(19) 대한민국특허청(KR)
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심사청구일자 없음

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전체 청구항 수 : 총 19 항

(54) 발명의 명칭 **유기 발광 소자 및 이를 포함하는 유기 발광 표시 장치**

(57) 요 약

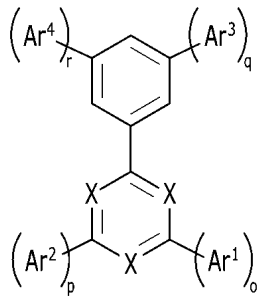
본 발명의 일 실시예에 따른 유기 발광 소자는 하기 화학식 1로 표시되는 제1 화합물 및 하기 화학식 2로 표시되

(뒷면에 계속)

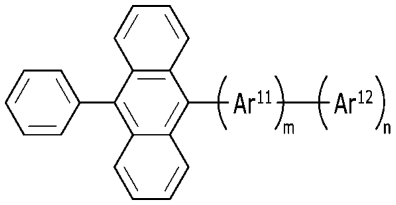
대 표 도 - 도2

는 제1 화합물을 포함할 수 있다.

[화학식 1]



[화학식 2]



(72) 발명자

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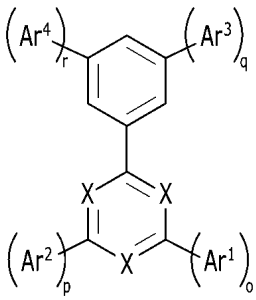
명 세 서

청구범위

청구항 1

하기 화학식 1로 표시되는 제1 화합물 및 하기 화학식 2로 표시되는 제1 화합물을 포함하는 유기 발광 소자:

[화학식 1]



상기 화학식 1에서,

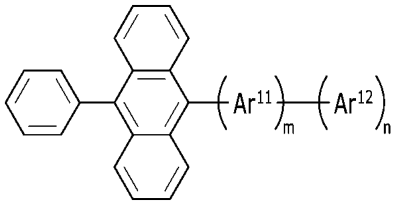
Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

X는 탄소(C) 또는 질소(N)이며,

o, p, q, r은 각각 1 내지 3의 정수이고

o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4는 서로 같거나 다르고,

[화학식 2]



상기 화학식 2에서

Ar^{11}은 치환 또는 비치환의 탄소수 7 내지 30의 아릴렌기 또는 치환 또는 비치환의 탄소수 7 내지 30의 헤테로 아릴렌기이고,

m은 0 내지 3의 정수이고, m이 0인 경우에는 Ar^{11}은 단결합이며,

Ar^{12}은 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

n은 1 내지 3의 정수이고,

m 또는 n이 2 이상인 경우 각각의 Ar^{11} 또는 Ar^{12}는 서로 같거나 다르다.

청구항 2

제1항에서,

상기 유기 발광 소자는

서로 마주하는 애노드와 캐소드,

상기 애노드와 상기 캐소드 사이에 개재되어 있는 발광층,

상기 애노드와 상기 발광층 사이에 개재되어 있는 정공 수송층 및

상기 캐소드와 상기 발광층 사이에 개재되어 있는 전자 수송층을 포함하고,

상기 전자 수송층은 상기 제1 화합물을 포함하며,

상기 발광층은 상기 제2 화합물을 포함하는 유기 발광 소자.

청구항 3

제2항에서,

상기 전자 수송층은 lithium quinolate(Liq)를 더 포함하는 유기 발광 소자.

청구항 4

제1항에서,

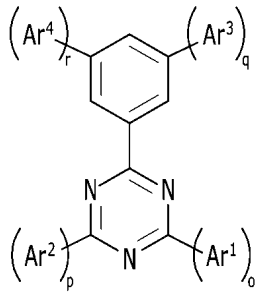
상기 제1 화합물의 Ar^1 내지 Ar^4는 페닐기, 나프틸기, 피리딘기, 퀴놀린기 또는 이소퀴놀린기인 유기 발광 소자.

청구항 5

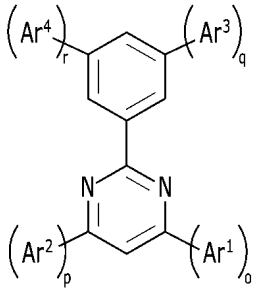
제1항에서,

상기 제1 화합물은 하기 화학식 3-1 내지 3-3으로 표시되는 화합물 중 하나인 유기 발광 소자:

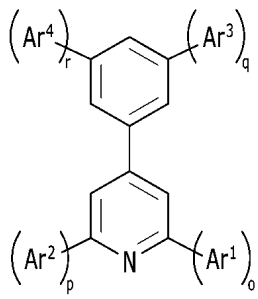
[화학식 3-1]



[화학식 3-2]



[화학식 3-3]



상기 화학식 3-1 내지 3-3에서,

Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

X는 탄소(C) 또는 질소(N)이며,

o, p, q, r 은 각각 1 내지 3의 정수이고

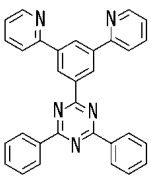
o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4 는 서로 같거나 다르다.

청구항 6

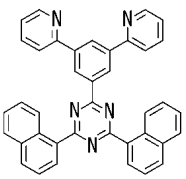
제1항에서,

상기 제1 화합물은 화학식 1-1 내지 화학식 1-249로 이루어진 군으로부터 선택된 하나를 포함하는 유기 발광 소자:

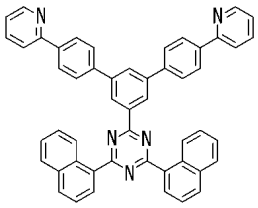
[화학식 1-1 ~ 화학식 1-249]



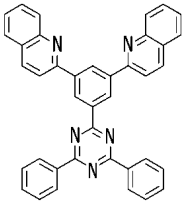
(1-1)



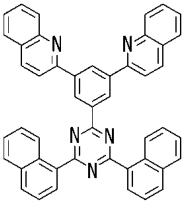
(1-2)



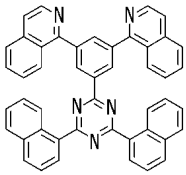
(1-3)



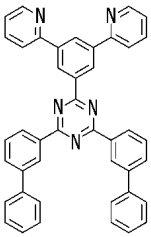
(1-4)



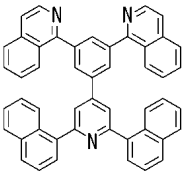
(1-5)



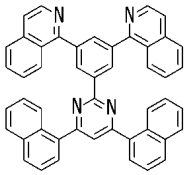
(1-6)



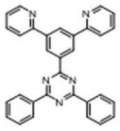
(1-7)



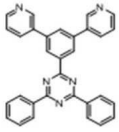
(1-8)



(1-9)



(1-10)



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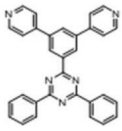

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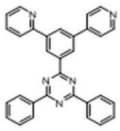

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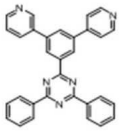

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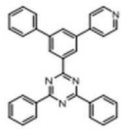

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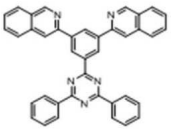

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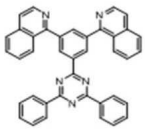

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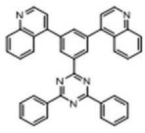

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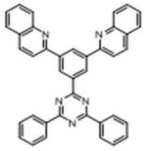

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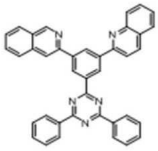

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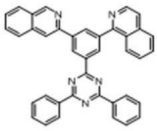

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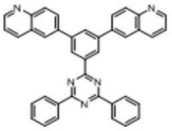

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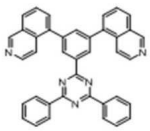

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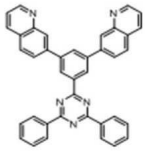

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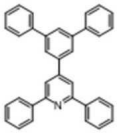

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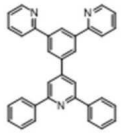

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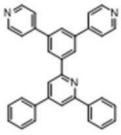

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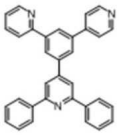

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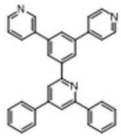

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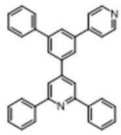

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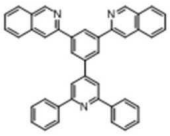

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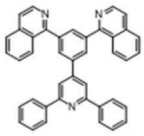

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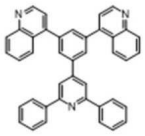

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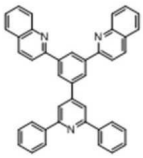

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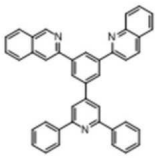

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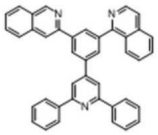

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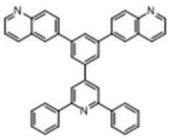

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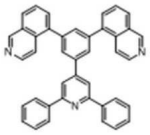

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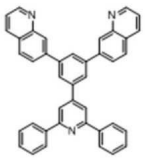

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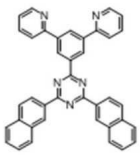

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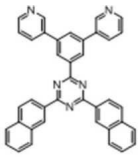

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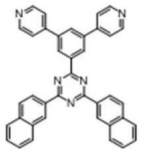

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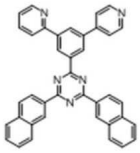

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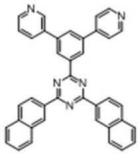

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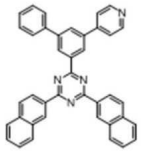

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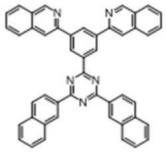

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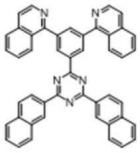

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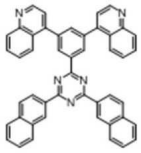

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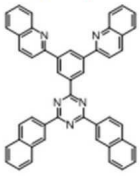

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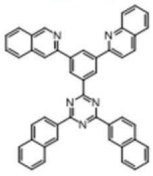

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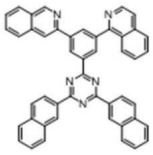

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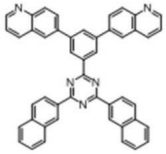

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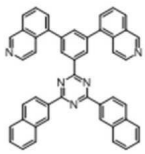

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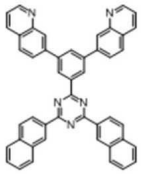

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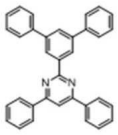

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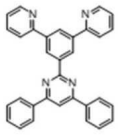

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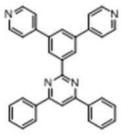

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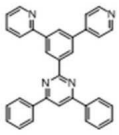

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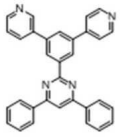

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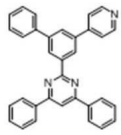

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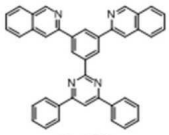

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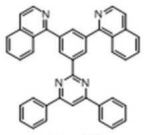

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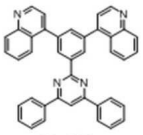

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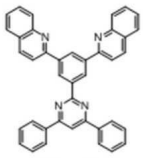

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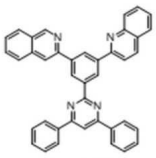

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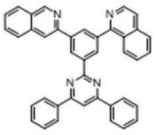

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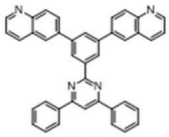

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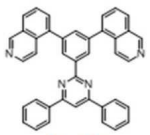

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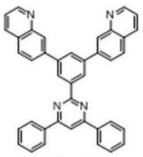

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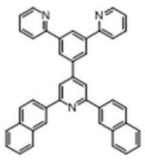

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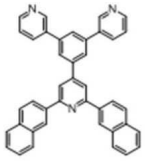

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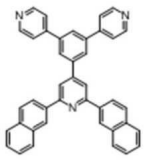

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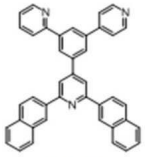

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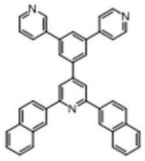

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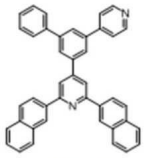

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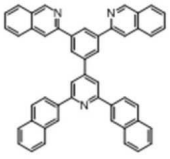

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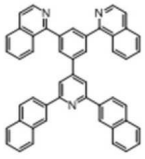

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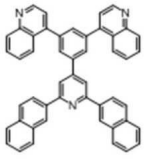

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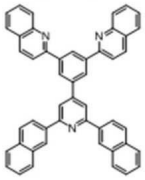

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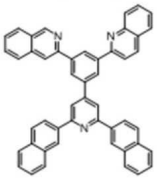

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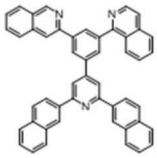

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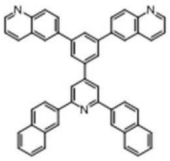

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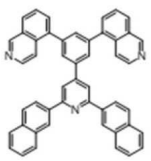

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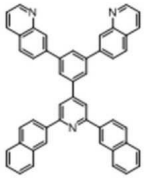

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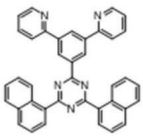

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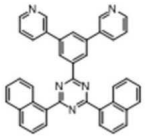

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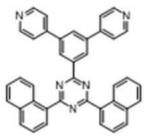

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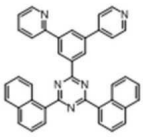

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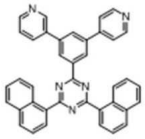

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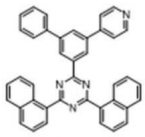

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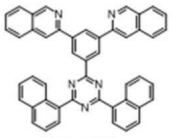

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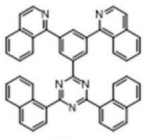

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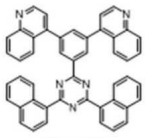

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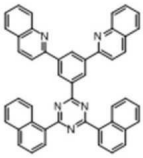

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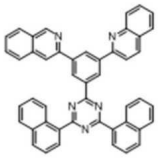

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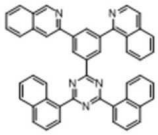

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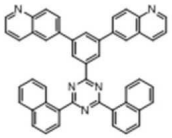

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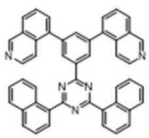

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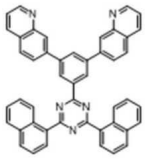

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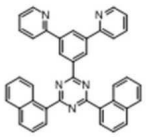

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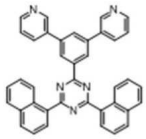

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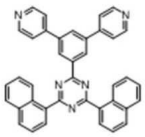

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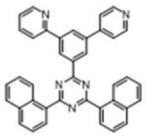

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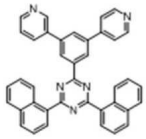

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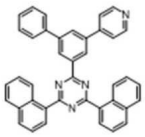

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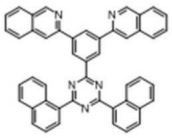

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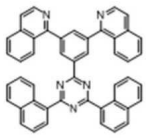

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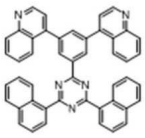

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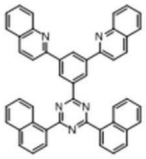

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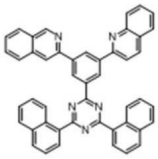

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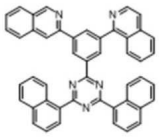

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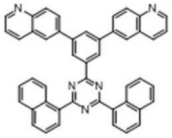

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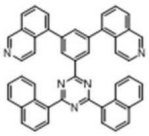

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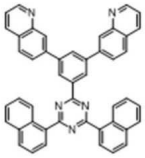

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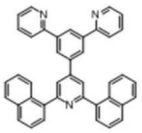

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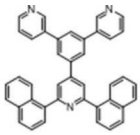

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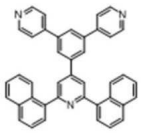

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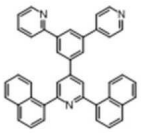

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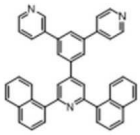

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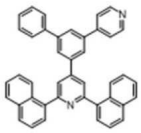

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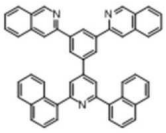

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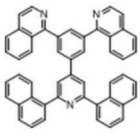

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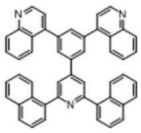

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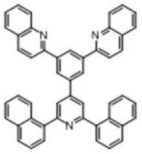

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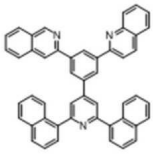

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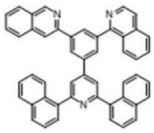

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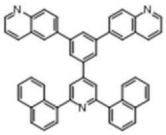

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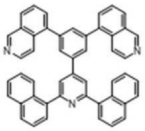

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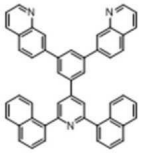

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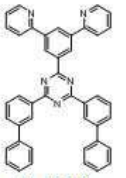
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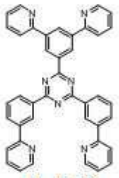
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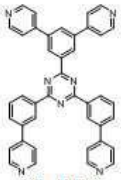
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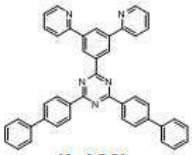
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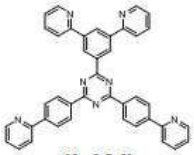
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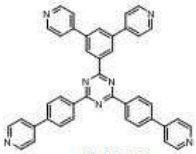
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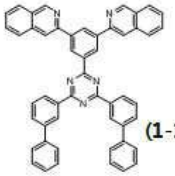
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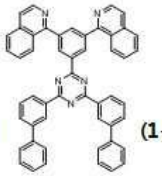
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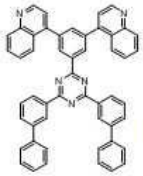
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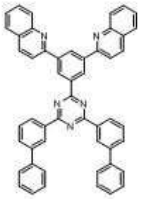
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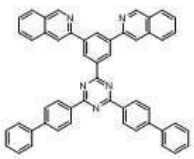
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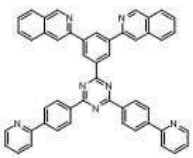
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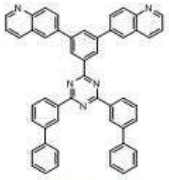
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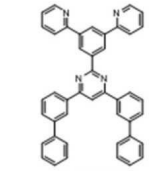

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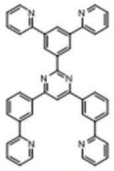

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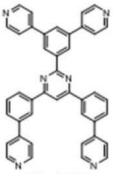

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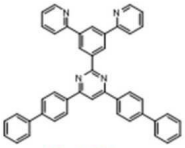

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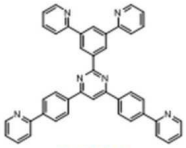

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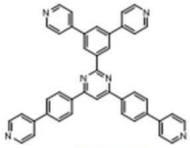

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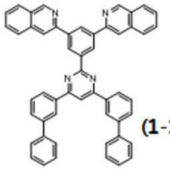

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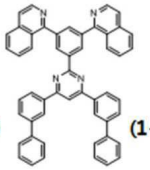

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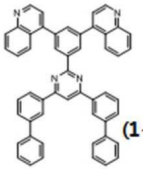

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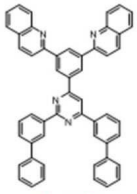

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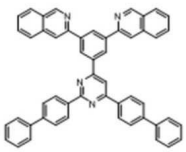

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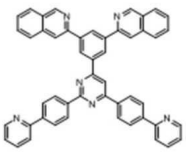

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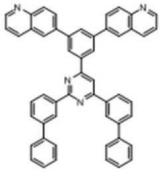

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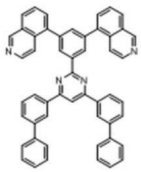

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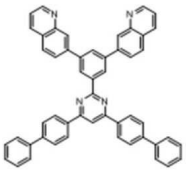

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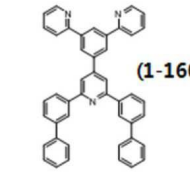

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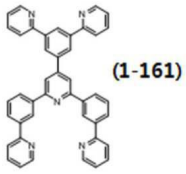

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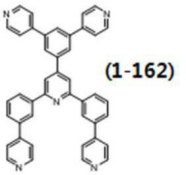

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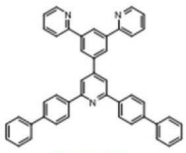

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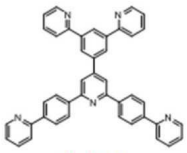

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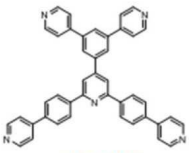

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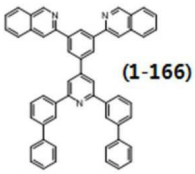

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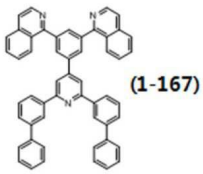

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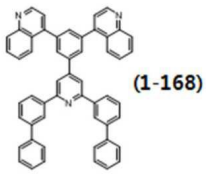

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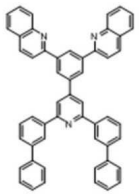

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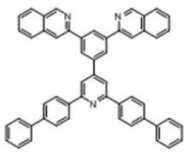

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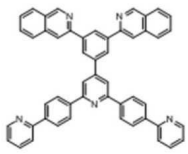

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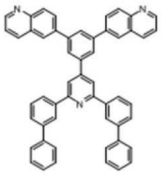

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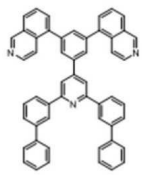

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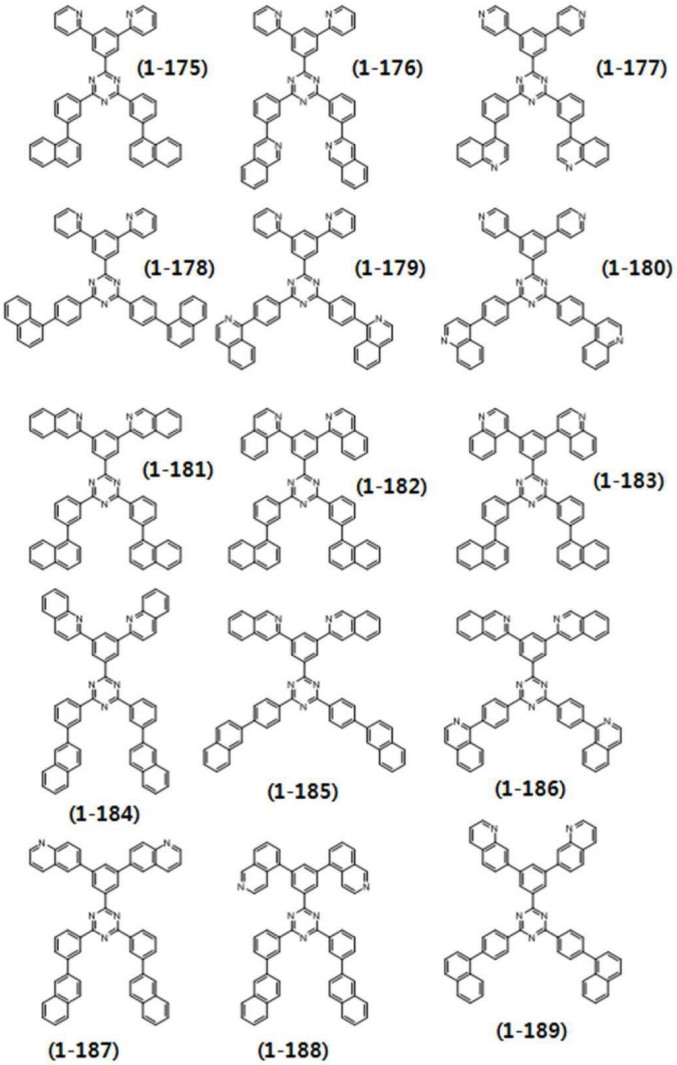
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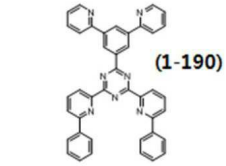

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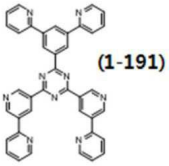

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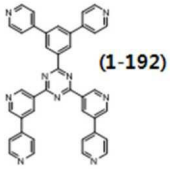

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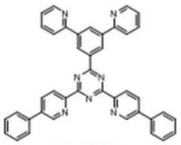

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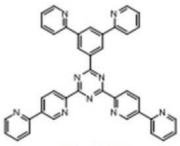

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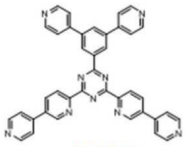

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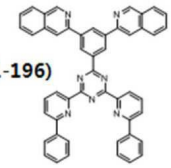

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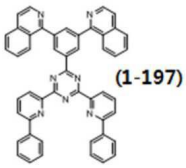

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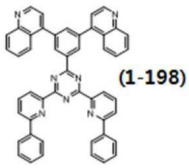

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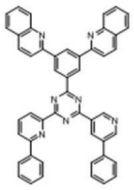

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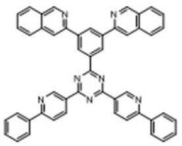

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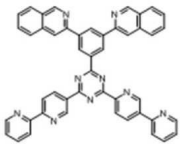

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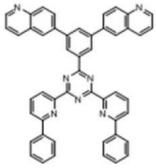

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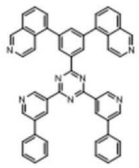

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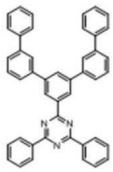

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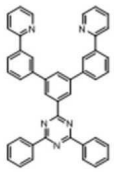

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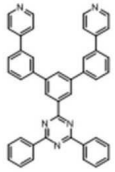

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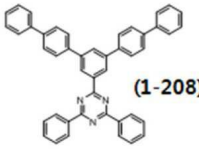

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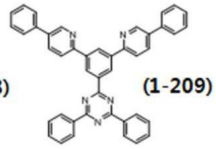

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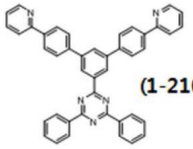

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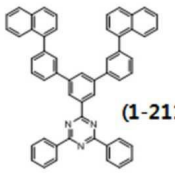

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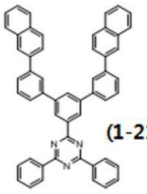

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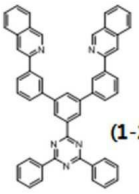

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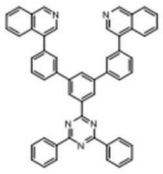

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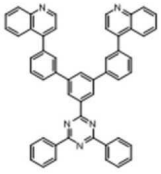

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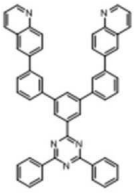

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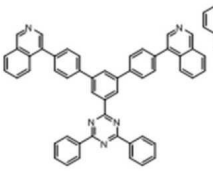

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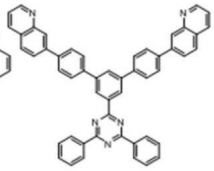

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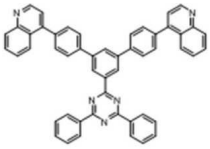

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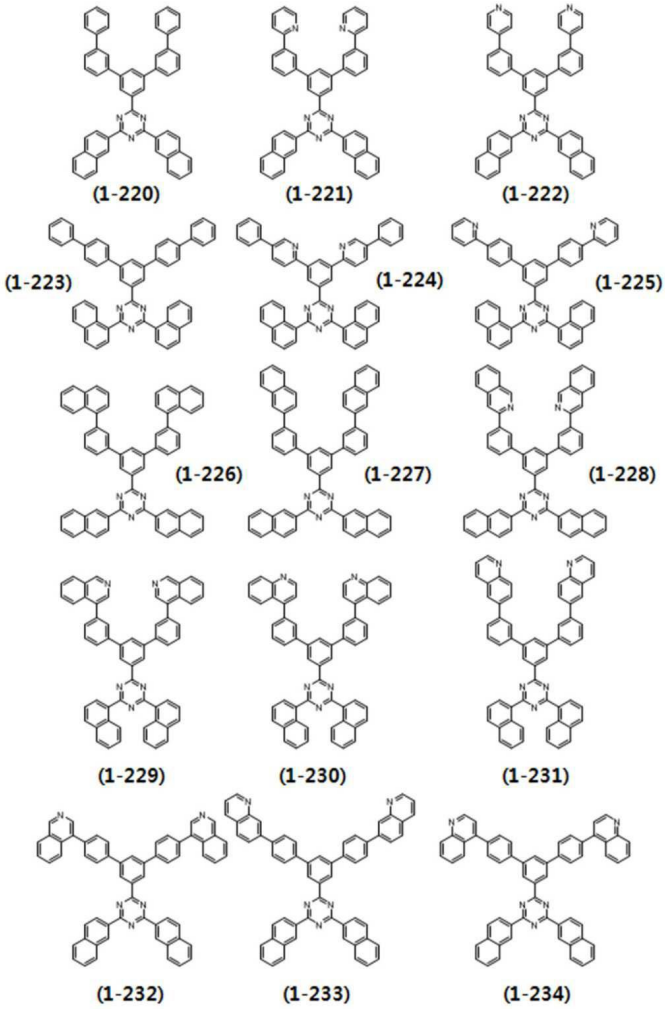
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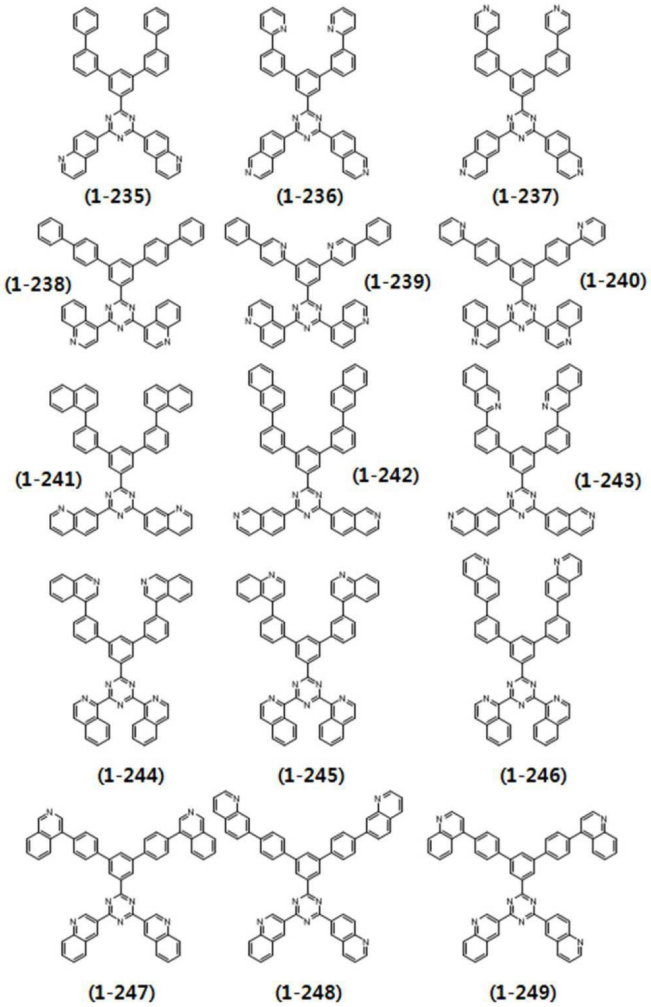

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청구항 7

제1항에서,

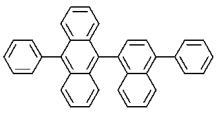
상기 제2 화합물의 Ar^{11}이 치환 또는 무치환의 페닐기, 또는 치환 또는 무치환의 나프틸기인 유기 발광 소자.

청구항 8

제1항에서,

상기 제2 화합물은 하기 화학식 2-1 내지 화학식 2-80으로 표시되는 화합물로 이루어진 군으로부터 선택되는 하나인 유기 발광 소자:

[화학식 2-1 ~ 화학식 2-80]



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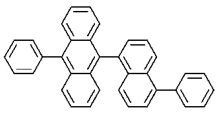

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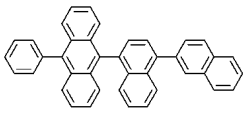

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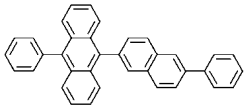

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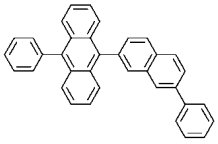

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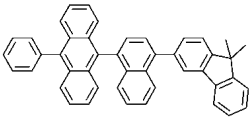

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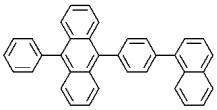

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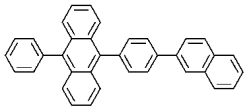

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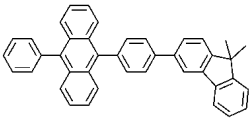

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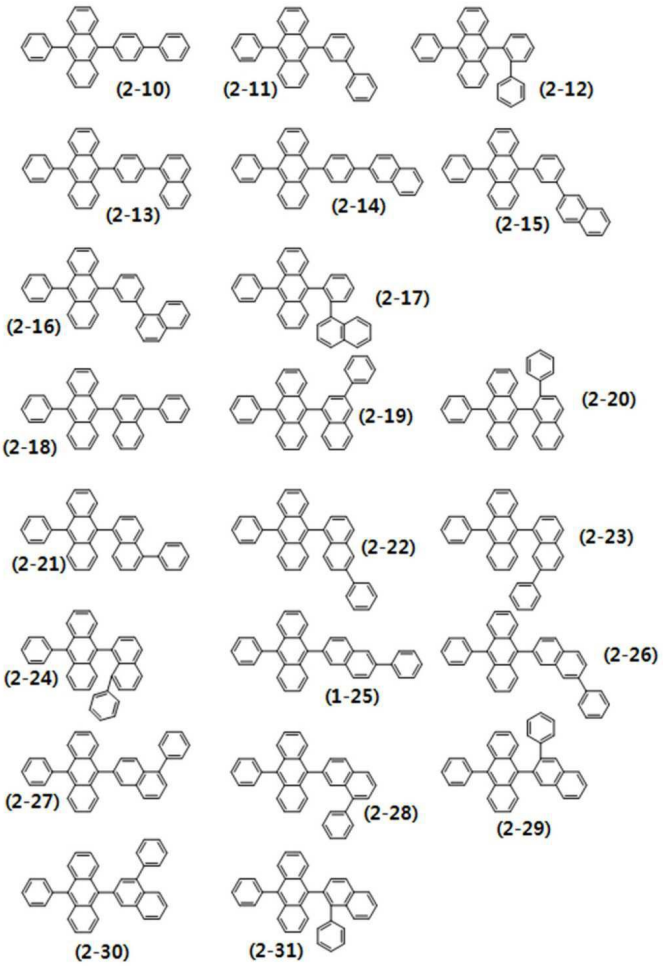
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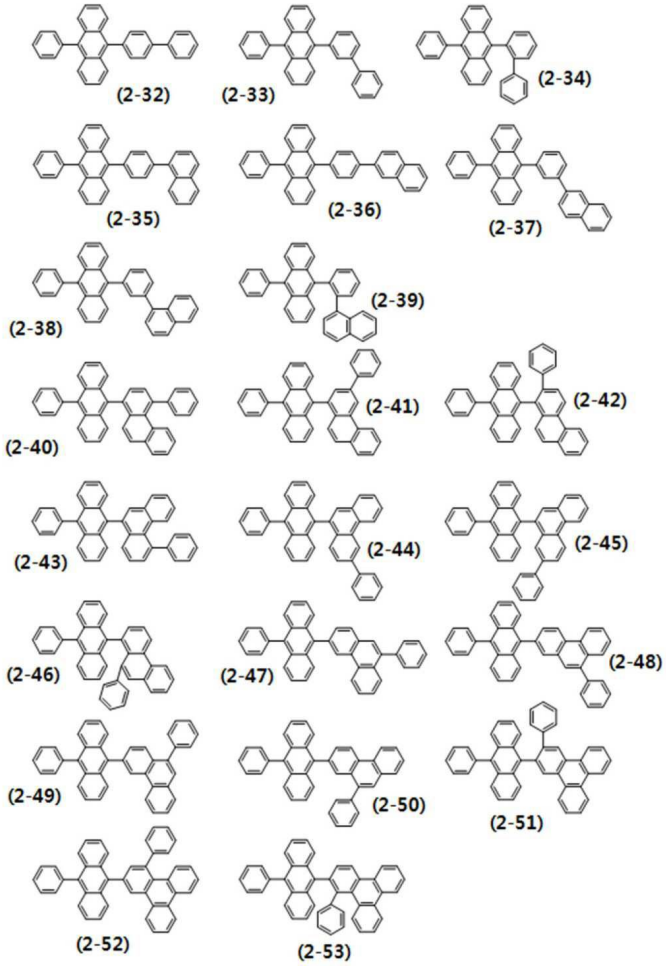
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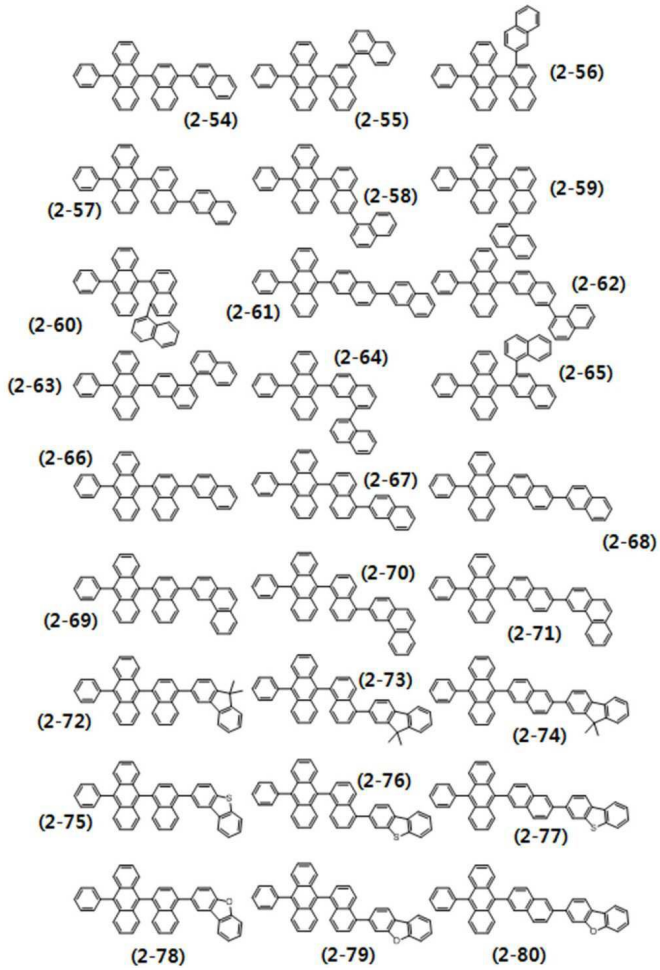

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청구항 9

제1항에서,

상기 유기 발광 소자는

서로 마주하는 애노드와 캐소드,

상기 애노드와 상기 캐소드 사이에 개재되어 있는 발광층,

상기 애노드와 상기 발광층 사이에 개재되어 있는 정공 수송층 및

상기 캐소드와 상기 발광층 사이에 개재되어 있는 전자 수송층 및 정공 저지층을 포함하고,

상기 정공 저지층은 상기 제1 화합물을 포함하고,

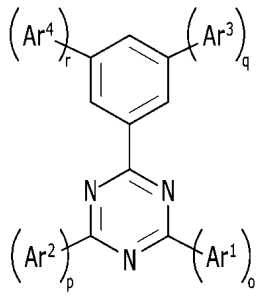
상기 발광층은 상기 제2 화합물을 포함하는 유기 발광 소자.

청구항 10

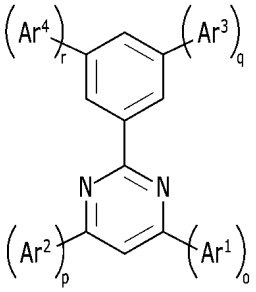
제9항에서,

상기 제1 화합물은 하기 화학식 3-1 내지 3-3으로 표시되는 화합물 중 하나인 유기 발광 소자:

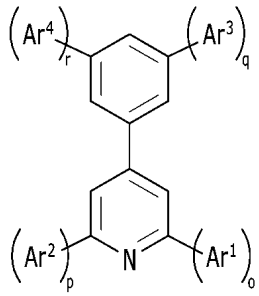
[화학식 3-1]



[화학식 3-2]



[화학식 3-3]



상기 화학식 3-1 내지 3-3에서,

Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

X는 탄소(C) 또는 질소(N)이며,

o, p, q, r 은 각각 1 내지 3의 정수이고

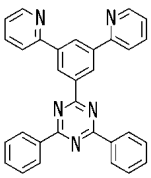
o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4 는 서로 같거나 다르다.

청구항 11

제9항에서,

상기 제1 화합물은 화학식 1-1 내지 화학식 1-249로 이루어진 군으로부터 선택된 하나인 유기 발광 소자:

[화학식 1-1 ~ 화학식 1-249]



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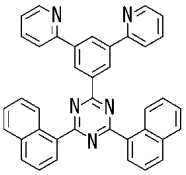

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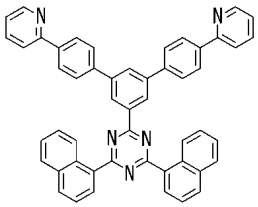

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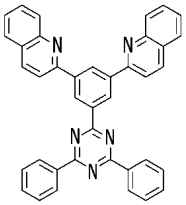

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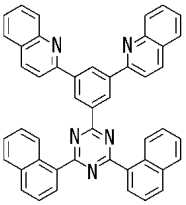

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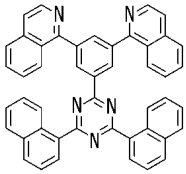

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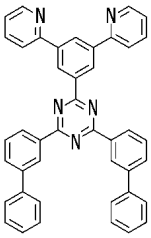

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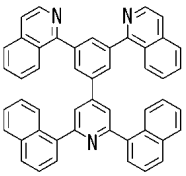

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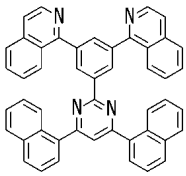

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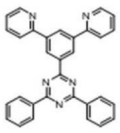

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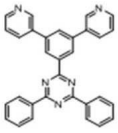

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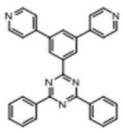

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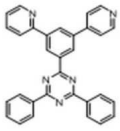

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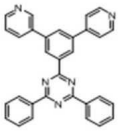

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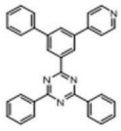

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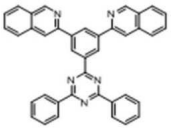

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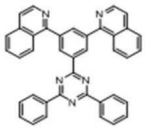

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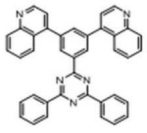

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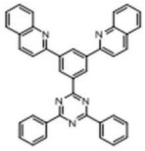

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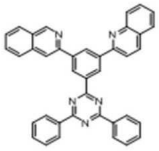

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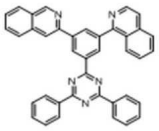

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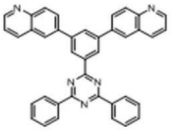

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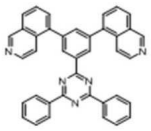

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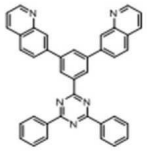

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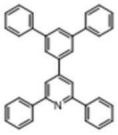

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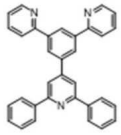

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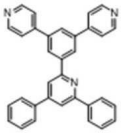

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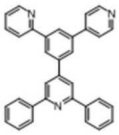

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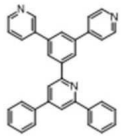

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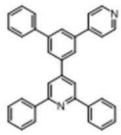

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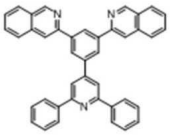

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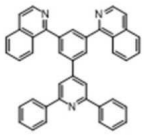

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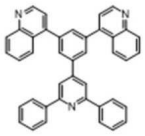

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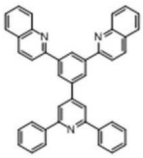

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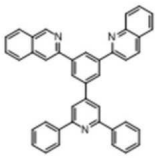

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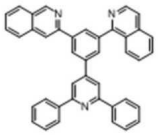

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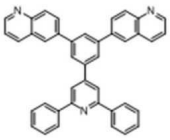

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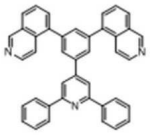

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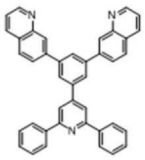

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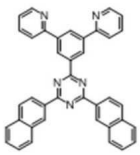

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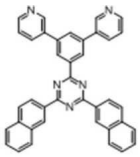

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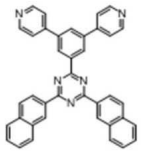

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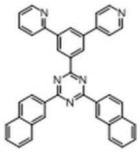

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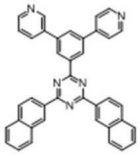

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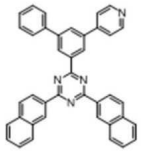

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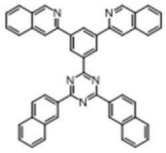

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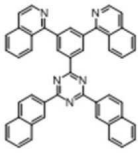

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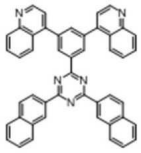

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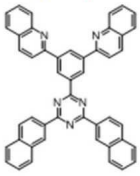

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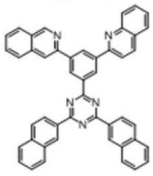

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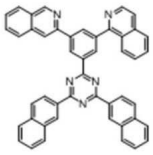

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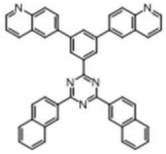

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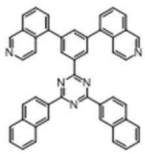

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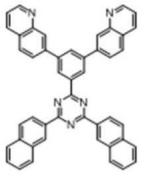

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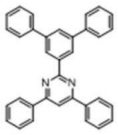

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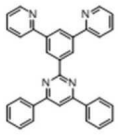

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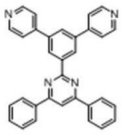

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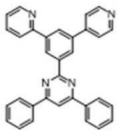

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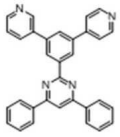

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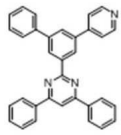

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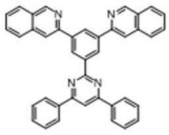

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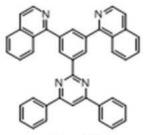

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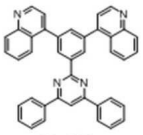

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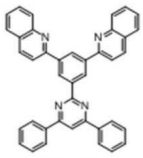

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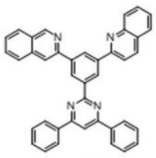

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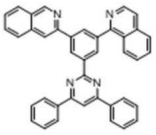

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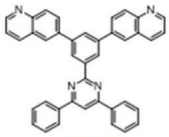

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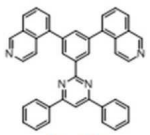

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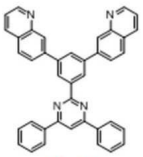

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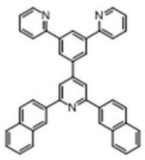

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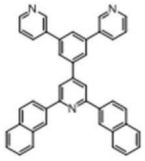

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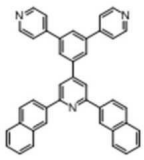

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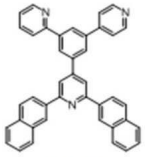

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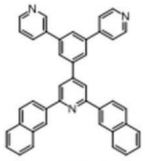

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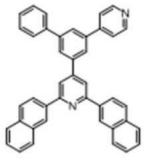

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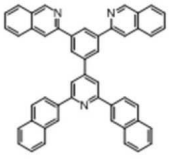

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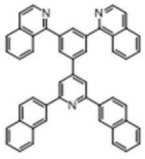

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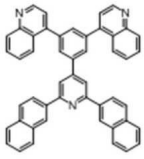

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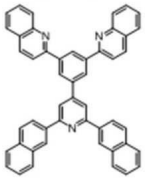

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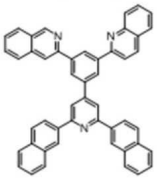

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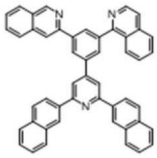

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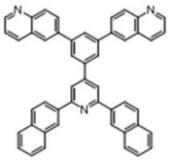

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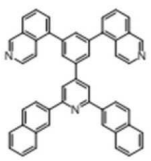

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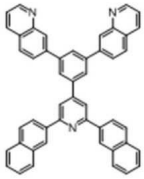

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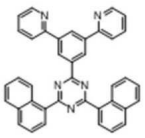

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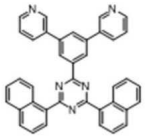

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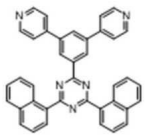

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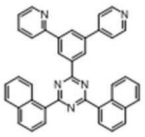

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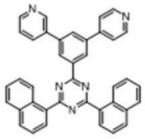

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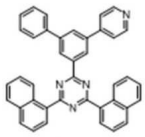

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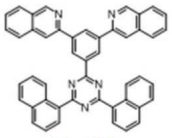

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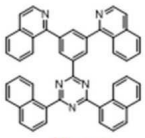

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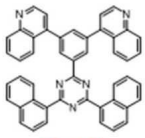

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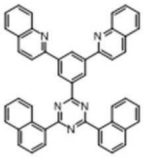

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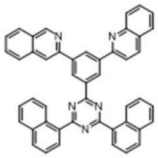

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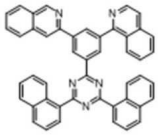

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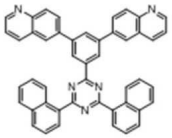

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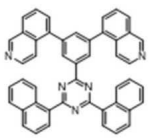

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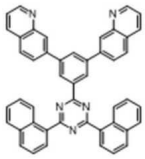

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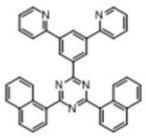

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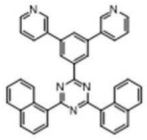

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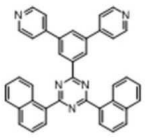

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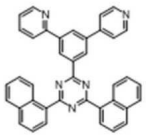

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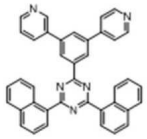

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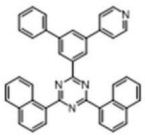

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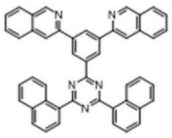

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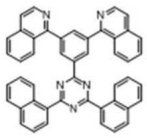

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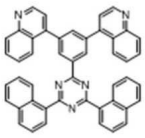

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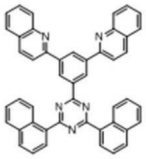

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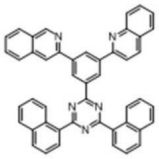

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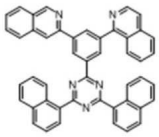

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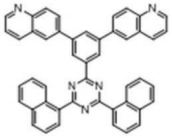

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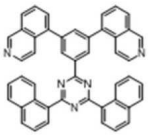

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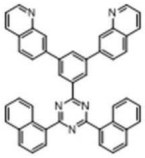

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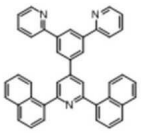

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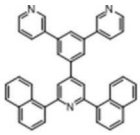

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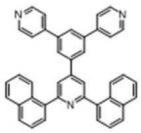

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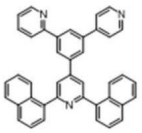

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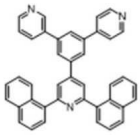

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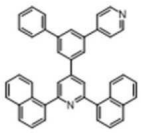

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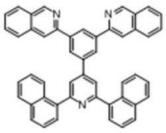

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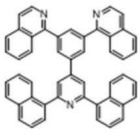

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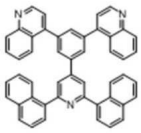

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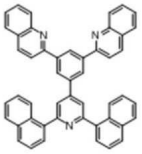

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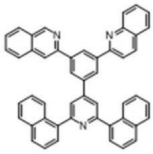

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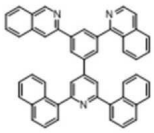

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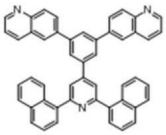

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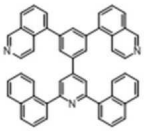

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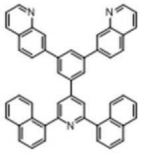

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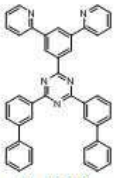
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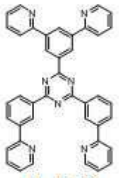
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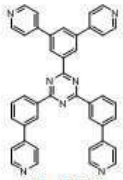
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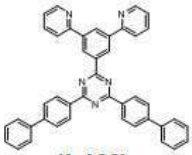
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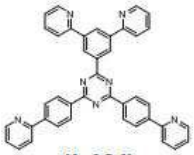
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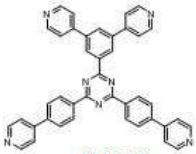
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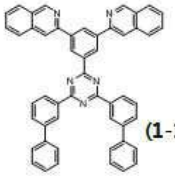
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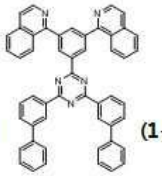
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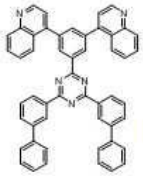
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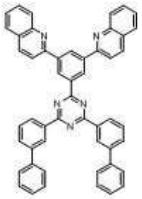
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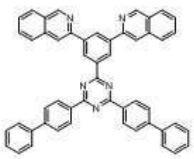
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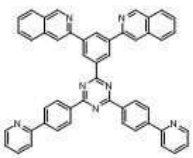
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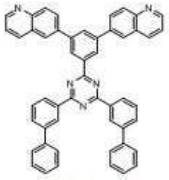
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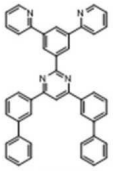

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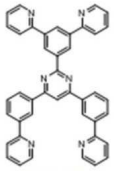

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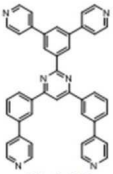

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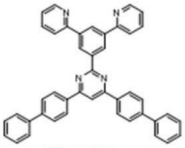

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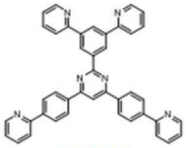

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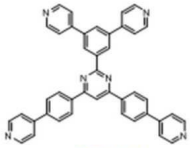

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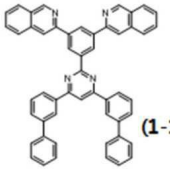

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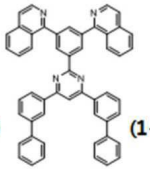

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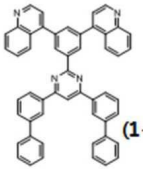

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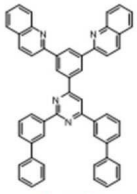

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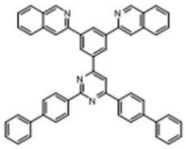

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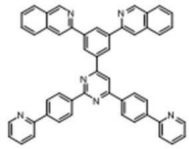

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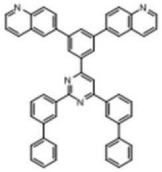

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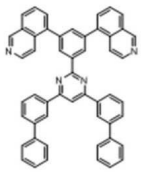

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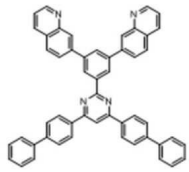

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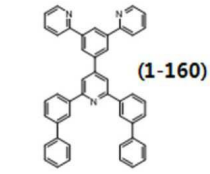

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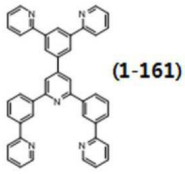

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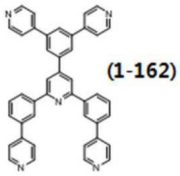

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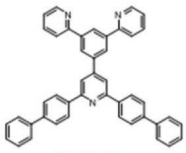

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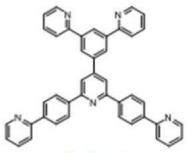

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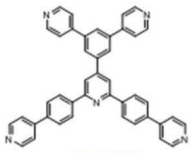

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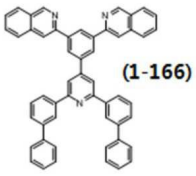

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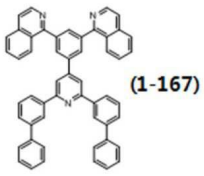

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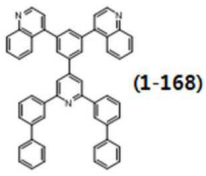

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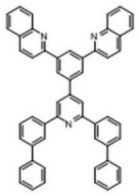

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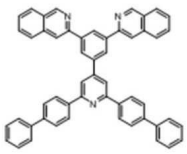

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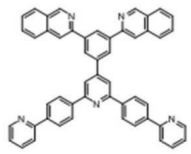

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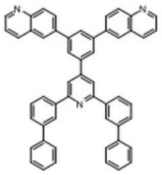

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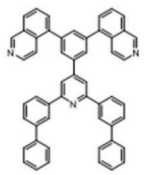

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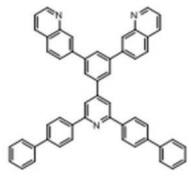

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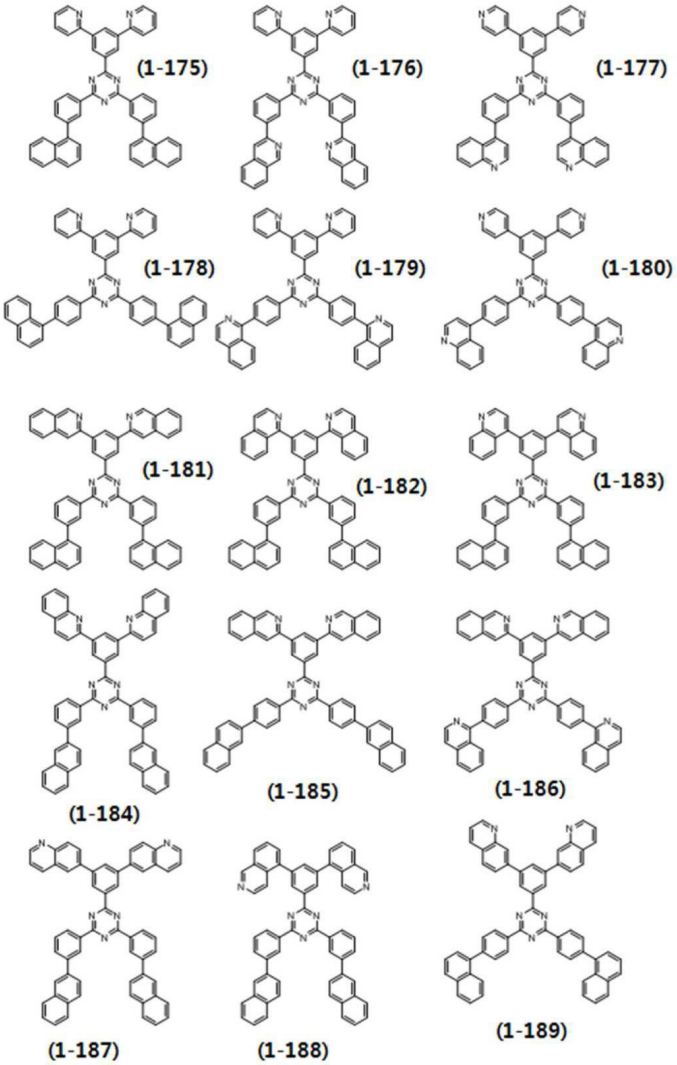
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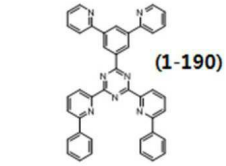

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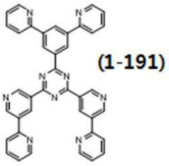

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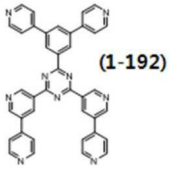

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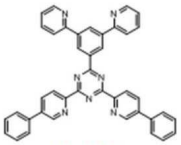

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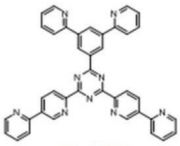

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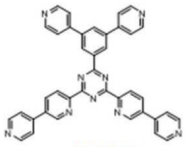

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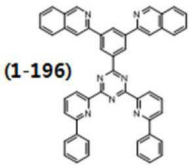

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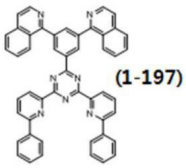

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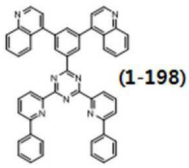

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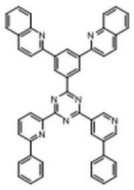

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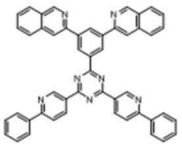

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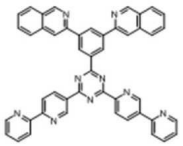

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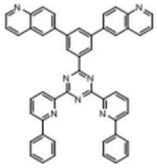

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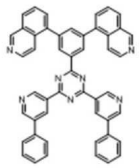

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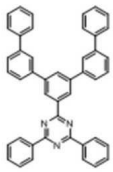

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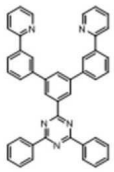

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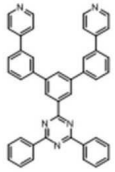

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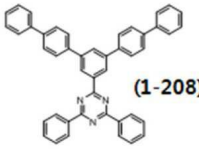

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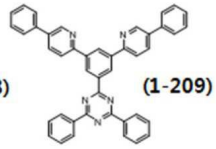

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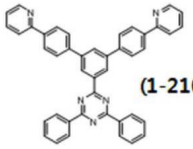

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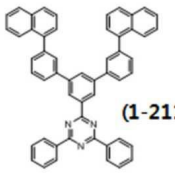

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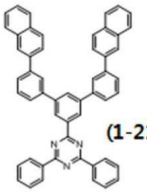

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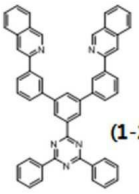

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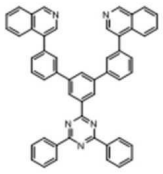

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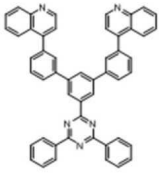

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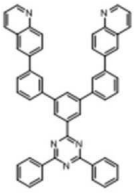

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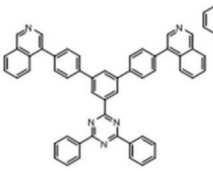

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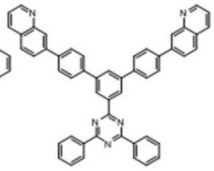

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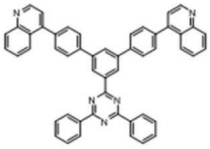

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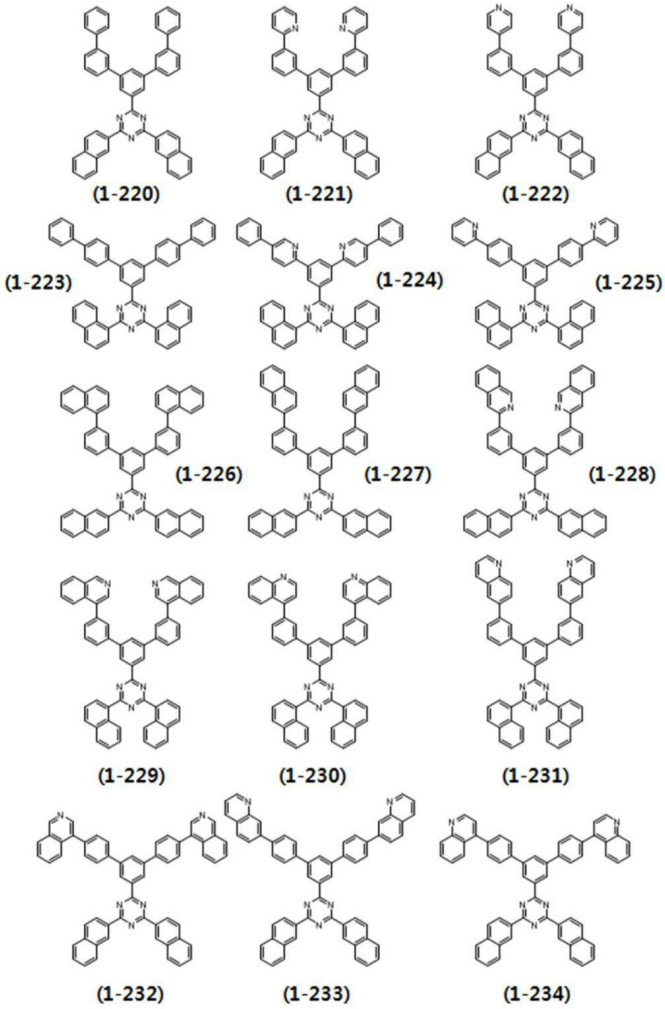
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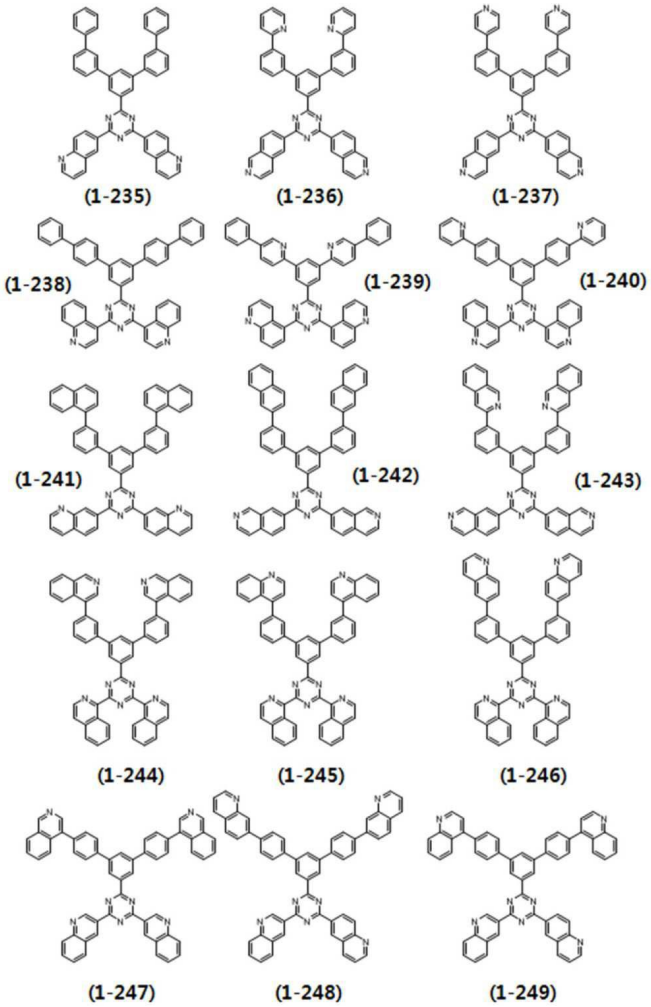

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청구항 12

기판

상기 기판 위에 위치하는 게이트선,

상기 게이트선과 교차하는 데이터선 및 구동 전압선,

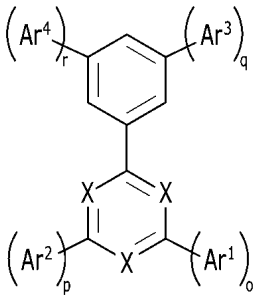
상기 게이트선 및 데이터선과 연결되어 있는 스위칭 박막 트랜지스터,

상기 스위칭 박막 트랜지스터 및 상기 구동 전압선과 연결되어 있는 구동 박막 트랜지스터,

상기 구동 박막 트랜지스터와 연결되어 있는 유기 발광 소자를 포함하며,

상기 유기 발광 소자는 하기 화학식 1로 표시되는 제1 화합물 및 하기 화학식 2로 표시되는 제2 화합물을 포함하는 유기 발광 표시 장치:

[화학식 1]



상기 화학식 1에서,

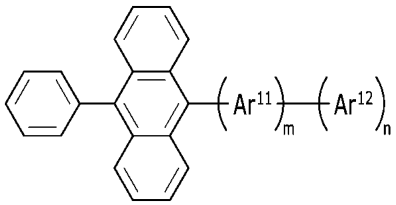
Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

X는 탄소(C) 또는 질소(N)이며,

o, p, q, r은 각각 1 내지 3의 정수이고

o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4는 서로 같거나 다르고,

[화학식 2]



상기 화학식 2에서

Ar^{11}은 치환 또는 비치환의 탄소수 7 내지 30의 아릴렌기 또는 치환 또는 비치환의 탄소수 7 내지 30의 헤테로 아릴렌기이고,

m은 0 내지 3의 정수이고, m이 0인 경우에는 Ar^{11}은 단결합이며,

Ar^{12}은 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

n은 1 내지 3의 정수이고,

m 또는 n이 2 이상인 경우 각각의 Ar^{11} 또는 Ar^{12}는 서로 같거나 다르다.

청구항 13

제12항에서,

상기 유기 발광 소자는

서로 마주하는 애노드와 캐소드,

상기 애노드와 상기 캐소드 사이에 개재되어 있는 발광층,

상기 애노드와 상기 발광층 사이에 개재되어 있는 정공 수송층 및

상기 캐소드와 상기 발광층 사이에 개재되어 있는 전자 수송층을 포함하고,

상기 전자 수송층은 상기 제1 화합물을 포함하고,

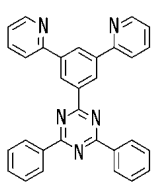
상기 발광층은 상기 제2 화합물을 포함하는 유기 발광 표시 장치.

청구항 14

제12항에서,

상기 제1 화합물은 하기 화학식 1-1 내지 1-249로 이루어진 군으로부터 선택된 하나인 유기 발광 표시 장치:

[화학식 1-1 ~ 화학식 1-249]



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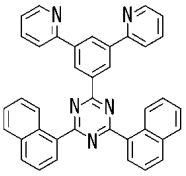

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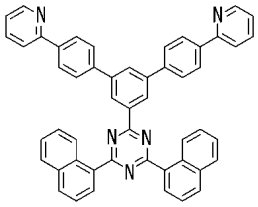

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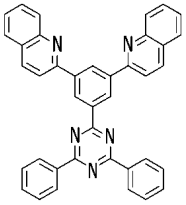

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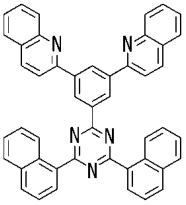

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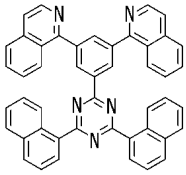

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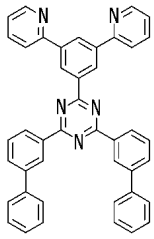

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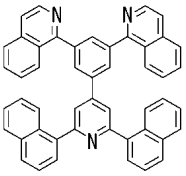

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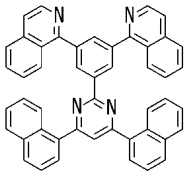

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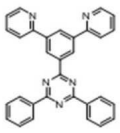

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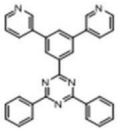

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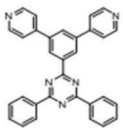

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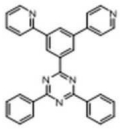

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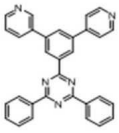

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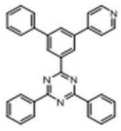

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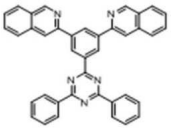

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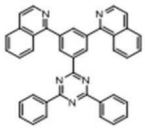

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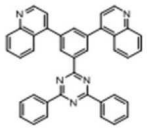

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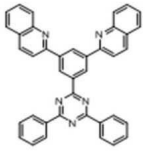

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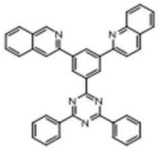

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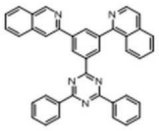

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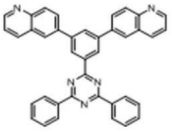

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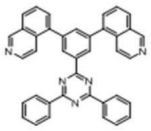

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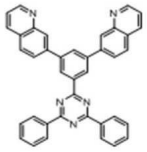

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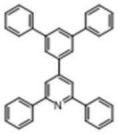

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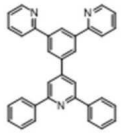

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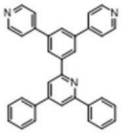

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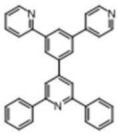

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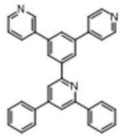

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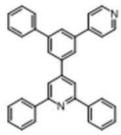

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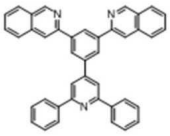

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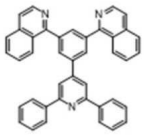

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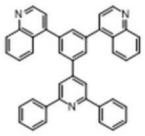

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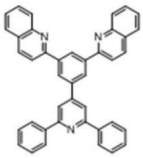

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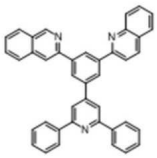

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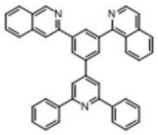

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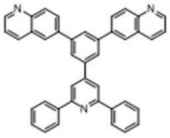

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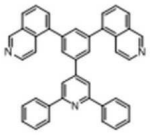

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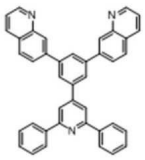

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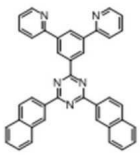

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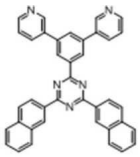

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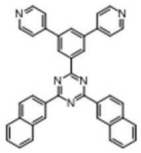

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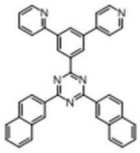

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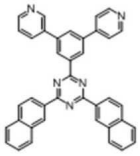

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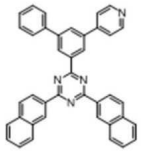

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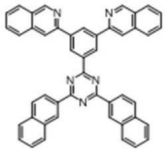

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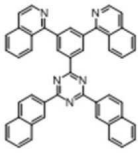

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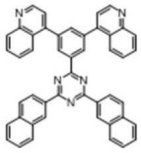

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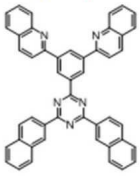

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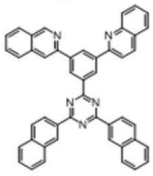

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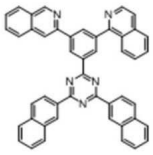

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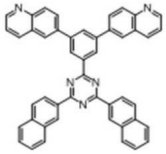

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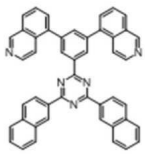

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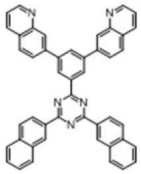

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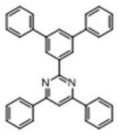

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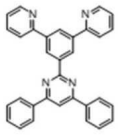

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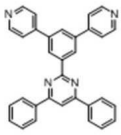

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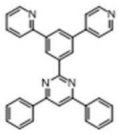

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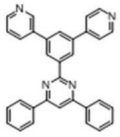

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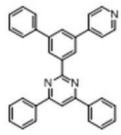

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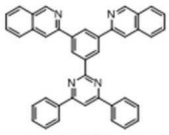

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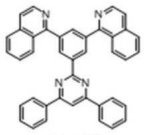

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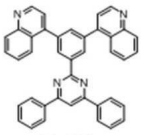

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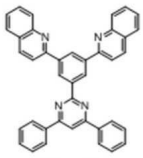

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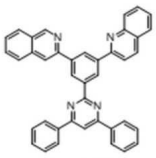

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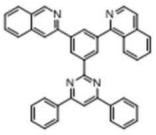

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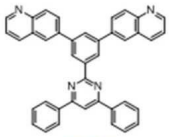

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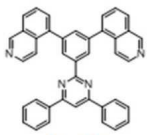

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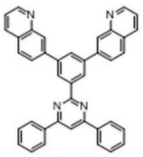

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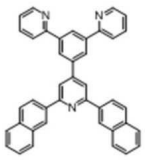

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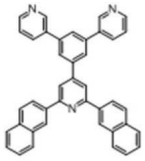

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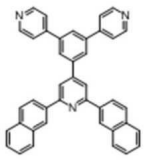

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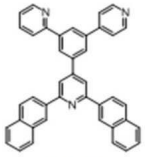

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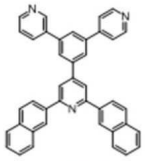

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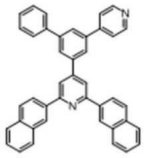

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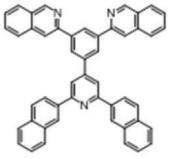

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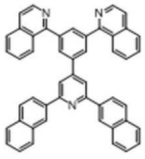

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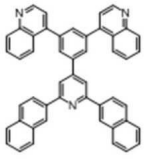

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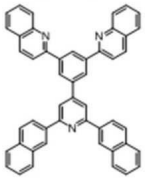

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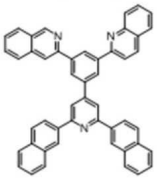

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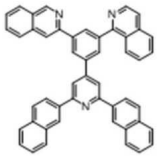

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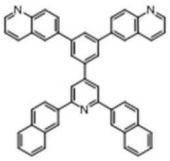

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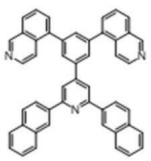

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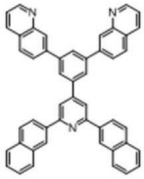

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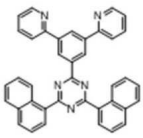

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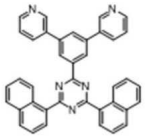

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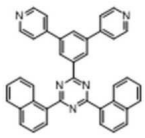

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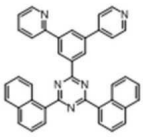

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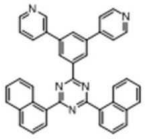

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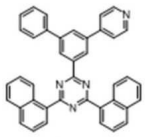

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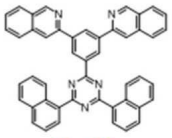

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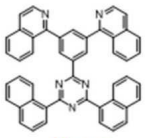

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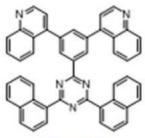

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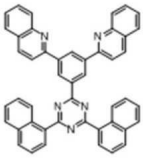

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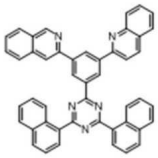

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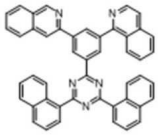

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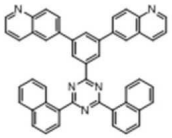

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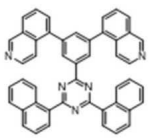

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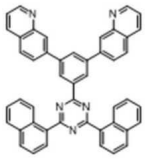

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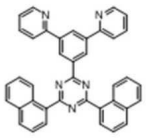

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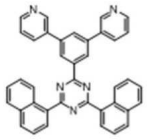

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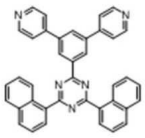

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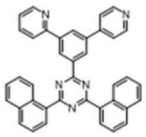

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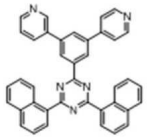

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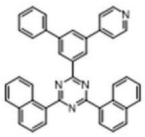

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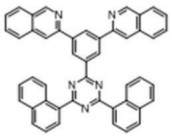

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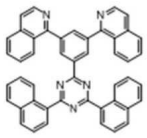

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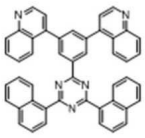

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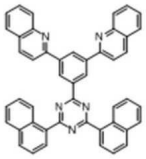

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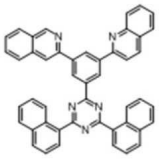

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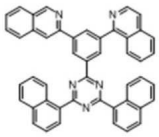

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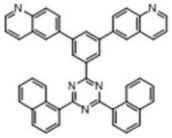

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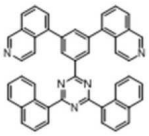

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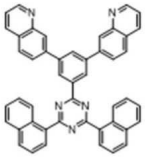

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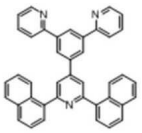

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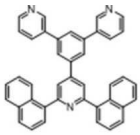

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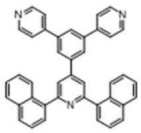

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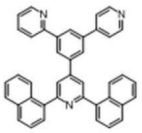

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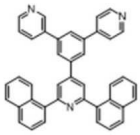

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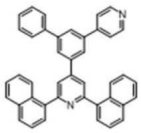

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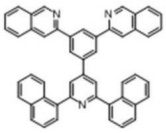

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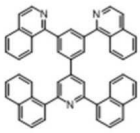

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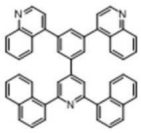

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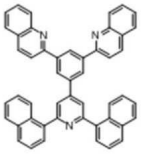

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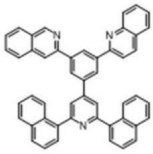

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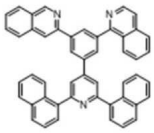

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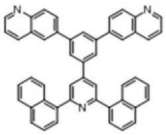

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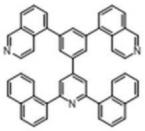

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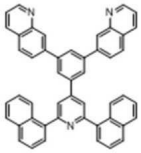

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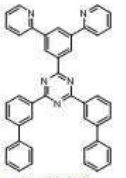
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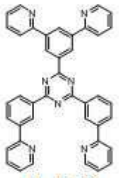
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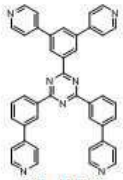
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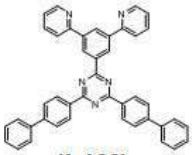
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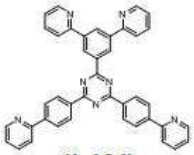
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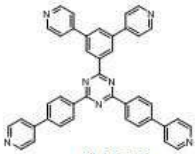
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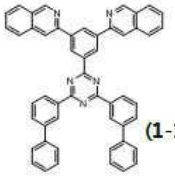
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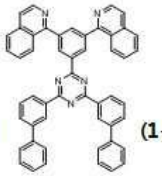
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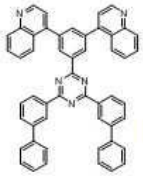
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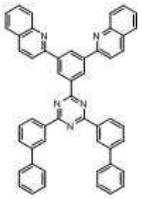
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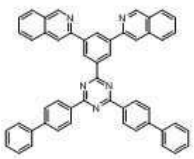
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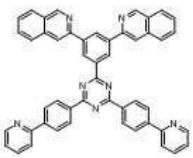
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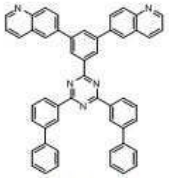
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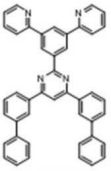

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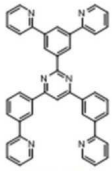

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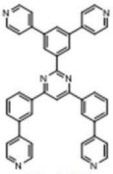

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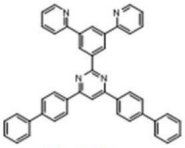

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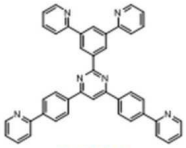

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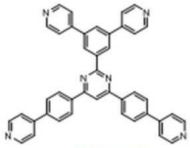

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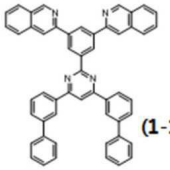

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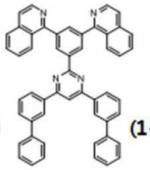

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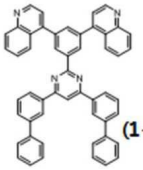

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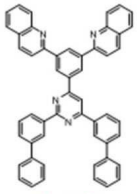

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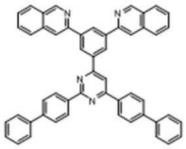

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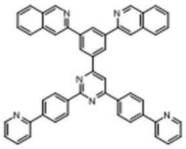

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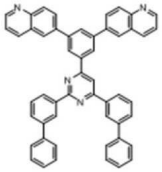

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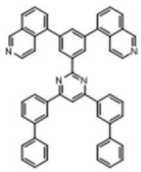

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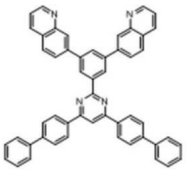

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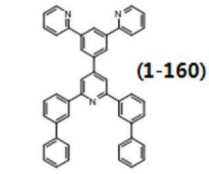

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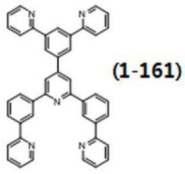

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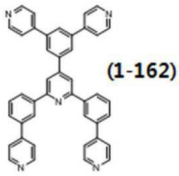

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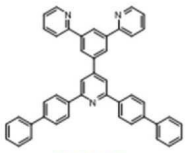

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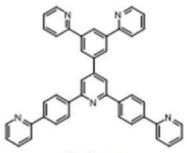

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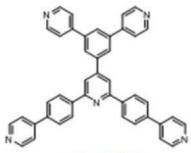

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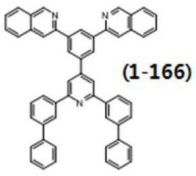

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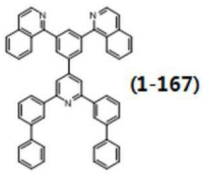

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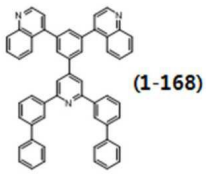

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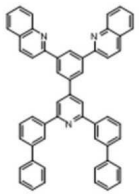

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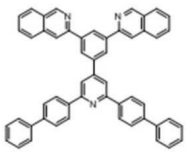

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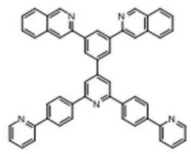

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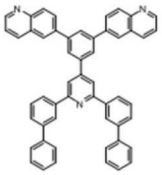

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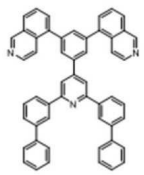

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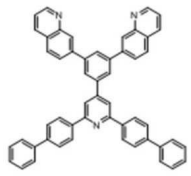

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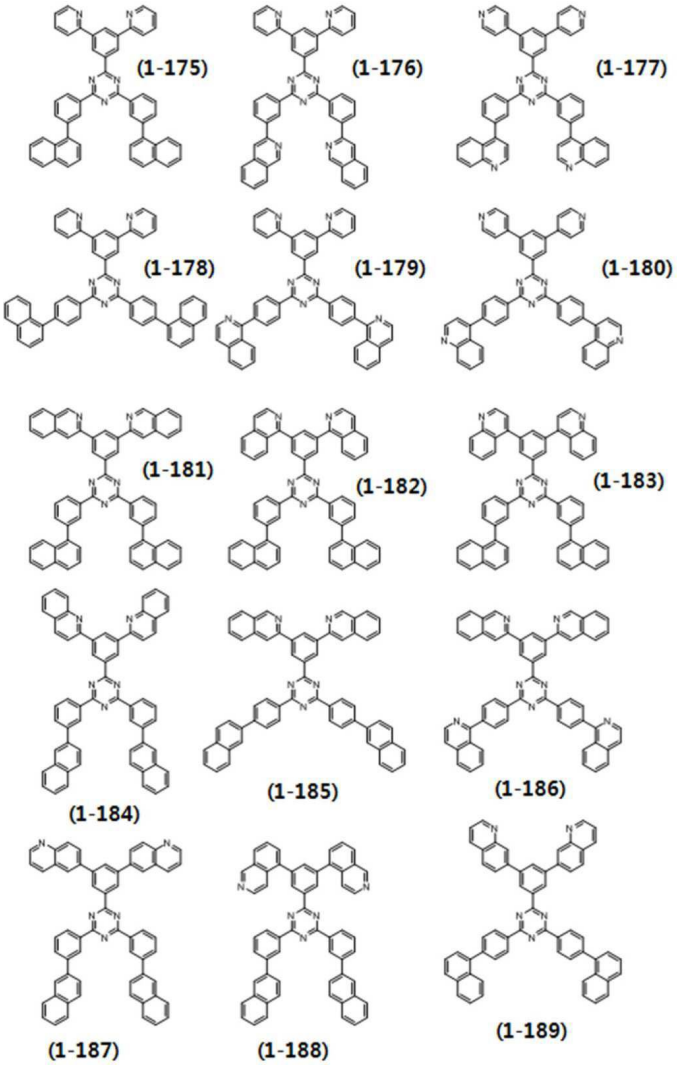
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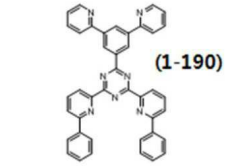

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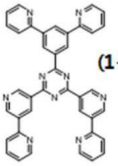

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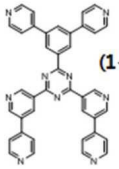

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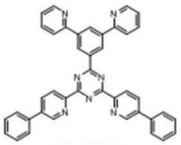

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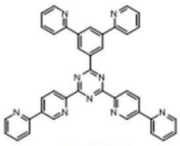

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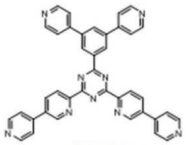

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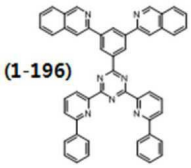

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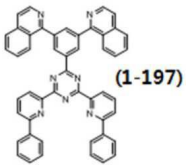

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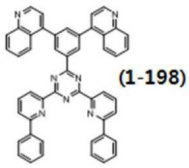

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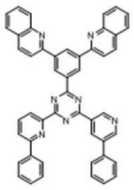

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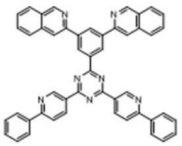

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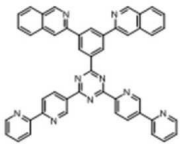

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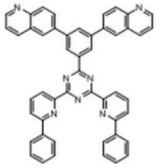

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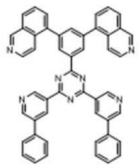

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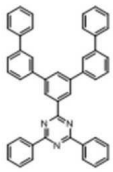
(1-204)



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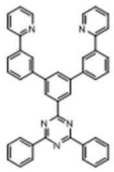

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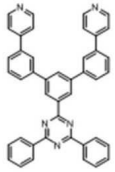

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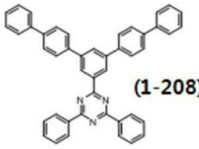

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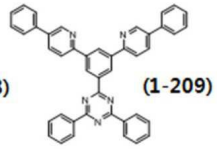

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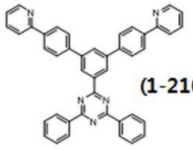

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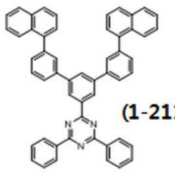
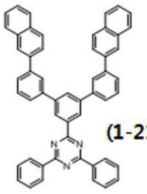
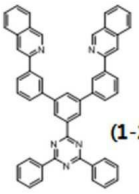


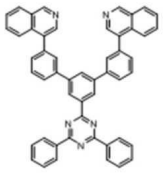
(1-211)



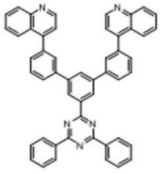
(1-212)



(1-213)



(1-214)



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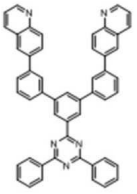

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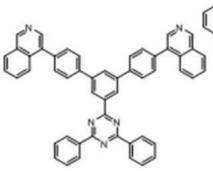

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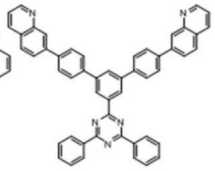

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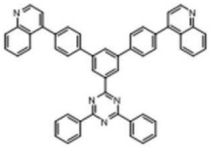

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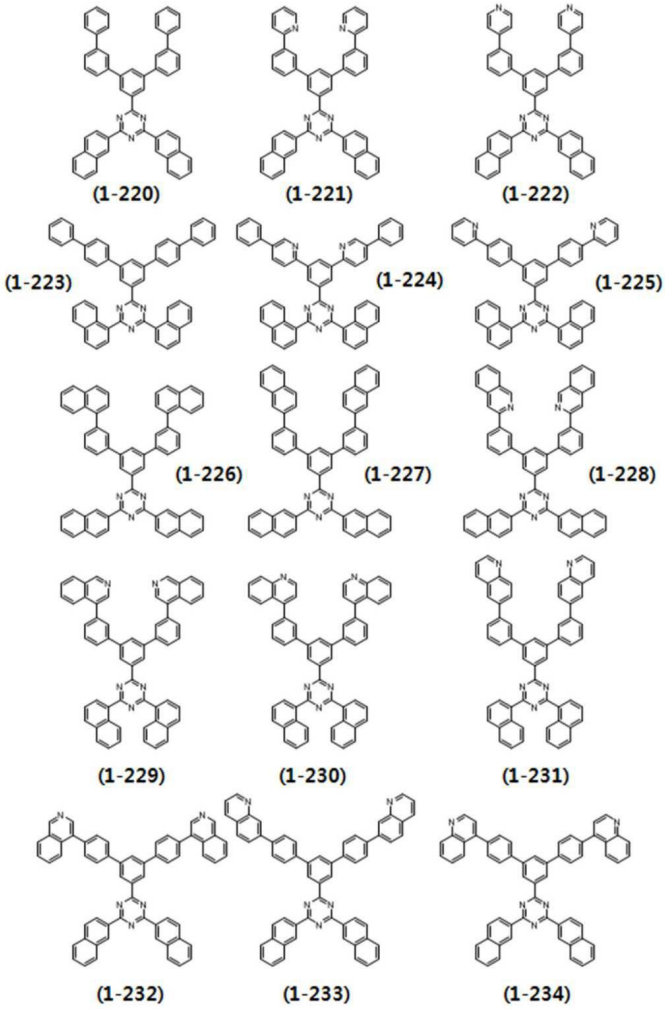
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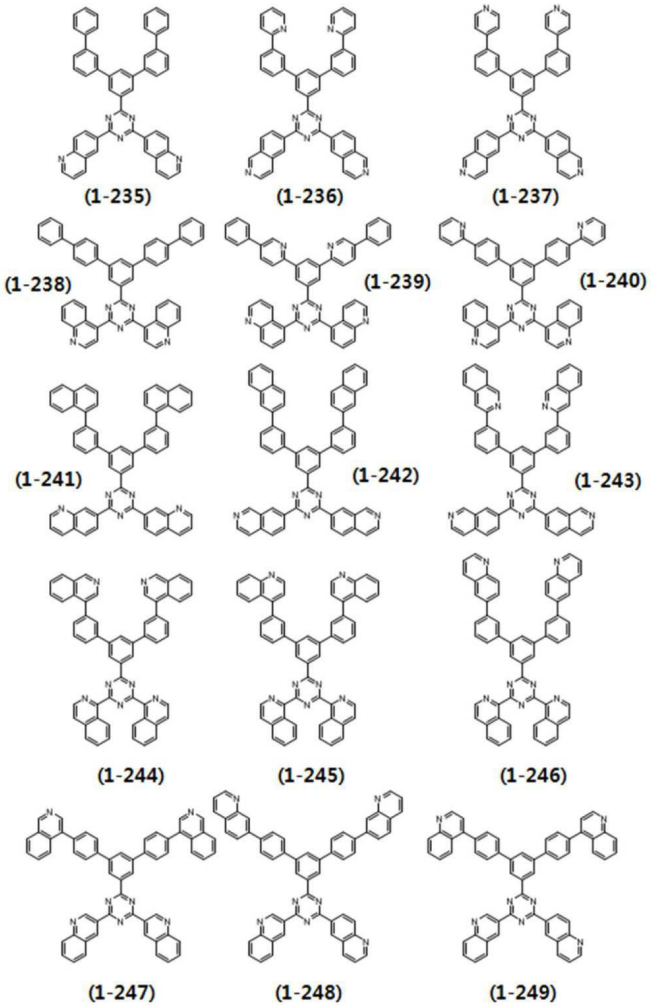

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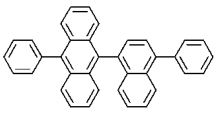
청구항 15

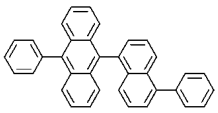
제12항에서,

상기 제2 화합물은 하기 화학식 2-1 내지 화학식 2-80으로 표시되는 화합물로 이루어진 군으로부터 선택되는 하나인 유기 발광 표시 장치:

[화학식 2-1 ~ 화학식 2-80]



(2-1)



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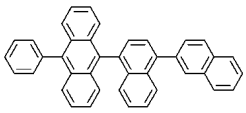

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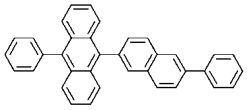

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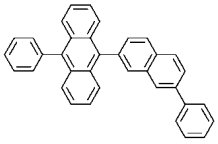

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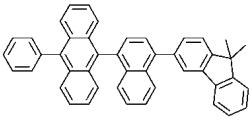

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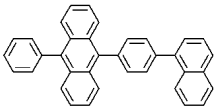

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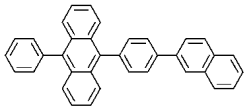

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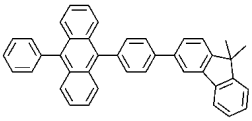

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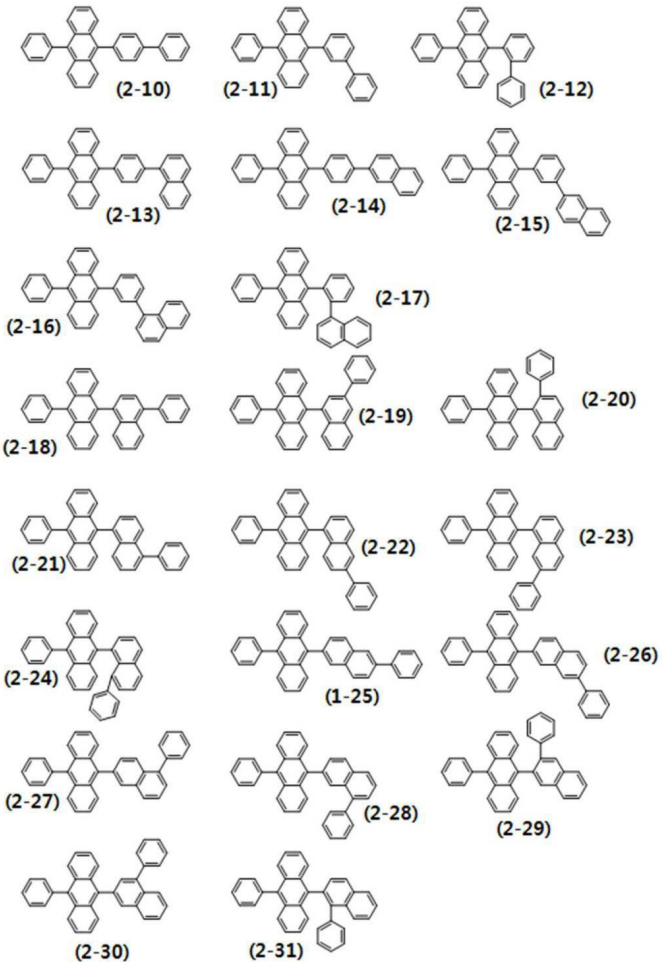
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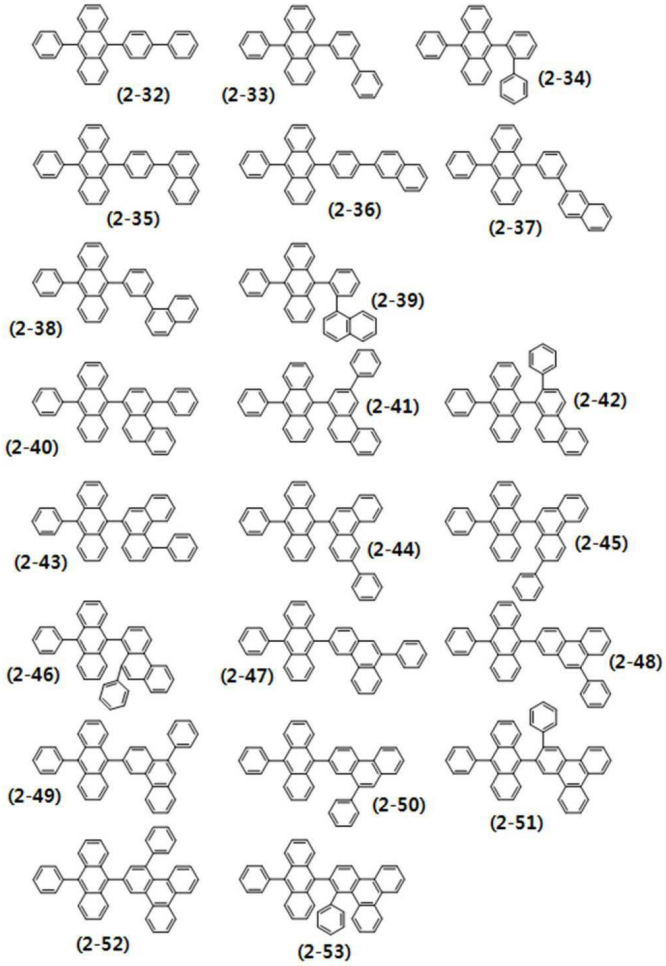
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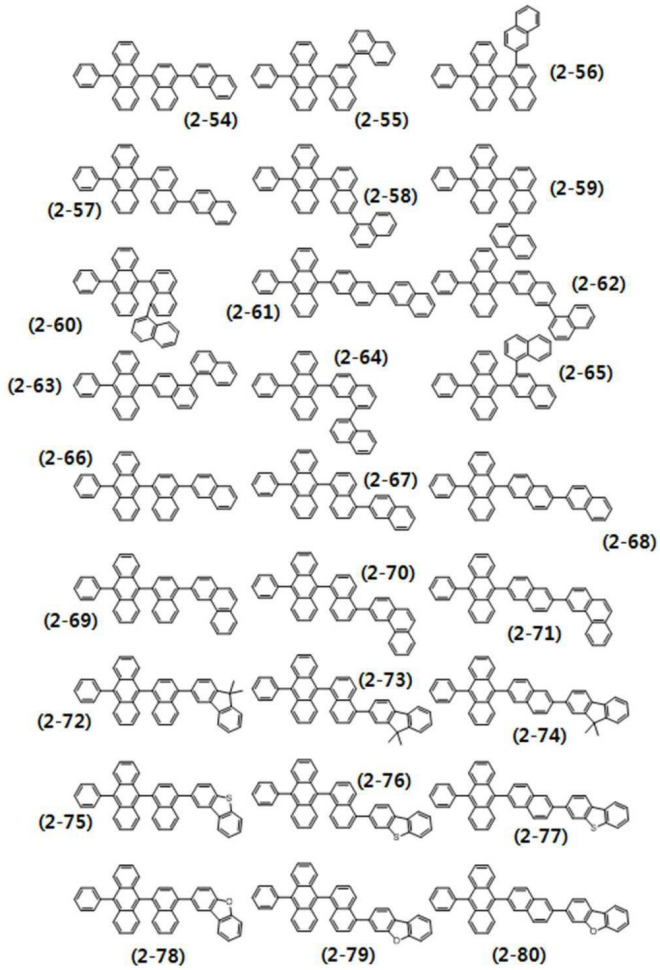
(2-53)



청구항 16

제12항에서,

상기 유기 발광 소자는

서로 마주하는 애노드와 캐소드,

상기 애노드와 상기 캐소드 사이에 개재되어 있는 발광층,

상기 애노드와 상기 발광층 사이에 개재되어 있는 정공 수송층 및

상기 캐소드와 상기 발광층 사이에 개재되어 있는 전자 수송층 및 정공 저지층을 포함하고,

상기 정공 저지층은 상기 제1 화합물을 포함하며,

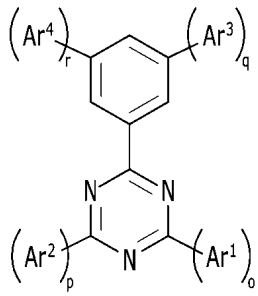
상기 발광층은 상기 제2 화합물을 포함하는 유기 발광 표시 장치.

청구항 17

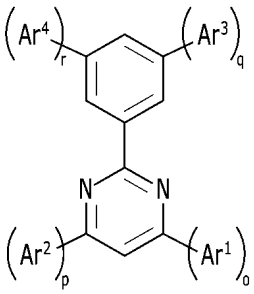
제16항에서,

상기 제1 화합물은 하기 화학식 3-1 내지 3-3으로 표시되는 화합물 중 하나인 유기 발광 표시 장치:

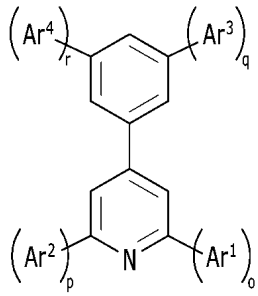
[화학식 3-1]



[화학식 3-2]



[화학식 3-3]



상기 화학식 3-1 내지 3-3에서,

Ar1 내지 Ar4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

X는 탄소(C) 또는 질소(N)이며,

o, p, q, r 은 각각 1 내지 3의 정수이고

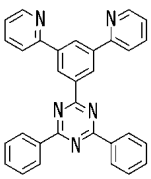
o, p, q, r 이 2 이상인 경우 각각의 Ar1 내지 Ar4 는 서로 같거나 다르다.

청구항 18

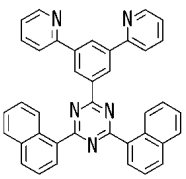
제16항에서,

상기 제1 화합물은 하기 화학식 1-1 내지 1-249로 이루어진 군으로부터 선택된 하나인 유기 발광 표시 장치:

[화학식 1-1 ~ 화학식 1-249]



(1-1)



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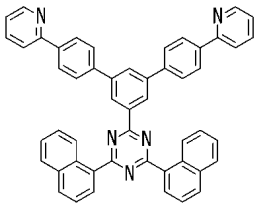

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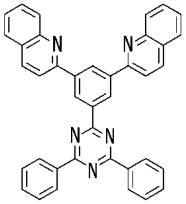

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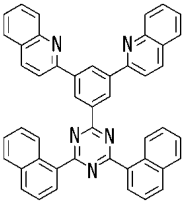

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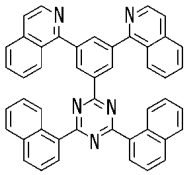

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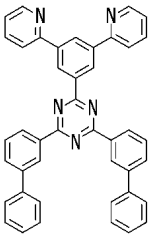

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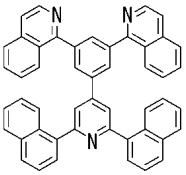

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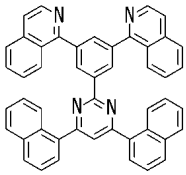

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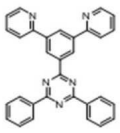

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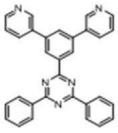

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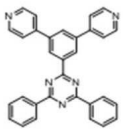

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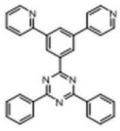

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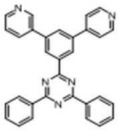

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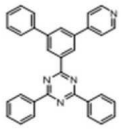

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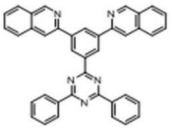

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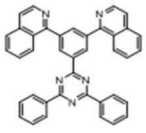

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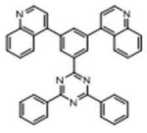

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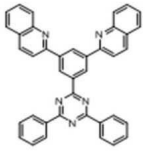

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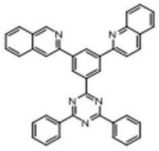

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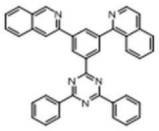

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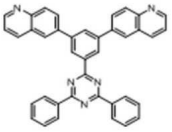

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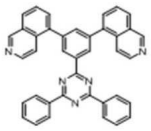

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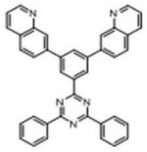

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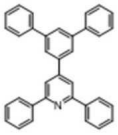

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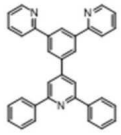

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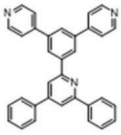

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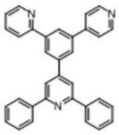

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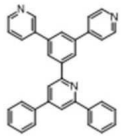

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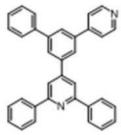

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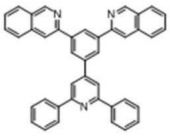

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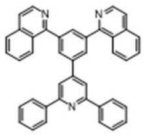

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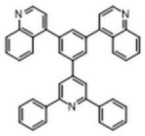

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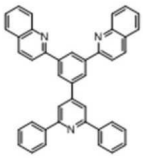

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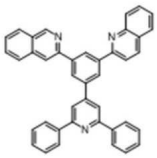

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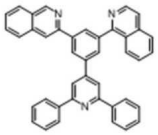

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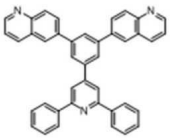

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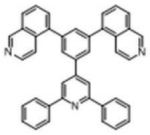

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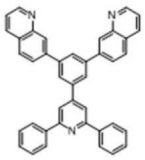

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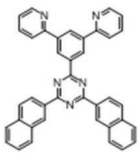

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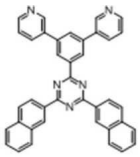

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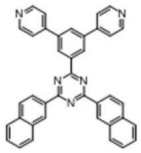

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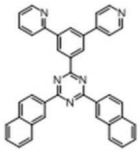

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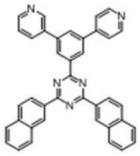

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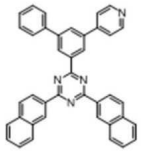

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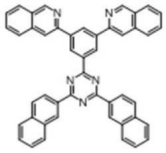

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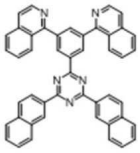

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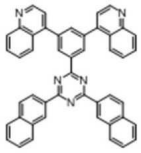

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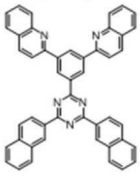

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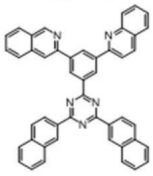

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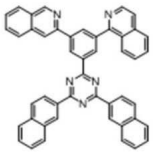

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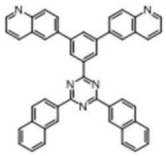

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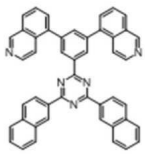

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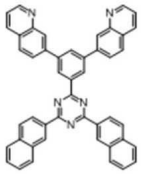

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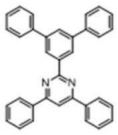

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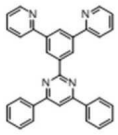

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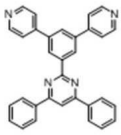

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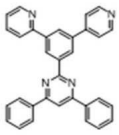

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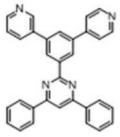

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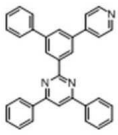

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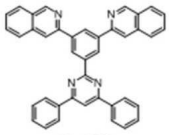

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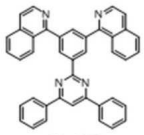

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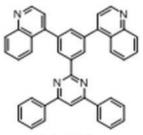

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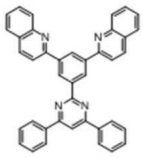

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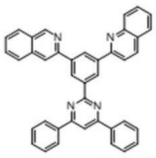

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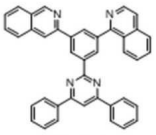

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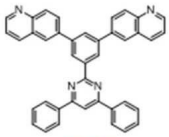

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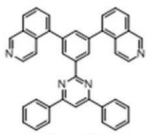

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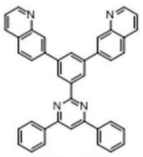

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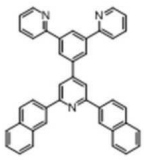

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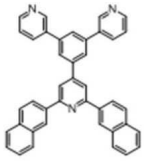

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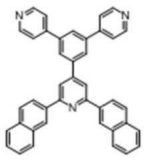

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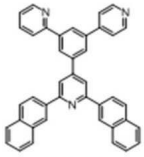

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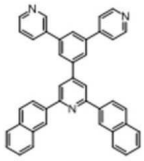

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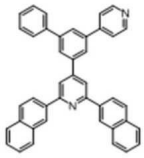

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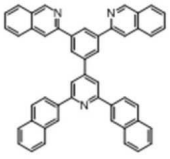

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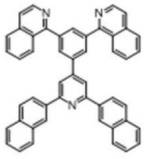

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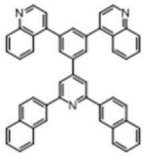

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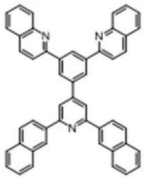

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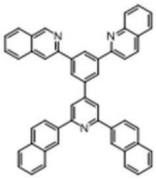

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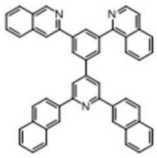

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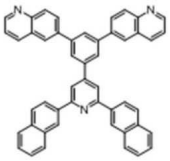

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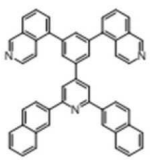

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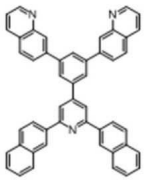

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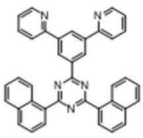

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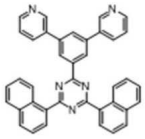

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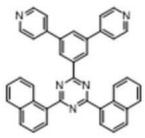

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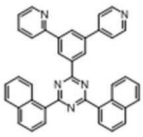

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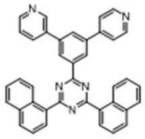

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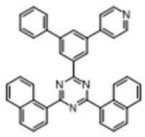

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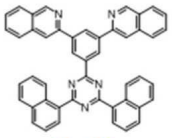

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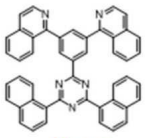

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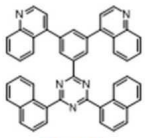

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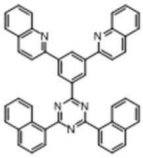

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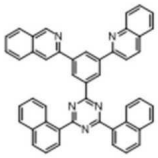

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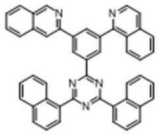

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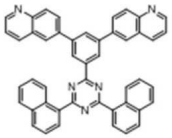

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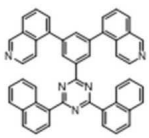

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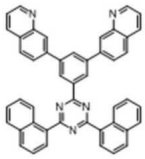

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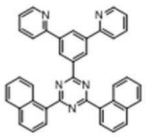

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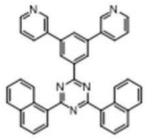

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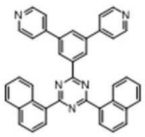

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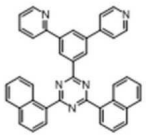

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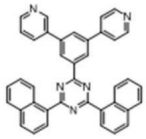

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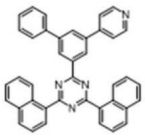

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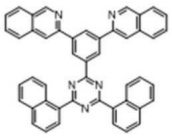

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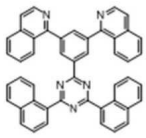

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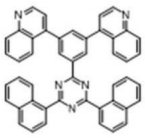

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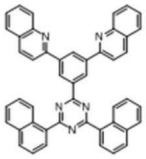

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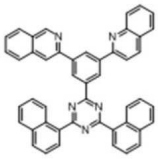

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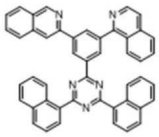

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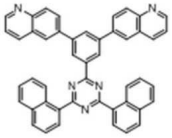

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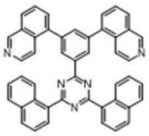

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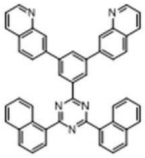

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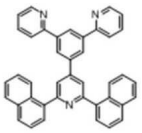

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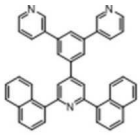

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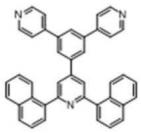

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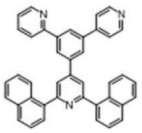

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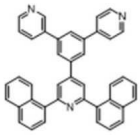

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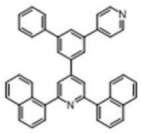

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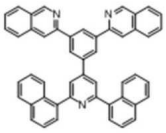

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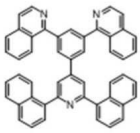

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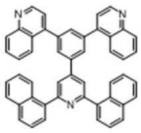

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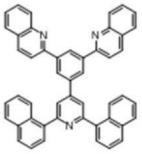

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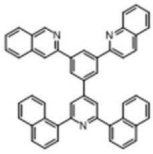

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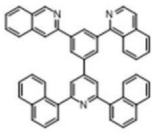

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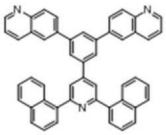

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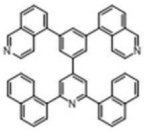

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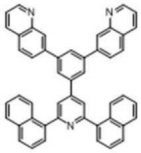

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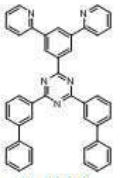
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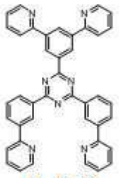
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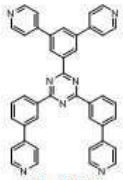
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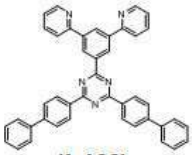
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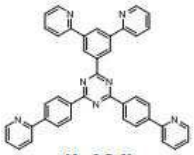
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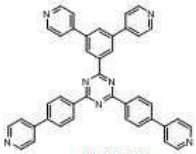
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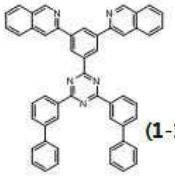
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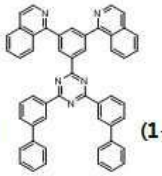
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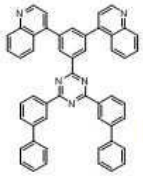
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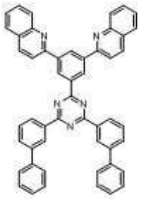
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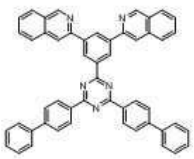
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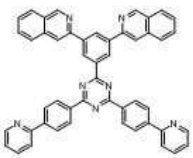
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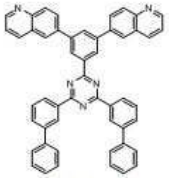
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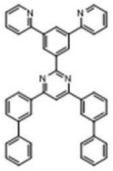

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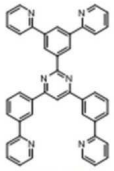

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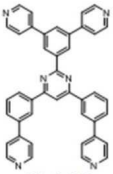

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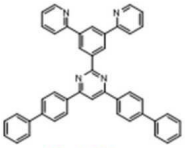

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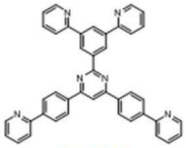

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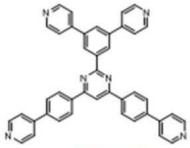

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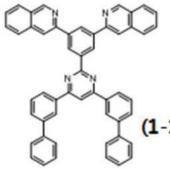

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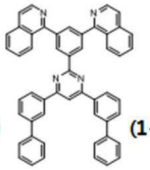

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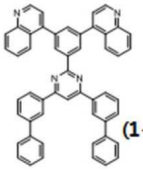

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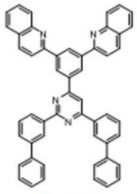

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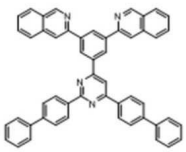

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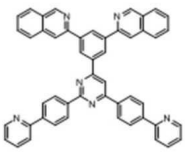

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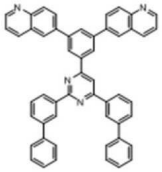

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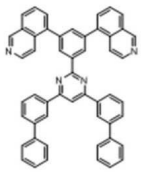

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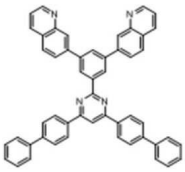

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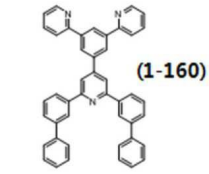

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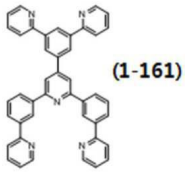

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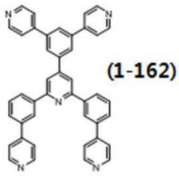

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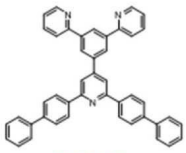

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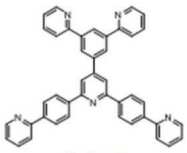

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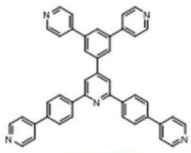

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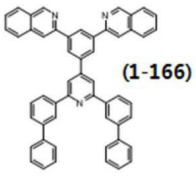

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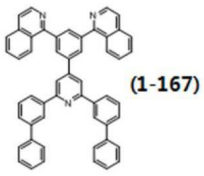

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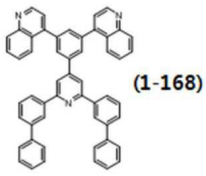

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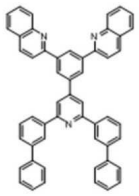

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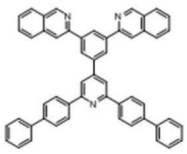

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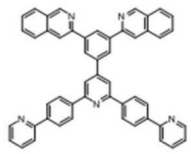

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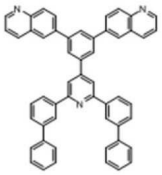

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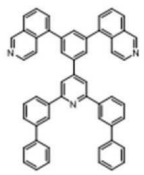

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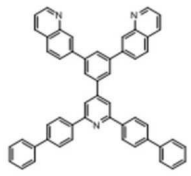

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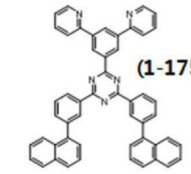
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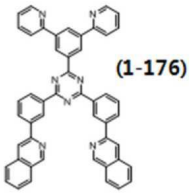
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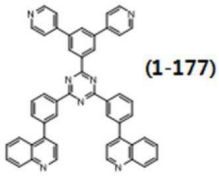
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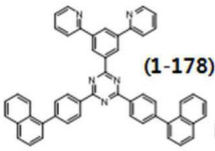
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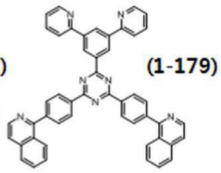
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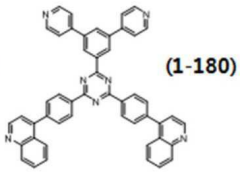
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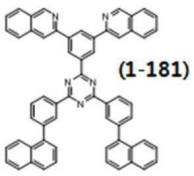
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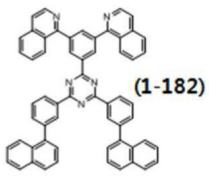
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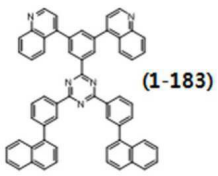
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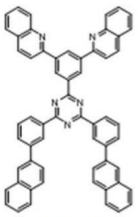
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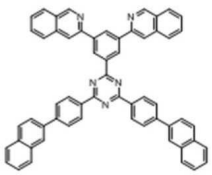
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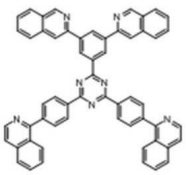
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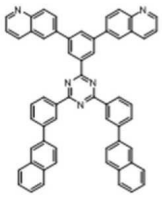
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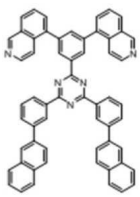
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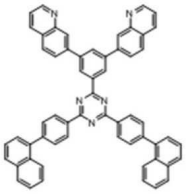
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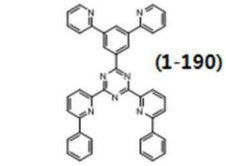

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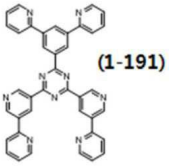

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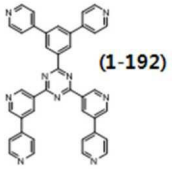

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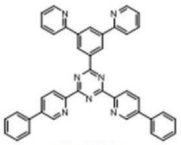

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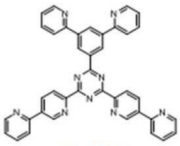

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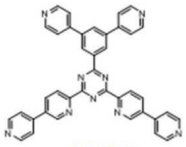

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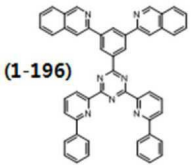

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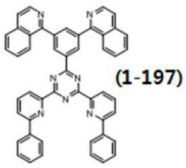

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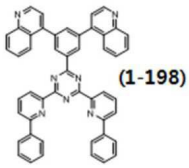

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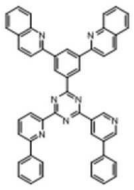

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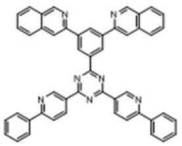

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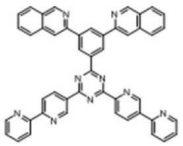

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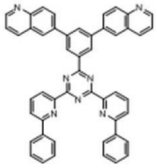

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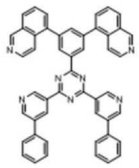

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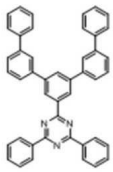

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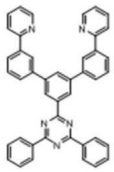

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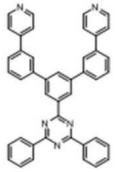

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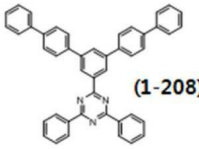

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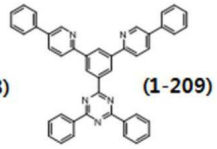

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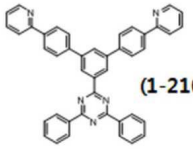

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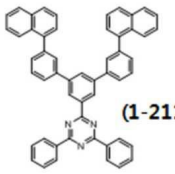

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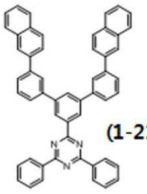

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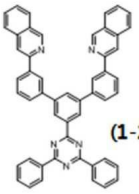

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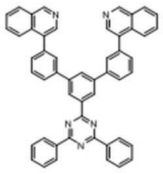

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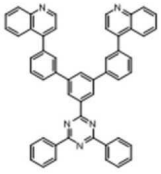

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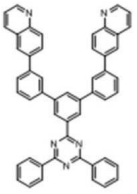

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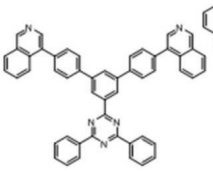

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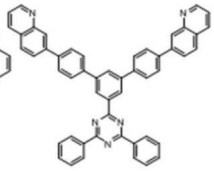

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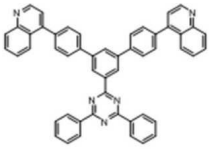

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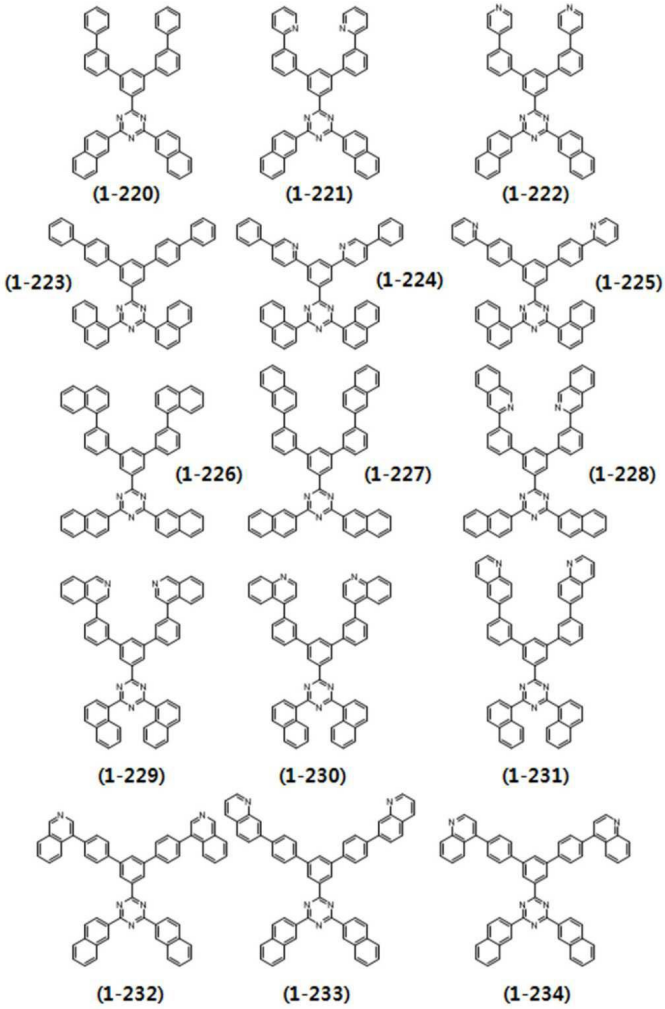
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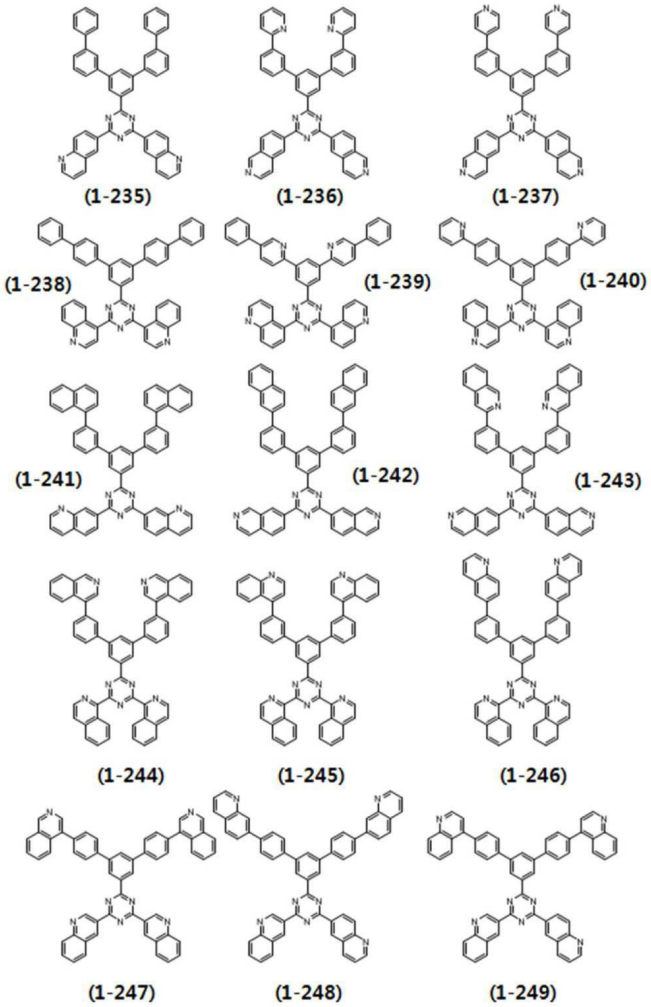
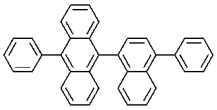


청구항 19

제16항에서,

상기 제2 화합물은 하기 화학식 2-1 내지 화학식 2-80으로 표시되는 화합물로 이루어진 군으로부터 선택되는 하나인 유기 발광 표시 장치:

[화학식 2-1 ~ 화학식 2-80]



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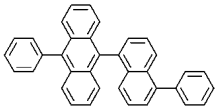

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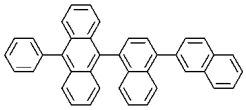

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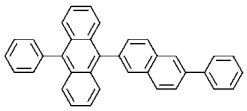

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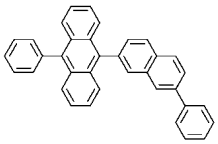

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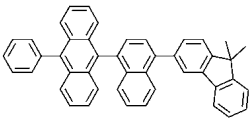

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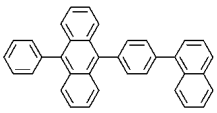

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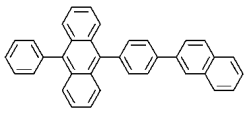

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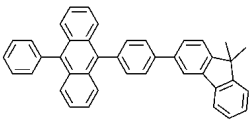

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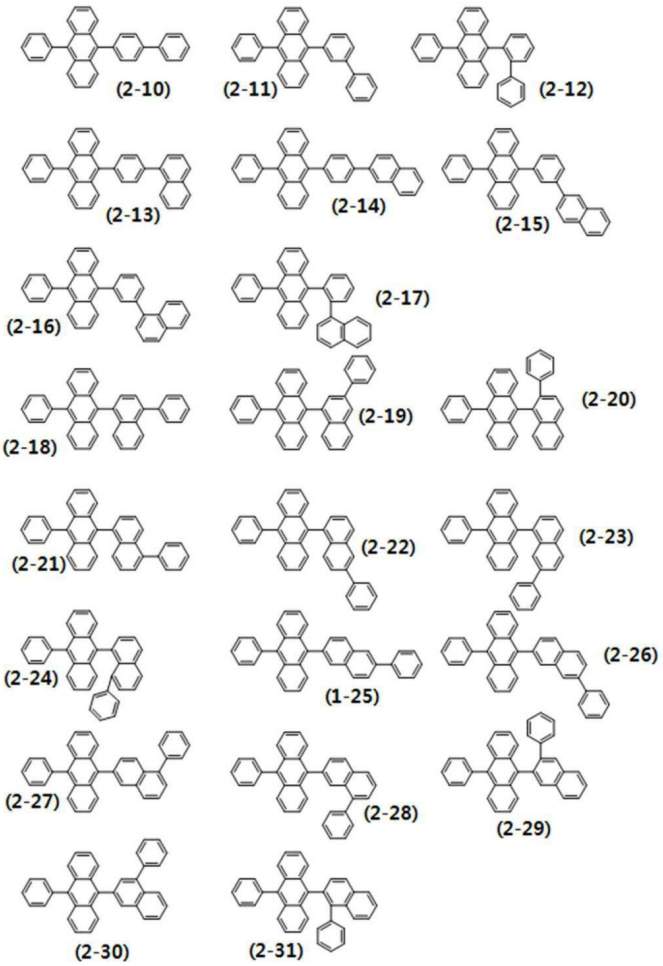
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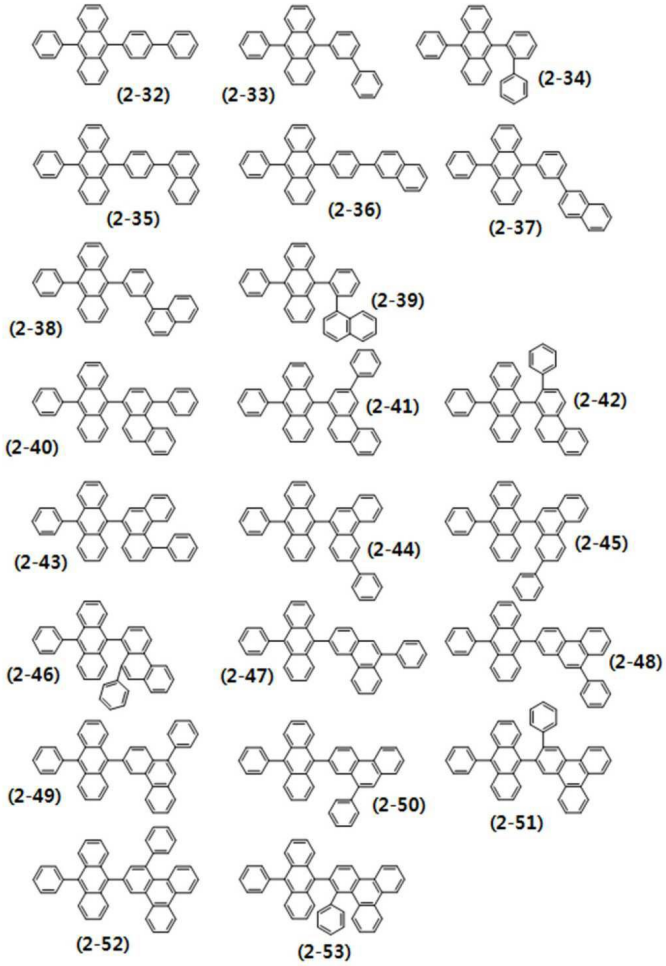
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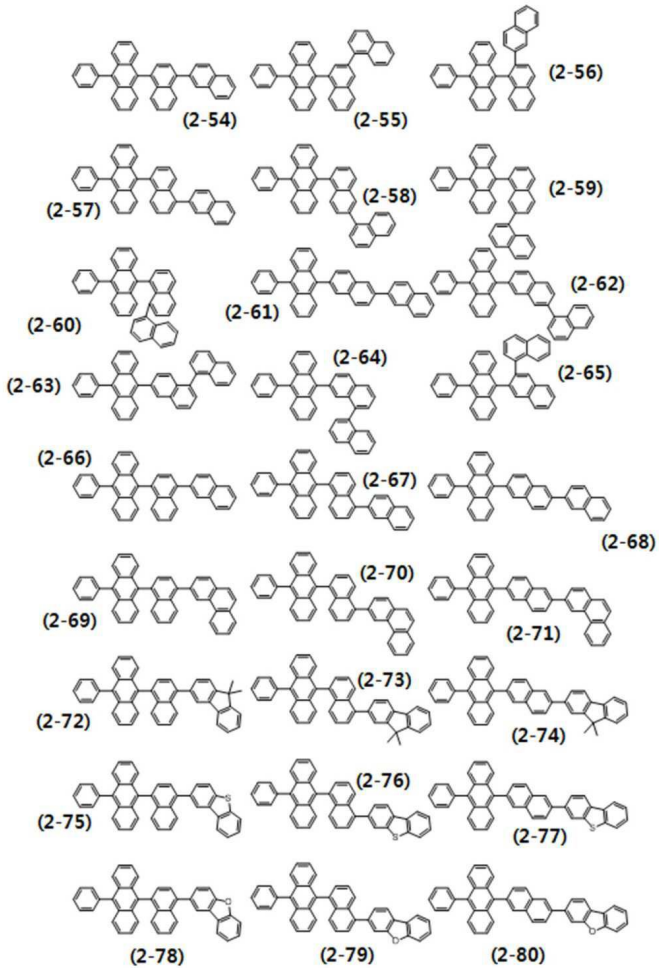


발명의 설명

기 술 분 야

[0001] 본 발명은 유기 발광 소자 및 이를 포함하는 유기 발광 표시 장치에 대한 것이다.

배 경 기 술

[0002] 최근 모니터 또는 텔레비전 등의 경량화 및 박형화가 요구되고 있으며, 이러한 요구에 따라 음극선관(cathode ray tube, CRT)이 액정 표시 장치(liquid crystal display, LCD)로 대체되고 있다. 그러나, 액정 표시 장치는 수발광 장치로서 별도의 백라이트(backlight)가 필요할 뿐만 아니라, 응답 속도 및 시야각 등에서 한계가 있다.

[0003] 최근 이러한 한계를 극복할 수 있는 표시 장치로서, 자발광형 표시소자로 시야각이 넓고 콘트라스트가 우수할 뿐만 아니라 응답시간이 빠르다는 장점을 가진 유기 발광 장치(organic light emitting diode device)가 커다란 주목을 받고 있다.

[0004] 유기 발광 장치는 하나의 전극으로부터 주입된 전자(electron)와 다른 전극으로부터 주입된 정공(hole)이 발광층에서 결합하여 여기자(exciton)를 형성하고, 여기자가 에너지를 방출하면서 발광한다.

[0005] 그러나 종래 유기 발광 장치는 구동 전압이 높고 발광 휘도나 발광 효율이 낮으며 발광 수명이 짧은 문제점이 있었다.

발명의 내용

해결하려는 과제

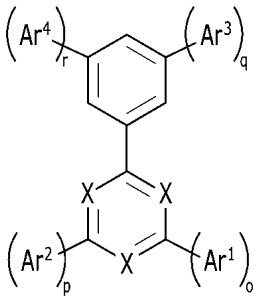
[0006] 본 발명이 이루고자 하는 기술적 과제는 효율이 높고 수명이 긴 유기 발광 소자 및 이를 포함하는 유기 발광 표

시 장치를를 제공하는 것이다.

과제의 해결 수단

[0007] 이러한 과제를 해결하기 위하여 본 발명의 일 실시예에 따른 하기 화학식 1로 표시되는 제1 화합물 및 하기 화학식 2로 표시되는 제1 화합물을 포함한다.

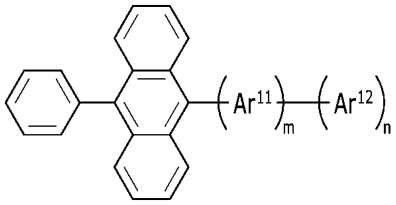
[0008] [화학식 1]



[0009]

[0010] 상기 화학식 1에서, Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고, X는 탄소(C) 또는 질소(N)이며, o, p, q, r은 각각 1 내지 3의 정수이고 o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4는 서로 같거나 다르고,

[0011] [화학식 2]



[0012]

[0013] 상기 화학식 2에서 Ar^{11}은 치환 또는 비치환의 탄소수 7 내지 30의 아릴렌기 또는 치환 또는 비치환의 탄소수 7 내지 30의 헤테로 아릴렌기이고, m은 0 내지 3의 정수이고, m이 0인 경우에는 Ar^{11}은 단결합이며, Ar^{12}은 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고, n은 1 내지 3의 정수이고, m 또는 n이 2 이상인 경우 각각의 Ar^{11} 또는 Ar^{12}는 서로 같거나 다르다.

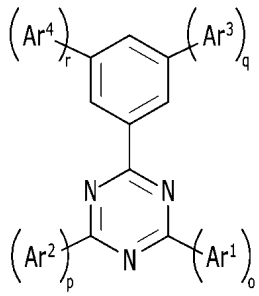
[0014] 상기 유기 발광 소자는 서로 마주하는 애노드와 캐소드, 상기 애노드와 상기 캐소드 사이에 개재되어 있는 발광층, 상기 애노드와 상기 발광층 사이에 개재되어 있는 정공 수송층 및 상기 캐소드와 상기 발광층 사이에 개재되어 있는 전자 수송층을 포함하고, 상기 전자 수송층은 상기 제1 화합물을 포함하며, 상기 발광층은 상기 제2 화합물을 포함할 수 있다.

[0015] 상기 전자 수송층은 lithium quinolate(Liq)를 더 포함할 수 있다.

[0016] 상기 제1 화합물의 Ar^1 내지 Ar^4는 페닐기, 나프틸기, 피리딘기, 퀴놀린기 또는 이소퀴놀린기일 수 있다.

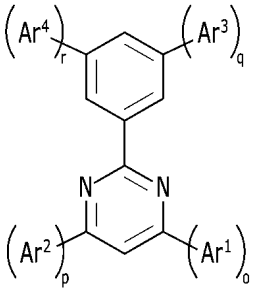
[0017] 상기 제1 화합물은 하기 화학식 3-1 내지 3-3으로 표시되는 화합물 중 하나일 수 있다.

[0018] [화학식 3-1]



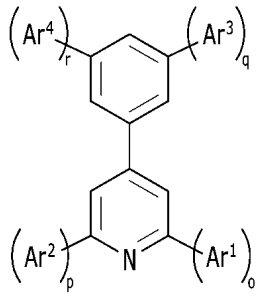
[0019]

[0020] [화학식 3-2]



[0021]

[0022] [화학식 3-3]



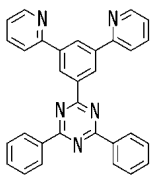
[0023]

[0024] 상기 화학식 3-1 내지 3-3에서,

[0025] Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고, X는 탄소(C) 또는 질소(N)이며, o, p, q, r 은 각각 1 내지 3의 정수이고 o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4 는 서로 같거나 다르다.

[0026] 상기 제1 화합물은 화학식 1-1 내지 화학식 1-249로 이루어진 군으로부터 선택된 하나를 포함할 수 있다.

[0027] [화학식 1-1 ~ 화학식 1-249]



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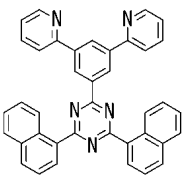

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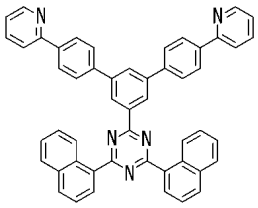

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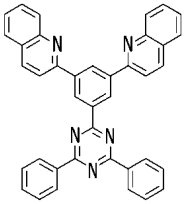

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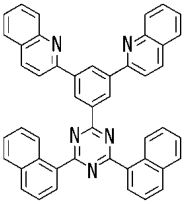

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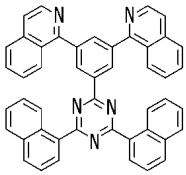

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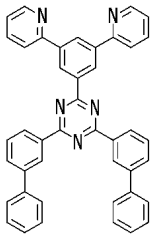

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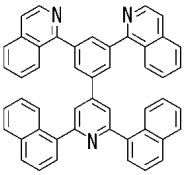

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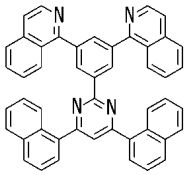
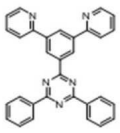


(1-9)

[0028]

[0029]



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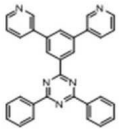

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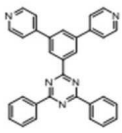

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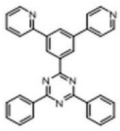

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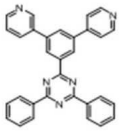

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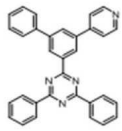

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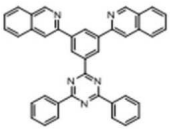

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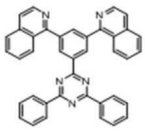

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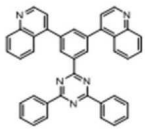

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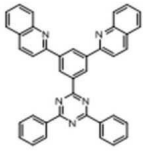

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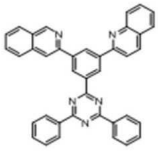

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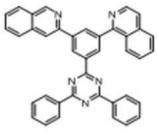

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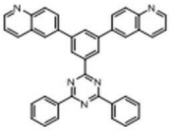

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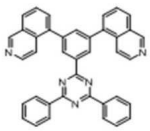

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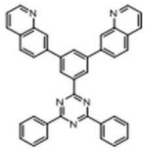

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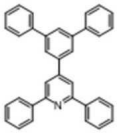
[0030]



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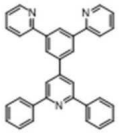

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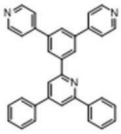

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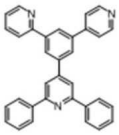

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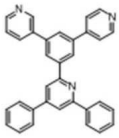

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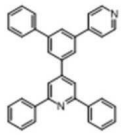

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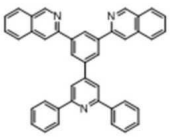

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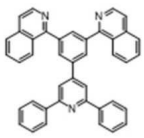

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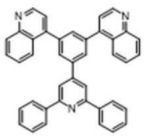

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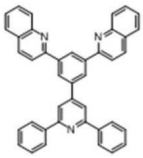

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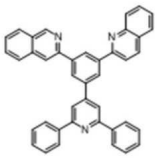

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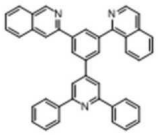

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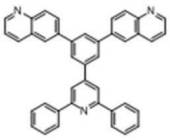

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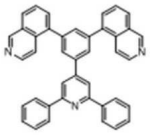

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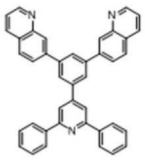

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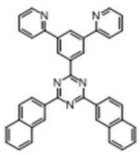

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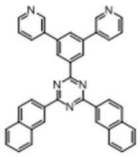

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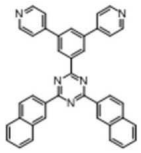

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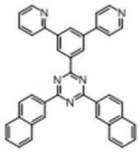

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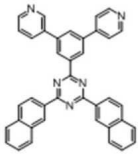

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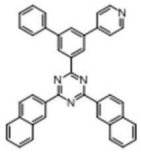

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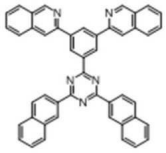

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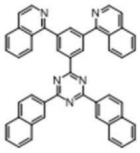

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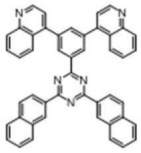

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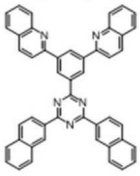

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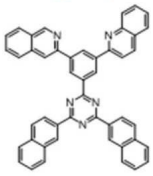

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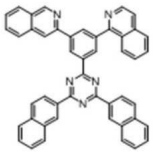

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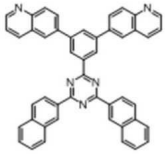

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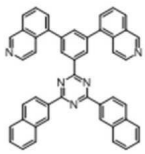

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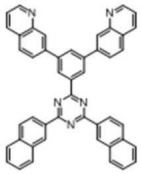

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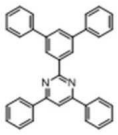

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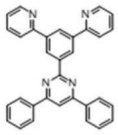

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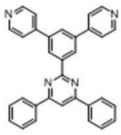

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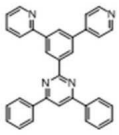

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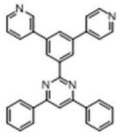

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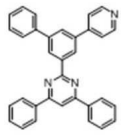

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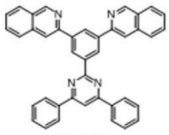

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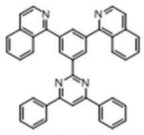

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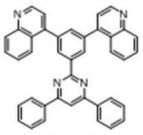

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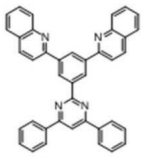

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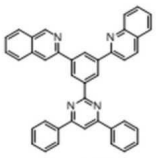

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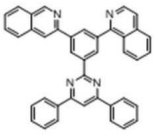

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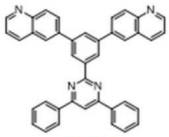

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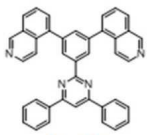

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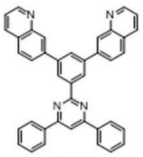

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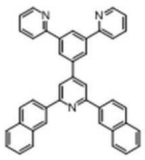

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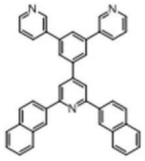

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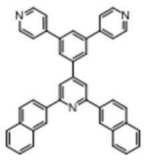

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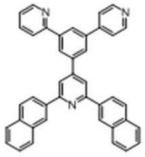

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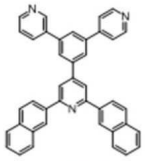

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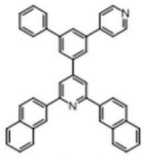

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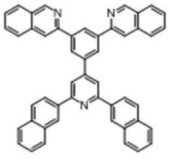

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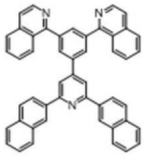

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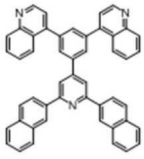

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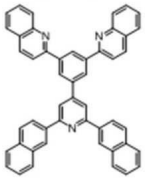

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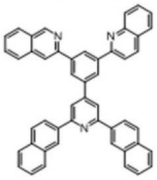

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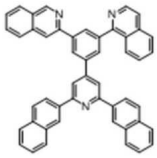

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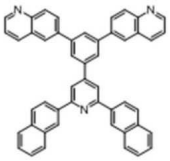

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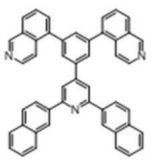

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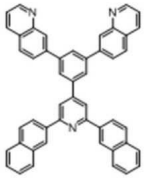

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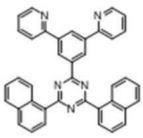

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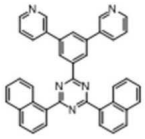

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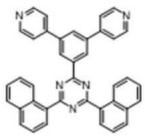

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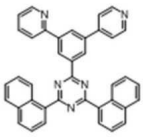

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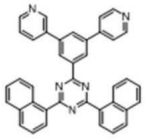

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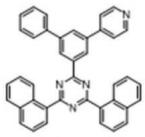

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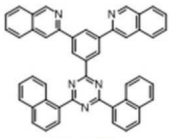

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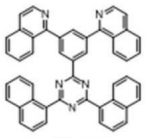

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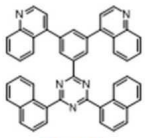

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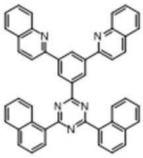

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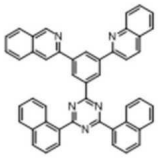

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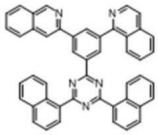

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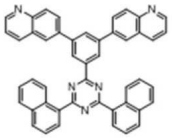

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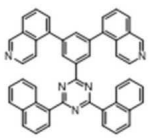

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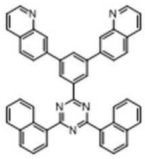

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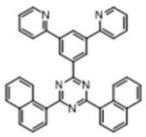

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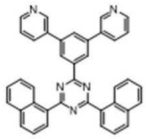

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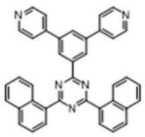

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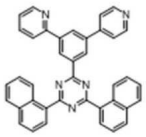

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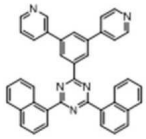

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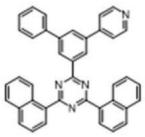

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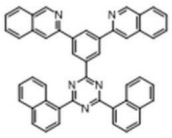

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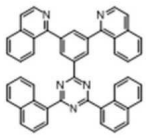

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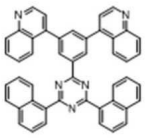

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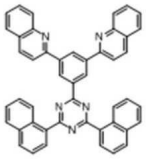

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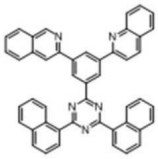

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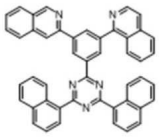

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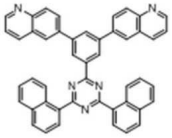

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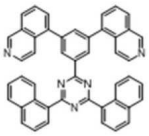

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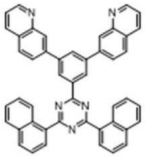

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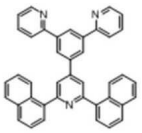

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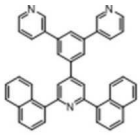

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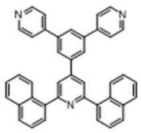

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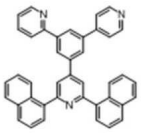

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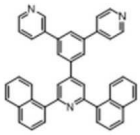

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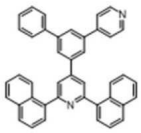

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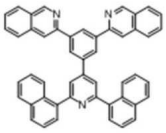

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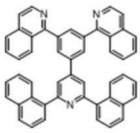

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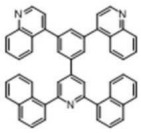

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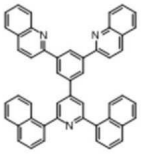

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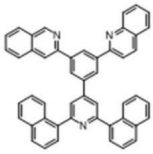

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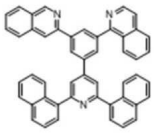

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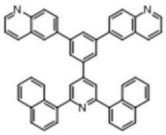

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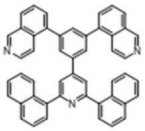

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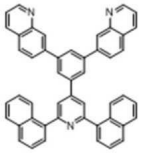

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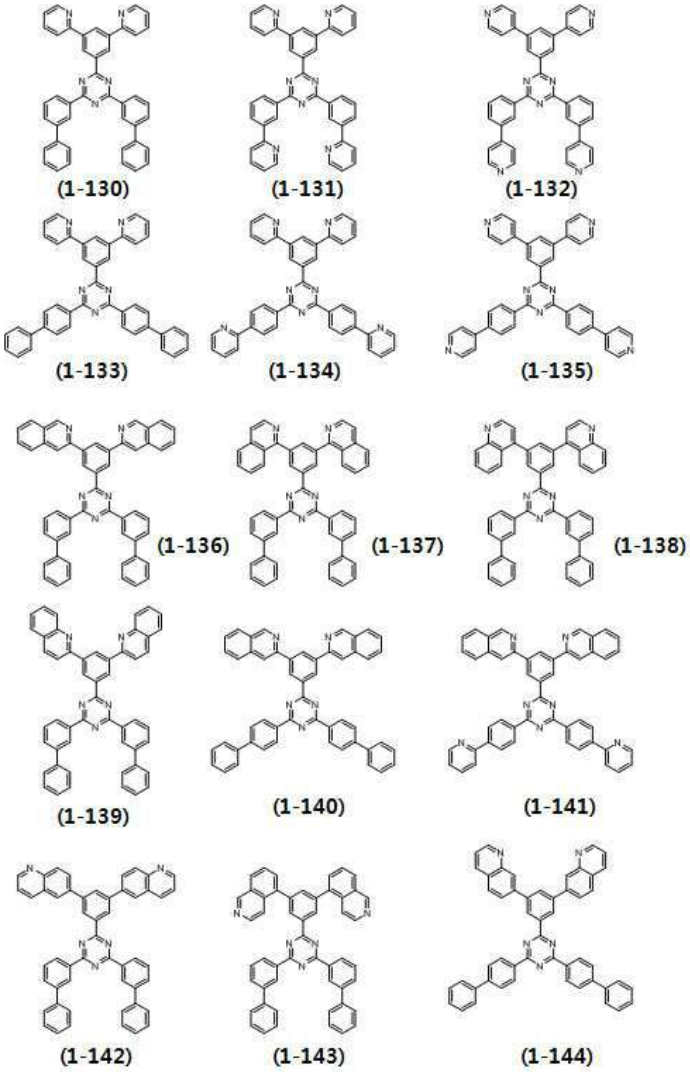
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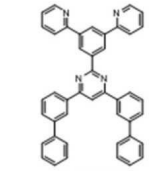
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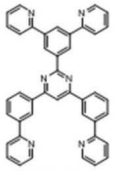
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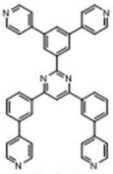
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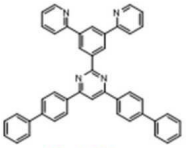
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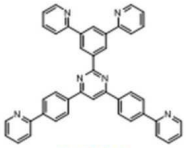
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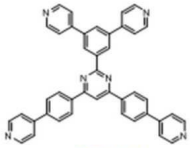
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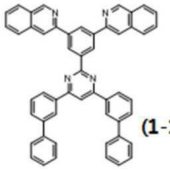
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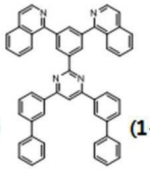
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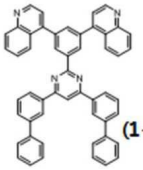
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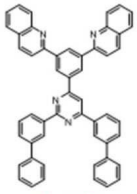
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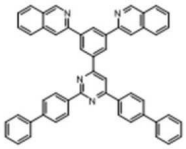
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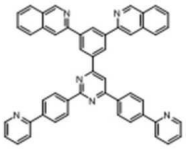
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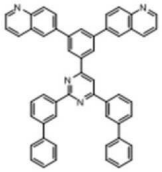
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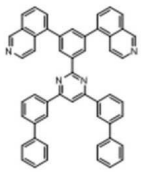
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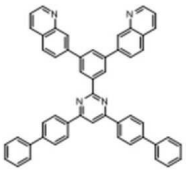
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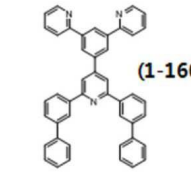
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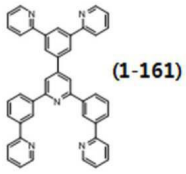
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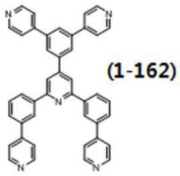
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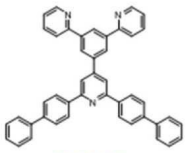
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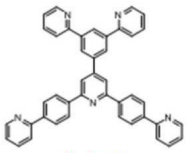
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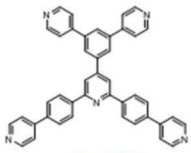
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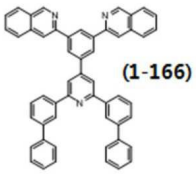
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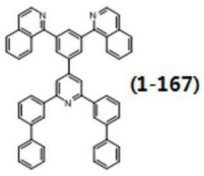
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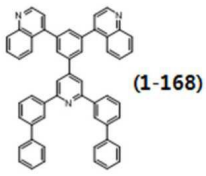
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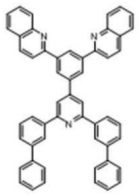
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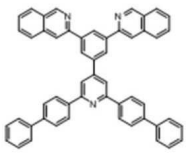
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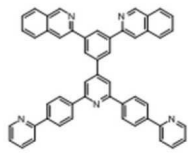
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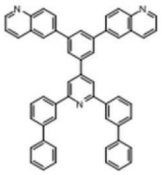
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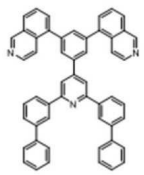
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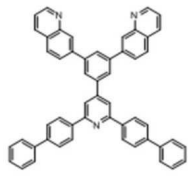
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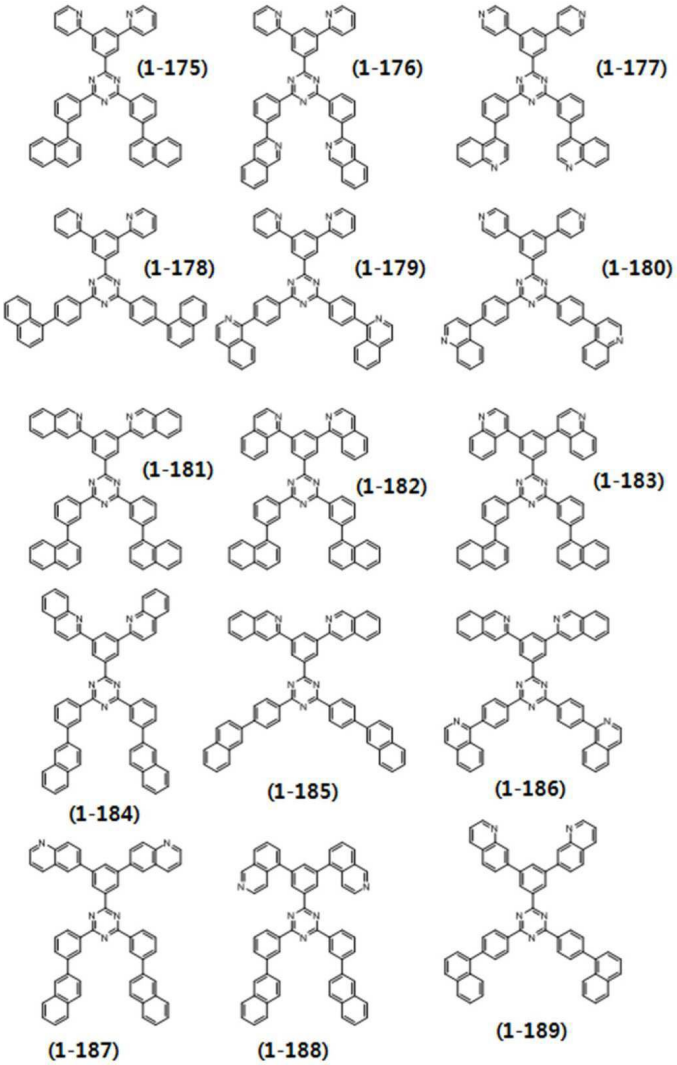
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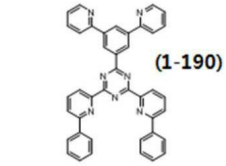

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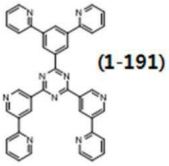

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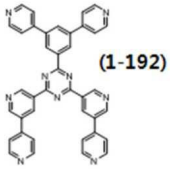

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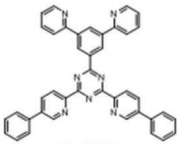

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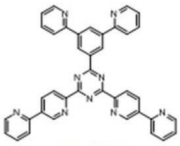

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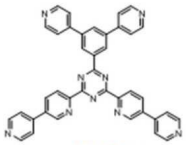

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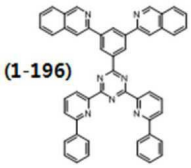

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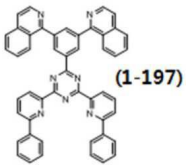

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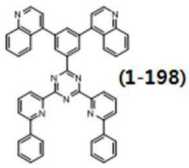

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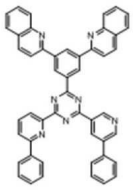

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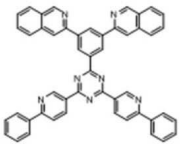

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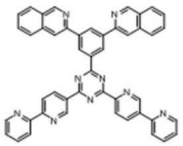

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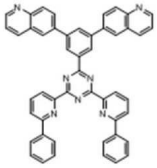

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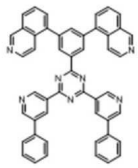

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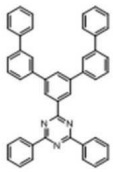

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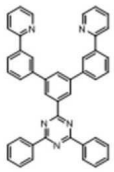

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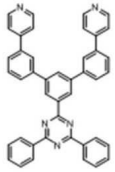

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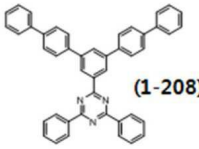

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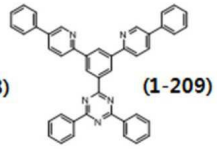

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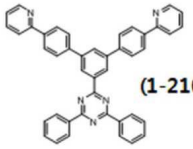

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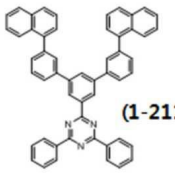

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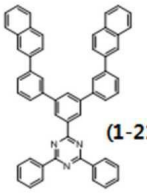

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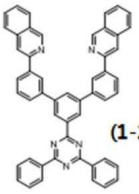

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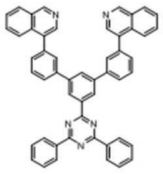

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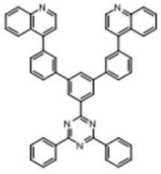

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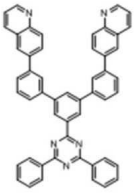

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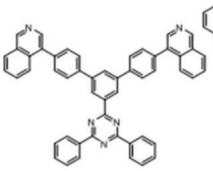

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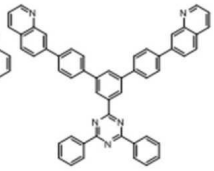

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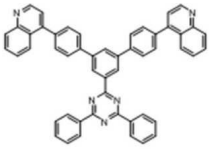

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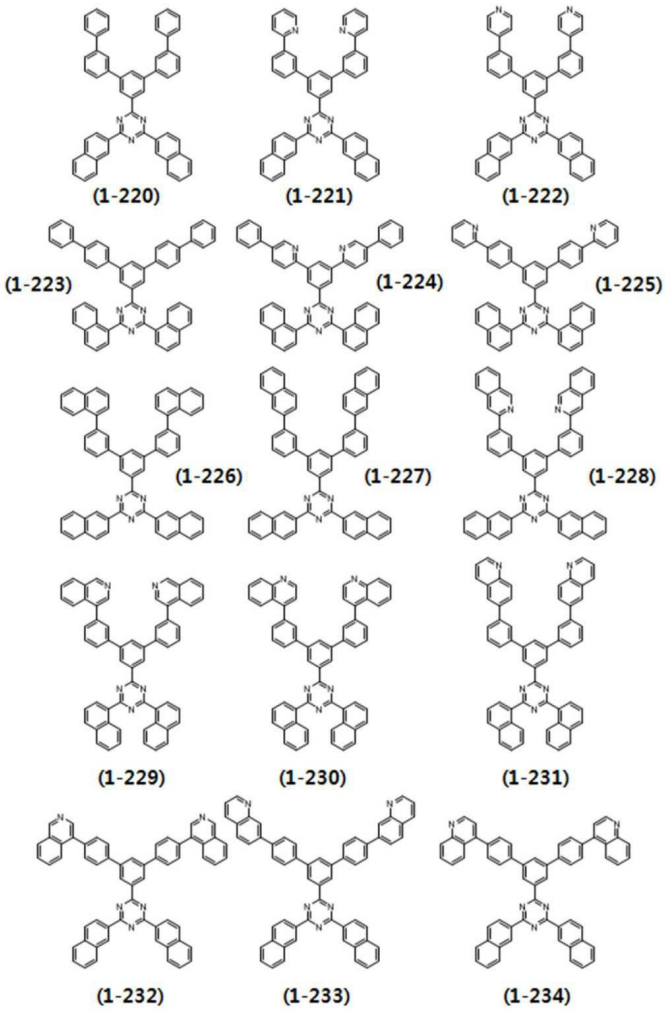
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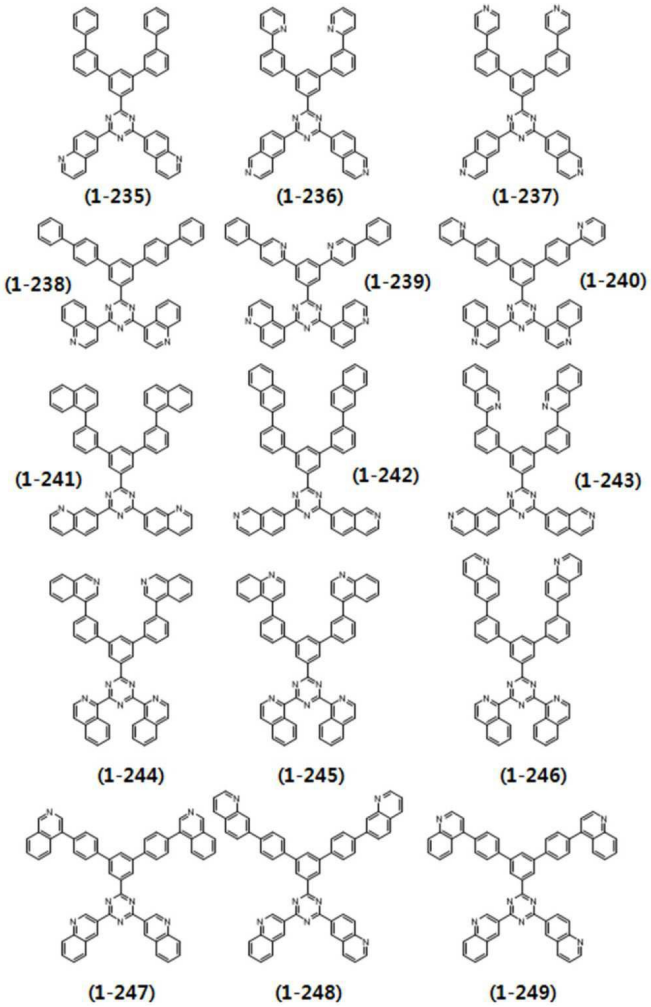
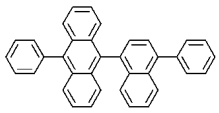


[0032] .

[0033] 상기 제2 화합물의 Ar^{11}이 치환 또는 무치환의 페닐기, 또는 치환 또는 무치환의 나프틸기일 수 있다.

[0034] 상기 제2 화합물은 하기 화학식 2-1 내지 화학식 2-80으로 표시되는 화합물로 이루어진 군으로부터 선택되는 하나일 수 있다.

[0035] [화학식 2-1 ~ 화학식 2-80]



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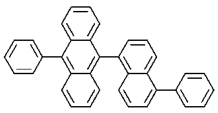

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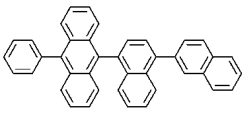

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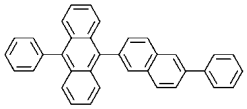

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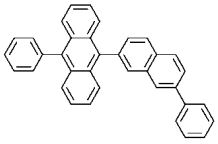

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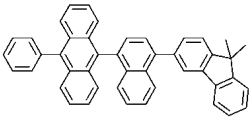

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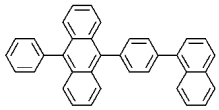

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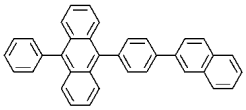

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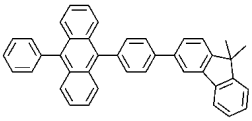

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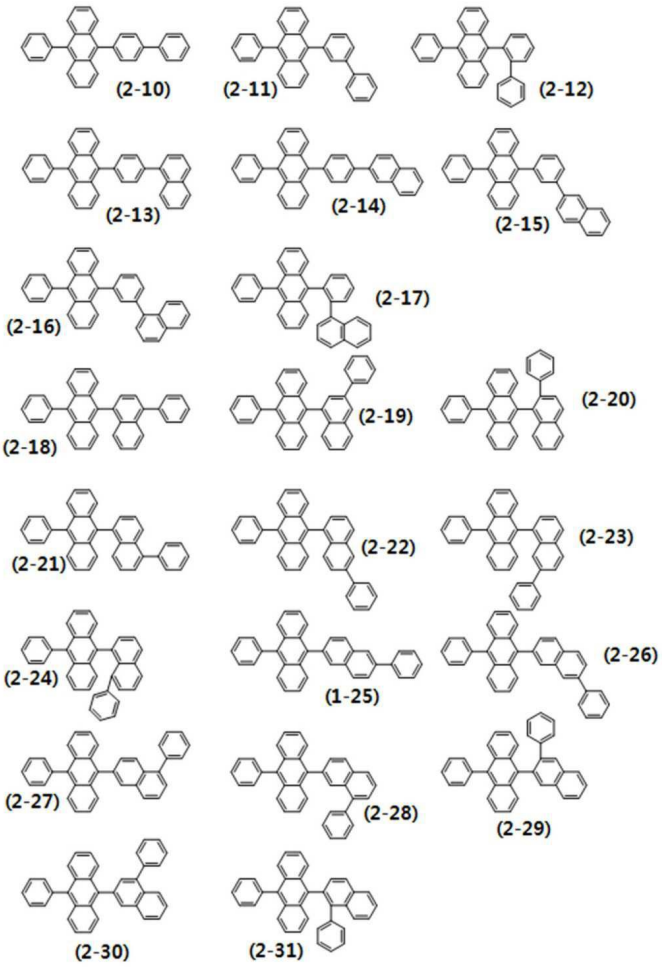
[0036]

[0037]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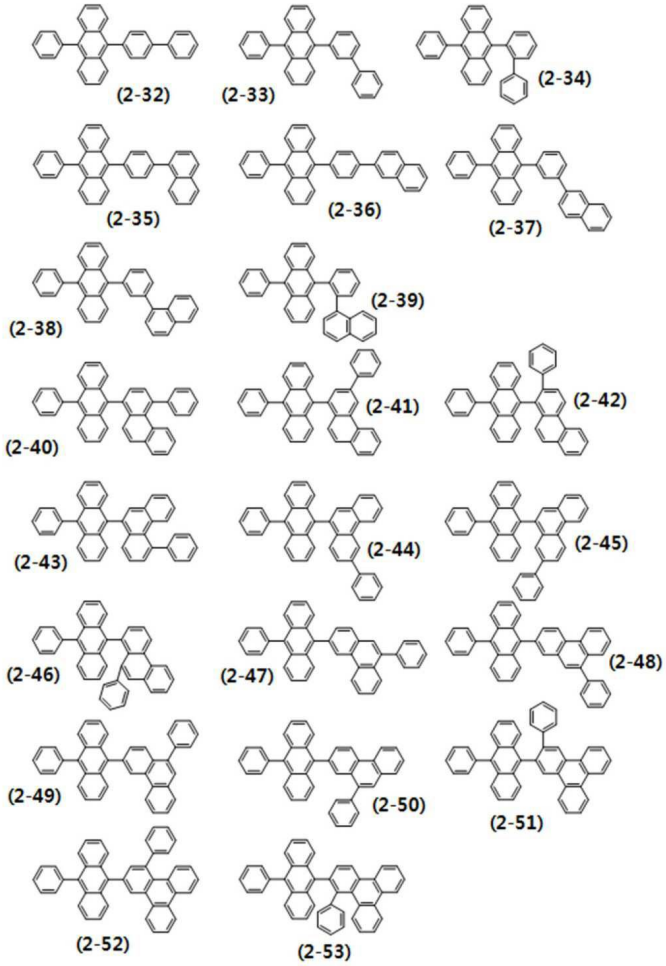
[0038]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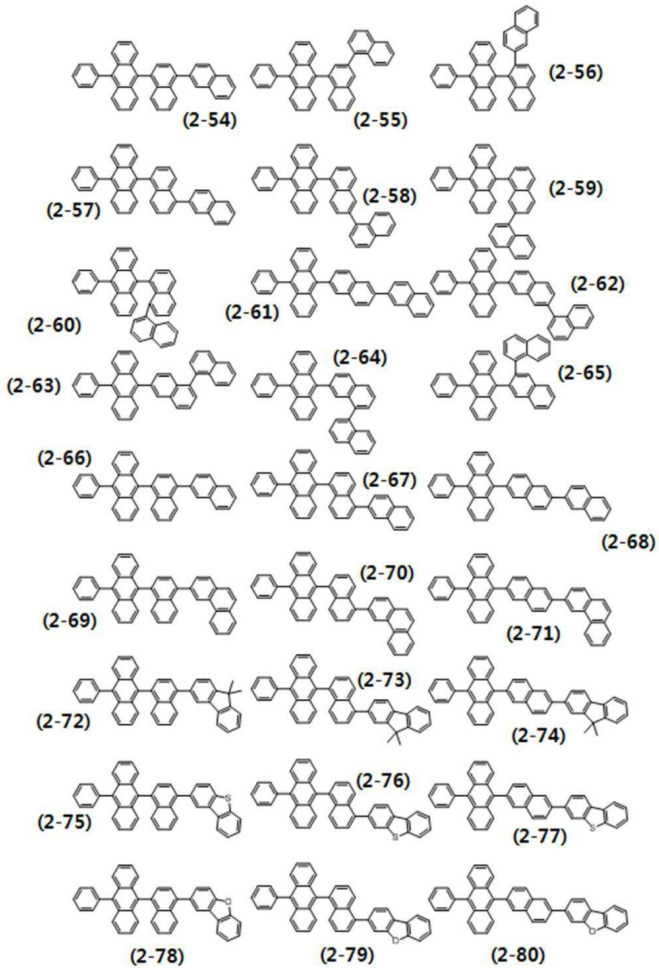
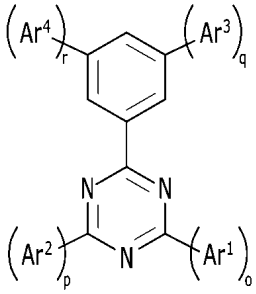


[0039] .

[0040] 상기 유기 발광 소자는 서로 마주하는 애노드와 캐소드, 상기 애노드와 상기 캐소드 사이에 개재되어 있는 발광층, 상기 애노드와 상기 발광층 사이에 개재되어 있는 정공 수송층 및 상기 캐소드와 상기 발광층 사이에 개재되어 있는 전자 수송층 및 정공 저지층을 포함하고, 상기 정공 저지층은 상기 제1 화합물을 포함하고, 상기 발광층은 상기 제2 화합물을 포함할 수 있다.

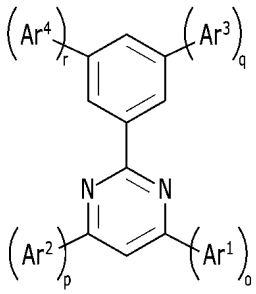
[0041] 상기 제1 화합물은 하기 화학식 3-1 내지 3-3으로 표시되는 화합물 중 하나일 수 있다.

[0042] [화학식 3-1]



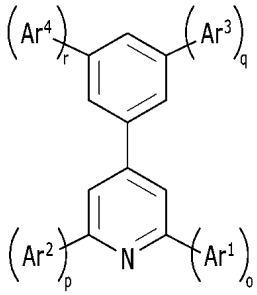
[0043]

[0044] [화학식 3-2]



[0045]

[0046] [화학식 3-3]

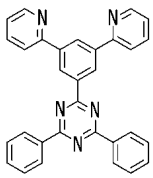


[0047]

[0048] 상기 화학식 3-1 내지 3-3에서, Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고, X는 탄소(C) 또는 질소(N)이며, o, p, q, r 은 각각 1 내지 3의 정수이고 o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4 는 서로 같거나 다르다.

[0049] 상기 제1 화합물은 화학식 1-1 내지 화학식 1-249로 이루어진 군으로부터 선택된 하나일 수 있다.

[0050] [화학식 1-1 ~ 화학식 1-249]



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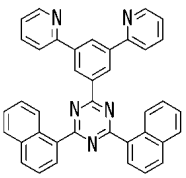

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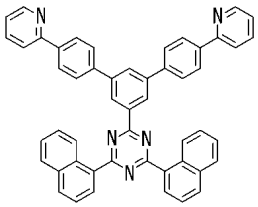

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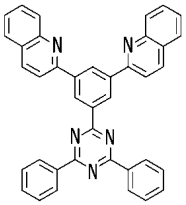

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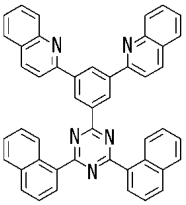

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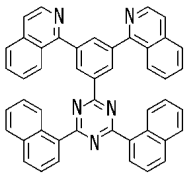

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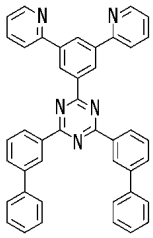

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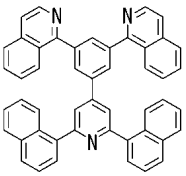

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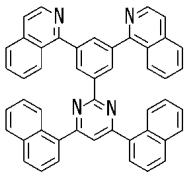

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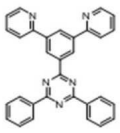

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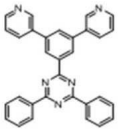

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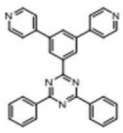

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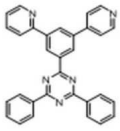

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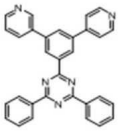

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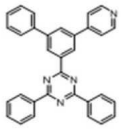

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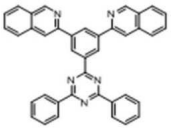

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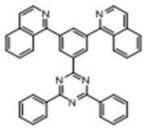

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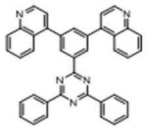

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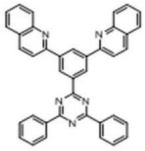

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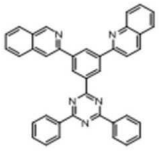

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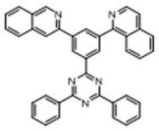

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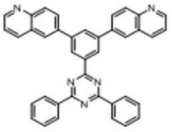

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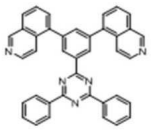

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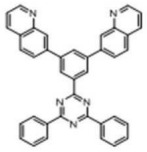

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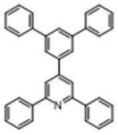
[0052]



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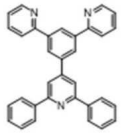

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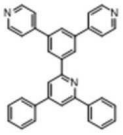

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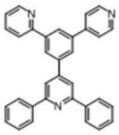

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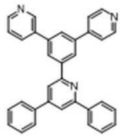

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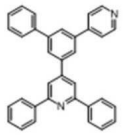

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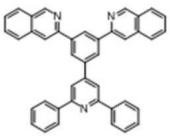

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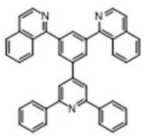

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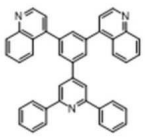

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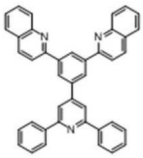

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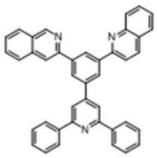

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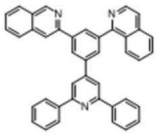

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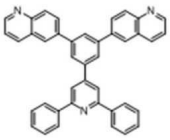

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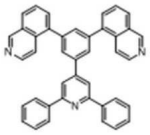

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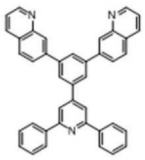

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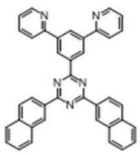

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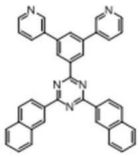

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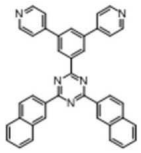

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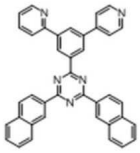

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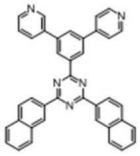

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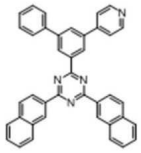

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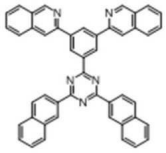

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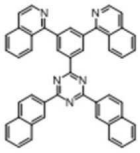

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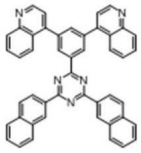

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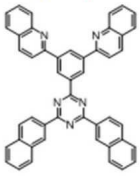

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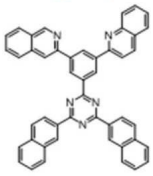

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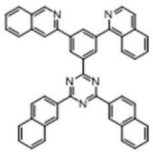

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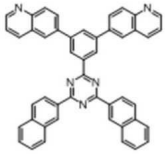

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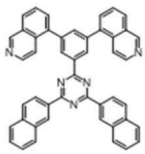

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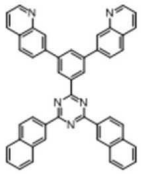

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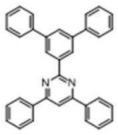

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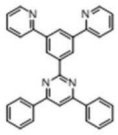

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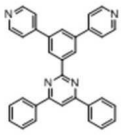

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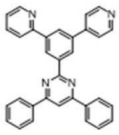

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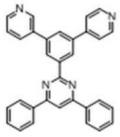

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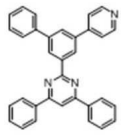

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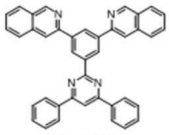

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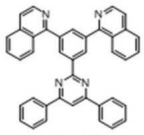

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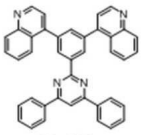

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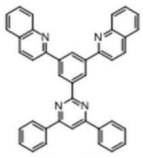

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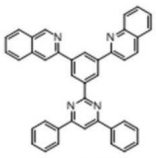

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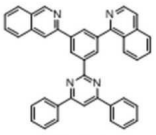

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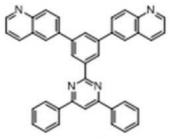

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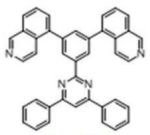

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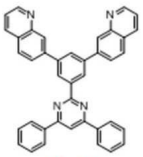

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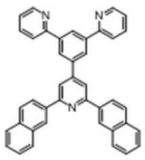

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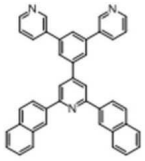

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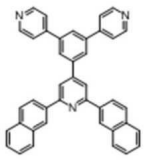

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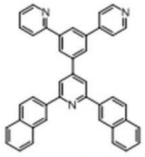

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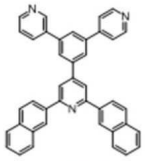

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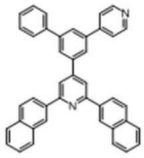

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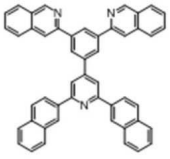

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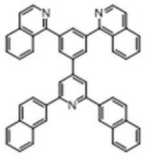

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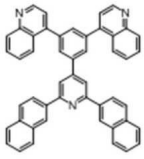

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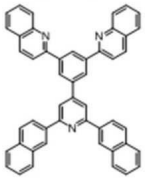

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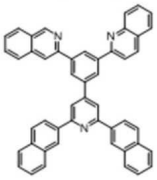

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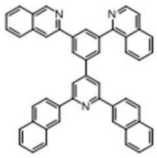

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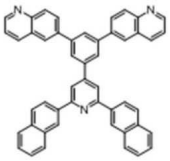

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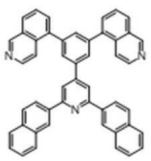

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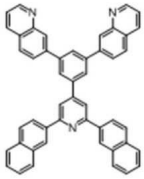

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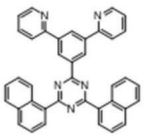

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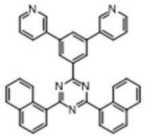

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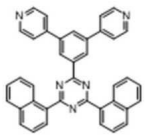

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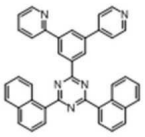

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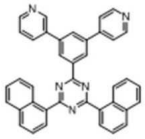

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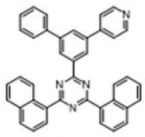

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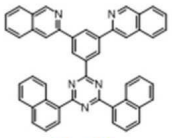

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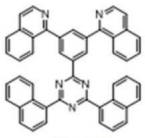

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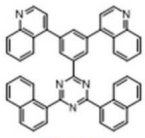

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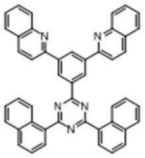

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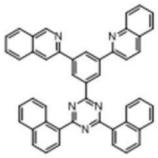

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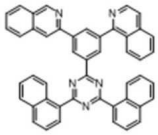

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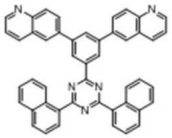

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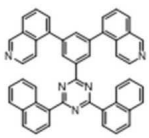

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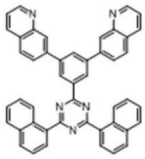

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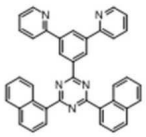

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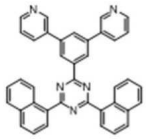

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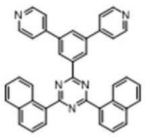

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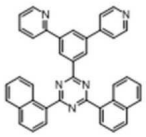

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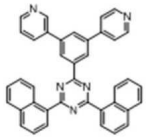

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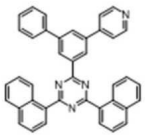

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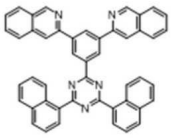

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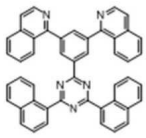

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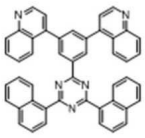

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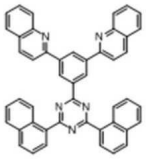

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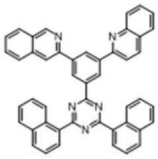

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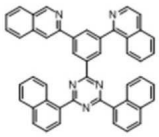

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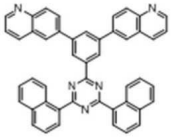

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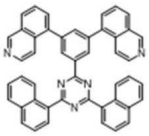

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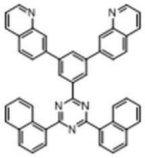

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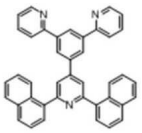

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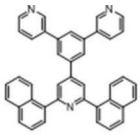

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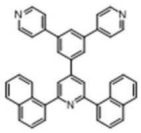

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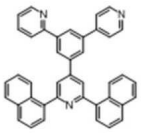

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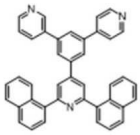

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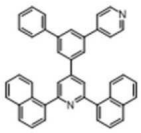

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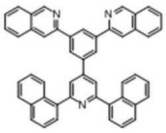

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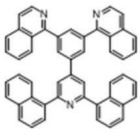

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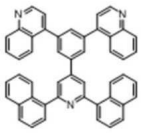

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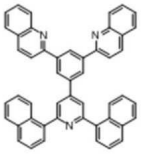

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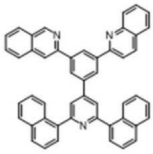

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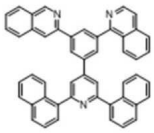

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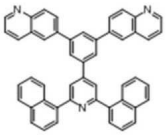

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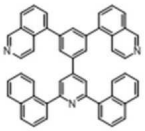

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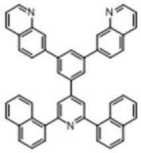

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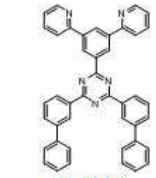
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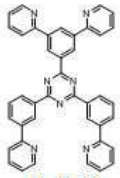
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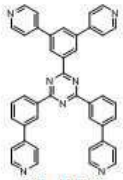
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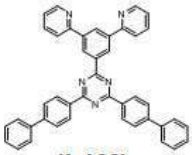
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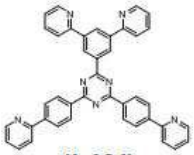
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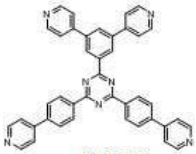
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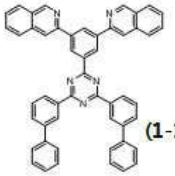
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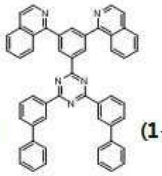
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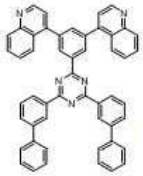
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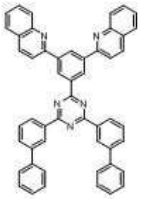
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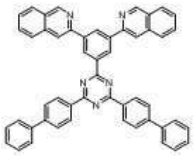
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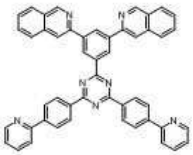
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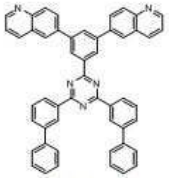
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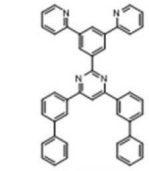
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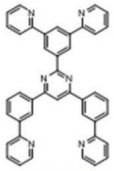
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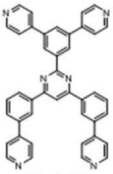
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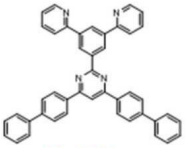
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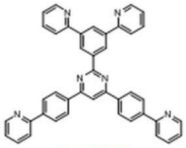
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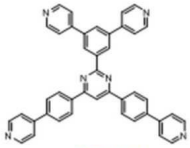
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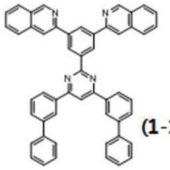
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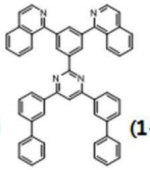
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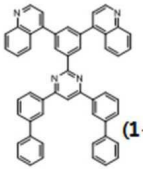
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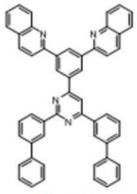
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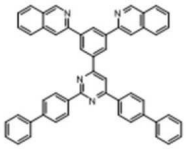
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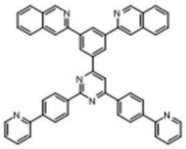
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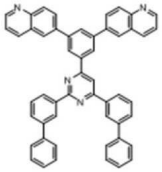
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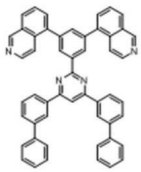
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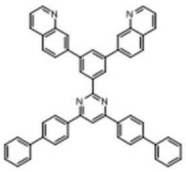
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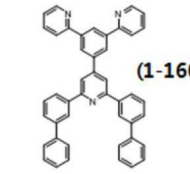
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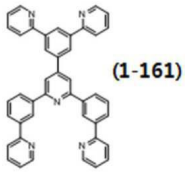
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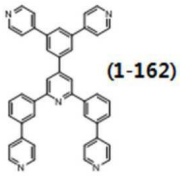
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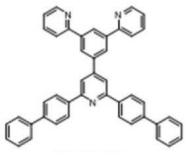
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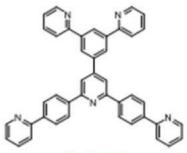
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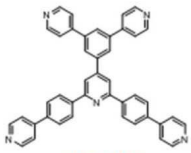
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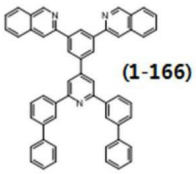
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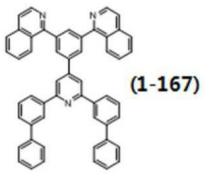
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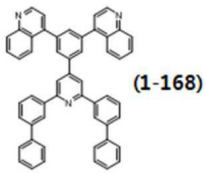
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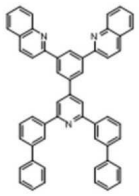
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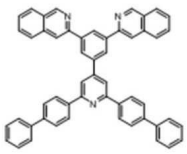
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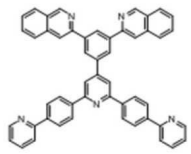
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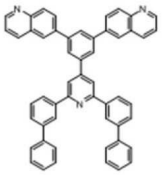
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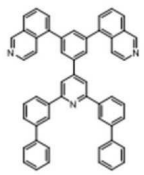
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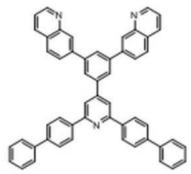
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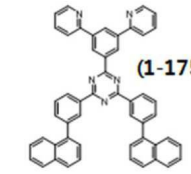
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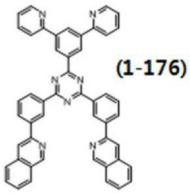
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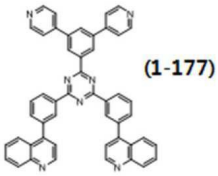
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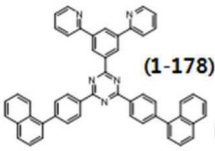
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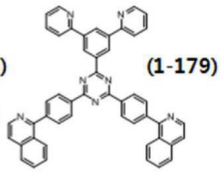
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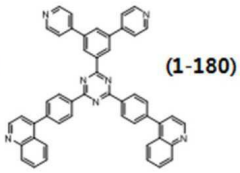
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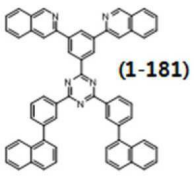
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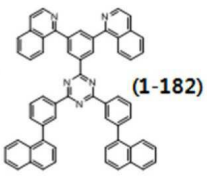
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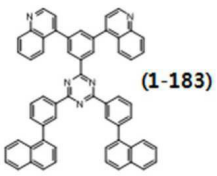
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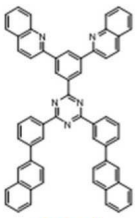
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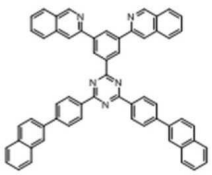
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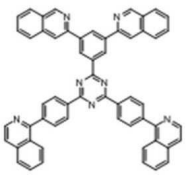
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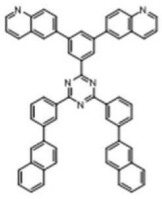
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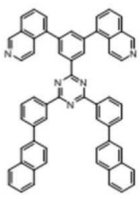
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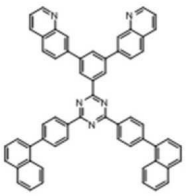
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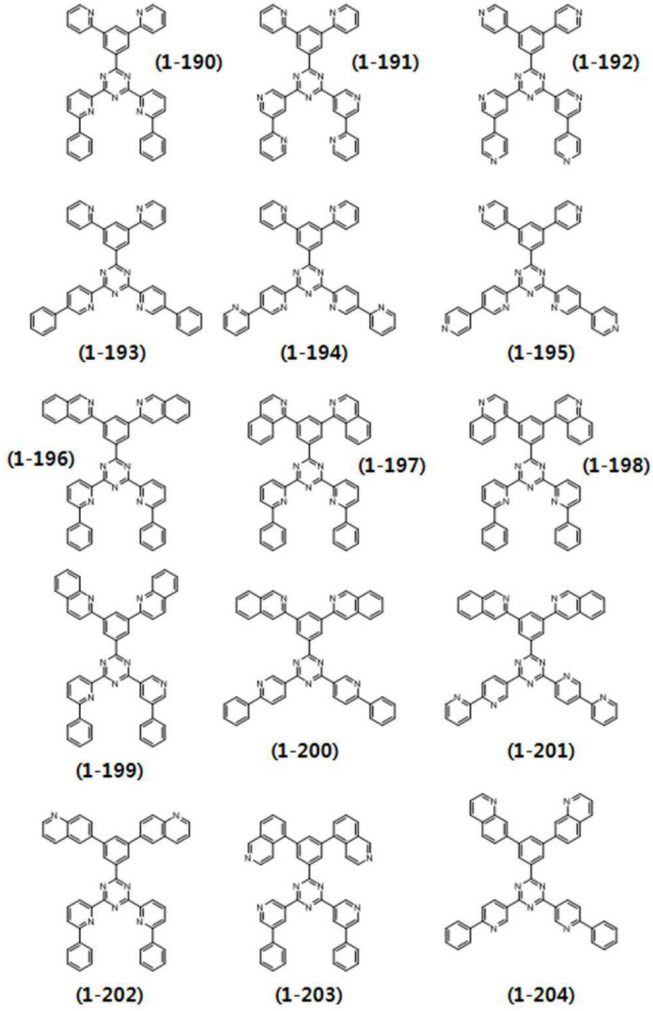
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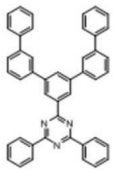

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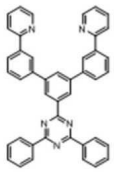

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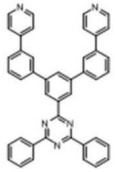

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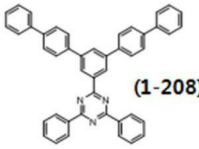

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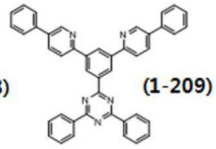

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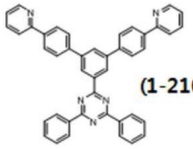

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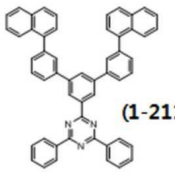

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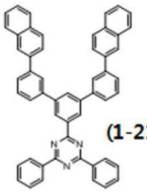

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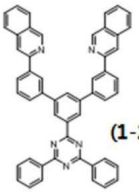

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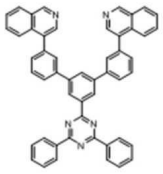

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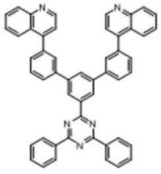

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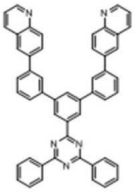

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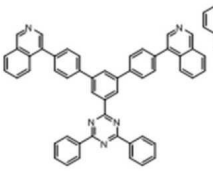

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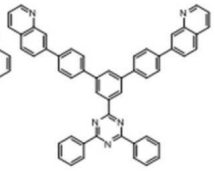

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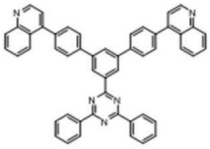

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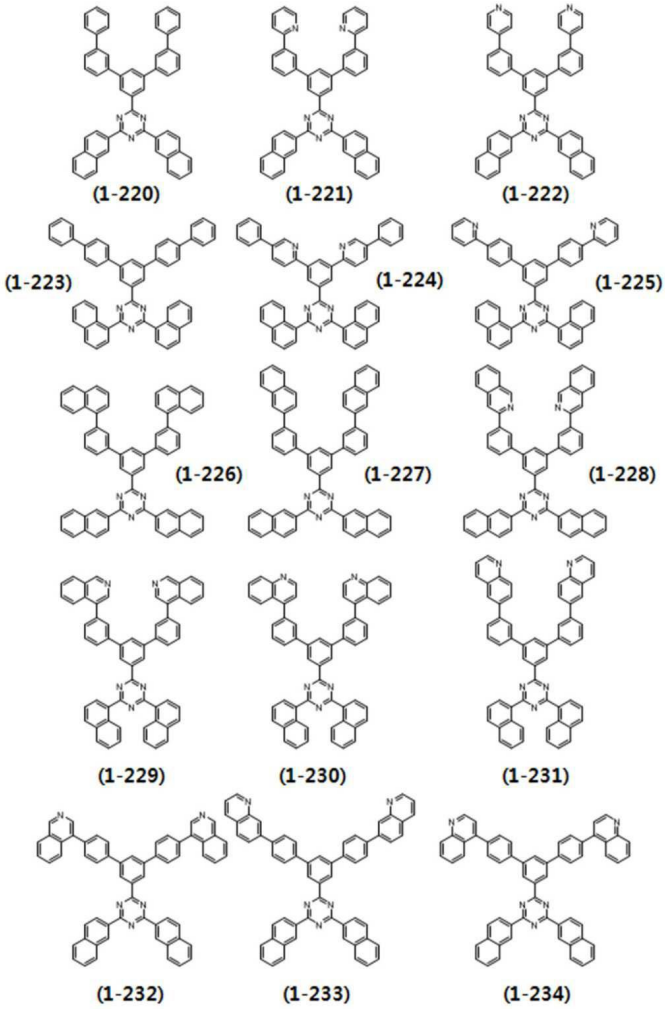
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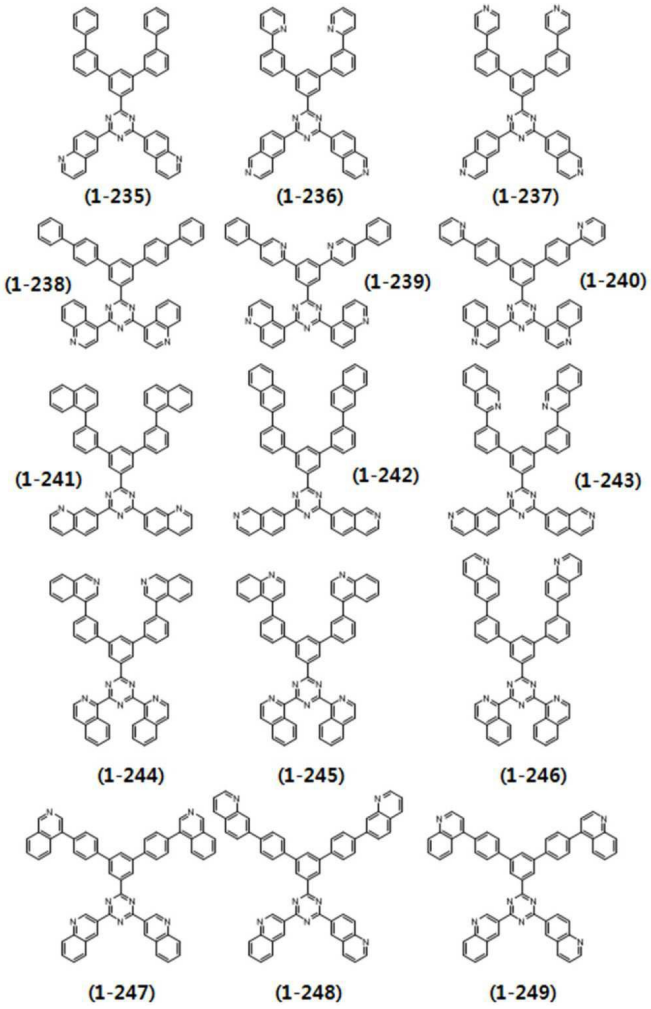
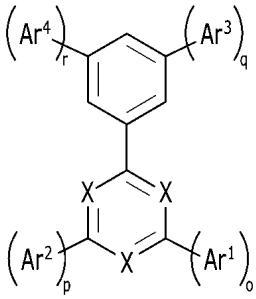


[0054] 본 발명의 일 실시예에 따른 유기 발광 표시 장치는 기판, 상기 기판 위에 위치하는 게이트선, 상기 게이트선과 교차하는 데이터선 및 구동 전압선, 상기 게이트선 및 데이터선과 연결되어 있는 스위칭 박막 트랜지스터, 상기 스위칭 박막 트랜지스터 및 상기 구동 전압선과 연결되어 있는 구동 박막 트랜지스터, 상기 구동 박막 트랜지스터와 연결되어 있는 유기 발광 소자를 포함하며, 상기 유기 발광 소자는 하기 화학식 1로 표시되는 제1 화합물 및 하기 화학식 2로 표시되는 제2 화합물을 포함할 수 있다.

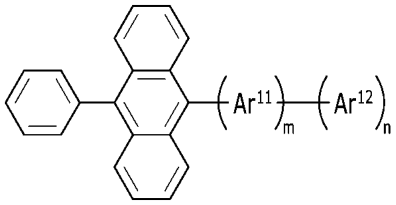
[0055] [화학식 1]



[0056]

[0057] 상기 화학식 1에서, Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고, X는 탄소(C) 또는 질소(N)이며, o, p, q, r은 각각 1 내지 3의 정수이고 o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4는 서로 같거나 다르고,

[0058] [화학식 2]



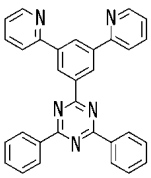
[0059]

[0060] 상기 화학식 2에서 Ar^{11}은 치환 또는 비치환의 탄소수 7 내지 30의 아릴렌기 또는 치환 또는 비치환의 탄소수 7 내지 30의 헤테로 아릴렌기이고, m은 0 내지 3의 정수이고, m이 0인 경우에는 Ar^{11}은 단결합이며, Ar^{12}은 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고, n은 1 내지 3의 정수이고, m 또는 n이 2 이상인 경우 각각의 Ar^{11} 또는 Ar^{12}는 서로 같거나 다르다.

[0061] 상기 유기 발광 소자는 서로 마주하는 애노드와 캐소드, 상기 애노드와 상기 캐소드 사이에 개재되어 있는 발광층, 상기 애노드와 상기 발광층 사이에 개재되어 있는 정공 수송층 및 상기 캐소드와 상기 발광층 사이에 개재되어 있는 전자 수송층을 포함하고, 상기 전자 수송층은 상기 제1 화합물을 포함하고, 상기 발광층은 상기 제2 화합물을 포함할 수 있다.

[0062] 상기 제1 화합물은 하기 화학식 1-1 내지 1-249로 이루어진 군으로부터 선택된 하나일 수 있다.

[0063] [화학식 1-1 ~ 화학식 1-249]



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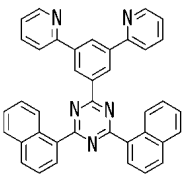

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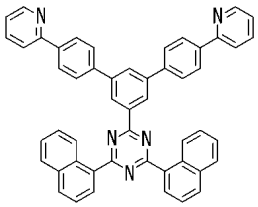

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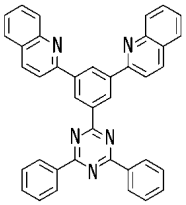

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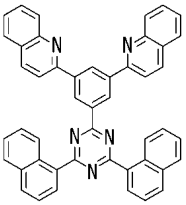

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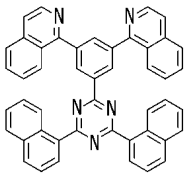

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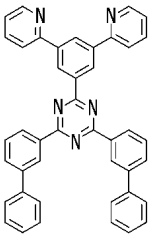

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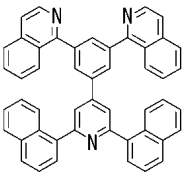

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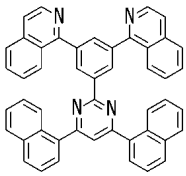

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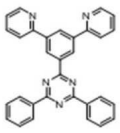
[0064]



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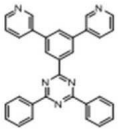

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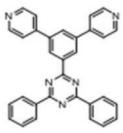

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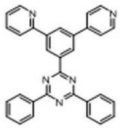

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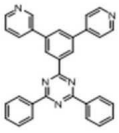

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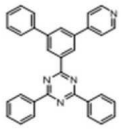

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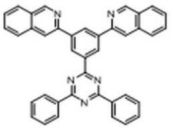

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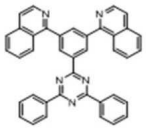

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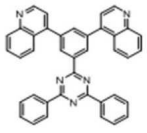

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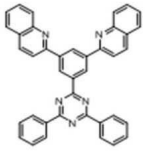

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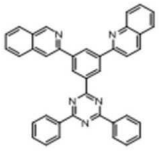

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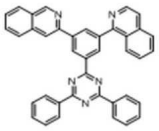

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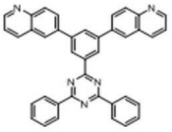

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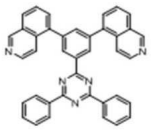

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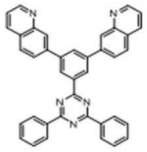

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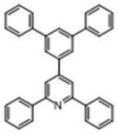

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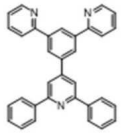

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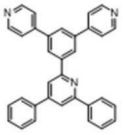

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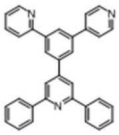

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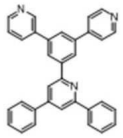

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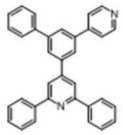

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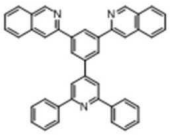

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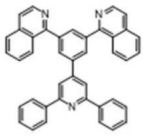

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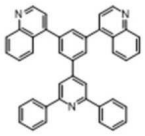

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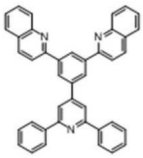

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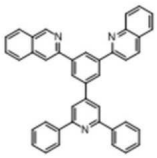

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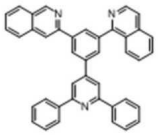

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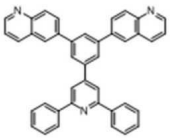

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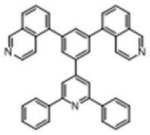

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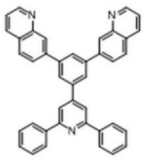

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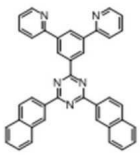

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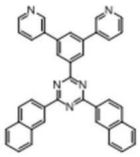

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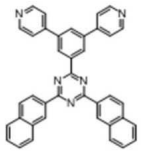

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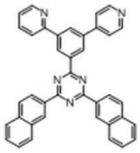

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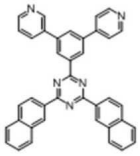

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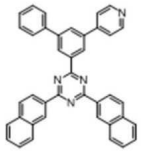

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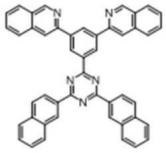

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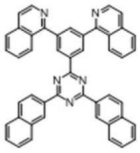

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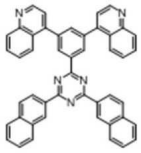

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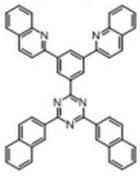

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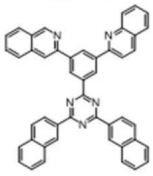

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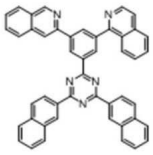

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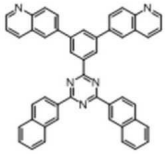

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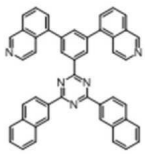

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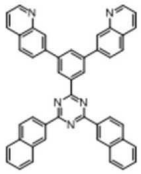

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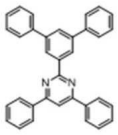

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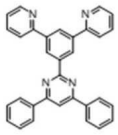

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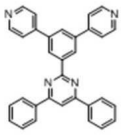

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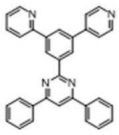

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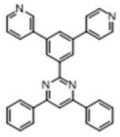

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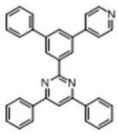

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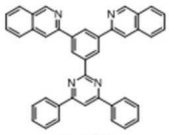

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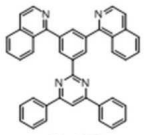

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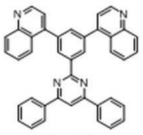

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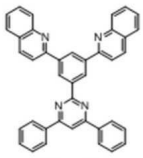

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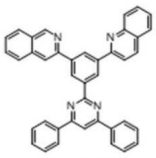

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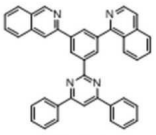

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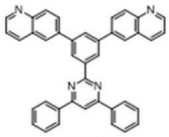

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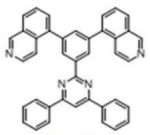

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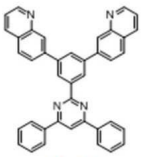

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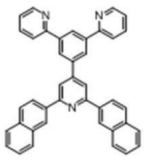

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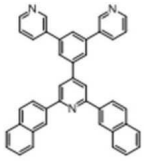

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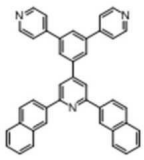

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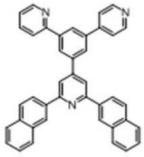

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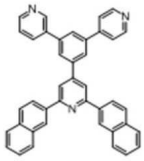

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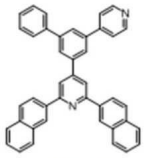

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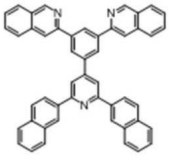

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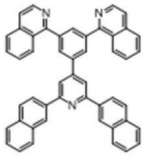

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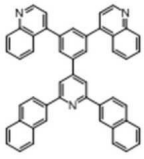

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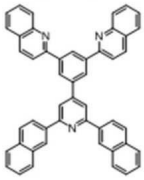

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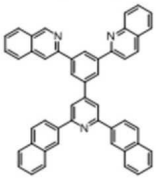

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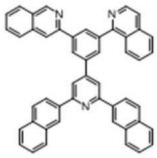

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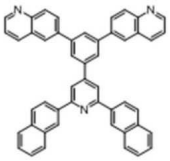

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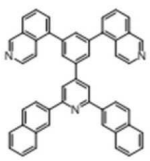

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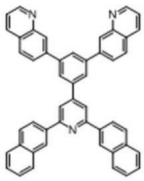

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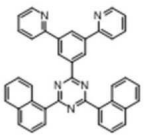

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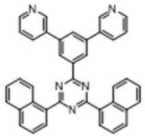

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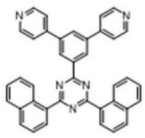

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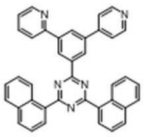

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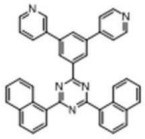

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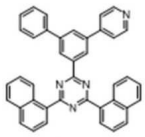

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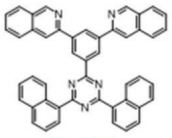

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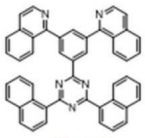

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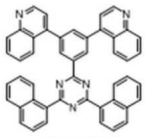

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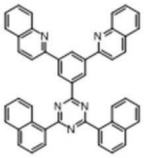

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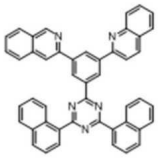

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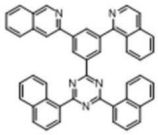

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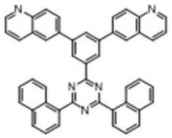

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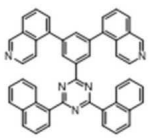

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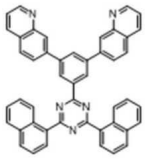

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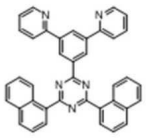

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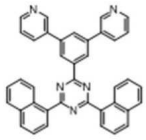

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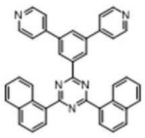

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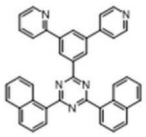

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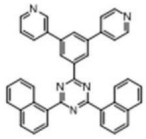

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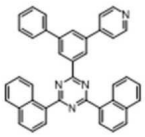

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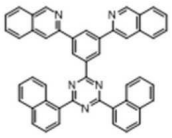

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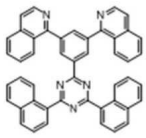

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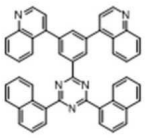

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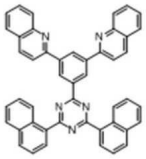

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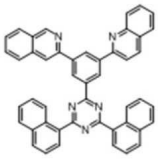

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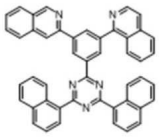

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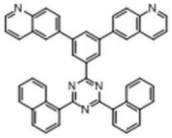

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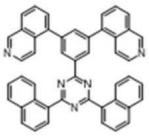

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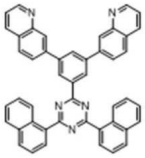

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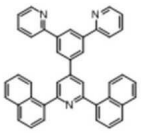

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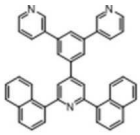

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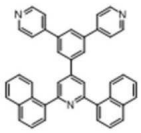

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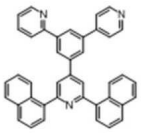

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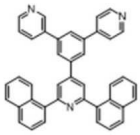

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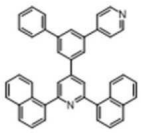

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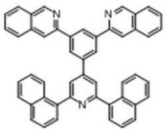

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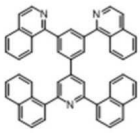

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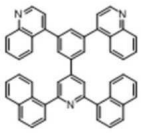

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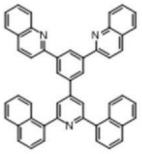

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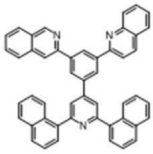

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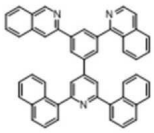

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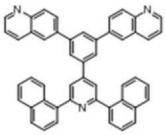

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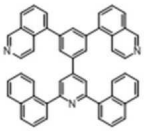

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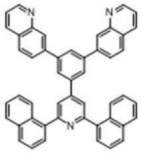

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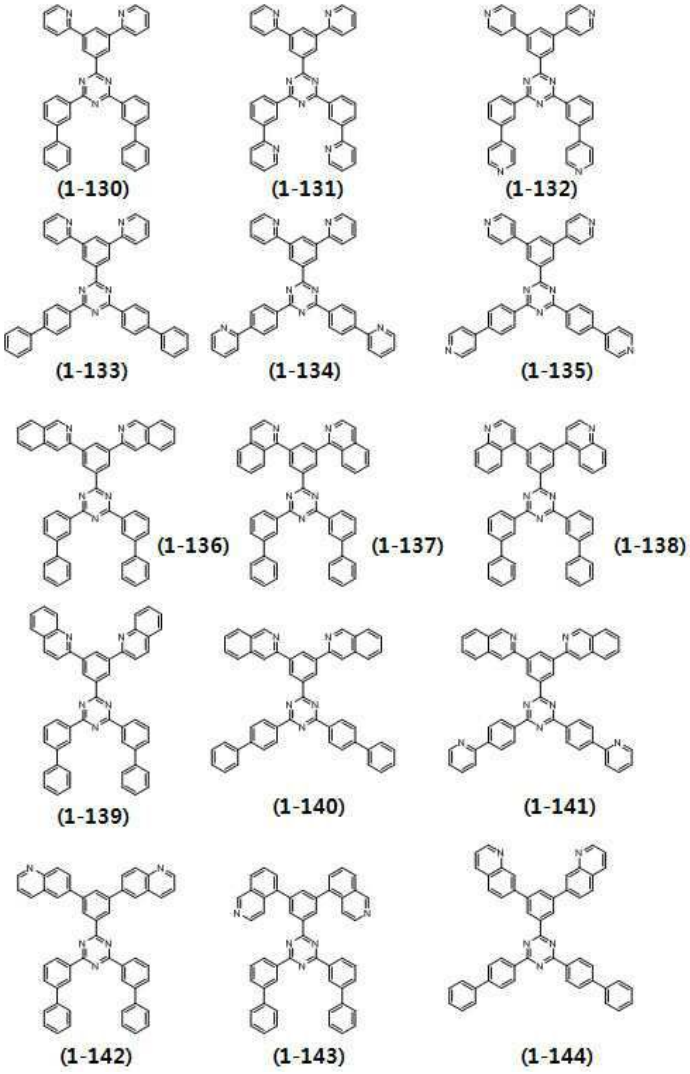
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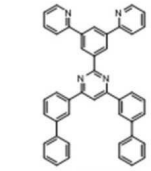

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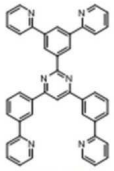

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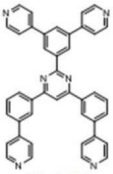

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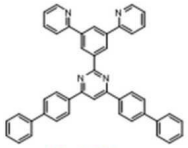

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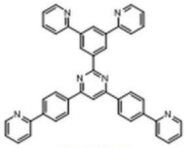

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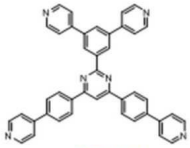

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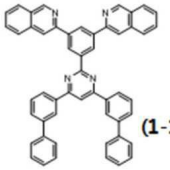

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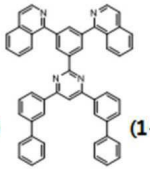

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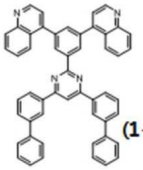

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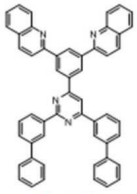

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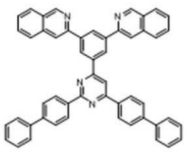

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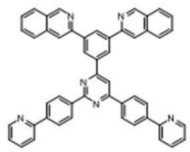

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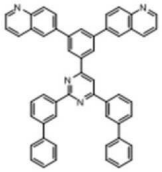

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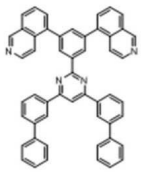

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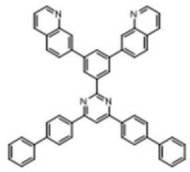

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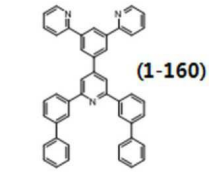
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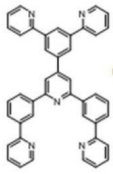
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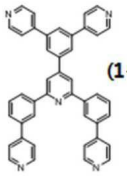
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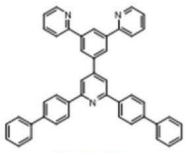
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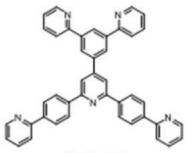
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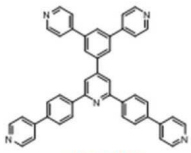
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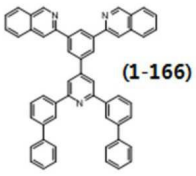
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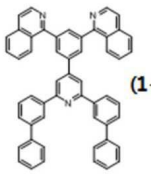
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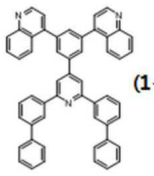
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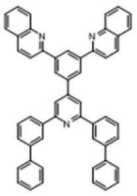
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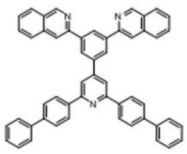
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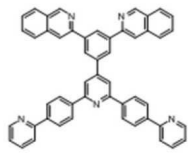
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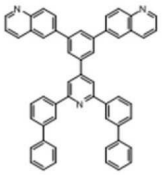
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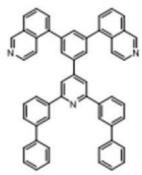
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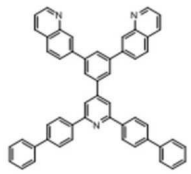
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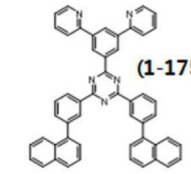
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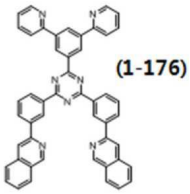
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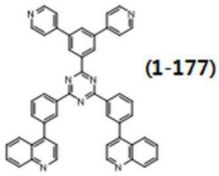
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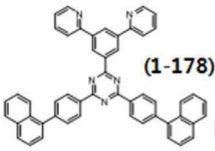
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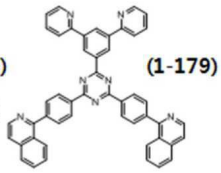
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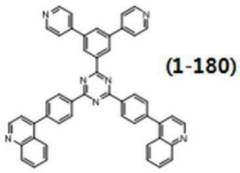
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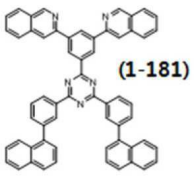
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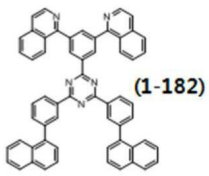
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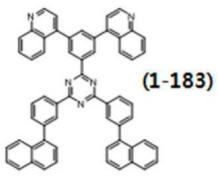
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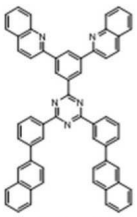
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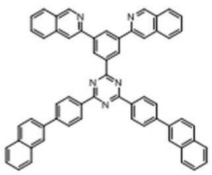
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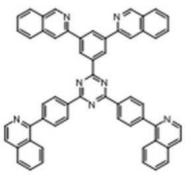
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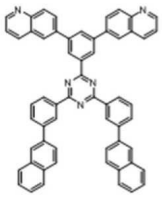
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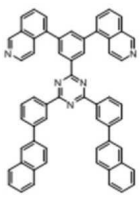
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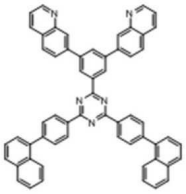
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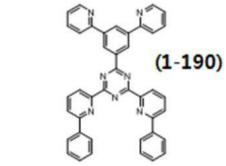

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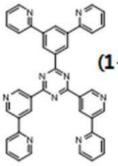

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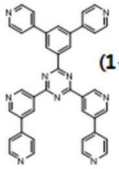

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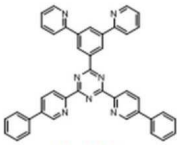

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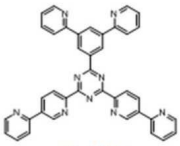

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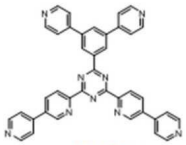

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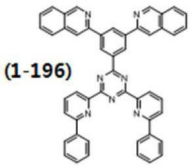

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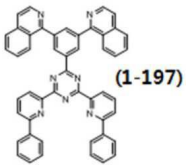

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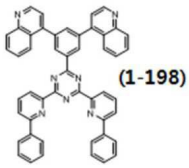

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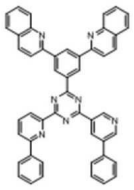

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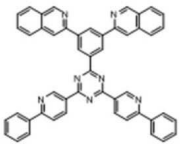

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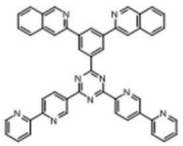

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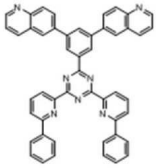

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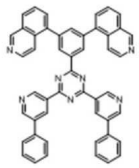

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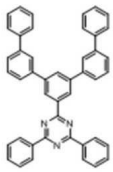

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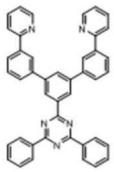

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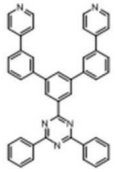

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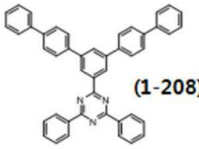

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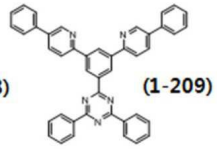

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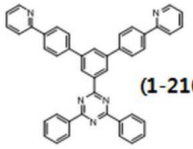

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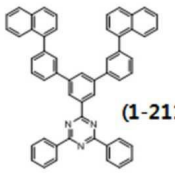

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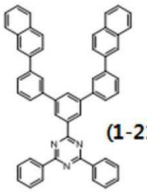

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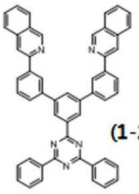

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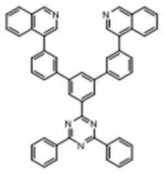

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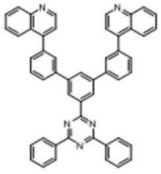

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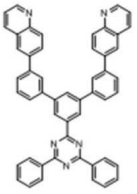

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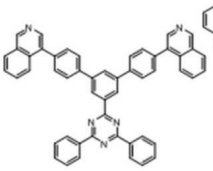

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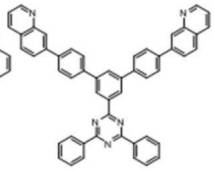

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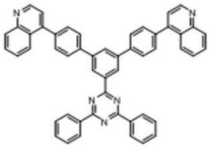

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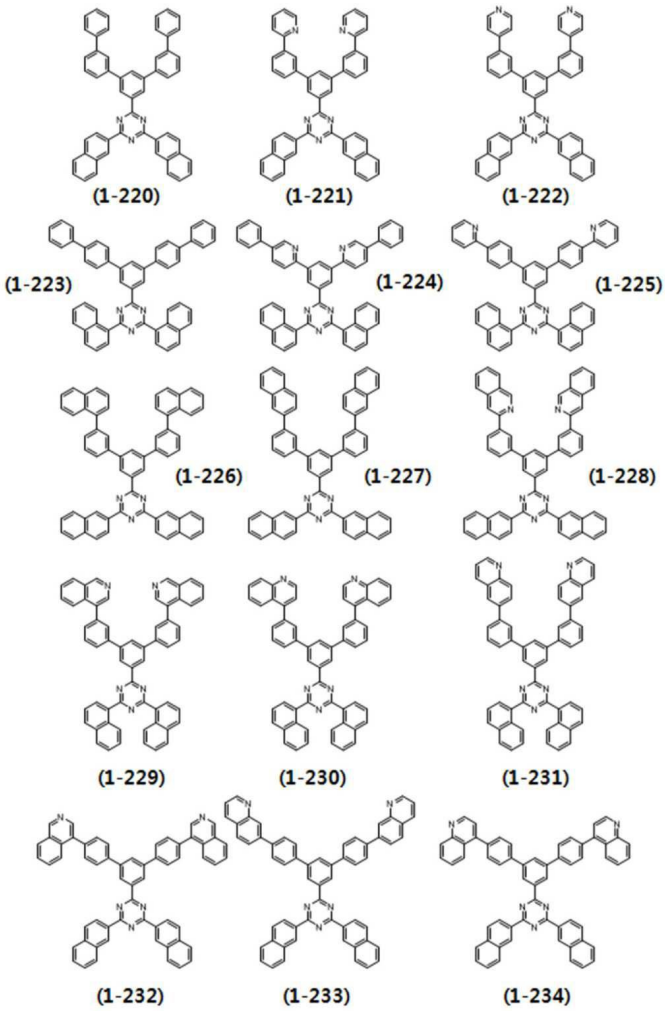
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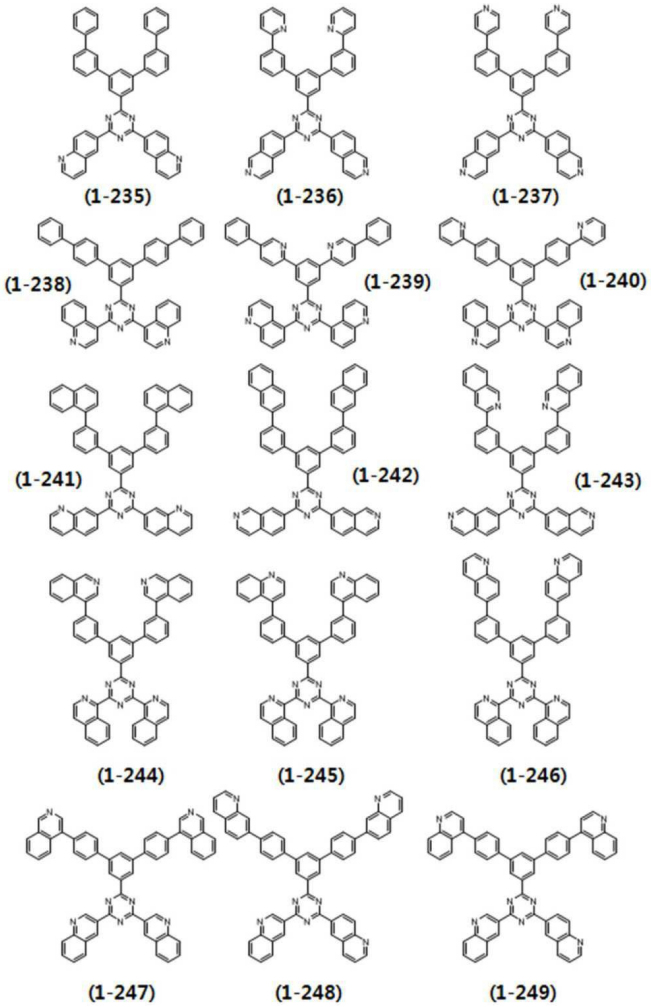
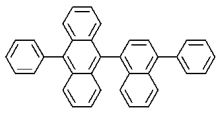
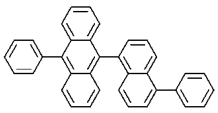


[0067] 상기 제2 화합물은 하기 화학식 2-1 내지 화학식 2-80으로 표시되는 화합물로 이루어진 군으로부터 선택되는 하나일 수 있다.

[0068] [화학식 2-1 ~ 화학식 2-80]



(2-1)



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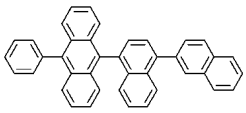

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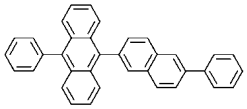

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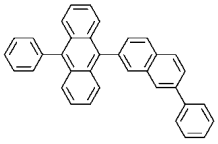
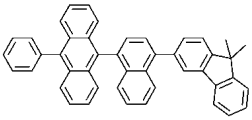
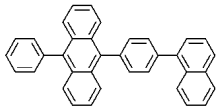


(2-5)



(2-6)



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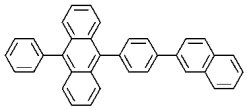

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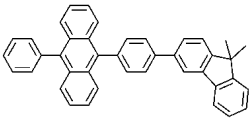
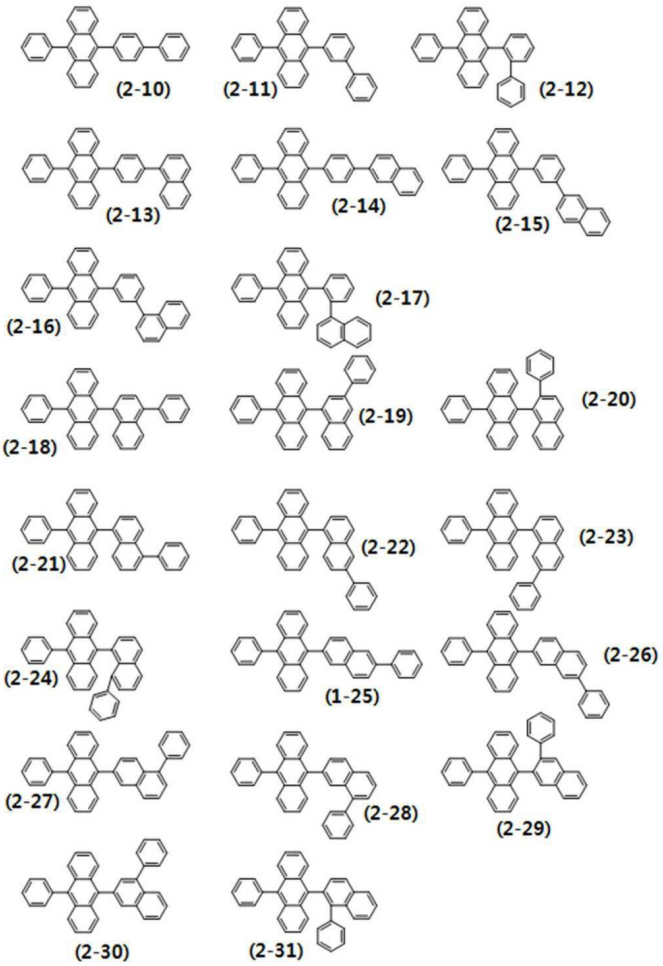


(2-9)

[0069]

[0070]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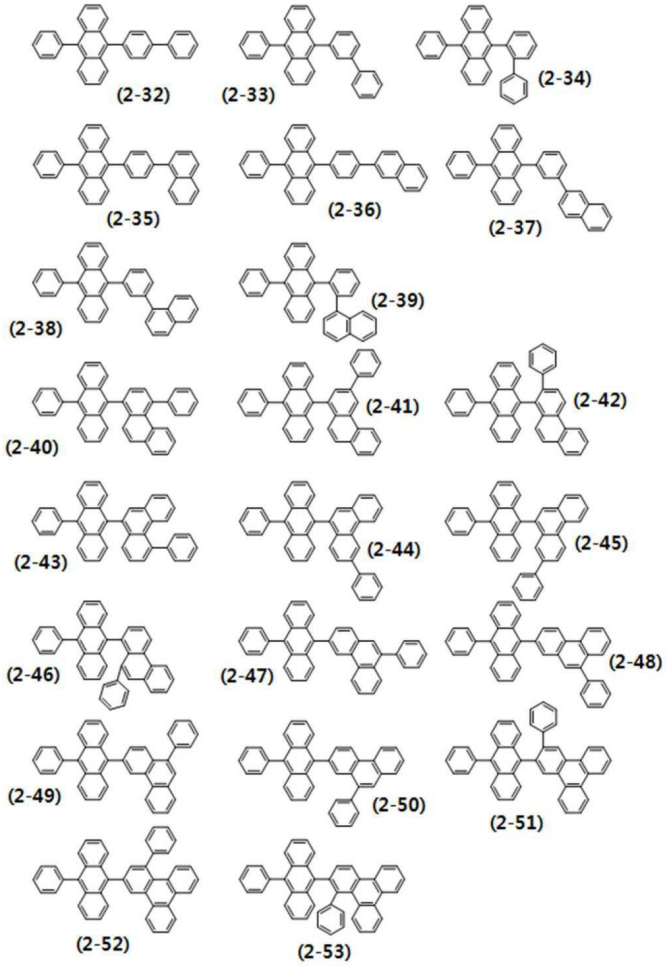
[0071]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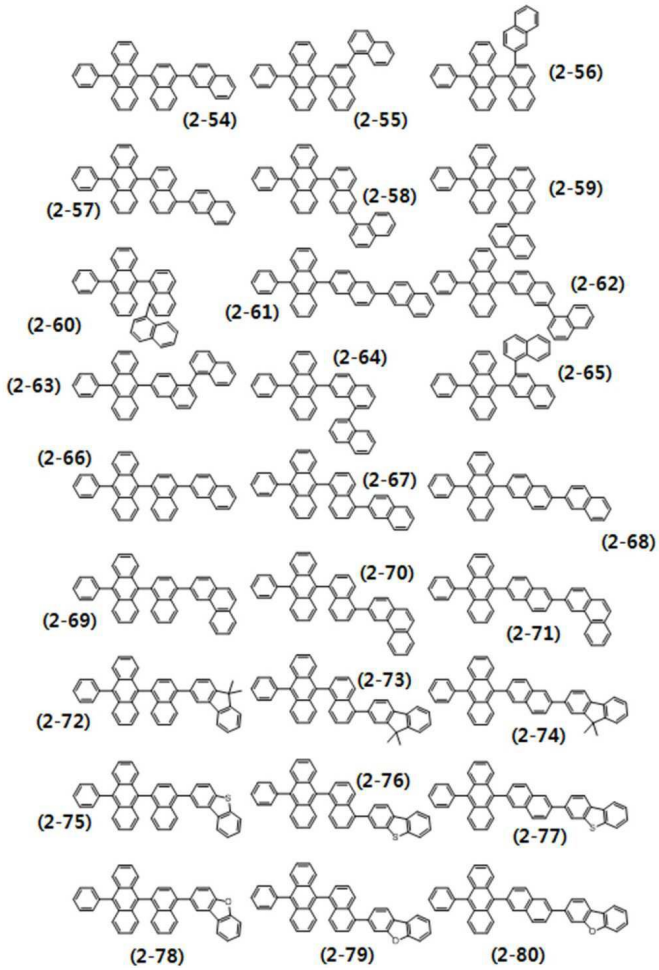
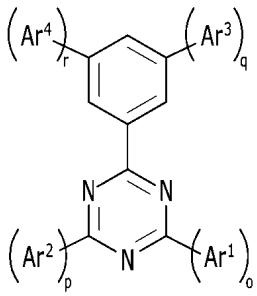


[0072] 상기 유기 발광 소자는 서로 마주하는 애노드와 캐소드, 상기 애노드와 상기 캐소드 사이에 개재되어 있는 발광층, 상기 애노드와 상기 발광층 사이에 개재되어 있는 정공 수송층 및 상기 캐소드와 상기 발광층 사이에 개재되어 있는 전자 수송층 및 정공 저지층을 포함하고, 상기 정공 저지층은 상기 제1 화합물을 포함하며, 상기 발광층은 상기 제2 화합물을 포함할 수 있다.

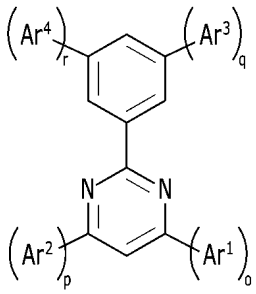
[0073] 상기 제1 화합물은 하기 화학식 3-1 내지 3-3으로 표시되는 화합물 중 하나일 수 있다.

[0074] [화학식 3-1]



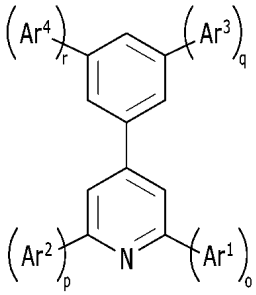
[0075]

[0076] [화학식 3-2]



[0077]

[0078] [화학식 3-3]

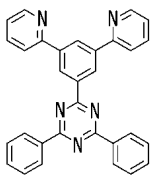


[0079]

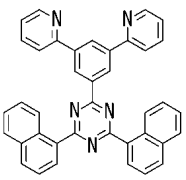
[0080] 상기 화학식 3-1 내지 3-3에서, Ar1 내지 Ar4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고, X는 탄소(C) 또는 질소(N)이며, o, p, q, r 은 각각 1 내지 3의 정수이고 o, p, q, r 이 2 이상인 경우 각각의 Ar1 내지 Ar4 는 서로 같거나 다르다.

[0081] 상기 제1 화합물은 하기 화학식 1-1 내지 1-249로 이루어진 군으로부터 선택된 하나일 수 있다.

[0082] [화학식 1-1 ~ 화학식 1-249]



(1-1)



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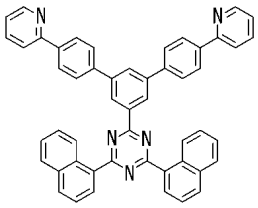

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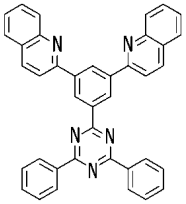

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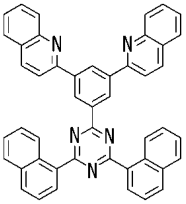
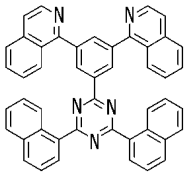
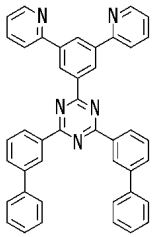


(1-5)



(1-6)



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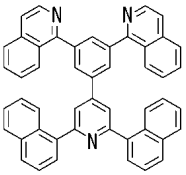

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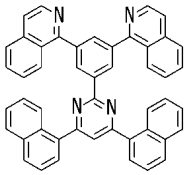

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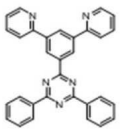
[0083]



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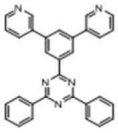

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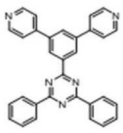

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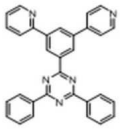
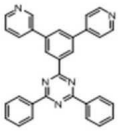
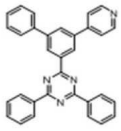


(1-13)



(1-14)



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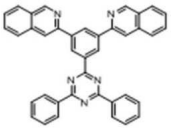

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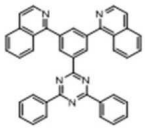

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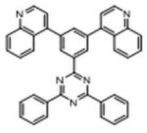

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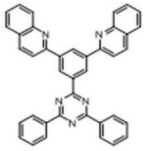

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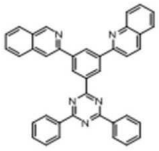

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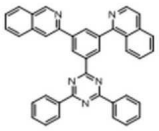

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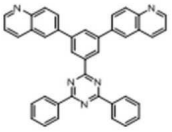

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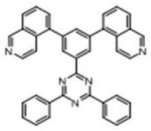

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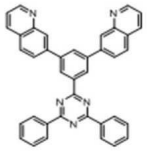

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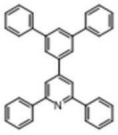

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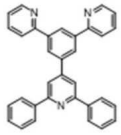

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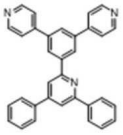

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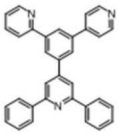

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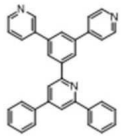

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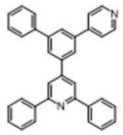

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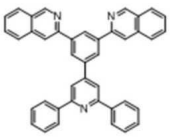

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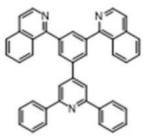

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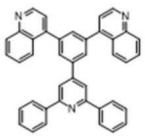

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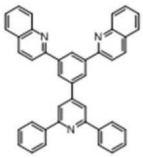

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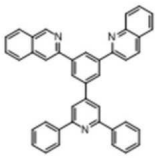

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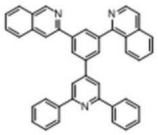

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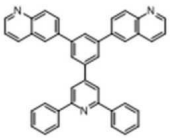

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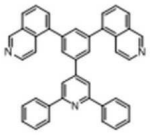

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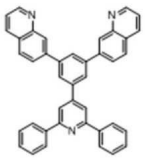

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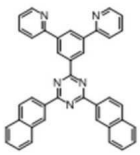

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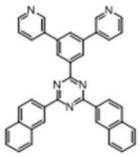

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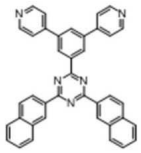

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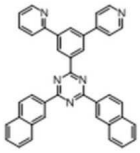

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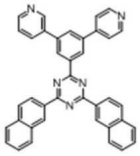

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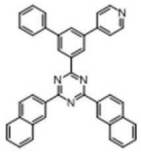

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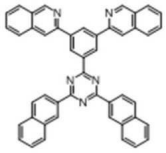

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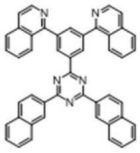

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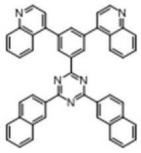

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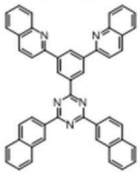

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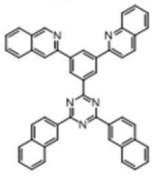

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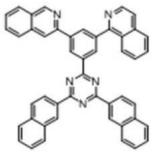

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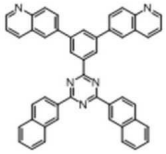

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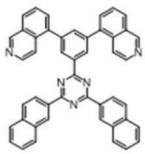

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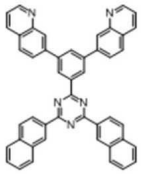

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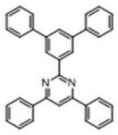

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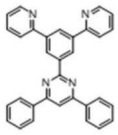

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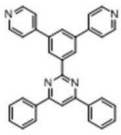

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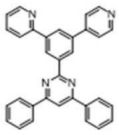

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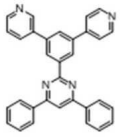

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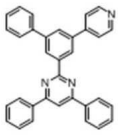

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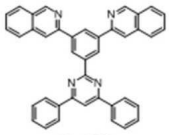

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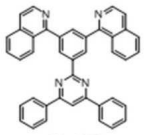

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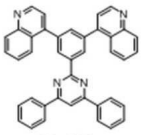

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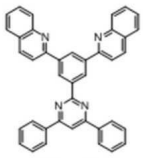

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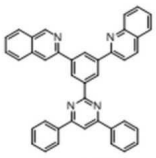

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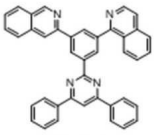

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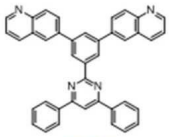

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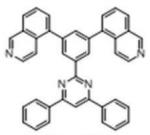

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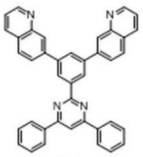

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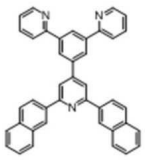

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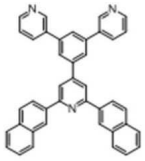

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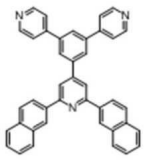

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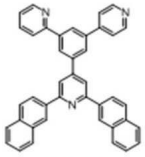

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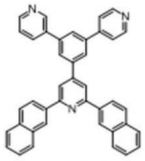

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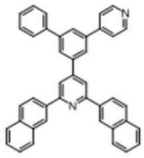

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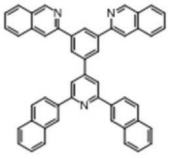

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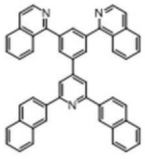

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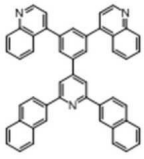

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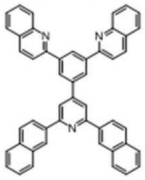

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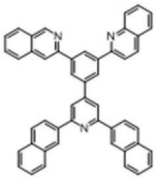

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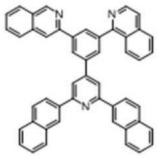

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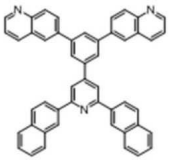

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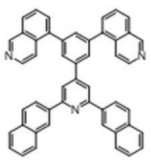

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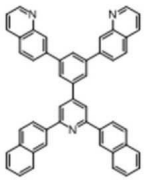

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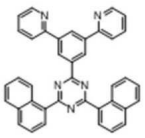

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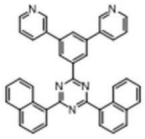

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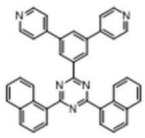

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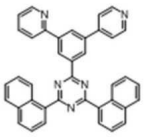

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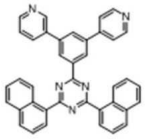

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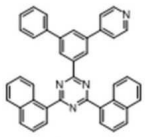

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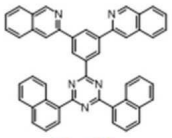

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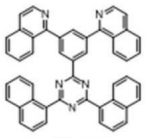

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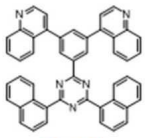

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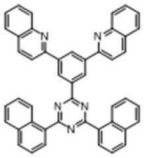

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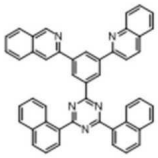

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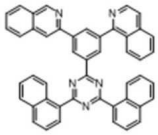

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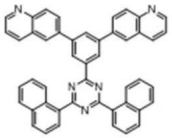

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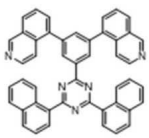

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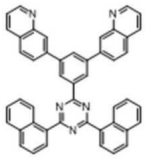

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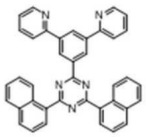

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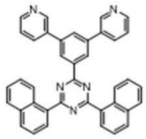

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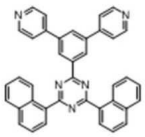

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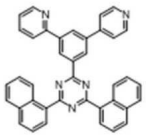

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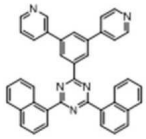

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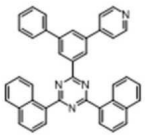

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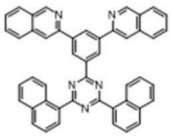

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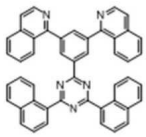

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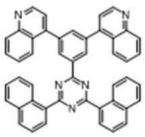

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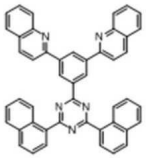

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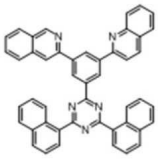

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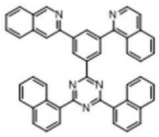

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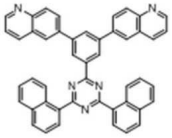

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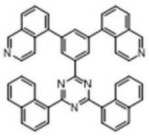

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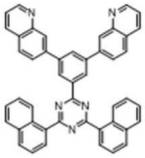

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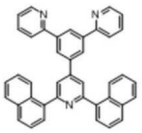

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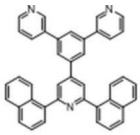

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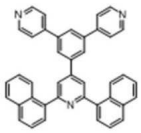

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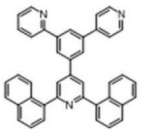

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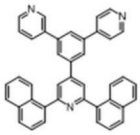

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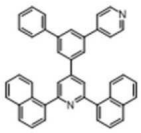

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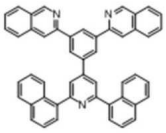

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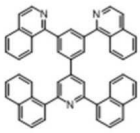

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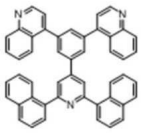

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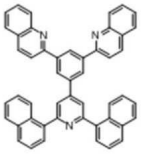

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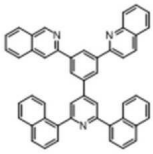

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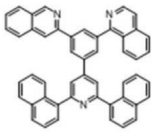

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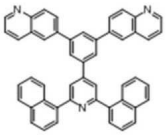

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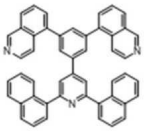

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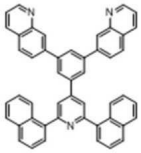

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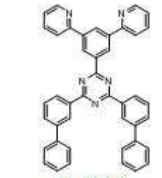
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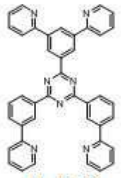
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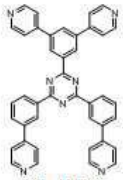
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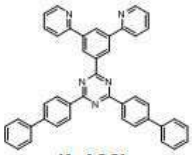
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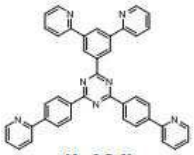
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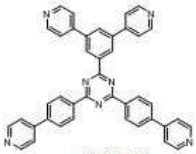
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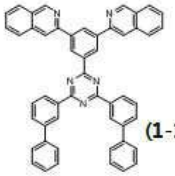
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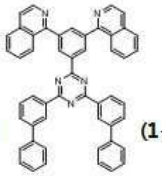
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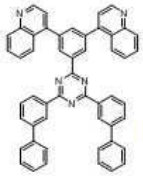
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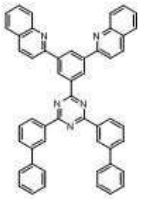
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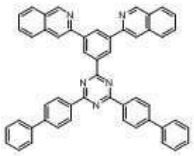
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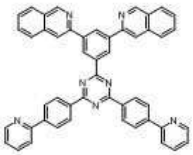
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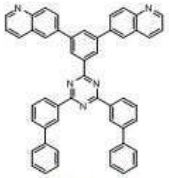
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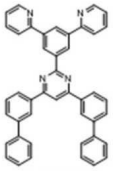

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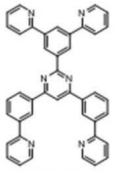

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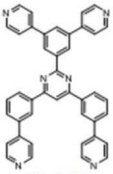

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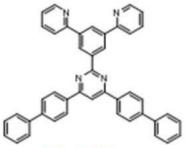

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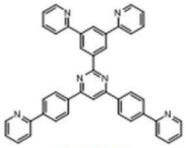

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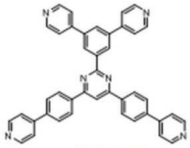

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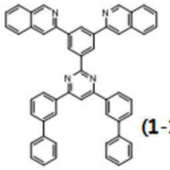

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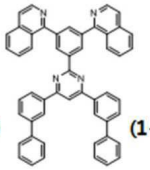

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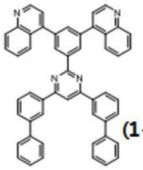

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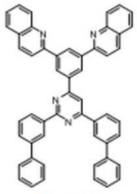

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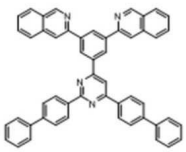

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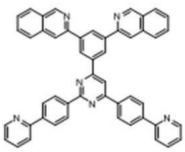

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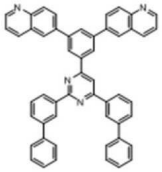

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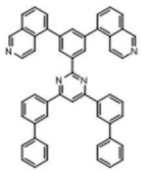

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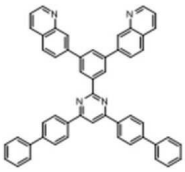

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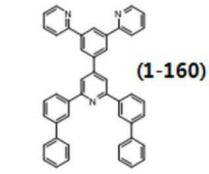

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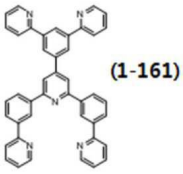

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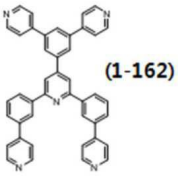

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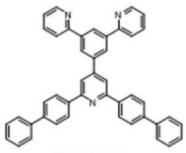

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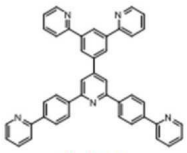

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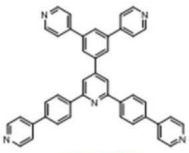

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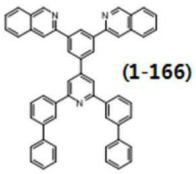

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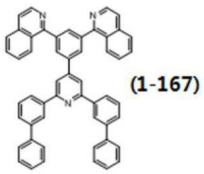

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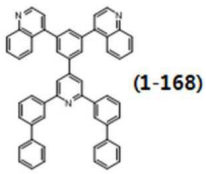

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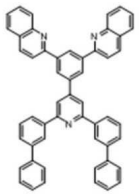

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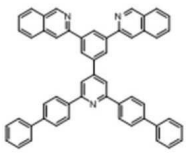

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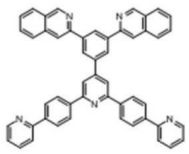

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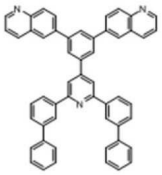

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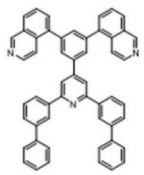

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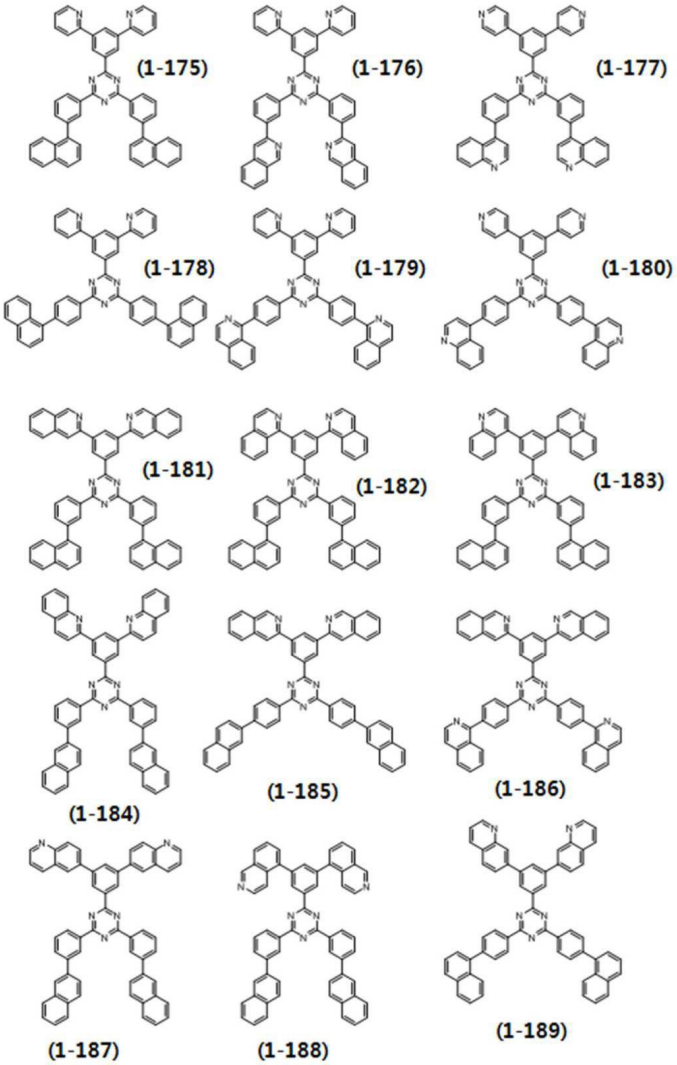
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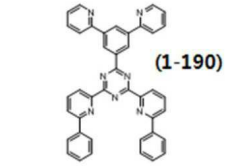

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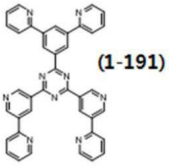

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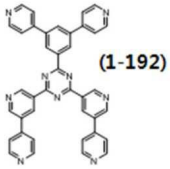

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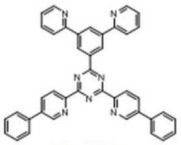

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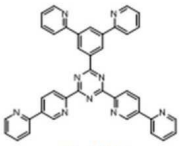

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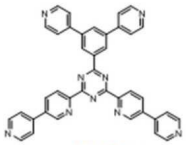

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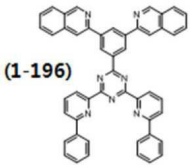

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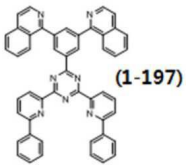

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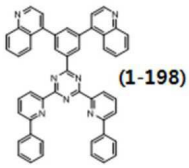

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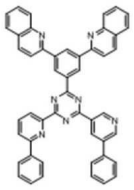

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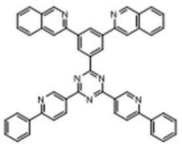

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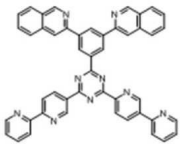

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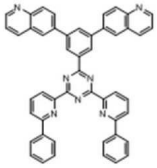

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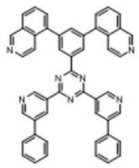

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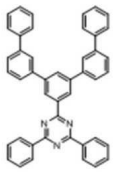

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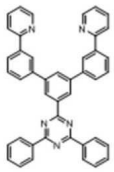

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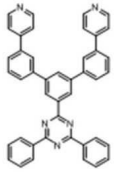

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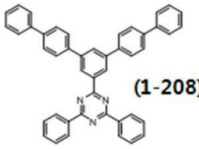

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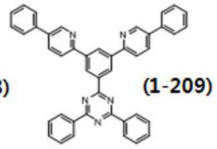

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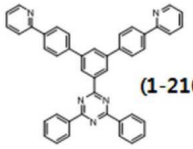

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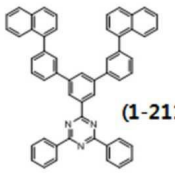

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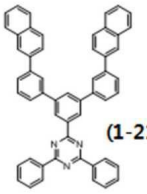

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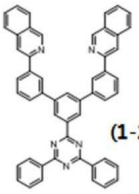

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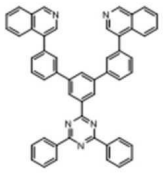

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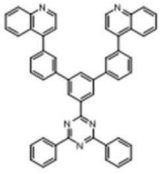

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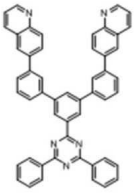

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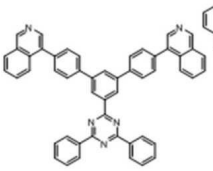

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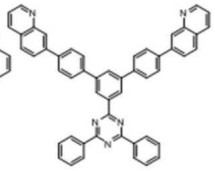

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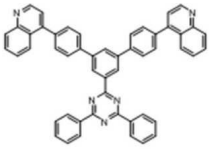

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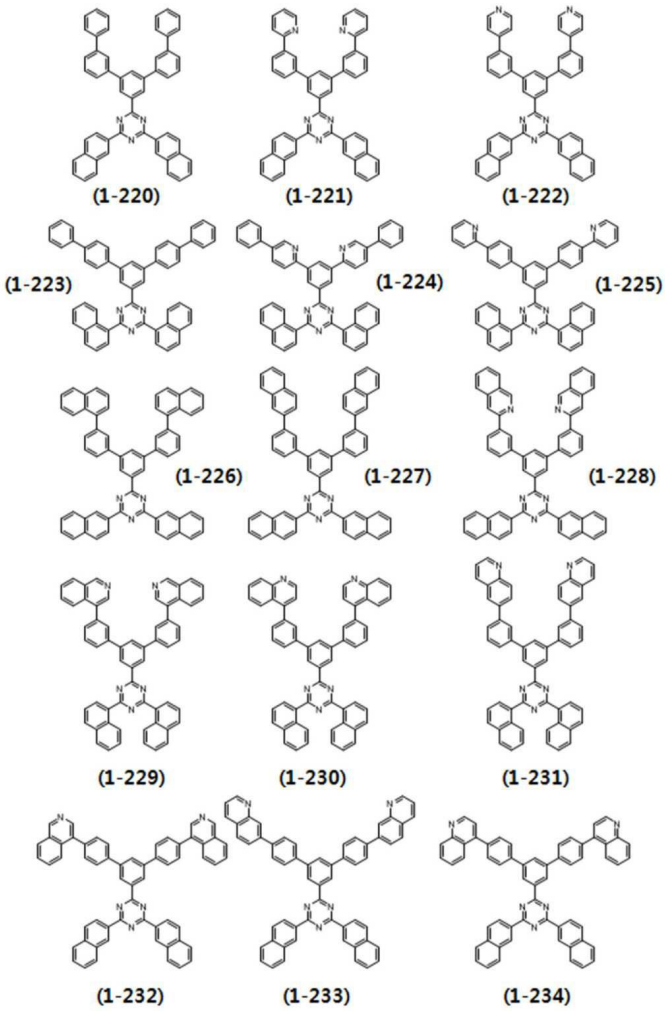
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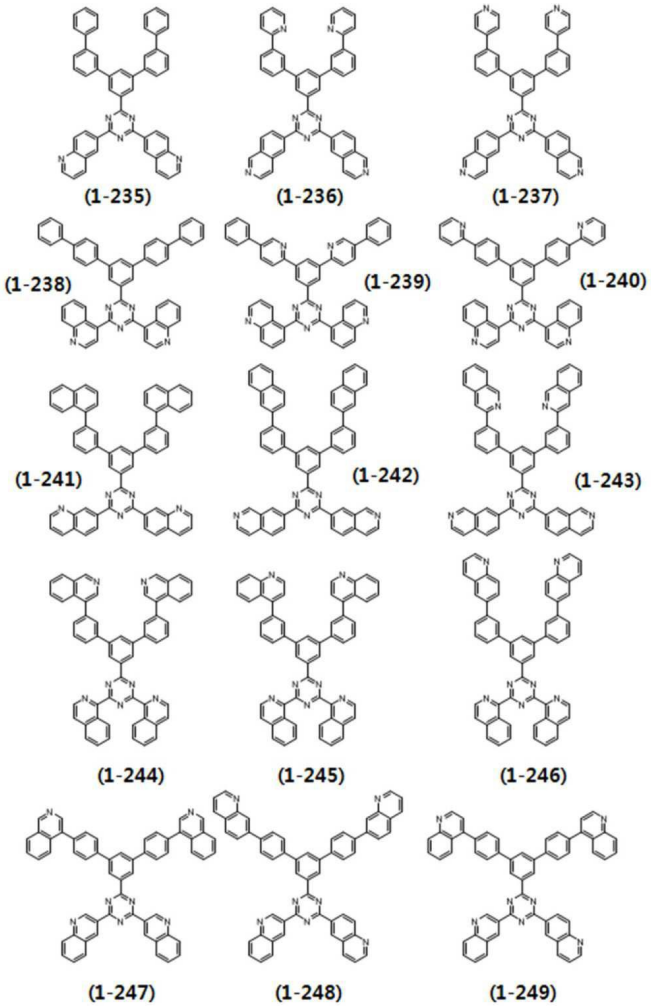
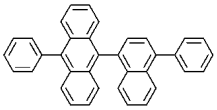
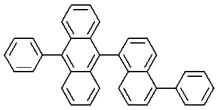


[0086] 상기 제2 화합물은 하기 화학식 2-1 내지 화학식 2-80으로 표시되는 화합물로 이루어진 군으로부터 선택되는 하나일 수 있다.

[0087] [화학식 2-1 ~ 화학식 2-80]



(2-1)



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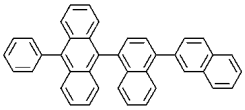

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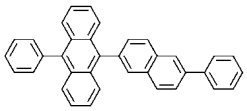

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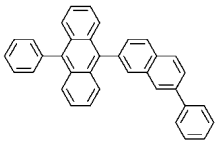

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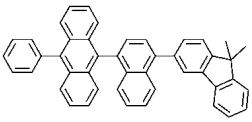

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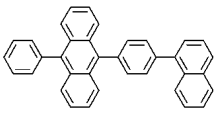

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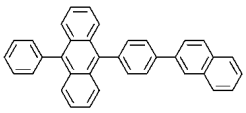

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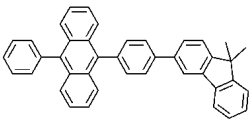

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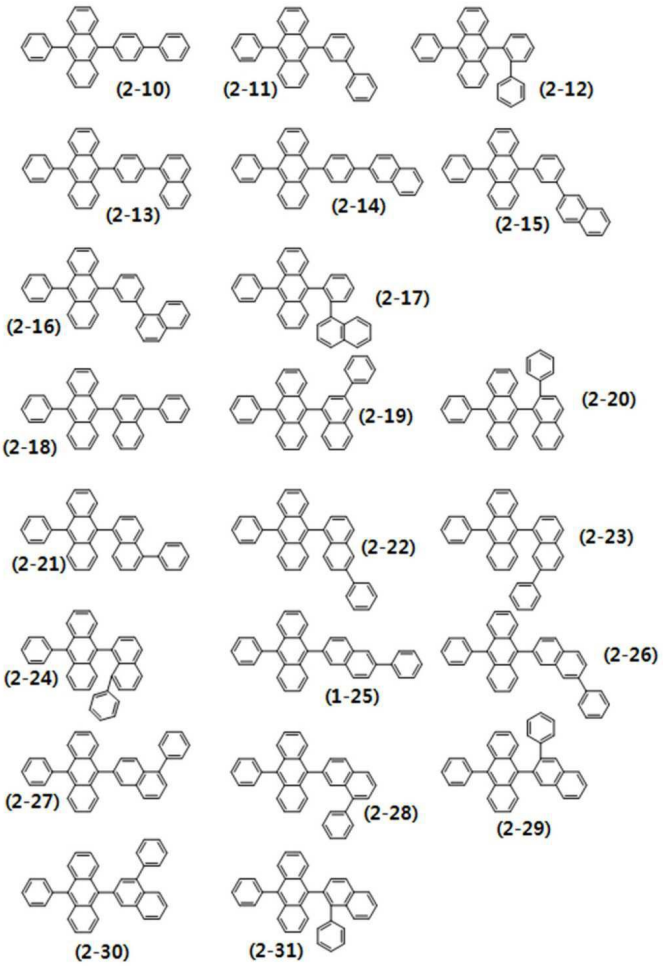
[0088]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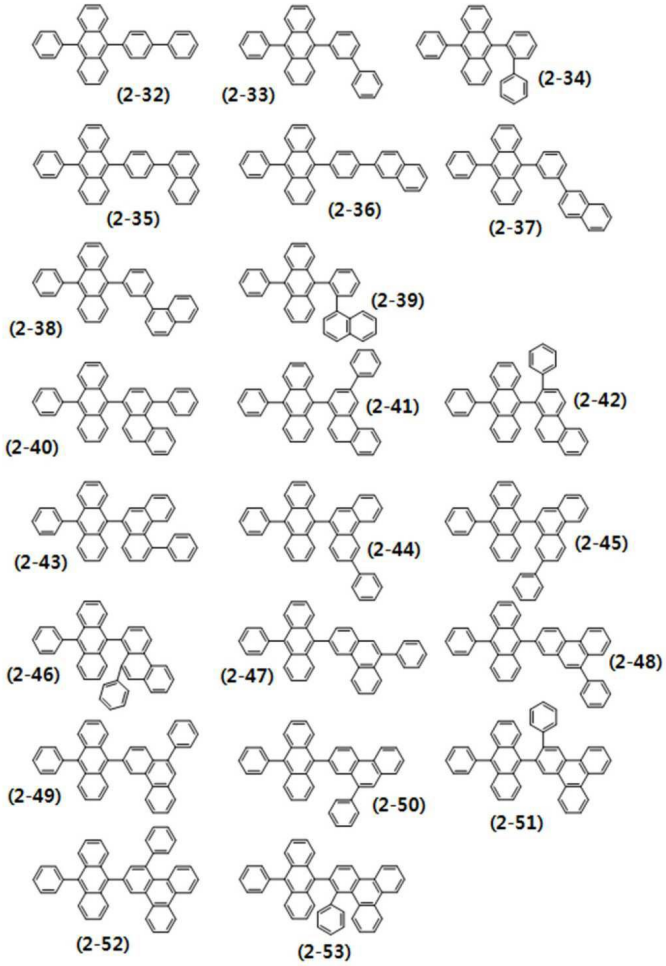
[0089]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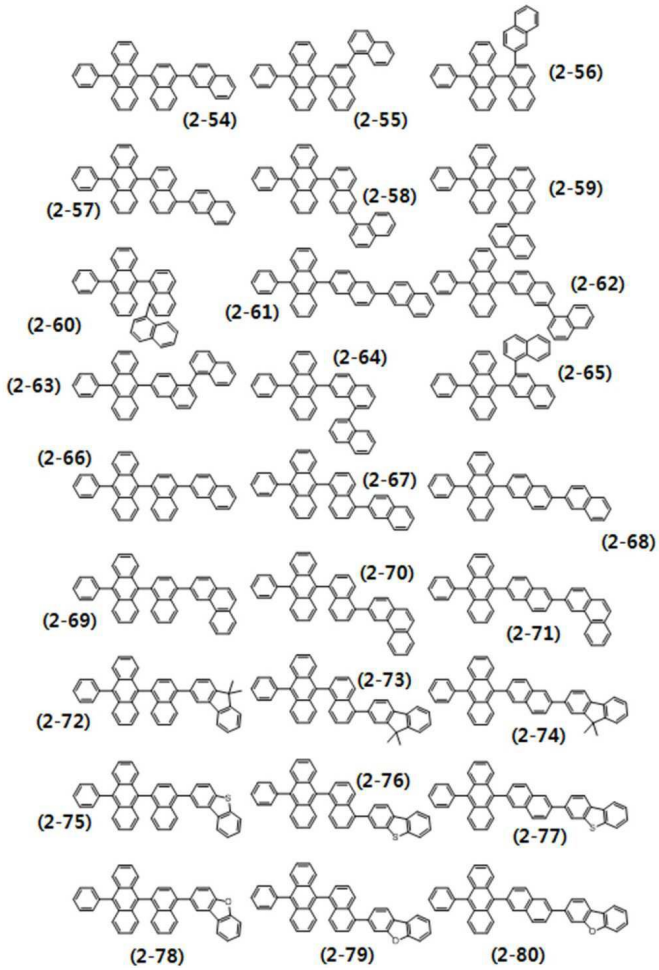


발명의 효과

[0090] 이상과 같이 본 발명의 일 실시예에 따른 유기 발광 소자는 유기 발광 소자의 발광층의 호스트로 페닐 치환된 안트라센계 화합물을, 유기 발광 소자의 전자 수송층 또는 정공 저지층으로 트리아진계 화합물을 사용함으로써 캐리어 밸런스(carrier balance)를 향상시키고, 소자의 효율 및 수명을 증가시켰다.

도면의 간단한 설명

[0091] 도 1 내지 도 3은 본 발명의 일 실시예에 따른 유기 발광 소자의 구조를 나타낸 도면이다.

도 4는 본 발명의 실시예에 따른 유기 발광 표시 장치의 배치도이다.

도 5는 도 4의 유기 발광 표시 장치의 V-V 단면선에 따른 단면도이다.

도 6는 도 4의 유기 발광 표시 장치의 VI-VI 단면선에 따른 단면도이다.

발명을 실시하기 위한 구체적인 내용

[0092] 첨부한 도면을 참고로 하여 본 발명의 실시예에 대하여 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자가 용이하게 실시할 수 있도록 상세히 설명한다. 그러나 본 발명은 여러 가지 상이한 형태로 구현될 수 있으며 여기에서 설명하는 실시예에 한정되지 않는다.

[0093] 도면에서 여러 층 및 영역을 명확하게 표현하기 위하여 두께를 확대하여 나타내었다. 명세서 전체를 통하여 유사한 부분에 대해서는 동일한 도면 부호를 붙였다. 층, 막, 영역, 판 등의 부분이 다른 부분 "위에" 있다고 할 때, 이는 다른 부분 "바로 위에" 있는 경우뿐 아니라 그 중간에 또 다른 부분이 있는 경우도 포함한다. 반대로 어떤 부분이 다른 부분 "바로 위에" 있다고 할 때에는 중간에 다른 부분이 없는 것을 뜻한다.

[0094] 본 명세서에서 "치환된"이란 별도의 정의가 없는 한, 각각 중수소, C1 내지 C30 알킬기, C6 내지 C36 아릴기,

C2 내지 C30 헤테로아릴기, C1 내지 C30 알콕시기, C2 내지 C30 알케닐기, C6 내지 C30 아릴옥시기, C3 내지 C30 실릴옥시기, C1 내지 C30 아실기, C2 내지 C30 아실옥시기, C2 내지 C30 헤테로아릴옥시기, C1 내지 C30 술포닐기, C1 내지 C30 알킬티올기, C6 내지 C30 아릴티올기, C1 내지 C30 헤테로시클로티올기, C1 내지 C30 인산아마이드기, C3 내지 C40 실릴기, NR"R'"(여기에서, R" 및 R'"은 각각 독립적으로, 수소 원자, C1 내지 C30 알킬기, 및 C6 내지 C30 아릴기로 이루어진 군에서 선택되는 치환기임), 카르복실기, 할로겐기, 시아노기, 니트로기, 아조기, 플루오렌기 및 하이드록시기로 이루어진 군에서 선택되는 치환기로 치환된 것을 의미한다.

[0095] 또한, 본 명세서에서 "헤테로"란 별도의 정의가 없는 한, 하나의 고리 내에 B, N, O, S, P, Si 및 P(=O)로 이루어진 군에서 선택되는 헤테로 원자를 1개 내지 3개 함유하고, 나머지는 탄소인 것을 의미한다.

[0096] 또한, 본 명세서의 화학식들에서 사용된 그룹 중 대표적인 그룹의 정의를 살펴보면 다음과 같다. (치환기를 한정하는 탄소수는 비제한적인 것으로서 치환기의 특성을 한정하지는 않는다).

[0097] 비치환된 C5 내지 C30 아릴기는 하나 이상의 고리를 포함하는 카보사이클 방향족 시스템을 의미하며, 2 이상의 고리를 가질 경우, 이들은 서로 융합되거나 단일결합 등을 통하여 연결될 수 있다. 아릴이라는 용어는 페닐, 나프틸, 안트라세닐 등과 같은 방향족 시스템을 포함한다. 상기 비치환된 C6 내지 C30 아릴기의 예로는 페닐기, 톨릴기, 바이페닐기, 나프틸기, 안트라세닐기, 터페닐기, 플루오레닐기, 페난트레닐기, 피레닐기, 디페닐안트라세닐기, 디나프틸안트라세닐기, 펜타세닐기, 브로모페닐기, 히드록시페닐기, 스틸벤기, 아조벤제닐기, 및 페로세닐기로 이루어진 군에서 선택된 것을 사용할 수 있다.

[0098] 비치환된 C5 내지 C30 헤테로 아릴기는 B, N, O, S, P, Si 및 P(=O)로 이루어진 군에서 선택된 1, 2 또는 3개의 헤테로원자를 포함하고, 2 이상의 고리를 가질 경우, 이들은 서로 융합되거나 단일결합 등을 통하여 연결될 수 있다. 비치환된 C2 내지 C30 헤테로아릴기의 예로는, 피라졸일기, 이미다졸일기, 옥사졸일기, 티아졸일기, 트리아지닐기, 트리아졸일기, 테트라졸일기, 옥사디아졸일기, 티아디아졸일기, 피리디닐기, 피리다지닐기, 피리미디닐기, 트리아지닐기, 카바졸일기, N-카바졸페닐기, 인돌일기, 퀴놀리닐기, 이소퀴놀리닐기, 티오펜기, 디벤조티오펜기, 디벤조퓨란기, 및 벤즈이미다졸일기로 이루어진 군에서 선택된 것을 사용할 수 있다.

[0099] 이하에서 일 구현예에 따른 유기 발광 소자를 상세하게 설명하기로 한다. 도 1 및 도 2는 일 구현예에 따른 유기 발광 소자를 도시한 단면도이다.

[0100] 도 1을 참고하면, 일 구현예에 따른 유기 발광 소자는 애노드(10), 애노드(10)와 마주하는 캐소드(20), 그리고 애노드(10)와 캐소드(20) 사이에 개재되어 있는 발광층(50)을 포함한다.

[0101] 기판(도시하지 않음)은 애노드(10) 측에 배치될 수도 있고 캐소드(20) 측에 배치될 수도 있다. 기판은 예컨대 유리와 같은 무기 물질 또는 폴리카보네이트, 폴리메틸메타크릴레이트, 폴리에틸렌테레프탈레이트, 폴리에틸렌나프탈레이트, 폴리아미드, 폴리에테르술폰 또는 이들의 조합과 같은 유기 물질, 실리콘웨이퍼 등으로 만들어질 수 있다.

[0102] 애노드(10)는 투명 전극 또는 불투명 전극일 수 있다. 상기 투명 전극은 예컨대 산화인듐주석(ITO), 산화인듐아연(IZO), 산화주석(SnO2), 산화아연(ZnO) 또는 이들의 조합과 같은 도전성 산화물 또는 알루미늄, 은, 마그네슘과 같은 금속을 얇은 두께로 형성할 수 있고, 상기 불투명 전극은 예컨대 알루미늄, 은, 마그네슘과 같은 금속으로 형성할 수 있다.

[0103] 보다 구체적으로, 본 발명의 일 실시예에 따른 유기 발광 장치의 애노드(10)로서 은(Ag), 알루미늄(Al), 크롬(Cr), 몰리브덴(Mo), 텅스텐(W), 티타늄(Ti), 금(Au), 팔라듐(Palladium)(Pd) 또는 이것들의 합금막으로 반사막을 형성하고, 전기 반사막으로 ITO, IZO 또는 ZnO등의 투명전극물질이 적층된 구조로 할 수 있다.

[0104] 애노드(10)의 형성은 스퍼터링(sputtering)법, 기상 증착(vapor phase deposition)법, 이온빔(ion beam) 증착(ion beam deposition)법, 전자빔 증착(electron beam deposition)법 또는 레이저 abrasion(laser ablation)법을 이용해서 수행할 수 있다.

[0105] 캐소드(20)는 전자주입이 용이하도록 일 함수가 작은 물질을 포함할 수 있다. 예컨대, 마그네슘, 칼슘, 나트륨, 칼륨, 타이타늄, 인듐, 이트륨, 리튬, 가돌리늄, 알루미늄, 은, 주석, 납, 세슘, 바륨 등과 같은 금속 또는 이들의 합금을 들 수 있고, LiF/Al, LiO2/Al, LiF/Ca, LiF/Al 및 BaF2/Ca과 같은 다층 구조 물질 등을 들 수 있으나, 이에 한정되는 것은 아니다. 바람직하게는 상기 캐소드로 알루미늄 등과 같은 금속전극을 사용할 수

있다.

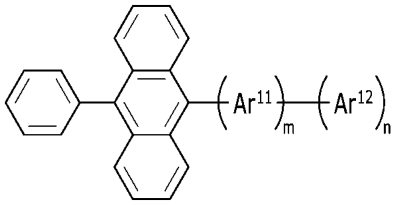
[0106] 보다 구체적으로, 본 발명의 일 실시예에 따른 캐소드(20)에 사용되는 도전성 물질로는 마그네슘, 칼슘, 주석, 납, 티타늄, 이트륨, 리튬, 루테늄, 망간, 알루미늄, 불화 리튬 등 및 그 합금이 사용되지만 이에 제한되지 않으며, 합금으로 마그네슘/실버, 마그네슘/인듐, 리튬/알루미늄 등이 있을 수 있다. 상기 합금들의 합금 비율은 증착원의 온도, 분위기, 진공도 등에 의해 제어되고 적절한 비율로서 선택된다.

[0107] 애노드(10) 및 캐소드(20) 는 필요한 경우 두 층 이상으로 구성될 수 있다.

[0108] 발광층(50)은 청색, 적색, 또는 녹색 발광물질을 포함할 수 있으며, 상기 발광층은 호스트 및 도펀트를 포함할 수 있다.

[0109] 본 발명의 일 실시예에 따른 발광층(50)은 하기 화학식 2로 표시되는 제2 화합물을 호스트로 포함할 수 있다.

[0110] [화학식 2]



[0111]

[0112] 상기 화학식 2에서

[0113] Ar^{11}은 치환 또는 비치환의 탄소수 7 내지 30의 아릴렌기 또는 치환 또는 비치환의 탄소수 7 내지 30의 헤테로 아릴렌기이고,

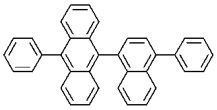
[0114] m은 0 내지 3의 정수이고, m이 0인 경우에는 Ar^{11}은 단결합이며,

[0115] Ar^{12}은 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

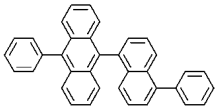
[0116] n은 1 내지 3의 정수이고,

[0117] m 또는 n이 2 이상인 경우 각각의 Ar^{11} 또는 Ar^{12}는 서로 같거나 다르다.

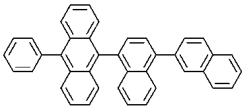
[0118] 이때, 상기 화학식 2의 화합물은 하기 화학식 2-1 내지 화학식 2-80으 로 표시되는 화합물로 이루어진 군으로부터 선택되는 하나일 수 있다.



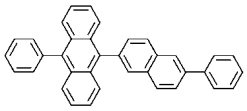
(2-1)



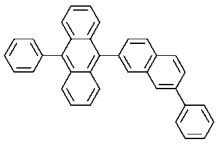
(2-2)



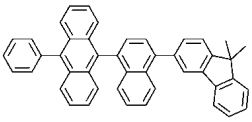
(2-3)



(2-4)



(2-5)



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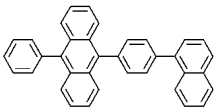

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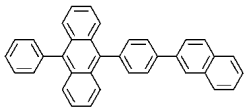
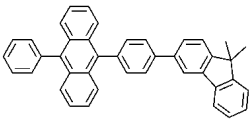


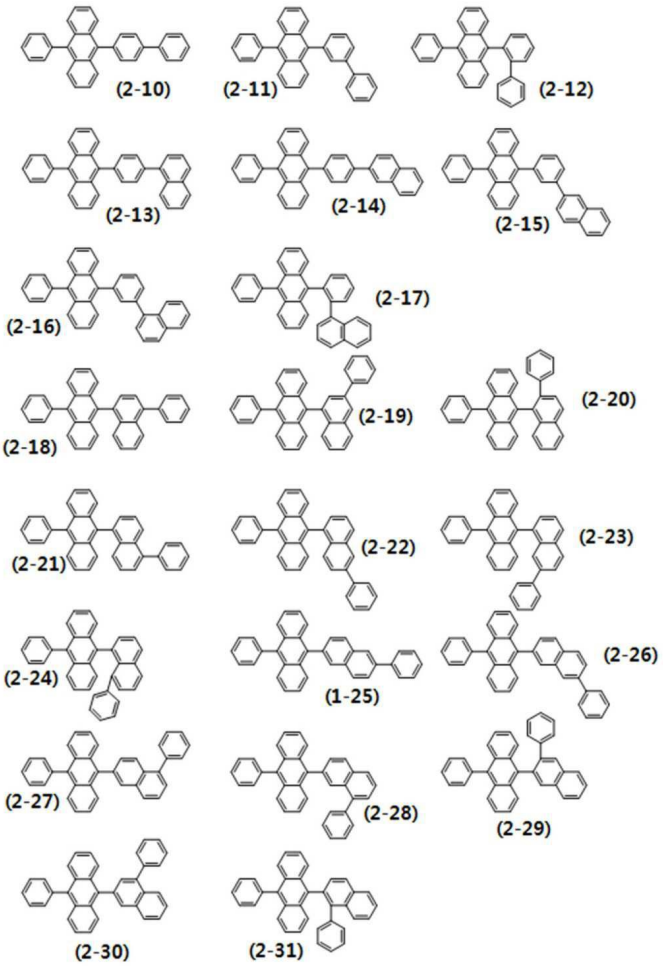
(2-8)



(2-9)

[0119]

[0120]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(2-24)
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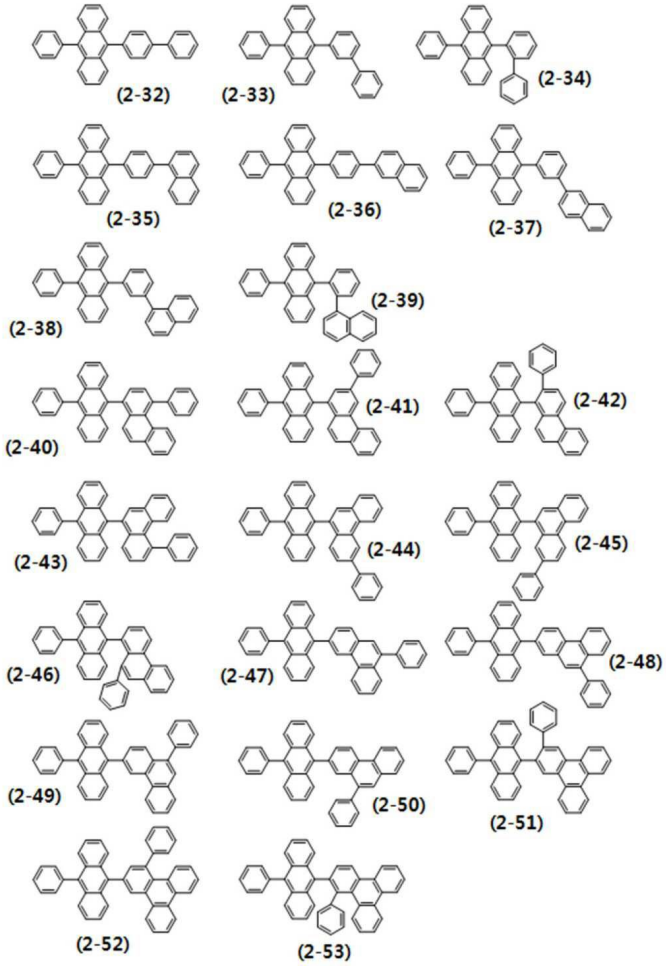
(2-26)
(2-27)
(2-28)
(2-29)
(2-30)
(2-31)

[0121]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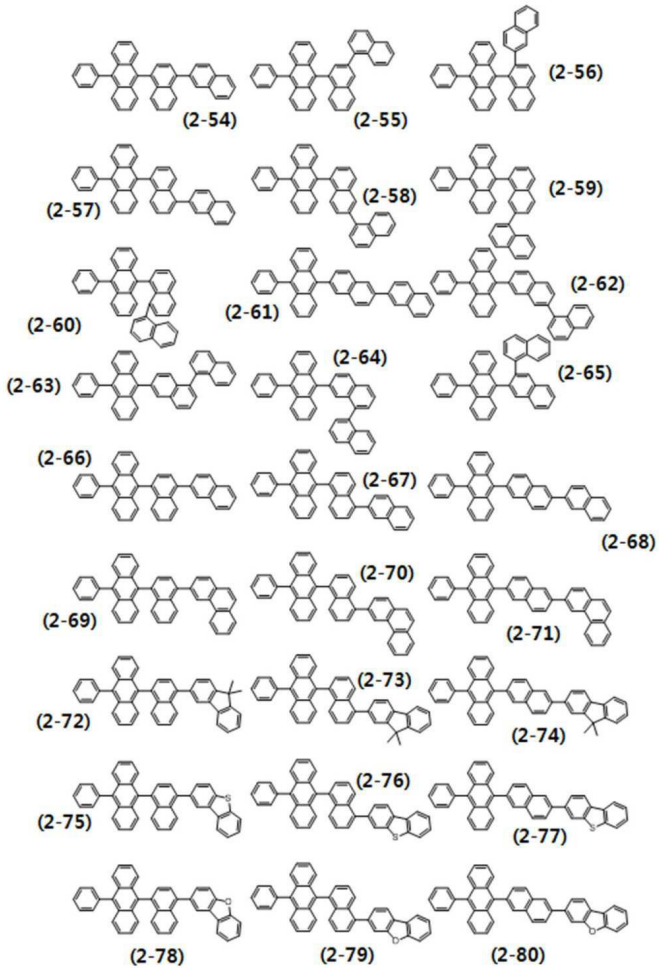


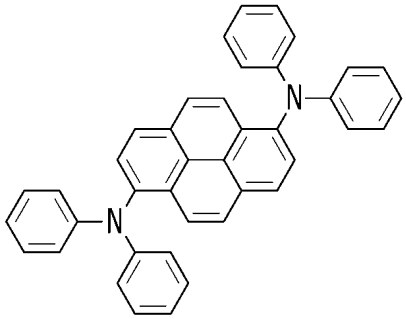
[0122] 상기 발광층(50)은 도펀트 재료를 추가로 포함할 수 있다. 도펀트 재료의 경우, 형광 도펀트로서는 이데미츠사(Idemitsu사)에서 구입가능한 IDE102, IDE105 및 하야시바라사에서 구입 가능한 C545T 등을 사용할 수 있으며, 인광 도펀트로서는 적색 인광 도펀트 PtOEP, UDC사의 RD 61, 녹색 인광 도판트 r(PPy)3(PPy=2-phenylpyridine), 청색 인광 도펀트인 F2Irpic, UDC사의 적색 인광 도펀트 RD 61 등을 사용할 수 있다.

[0123] 또한 발광층(50)의 도펀트로는 Ir(ppy)3, Ir(ppy)2acac, (piq)2Ir(acac), Pt(OEP) 등을 사용할 수 있으나, 반드시 이에 한정되는 것은 아니다.

[0124] 상기 도펀트의 도핑 농도는 특별히 제한 되지 않으나 통상적으로 호스트 100 중량부를 기준으로 하여 상기 도펀트의 함량은 0.01 ~ 15 중량부이다.

[0125] 본 발명의 일 실시예에서, 상기 발광층(50)에 포함되는 도펀트는 하기 화학식 4로 표현되는 제4 화합물일 수 있다.

[0126] [화학식 4]



[0127]

[0128] 상기 제4 화합물은 호스트 100 중량부를 기준으로 하여 1 내지 10 중량부 포함될 수 있다.

[0129] 상기 제4 화합물은 발광층에 5 중량% 포함될 수 있다.

[0130] 발광층(50)의 두께는 5nm 내지 200nm일 수 있으며, 특히 소자의 인가 전압을 낮게 할 수 있도록 10nm 내지 40nm의 범위일 수 있다.

[0131] 발광층(50)은 예컨대 진공 증착법, 스핀 코팅법, 캐스트법, LB법 등과 같은 다양한 방법을 이용하여 형성할 수 있다.

[0132] 진공 증착법에 의하여 발광층(50) 등의 유기층을 형성하는 경우, 그 증착 조건은 유기층의 재료로서 사용하는 화합물, 목적으로 하는 유기층의 구조 및 열적 특성 등에 따라 다르지만, 일반적으로 증착온도 100 내지 500℃, 진공도 10^{-8} 내지 10^{-3} torr, 증착속도 0.01 내지 100Å/sec의 범위에서 선택될 수 있으며, 이에 한정되는 것은 아니다.

[0133] 스핀 코팅법에 의하여 발광층(50) 등의 유기층을 형성하는 경우, 그 코팅 조건은 유기층의 재료로서 사용하는 화합물, 목적으로 하는 유기층의 구조 및 열적 특성 등에 따라 상이하지만, 약 2000 rpm 내지 5000 rpm의 코팅 속도, 코팅 후 용매 제거를 위한 열처리 온도는 약 80℃ 내지 200℃의 온도 범위에서 선택될 수 있으며, 이에 한정되는 것은 아니다.

[0134] 이하 도 2를 참고하여 본 발명 일 실시예에 따른 유기 발광 소자를 설명한다.

[0135] 도 2를 참고하면, 본 발명 일 실시예에 따른 유기 발광 소자는 전술한 실시예와 마찬가지로, 서로 마주하는 애노드(10)와 캐소드(20), 애노드(10)와 캐소드(20) 사이에 위치하는 발광층(50)을 포함한다. 그러나 본 실시예에 따른 유기 발광 장치는 전술한 실시예와 달리, 애노드(10)와 발광층(50) 사이에 위치하는 정공 수송층(30), 및 캐소드(20)와 발광층(50) 사이에 위치하는 전자 수송층(40)을 더 포함한다.

[0136] 캐소드, 애노드 및 발광층은 도 1의 실시예에 따른 유기 발광 소자에 대한 설명과 동일하다. 즉, 발광층은 상기 화학식 2로 표시되는 화합물을 포함한다. 유사한 구성요소에 대한 구체적인 설명은 생략한다.

[0137] 정공 수송층(30)은 공지된 정공 수송 물질을 포함할 수 있는데, 예를 들면, 아릴렌디아민 유도체, 스타버스트계 화합물, 스피로기를 포함하는 바이페닐디아민 유도체 및 래더형 화합물 등을 포함할 수 있다. 보다 상세하게는 4, 4", 4""트리스 [(3-메틸페닐(페닐)아미노)]트리페닐아민(m-MTDATA), 1, 3, 5-트리스 [4- (3-메틸페닐페닐아미노)페닐]벤젠(m-MTDATB) 및 프탈로시아닌구리(CuPc) 등을 포함할 수 있으나, 이에 한정되는 것은 아니다.

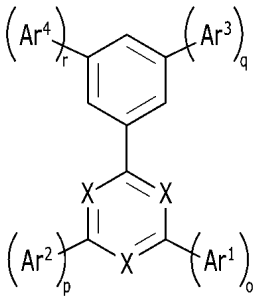
[0138] 정공 수송층(30)의 두께는 약 50Å 내지 1000Å, 구체적으로는 100Å 내지 600Å일 수 있다. 정공 수송층(30)의 두께가 전술한 바와 같은 범위를 만족할 경우, 실질적인 구동전압 상승 없이 우수한 정공 수송 특성을 얻을 수 있다.

[0139] 정공 수송층(30)은, 막의 전도율 등을 향상시키기 위하여 보조 물질을 더 포함할 수 있으며, 정공 수송층(30)이 상기 보조 물질을 더 포함할 경우, 상기 보조 물질은 상기 층들 중에 균일하게 분산되거나, 또는 불균일하게 분포되어 있을 수 있는 등 다양한 변형이 가능하다.

[0140] 애노드(10) 상부에 진공 증착법, 스핀 코팅법, 캐스트법, LB법 등과 같은 다양한 방법을 이용하여 정공 수송층(30)을 형성할 수 있다. 진공 증착법 및 스핀 코팅법에 의하여 정공 수송층(30)을 형성하는 경우, 그 증착조건 및 코팅조건은 사용하는 화합물에 따라 다를 수 있다.

[0141] 본 실시예에 따른 유기 발광 소자는, 전자 수송층이 하기 화학식 1로 표시되는 제1 화합물을 포함한다.

[0142] [화학식 1]



[0143]

[0144] 상기 화학식 1에서,

[0145] Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

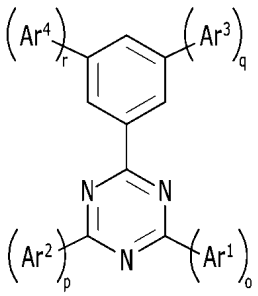
[0146] X는 탄소(C) 또는 질소(N)이며,

[0147] o, p, q, r은 각각 1 내지 3의 정수이고

[0148] o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4는 서로 같거나 다르다. .

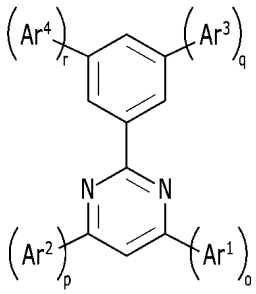
[0149] 제1 화합물은 하기 화학식 3-1 내지 3-3으로 표시되는 화합물 중 하나일 수 있다.

[0150] [화학식 3-1]



[0151]

[0152] [화학식 3-2]



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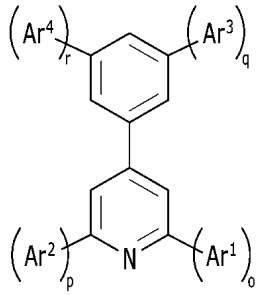
[0154] [화학식 3-3]



[0155]

[0156] 상기 화학식 3-1 내지 3-3에서,

[0157] Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

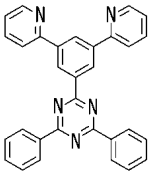
[0158] X는 탄소(C) 또는 질소(N)이며,

[0159] o, p, q, r 은 각각 1 내지 3의 정수이고

[0160] o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4 는 서로 같거나 다르다.

[0161] 상기 Ar^1 내지 Ar^4는 페닐기, 나프틸기, 피리딘기, 퀴놀린기 또는 이소퀴놀린기일 수 있다.

[0162] 본 발명에서 상기 제1 화합물은 하기 화학식 1-1 내지 화학식 1-249 로 표시되는 화합물로 이루어진 군으로부터 선택되는 하나일 수 있다.



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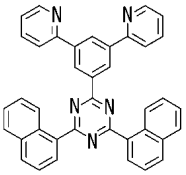

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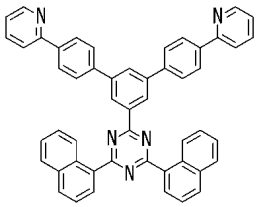

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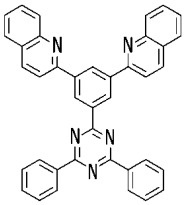

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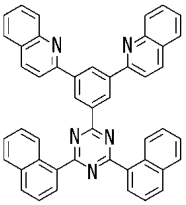

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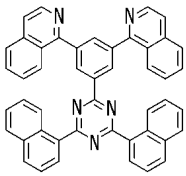

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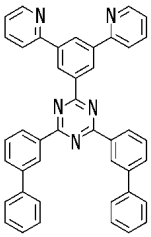

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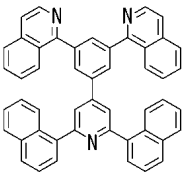

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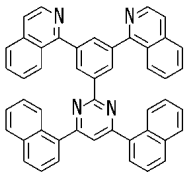

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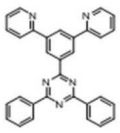
[0163]

[0164]



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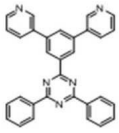

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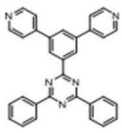

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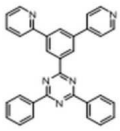

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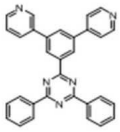

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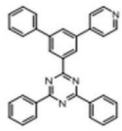

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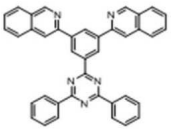

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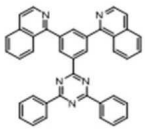

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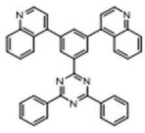

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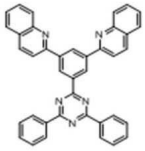

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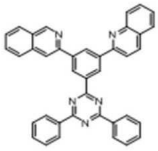

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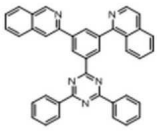

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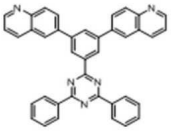

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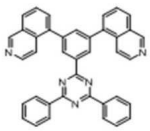

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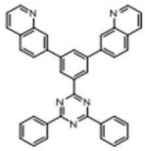

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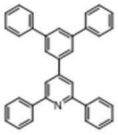

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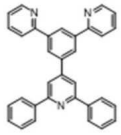

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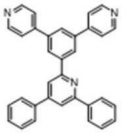

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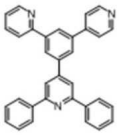

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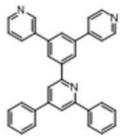

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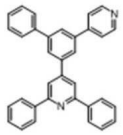

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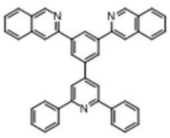

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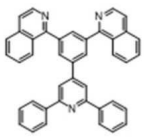

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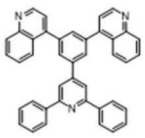

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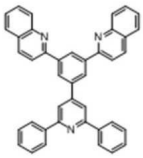

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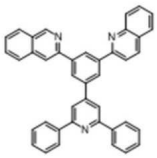

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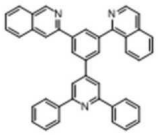

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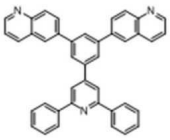

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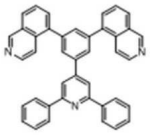

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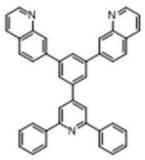

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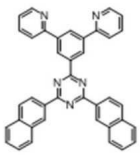

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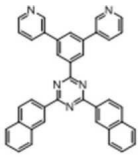

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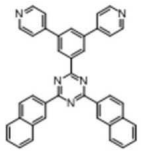

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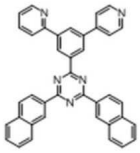

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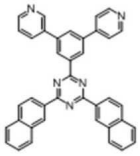

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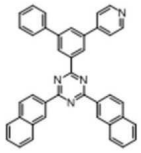

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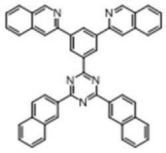

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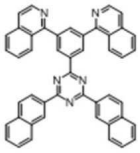

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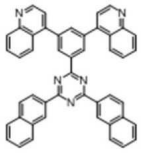

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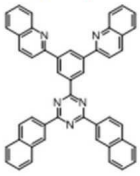

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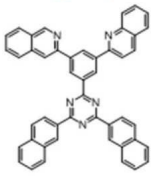

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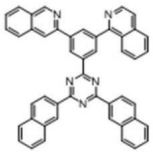

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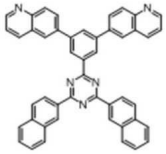

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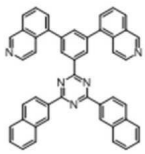

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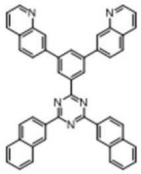

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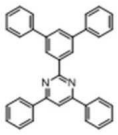

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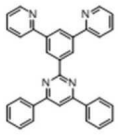

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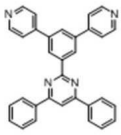

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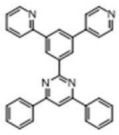

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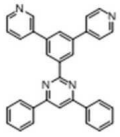

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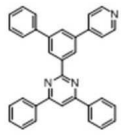

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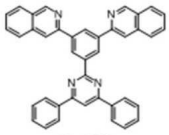

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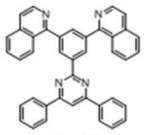

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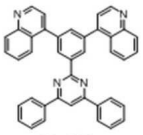

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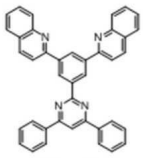

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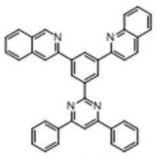

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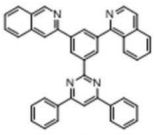

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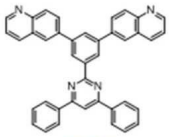

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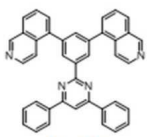

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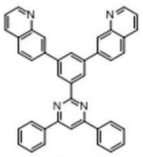

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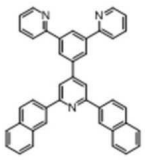

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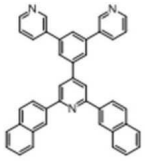

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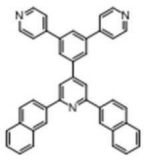

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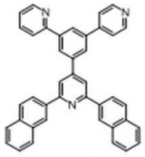

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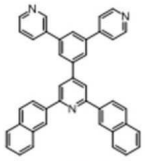

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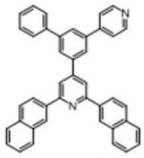

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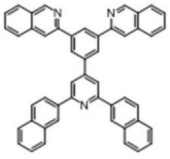

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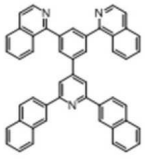

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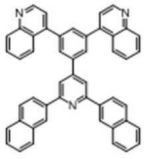

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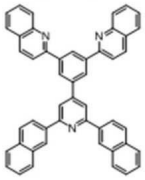

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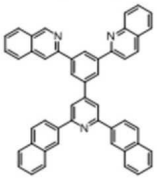

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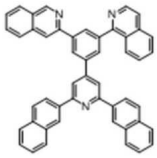

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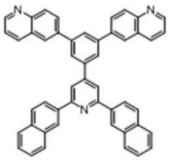

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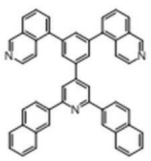

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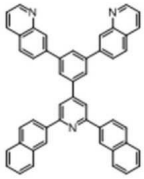

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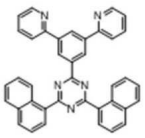

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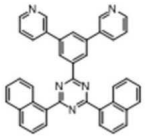

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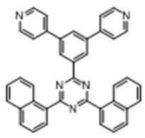

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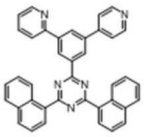

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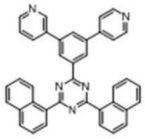

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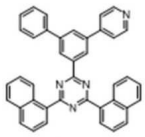

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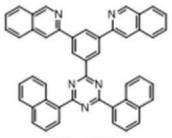

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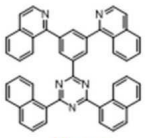

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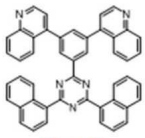

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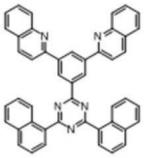

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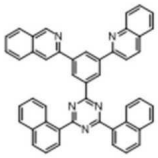

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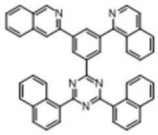

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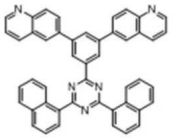

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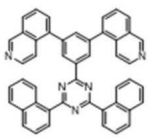

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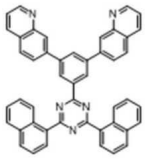

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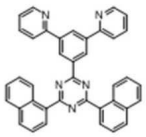

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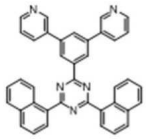

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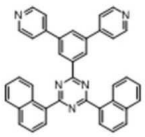

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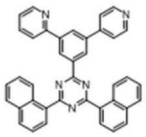

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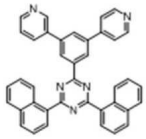

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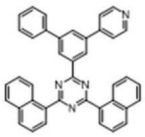

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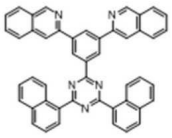

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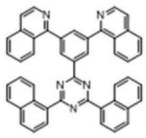

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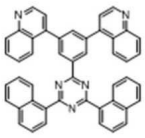

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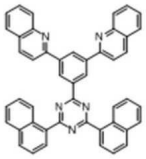

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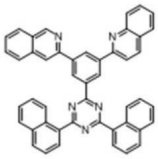

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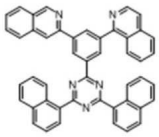

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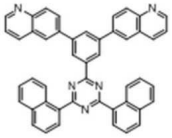

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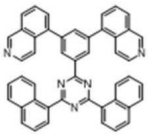

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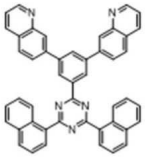

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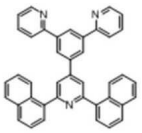

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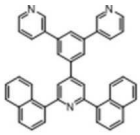

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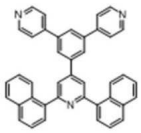

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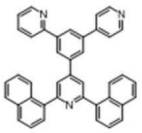

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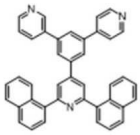

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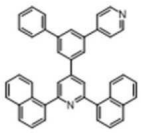

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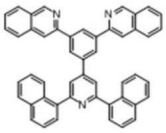

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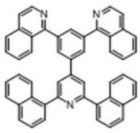

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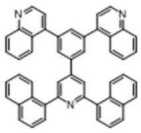

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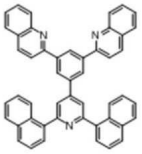

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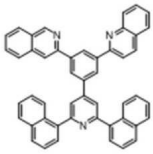

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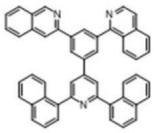

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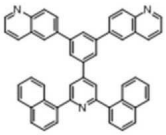

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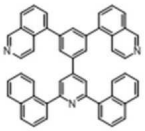

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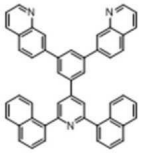

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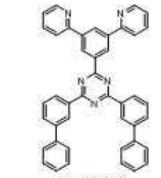
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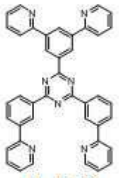
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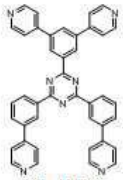
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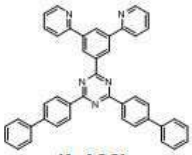
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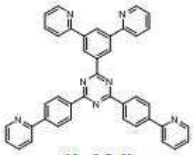
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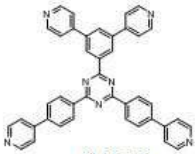
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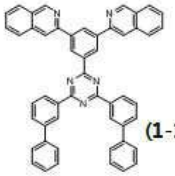
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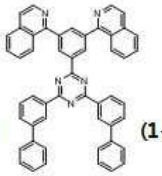
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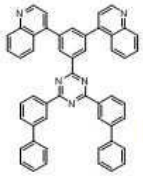
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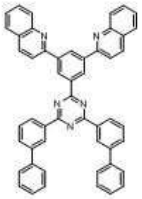
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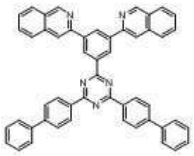
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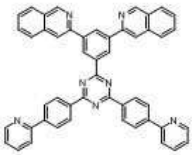
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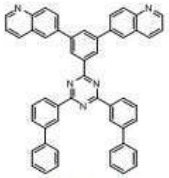
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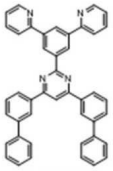

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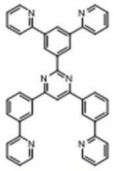

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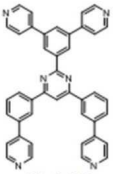

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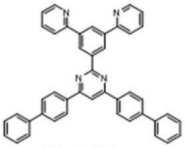

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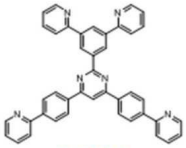

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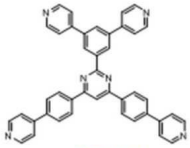

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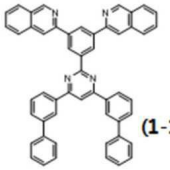

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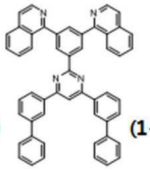

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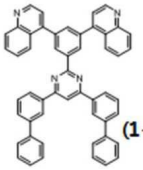

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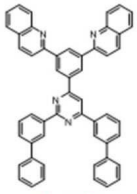

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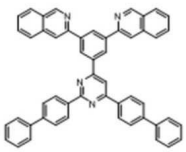

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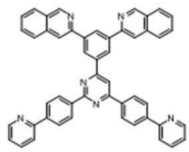

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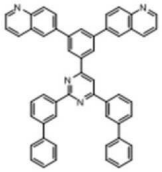

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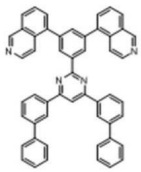

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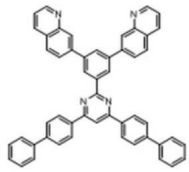

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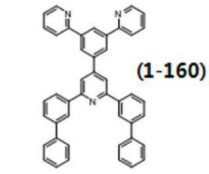

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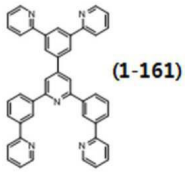

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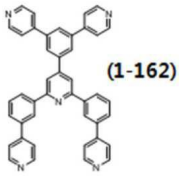

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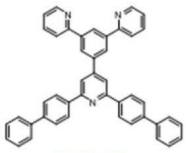

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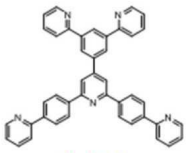

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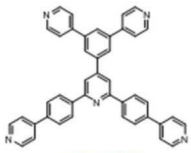

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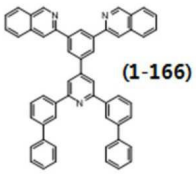

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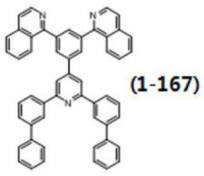

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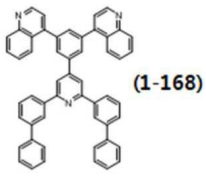

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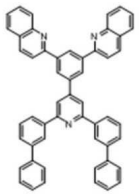

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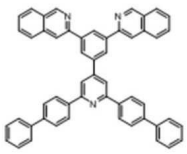

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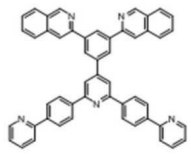

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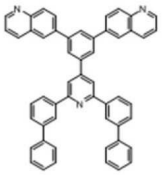

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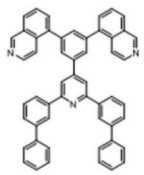

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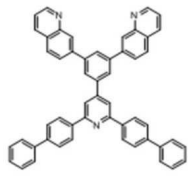

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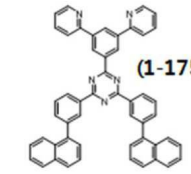
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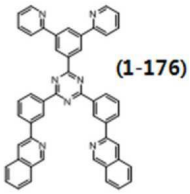
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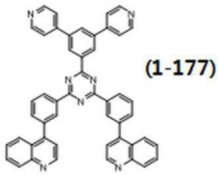
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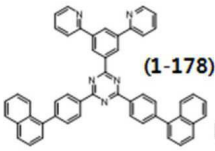
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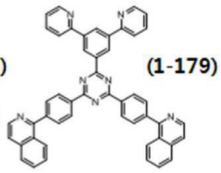
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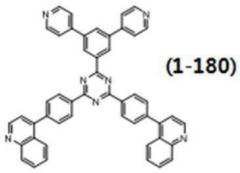
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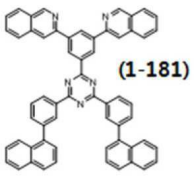
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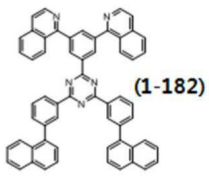
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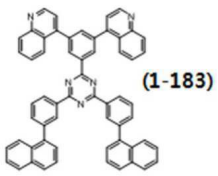
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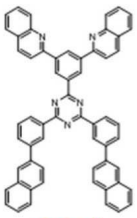
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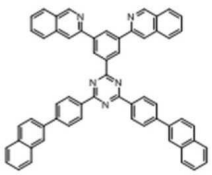
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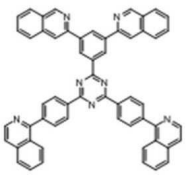
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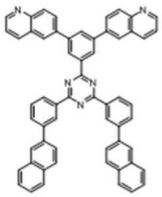
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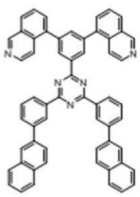
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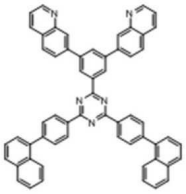
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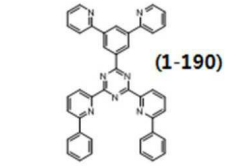

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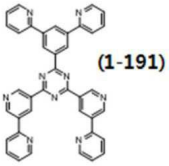

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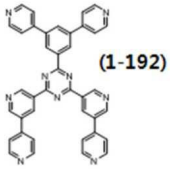

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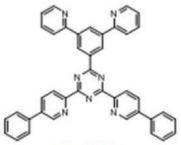

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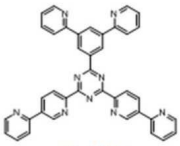

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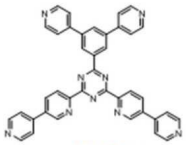

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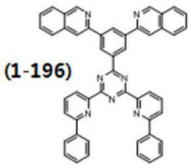

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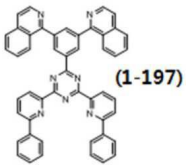

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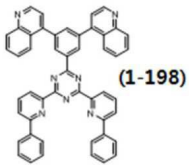

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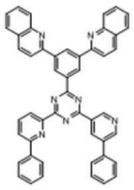

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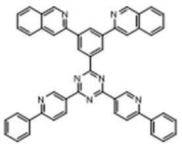

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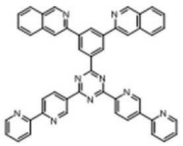

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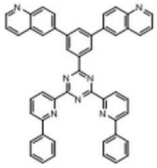

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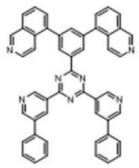

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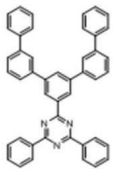

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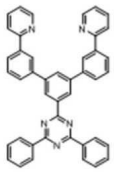

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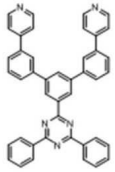

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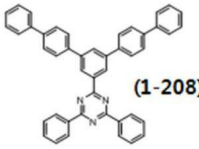

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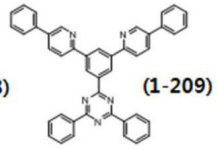

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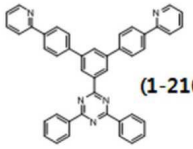

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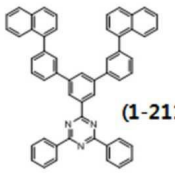

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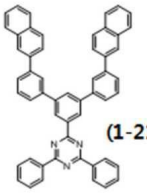

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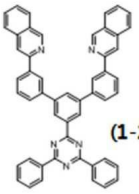

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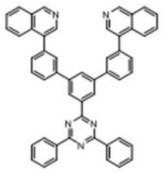

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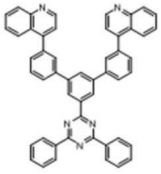

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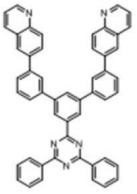

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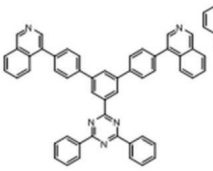

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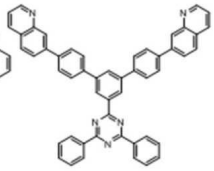

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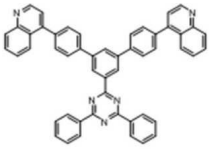

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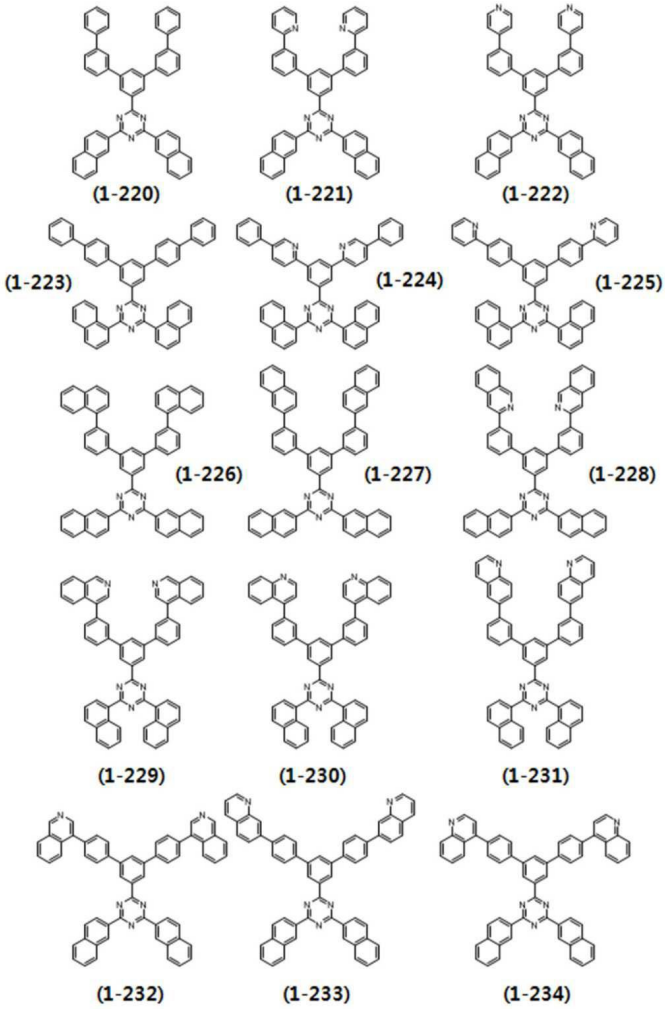
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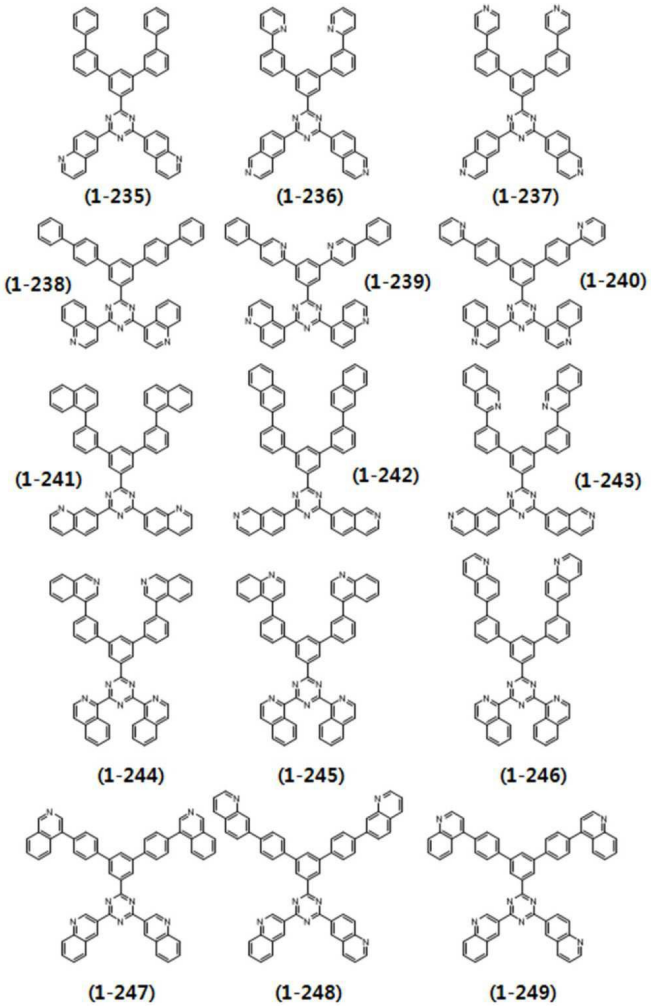


[0167] 즉 본 발명 일 실시예에 따른 유기 발광 소자는 전자 수송층(40)이 상기 화학식 1-1 내지 1-9의 화합물을 포함하는 군으로부터 선택되는 하나 이상의 화합물을 포함할 수 있다.

[0168] 전자 수송층(40)의 두께는 약 100Å 내지 1000Å, 구체적으로는 100Å 내지 500Å일 수 있다. 전자 수송층(40)의 두께가 전술한 바와 같은 범위를 만족할 경우, 실질적인 구동 전압 상승 없이 우수한 전자 수송 특성을 얻을 수 있다.

[0169] 전자 수송층(40)은 진공 증착법, 또는 스핀 코티법, 캐스트법 등의 다양한 방법을 이용하여 형성한다. 진공 증착법 및 스핀 코팅법에 의해 형성하는 경우, 그 조건은 사용하는 화합물에 따라 다를 수 있다.

[0170] 본 발명 다른 실시예에 따른 유기 발광 소자는, 상기 화학식 1로 표시되는 화합물에 Liq (lithium quinolate)가 도핑되어 전자 수송층을 구성할 수 있다. 이때 도핑농도는 50 중량%일 수 있다. 즉, 상기 화학식 1로 표시되는 화합물과 Liq가 1:1의 중량비로 증착되어 전자 수송층을 형성할 수 있다.

[0171] 본 발명의 일 실시예에 따른 유기 발광 소자는 유기 발광 소자의 발광층(50)의 호스트로 상기 화학식 2로 표현되는 안트라센계 화합물을 사용하고, 동시에 유기 발광 소자의 전자 수송층으로 상기 화학식 1로 표현되는 아진계 화합물을 사용함으로써 캐리어 밸런스를 향상시키고, 유기 발광 소자의 효율을 개선하고 수명을 증가시켰다.

[0172] 그러면, 도 3을 참고로 하여 본 발명 일 실시예에 따른 유기 발광 소자를 설명한다.

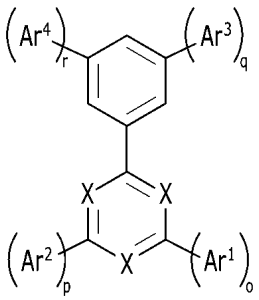
[0173] 도 3을 참고하면, 본 실시예에 따른 유기 발광 소자는 앞선 실시예와 마찬가지로, 서로 마주하는 애노드(10)와 캐소드(20), 애노드(10)와 캐소드(20) 사이에 위치하는 발광층(50), 애노드(10)와 발광층(50) 사이에 위치하는 정공 수송층(30), 캐소드(20)와 발광층(50) 사이에 위치하는 전자 수송층(40)을 포함하고, 발광층(50)과 전자 수송층(40) 사이에 위치하는 정공 저지층(60)을 추가로 포함한다. 또한, 도시되지는 않았지만 발광층(50)과 정

공 수송층(30) 사이에 위치하는 전자 저지층을 추가로 포함할 수 있다.

[0174] 본 실시예에 따른 유기 발광 소자에서, 캐소드, 애노드 및 발광층에 대한 내용은 도 1의 실시예에 따른 유기 발광 소자에서 설명한 내용과 동일하다. 유사한 구성요소에 대한 구체적인 설명은 생략한다.

[0175] 본 실시예에 따른 유기 발광 소자에서 정공 저지층(60)은 하기 화학식 1로 표시되는 제1 화합물을 포함할 수 있다.

[0176] [화학식 1]



[0177]

[0178] 상기 화학식 1에서,

[0179] Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

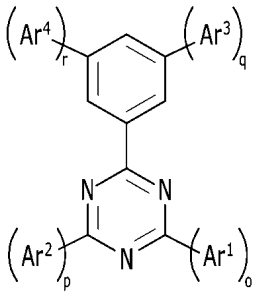
[0180] X는 탄소(C) 또는 질소(N)이며,

[0181] o, p, q, r은 각각 1 내지 3의 정수이고

[0182] o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4는 서로 같거나 다르다. .

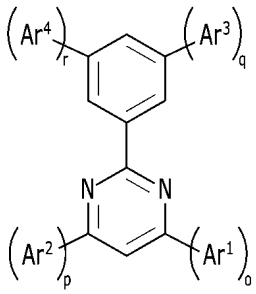
[0183] 상기 제1 화합물은 하기 화학식 3-1 내지 3-3으로 표시되는 화합물 중 하나일 수 있다.

[0184] [화학식 3-1]



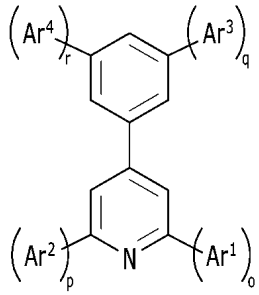
[0185]

[0186] [화학식 3-2]



[0187]

[0188] [화학식 3-3]



[0189]

[0190] 상기 화학식 3-1 내지 3-3에서,

[0191] Ar^1 내지 Ar^4는 각각 치환 또는 비치환의 탄소수 5 내지 30의 아릴기 또는 치환 또는 비치환의 탄소수 5 내지 30의 헤테로 아릴기이고,

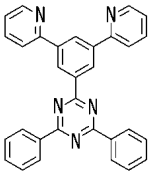
[0192] X는 탄소(C) 또는 질소(N)이며,

[0193] o, p, q, r 은 각각 1 내지 3의 정수이고

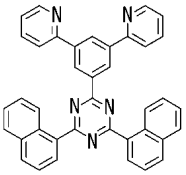
[0194] o, p, q, r 이 2 이상인 경우 각각의 Ar^1 내지 Ar^4 는 서로 같거나 다르다.

[0195] 상기 제1 화합물의 Ar^1 내지 Ar^4는 페닐기, 나프틸기, 피리딘기, 퀴놀린기 또는 이소퀴놀린기일 수 있다.

[0196] 본 발명의 일 실시예에서 상기 제1 화합물은 하기 화학식 1-249 내지 화학식 1-9 로 표시되는 화합물로 이루어진 군으로부터 선택되는 하나일 수 있다.



(1-1)



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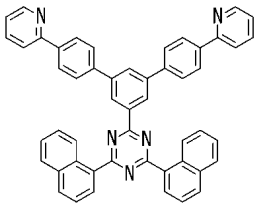

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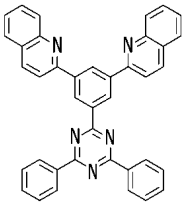

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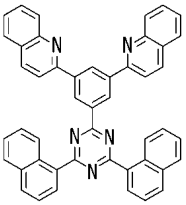

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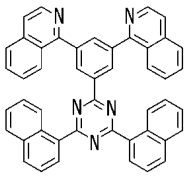

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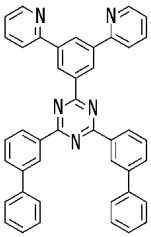

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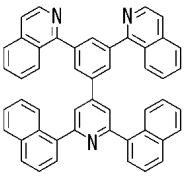

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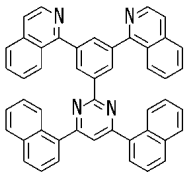
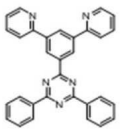


(1-9)

[0197]

[0198]



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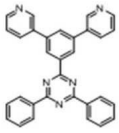

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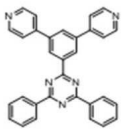

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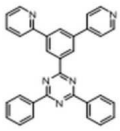

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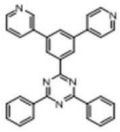

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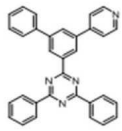

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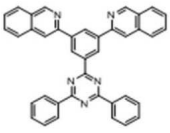

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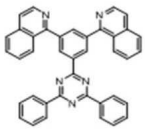

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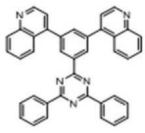

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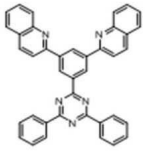

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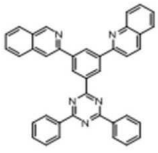

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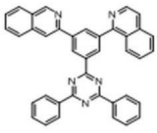

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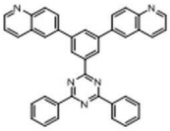

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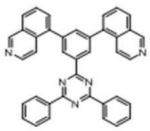

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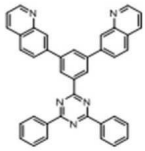

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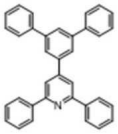
[0199]



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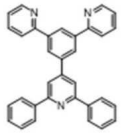

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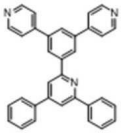

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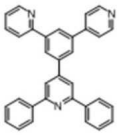

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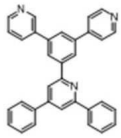

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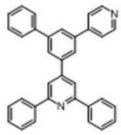

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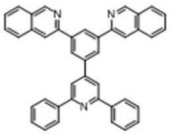

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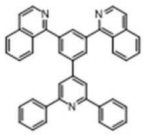

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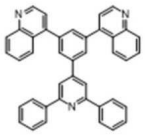

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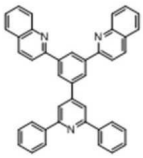

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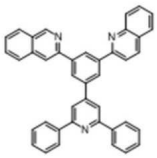

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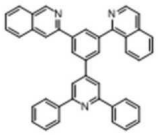

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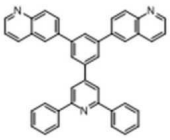

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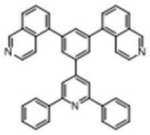

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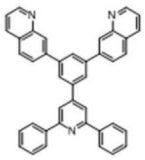

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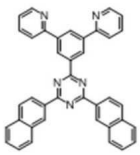

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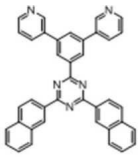

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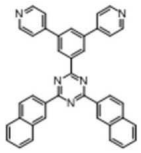

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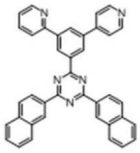

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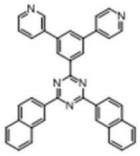

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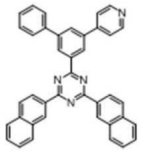

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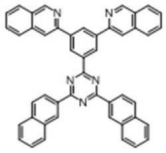

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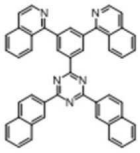

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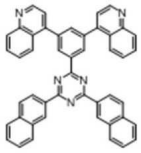

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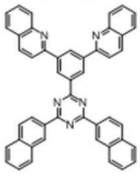

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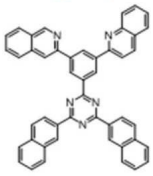

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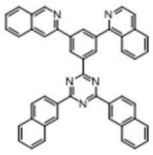

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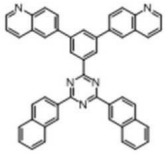

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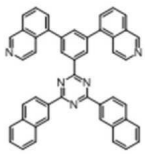

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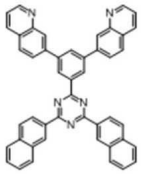

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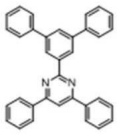

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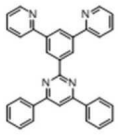

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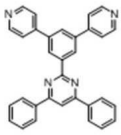

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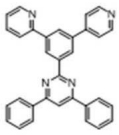

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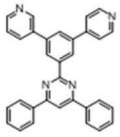

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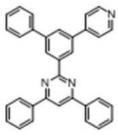

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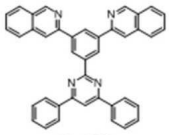

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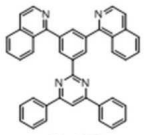

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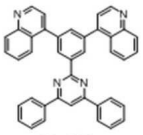

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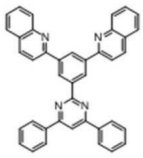

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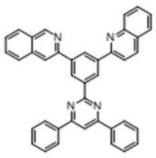

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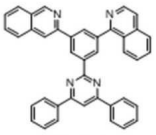

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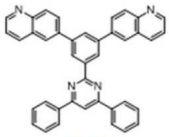

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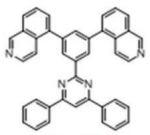

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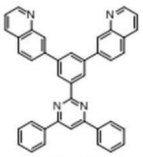

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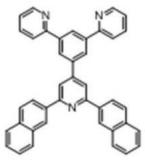

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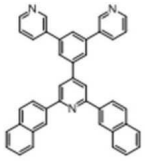

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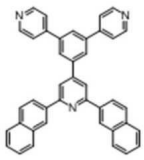

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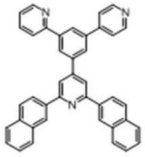

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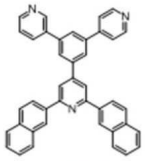

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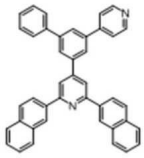

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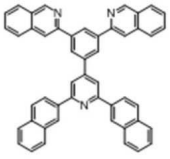

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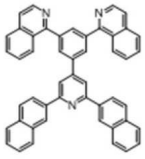

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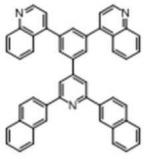

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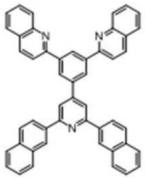

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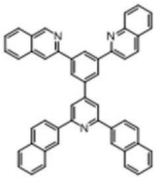

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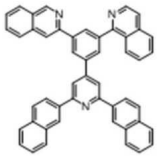

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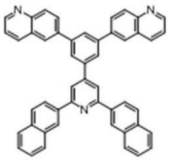

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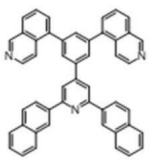

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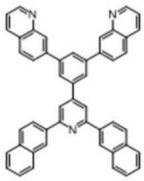

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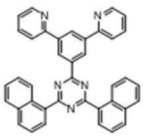

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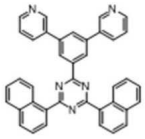

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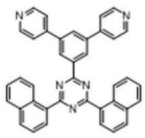

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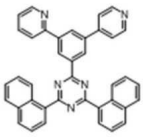

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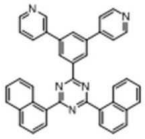

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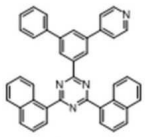

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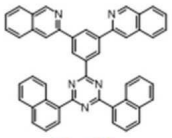

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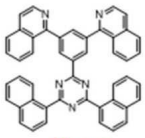

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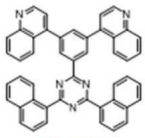

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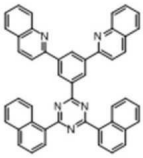

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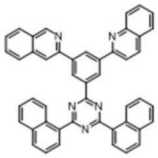

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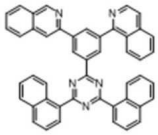

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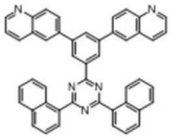

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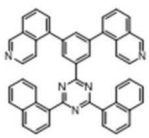

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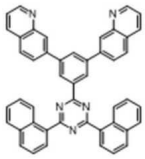

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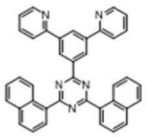

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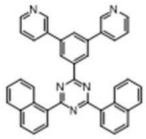

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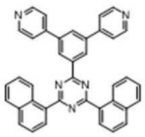

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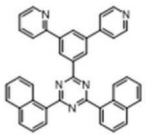

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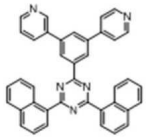

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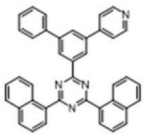

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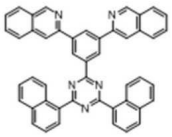

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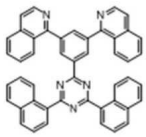

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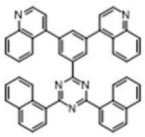

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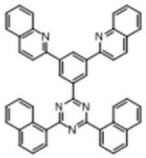

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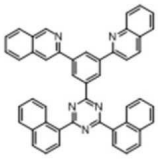

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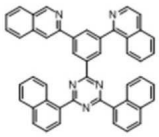

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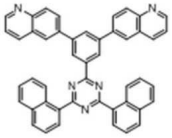

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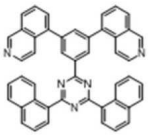

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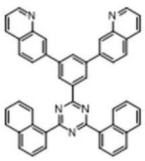

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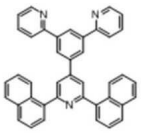

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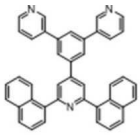

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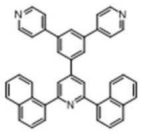

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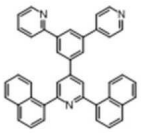

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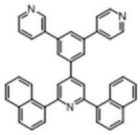

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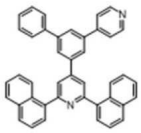

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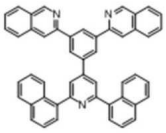

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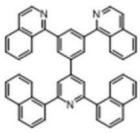

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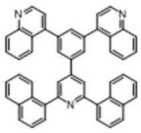

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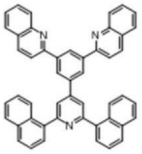

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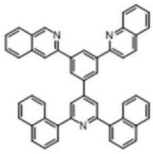

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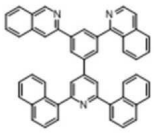

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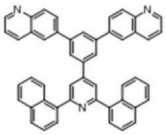

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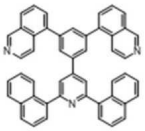

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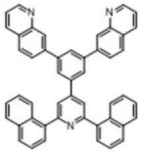

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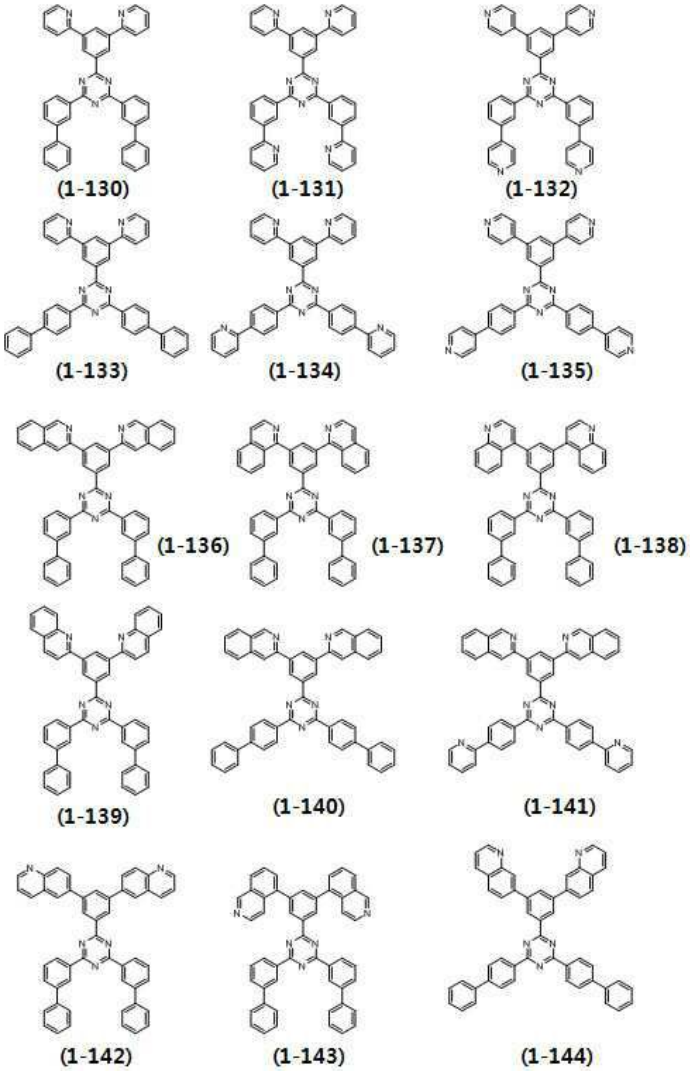
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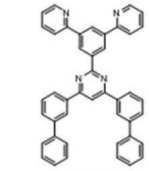

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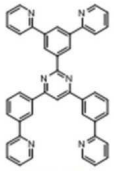

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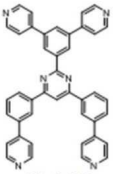

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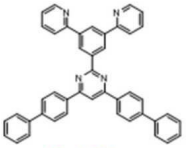

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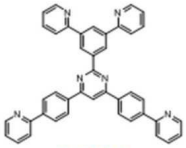

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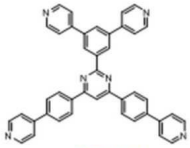

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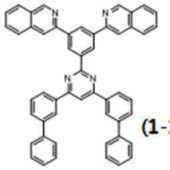

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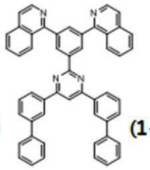

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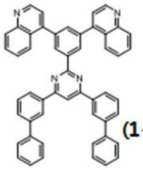

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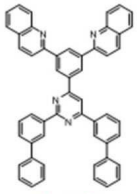

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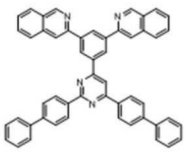

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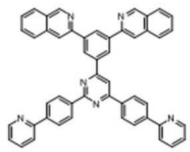

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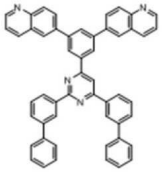

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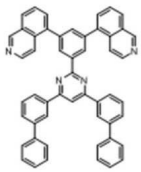

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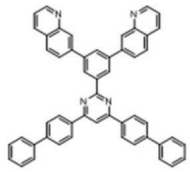

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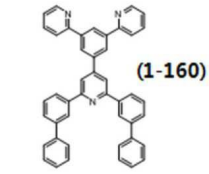
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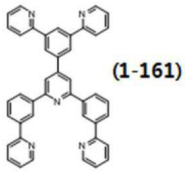
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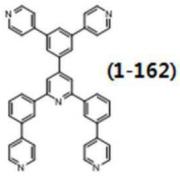
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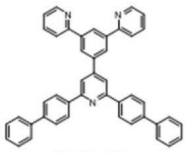
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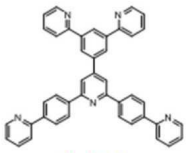
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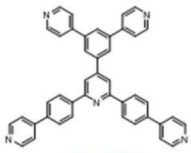
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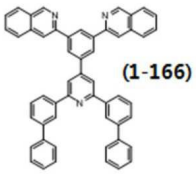
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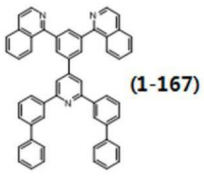
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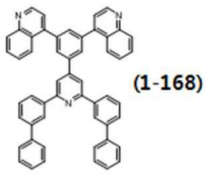
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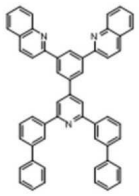
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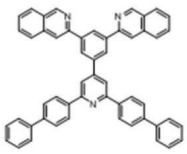
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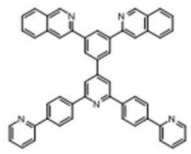
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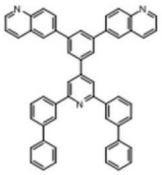
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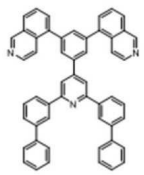
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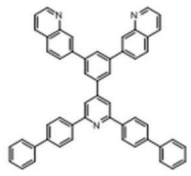
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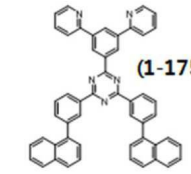
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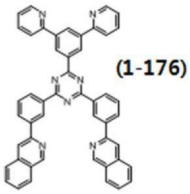
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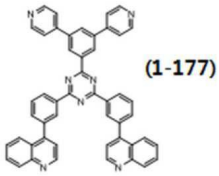
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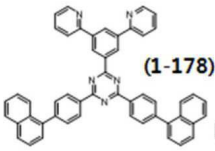
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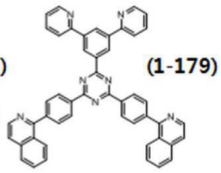
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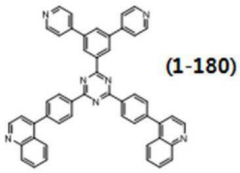
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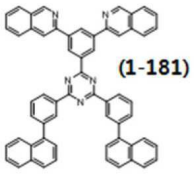
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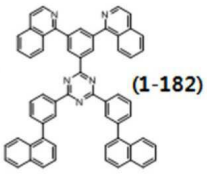
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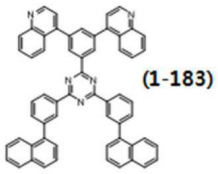
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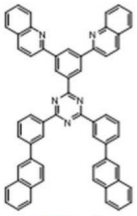
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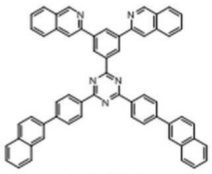
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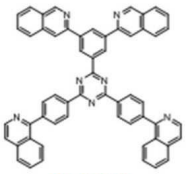
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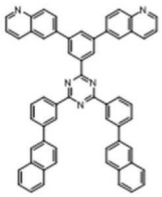
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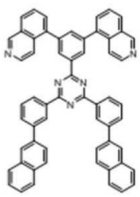
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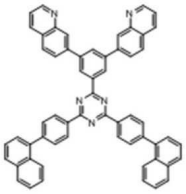
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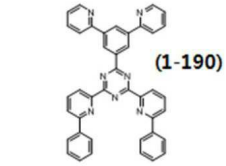

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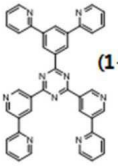

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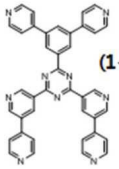

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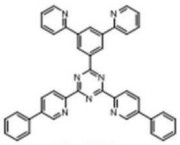

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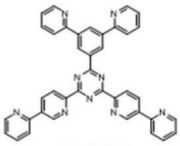

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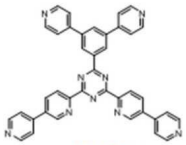

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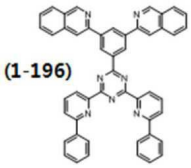

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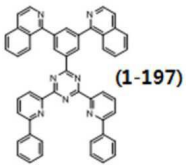

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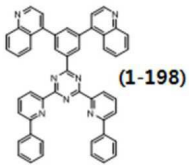

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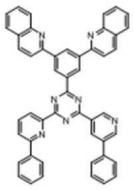

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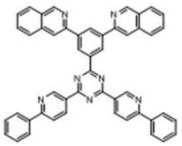

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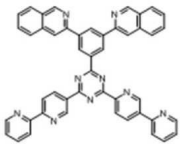

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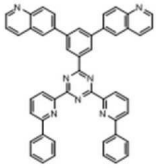

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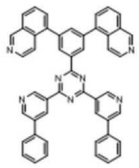

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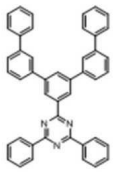

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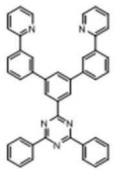

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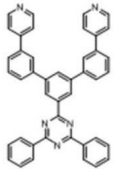

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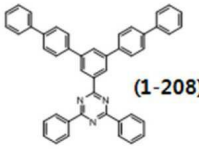

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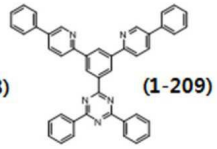

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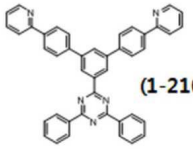

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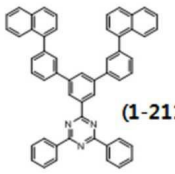

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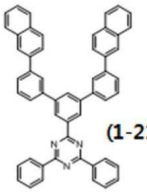

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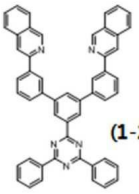

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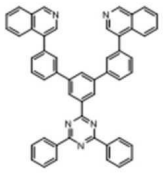

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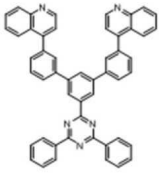

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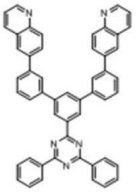

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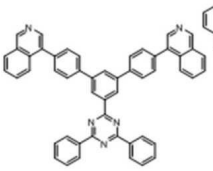

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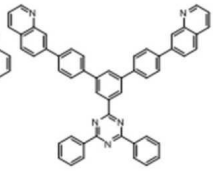

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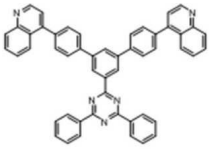

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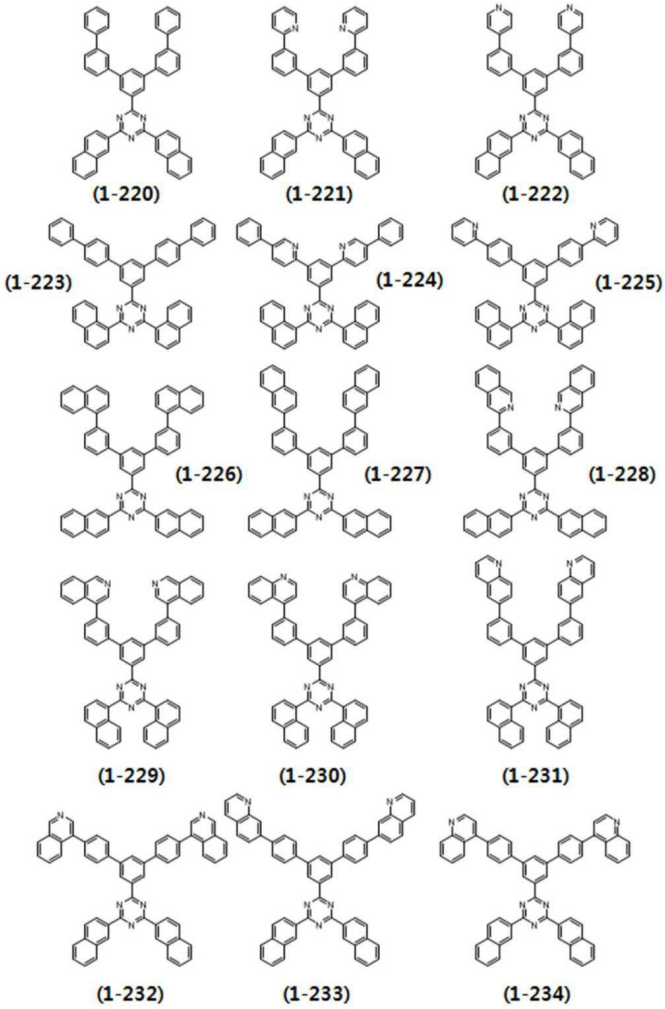
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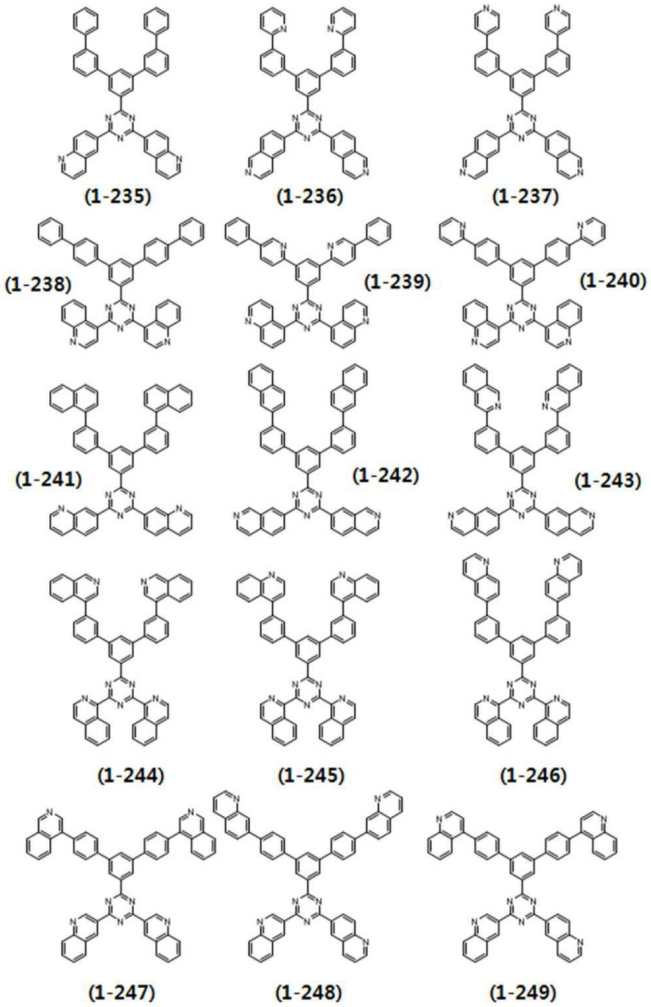


[0201] 즉 본 발명 일 실시예에 따른 유기 발광 소자는 정공 저지층이 상기 화학식 1-1 내지 1-249의 화합물을 포함하는 군으로부터 선택되는 하나 이상의 화합물을 포함할 수 있다.

[0202] 본 실시예에서 발광층(50)에 관한 설명은 앞서 설명한 바와 동일하다. 즉 화학식 2로 표현되는 제2 화합물이 발광층(50)에 호스트로 포함될 수 있다. 유사한 구성요소에 대한 구체적인 설명은 생략한다.

[0203] 본 실시예에서 전자수송층(40)으로는 퀴놀린 유도체, 특히 tris(8-hydroxyquinolinato)aluminium (Alq3), 3-(4-biphenyl)-4-phenyl-5-(4-tert- butylphenyl)-1,2,4-triazole (TAZ), (2-methyl-8-quninolinato)-4-phenylphenolate (Balq), bis(10-hydroxybenzo(h)quinolinato)beryllium (Bebq2) 또는 4,7-diphenyl-l-10-phenanthroline (BPhen)과 같은 공지의 재료를 사용할 수 있다. 또는 상기 공지의 재료에 lithium quinolate((Liq)를 도핑하여 사용할 수 있다. 이때 도핑 농도는 50 중량% 일 수 있다.

[0204] 본 발명의 일 실시예에 따른 유기 발광 장치는, 애노드/정공 주입층/발광층/캐소드, 애노드/정공 주입층/정공 수송층/발광층/전자 수송층/캐소드, 애노드/정공 주입층/정공 수송층/발광층/전자 수송층/전자 주입층/캐소드 구조 또는 애노드/정공 주입층/정공 수송층/전자 저지층/발광층/정공 저지층/ 전자 수송층/ 전자 주입층/ 캐소드 구조를 가질 수 있다. 또는 상기 유기 발광 장치는 애노드/정공 주입기능 및 정공 수송기능을 동시에 갖는 기능층/발광층/전자 수송층/캐소드, 또는 애노드/정공 주입기능 및 정공 수송기능을 동시에 갖는 기능층/발광층/전자 수송층/전자 주입층/캐소드 구조를 가질 수 있다. 또는 상기 유기 발광 장치는 애노드/정공 수송층/발광층/전자 주입 및 전자 수송기능을 동시에 갖는기능층/캐소드, 애노드/정공 주입층/발광층/전자 주입 및 전자 수송기능을 동시에 갖는 기능층/캐소드, 또는 애노드/정공 주입층/정공 수송층/발광층/전자 주입 및 전자 수송기능을 동시에 갖는기능층/캐소드 구조를 가질 수 있으나, 이에 한정되는 것은 아니다.

[0205] 일 구현예에 따른 유기 발광 소자는 전면 발광형, 배면 발광형, 양면 발광형 등 다양한 구조로 적용 가능하다.

[0206] 일 구현예를 따르는 유기 발광 소자는 다양한 형태의 평판 표시 장치, 예를 들면 수동 매트릭스 유기 발광 표시 장치 및 능동 매트릭스 유기 발광 표시 장치에 구비될 수 있다. 능동 매트릭스 유기 발광 표시 장치에 구비되는 경우, 애노드(10)는 화소 전극으로서 박막 트랜지스터에 전기적으로 연결될 수 있다

[0207] 그러면, 이하에서 본 발명의 일 실시예에 따른 유기 발광 소자를 포함하는 유기 발광 표시 장치에 대하여 도 4 내지 도 6을 참고로 하여 상세하게 설명한다.

[0208] 도 4는 본 발명의 실시예에 따른 유기 발광 표시 장치의 배치도이다. 도 5는 도 4의 유기 발광 표시 장치의 V-V 단면선에 따른 단면도이다. 도 6은 도 4의 유기 발광 표시 장치의 VI-VI 단면선에 따른 단면도이다.

[0209] 투명한 유리 따위로 만들어진 기판(110) 위에 산화규소 또는 질화규소 등으로 만들어진 차단층(blocking layer)(111)이 형성되어 있다. 차단층(111)은 이중막 구조를 가질 수 있다.

[0210] 차단층(111) 위에 다결정 규소 따위로 만들어진 복수 쌍의 제1 및 제2 섬형 반도체(151a, 151b)가 형성되어 있다. 섬형 반도체(151a, 151b) 각각은 n형 또는 p형의 도전성 불순물을 포함하는 복수의 불순물 영역(extrinsic region)과 도전성 불순물을 거의 포함하지 않은 적어도 하나의 진성 영역(intrinsic region)을 포함한다.

[0211] 제1 반도체(151a)에서, 불순물 영역은 제1 소스 및 드레인 영역(source/drain region)(153a, 155a)과 중간 영역(intermediate region)(1535)을 포함하며, 이들은 n형 불순물로 도핑되어 있고 서로 분리되어 있다. 진성 영역은 불순물 영역(153a, 1535, 155a) 사이에 위치한 한 쌍의 제1 채널 영역(channel region)(154a1, 154a2) 등을 포함한다.

[0212] 제2 반도체(151b)에서, 불순물 영역은 제2 소스 및 드레인 영역(153b, 155b)을 포함하며, 이들은 p형 불순물로 도핑되어 있고 서로 분리되어 있다. 진성 영역은 제2 소스 및 드레인 영역(153b, 155b) 사이에 위치한 제2 채널 영역(154b)과 제2 소스 및 드레인 영역(153b)으로부터 위로 길게 뻗어 나온 유지 영역(storage region)(157)을 포함한다.

[0213] 불순물 영역은 채널 영역(154a1, 154a2, 154b)과 소스 및 드레인 영역(153a, 155a, 153b, 155b) 사이에 위치한 저농도 도핑 영역(lightly doped region)(도시하지 않음)을 더 포함할 수 있다. 이러한 저농도 도핑 영역은 불순물을 거의 포함하지 않는 오프셋 영역(offset region)으로 대체할 수 있다.

[0214] 이와는 달리, 제1 반도체(151a)의 불순물 영역(153a, 155a)이 p형 불순물로 도핑되거나, 제2 반도체(151b)의 불순물 영역(153b, 155b)이 n형 불순물로 도핑될 수 있다. p형의 도전성 불순물로는 붕소(B), 갈륨(Ga) 등을 들 수 있고, n형의 도전성 불순물로는 인(P), 비소(As) 등을 들 수 있다.

[0215] 반도체(151a, 151b) 및 차단층(111) 위에는 산화규소 또는 질화규소로 이루어진 게이트 절연막(gate insulating layer)(140)이 형성되어 있다.

[0216] 게이트 절연막(140) 위에는 제1 제어 전극(control electrode)(124a)을 포함하는 복수의 게이트선(gate line)(121)과 복수의 제2 제어 전극(124b)을 포함하는 복수의 게이트 도전체(gate conductor)가 형성되어 있다.

[0217] 게이트선(121)은 게이트 신호를 전달하며 주로 가로 방향으로 뻗어 있다. 제1 제어 전극(124a)은 게이트선(121)으로부터 위로 뻗어 제1 반도체(151a)와 교차하는데, 제1 채널 영역(154a1, 154a2)과 중첩한다. 각 게이트선(121)은 다른 층 또는 외부 구동 회로와의 접속을 위하여 면적이 넓은 끝 부분을 포함할 수 있다. 게이트 신호를 생성하는 게이트 구동 회로가 기판(110) 위에 집적되는 경우 게이트선(121)이 연장되어 게이트 구동 회로와 직접 연결될 수 있다.

[0218] 제2 제어 전극(124b)은 게이트선(121)과 분리되어 있고 제2 반도체(151b)의 제2 채널 영역(154b)과 중첩한다. 제2 제어 전극(124b)은 연장되어 유지 전극(storage electrode)(127)을 이루며, 유지 전극(127)은 제2 반도체(151b)의 유지 영역(157)과 중첩한다.

[0219] 게이트 도전체(121, 124b)는 알루미늄(Al)이나 알루미늄 합금 등 알루미늄 계열 금속, 은(Ag)이나 은 합금 등 은 계열의 금속, 구리(Cu)나 구리 합금 등 구리 계열의 금속, 몰리브덴(Mo)이나 몰리브덴 합금 등 몰리브덴 계열의 금속, 크롬(Cr), 탄탈륨(Ta) 및 티타늄(Ti) 따위로 만들어질 수 있다. 그러나 이들은 물리적 성질이 다른 두 개의 도전막(도시하지 않음)을 포함하는 다중막 구조를 가질 수도 있다. 이 중 한 도전막은 신호 지연이나

전압 강하를 줄일 수 있도록 낮은 비저항(resistivity)의 금속, 예를 들면 알루미늄 계열 금속, 은 계열 금속, 구리 계열 금속 등으로 만들어진다. 이와는 달리, 다른 도전막은 다른 물질, 특히 ITO(indium tin oxide) 및 IZO(indium zinc oxide)와의 물리적, 화학적, 전기적 접촉 특성이 우수한 물질, 이를테면 몰리브덴 계열 금속, 크롬, 티타늄, 탄탈륨 등으로 만들어진다. 이러한 조합의 좋은 예로는 크롬 하부막과 알루미늄 (합금) 상부막 및 알루미늄 (합금) 하부막과 몰리브덴 (합금) 상부막을 들 수 있다. 그러나 게이트 도전체(121, 124b)는 이외에도 여러 가지 다양한 여러 가지 금속과 도전체로 만들어질 수 있다.

[0220] 게이트 도전체(121, 124b)의 측면은 기판(110) 면에 대하여 경사져 있으며 그 경사각은 약 30-80° 인 것이 바람직하다.

[0221] 게이트 도전체(121, 124b) 위에는 층간 절연막(interlayer insulating film)(160)이 형성되어 있다. 층간 절연막(160)은 질화규소나 산화규소 따위의 무기 절연물, 유기 절연물, 저유전율 절연물 따위로 만들어진다. 저유전율 절연물의 유전 상수는 4.0 이하인 것이 바람직하며 플라스마 화학 기상 증착(plasma enhanced chemical vapor deposition, PECVD)으로 형성되는 a-Si:C:O, a-Si:O:F 등이 그 예이다. 유기 절연물 중 감광성(photosensitivity)을 가지는 것으로 층간 절연막(160)을 만들 수도 있으며, 층간 절연막(160)의 표면은 평탄할 수 있다.

[0222] 층간 절연막(160)에는 제2 제어 전극(124b)을 노출하는 복수의 접촉 구멍(contact hole)(164)이 형성되어 있다. 또한, 층간 절연막(160)과 게이트 절연막(140)에는 소스 및 드레인 영역(153a, 153b, 155a, 155b)을 드러내는 복수의 접촉 구멍(163a, 163b, 165a, 165b)이 형성되어 있다.

[0223] 층간 절연막(160) 위에는 데이터선(data line)(171), 구동 전압선(driving voltage line)(172) 및 제1 및 제2 출력 전극(output electrode)(175a, 175b)을 포함하는 복수의 데이터 도전체(data conductor)가 형성되어 있다.

[0224] 데이터선(171)은 데이터 신호를 전달하며 주로 세로 방향으로 뻗어 게이트선(121)과 교차한다. 각 데이터선(171)은 접촉 구멍(163a)을 통하여 제1 소스 및 드레인 영역(153a)과 연결되어 있는 복수의 제1 입력 전극(input electrode)(173a)을 포함하며, 다른 층 또는 외부 구동 회로와의 접속을 위하여 면적이 넓은 끝 부분을 포함할 수 있다. 데이터 신호를 생성하는 데이터 구동 회로가 기판(110) 위에 집적되어 있는 경우, 데이터선(171)이 연장되어 데이터 구동 회로와 직접 연결될 수 있다.

[0225] 구동 전압선(172)은 구동 전압을 전달하며 주로 세로 방향으로 뻗어 게이트선(121)과 교차한다. 각 구동 전압선(172)은 접촉 구멍(163b)을 통하여 제2 소스 및 드레인 영역(153b)과 연결되어 있는 복수의 제2 입력 전극(173b)을 포함한다. 구동 전압선(172)은 유지 전극(127)과 중첩하며, 서로 연결될 수 있다.

[0226] 제1 출력 전극(175a)은 데이터선(171) 및 구동 전압선(172)으로부터 분리되어 있다. 제1 출력 전극(175a)은 접촉 구멍(165a)을 통하여 제1 소스 및 드레인 영역(155a)에 연결되어 있고, 접촉 구멍(164)을 통하여 제2 제어 전극(124b)과 연결되어 있다.

[0227] 제2 출력 전극(175b)은 데이터선(171), 구동 전압선(172) 및 제1 출력 전극(175a)으로부터 분리되어 있으며, 접촉 구멍(165b)을 통하여 제2 소스 및 드레인 영역(155b)에 연결되어 있다.

[0228] 데이터 도전체(171, 172, 175a, 175b)는 몰리브덴, 크롬, 탄탈륨 및 티타늄 등 내화성 금속 또는 이들의 합금으로 만들어지는 것이 바람직하며, 내화성 금속 따위의 도전막(도시하지 않음)과 저저항 물질 도전막(도시하지 않음)으로 이루어진 다층막 구조를 가질 수 있다. 다층막 구조의 예로는 크롬 또는 몰리브덴 (합금) 하부막과 알루미늄 (합금) 상부막의 이중막, 몰리브덴 (합금) 하부막과 알루미늄 (합금) 중간막과 몰리브덴 (합금) 상부막의 삼중막을 들 수 있다. 그러나 데이터 도전체(171, 172, 175a, 175b)는 이외에도 여러 가지 다양한 여러 가지 금속과 도전체로 만들어질 수 있다.

[0229] 게이트 도전체(121, 121b)와 마찬가지로 데이터 도전체(171, 172, 175a, 175b) 또한 그 측면이 기판(110) 면에 대하여 약 30-80° 의 경사각으로 기울어진 것이 바람직하다.

[0230] 데이터 도전체(171, 172, 175a, 175b) 위에는 보호막(passivation layer)(180)이 형성되어 있다. 보호막(180)은 무기물, 유기물, 저유전율 절연 물질 따위로 이루어진다.

[0231] 보호막(180)에는 제2 출력 전극(175b)을 드러내는 복수의 접촉 구멍(185)이 형성되어 있다. 보호막(180)에는 또한 데이터선(171)의 끝 부분을 드러내는 복수의 접촉 구멍(도시하지 않음)이 형성될 수 있으며, 보호막(180)과 층간 절연막(160)에는 게이트선(121)의 끝 부분을 드러내는 복수의 접촉 구멍(도시하지 않음)이 형성될 수

있다.

[0232] 보호막(180) 위에는 복수의 화소 전극(pixel electrode)(190)이 형성되어 있다. 화소 전극(190)은 접촉 구멍(185)을 통하여 제2 출력 전극(175b)과 물리적ㅇ전기적으로 연결되어 있으며, ITO 또는 IZO 등의 투명한 도전 물질이나 알루미늄, 은 또는 그 합금 등의 반사성 금속으로 만들어질 수 있다.

[0233] 보호막(180) 위에는 또한 복수의 접촉 보조 부재(contact assistant)(도시하지 않음) 또는 연결 부재(connecting member)(도시하지 않음)가 형성될 수 있으며, 이들은 게이트선(121)과 데이터선(171)의 노출된 끝 부분과 연결된다.

[0234] 보호막(180) 위에는 격벽(partition)(360)이 형성되어 있다. 격벽(360)은 화소 전극(190) 가장자리 주변을 둑(bank)처럼 둘러싸서 개구부(opening)를 정의하며 유기 절연물 또는 무기 절연물로 만들어진다. 격벽(360)은 또한 검정색 안료를 포함하는 감광제로 만들어질 수 있는데, 이 경우 격벽(360)은 차광 부재의 역할을 하며 그 형성 공정이 간단하다.

[0235] 화소 전극(190) 위에는 유기 발광층(370)이 형성되고, 유기 발광층(370) 상에는 공통 전극(270)이 형성된다. 이와 같이, 화소 전극(190), 유기 발광층(370) 및 공통 전극(270)을 포함하는 유기 발광 소자가 형성된다.

[0236] 유기 발광 소자에 대한 설명은 앞서 설명한 바와 동일하다. 즉, 유기 발광 소자는 애노드/발광층/캐소드, 애노드/정공 수송층/발광층/전자 주입층/캐소드, 애노드/정공 수송층/ 발광층/정공 저지층/전자 수송층/캐소드 또는 애노드/정공 수송층/ 발광층/정공 저지층/전자 수송층/캐소드의 적층 구조를 가질 수 있다.

[0237] 이때, 화소 전극(191)은 정공 주입 전극인 애노드이며, 공통 전극(270)은 전자 주입 전극인 캐소드가 된다. 그러나 본 발명에 따른 일 실시예는 반드시 이에 한정되는 것은 아니며, 유기 발광 표시 장치의 구동 방법에 따라 화소 전극(190)이 캐소드가 되고, 공통 전극(270)이 애노드가 될 수도 있다. 화소 전극(190) 및 공통 전극(270)으로부터 각각 정공과 전자가 유기 발광층(370) 내부로 주입되고, 주입된 정공과 전자가 결합한 엑시톤(exiton)이 여기 상태로부터 기저 상태로 떨어질 때 발광이 이루어진다.

[0238] 유기 발광층 (370) 위에는 공통 전극(common electrode)(270)이 형성되어 있다. 공통 전극(270)은 공통 전압을 인가 받으며, 칼슘(Ca), 바륨(Ba), 마그네슘(Mg), 알루미늄, 은 등을 포함하는 반사성 금속 또는 ITO 또는 IZO 등의 투명한 도전 물질로 만들어진다.

[0239] 유기 발광 소자의 발광층 및 정공 저지층, 전자 주입층에 대한 내용은 앞서 설명한 바와 동일하다. 즉 발광층의 호스트로는 페닐 치환된 안트라센계 화합물인 제 2 화합물이 포함될 수 있고, 정공 저지층 또는 전자 수송층으로는 아진계 화합물인 제1 화합물이 포함될 수 있다.

[0240] 이러한 유기 발광 표시 장치에서, 제1 반도체(151a), 게이트선(121)에 연결되어 있는 제1 제어 전극(124a), 데이터선(171)에 연결되어 있는 제1 입력 전극(173a) 및 제1 출력 전극(175a)은 스위칭 박막 트랜지스터(switching TFT)(Qs)를 이루며, 스위칭 박막 트랜지스터(Qs)의 채널(channel)은 제1 반도체(151a)의 채널 영역(154a1, 154a2)에 형성된다. 제2 반도체(151b), 제1 출력 전극(175a)에 연결되어 있는 제2 제어 전극(124b), 구동 전압선(172)에 연결되어 있는 제2 입력 전극(173b) 및 화소 전극(190)에 연결되어 있는 제2 출력 전극(175b)은 구동 박막 트랜지스터(driving TFT)(Qd)를 이루며, 구동 박막 트랜지스터(Qd)의 채널은 제2 반도체(151b)의 채널 영역(154b)에 형성된다. 화소 전극(190), 유기 발광 부재(370) 및 공통 전극(270)은 유기 발광 다이오드를 이루며, 화소 전극(190)이 애노드(anode), 공통 전극(270)이 캐소드(cathode)가 되거나 반대로 화소 전극(190)이 캐소드, 공통 전극(270)이 애노드가 된다. 서로 중첩하는 유지 전극(127)과 구동 전압선(172) 및 유지 영역(157)은 유지 축전기(storage capacitor)(Cst)를 이룬다.

[0241] 스위칭 박막 트랜지스터(Qs)는 게이트선(121)의 게이트 신호에 응답하여 데이터선(171)의 데이터 신호를 전달한다. 구동 박막 트랜지스터(Qd)는 데이터 신호를 받으면 제2 제어 전극(124b)과 제2 입력 전극(173b) 사이의 전압차에 의존하는 크기의 전류를 흘린다. 제2 제어 전극(124b)과 제2 입력 전극(173b) 사이의 전압차는 또한 유지 축전기(Cst)에 충전되어 스위칭 박막 트랜지스터(Qs)가 턴 오프된 후에도 유지된다. 유기 발광 다이오드는 구동 박막 트랜지스터(Qd)가 흘리는 전류의 크기에 따라 세기를 달리하여 발광함으로써 영상을 표시한다.

[0242] 이하에서, 구체적인 실시예를 통해서 본 발명을 보다 상세하게 설명한다. 다만 하기의 실시예는 단지 설명의 목적을 위한 것이며 본 발명의 범위를 제한하는 것은 아니다.

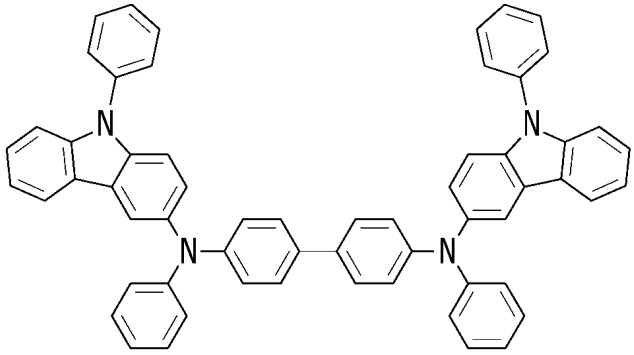
[0243] **실시예 1**

[0244] 유리 기판 위에 인듐 주석 산화물(ITO) 투명 전극을 120 nm의 두께로 형성했다. 그 후 초음파로 세정하고, 전처리(UV-O3 처리, 열처리)를 하였다.

[0245] 전처리된 양극 위에 정공 주입층으로써 화합물 하기 화학식 5로 표현되는 화합물을 50nm 의 두께로 증착한 후, 그 위에 정공 수송층으로써 하기 화학식 6으로 표현되는 화합물을 45 nm의 두께로 증착했다. 그리고 호스트 재료인 하기 화학식 2-1의 화합물에 도핑 재료인 하기 화학식 4의 화합물을 5 중량%의 농도로 동시 증착하여 두께 30 nm의 발광층을 형성하였다.

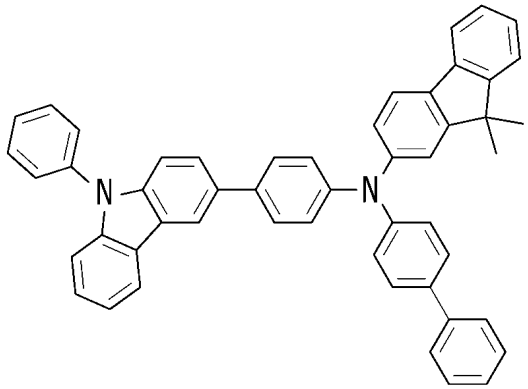
[0246] 다음 발광층 위에 전자 수송층으로써 화학식 1-1의 화합물을 25 nm의 두께로 증착했다. 그 후, 음극으로써 불화리튬을 0.5 nm의 두께로 증착하고 이어서 알루미늄을 150 nm의 두께로 증착하여 유기 발광 소자를 제작하였다.

[0247] [화학식 5]



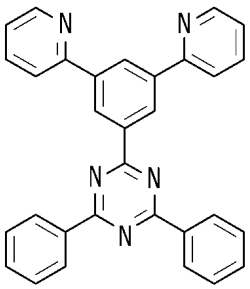
[0248]

[0249] [화학식 6]



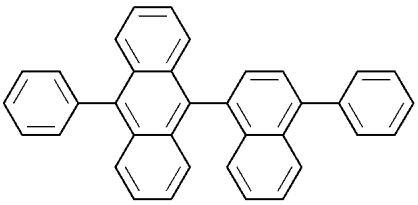
[0250]

[0251] [화학식 1-1]



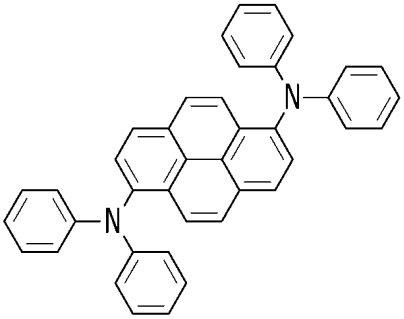
[0252]

[0253] [화학식 2-1]



[0254]

[0255] [화학식 4]

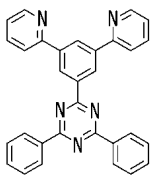


[0256]

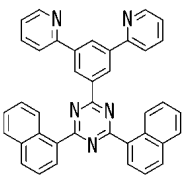
[0257] 제작한 유기 발광 소자에 대해서 전류밀도 10 mA/cm^2 로 구동시의 소자 성능(=전류 효율, Cd/A)을 측정하고, 전류 밀도 50 mA/cm^2 에서 초기 휘도에서 휘도가 80%로 저하할때까지의 시간(=수명)을 각각 측정하였다.

[0258] 발광층의 호스트 화합물을 하기 2-1 내지 2-9로 각각 변경하고, 전자 수송층의 화합물을 하기 화학식 1-1 내지 1-9의 화합물로 각각 변경하여 동일한 조건에서 소자 성능 및 수명을 측정하였다.

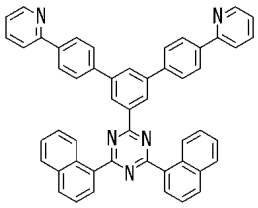
[0259] [화학식 1-1 ~ 1-9]



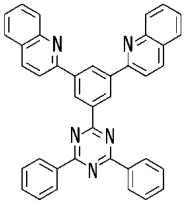
(1-1)



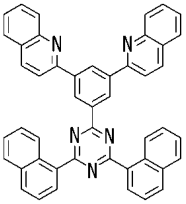
(1-2)



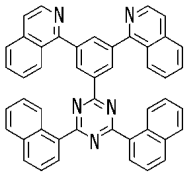
(1-3)



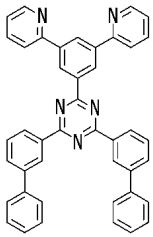
(1-4)



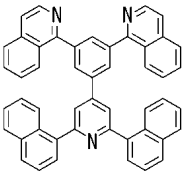
(1-5)



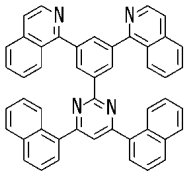
(1-6)



(1-7)



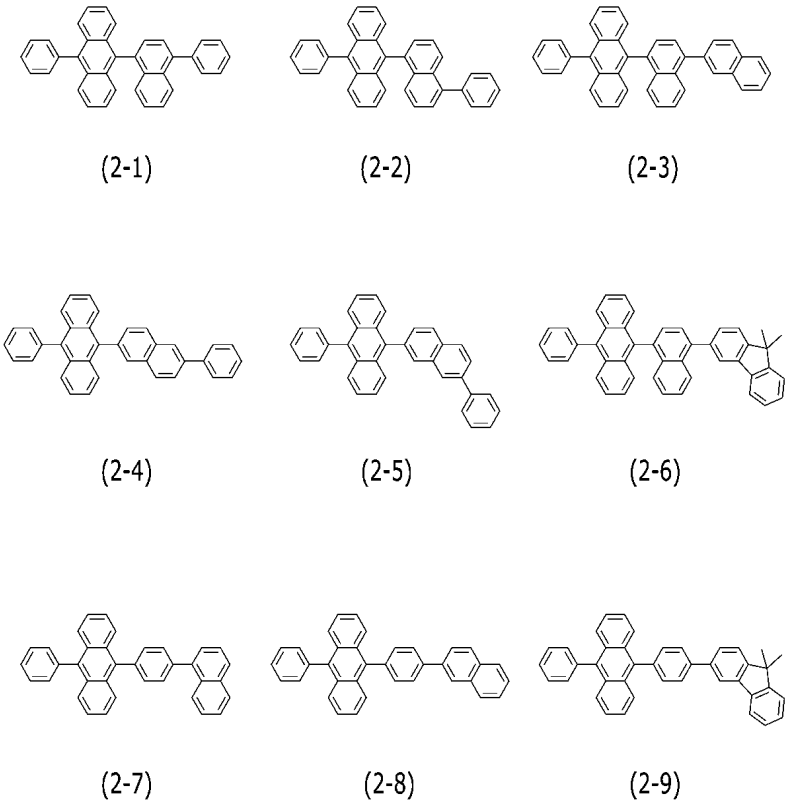
(1-8)



(1-9)

[0260]

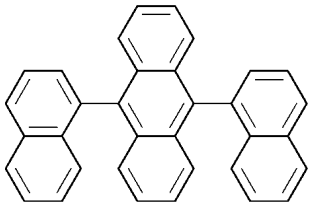
[0261] [화학식 2-1 내지 2-9]



[0262]

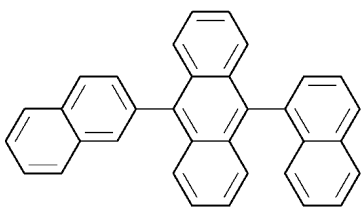
[0263] 또한, 비교예로서 발광층의 호스트 화합물을 하기 화학식 7 내지 화학식 9의 화합물로 변경한 것을 제외하고는 다른 조건은 동일하게 유기 발광 소자를 제작하여 소자 성능 및 수명을 측정하였다.

[0264] [화학식 7]



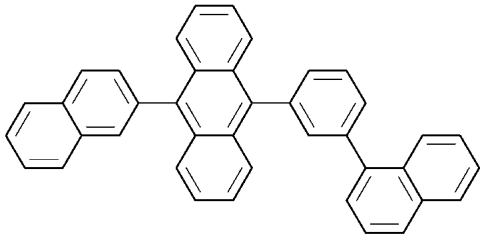
[0265]

[0266] [화학식 8]



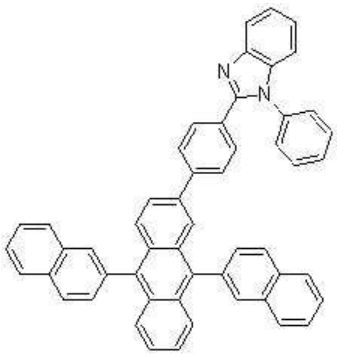
[0267]

[0268] [화학식 9]



[0269]

[0270] 또한, 비교예로서 발광층의 전자 수송층을 하기 화학식 10으로 변경하고, 호스트 화합물을 상기 화학식 2-1의 화합물로 변경한 것을 제외하고는 다른 조건은 동일하게 유기 발광 소자를 제작하여 소자 성능 및 수명을 측정하였다.



[0271] [화학식 10]

[0272] 측정 결과를 하기 표 1에 나타내었다.

표 1

[0273]

실시예	호스트	전자수송층	효율 (cd/A)	수명(hr)
실시예 1-1	화학식 2-1	화학식 1-1	5.2	120
실시예 1-2	화학식 2-1	화학식 1-2	5.3	130
실시예 1-3	화학식 2-1	화학식 1-3	5.5	110
실시예 1-4	화학식 2-1	화학식 1-4	5.4	100
실시예 1-5	화학식 2-1	화학식 1-5	5.5	110
실시예 1-6	화학식 2-1	화학식 1-6	5.7	120
실시예 1-7	화학식 2-1	화학식 1-7	5.6	100
실시예 1-8	화학식 2-1	화학식 1-8	5.5	130
실시예 1-9	화학식 2-1	화학식 1-9	5.7	120
실시예 1-10	화학식 2-2	화학식 1-6	5.6	120
실시예 1-11	화학식 2-3	화학식 1-6	5.8	130
실시예 1-12	화학식 2-4	화학식 1-6	5.5	130
실시예 1-13	화학식 2-5	화학식 1-6	5.4	120
실시예 1-14	화학식 2-6	화학식 1-6	5.8	110
실시예 1-15	화학식 2-7	화학식 1-6	5.4	130
실시예 1-16	화학식 2-8	화학식 1-6	5.4	140
실시예 1-17	화학식 2-9	화학식 1-6	5.7	100
비교예 1	화학식 7	화학식 1-6	4.9	70
비교예 2	화학식 8	화학식 1-6	4.7	80
비교예 3	화학식 9	화학식 1-6	5.0	100

비교예 4	화학식 2-1	화학식 10	4.9	90

[0274] 상기 표 1을 통해 확인할 수 있는 바와 같이 본 발명의 화학식 1의 화합물을 전자 수송 재료로, 동시에 본 발명의 화학식 2의 화합물을 호스트 재료로서 조합하여 사용한 경우 효율 및 수명에서 현저한 효과를 가짐을 확인할 수 있었다.

[0275] 표 1을 참고하면, 화학식 1의 화합물을 전자 수송 재료로 사용하고 화학식 7 또는 화학식 9의 화합물을 호스트로 사용한 본 발명 비교예는, 실시예에 비하여 효율 및 수명이 감소함을 확인할 수 있었다.

[0276] 또한, 비교예 4를 참고하면 화학식 2의 화합물을 호스트로 사용하더라도, 비교예와 같이 화학식 10의 화합물을 호스트로 사용하는 경우에 효율 및 수명이 감소함을 확인할 수 있었다.

[0277] 즉 본 발명은 페닐 치환된 안트라센계 화합물을 호스트로, 트리아진계 화합물을 전자 수송층으로 사용함으로써 유기 발광 소자의 효율 및 수명을 개선하였다.

[0278] **실시예 2**

[0279] 전자 수송 재료로 화학식 2-1 내지 2-9의 화합물에 lithium quinolate (Liq)를 도핑하여 사용한 것을 제외하고는 실시예 1과 동일한 조건으로 유기 발광 소자를 제작하였다. 전자 수송층으로 하기 화학식 2-1 내지 2-5의 화합물에 도핑 재료로서 Liq를 50 중량%로 동시 증착하여 사용하였다. 제작한 유기 발광 소자의 수명 및 효율을 실시예 1과 동일한 조건으로 측정하고, 그 결과를 하기 표 2에 나타내었다.

표 2

[0280]

실시예	**호스트**	**전자수송층**	**효율 (cd/A)**	**수명(hr)**
실시예 2-1	화학식 2-1	화학식 1-1:Liq	5.1	130
실시예 2-2	화학식 2-1	화학식 1-2:Liq	5.3	140
실시예 2-3	화학식 2-1	화학식 1-3:Liq	5.4	120
실시예 2-4	화학식 2-1	화학식 1-4:Liq	5.4	120
실시예 2-5	화학식 2-1	화학식 1-5:Liq	5.4	110
실시예 2-6	화학식 2-1	화학식 1-6:Liq	5.6	120
실시예 2-7	화학식 2-1	화학식 1-7:Liq	5.5	110
실시예 2-8	화학식 2-1	화학식 1-8:Liq	5.4	140
실시예 2-9	화학식 2-1	화학식 1-9:Liq	5.7	120
비교예 5	화학식 7	화학식 1-2:Liq	4.8	70
바교예 6	화학식 8	화학식 1-2:Liq	4.6	80
비교예 7	화학식 9	화학식 1-2:Liq	4.9	100
비교예 8	화학식 2-1	화학식 10:Liq	4.8	90

[0281] 상기 표 2를 통해 확인할 수 있는 바와 같이, 전자 수송층으로 화학식 1-1 내지 1-9중 하나의 화합물과 Liq를 동시 적용하고, 발광층의 호스트로 화학식 2-1 내지 2-9 중 하나의 화합물을 적용한 경우에도 효율 및 수명이 증가하였다.

[0282] 즉 본 발명은 페닐 치환된 안트라센계 화합물을 호스트로, Liq가 도핑된 트리아진계 화합물을 전자수송층으로 사용함으로써 유기 발광 소자의 효율 및 수명을 개선하였다.

[0283] **실시예 3**

[0284] 유리 기판 위에 인듐 주석 산화물(ITO) 투명 전극을 120 nm의 두께로 형성했다. 그 후 초음파로 세정하고, 전처리(UV-O3 처리, 열처리)를 하였다.

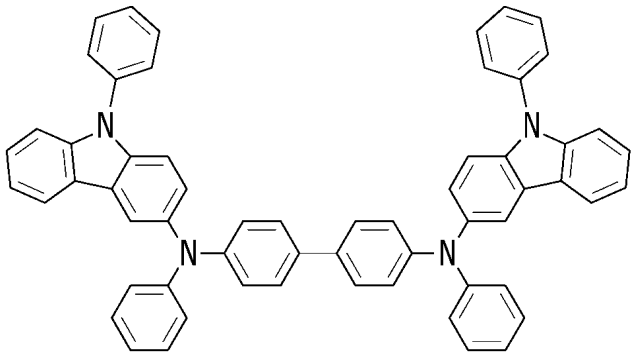
[0285] 전처리된 양극 위에 정공 주입층으로써 화합물 하기 화학식 5로 표현되는 화합물을 50nm 의 두께로 증착한 후, 그 위에 정공 수송층으로써 하기 화학식 6으로 표현되는 화합물을 45 nm의 두께로 증착했다. 그리고 호스트 재료인 안트라센 유도체 하기 화학식 2-1의 화합물에 도핑 재료인 하기 화학식 4의 화합물을 5 중량%의 농도로 동

시 증착하여 두께 30 nm의 발광층을 형성하였다.

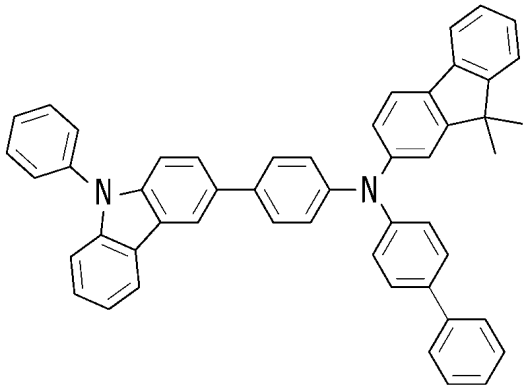
[0286] 발광층을 형성한 후, 정공저지층으로 화학식 1-1의 화합물을 10 nm의 두께로 형성하였다. 그 후, 전자 수송층으로 BPhen(4,7-디페닐-1-10-페난트롤린)을 15 nm의 두께로 형성하였다. 이때, 전자 수송층으로 BPhen 을 형성할 때 도핑 재료로서 Liq를 50 중량% 로 동시 증착하여 사용하였다.

[0287] 그 후, 음극으로써 불화리튬을 0.5 nm의 두께로 증착하고 이어서 알루미늄을 150 nm의 두께로 증착하여 유기 발광 소자를 제작하였다.

[0288] [화학식 5]

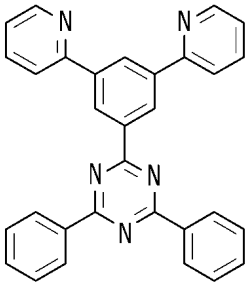


[0289]



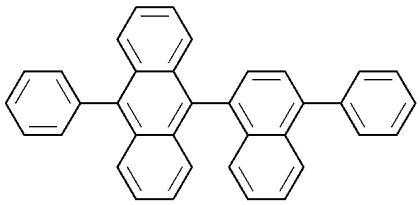
[0290] [화학식 6]

[0291] [화학식 1-1]



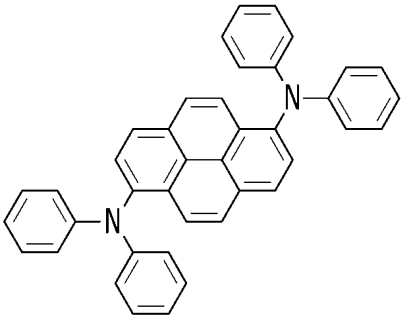
[0292]

[0293] [화학식 2-1]



[0294]

[0295] [화학식 4]



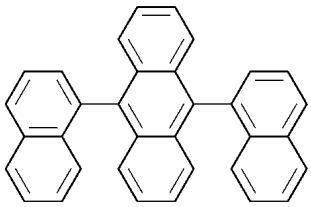
[0296]

[0297] 제작한 유기 발광 소자에 대해서 전류밀도 10mA/cm2 로 구동시의 소자 성능(=전류 효율, Cd/A)을 측정하고, 전류 밀도 50 mA/cm2 에서 초기 휘도에서 휘도가 80%로 저하할 때까지의 시간(=수명)을 각각 측정하였다.

[0298] 발광층의 호스트 화합물을 하기 화학식 2-1 내지 2-9의 화합물로 각각 변경하고, 정공 저지층의 화합물을 하기 화학식 1-1 내지 1-9의 화합물로 각각 변경하여 동일한 조건에서 소자 성능 및 수명을 측정하였다.

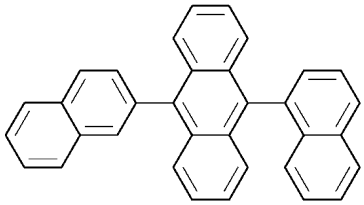
[0299] 또한, 비교예로서 발광층의 호스트 화합물을 하기 화학식 7 내지 화학식 9의 화합물로 변경한 것을 제외하고는 다른 조건은 동일하게 유기 발광 소자를 제작하여 소자 성능 및 수명을 측정하였다.

[0300] [화학식 7]



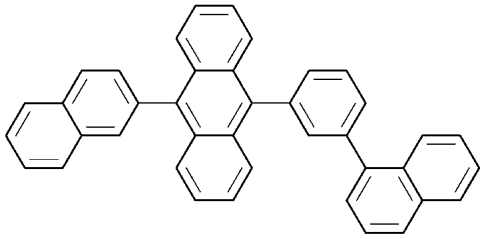
[0301]

[0302] [화학식 8]



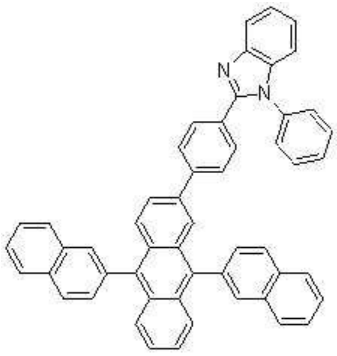
[0303]

[0304] [화학식 9]



[0305]

[0306] 또한, 비교예로서 발광층의 정공 저지층을 하기 화학식 10으로 변경하고, 호스트 화합물을 상기 화학식 2-1의 화합물로 변경한 것을 제외하고는 다른 조건은 동일하게 유기 발광 소자를 제작하여 소자 성능 및 수명을 측정하였다.



[0307] [화학식 10]

표 3

[0308]

실시예	호스트	정공 저지층	전자수송층	효율 (cd/A)	수명(hr)
실시예 3-1	화학식 2-1	화학식 1-1	BPhen:Liq	5.3	120
실시예 3-2	화학식 2-1	화학식 1-2	BPhen:Liq	5.3	130
실시예 3-3	화학식 2-1	화학식 1-3	BPhen:Liq	5.4	120
실시예 3-4	화학식 2-1	화학식 1-4	BPhen:Liq	5.3	110
실시예 3-5	화학식 2-1	화학식 1-5	BPhen:Liq	5.4	120
실시예 3-6	화학식 2-1	화학식 1-6	BPhen:Liq	5.6	130
실시예 3-7	화학식 2-1	화학식 1-7	BPhen:Liq	5.5	100
실시예 3-8	화학식 2-1	화학식 1-8	BPhen:Liq	5.3	120
실시예 3-9	화학식 2-1	화학식 1-9	BPhen:Liq	5.5	130
실시예 3-10	화학식 2-2	화학식 1-6	BPhen:Liq	5.6	140
실시예 3-11	화학식 2-3	화학식 1-6	BPhen:Liq	5.5	140
실시예 3-12	화학식 2-4	화학식 1-6	BPhen:Liq	5.6	130
실시예 3-13	화학식 2-5	화학식 1-6	BPhen:Liq	5.6	120
실시예 3-14	화학식 2-6	화학식 1-6	BPhen:Liq	5.7	120
실시예 3-15	화학식 2-7	화학식 1-6	BPhen:Liq	5.4	150
실시예 3-16	화학식 2-8	화학식 1-6	BPhen:Liq	5.3	160
실시예 3-17	화학식 2-9	화학식 1-6	BPhen:Liq	5.5	110
비교예 9	화학식 7	화학식 1-6	BPhen:Liq	4.9	70
비교예 10	화학식 8	화학식 1-6	BPhen:Liq	4.7	80
비교예 11	화학식 9	화학식 1-6	BPhen:Liq	5.0	100
비교예 12	화학식 2-1	화학식 10	BPhen:Liq	4.9	100

[0309] 상기 표 3을 통해 확인할 수 있는 바와 같이 본 발명의 화학식 1의 화합물을 정공 저지 재료로, 동시에 본 발명의 화학식 2의 화합물을 호스트 재료로서 조합하여 사용한 경우 효율 및 수명에서 현저한 효과를 가짐을 확인할 수 있었다.

[0310] 즉 표 1 및 표 2에서와 같이 화학식 1의 화합물을 전자 수송층으로 사용한 경우뿐만 아니라, 화학식 1의 화합물(트리아진계 화합물)을 정공 보조층으로 적용하고 화학식 2의 화합물(페닐 치환된 안트라센계 화합물)을 호스트로 적용하고, 전자 수송층으로는 공지의 화합물을 사용한 경우에도 소자의 효율 및 수명이 개선됨을 확인하였다.

[0311] 이상과 같이 본 발명의 일 실시예에 따른 유기 발광 소자는 상기 화학식 1로 표시되는 포스핀계 화합물을 정공 저지층 또는 전자 수송층으로 적용하고, 상기 화학식 2로 표시되는 페닐 치환된 안트라센계 화합물을 발광층을 호스트로 적용함으로써 소자의 효율 및 수명을 개선할 수 있다.

[0312] 이상에서 본 발명의 바람직한 실시예에 대하여 상세하게 설명하였지만 본 발명의 권리범위는 이에 한정되는 것은 아니고 다음의 청구범위에서 정의하고 있는 본 발명의 기본 개념을 이용한 당업자의 여러 변형 및 개량 형태 또한 본 발명의 권리범위에 속하는 것이다.

부호의 설명

[0313] 10: 애노드 20: 캐소드

30: 정공 수송층 40: 전자 수송층

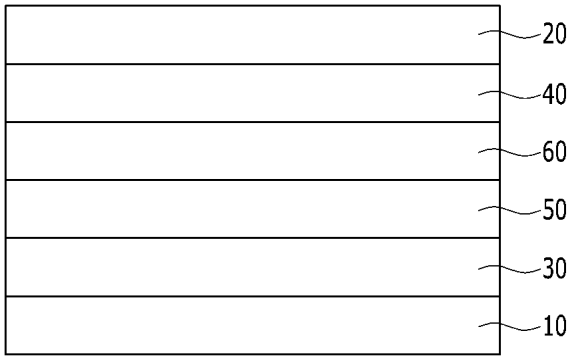
50: 발광층 60: 정공 저지층

도면

도면1

도면2

도면3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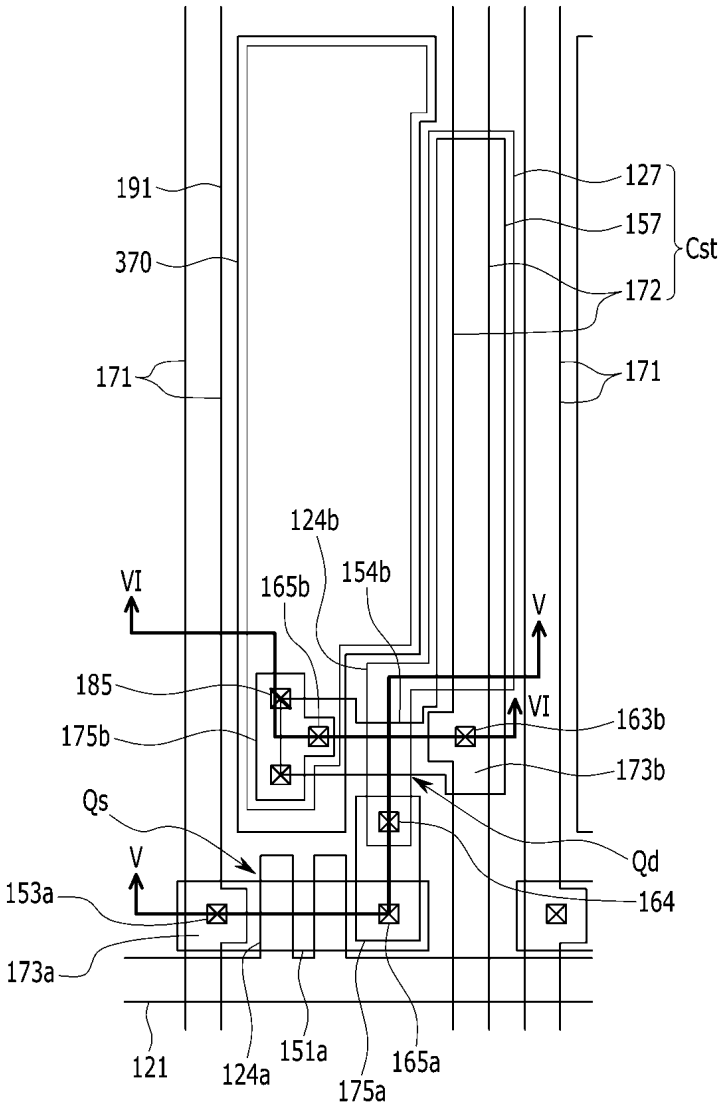
도면4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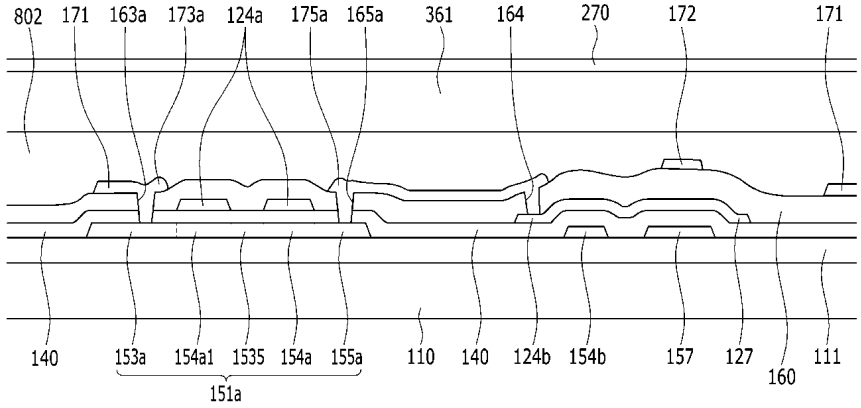
도면5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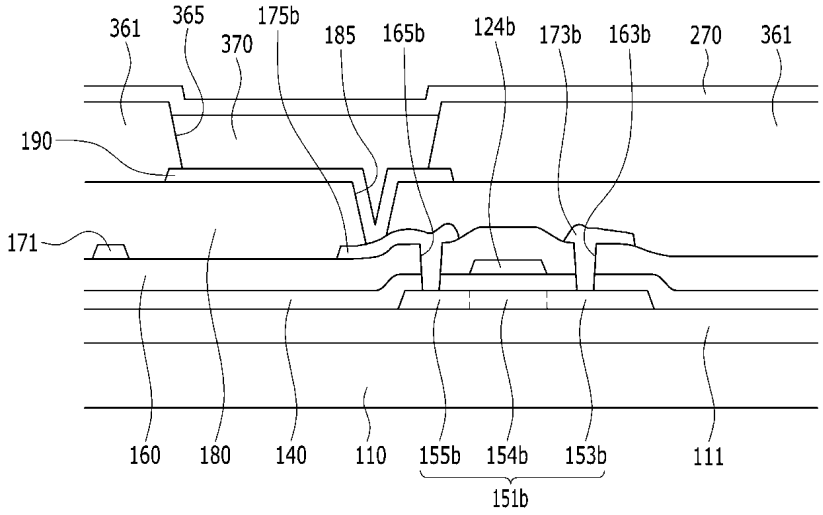
도면6


361
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153b
111
151b

专利名称(译)	有机发光器件和包括其的有机发光显示器		
公开(公告)号	KR1020160007985A	公开(公告)日	2016-01-21
申请号	KR1020140086978	申请日	2014-07-10
[标]申请(专利权)人(译)	三星显示有限公司		
申请(专利权)人(译)	三星显示器有限公司		
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摘要(译)

本发明涉及有机发光元件和包含该有机发光元件的有机发光显示装置。根据本发明的一个实施方案的有机发光元件包含由化学式1表示的第一化合物和由化学式2表示的第一化合物。