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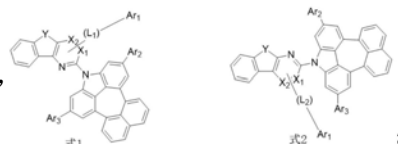
(54)发明名称

一种磷光化合物和使用该化合物的有机发光二极管器件

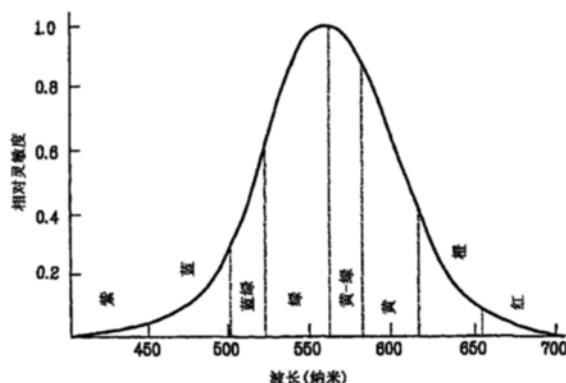
(57)摘要

本发明涉及一种磷光化合物和使用该化合物的有机发光二极管器件,更具体而言,涉及一种具有优异的色纯度和高亮度及发光效率的可溶的磷光主体化合物以及使用该化合物的OLED器件。一种磷光化合物,其特征在于:其结构式如

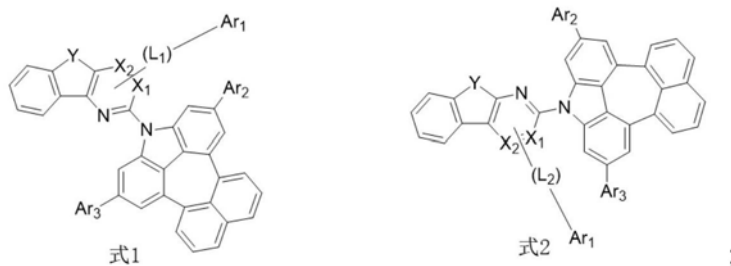
式1或式2所示,



本发明使用结构式1和结构式2所示的磷光化合物作为有机发光二极管器件的发光层,具有优异的色纯度和亮度以及延长的耐久性效果。

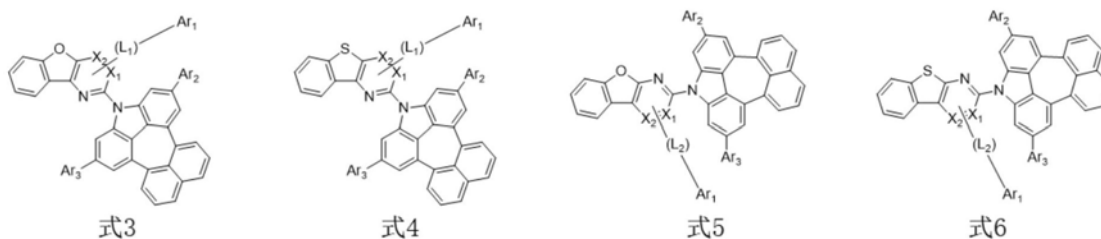


1. 一种磷光化合物,其特征在于:其结构式如式1或式2所示,

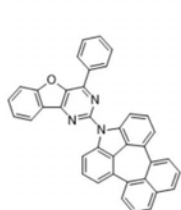


在上述式1和式2中Ar1分别独立地选自C6~C60芳基,茱基,包括O、N、S、Si和P其中至少一种杂原子的C2~C60杂环基,C3~C60脂环族和C6~C60芳香族环的稠环基,C2~C20烯基,C2~C20炔基中的一种;L1和L2分别独立地选自由单键、C6~C60亚芳基、茱烯基组成的基团,C3~C60脂环族和C6~C60芳香族环的稠环基,C2~C60杂环基中的一种;X1~X2独立地选自N原子或C原子,其中X1~X2中的至少一个为N;其中Y选自O、S和Se;其中Ar2和Ar3选自H,C6~C60芳基,茱基,包括O、N、S、Si和P其中至少一种杂原子的C2~C60杂环基,C3~C60脂环族和C6~C60芳香族环的稠环基,C2~C20烯基,C2~C20炔基中的一种。

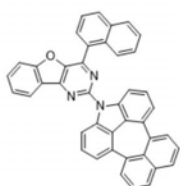
2. 如权利要求1中任意一项所述的磷光化合物,其特征在于,所述式1和式2独立地选自式3~式6的任何一种结构:



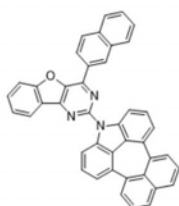
3. 如权利要求1-2中任意一项所述的磷光化合物,其特征在于:所述的磷光化合物独立地选自下列化合物:



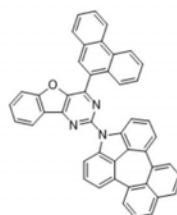
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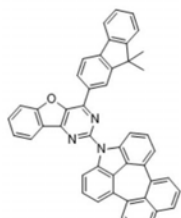
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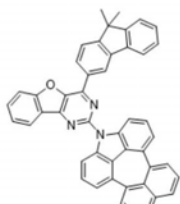
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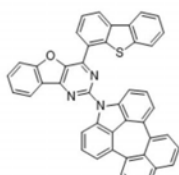
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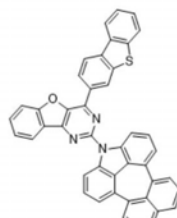
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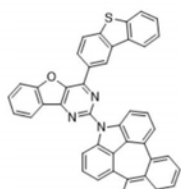
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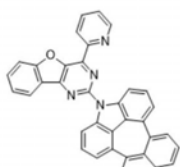
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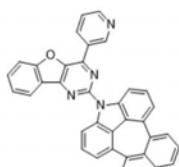
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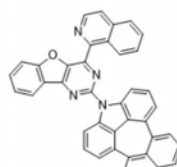
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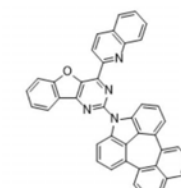
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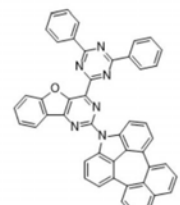
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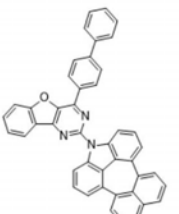
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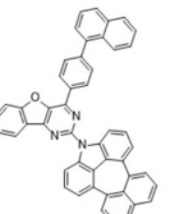
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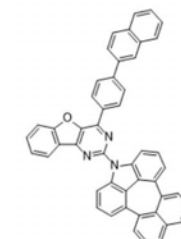
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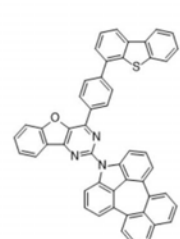
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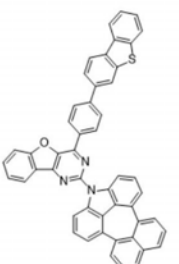
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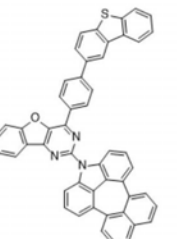
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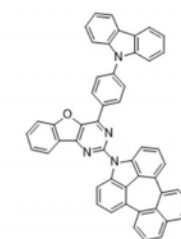
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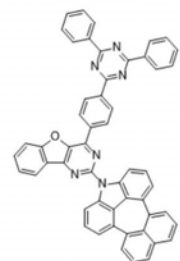
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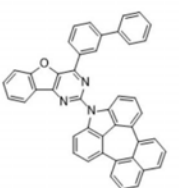
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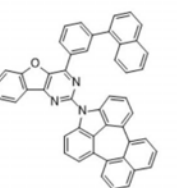
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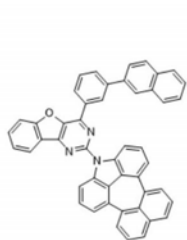
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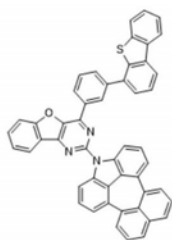
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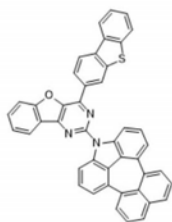
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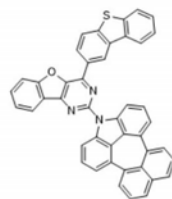
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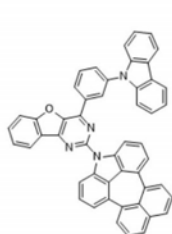
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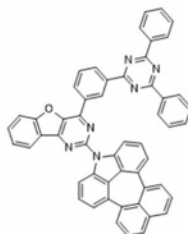
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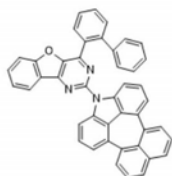
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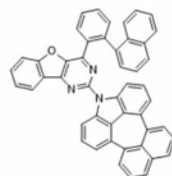
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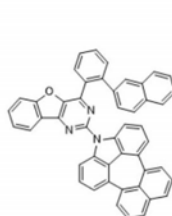
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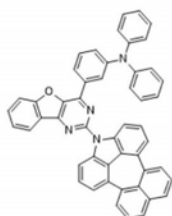
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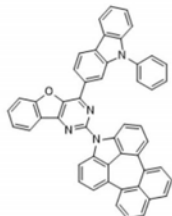
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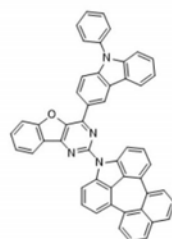
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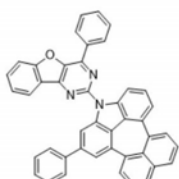
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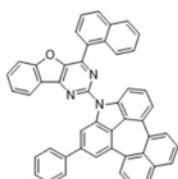
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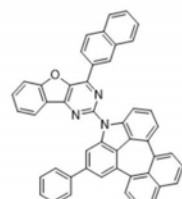
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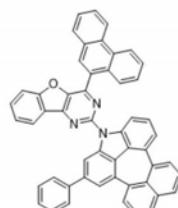
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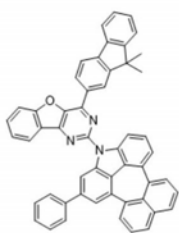
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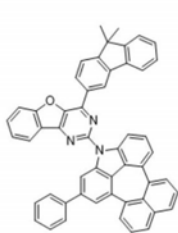
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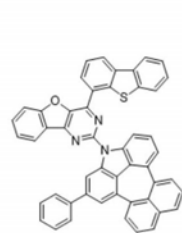
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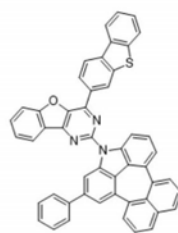
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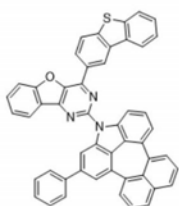
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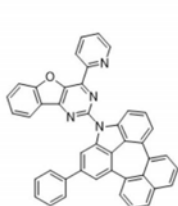
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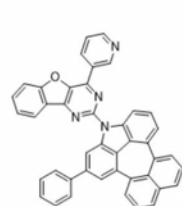
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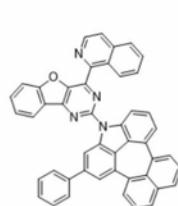
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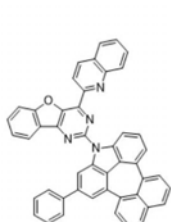
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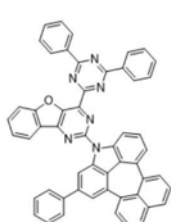
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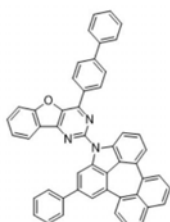
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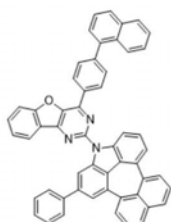
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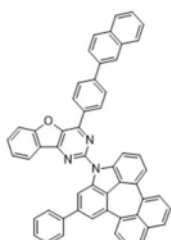
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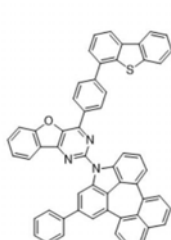
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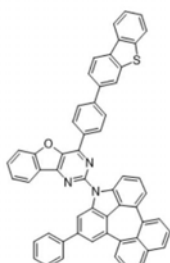
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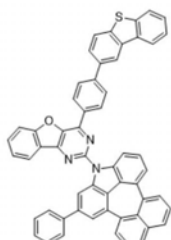
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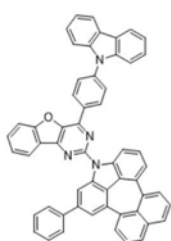
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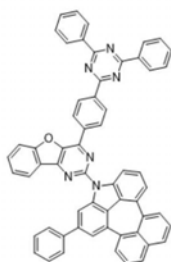
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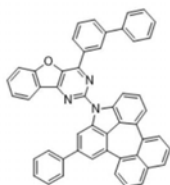
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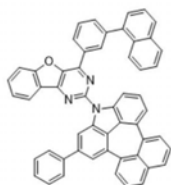
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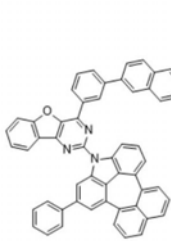
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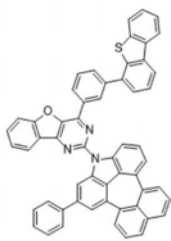
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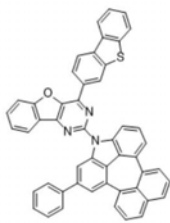
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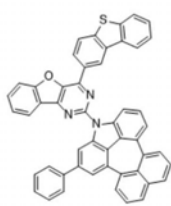
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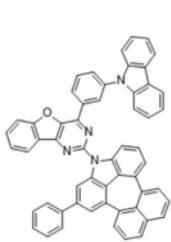
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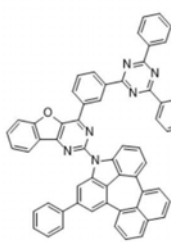
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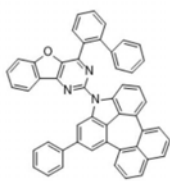
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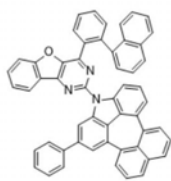
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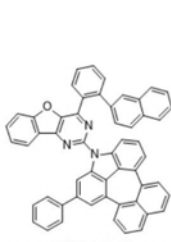
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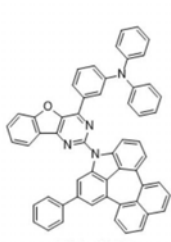
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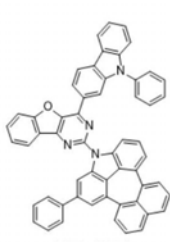
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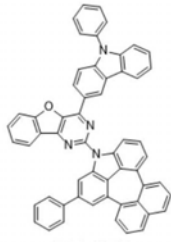
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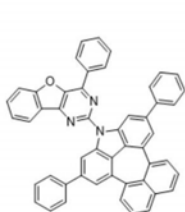
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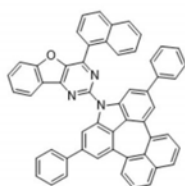
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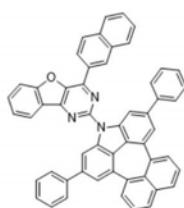
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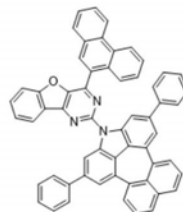
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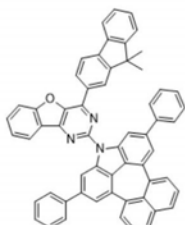
RH-074



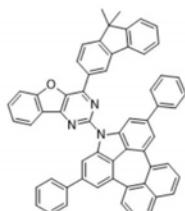
RH-075



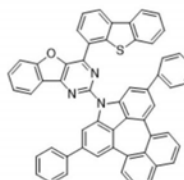
RH-076



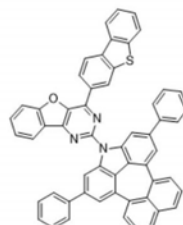
RH-077



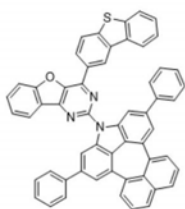
RH-078



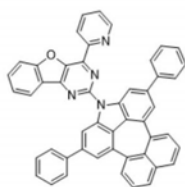
RH-079



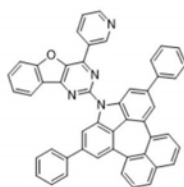
RH-080



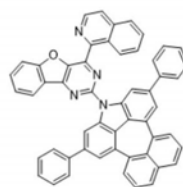
RH-081



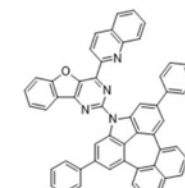
RH-082



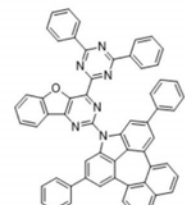
RH-083



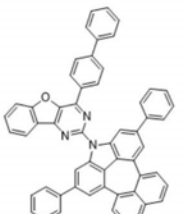
RH-084



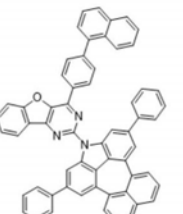
RH-085



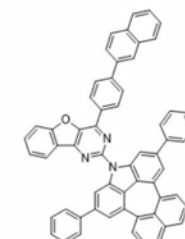
RH-086



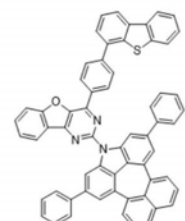
RH-087



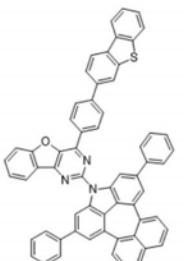
RH-088



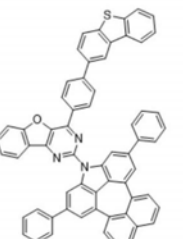
RH-089



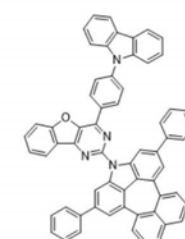
RH-090



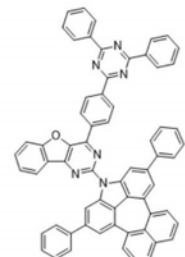
RH-091



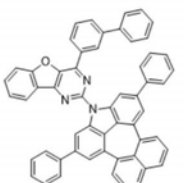
RH-092



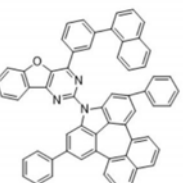
RH-093



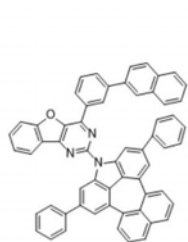
RH-094

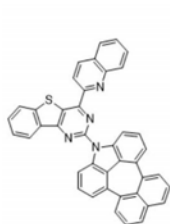


RH-095

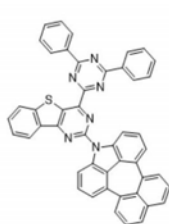


RH-096

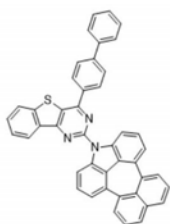




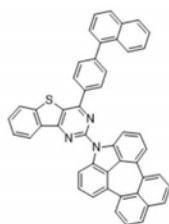
RH-121



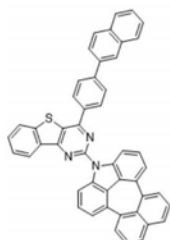
RH-122



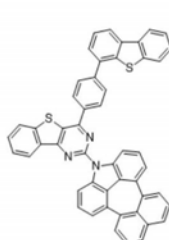
RH-123



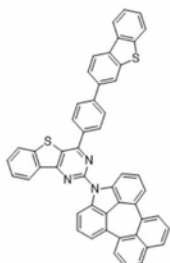
RH-124



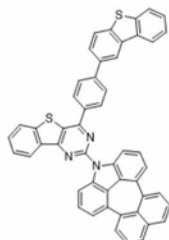
RH-125



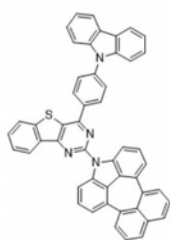
RH-126



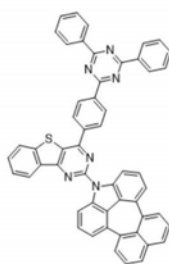
RH-127



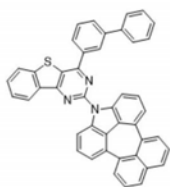
RH-128



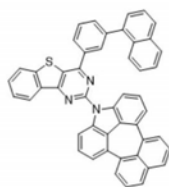
RH-129



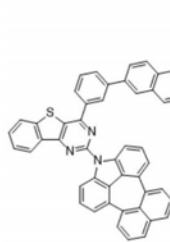
RH-130



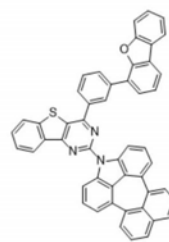
RH-131



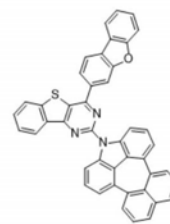
RH-132



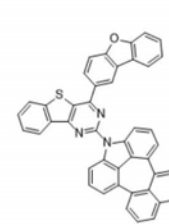
RH-133



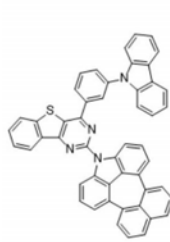
RH-134



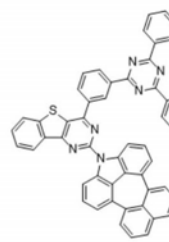
RH-135



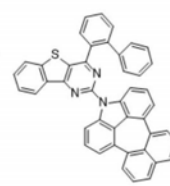
RH-136



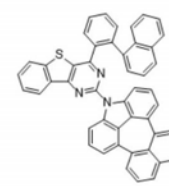
RH-137



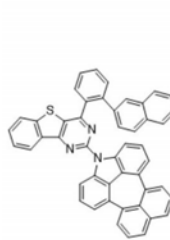
RH-138



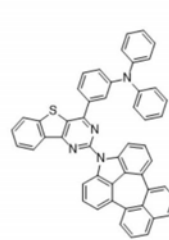
RH-139



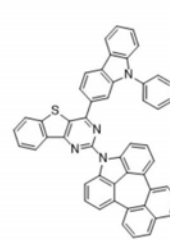
RH-140



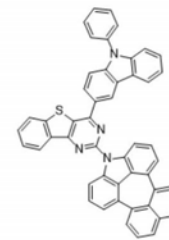
RH-141



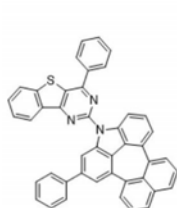
RH-142



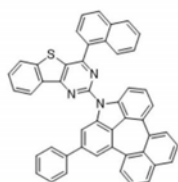
RH-143



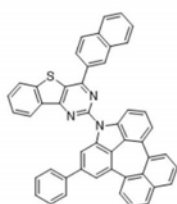
RH-144



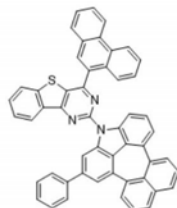
RH-145



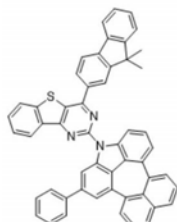
RH-146



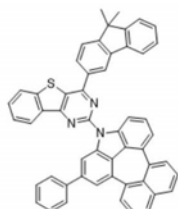
RH-147



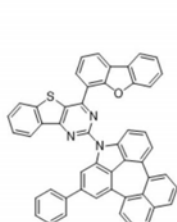
RH-148



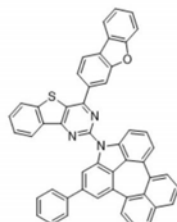
RH-149



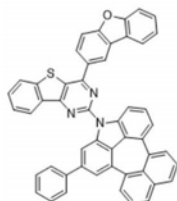
RH-150



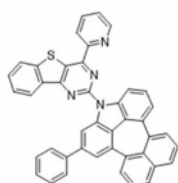
RH-151



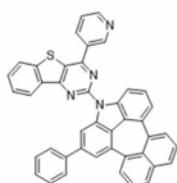
RH-152



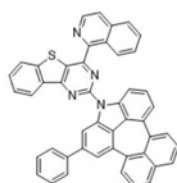
RH-153



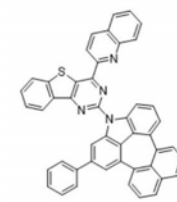
RH-154



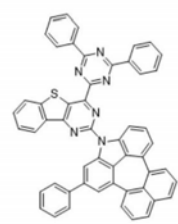
RH-155



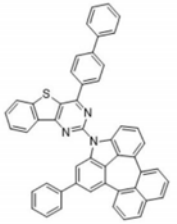
RH-156



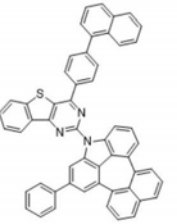
RH-157



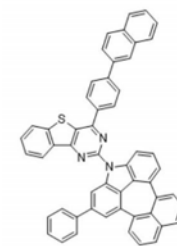
RH-158



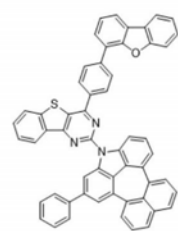
RH-159



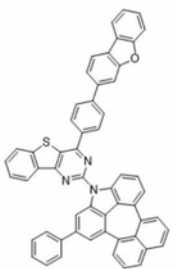
RH-160



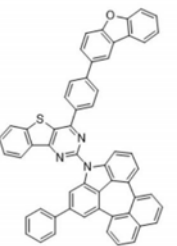
RH-161



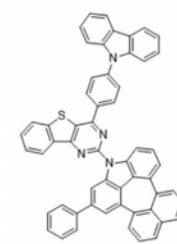
RH-162



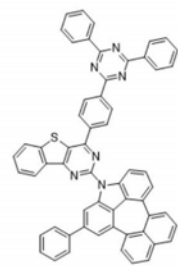
RH-163



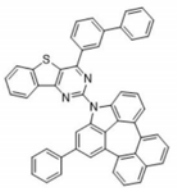
RH-164



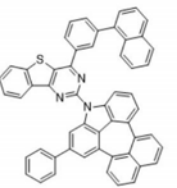
RH-165



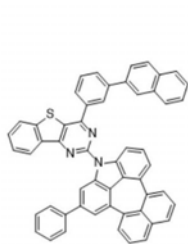
RH-166



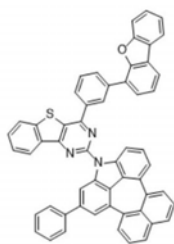
RH-167



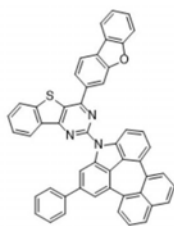
RH-168



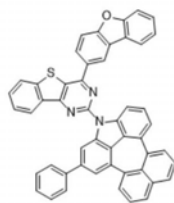
RH-169



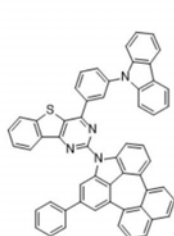
RH-170



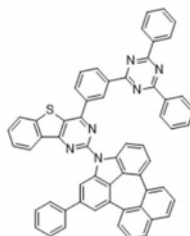
RH-171



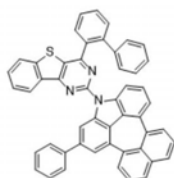
RH-172



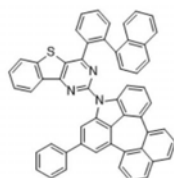
RH-173



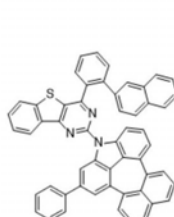
RH-174



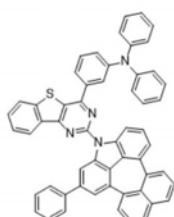
RH-175



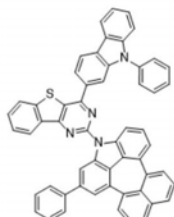
RH-176



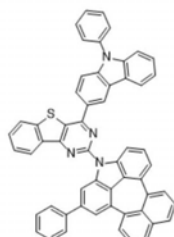
RH-177



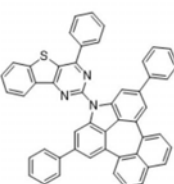
RH-178



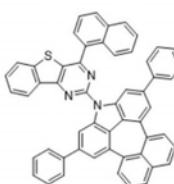
RH-179



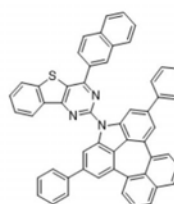
RH-180



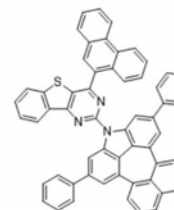
RH-181



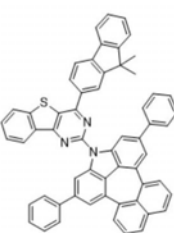
RH-182



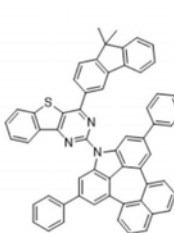
RH-183



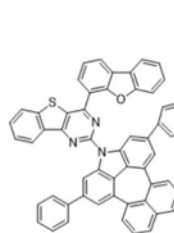
RH-184



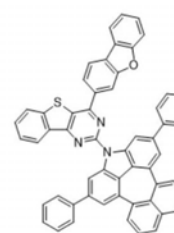
RH-185



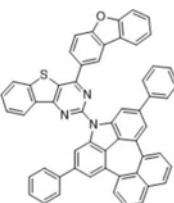
RH-186



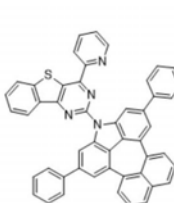
RH-187



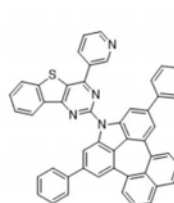
RH-188



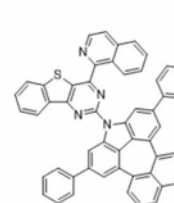
RH-189



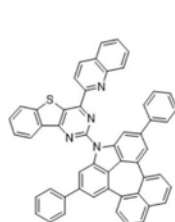
RH-190



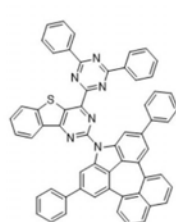
RH-191



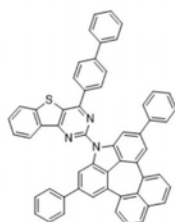
RH-192



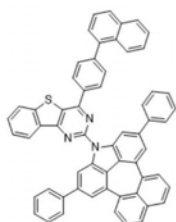
RH-193



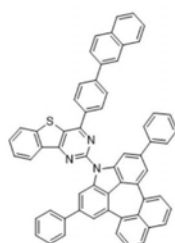
RH-194



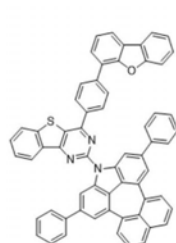
RH-195



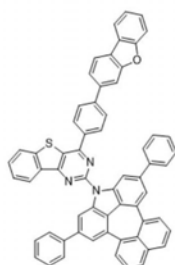
RH-196



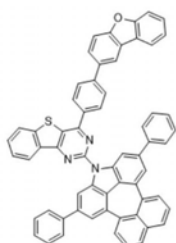
RH-197



RH-198



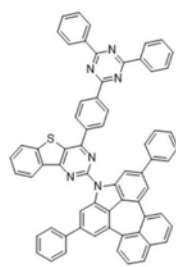
RH-199



RH-200



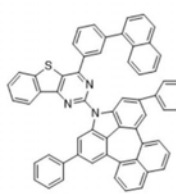
RH-201



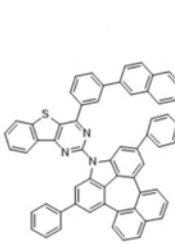
RH-202



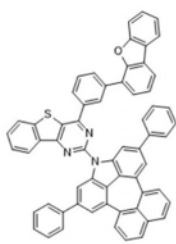
RH-203



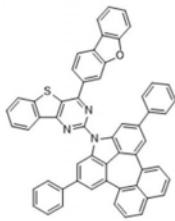
RH-204



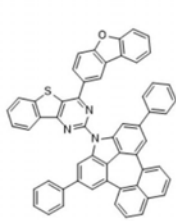
RH-205



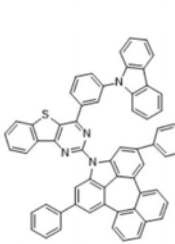
RH-206



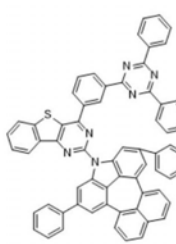
RH-207



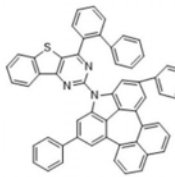
RH-208



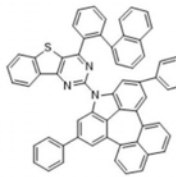
RH-209



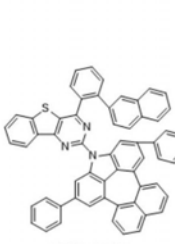
RH-210



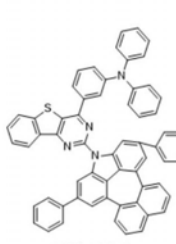
RH-211



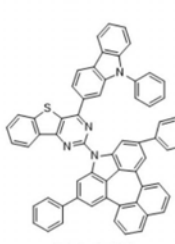
RH-212



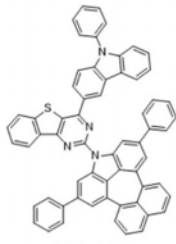
RH-213



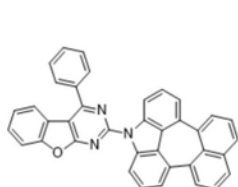
RH-214



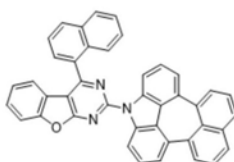
RH-215



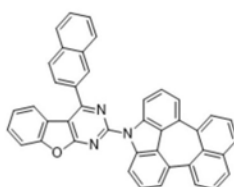
RH-216



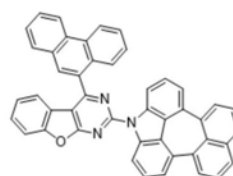
RH-217



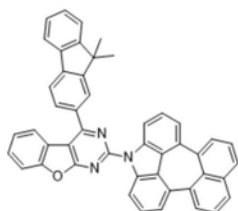
RH-218



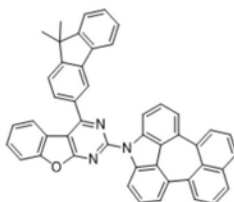
RH-219



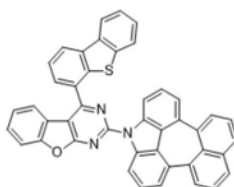
RH-220



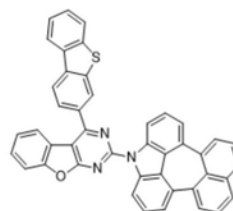
RH-221



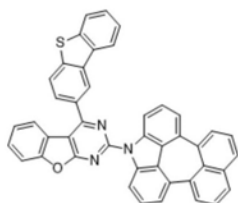
RH-222



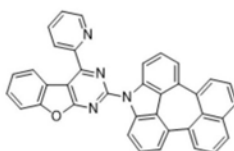
RH-223



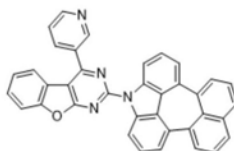
RH-224



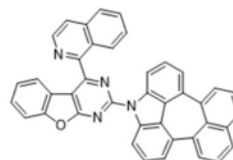
RH-225



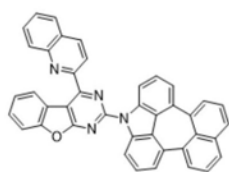
RH-226



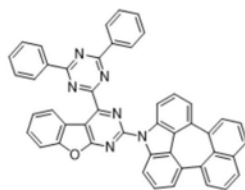
RH-227



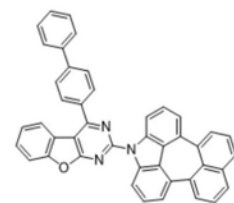
RH-228



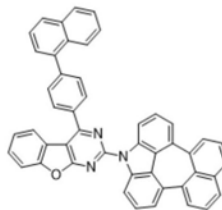
RH-229



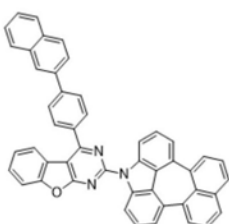
RH-230



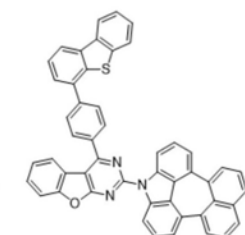
RH-231



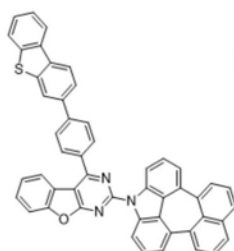
RH-232



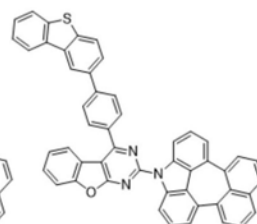
RH-233



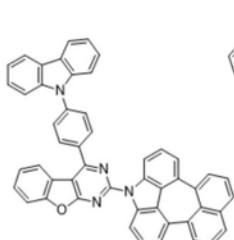
RH-234



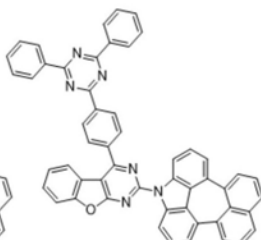
RH-235



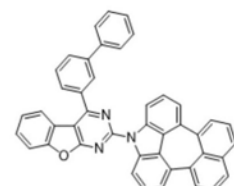
RH-236



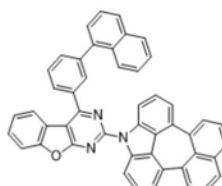
RH-237



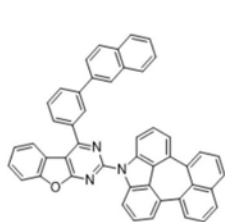
RH-238



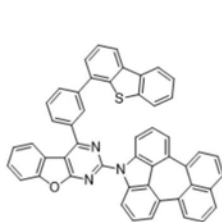
RH-239



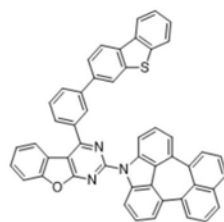
RH-240



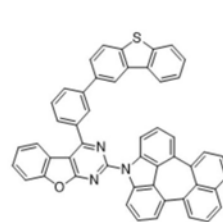
RH-241



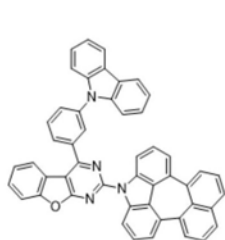
RH-242



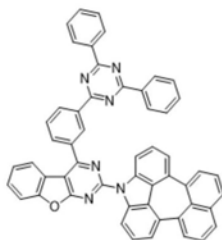
RH-243



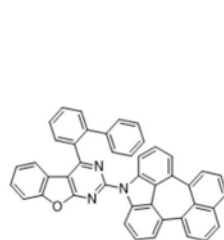
RH-244



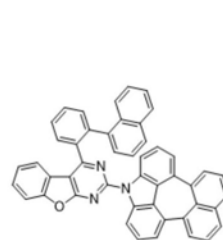
RH-245



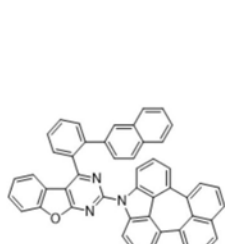
RH-246



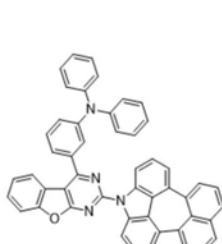
RH-247



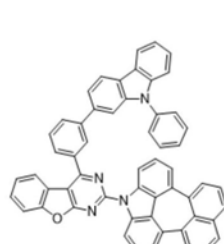
RH-248



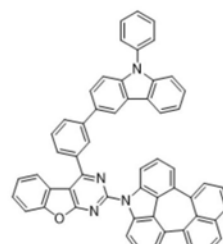
RH-249



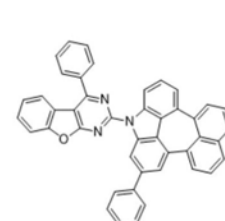
RH-250



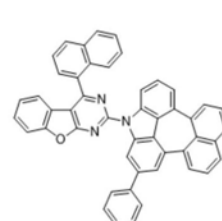
RH-251



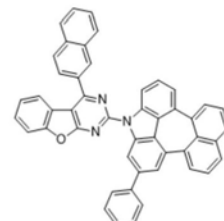
RH-252



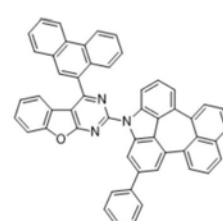
RH-253



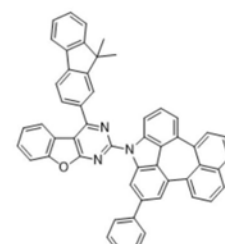
RH-254



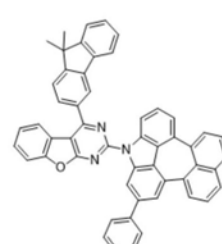
RH-255



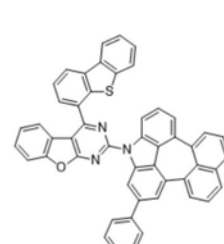
RH-256



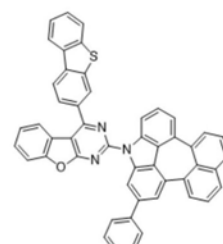
RH-257



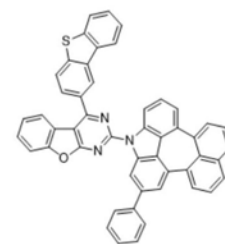
RH-258



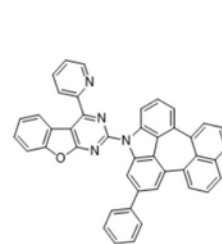
RH-259



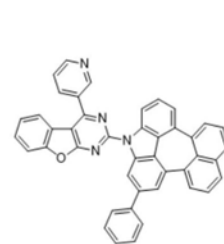
RH-260



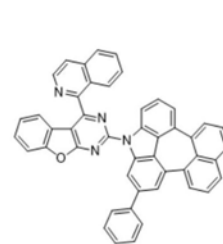
RH-261



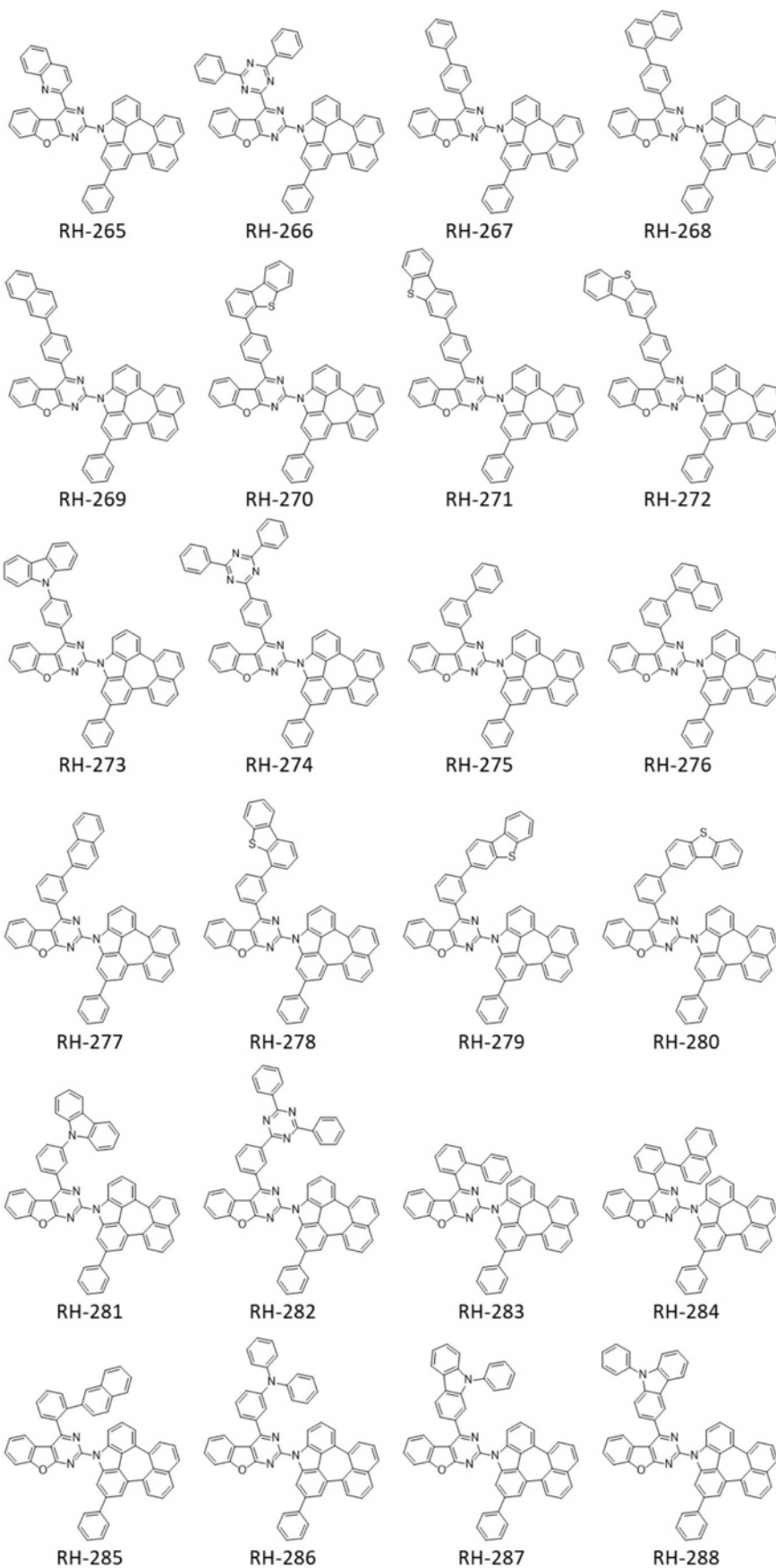
RH-262

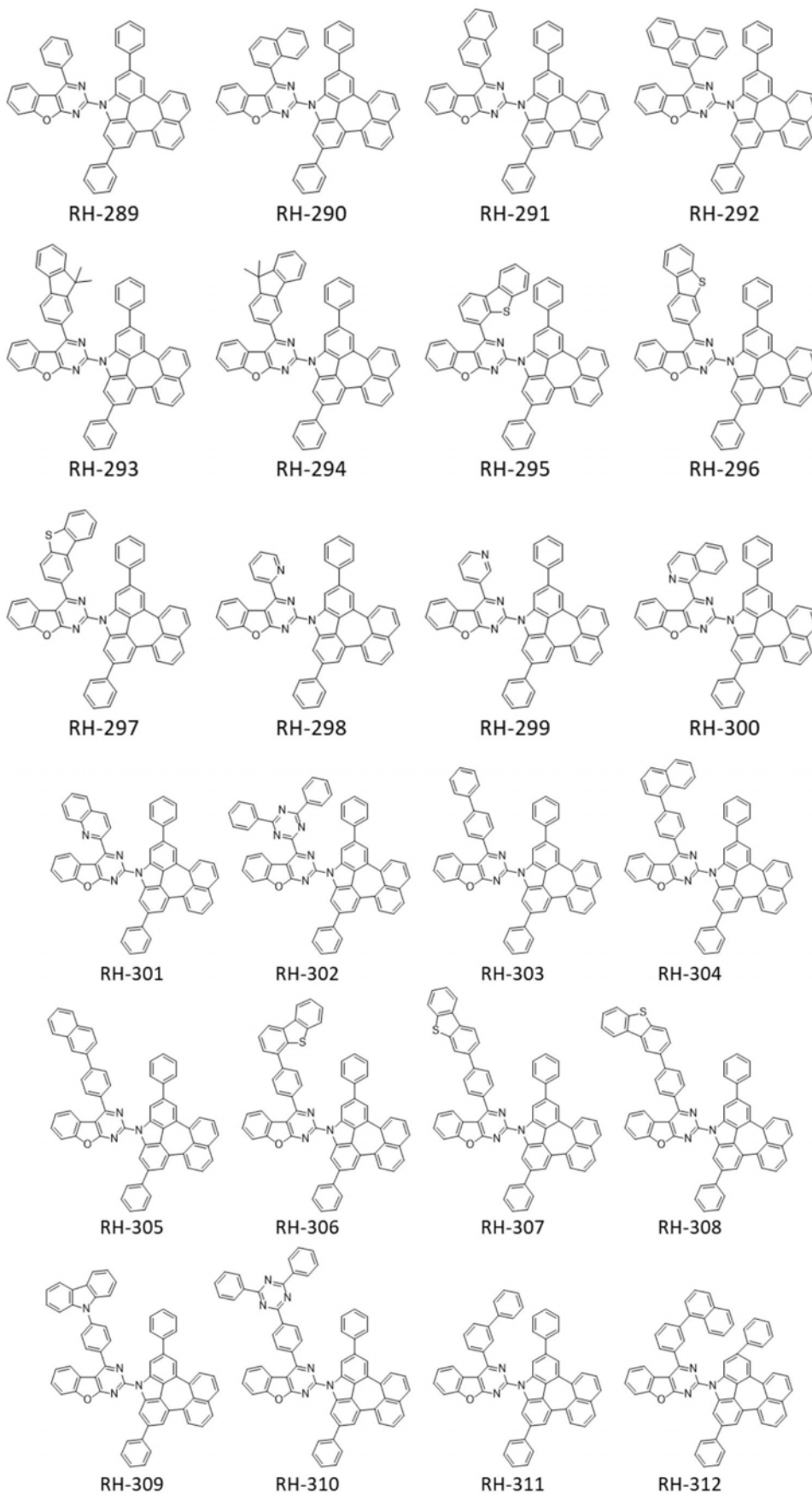


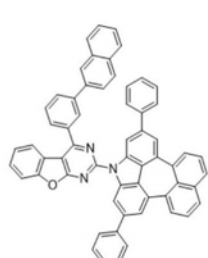
RH-263



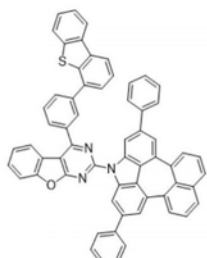
RH-264



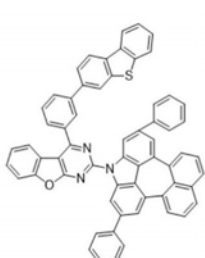




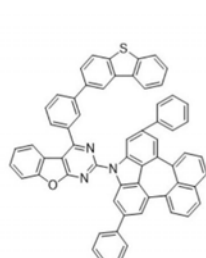
RH-313



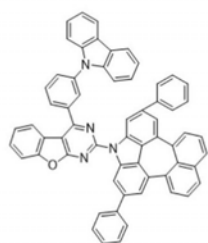
RH-314



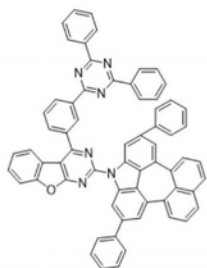
RH-315



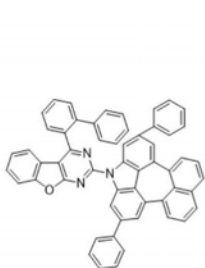
RH-316



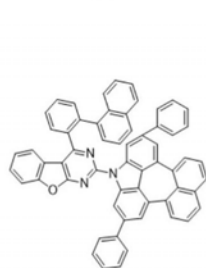
RH-317



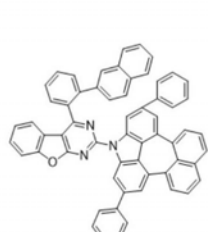
RH-318



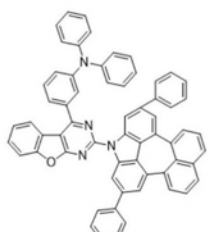
RH-319



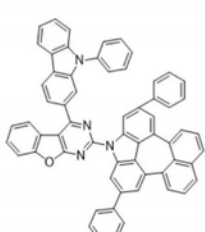
RH-320



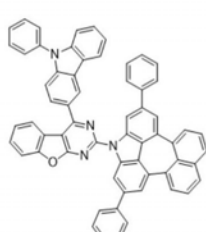
RH-321



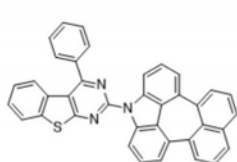
RH-322



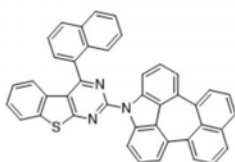
RH-323



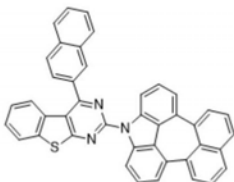
RH-324



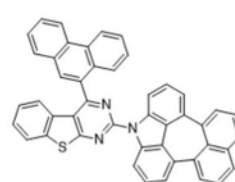
RH-325



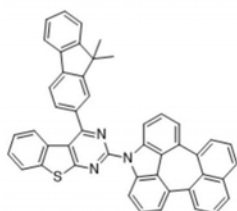
RH-326



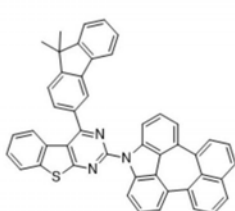
RH-327



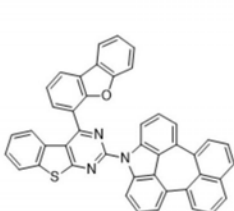
RH-328



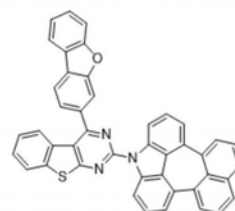
RH-329



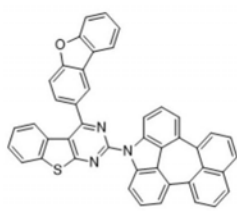
RH-330



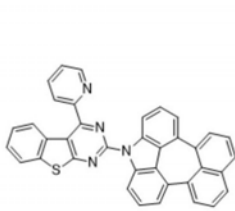
RH-331



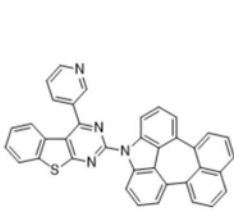
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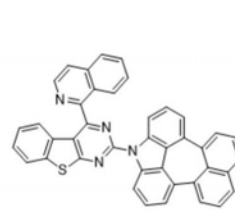
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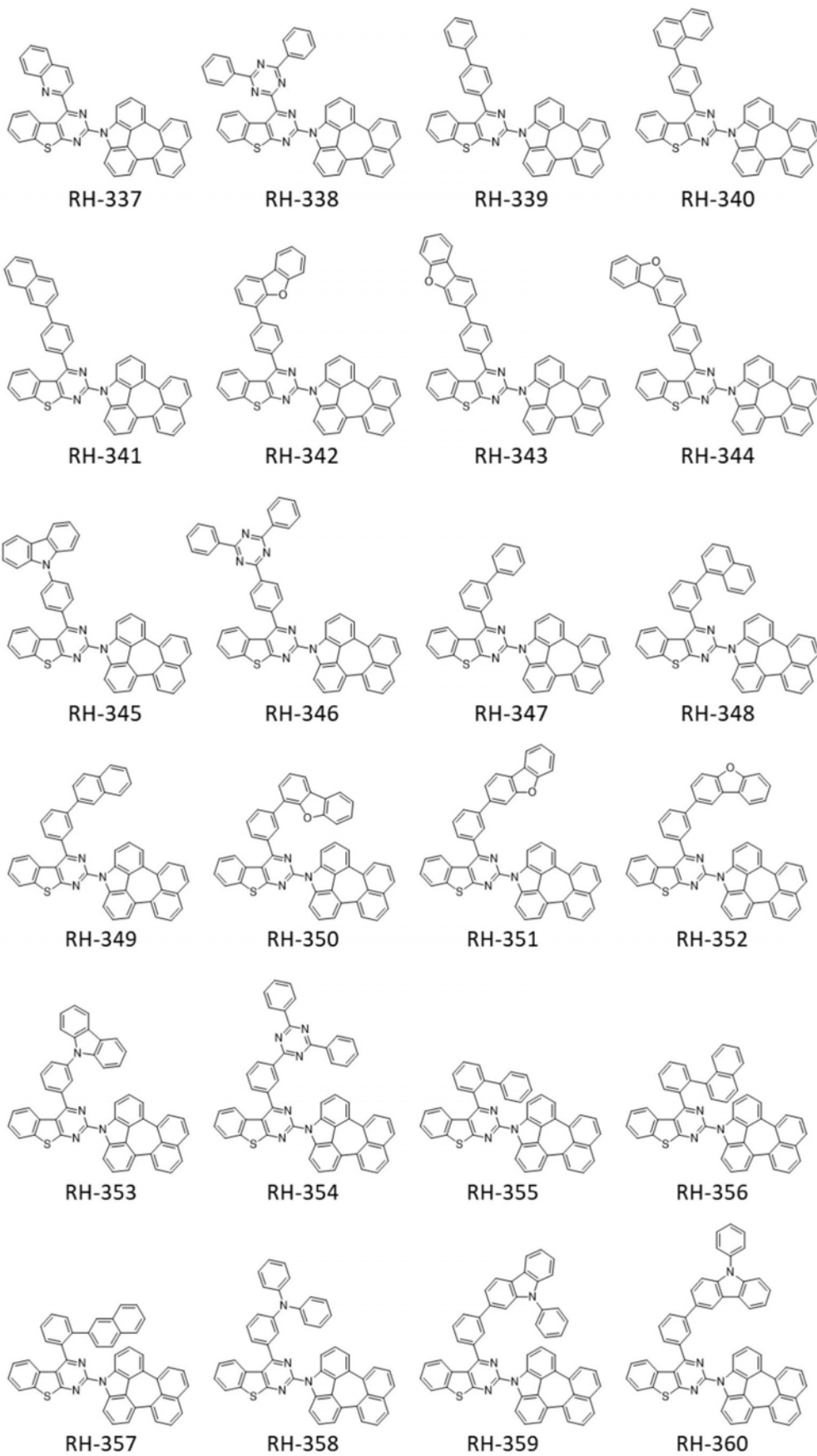
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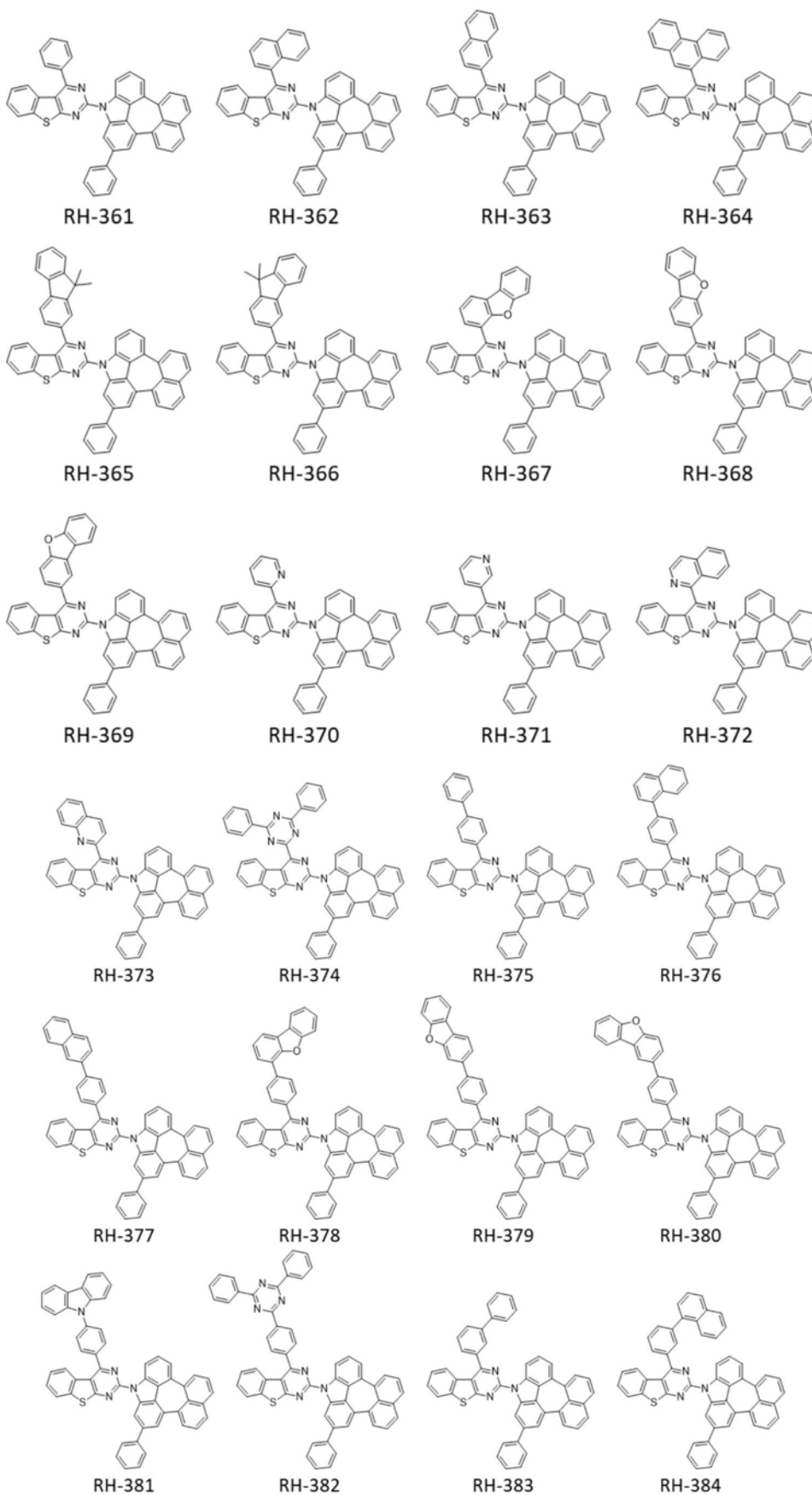


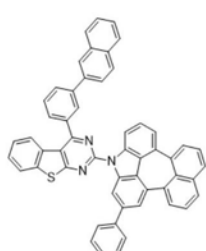
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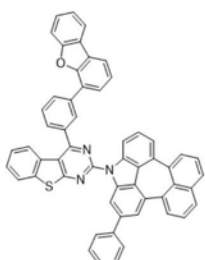
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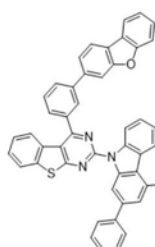




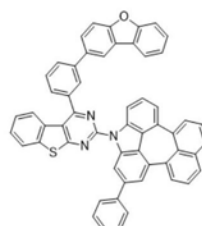
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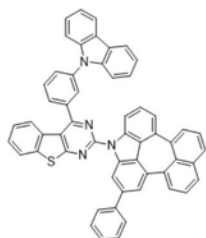
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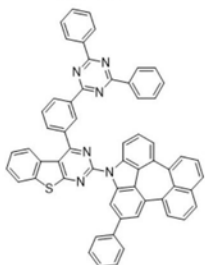
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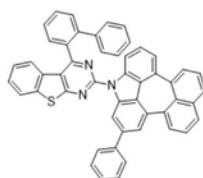
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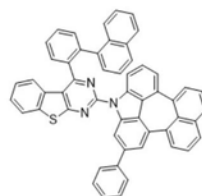
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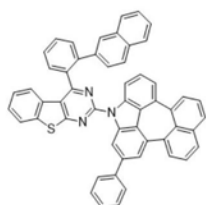
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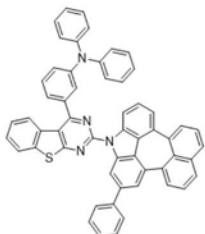
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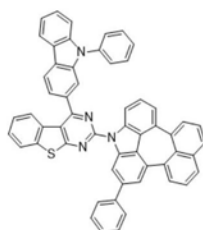
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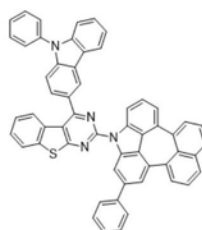
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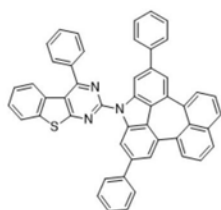
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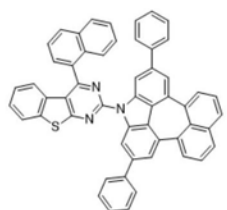
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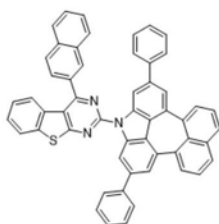
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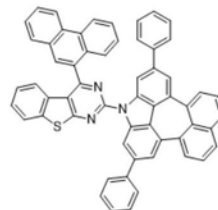
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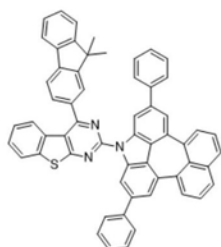
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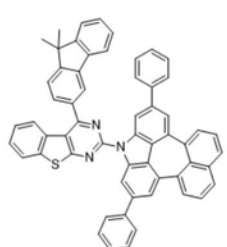
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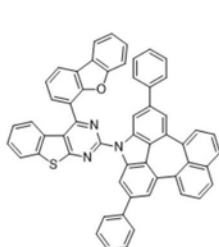
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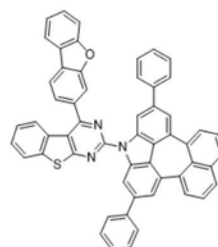
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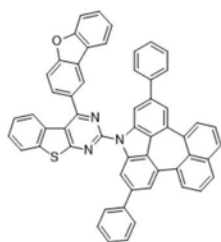
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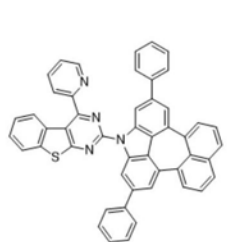
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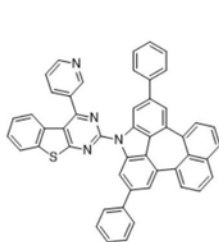
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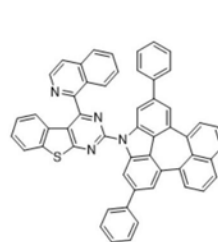
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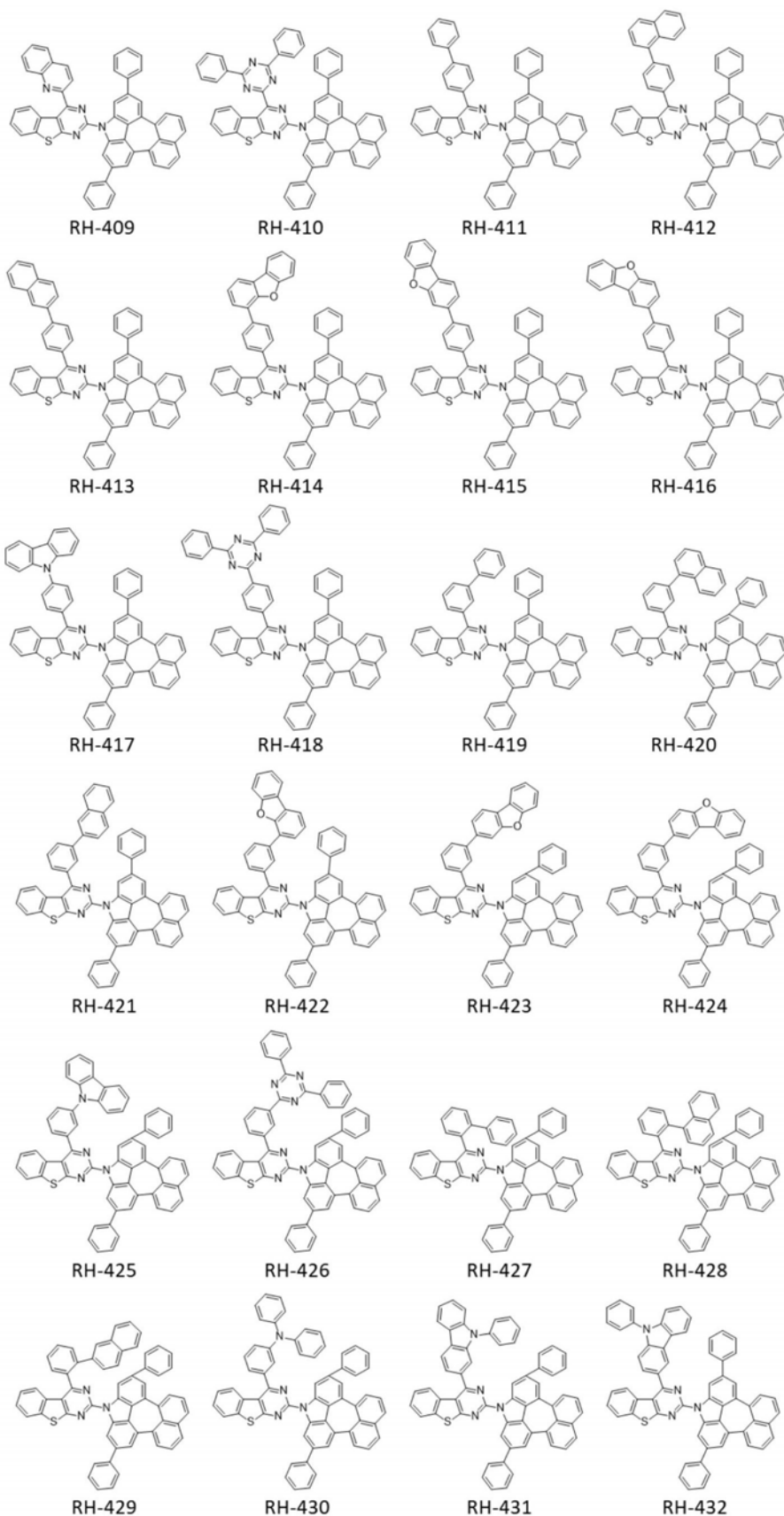
RH-406



RH-407



RH-408



4. 一种使用权利要求1-3中任意一项所述的磷光化合物的有机电致发光二极管器件，其特征在于：所述的有机电致发光器件顺次包括沉积的阳极、空穴注入层、空穴传输层、发光层、电子传输层、电子注入层和阴极，所述磷光化合物作为发光层的主体材料。

一种磷光化合物和使用该化合物的有机发光二极管器件

技术领域

[0001] 本发明涉及一种磷光化合物和使用该化合物的有机发光二极管器件,更具体而言,涉及一种具有优异的色纯度和高亮度及发光效率的可溶的磷光主体化合物以及使用该化合物的OLED器件。

背景技术

[0002] 近来,对于平板显示器(例如液晶显示器和等离子显示面板)的需求在增加。但是,这些平板显示器与阴极射线管(CRT)相比具有较低的响应时间和较窄的视角。

[0003] 有机发光二极管(OLED)器件是能够解决以上问题并占地较小的下一代平板显示器之一。

[0004] OLED器件的元素可以在柔性基板(例如塑料基板)上形成。另外,OLED器件在视角、驱动电压、能耗和色纯度方面具有优势。另外,OLED器件足以产生全色图像。

[0005] 通常,OLED器件的发光二极管包括阳极、空穴注入层(HIL)、空穴输送层(HTL)、发光材料层(EML)、电子输送层(ETL)、电子注入层(EIL)和阴极。

[0006] OLED器件通过以下方式发光:由作为电子注入电极的阴极和由作为空穴注入电极的阳极分别将电子和空穴注入发光化合物层中,从而使电子与空穴复合以产生激子,并使激子由激发态跃迁至基态。

[0007] 发光原理可以分为荧光发光和磷光发光。在荧光发光中,单线态激发状态的有机分子跃迁至基态,由此发出光。另一方面,在磷光发光中,三线态激发状态的有机分子跃迁至基态,由此发出光。

[0008] 当发光材料层发射对应于能带隙的光时,具有0自旋的单线态激子和具有1自旋的三线态激子以1:3的比例产生。有机材料的基态为单线态,这使单线态激子可以跃迁至基态并伴随发光。但是,由于三线态激子不能发生伴随发光的跃迁,因此使用荧光材料的OLED器件的内量子效率被限制在25%以内。

[0009] 另一方面,如果自旋轨道耦合动量很高,则单线态和三线态混合以使得在单线态和三线态之间产生系间跨越,并且三线态激子也可以跃迁至基态并伴随发光。磷光材料可以使用三线态激子和单线态激子,以使得使用磷光材料的OLED器件可以具有100%的内量子效率。

[0010] 近来,已将铱络合物,例如双(2-苯基喹啉)(乙酰丙酮)铱(III)(Ir(2-phq)₂(acac))、双(2-苯并[b]噻吩-2-基吡啶)(乙酰丙酮)铱(III)(Ir(btp)₂(acac))和三(2-苯基喹啉)铱(III)Ir(2-phq)₃掺杂剂引入。

[0011] 为了利用磷光材料获得高电流发光效率(Cd/A),需要优异的内部量子效率、高的色纯度和长寿命。特别是,参照图1,色纯度越高,即,CIE(X)越高,颜色灵敏度越差。结果,在高内量子效率下,非常难获得发光效率。因此,需要具有优异色纯度(CIE(X) ≥ 0.65)和高发光效率的新型红色磷光化合物。

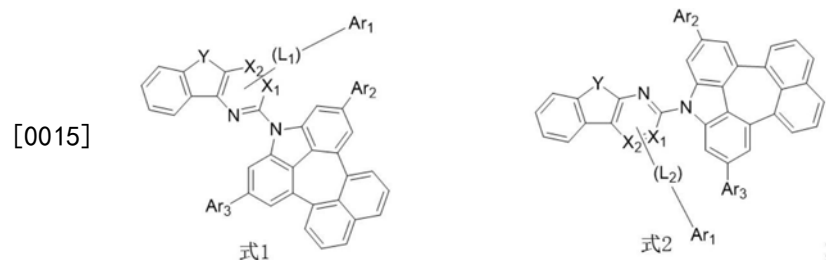
[0012] 另一方面,除了上述的铱络合物之外,例如,4,4'-N,N'-咔唑联苯(CBP)或其他金属络

合物用作红色磷光化合物。然而,这些化合物在溶剂中不具有理想的溶解度,因而不能通过溶液工艺来形成发光层。发光层应当通过沉积工艺形成,因此,制造过程极为复杂,工艺效率也极低。另外,沉积工艺中的废料非常多,导致生产成本增大。

发明内容

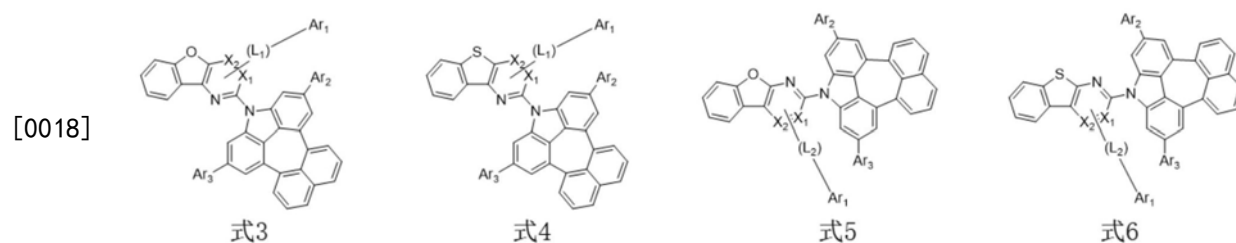
[0013] 本发明的目的是提供一种磷光化合物和使用该化合物的有机发光二极管器件以解决现有技术的不足之处。

[0014] 本发明为解决其技术问题所采用的技术方案是提供式1或式2的磷光化合物,

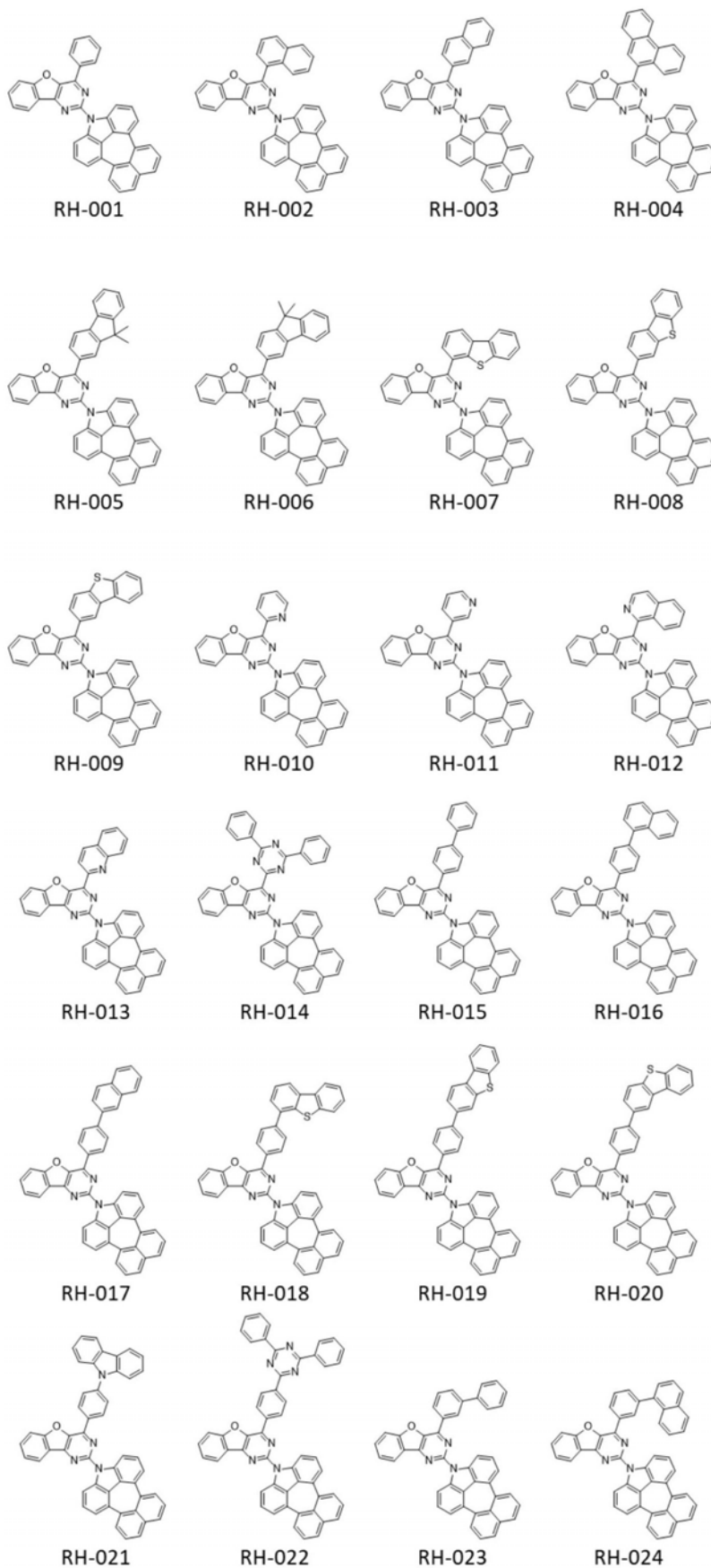


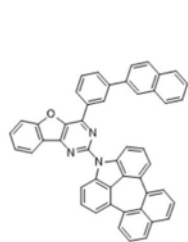
[0016] 在上述式1和式2中Ar1分别独立地选自C6~C60芳基,苧基,包括O,N,S,Si和P其中至少一种杂原子的C2~C60杂环基,C3~C60脂环族和C6~C60芳香族环的稠环基,C2~C20烯基,C2~C20炔基中的一种。L1和L2分别独立地选自由单键、C6~C60亚芳基、苧烯基组成的基团,C3~C60脂环族和C6~C60芳香族环的稠环基,C2~C60杂环基中的一种。X1~X2独立地选自N原子或C原子,其中X1至X2中的至少一个为N。其中Y选自O,S和Se。进一步的,所述的Ar2和Ar3选自H,C6~C60芳基,苧基,包括O,N,S,Si和P其中至少一种杂原子的C2~C60杂环基,C3~C60脂环族和C6~C60芳香族环的稠环基,C2~C20烯基,C2~C20炔基中的一种。

[0017] 进一步的,所述式1和式2独立地选自式3~式6的任何一种结构:

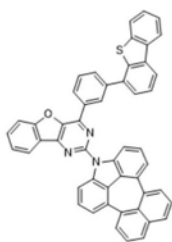


[0019] 进一步的,所述的磷光化合物独立地选自下列化合物:

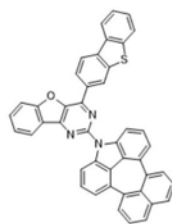




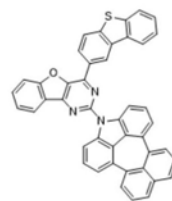
RH-025



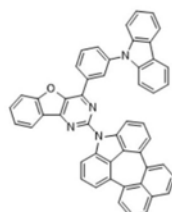
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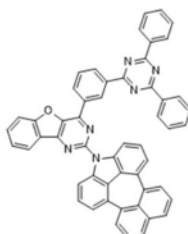
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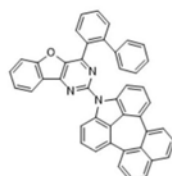
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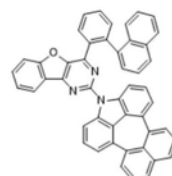
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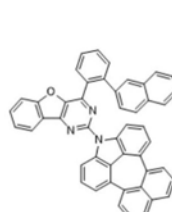
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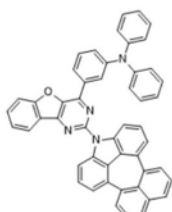
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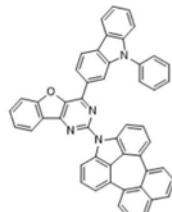
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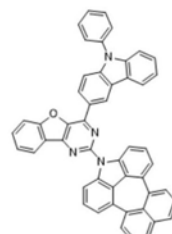
RH-033



RH-034

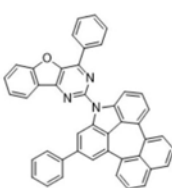


RH-035

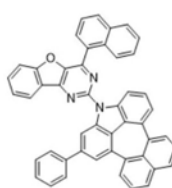


RH-036

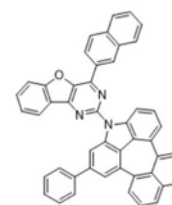
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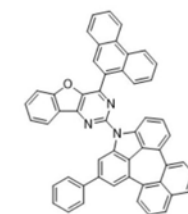
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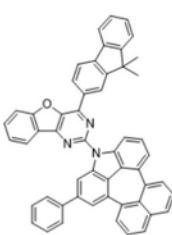
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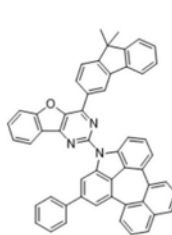
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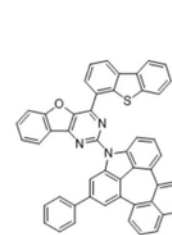
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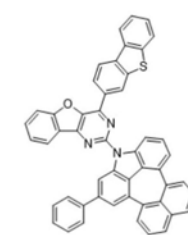
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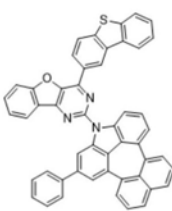
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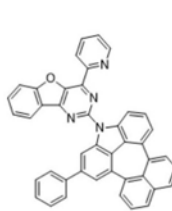
RH-043



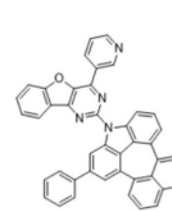
RH-044



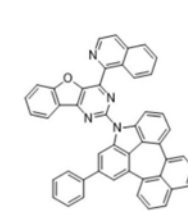
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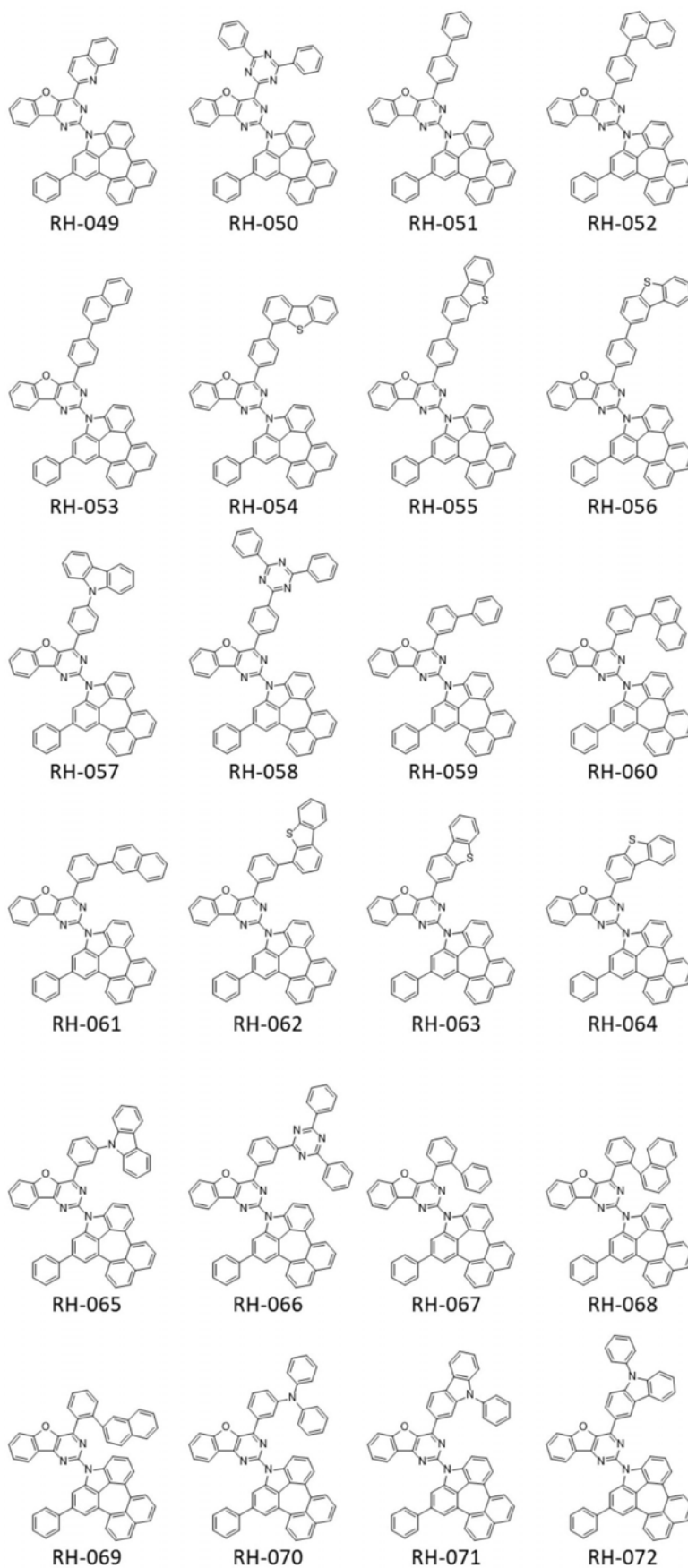
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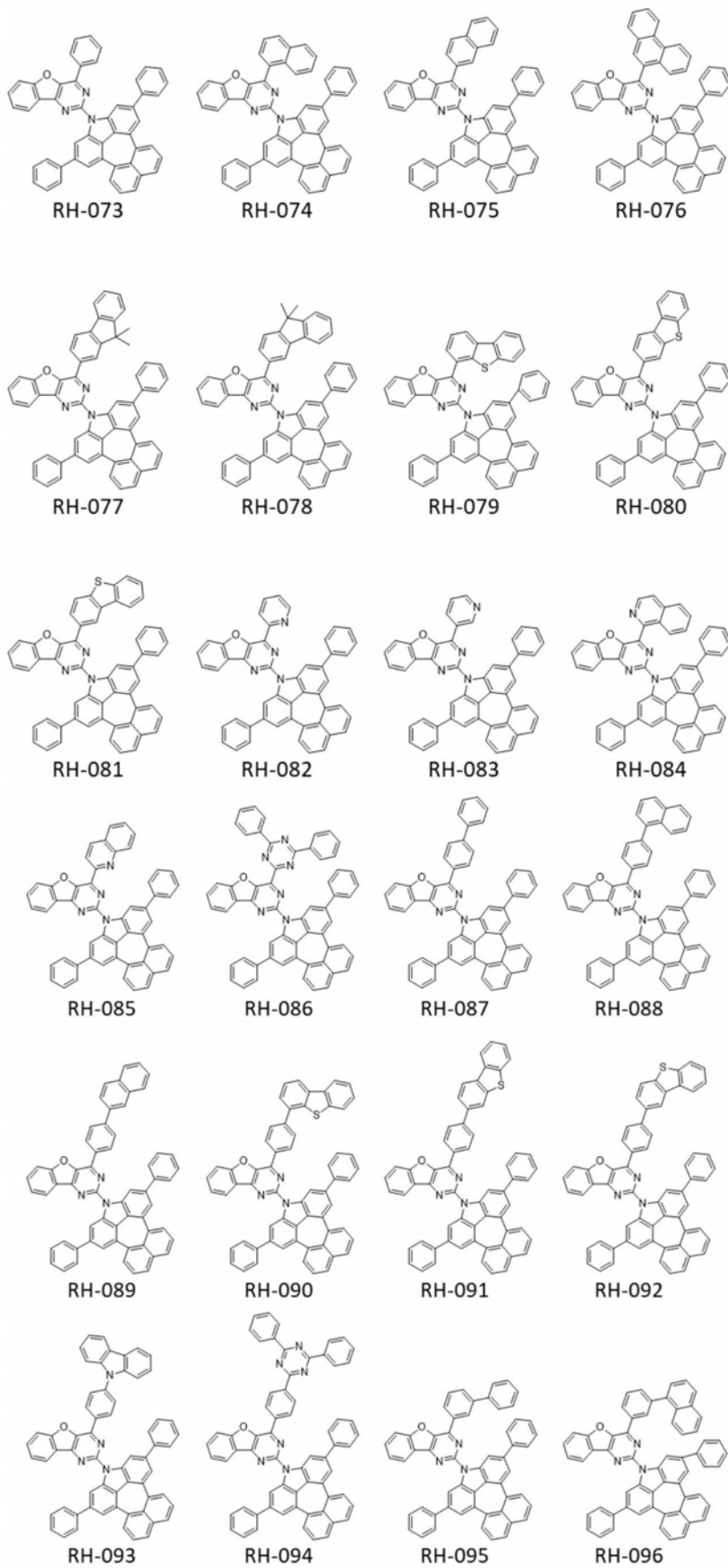
RH-047



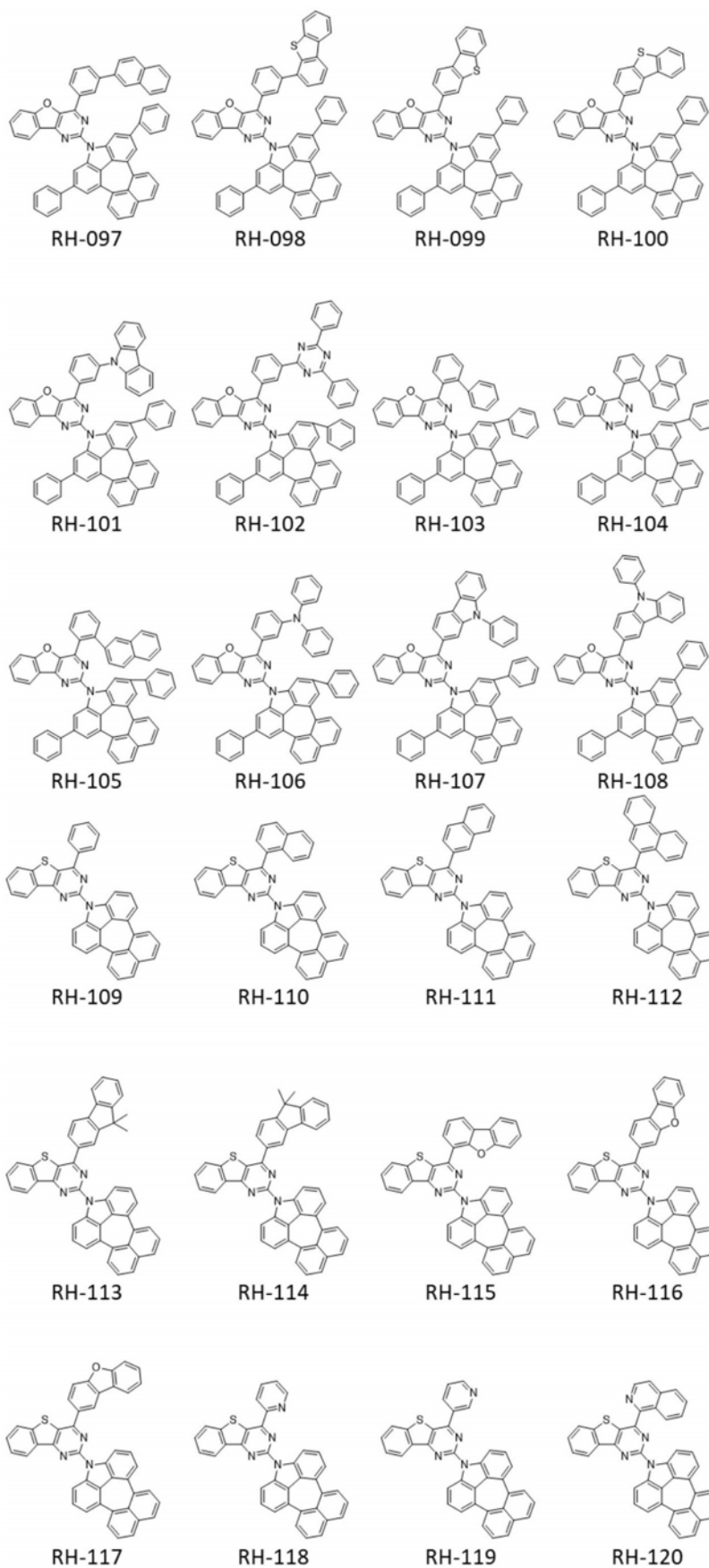
RH-048

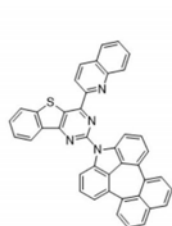


[0022]

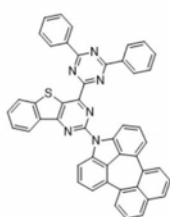


[0023]

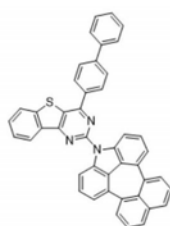




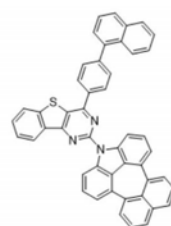
RH-121



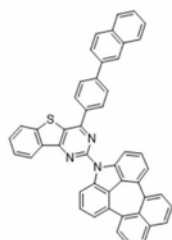
RH-122



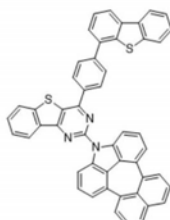
RH-123



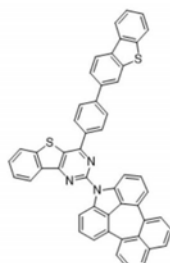
RH-124



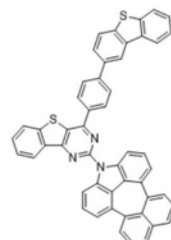
RH-125



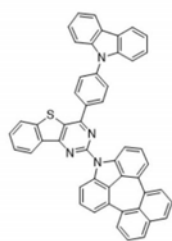
RH-126



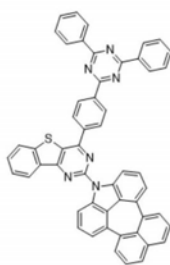
RH-127



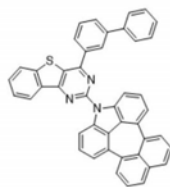
RH-128



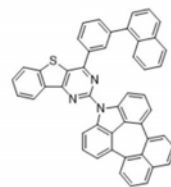
RH-129



RH-130

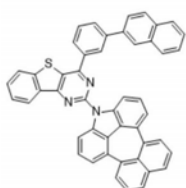


RH-131

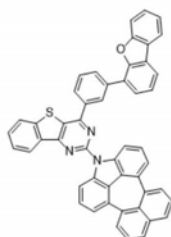


RH-132

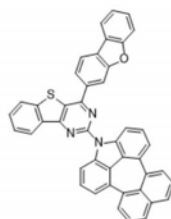
[0025]



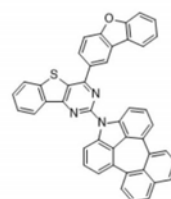
RH-133



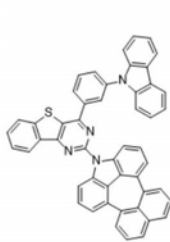
RH-134



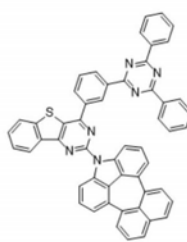
RH-135



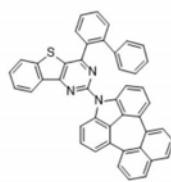
RH-136



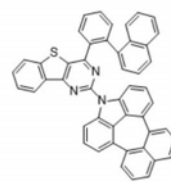
RH-137



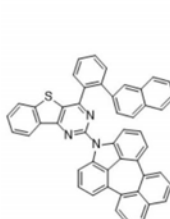
RH-138



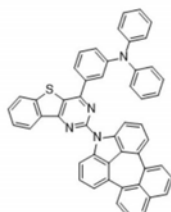
RH-139



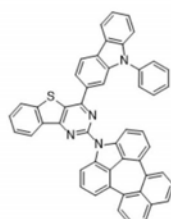
RH-140



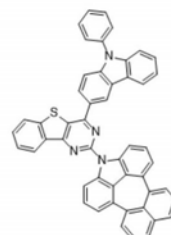
RH-141



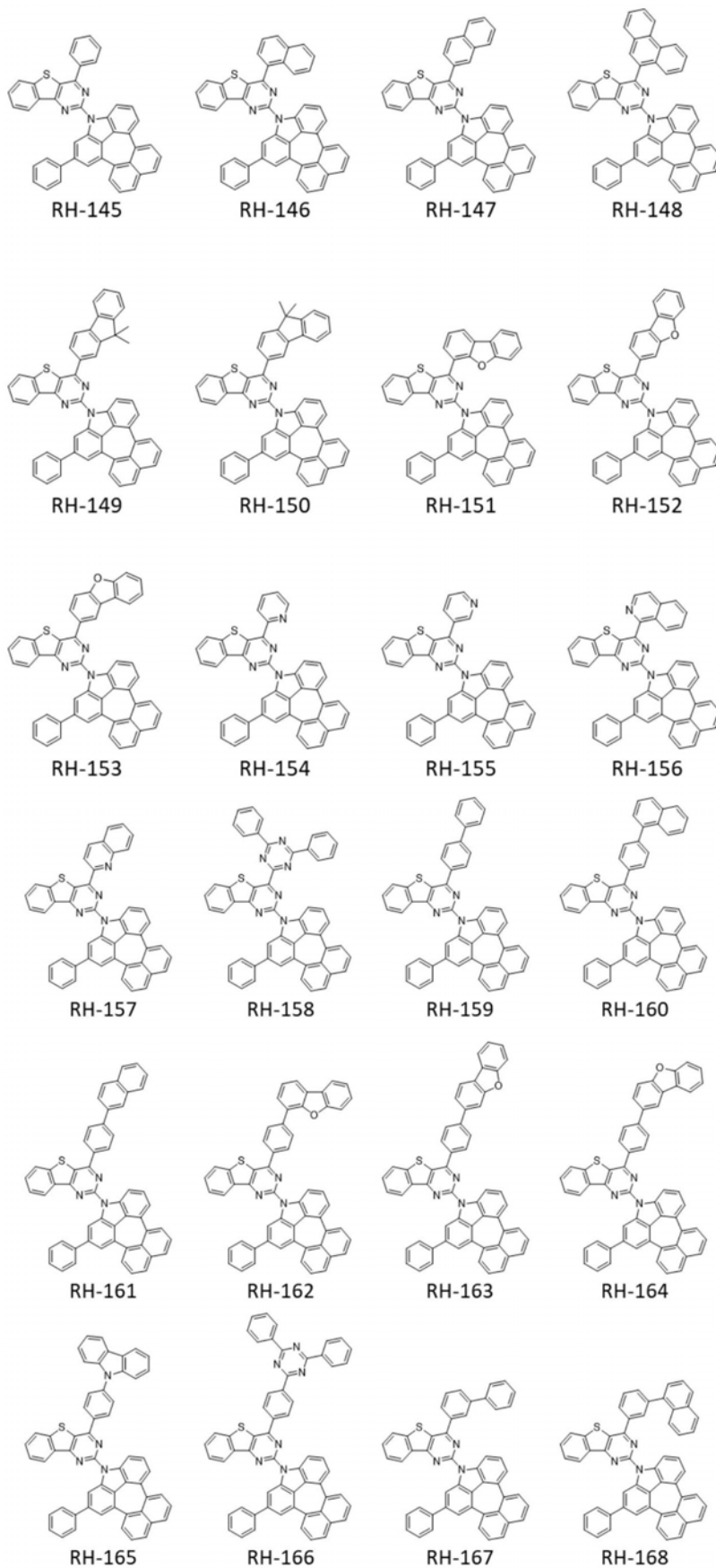
RH-142



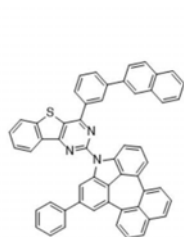
RH-143



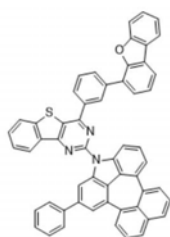
RH-144



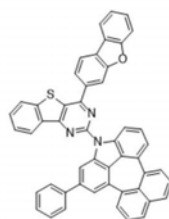
[0026]



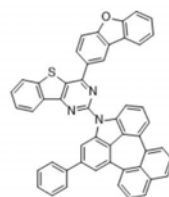
RH-169



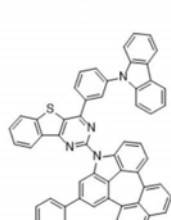
RH-170



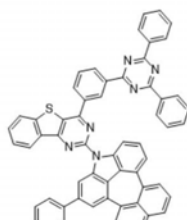
RH-171



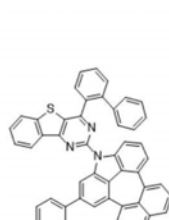
RH-172



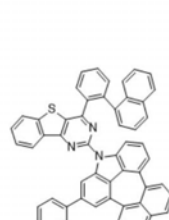
RH-173



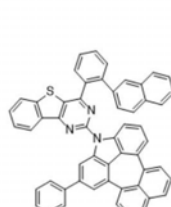
RH-174



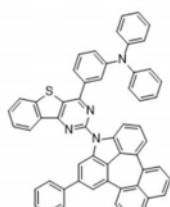
RH-175



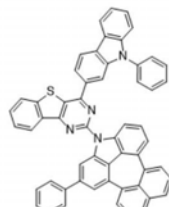
RH-176



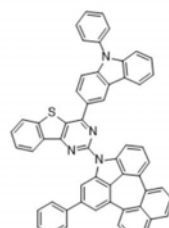
RH-177



RH-178

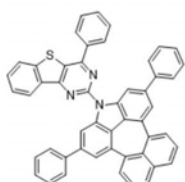


RH-179

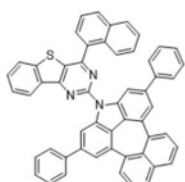


RH-180

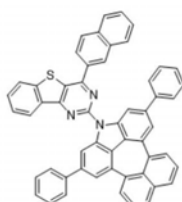
[0027]



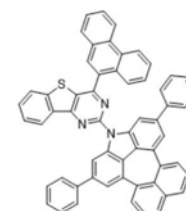
RH-181



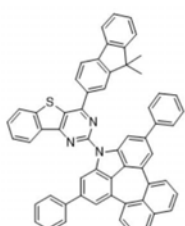
RH-182



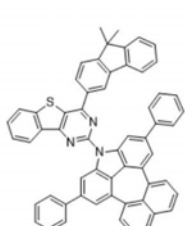
RH-183



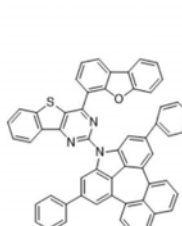
RH-184



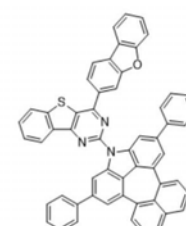
RH-185



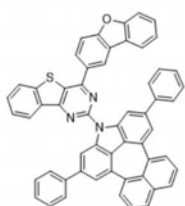
RH-186



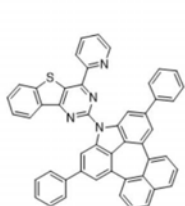
RH-187



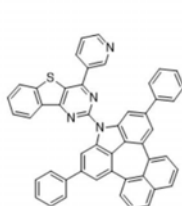
RH-188



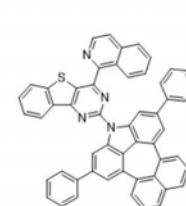
RH-189



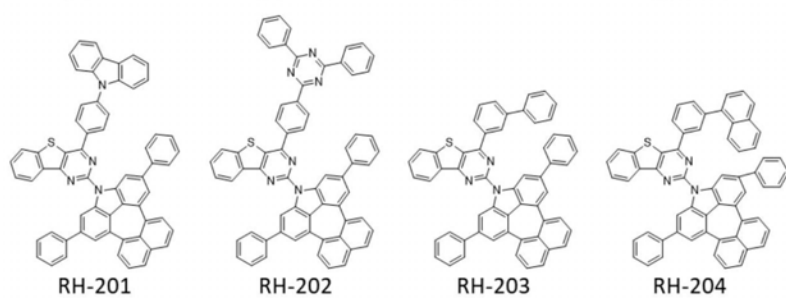
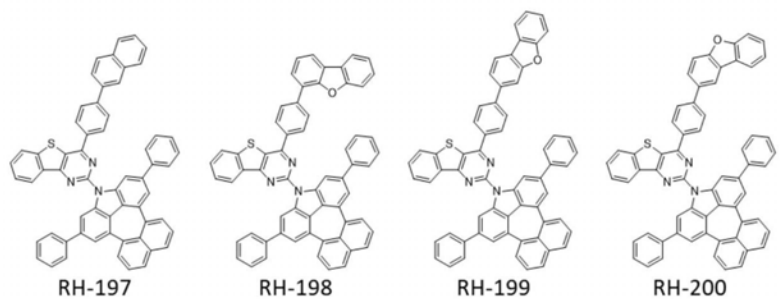
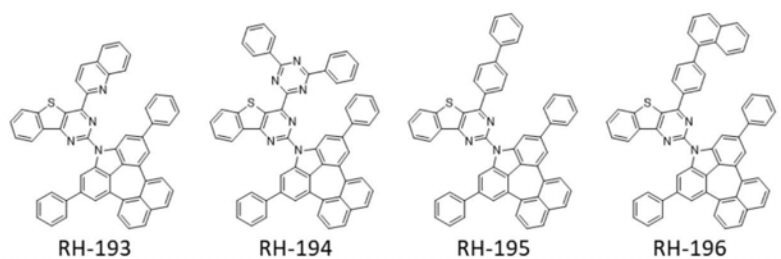
RH-190



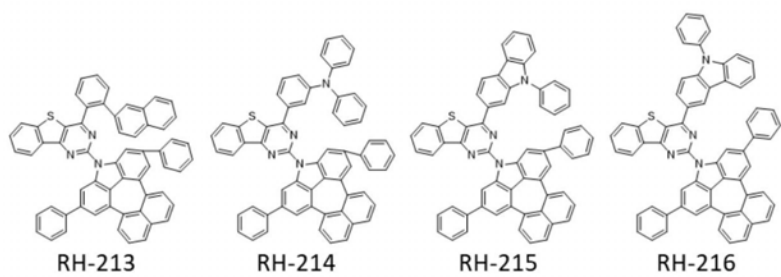
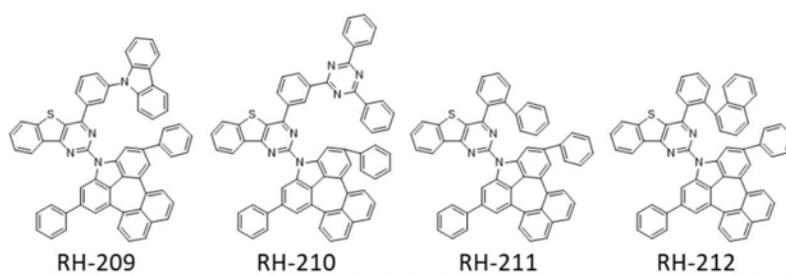
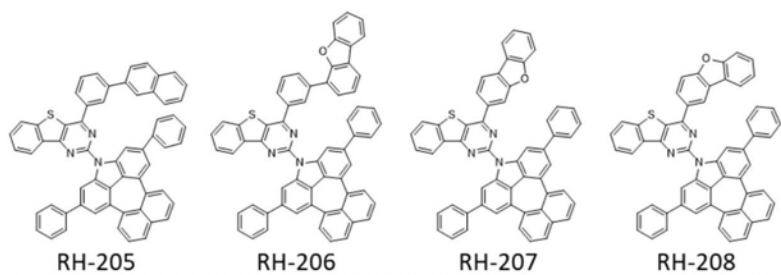
RH-191

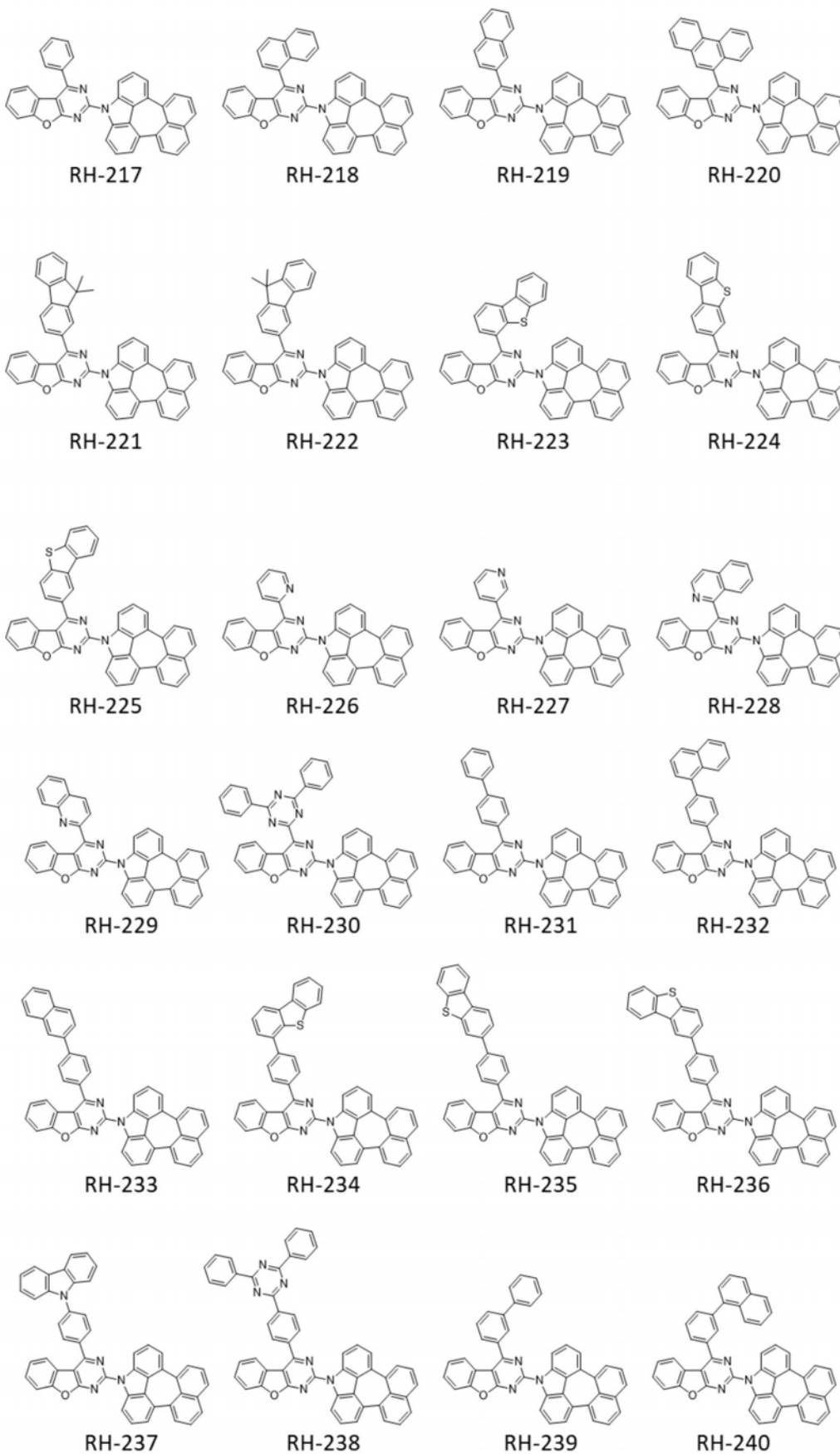


RH-192

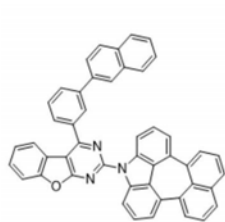


[0028]

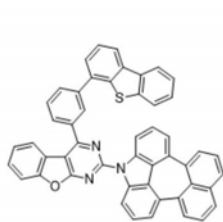




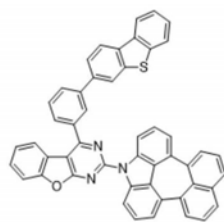
[0029]



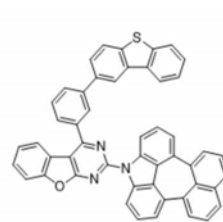
RH-241



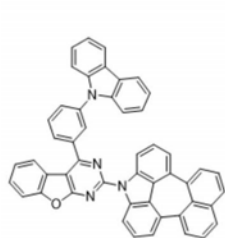
RH-242



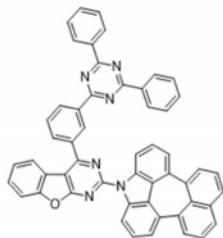
RH-243



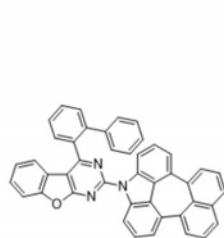
RH-244



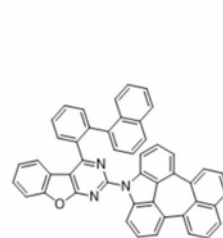
RH-245



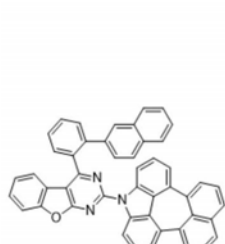
RH-246



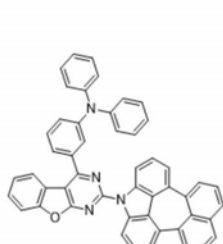
RH-247



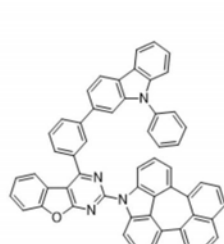
RH-248



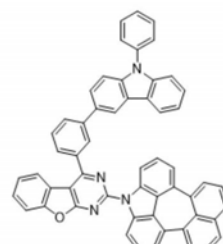
RH-249



RH-250

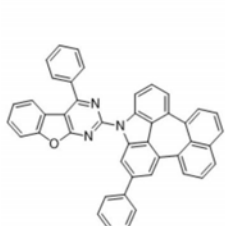


RH-251

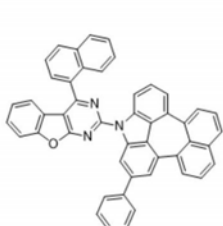


RH-252

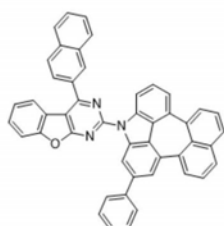
[0030]



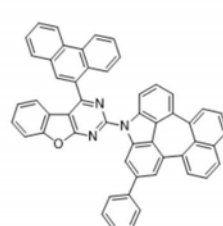
RH-253



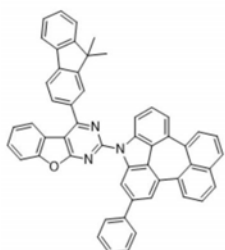
RH-254



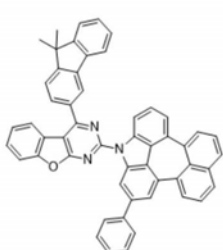
RH-255



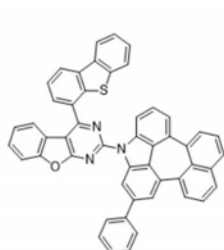
RH-256



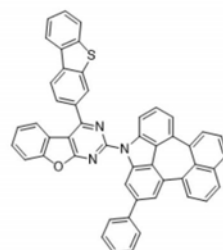
RH-257



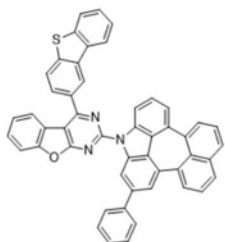
RH-258



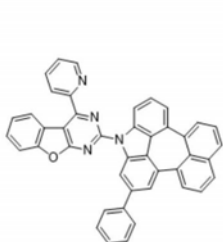
RH-259



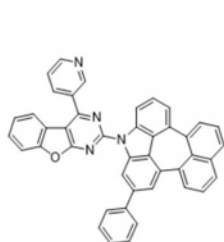
RH-260



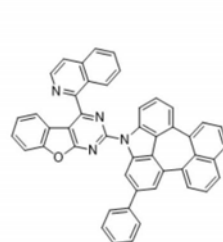
RH-261



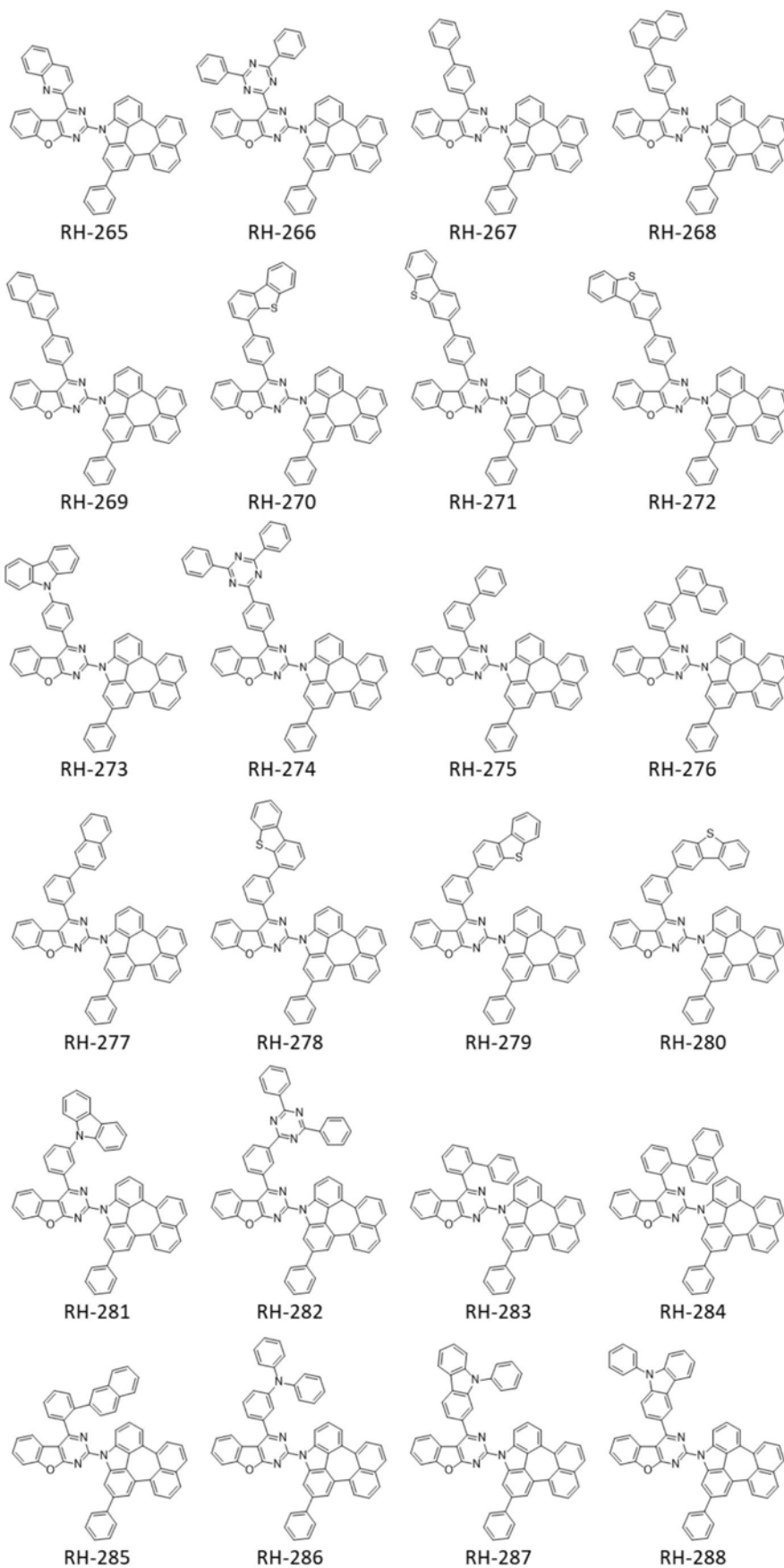
RH-262



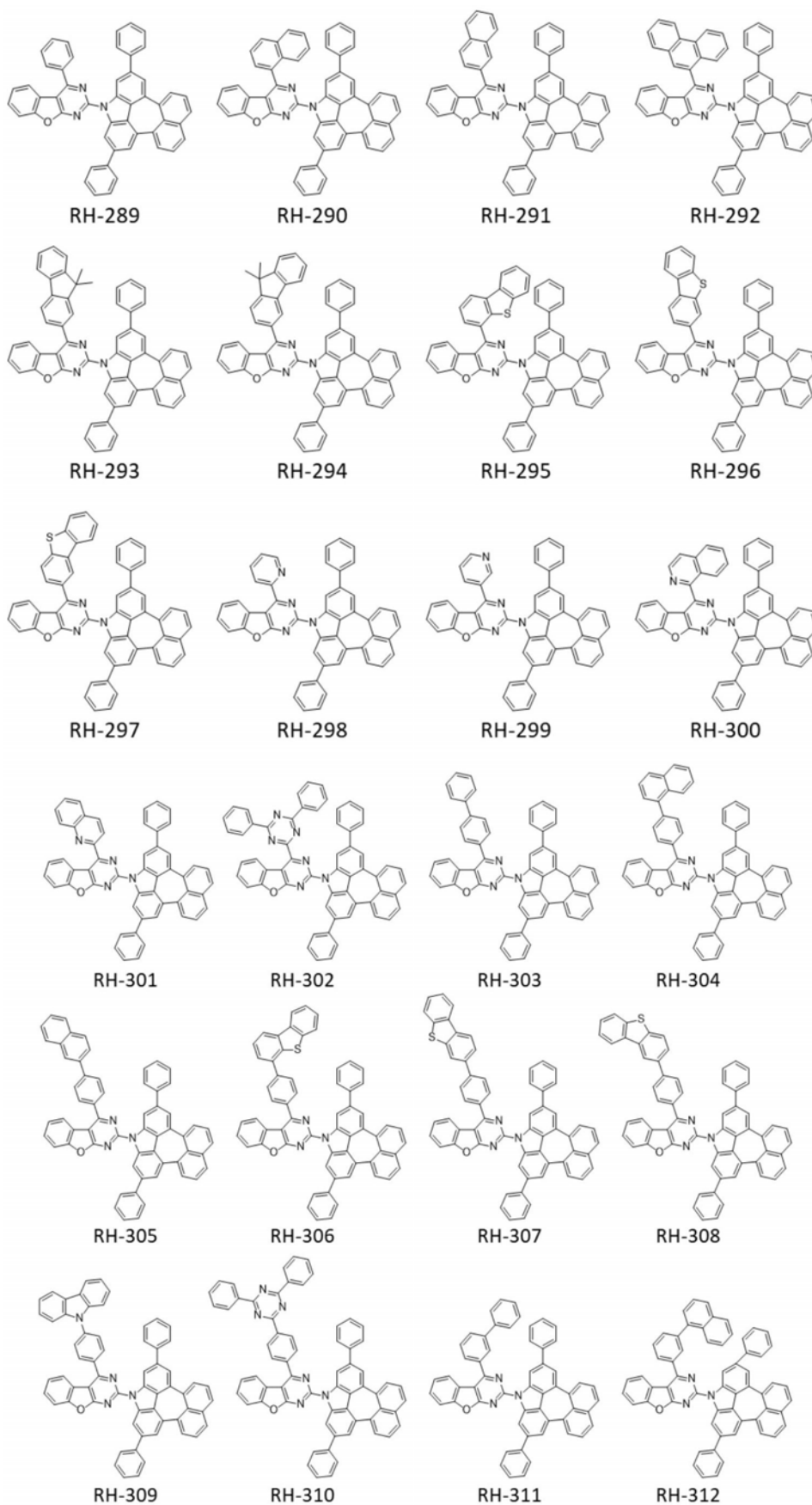
RH-263



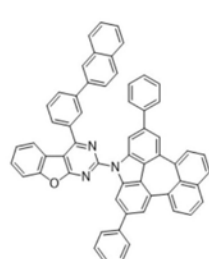
RH-264



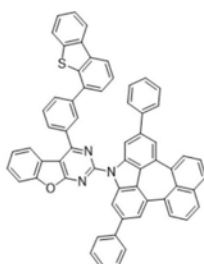
[0031]



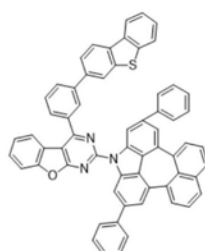
[0032]



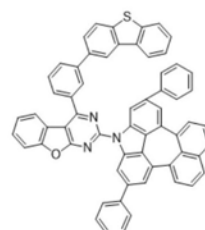
RH-313



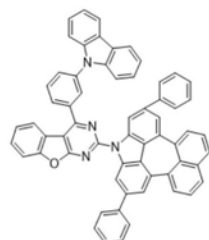
RH-314



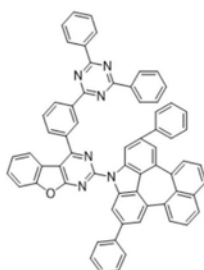
RH-315



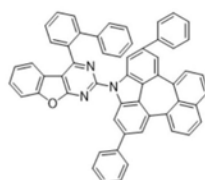
RH-316



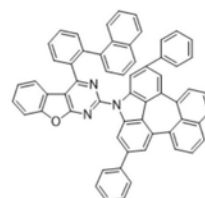
RH-317



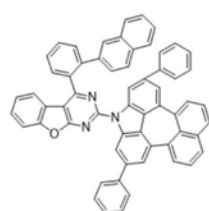
RH-318



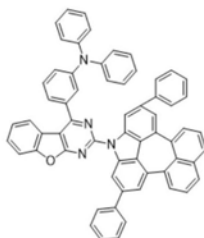
RH-319



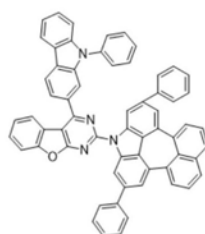
RH-320



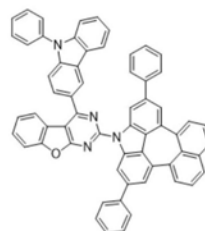
RH-321



RH-322

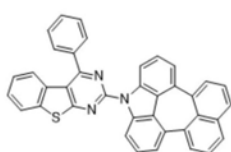


RH-323

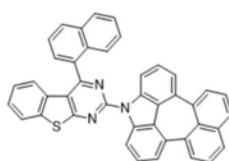


RH-324

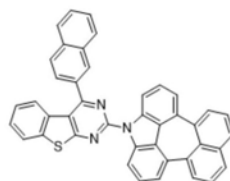
[0033]



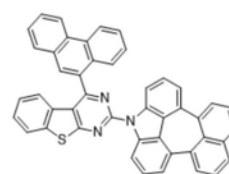
RH-325



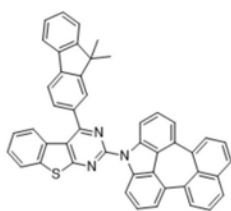
RH-326



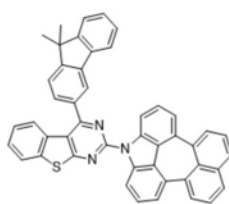
RH-327



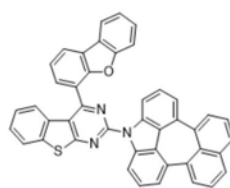
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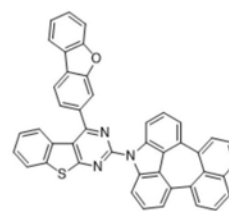
RH-329



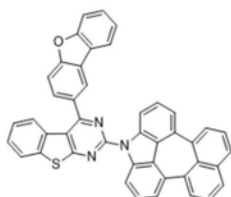
RH-330



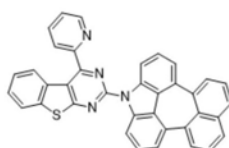
RH-331



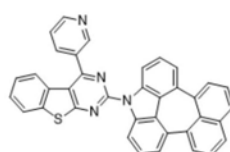
RH-332



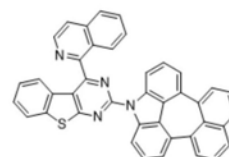
RH-333



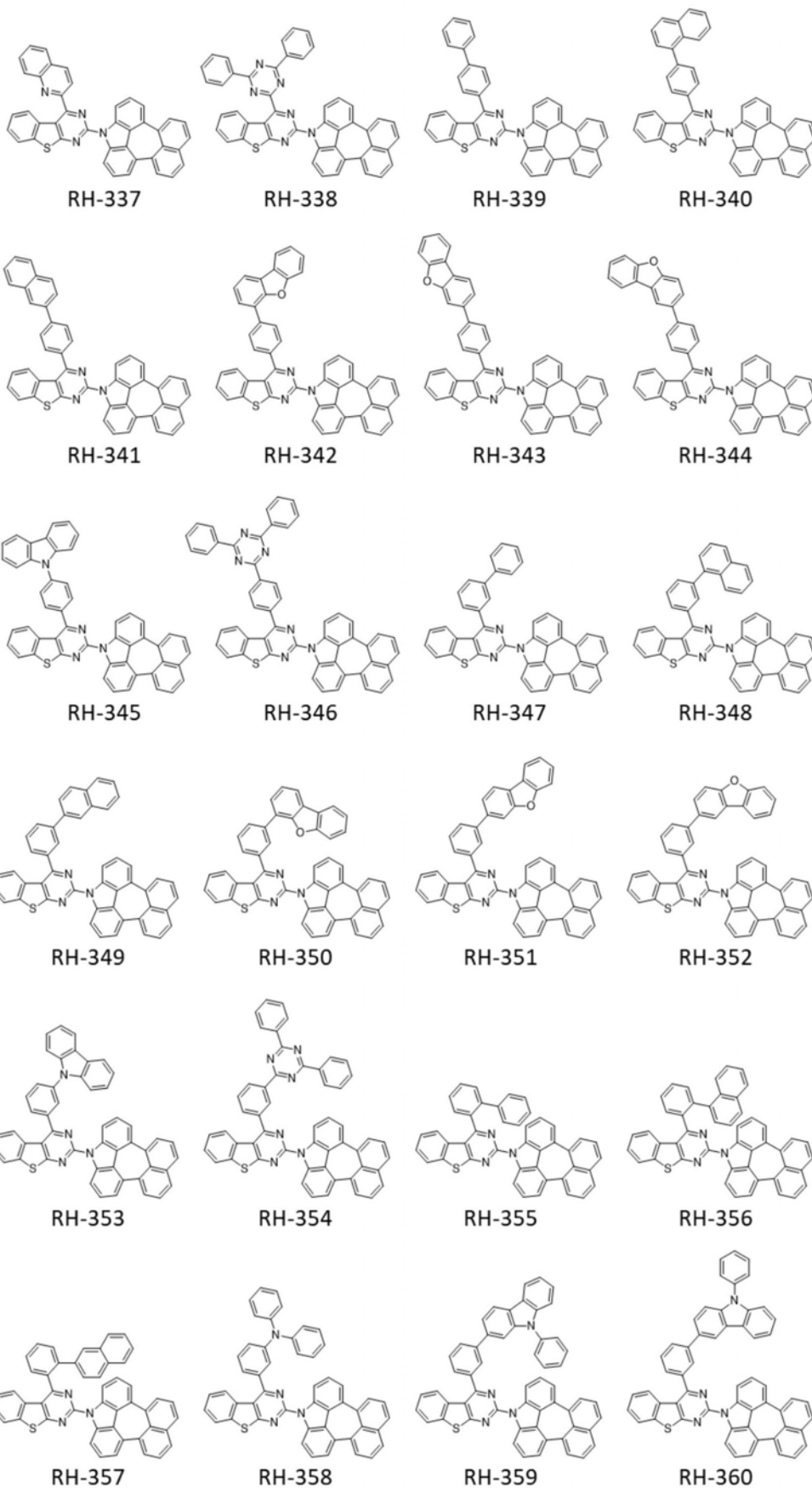
RH-334

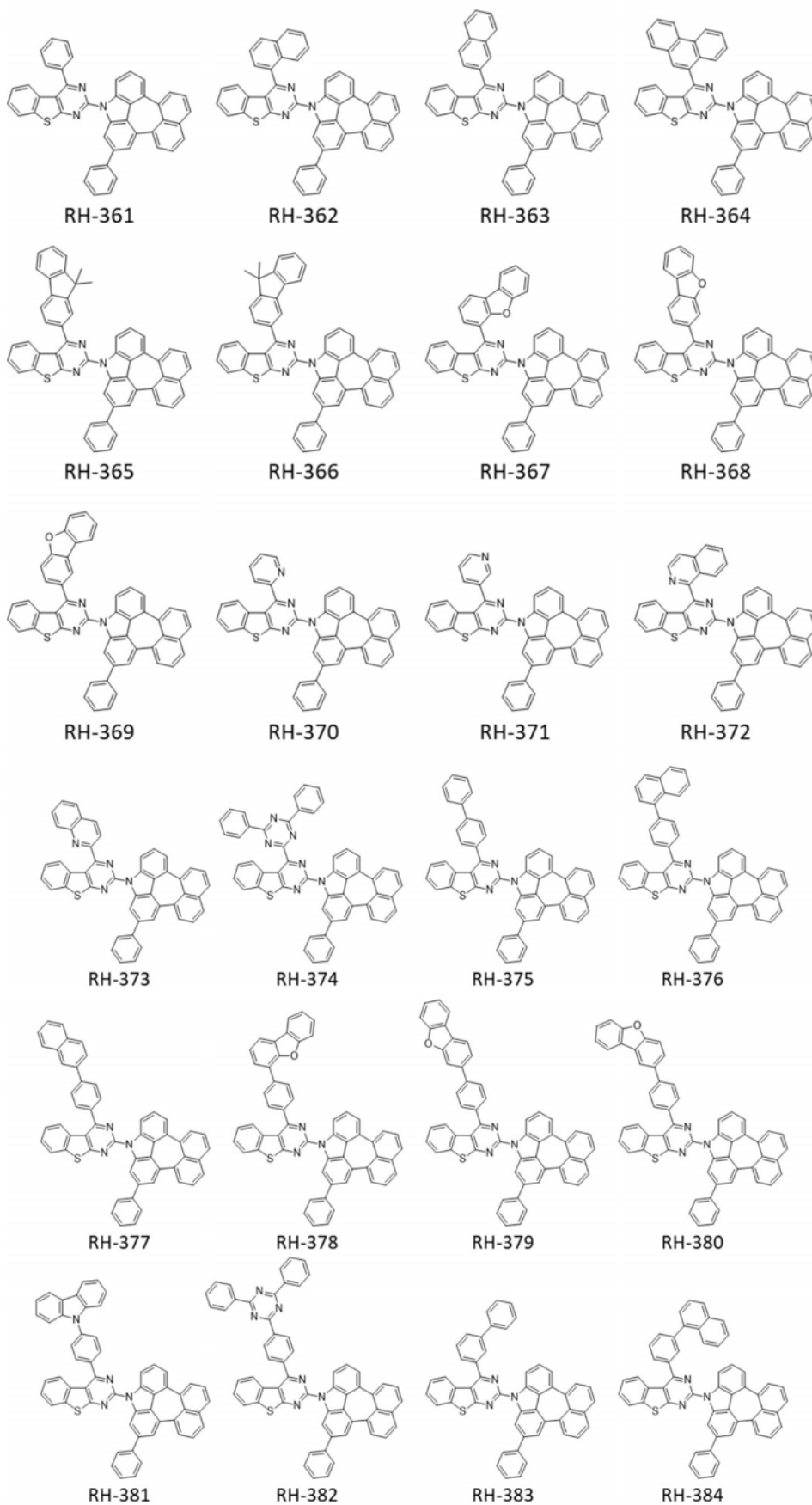


RH-335

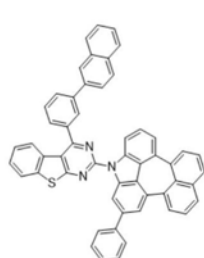


RH-336

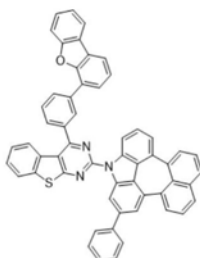




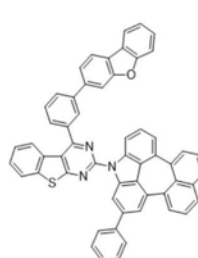
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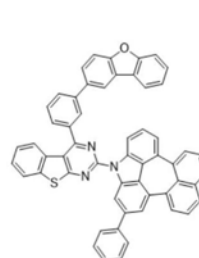
RH-385



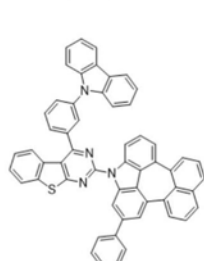
RH-386



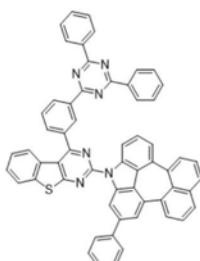
RH-387



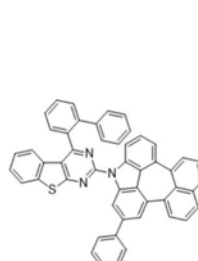
RH-388



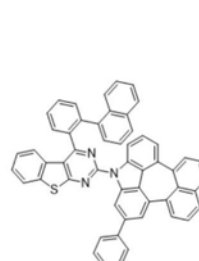
RH-389



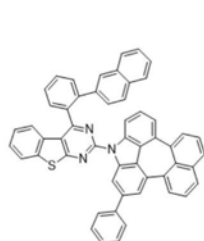
RH-390



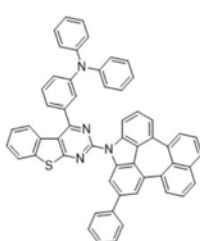
RH-391



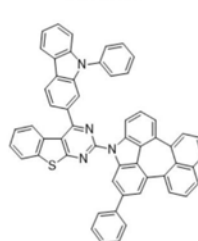
RH-392



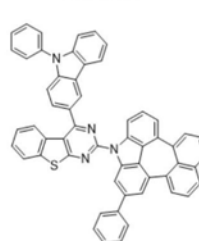
RH-393



RH-394

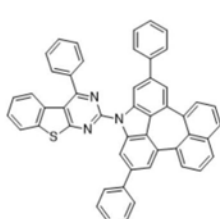


RH-395

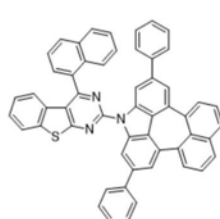


RH-396

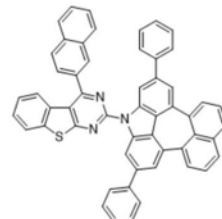
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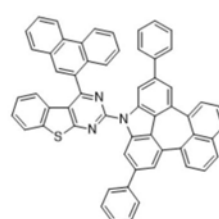
RH-397



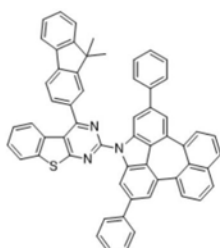
RH-398



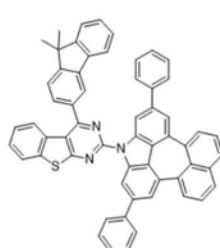
RH-399



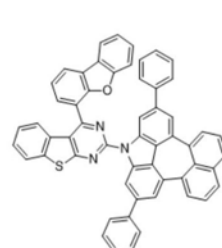
RH-400



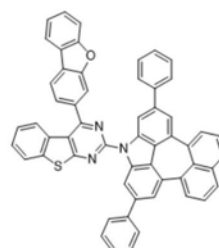
RH-401



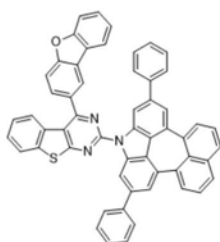
RH-402



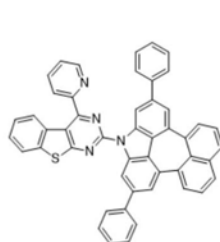
RH-403



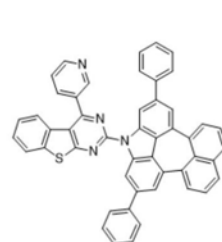
RH-404



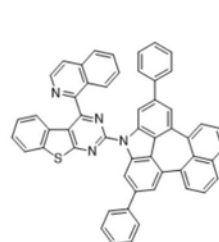
RH-405



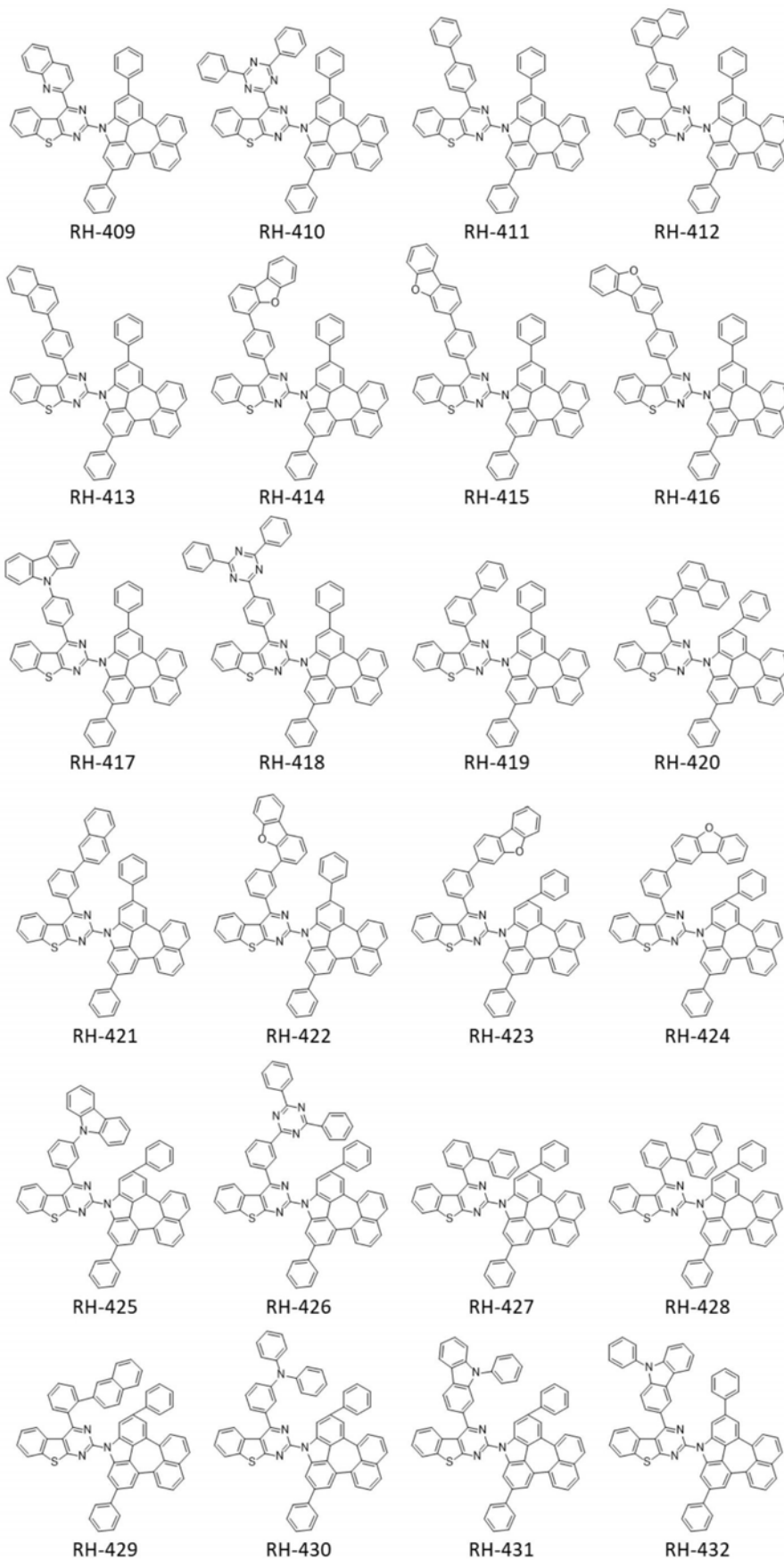
RH-406



RH-407



RH-408



[0037]

[0038] 进一步的,所述的有机电致发光器件顺次包括沉积的阳极,空穴注入层,空穴传输层,发光层,电子传输层,电子注入层和阴极,所述磷光化合物作为发光层的主体材料。

[0039] 本发明的优点在于：本发明使用式1或式2所示的磷光化合物作为有机发光二极管器件的发光层，具有优异的色纯度和亮度以及延长的耐久性效果。

附图说明

[0040] 图1为有机电发光二极管发光色度和可见度关系图。

[0041] 图2为在本发明的实施方案中使用的化合物铜(II)酞菁(CuPc), NPB, (mxmq) 2Ir(acac), Alq3和CBP的结构式。

具体实施方式

[0042] 为了使本发明实现的技术手段、创作特征、达成目的与功效易于明白了解，下面结合图示与具体实施例，进一步阐述本发明。

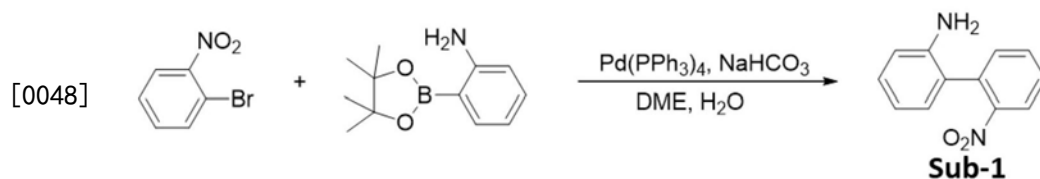
[0043] 由于结构式如式1和式2的红色磷光化合物均具有优异的色纯度、高亮度和优异的发光效率，现以RH-001、RH-014、RH-022、RH-145、RH-158和RH-166制备方法和测试结果为例，证明本发明提供的技术方案和达到的技术效果。

[0044] 以下实施方案中，NPB为4,4'-双[N-(1-萘基)-N-苯氨基]联苯，CBP为4,4'-N,N'-二咔哇联苯，CuPc为酞菁铜，LiF氟化锂，ITO为氧化铟锡，Alq3为三(8-羟基喹啉)铝。

[0045] LC-MS:液相色谱-质谱联用仪，M/Z:质子数/电荷数的比值。

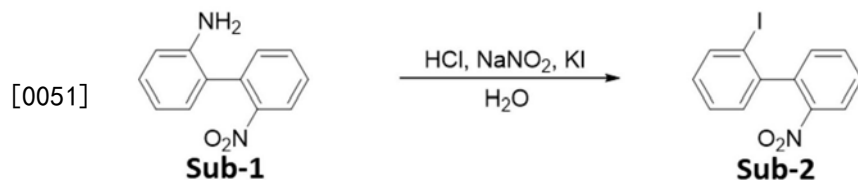
[0046] 形成例

[0047] 1. 1. 中间体Sub-1的合成：



[0049] 在2000mL反应瓶中加入2-溴硝基苯(150.0g, 742.5mmol), 2-氨基苯硼酸频哪醇酯(179.0g, 816.8mmol), 四(三苯基膦)钯(5mol%), 碳酸氢钠(187.1g, 2227.6mmol), 乙二醇二甲醚(1200mL)和水(200mL)。反应体系升温至90℃, 氮气保护下反应12小时。反应完成后, 将反应液冷却至室温, 用乙酸乙酯和水萃取。有机层用无水硫酸镁干燥, 浓缩, 重结晶所得粗品过硅胶柱得到中间体Sub-1(133.6g, 收率84%) LC-MS: M/Z 215.2 (M+H)⁺。

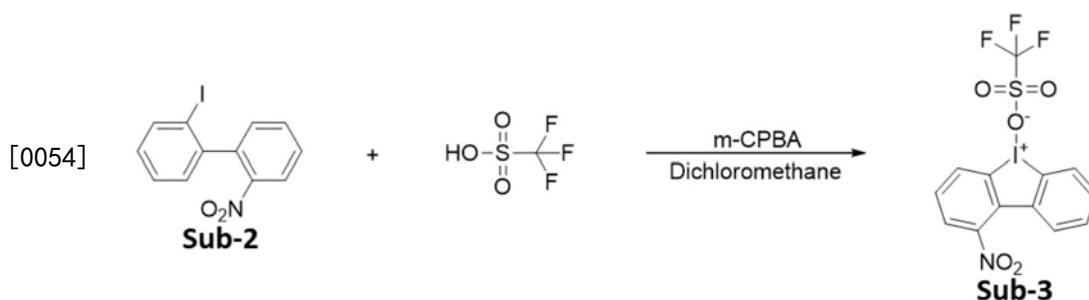
[0050] 2. 中间体Sub-2的合成：



[0052] 在2000mL反应瓶中加入中间体Sub-1(130.0g, 606.9mmol), 水(800mL)和浓盐酸(200mL)混合物加热60℃, 得到清晰的溶液。混合物在5℃下加入亚硝酸钠(46.1g, 667.5mmol)水溶液(150mL)进行重氮化。然后搅拌30分钟, 混合物里迅速加入碘化钾(120.9g, 728.2mmol)水溶液(300mL)以后慢慢加热至沸点, 继续回流6小时。反应完成后冷却至室温。加入饱和硫酸钠溶液对混合物进行淬灭, 用饱和氢氧化钠水溶液将pH调节至8-10。以乙酸乙酯为萃取合并的有机溶剂在用硫酸钠上干燥, 减压浓缩。利用色谱法(乙酸乙

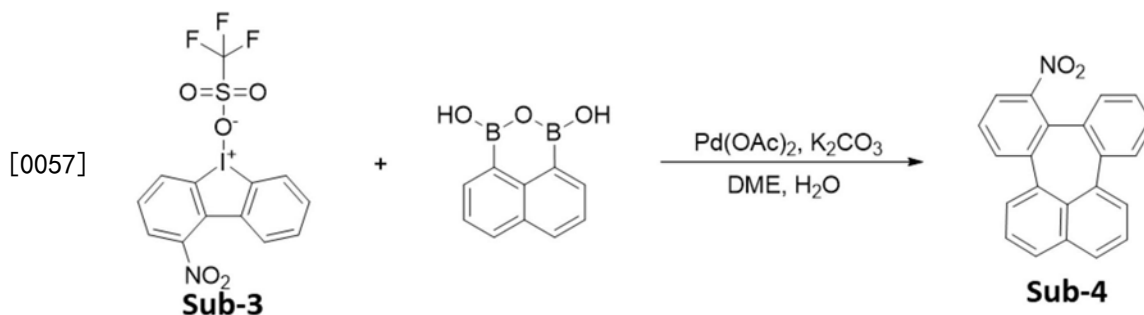
酯/石油醚=1/30)得到中间体Sub-2 (153.9g, 收率78%)。LC-MS: M/Z 326.1 (M+H)⁺。

[0053] 3. 中间体Sub-3的合成:



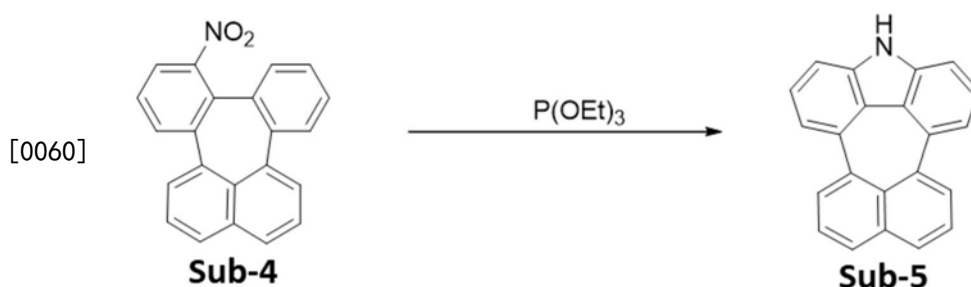
[0055] 将中间体Sub-2 (150.0g, 461.4mmol) 溶剂在无水二氯甲烷 (1500mL) 以后, 搅拌的条件下加入间氯过氧苯甲酸 (119.4g, 692.1mmol), 三氟甲磺酸 (122.5mL, 1384.2mmol)。将上面混合物室温下搅拌2小时。通过旋转蒸发除掉二氯甲烷, 然后加入乙醚与混合物搅拌30分钟, 并过滤。将收集的固体用乙醚洗涤三次, 真空干燥, 得到中间体Sub-3 (172.4g, 收率79%)。LC-MS: M/Z 474.2 (M+H)⁺。

[0056] 4. 中间体Sub-4的合成:



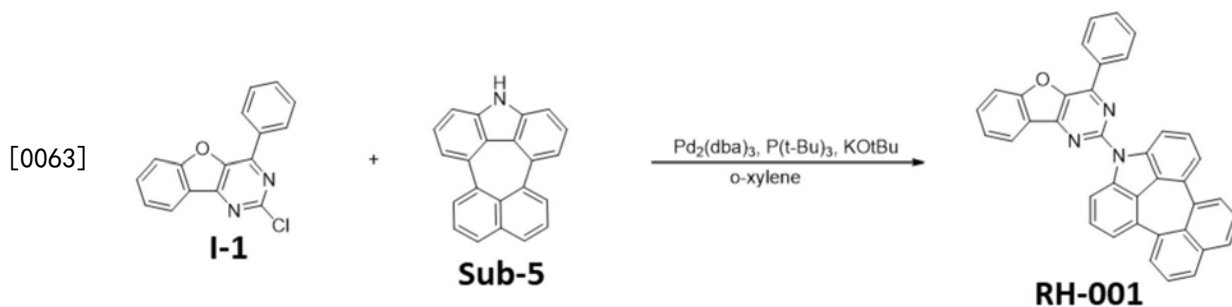
[0058] 在2000mL三口烧瓶中加入中间体Sub-3 (170.0g, 359.3mmol), 萘-1,8-二硼酸 (78.2g, 395.2mmol), 醋酸钯 (10mol%), 碳酸钾 (124.1g, 898.3mmol), 乙二醇二甲醚 (1000mL) 和水 (450mL)。反应体系升温至120℃, 氮气保护下反应14小时。反应完成后, 将反应液冷却至室温, 用乙酸乙酯和水萃取。有机层用无水硫酸镁干燥, 浓缩, 重结晶所得粗品过硅胶柱得到中间体Sub-4 (41.8g, 收率36%)。LC-MS: M/Z 324.3 (M+H)⁺。

[0059] 5. 中间体Sub-5的合成:



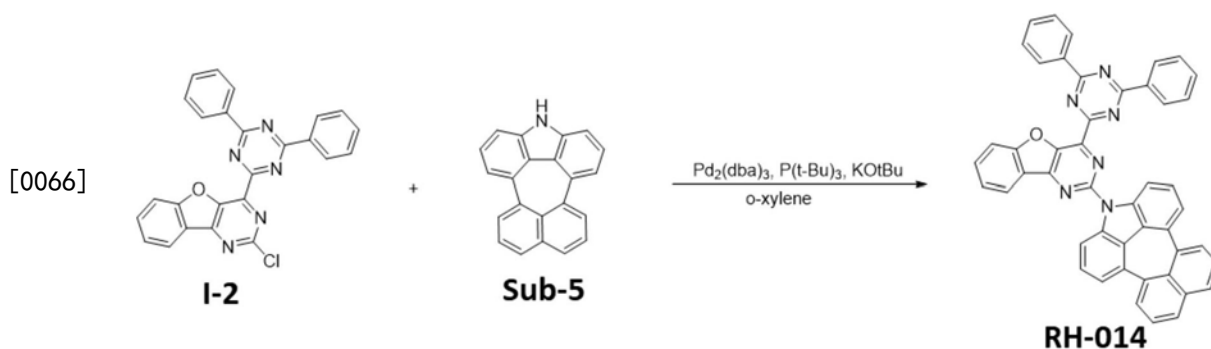
[0061] 在500mL反应瓶中加入中间体Sub-4 (40.0g, 123.7mmol) 和亚磷酸三乙酯 (200mL)。反应体系升温至80℃, 氮气保护下反应18小时。反应完成后, 将反应液冷却至室温, 用邻二氯苯和水萃取。有机层用无水硫酸镁干燥, 浓缩, 重结晶所得粗品过硅胶柱得到中间体Sub-5 (20.9g, 收率58%) LC-MS: M/Z 292.4 (M+H)⁺。

[0062] 6. RH-001的合成:



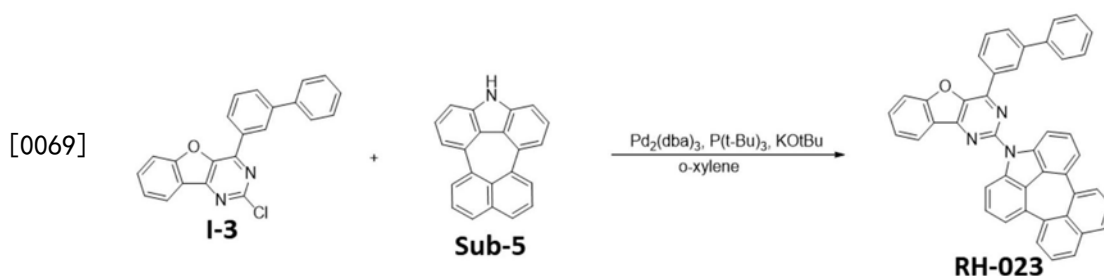
[0064] 在250ml三口烧瓶中加入中间体I-1 (3.0g, 10.7mmol), 中间体Sub-5 (3.4g, 11.8mmol), 三(二亚苄基丙酮)二钯 (4mol%), 三叔丁基膦 (8mol%), 叔丁醇钾 (3.6g, 32.1mmol) 和邻二甲苯 (80mL)。反应体系升温至120℃, 氮气保护下反应14小时。反应完成后, 将反应液冷却至室温, 用邻二氯苯和水萃取。有机层用无水硫酸镁干燥, 浓缩, 重结晶所得粗品过硅胶柱得到RH-001 (4.3g, 收率75%)。LC-MS: M/Z 536.6 (M+H)⁺。

[0065] 7. RH-014的合成:



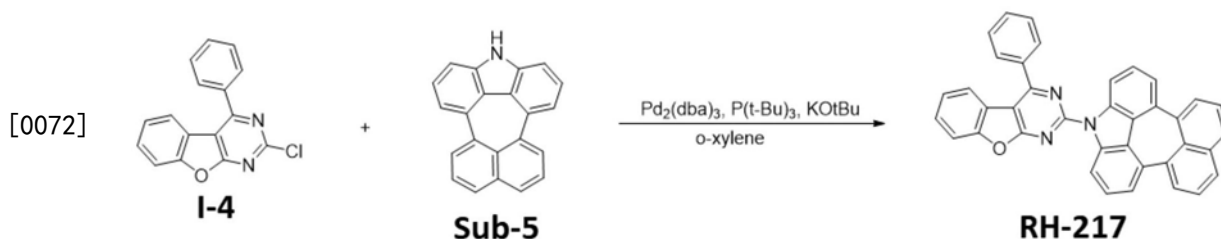
[0067] 在250mL三口烧瓶中加入中间体I-2 (3.0g, 6.9mmol), 中间体Sub-5 (2.2g, 7.6mmol), 三(二亚苄基丙酮)二钯 (4mol%), 三叔丁基膦 (8mol%), 叔丁醇钾 (2.3g, 20.6mmol) 和邻二甲苯 (80mL)。反应体系升温至120℃, 氮气保护下反应14小时。反应完成后, 将反应液冷却至室温, 用邻二氯苯和水萃取。有机层用无水硫酸镁干燥, 浓缩, 重结晶所得粗品过硅胶柱得到RH-014 (3.3g, 收率70%)。LC-MS: M/Z 691.8 (M+H)⁺。

[0068] 8. RH-023的合成:



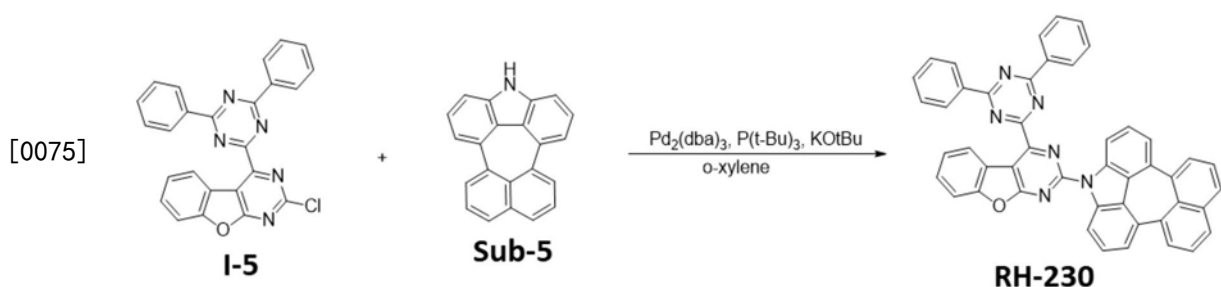
[0070] 在250mL三口烧瓶中加入中间体I-3 (3.0g, 8.4mmol), 中间体Sub-5 (2.7g, 9.2mmol), 三(二亚苄基丙酮)二钯 (4mol%), 三叔丁基膦 (8mol%), 叔丁醇钾 (2.8g, 25.2mmol) 和邻二甲苯 (80mL)。反应体系升温至120℃, 氮气保护下反应14小时。反应完成后, 将反应液冷却至室温, 用邻二氯苯和水萃取。有机层用无水硫酸镁干燥, 浓缩, 重结晶所得粗品过硅胶柱得到RH-023 (3.8g, 收率73%)。LC-MS: M/Z 611.7 (M+H)⁺。

[0071] 9. RH-217的合成:



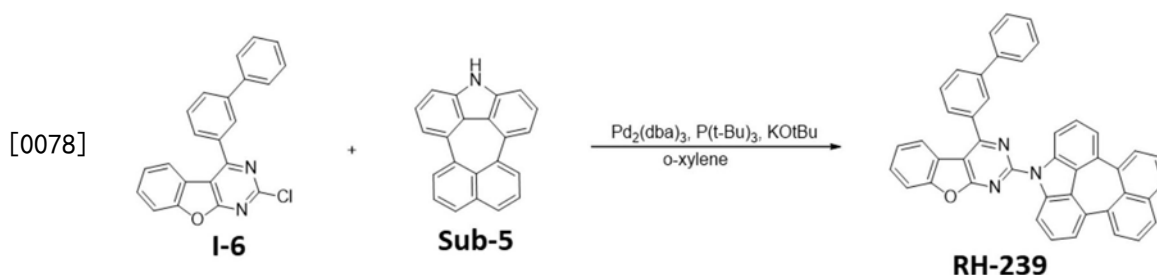
[0073] 在250ml三口烧瓶中加入中间体I-4 (3.0g, 10.7mmol), 中间体Sub-5 (3.4g, 11.8mmol), 三(二亚苄基丙酮)二钯 (4mol%), 三叔丁基膦 (8mol%), 叔丁醇钾 (3.6g, 32.1mmol) 和邻二甲苯 (80mL)。反应体系升温至120℃, 氮气保护下反应14小时。反应完成后, 将反应液冷却至室温, 用邻二氯苯和水萃取。有机层用无水硫酸镁干燥, 浓缩, 重结晶所得粗品过硅胶柱得到RH-217 (4.4g, 收率76%)。LC-MS: M/Z 536.6 (M+H)⁺。

[0074] 10. RH-230的合成:



[0076] 在250mL三口烧瓶中加入中间体I-5 (3.0g, 6.9mmol), 中间体Sub-5 (2.2g, 7.6mmol), 三(二亚苄基丙酮)二钯 (4mol%), 三叔丁基膦 (8mol%), 叔丁醇钾 (2.3g, 20.6mmol) 和邻二甲苯 (80mL)。反应体系升温至120℃, 氮气保护下反应14小时。反应完成后, 将反应液冷却至室温, 用邻二氯苯和水萃取。有机层用无水硫酸镁干燥, 浓缩, 重结晶所得粗品过硅胶柱得到RH-230 (3.4g, 收率72%)。LC-MS: M/Z 691.8 (M+H)⁺。

[0077] 11. RH-239的合成:



[0079] 在250mL三口烧瓶中加入中间体I-6 (3.0g, 8.4mmol), 中间体Sub-5 (2.7g, 9.2mmol), 三(二亚苄基丙酮)二钯 (4mol%), 三叔丁基膦 (8mol%), 叔丁醇钾 (2.8g, 25.2mmol) 和邻二甲苯 (80mL)。反应体系升温至120℃, 氮气保护下反应14小时。反应完成后, 将反应液冷却至室温, 用邻二氯苯和水萃取。有机层用无水硫酸镁干燥, 浓缩, 重结晶所得粗品过硅胶柱得到RH-239 (3.8g, 收率74%)。LC-MS: M/Z 612.7 (M+H)⁺。

[0080] 实施方案

[0081] 1. 第一实施方案

[0082] 使ITO玻璃基板图案化, 以具有3mm×3mm的发光区域。然后, 洗涤图案化的ITO玻璃基板。

[0083] 随后将该基板安放在真空室。标准压力设定为 1×10^{-6} 托。此后,在ITO基板上以CuPc(200Å),NPB(400Å),RH-001+(mxmq)₂Ir(acac) ((5%)(200Å),Alq₃(300Å),LiF(5Å)和Al(1000Å)的顺序形成有机物质的层。

[0084] 在0.9mA下,亮度等于1732cd/m²(5.1V)。此时,CIE_x=0.657,CIE_y=0.341。

[0085] 2.第二实施方案

[0086] 使ITO玻璃基板图案化,以具有3mm×3mm的发光区域。然后,洗涤图案化的ITO玻璃基板。

[0087] 随后将该基板安放在真空室。标准压力设定为 1×10^{-6} 托。此后,在ITO基板上以CuPc(200Å),NPB(400Å),RH-014+(mxmq)₂Ir(acac) (5%)(200Å),Alq₃(300Å),LiF(5Å)和Al(1000Å)的顺序形成有机物质的层。

[0088] 在0.9mA下,亮度等于1639cd/m²(5.3V)。此时,CIE_x=0.658,CIE_y=0.340。

[0089] 3.第三实施方案

[0090] 使ITO玻璃基板图案化,以具有3mm×3mm的发光区域。然后,洗涤图案化的ITO玻璃基板。

[0091] 随后将该基板安放在真空室。标准压力设定为 1×10^{-6} 托。此后,在ITO基板上以CuPc(200Å),NPB(400Å),RH-023+(mxmq)₂Ir(acac) (5%)(200Å),Alq₃(300Å),LiF(5Å)和Al(1000Å)的顺序形成有机物质的层。

[0092] 在0.9mA下,亮度等于1711cd/m²(5.2V)。此时,CIE_x=0.657,CIE_y=0.340。

[0093] 4.第四实施方案

[0094] 使ITO玻璃基板图案化,以具有3mm×3mm的发光区域。然后,洗涤图案化的ITO玻璃基板。

[0095] 随后将该基板安放在真空室。标准压力设定为 1×10^{-6} 托。此后,在ITO基板上以CuPc(200Å),NPB(400Å),RH-217+(mxmq)₂Ir(acac) (5%)(200Å),Alq₃(300Å),LiF(5Å)和Al(1000Å)的顺序形成有机物质的层。

[0096] 在0.9mA下,亮度等于1719cd/m²(5.1V)。此时,CIE_x=0.657,CIE_y=0.341。

[0097] 5.第五实施方案

[0098] 使ITO玻璃基板图案化,以具有3mm×3mm的发光区域。然后,洗涤图案化的ITO玻璃基板。

[0099] 随后将该基板安放在真空室。标准压力设定为 1×10^{-6} 托。此后,在ITO基板上以CuPc(200Å),NPB(400Å),RH-230+(mxmq)₂Ir(acac) (5%)(200Å),Alq₃(300Å),LiF(5Å)和Al(1000Å)的顺序形成有机物质的层。

[0100] 在0.9mA下,亮度等于1621cd/m²(5.4V)。此时,CIE_x=0.657,CIE_y=0.340。

[0101] 6.第六实施方案

[0102] 使ITO玻璃基板图案化,以具有3mm×3mm的发光区域。然后,洗涤图案化的ITO玻璃基板。

[0103] 随后将该基板安放在真空室。标准压力设定为 1×10^{-6} 托。此后,在ITO基板上以CuPc(200Å),NPB(400Å),RH-239+(mxmq)₂Ir(acac)(5%)(200Å),Alq₃(300Å),LiF(5Å)和Al(1000Å)的顺序形成有机物质的层。

[0104] 在0.9mA下,亮度等于1689cd/m²(5.3V)。此时,CIE_x=0.658,CIE_y=0.340。

[0105] 7.对比例

[0106] 使ITO玻璃基板图案化,以具有3mm×3mm的发光区域。然后,洗涤图案化的ITO玻璃基板。

[0107] 随后将该基板安放在真空室。标准压力设定为 1×10^{-6} 托。在ITO基板上以CuPc(200Å),NPB(400Å),CPB+(mxmq)₂Ir(acac)(5%)(200Å),Alq₃(300Å),LiF(5Å)和Al(1000Å)的顺序形成有机物质的层。

[0108] 在0.9mA下,亮度等于1409cd/m²(5.7V)。此时,CIE_x=0.657,CIE_y=0.341。

[0109] 如图1所示显示有机电致发光器件的色纯度增加(即随色度坐标的X值变得更大)可见度降低。

[0110] 依据上述实施方案和对比例,效率,色度坐标,和亮度的特性显示在下表1中。

[0111] 表1

器件	电压 (V)	电流 (mA)	亮度 (cd/m ²)	电流效率 (cd/A)	功率效率 (lm/W)	CIE(x)	CIE(y)
第一实施方案	5.1	0.9	1732	17.3	10.7	0.657	0.341
第二实施方案	5.3	0.9	1639	16.4	9.7	0.658	0.340
第三实施方案	5.2	0.9	1711	17.1	10.3	0.657	0.340
第四实施方案	5.1	0.9	1719	17.2	10.5	0.657	0.341
第五实施方案	5.4	0.9	1621	16.2	9.4	0.657	0.340
第六实施方案	5.3	0.9	1689	16.9	10.0	0.658	0.340
对比例	5.7	0.9	1409	14.1	7.8	0.657	0.341

[0114] 如表1所示,甚至当色纯度高时,该器件在低电压下也高效率地运行。并且,与对比例相比,第二实施方案电流效率增加20%以上。

[0115] 以上显示和描述了本发明的基本原理、主要特征和本发明的优点。本行业的技术人员应该了解,本发明不受上述实施例的限制,上述实施例和说明书中描述的只是说明本发明的原理,在不脱离本发明精神和范围的前提下本发明还会有各种变化和改进,这些变

化和改进都落入要求保护的本发明范围内。本发明要求保护范围由所附的权利要求书及其等同物界定。

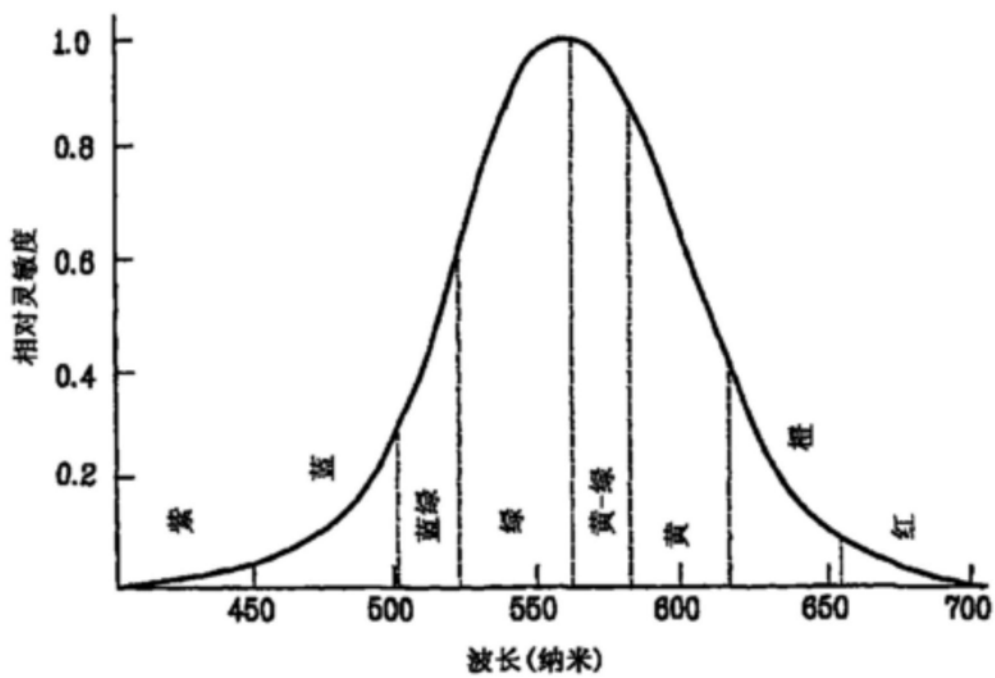


图1

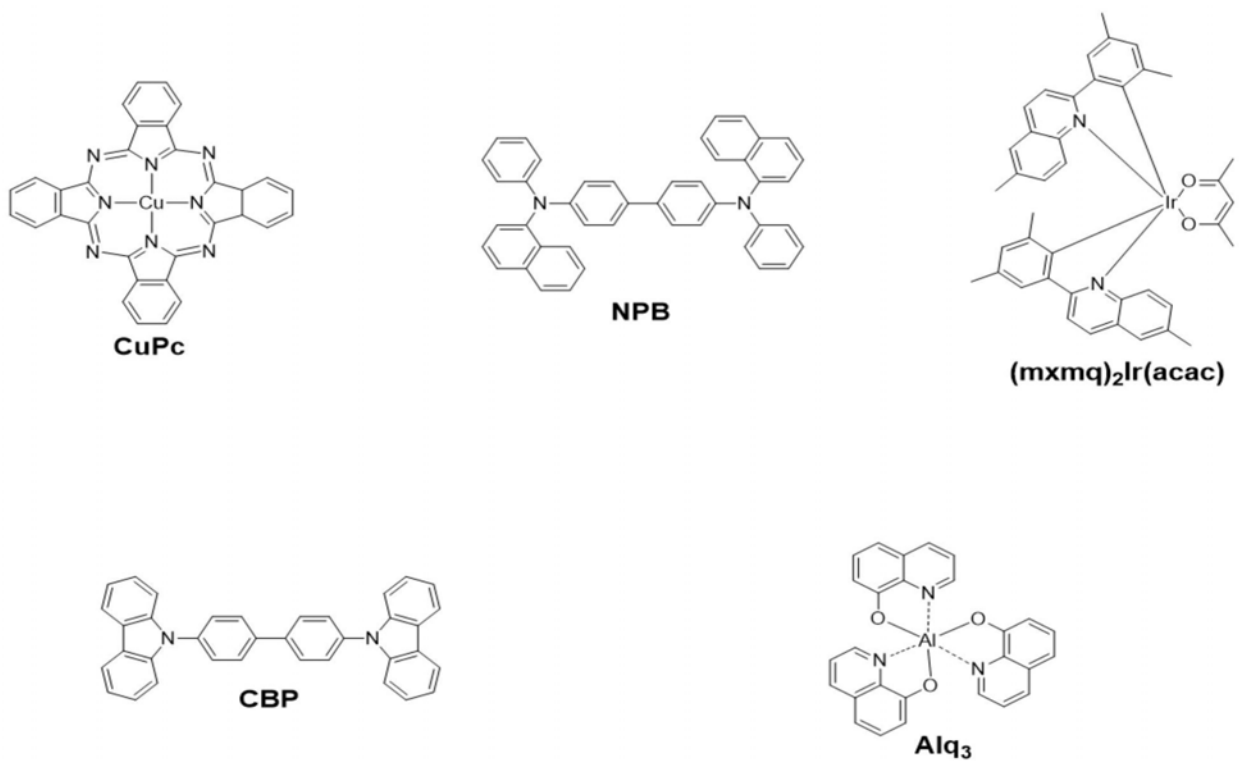


图2

专利名称(译)	一种磷光化合物和使用该化合物的有机发光二极管器件		
公开(公告)号	CN110746962A	公开(公告)日	2020-02-04
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摘要(译)

本发明涉及一种磷光化合物和使用该化合物的有机发光二极管器件，更具体而言，涉及一种具有优异的色纯度和高亮度及发光效率的可溶的磷光主体化合物以及使用该化合物的OLED器件。一种磷光化合物,其特征在于：其结构式如式1或式2所示，本发明使用结构式1和结构式2所示的磷光化合物作为有机发光二极管器件的发光层，具有优异的色纯度和亮度以及延长的耐久性效果。

