体间的 MLCT³ 吸收，会使吸收光谱显著红移，磷光材料的半峰宽相比荧光材料会较宽，一般大于 50 nm，这样使得磷光材料的器件色纯度低，导致屏体的显示色域面积较小。

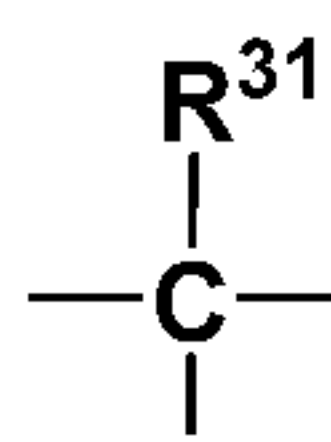
为此，本申请提供了一种有机电致发光器件，有机电致发光器件包括第一电极、第二电极以及位于第一电极和第二电极之间的有机层；

有机层包括发光层 (EML)，发光层中含有主体材料、热活化延迟荧光敏化剂和绿色荧光染料，且绿色荧光染料具有式 I 所示的结构：

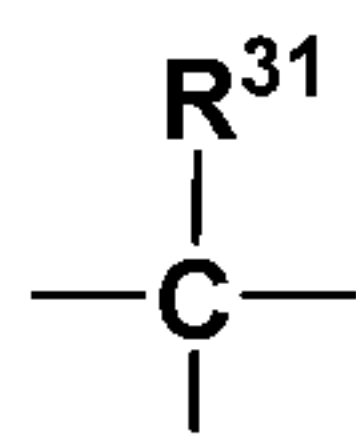


式 I

式 I 中，X¹ 为 NR¹，X² 为 NR²，R¹ 和 R² 各自独立地选自取代或未取代的下述基团中的一种：C1-C10 烷基、C6-C30 单环芳基、C10-C30 稠环芳基、C5-C30 单环杂芳基或 C8-C30



稠环杂芳基，且 R¹ 和 R² 各自独立地通过 -O-、-S-、 或单键与相邻的苯环键接或者不与相邻的苯环键接；



上述 -O-、-S- 和 中支出的短直线代表连接位置，不代表甲基；上述“相邻的苯环”指的是式 I 中显示的三个苯环，R¹ 和 R² 可以和其键接，也可以不与其键接；

R²¹、R²²、R²³、R²⁴、R²⁵、R²⁶、R²⁷、R²⁸、R²⁹、R³⁰、R³¹ 和 R³² 各自独立地选自氢、氘或者取代或未取代的下述基团中的一种：C6-C48 单环芳基、C10-C48 稠环芳基、C3-C48 单环杂芳基、C6-C48 稠环杂芳基、C6-C30 芳基氨基、C3-C30 杂芳基氨基、C1-C36 烷基或 C1-C6 烷氧基，且 R²¹ 至 R³⁰ 不同时为氢，并且 R²¹ 至 R³⁰ 中相邻的两个基团彼此不键合或键合形成取代或未取代的下述基团中的一种：C1-C10 环烷基、C6-C30 芳基或 C5-C30 杂芳基；R²¹ 至 R³⁰ 彼此之间可以键合，也可以不键合，即仅以单取代的方式存在；

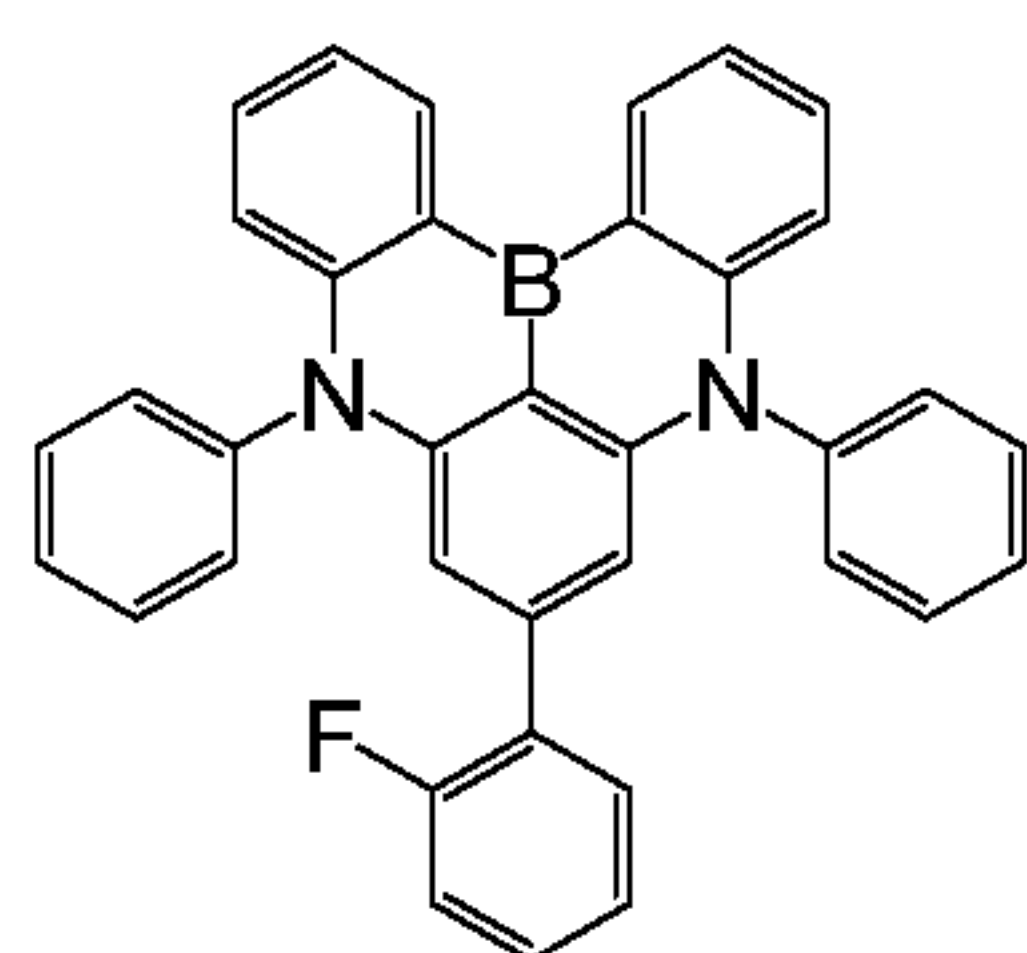
R^{40} 选自取代或未取代的 C6-C48 单环芳基、取代或未取代的 C10-C48 稠环芳基、取代或未取代的 C3-C48 含氮单环杂芳基、取代或未取代的 C6-C48 含氮稠环杂芳基中的一种；

当上述基团被取代基取代时，取代基各自独立地选自 C1-C10 烷基、C3-C10 环烷基、C2-C10 烯基、C1-C6 烷氧基、C1-C6 硫代烷氧基、C6-C30 单环芳基、C10-C30 稠环芳基、C3-C30 单环杂芳基或 C6-C30 稠环杂芳基中的一种。

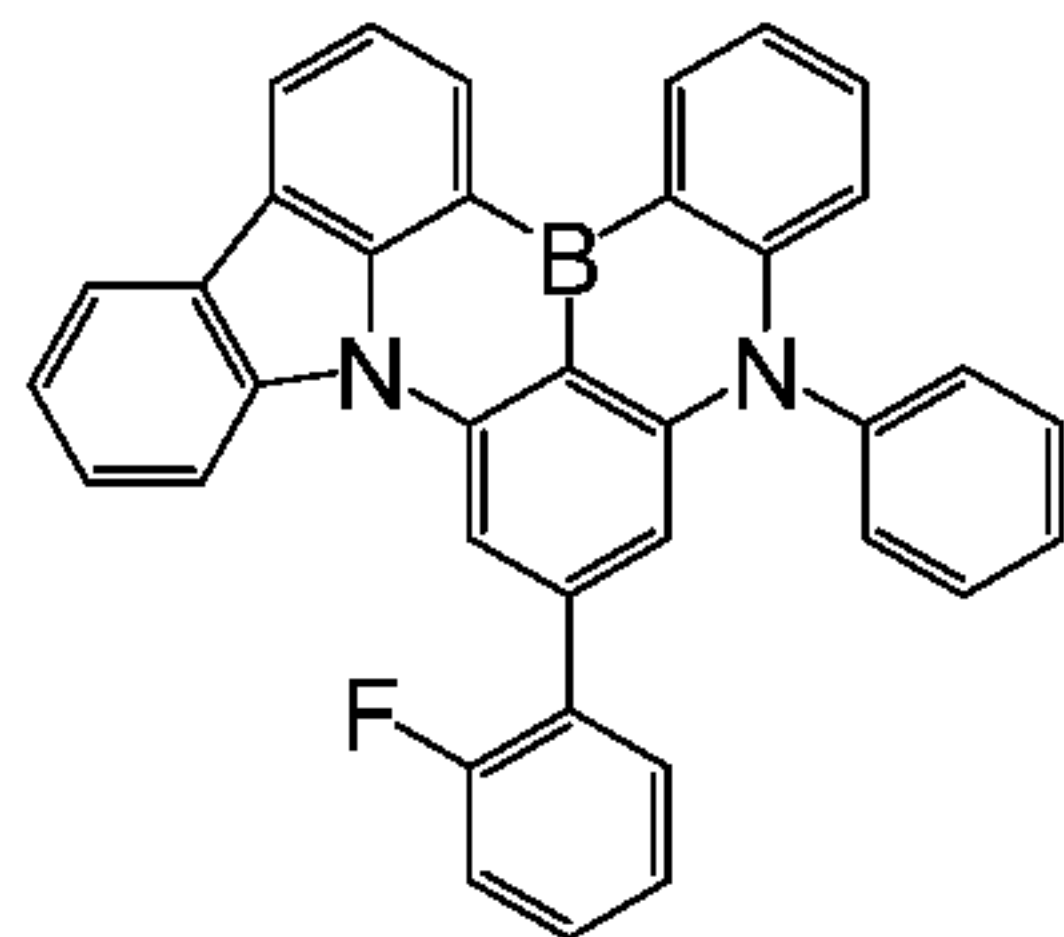
本申请提供了一种新型的有机电致发光器件，使用热活化敏化荧光技术，利用其敏化荧光材料的特性，同时选用具有式 I 结构的荧光染料与敏化剂和主体材料搭配。式 I 结构的荧光染料为一类硼氮共振材料，这类材料自身无 D-A 结构，且斯托克斯位移较小，发射光谱窄，使用这类染料、主体、敏化剂的搭配组合，最终实现了窄化器件光谱、提高器件色纯度的效果，且器件具有与磷光器件相当的效率，具有较高的电流效率。

进一步地，绿色荧光染料的半峰宽为 10~45 nm，例如 15 nm、20 nm、25 nm、30 nm、35 nm、40 nm 等。较窄的半峰宽起到窄化器件光谱、提高绿光色纯度的作用。

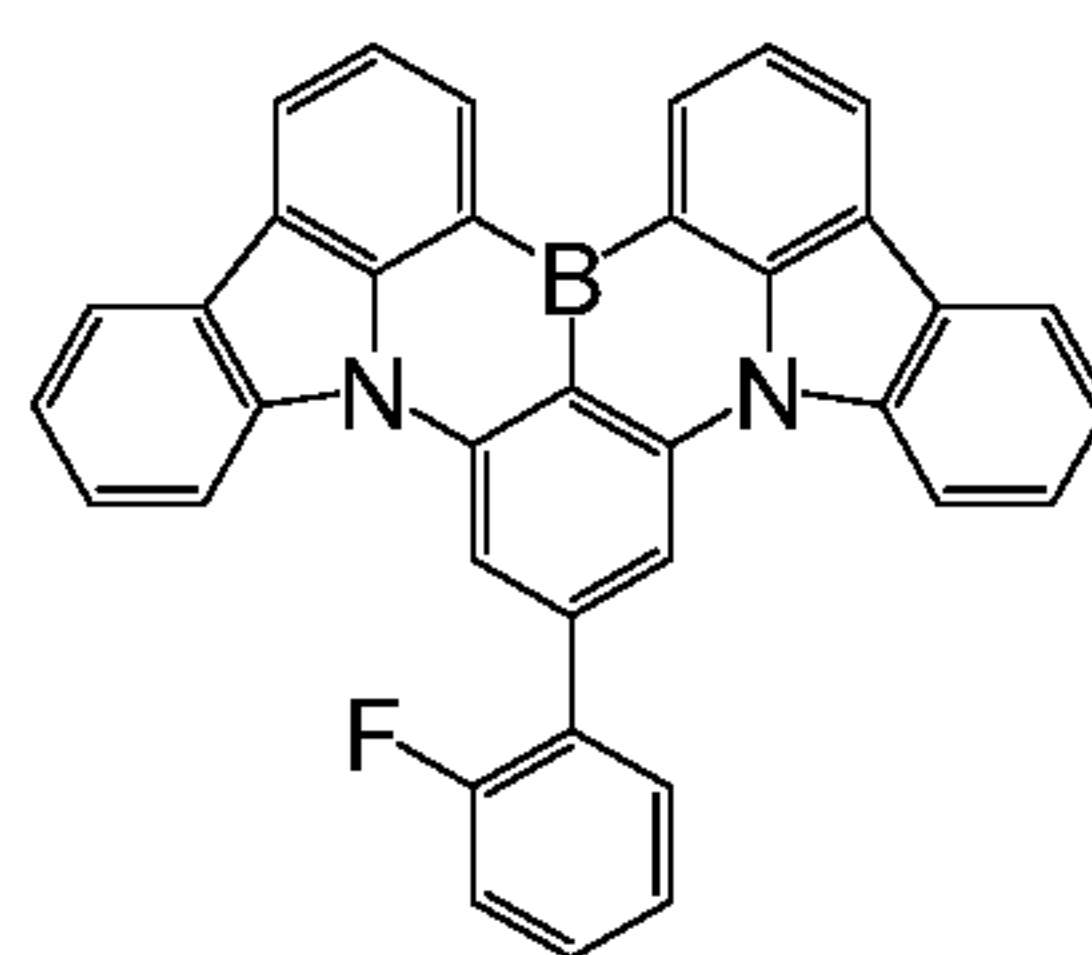
进一步地，绿色荧光染料选自如下 C-1 至 C-204 所示的化合物中的任意一种：



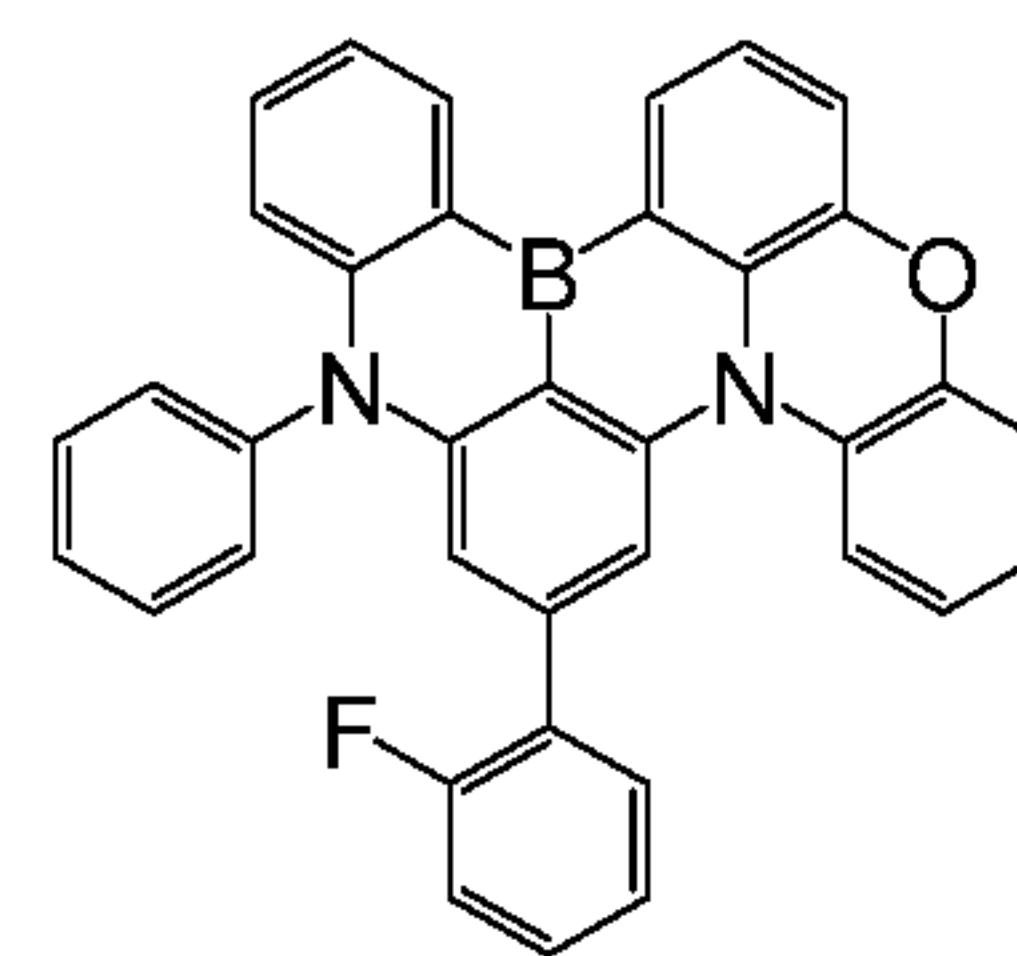
C-1



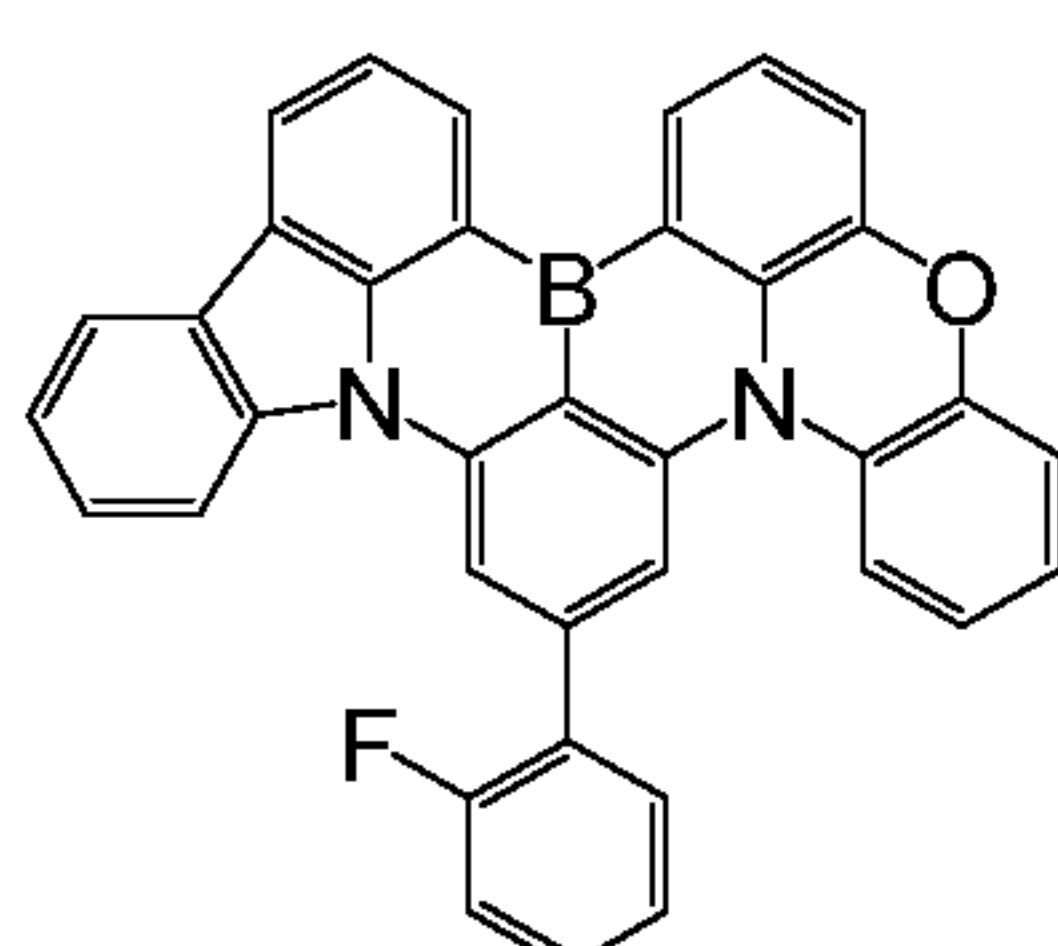
C-2



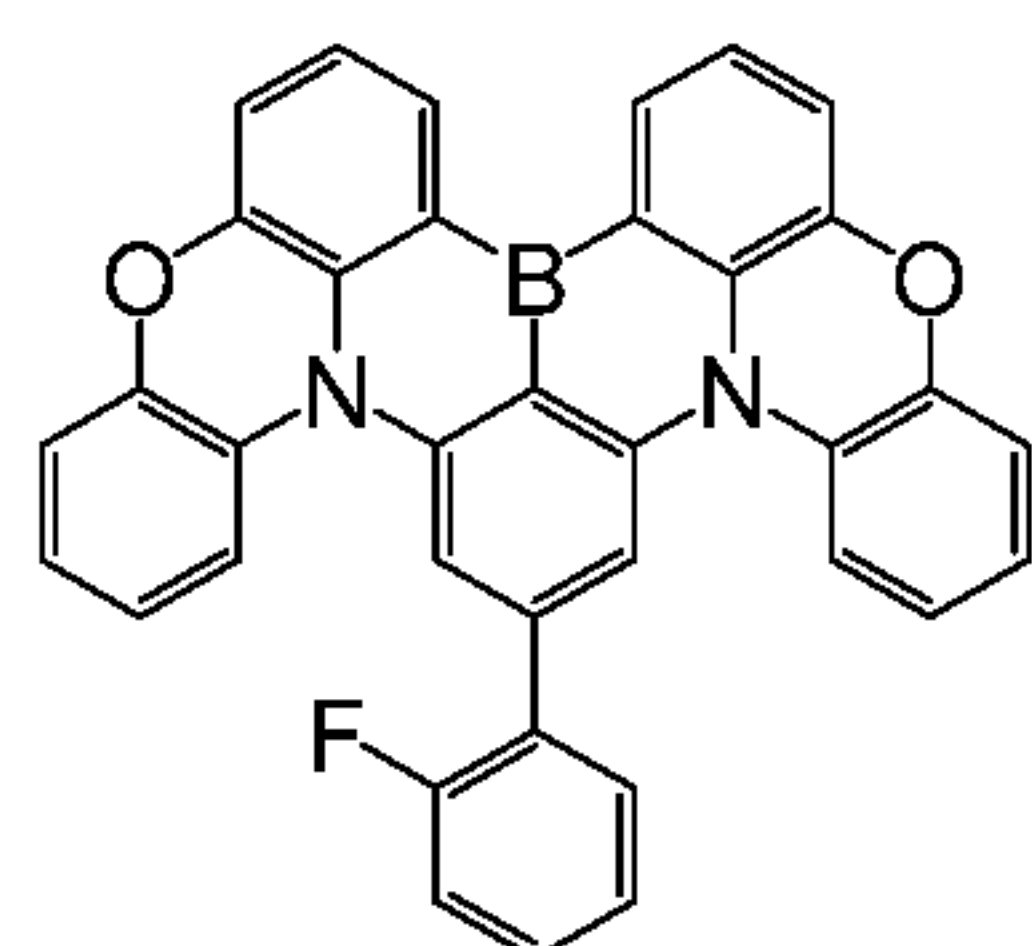
C-3



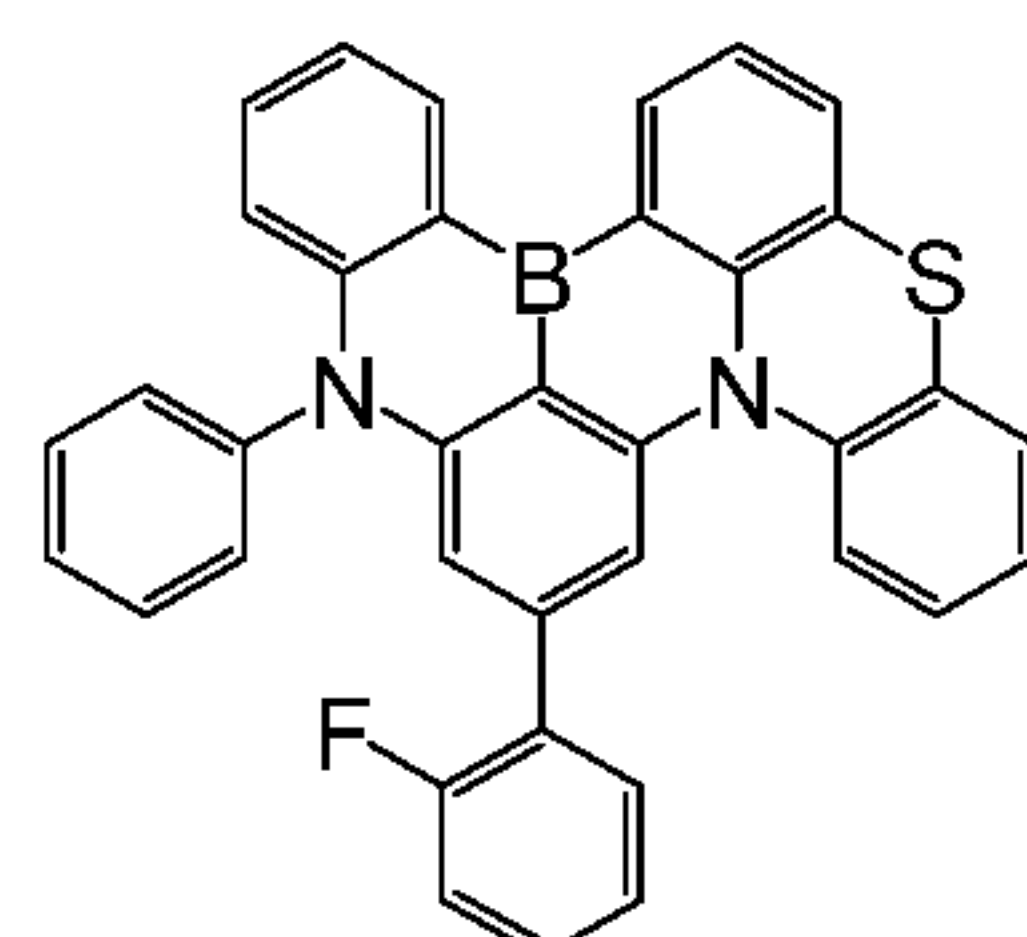
C-4



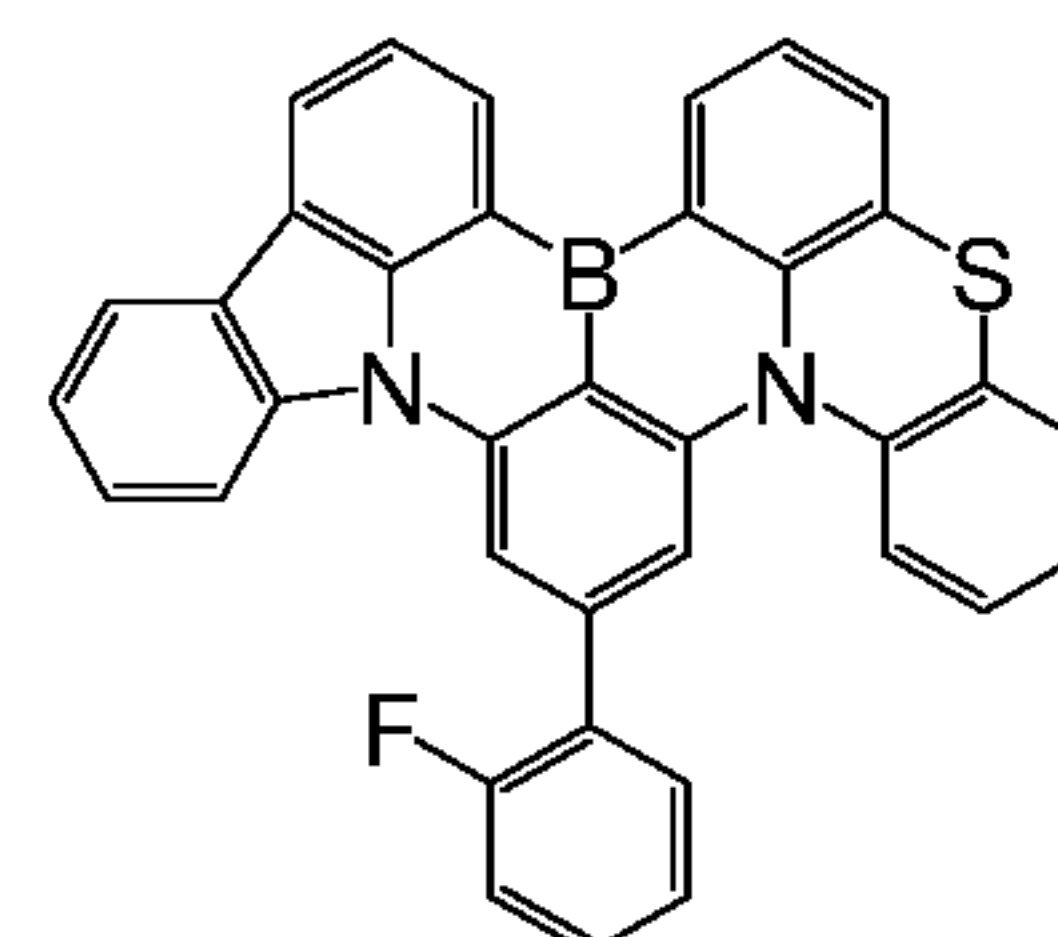
C-5



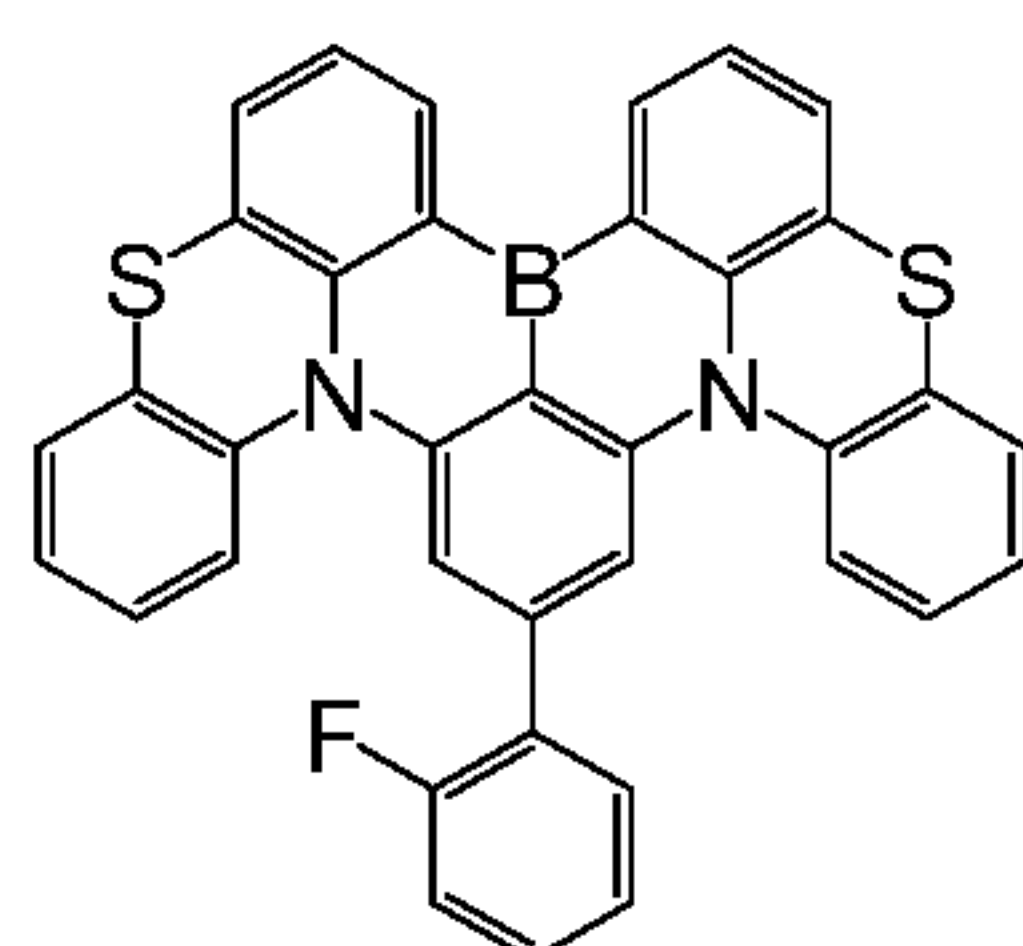
C-6



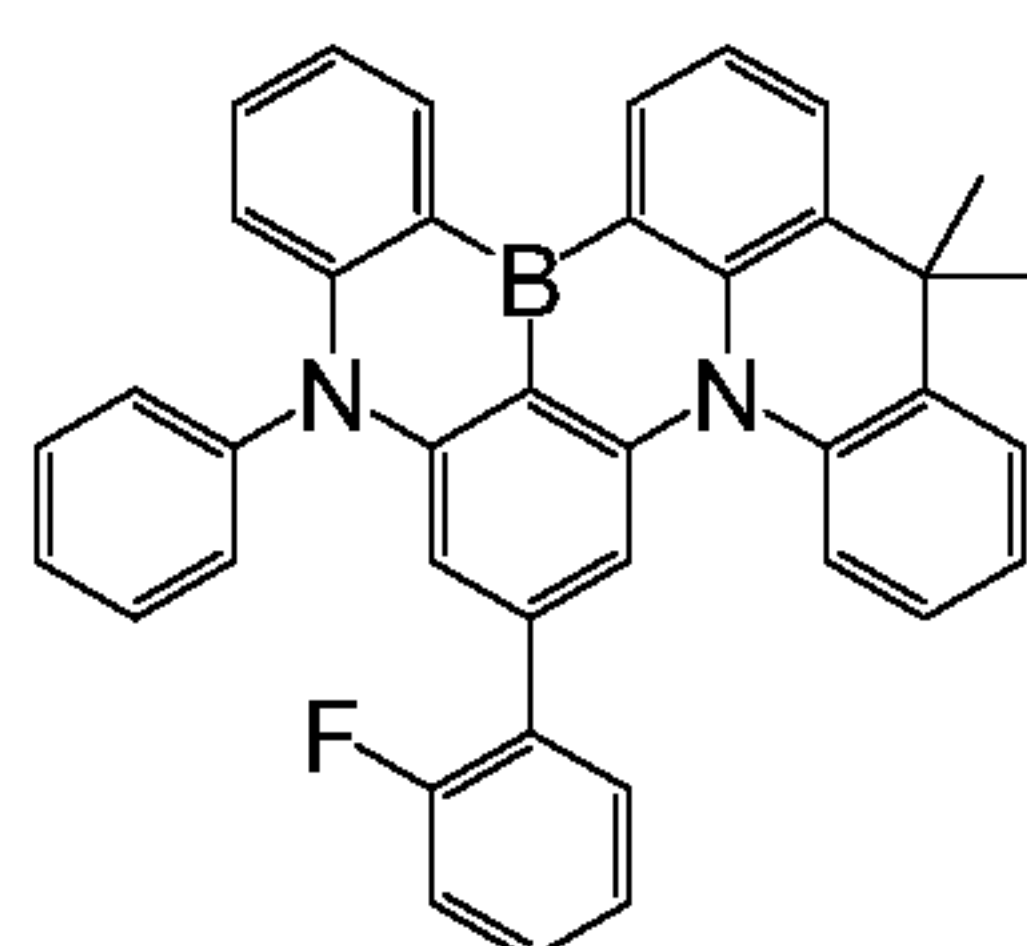
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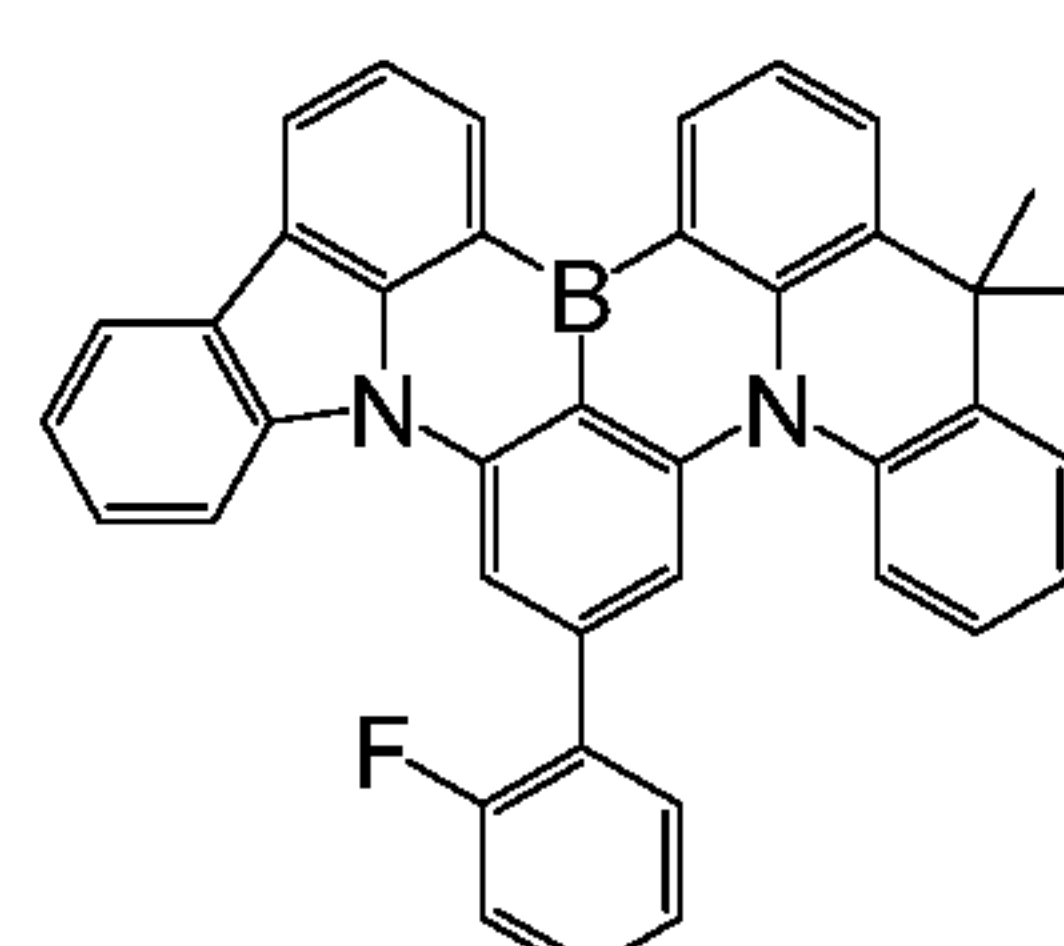
C-8



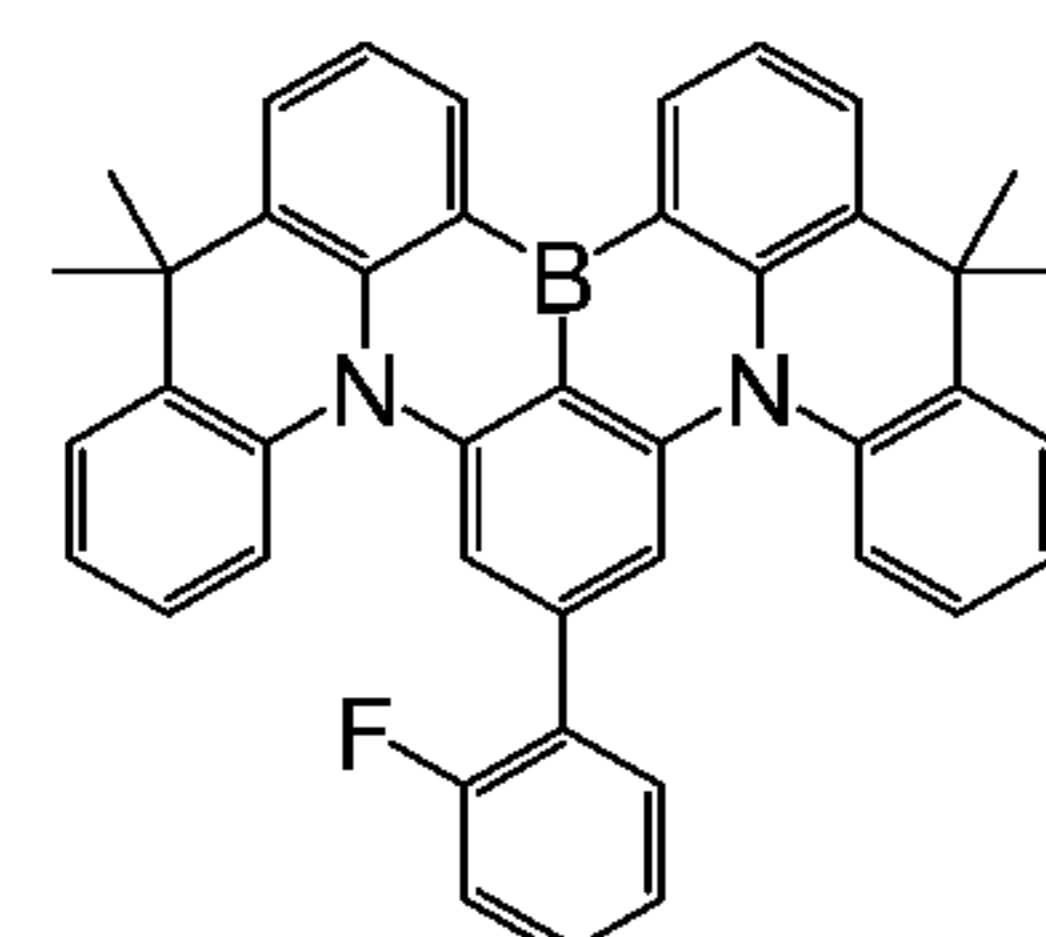
C-9



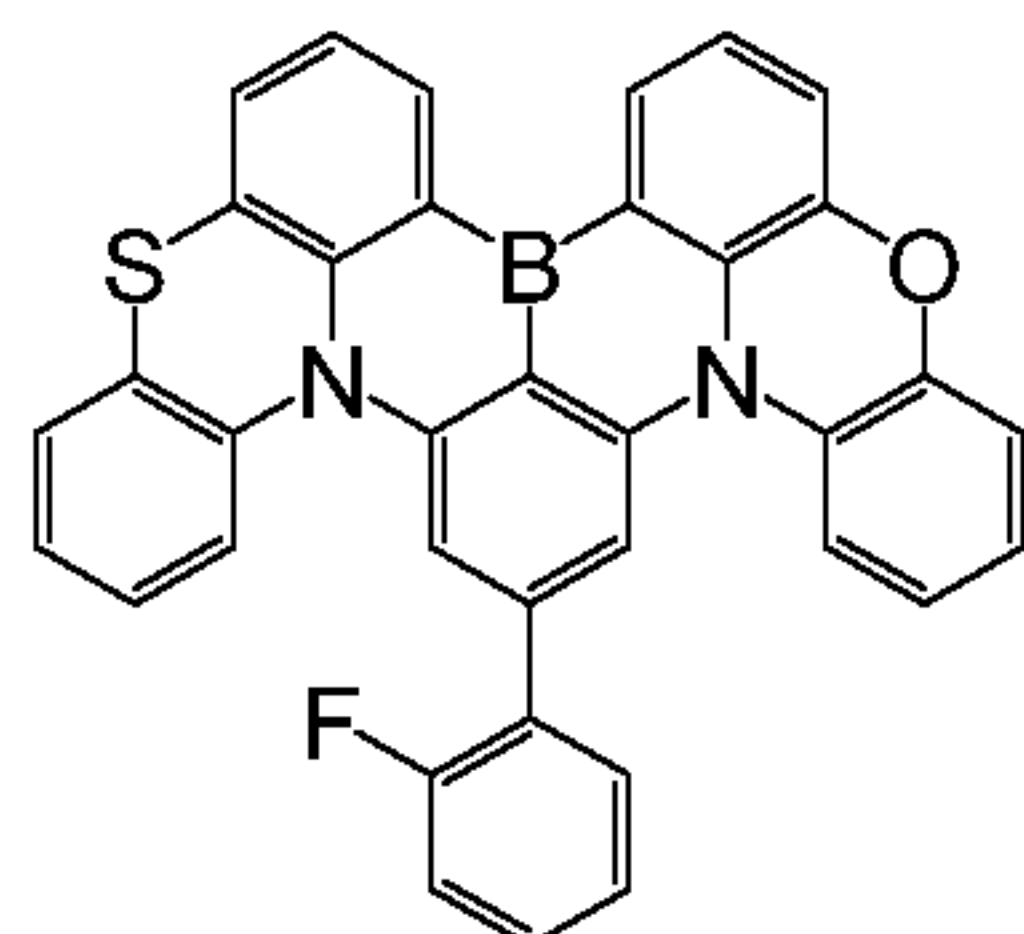
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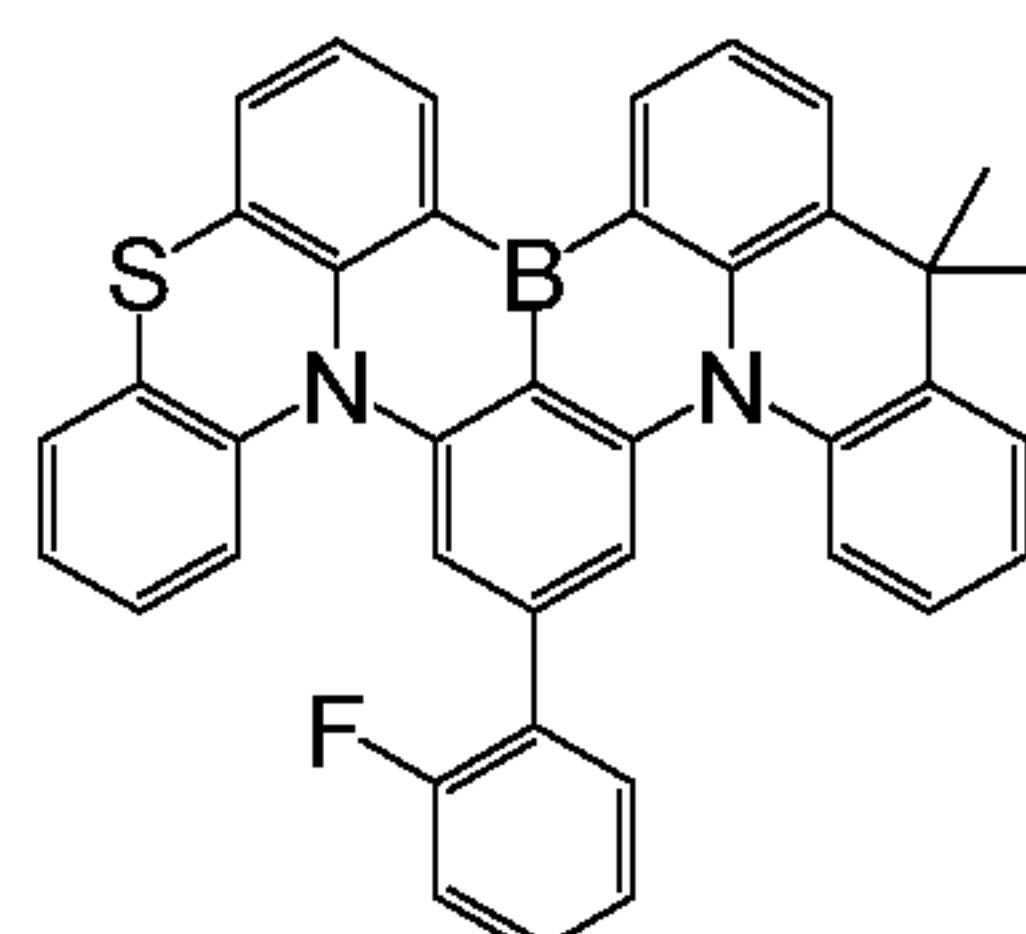
C-11



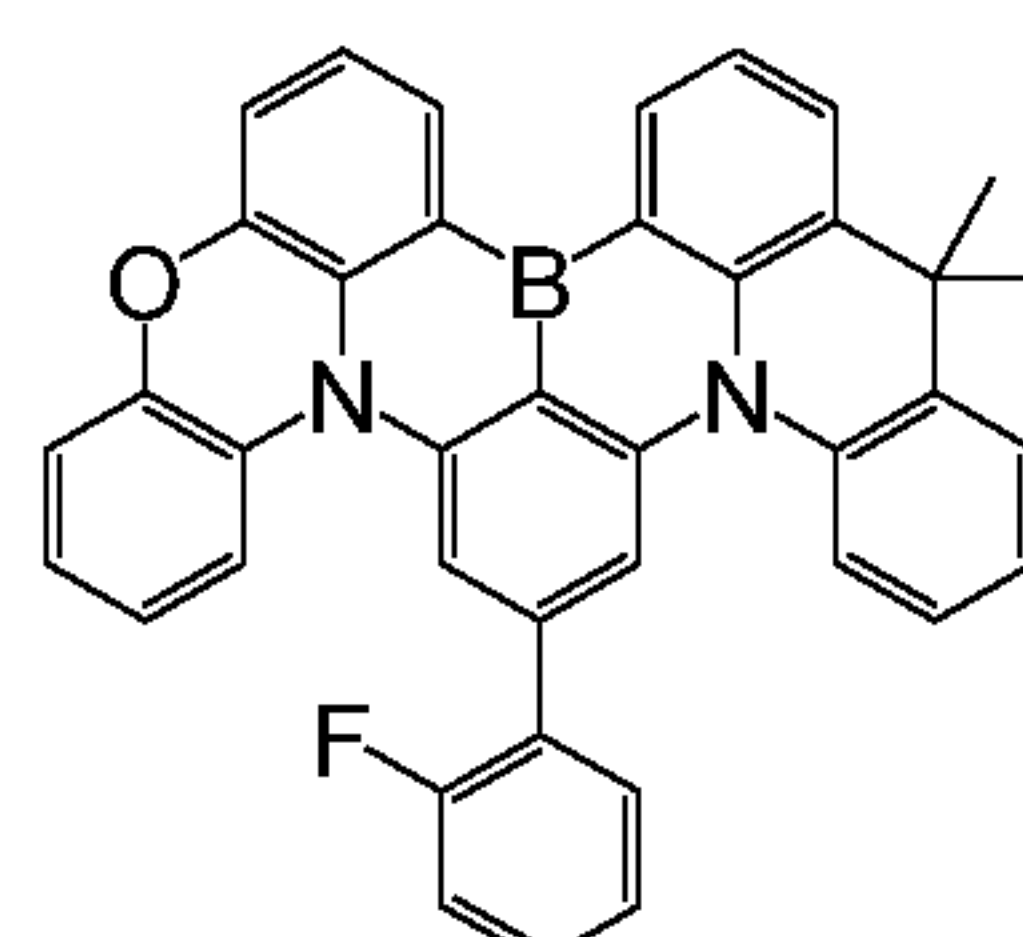
C-12



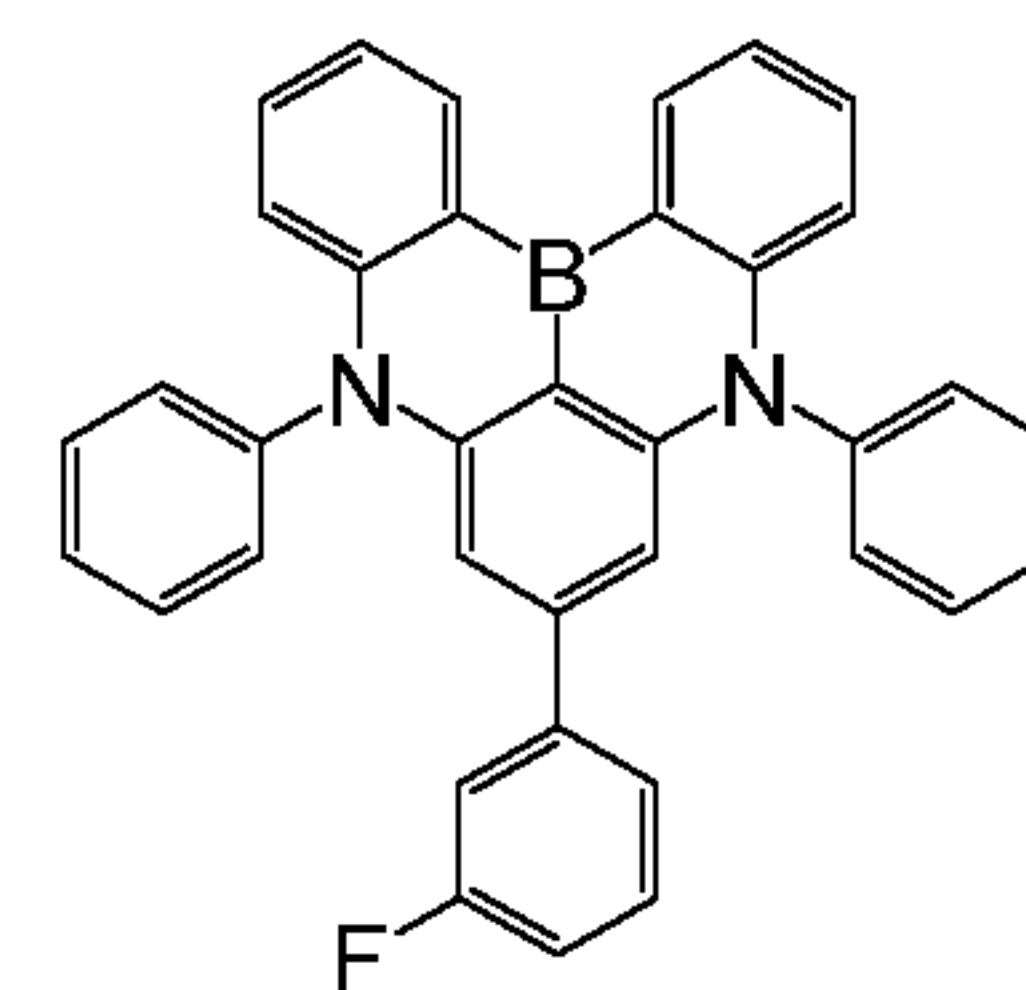
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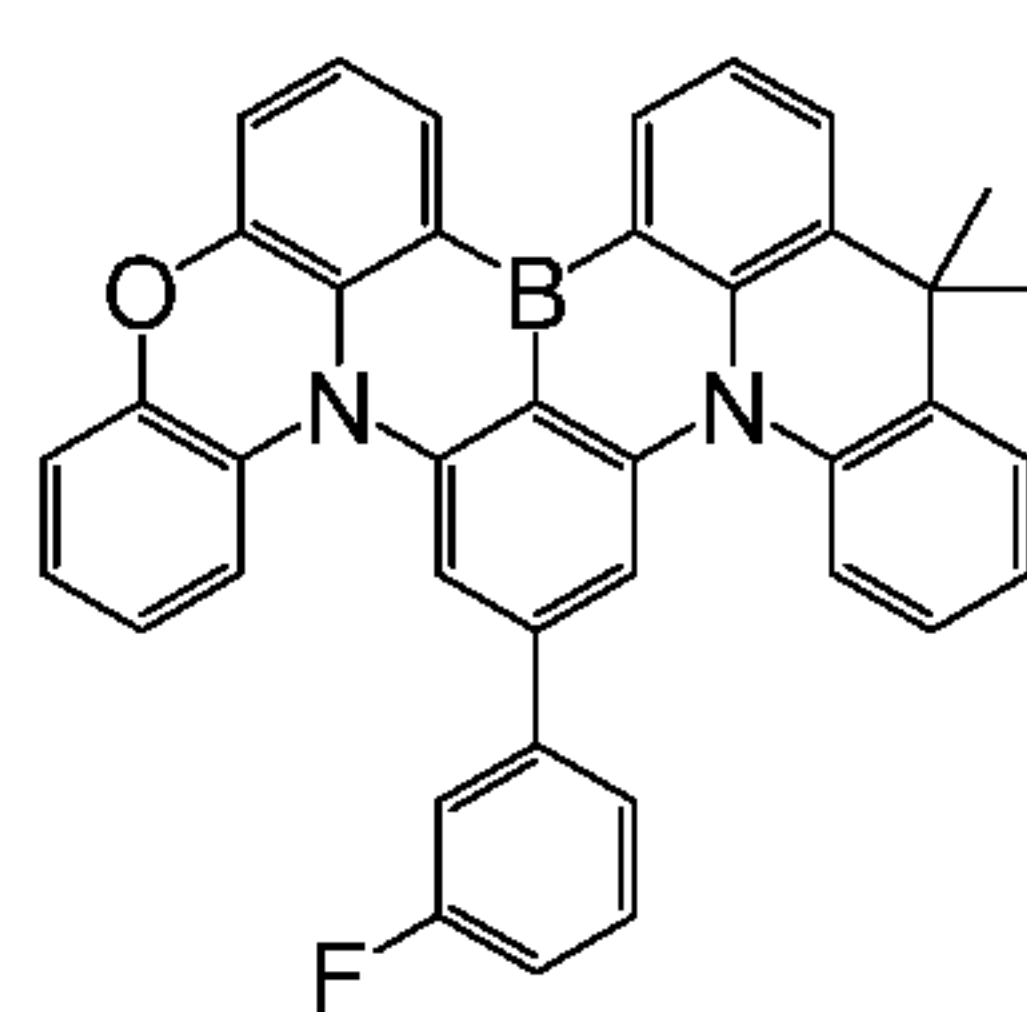
C-14



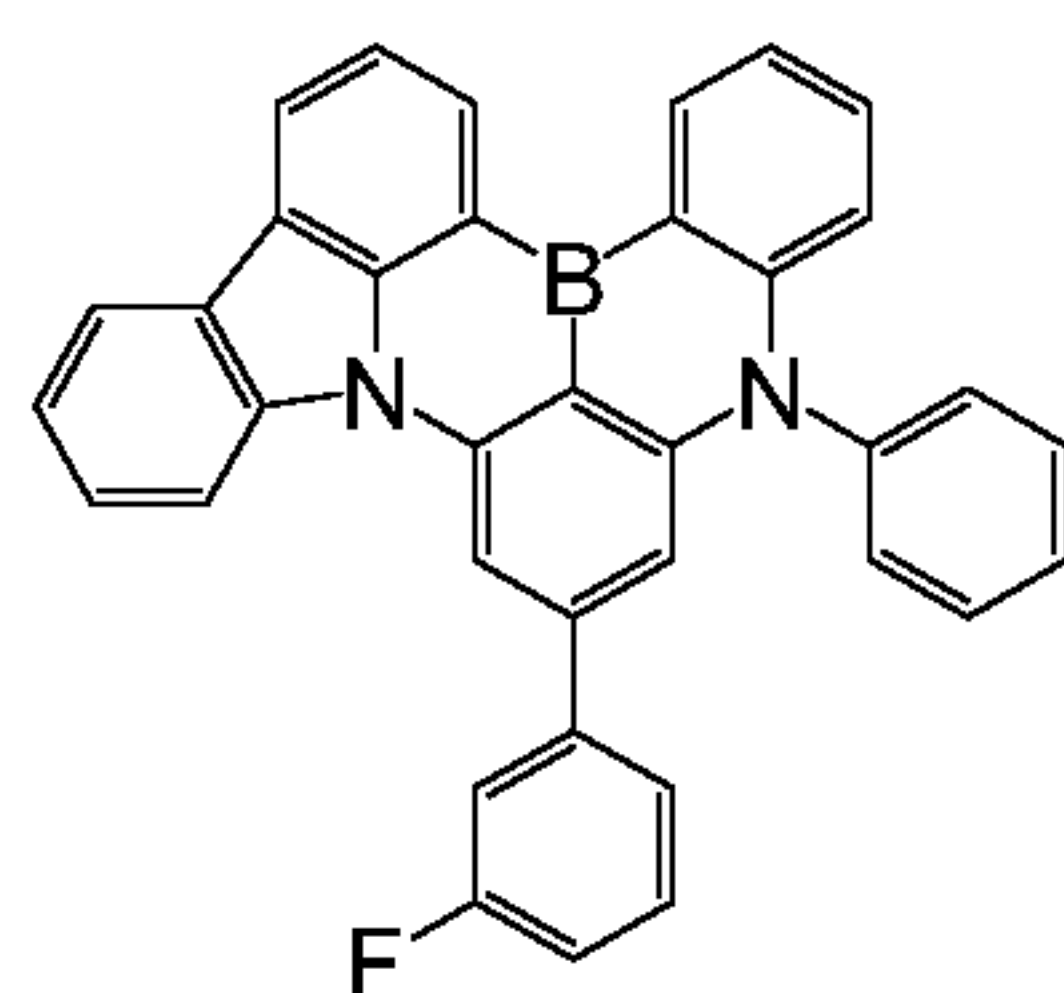
C-15



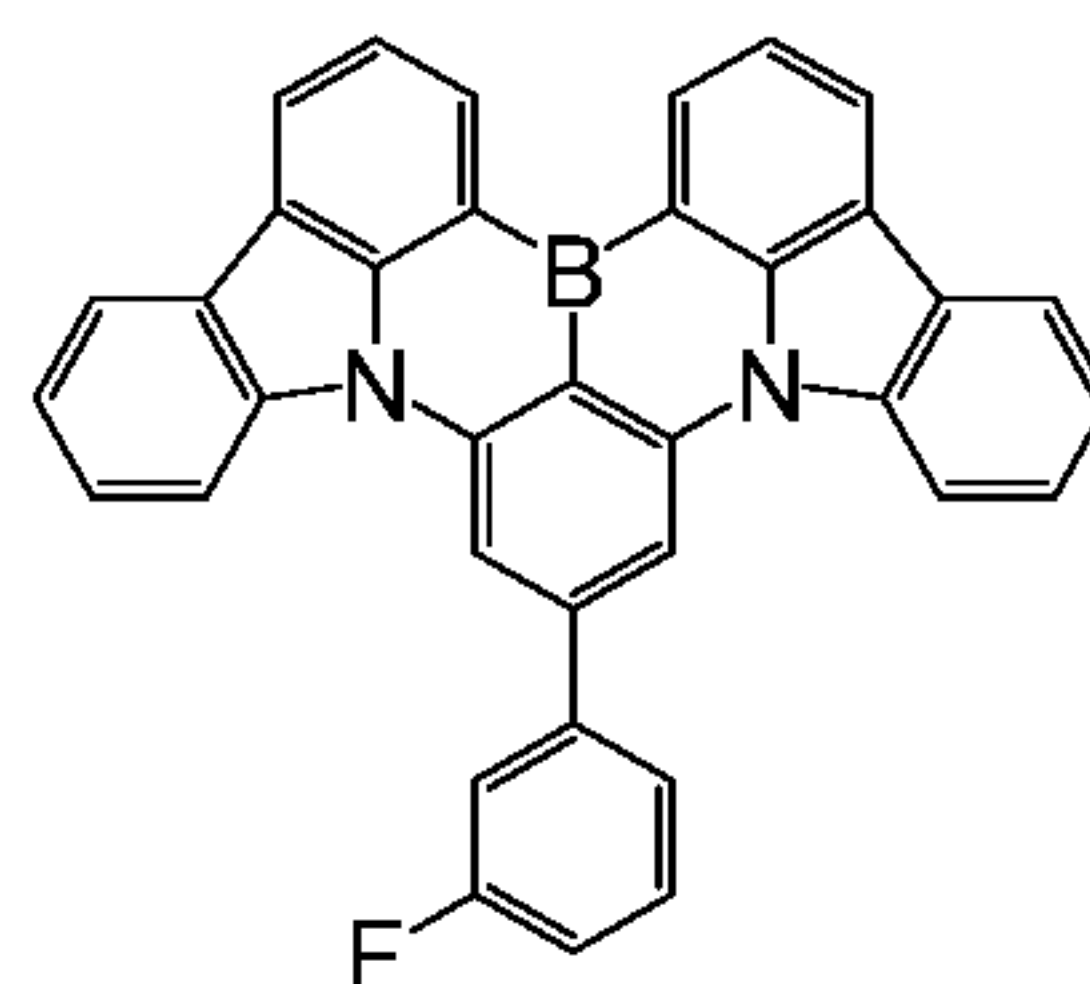
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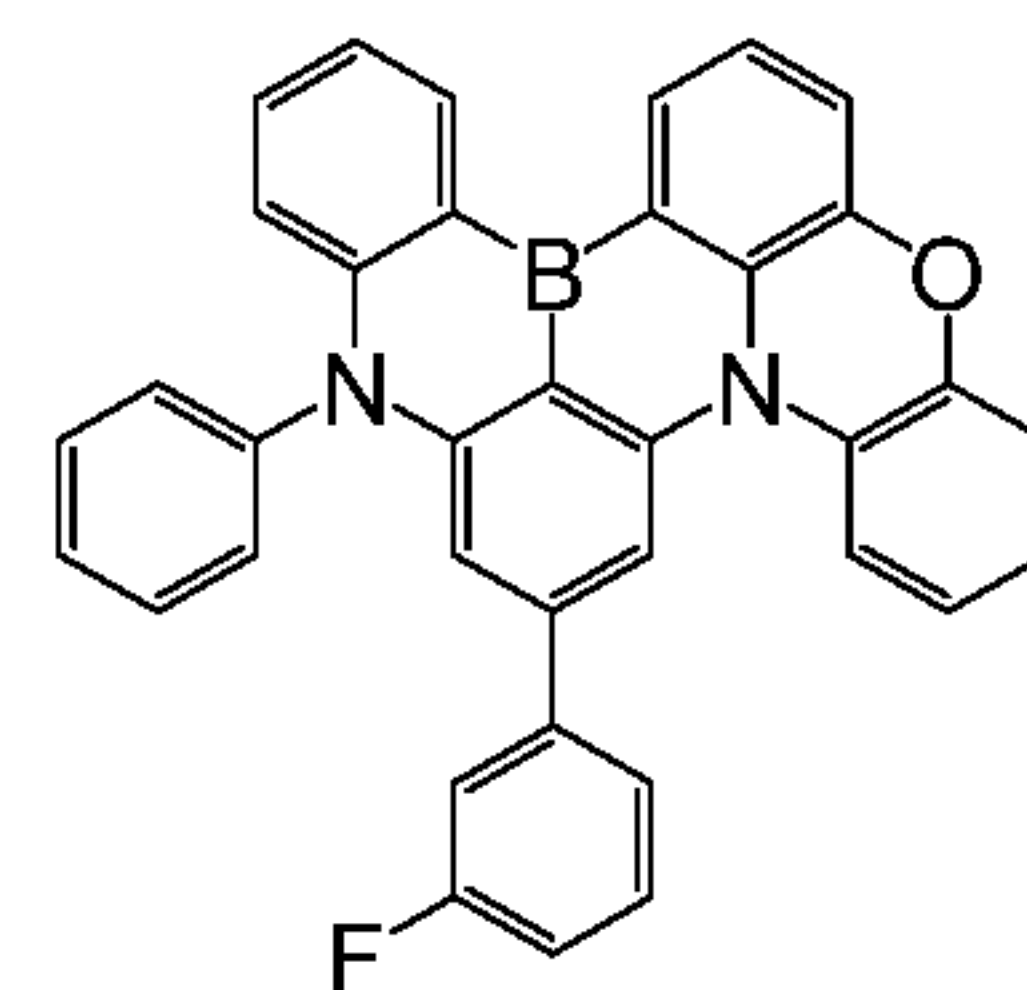
C-17



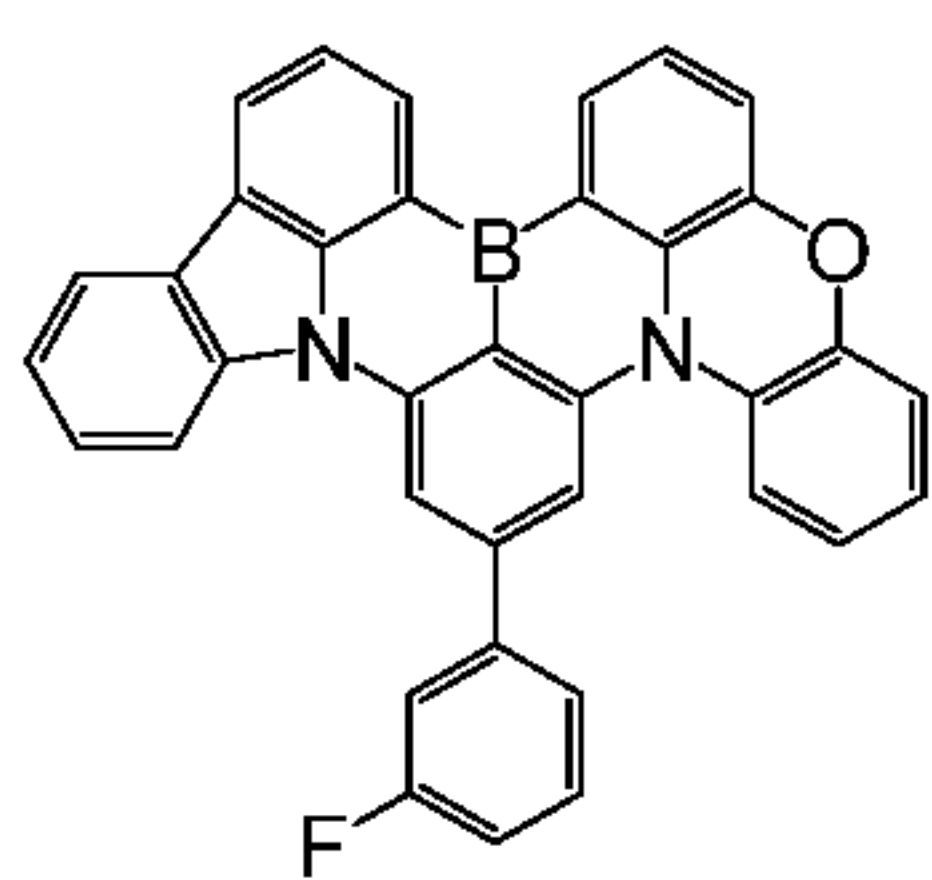
C-18



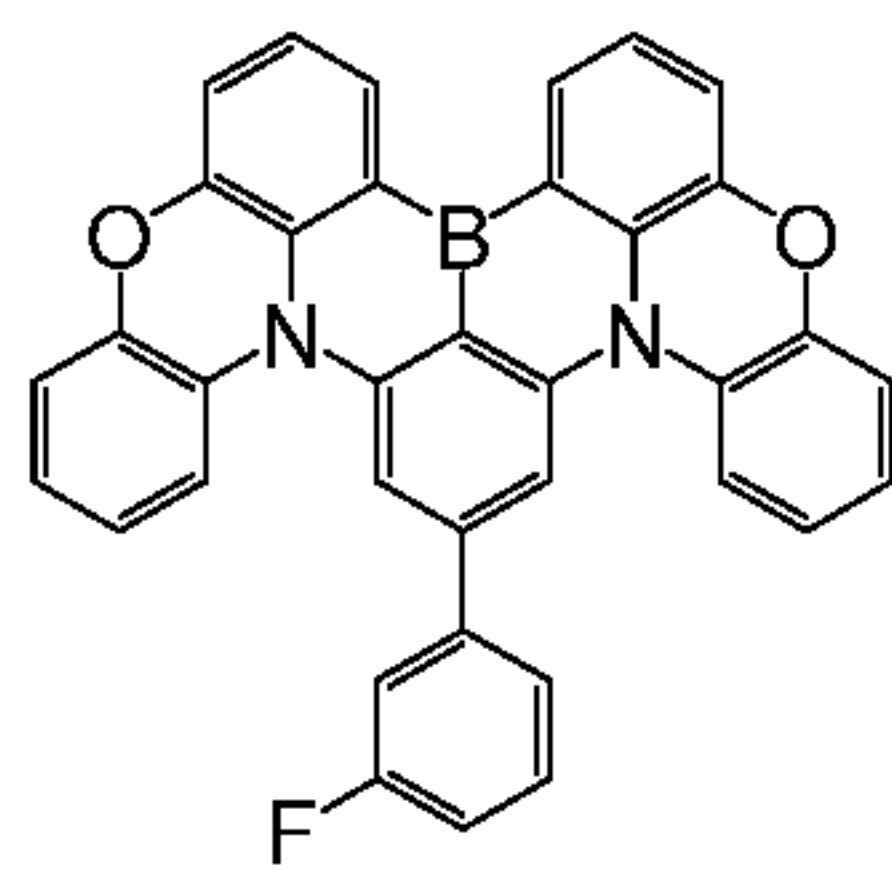
C-19



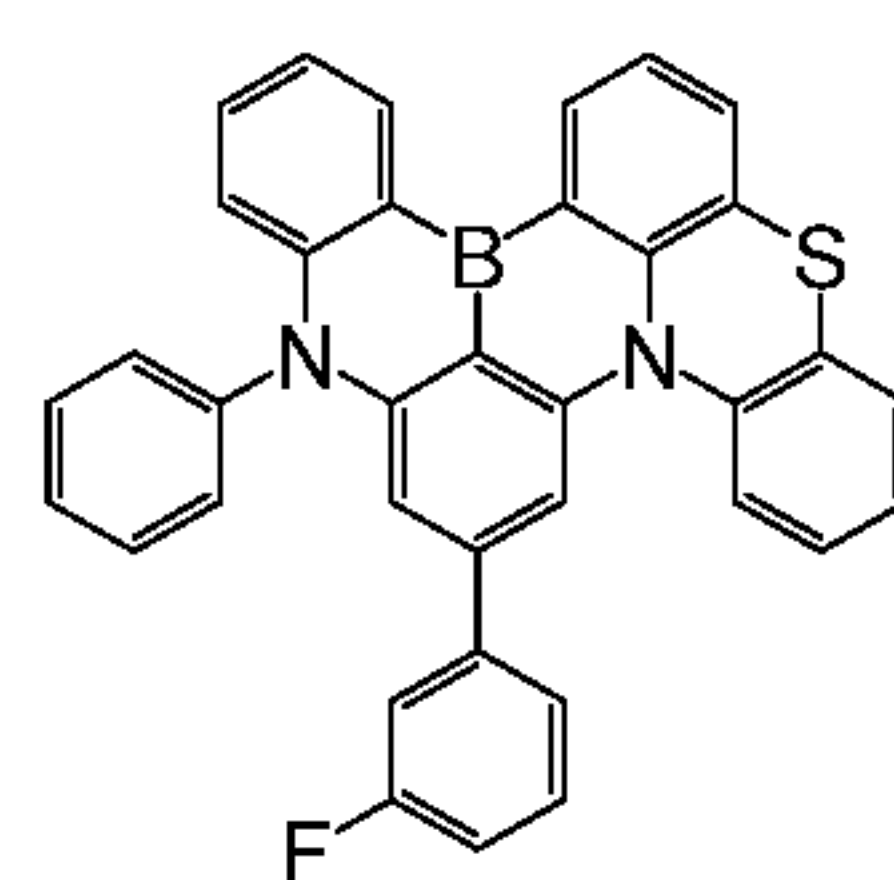
C-20



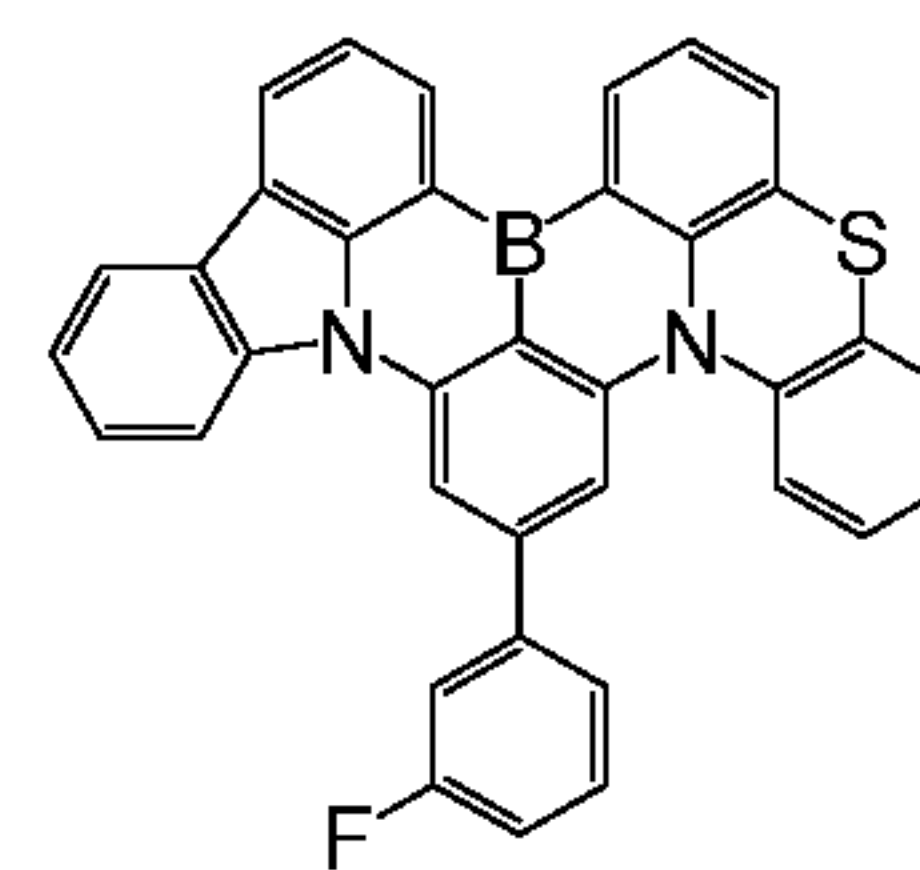
C-21



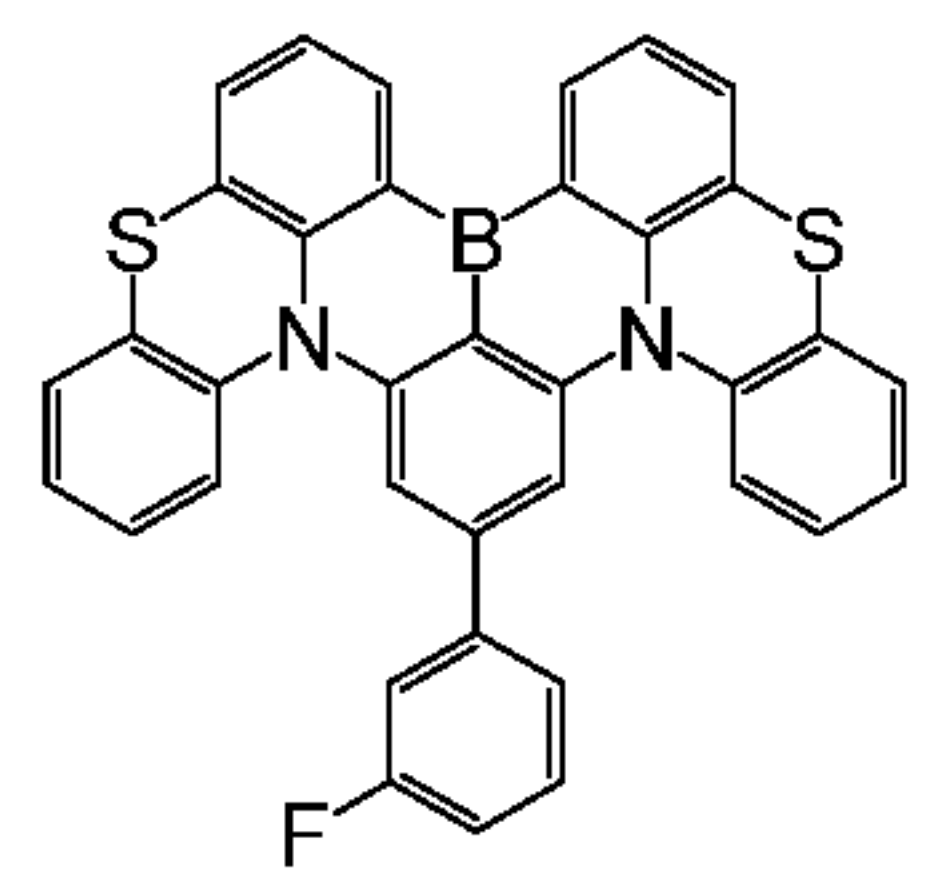
C-22



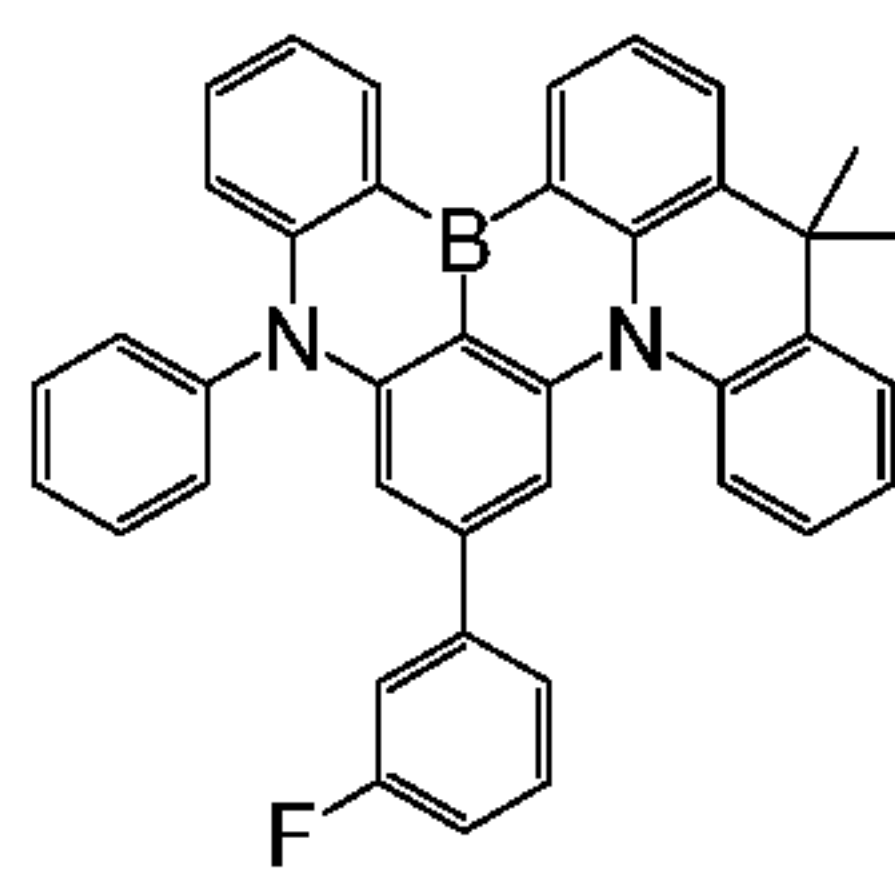
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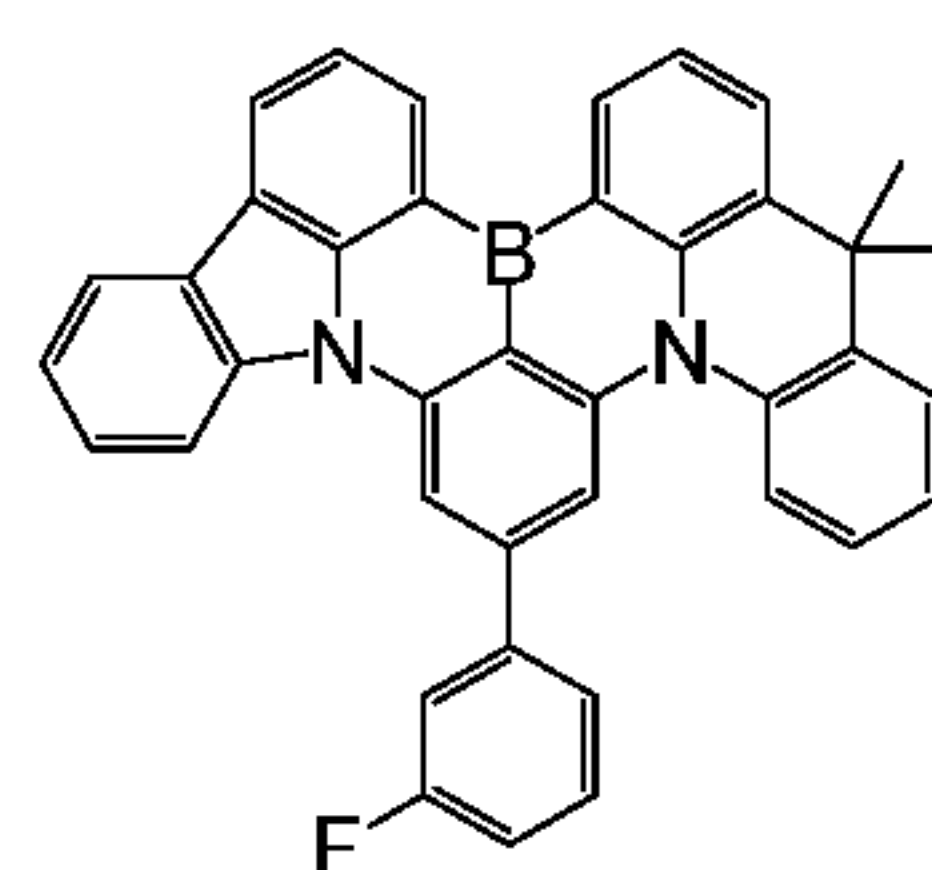
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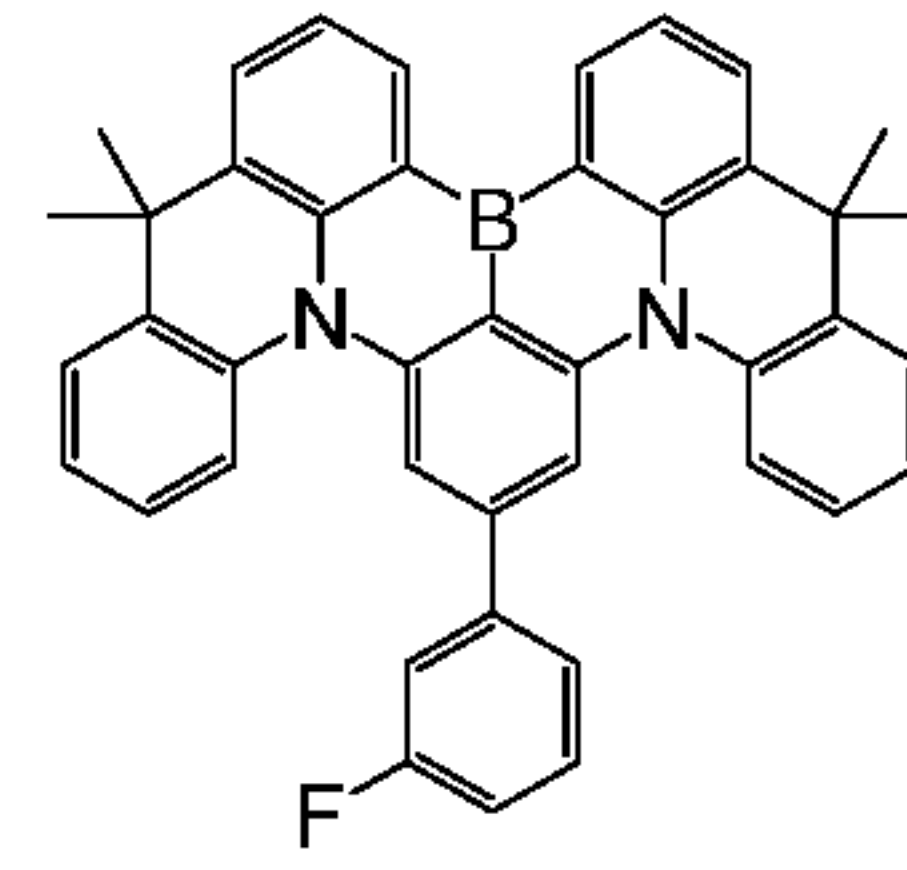
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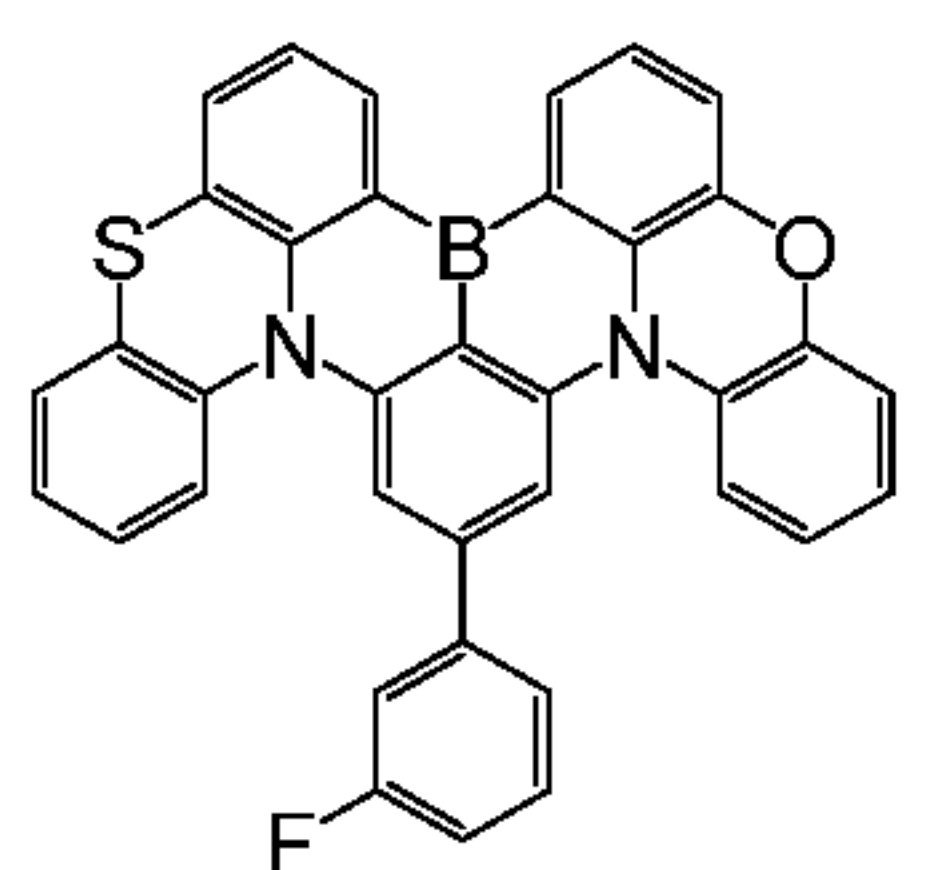
C-26



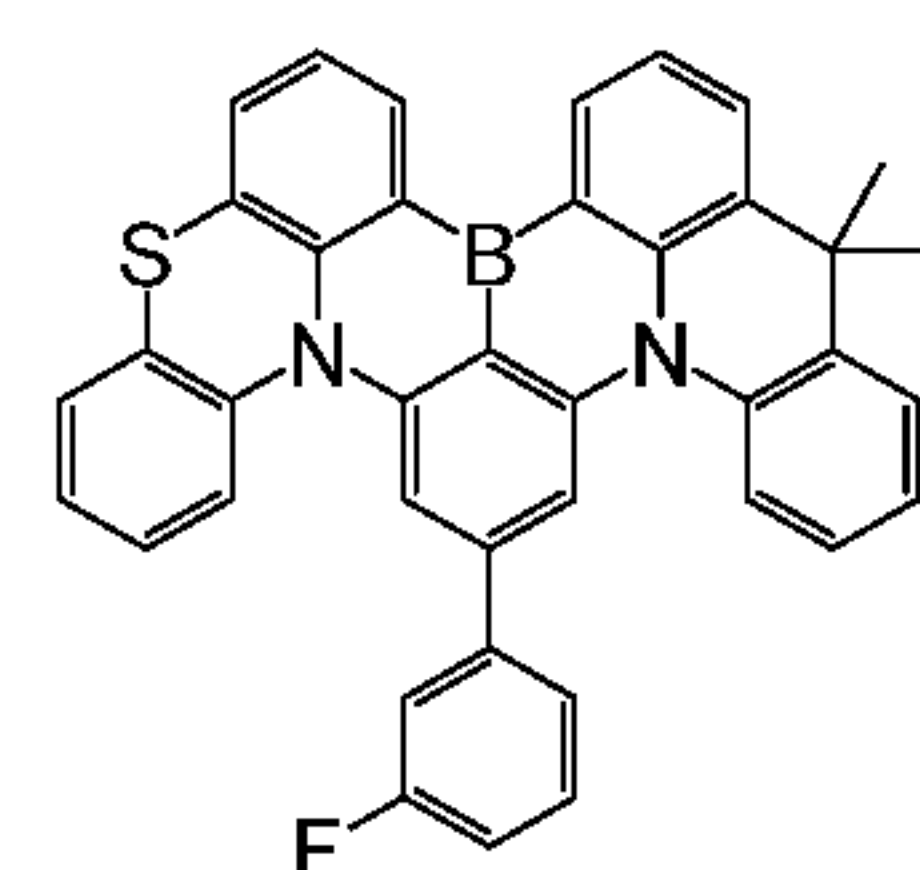
C-27



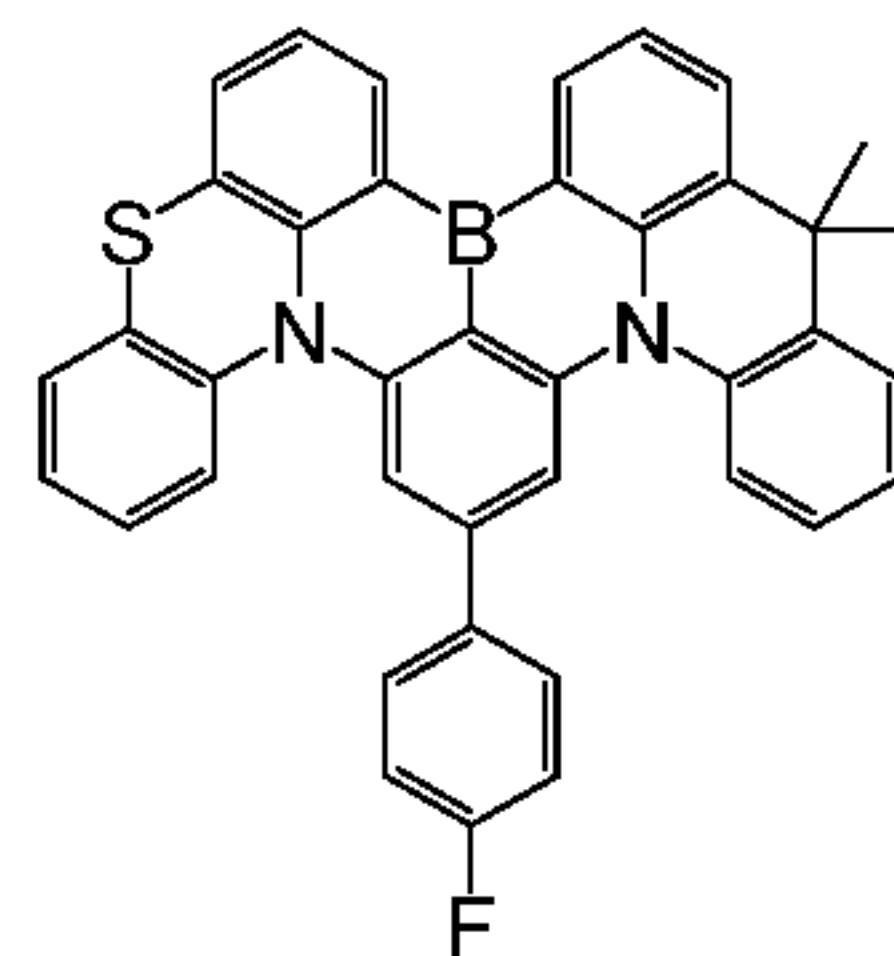
C-28



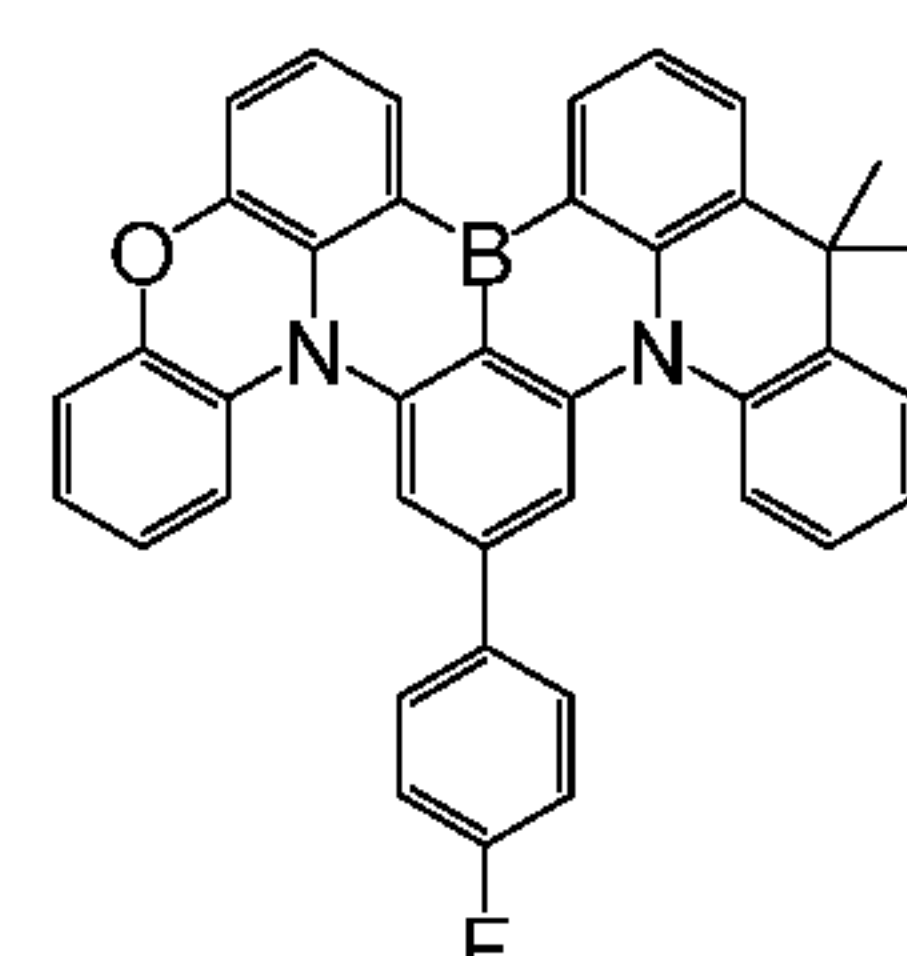
C-29



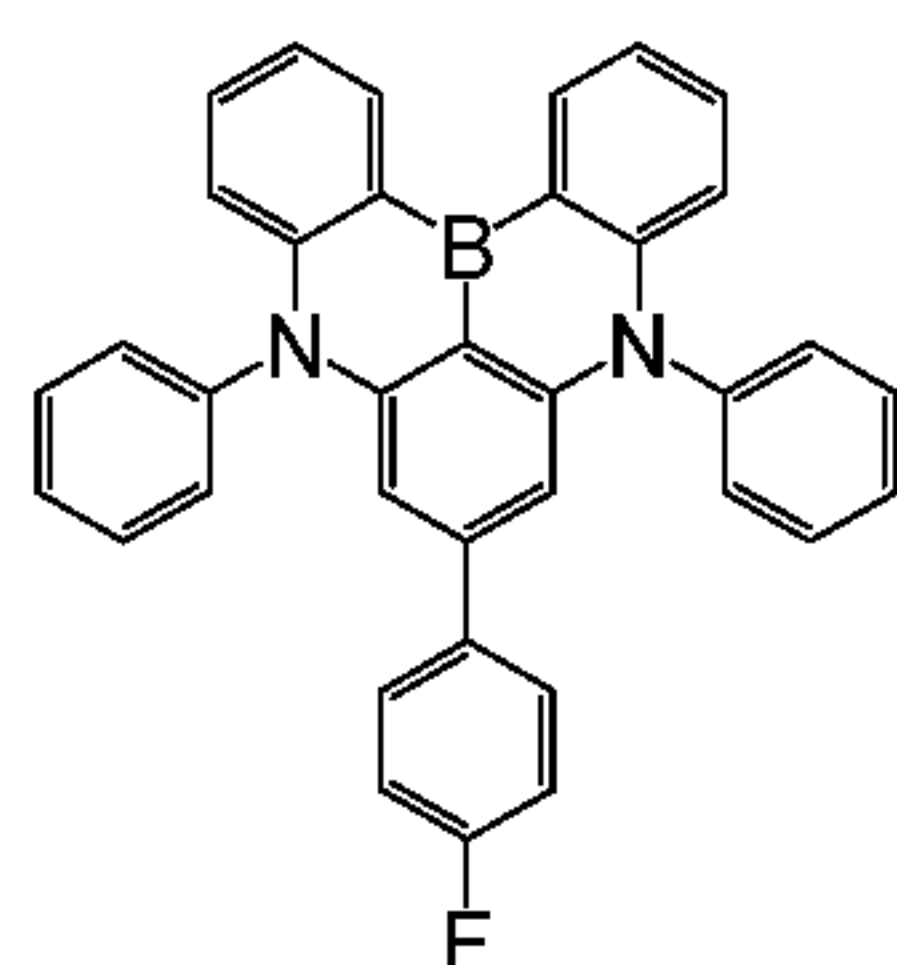
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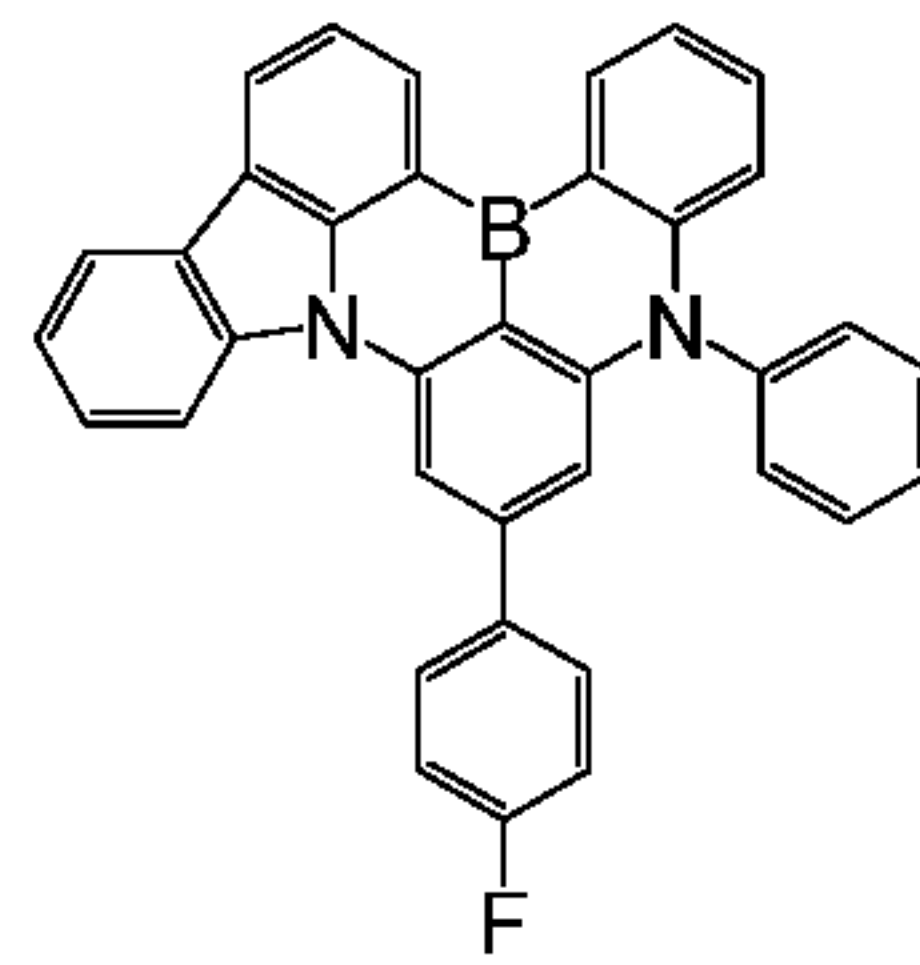
C-31



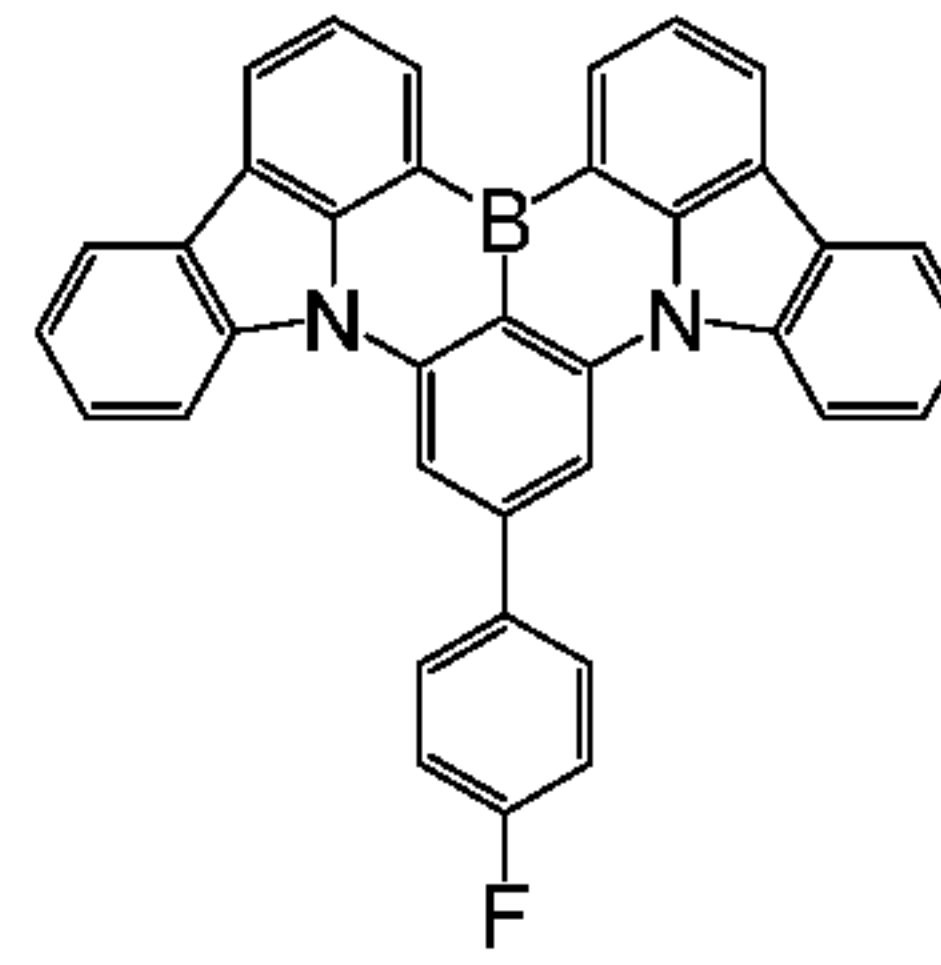
C-32



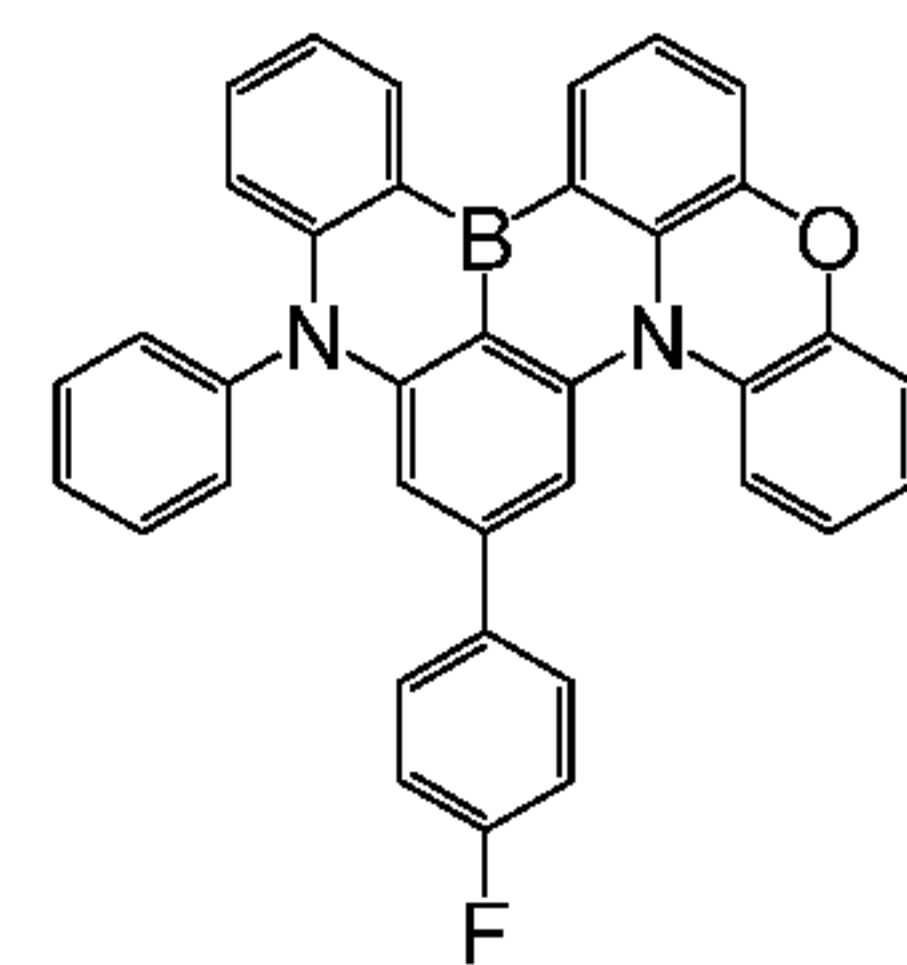
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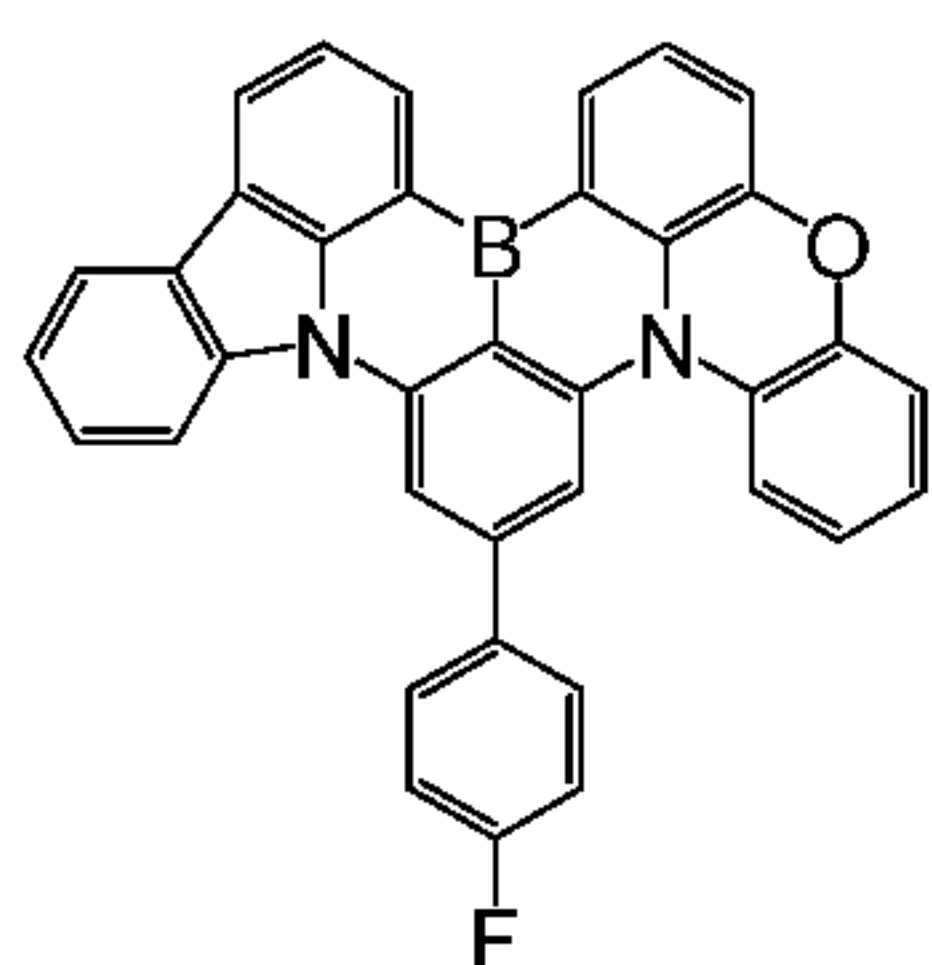
C-34



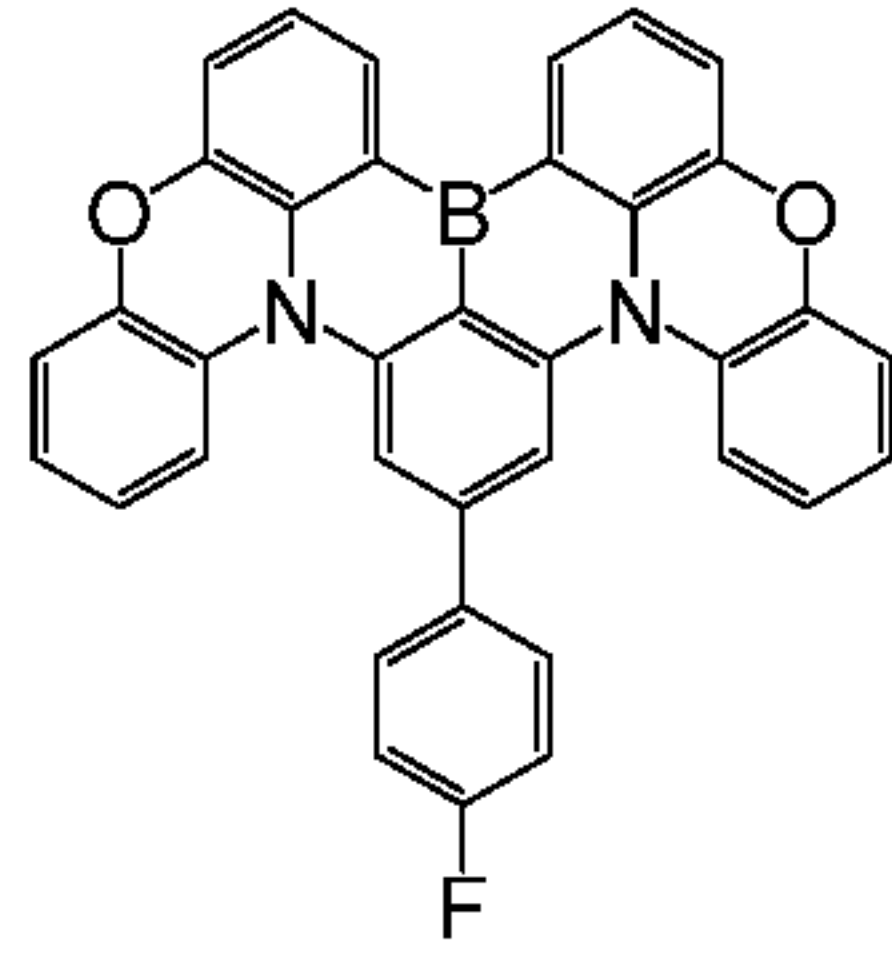
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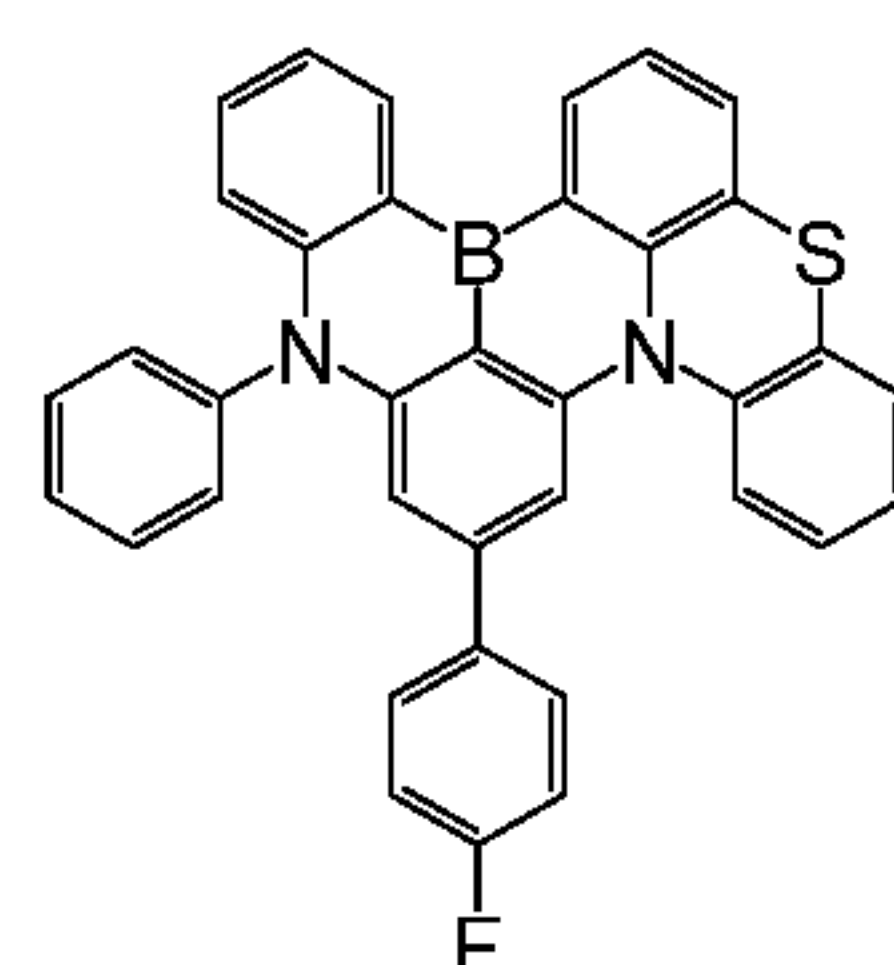
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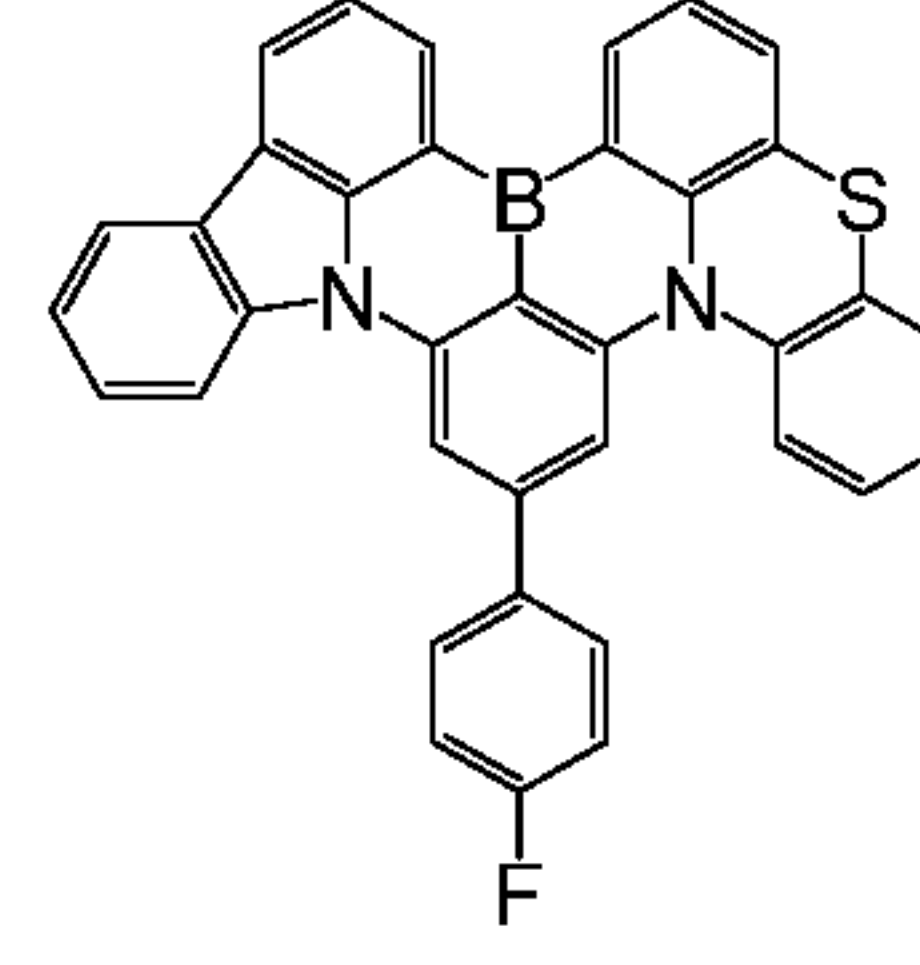
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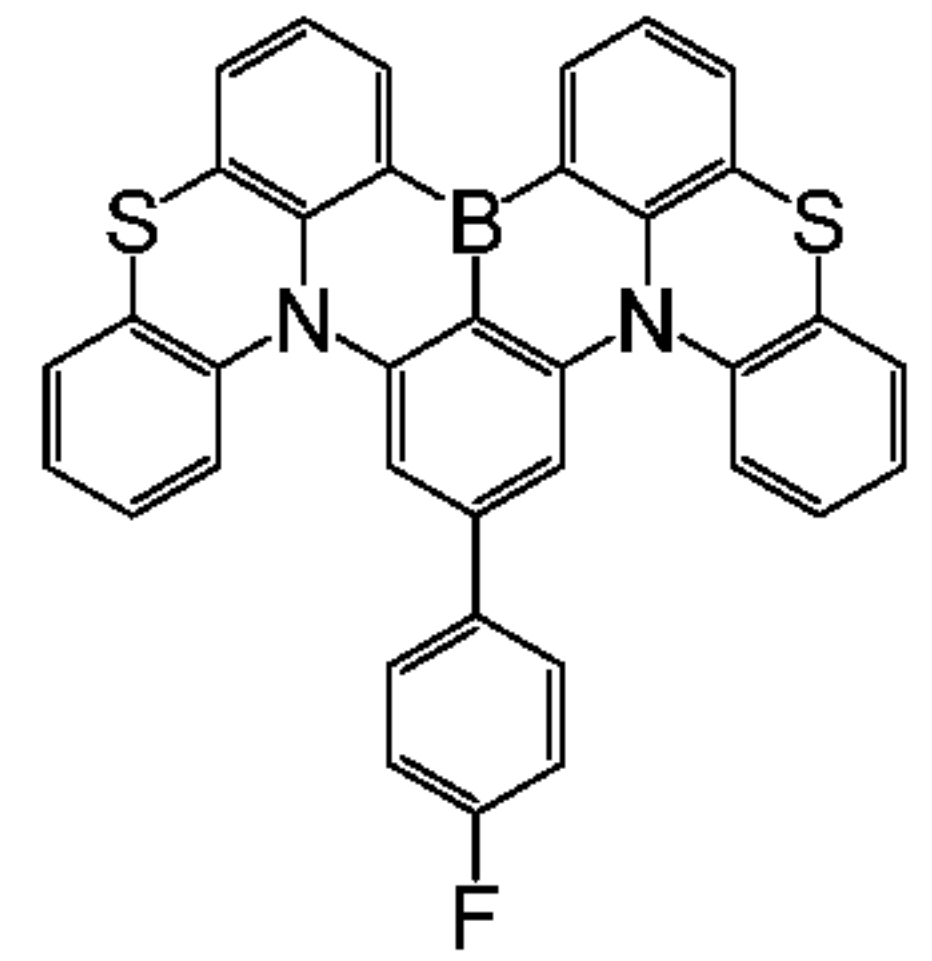
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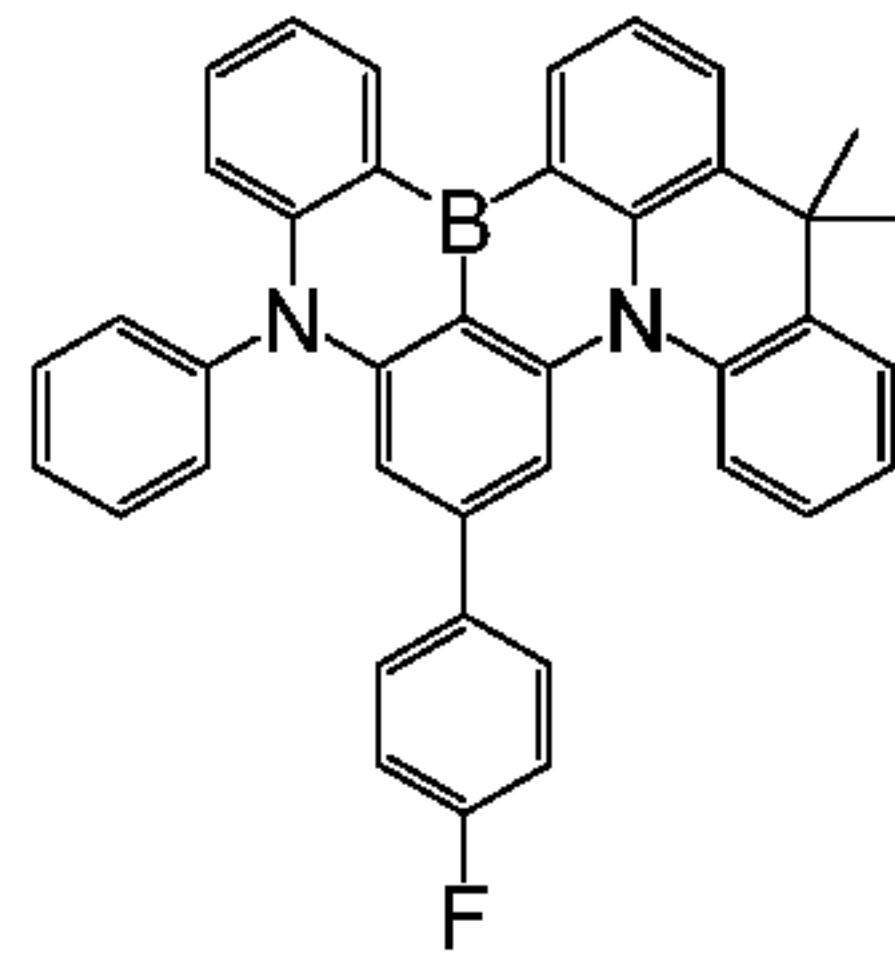
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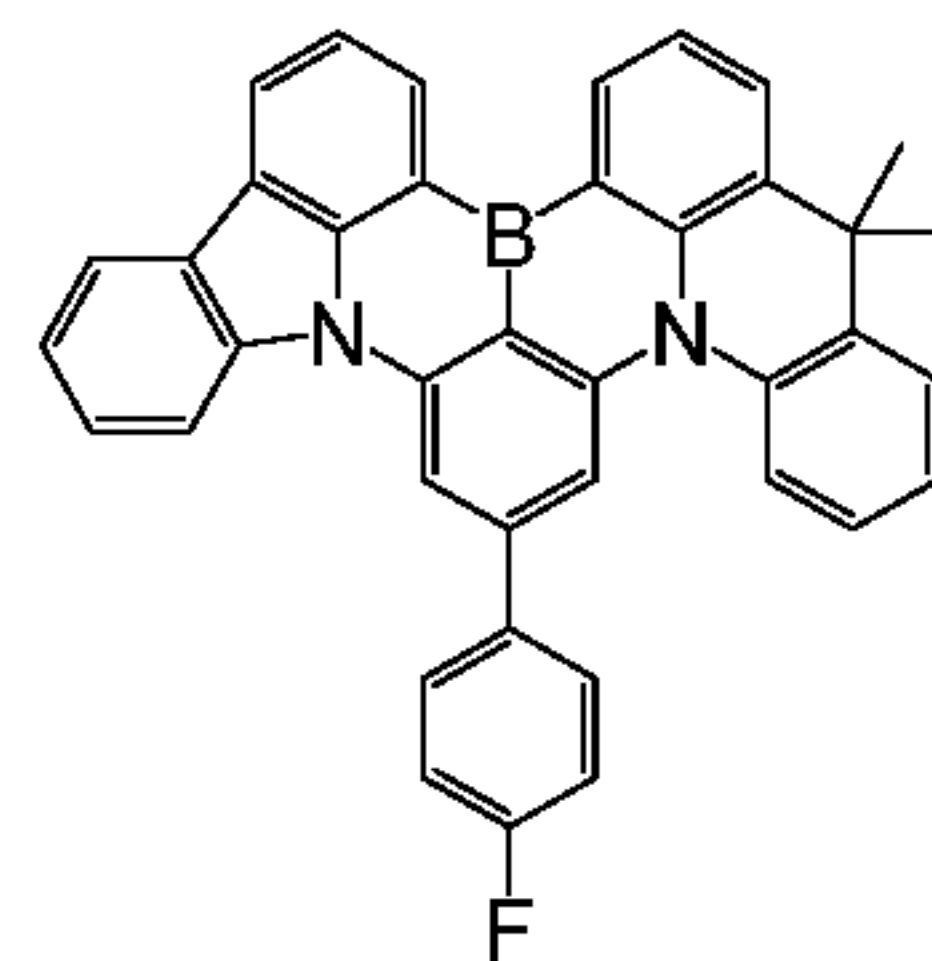
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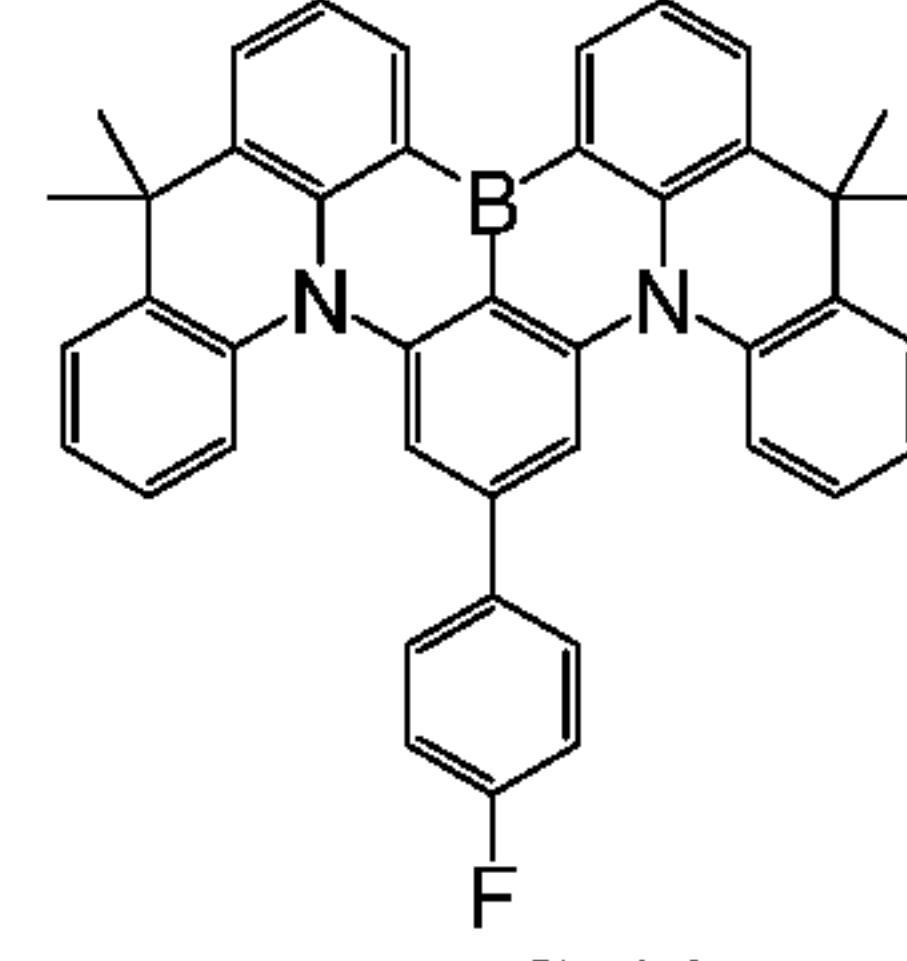
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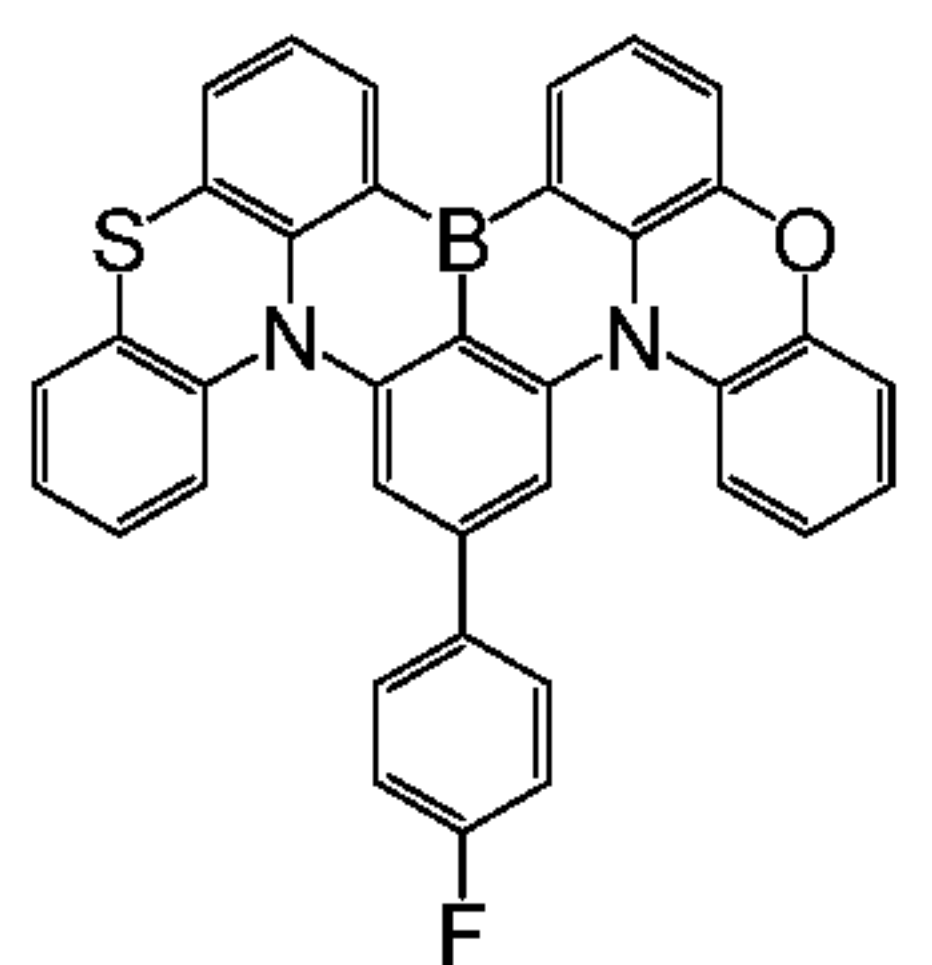
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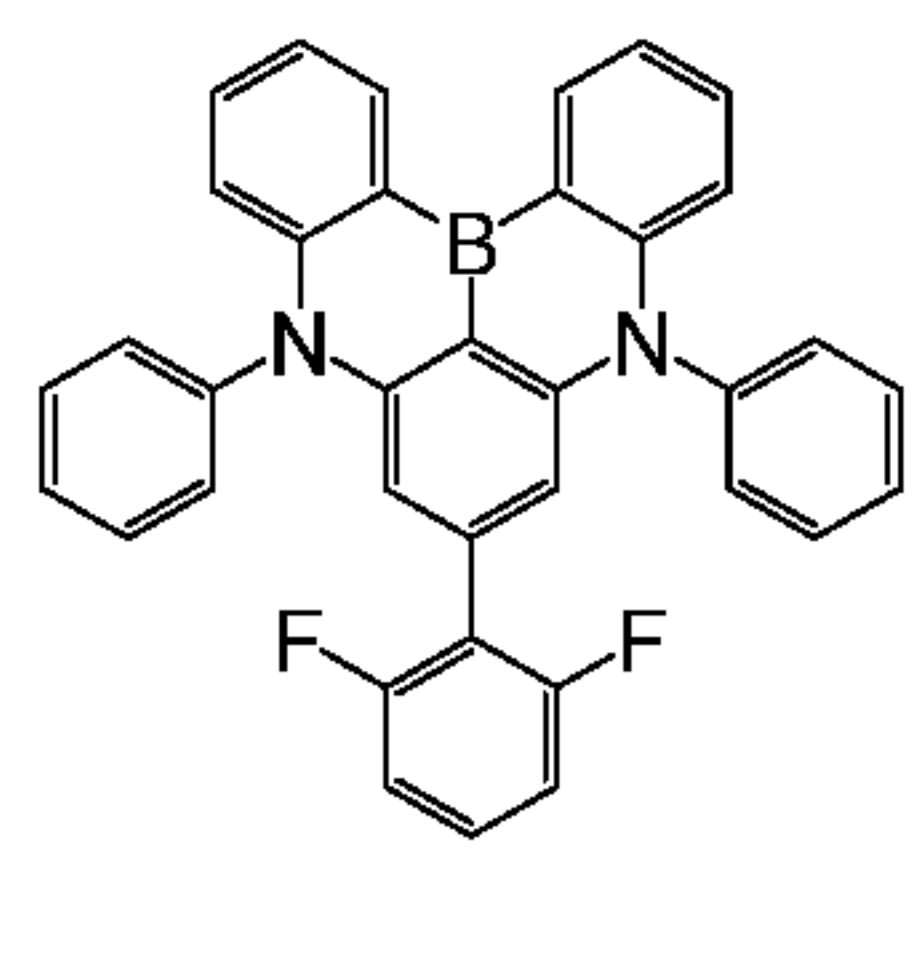
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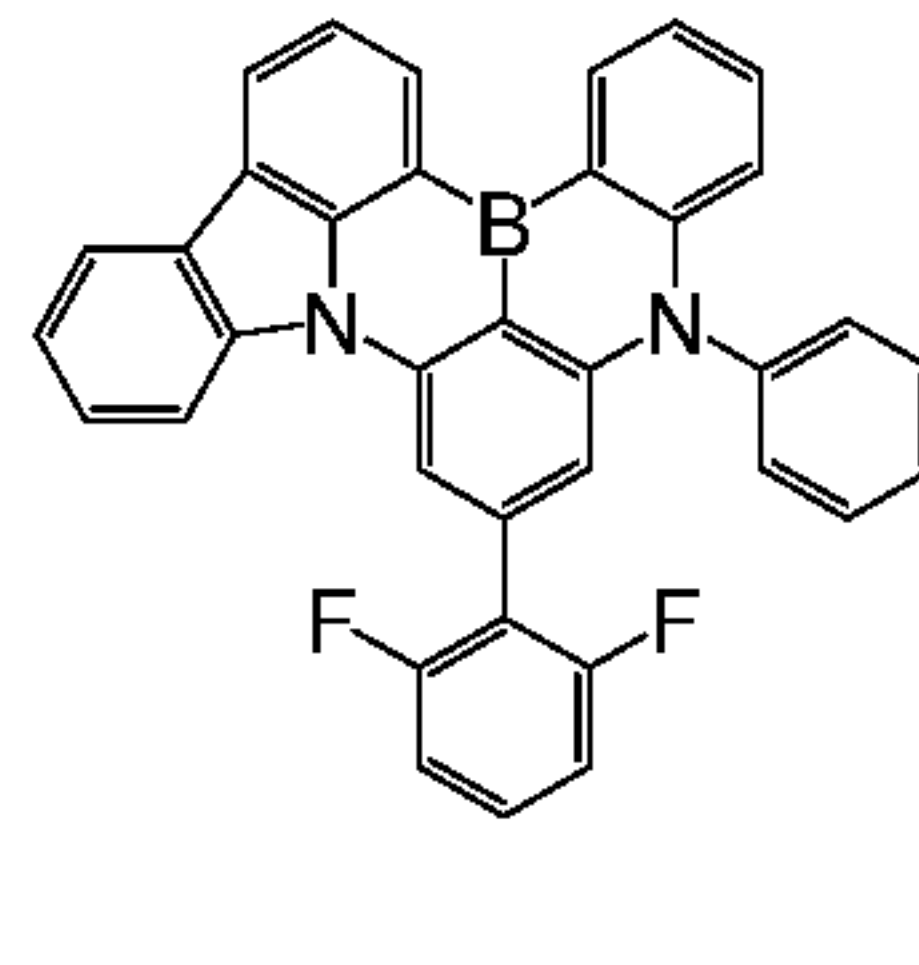
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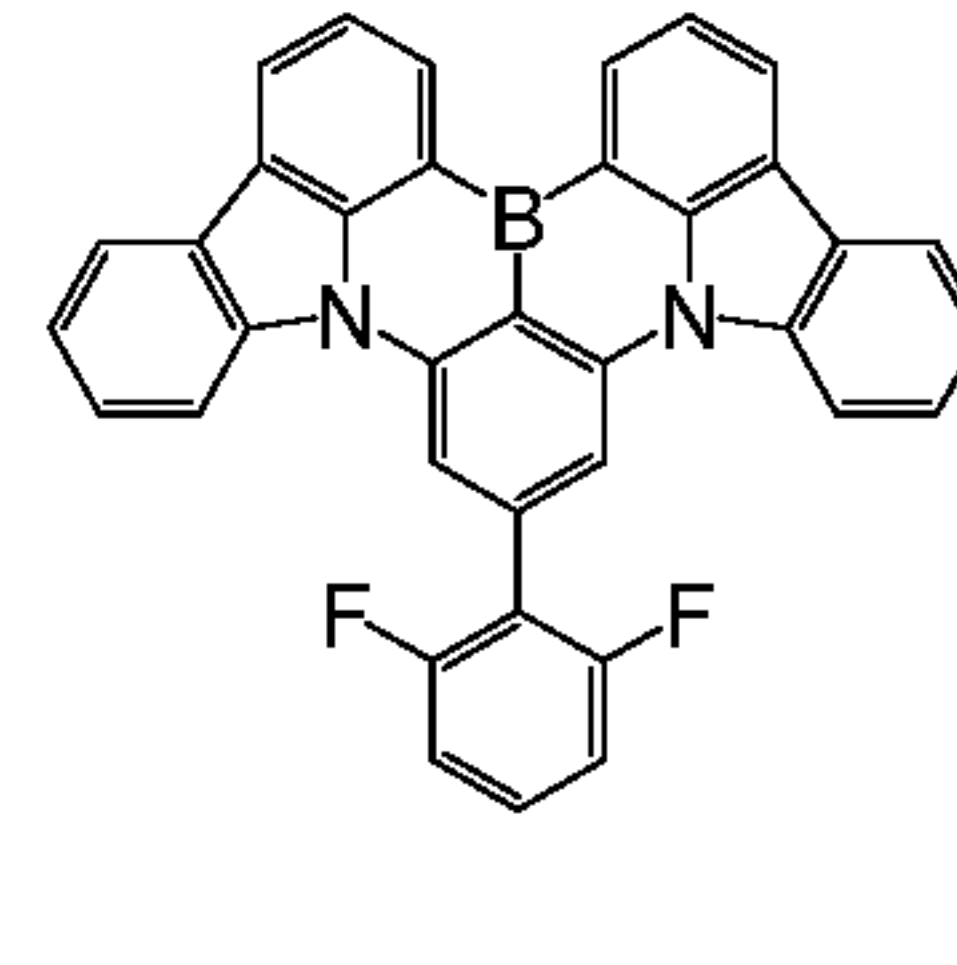
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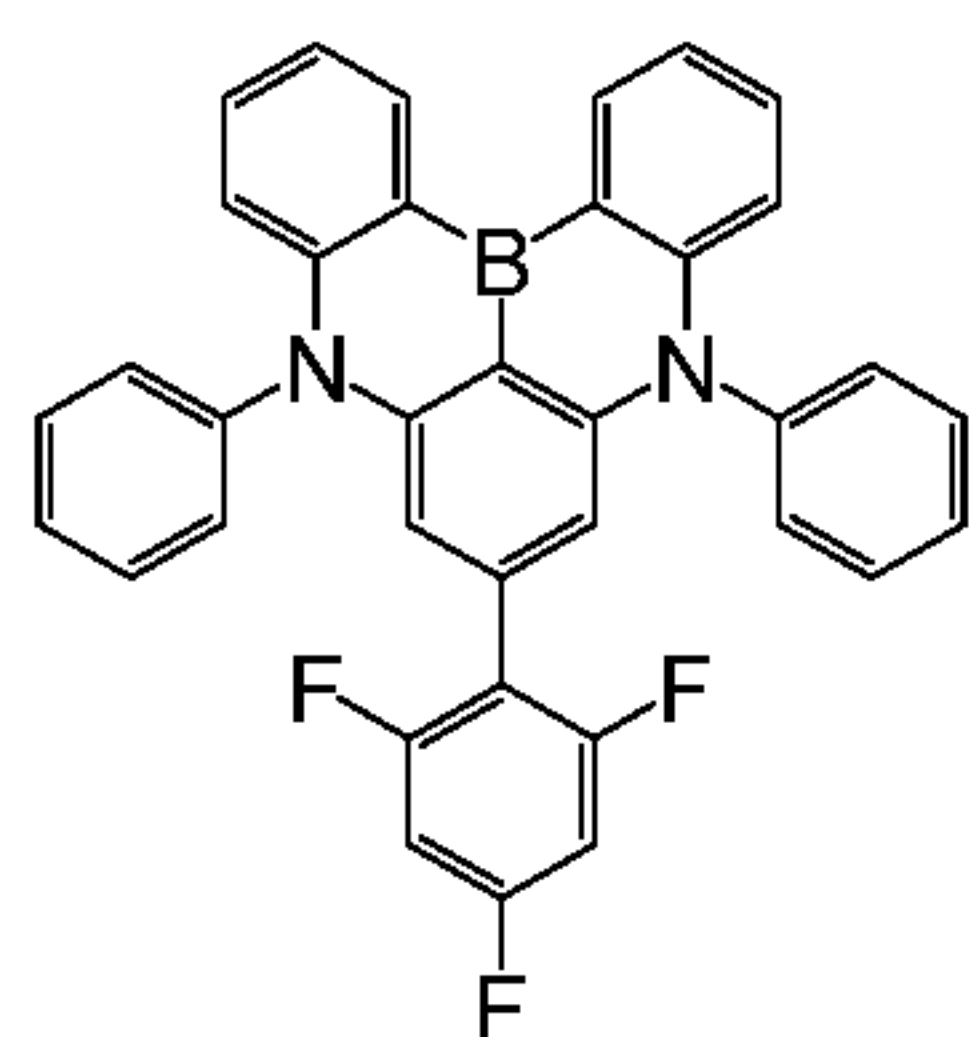
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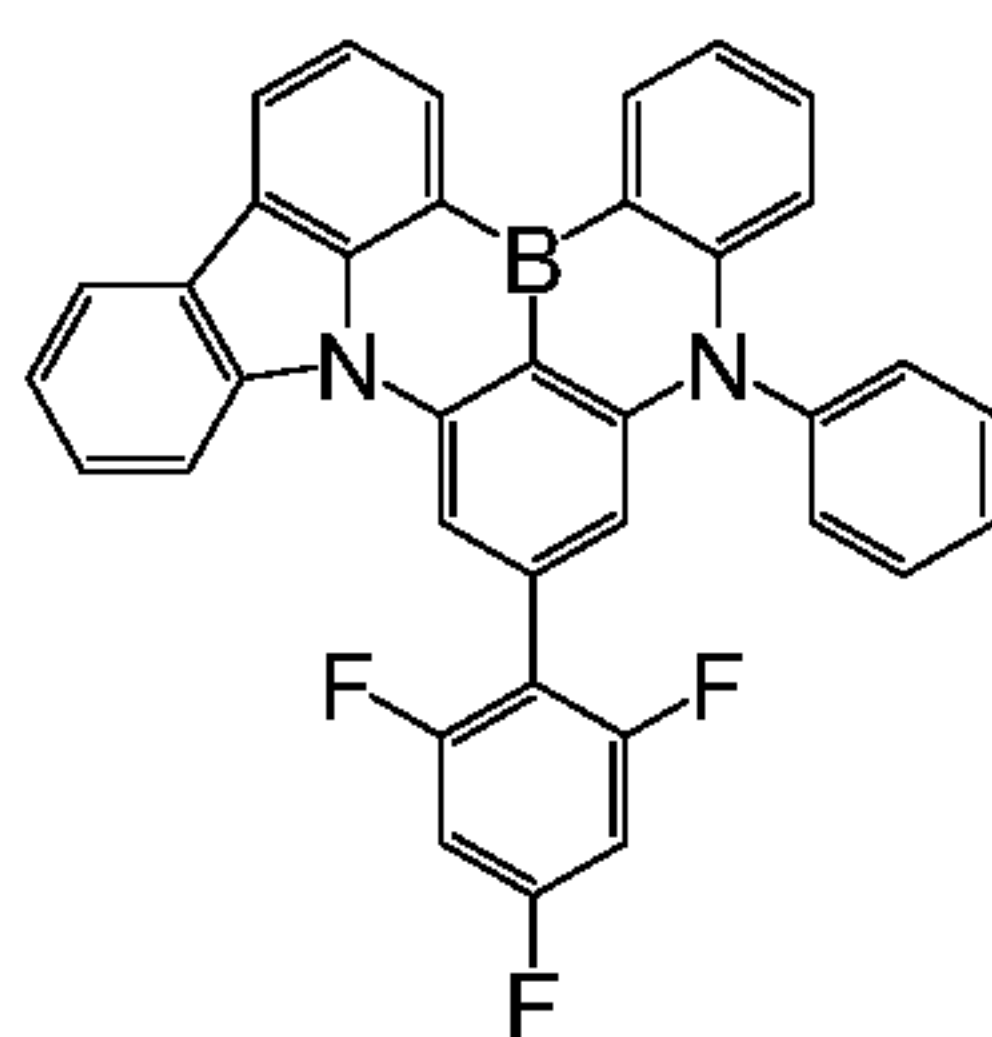
C-47



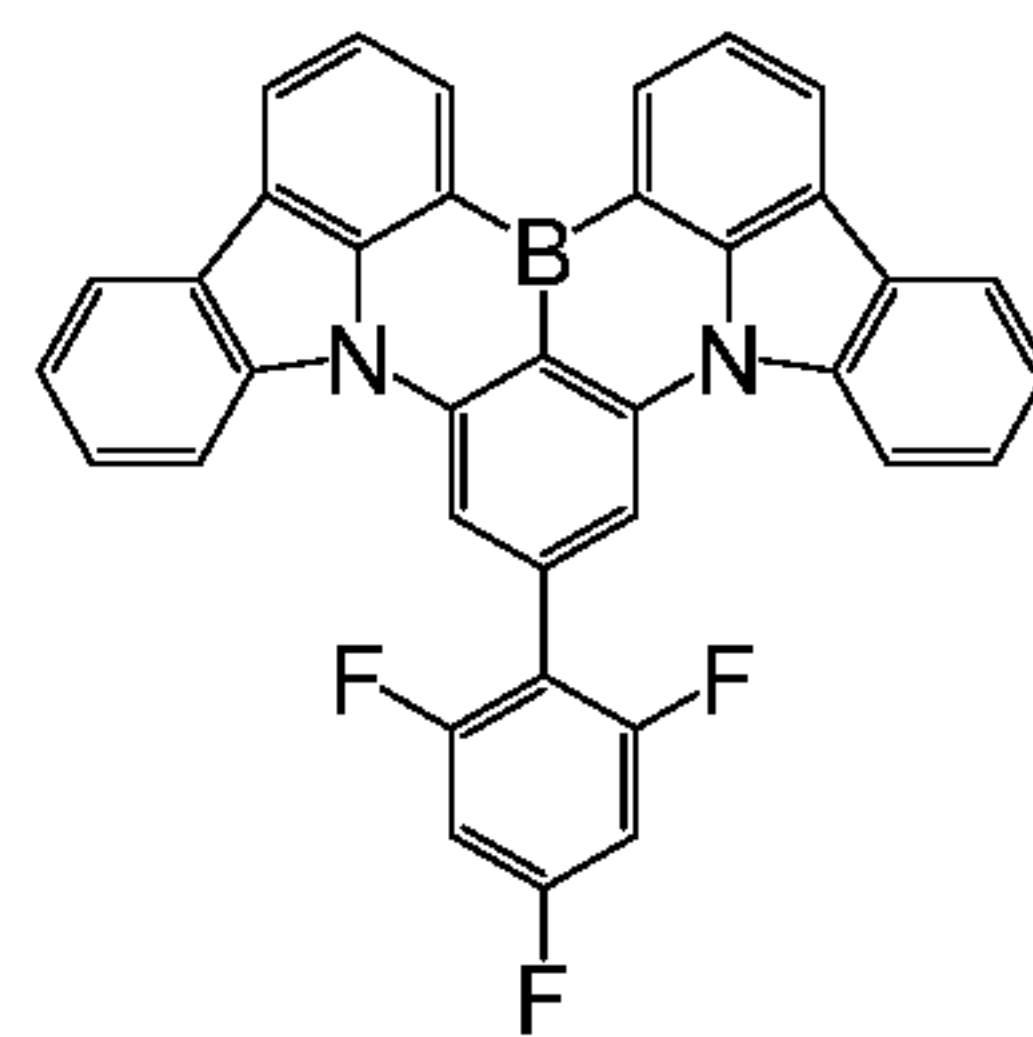
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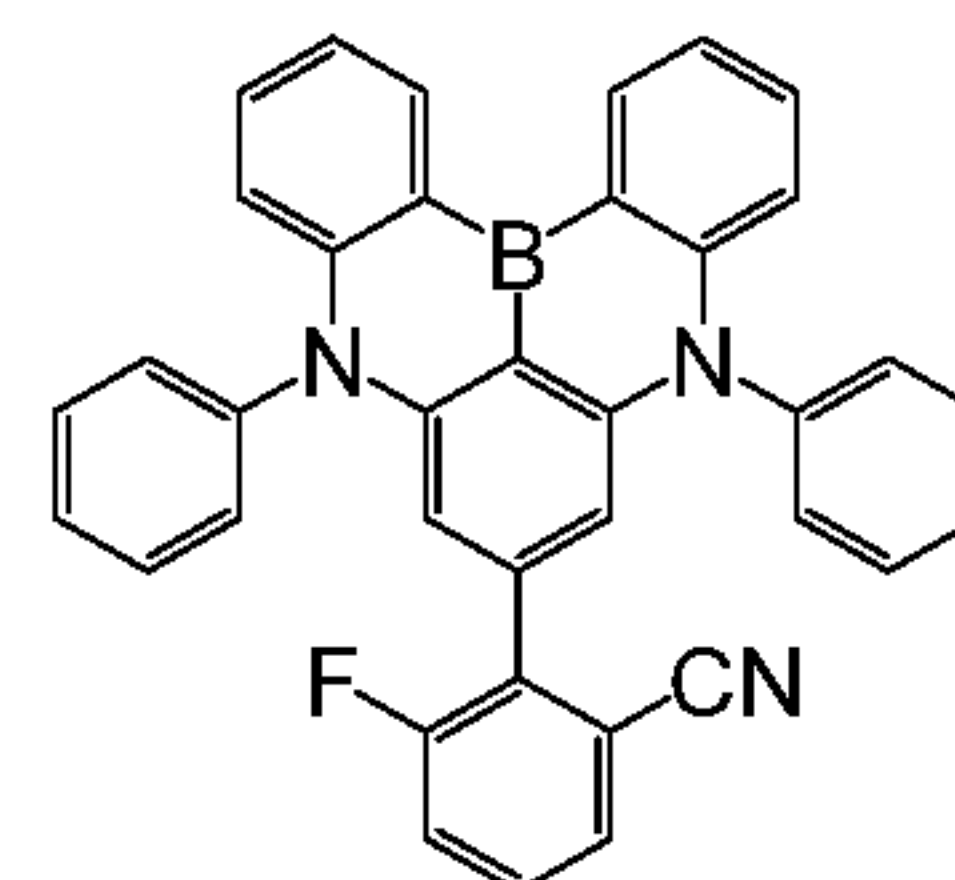
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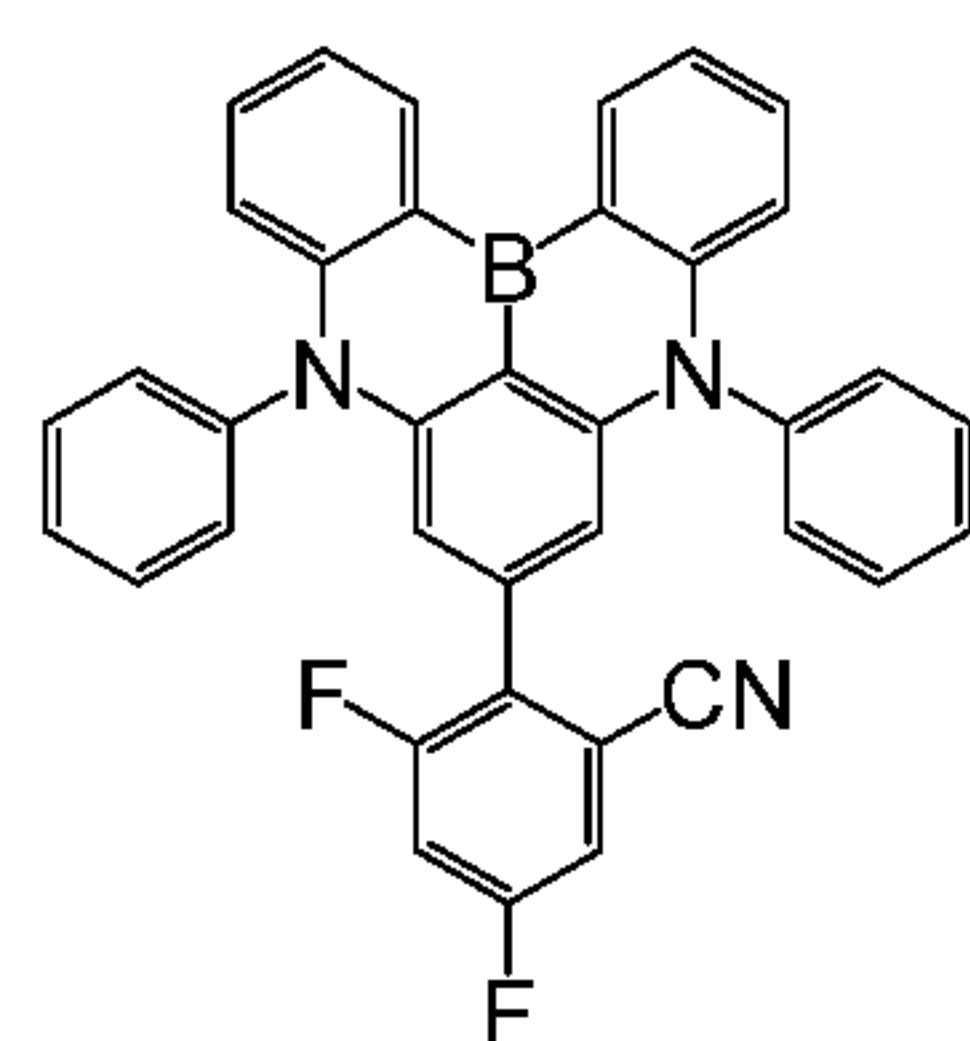
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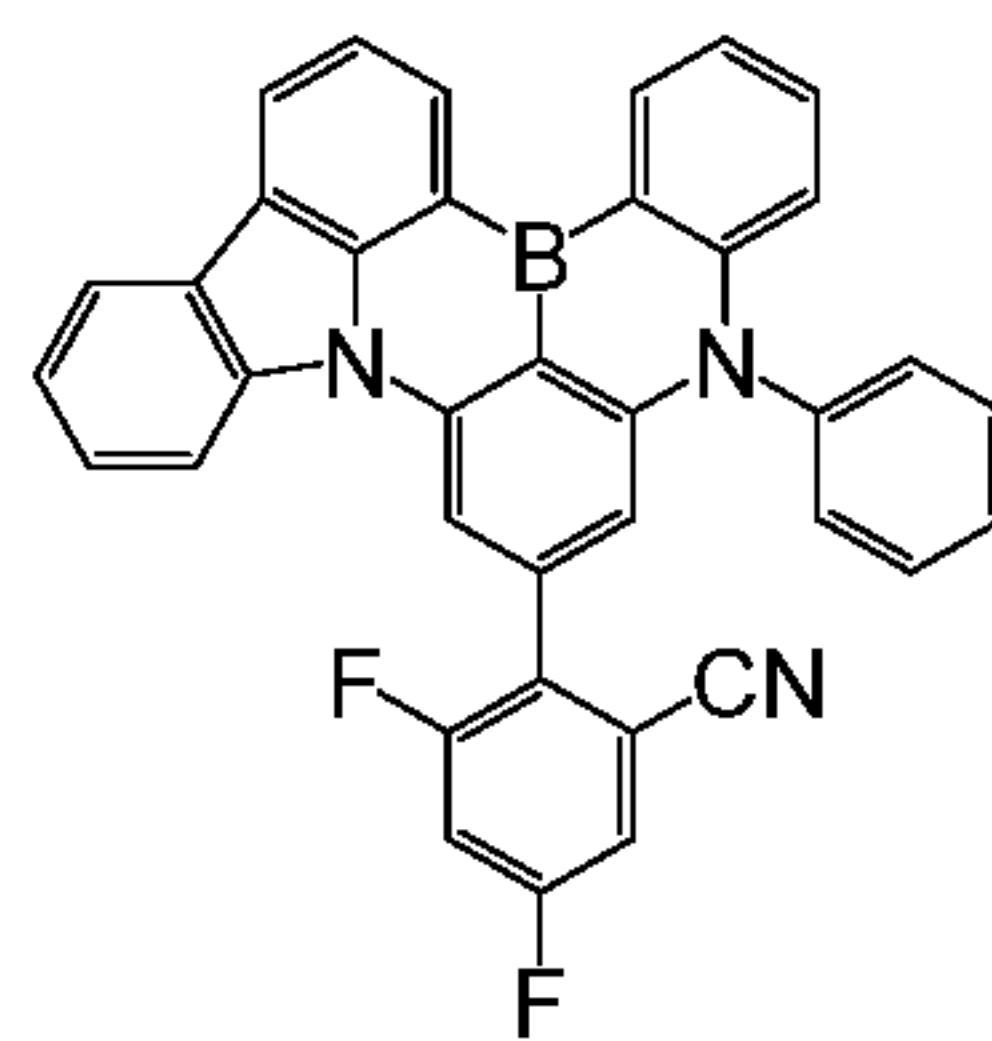
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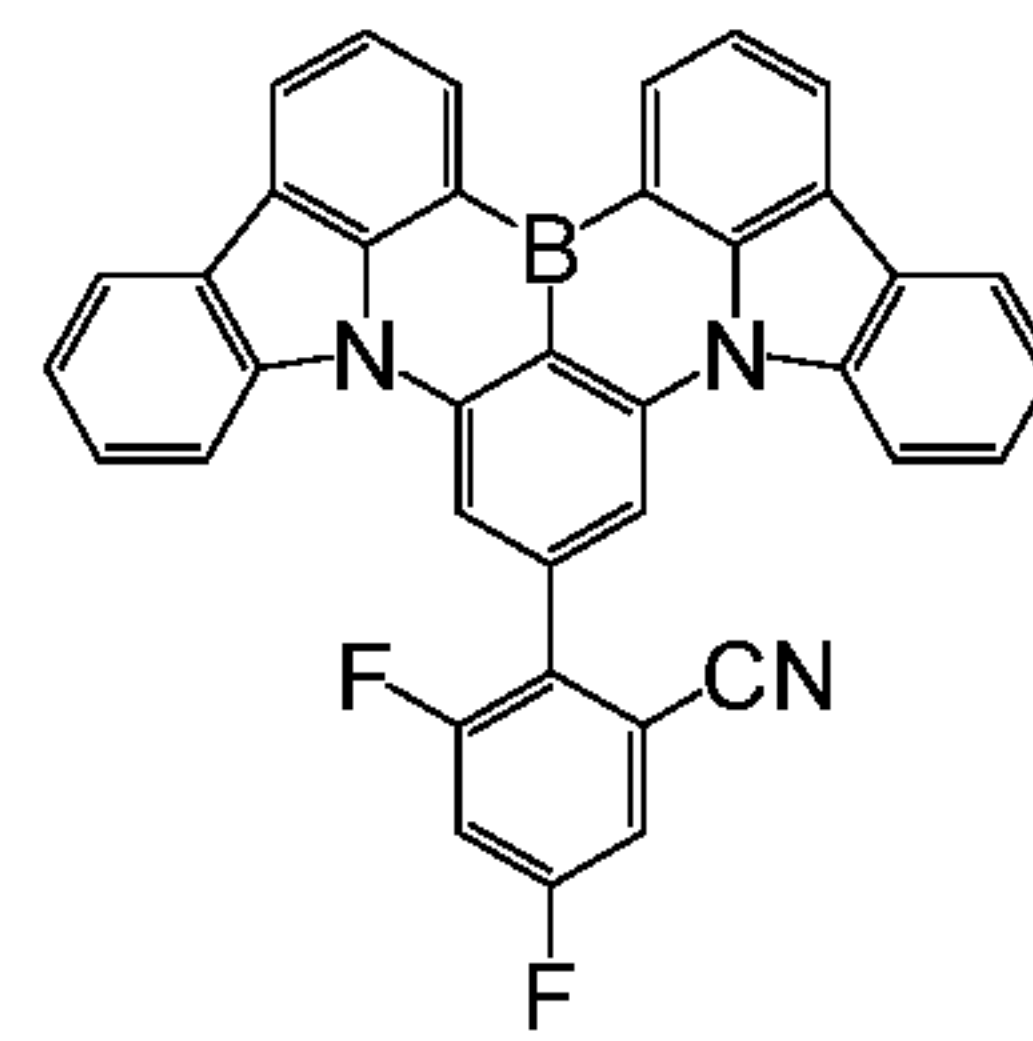
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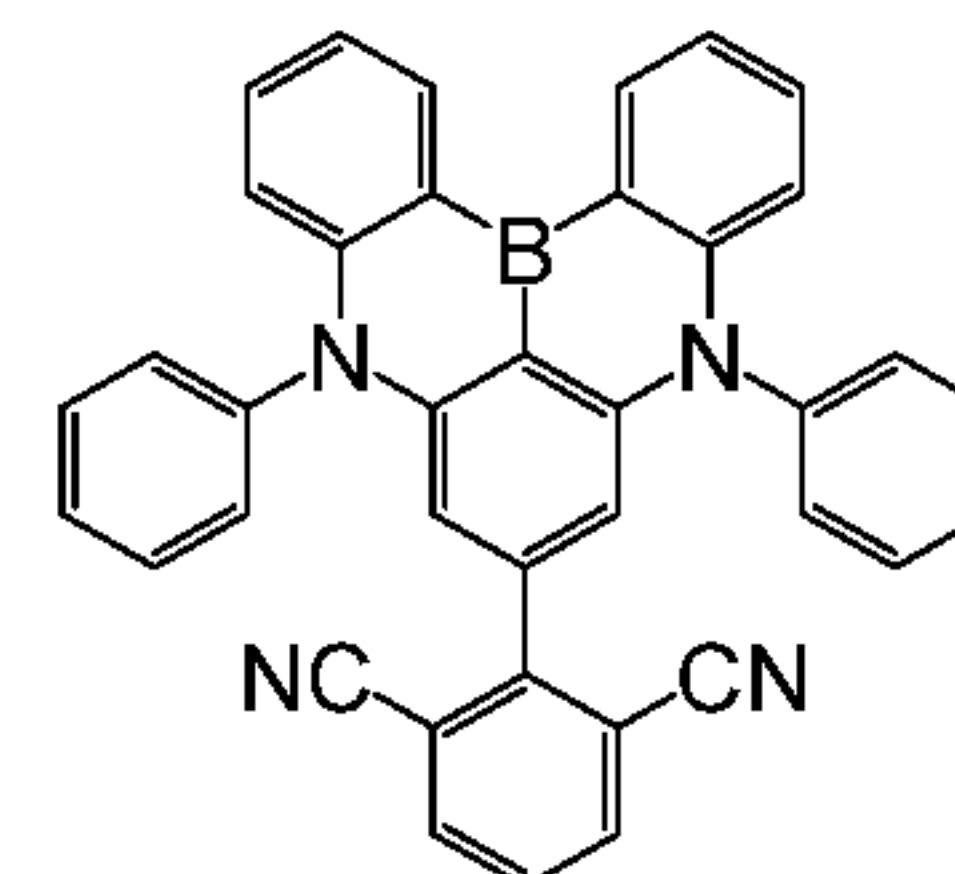
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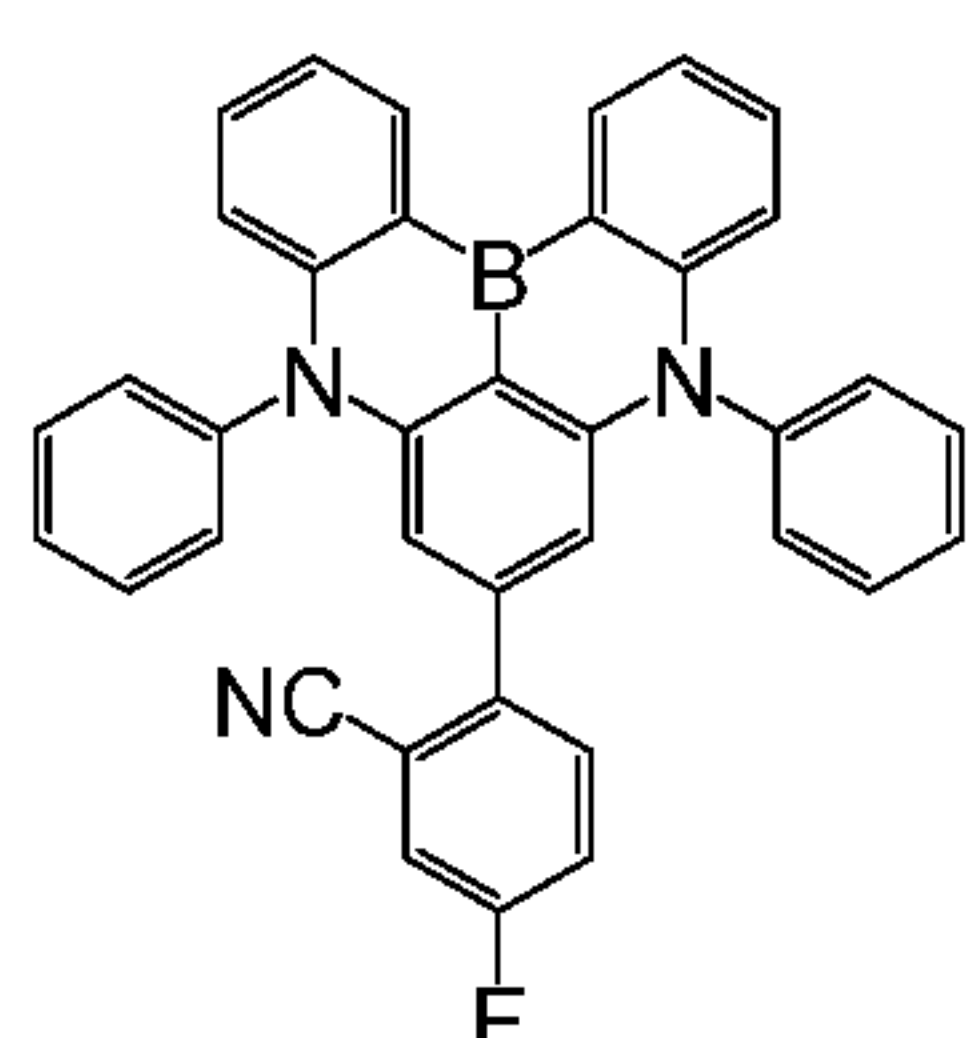
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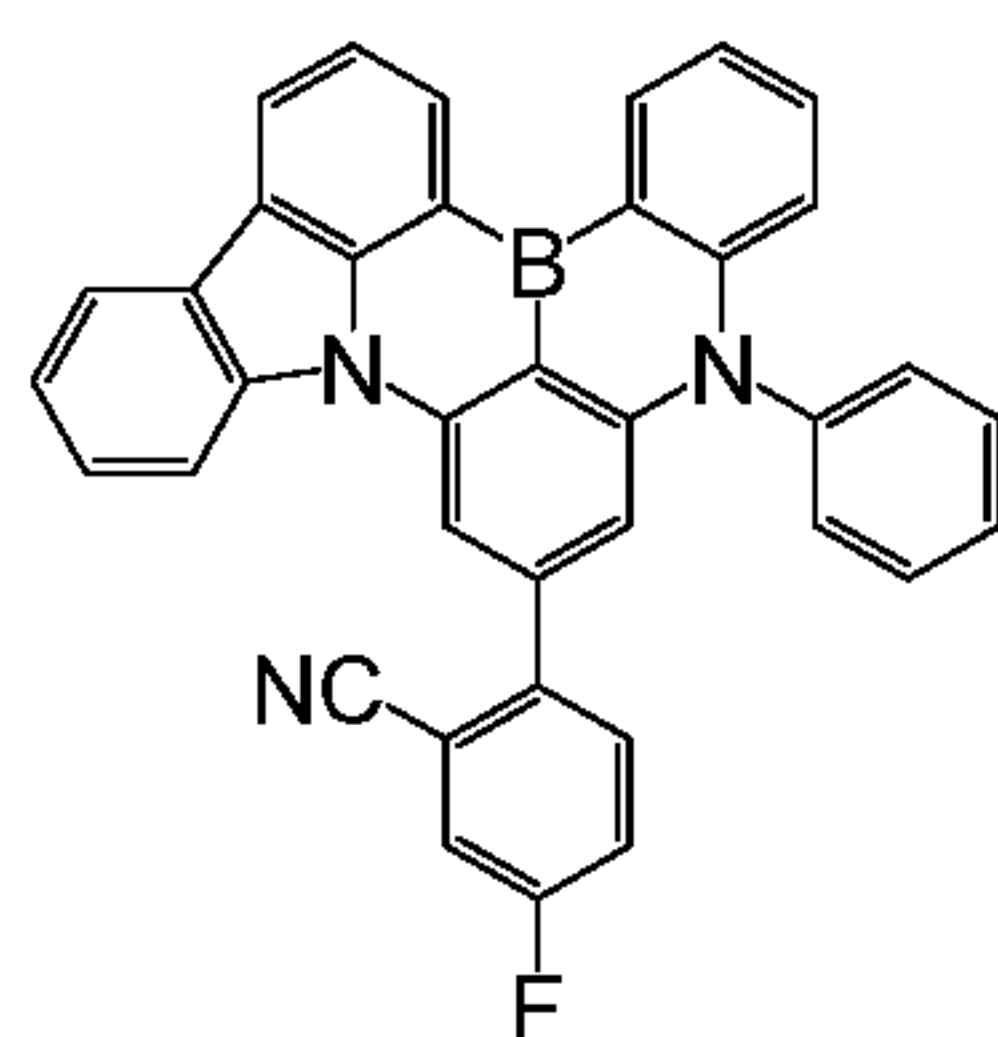
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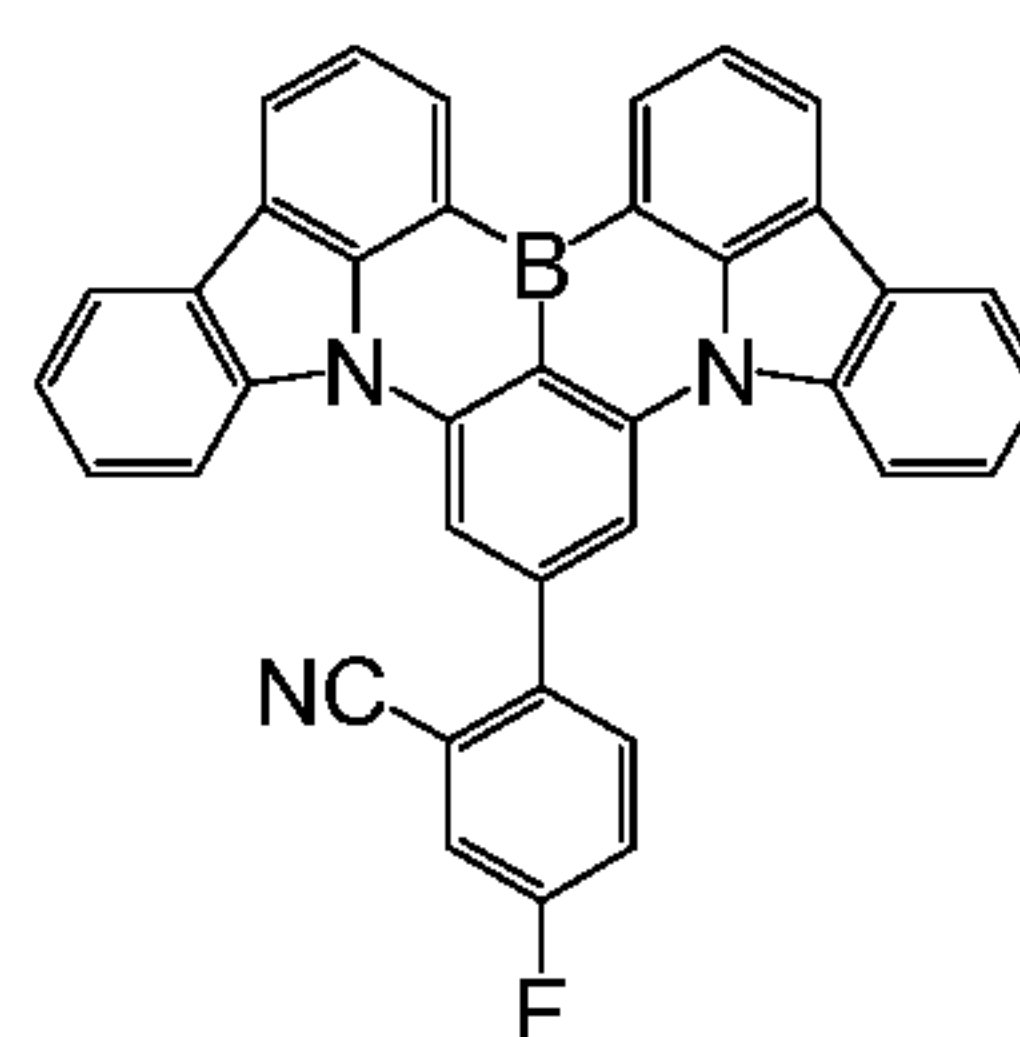
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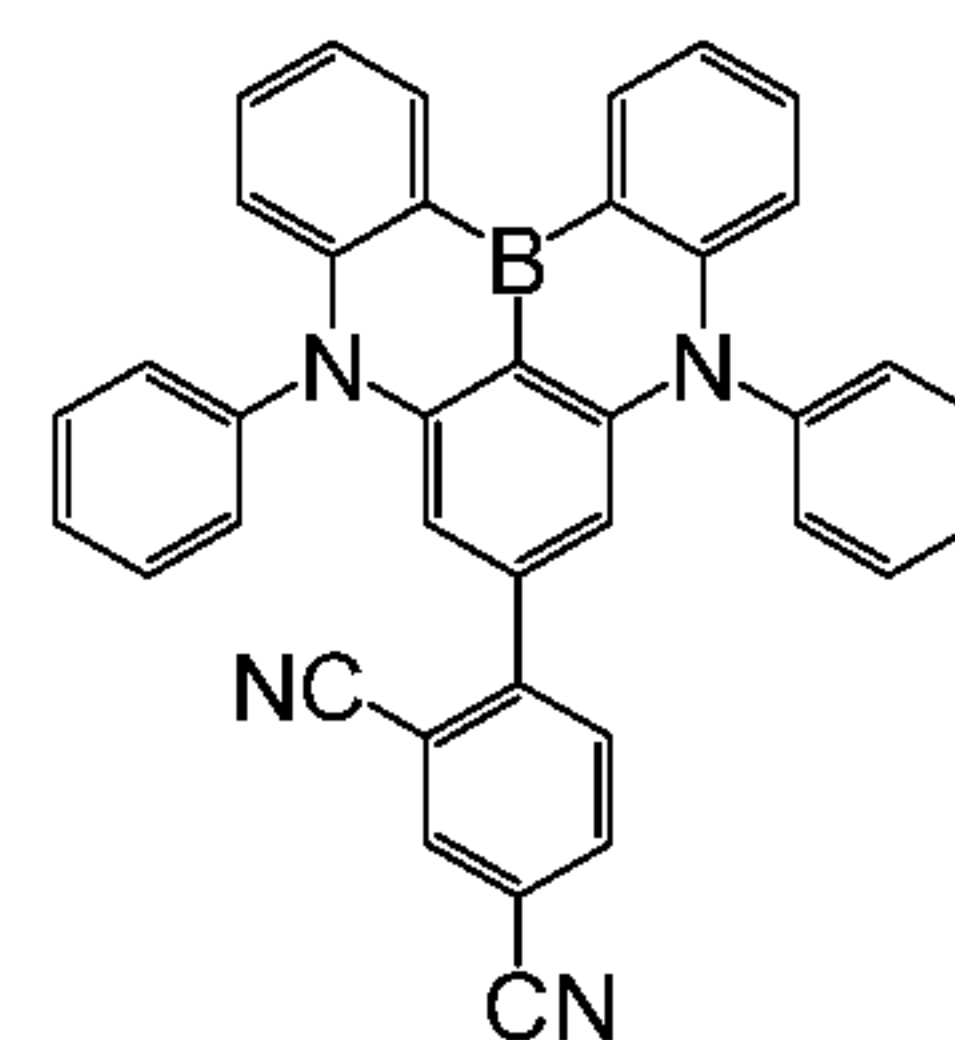
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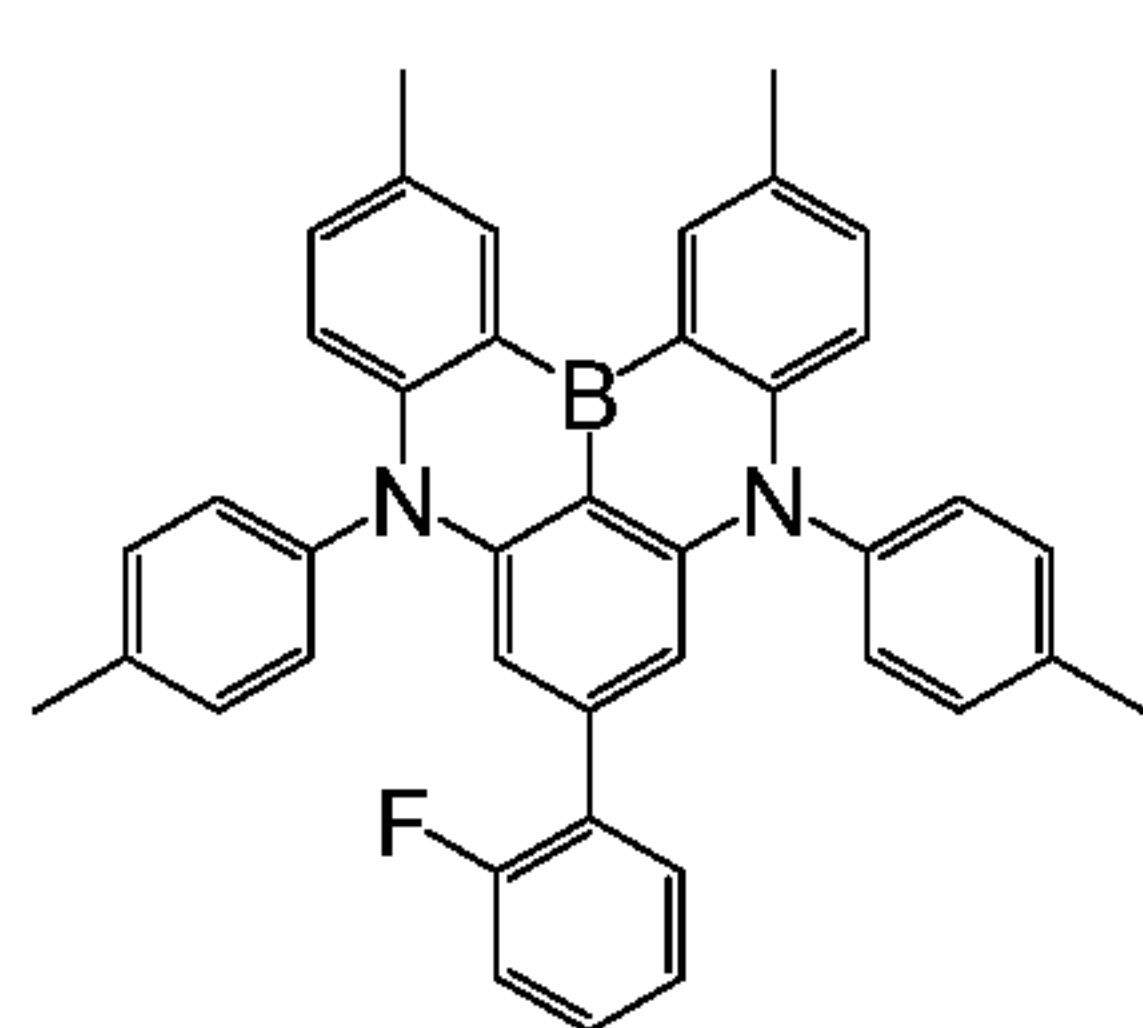
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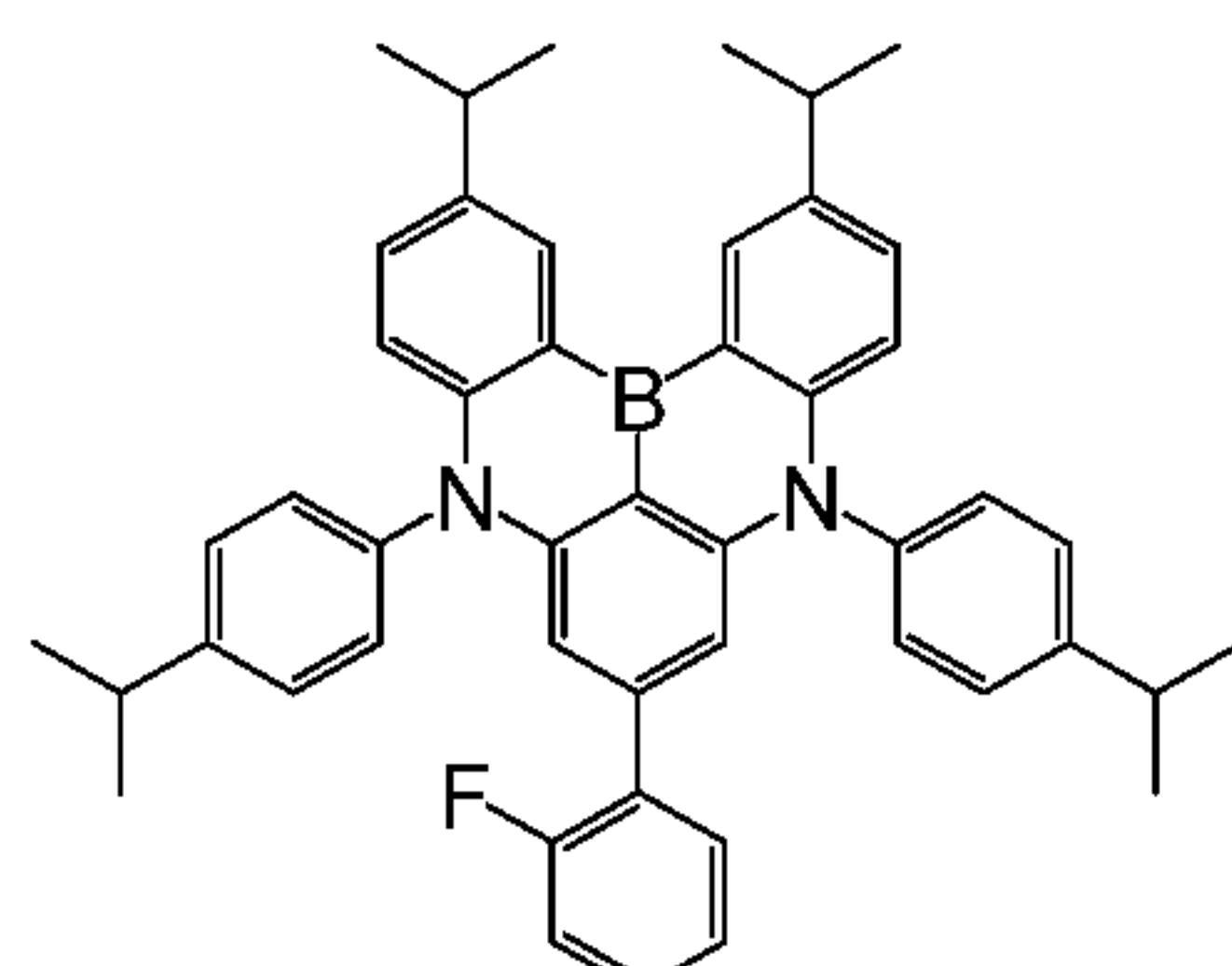
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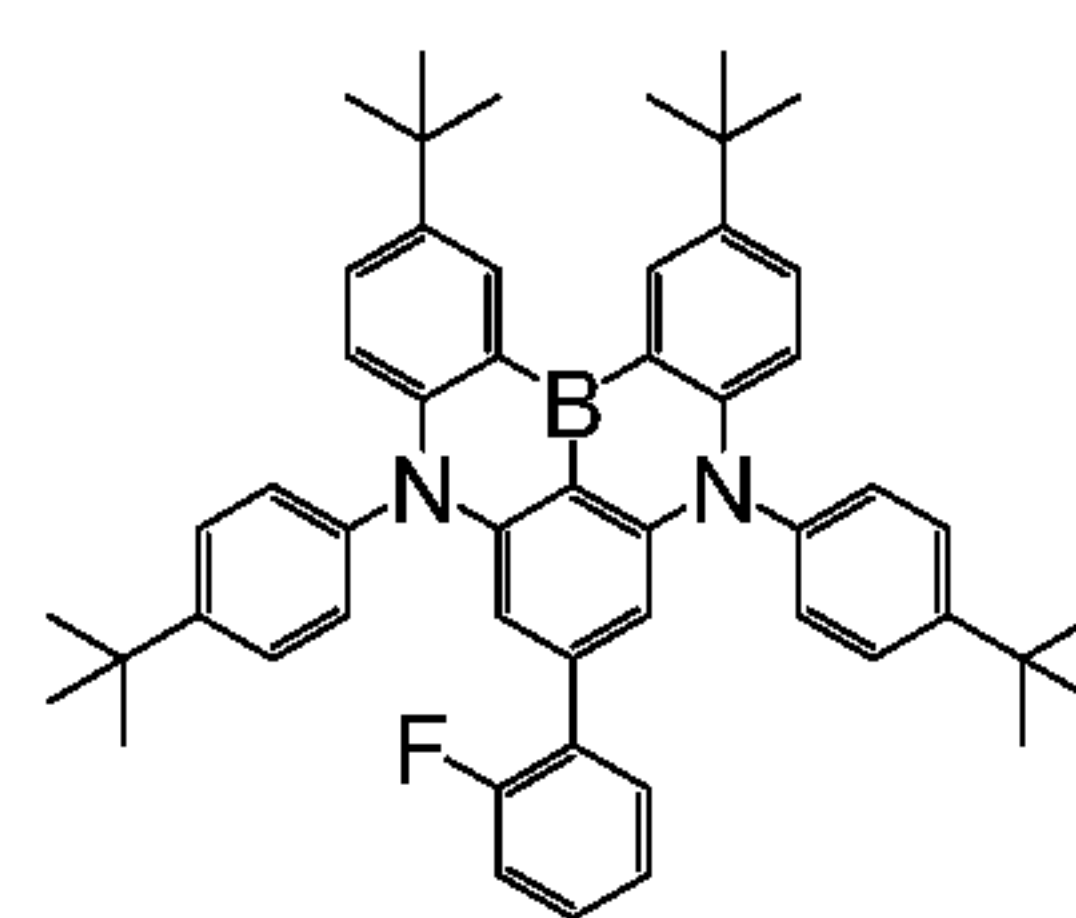
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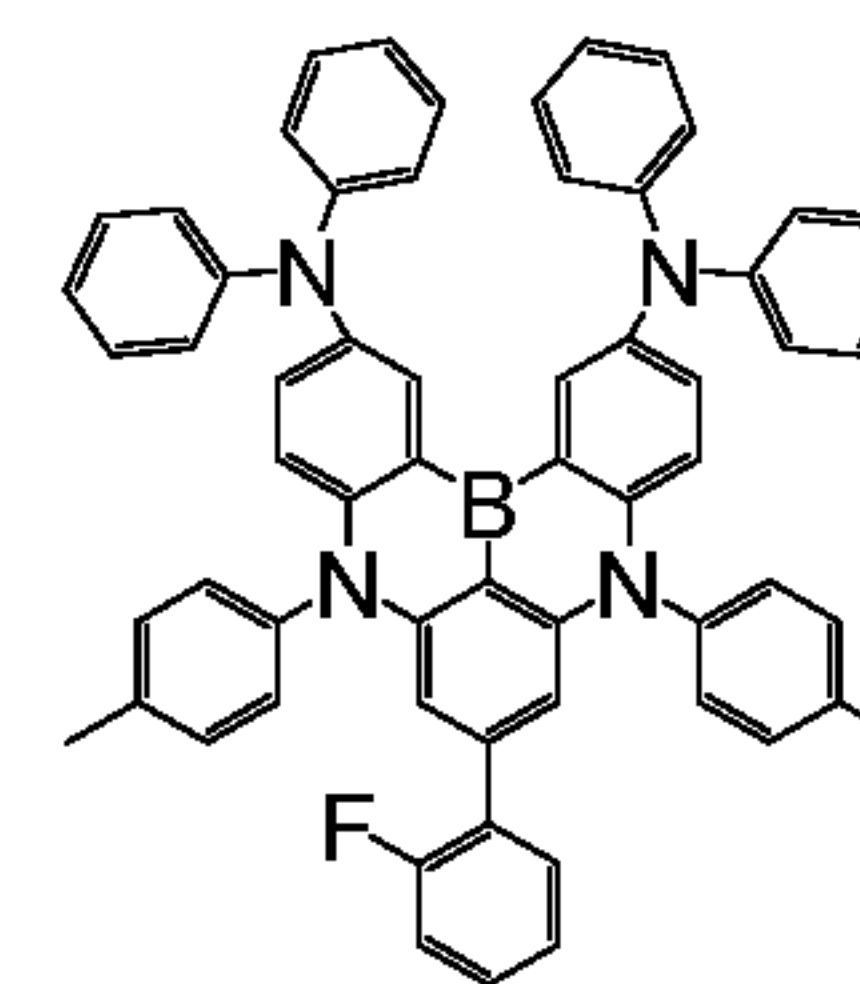
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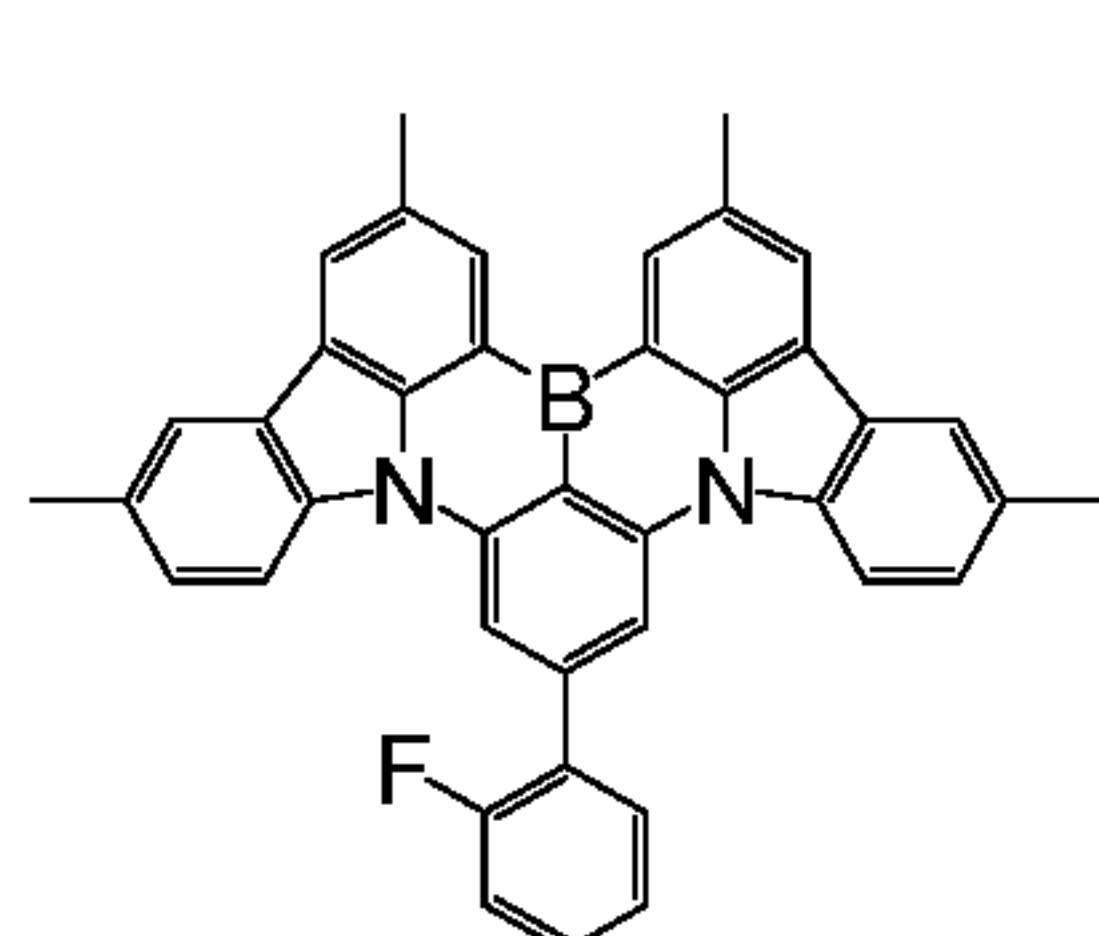
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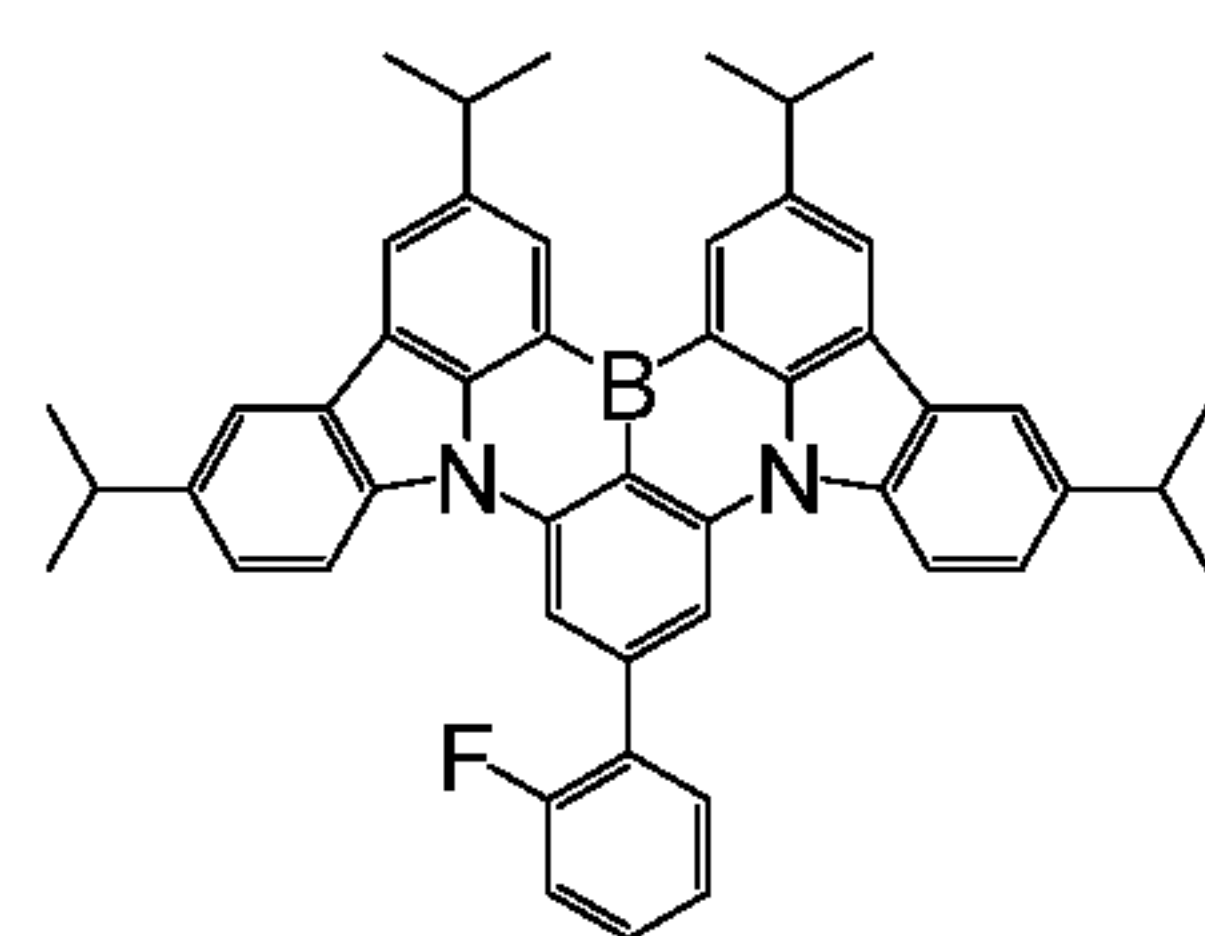
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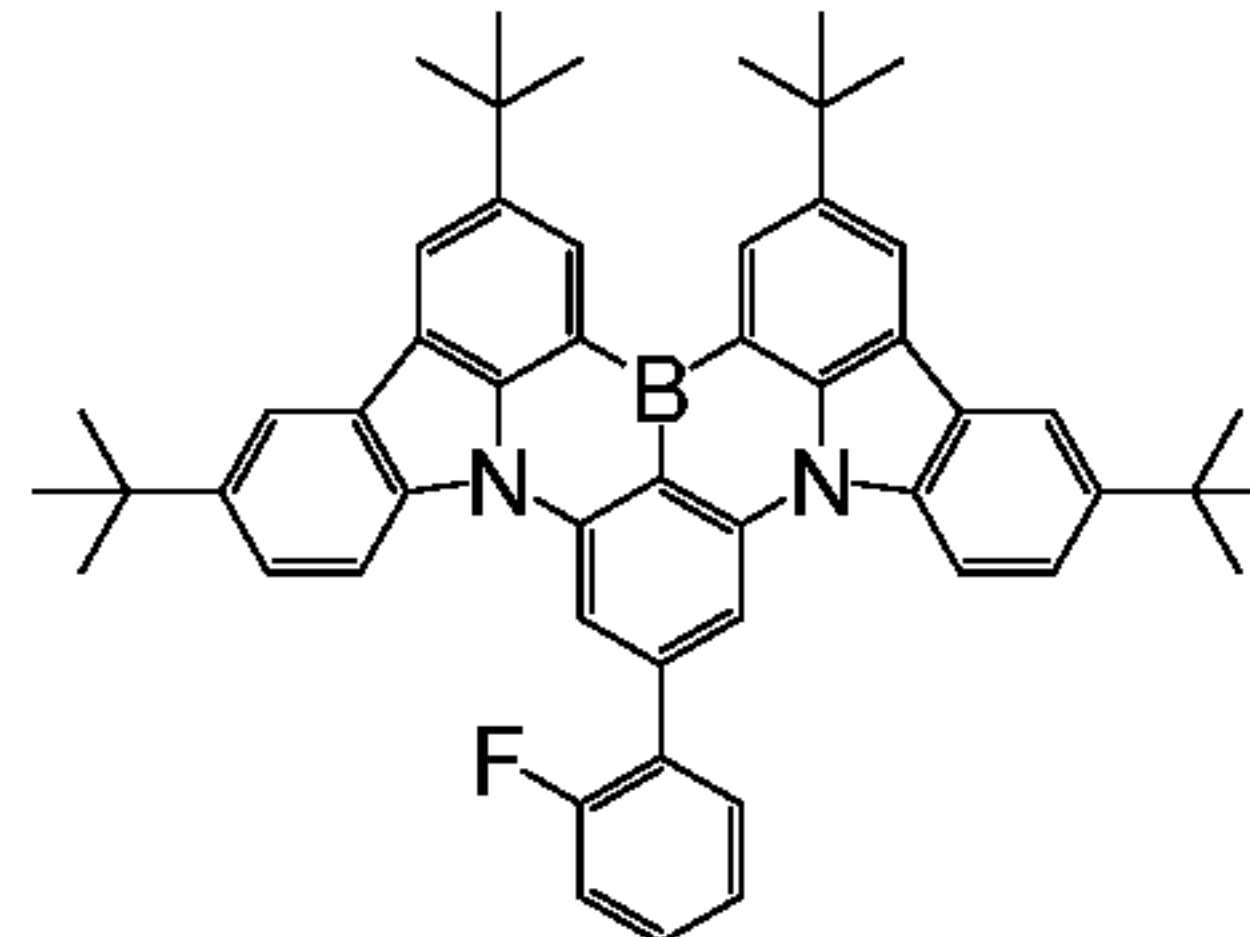
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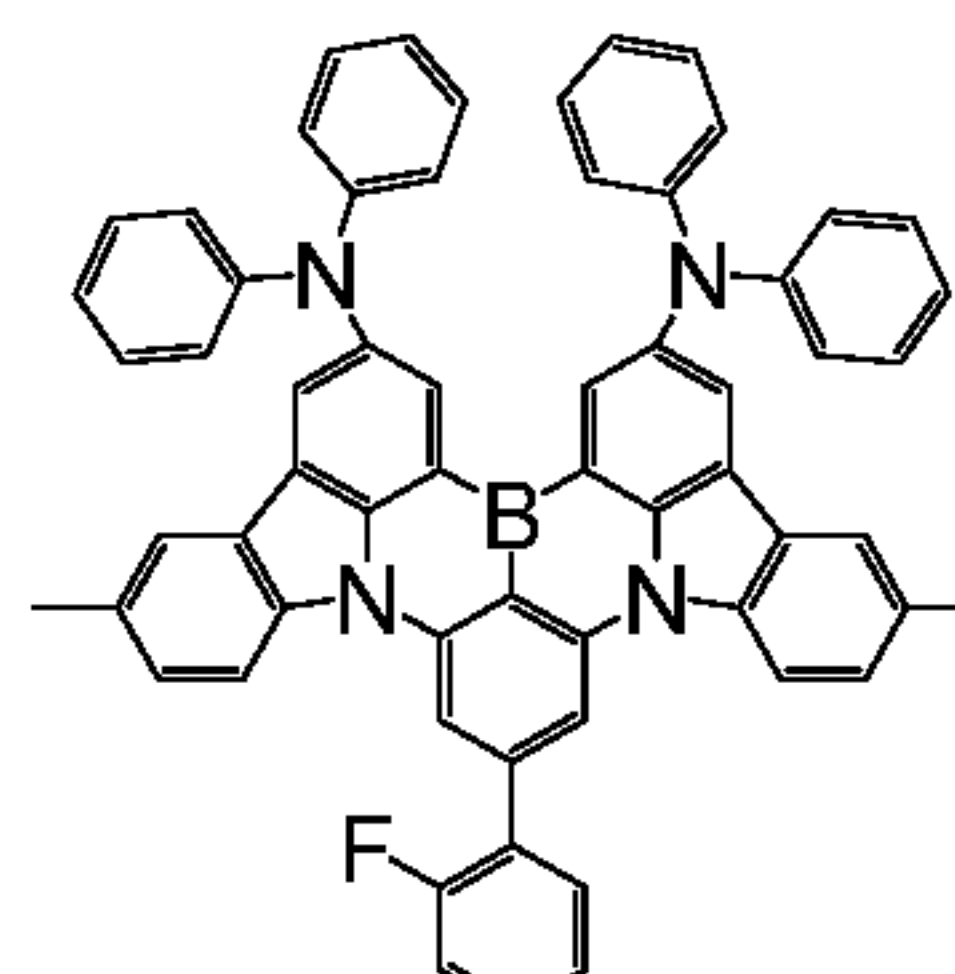
C-65



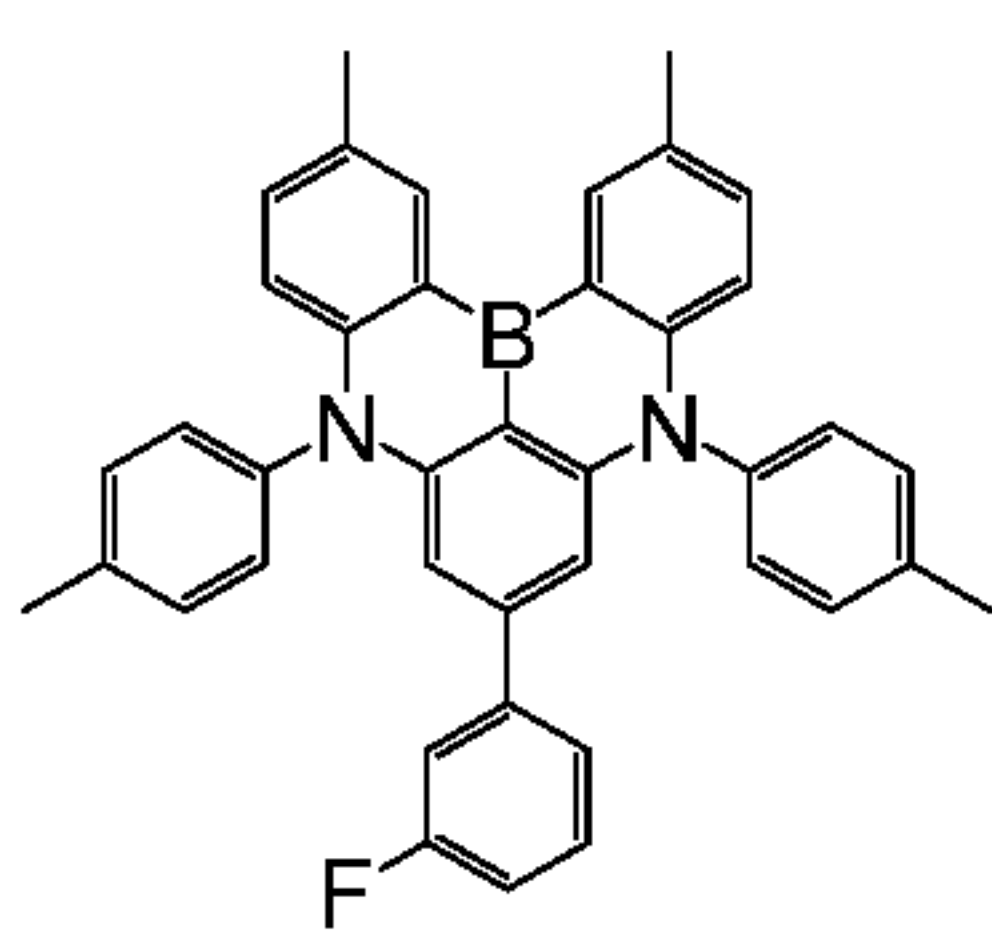
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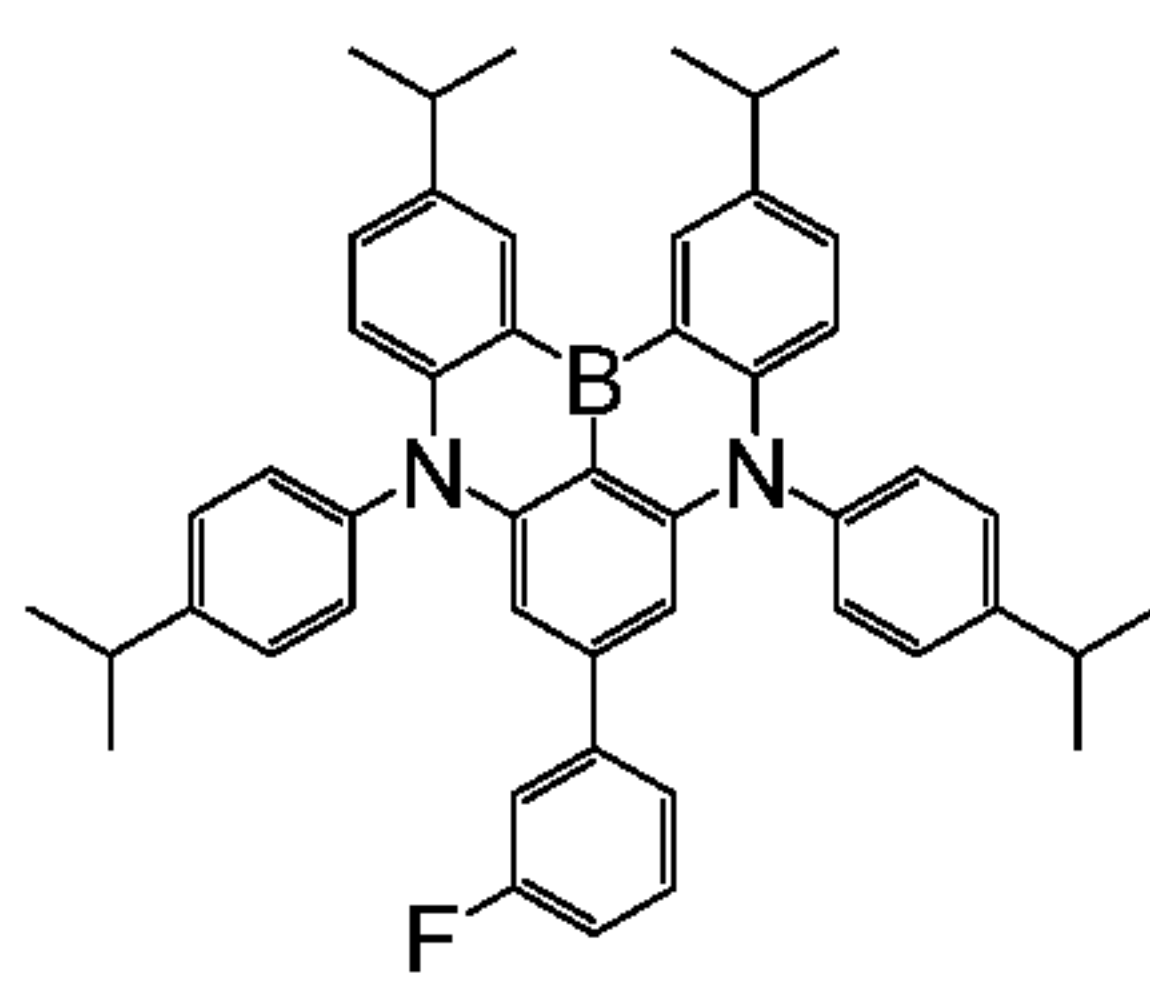
C-67



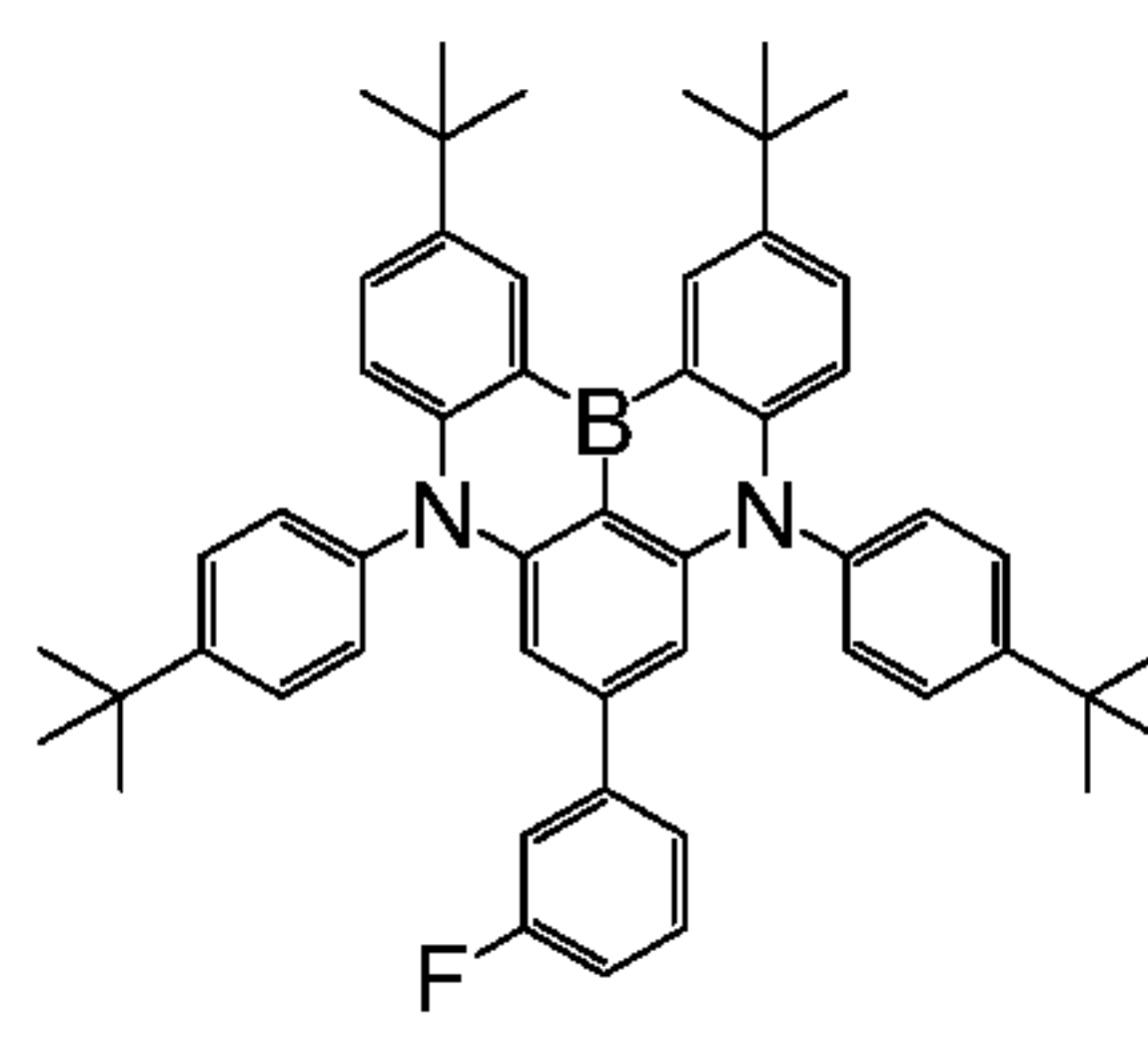
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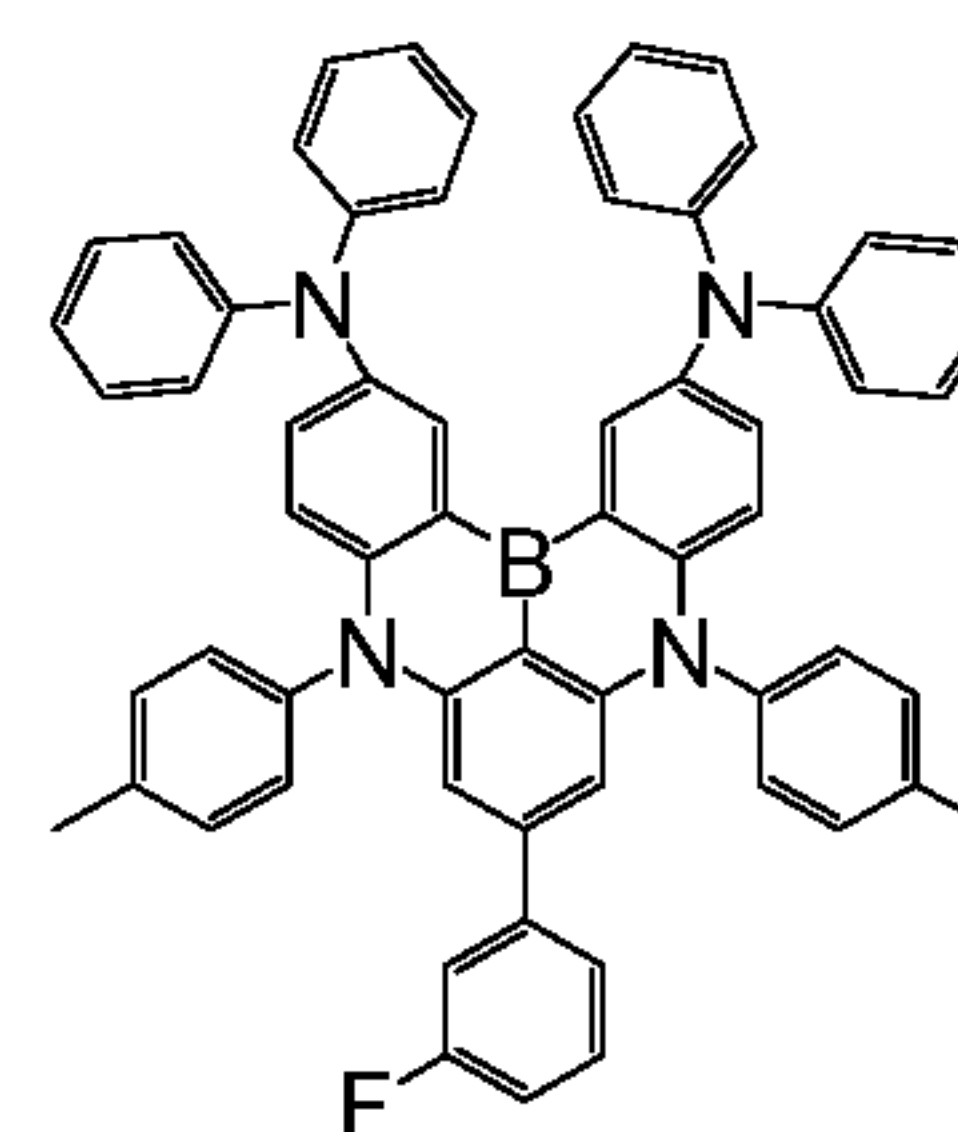
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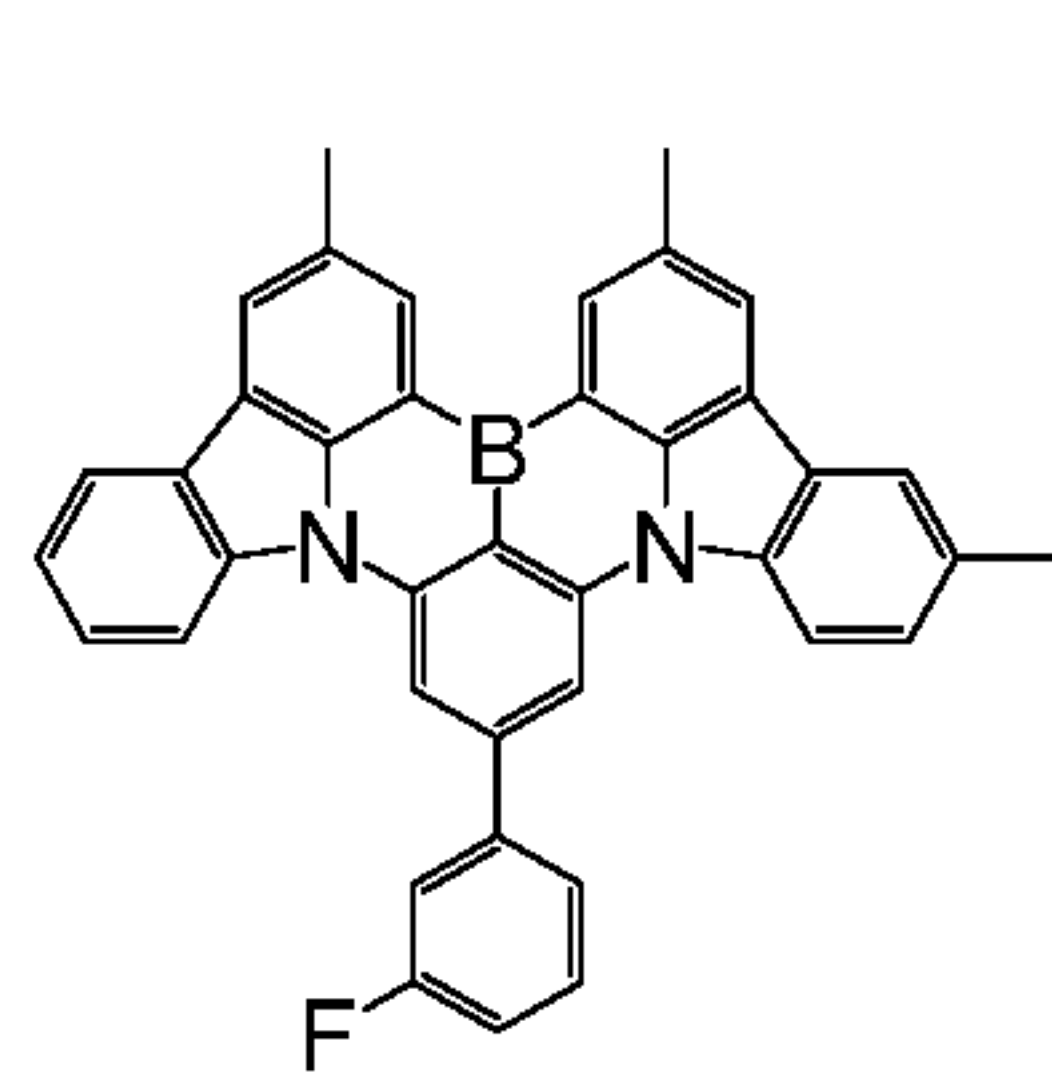
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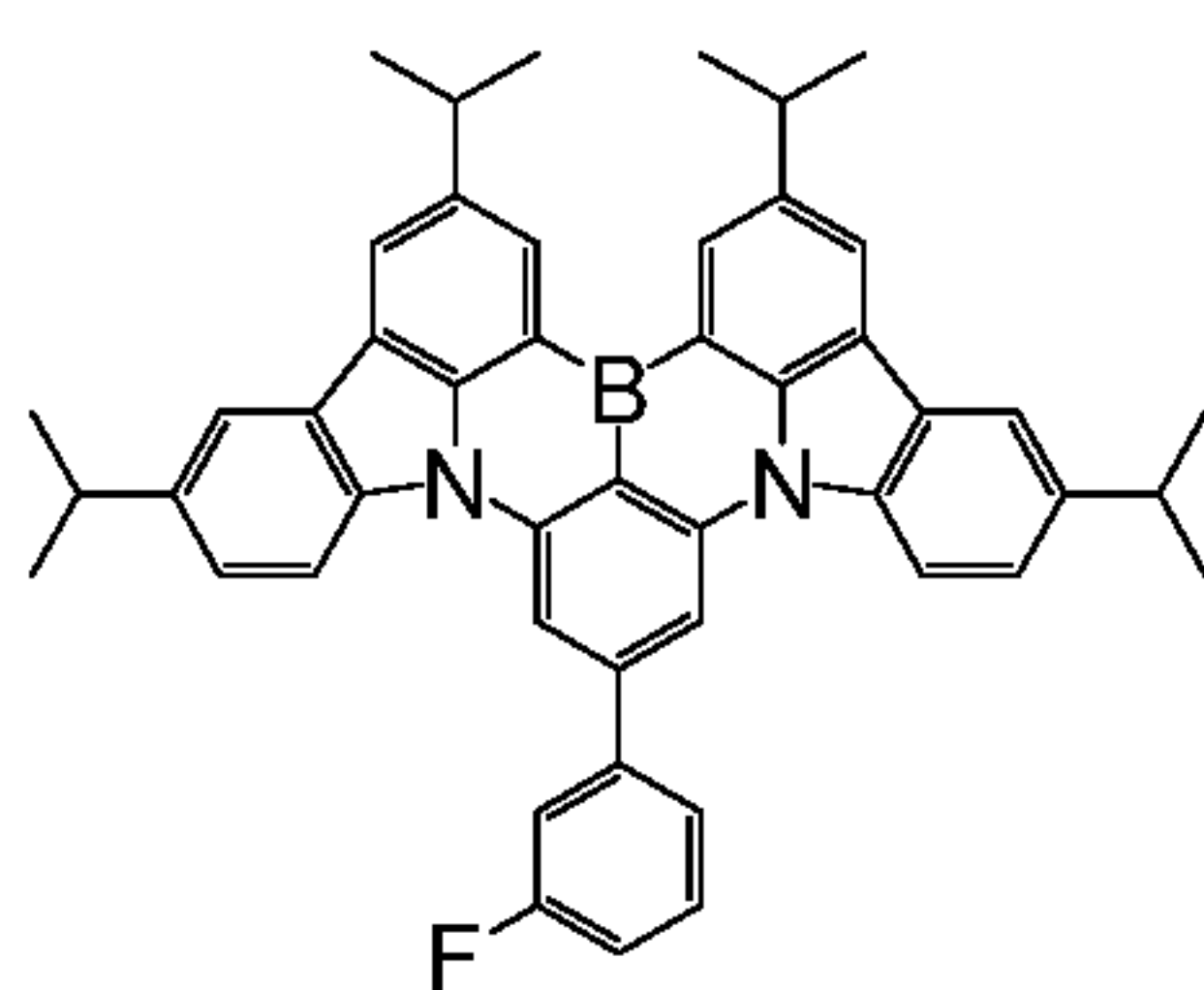
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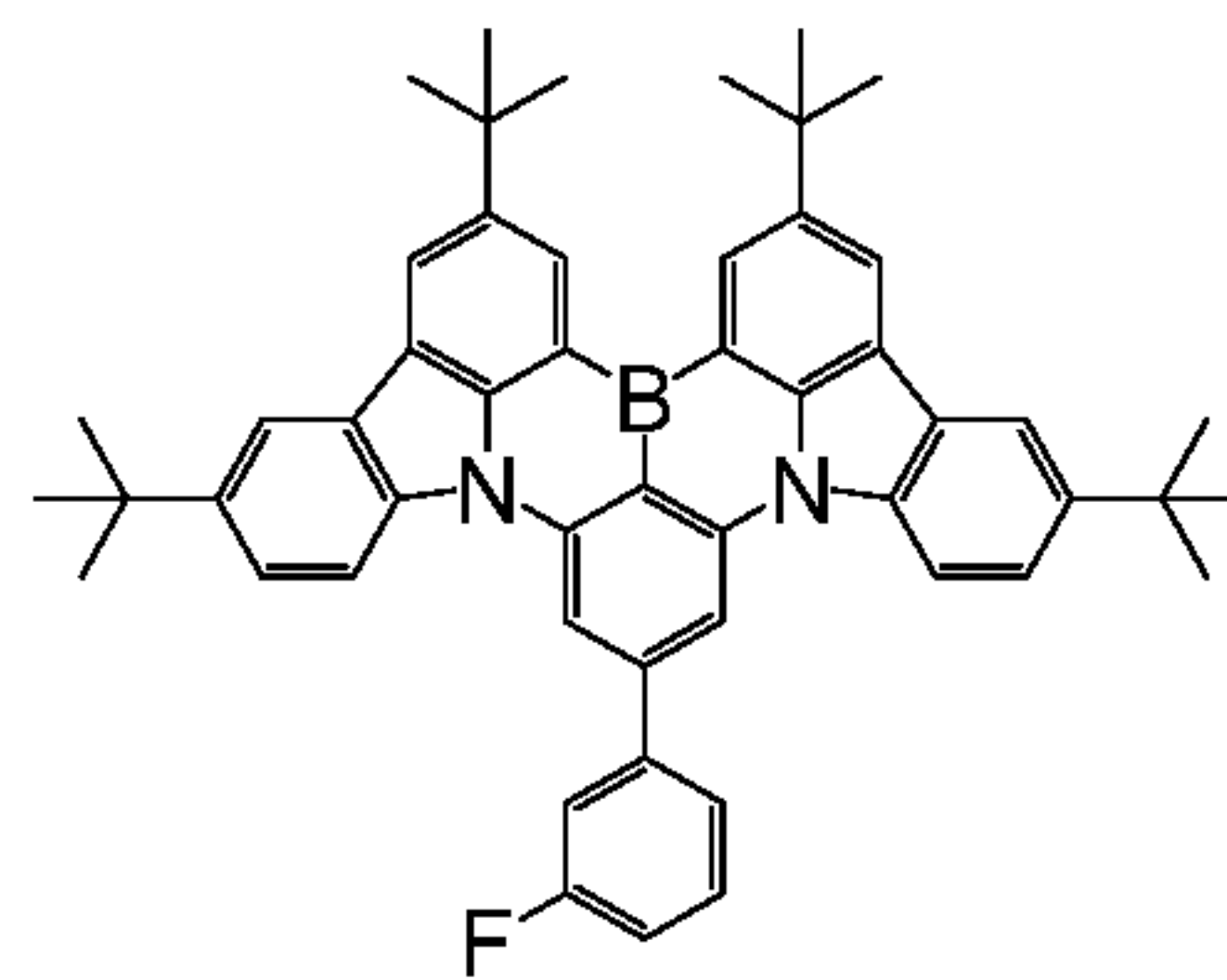
C-72



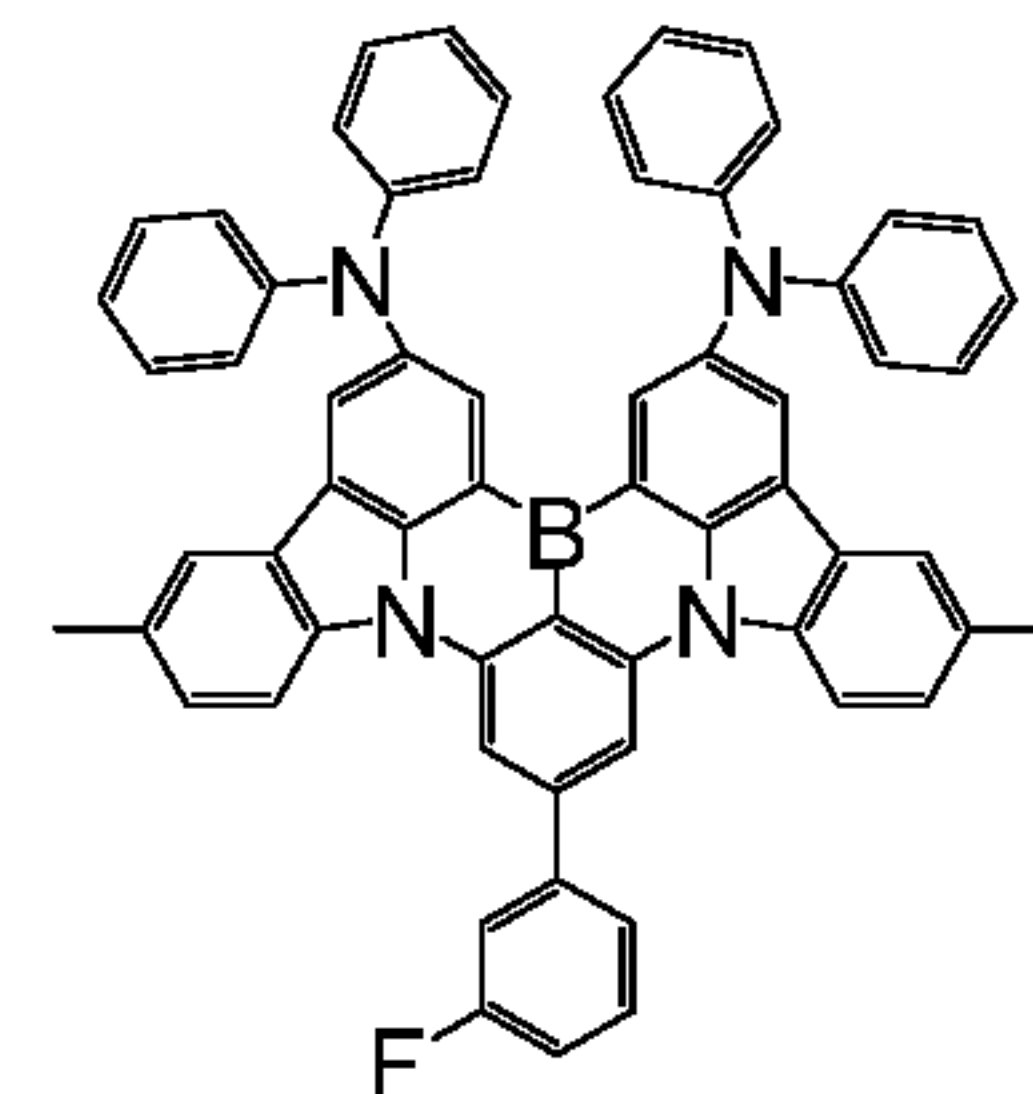
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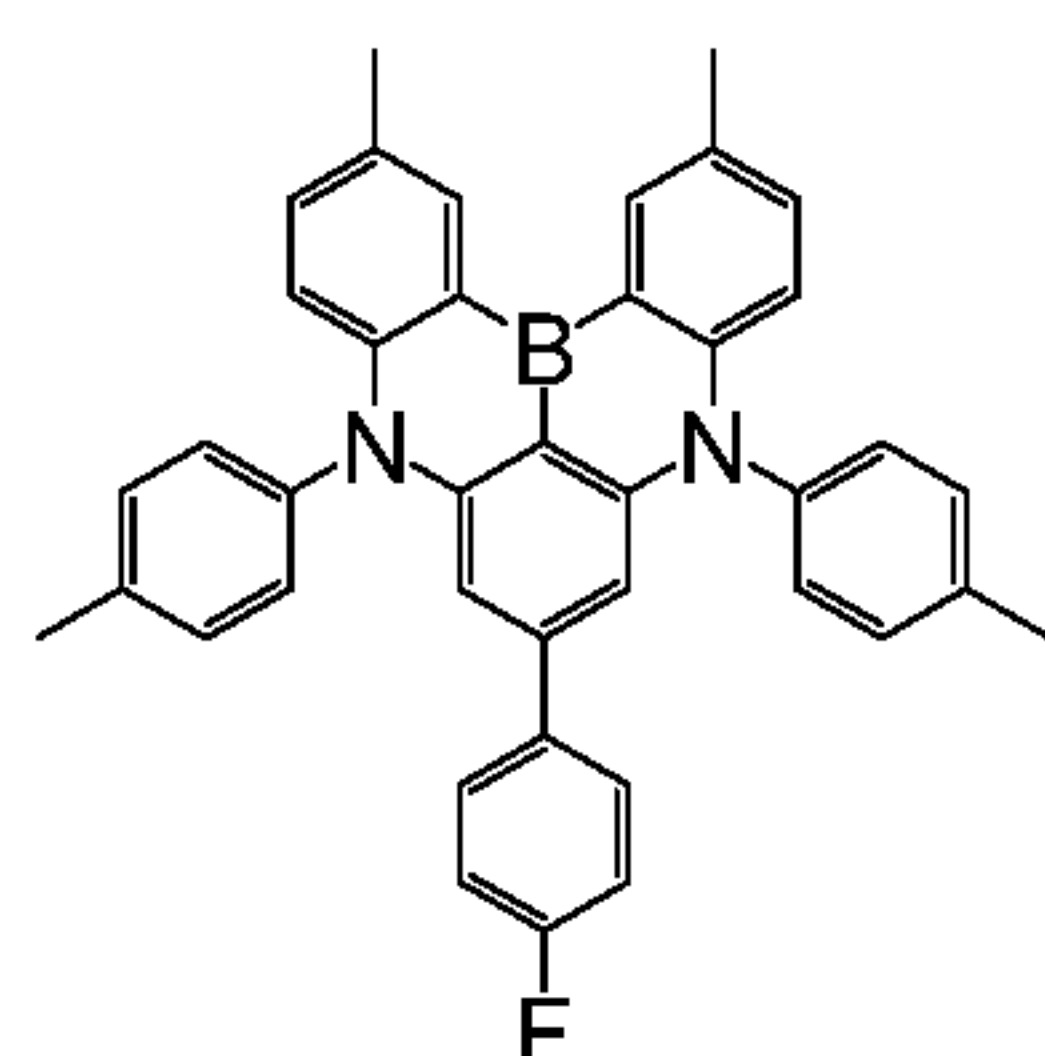
C-74



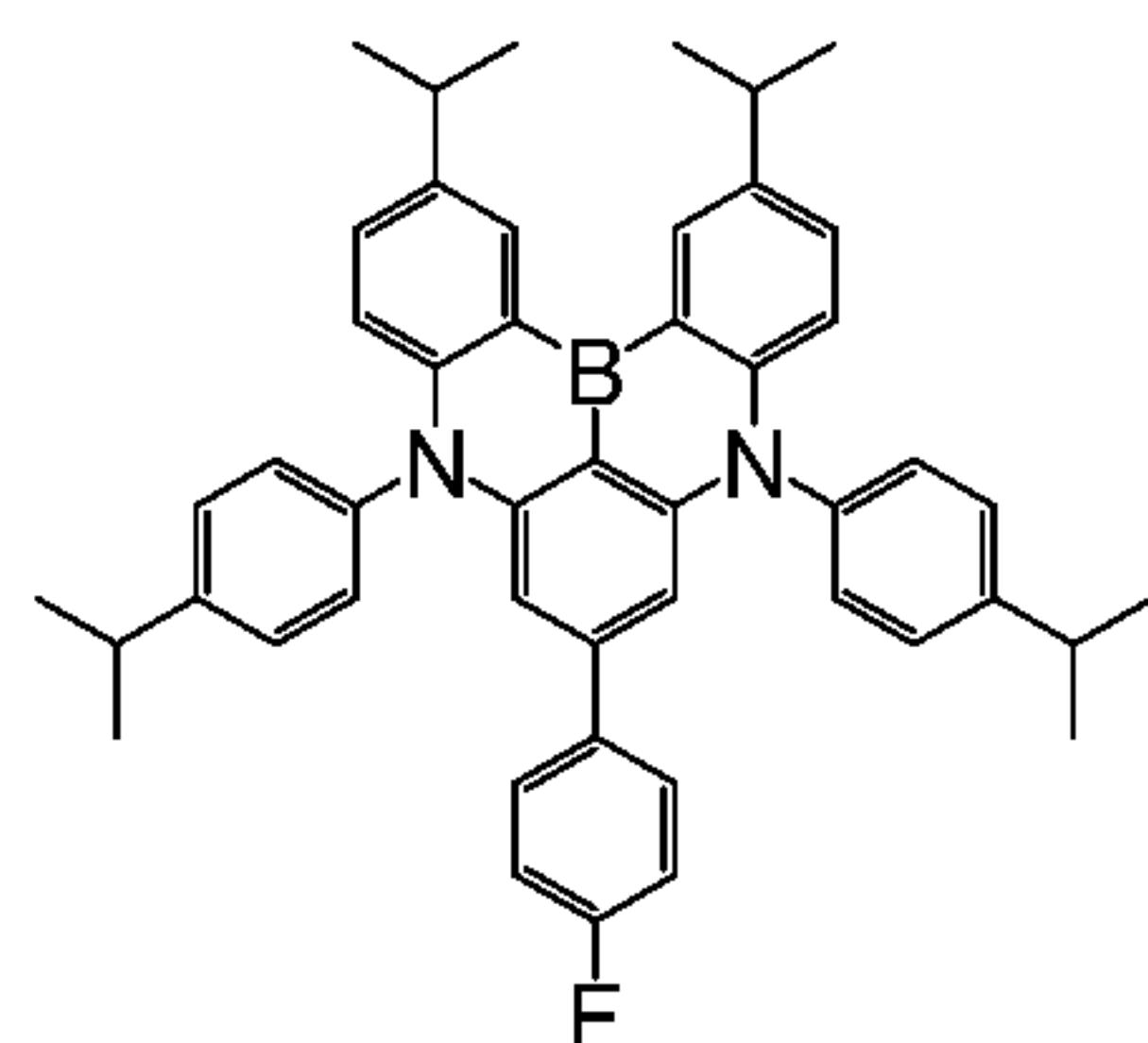
C-75



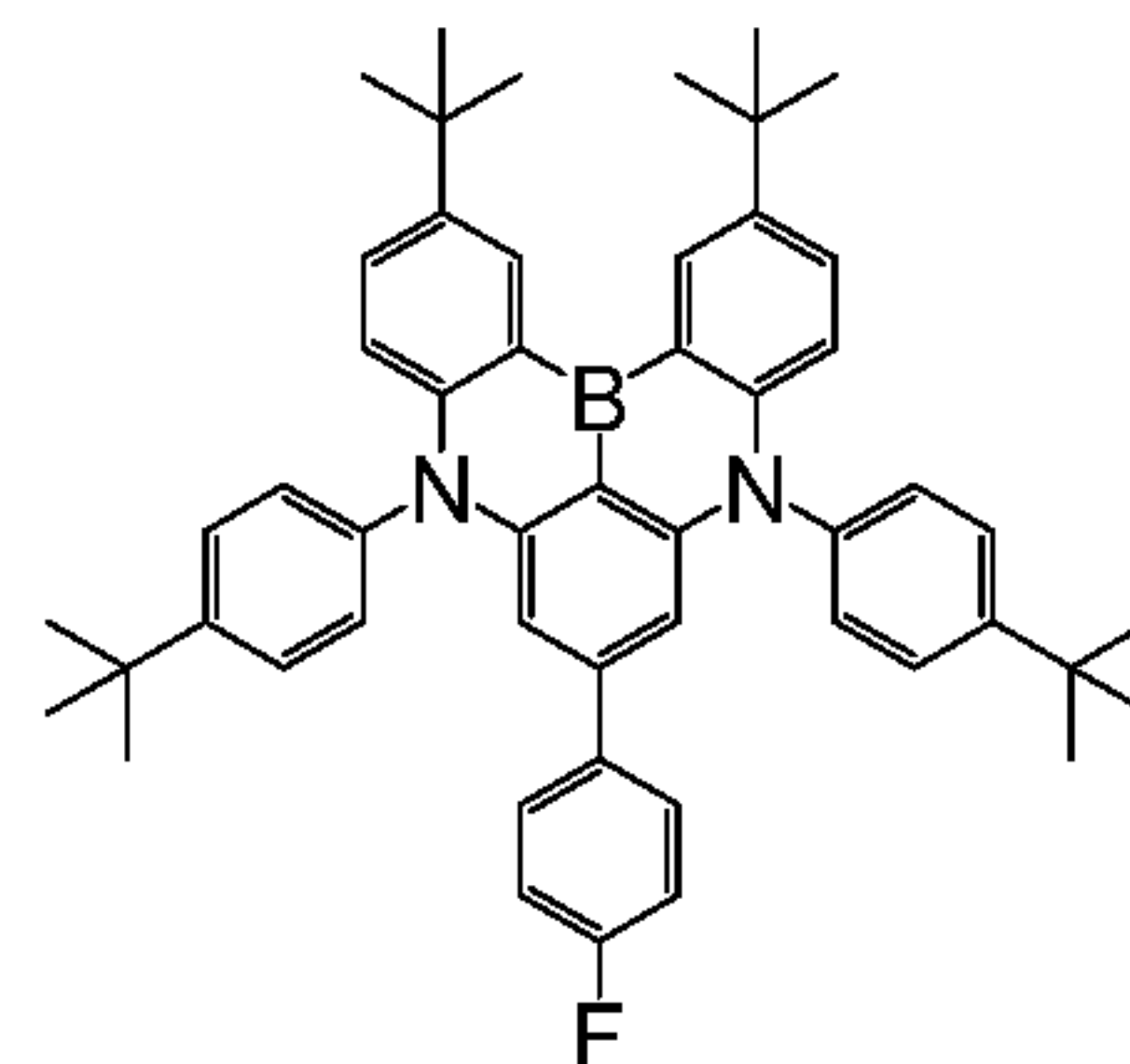
C-76



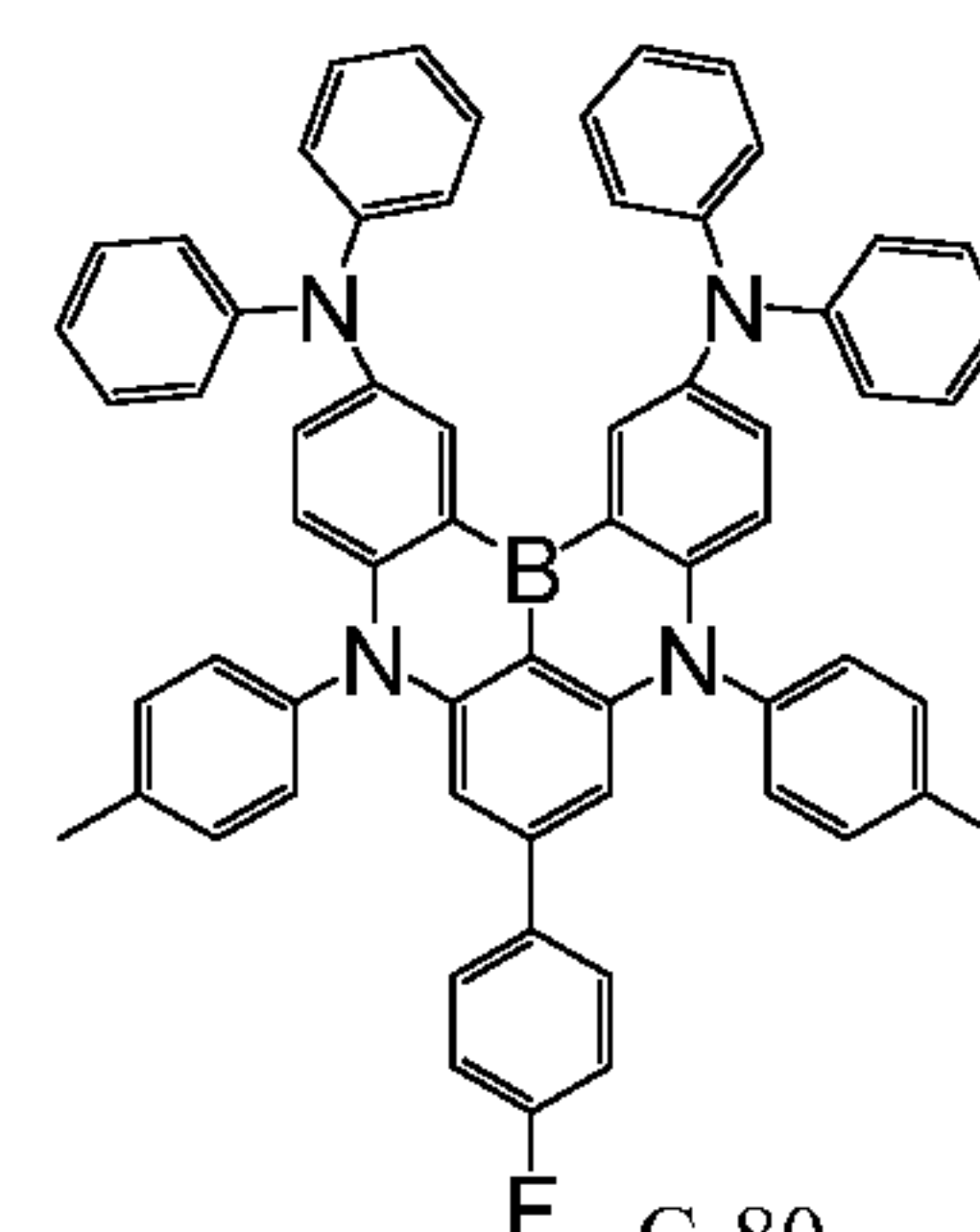
C-77



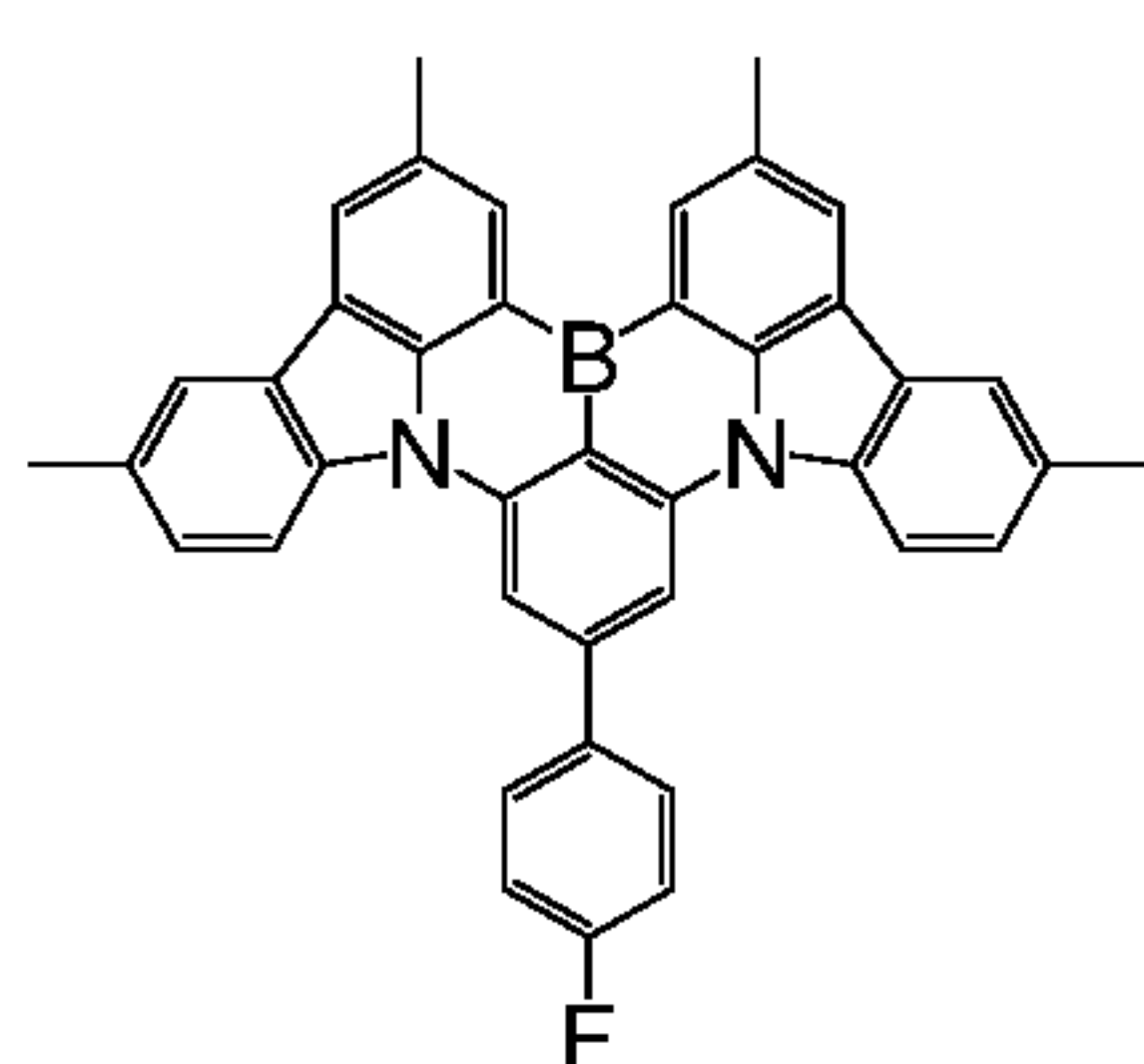
C-78



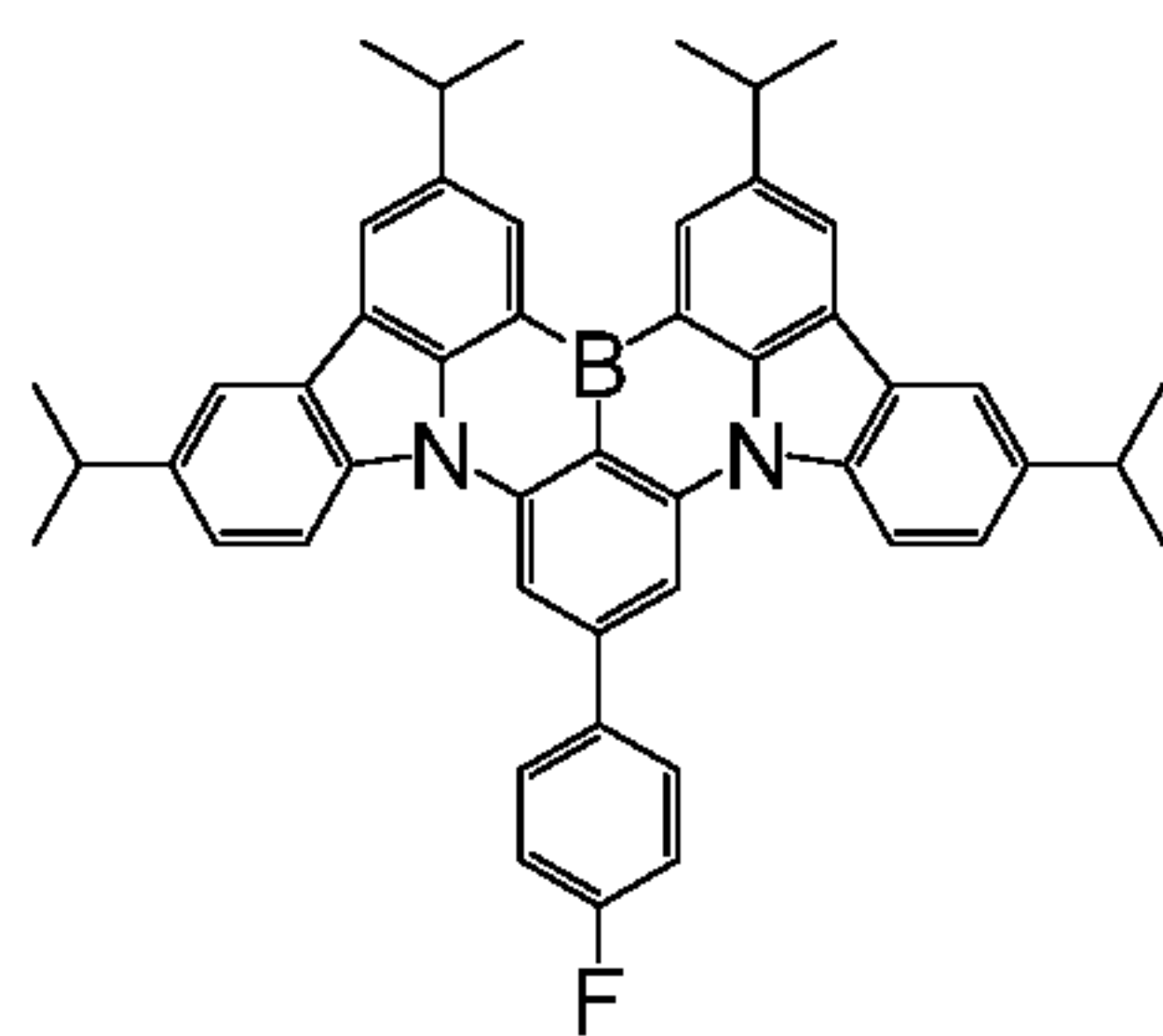
C-79



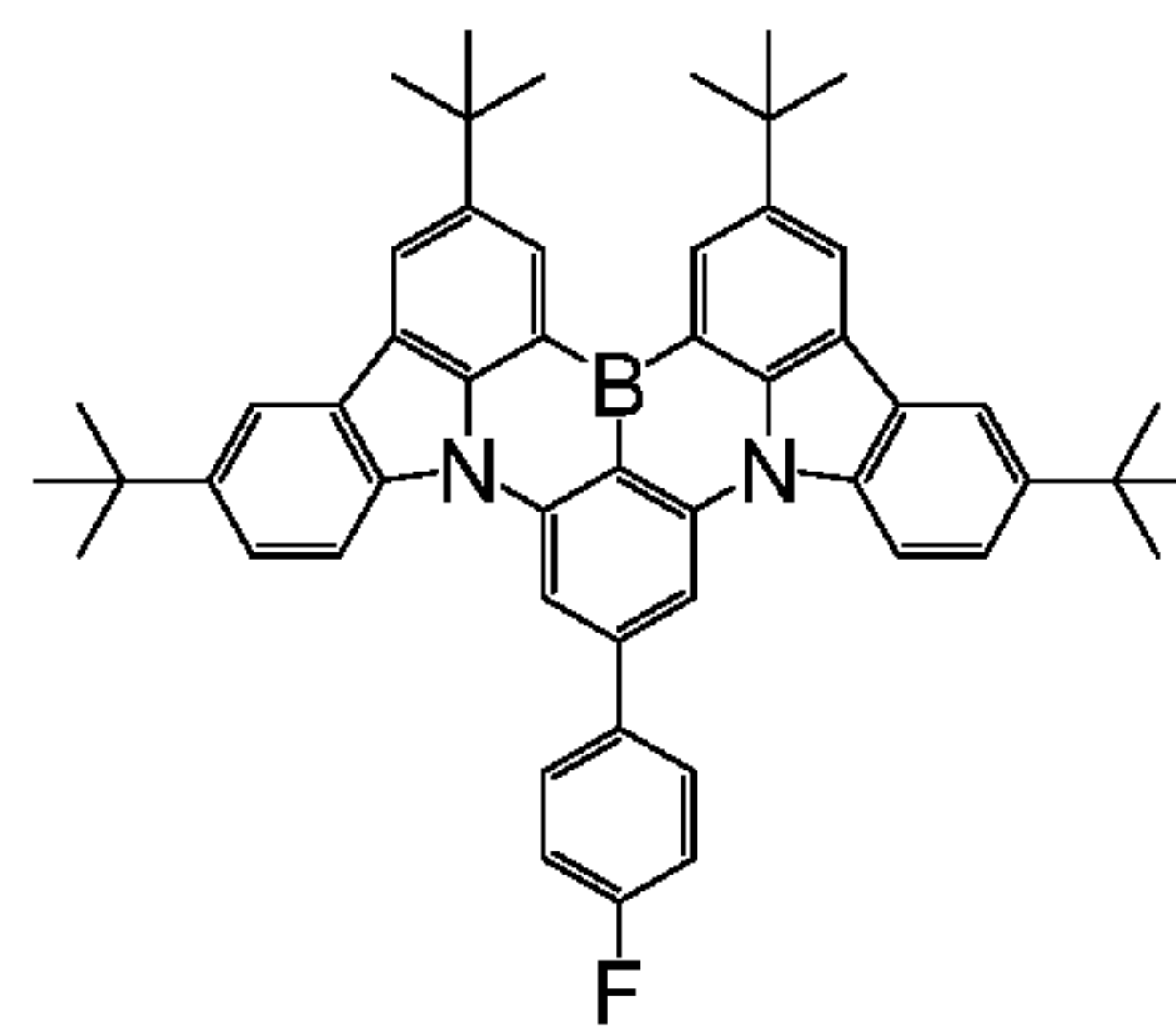
C-80



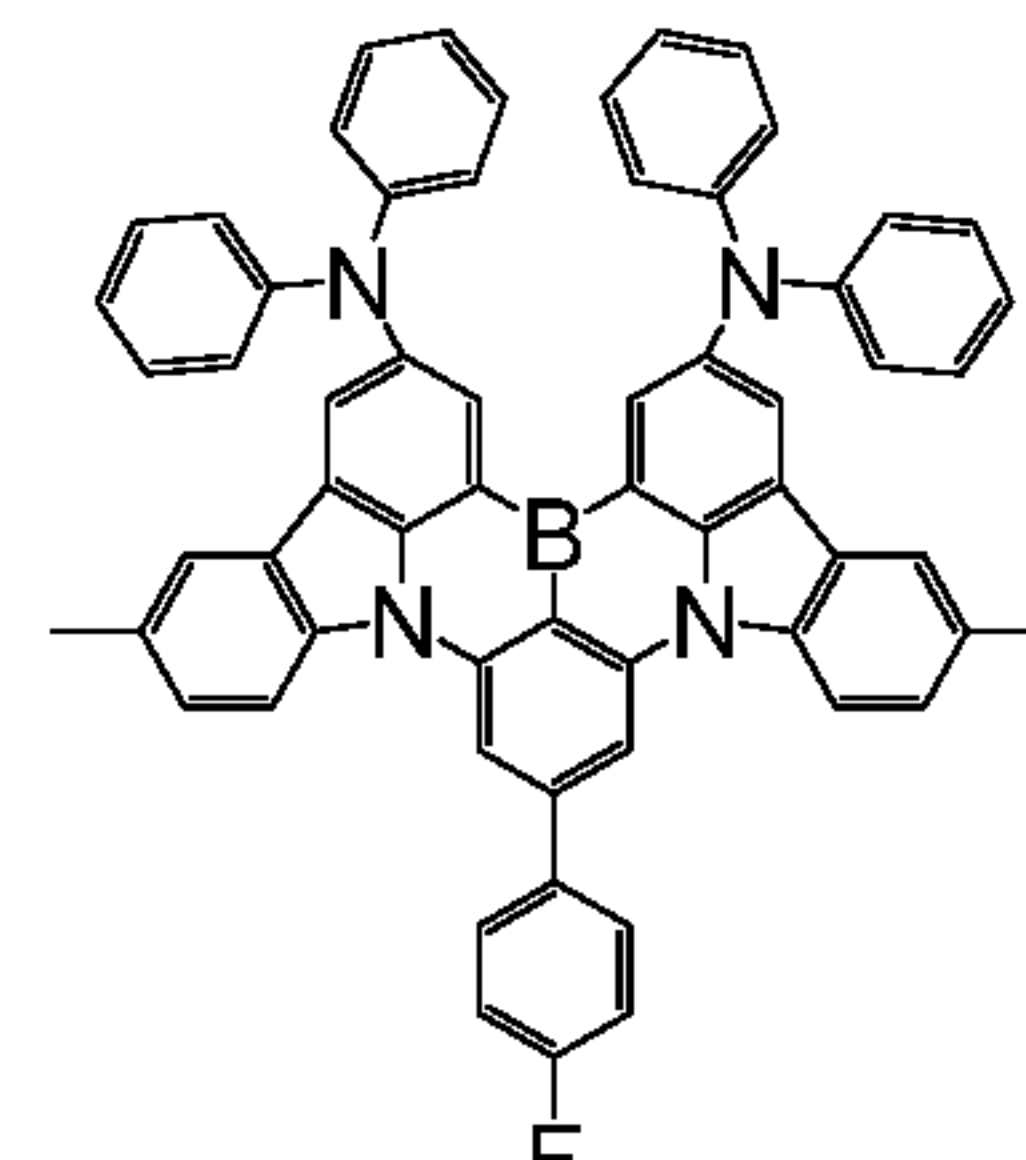
C-81



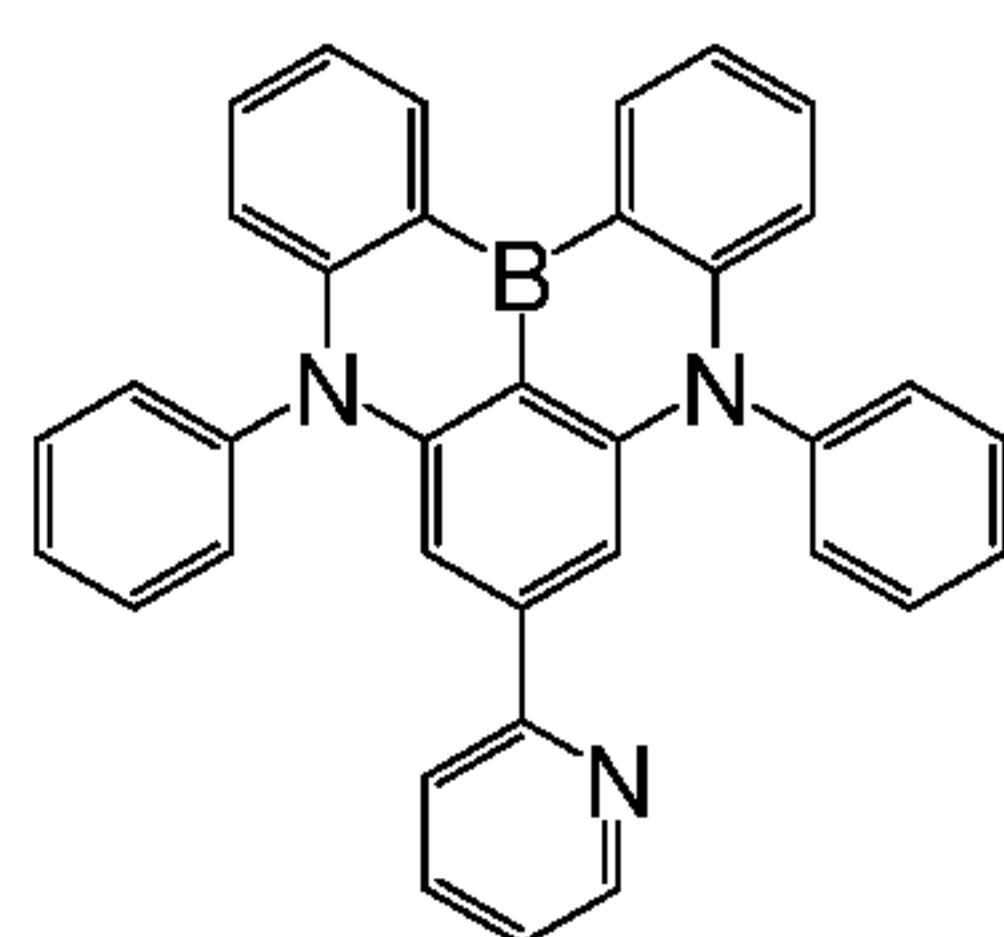
C-82



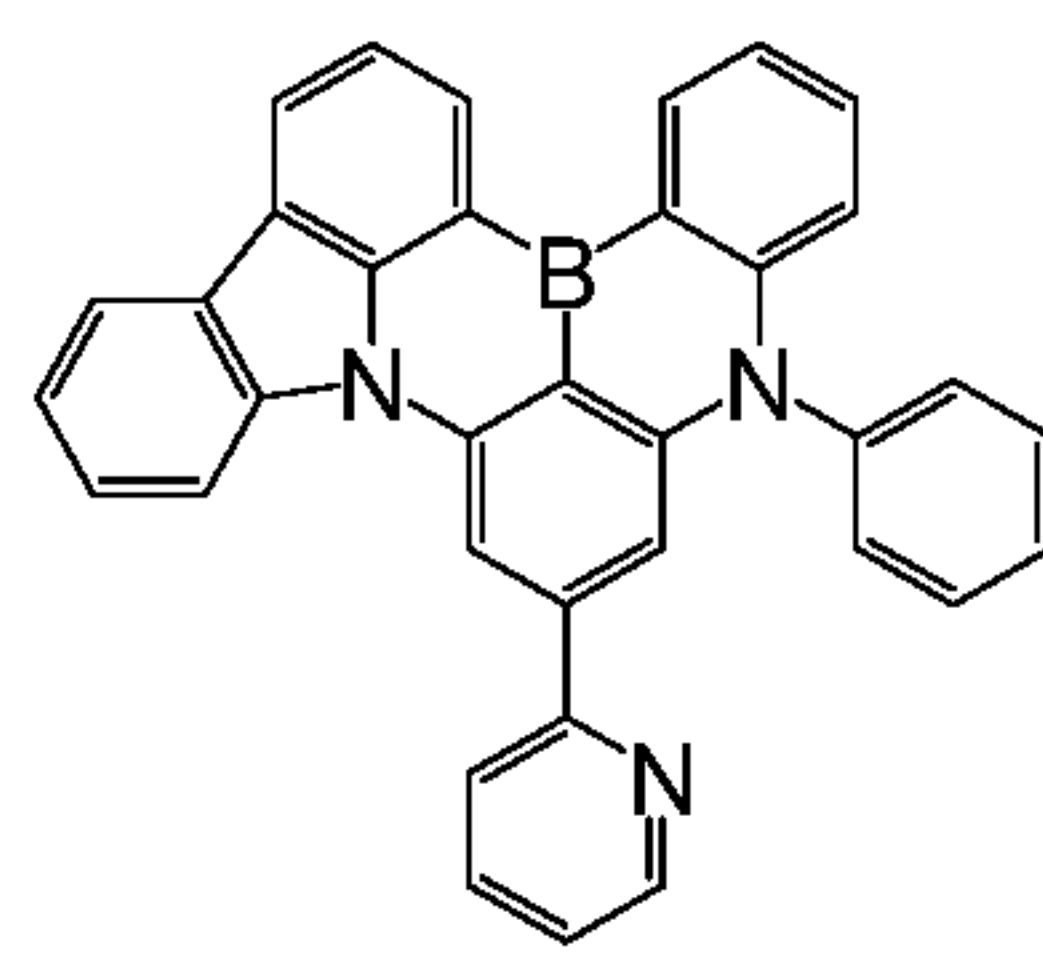
C-83



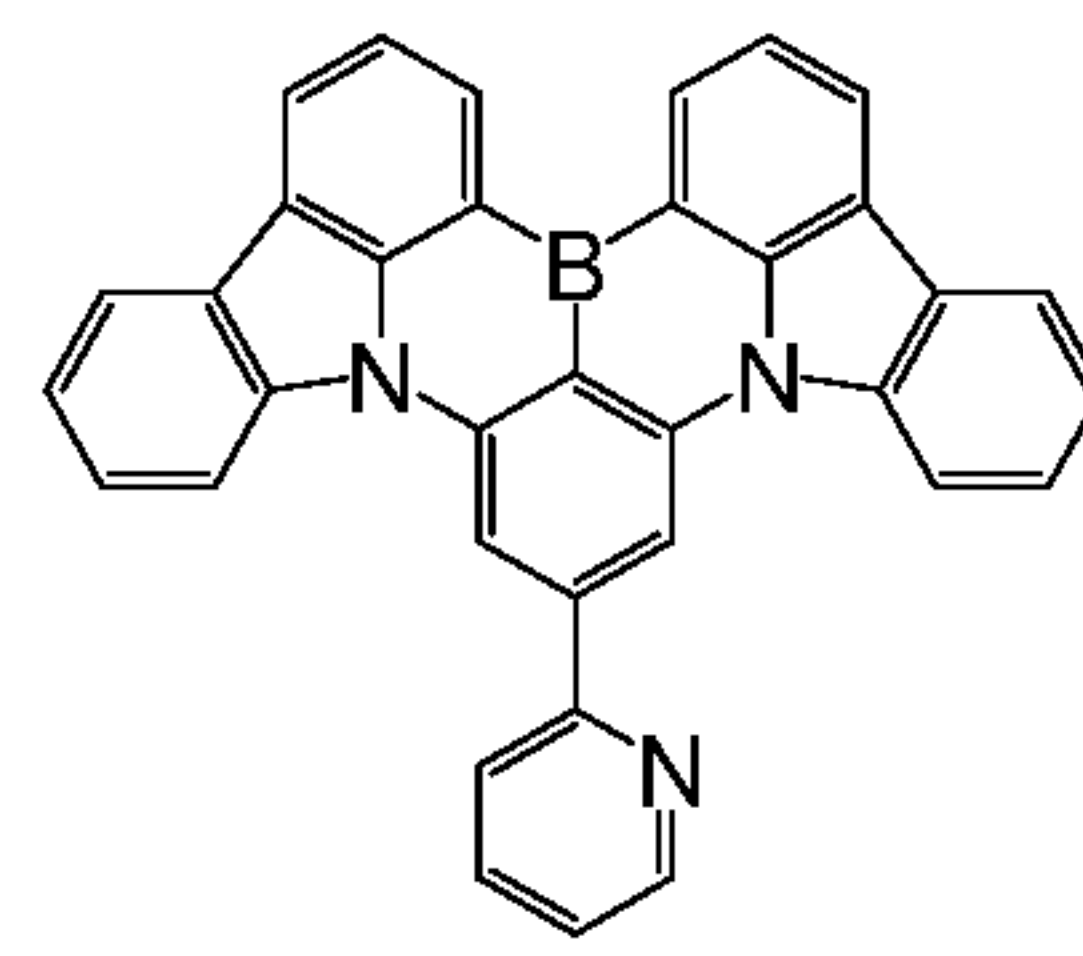
C-84



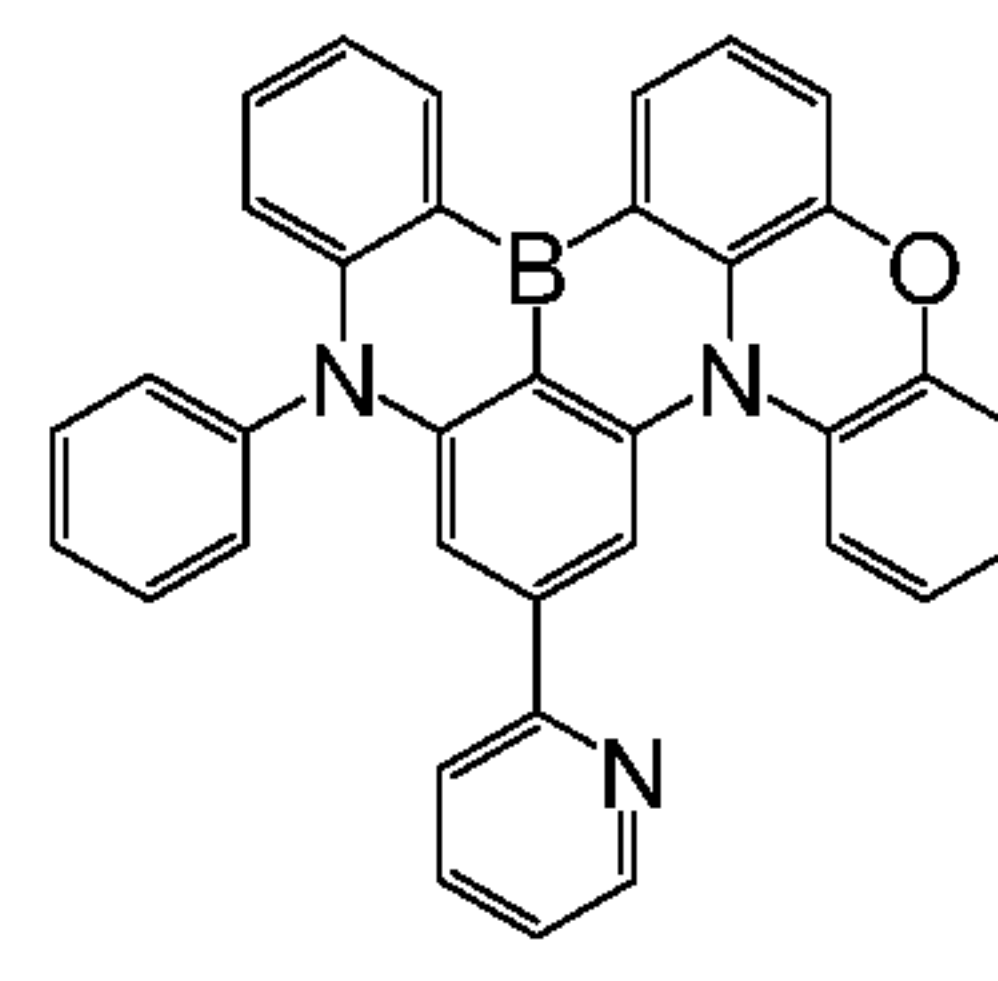
C-85



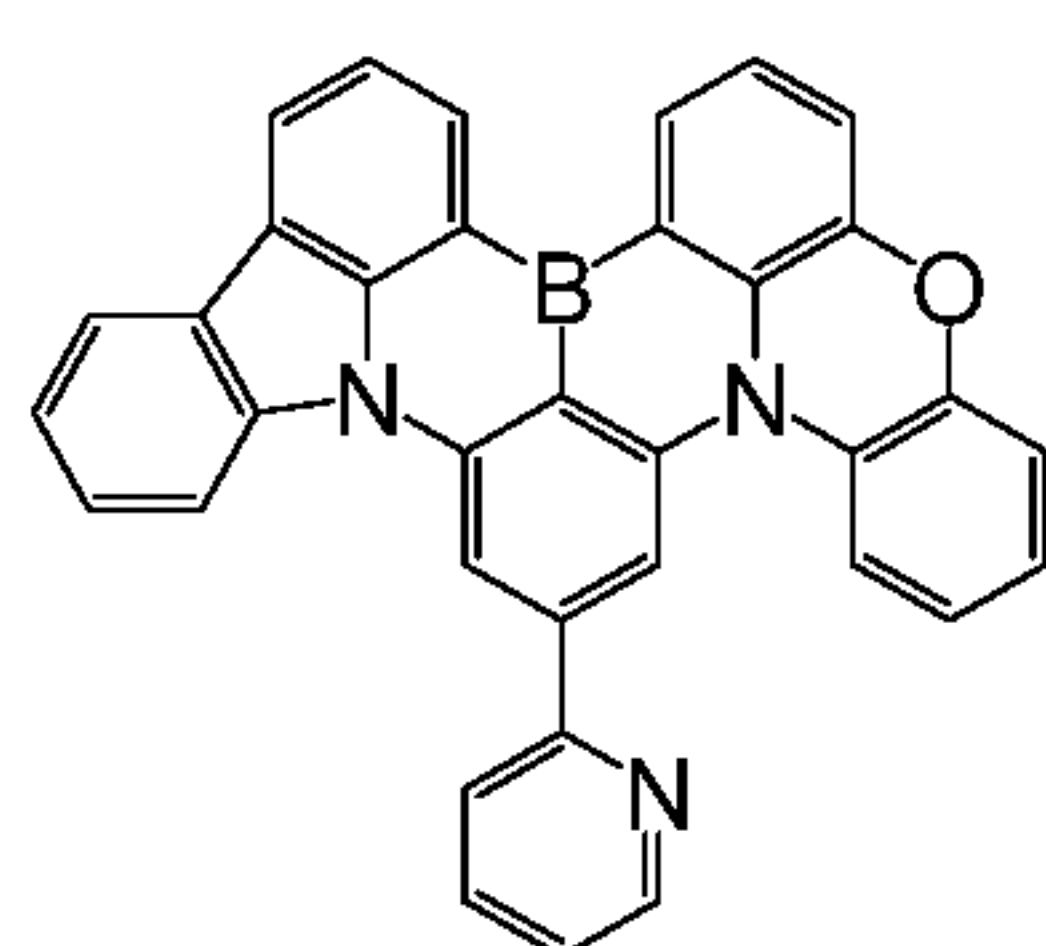
C-86



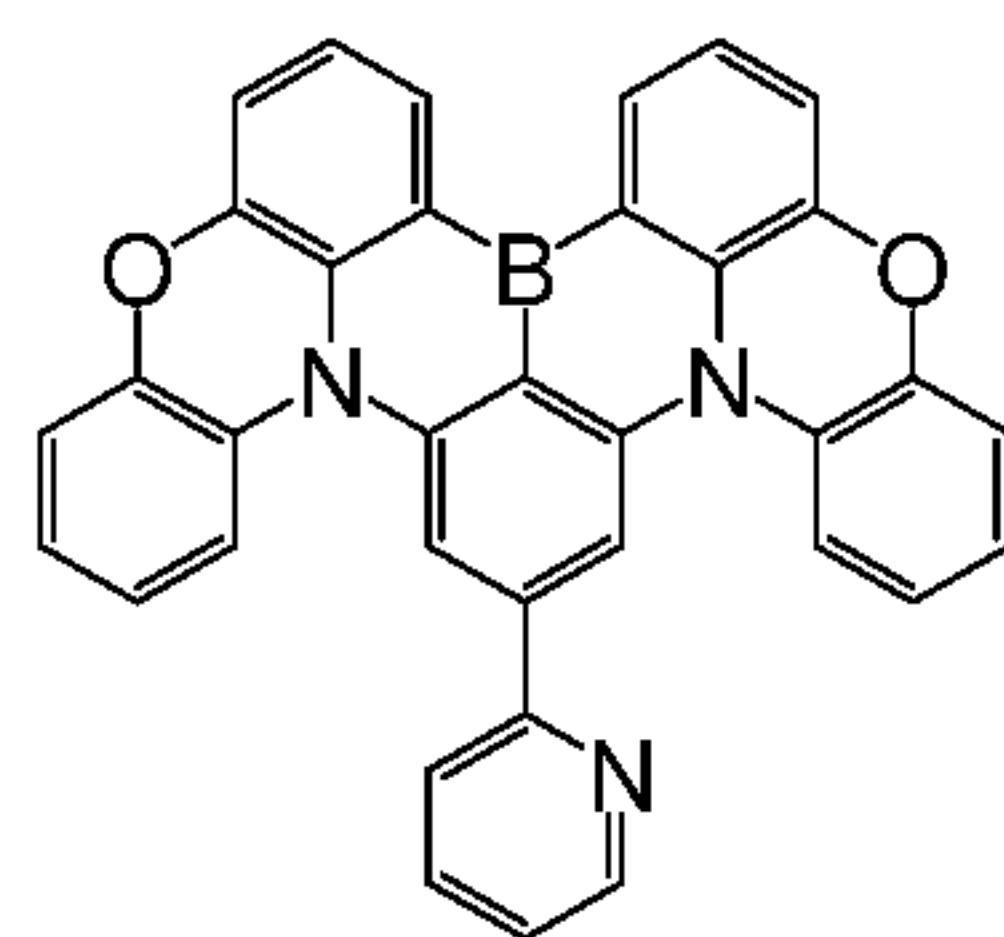
C-87



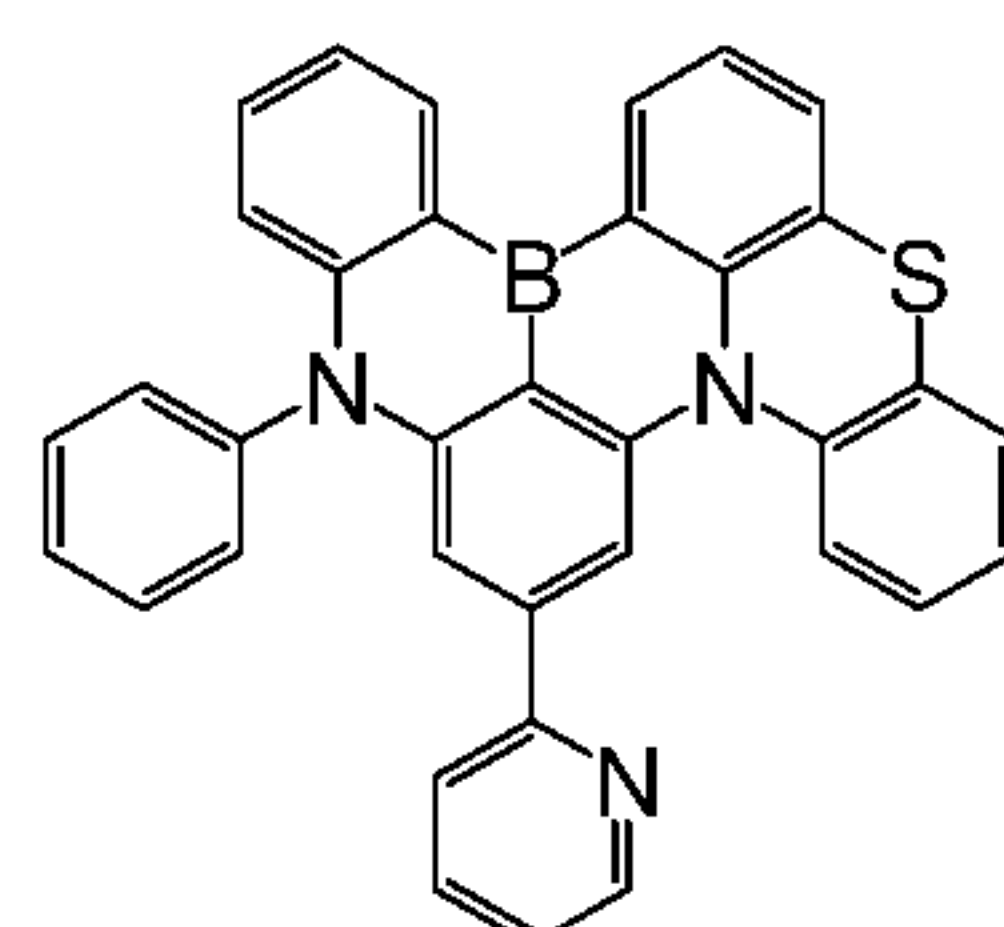
C-88



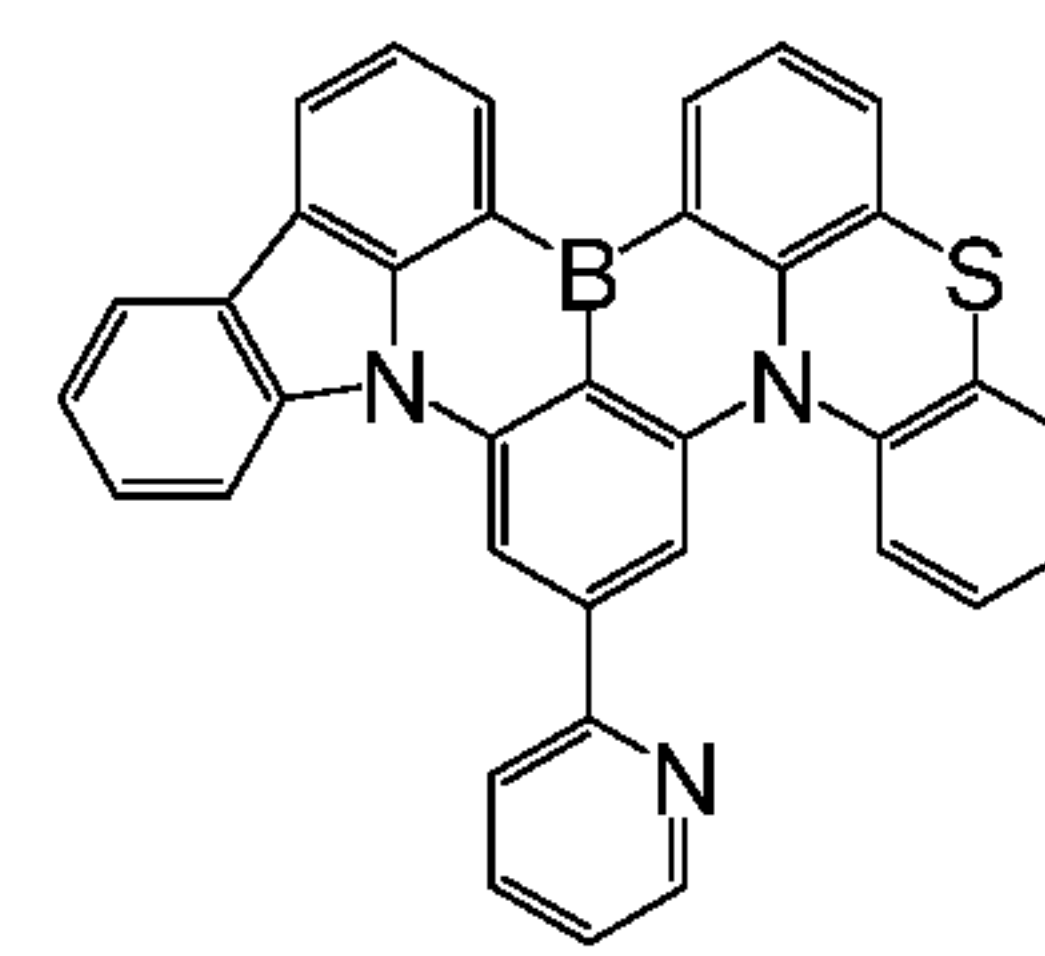
C-89



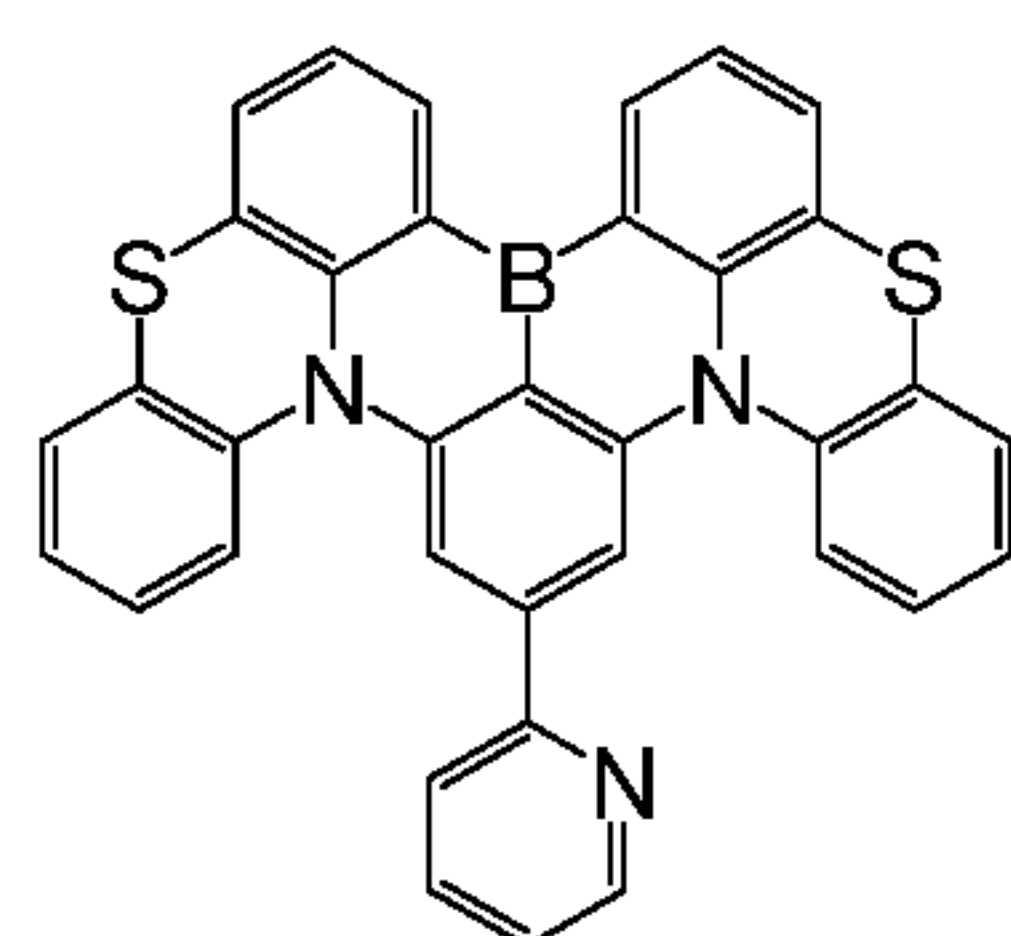
C-90



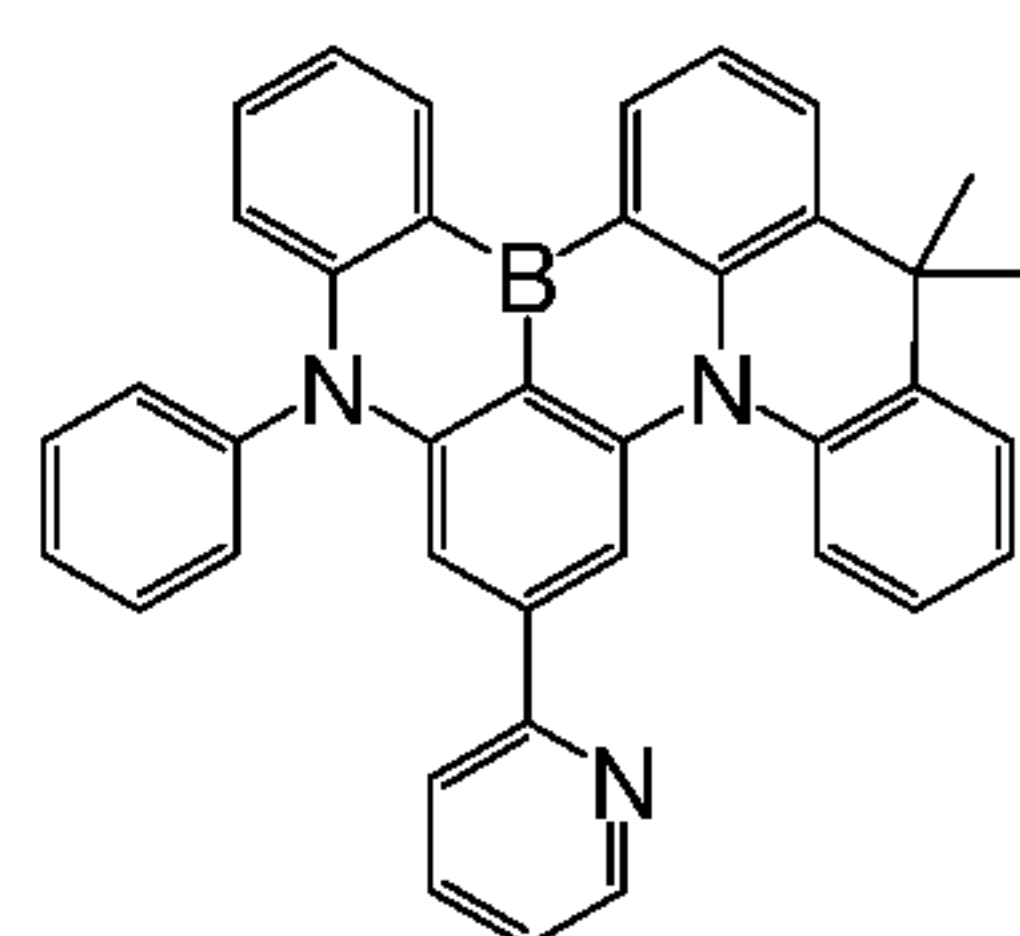
C-91



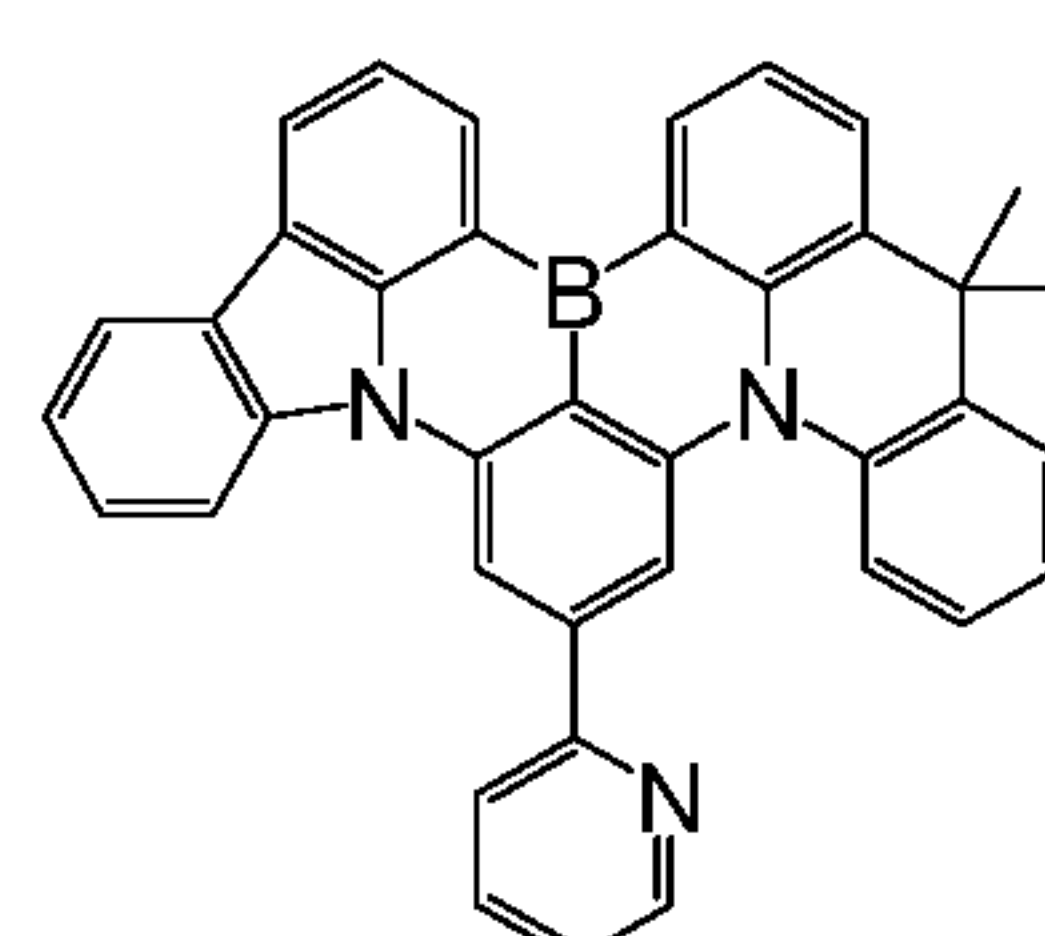
C-92



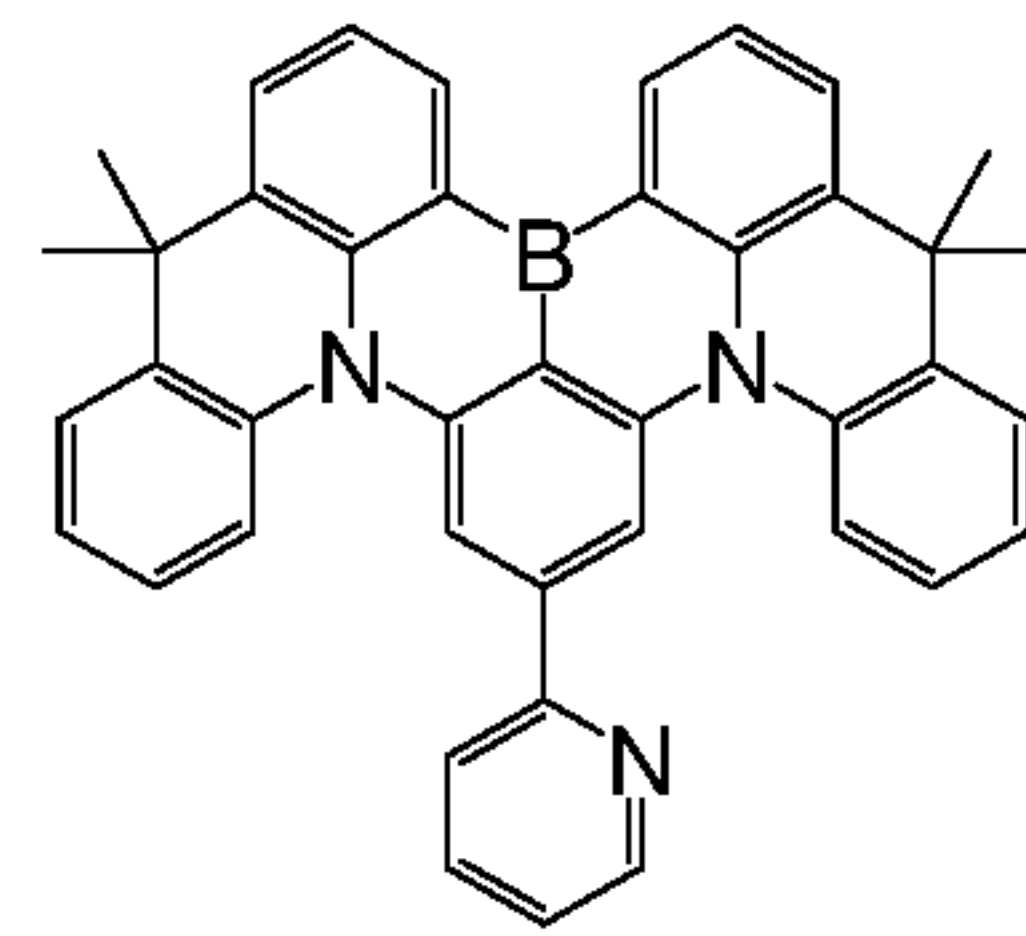
C-93



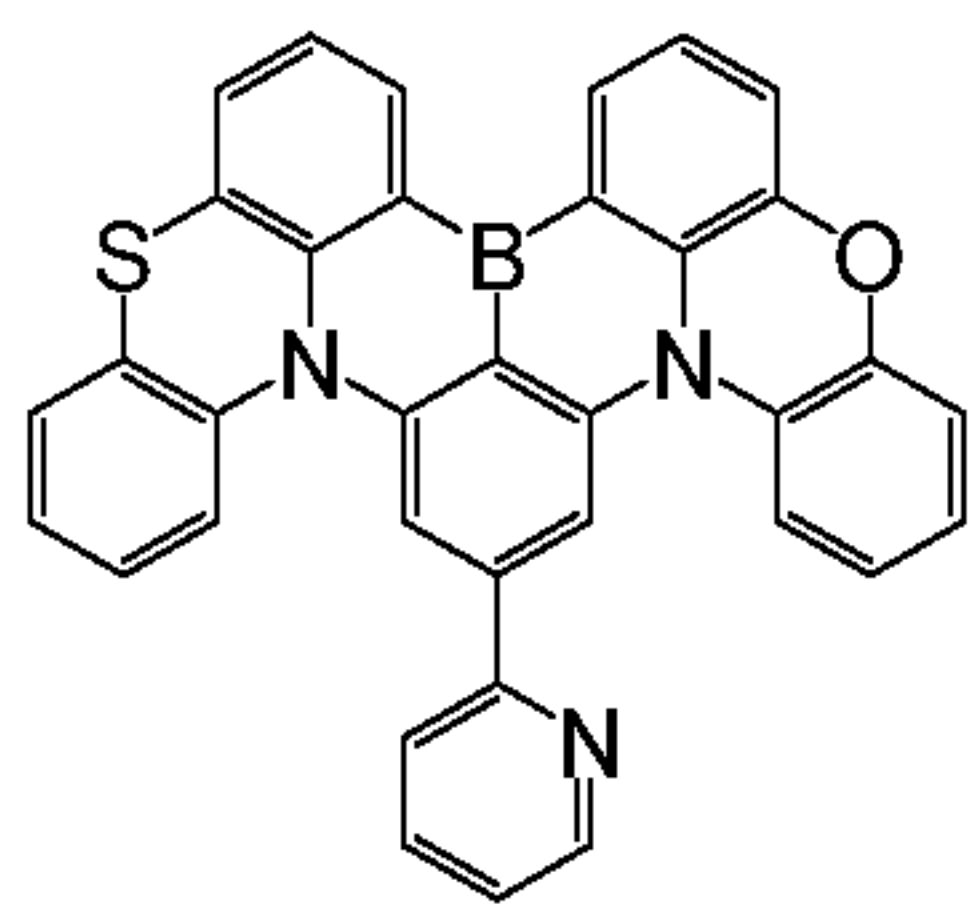
C-94



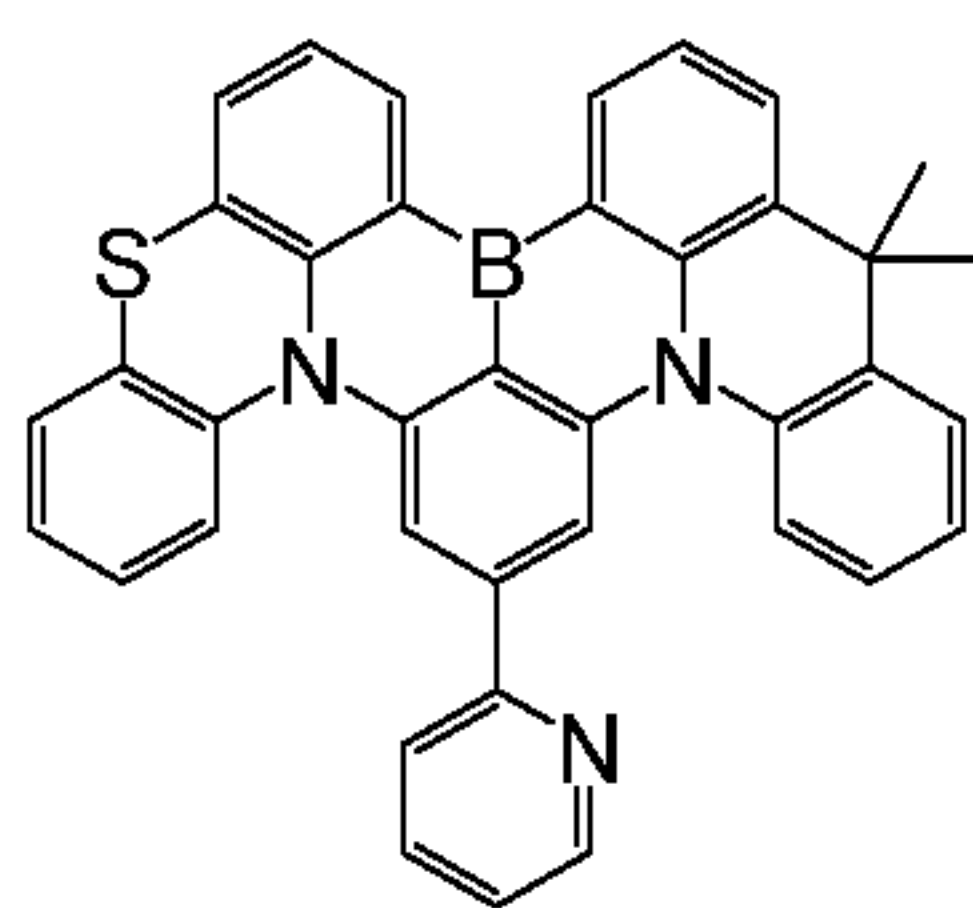
C-95



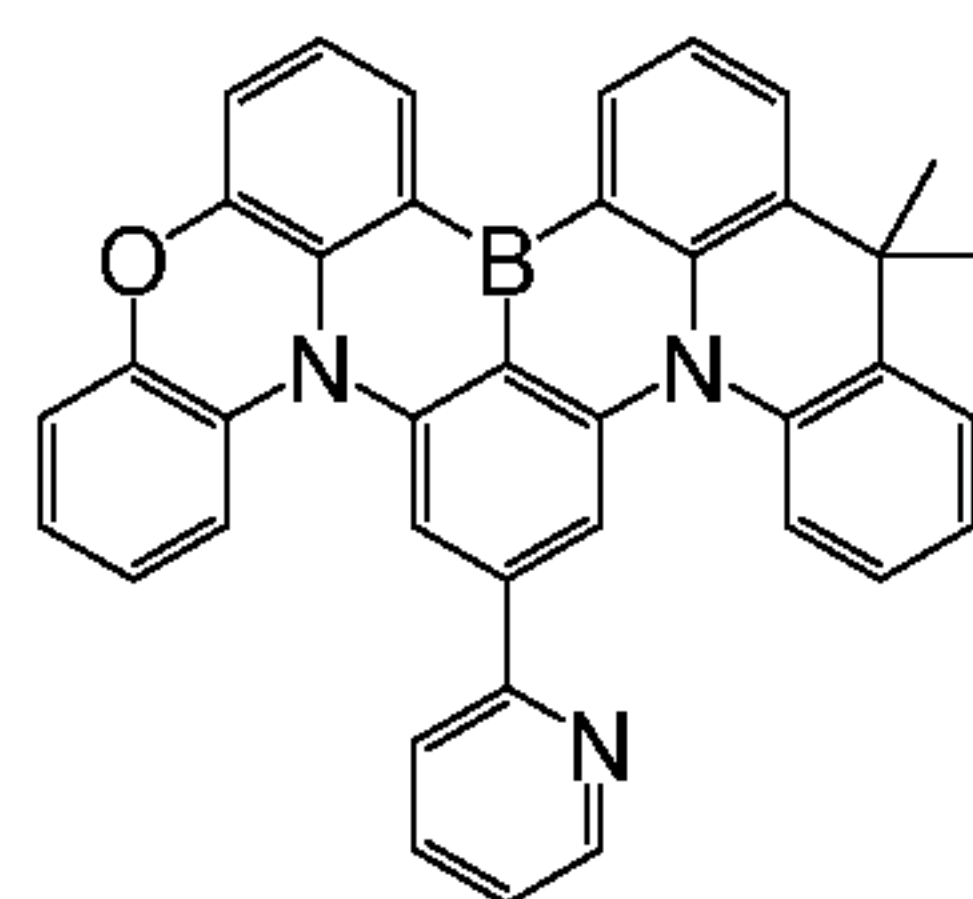
C-96



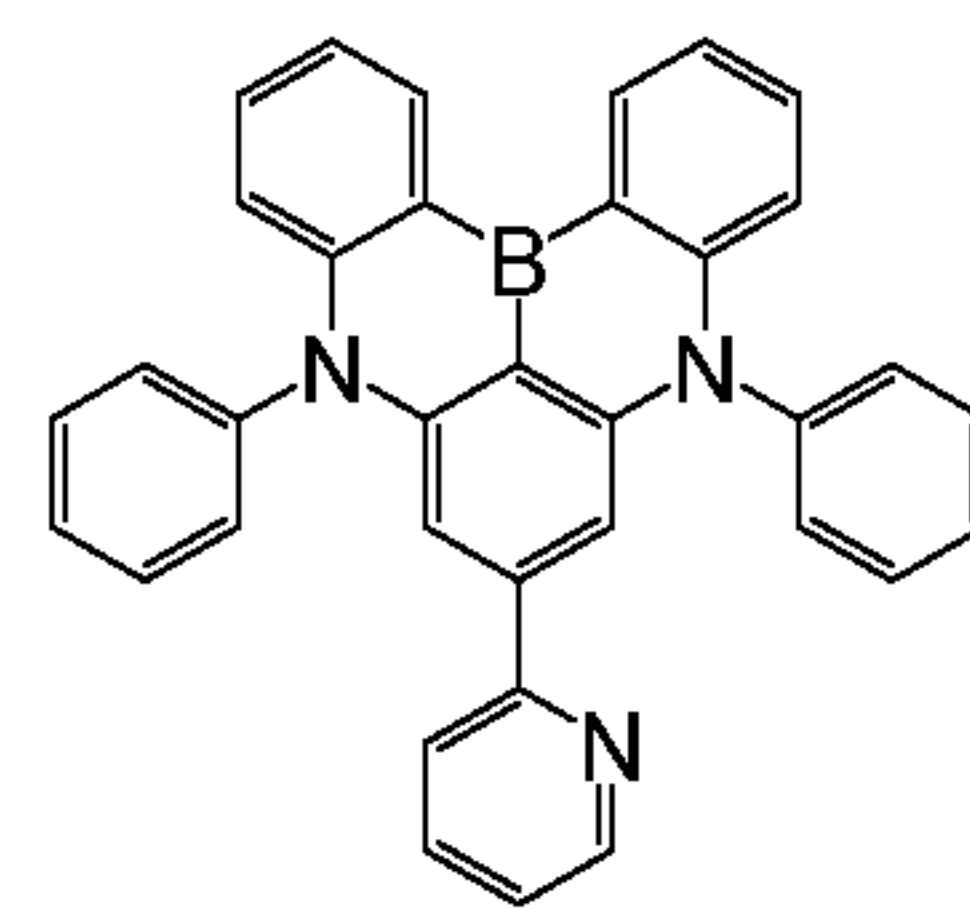
C-97



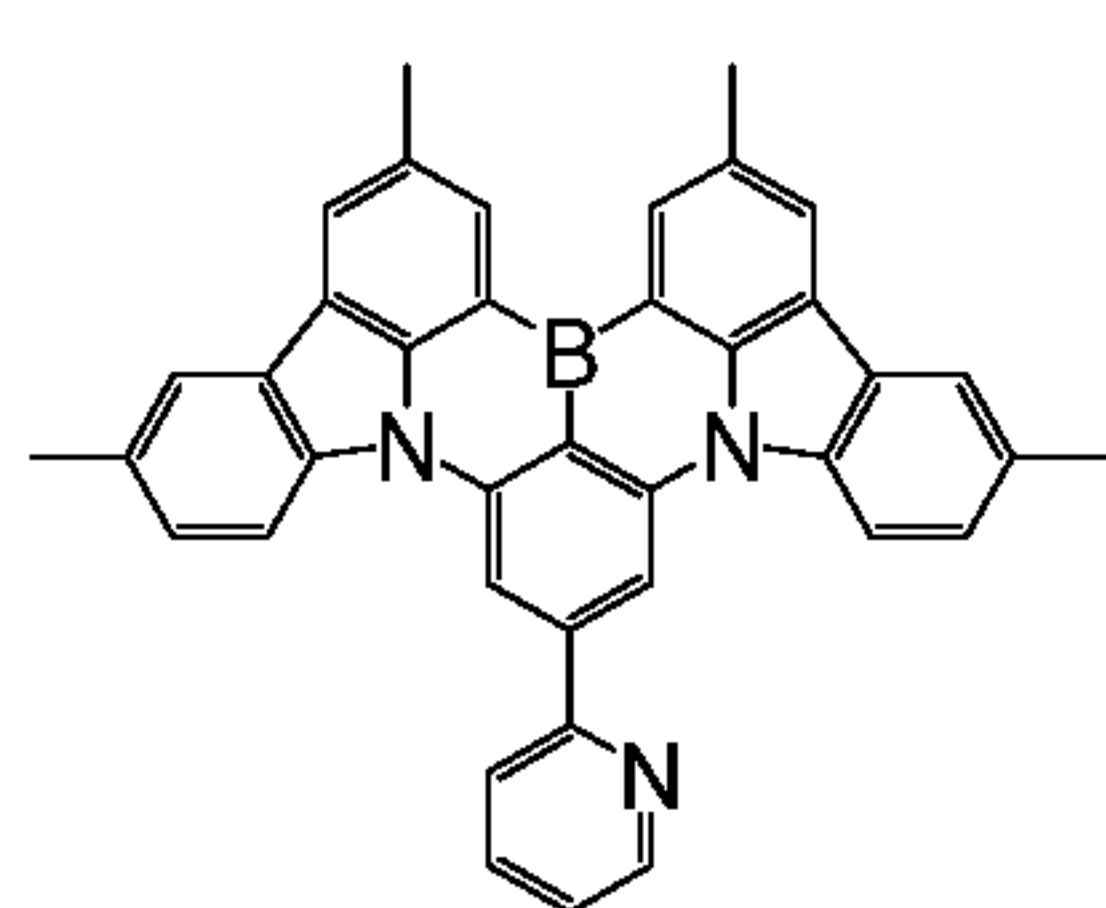
C-98



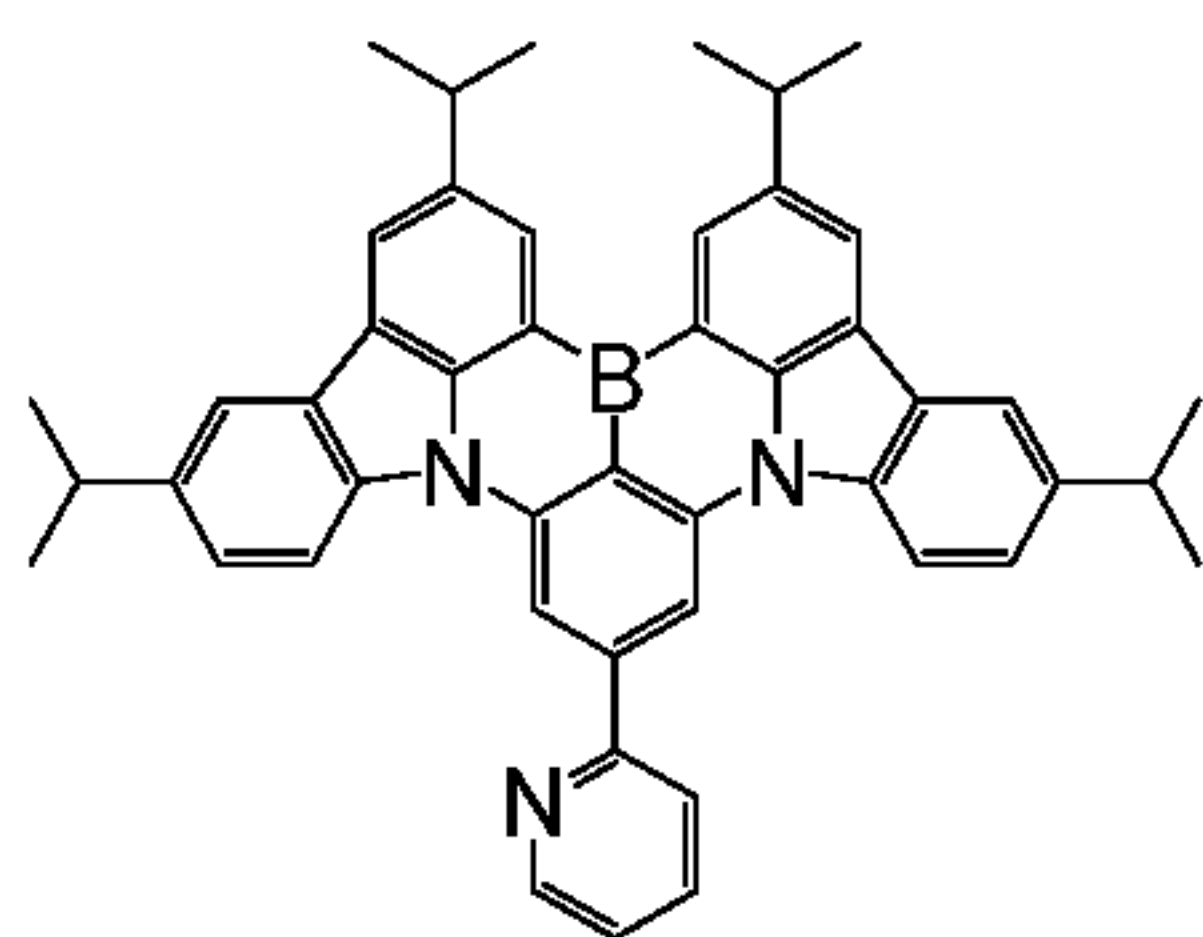
C-99



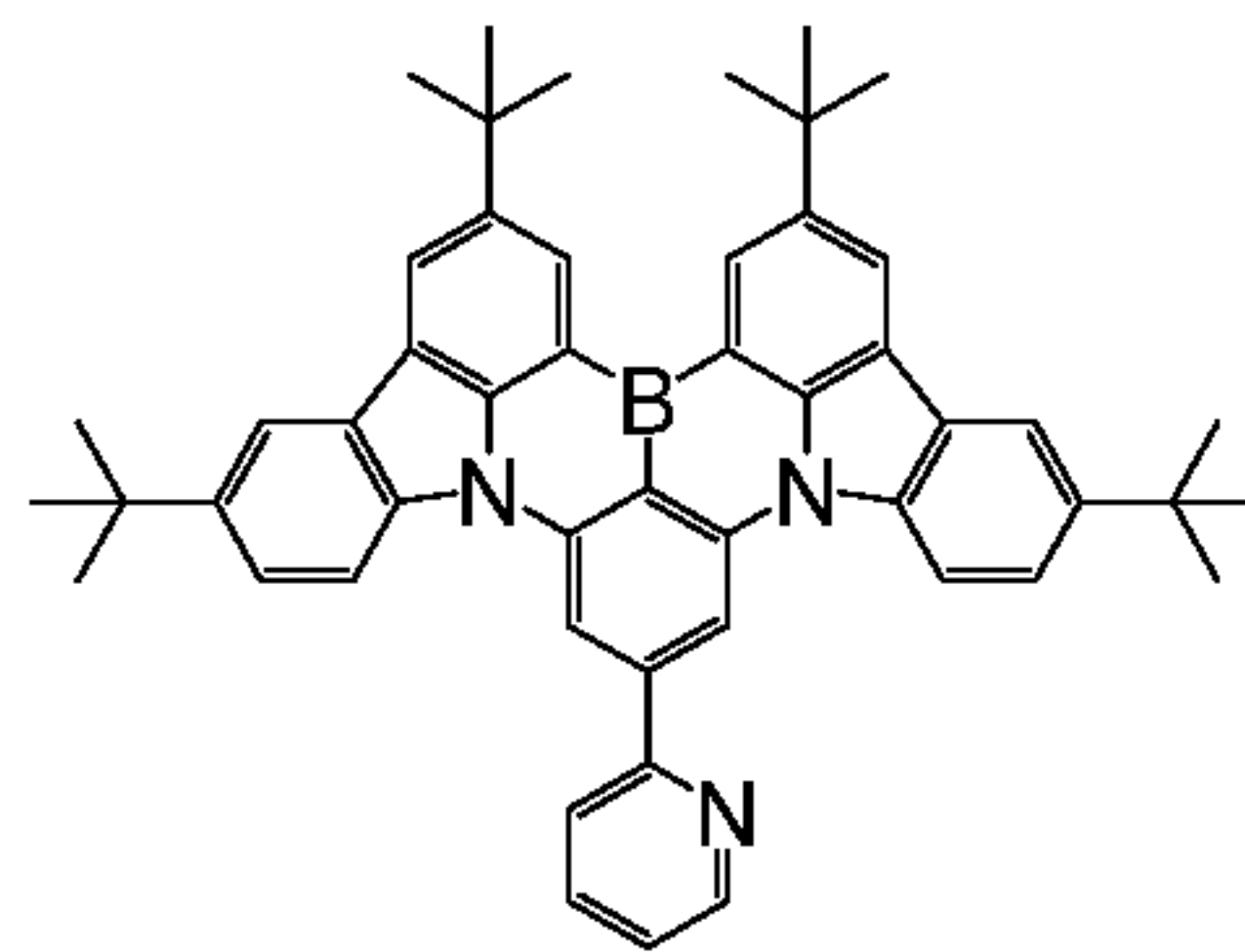
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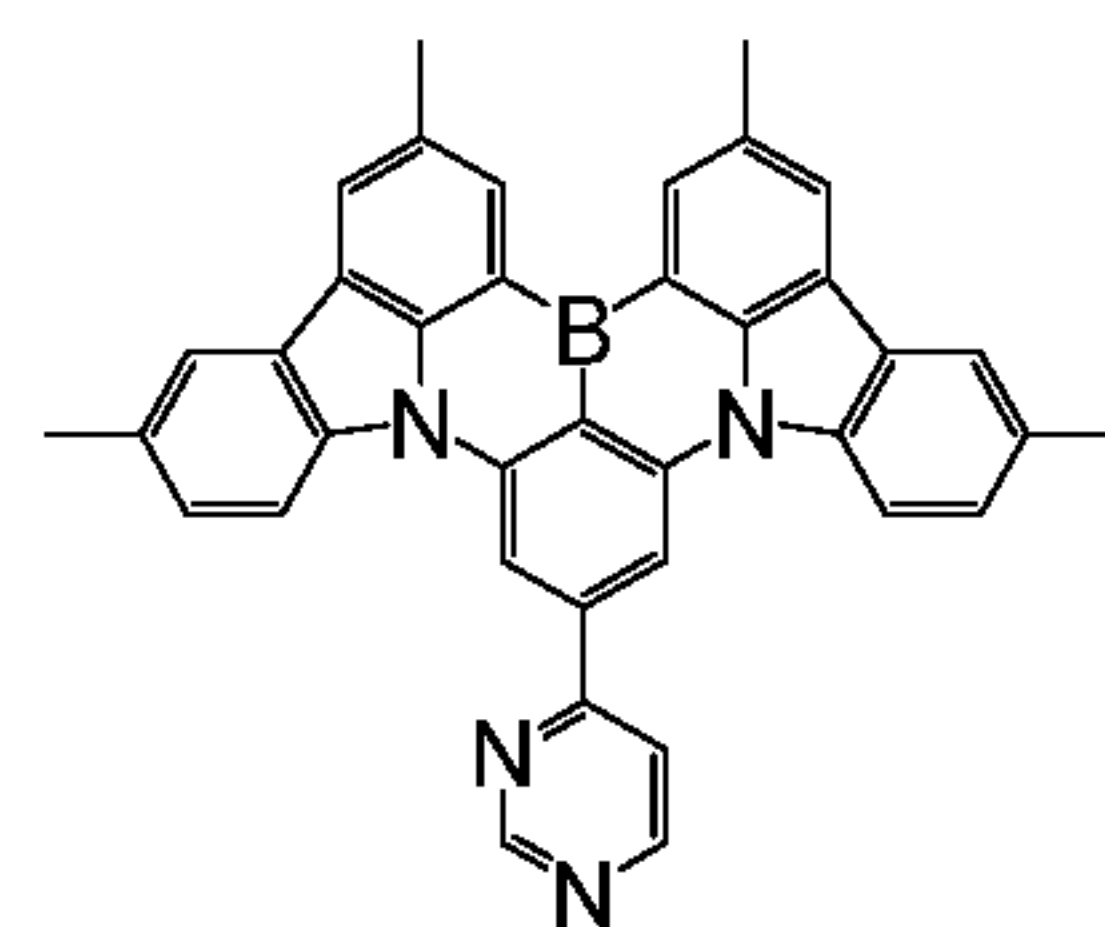
C-101



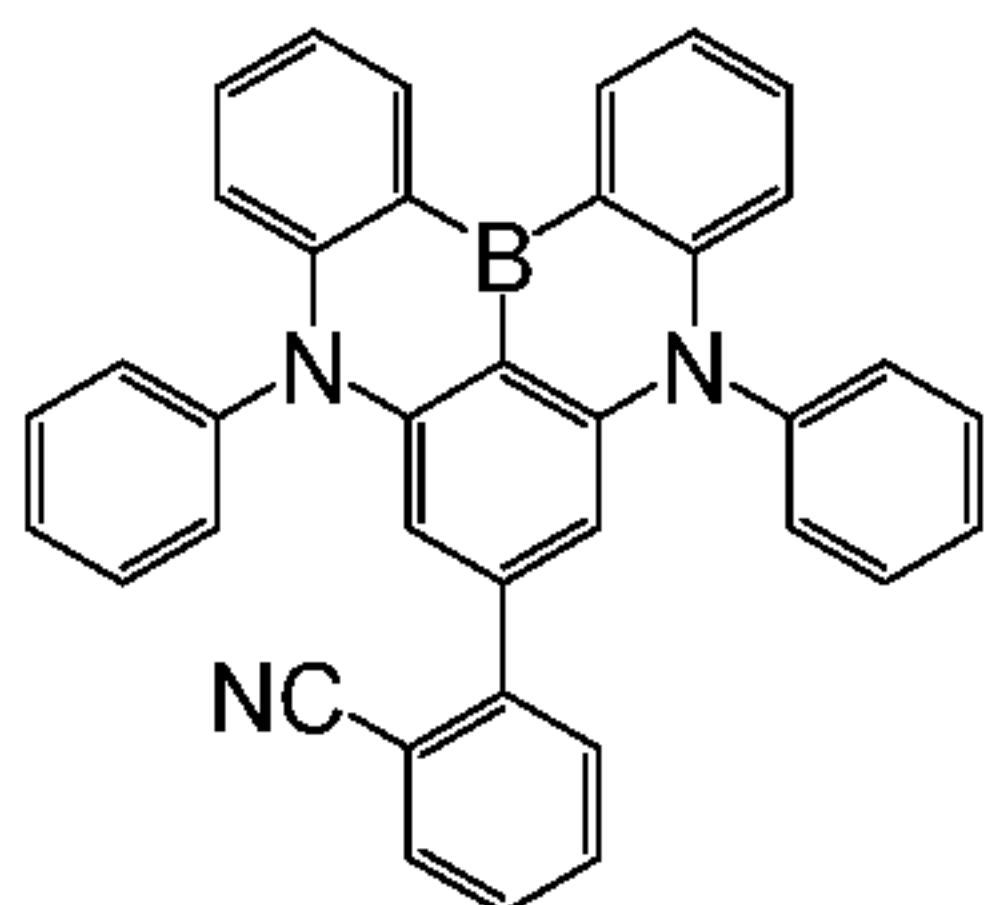
C-102



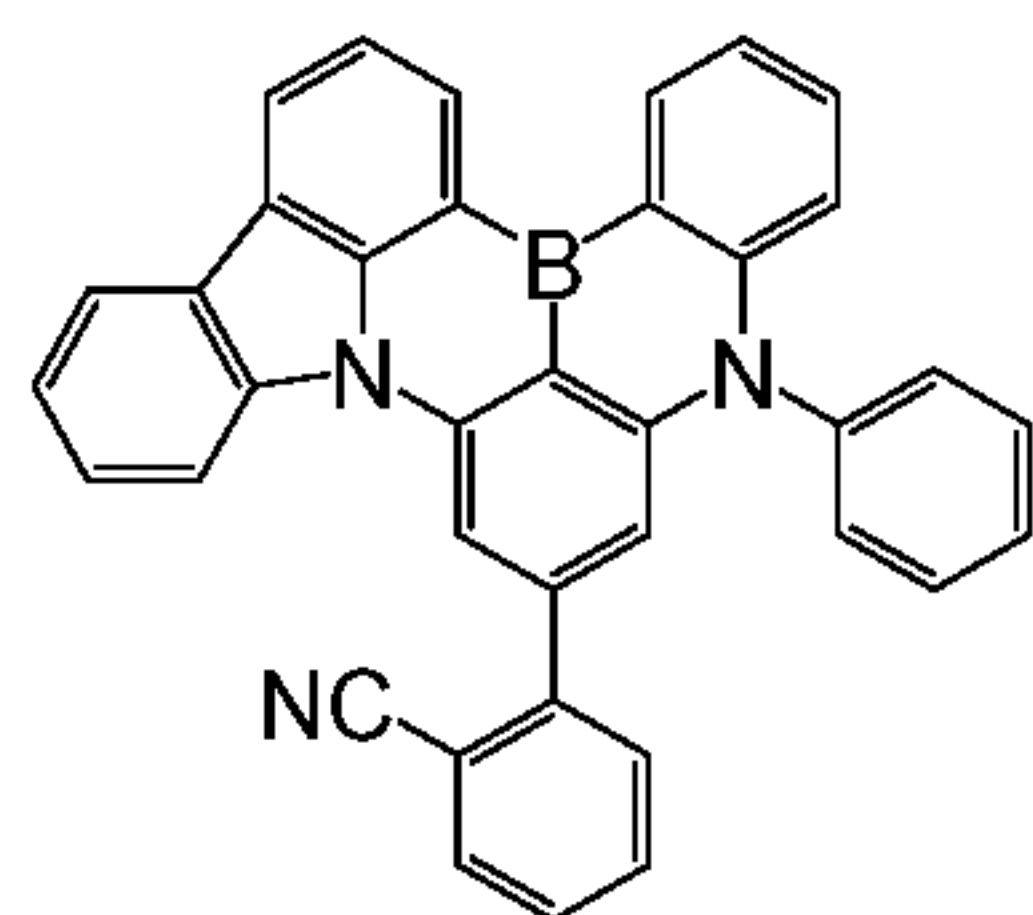
C-103



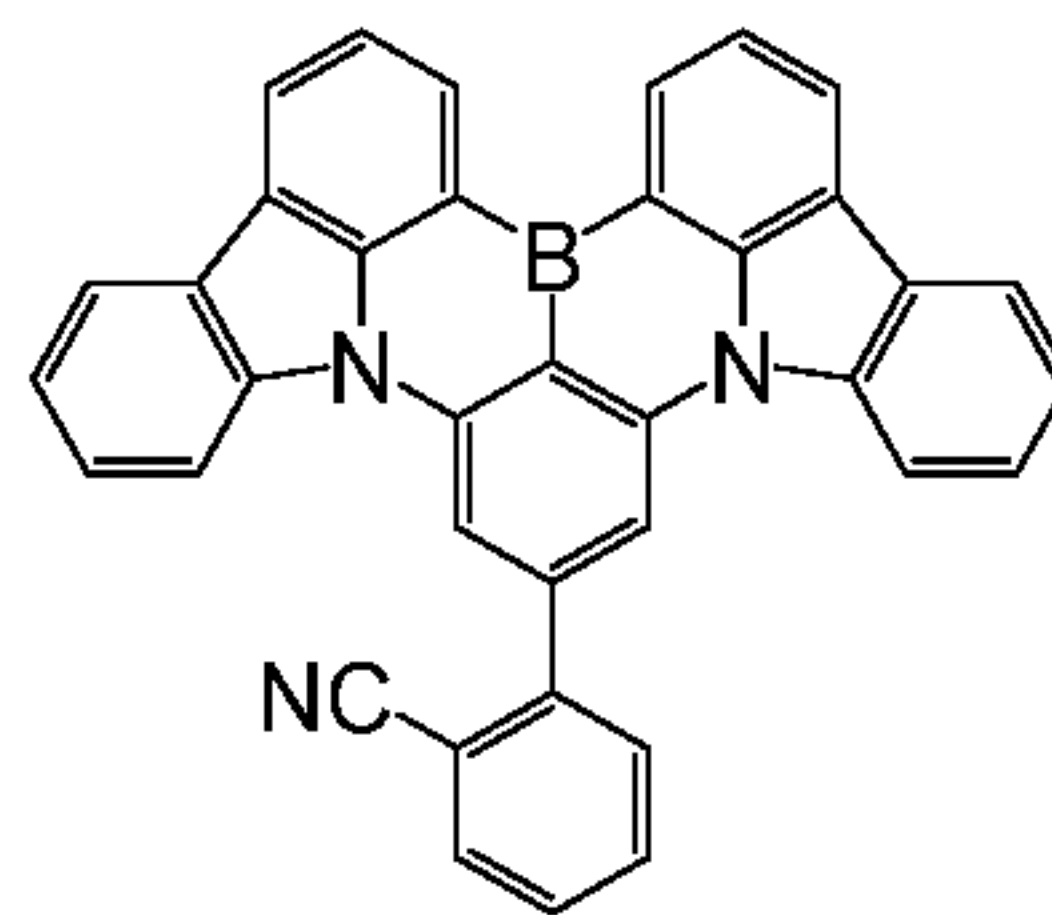
C-104



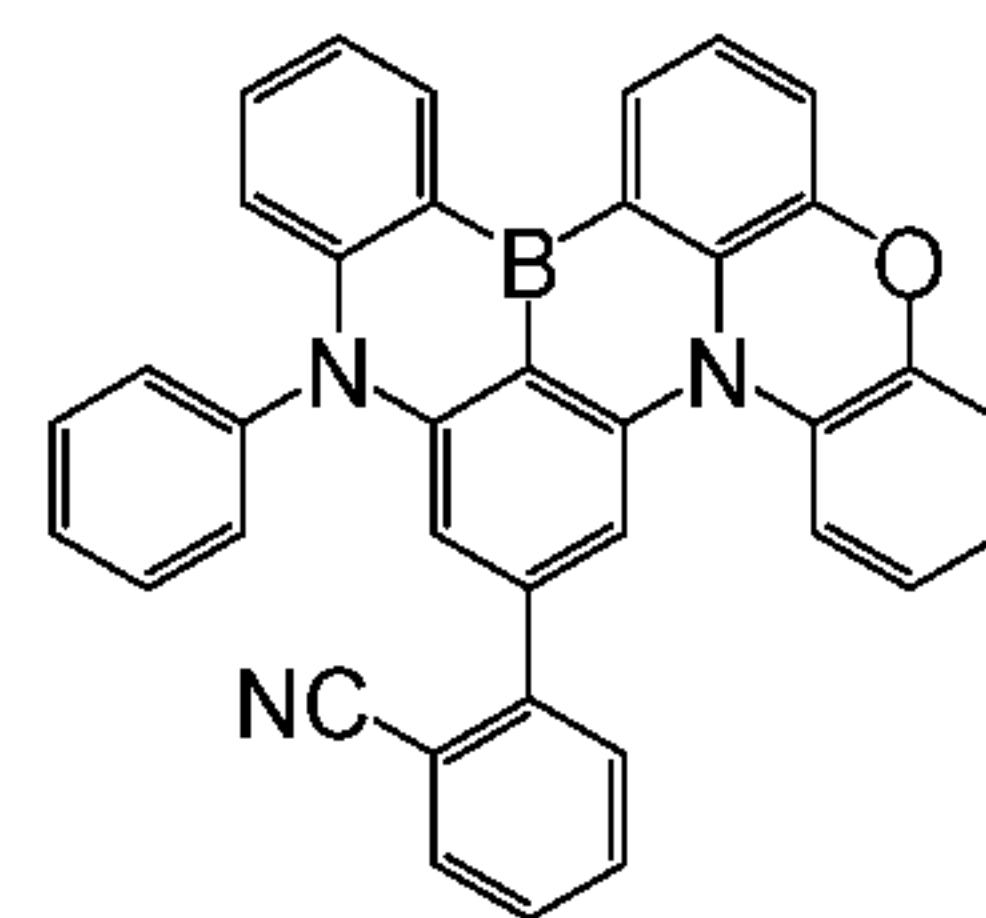
C-105



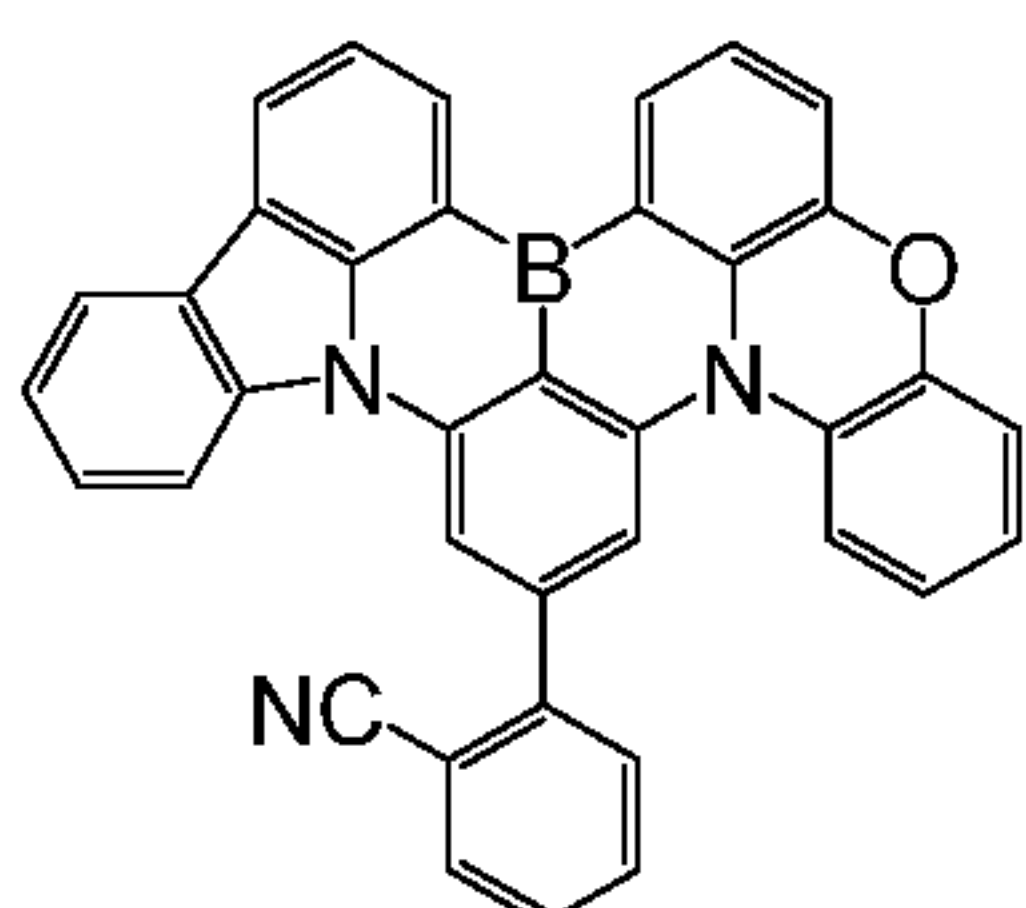
C-106



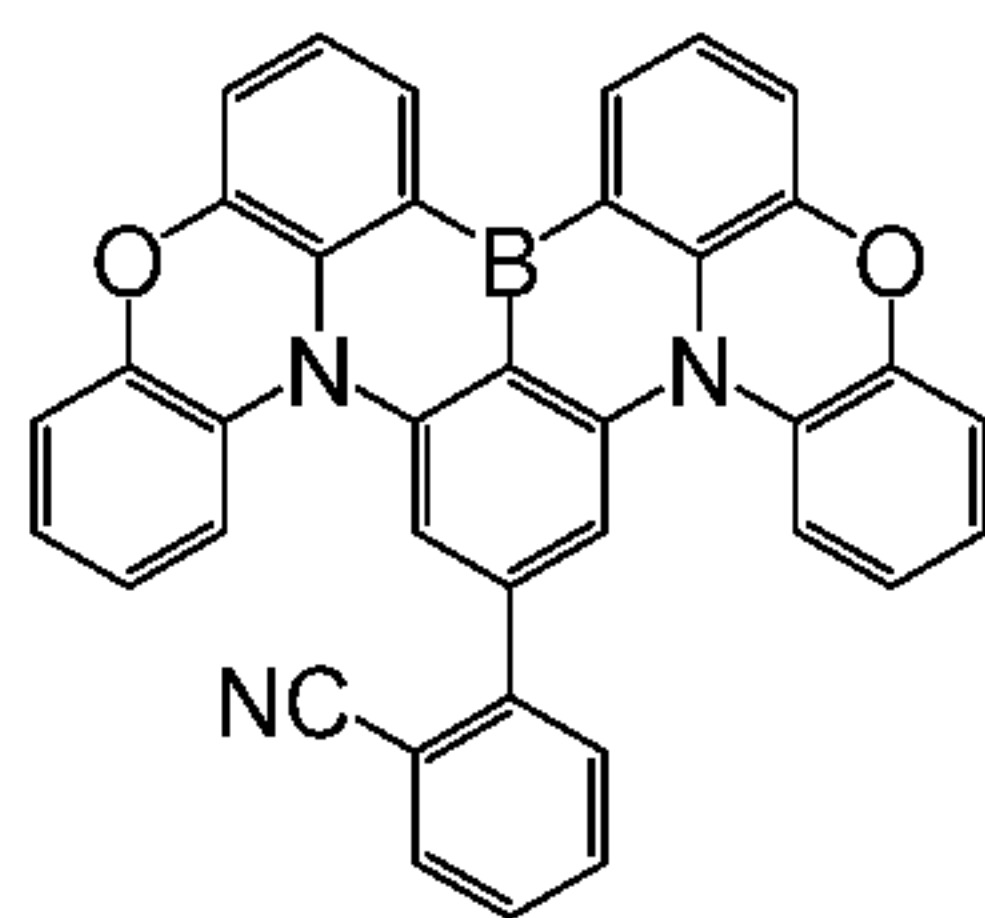
C-107



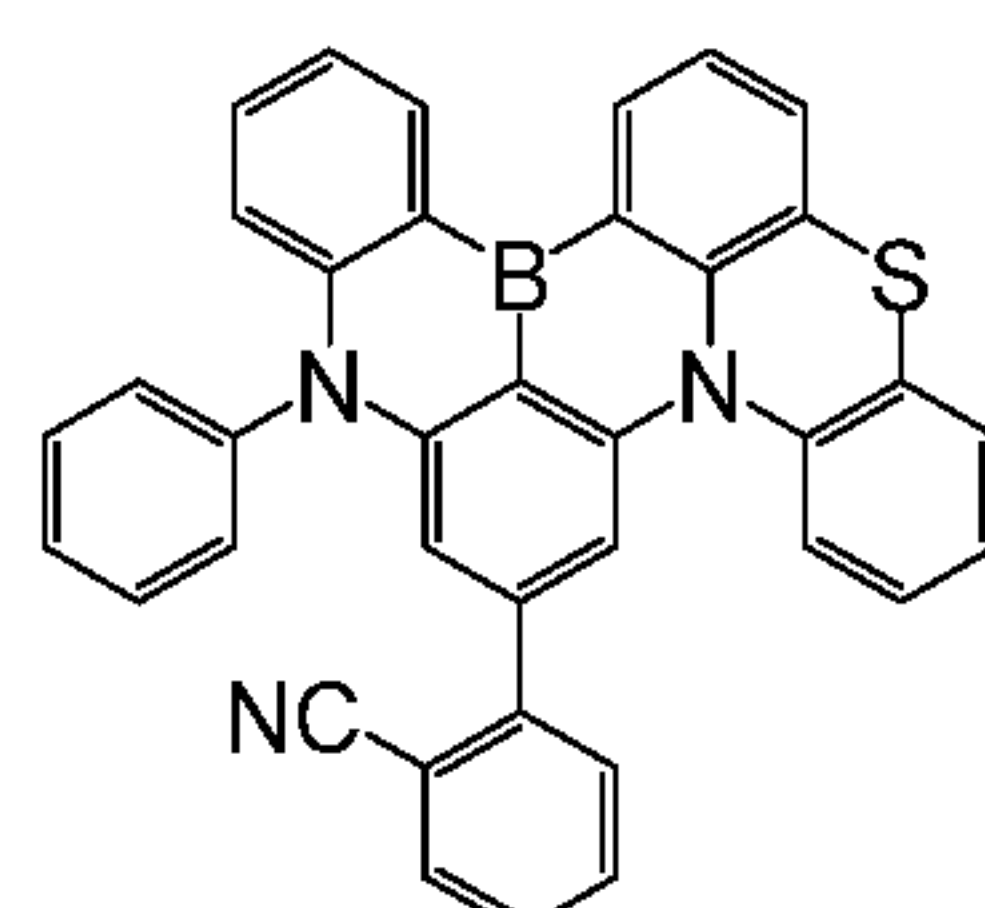
C-108



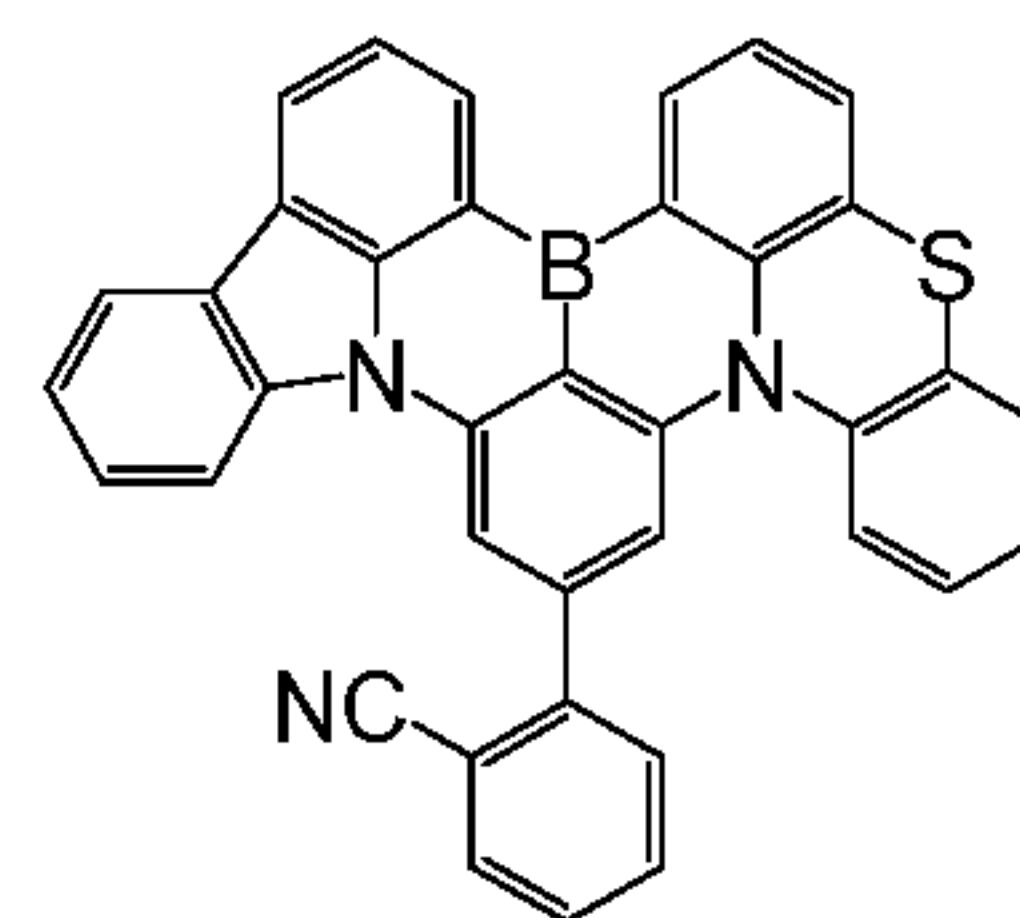
C-109



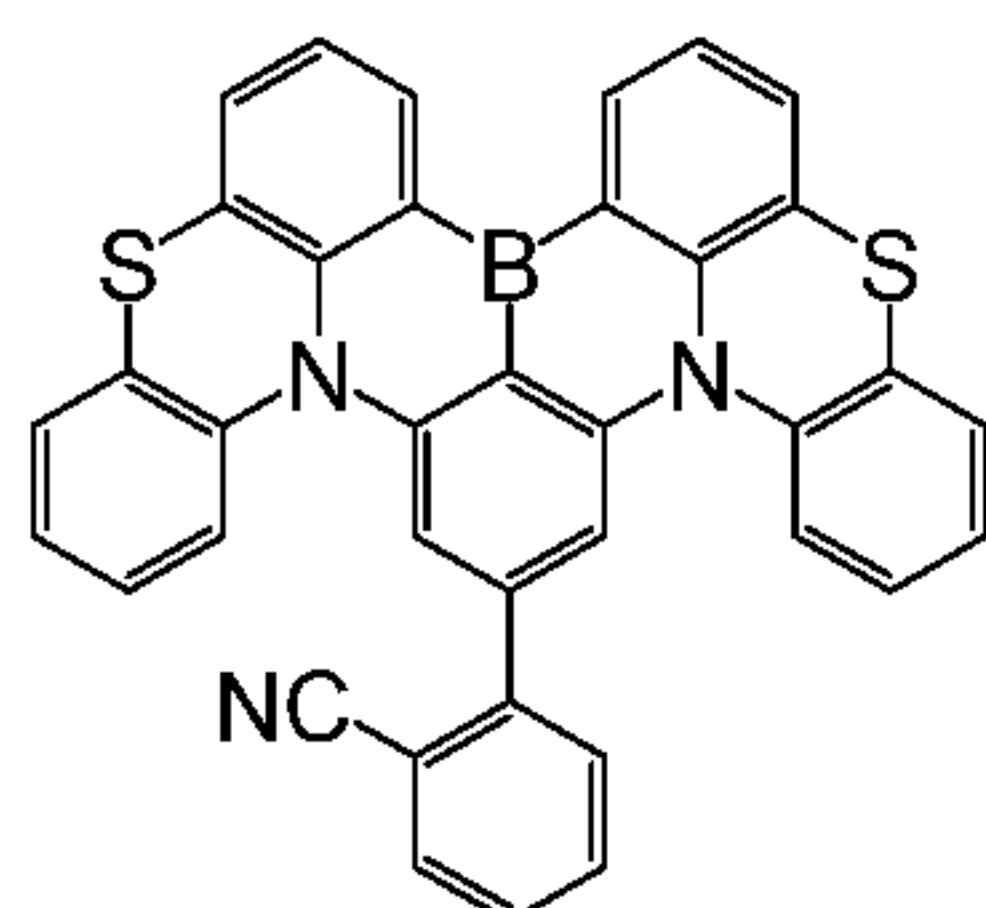
C-110



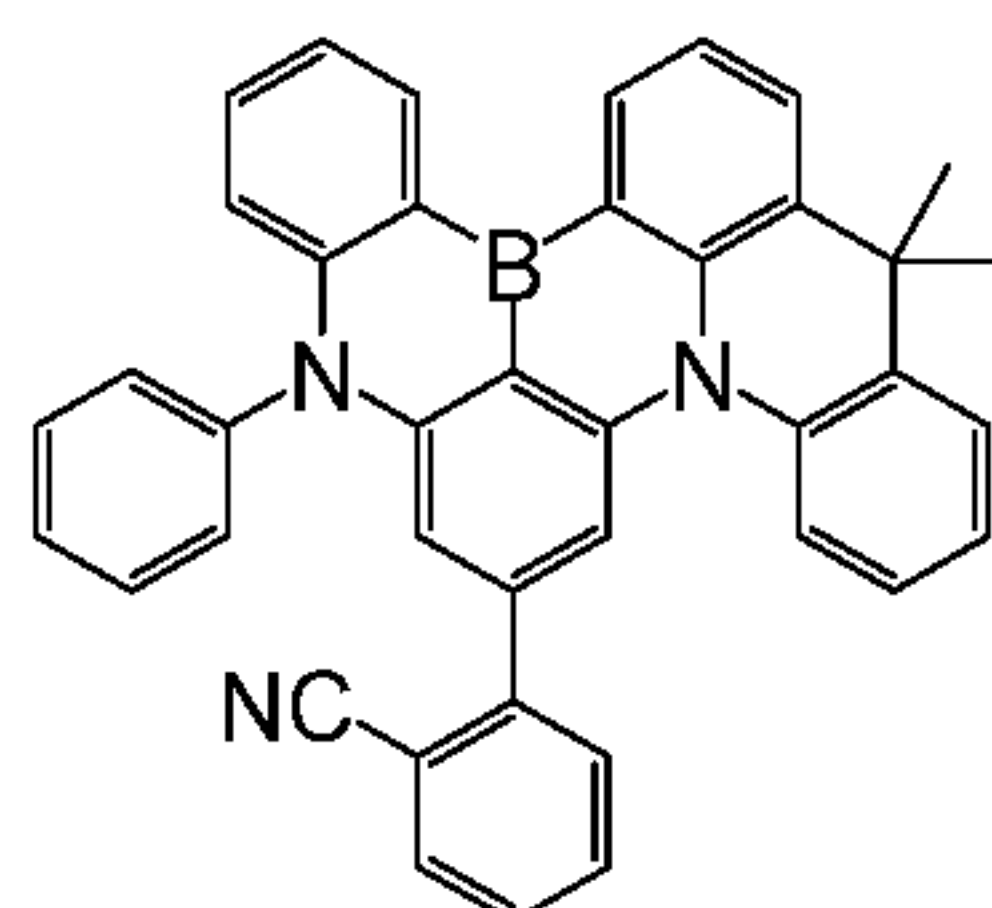
C-111



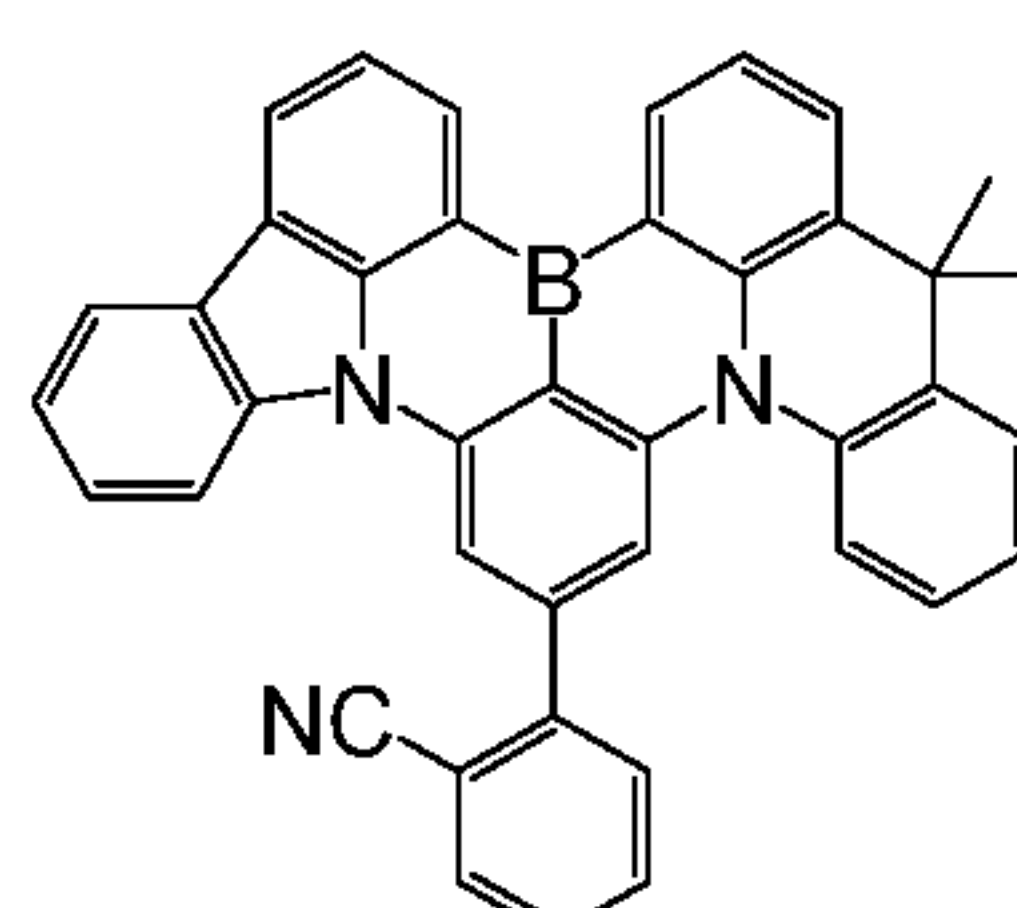
C-112



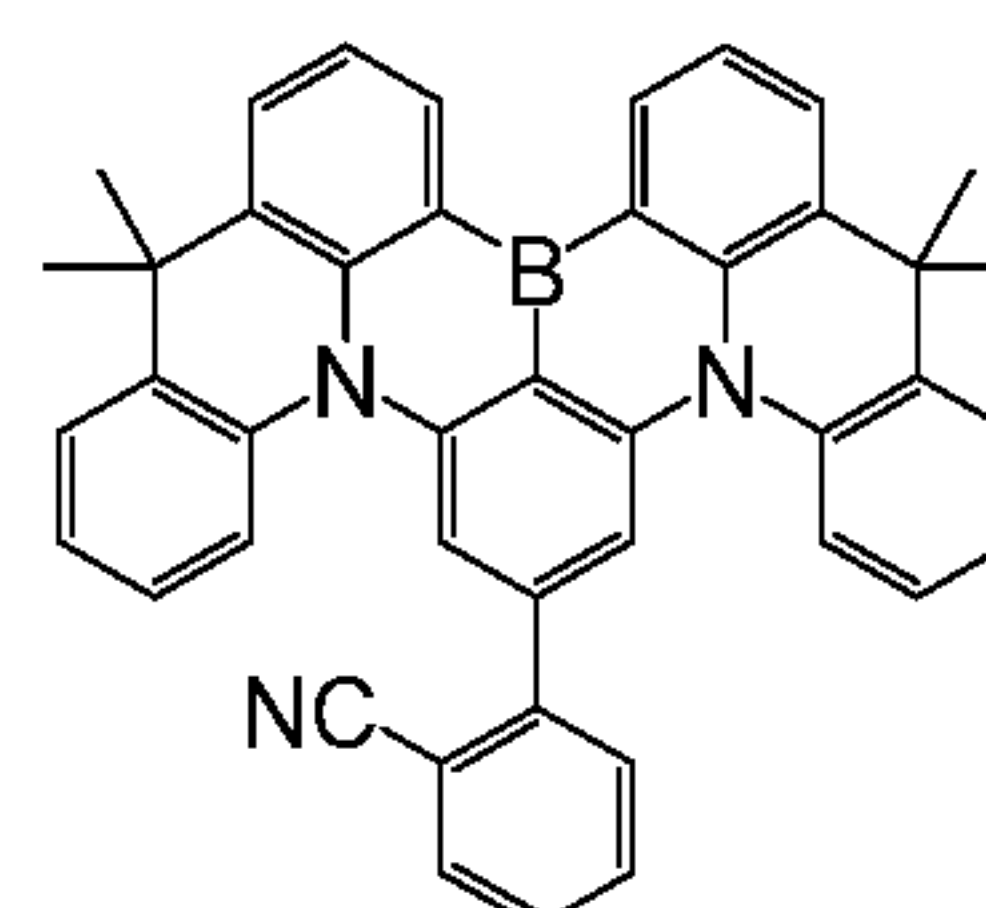
C-113



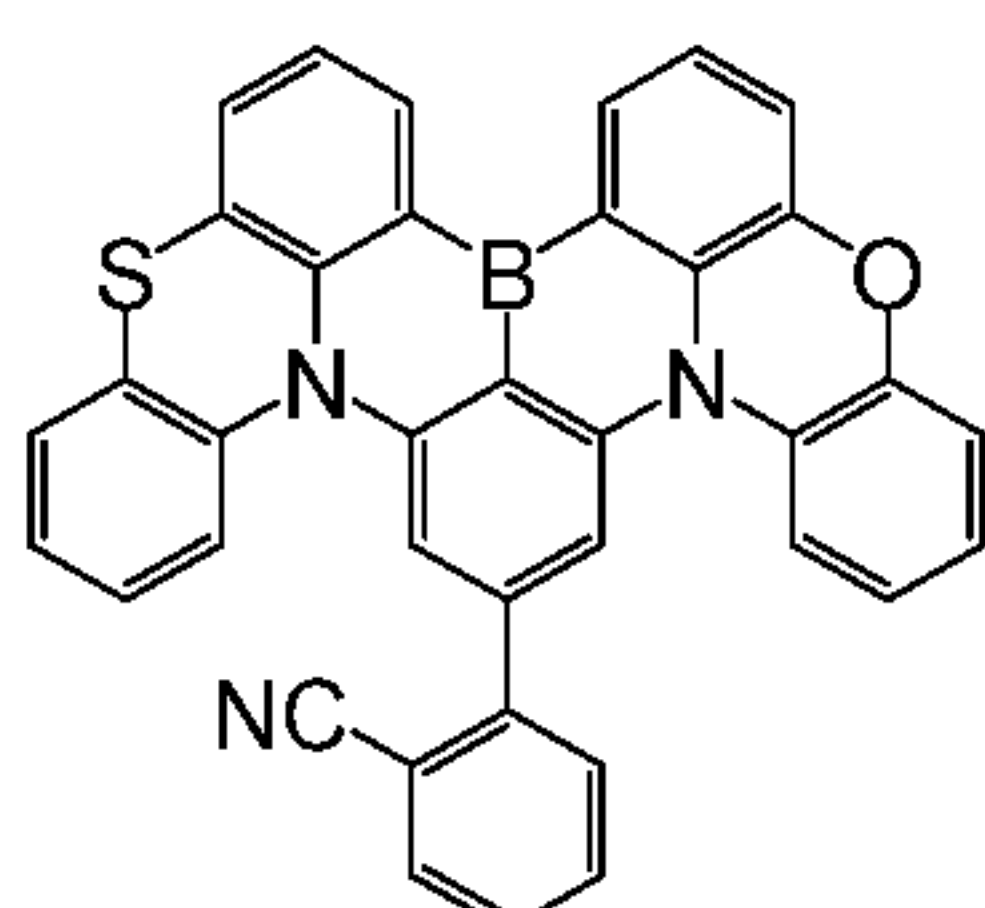
C-114



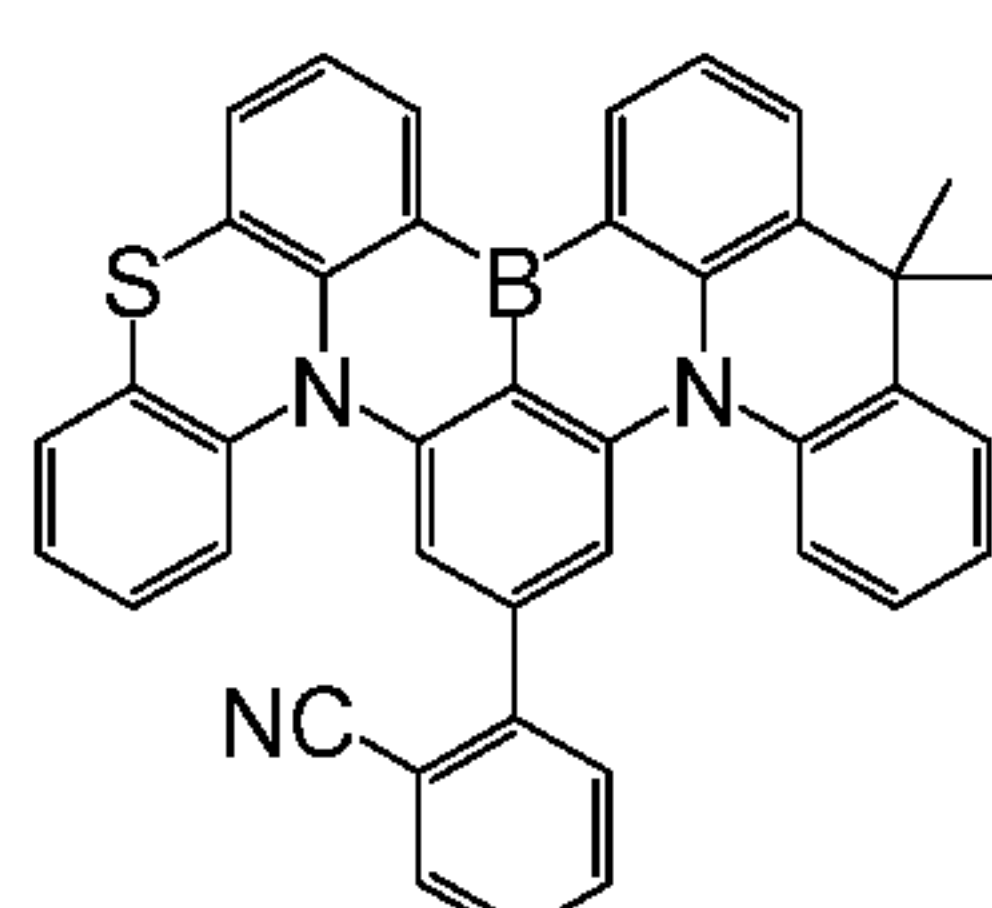
C-115



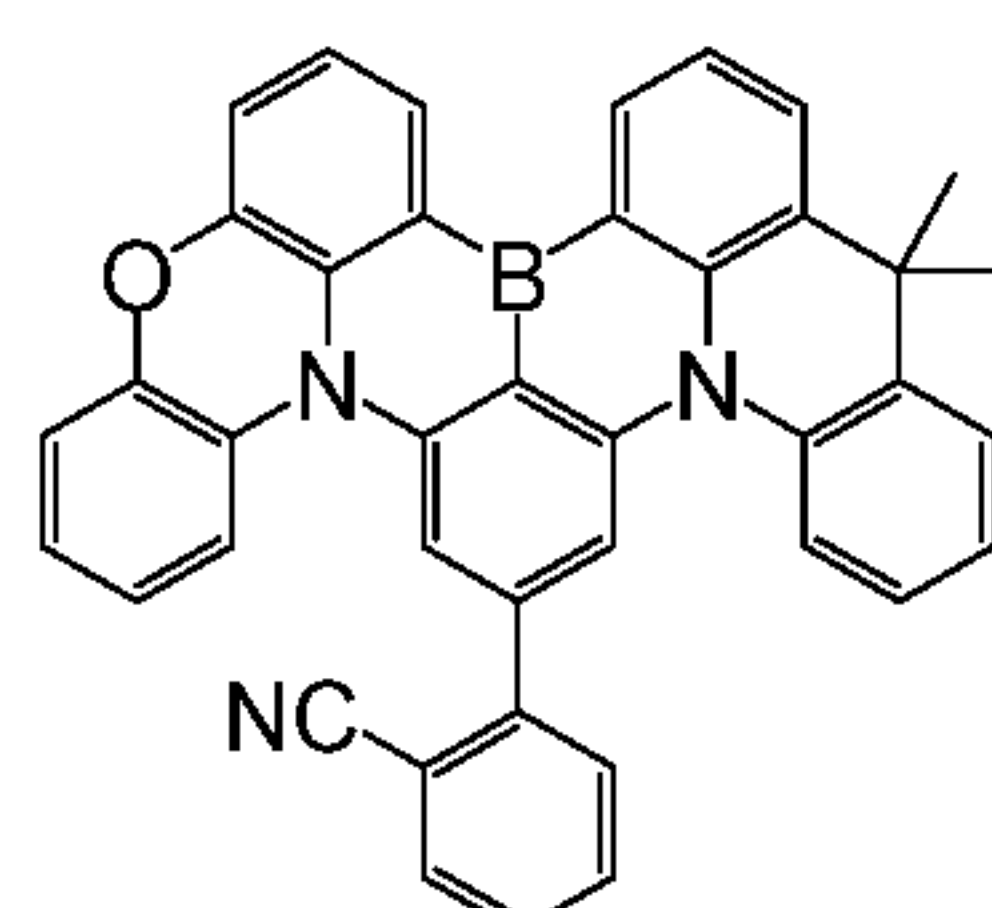
C-116



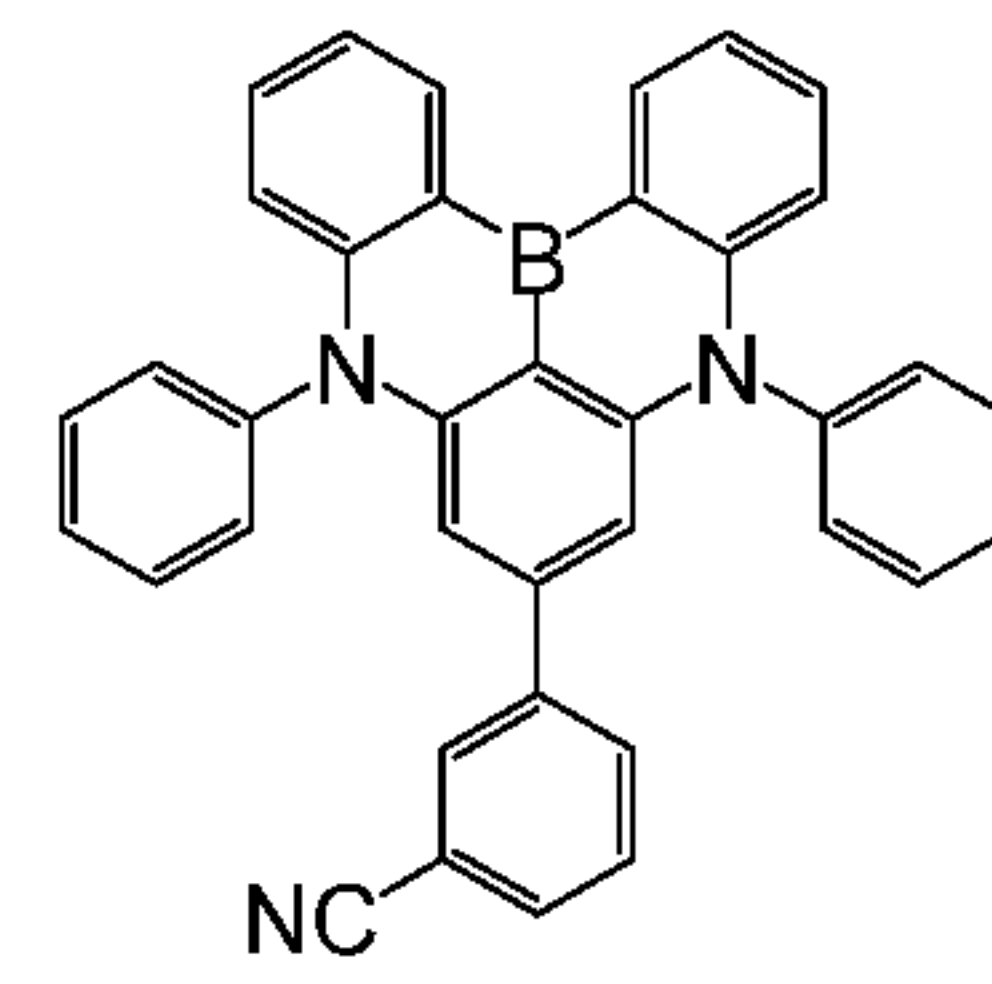
C-117



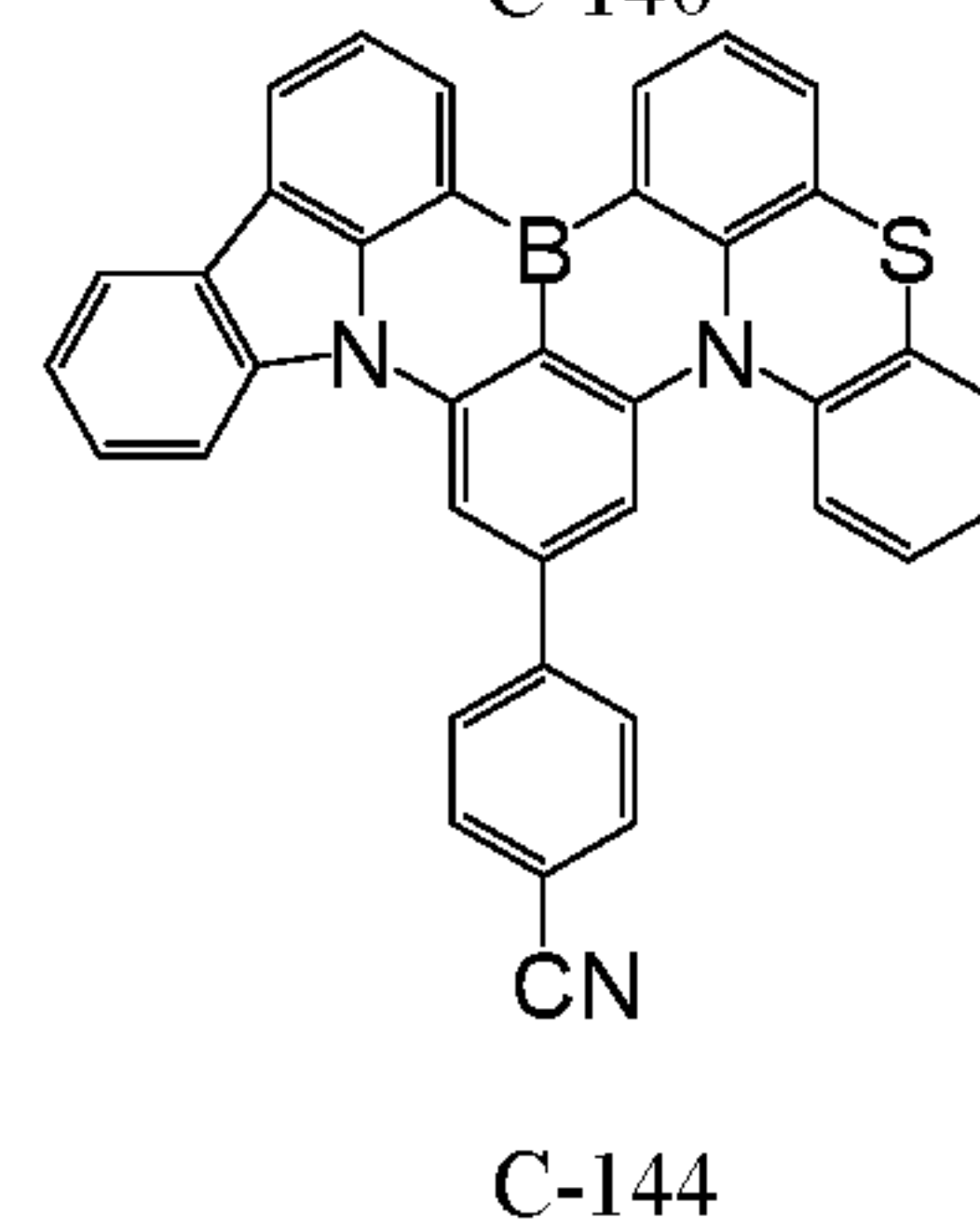
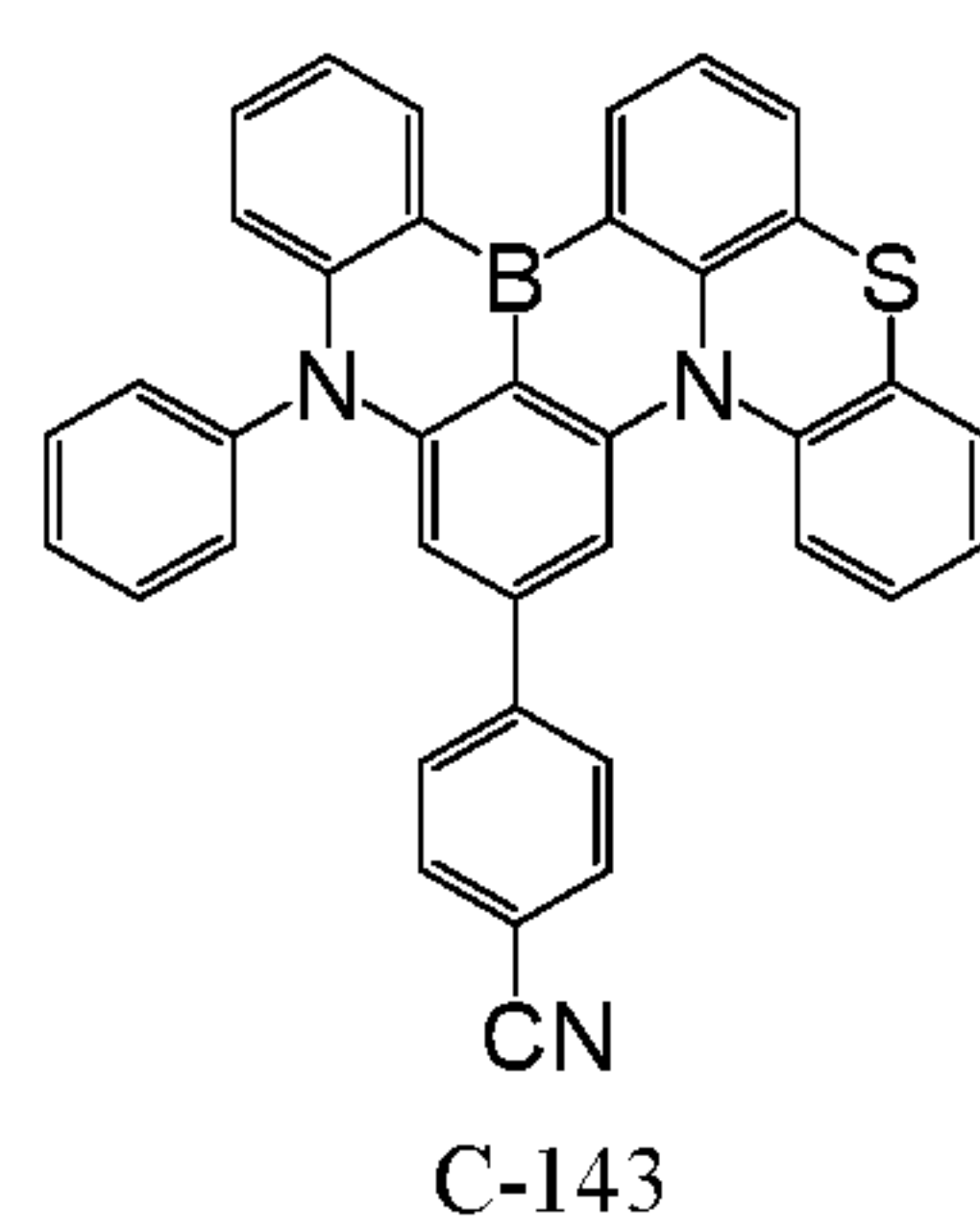
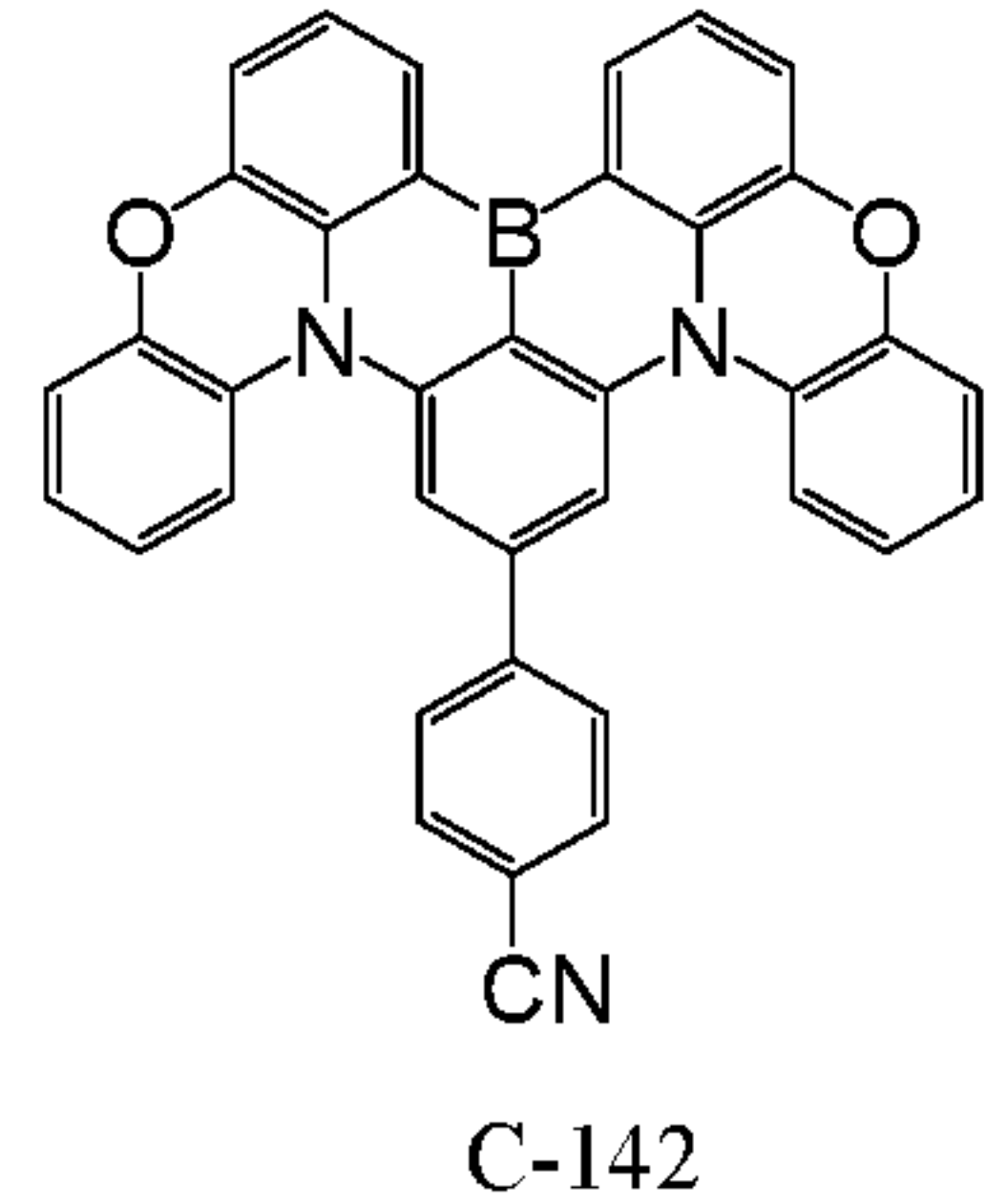
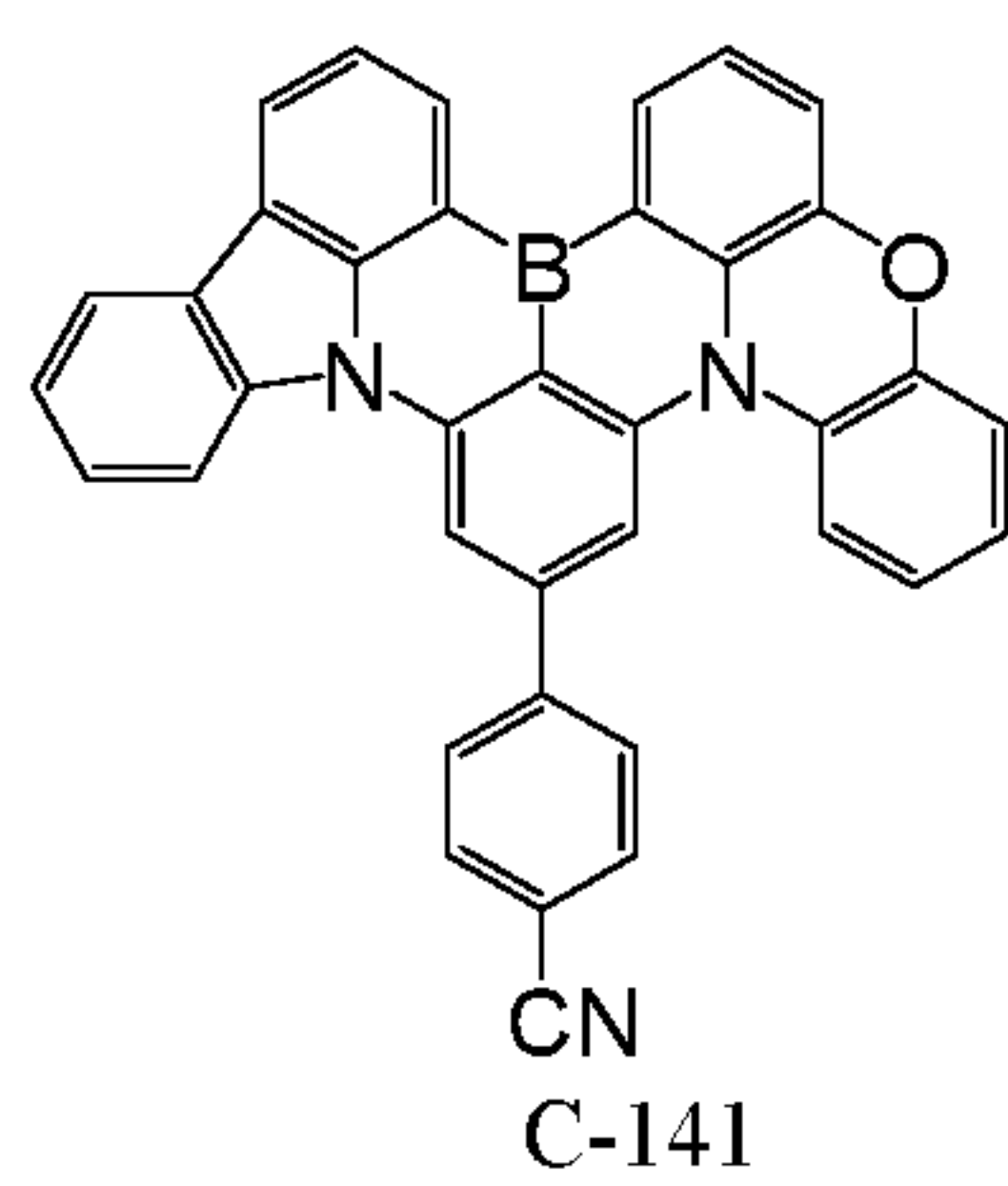
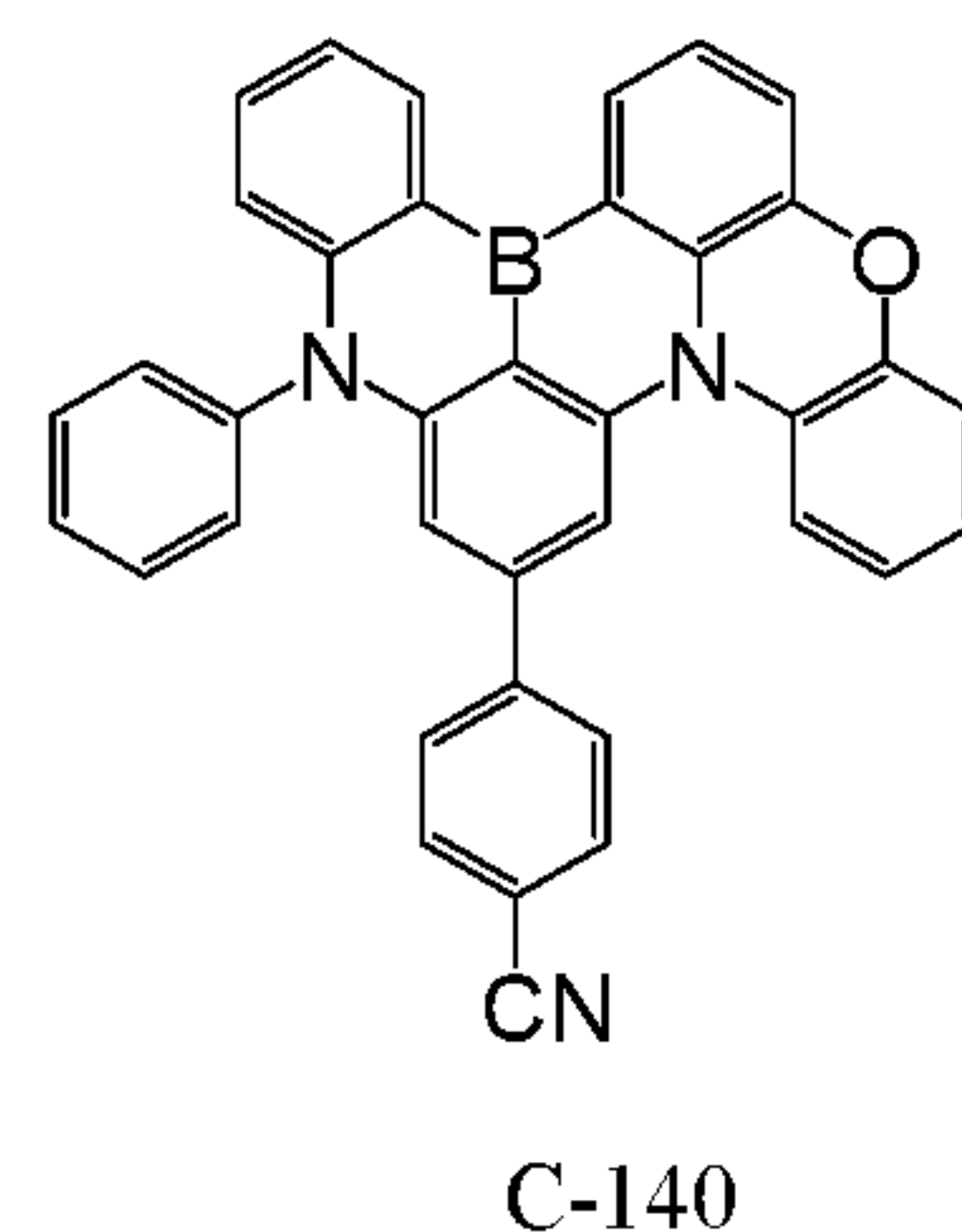
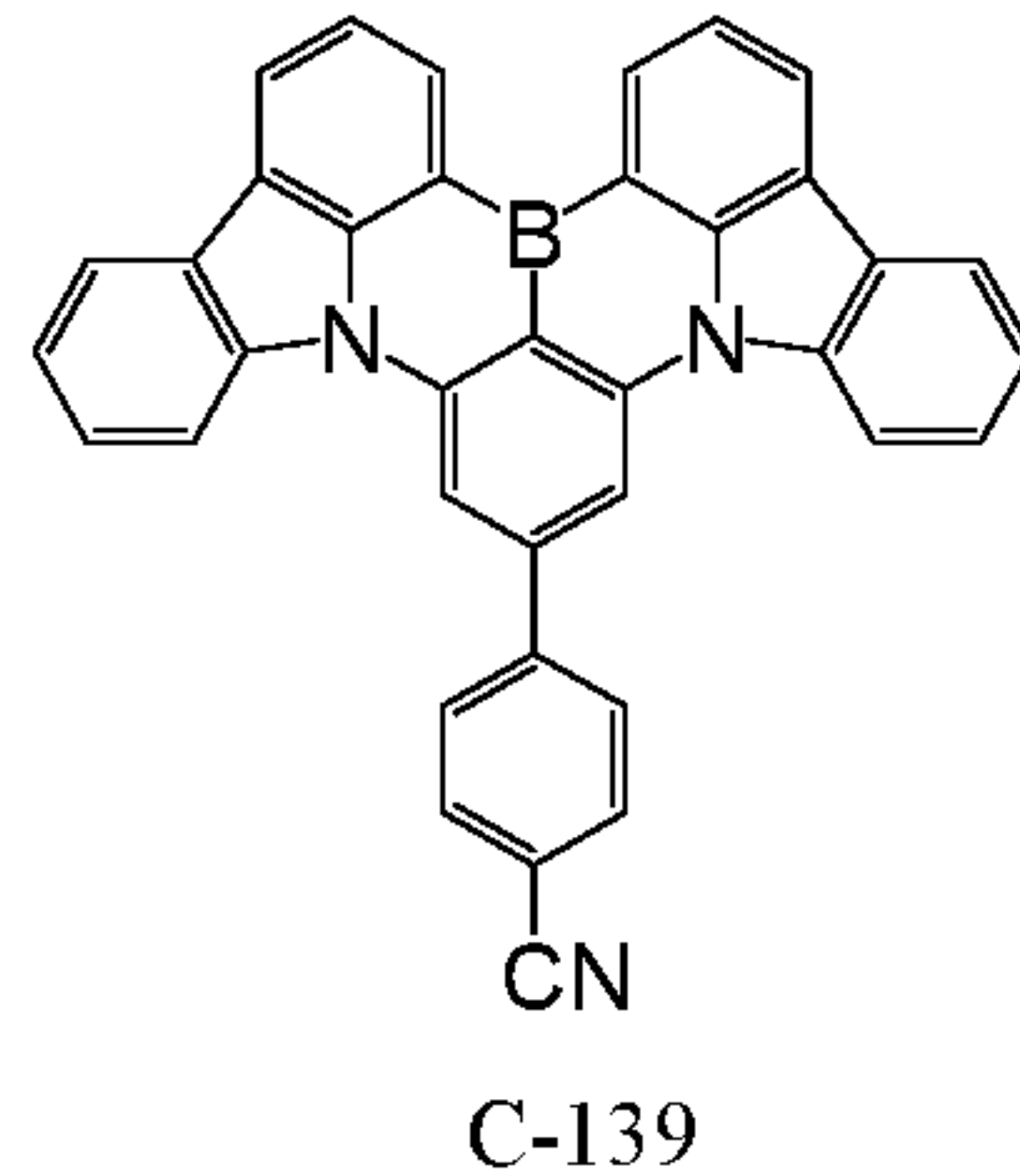
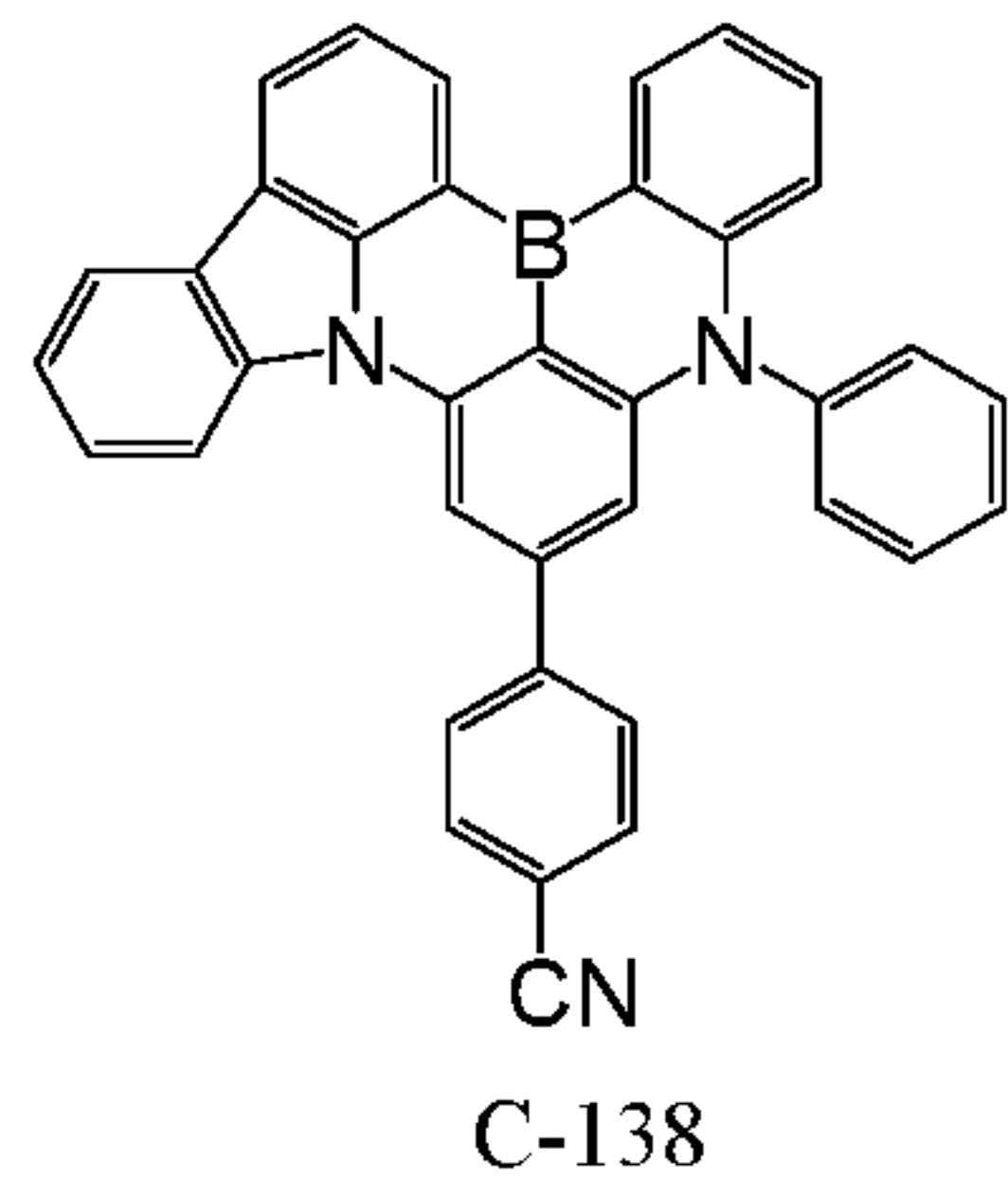
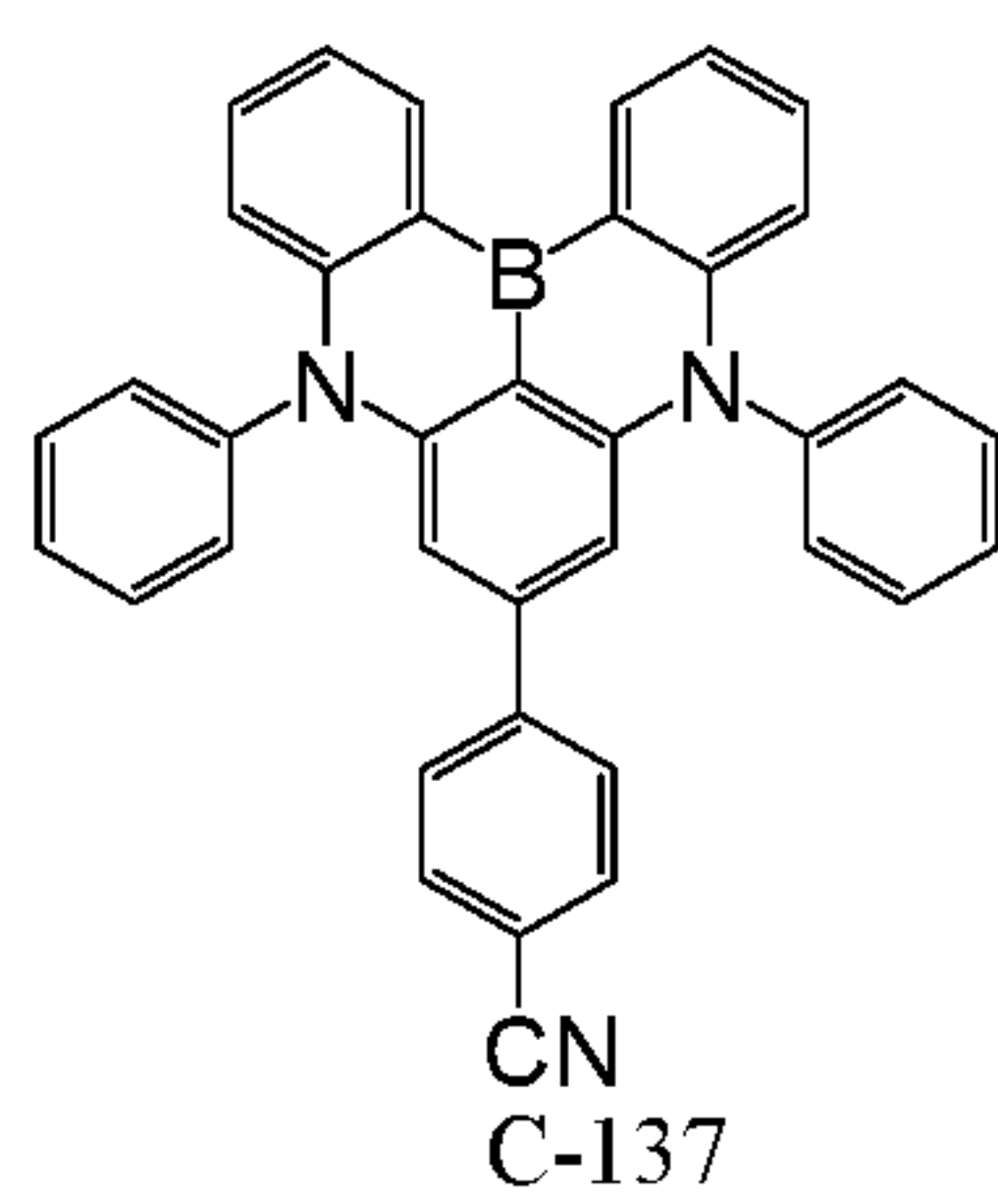
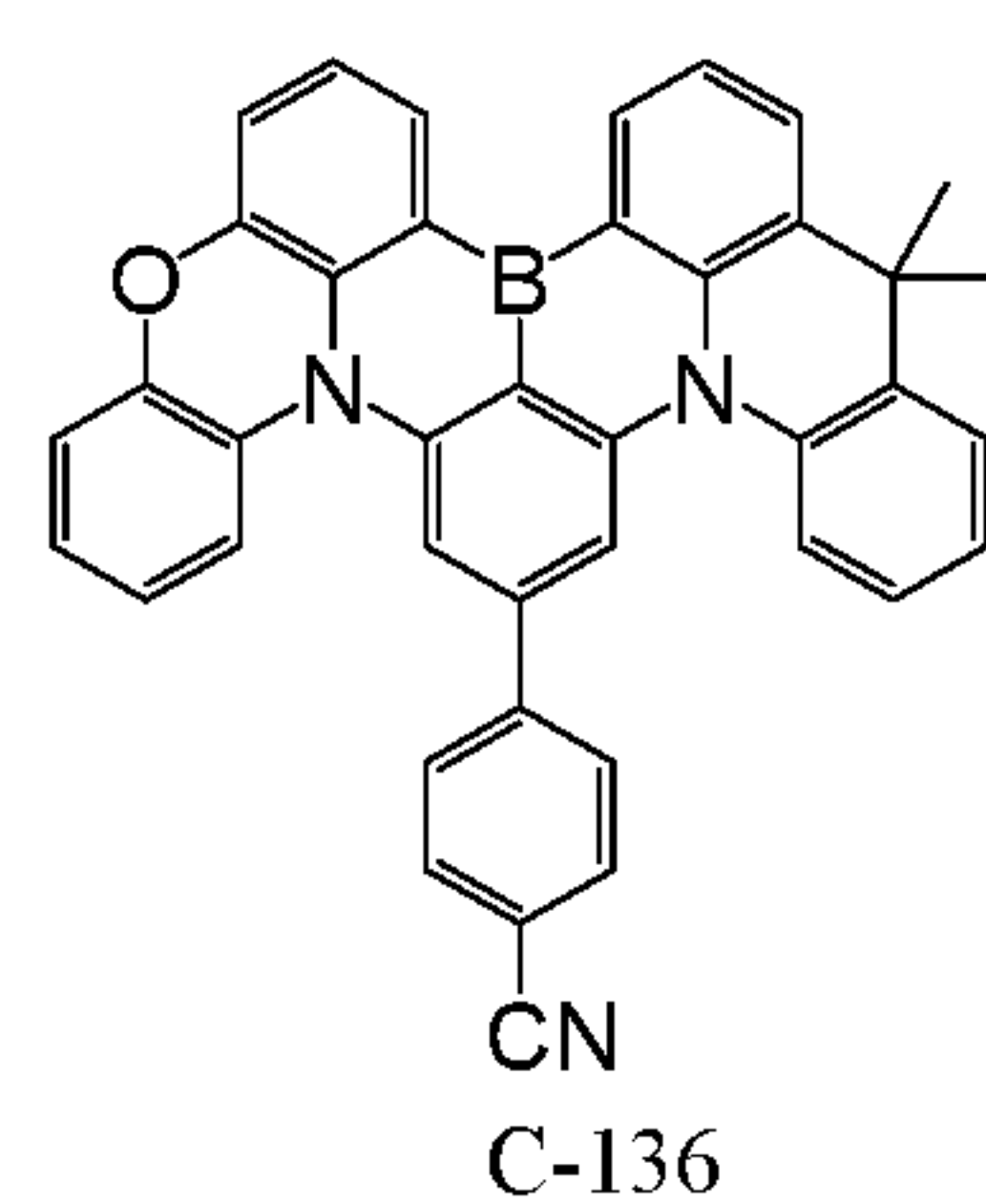
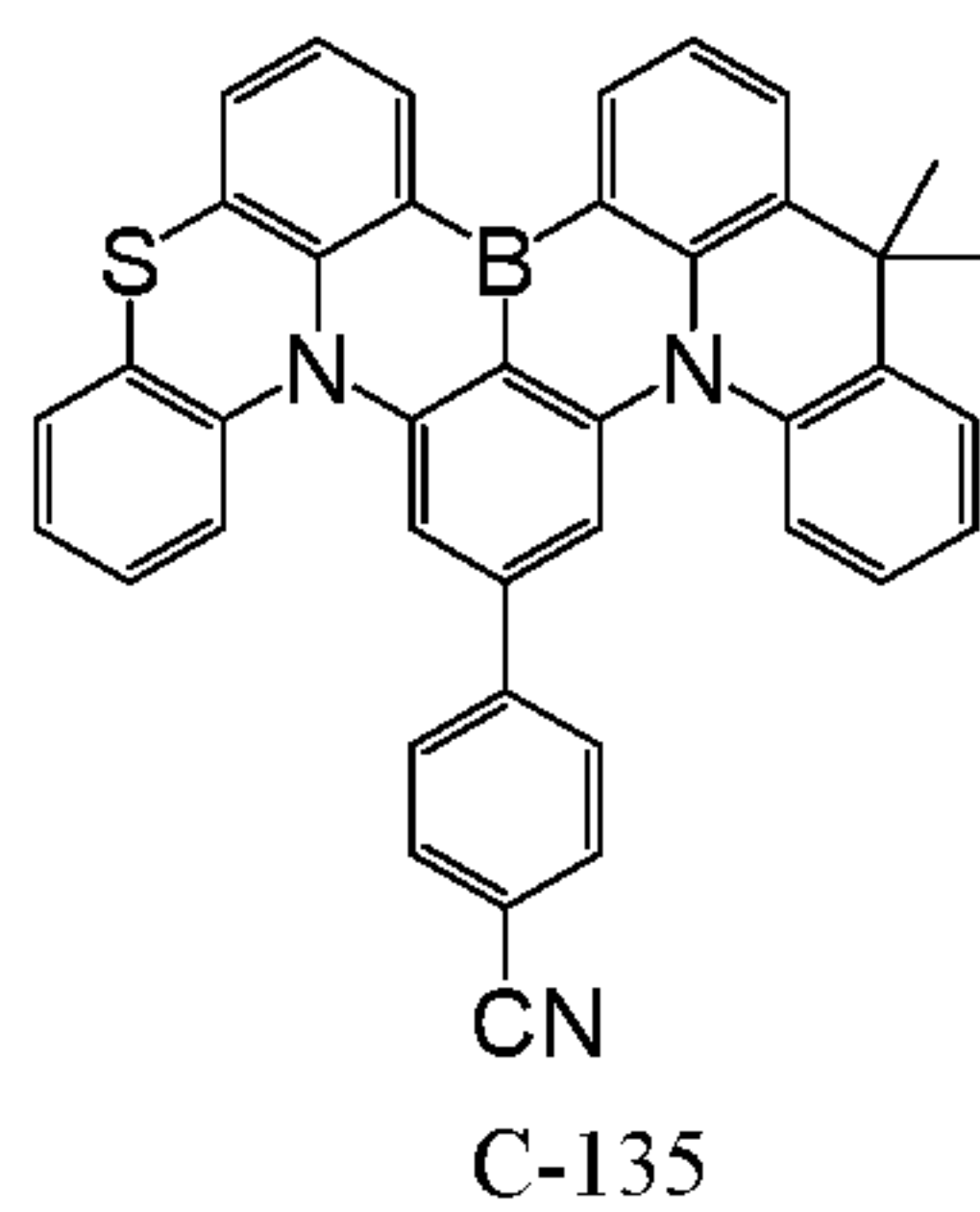
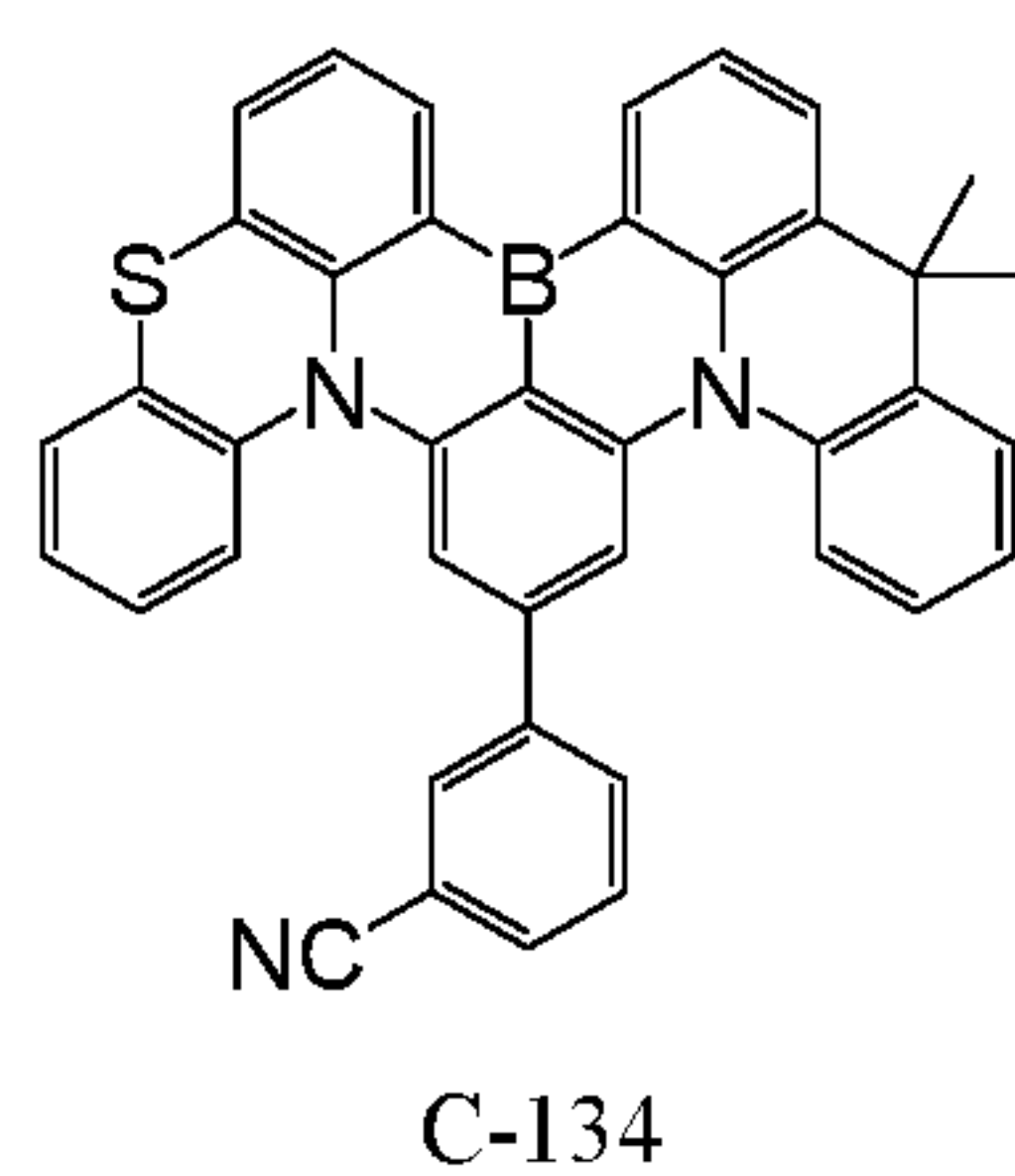
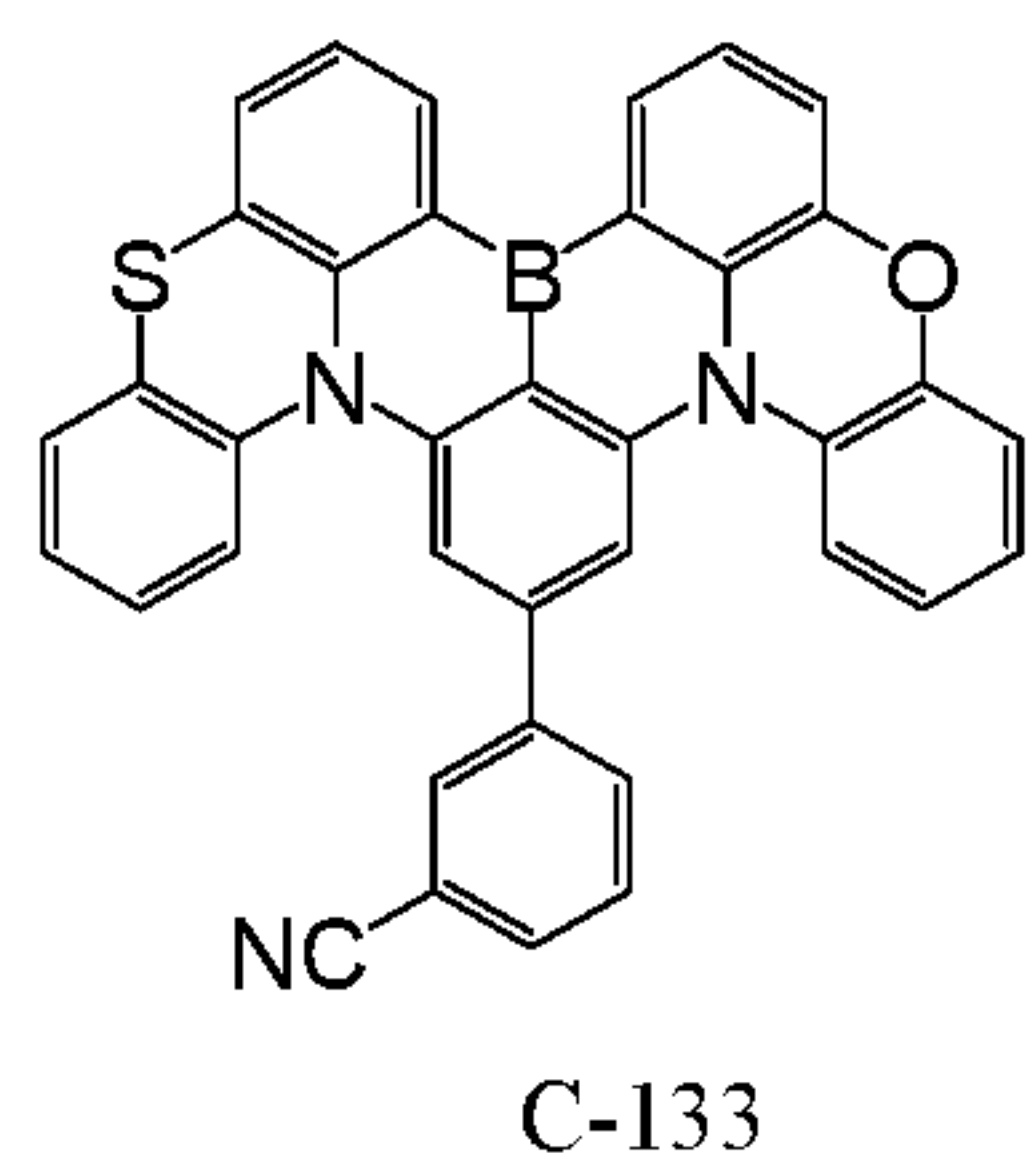
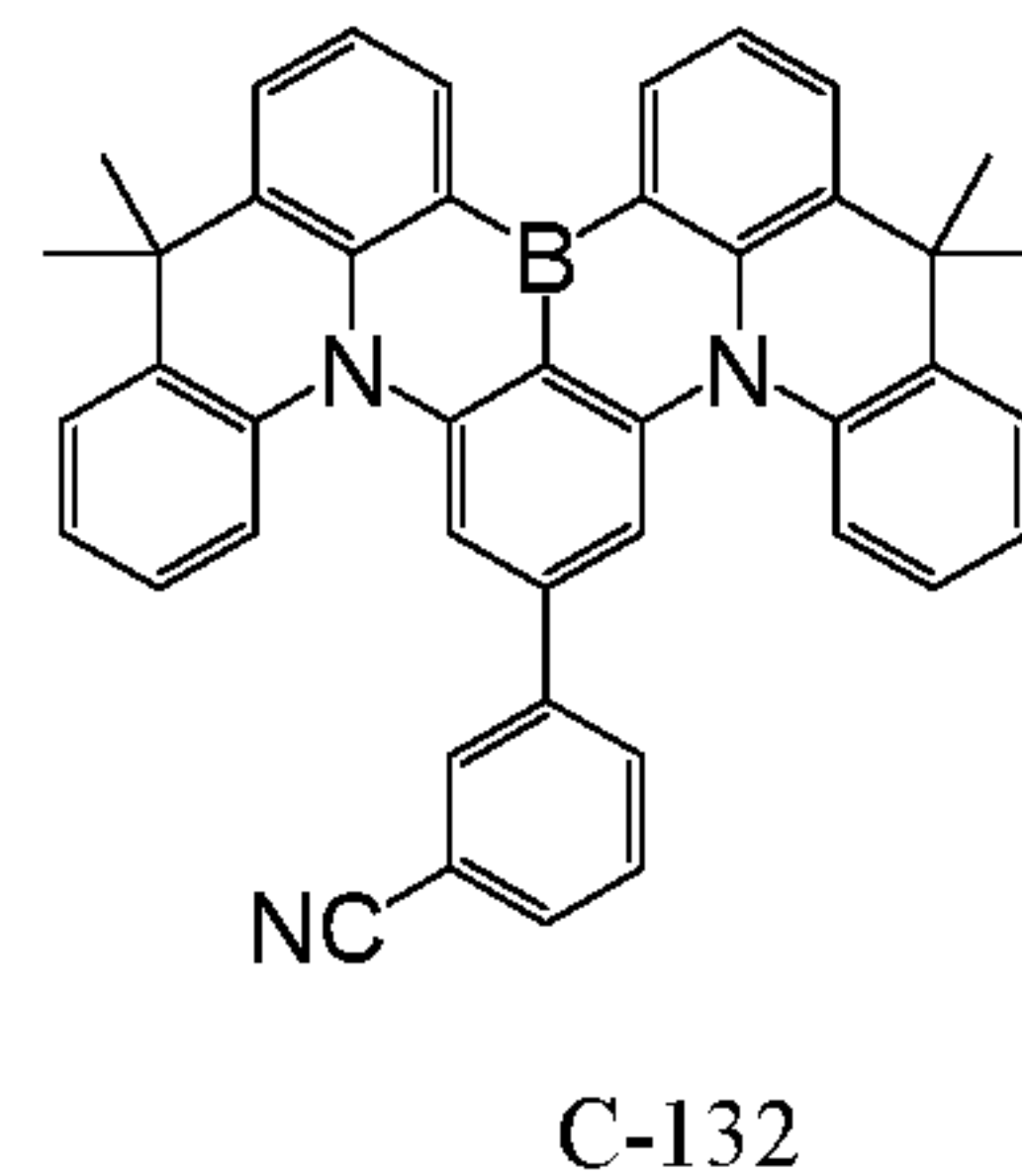
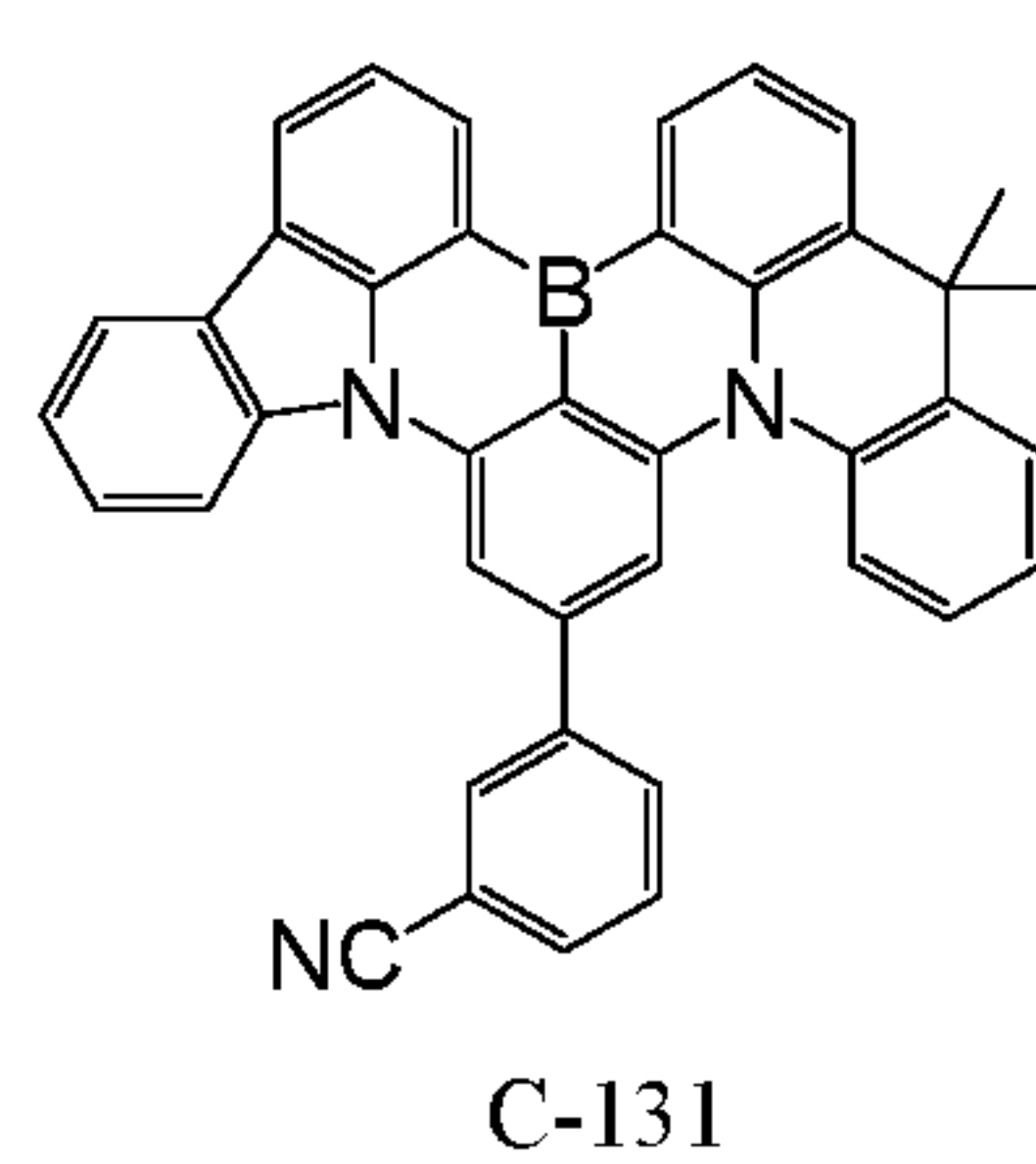
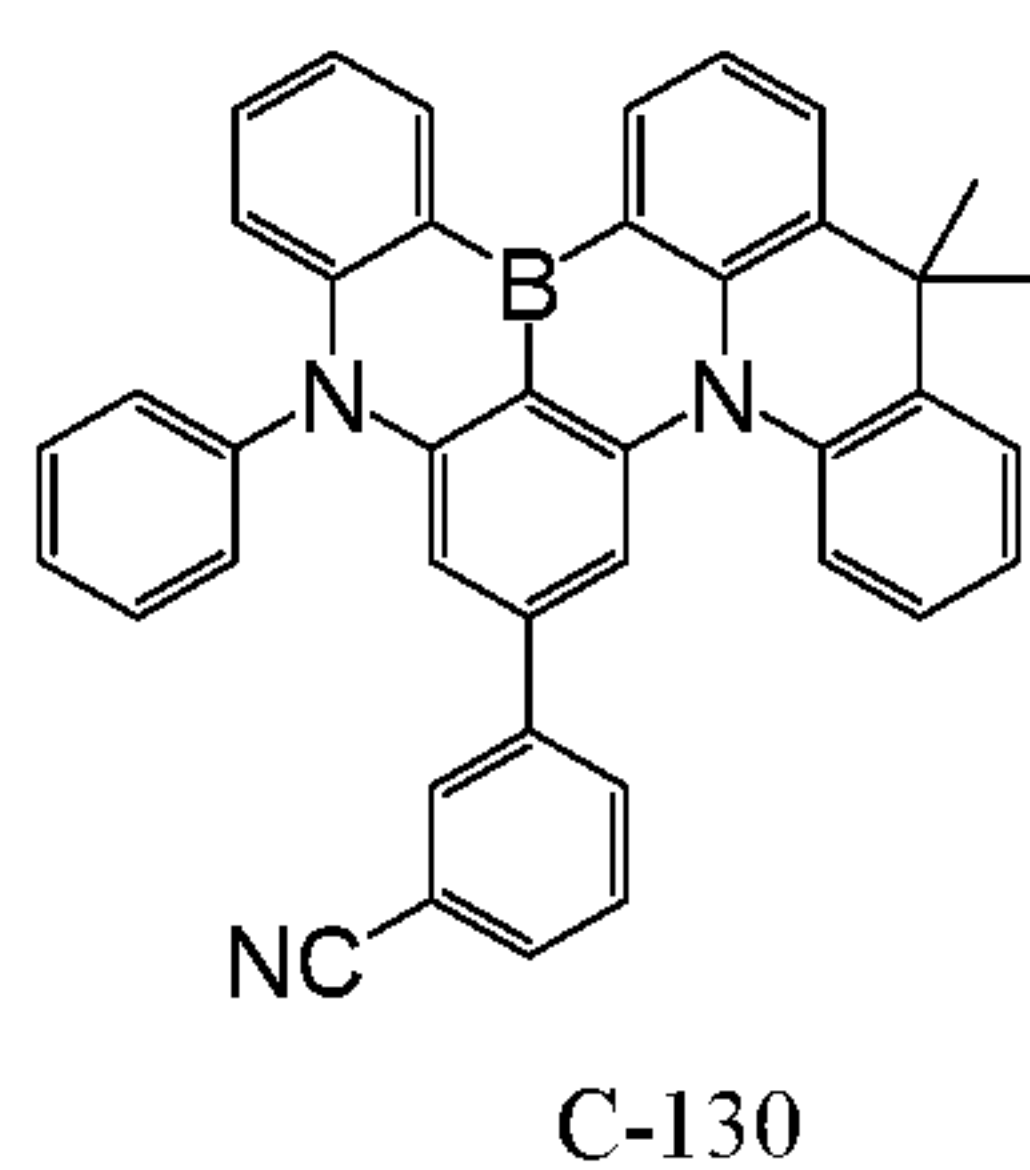
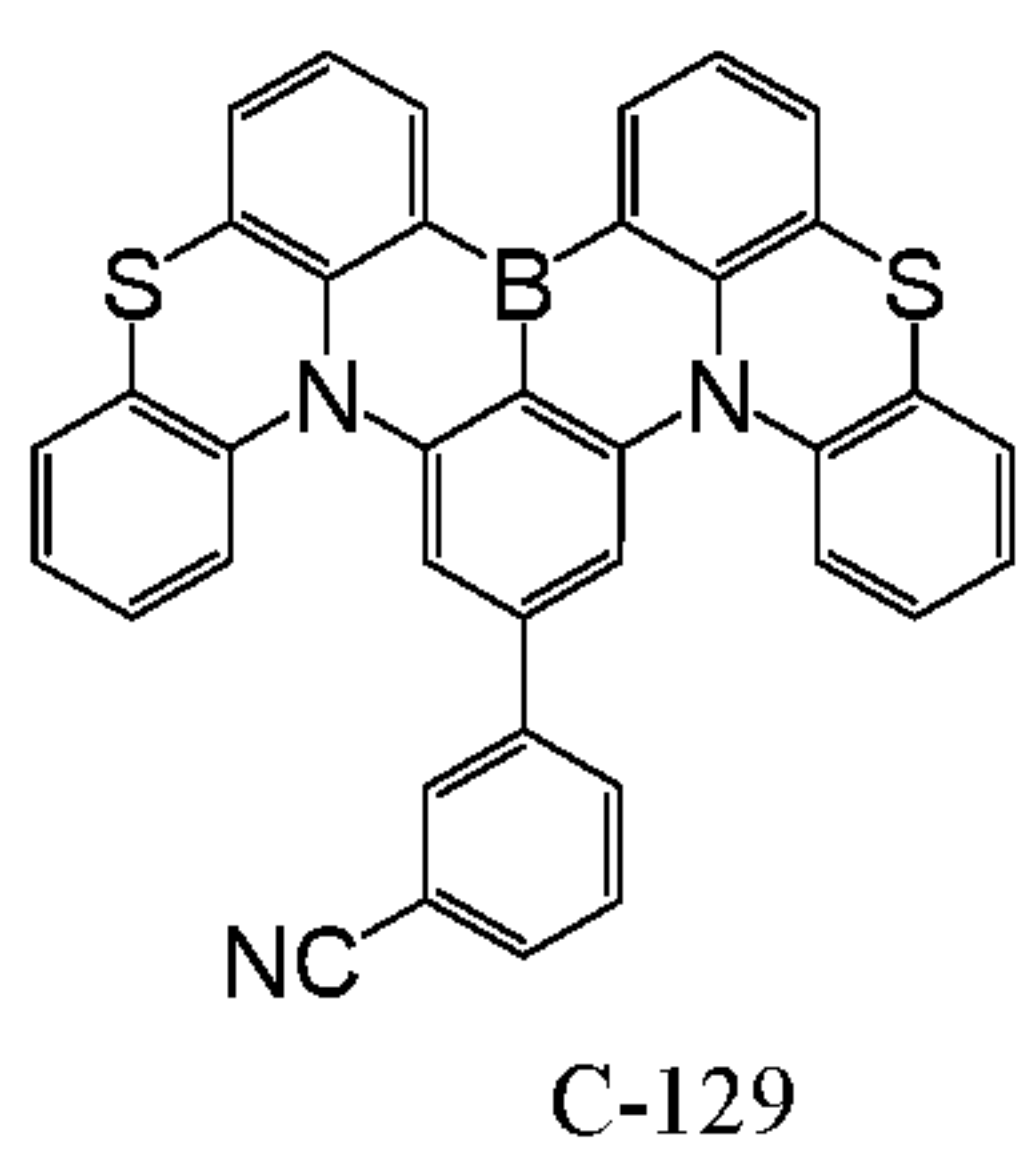
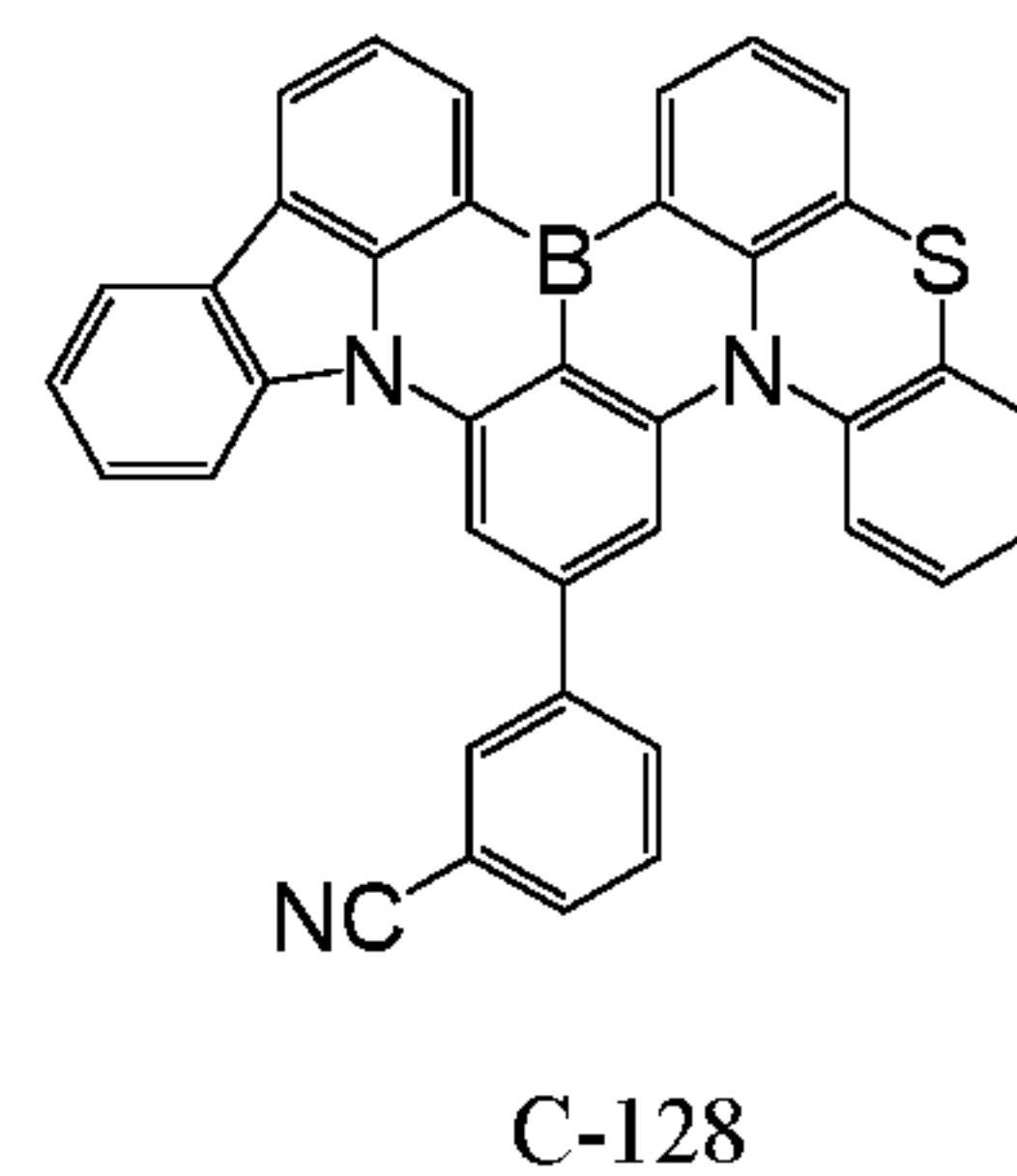
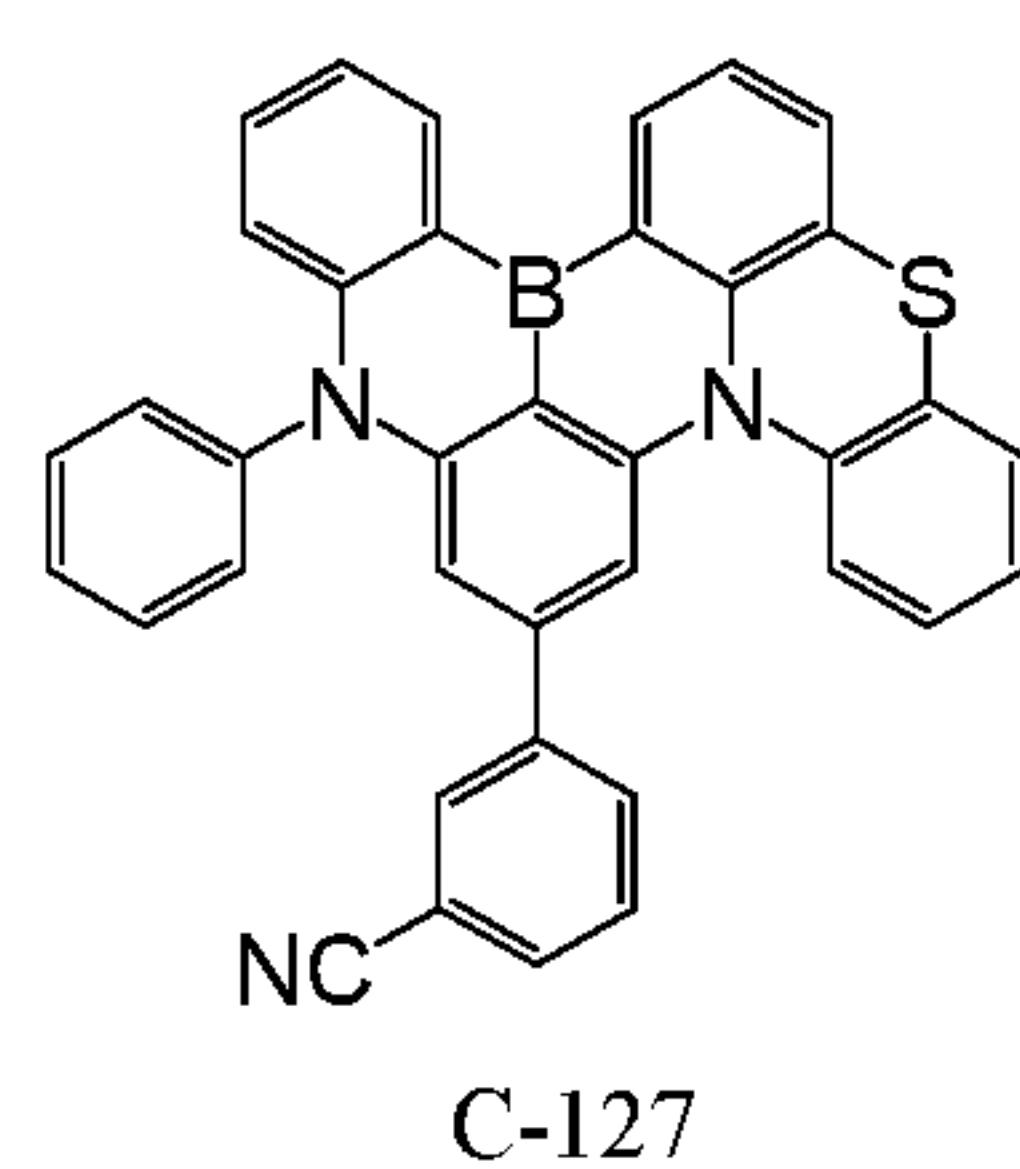
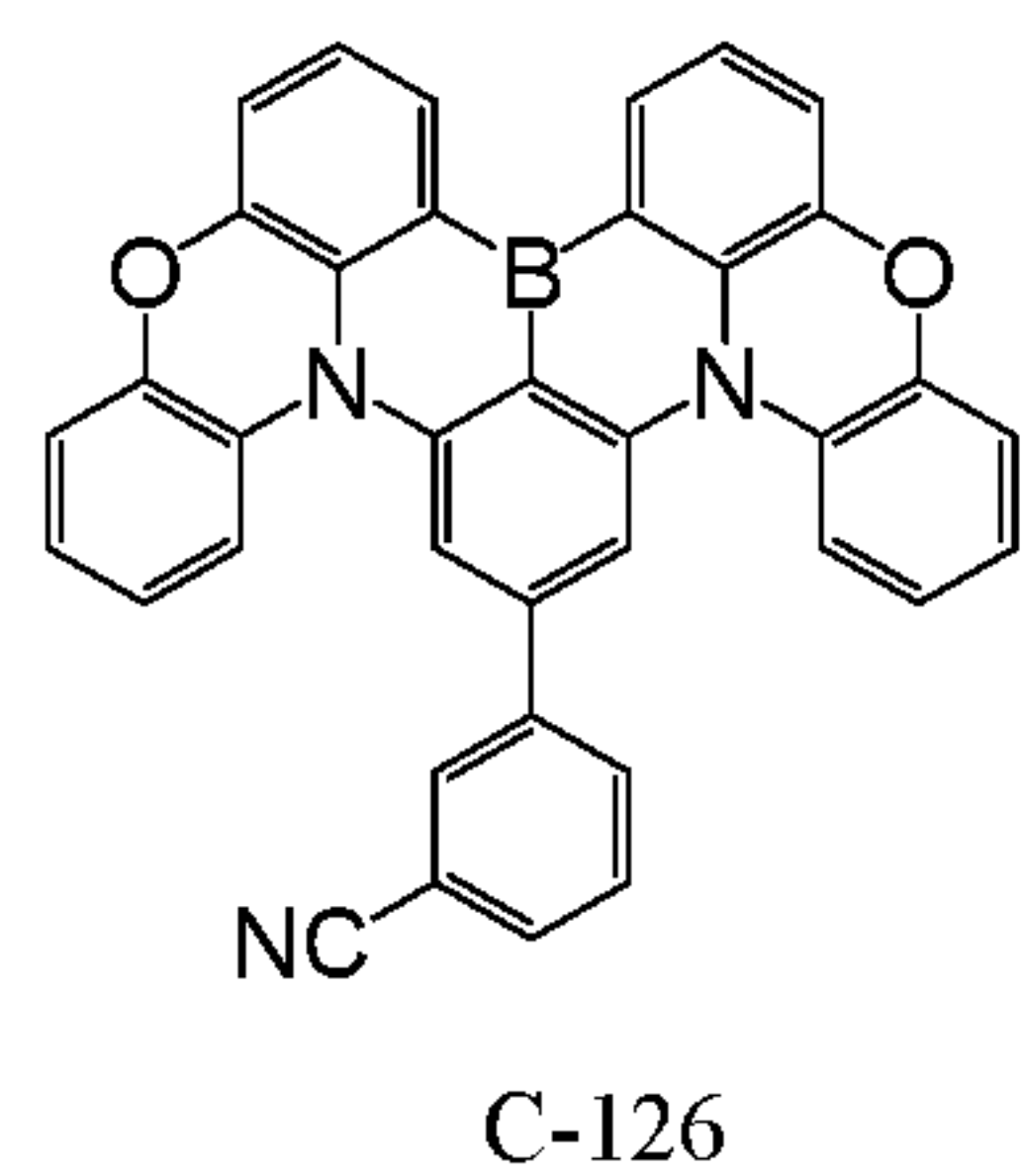
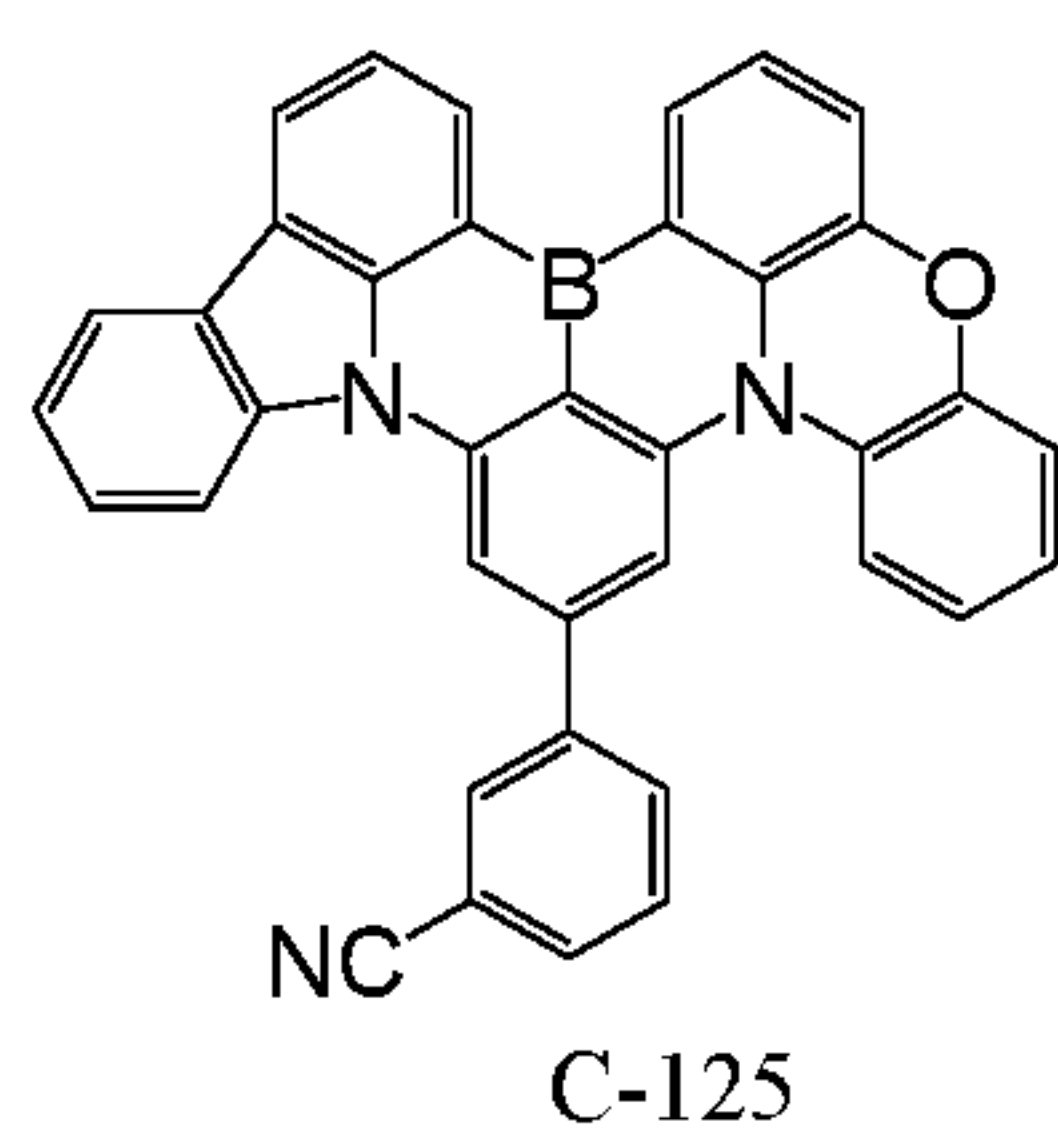
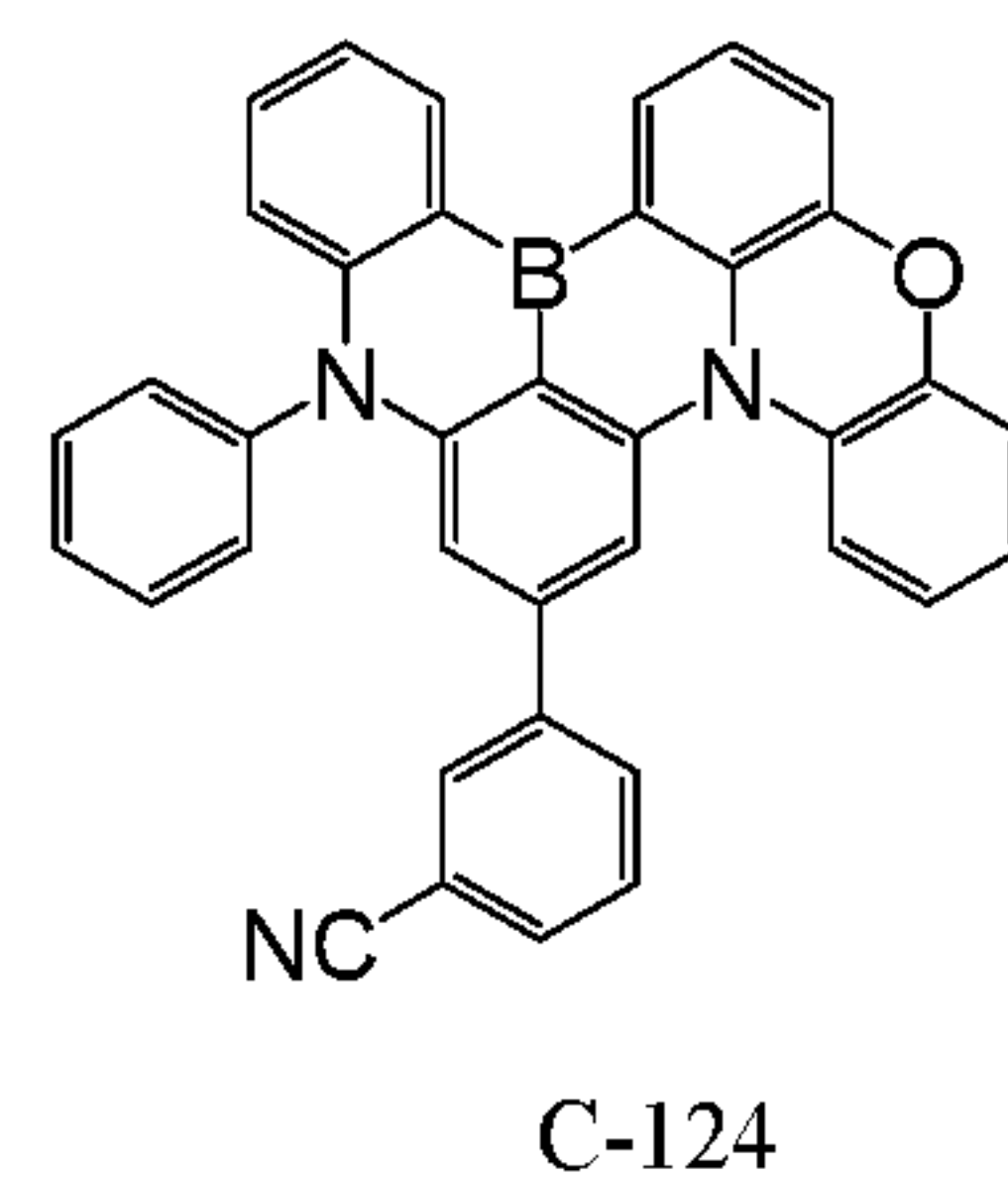
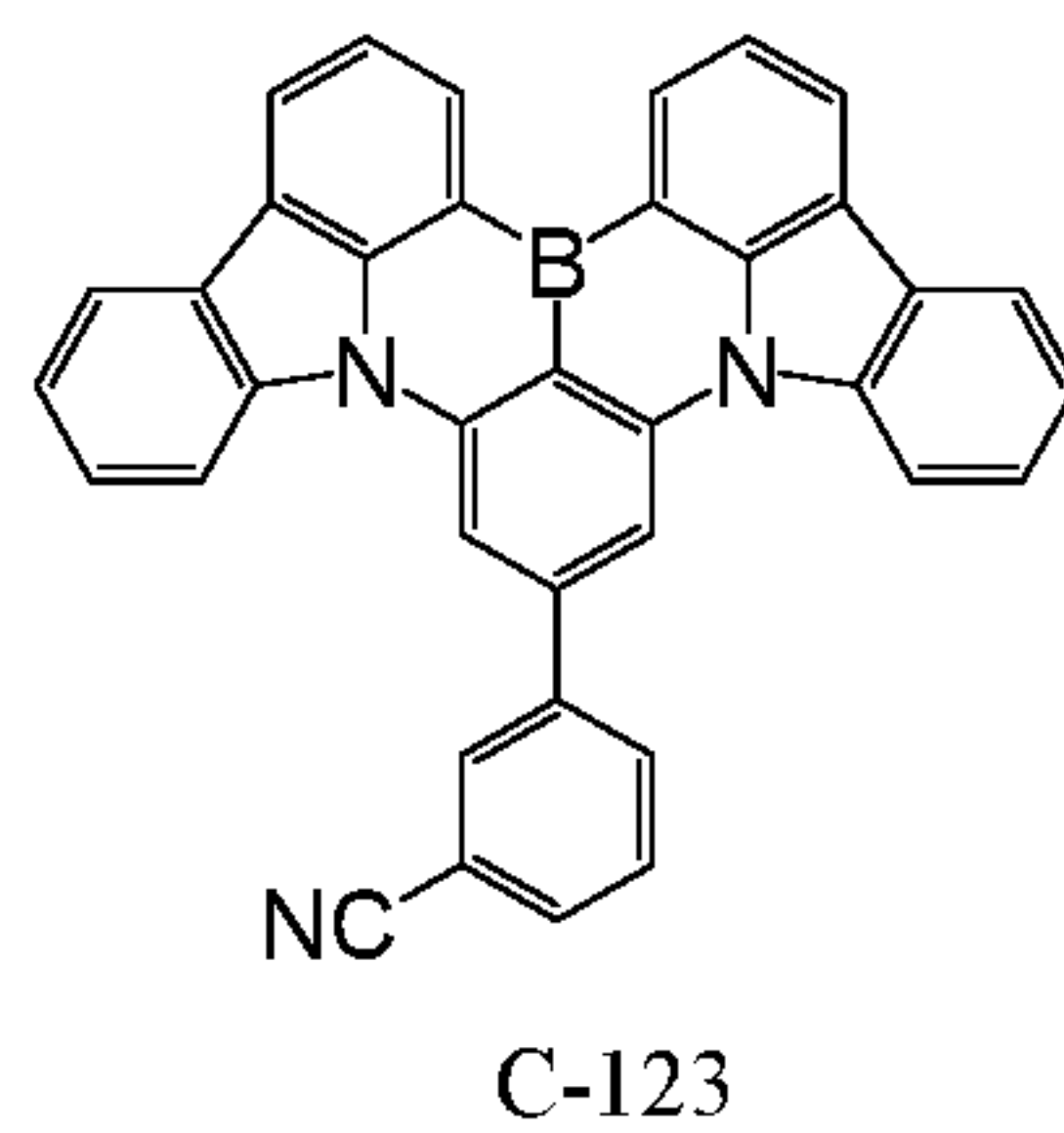
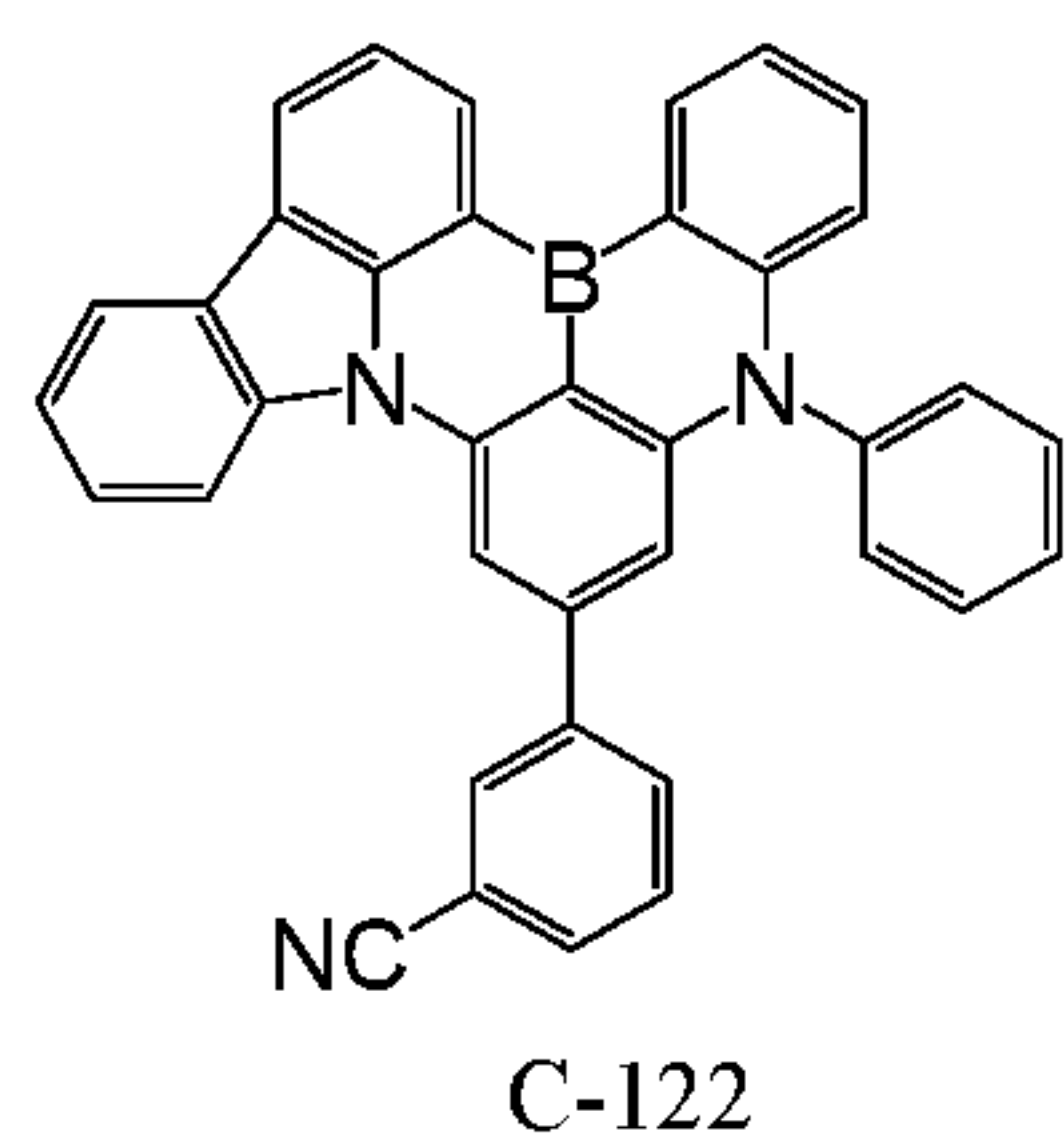
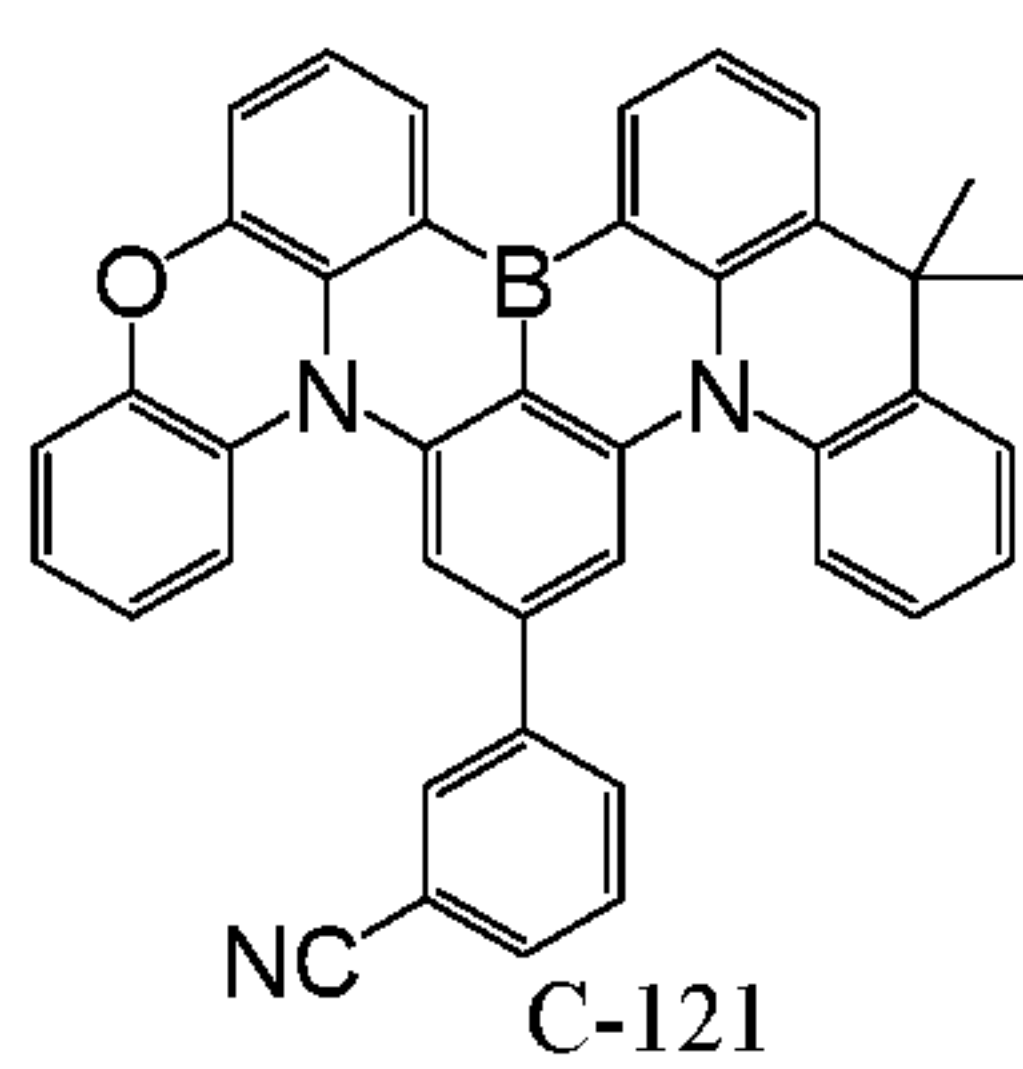
C-118

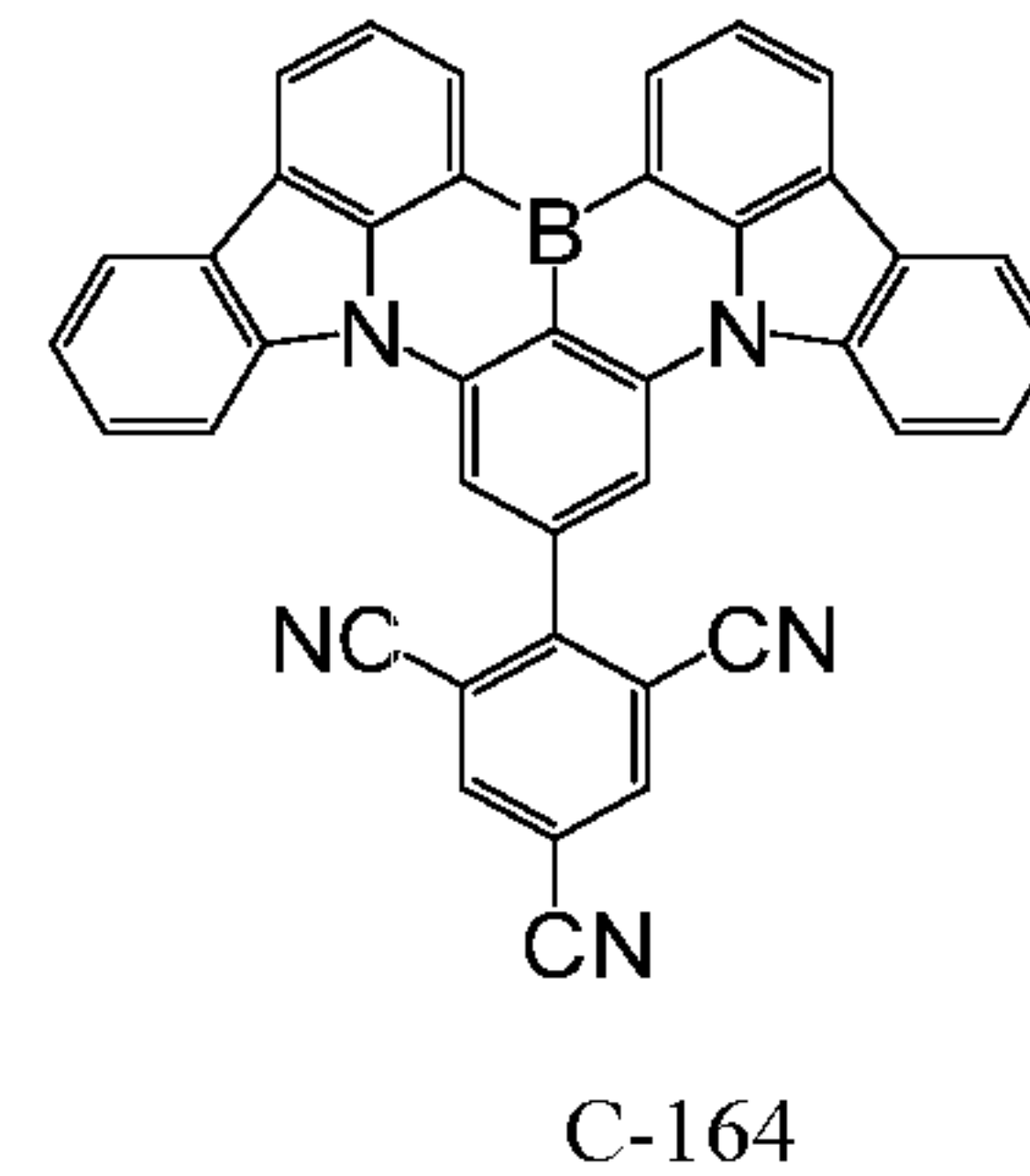
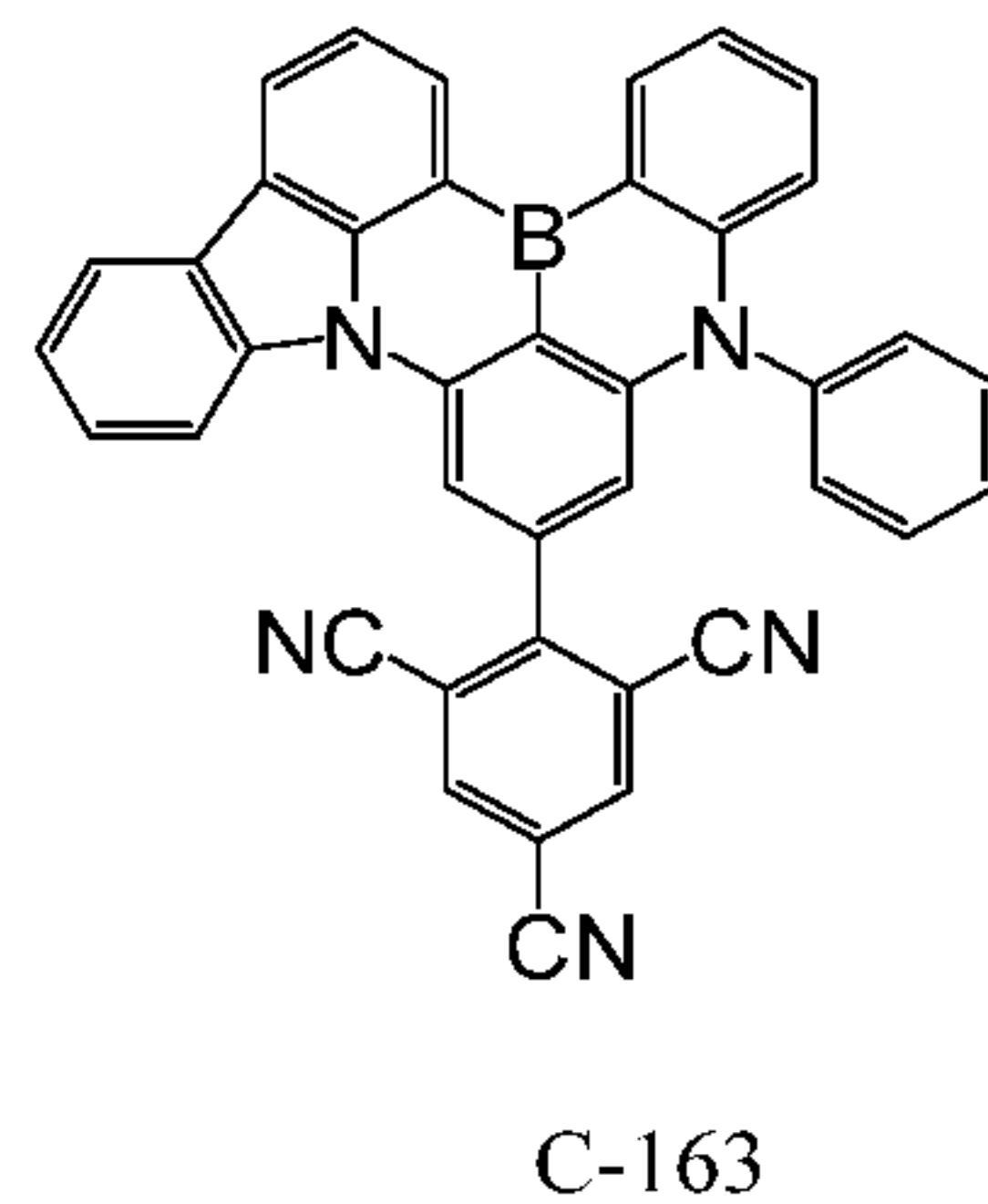
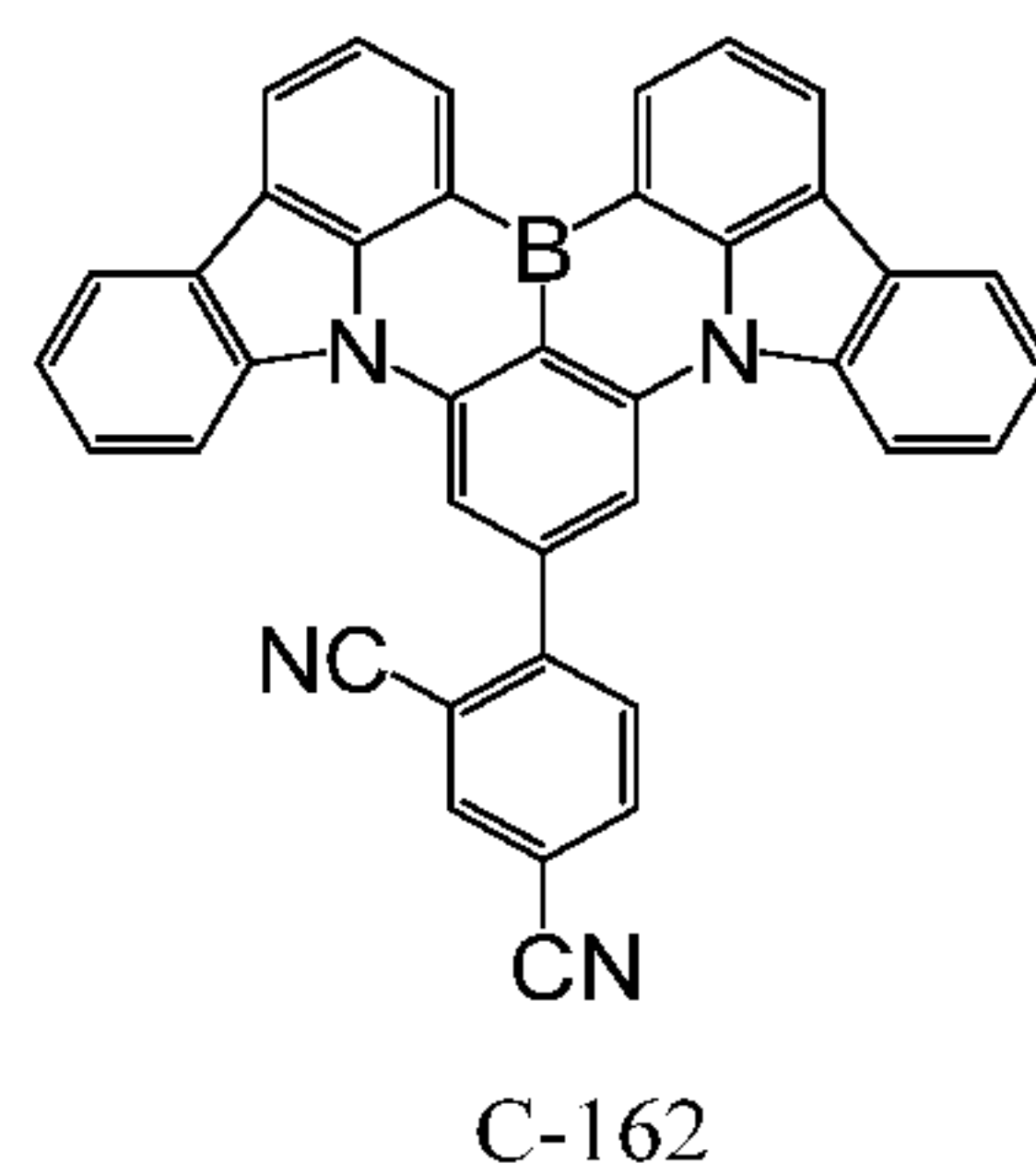
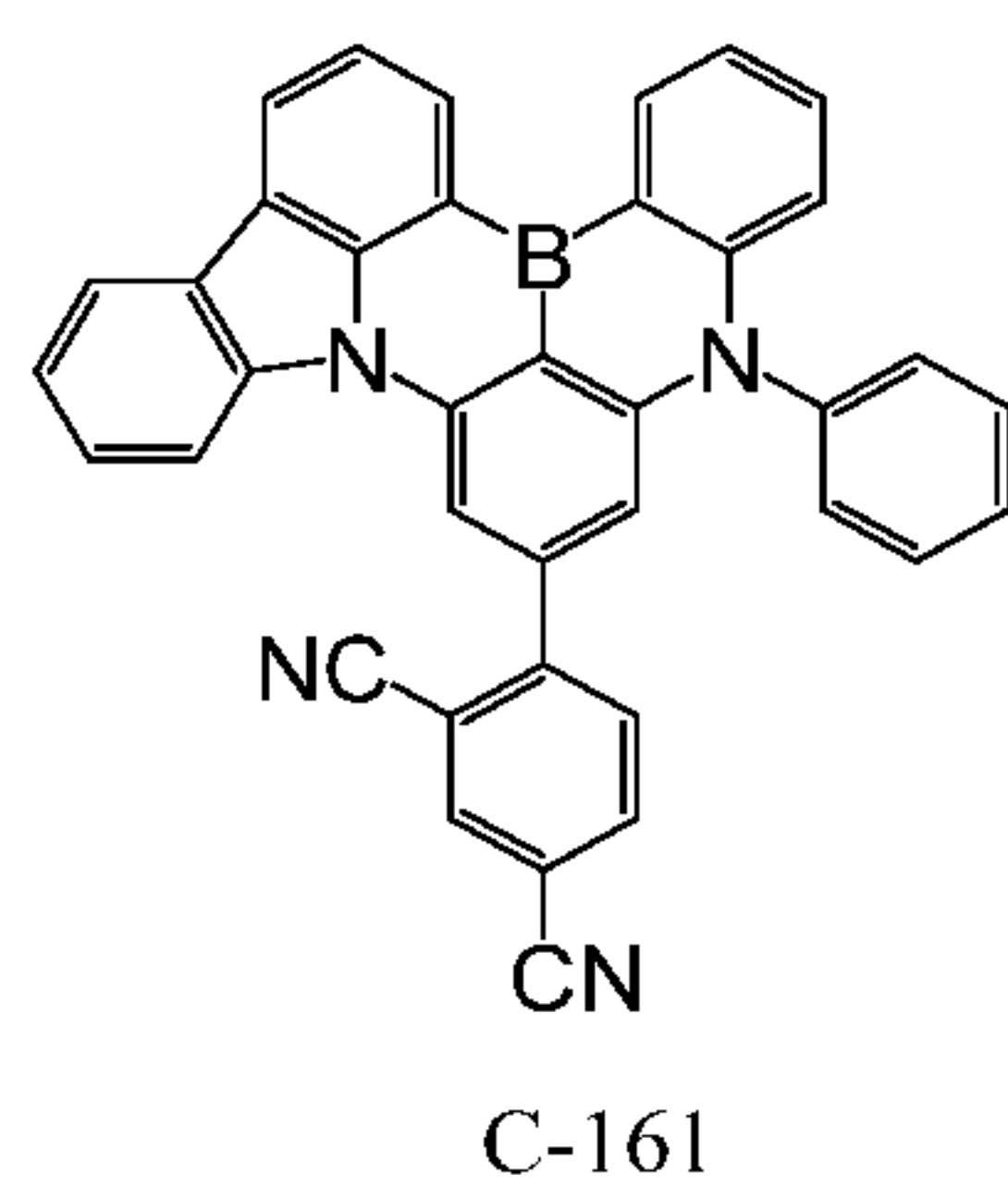
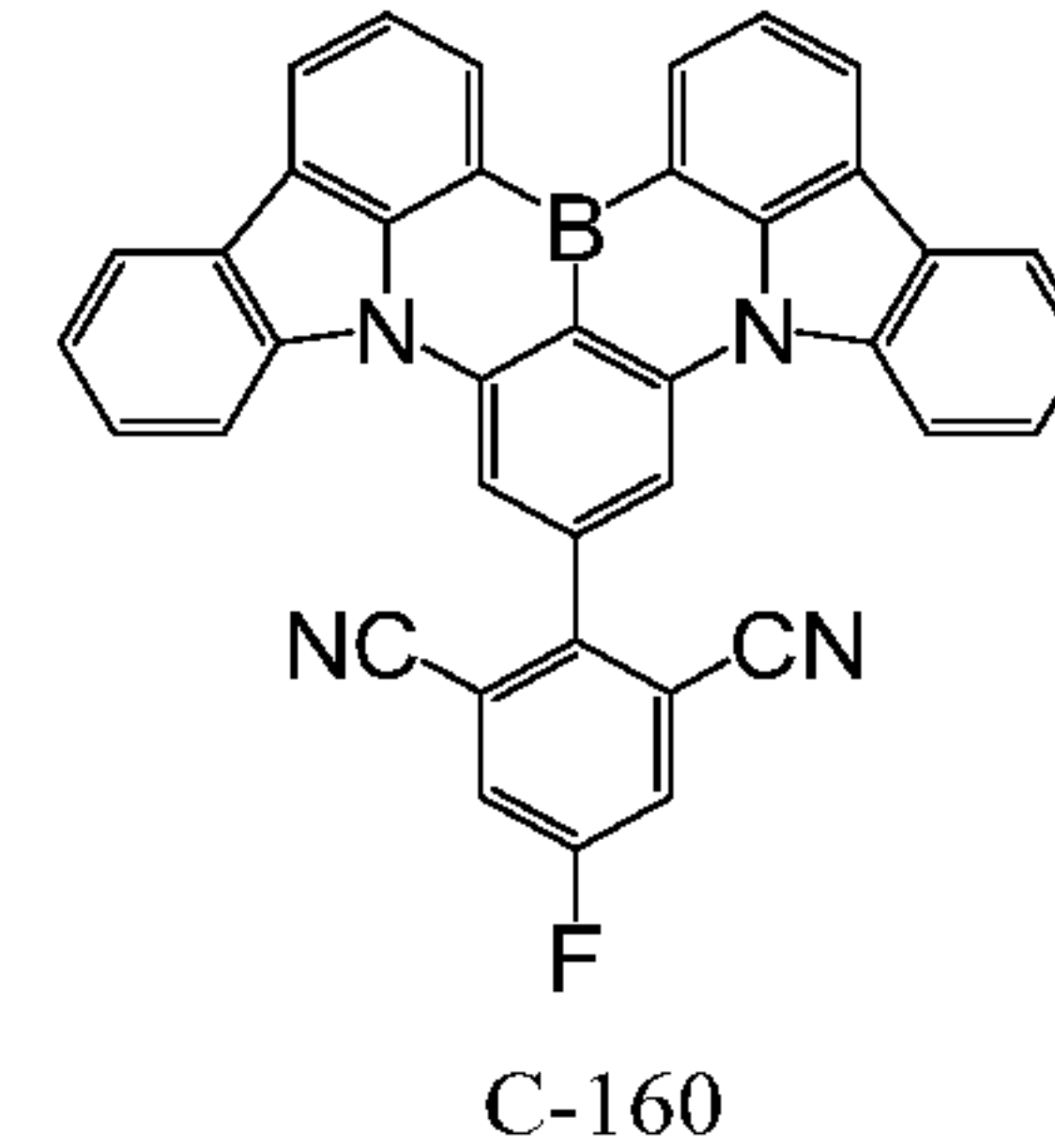
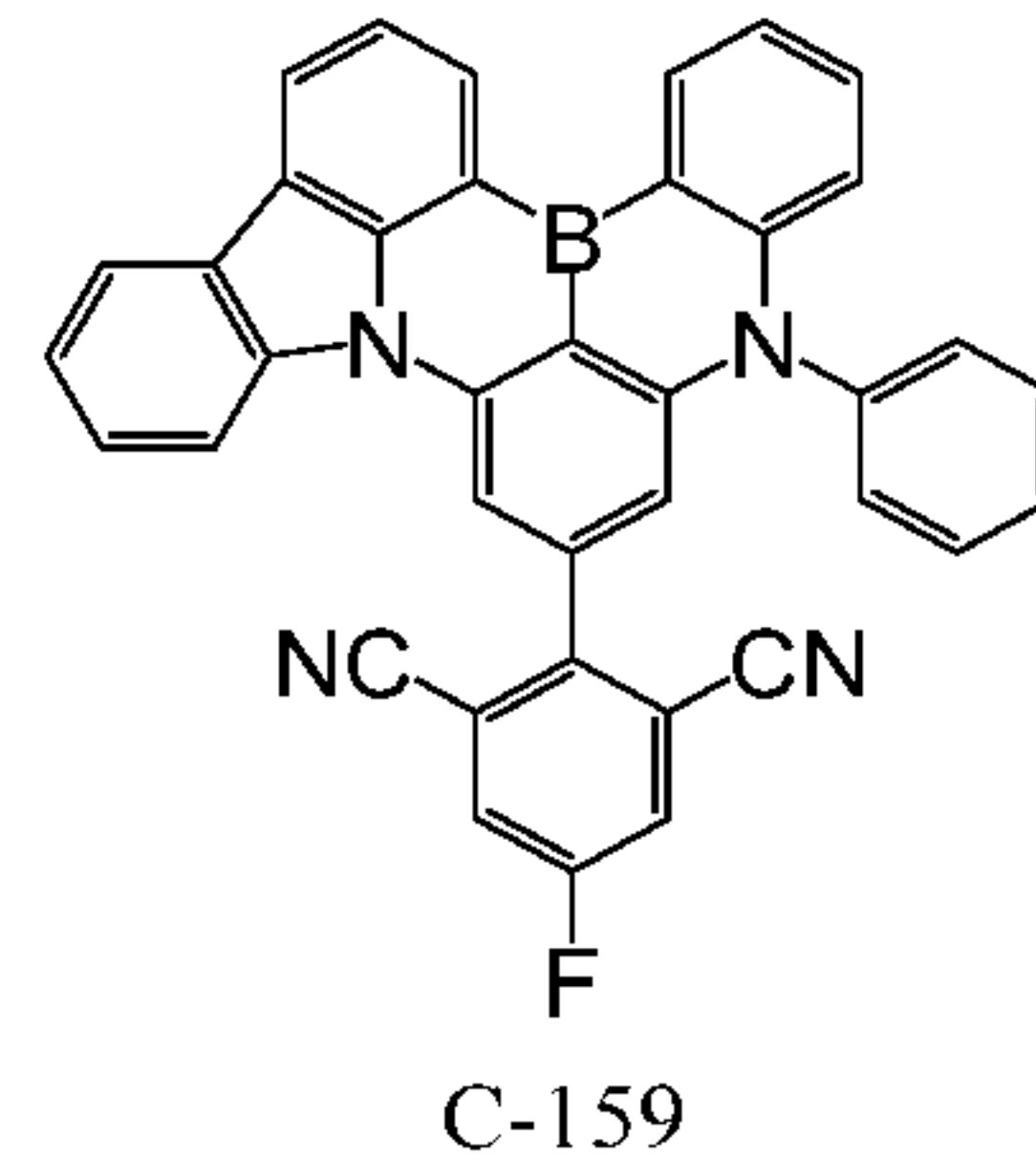
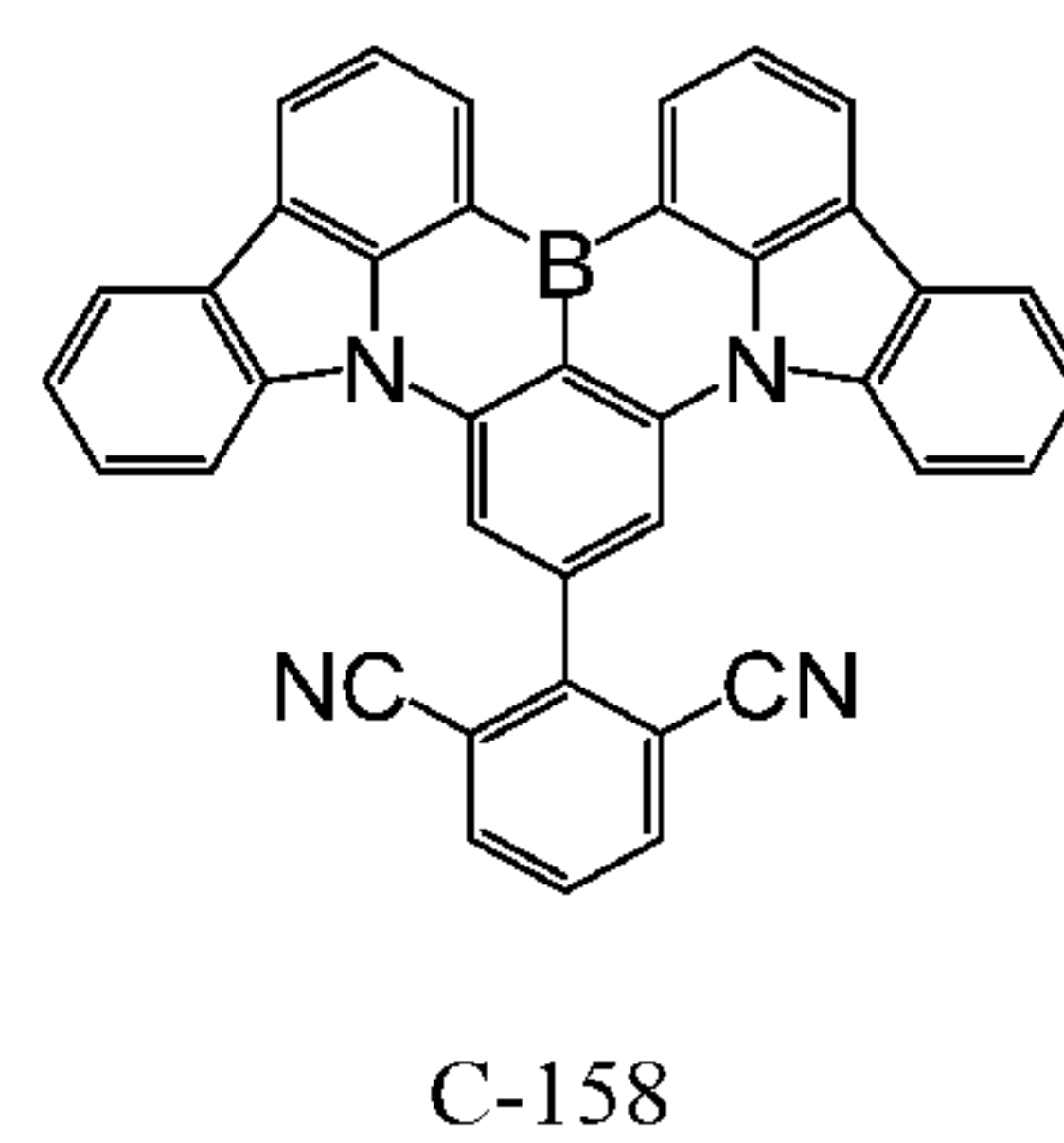
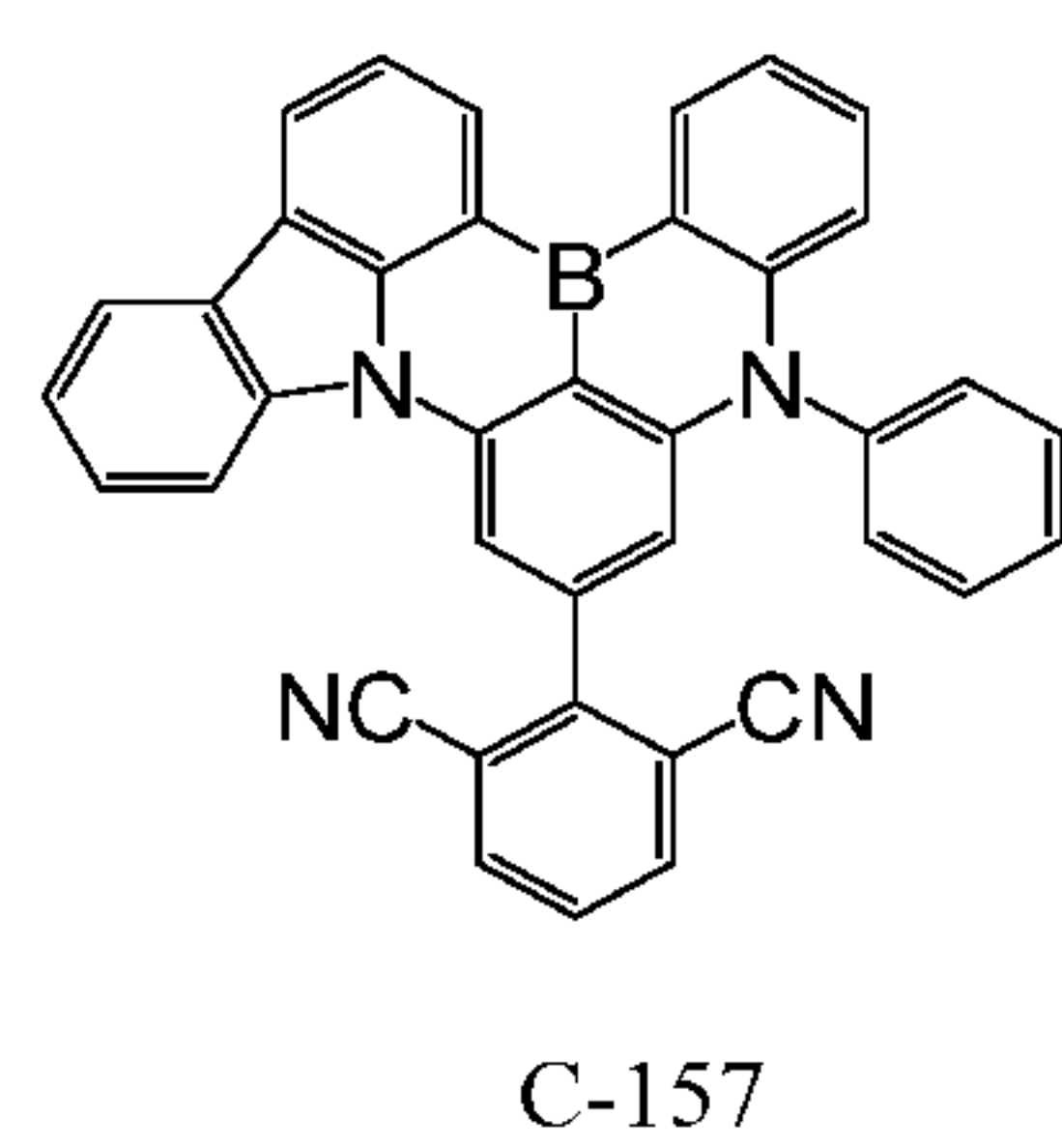
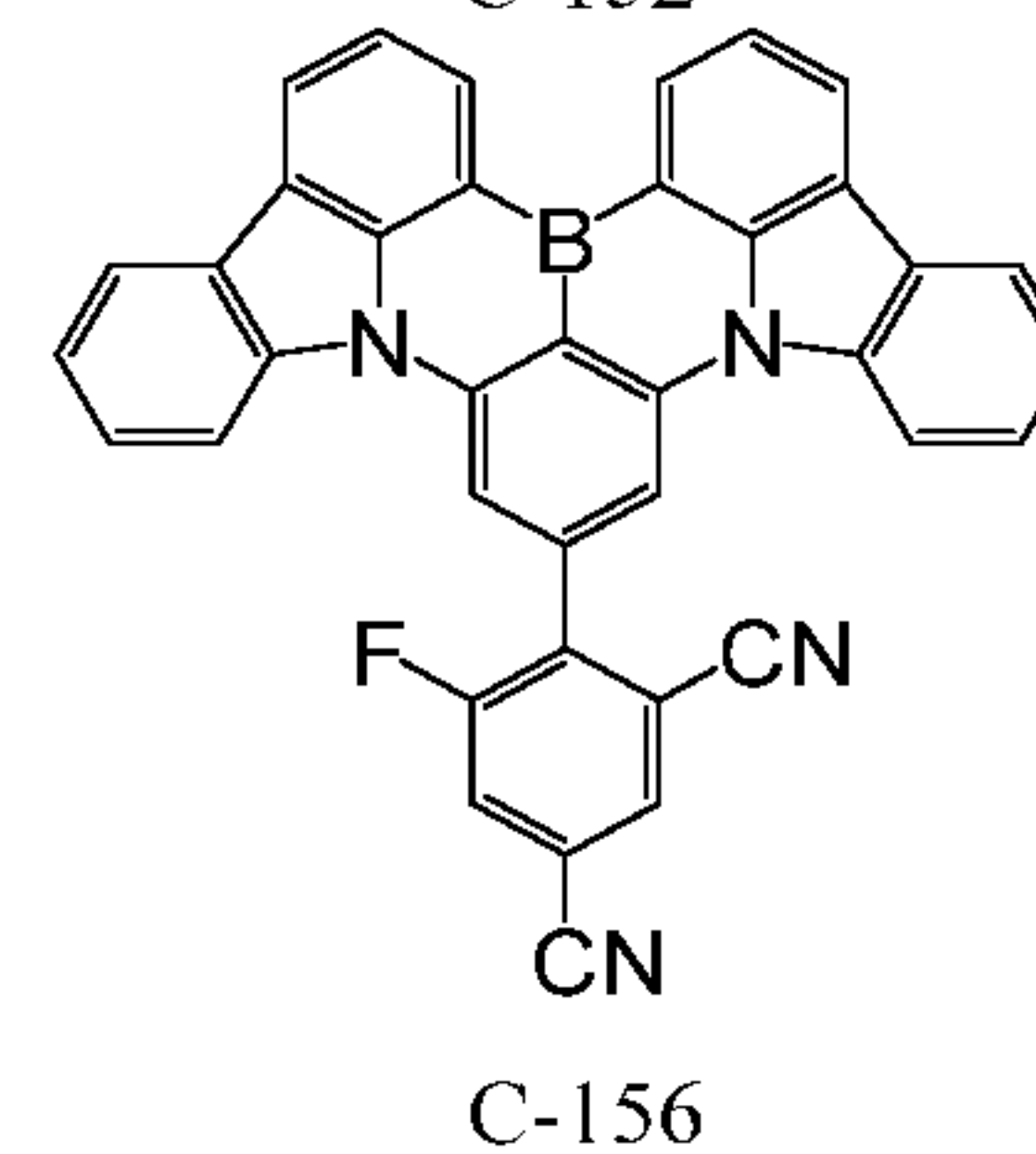
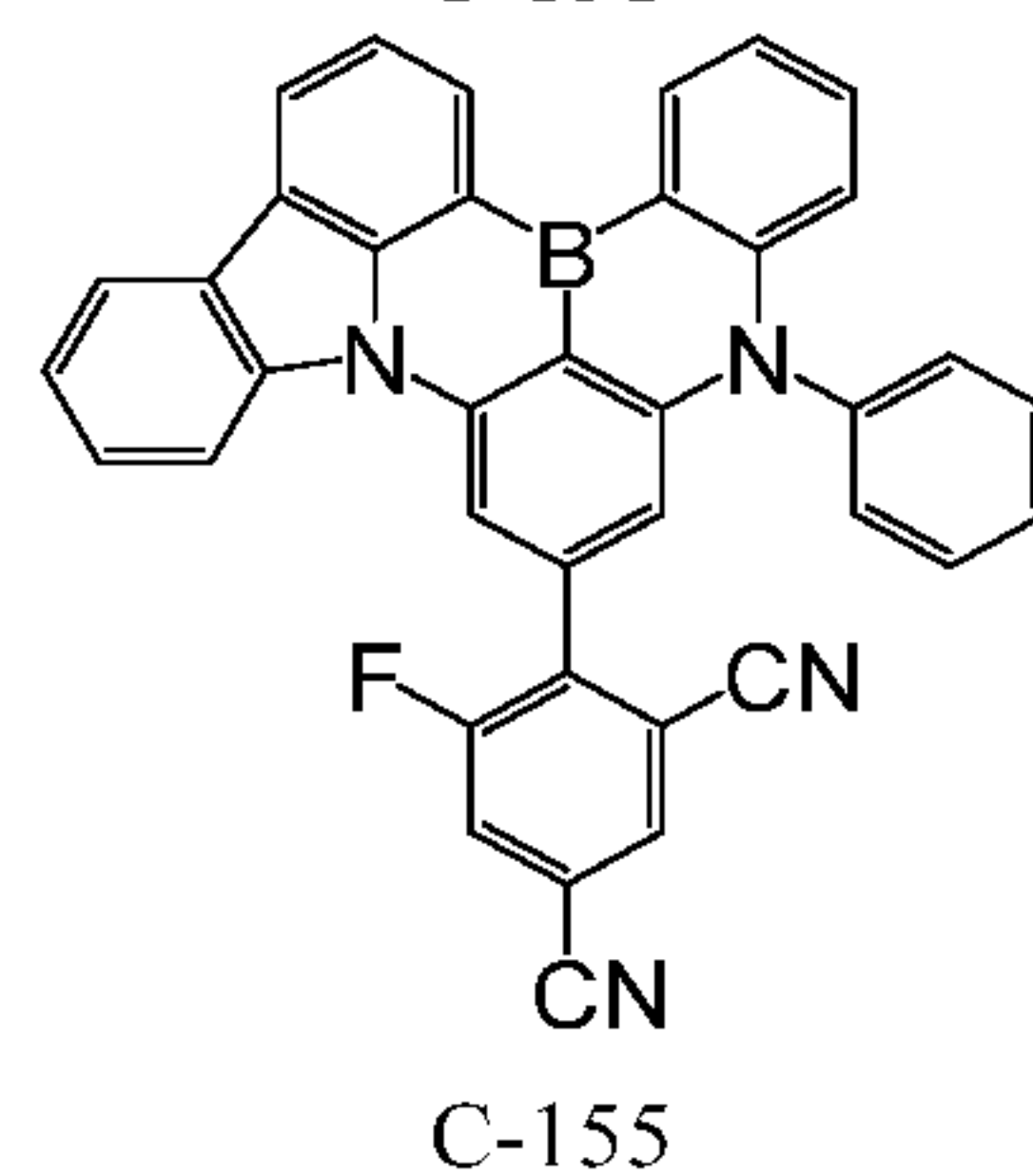
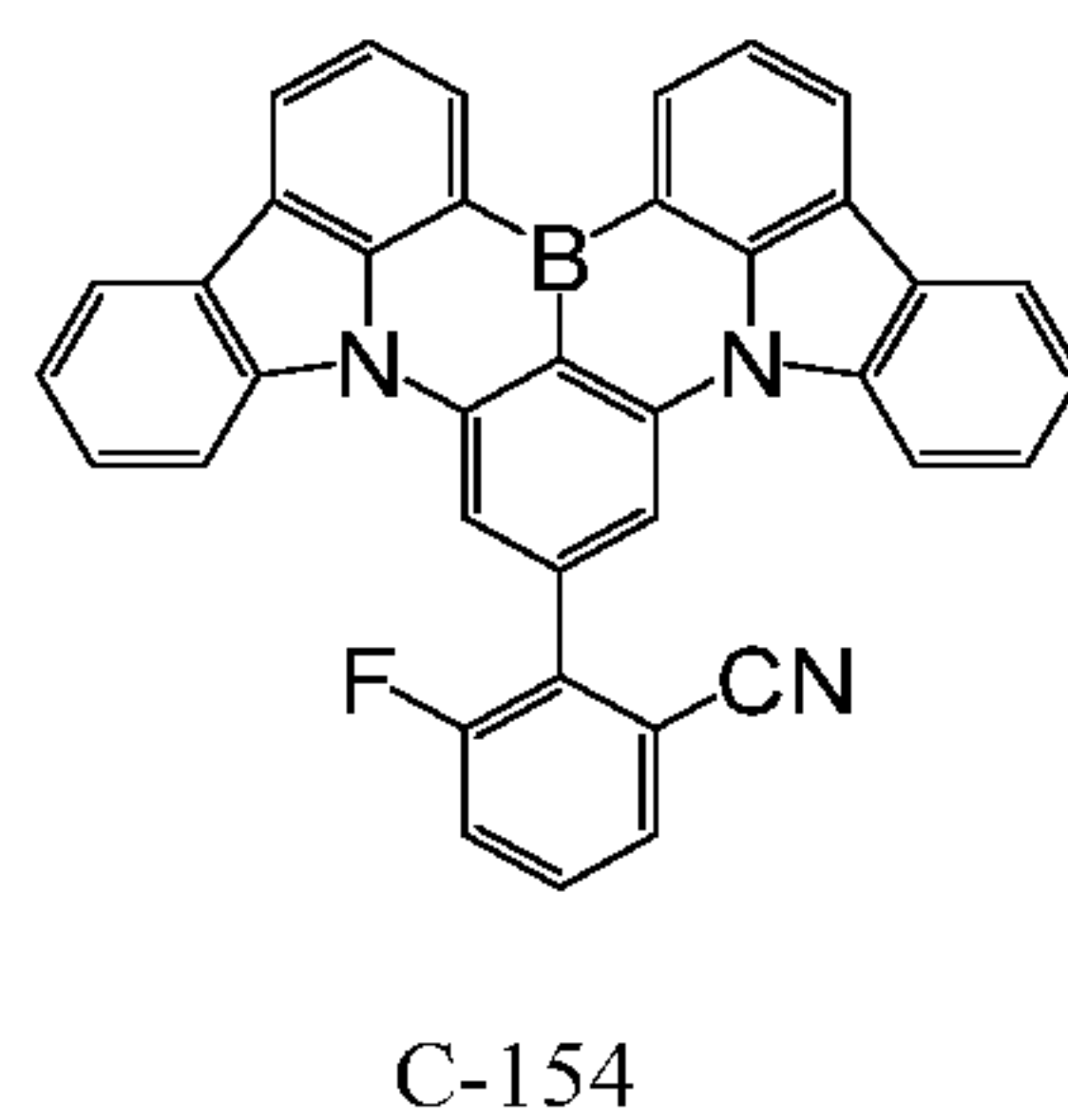
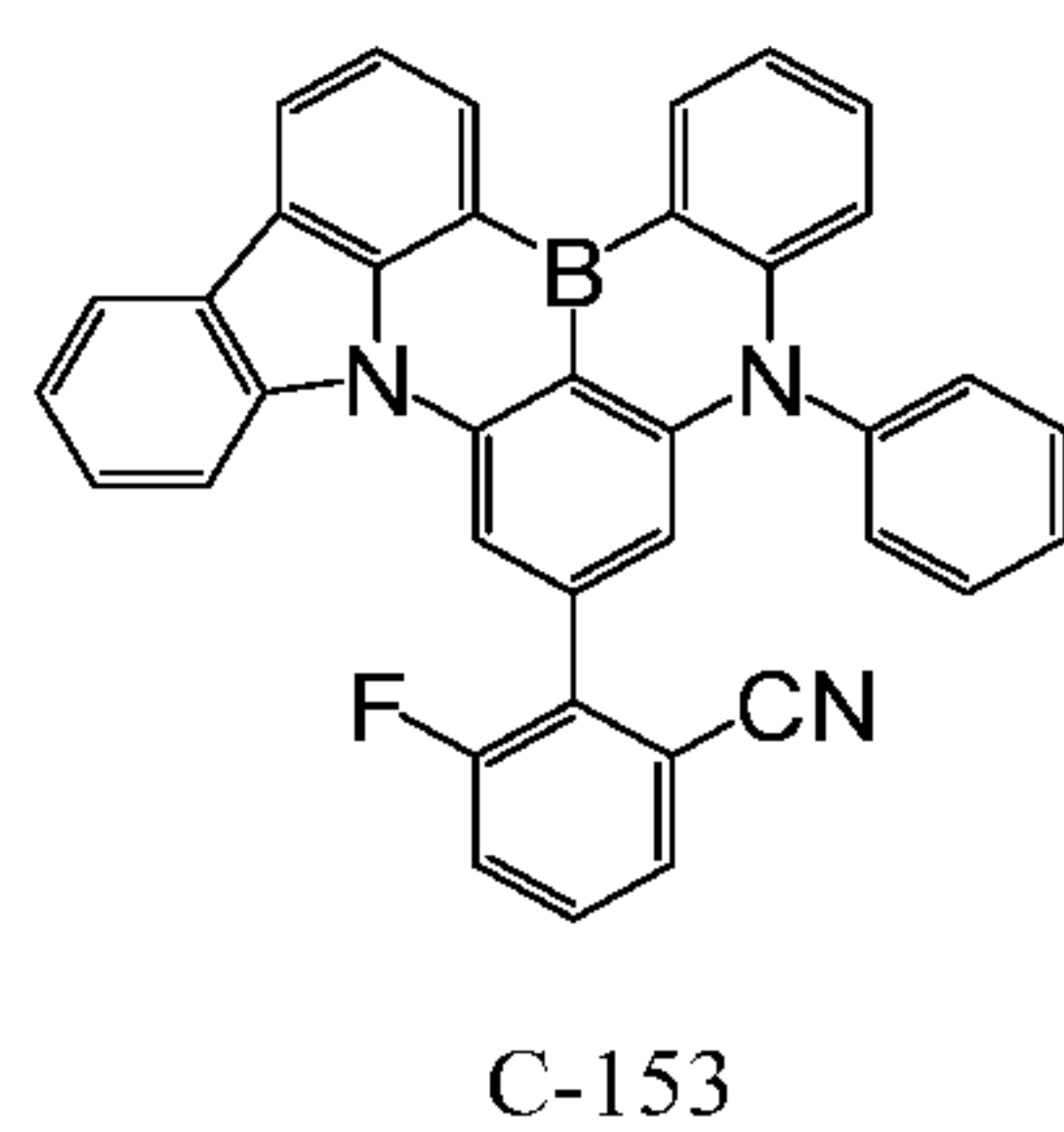
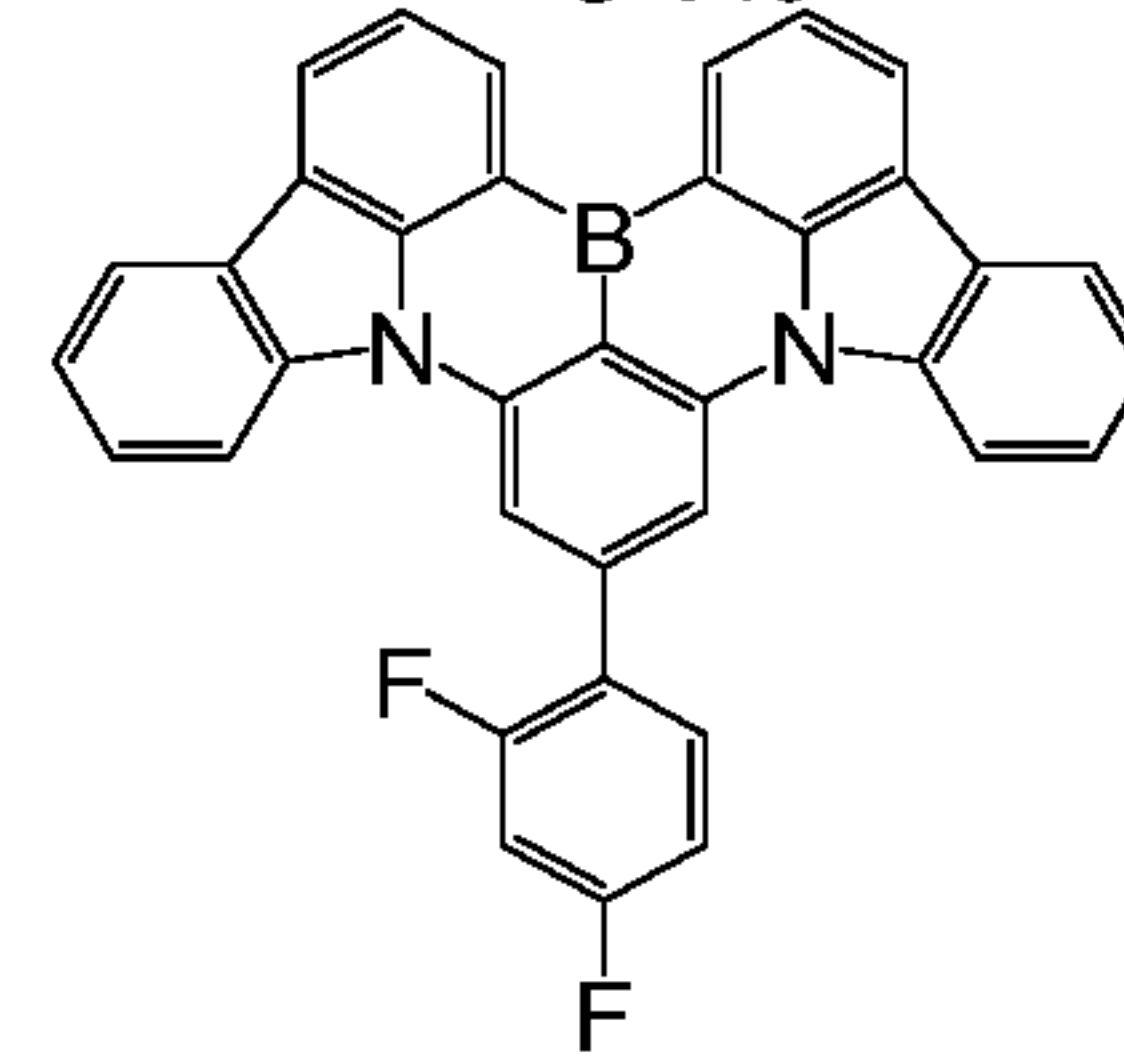
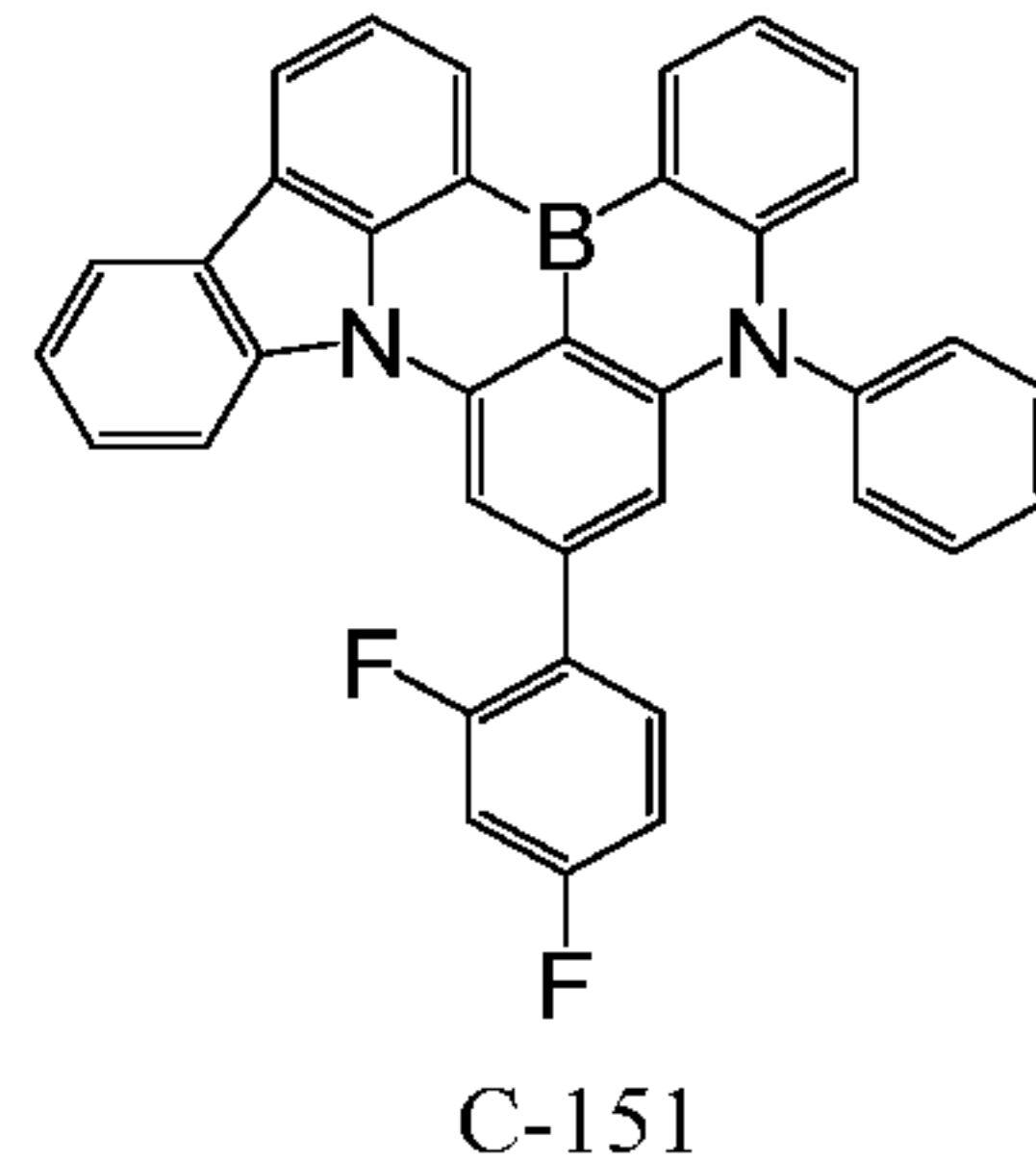
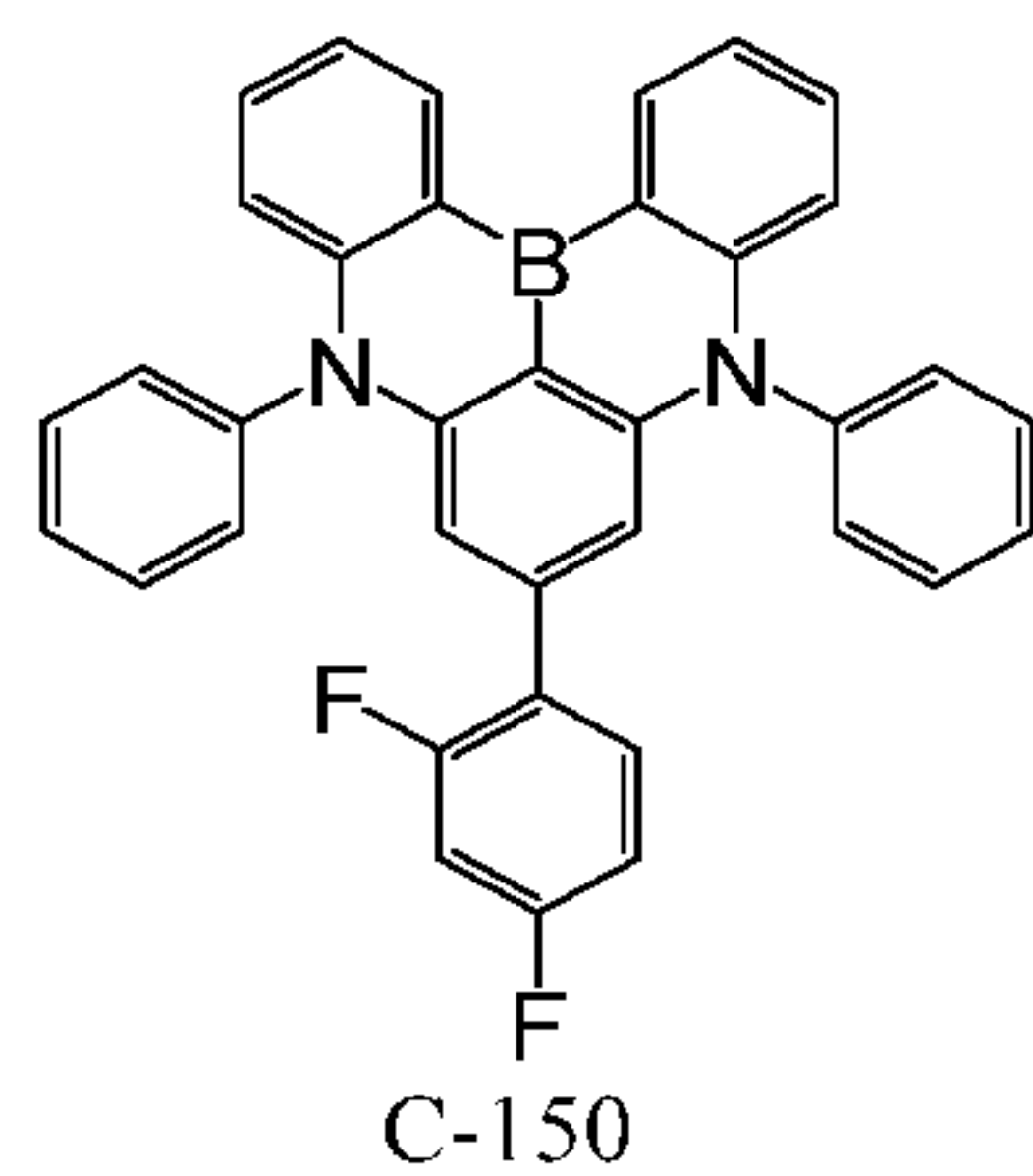
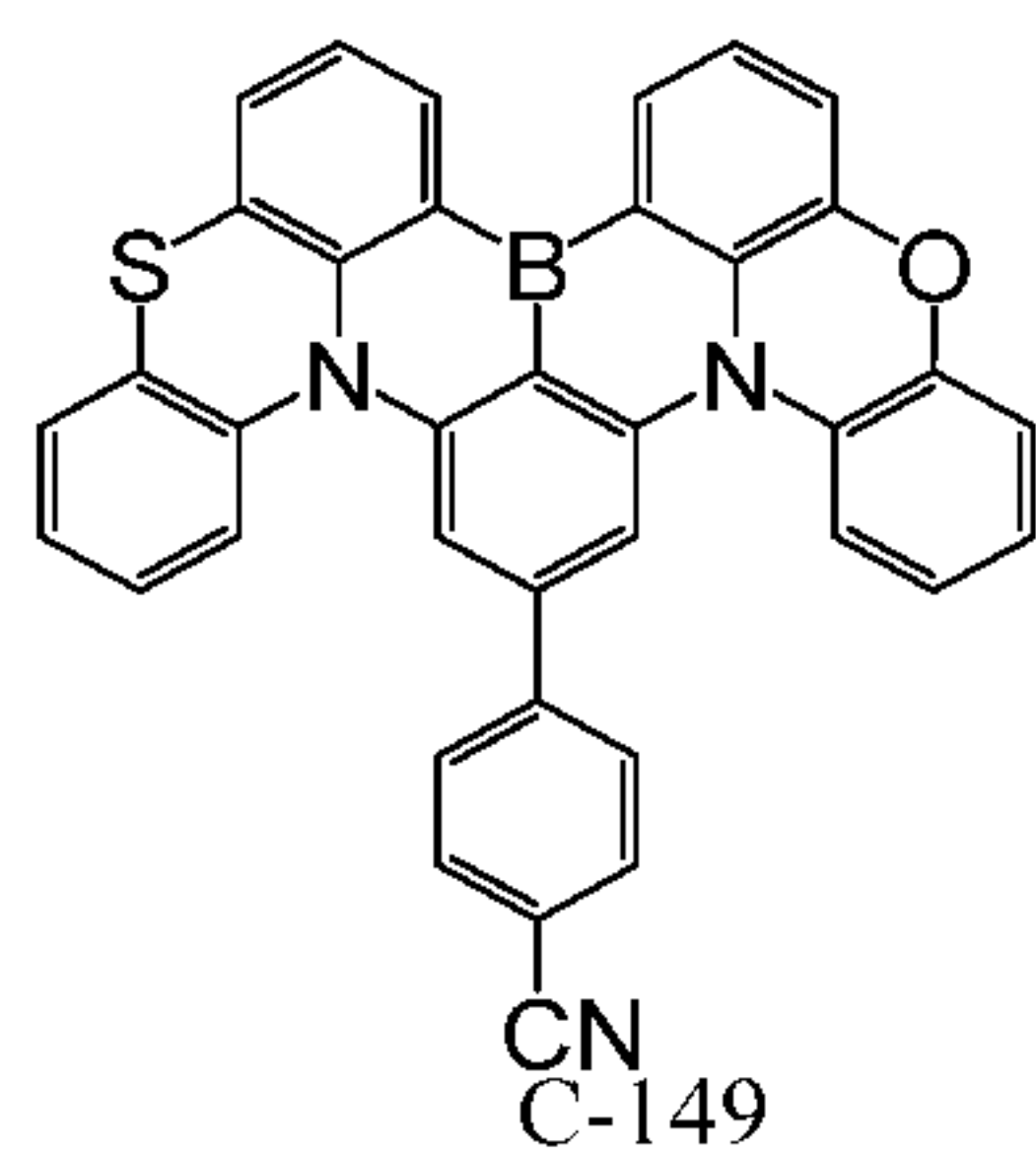
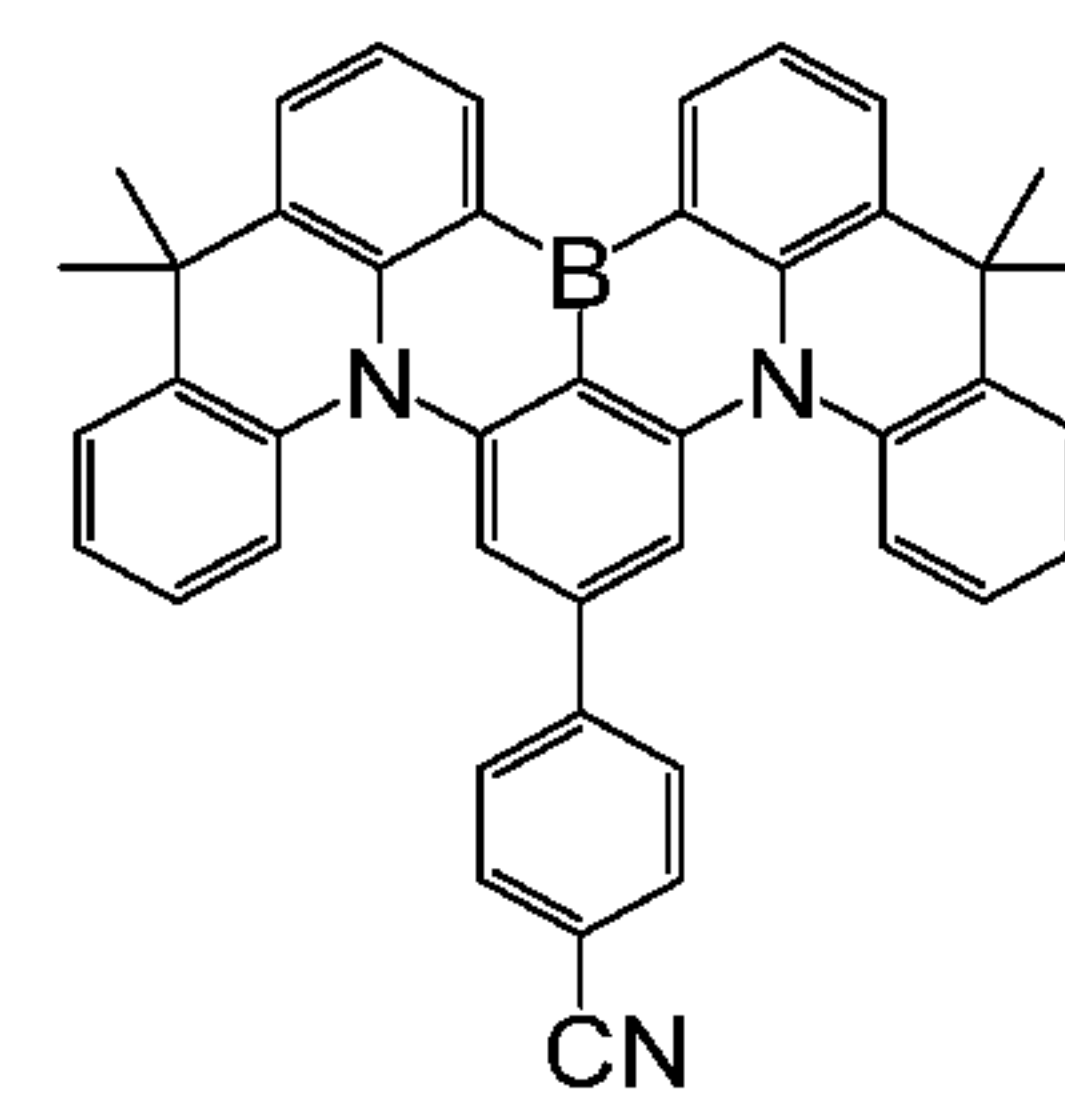
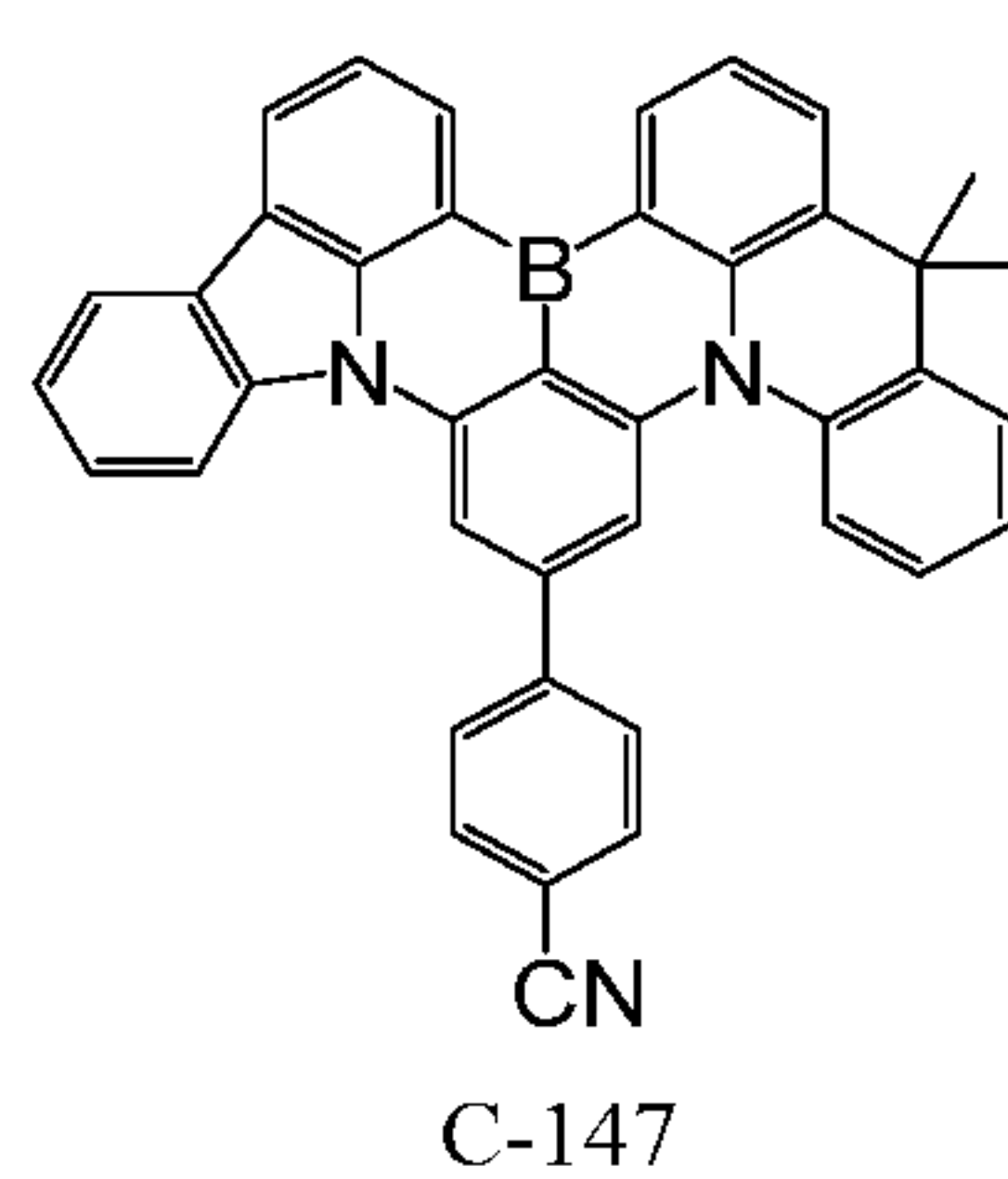
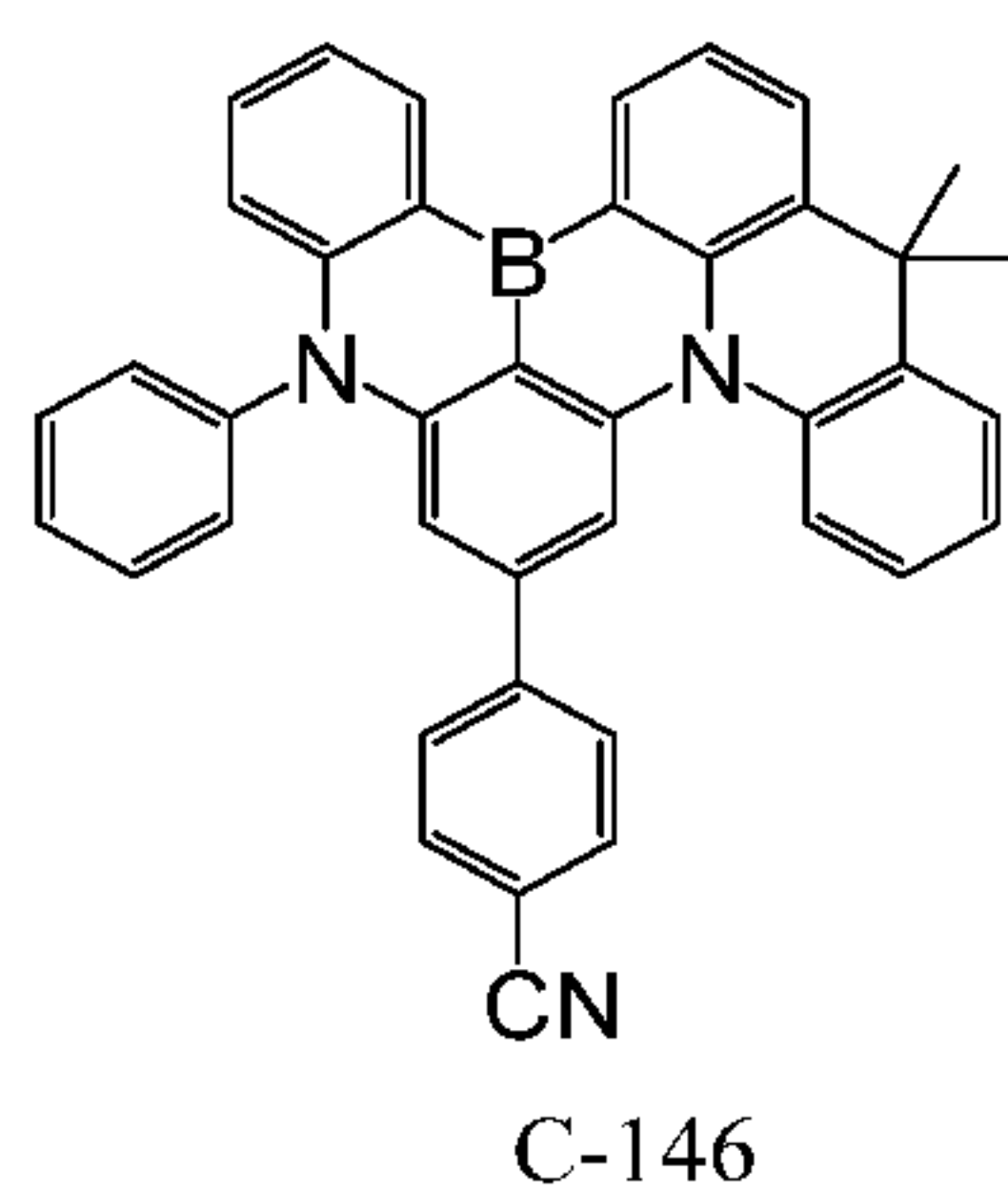
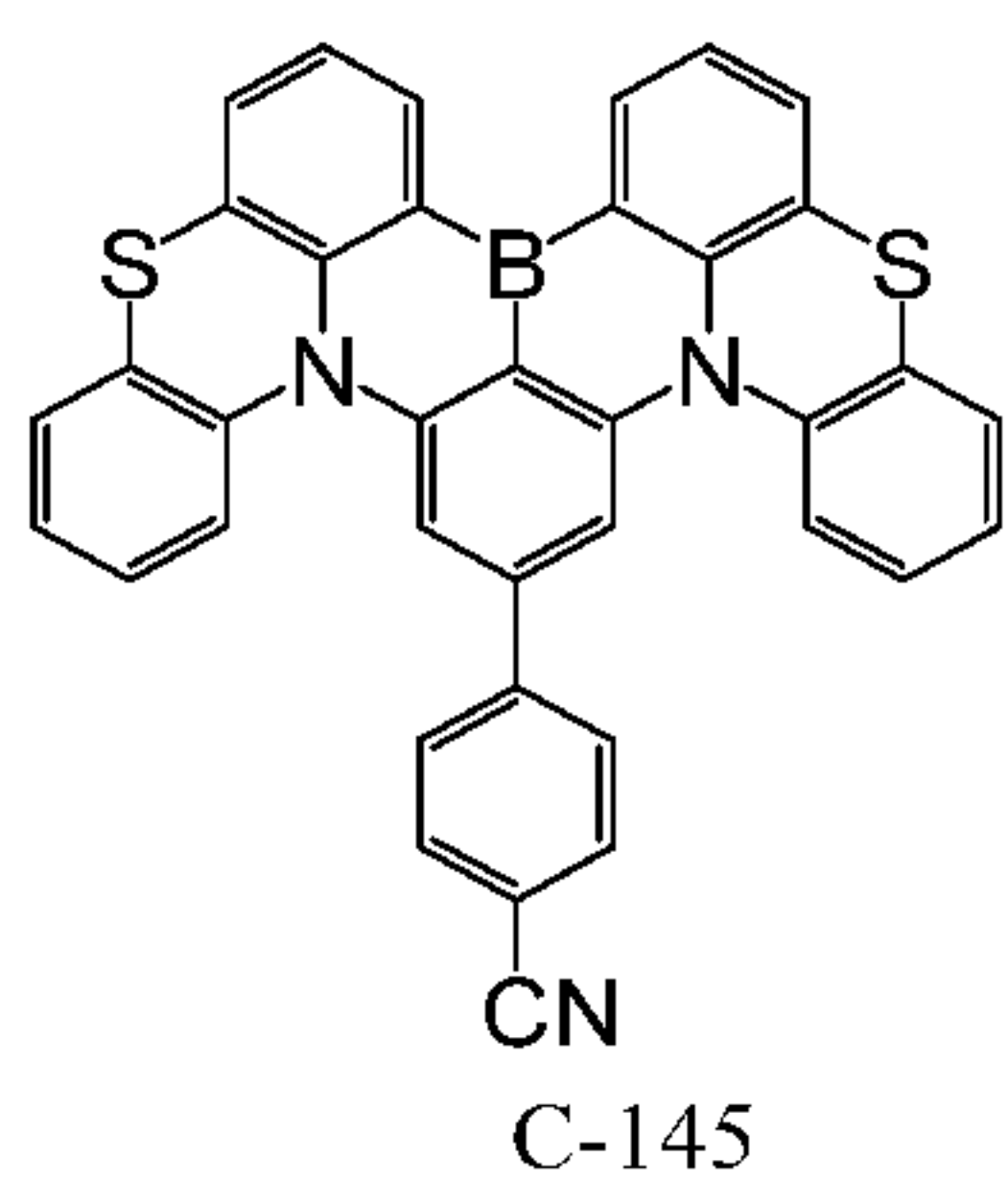


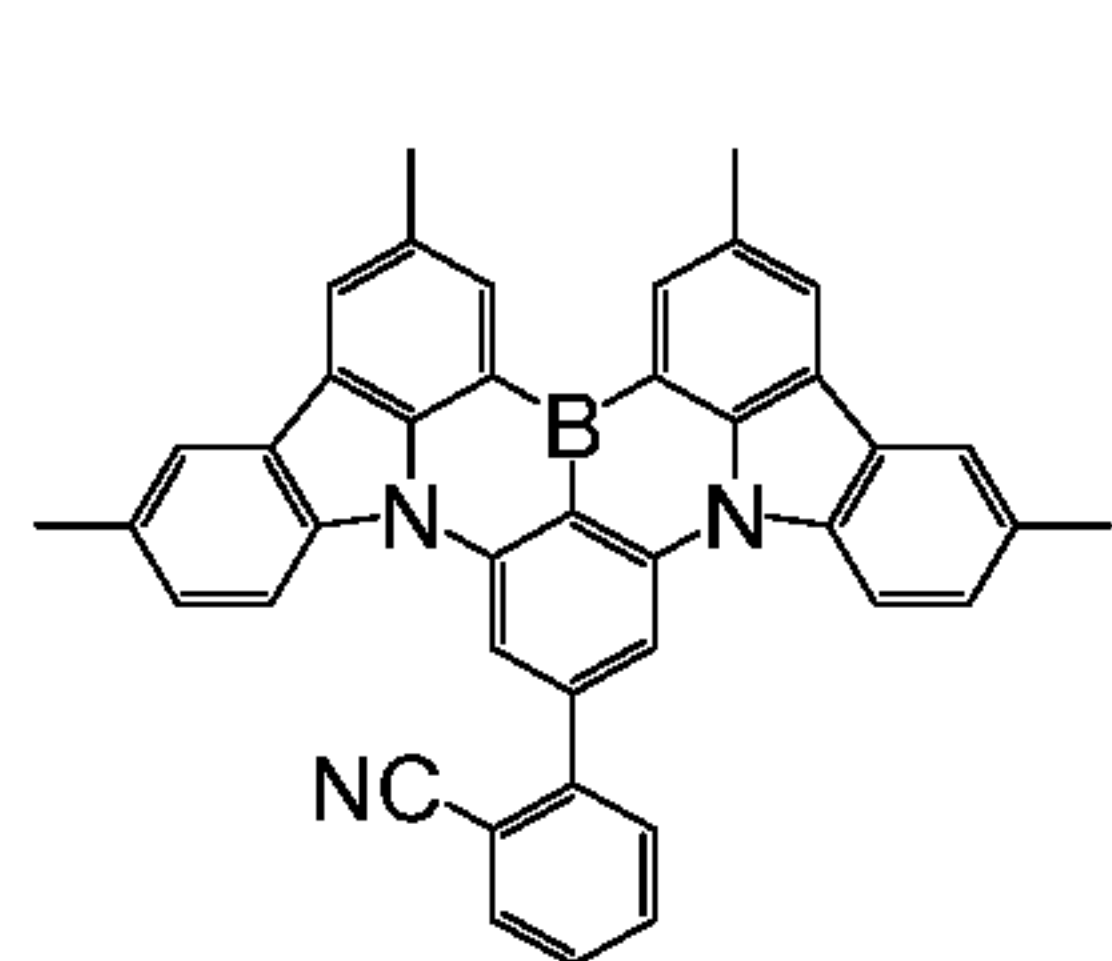
C-119



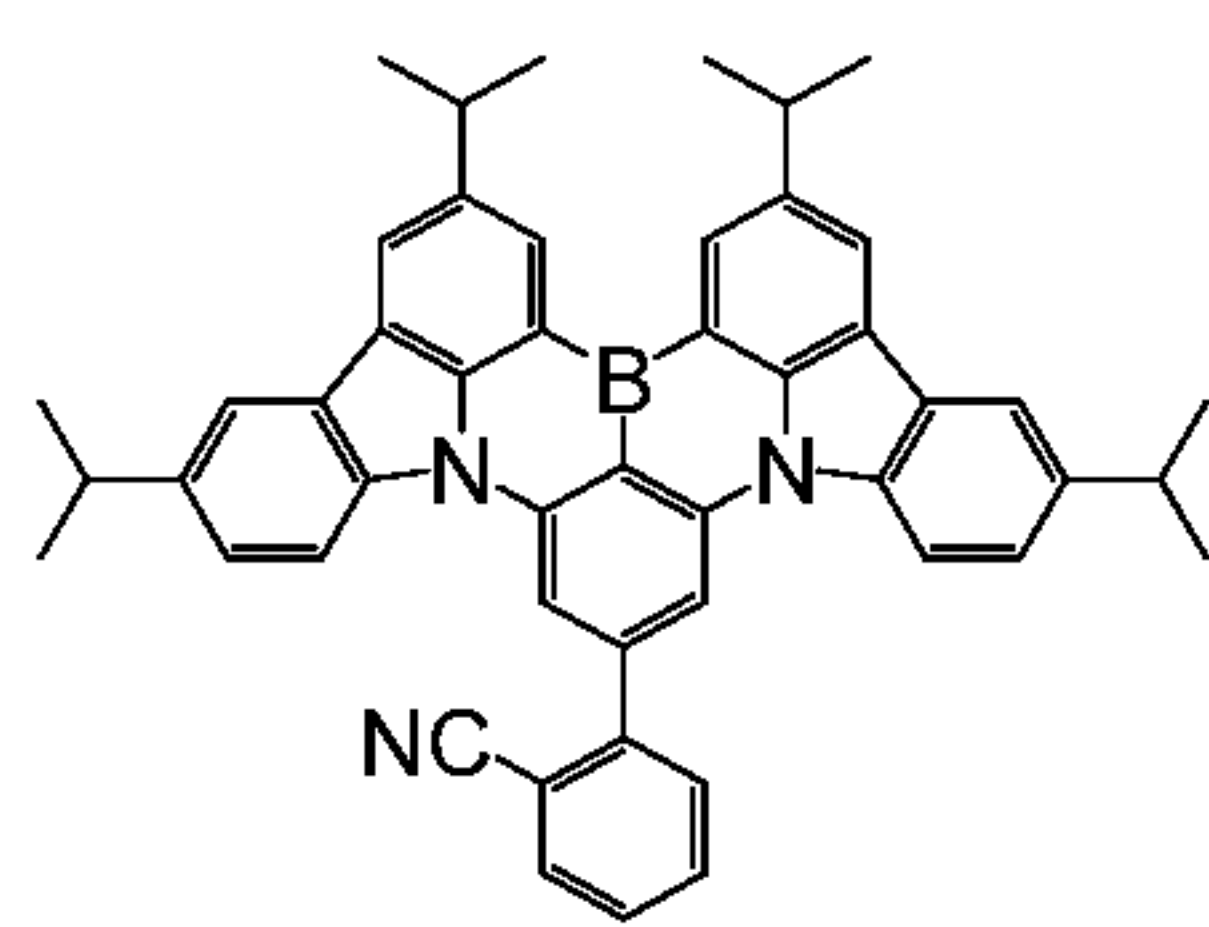
C-120



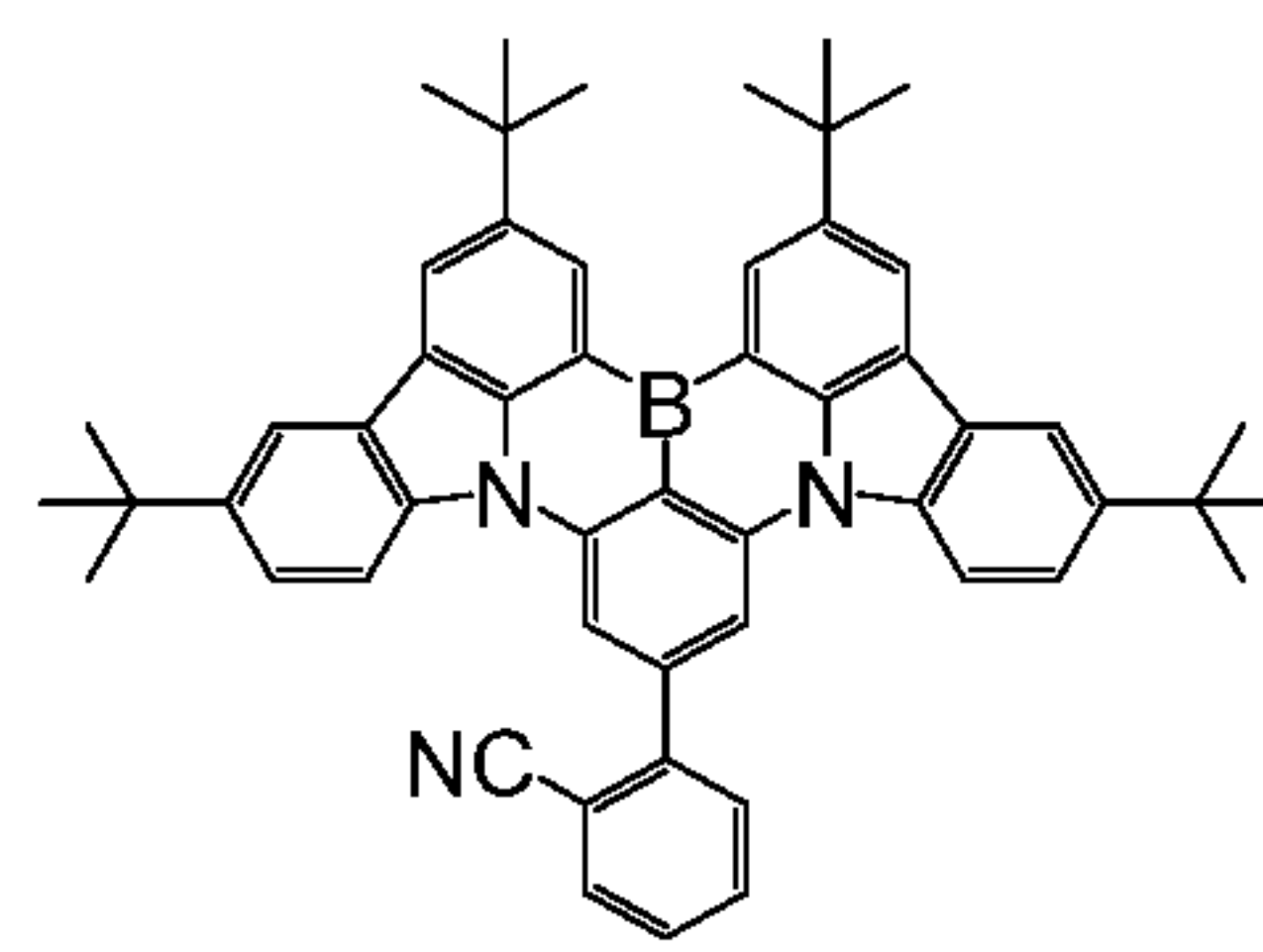




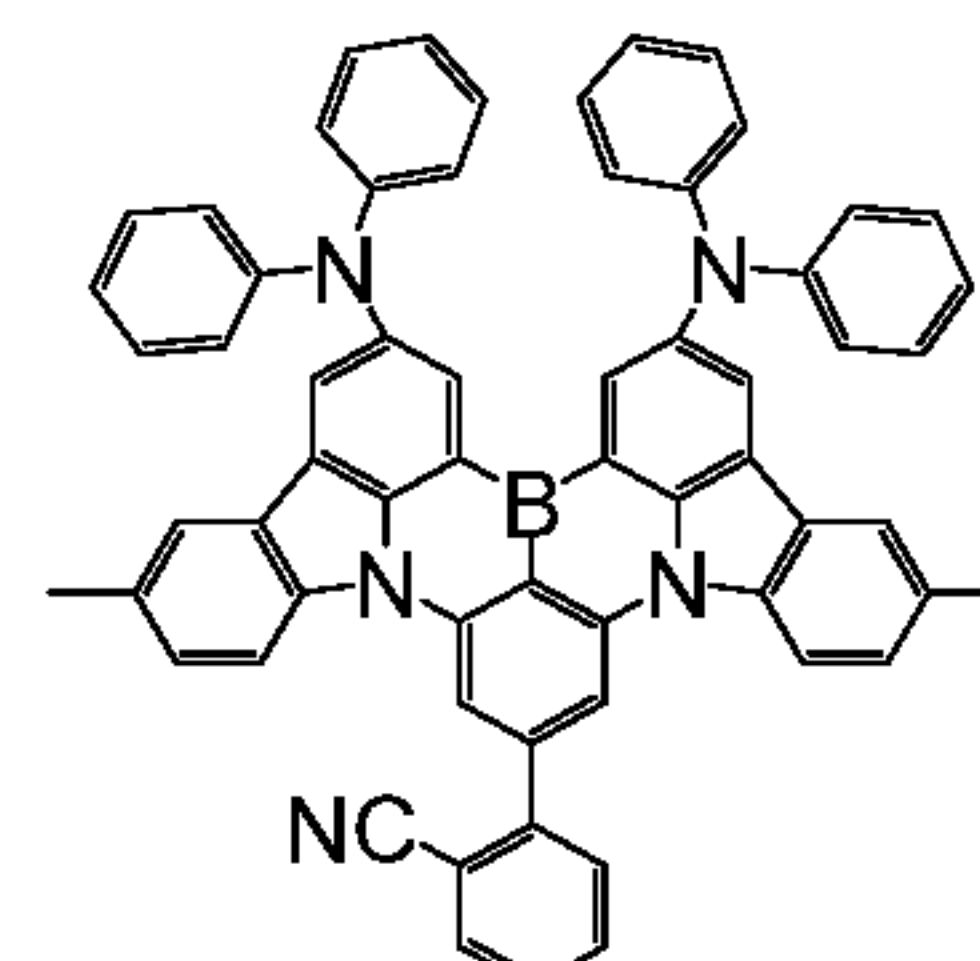
C-165



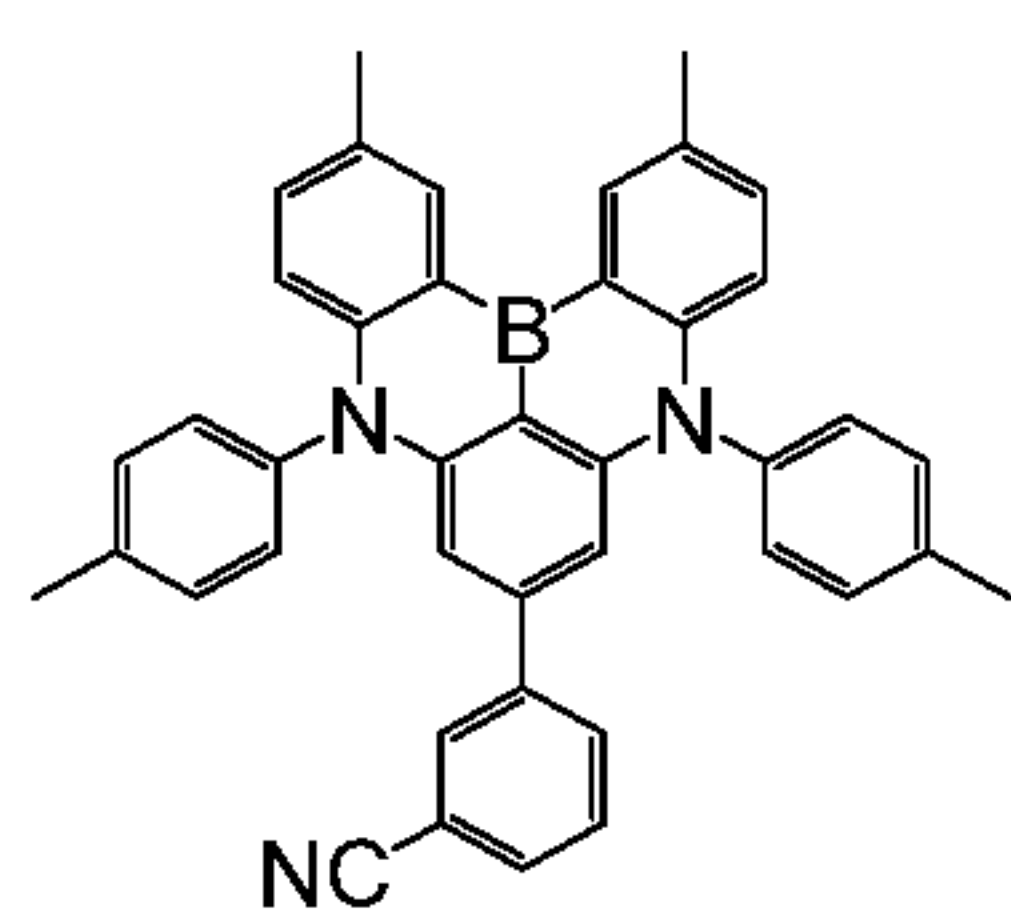
C-166



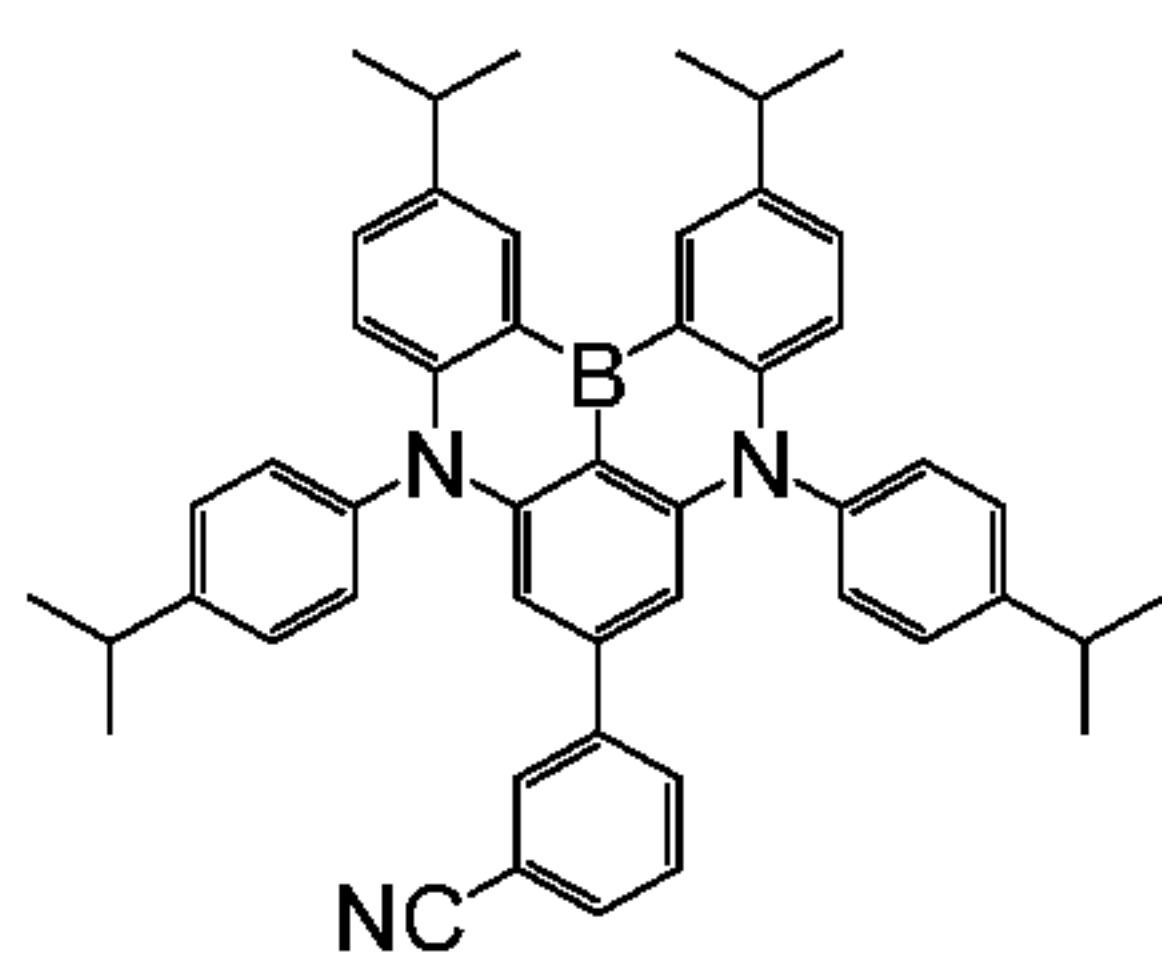
C-167



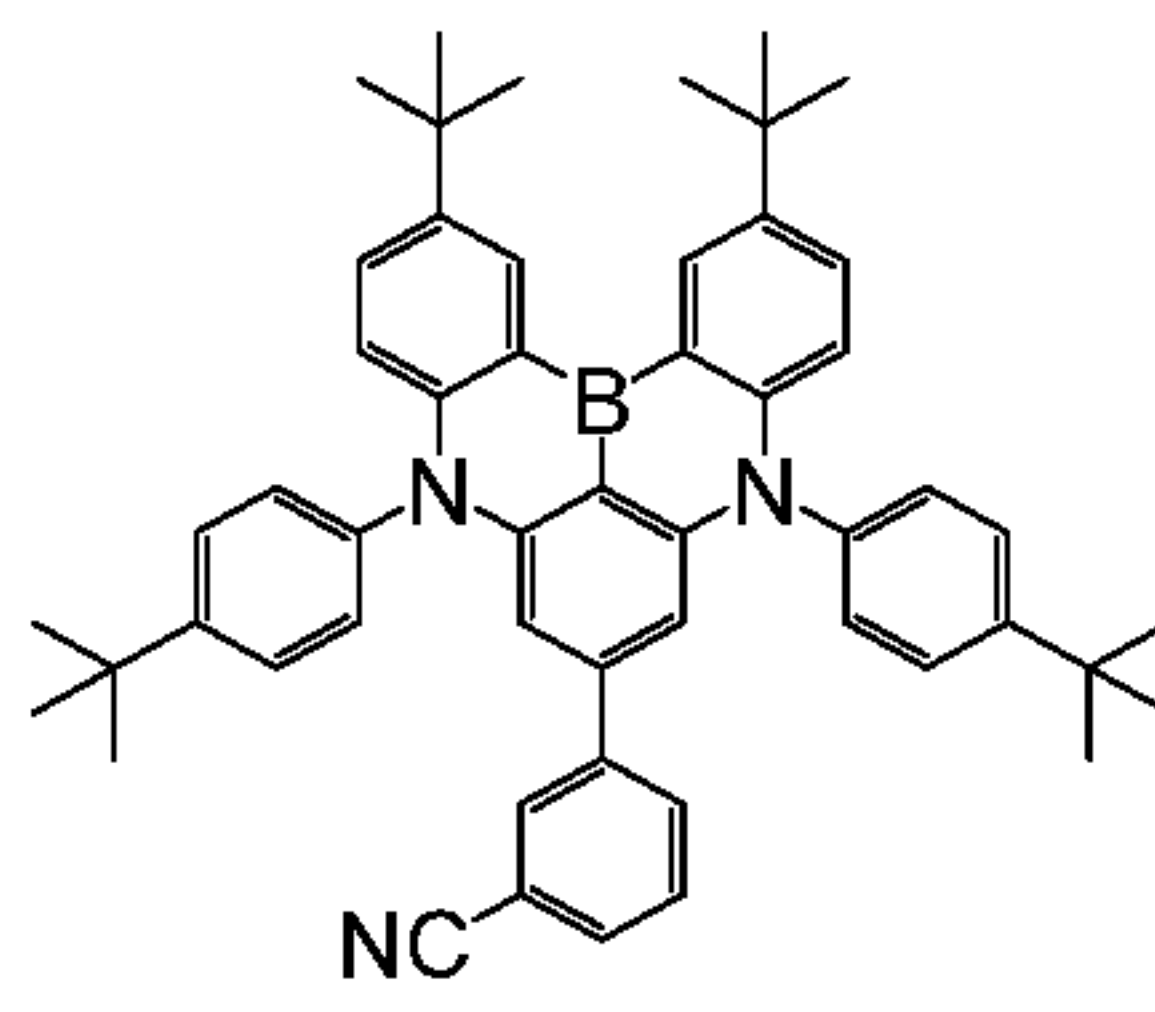
C-168



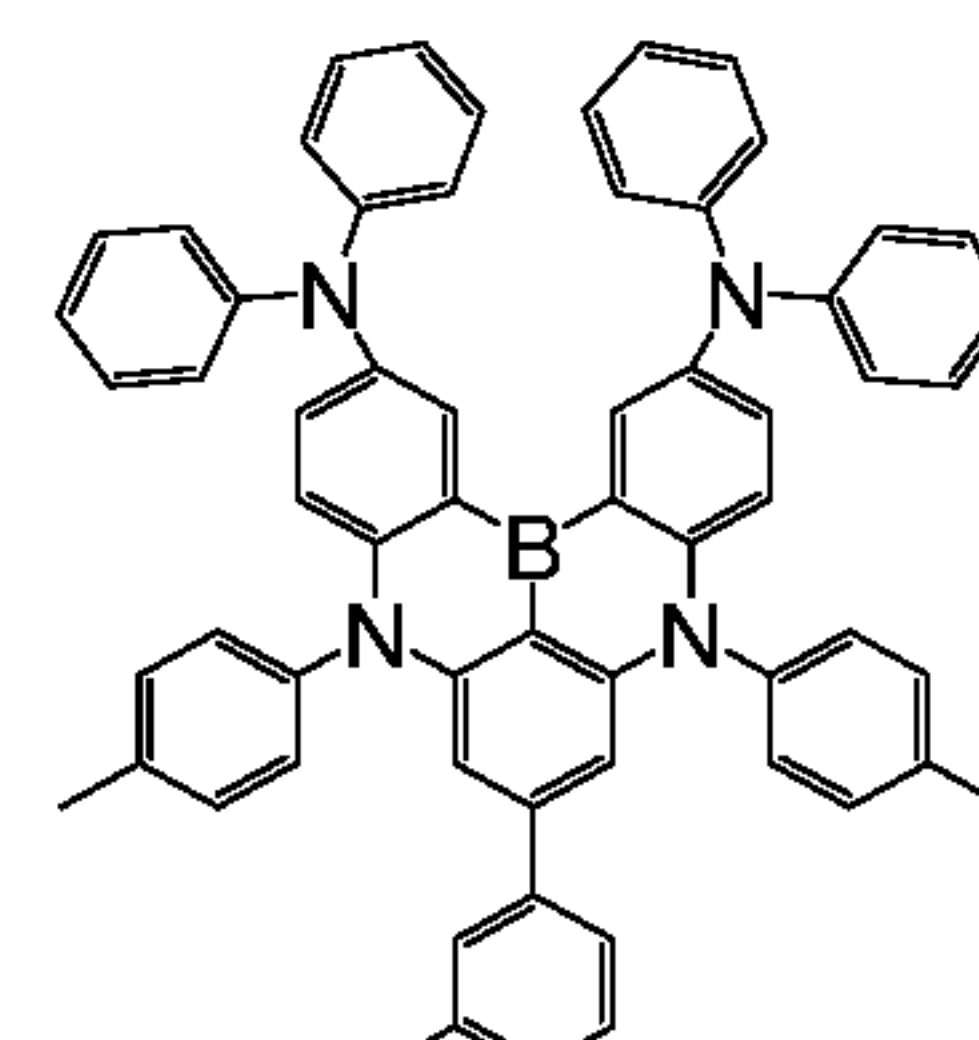
C-169



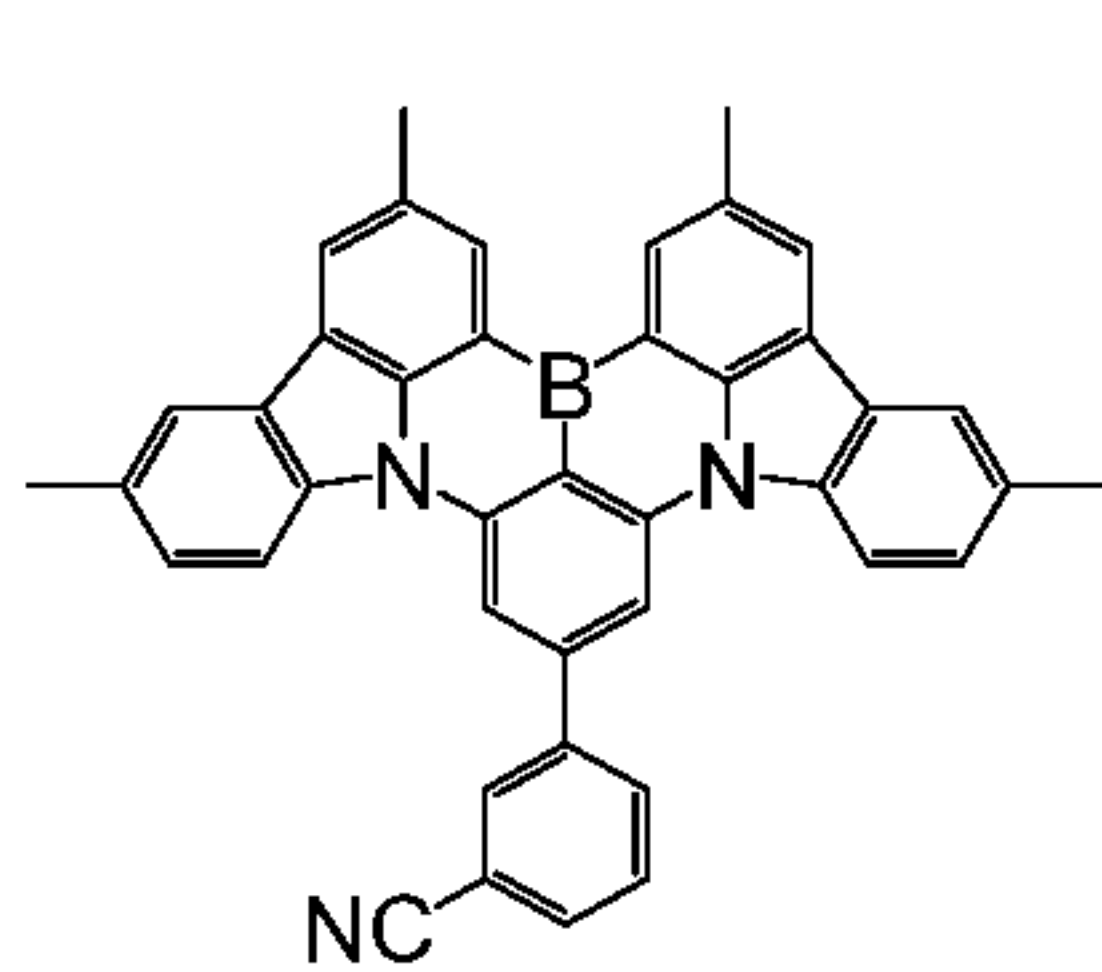
C-170



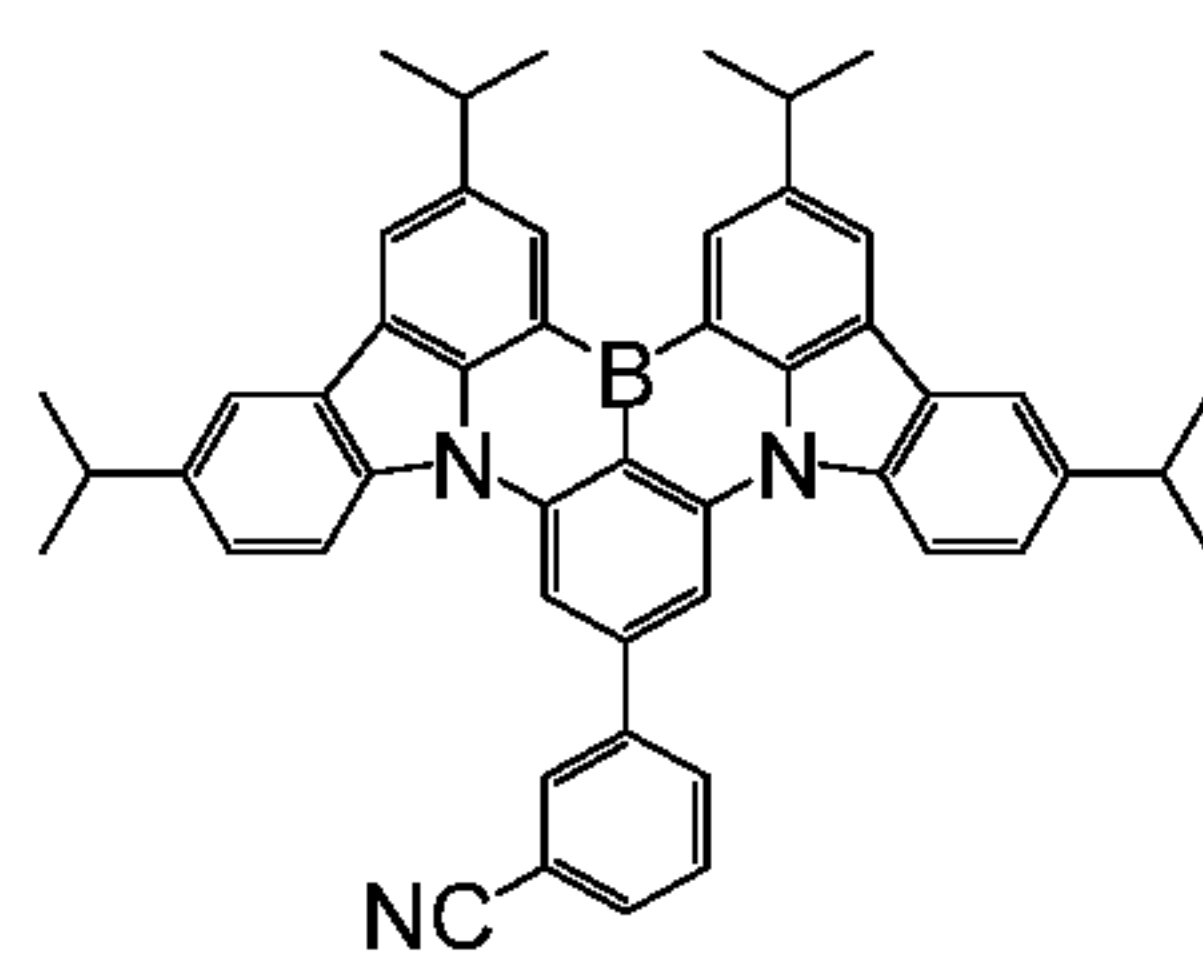
C-171



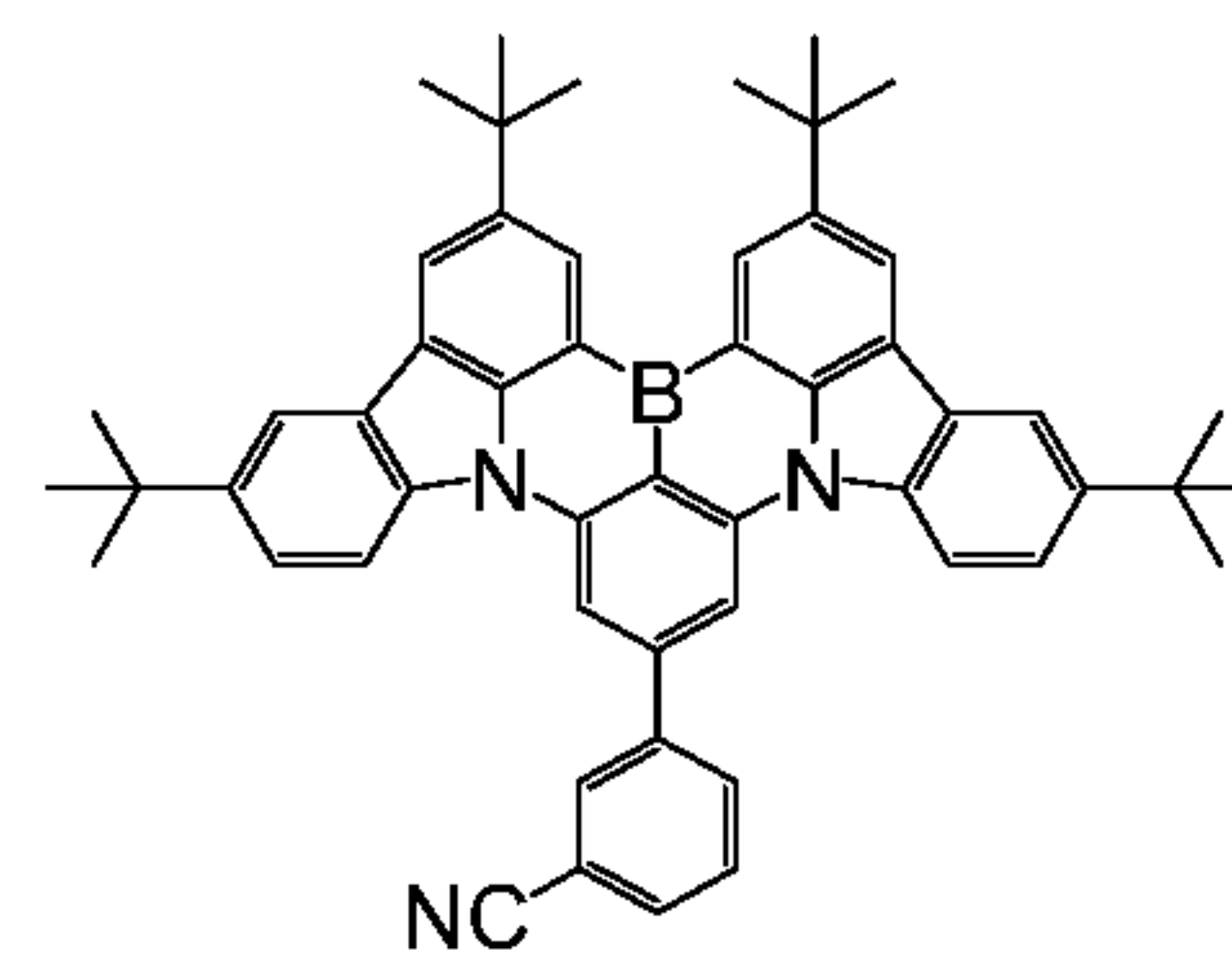
C-172



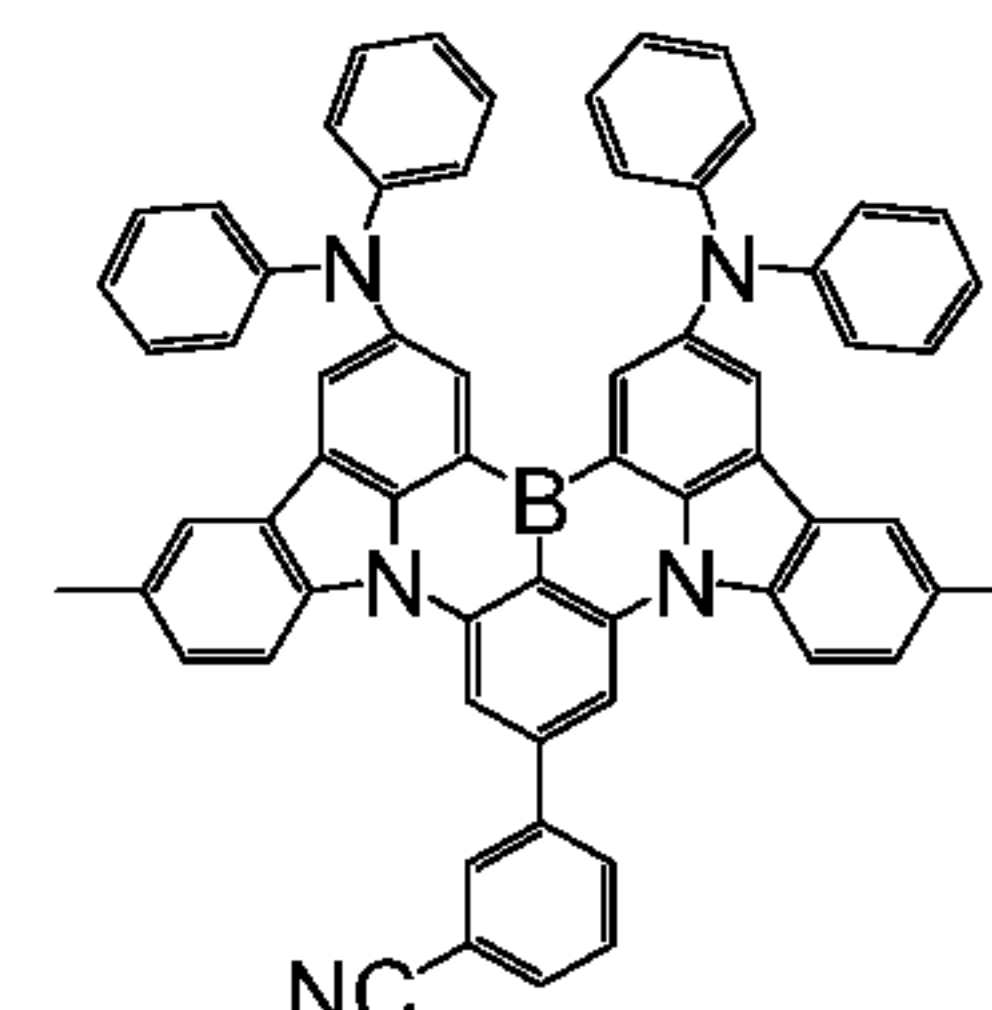
C-173



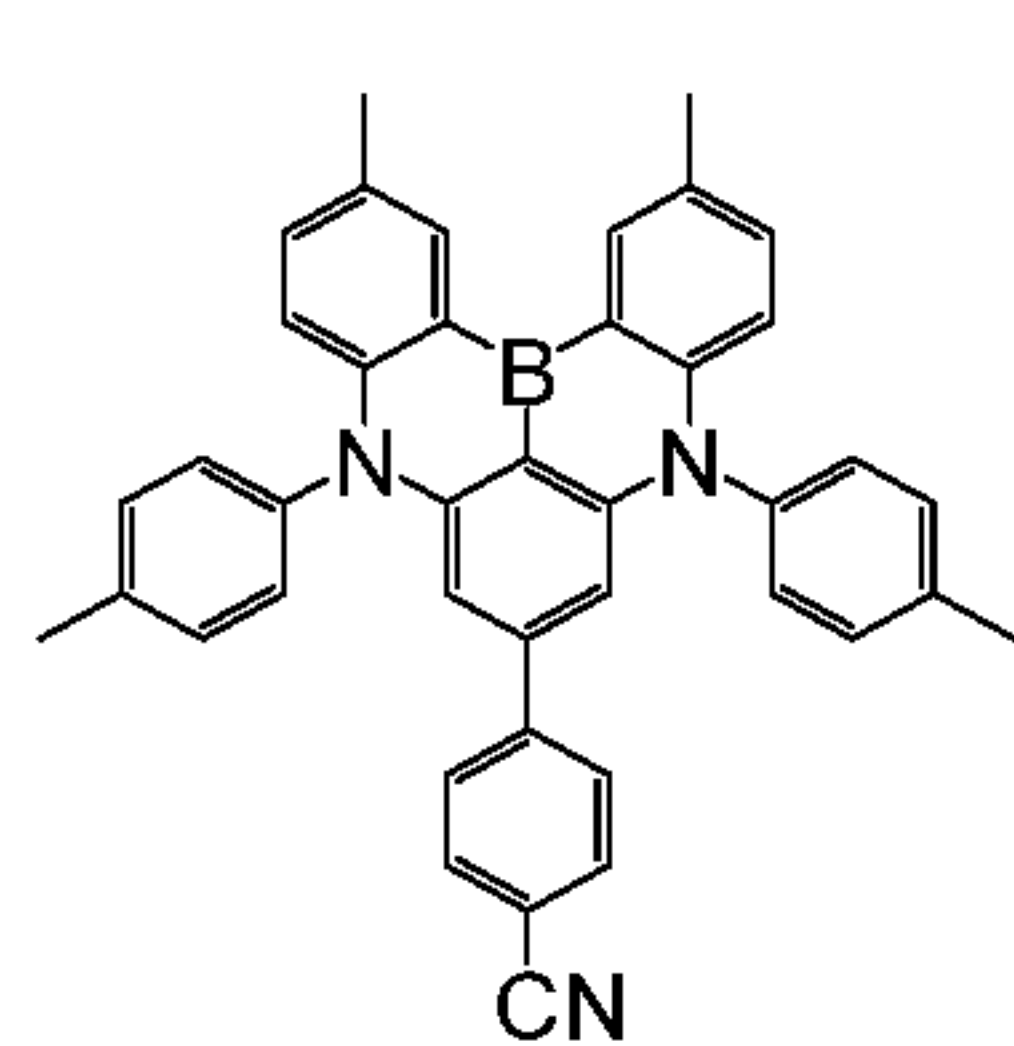
C-174



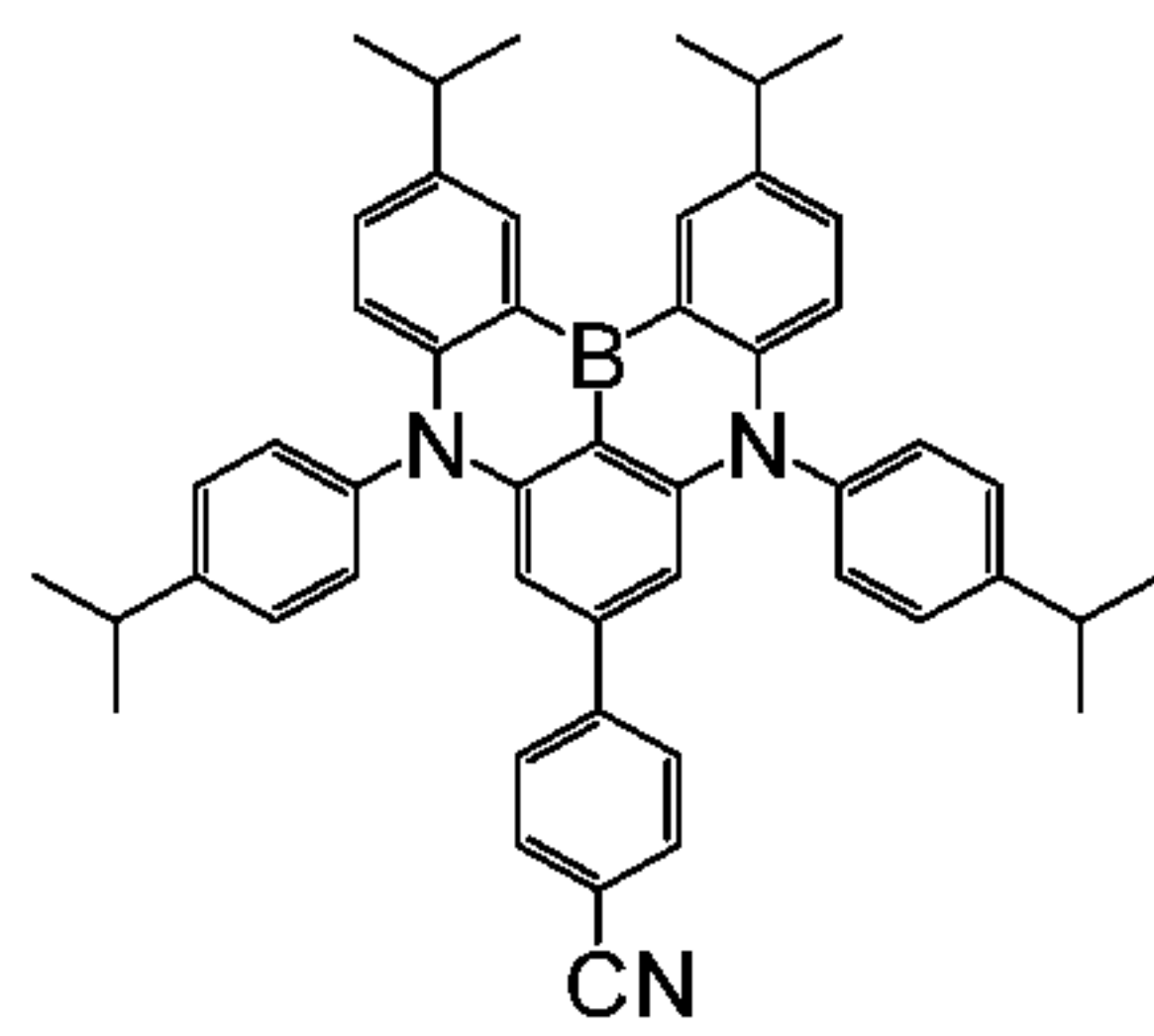
C-175



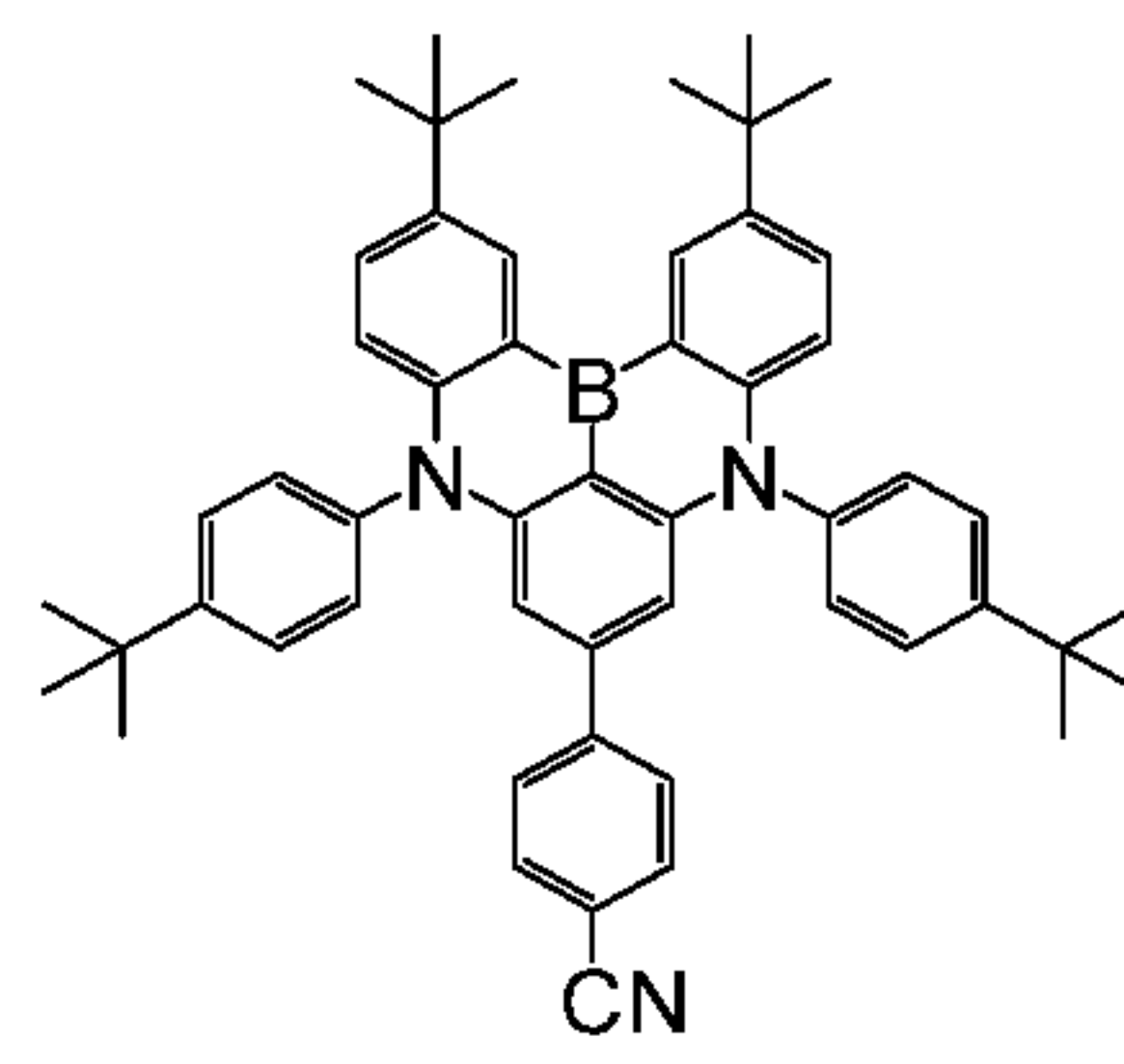
C-176



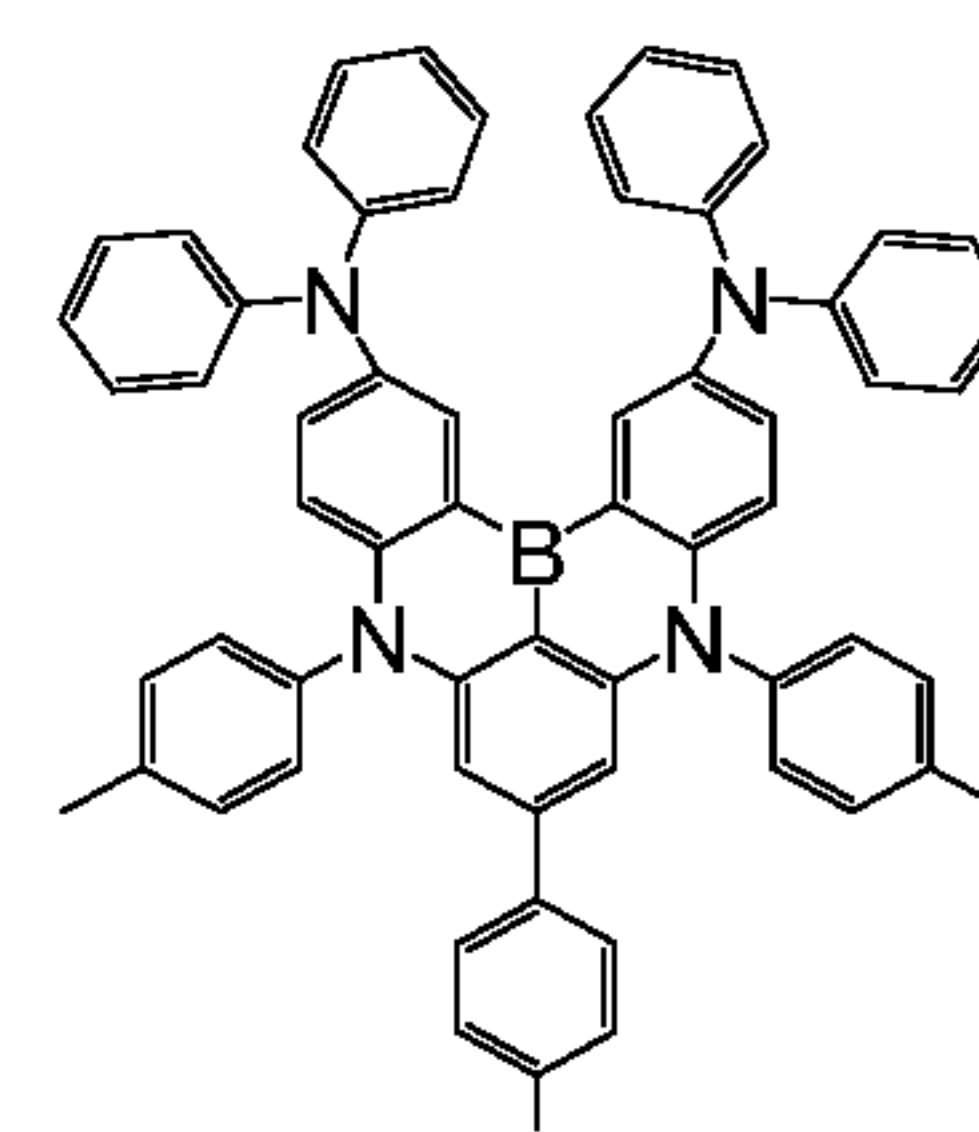
C-177



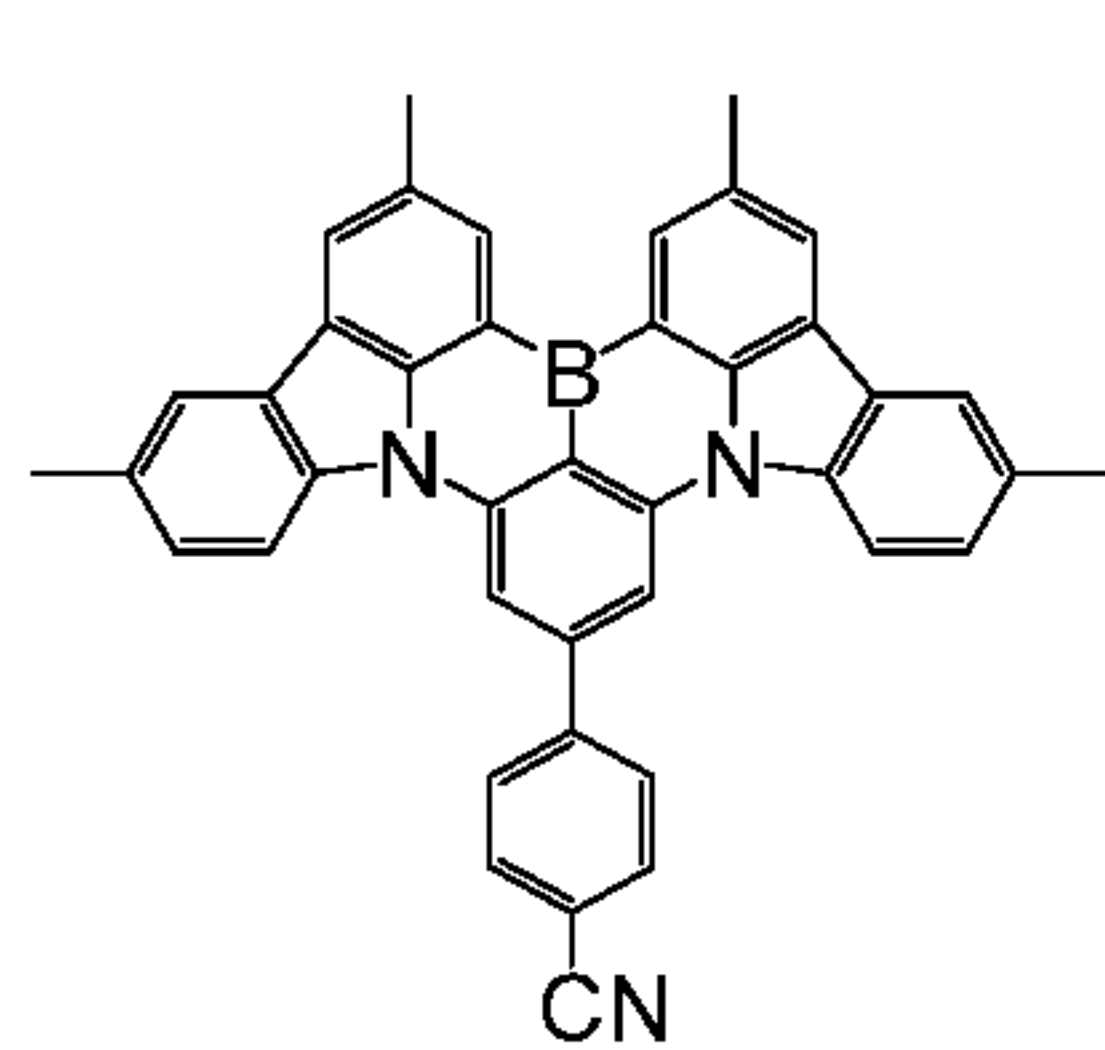
C-178



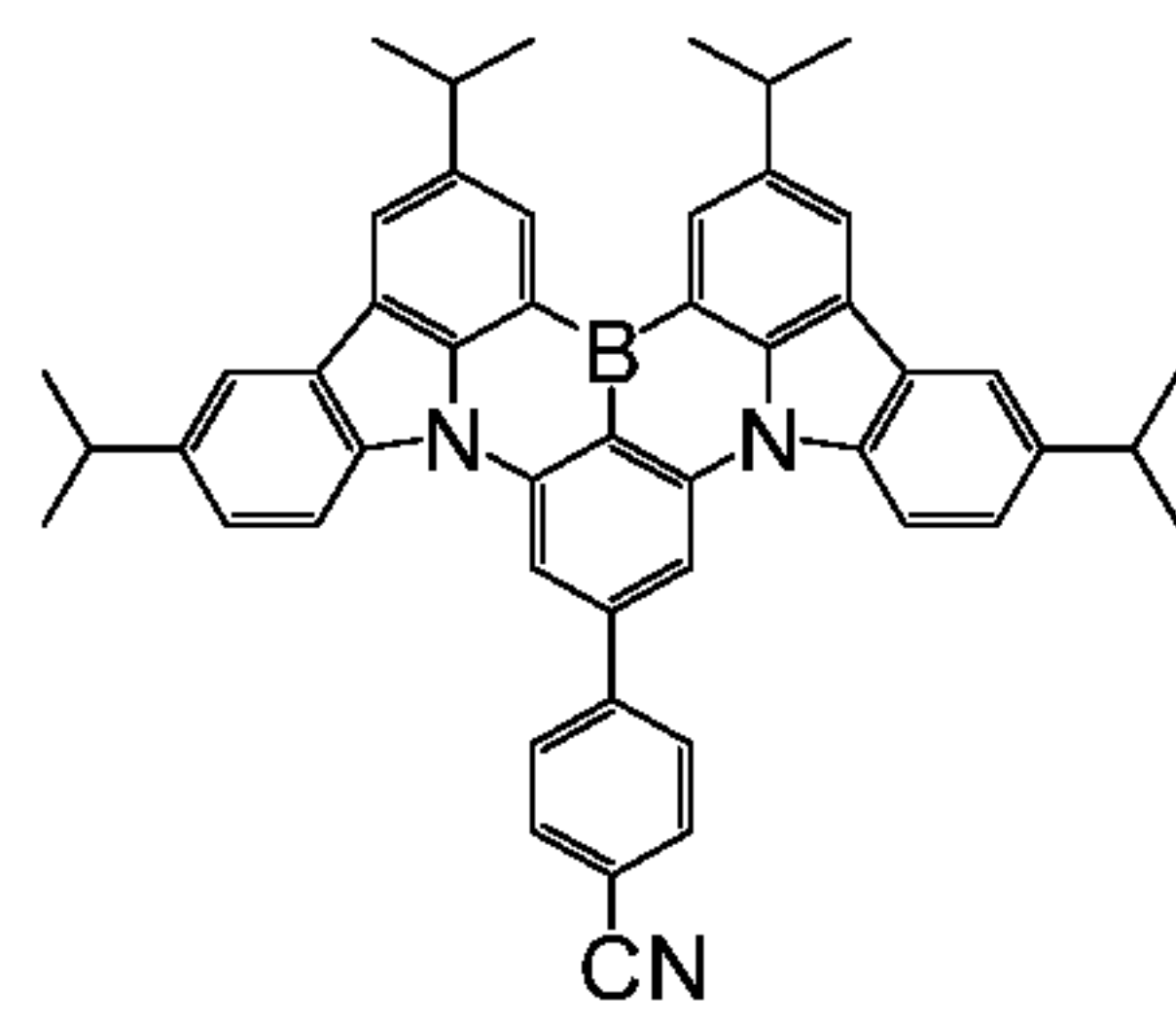
C-179



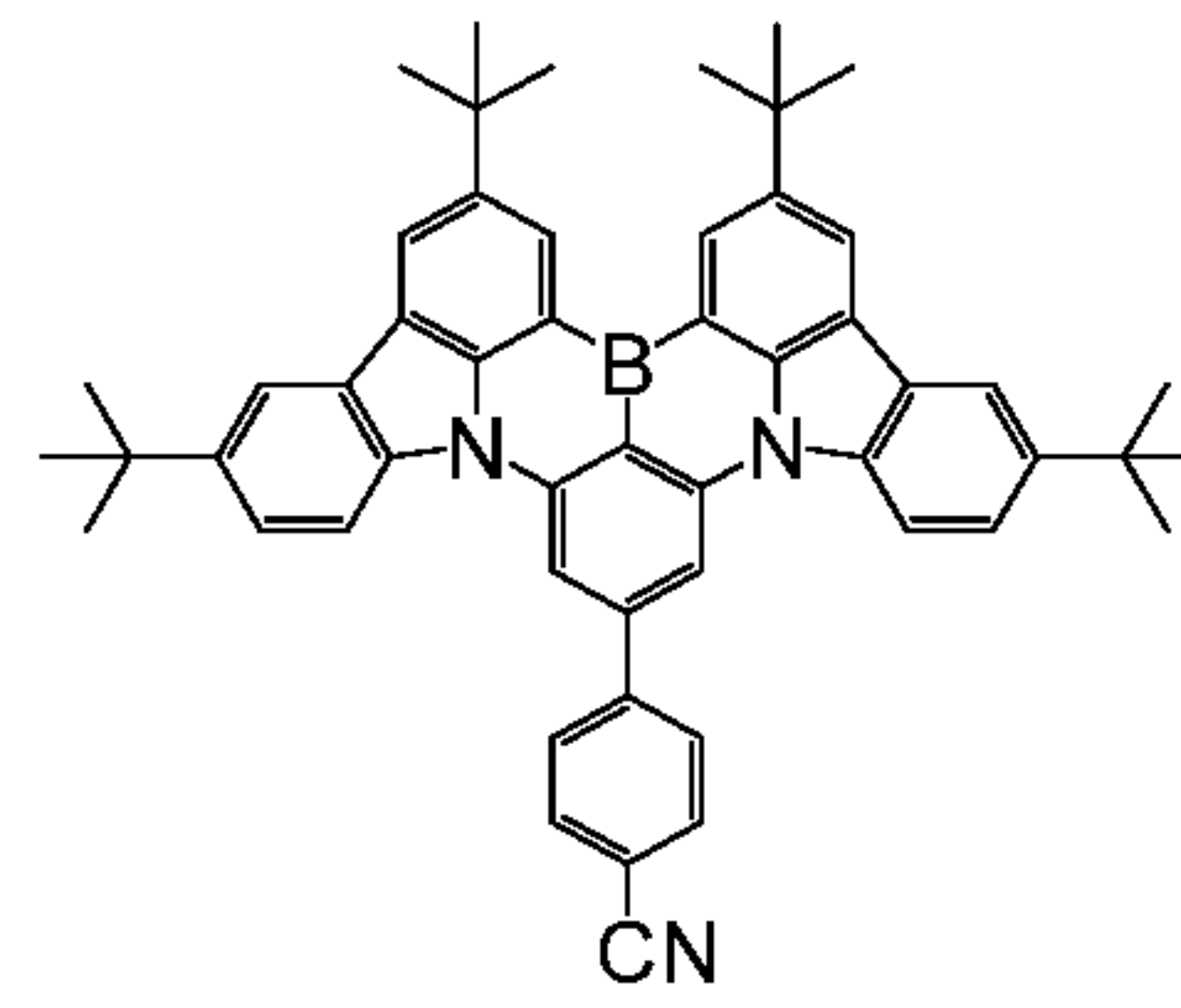
C-180



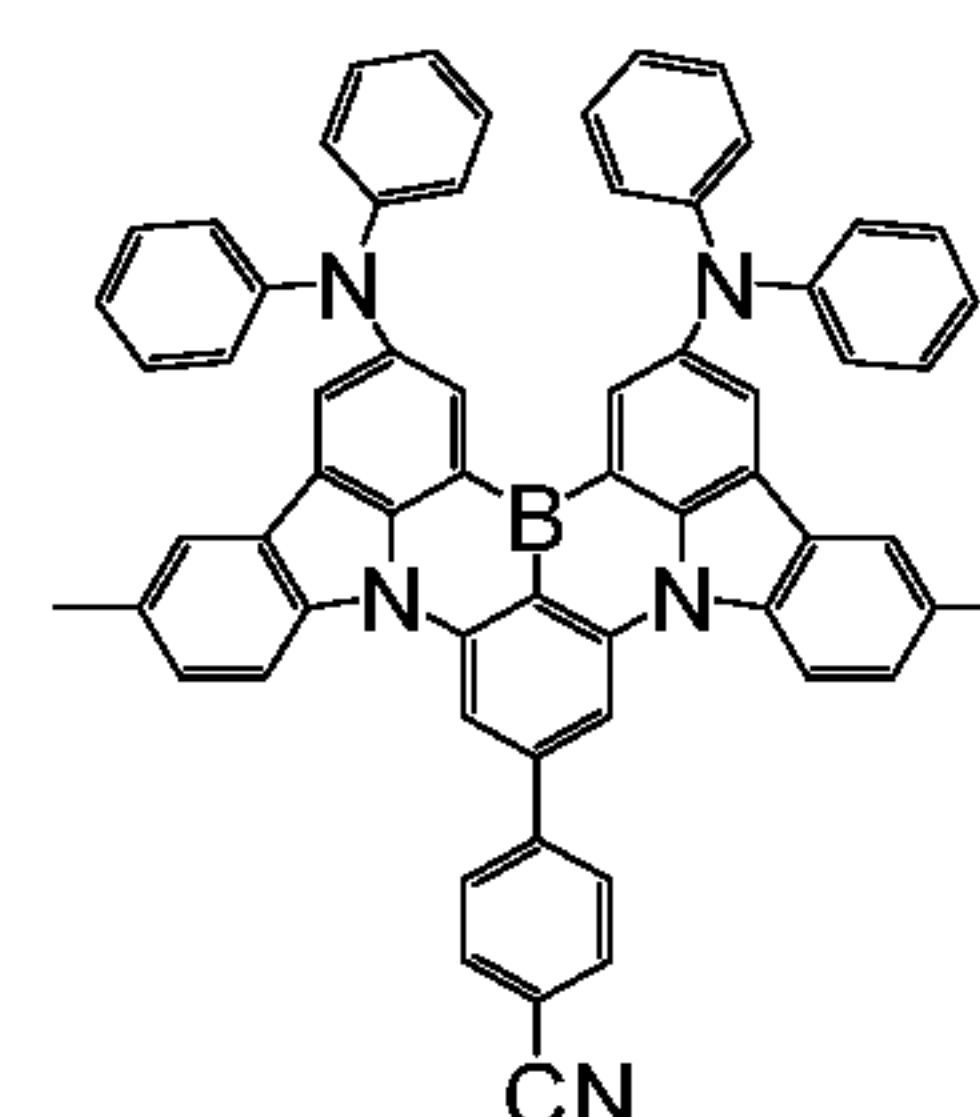
C-181



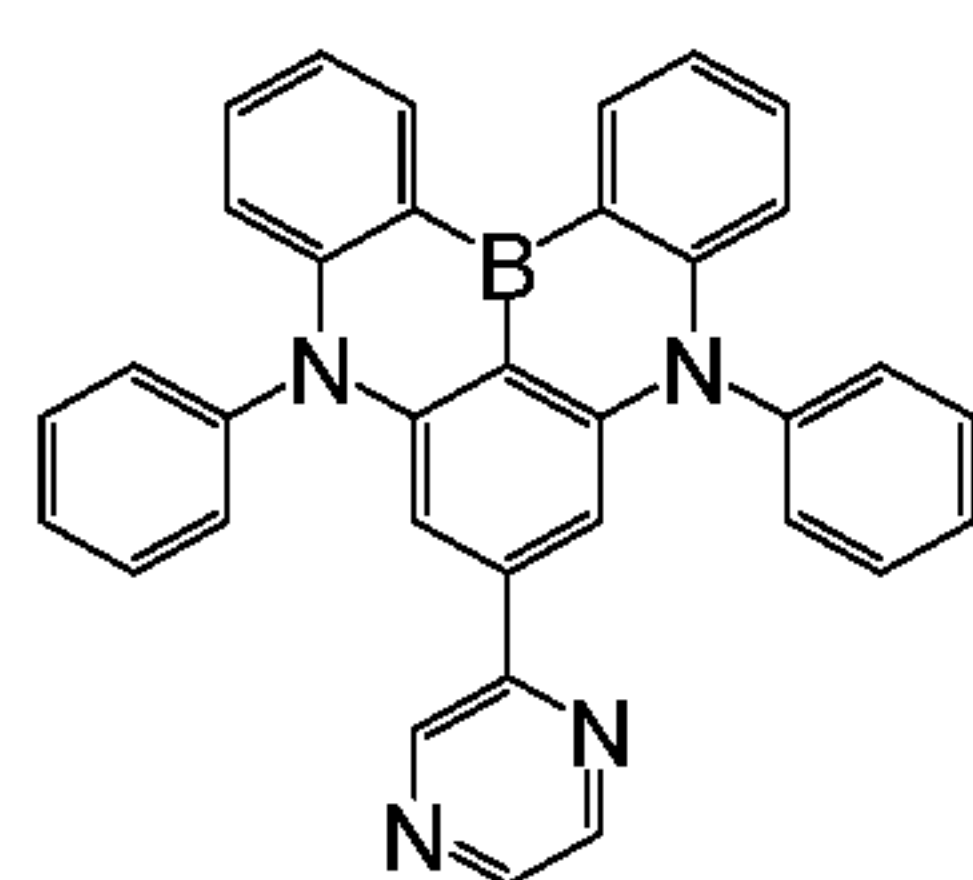
C-182



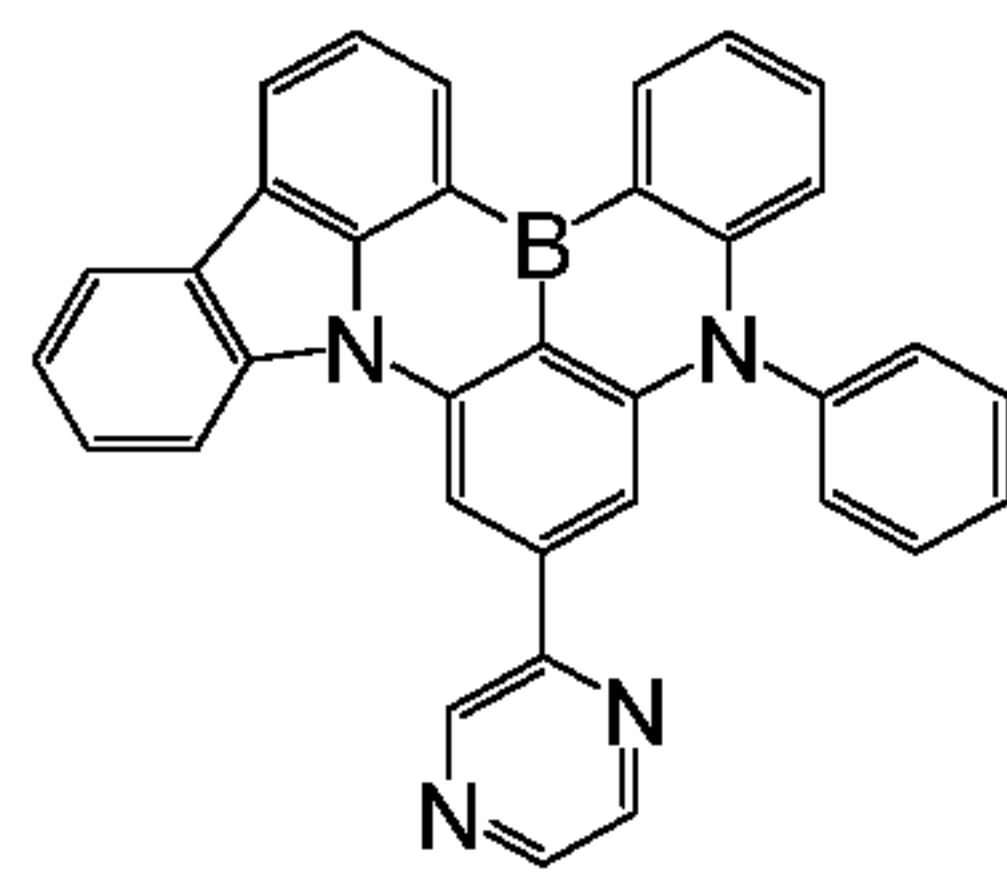
C-183



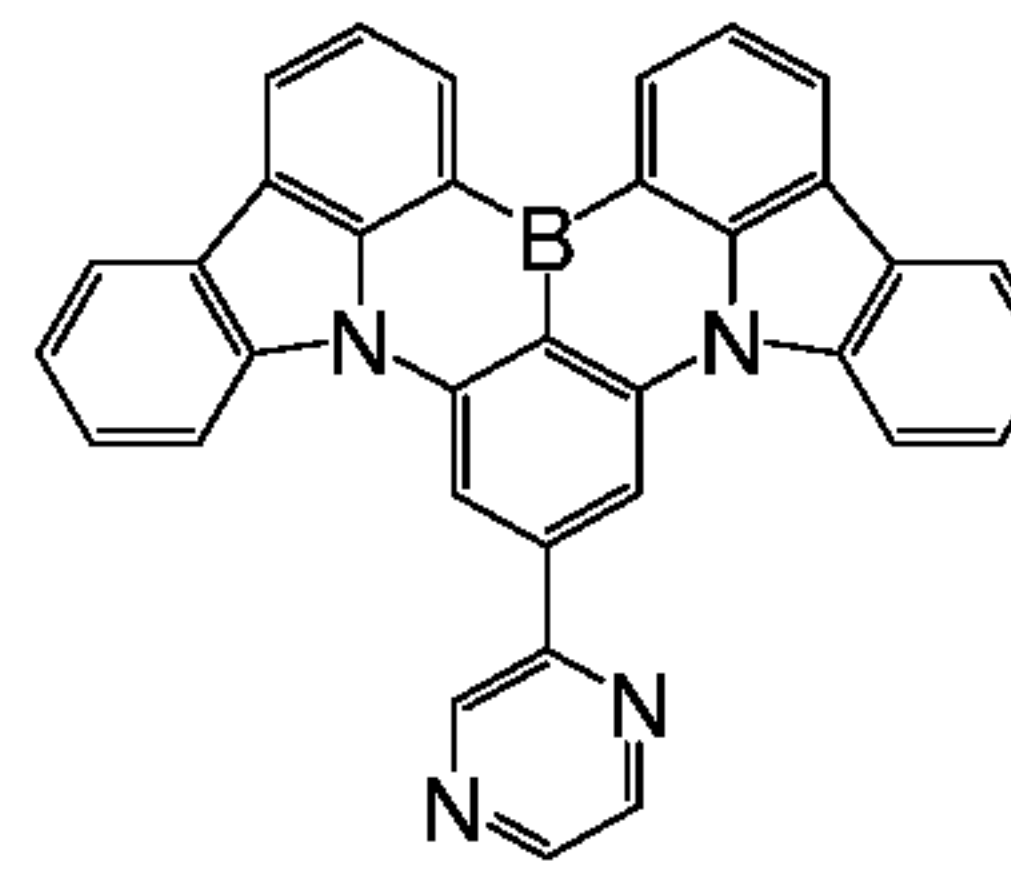
C-184



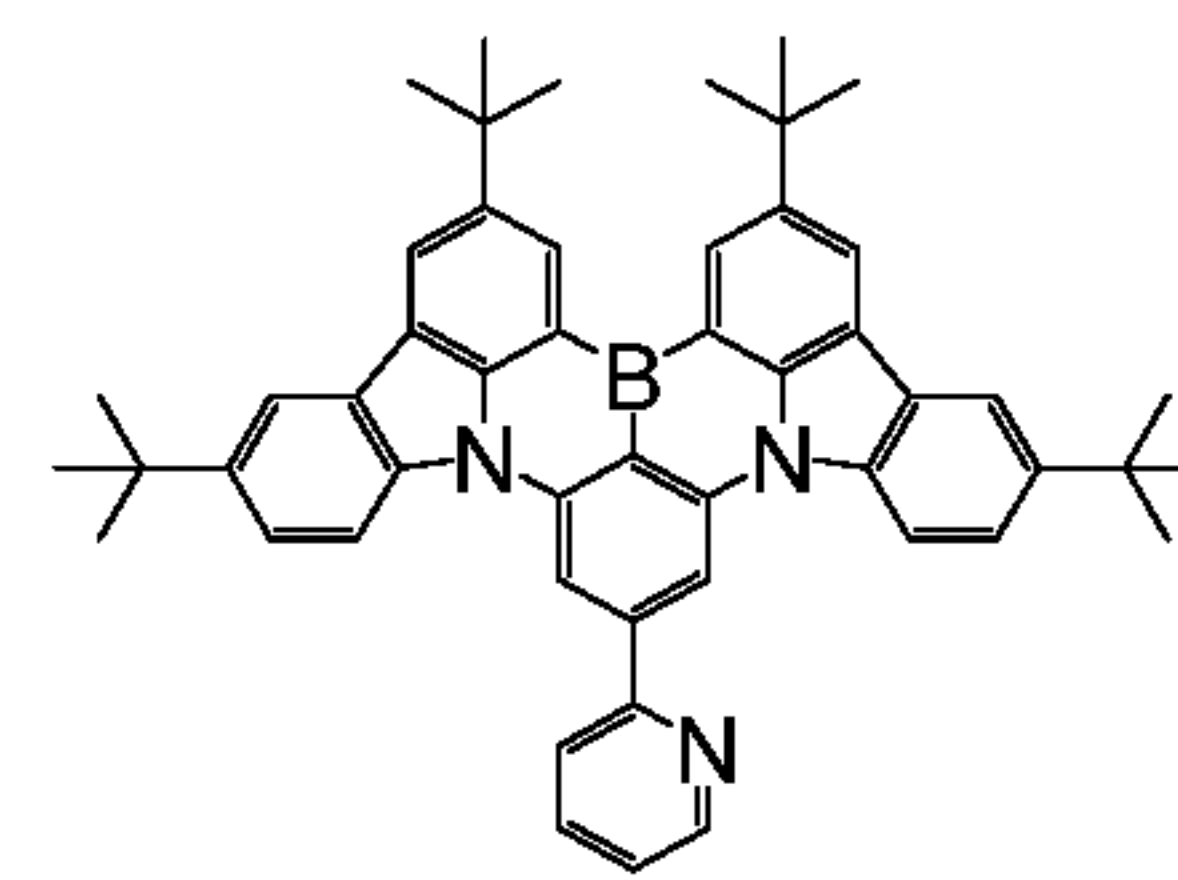
C-185



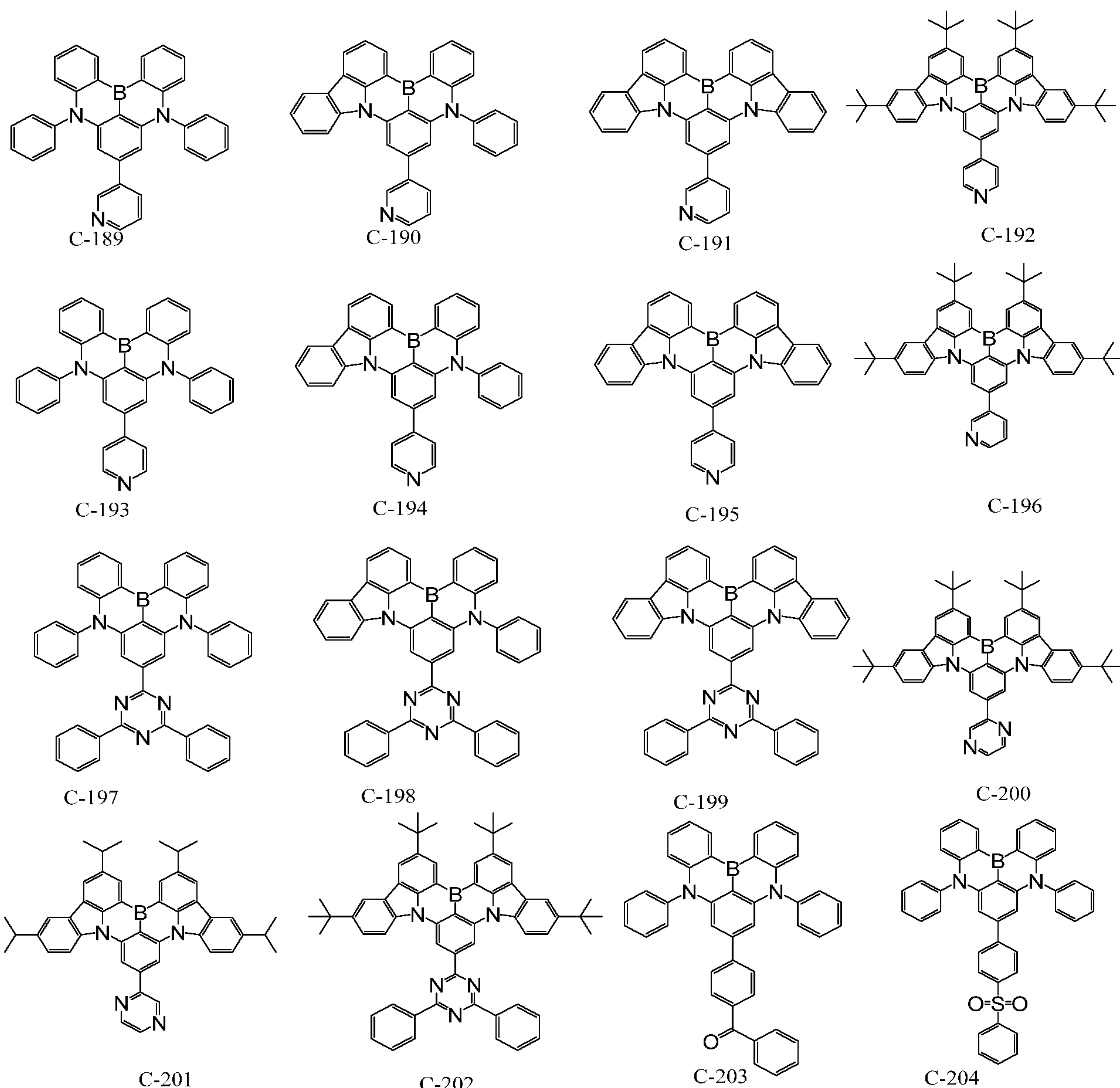
C-186



C-187



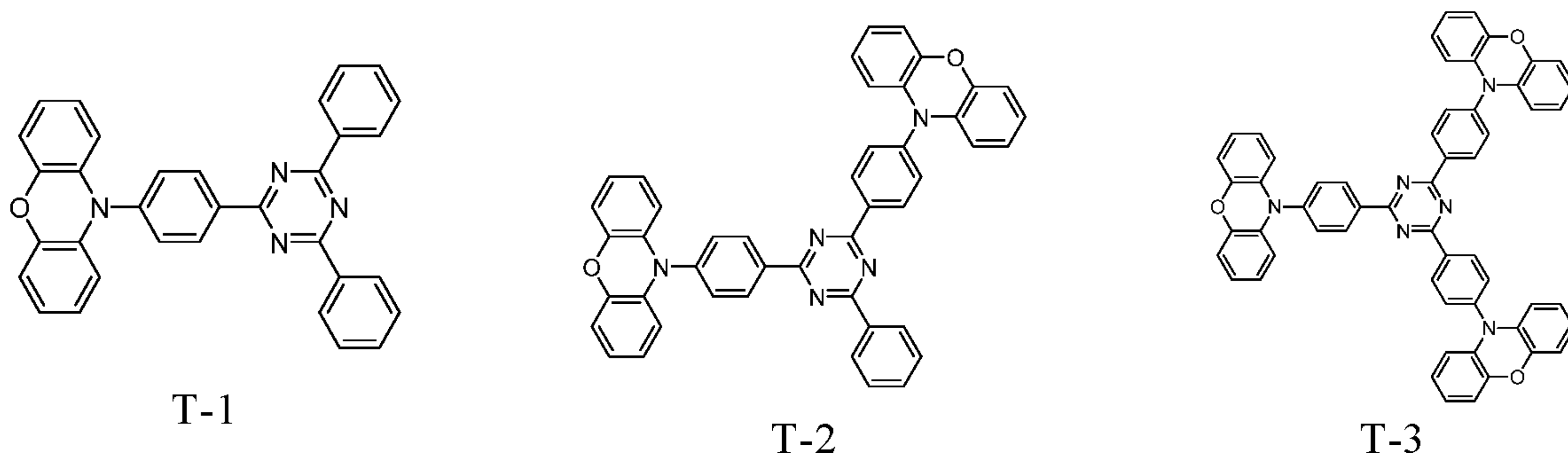
C-188

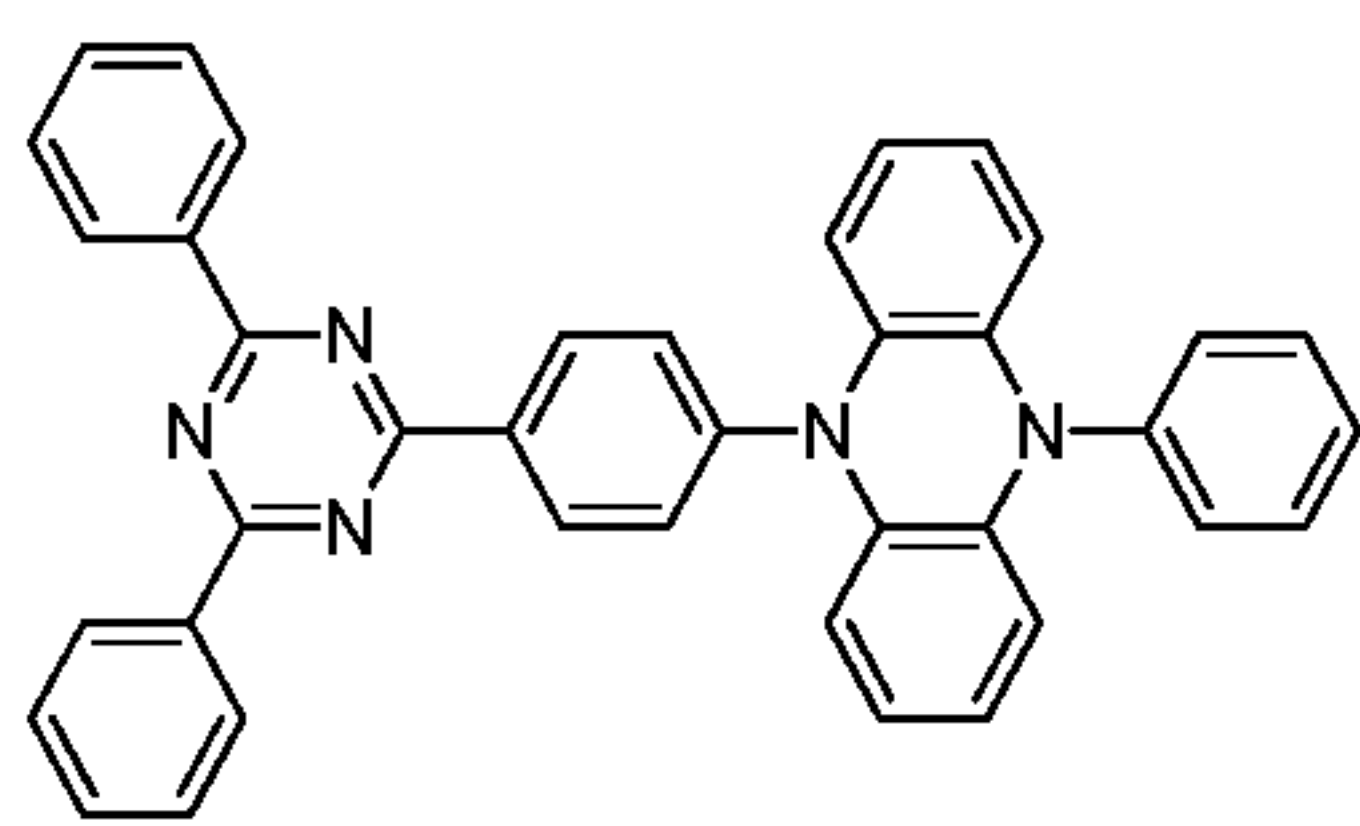


上述一系列具体的化合物用作绿色荧光染料时，能够使器件具有更窄的绿光发射光谱以及更好的色纯度。

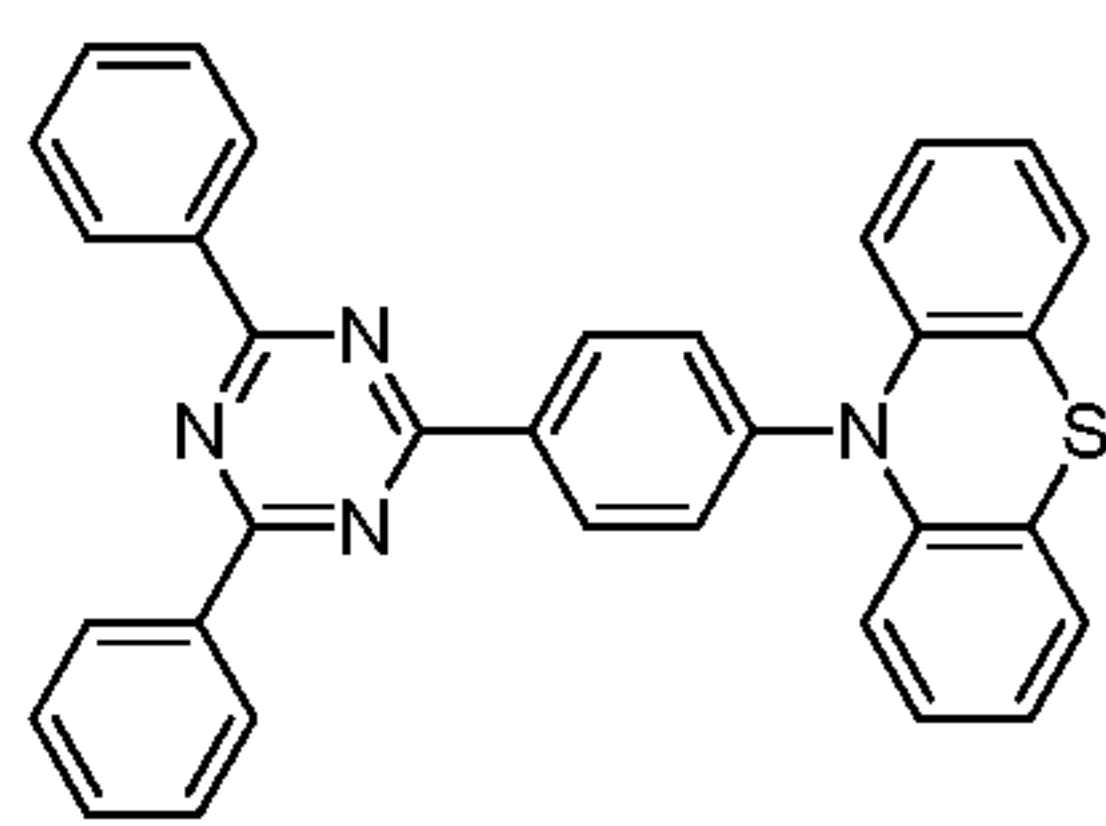
进一步地，热活化延迟荧光敏化剂的单线态和三线态能级差 ≤ 0.3 eV，例如 0.1 eV、0.12 eV、0.14 eV、0.16 eV、0.18 eV、0.2 eV、0.22 eV、0.24 eV、0.26 eV、0.28 eV、0.29 eV 等。

进一步地，热活化延迟荧光敏化剂包括如下 T-1 至 T-99 所示的化合物中的任意一种或至少两种组合（例如 T-1 和 T-2 的组合，T-5、T-7 和 T-12 的组合，T-3、T-60、T-70 和 T-80 的组合等）：

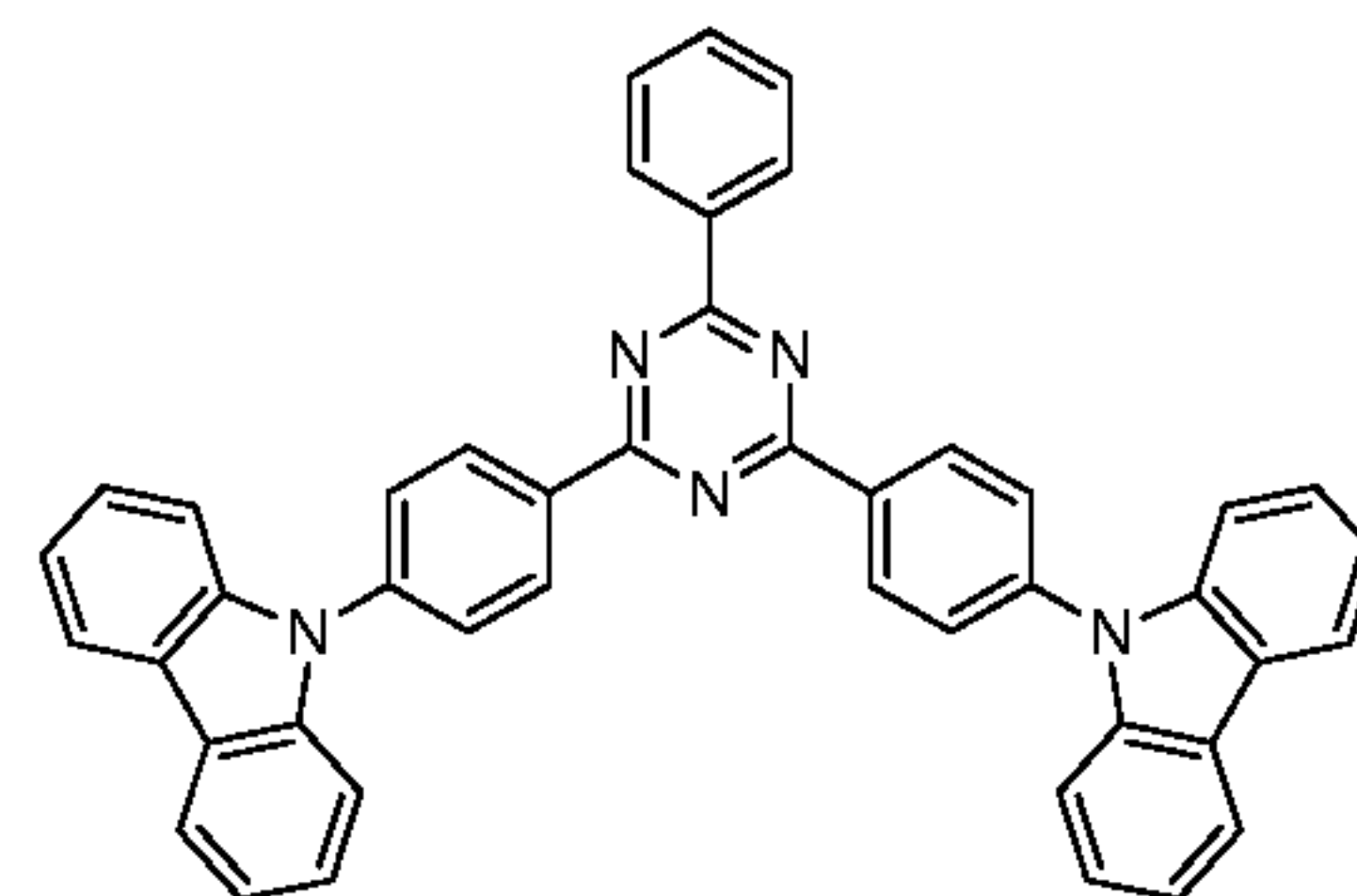




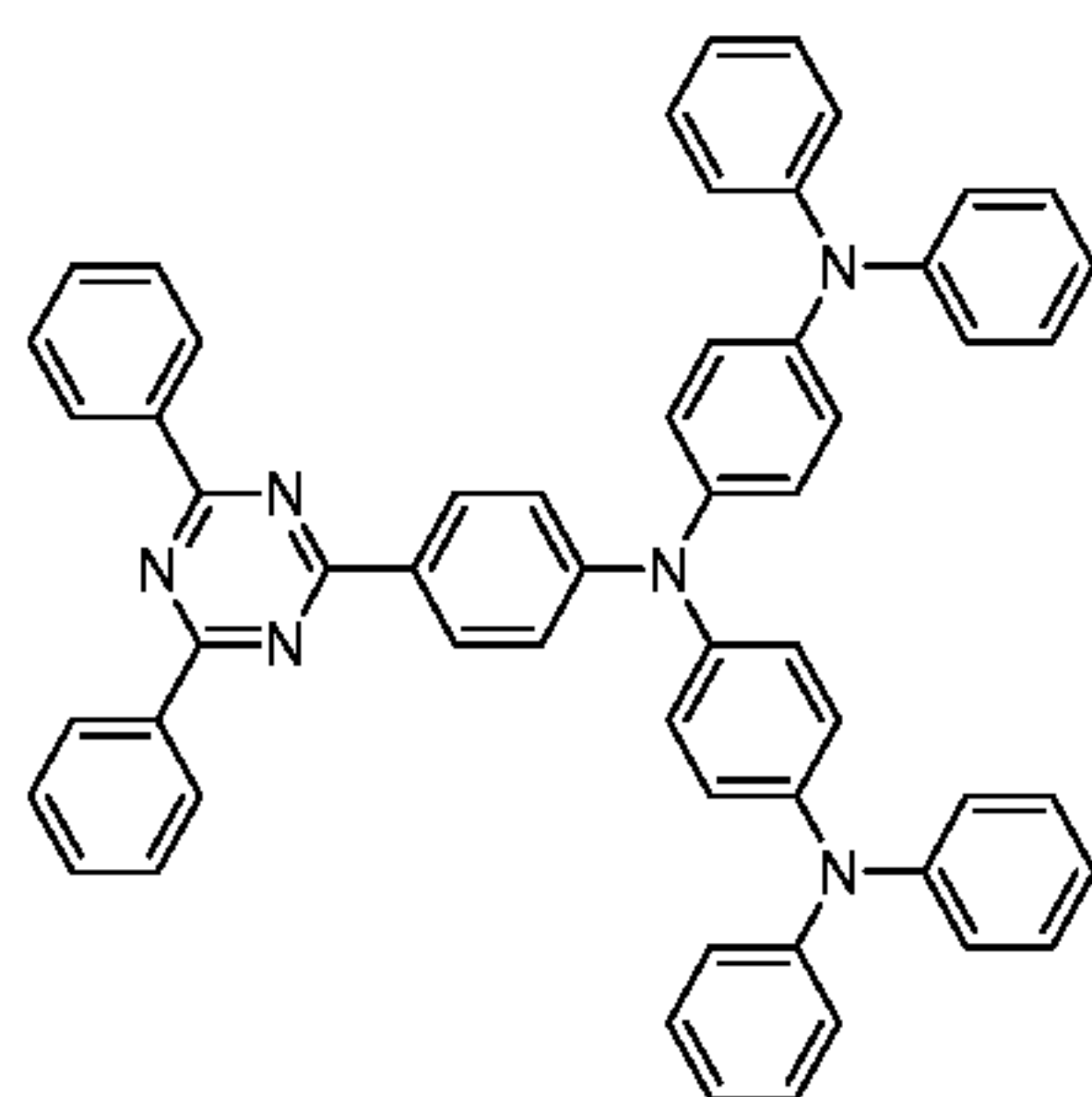
T-4



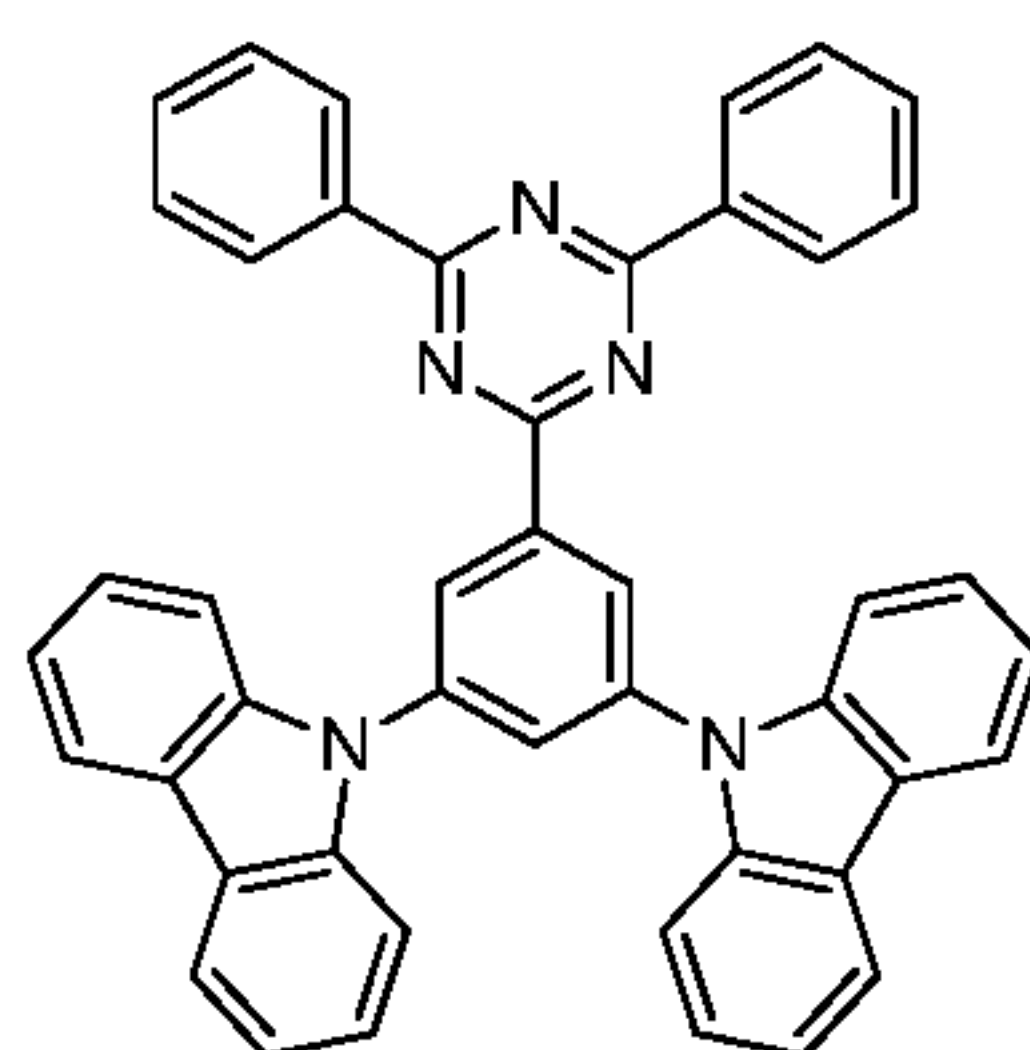
T-5



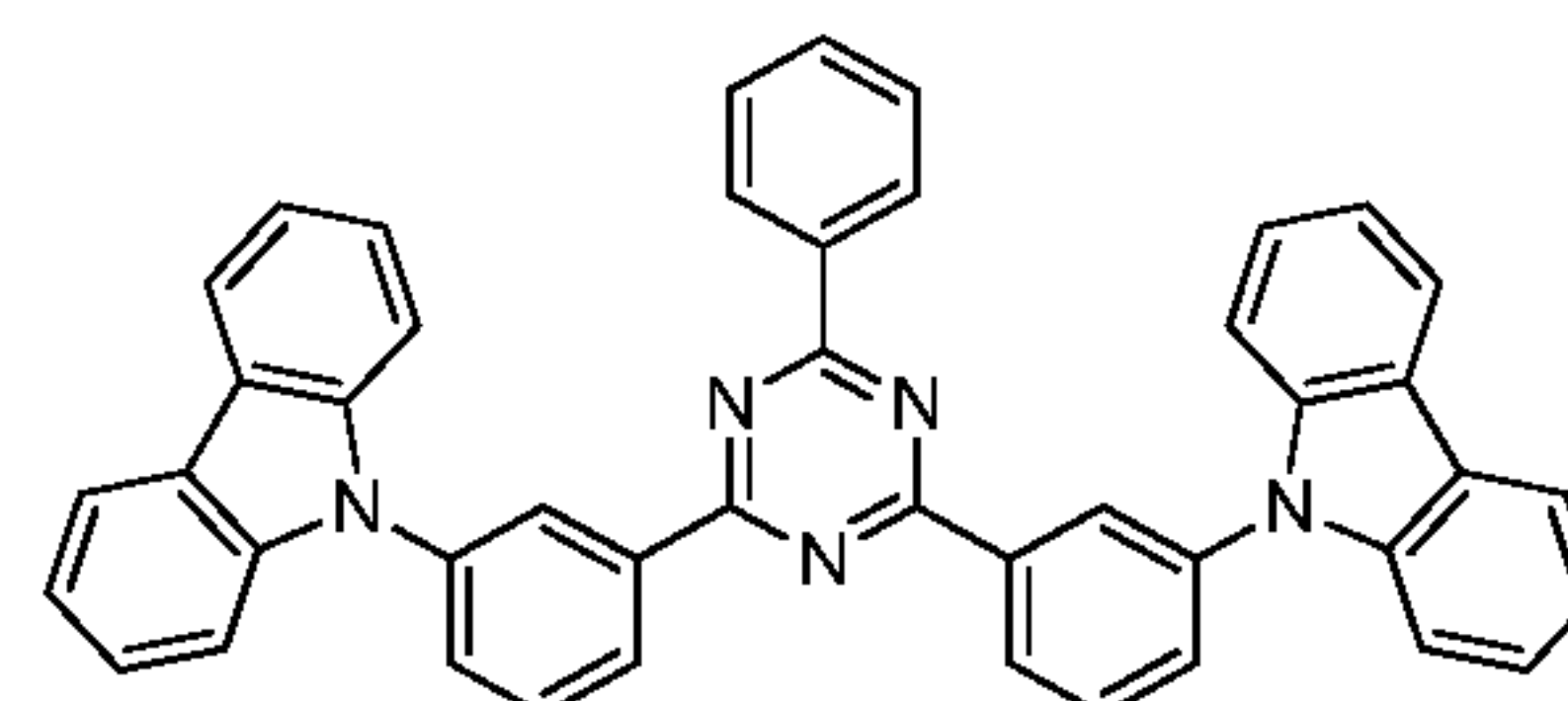
T-6



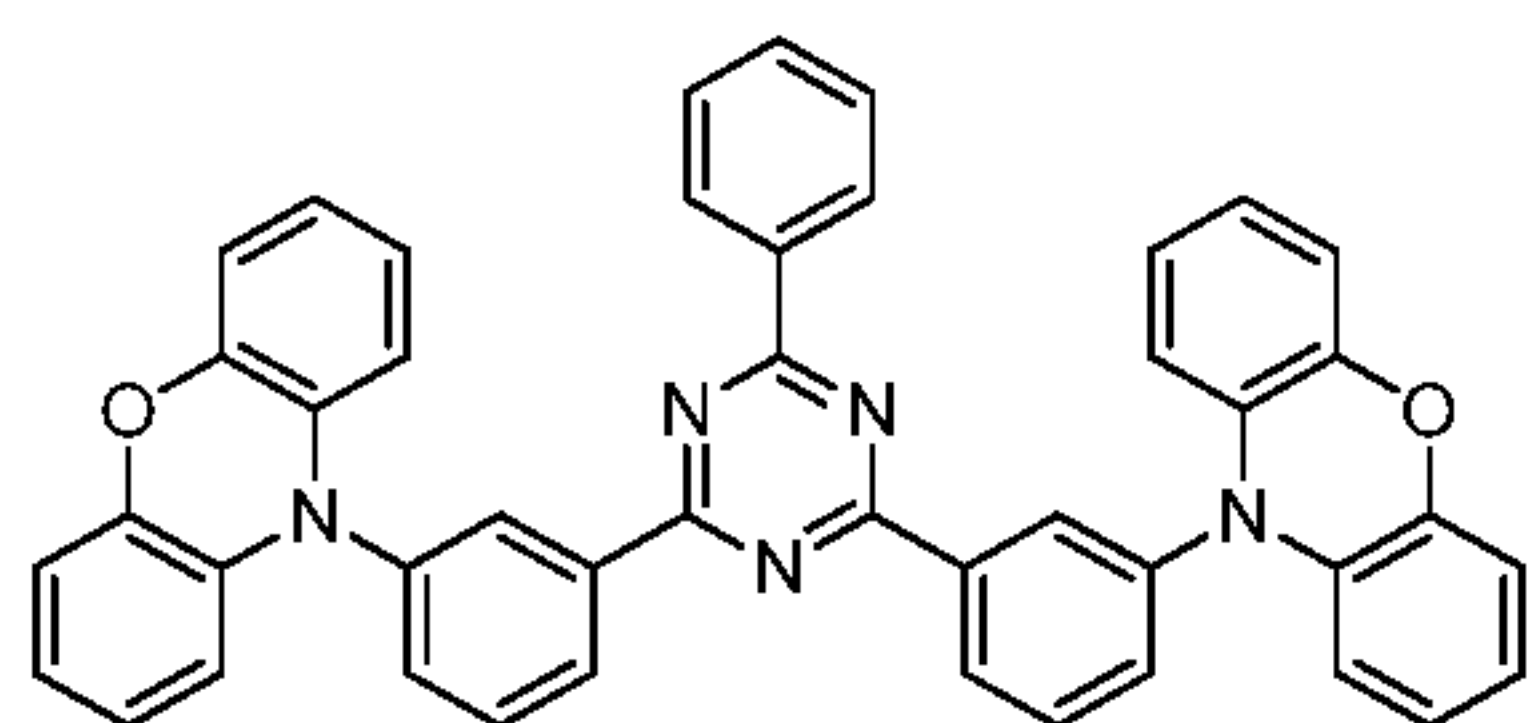
T-7



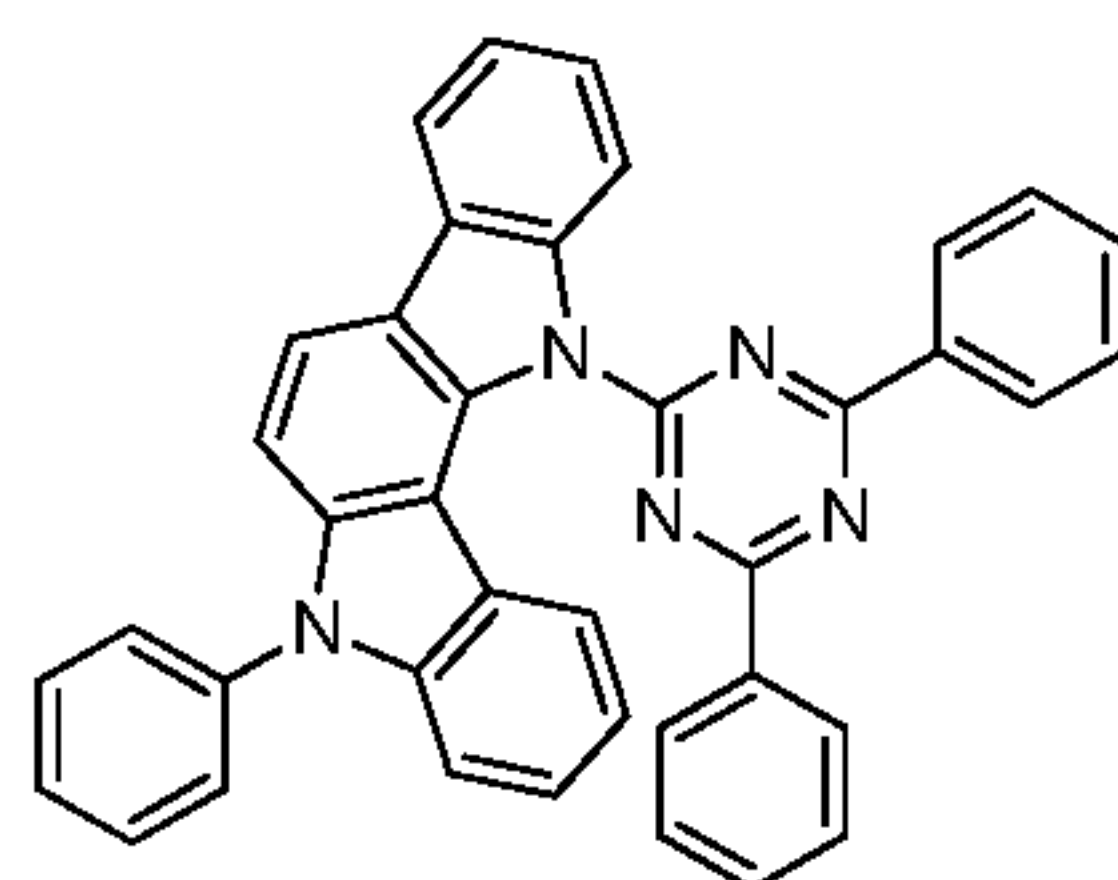
T-8



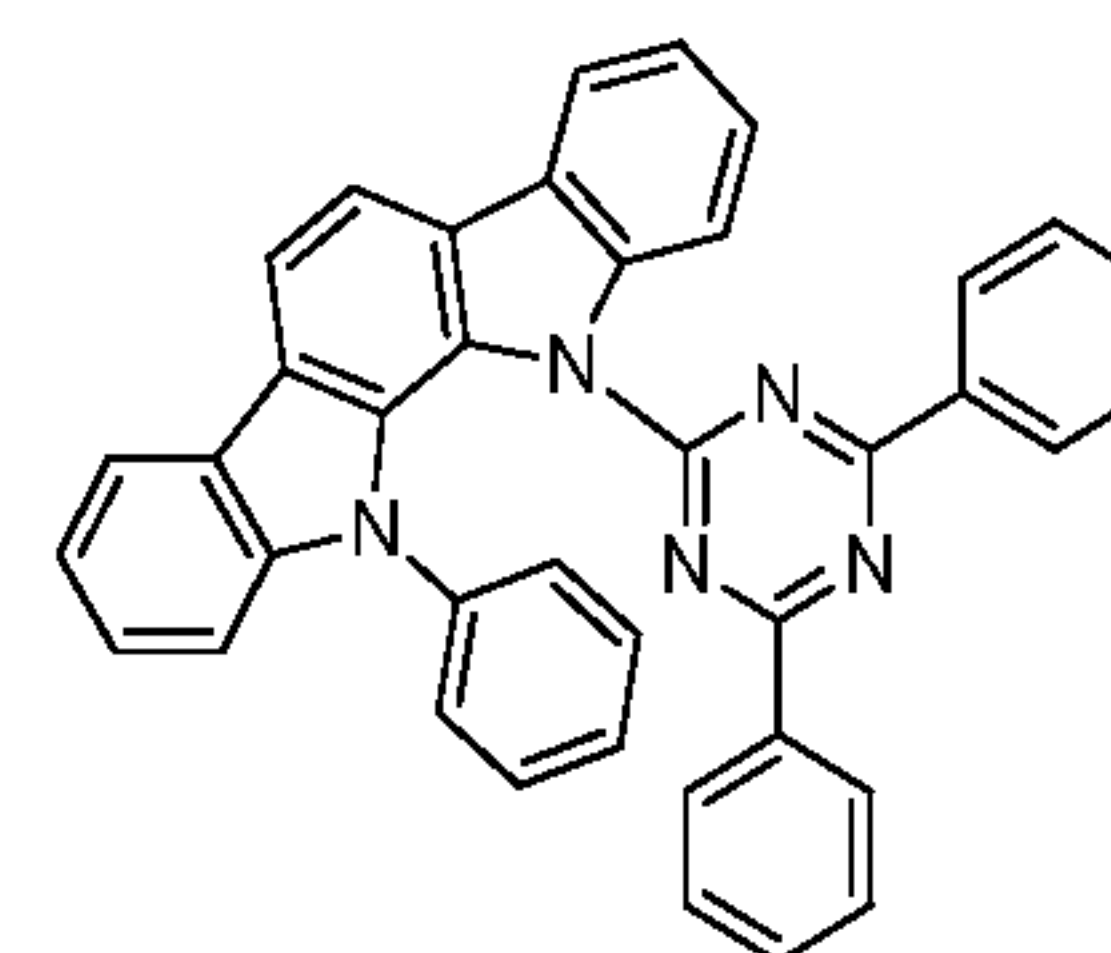
T-9



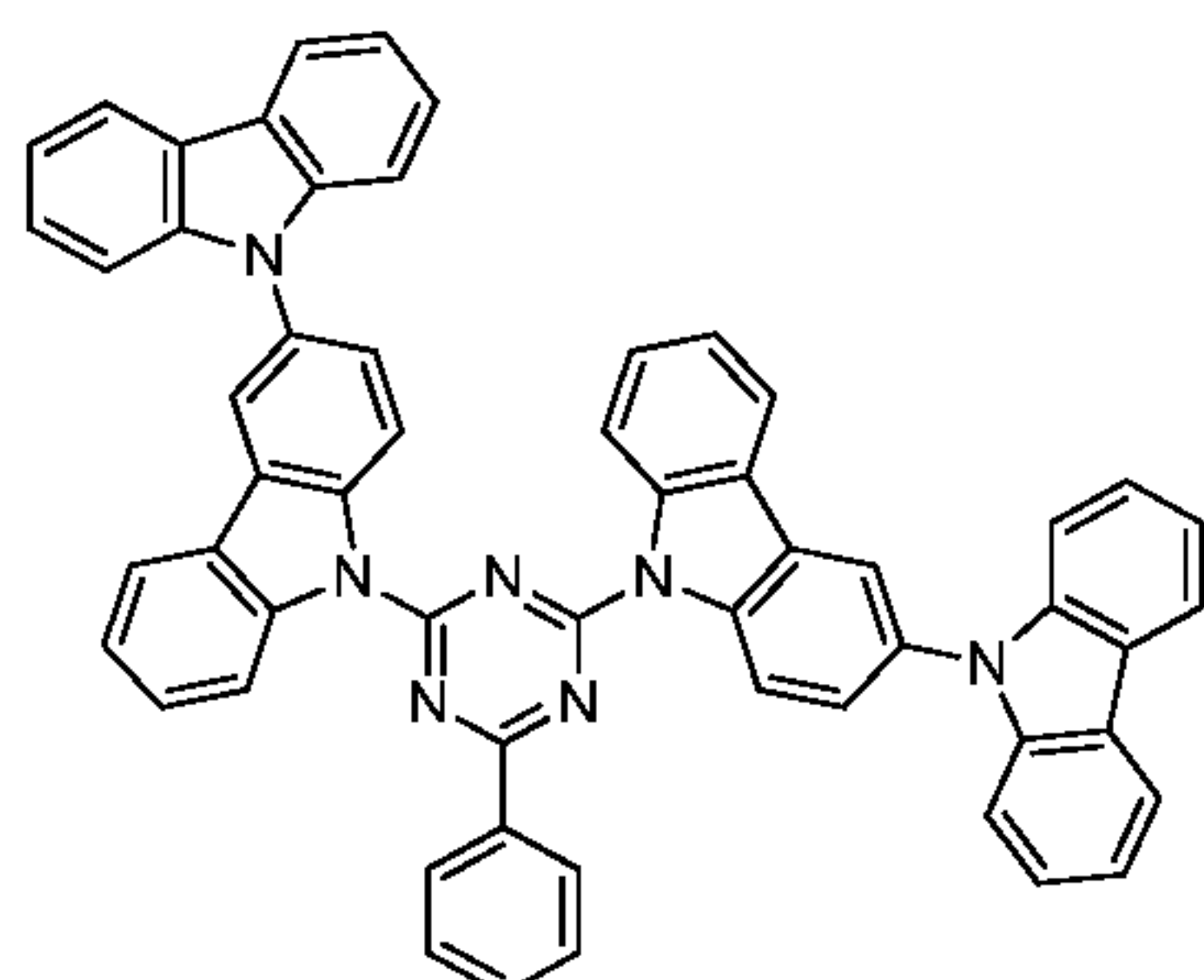
T-10



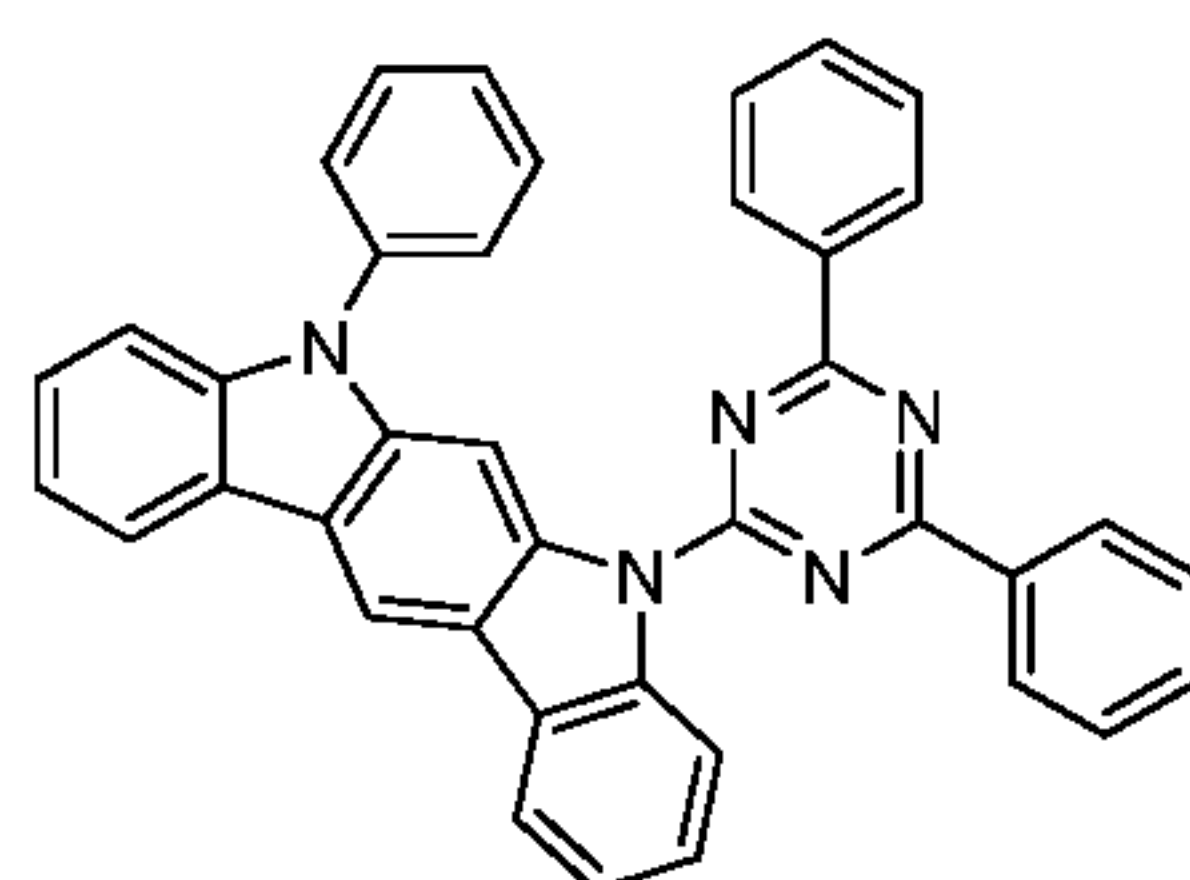
T-11



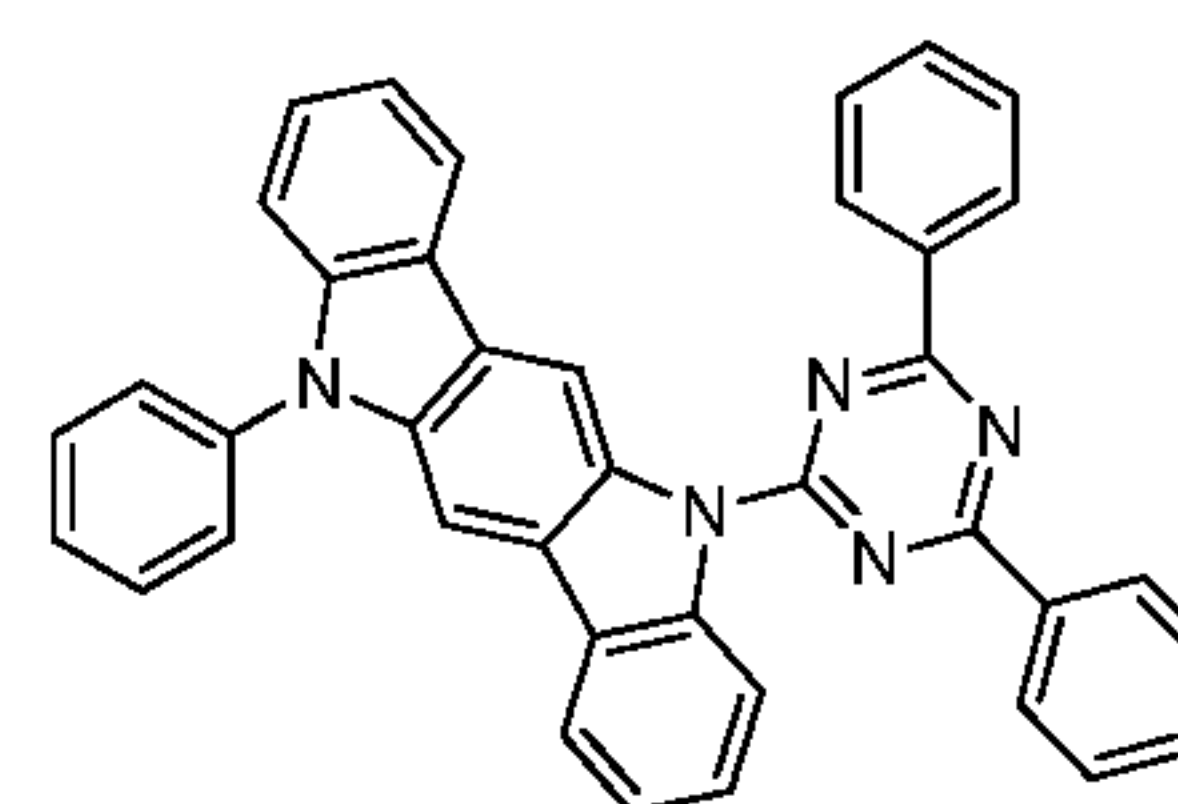
T-12



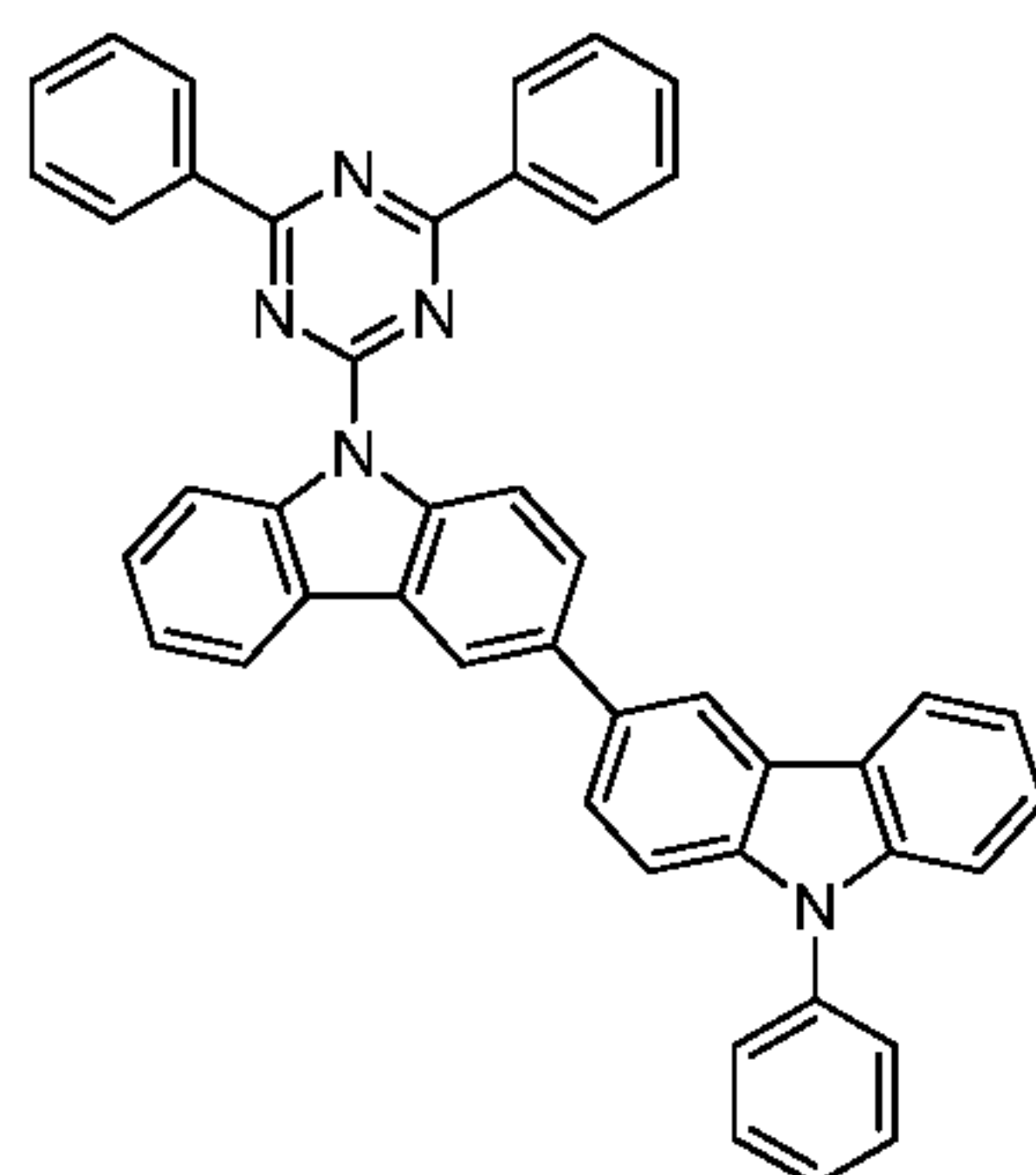
T-13



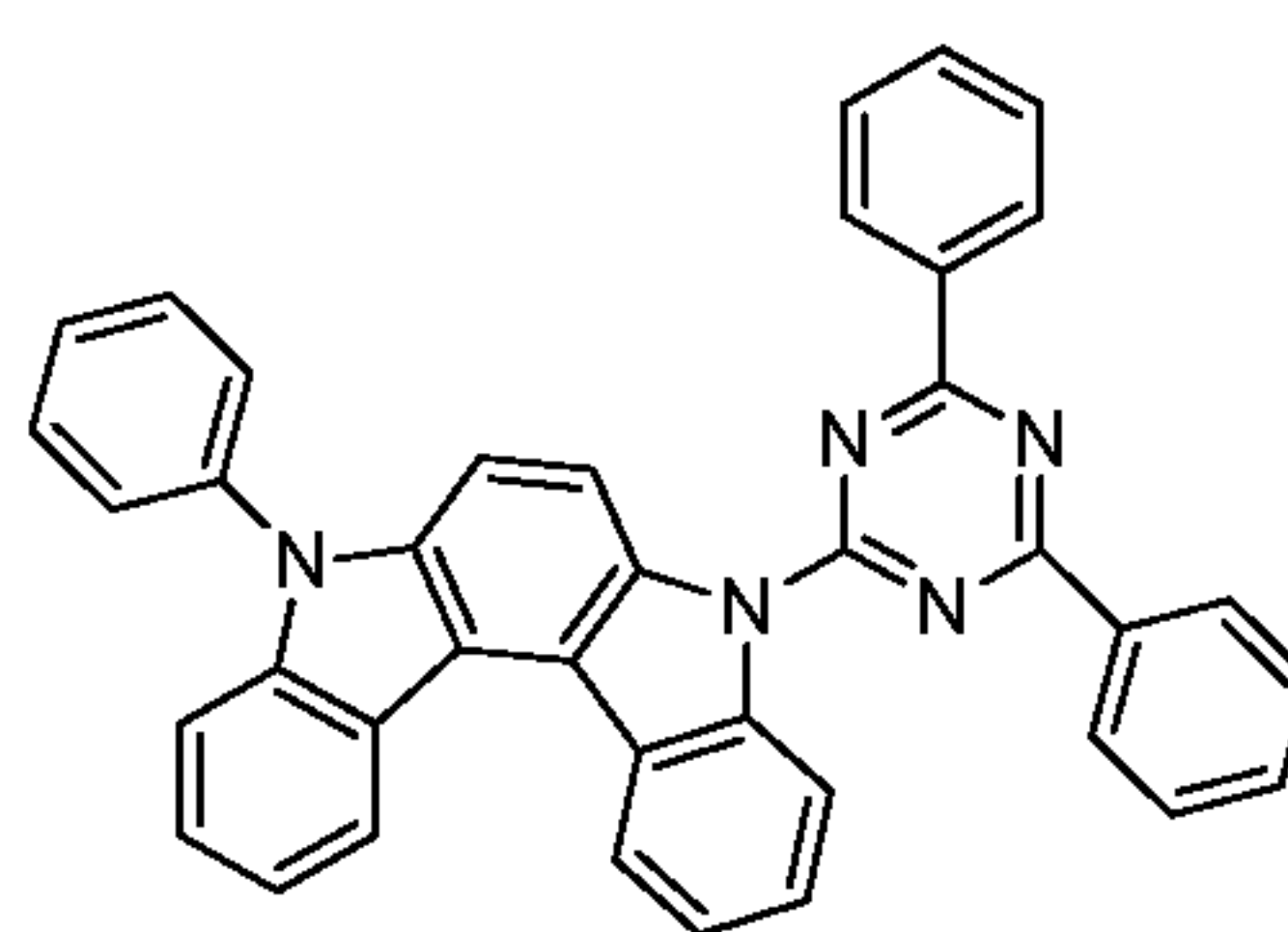
T-14



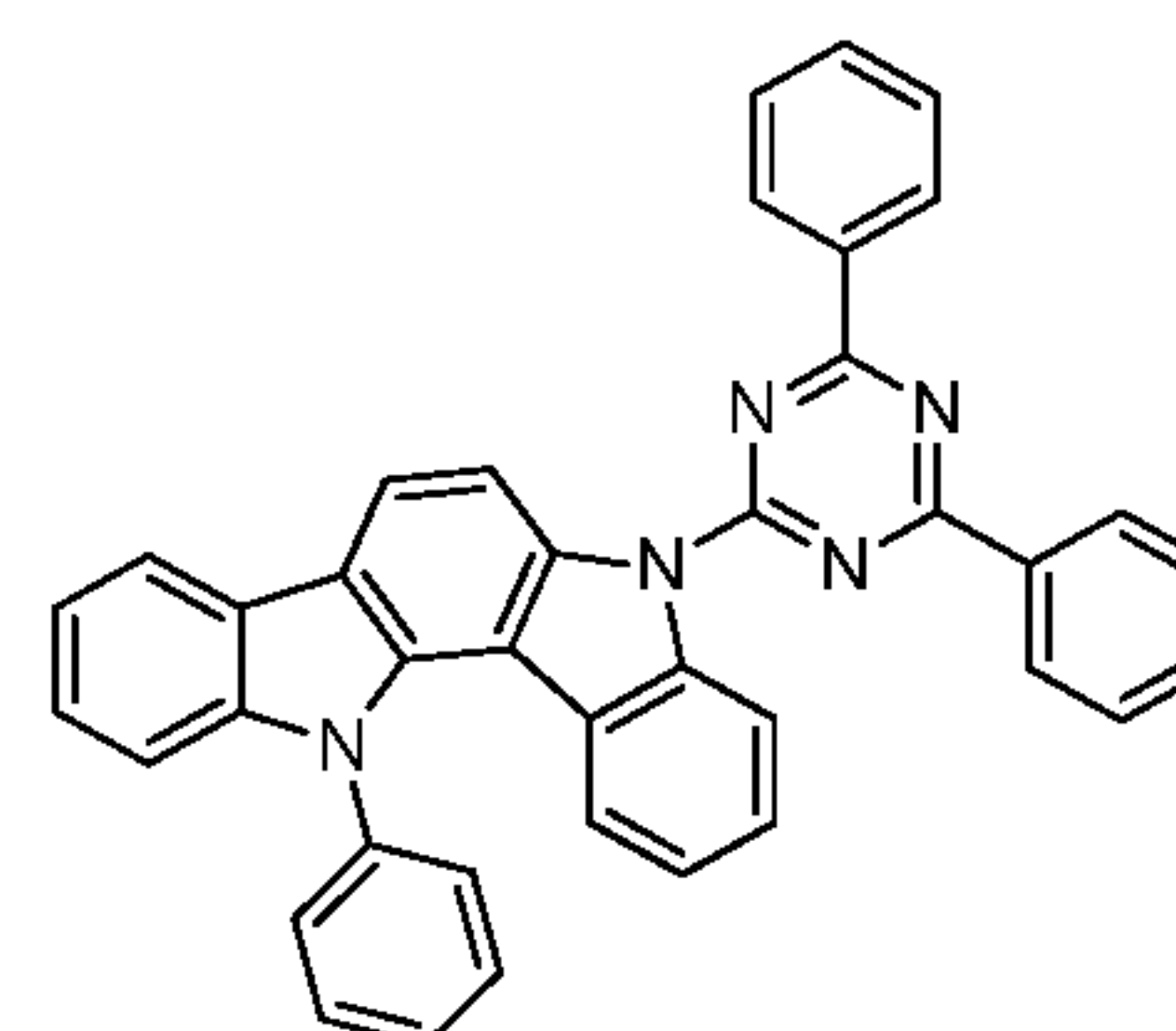
T-15



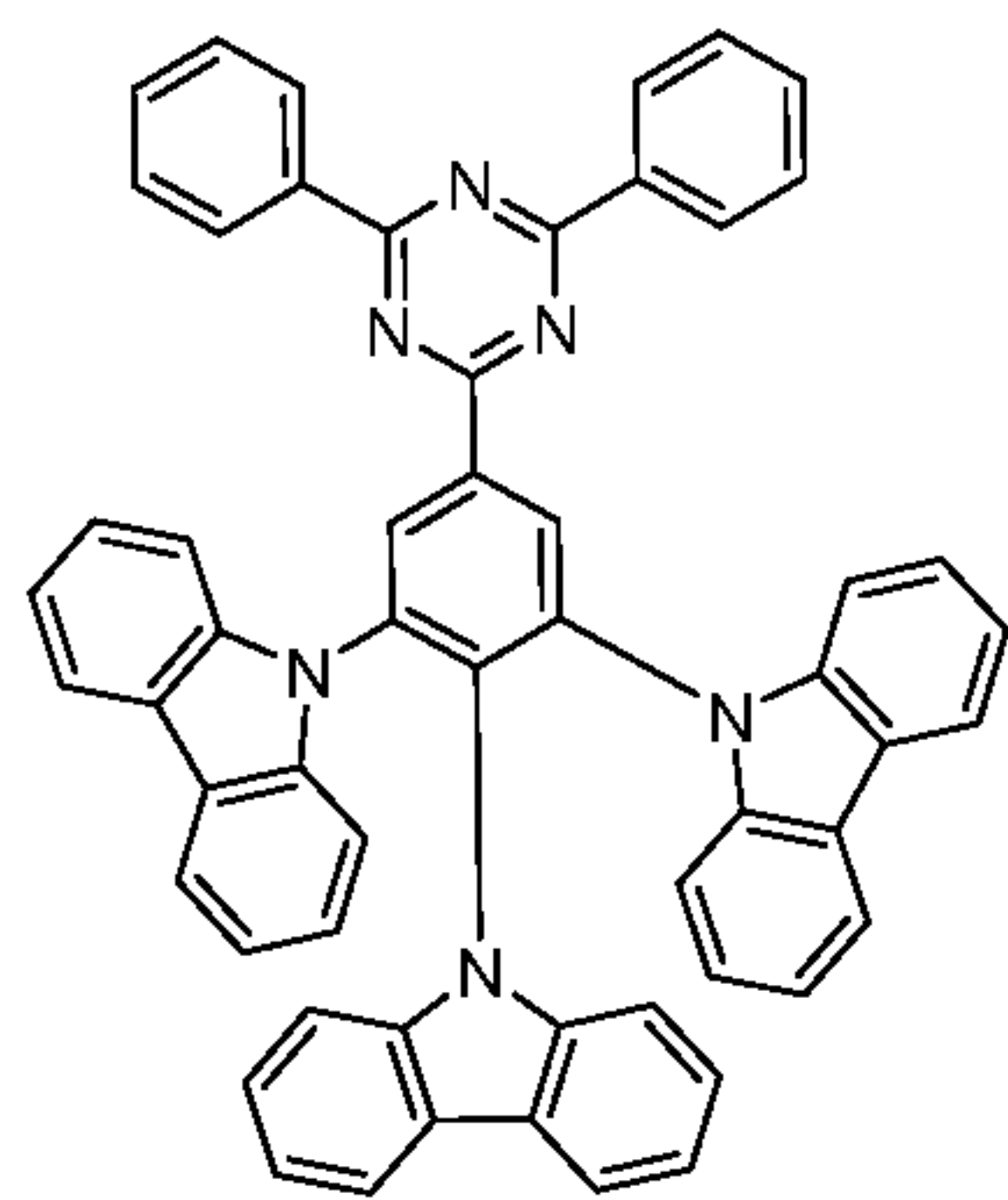
T-16



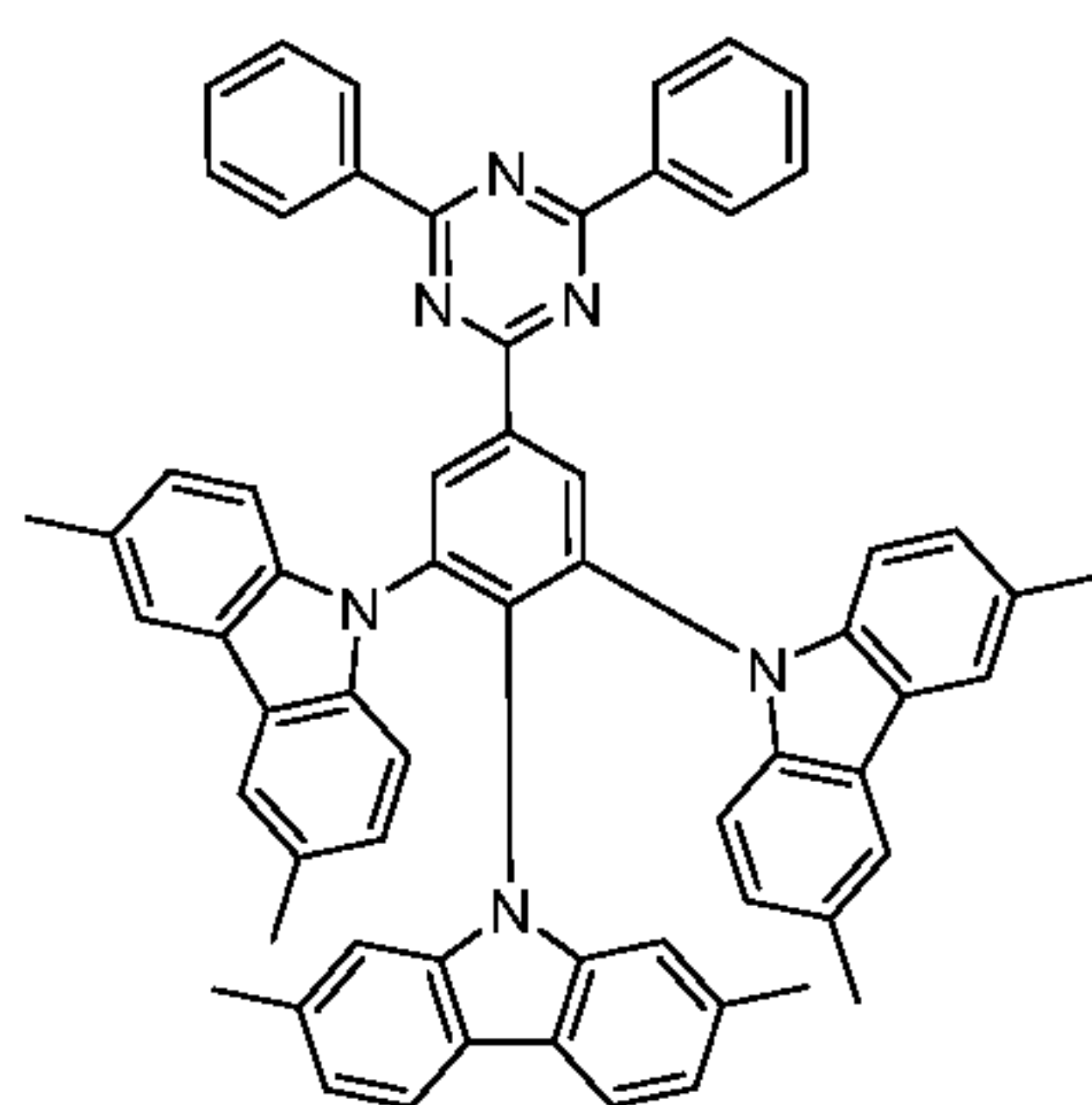
T-17



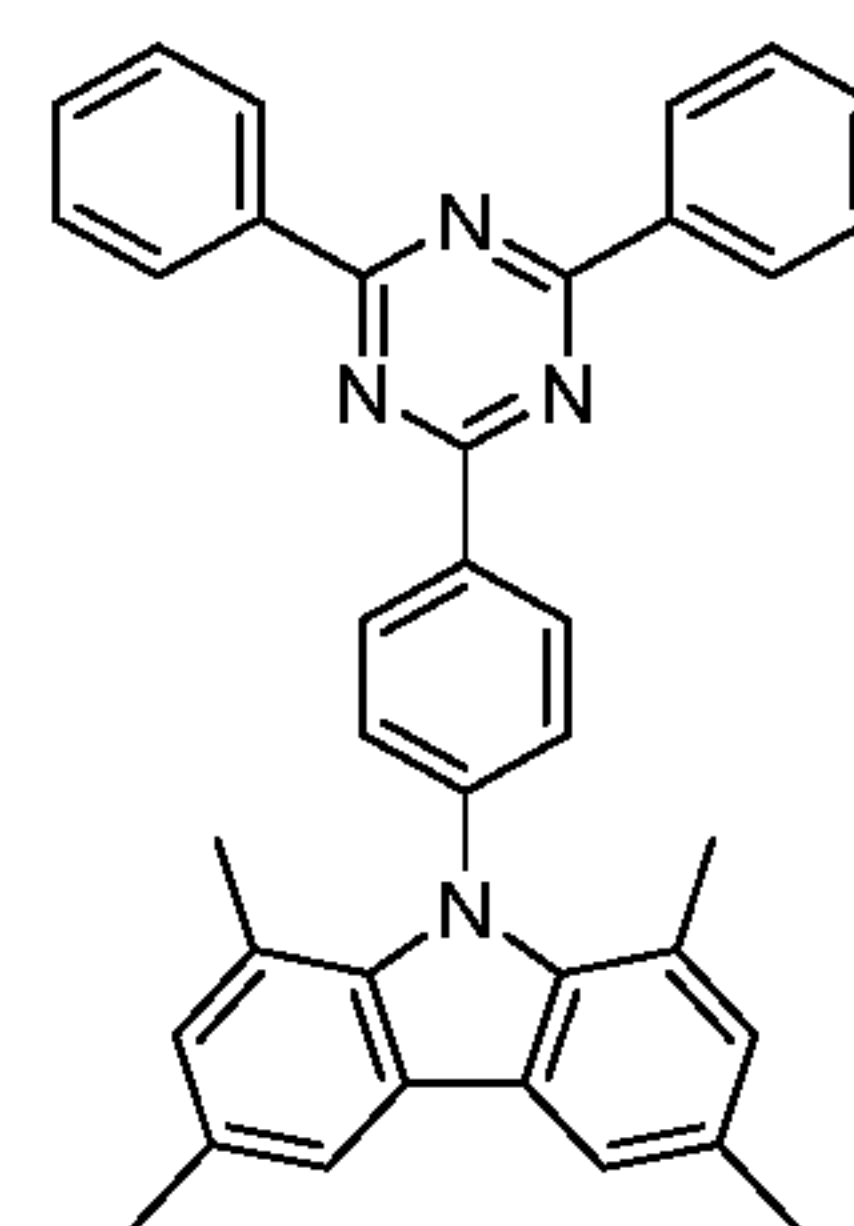
T-18



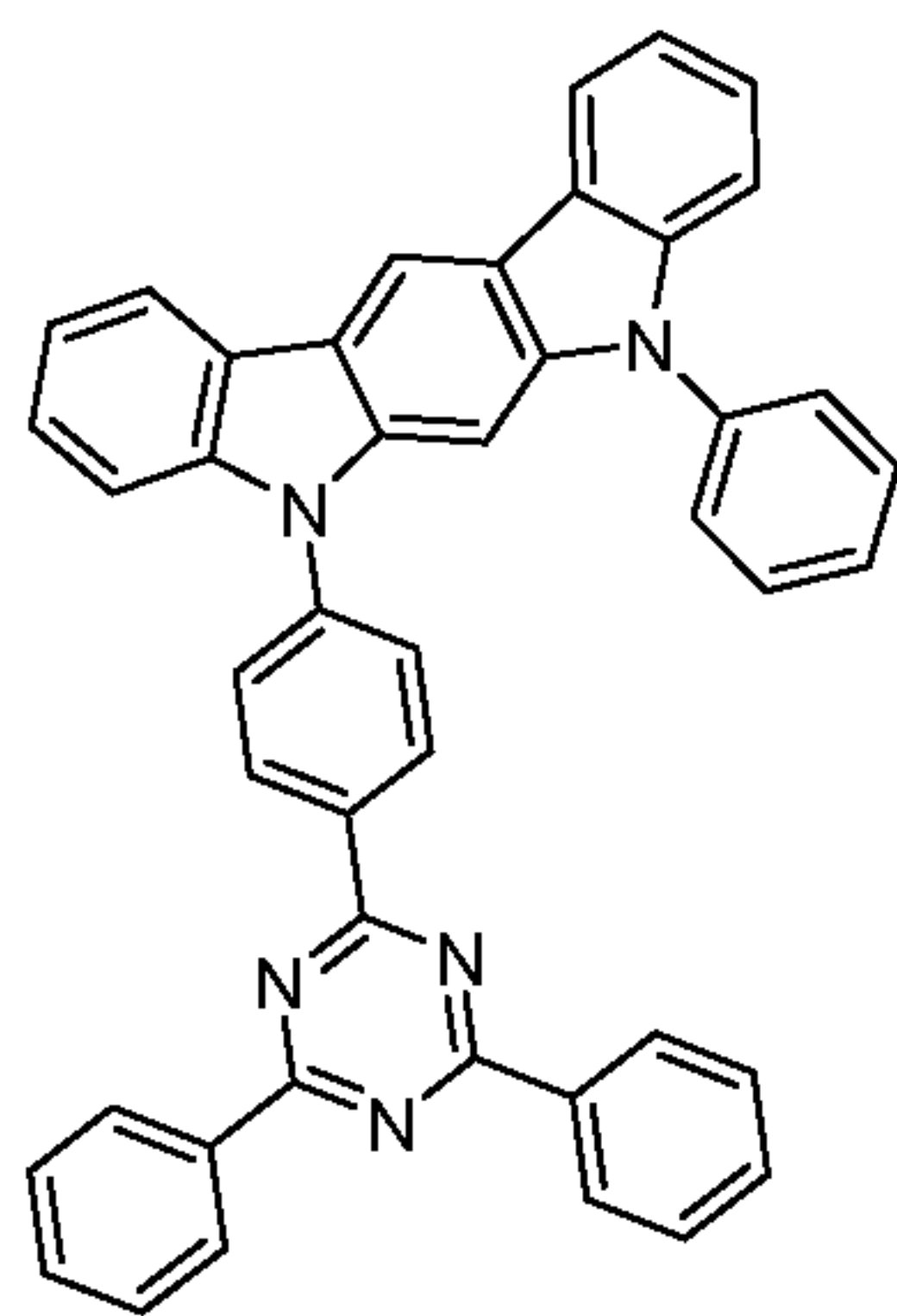
T-19



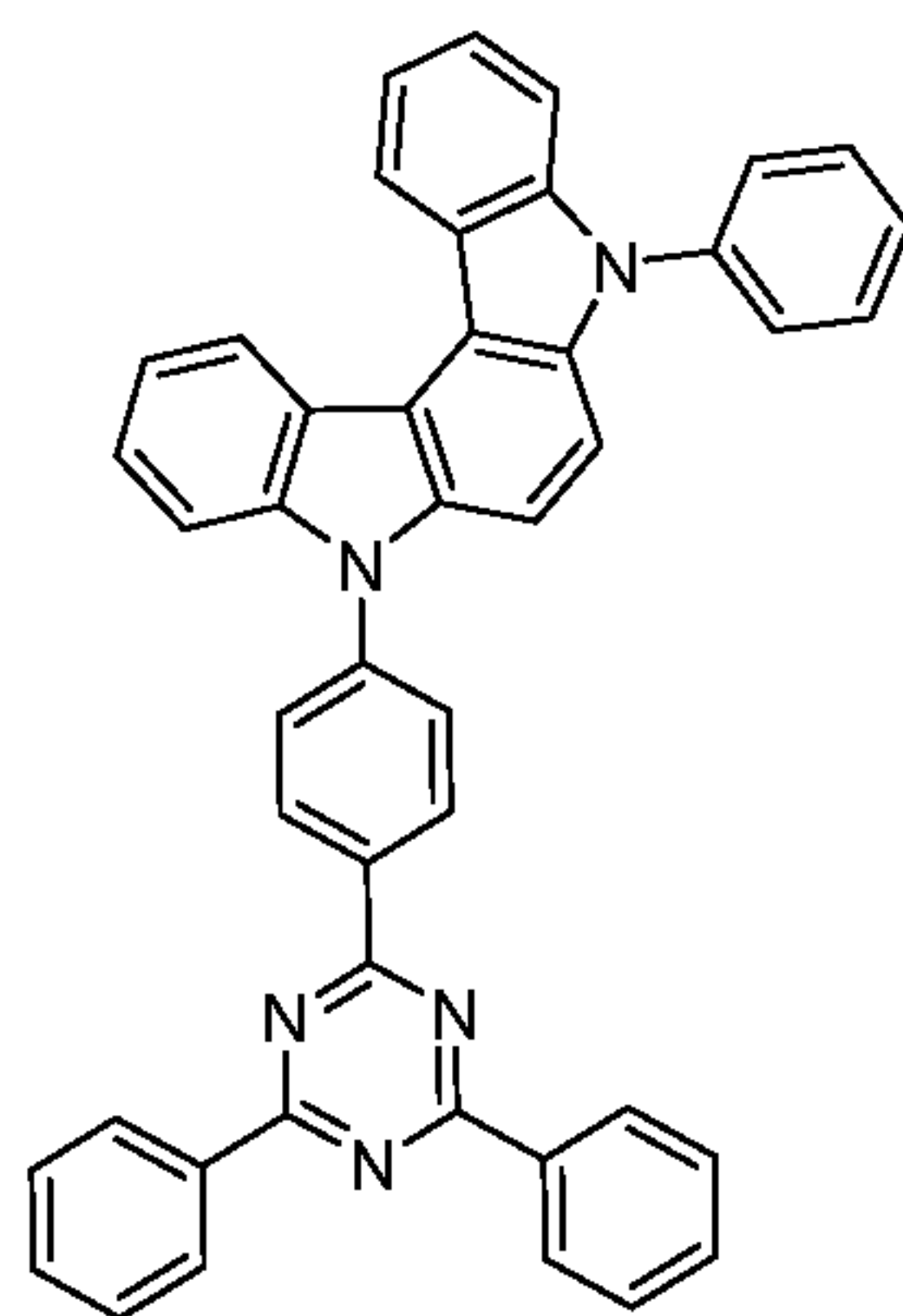
T-20



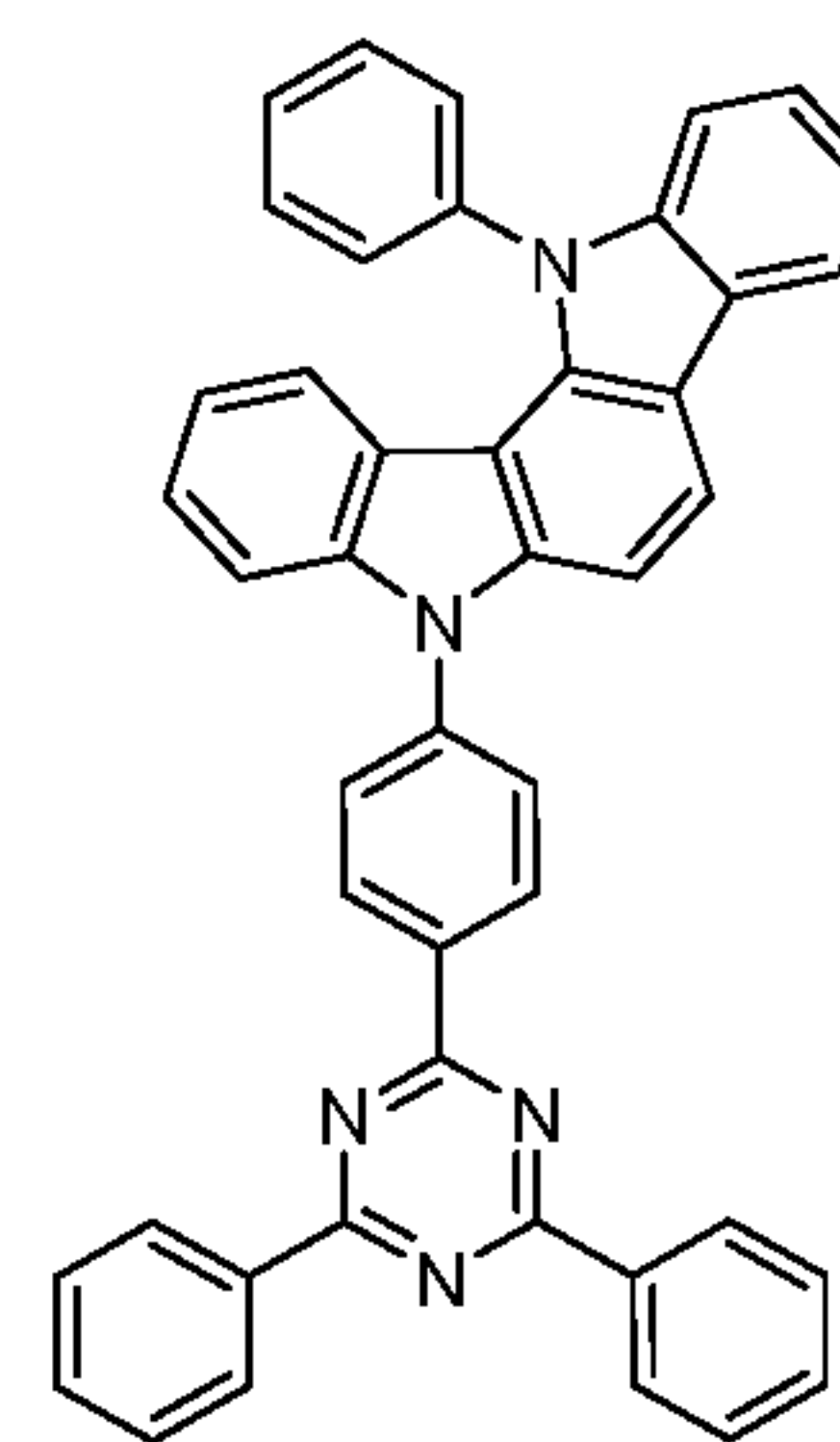
T-21



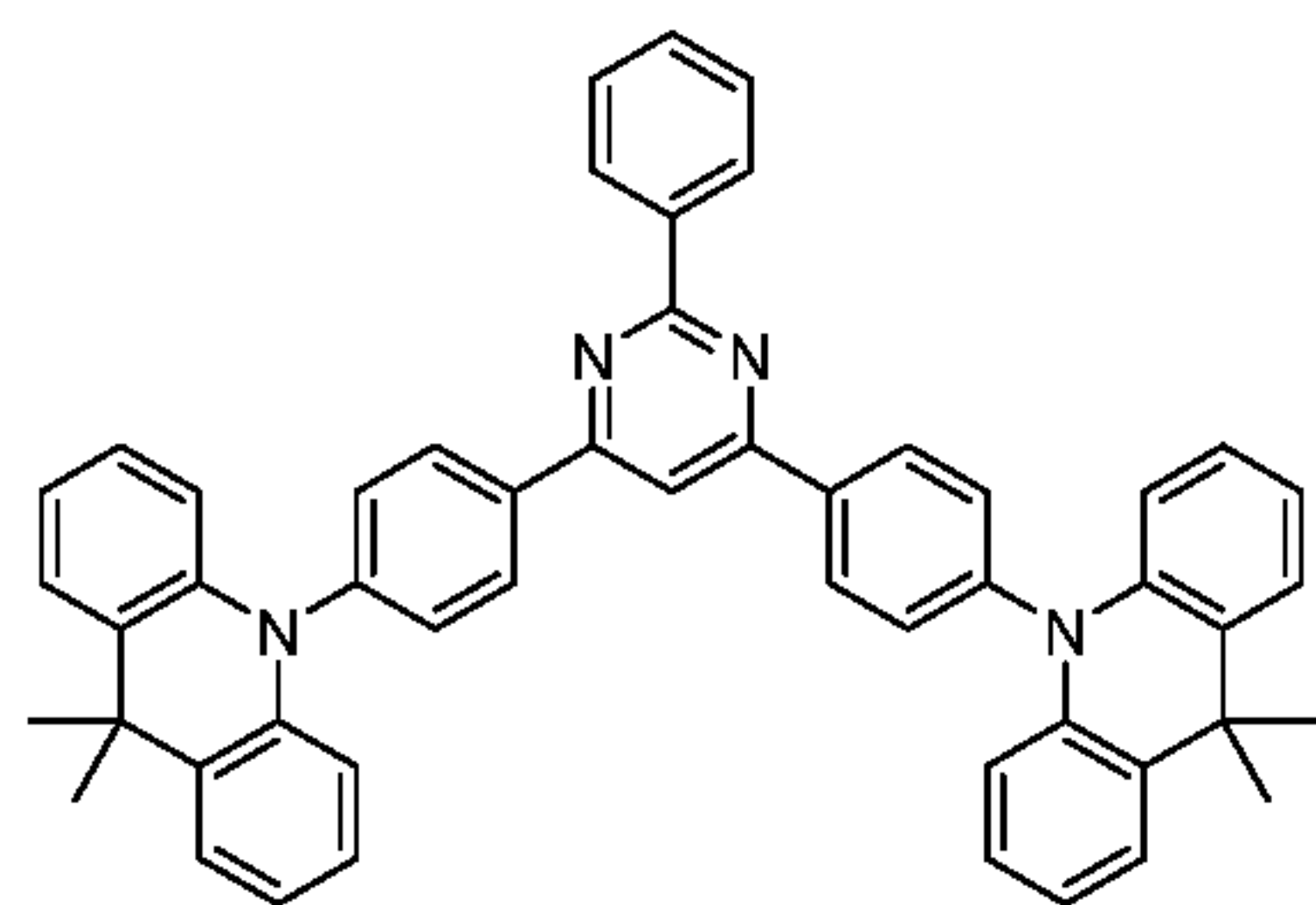
T-22



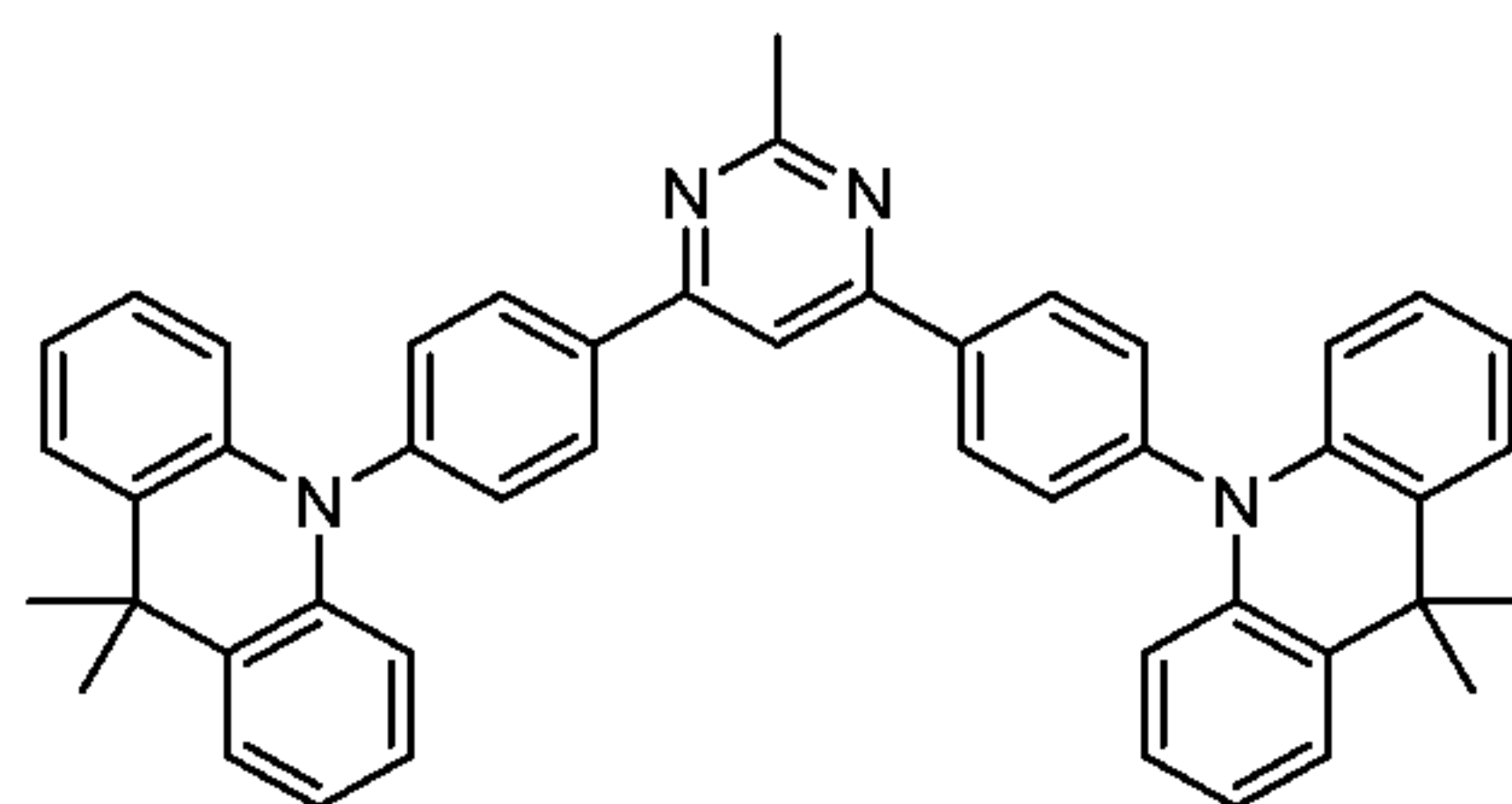
T-23



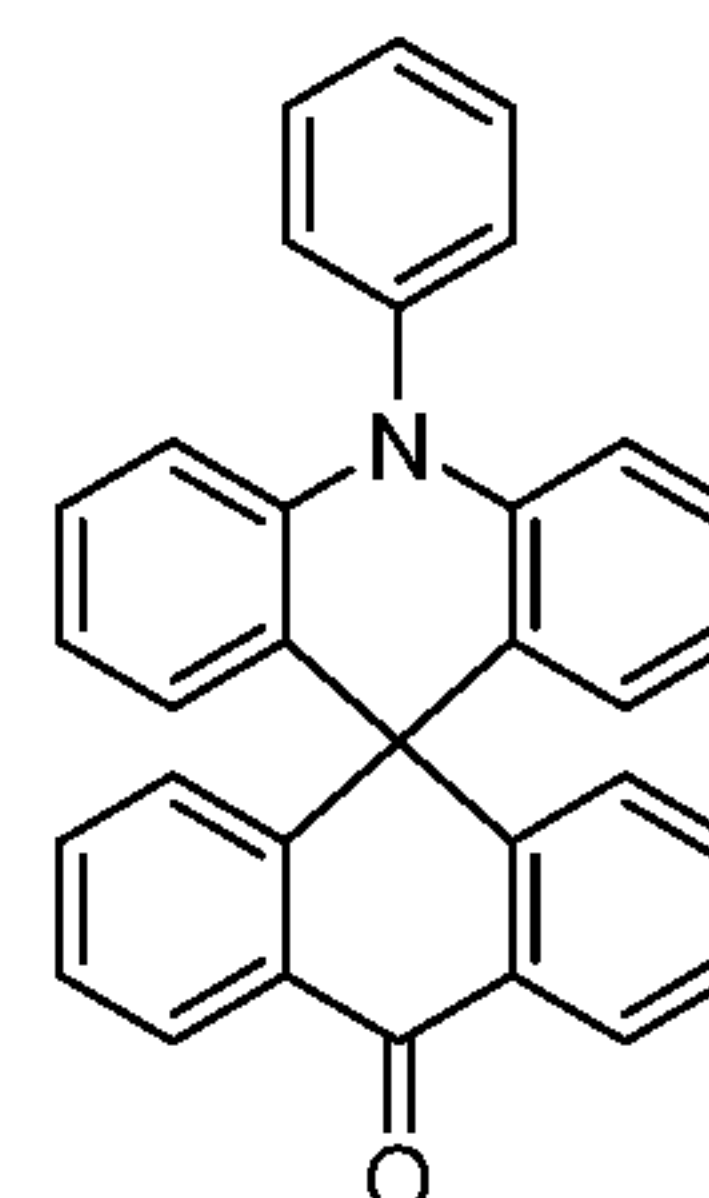
T-24



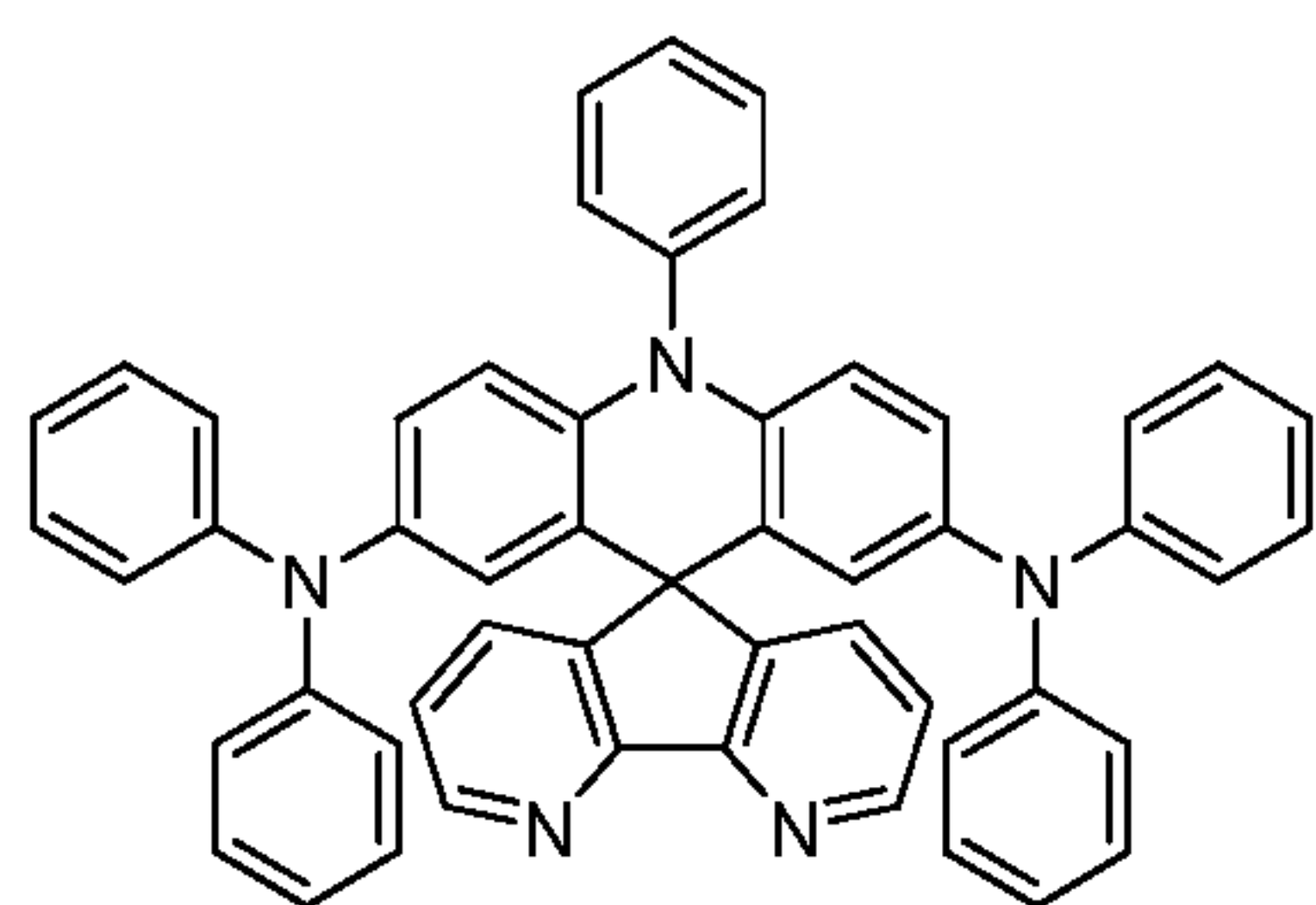
T-25



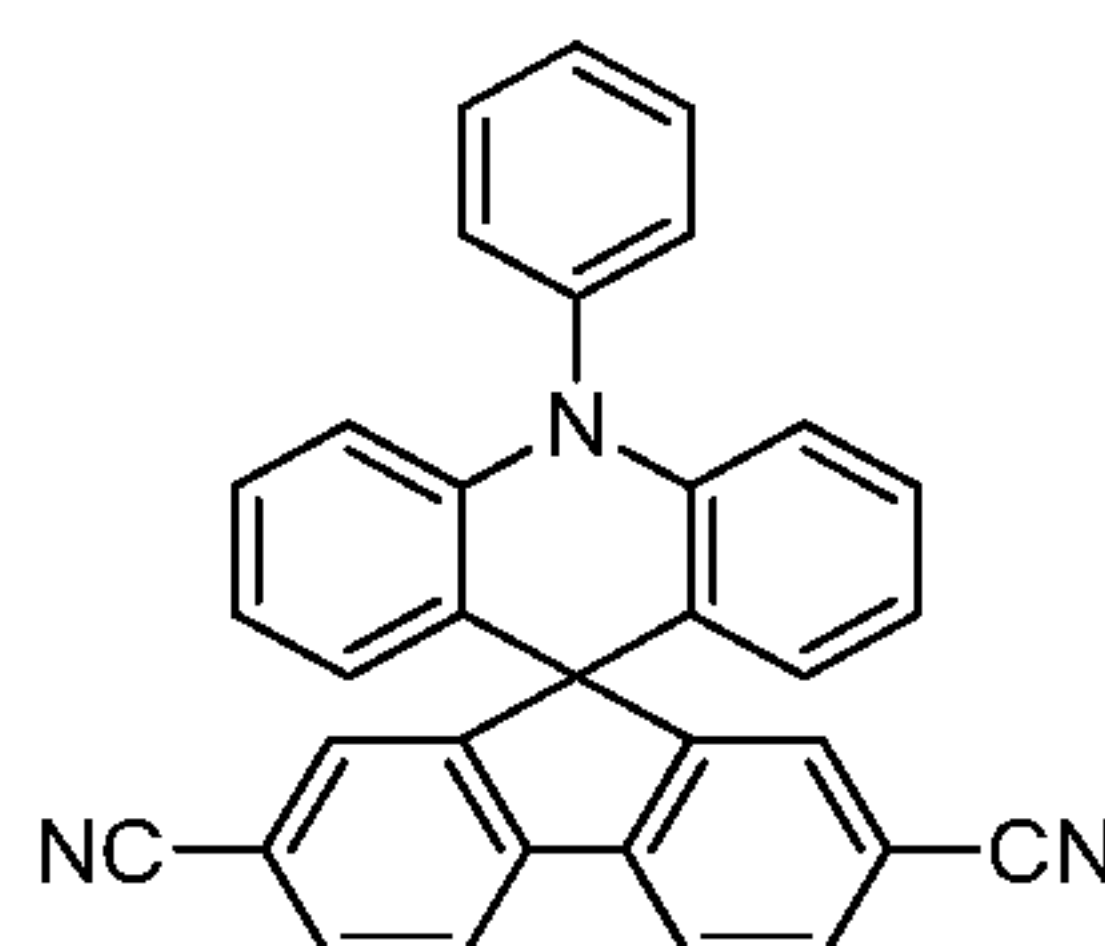
T-26



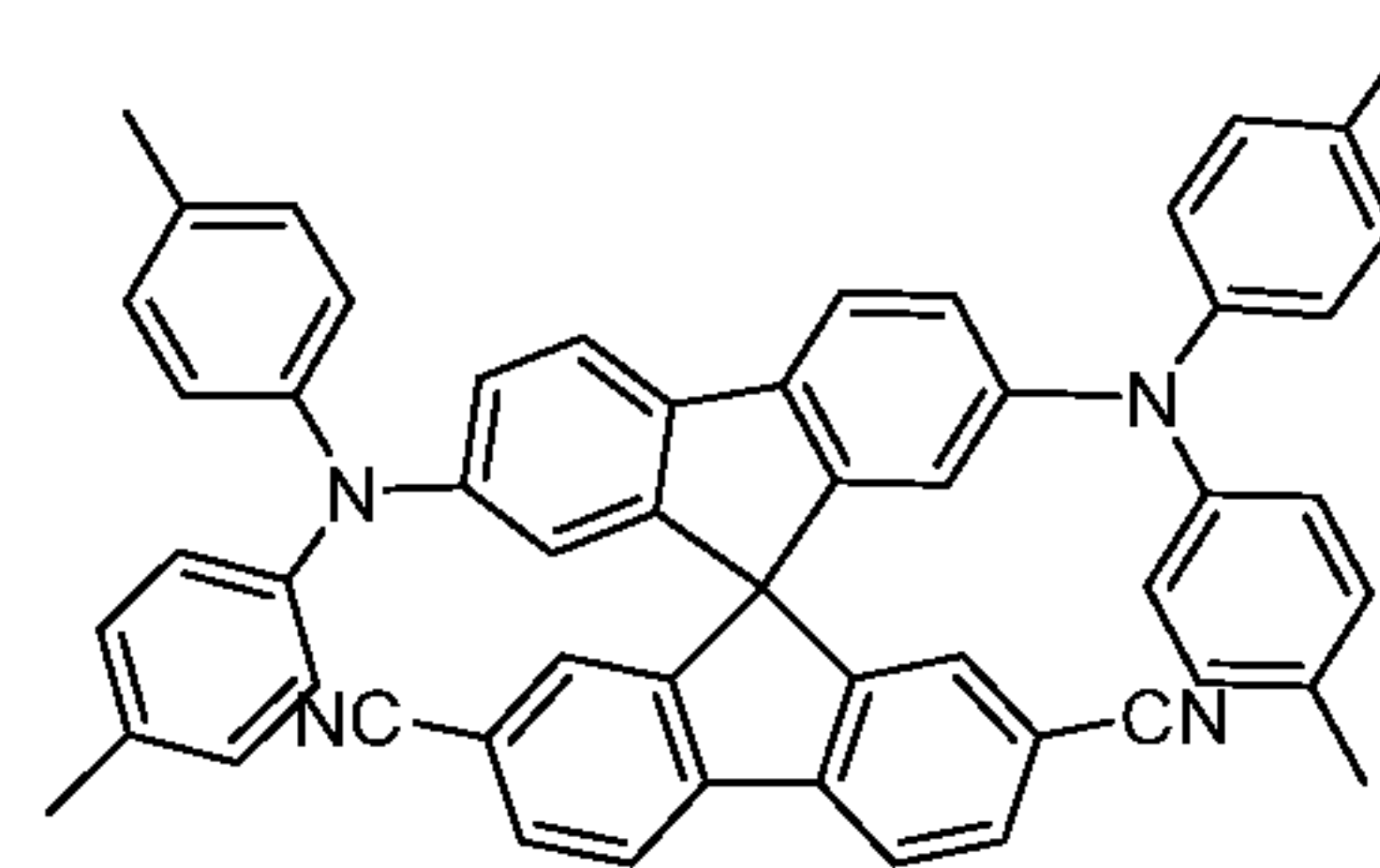
T-27



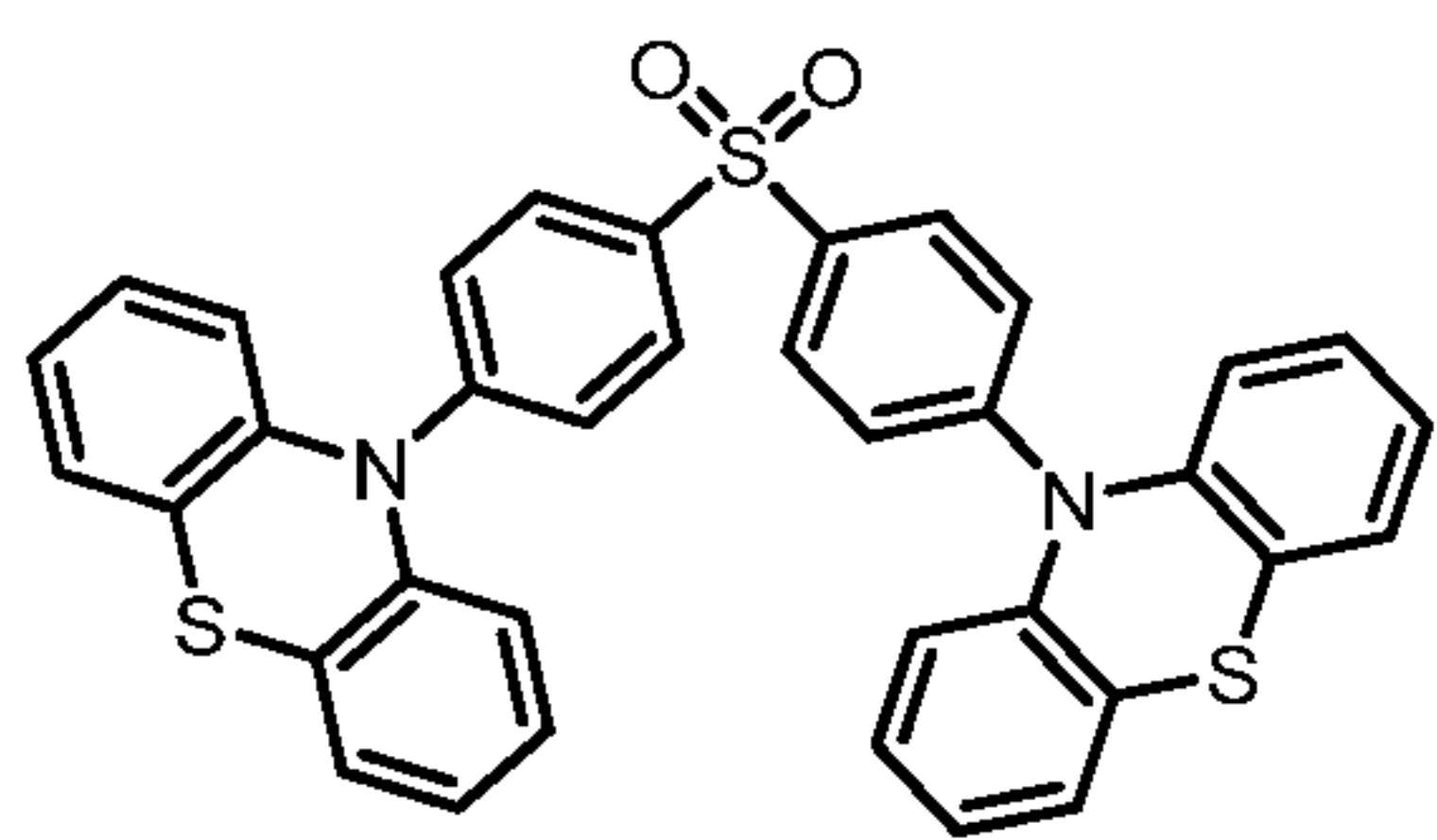
T-28



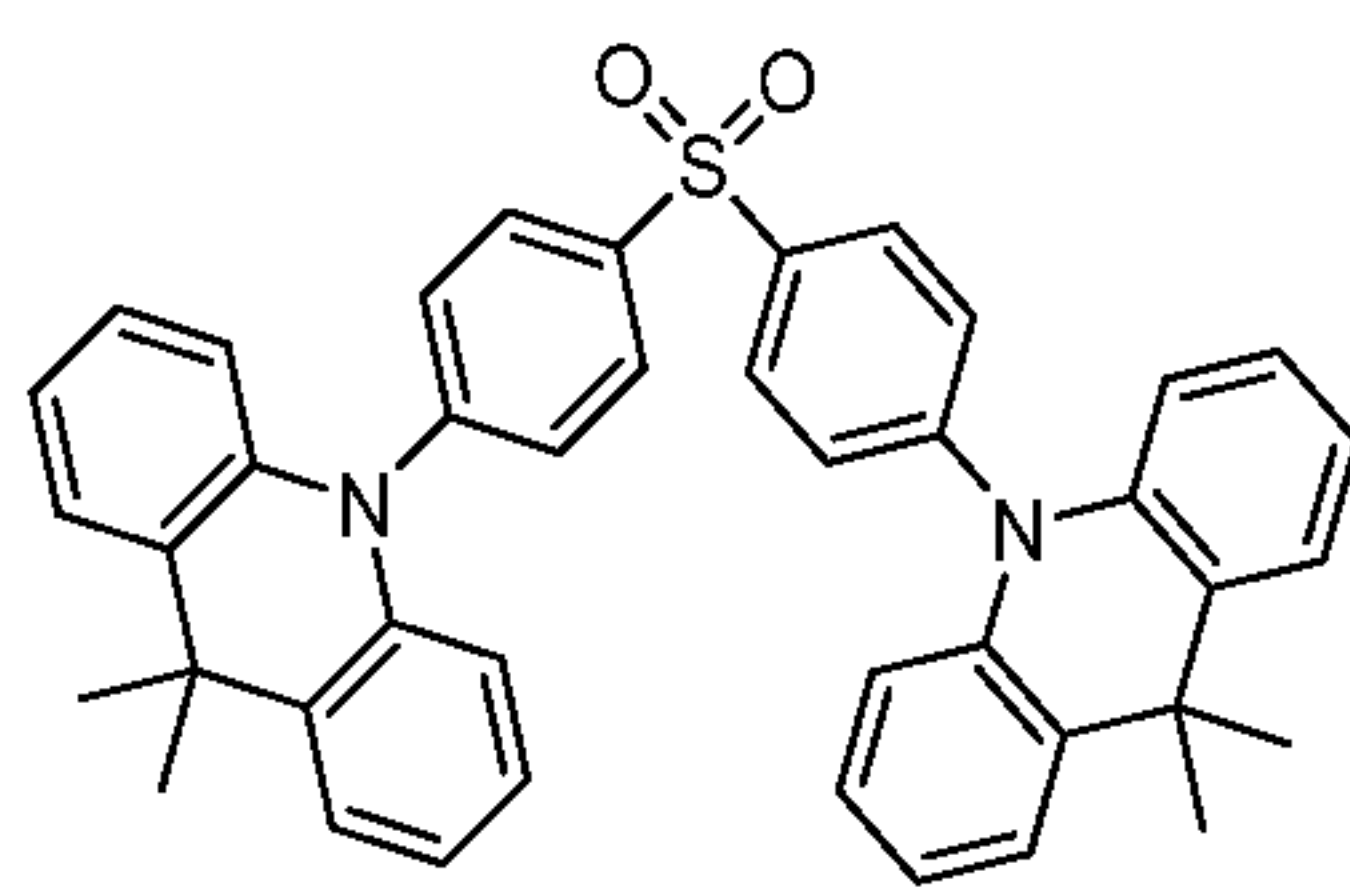
T-29



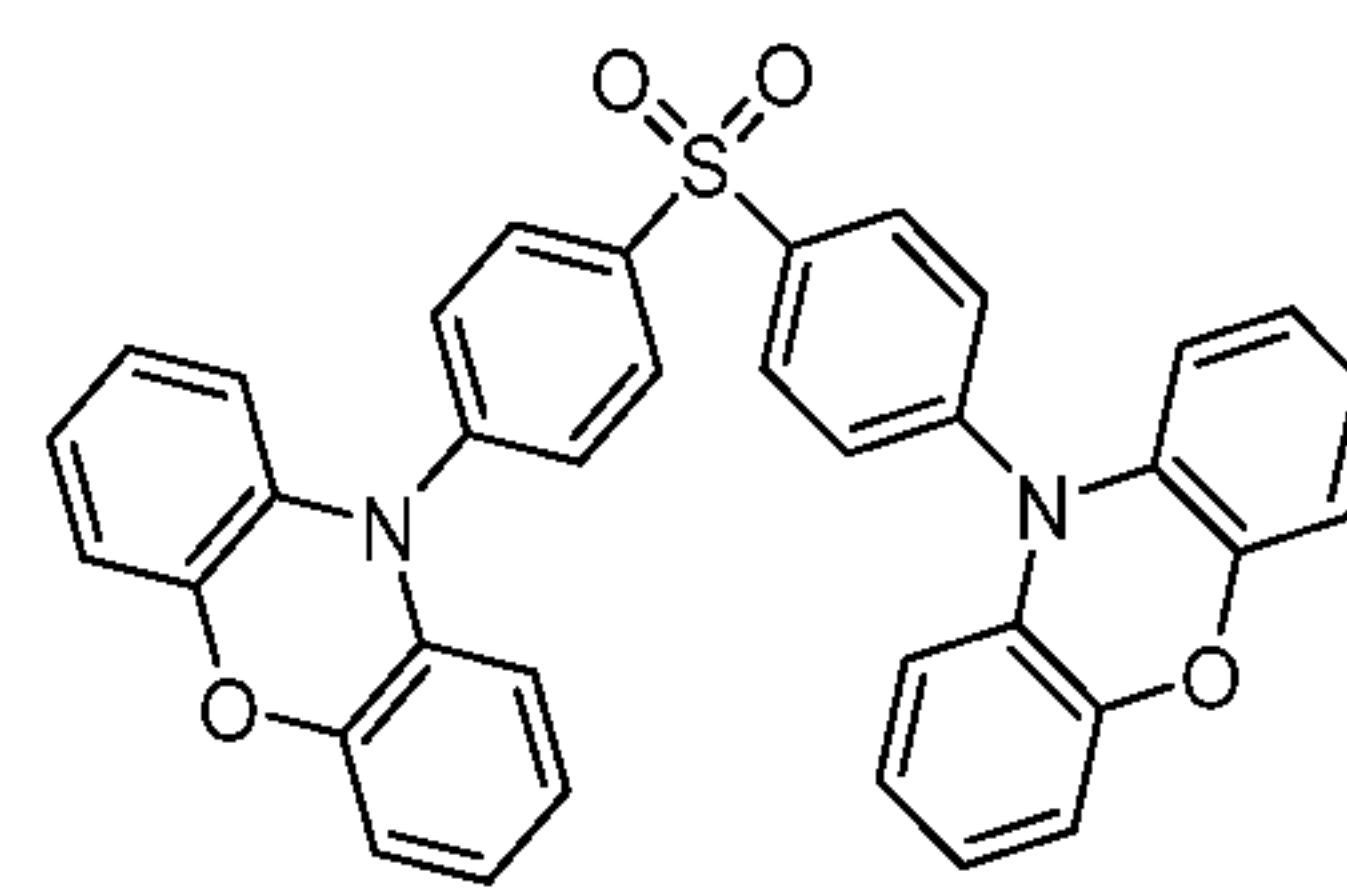
T-30



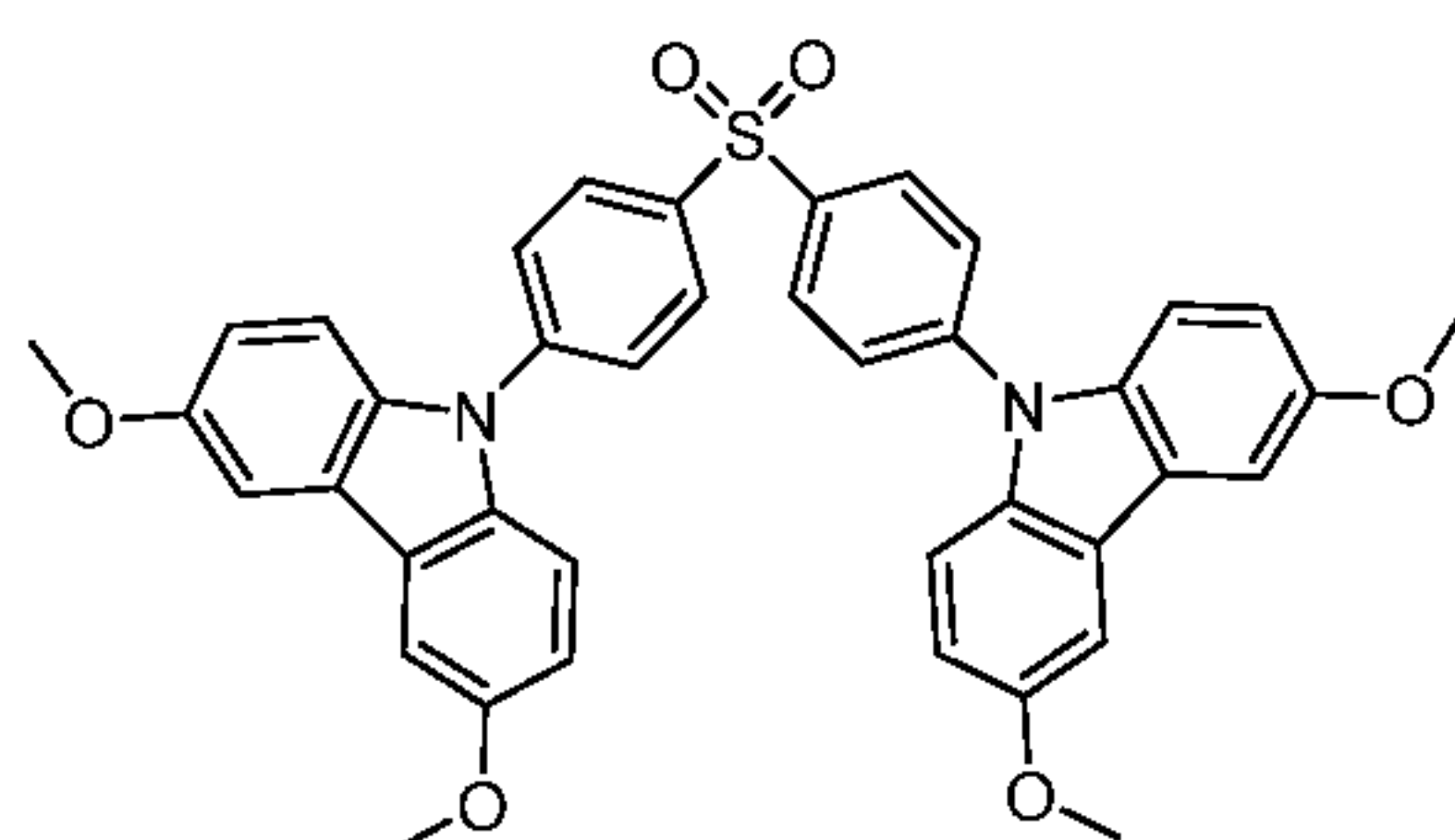
T-31



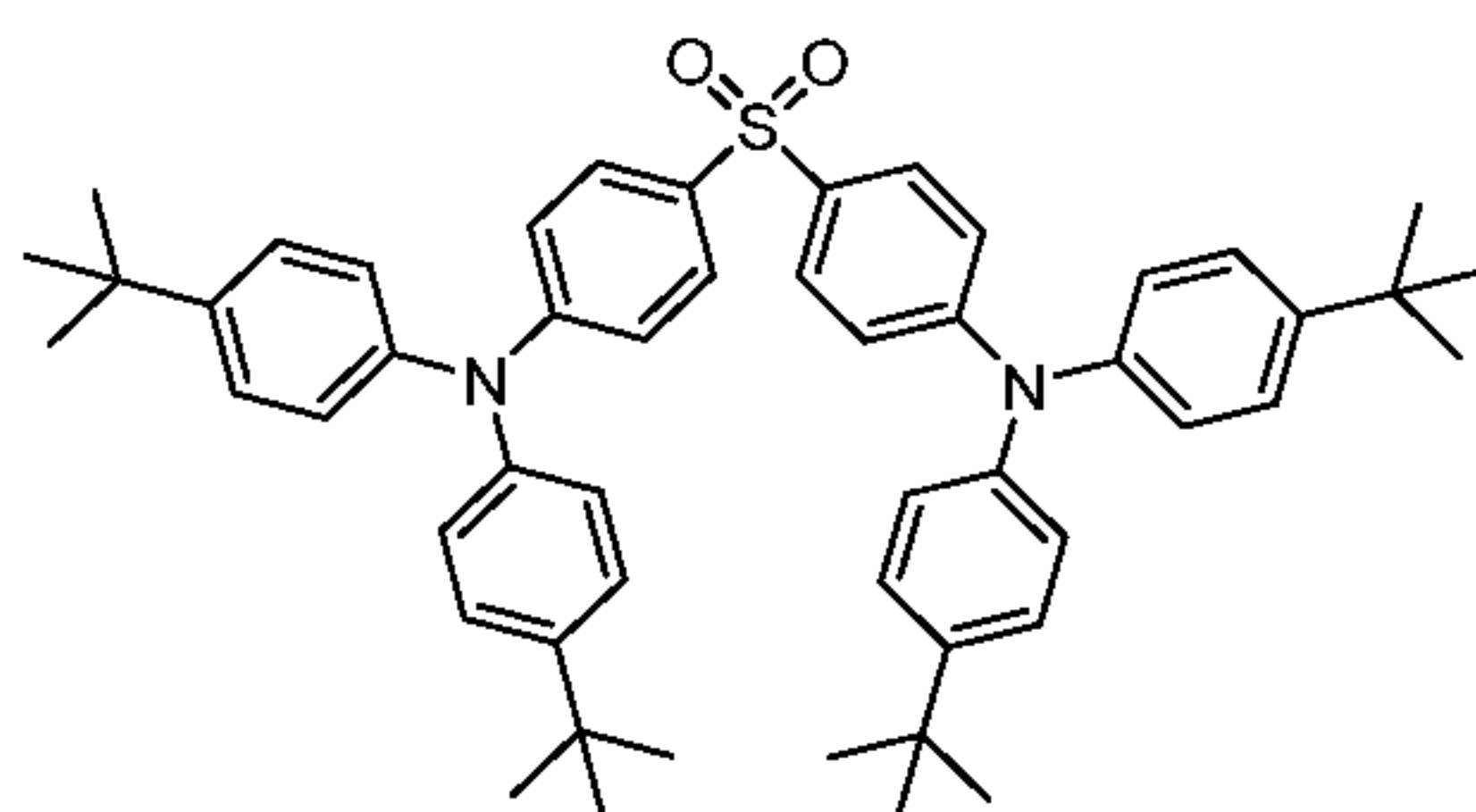
T-32



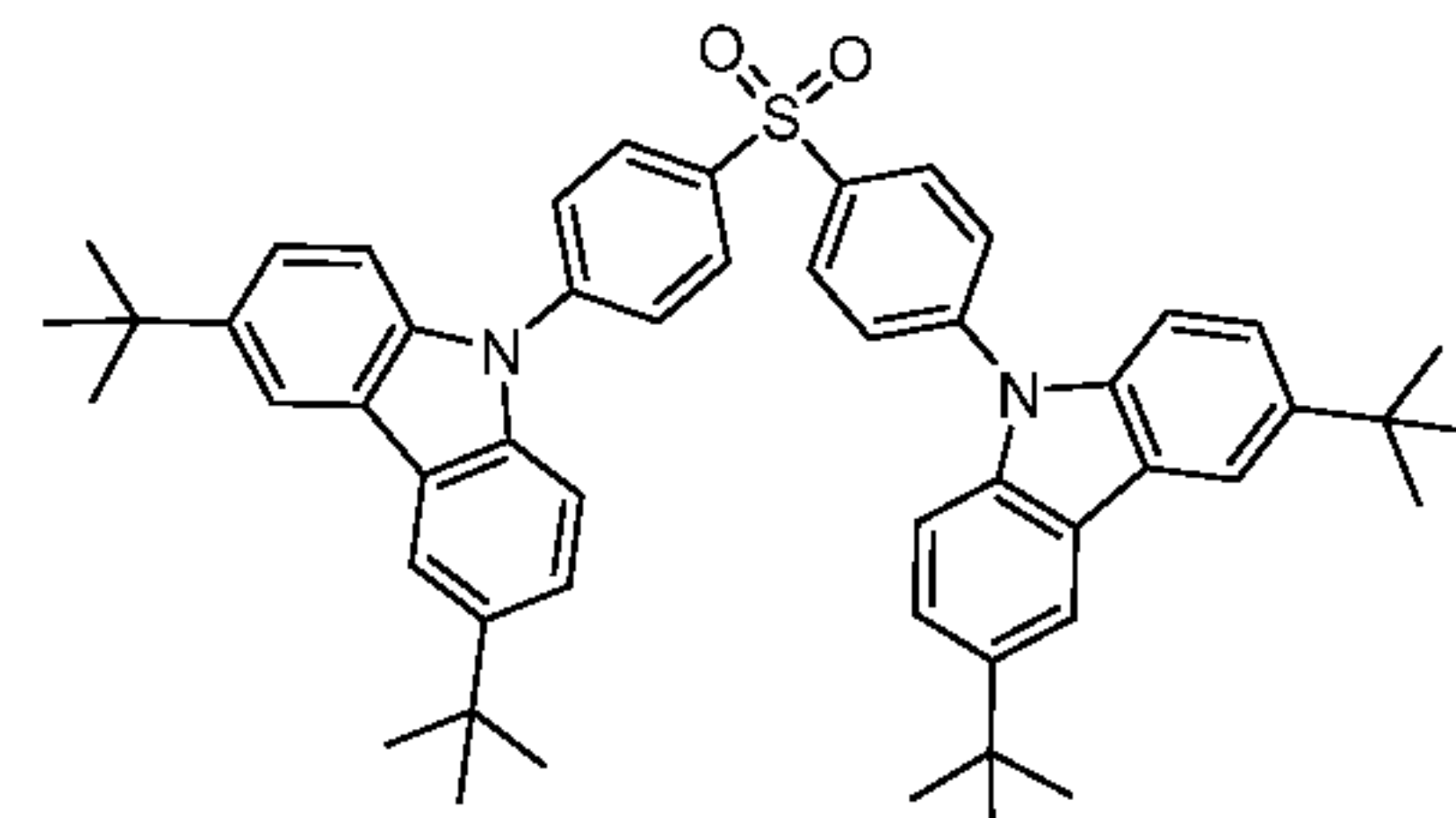
T-33



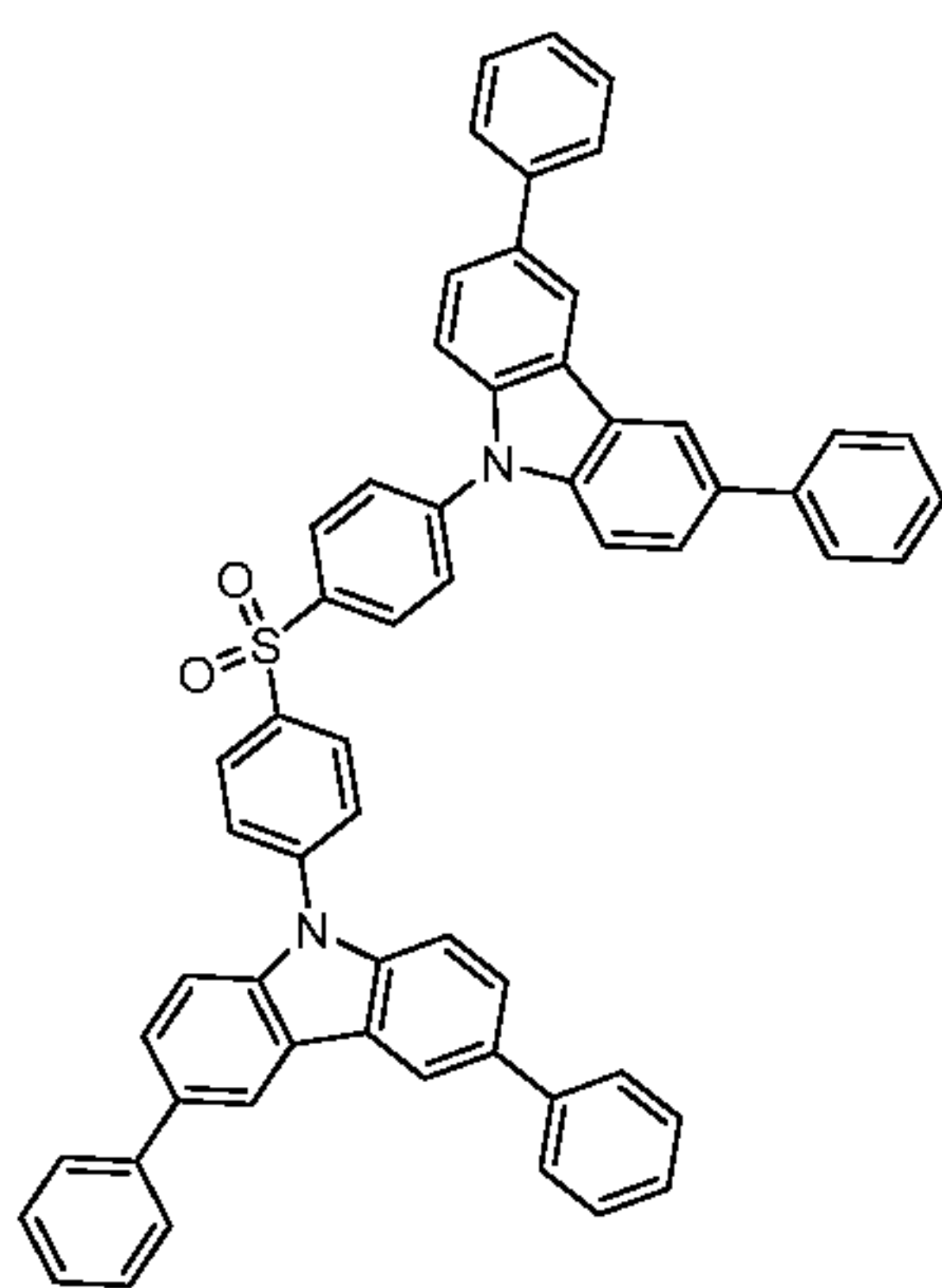
T-34



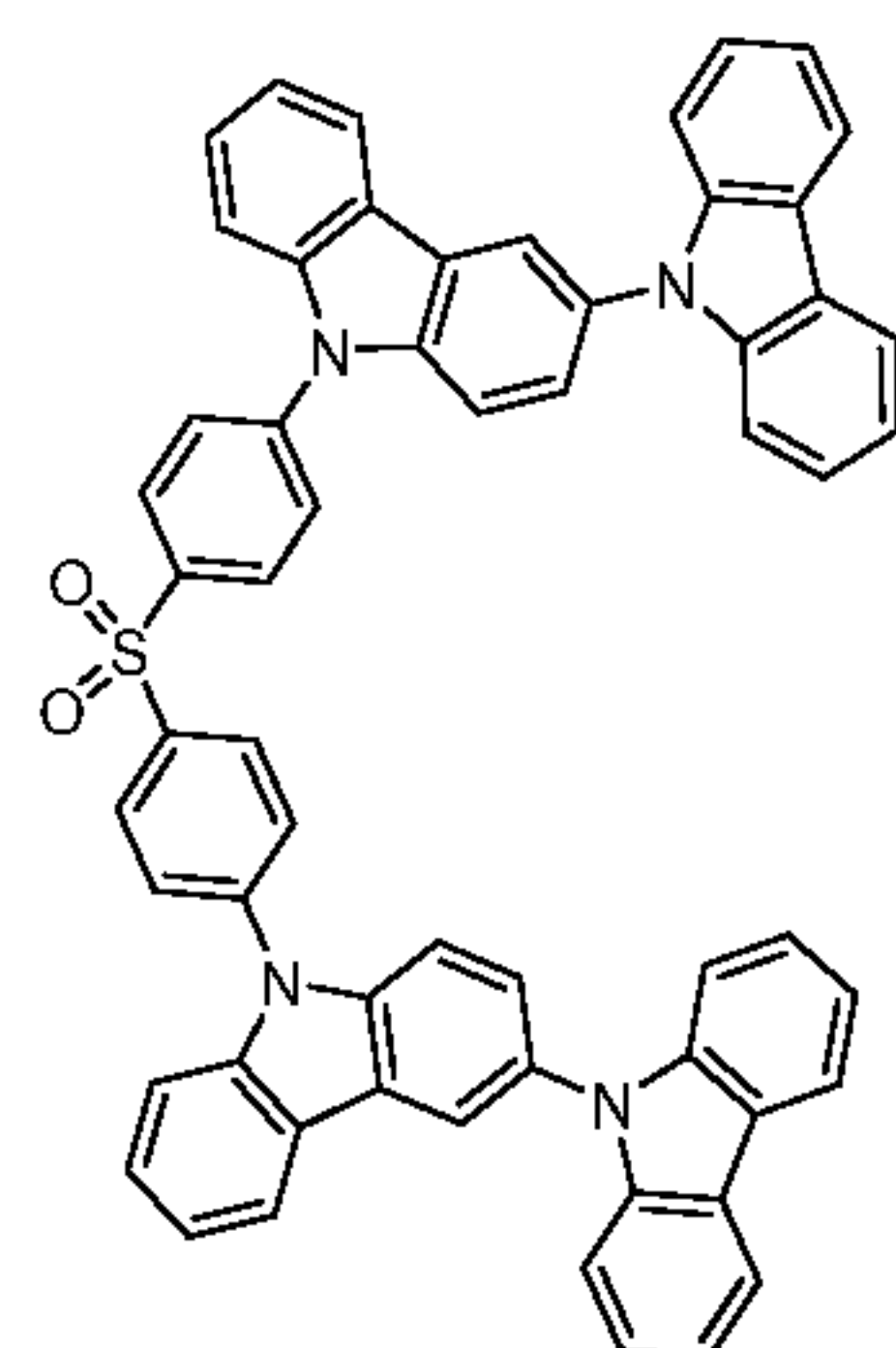
T-35



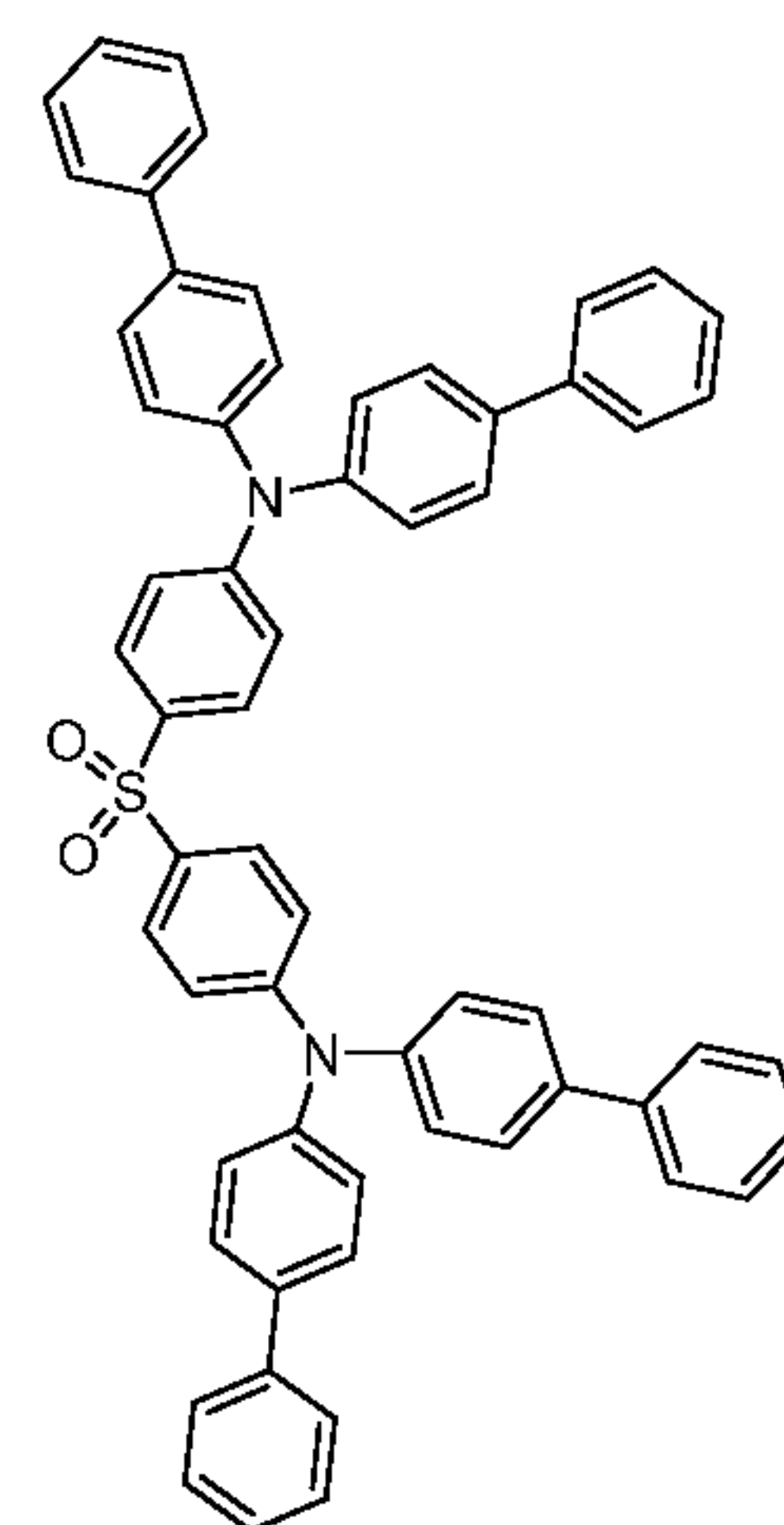
T-36



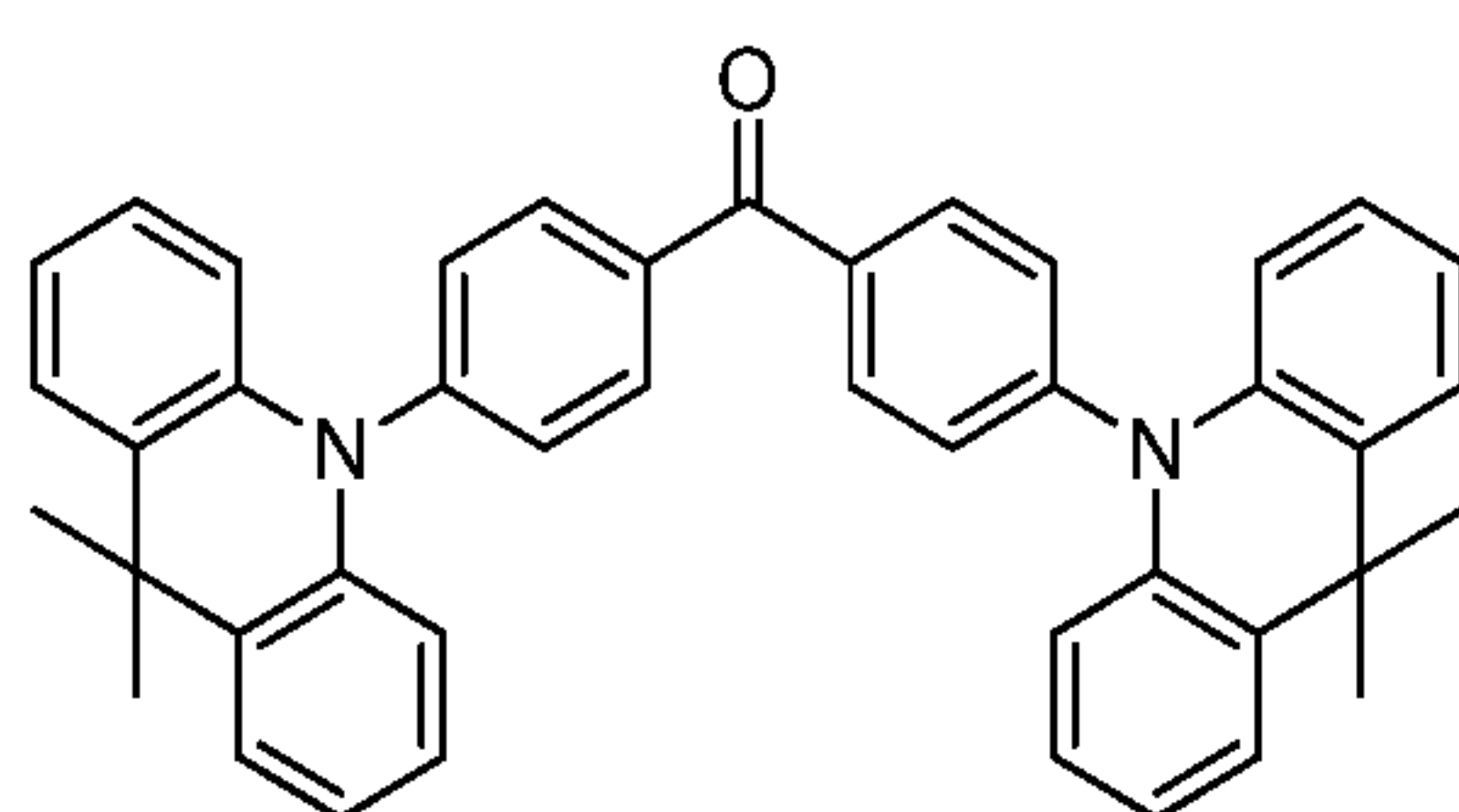
T-37



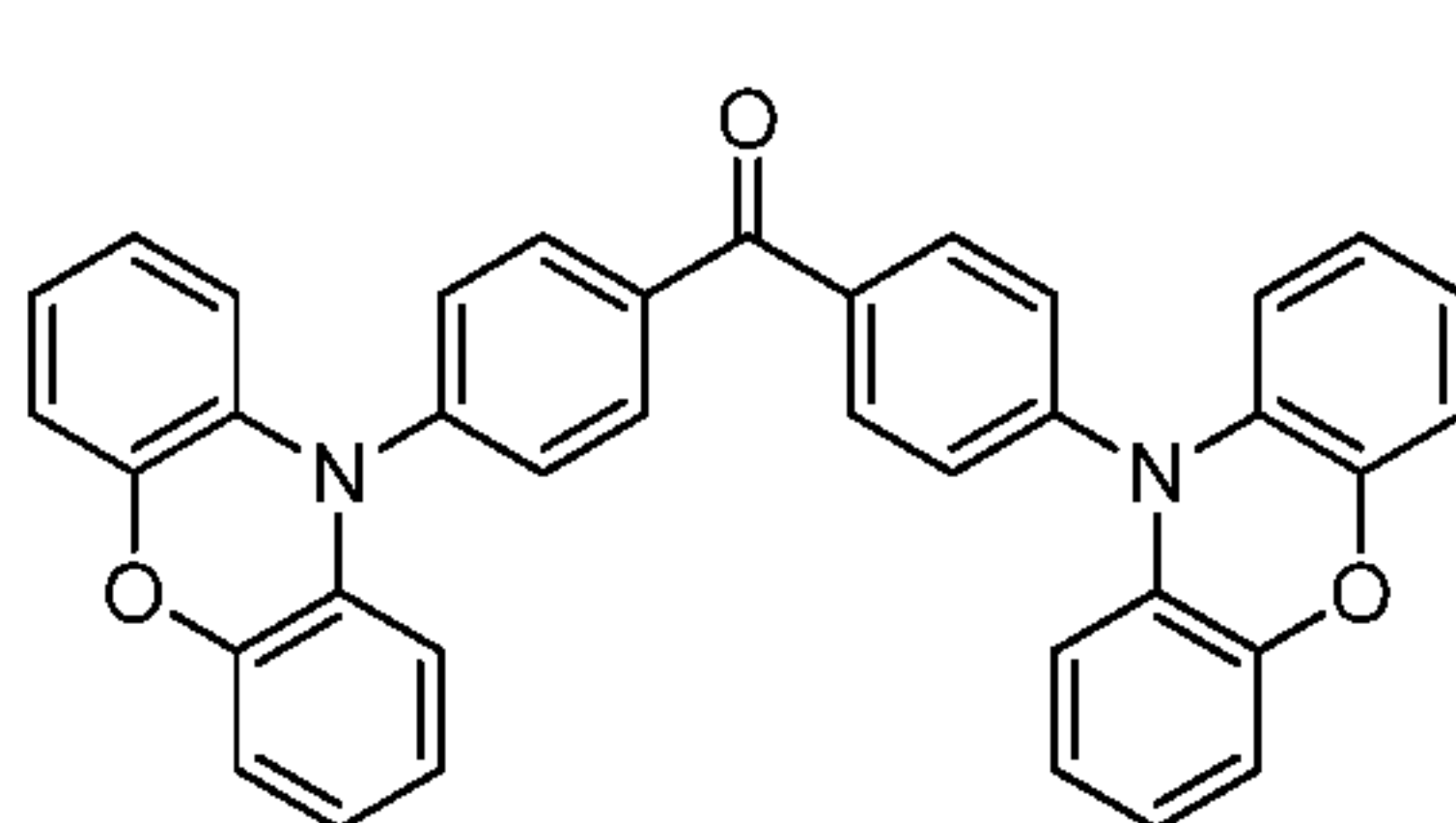
T-38



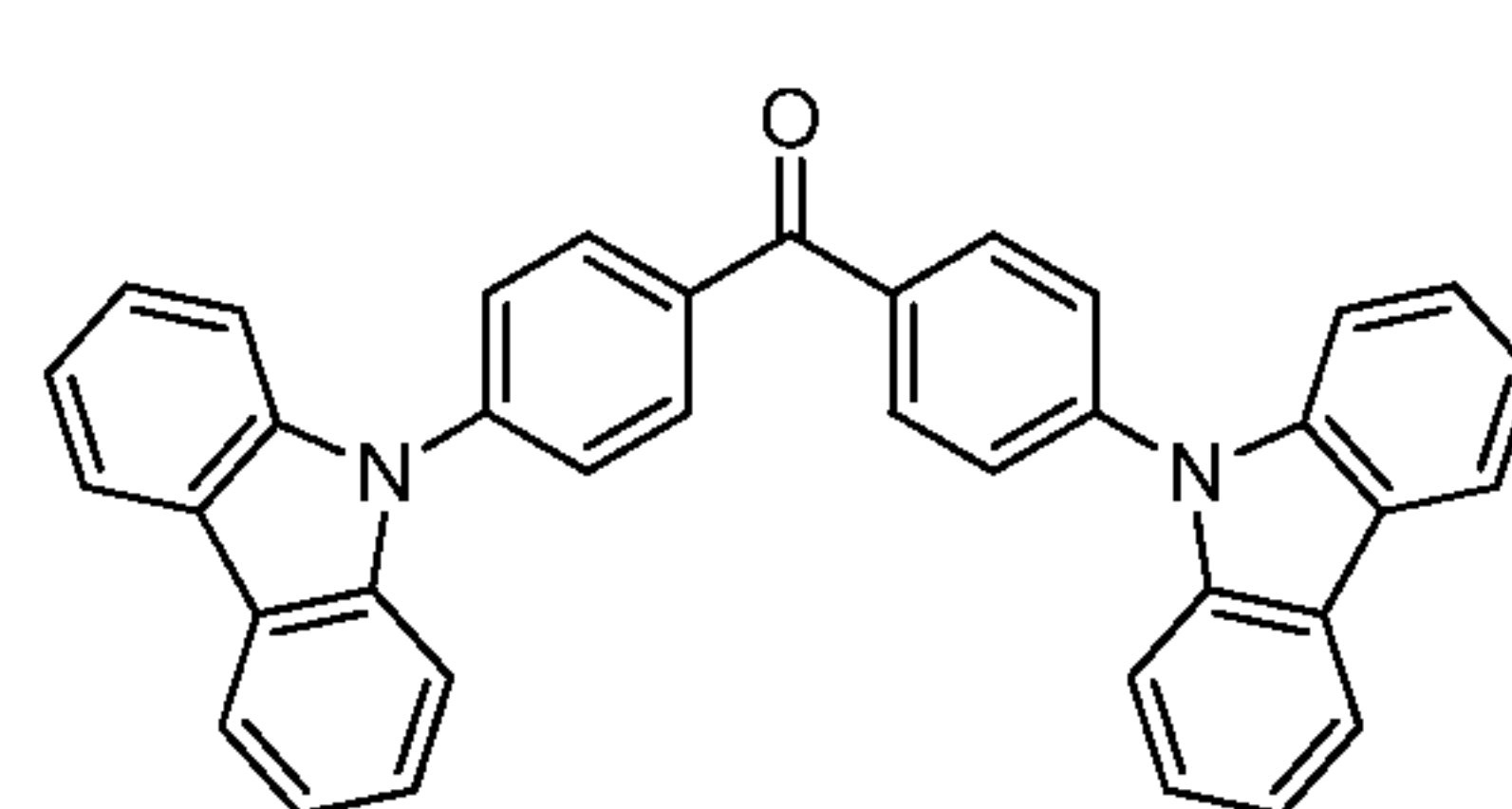
T-39



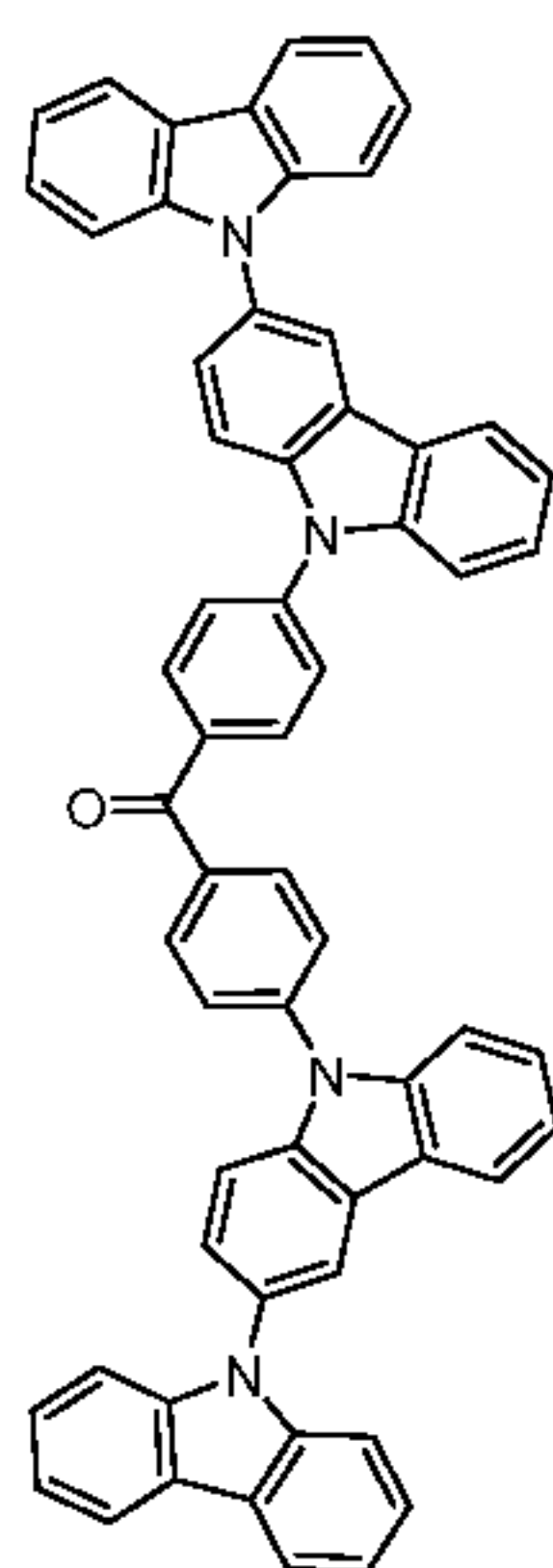
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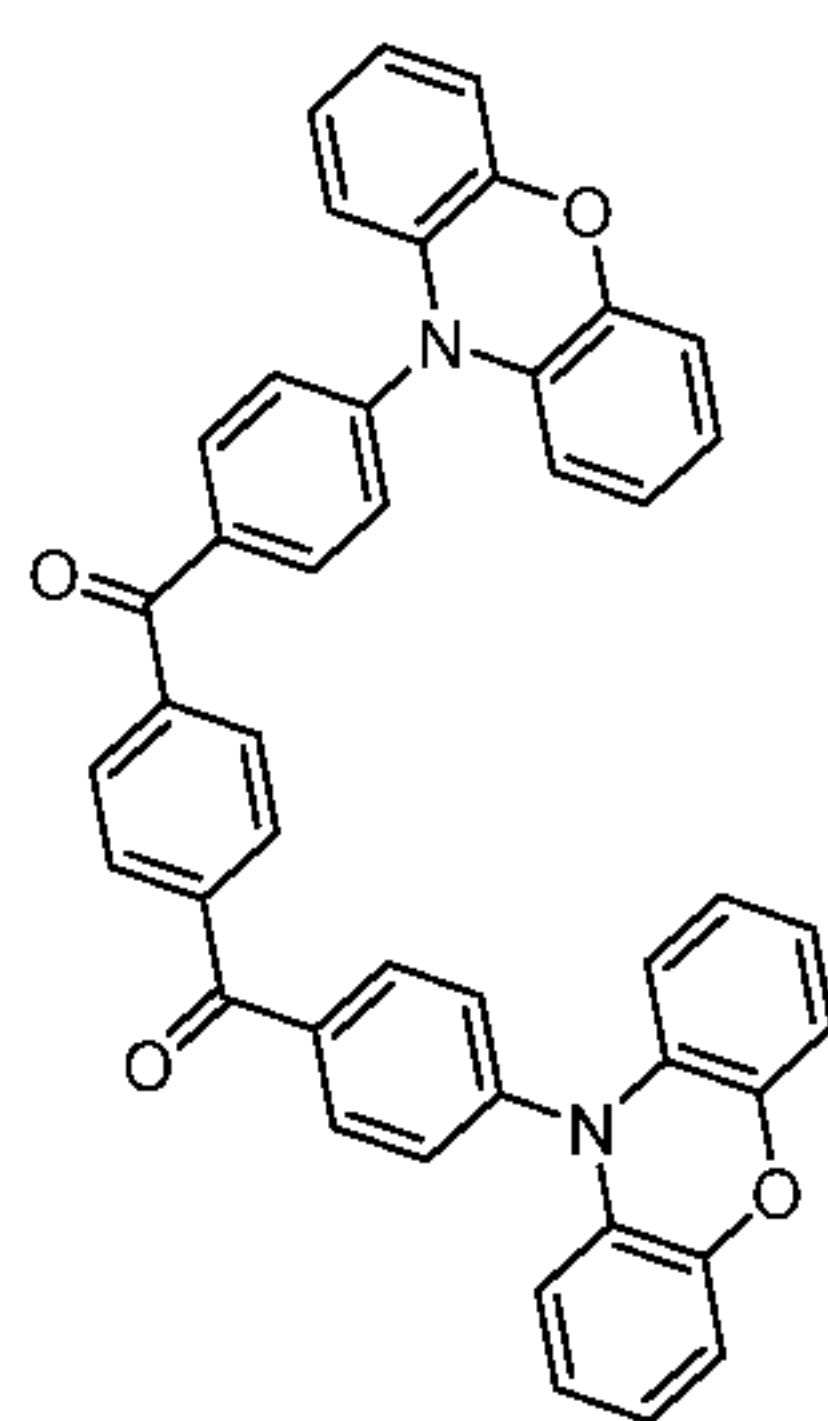
T-41



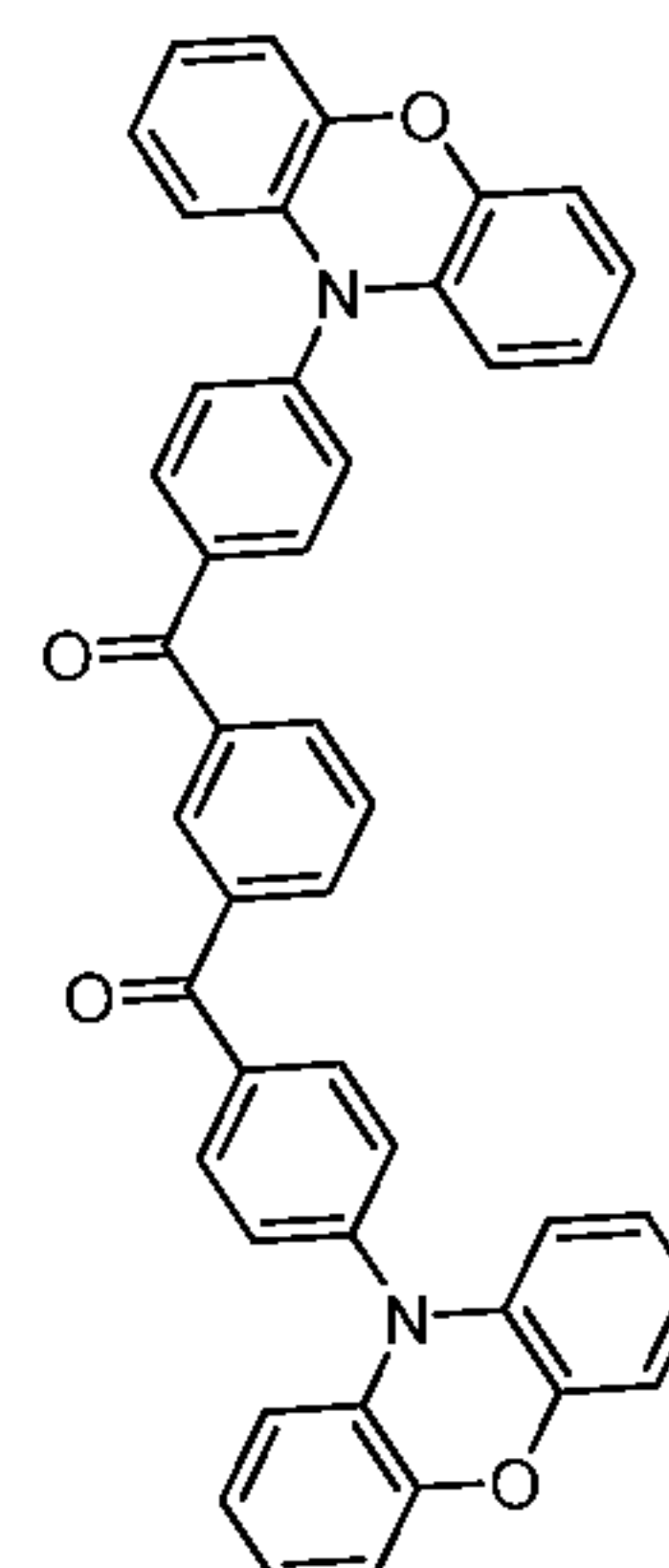
T-42



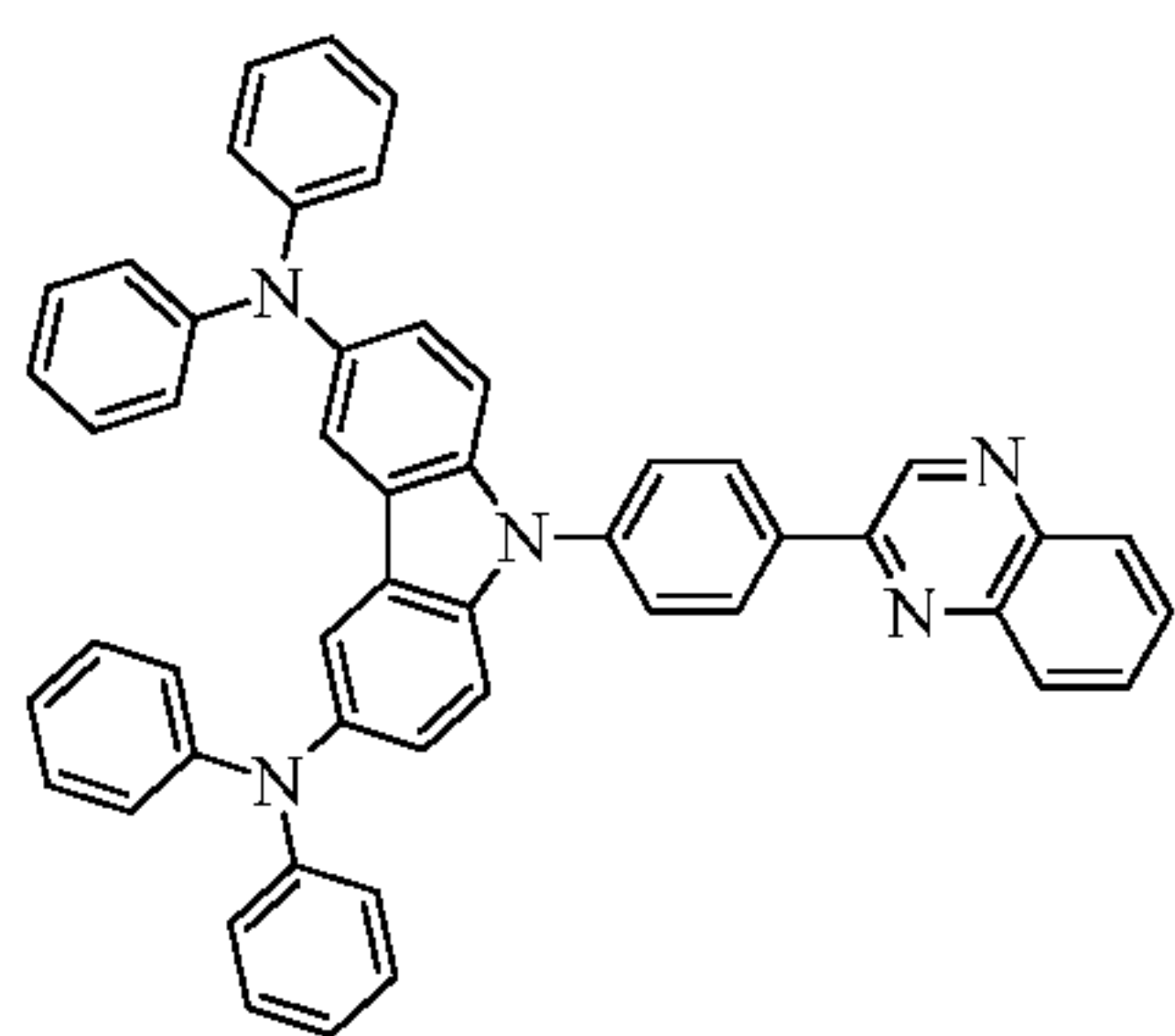
T-43



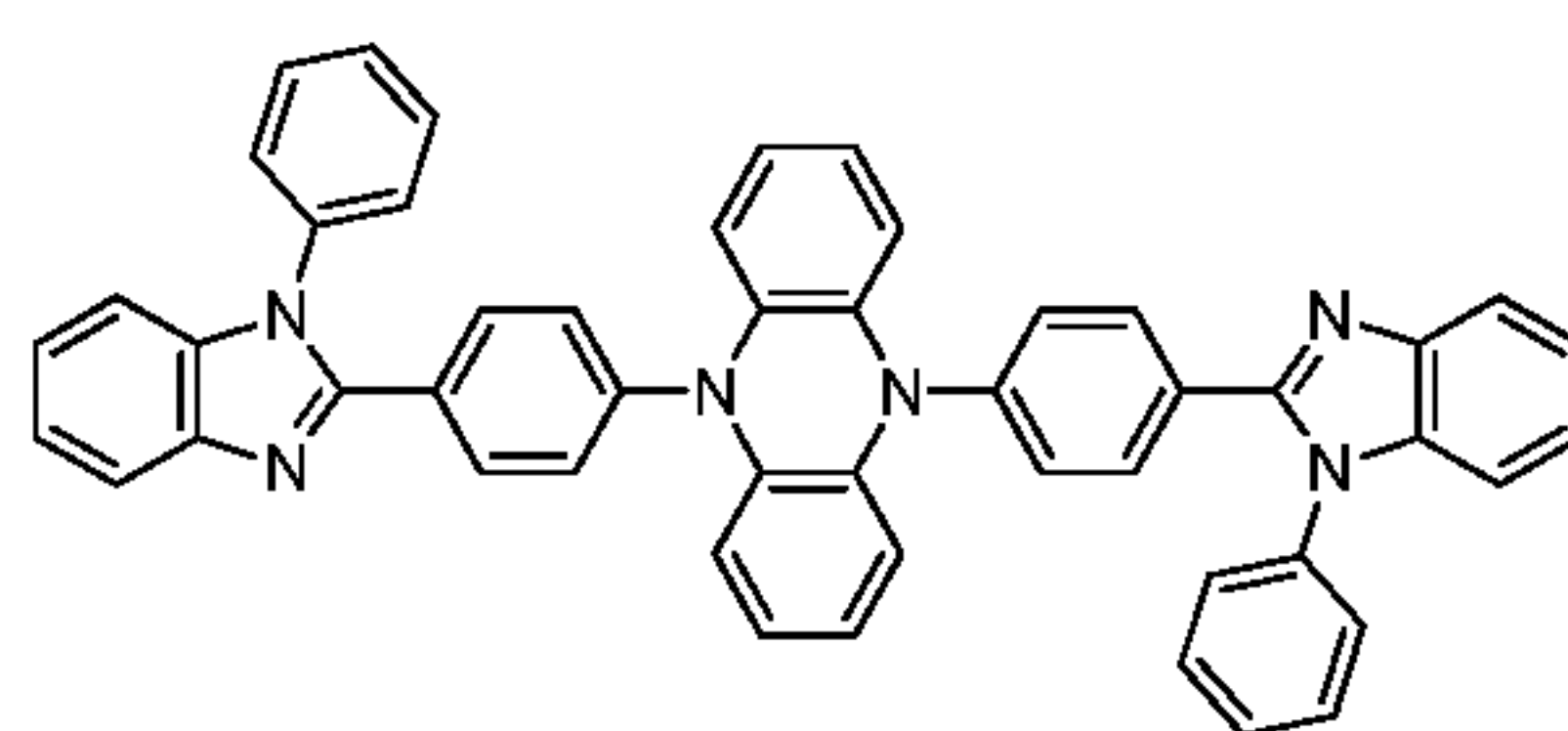
T-44



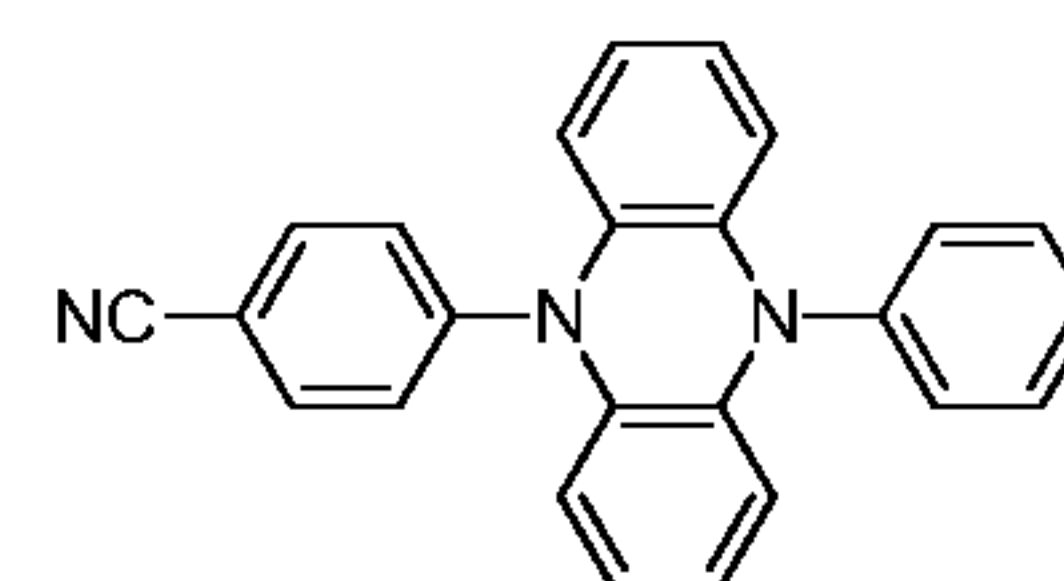
T-45



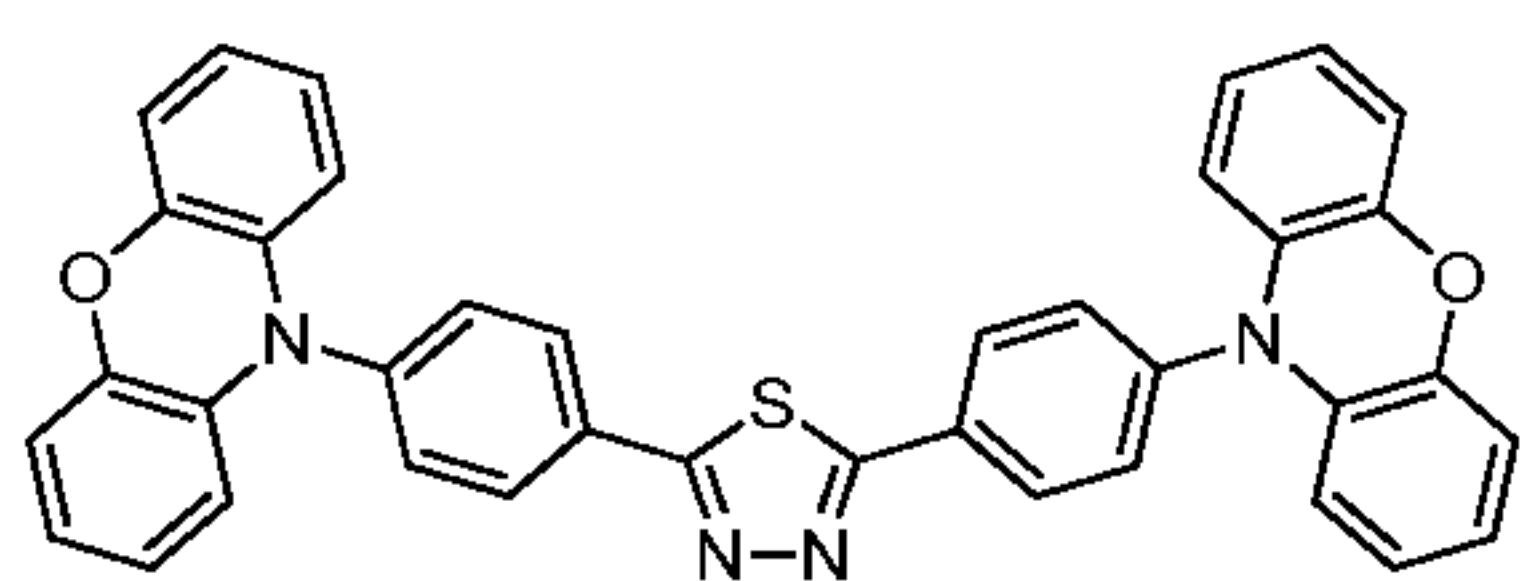
T-46



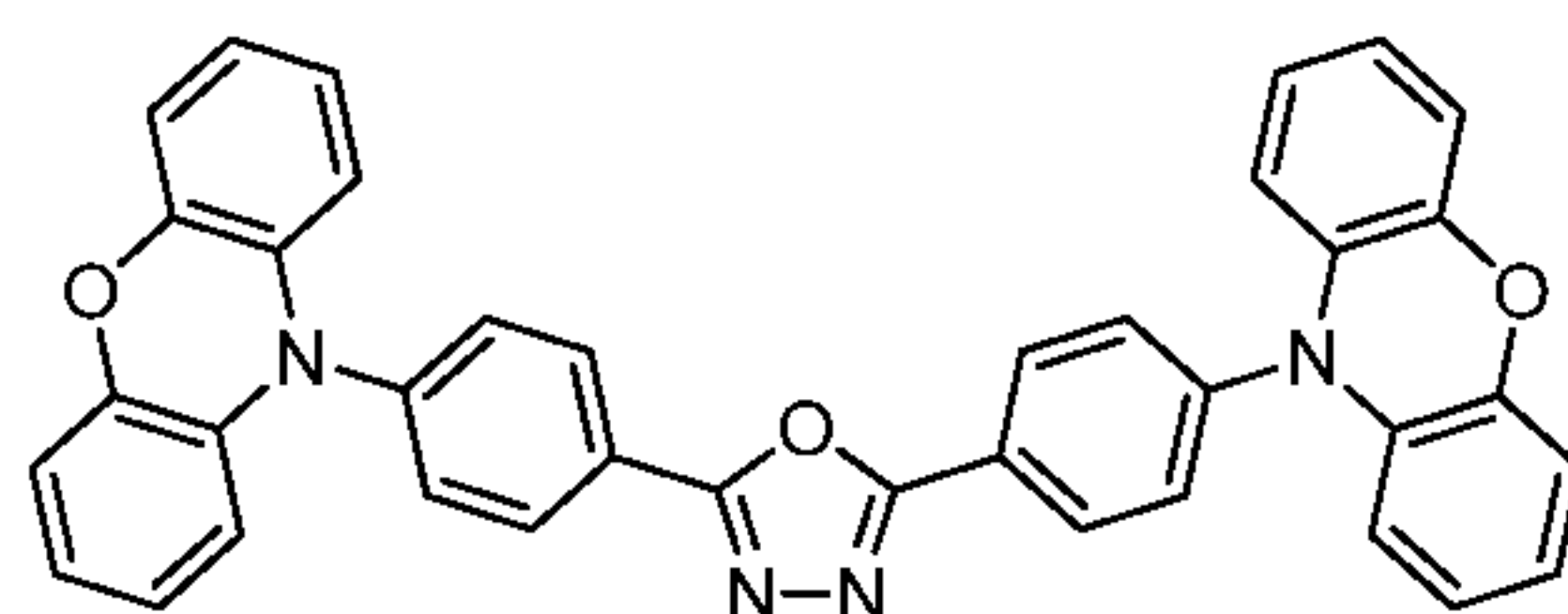
T-47



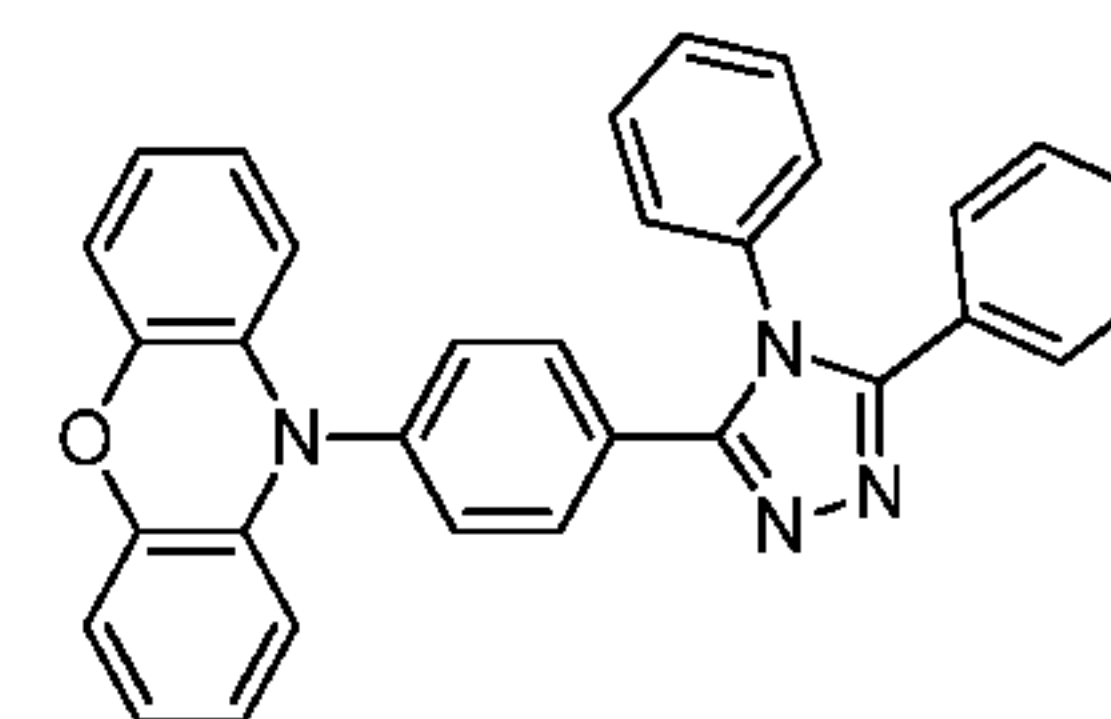
T-48



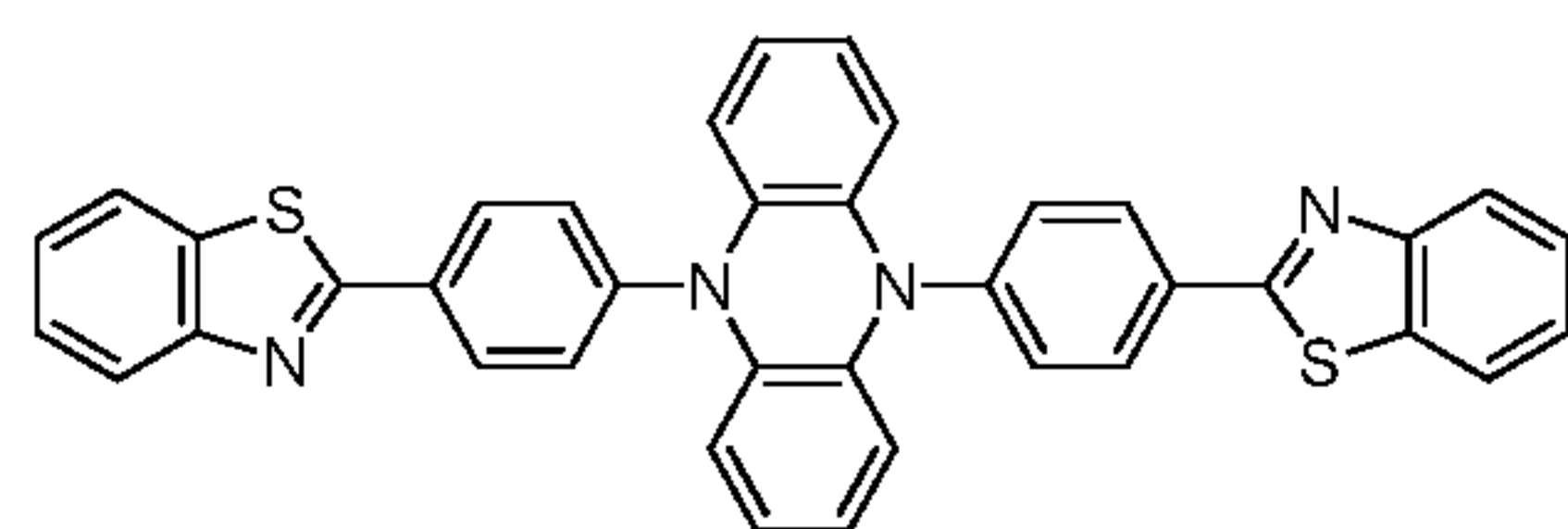
T-49



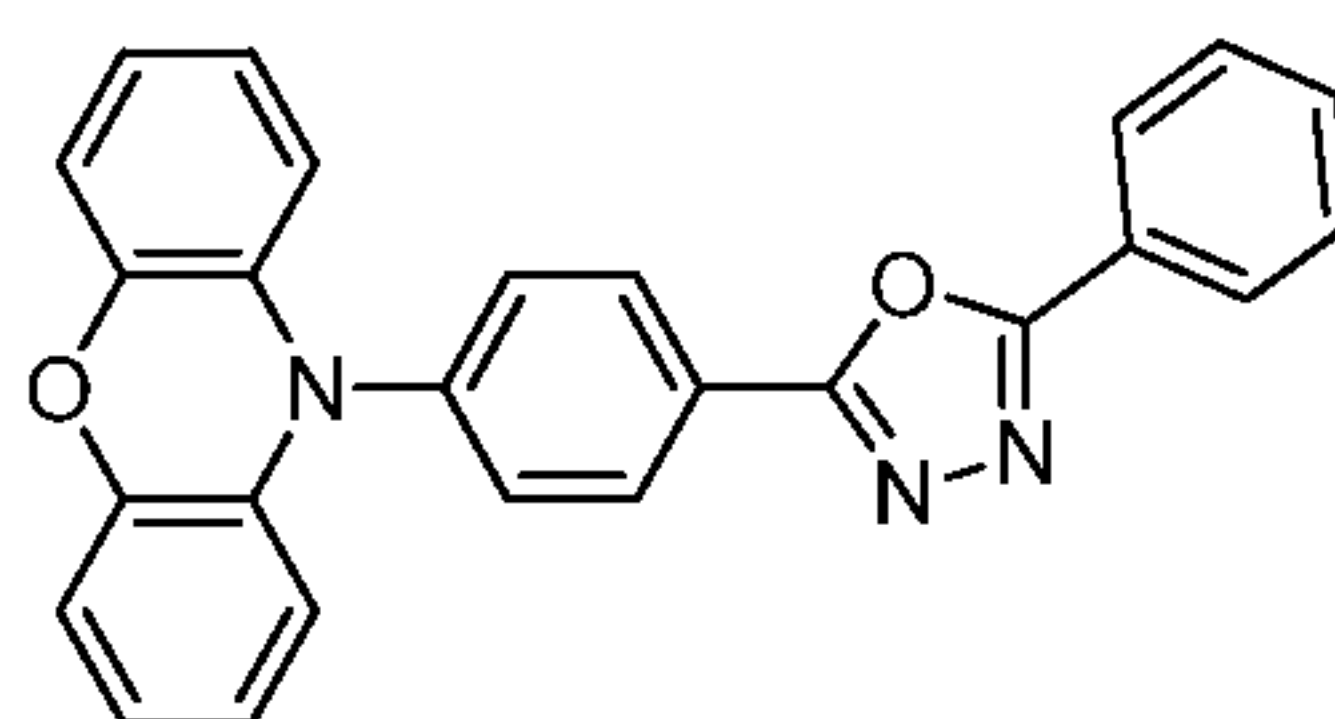
T-50



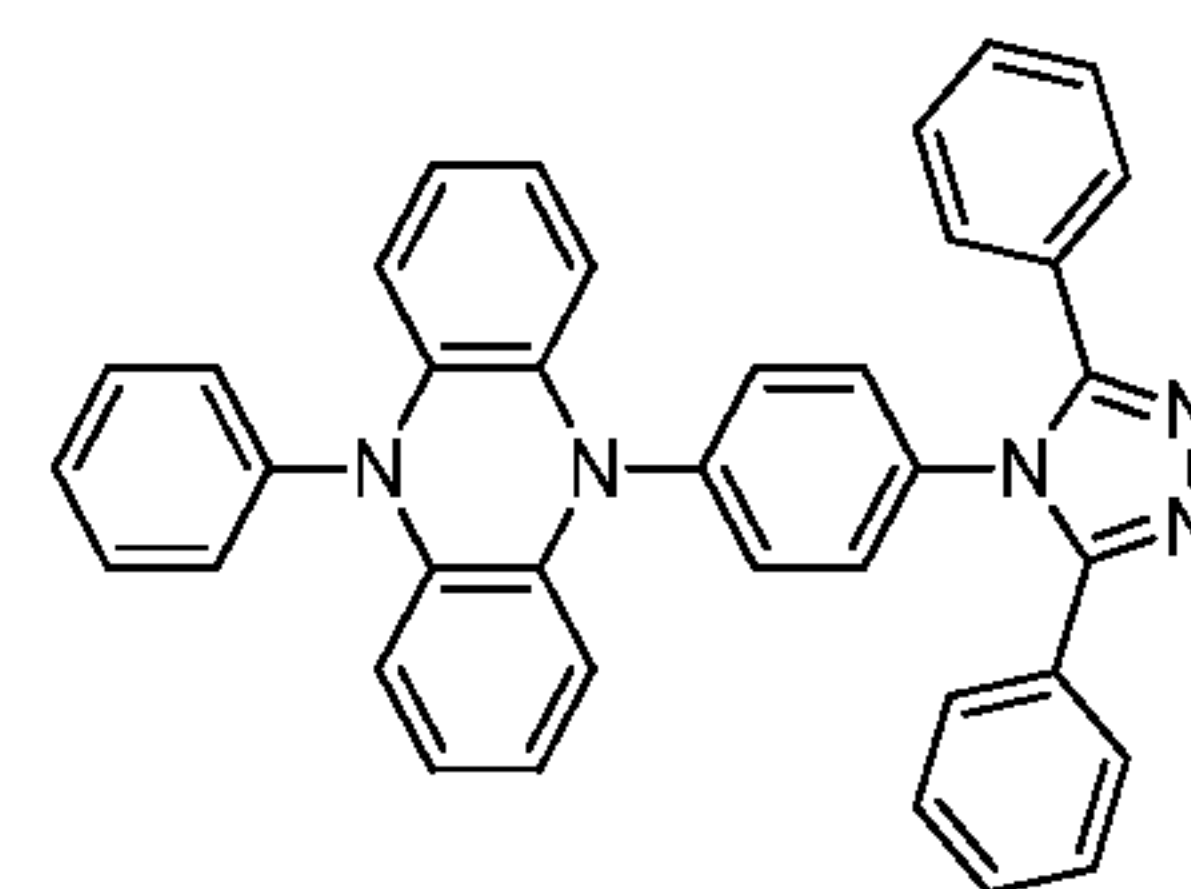
T-51



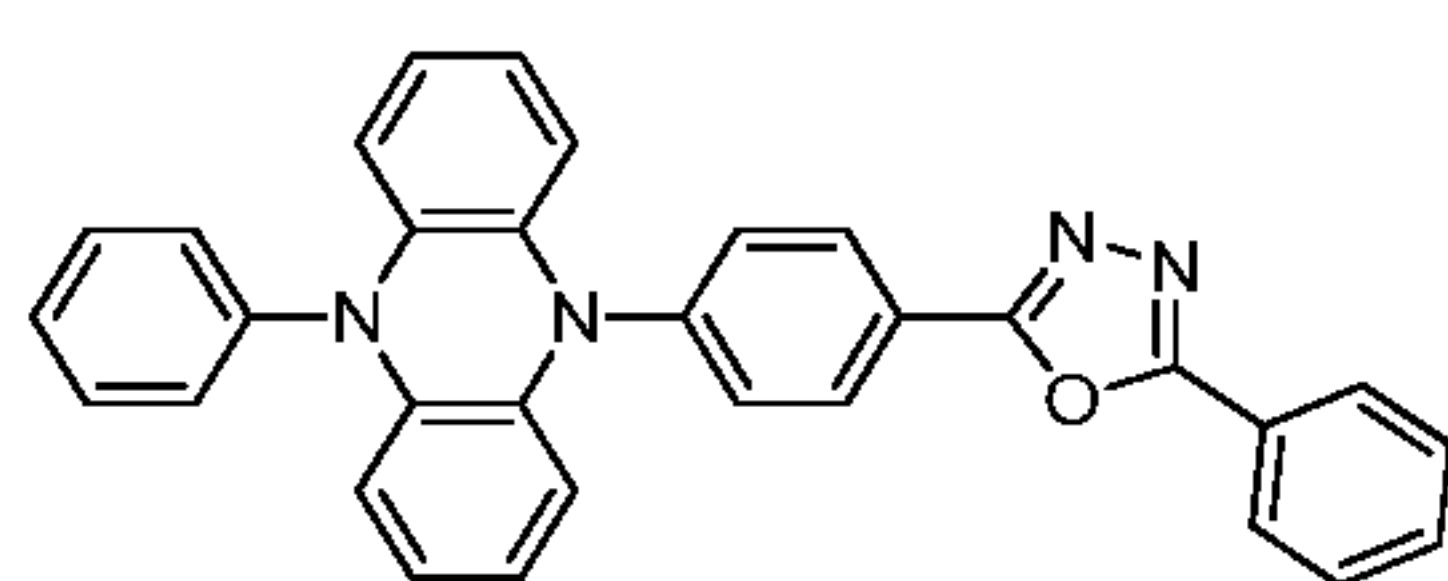
T-52



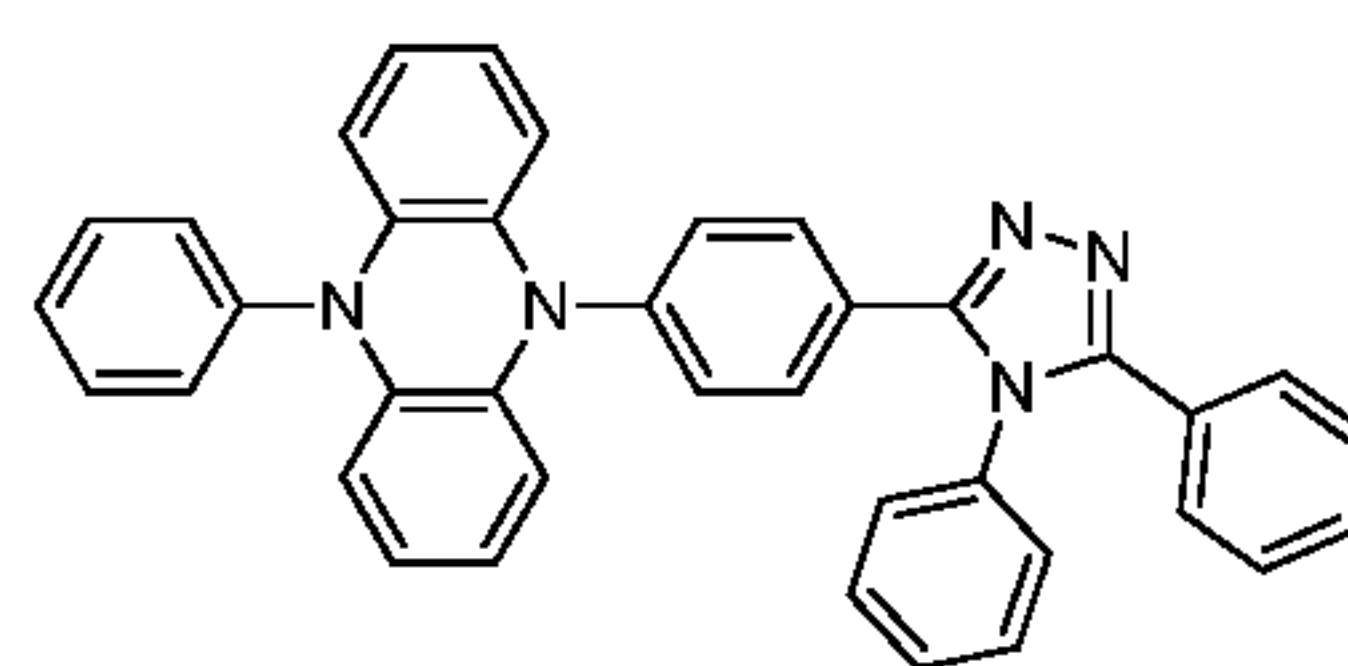
T-53



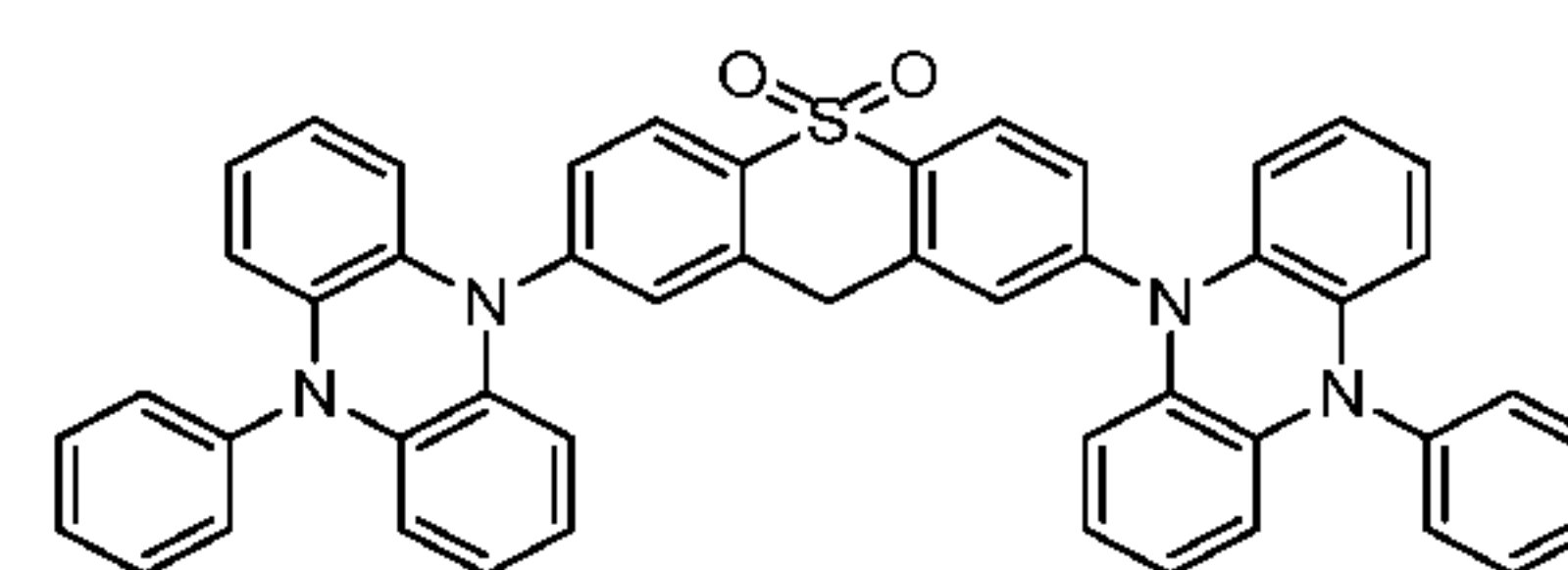
T-54



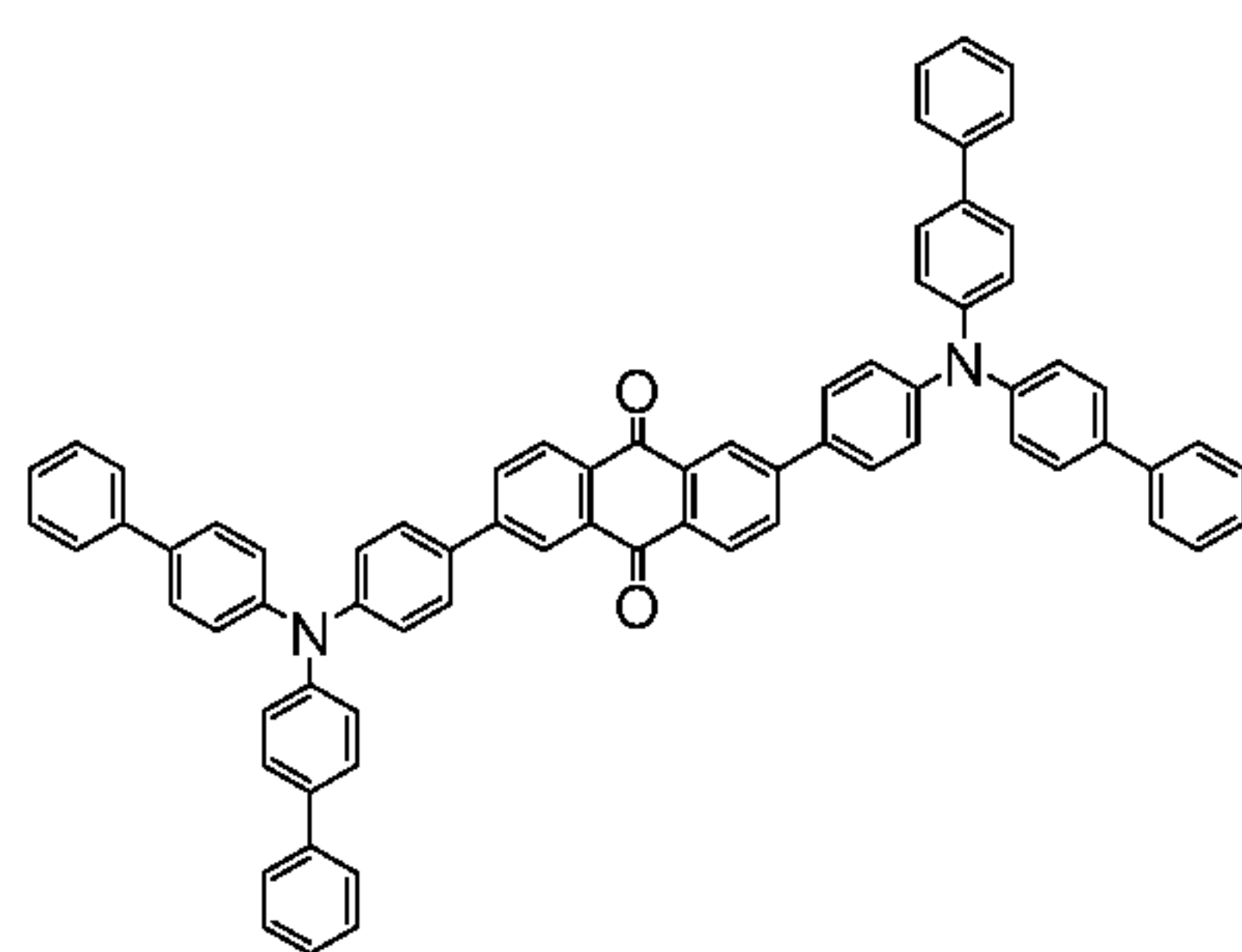
T-55



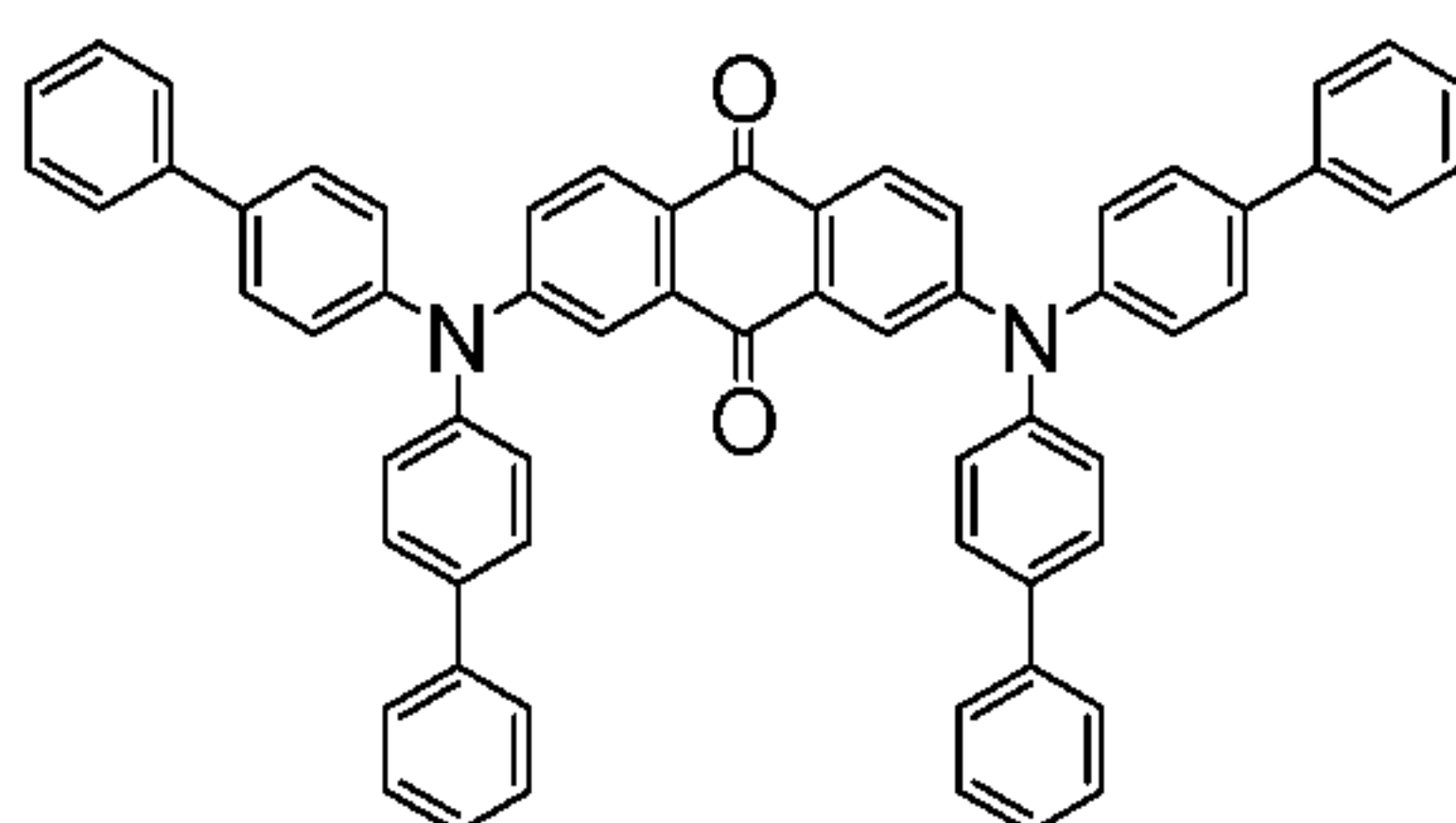
T-56



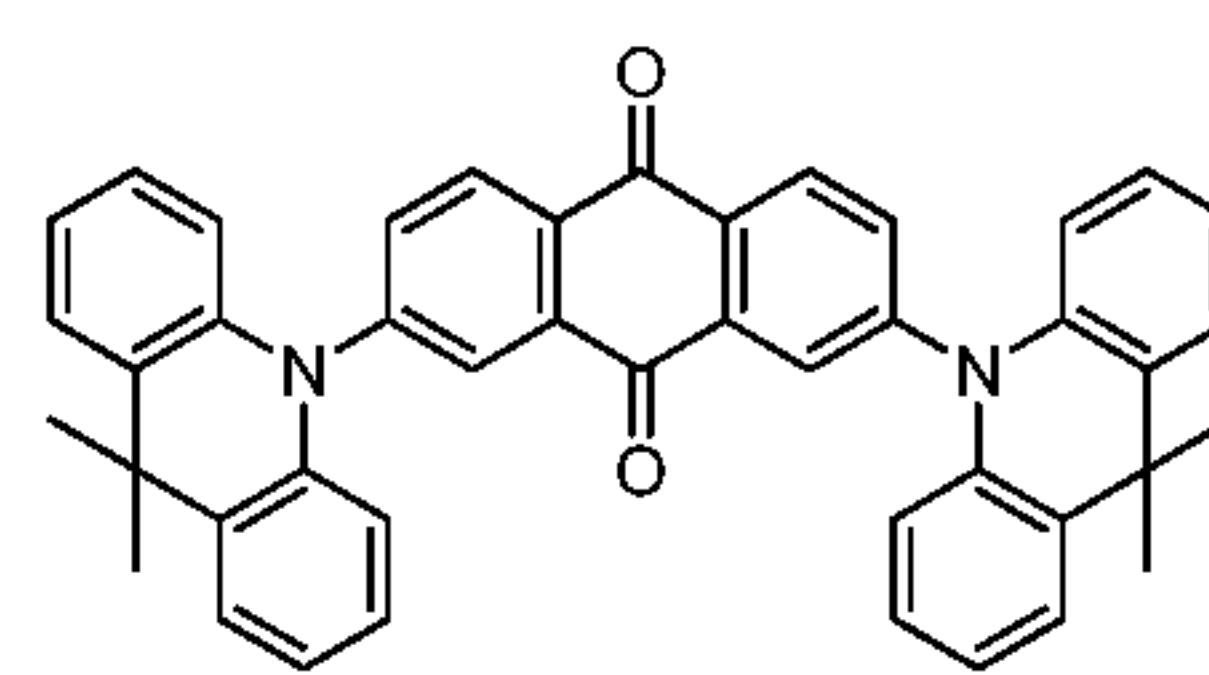
T-57



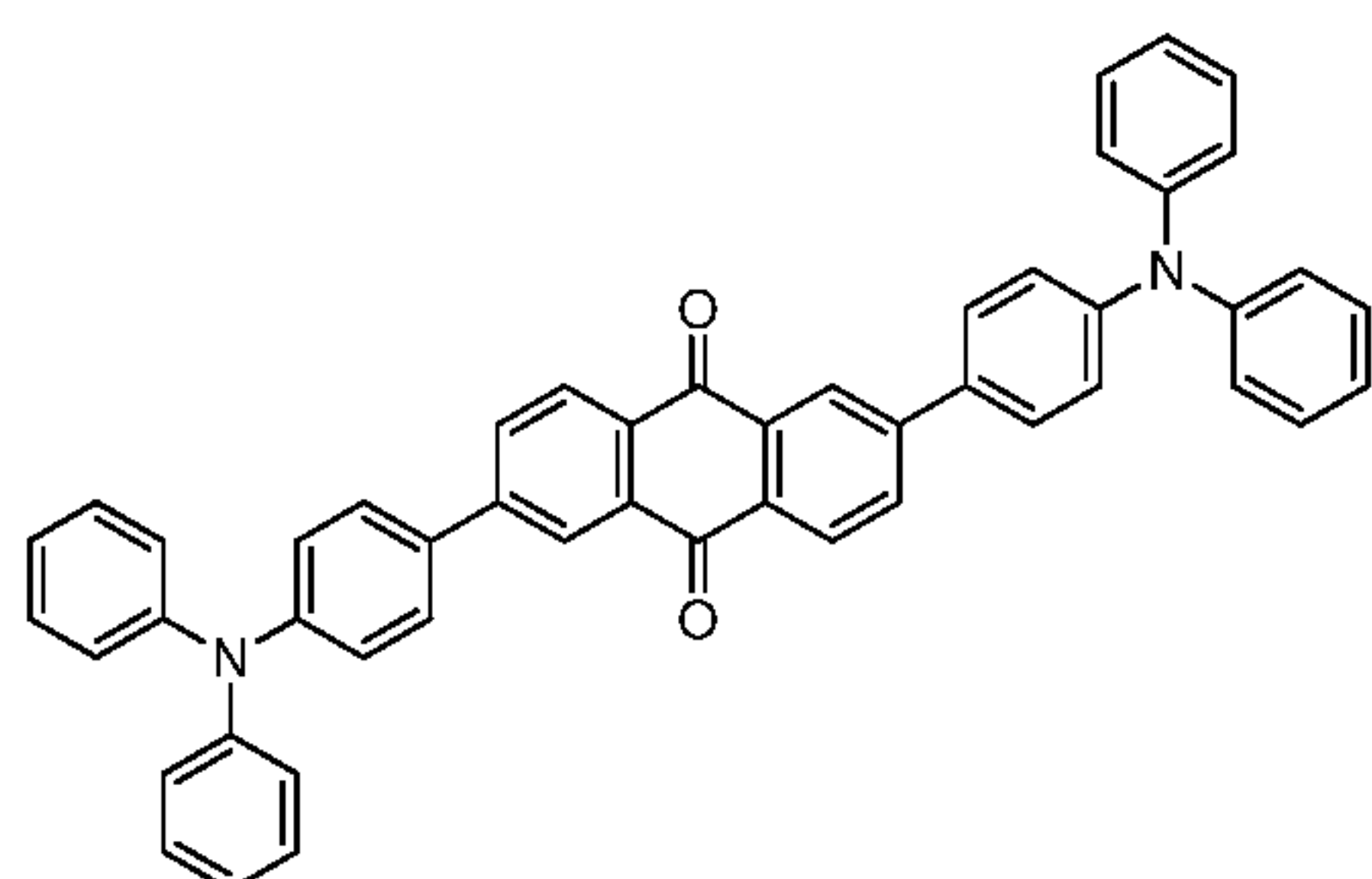
T-58



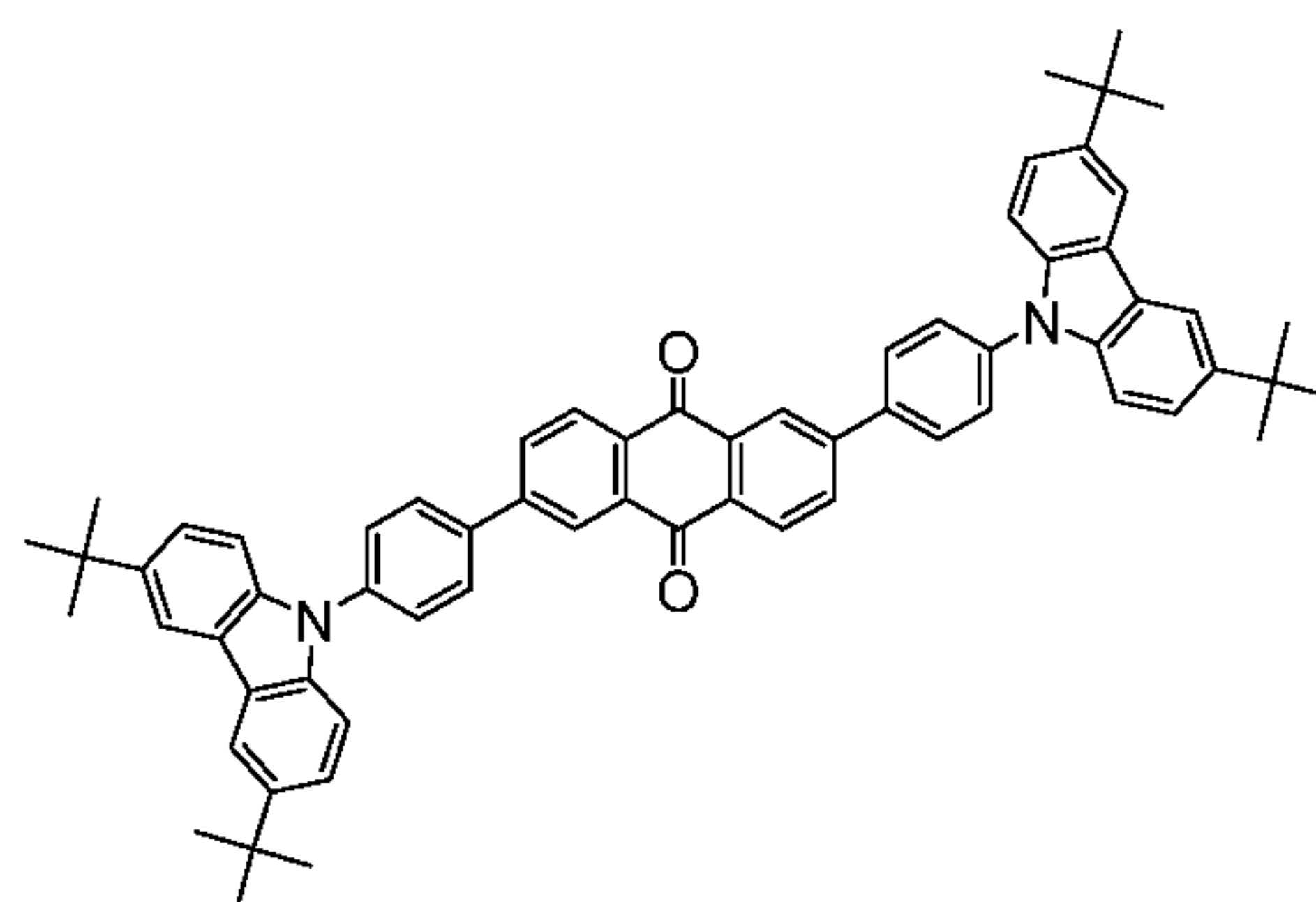
T-59



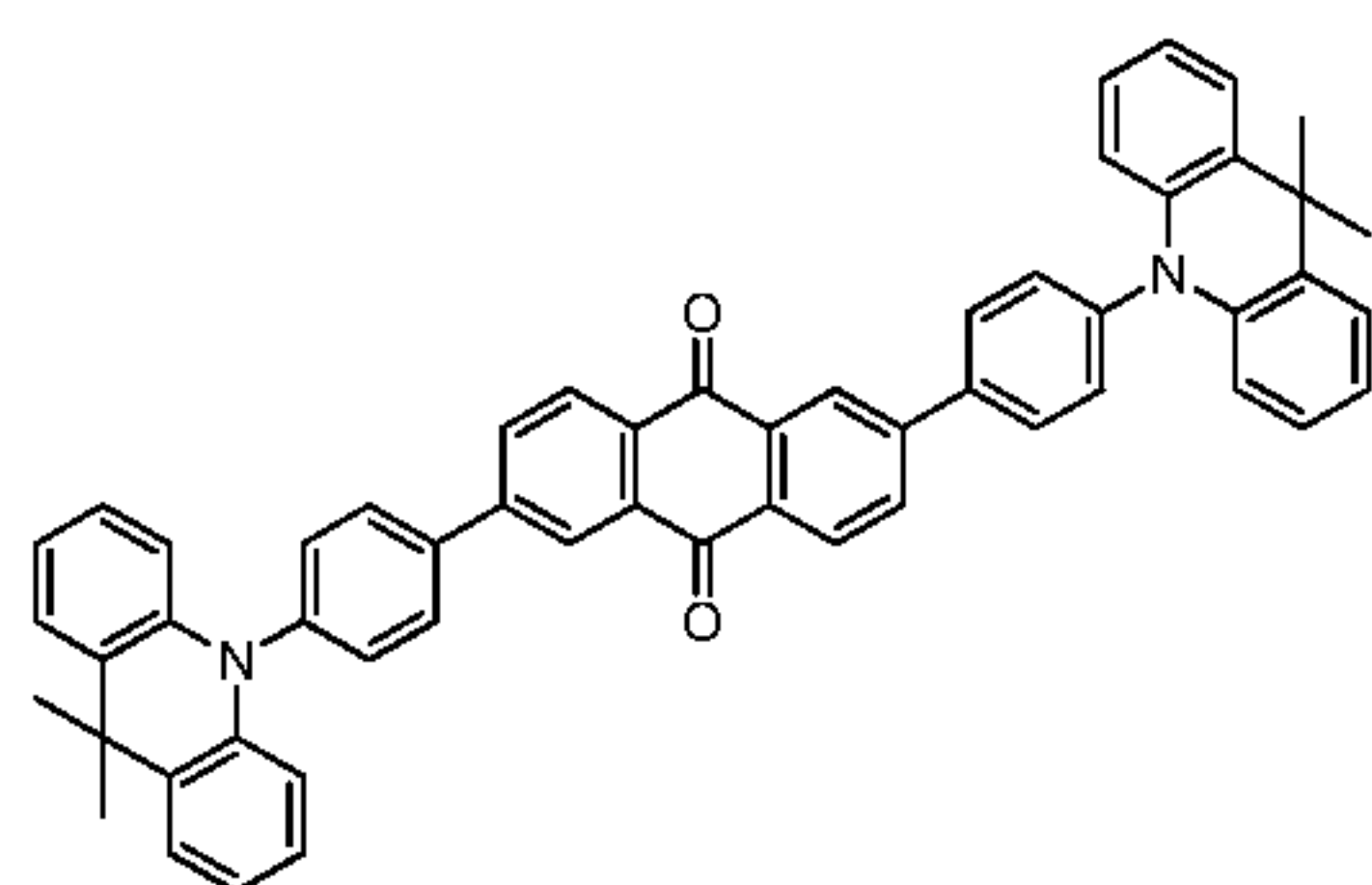
T-60



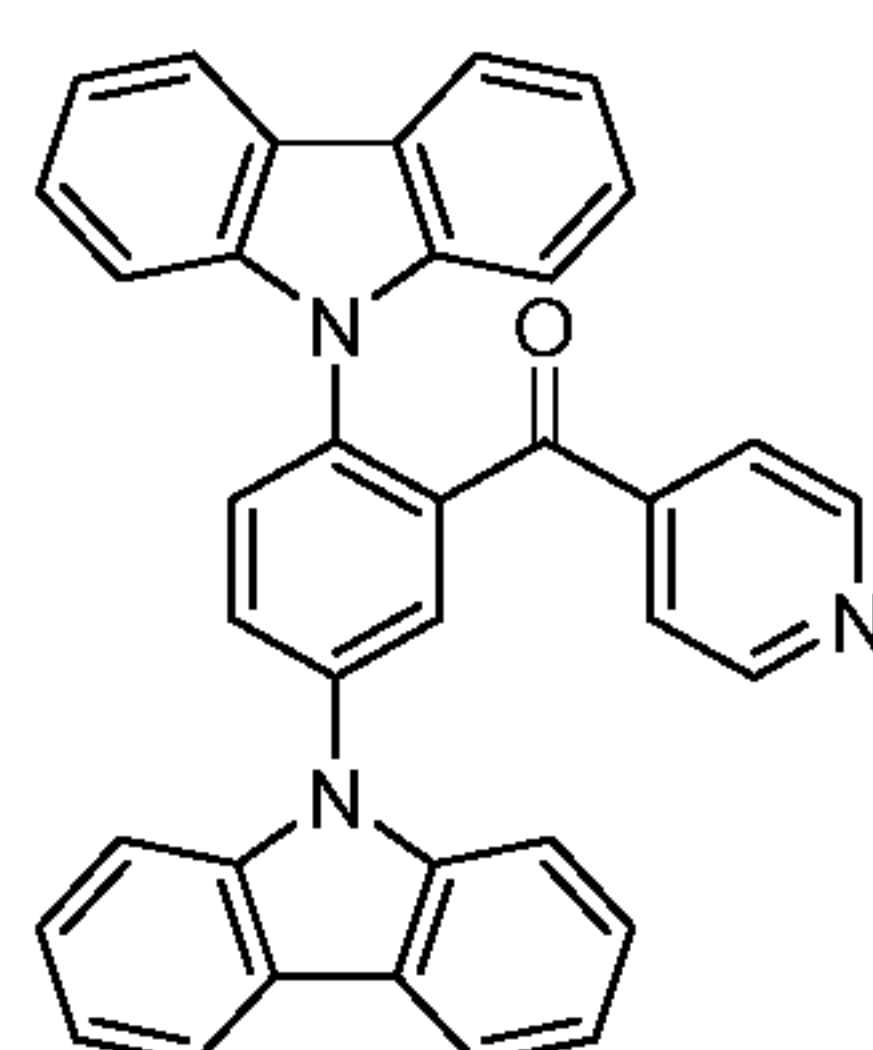
T-61



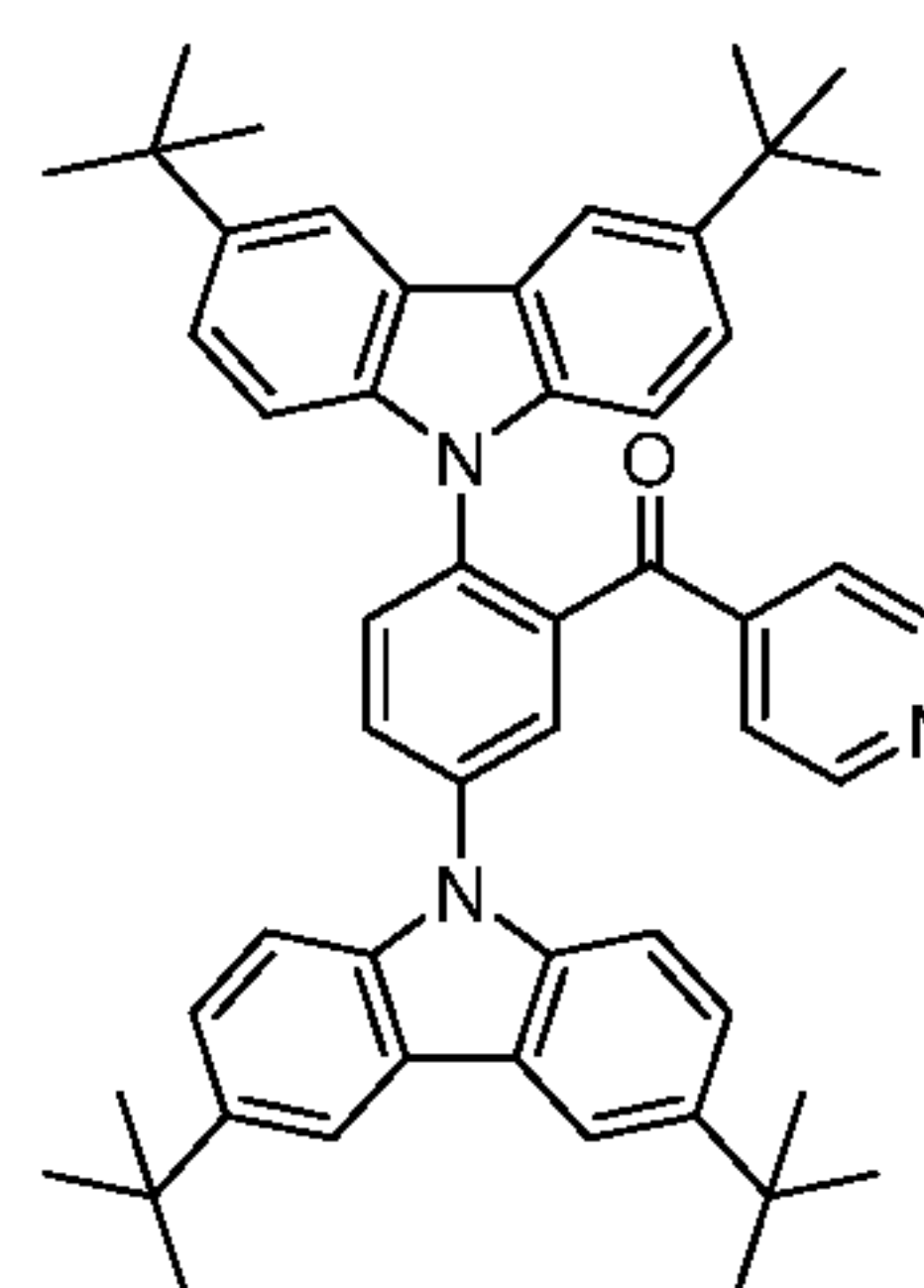
T-62



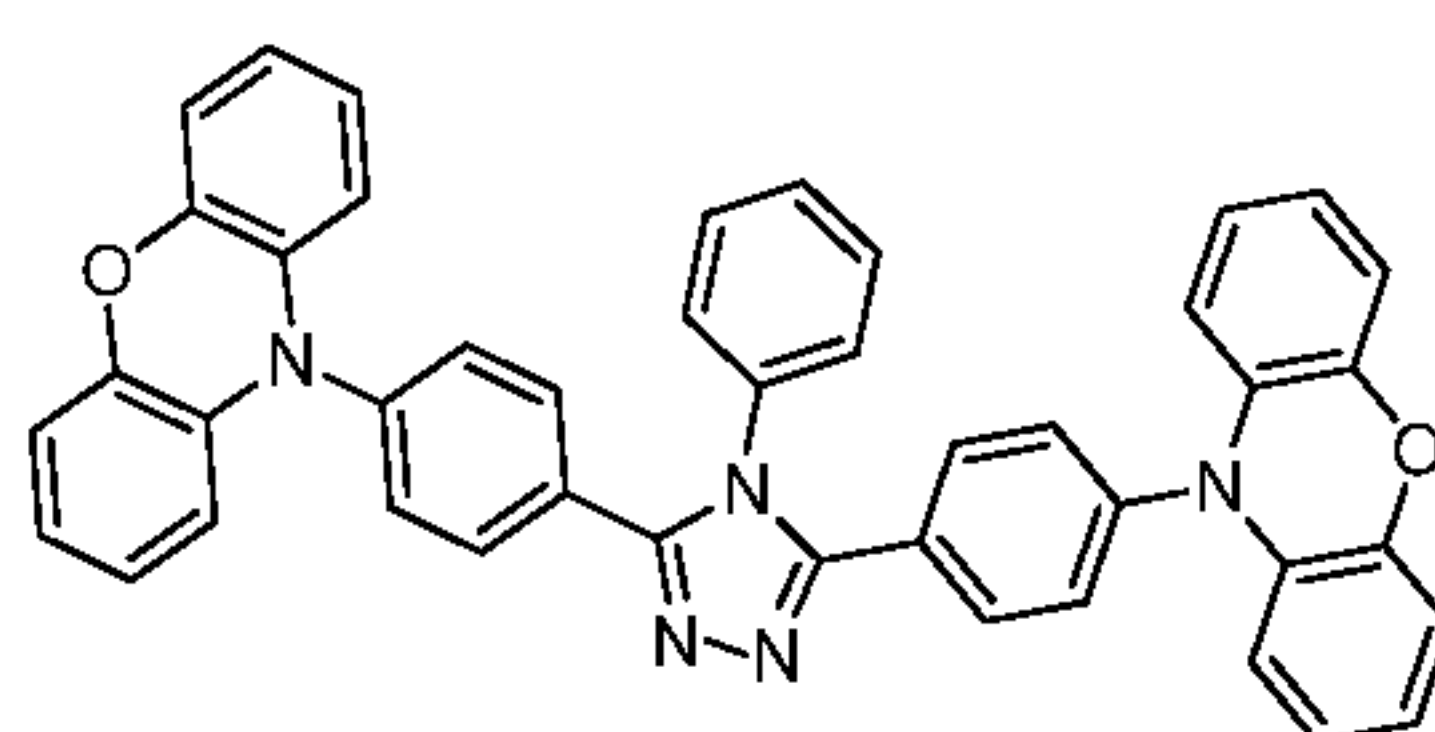
T-63



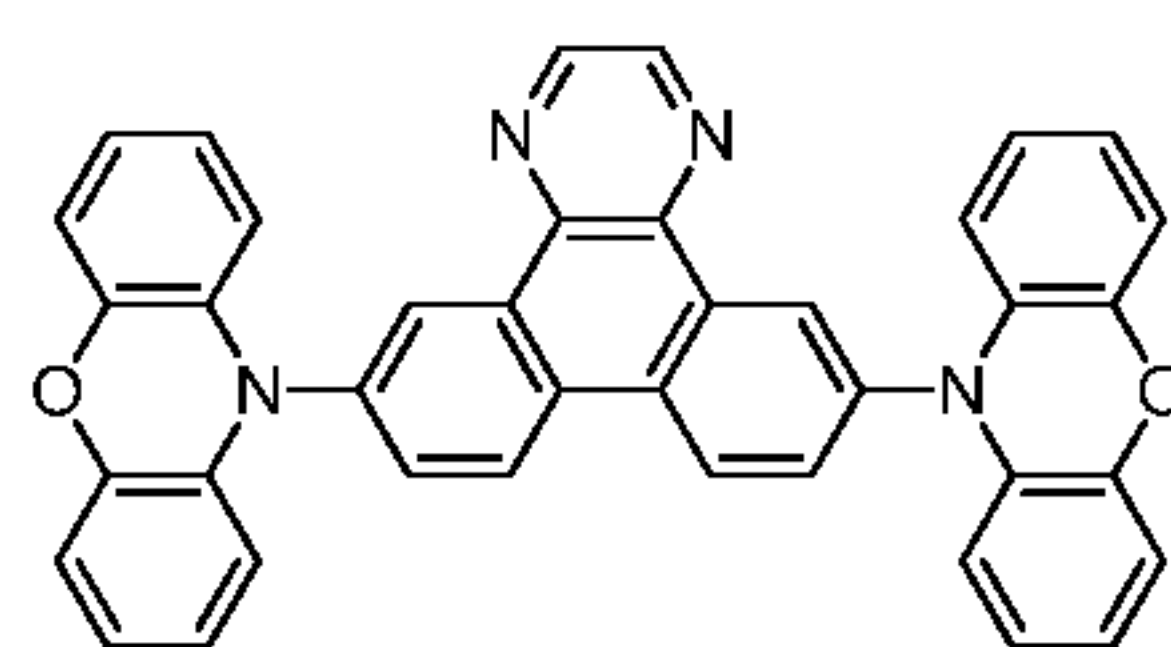
T-64



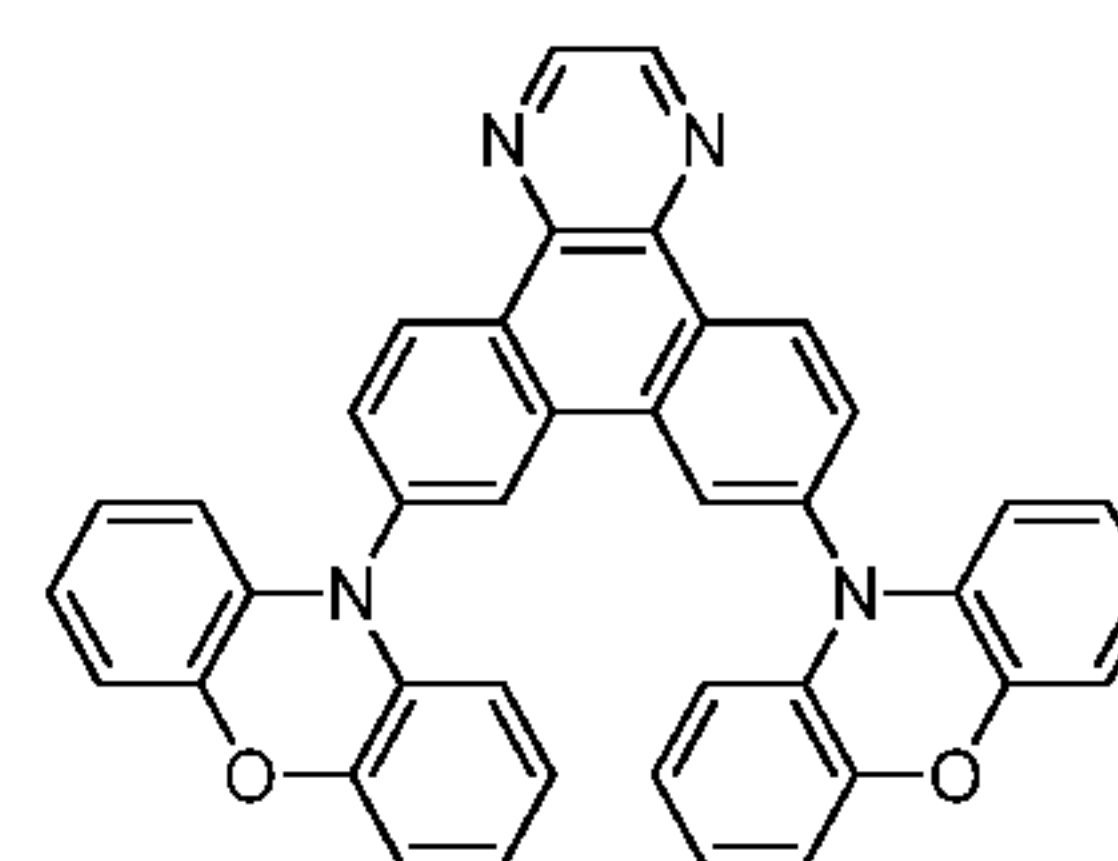
T-65



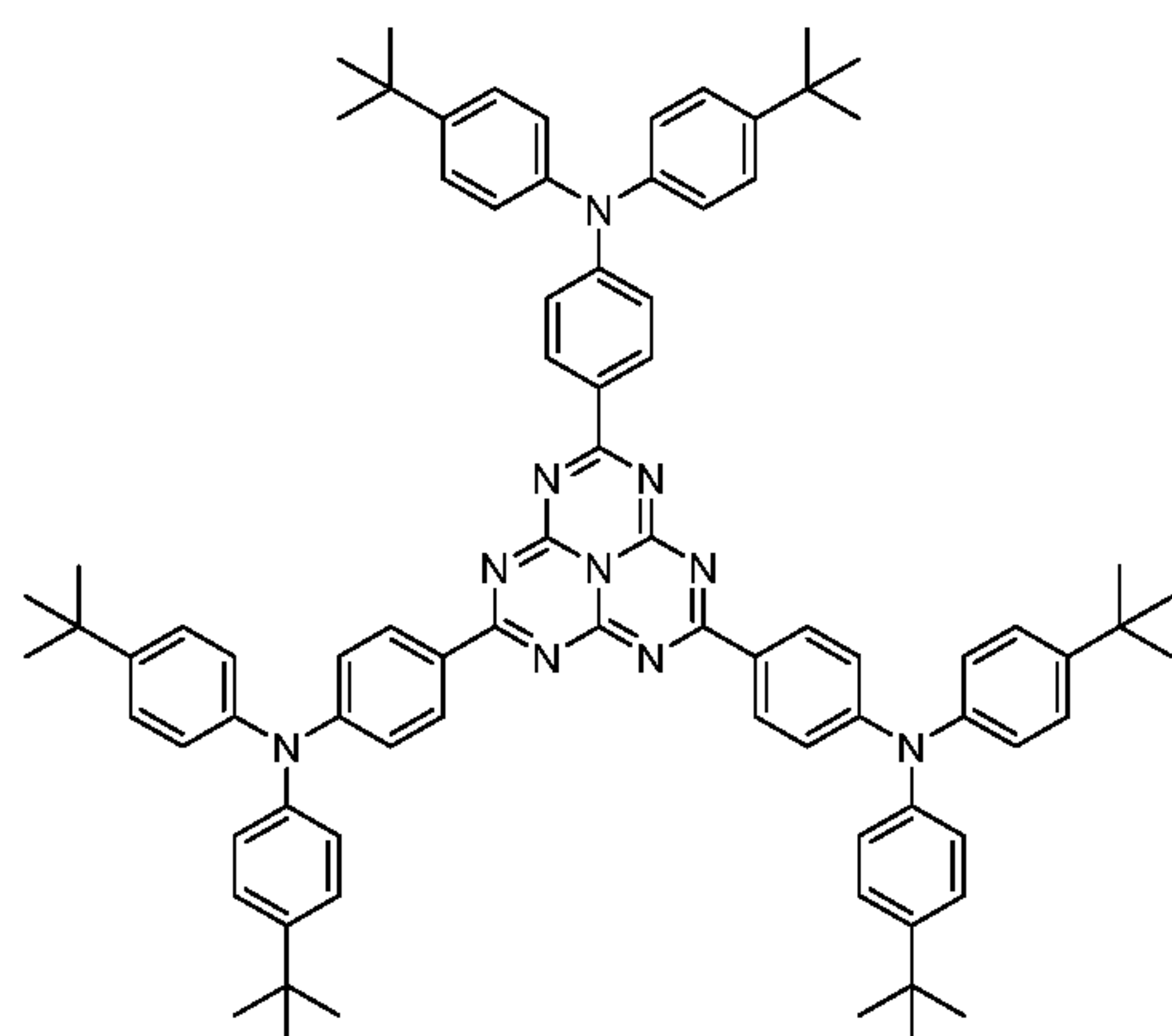
T-66



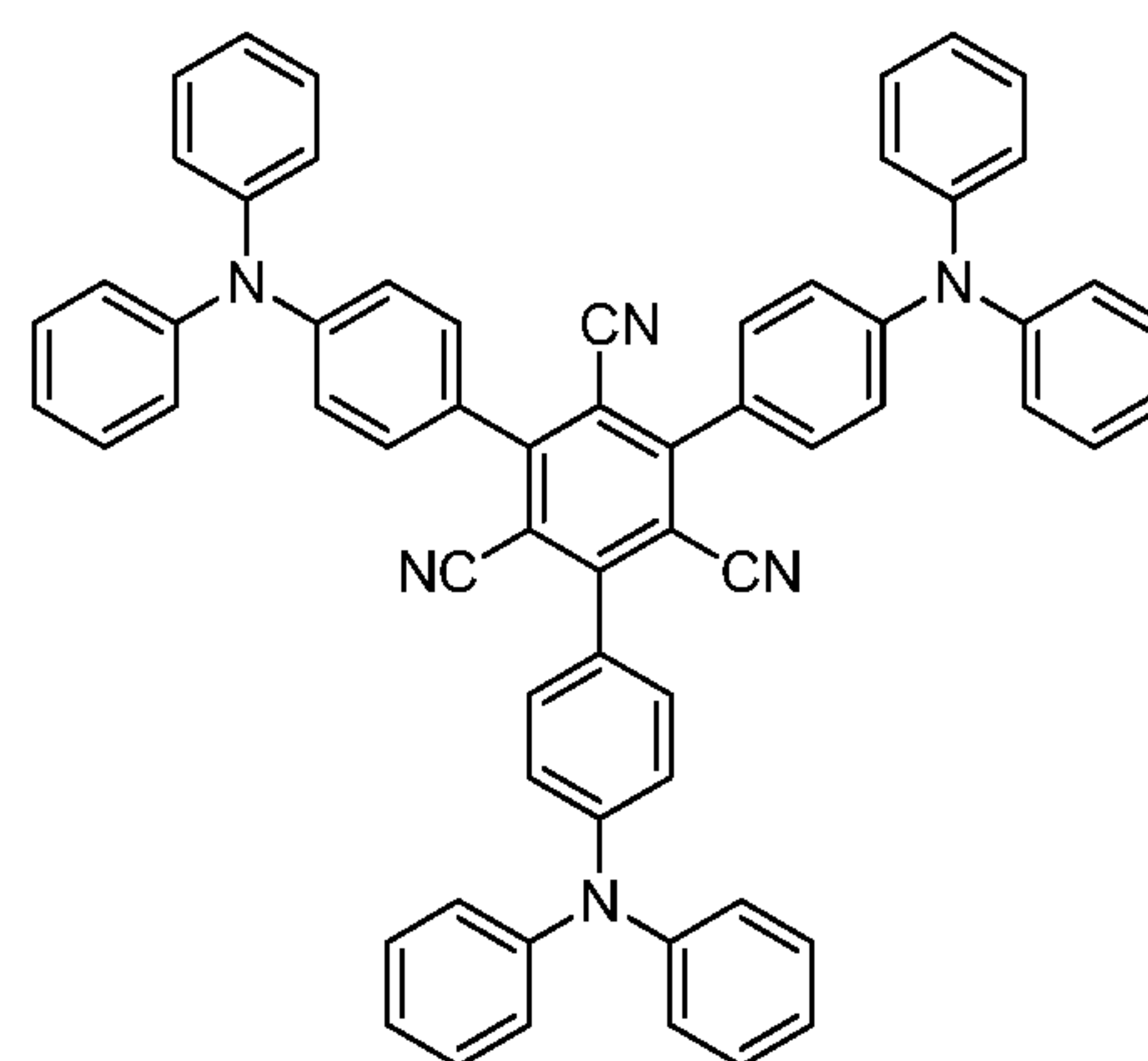
T-67



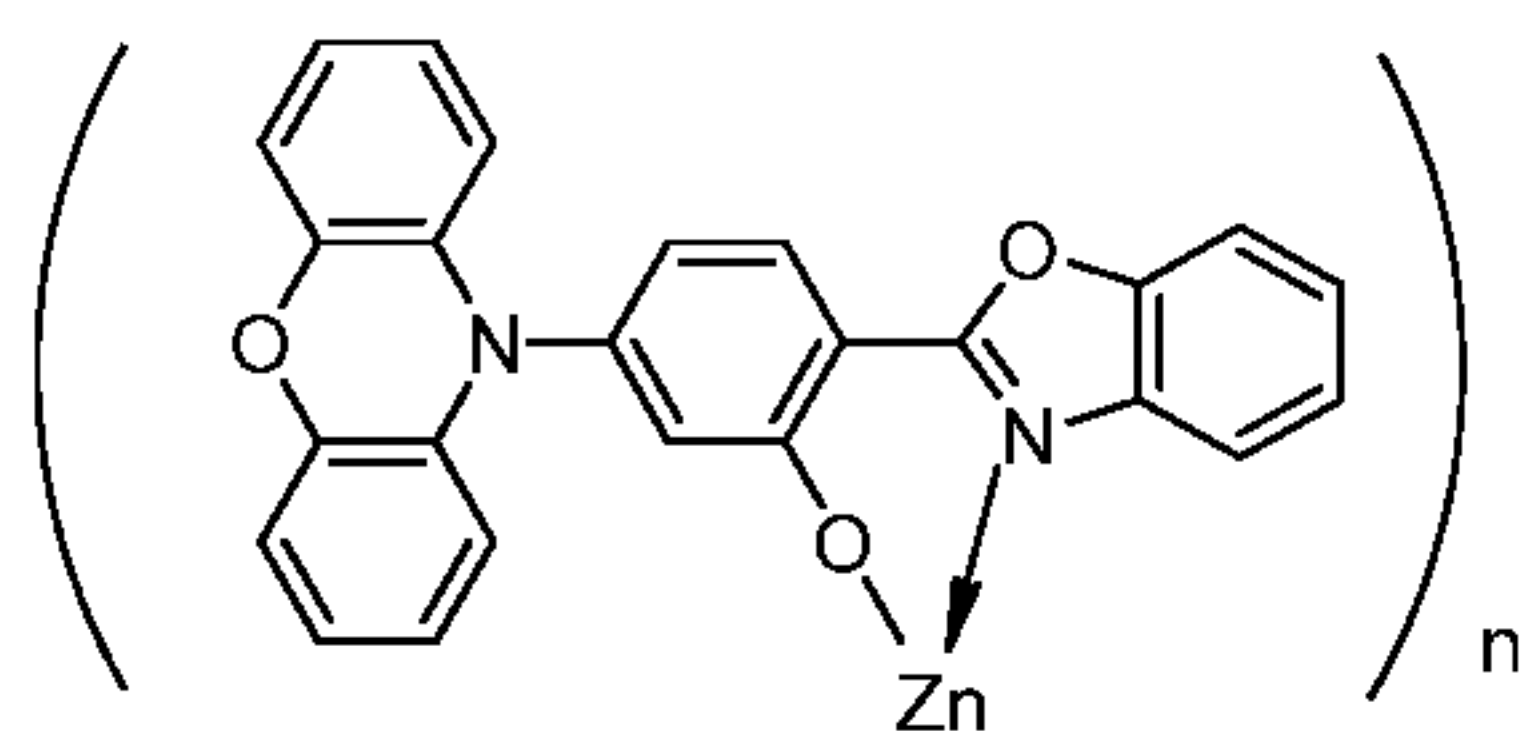
T-68



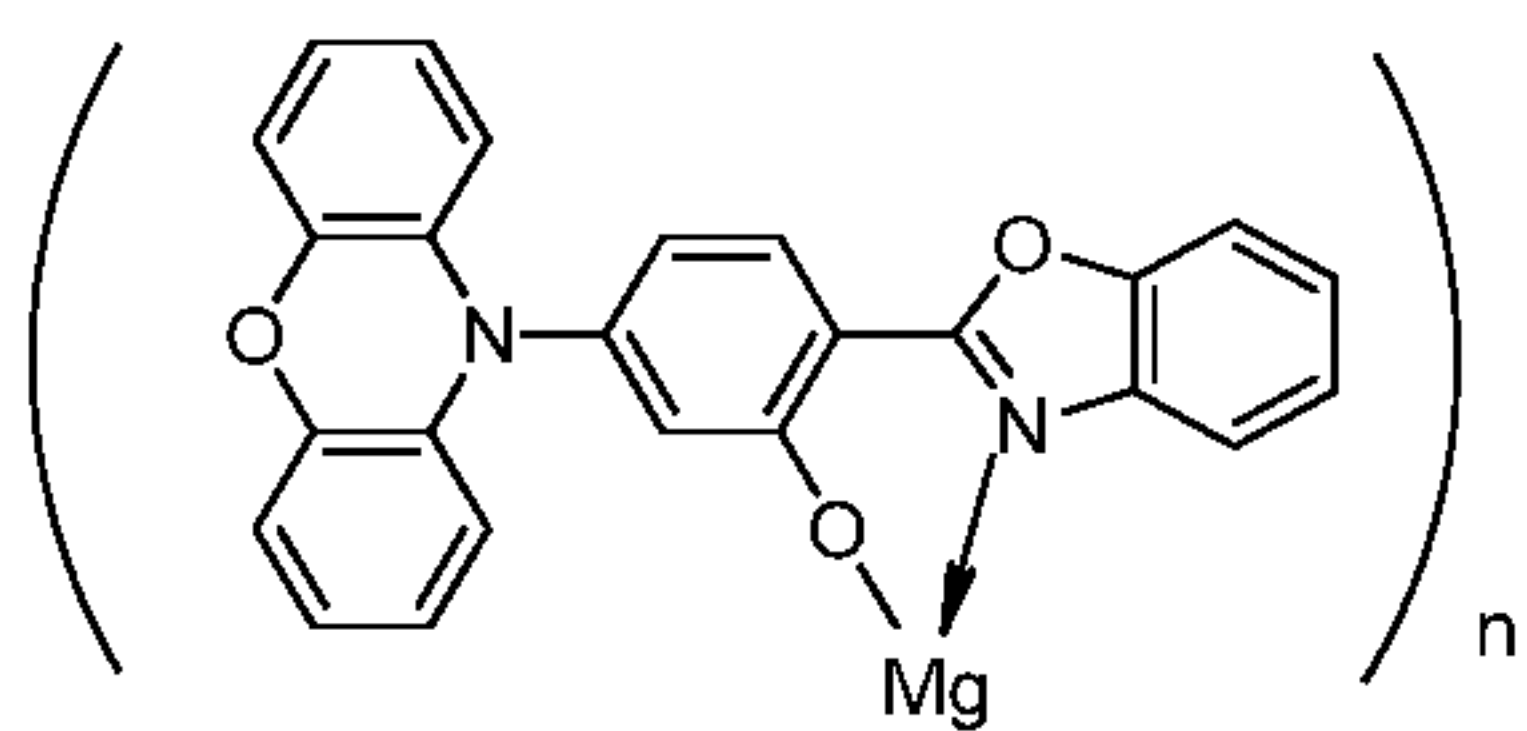
T-69



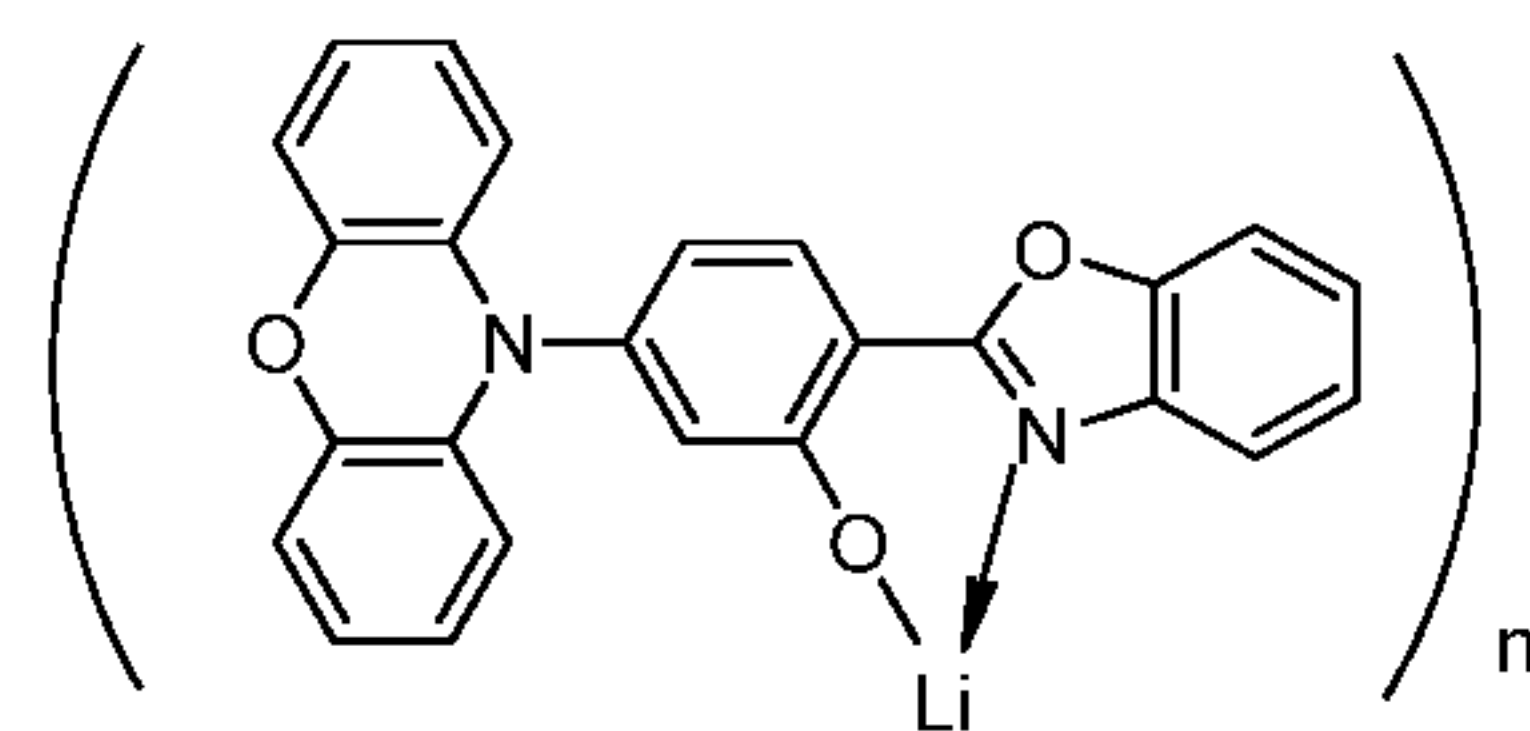
T-70



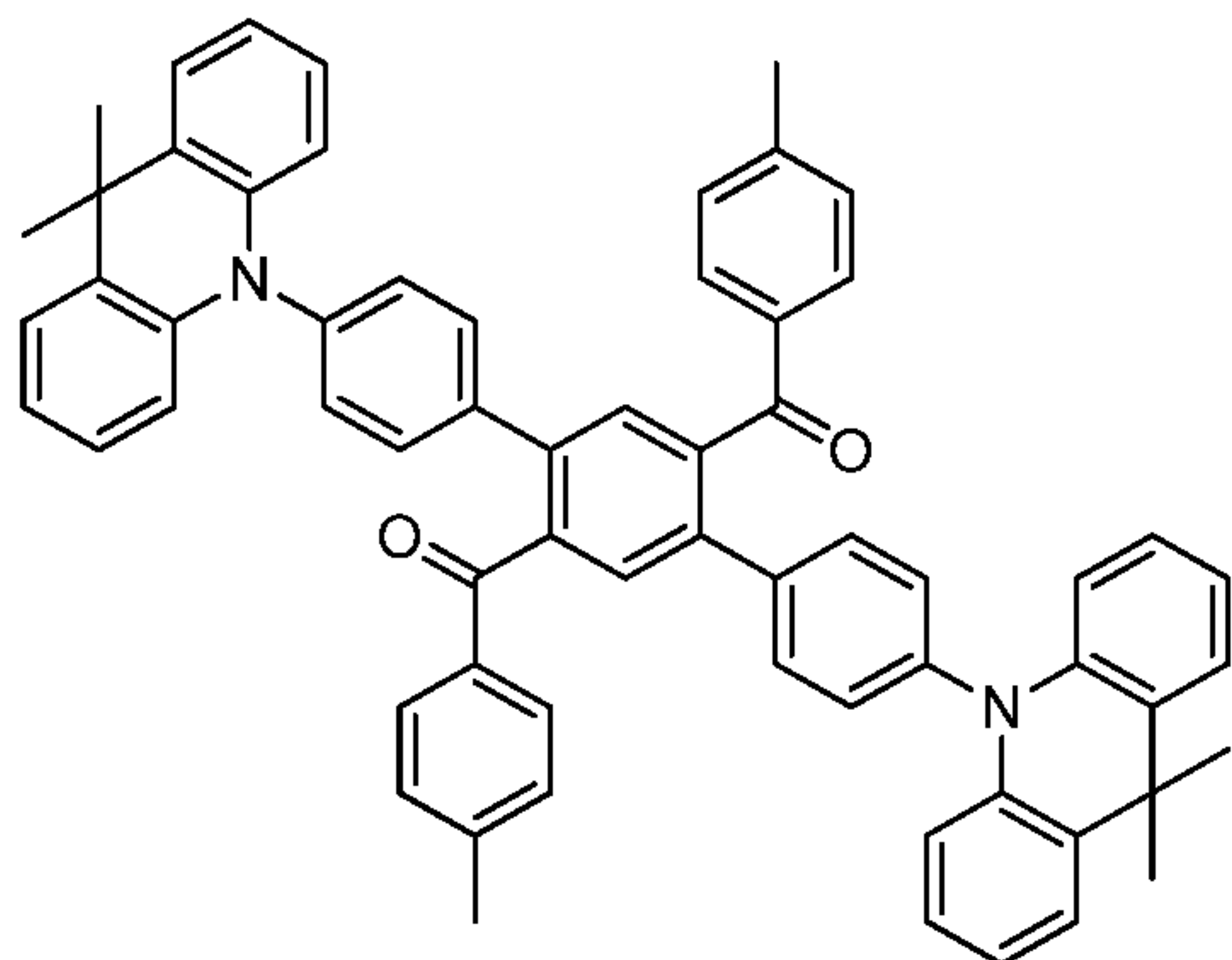
T-71



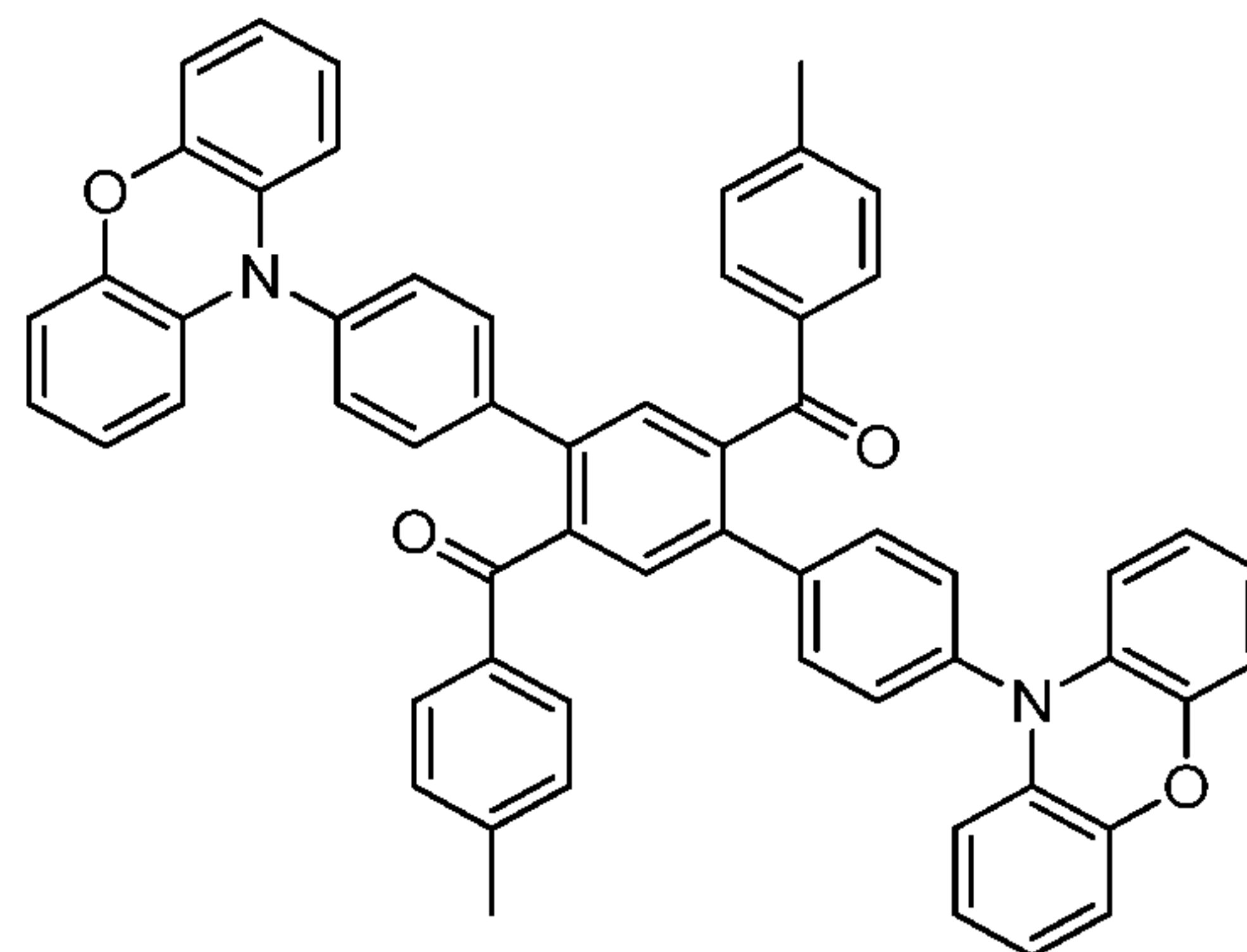
T-72



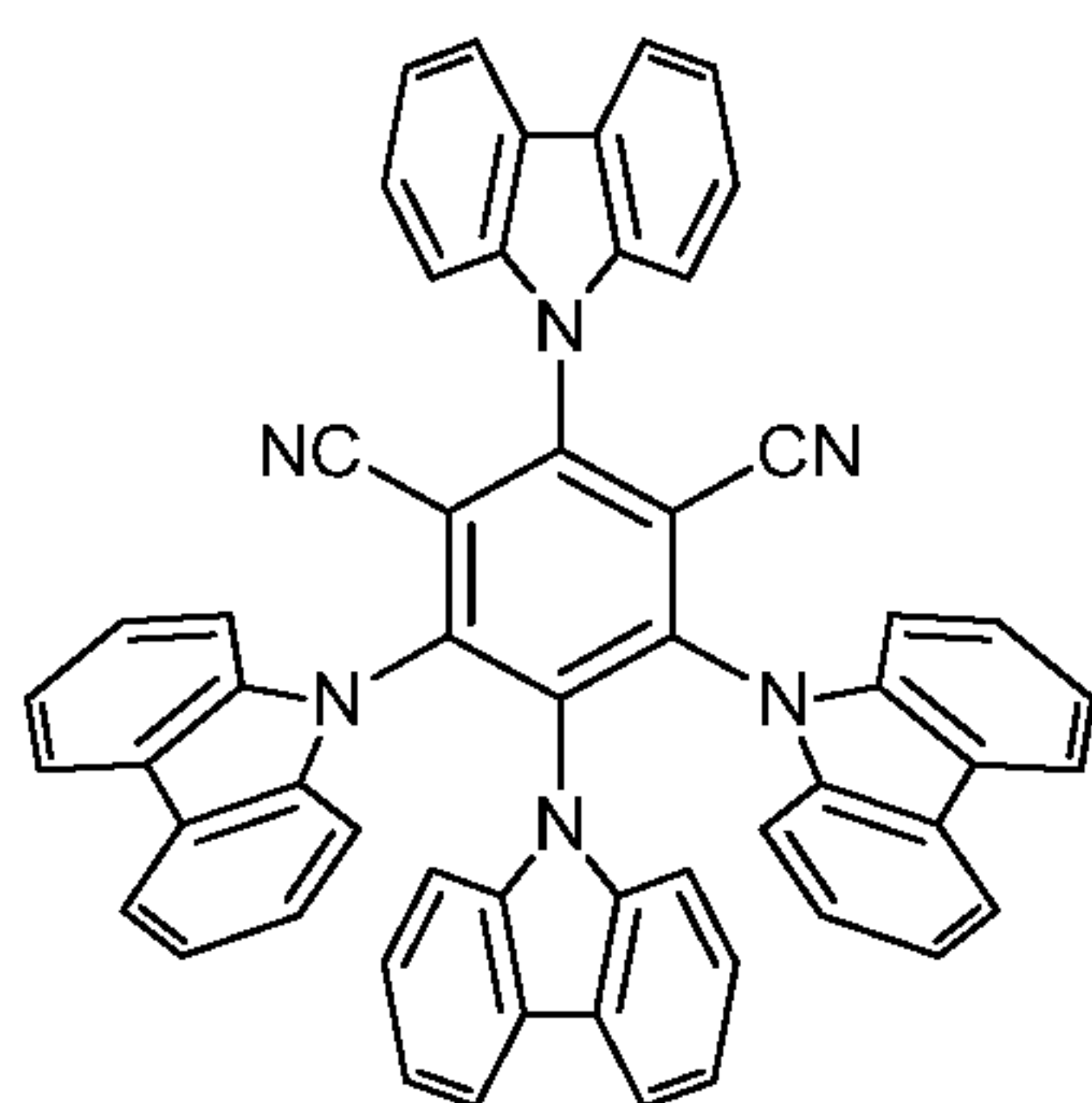
T-73



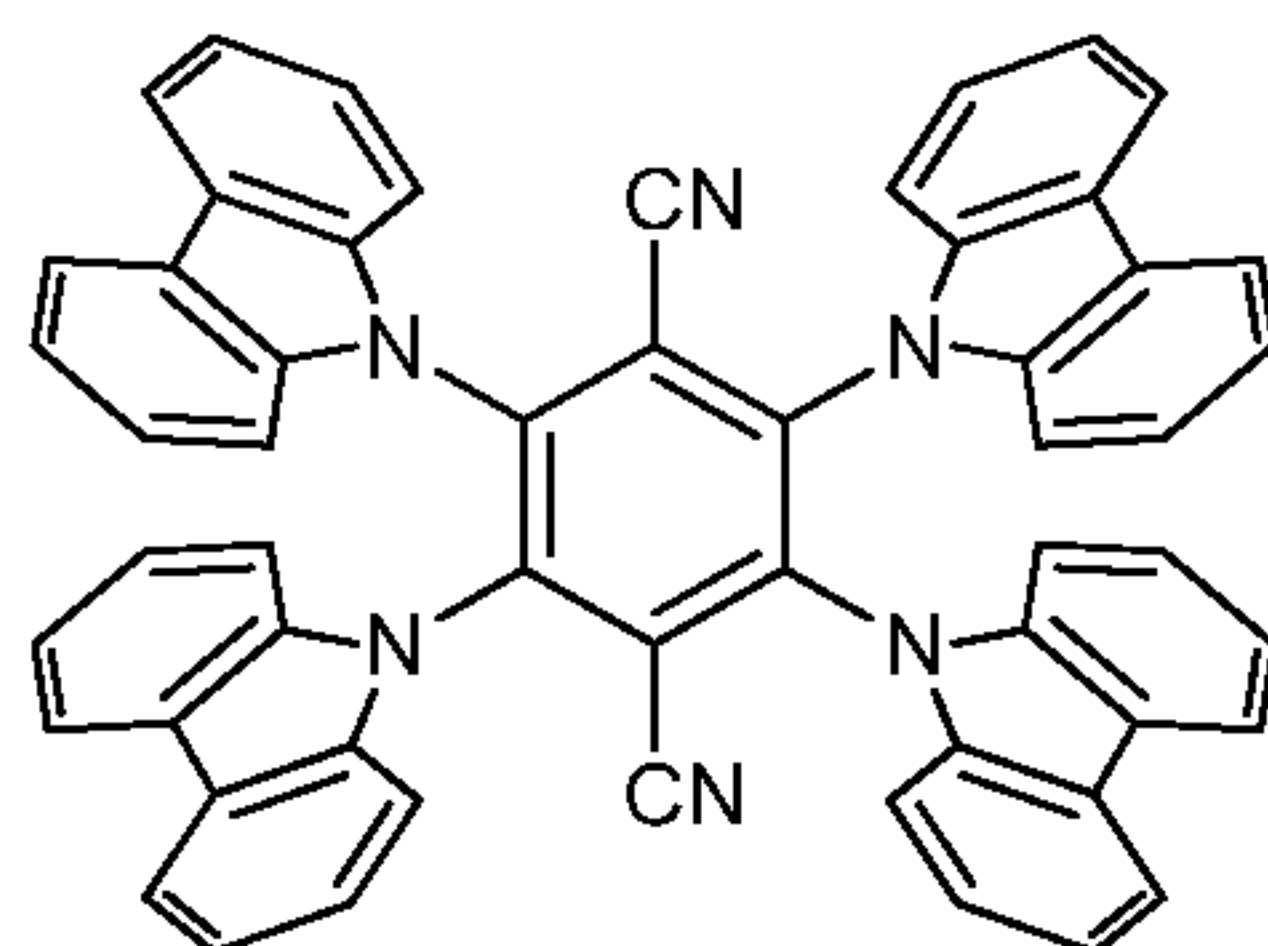
T-74



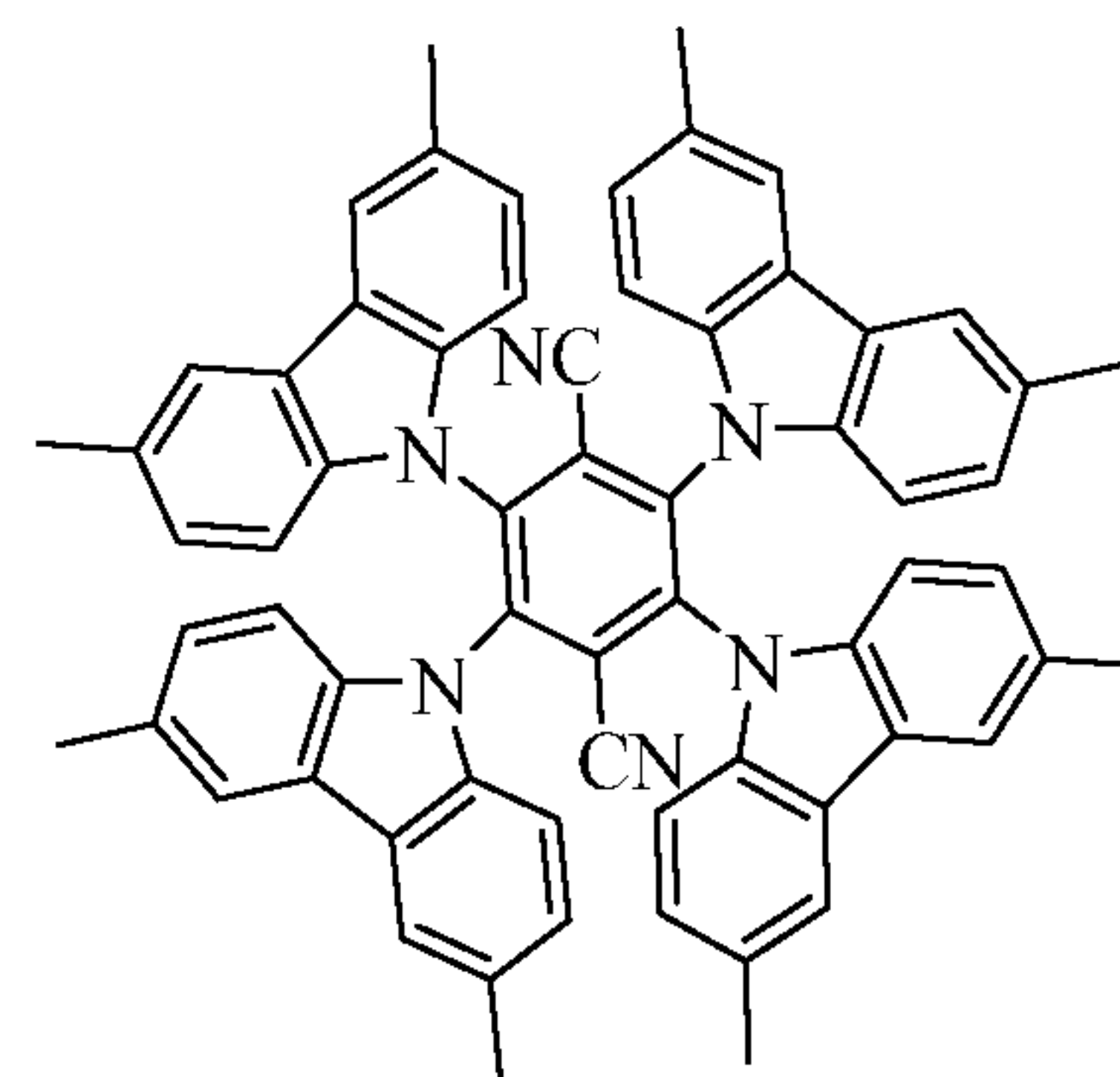
T-75



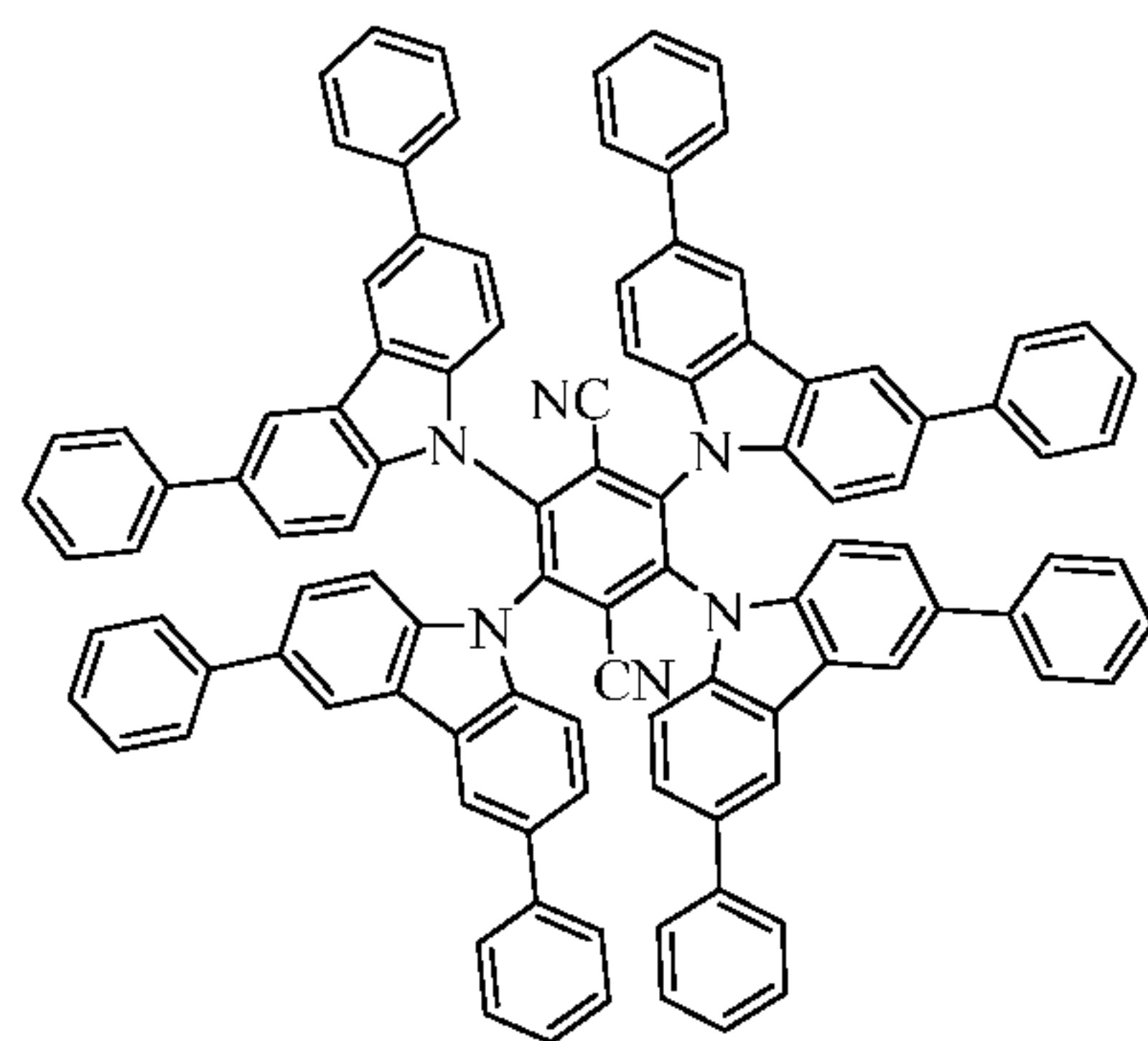
T-76



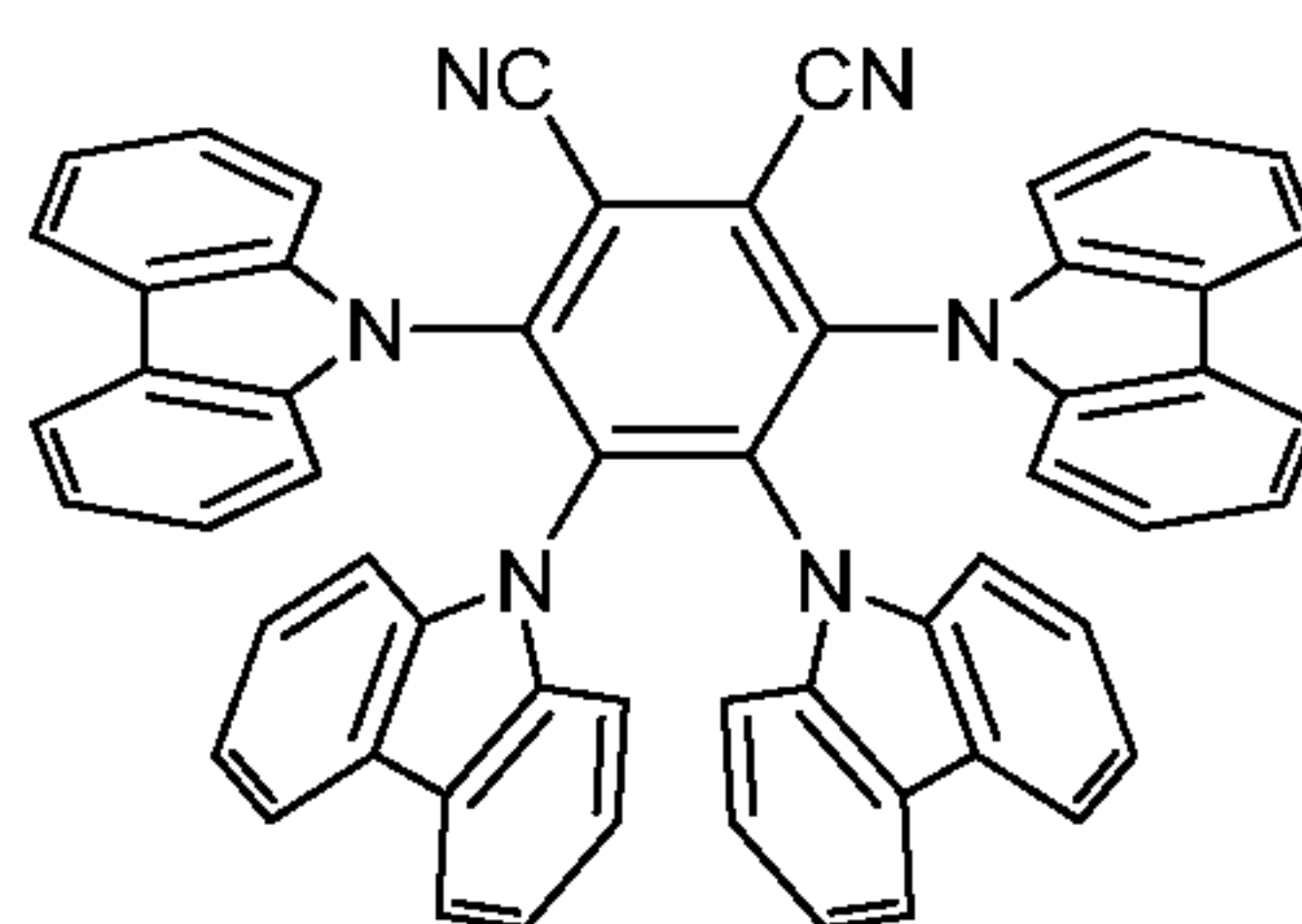
T-77



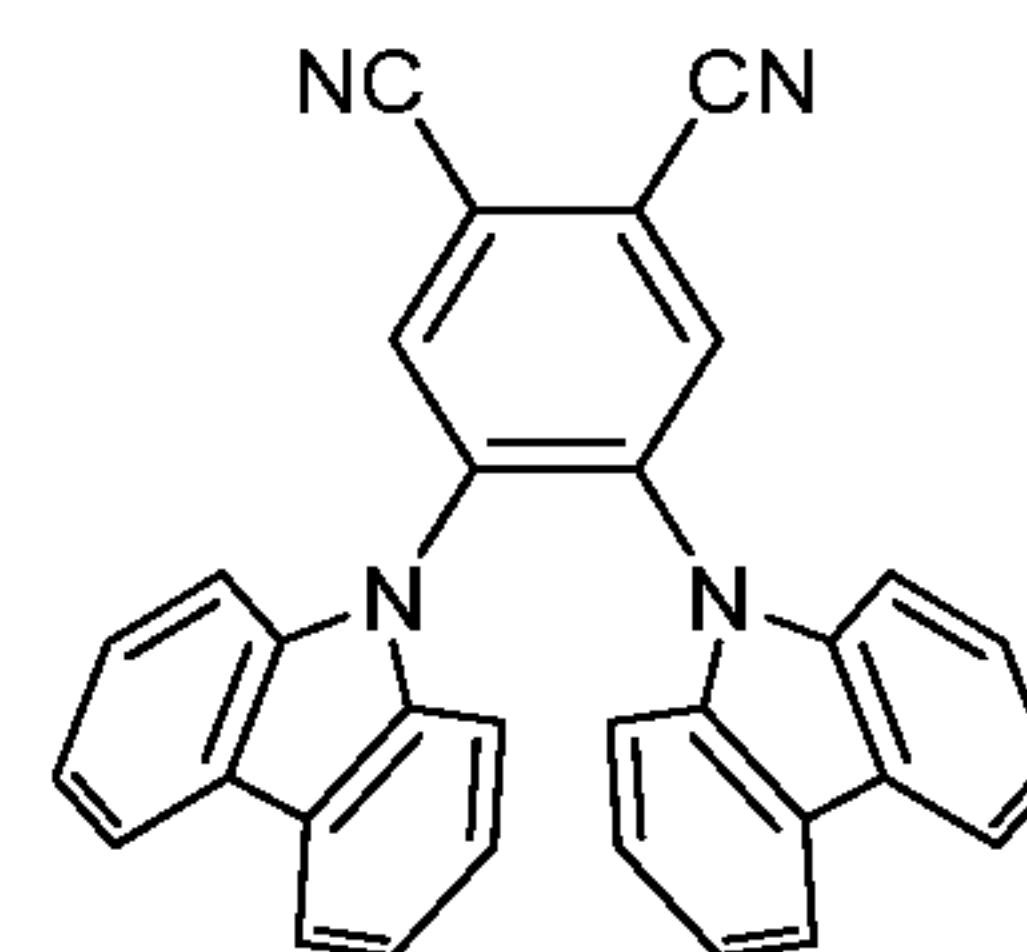
T-78



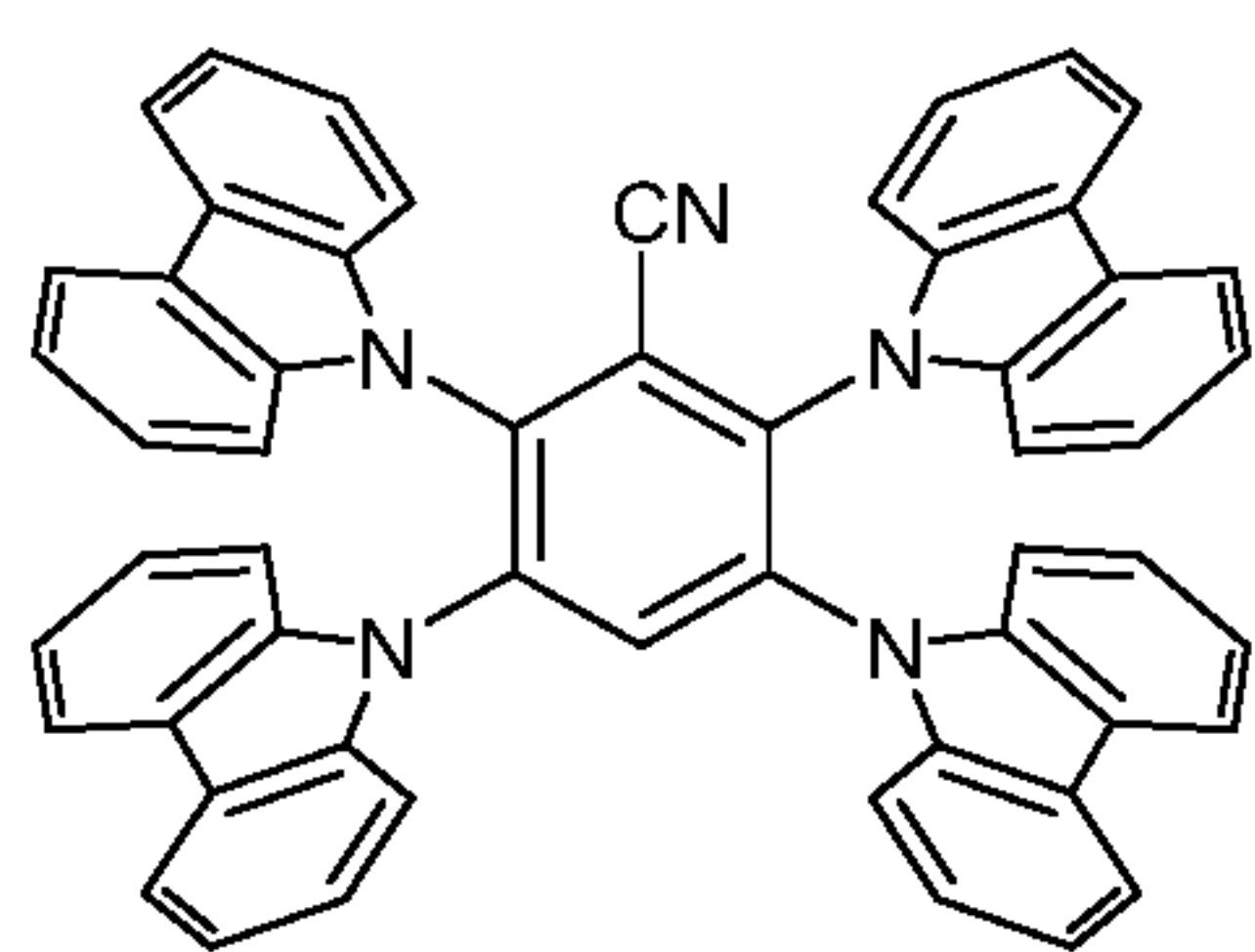
T-79



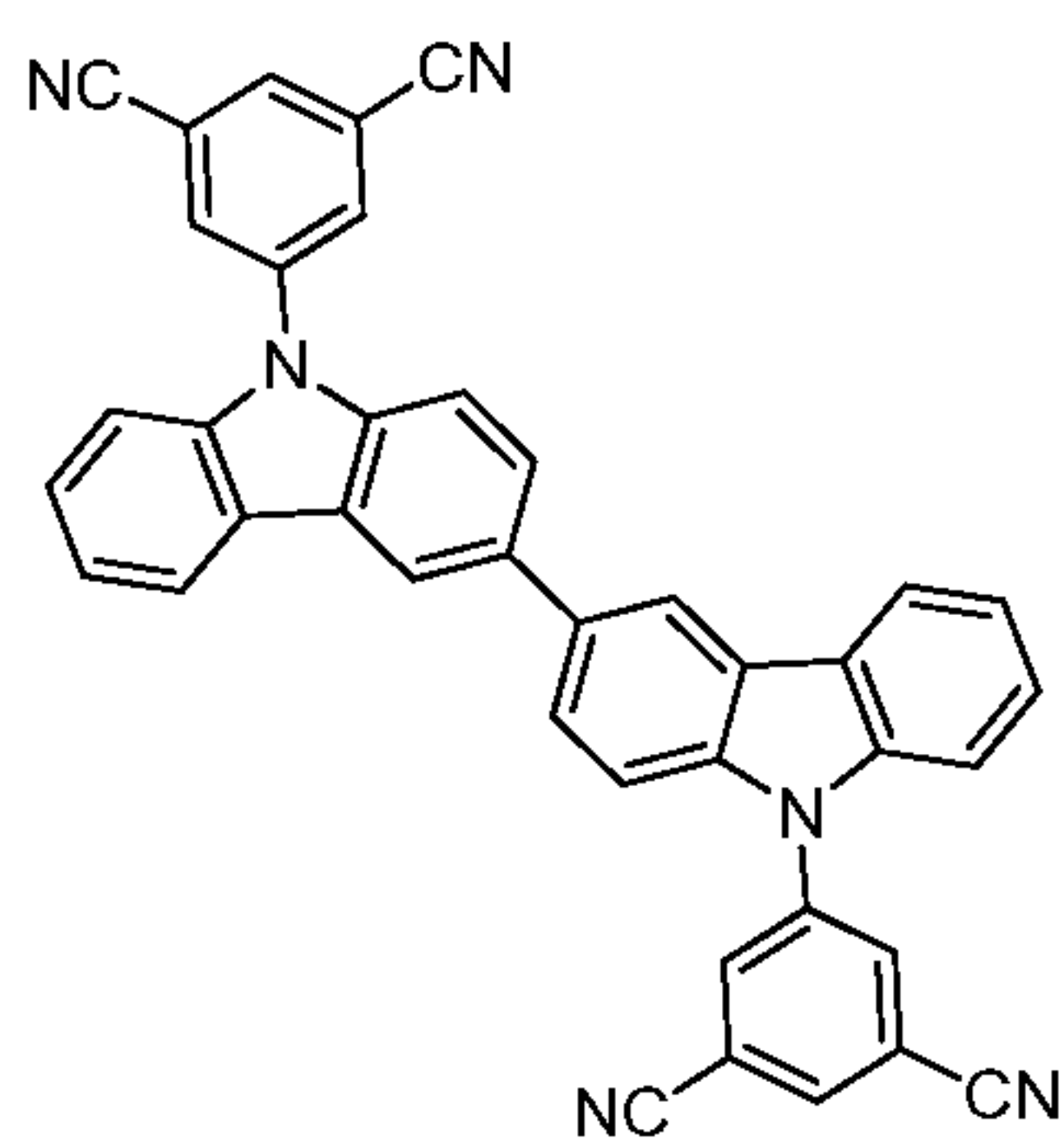
T-80



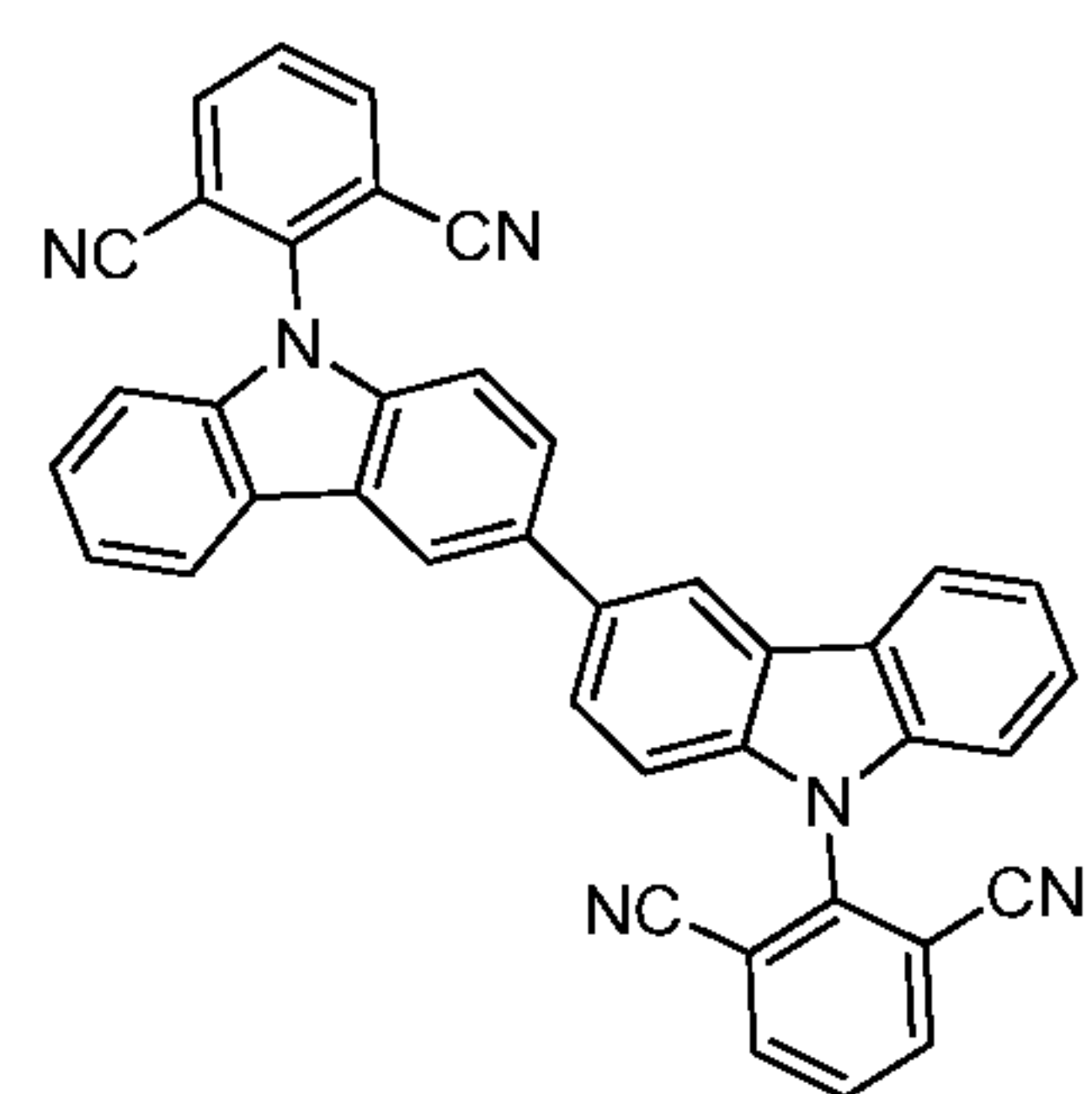
T-81



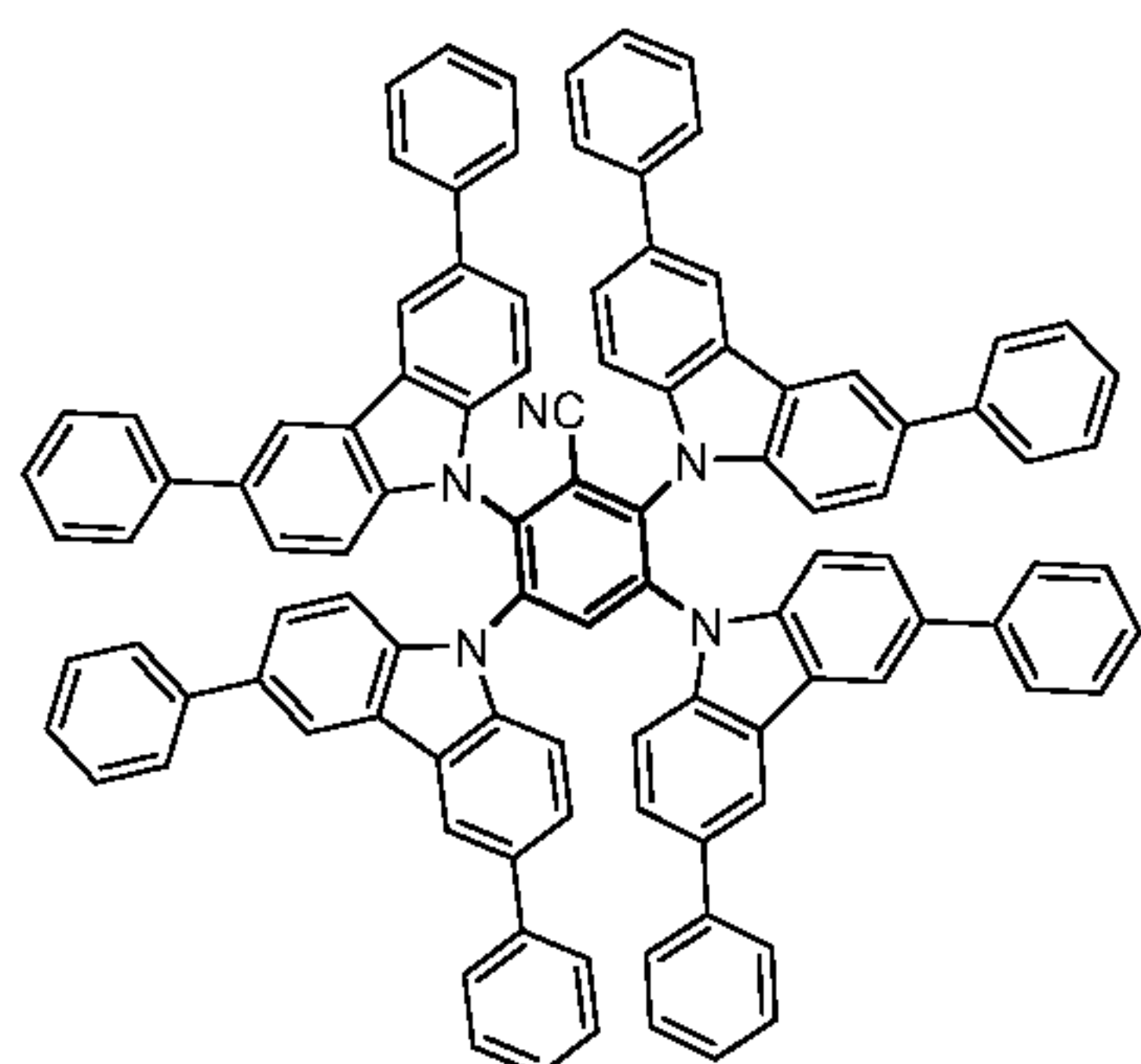
T-82



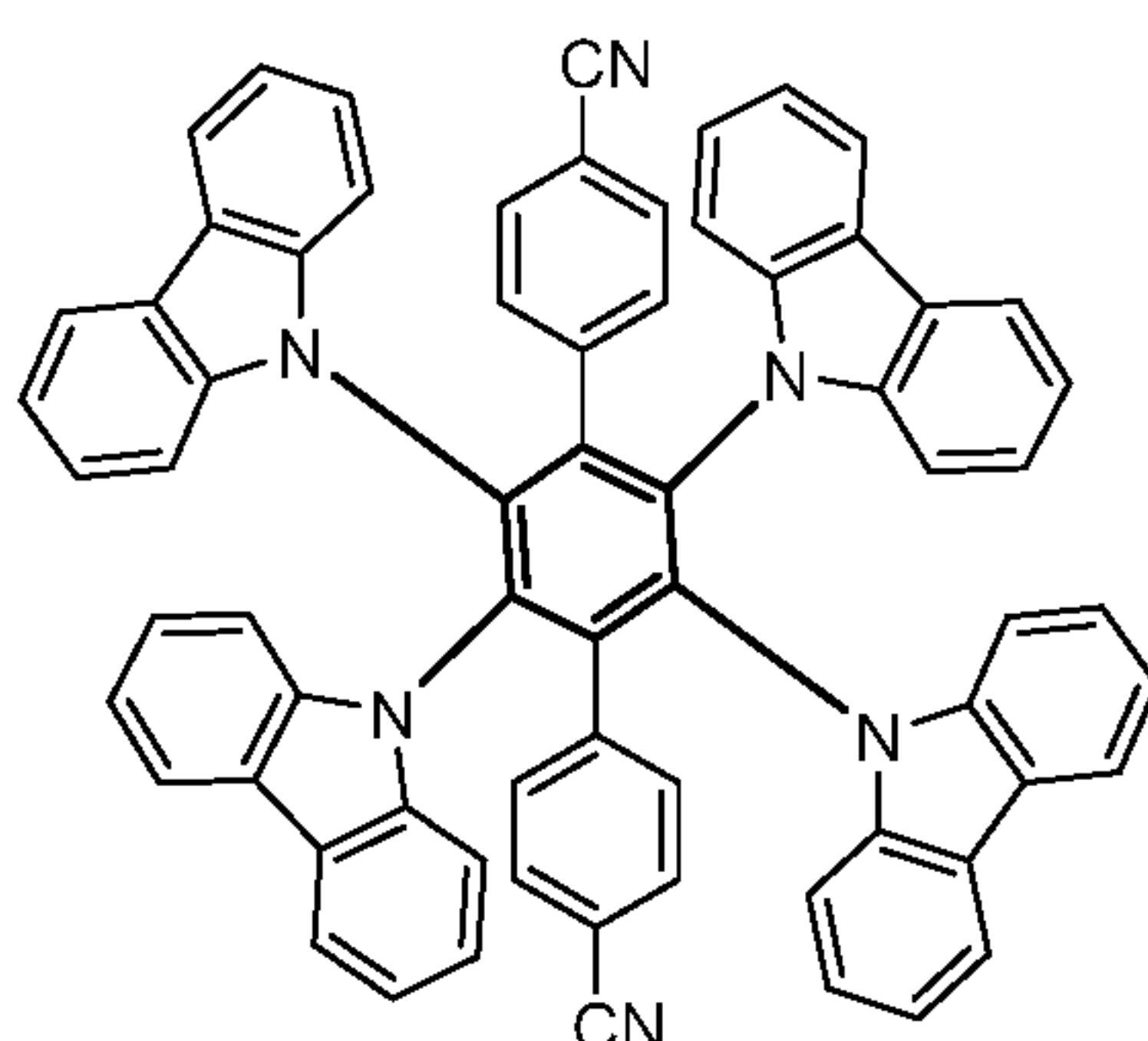
T-83



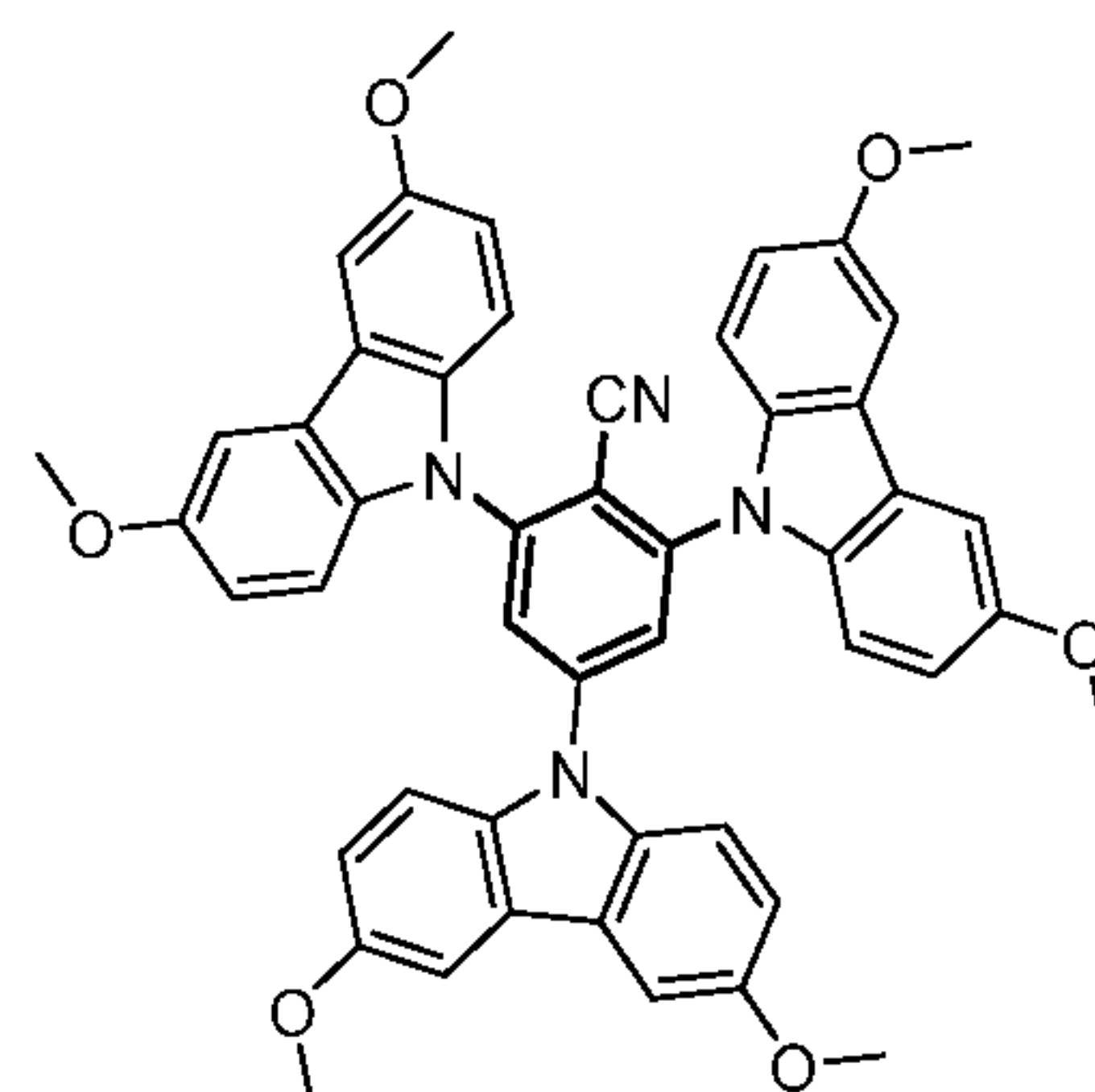
T-84



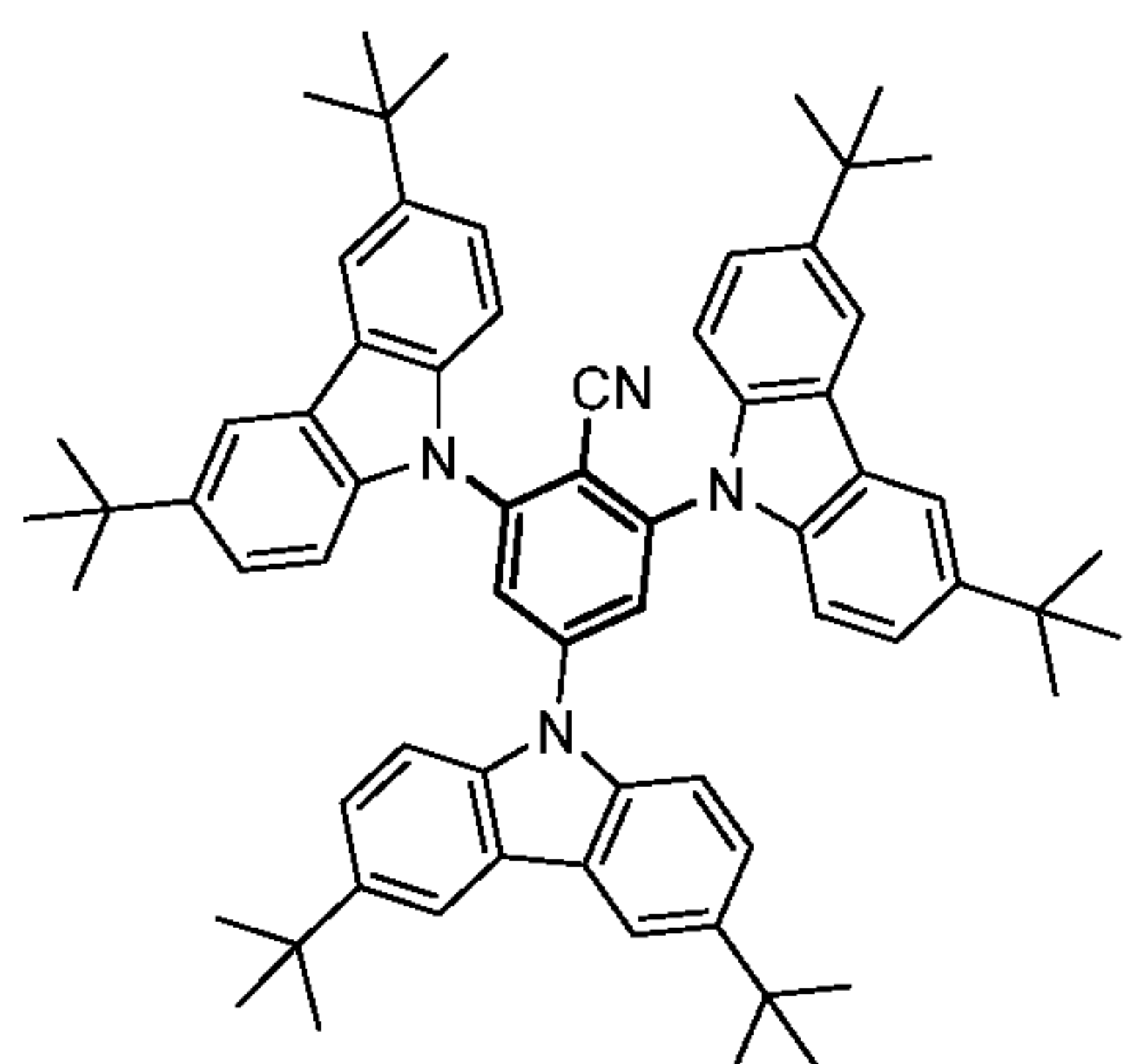
T-85



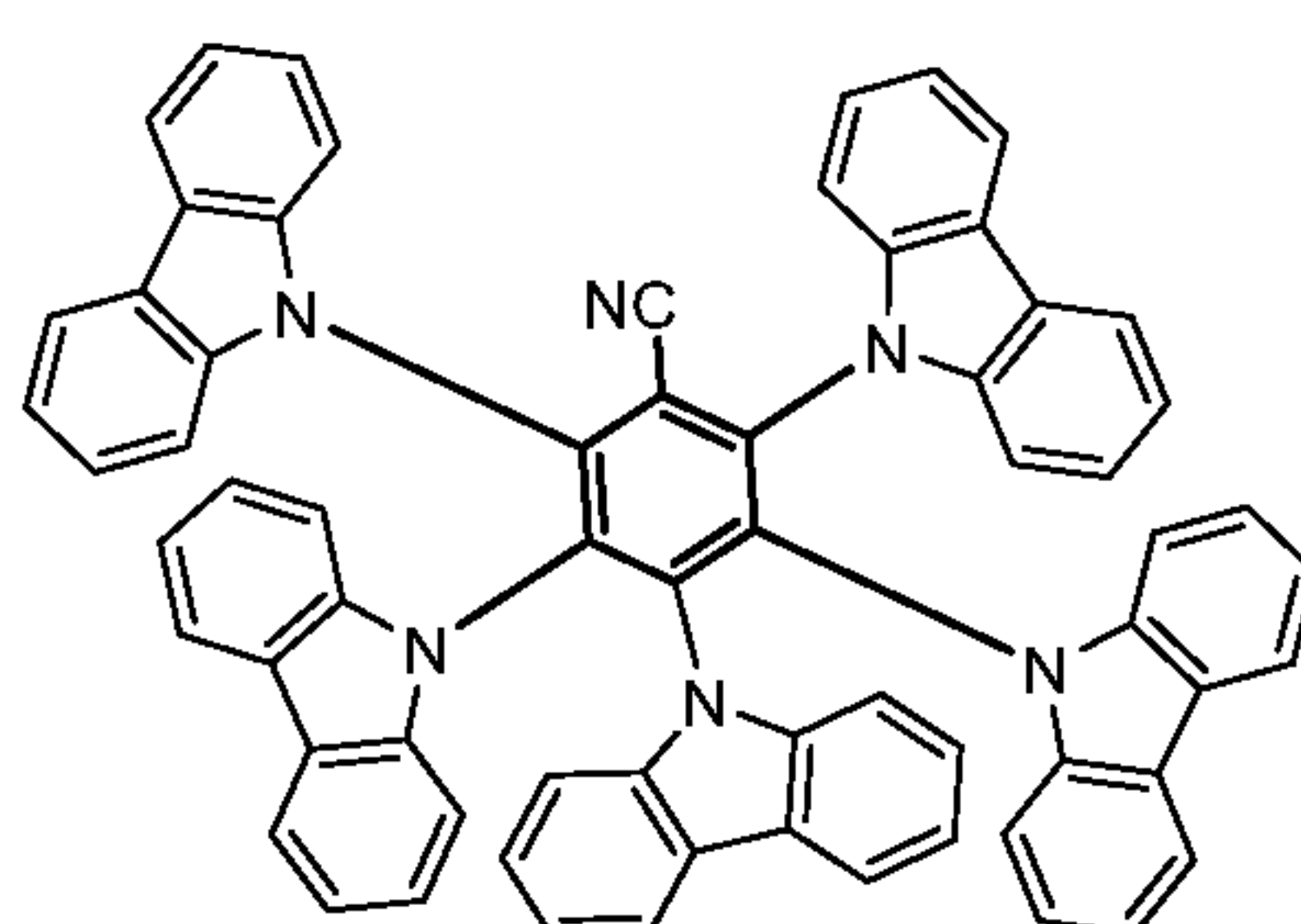
T-86



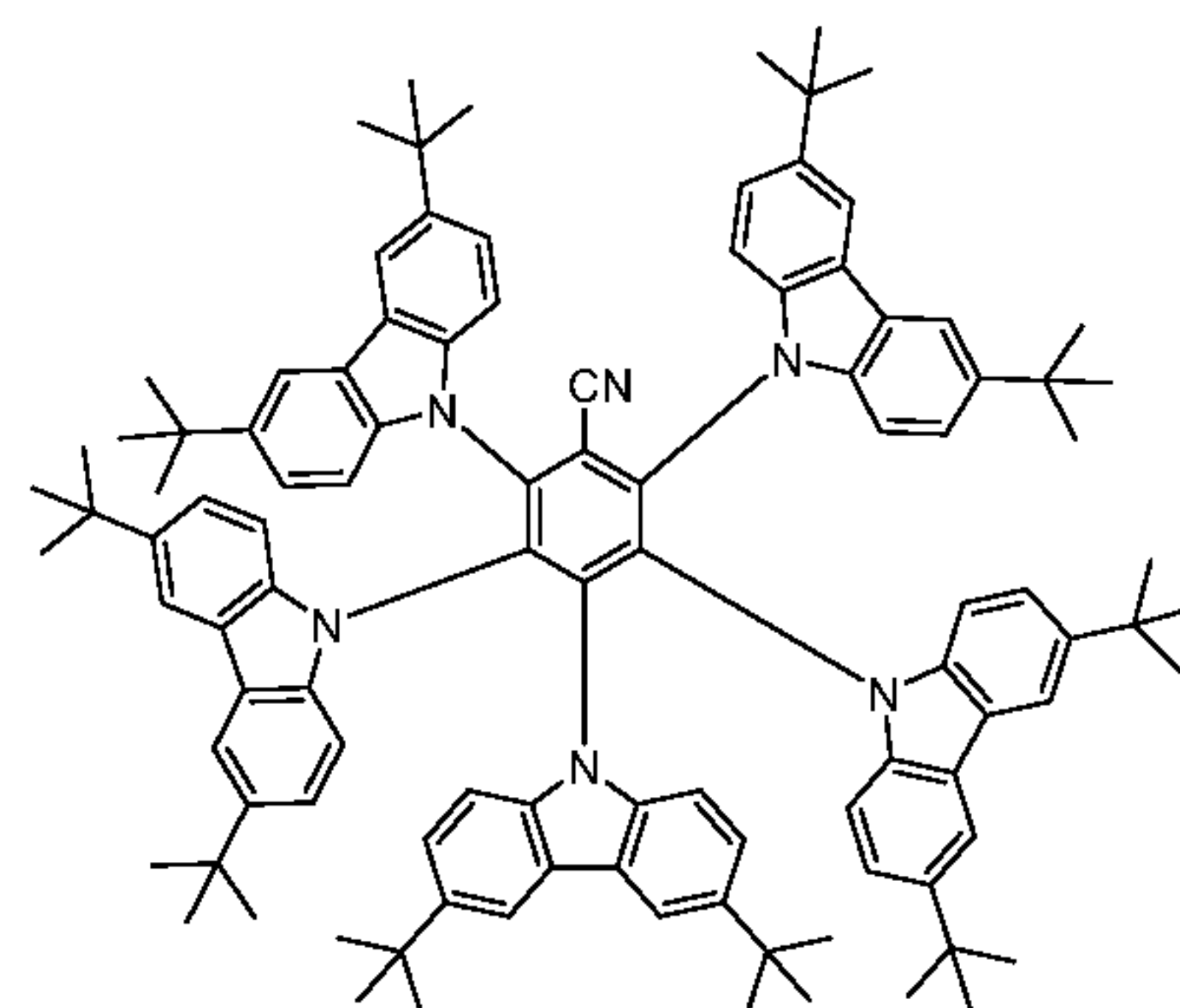
T-87



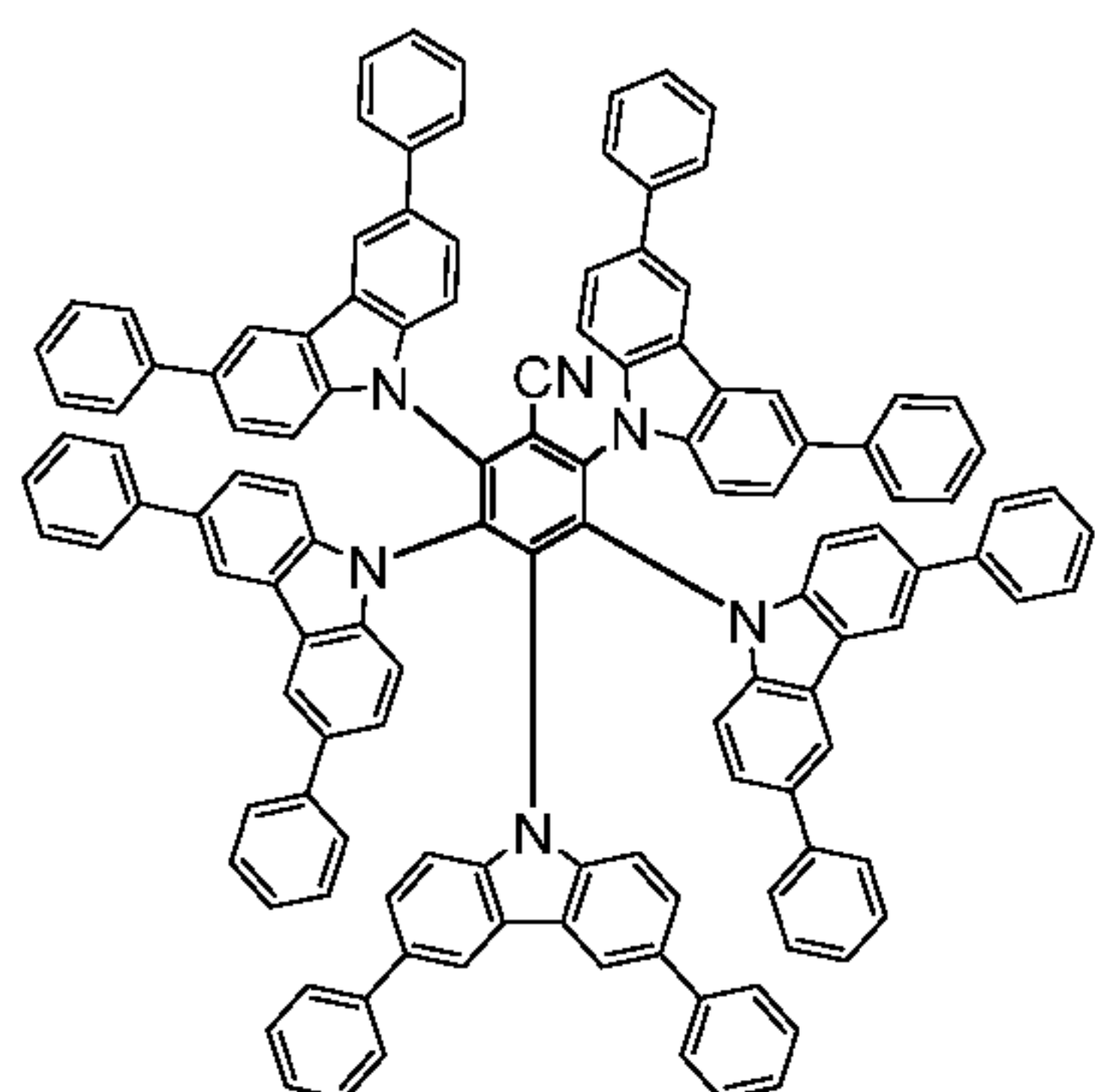
T-88



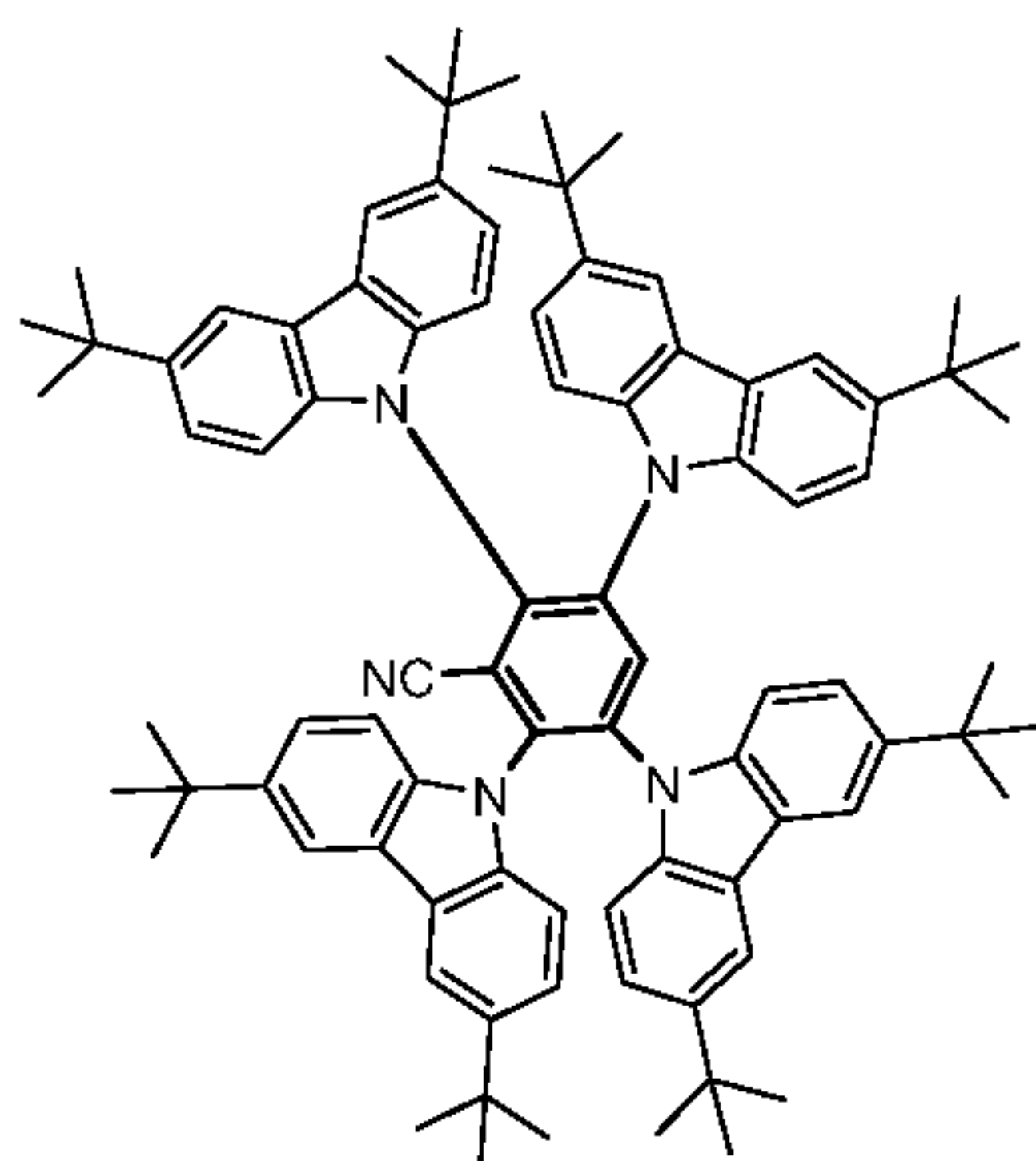
T-89



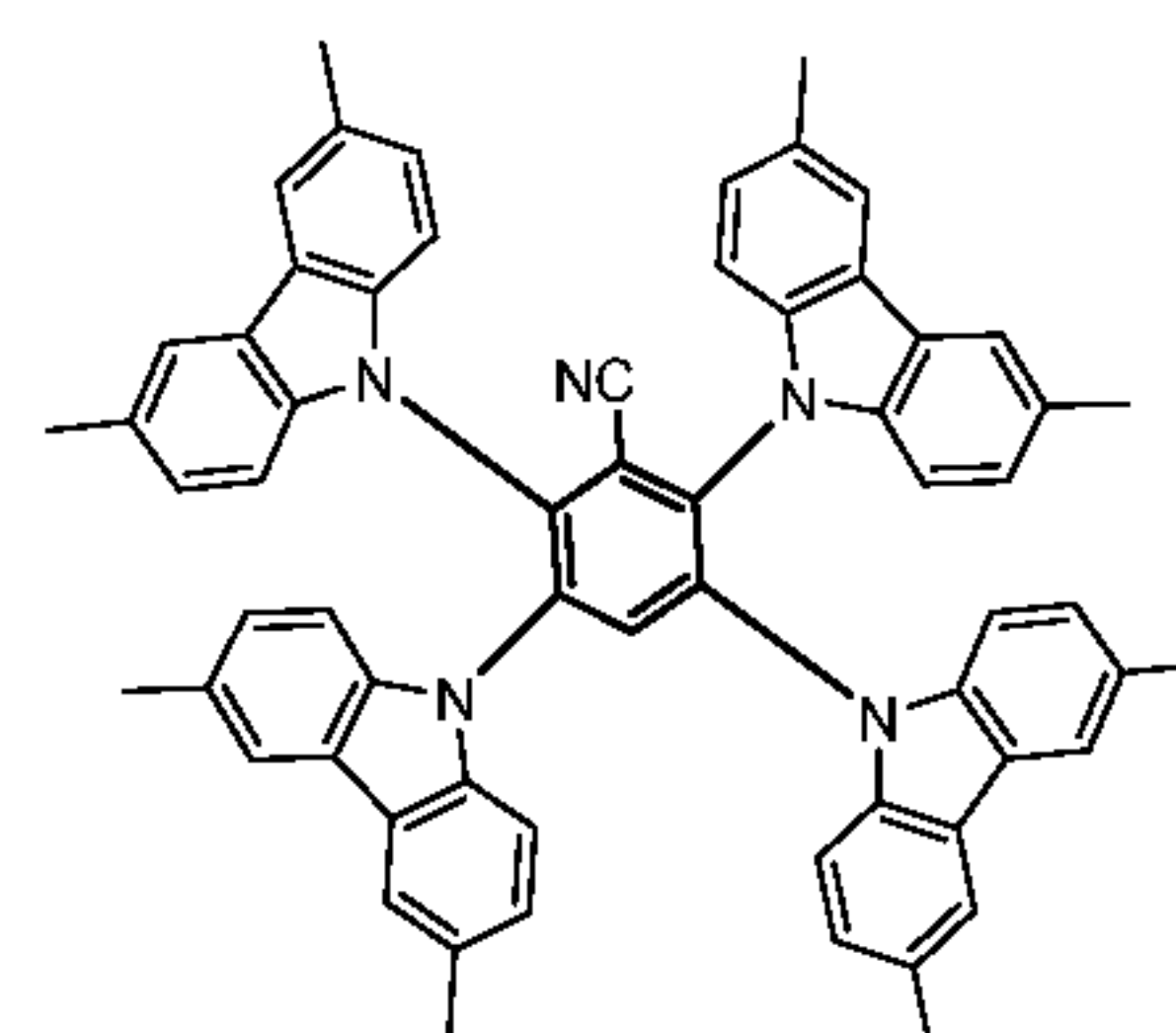
T-90



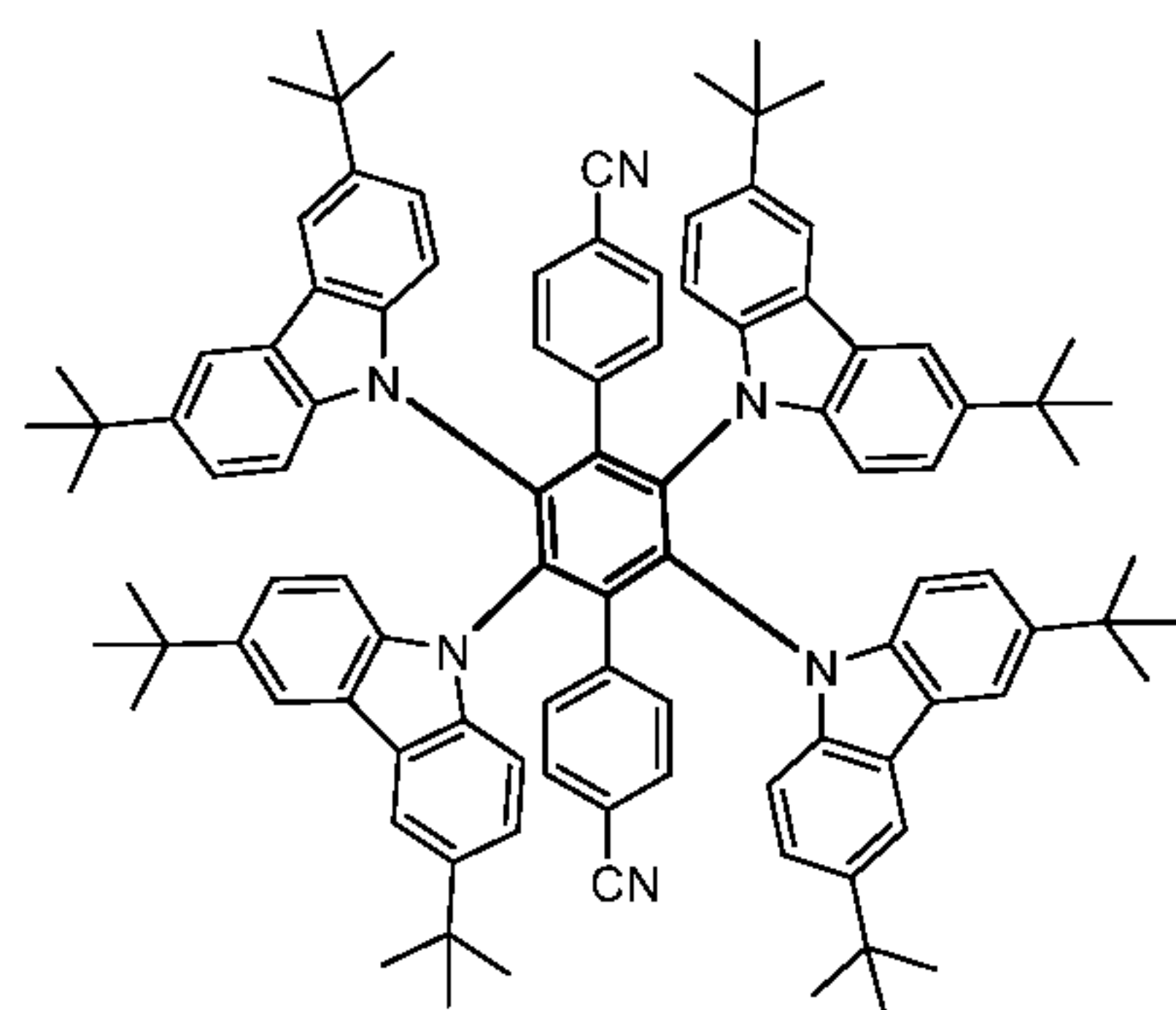
T-91



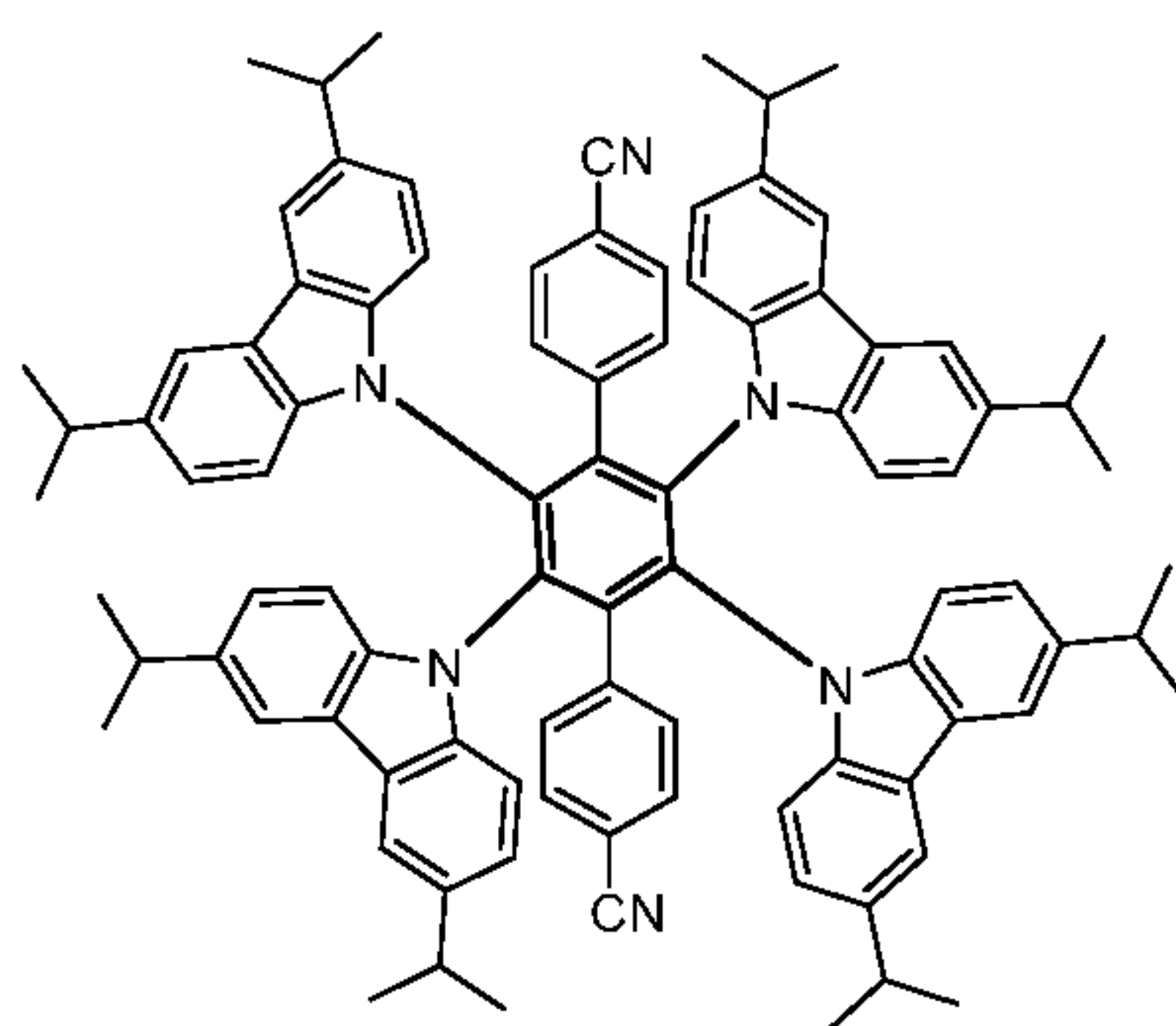
T-92



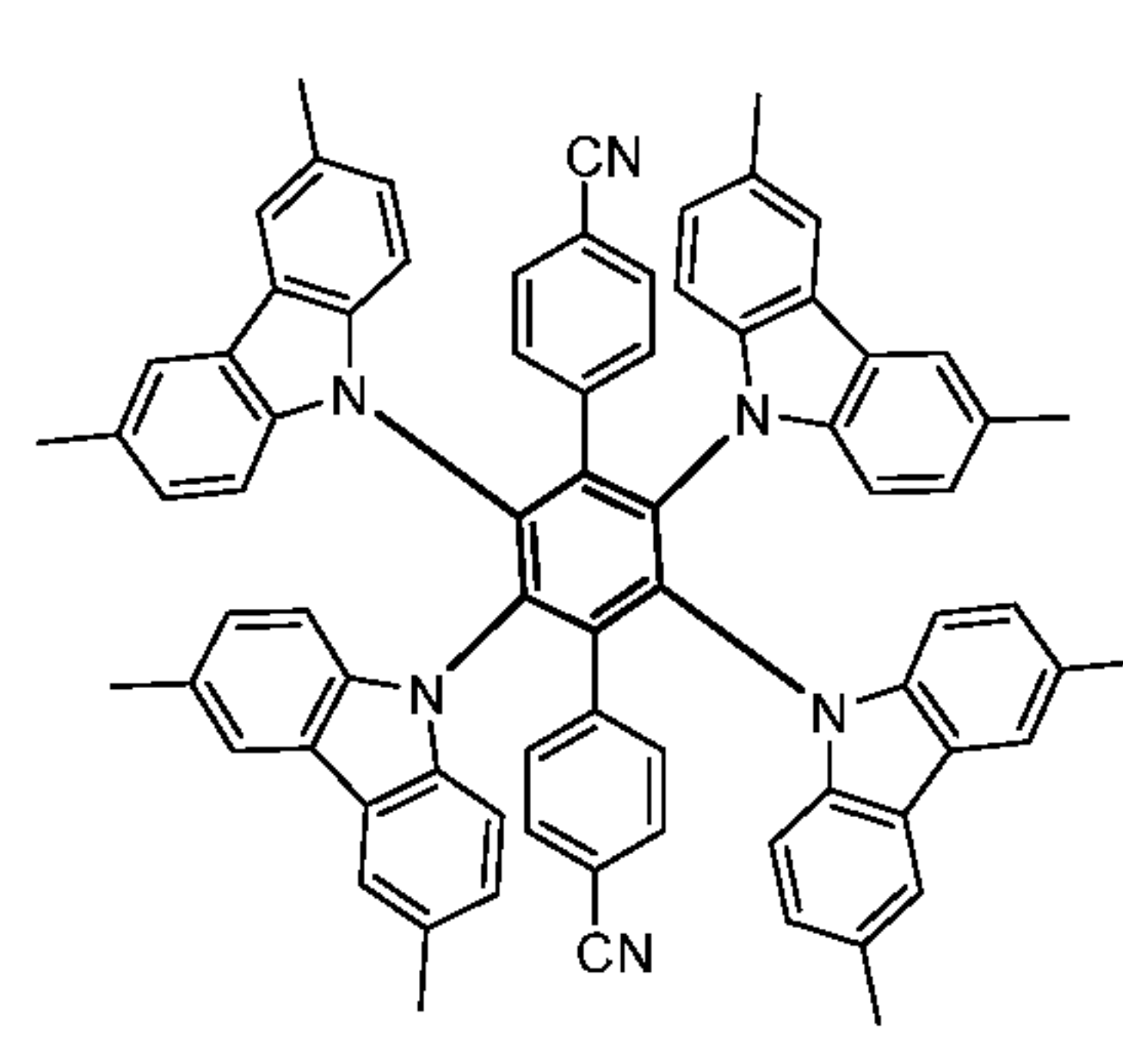
T-93



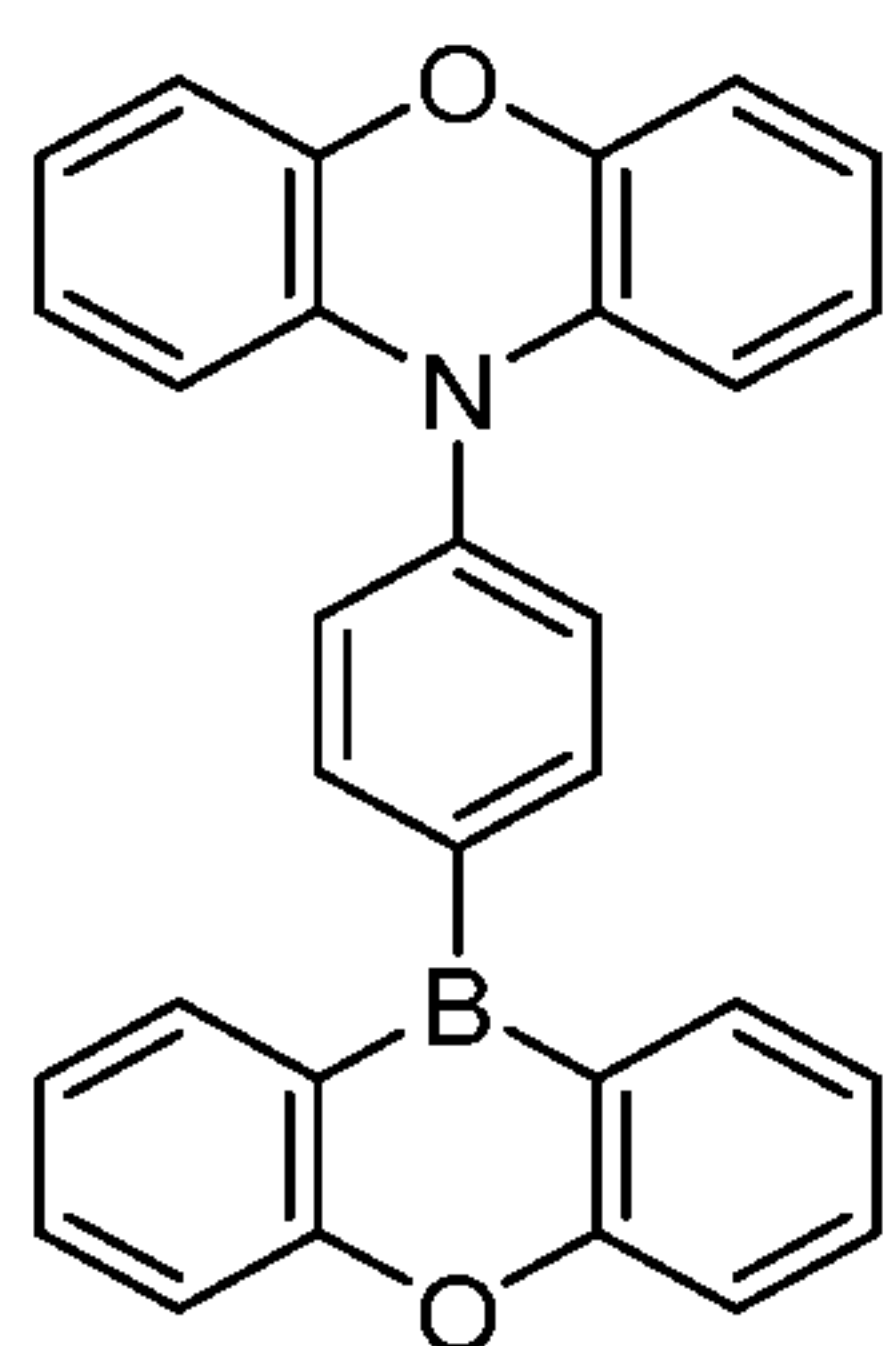
T-94



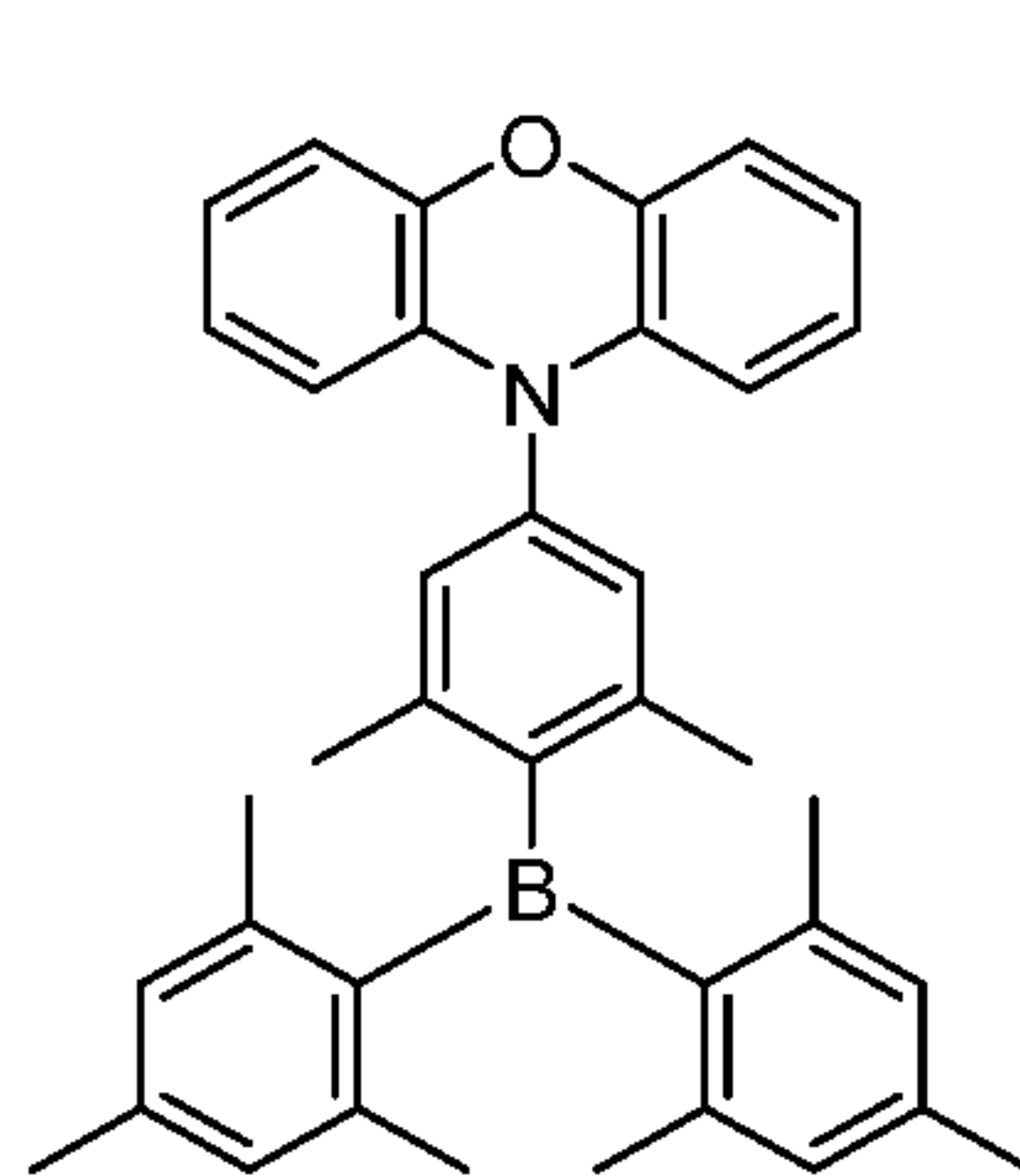
T-95



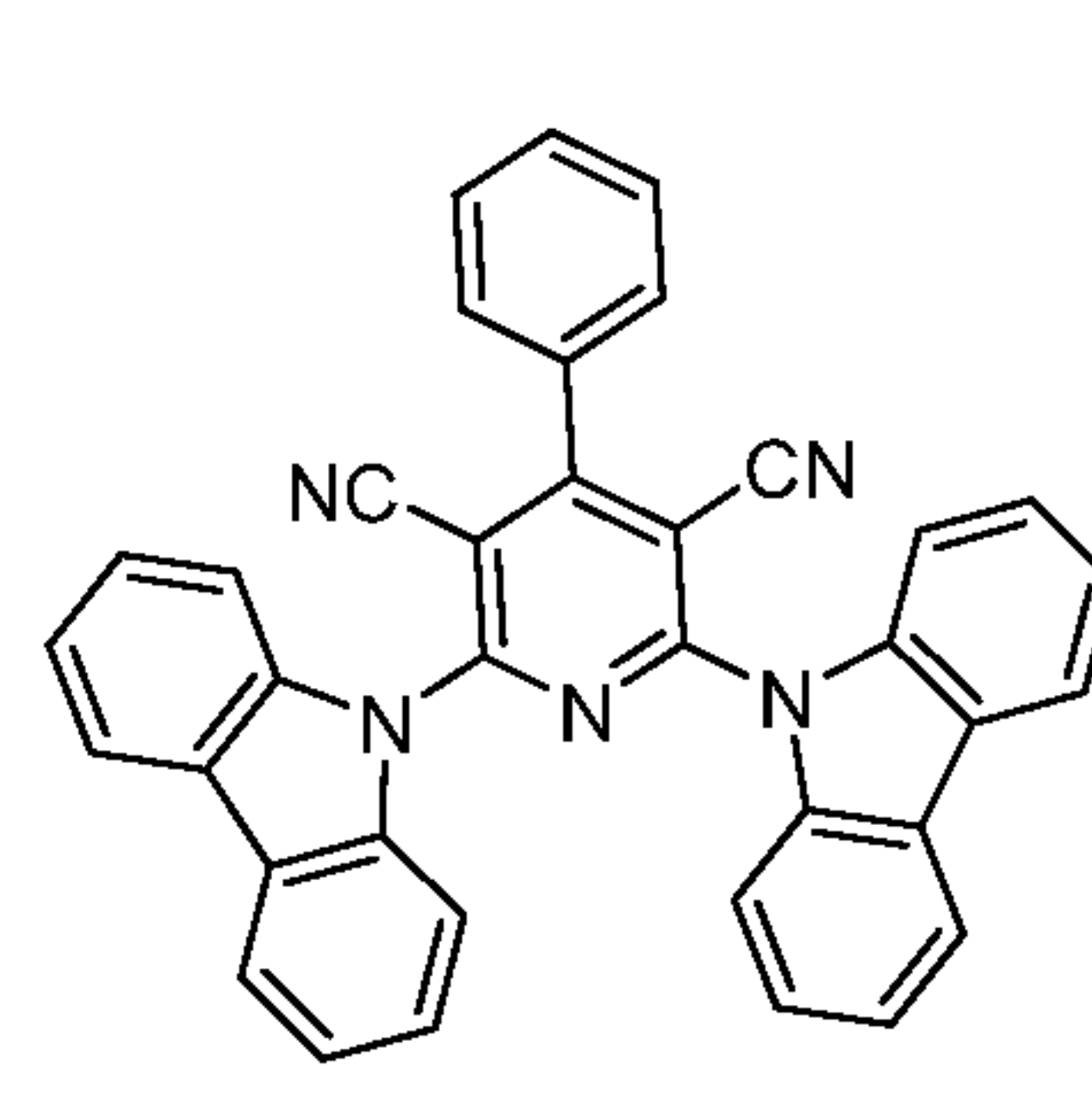
T-96



T-97



T-98

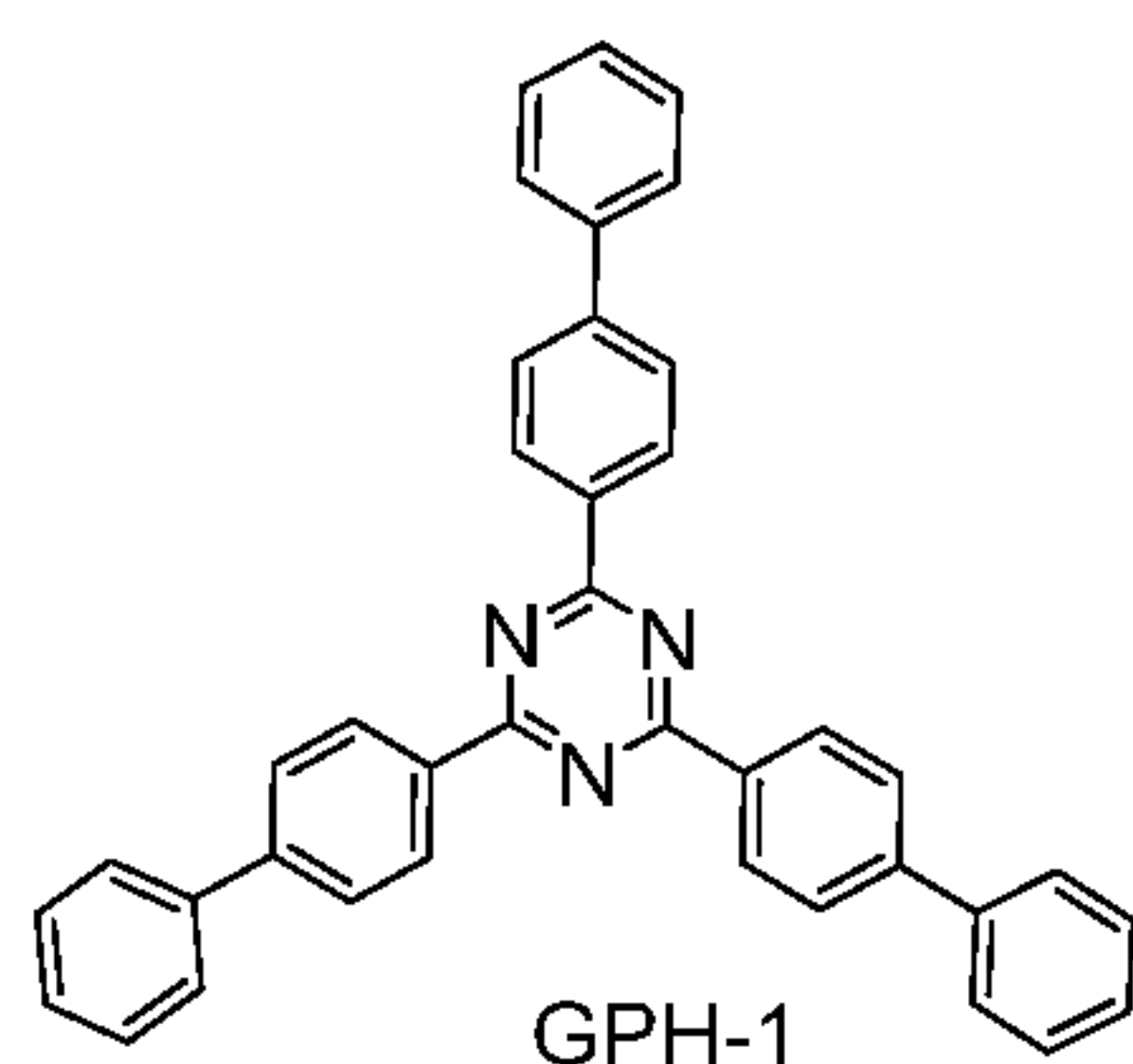


T-99;

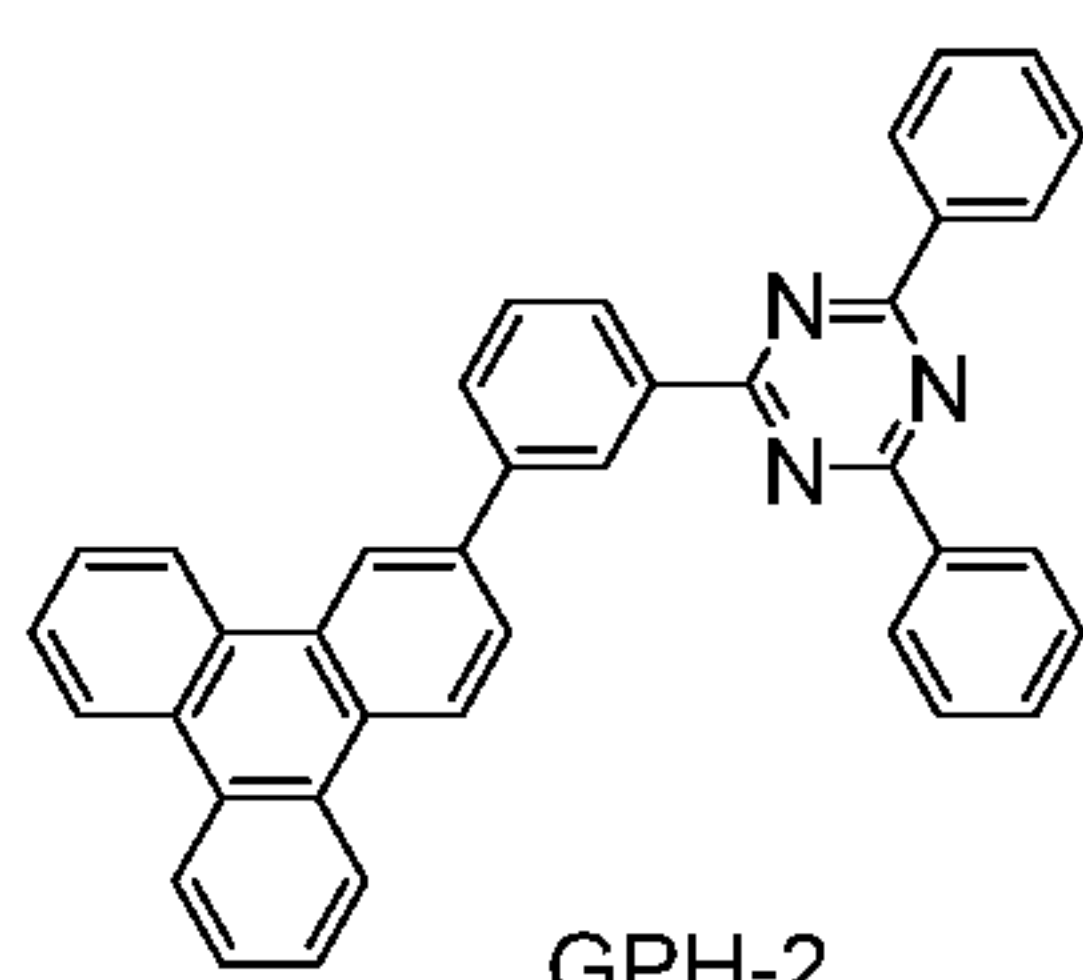
T-71、T-72 和 T-73 中， n 各自独立地为 1、2 或 3。

本申请优选上述一系列特定结构的敏化剂，与绿色荧光染料配合，能够进一步窄化光谱，提高绿光色纯度，同时提高器件效率。

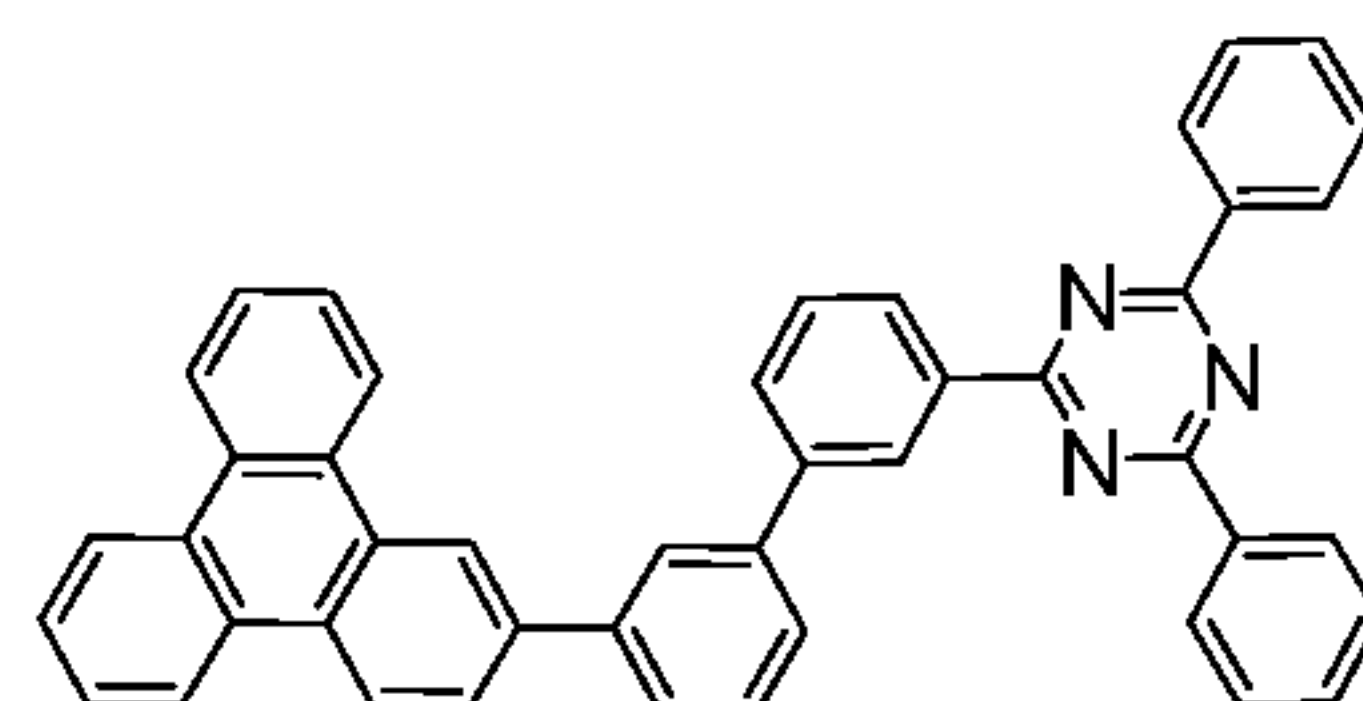
进一步地，主体材料包括如下 **GPH-1** 至 **GPH-80** 的化合物中的任意一种或至少两种组合（例如 **GPH-1** 和 **GPH-2** 的组合，**GPH-5**、**GPH-7** 和 **GPH-12** 的组合，**GPH-3**、**GPH-60**、**GPH-70** 和 **GPH-80** 的组合等）：



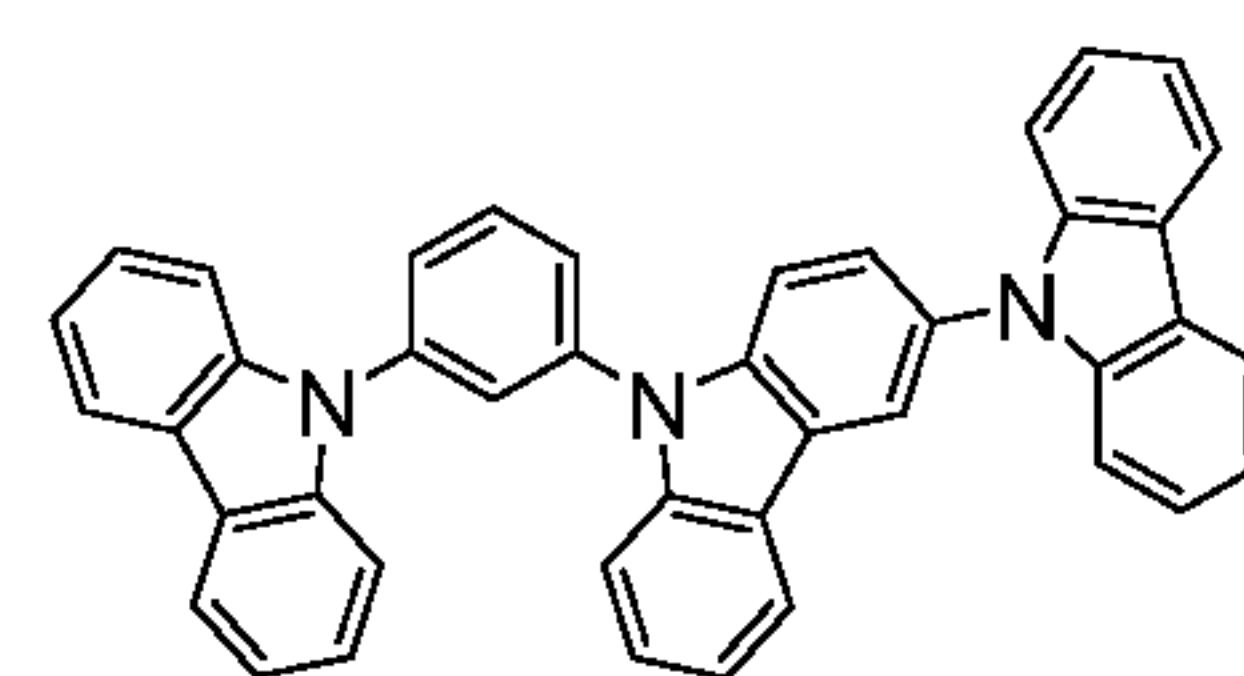
GPH-1



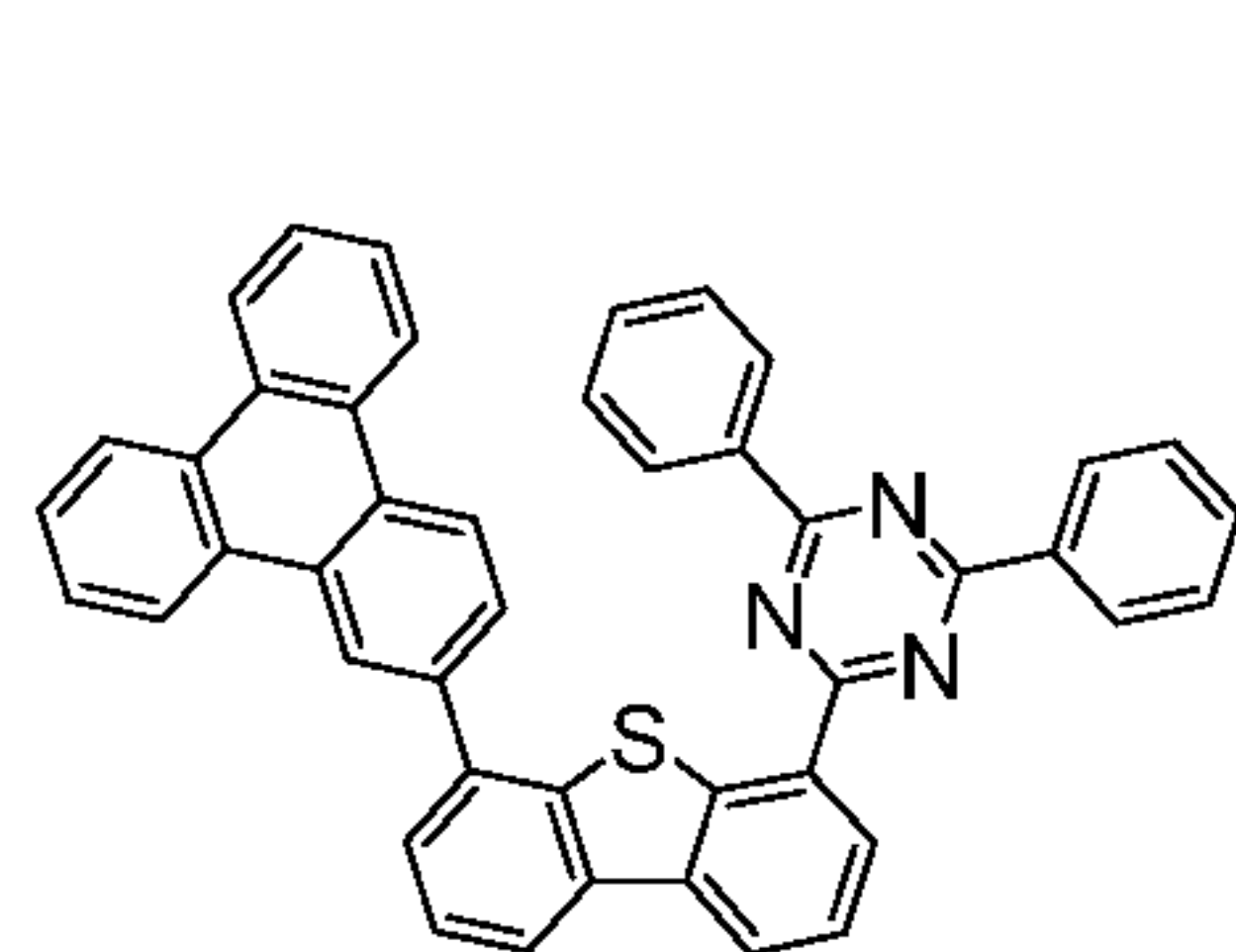
GPH-2



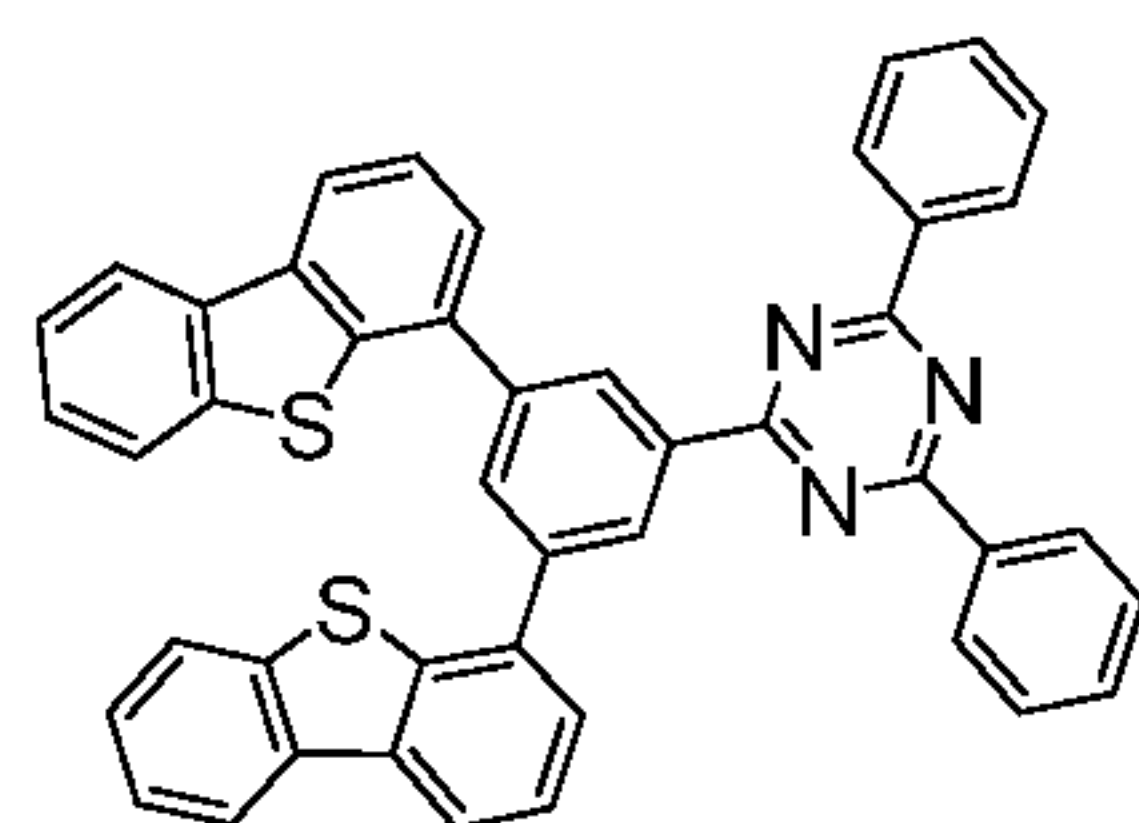
GPH-3



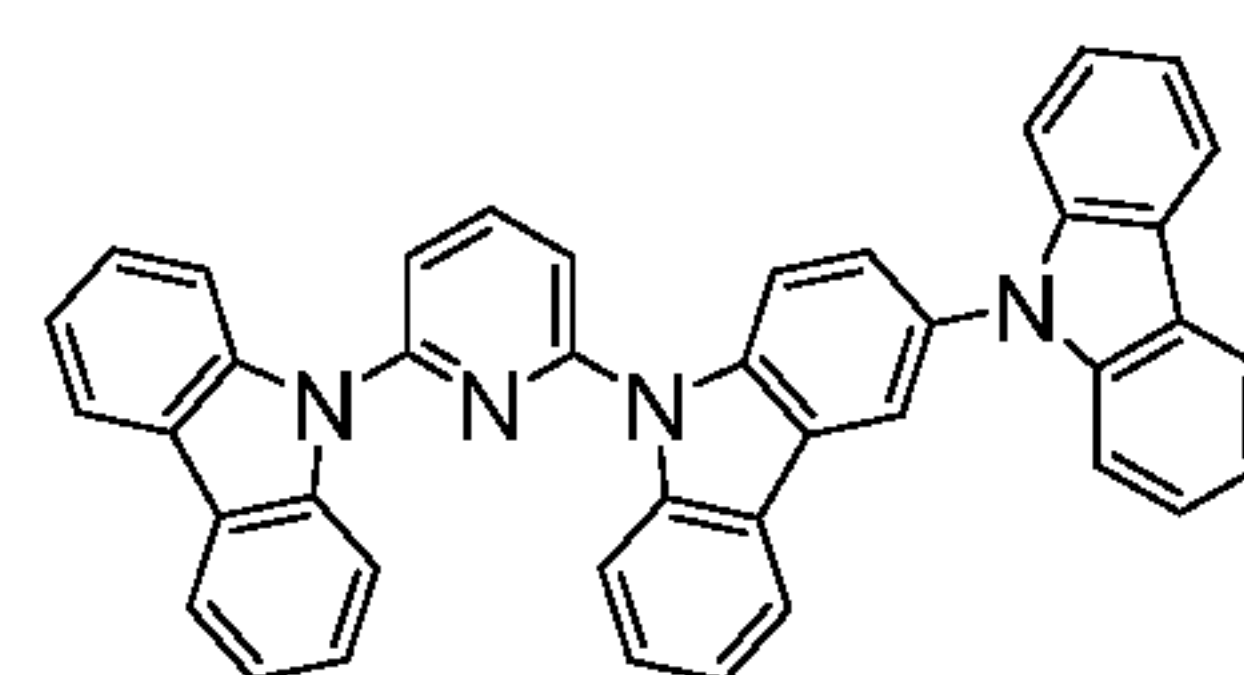
GPH-4



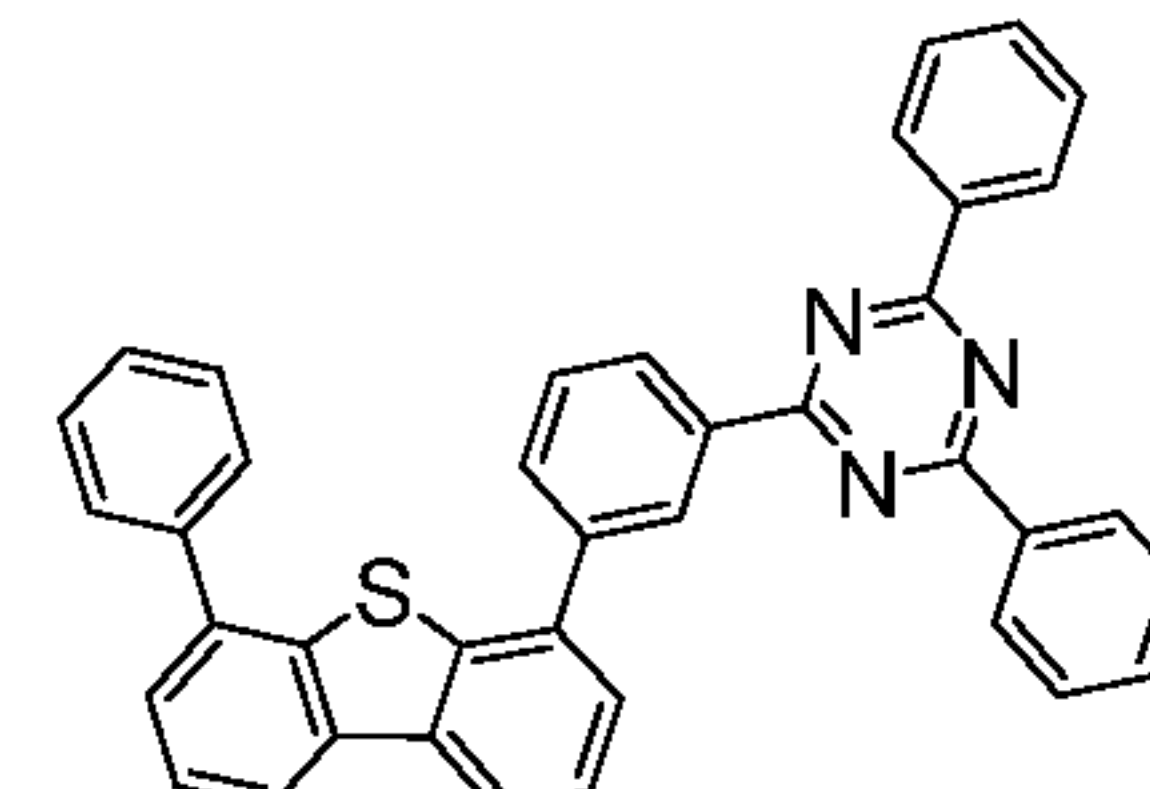
GPH-5



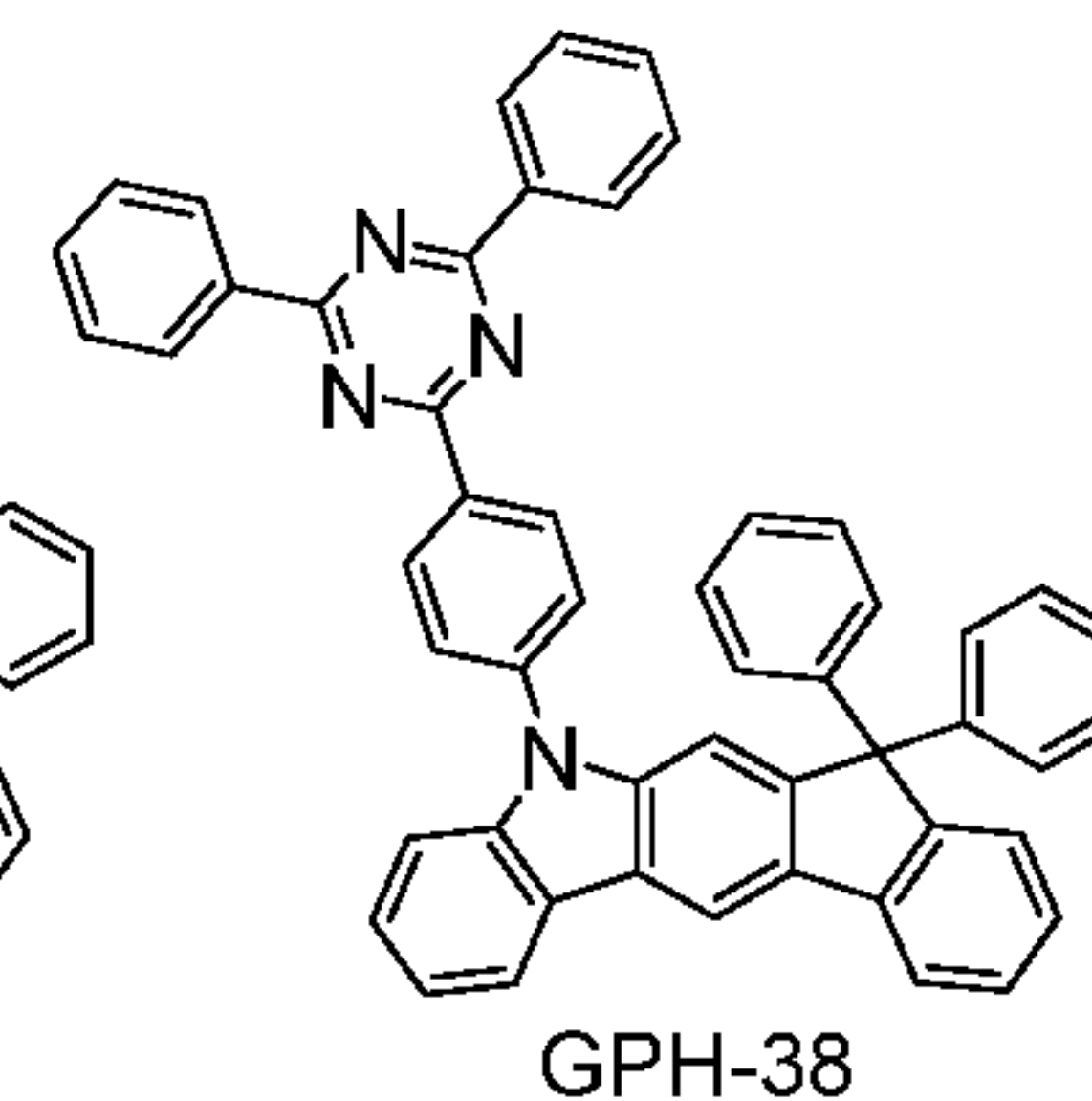
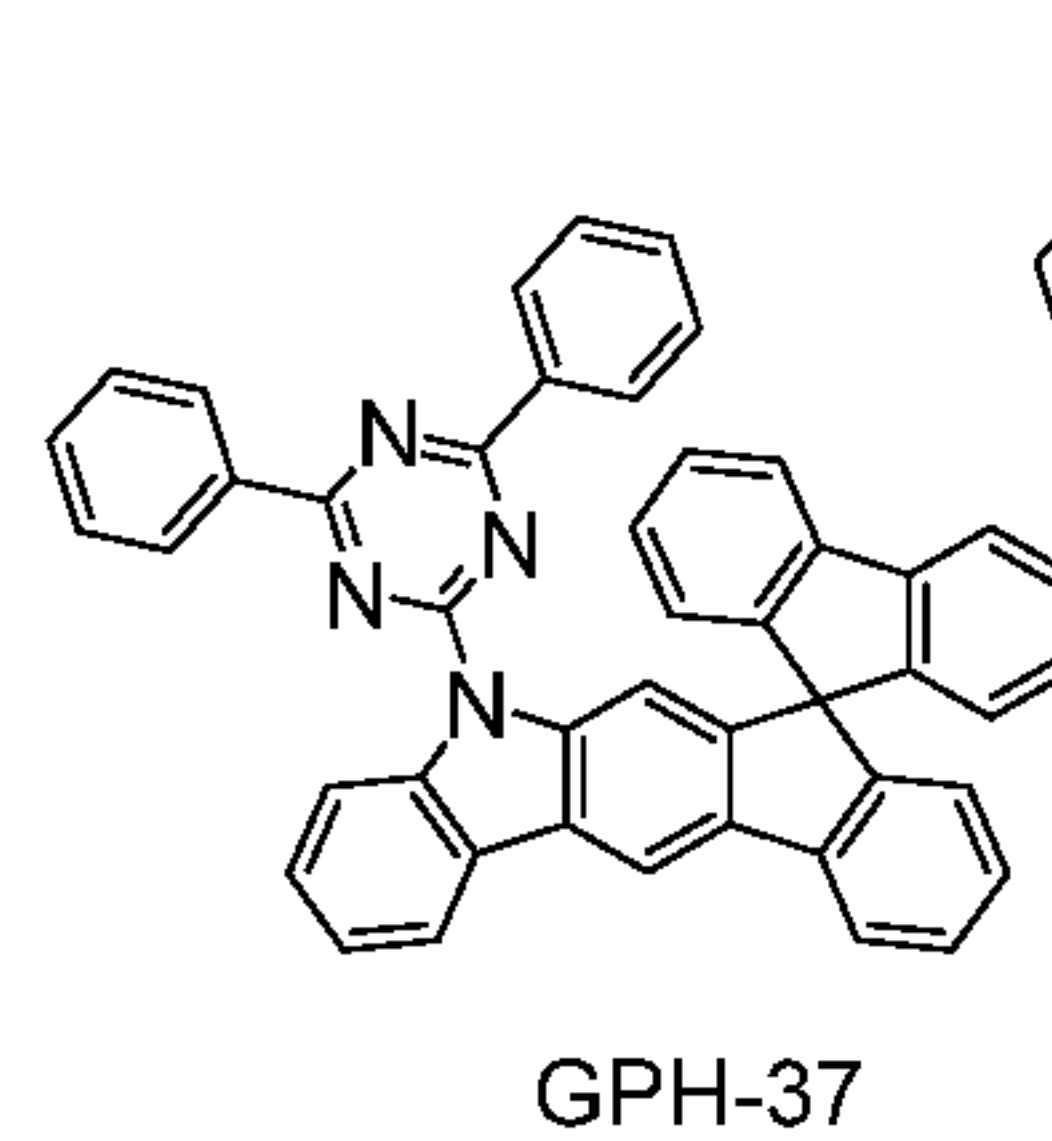
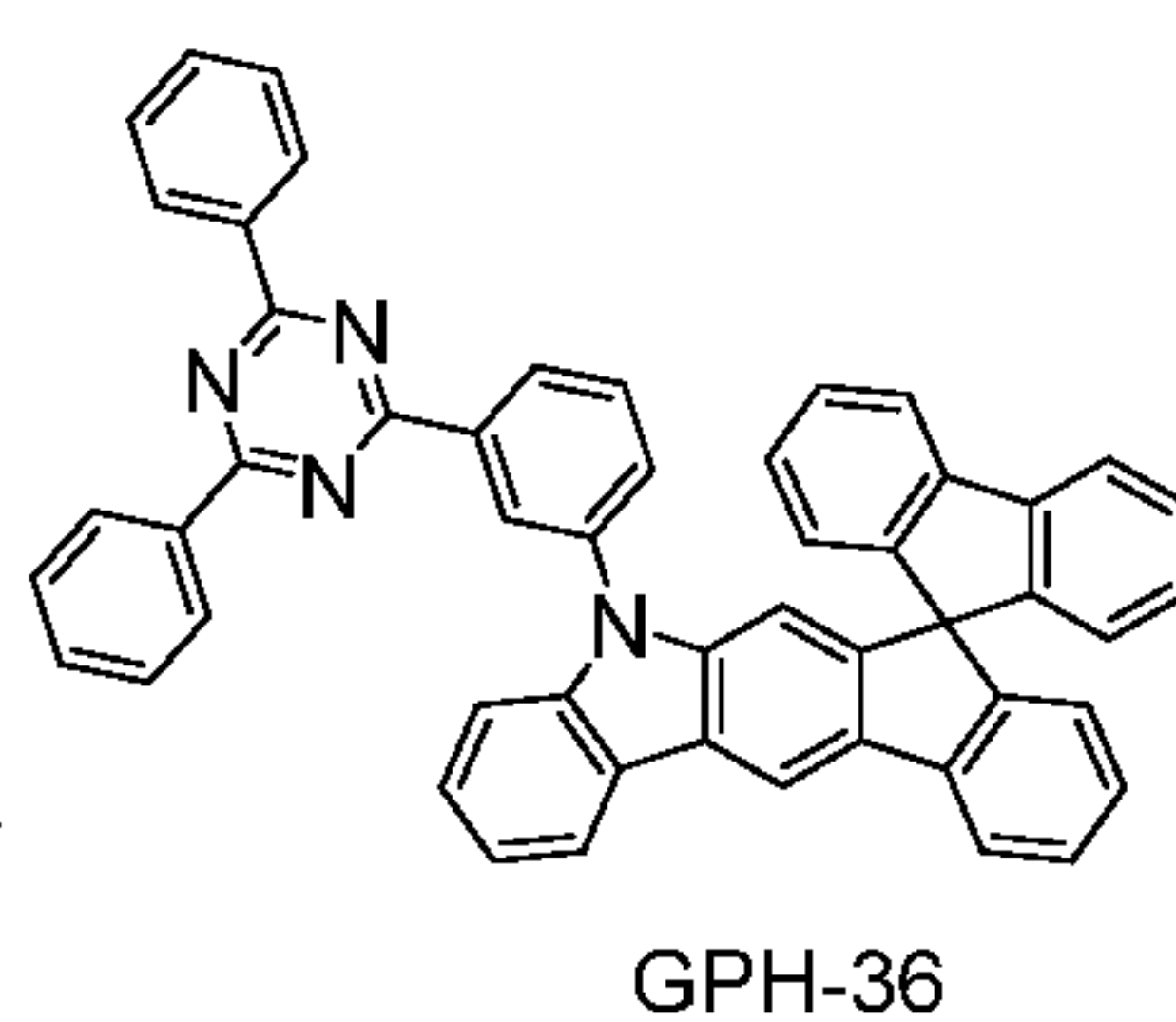
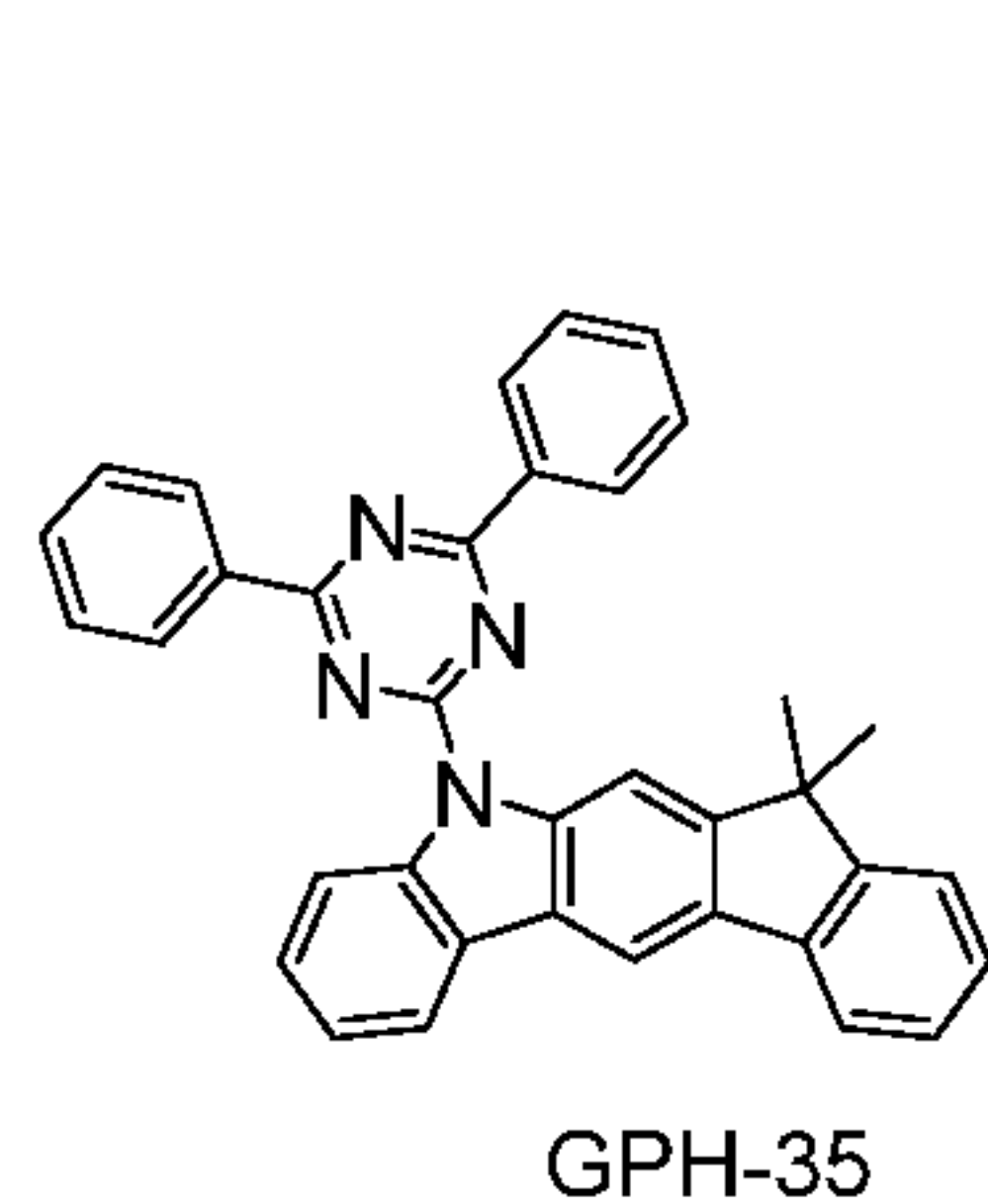
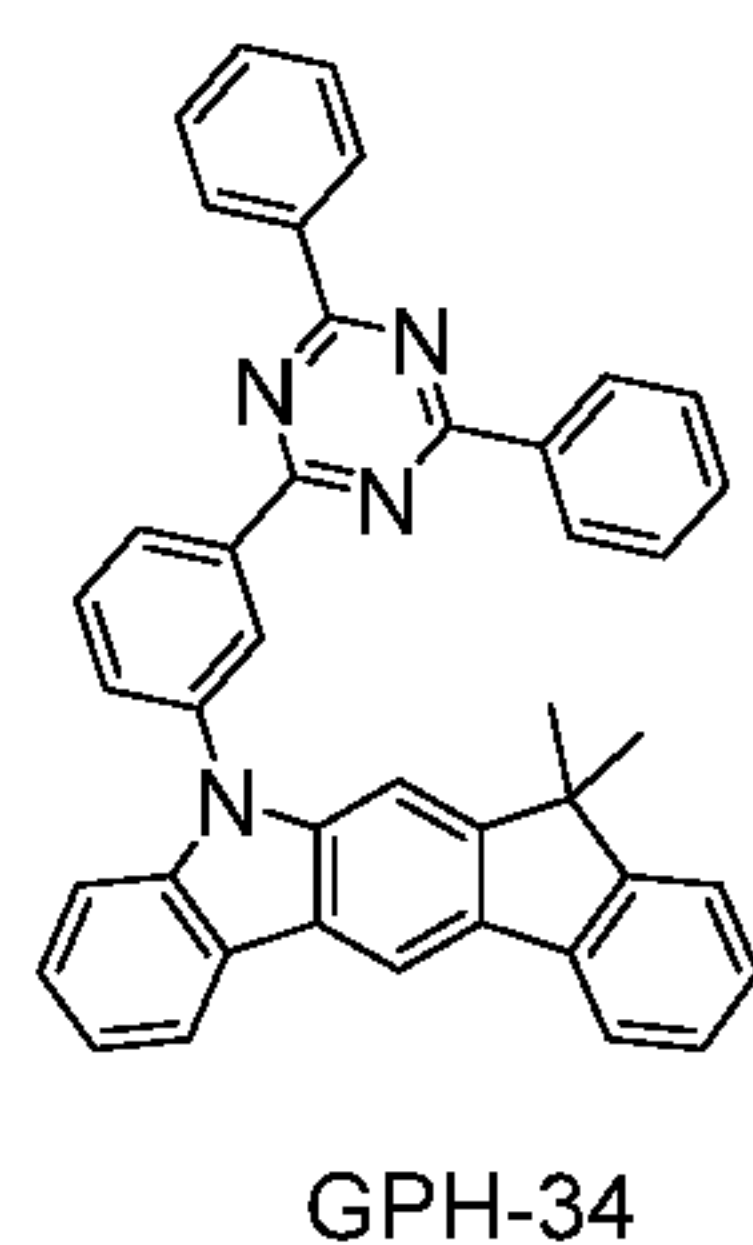
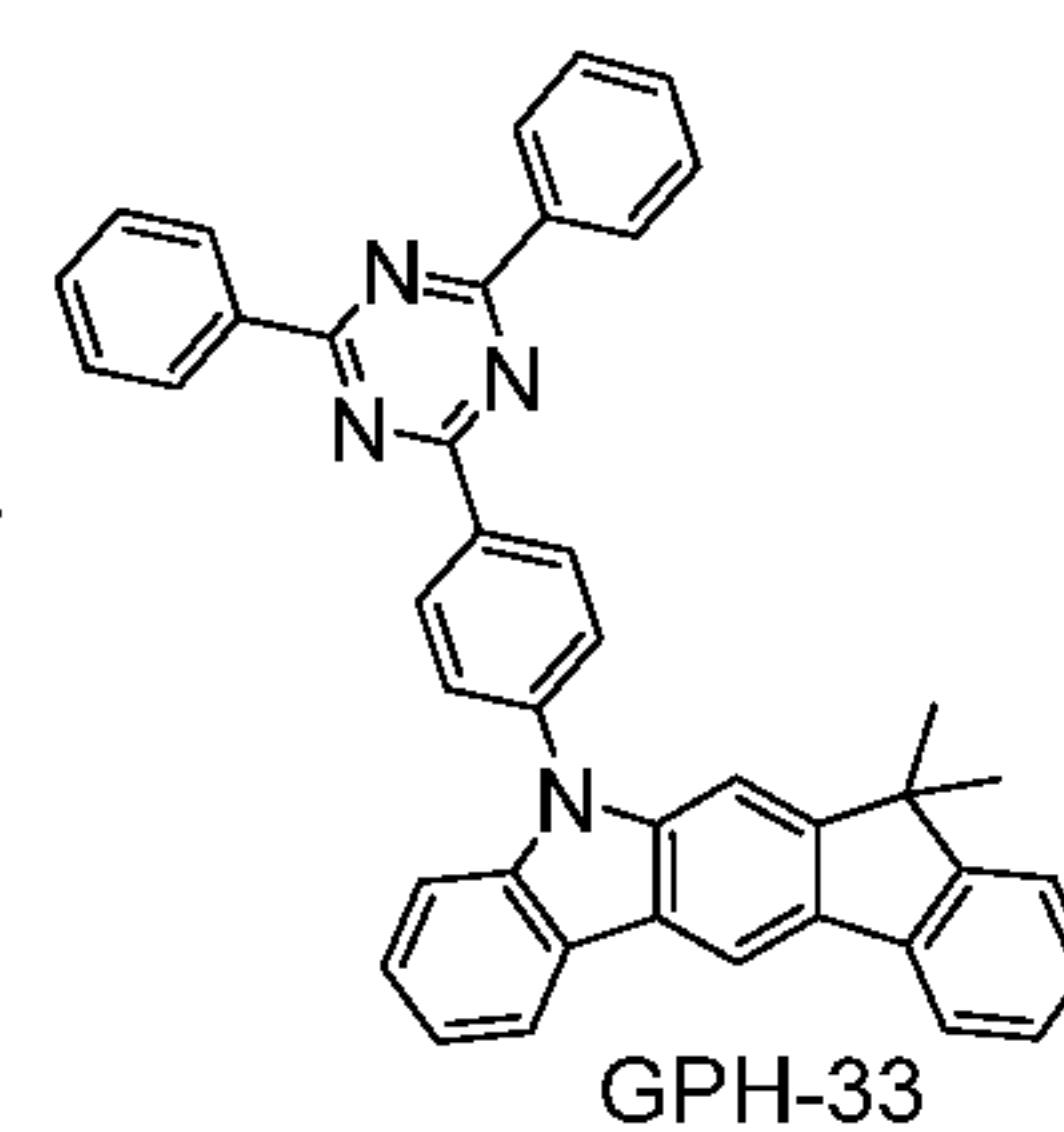
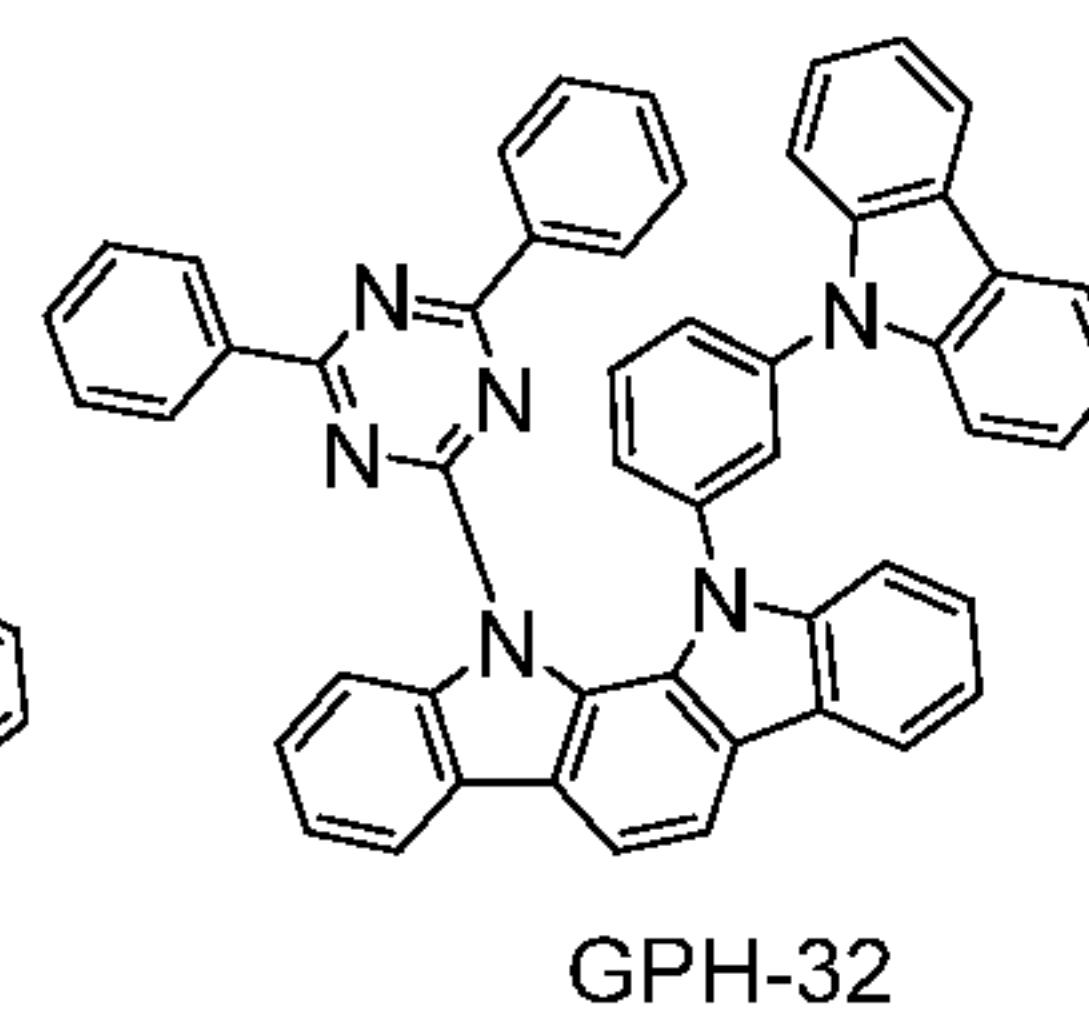
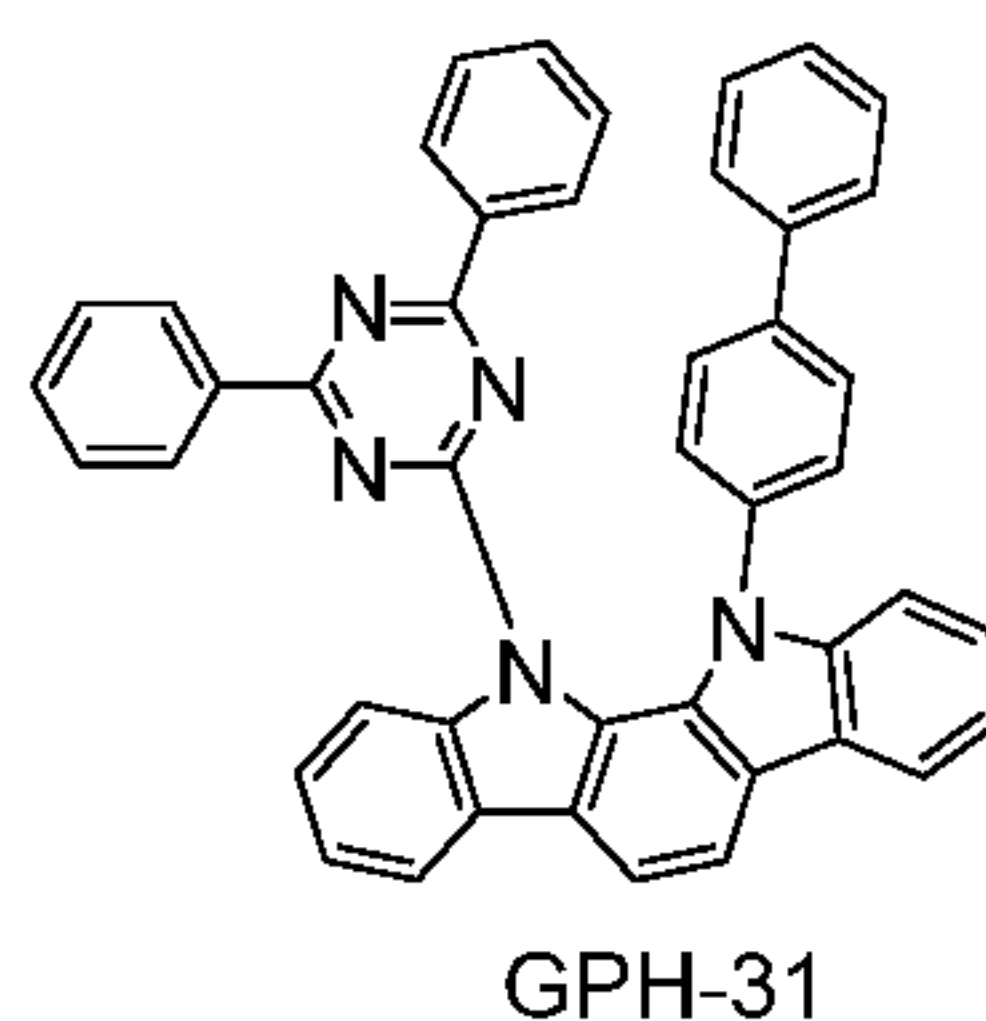
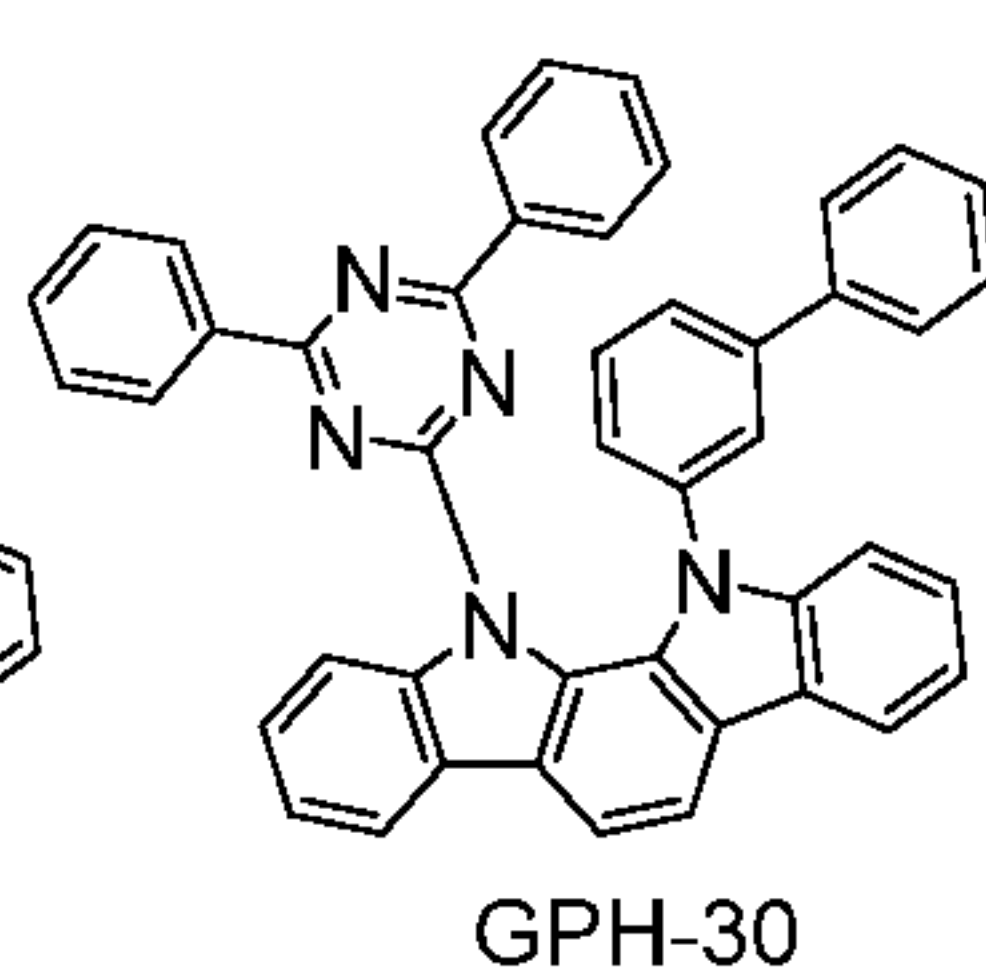
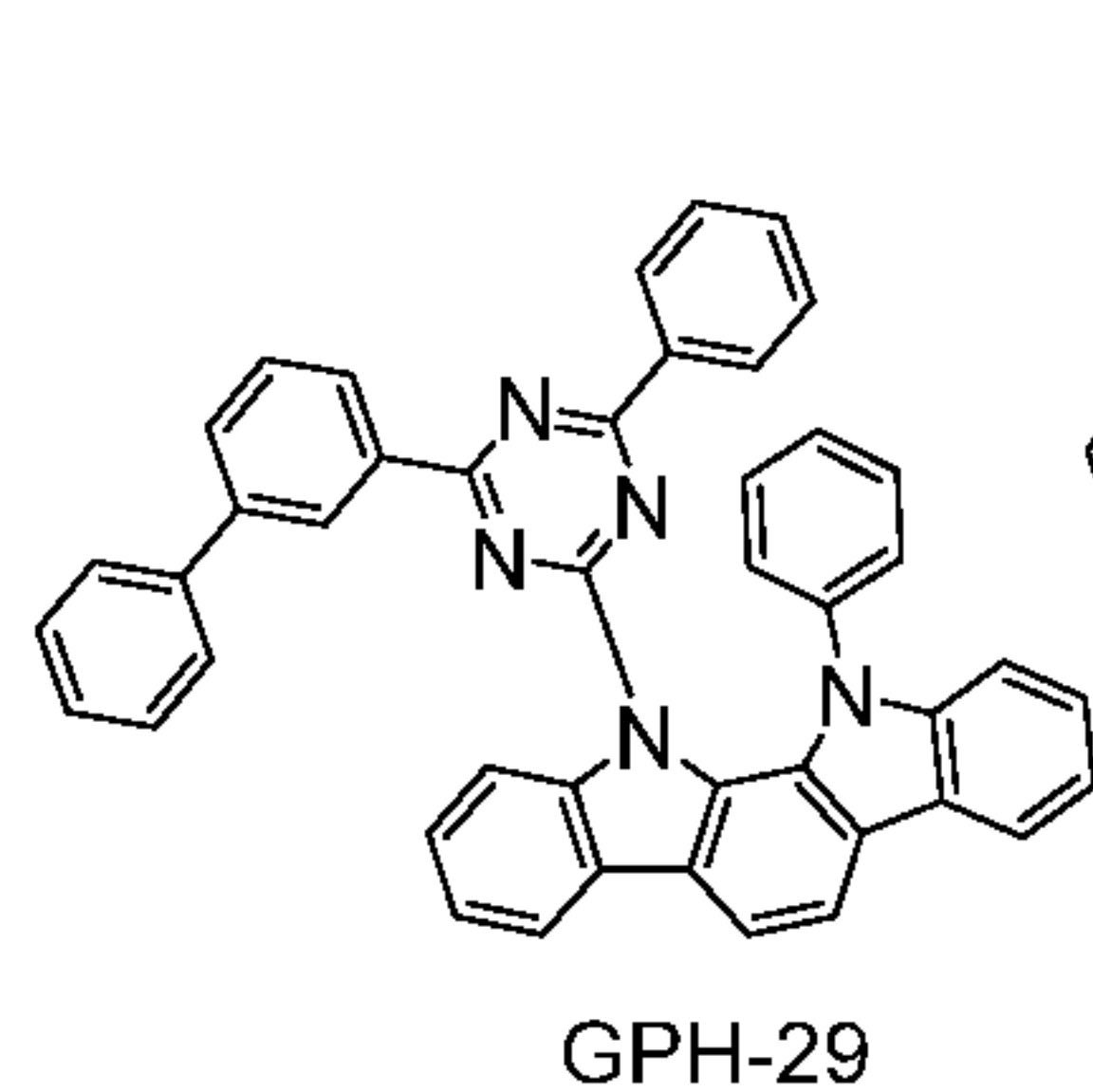
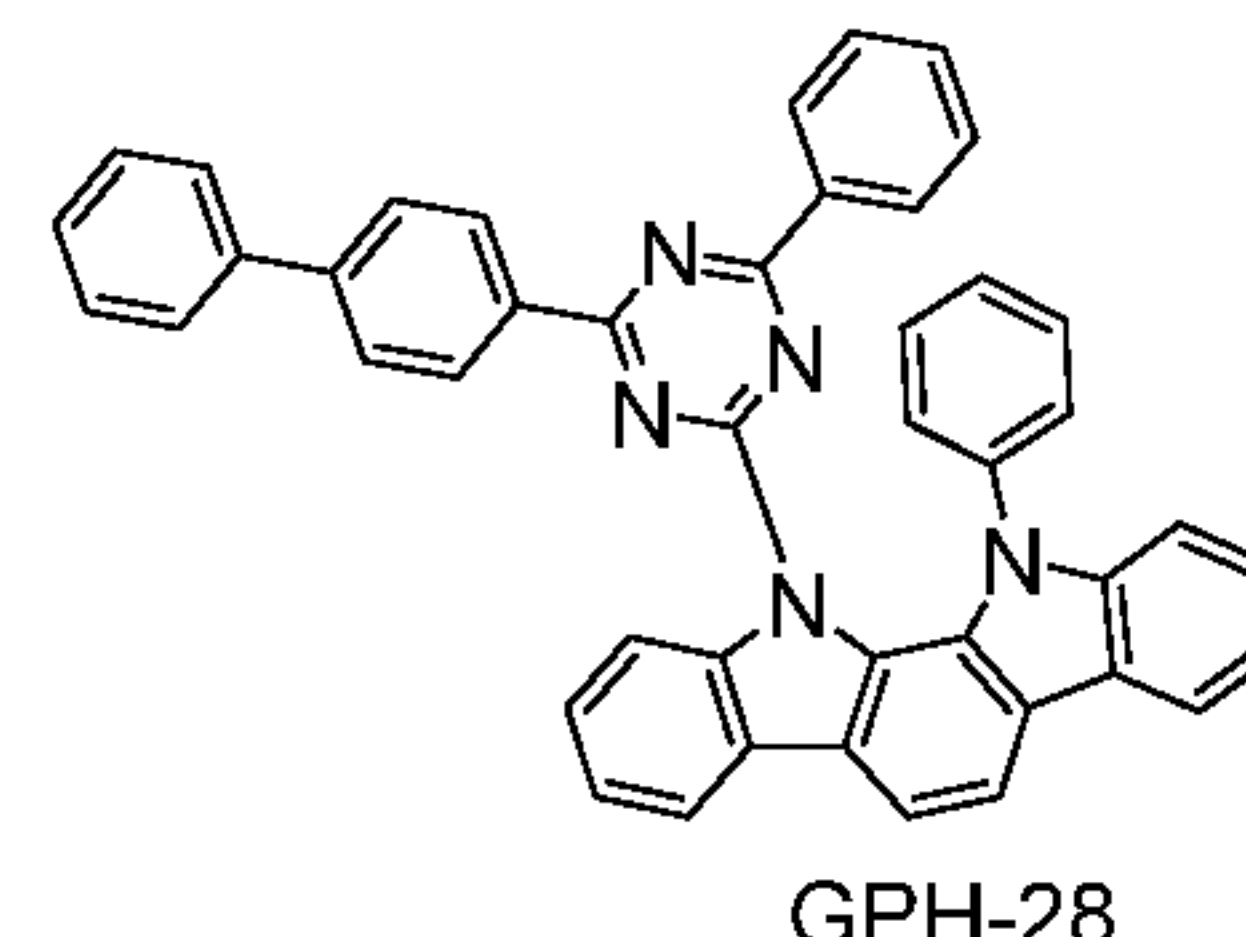
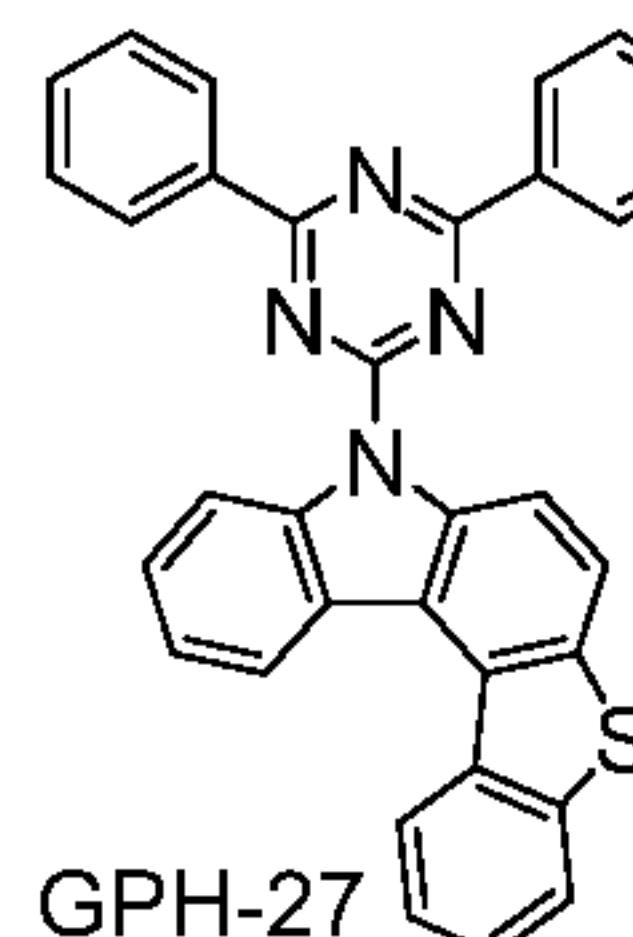
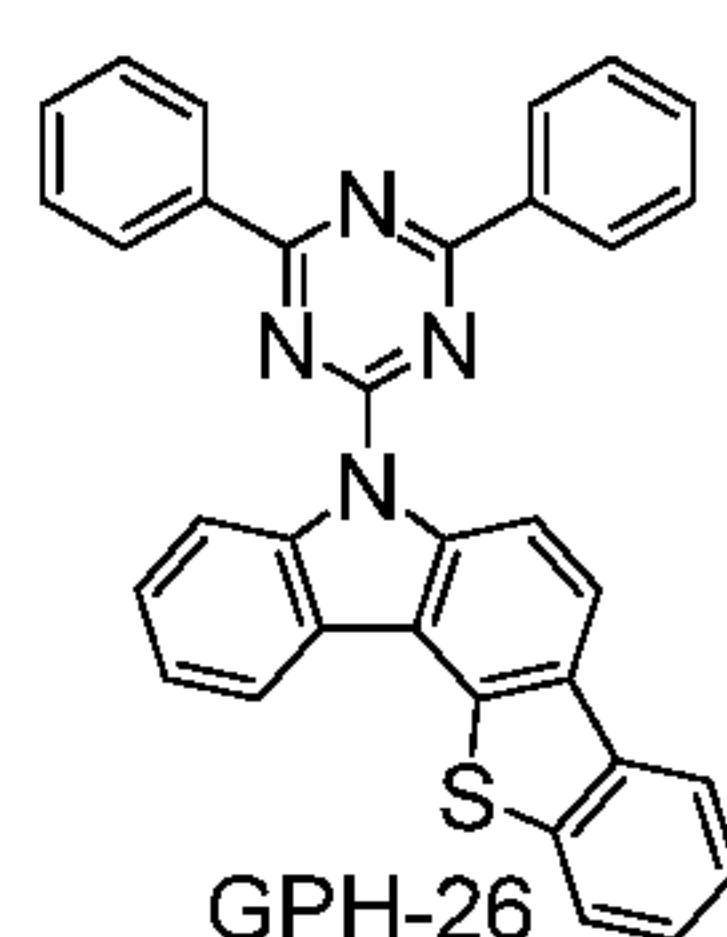
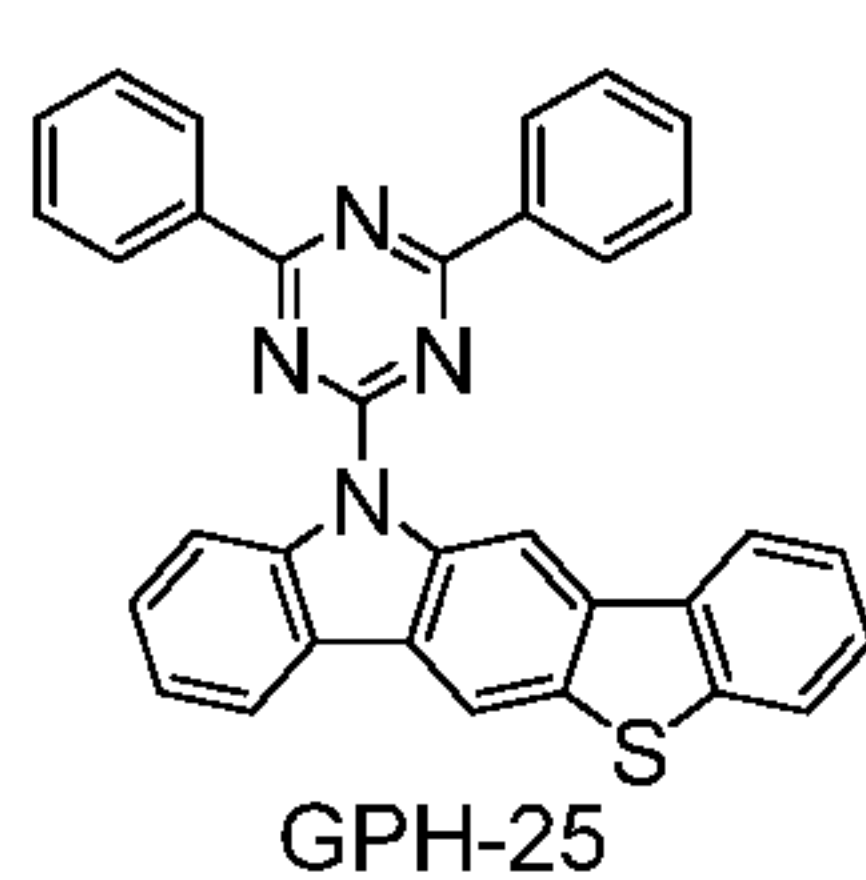
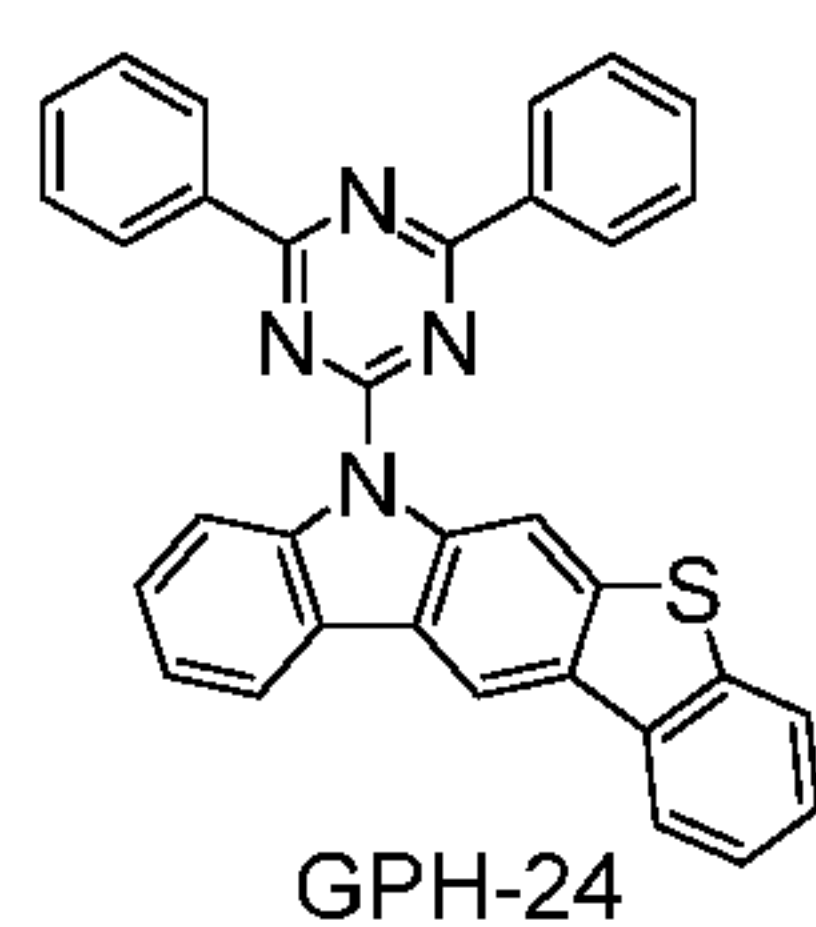
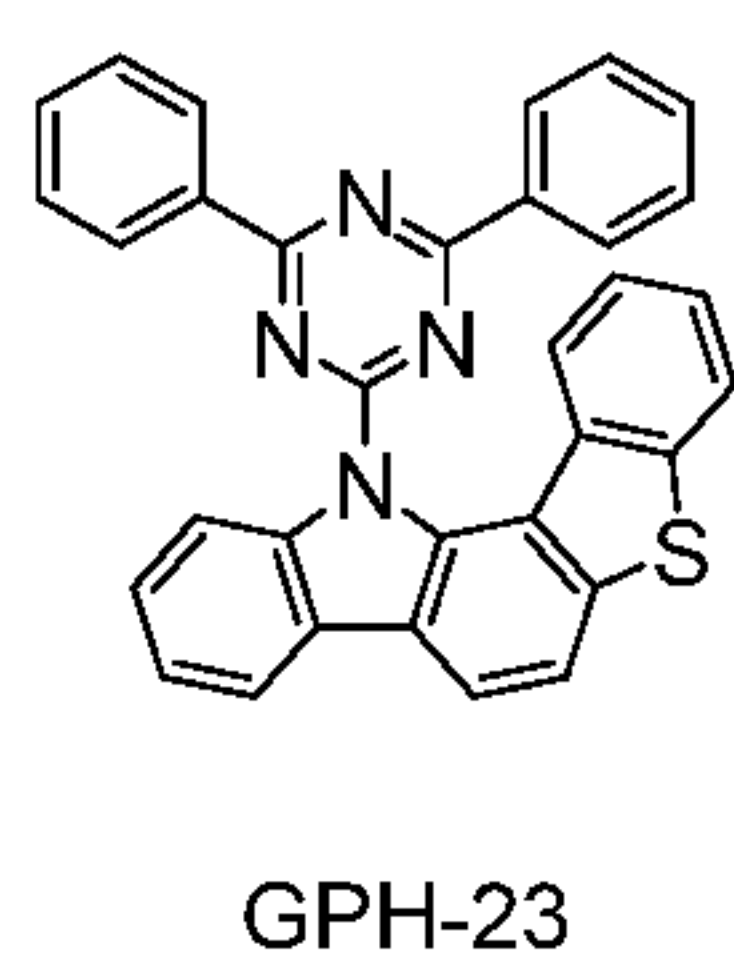
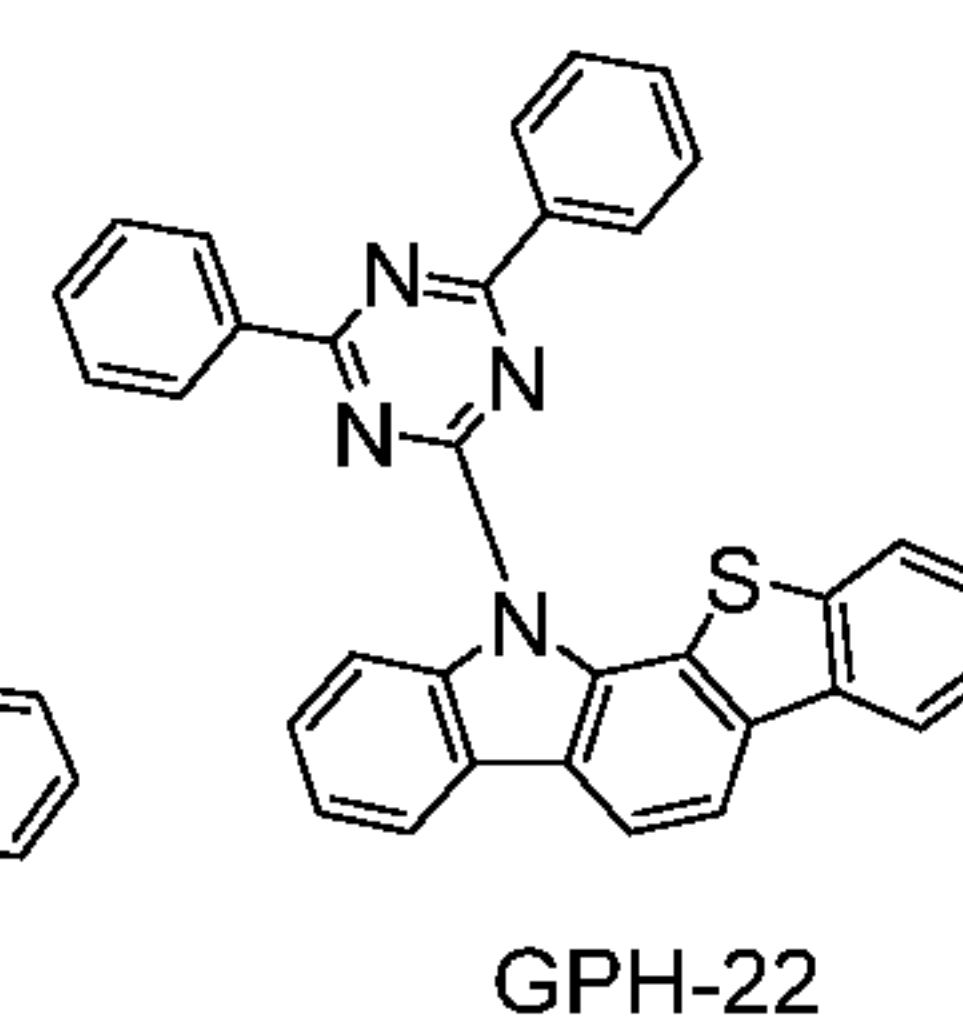
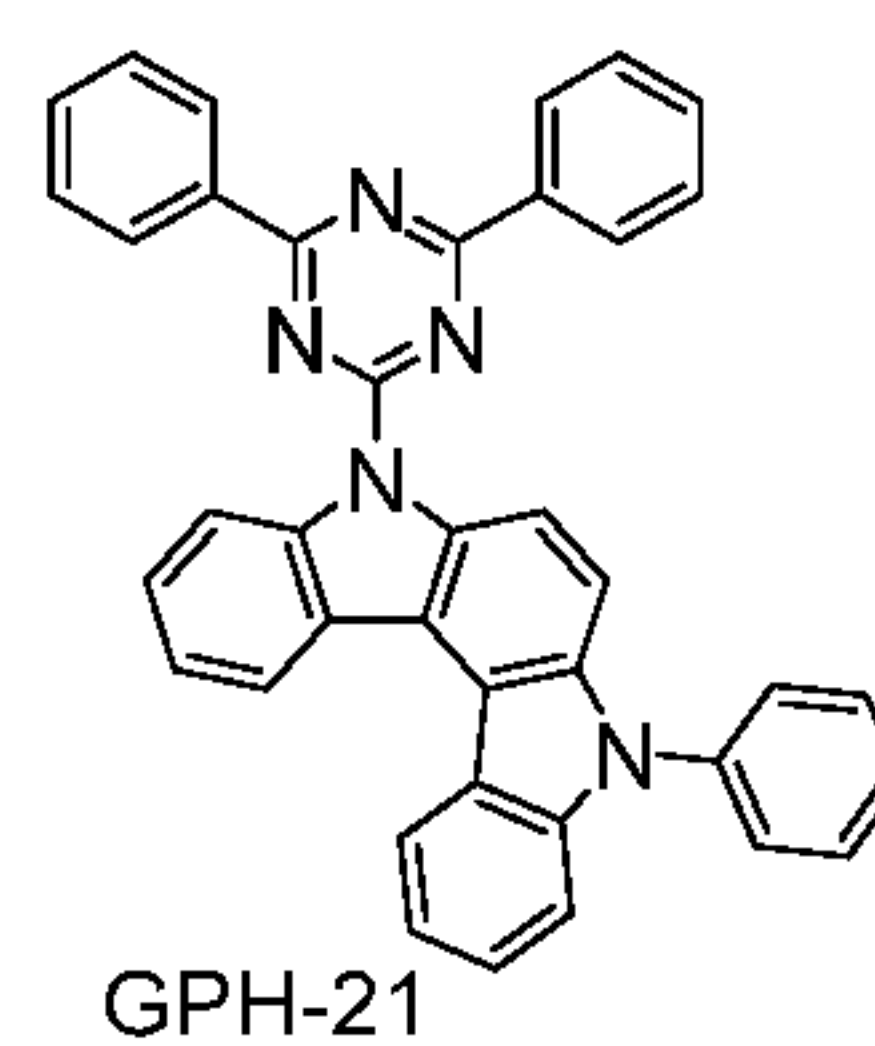
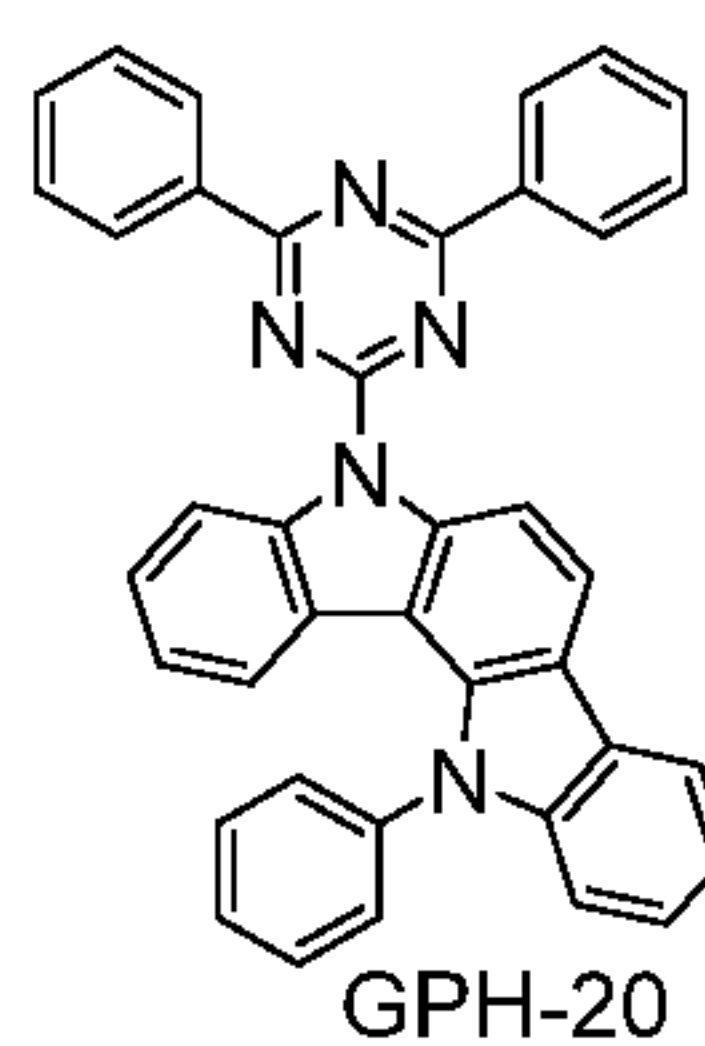
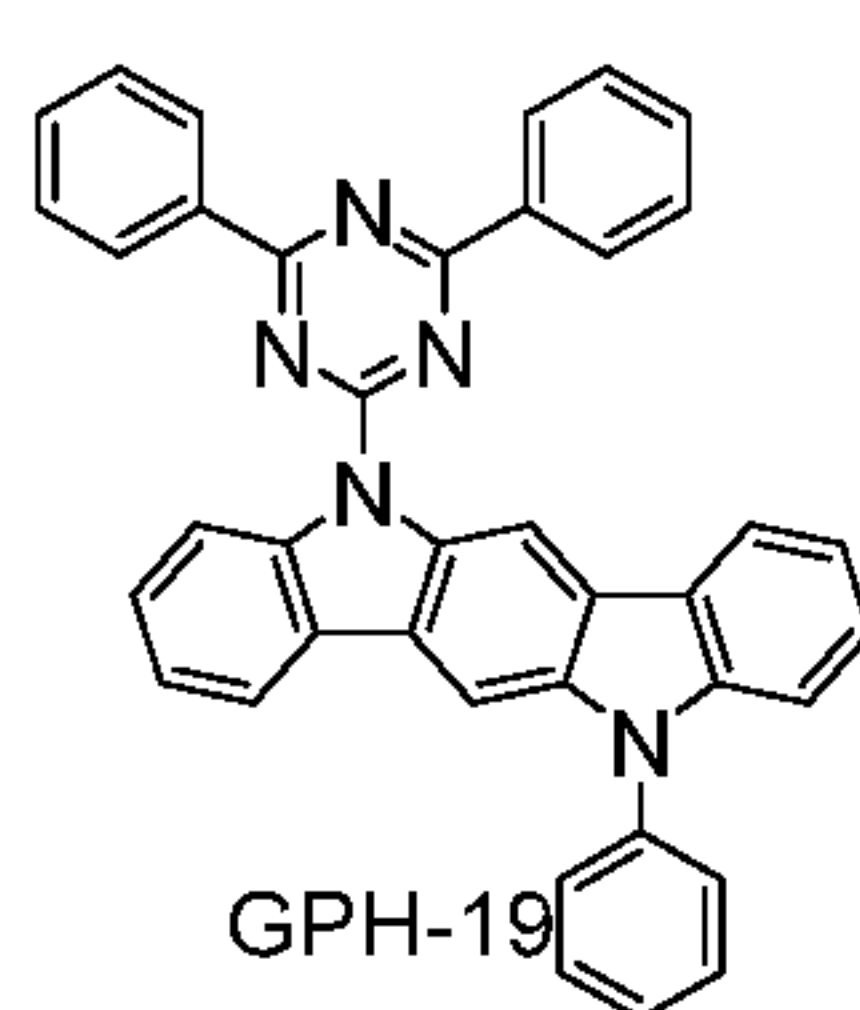
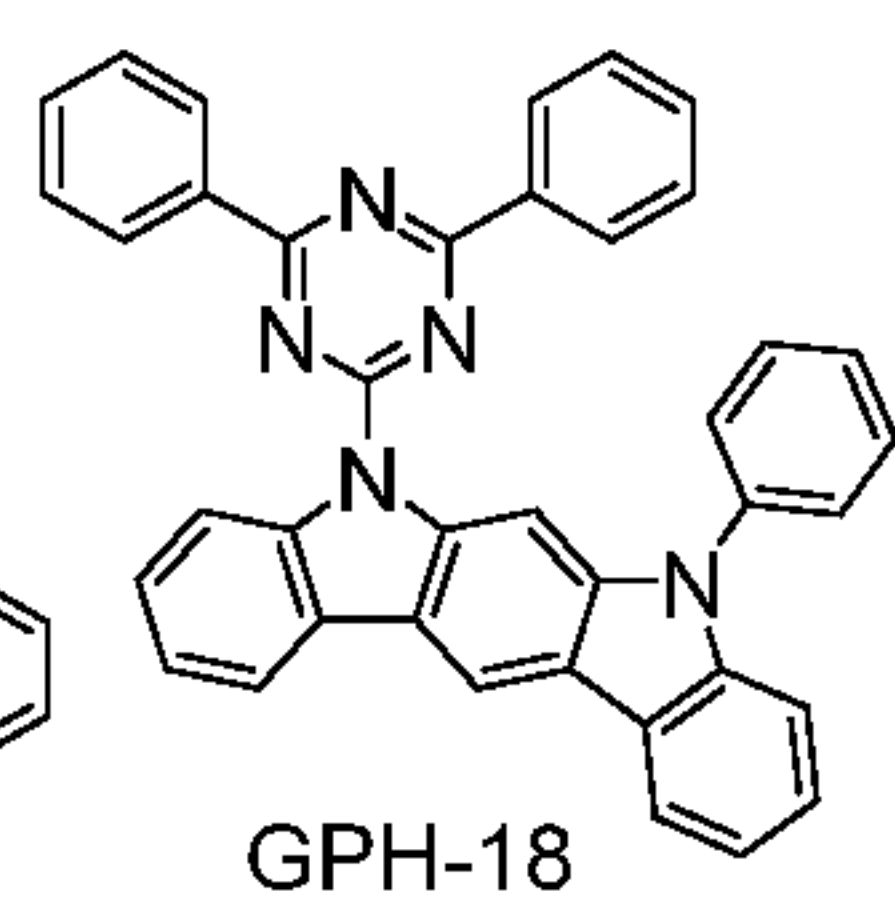
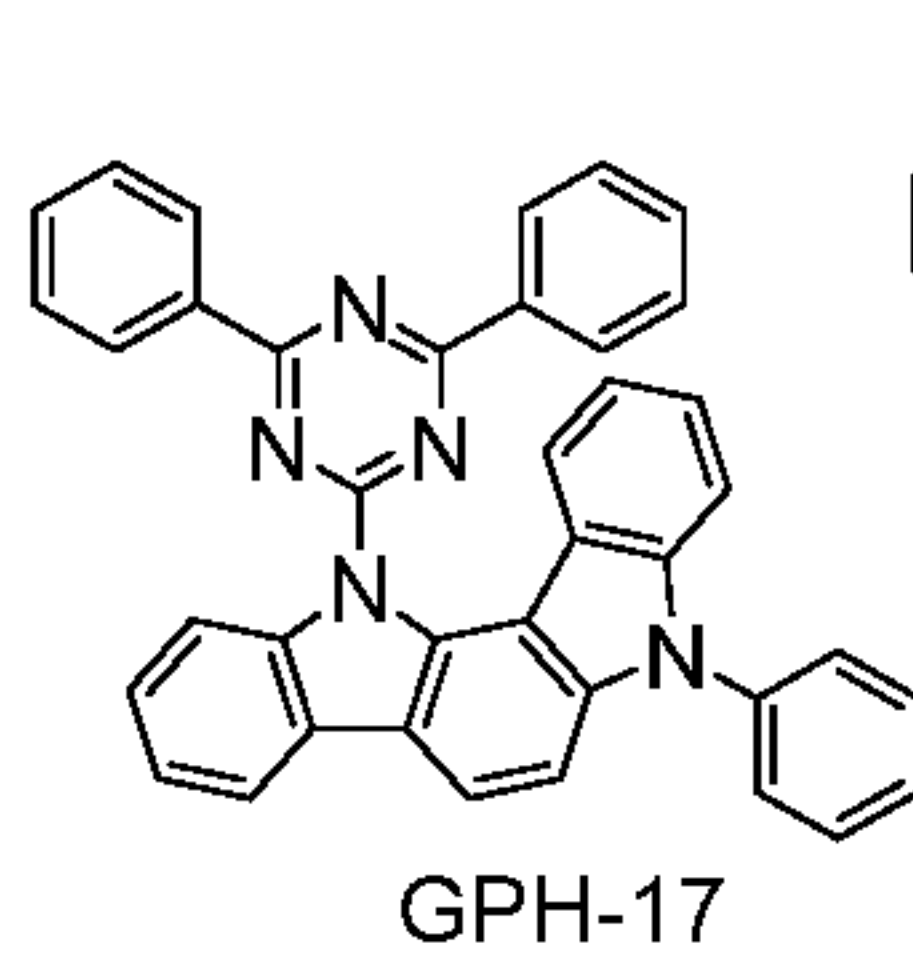
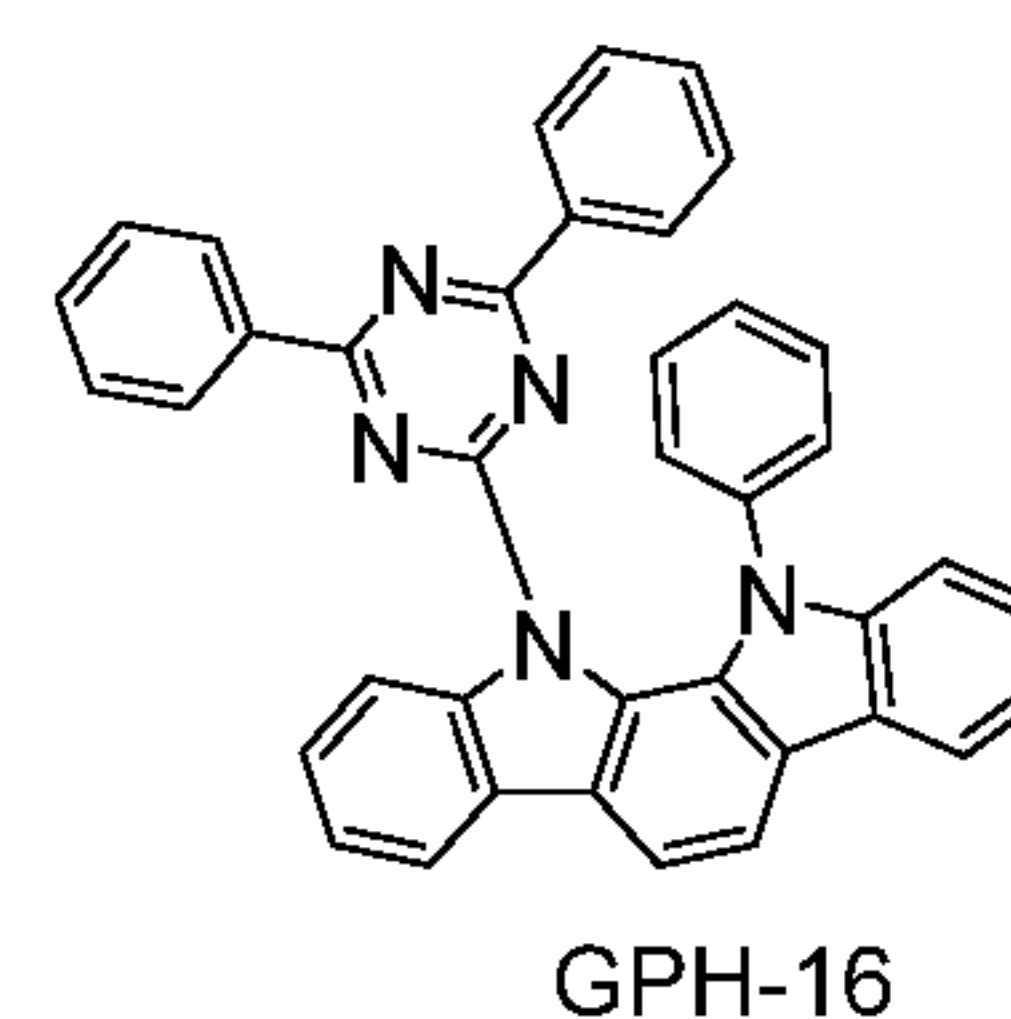
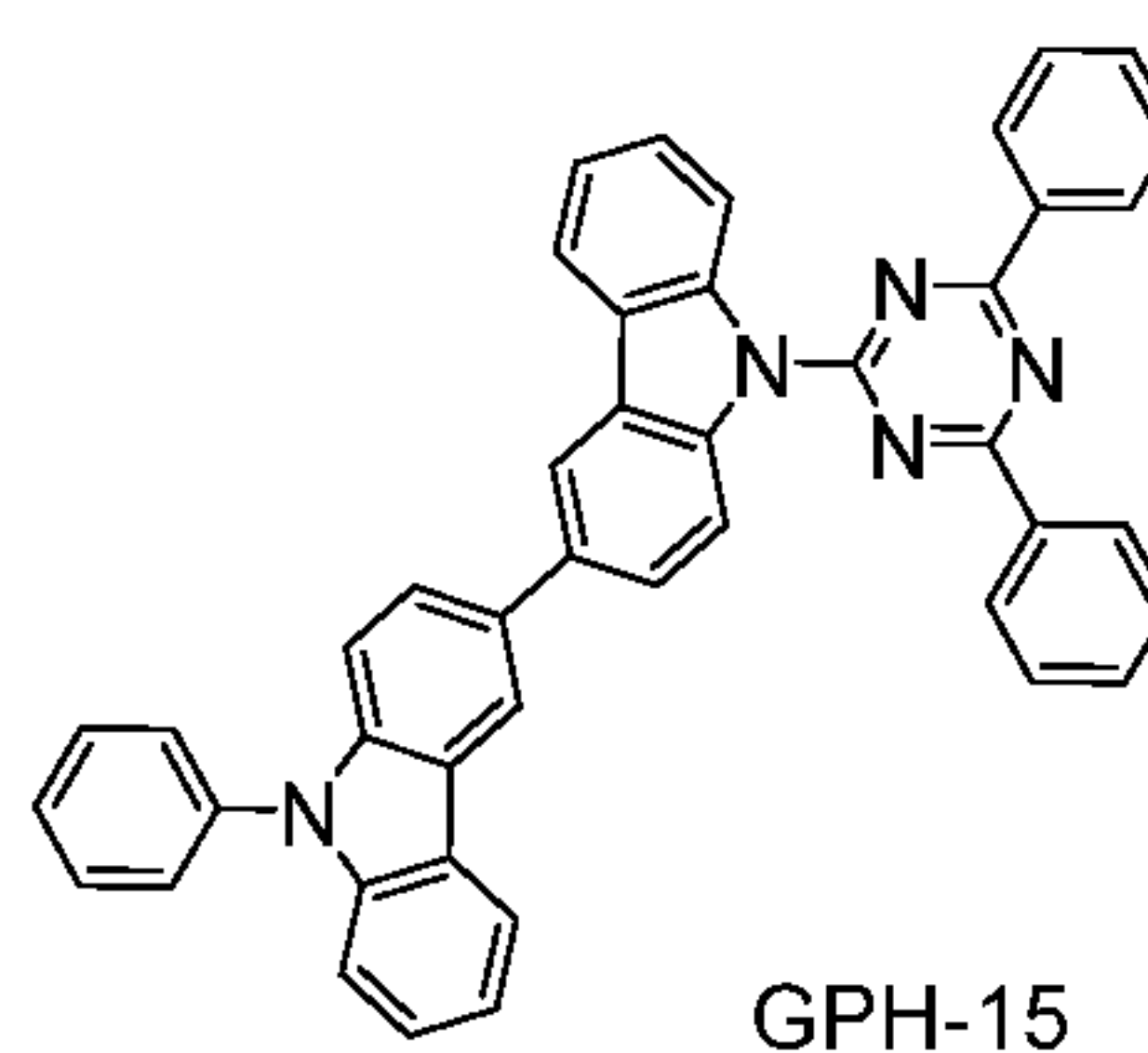
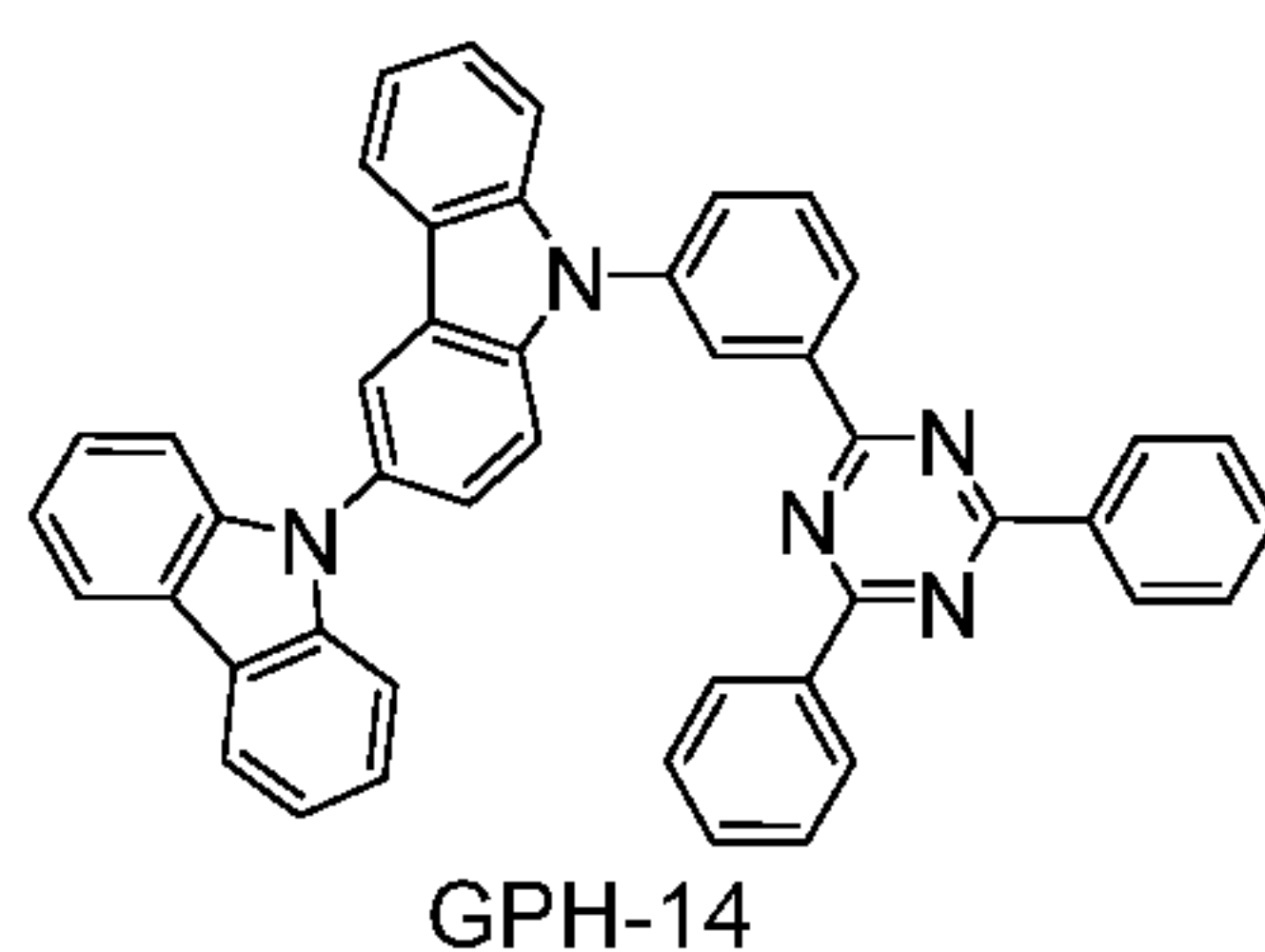
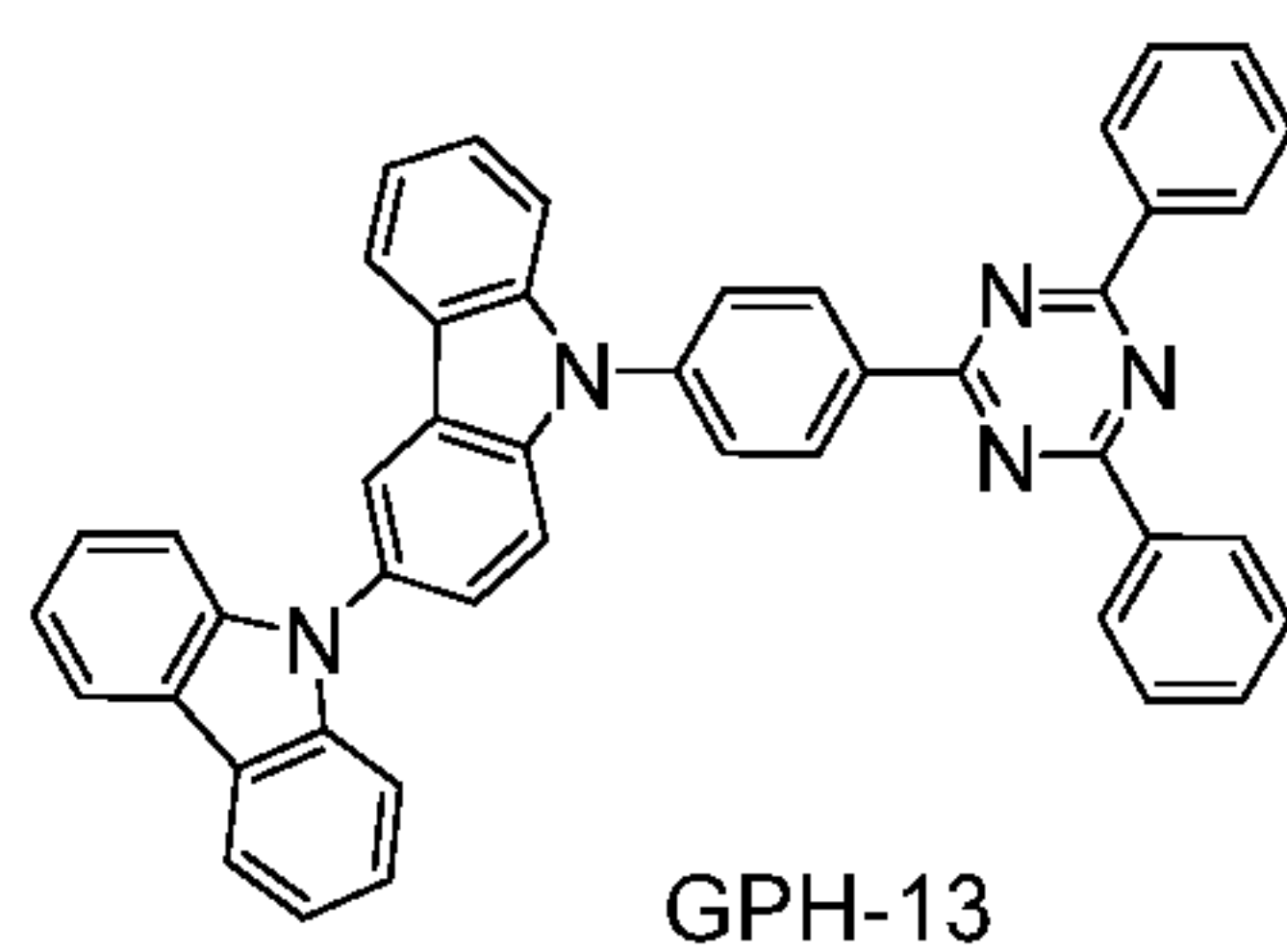
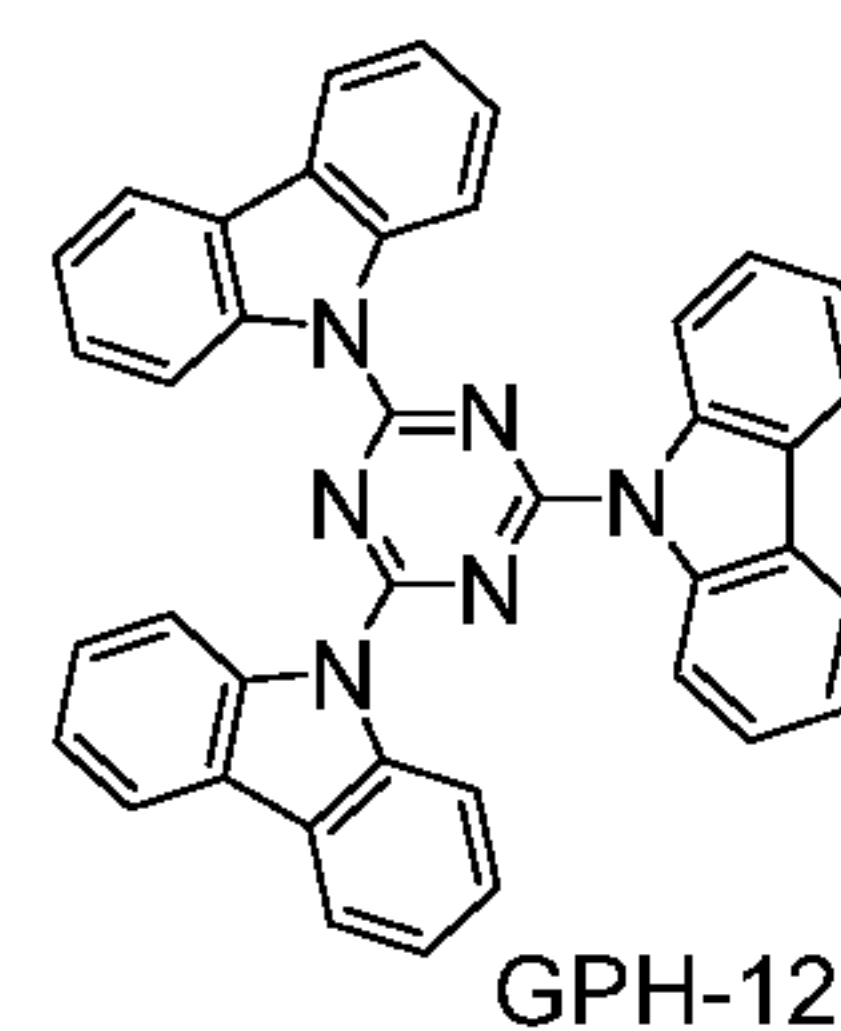
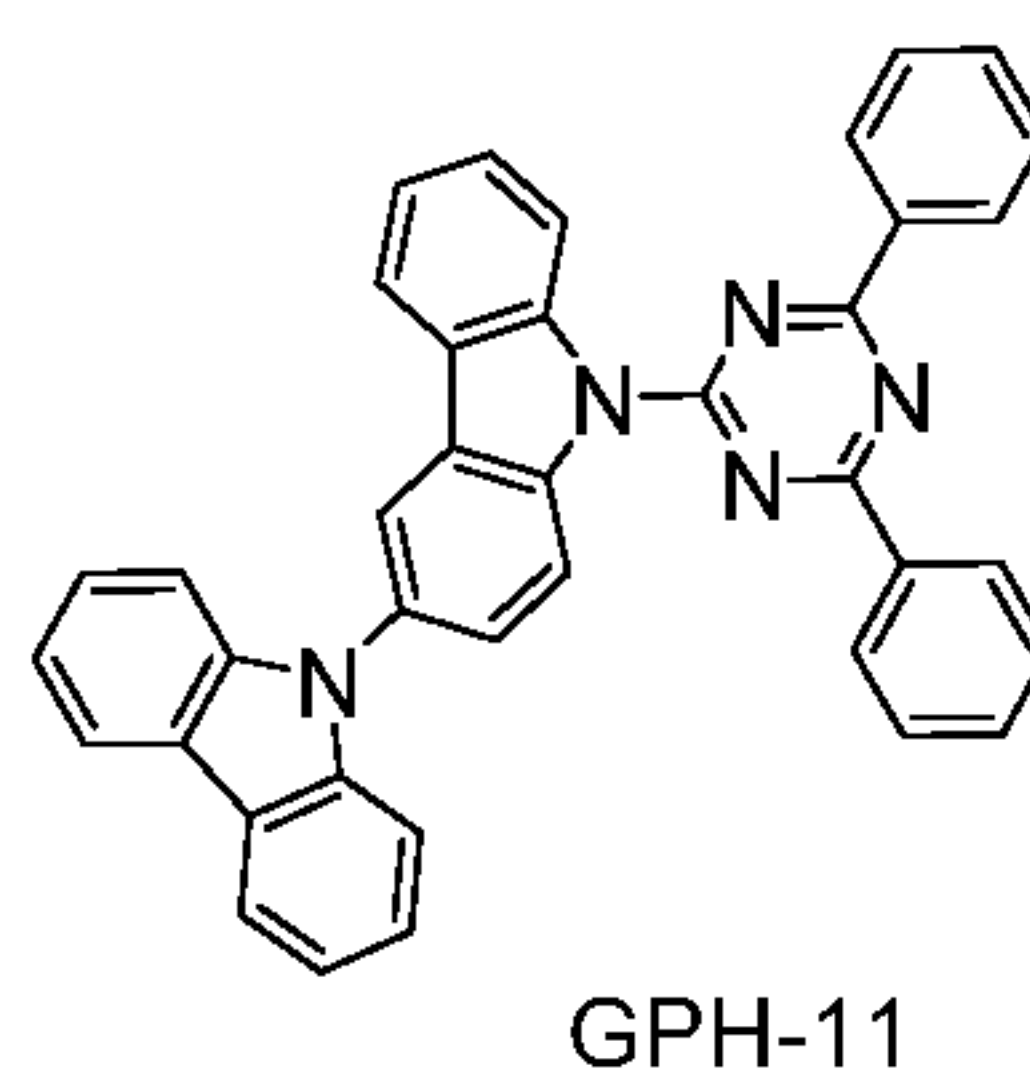
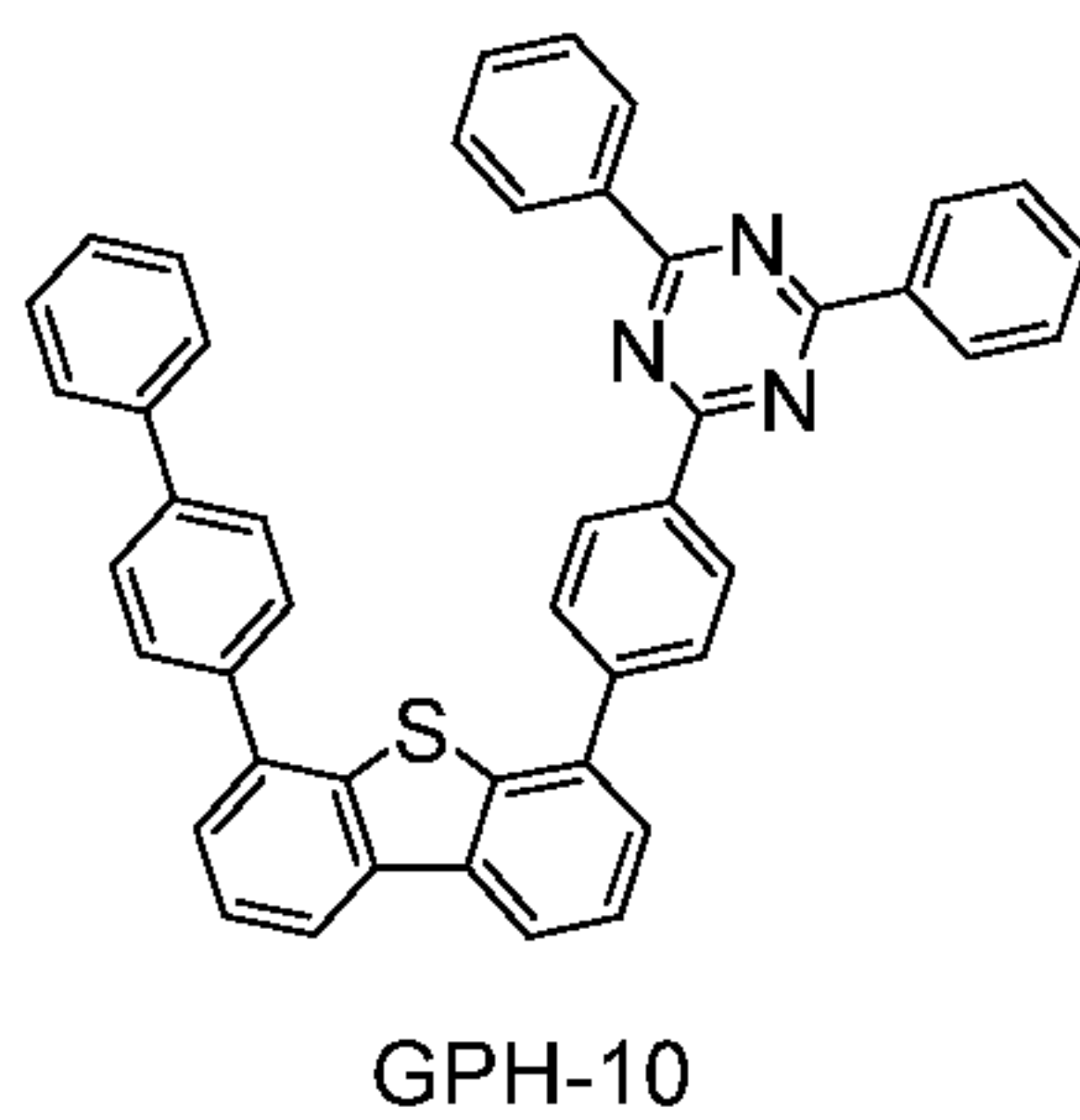
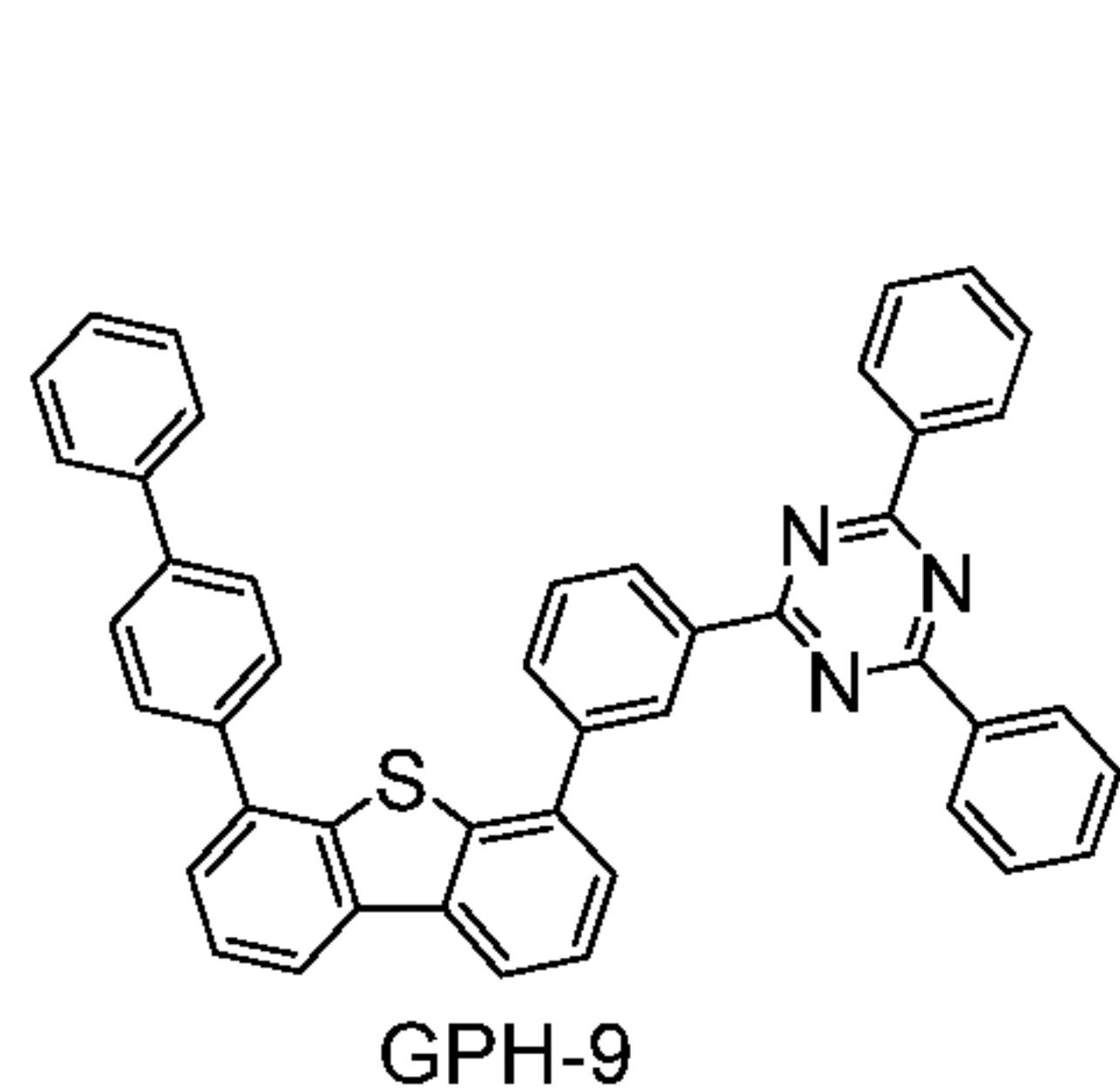
GPH-6

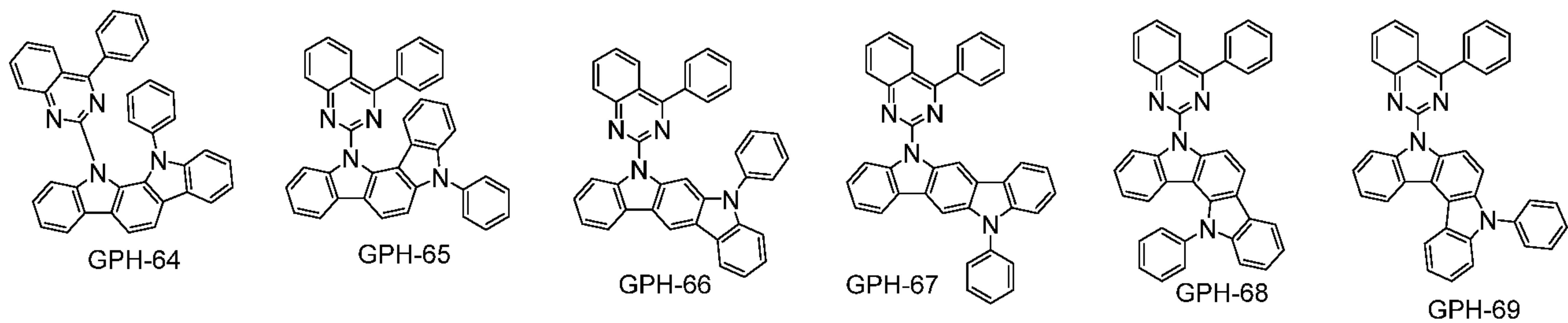
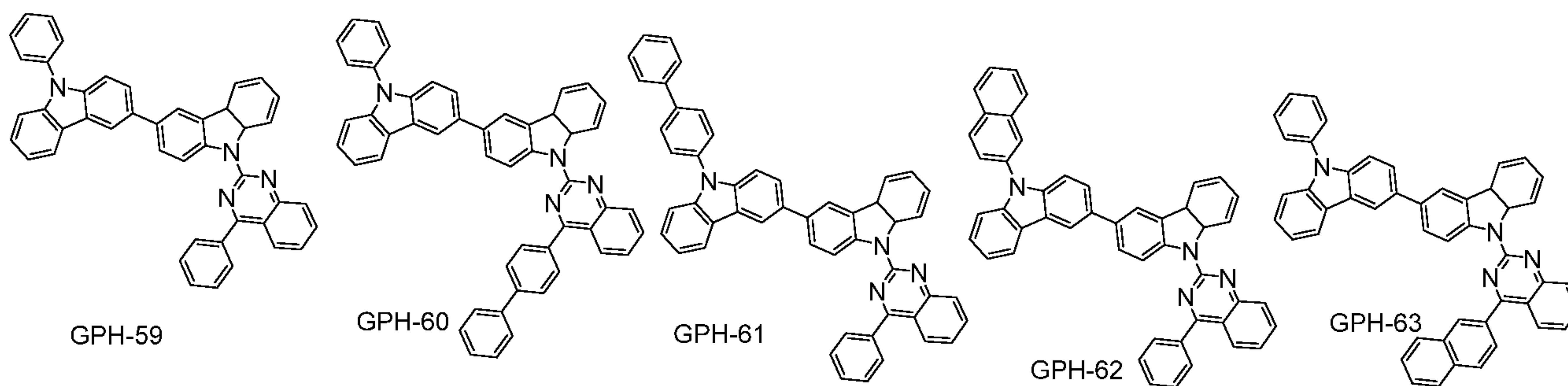
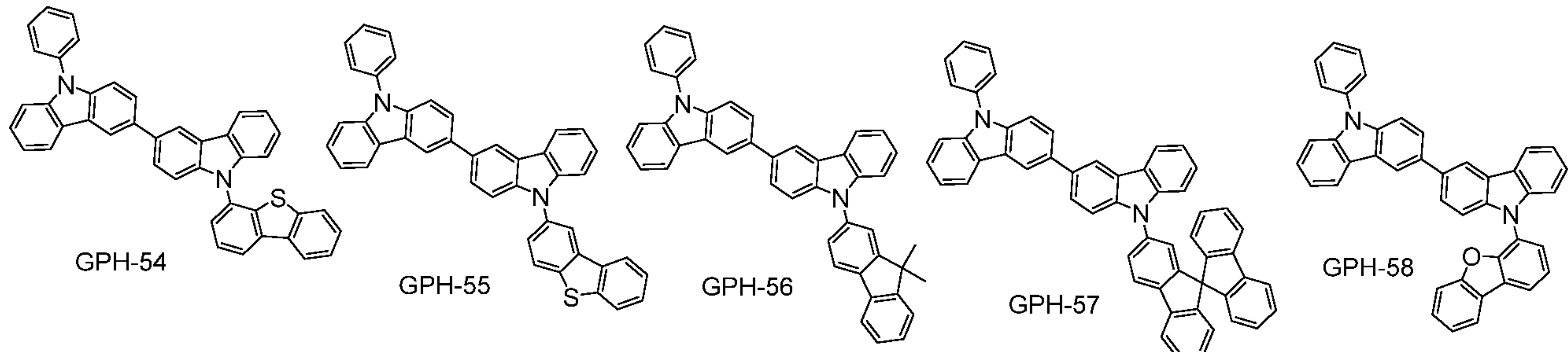
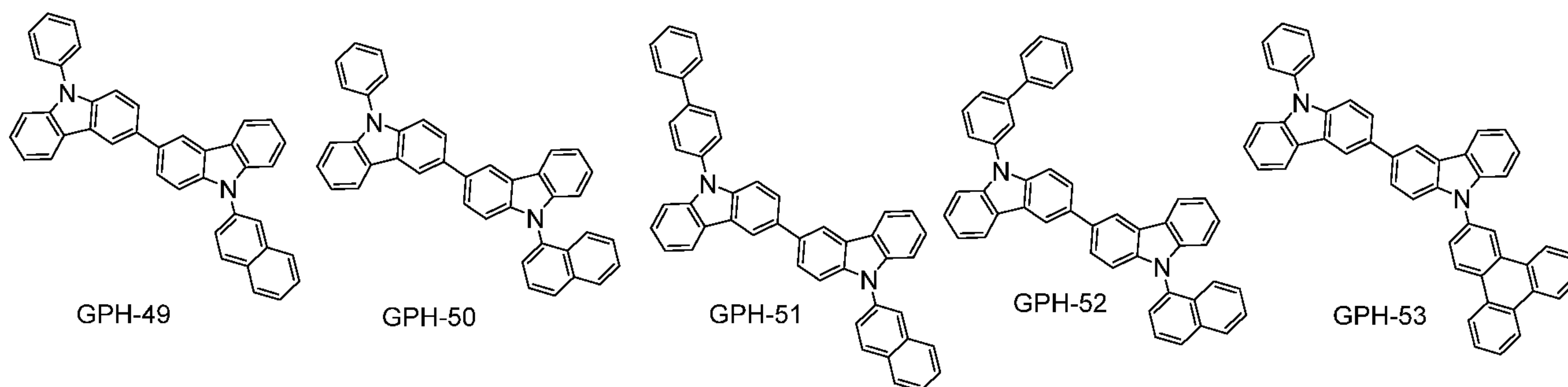
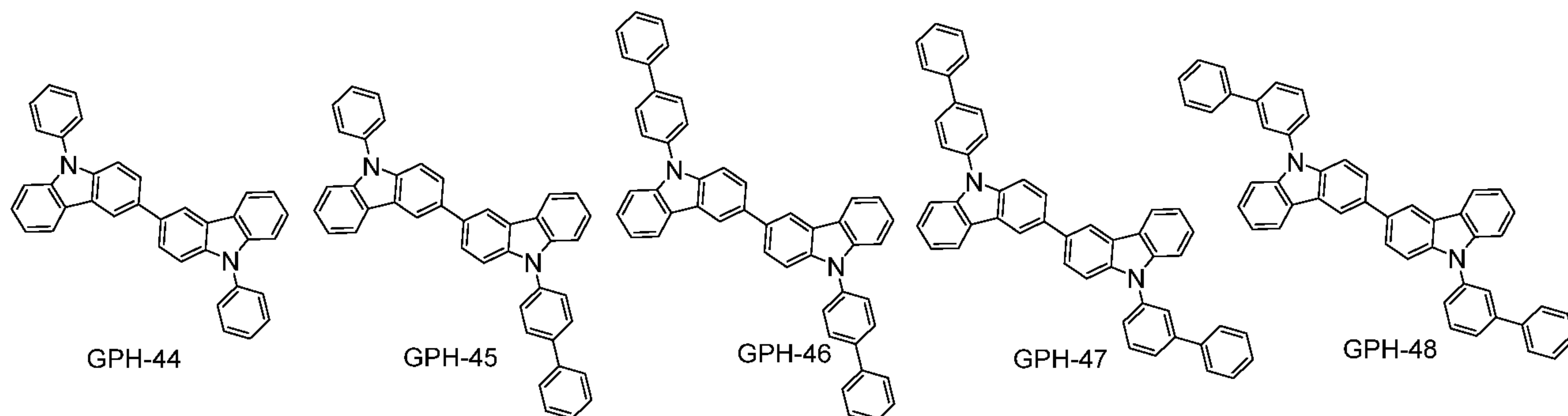
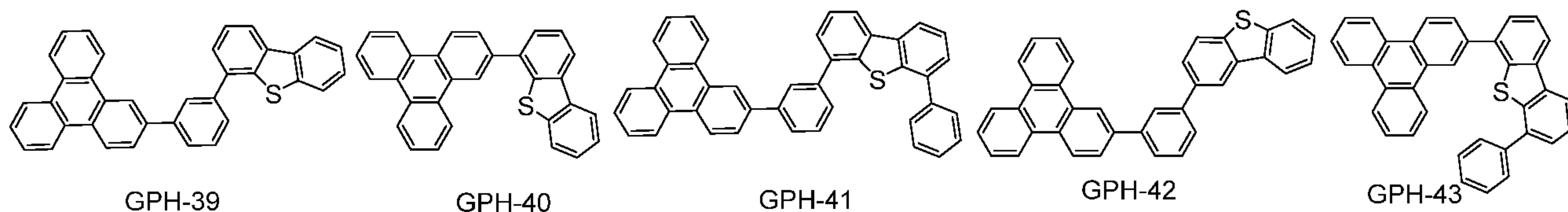


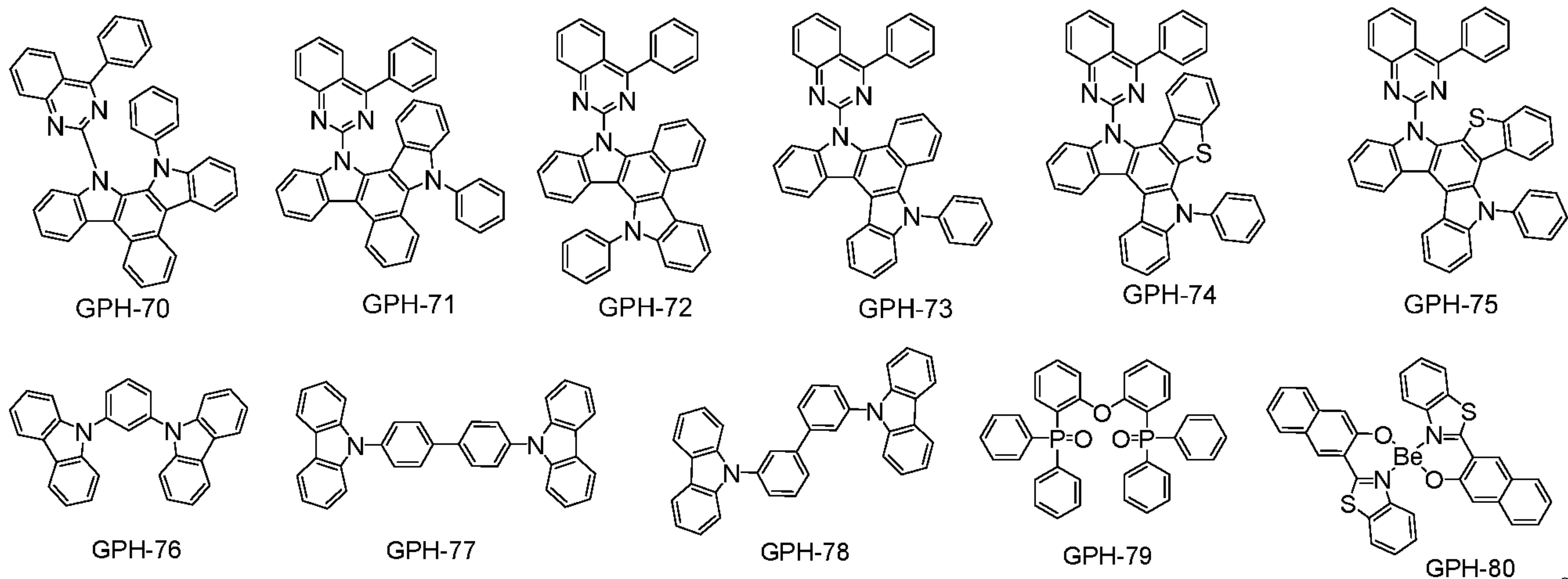
GPH-7



GPH-8







本申请优选上述一系列特定结构的主体材料，与绿色荧光染料配合，能够进一步窄化光谱，提高绿光色纯度，同时提高器件效率。当上述特定结构的主体材料与特定结构的敏化剂共同与绿色荧光染料配合时，效果最佳。

进一步地，绿色荧光染料占发光层材料的质量比（掺杂浓度）为 0.1~30%，例如 2%、5%、10%、15%、20%等；

和/或，热活化延迟荧光敏化剂占发光层材料的质量比（掺杂浓度）为 1~99%，例如 2%、5%、10%、15%、20%、25%、30%、35%、40%、45%、50%、60%、70%、80%、90%等。

进一步地，热活化延迟荧光敏化剂占发光层材料的质量比为 10~50%。

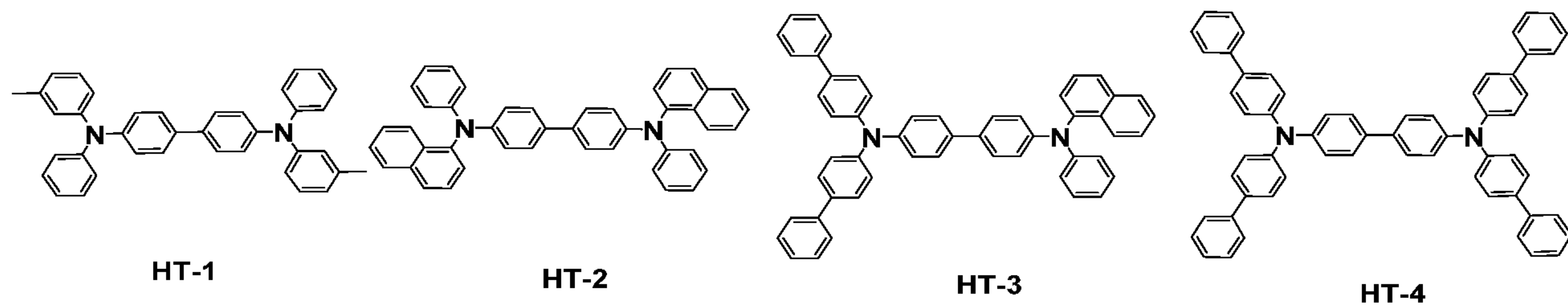
发光层材料指的是主体材料、热活化延迟荧光敏化剂和绿色荧光染料的总和。

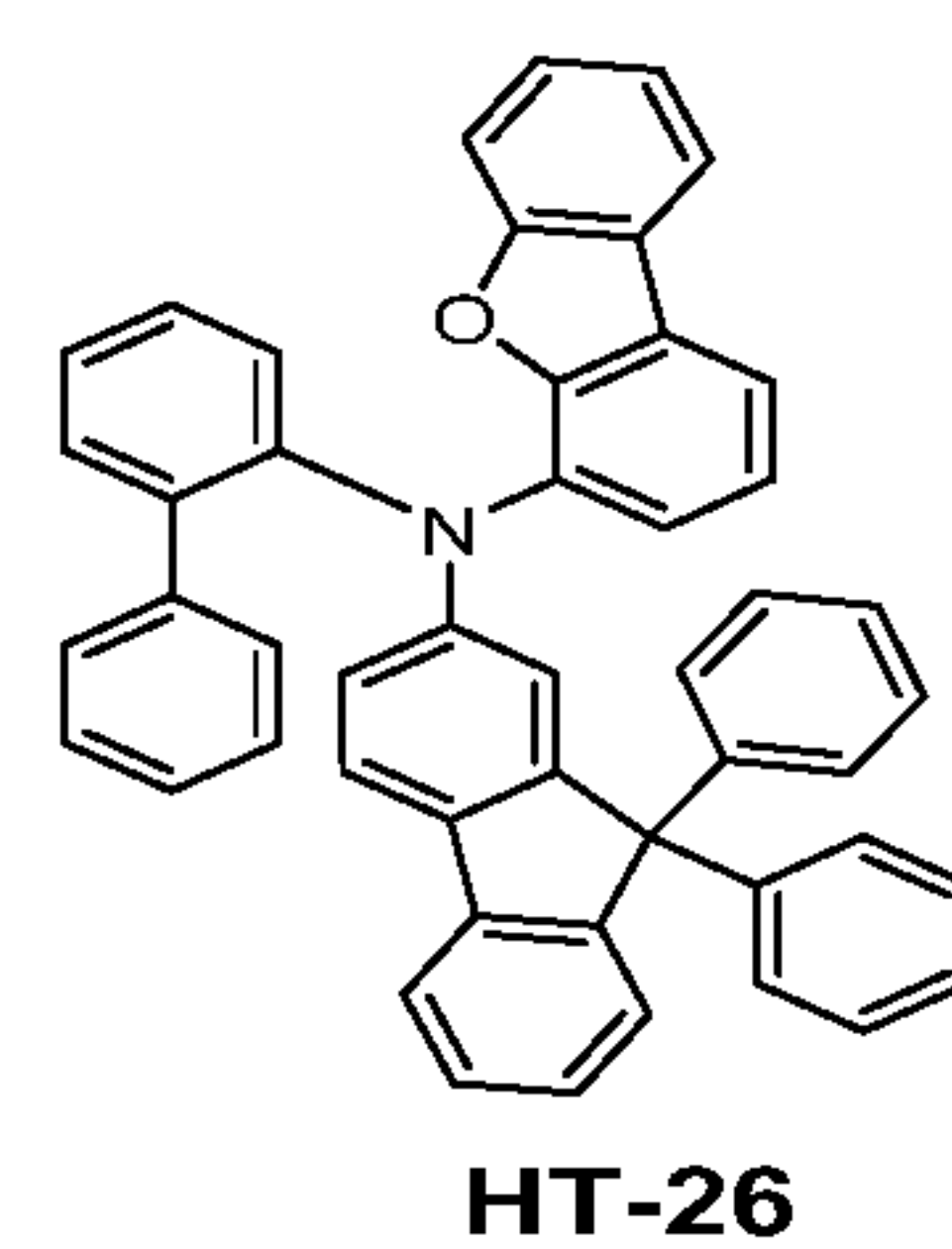
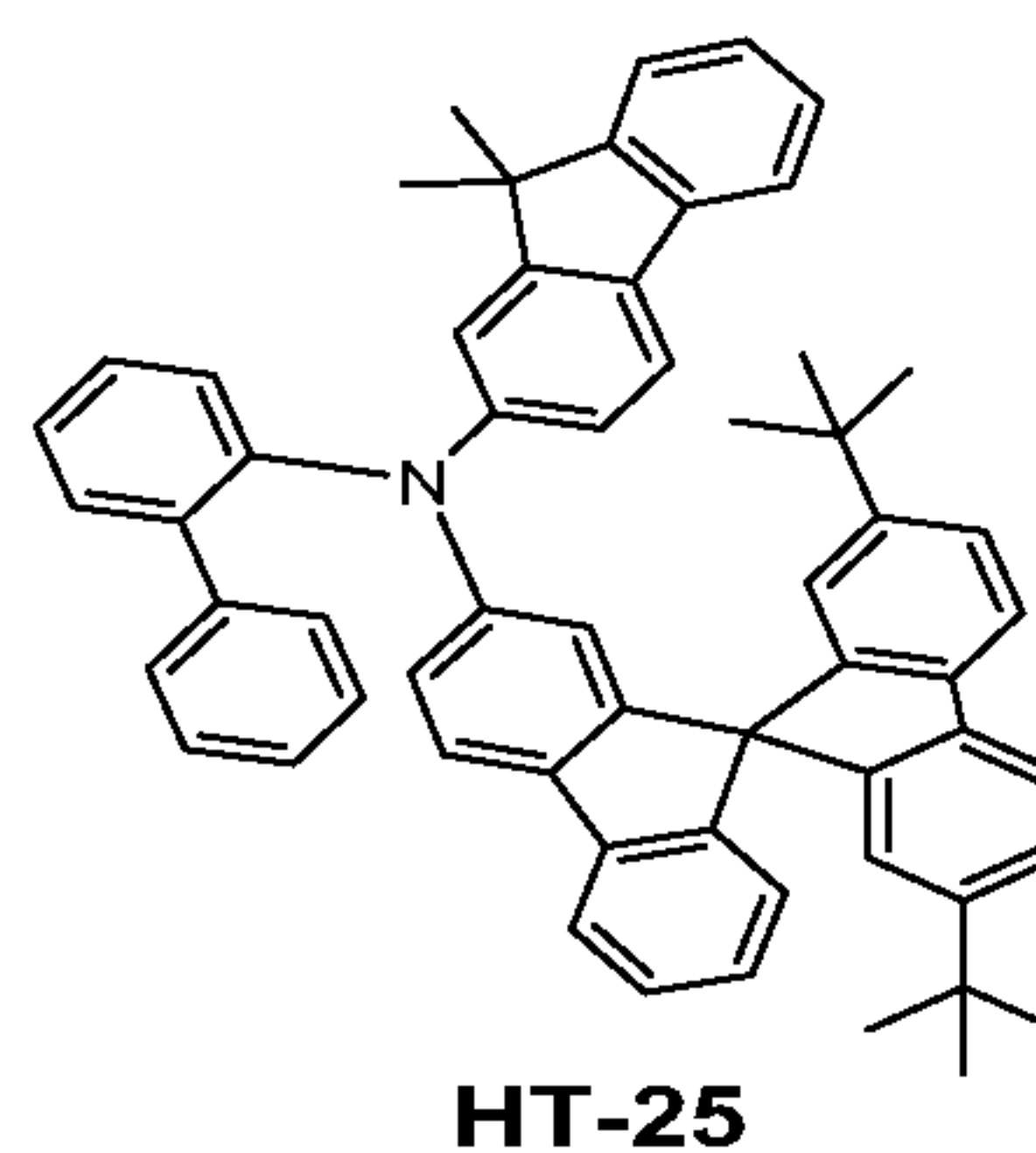
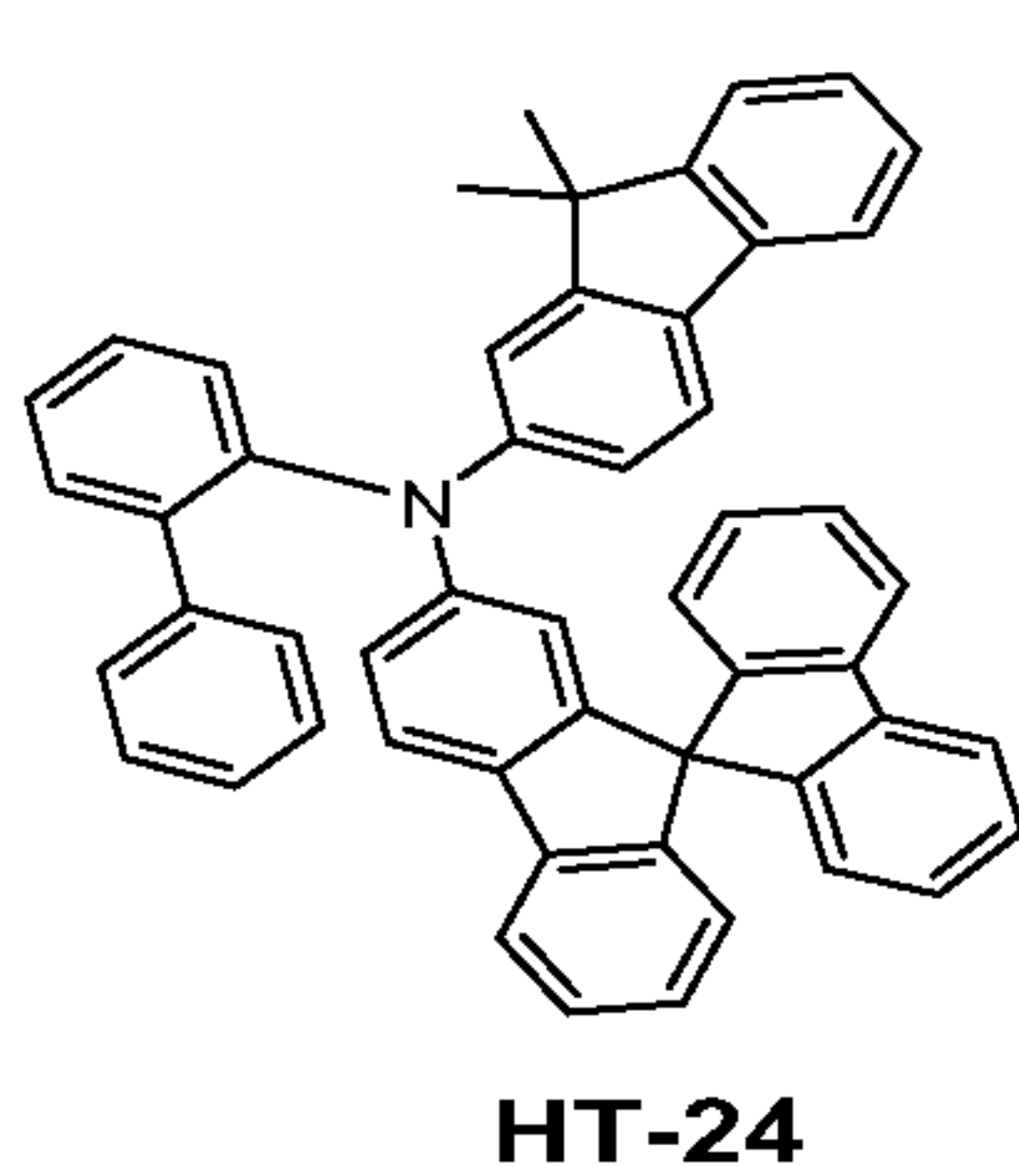
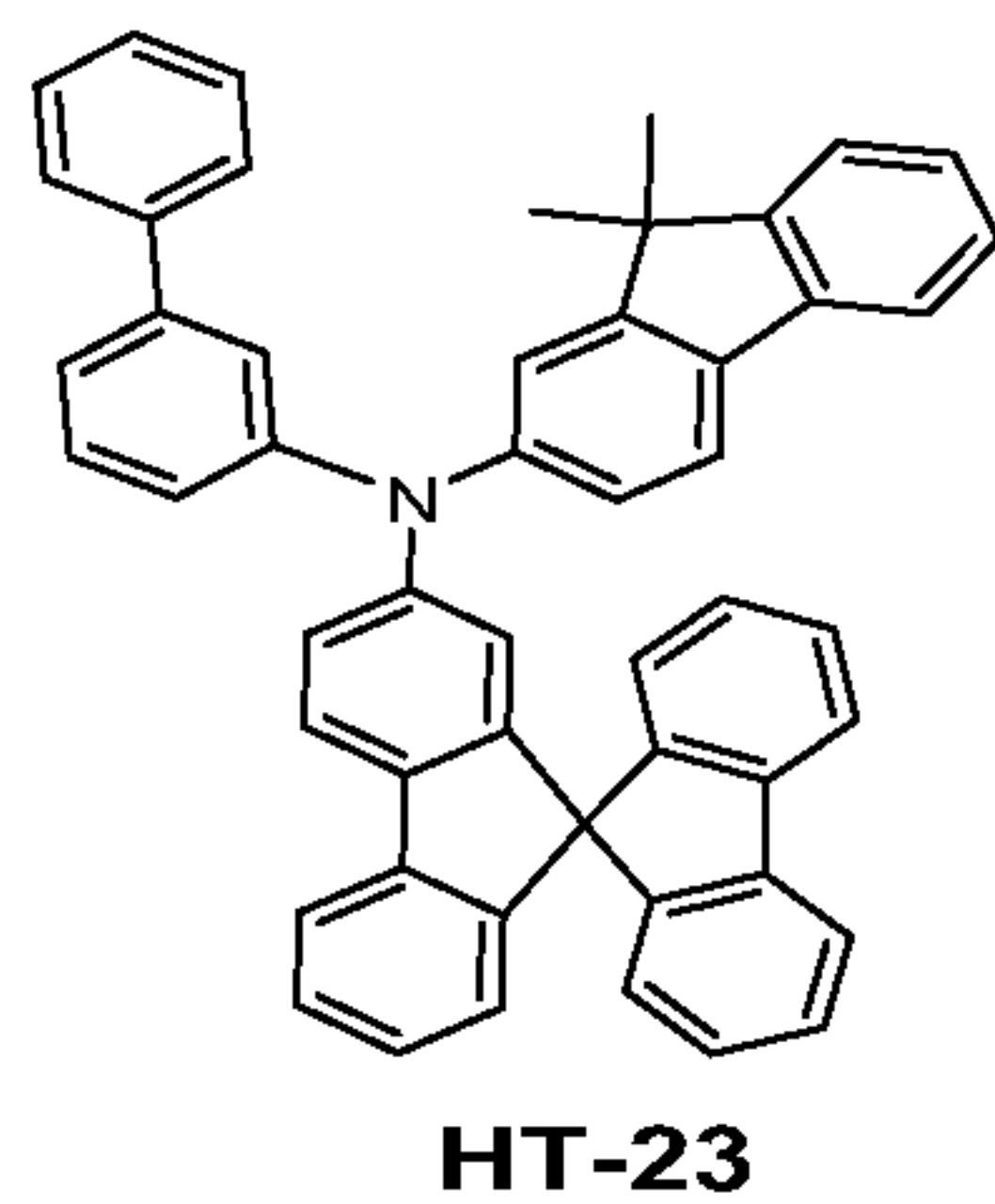
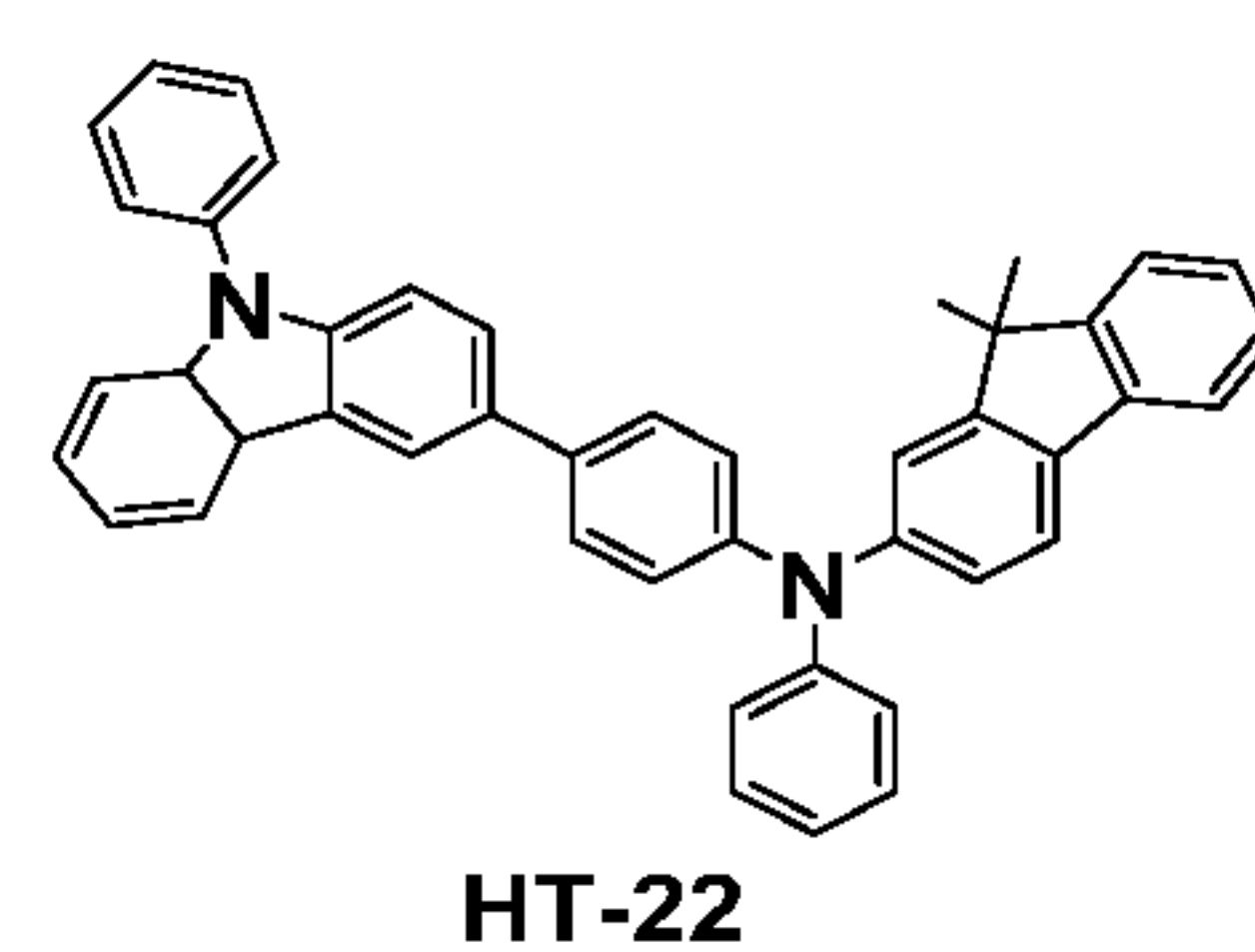
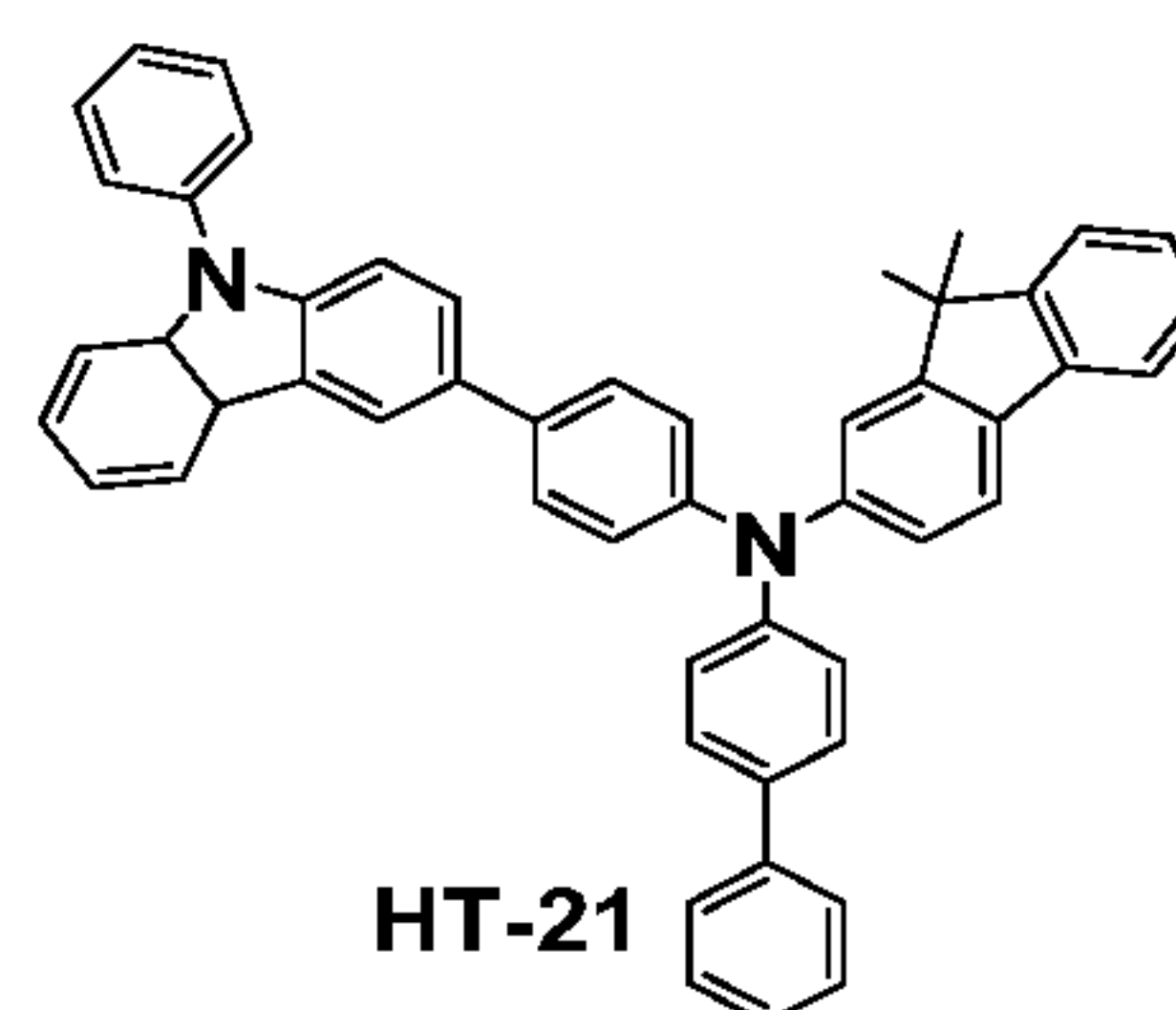
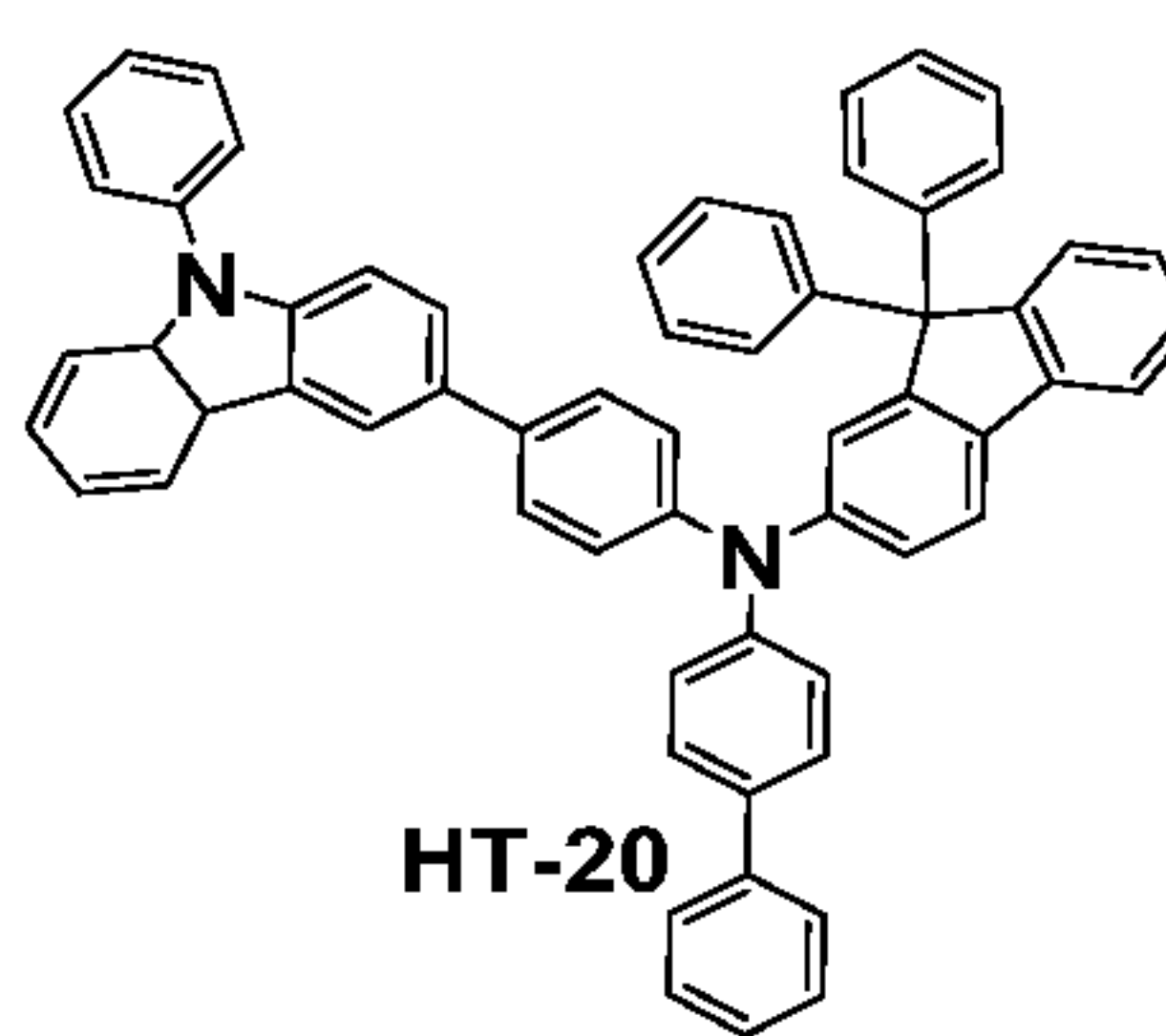
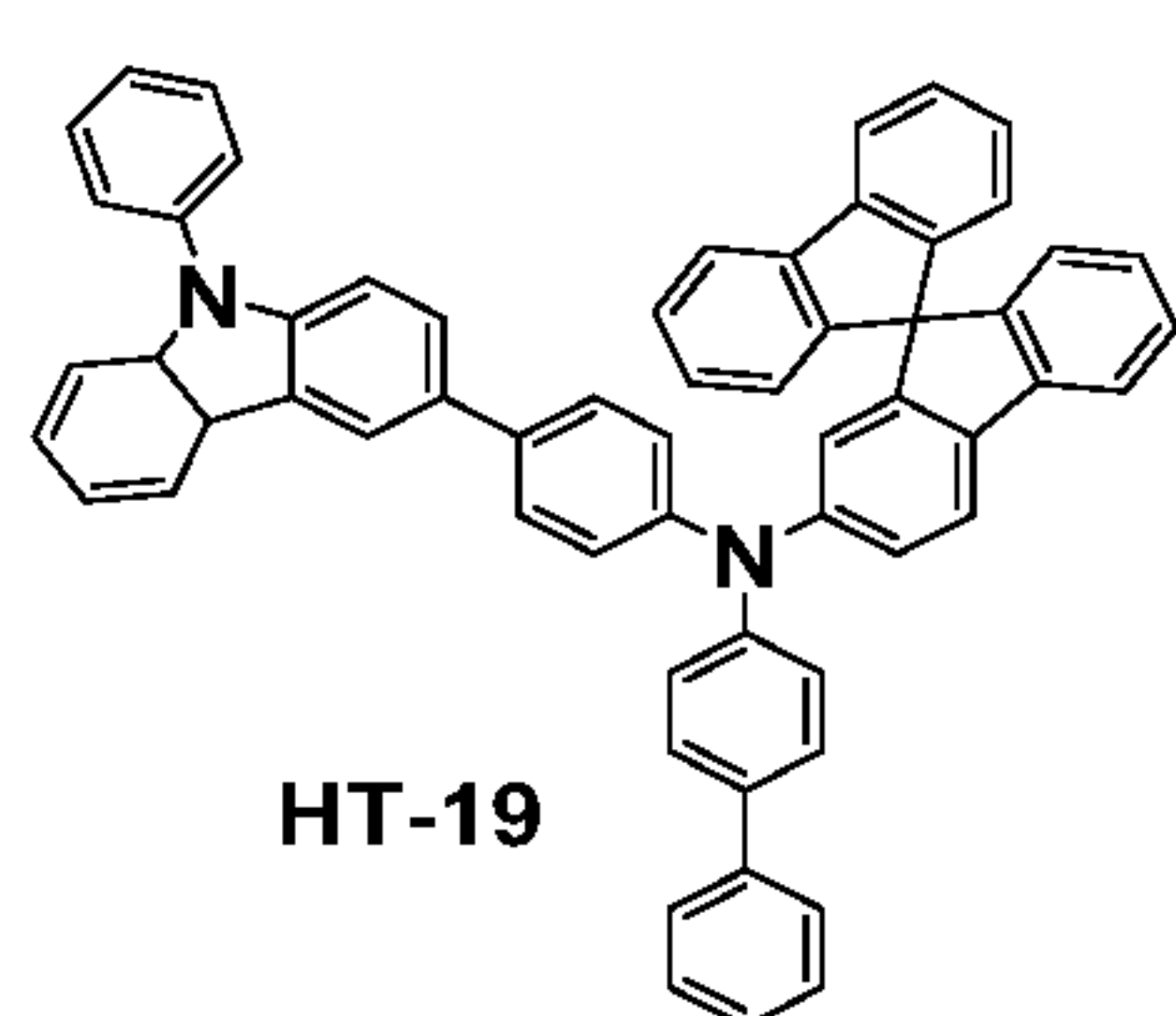
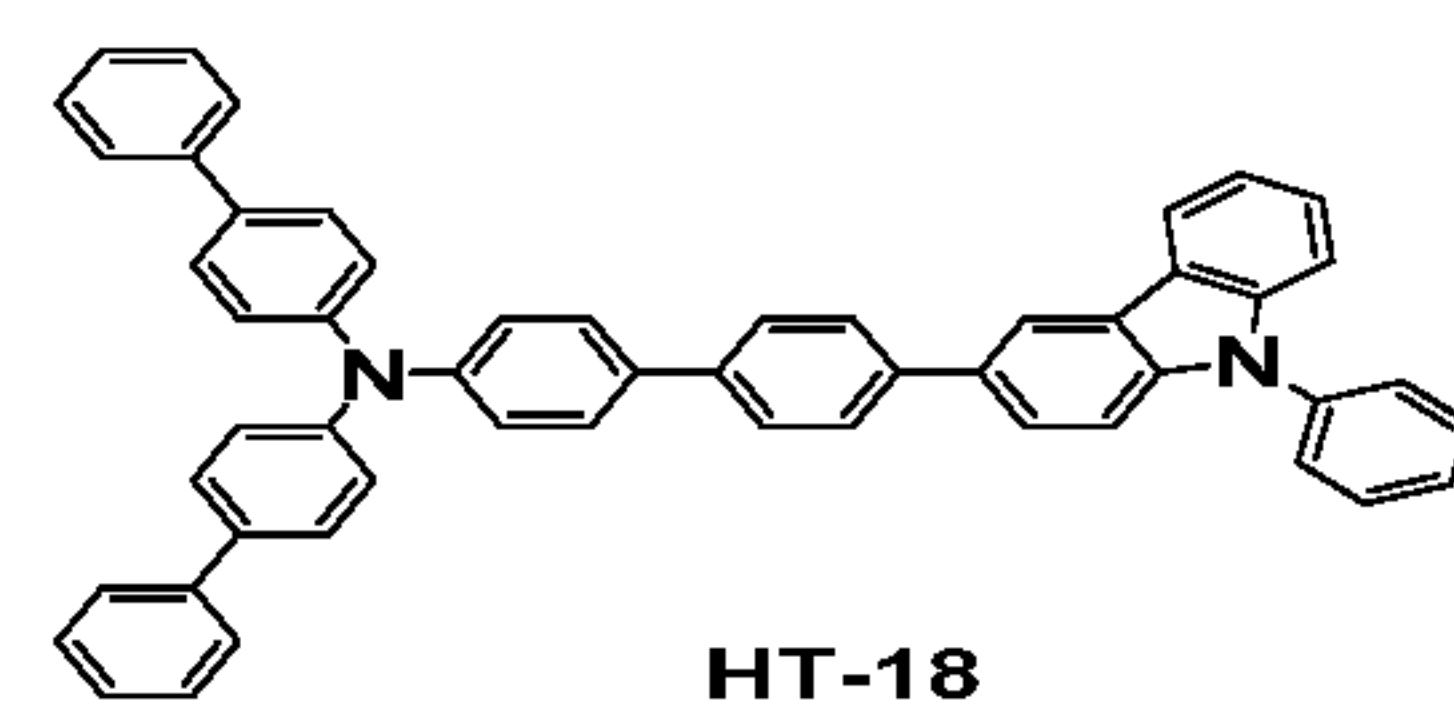
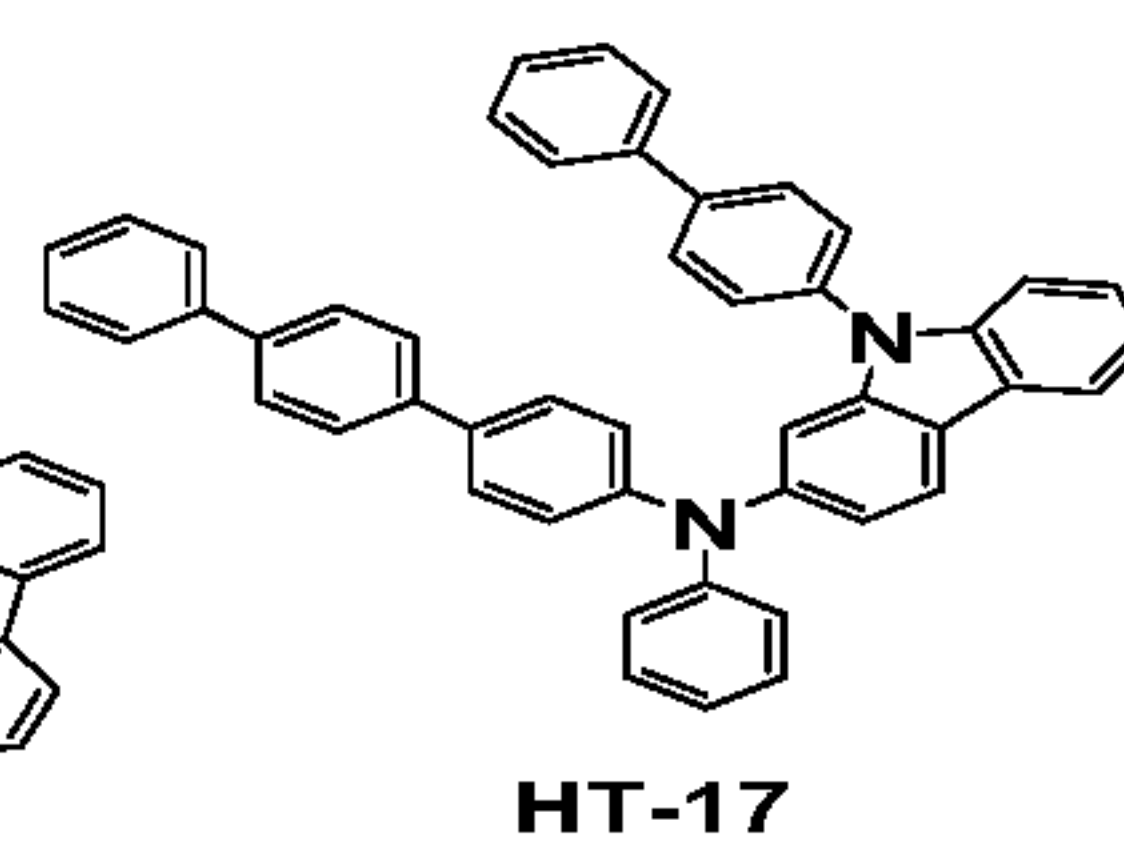
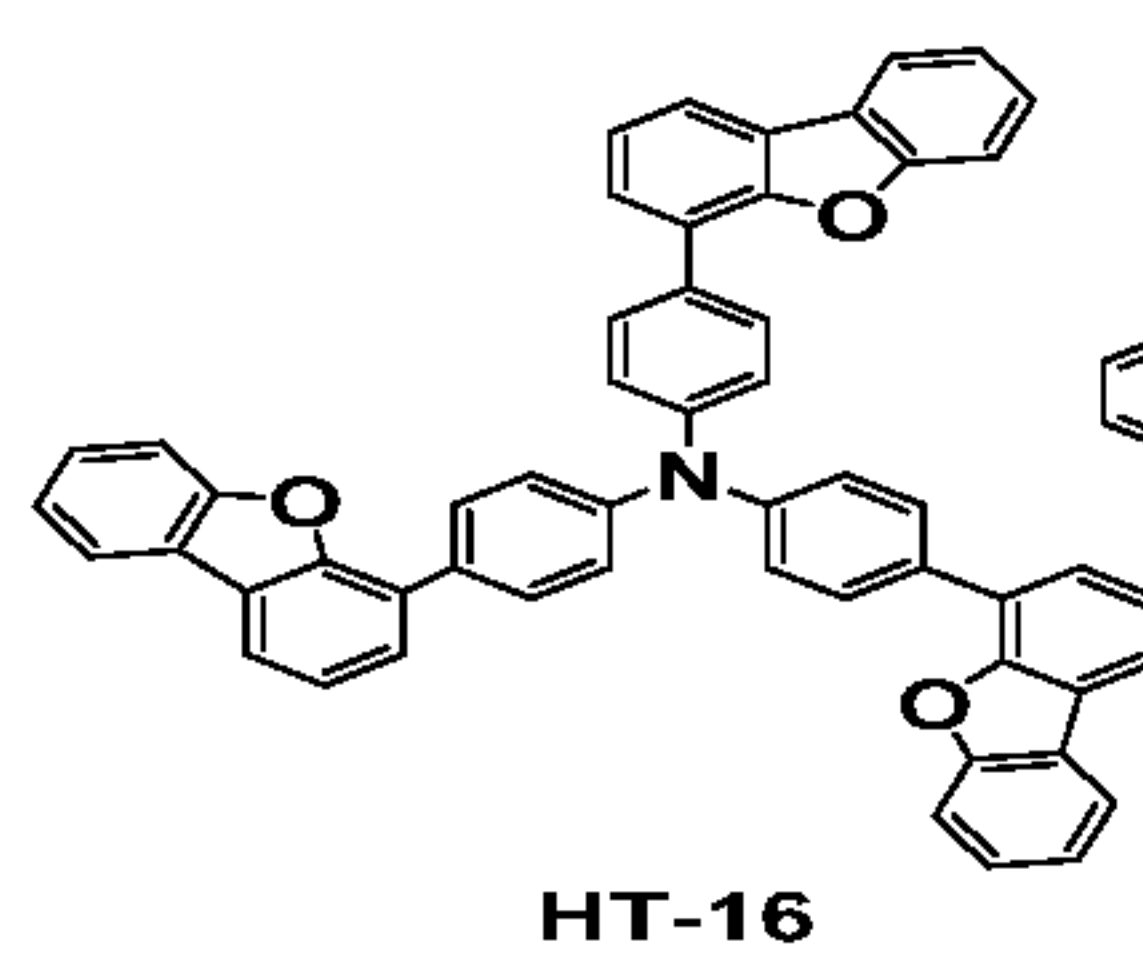
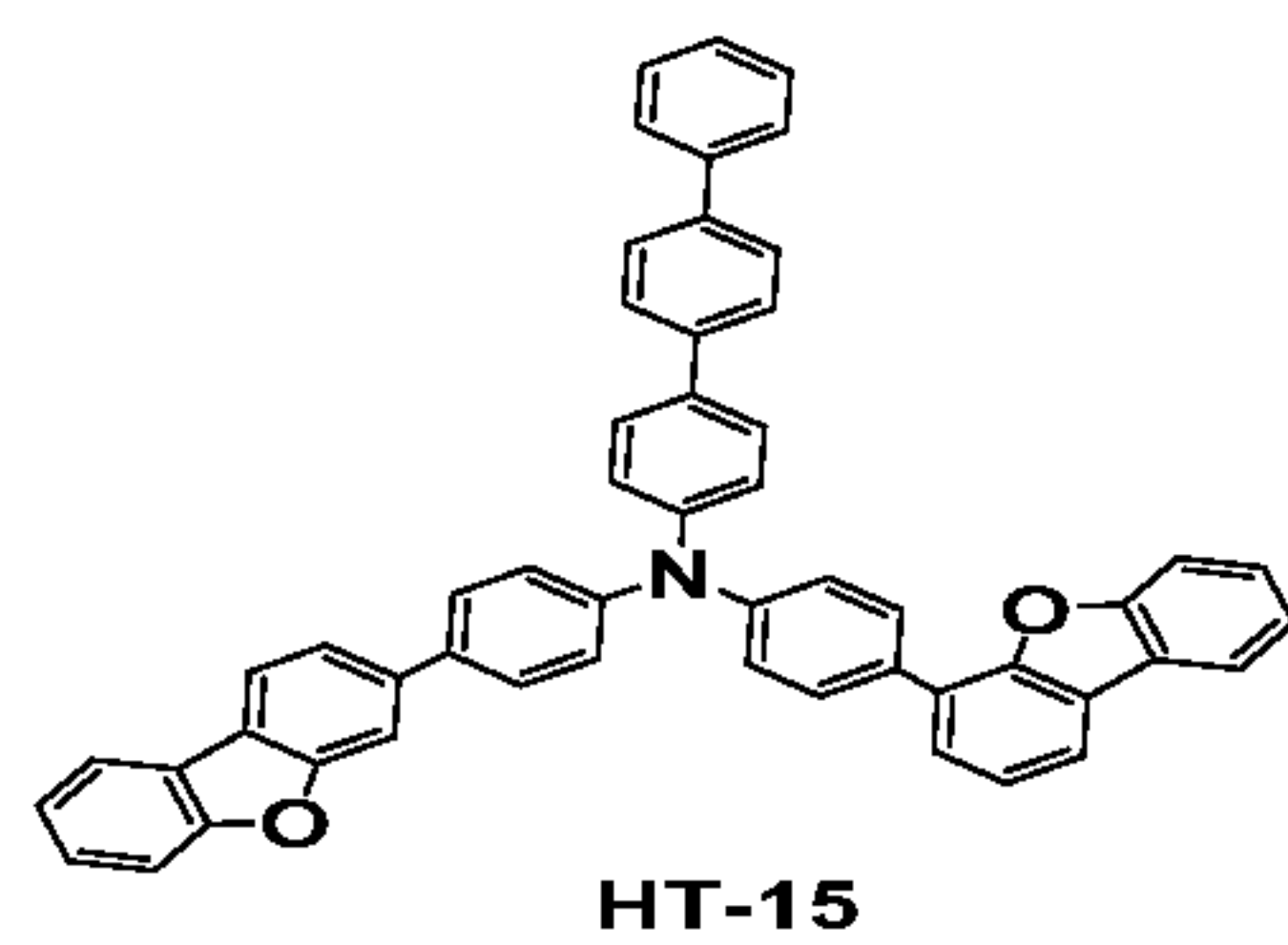
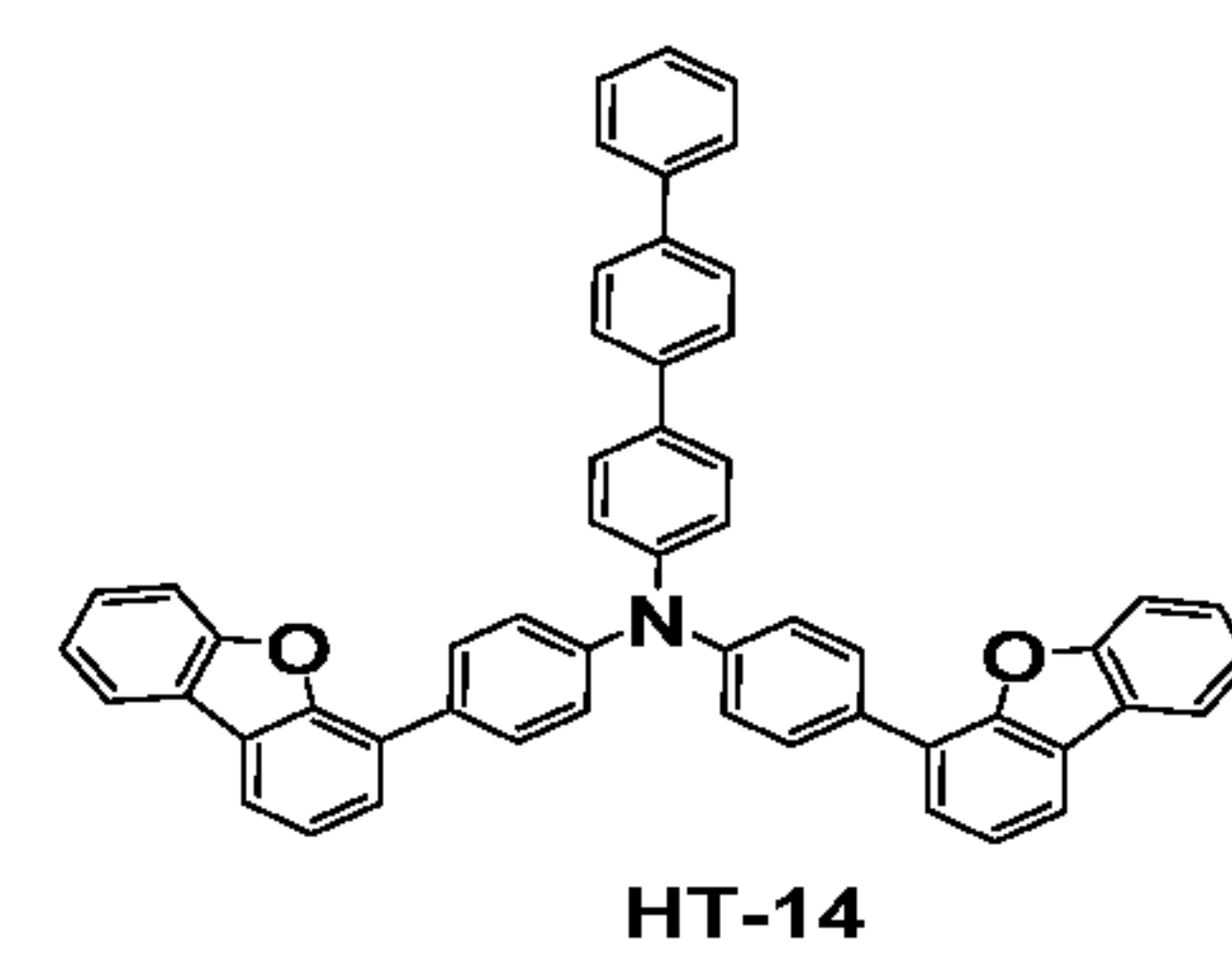
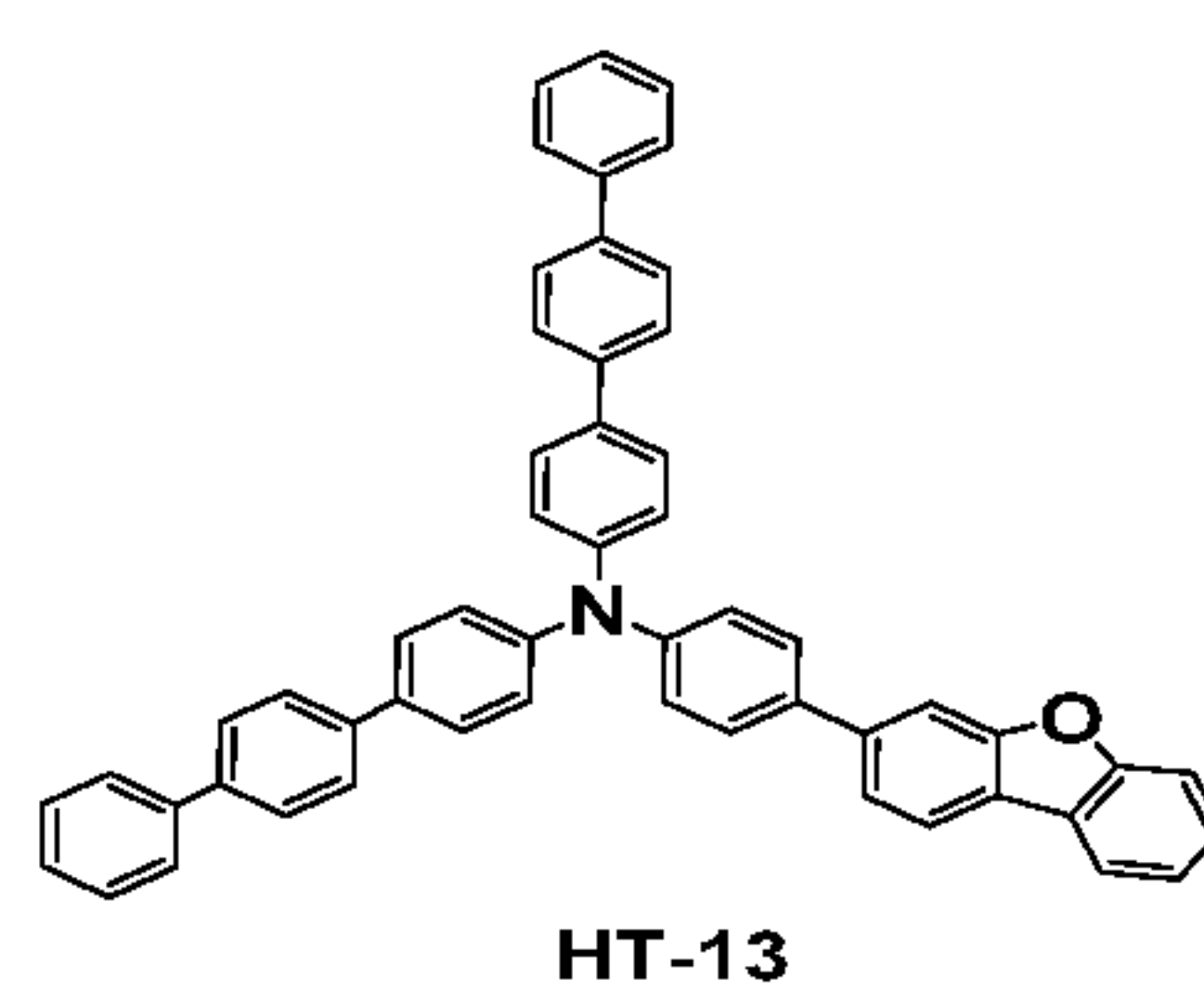
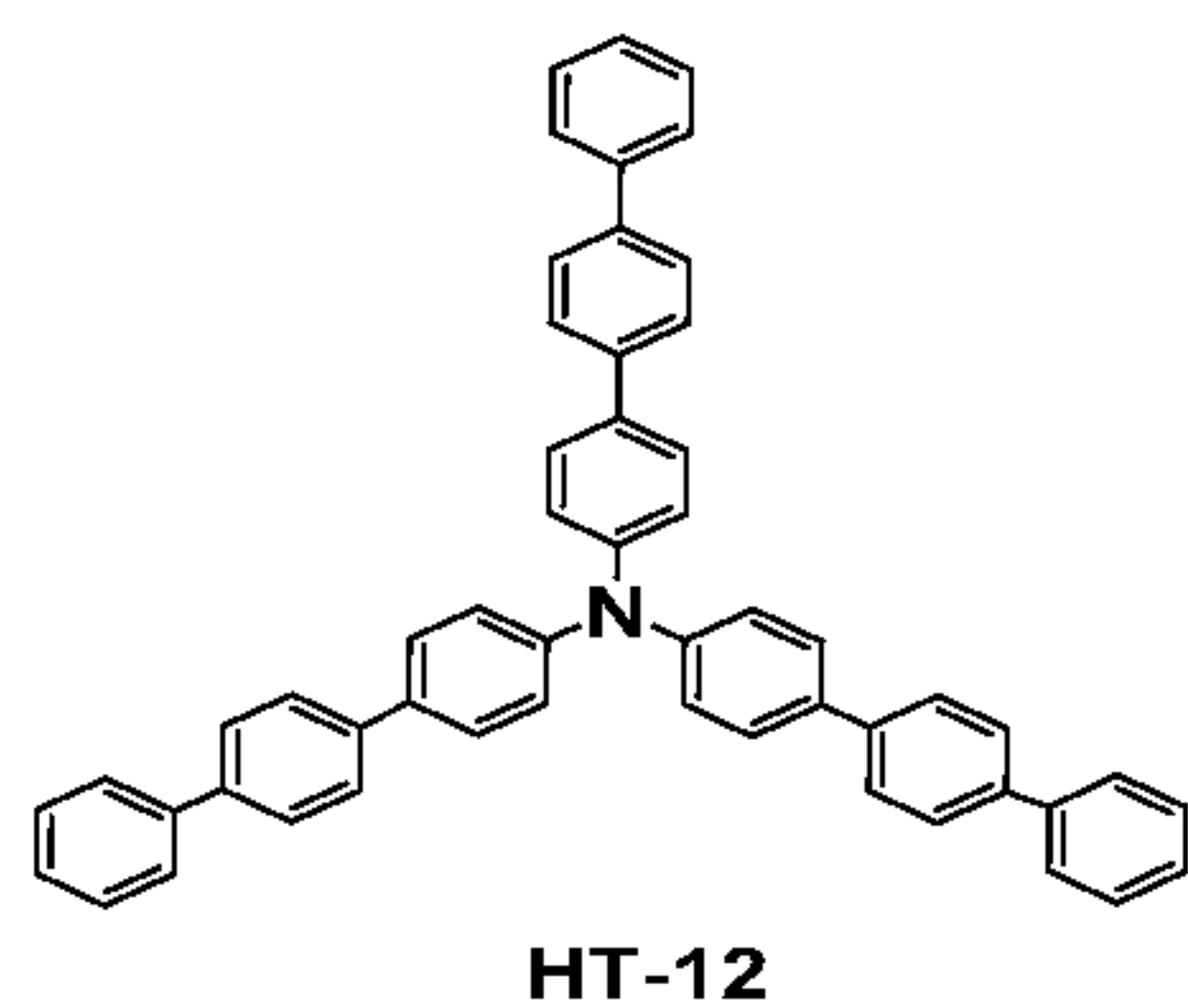
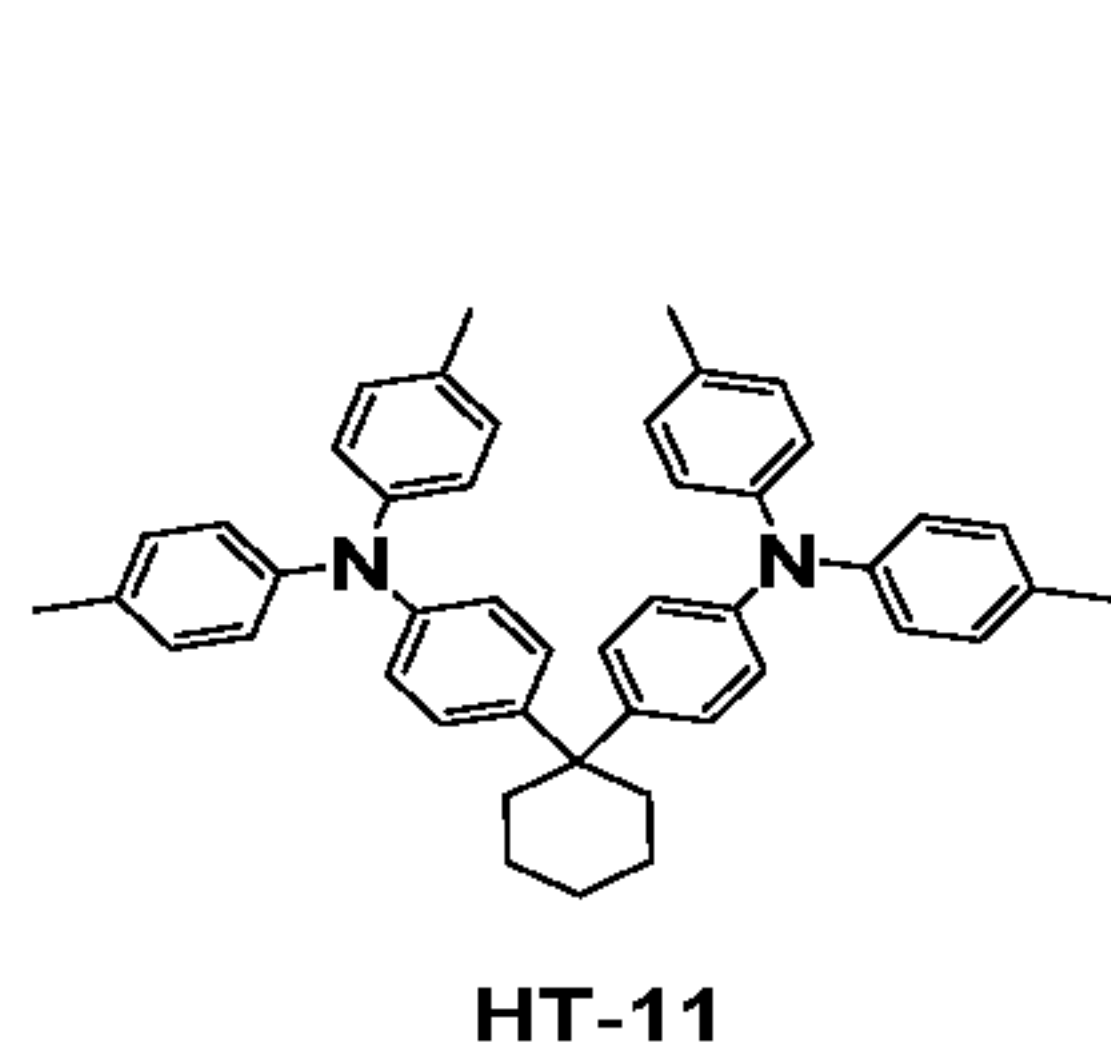
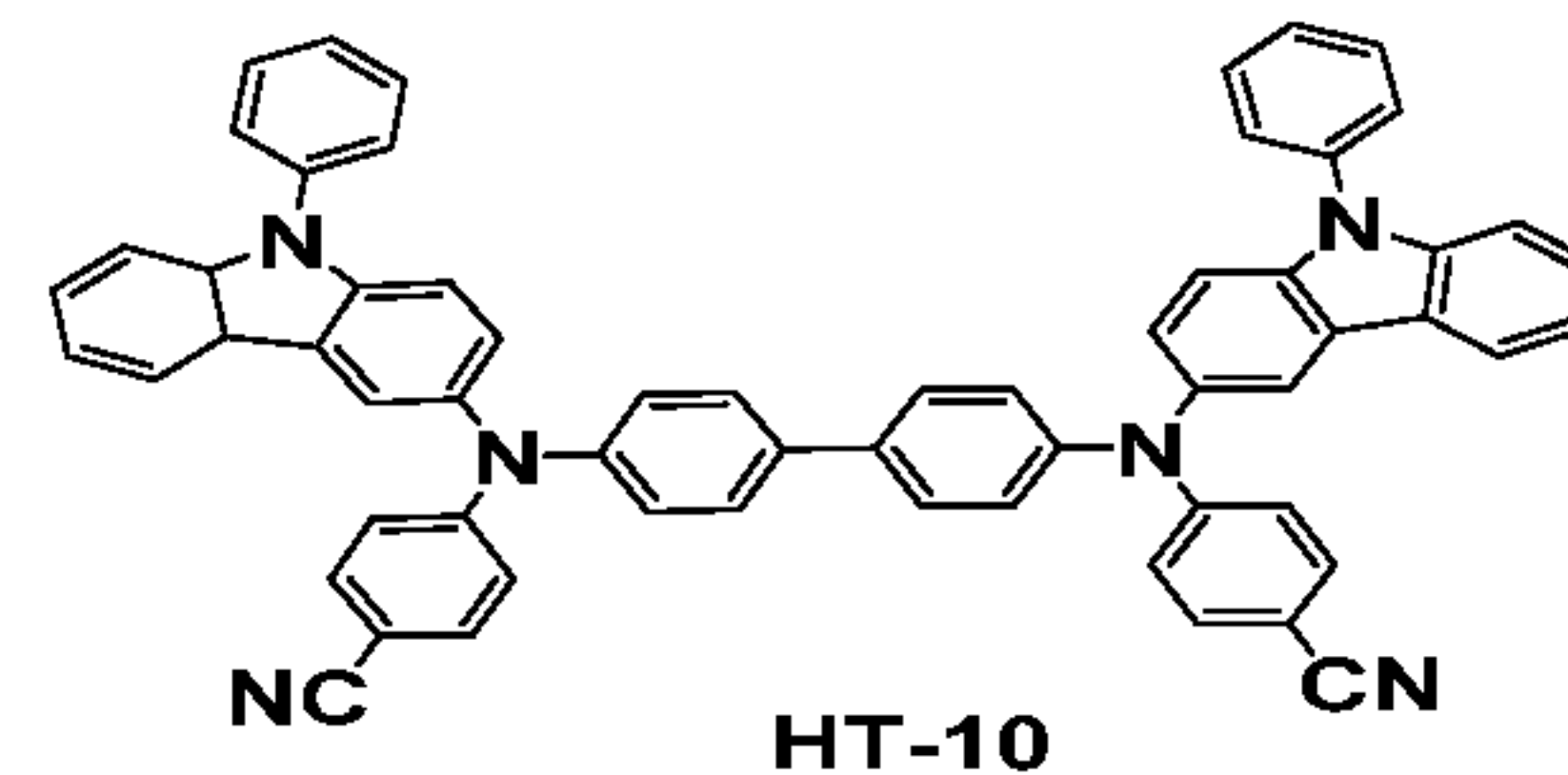
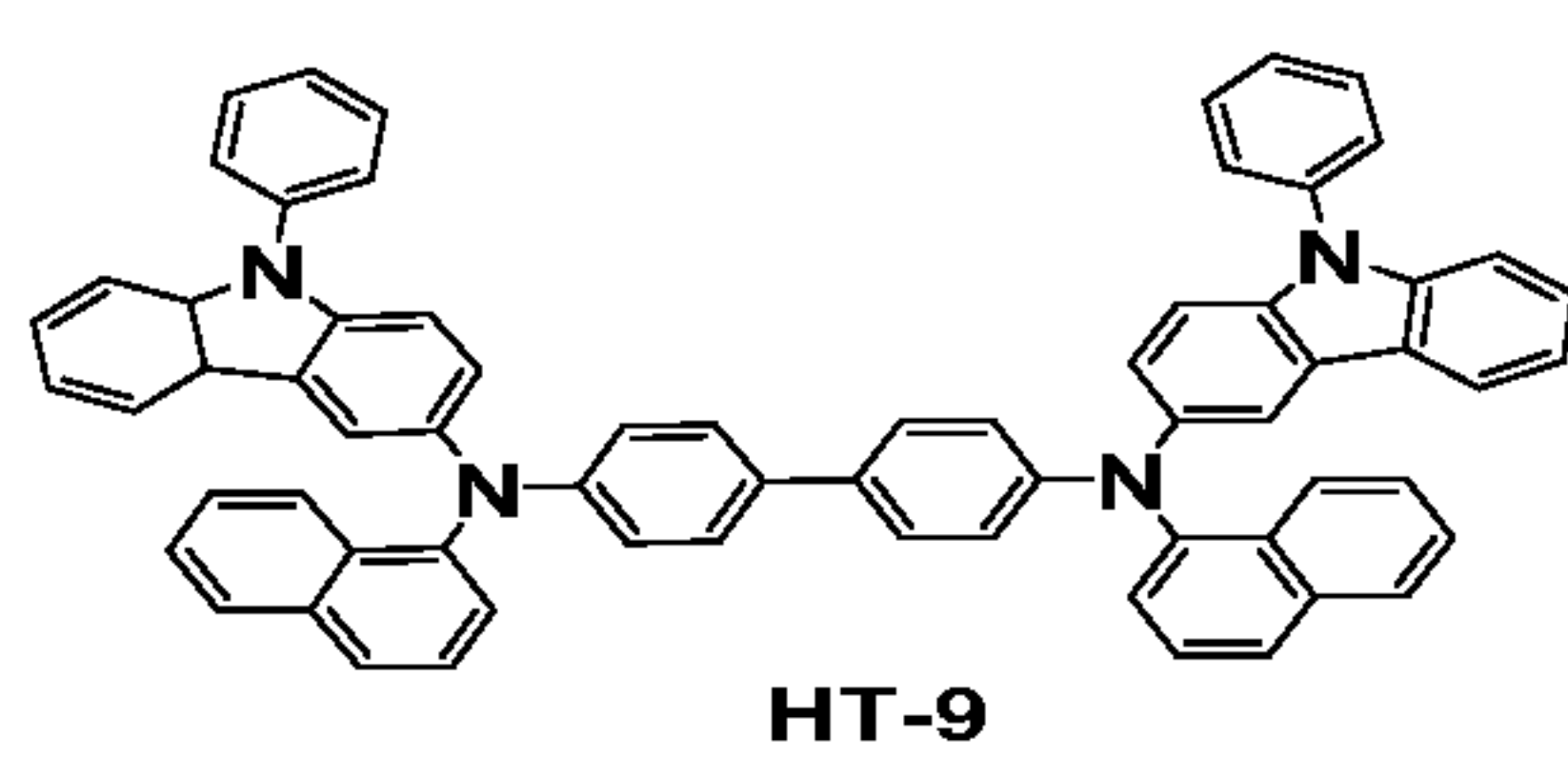
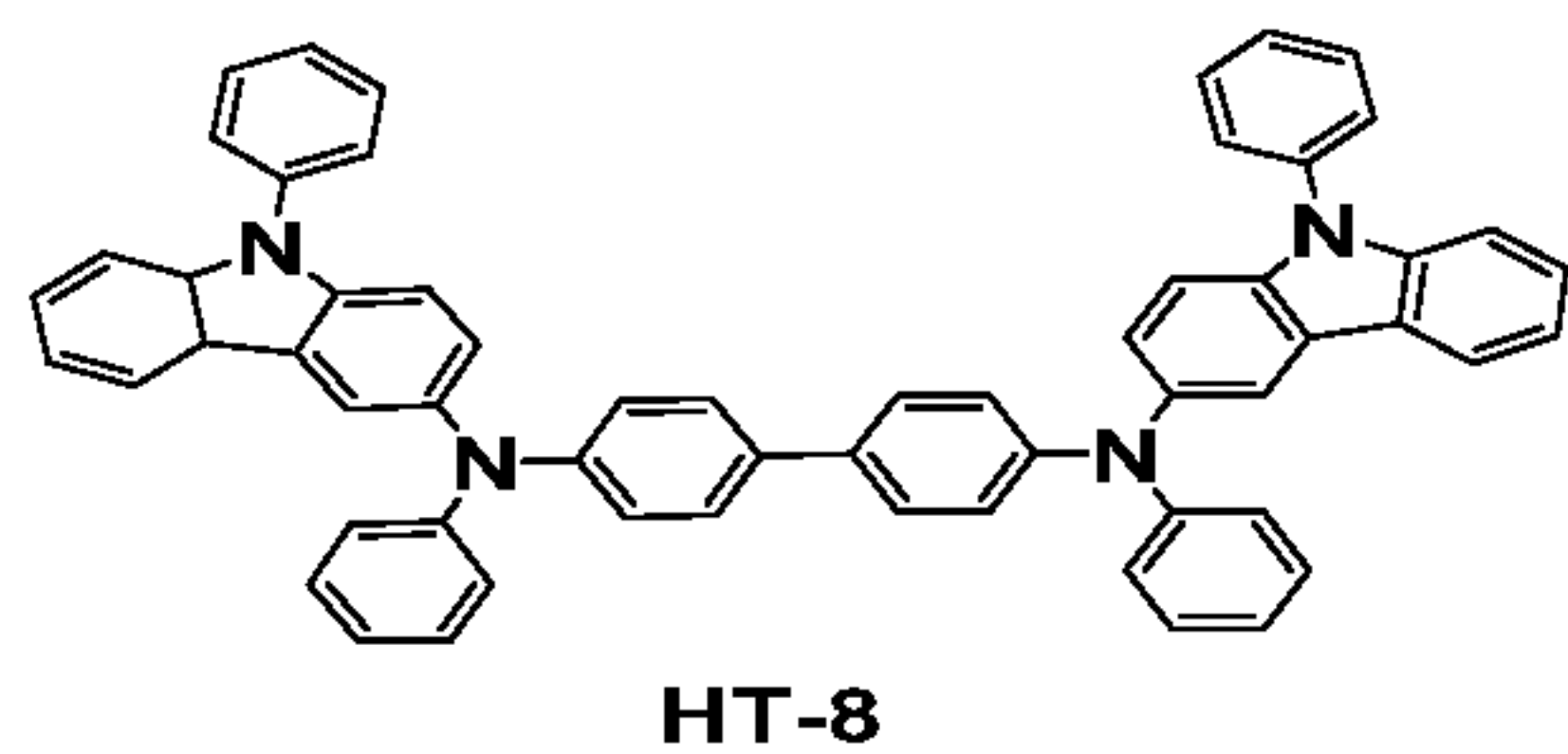
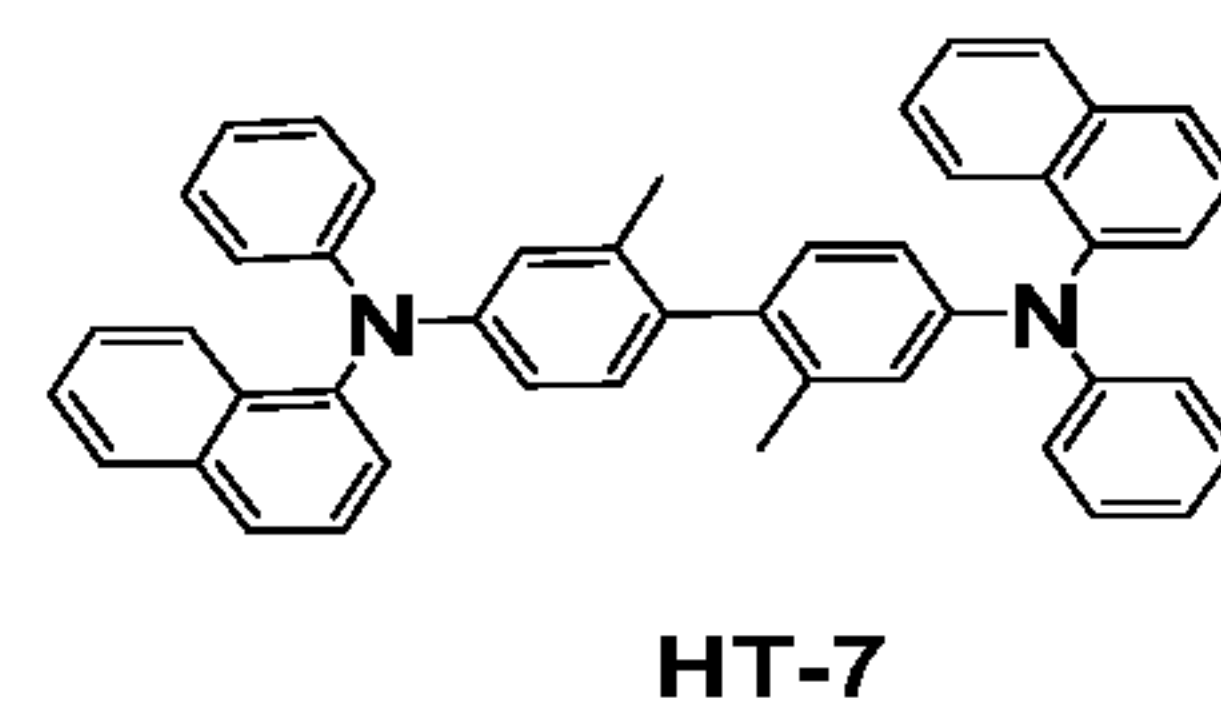
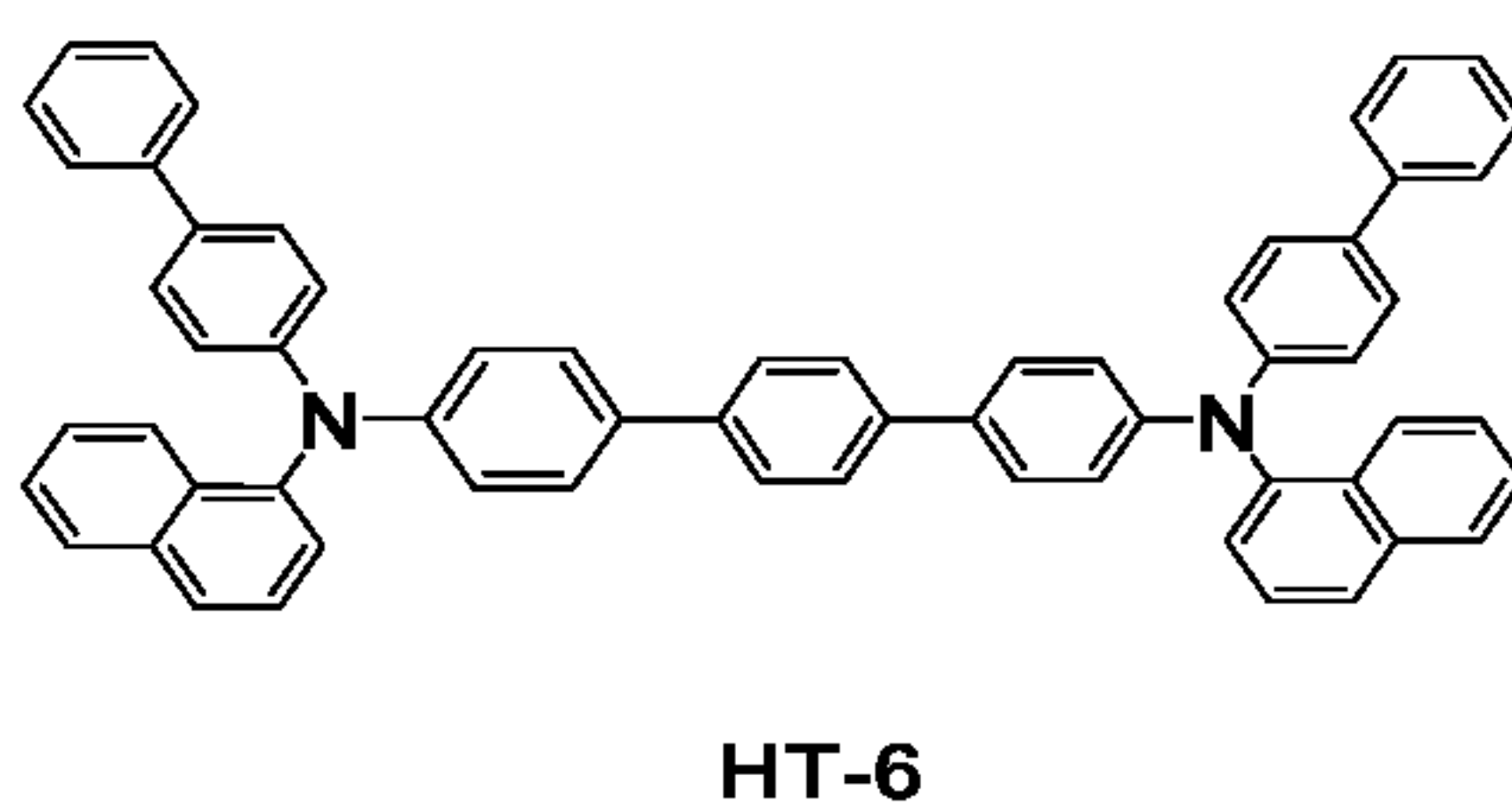
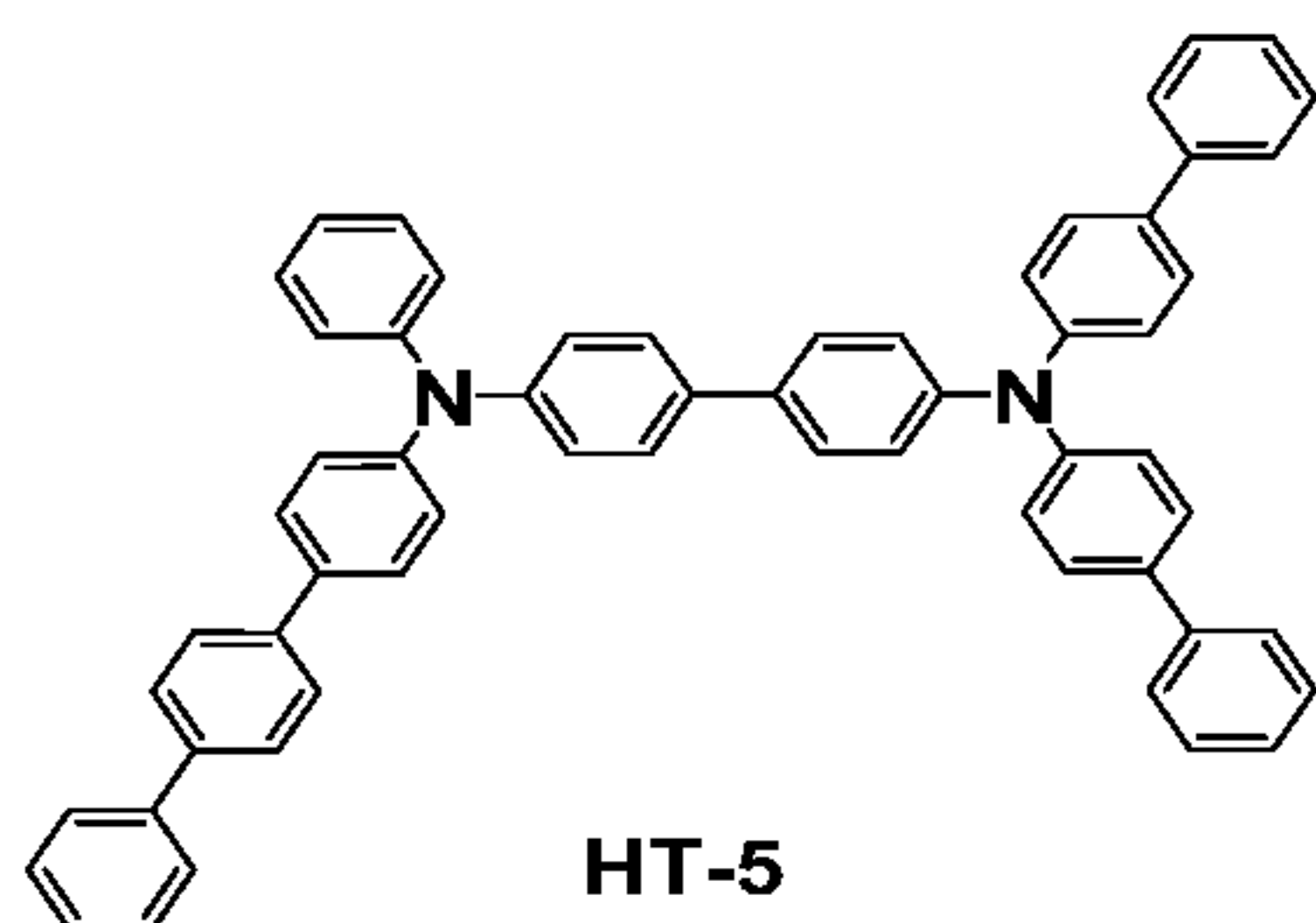
进一步地，发光层的厚度为 1~100 nm，例如 5 nm、10 nm、20 nm、30 nm、40 nm、50 nm、60 nm、70 nm、80 nm、90 nm 等。

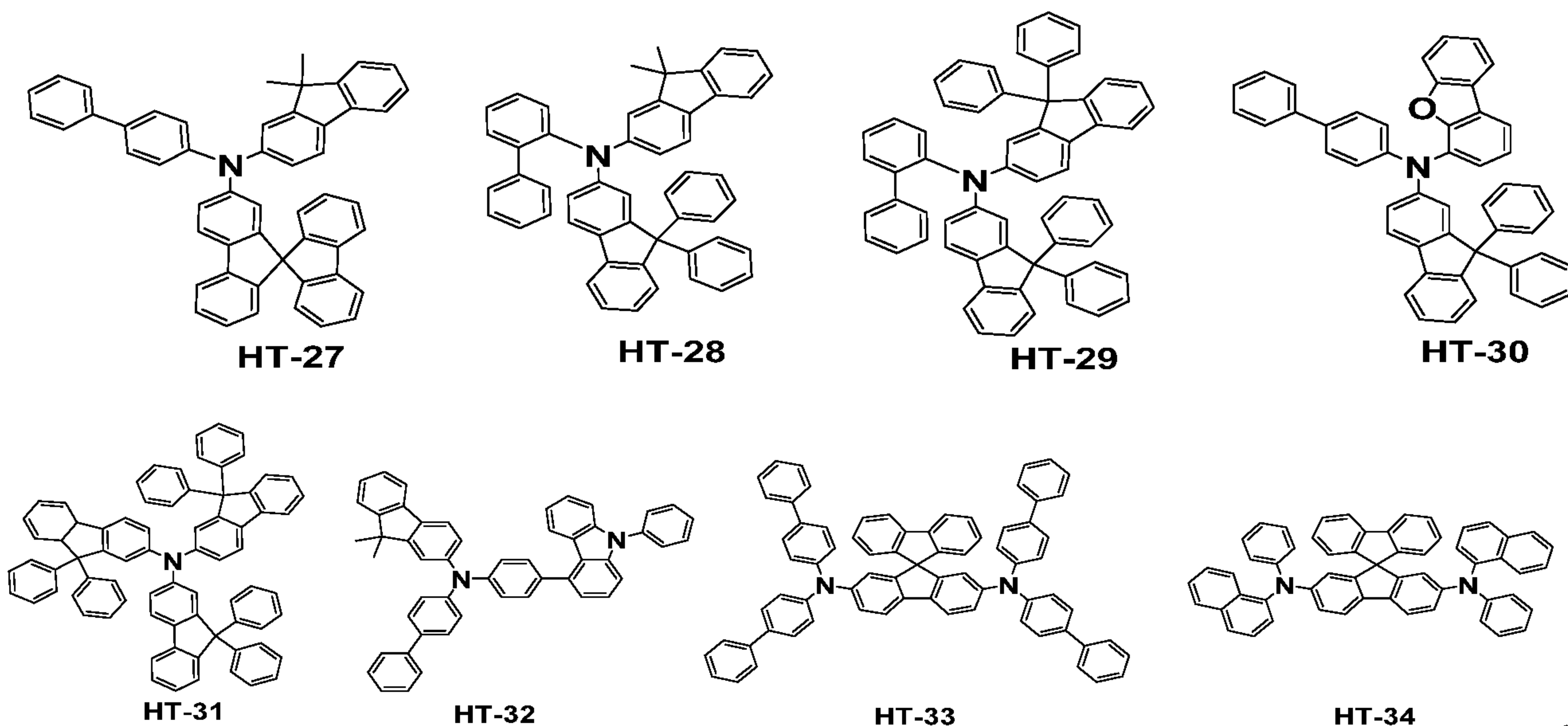
进一步地，有机层还包括空穴注入层（HIL）、空穴传输层（HTL）、电子阻挡层（EBL）、空穴阻挡层（HBL）、电子传输层（ETL）和电子注入层（EIL）中的任意一种或至少两种组合。

空穴传输区位于阳极和发光层之间。空穴传输区可以为单层结构的空穴传输层（HTL），包括只含有一种化合物的单层空穴传输层和含有多种化合物的单层空穴传输层。空穴传输区也可以为包括空穴注入层（HIL）、空穴传输层（HTL）、电子阻挡层（EBL）中的至少一层的多层结构。

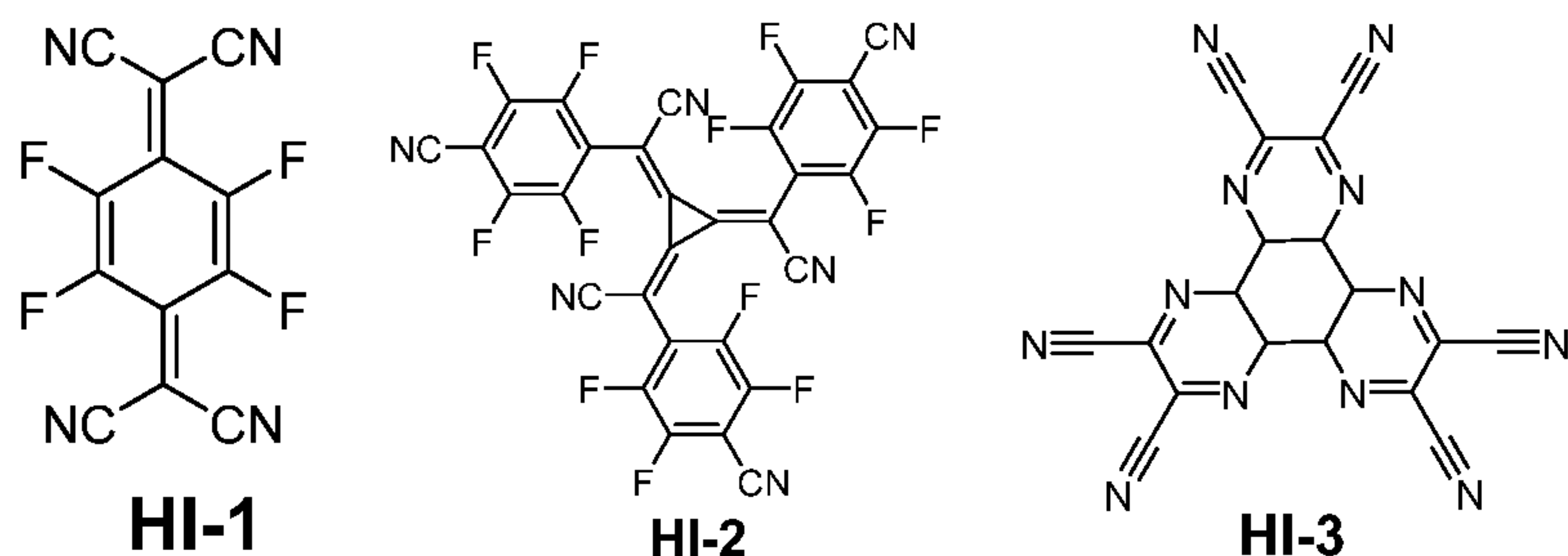
空穴传输区的材料可以选自、但不限于酞菁衍生物如 CuPc、导电聚合物或含导电掺杂剂的聚合物如聚苯撑乙烯、聚苯胺/十二烷基苯磺酸（Pani/DBSA）、聚(3,4-乙撑二氧噻吩)/聚(4-苯乙烯磺酸盐)（PEDOT/PSS）、聚苯胺/樟脑磺酸（Pani/CSA）、聚苯胺/聚(4-苯乙烯磺酸盐)（Pani/PSS）、芳香胺衍生物如下面 HT-1 至 HT-34 所示的化合物；或者其任意组合（例如 HT-1 和 HT-2 的组合，HT-5、HT-10 和 HT-16 的组合，HT-31、HT-3、HT-27 和 HT-28 的组合等）。



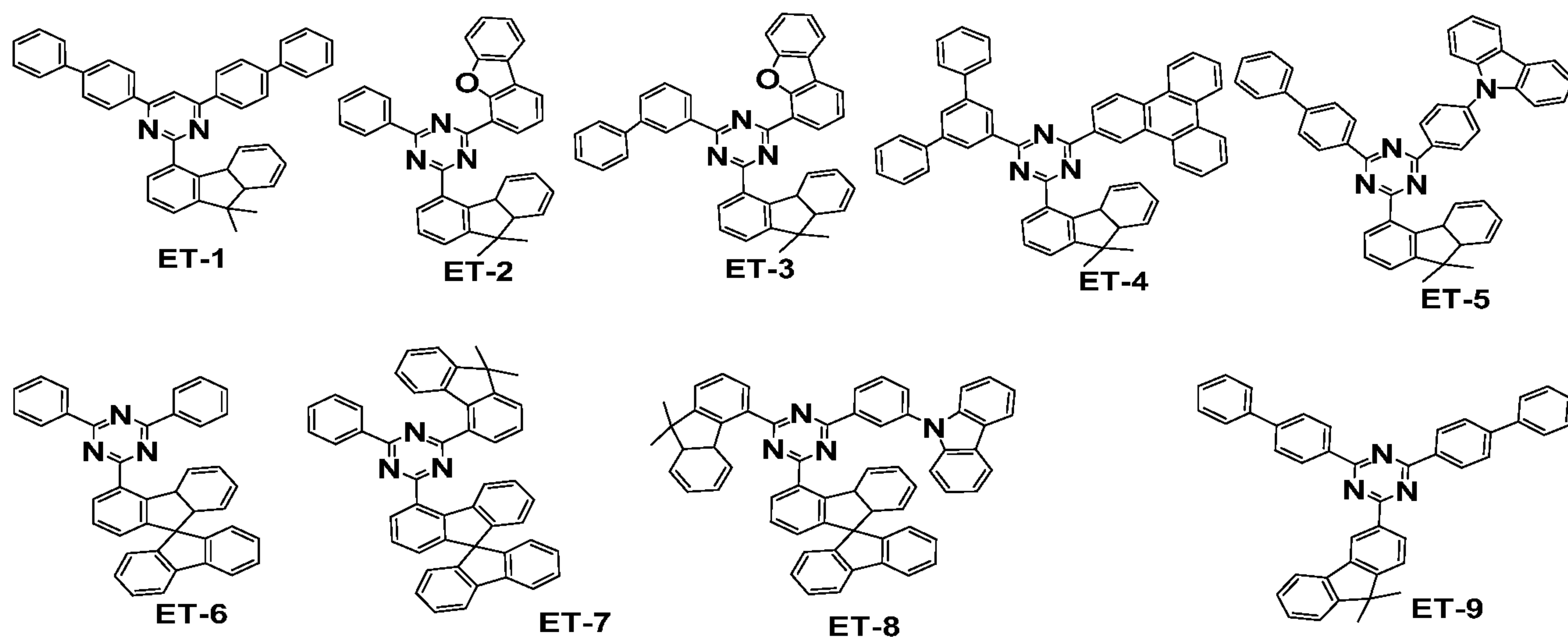


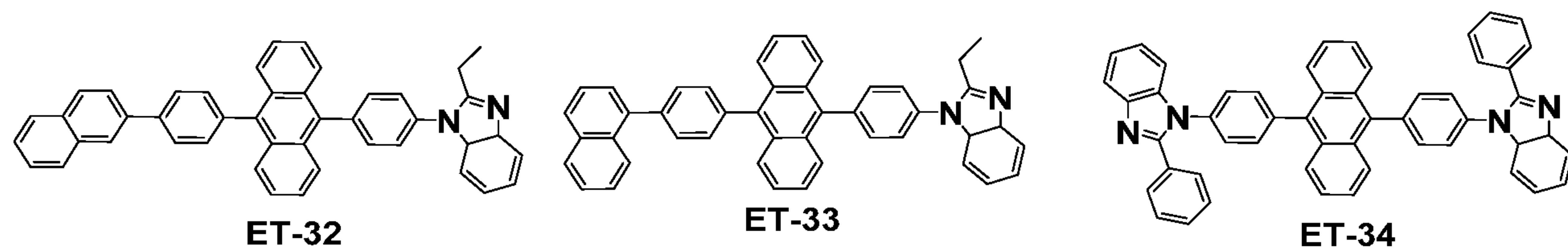
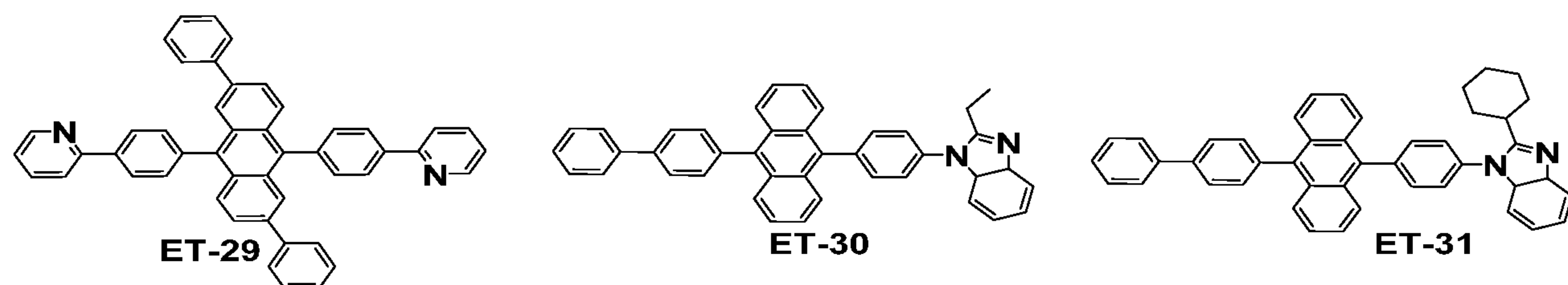
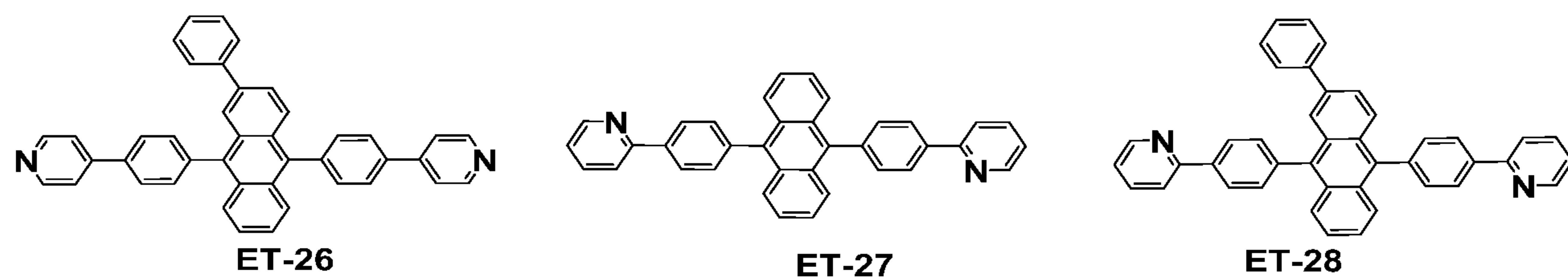
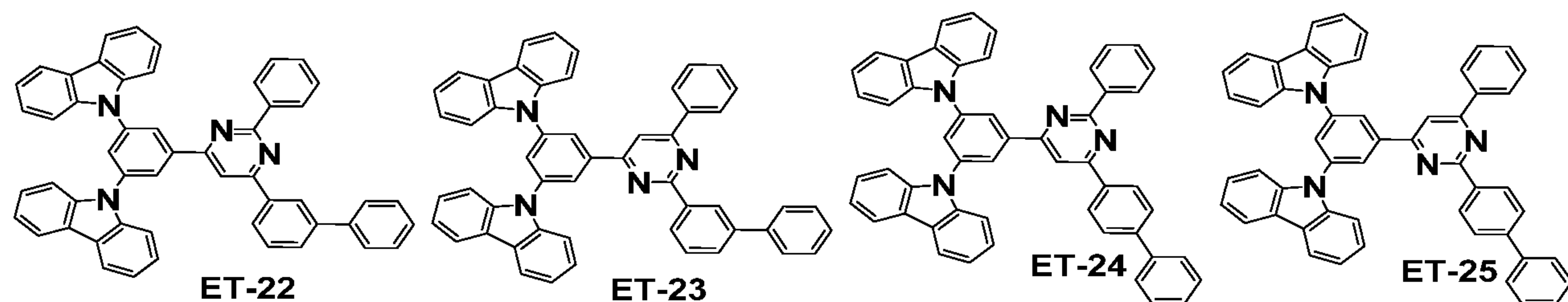
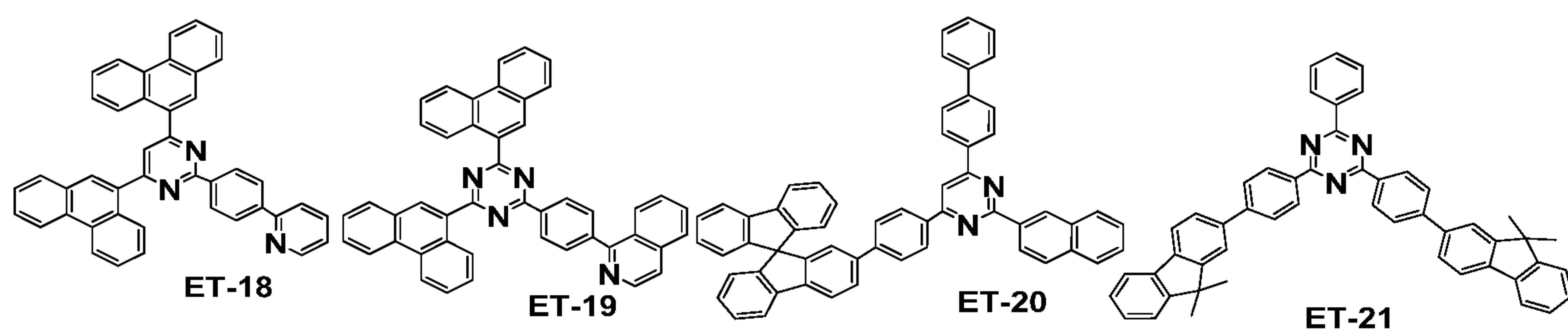
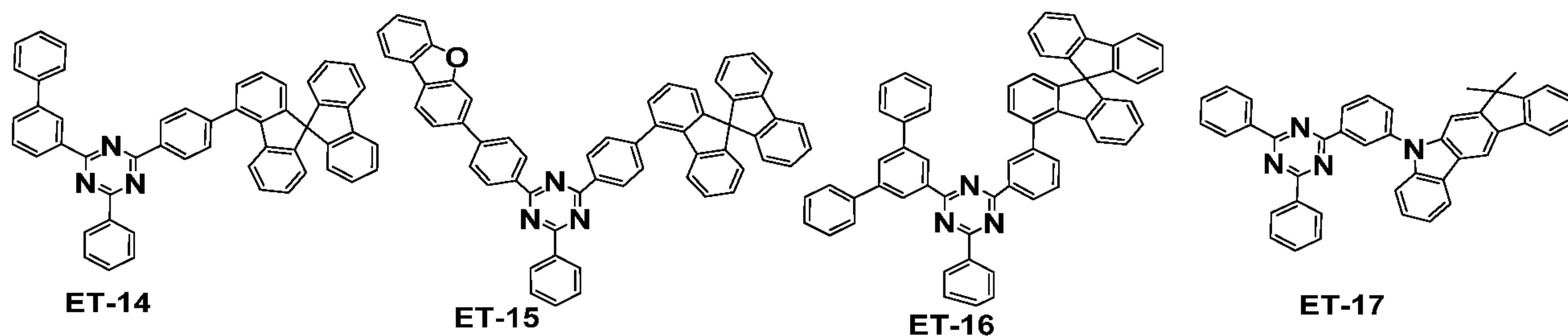
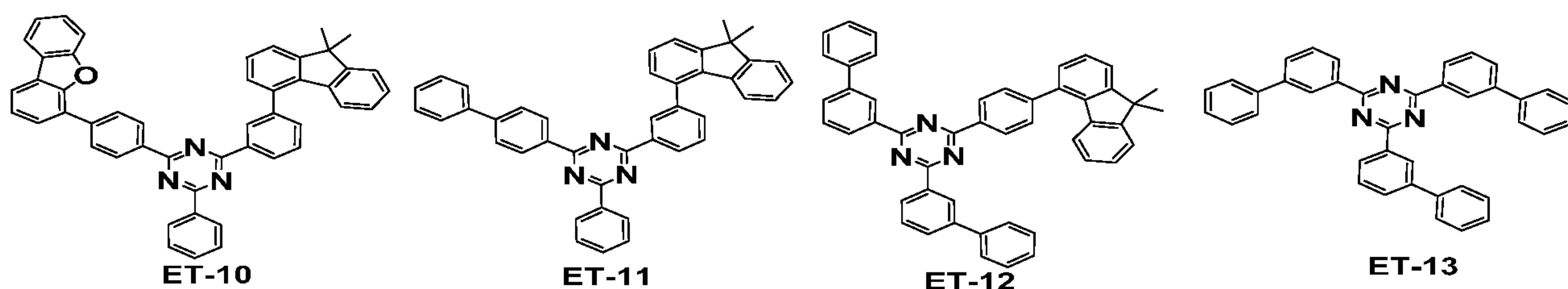


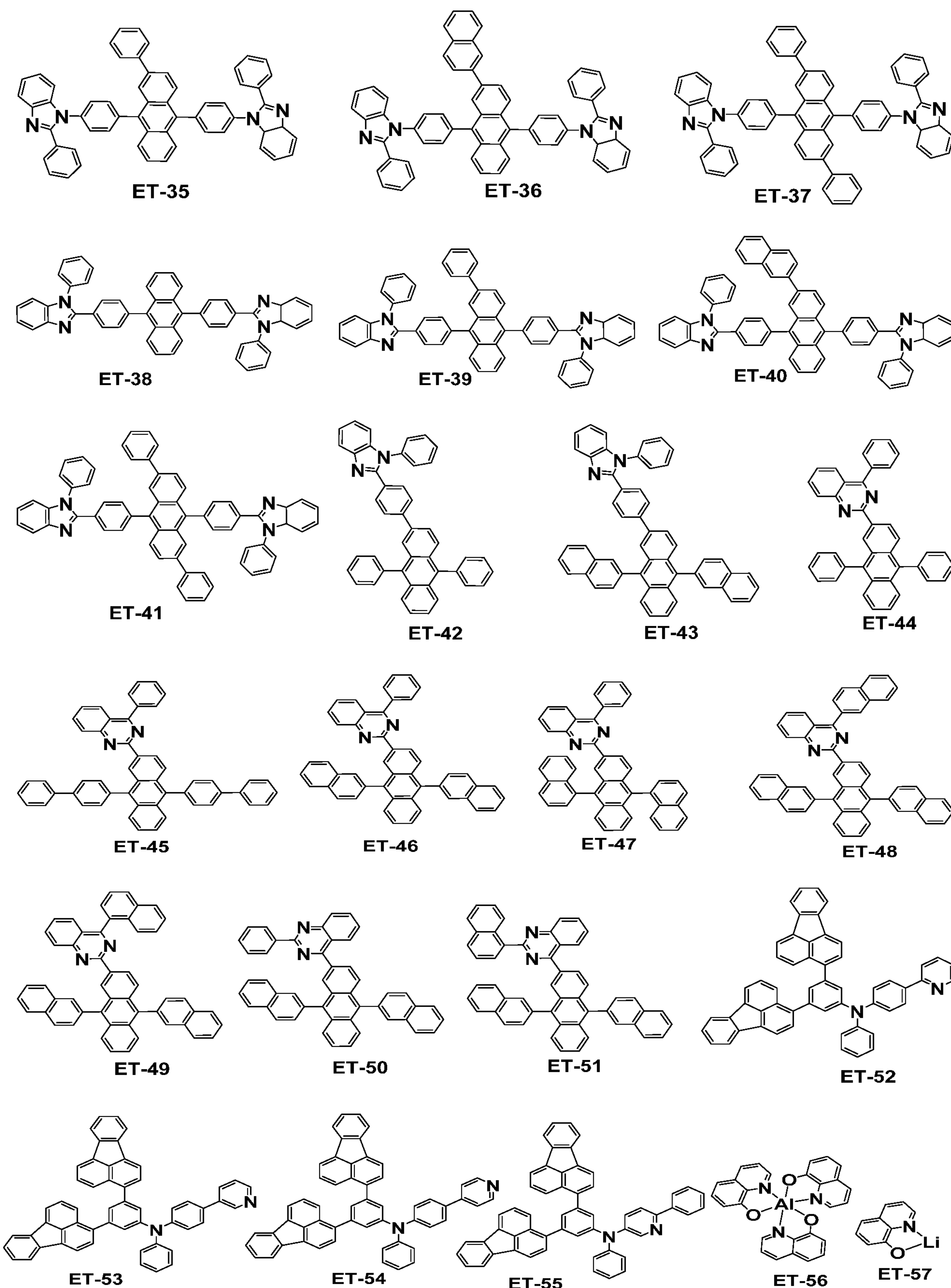
空穴注入层位于阳极和空穴传输层之间。空穴注入层可以是单一化合物材料，也可以是多种化合物的组合。例如，空穴注入层可以采用上述 HT-1 至 HT-34 的一种或多种化合物，或者采用下述 HI-1-HI-3 中的一种或多种化合物；也可以采用 HT-1 至 HT-34 的一种或多种化合物掺杂下述 HI-1-HI-3 中的一种或多种化合物（例如 HT-1 和 HI-2 的组合，HT-1、HT-2 和 HI-3 的组合等）。



进一步地，电子传输层中包含 ET-1 至 ET-57 所示的化合物中的任意一种或至少两种组合（例如 ET-1 和 ET-2 的组合，ET-5、ET-10 和 ET-16 的组合，ET-3、ET-30、ET-27 和 ET-18 的组合等）：







进一步地，电子注入层中的电子注入材料包括如下化合物中的任意一种或至少两种组合（例如 Liq 和 CsF 的组合， Cs_2CO_3 、BaO 和 Li_2O 的组合，Mg、Ca、Yb 和 LiF 的组合等）：Liq、LiF、NaCl、CsF、 Li_2O 、 Cs_2CO_3 、BaO、Na、Li、Ca、Mg、Ag、Yb。

进一步地,在第一电极下方或者第二电极上方可以使用基板。基板均为具有机械强度、热稳定性、防水性优异的玻璃或聚合物材料。此外,将有机电致发光器件用于显示面板中时,基板上也可以带有薄膜晶体管(TFT)。

进一步地,第一电极可以通过在基板上溅射或者沉积用作第一电极的材料的方式来形成。第一电极可以作为阳极或阴极。当第一电极作为阳极时,可以采用铟锡氧(ITO)、铟锌氧(IZO)、二氧化锡(SnO₂)、氧化锌(ZnO)、银(Ag)等导电材料和它们的任意组合。第一电极作为阴极时,可以采用镁(Mg)、银(Ag)、铝(Al)、铝-锂(Al-Li)、钙(Ca)、镁-铟(Mg-In)、镁-银(Mg-Ag)等金属或合金以及它们之间的任意组合。

进一步地,第二电极可以通过在基板上溅射或者沉积用作第二电极的材料的方式来形成。第二电极可以作为阳极或阴极。当第二电极作为阳极时,可以采用铟锡氧(ITO)、铟锌氧(IZO)、二氧化锡(SnO₂)、氧化锌(ZnO)、银(Ag)等导电材料和它们的任意组合。当第二电极作为阴极时,可以采用镁(Mg)、银(Ag)、铝(Al)、铝-锂(Al-Li)、钙(Ca)、镁-铟(Mg-In)、镁-银(Mg-Ag)等金属或合金以及它们之间的任意组合。在一个方案中,第一电极为阳极,并且第二电极为阴极。在另一个方案中,第一电极为阴极,并且第二电极为阳极。

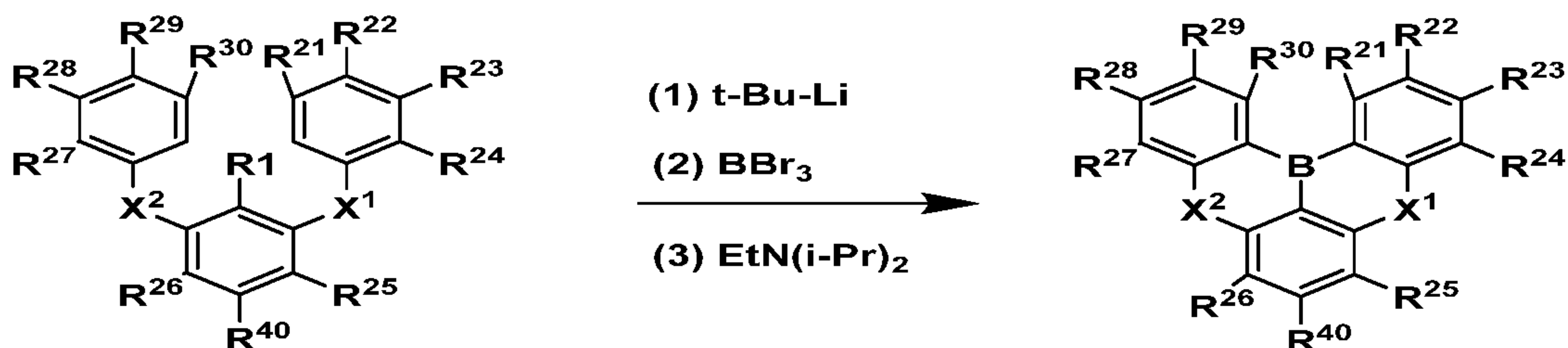
进一步地,有机层可以通过真空热蒸镀、旋转涂敷、打印等方法形成于电极之上。用作有机层的化合物可以为有机小分子、有机大分子和聚合物,以及它们的组合。

本申请还提供了一种显示面板,该显示面板中包含本申请的有机电致发光器件。

由于本申请提供的有机电致发光器件具有窄光谱、高色纯度的绿光发射,将其应用于显示面板中,能够使显示面板具有较大的显示色域面积,有利于未来实现显示面板的宽色域显示。

本申请还提供了一种显示装置,所述显示装置中含有本申请的显示面板。示例性地,显示装置可以为手机、平板电脑、电视、电脑显示屏等。

下面对式 I 化合物的合成方法进行简要的说明,首先,利用正丁基锂或叔丁基锂等对 X¹ 与 X² 之间的氢原子进行邻位金属化。继而,添加三溴化硼等,进行锂-硼或锂-磷的金属交换后,添加 *N,N*-二异丙基乙基胺等布朗斯特碱(Bronsted base),由此进行串联式硼杂弗里德-克拉夫茨反应(Tandem Bora-Friedel-Crafts Reaction),而可获得目标物,反应式如下:

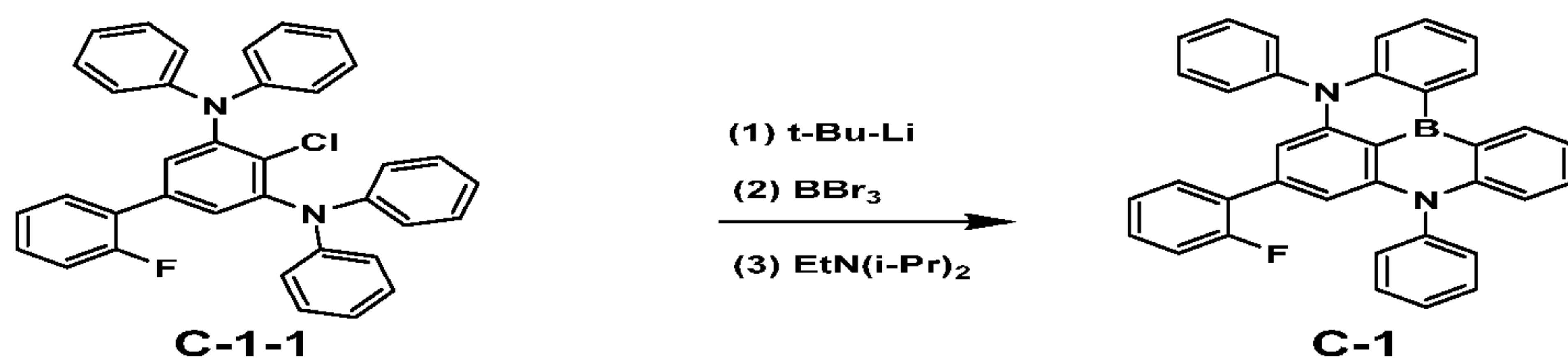


X¹、X²、R²¹至R³⁰、R⁴⁰均具有与式 I 中相同的意义,其中,R²¹、R²²、R²³、R²⁴、R²⁵、R²⁶、R²⁷、R²⁸、R²⁹及R³⁰中的邻接的基团彼此可键结并与母核中的三个苯环一同形成芳基环或杂芳基环,所形成的环中的至少一个氢可由芳基、杂芳基、二芳基氨基、二杂芳基氨基、芳基杂芳基氨基、烷基、烷氧基或芳氧基取代。

本申请中所用的各种化学药品如石油醚、叔丁苯、乙酸乙酯、硫酸钠、甲苯、二氯甲烷、碳酸钾、三溴化硼、*N,N*-二异丙基乙胺、反应中间体等基础化工原料均购自上海泰坦科技股份有限公司和西陇化工股份有限公司。确定下述化合物所用的质谱仪采用的是 ZAB-HS 型质谱仪测定(英国 Micromass 公司制造)。

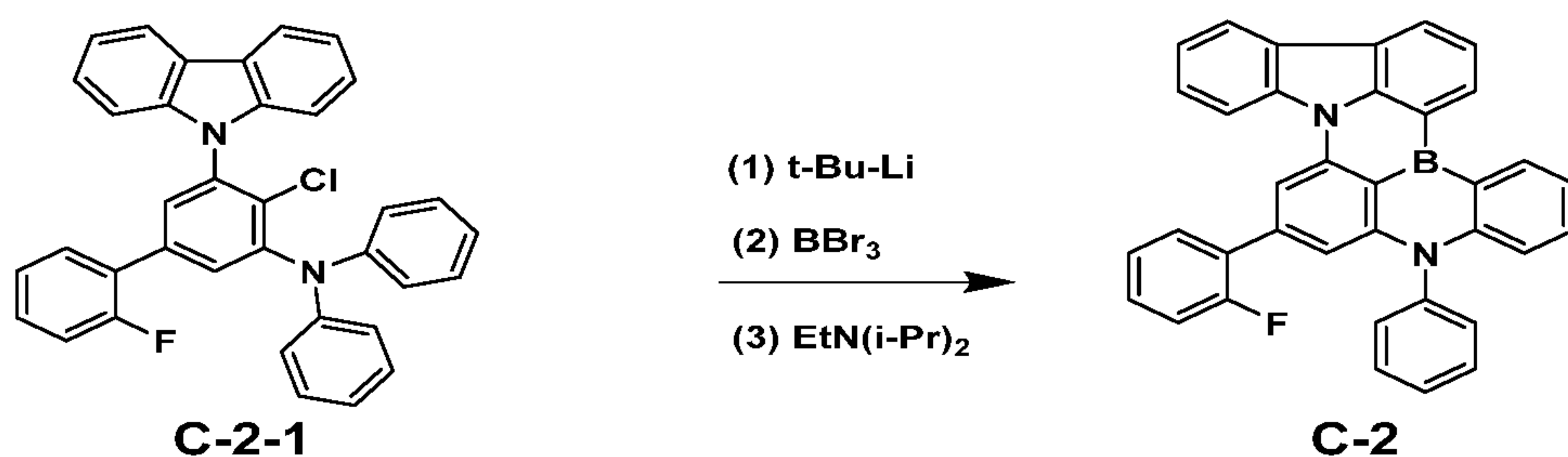
更具体地,以下合成例给出本申请的代表性化合物的合成方法。

合成例 1: 化合物 C-1 的合成



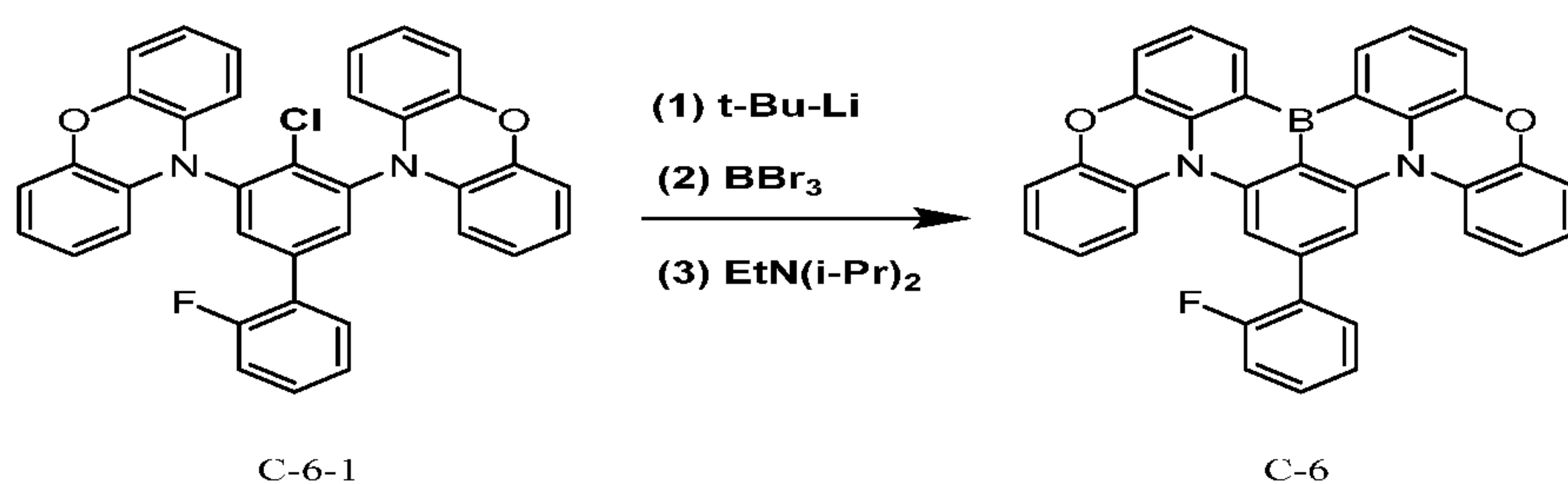
氮气气氛下，将叔丁基锂的戊烷溶液（11.09mL，1.60M，17.74mmol）缓慢加入到 0℃ 的 C-1-1（8.00g，14.79mmol）的叔丁苯（150mL）溶液中，而后依次升温至 80℃、100℃、120℃ 各反应 1 小时。反应结束后降温至 -30℃，缓慢加入三溴化硼（5.56g，22.18mmol），室温继续搅拌 0.5 小时。室温下加入 *N,N*-二异丙基乙胺（3.82g，29.57mmol），并在 145℃ 下继续反应 5 小时后停止。真空旋干溶剂，过硅胶柱（展开剂：乙酸乙酯：石油醚=50:1），得目标化合物 C-1（1.00g，13% 收率，HPLC 分析纯度 99.56%），为黄色固体。MALDI-TOF-MS 结果：分子离子峰：514.45；元素分析结果：理论值：C，84.06%；H，4.70%；B，2.10%；F，3.69%；N，5.45%；实验值：C，84.42%；H，4.66%；B，2.23%；F，3.71%；N，4.98%。

合成例 2：化合物 C-2 的合成



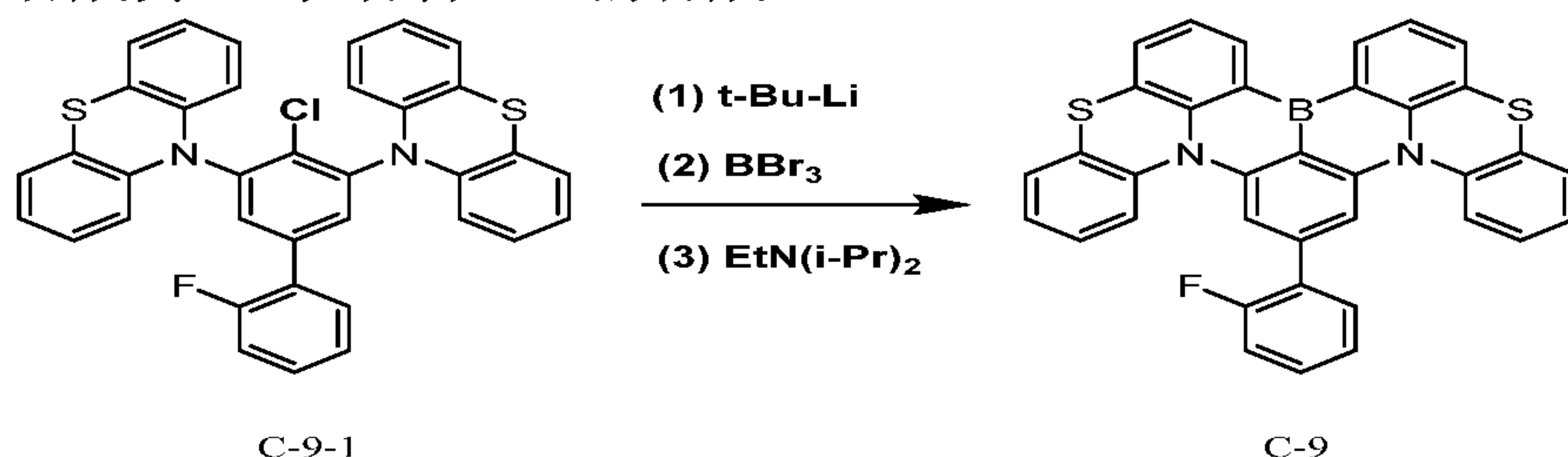
本实施例与合成例 1 的不同之处在于：本例中需将 C-1-1 换为等物质的量的 C-2-1。目标化合物 C-2（1.00g，13% 收率，HPLC 分析纯度 99.66%），为黄色固体。MALDI-TOF-MS 结果：分子离子峰：512.45 元素分析结果：理论值：C，84.39%；H，4.33%；B，2.11%；F，3.71%；N，5.47%；实验值：C，84.42%；H，4.01%；B，2.52%；F，3.51%；N，5.54%。

合成例 3：化合物 C-6 的合成



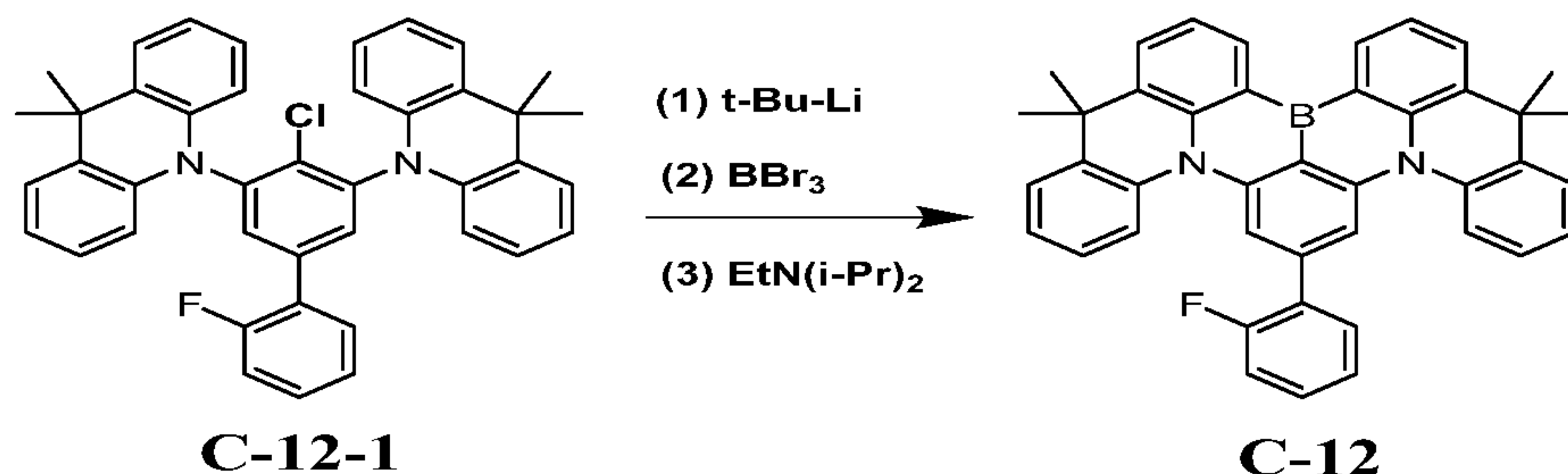
本实施例与合成例 1 的不同之处在于：本例中需将 C-1-1 换为等物质的量的 C-6-1。目标化合物 C-6（0.62g，8% 收率，HPLC 分析纯度 99.56%），为黄色固体。MALDI-TOF-MS 结果：分子离子峰：542.32 元素分析结果：理论值：C，79.72%；H，3.72%；B，1.99%；F，3.50%；N，5.17%；O，5.90%；实验值：C，79.77%；H，3.72%；B，1.94%；F，3.55%；N，5.17%；O，5.85%。

合成例 4：化合物 C-9 的合成



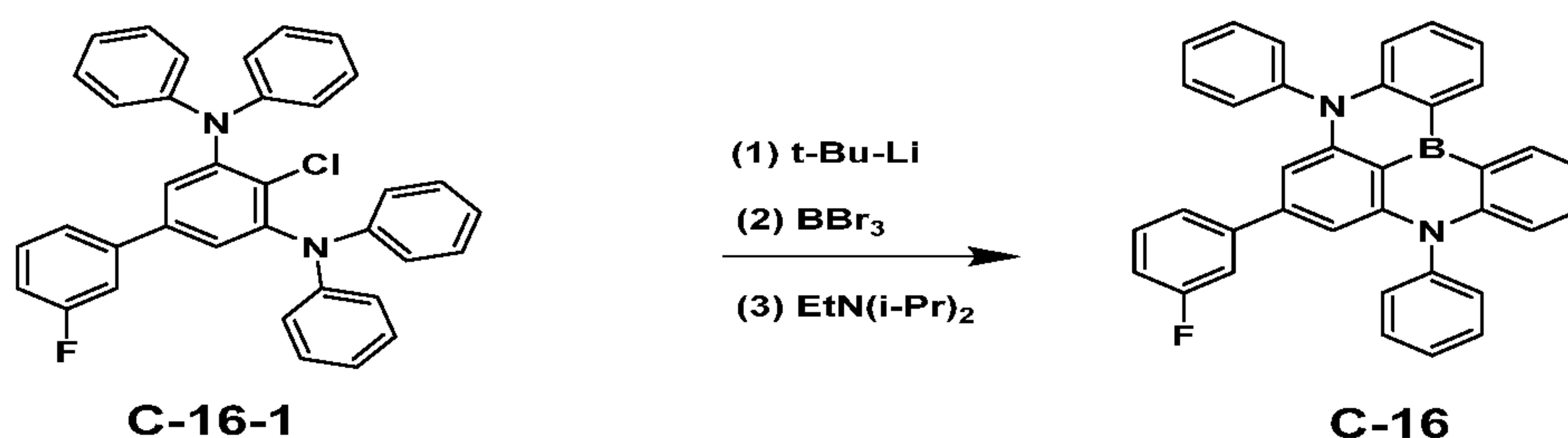
本实施例与合成例 1 的不同之处在于：本例中需将 C-1-1 换为等物质的量的 C-9-1。目标化合物 C-9 (0.76g, 9%收率, HPLC 分析纯度 99.56%), 为黄色固体。MALDI-TOF-MS 结果：分子离子峰：574.42 元素分析结果：理论值：C, 75.26%; H, 3.51%; B, 1.88%; F, 3.31%; N, 4.88%; S, 11.16%; 实验值：C, 75.16%; H, 3.41%; B, 1.98%; F, 3.21%; N, 4.88%; S, 11.16%。

合成例 5：化合物 C-12 的合成



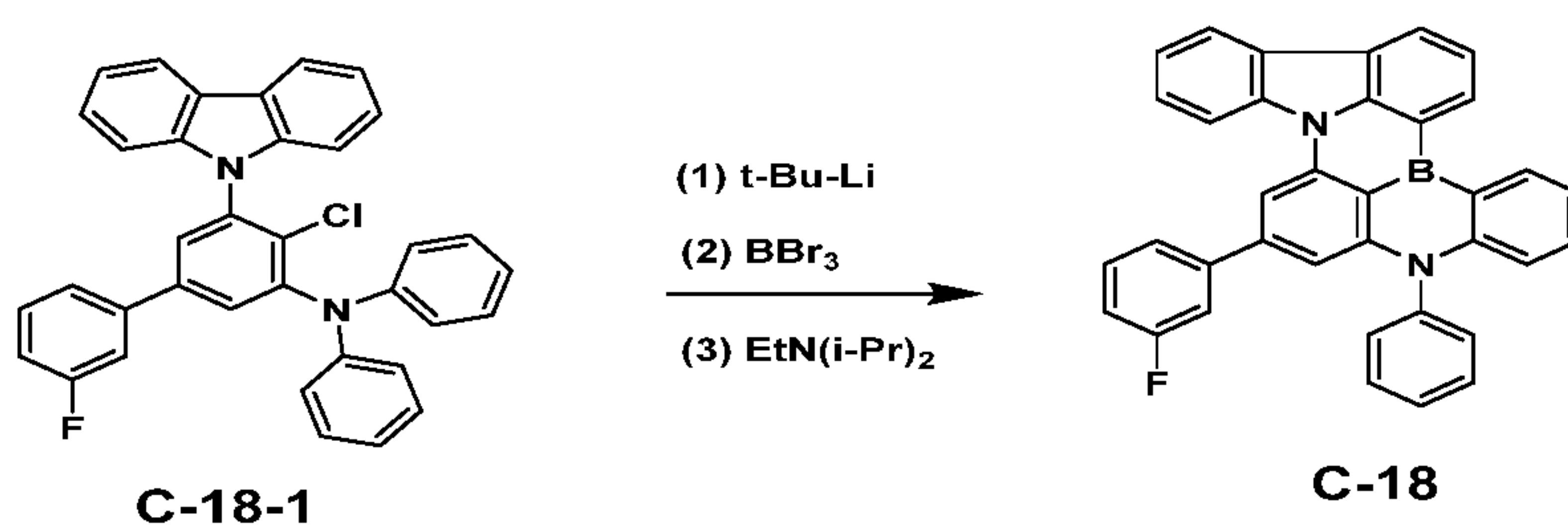
本实施例与合成例 1 的不同之处在于：本例中需将 C-1-1 换为等物质的量的 C-12-1。目标化合物 C-12 (0.90g, 10%收率, HPLC 分析纯度 99.56%), 为黄色固体。MALDI-TOF-MS 结果：分子离子峰：606.37 元素分析结果：理论值：C, 85.15%; H, 5.32%; B, 1.78%; F, 3.13%; N, 4.62%; 实验值：C, 85.25%; H, 5.32%; B, 1.68%; F, 3.33%; N, 4.42%。

合成例 6：化合物 C-16 的合成



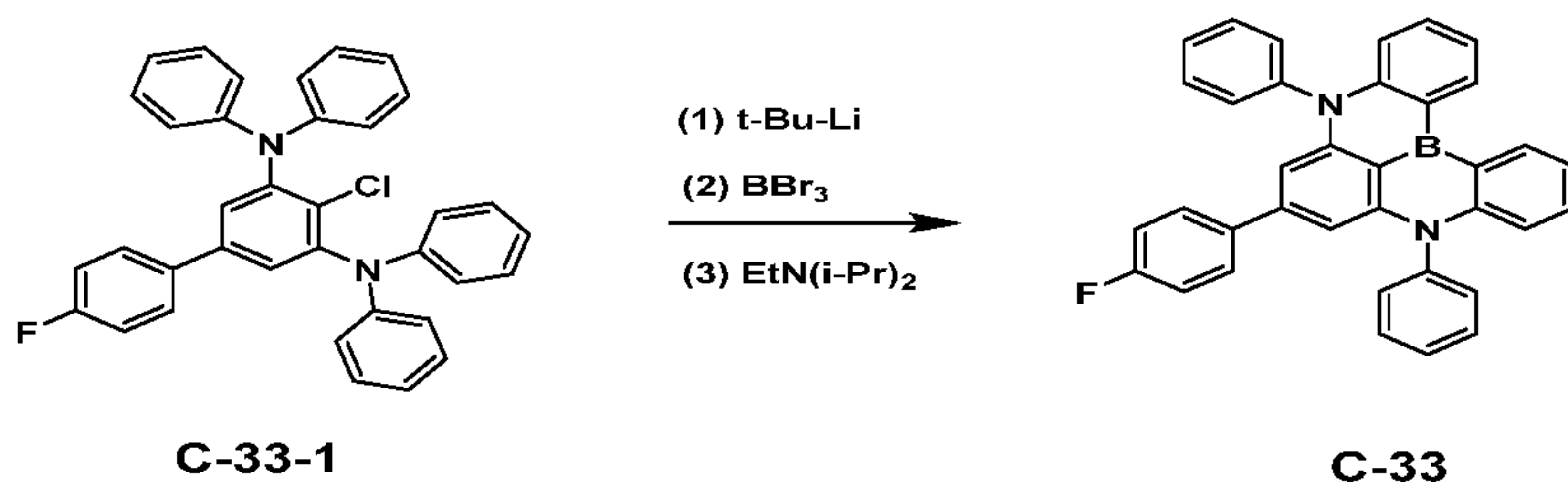
本实施例与合成例 1 的不同之处在于：本例中需将 C-1-1 换为等物质的量的 C-16-1。C-16 (1.02g, 13%收率, HPLC 分析纯度 99.74%), 为黄色固体。MALDI-TOF-MS 结果：分子离子峰：514.35; 元素分析结果：理论值：C, 84.06%; H, 4.70%; B, 2.10%; F, 3.69%; N, 5.45%; 实验值：C, 84.22%; H, 4.86%; B, 2.23%; F, 3.91%; N, 4.78%。

合成例 7：化合物 C-18 的合成



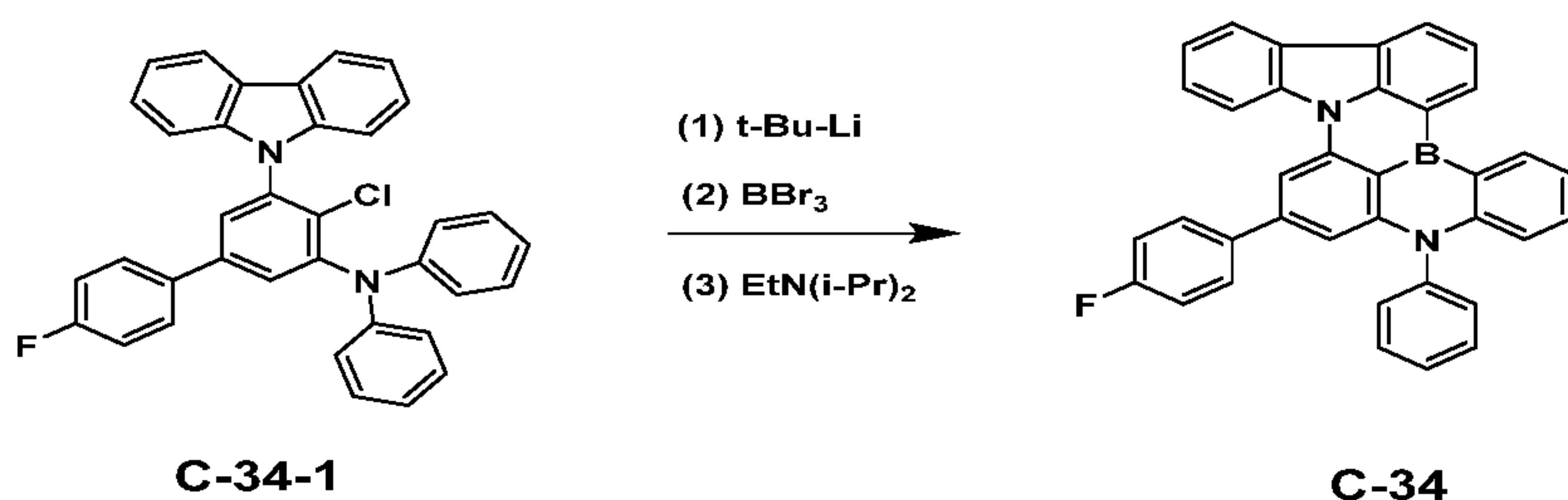
本实施例与合成例 1 的不同之处在于：本例中需将 C-1-1 换为等物质的量的 C-18-1。目标化合物 C-18 (1.00g, 13%收率, HPLC 分析纯度 99.66%), 为黄色固体。MALDI-TOF-MS 结果：分子离子峰：512.33; 元素分析结果：理论值：C, 84.39%; H, 4.33%; B, 2.11%; F, 3.71%; N, 5.47%; 实验值：C, 84.52%; H, 4.11%; B, 2.42%; F, 3.41%; N, 5.54%。

合成例 8：化合物 C-33 的合成



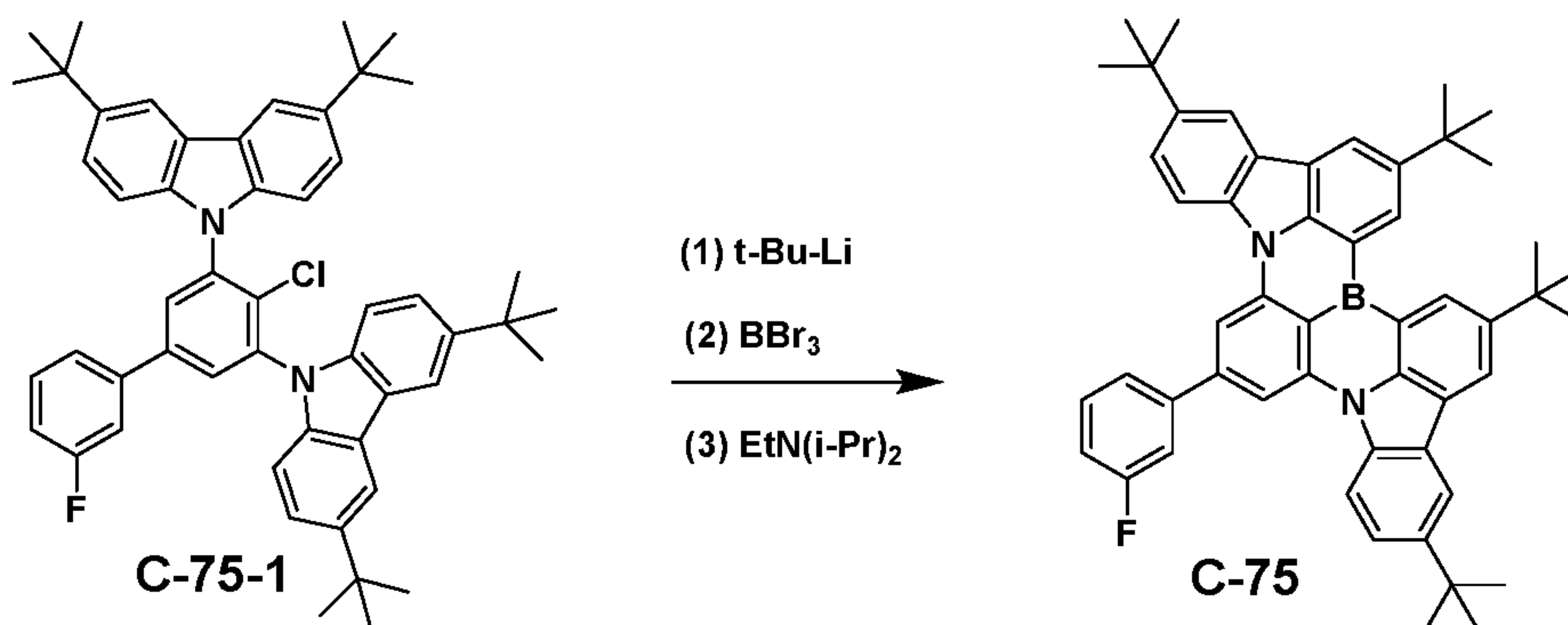
本实施例与合成例 1 的不同之处在于：本例中需将 C-1-1 换为等物质的量的 C-33-1。C-33 (1.02g, 13%收率, HPLC 分析纯度 99.74%), 为黄色固体。MALDI-TOF-MS 结果：分子离子峰：515.15；元素分析结果：理论值：C, 84.06%；H, 4.70%；B, 2.10%；F, 3.69%；N, 5.45%；实验值：C, 84.12%；H, 4.96%；B, 2.03%；F, 3.71%；N, 4.78%。

合成例 9：化合物 C-34 的合成



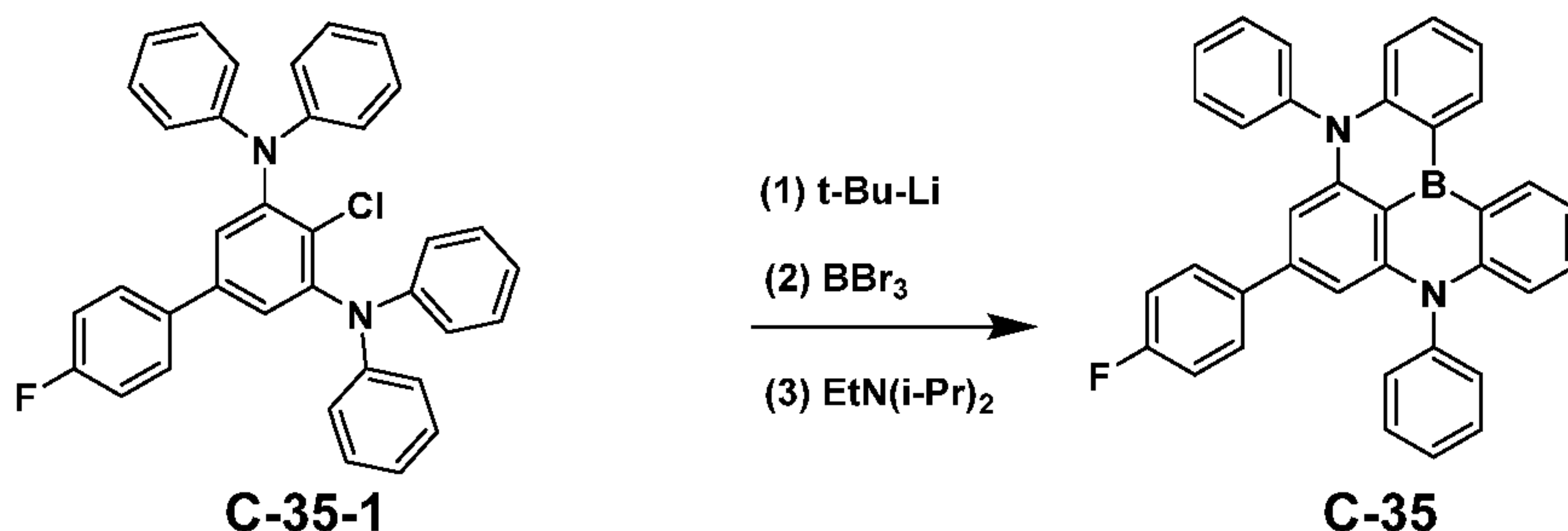
本实施例与合成例 1 的不同之处在于：本例中需将 C-1-1 换为等物质的量的 C-34-1。目标化合物 C-34 (1.00g, 13%收率, HPLC 分析纯度 99.46%), 为黄色固体。MALDI-TOF-MS 结果：分子离子峰：511.93；元素分析结果：理论值：C, 84.39%；H, 4.33%；B, 2.11%；F, 3.71%；N, 5.47%；实验值：C, 84.56%；H, 4.07%；B, 2.33%；F, 3.50%；N, 5.54%。

合成例 10：化合物 C-75 的合成



本实施例与合成例 1 的不同之处在于：本例中需将 C-1-1 换为等物质的量的 C-75-1，目标化合物 C-75 (2.22g, 20%收率, HPLC 分析纯度 99.56%), 为黄色固体。MALDI-TOF-MS 结果：分子离子峰：743.42；元素分析结果：理论值：C, 85.00%；H, 7.13%；B, 1.47%；F, 2.59%；N, 3.81%；实验值：C, 85.20%；H, 7.03%；B, 1.44%；F, 2.49%；N, 3.84%。

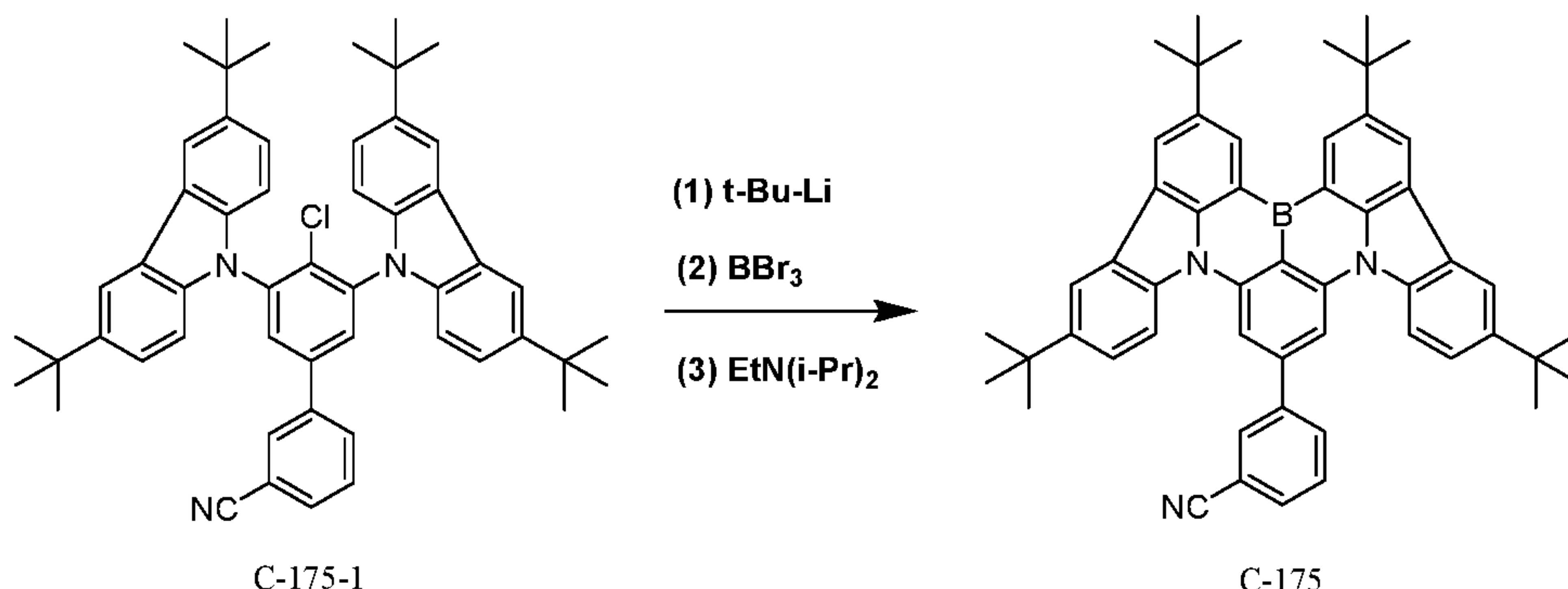
合成例 11：化合物 C-35 的合成



与合成例 1 的不同之处在于：将 C-1-1 换为等物质的量的 C-35-1。目标化合物 C-35 (1.29g,

17%收率, HPLC 分析纯度 99.59%), 为黄色固体。MALDI-TOF-MS 结果: 分子离子峰: 512.31 元素分析结果: 理论值: C, 84.06%; H, 4.70%; B, 2.10%; F, 3.69%; N, 5.45%; N, 5.47%; 实验值: C, 84.22%; H, 4.65%; B, 2.22%; F, 3.61%; N, 5.51%。

合成例 12: 化合物 C-175 的合成



与合成例 1 的不同之处在于: 本例中需将 C-1-1 换为等物质的量的 C-175-1。目标化合物 C-175 (1.59g, 14.5%收率, HPLC 分析纯度 99.91%), 为黄色固体。MALDI-TOF-MS 结果: 分子离子峰: 741.32 元素分析结果: 理论值: C, 85.81%; H, 7.07%; B, 1.46%; N, 5.66%; N, 5.17%; 实验值: C, 85.67%; H, 7.11%; B, 1.53%; N, 5.74%; N, 5.22%。

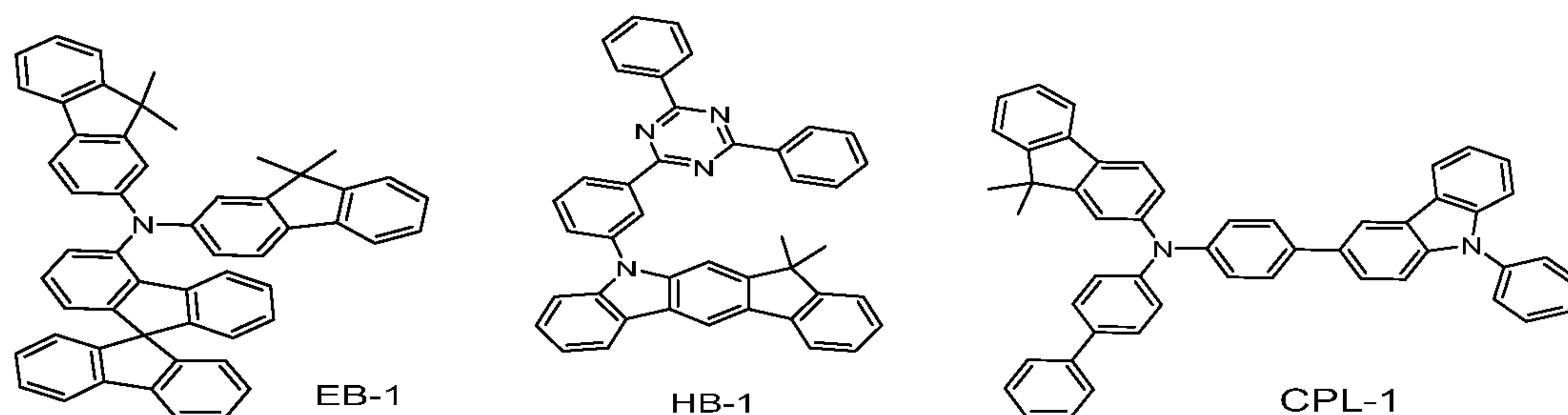
下面通过具体实施方式来进一步说明本申请的技术方案。本领域技术人员应该明了, 实施例仅仅是帮助理解本申请, 不应视为对本申请的具体限制。

以下通过具体实施例对本申请的有机电致发光器件进行进一步的介绍。

实施例 1-24、对比例 1-5

实施例 1-24、对比例 1-5 分别提供一种有机电致发光器件, 其器件结构依次包括阳极、空穴注入层 (HIL)、空穴传输层 (HTL)、电子阻挡层 (EBL)、发光层 (EML)、空穴阻挡层 (HBL)、电子传输层 (ETL)、电子注入层 (EIL)、阴极和光取出层 (CPL)。

其中, 阳极为 ITO/Ag/ITO 导电层, 空穴注入层的材料为 HI-2 和 HT-24 共掺混合层, HI-2 的质量比例为 3%, 空穴注入层厚度为 10 nm; 空穴传输层材料为 HT-24, 厚度为 110 nm; 电子阻挡层材料为 EB-1, 厚度为 35 nm; 发光层的材料包括主体材料、敏化剂和荧光染料, 发光层的厚度为 42 nm。空穴阻挡层的材料为 HB-1, 厚度为 5 nm。电子传输层的材料为 ET-52 和 ET-57 混合共蒸, 两者质量比例为 1:1, 厚度为 28 nm。电子注入层的材料为 Yb (1 nm)、阴极材料为 Mg 和 Ag 共混, 质量比例为 1:9, 厚度为 13 nm; 光取出层 (CPL) 材料为 CPL-1, 厚度为 65 nm。



实施例 1 提供的有机电致发光器件的具体结构如图 1 所示, 图 1 中显示, 该器件由下至上包括阳极层、HIL、HTL、EBL、EML、HBL、ETL、EIL、阴极层和 CPL。

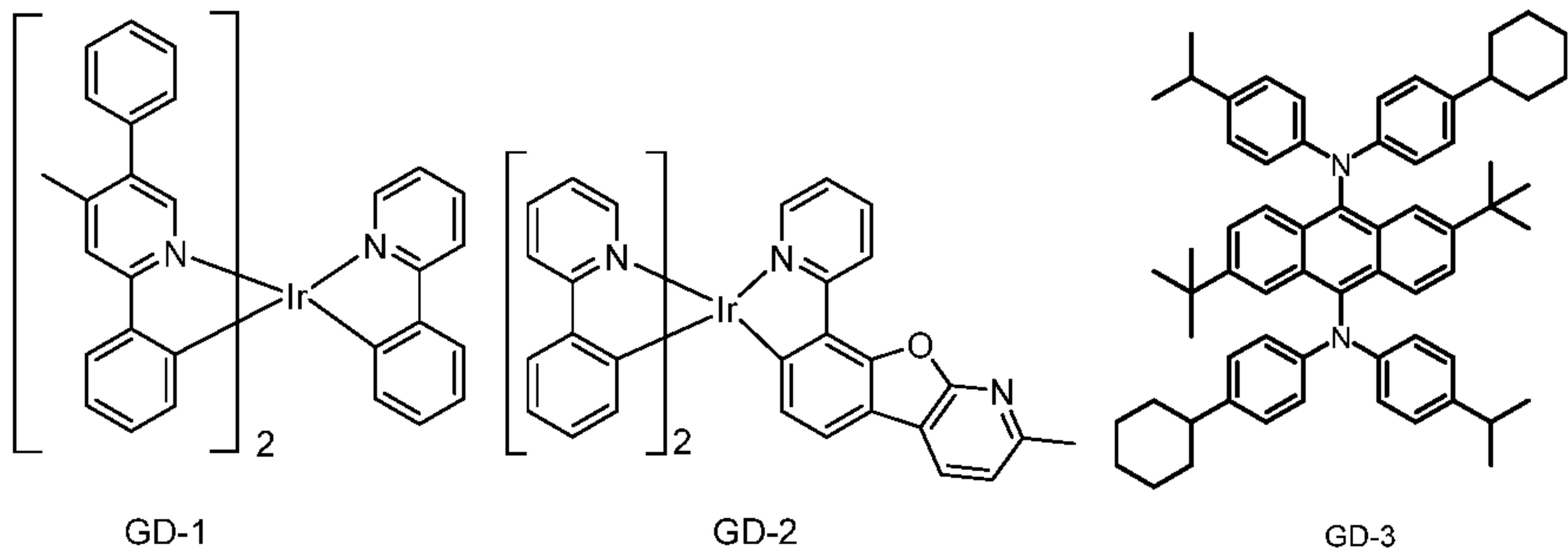
实施例 1-24、对比例 1-5 所提供的有机电致发光器件中, 主体材料、敏化剂和染料及掺杂浓度具体详见表 1。

实施例 1-24、对比例 1-5 的有机电致发光器件制备方法如下:

(1) 将涂布了 ITO/Ag/ITO 导电层的玻璃板在商用清洗剂中超声处理, 在去离子水中冲洗, 在丙酮: 乙醇混合溶剂中超声除油, 在洁净环境下烘烤至完全除去水份, 用紫外光和臭

- 氧清洗，并用低能阳离子束轰击表面；
- (2) 把上述带有阳极的玻璃基片置于真空腔内，抽真空至小于 1×10^{-5} Pa，在上述阳极层膜上真空蒸镀作为空穴注入层，蒸镀速率为 0.1 nm/s，蒸镀膜厚为 10 nm；
- (3) 在空穴注入层之上真空蒸镀空穴传输层，蒸镀速率为 0.1 nm/s，蒸镀总膜厚为 110 nm；
- (4) 在空穴传输层之上真空蒸镀电子阻挡层，蒸镀速率为 0.1 nm/s，蒸镀总膜厚为 35 nm；
- (5) 在电子阻挡层之上真空蒸镀发光层，发光层包括主体材料、敏化剂和荧光染料，利用多源共蒸的方法，蒸镀速率为 0.1 nm/s，蒸镀膜厚为 42 nm。
- (6) 在发光层之上真空蒸镀空穴阻挡层，蒸镀速率为 0.1 nm/s，蒸镀总膜厚为 5 nm；
- (7) 在空穴阻挡层之上真空蒸镀电子传输层，其蒸镀速率为 0.1 nm/s，蒸镀总膜厚为 28 nm；
- (8) 在电子传输层上真空蒸镀厚度为 1 nm 的电子注入层，厚度为 13 nm 的阴极，以及厚度为 65 nm 的光取出层。

对比例中涉及到的染料的结构如下：



性能测试

(1) 电流效率测试：

在同样亮度下，使用 Photo Research 公司的 PR 750 型光辐射计、ST-86LA 型亮度计（北京师范大学光电仪器厂）及 Keithley4200 测试系统测定实施例和对比例中制备得到的有机电致发光器件的电流效率。具体而言，以每秒 0.1 V 的速率提升电压，测定当有机电致发光器件的亮度达到 5000 cd/m²时的电流密度；亮度与电流密度的比值即为电流效率（cd/A）；

对比例 1 器件的电流效率计为 100%，其余器件的电流效率均为与其对比的相对值。

(2) 半峰宽测试：

在 5000 cd/m² 亮度下，使用 Photo Research 公司的 PR 750 型光辐射计测试计算得到。

上述性能测试结果如表 1 所示。

表 1

	主体材料	敏化剂	敏化剂 掺杂浓 度	染料	染料掺 杂浓度	半峰宽 (nm)	电流效率 (cd/A)
实施例 1	GPH-4	T-90	30%	C-35	5%	21	113%
实施例 2	GPH-4	T-90	30%	C-51	5%	22	107%
实施例 3	GPH-4	T-90	30%	C-103	5%	22	109%
实施例 4	GPH-4	T-90	30%	C-120	5%	23	126%
实施例 5	GPH-4	T-90	30%	C-123	5%	21	121%
实施例 6	GPH-4	T-90	30%	C-132	5%	23	108%
实施例 7	GPH-4	T-90	30%	C-175	5%	20	129%
实施例 8	GPH-4	T-90	30%	C-175	40%	26	93%
实施例 9	GPH-5	T-90	30%	C-175	5%	21	117%

实施例 10	GPH-78	T-90	30%	C-175	5%	20	113%
实施例 11	GPH-46:GPH-3 (比例 1:1)	T-90	30%	C-175	5%	21	133%
实施例 12	GPH-45:GPH-3 (比例 1:1)	T-90	30%	C-175	5%	21	130%
实施例 13	GPH-4	T-37	30%	C-175	5%	20	115%
实施例 14	GPH-4	T-82	30%	C-175	5%	21	119%
实施例 15	GPH-4	T-89	30%	C-175	5%	21	126%
实施例 16	GPH-4	T-91	30%	C-175	5%	20	124%
实施例 17	GPH-4	T-91	85%	C-175	5%	25	104%
实施例 18	GPH-4	T-90	5%	C-75	1%	19	102%
实施例 19	GPH-4	T-90	50%	C-75	10%	19	112%
实施例 20	GPH-4	T-90	50%	C-75	30%	19	107%
实施例 21	GPH-5	T-37	30%	C-103	5%	23	108%
实施例 22	GPH-46:GPH-3 (比例 1:1)	T-91	30%	C-123	10%	23	109%
实施例 23	GPH-78	T-82	30%	C-35	5%	20	112%
实施例 24	GPH-45:GPH-3 (比例 1:1)	T-82	30%	C-120	5%	24	125%
对比例 1	GPH-4	/	/	GD-1	10%	32	100%
对比例 2	GPH-4	/	/	GD-2	10%	30	103%
对比例 3	GPH-4	/	/	GD-3	5%	26	22%
对比例 4	GPH-4	T-90	40%	GD-3	5%	27	84%
对比例 5	GPH-4	/	/	C-175	5%	20	24%

表 1 中，/代表不添加对应物质。

由表 1 可知，本申请提供的有机电致发光器件实现了窄光谱、高色纯度的绿光发射，且器件效率较高，半峰宽为 19~26 nm。

对比例 1 和对比例 2 提供的器件中不加入敏化剂、使用磷光染料 GD-1 和 GD-2，半峰宽较宽；

对比例 3 提供的器件中不加入敏化剂、使用与式 I 结构不同的荧光染料，半峰宽较宽，且电流效率较低；

对比例 4 提供的器件中加入敏化剂、使用与式 I 结构不同的荧光染料，半峰宽较宽，电流效率较低；

对比例 5 提供的器件中不加入敏化剂、使用式 I 的荧光染料，虽然半峰宽较窄，但是电流效率较低。

由此可知，只有在三掺器件（发光层包括主体材料、敏化剂和染料）中使用式 I 的绿色荧光染料，才能够获得窄光谱、高色纯度的绿光发射且器件效率较高的有机电致发光器件。

实施例 8 相较于实施例 7 仅将染料的掺杂浓度提升至 40%，半峰宽变大，电流效率降低，实施例 17 相较于实施例 16 仅将敏化剂的掺杂浓度提升至 85%，半峰宽变大，电流效率降低，由此证明，染料和敏化剂的掺杂浓度不易过高，分别在 0.1~30%、10~50%范围内性能最佳。

应用例 1

本应用例提供一种显示面板，显示面板包含红光单元、绿光单元和蓝光单元，其中红光单元的发射光色 CIE = (0.669,0.329)；蓝光单元的发射光色 CIE = (0.140,0.051)；绿光单元应用实施例 4 的有机电致发光器件，绿光单元发射光色 CIE = (0.164,0.771)。

应用例 1 的显示面板的结构如图 2 所示，显示面板包括基板 1、发光单元 2 和缓冲封装

层 3，发光单元 2 包括红光单元 21、绿光单元 22 和蓝光单元 23。

应用例 2

与应用例 1 的区别在于，绿光单元应用实施例 7 的有机电致发光器件，绿光单元发射光色 CIE = (0.153,0.787)。

对比应用例 1

与应用例 1 的区别在于，绿光单元应用对比例 1 的有机电致发光器件，绿光单元发射光色 CIE = (0.206,0.726)。

性能测试

针对应用例和对比应用例得到的显示面板进行如下性能测试：

- (1) 使用 Photo Research 公司的 PR 750 型光辐射计测试得到 CIE-x 和 CIE-y；
- (2) 测试屏体的 RGB 光色色坐标，导入 CIE 1931 色域图中，计算色域显示面积。

将对比应用例 1 的色域显示面积记为 100%，其余应用例的色域显示面积均为与其对比的相对值，测试结果如表 2 所示。

表 2

	蓝光单元 CIE (x,y)	红光单元 CIE (x,y)	绿光单元 CIE (x,y)	色域显示面积 (CIE 1931)
应用例 1	0.140, 0.051	0.669, 0.329	0.164, 0.771	110.5%
应用例 2	0.140, 0.051	0.669, 0.329	0.153, 0.787	113.9%
对比应用例 1	0.140, 0.051	0.669, 0.329	0.206, 0.726	100%

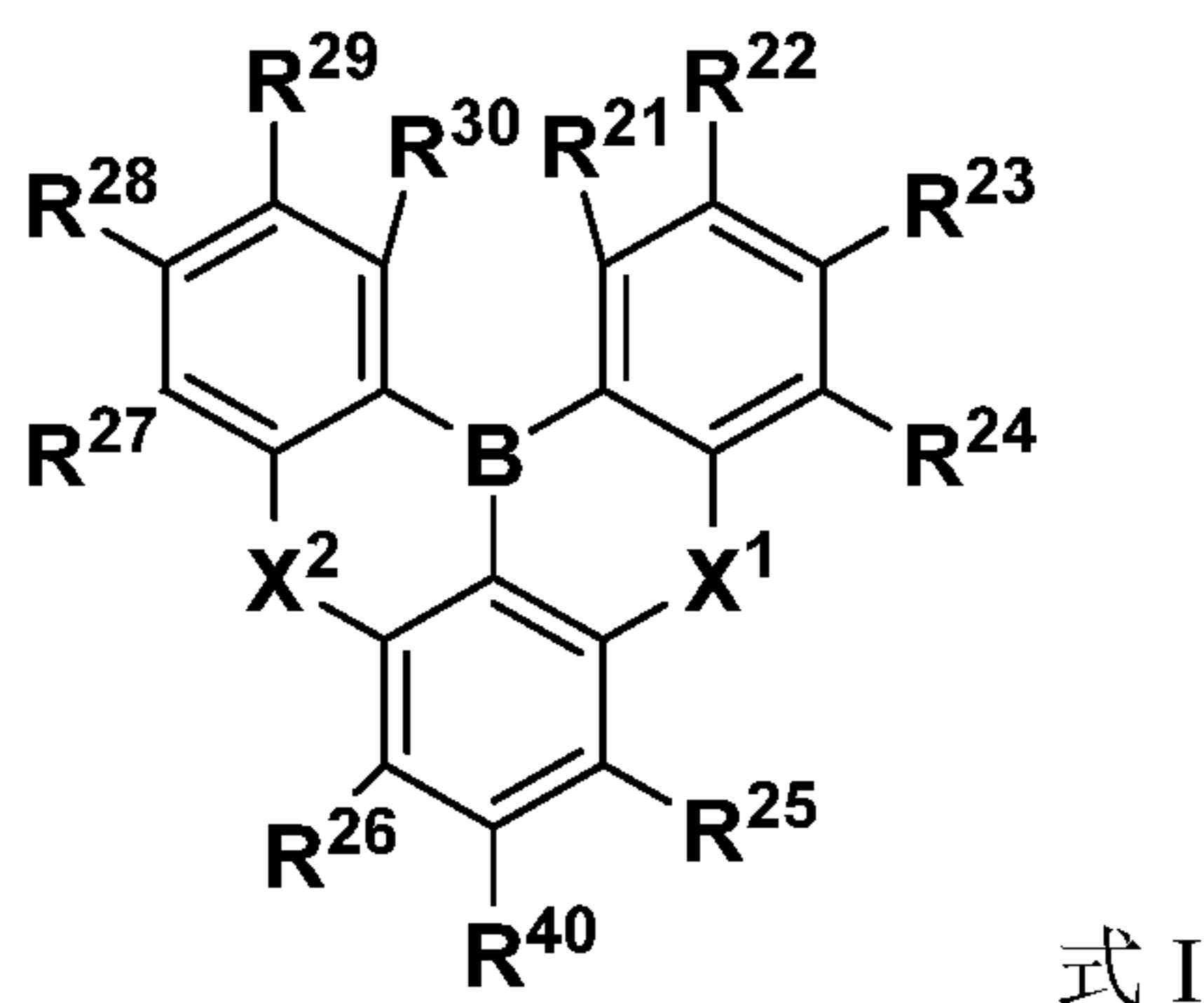
由表 2 可知，与对比应用例 1 相比，应用例 1-2 的显示面板的色域显示面积明显增大，由此证明，将本申请提供的有机电致发光器件应用于显示面板，能够提高显示面板的色域显示面积。

申请人声明，本申请通过上述实施例来说明本申请的详细工艺设备和工艺流程，但本申请并不局限于上述详细工艺设备和工艺流程，即不意味着本申请必须依赖上述详细工艺设备和工艺流程才能实施。所属技术领域的技术人员应该明了，对本申请的任何改进，对本申请产品各原料的等效替换及辅助成分的添加、具体方式的选择等，均落在本申请的保护范围和公开范围之内。

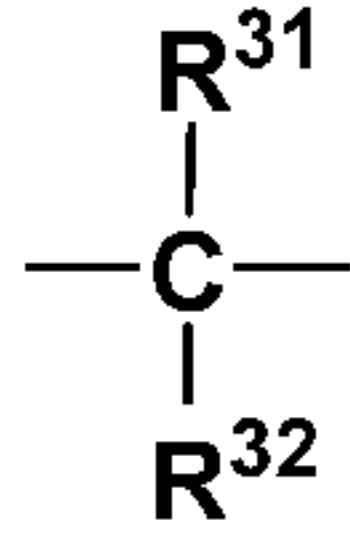
权利要求书

1、一种有机电致发光器件，其包括第一电极、第二电极以及位于所述第一电极和第二电极之间的有机层；

其中，所述有机层包括发光层，所述发光层中含有主体材料、热活化延迟荧光敏化剂和绿色荧光染料，且所述绿色荧光染料具有式 I 所示的结构：



式 I 中，所述 X^1 为 NR^1 ，所述 X^2 为 NR^2 ，所述 R^1 和 R^2 各自独立地选自取代或未取代的下述基团中的一种：C1-C10 烷基、C6-C30 单环芳基、C10-C30 稠环芳基、C5-C30 单环杂芳

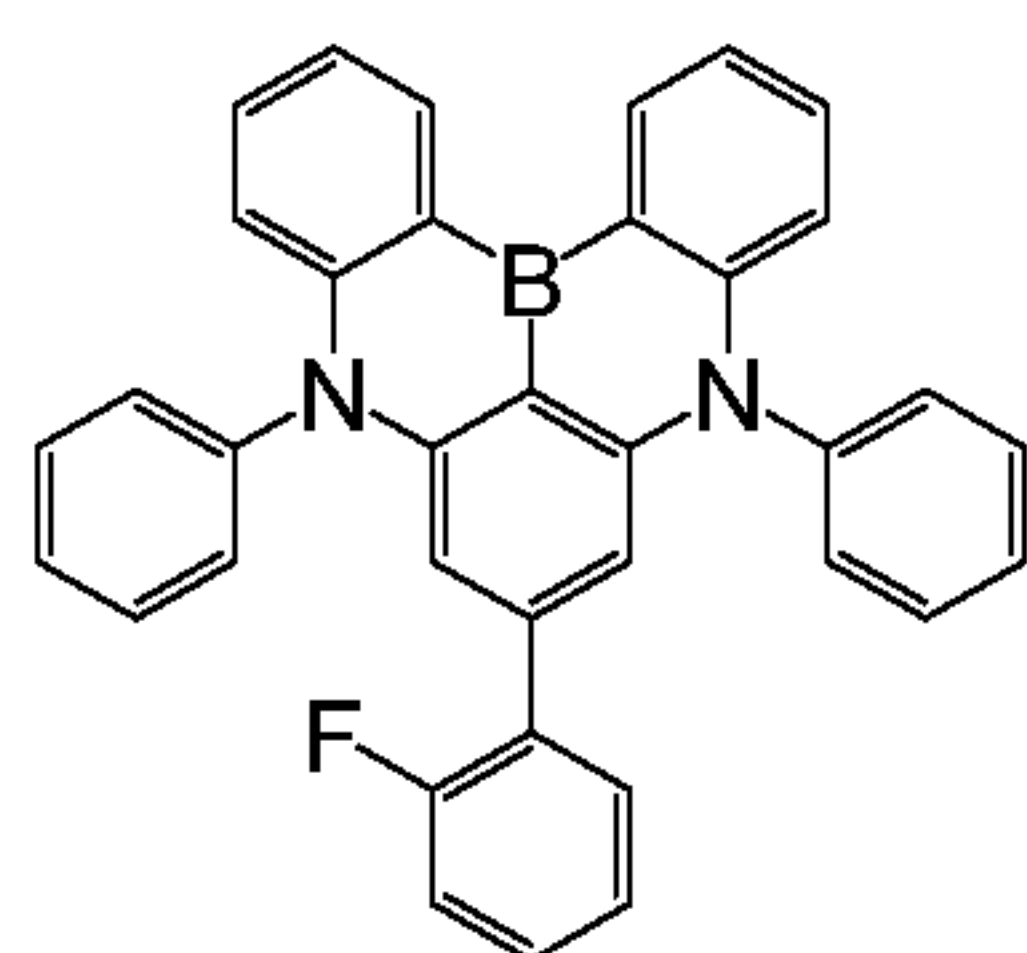
基或 C8-C30 稠环杂芳基，且所述 R^1 和 R^2 各自独立地通过 -O-、-S-、 或单键与相邻的苯环键接或者不与相邻的苯环键接；

所述 R^{21} 、 R^{22} 、 R^{23} 、 R^{24} 、 R^{25} 、 R^{26} 、 R^{27} 、 R^{28} 、 R^{29} 、 R^{30} 、 R^{31} 和 R^{32} 各自独立地选自氢、氘或者取代或未取代的下述基团中的一种：C6-C48 单环芳基、C10-C48 稠环芳基、C3-C48 单环杂芳基、C6-C48 稠环杂芳基、C6-C30 芳基氨基、C3-C30 杂芳基氨基、C1-C36 烷基或 C1-C6 烷氧基，且 R^{21} 至 R^{30} 不同时为氢，并且 R^{21} 至 R^{30} 中相邻的两个基团彼此不键合或键合形成取代或未取代的下述基团中的一种：C1-C10 环烷基、C6-C30 芳基或 C5-C30 杂芳基；

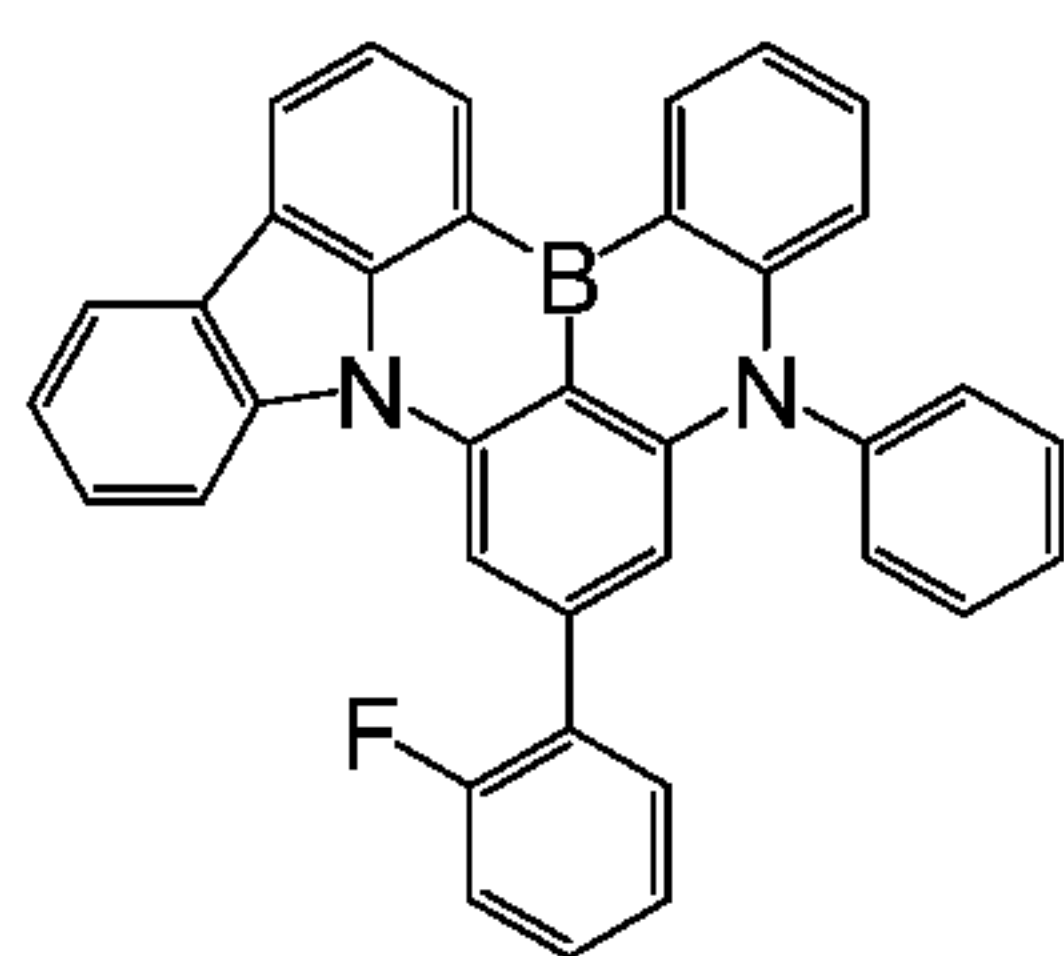
所述 R^{40} 选自取代或未取代的 C6-C48 单环芳基、取代或未取代的 C10-C48 稠环芳基、取代或未取代的 C3-C48 含氮单环杂芳基、取代或未取代的 C6-C48 含氮稠环杂芳基中的一种；

当上述基团被取代基取代时，所述取代基各自独立地选自 C1-C10 烷基、C3-C10 环烷基、C2-C10 烯基、C1-C6 烷氧基、C1-C6 硫代烷氧基、C6-C30 单环芳基、C10-C30 稠环芳基、C3-C30 单环杂芳基或 C6-C30 稠环杂芳基中的一种。

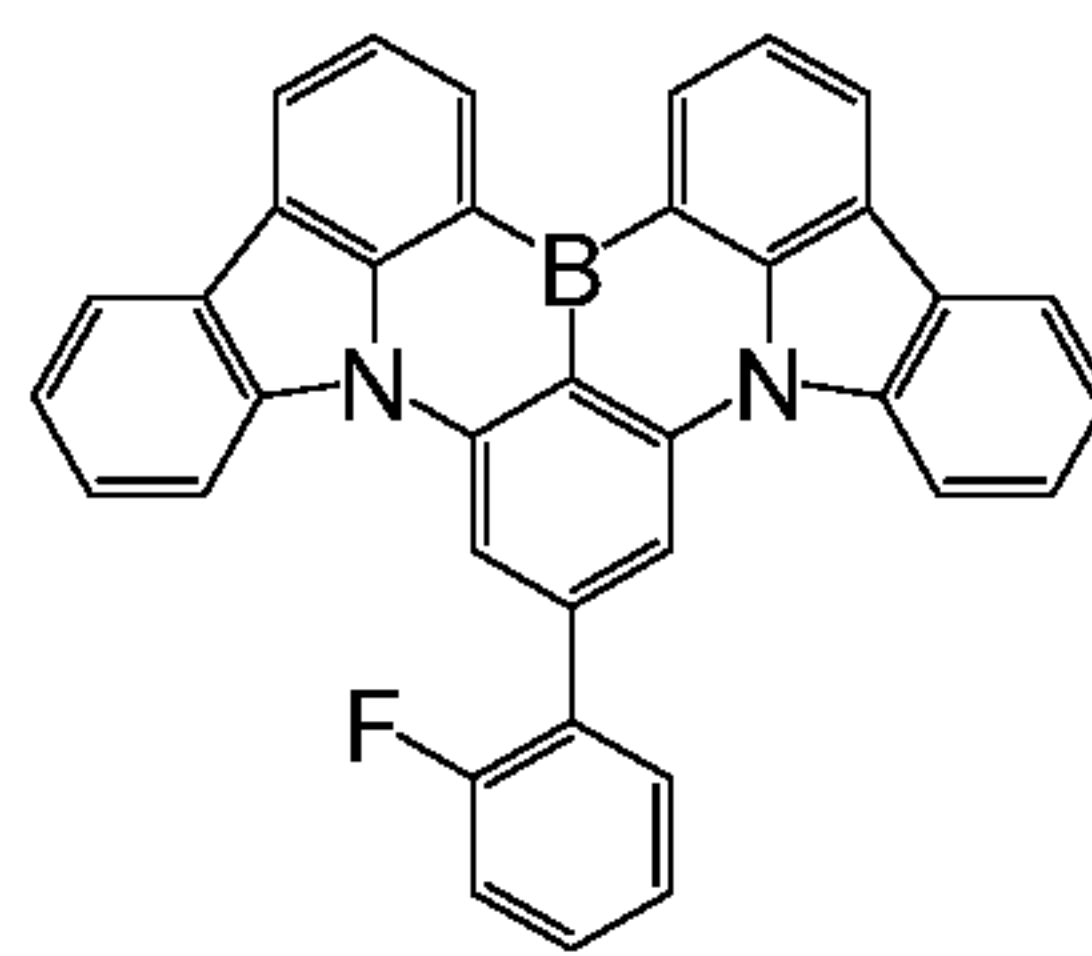
2、根据权利要求 1 所述的有机电致发光器件，其中，所述绿色荧光染料选自如下 C-1 至 C-204 所示的化合物中的任意一种：



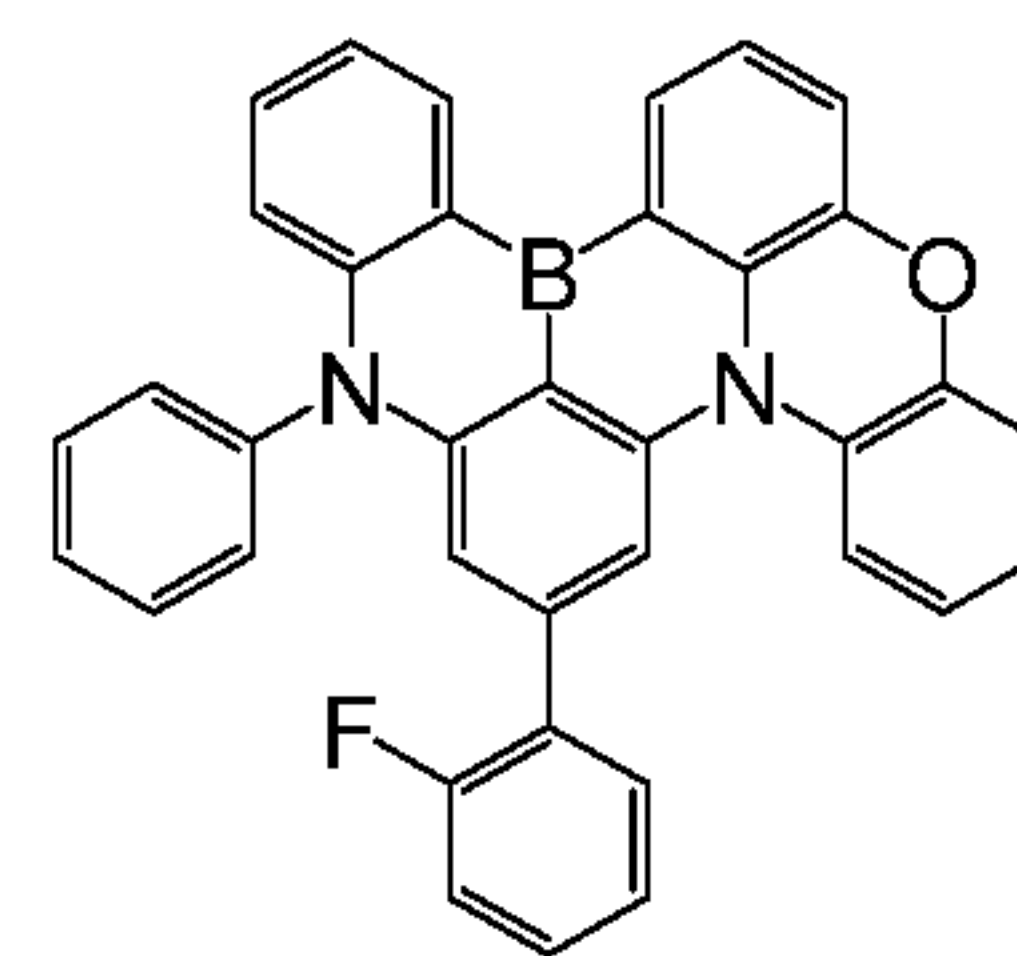
C-1



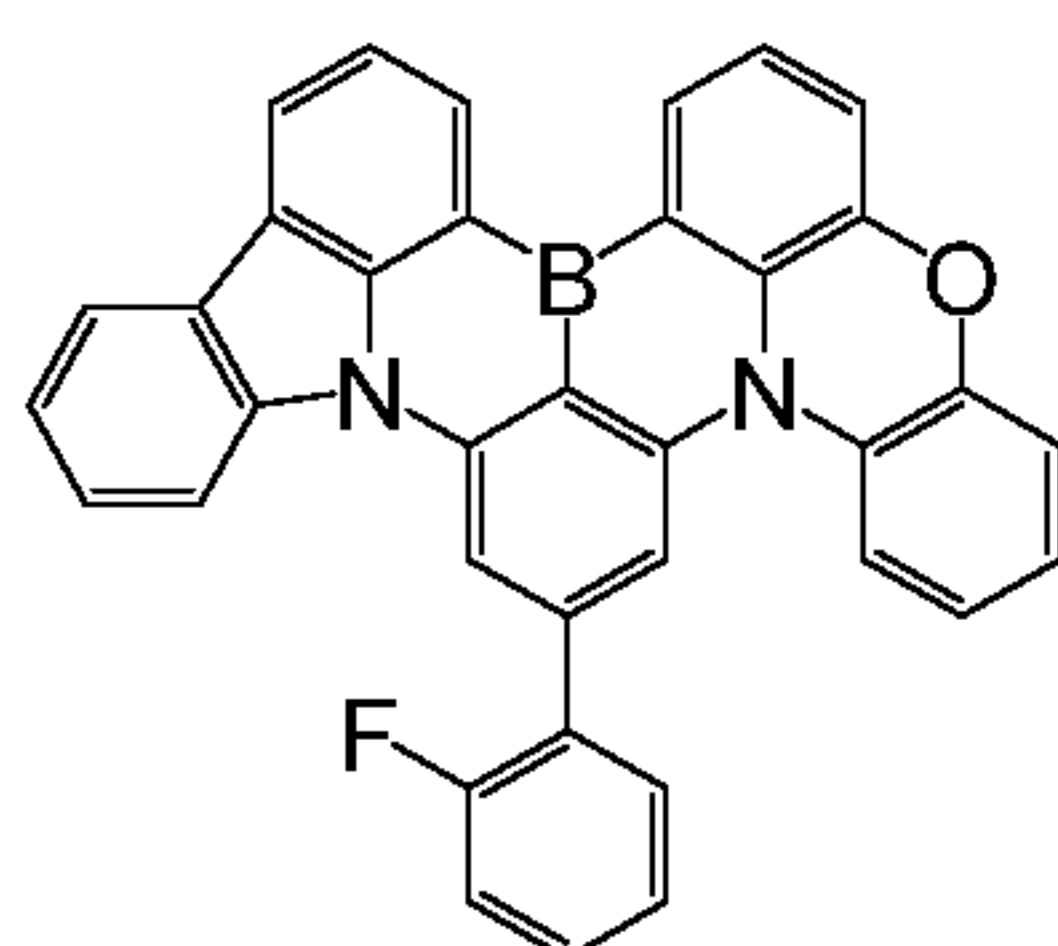
C-2



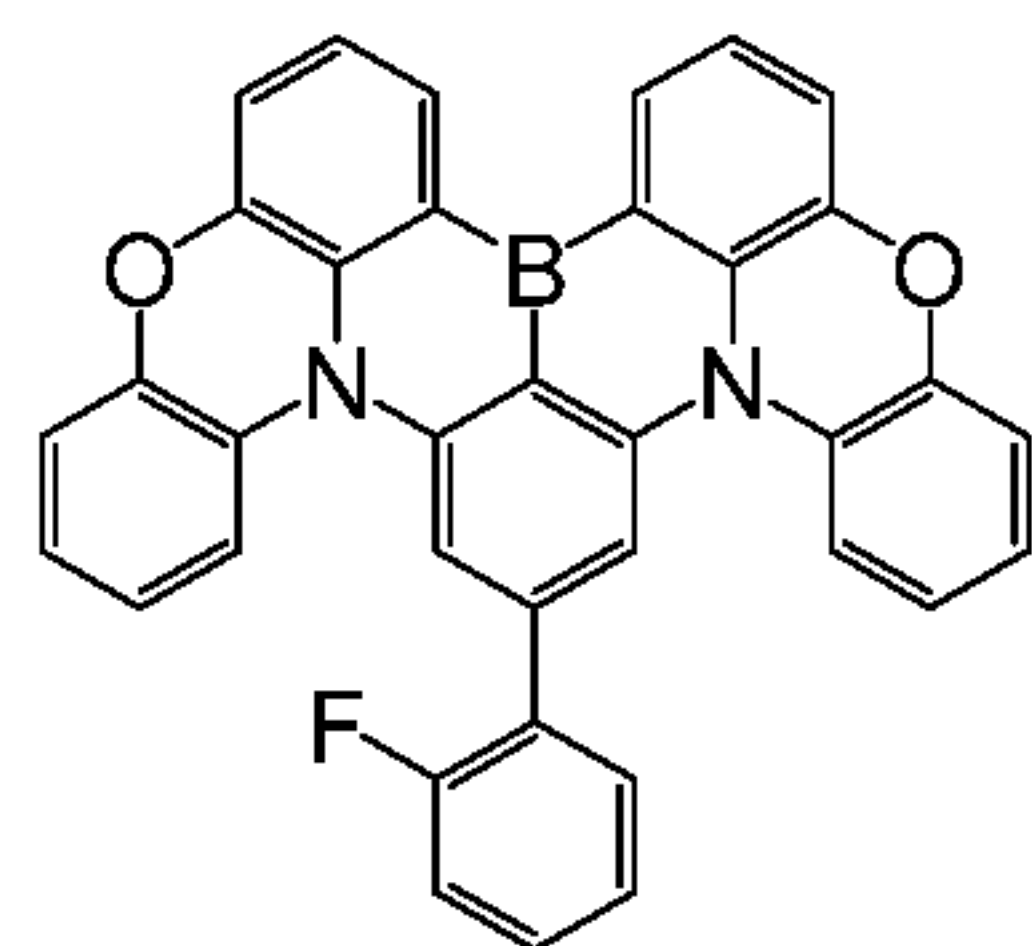
C-3



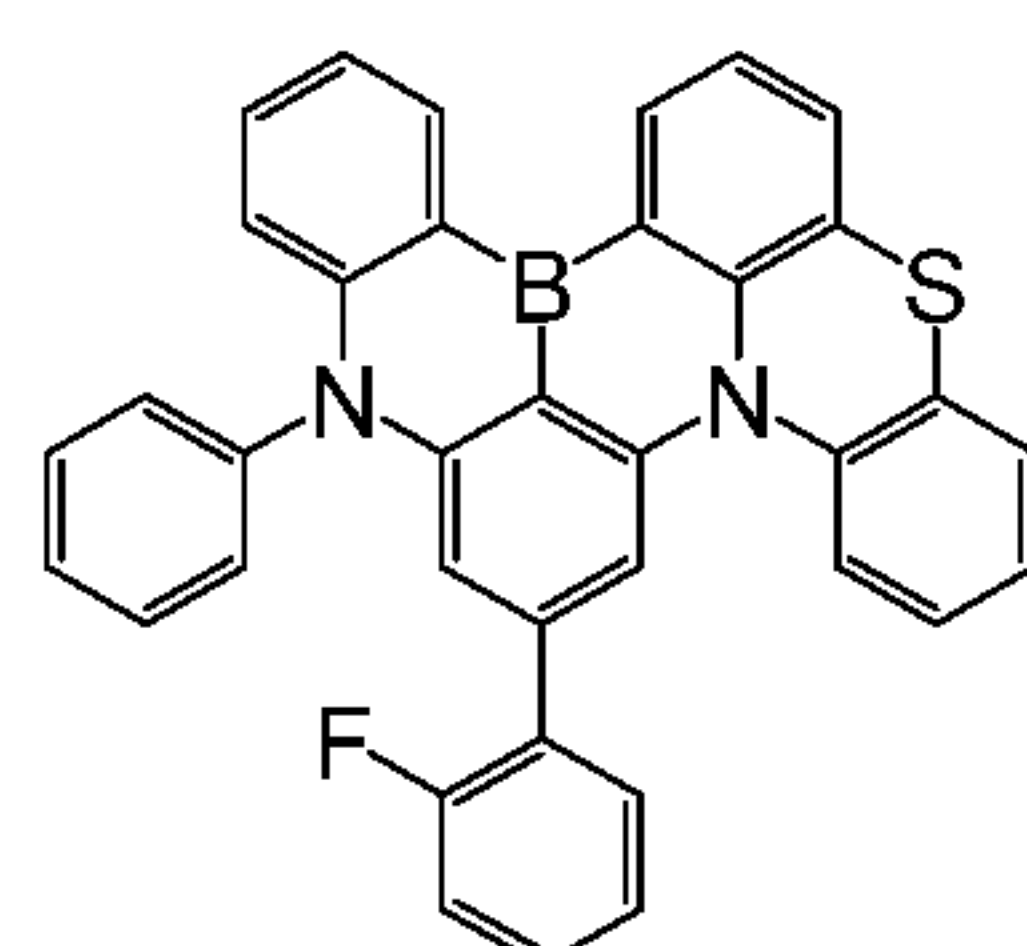
C-4



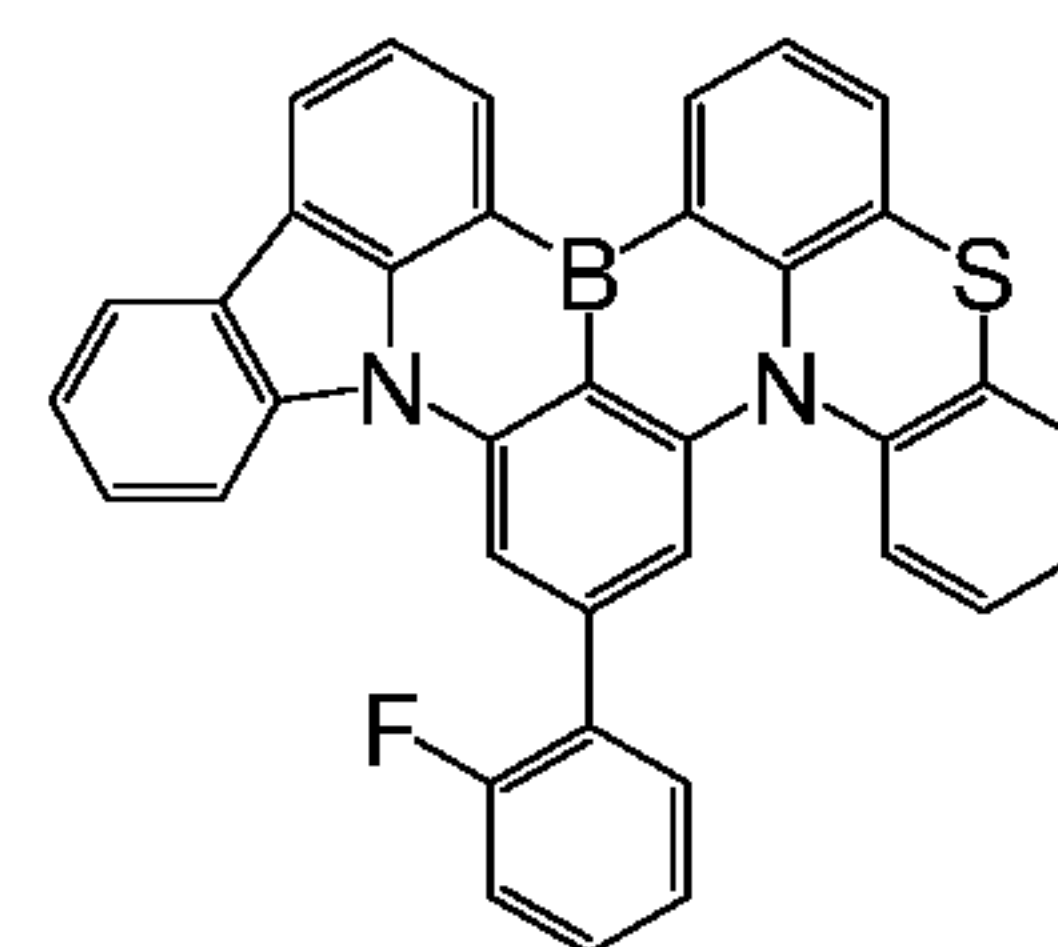
C-5



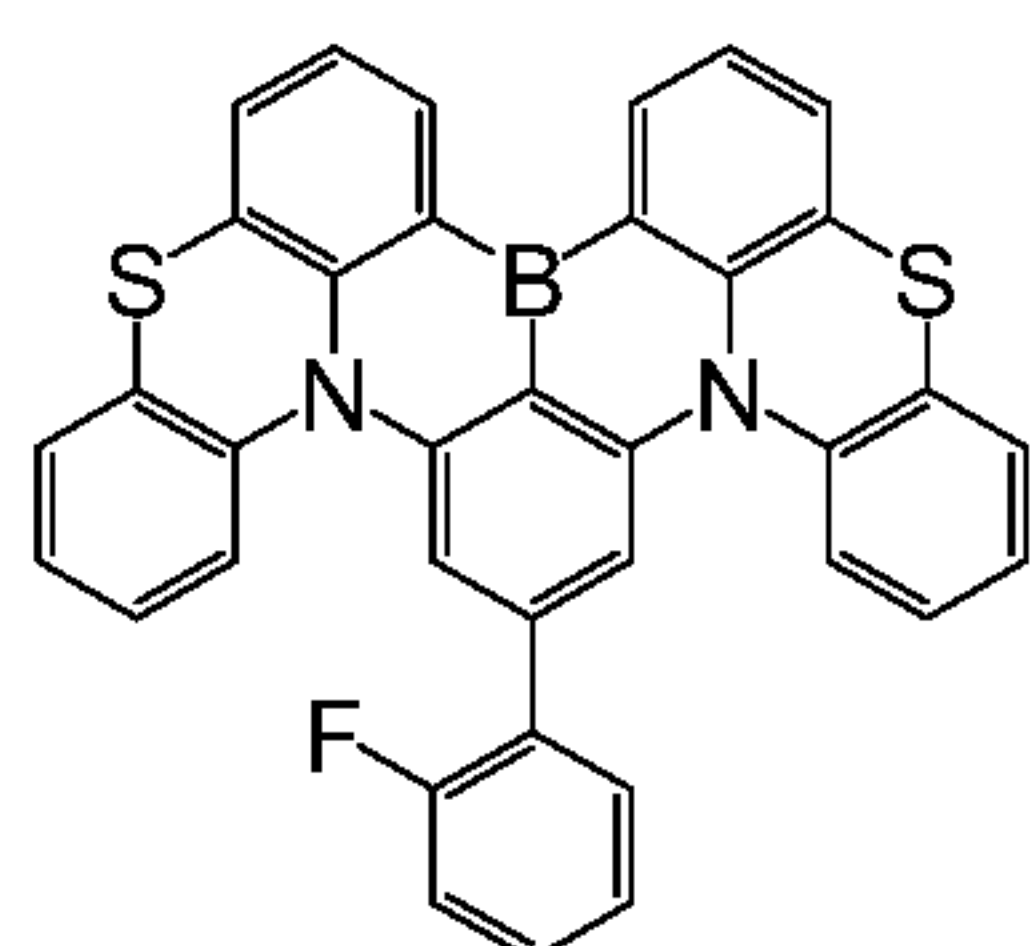
C-6



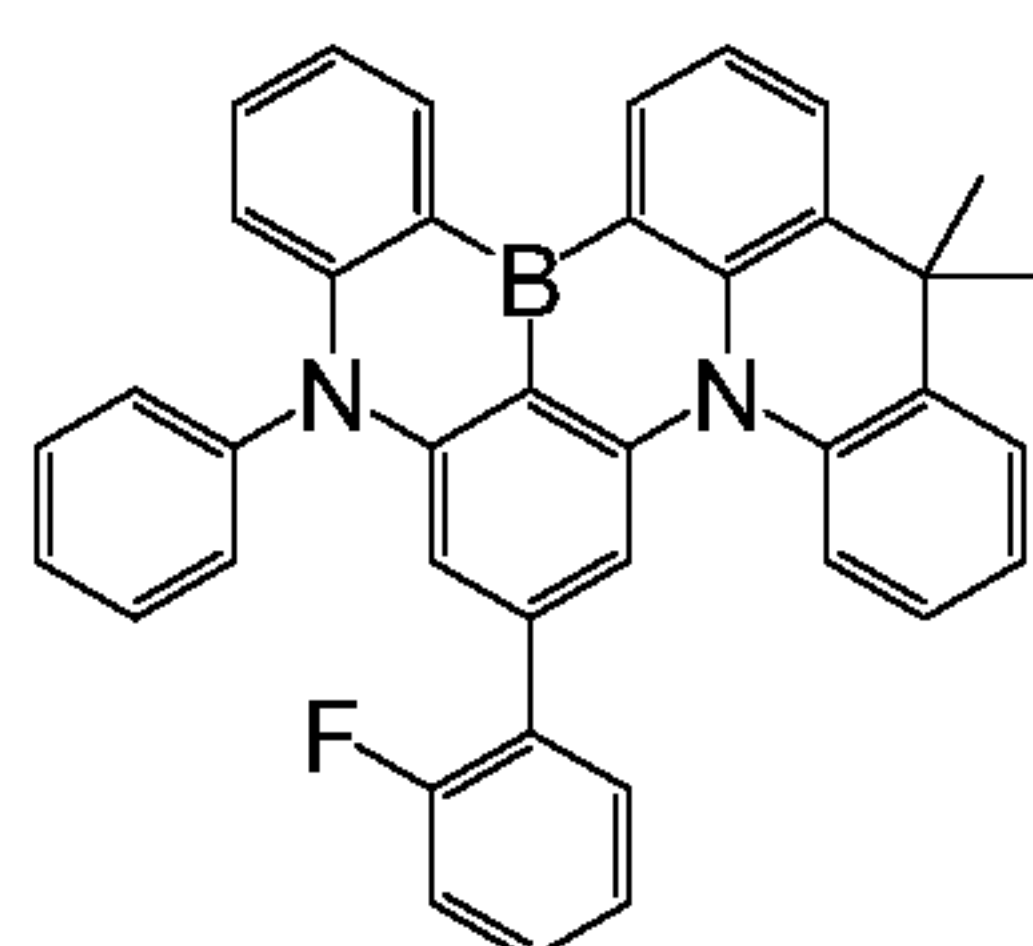
C-7



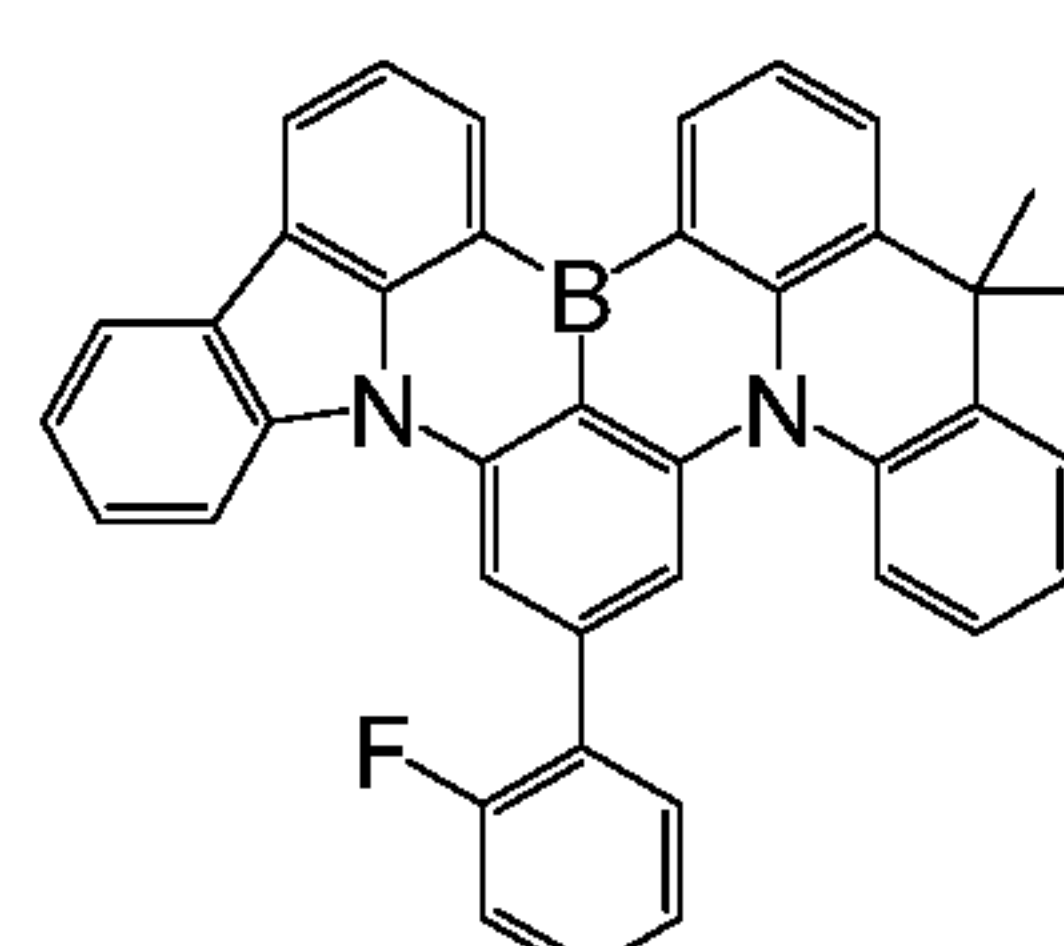
C-8



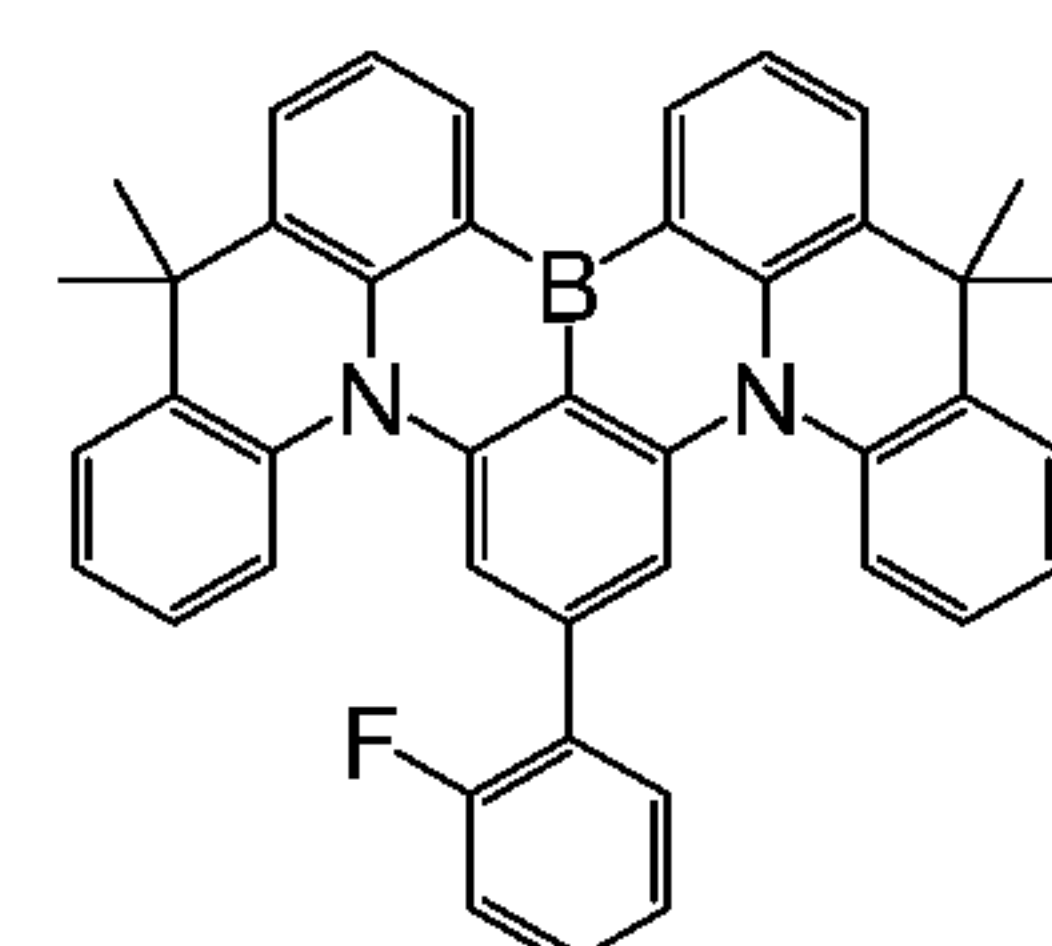
C-9



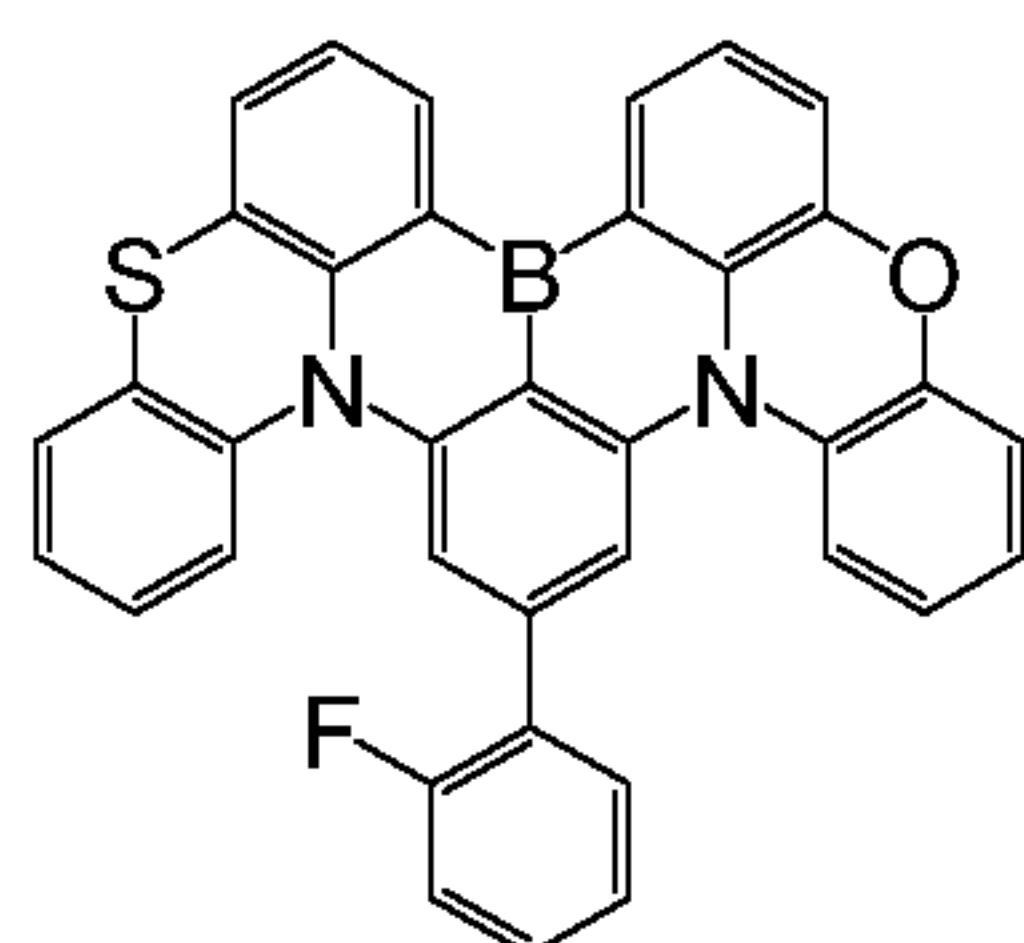
C-10



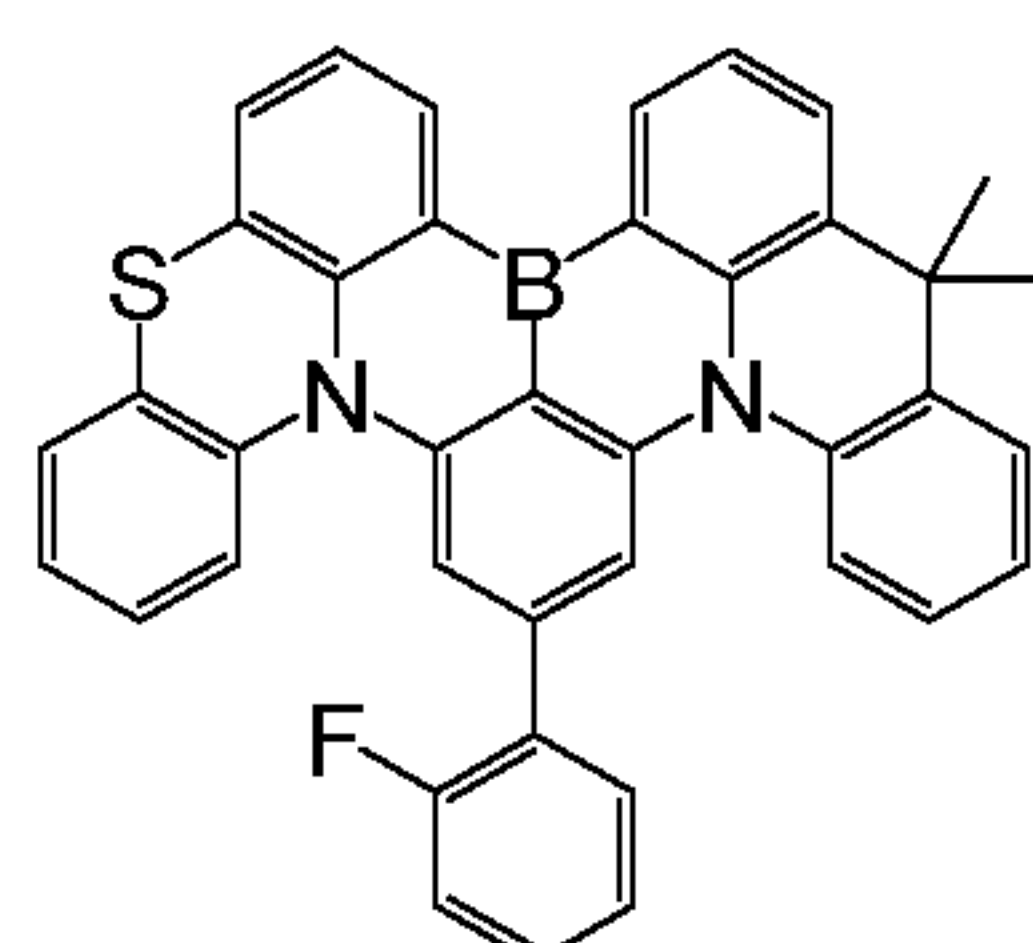
C-11



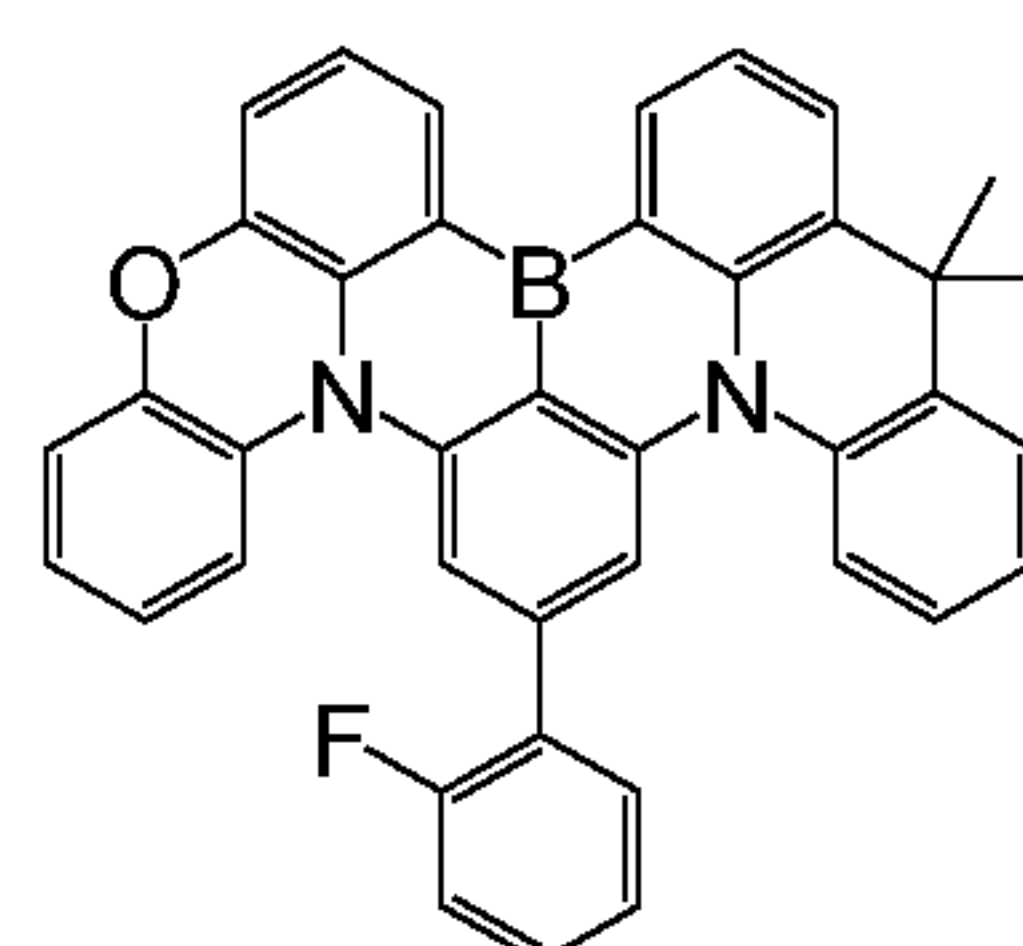
C-12



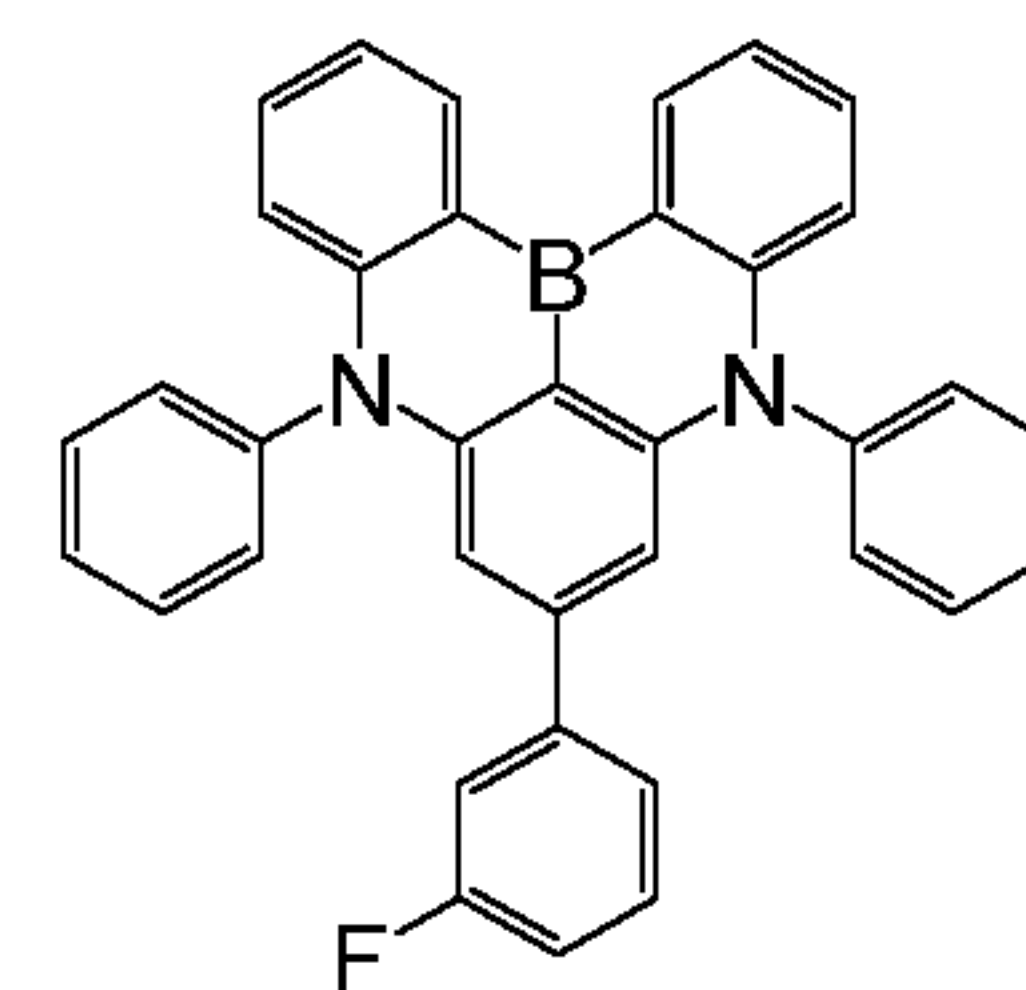
C-13



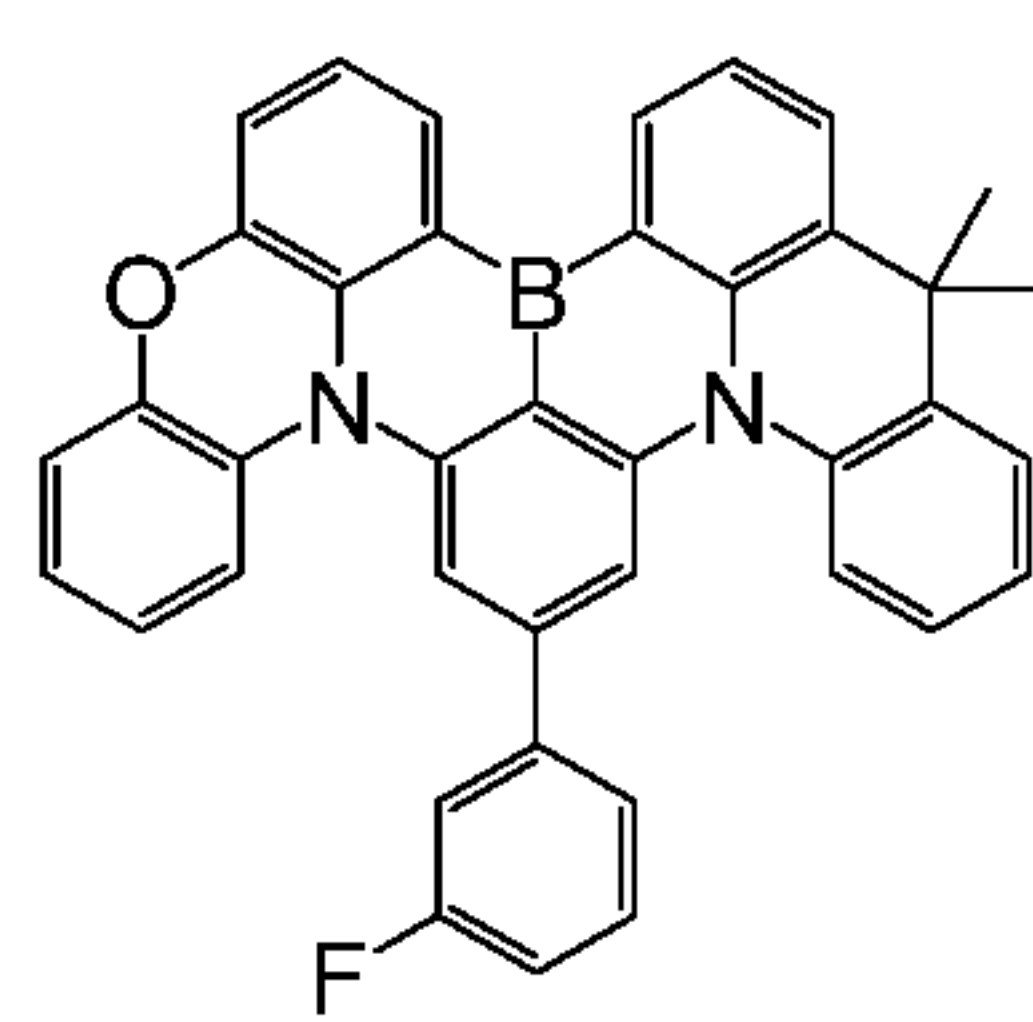
C-14



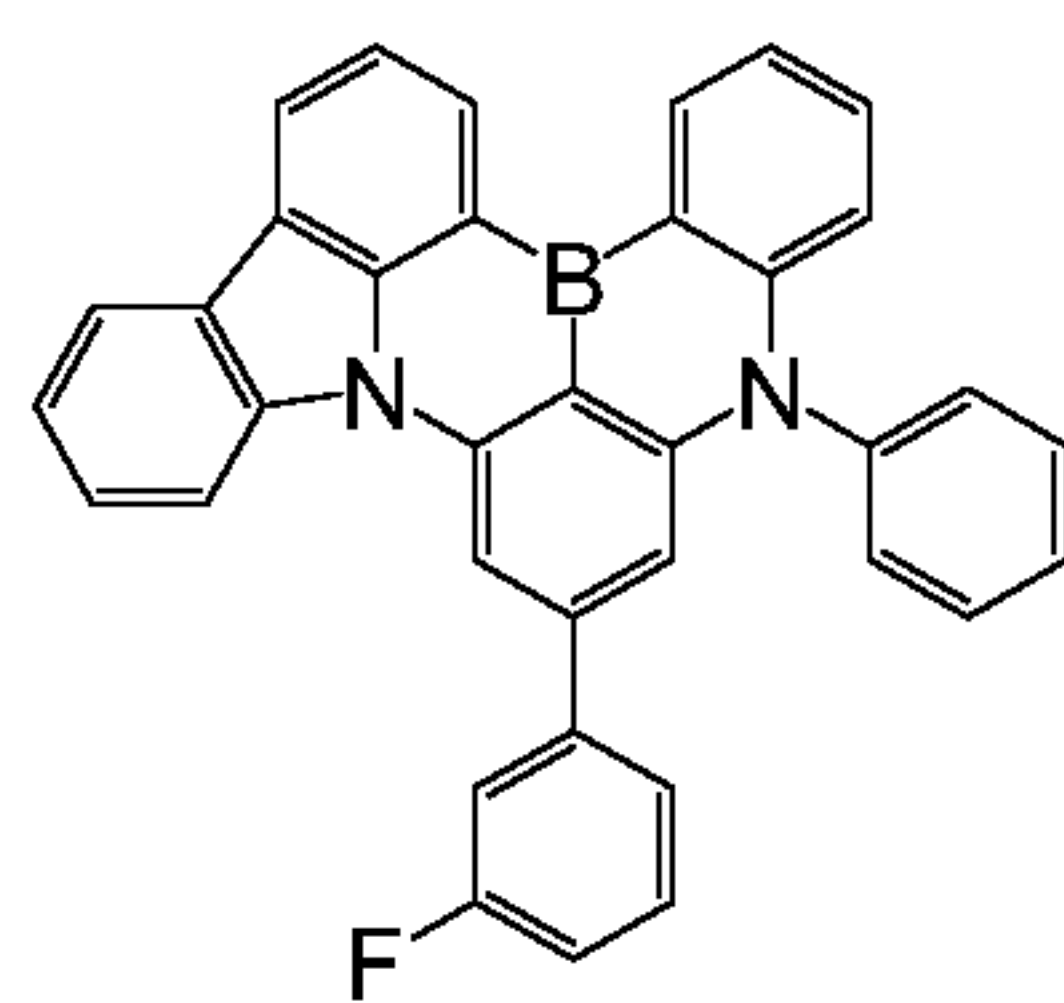
C-15



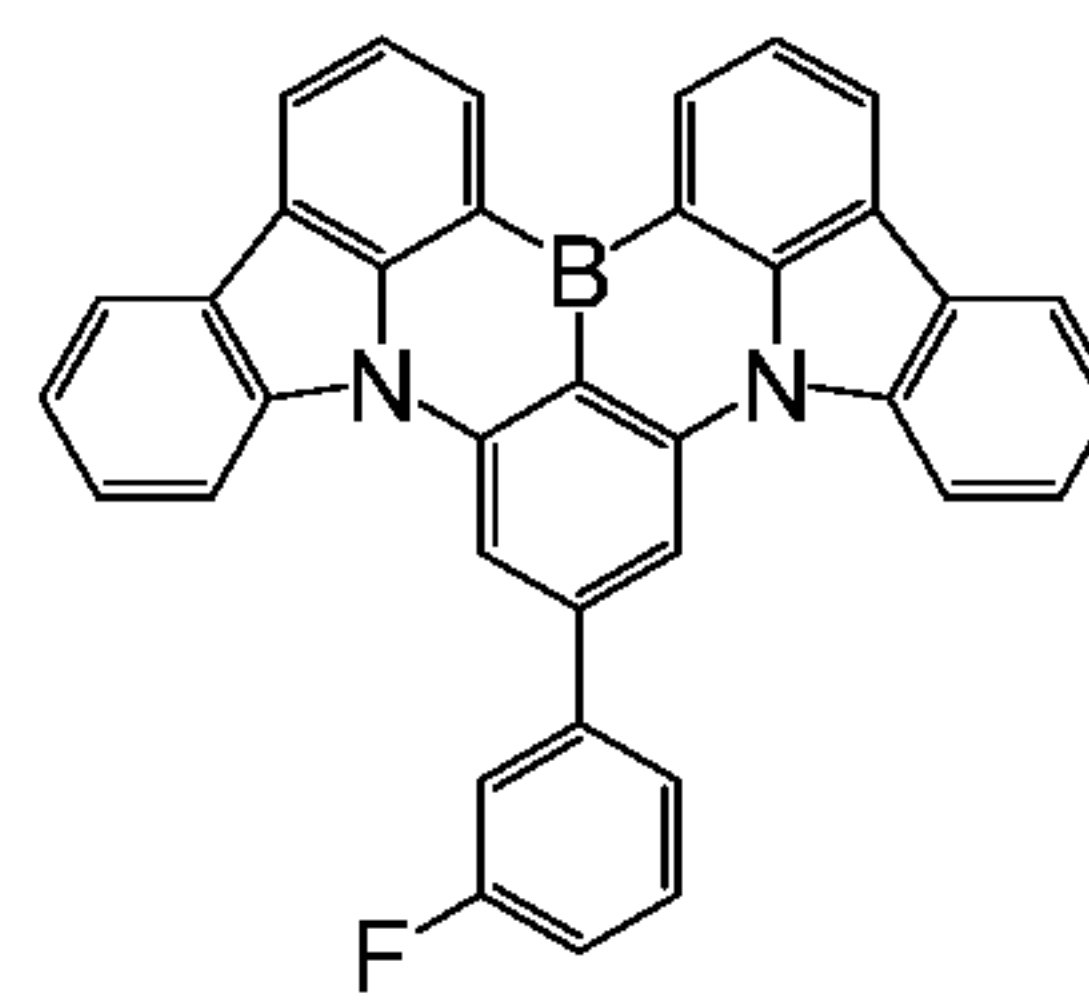
C-16



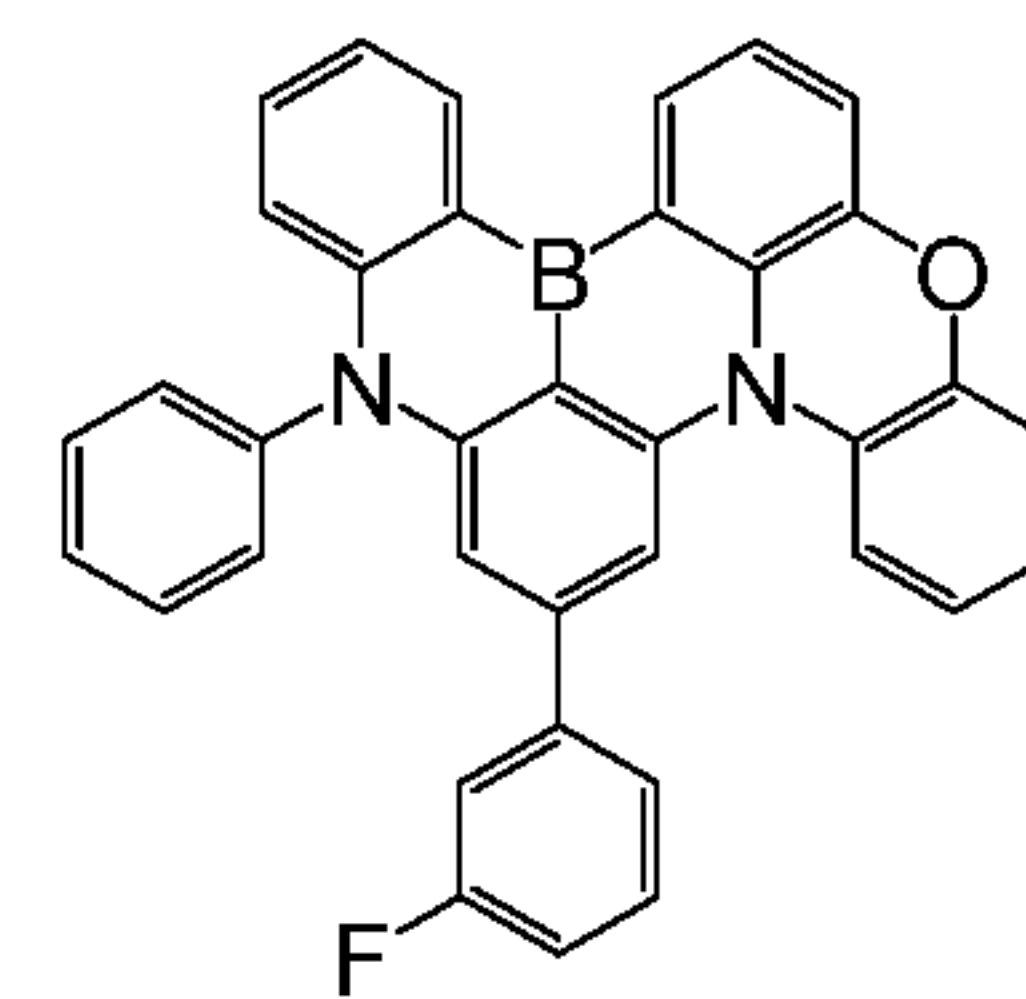
C-17



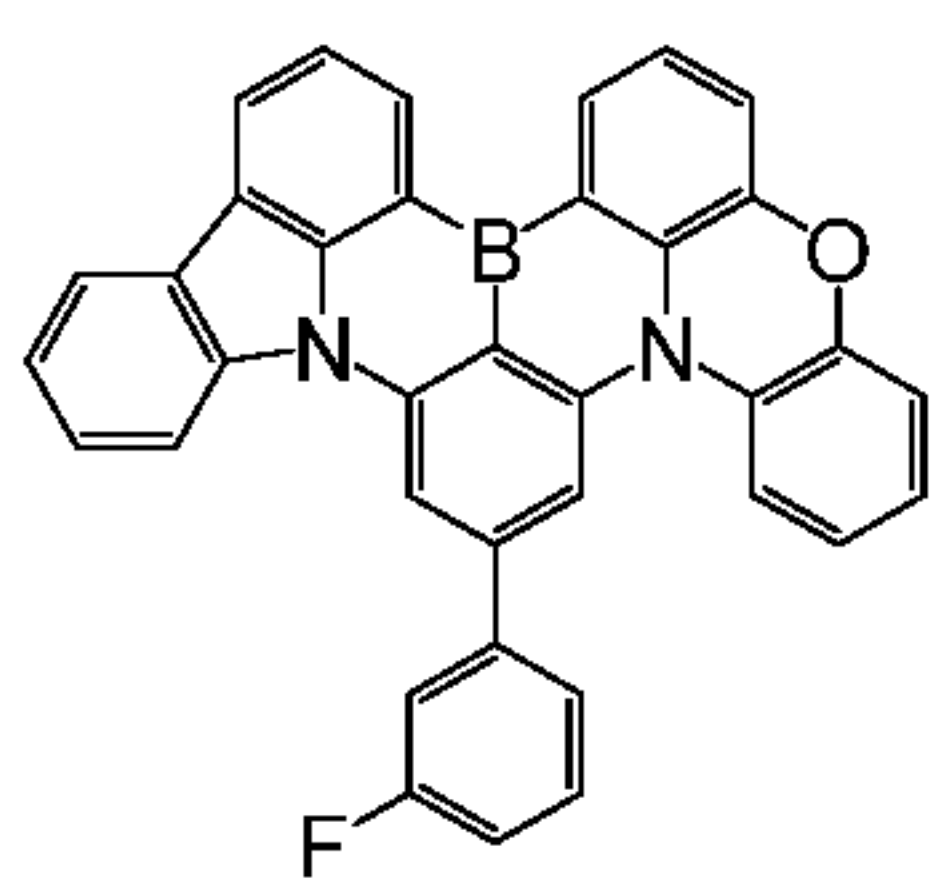
C-18



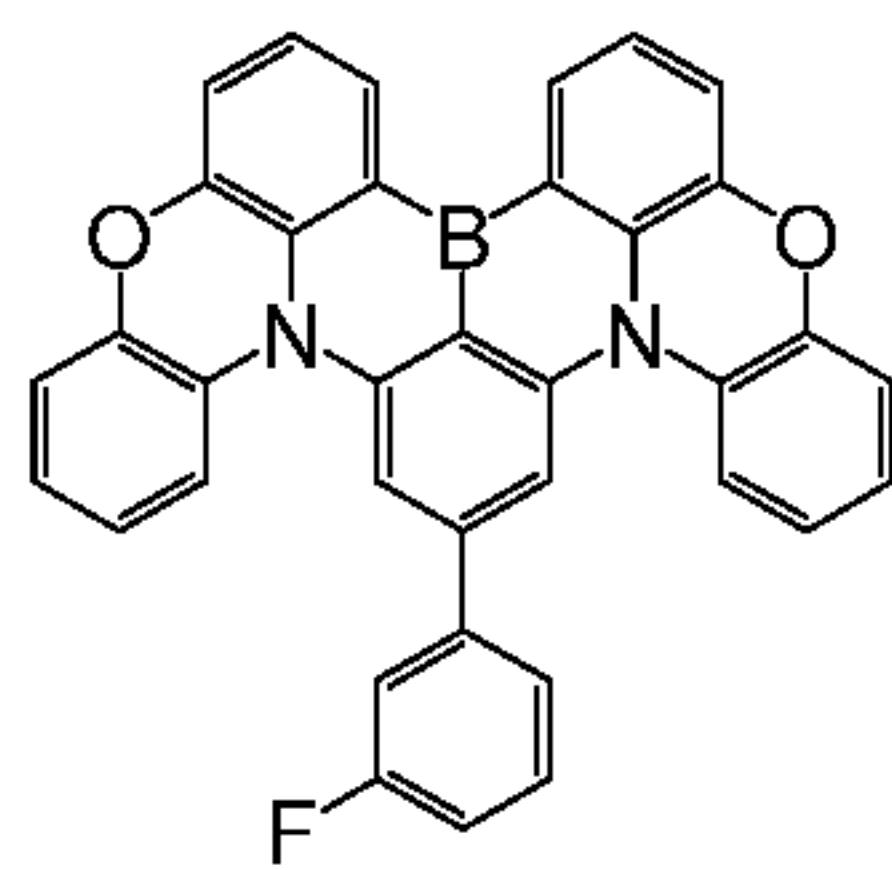
C-19



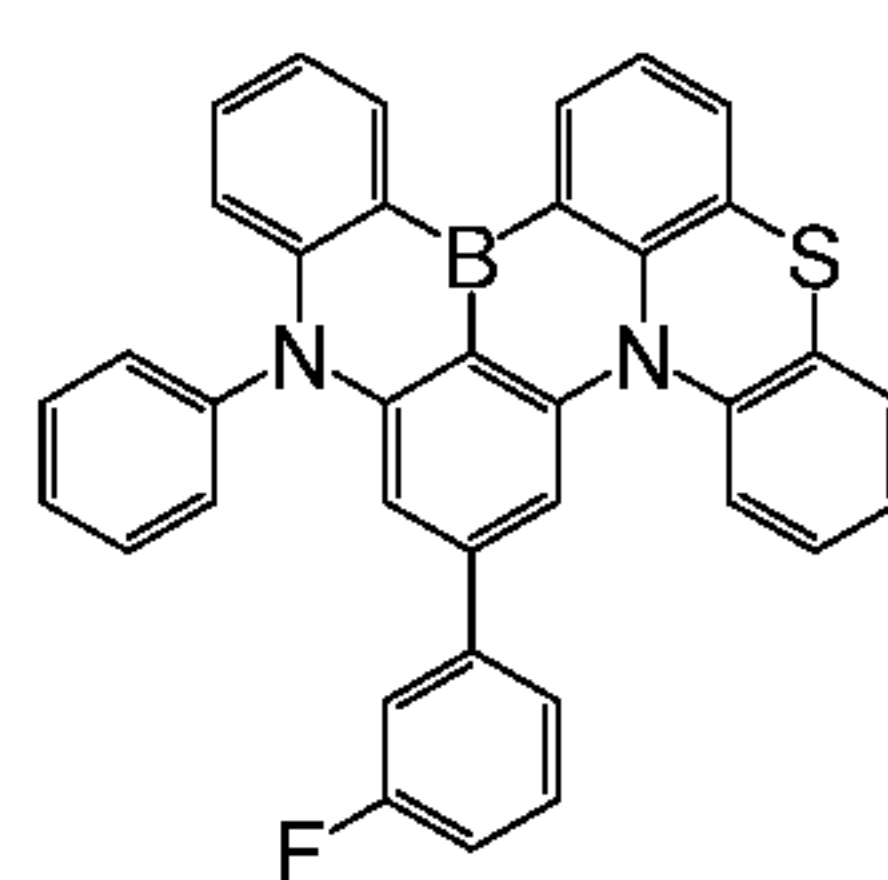
C-20



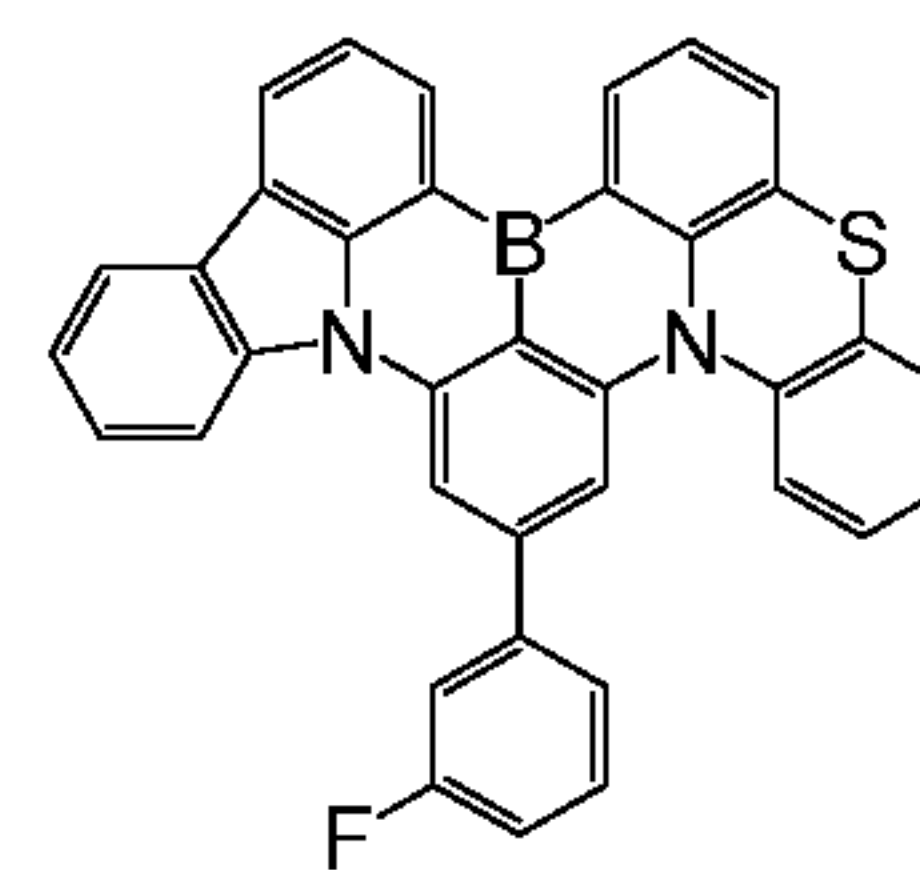
C-21



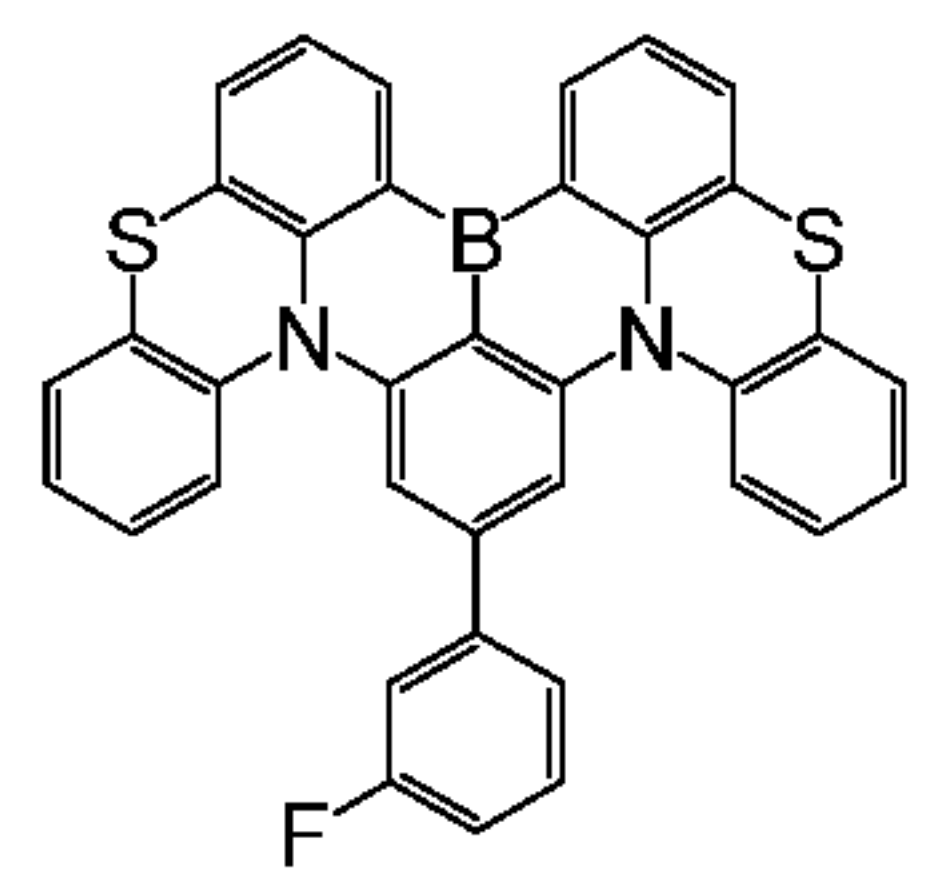
C-22



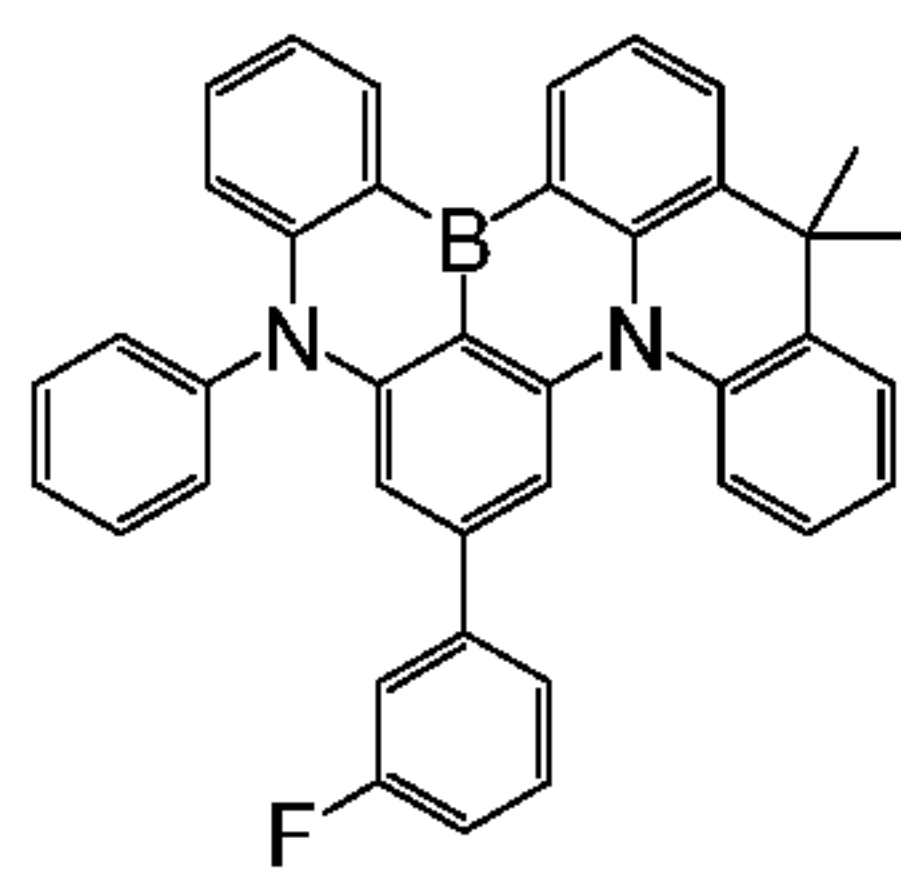
C-23



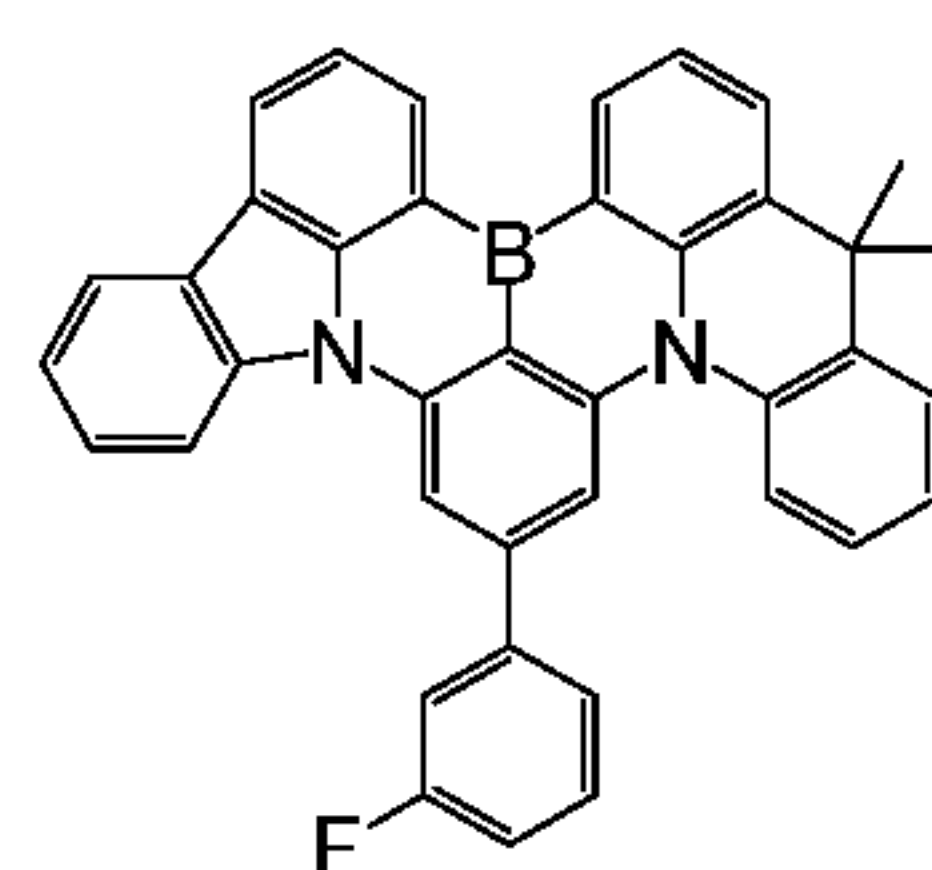
C-24



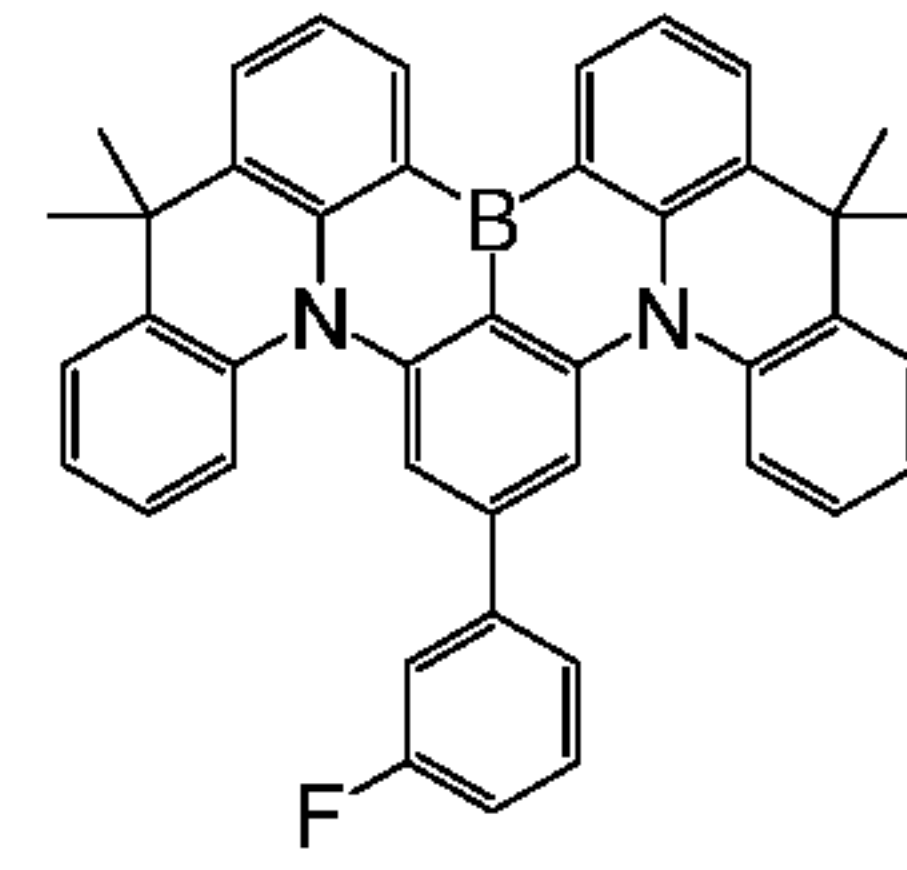
C-25



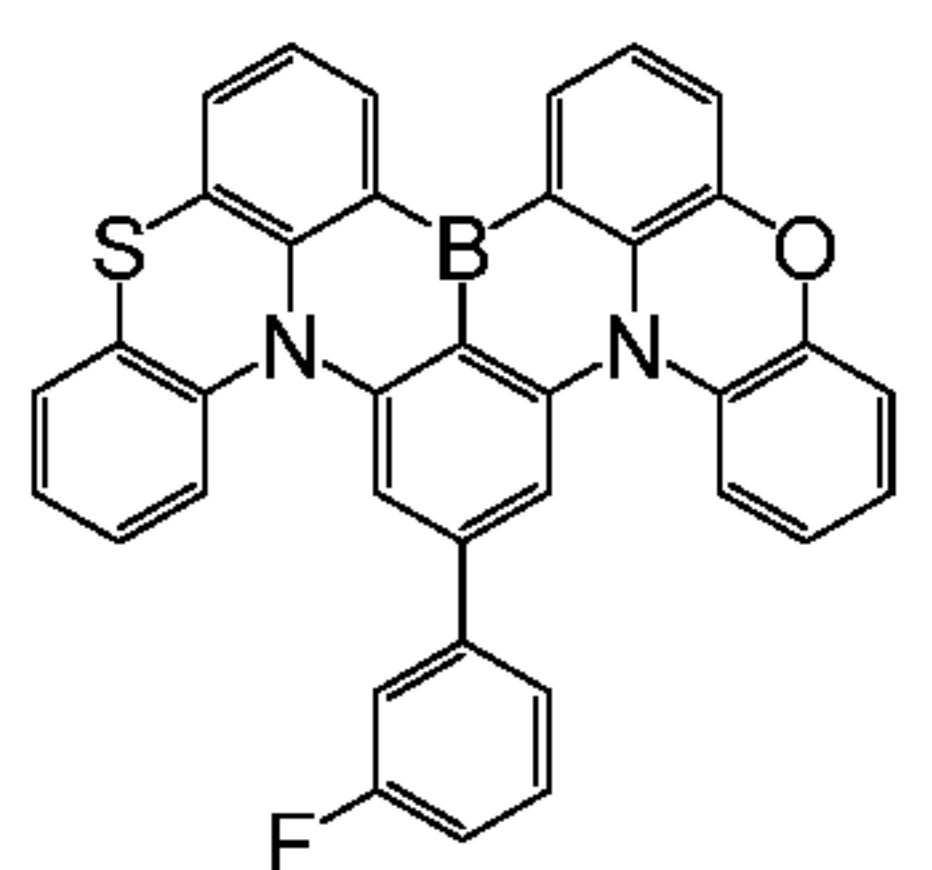
C-26



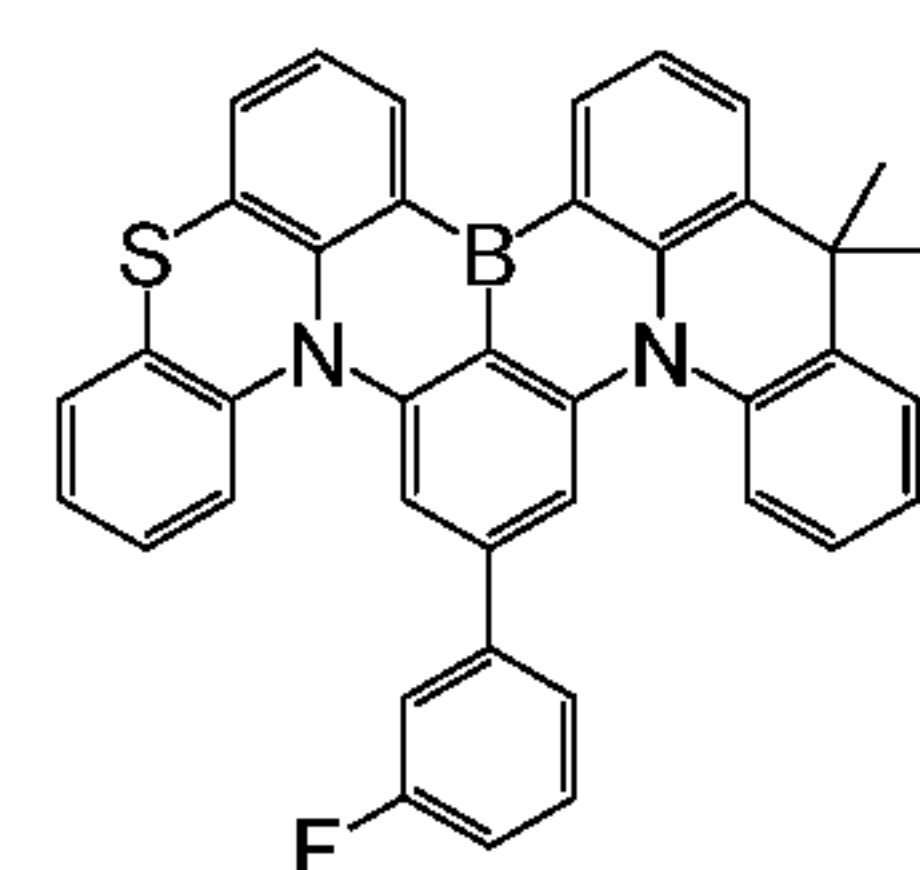
C-27



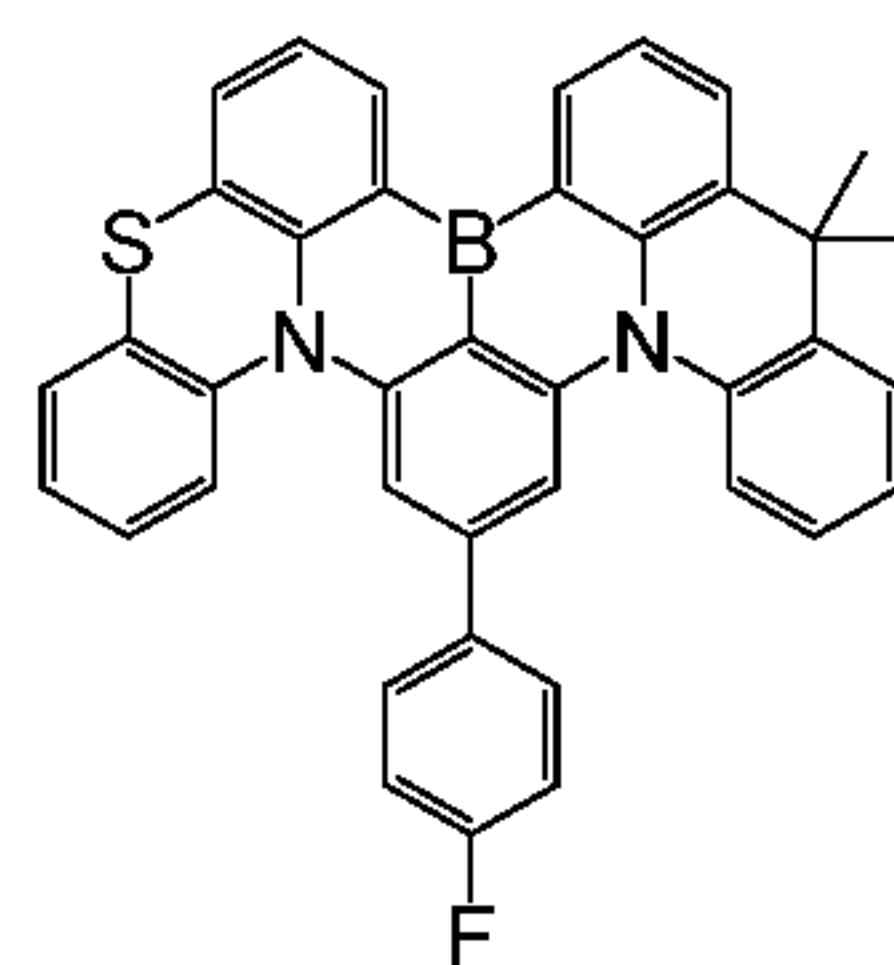
C-28



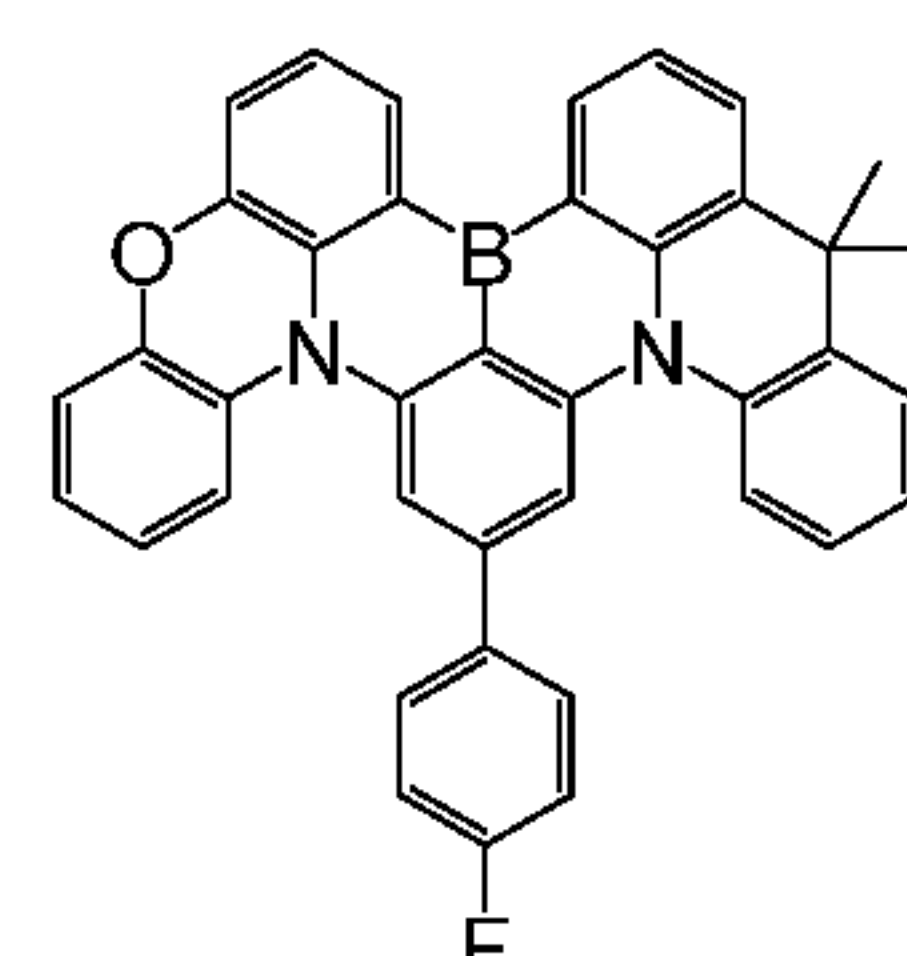
C-29



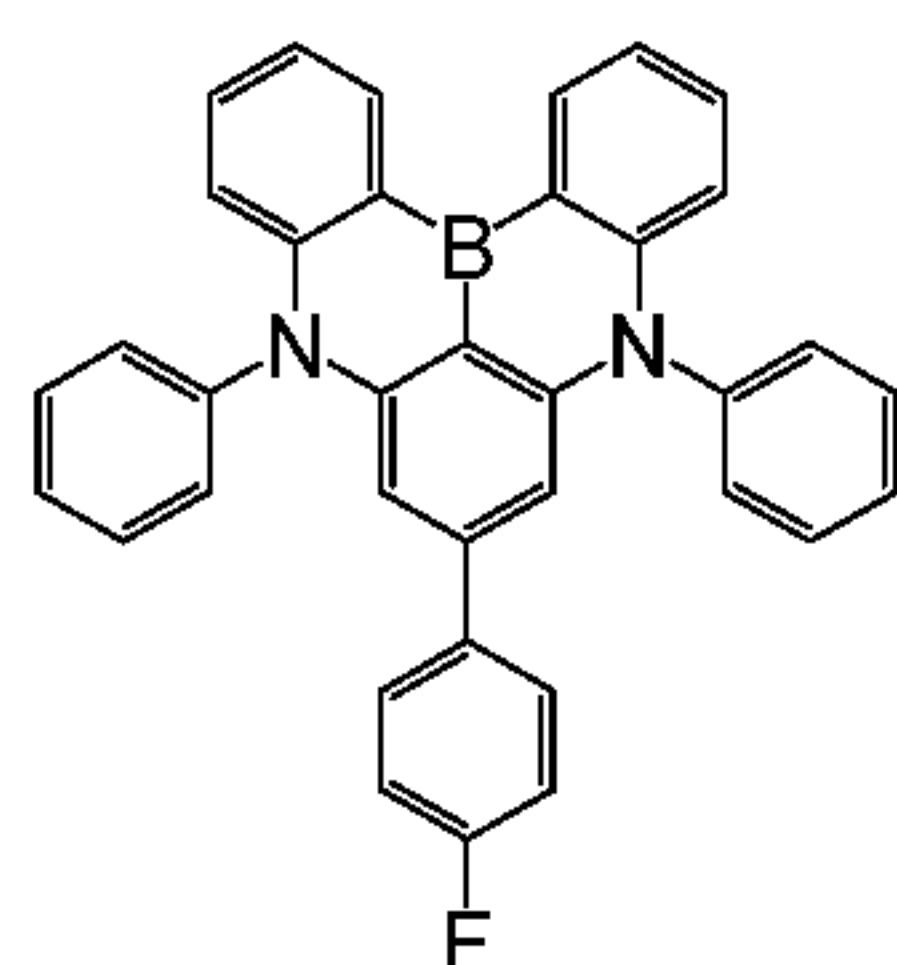
C-30



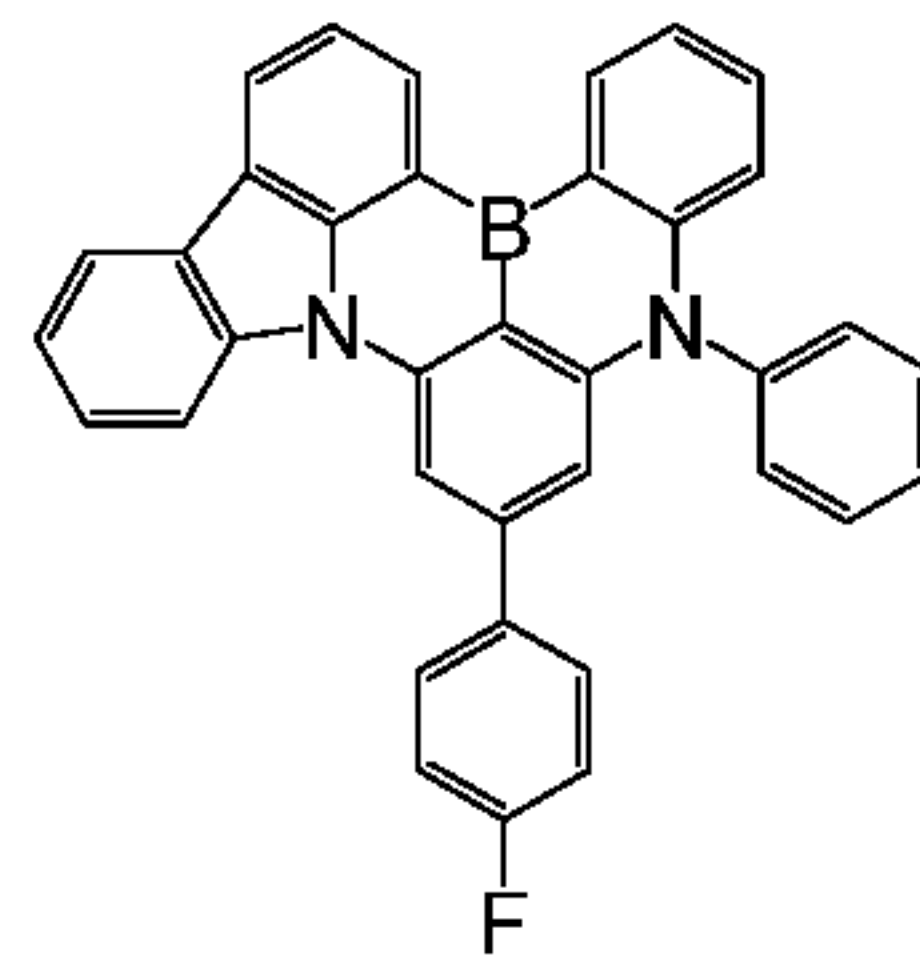
C-31



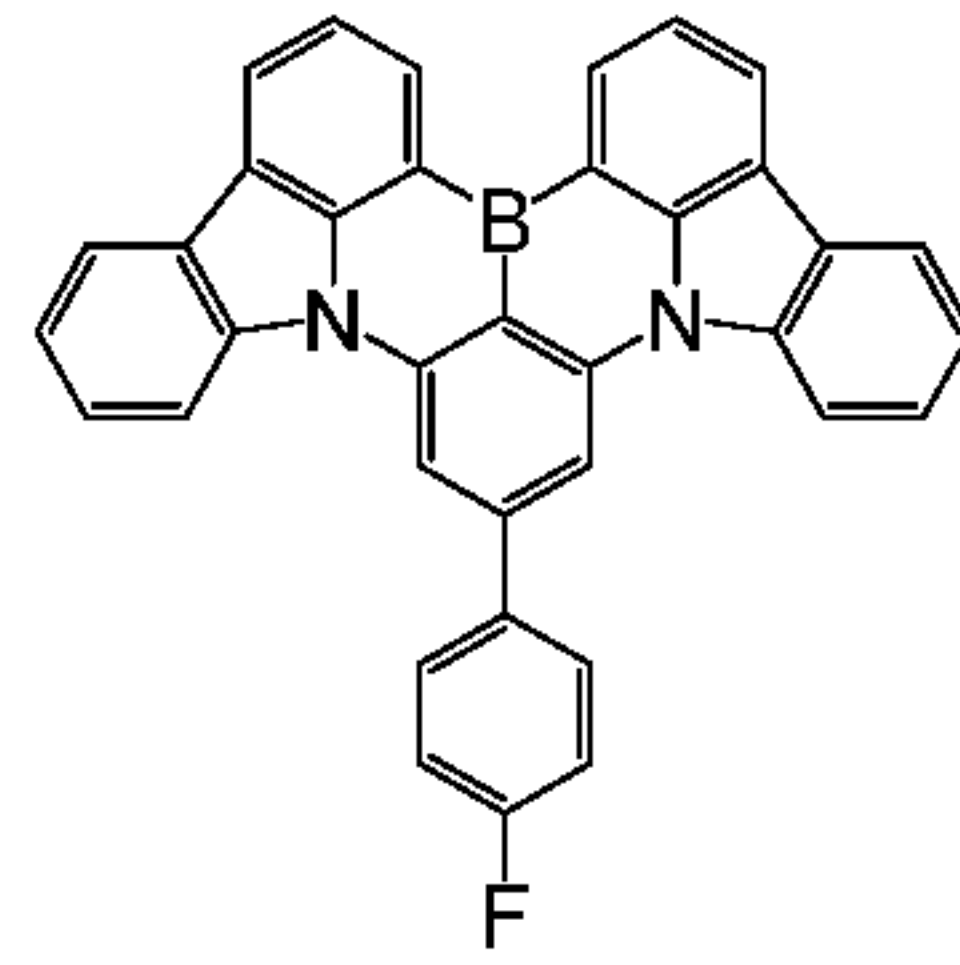
C-32



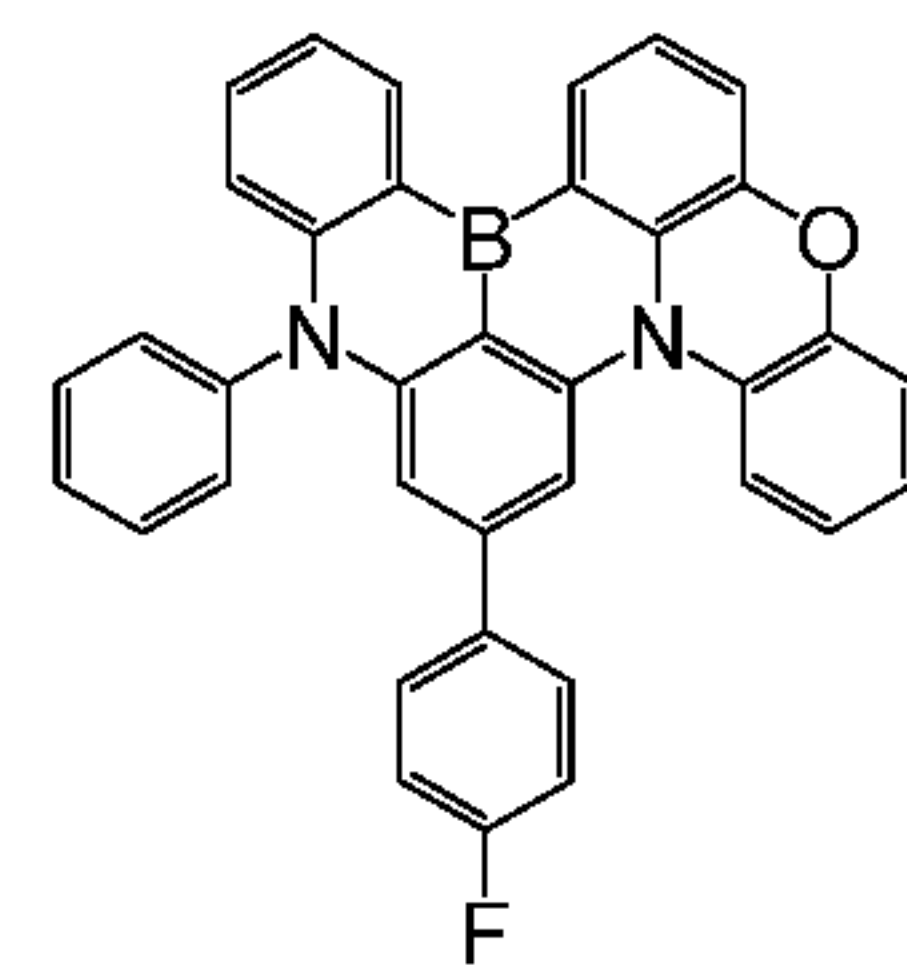
C-33



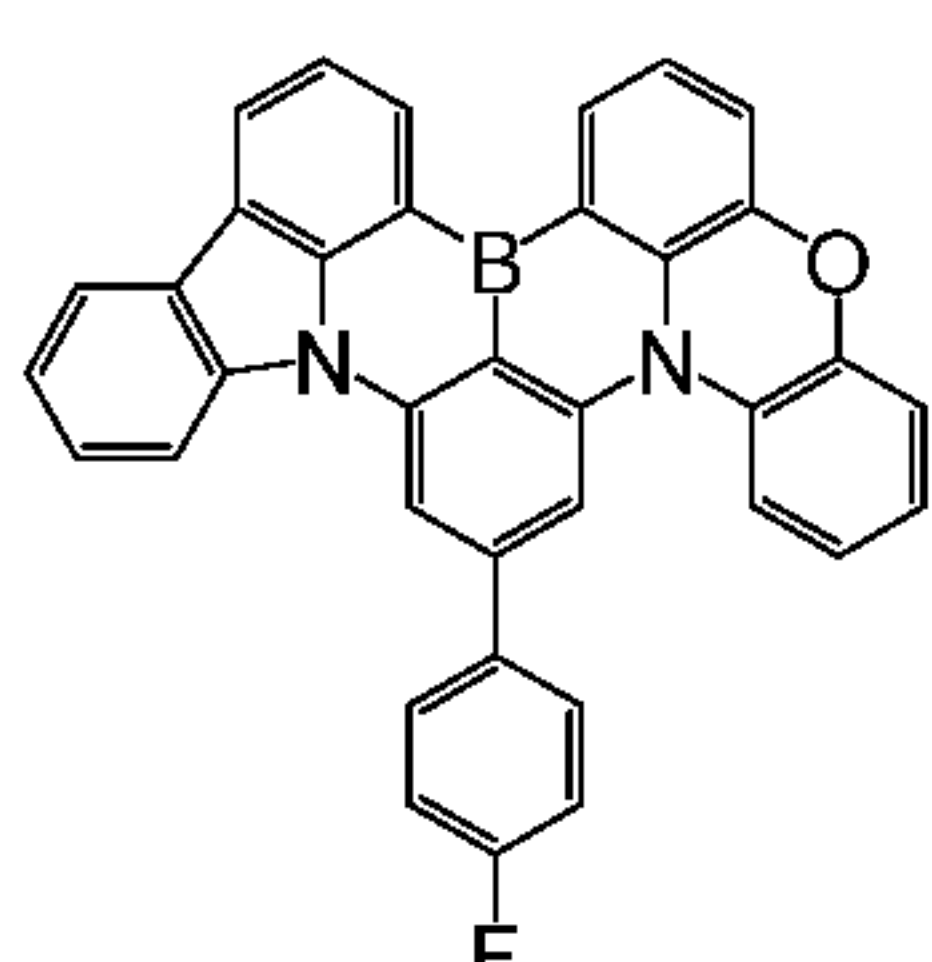
C-34



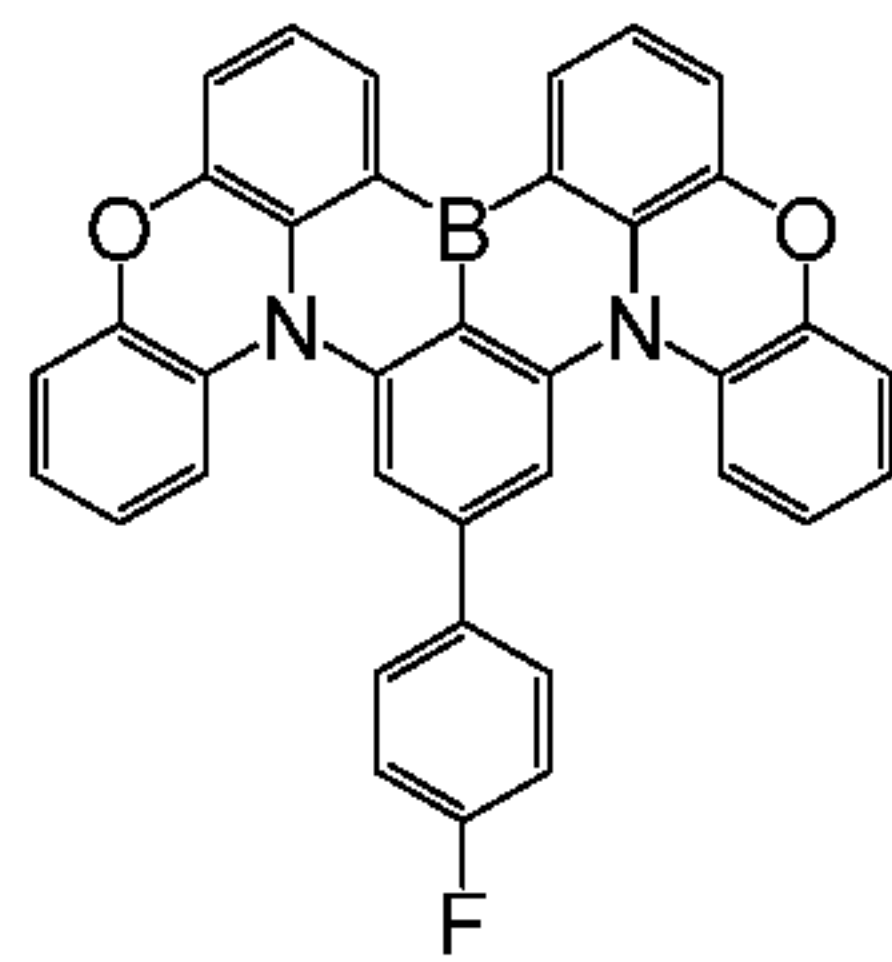
C-35



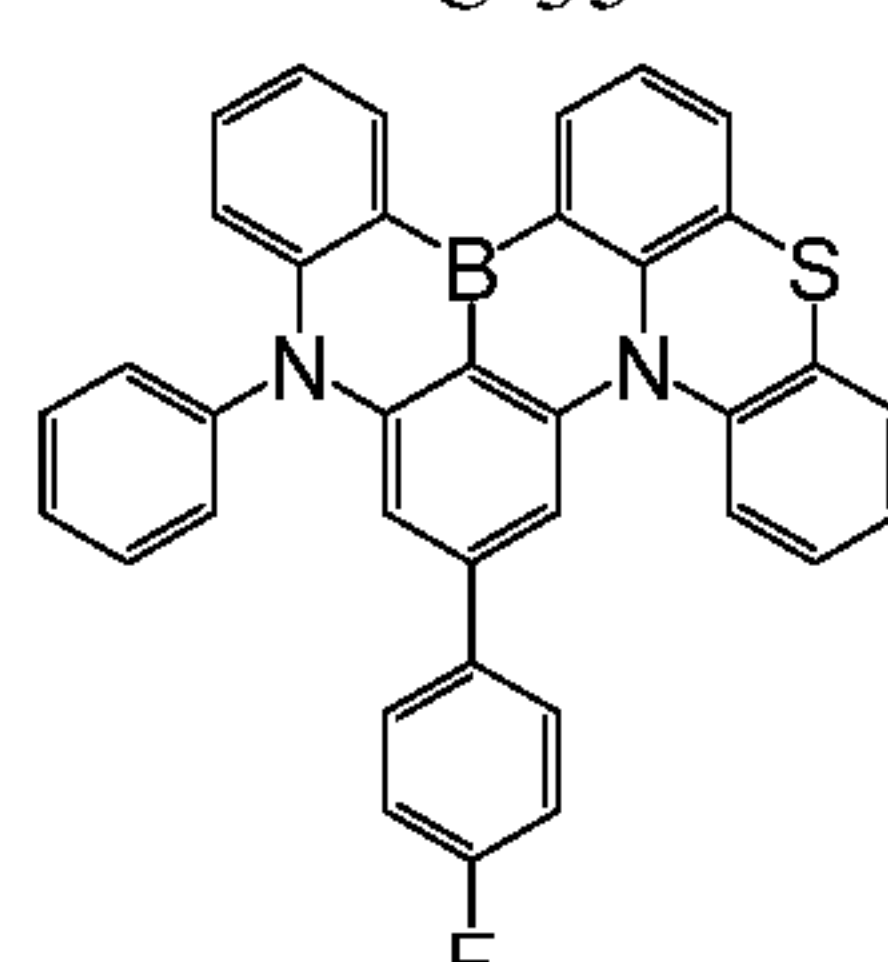
C-36



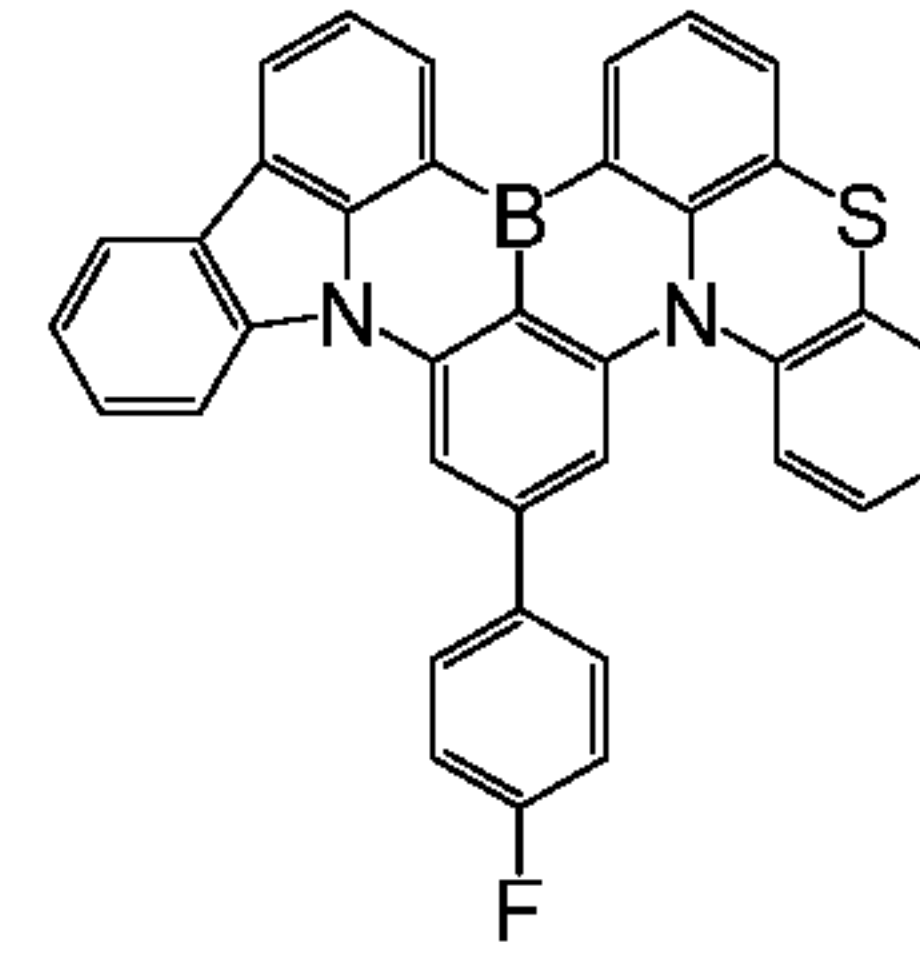
C-37



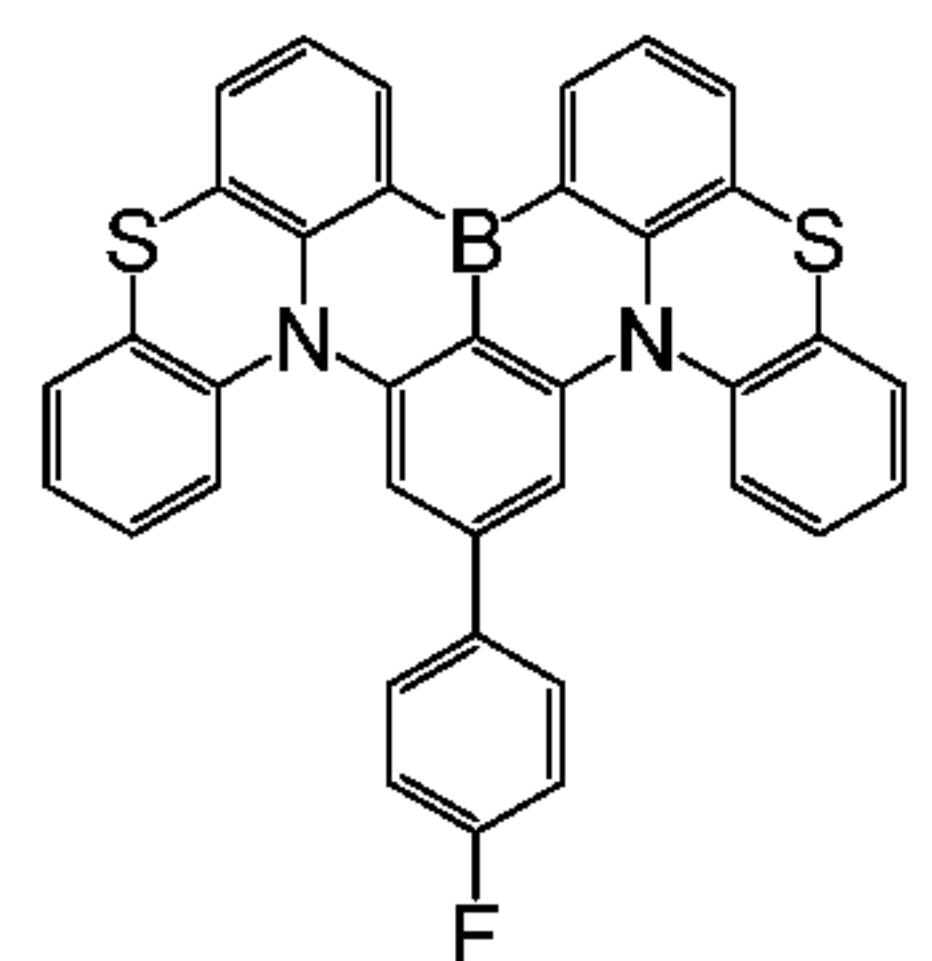
C-38



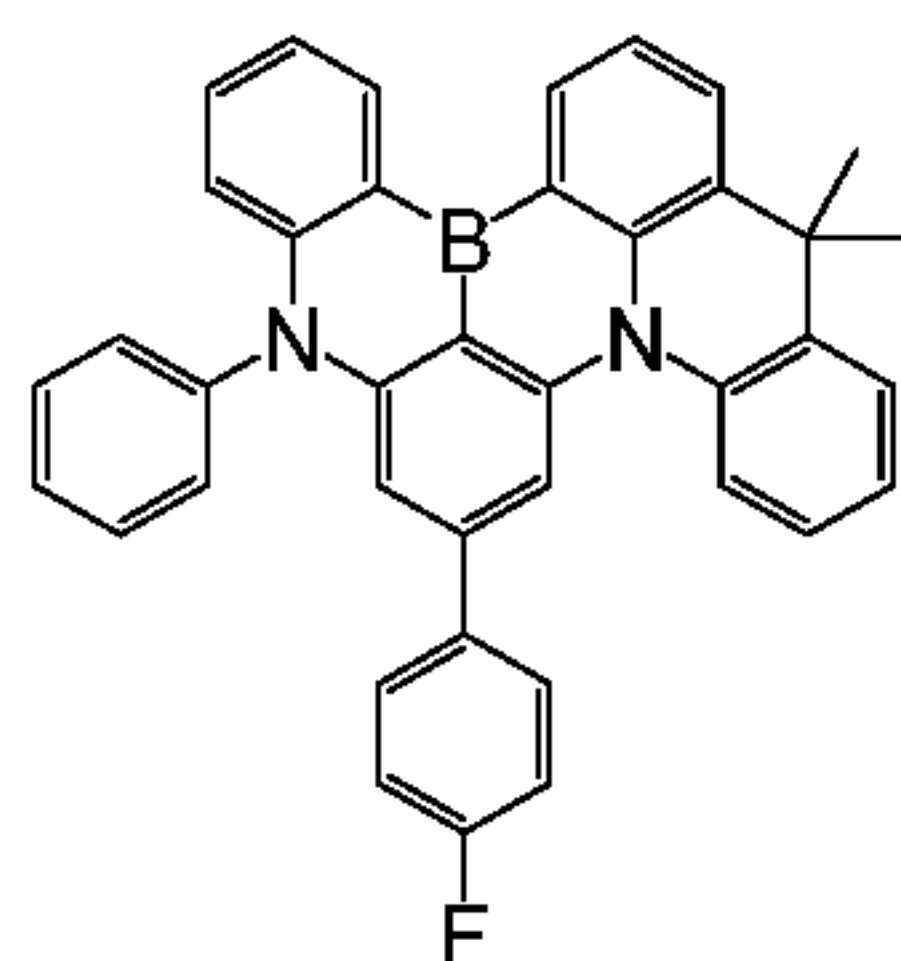
C-39



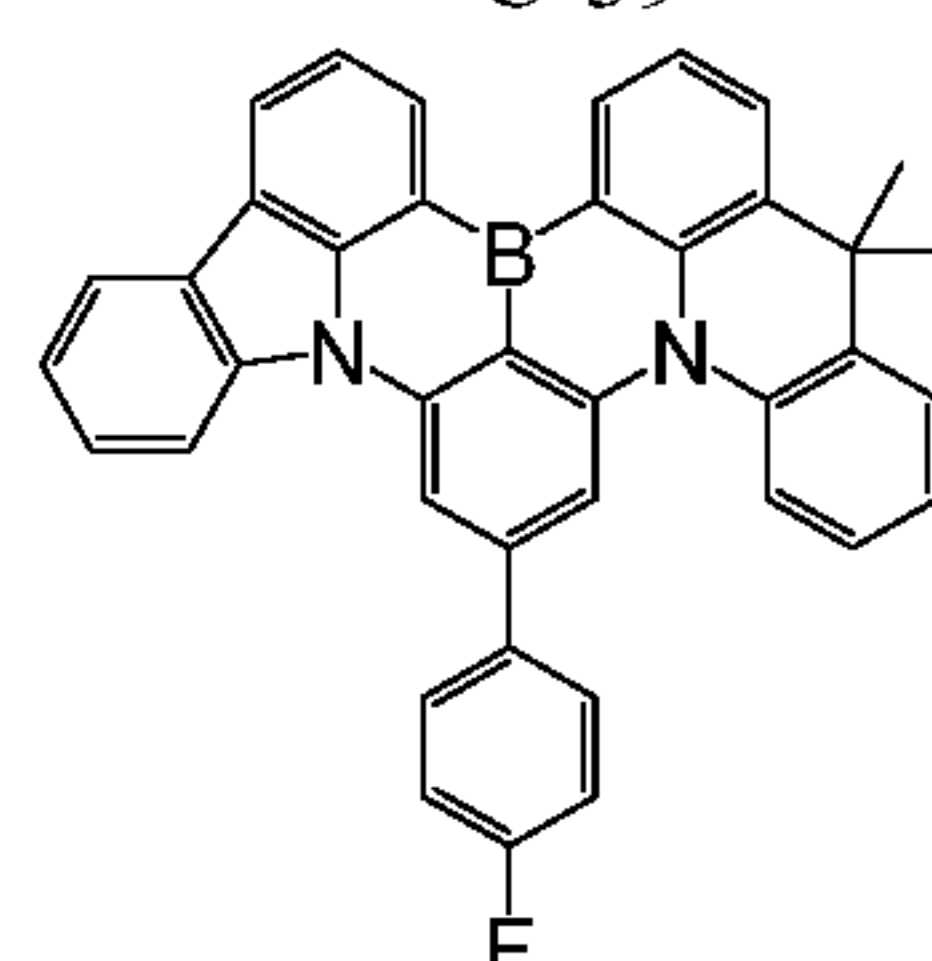
C-40



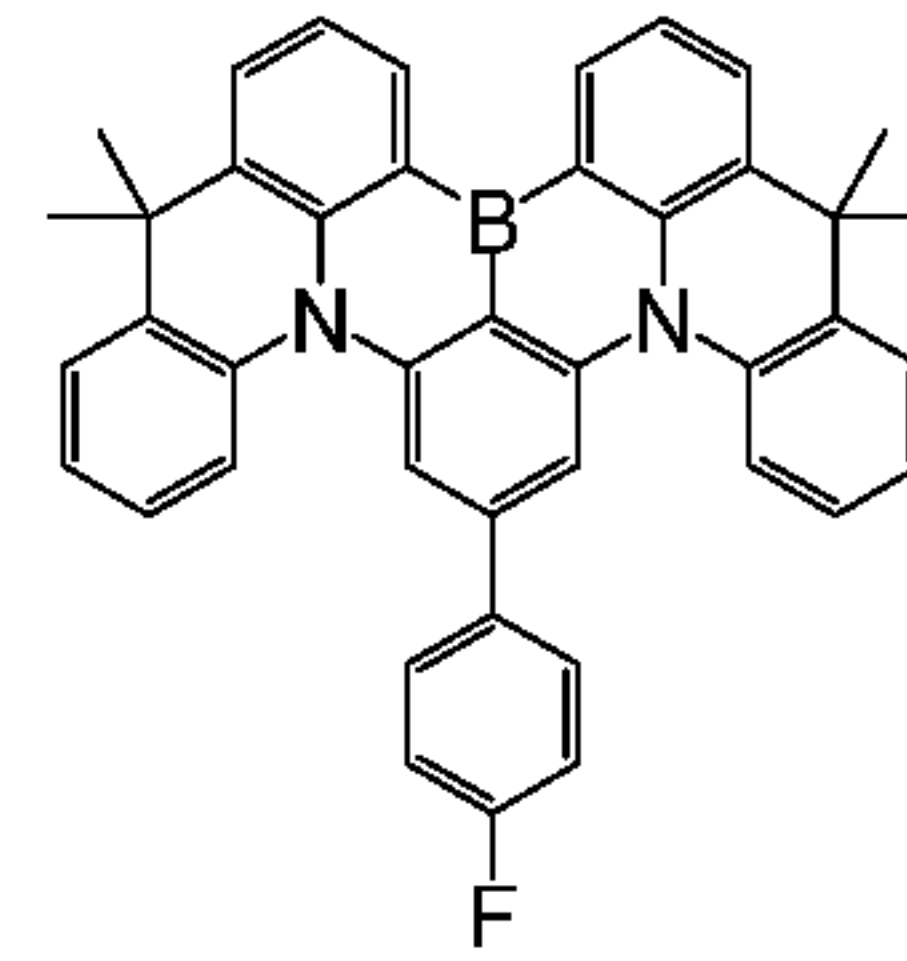
C-41



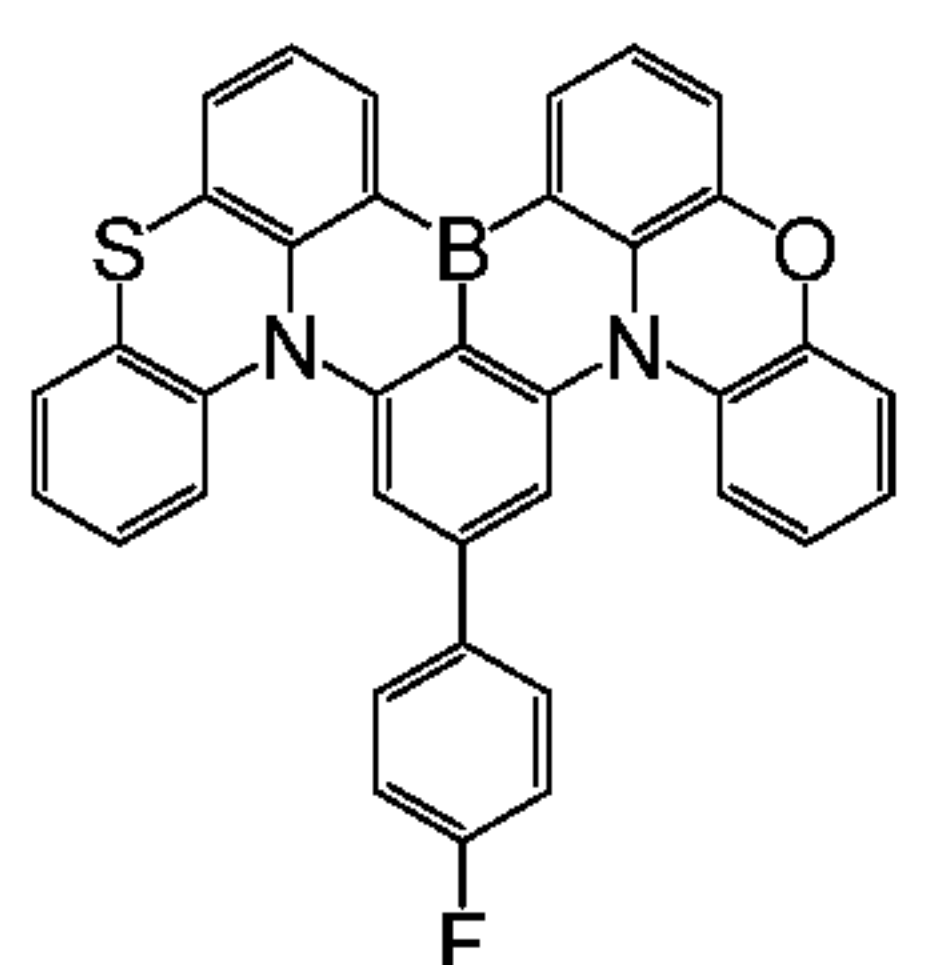
C-42



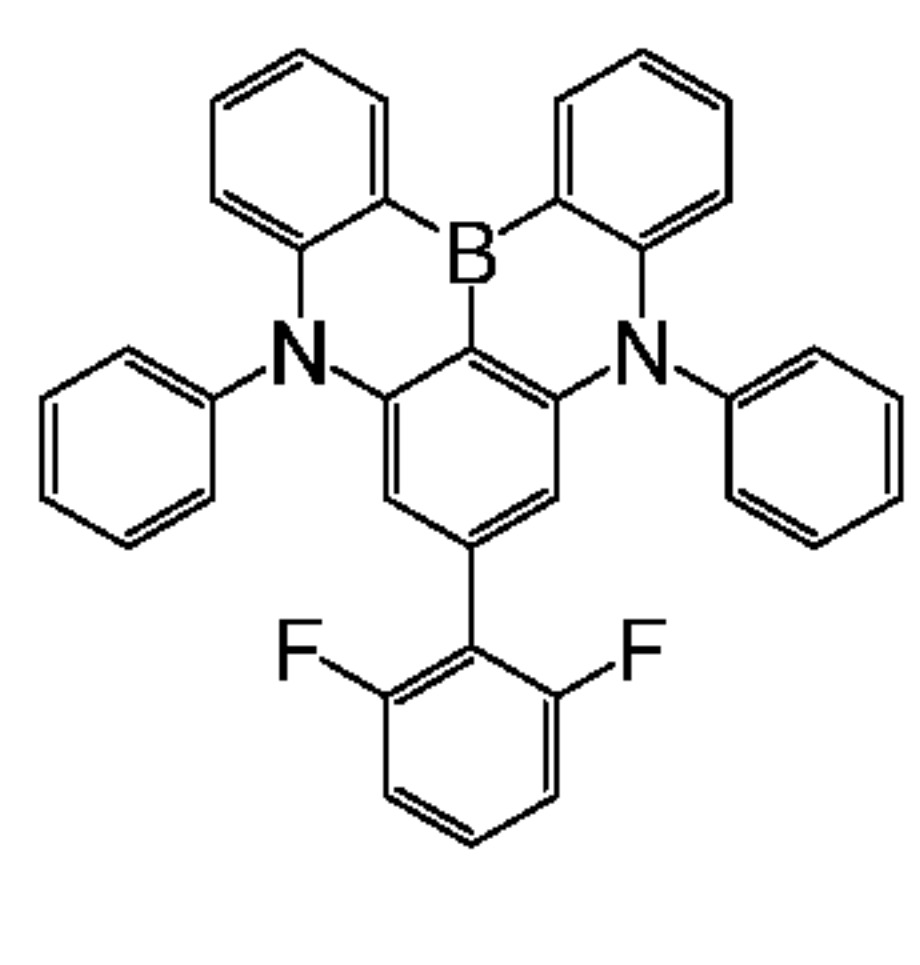
C-43



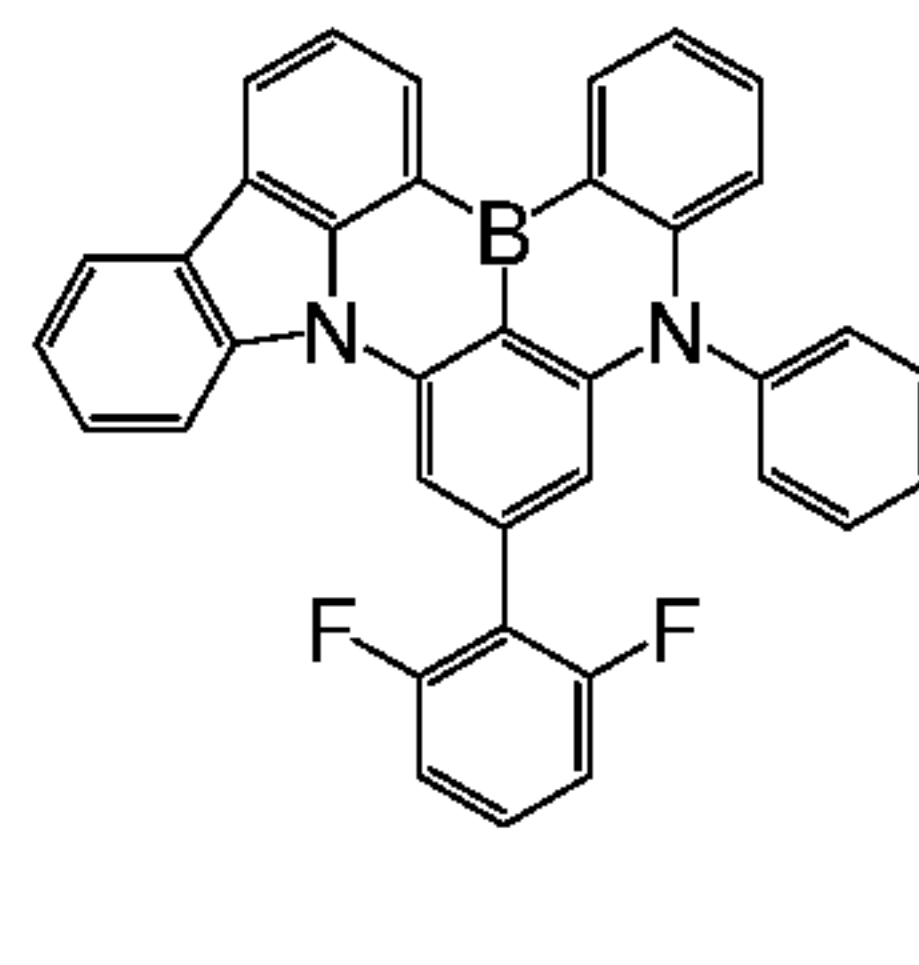
C-44



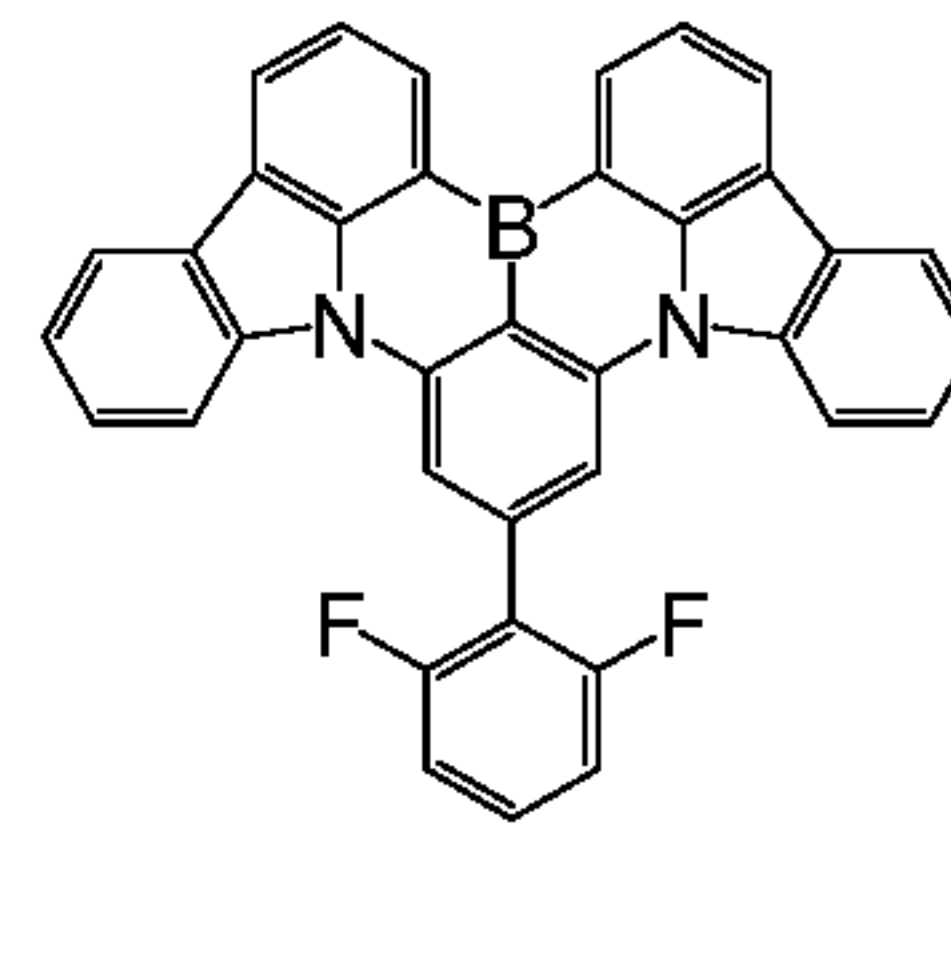
C-45



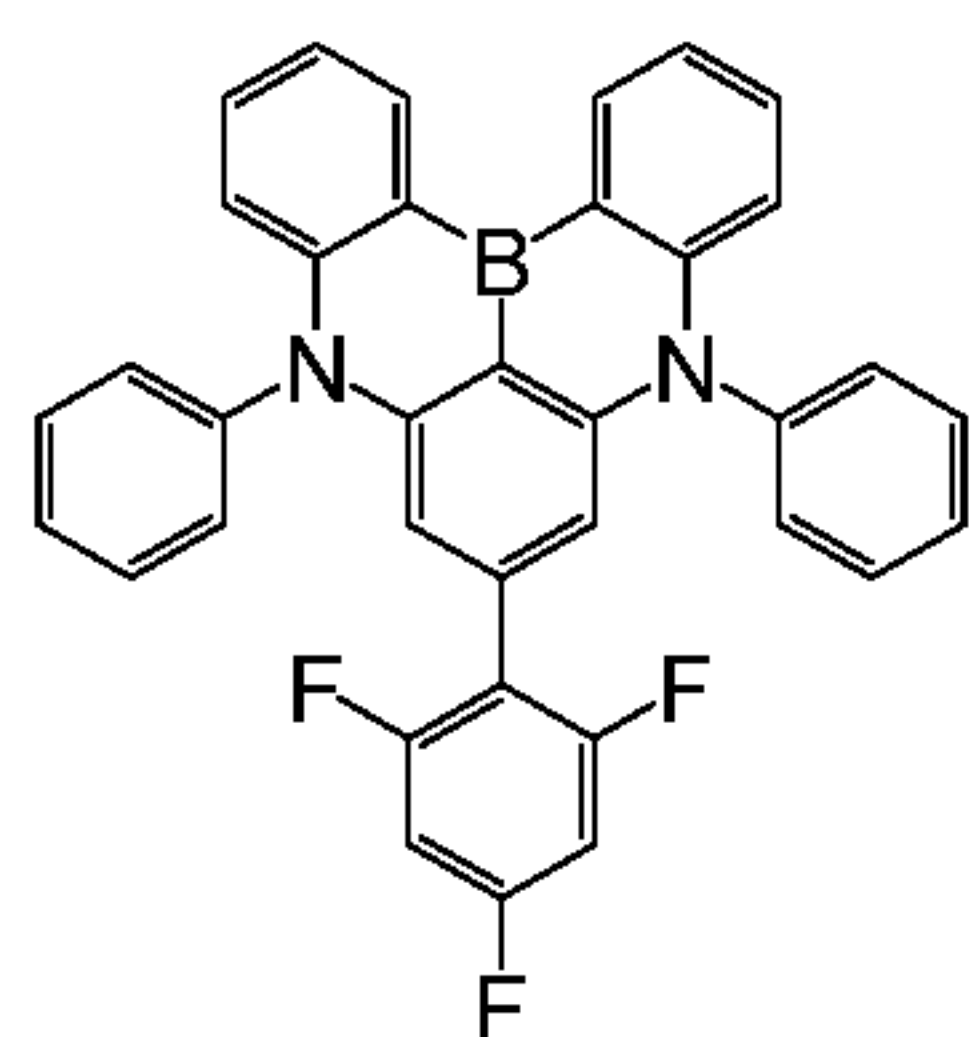
C-46



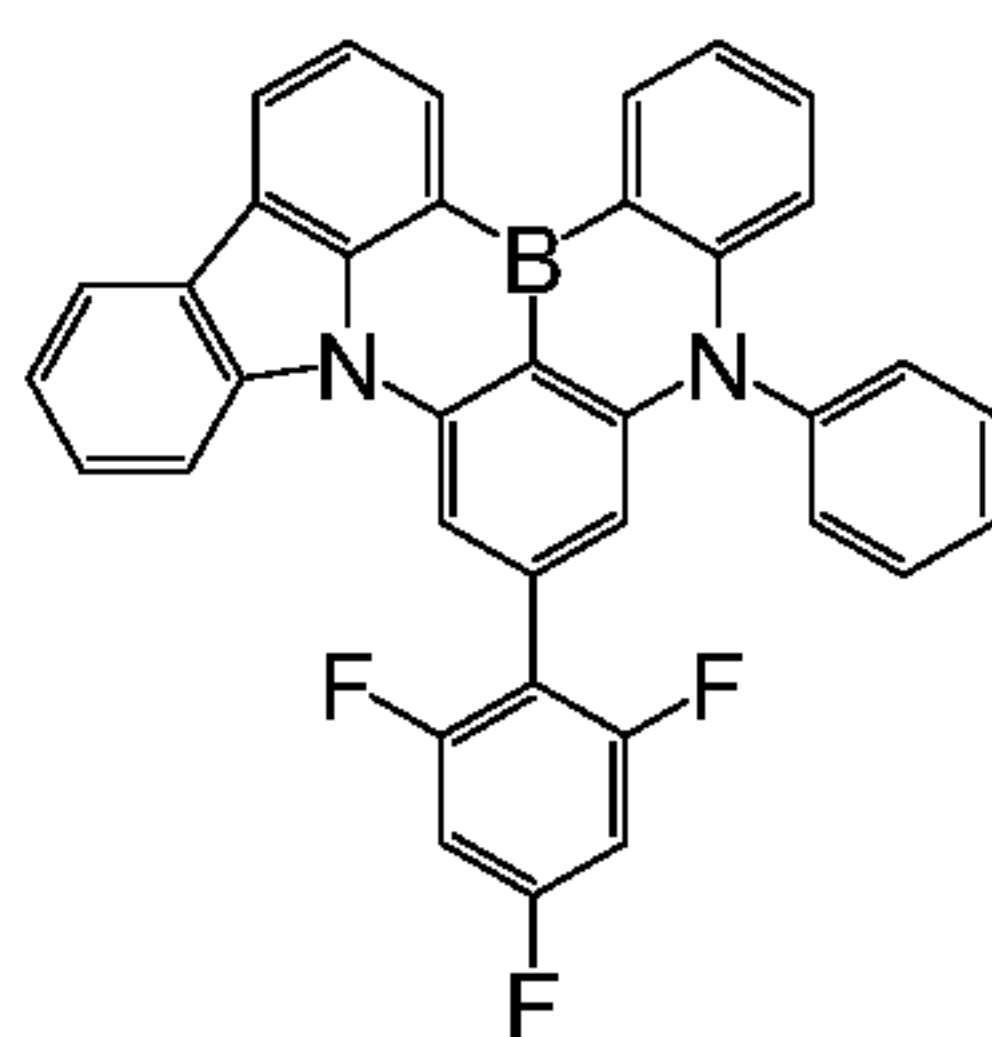
C-47



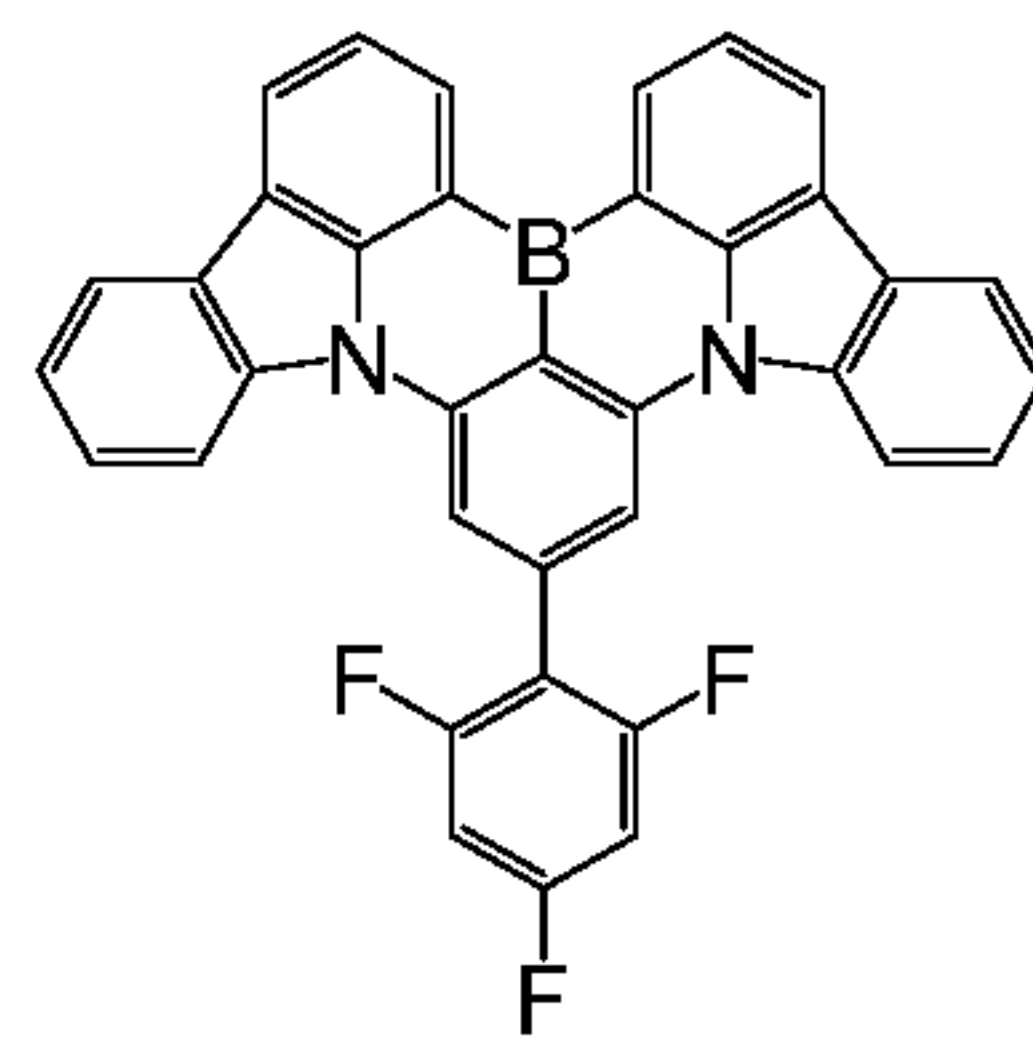
C-48



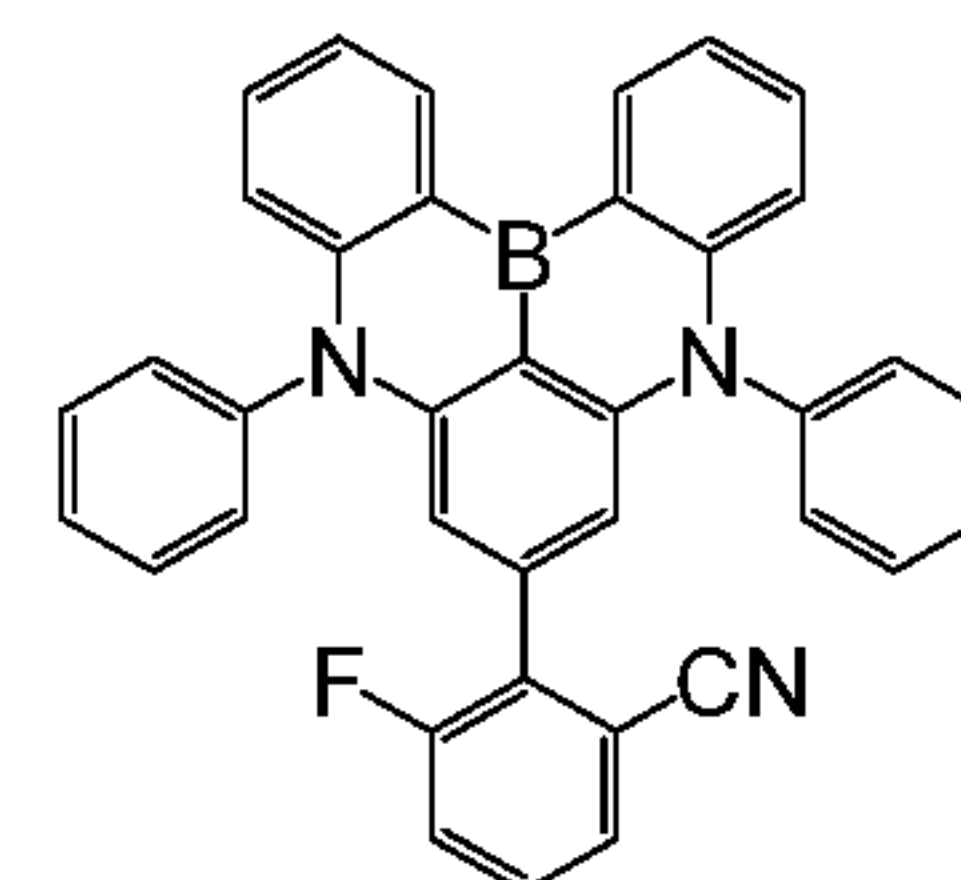
C-49



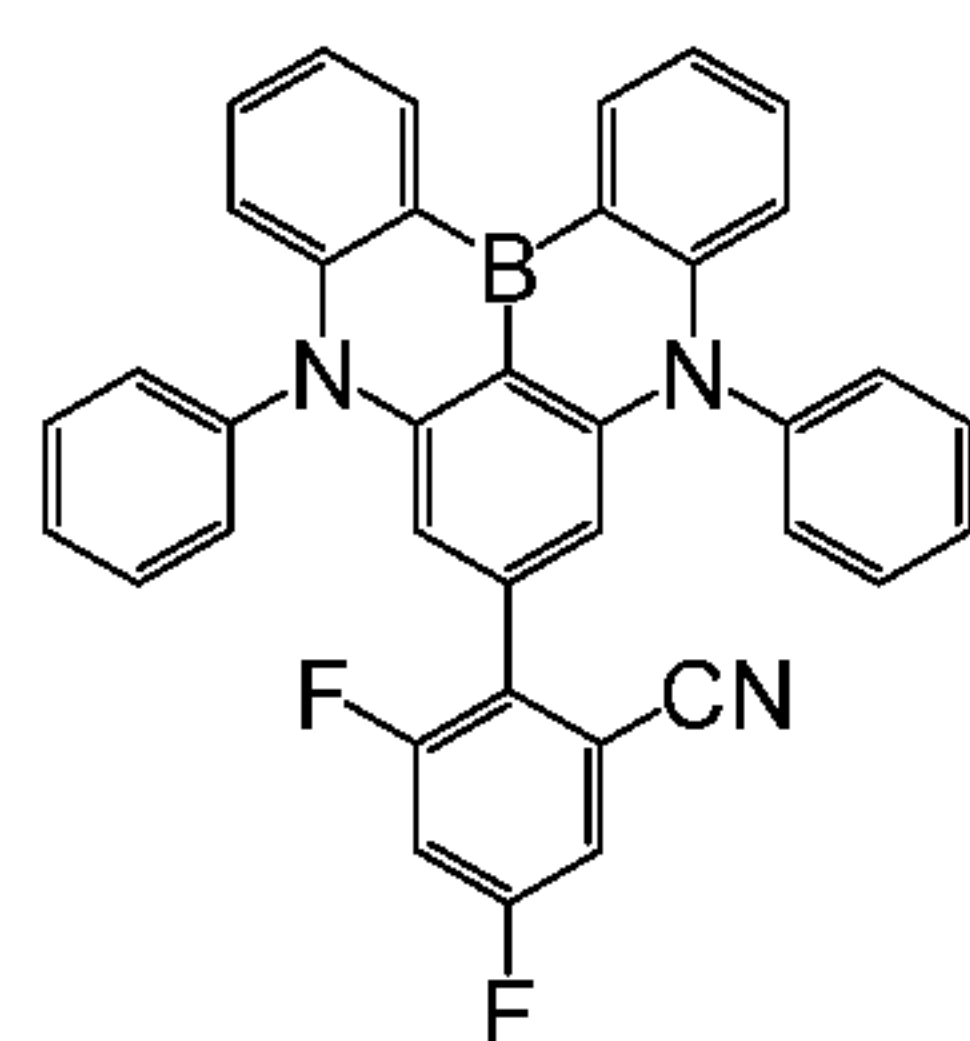
C-50



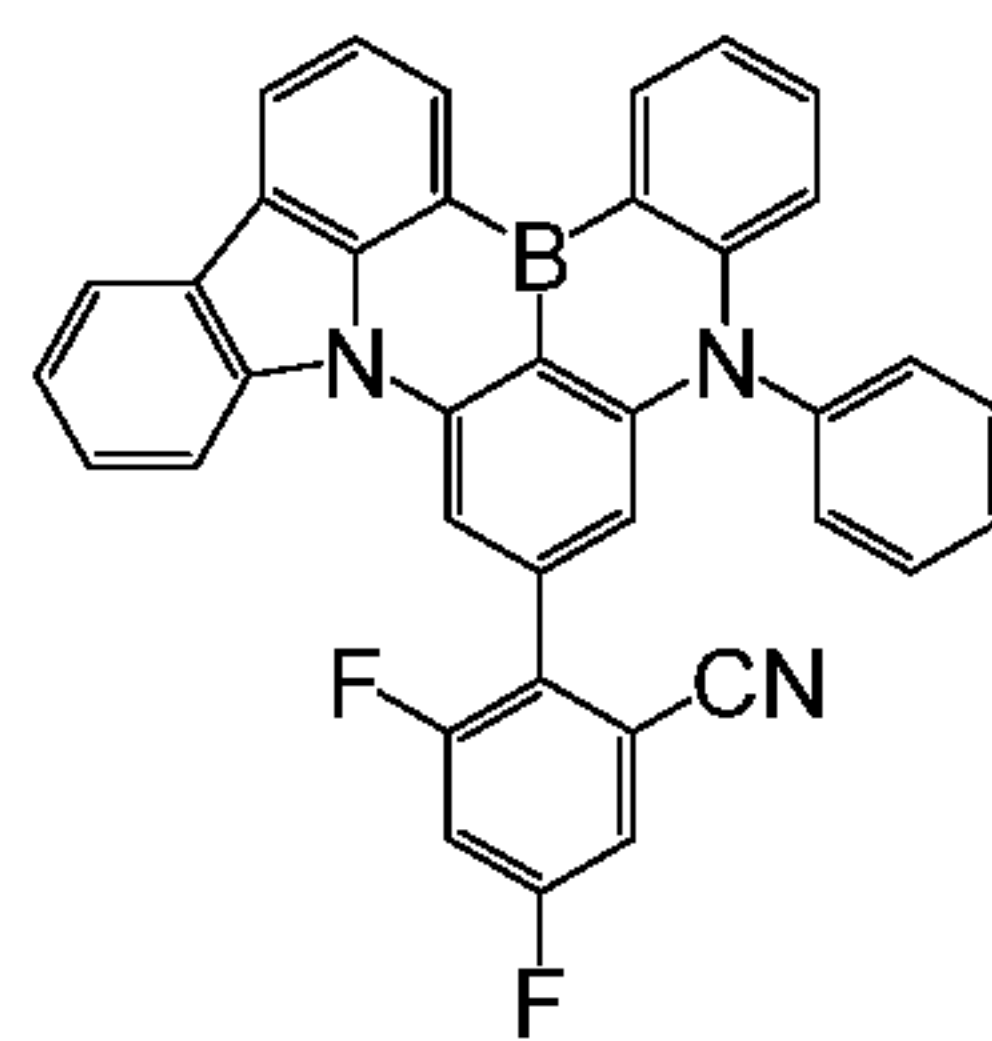
C-51



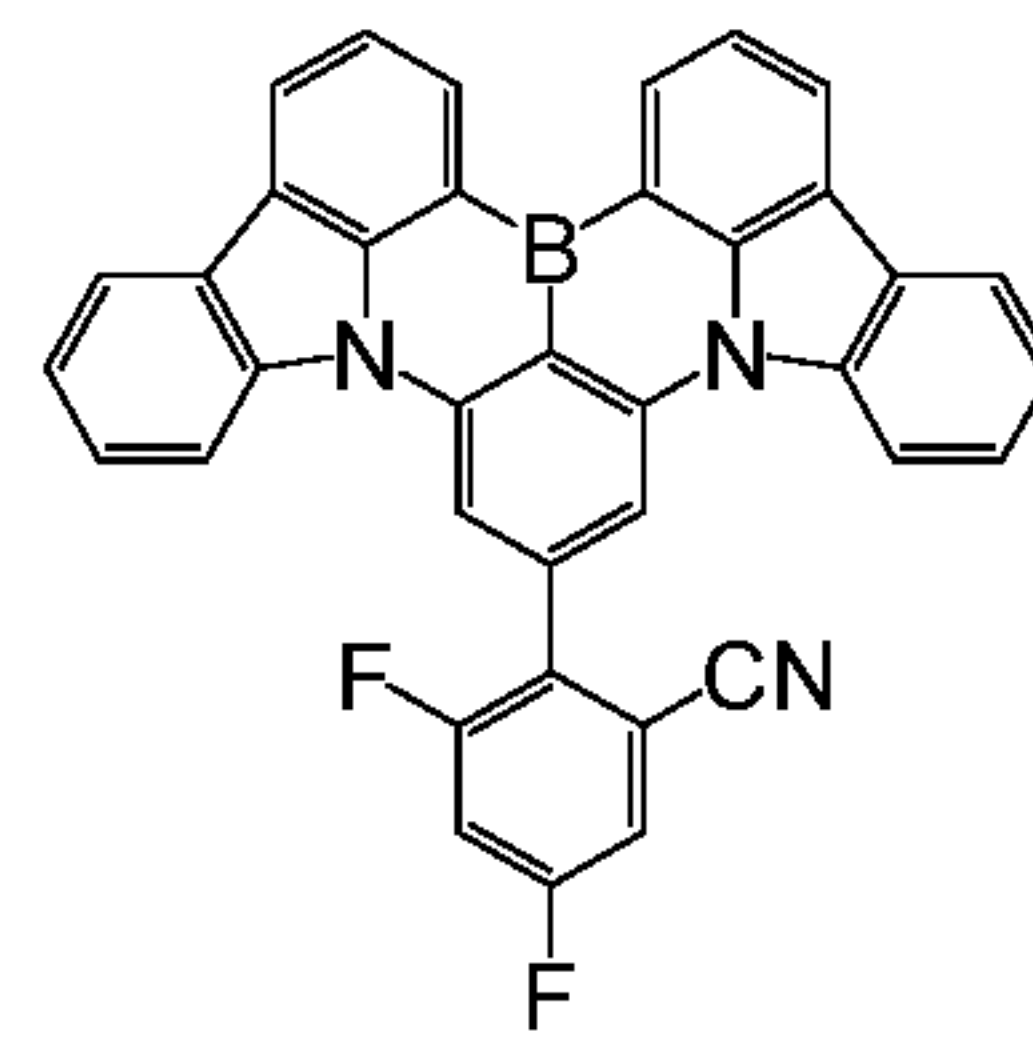
C-52



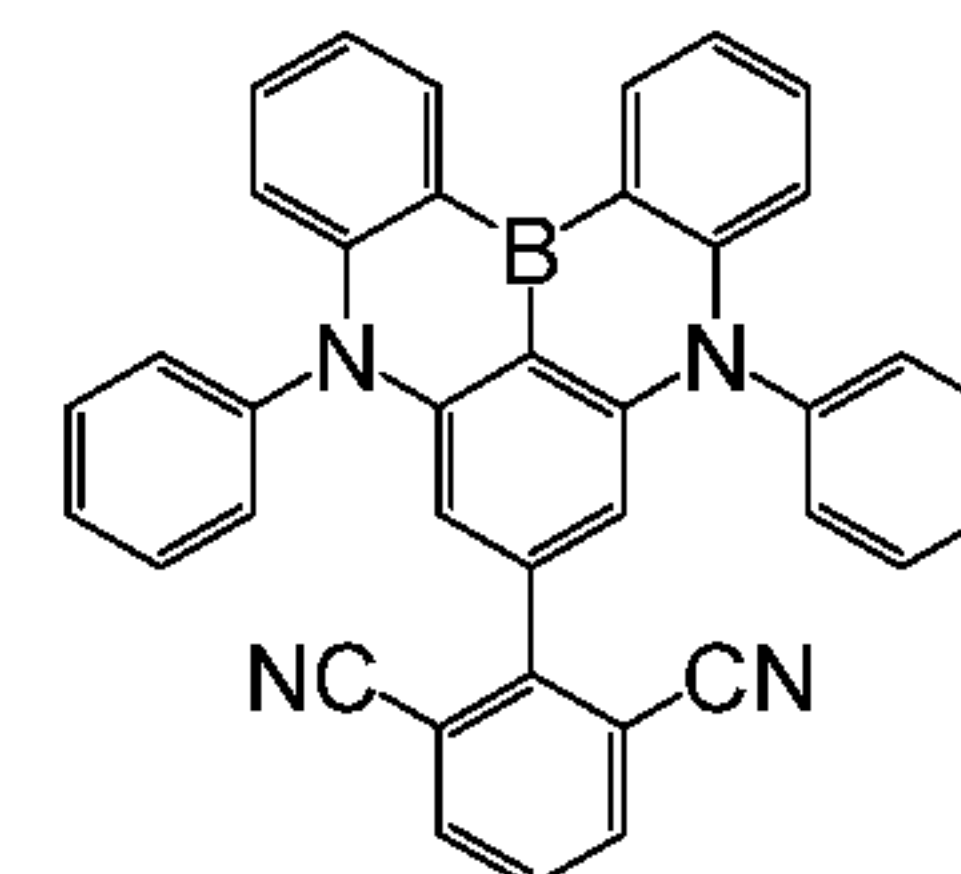
C-53



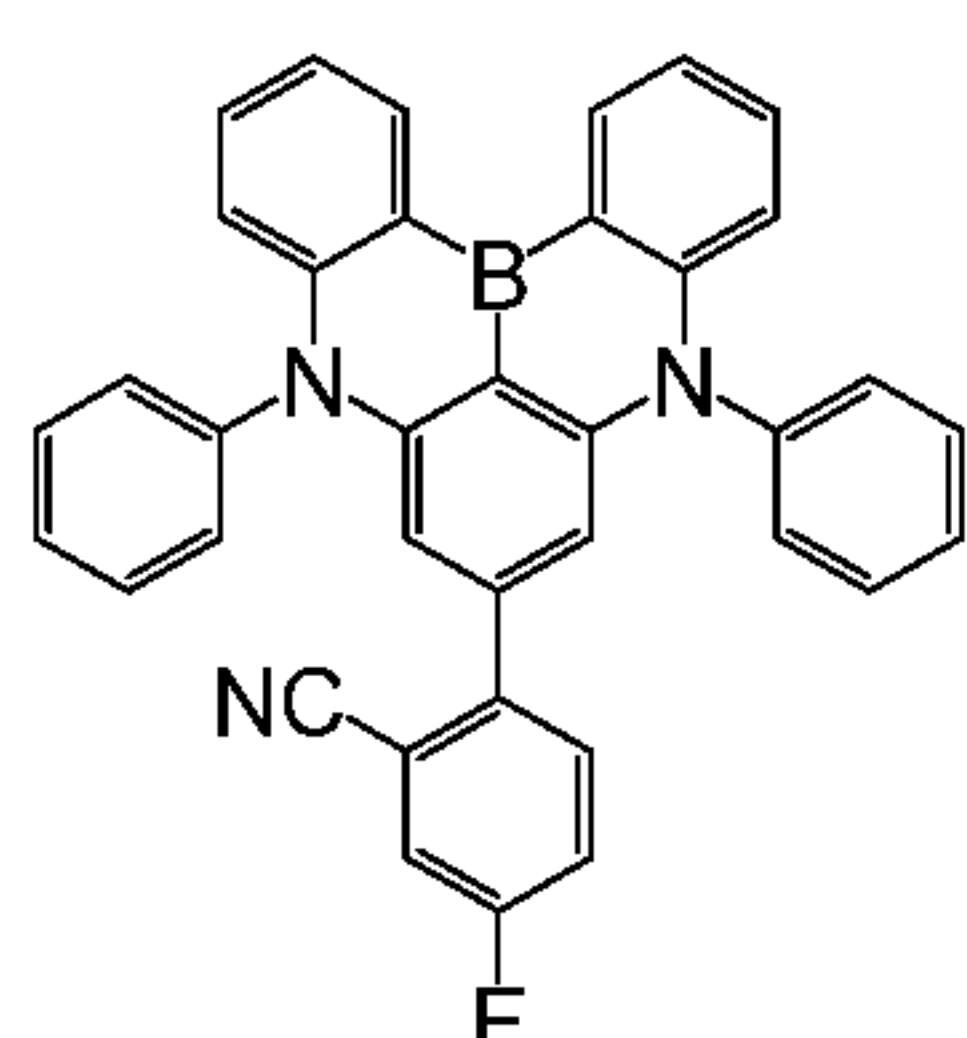
C-54



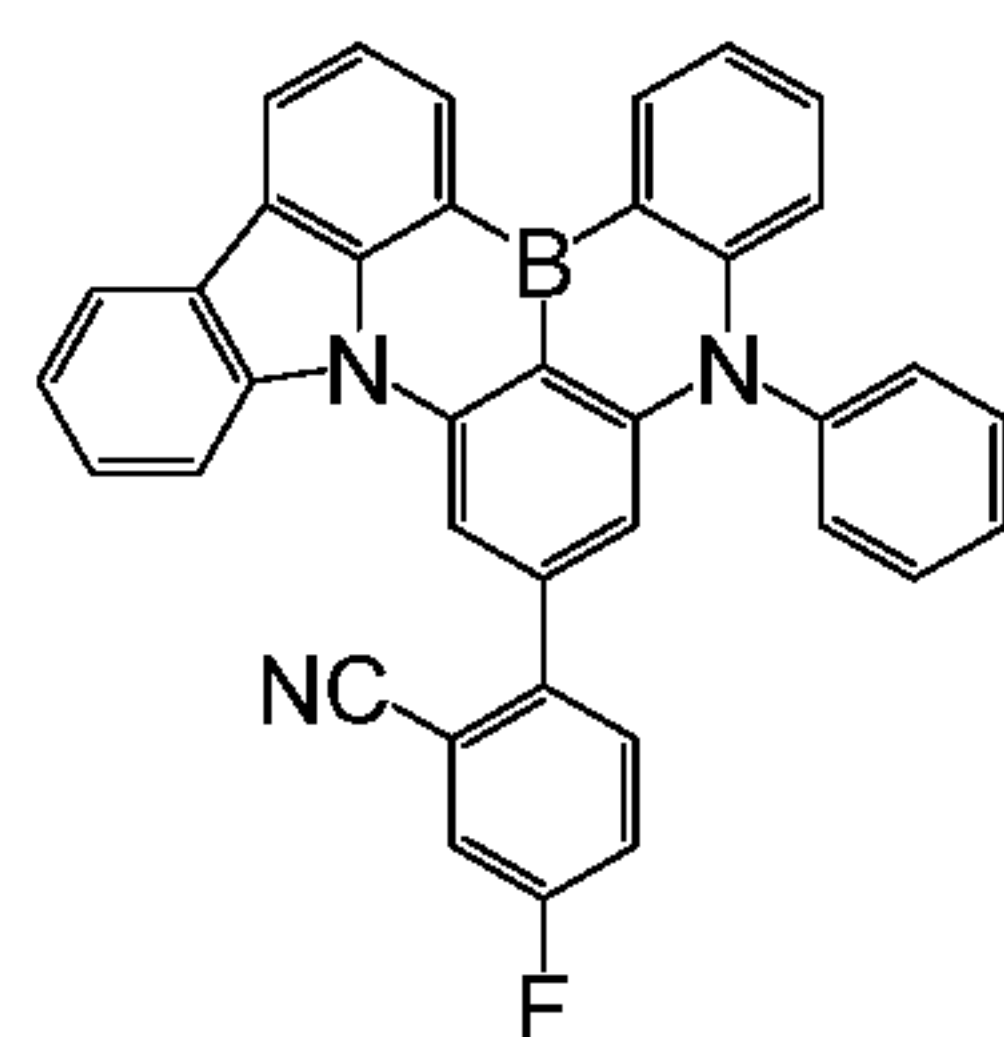
C-55



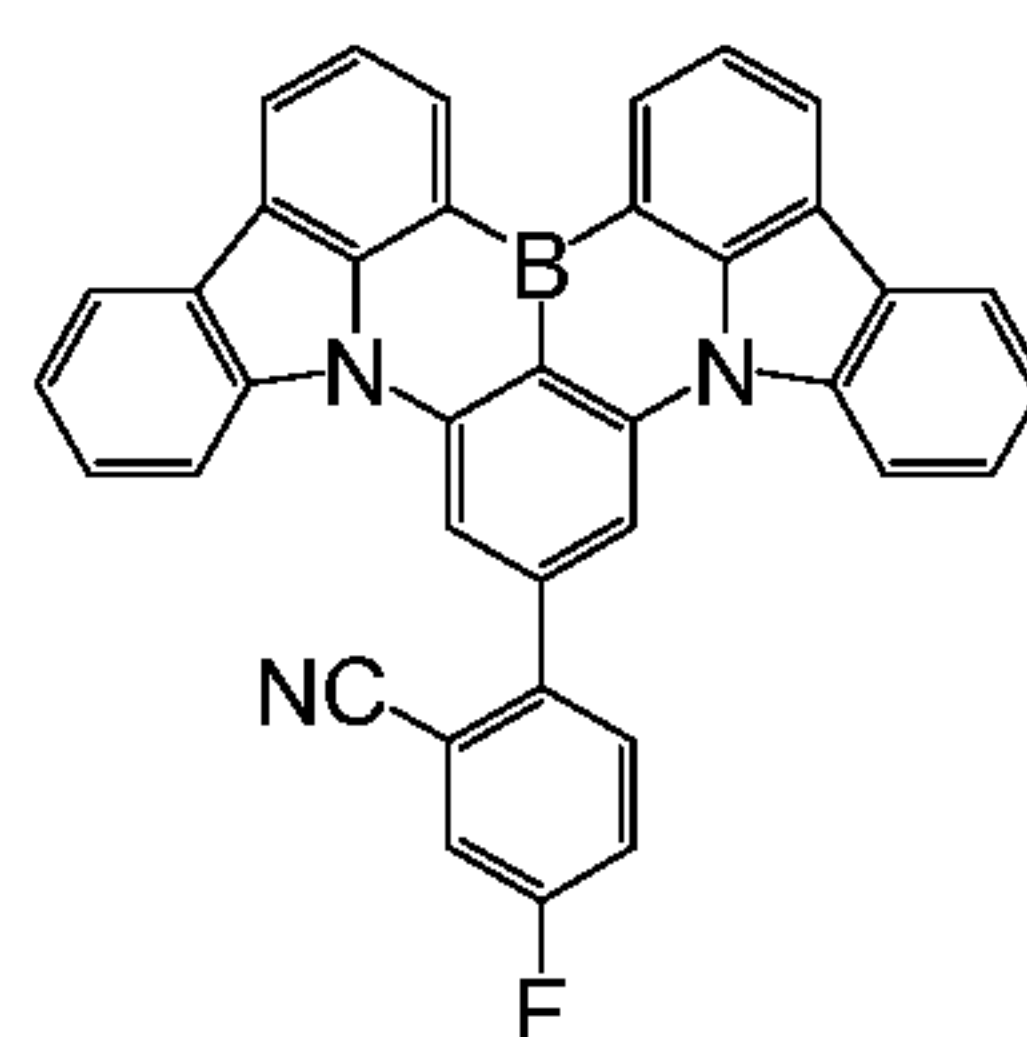
C-56



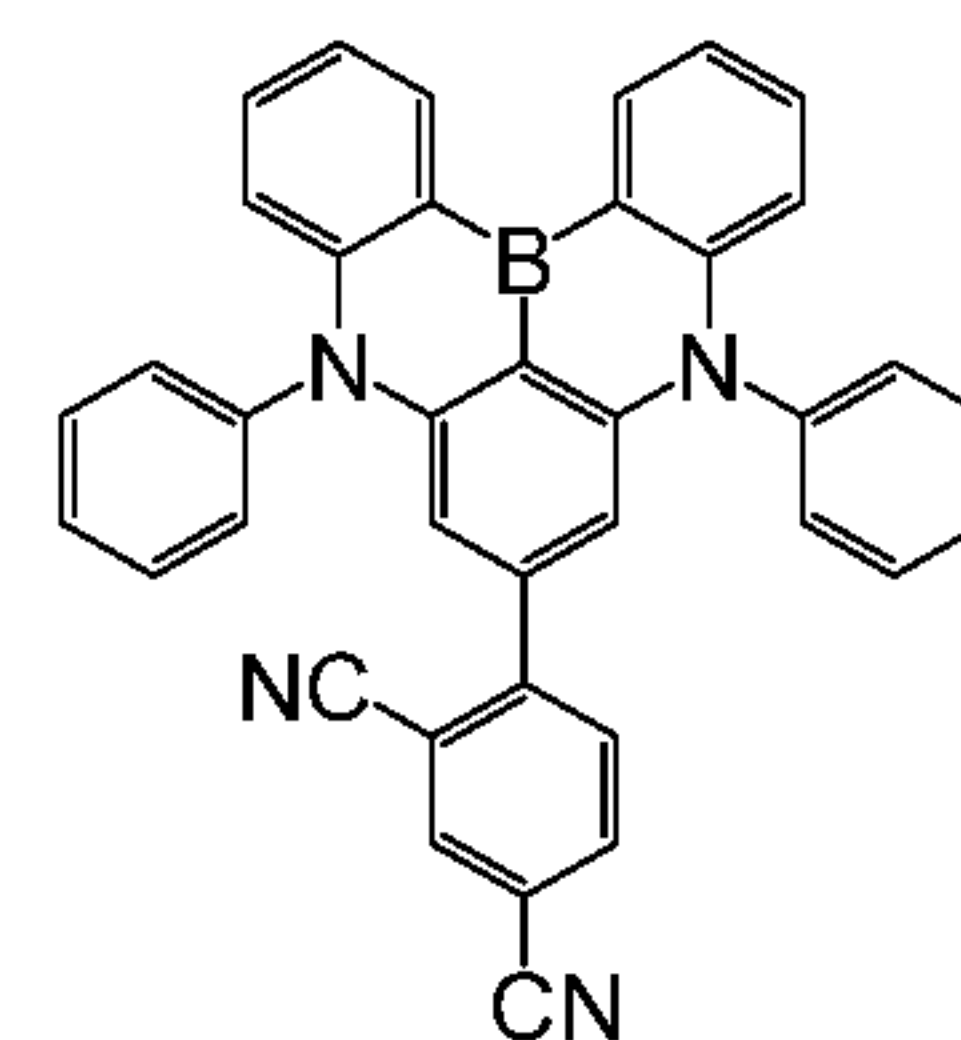
C-57



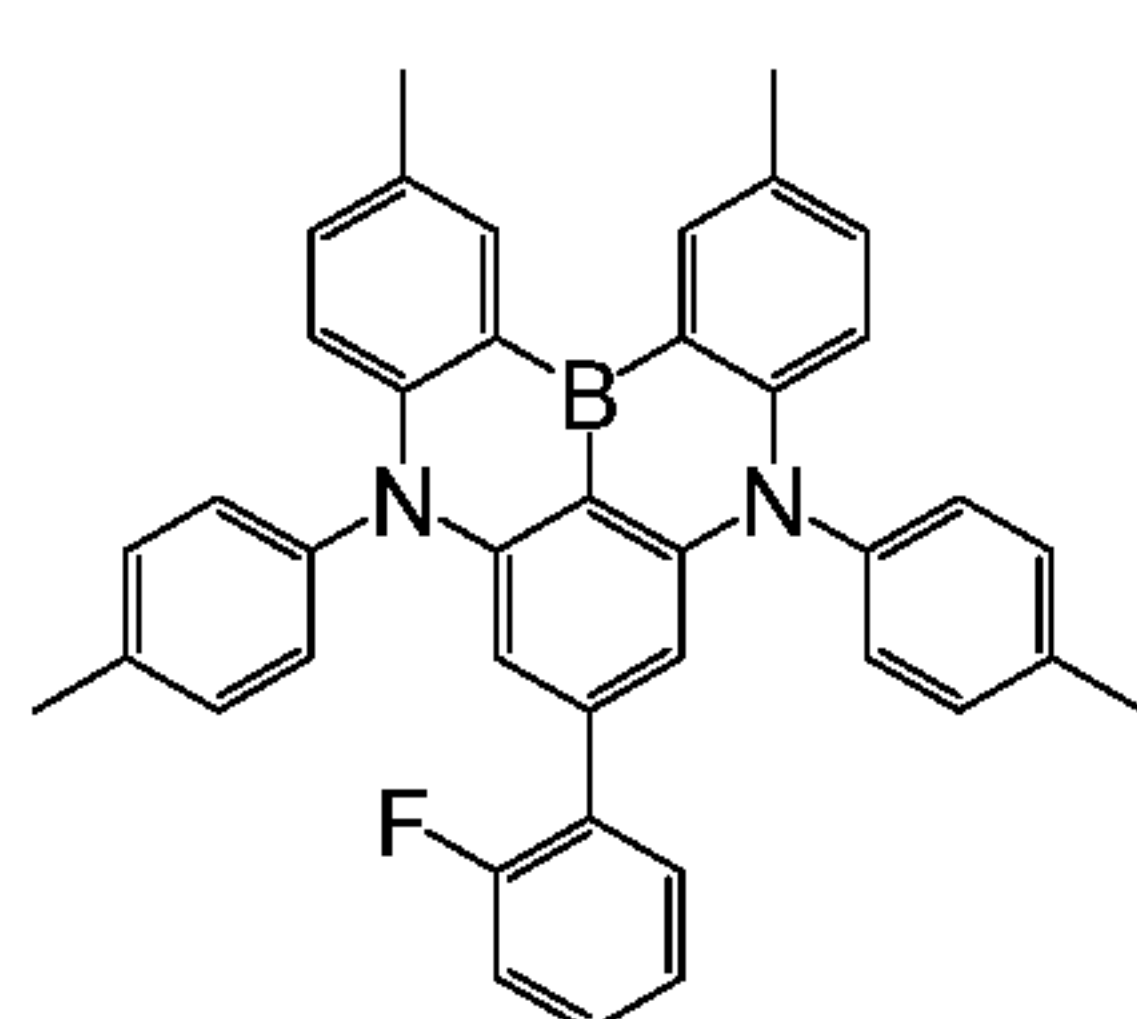
C-58



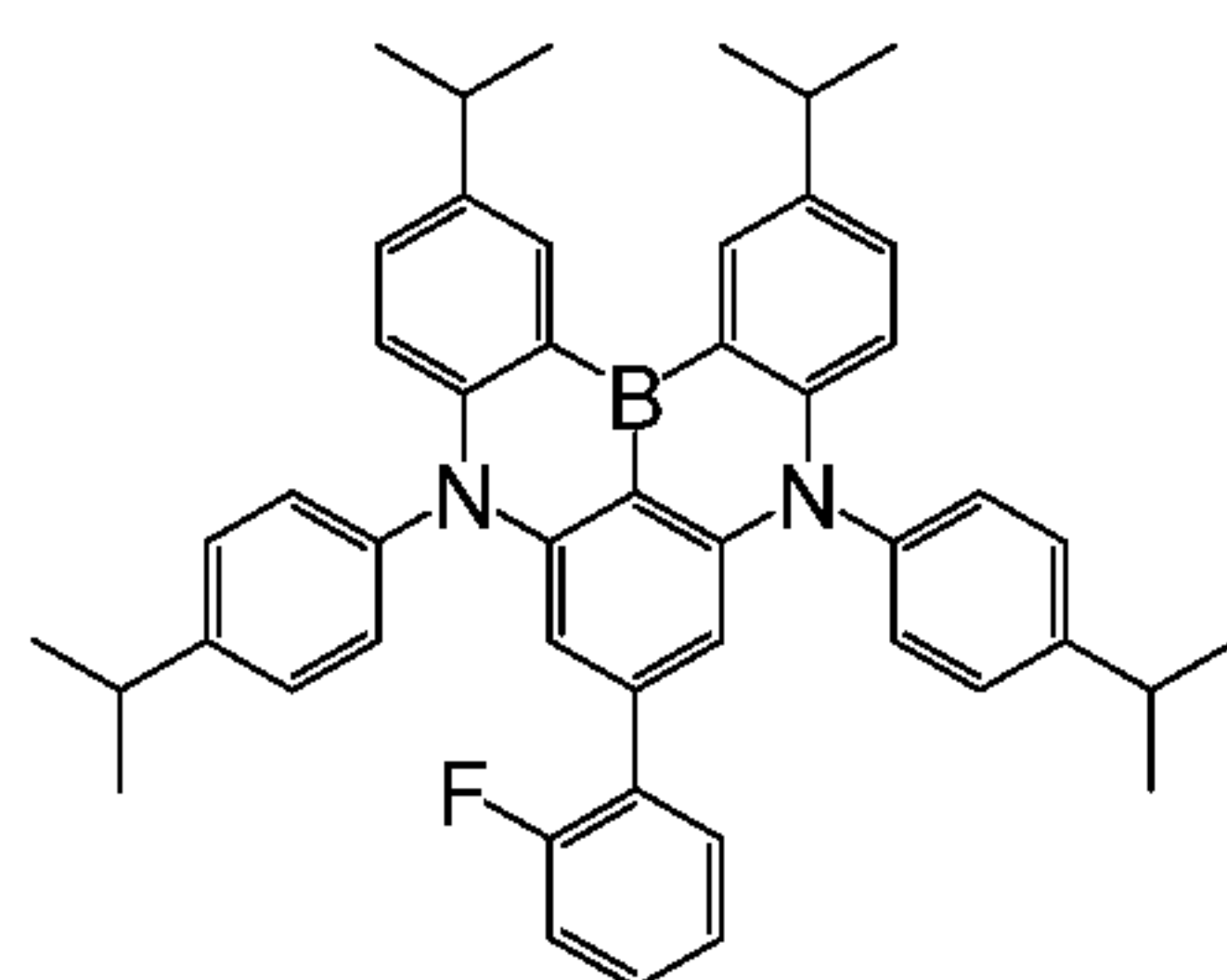
C-59



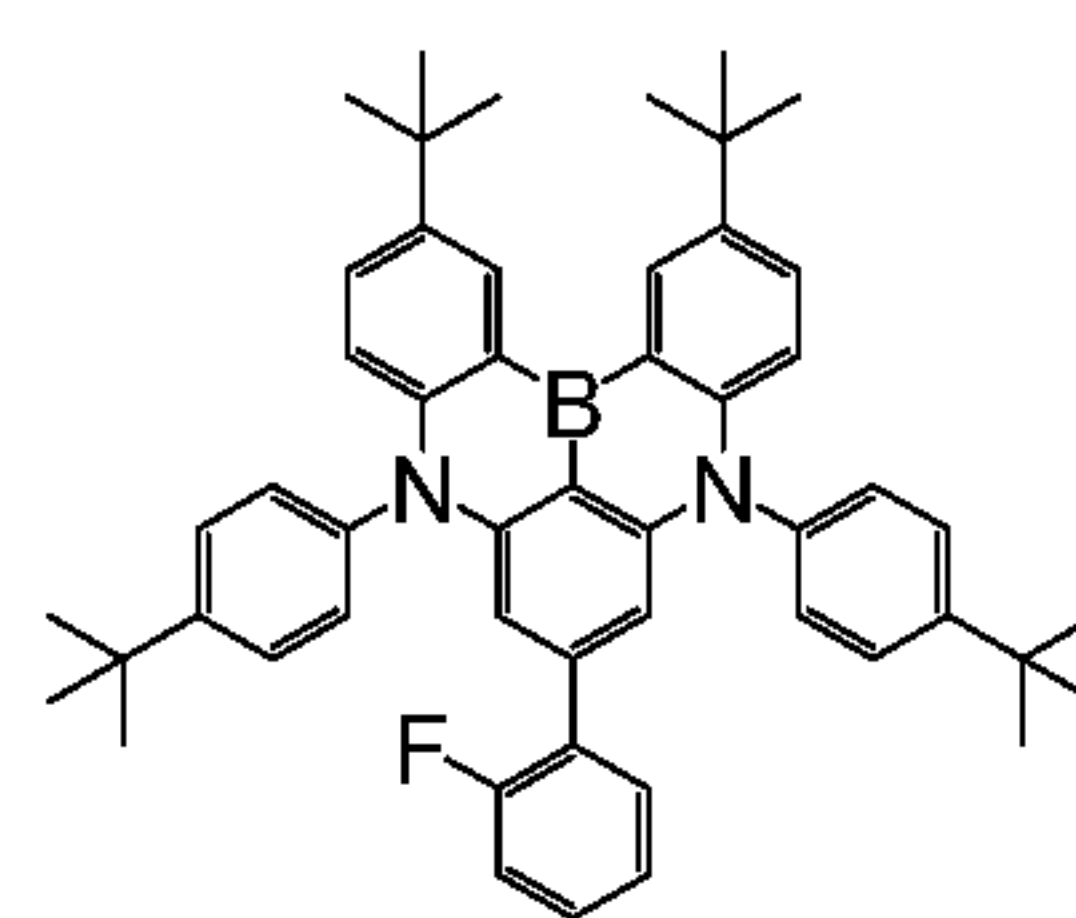
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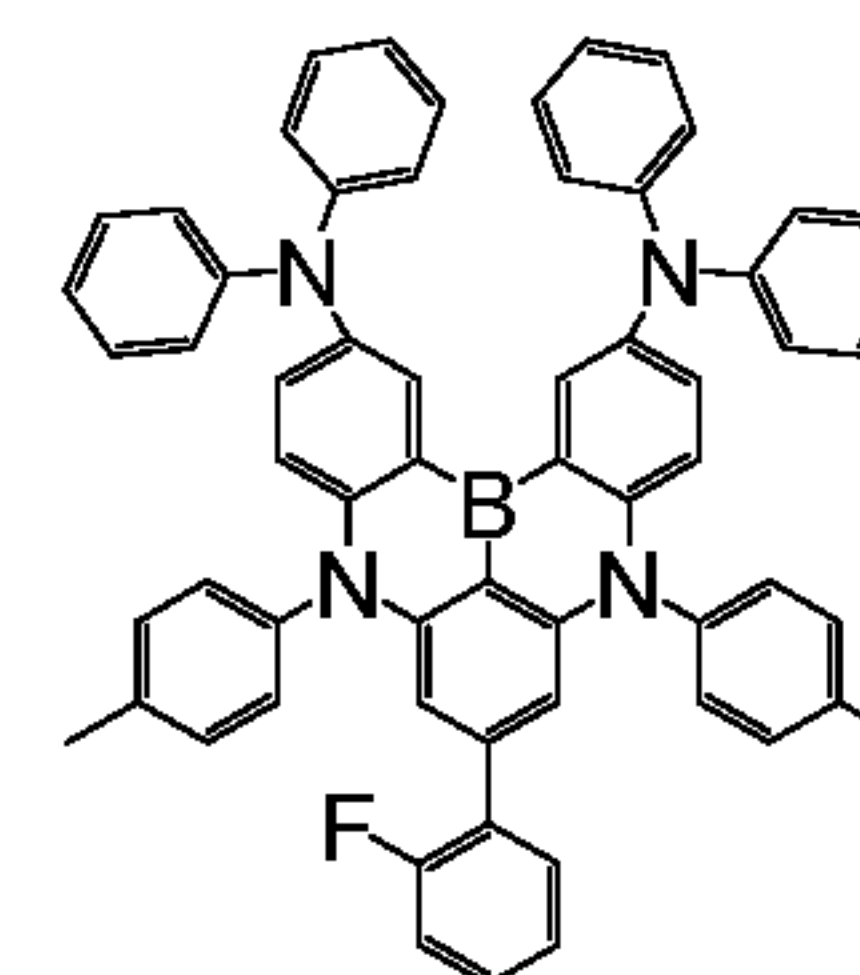
C-61



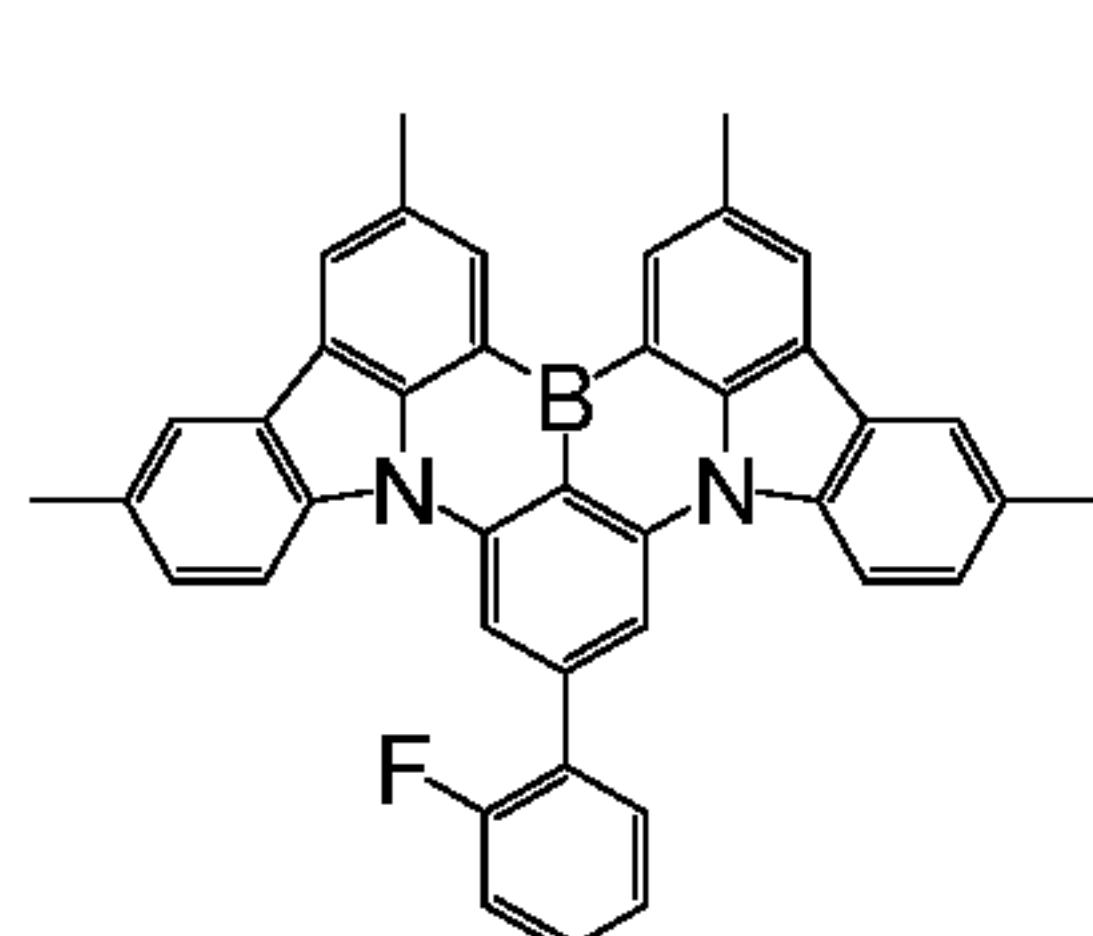
C-62



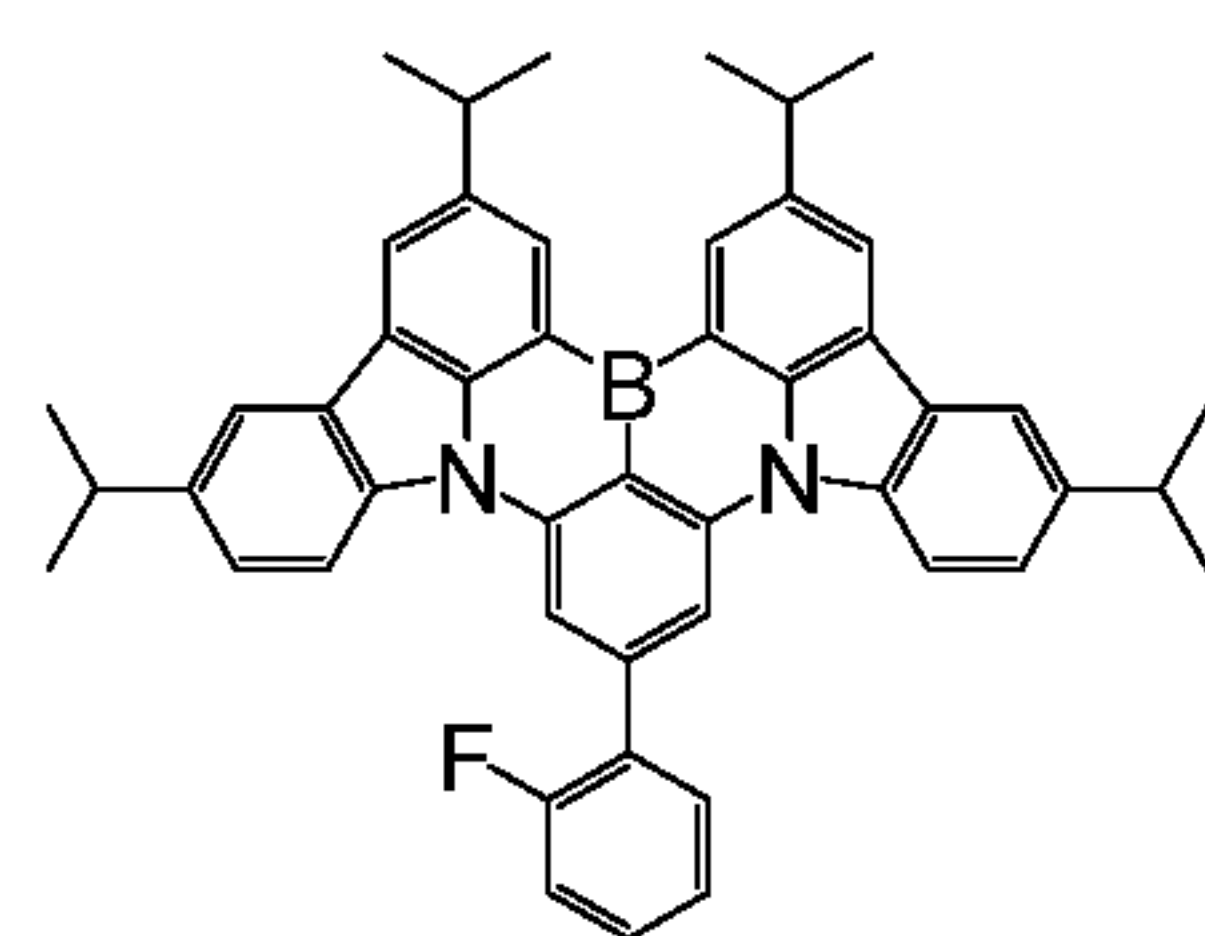
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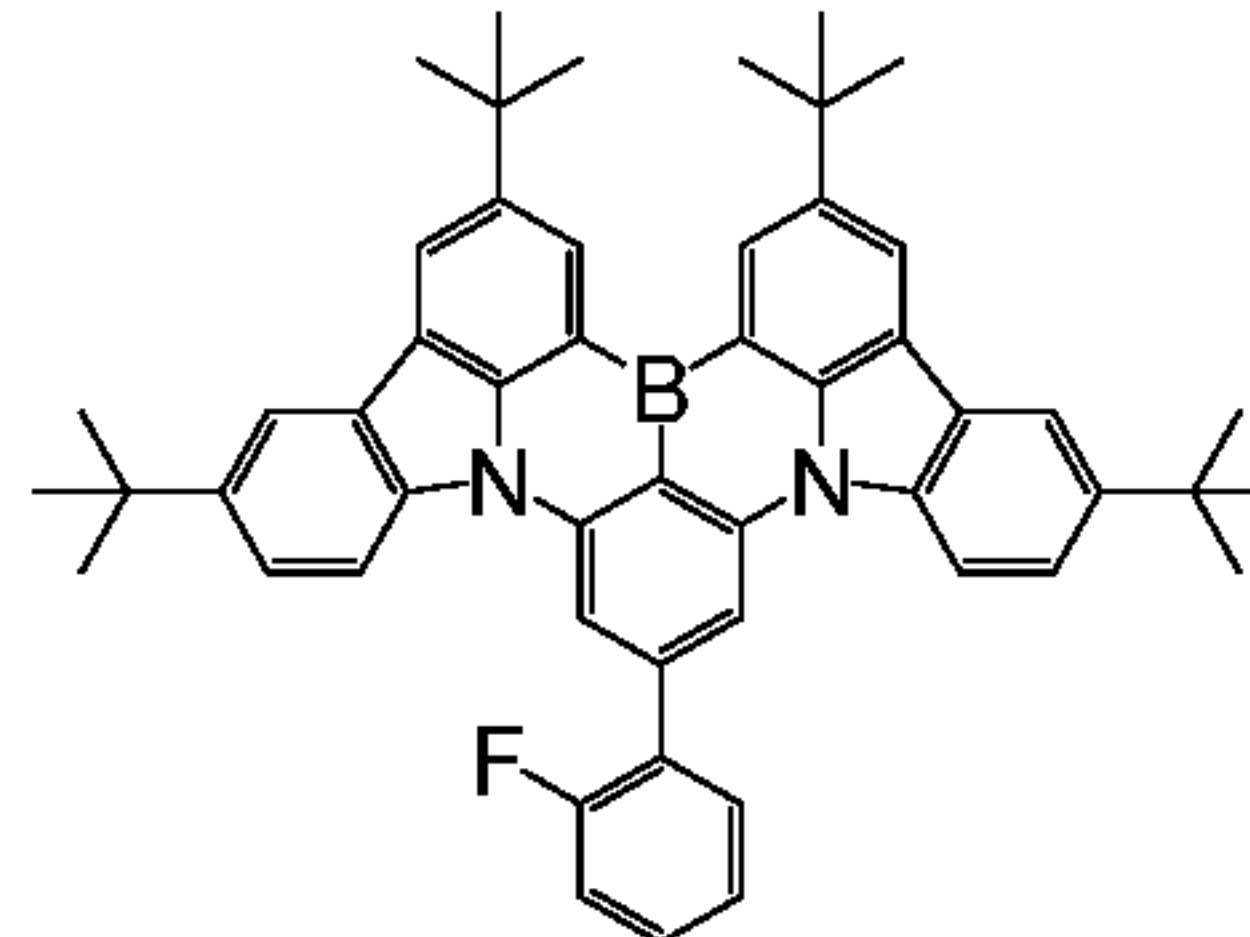
C-64



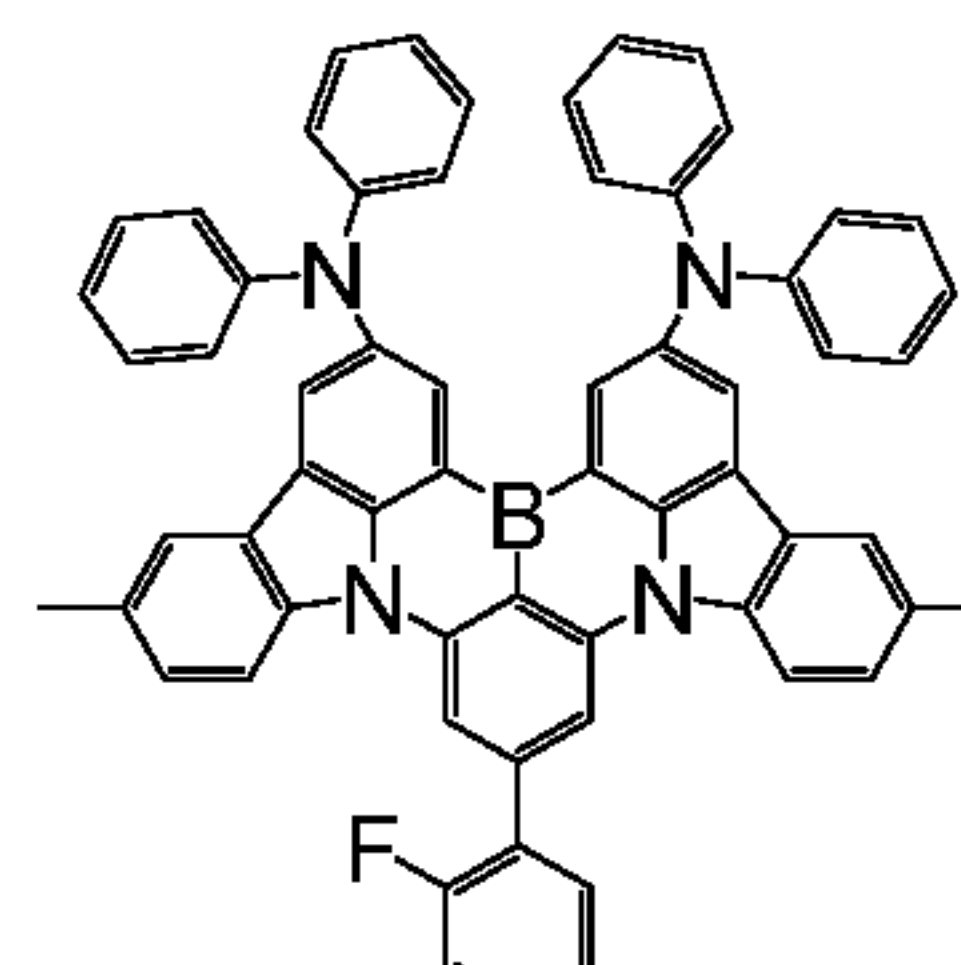
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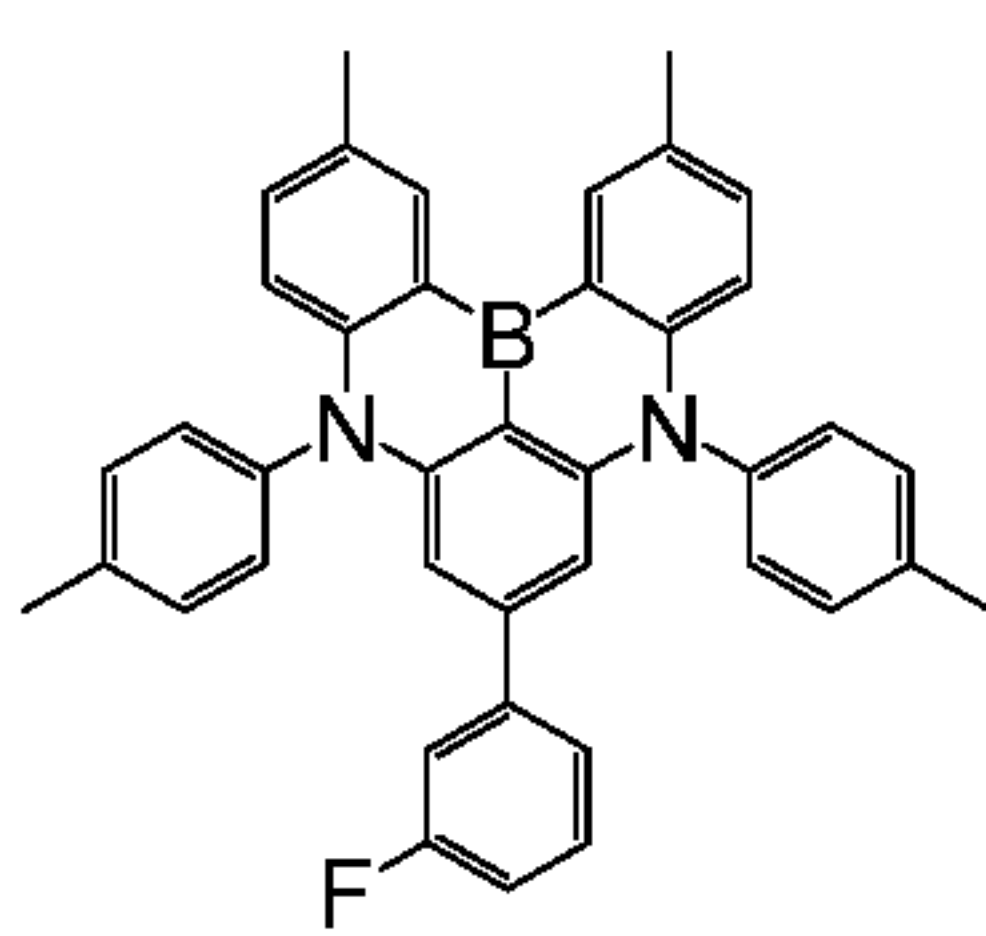
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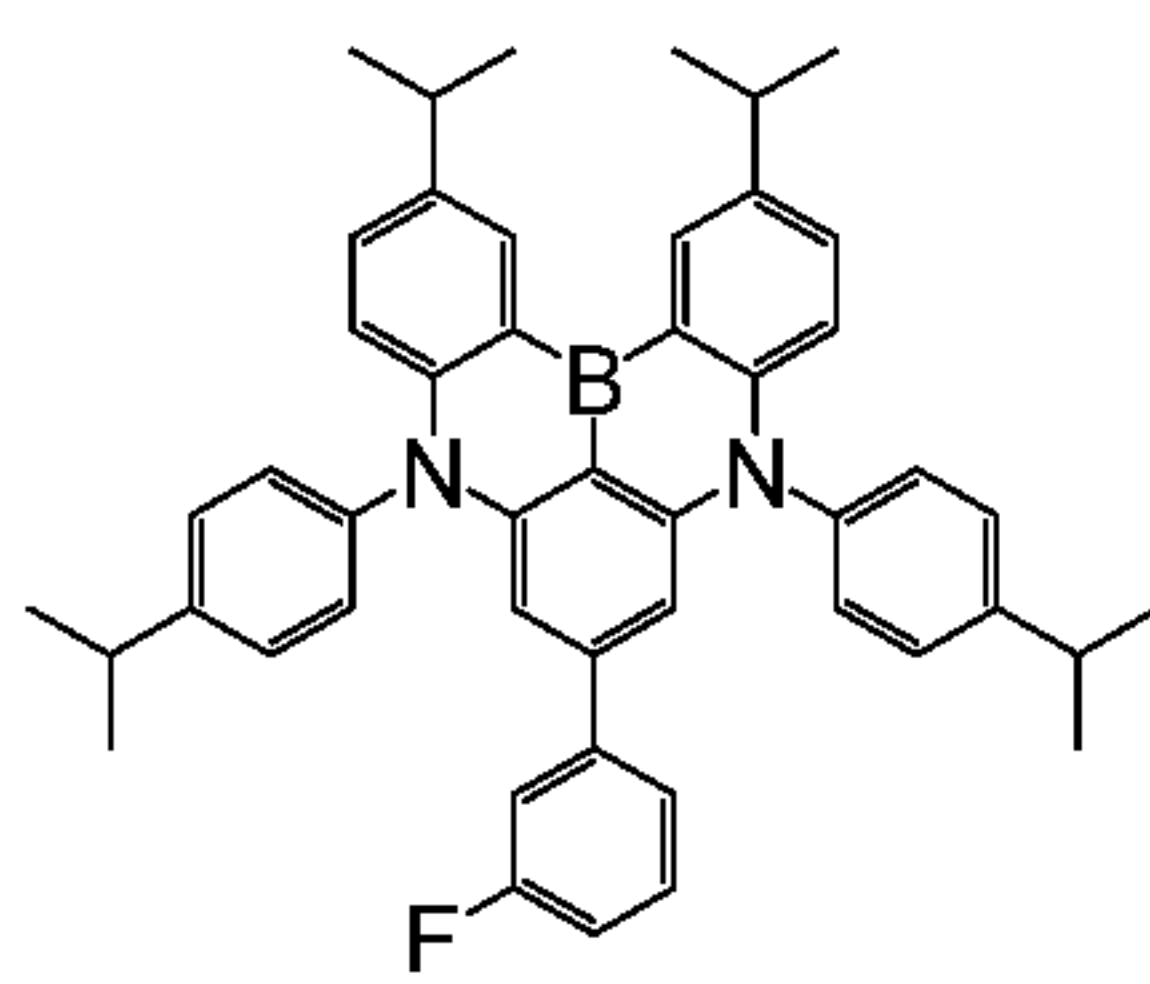
C-67



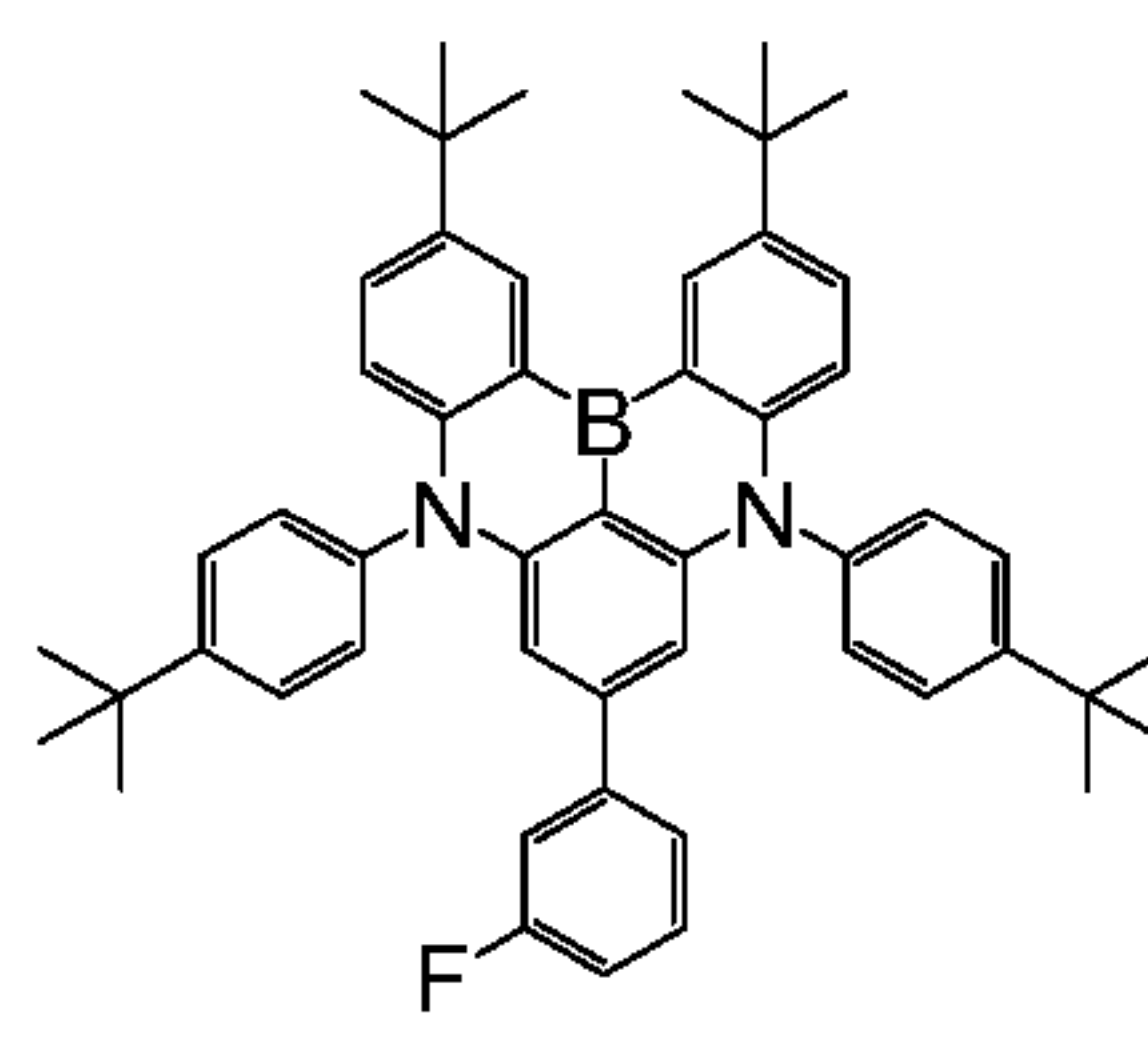
C-68



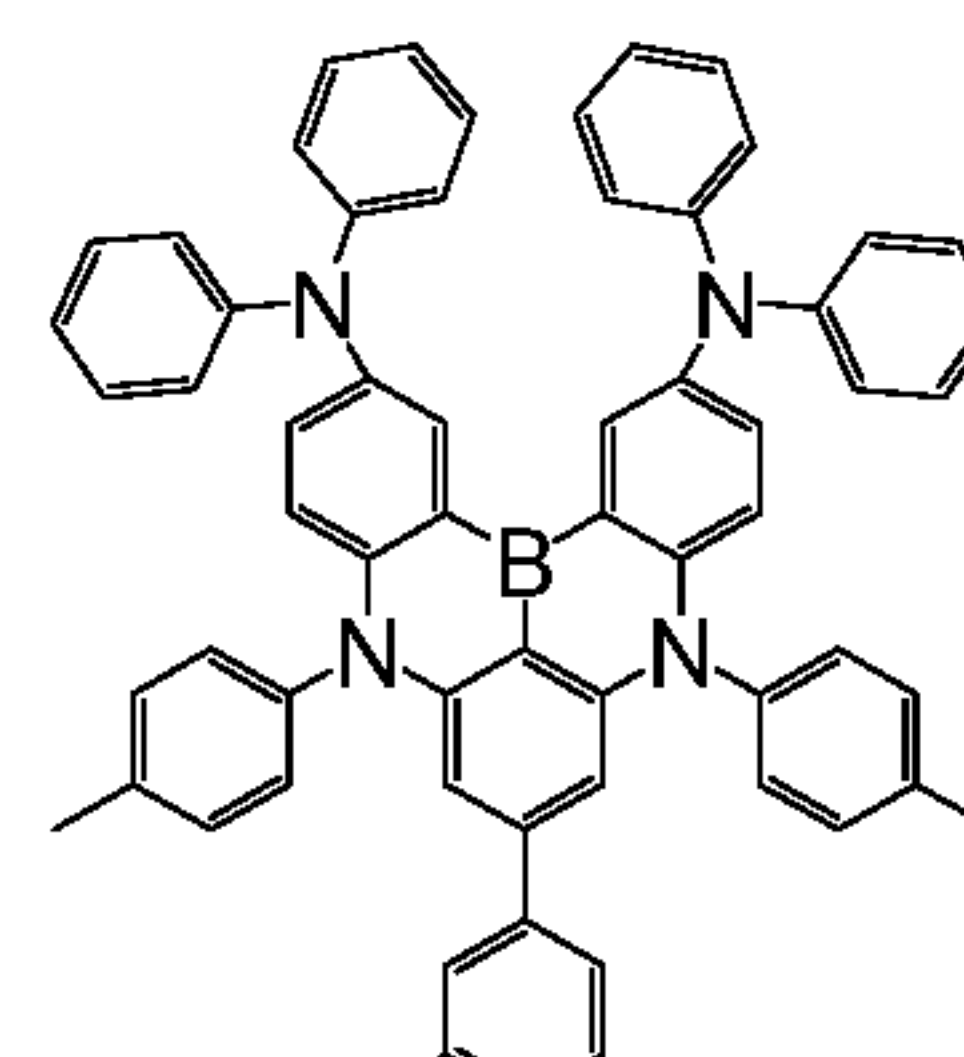
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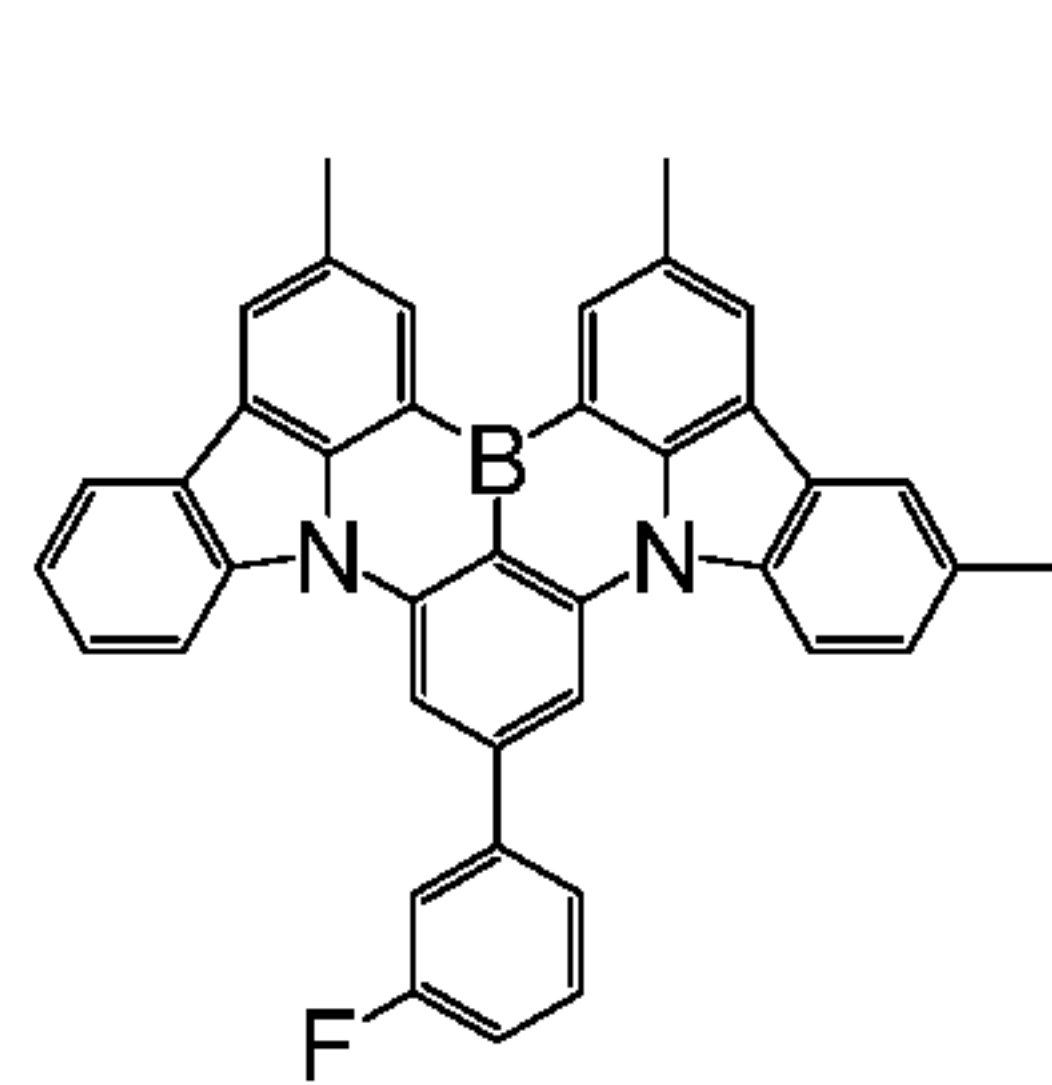
C-70



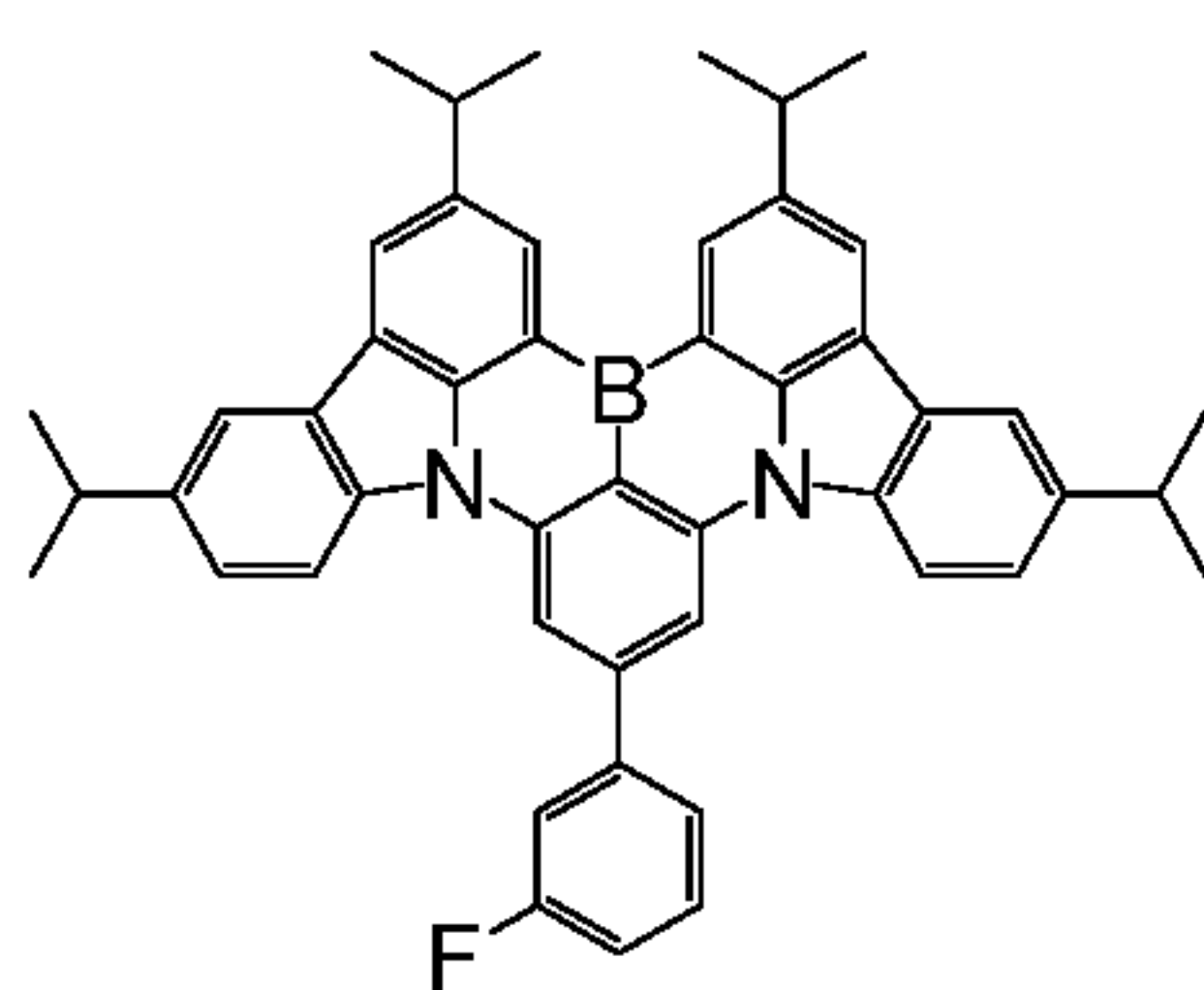
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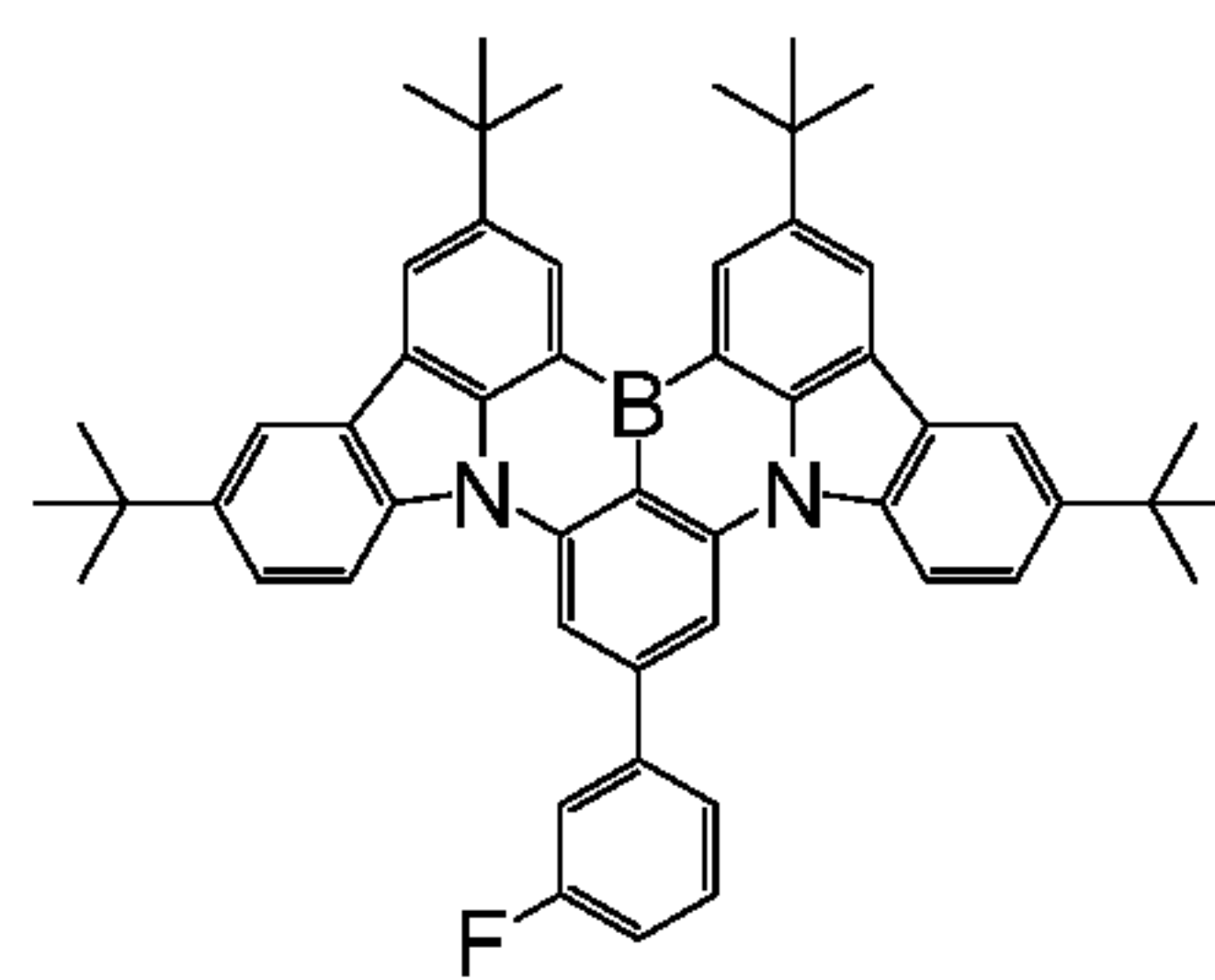
C-72



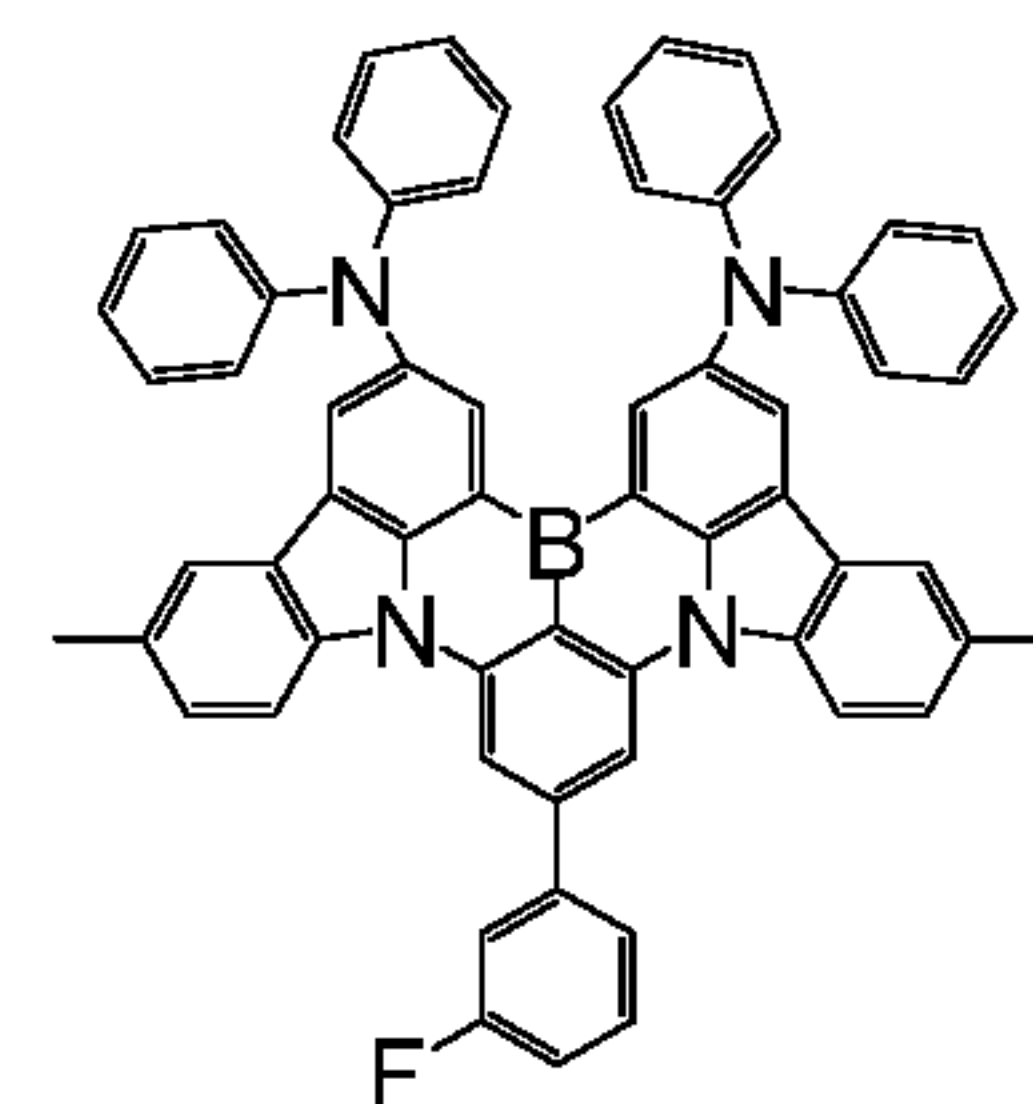
C-73



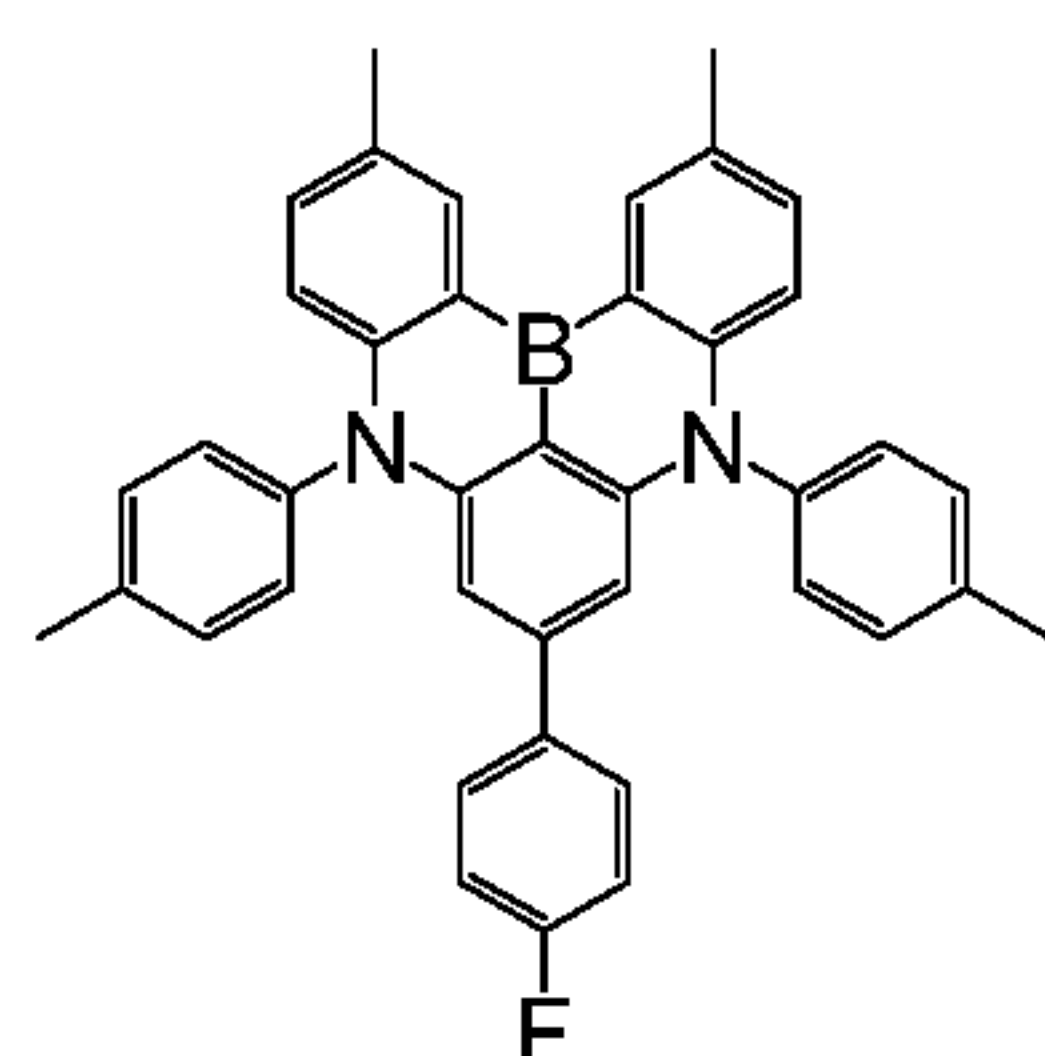
C-74



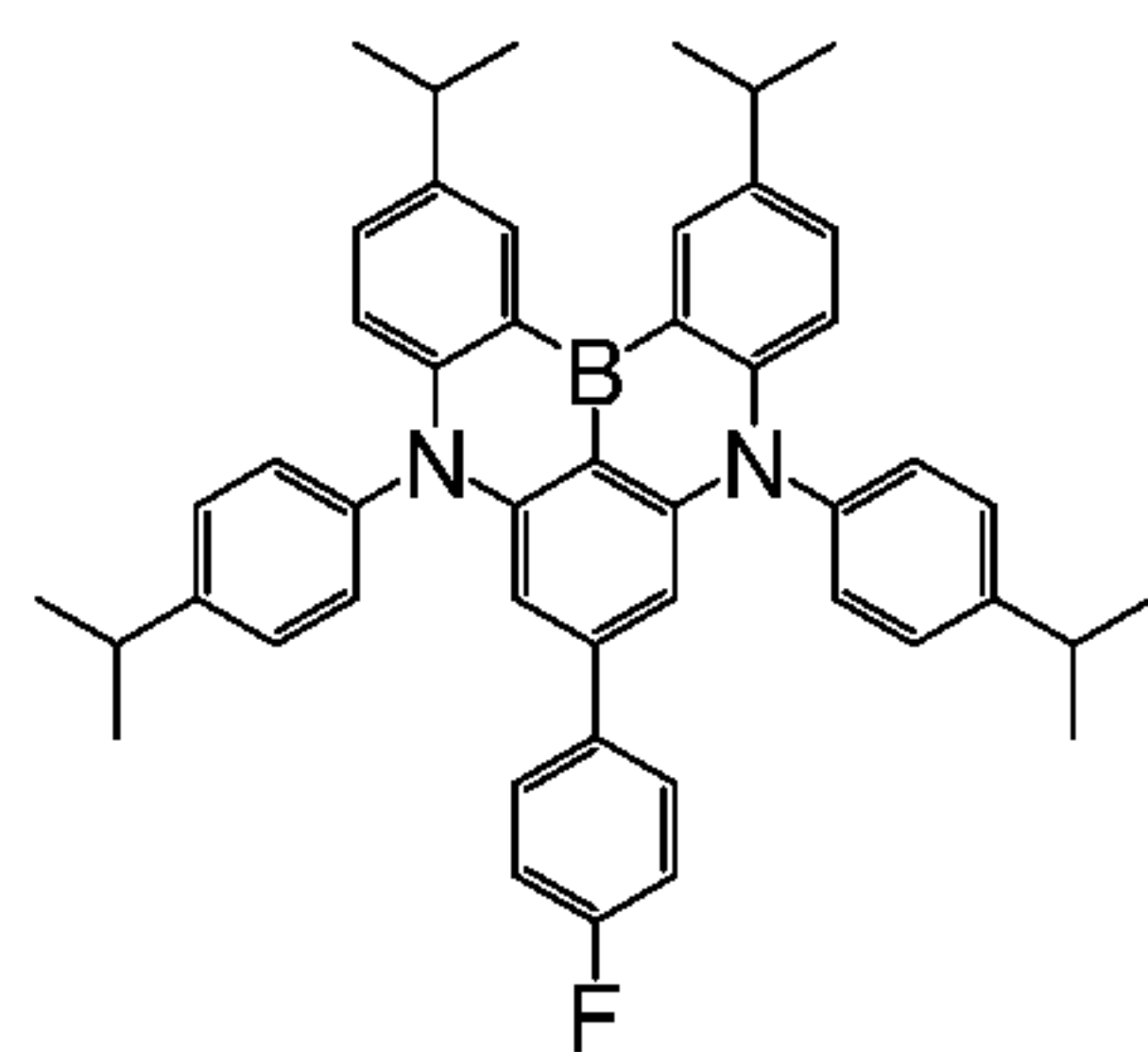
C-75



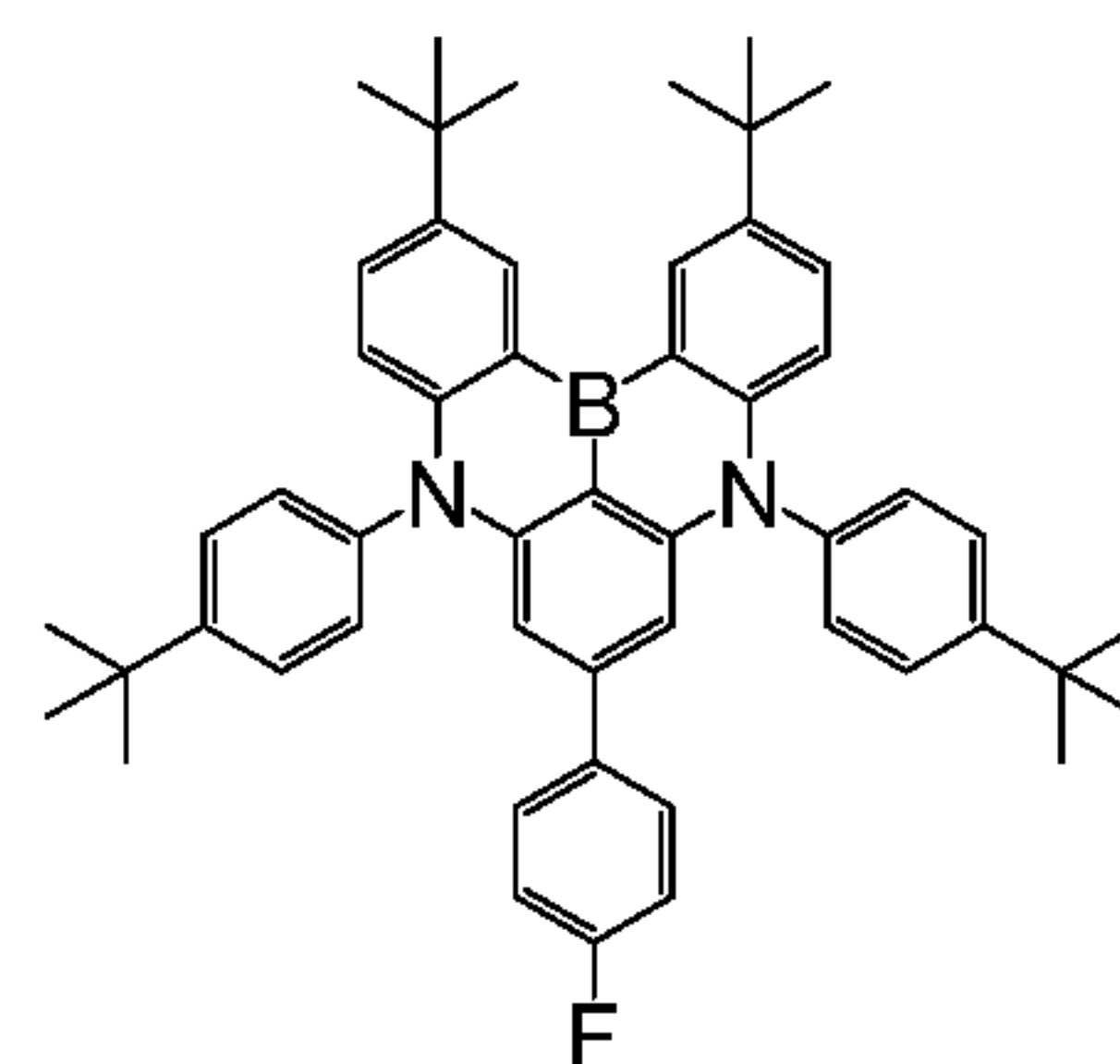
C-76



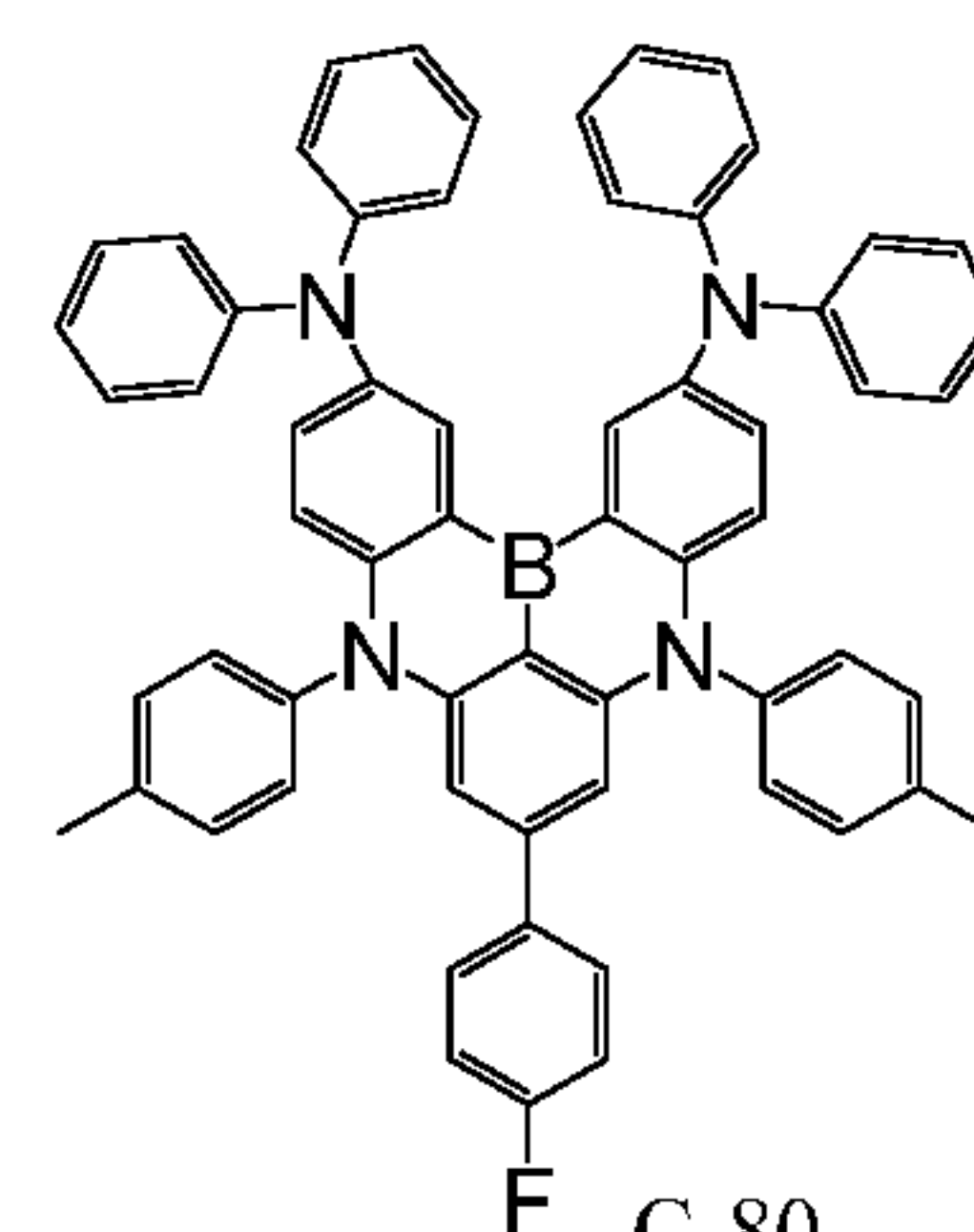
C-77



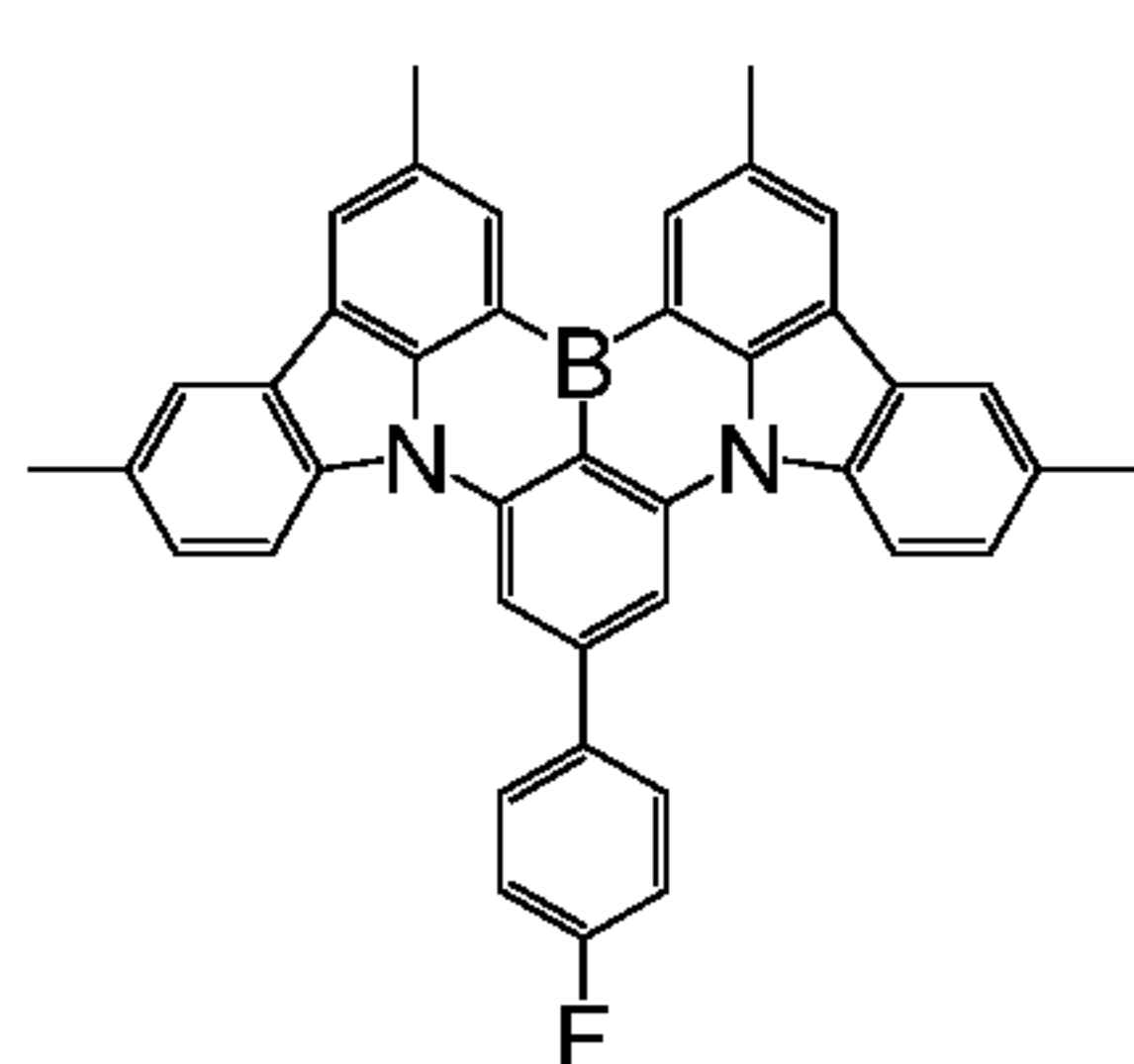
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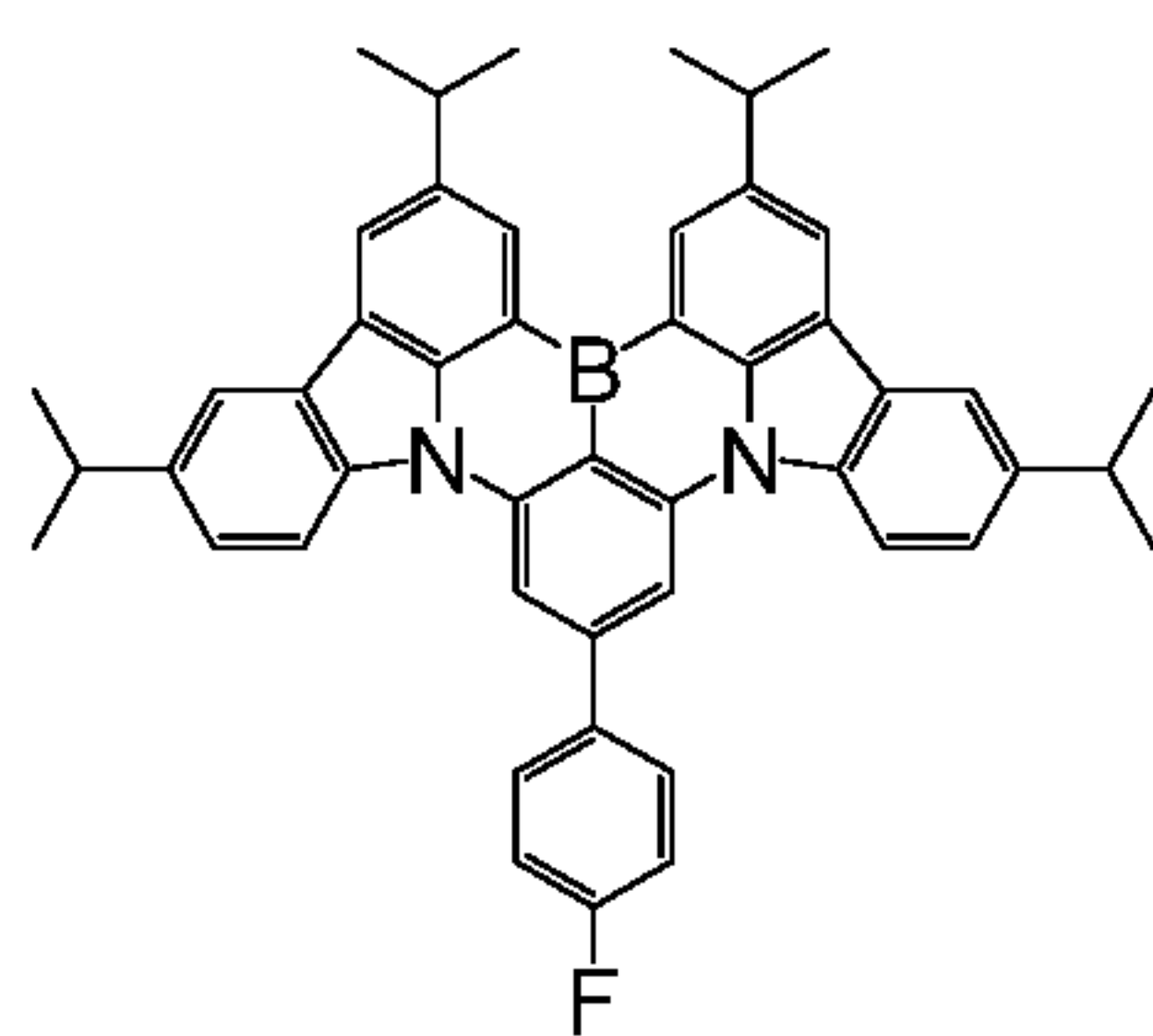
C-79



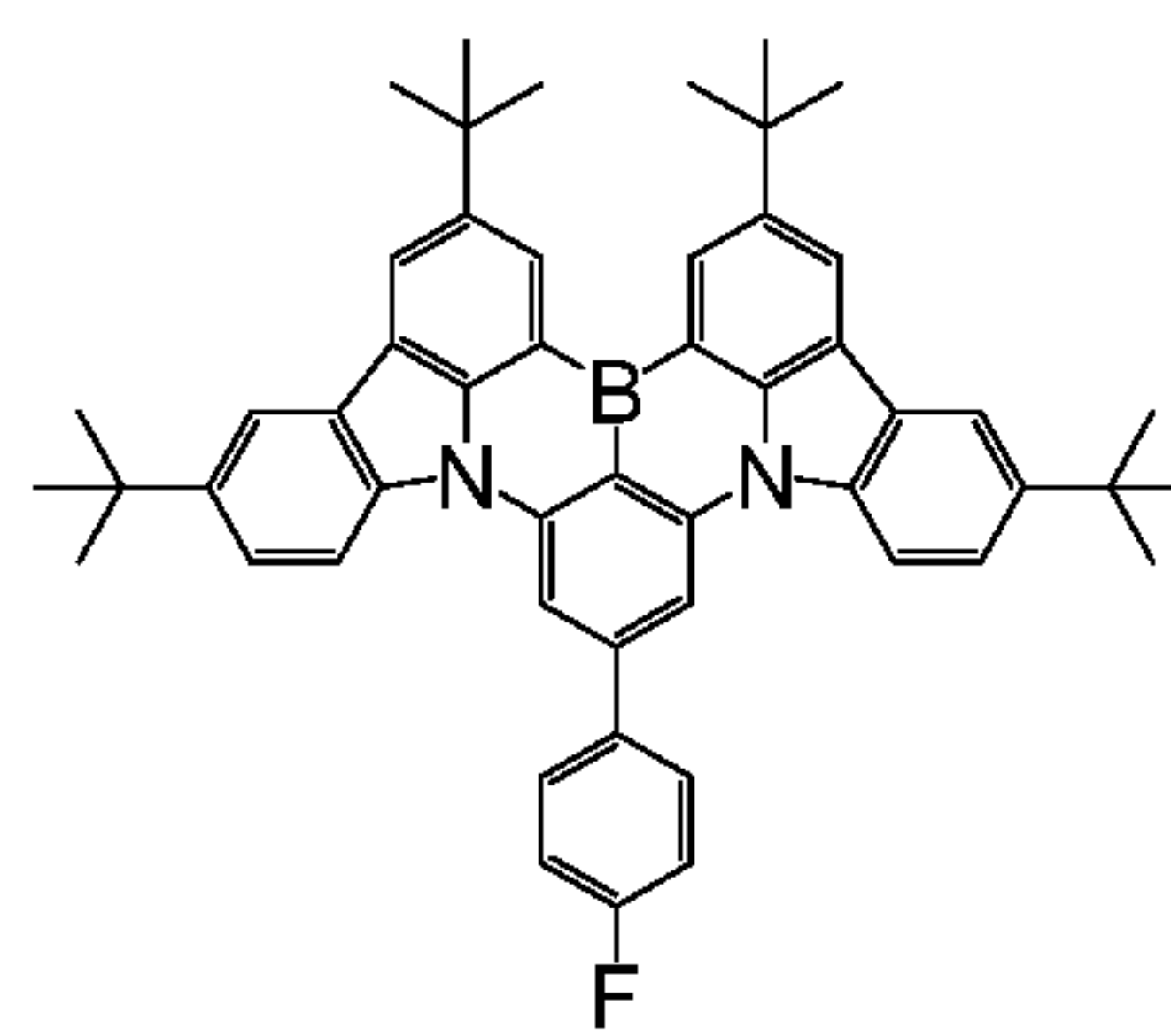
C-80



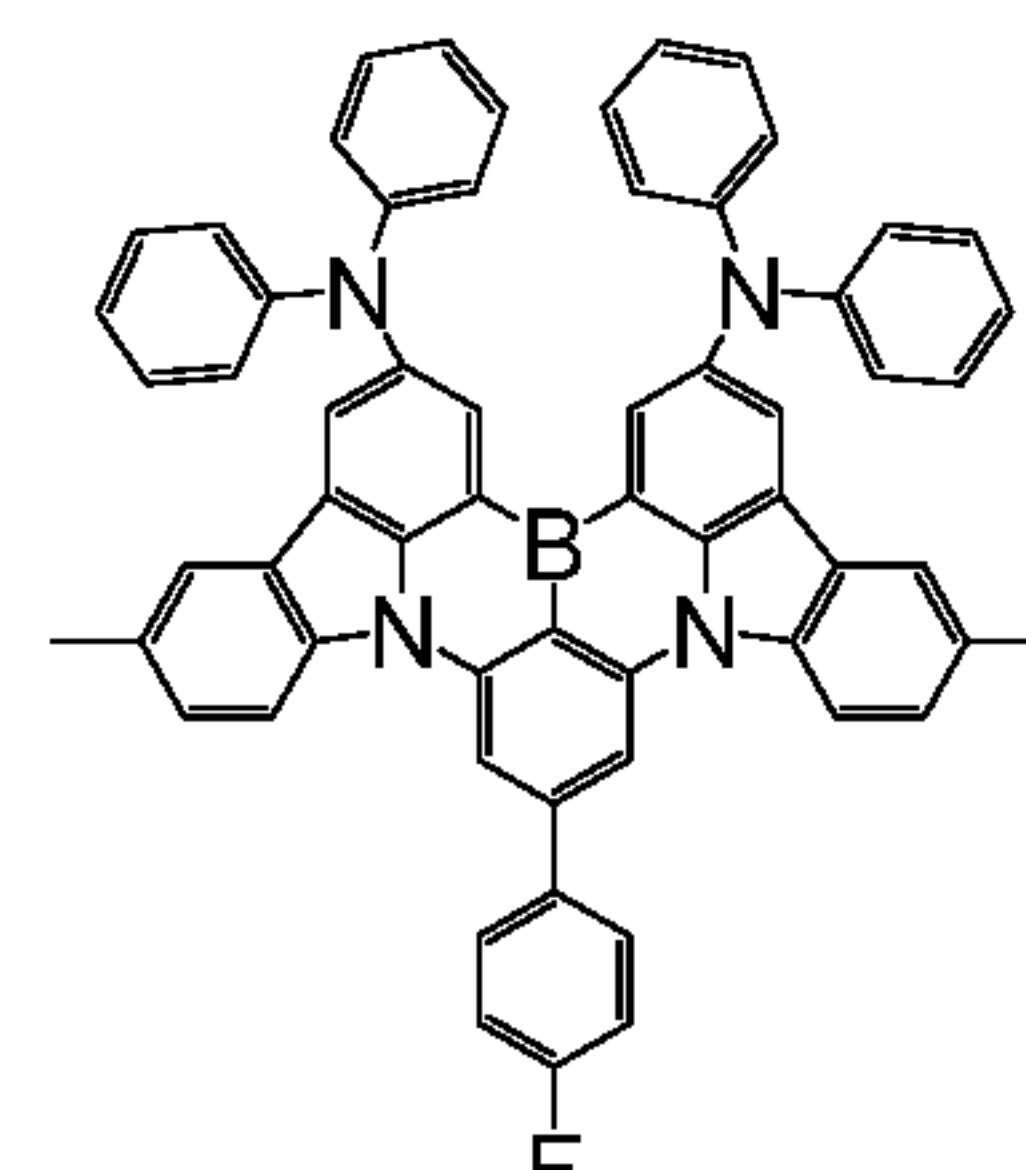
C-81



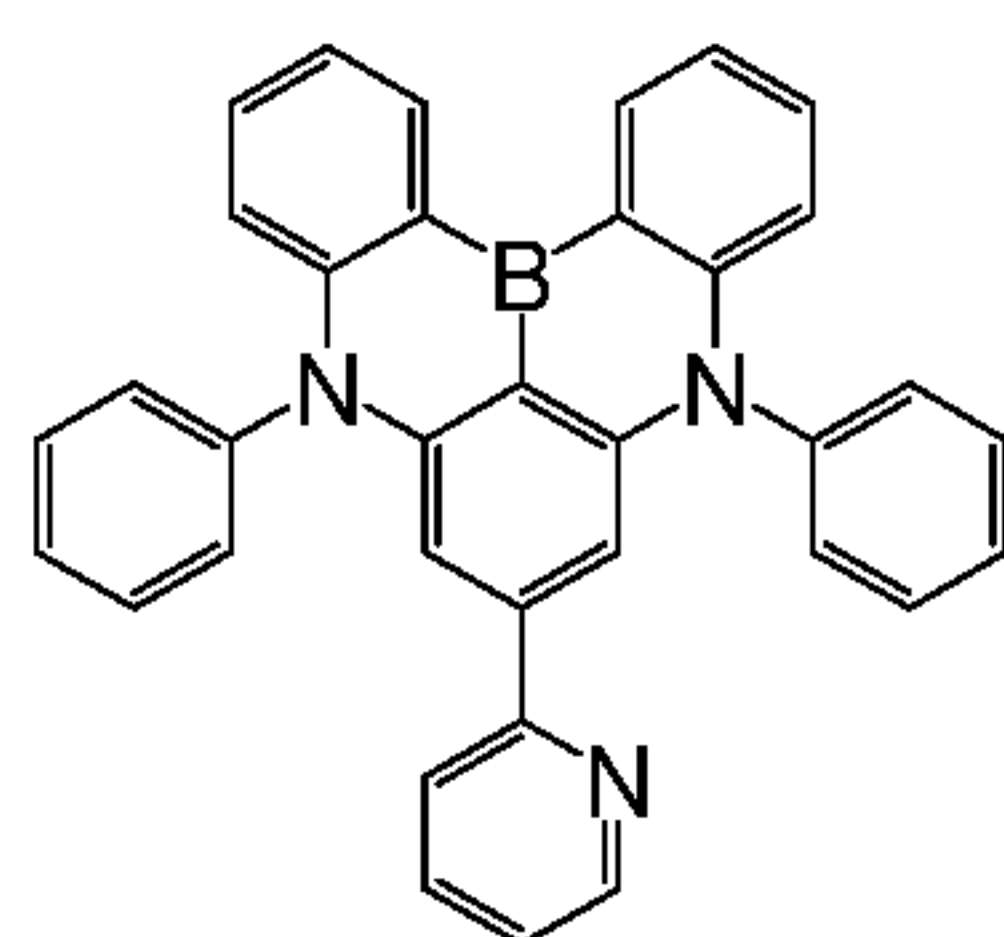
C-82



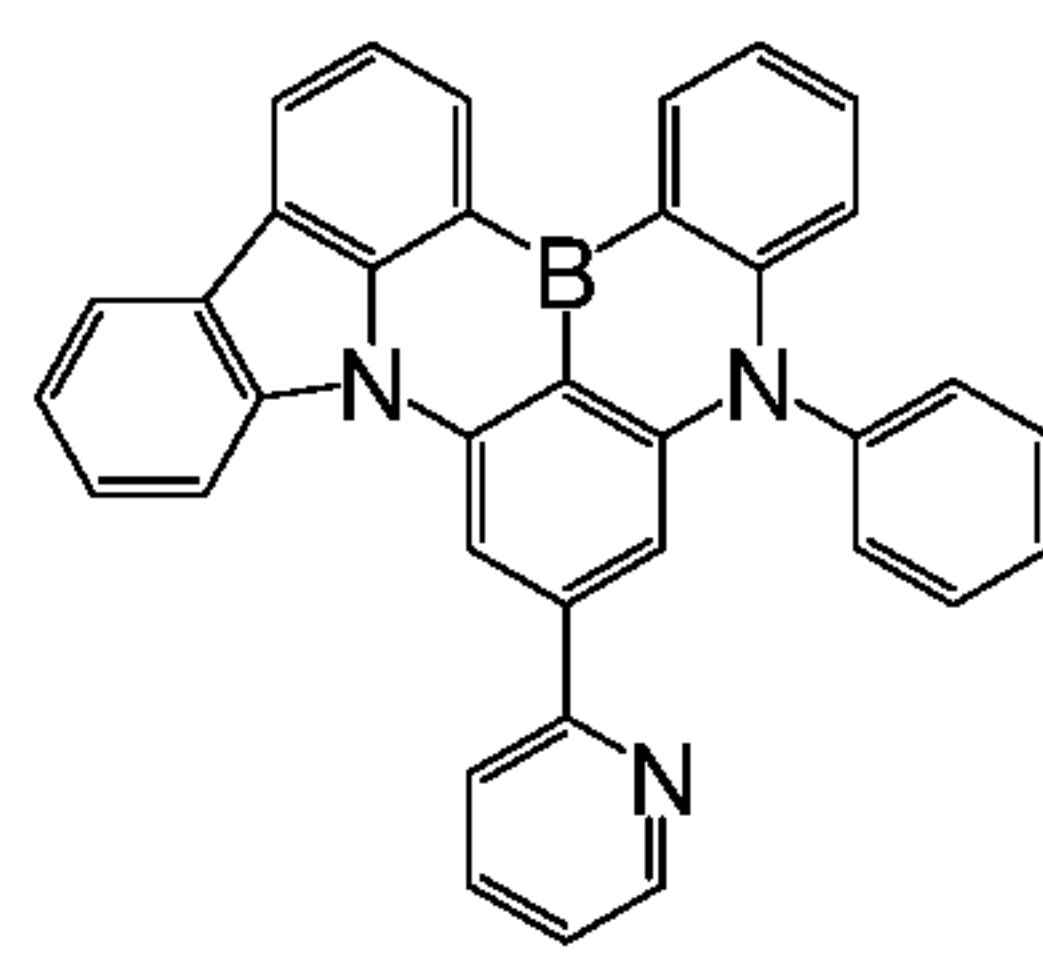
C-83



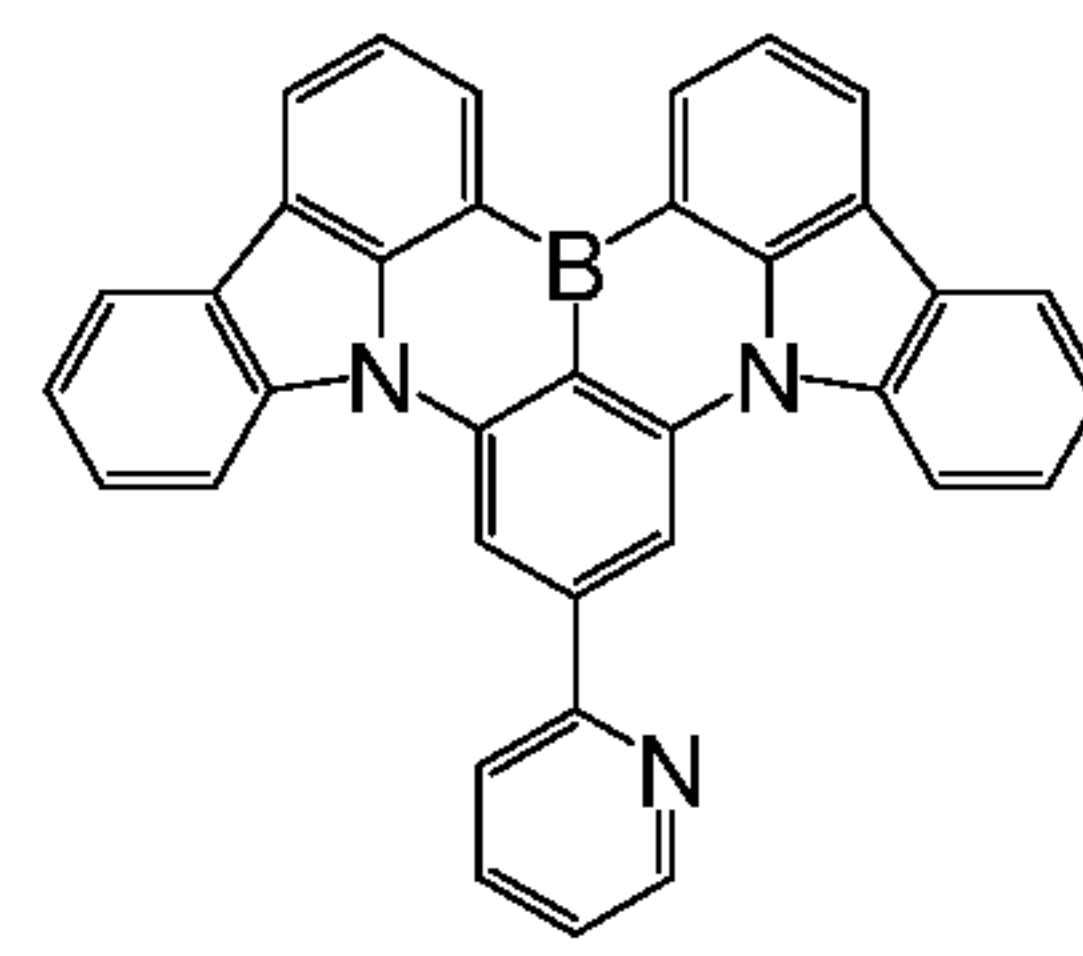
C-84



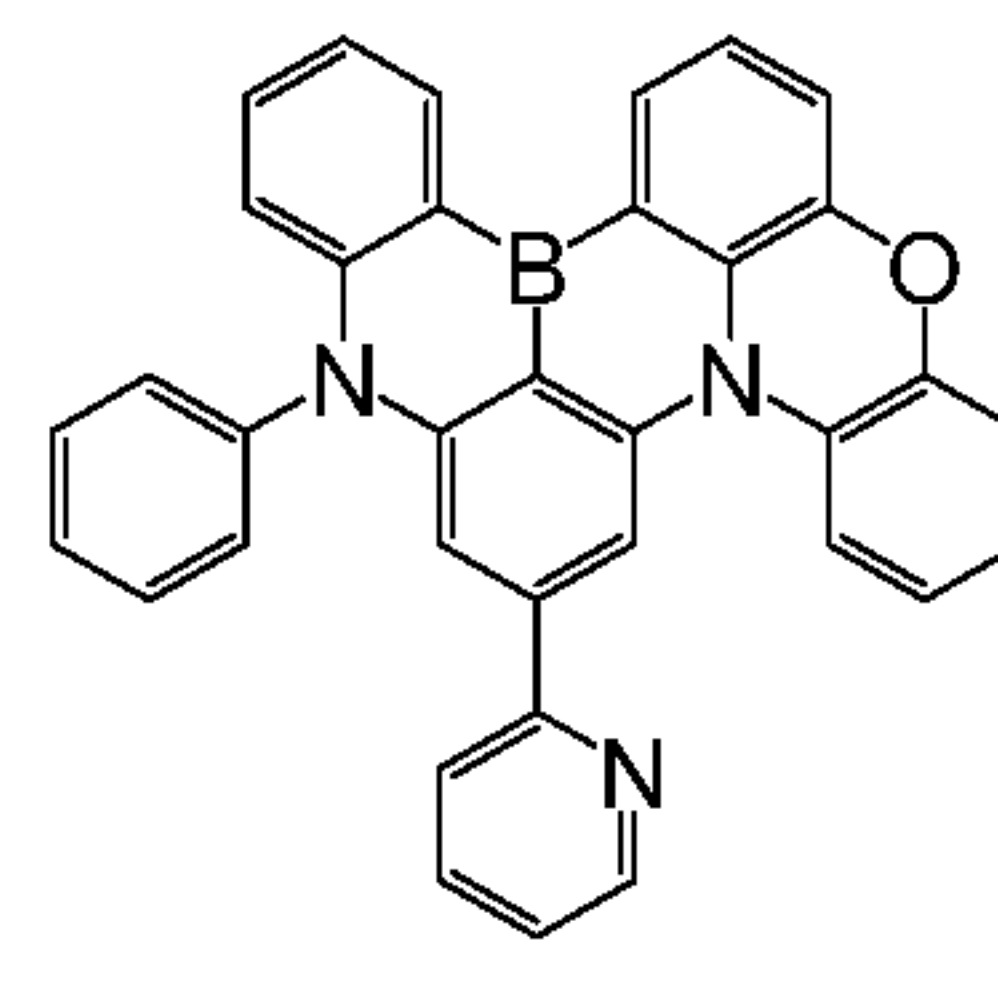
C-85



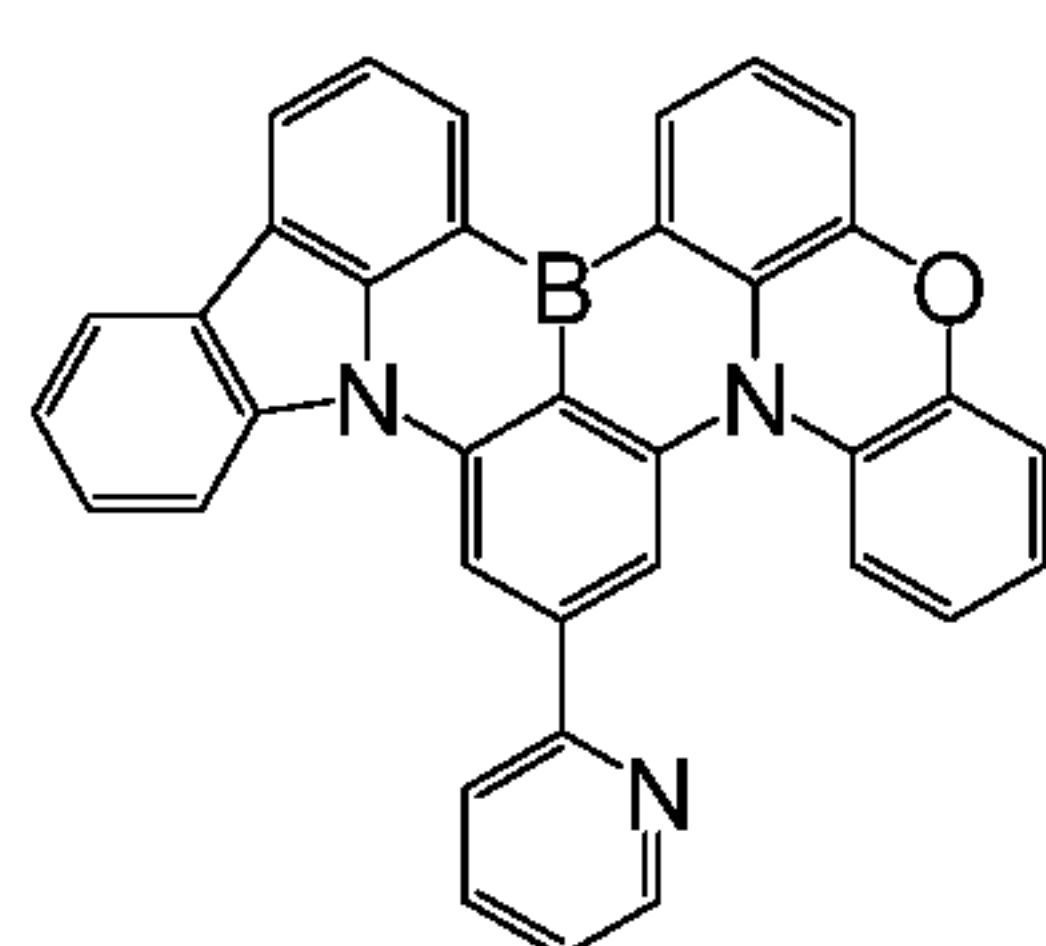
C-86



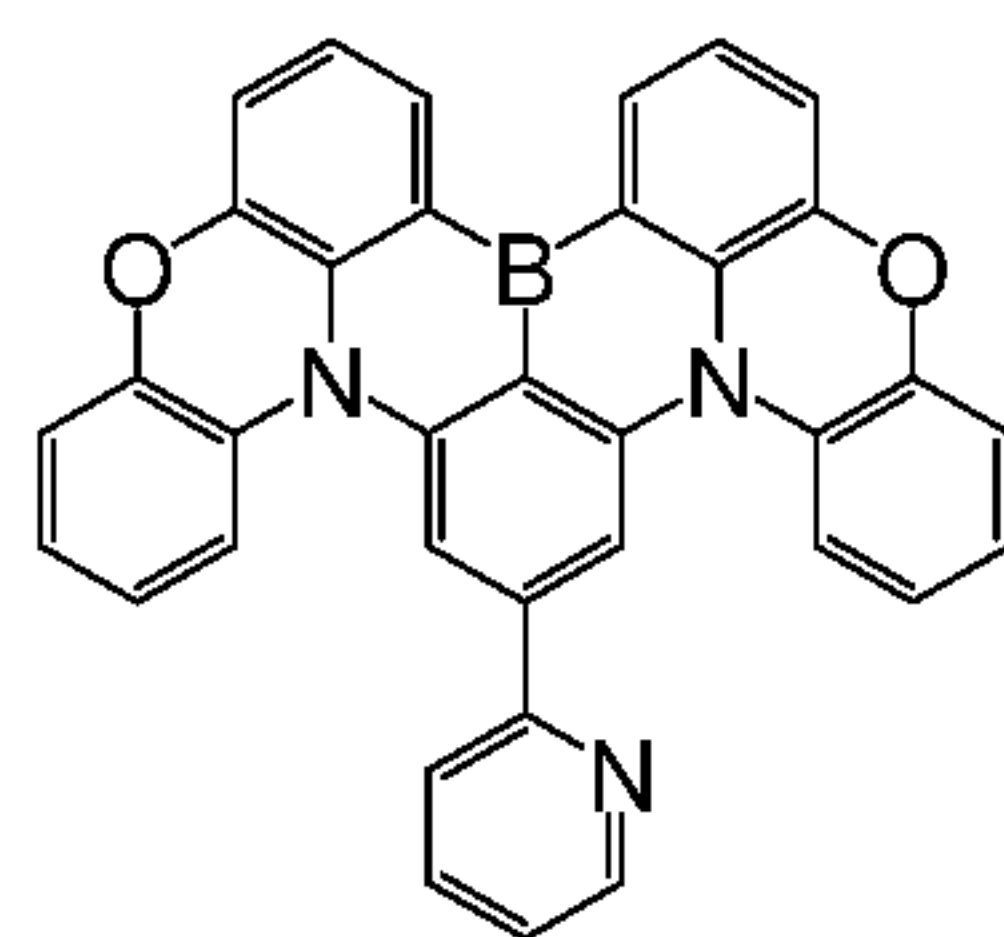
C-87



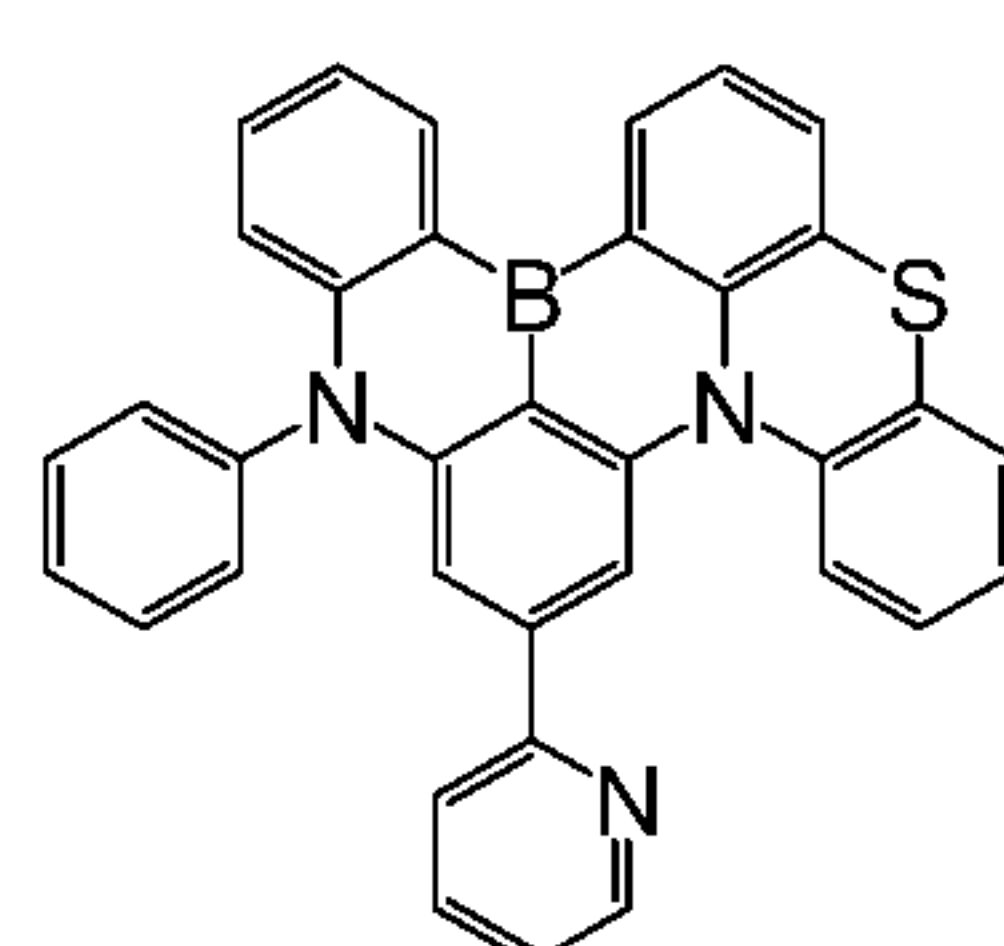
C-88



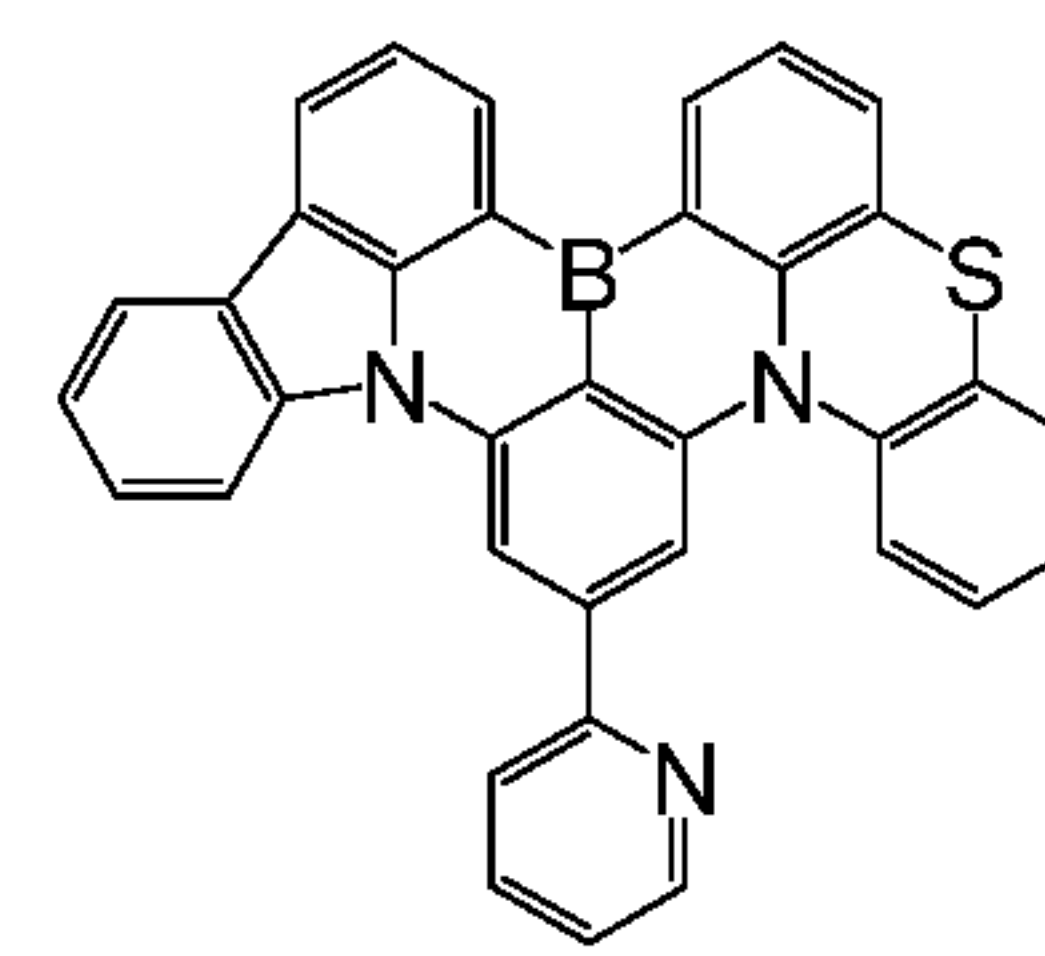
C-89



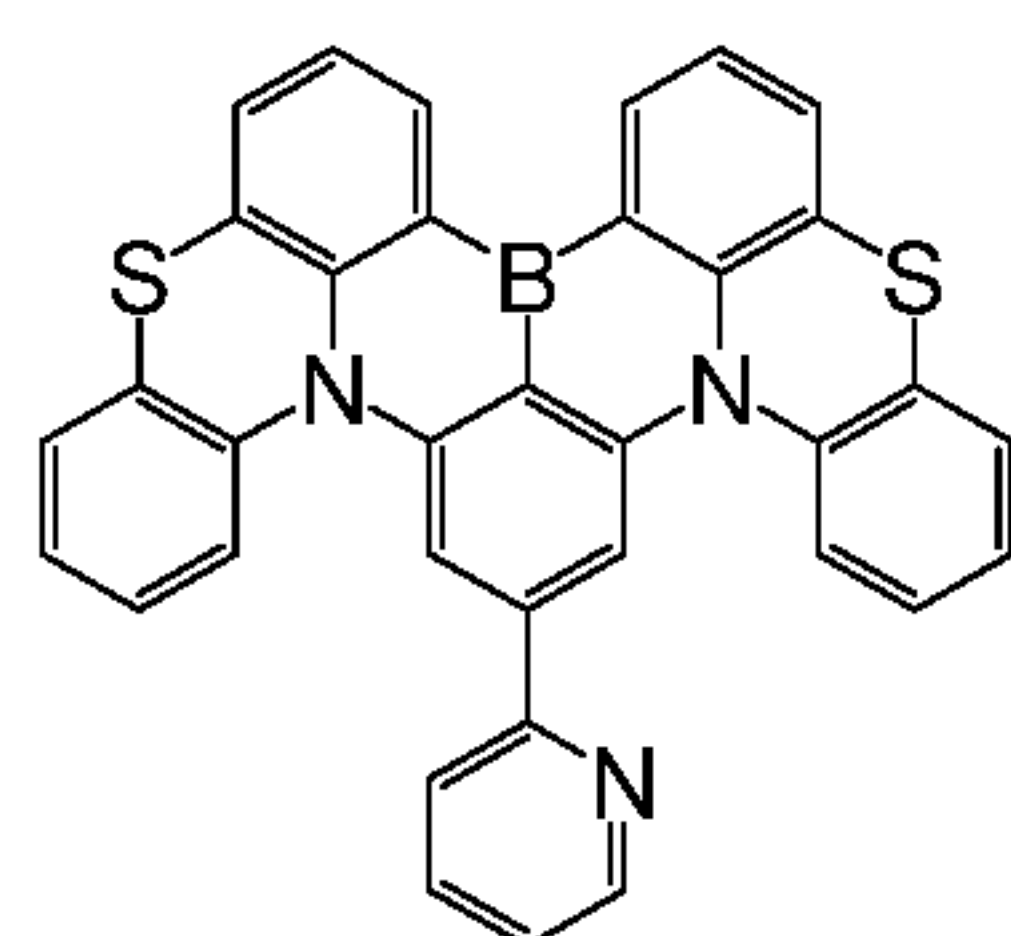
C-90



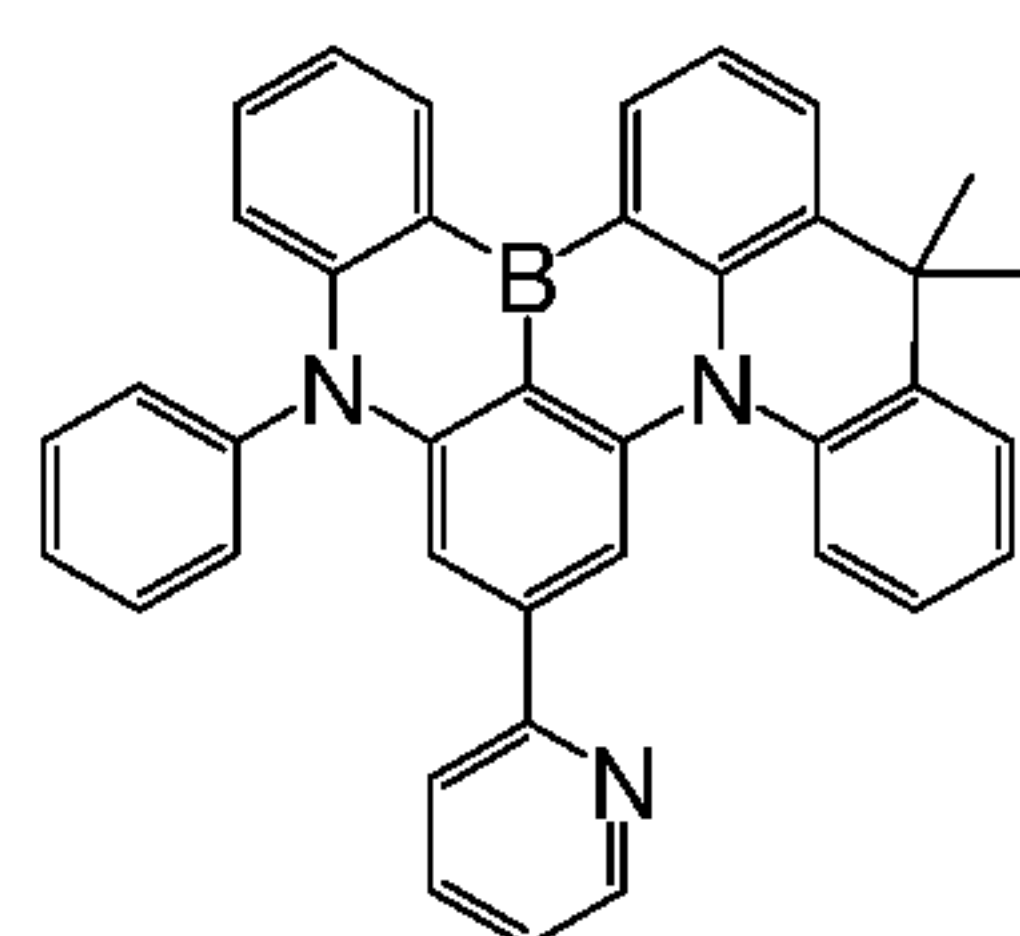
C-91



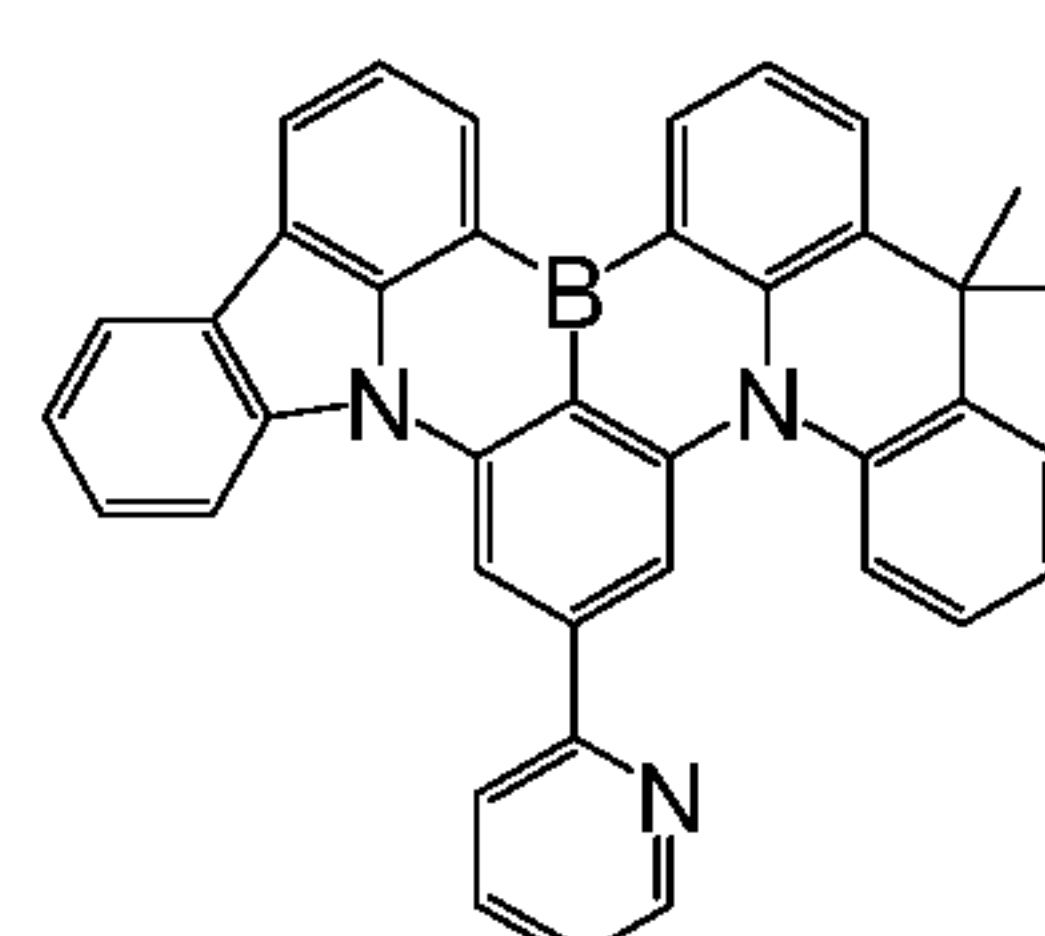
C-92



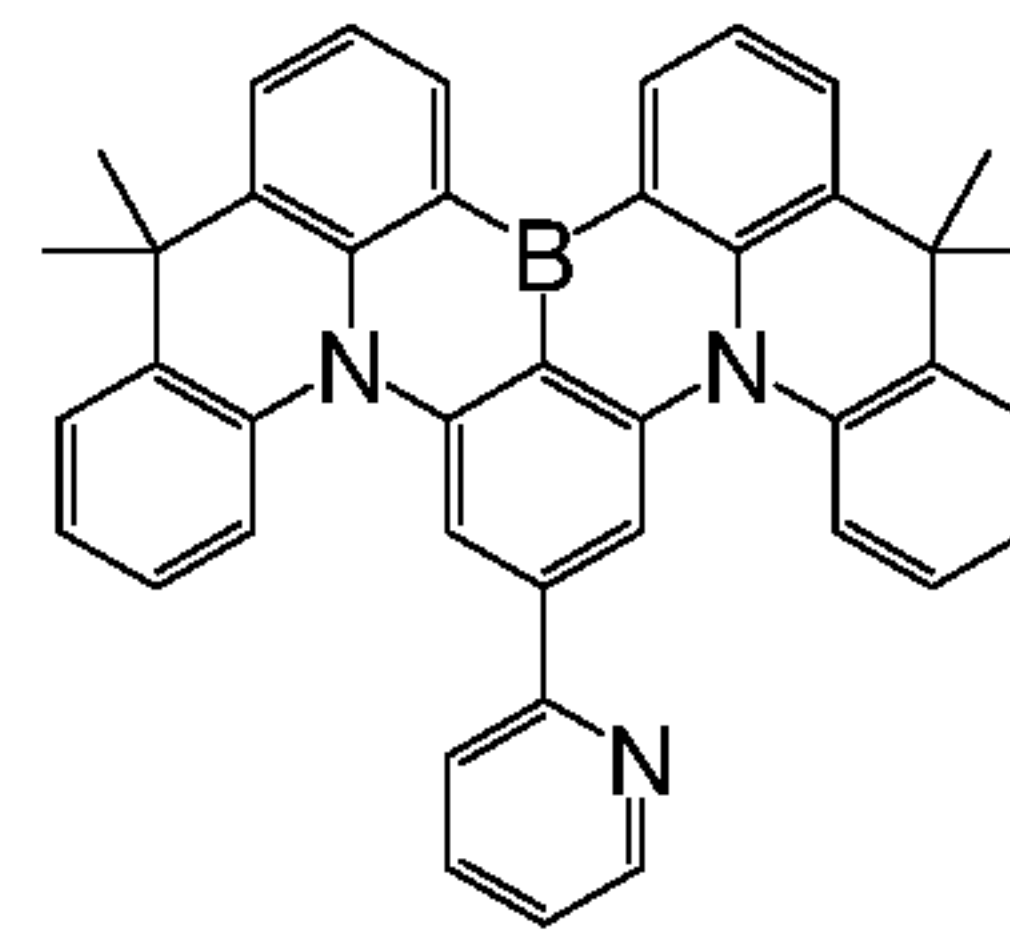
C-93



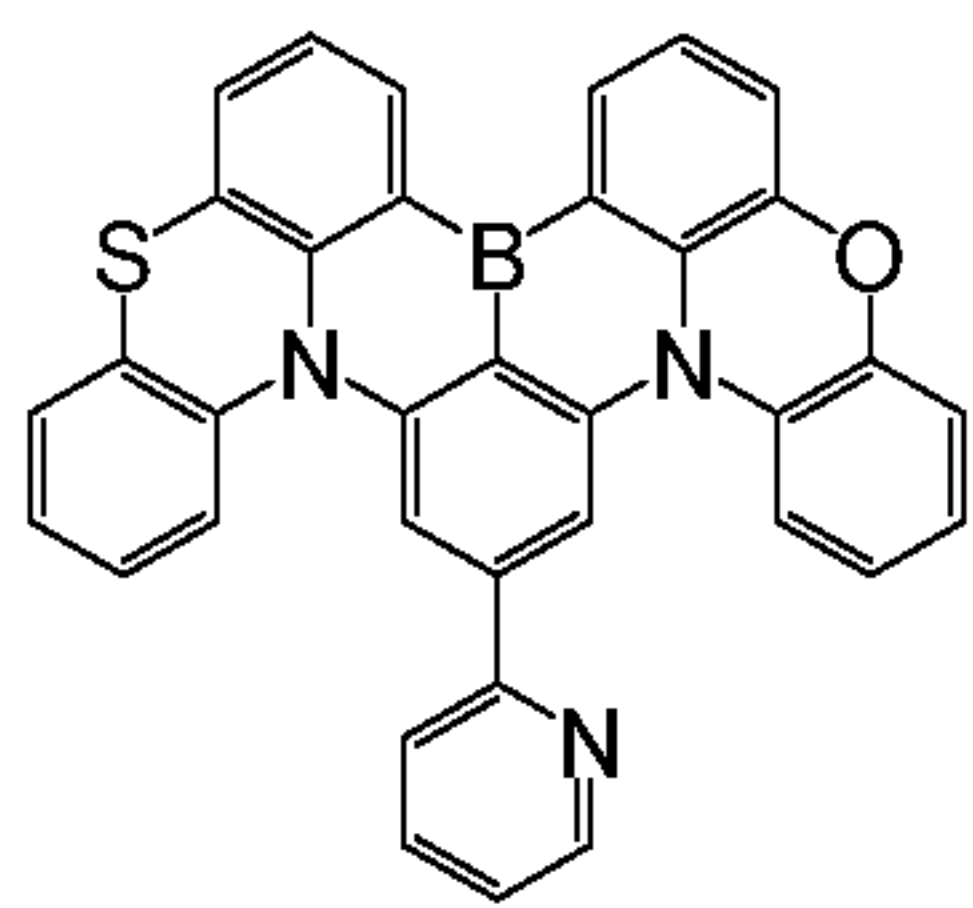
C-94



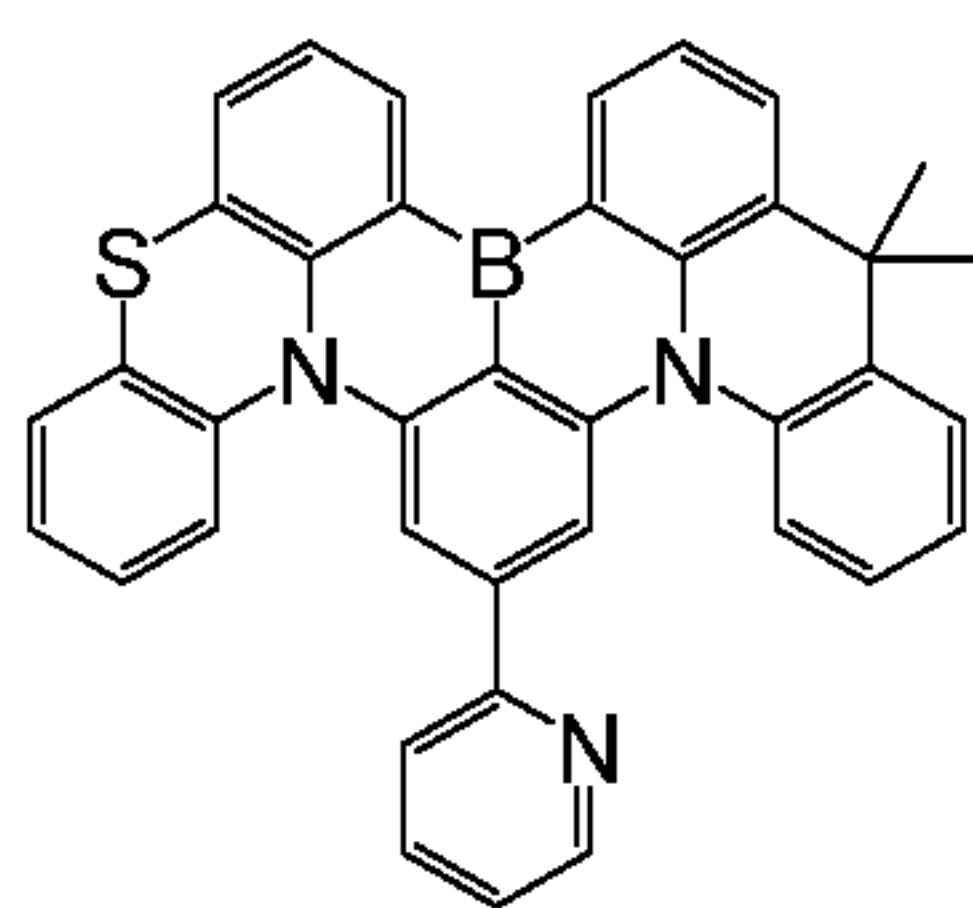
C-95



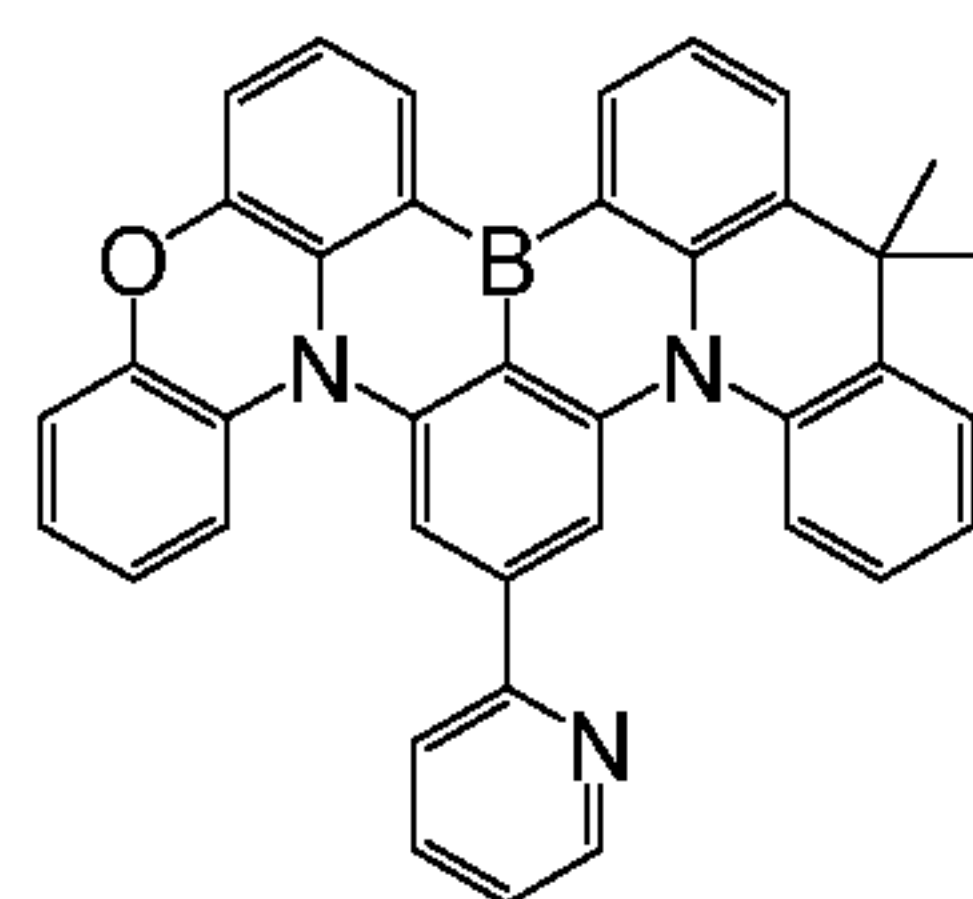
C-96



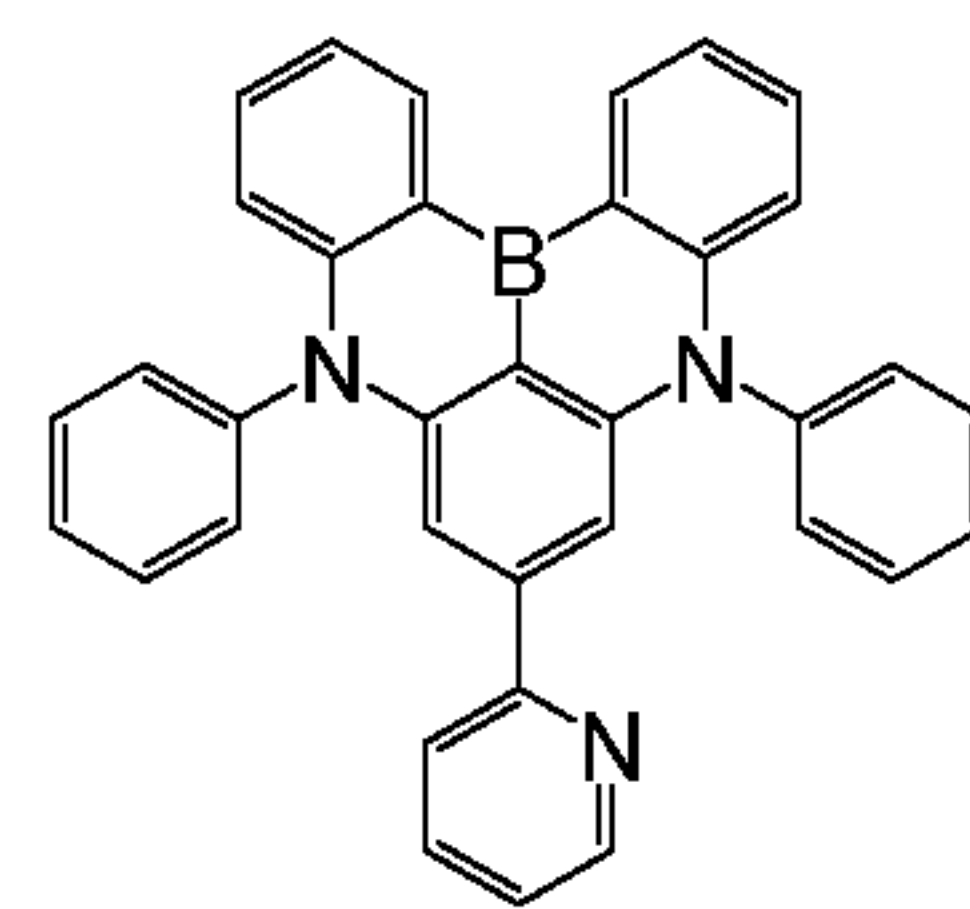
C-97



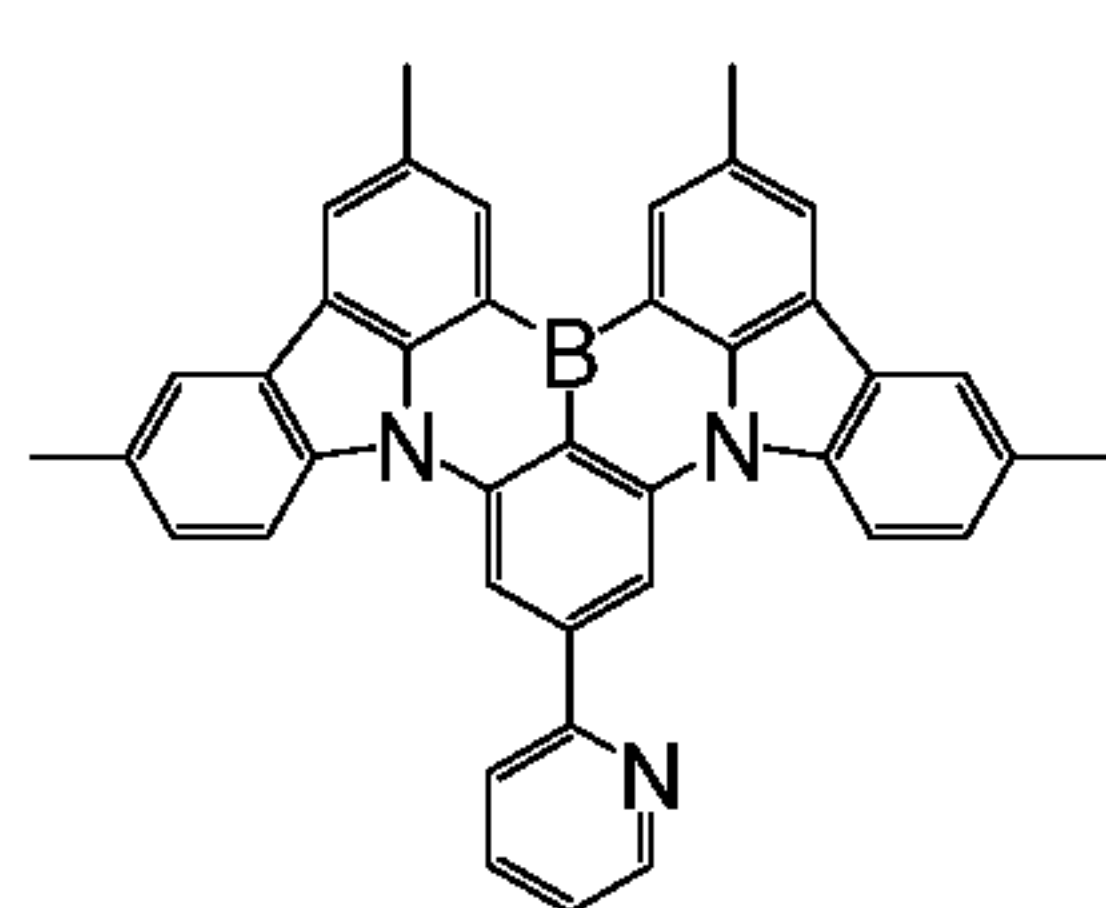
C-98



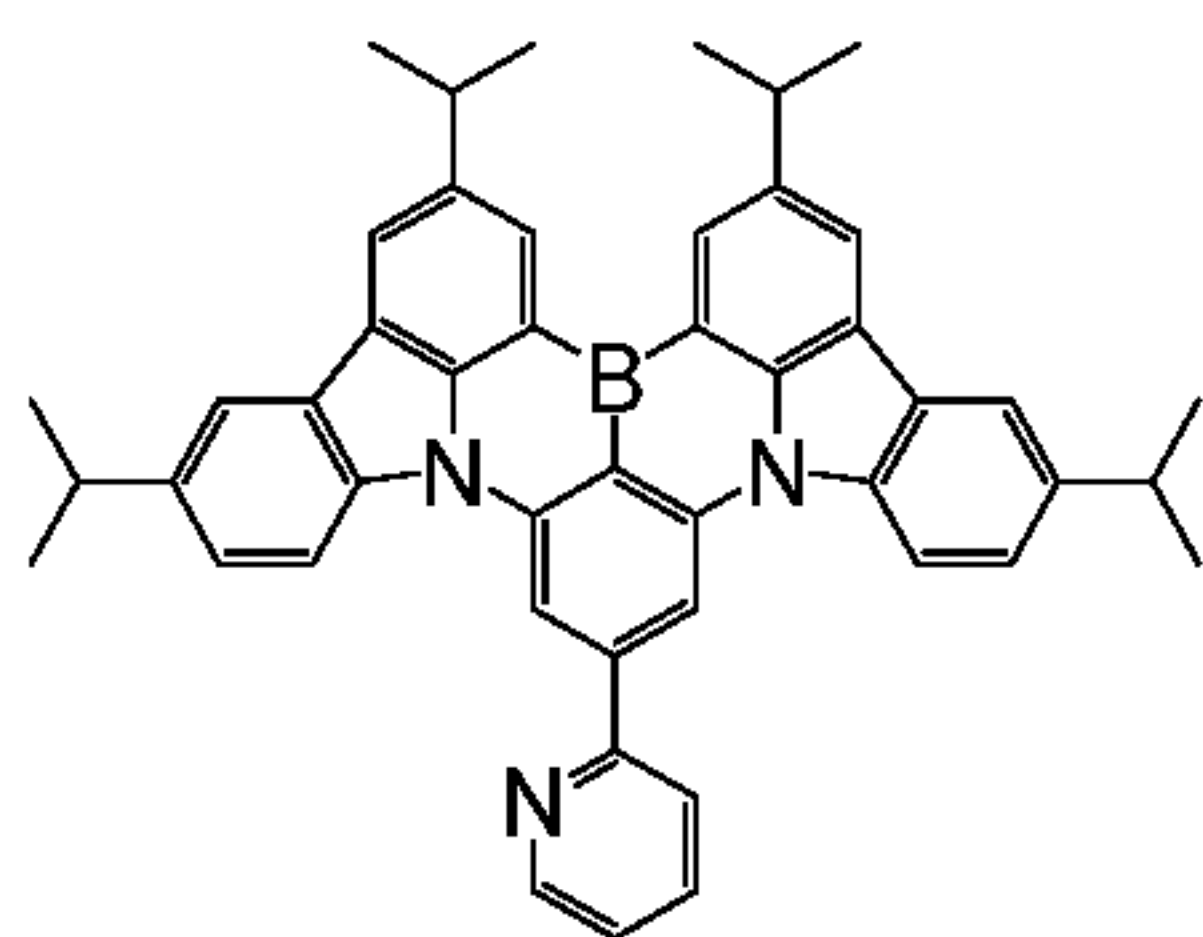
C-99



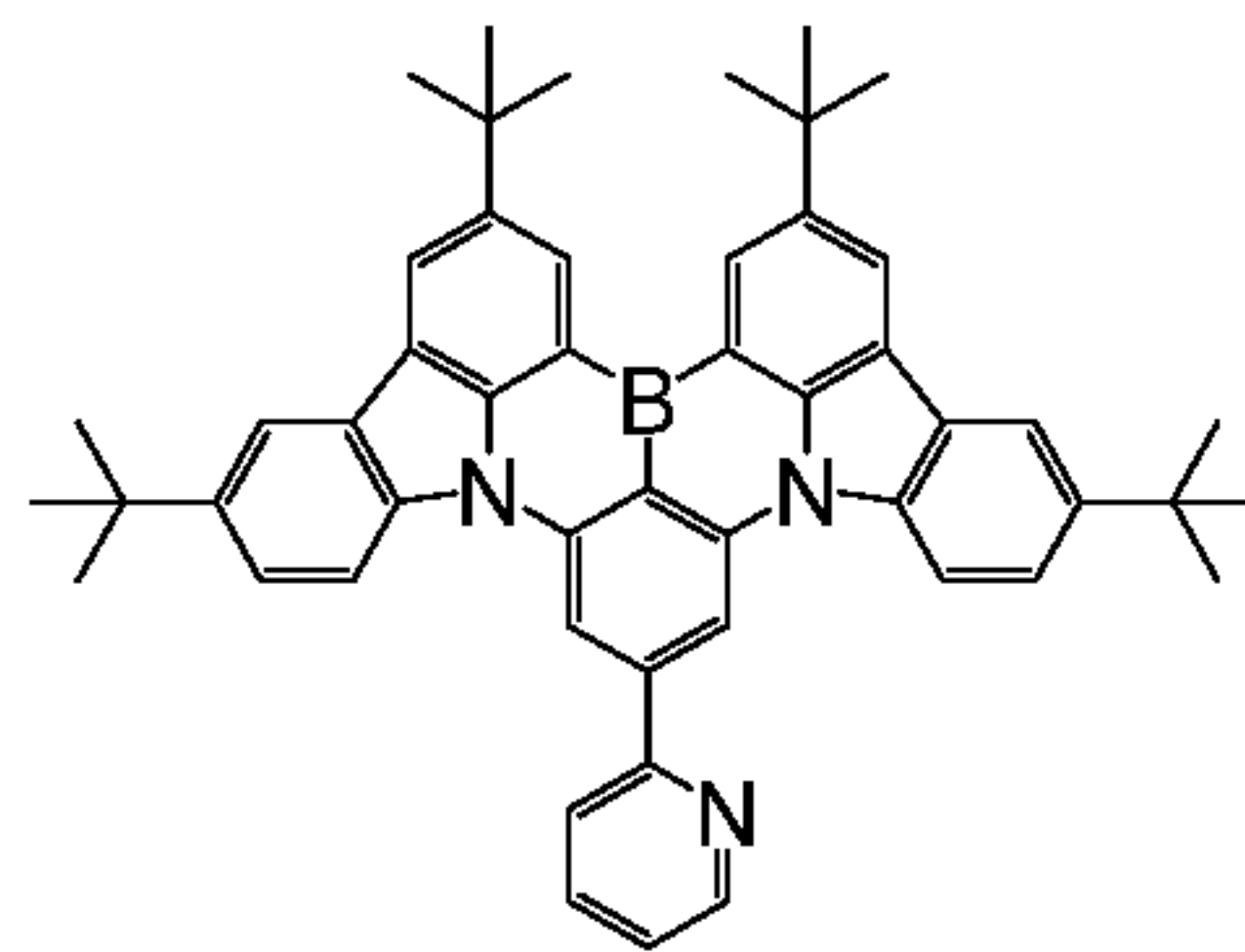
C-100



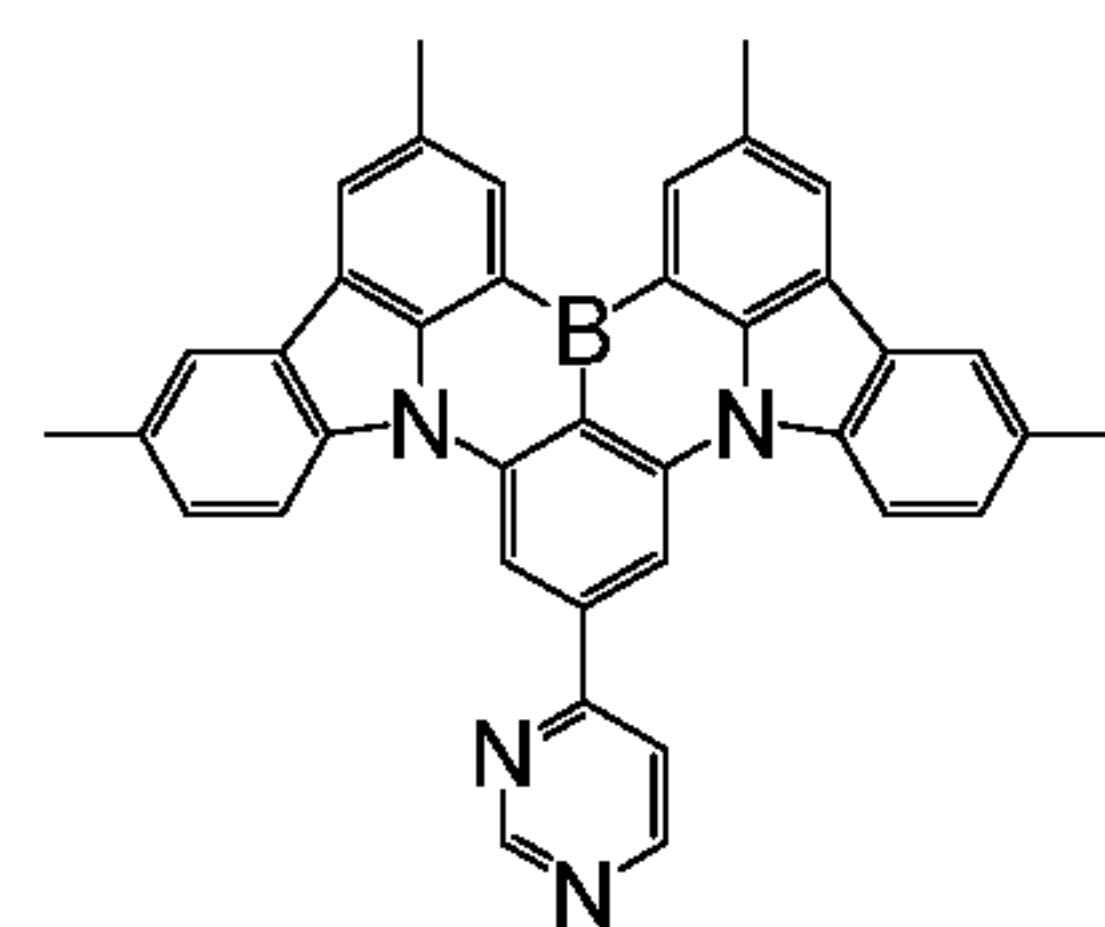
C-101



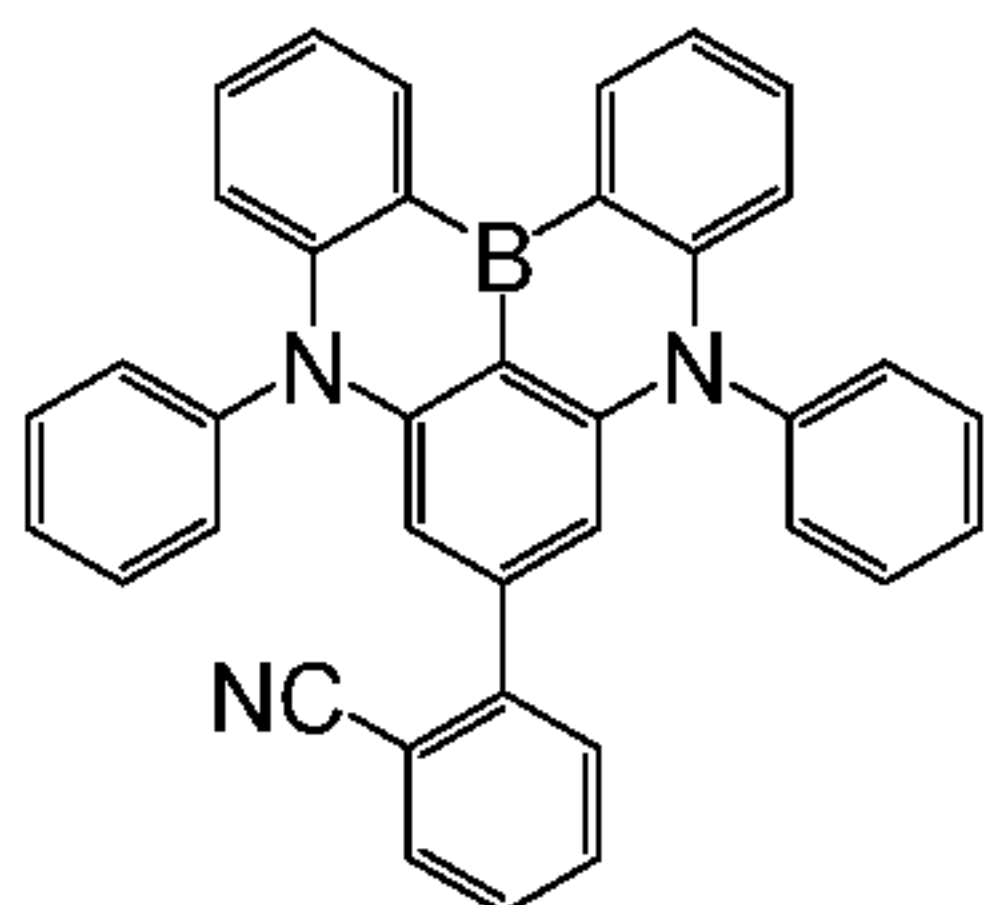
C-102



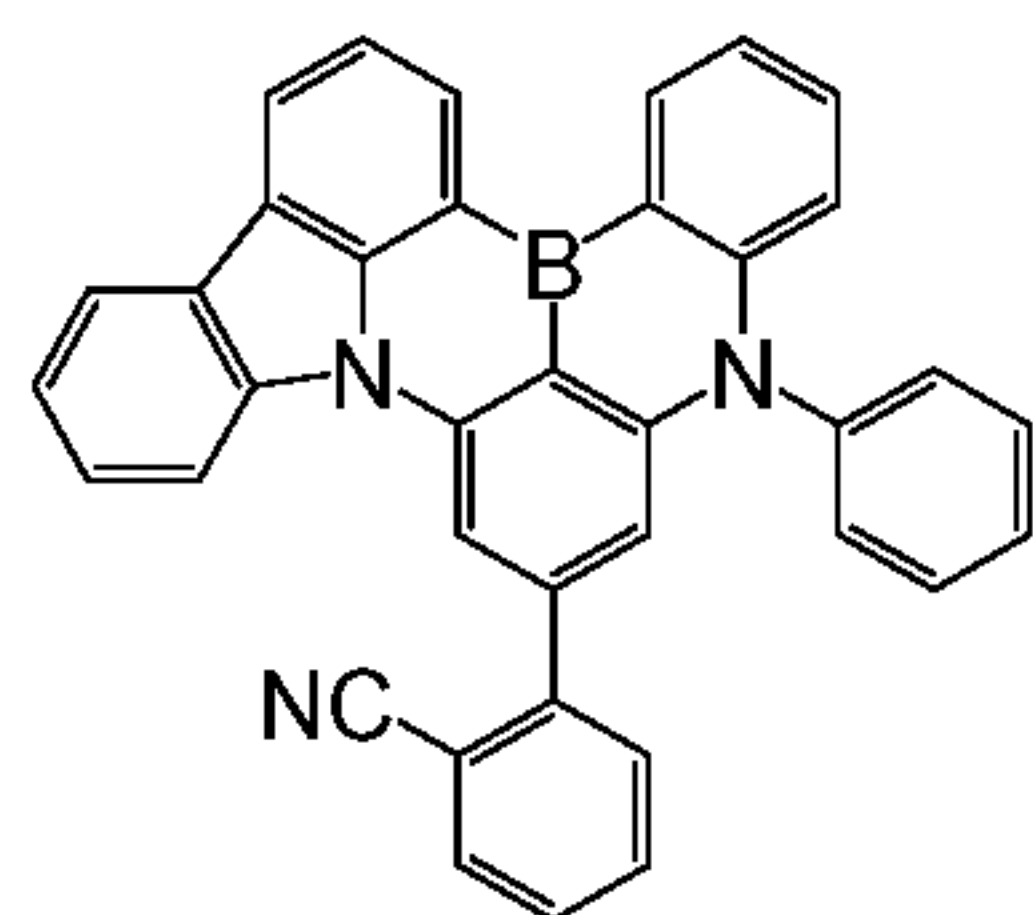
C-103



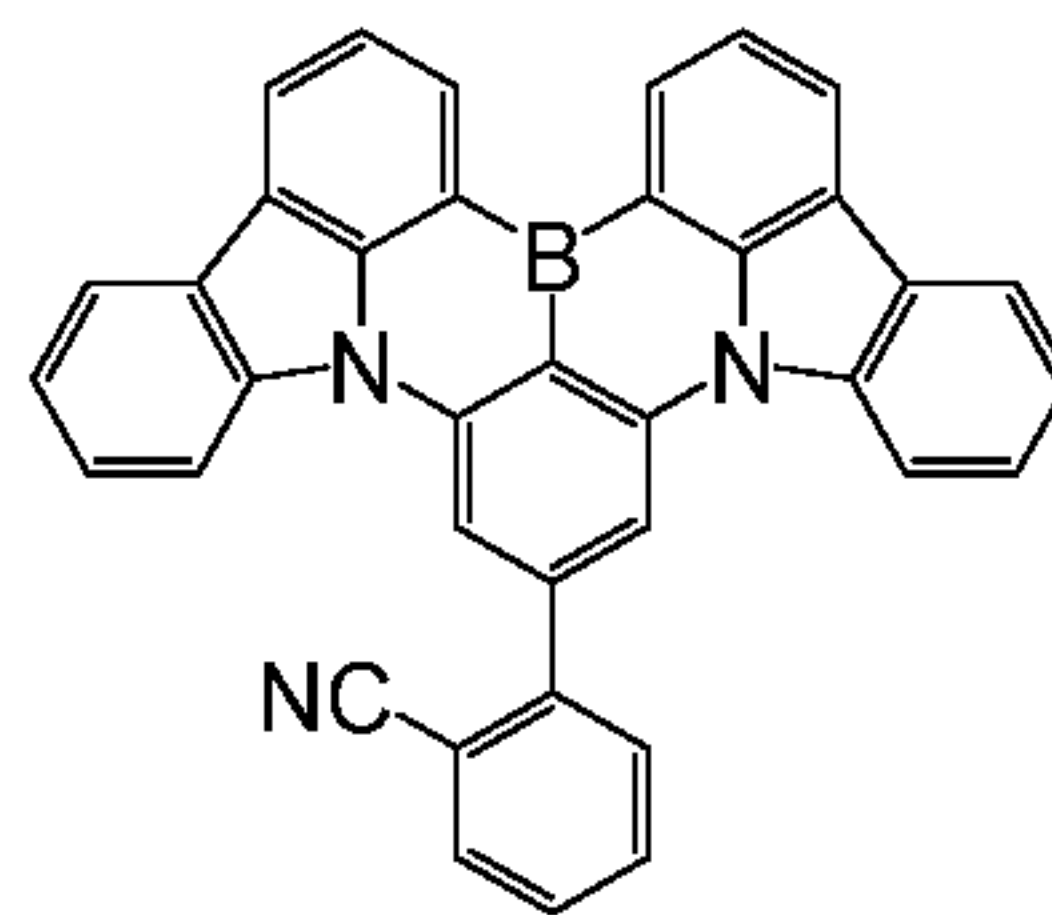
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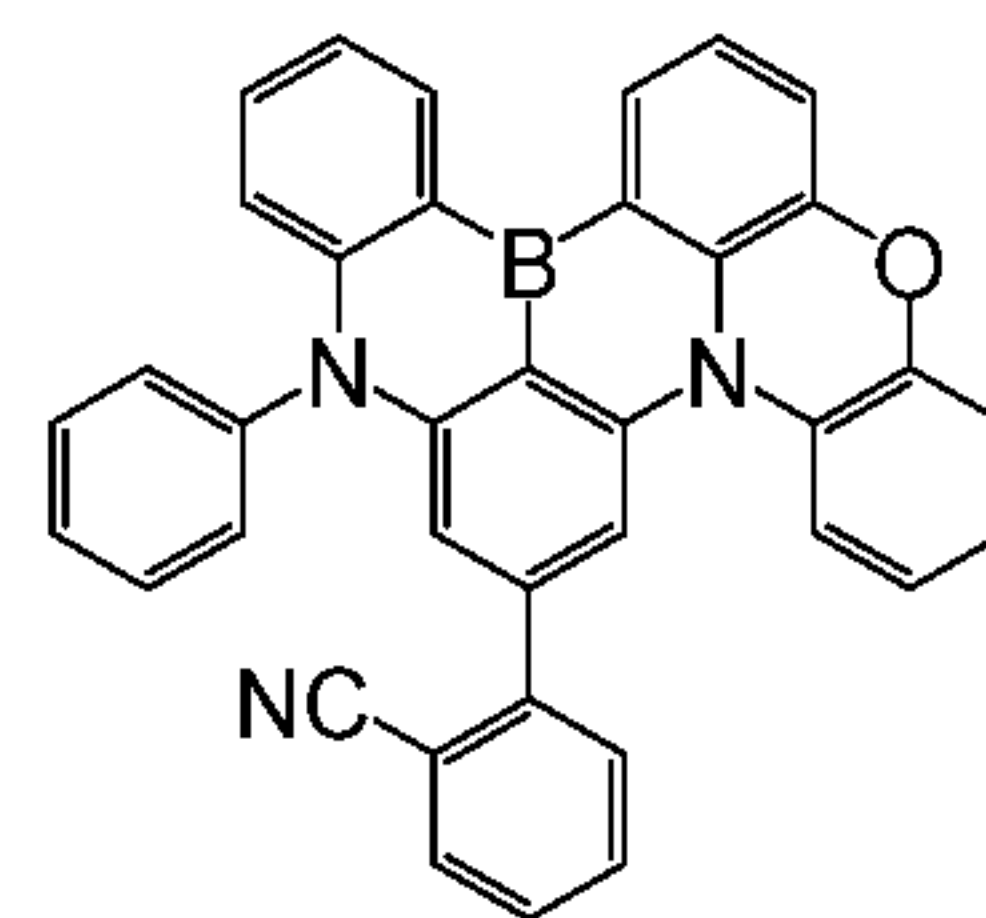
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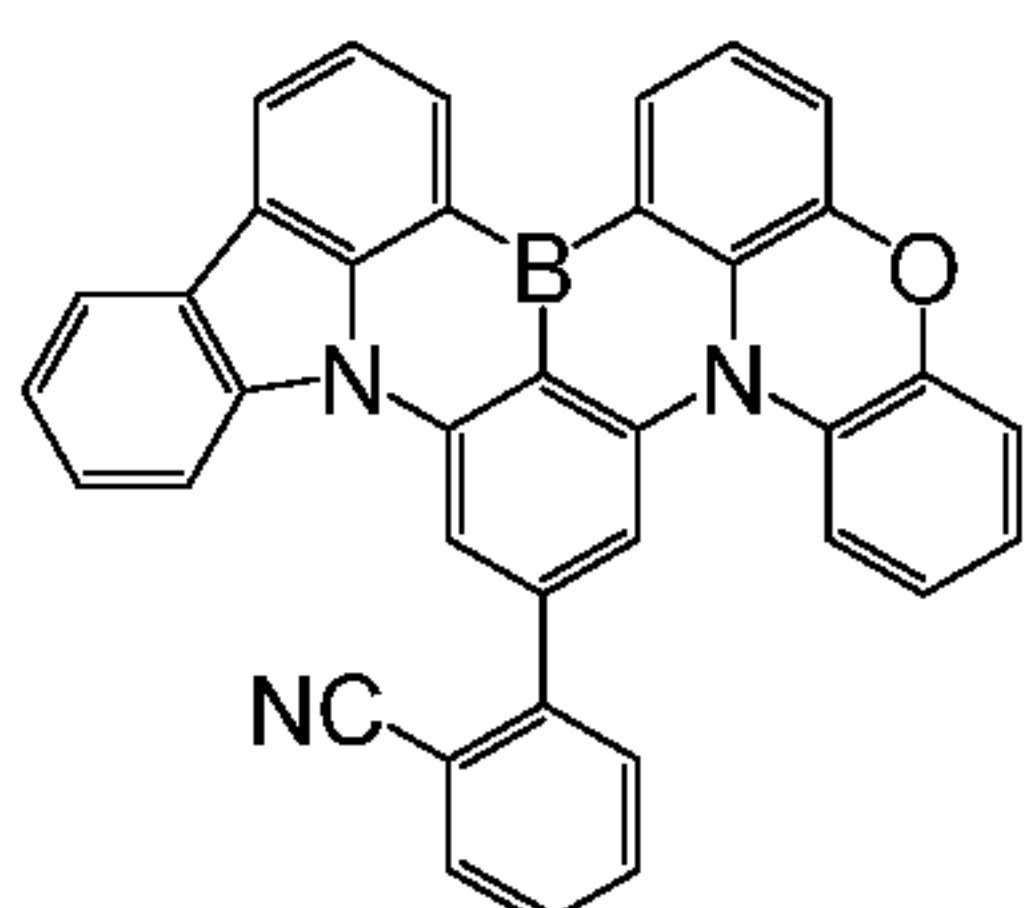
C-106



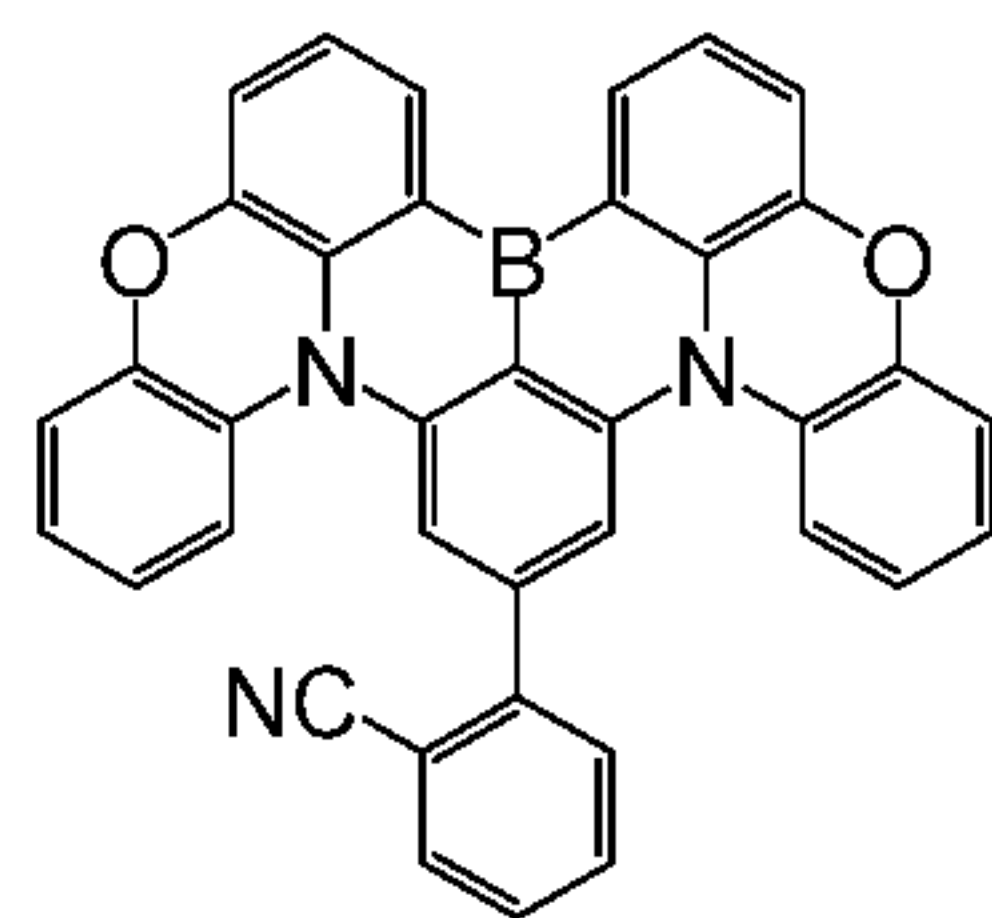
C-107



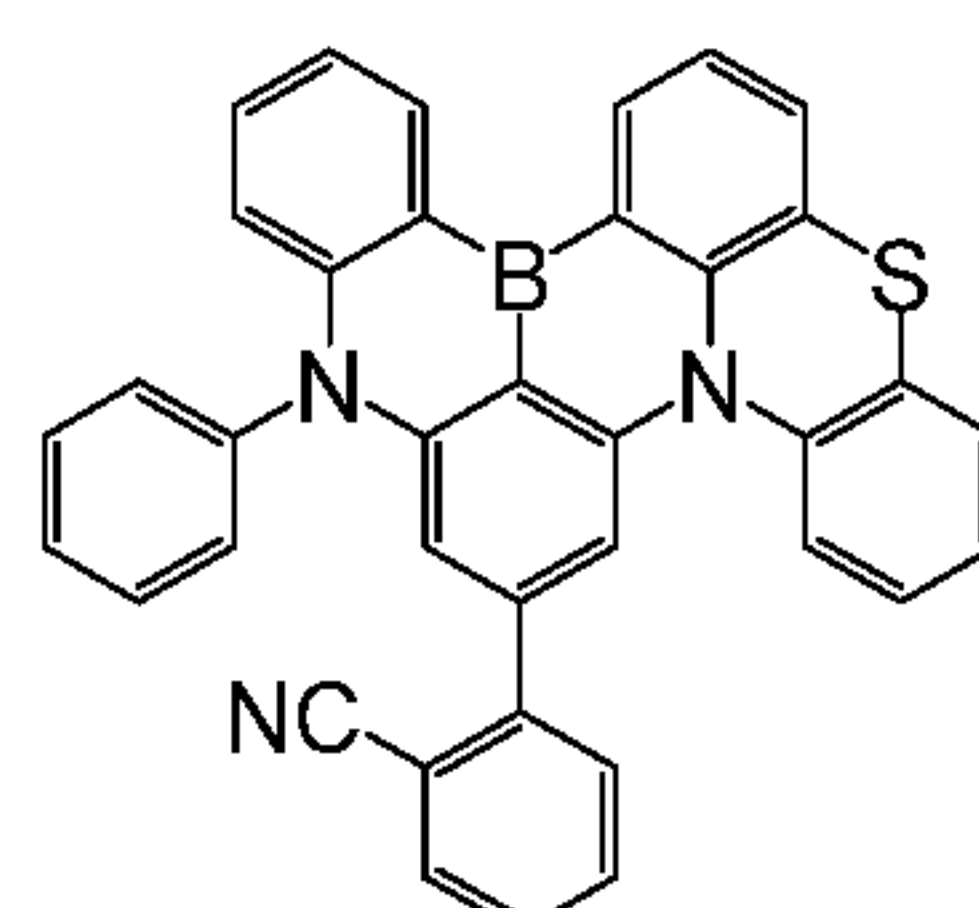
C-108



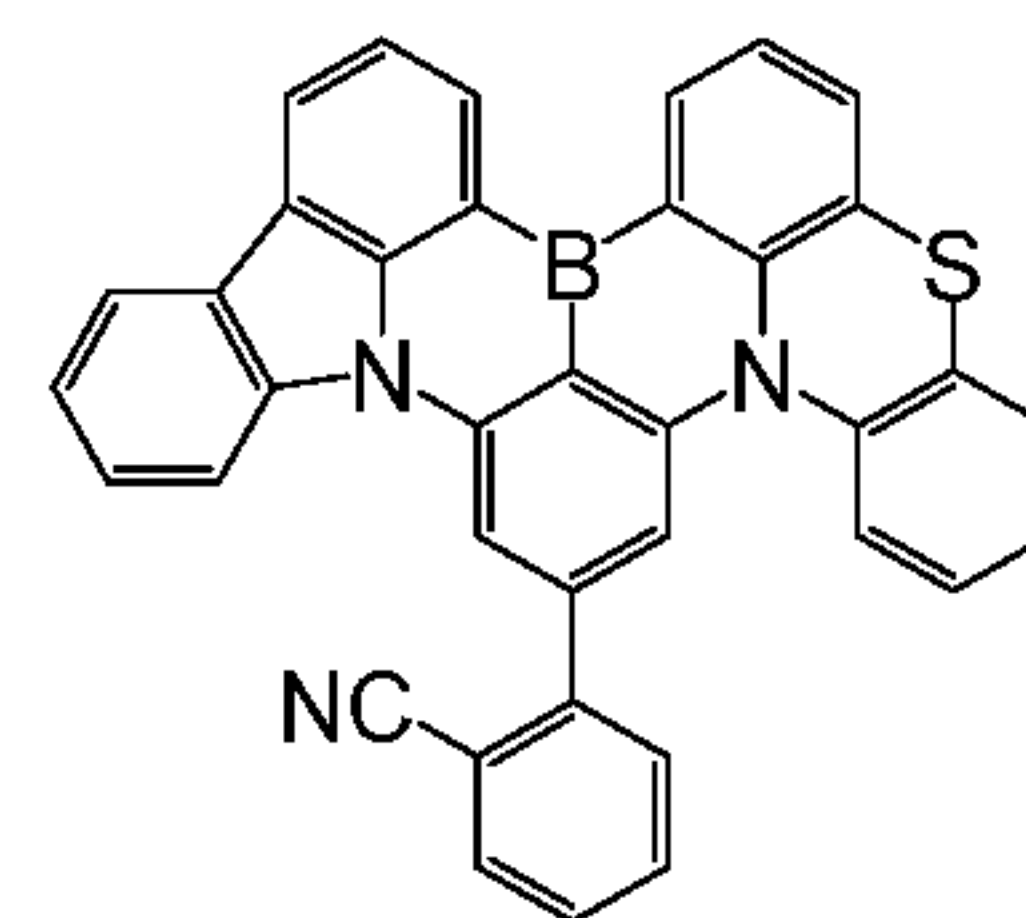
C-109



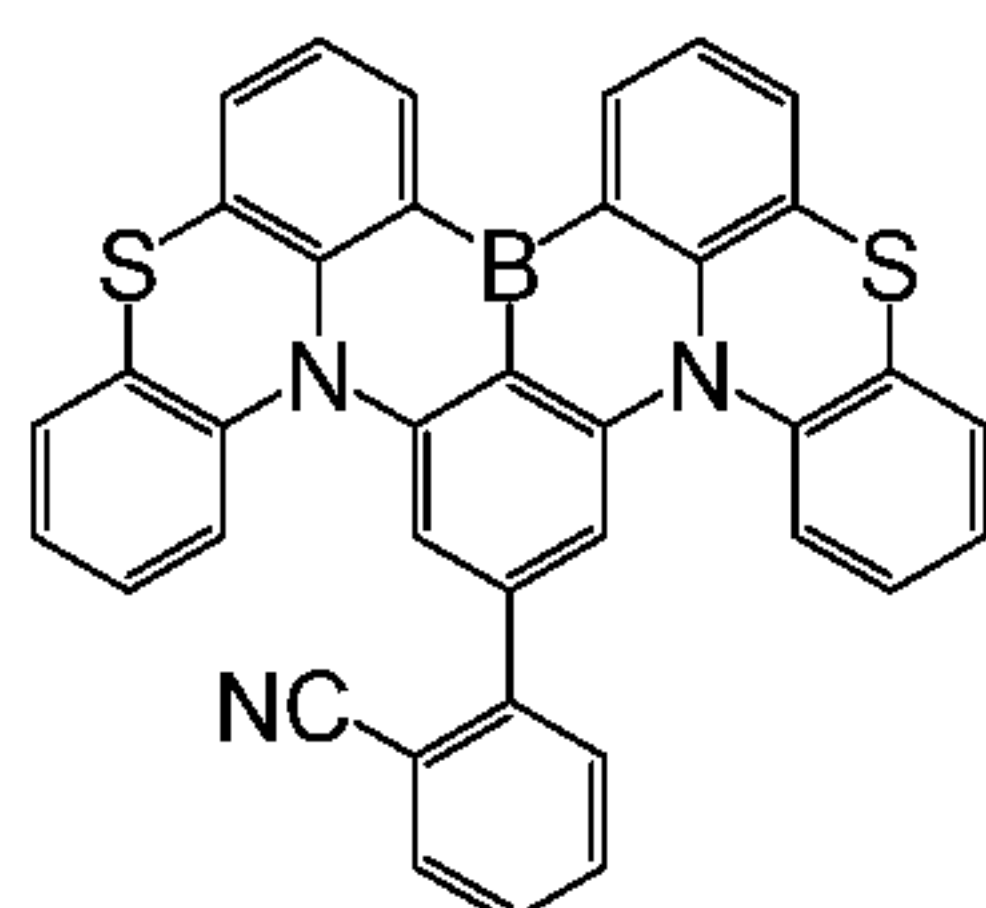
C-110



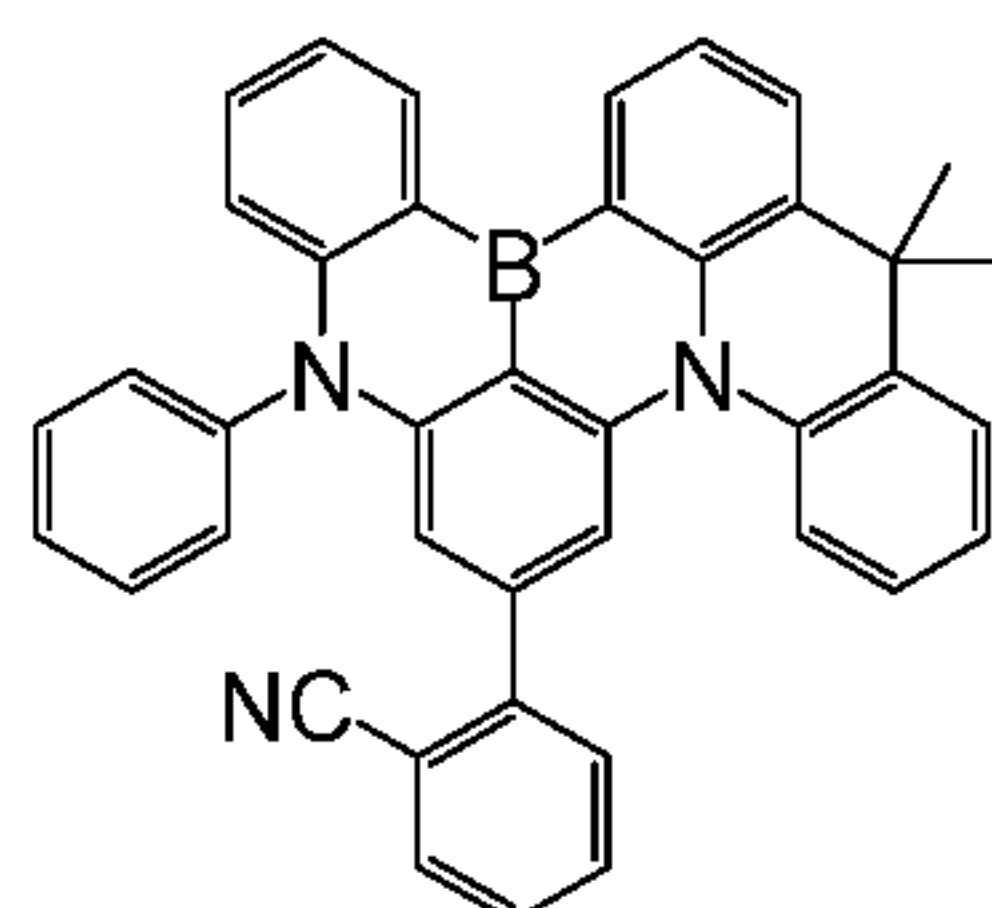
C-111



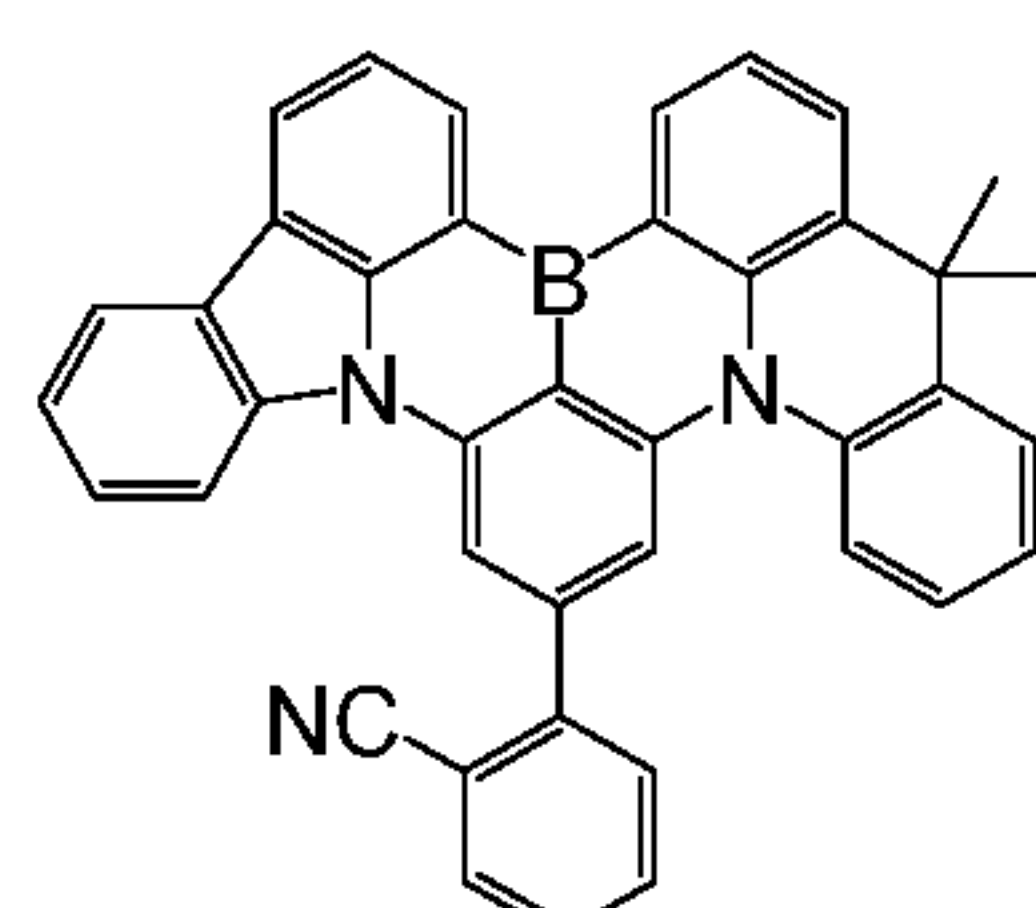
C-112



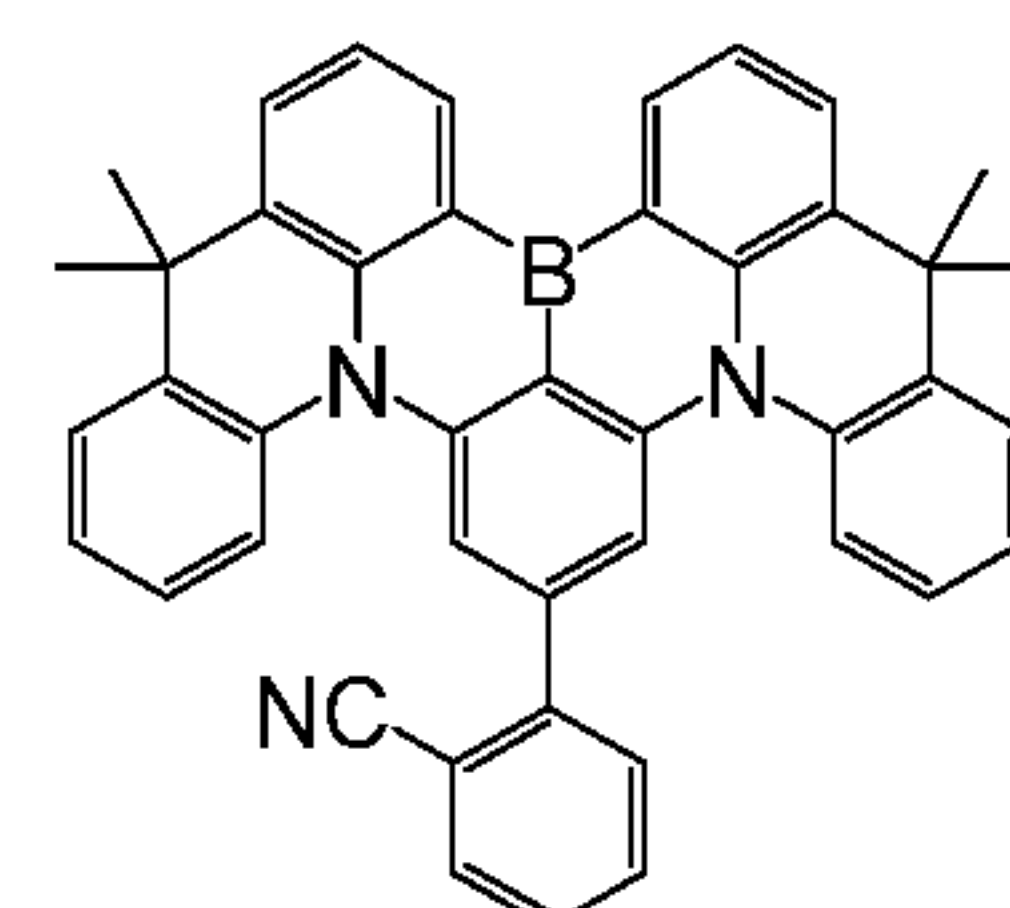
C-113



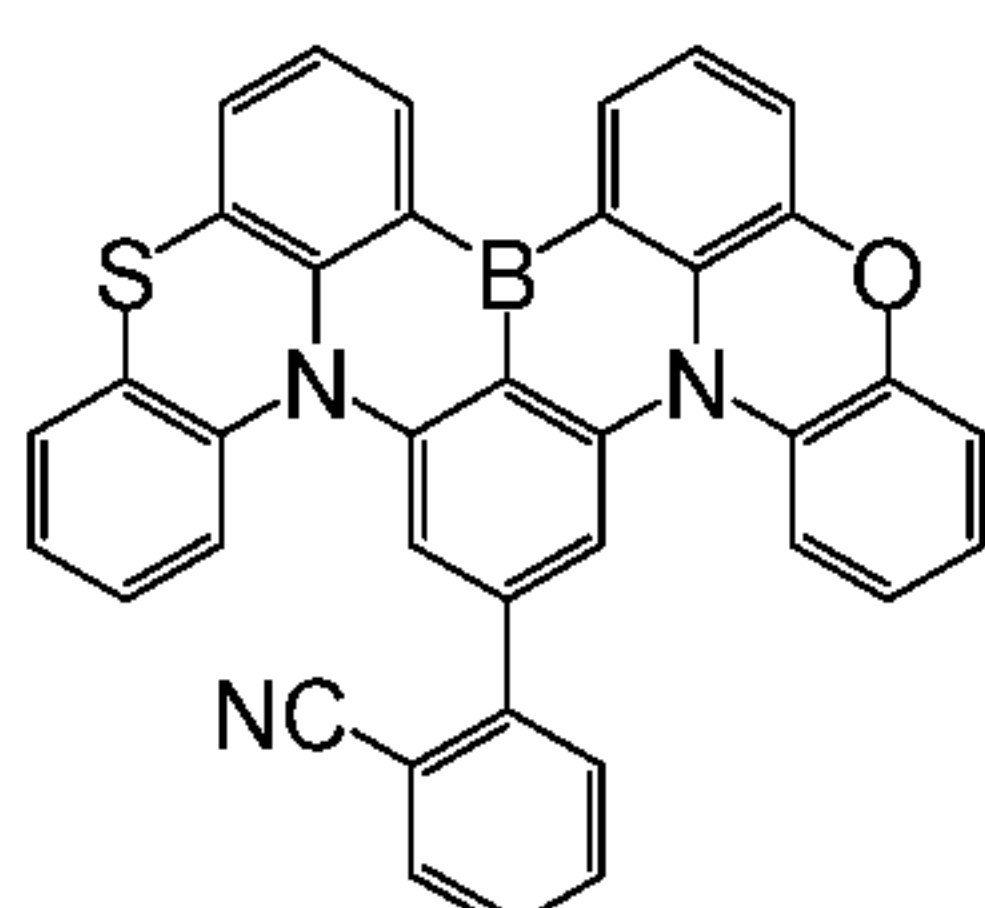
C-114



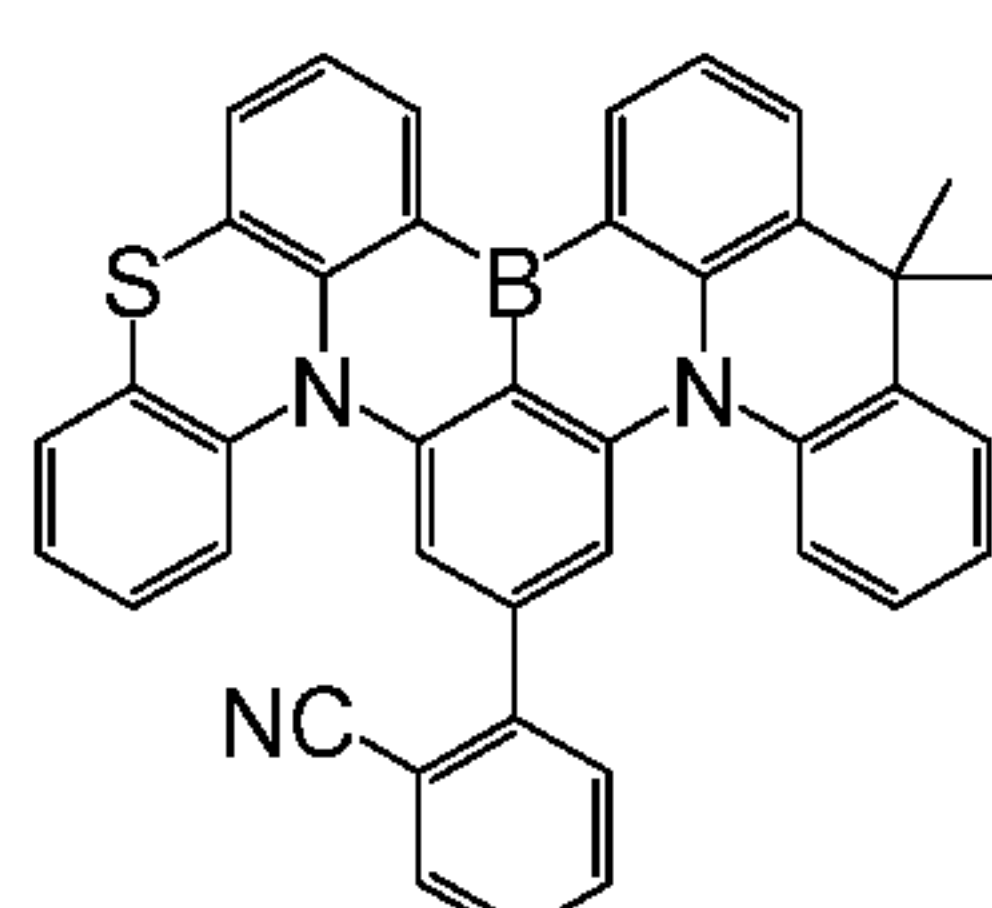
C-115



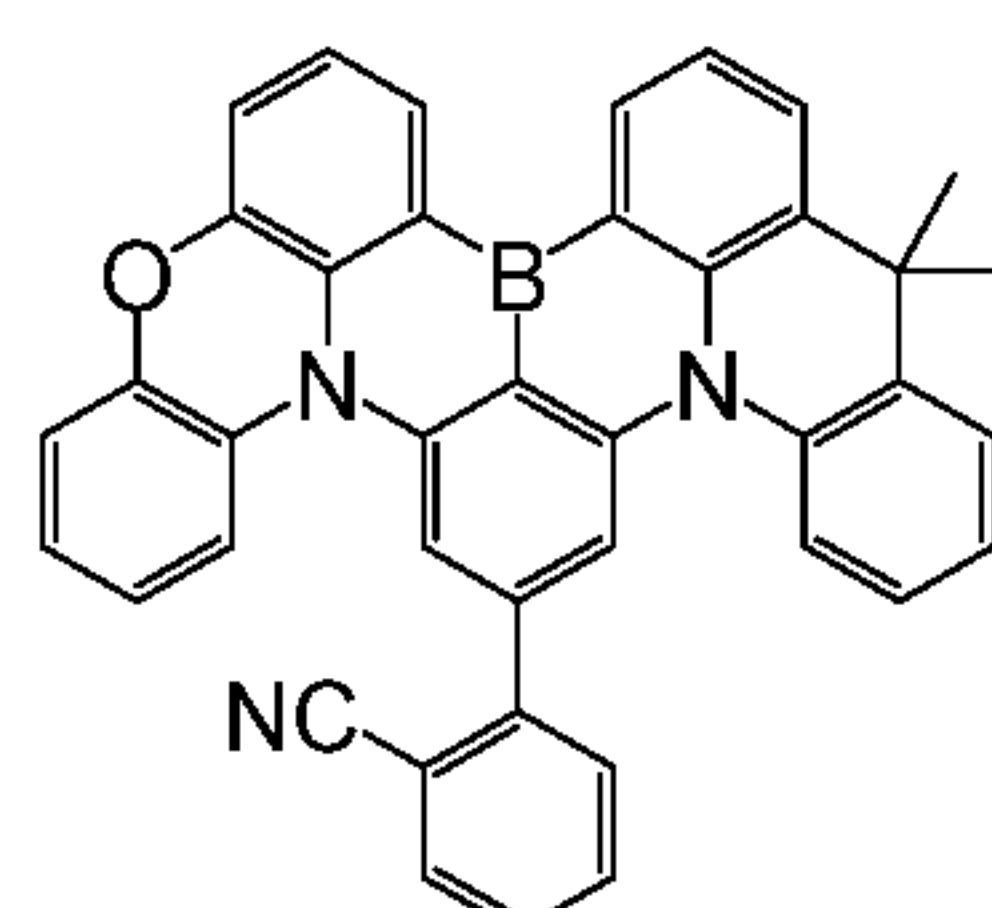
C-116



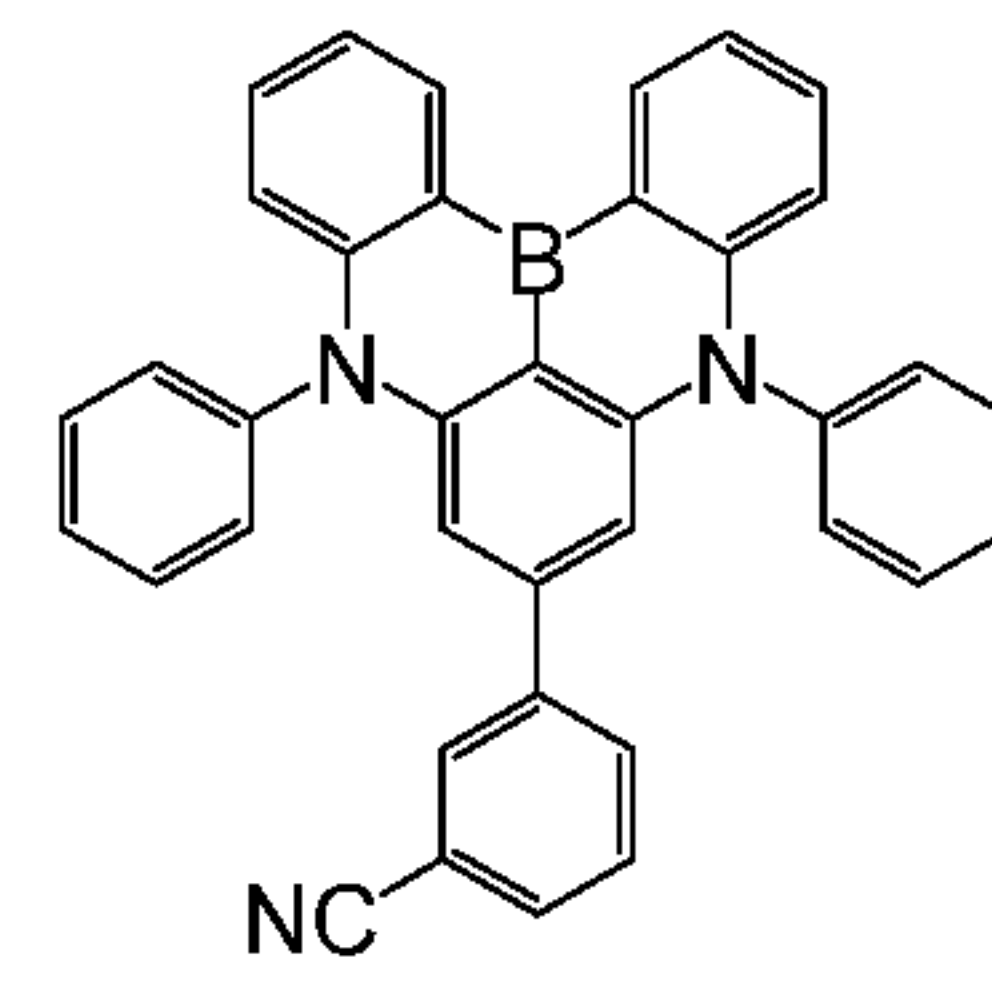
C-117



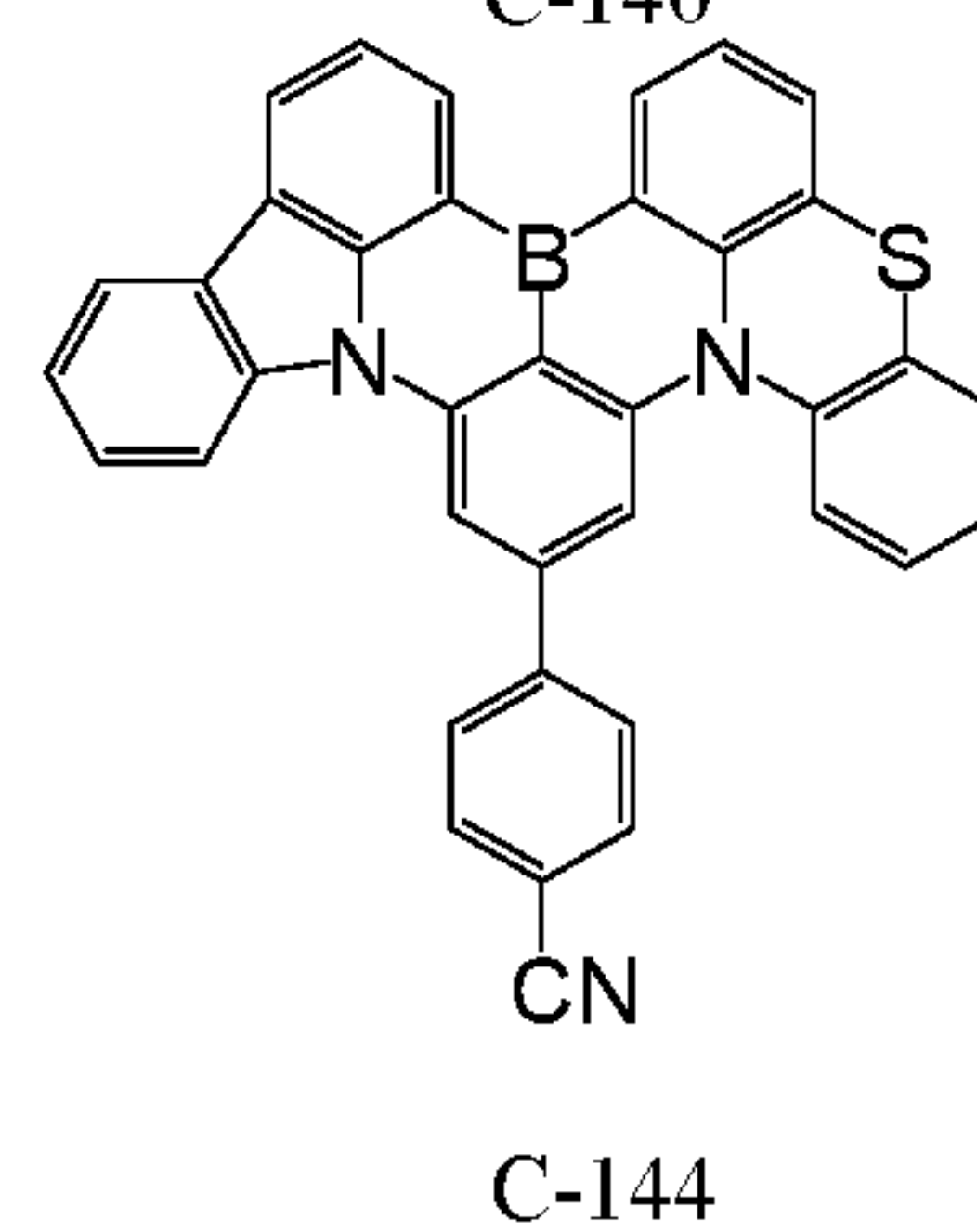
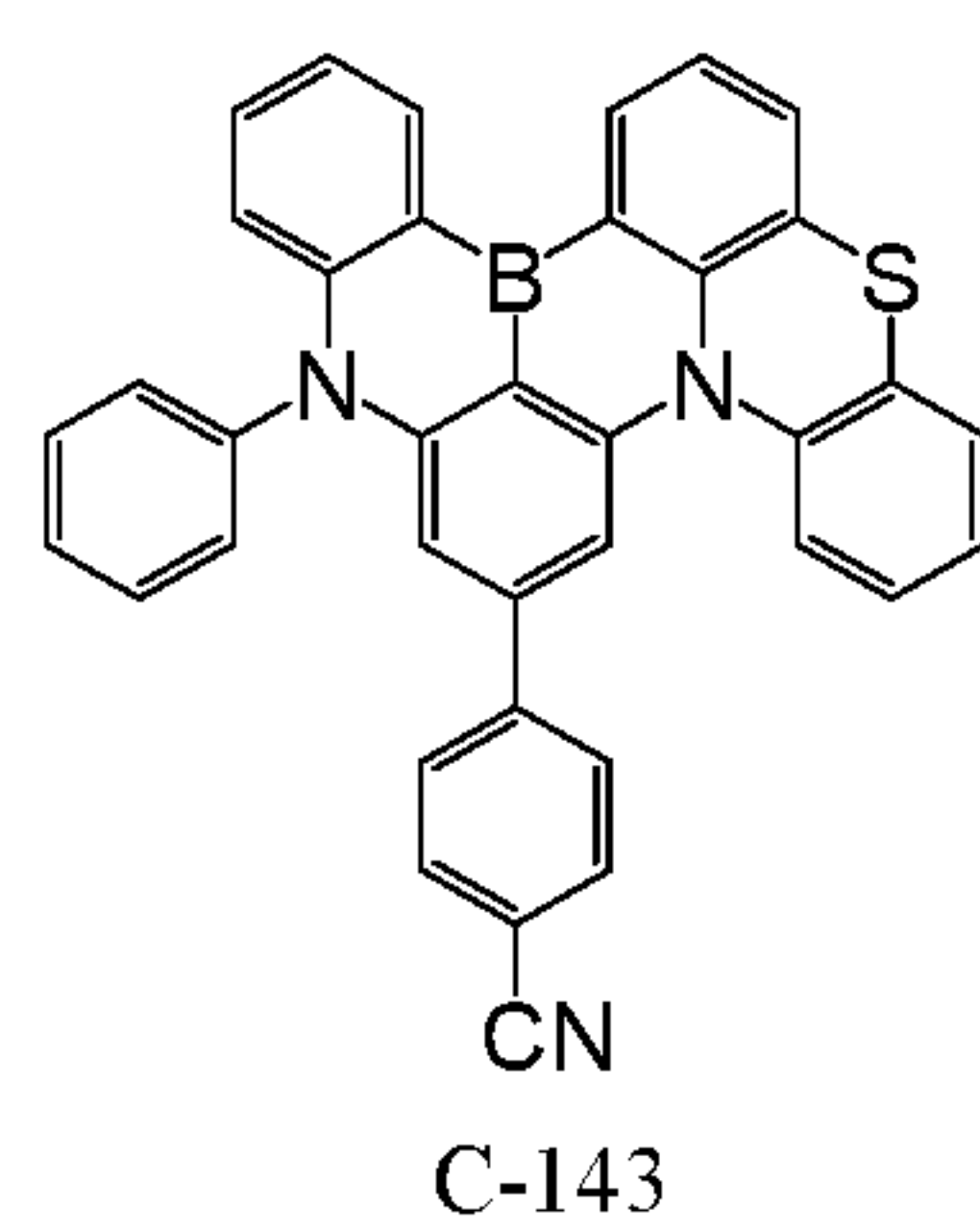
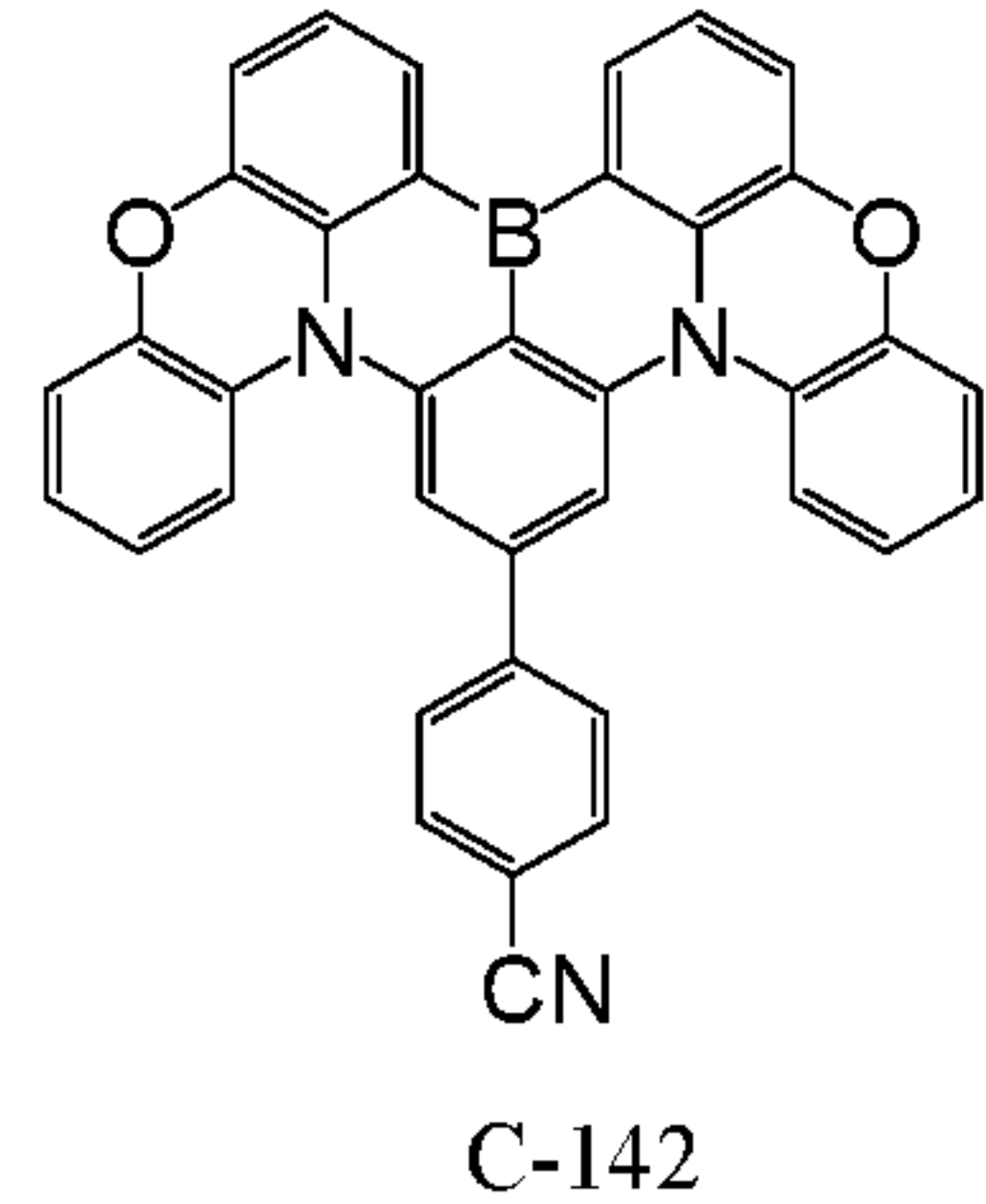
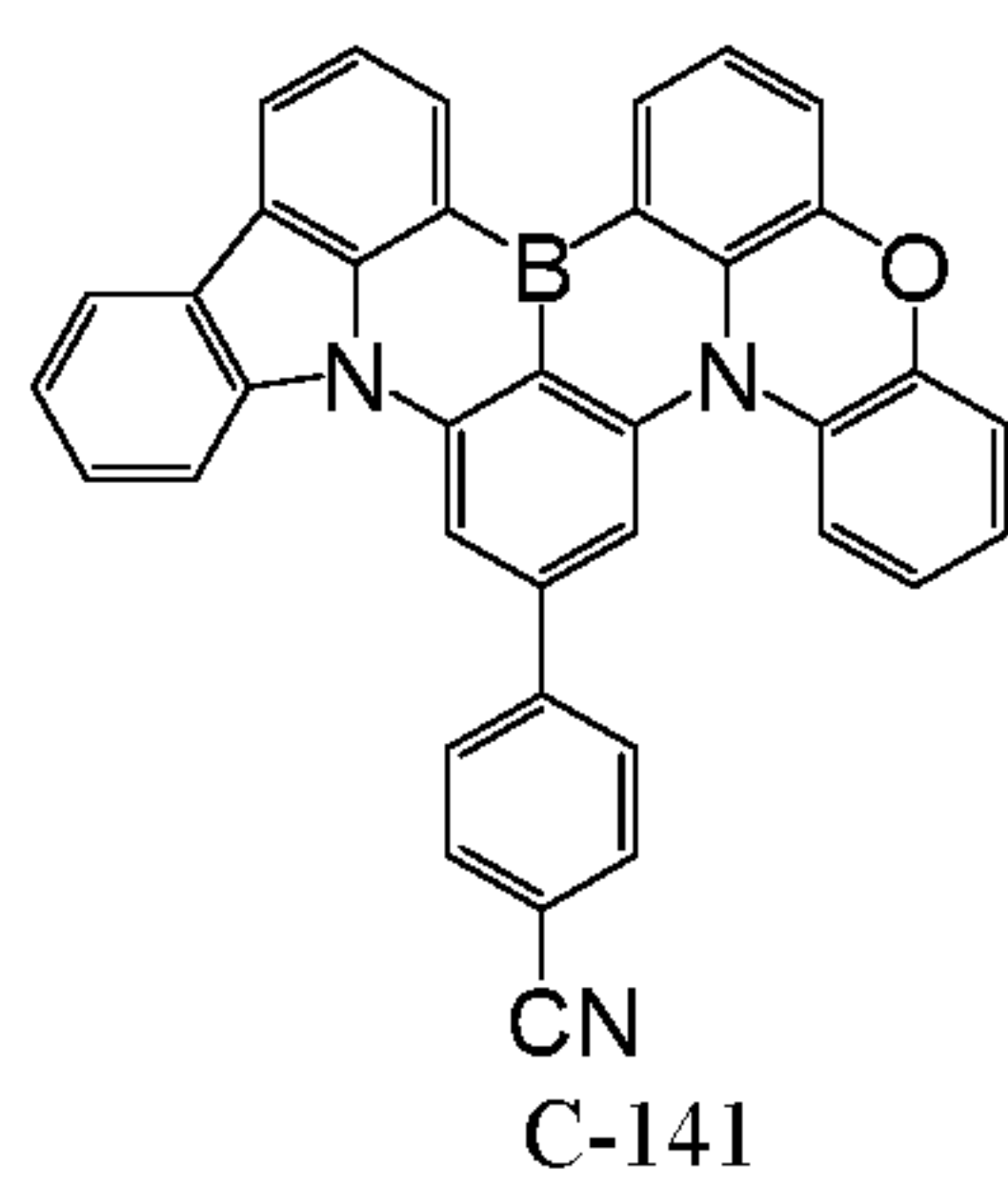
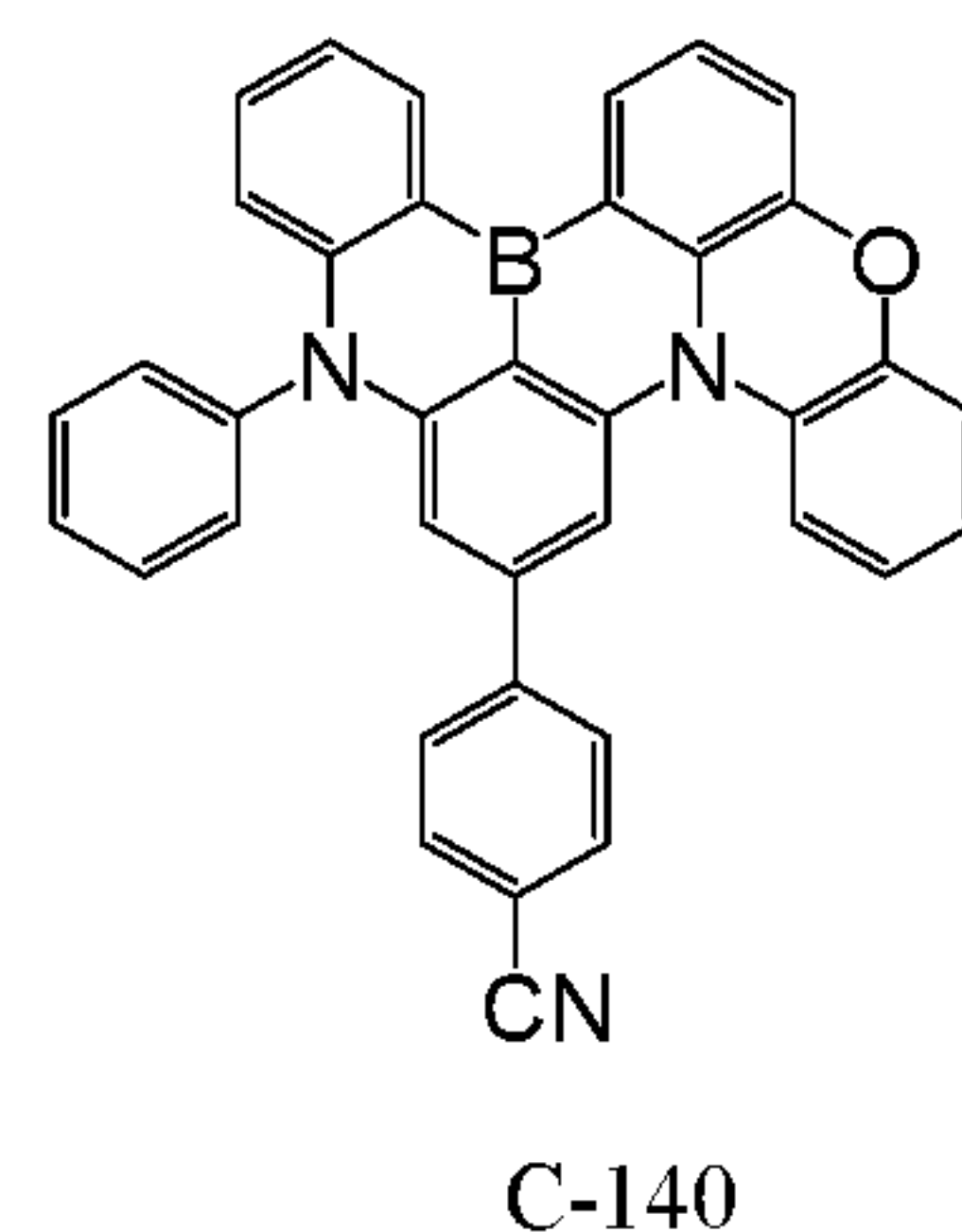
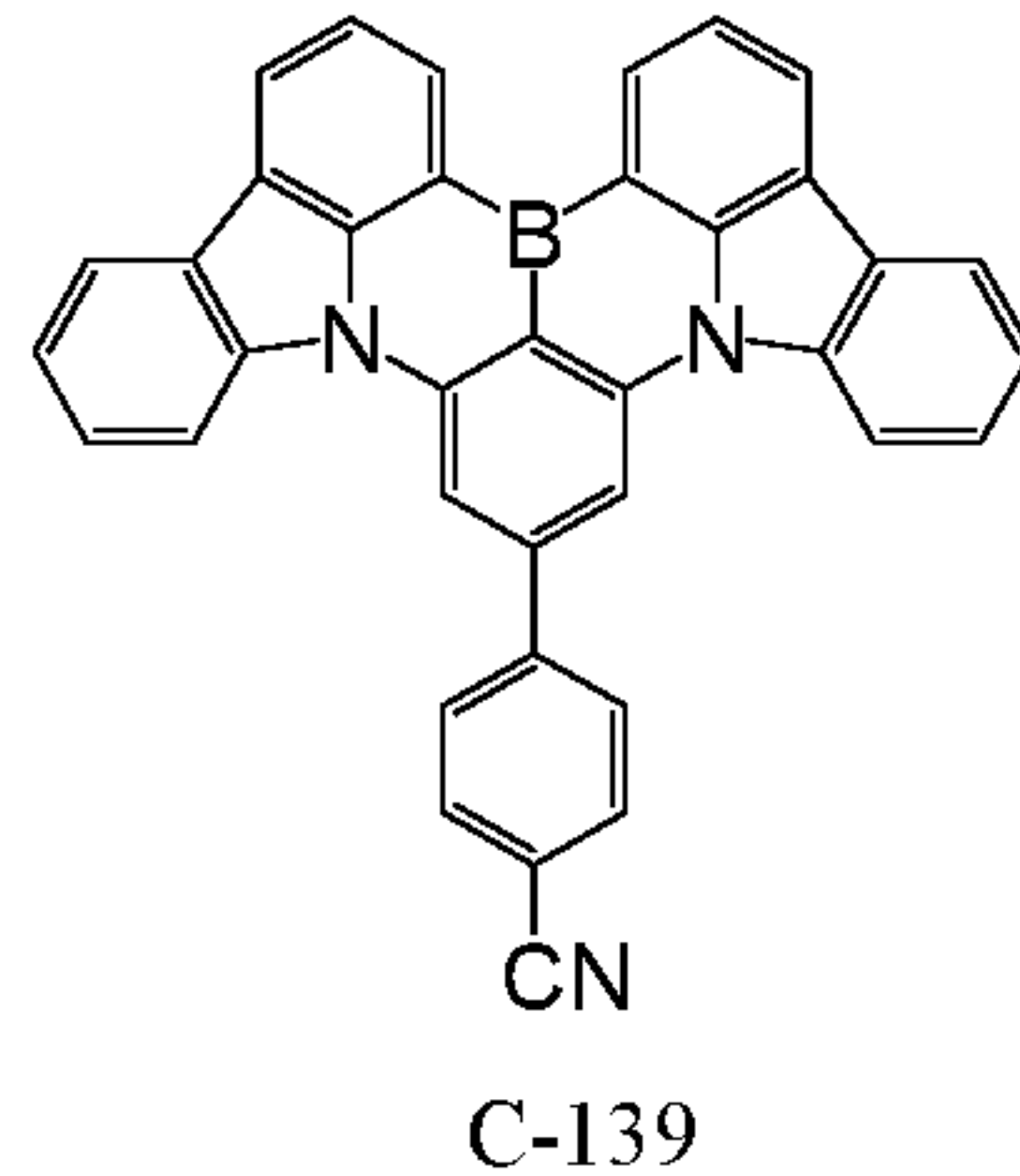
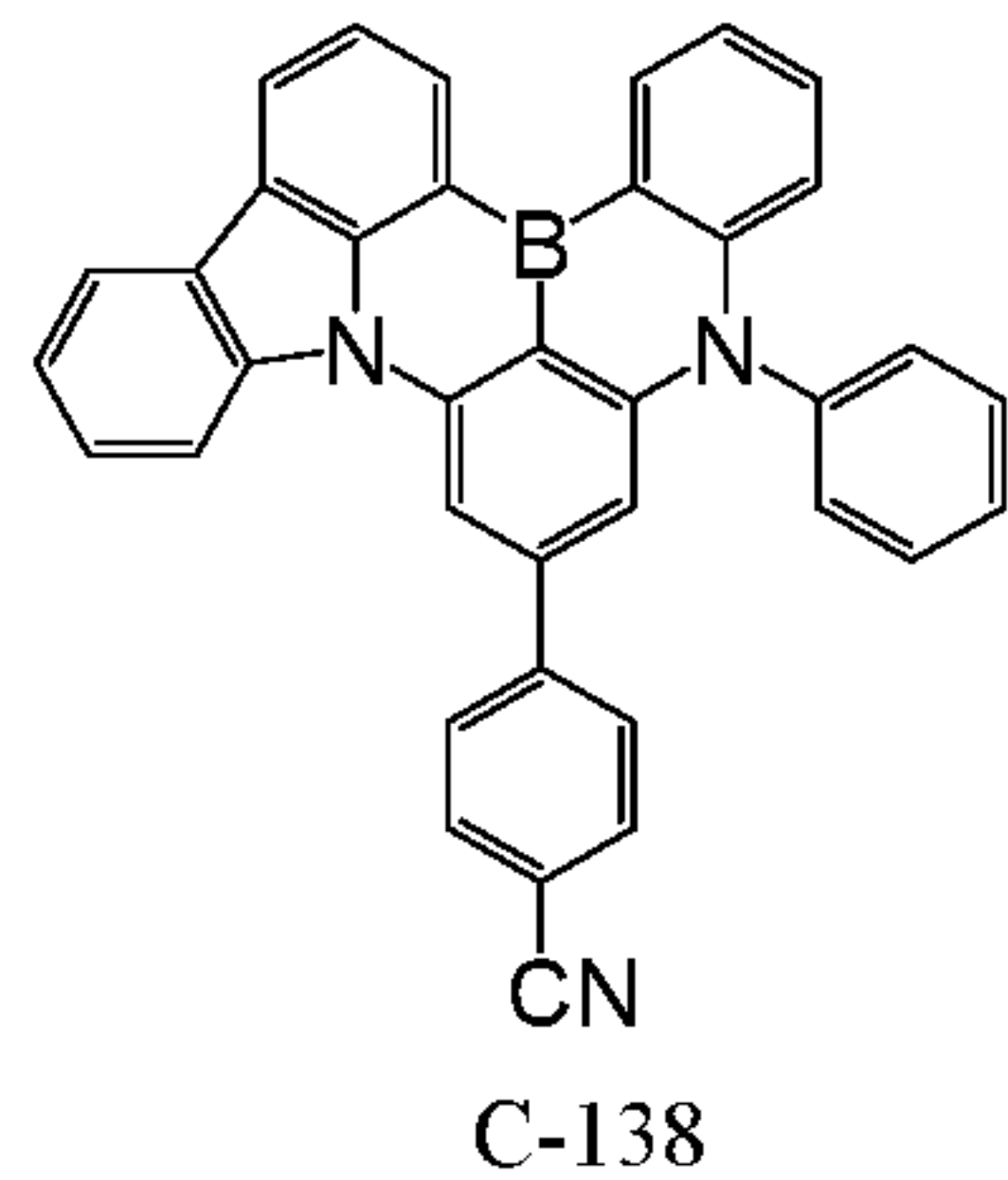
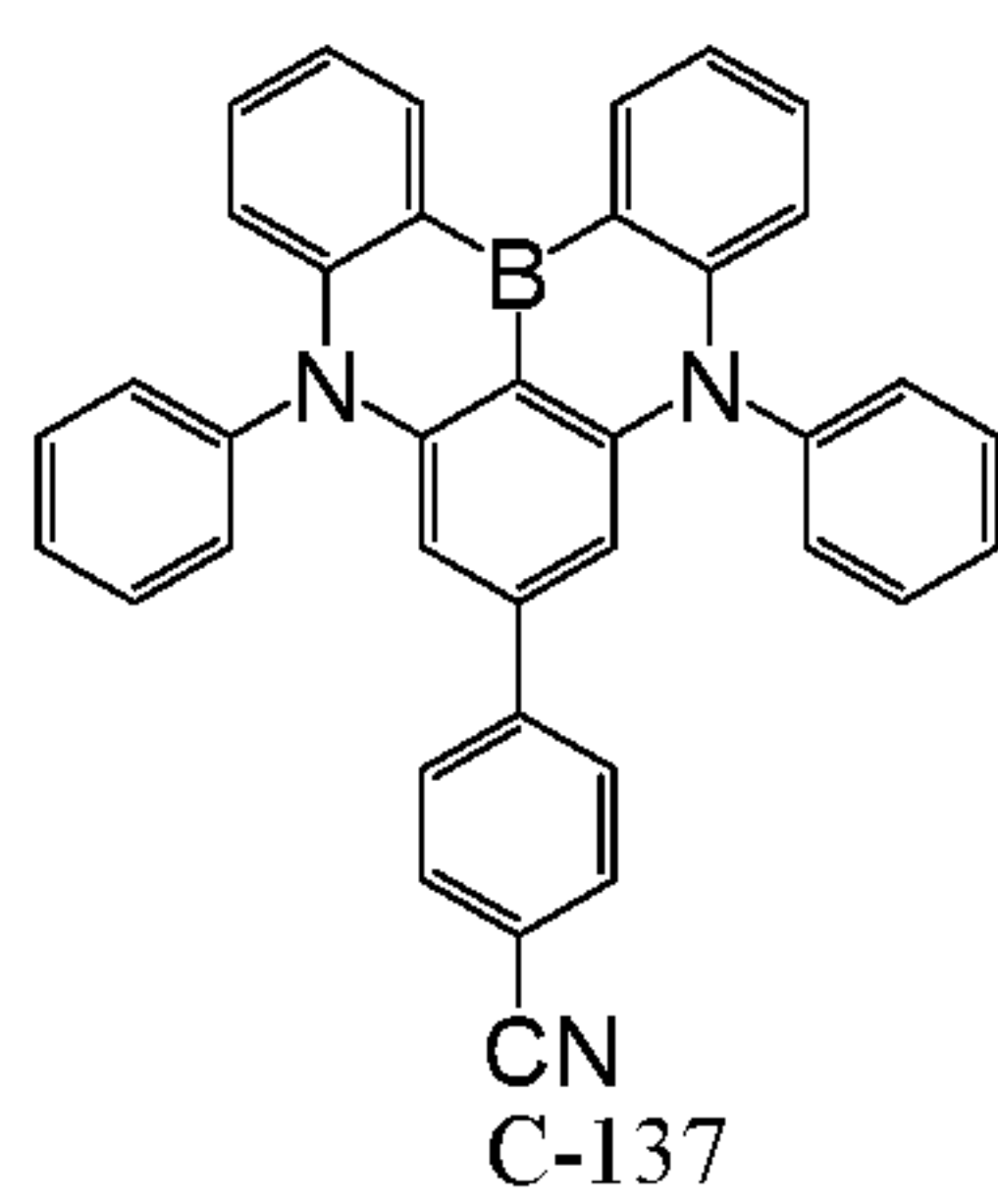
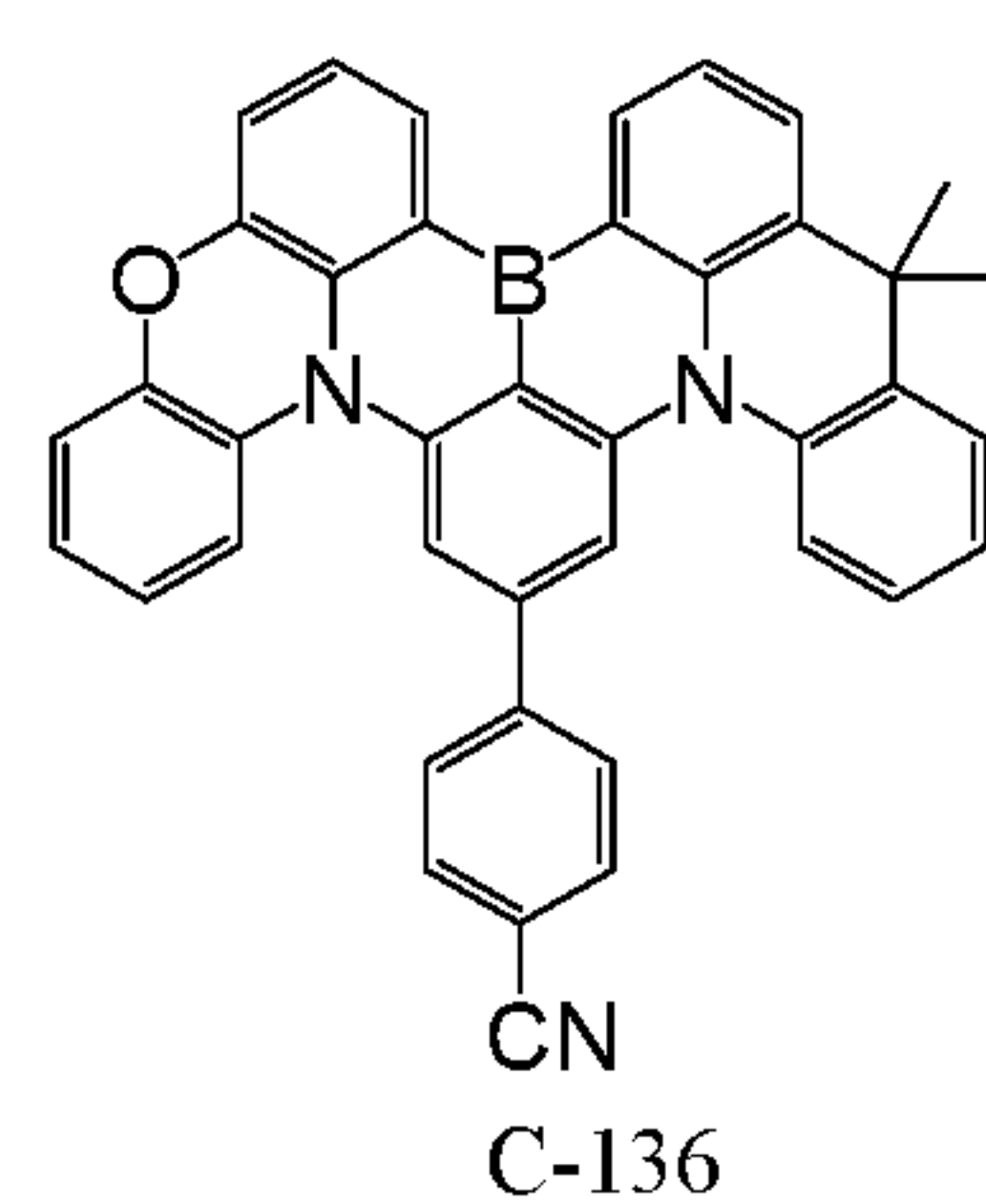
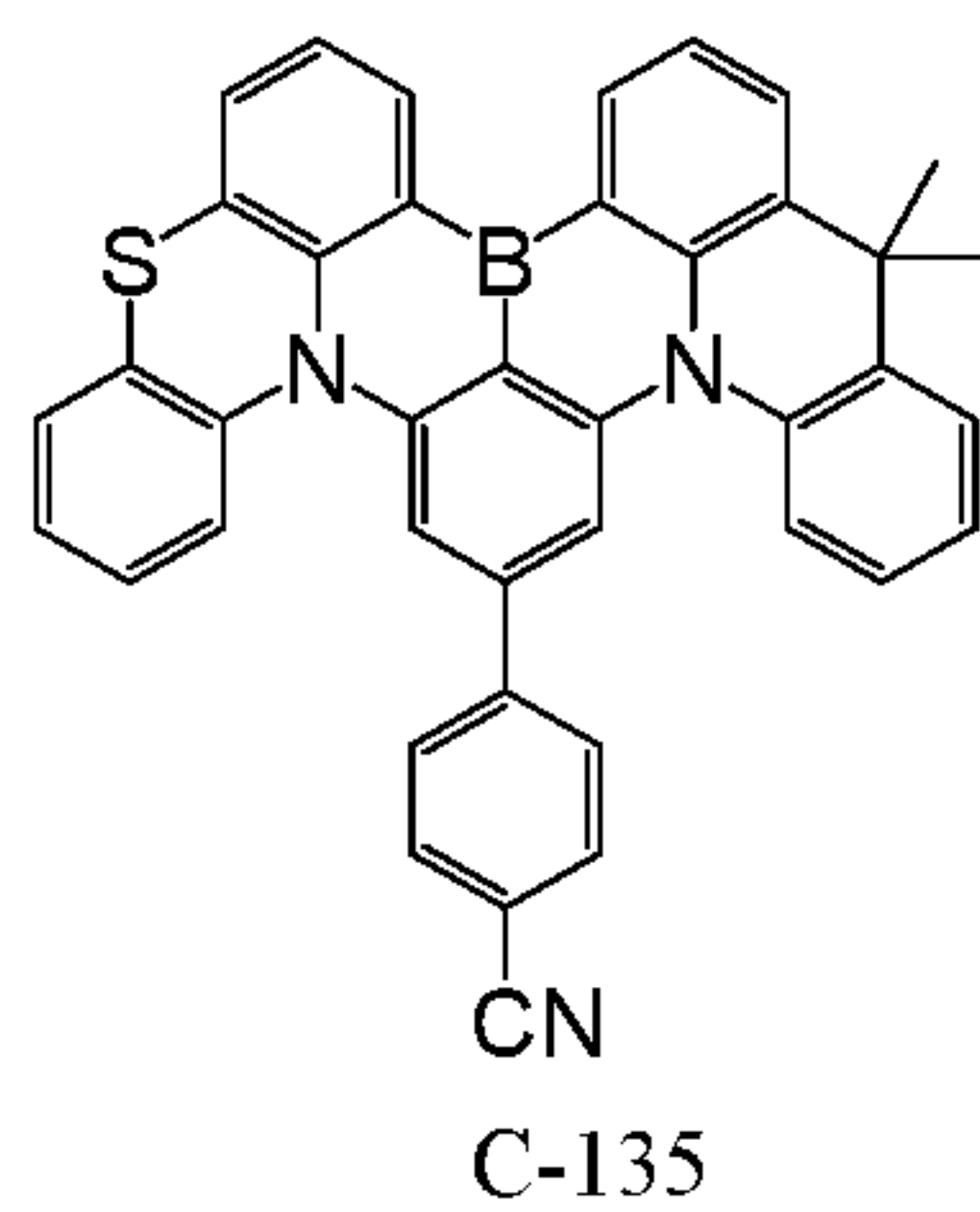
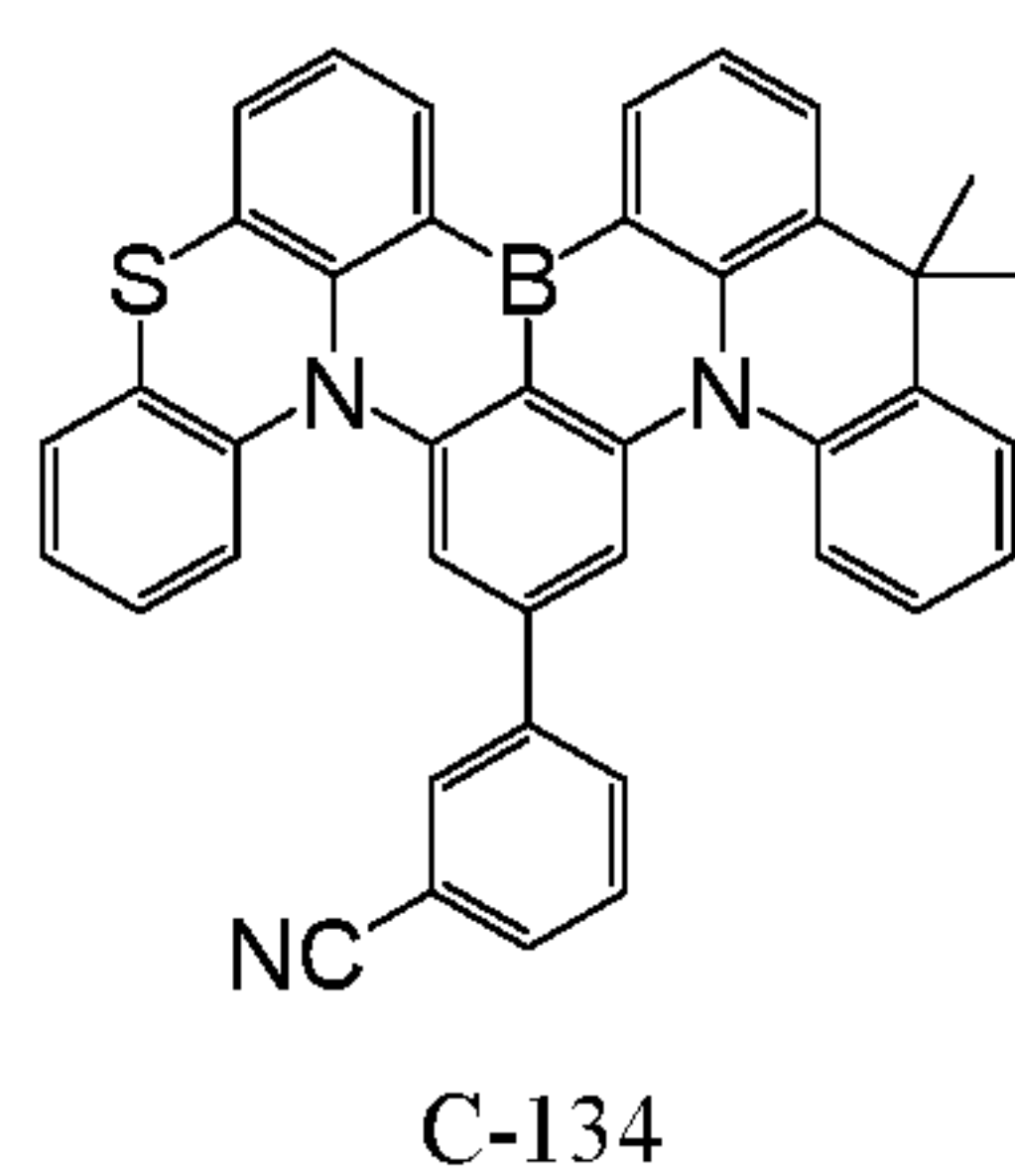
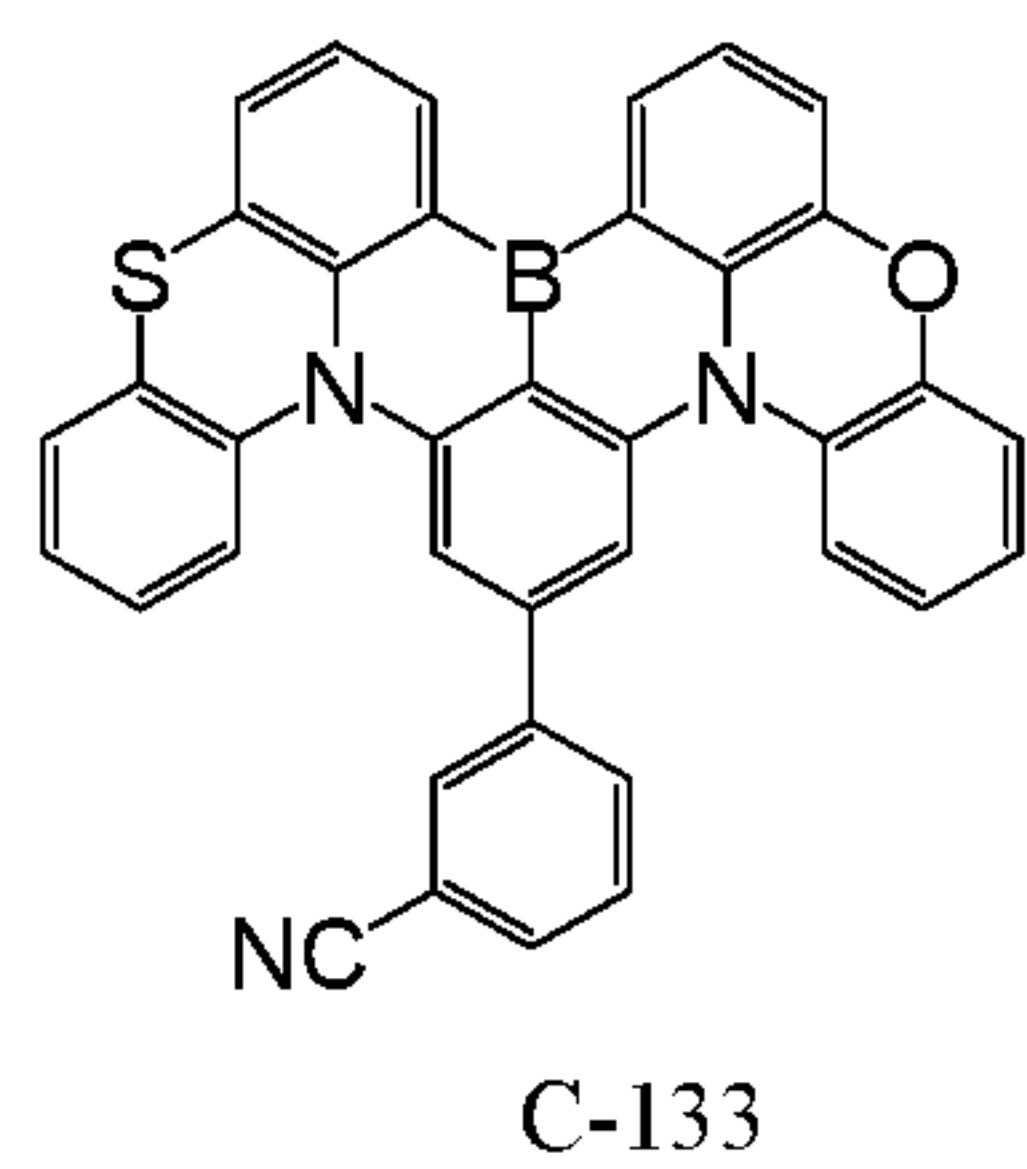
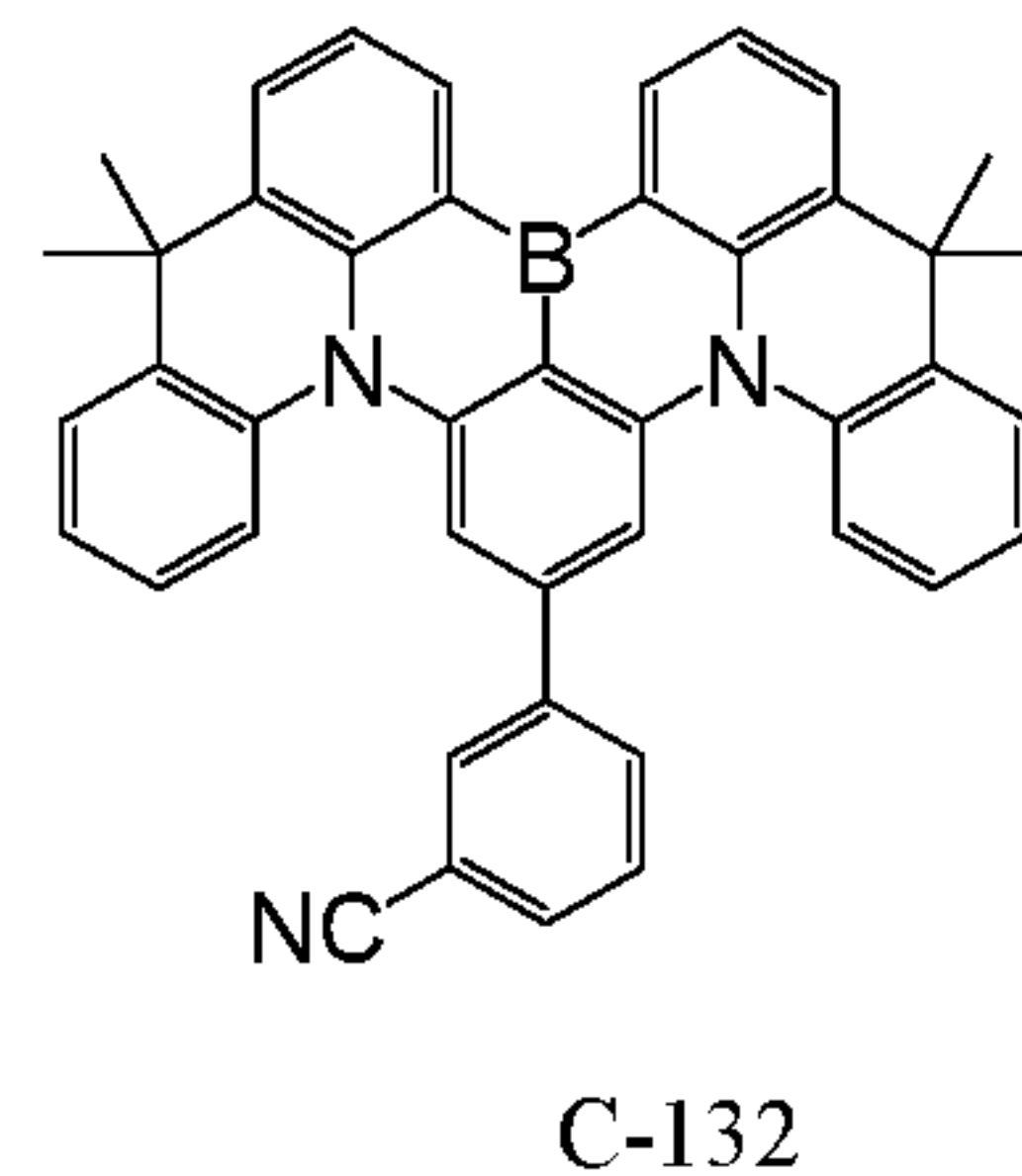
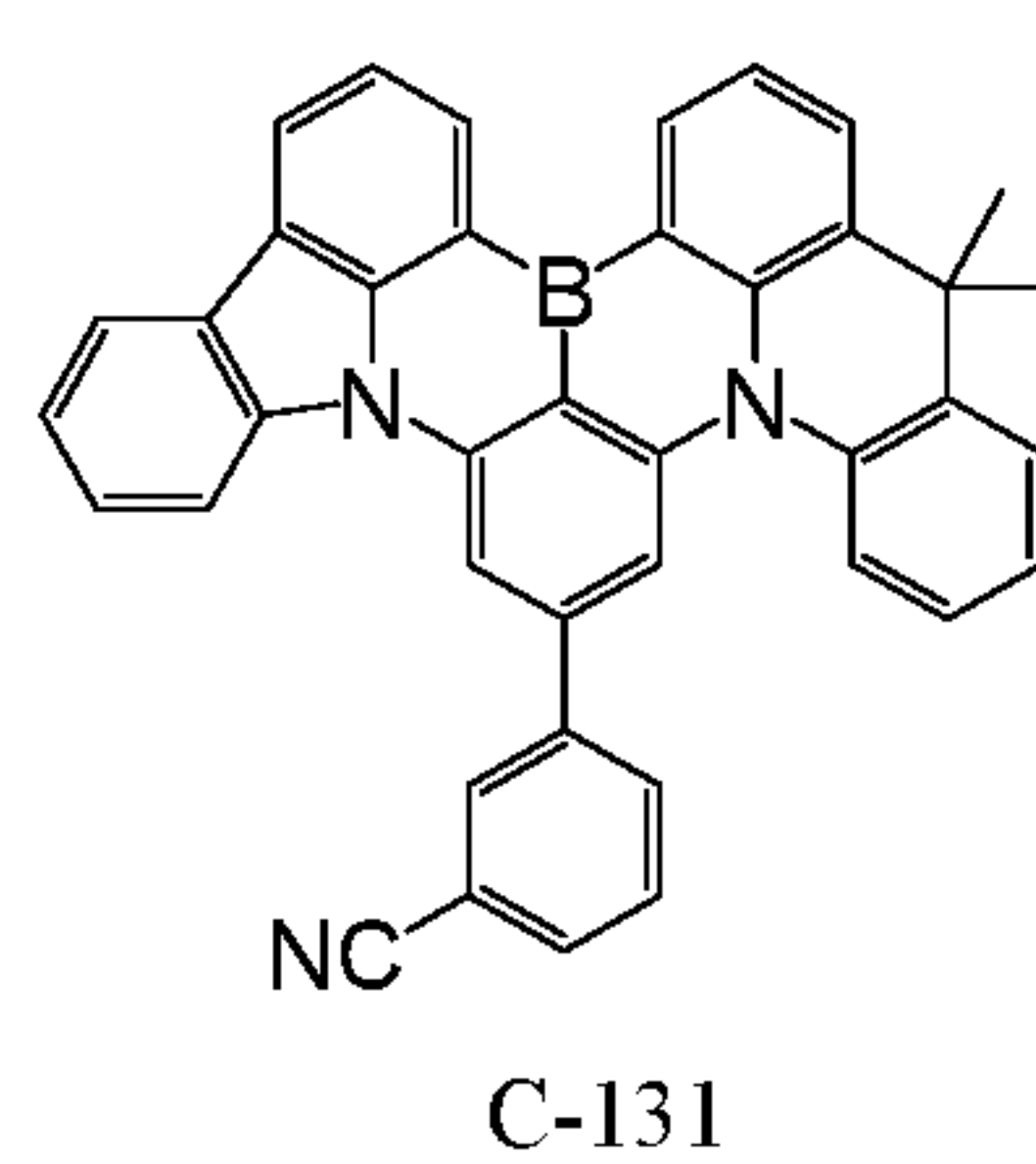
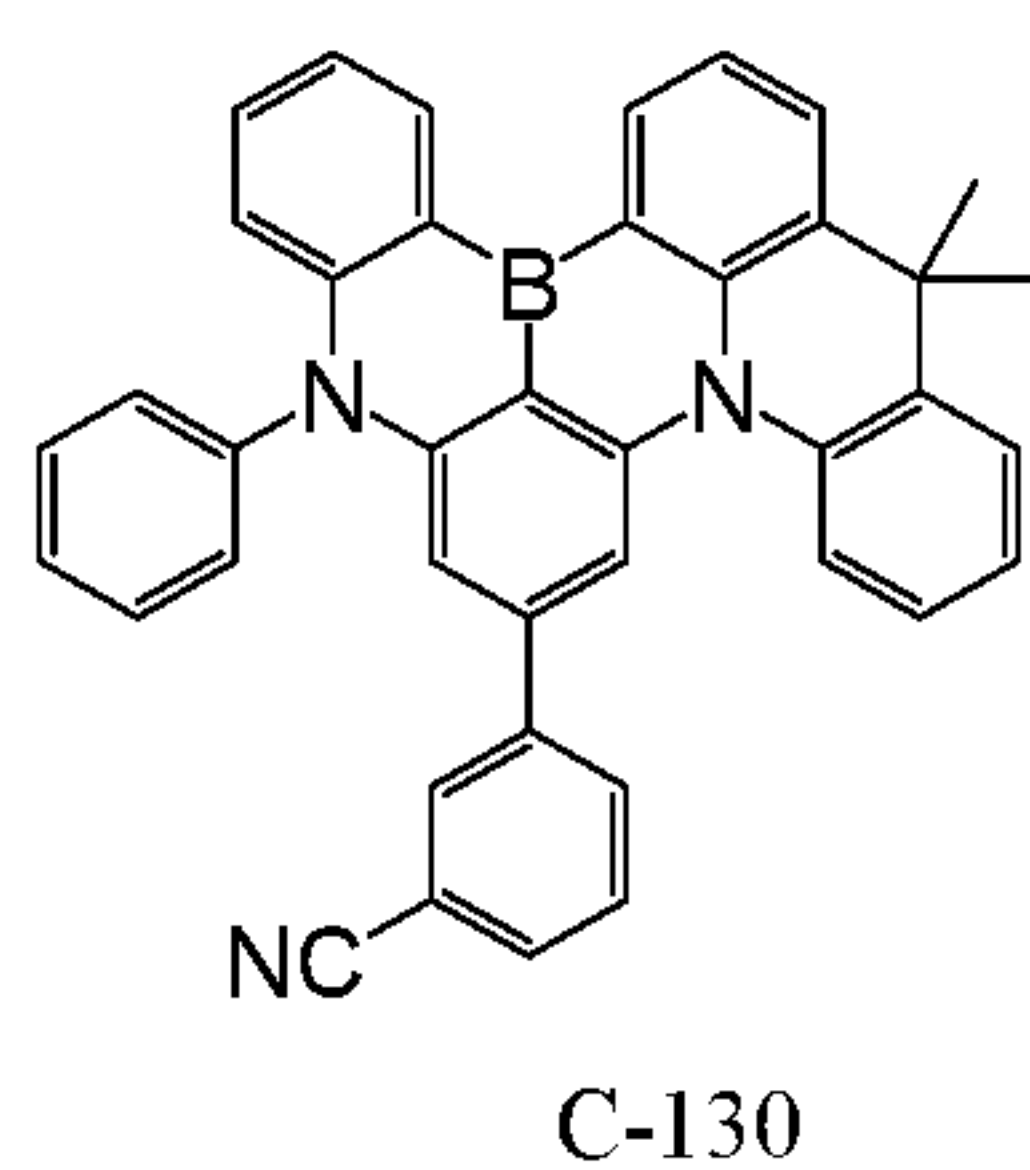
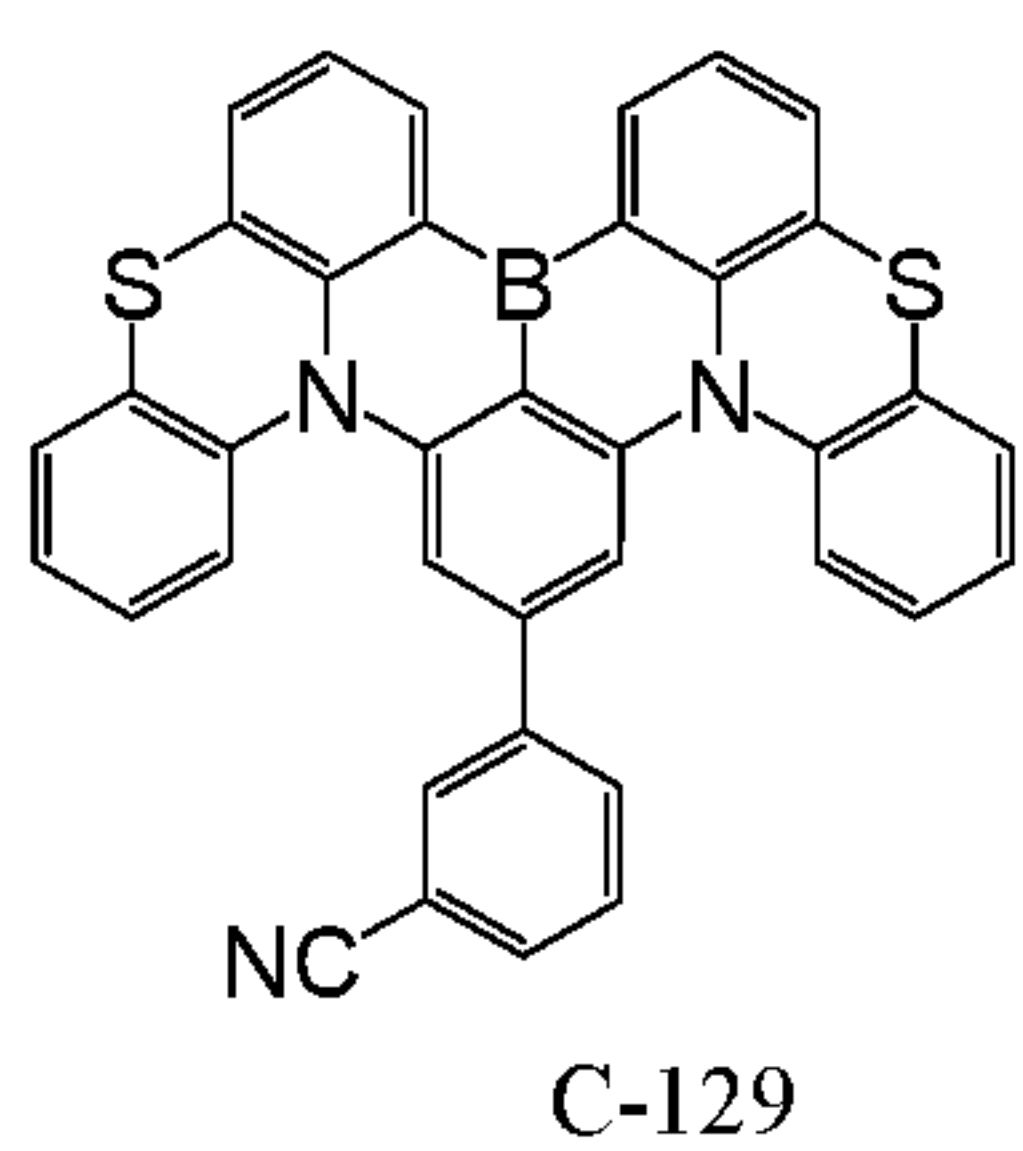
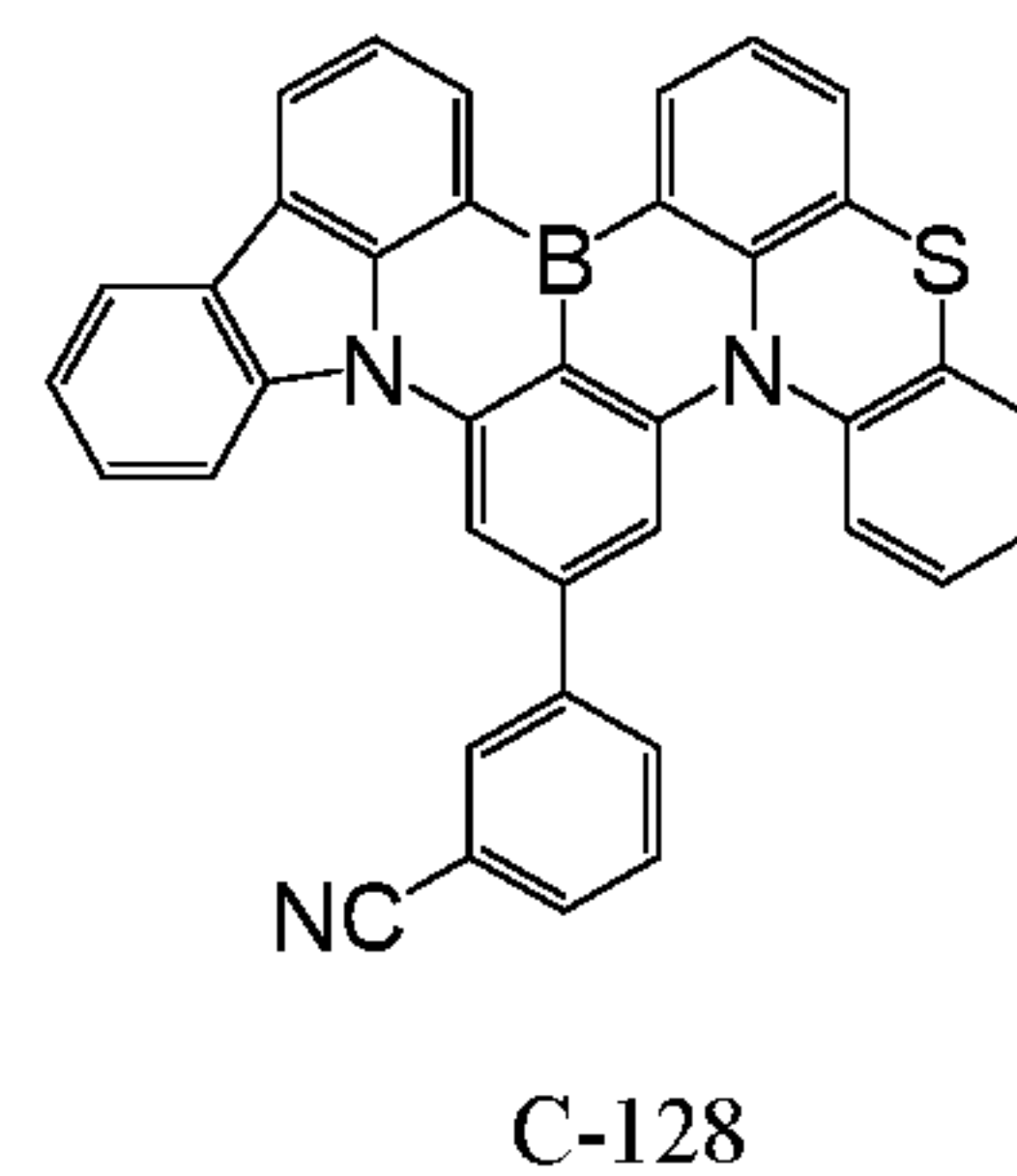
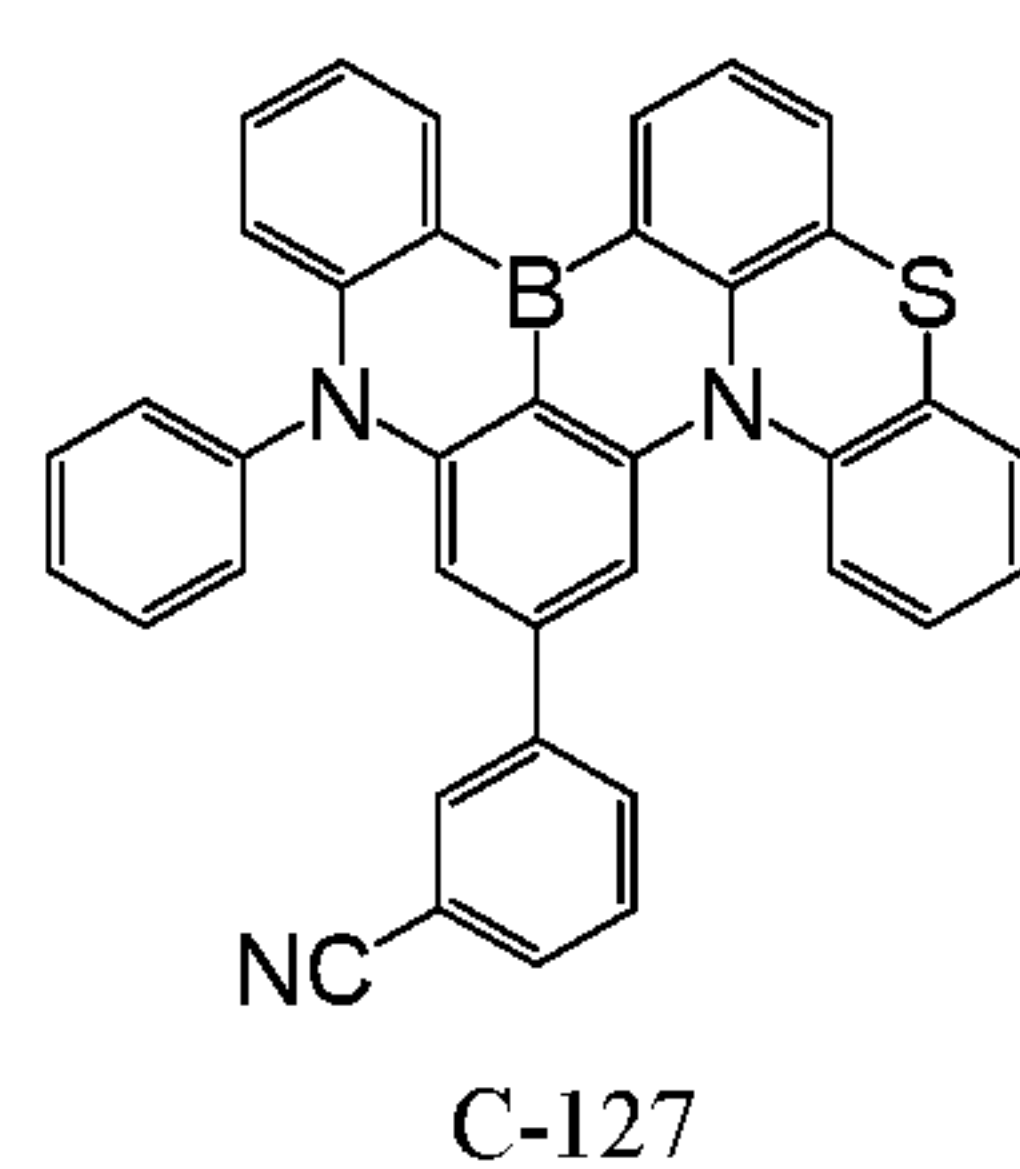
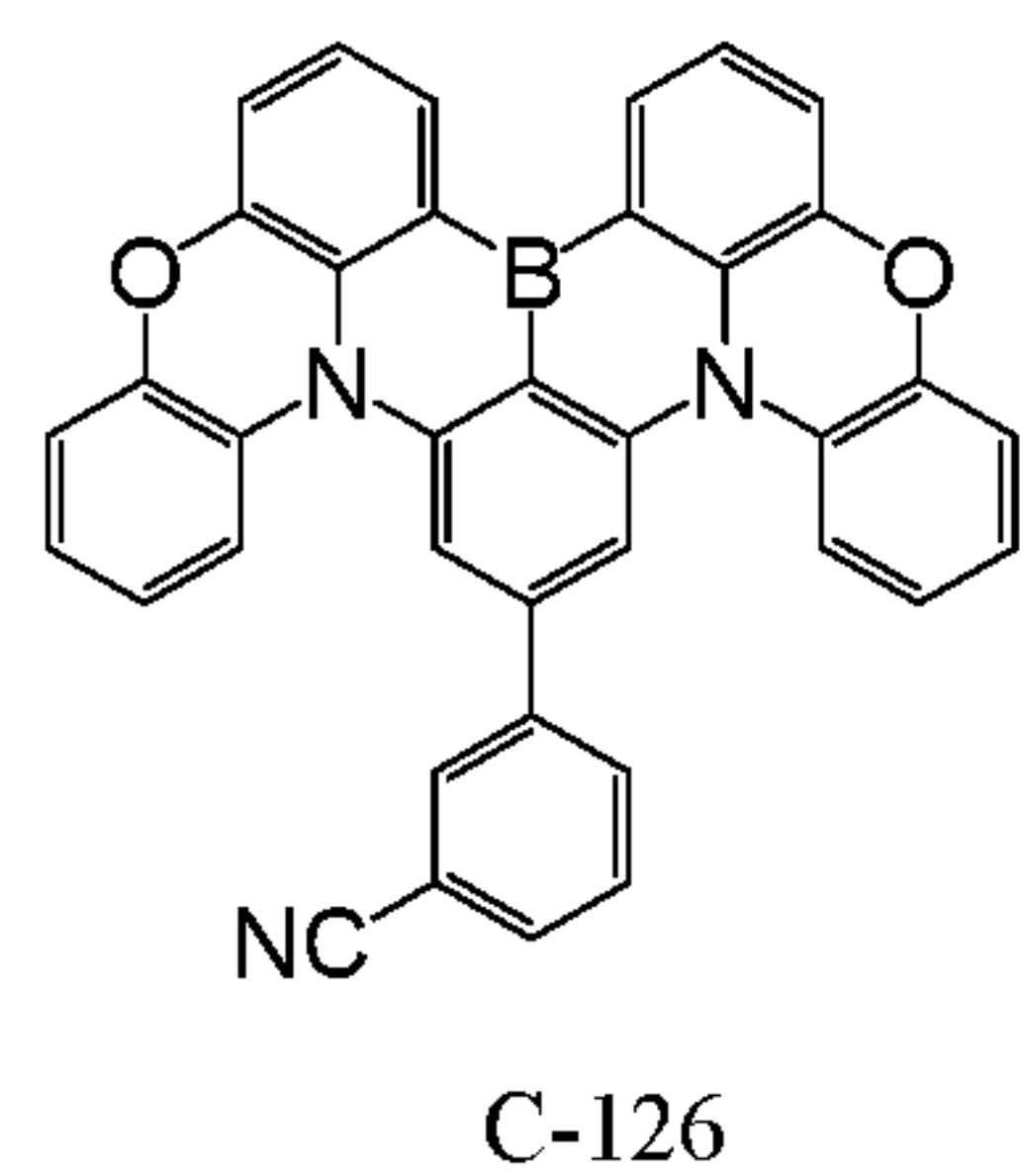
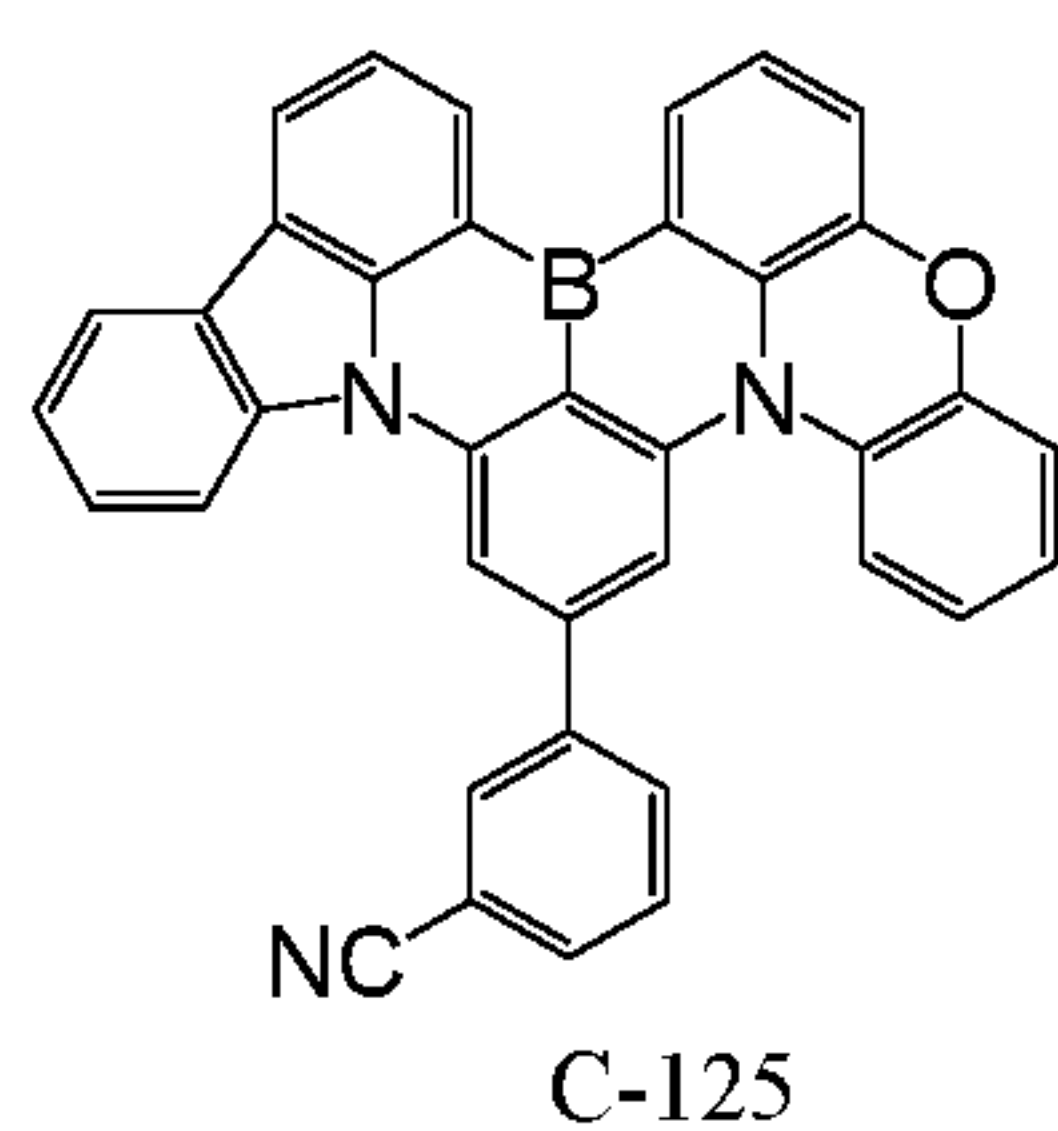
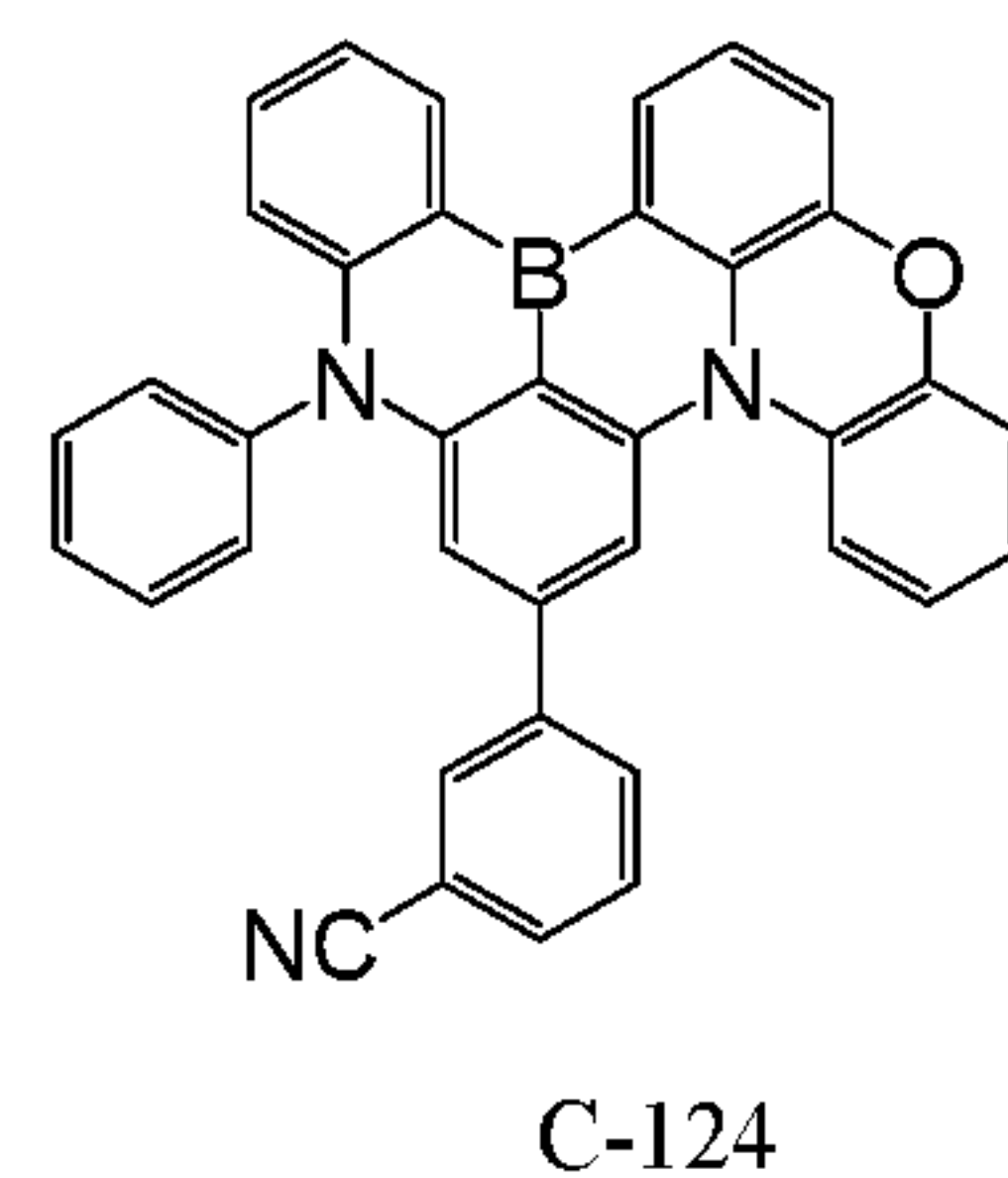
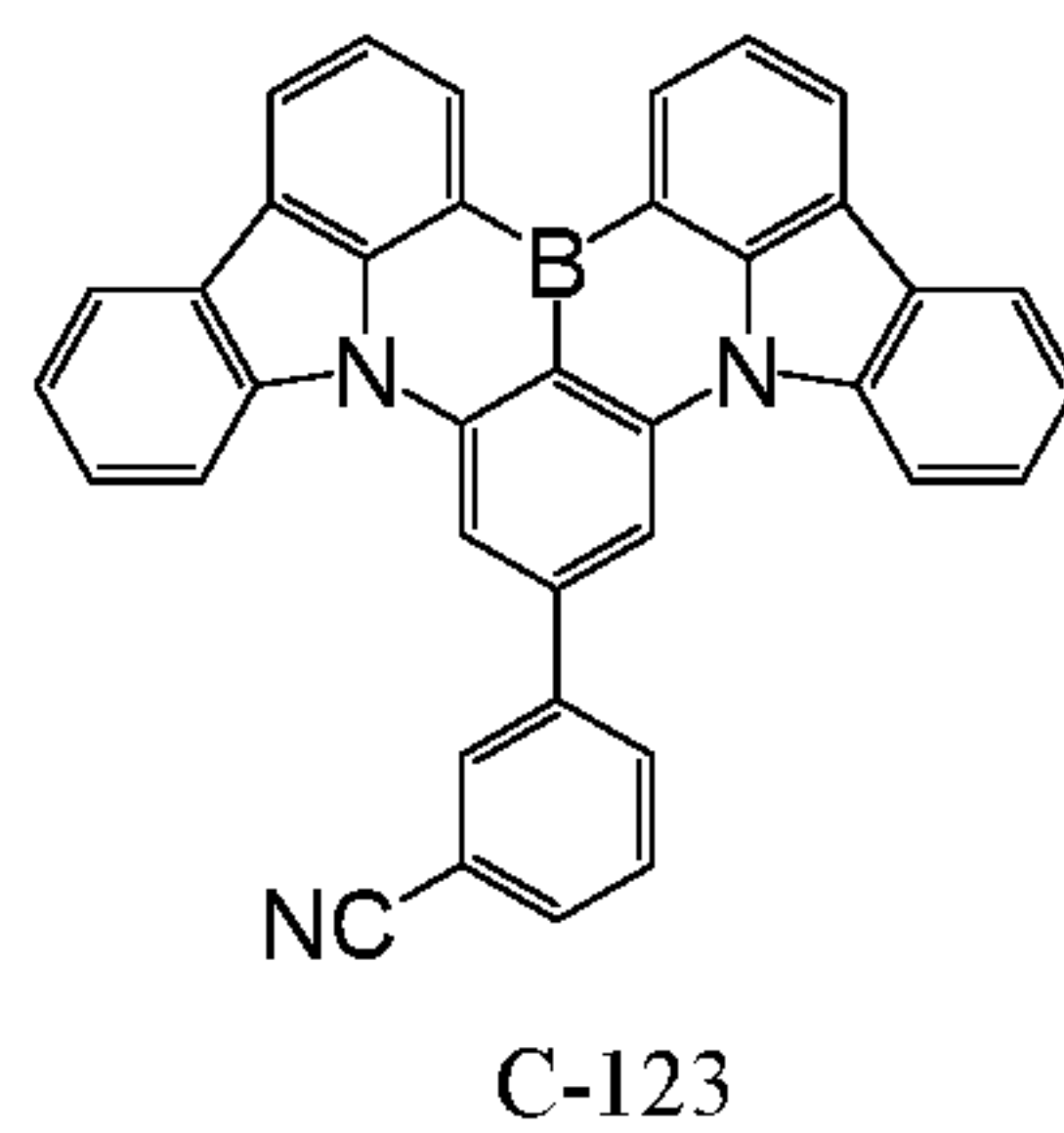
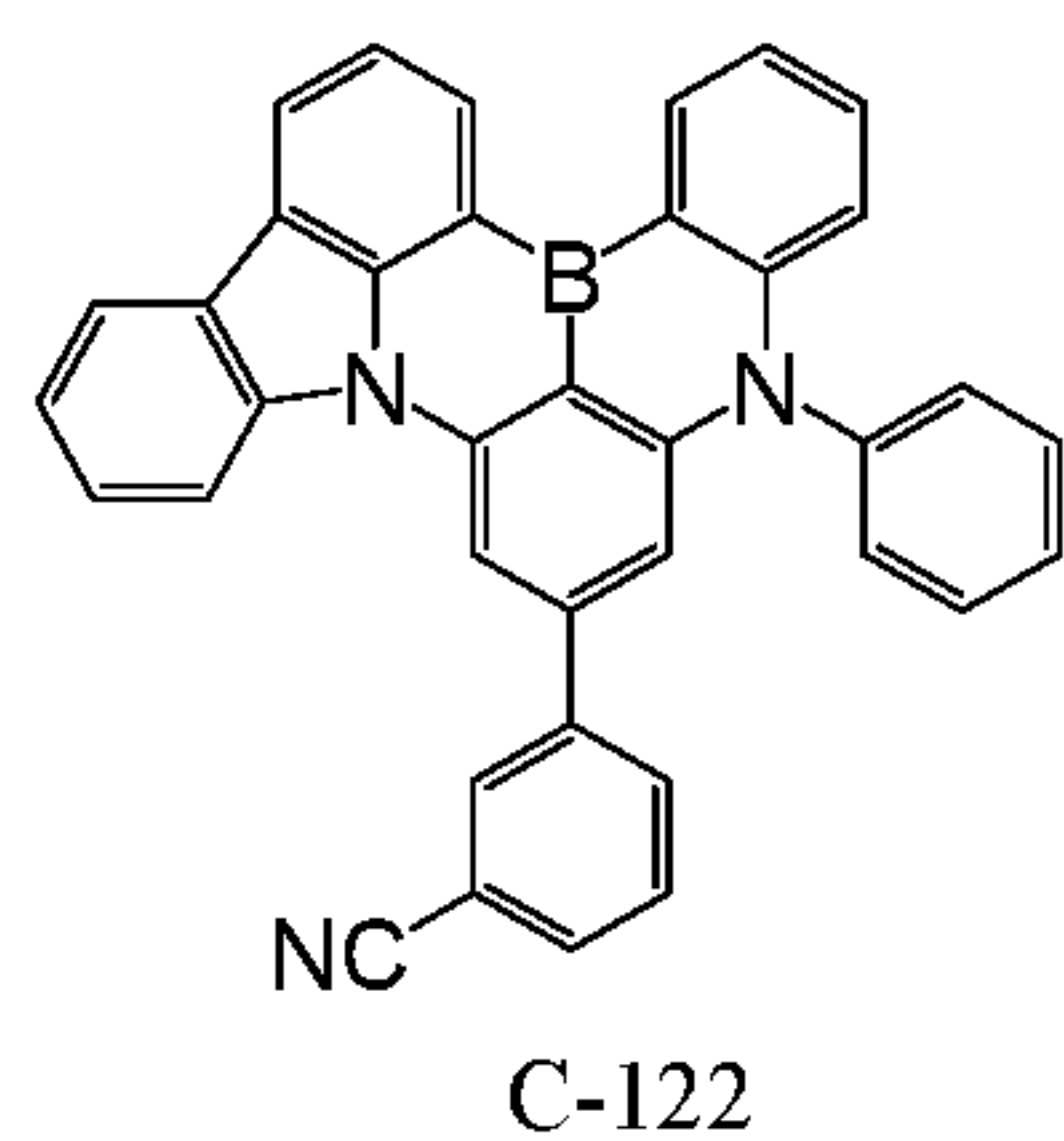
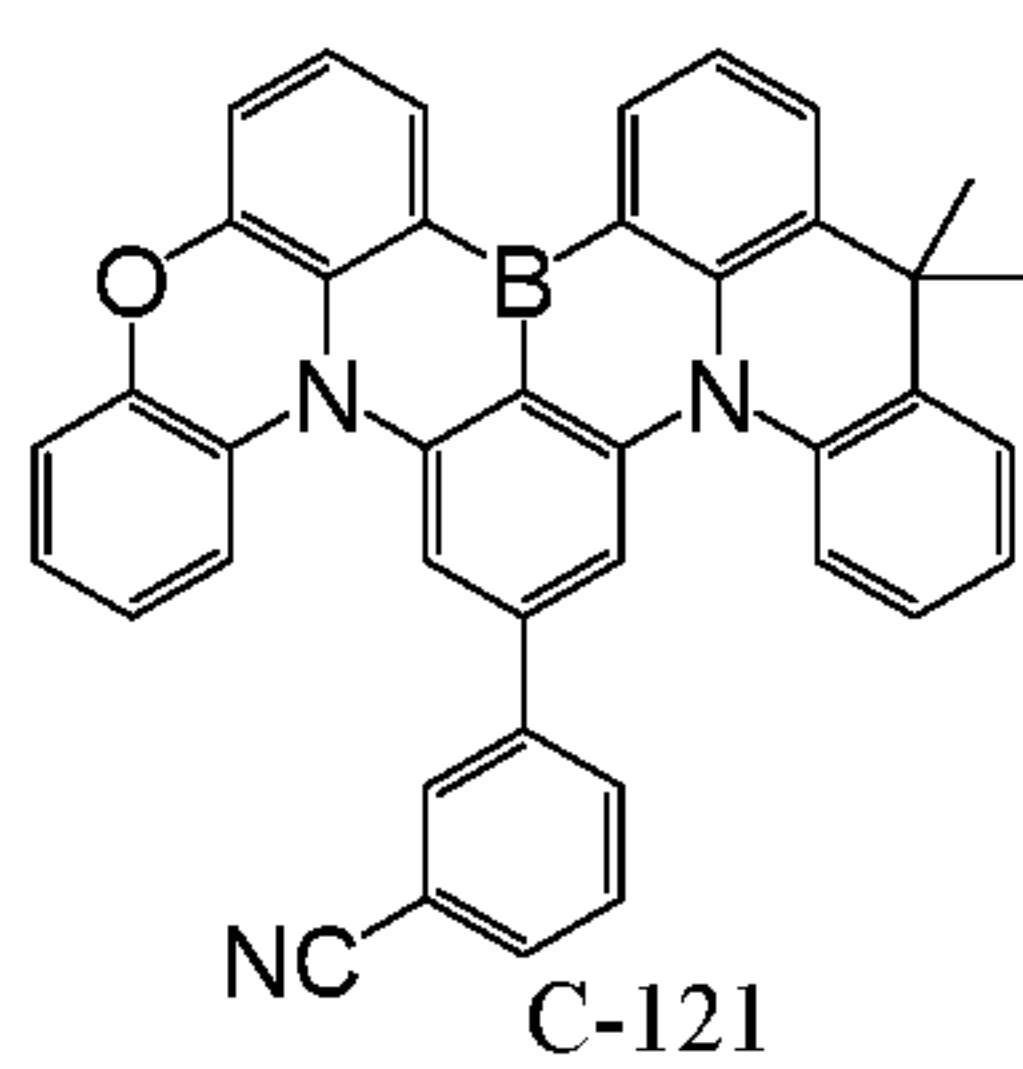
C-118

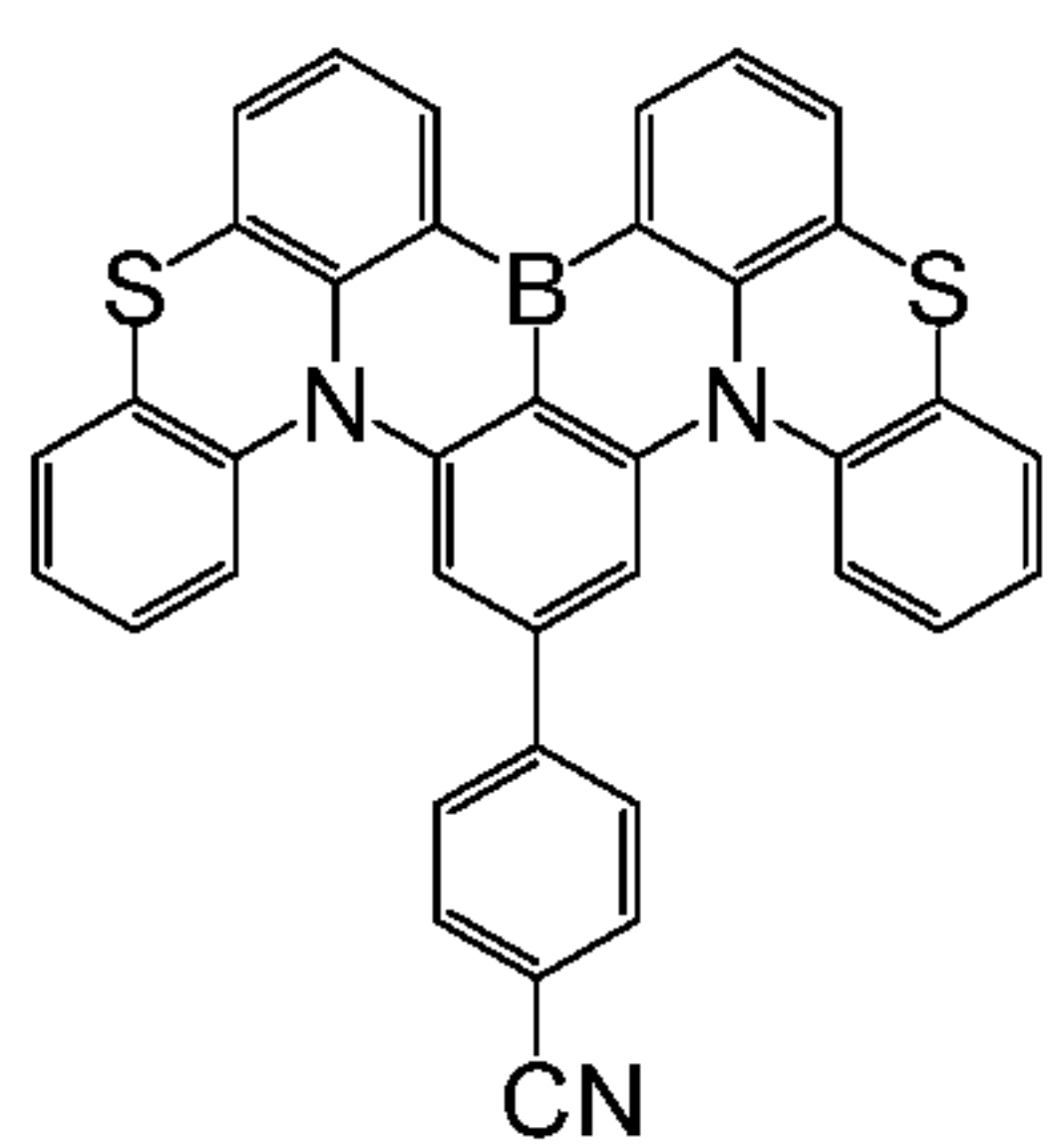


C-119

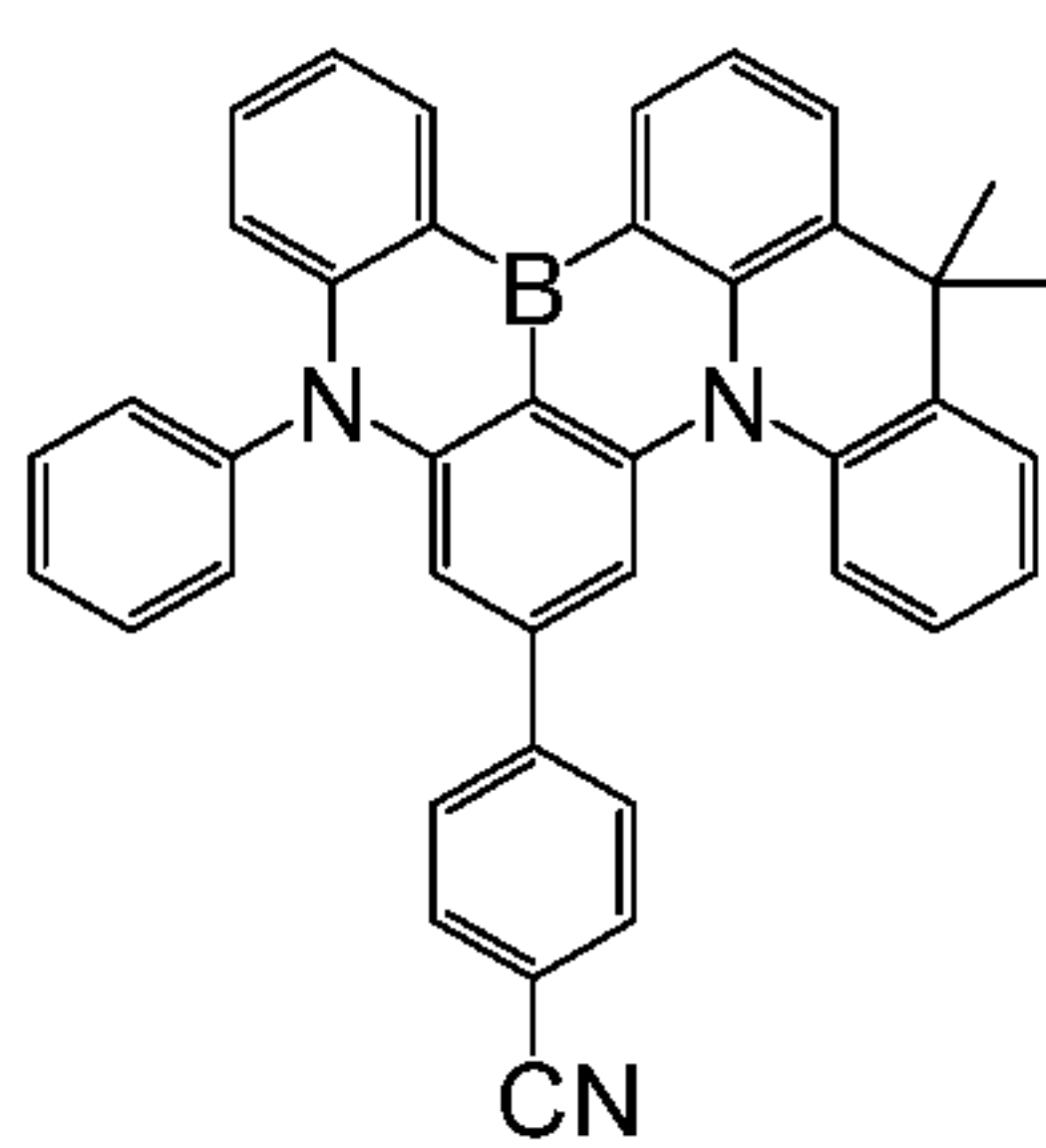


C-120

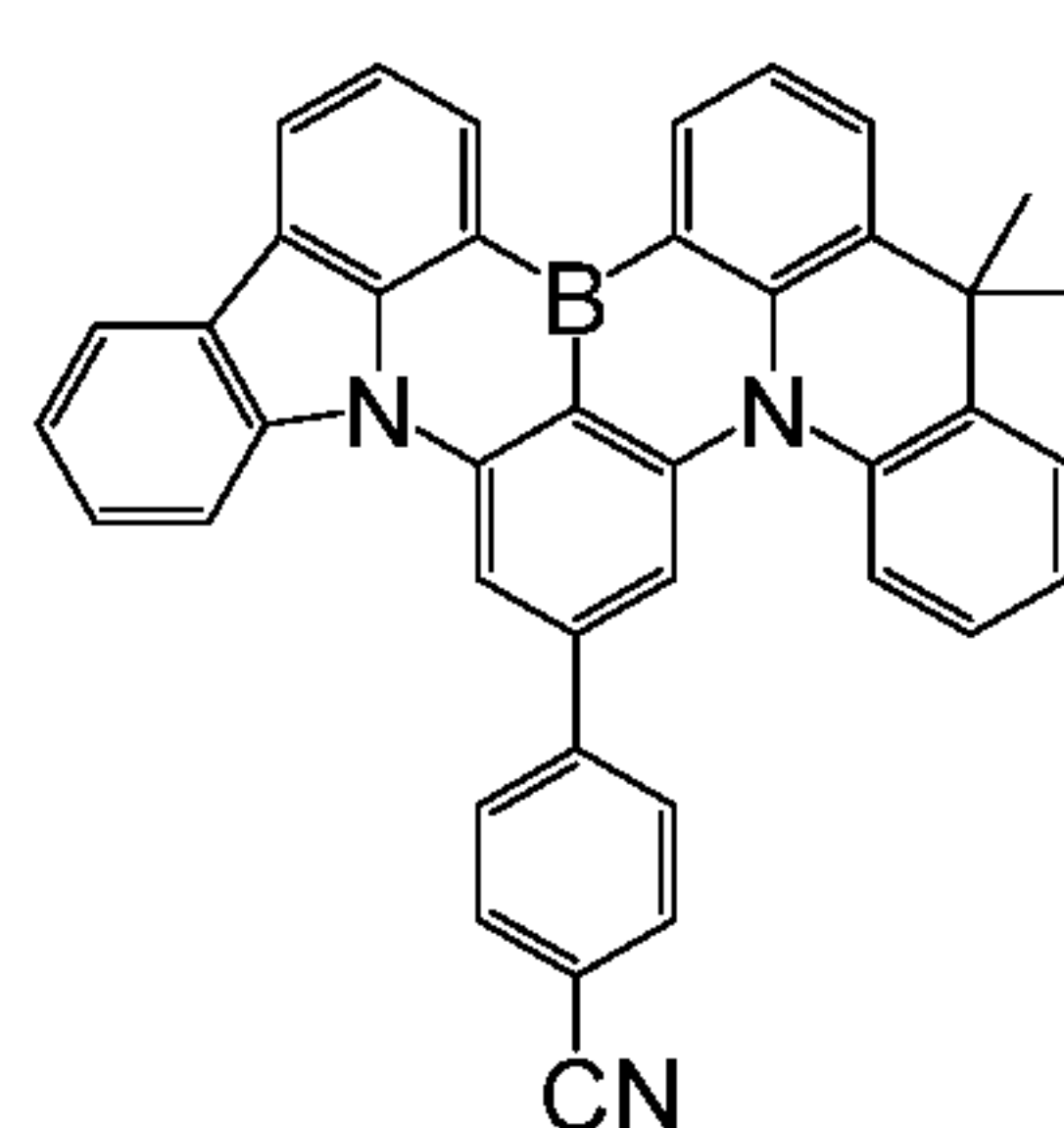




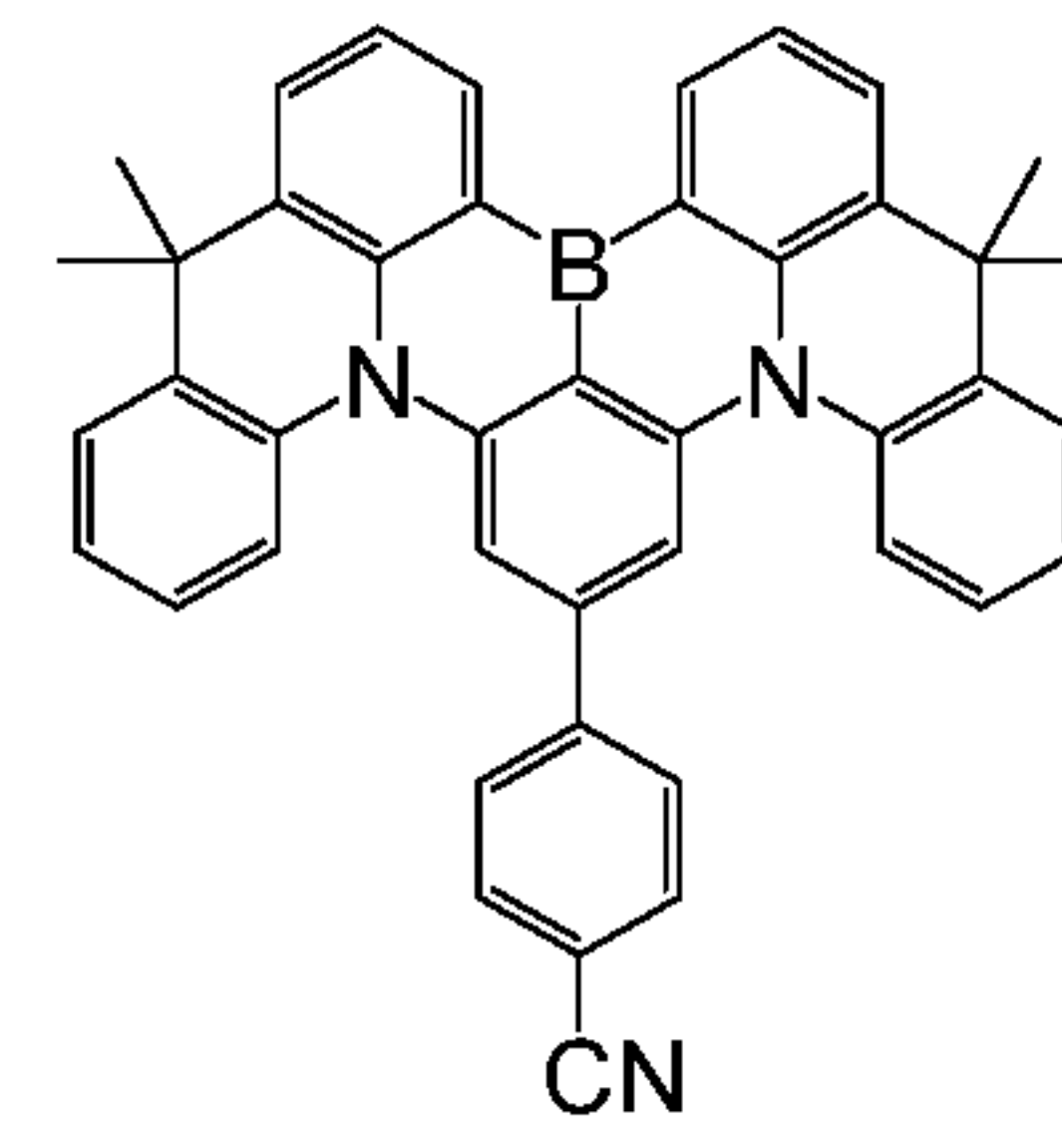
C-145



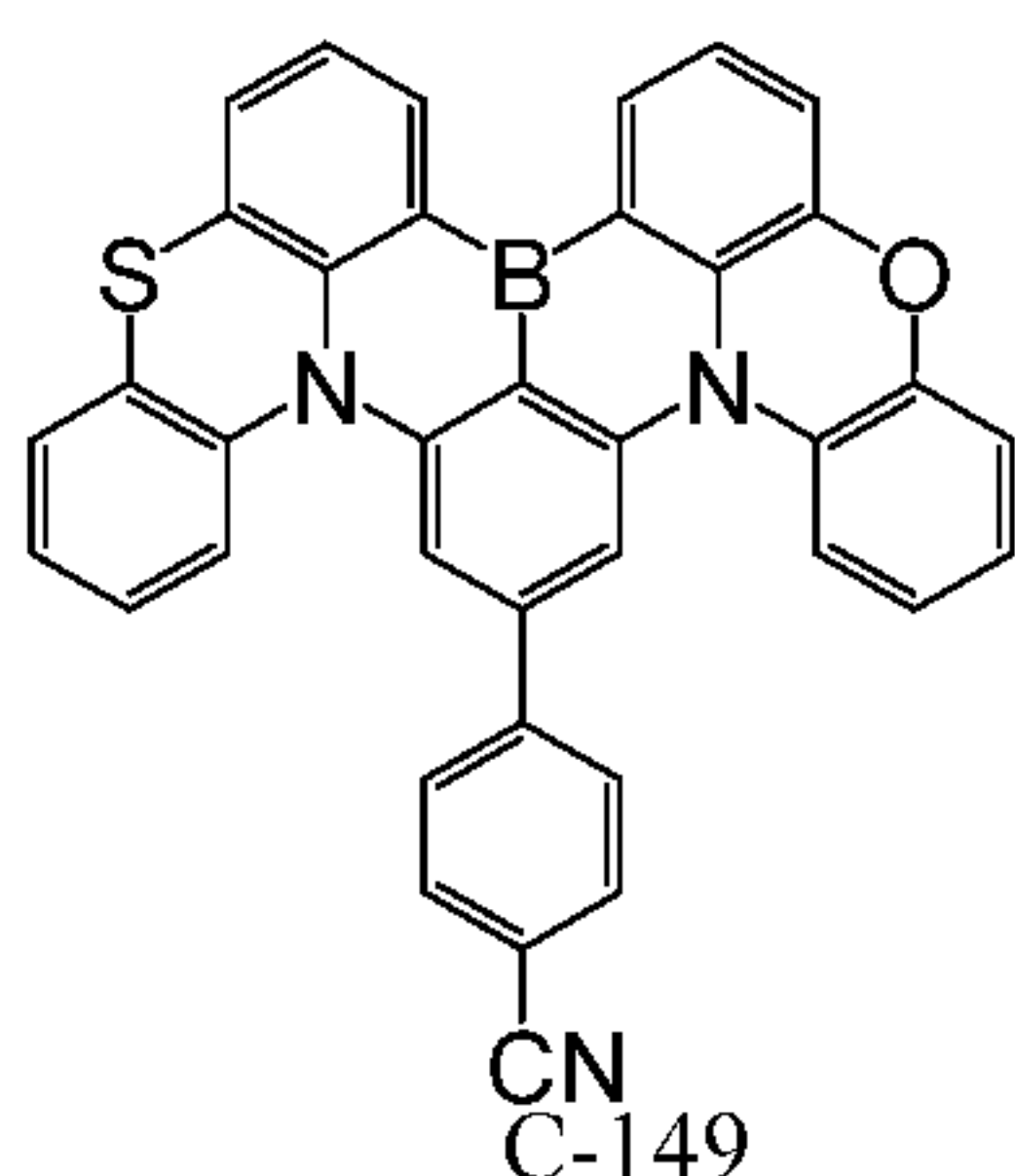
C-146



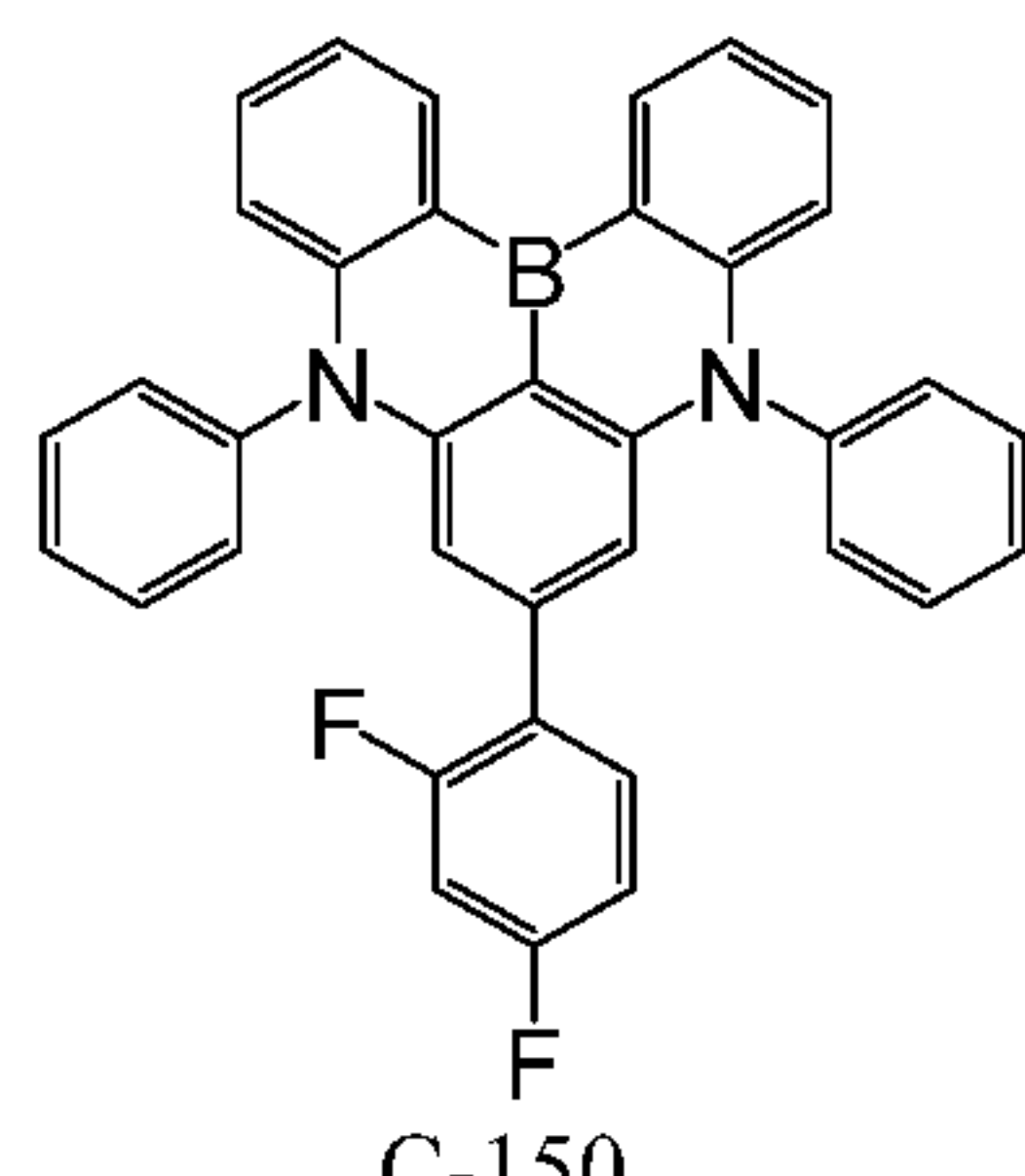
C-147



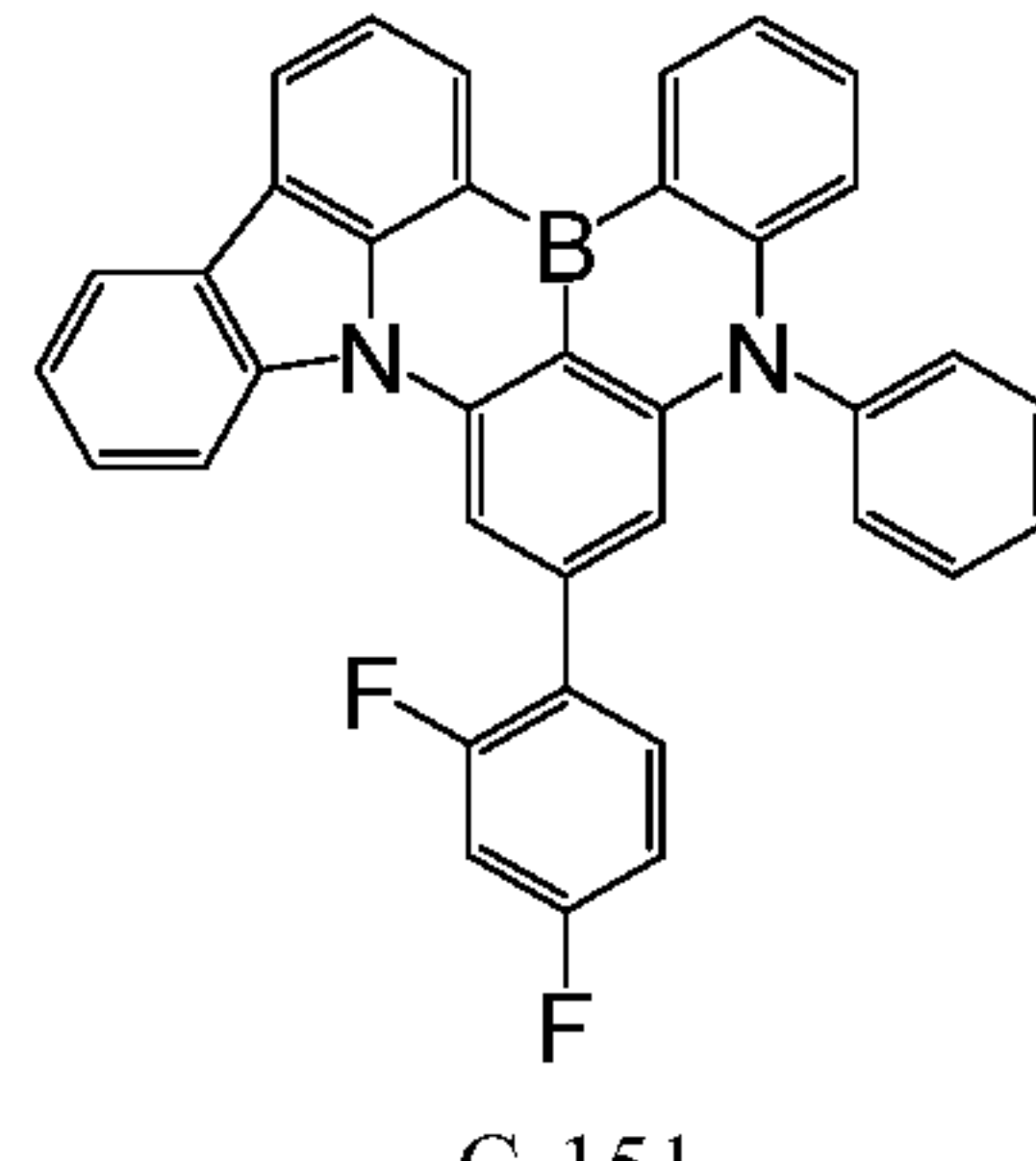
C-148



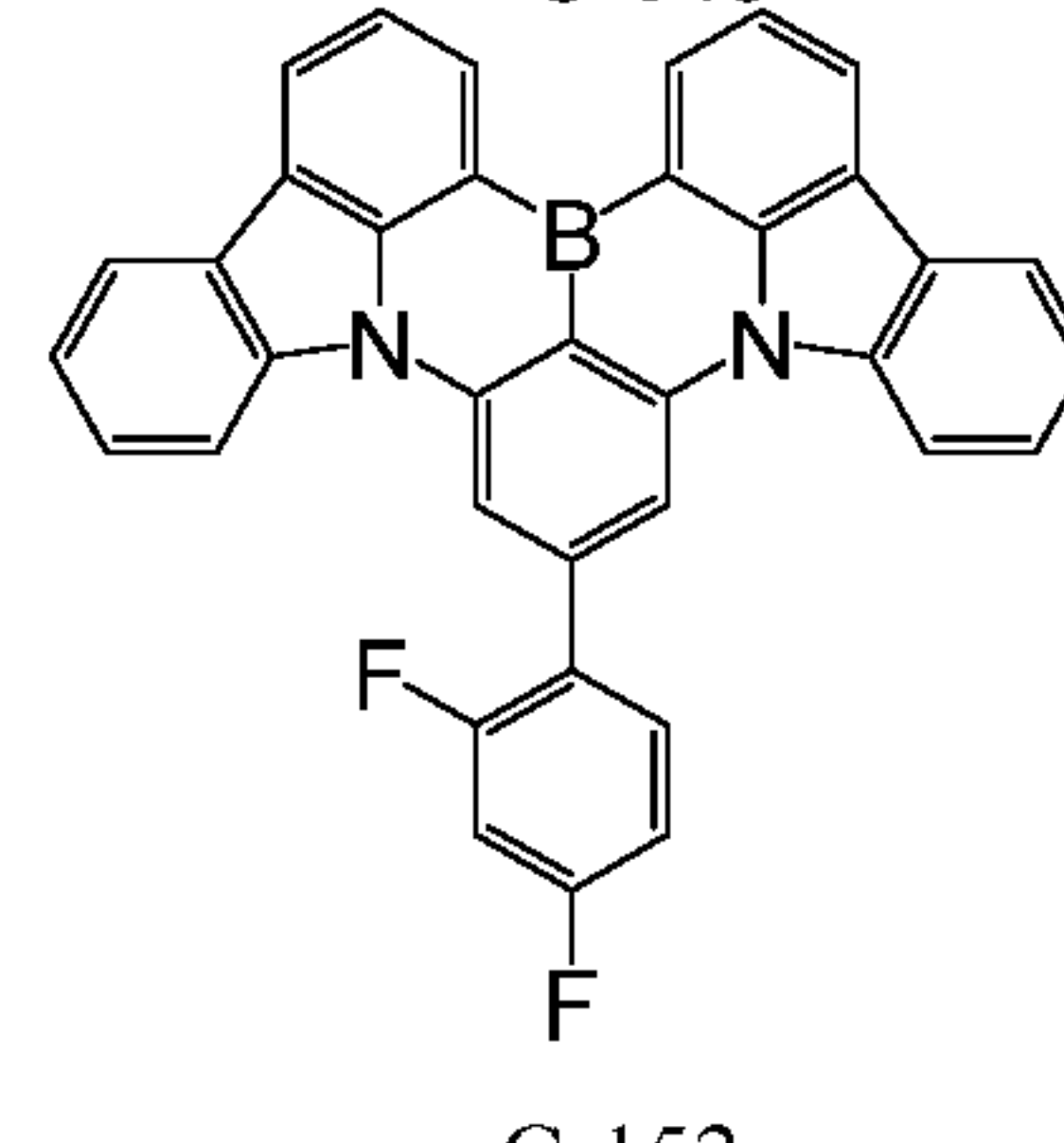
C-149



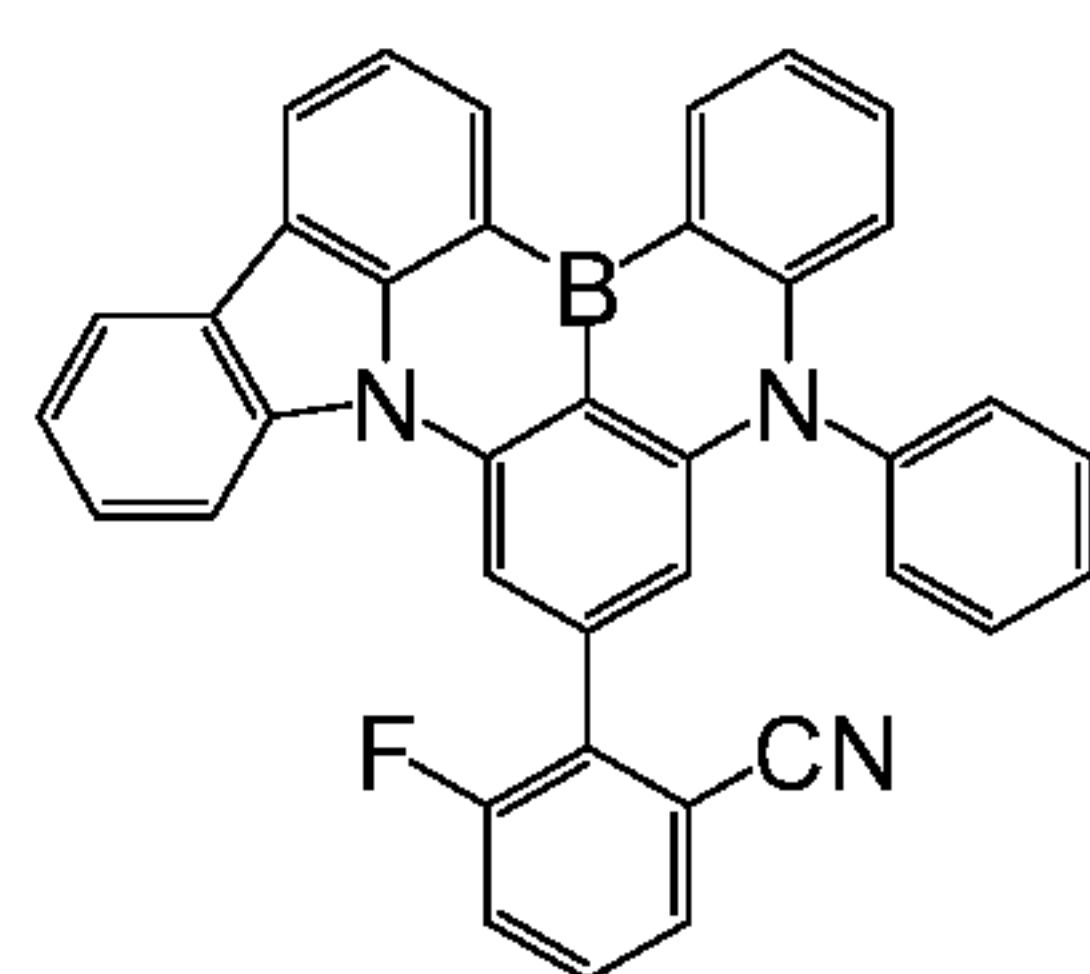
C-150



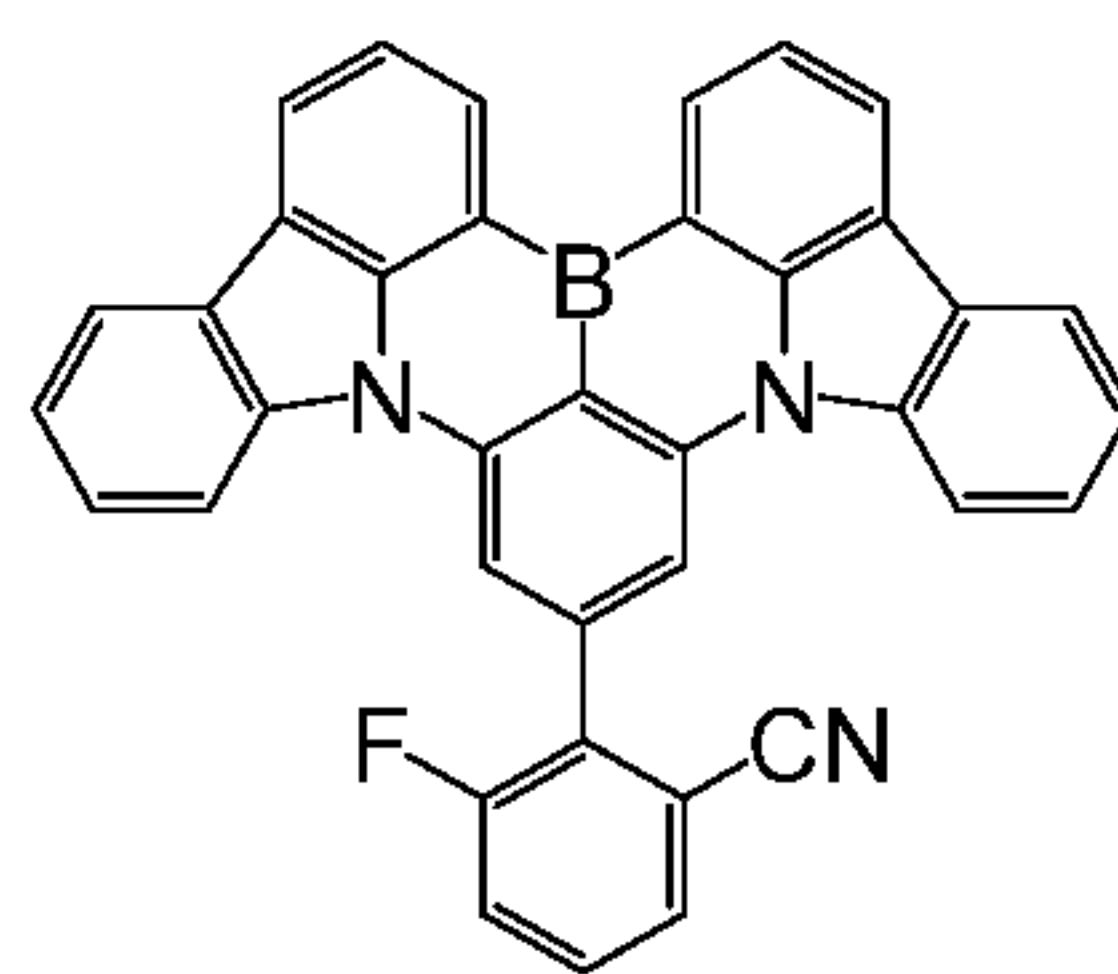
C-151



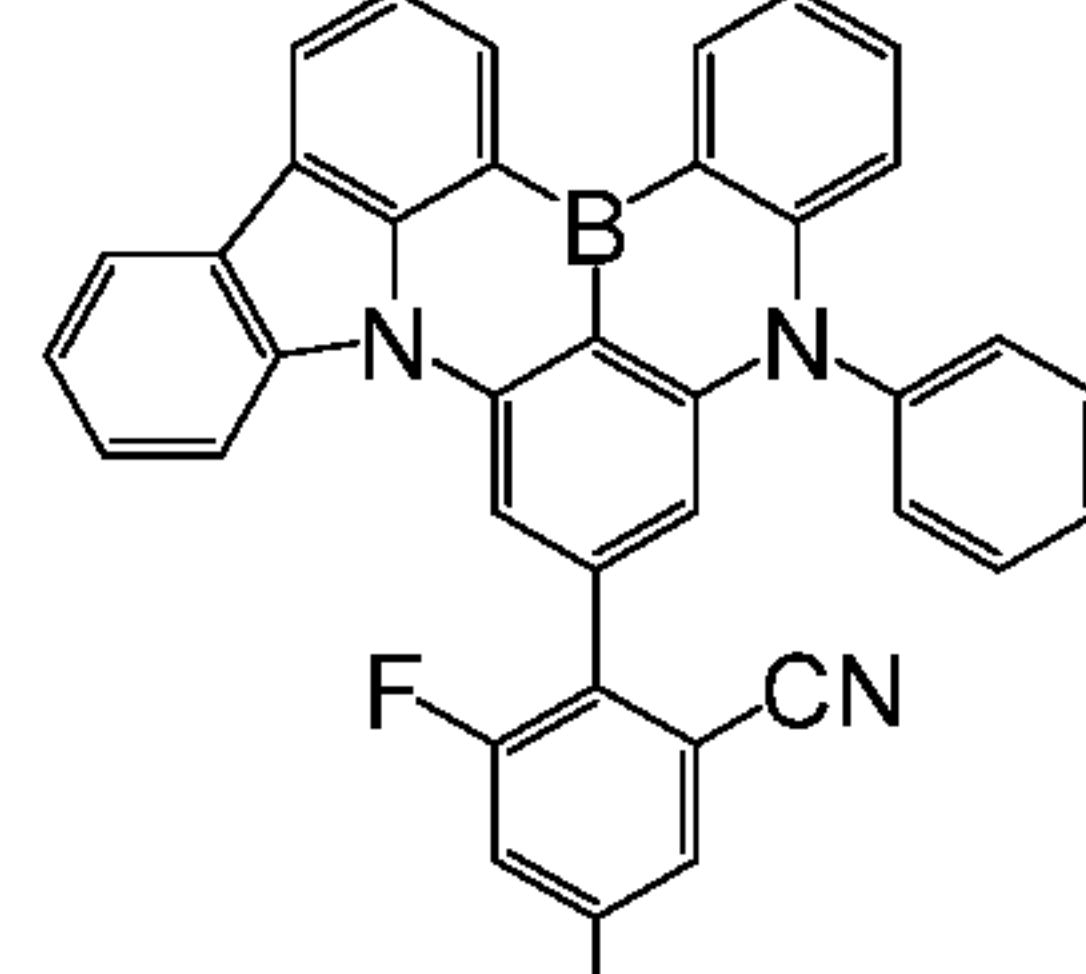
C-152



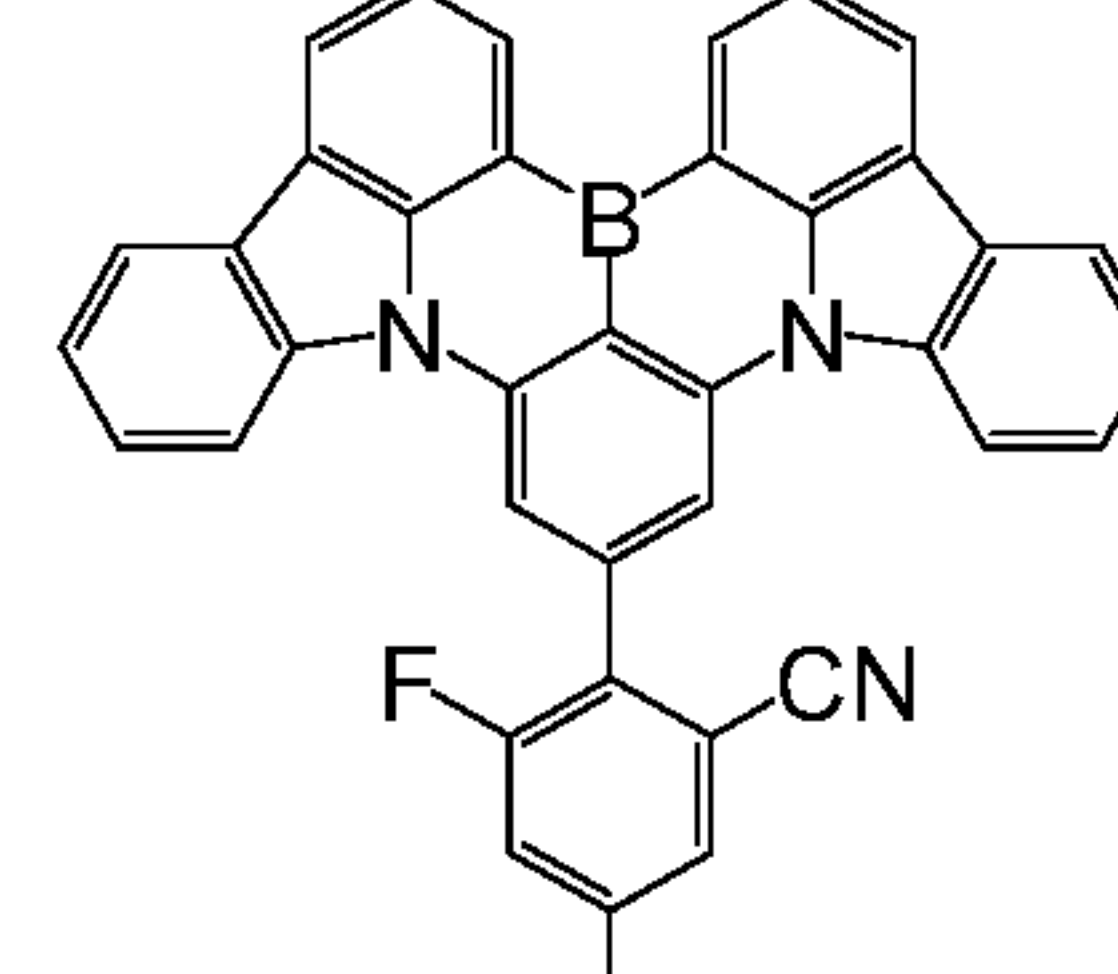
C-153



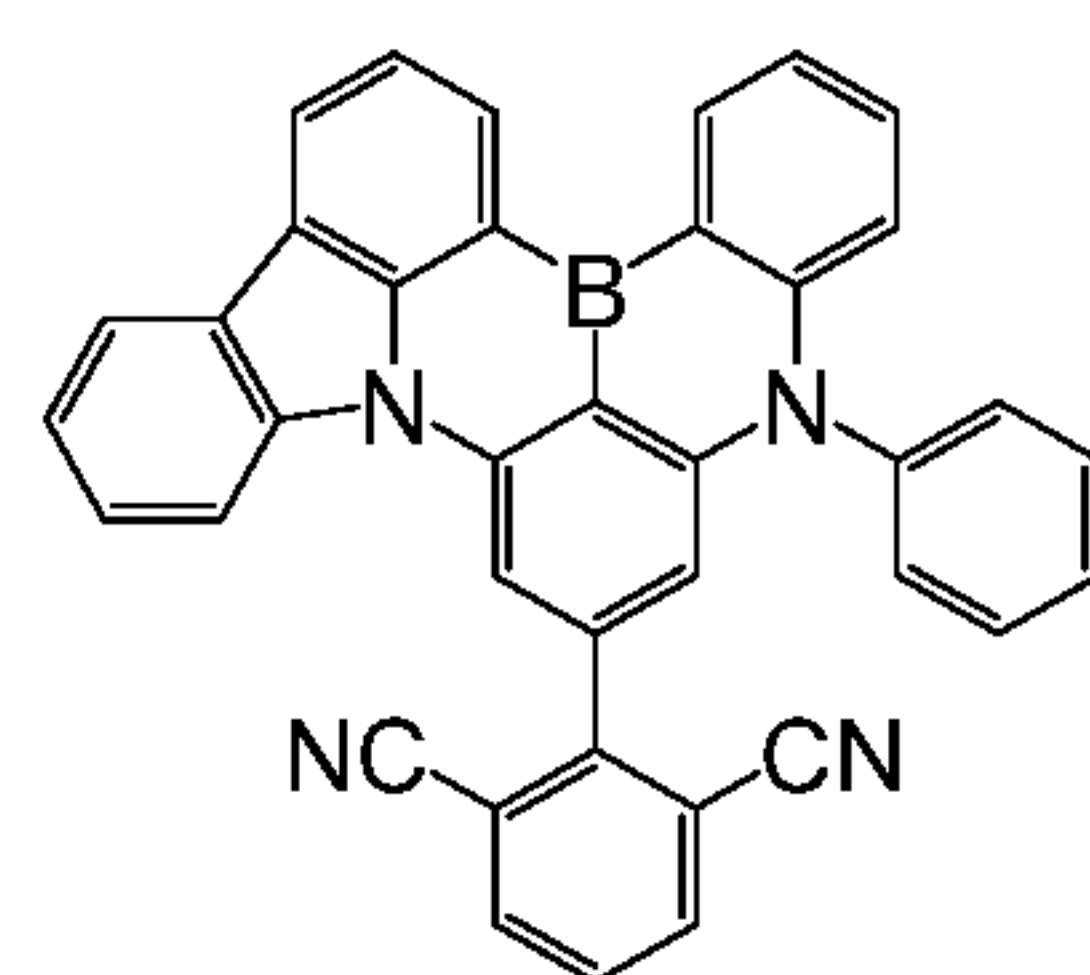
C-154



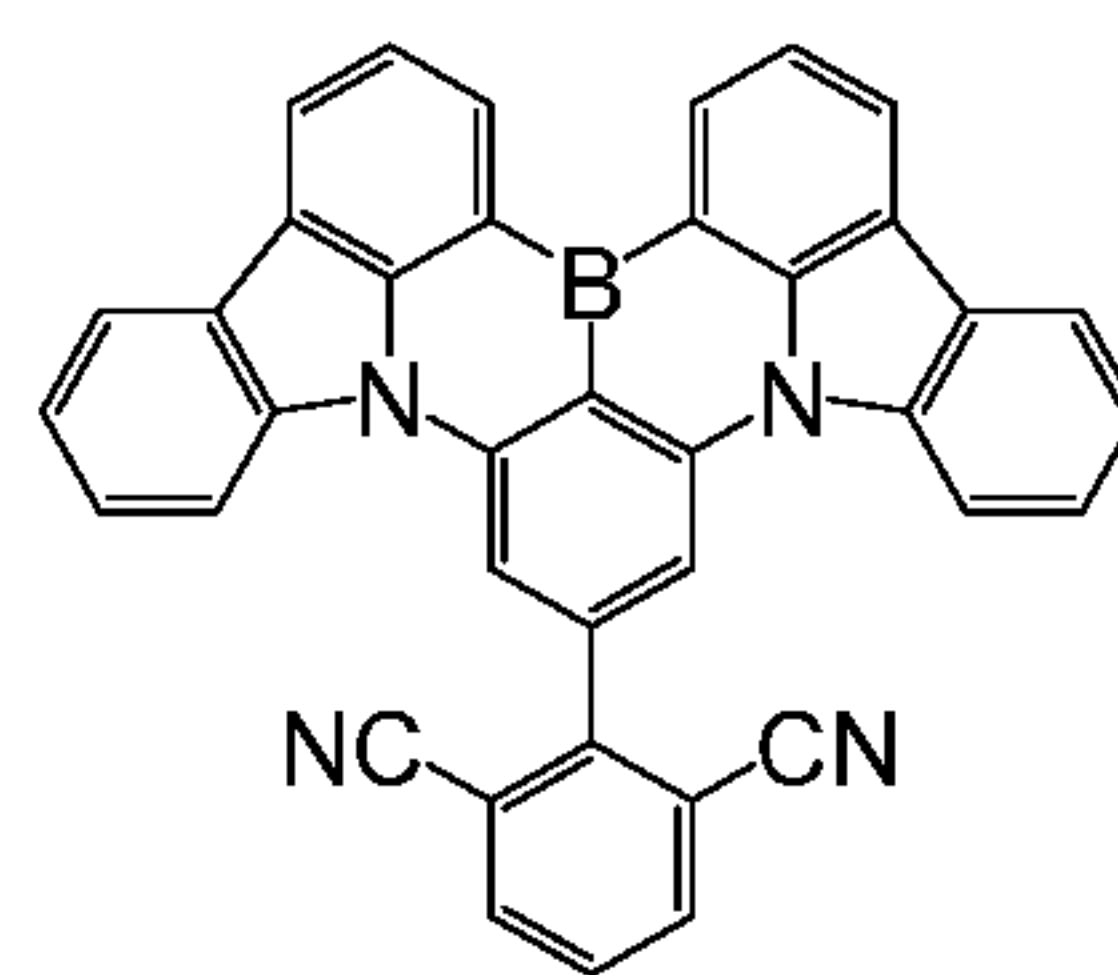
C-155



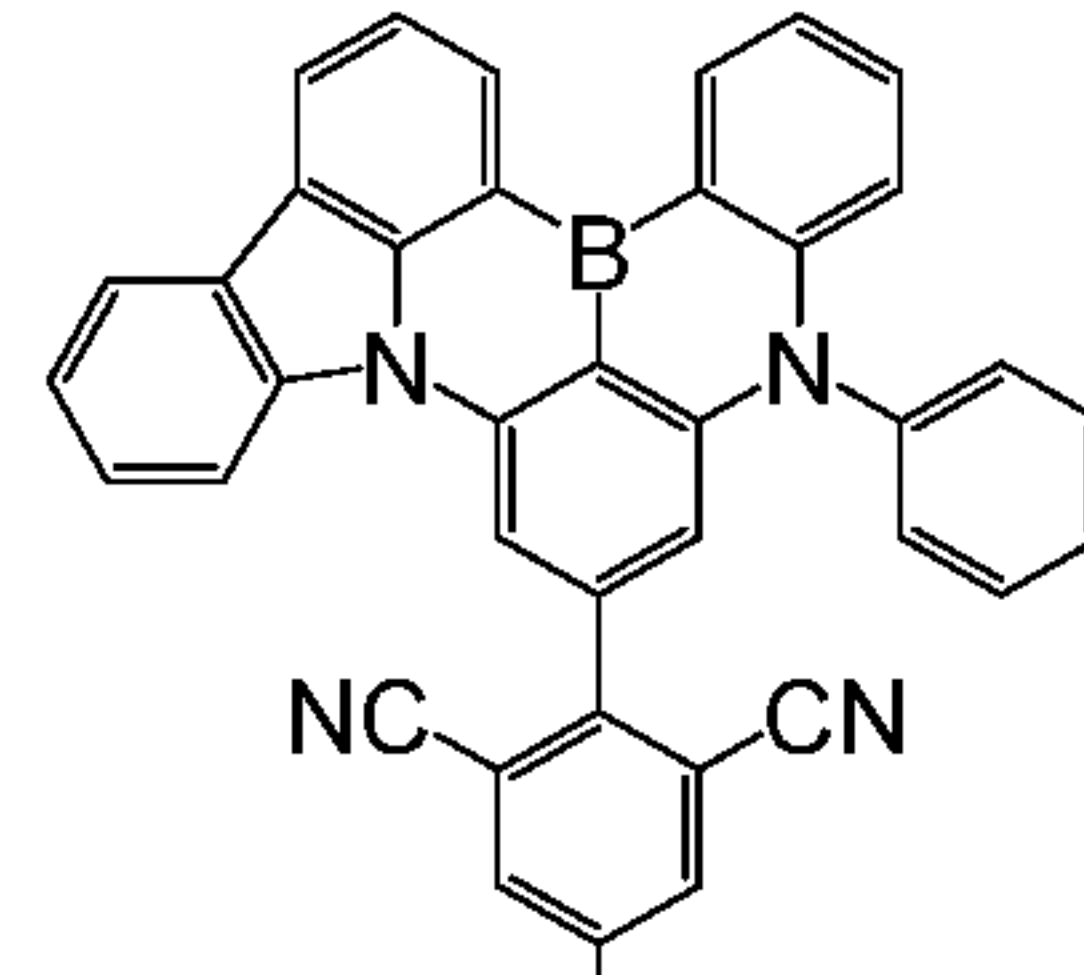
C-156



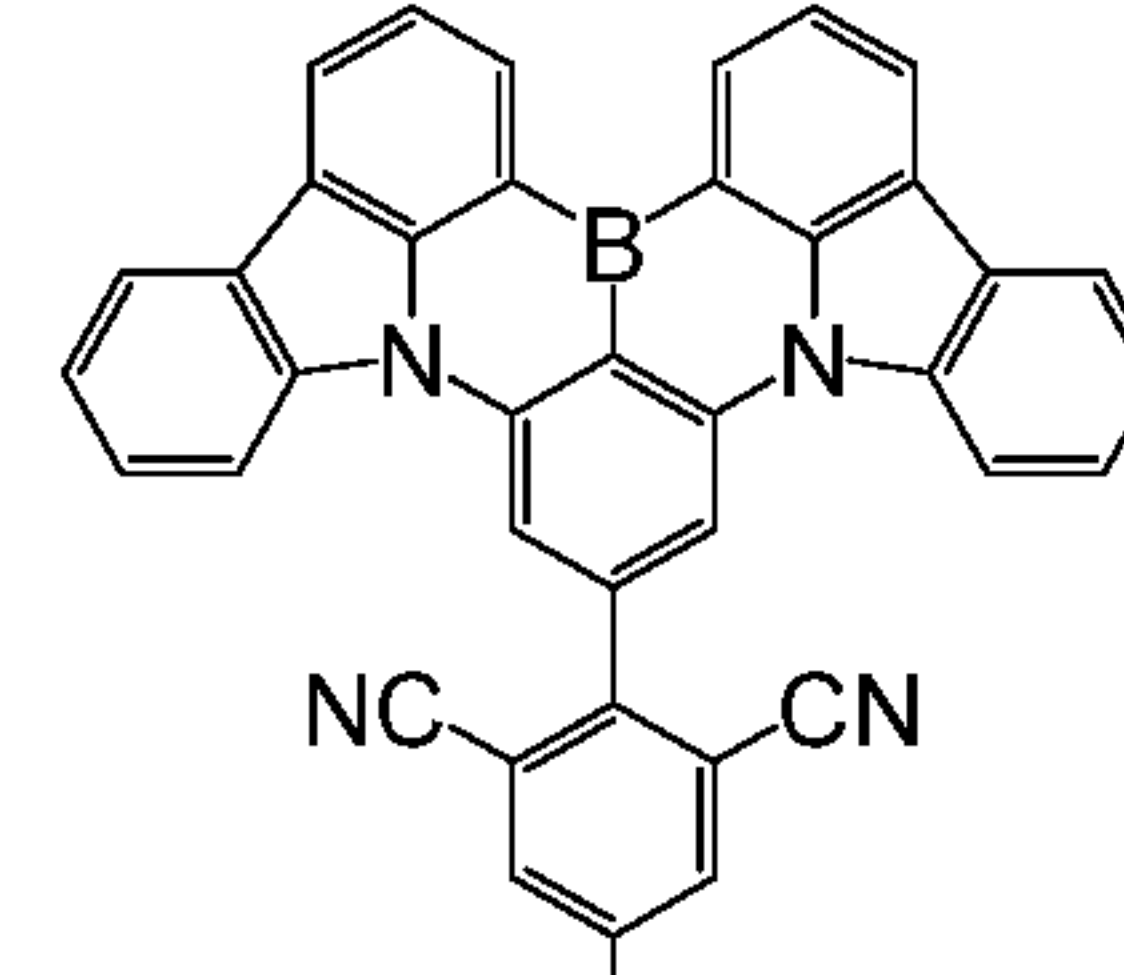
C-157



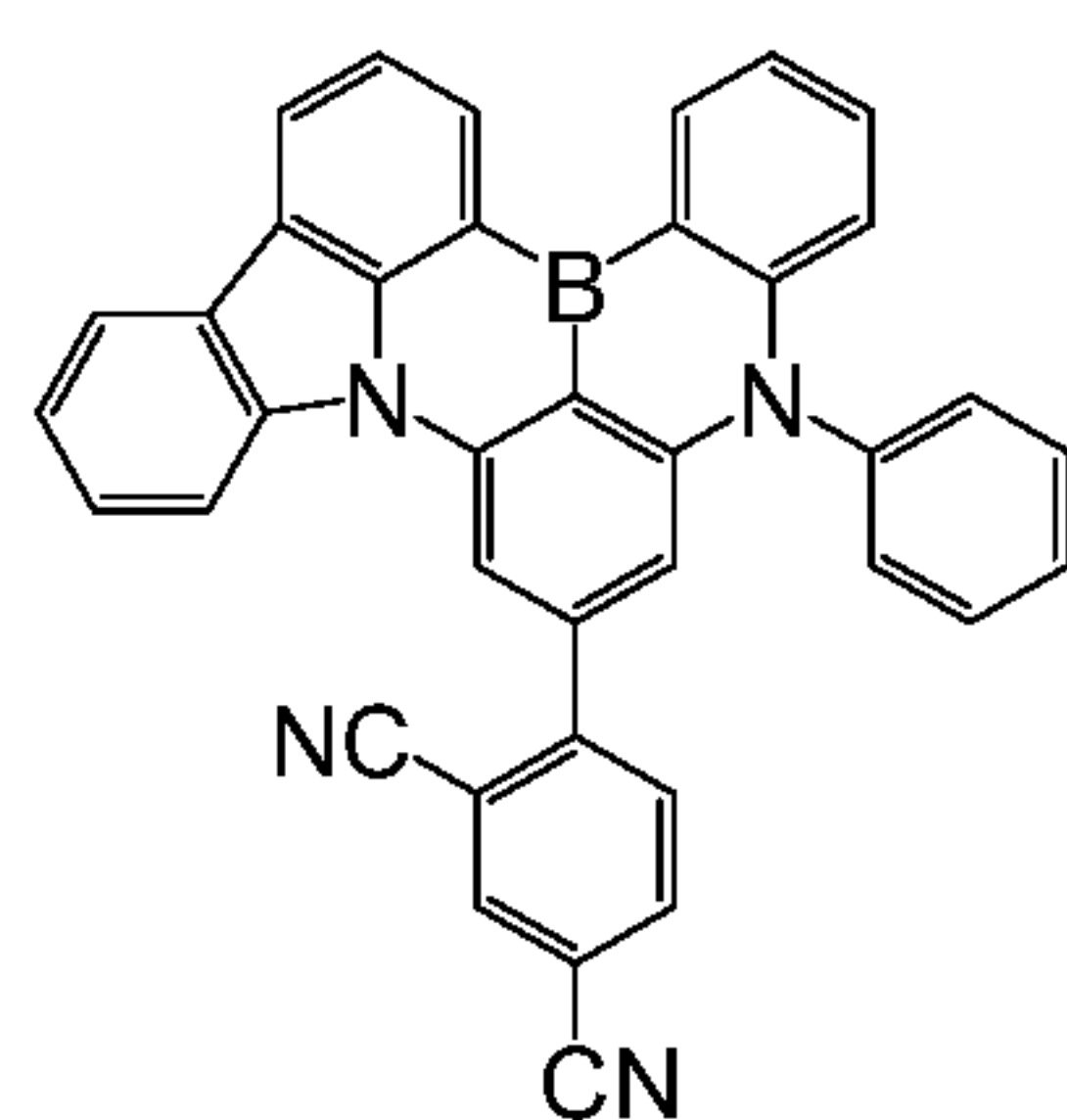
C-158



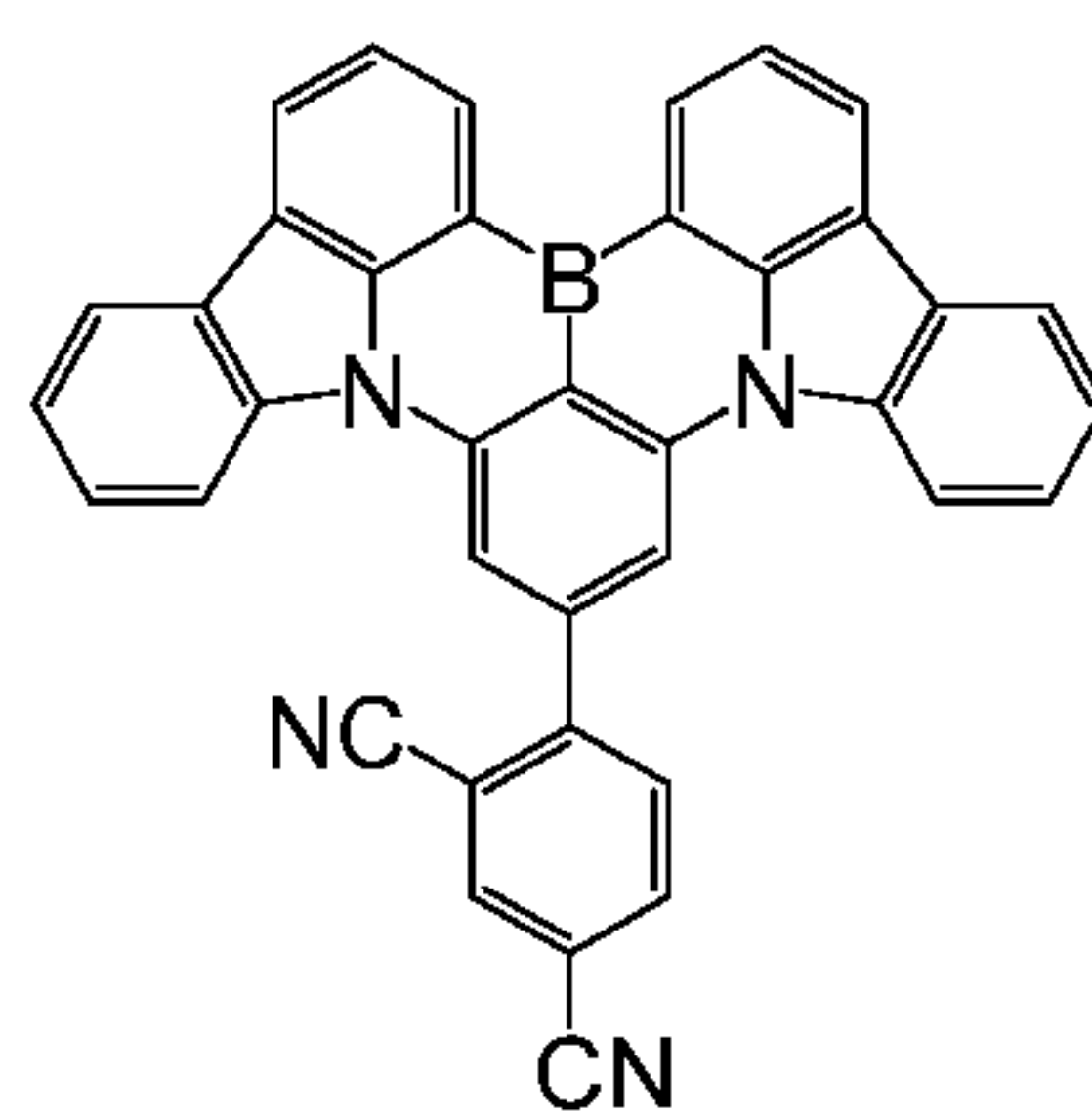
C-159



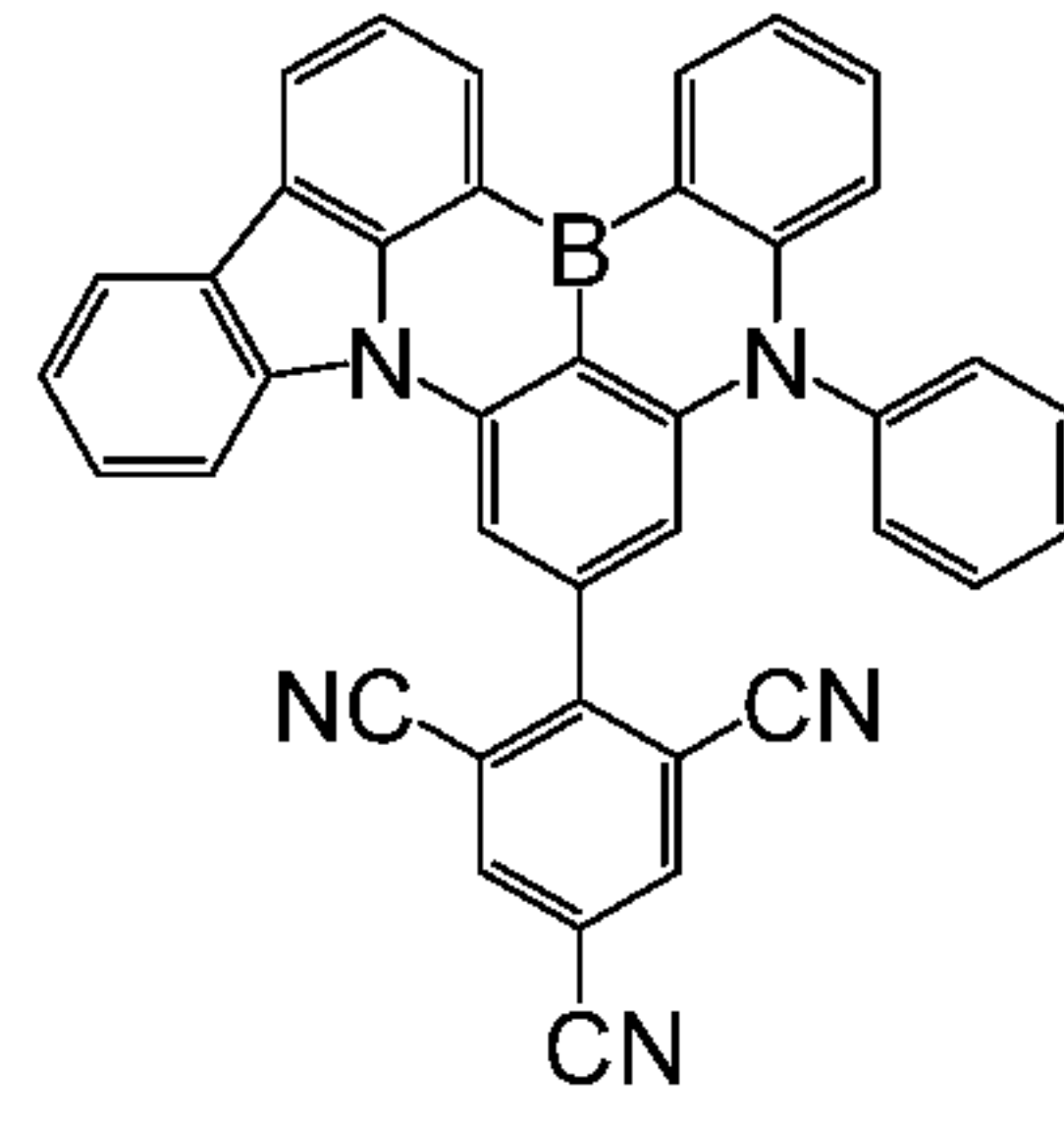
C-160



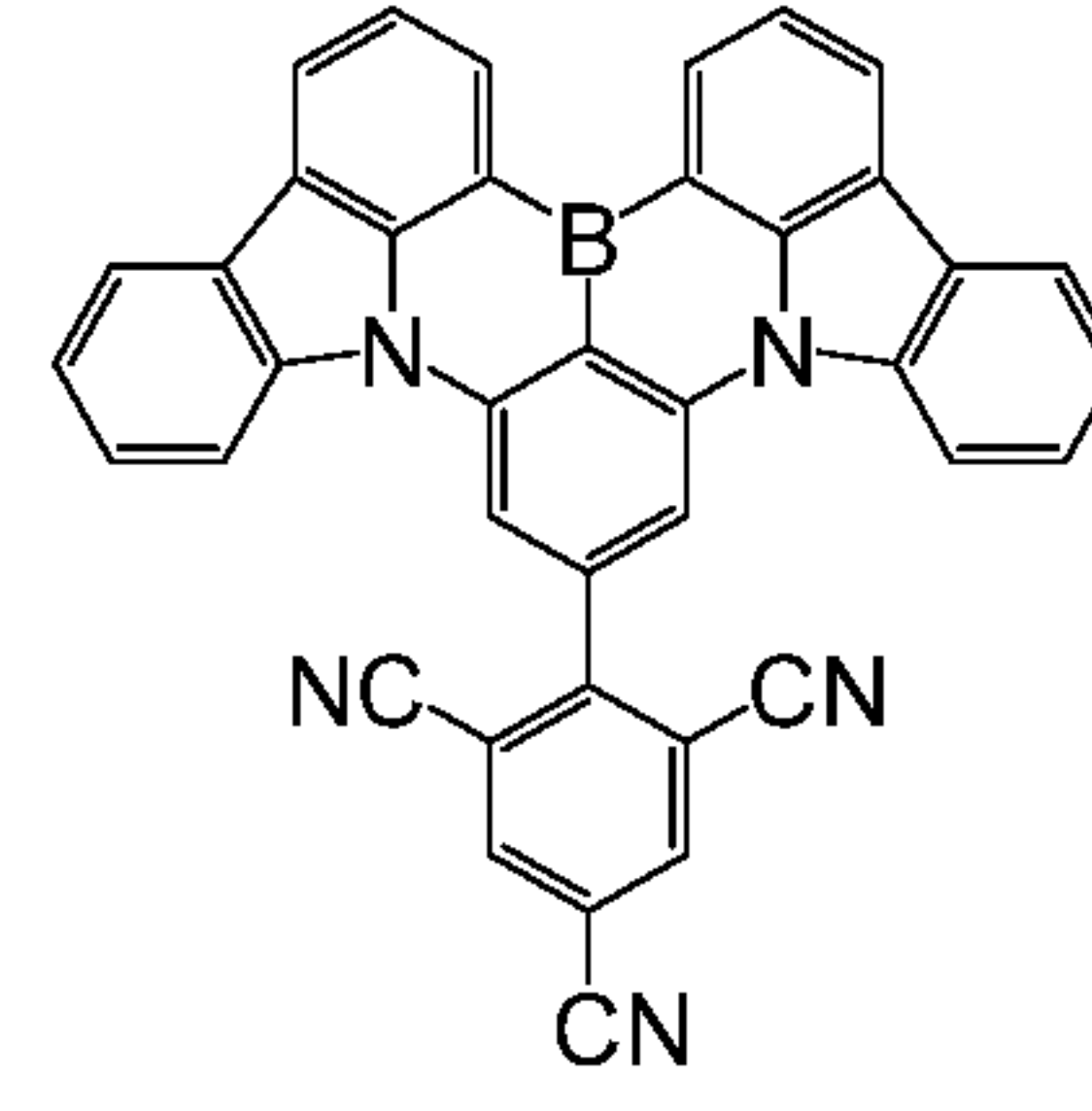
C-161



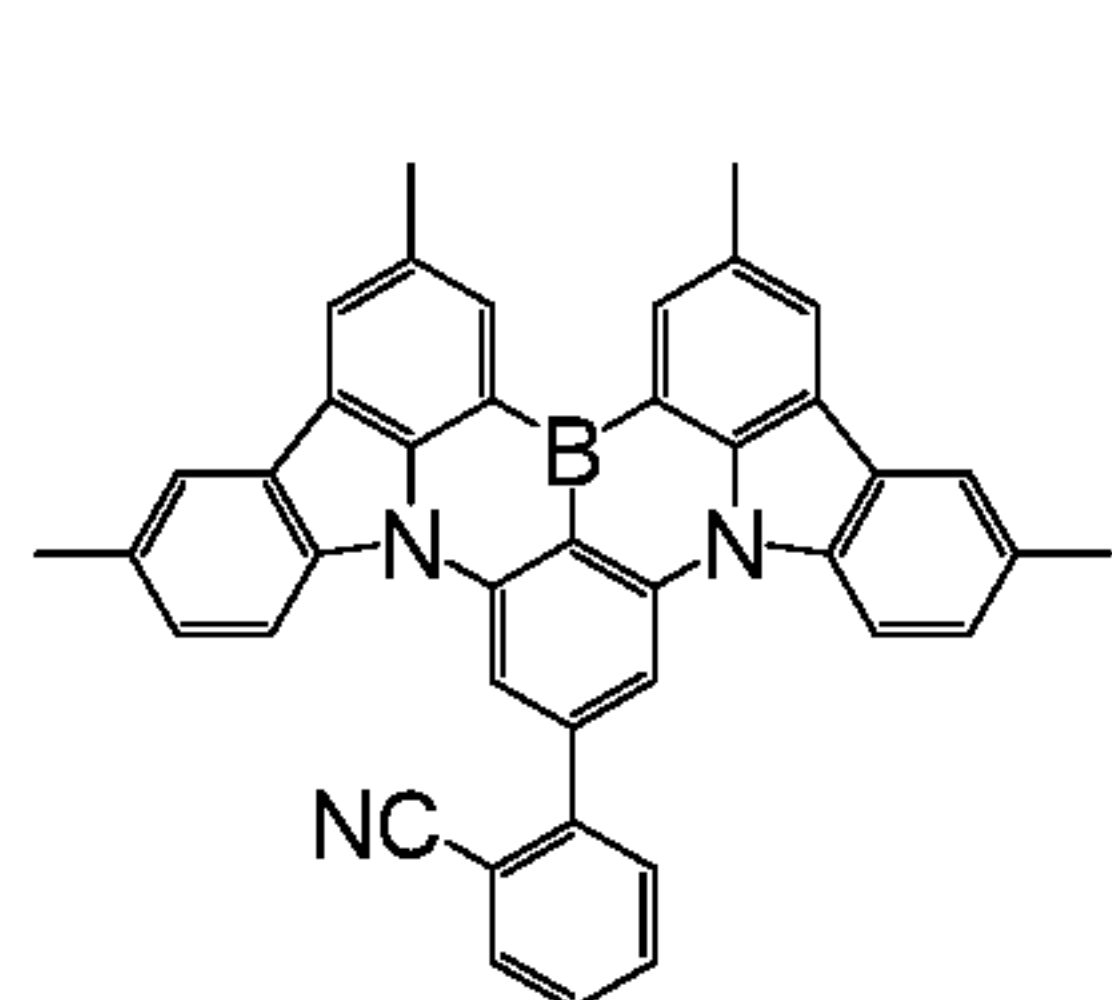
C-162



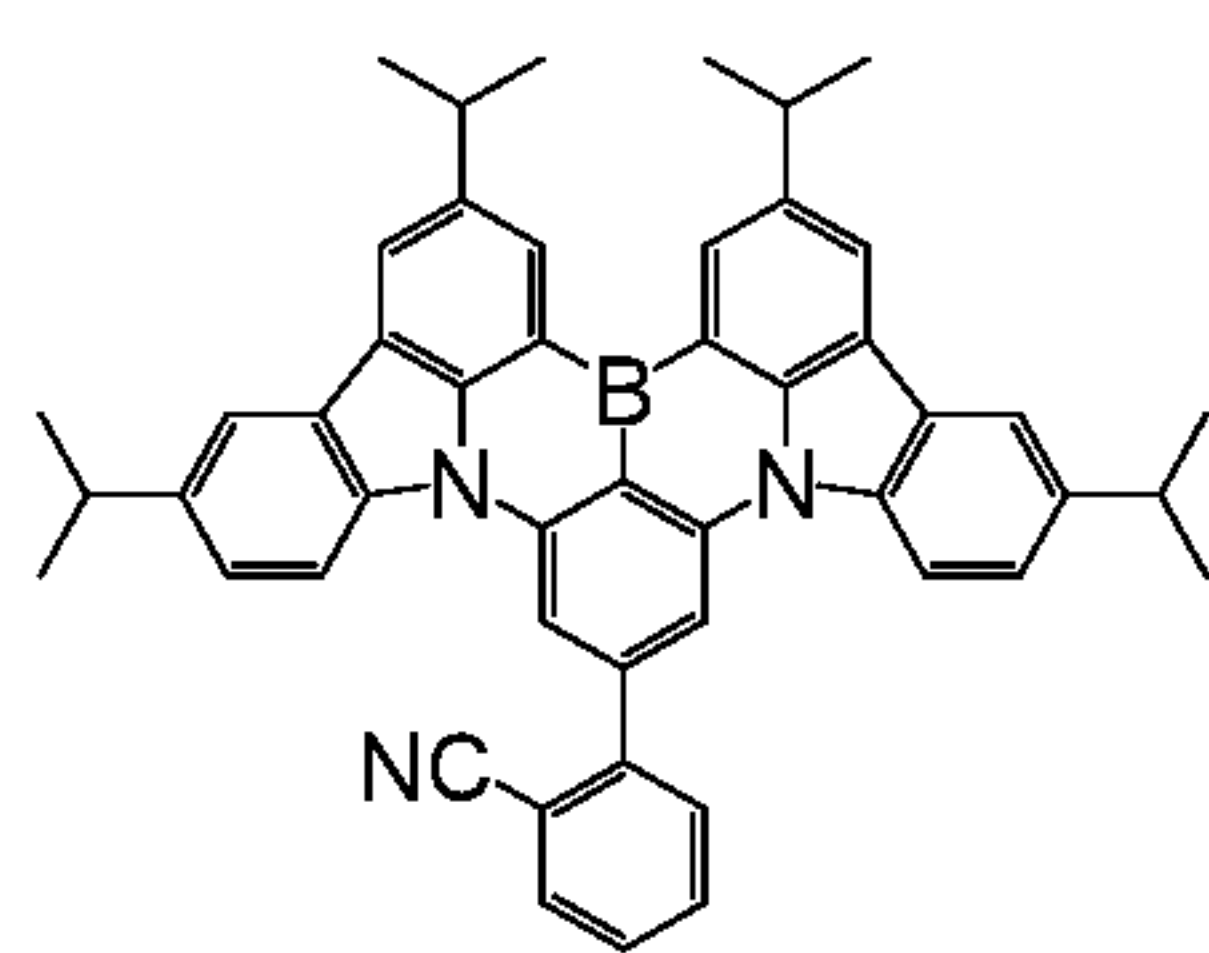
C-163



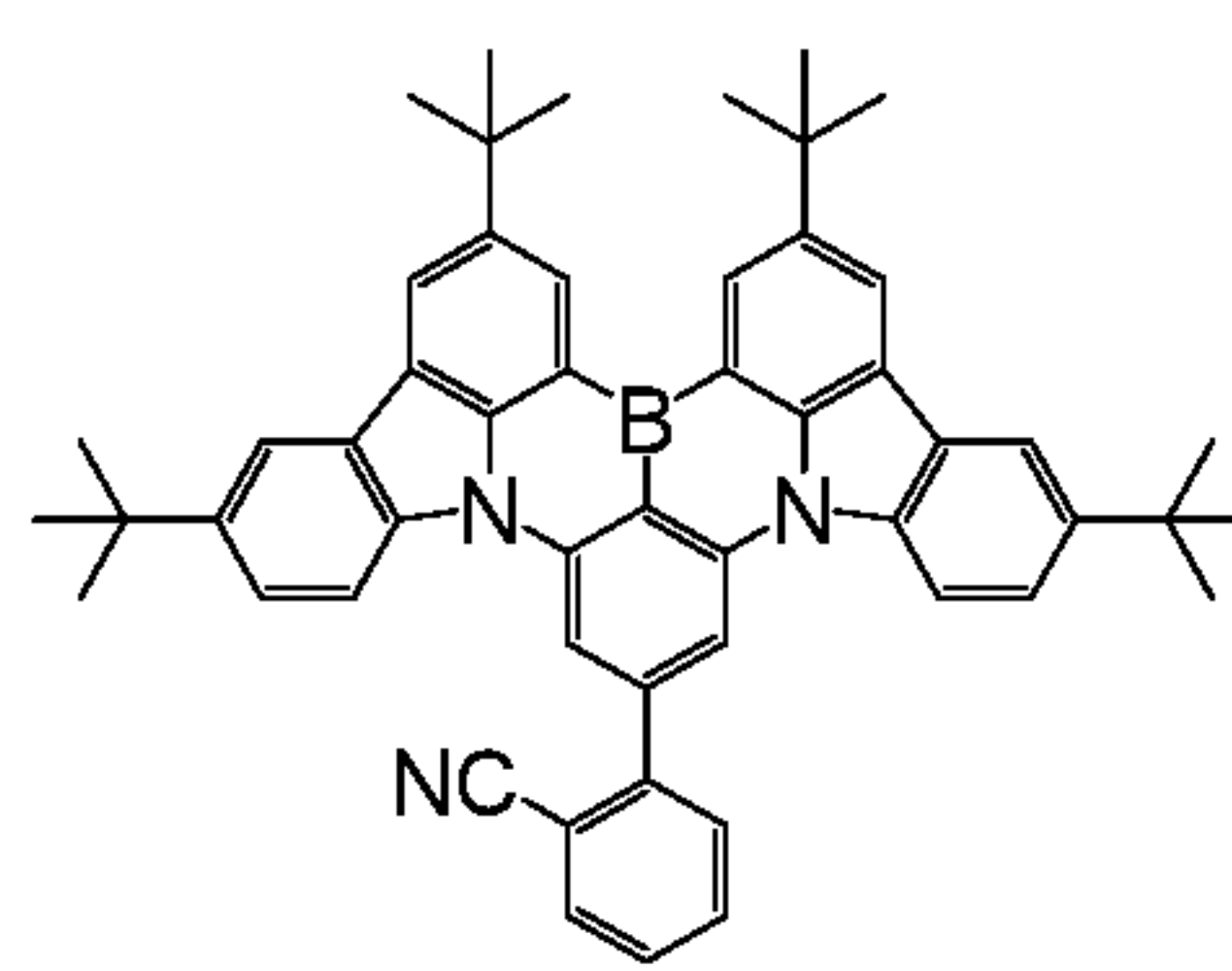
C-164



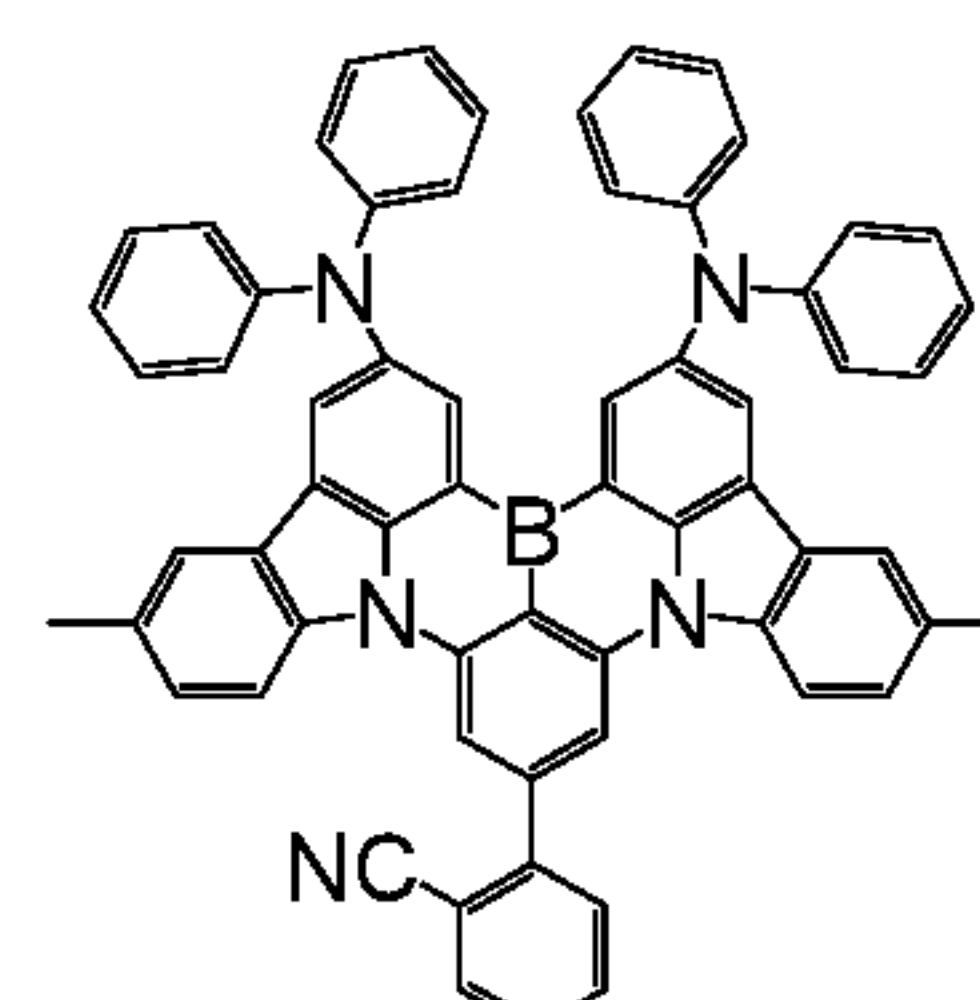
C-165



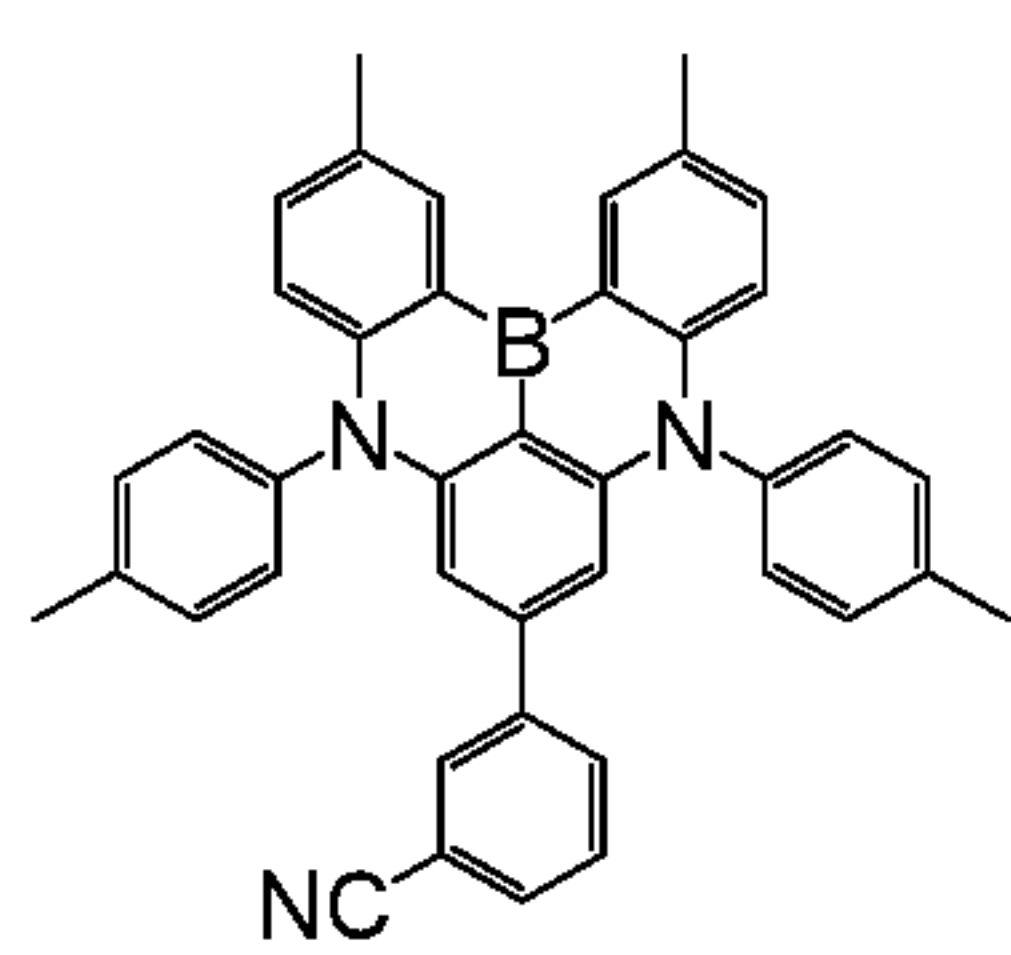
C-166



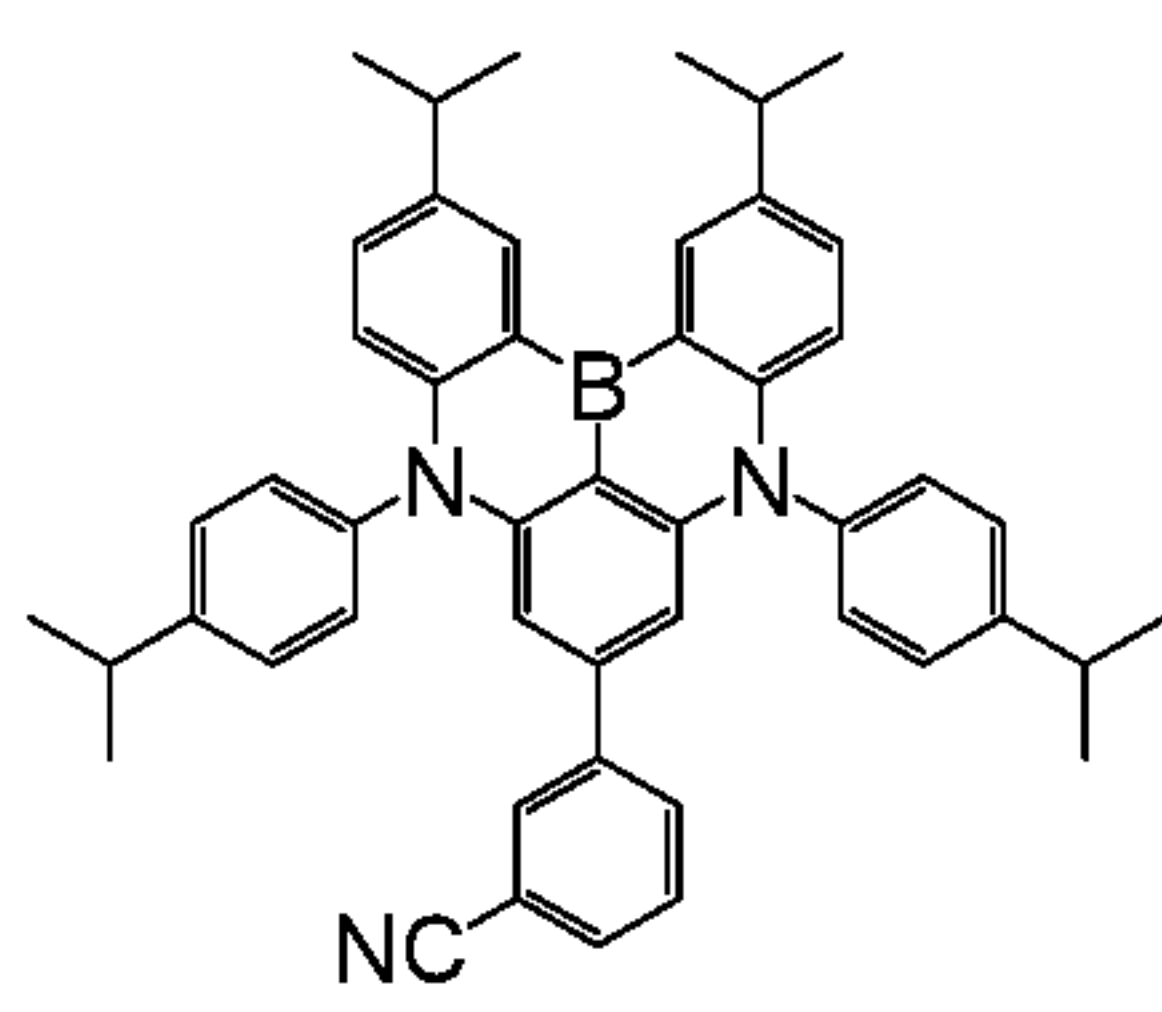
C-167



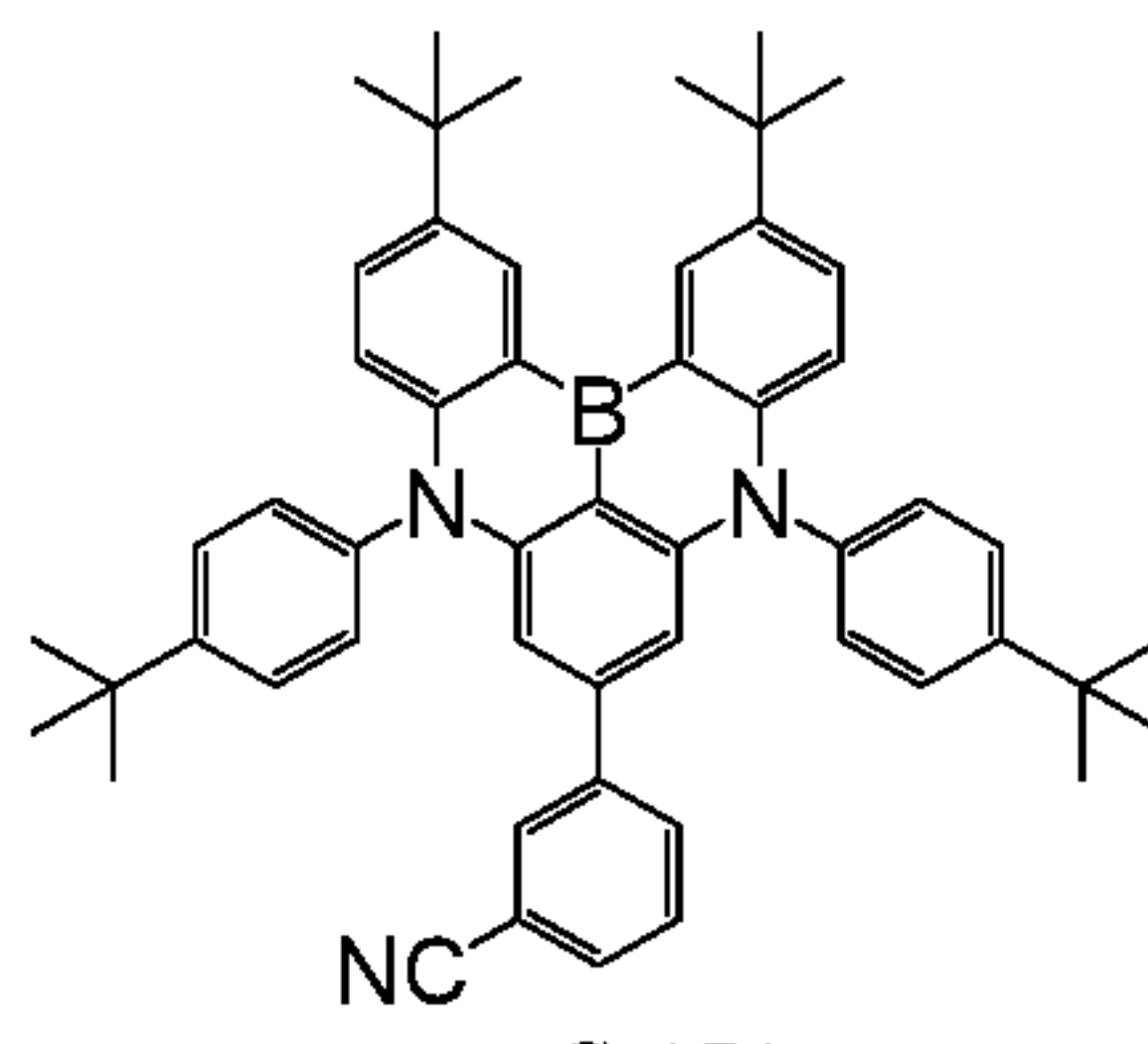
C-168



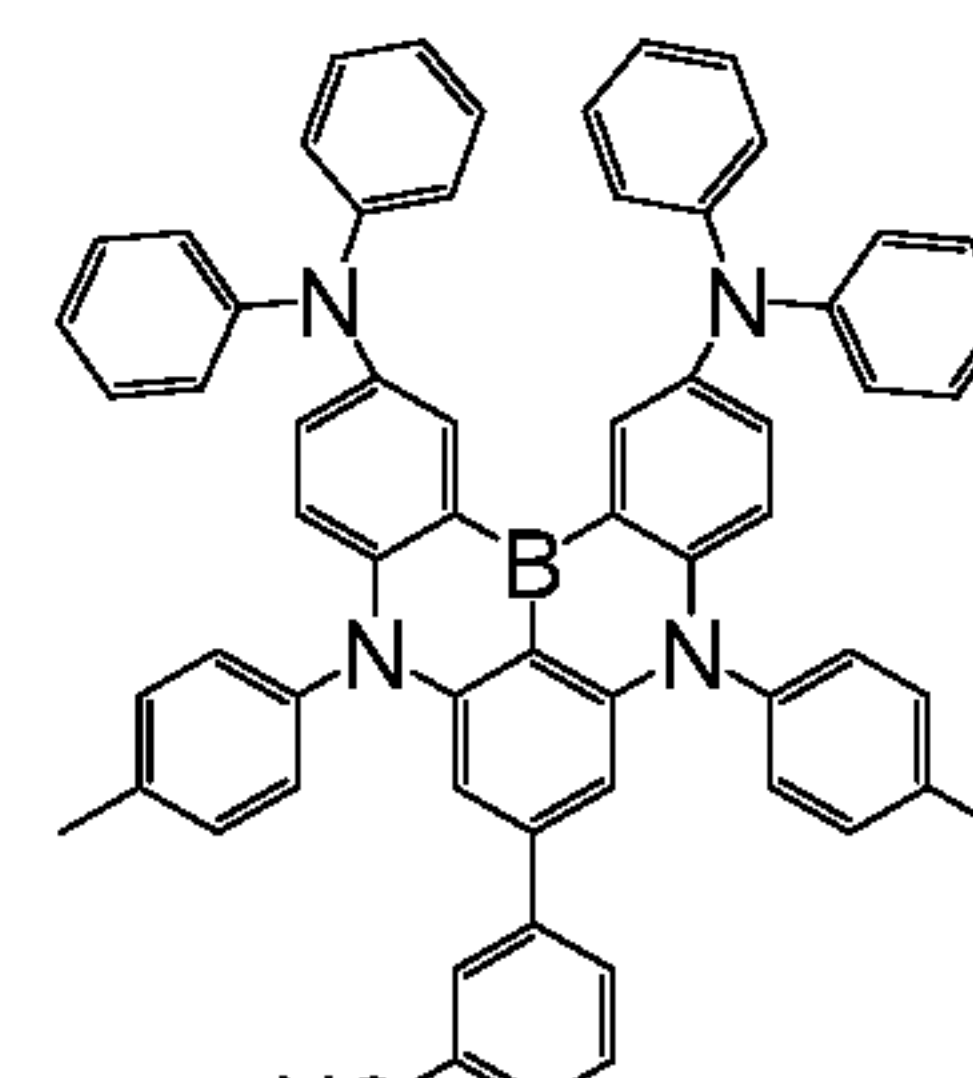
C-169



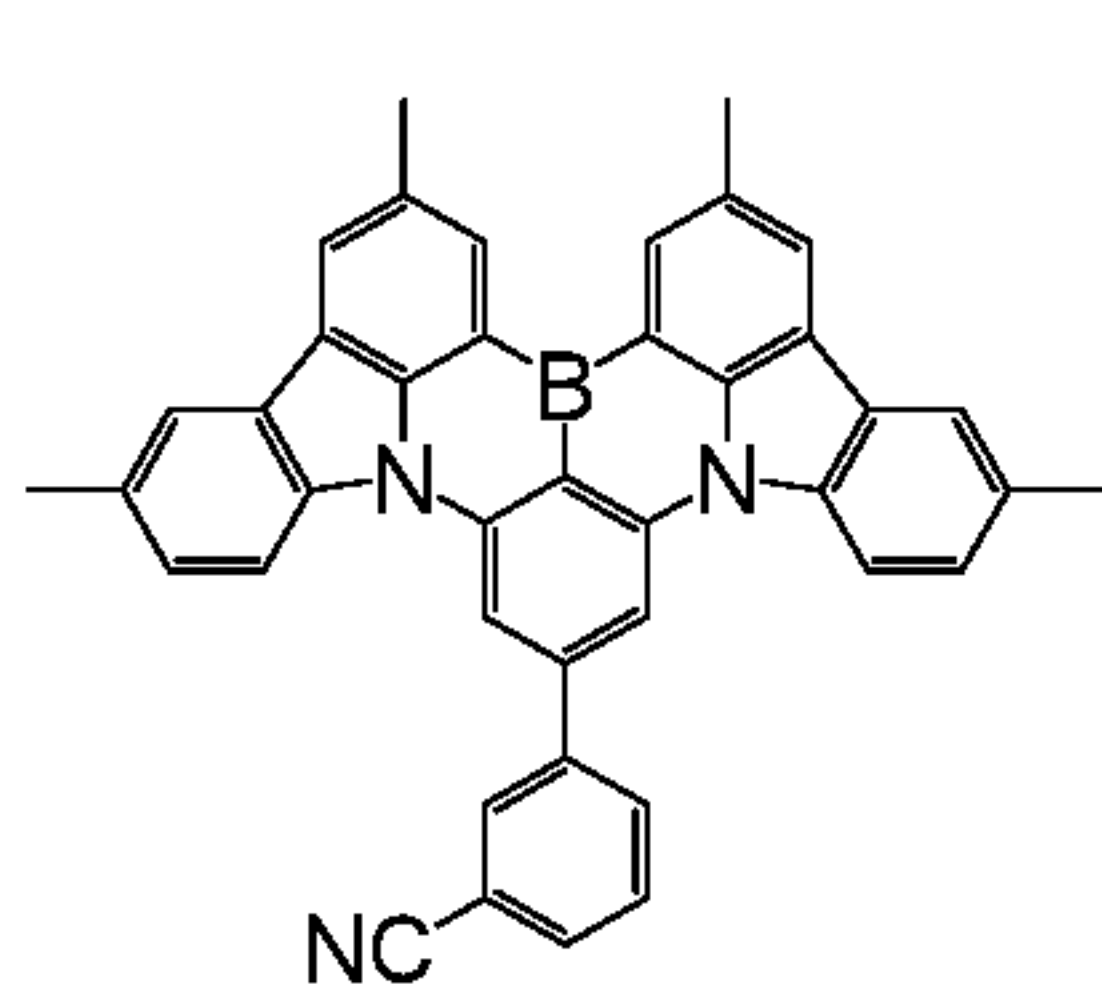
C-170



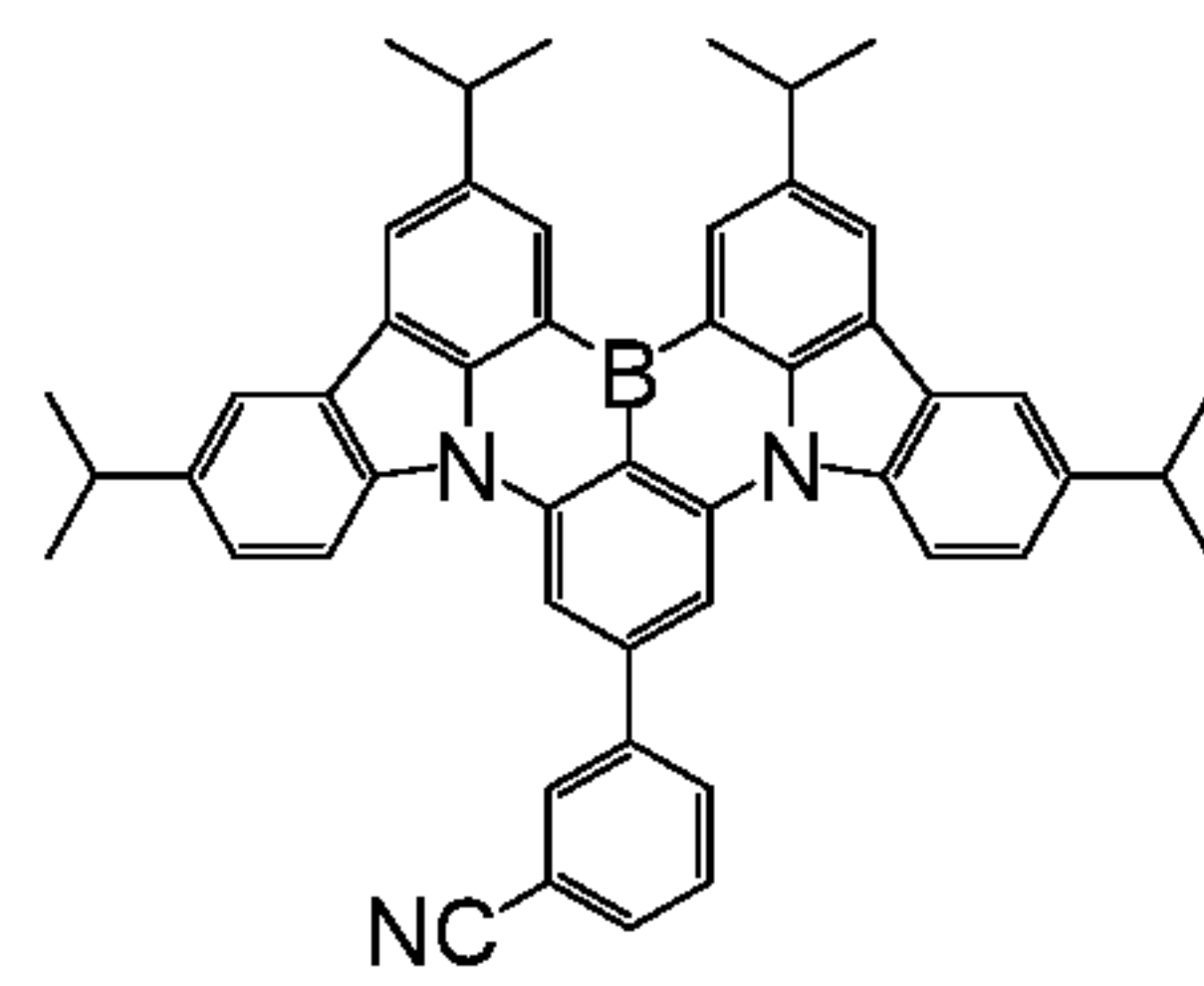
C-171



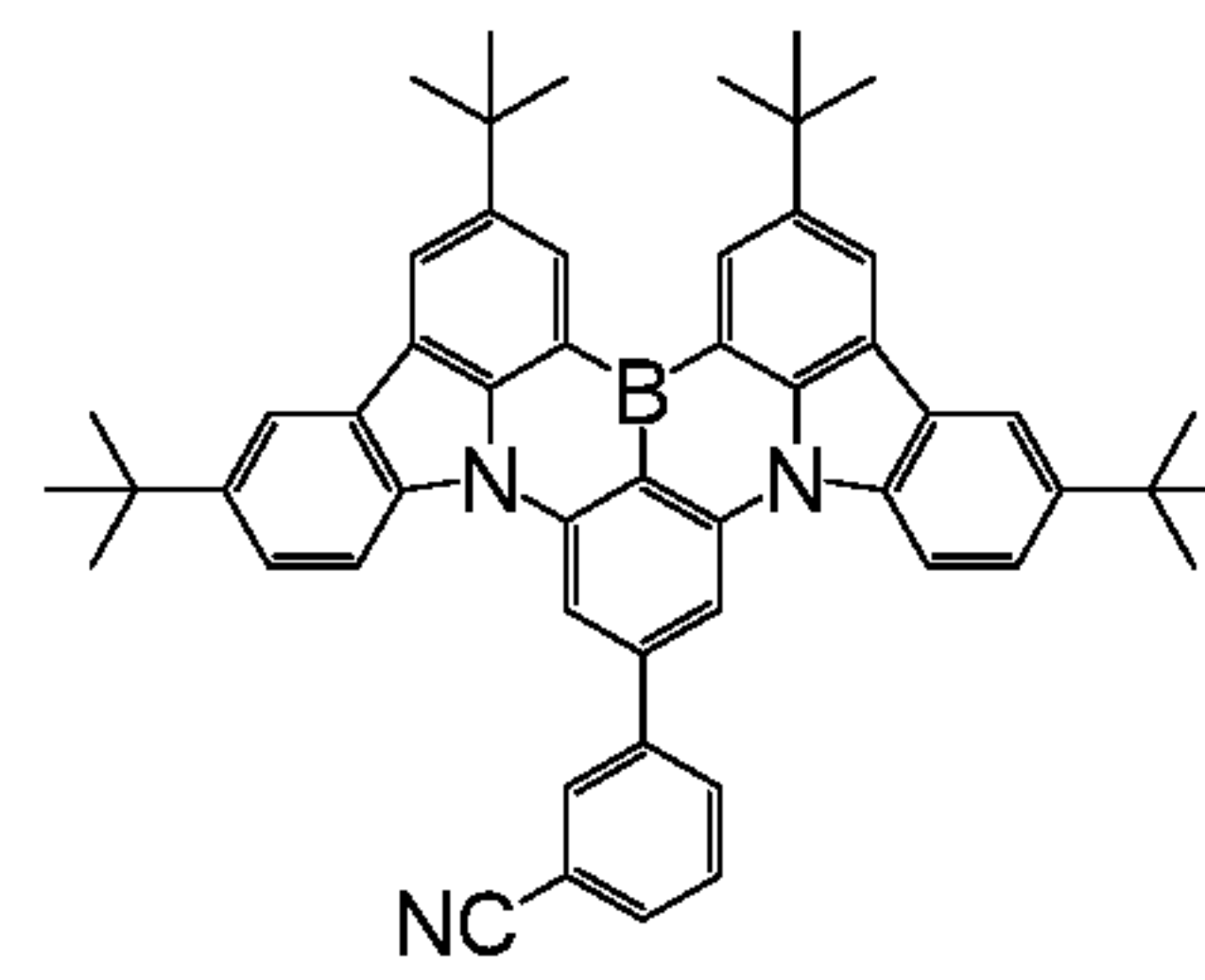
C-172



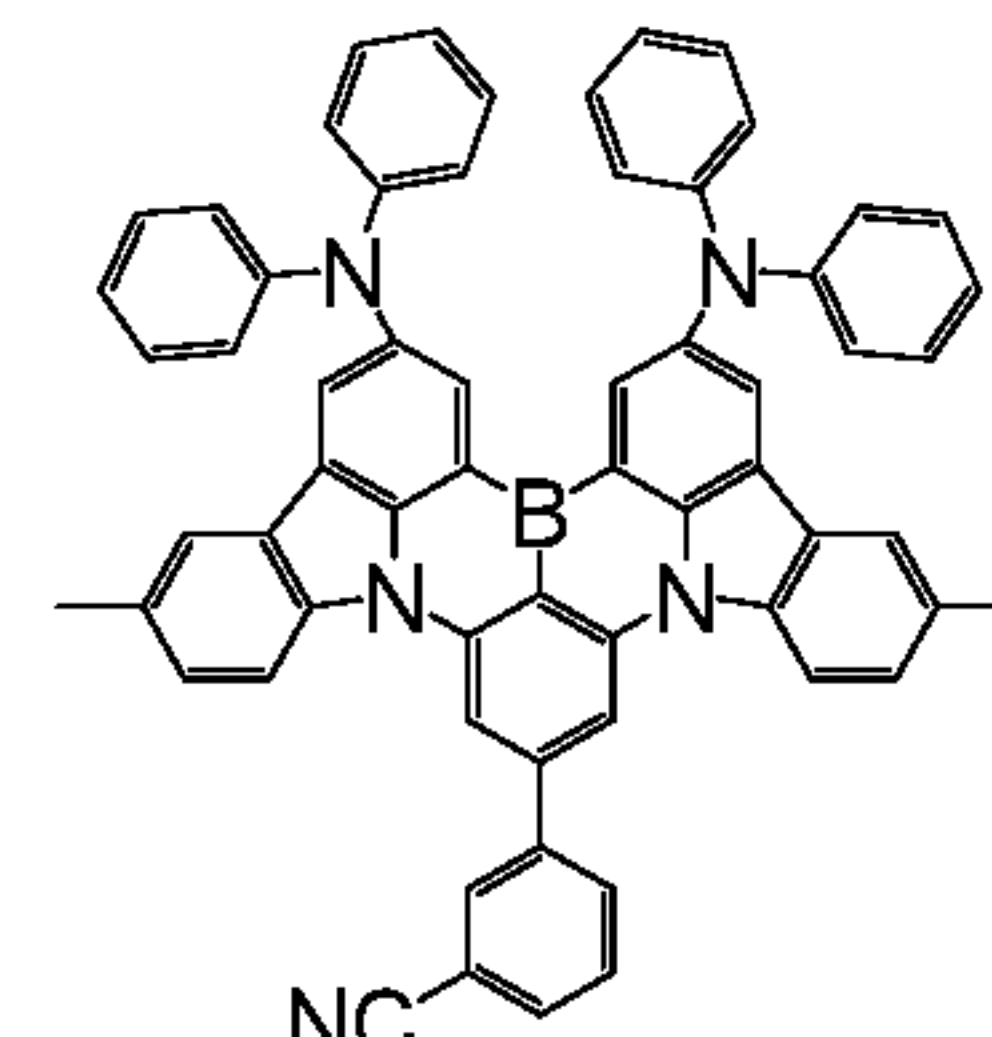
C-173



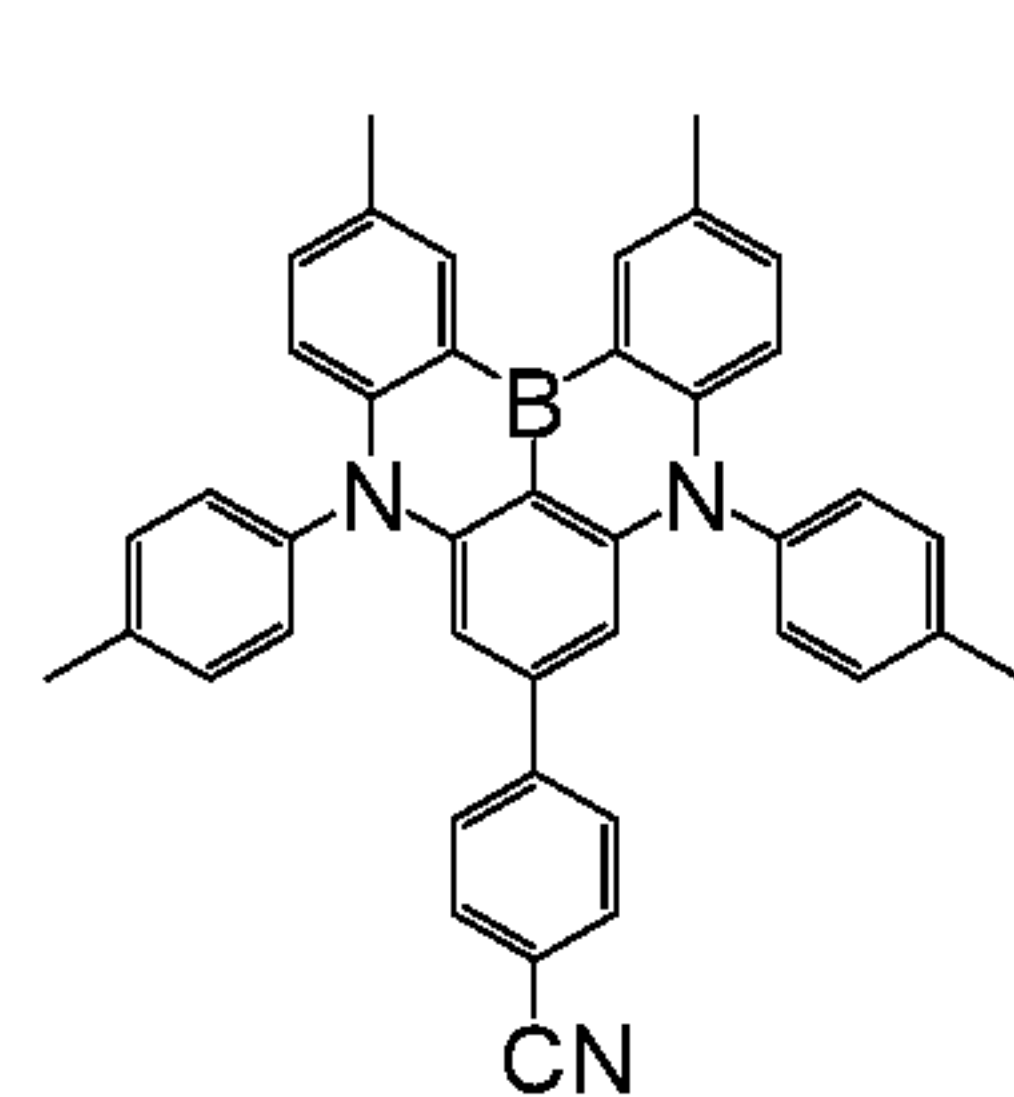
C-174



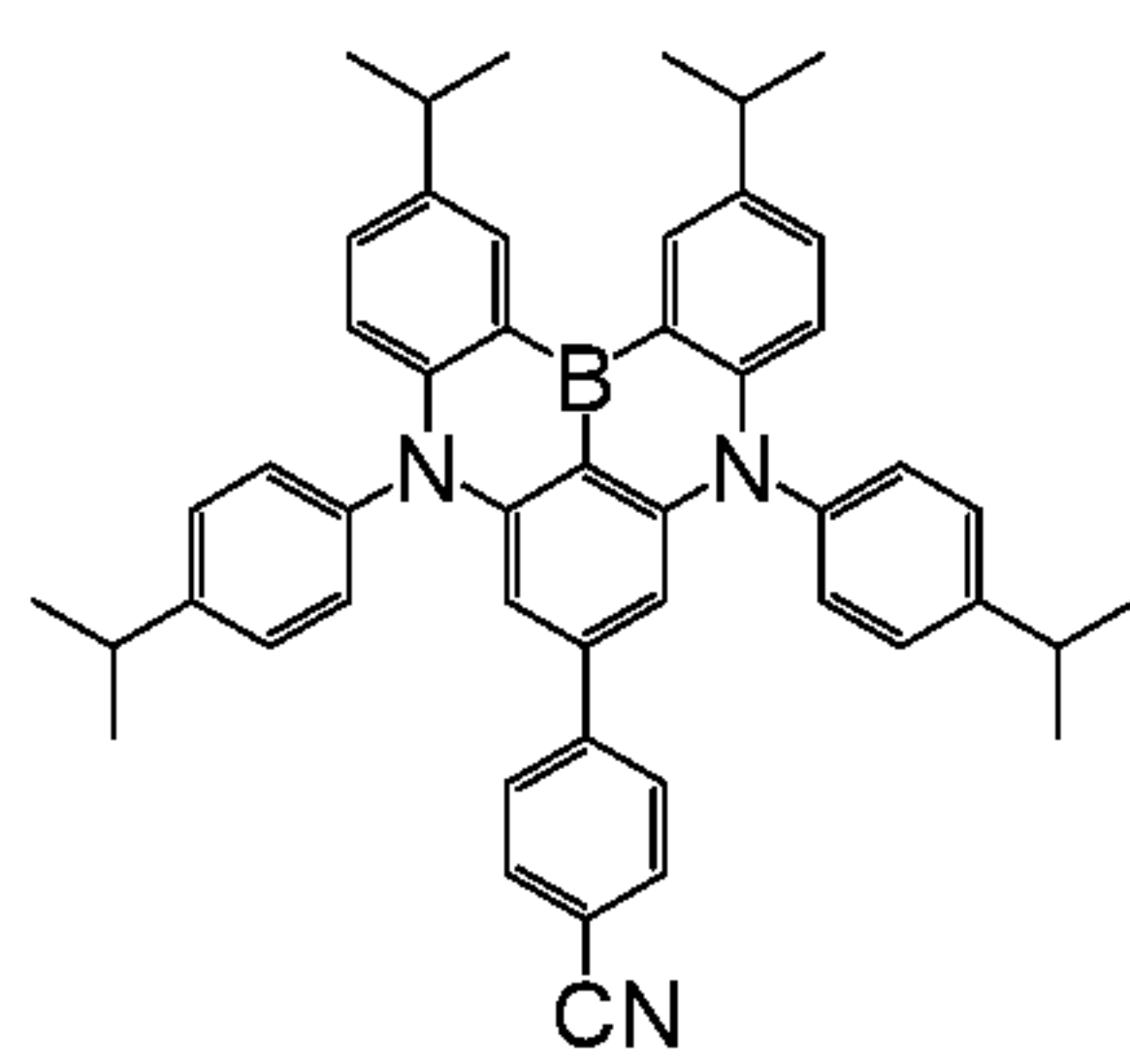
C-175



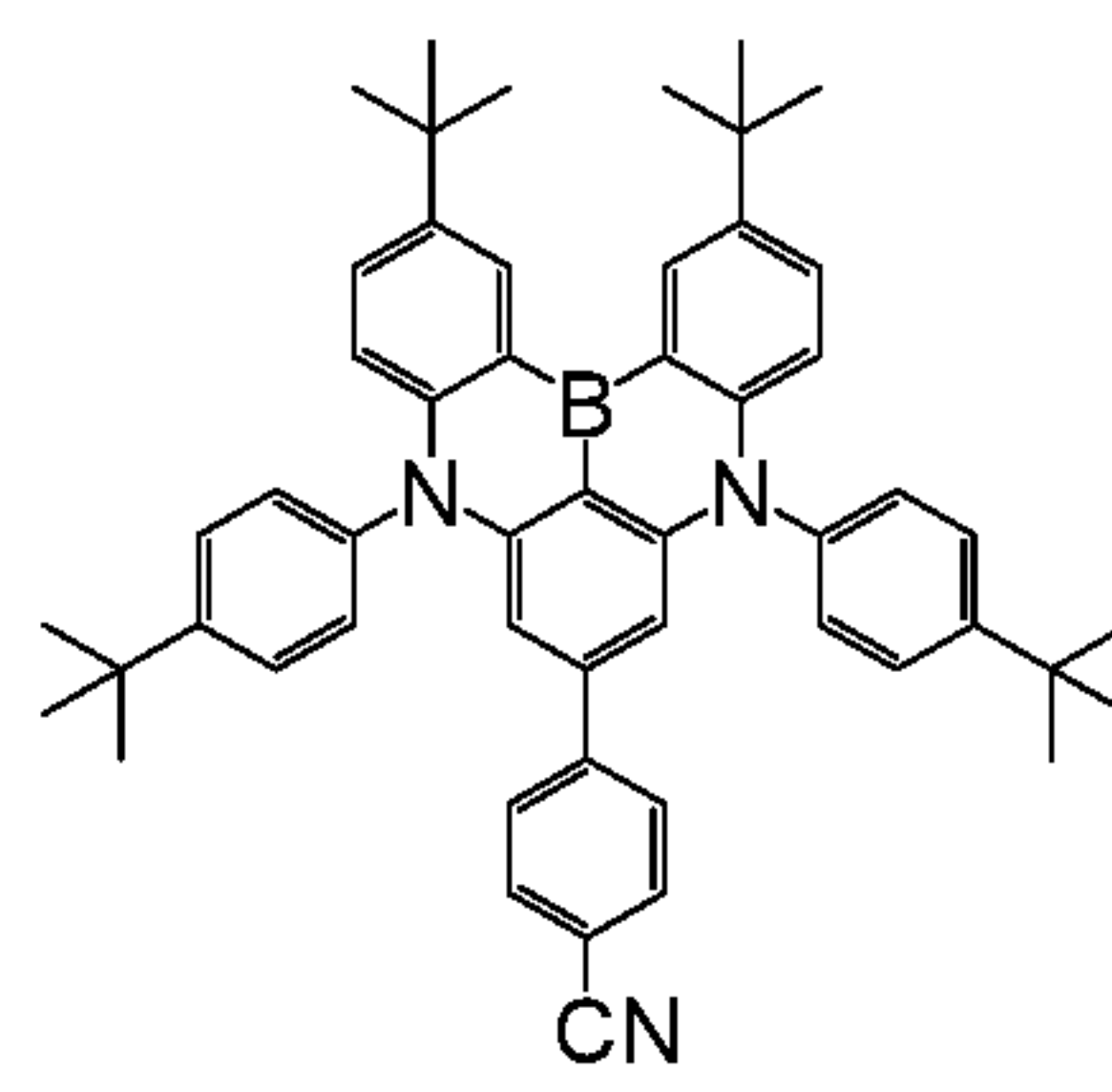
C-176



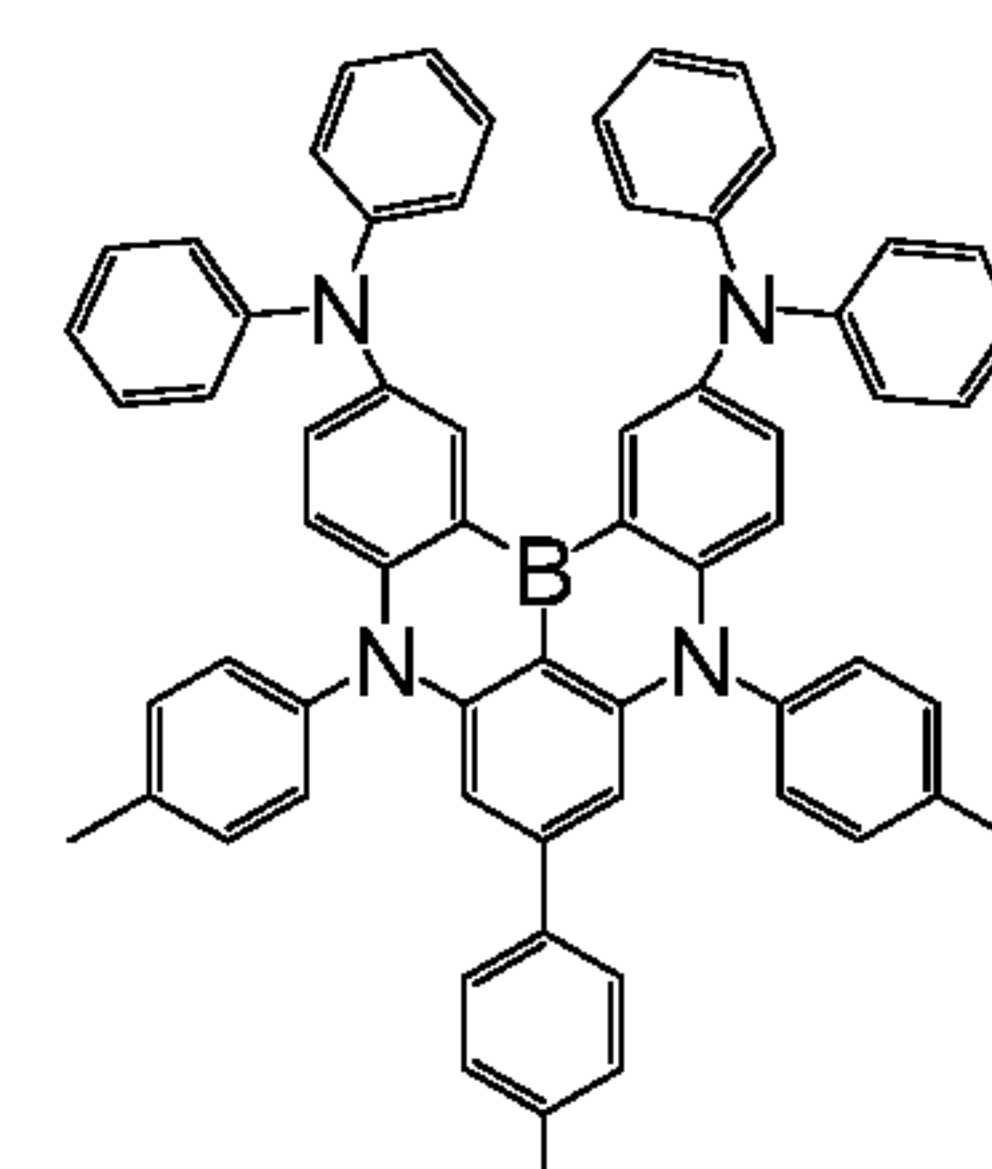
C-177



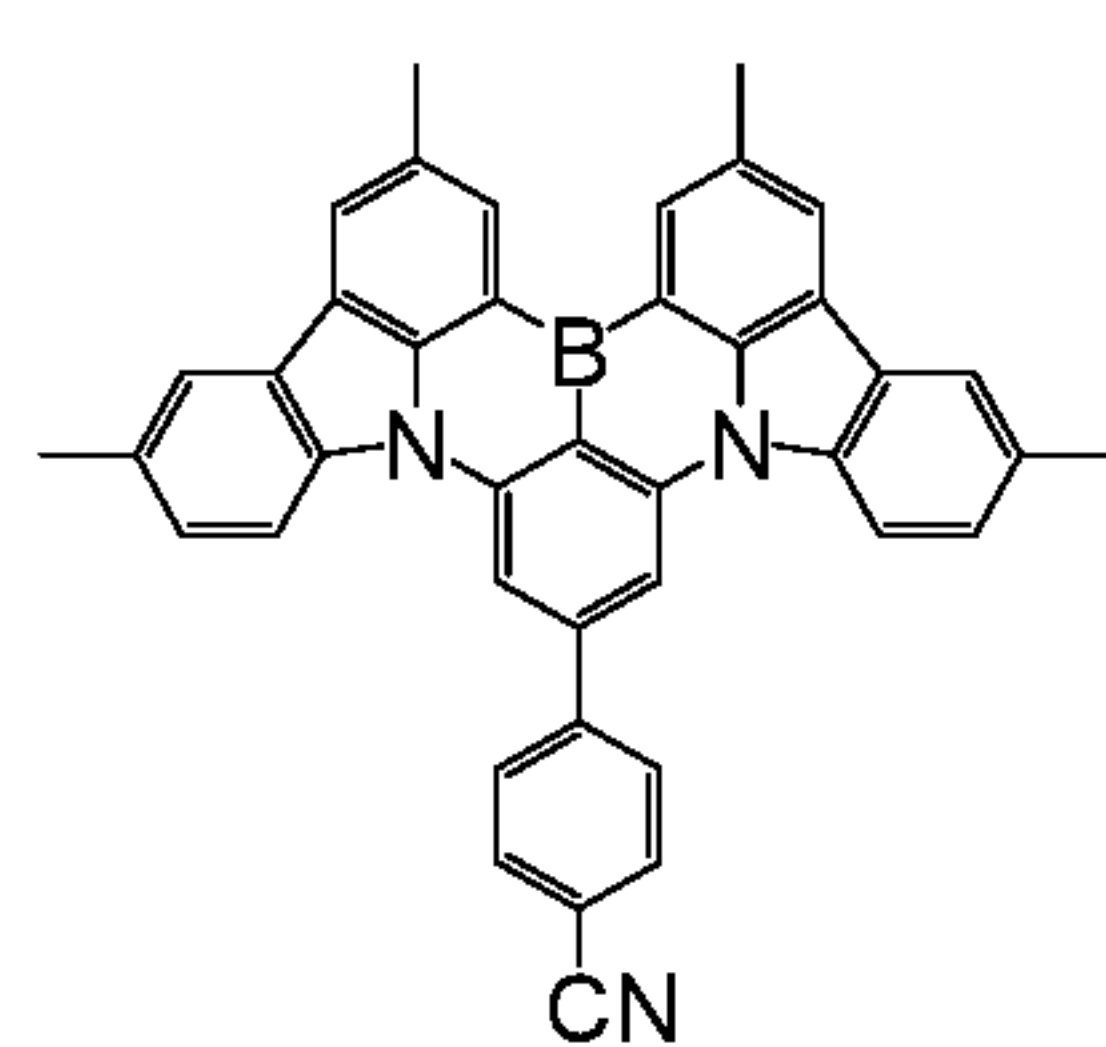
C-178



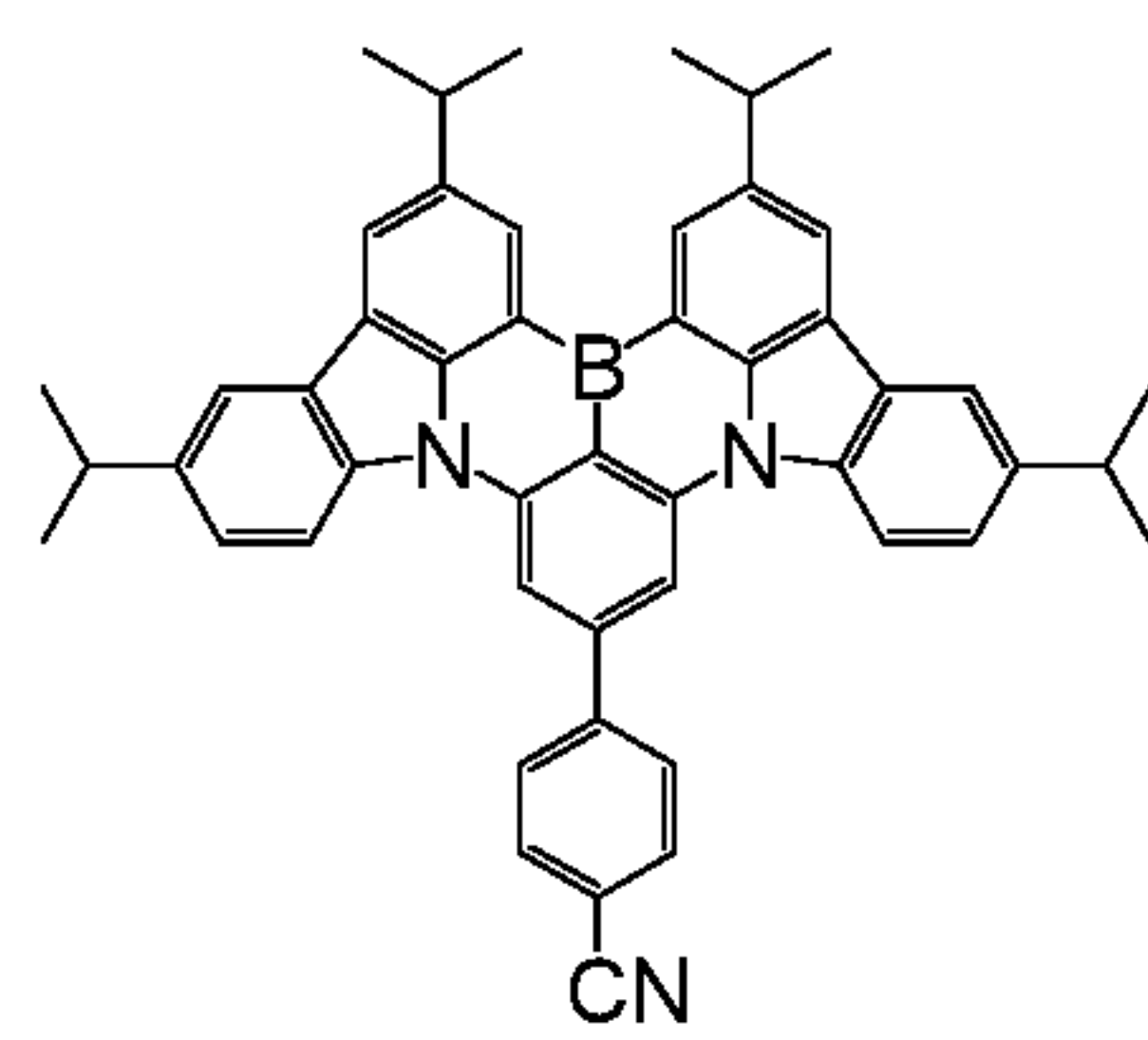
C-179



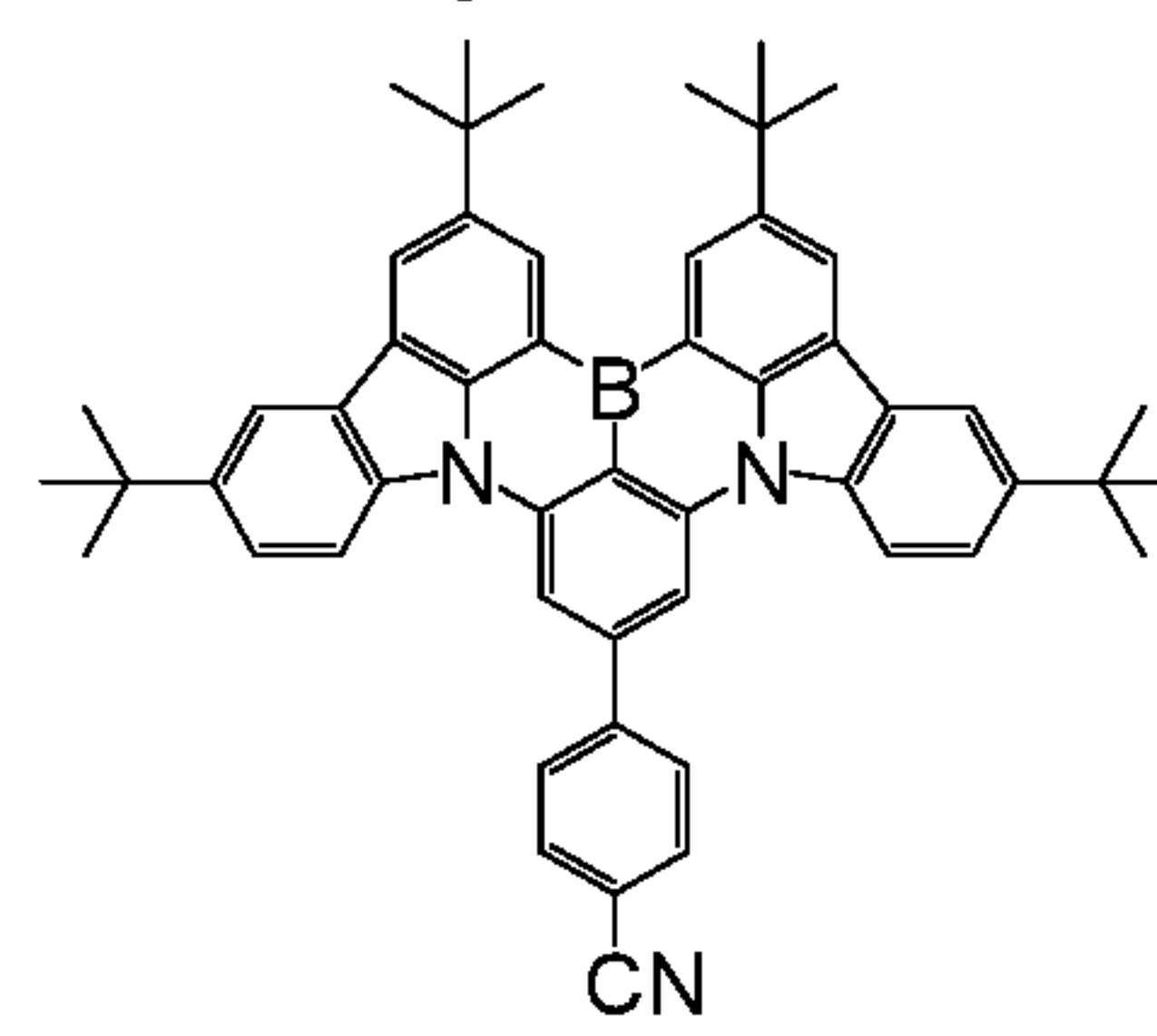
C-180



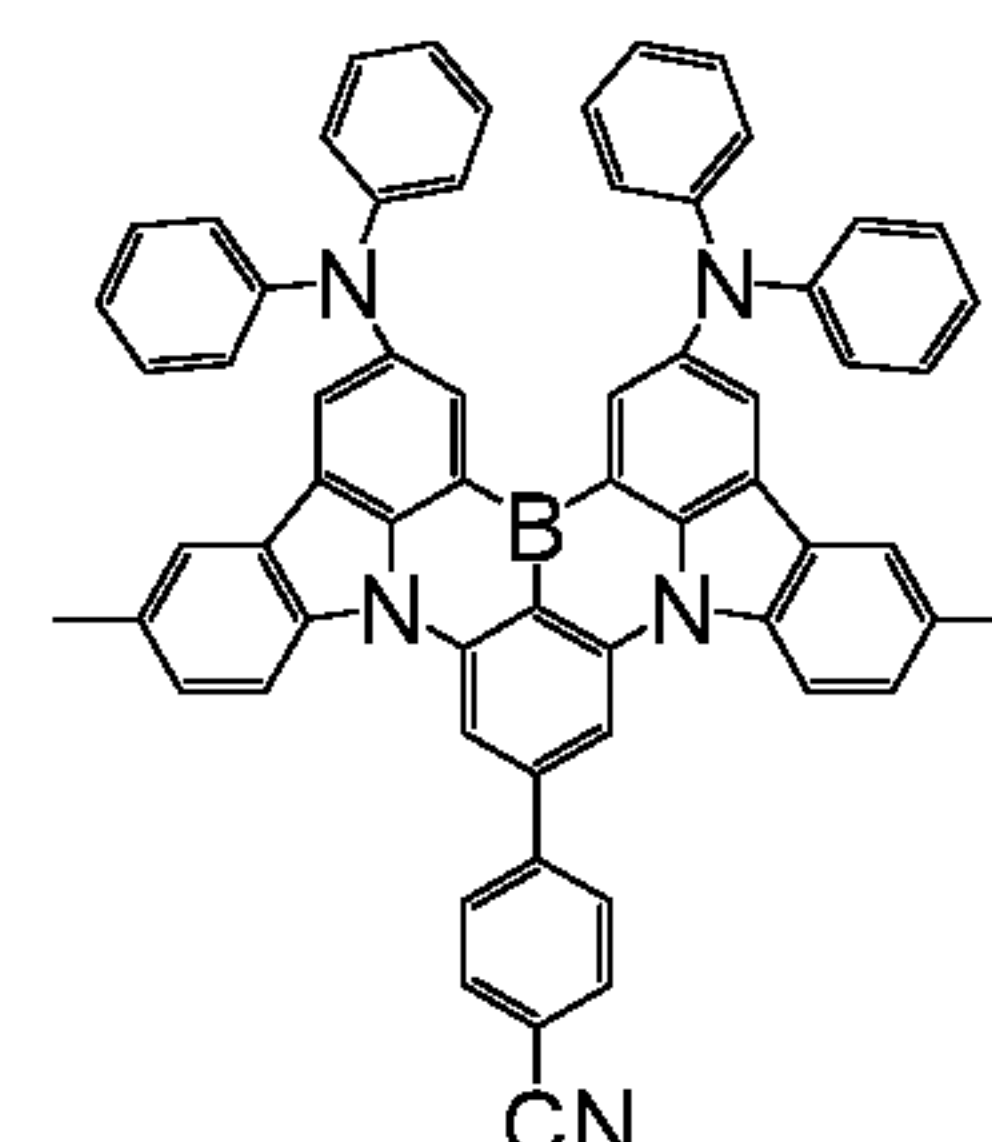
C-181



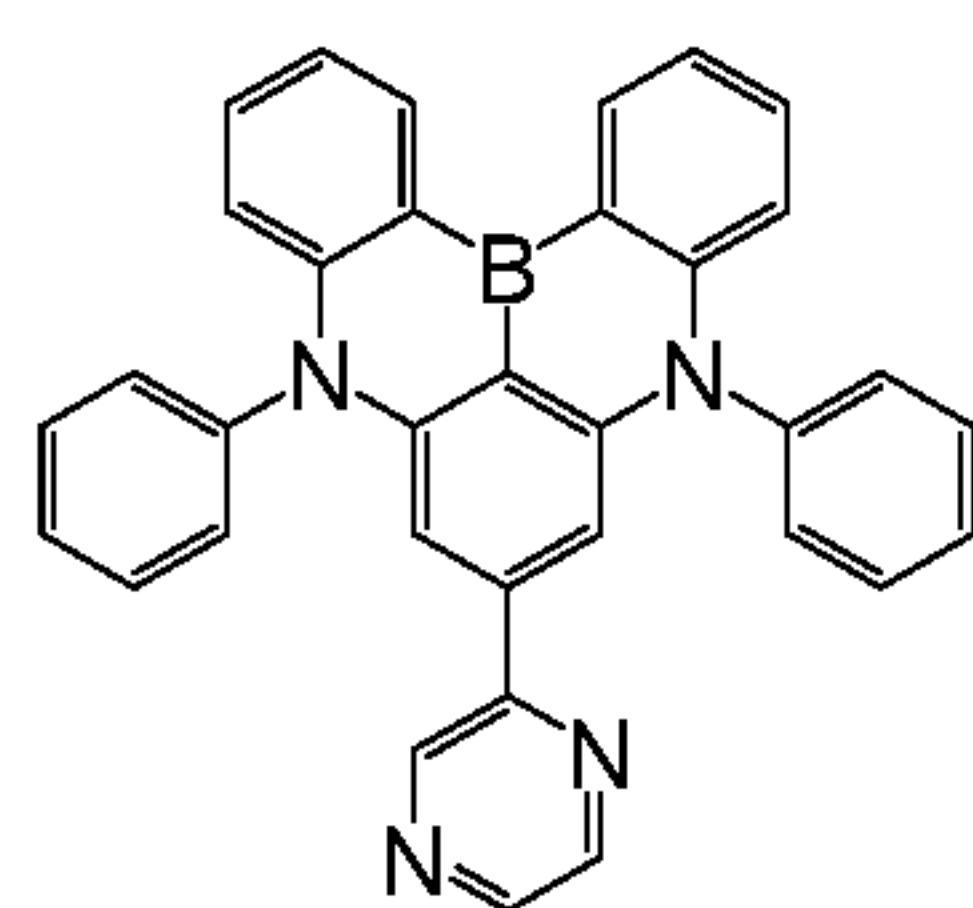
C-182



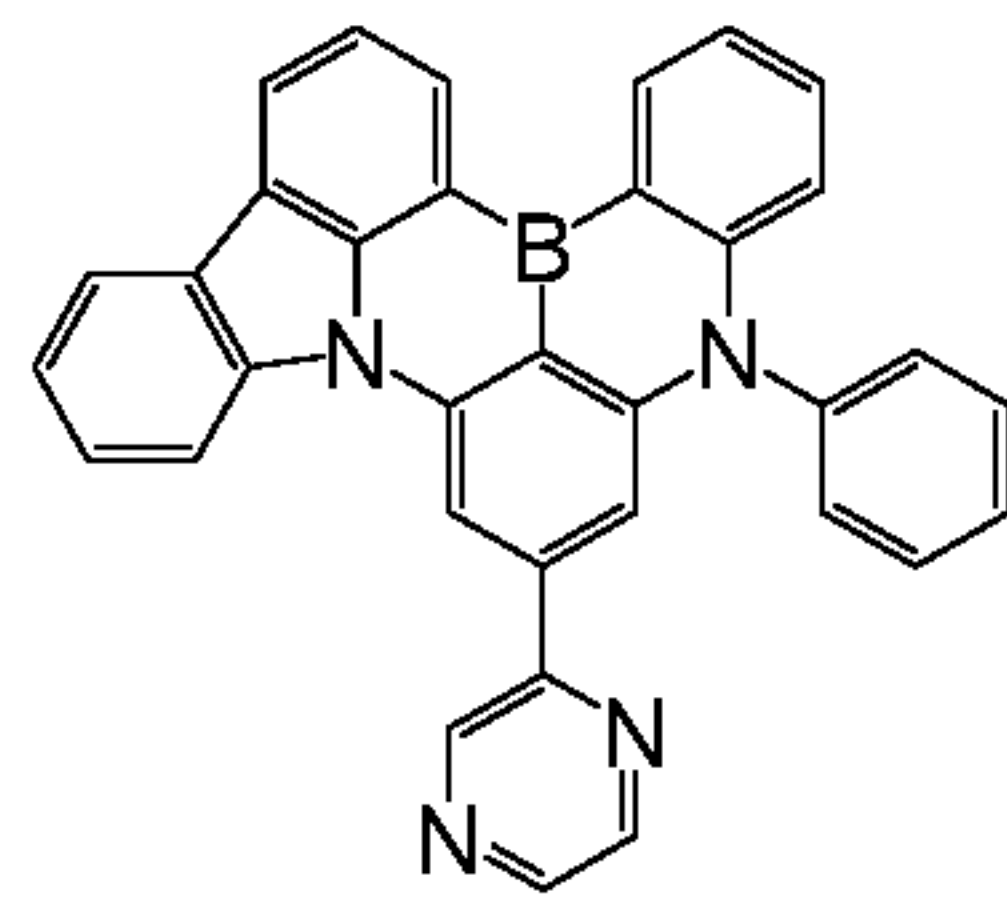
C-183



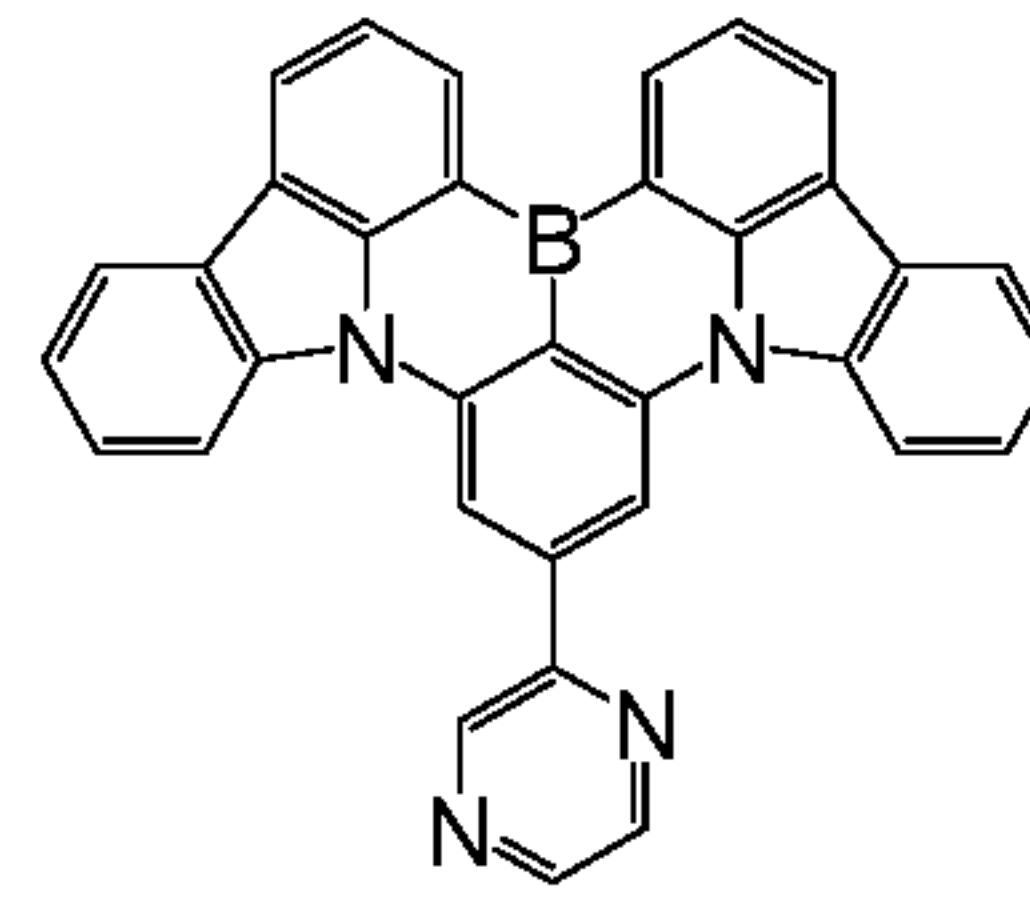
C-184



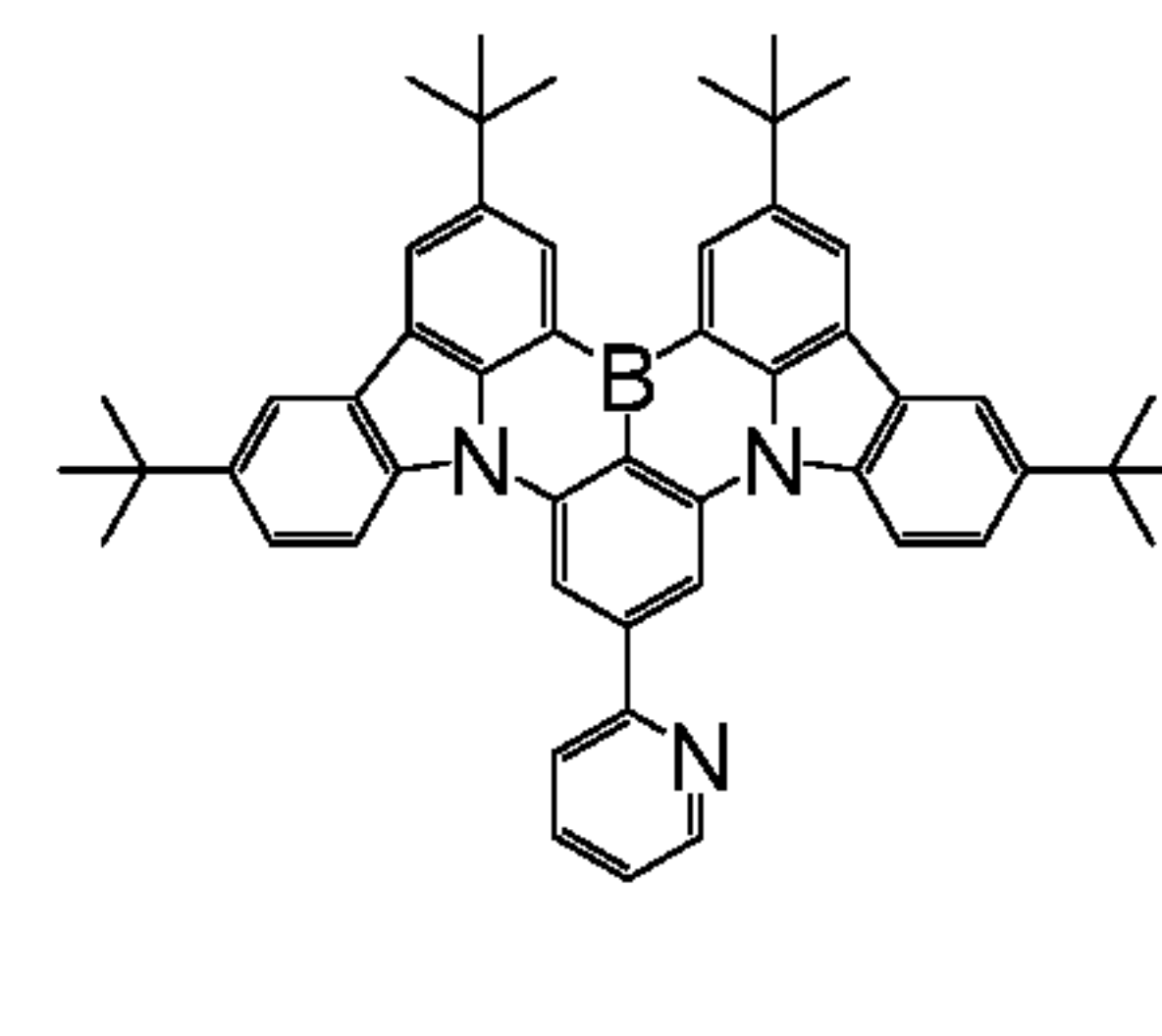
C-185



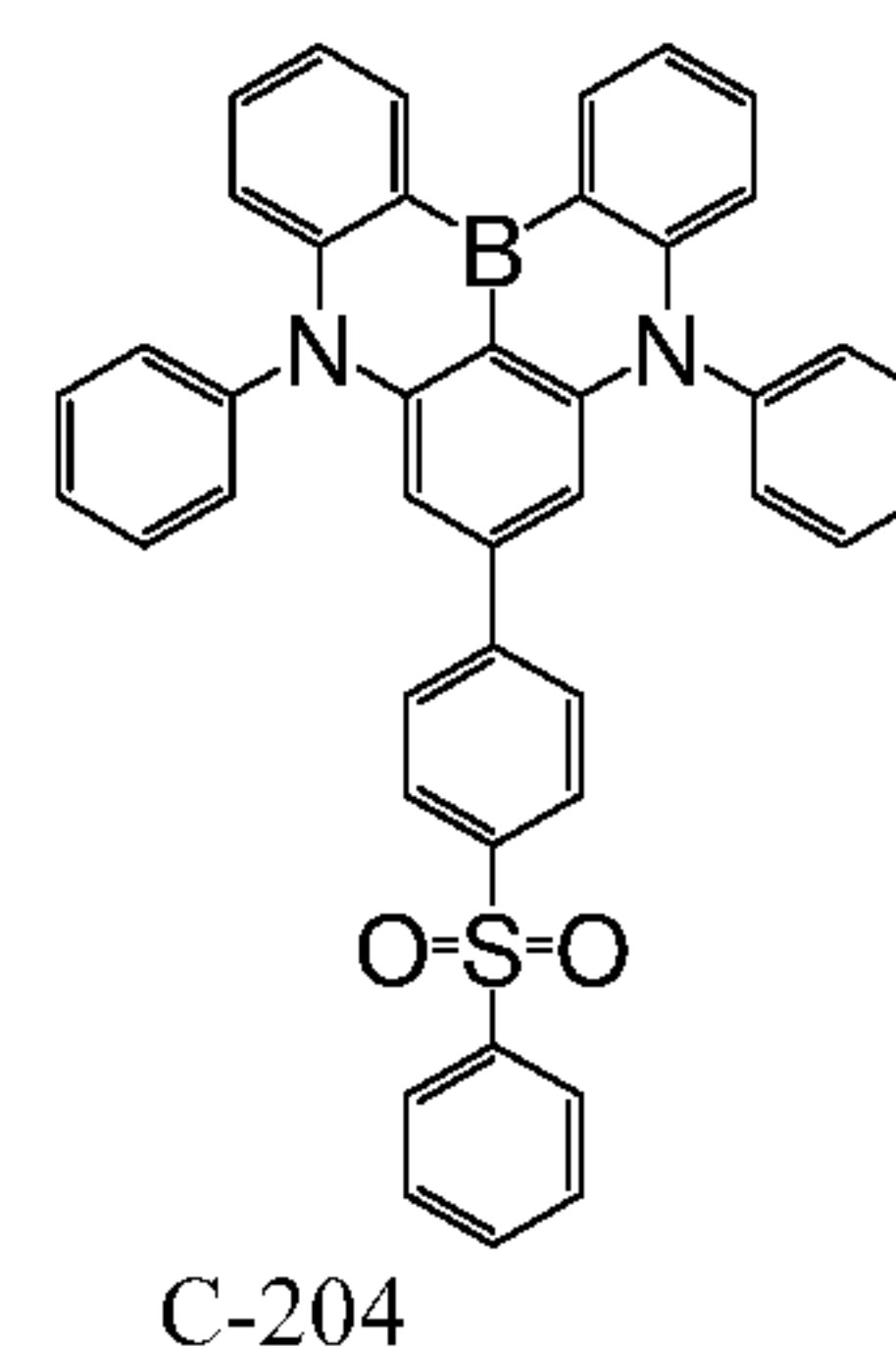
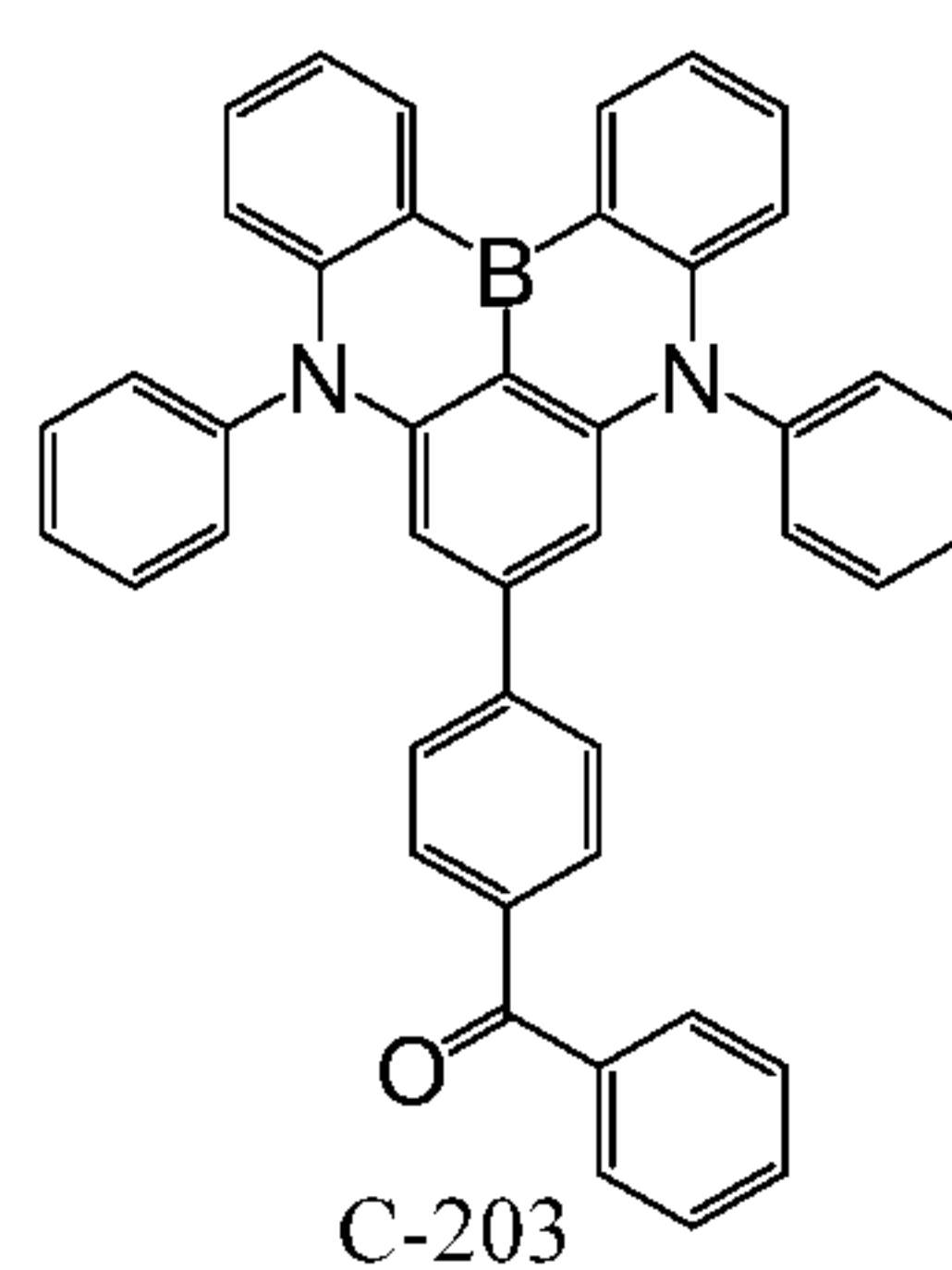
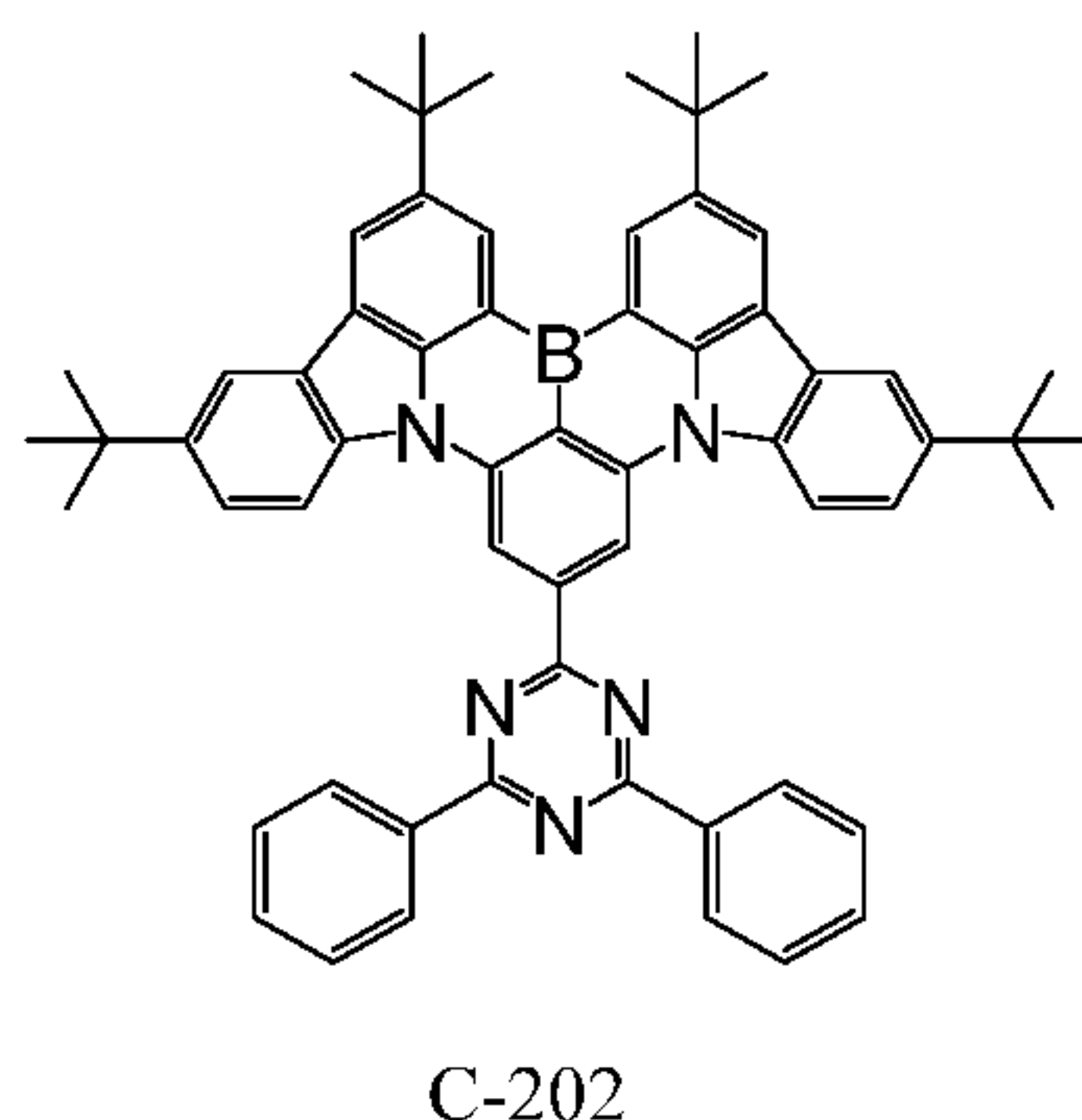
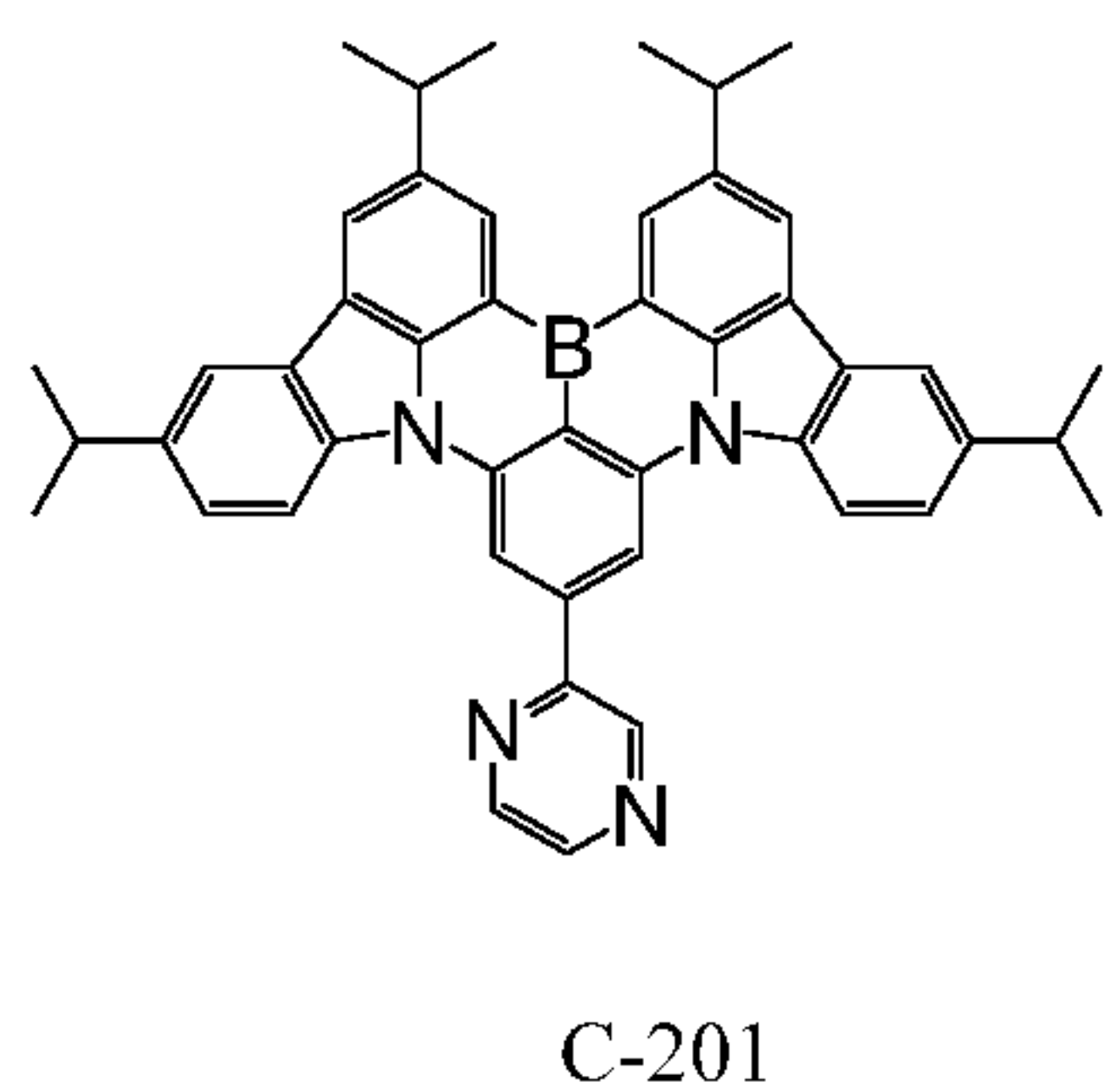
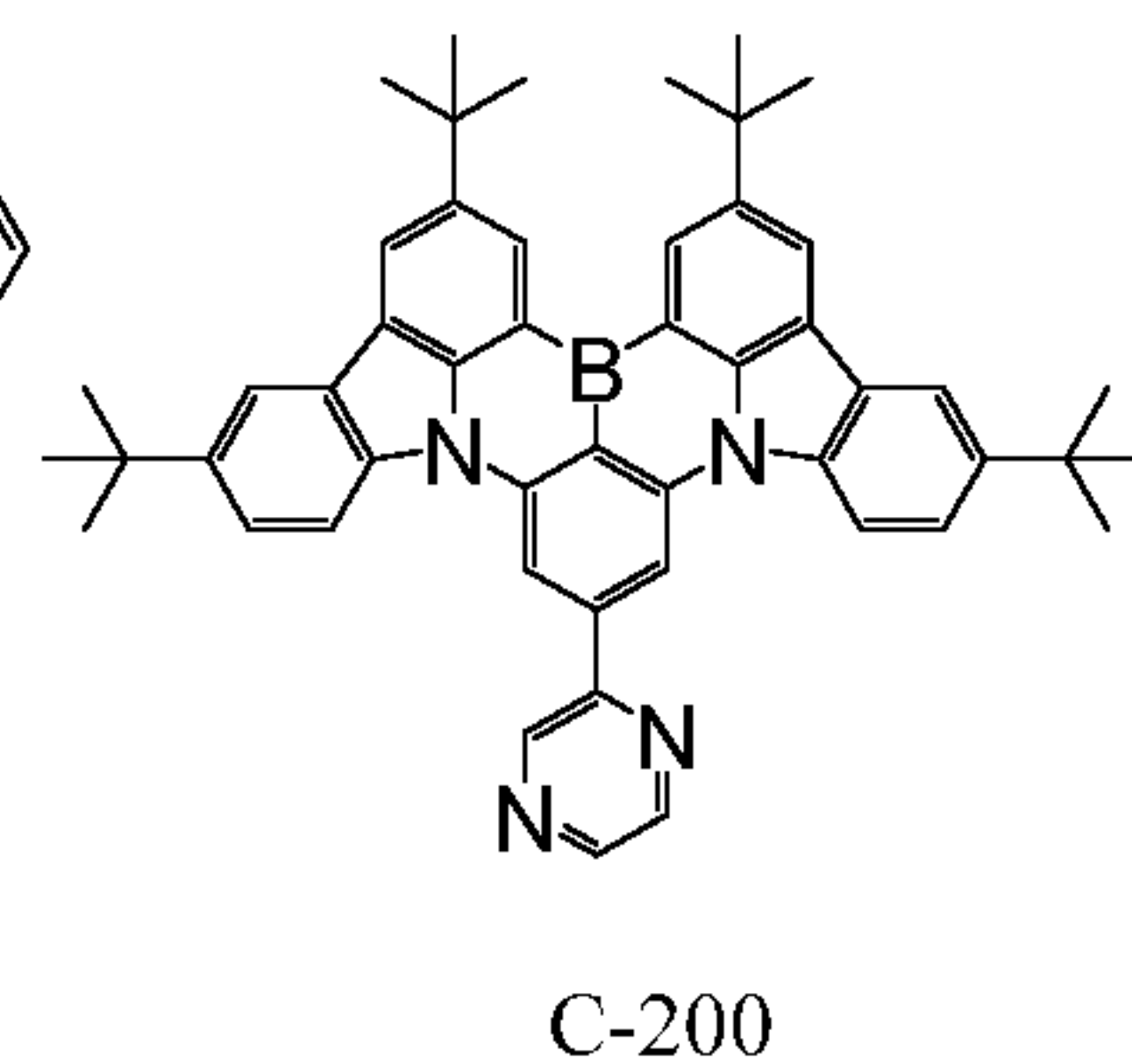
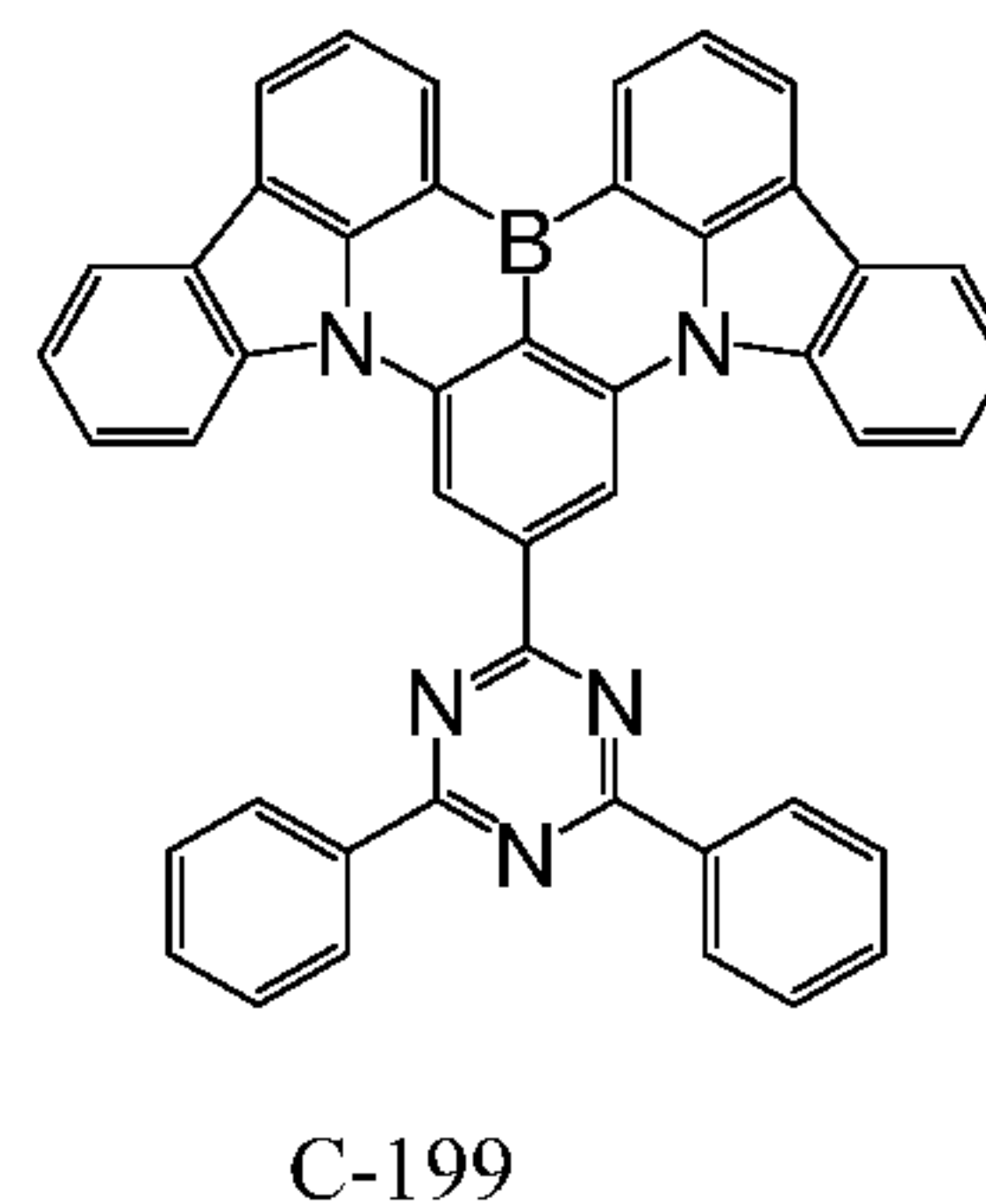
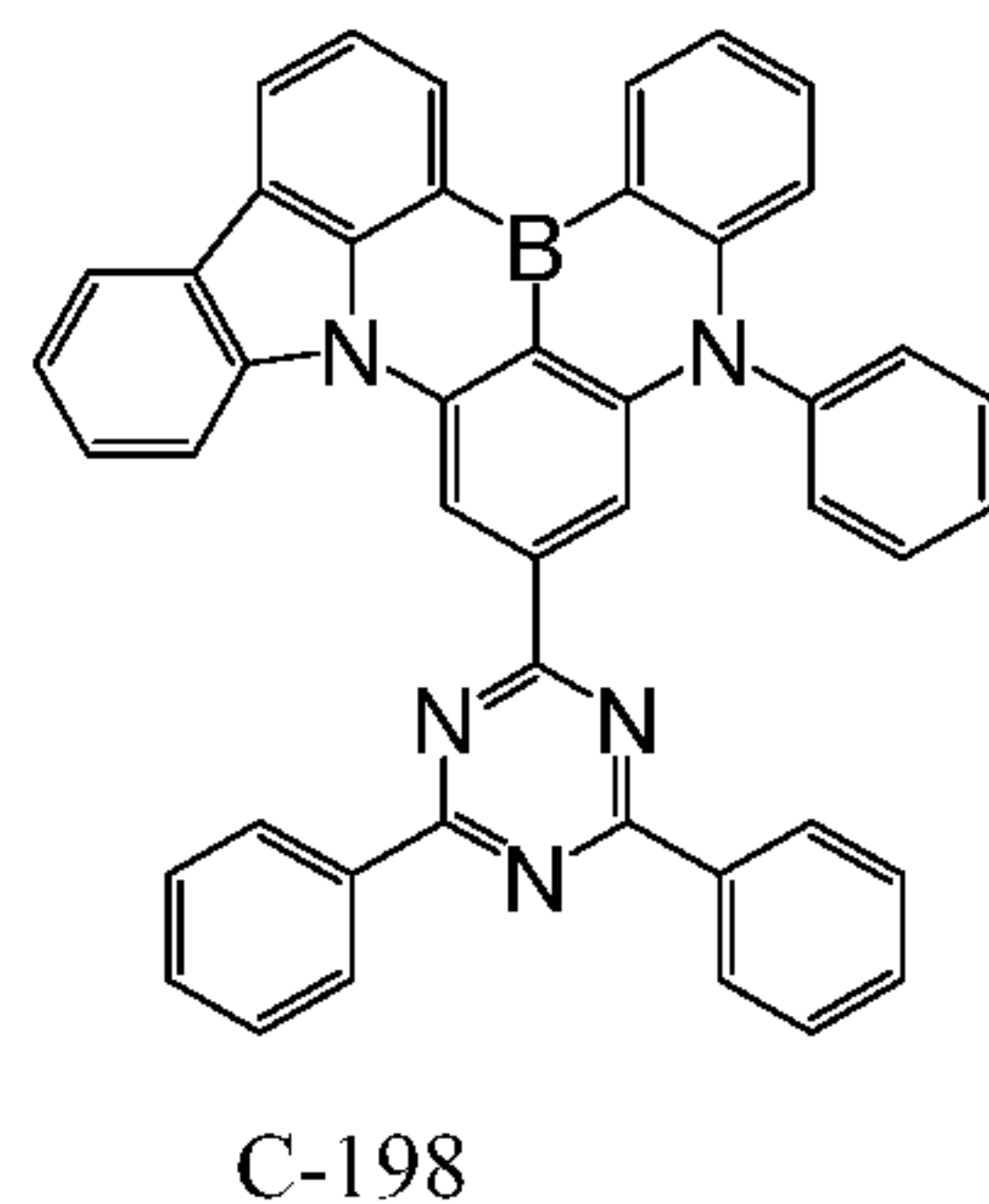
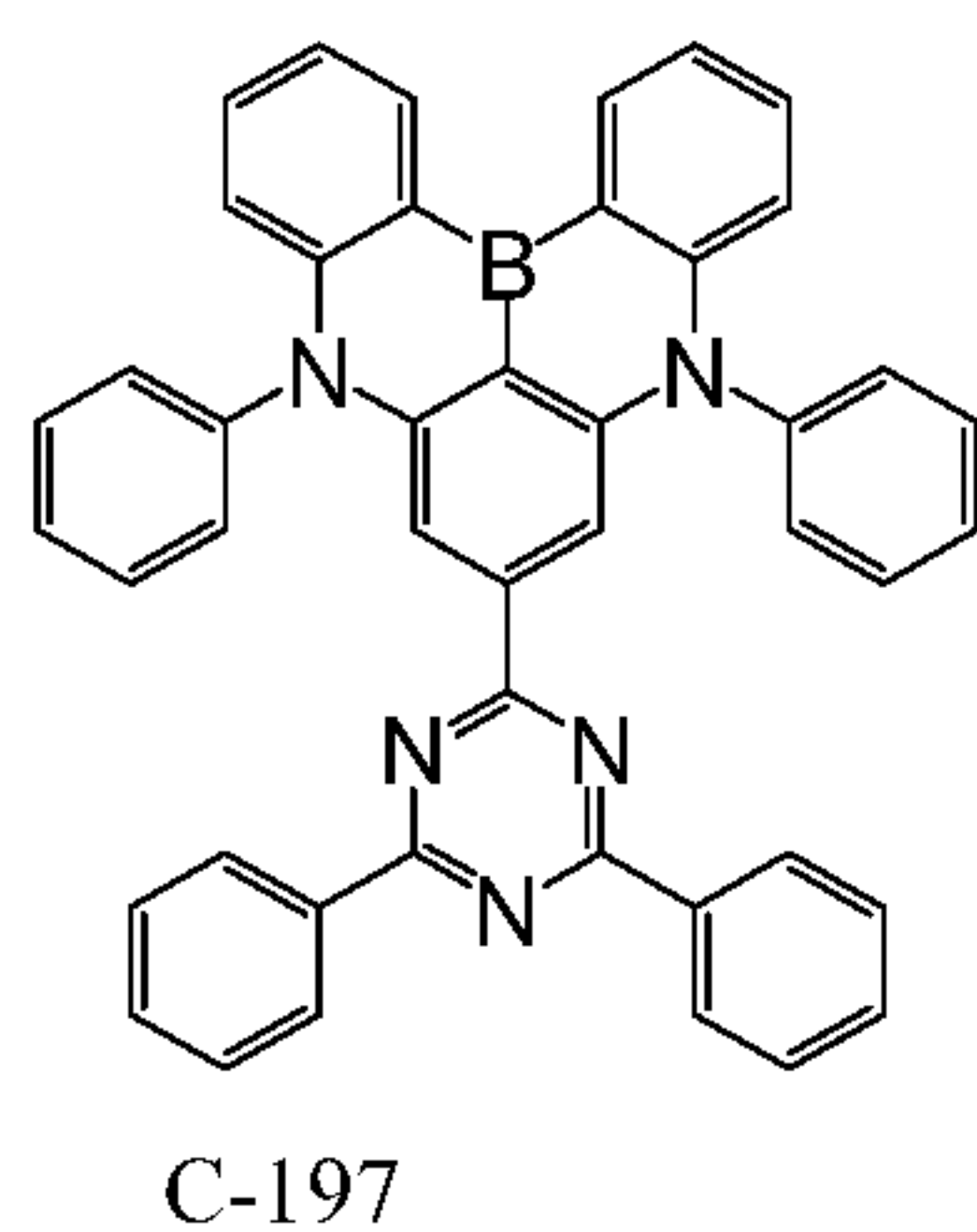
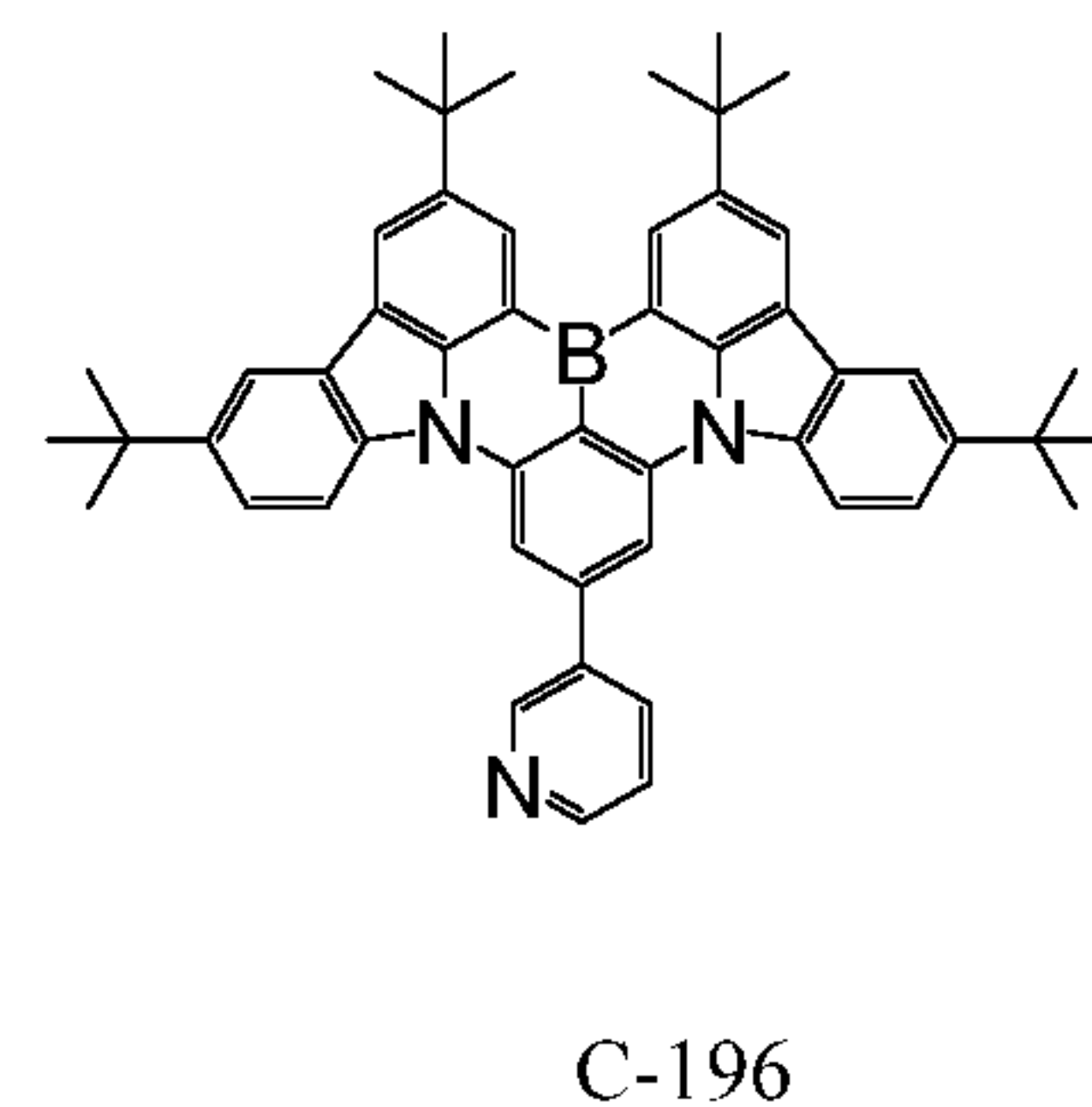
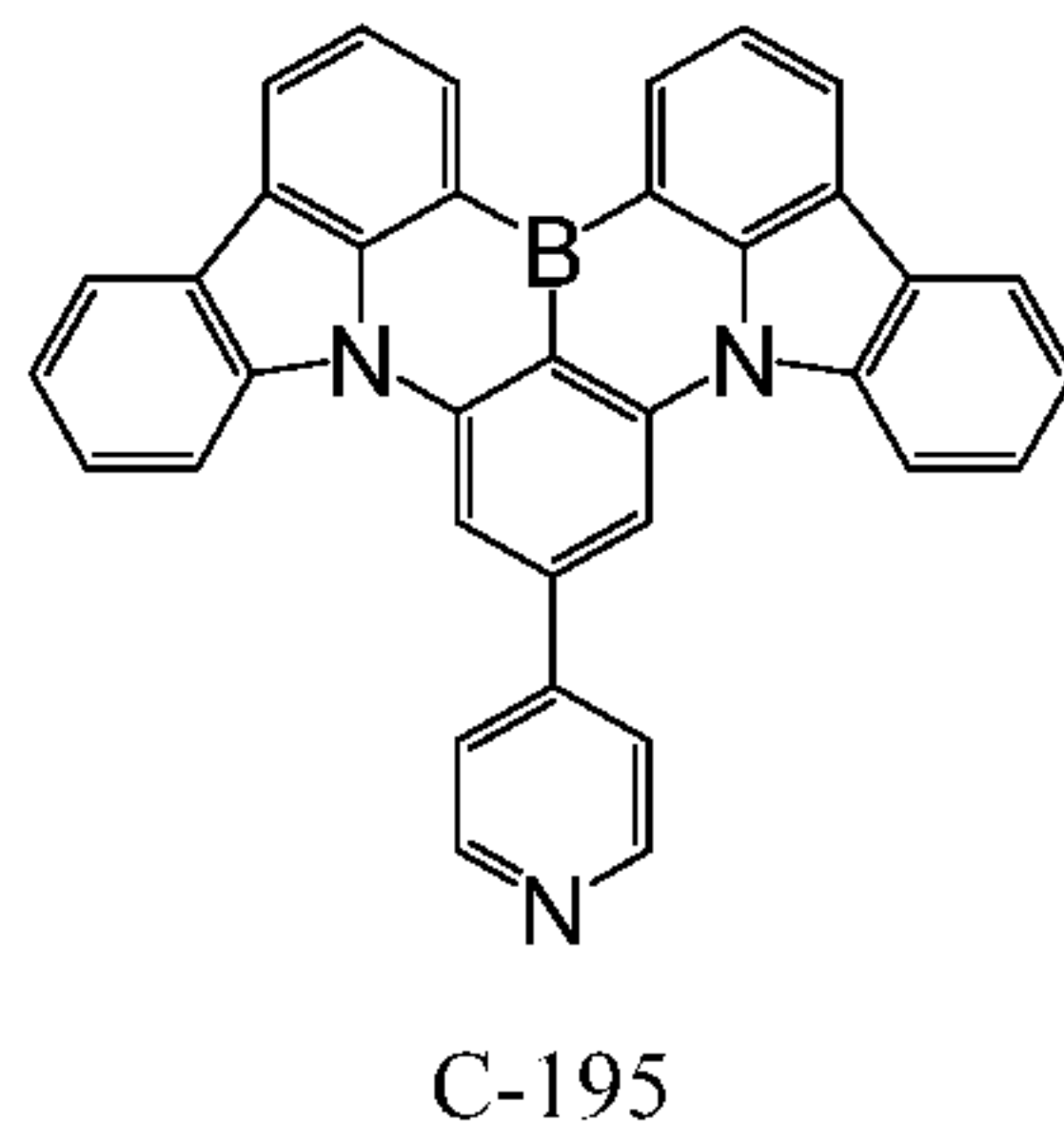
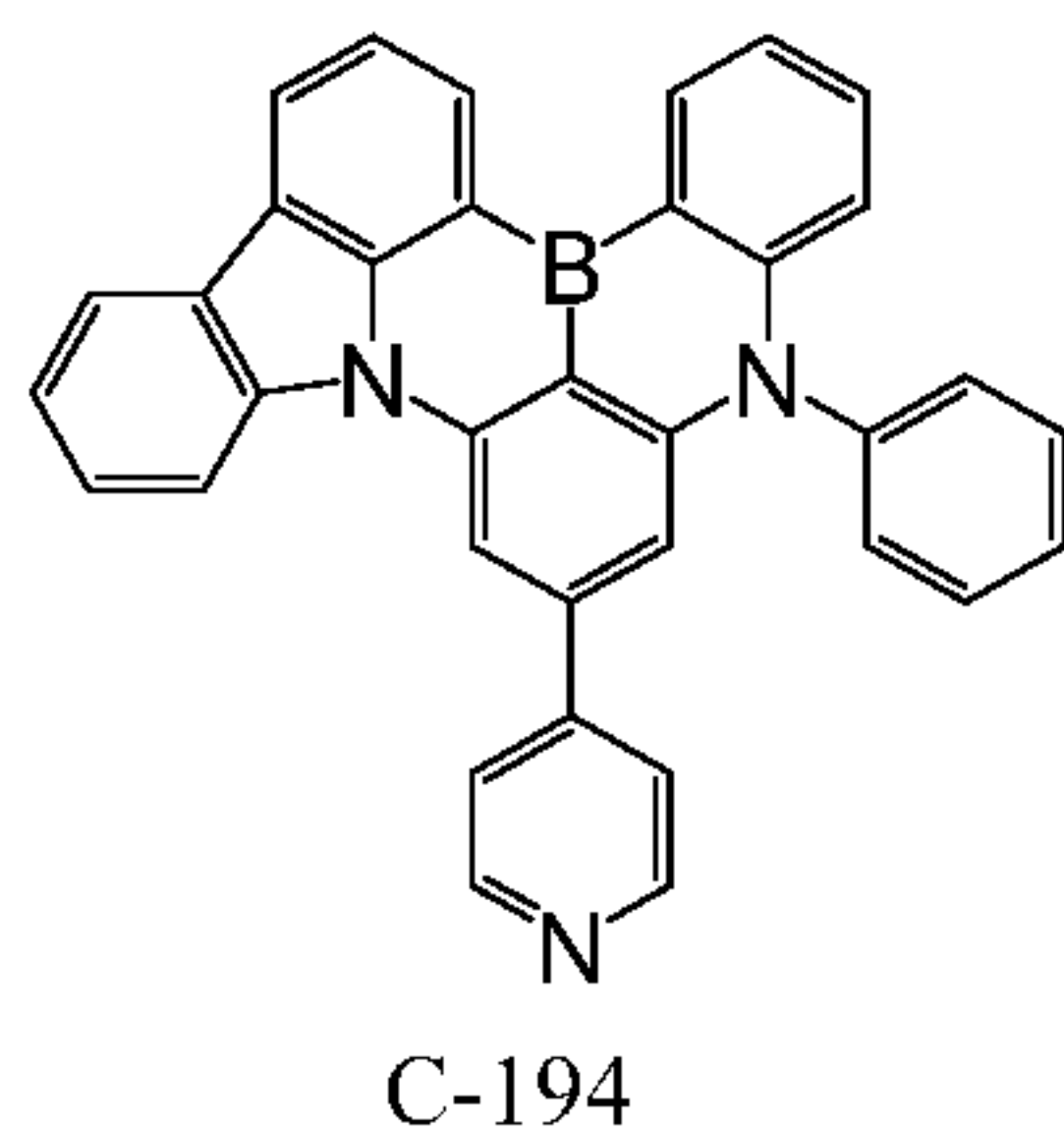
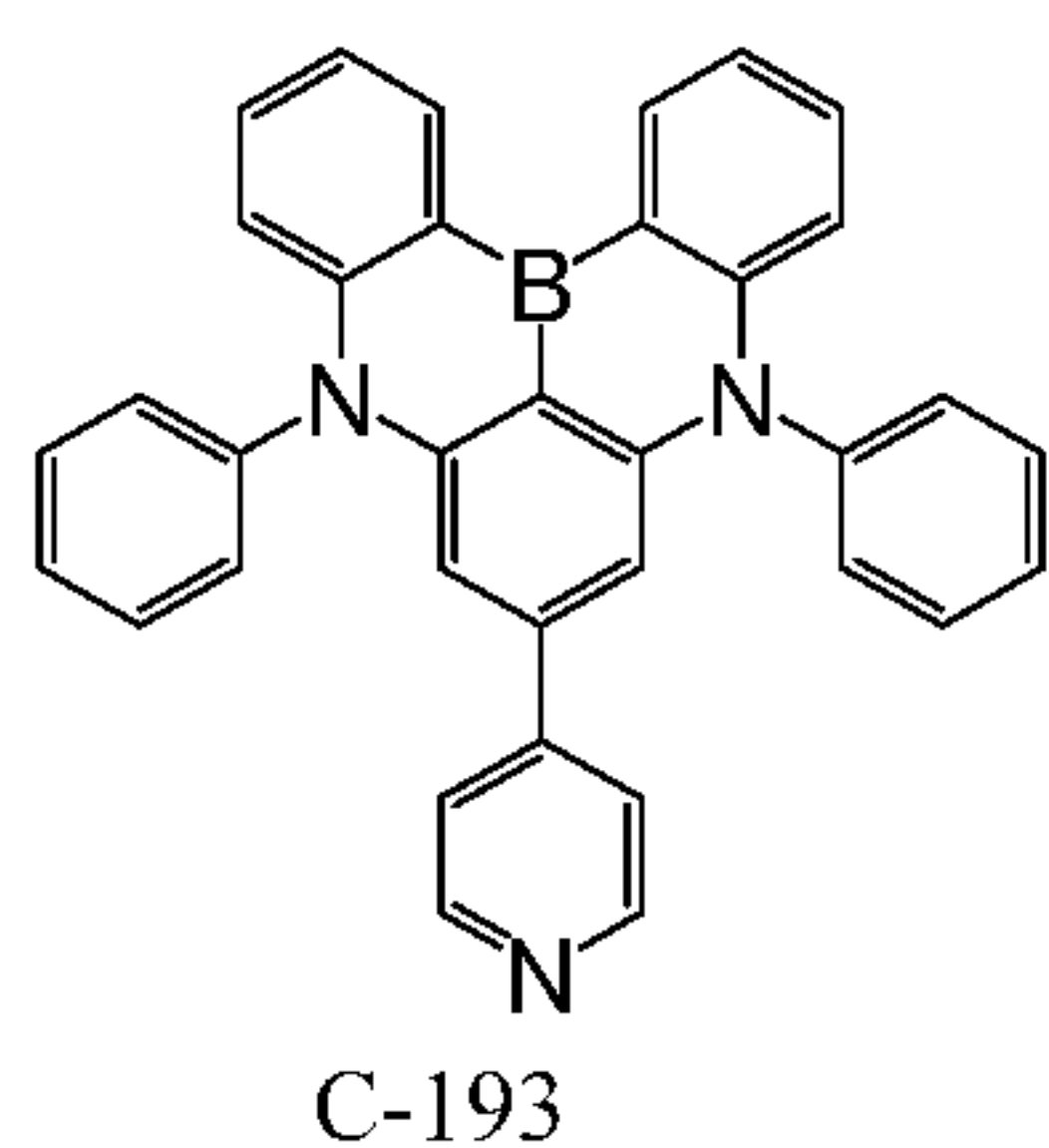
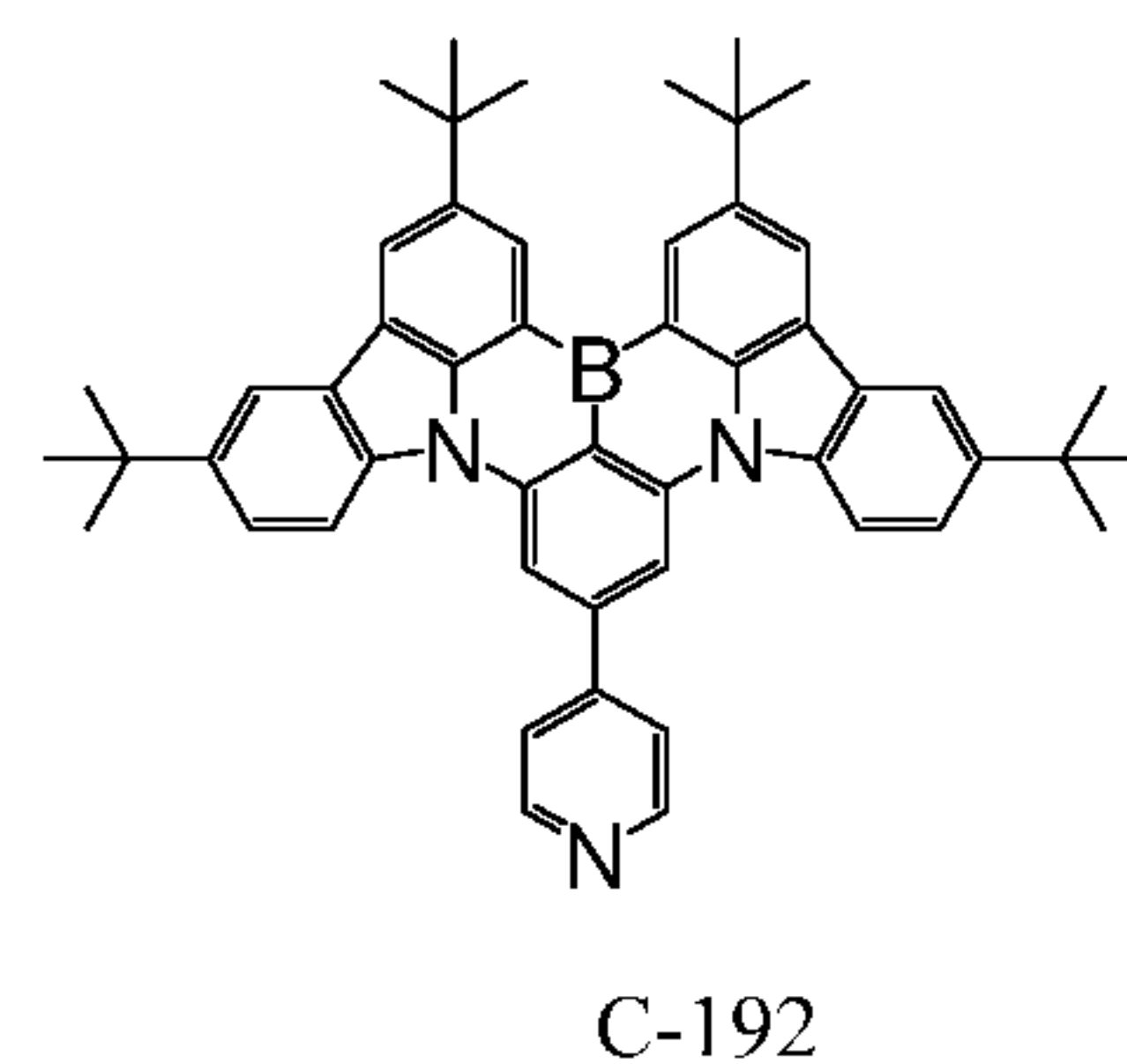
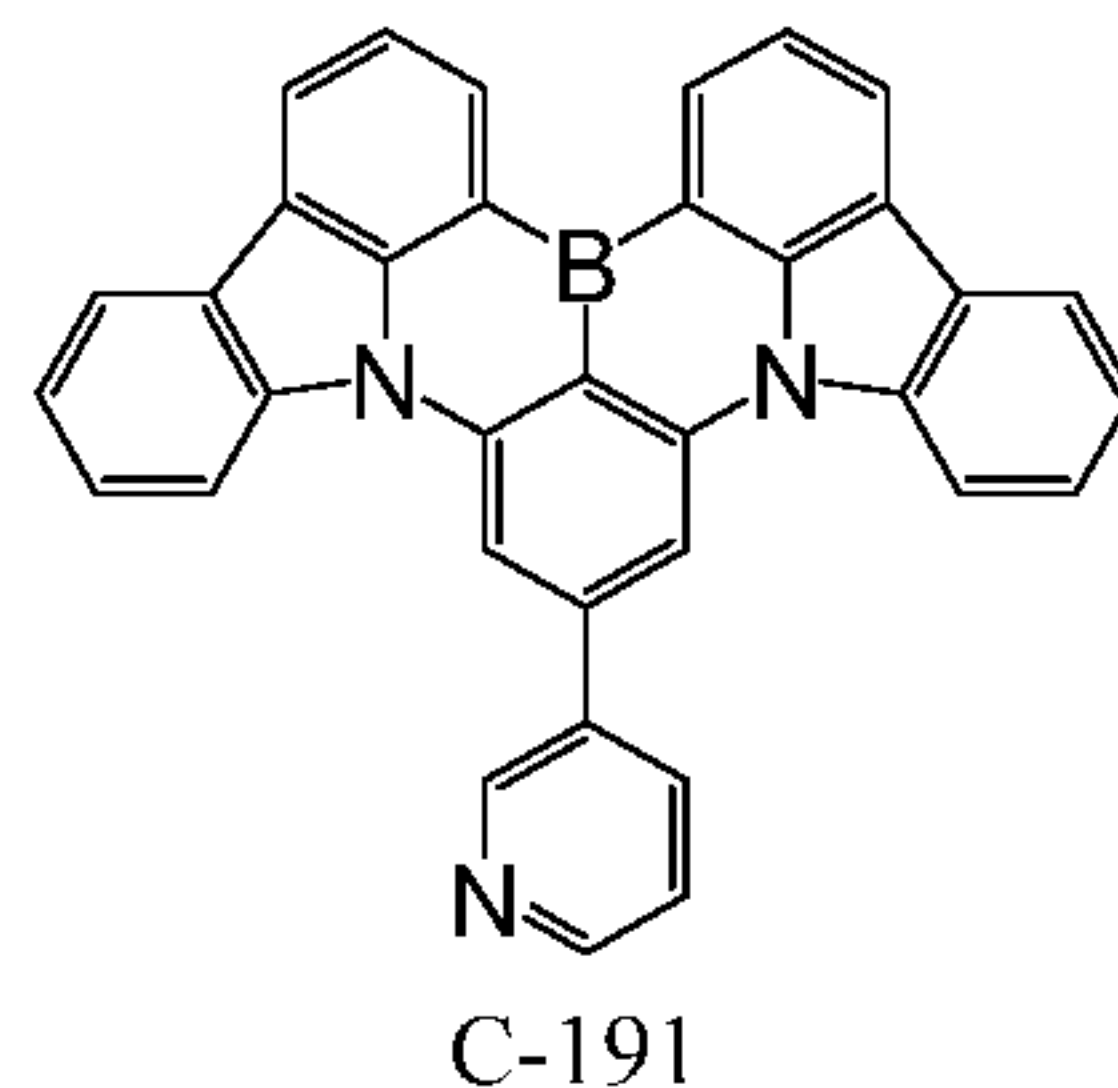
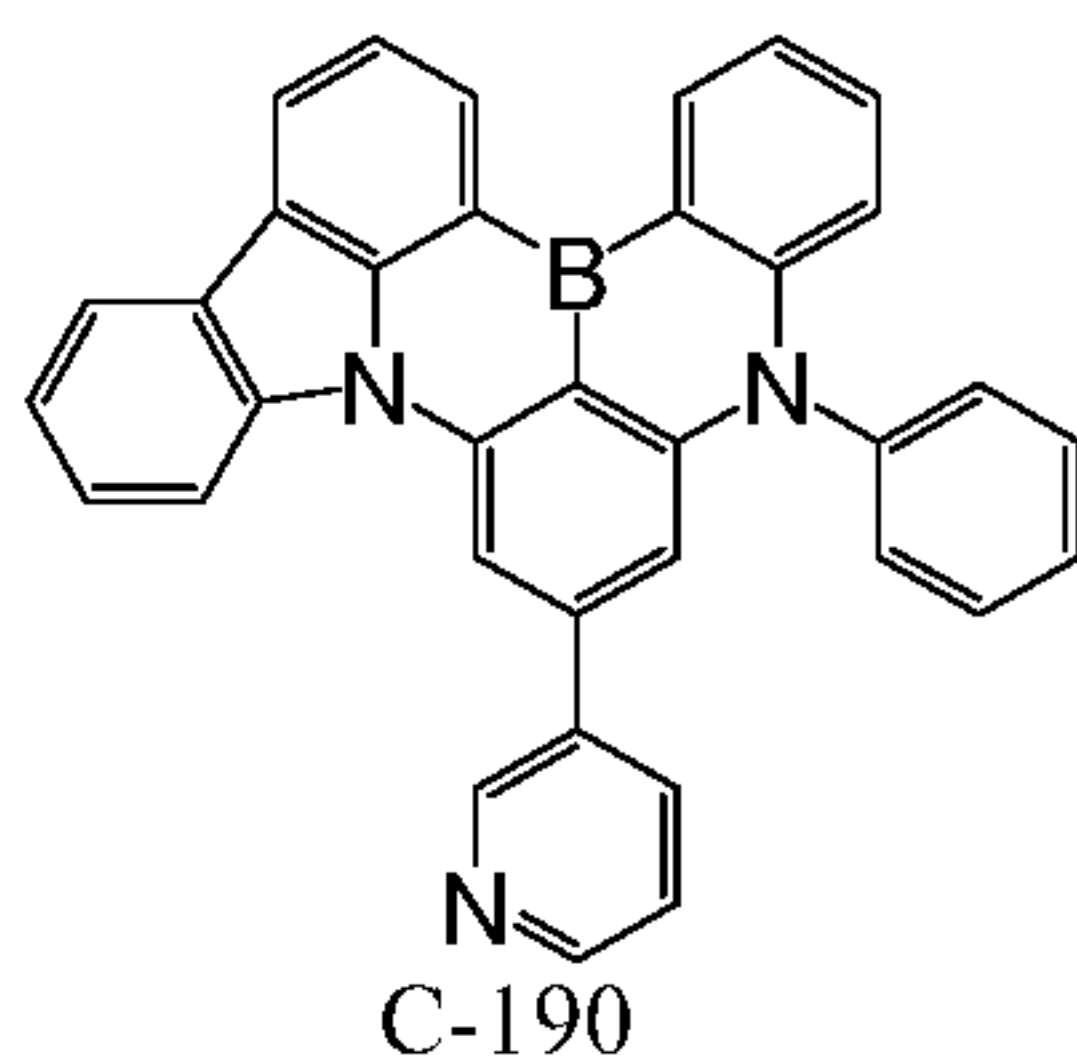
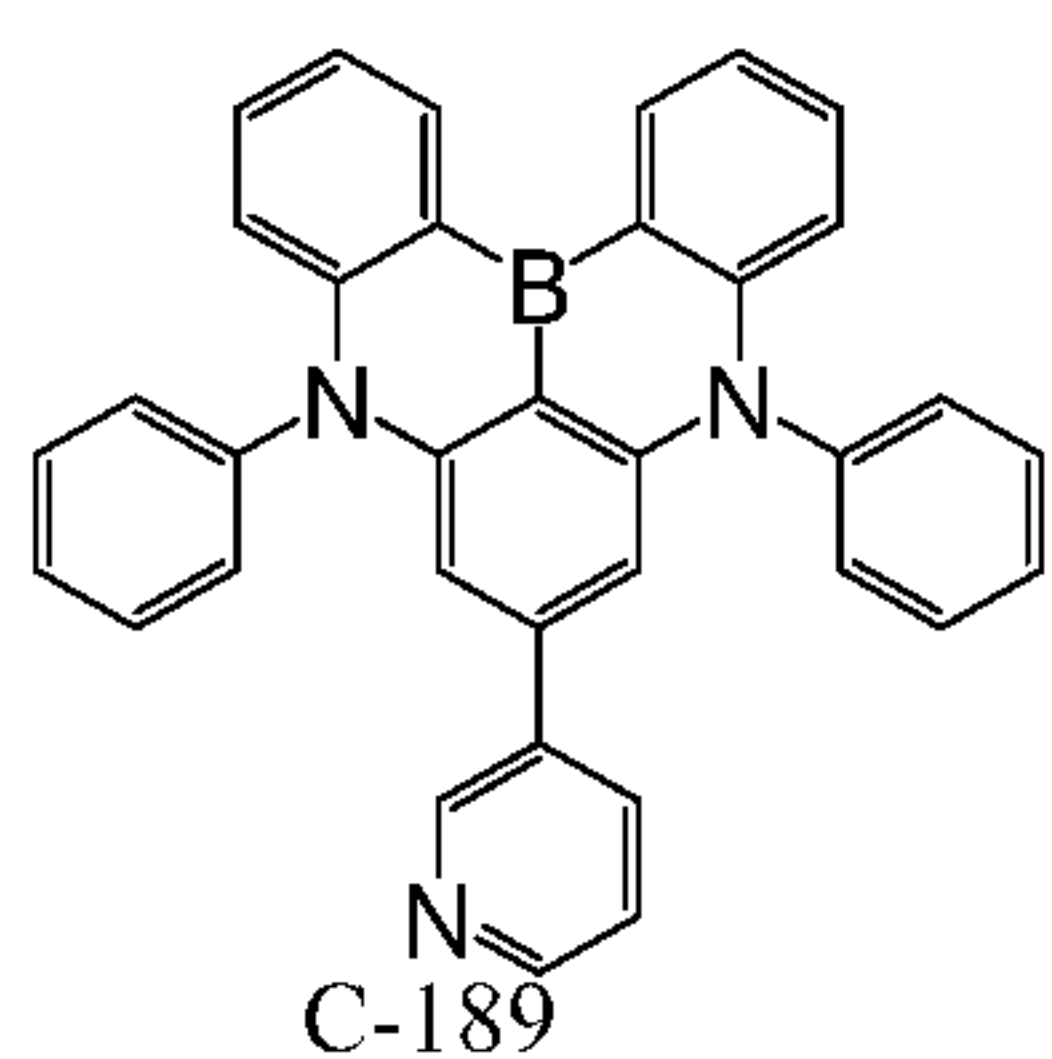
C-186



C-187

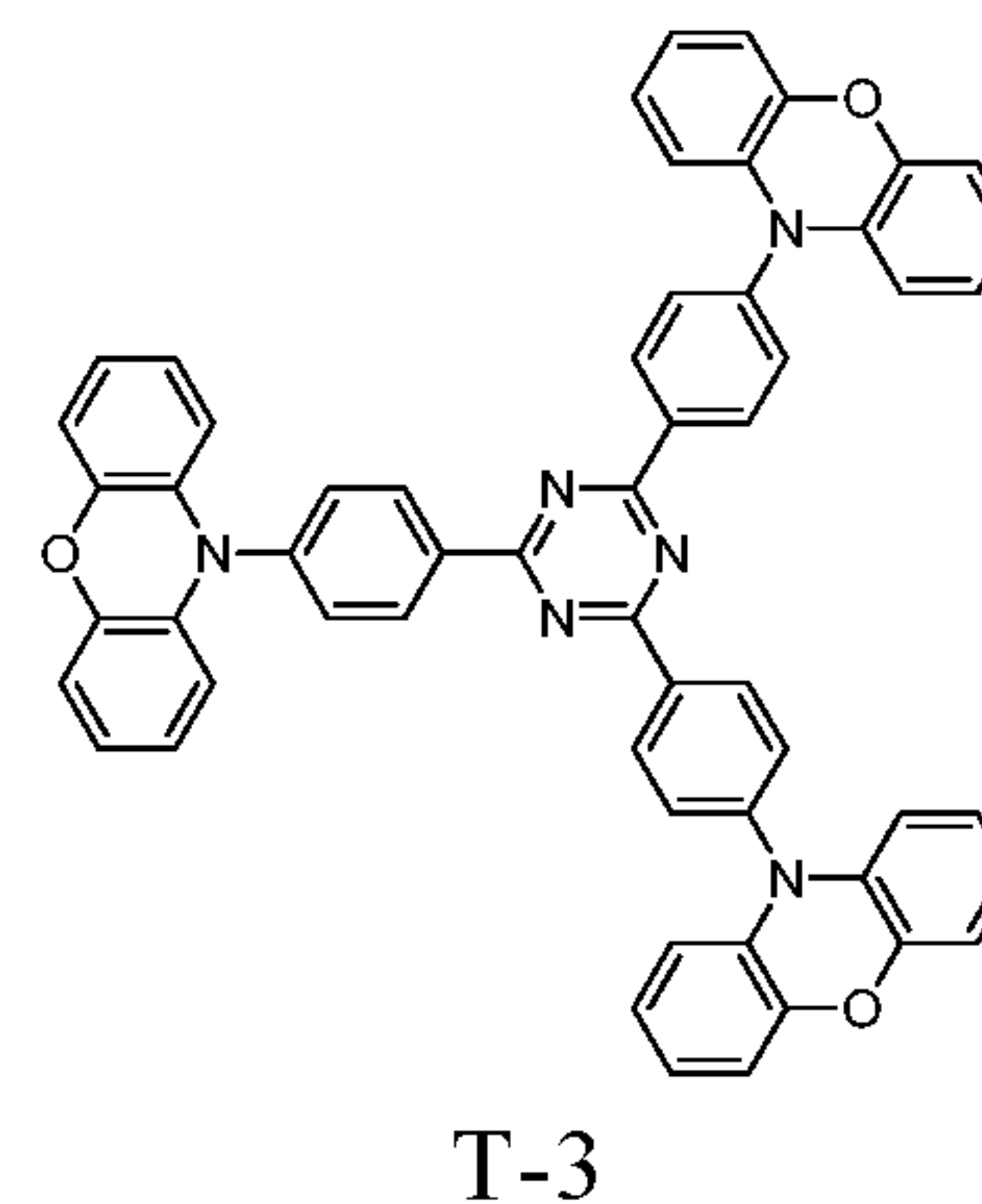
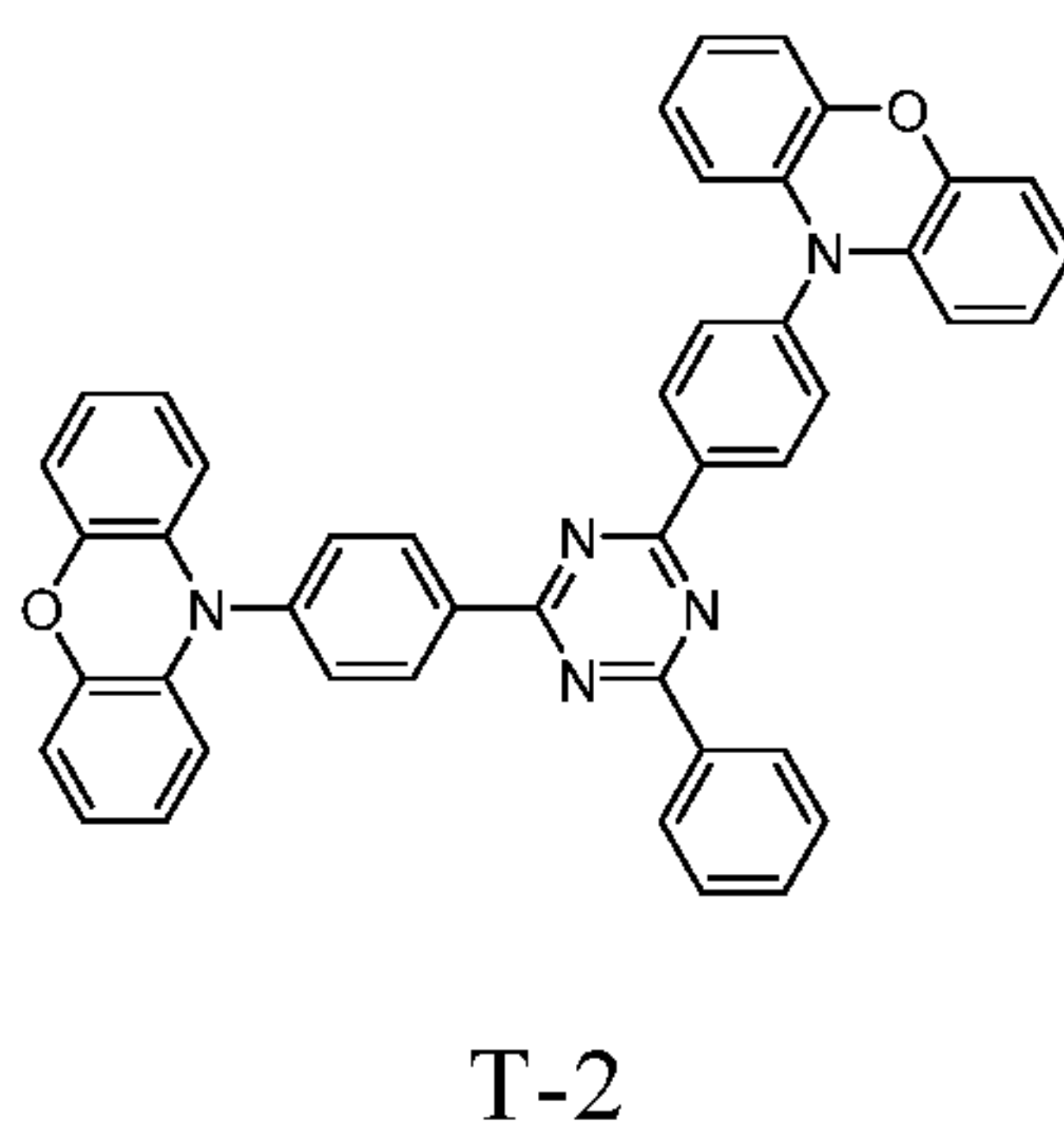
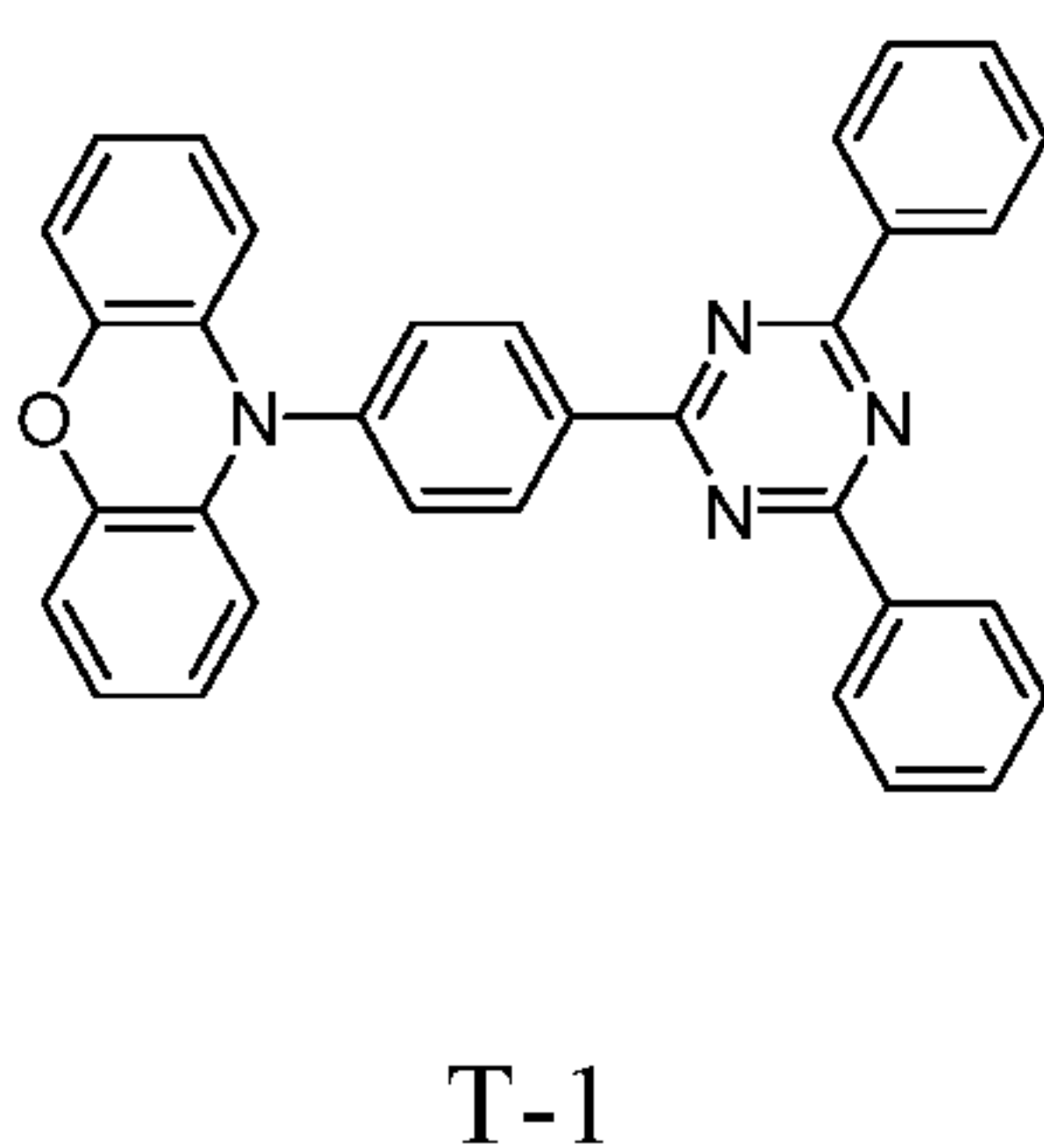


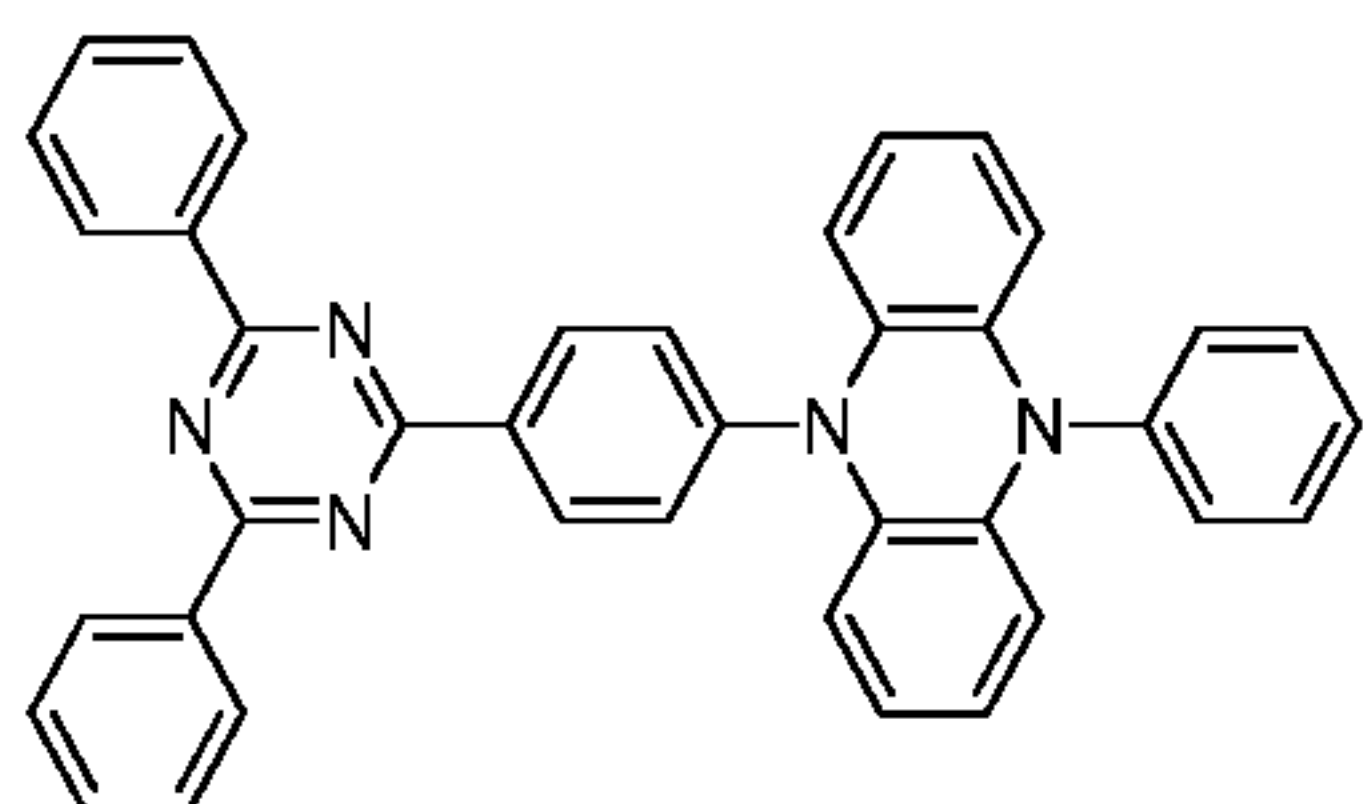
C-188



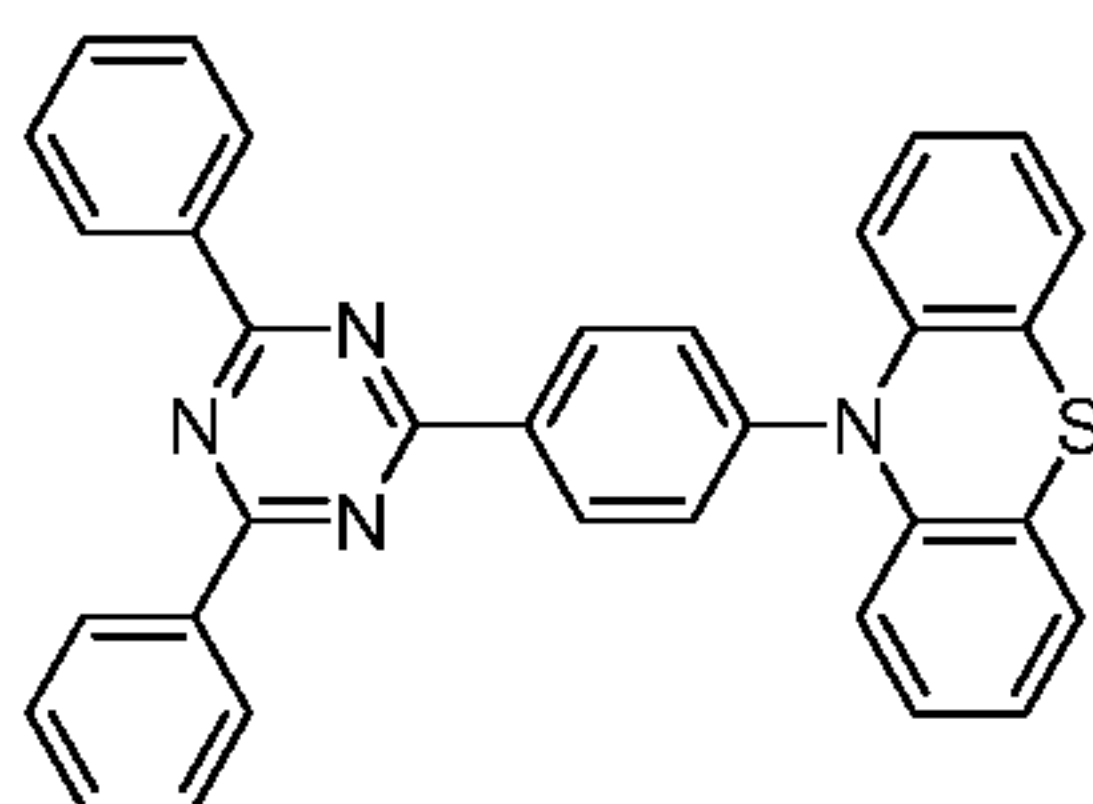
3、根据权利要求 1 或 2 中任一项所述的有机电致发光器件，其中，所述热活化延迟荧光敏化剂的单线态和三线态能级差 ≤ 0.3 eV。

4、根据权利要求 1~3 中任一项所述的有机电致发光器件，其中，所述热活化延迟荧光敏化剂包括如下 T-1 至 T-99 所示的化合物中的任意一种或至少两种组合：

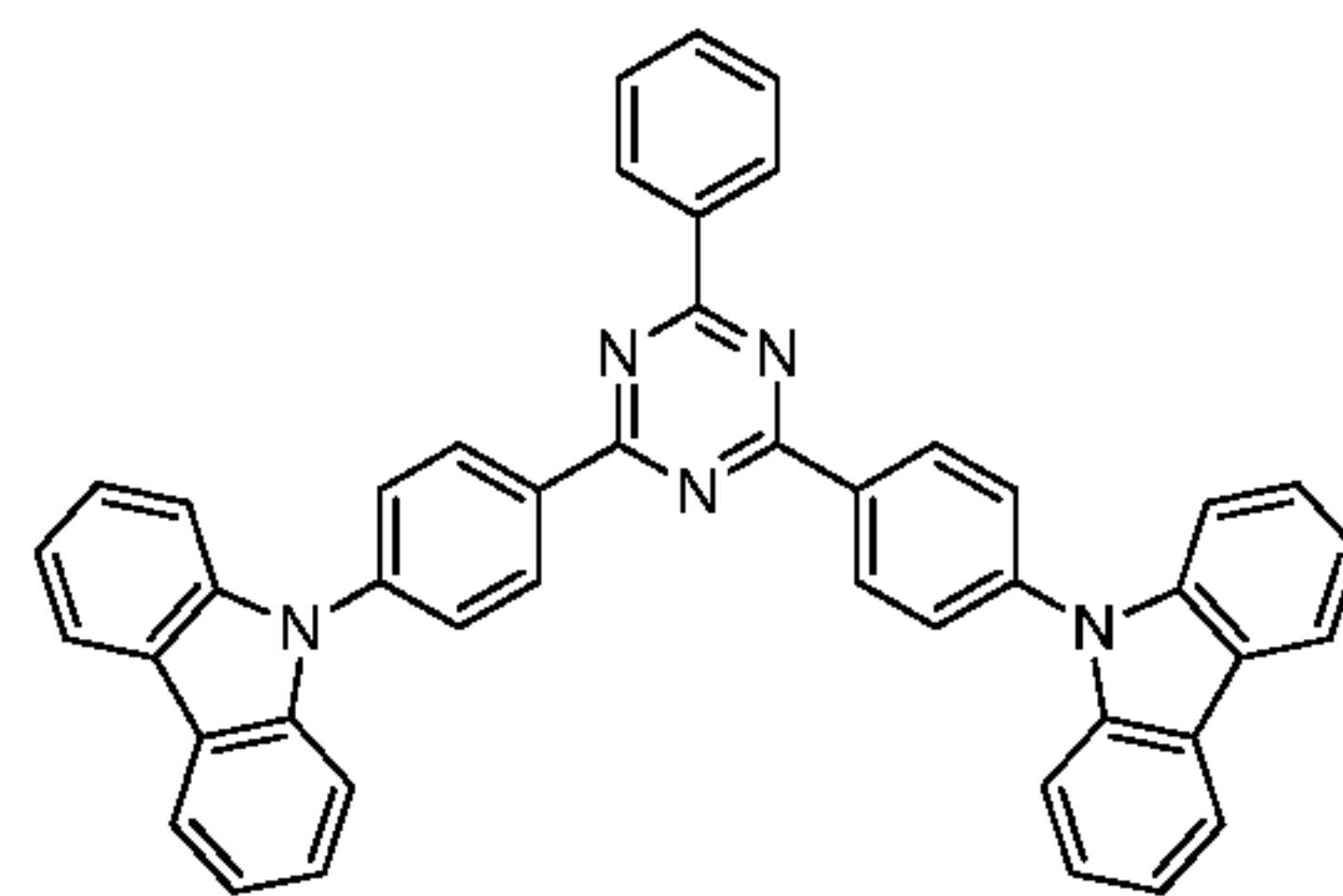




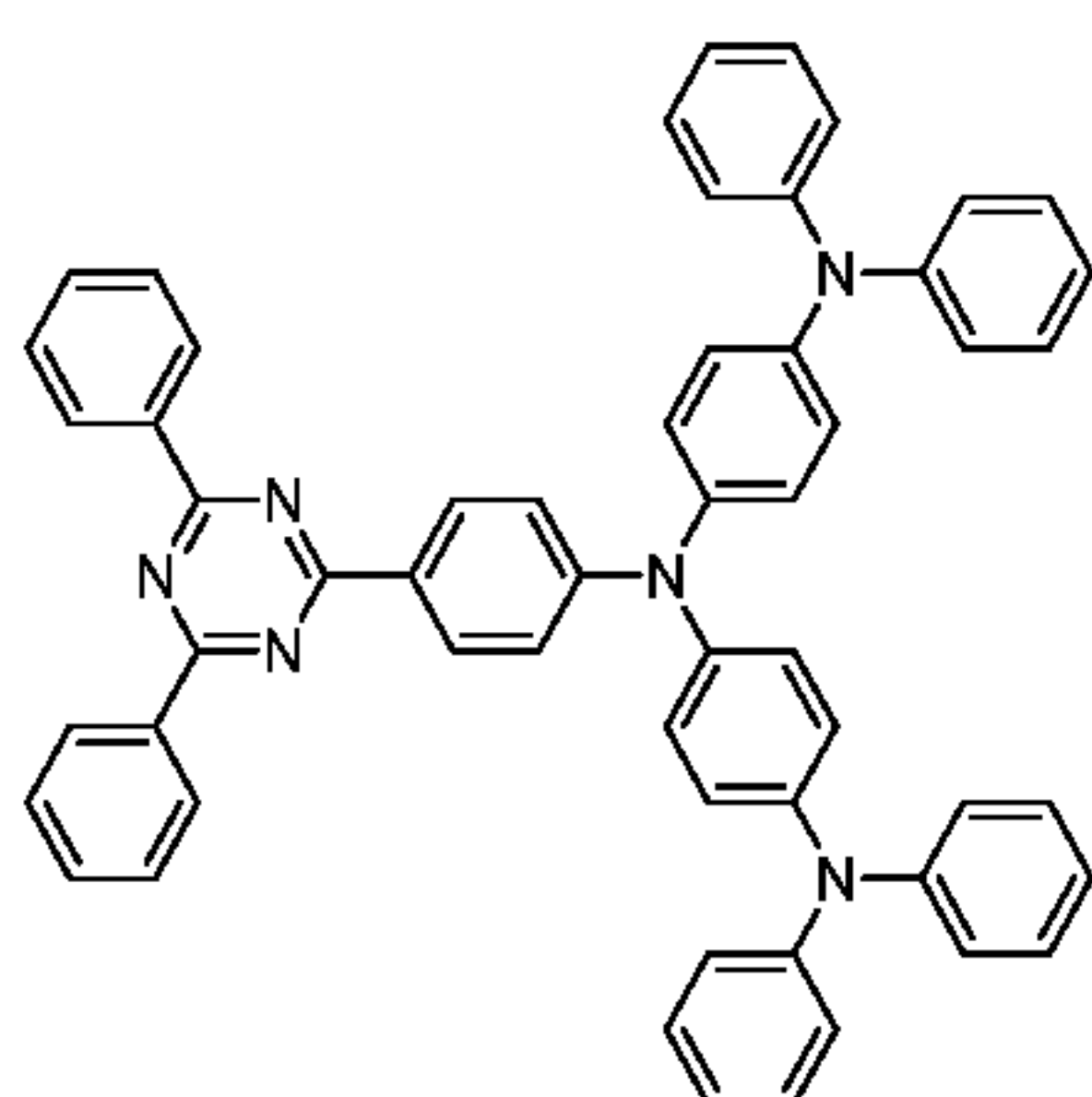
T-4



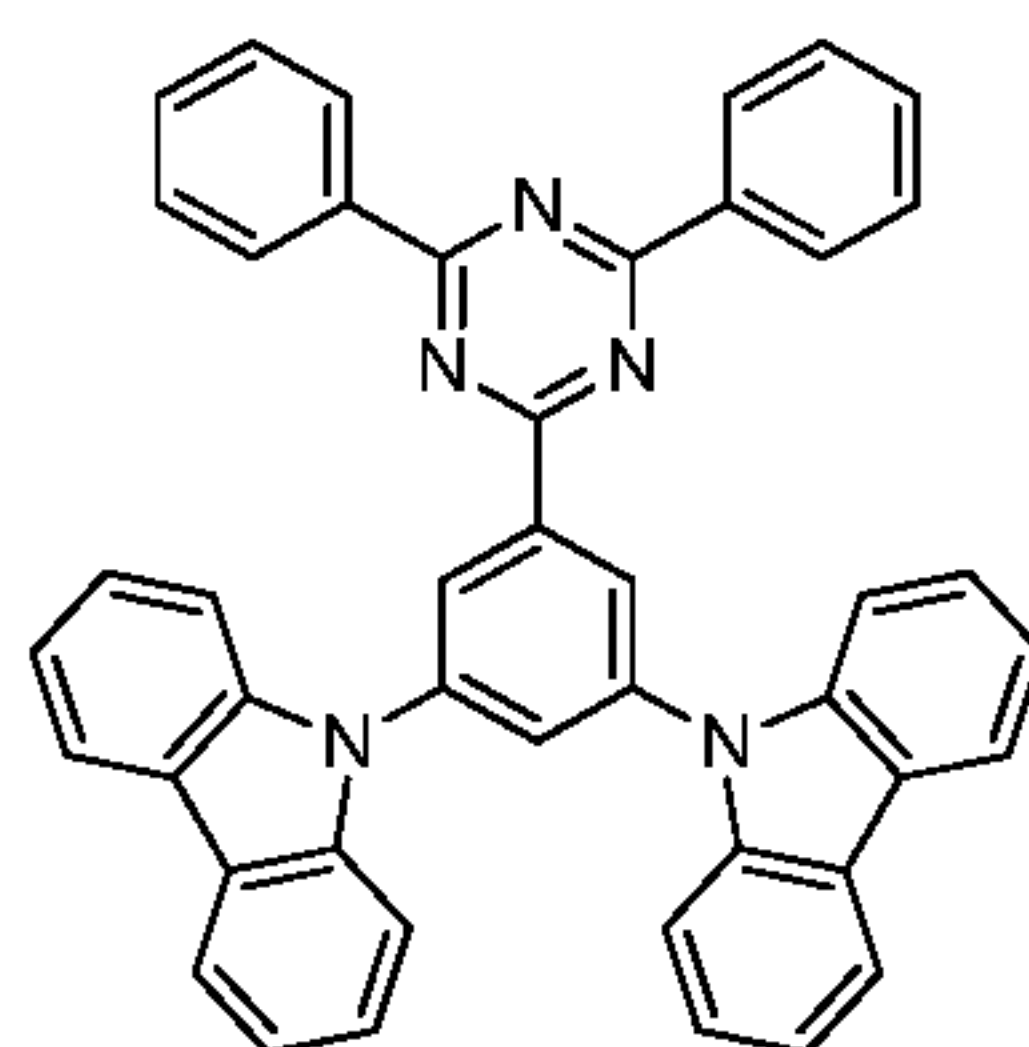
T-5



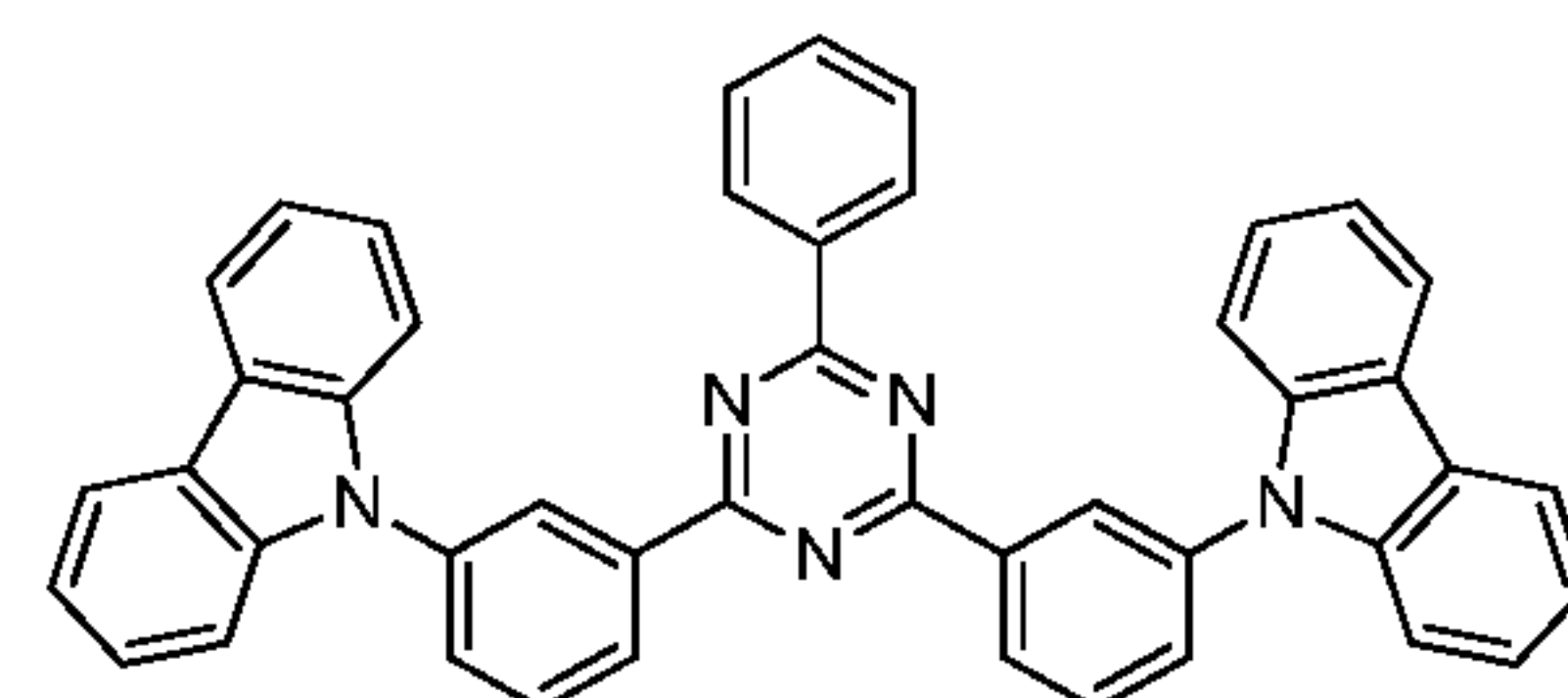
T-6



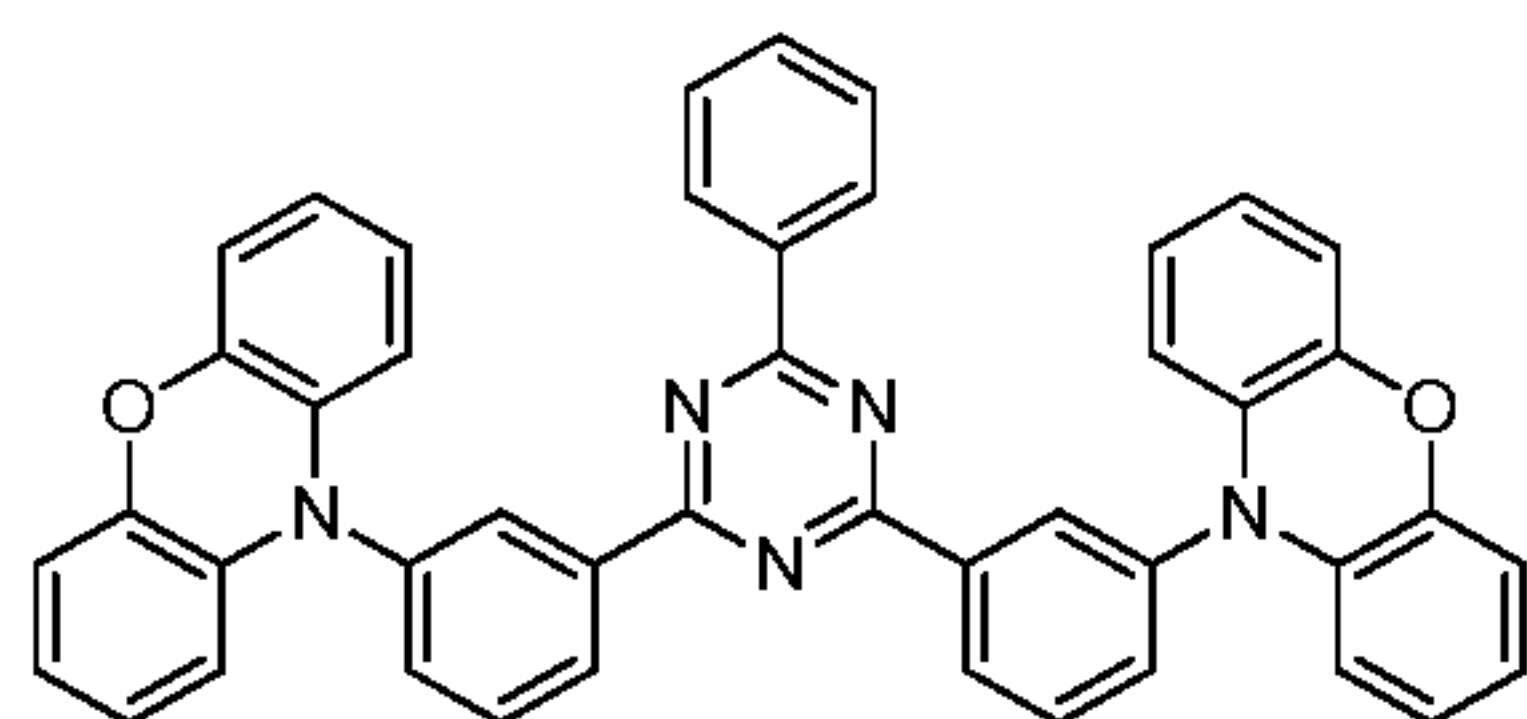
T-7



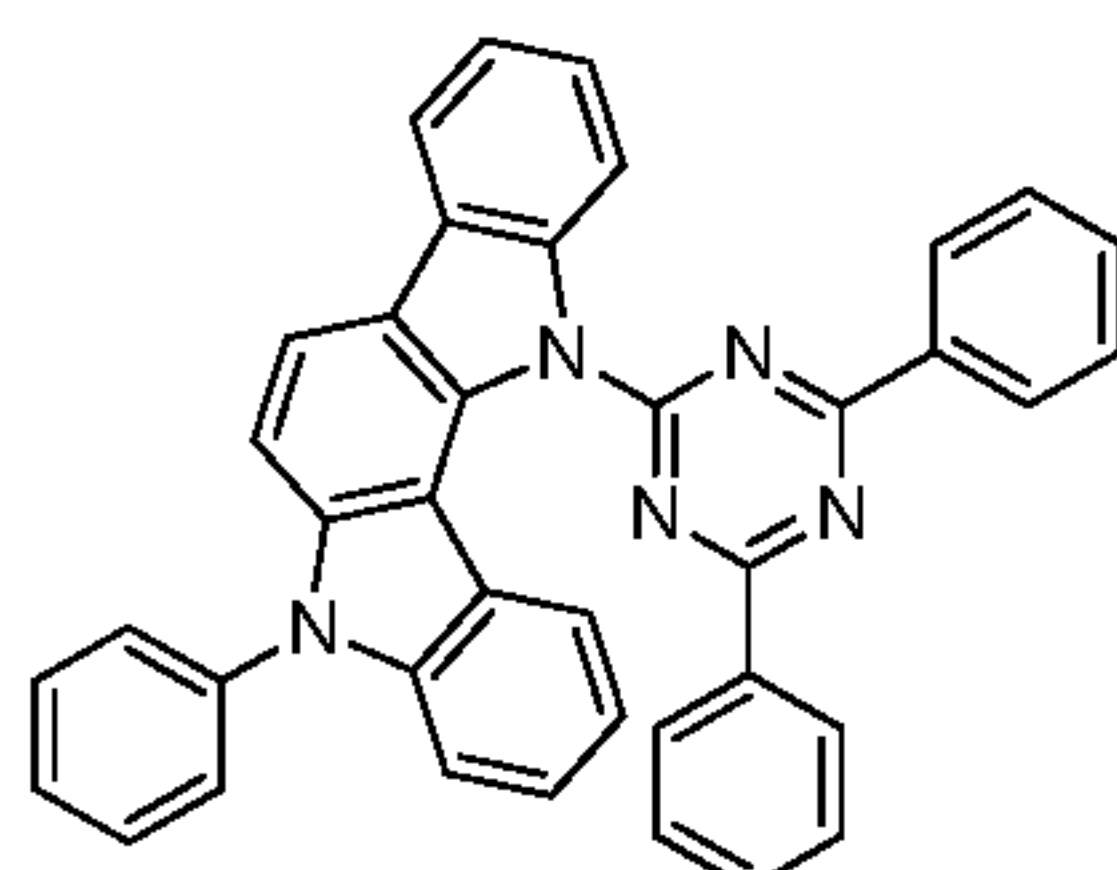
T-8



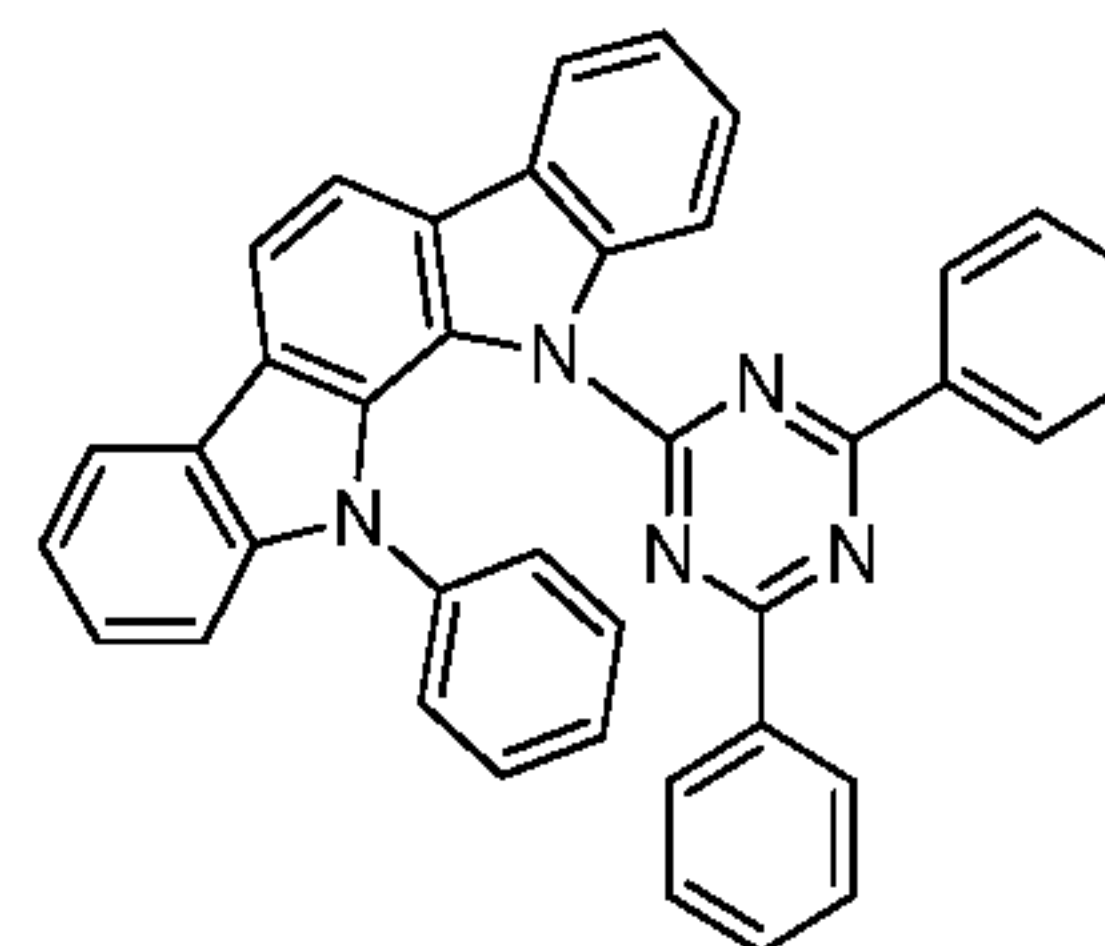
T-9



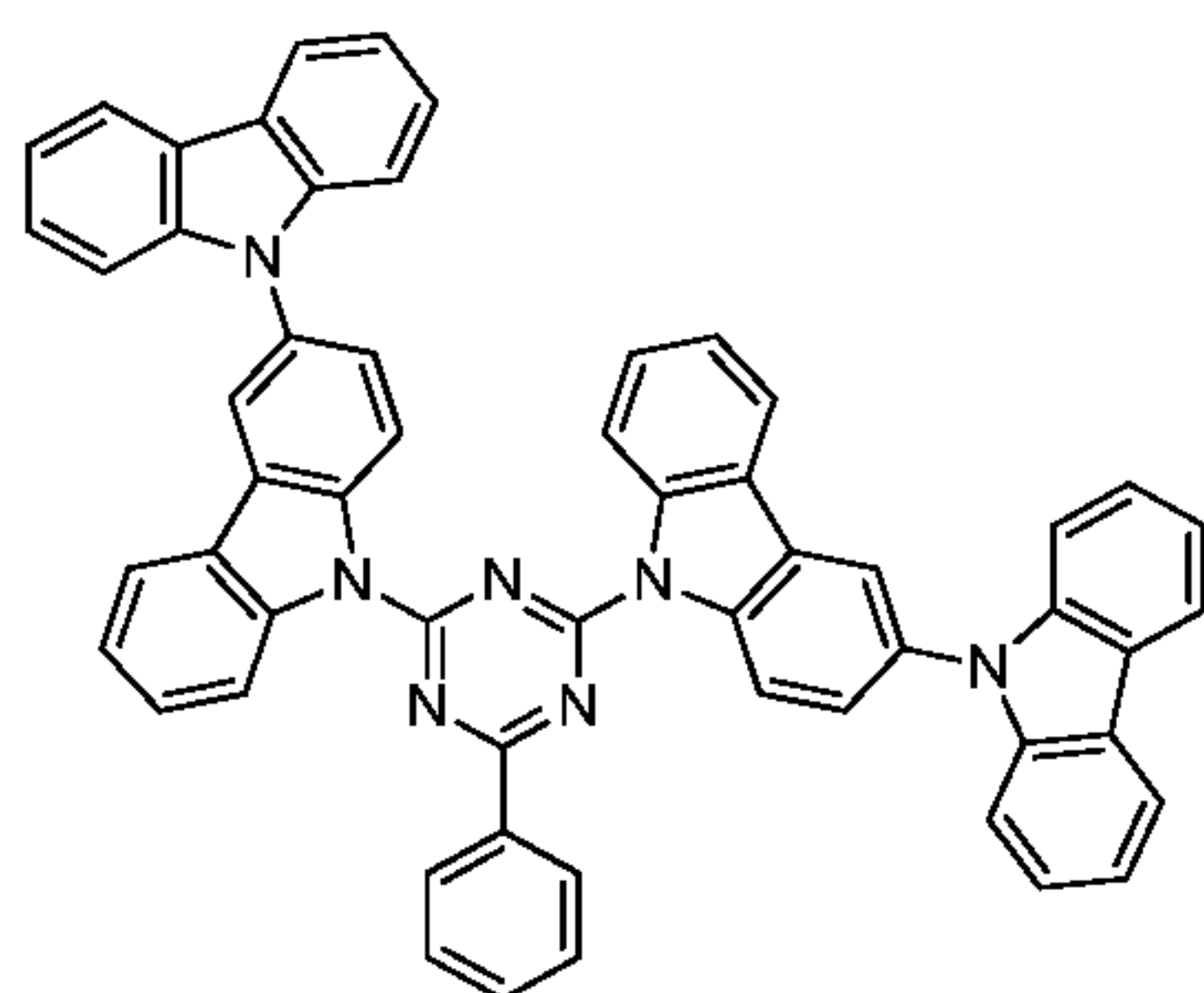
T-10



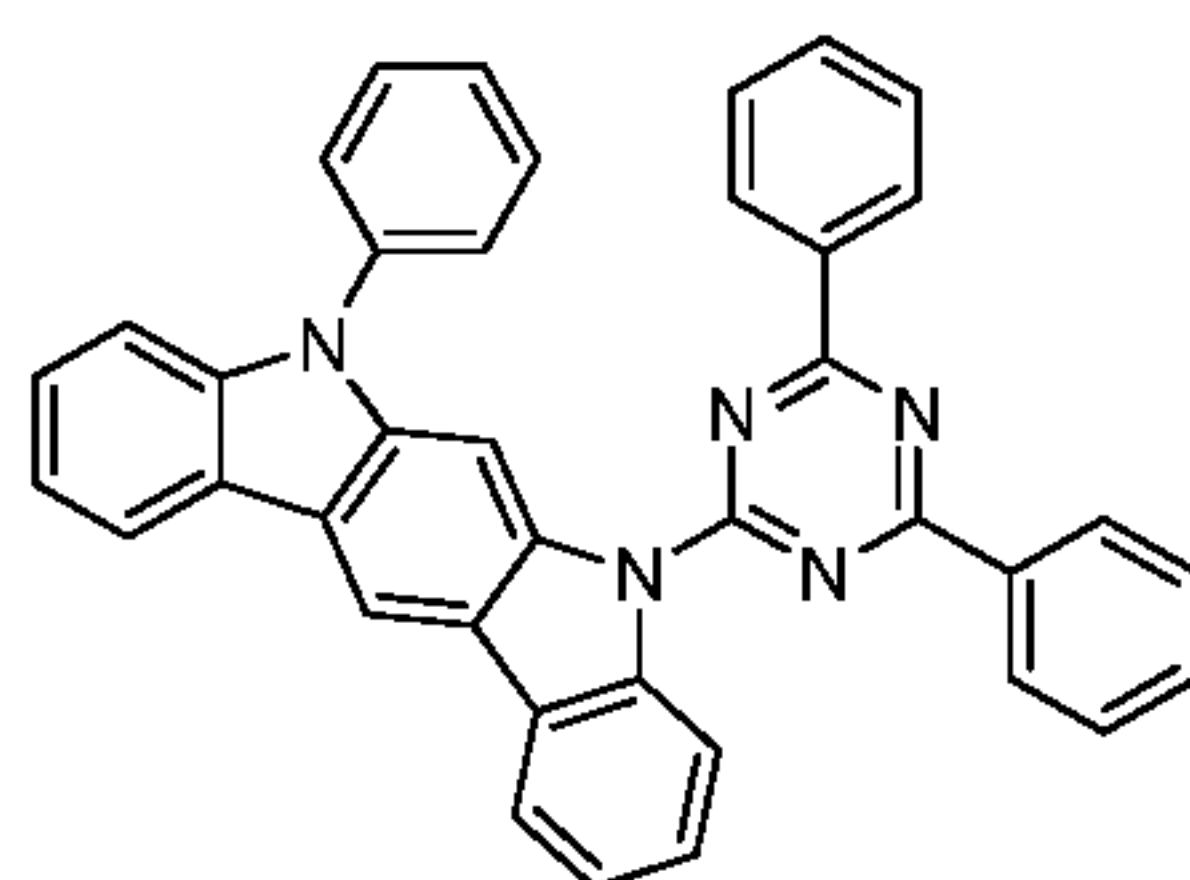
T-11



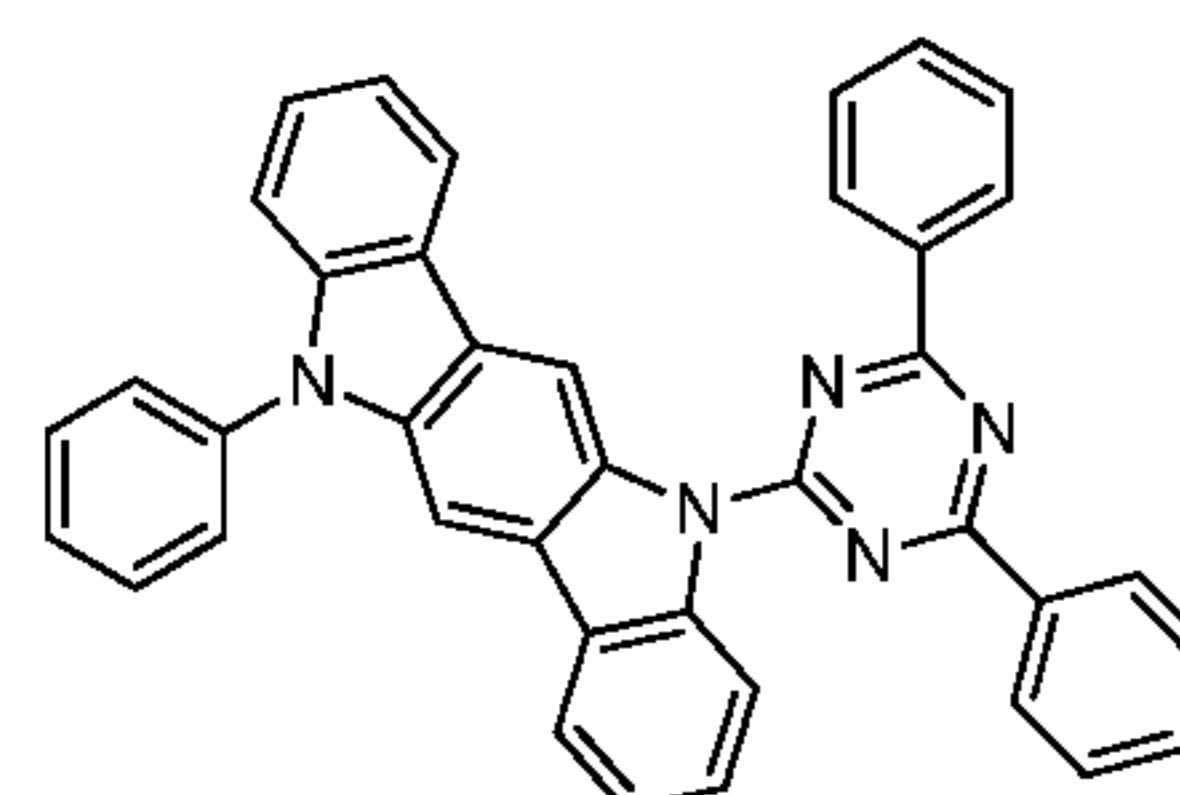
T-12



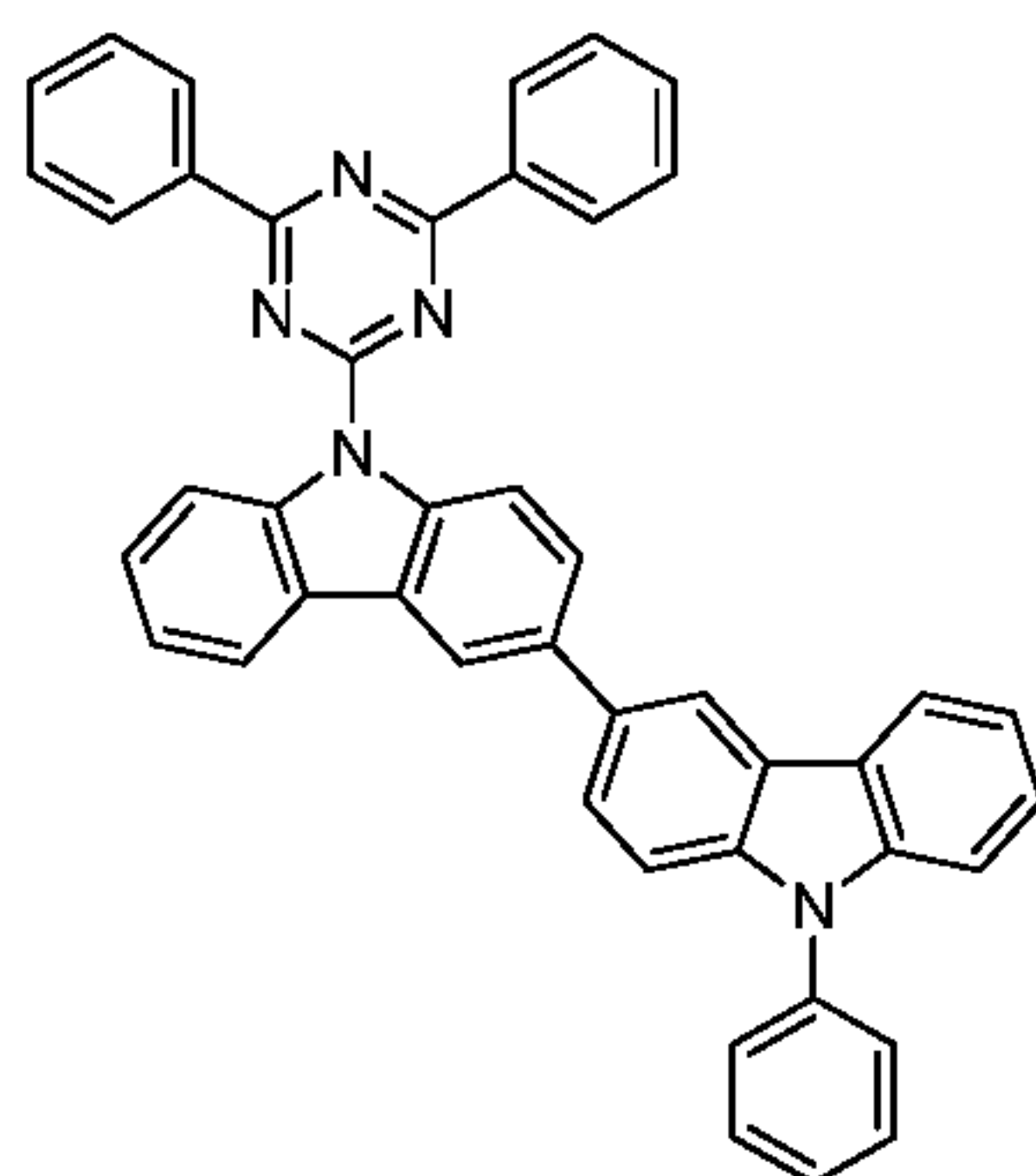
T-13



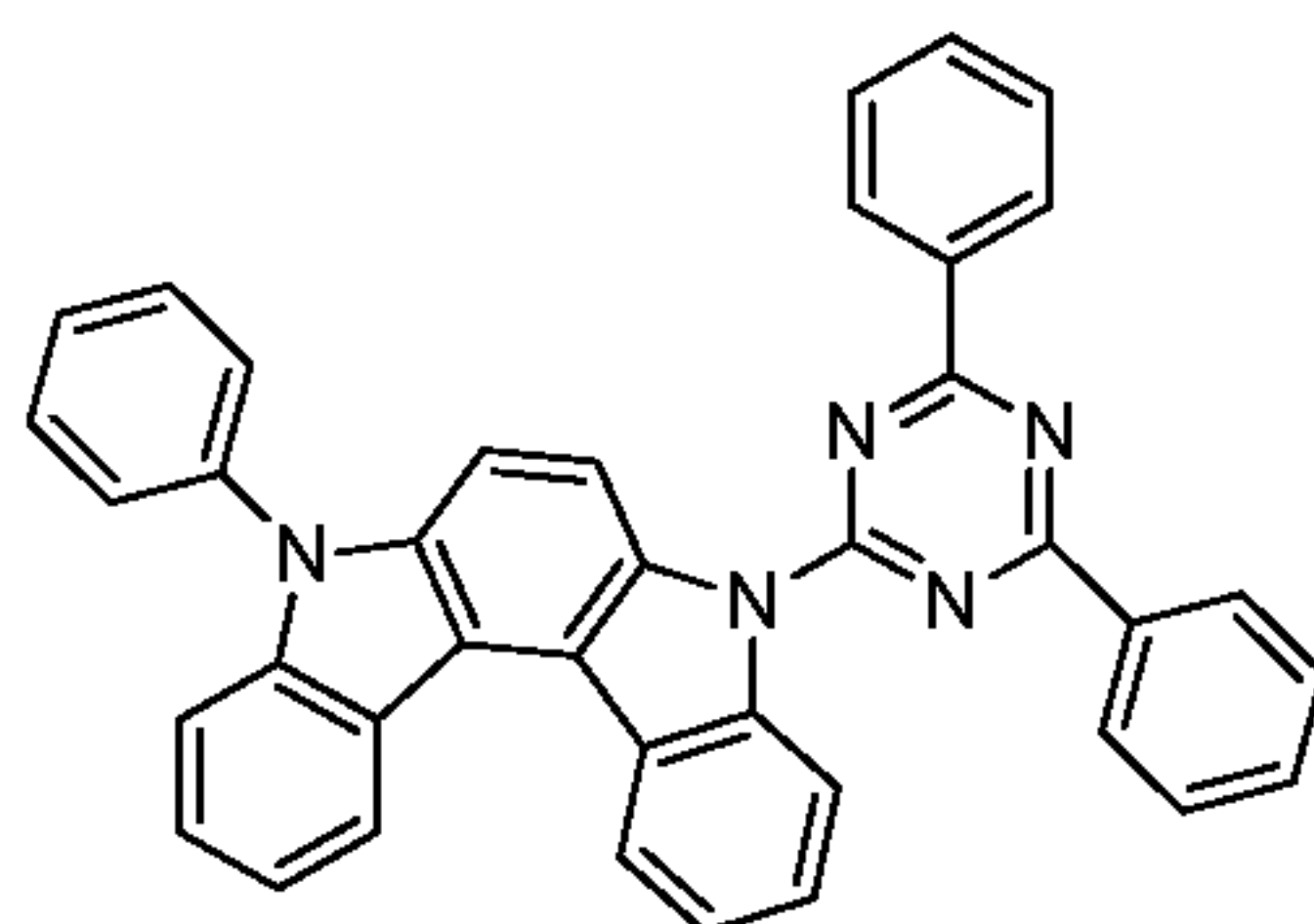
T-14



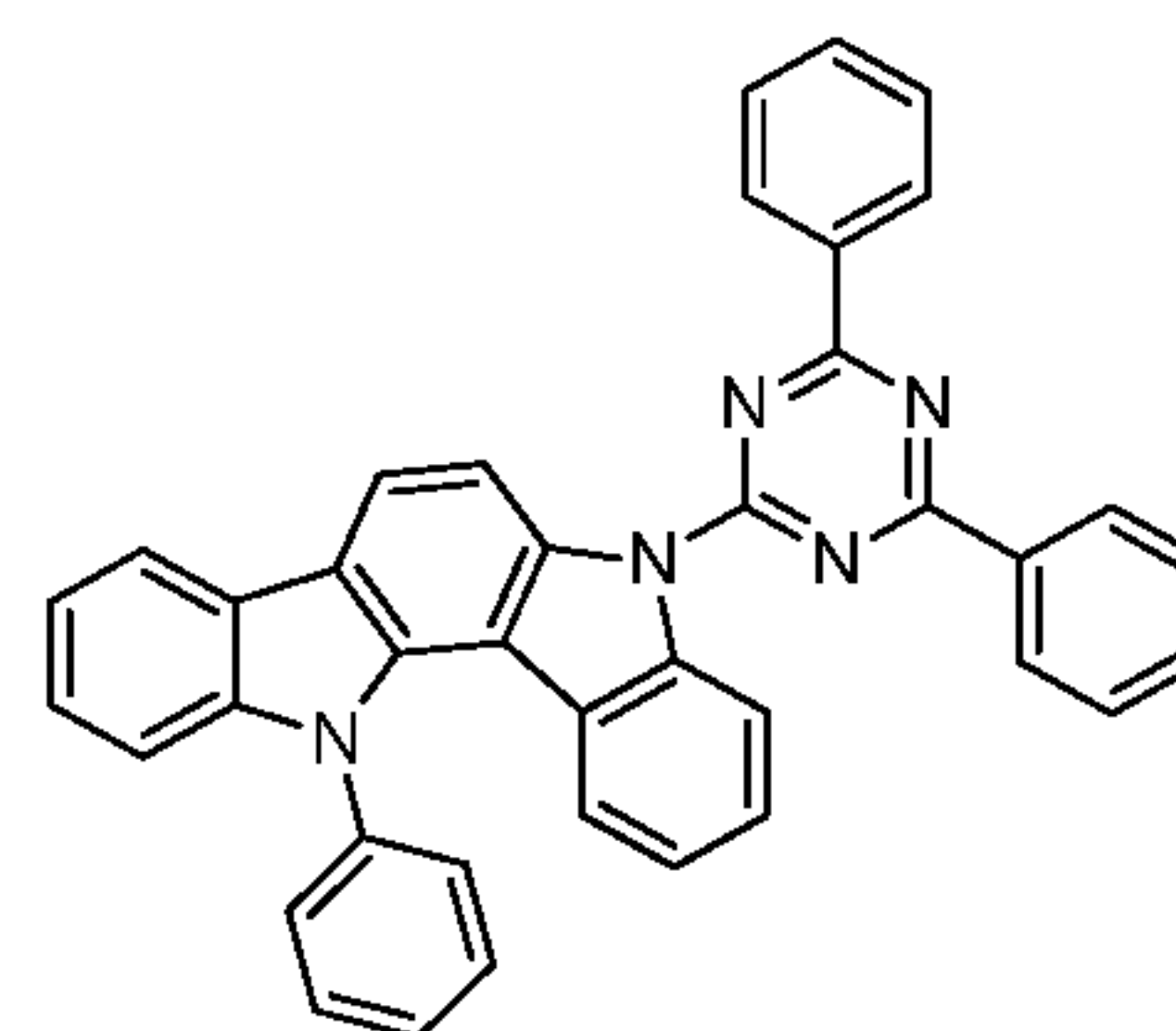
T-15



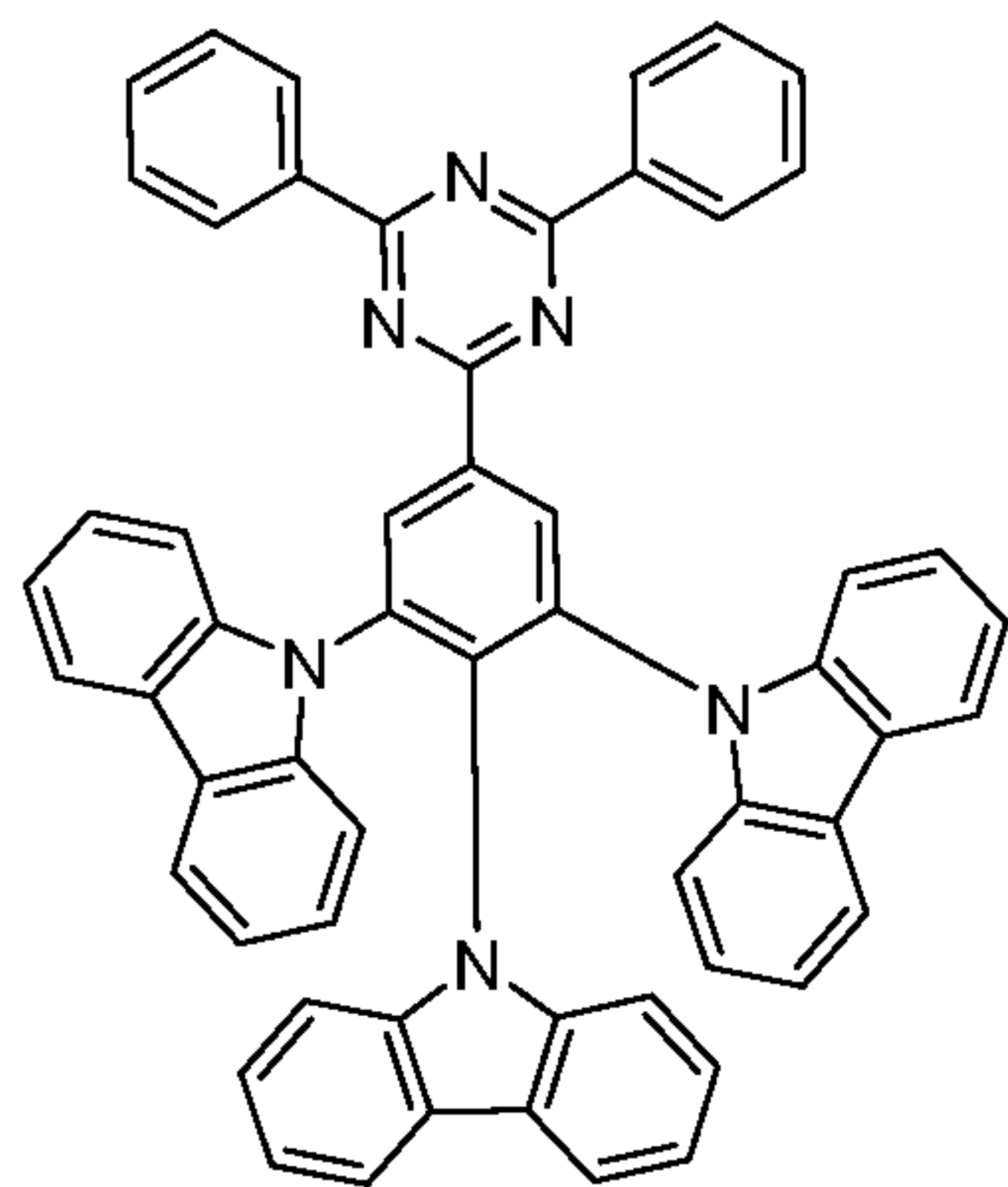
T-16



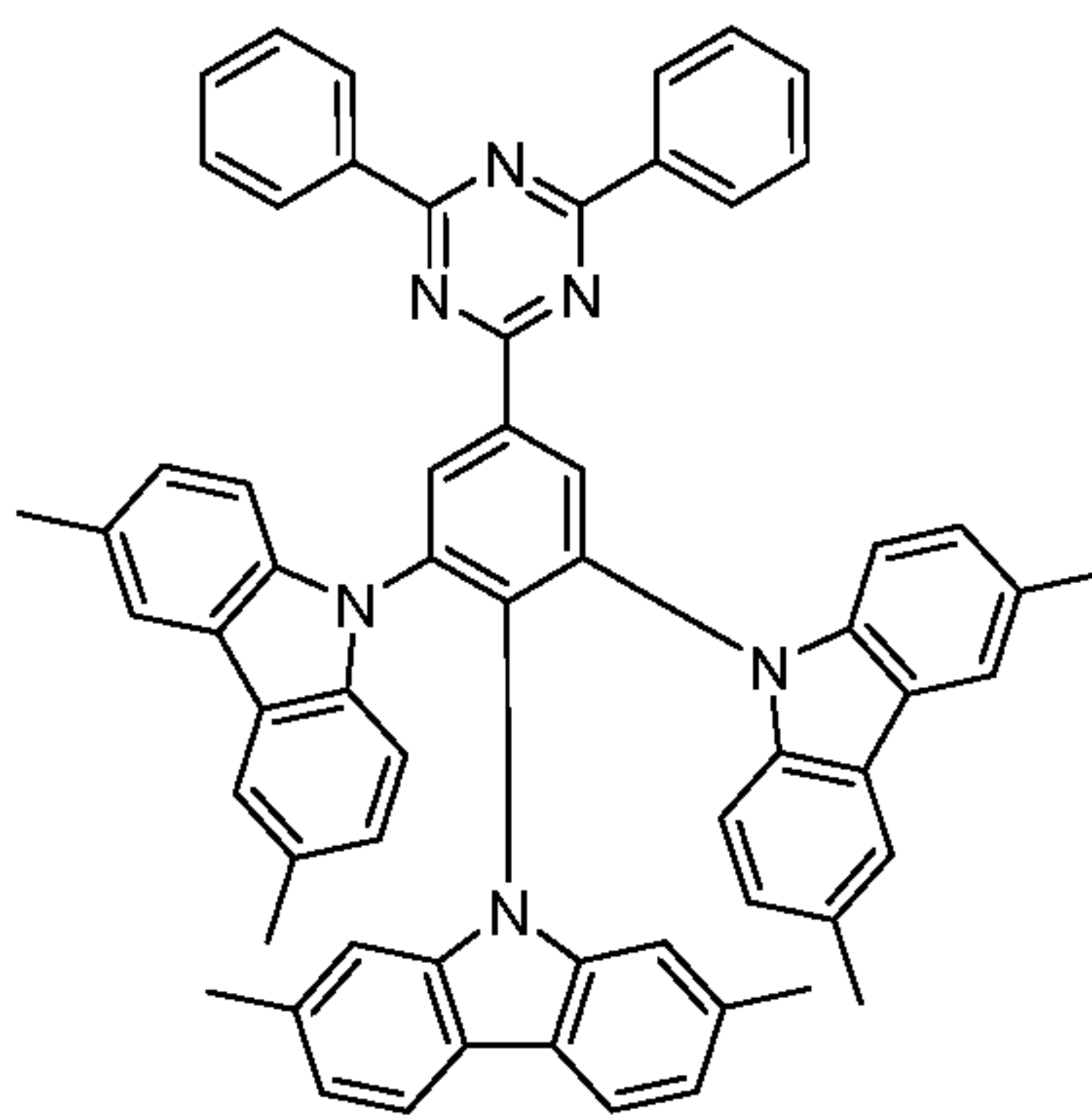
T-17



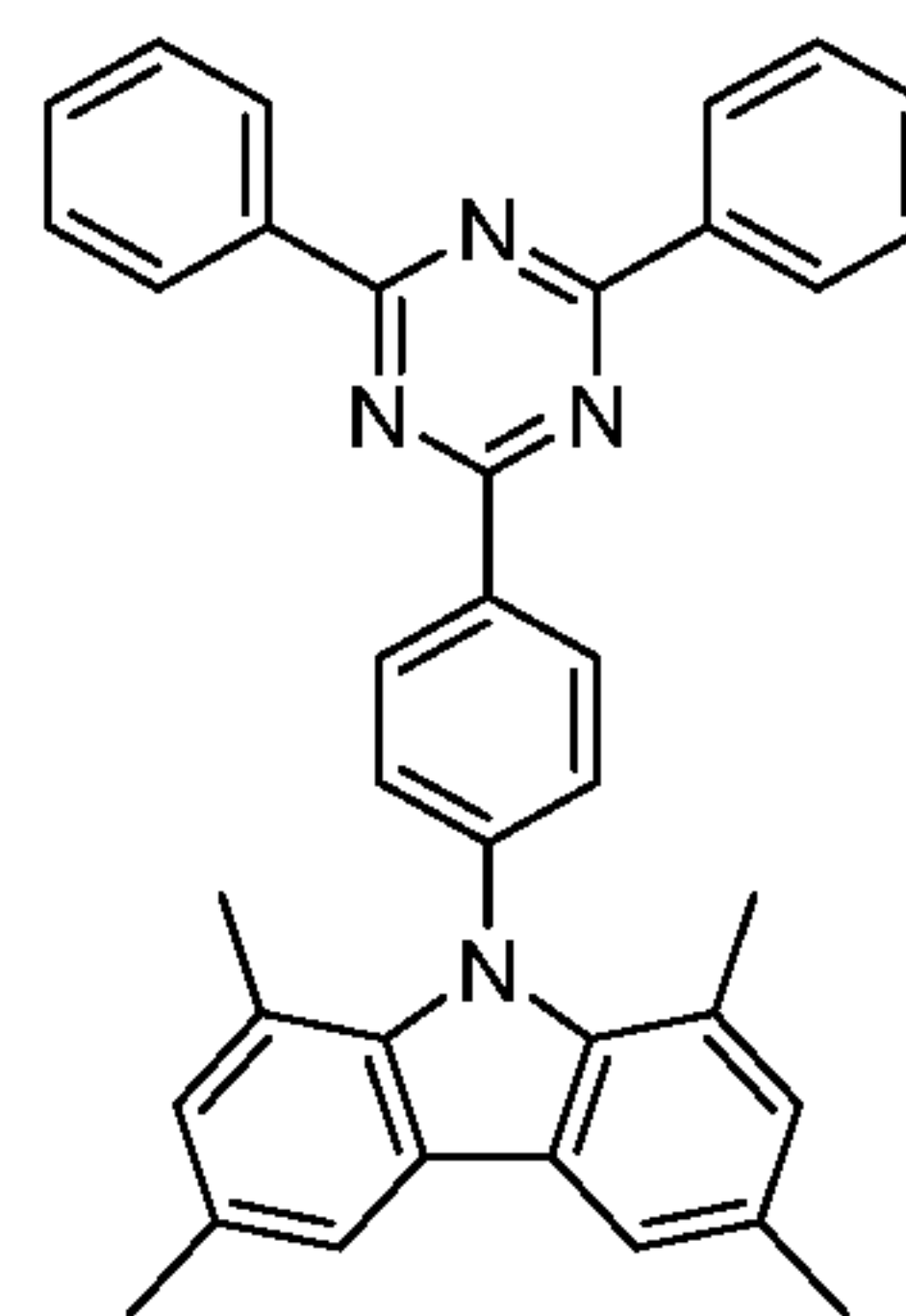
T-18



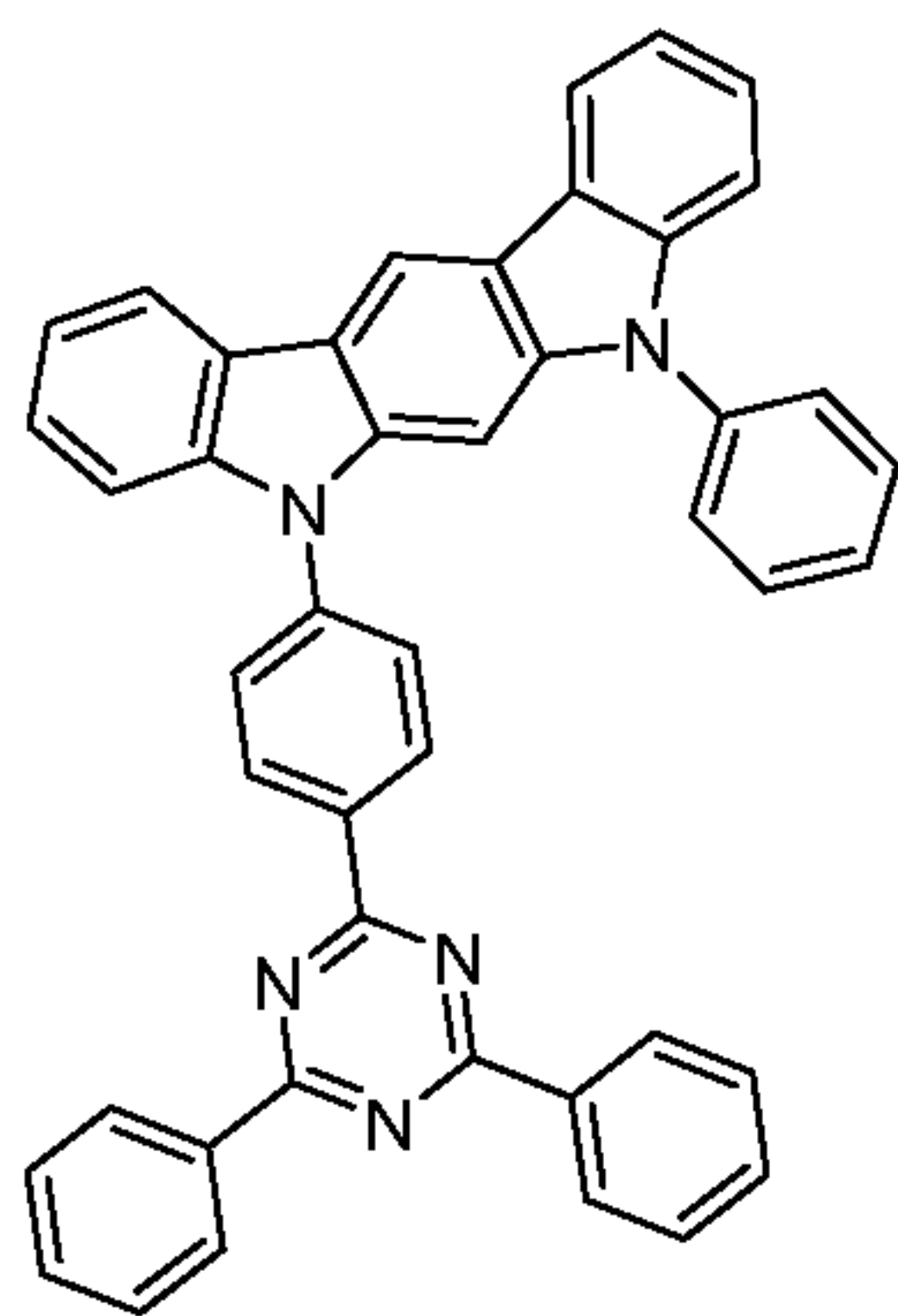
T-19



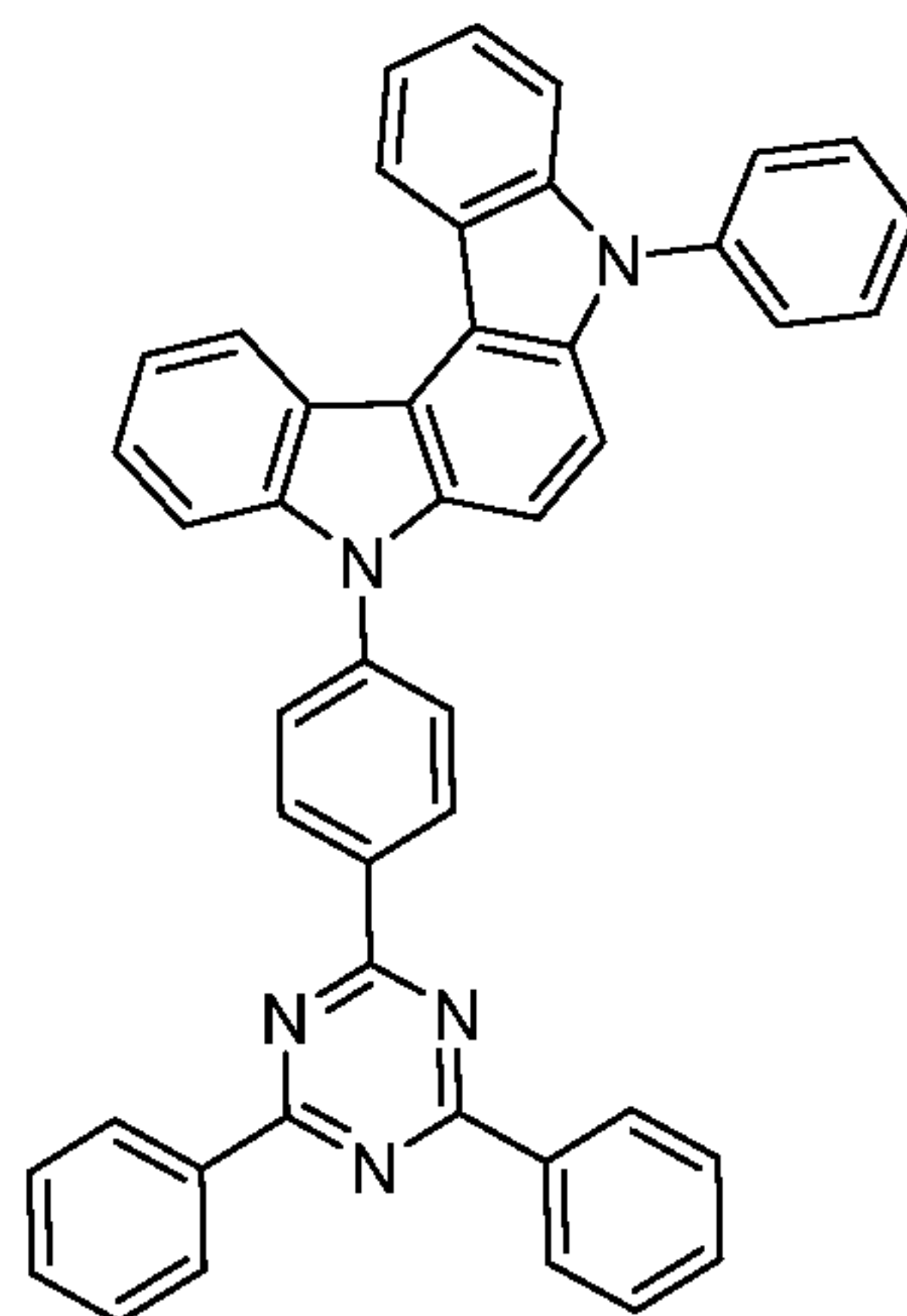
T-20



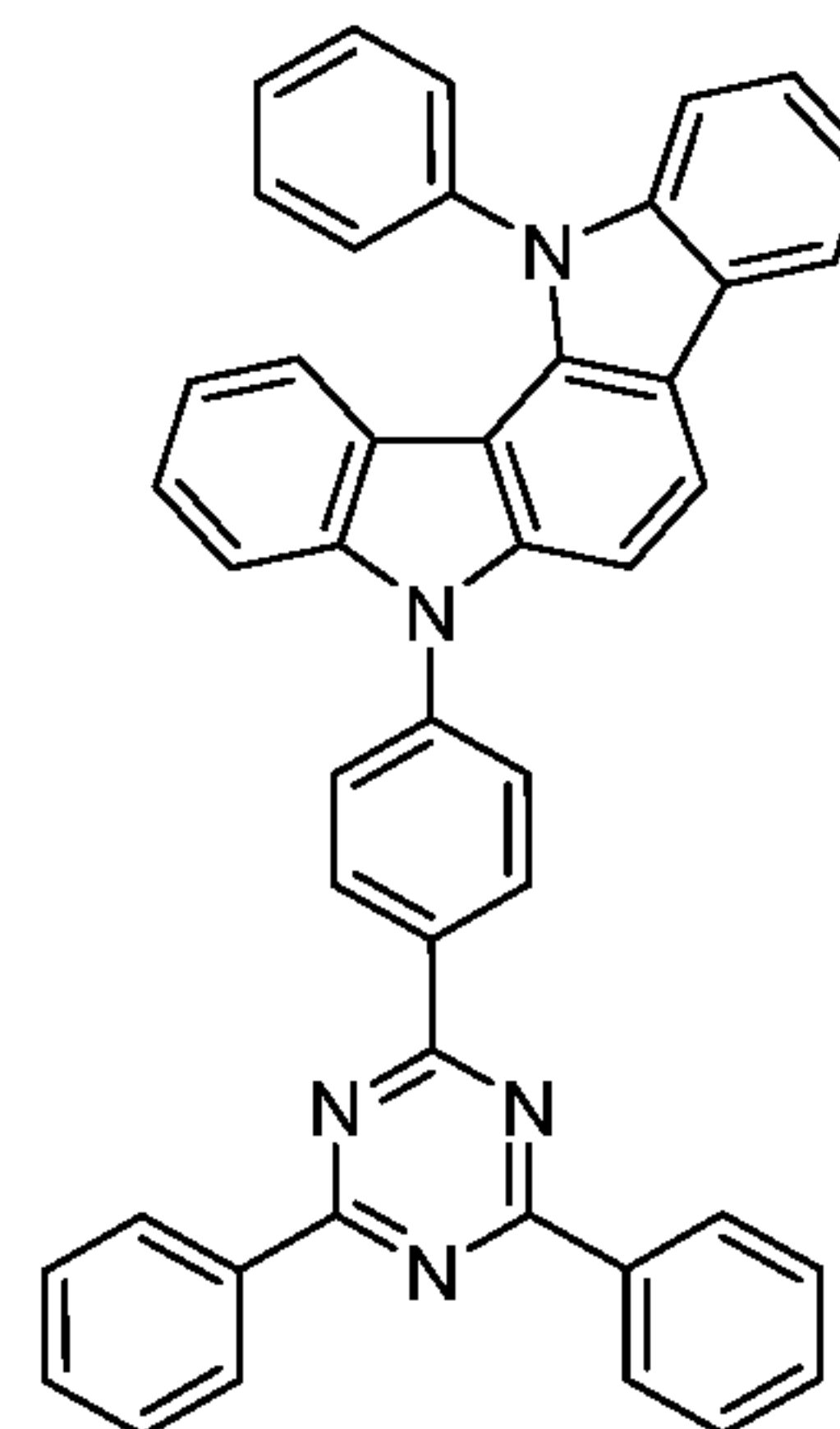
T-21



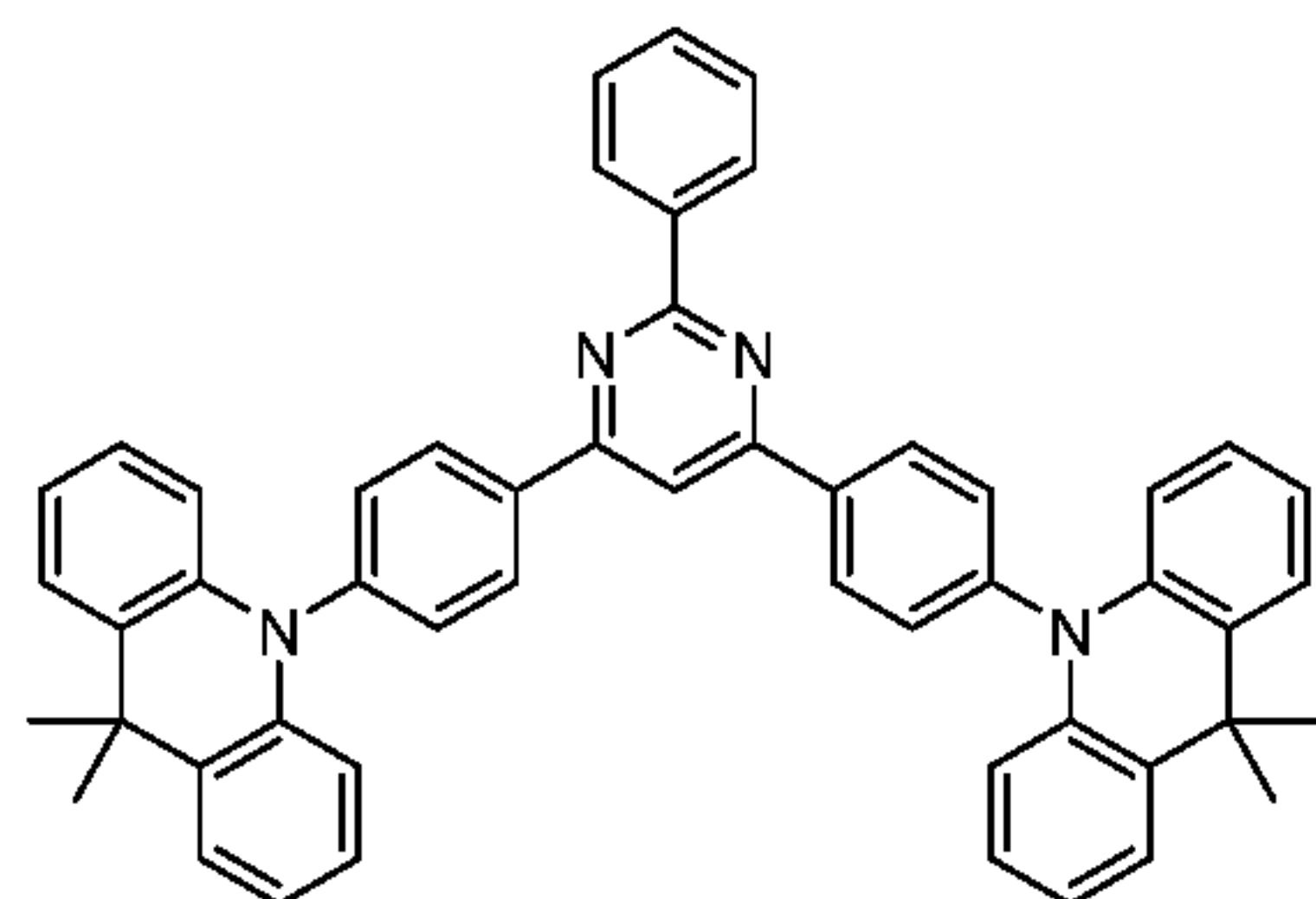
T-22



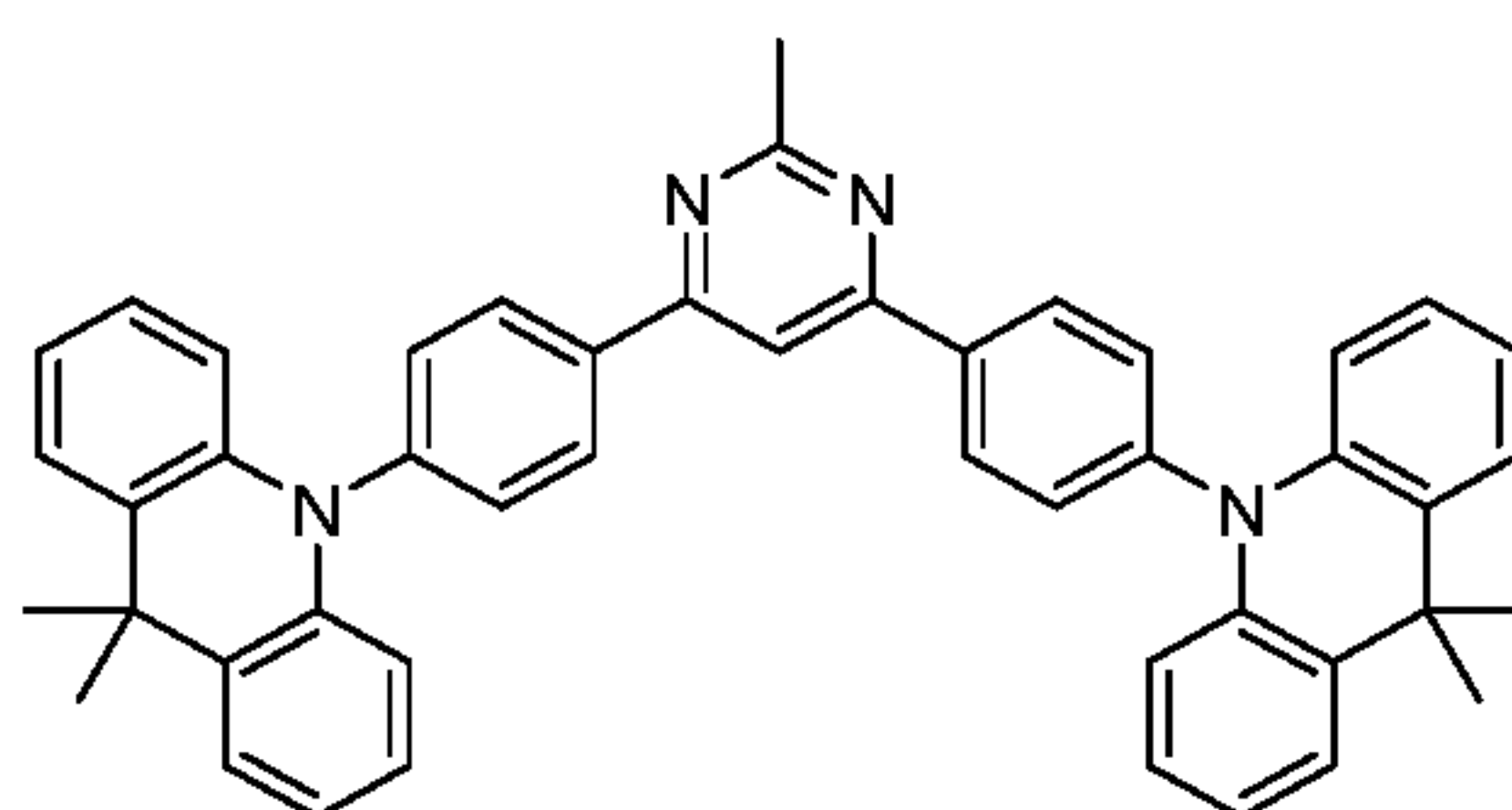
T-23



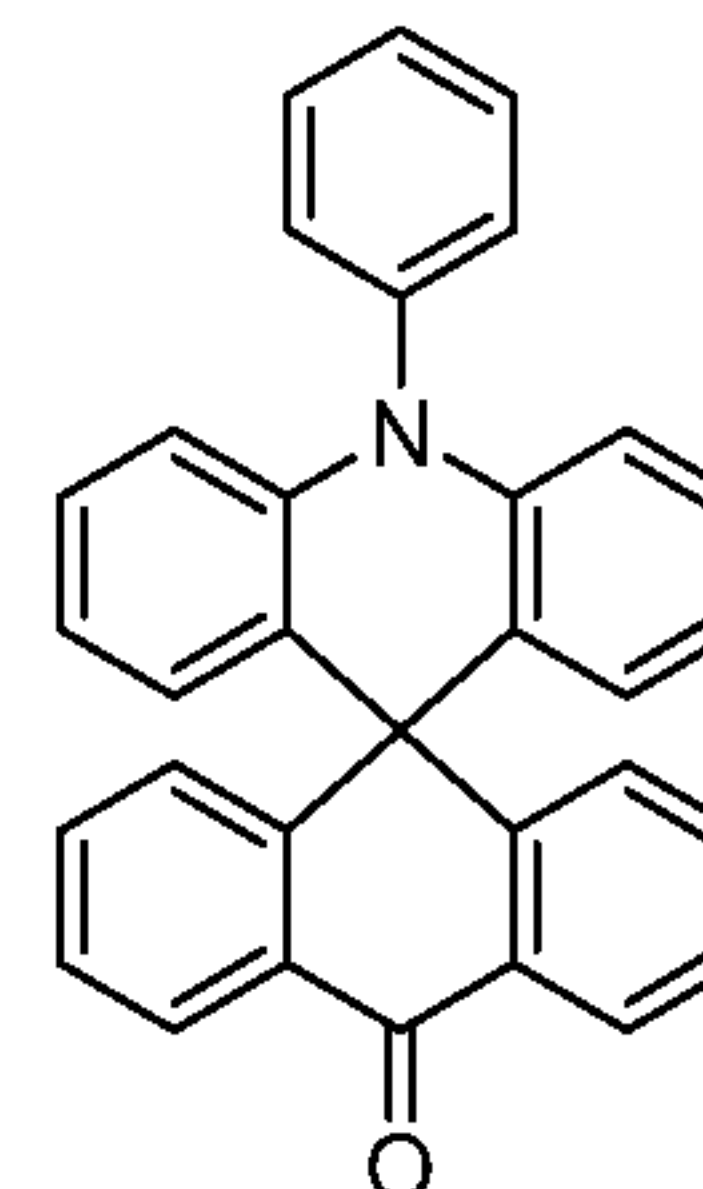
T-24



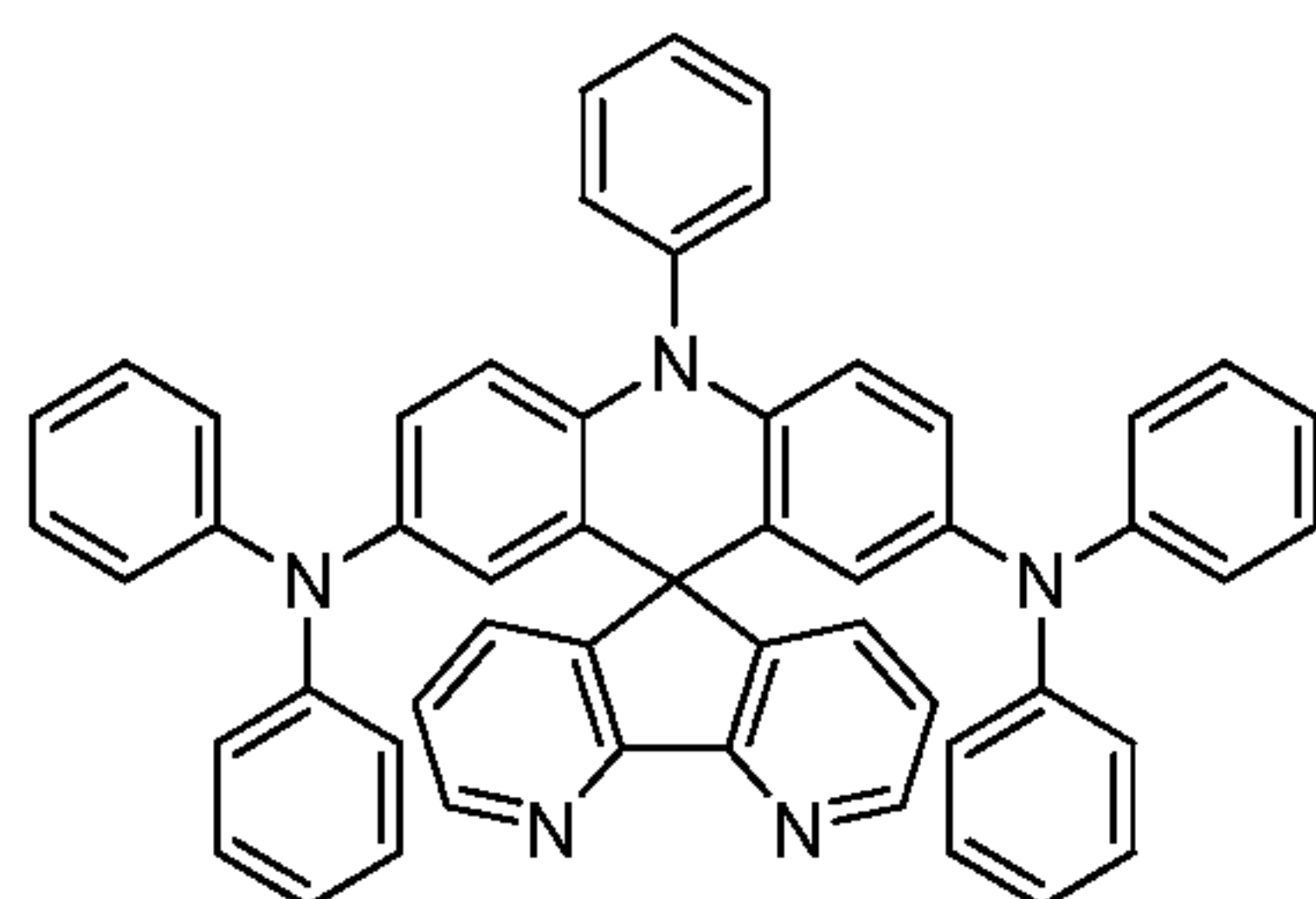
T-25



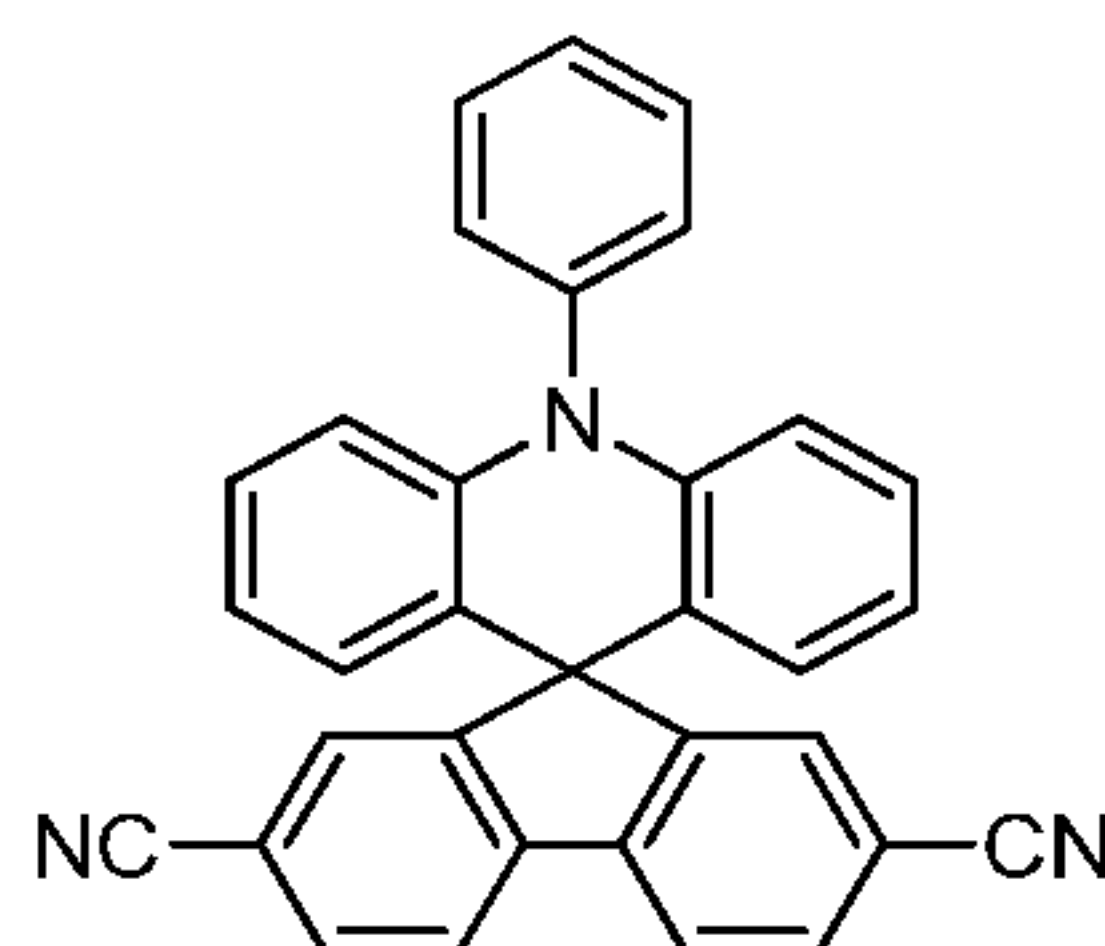
T-26



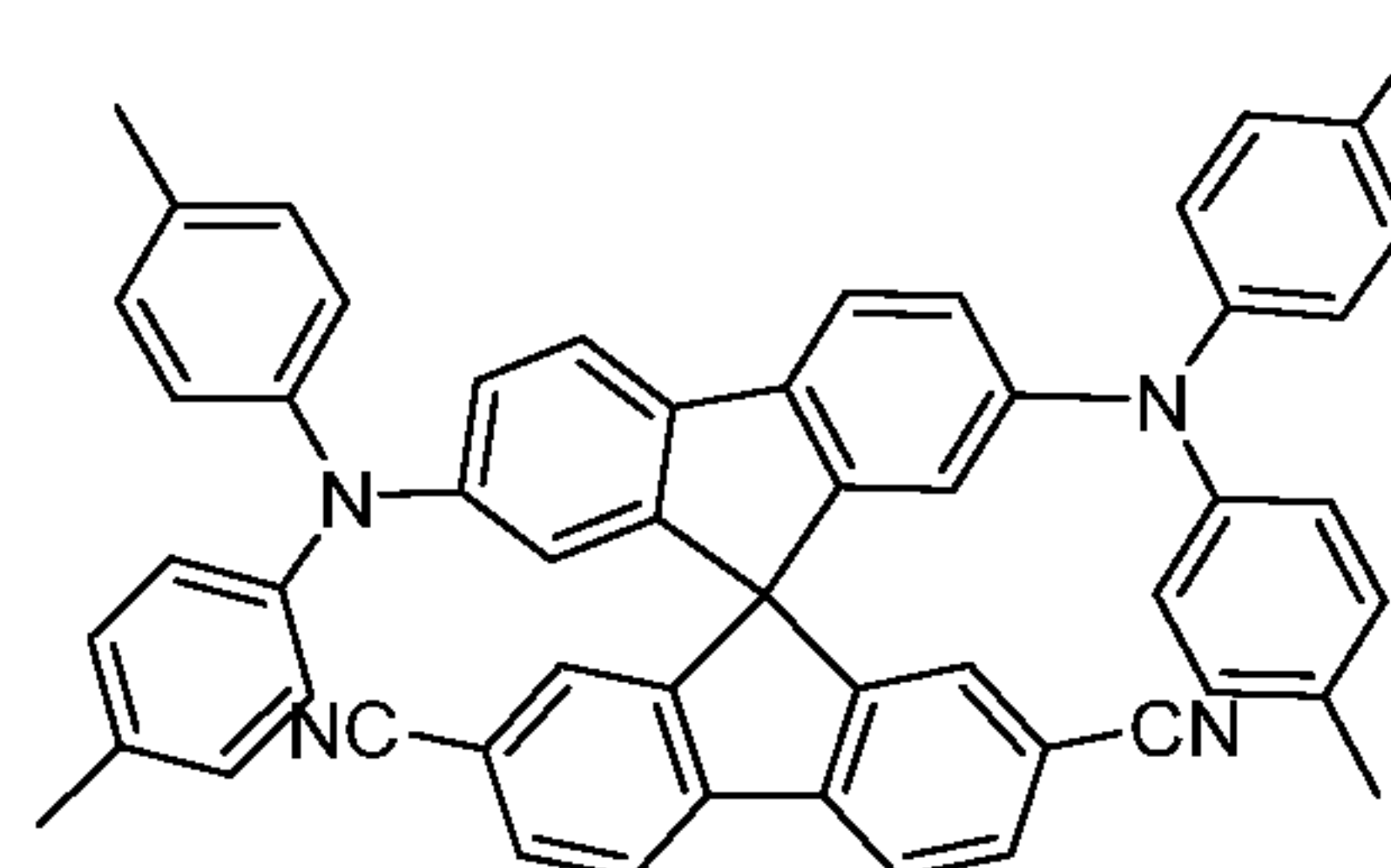
T-27



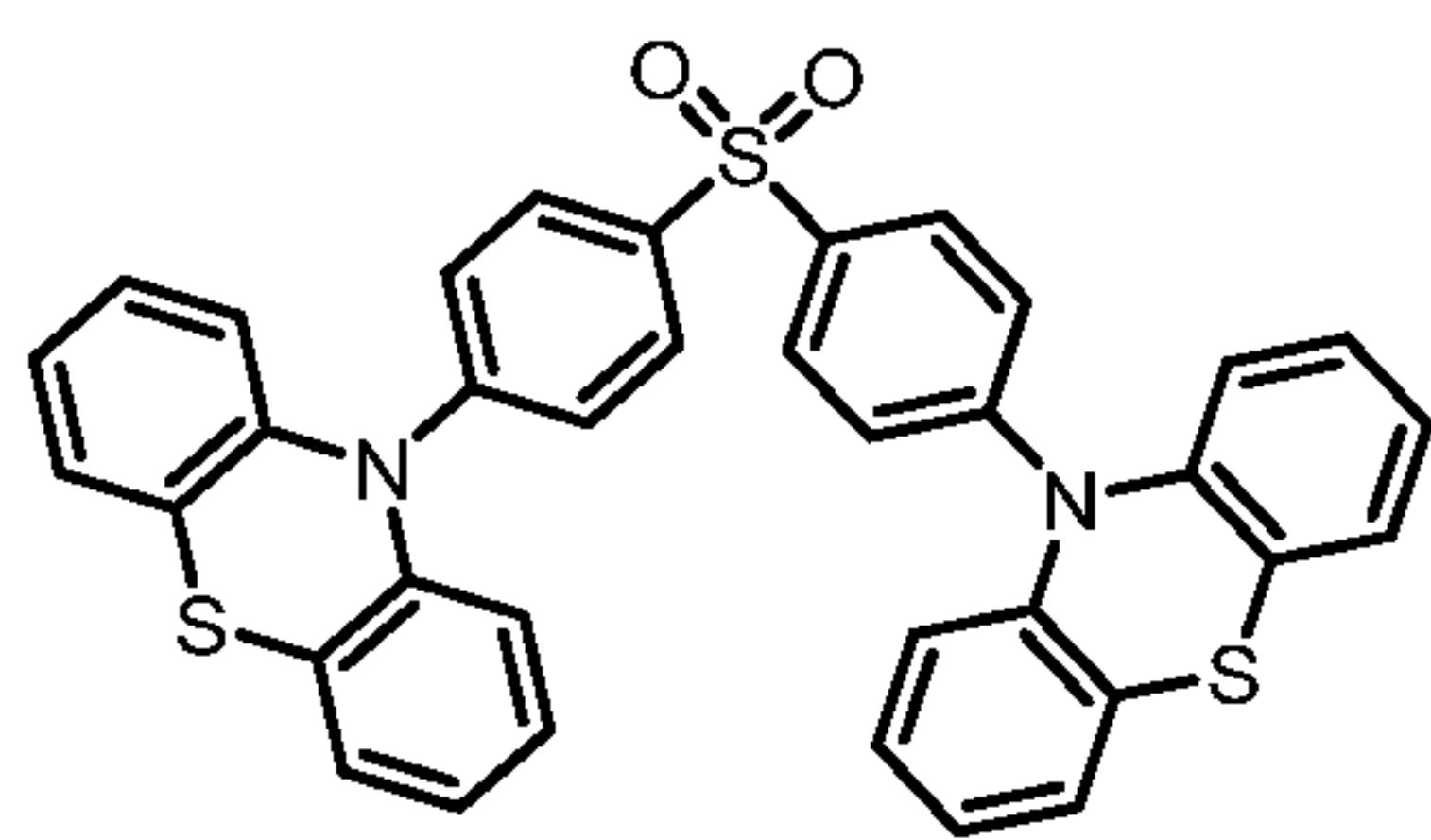
T-28



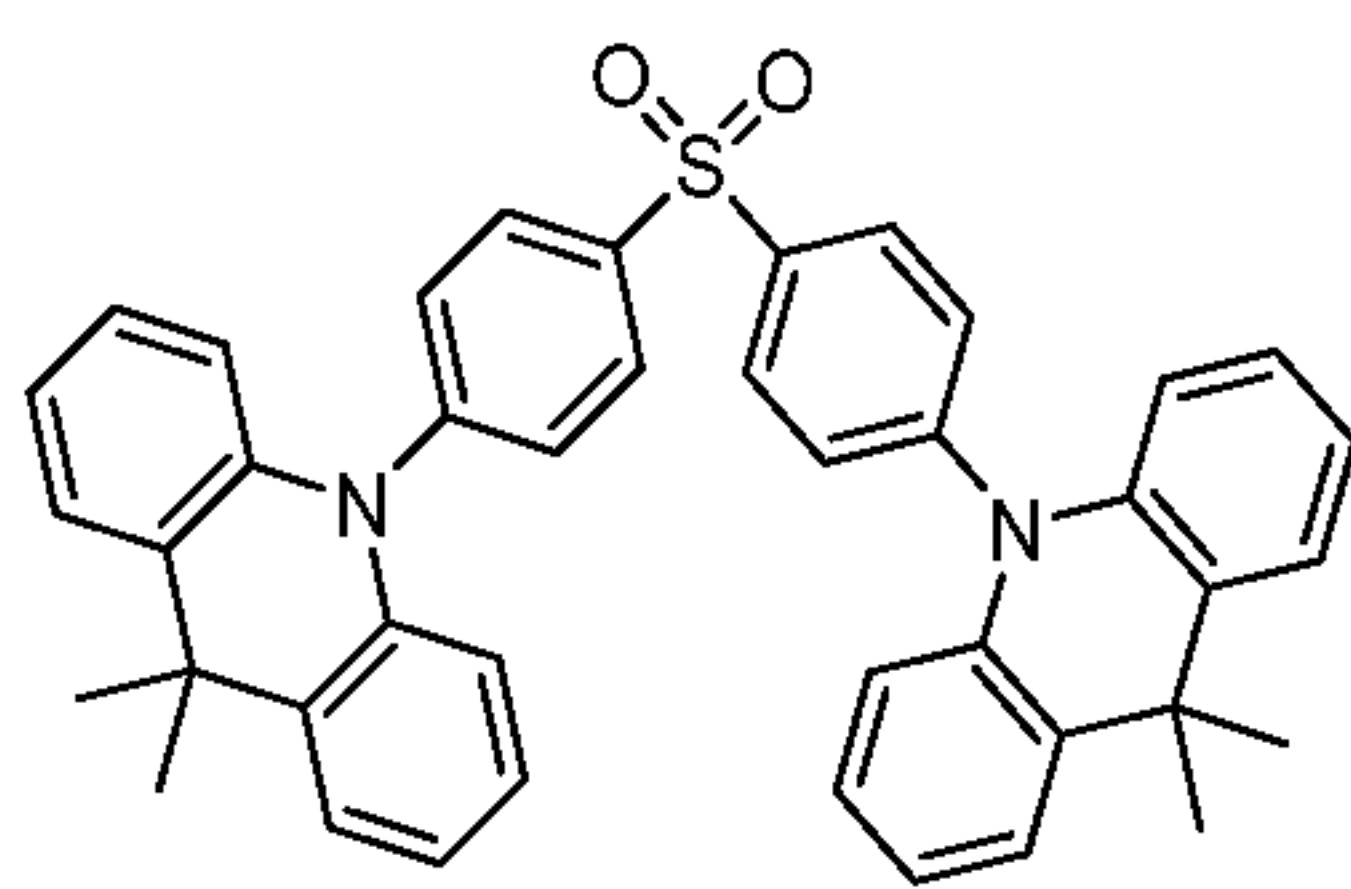
T-29



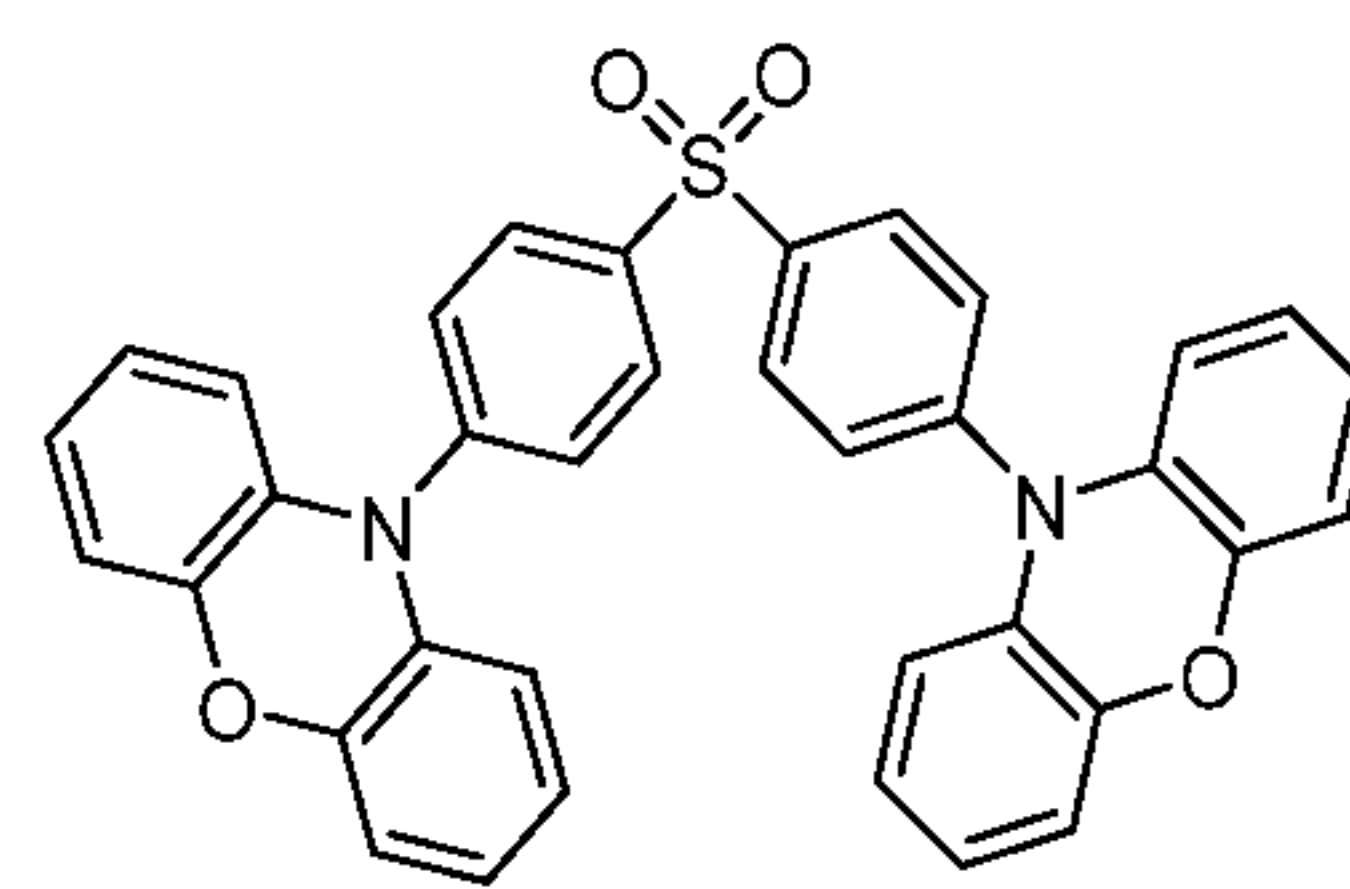
T-30



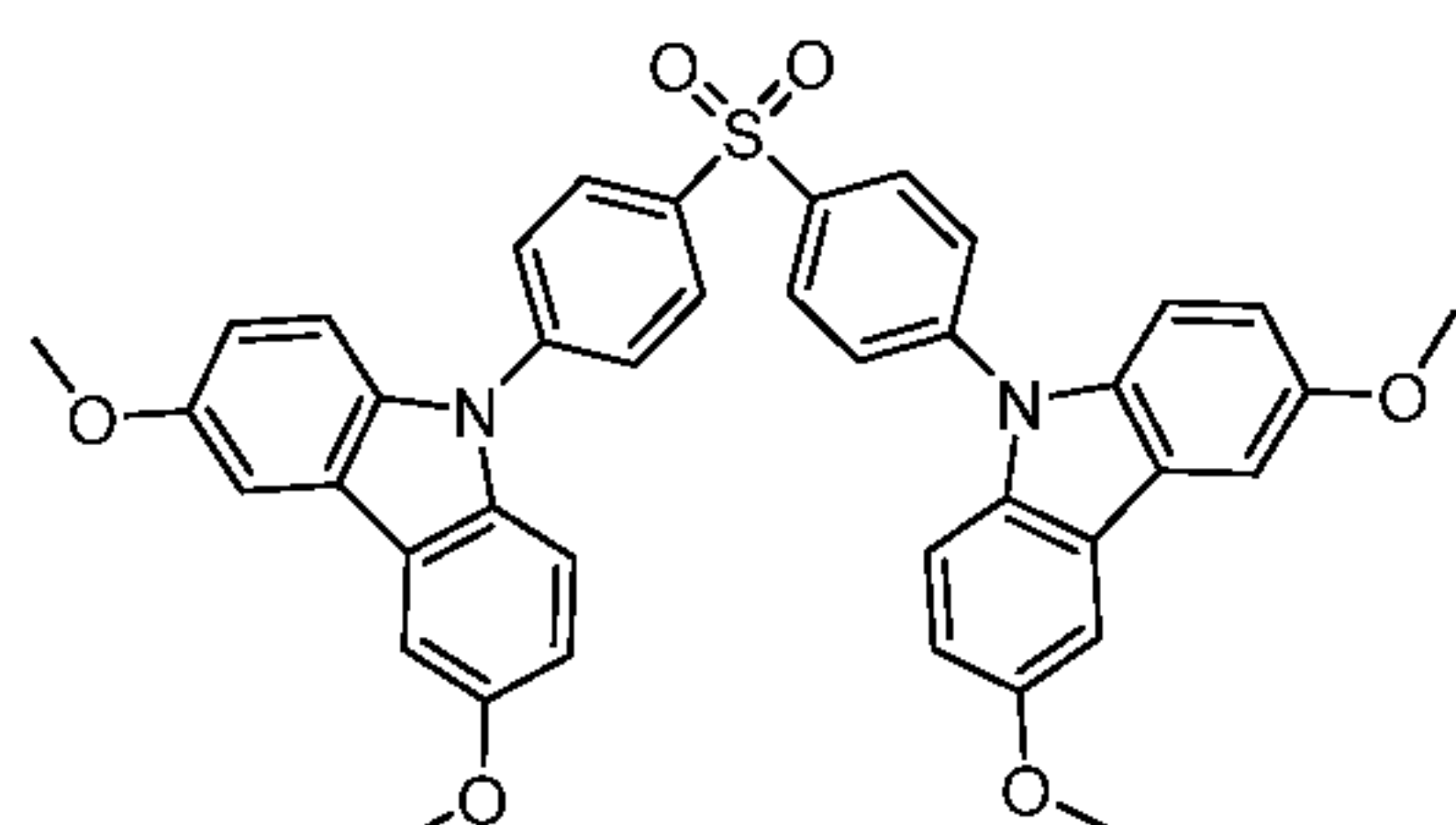
T-31



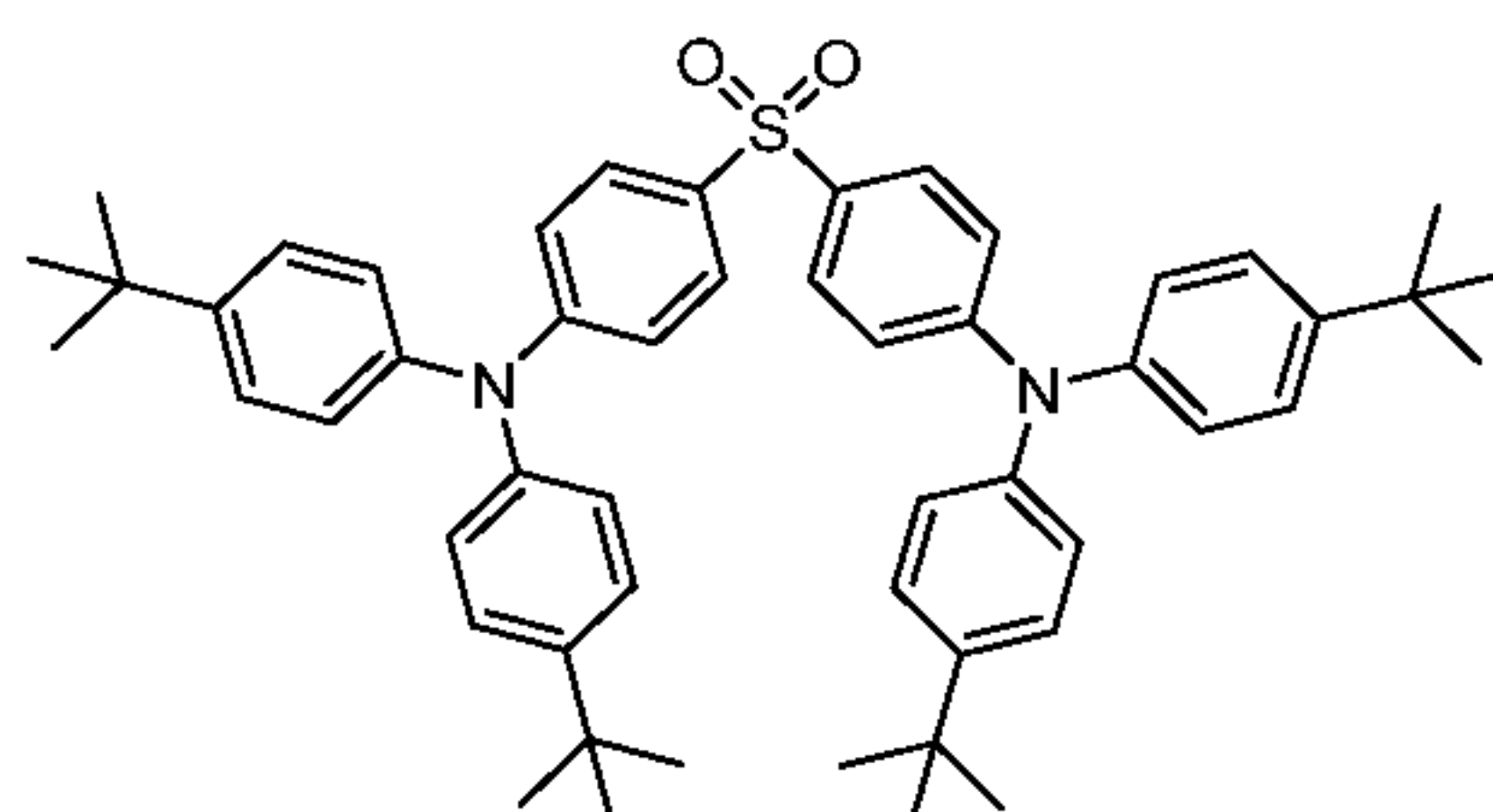
T-32



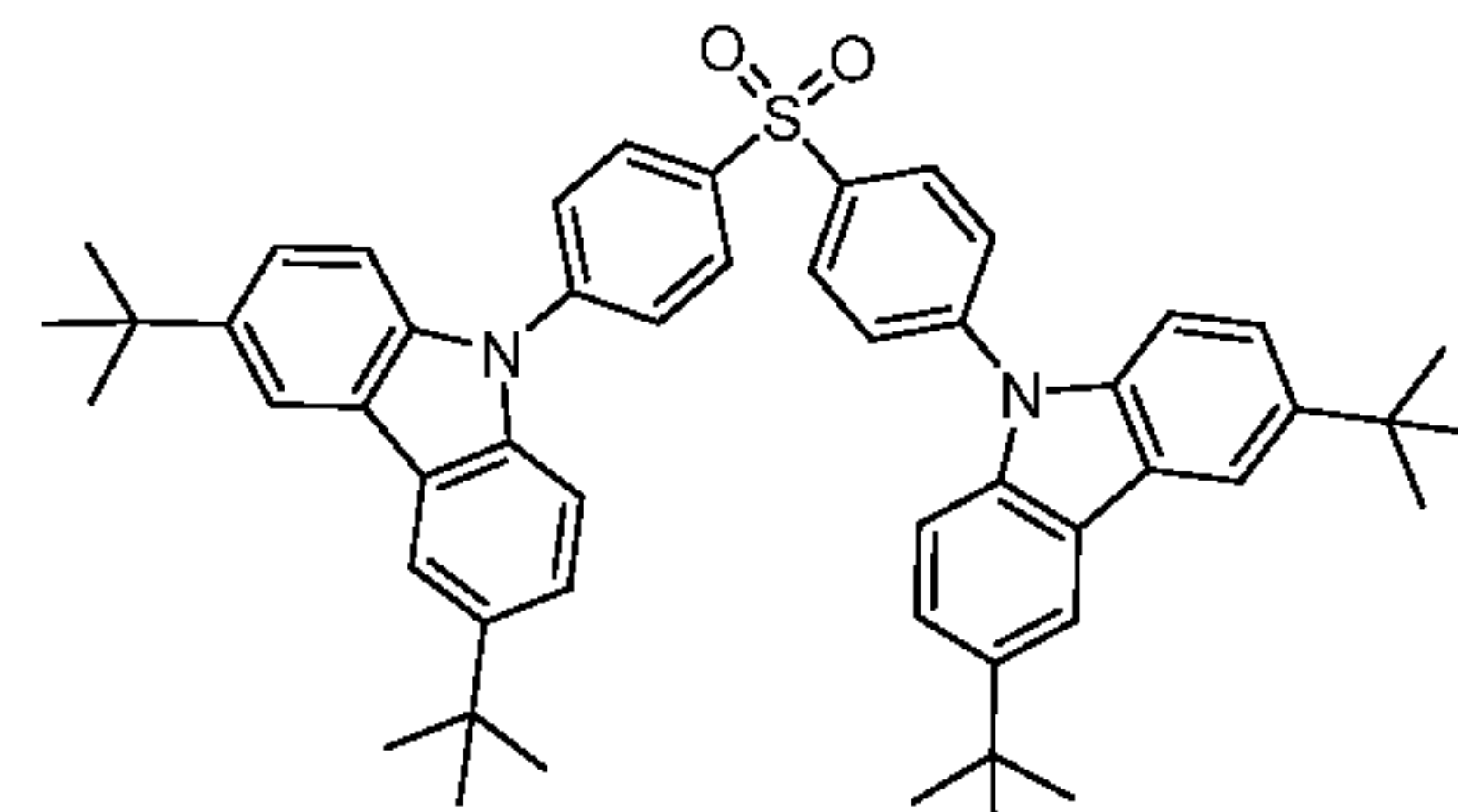
T-33



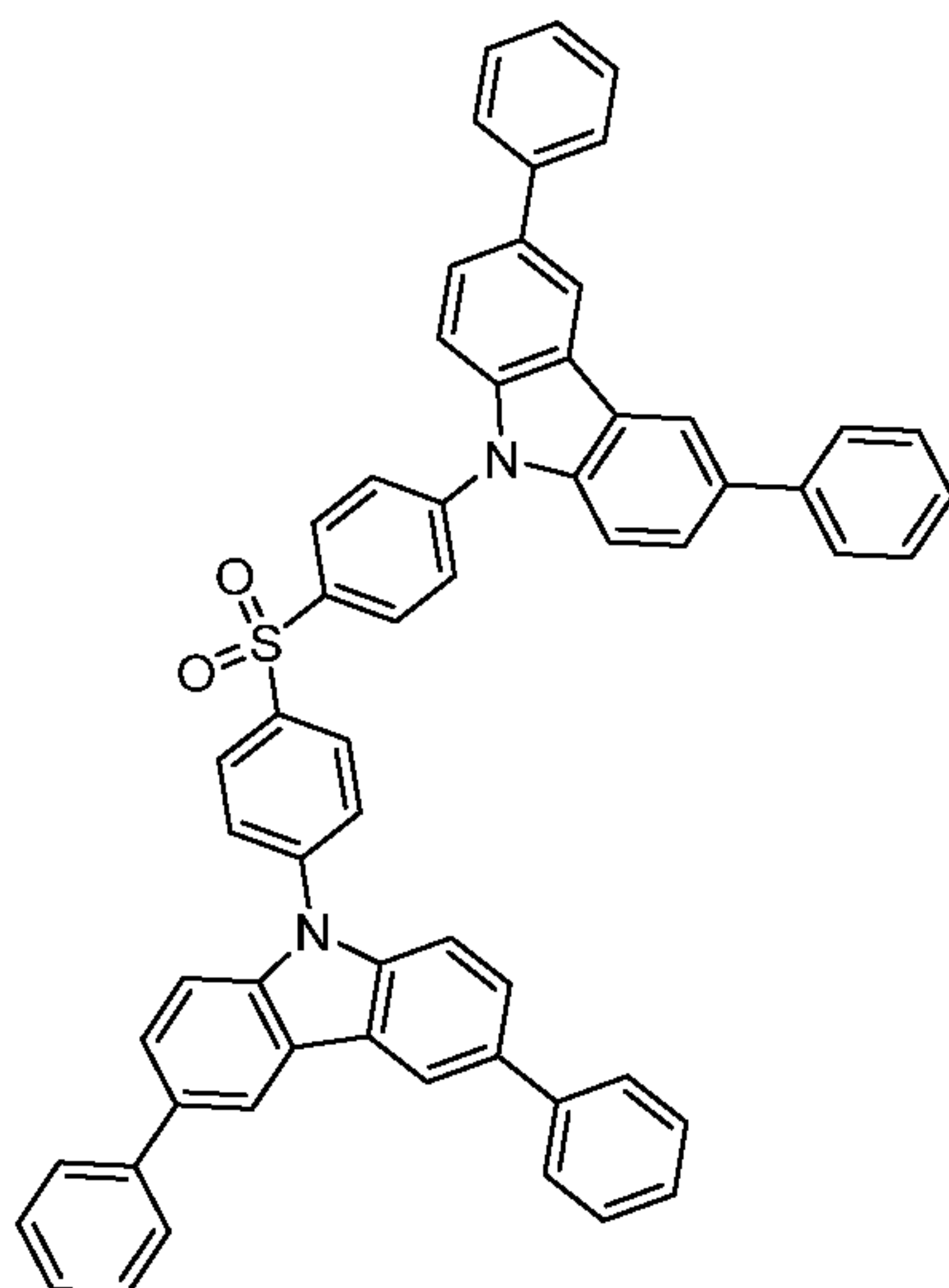
T-34



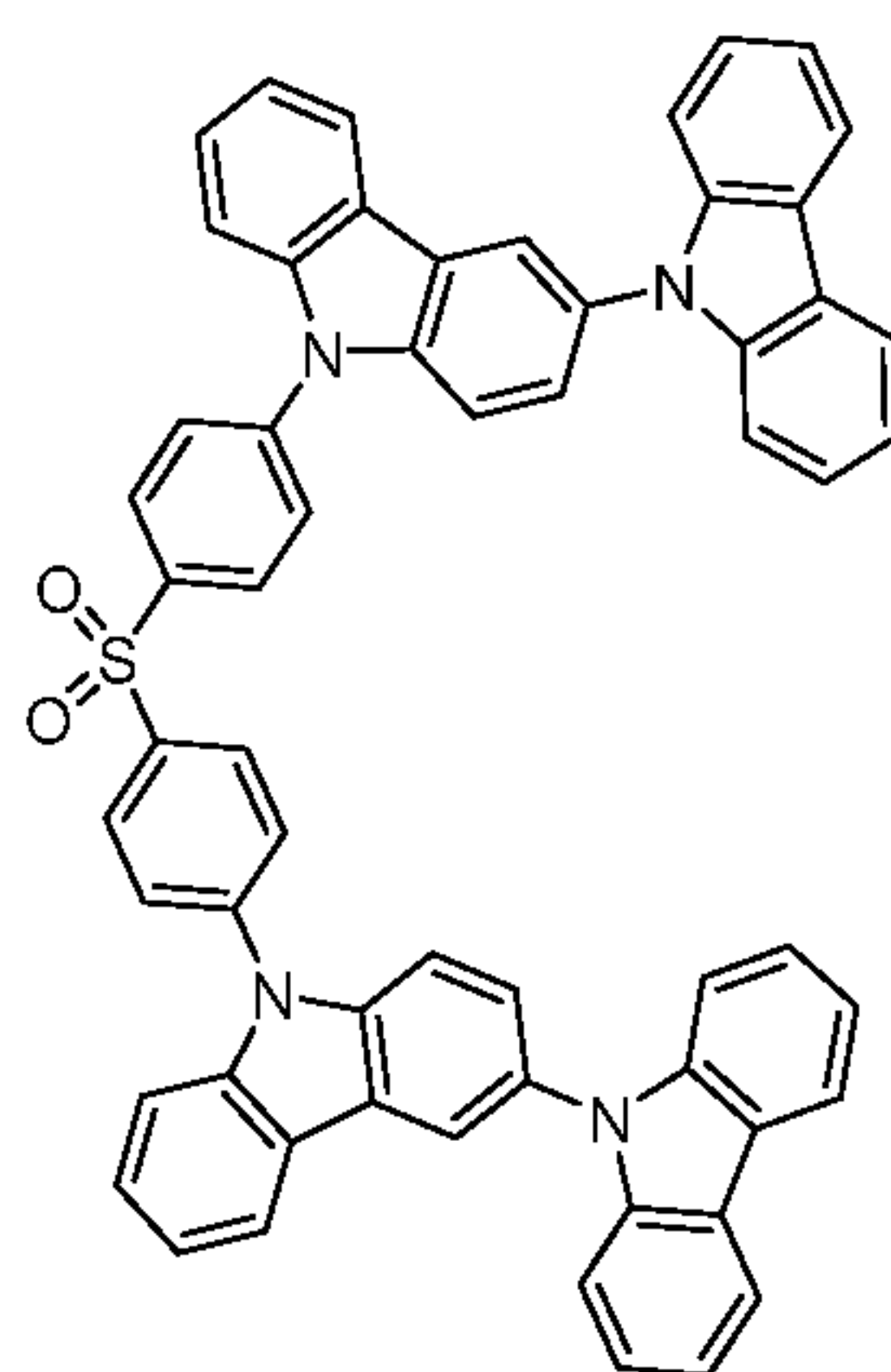
T-35



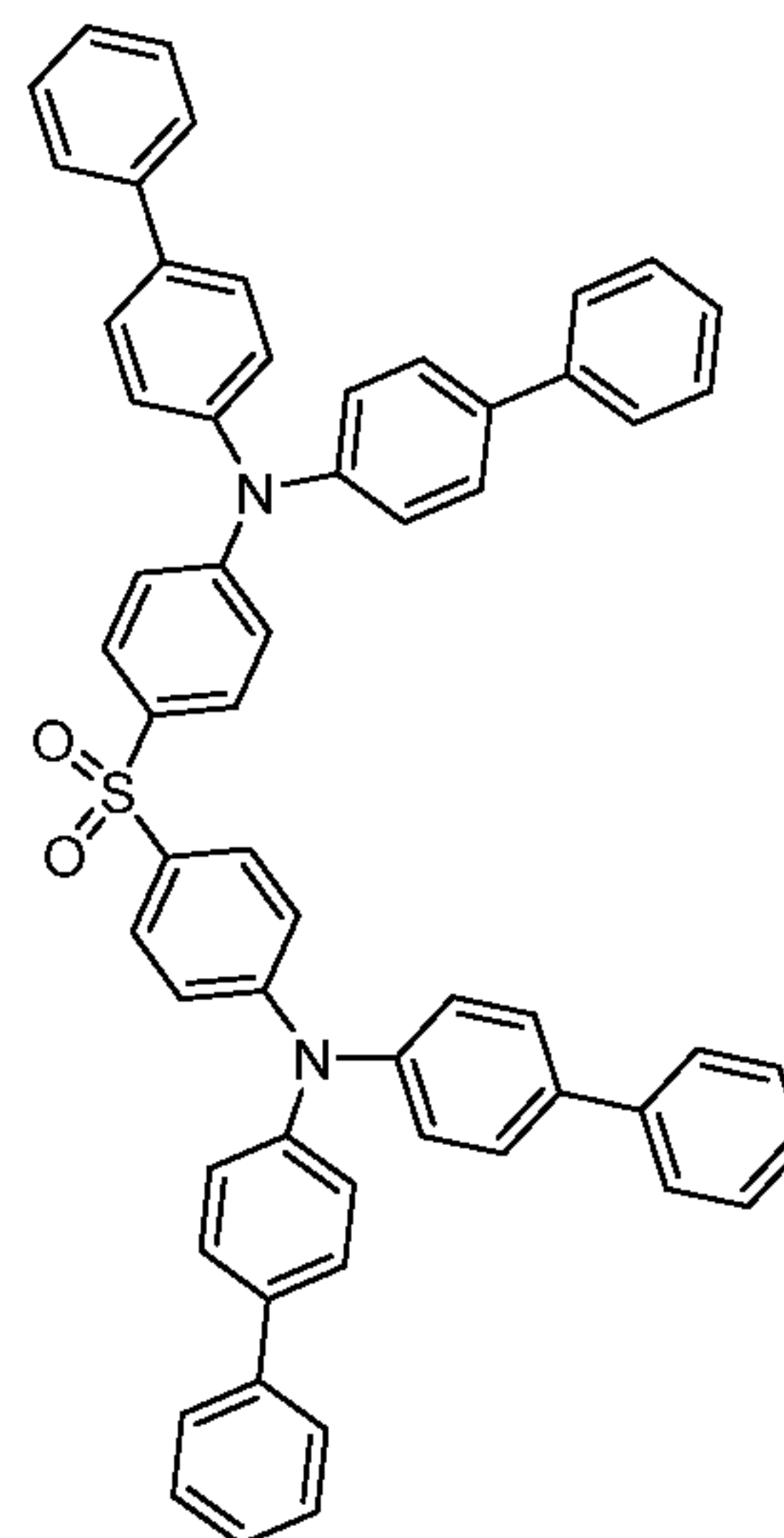
T-36



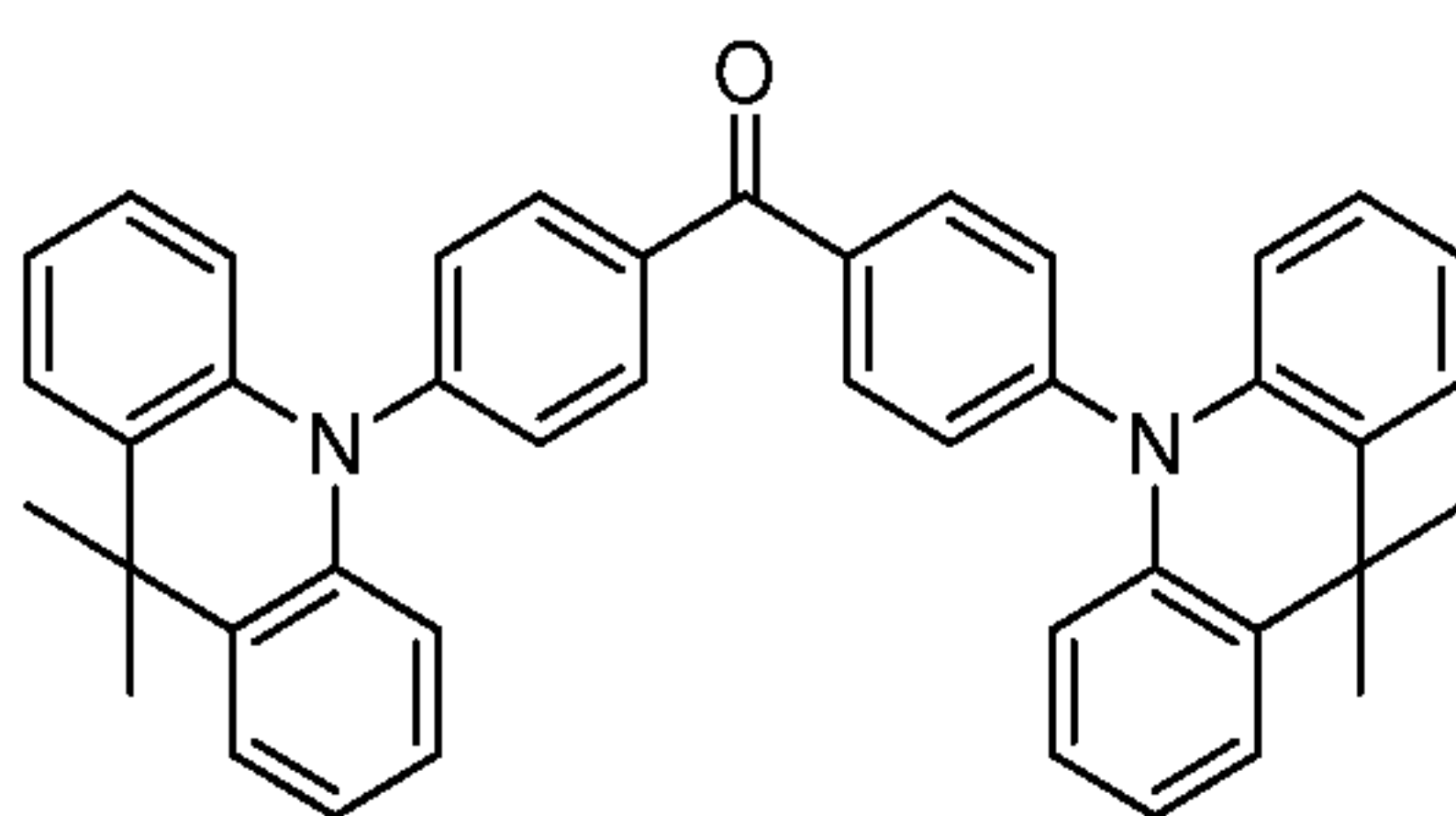
T-37



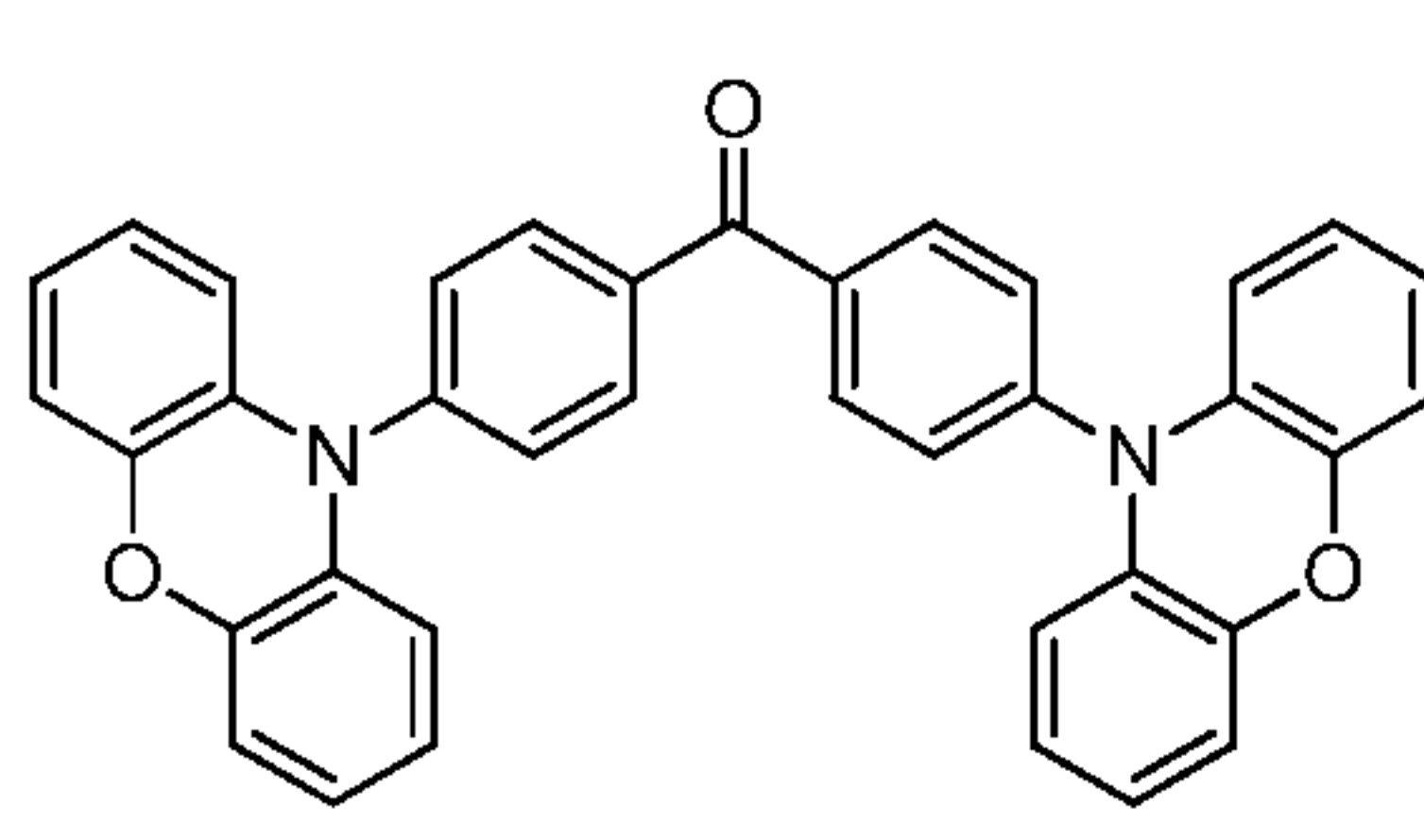
T-38



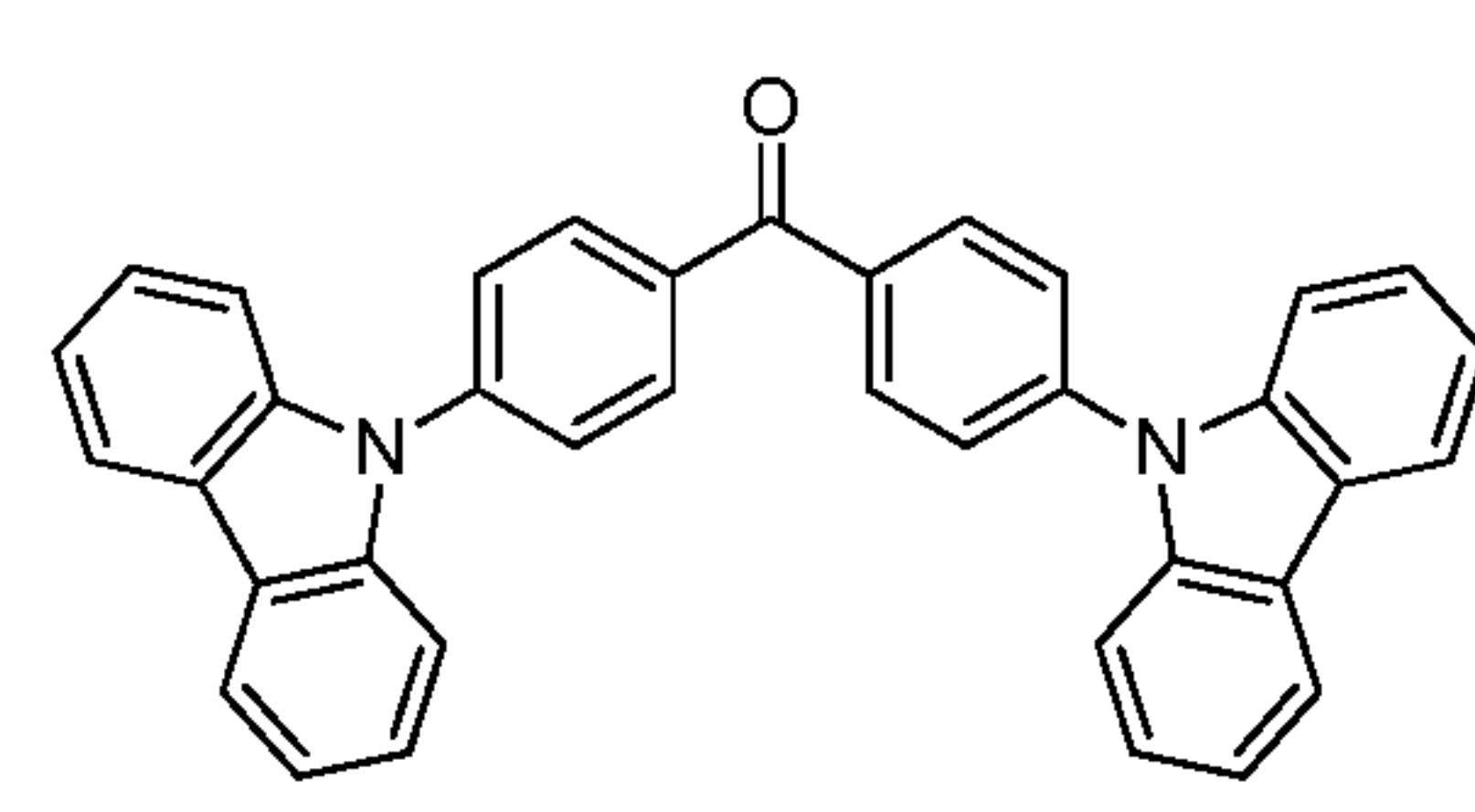
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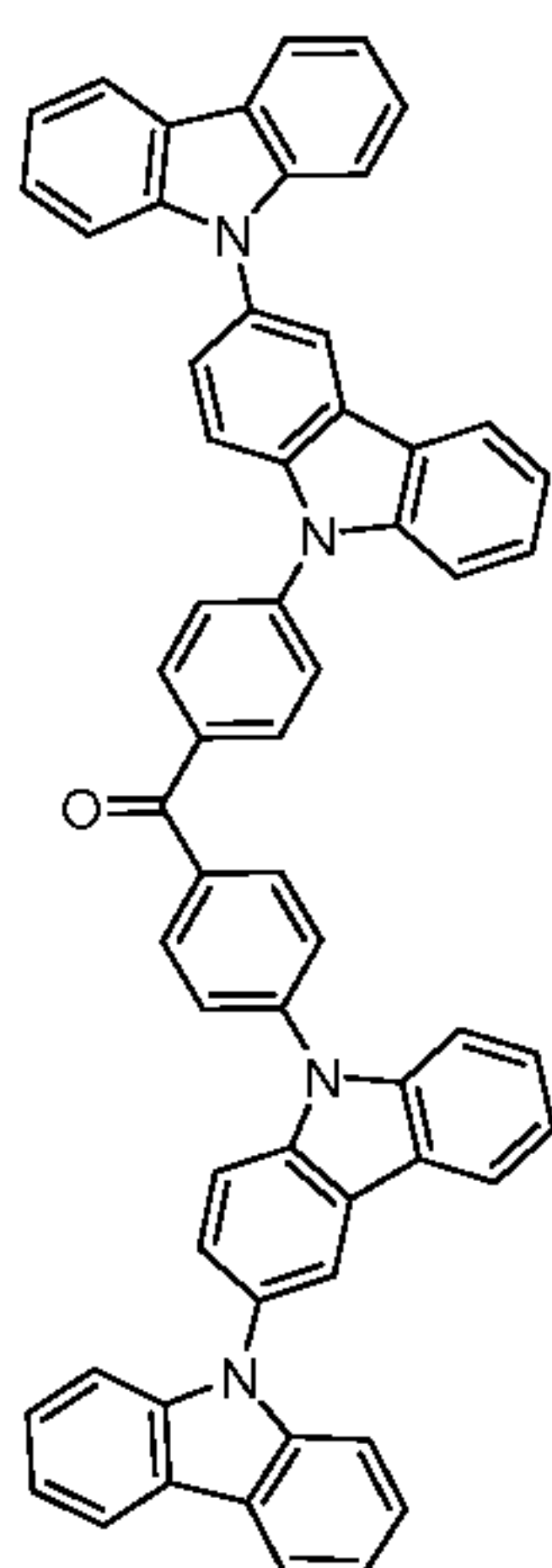
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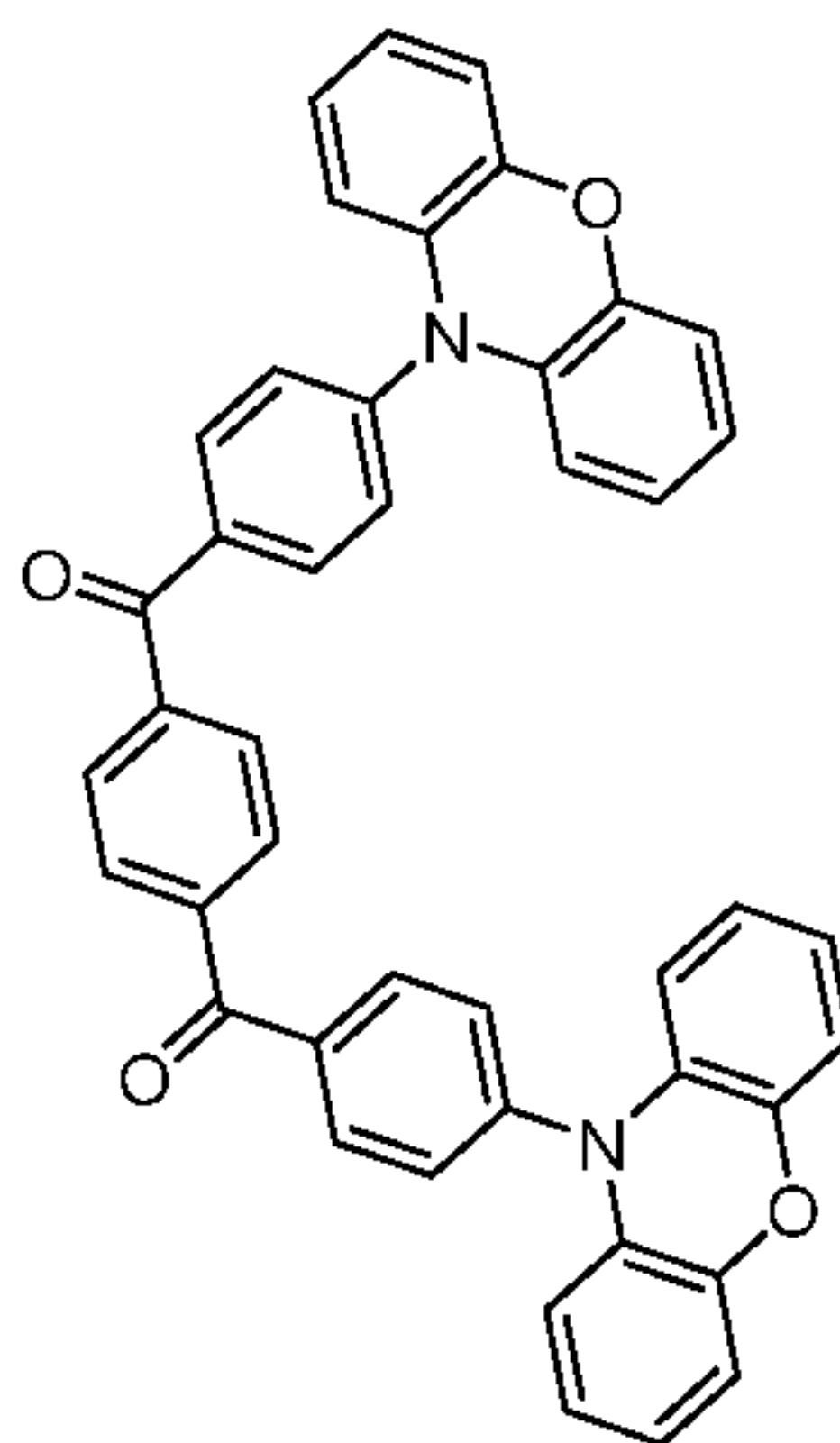
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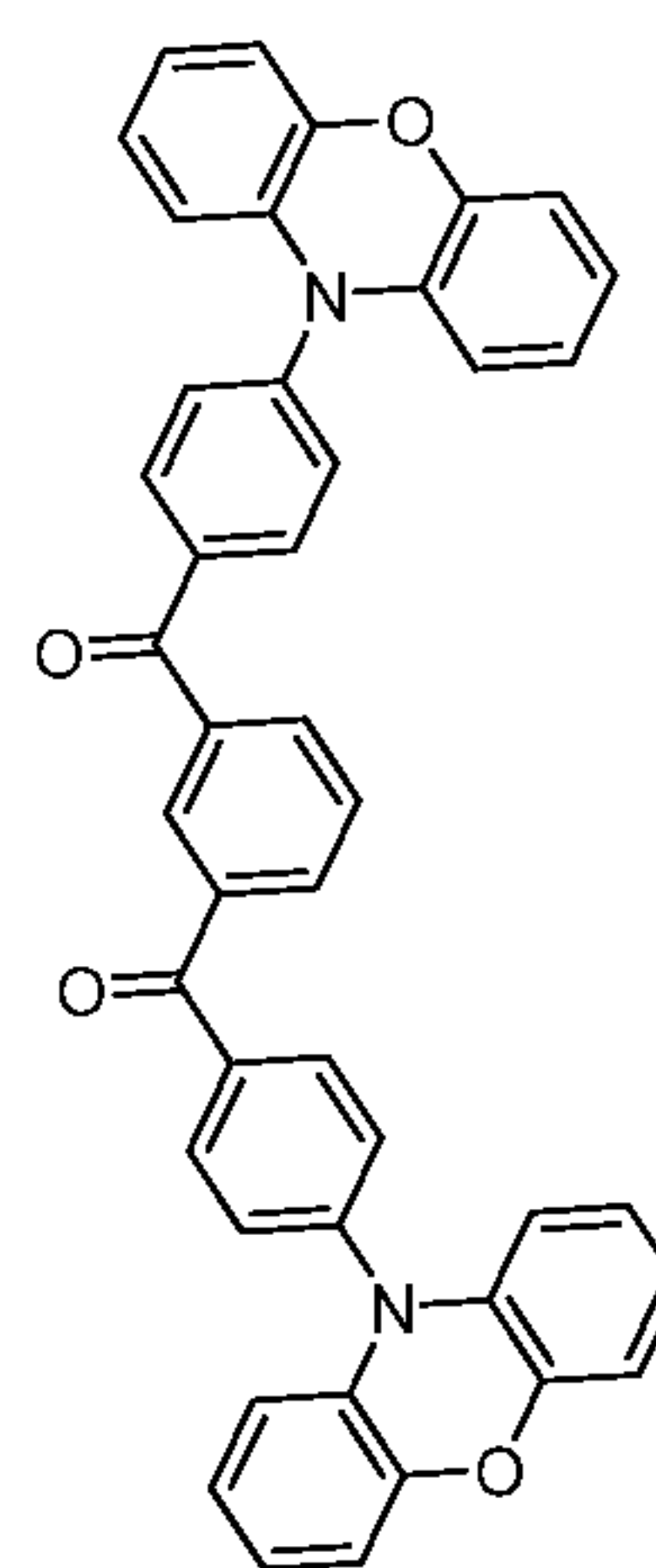
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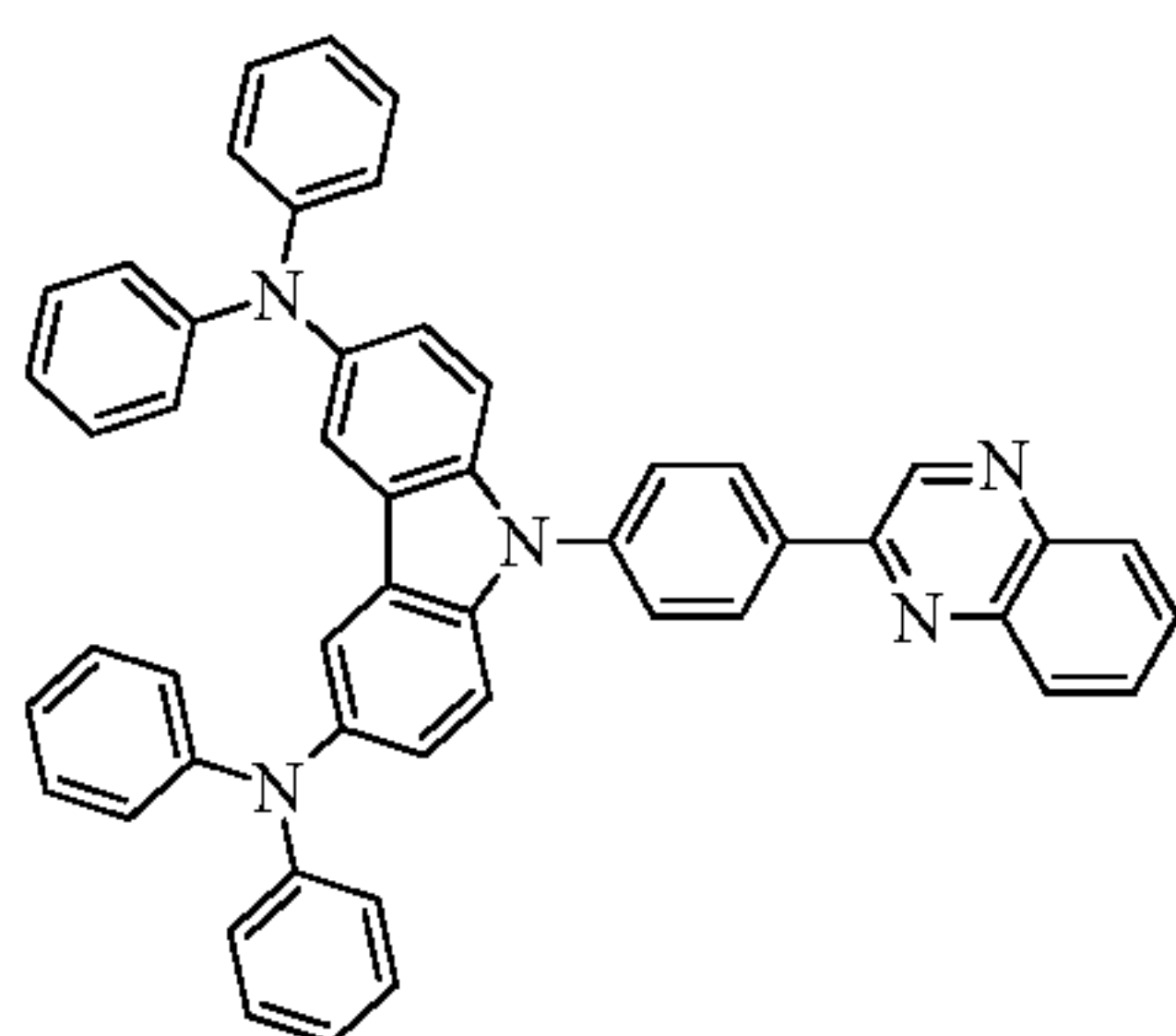
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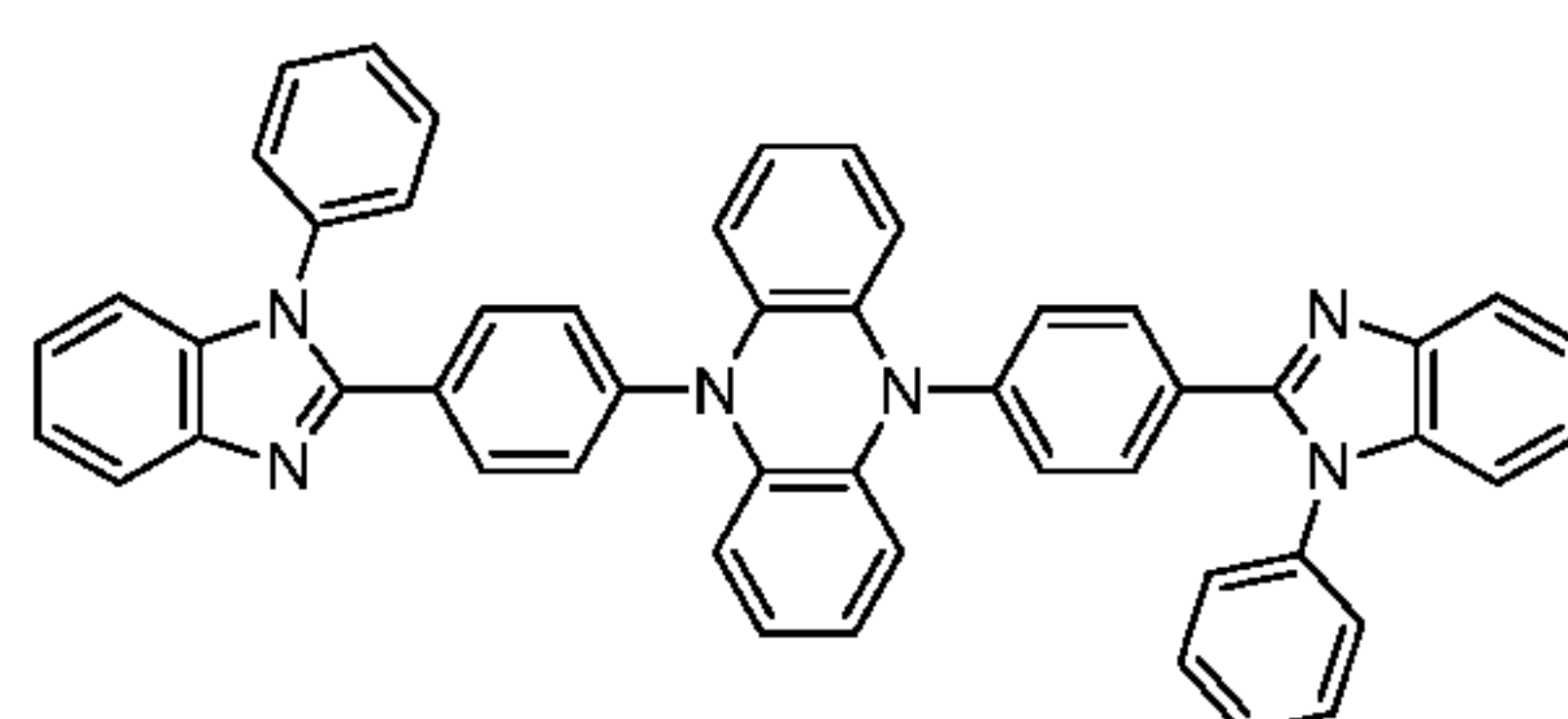
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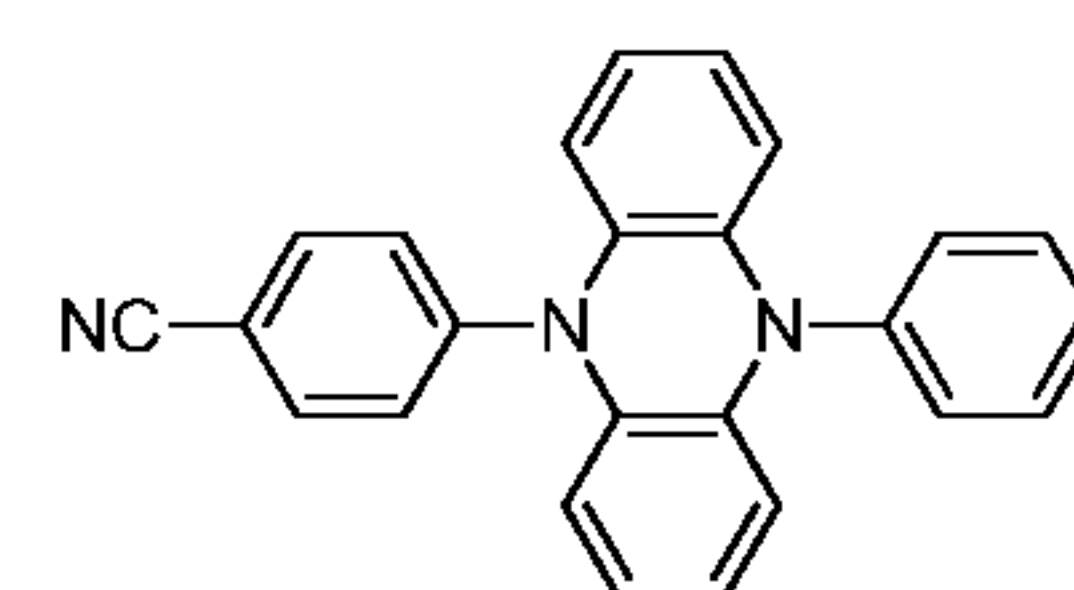
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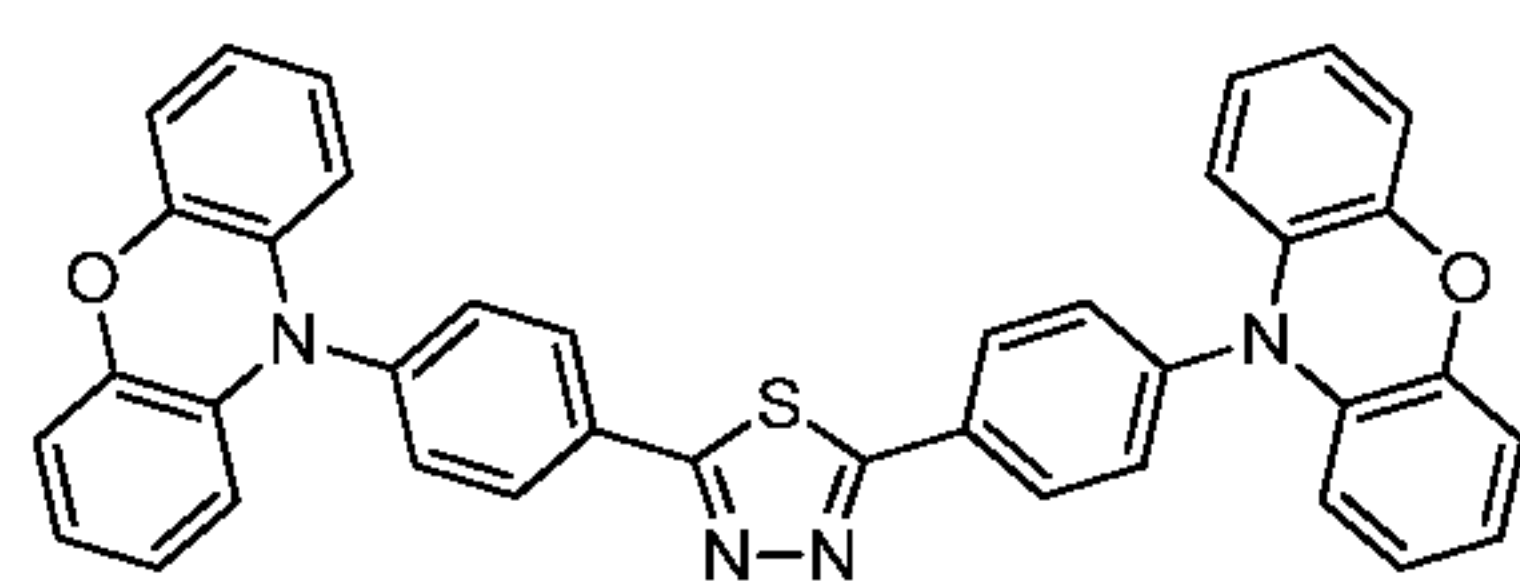
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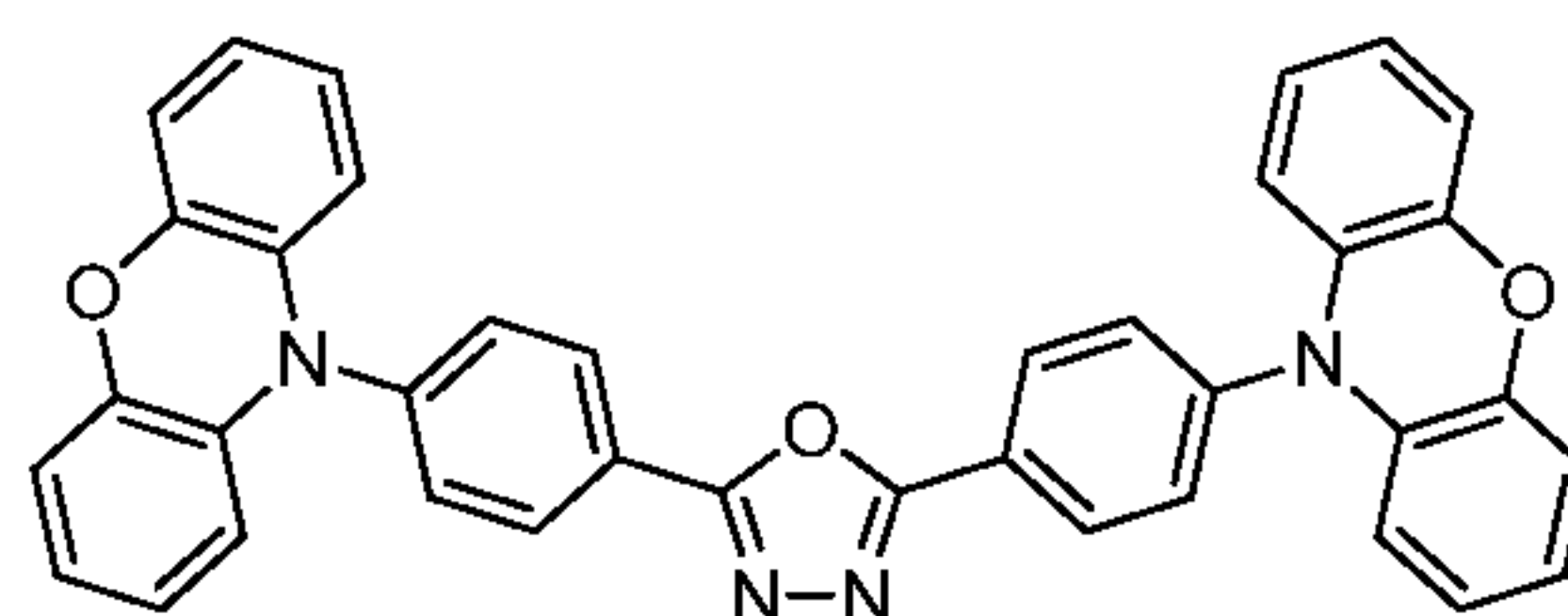
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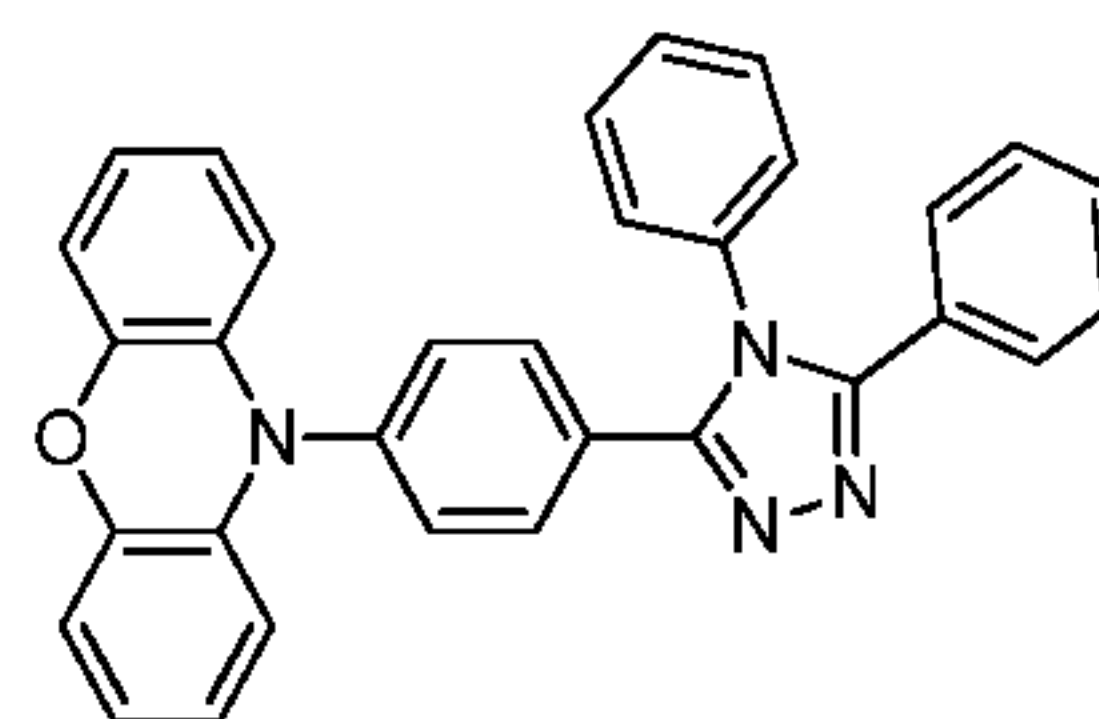
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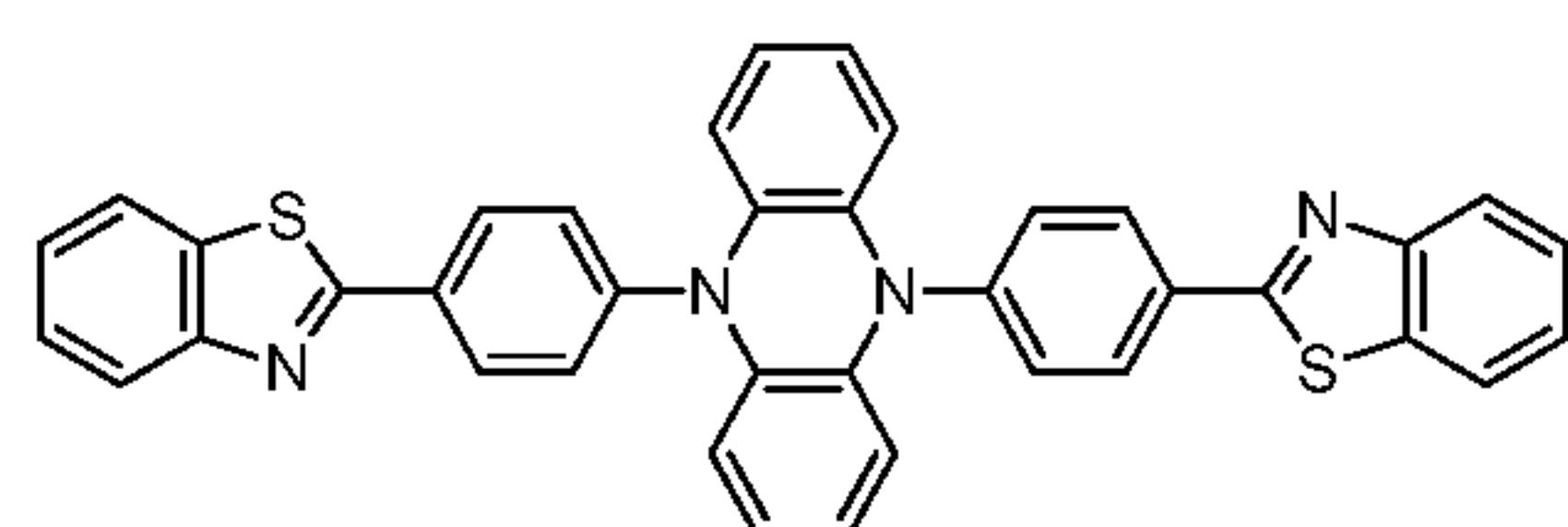
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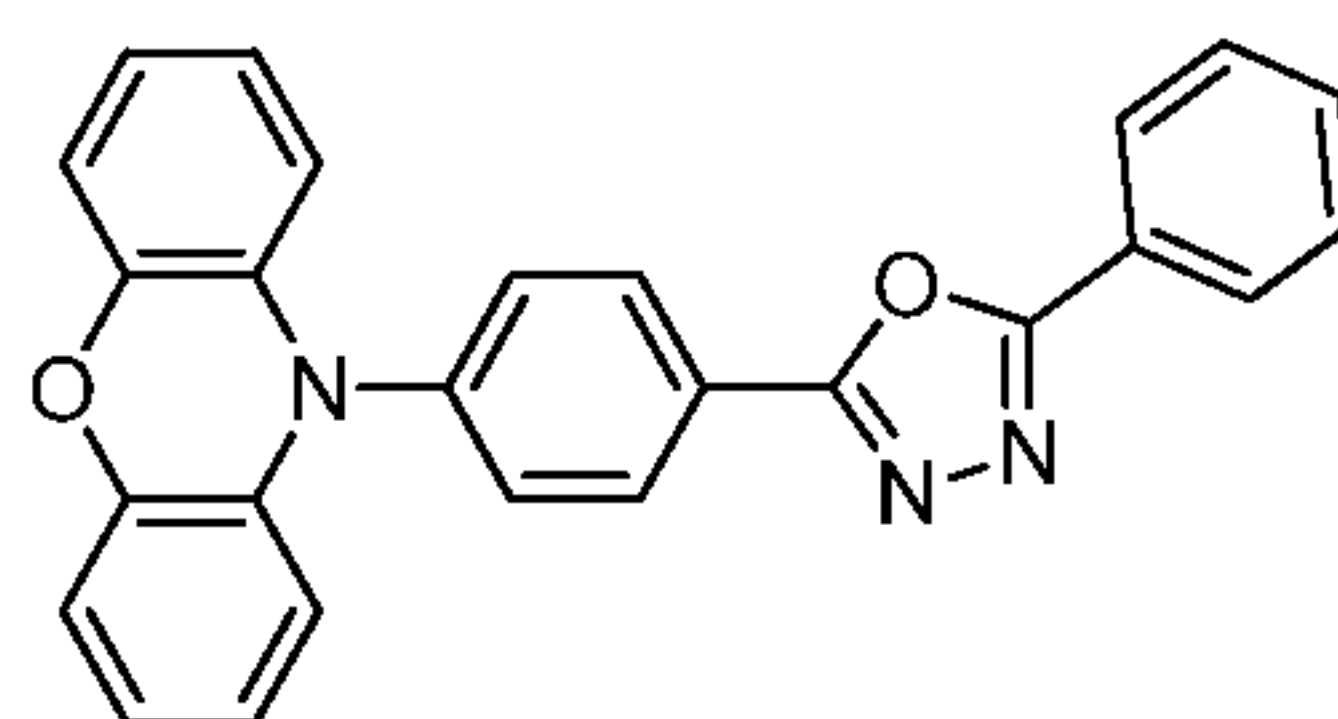
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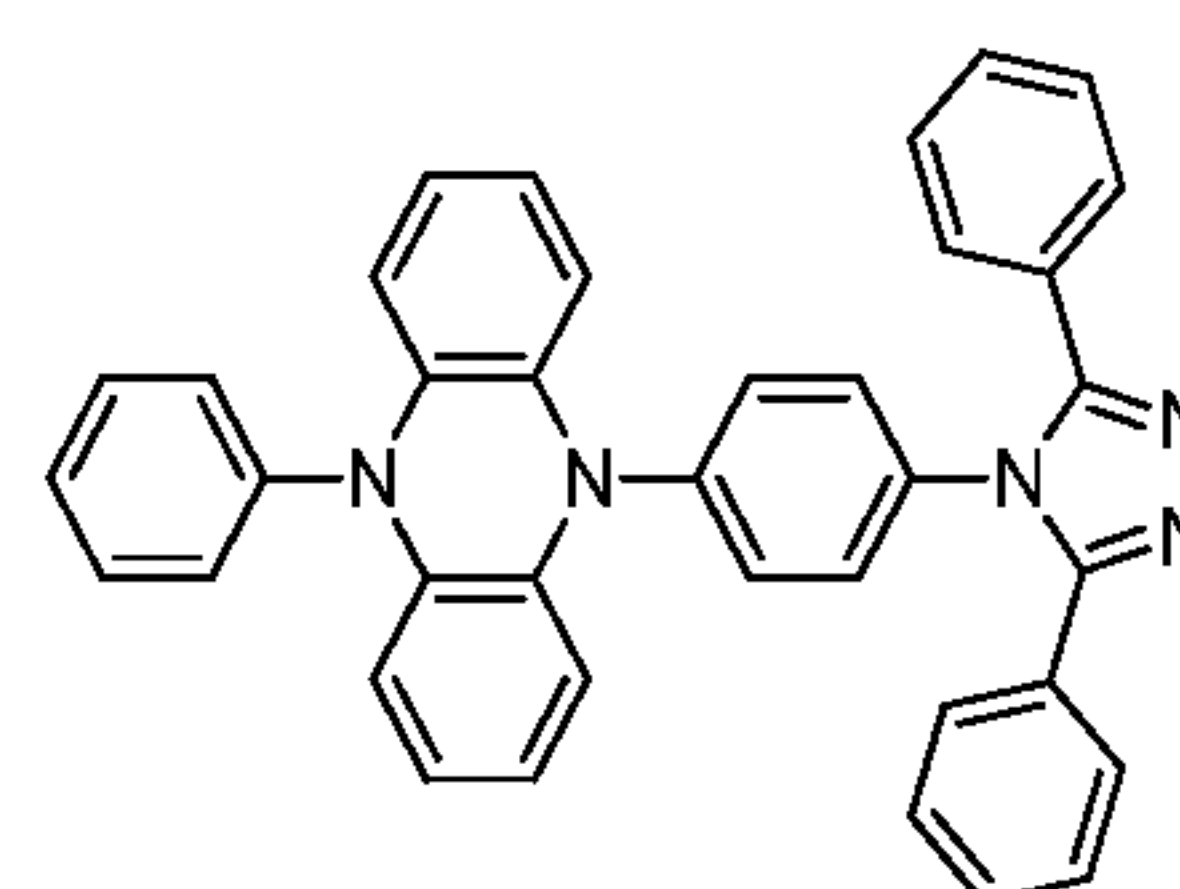
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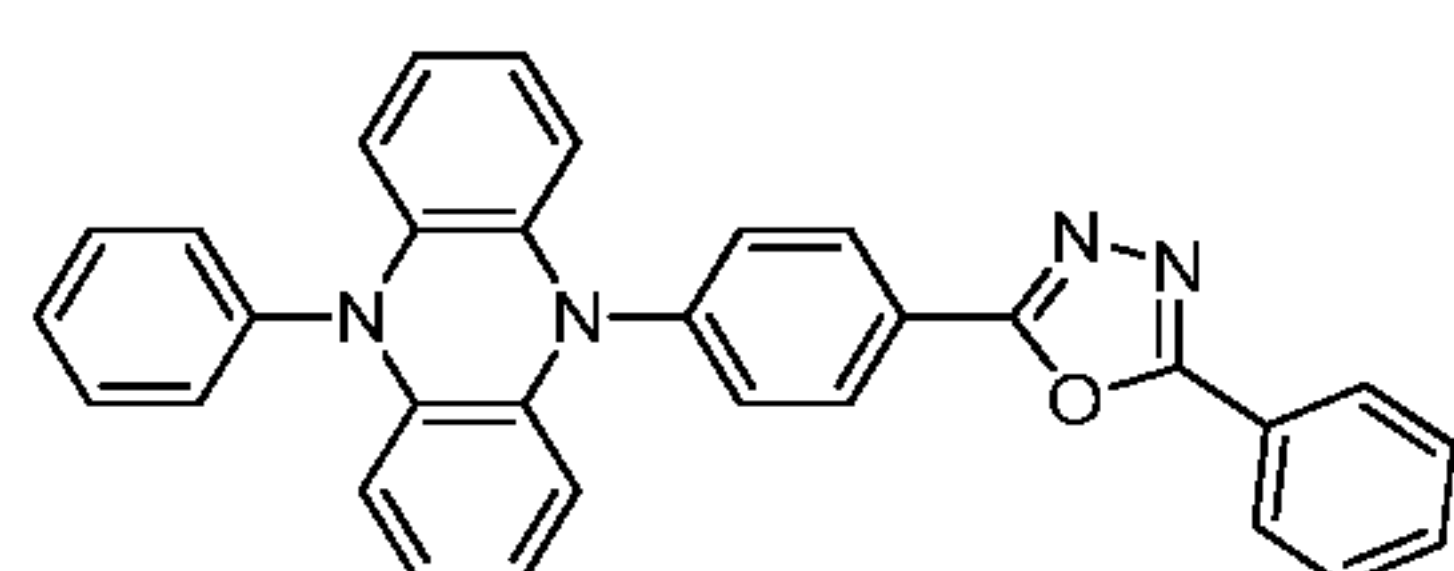
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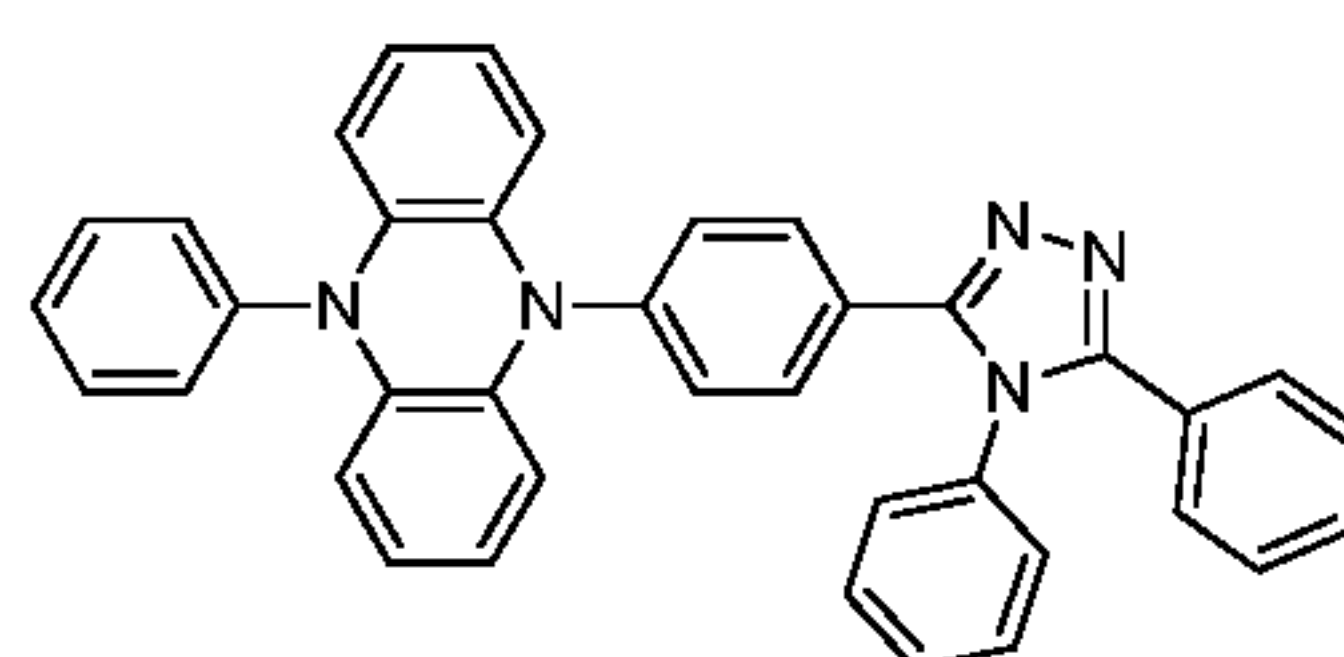
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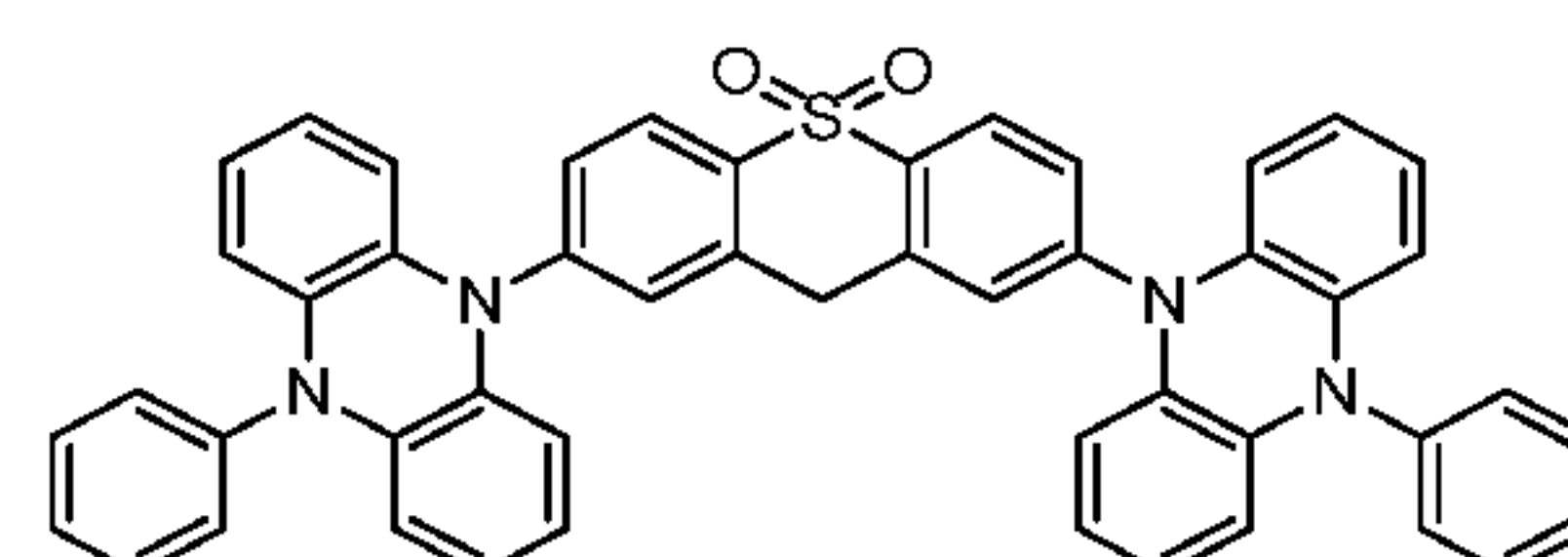
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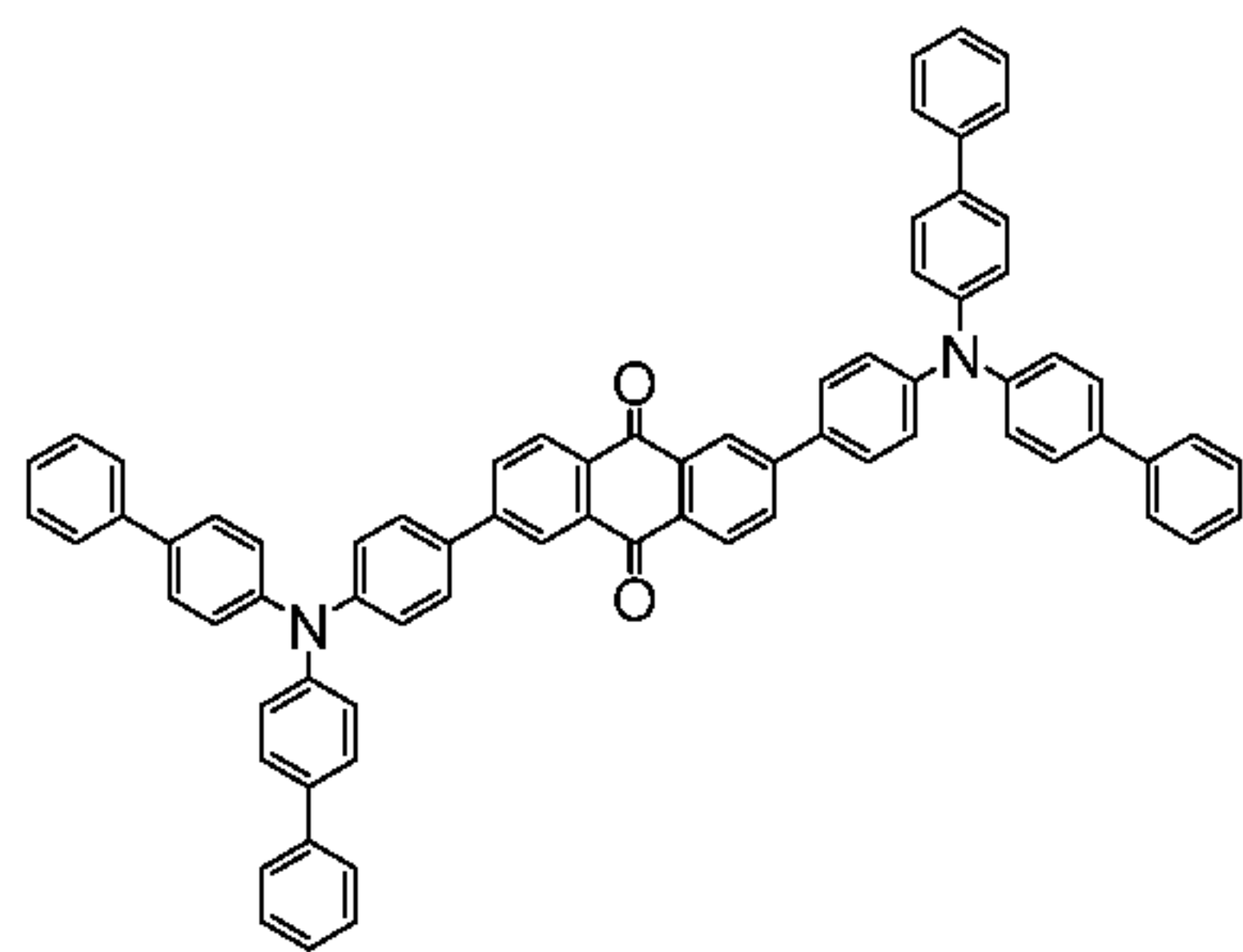
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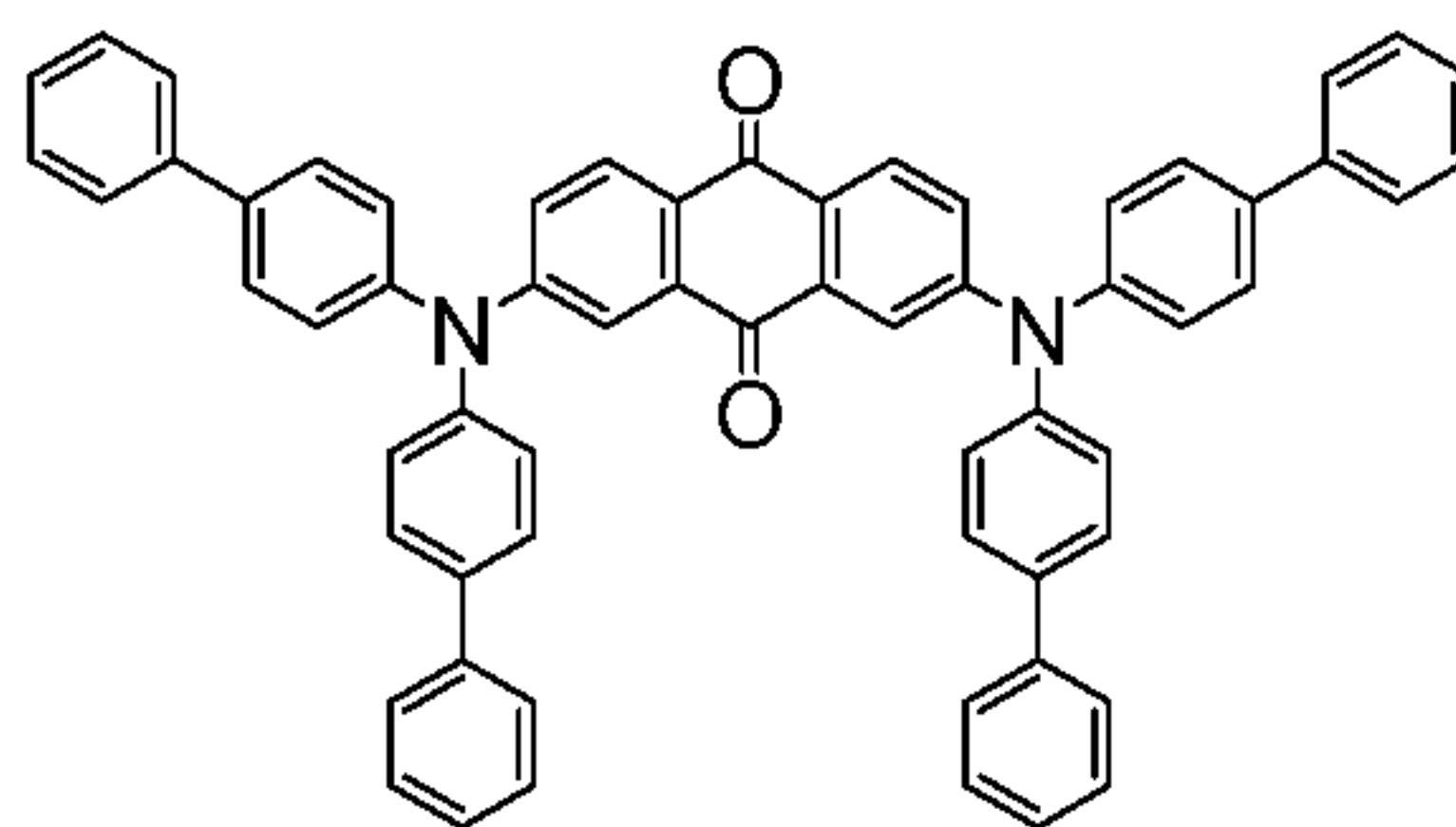
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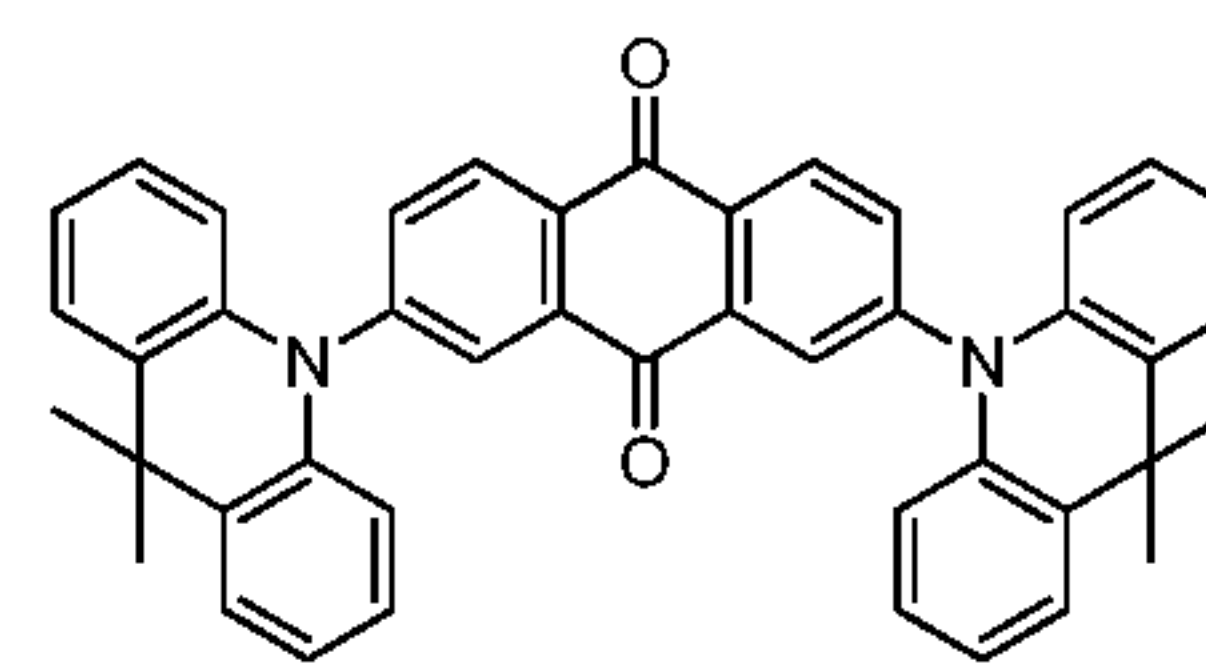
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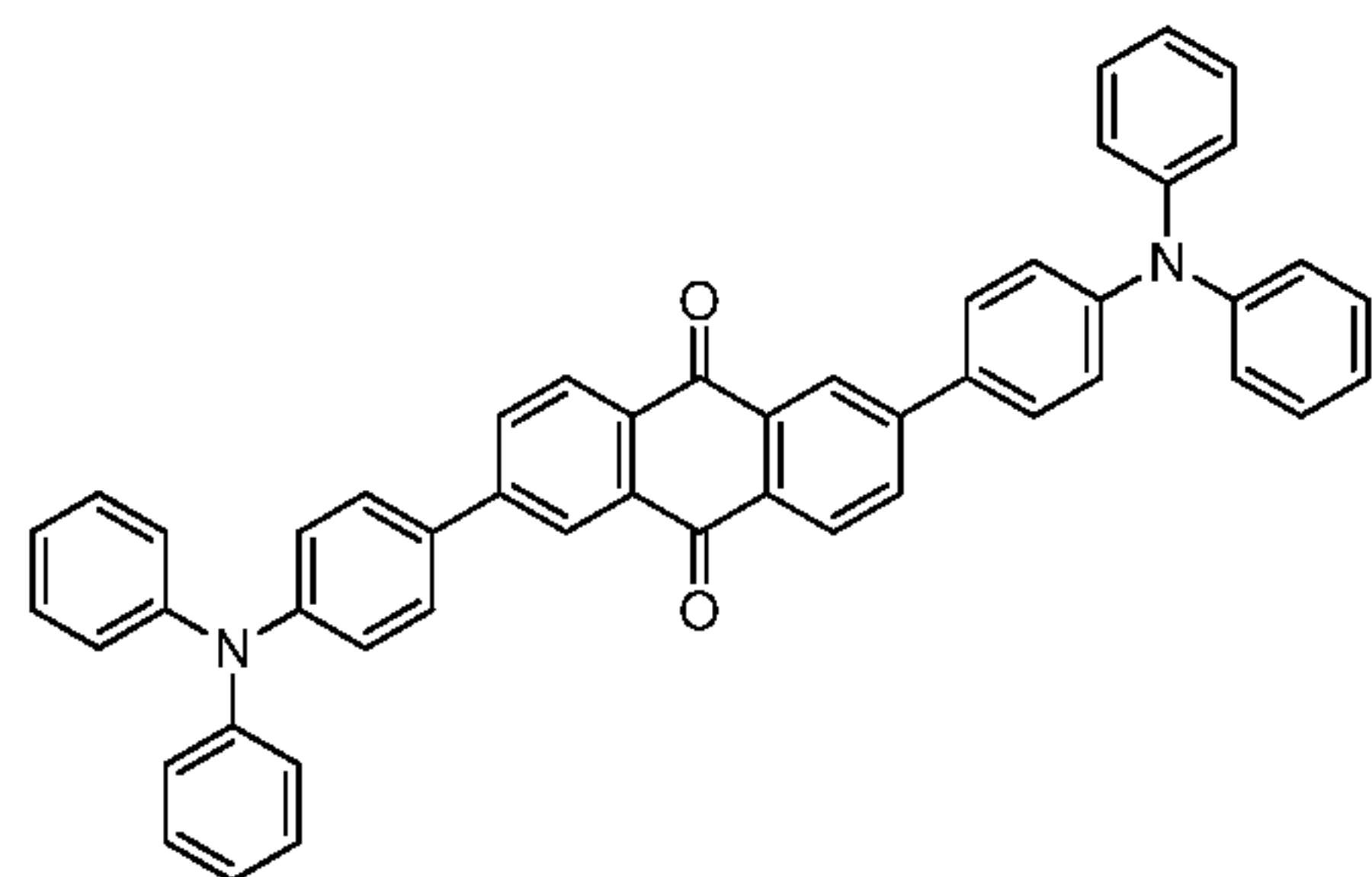
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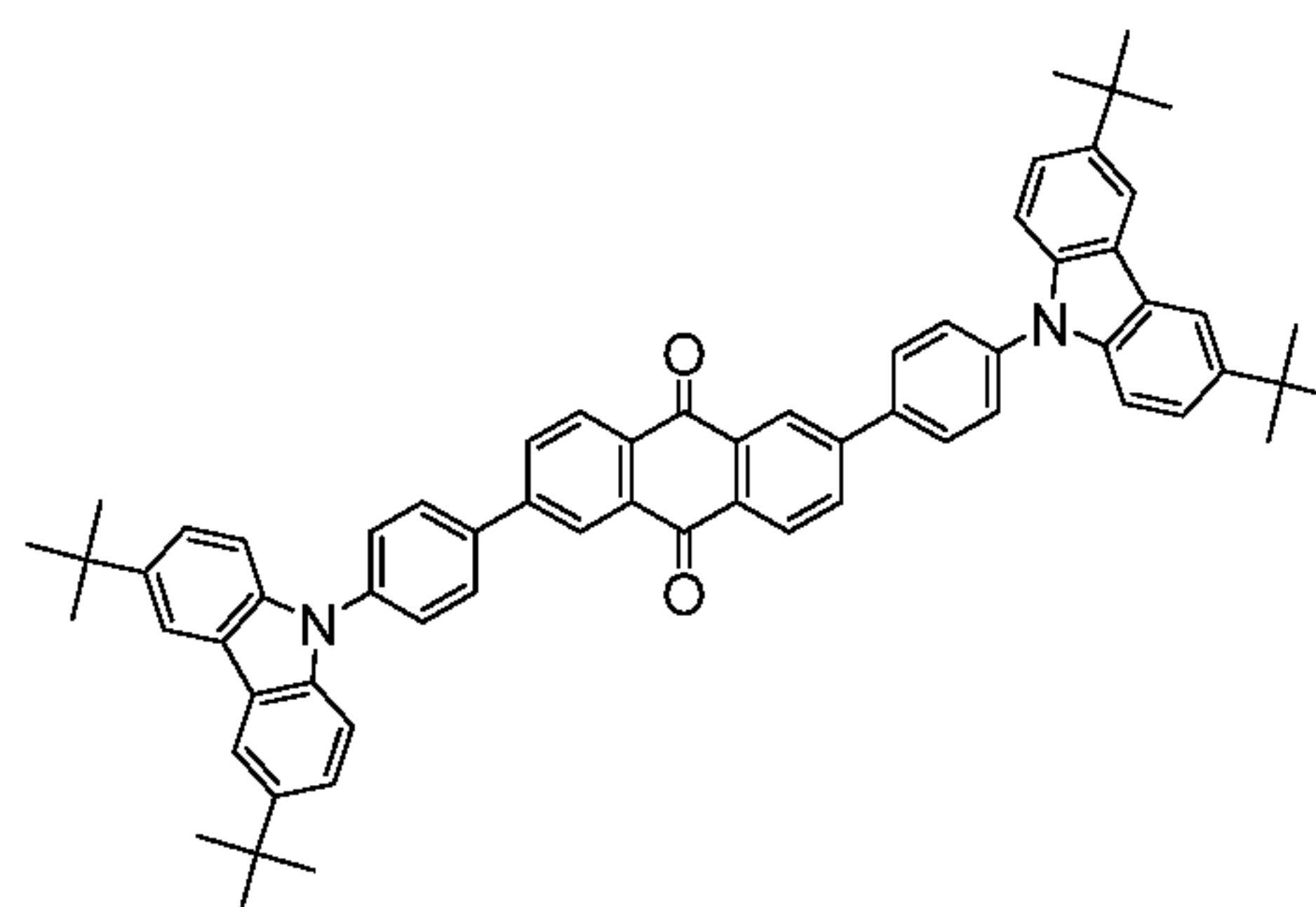
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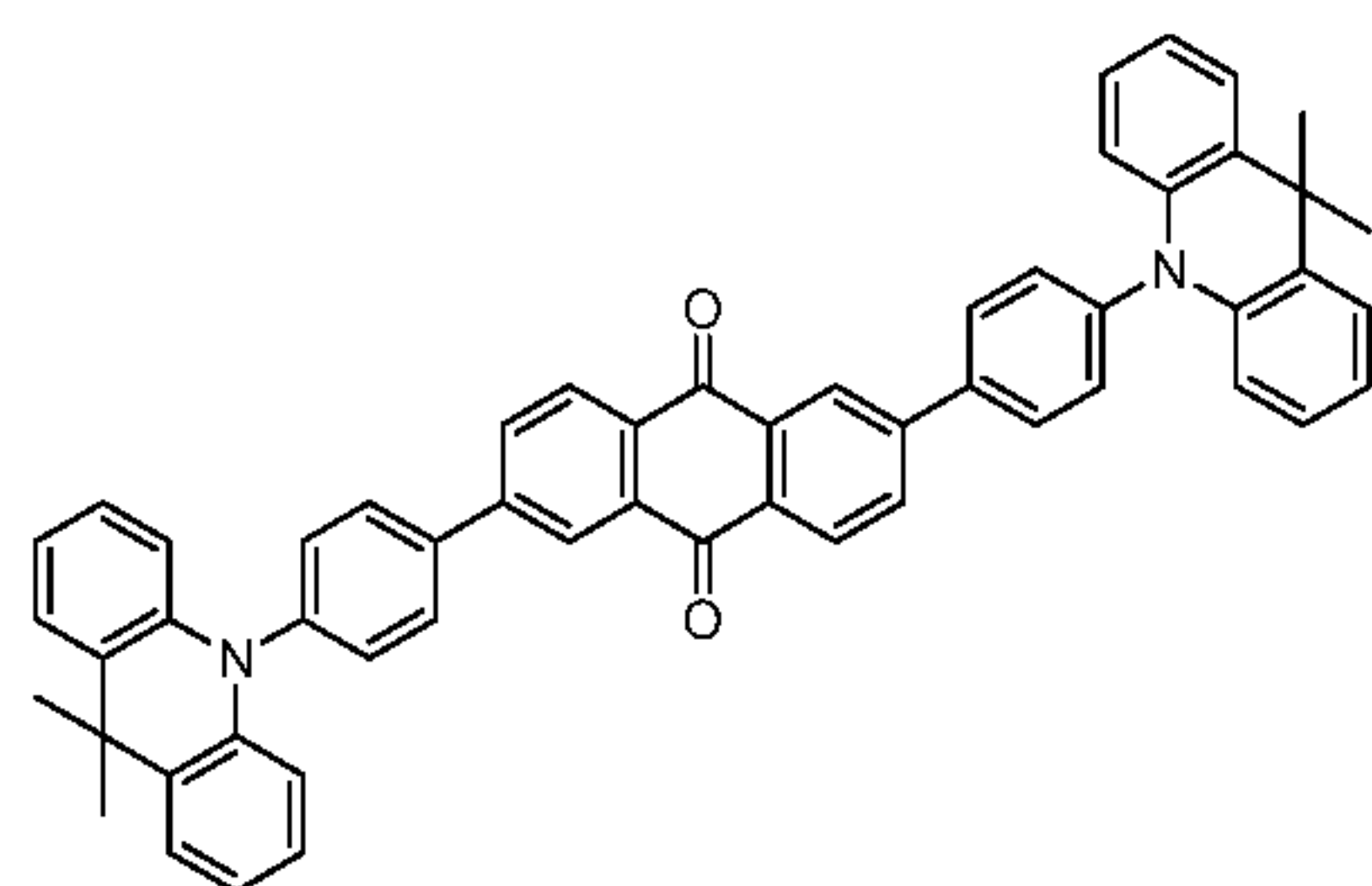
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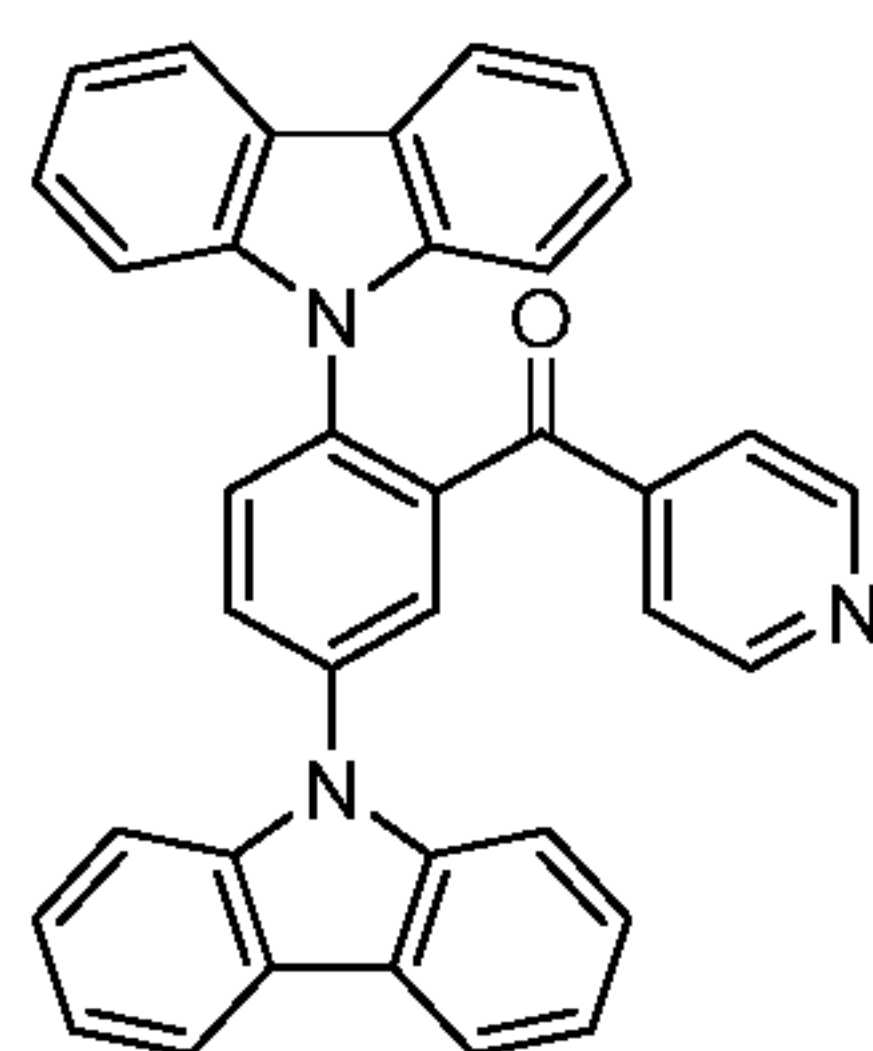
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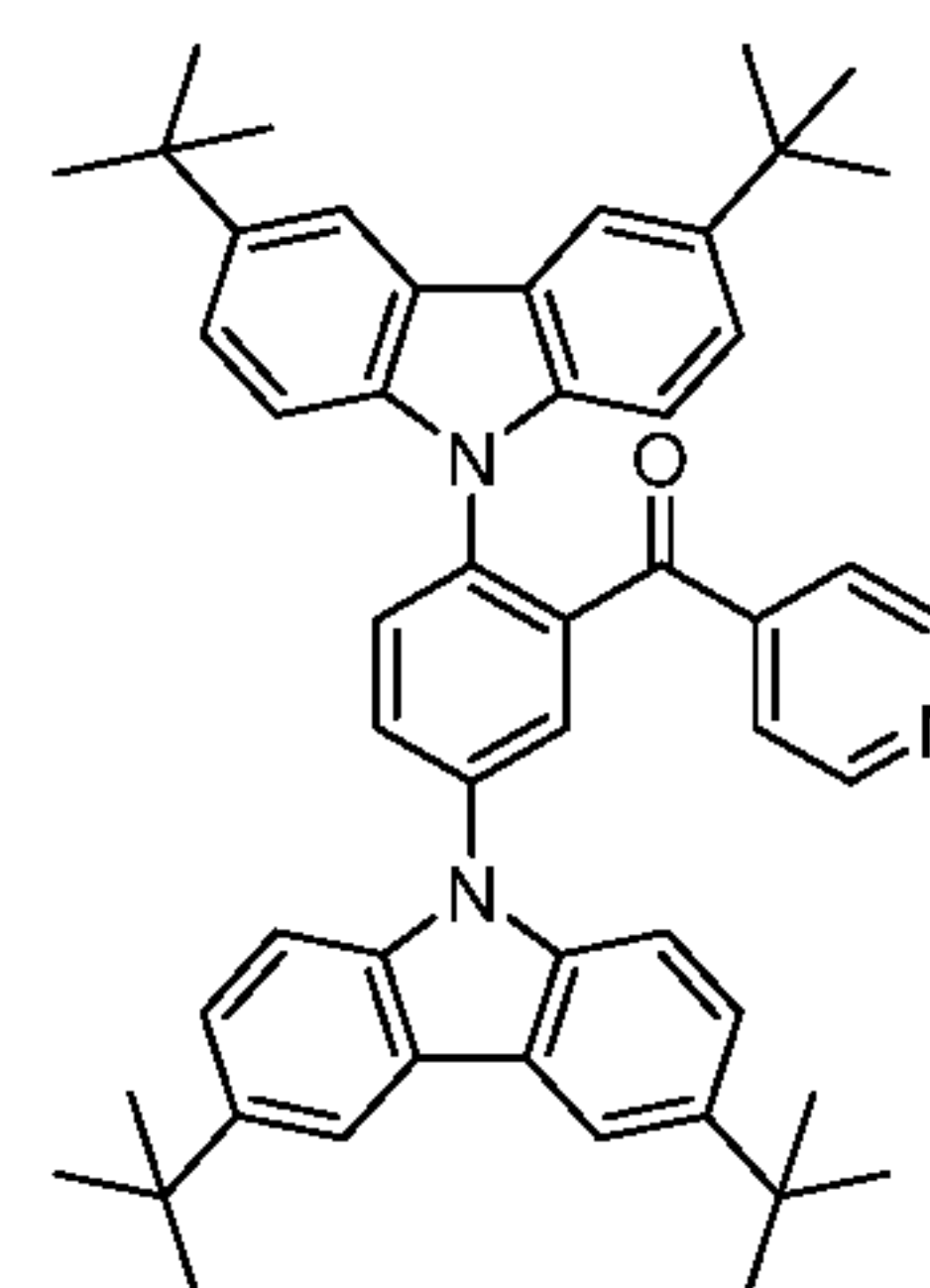
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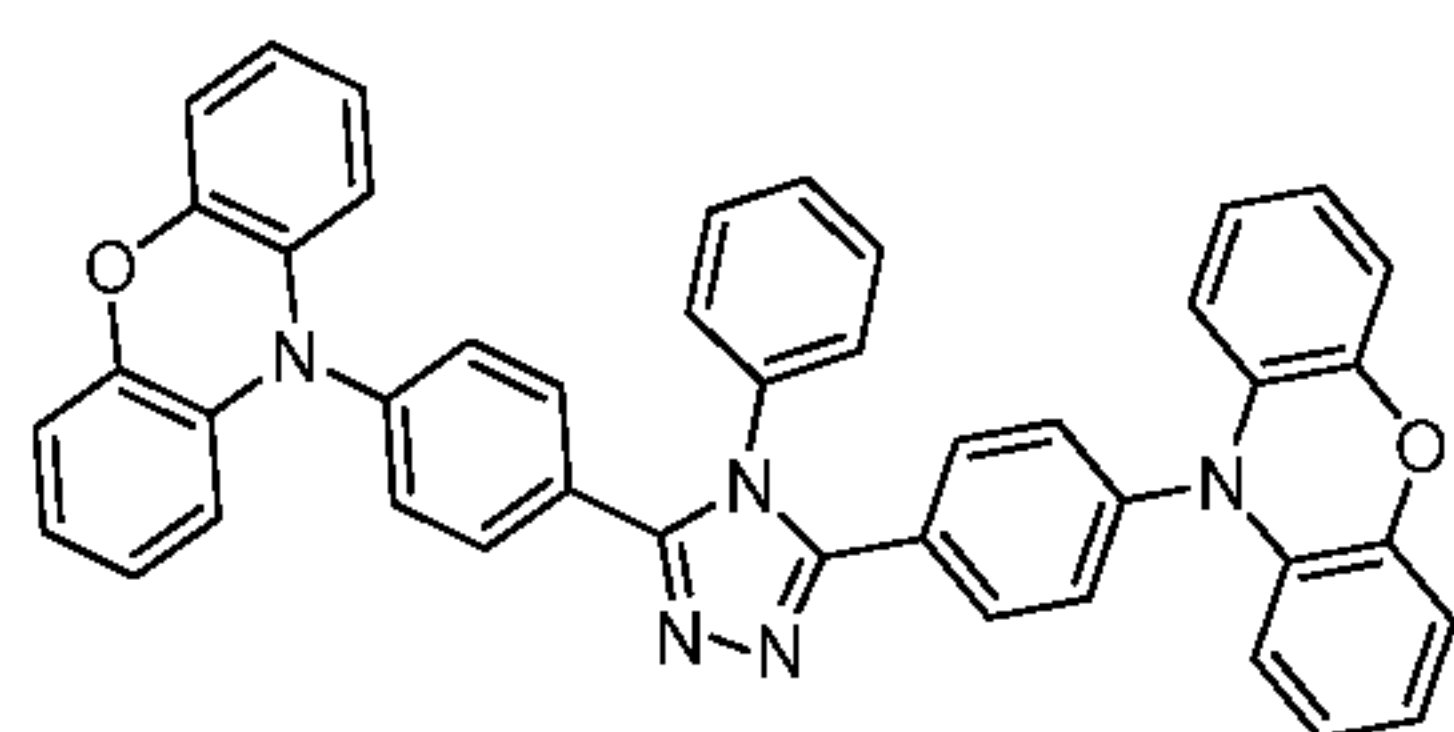
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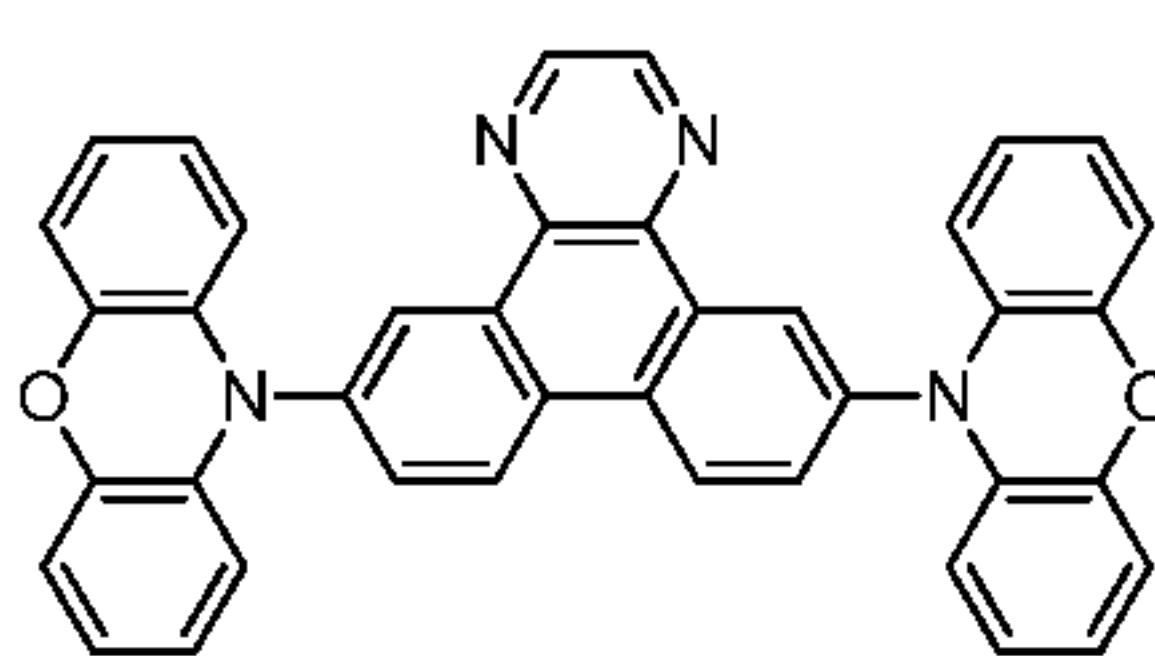
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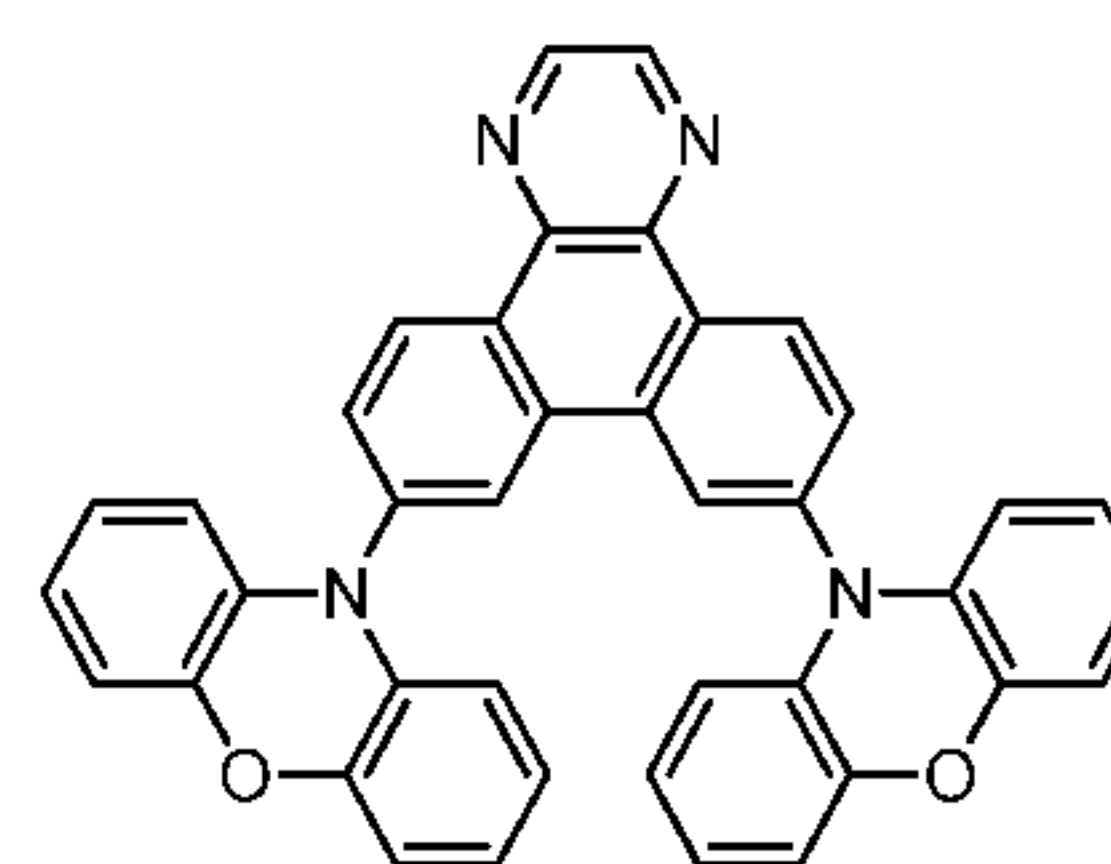
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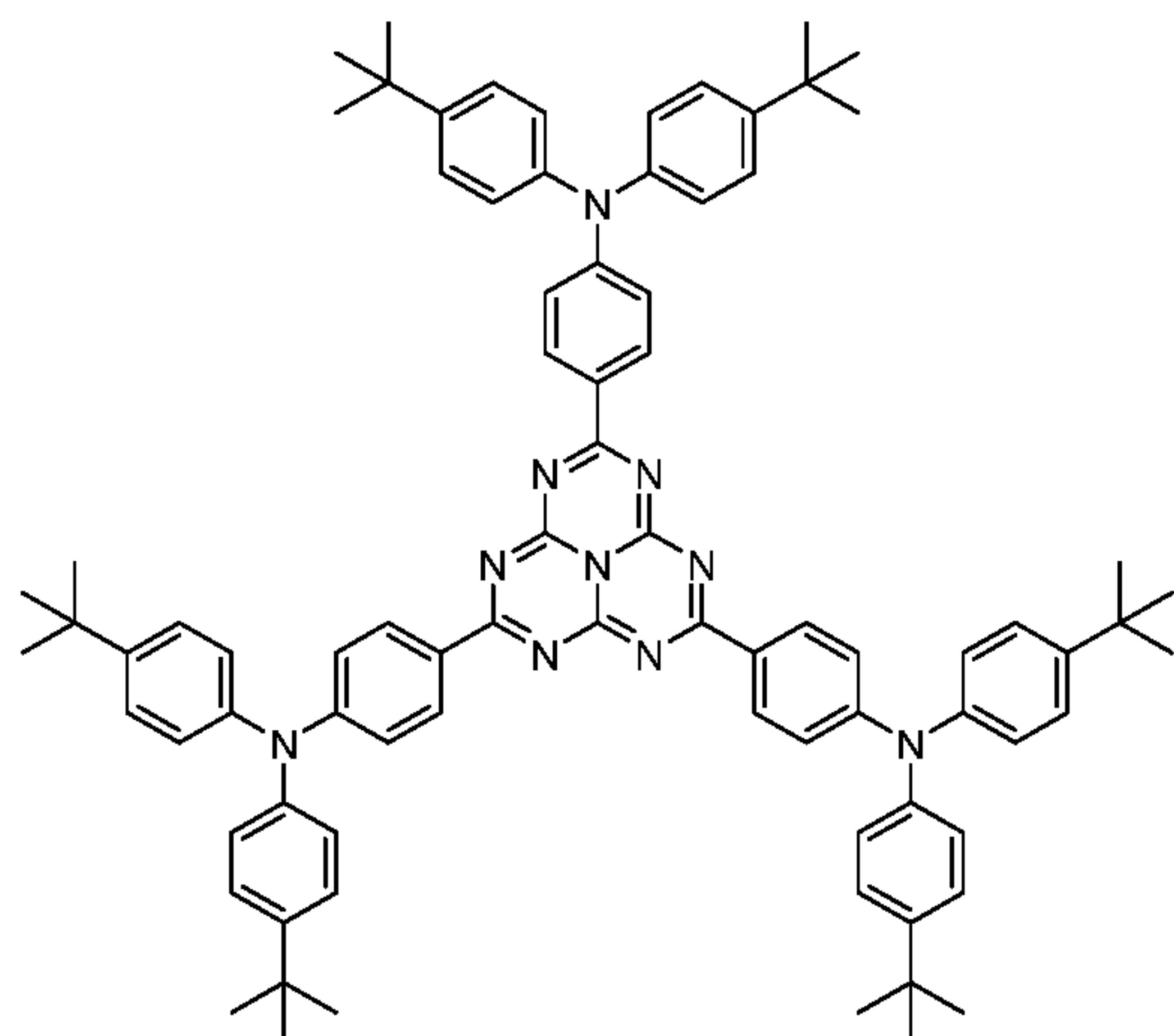
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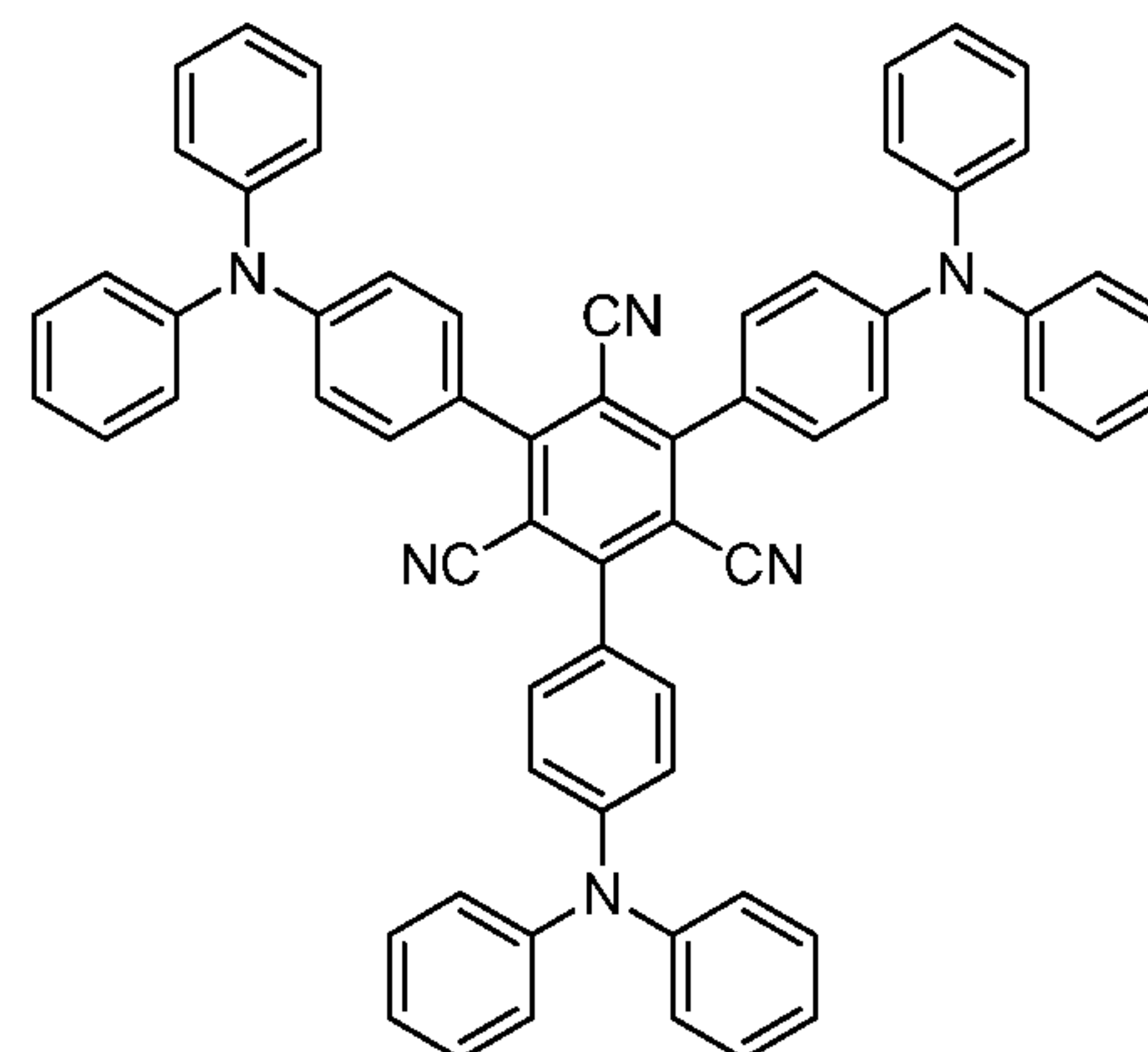
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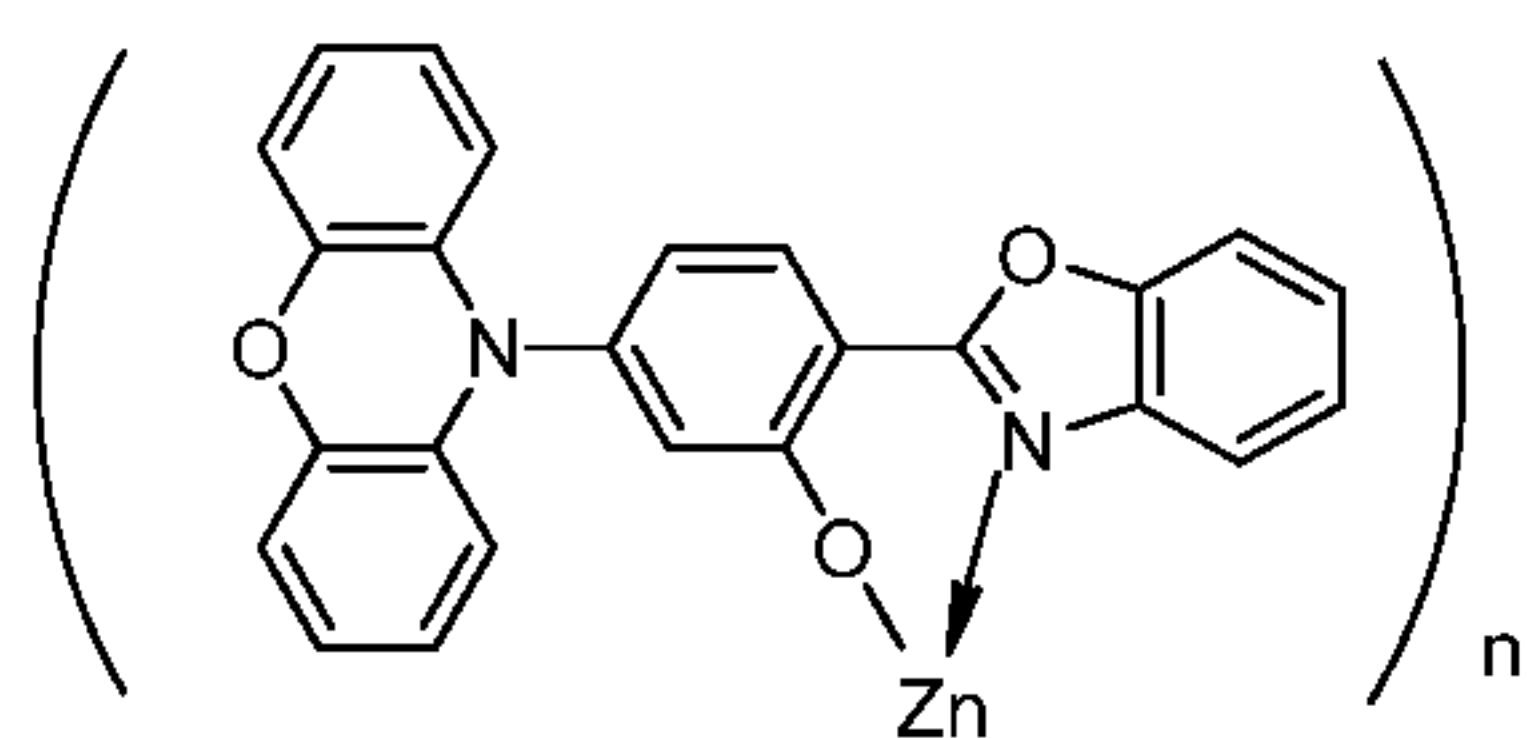
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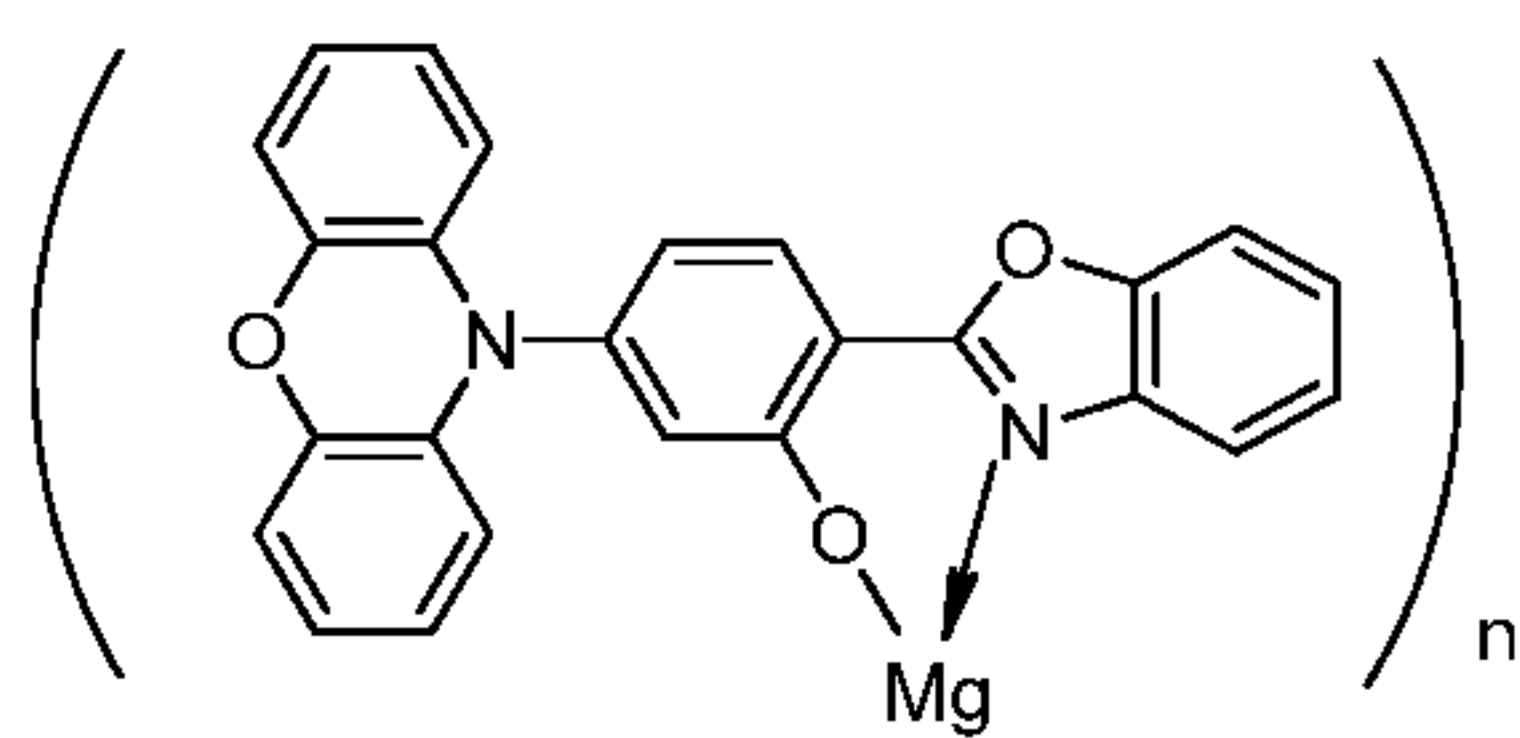
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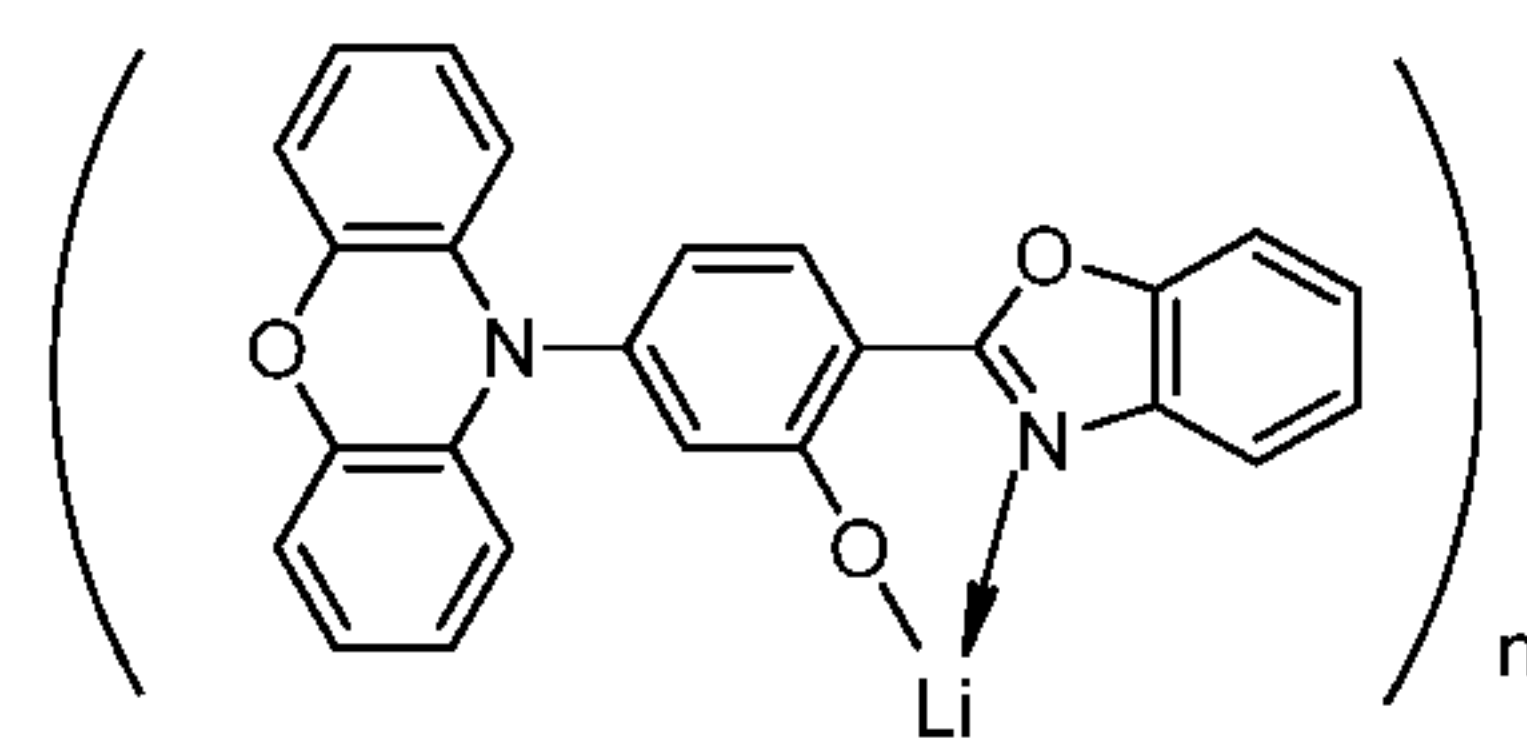
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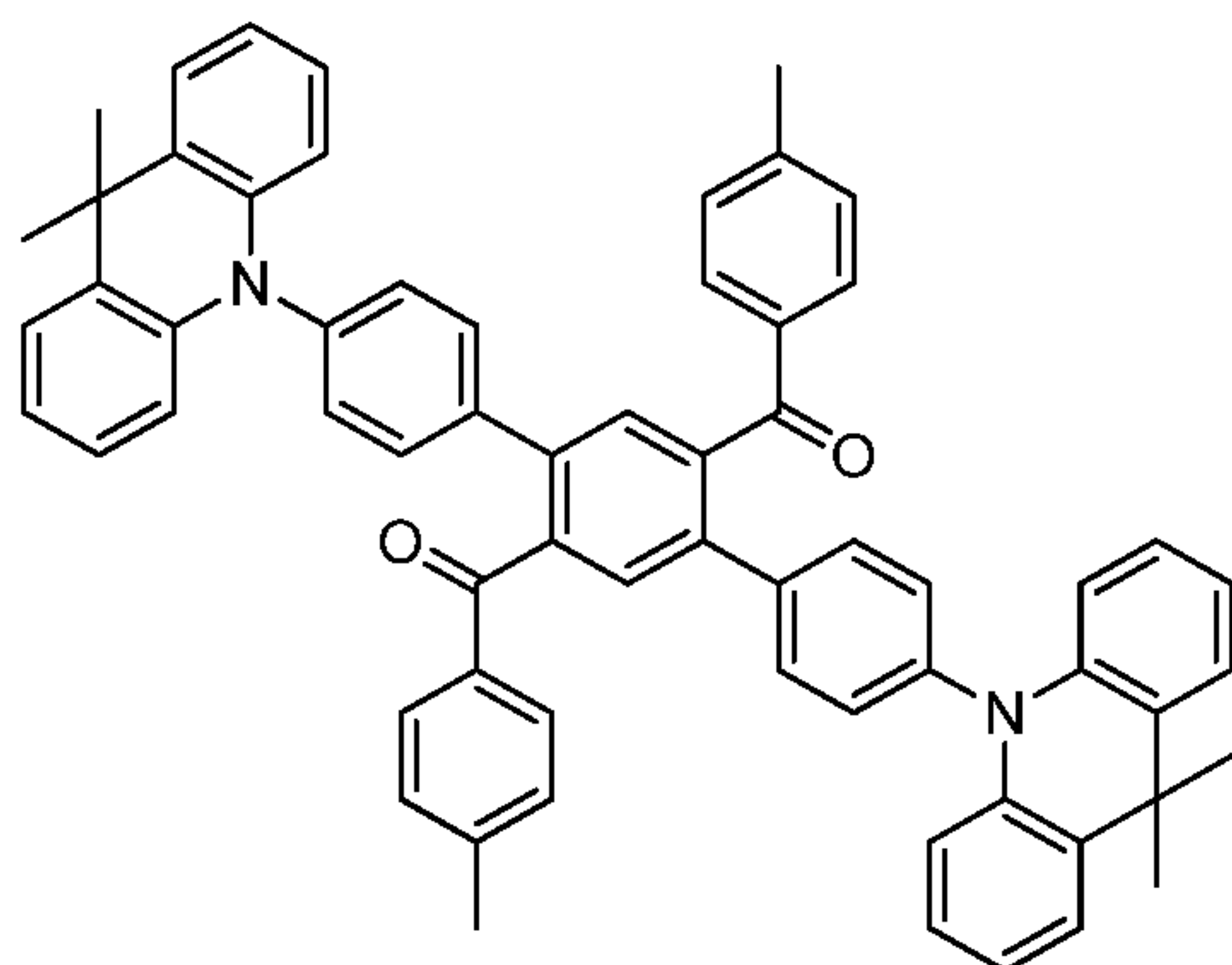
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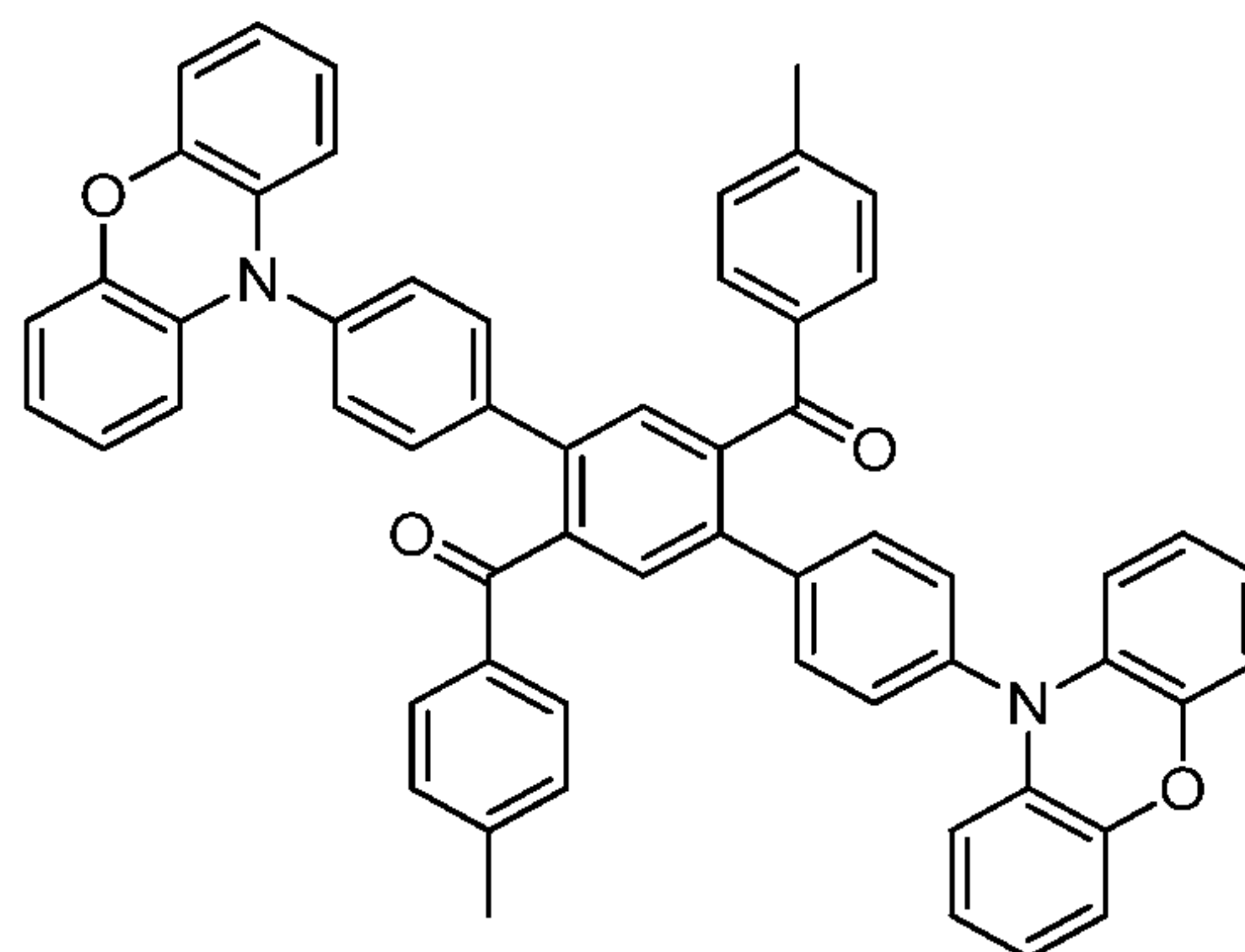
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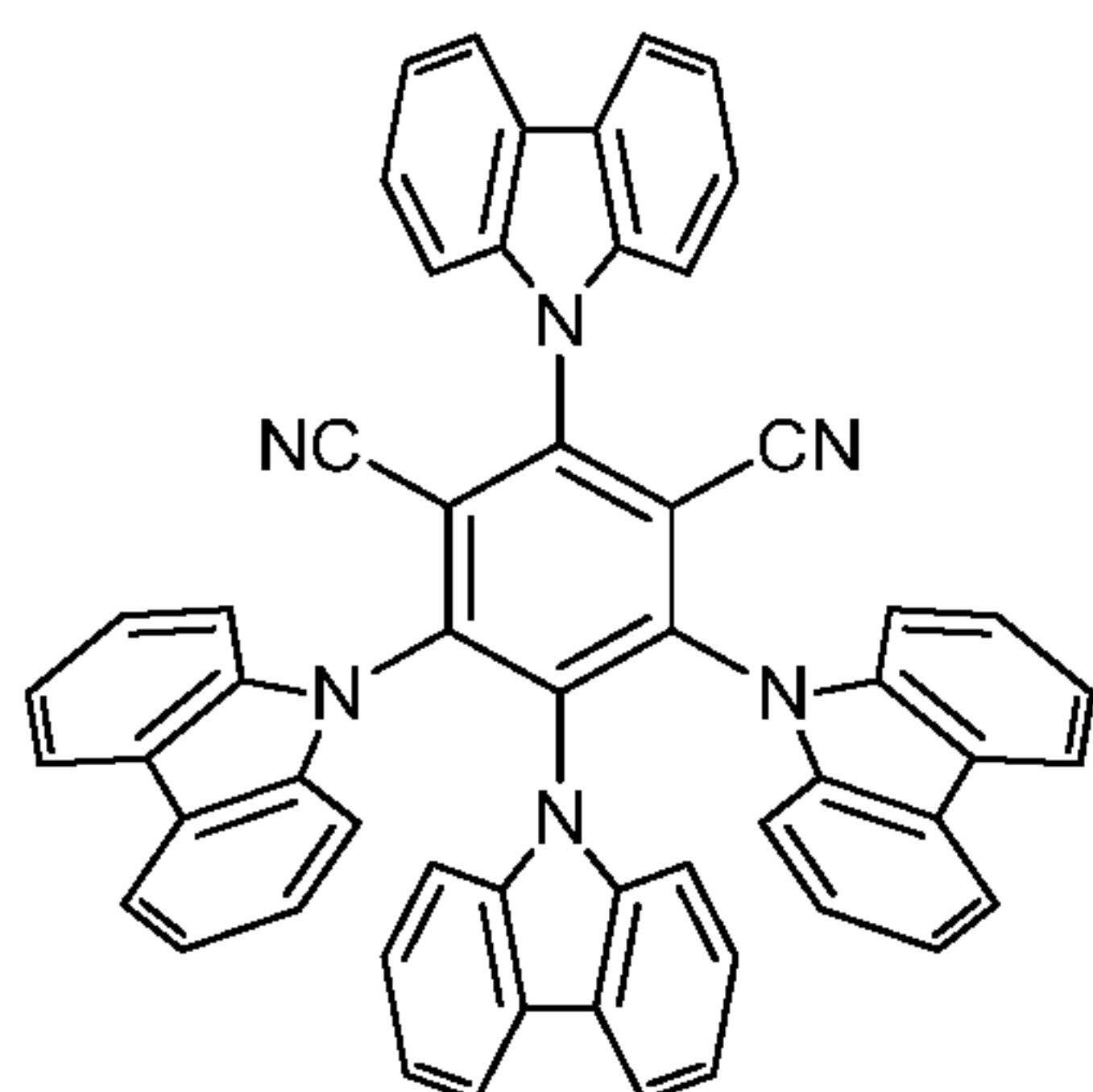
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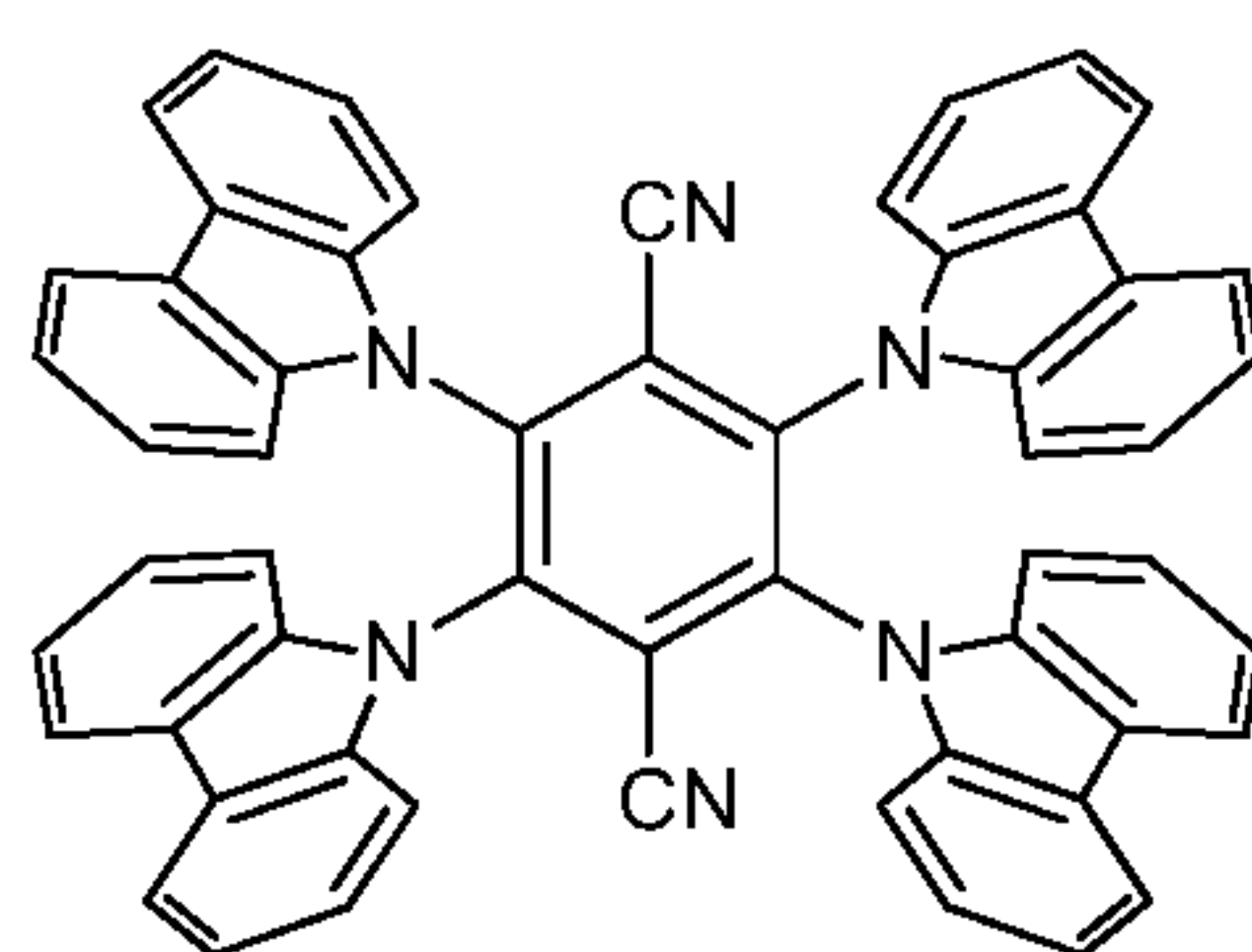
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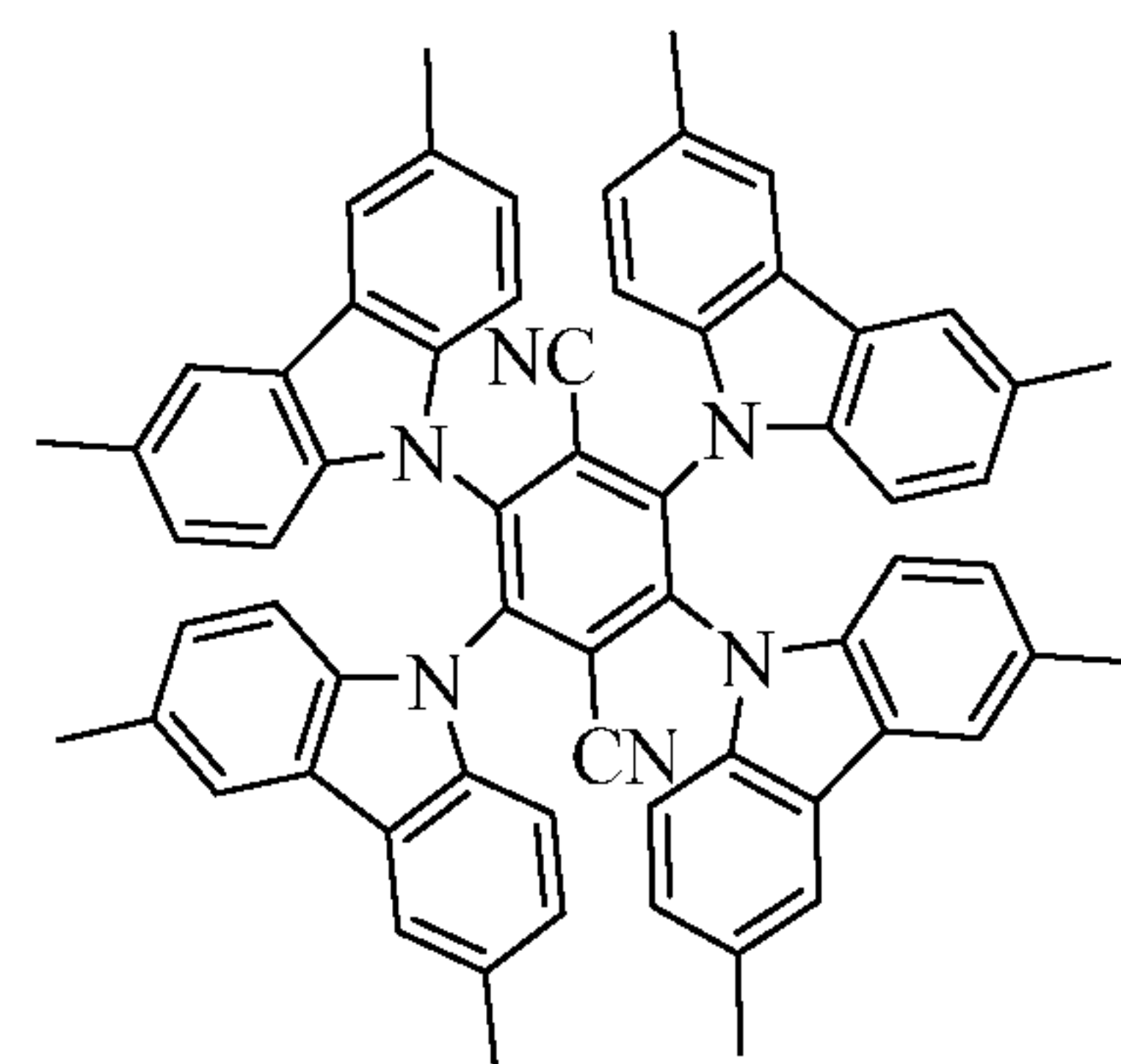
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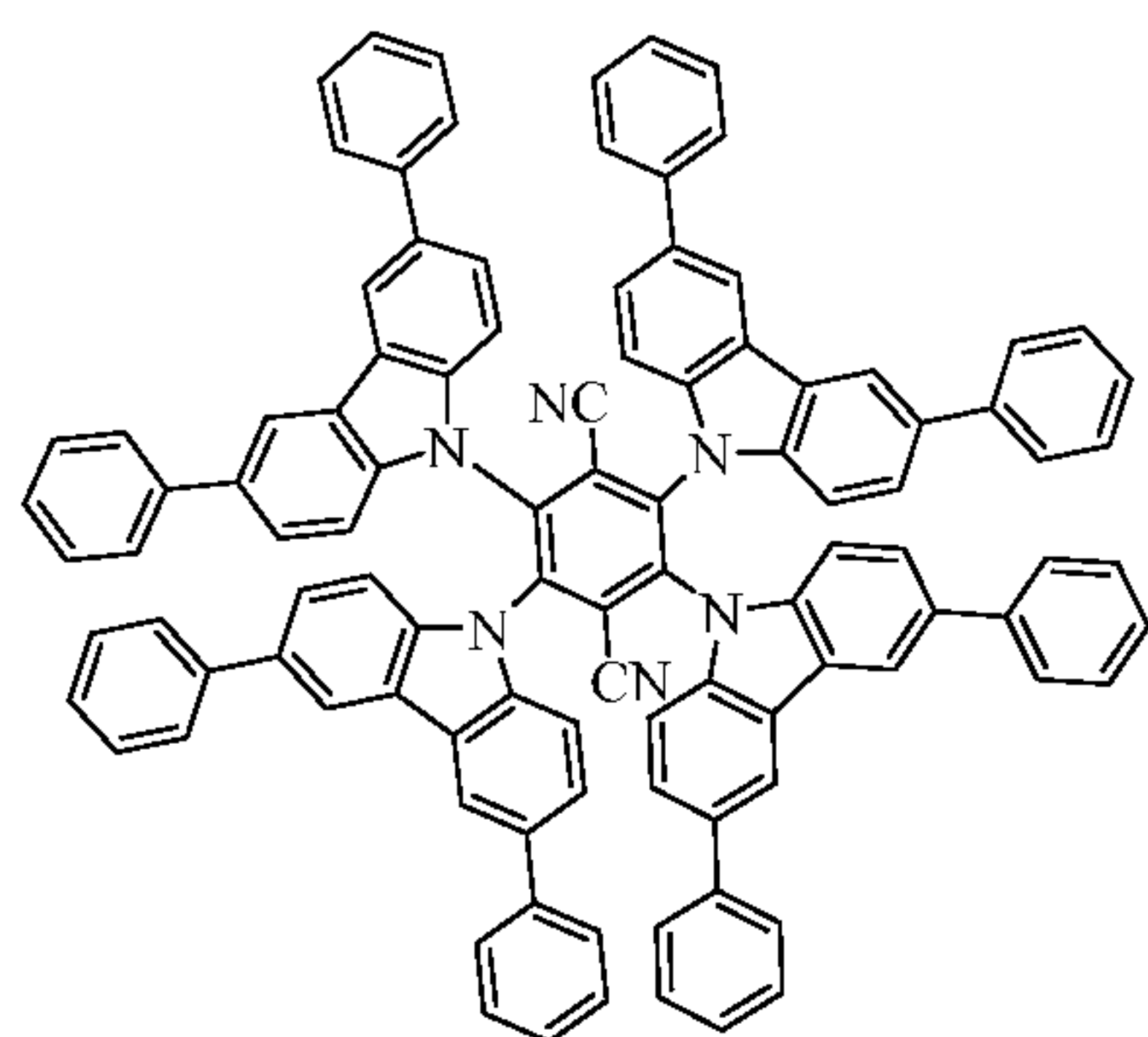
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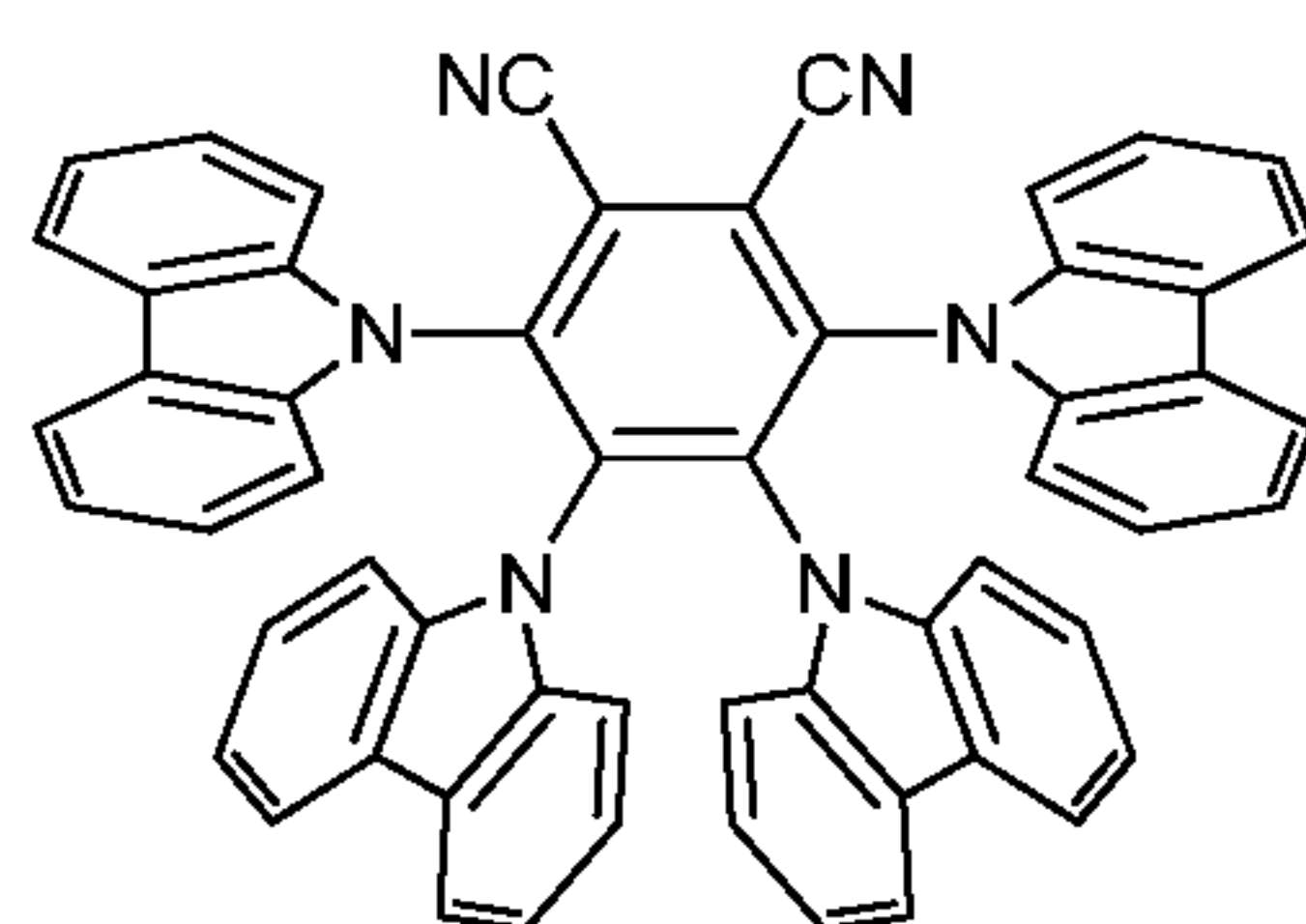
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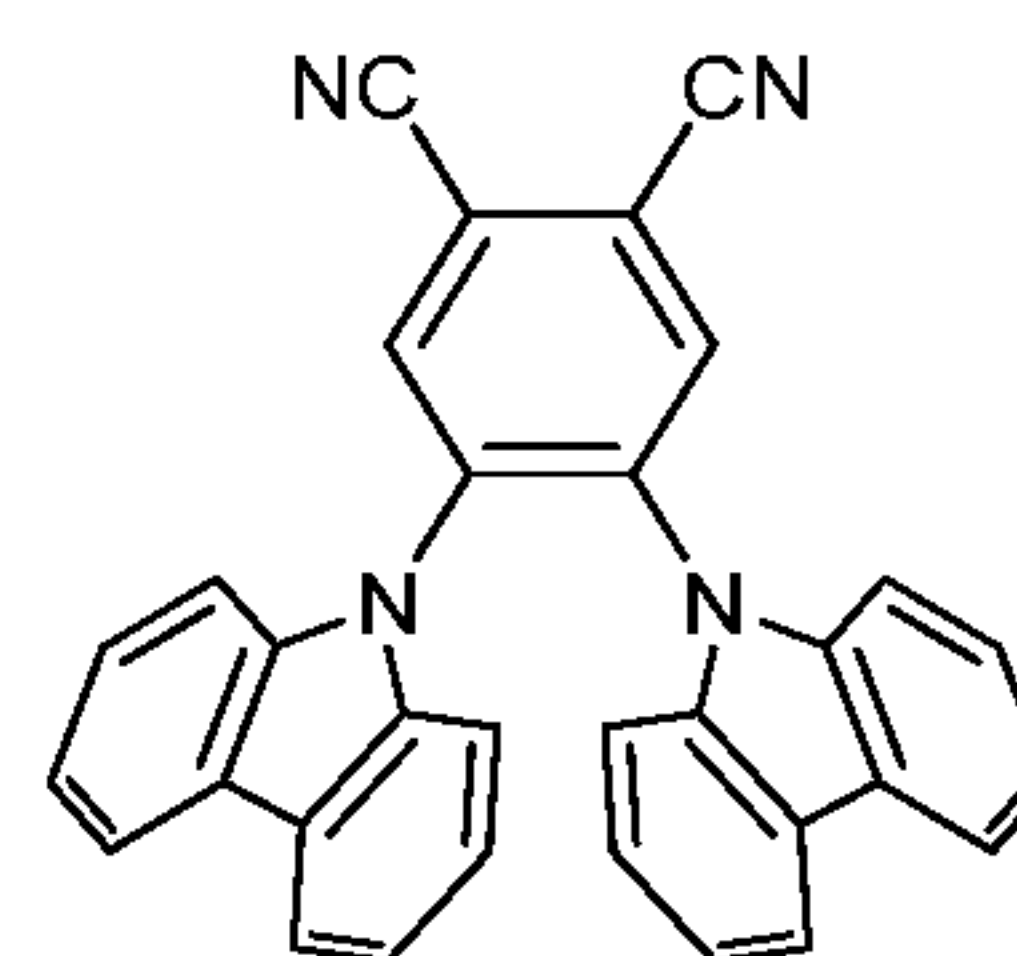
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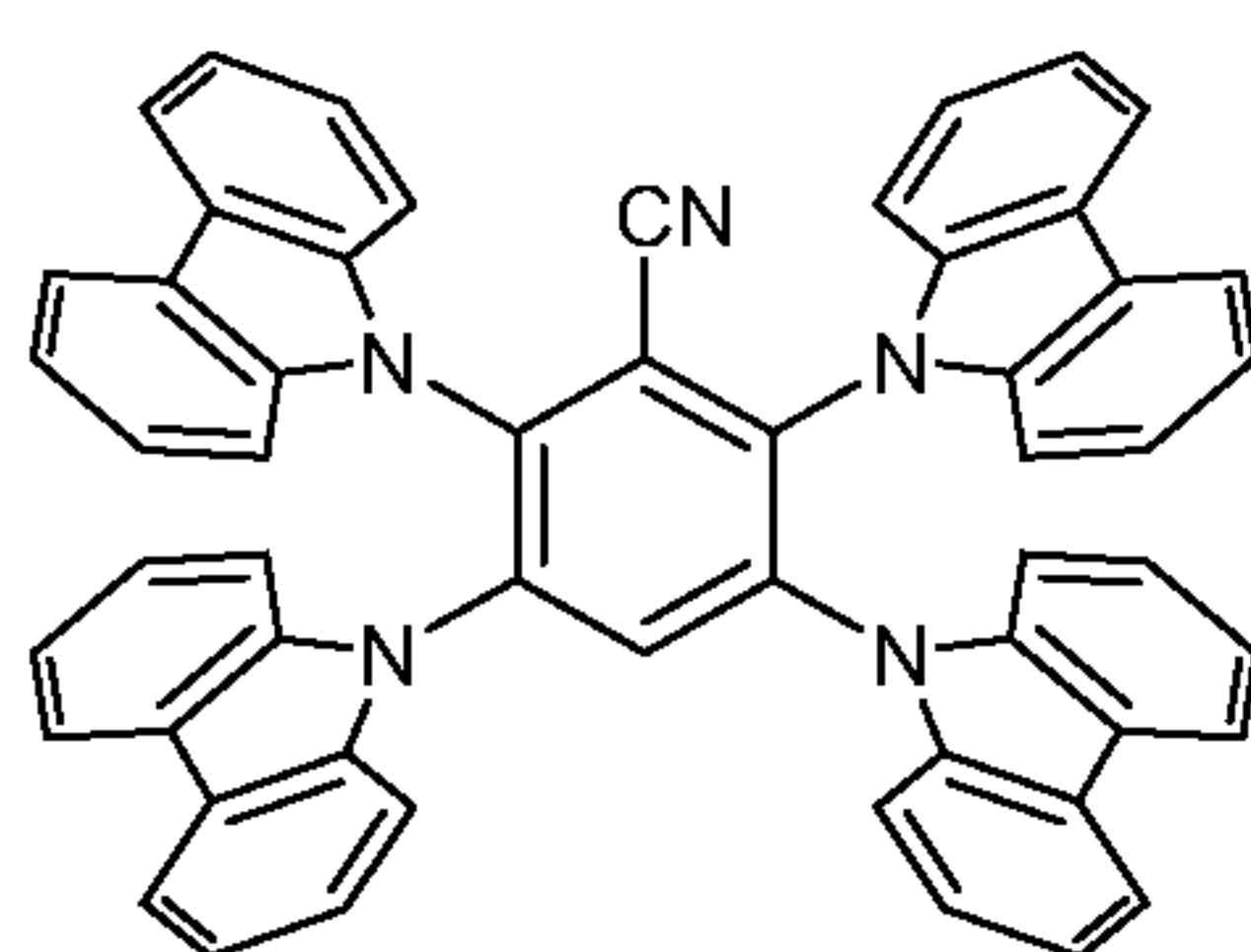
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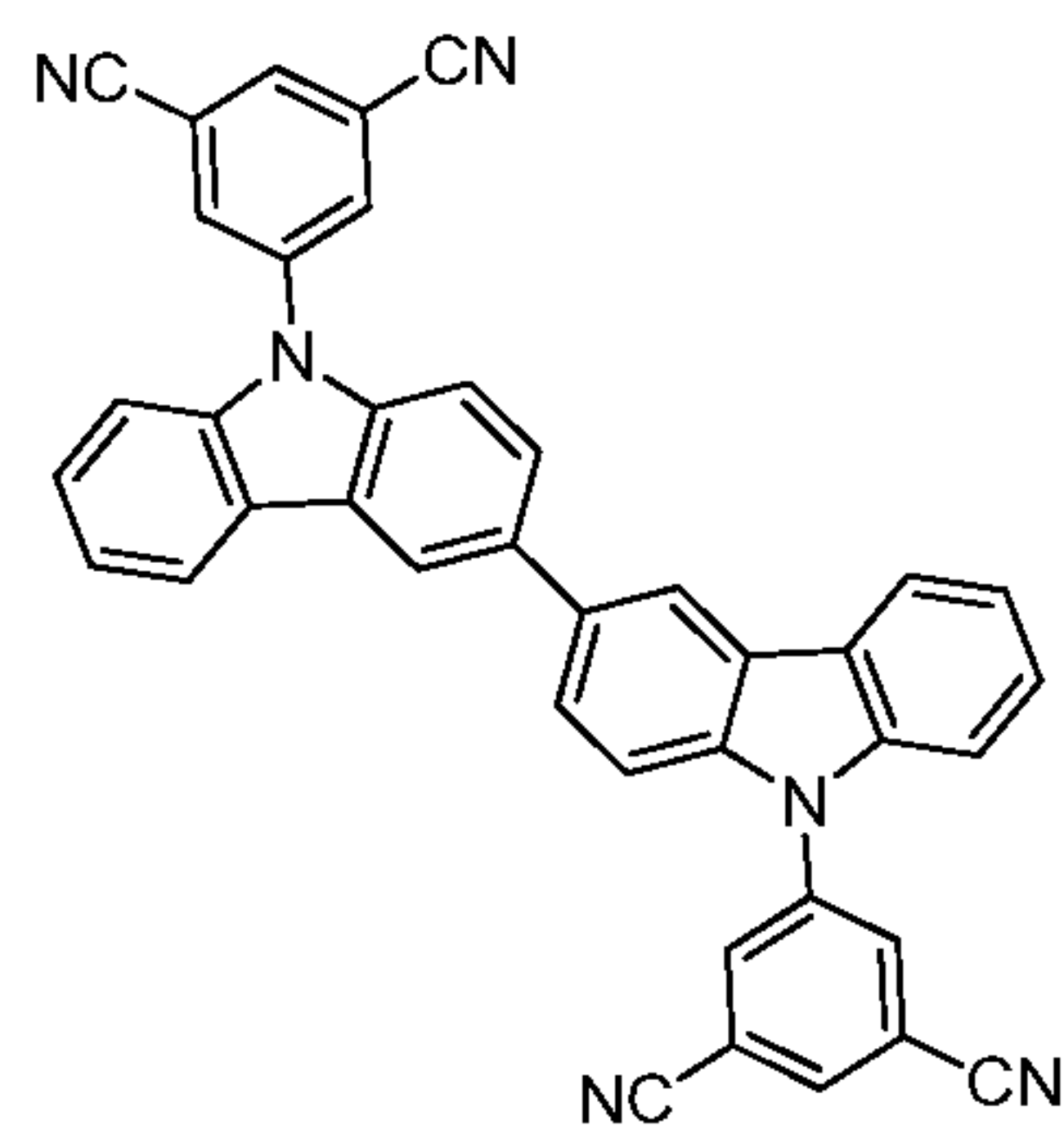
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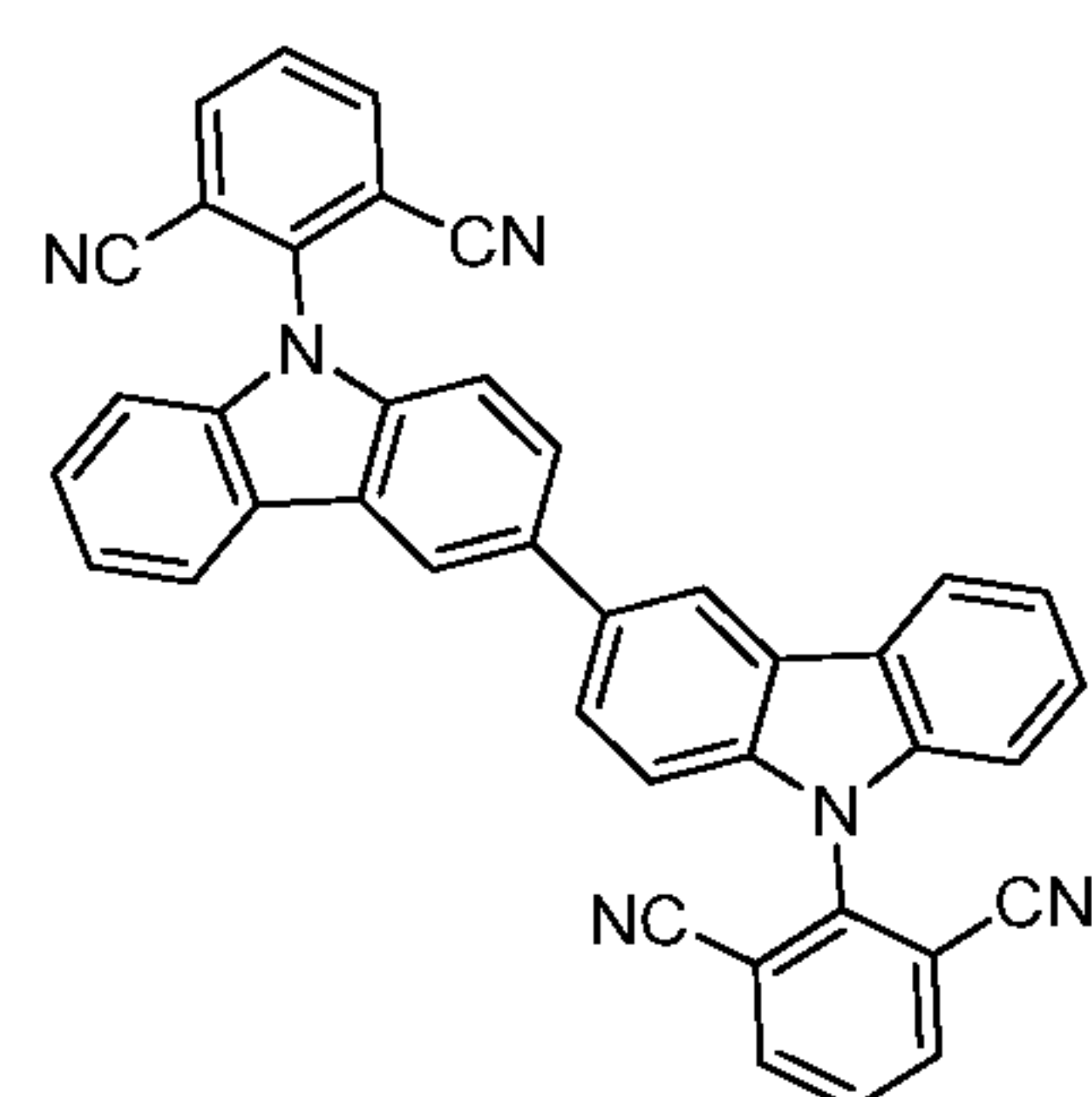
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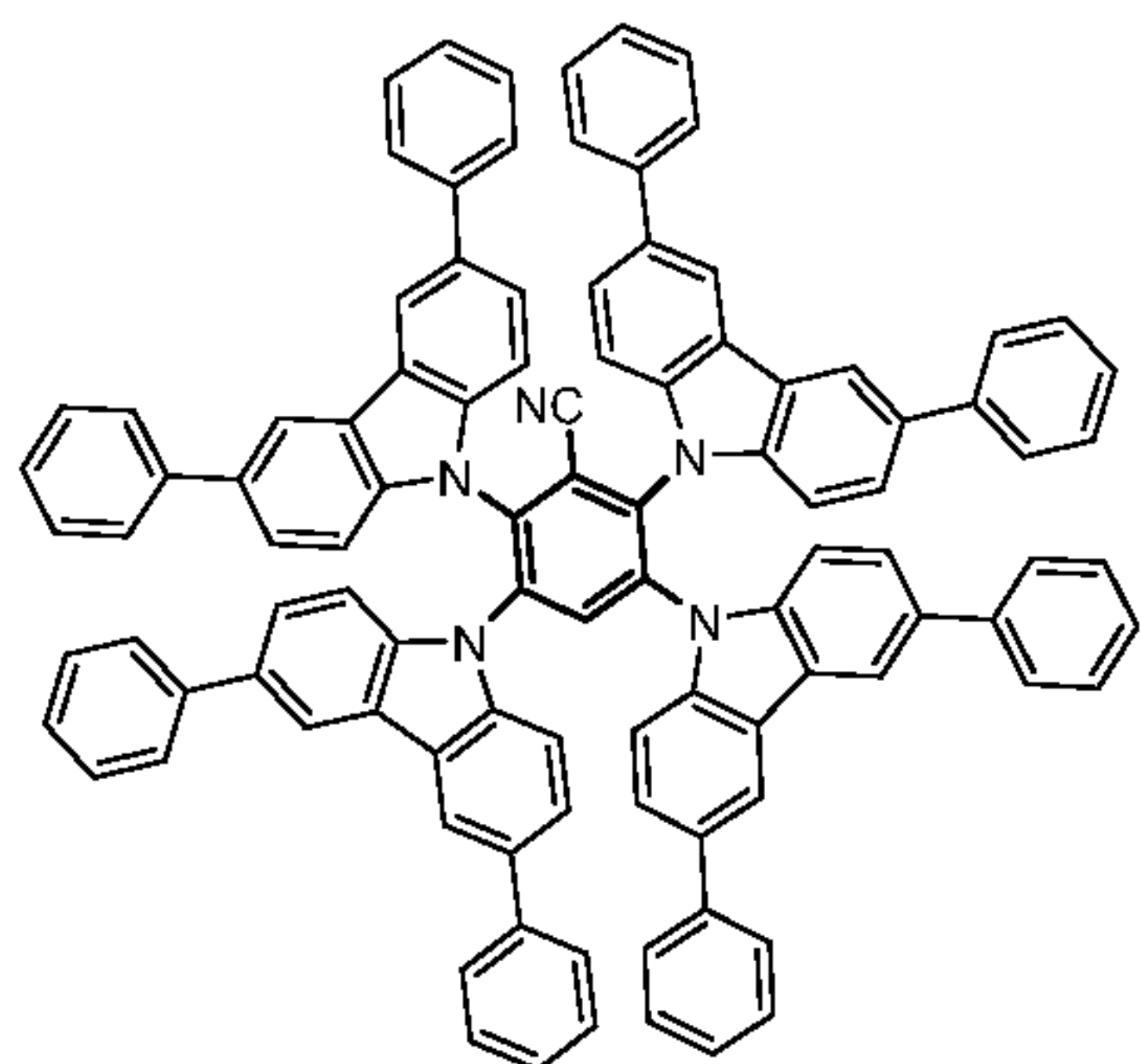
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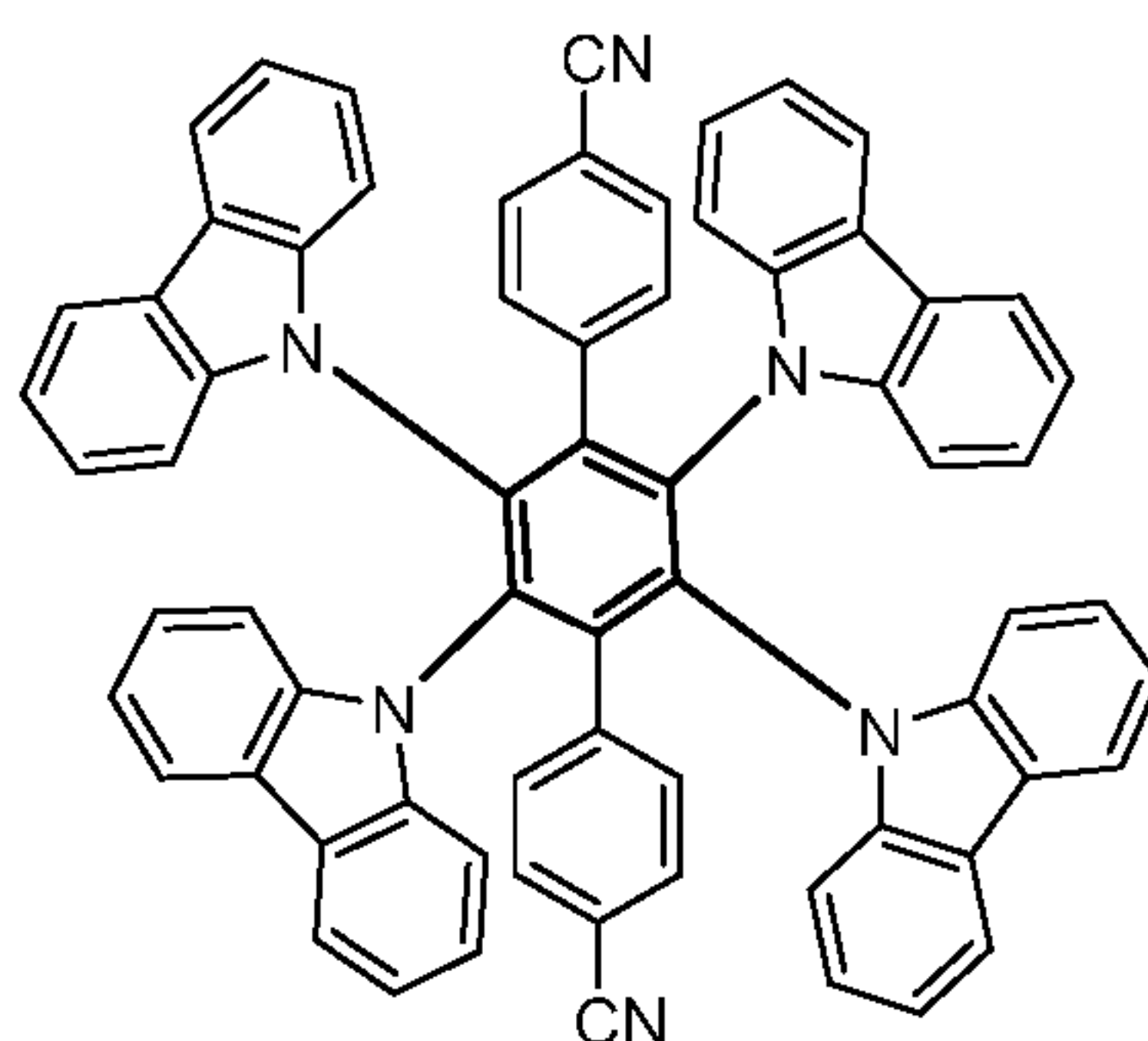
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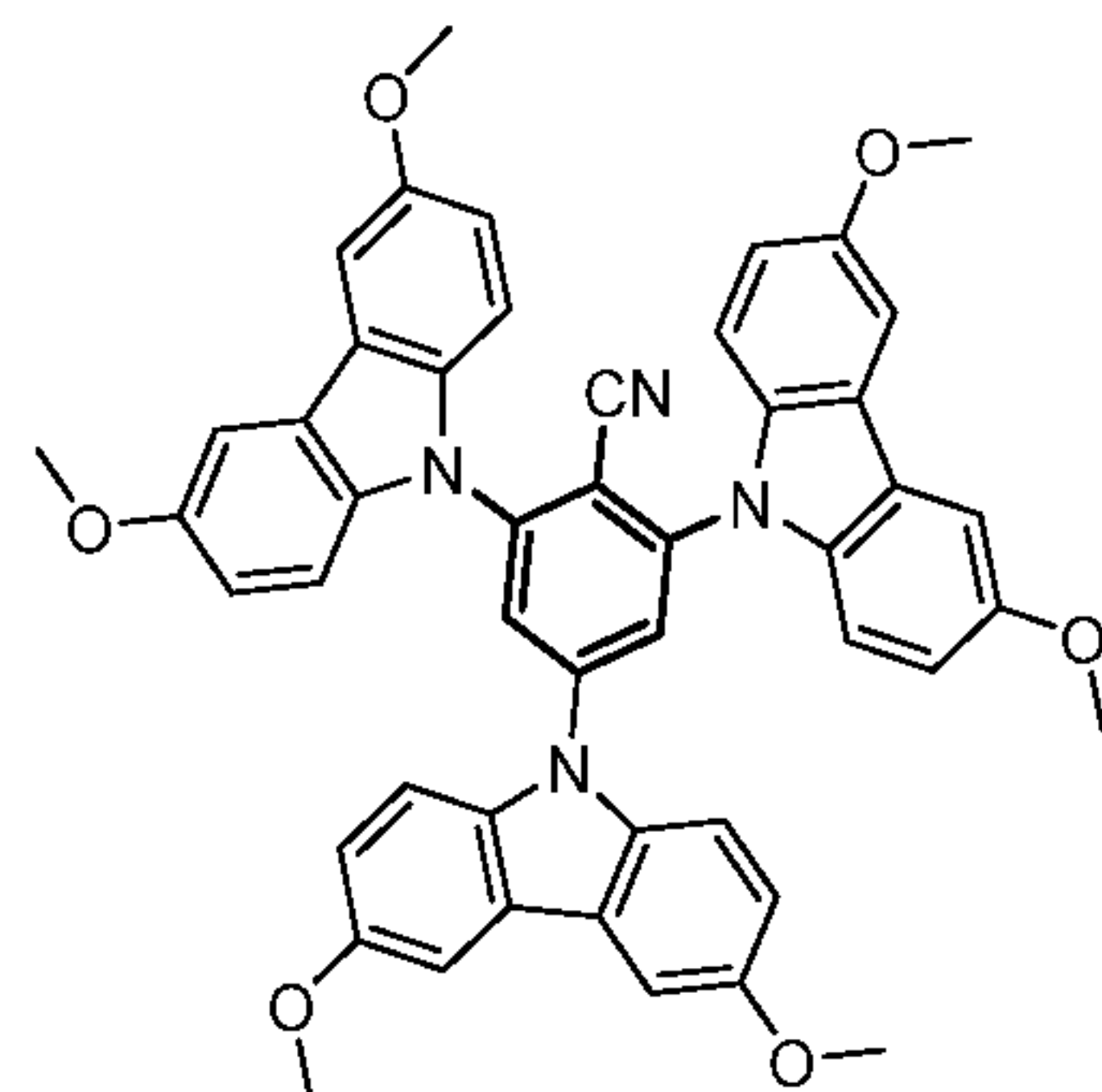
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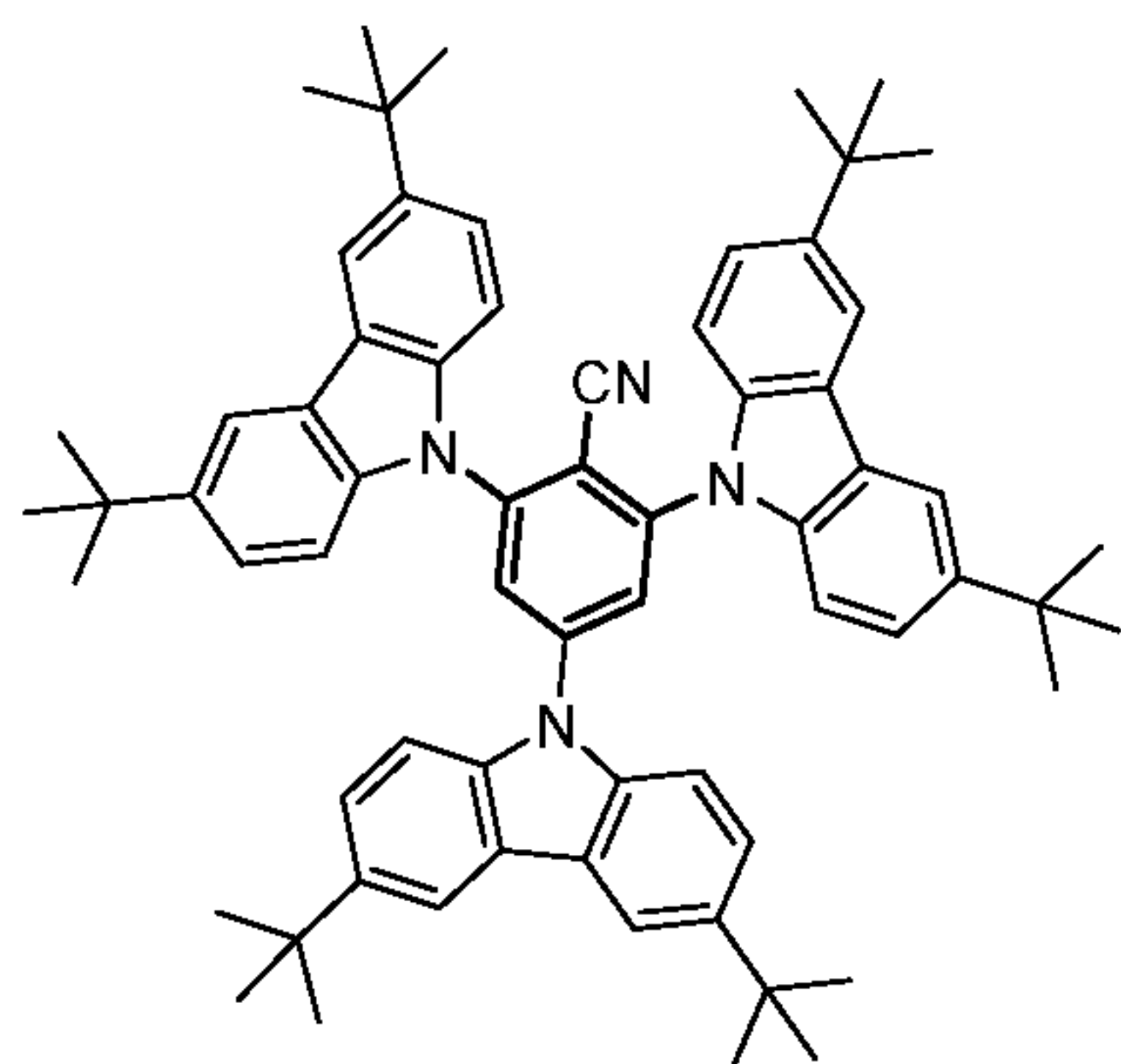
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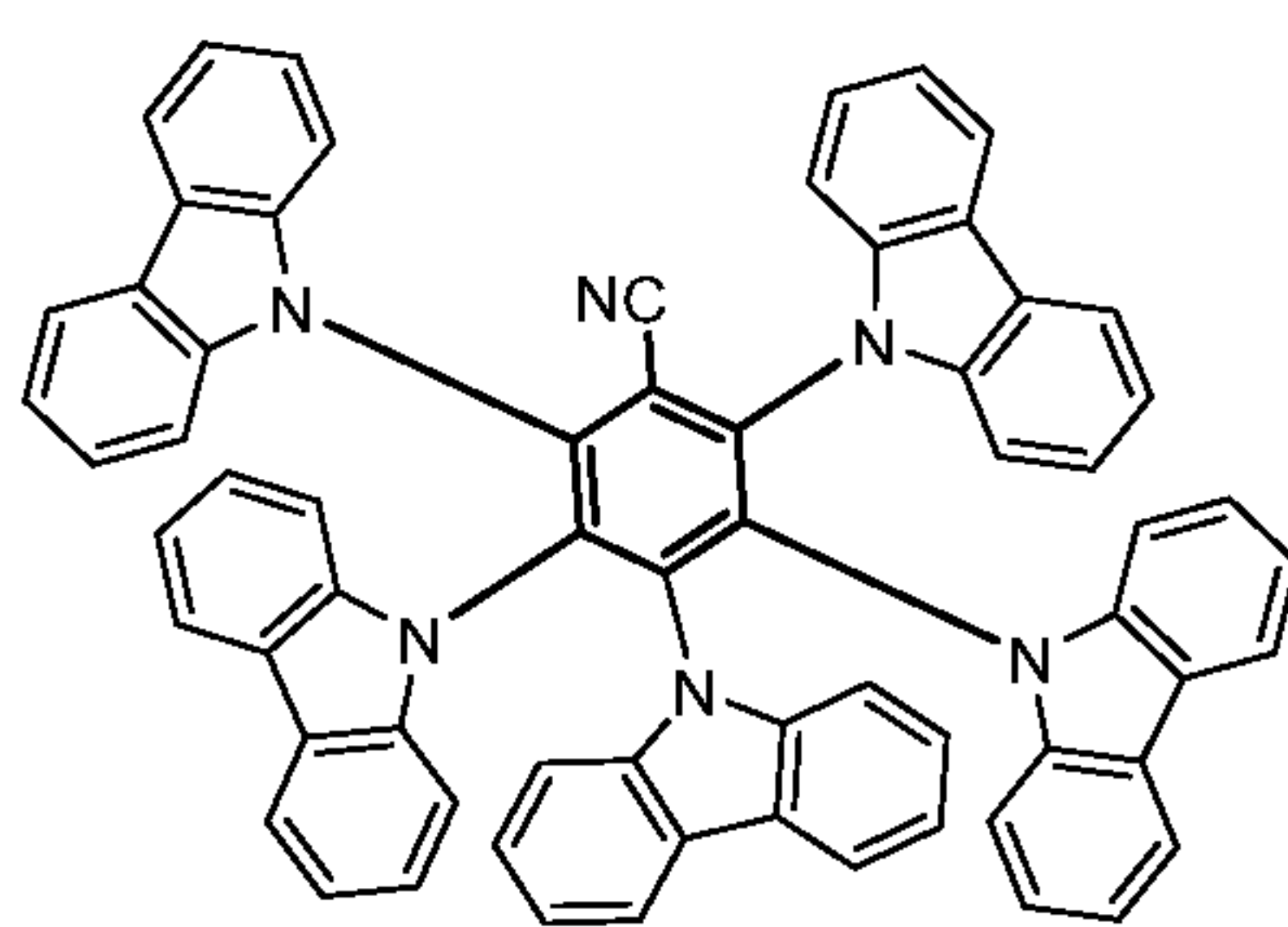
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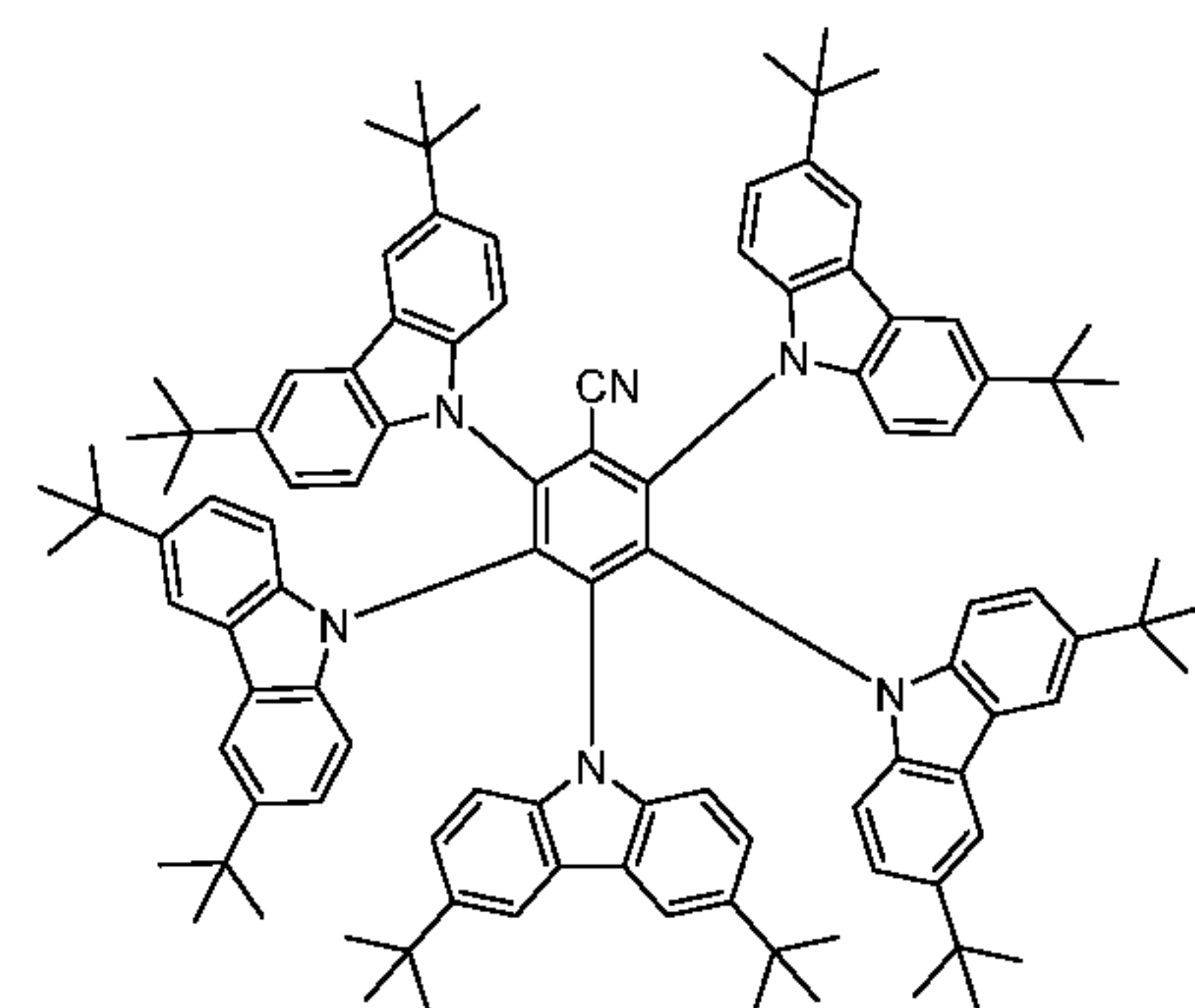
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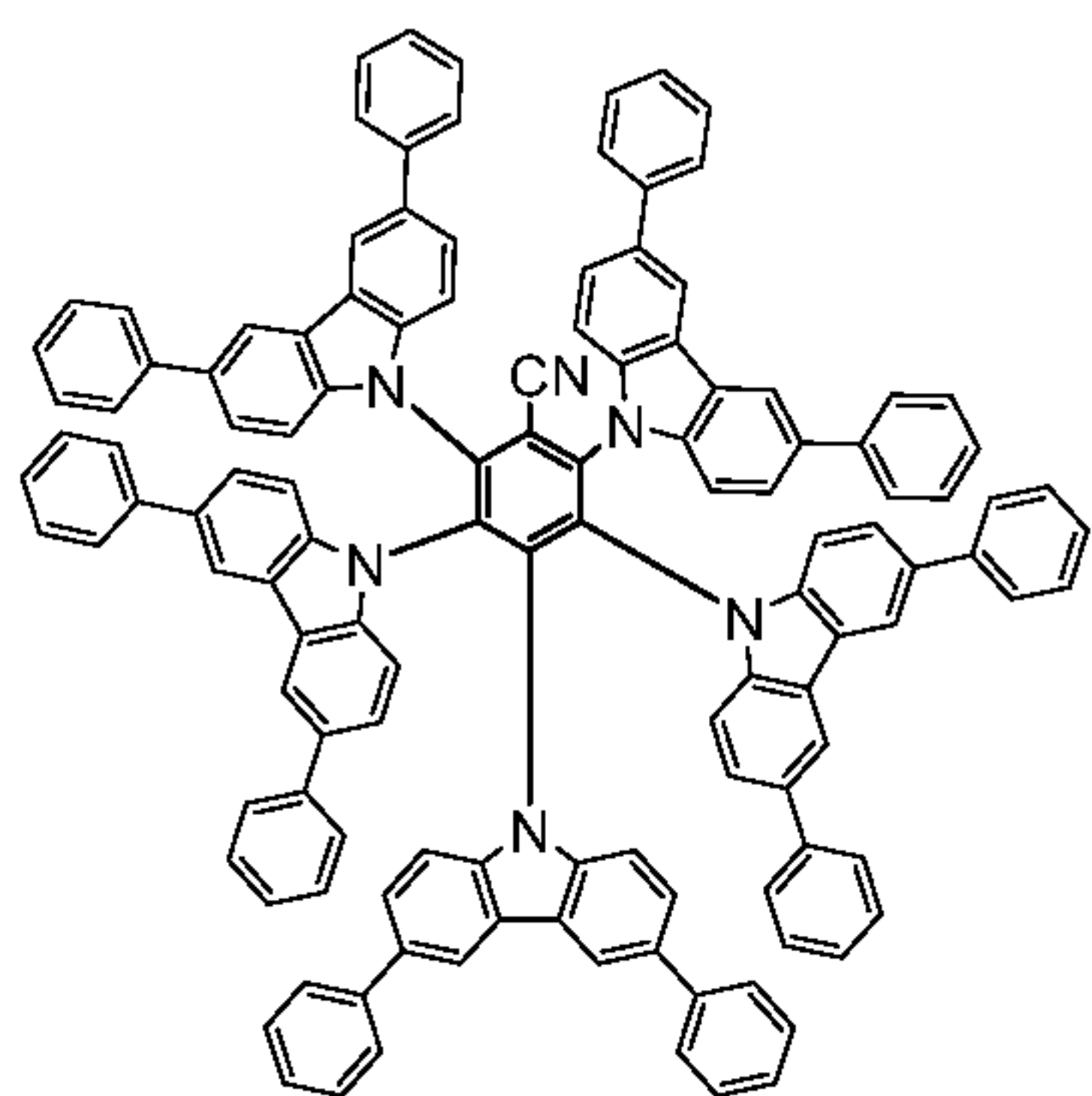
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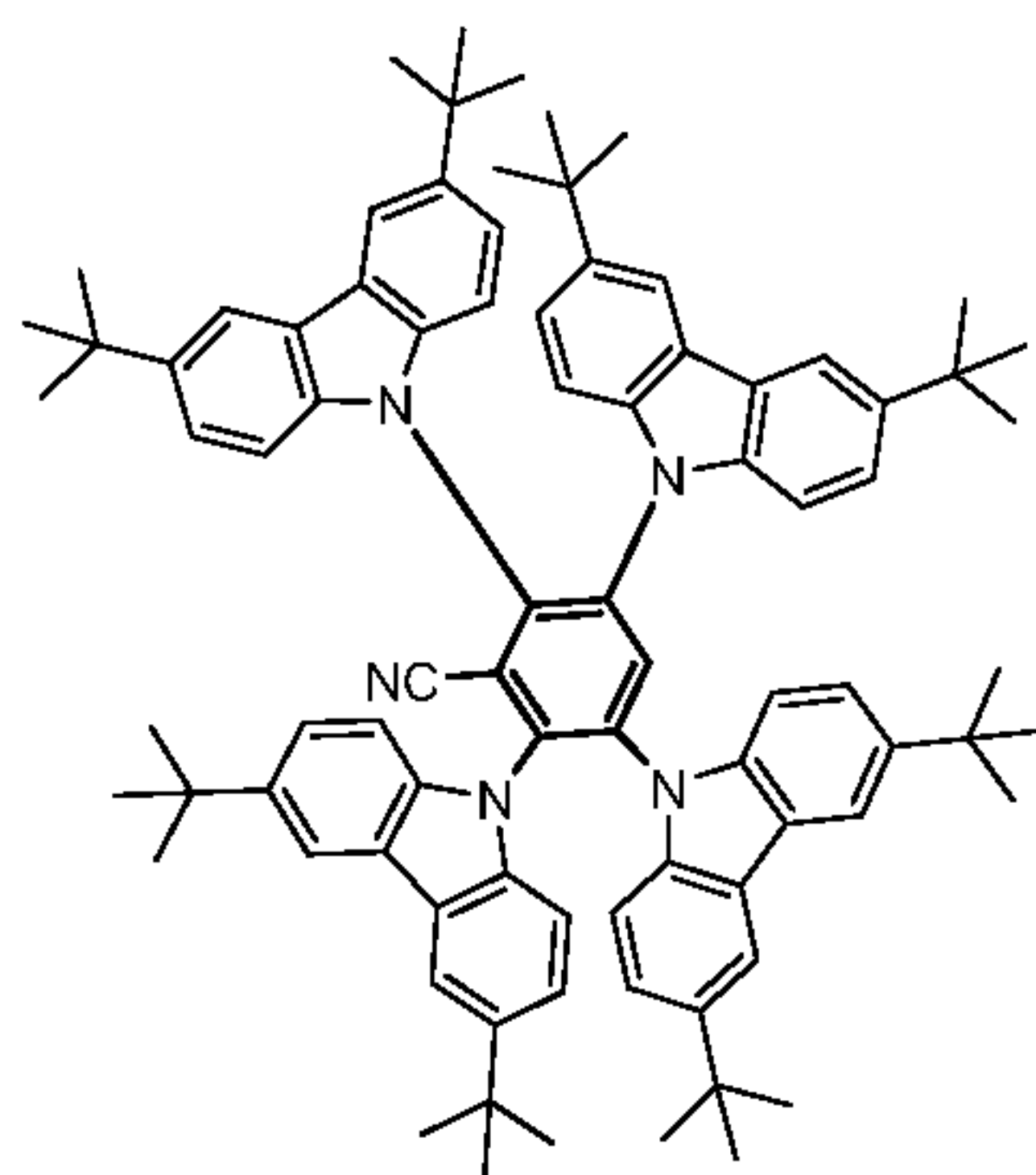
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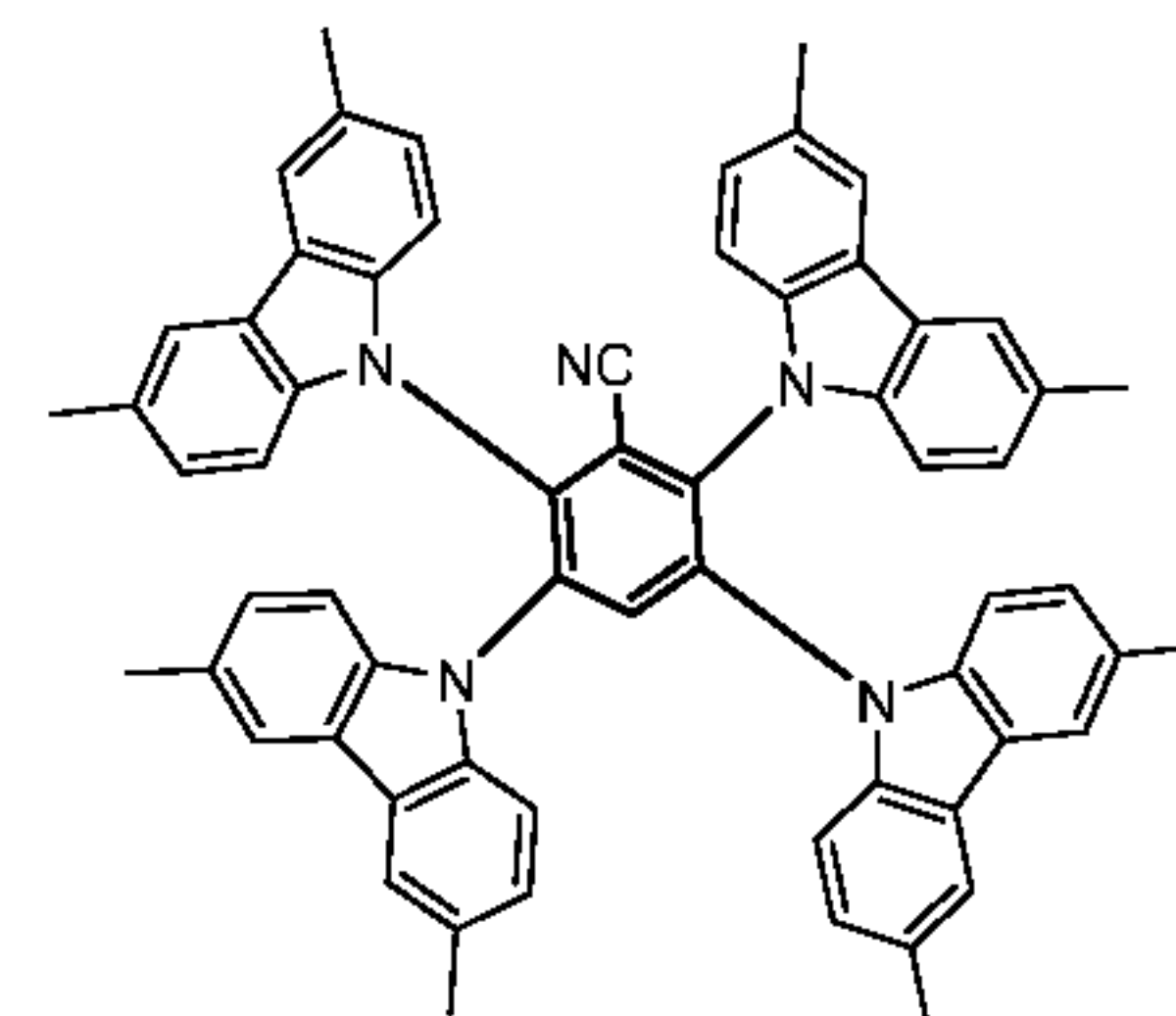
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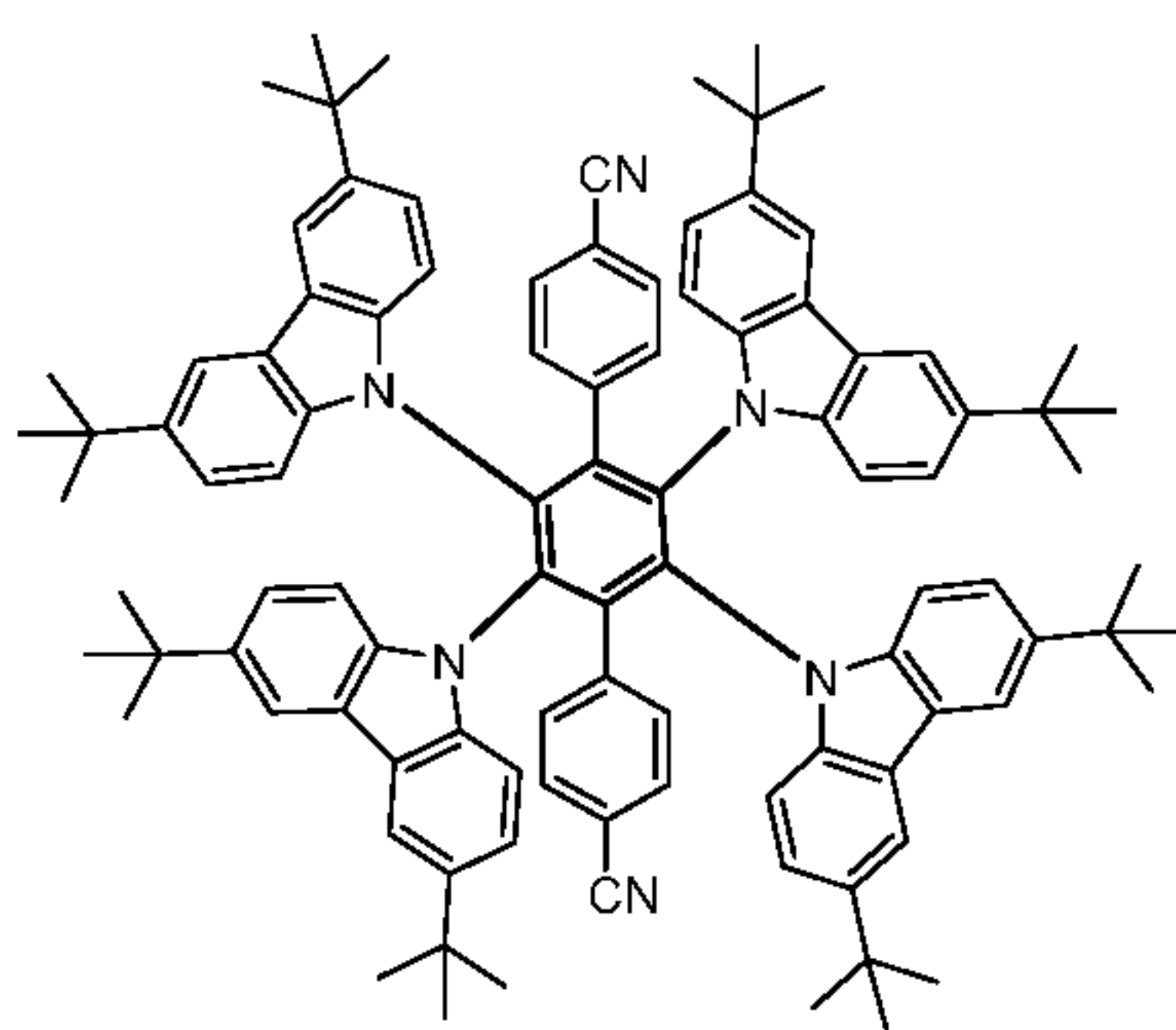
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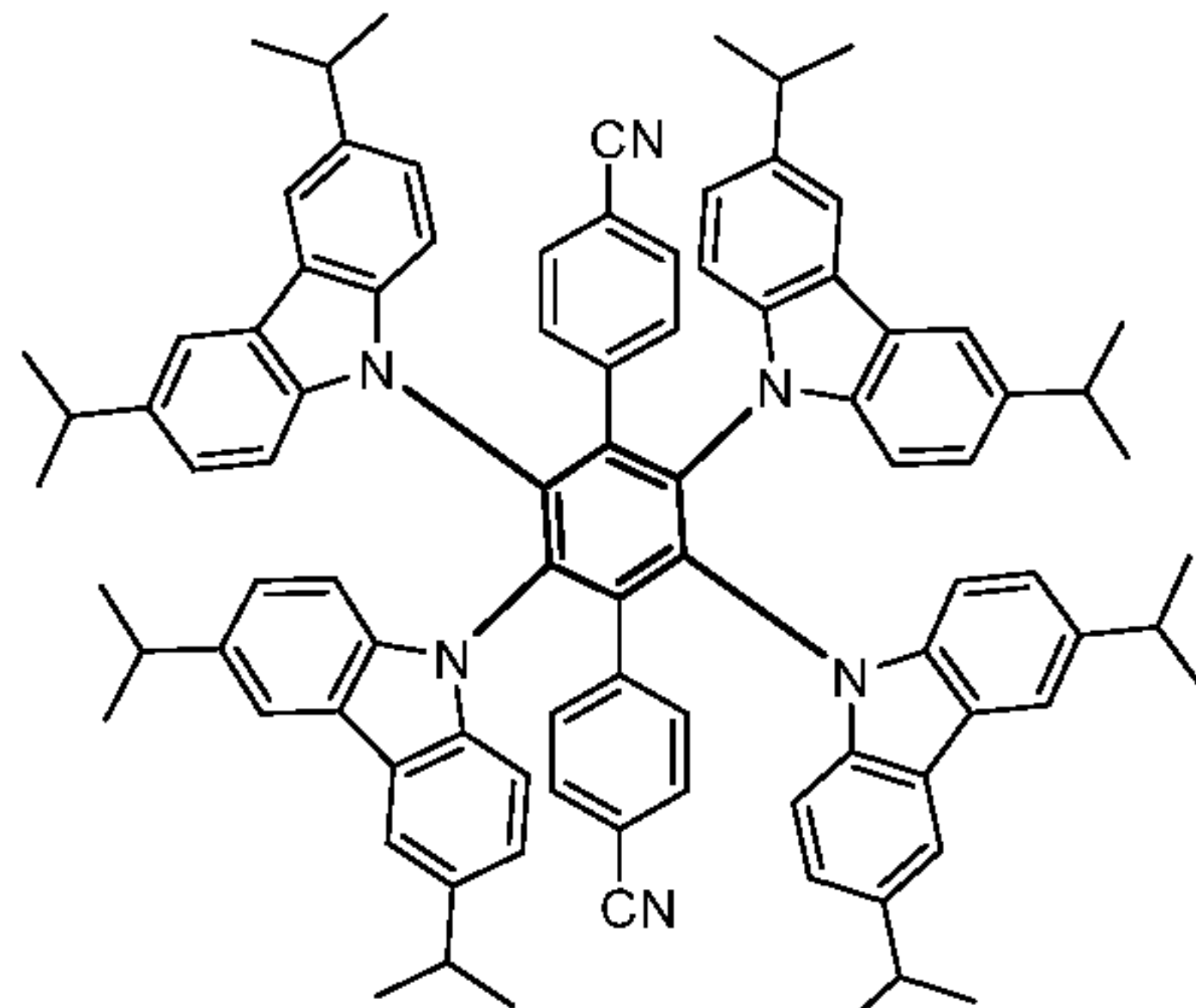
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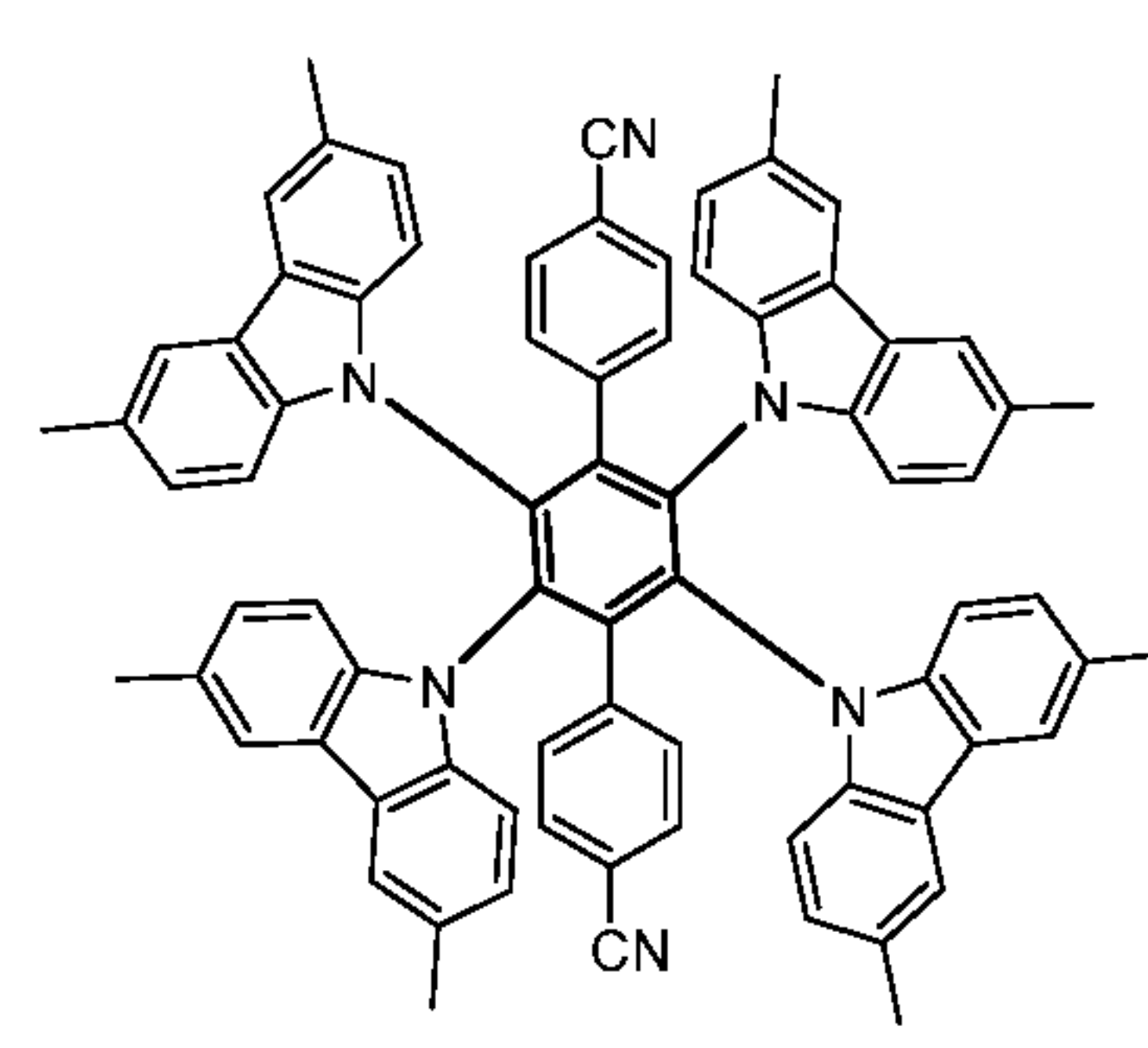
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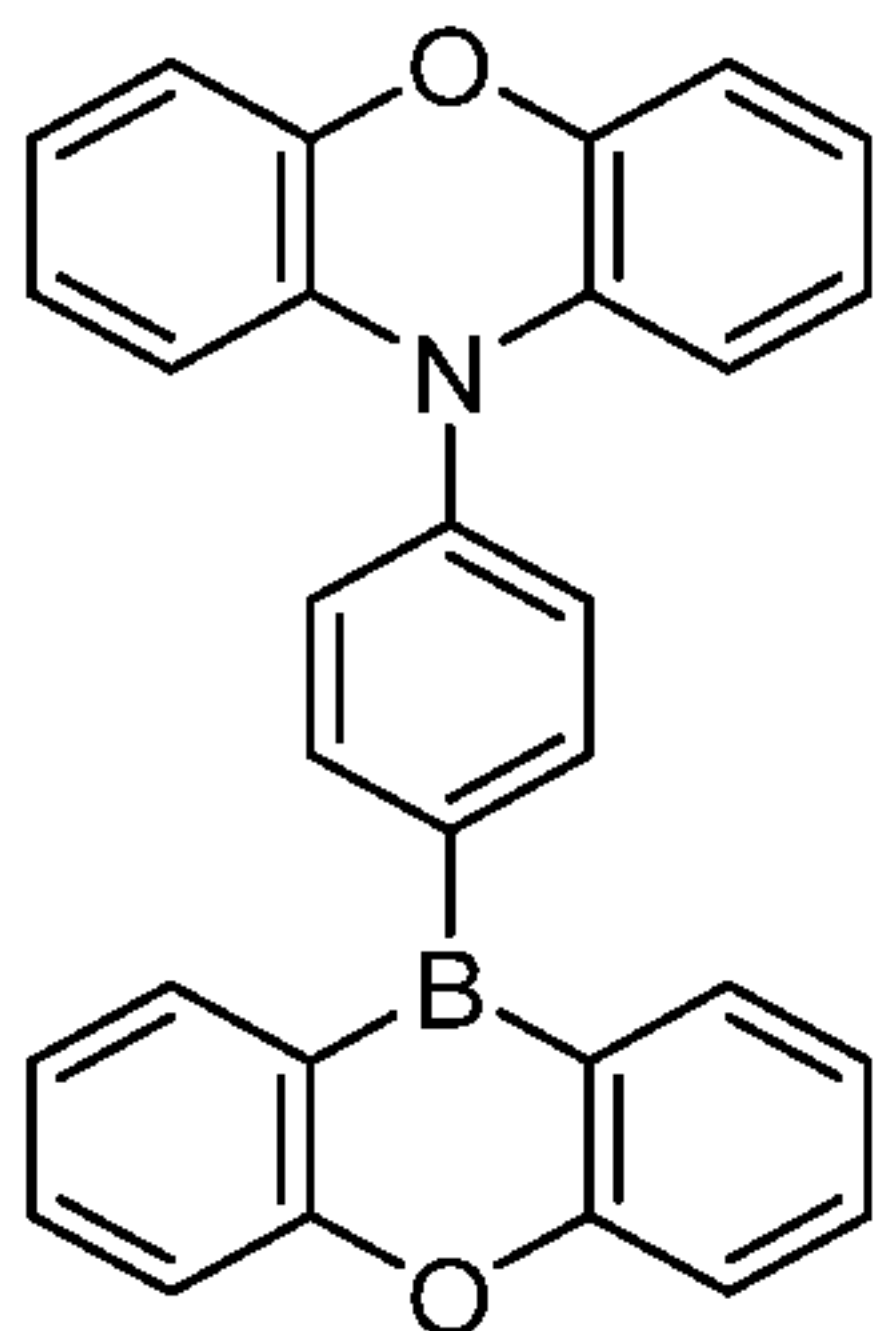
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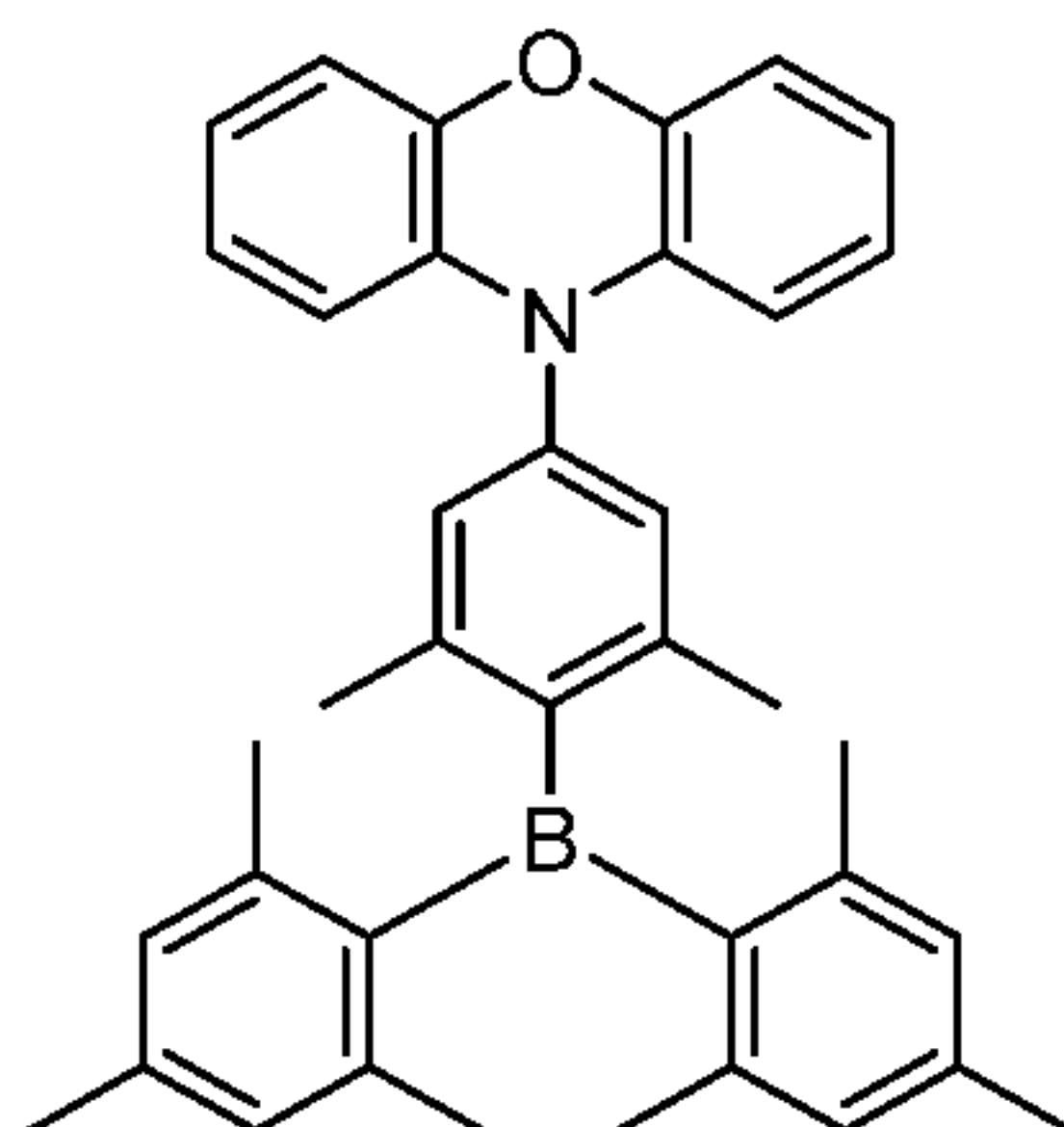
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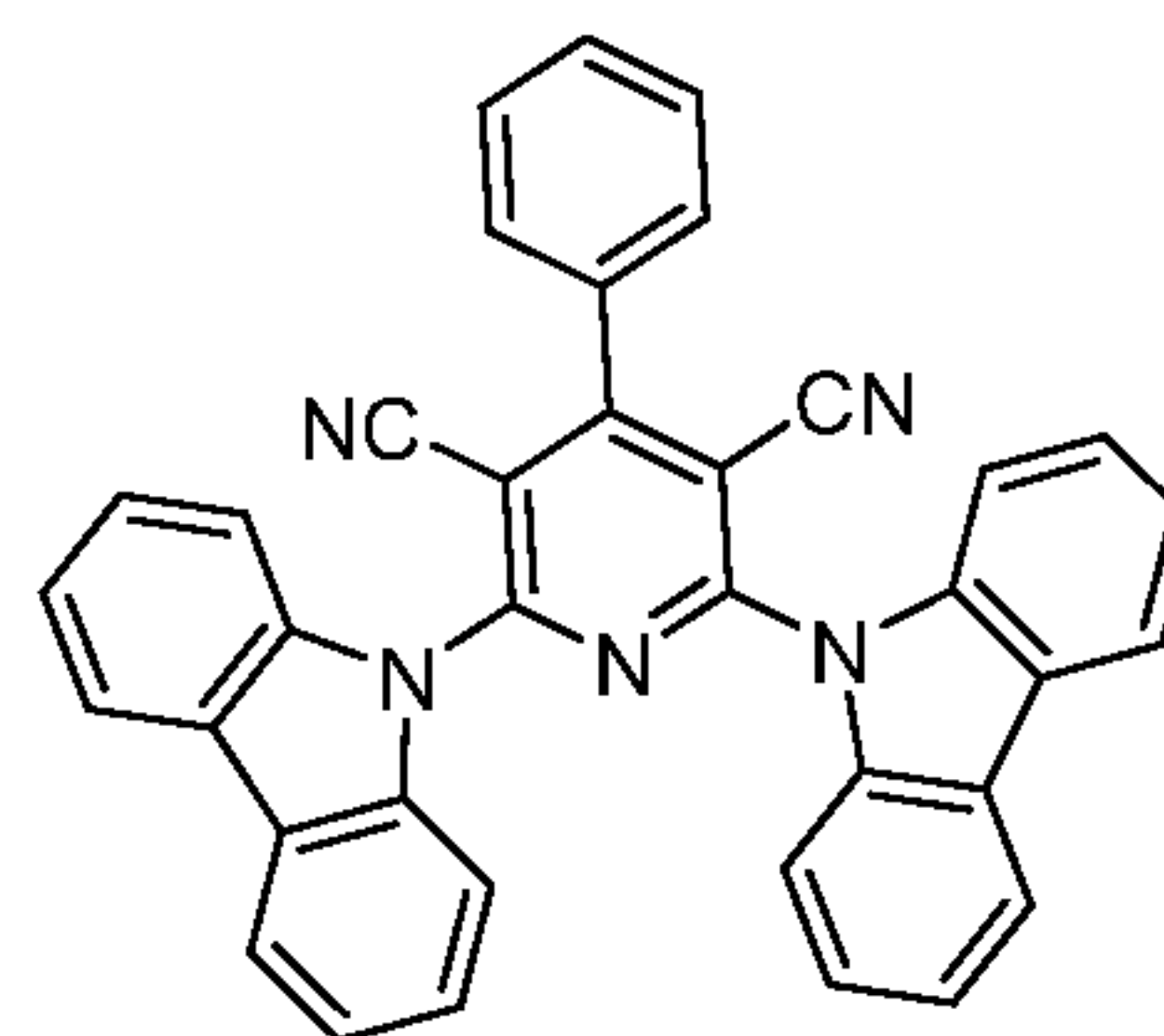
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T-97



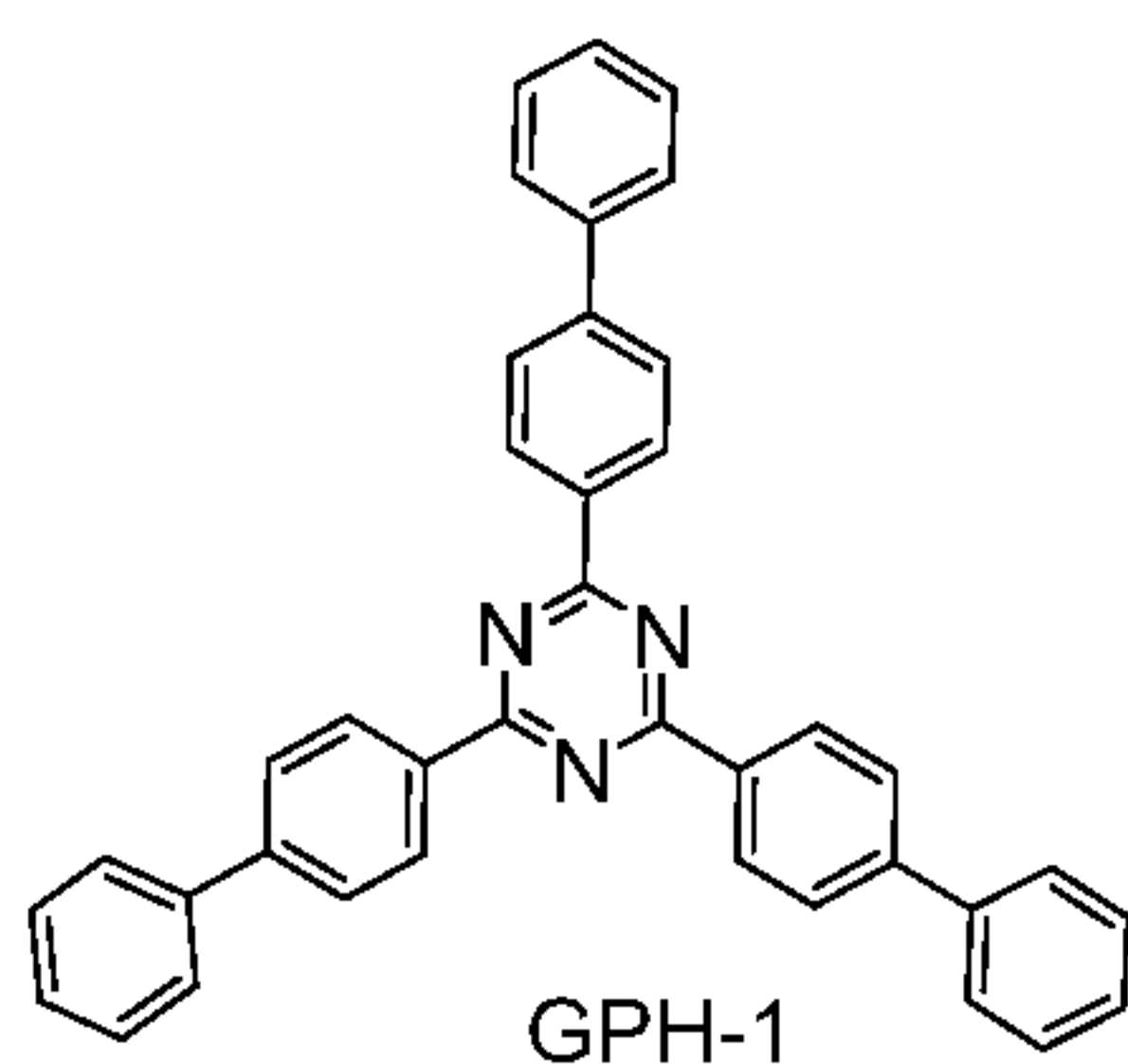
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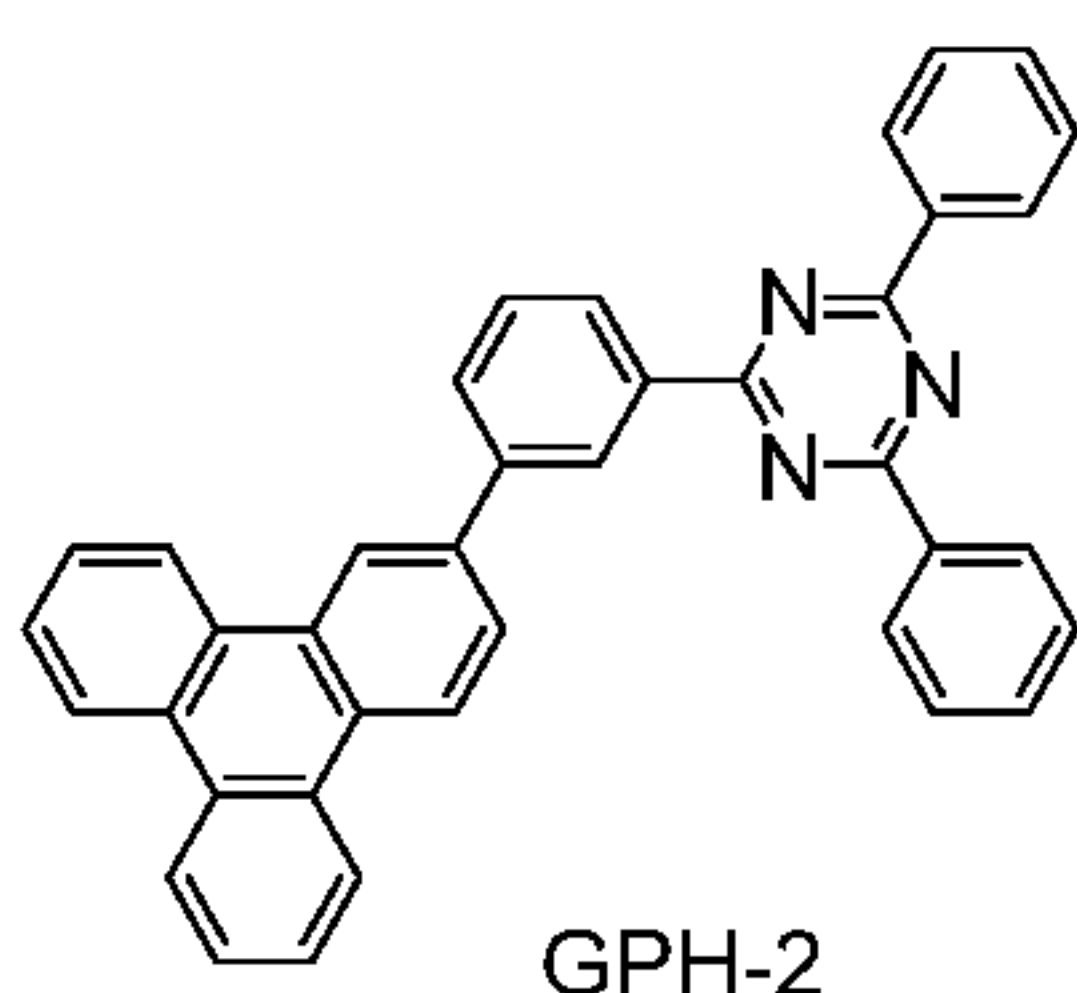
T-99;

其中, 所述 T-71、T-72 和 T-73 中, n 各自独立地为 1、2 或 3。

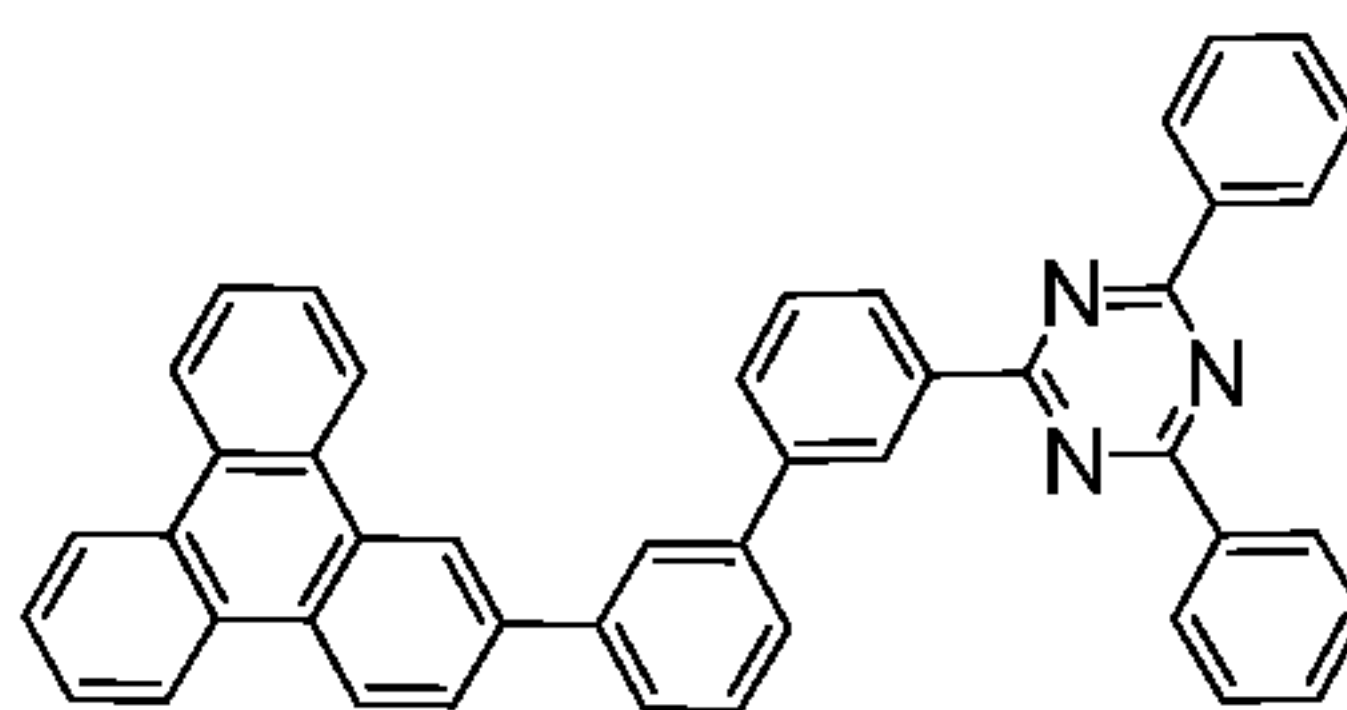
5、根据权利要求 1~4 中任一项所述的有机电致发光器件, 其中, 所述主体材料包括如下 GPH-1 至 GPH-80 所述的化合物中的任意一种或至少两种组合:



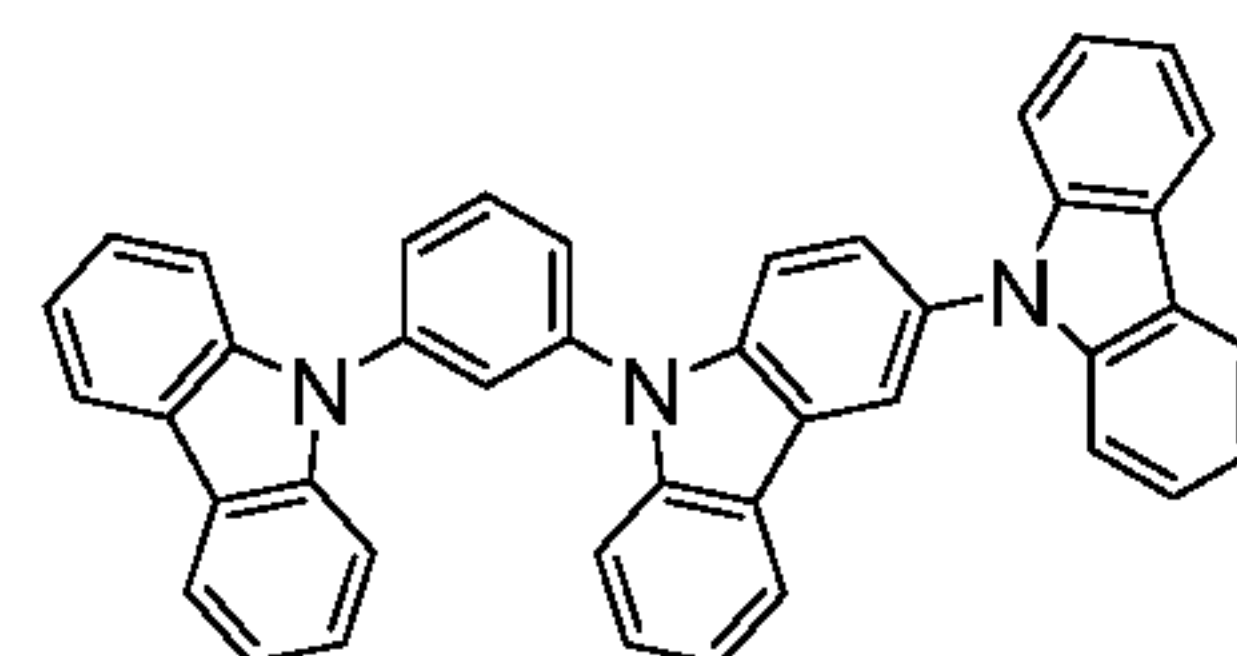
GPH-1



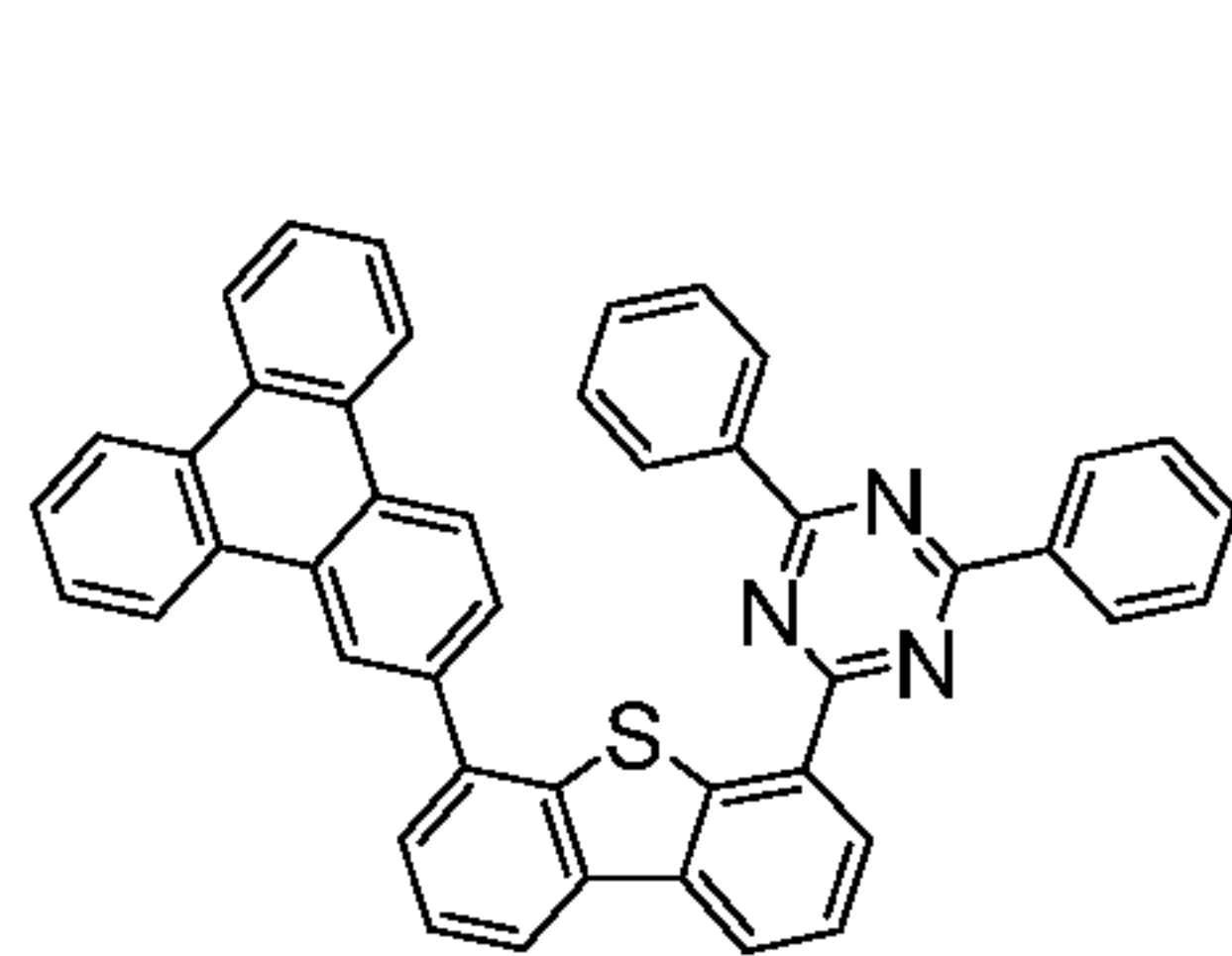
GPH-2



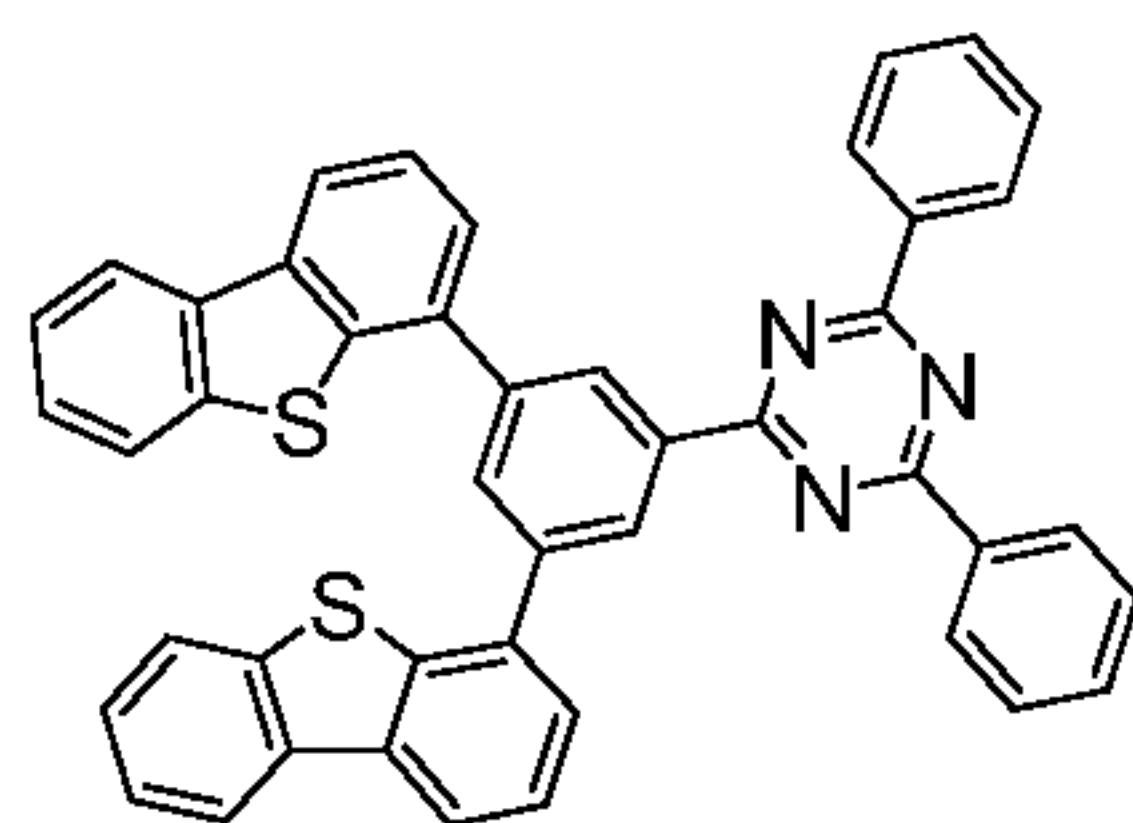
GPH-3



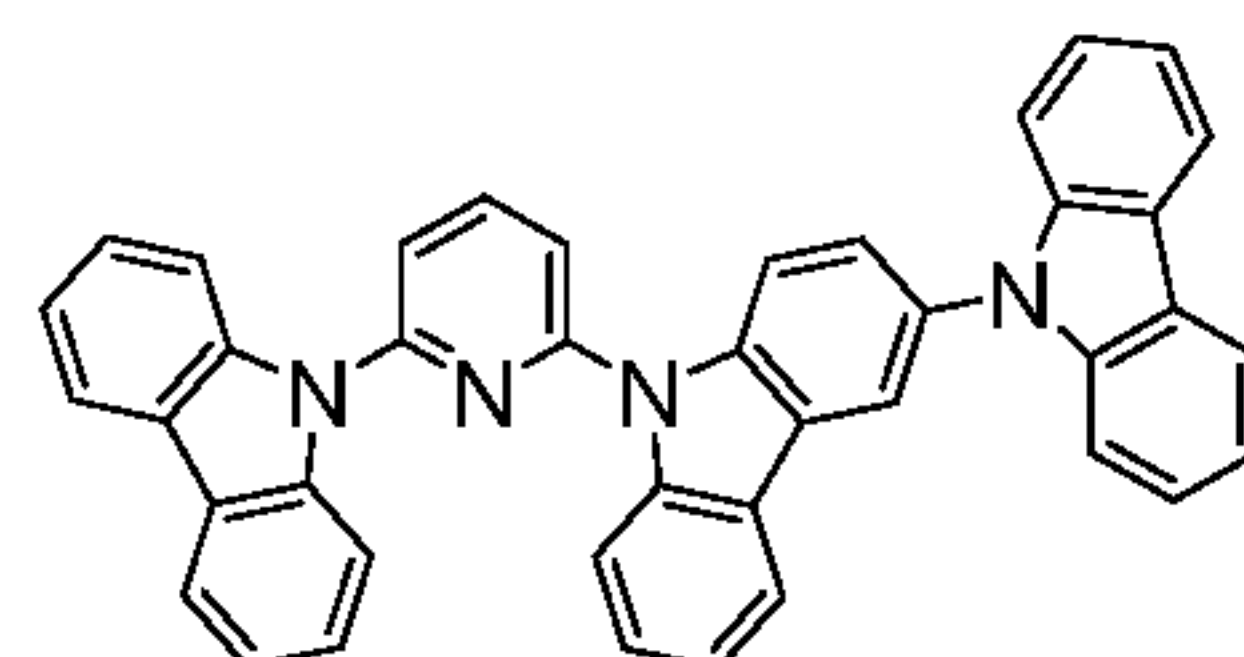
GPH-4



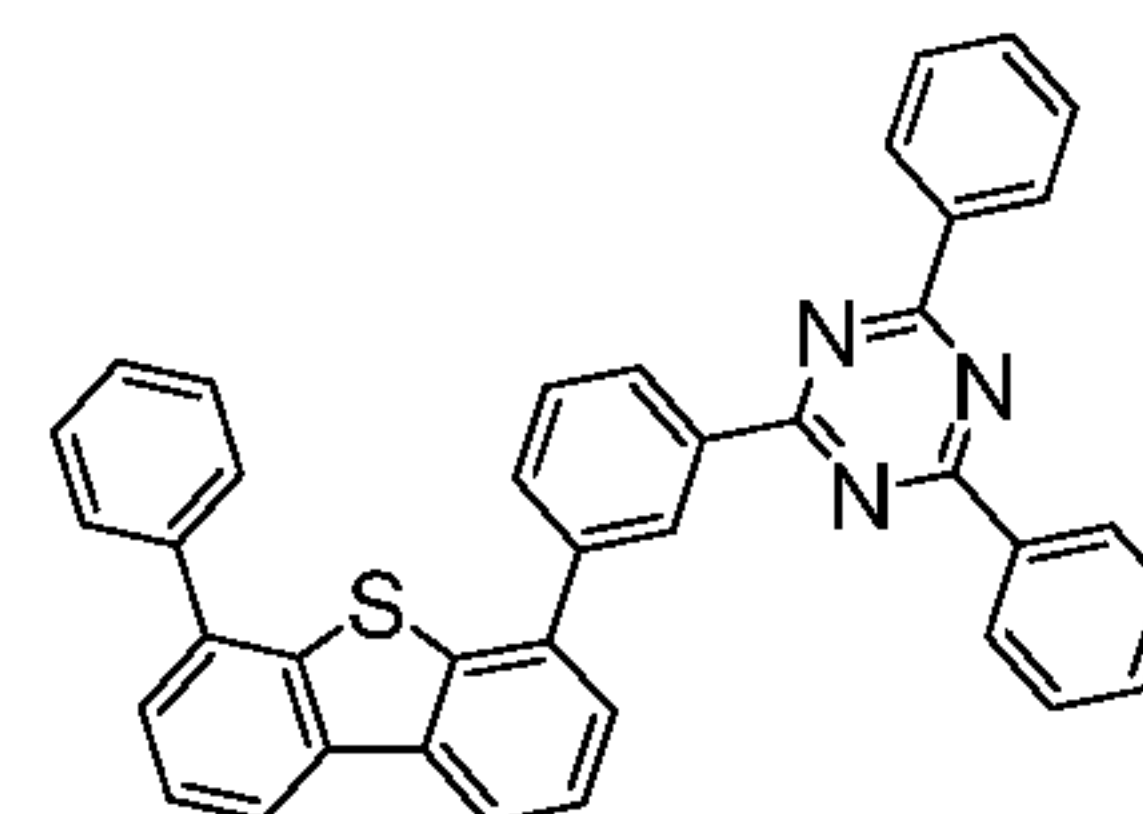
GPH-5



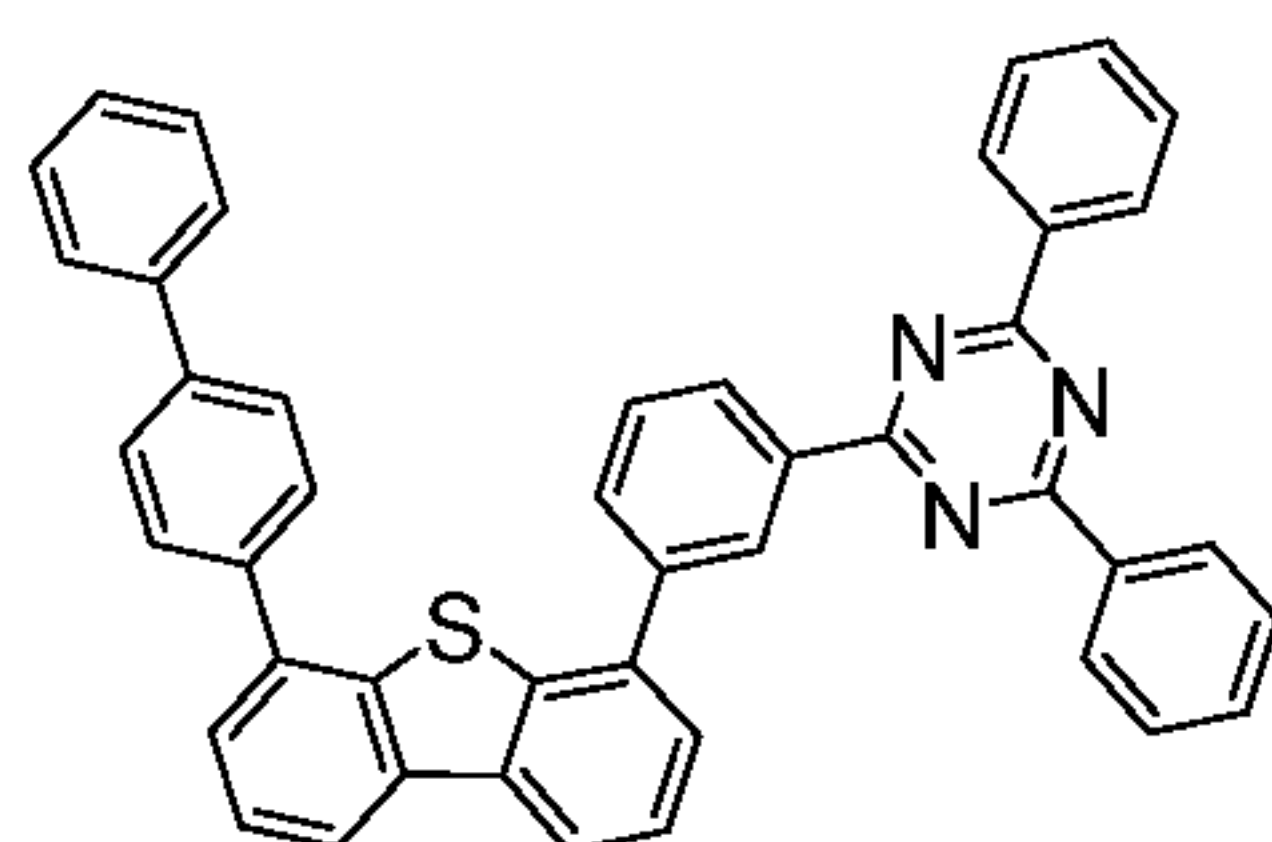
GPH-6



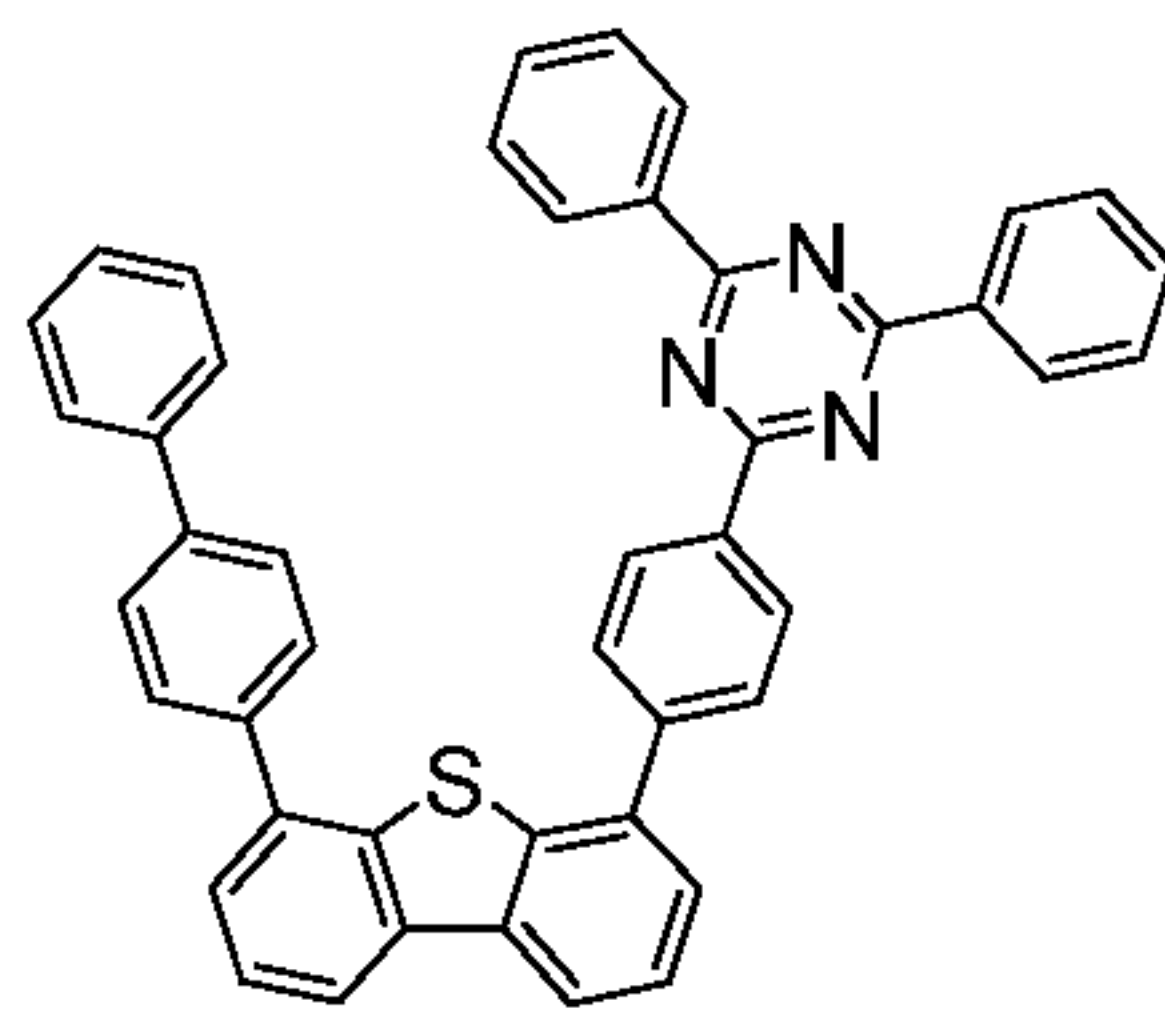
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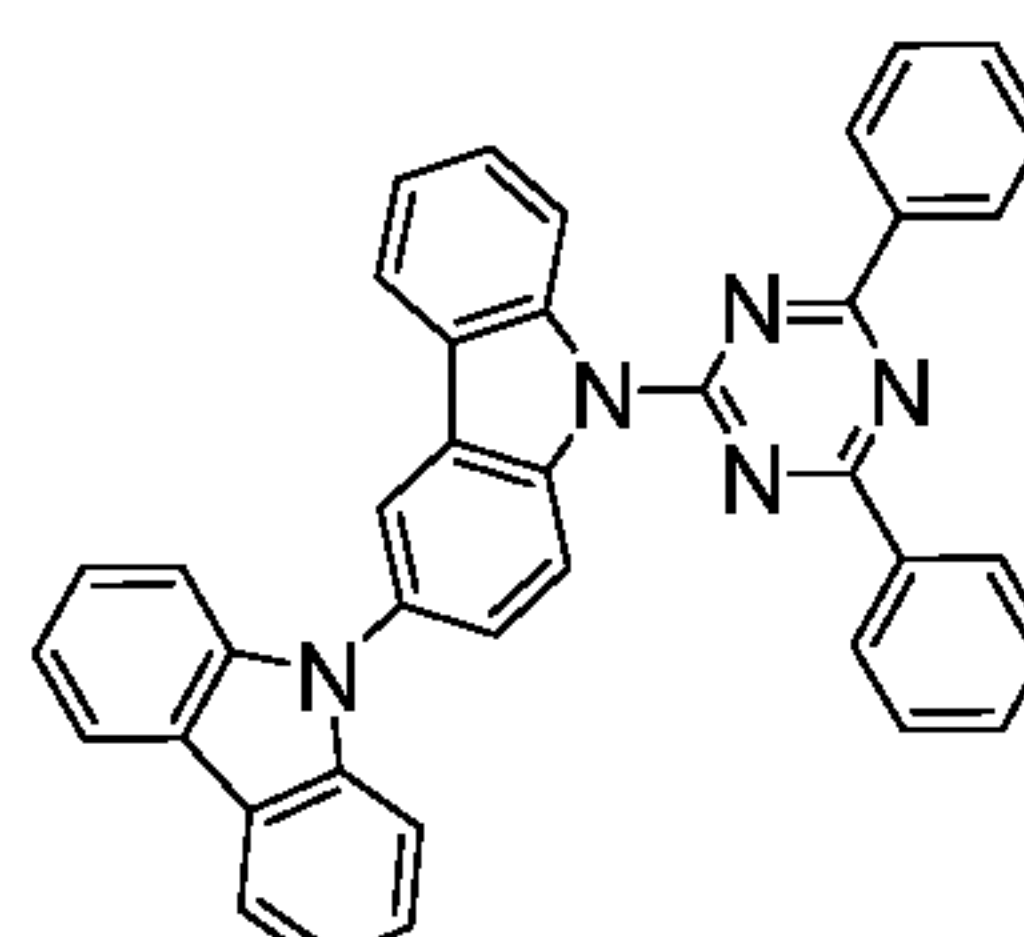
GPH-8



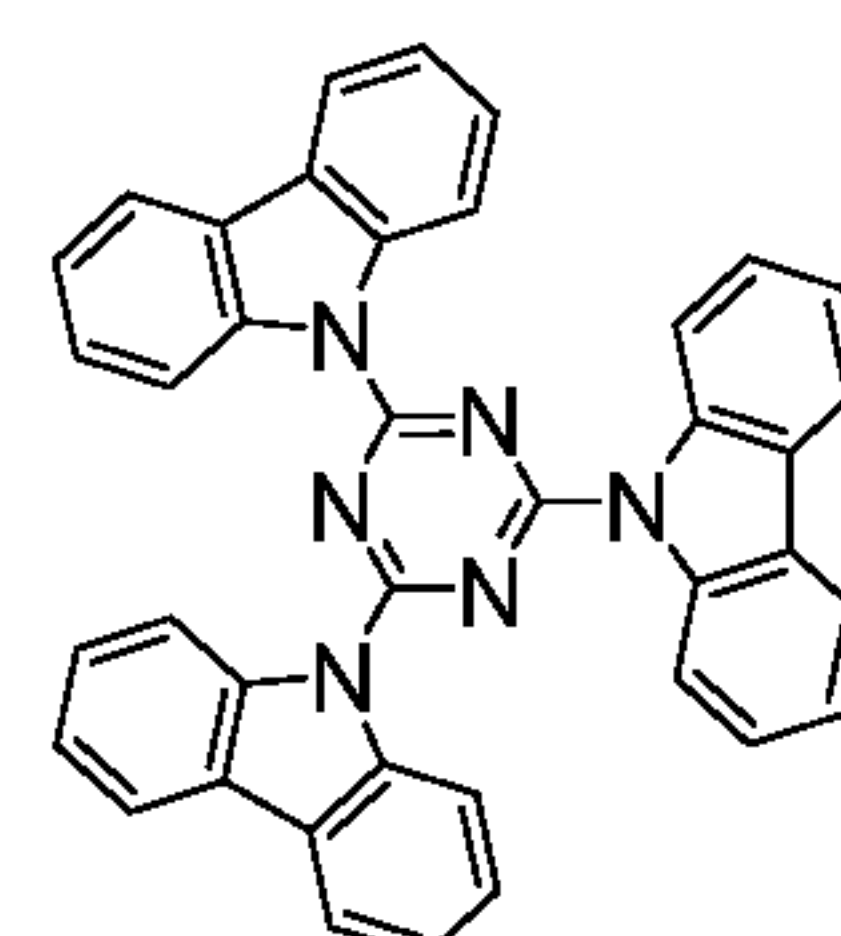
GPH-9



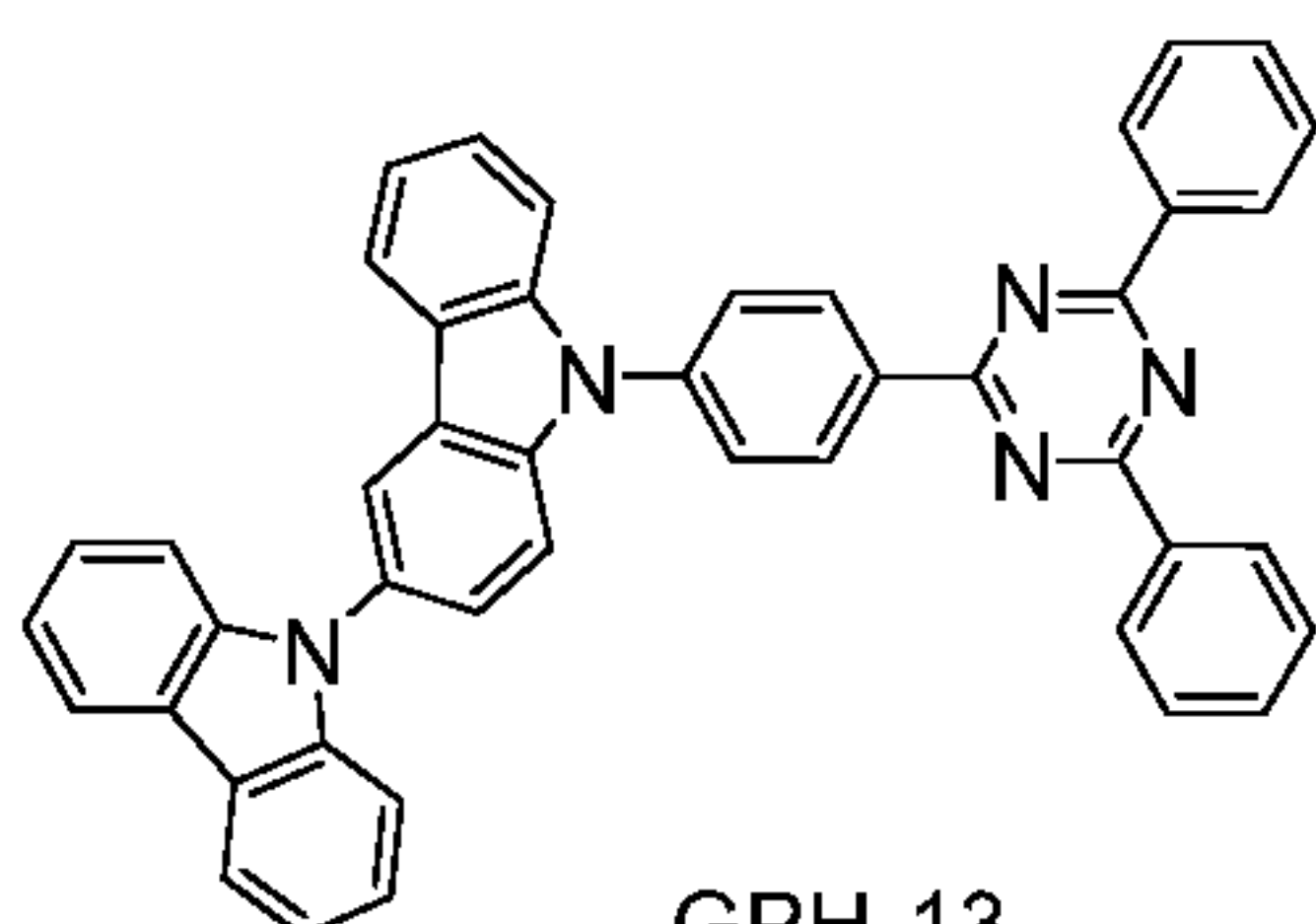
GPH-10



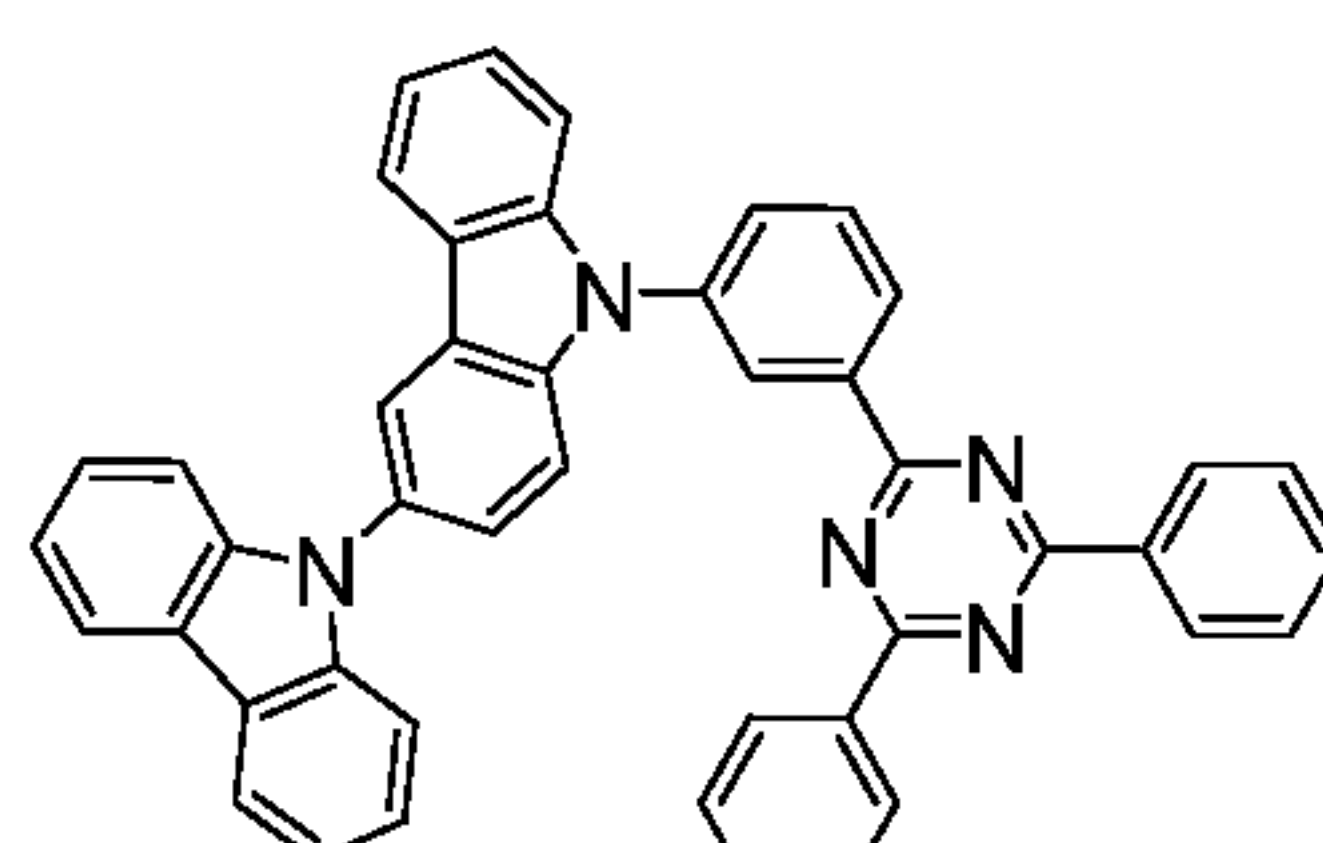
GPH-11



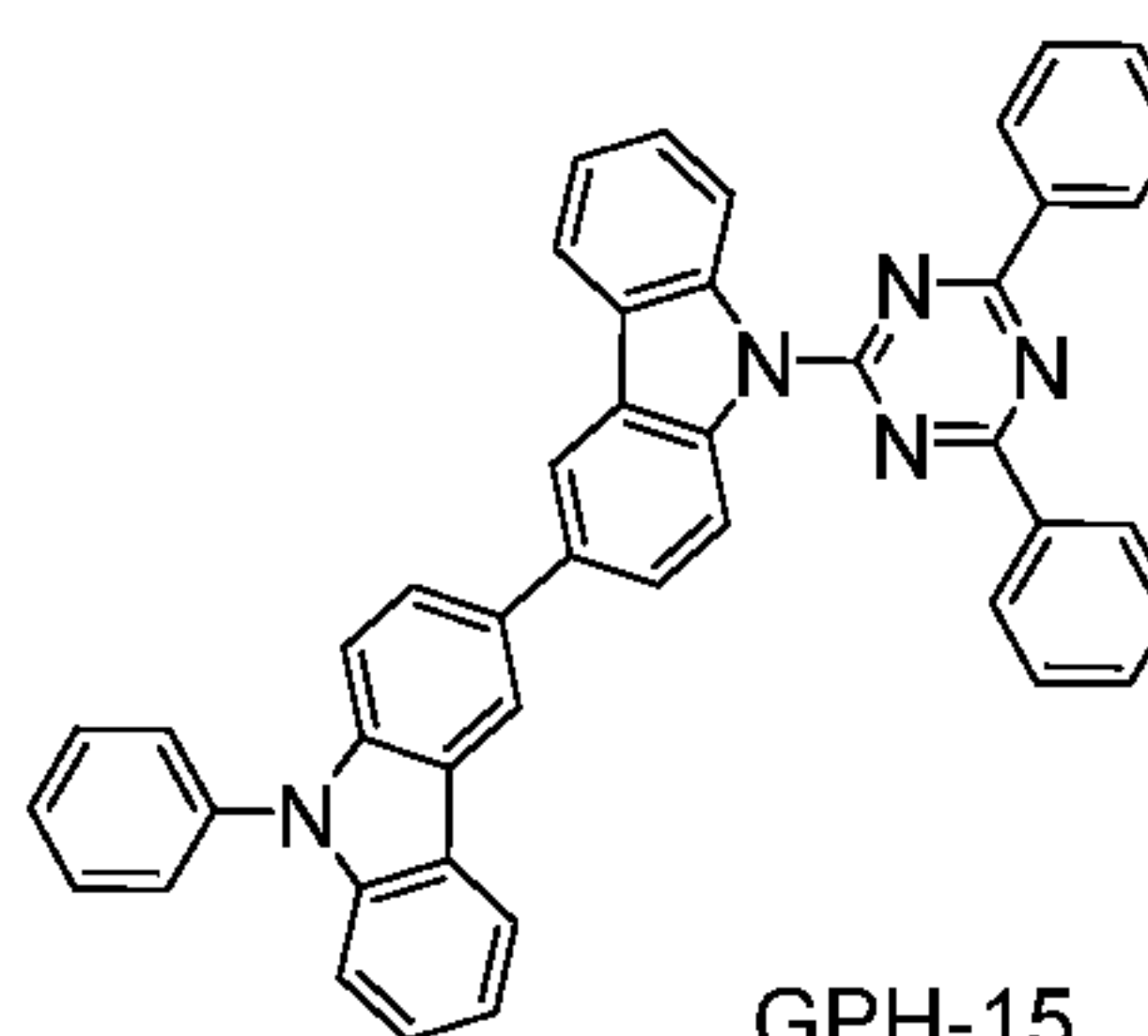
GPH-12



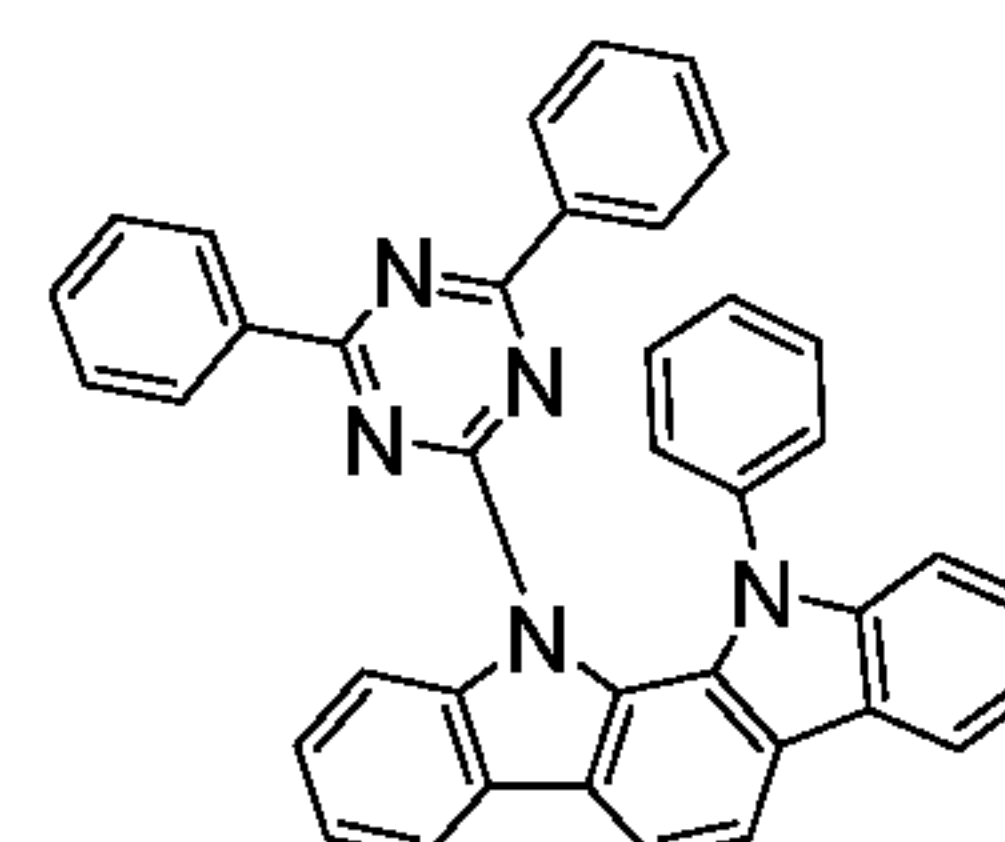
GPH-13



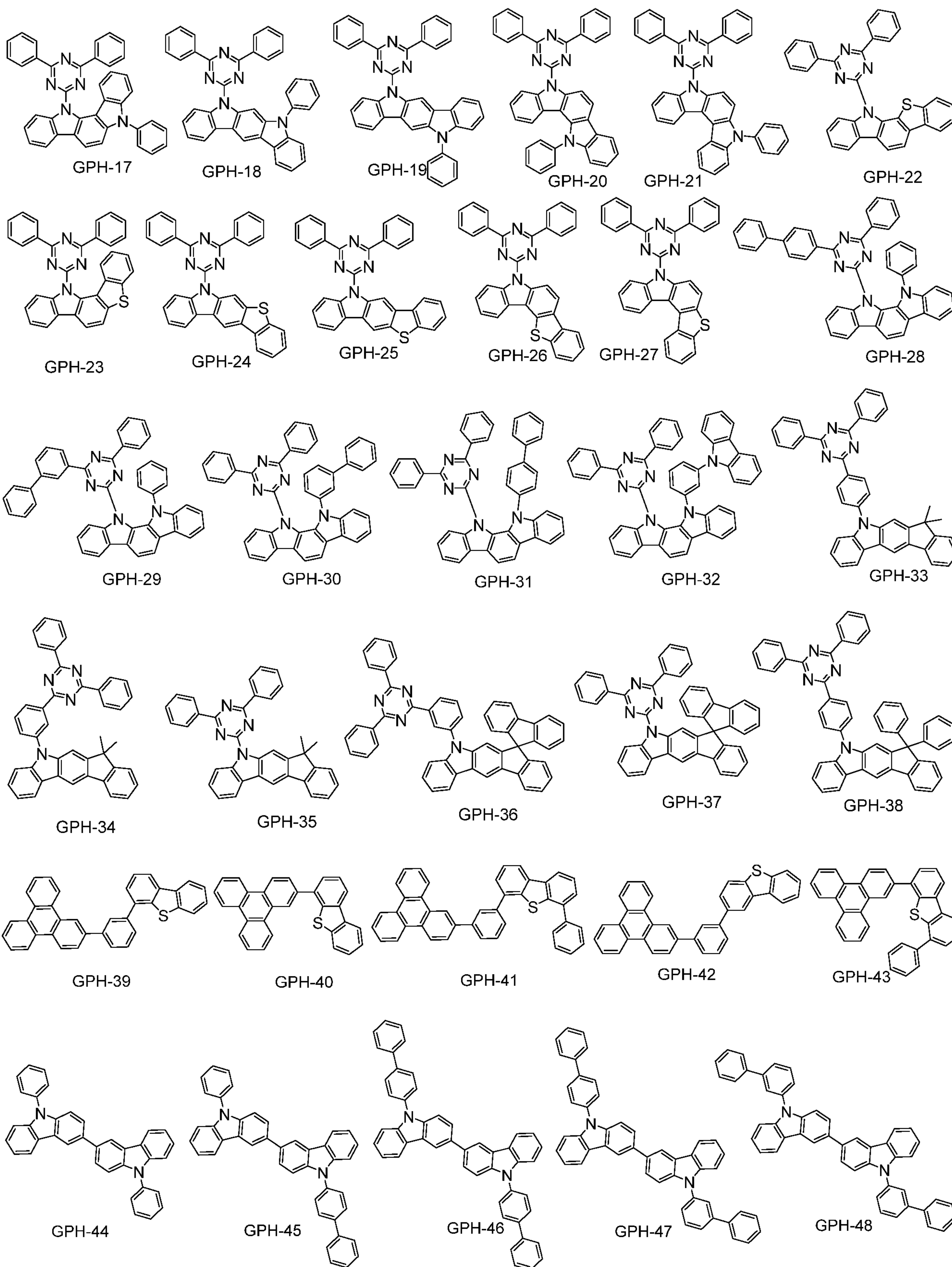
GPH-14

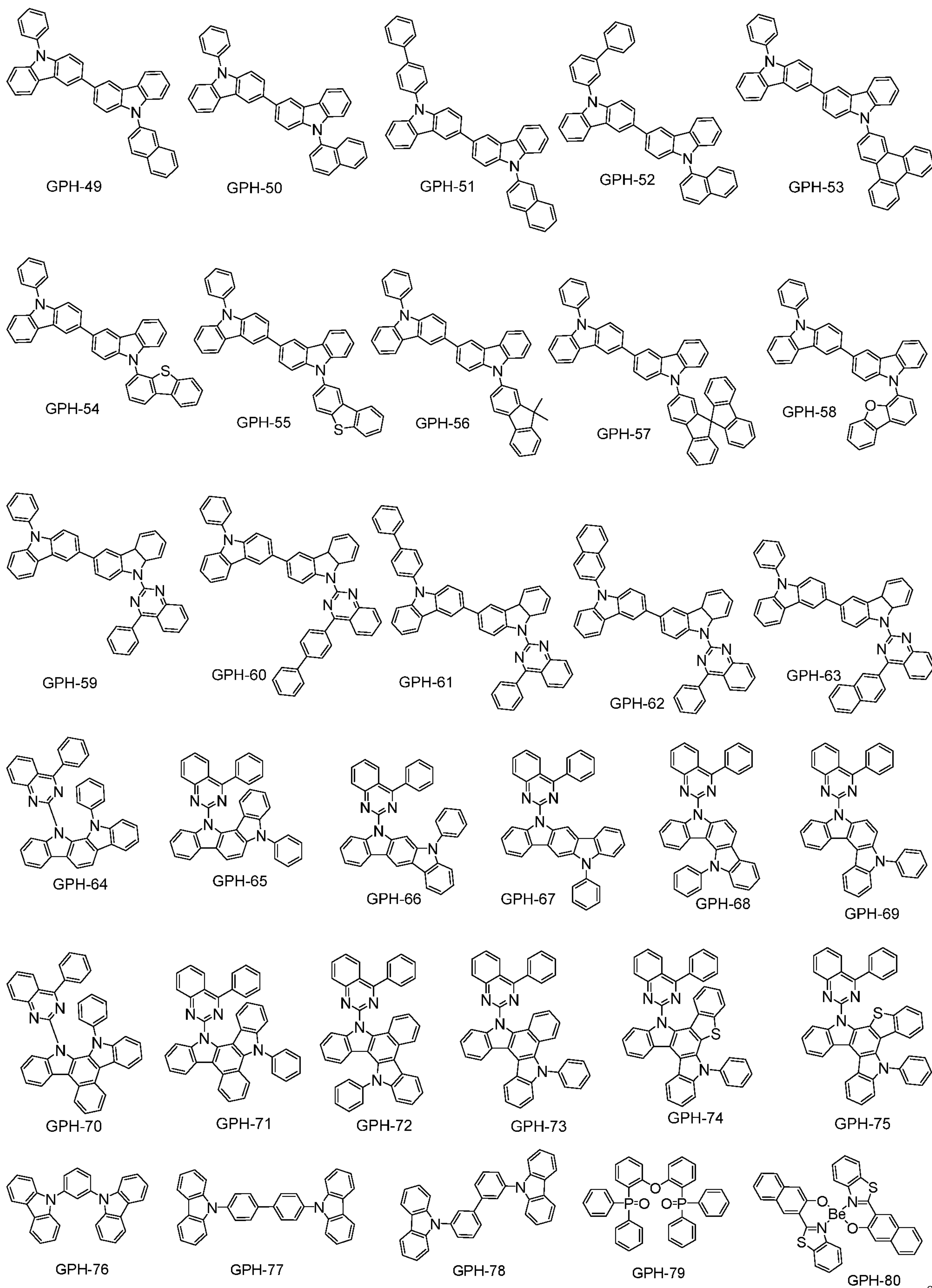


GPH-15



GPH-16





6、根据权利要求 1~5 中任一项所述的有机电致发光器件，其中，所述绿色荧光染料占发光层材料的质量比为 0.1~30%；

和/或，所述热活化延迟荧光敏化剂占发光层材料的质量比为 1~99%。

7、根据权利要求 1~6 中任一项所述的有机电致发光器件，其中，所述热活化延迟荧光敏化剂占发光层材料的质量比为 10~50%。

8、根据权利要求 1~7 中任一项所述的有机电致发光器件，其中，所述有机层还包括空穴注入层、空穴传输层、电子阻挡层、空穴阻挡层、电子传输层和电子注入层中的任意一种或至少两种组合。

9、一种显示面板，其包含权利要求 1~8 中任一项所述的有机电致发光器件。

10、一种显示装置，其含有权利要求 9 所述的显示面板。

CPL 650Å
Mg:Ag(1:9) 130Å
Yb 10Å
ETL 280Å
HBL 50Å
EML 420Å
EBL 350Å
HTL 1100 Å
HTL:HIL 3% 100Å
ITO/Ag/ITO

图 1

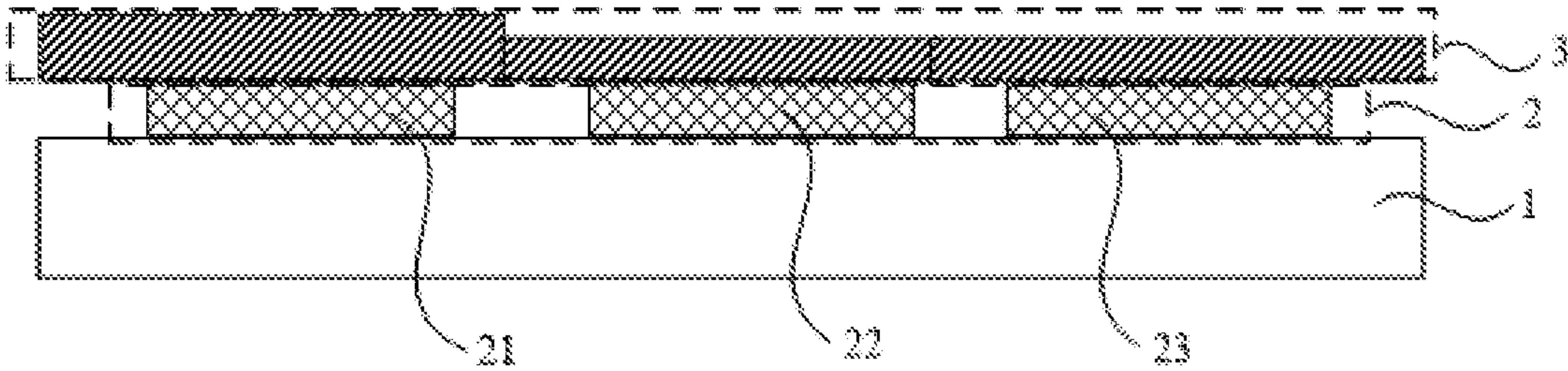


图 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/113190

A. CLASSIFICATION OF SUBJECT MATTER

H01L 51/50(2006.01)i; H01L 51/54(2006.01)i; H01L 27/32(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01L

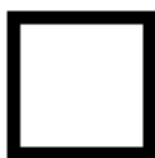
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

CNABS; CNTXT; CNKI; DWPI; SIPOABS: 有机, 电致, 发光, 激活, 延迟, 荧光, 敏化, 绿, 硼, 氮, 共振, organic, electroluminescen+, light, emission, emitting, activat+, delayed, fluorescen+, sensitization, sensibilization, green, boron, nitrogen, resona+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 111029477 A (KUNSHAN GOVISIONOX OPTOELECTRONICS CO., LTD.) 17 April 2020 (2020-04-17) description, paragraphs 0005-0183	1-10
X	CN 110407859 A (TSINGHUA UNIVERSITY) 05 November 2019 (2019-11-05) description, paragraphs 0006-0176	1-10
A	CN 110003208 A (WUHAN CHINA STAR OPTOELECTRONICS SEMICONDUCTOR DISPLAY TECHNOLOGY CO., LTD.) 12 July 2019 (2019-07-12) entire document	1-10
A	US 2019341571 A1 (CYNORA GMBH) 07 November 2019 (2019-11-07) entire document	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
“A” document defining the general state of the art which is not considered to be of particular relevance	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search

24 November 2020

Date of mailing of the international search report

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Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/113190

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	111029477	A	17 April 2020	None			
CN	110407859	A	05 November 2019	None			
CN	110003208	A	12 July 2019	None			
US	2019341571	A1	07 November 2019	KR	20190127581	A	13 November 2019
				EP	3565018	A1	06 November 2019
				JP	2019204947	A	28 November 2019
				TW	201947010	A	16 December 2019

国际检索报告		国际申请号 PCT/CN2020/113190
A. 主题的分类 H01L 51/50(2006.01)i; H01L 51/54(2006.01)i; H01L 27/32(2006.01)i 按照国际专利分类(IPC)或者同时按照国家分类和IPC两种分类		
B. 检索领域 检索的最低限度文献(标明分类系统和分类号) H01L 包含在检索领域中的除最低限度文献以外的检索文献 在国际检索时查阅的电子数据库(数据库的名称, 和使用的检索词(如使用)) CNABS;CNTXT;CNKI;DWPI;SIPOABS:有机, 电致, 发光, 激活, 延迟, 荧光, 敏化, 绿, 硼, 氮, 共振, organic, electroluminescent+, light, emission, emitting, activat+, delayed, fluorescen+, sensitization, sensibilization, green, boron, nitrogen, resona+		
C. 相关文件		
类 型*	引用文件, 必要时, 指明相关段落	相关的权利要求
PX	CN 111029477 A (昆山国显光电有限公司) 2020年 4月 17日 (2020 - 04 - 17) 说明书第0005-0183段	1-10
X	CN 110407859 A (清华大学) 2019年 11月 5日 (2019 - 11 - 05) 说明书第0006-0176段	1-10
A	CN 110003208 A (武汉华星光电半导体显示技术有限公司) 2019年 7月 12日 (2019 - 07 - 12) 全文	1-10
A	US 2019341571 A1 (CYNORA GMBH) 2019年 11月 7日 (2019 - 11 - 07) 全文	1-10
☐ 其余文件在C栏的续页中列出。 ☒ 见同族专利附件。		
* 引用文件的具体类型: “A” 认为不特别相关的表示了现有技术一般状态的文件 “E” 在国际申请日的当天或之后公布的在先申请或专利 “L” 可能对优先权要求构成怀疑的文件, 或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件(如具体说明的) “O” 涉及口头公开、使用、展览或其他方式公开的文件 “P” 公布日先于国际申请日但迟于所要求的优先权日的文件 “T” 在申请日或优先权日之后公布, 与申请不相抵触, 但为了解发明之理论或原理的在后文件 “X” 特别相关的文件, 单独考虑该文件, 认定要求保护的发明不是新颖的或不具有创造性 “Y” 特别相关的文件, 当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时, 要求保护的发明不具有创造性 “&” 同族专利的文件		
国际检索实际完成的日期 2020年 11月 24日		国际检索报告邮寄日期 2020年 12月 3日
ISA/CN的名称和邮寄地址 中国国家知识产权局(ISA/CN) 中国北京市海淀区蓟门桥西土城路6号 100088 传真号 (86-10)62019451		授权官员 刘颖洁 电话号码 86-010-62089869

国际检索报告
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国际申请号
PCT/CN2020/113190

检索报告引用的专利文件			公布日 (年/月/日)	同族专利			公布日 (年/月/日)
CN	111029477	A	2020年 4月 17日	无			
CN	110407859	A	2019年 11月 5日	无			
CN	110003208	A	2019年 7月 12日	无			
US	2019341571	A1	2019年 11月 7日	KR	20190127581	A	2019年 11月 13日
				EP	3565018	A1	2019年 11月 6日
				JP	2019204947	A	2019年 11月 28日
				TW	201947010	A	2019年 12月 16日

PCT/ISA/210 表(同族专利附件) (2015年1月)