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(71)申请人 吉林奥来德光电材料股份有限公司

地址 130000 吉林省长春市高新开发区繁荣路5299号

(72)发明人 王辉 赵贺 毕岩 孙峰 李明
李文军 马晓宇

(74)专利代理机构 北京集佳知识产权代理有限公司 11227

代理人 赵青朵

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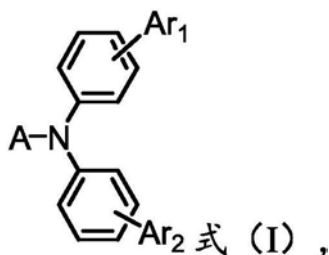
(54)发明名称

一种化合物的应用

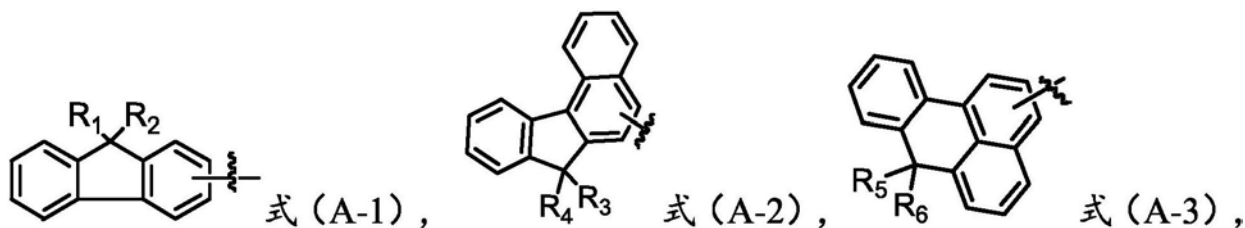
(57)摘要

本发明提供了一种化合物的应用,本发明提供的式(I)所示的化合物作为CPL层在制备有机电致发光器件后,可有效提高器件的光取出效率。

1. 一种式 (I) 所示的化合物作为CPL层在制备有机电致发光器件中的应用,



其中,所述Ar₁、Ar₂独立的选自氢、C1~C8的烷基、C6~C25的芳基或C2~C20的杂芳基;
所述A为式 (A-1)、式 (A-2) 或式 (A-3),



所述R₁、R₂、R₃、R₄、R₅、R₆独立的选自氢、C1~C3的烷基或C6~C10的芳基,
或者所述R₁和R₂与其所在的碳形成C10~C20的稠环基。

2. 根据权利要求1所述的应用,其特征在于,所述Ar₁选自氢、C1~C5的烷基、苯基、C1~C5烷基取代的苯基、C10~20的稠环芳基或C3~C15的含氮杂芳基。

3. 根据权利要求1所述的应用,其特征在于,所述Ar₂选自氢、C1~C5的烷基、苯基、C1~C5的烷基取代的苯基、C10~20的稠环芳基或C3~C15的含氮杂芳基。

4. 根据权利要求1所述的应用,其特征在于,所述Ar₁选自氢、甲基、乙基、丙基、正丁基、叔丁基、戊基、三氟甲基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基、4-甲基苯基、3,5-二甲基苯基、吡啶基、哒嗪基、吡嗪基、三嗪基或吡啶基。

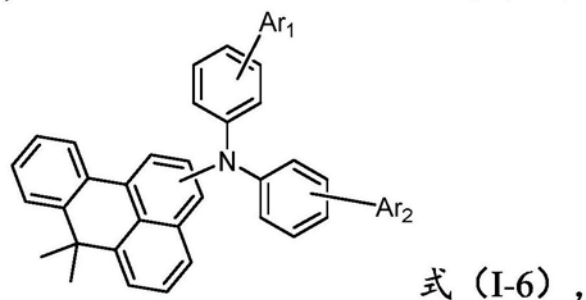
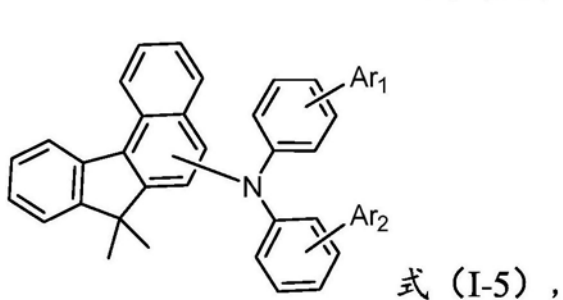
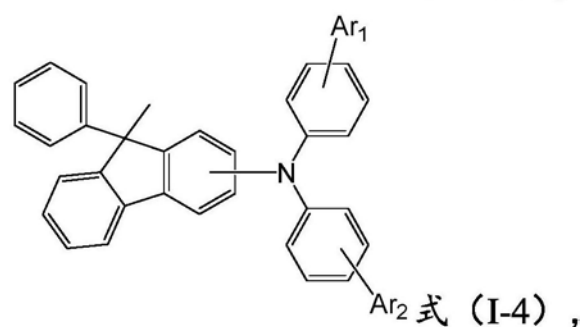
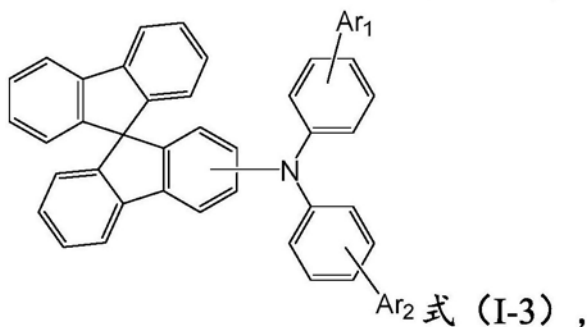
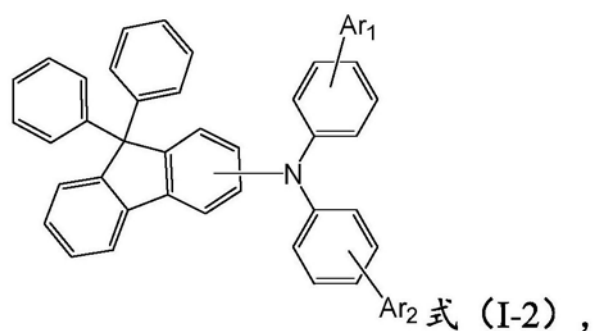
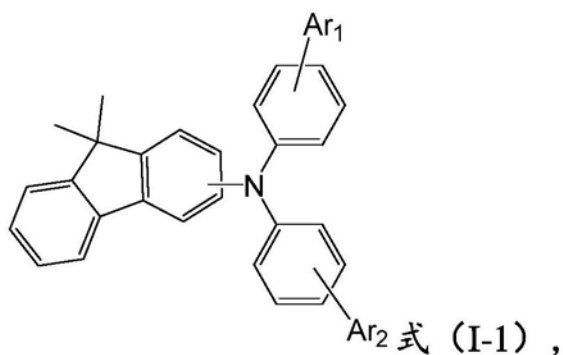
5. 根据权利要求1所述的应用,其特征在于,所述Ar₂选自氢、甲基、乙基、丙基、正丁基、叔丁基、戊基、三氟甲基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基、4-甲基苯基、3,5-二甲基苯基、吡啶基、哒嗪基、吡嗪基、三嗪基或吡啶基。

6. 根据权利要求1所述的应用,其特征在于,所述R₁、R₂独立的选自氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基;

或者所述R₁和R₂与其所在的碳形成茚基。

7. 根据权利要求1所述的应用,其特征在于,所述R₃、R₄、R₅、R₆独立的选自氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基。

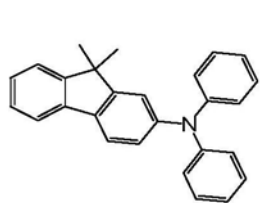
8. 根据权利要求1所述的应用,其特征在于,所述式 (I) 所示的化合物为式 (I-1)、式 (I-2)、式 (I-3)、式 (I-4)、式 (I-5) 或式 (I-6),



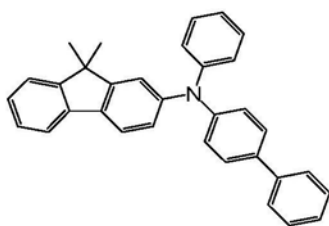
其中,所述Ar₁、Ar₂独立的选自氢、C₁~C₈的烷基、C₆~C₂₅的芳基或C₂~C₂₀的杂芳基。

9. 根据权利要求1所述的应用,其特征在于,所述式(I)所示的化合物为式(001)、式(002)、式(003)、式(004)、式(005)、式(006)、式(007)、式(008)、式(009)、式(010)、式(011)、式(012)、式(013)、式(014)、式(015)、式(016)、式(017)、式(018)、式(019)、式(020)、式(021)、式(022)、式(023)、式(024)、式(025)、式(026)、式(027)、式(028)、式(029)、式(030)、式(031)、式(032)、式(033)、式(034)、式(035)、式(036)、式(037)、式(038)、式(039)、式(040)、式(041)、式(042)、式(043)、式(044)、式(045)、式(046)、式(047)、式(048)、式(049)、式(050)、式(051)、式(052)、式(053)、式(054)、式(055)、式(056)、式(057)、式(058)、式(059)、式(060)、式(061)、式(062)、式(063)、式(064)、式(065)、式(066)、式(067)、式(068)、式(069)、式(070)、式(071)、式(072)、式(073)、式(074)、式(075)、式(076)、式(077)、式(078)、式(079)、式(080)、式(081)、式(082)、式(083)、式(084)、式(085)、式(086)、式(087)、式(088)、式(089)、式(090)、式(091)、式(092)、式(093)、式(094)、式(095)、式(096)、式(097)、式(098)、式(099)、式(100)、式(101)、式(102)、式(103)、式(104)、式(105)、式(106)、式(107)、式(108)、式(109)、式(110)、式(111)、式(112)、式(113)、式(114)、式(115)、式(116)、式(117)、式(118)、式(119)、式(120)、式(121)、式(122)、式(123)、式(124)、式(125)、式(126)、式(127)、式(128)、式(129)、式(130)、式(131)、式(132)、式(133)、式(134)、式(135)、式(136)、式(137)、式(138)、式(139)、式(140)、式(141)、式(142)、式(143)、式(144)、式(145)、式

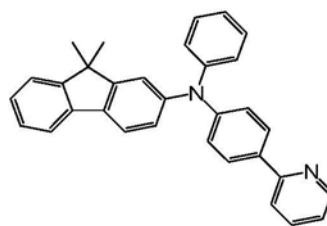
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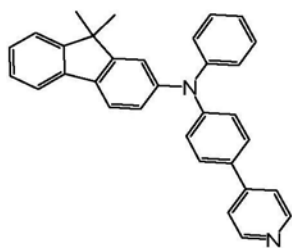
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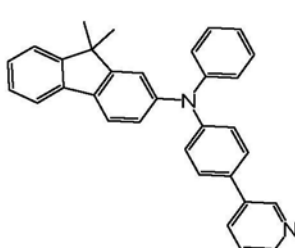
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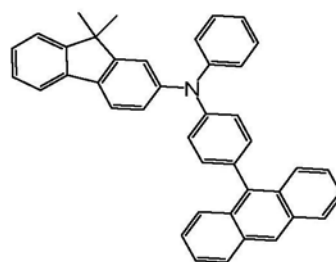
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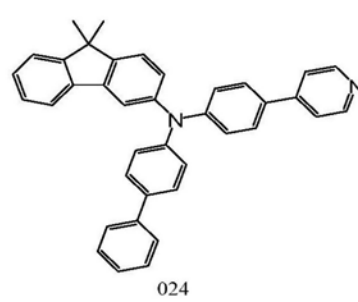
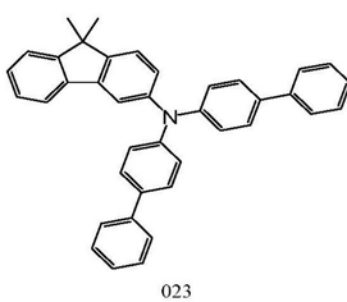
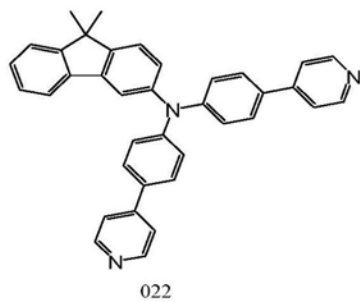
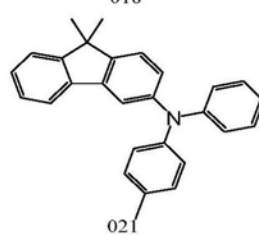
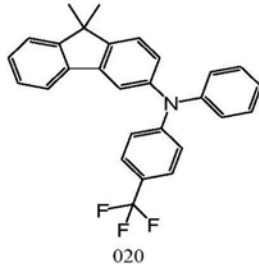
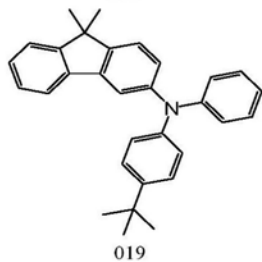
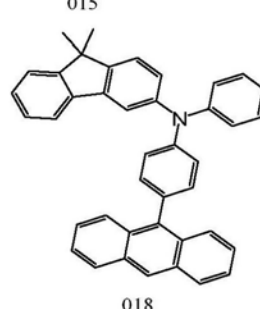
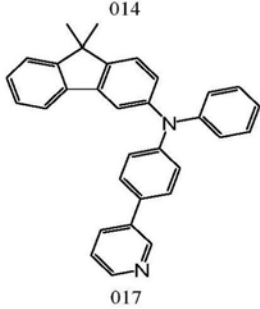
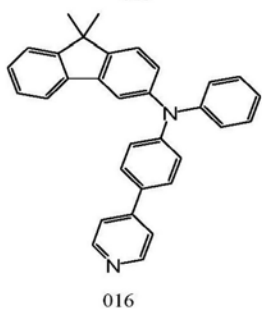
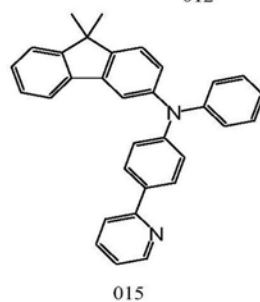
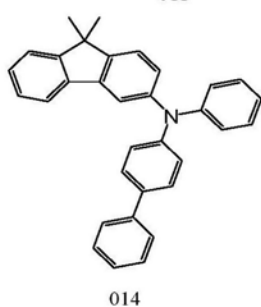
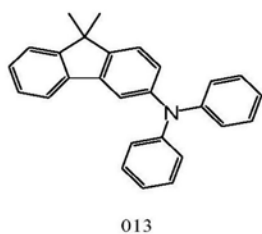
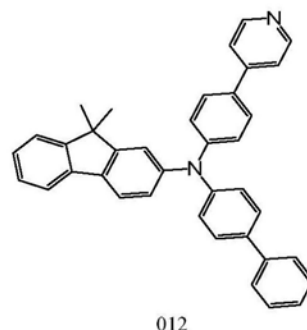
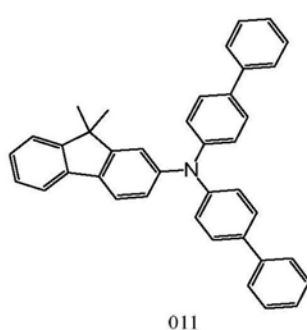
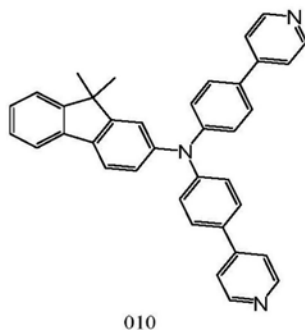
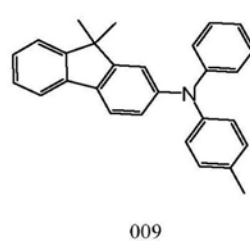
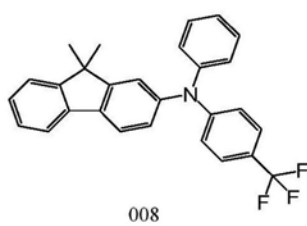
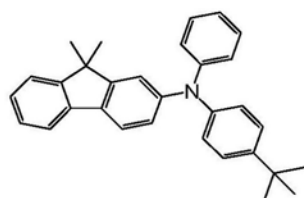
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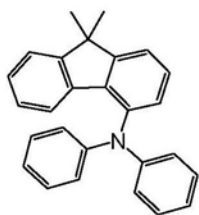


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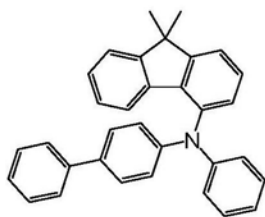


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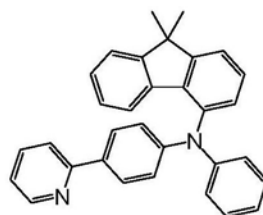




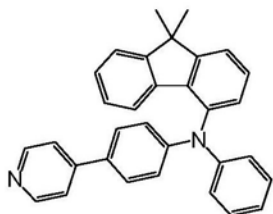
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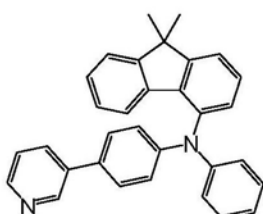
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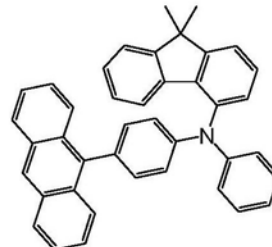
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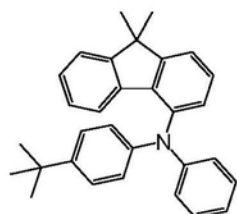
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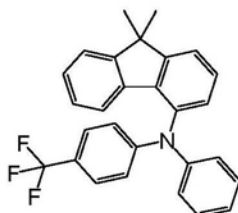
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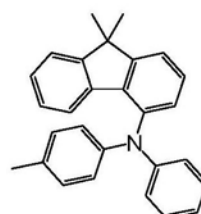
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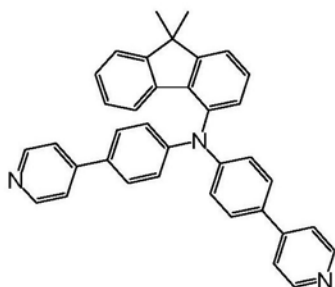
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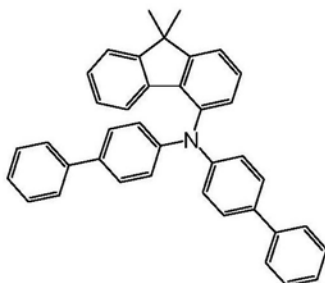
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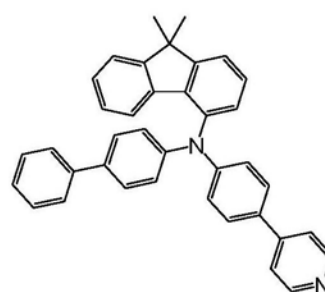
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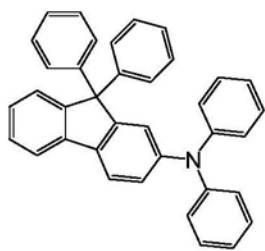
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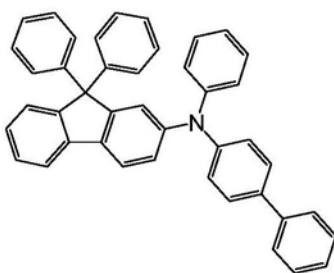
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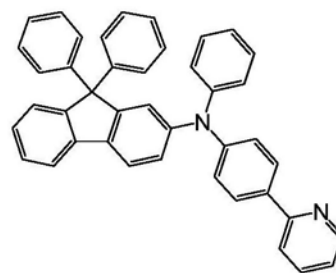
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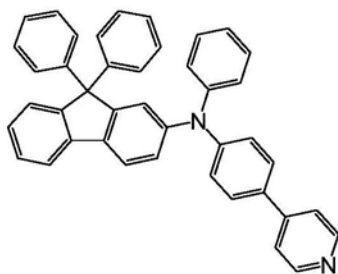
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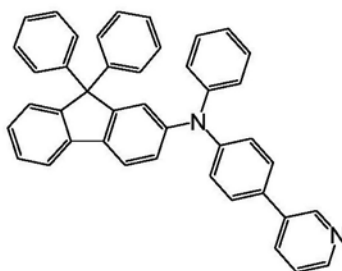
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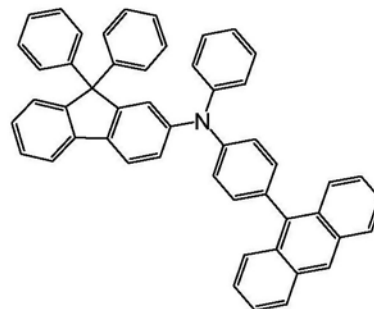
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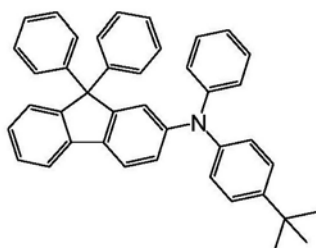
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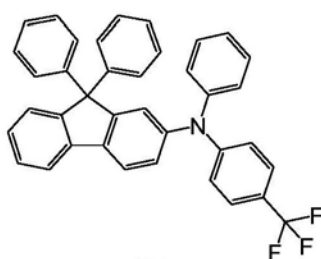
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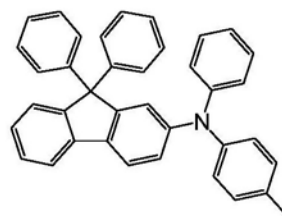
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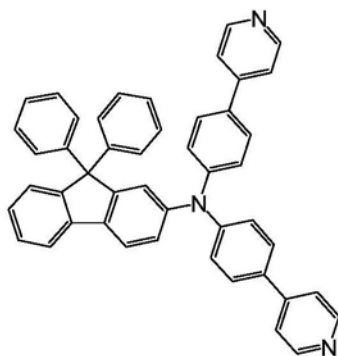
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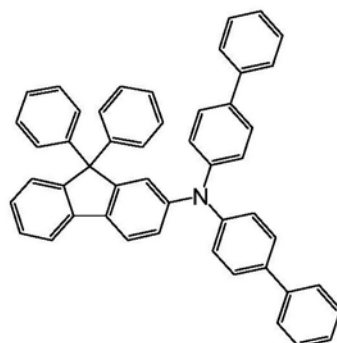
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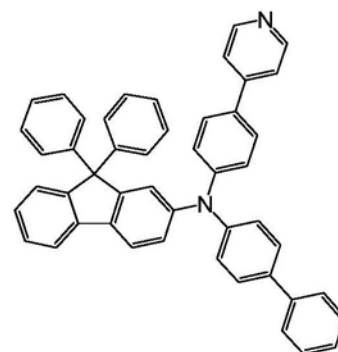
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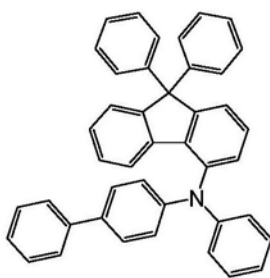
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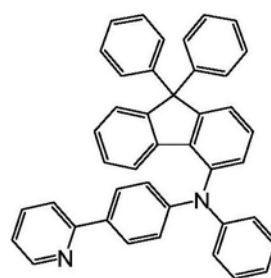
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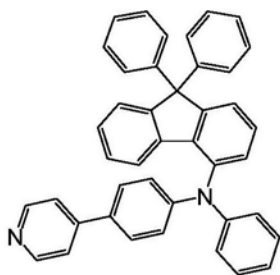
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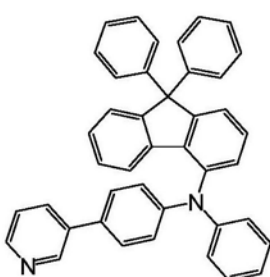
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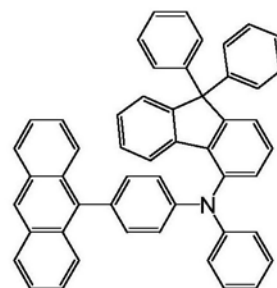
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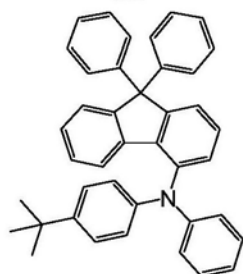
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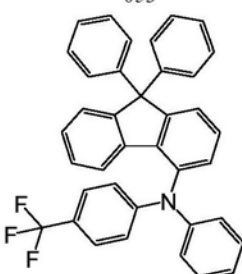
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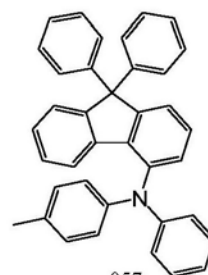
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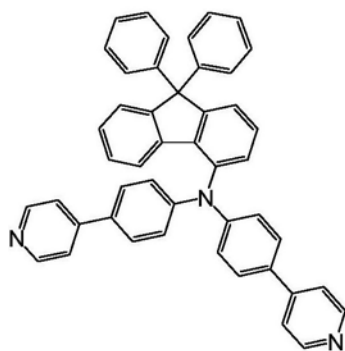
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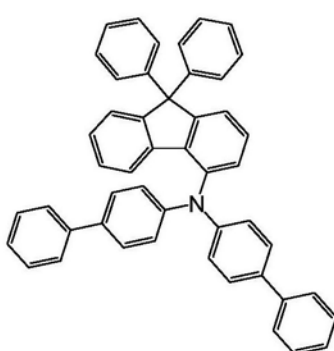
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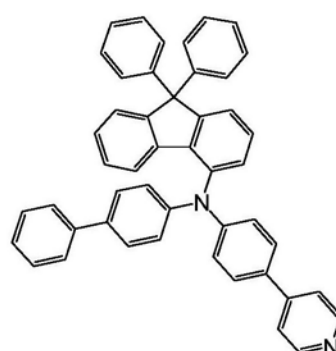
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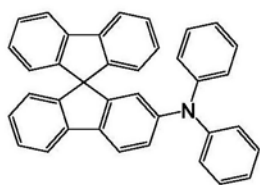
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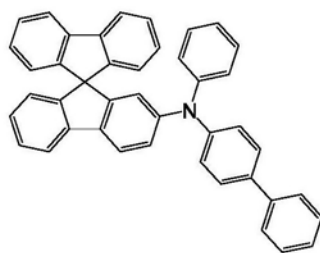
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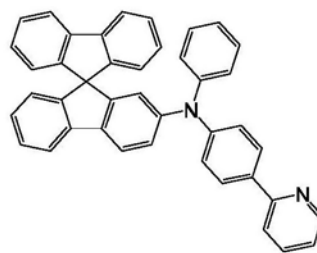
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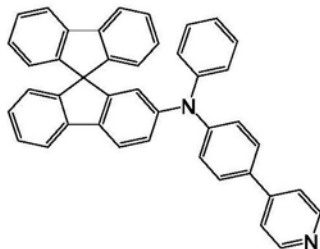
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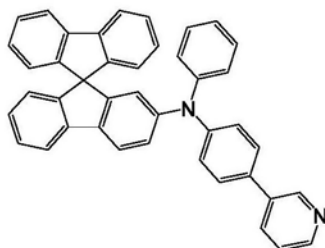
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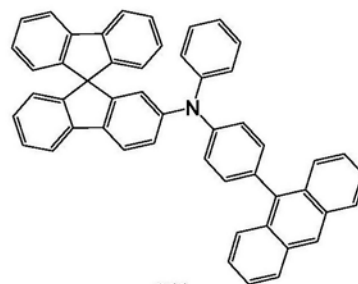
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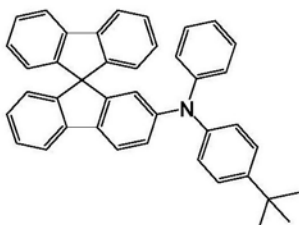
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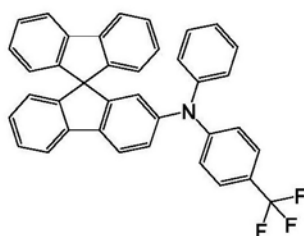
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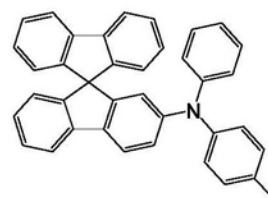
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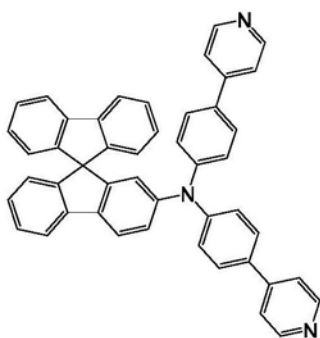
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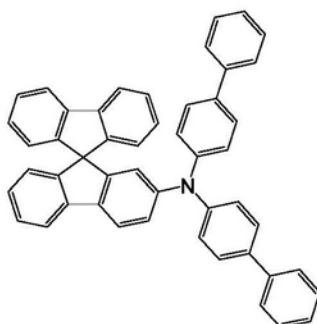
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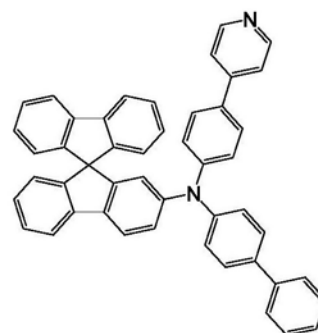
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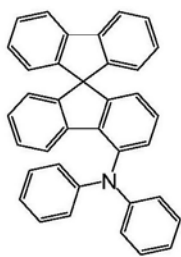
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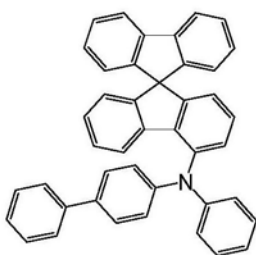
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072



073



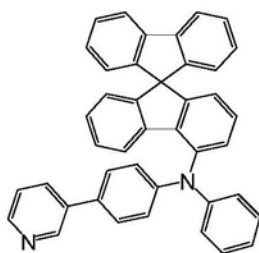
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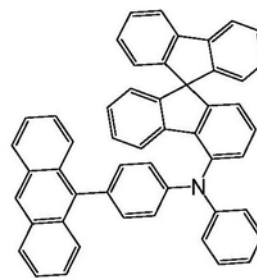
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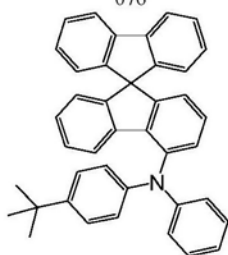
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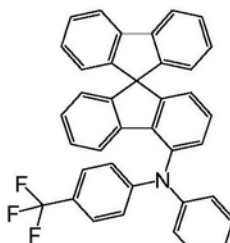
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078



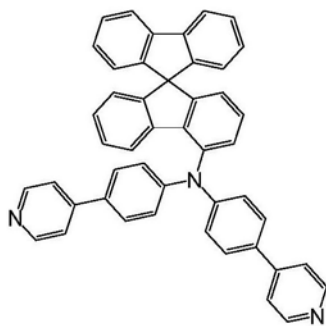
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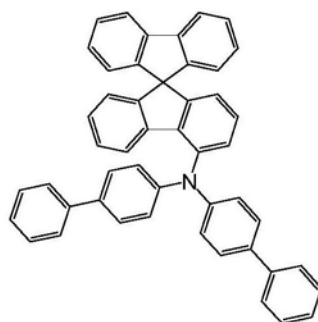
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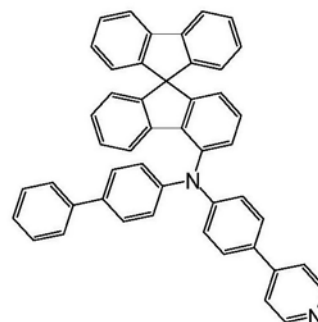
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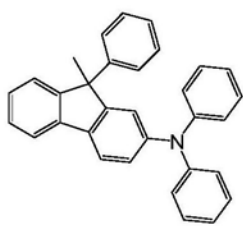
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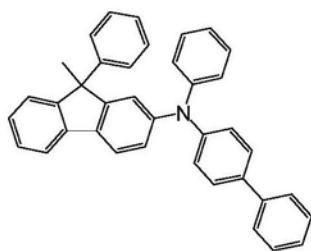
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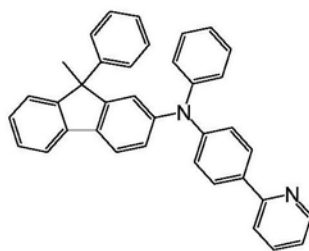
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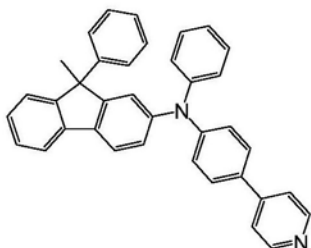
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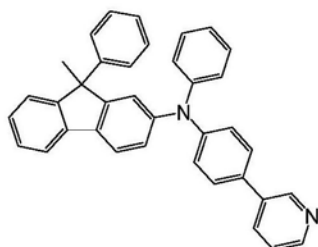
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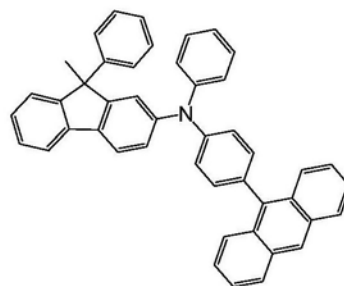
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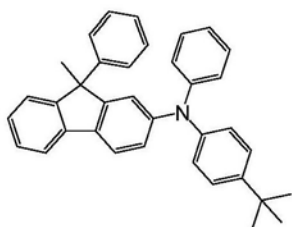
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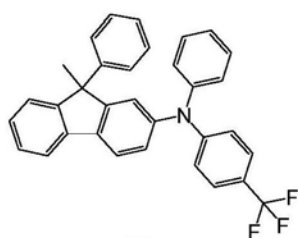
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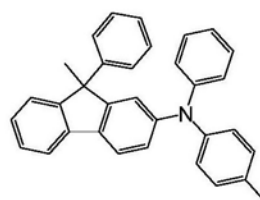
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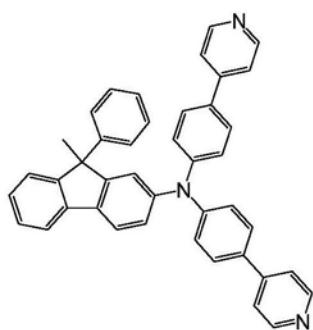
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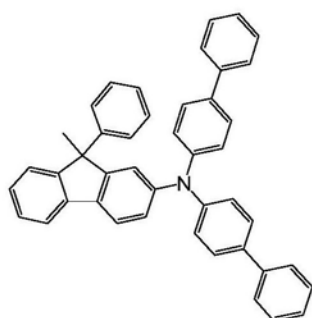
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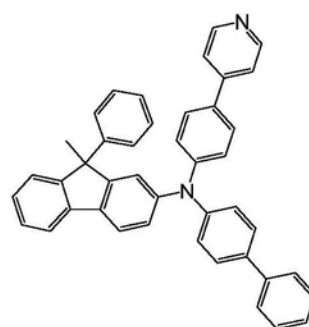
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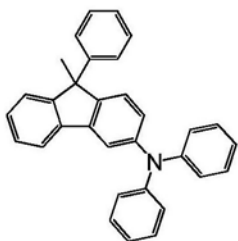
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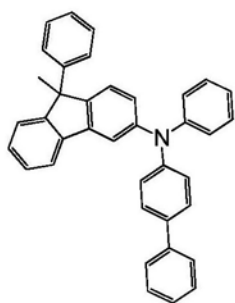
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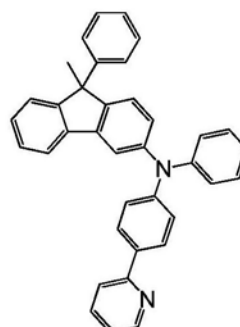
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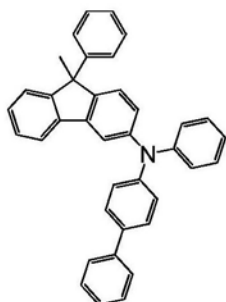
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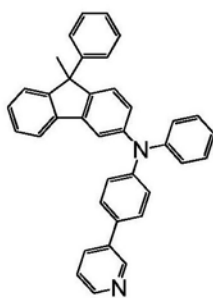
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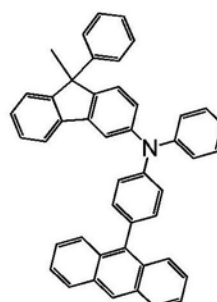
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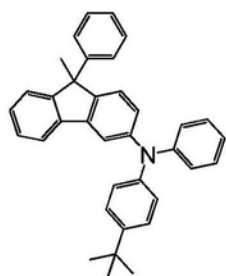
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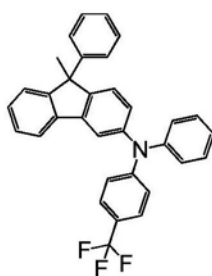
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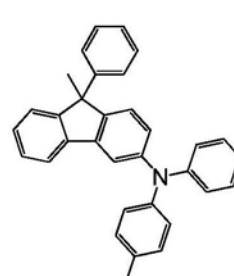
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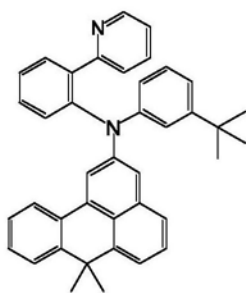
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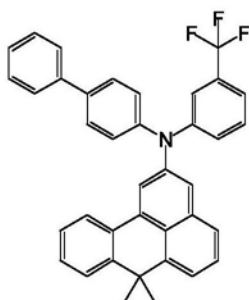
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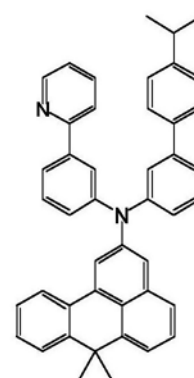
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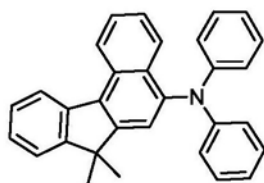
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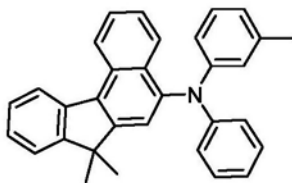
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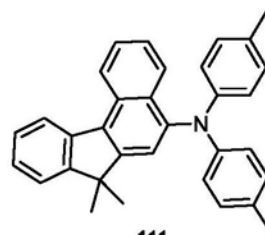
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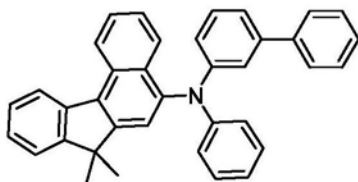
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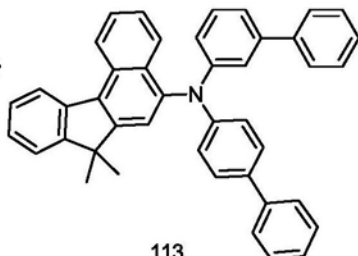
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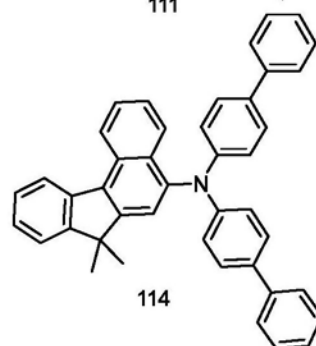
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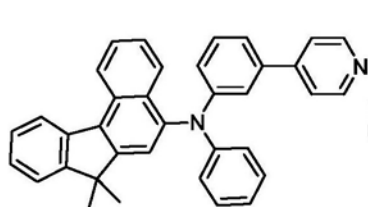
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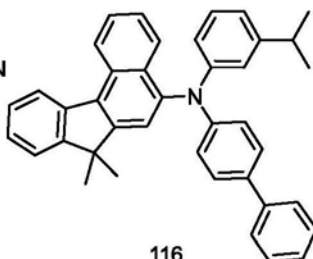
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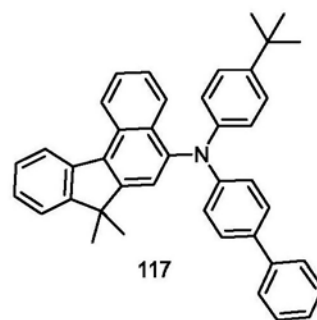
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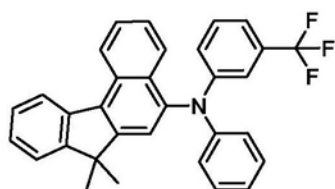
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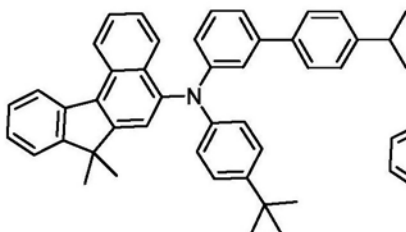
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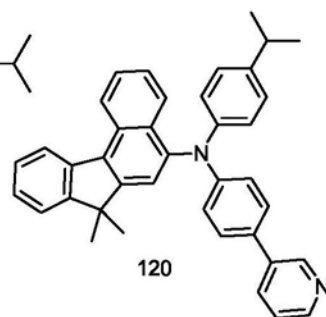
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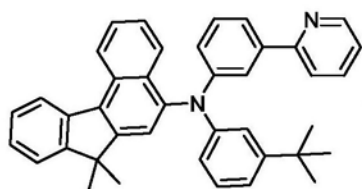
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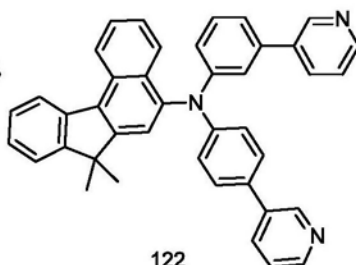
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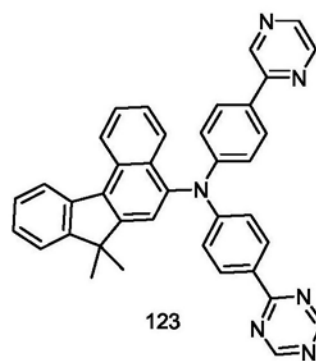
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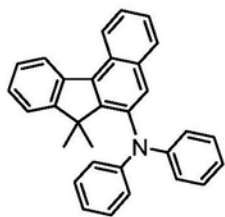
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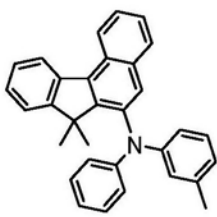
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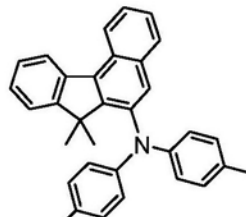
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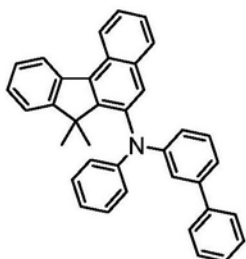
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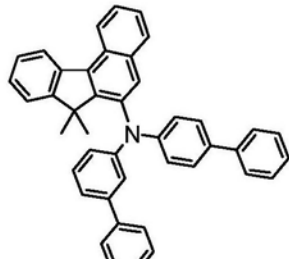
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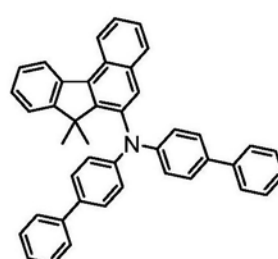
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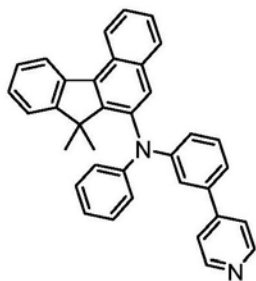
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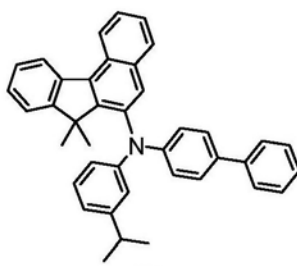
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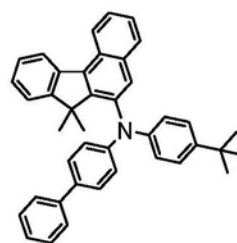
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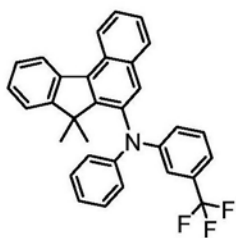
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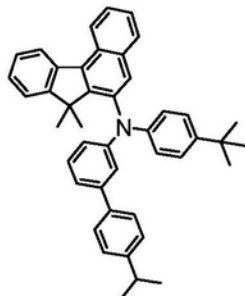
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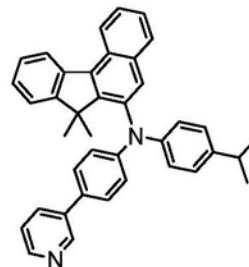
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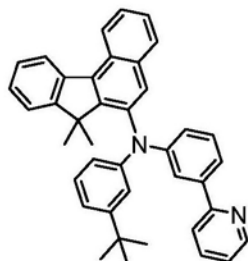
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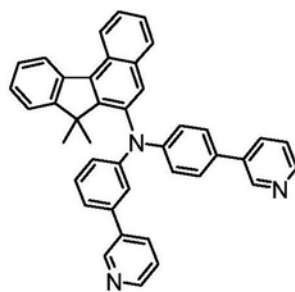
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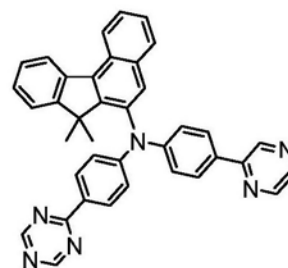
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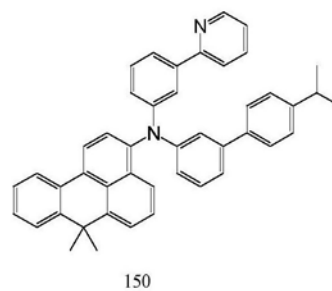
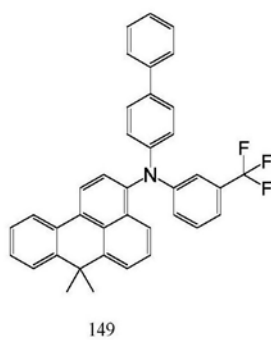
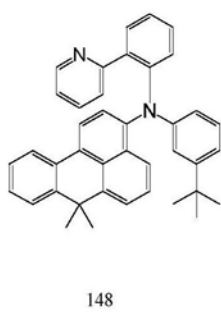
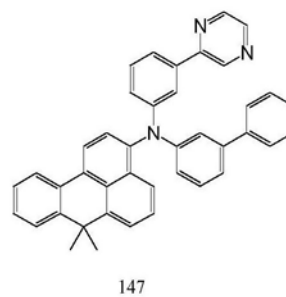
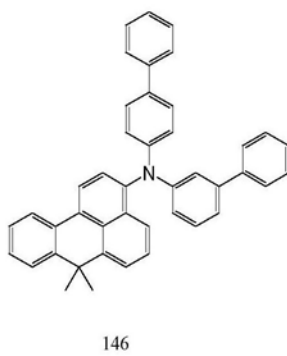
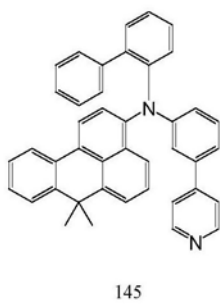
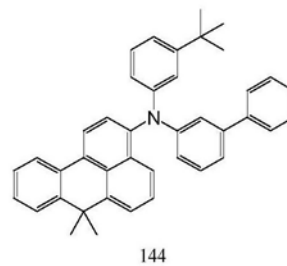
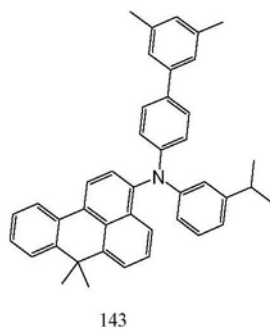
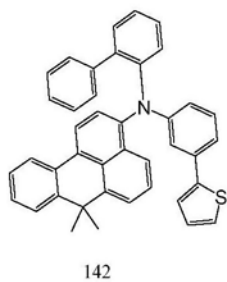
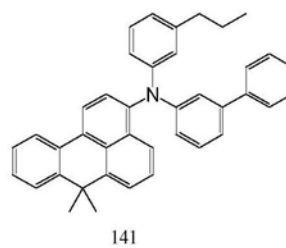
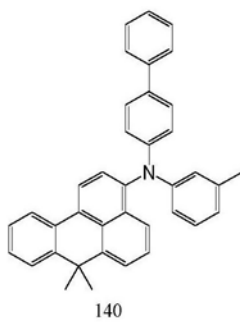
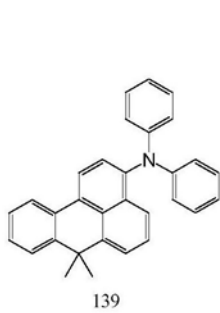
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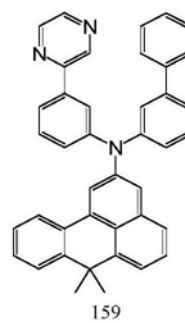
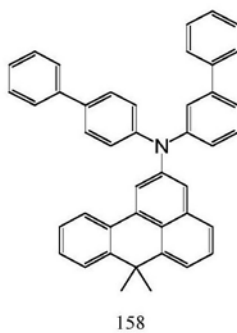
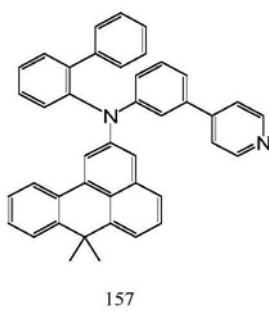
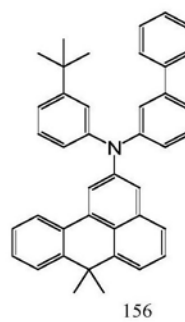
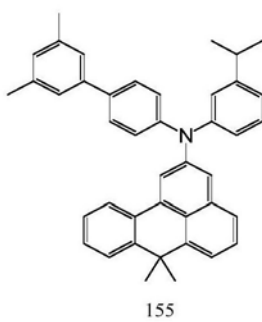
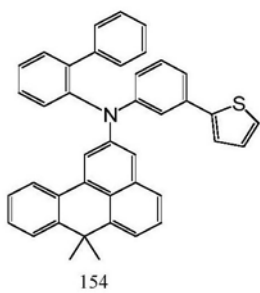
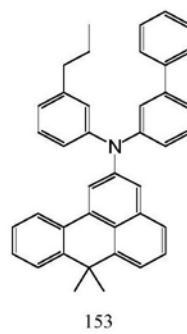
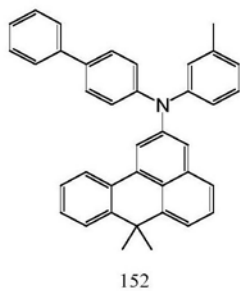
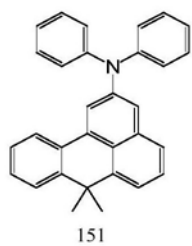


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一种化合物的应用

技术领域

[0001] 本发明涉及有机光电材料技术领域,尤其是涉及一种化合物的应用。

背景技术

[0002] 有机电致发光器件的相关研究初始于19世纪60年代,直到80年代末OLED才蓬勃发展起来。OLED具有全固态、低压驱动、主动发光、响应快速、宽视角、发光面积大、发光波长覆盖整个可见光区以及色彩丰富等优点,在实现全色大面积显示领域具有很大的优势,成为极具前景的平板显示器件。有机电致发光器件的发光亮度正比于空穴和电子的浓度及激子的复合概率的乘积,想要获得较高的发光效率,不仅需要空穴和电子能够有效注入、传输及复合且要求空穴和电子注入达到平衡。因此,在有机电致发光器件中,有机层之间及有机层与两电极的能带匹配对器件复合发光非常重要。

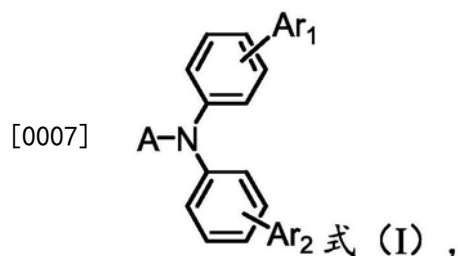
[0003] 为了优化和平衡器件的各项性能,人们引入了多种不同作用的功能层,例如空穴注入层、空穴阻挡层等。在ITO阳极和空穴传输层之间加入空穴注入层的作用主要表现在降低界面势垒、增加空穴传输层与ITO电极的黏附能力、提高其稳定性以及平衡电子和空穴注入等方面。

[0004] 此外,由于OLED的外量子效率与内量子效率之间存在巨大的差距,极大的制约了OLED的发展,因此,如何提高OLED的光取出效率也成为研究的热点。ITO薄膜和玻璃衬底的界面以及玻璃衬底与空气的界面处会发生全反射,出射到OLED器件前向外部空间的光约占有机材料薄膜EL总量的20%,其余约80%的光主要以导波形式限制在有机材料薄膜、ITO薄膜和玻璃衬底中,严重制约了OLED的发展与应用,如何减少OLED器件中的全反射效应、提高光耦合到器件前向外部空间的比例引,进而提高器件的性能起了人们的广泛关注。

发明内容

[0005] 有鉴于此,本发明所要解决的技术问题在于提供一种化合物的应用,本发明提供的化合物作为OLED器件中的CPL层材料能够提高器件的效率。

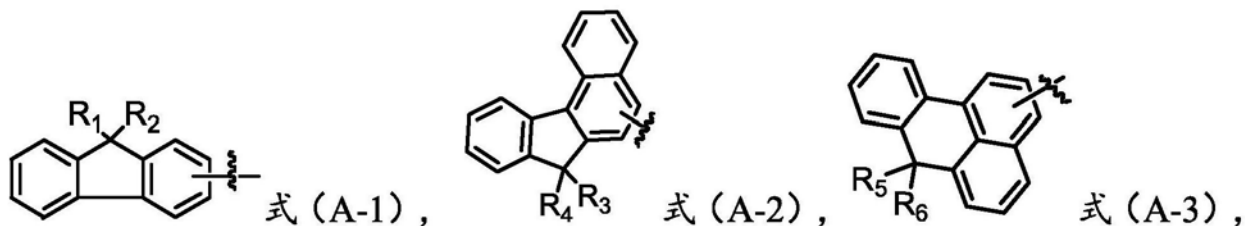
[0006] 本发明提供了一种式(I)所示的化合物作为CPL层在制备有机电致发光器件中的应用,



[0008] 其中,所述Ar₁、Ar₂独立的选自氢、C₁~C₈的烷基、C₆~C₂₅的芳基或C₂~C₂₀的杂芳基;

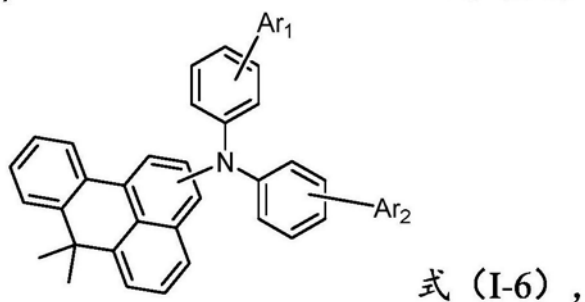
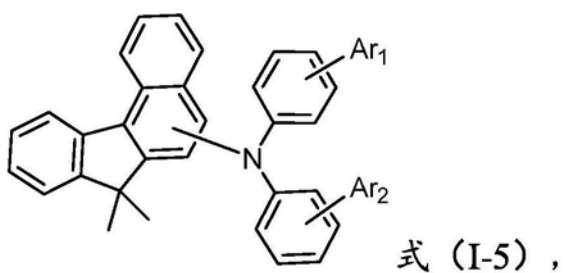
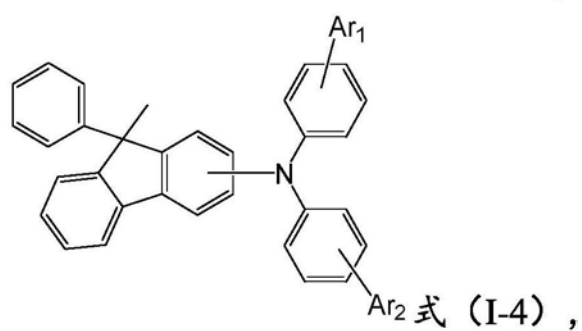
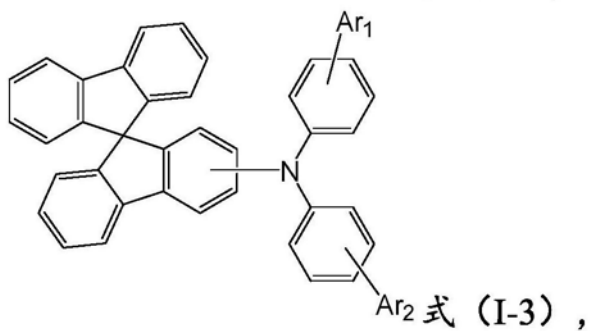
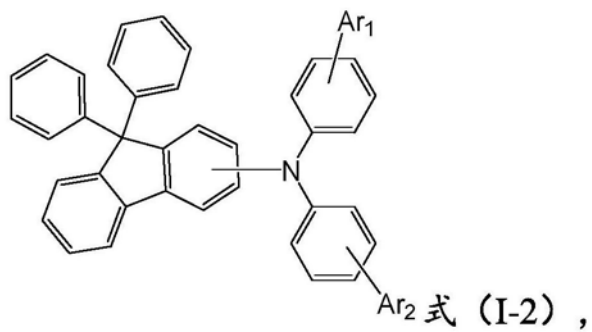
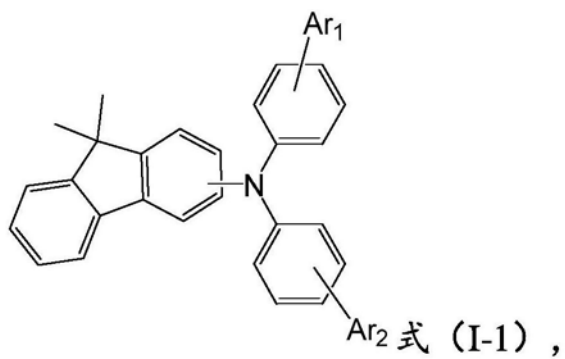
[0009] 所述A为式(A-1)、式(A-2)或式(A-3),

[0010]

[0011] 所述R₁、R₂、R₃、R₄、R₅、R₆独立的选自氢、C1~C3的烷基或C6~C10的芳基,[0012] 或者所述R₁和R₂与其所在的碳形成C10~C20的稠环基。[0013] 优选的,所述Ar₁选自氢、C1~C5的烷基、苯基、C1~C5烷基取代的苯基、C10~20的稠环芳基或C3~C15的含氮杂芳基。[0014] 优选的,所述Ar₂选自氢、C1~C5的烷基、苯基、C1~C5的烷基取代的苯基、C10~20的稠环芳基或C3~C15的含氮杂芳基。[0015] /4、根据权利要求1所述的应用,其特征在于,所述Ar₁选自氢、甲基、乙基、丙基、正丁基、叔丁基、戊基、三氟甲基、苯基、苄基、萘基、蒽基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基、4-甲基苯基、3,5-二甲基苯基、吡啶基、呋喃基、吡嗪基、三嗪基或吡啶基。[0016] 优选的,所述Ar₂选自氢、甲基、乙基、丙基、正丁基、叔丁基、戊基、三氟甲基、苯基、苄基、萘基、蒽基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基、4-甲基苯基、3,5-二甲基苯基、吡啶基、呋喃基、吡嗪基、三嗪基或吡啶基。[0017] 优选的,所述R₁、R₂独立的选自氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、蒽基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基;[0018] 或者所述R₁和R₂与其所在的碳形成苄基。[0019] 优选的,所述R₃、R₄、R₅、R₆独立的选自氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、蒽基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基。

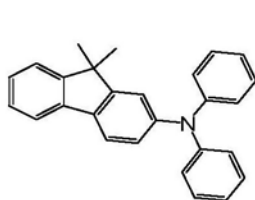
[0020] 优选的,所述式(I)所示的化合物为式(I-1)、式(I-2)、式(I-3)、式(I-4)、式(I-5)或式(I-6),

[0021]

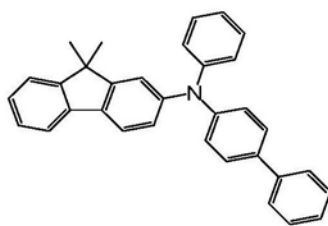


[0022] 其中,所述Ar₁、Ar₂独立的选自氢、C₁~C₈的烷基、C₆~C₂₅的芳基或C₂~C₂₀的杂芳基。

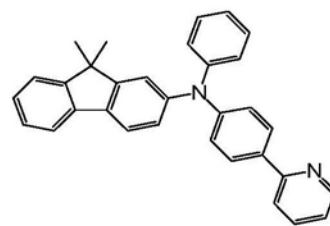
[0023] 优选的,所述式(I)所示的化合物为式(001)~式(159),



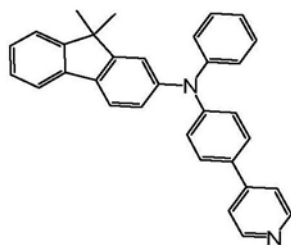
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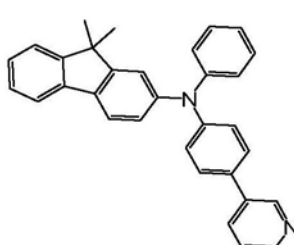
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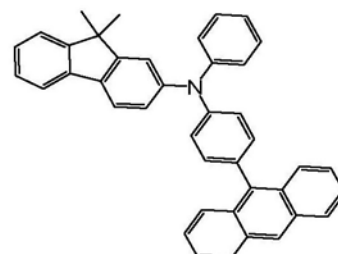
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004

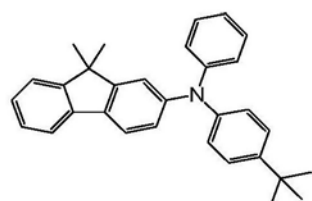


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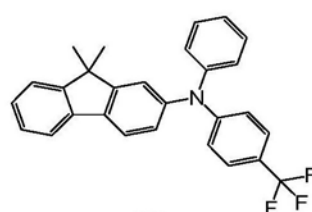


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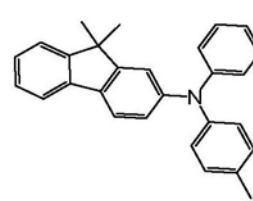
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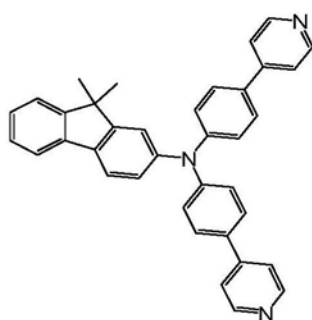
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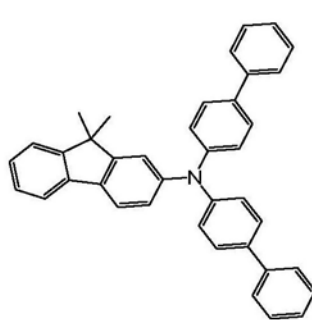
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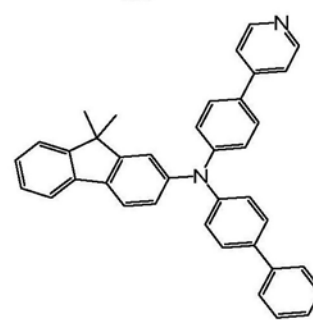
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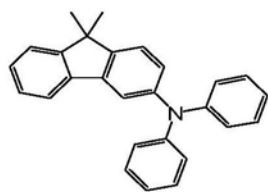


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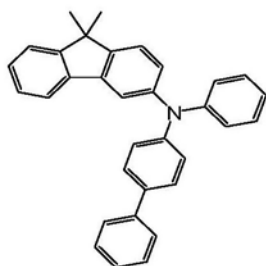


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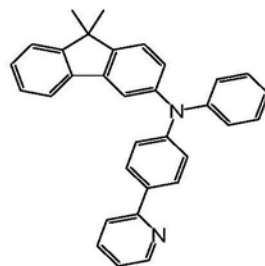
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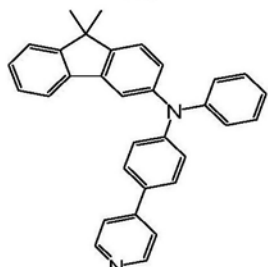
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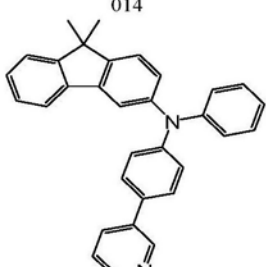
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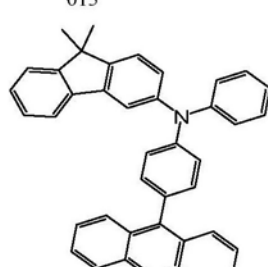
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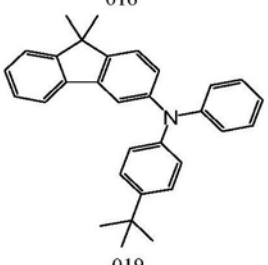
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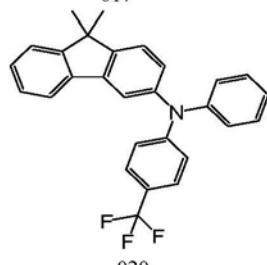
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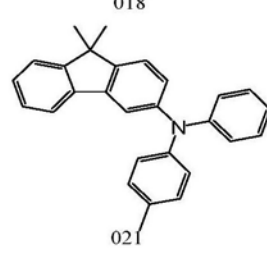
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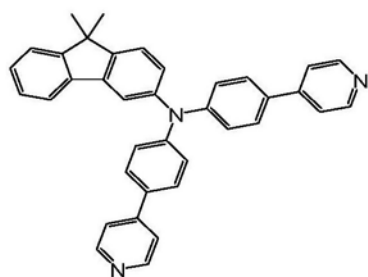
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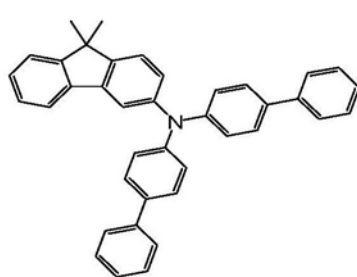
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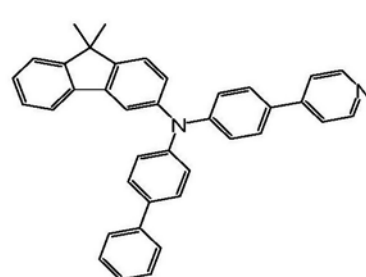
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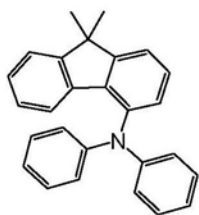
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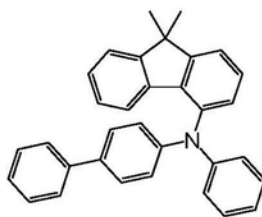
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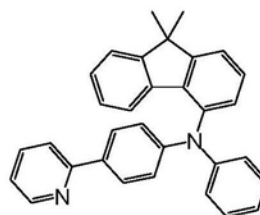
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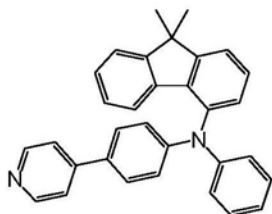
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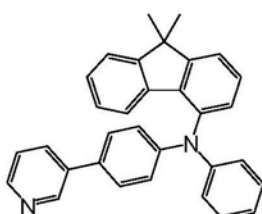
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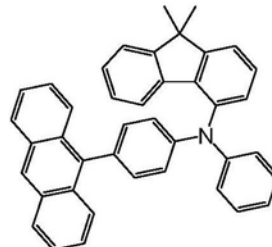
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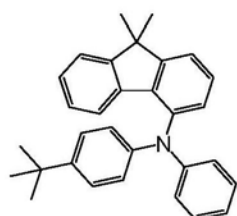


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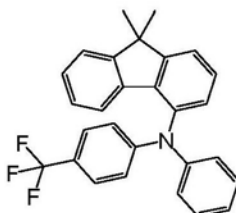


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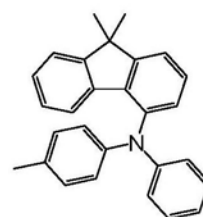
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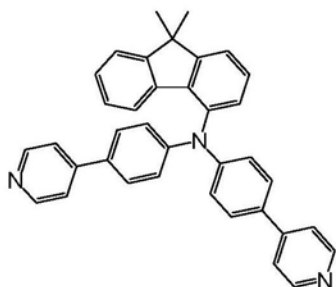
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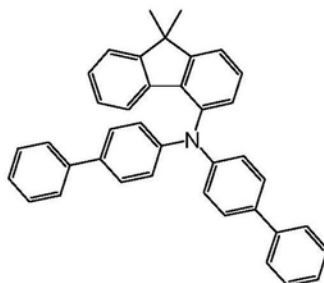
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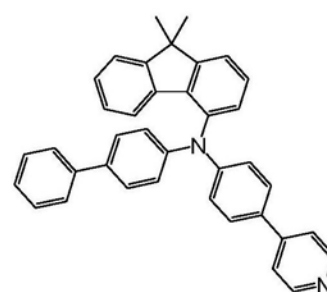
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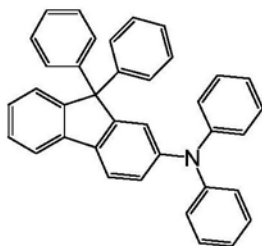


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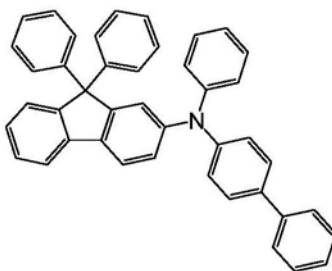


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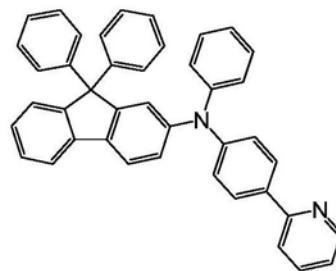
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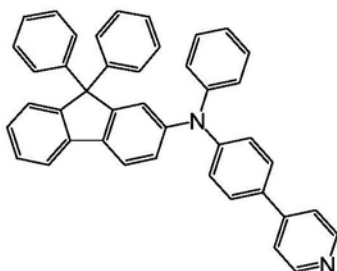
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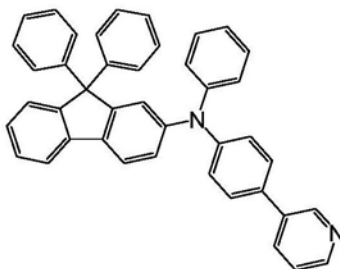
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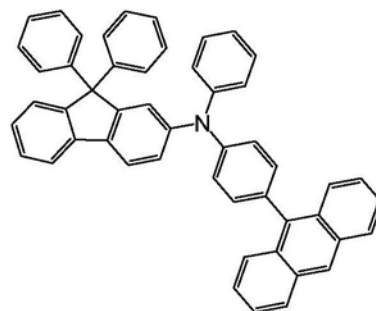
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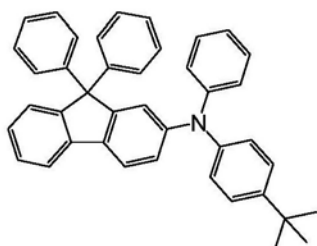
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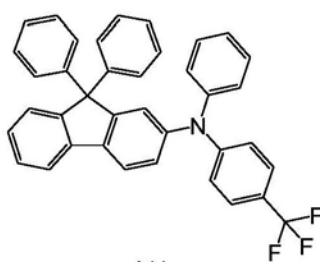
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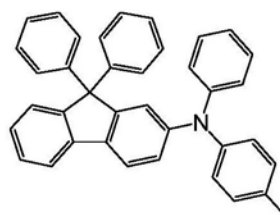
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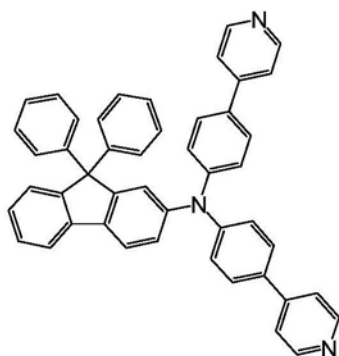
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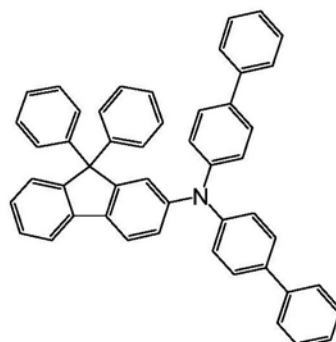
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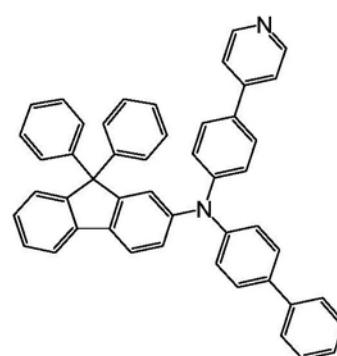
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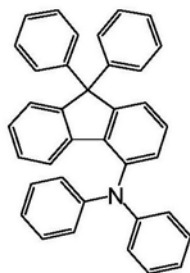


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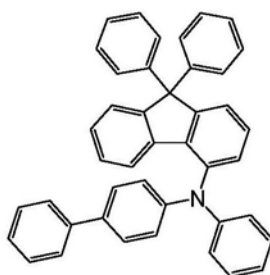


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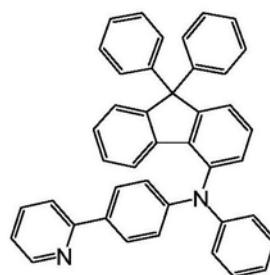
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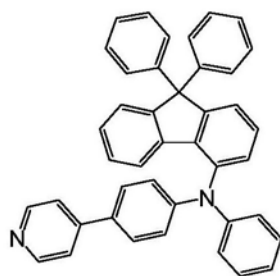
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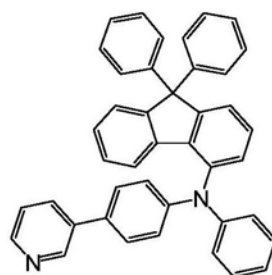
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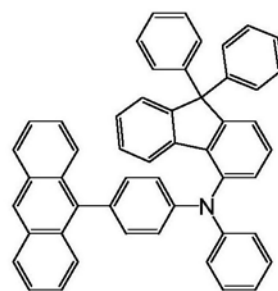
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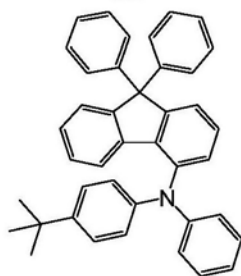
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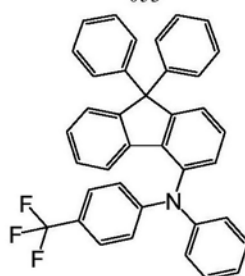
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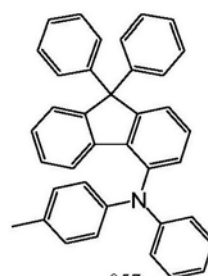
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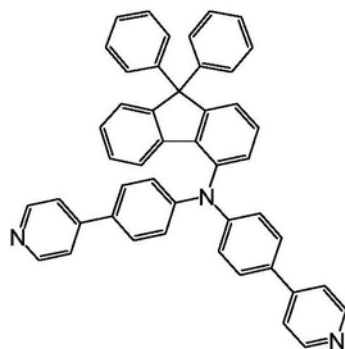
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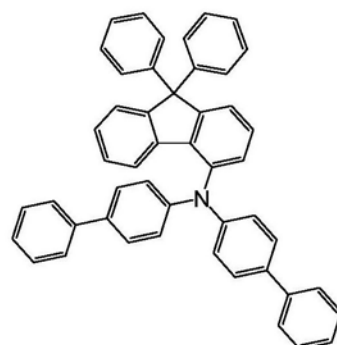
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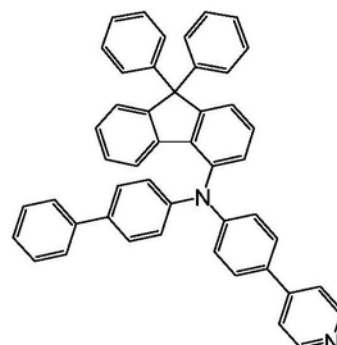
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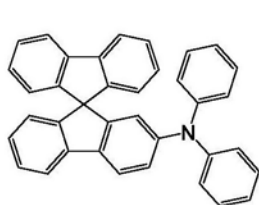
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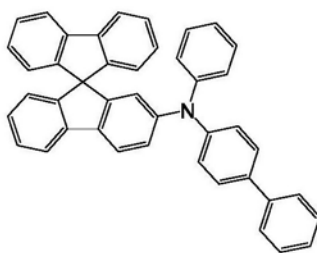
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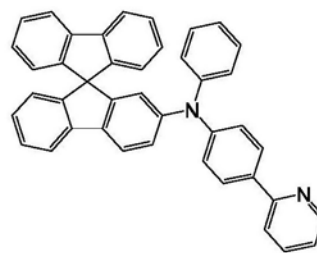
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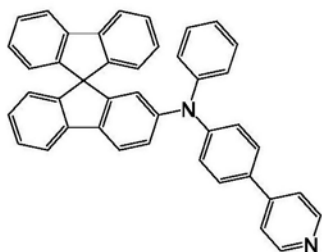
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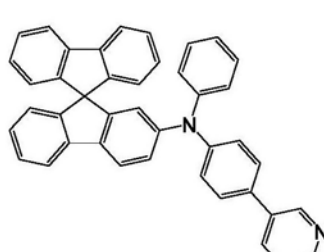
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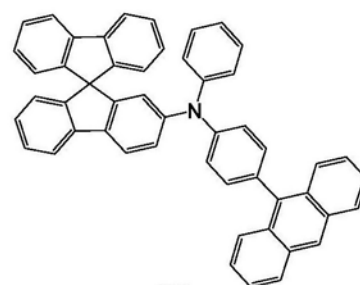
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064

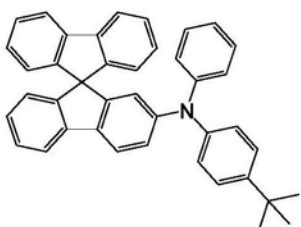


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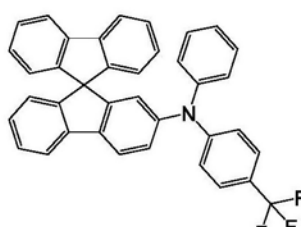


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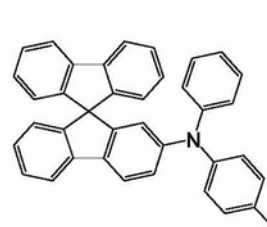
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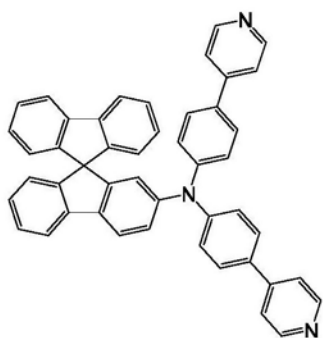
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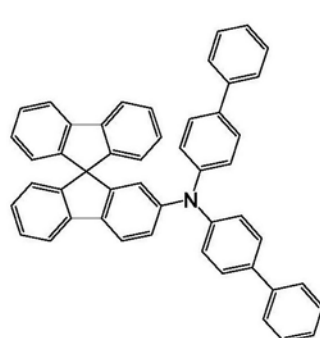
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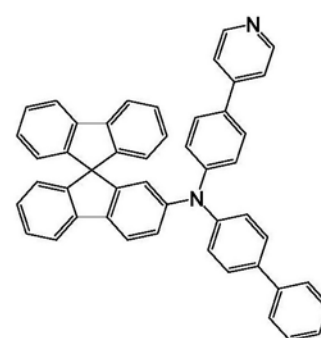
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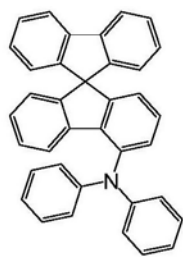
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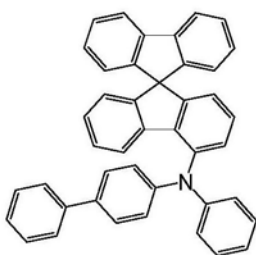
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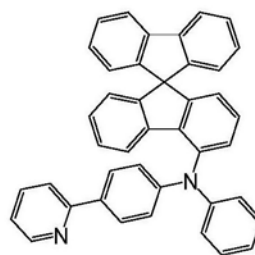
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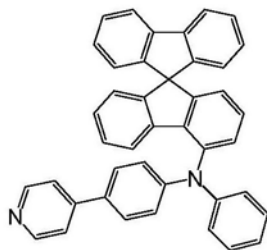
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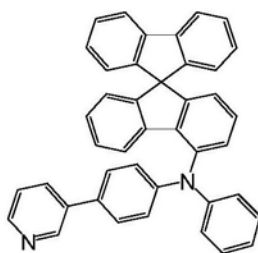
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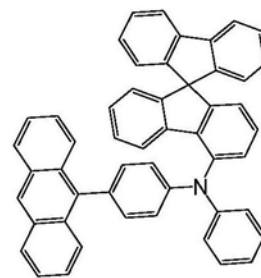
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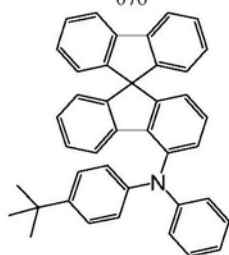


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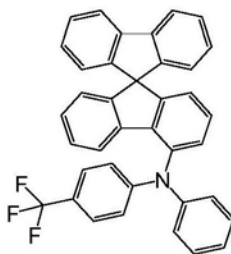


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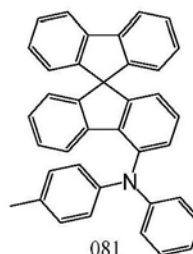
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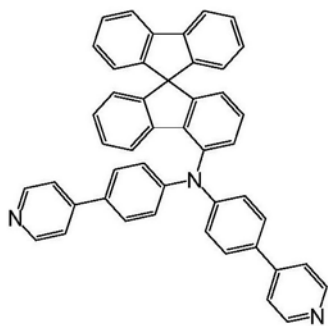
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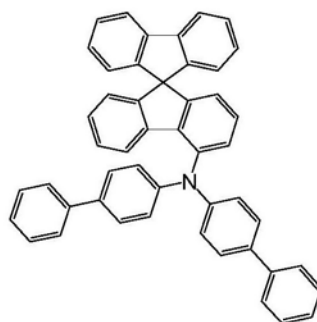
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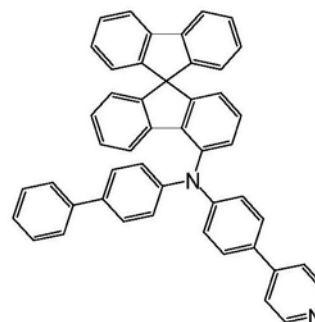
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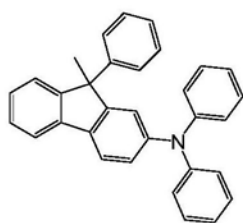
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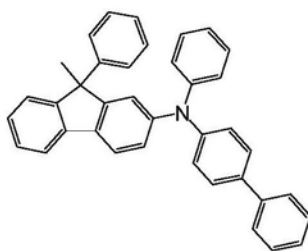
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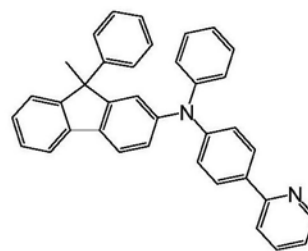
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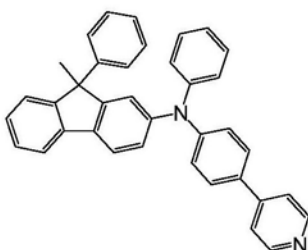
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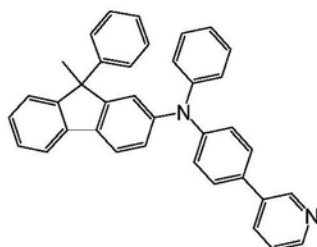
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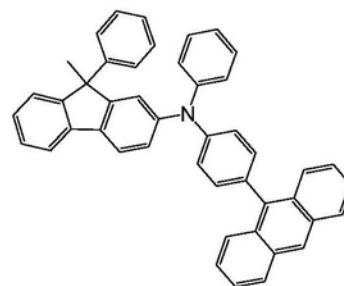
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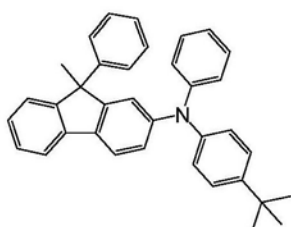


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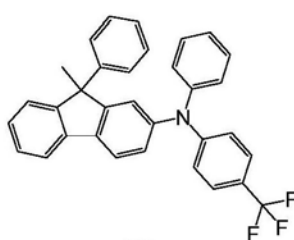


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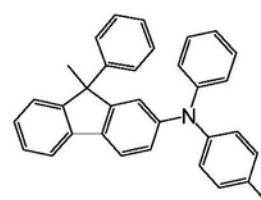
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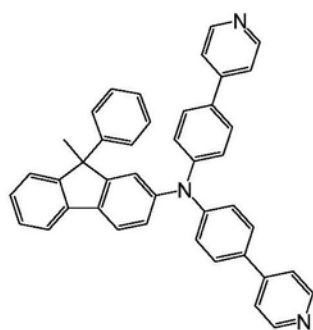
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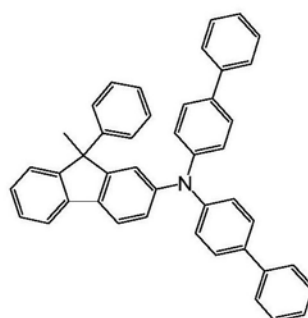
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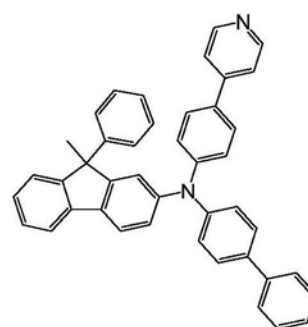
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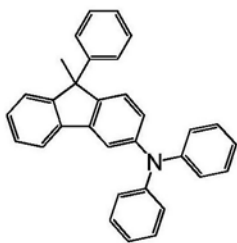
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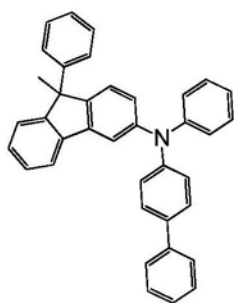
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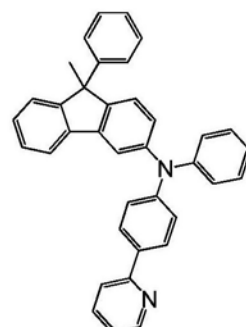
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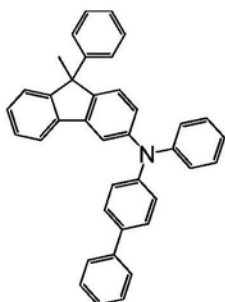
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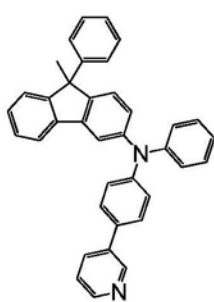
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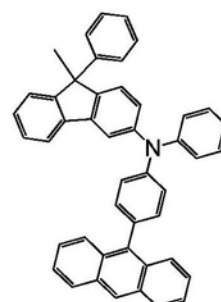
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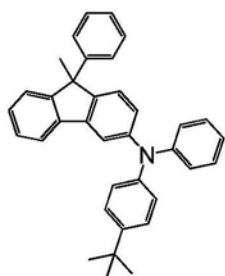


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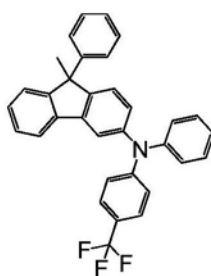


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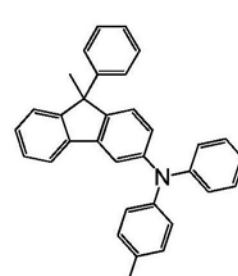
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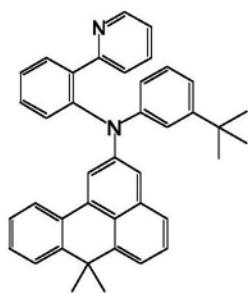
103



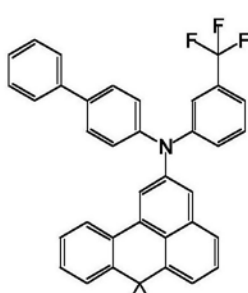
104



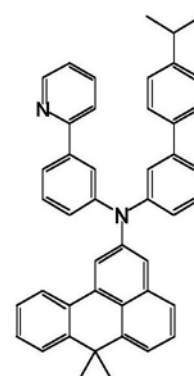
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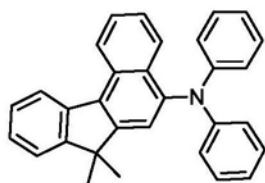
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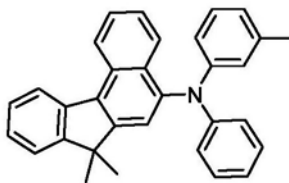
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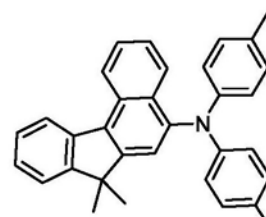
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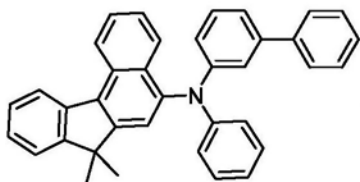
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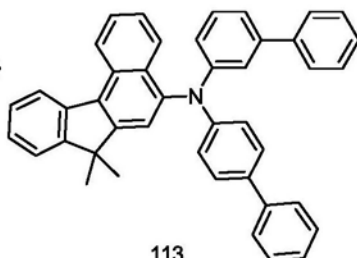
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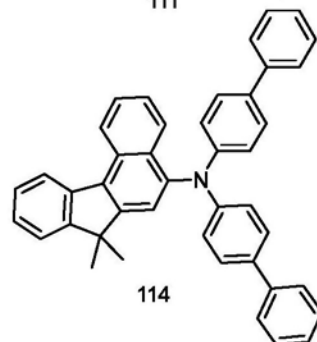
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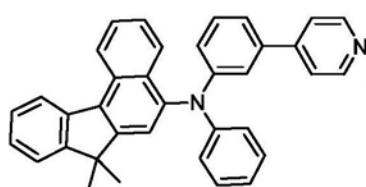
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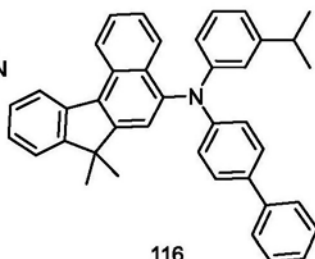
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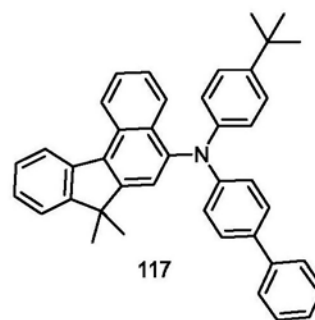
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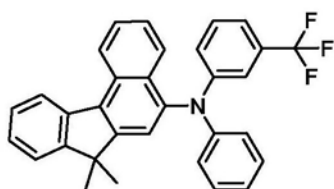


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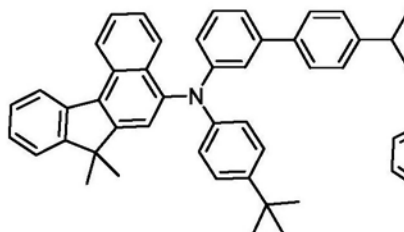


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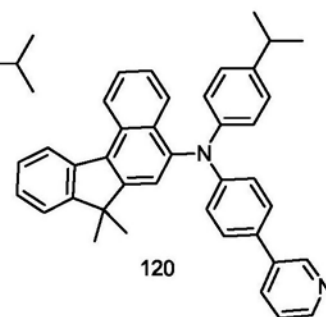
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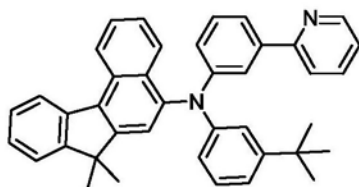
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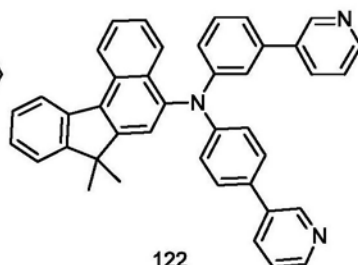
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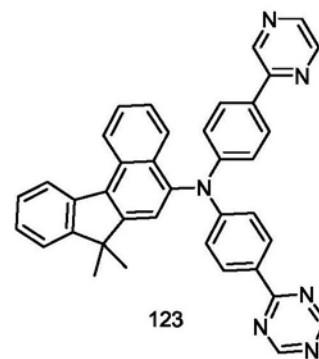
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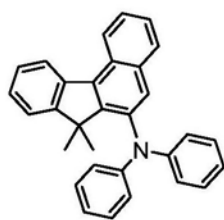
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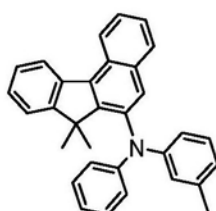
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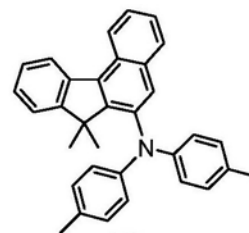
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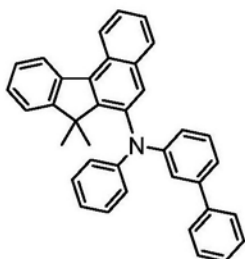
124



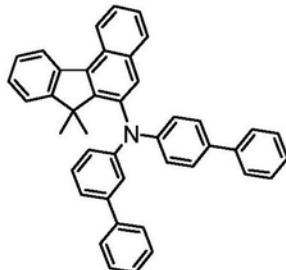
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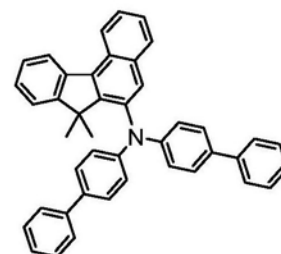
126



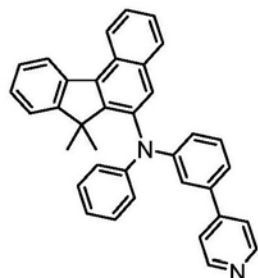
127



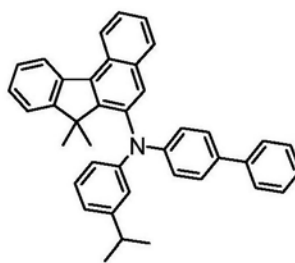
128



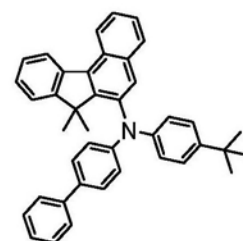
129



130

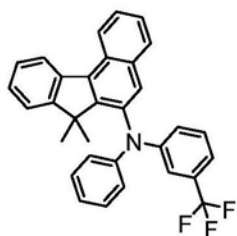


131

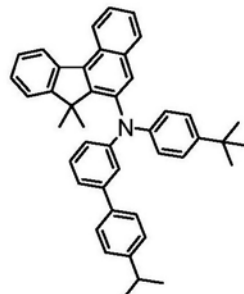


132

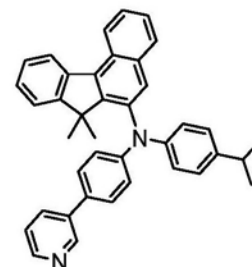
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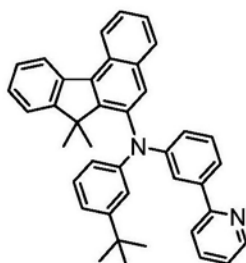
133



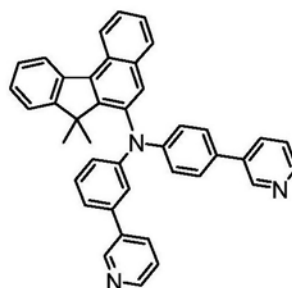
134



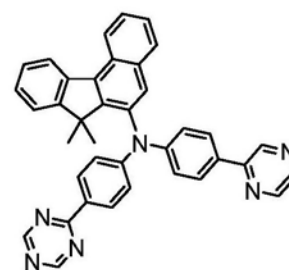
135



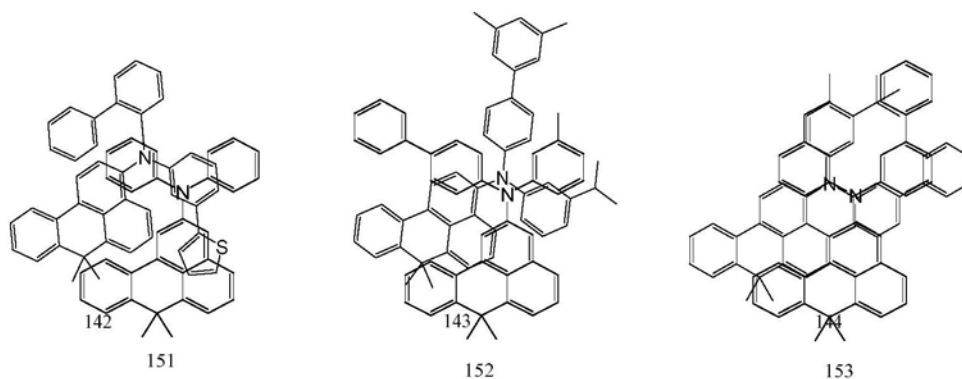
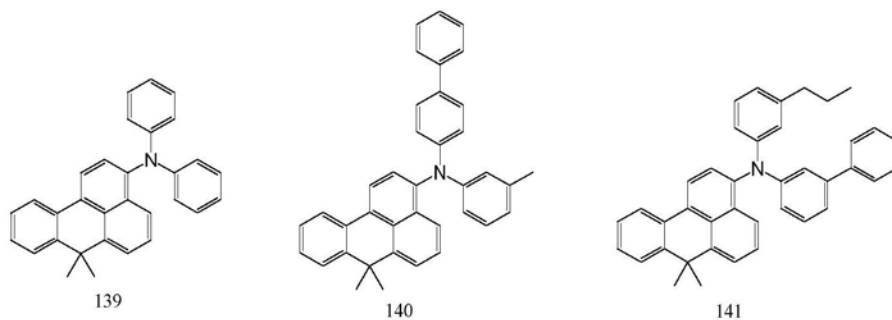
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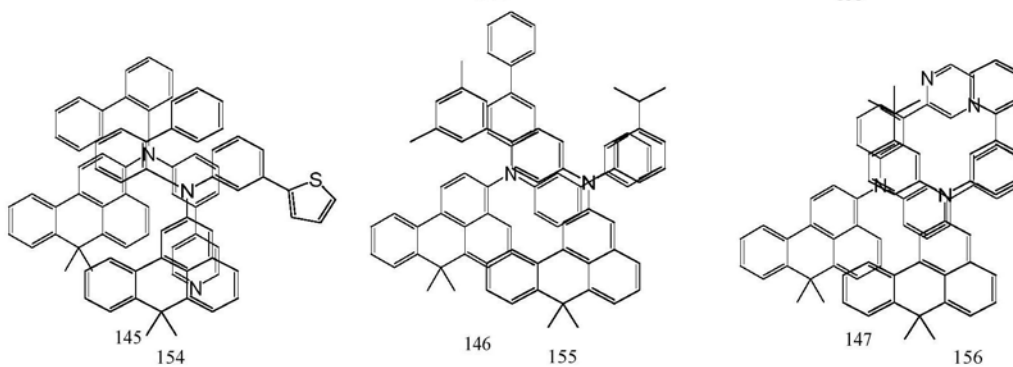
137



138



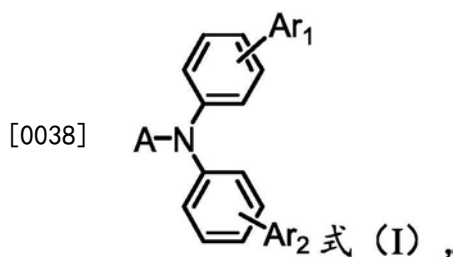
[0035]



[0036] 与现有技术相比,本发明提供了一种式(I)所示的化合物作为CPL层在制备有机电致发光器件中的应用,实验结果表明,本发明提供的化合物用作OLED器件的CPL层(Cap layer,光提取覆盖层)材料后,可有效提高器件的光取出效率。

具体实施方式

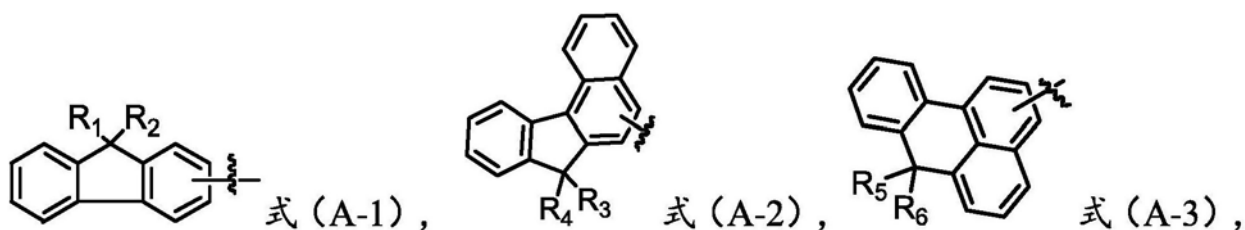
[0037] 本发明提供了一种式(I)所示的化合物作为CPL层在制备有机电致发光器件中的应用,



[0039] 其中,所述Ar₁、Ar₂独立的选自氢、C₁~C₈的烷基、C₆~C₂₅的芳基或C₂~C₂₀的杂芳基;

[0040] 所述A为式(A-1)、式(A-2)或式(A-3),

[0041]



[0042] 所述R₁、R₂、R₃、R₄、R₅、R₆独立的选自氢、C₁~C₃的烷基或C₆~C₁₀的芳基,

[0043] 或者所述R₁和R₂与其所在的碳形成C₁₀~C₂₀的稠环基。

[0044] 按照本发明,所述Ar₁选自氢、C₁~C₅的烷基、苯基、C₁~C₅烷基取代的苯基、C₁₀~C₂₀的稠环芳基或C₃~C₁₅的含氮杂芳基,更优选为氢、甲基、乙基、丙基、正丁基、叔丁基、戊基、三氟甲基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基、4-甲基苯基、3,5-二甲基苯基、吡啶基、吡嗪基、吡嗪基、三嗪基或吡啶基;所述Ar₂选自氢、C₁~C₅的烷基、苯基、C₁~C₅烷基取代的苯基、C₁₀~C₂₀的稠环芳基或C₃~C₁₅的含氮杂芳基,更优选为氢、甲基、乙基、丙基、正丁基、叔丁基、戊基、三氟甲基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基、4-甲基苯基、3,5-二甲基苯基、吡啶基、吡嗪基、吡嗪基、三嗪基或吡啶基。

[0045] 所述R₁优选为氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基;所述R₂优选为氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基;或者所述R₁和R₂与其所在的碳形成茈基。

[0046] 所述R₃优选为氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基。

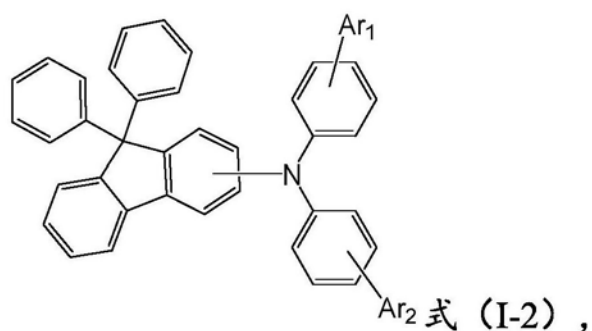
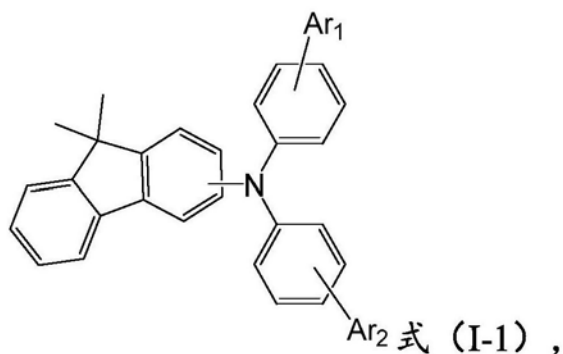
[0047] 所述R₄优选为氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基。

[0048] 所述R₅优选为氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基。

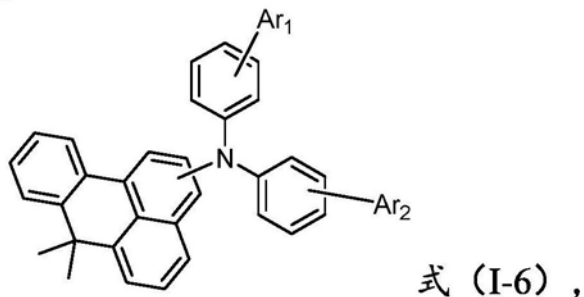
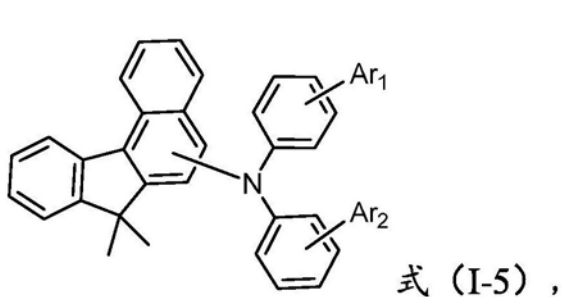
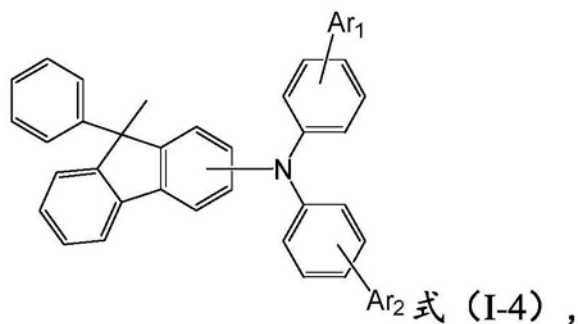
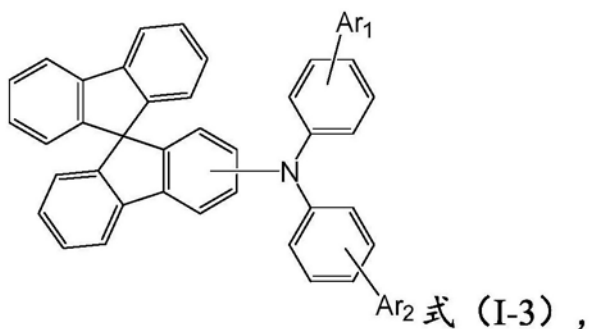
[0049] 所述R₆优选为氢、甲基、乙基、正丙基、异丙基、苯基、苄基、萘基、菲基、3-叔丁基苯基、3-三氟甲基苯基、3-正丙基苯基、3-异丙基苯基、3-甲基苯基、4-叔丁基苯基、4-三氟甲基苯基、4-正丙基苯基、4-异丙基苯基或4-甲基苯基。

[0050] 具体的,所述式(I)所示的化合物为式(I-1)、式(I-2)、式(I-3)、式(I-4)、式(I-5)或式(I-6),

[0051]

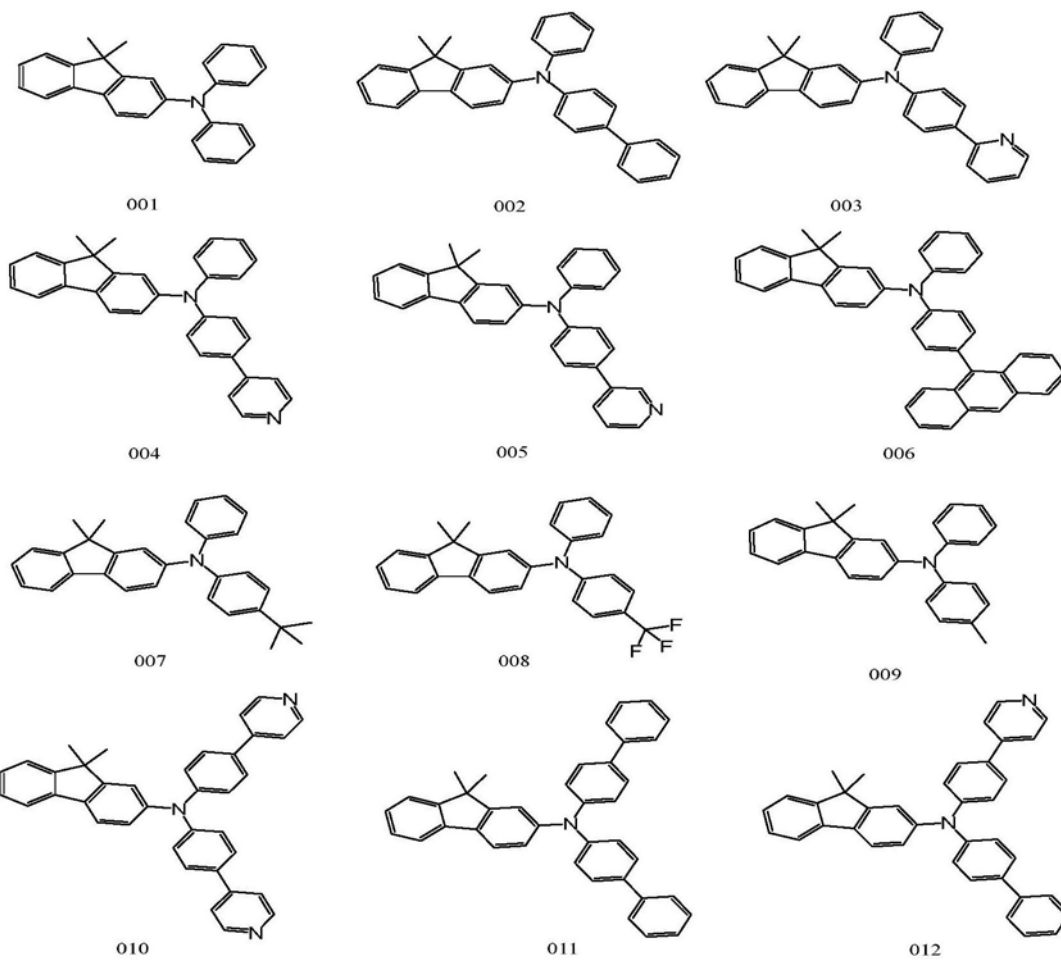


[0052]



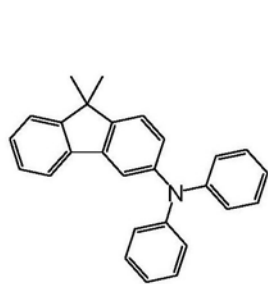
[0053] 其中,所述Ar₁、Ar₂独立的选自氢、C₁~C₈的烷基、C₆~C₂₅的芳基或C₂~C₂₀的杂芳基。

[0054] 更具体的,所述式(I)所示的化合物为式(001)~式(159),

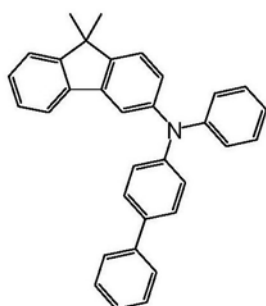


[0055]

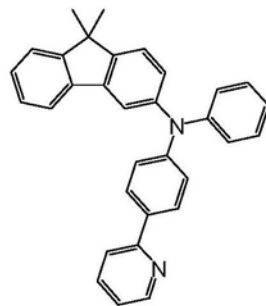
[0056]



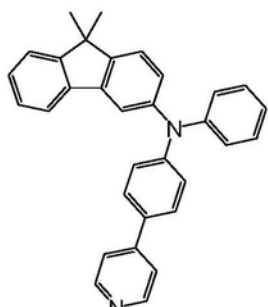
013



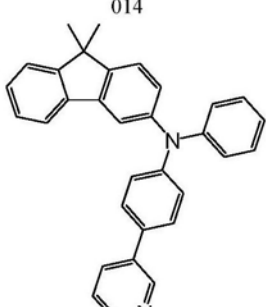
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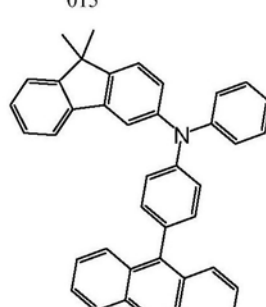
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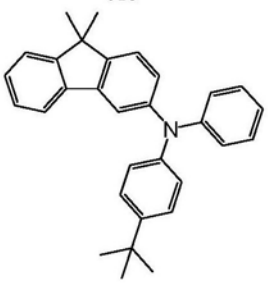
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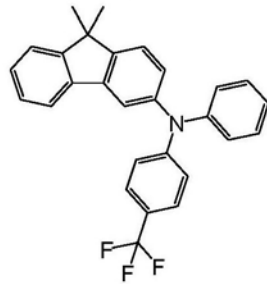
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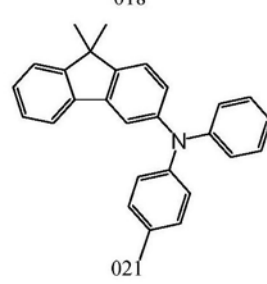
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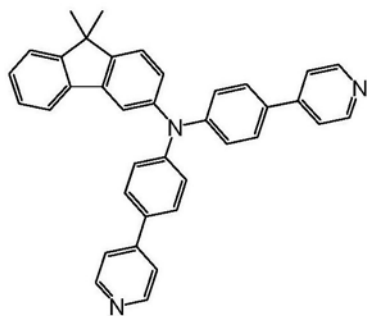
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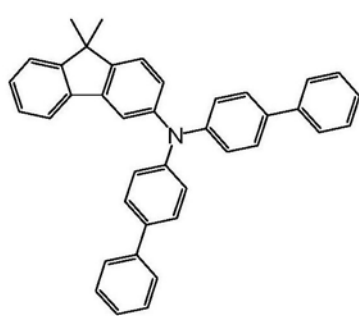
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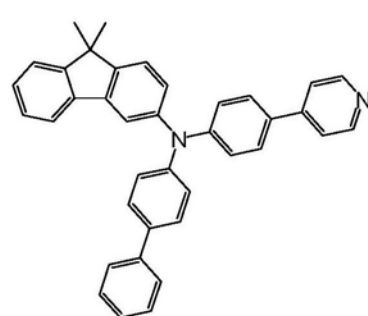
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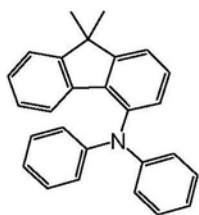
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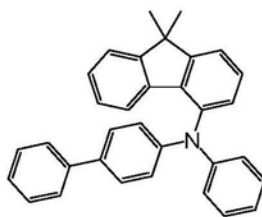
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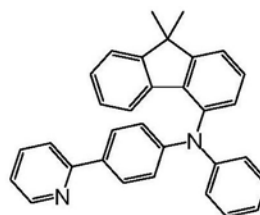
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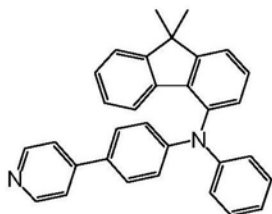
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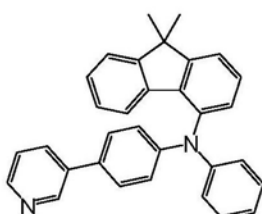
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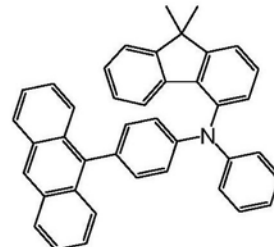
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028

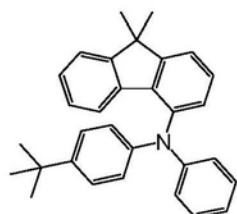


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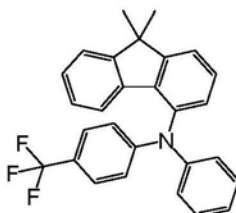


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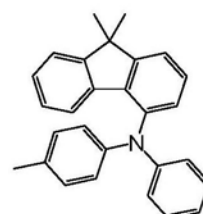
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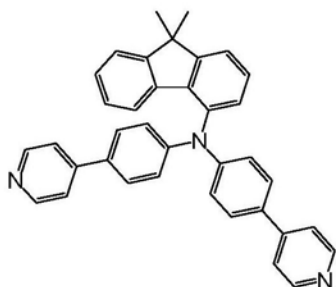
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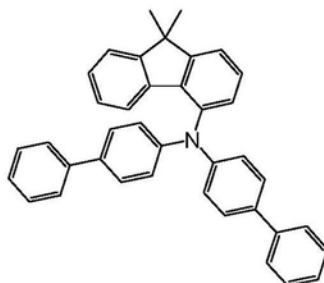
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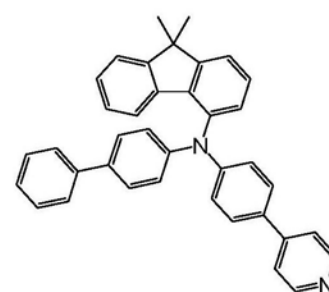
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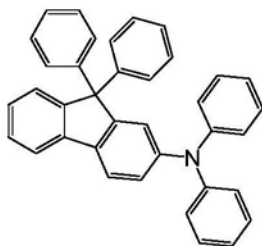


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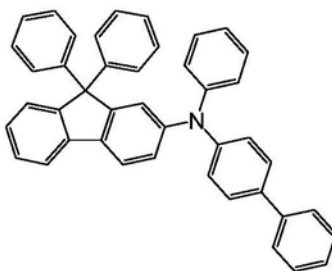


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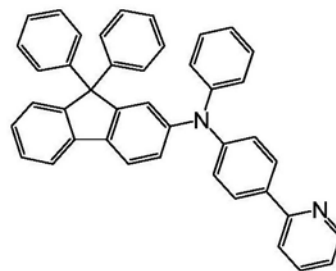
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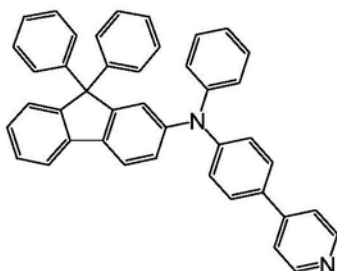
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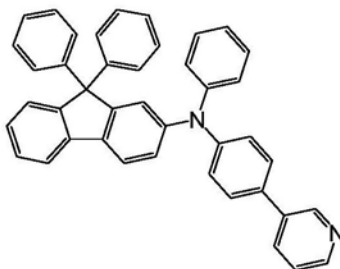
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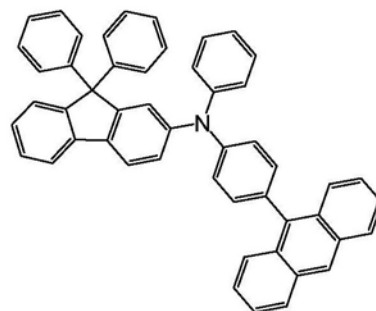
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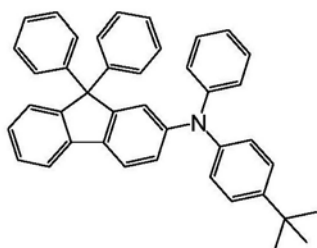
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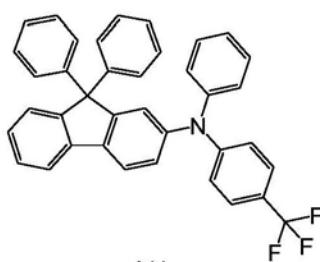
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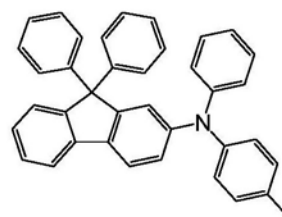
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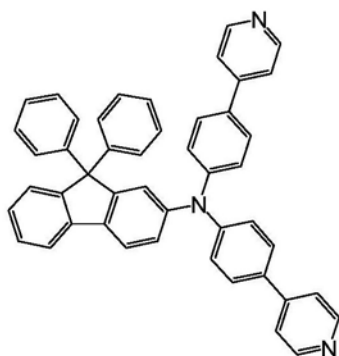
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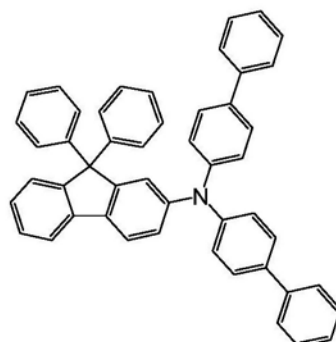
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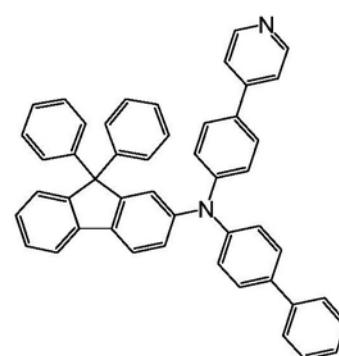
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046



047

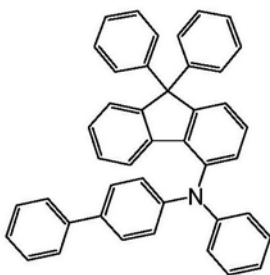


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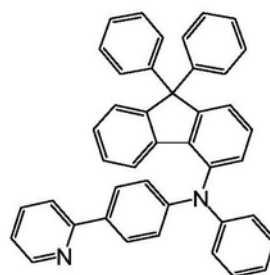
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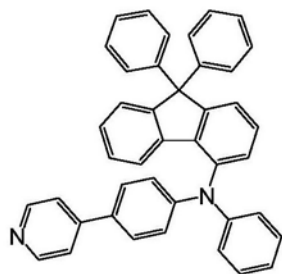
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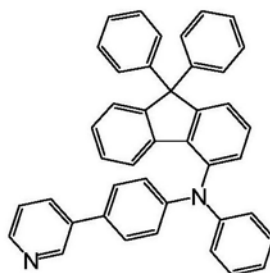
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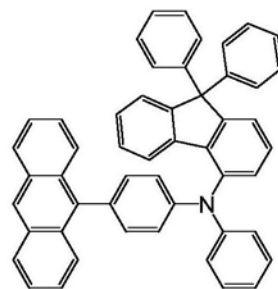
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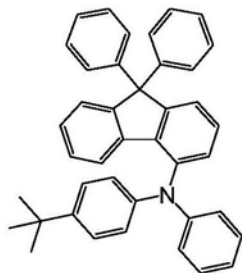
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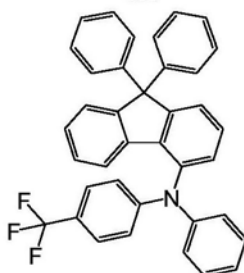
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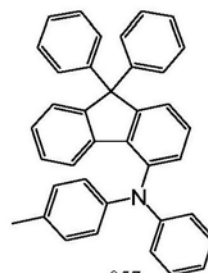
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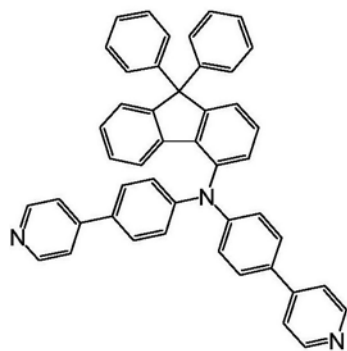
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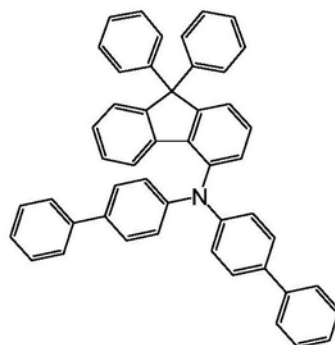
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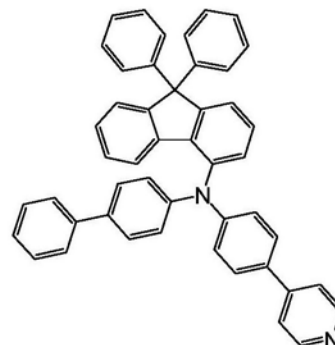
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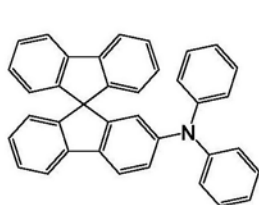
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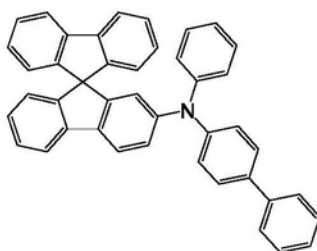
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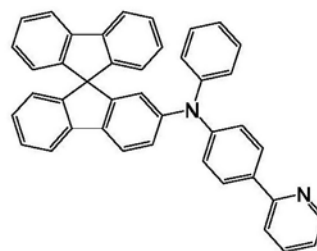
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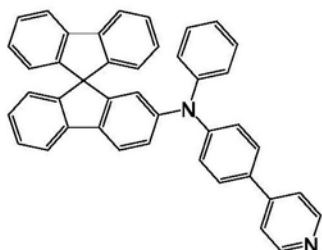
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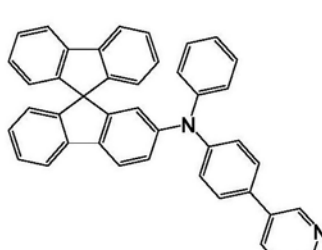
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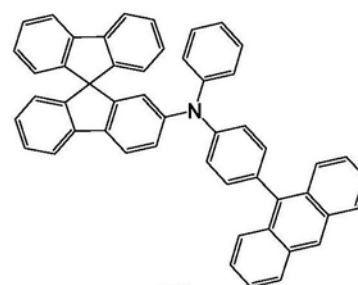
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064

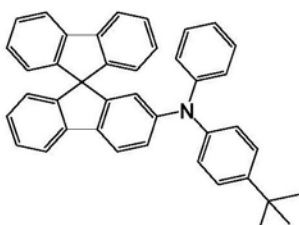


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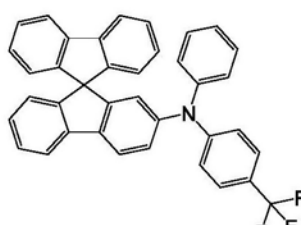


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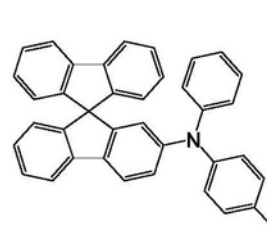
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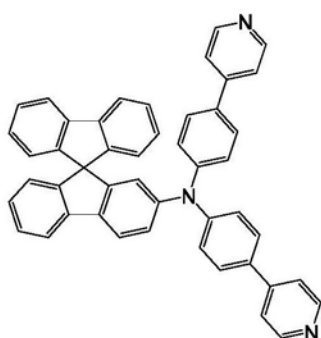
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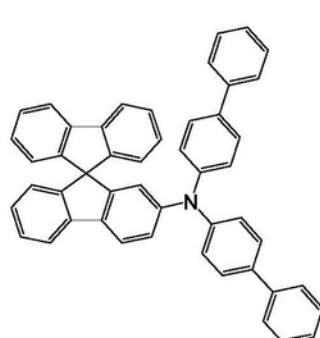
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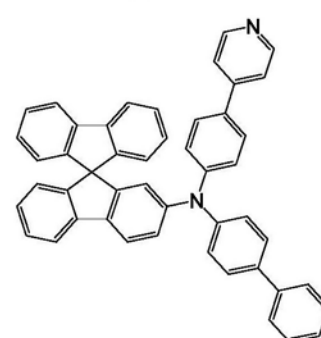
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070



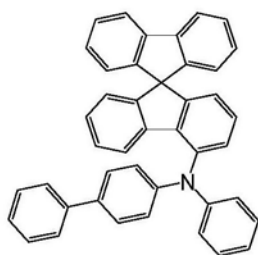
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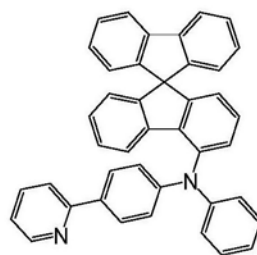
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073



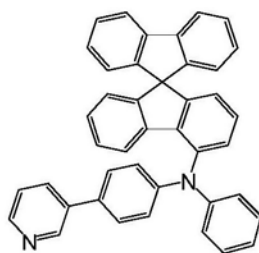
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075



076

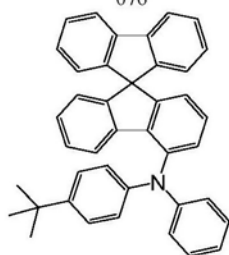


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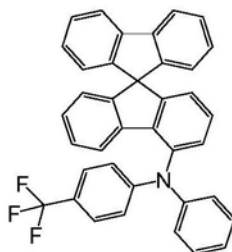


078

[0061]



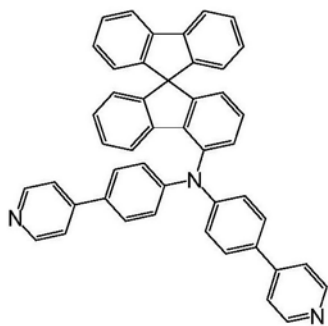
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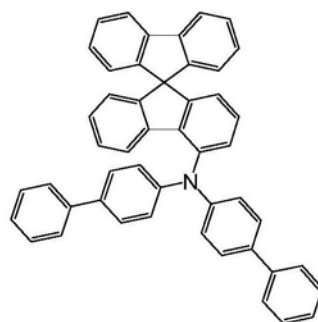
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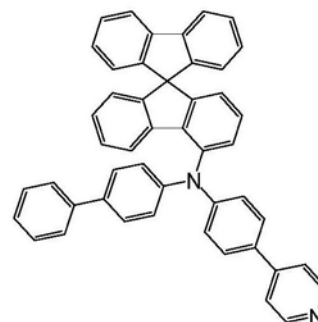
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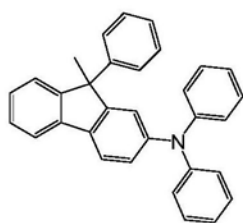
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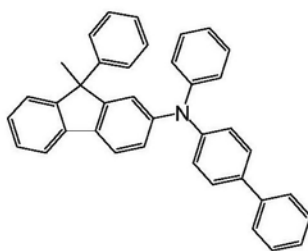
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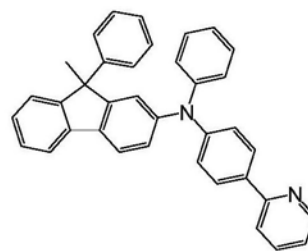
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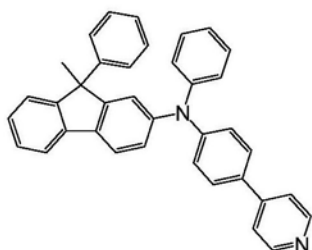
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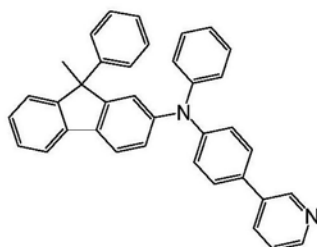
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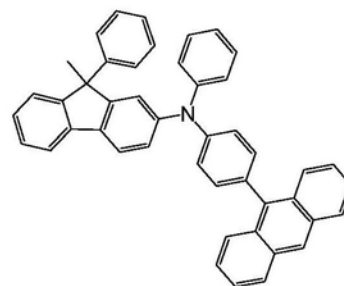
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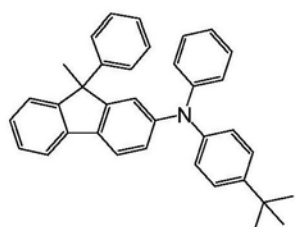


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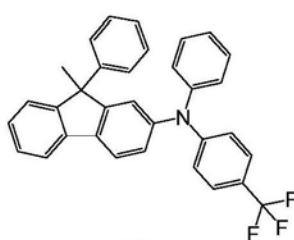


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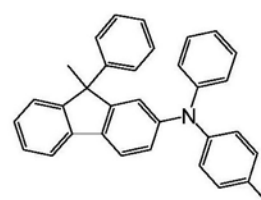
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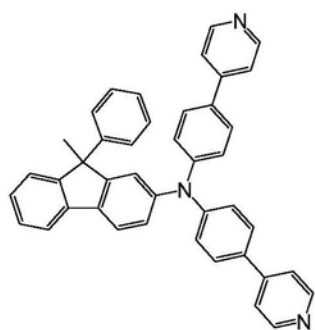
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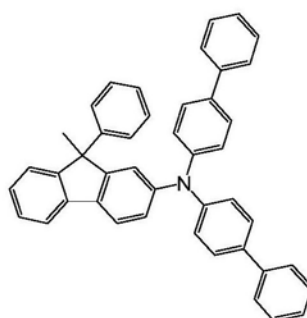
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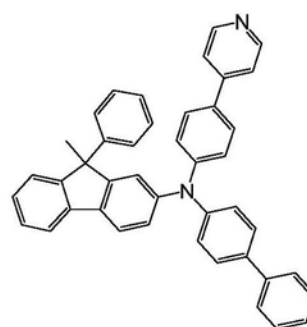
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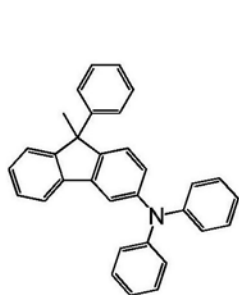
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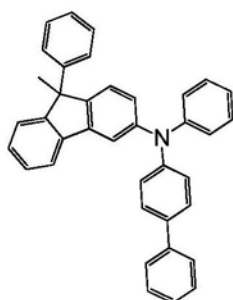
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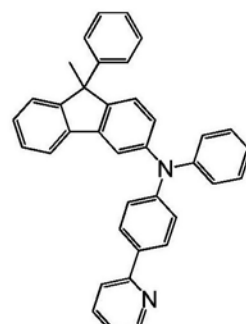
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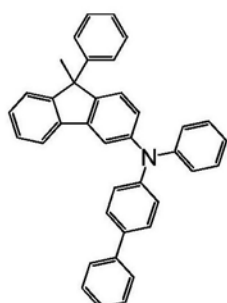
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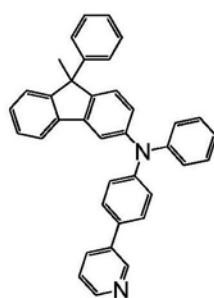
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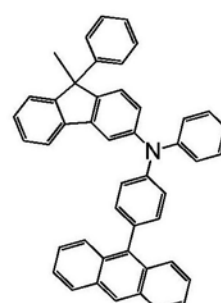
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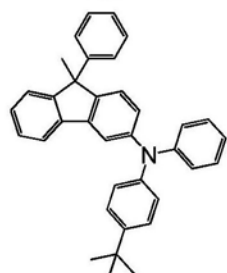


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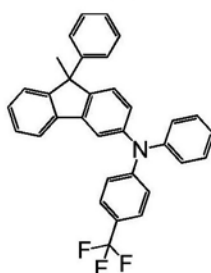


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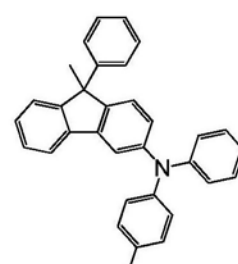
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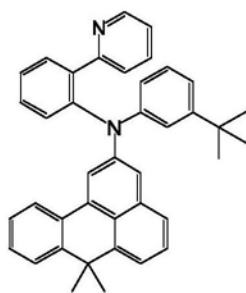
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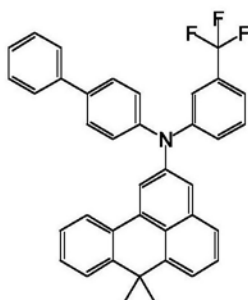
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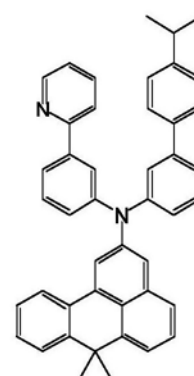
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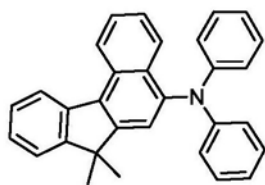
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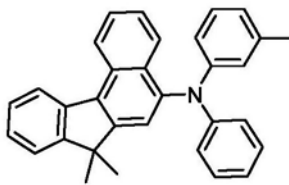
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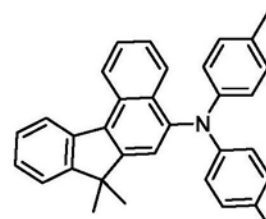
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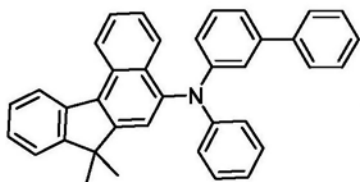
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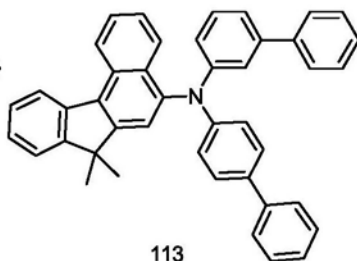
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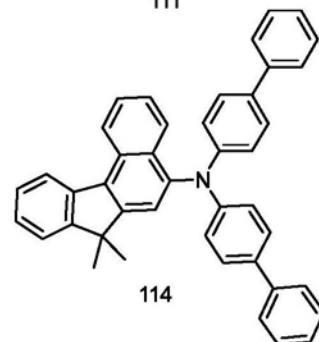
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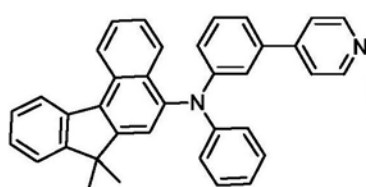
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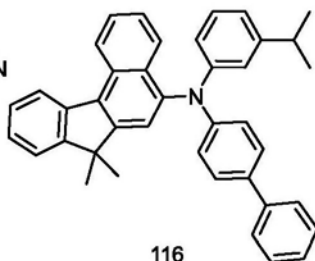
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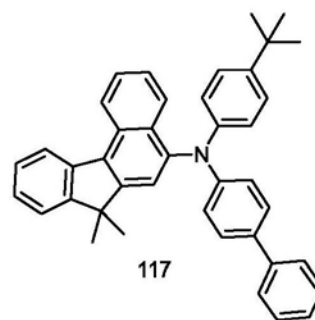
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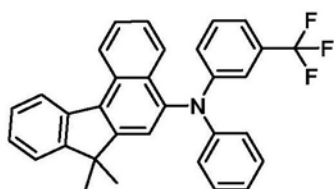


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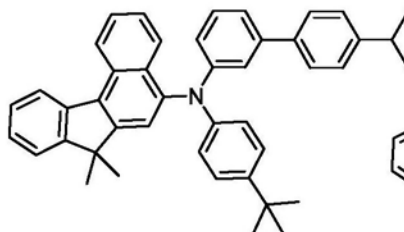


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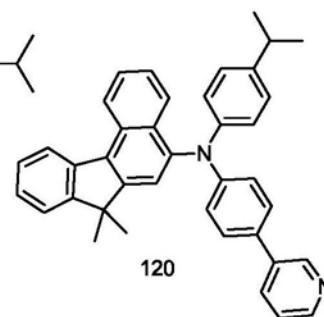
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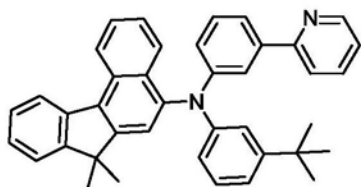
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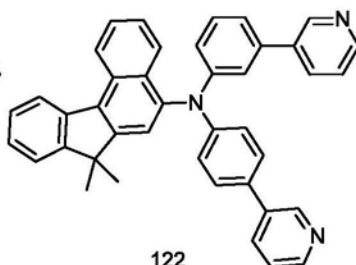
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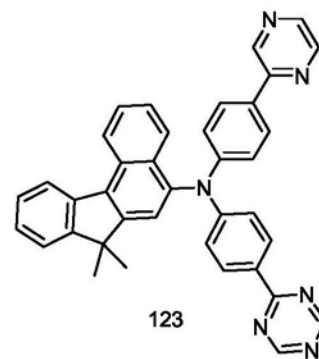
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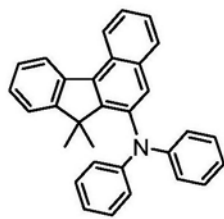
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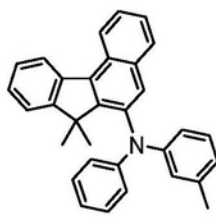
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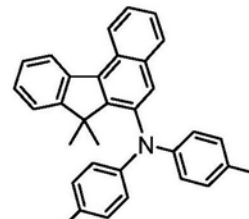
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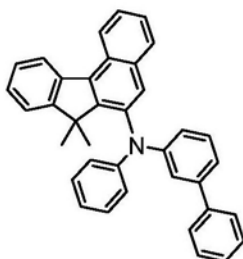
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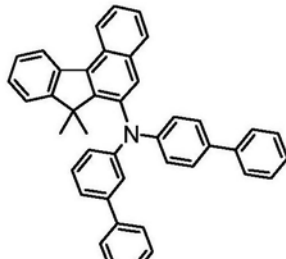
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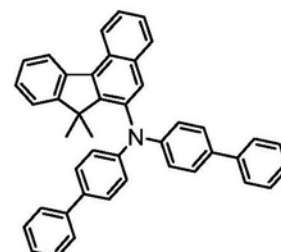
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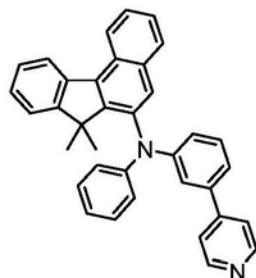
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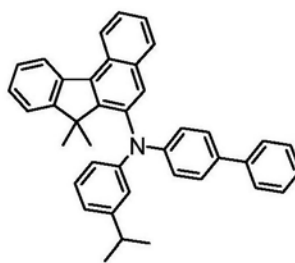
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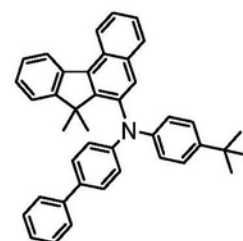
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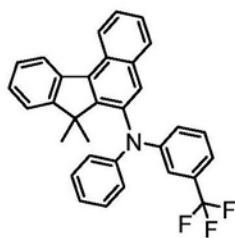
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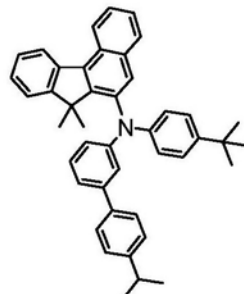
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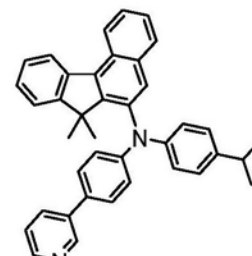
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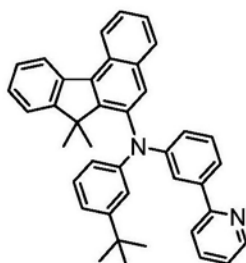
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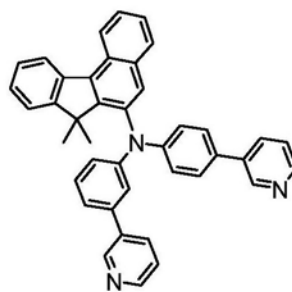
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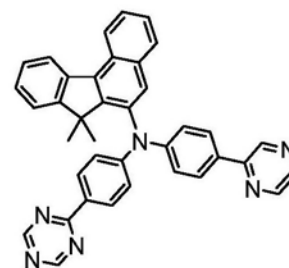
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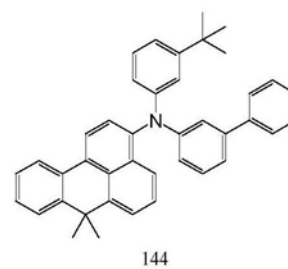
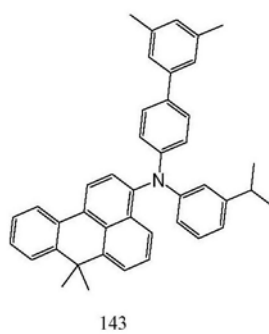
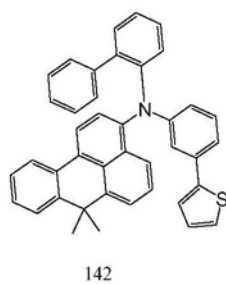
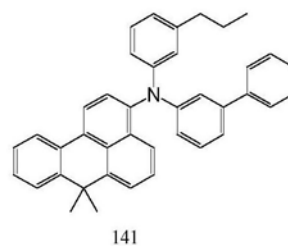
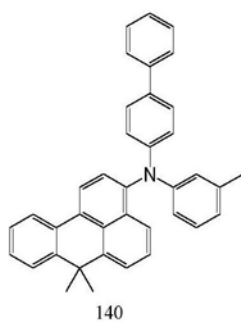
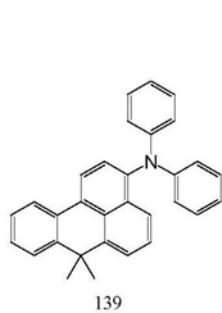


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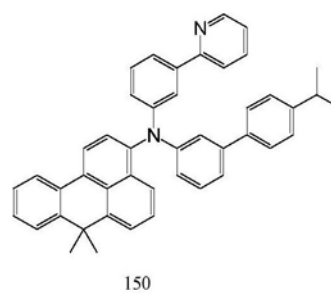
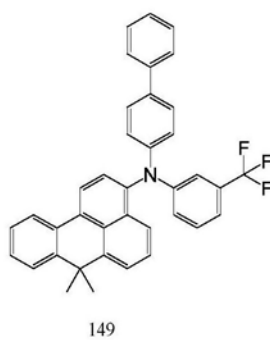
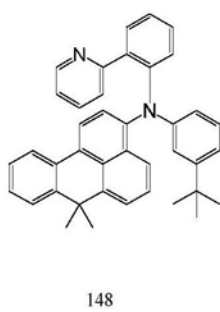
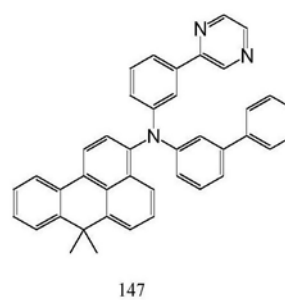
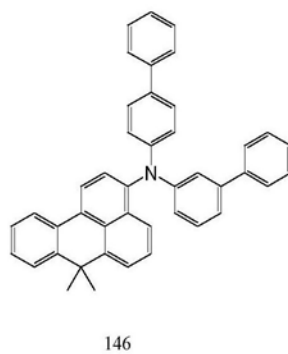
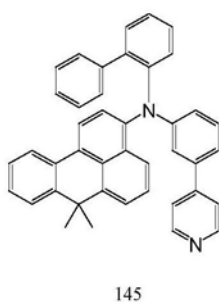


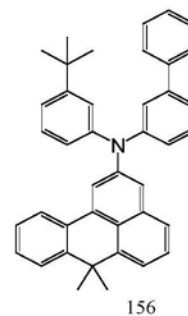
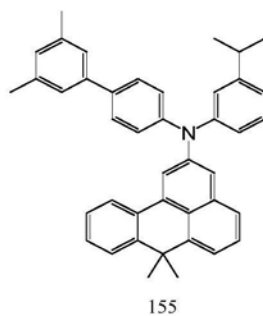
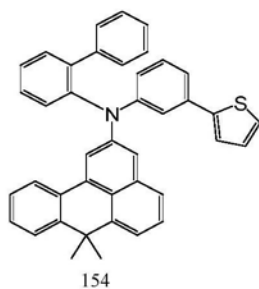
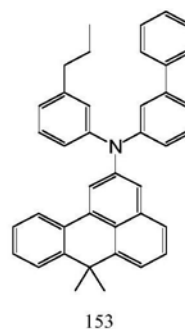
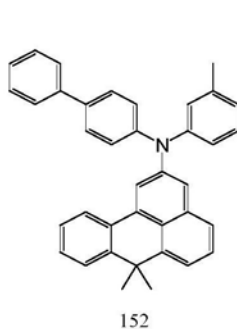
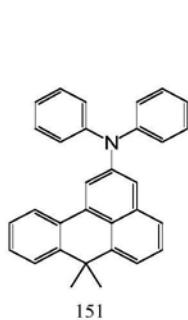
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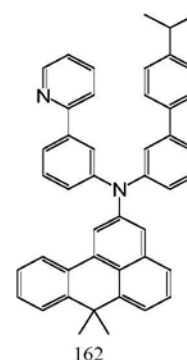
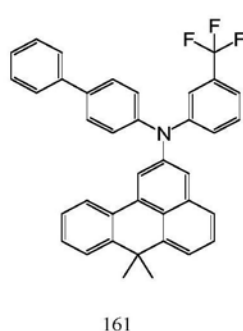
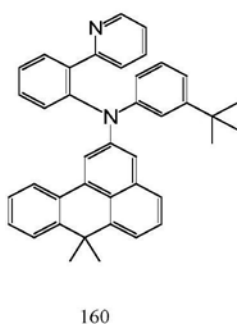
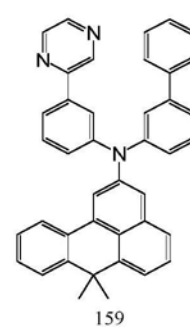
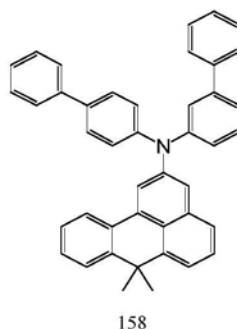
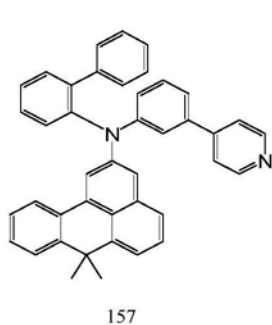


[0066]





[0067]



[0068] 本发明提供了一种式(I)所示的化合物作为CPL层在制备有机电致发光器件中的应用,通过选用特定的本发明提供的化合物用作OLED器件的CPL层(Cap layer,光提取覆盖层)材料后,可有效提高器件的光取出效率。且原料来源广泛,具有广阔的工业应用前景。

[0069] 另外,本发明中 $\text{—}\text{N}\text{—}$ 代表基团的连接键; $\text{—}\text{N}\text{—}$ 中-N代表该键可以在芳基的任意一个位置。

[0070] 下面将结合本发明实施例的技术方案进行清楚、完整地描述,显然,所描述的实施例仅仅是本发明一部分实施例,而不是全部的实施例。基于本发明中的实施例,本领域普通

技术人员在没有做出创造性劳动前提下所获得的所有其他实施例,都属于本发明保护的范围。

[0071] 实施例1

[0072] 将本发明所述的式(I)化合物作为CPL层应用于OLED器件的制备,其中,本发明对式(I)化合物的来源没有特殊要求,可以购买或自制,如果自制时,可以根据本领域常规的技术手段进行制备。

[0073] 本实施例中的OLED器件为顶发射有机电致发光器件结构包括:基板1,和在基板1上依次镀覆形成的反射层2、阳极3、空穴注入层(HIL)4、空穴传输层(HTL)5、发光层(EML)6、电子传输层(ETL)7、电子注入层(EIL)8、阴极9和覆盖层10。

[0074] 其中,基板1为玻璃基板、石英基板或柔性高分子基板(塑料或聚酰亚胺等);

[0075] 反射层2可为金属银或银合金,金属铝或铝合金层,用于反射入射基板方向的光线;

[0076] 阳极层3可为ITO(氧化铟锡)、IZO(氧化铟锌)、高功函数金属或合金、C60等有机半导体材料;均能实现本发明的目的,属于本发明的保护范围。

[0077] 空穴注入层4选用4,4',4''-三(N-3-甲基苯基-N-苯基氨基)三苯胺(MTDATA)和2,3,5,6-四氟四氰基奎二甲烷(F4TCNQ)的混合物,两者的质量比例为25:1。

[0078] 空穴传输层5为N,N'-二-(1-萘基)-N,N'-二苯基-1,1'-联苯基-4,4'-二胺(NPB)。

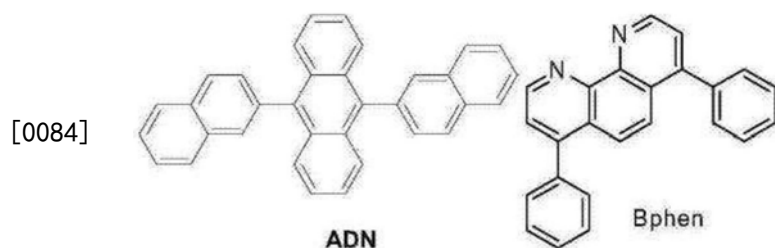
[0079] 发光层6可以是红光、绿光或蓝光。其中,红光的主体RH为Bebq2(双(10-羟基苯并[h]喹啉)铍)、掺杂RD为Ir(piq)2(acac),绿光的主体GH为CBP(4,4'-双(N-咔唑)-1,1'-联苯)、掺杂GD为Ir(ppy)3,蓝光主体BH为ADN、掺杂BD为DPAVB(1,4-二[4-(二甲氨基苯基)苯乙烯基]苯),

[0080] 电子传输层7为Bphen。电子注入层8可为无机碱金属化合物或有机碱金属配合物。优选碱金属为无机碱金属化合物为LiF,有机碱金属配合物为八羟基喹啉锂。

[0081] 具体制备器件如下:

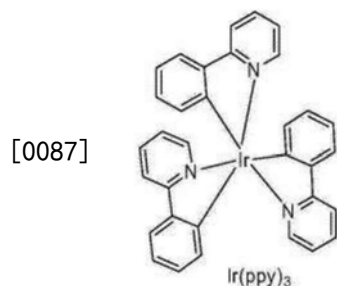
[0082] 蓝光器件

[0083] 基板1为玻璃基板,在基板1上溅射沉积Ag作为反射层2,厚度为150nm,溅射10nm的ITO作为器件的阳极3,并蚀刻出所需的图形,用O₃等离子处理3分钟。将所得基板1置于真空中,通过共蒸沉积130nm的MTDATA和F4TCNQ的混合物作为空穴注入层(HIL)4,其中F4TCNQ重量为MTDATA重量的4%。接着沉积10nm的NPB作为空穴传输层(HTL)5。再共蒸沉积30nm的ADN和DPAVB的混合物作为发光层6,其中DPAVB与ADN的摩尔比为1:20。然后沉积20nm的Bphen作为电子传输层(ETL)7。再蒸镀1nm的LiF作为电子注入层8。阴极9为共同蒸镀K和Ag的合金层10nm,其中K通过KBH₄在蒸镀过程中(温度400℃)分解的方式蒸镀,K和Ag摩尔比为8:1,然后沉积25nm的Ag。蒸镀30nm的本发明化合物001作为CPL层。



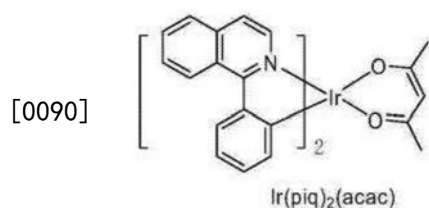
[0085] 绿光器件

[0086] 与蓝光器件的制备方法一致,只是将HIL的厚度改为170nm,发光层的材料改为CBP和Ir(ppy)₃的混合物,其中Ir(ppy)₃与CBP的摩尔比1:10。



[0088] 红光器件

[0089] 与蓝光器件的制备方法一致,只是将HIL的厚度改为60nm,发光层的材料改为BeBq₂和Ir(piq)₂(acac)的混合物,其中Ir(piq)₂(acac)与BeBq₂的摩尔比为1:10。



[0091] 实施例2

[0092] 具体实施步骤同实施例1,唯一不同的是阴极9为:K和Ag合金层,摩尔比为2:1,厚度为7nm;Ag层为25nm;CPL层为本发明化合物037,厚度为50nm,制备红光器件。

[0093] 实施例3

[0094] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为4:1,厚度为5nm;Ag层为20nm;CPL层为本发明化合物061,厚度为60nm,制备绿光器件。

[0095] 实施例4

[0096] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为6:1,厚度为7nm;Ag层为25nm;CPL层为本发明化合物085,厚度为30nm,制备红光器件。

[0097] 实施例5

[0098] 具体实施步骤同实施例1,唯一不同的是阴极9为:Li和Ag合金层,摩尔比为8:1,厚度为9nm;Ag层为30nm;CPL层为本发明化合物109,厚度为50nm,制备绿光器件。

[0099] 实施例6

[0100] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为4:1,厚度为11nm;Ag层为20nm;CPL层为本发明化合物139,厚度为45nm,制备蓝光器件。

[0101] 实施例7

[0102] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为4:1,厚度为11nm;Ag层为20nm;CPL层为本发明化合物013,厚度为45nm,制备蓝光器件。

[0103] 实施例8

[0104] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为4:1,厚度为3nm;Ag层为15nm;CPL层为本发明化合物050,厚度为100nm,制备蓝光器件。

[0105] 实施例9

[0106] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为4:1,厚

度为3nm;Ag层为15nm;CPL层为本发明化合物059,厚度为100nm,制备蓝光器件。

[0107] 实施例10

[0108] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为6:1,厚度为7nm;Ag层为25nm;CPL层为本发明化合物002,厚度为30nm,制备红光器件。

[0109] 实施例11

[0110] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为6:1,厚度为7nm;Ag层为25nm;CPL层为本发明化合物003,厚度为30nm,制备红光器件。

[0111] 实施例12

[0112] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为6:1,厚度为7nm;Ag层为25nm;CPL层为本发明化合物004,厚度为30nm,制备红光器件。

[0113] 实施例13~实施例16

[0114] 具体实施步骤同实施例1,唯一不同的是阴极9为:Li和Ag合金层,摩尔比为8:1,厚度为9nm;Ag层为30nm;CPL层为本发明化合物005~008,厚度为50nm,制备绿光器件。

[0115] 实施例17~实施例20

[0116] 具体实施步骤同实施例1,唯一不同的是阴极9为:Mg和Ag合金层,摩尔比为4:1,厚度为3nm;Ag层为15nm;CPL层为本发明化合物009~012,厚度为100nm,制备蓝光器件。

[0117] 对比例1

[0118] 本对比例是OLED器件制备实施例,具体步骤如实施例1所述,唯一不同的是所述OLED透明复合阴极9仅包括依次设置的低功函数金属与Ag的合金层、Ag层,不包括CPL层,制备红光器件、绿光器件和蓝光器件。

[0119] 对比例2

[0120] 本对比例中OLED器件制备步骤同实施例1,不同的是所述阴极9是一种OLED复合阴极结构,所述OLED复合阴极结构包括依次设置的低功函数金属与Ag的合金层、Ag层。具体步骤如下:在真空条件下,利用热蒸镀技术,蒸镀Mg/Ag合金材料作为所述合金层,Mg/Ag的摩尔比为1:1,所述合金层的厚度为10nm;在真空条件下,利用热蒸镀技术,在所述合金层的上方蒸镀一层Ag层,厚度为10nm,制备红光器件、绿光器件和蓝光器件。

[0121] 实施例21

[0122] 对实施例2~8以及对比例1~2得到的OLED器件的性能进行测试,结果见表1。

[0123] 表1

[0124]

| | 器件 类型 | 驱动电压 (V) | 电流效率 (cd/A) | 亮度 (cd/m ²) | 寿命 T (95) | 色坐标 |
|-----------|----------|-------------|----------------|----------------------------|-----------------|-------------|
| 对比 例 1 | 蓝光 器件 | 5.1 | 3.3 | 280 | 52.2 | (0.14,0.08) |
| | 绿光 器件 | 5.2 | 46.1 | 12260 | 68.9 | (0.24,0.69) |
| | 红光 器件 | 5.9 | 13.2 | 7880 | 70.2 | (0.68,0.32) |
| 对比 例 2 | 蓝光 器件 | 5.1 | 3.8 | 140 | 52.9 | (0.14,0.06) |
| | 绿光 器件 | 5.2 | 66.3 | 5520 | 70.2 | (0.19,0.73) |
| | 红光 器件 | 5.9 | 16.1 | 3420 | 72.6 | (0.67,0.33) |
| 实施 例 2 | 蓝光 器件 | 5.1 | 7.3 | 598 | 55.6 | (0.14,0.06) |
| | 绿光 | 5.2 | 70.3 | 17300 | 120.6 | (0.18,0.73) |

[0125]

| | 器件 | | | | | |
|--------|------|-----|------|-------|-------|-------------|
| | 红光器件 | 5.9 | 21.4 | 12398 | 130.8 | (0.67,0.33) |
| 实施例 3 | 红光器件 | 5.8 | 22.9 | 11592 | 132.5 | (0.67,0.33) |
| 实施例 4 | 绿光器件 | 5.4 | 70.9 | 22198 | 124.5 | (0.18,0.73) |
| 实施例 5 | 红光器件 | 5.1 | 22.1 | 11389 | 135.4 | (0.67,0.36) |
| 实施例 6 | 绿光器件 | 5.3 | 72.1 | 20992 | 126.3 | (0.18,0.73) |
| 实施例 7 | 蓝光器件 | 5.4 | 6.5 | 580 | 110.0 | (0.14,0.17) |
| 实施例 8 | 蓝光器件 | 5.5 | 6.7 | 590 | 108.3 | (0.14,0.15) |
| 实施例 9 | 蓝光器件 | 5.6 | 6.4 | 592 | 109.6 | (0.14,0.16) |
| 实施例 10 | 红光器件 | 5.9 | 24.9 | 11611 | 133.5 | (0.66,0.33) |
| 实施例 11 | 红光器件 | 5.8 | 24.8 | 11621 | 132.5 | (0.65,0.32) |
| 实施例 12 | 红光器件 | 5.6 | 24.4 | 11618 | 134.5 | (0.62,0.31) |
| 实施例 13 | 绿光器件 | 5.5 | 75.1 | 22197 | 126.5 | (0.18,0.73) |
| 实施例 14 | 绿光器件 | 5.4 | 75.2 | 22196 | 124.6 | (0.17,0.71) |
| 实施例 15 | 绿光器件 | 5.3 | 74.8 | 22193 | 125.6 | (0.18,0.72) |
| 实施例 16 | 绿光器件 | 5.5 | 75.9 | 22199 | 126.7 | (0.17,0.73) |
| 实施例 17 | 蓝光器件 | 5.4 | 6.5 | 588 | 109.8 | (0.13,0.16) |
| 实施例 18 | 蓝光器件 | 5.3 | 6.4 | 585 | 110.1 | (0.14,0.17) |
| 实施例 19 | 蓝光器件 | 5.4 | 6.5 | 582 | 109.9 | (0.12,0.16) |
| 实施例 20 | 蓝光器件 | 5.3 | 6.6 | 586 | 110.3 | (0.14,0.17) |

[0126] 从上表可以看出,相同类型的器件,本发明提供的器件比比例中的器件的电流效率、亮度寿命更好。

[0127] 以上实施例的说明只是用于帮助理解本发明的方法及其核心思想。应当指出,对于本技术领域的普通技术人员来说,在不脱离本发明原理的前提下,还可以对本发明进行

若干改进和修饰,这些改进和修饰也落入本发明权利要求的保护范围内。

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|----------------|--|---------|------------|
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| [标]申请(专利权)人(译) | 吉林奥来德光电材料股份有限公司 | | |
| 申请(专利权)人(译) | 吉林奥来德光电材料股份有限公司 | | |
| 当前申请(专利权)人(译) | 吉林奥来德光电材料股份有限公司 | | |
| [标]发明人 | 王辉 赵贺 毕岩 孙峰 李明 李文军 马晓宇 | | |
| 发明人 | 王辉 赵贺 毕岩 孙峰 李明 李文军 马晓宇 | | |
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摘要(译)

本发明提供了一种化合物的应用，本发明提供的式(I)所示的化合物作为CPL层在制备有机电致发光器件后，可有效提高器件的光取出效率。

