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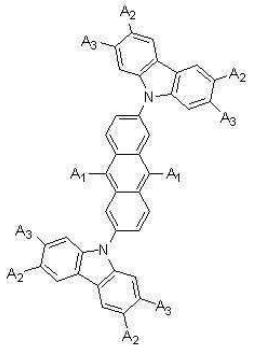
전체 청구항 수 : 총 8 항

(54) 청색 발광 화합물 및 이를 포함하는 유기전계발광소자

(57) 요 약

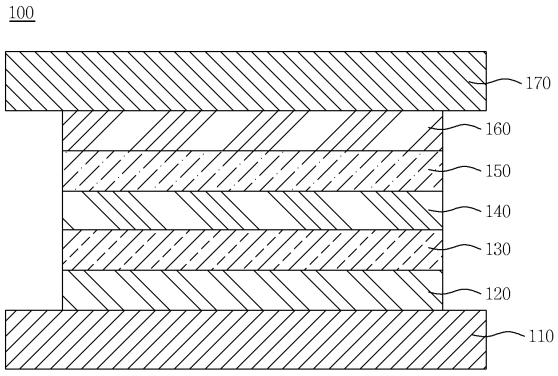
본 발명은 청색 발광 화합물 및 이를 포함하는 유기전계발광소자에 관한 것으로, 하기의 화학식 1로 표시되는 청색 발광 화합물을 제공한다.

화학식 1



상기 화학식 1에서, A_1, A_2 및 A_3은 각각 독립적으로 수소, 치환되거나 치환되지 않은 방향족 그룹, 이형고리 그룹 또는 지방족 그룹 중 선택된 어느 하나일 수 있다.

대 표 도 - 도1

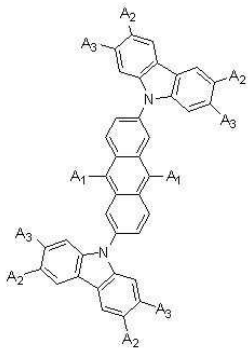


특허청구의 범위

청구항 1

하기의 화학식 1로 표시되는 청색 발광 화합물.

[화학식 1]



상기 화학식 1에서, A_1, A_2 및 A_3은 각각 독립적으로 수소, 치환되거나 치환되지 않은 방향족 그룹, 이형고리 그룹 또는 지방족 그룹 중 선택된 어느 하나일 수 있다.

청구항 2

제 1항에 있어서,

상기 치환되거나 치환되지 않은 A_1, A_2 및 A_3은 각각 페닐, 바이페닐, 나프틸, 페닌스렌닐, 터페닐, 피리딜, 바이피리딜, 페닐피리딜, 피리딜페닐, 터피리딜, 퀴놀리닐, 이소퀴놀리닐, 페녹살리닐, 퀴녹살리닐, 메틸, 에틸, 프로필, 이소프로필, 부틸, 터트부틸, 트리메틸실릴, 트리플루오르메틸, 시아노, 플루오르, 메톡시 및 에톡시로부터 선택된 어느 하나인 것을 특징으로 하는 청색 발광 화합물.

청구항 3

제 2항에 있어서,

상기 A_1, A_2 및 A_3이 치환된 경우에,

상기 A_1, A_2 및 A_3의 치환기는 아릴, 알킬, 알콕시, 할로겐, 시아노, 실릴 그룹으로 이루어진 군에서 선택된 어느 하나인 것을 특징으로 하는 청색 발광 화합물.

청구항 4

제 3항에 있어서,

상기 A_1, A_2 및 A_3이 치환된 경우에,

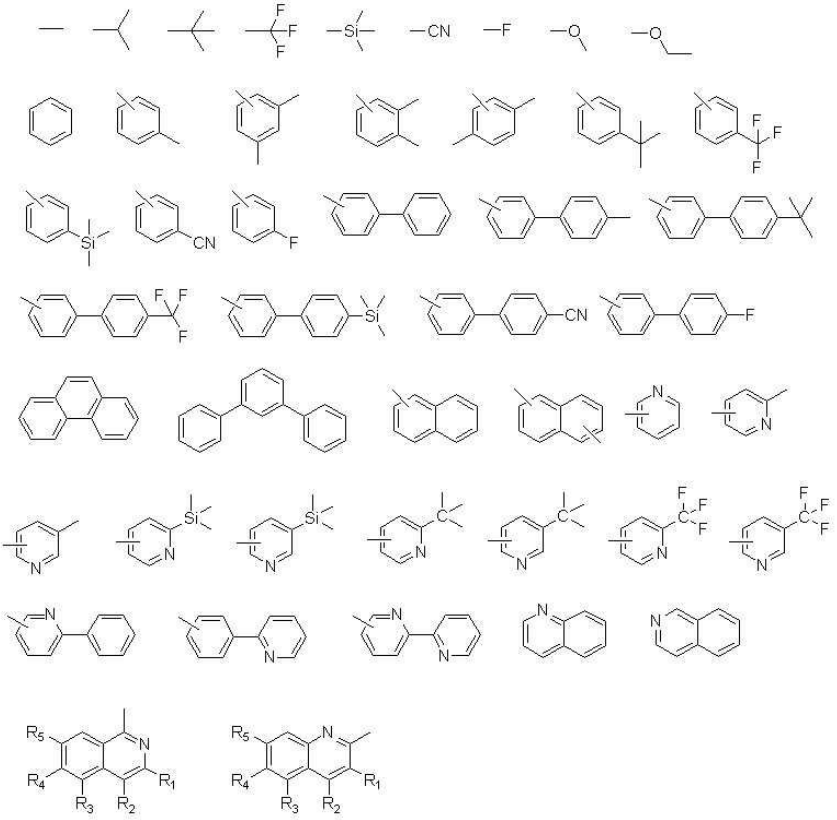
상기 A_1, A_2 및 A3의 치환기는 각각 독립적으로 메틸, 에틸, 프로필, 이소플로필, 부틸, 메톡시, 에톡시, 부톡시, 트리메텔실릴, 불소, 염소로 이루어지는 군에서 선택된 어느 하나인 것을 특징으로 하는 청색 발광 화합물.

청구항 5

제 1항에 있어서,

상기 A_1, A_2 및 A_3은 하기 화학식 2 중 어느 하나인 것을 특징으로 하는 청색 발광 화합물.

[화학식 2]



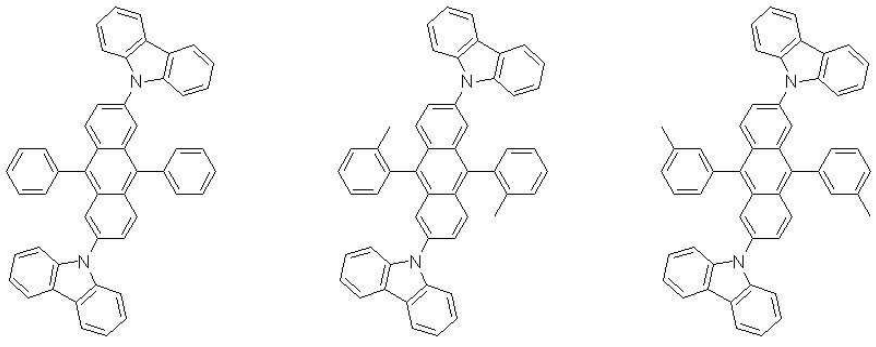
여기서, R_1, R_2, R_3, R_4 및 R_5는 적어도 하나 이상의 메틸기를 포함할 수 있다.

청구항 6

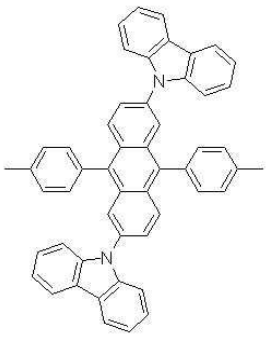
제 1항에 있어서,

상기 청색 발광 화합물은 하기 화학식 3 중 어느 하나인 것을 특징으로 하는 청색 발광 화합물.

[화학식 3]



D-01 D-02 D-03



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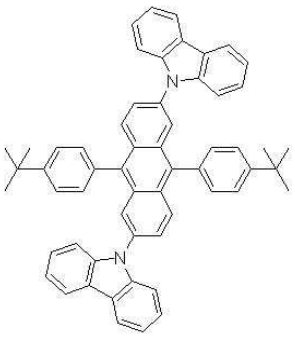

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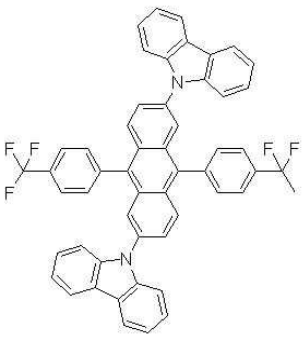

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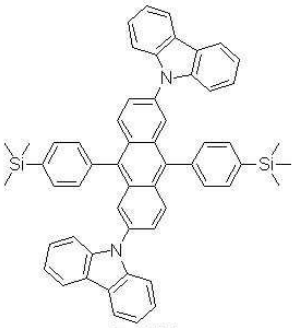

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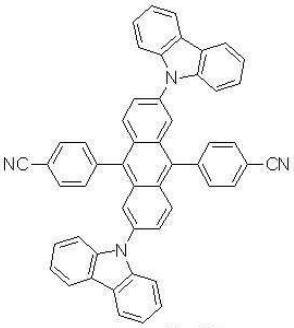

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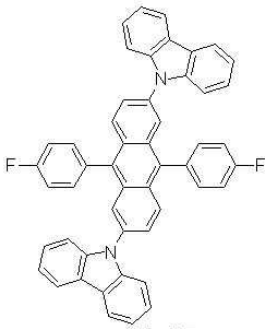

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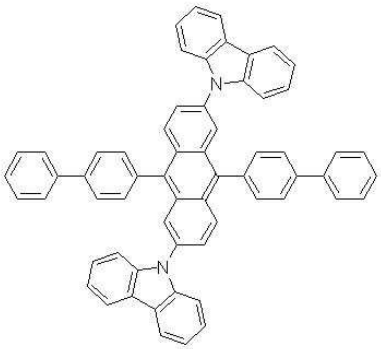

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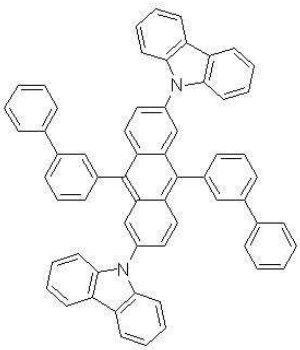

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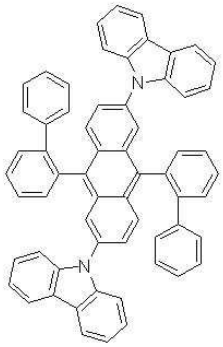

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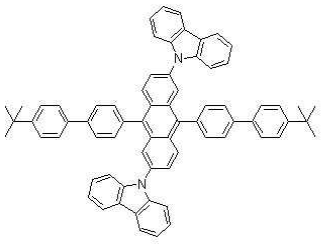

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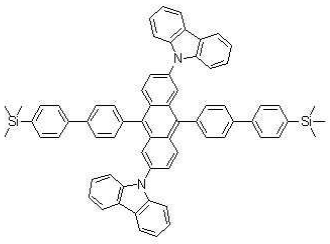

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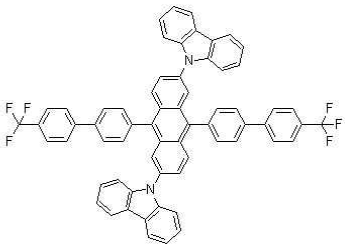

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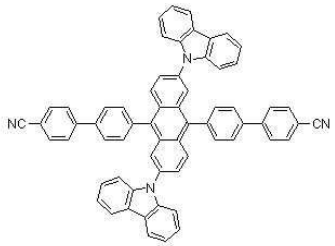

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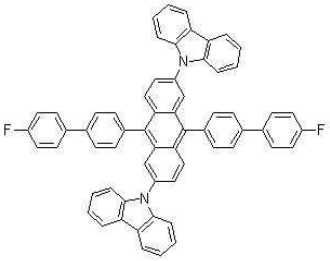

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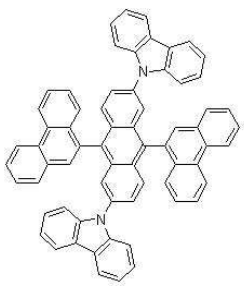

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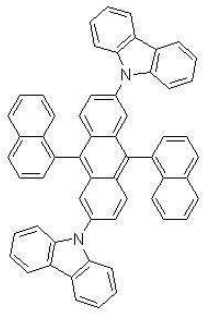

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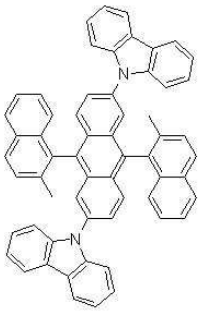

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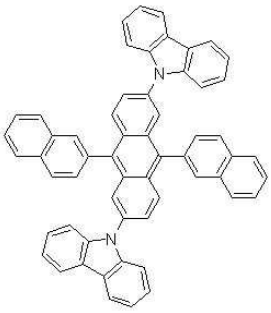

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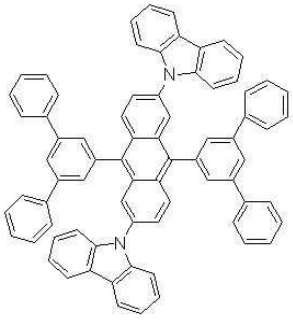

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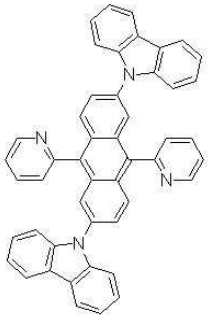

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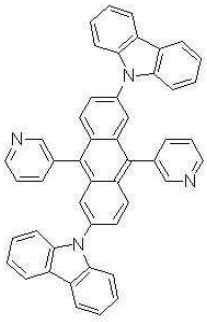

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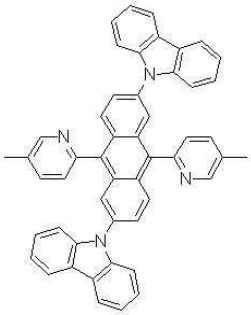

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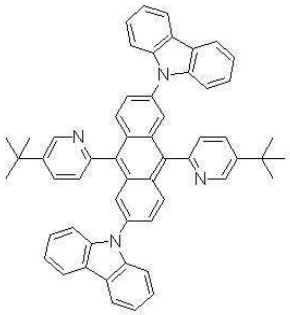

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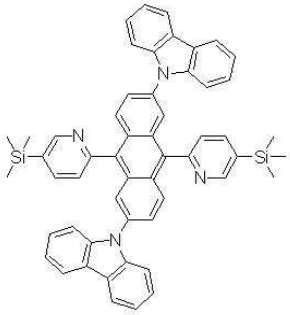

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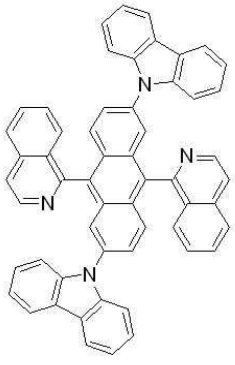

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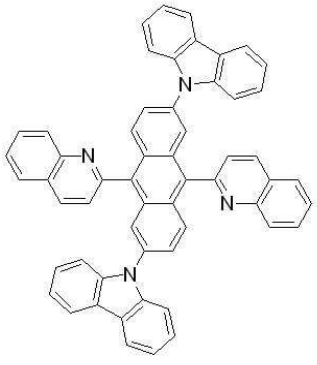

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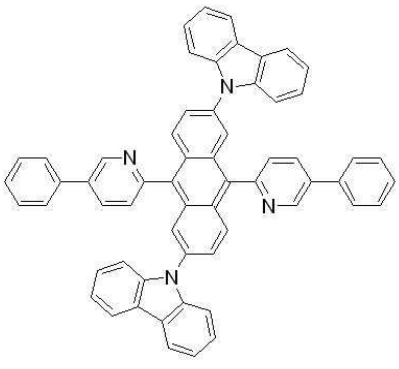

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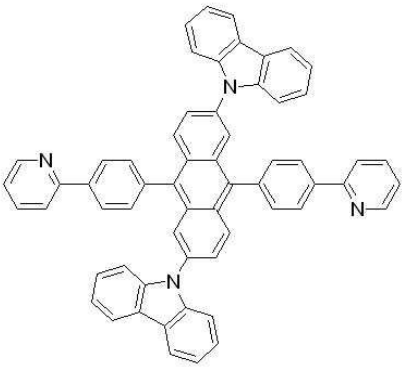

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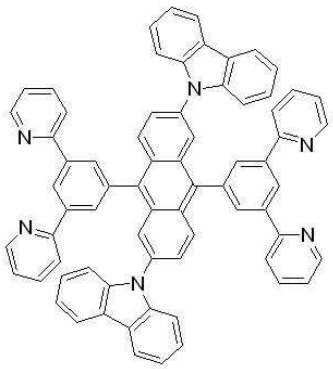

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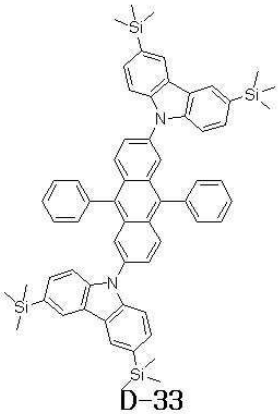

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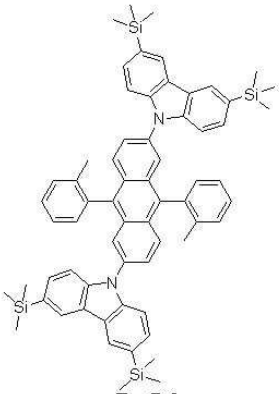

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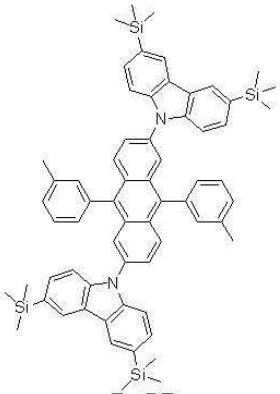

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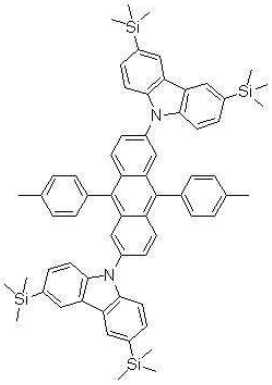

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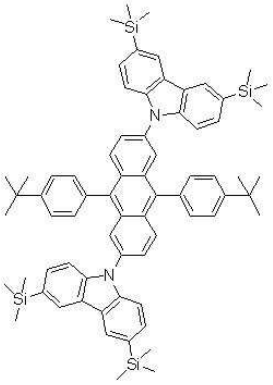

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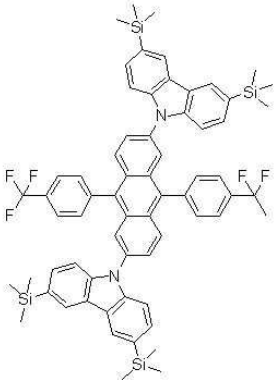

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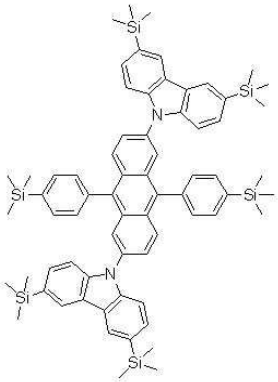

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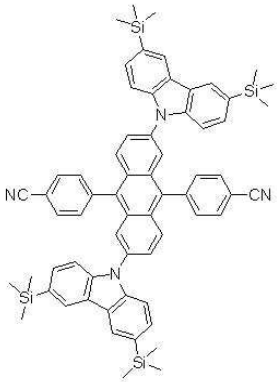
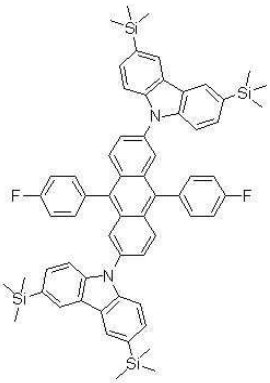
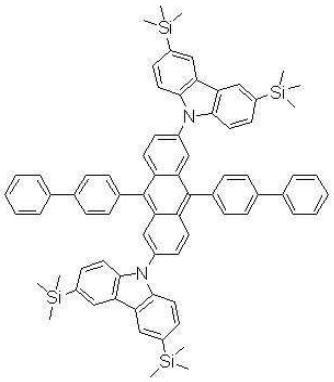


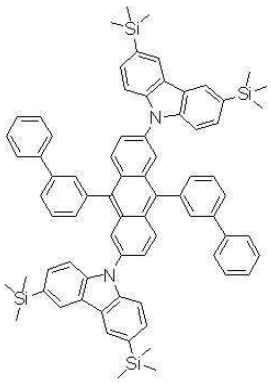
D-40



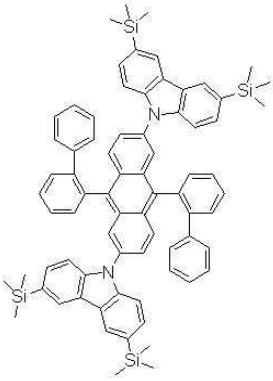
D-41



D-42



D-43



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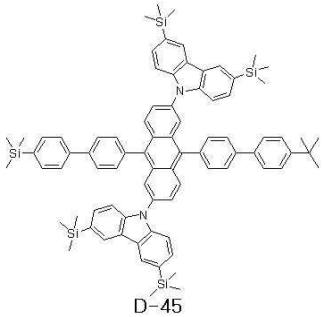

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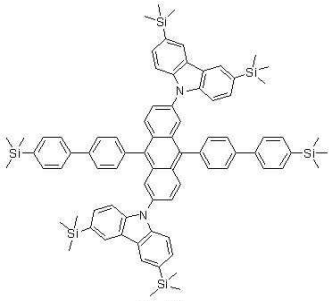

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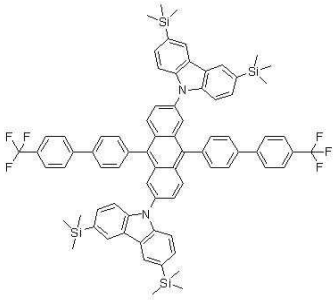

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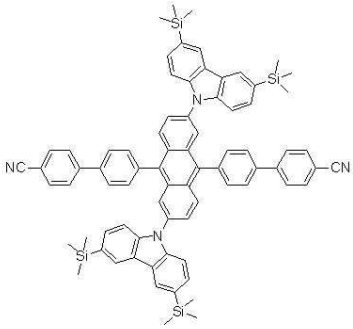

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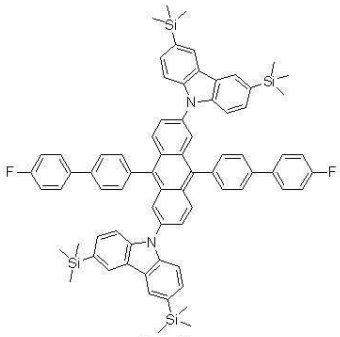

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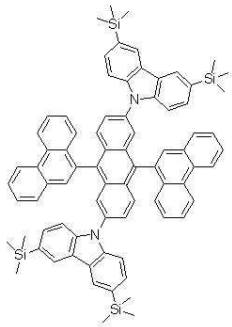

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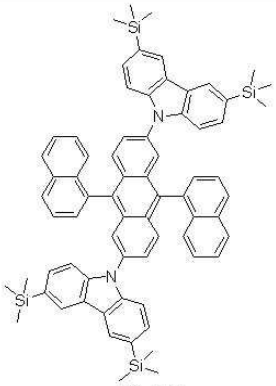

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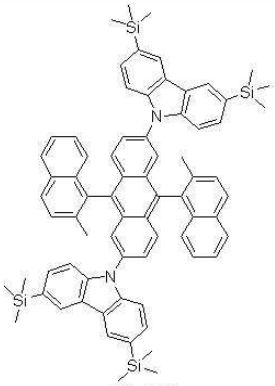

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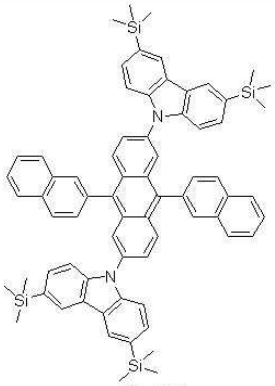

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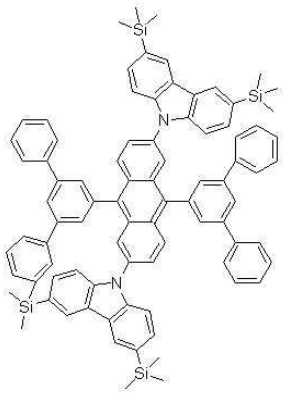

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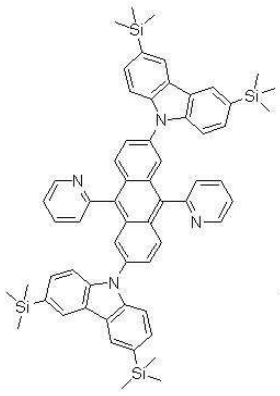

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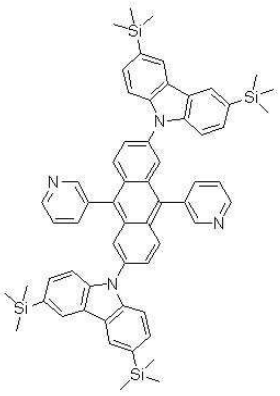

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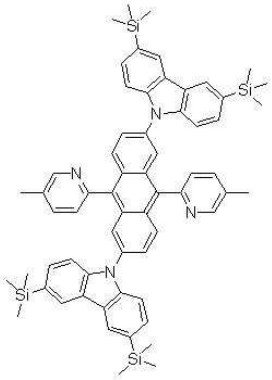

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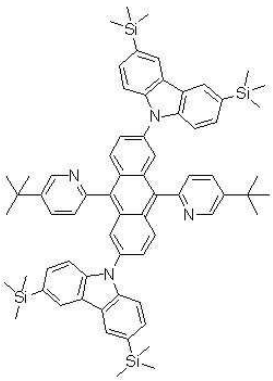

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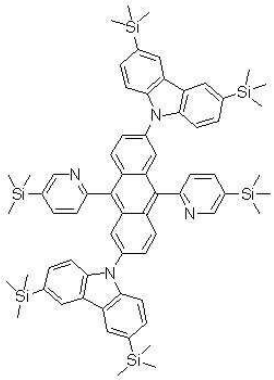

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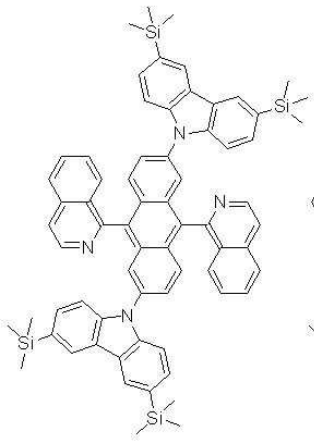

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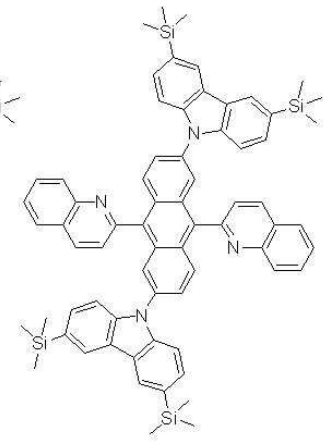

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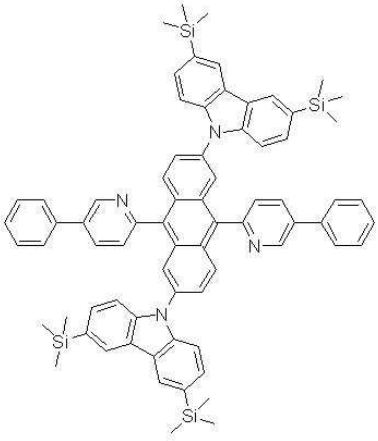

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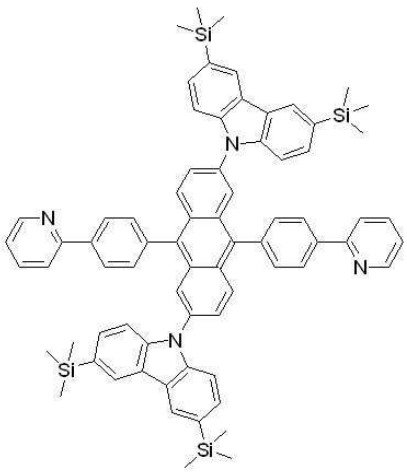

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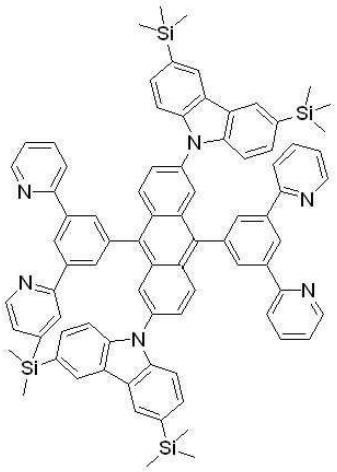

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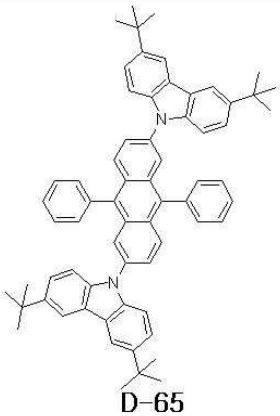

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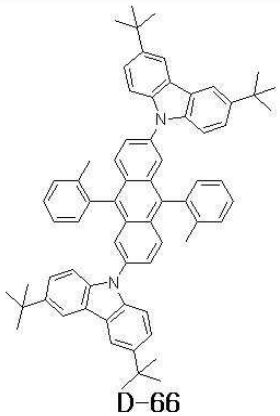

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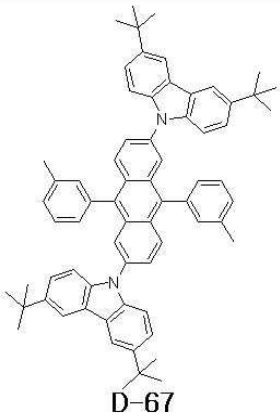

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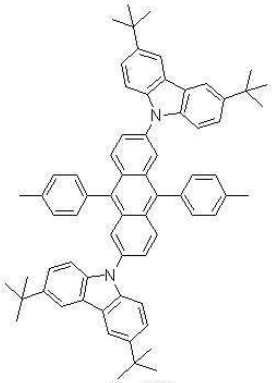

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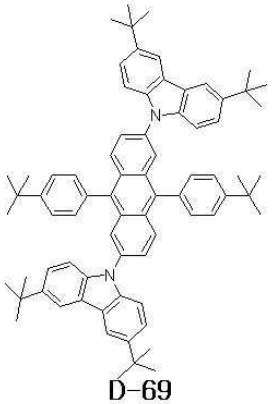

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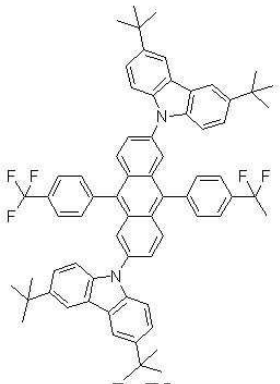

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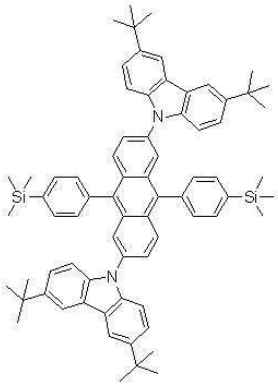

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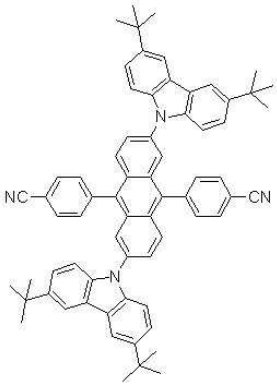

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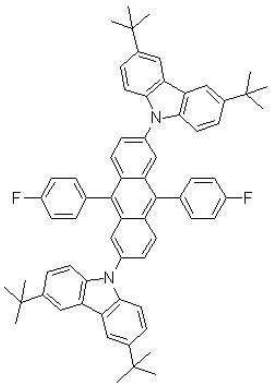

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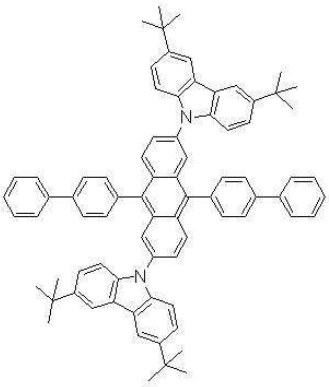

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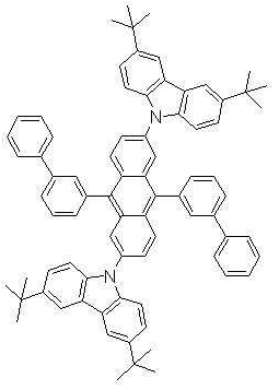

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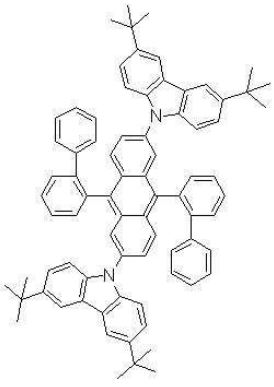

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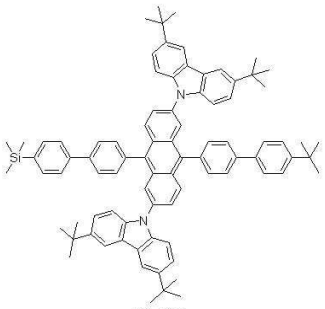

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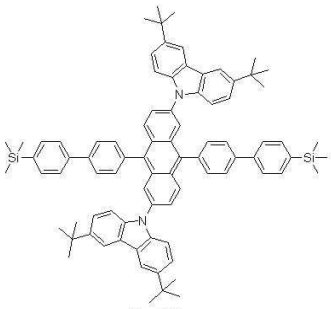

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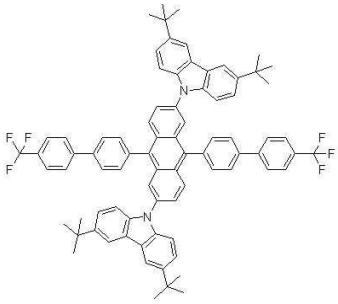

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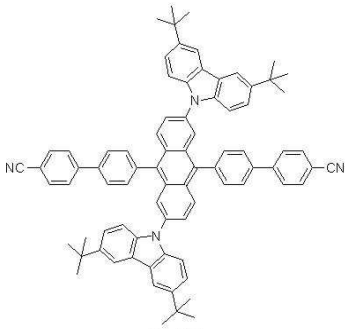

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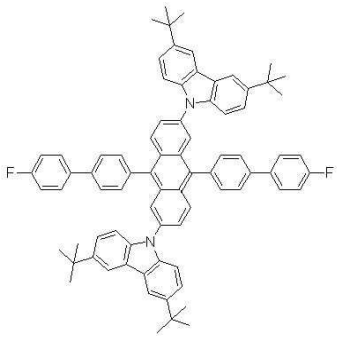

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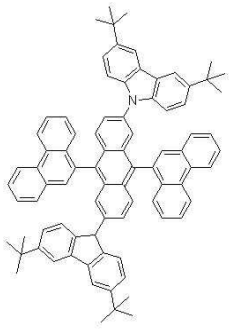

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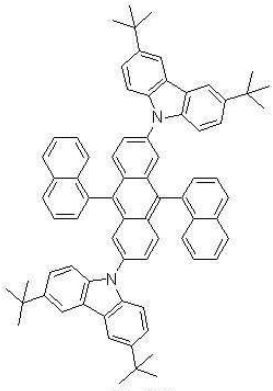

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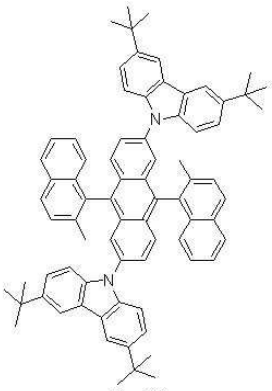

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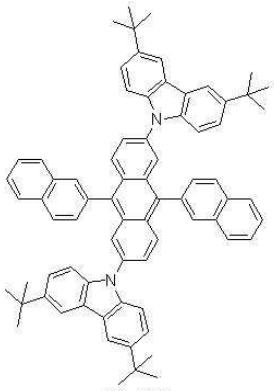

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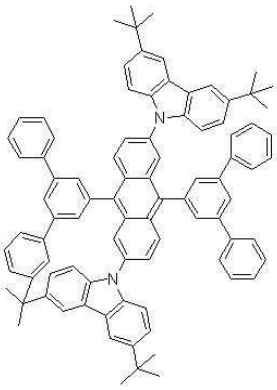

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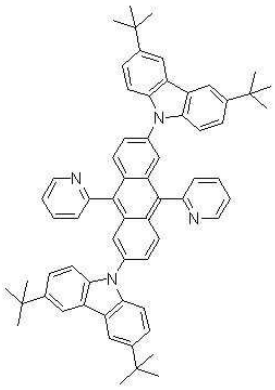

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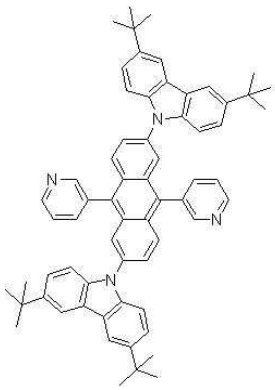

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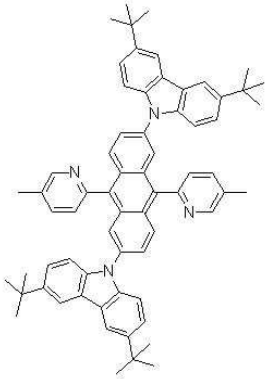

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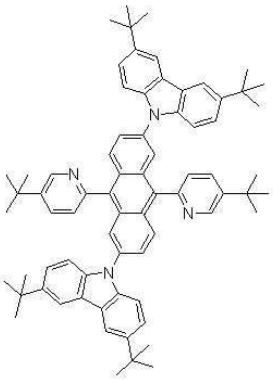

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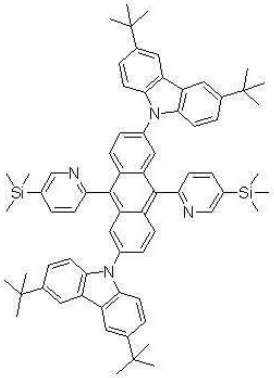

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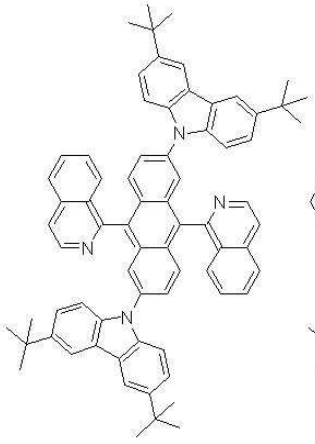

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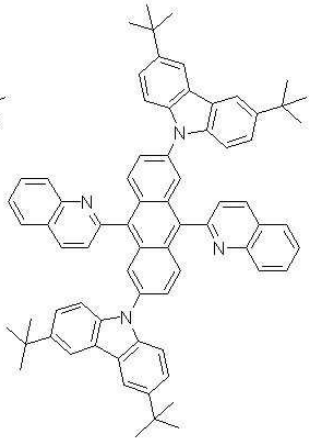

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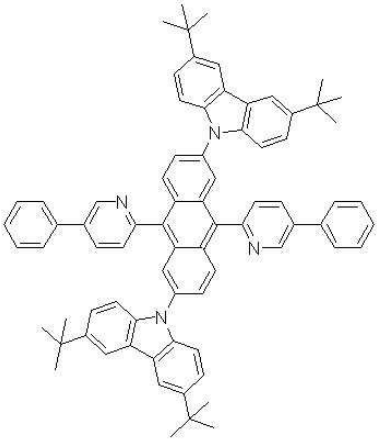

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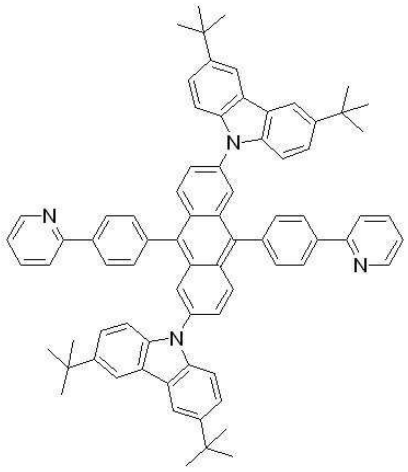

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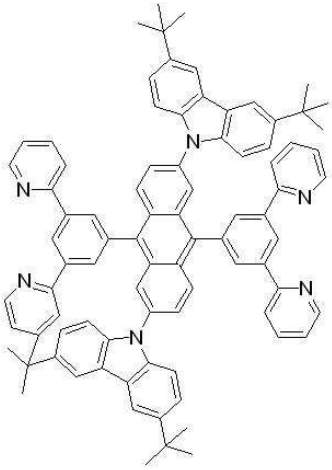

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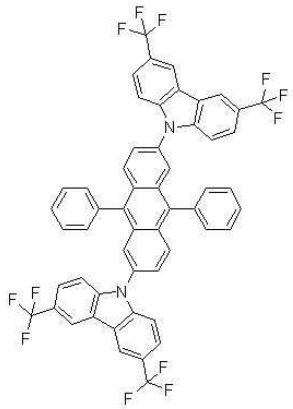
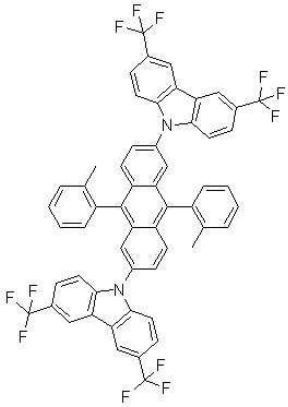


D-97



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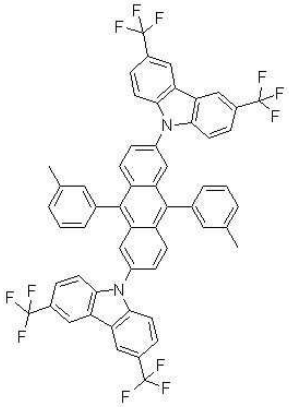

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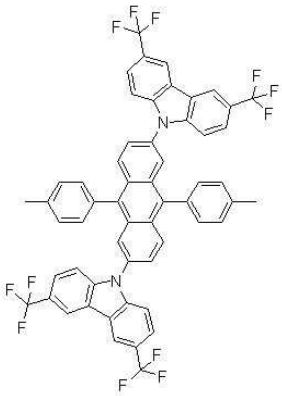

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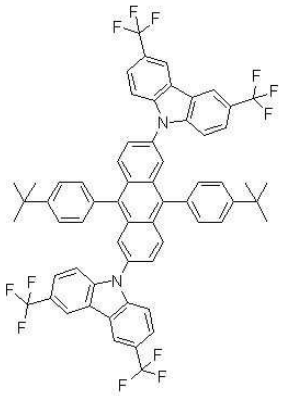

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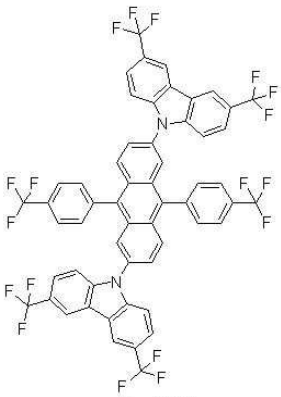
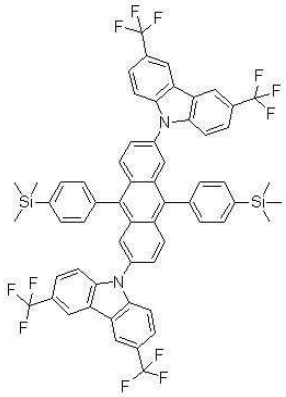
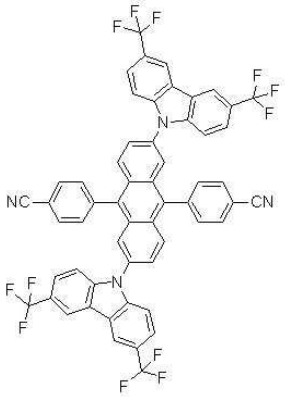


D-102



D-103



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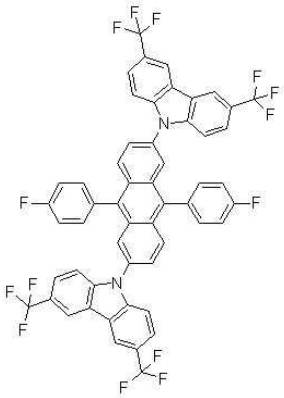

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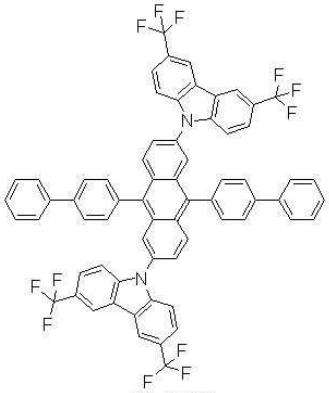

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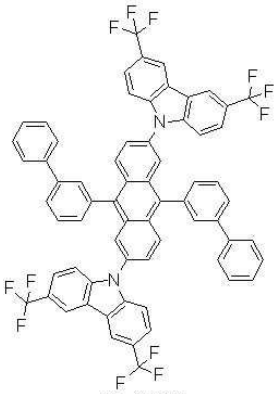

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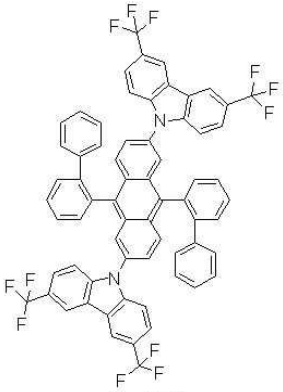

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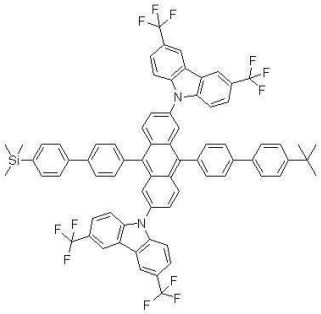

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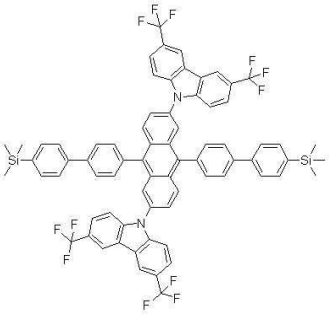

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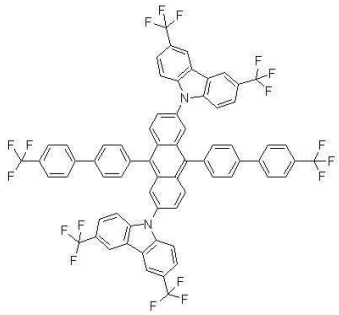

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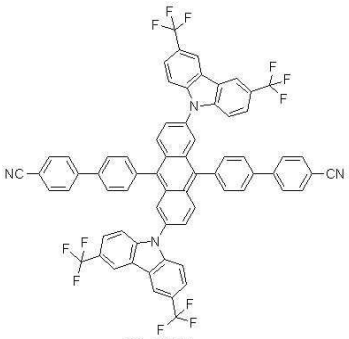

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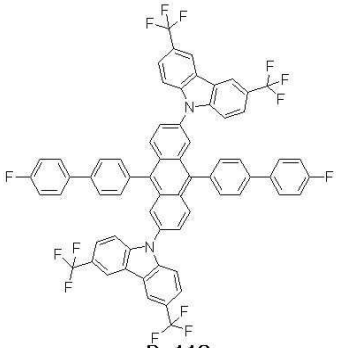

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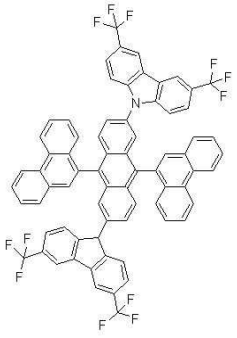

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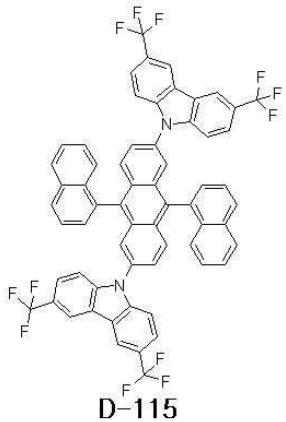

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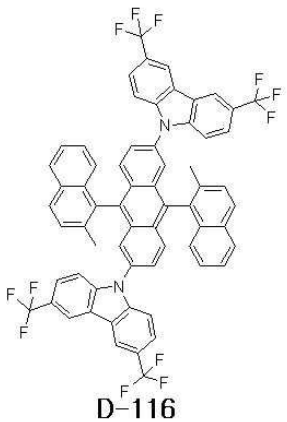

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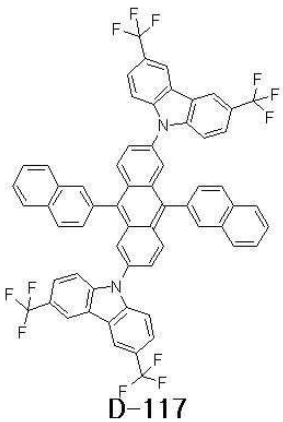

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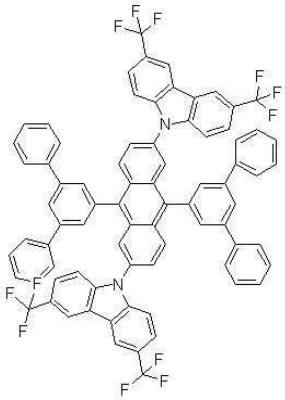

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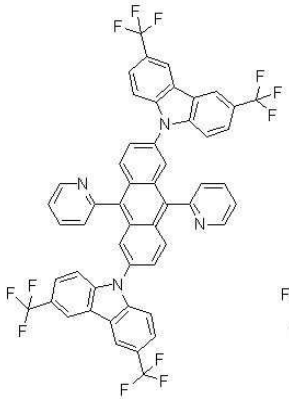

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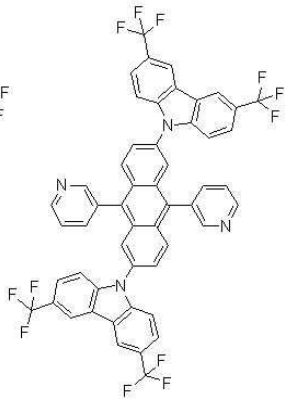

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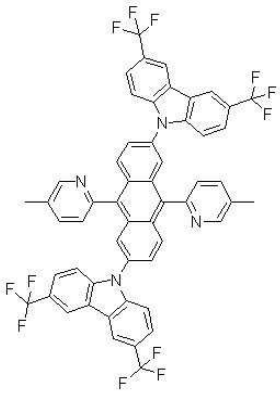

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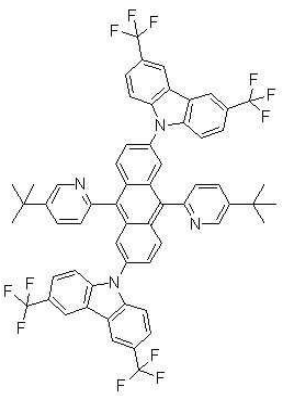

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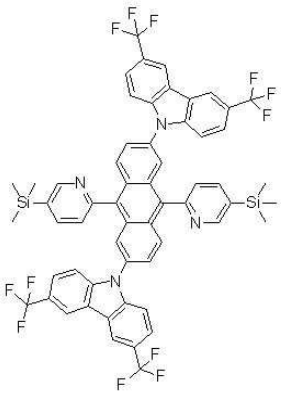

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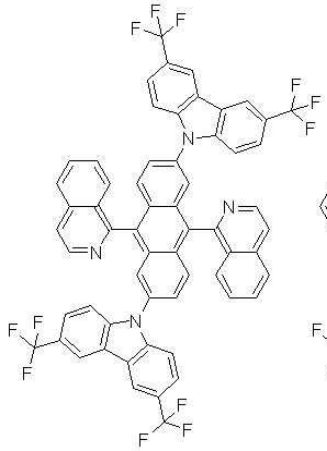

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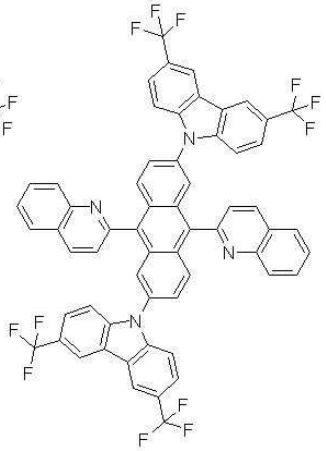

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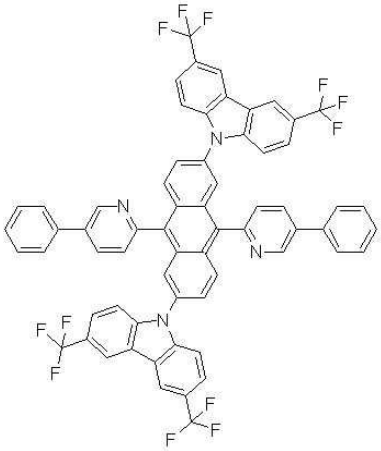

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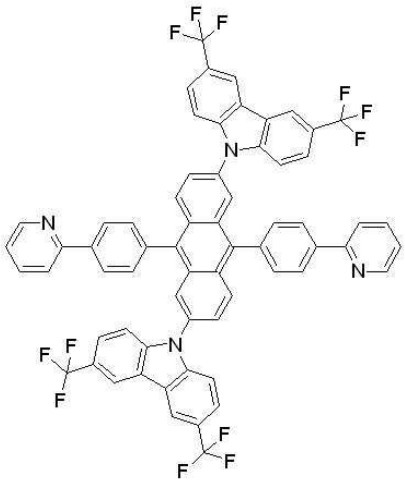

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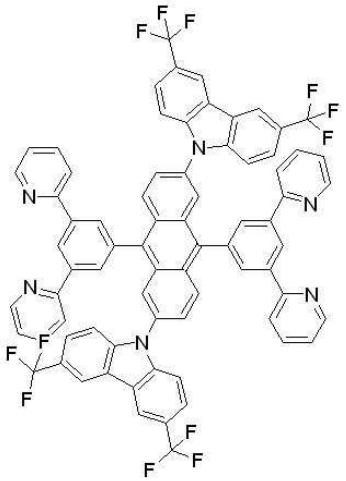

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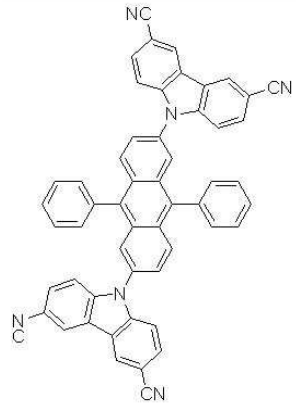

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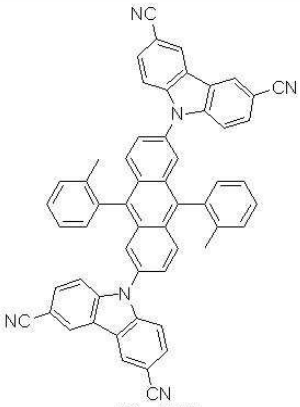

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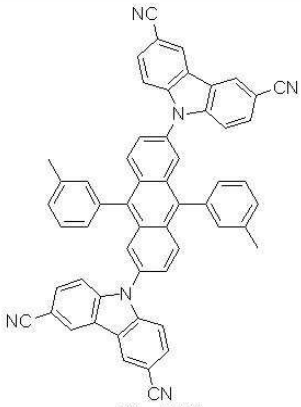

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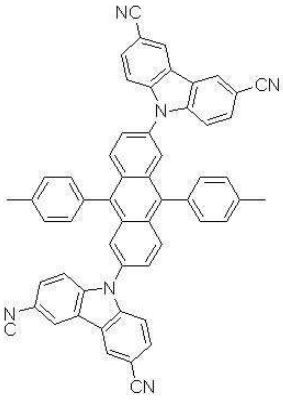

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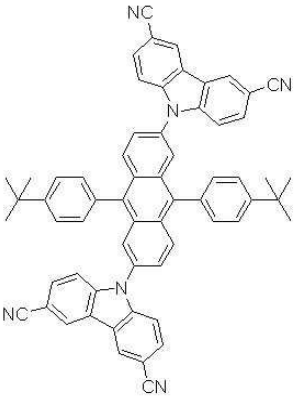

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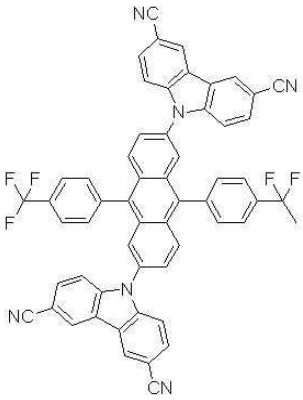

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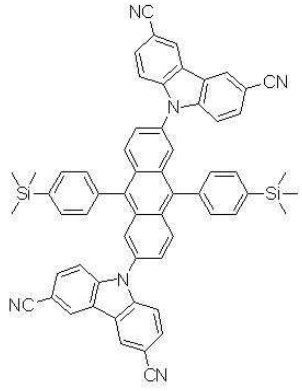

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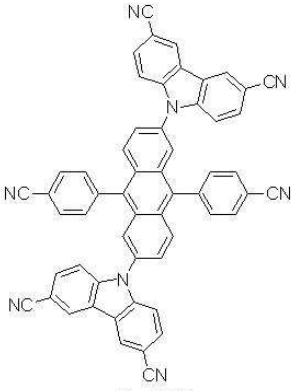

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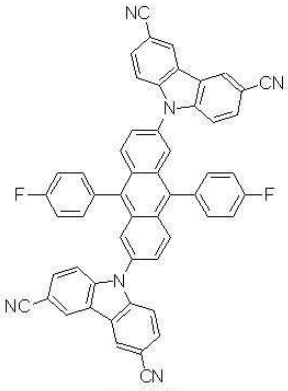

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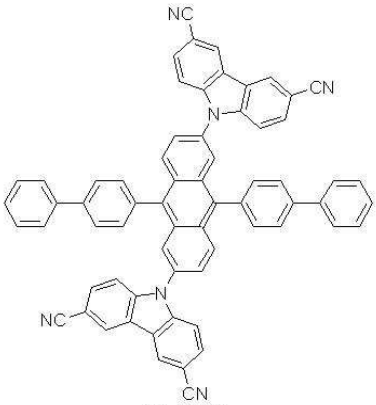

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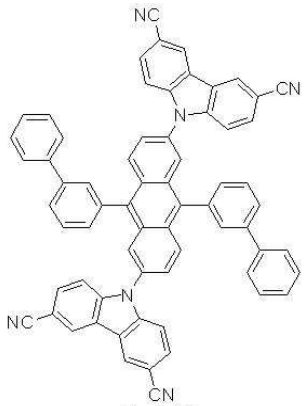

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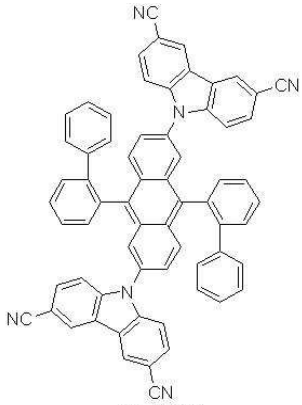

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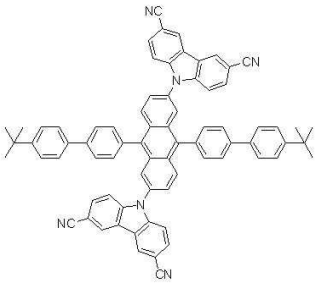

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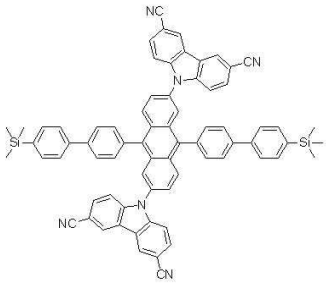

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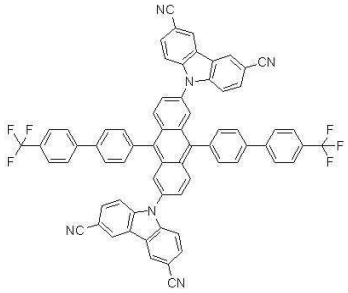

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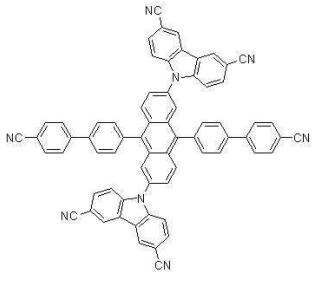

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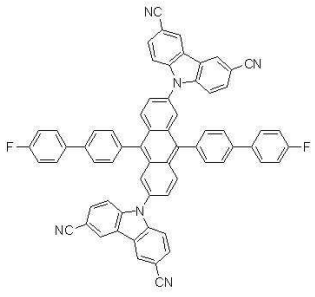

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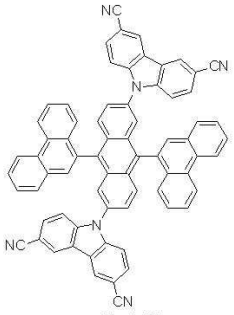

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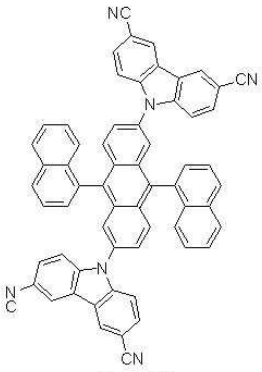

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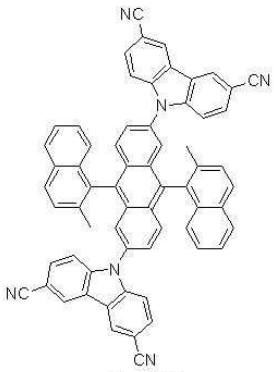

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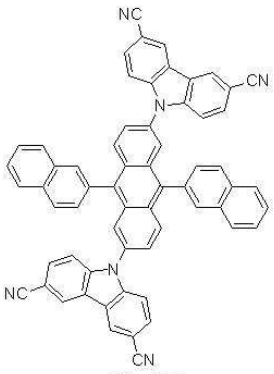

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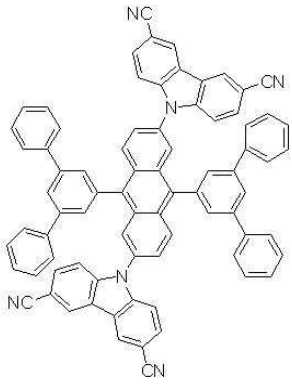

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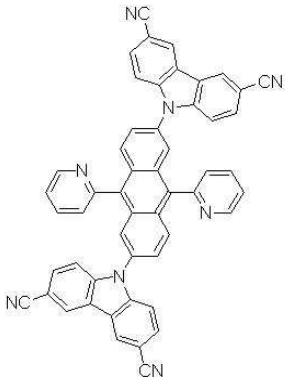

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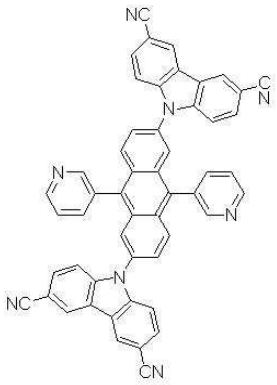

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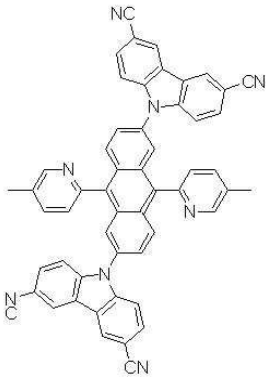
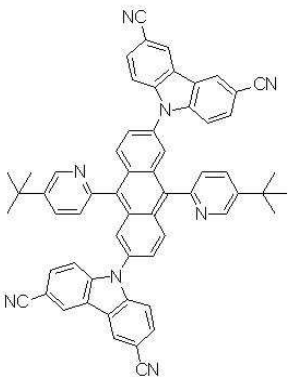
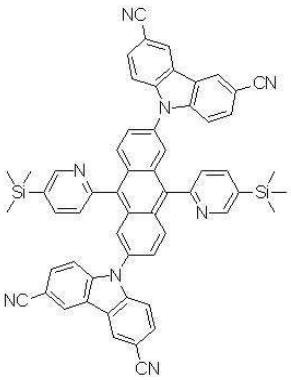


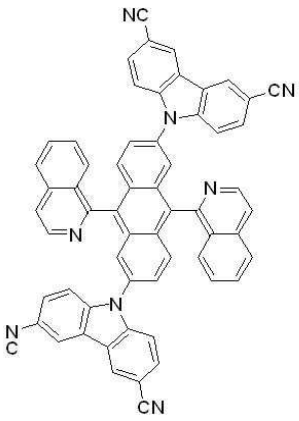
D-155



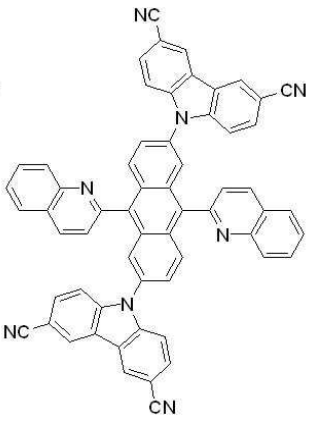
D-156



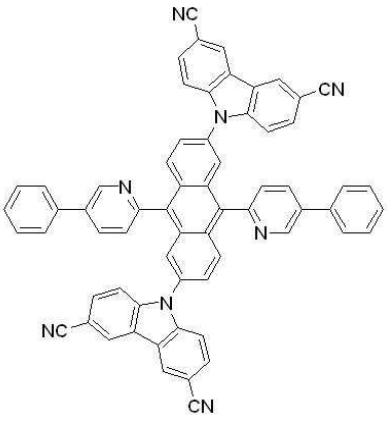
D-157



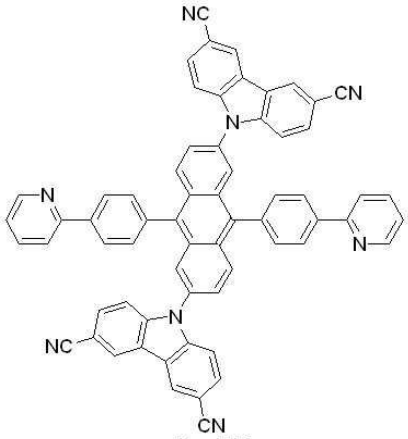
D-158



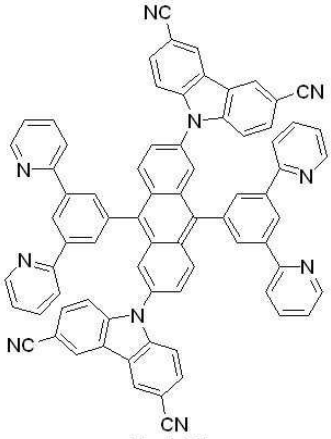
D-159



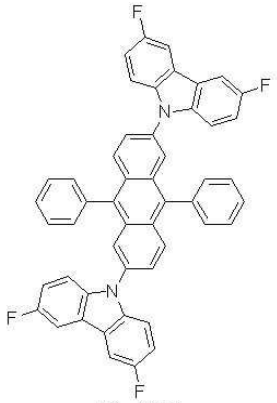
D-160



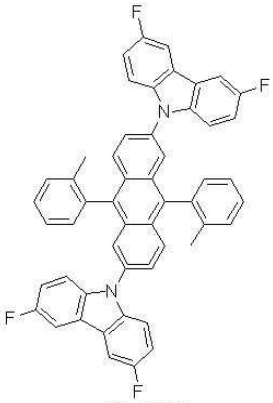
D-161



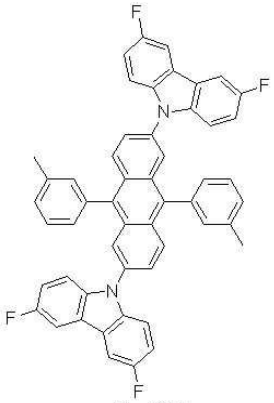
D-162



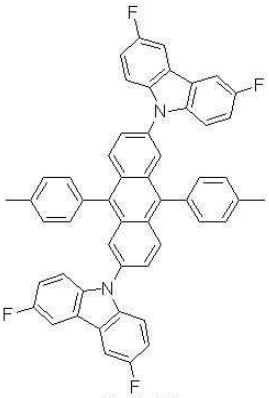
D-163



D-164



D-165



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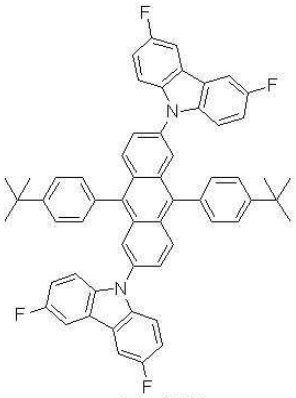

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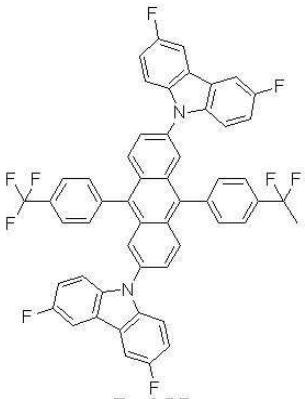

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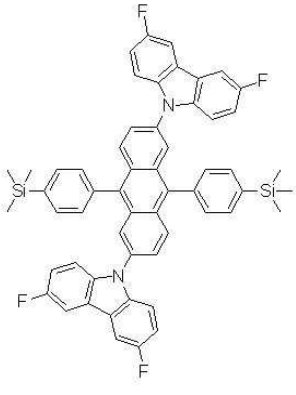

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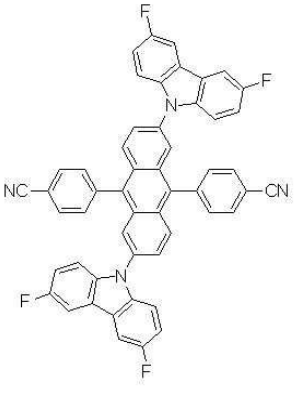

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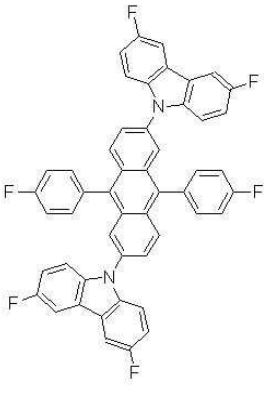

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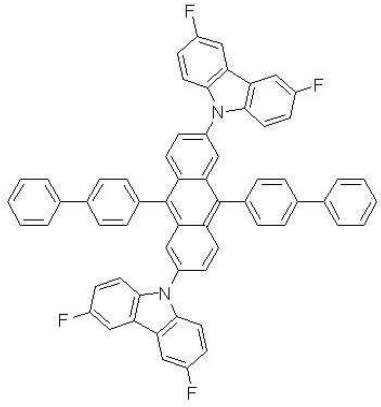
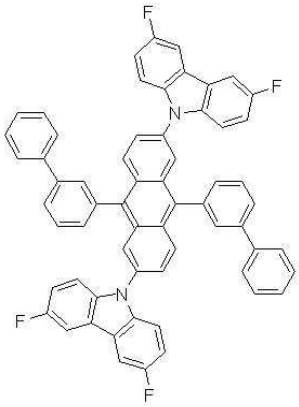
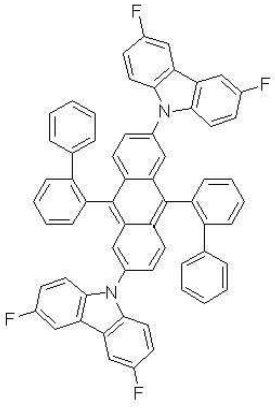


D-172



D-173



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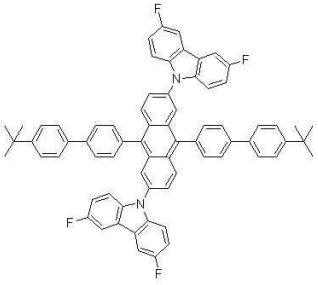

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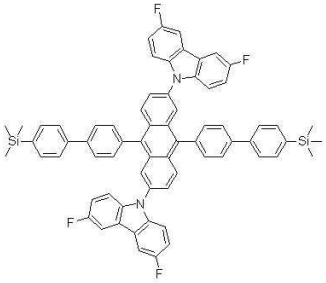
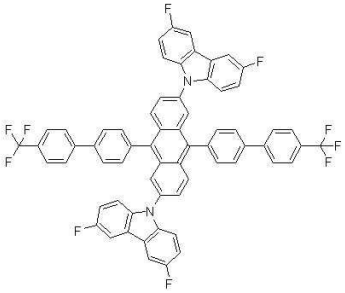


D-176



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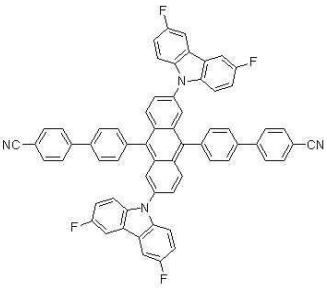

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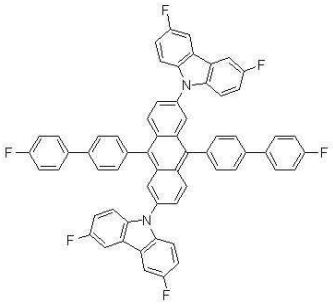

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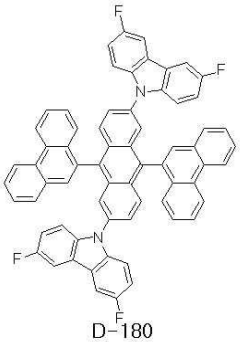

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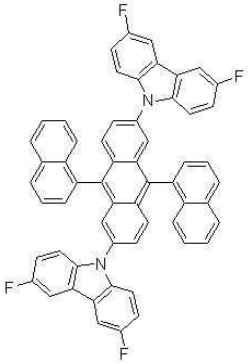

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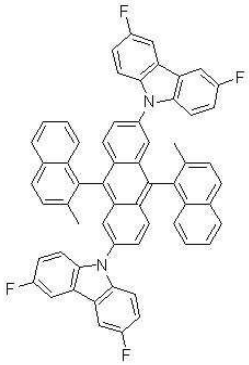
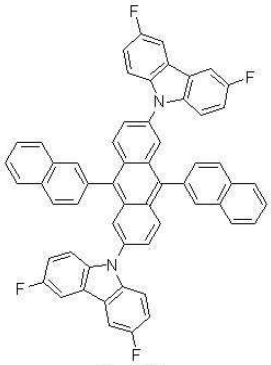


D-182



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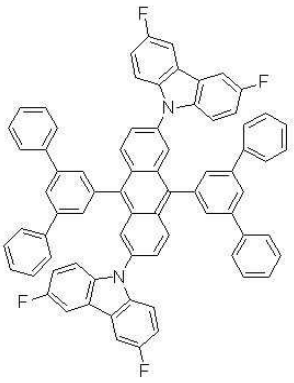
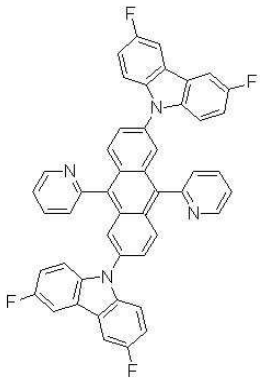
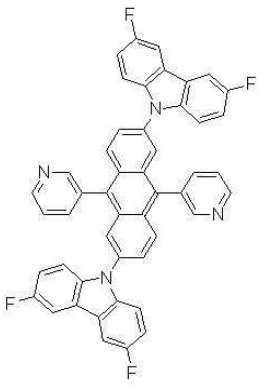


D-184



D-185



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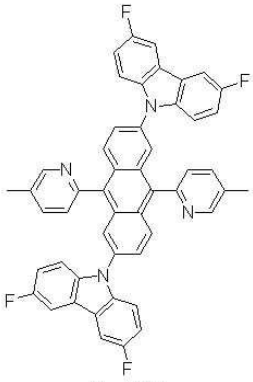

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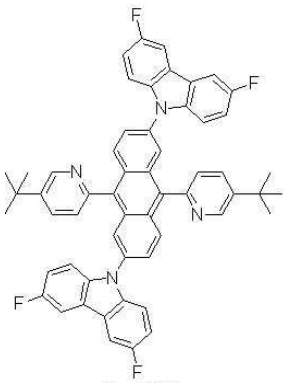

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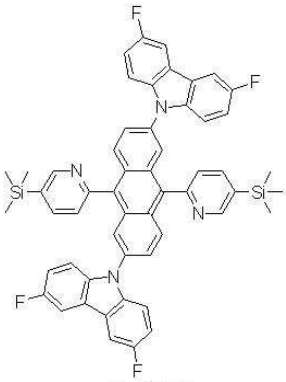

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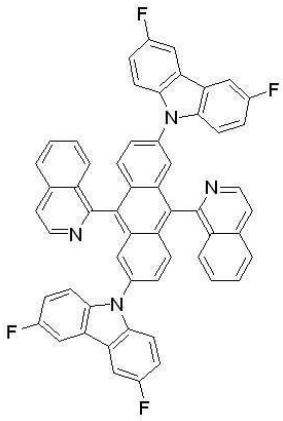
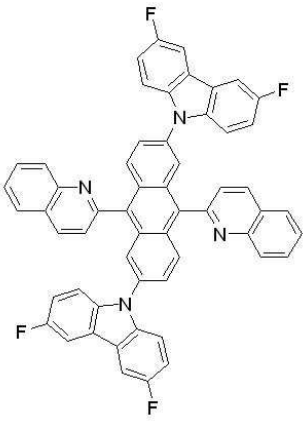


D-190



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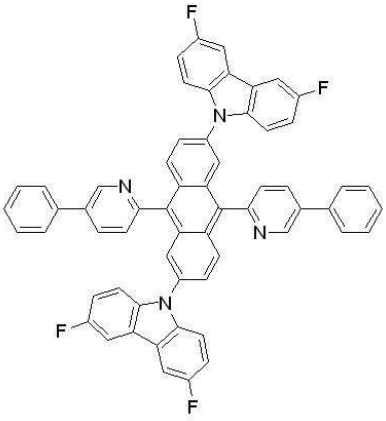

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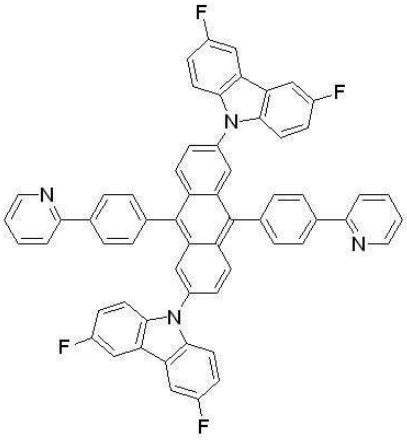

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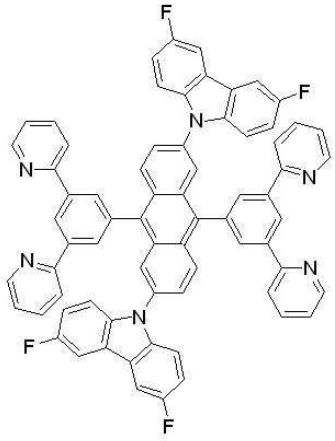


D-194

청구항 7

양극, 정공주입층, 정공수송층, 발광층, 전자수송층, 전자주입층 및 음극을 포함하는 유기전계발광소자에 있어서,

상기 제 1항 내지 제 6항의 청색 발광 화합물을 상기 발광층의 도펀트로 포함하는 것을 특징으로 하는 유기전계발광소자.

청구항 8

제 7항에 있어서,

상기 도펀트의 도핑 농도는 0.5 내지 10 중량부인 것을 특징으로 하는 유기전계발광소자.

명 세 서

발명의 상세한 설명

기 술 분 야

[0001] 본 발명은 유기전계발광소자에 관한 것으로, 보다 자세하게는 신규한 청색 발광 화합물을 포함하는 유기전계발광소자에 관한 것이다.

배 경 기 술

[0002] 최근, 표시장치(FPD: Flat Panel Display)는 멀티미디어의 발달과 함께 그 중요성이 증대되고 있다. 이에 부응하여 액정표시장치(Liquid Crystal Display : LCD), 플라즈마 디스플레이 패널(Plasma Display Panel: PDP), 전계방출표시장치(Field Emission Display: FED), 유기전계발광소자(Organic Light Emitting Diode Display Device) 등과 같은 여러 가지의 디스플레이가 실용화되고 있다.

[0003] 이들 중, 유기전계발광소자는 전자 주입 전극인 음극과 정공 주입 전극인 양극 사이에 형성된 유기발광층에 전하를 주입하면 전자와 정공이 쌍을 이룬 후 소멸하면서 빛을 내는 자발광소자이다.

[0004] 유기전계발광소자는 플라스틱 같은 유연한 기판 위에도 소자를 형성할 수 있을 뿐 아니라, 플라즈마 디스플레이 패널이나 무기전계발광 디스플레이에 비해 10V 이하의 낮은 전압에서 구동이 가능하고, 전력소모가 비교적 적으며 색감이 뛰어나다는 장점이 있다. 또한, 유기전계발광소자는 적색, 녹색 및 청색의 3가지 색을 나타낼 수 있어 풍부한 색을 표현하는 차세대 디스플레이 소자로 많은 사람들의 관심의 대상이 되고 있다.

[0005] 여기서, 청색 유기전계발광소자는 양극, 정공주입층, 정공수송층, 발광층, 전자수송층, 전자주입층 및 음극을 순차적으로 적층하여 형성할 수 있다. 이때 발광층은 호스트-도펀트 시스템을 이용하고 있지만 종래 사용되는 도펀트 물질은 비교적 높은 구동전압과 낮은 발광효율을 나타내고 있다.

[0006] 따라서, 고휘도, 고효율의 유기전계발광소자를 구현하기 위한 새로운 구조의 도펀트 물질의 개발이 요구되고 있다.

발명의 내용

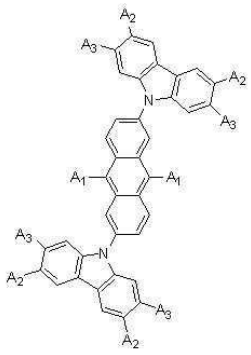
해결 하고자하는 과제

[0007] 따라서, 본 발명의 청색 발광 화합물 및 이를 포함하는 유기전계발광소자는 고휘도, 고효율을 나타낼 수 있는 유기전계발광소자를 제공할 수 있는 이점이 있다.

과제 해결수단

[0008] 상기한 목적을 달성하기 위해, 본 발명의 일 실시 예에 따른 청색 발광 화합물은 하기의 화학식 1로 표시될 수 있다.

[0009] [화학식 1]



[0010]

[0011] 상기 화학식 1에서, A_1, A_2 및 A_3은 각각 독립적으로 수소, 치환되거나 치환되지 않은 방향족 그룹, 이형고리 그룹 또는 지방족 그룹 중 선택된 어느 하나일 수 있다.

[0012] 또한, 본 발명의 일 실시 예에 따른 유기전계발광소자는 양극, 정공주입층, 정공수송층, 발광층, 전자수송층, 전자주입층 및 음극을 포함하는 유기전계발광소자에 있어서, 상기 청색 발광 화합물을 상기 발광층의 도펀트로 포함할 수 있다.

효 과

[0013] 본 발명의 청색 발광 화합물 및 이를 포함하는 유기전계발광소자는 발광휘도, 전류효율 및 전력효율을 향상시킬 수 있는 이점이 있다.

발명의 실시를 위한 구체적인 내용

[0014] 이하, 첨부된 도면을 참조하여 본 발명의 다양한 실시 예들을 자세하게 설명하면 다음과 같다.

[0015] 도 1은 본 발명의 일 실시 예에 따른 유기전계발광소자를 나타낸 도면이다.

[0016] 도 1을 참조하면, 본 발명의 일 실시 예에 따른 유기전계발광소자(100)는 양극(110), 정공주입층(120), 정공수송층(130), 발광층(140), 전자수송층(150), 전자주입층(160) 및 음극(170)을 포함할 수 있다.

[0017] 상기 양극(110)은 정공을 주입하는 전극으로 일함수가 높은 ITO(Indium Tin Oxide), IZO(Indium Zinc Oxide)

또는 ZnO(Zinc Oxide) 중 어느 하나일 수 있다. 또한, 상기 양극(110)이 반사 전극일 경우에 양극(110)은 ITO, IZO 또는 ZnO 중 어느 하나로 이루어진 층 하부에 알루미늄(Al), 은(Ag) 또는 니켈(Ni) 중 어느 하나로 이루어진 반사층을 더 포함할 수 있다.

[0018] 상기 정공주입층(120)은 양극(110)으로부터 발광층(140)으로 정공의 주입을 원활하게 하는 역할을 할 수 있으며, CuPc(cupper phthalocyanine), PEDOT(poly(3,4)-ethylenedioxythiophene), PANI(polyaniline) 및 NPD(N,N-dinaphthyl-N,N'-diphenyl benzidine)로 이루어진 군에서 선택된 어느 하나 이상으로 이루어질 수 있으나 이에 한정되지 않는다.

[0019] 상기 정공주입층(120)의 두께는 1 내지 150nm일 수 있다. 여기서, 상기 정공주입층(120)의 두께가 1nm 이상이면, 정공 주입 특성이 저하되는 것을 방지할 수 있는 이점이 있고, 150nm 이하이면, 정공주입층(120)의 두께가 너무 두꺼워 정공의 이동을 향상시키기 위해 구동전압이 상승되는 것을 방지할 수 있는 이점이 있다.

[0020] 상기 정공수송층(130)은 정공의 수송을 원활하게 하는 역할을 하며, NPD(N,N-dinaphthyl-N,N'-diphenyl benzidine), TPD(N,N'-bis-(3-methylphenyl)-N,N'-bis-(phenyl)-benzidine), s-TAD 및 MTDATA(4,4',4"-Tris(N-3-methylphenyl-N-phenyl-amino)-triphenylamine)로 이루어진 군에서 선택된 어느 하나 이상으로 이루어질 수 있으나 이에 한정되지 않는다.

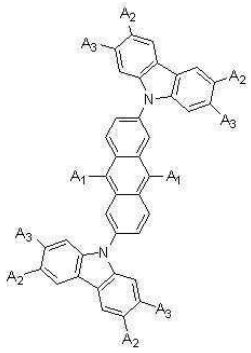
[0021] 상기 정공수송층(130)의 두께는 1 내지 150nm일 수 있다. 여기서, 상기 정공수송층(130)의 두께가 5nm 이상이면, 정공 수송 특성이 저하되는 것을 방지할 수 있는 이점이 있고, 150nm 이하이면, 정공수송층(130)의 두께가 너무 두꺼워 정공의 이동을 향상시키기 위해 구동전압이 상승되는 것을 방지할 수 있는 이점이 있다.

[0022] 상기 발광층(140)은 적색, 녹색 및 청색을 발광하는 물질로 이루어질 수 있으며, 인광 또는 형광물질을 이용하여 형성할 수 있다. 본 실시 예에서는 청색을 발광하는 물질에 대해 설명한다.

[0023] 상기 발광층(140)은 호스트 및 도펀트 물질을 포함할 수 있다. 호스트 물질로는 spiro-DPVBi, DPVBi, spiro-6P, 디스틸벤젠(DSB), 디스트릴아릴렌(DSA), PFO계 고분자 및 PPV계 고분자로 이루어진 군에서 선택된 어느 하나로 이루어질 수 있으나 이에 한정되지 않는다.

[0024] 도펀트 물질은 하기 화학식 1로 표시되는 물질을 사용할 수 있다.

[0025] [화학식 1]



[0026]

[0027] 상기 화학식 1에서, A_1, A_2 및 A_3은 각각 독립적으로 수소, 치환되거나 치환되지 않은 방향족 그룹, 이형고리 그룹 또는 지방족 그룹 중 선택된 어느 하나일 수 있다.

[0028] 상기 치환되거나 치환되지 않은 A_1, A_2 및 A_3은 각각 페닐, 바이페닐, 나프틸, 페닌스렌닐, 터페닐, 피리딜, 바이피리딜, 페닐피리딜, 피리딜페닐, 터피리딜, 퀴놀리닐, 이소퀴놀리닐, 페녹살리닐, 퀴녹살리닐, 메틸, 에틸, 프로필, 이소프로필, 부틸, 터트부틸, 트리메틸실릴, 트리플루오르메틸, 시아노, 플루오르, 메톡시 및 에톡시로부터 선택된 어느 하나일 수 있다.

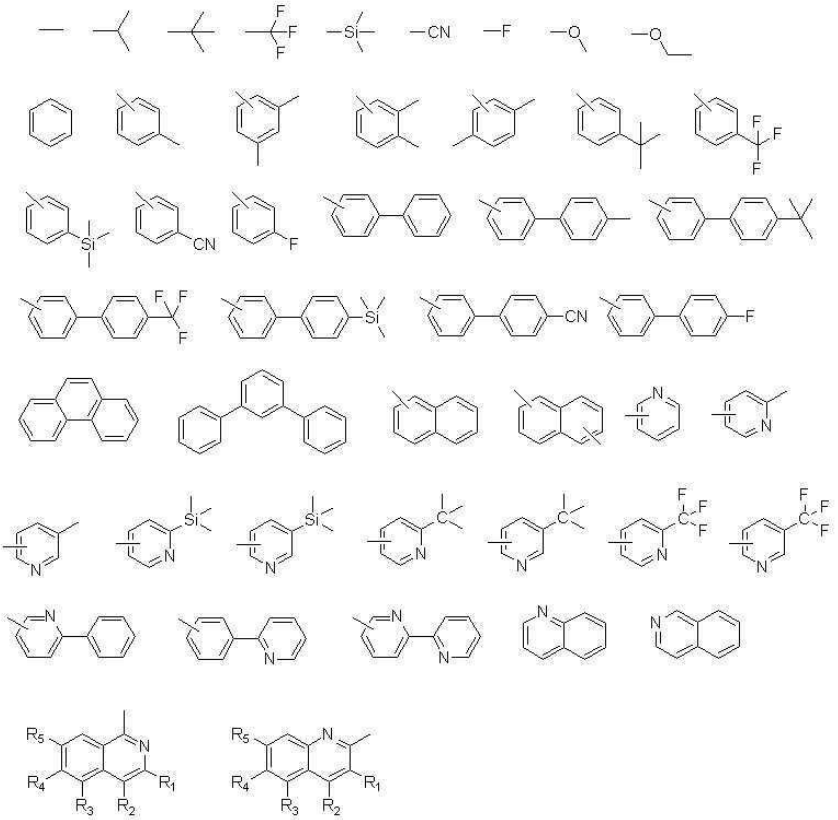
[0029] 상기 A_1, A_2 및 A_3이 치환된 경우에, 상기 A_1, A_2 및 A_3의 치환기는 아릴, 알킬, 알콕시, 할로겐, 시아노, 실릴 그룹으로 이루어진 군에서 선택된 어느 하나일 수 있다.

[0030] 상기 A_1, A_2 및 A_3이 치환된 경우에, 상기 A_1, A_2 및 A3의 치환기는 각각 독립적으로 메틸, 에틸, 프로필, 이소플로필, 부틸, 메톡시, 에톡시, 부톡시, 트리메텔실릴, 불소, 염소로 이루어지는 군에서 선택된 어느 하나일 수

있다.

[0031] 상기 A_1, A_2 및 A_3은 하기 화학식 2 중 어느 하나일 수 있다.

화학식 2

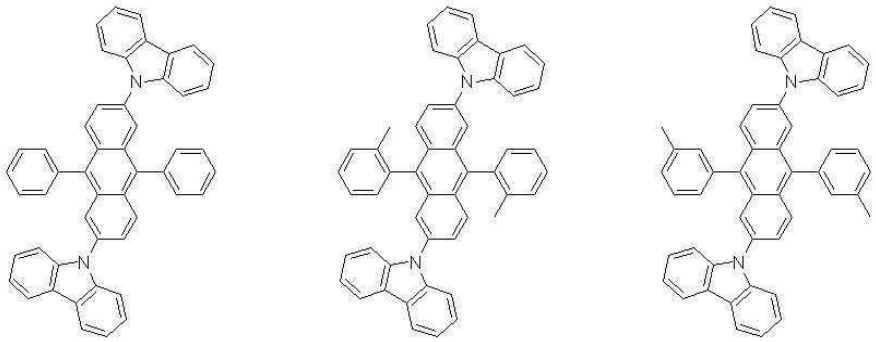


[0032]

[0033] 여기서, R_1, R_2, R_3, R_4 및 R_5는 적어도 하나 이상의 메틸기를 포함할 수 있다.

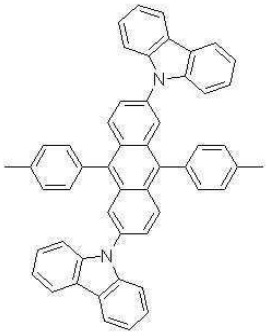
[0034] 상기 청색 발광 화합물은 하기 화학식 3 중 어느 하나일 수 있다.

화학식 3

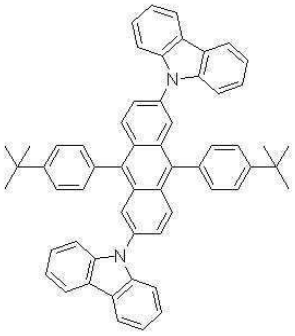


[0035] D-01 D-02 D-03

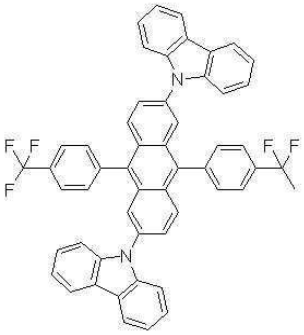
[0036]



D-04

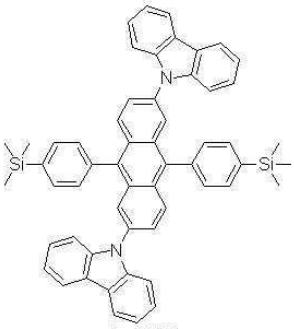


D-05

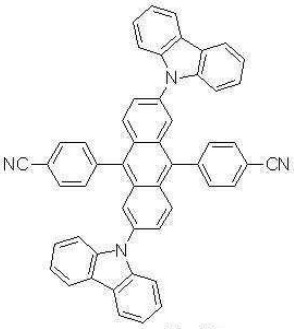


D-06

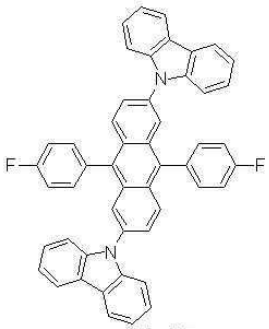
[0037]



D-07

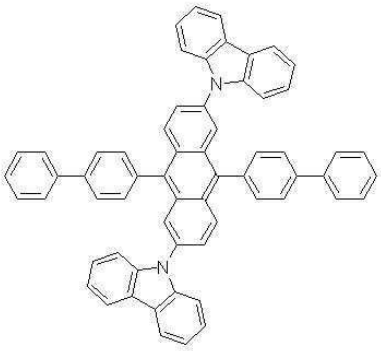


D-08

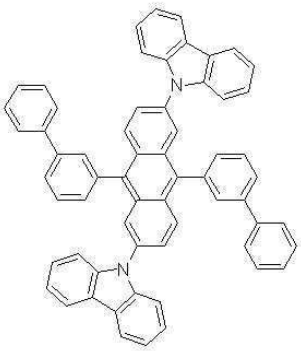


D-09

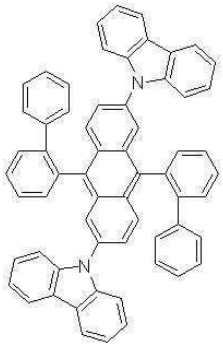
[0038]



D-10

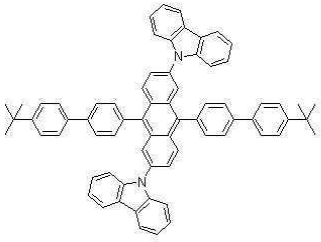


D-11

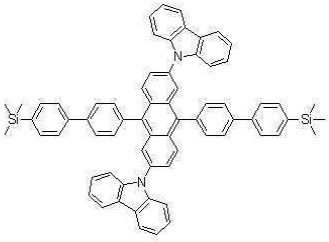


D-12

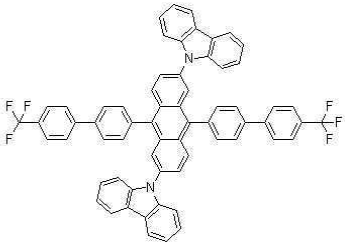
[0039]



D-13

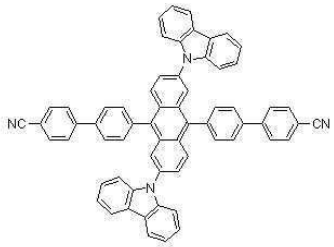


D-14

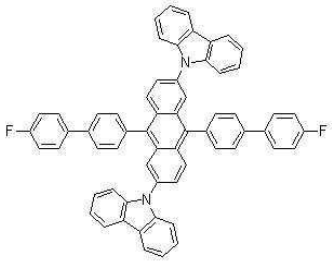


D-15

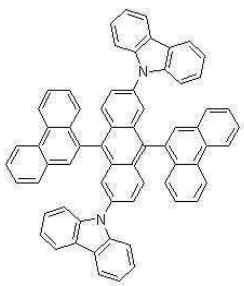
[0040]



D-16

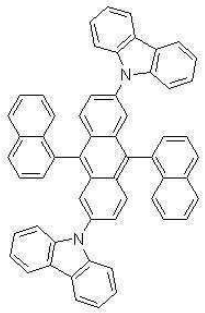


D-17

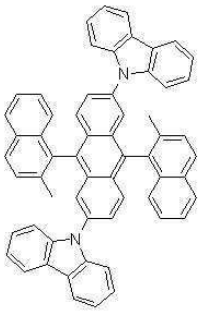


D-18

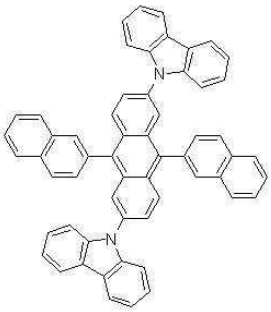
[0041]



D-19

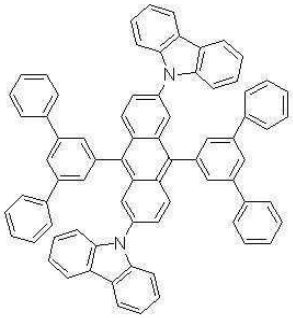


D-20

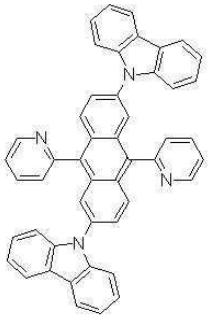


D-21

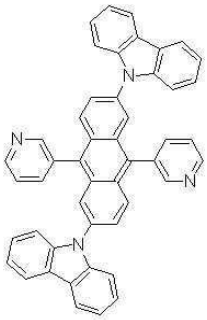
[0042]



D-22

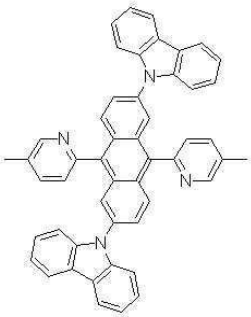


D-23

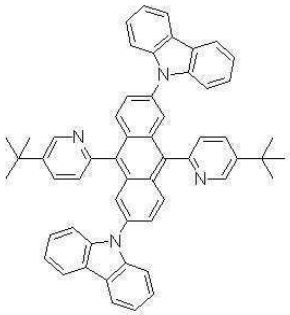


D-24

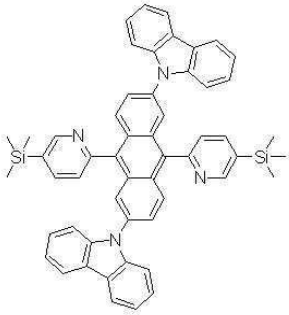
[0043]



D-25

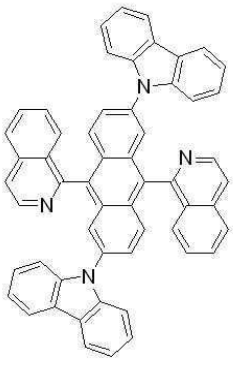


D-26

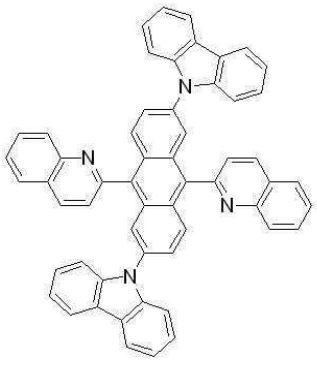


D-27

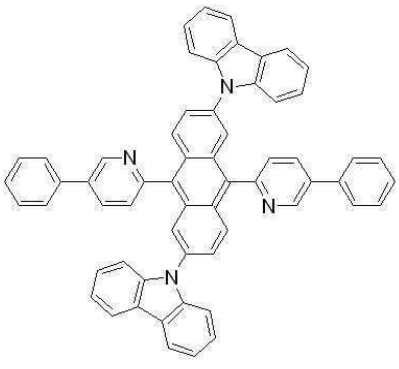
[0044]



D-28

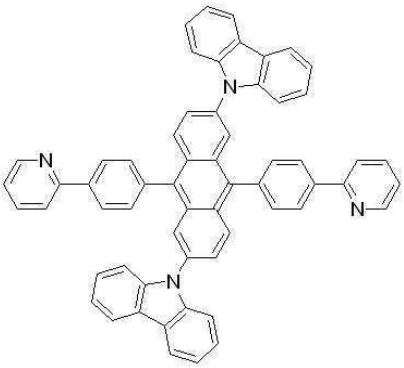


D-29

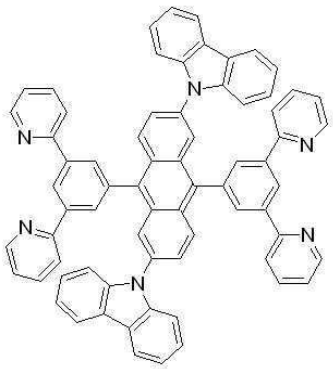


D-30

[0045]

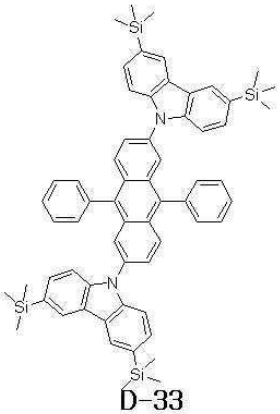


D-31

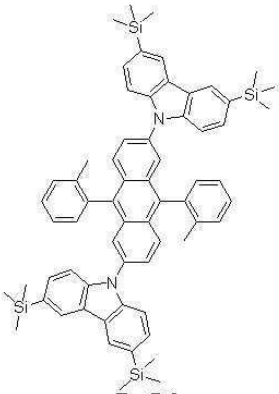


D-32

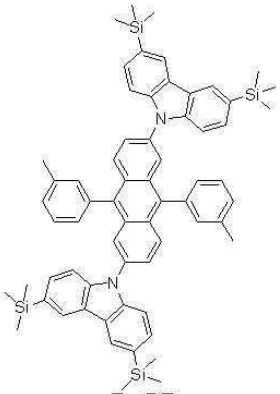
[0046]



D-33

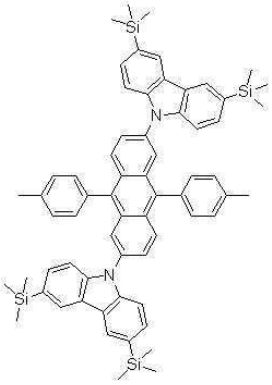


D-34

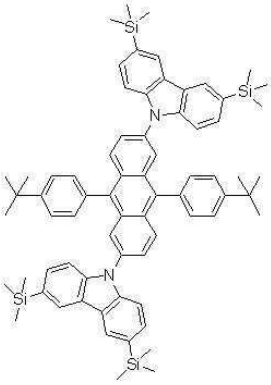


D-35

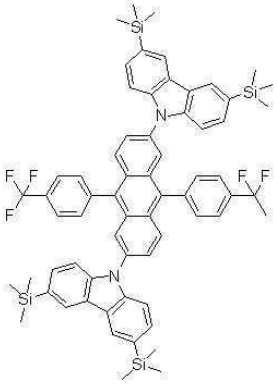
[0047]



D-36

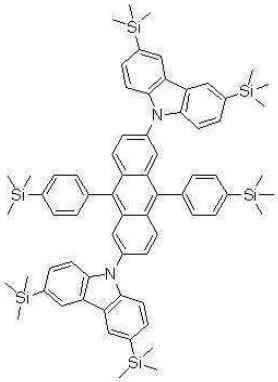


D-37

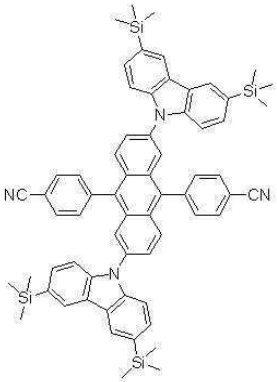


D-38

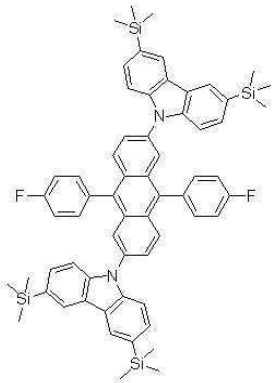
[0048]



D-39

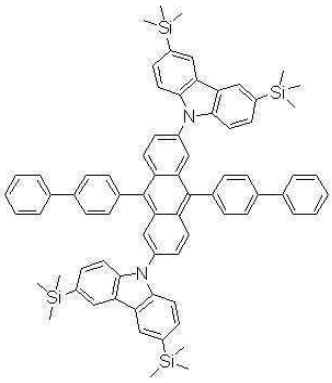


D-40

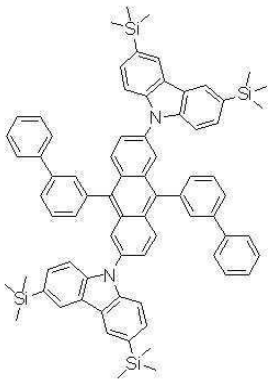


D-41

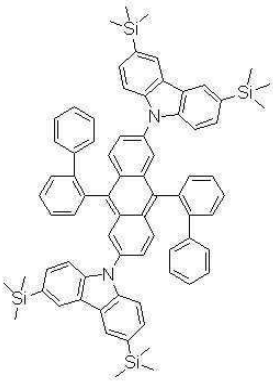
[0049]



D-42

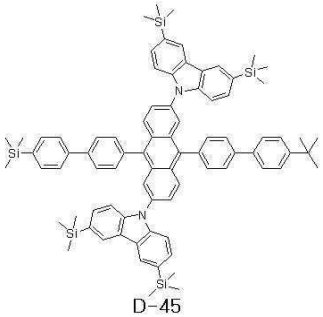


D-43

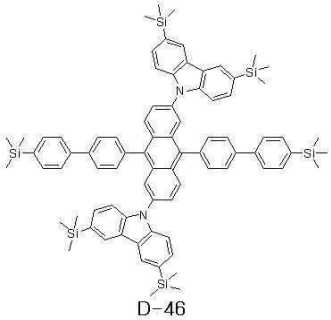


D-44

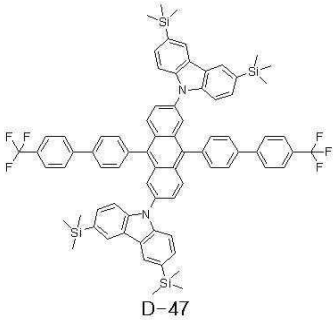
[0050]



D-45



D-46



D-47

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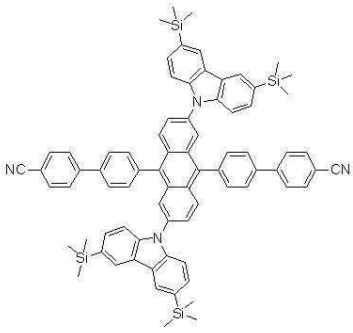
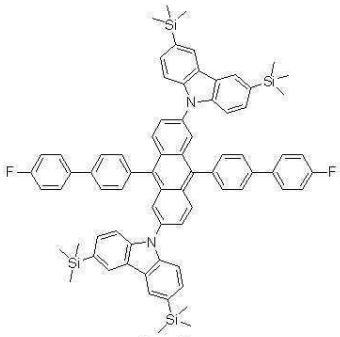
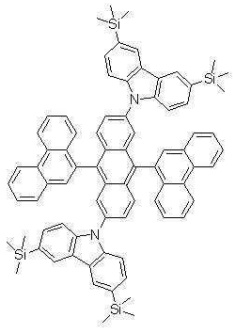


D-48



D-49



D-50

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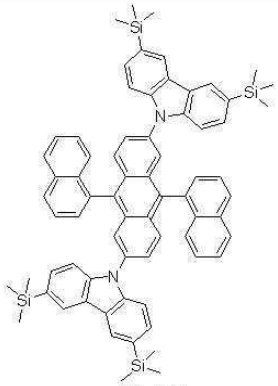

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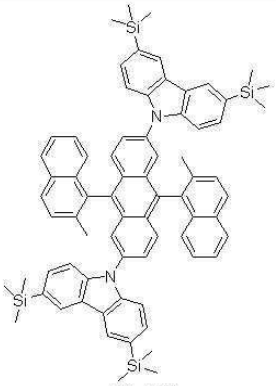

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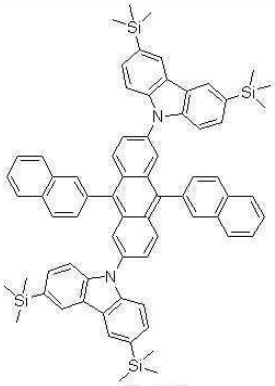

D-53

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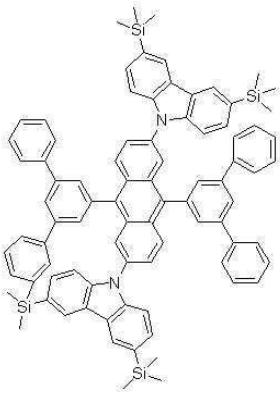
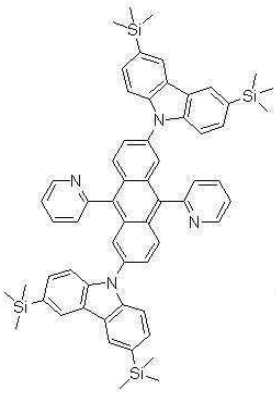


D-54



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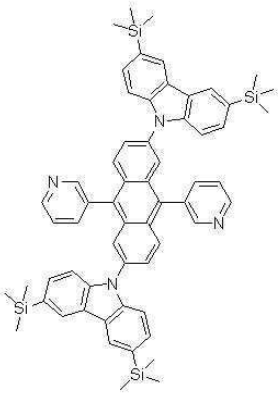

D-56

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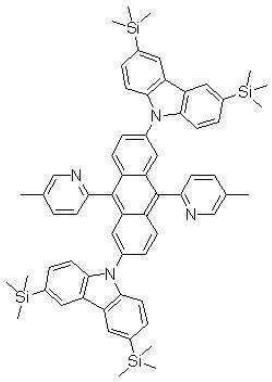
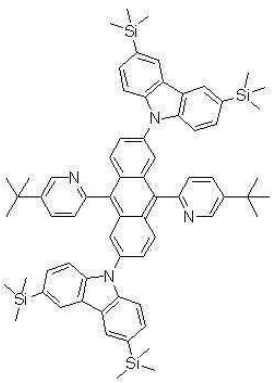
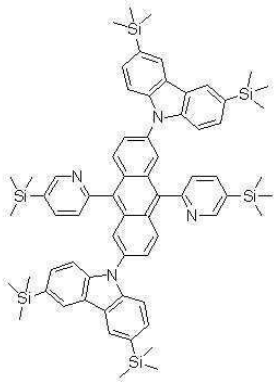


D-57



D-58



D-59

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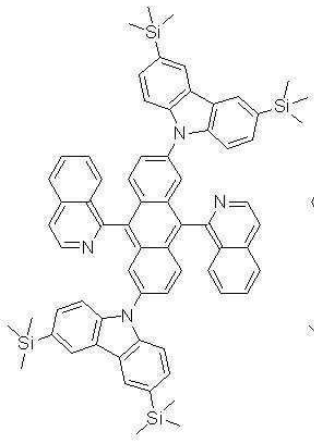

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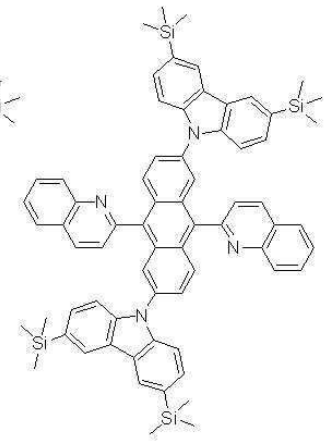
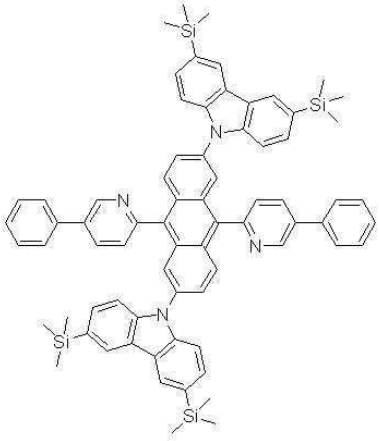


D-61



D-62

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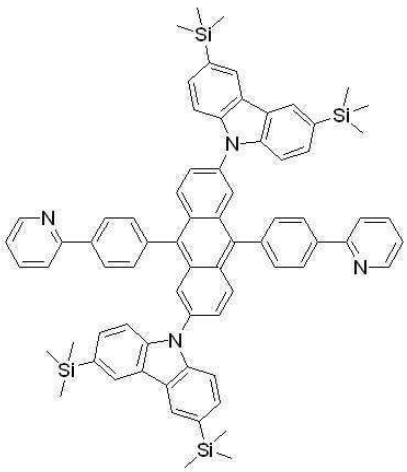

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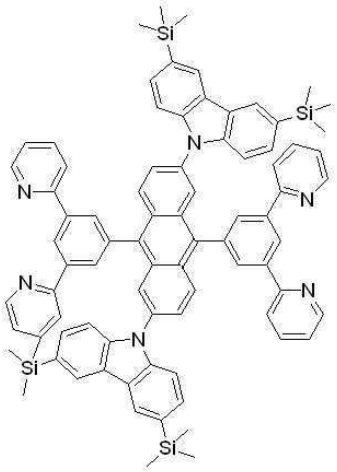

D-64

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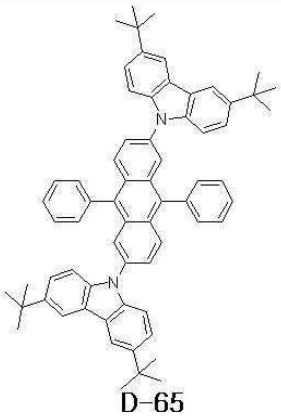

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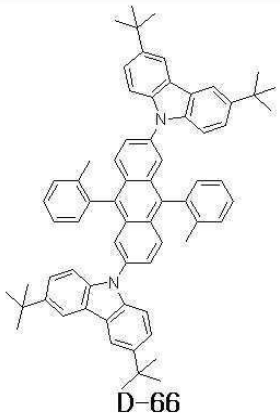

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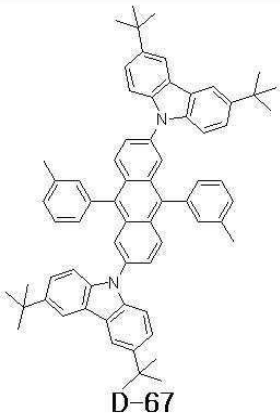

D-67

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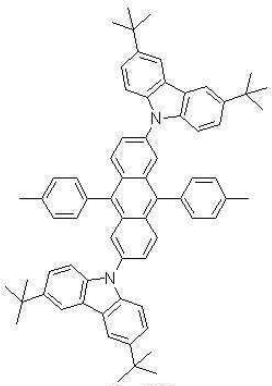
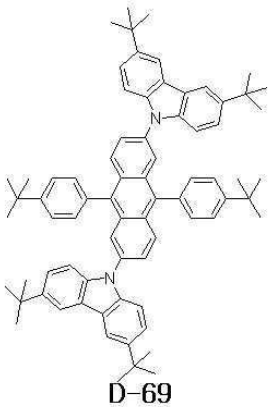


D-68



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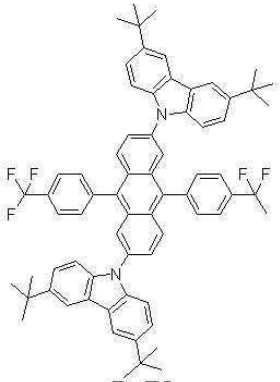

D-70

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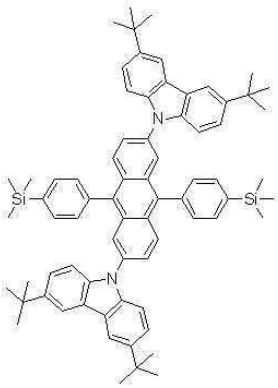
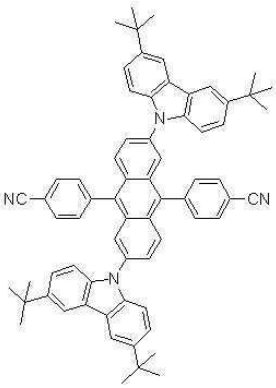


D-71



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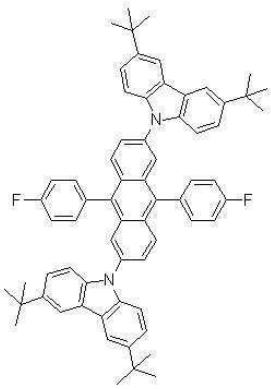

D-73

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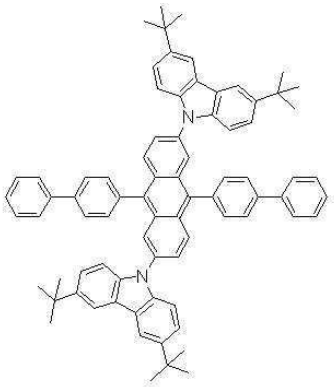
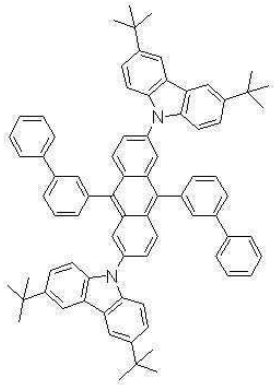


D-74



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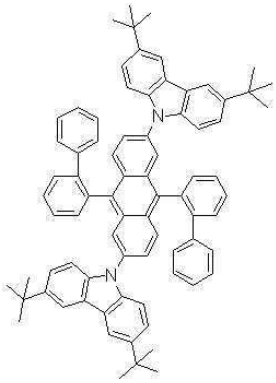

D-76

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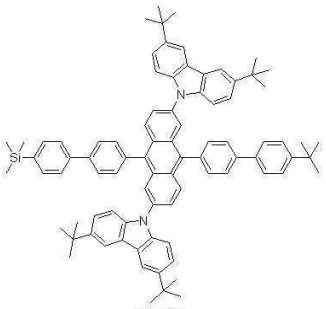

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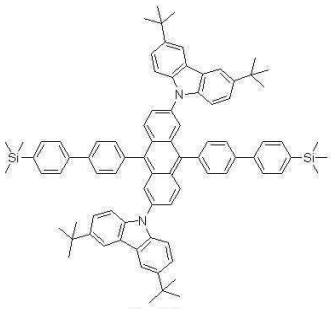

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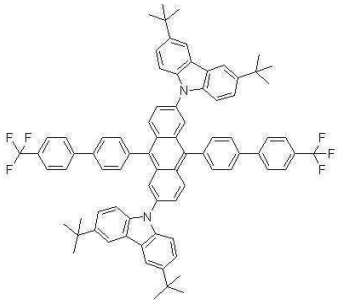

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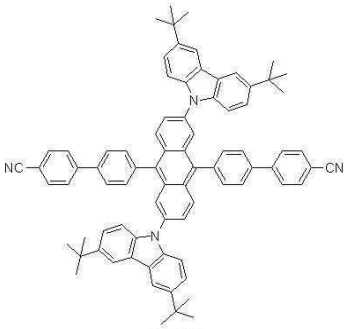

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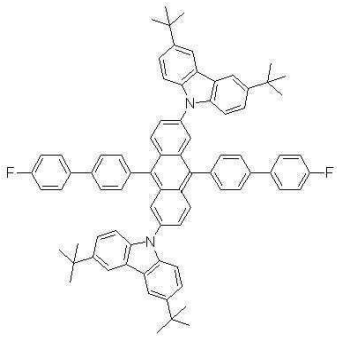

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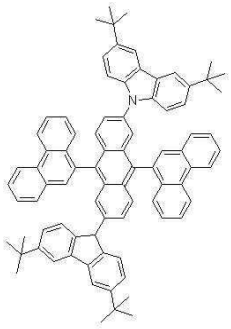

D-82

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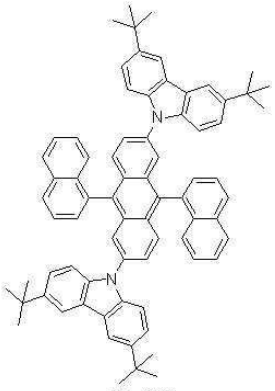

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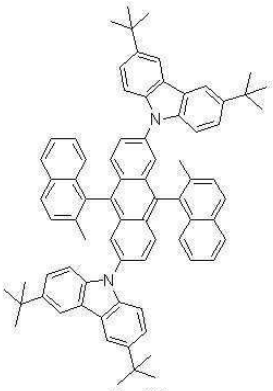

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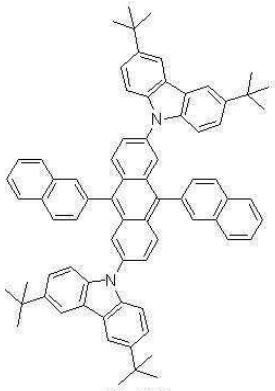

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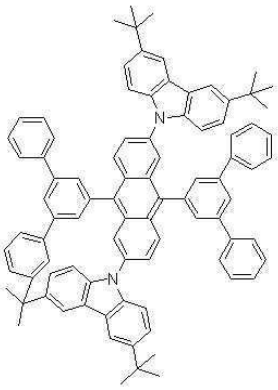
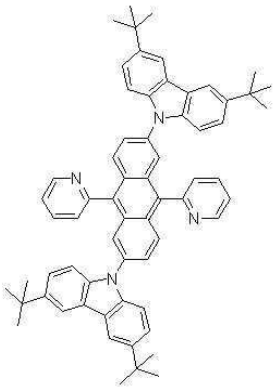
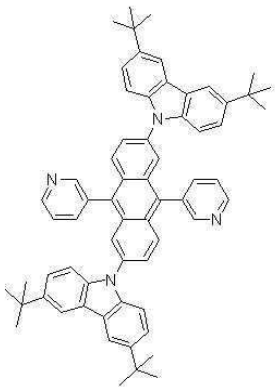


D-86



D-87



D-88

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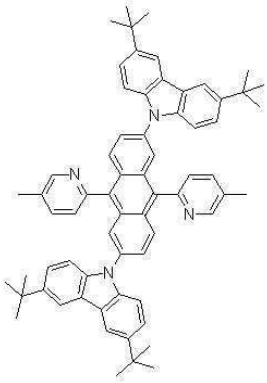

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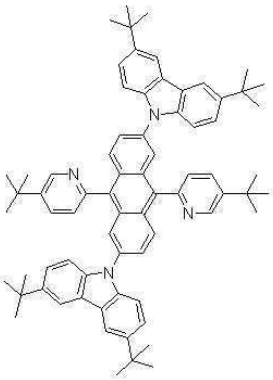

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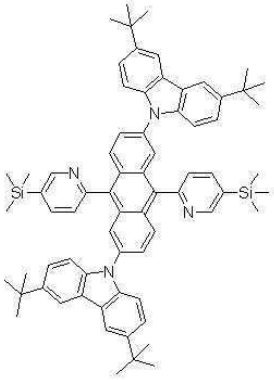

D-91

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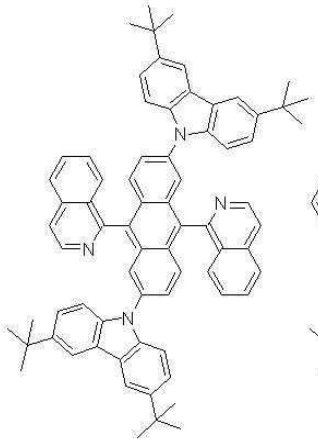

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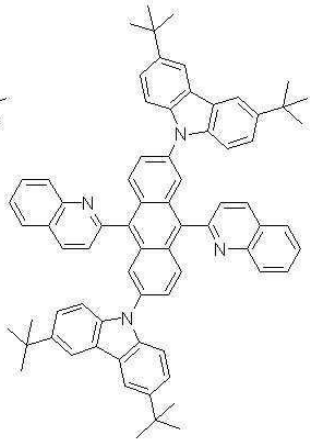
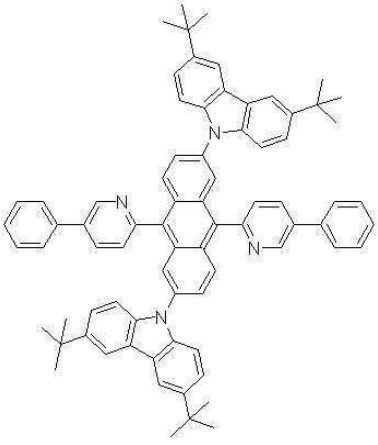


D-93



D-94

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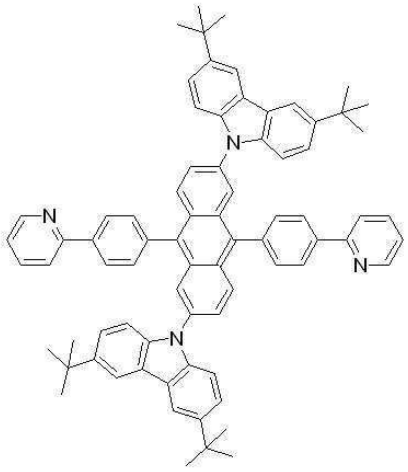
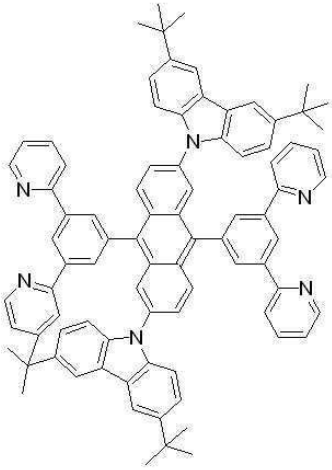


D-95



D-96

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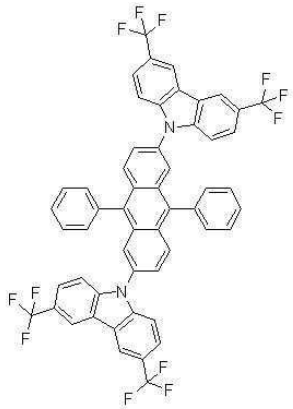
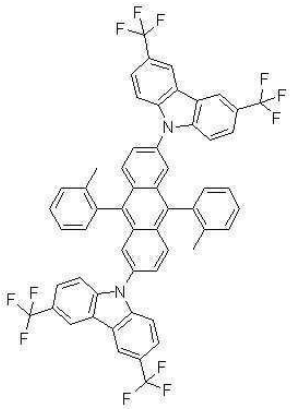
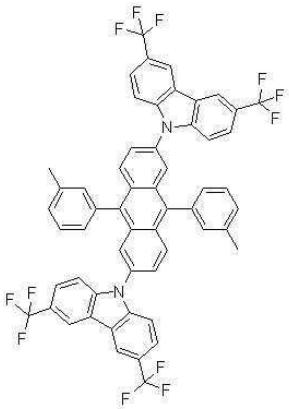


D-97



D-98



D-99

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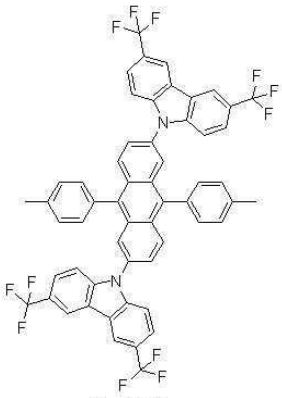

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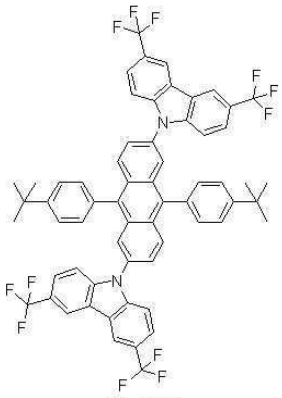
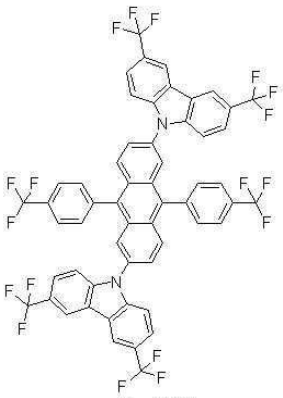


D-101



D-102

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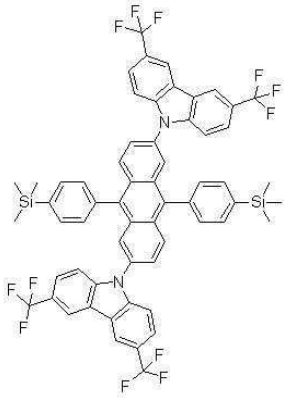
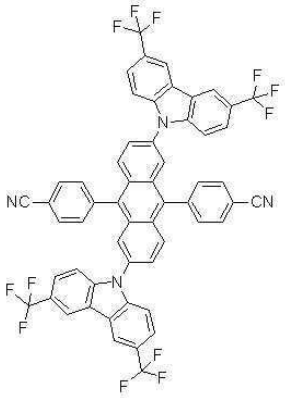
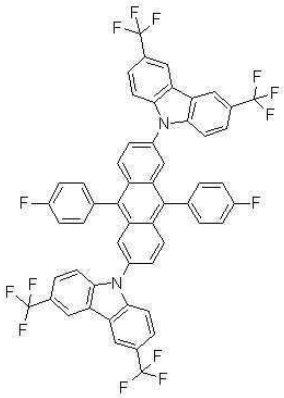


D-103

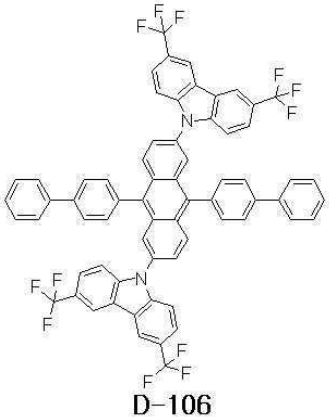


D-104

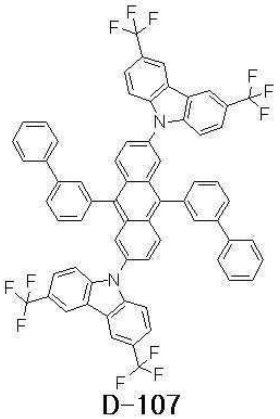


D-105

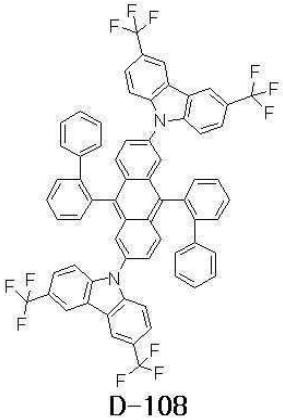
[0071]



D-106



D-107



D-108

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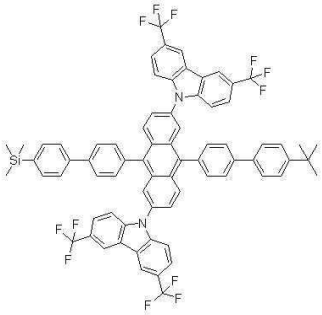
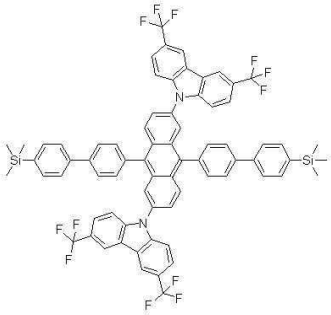
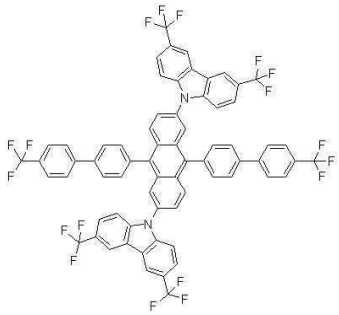


D-109



D-110



D-111

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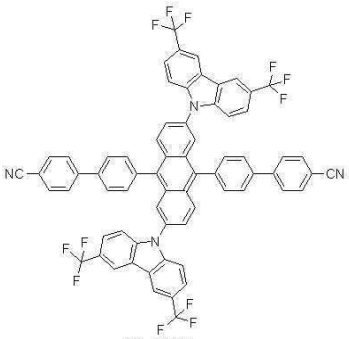

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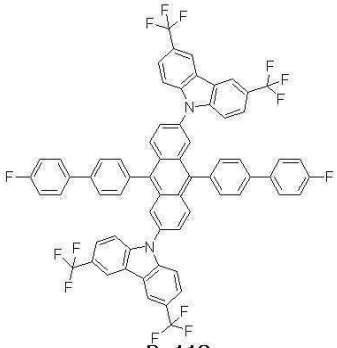
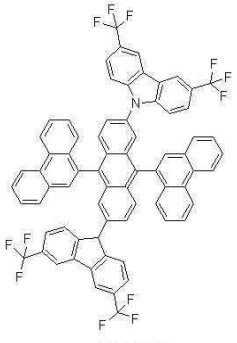


D-113



D-114

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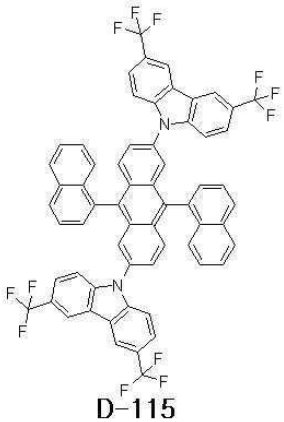
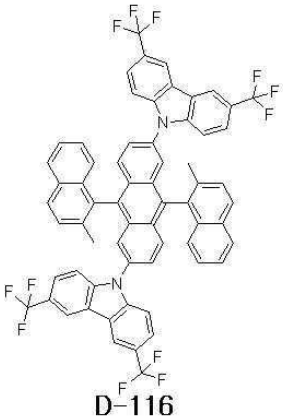
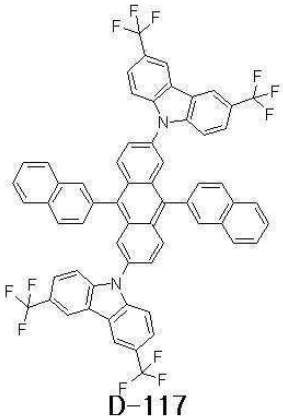


D-115



D-116



D-117

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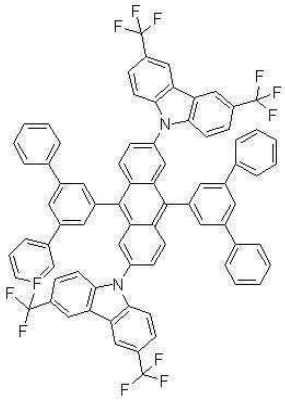
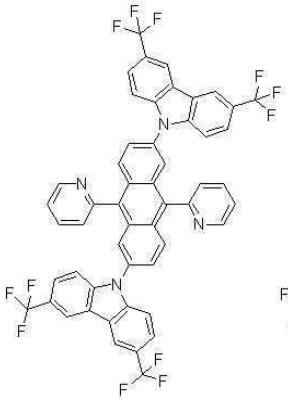


D-118



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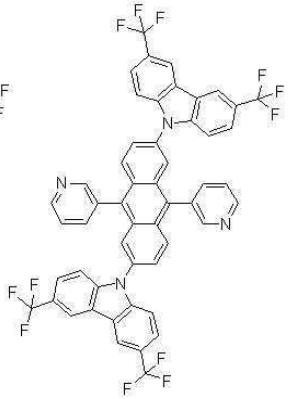

D-120

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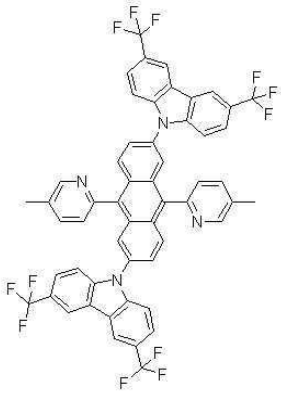

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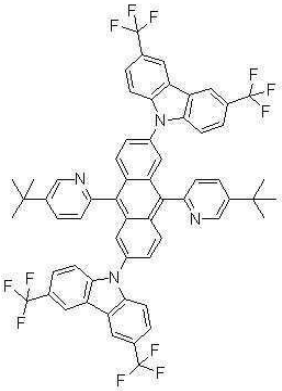

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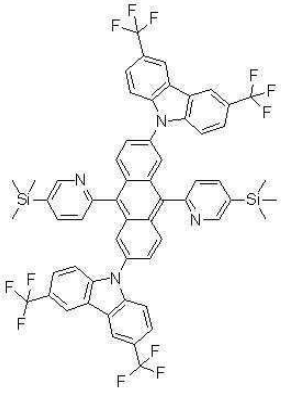

D-124

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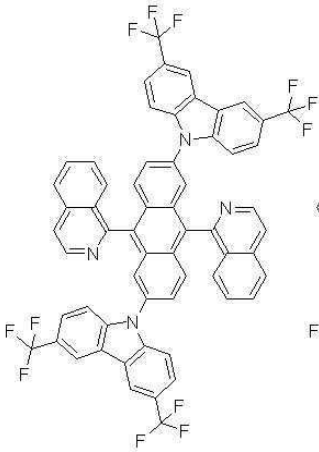

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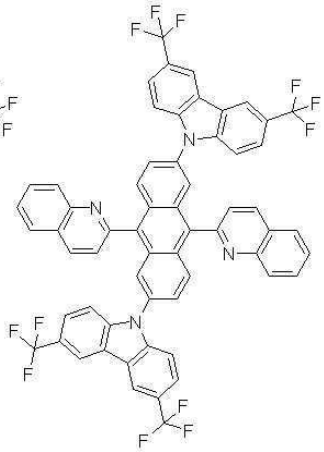

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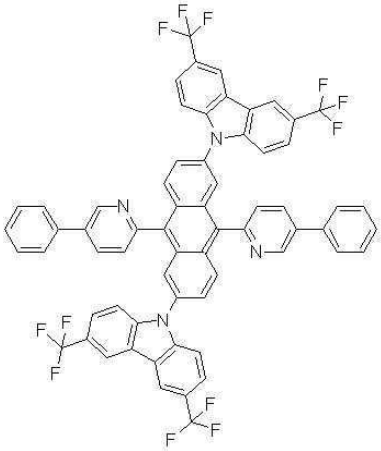

D-127

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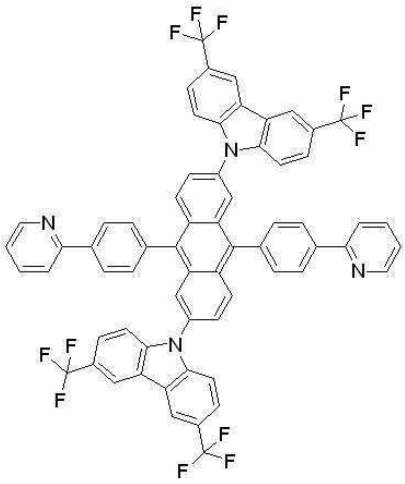

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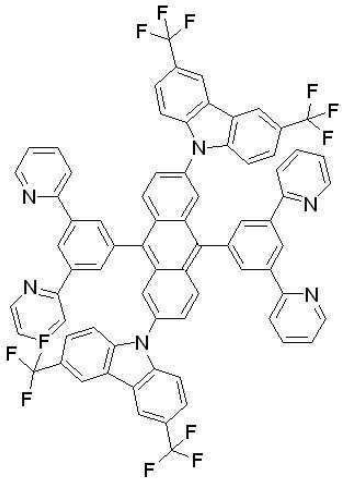

D-129

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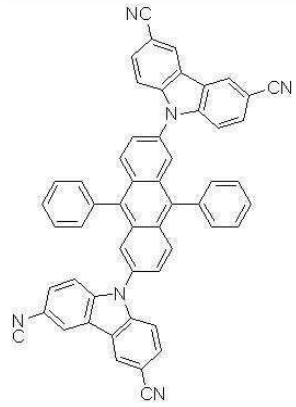

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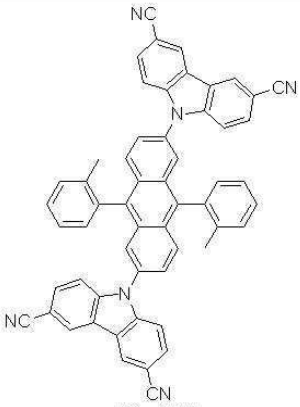

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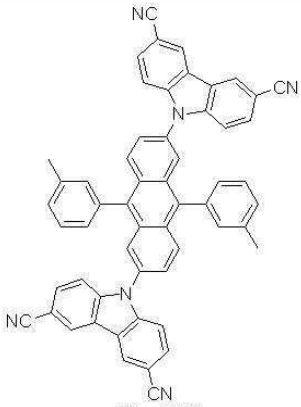

D-132

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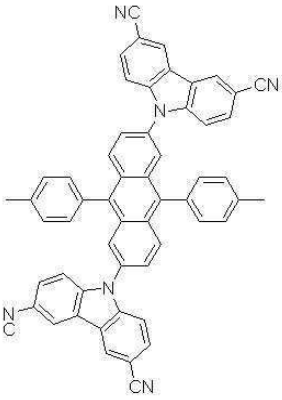

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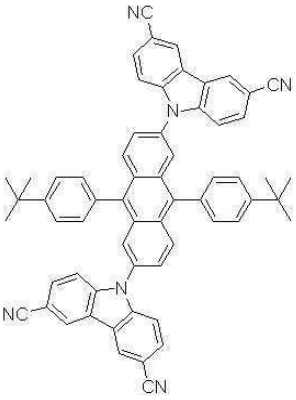

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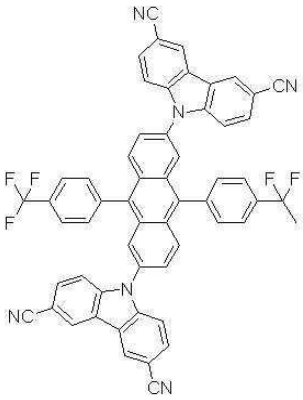

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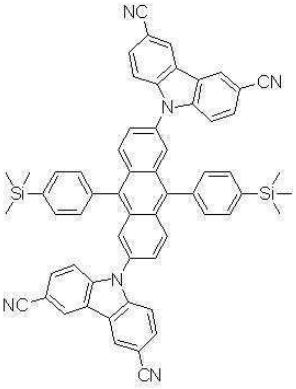

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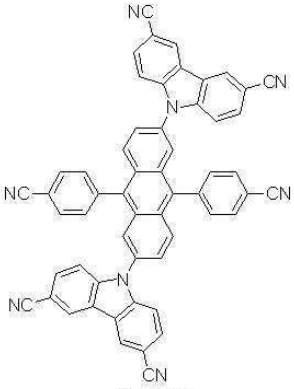

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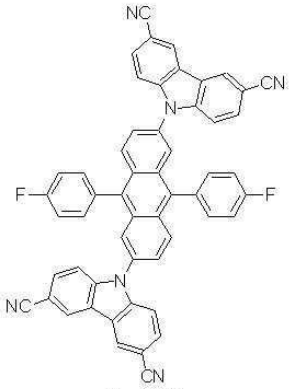

D-138

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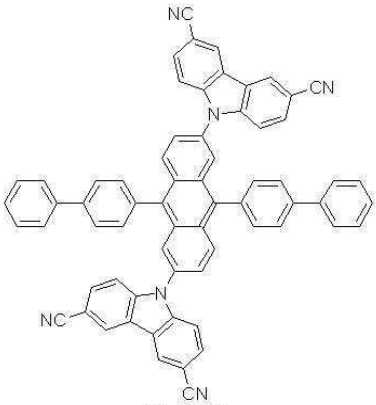

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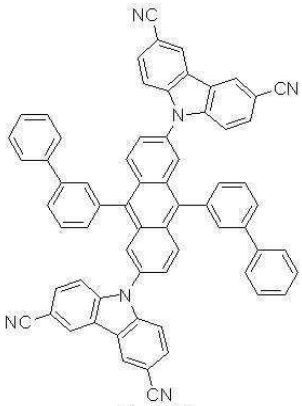

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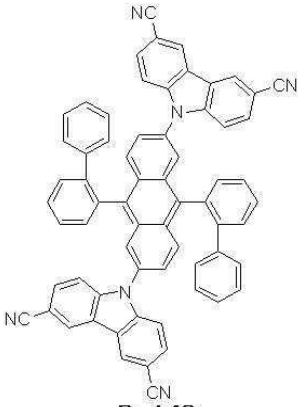

D-142

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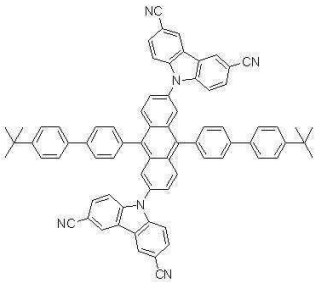
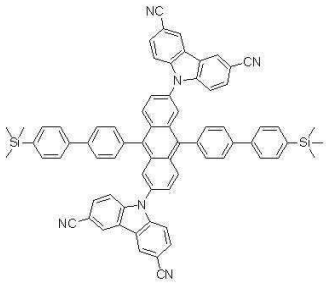


D-143



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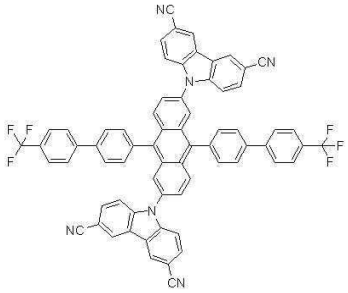

D-145

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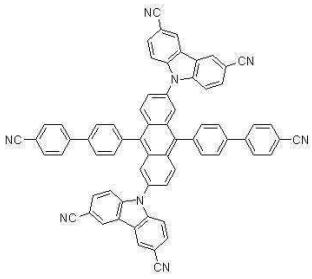
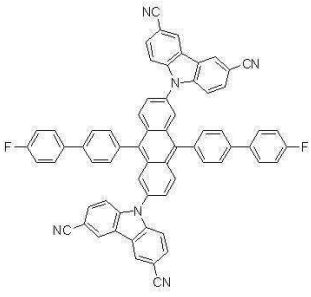
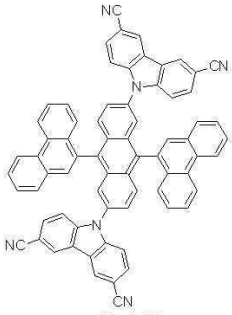


D-146



D-147



D-148

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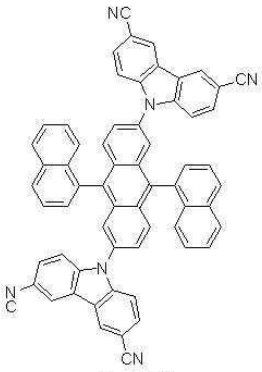
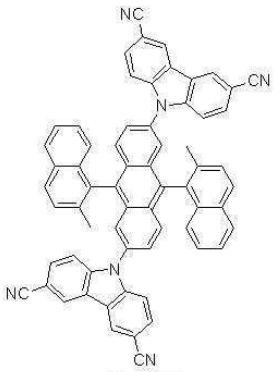
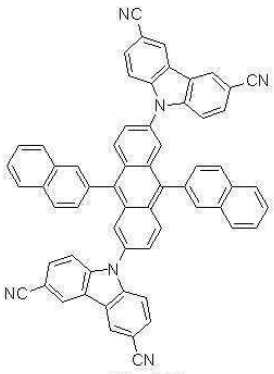


D-149



D-150



D-151

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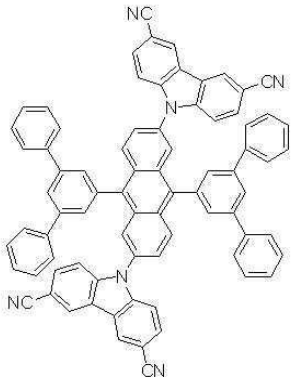
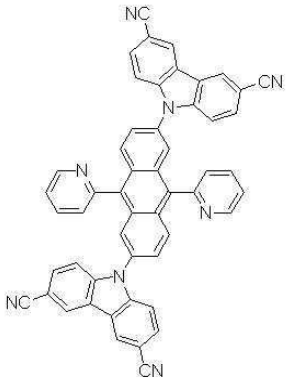
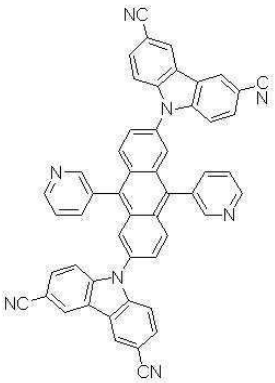


D-152



D-153



D-154

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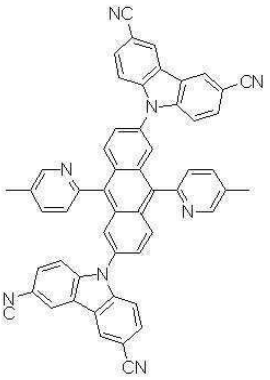
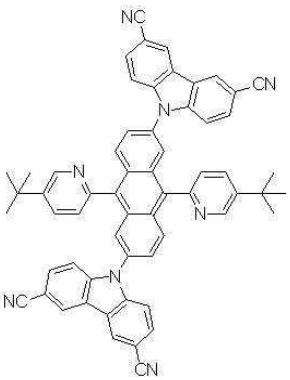
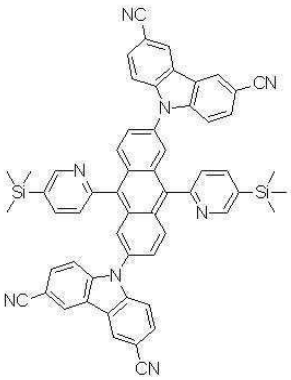


D-155



D-156



D-157

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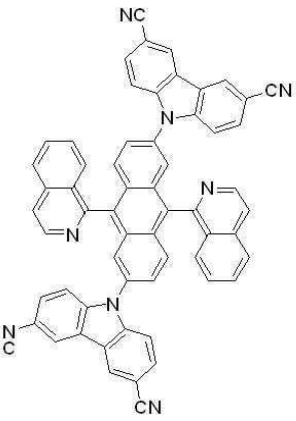
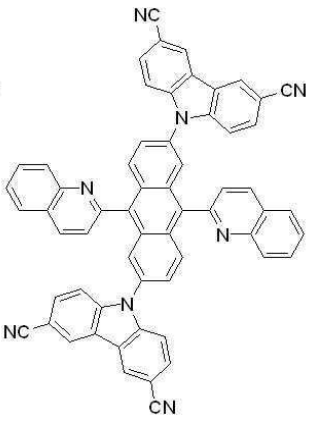
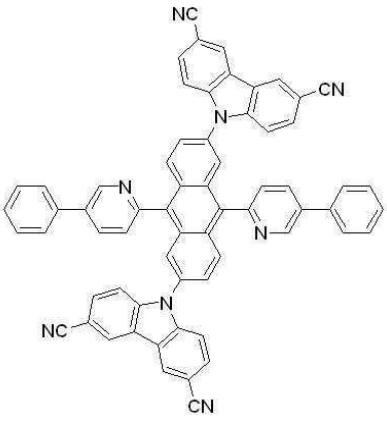


D-158



D-159



D-160

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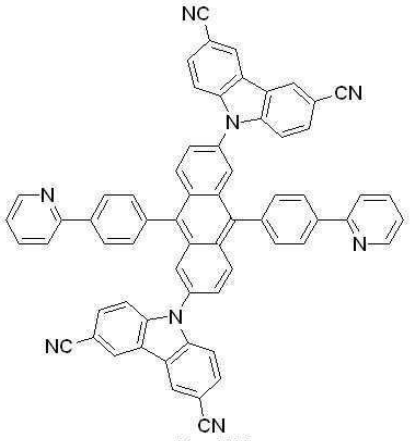
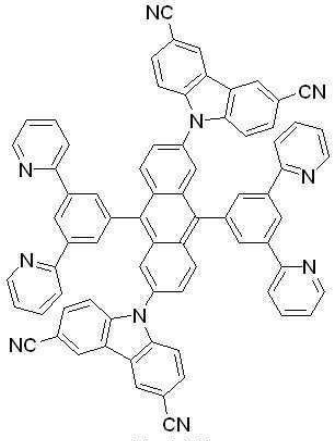


D-161



D-162

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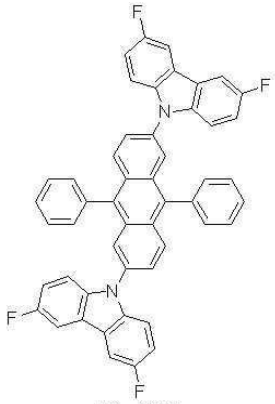
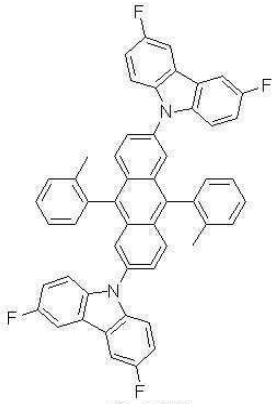
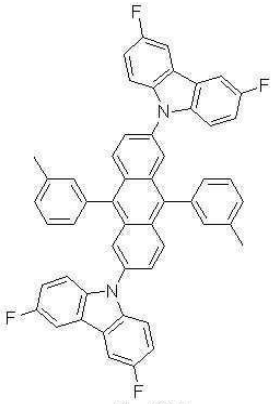


D-163

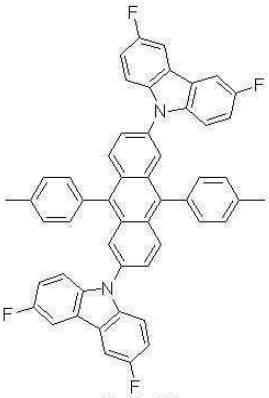


D-164

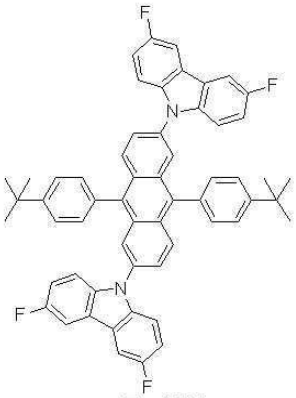


D-165

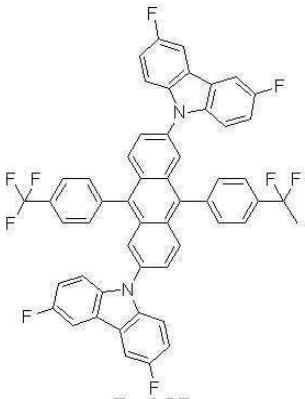
[0091]



D-166

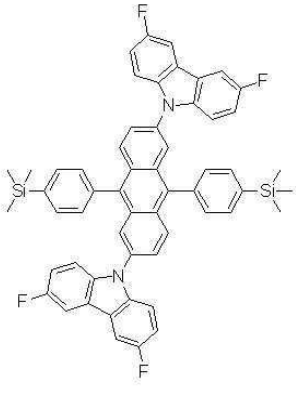


D-167

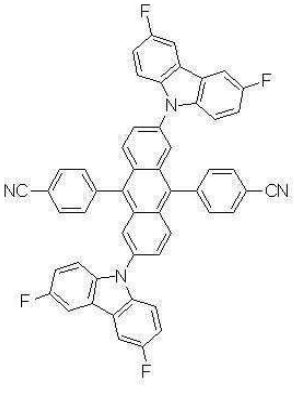


D-168

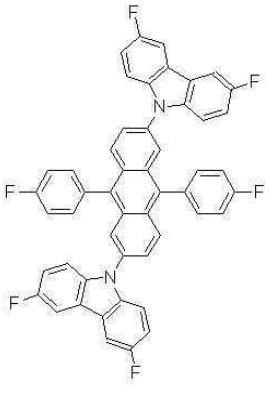
[0092]



D-169

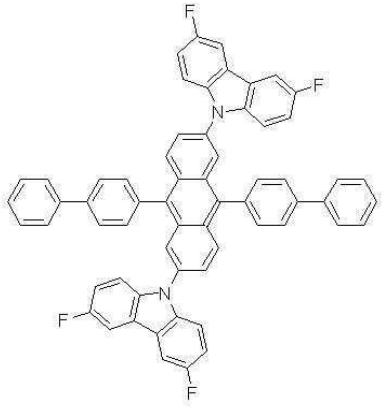


D-170

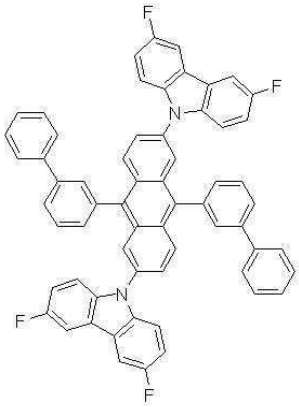


D-171

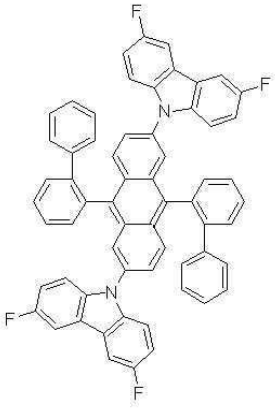
[0093]



D-172

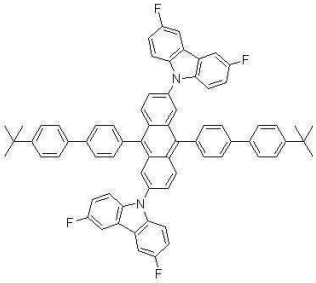


D-173

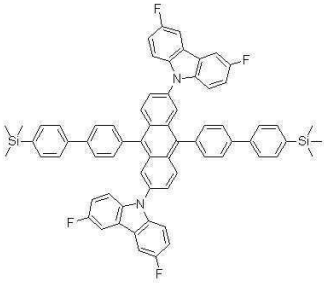


D-174

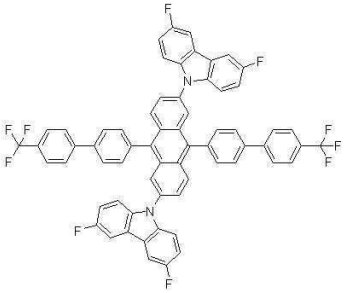
[0094]



D-175

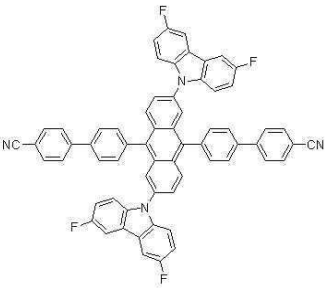


D-176

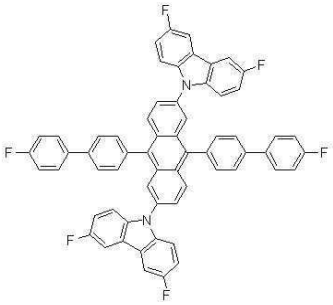


D-177

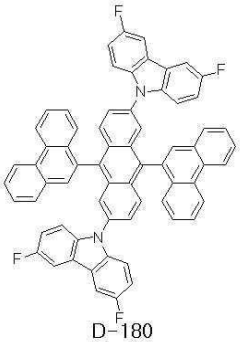
[0095]



D-178

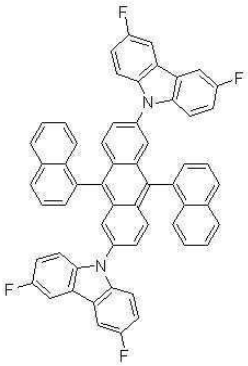


D-179

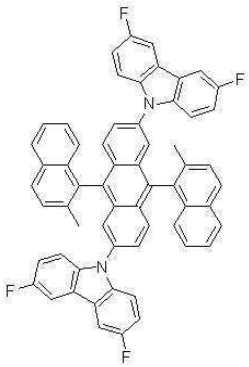


D-180

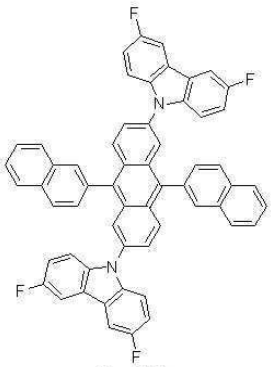
[0096]



D-181

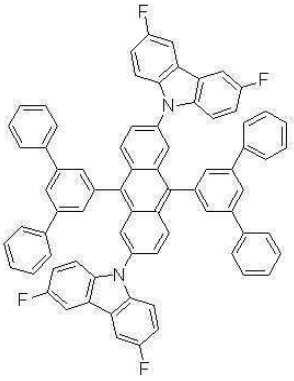


D-182

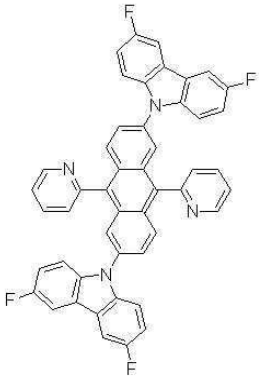


D-183

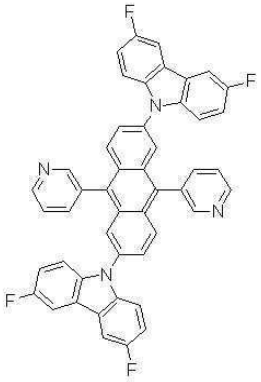
[0097]



D-184

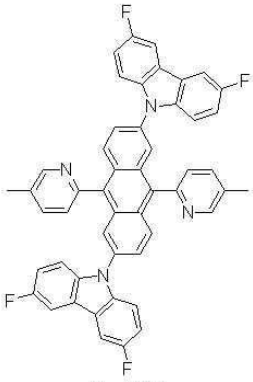


D-185

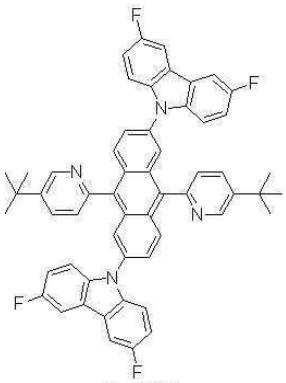


D-186

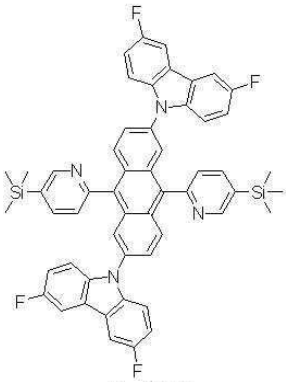
[0098]



D-187

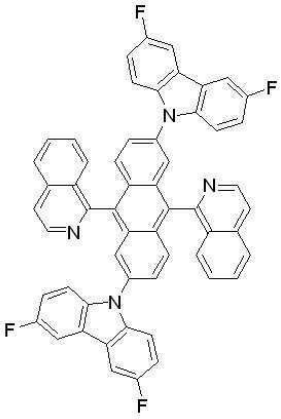


D-188

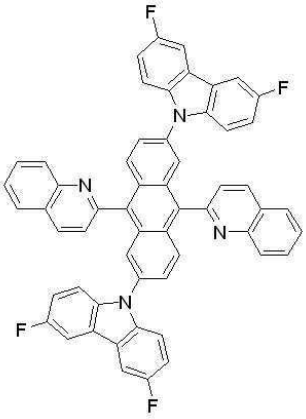


D-189

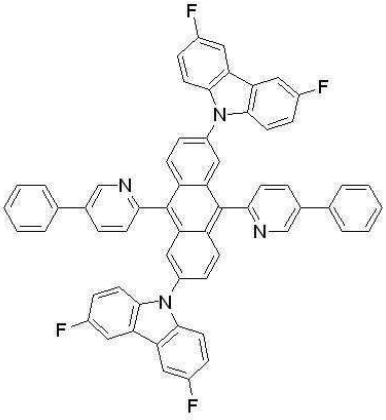
[0099]



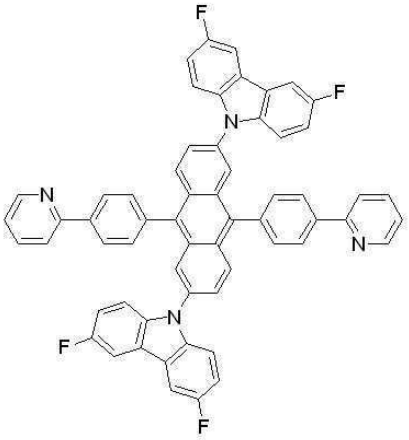
D-190



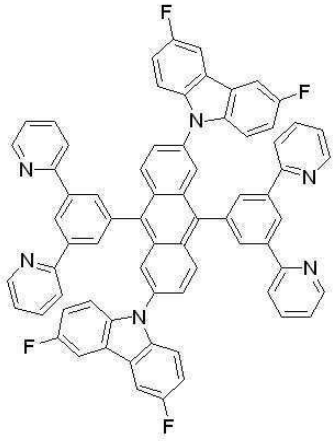
D-191



D-192



D-193



D-194

[0100]

[0101] 상기 도펀트의 도핑 농도는 0.5 내지 10 중량부일 수 있다.

[0102] 상기 전자수송층(150)은 전자의 수송을 원활하게 하는 역할을 하며, Alq3(tris(8-hydroxyquinolino)aluminum), PBD, TAZ, spiro-PBD, BAlq 및 SAlq로 이루어진 군에서 선택된 어느 하나 이상으로 이루어질 수 있으나 이에 한정되지 않는다.

[0103] 상기 전자수송층(150)의 두께는 1 내지 50nm일 수 있다. 여기서, 상기 전자수송층(150)의 두께가 1nm 이상이면, 전자 수송 특성이 저하되는 것을 방지할 수 있는 이점이 있고, 50nm 이하이면, 전자수송층(150)의 두께가 너무 두꺼워 전자의 이동을 향상시키기 위해 구동전압이 상승되는 것을 방지할 수 있는 이점이 있다.

[0104] 상기 전자주입층(160)은 전자의 주입을 원활하게 하는 역할을 하며, Alq3(tris(8-hydroxyquinolino)aluminum), PBD, TAZ, spiro-PBD, BAlq 또는 SAlq를 사용할 수 있으나 이에 한정되지 않는다.

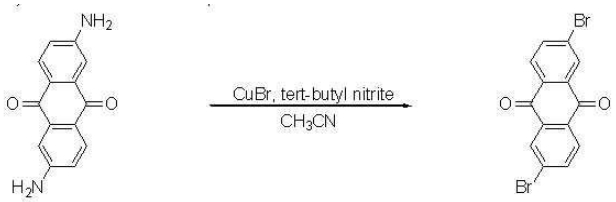
[0105] 상기 전자주입층(160)의 두께는 1 내지 50nm일 수 있다. 여기서, 상기 전자주입층(160)의 두께가 1nm 이상이면, 전자 주입 특성이 저하되는 것을 방지할 수 있는 이점이 있고, 50nm 이하이면, 전자주입층(150)의 두께가 너무 두꺼워 전자의 이동을 향상시키기 위해 구동전압이 상승되는 것을 방지할 수 있는 이점이 있다.

[0106] 상기 음극(170)은 전자 주입 전극으로, 일함수가 낮은 마그네슘(Mg), 칼슘(Ca), 알루미늄(Al), 은(Ag) 또는 이들의 합금으로 이루어질 수 있다. 여기서, 양극(170)은 유기전계발광소자가 전면 또는 양면발광구조일 경우, 빛을 투과할 수 있을 정도로 얇은 두께로 형성할 수 있으며, 유기전계발광소자가 배면발광구조일 경우, 빛을 반사시킬 수 있을 정도로 두껍게 형성할 수 있다.

[0107] 이하, 본 발명의 청색 발광 화합물의 합성예 및 이 화합물을 포함하는 유기전계발광소자에 관하여 하기 합성예 및 실시예에서 상술하기로 한다. 다만, 하기의 실시예는 본 발명을 예시하는 것일 뿐 본 발명이 하기 실시예에 한정되는 것은 아니다.

[0108] **합성예**

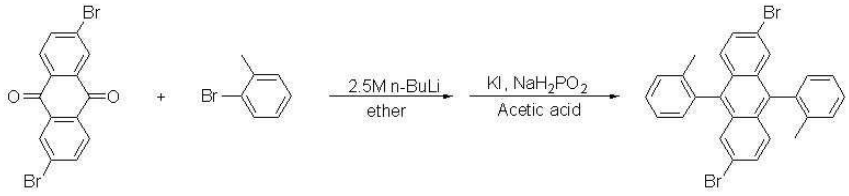
[0109] 1) 2,6-디브로모안트라퀴논의 합성

[0110] 

[0111] 2-라운드 플라스크에 구리(II) 브로마이드(24g, 0.1mol)와 터트부틸나이트라이트(10.8g, 0.1mol)을 200mL의 아세토니트릴에 넣고 저어준 후, 온도를 65℃로 올린 다음 2,6-디아미노안트라퀴논(10g, 0.04mol)을 10분 동안 천천히 적가하였다. 그리고, TLC로 반응 확인 후 온도를 상온으로 내린 다음, aq. 2N HCl 200mL를 넣었다. 다음

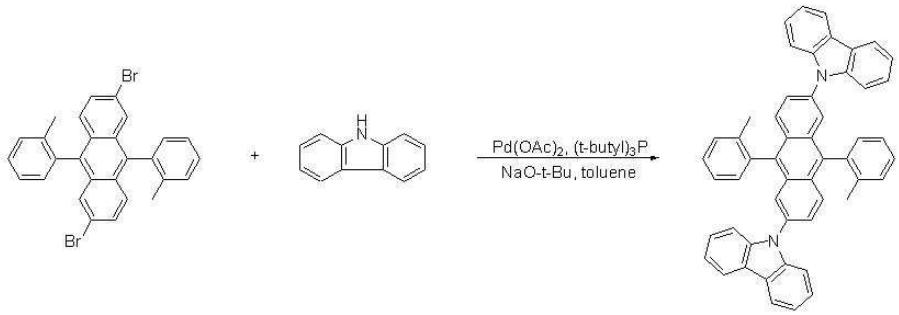
생성된 고체를 필터링하고 증류수와 메탄올로 워싱하여 2,6-디브로모안트라퀴논(9.2g, yield:60%)을 얻었다.

[0112] 2) 2,6-디브로모-9,10-디-오-톨릴안트라센의 합성

[0113] 

[0114] 2-라운드 플라스크에 2-브로모-오-톨루엔(5g, 31.3mmol)을 50mL의 에테르에 넣고 저어주고 온도를 -78℃로 내린 후, 2.5M n-BuLi(12.5mL, 31.3mmol)를 천천히 적가하고 1시간 동안 저어주었다. 다시 온도를 -78℃로 내린 후, 2,6-디브로모안트라퀴논(5g, 14.9mmol)을 넣고 상온에서 4시간 동안 저어주었다. 이후에 1N HCl aq 용액으로 quenching한 다음, 메틸렌 클로라이드로 추출, 솔벤트를 증발, 실리카겔 컬럼으로 정제하여 2,6-디브로모-9,10-디-오-토릴안트라퀴놀을 얻었다. 여기에 요오드화 칼륨(12.4g, 0.07mol), 차아인산나트륨(13g, 0.15mol)과 50mL의 아세틱 산을 넣고 100℃에서 6시간 동안 저어주었다. 이후, 상온으로 온도를 내린 다음 aq 2N HCl 100mL를 넣었다. 이때 생성된 고체를 필터링하고 증류수와 메탄올로 워싱하여 2,6-디브로모-9,10-디-오-톨릴안트라센(5.4g, yield:70%)를 얻었다.

[0115] 3) 2,6-디카바졸릴-9,10-디-오-톨릴안트라센의 합성

[0116] 

[0117] 2-라운드 플라스크에 2,6-디브로모-9,10-디-오-톨릴안트라센(2g, 3.9mmol), 카바졸(1.4g, 8.8mmol), 팔라듐 아세테이트(0.03g, 11.6mmol%), 트리(터트부틸)포스핀(0.03g, 15.5mmol%), 소듐 터트부톡사이드(1.1g, 11.6mmol)을 30mL의 톨루엔에 넣고 130℃에서 12시간 동안 환류시켰다. 이후 TLC로 반응을 확인한 다음 온도를 상온으로 내리고 메탄올 50mL로 quenching시켰다. 다음 생성된 고체를 필터링한 다음 실리카켈 컬럼으로 정제하여 2,6-디카바졸릴-9,10-디-오-톨릴안트라센(2.1g, yield:80%)을 얻었다.

[0118] **실시예**

[0119] 이하, 전술한 D-1 내지 D-194로 표시되는 본 발명의 청색 발광 화합물을 청색 도펀트로 사용하여 유기전계발광소자를 제작한 실시예를 개시한다.

[0120] <실시예 1>

[0121] ITO 글라스의 발광 면적이 3mm×3mm 크기가 되도록 패터닝한 후 세정하였다. 기판을 진공 챔버에 장착한 후 베이스 압력이 1×10^{-6}torr가 되도록 한 후 양극 ITO위에 정공주입층인 CuPc를 650Å의 두께로 성막하고, 정공수송층인 NPD를 400Å의 두께로 성막하고, 발광층으로 호스트인 DPBVi 200Å과 도펀트인 D-01로 표시되는 화합물 50Å을 도펀트의 도핑 농도 1 중량부로 성막하였다. 그 다음 전자수송층인 Alq_3를 350Å의 두께로 성막하고, 전자주입층인 LiF를 5Å의 두께로 성막하고, 음극인 Al을 1000Å의 두께로 성막하여 유기전계발광소자를

제작하였다.

[0122] <실시예 2>

[0123] 전술한 실시예 1과 동일한 조건 하에, D-02로 표시되는 화합물로 도펀트 물질만을 달리하여 유기전계발광소자를 제작하였다.

[0124] <실시예 3>

[0125] 전술한 실시예 1과 동일한 조건 하에, D-07로 표시되는 화합물로 도펀트 물질만을 달리하여 유기전계발광소자를 제작하였다.

[0126] <실시예 4>

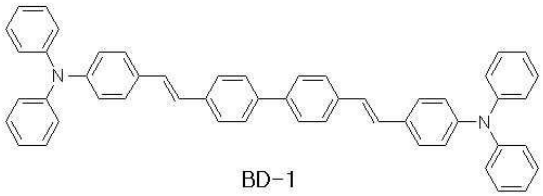
[0127] 전술한 실시예 1과 동일한 조건 하에, D-19로 표시되는 화합물로 도펀트 물질만을 달리하여 유기전계발광소자를 제작하였다.

[0128] <실시예 5>

[0129] 전술한 실시예 1과 동일한 조건 하에, D-22로 표시되는 화합물로 도펀트 물질만을 달리하여 유기전계발광소자를 제작하였다.

[0130] <비교예>

[0131] 전술한 실시예 1과 동일한 조건 하에, 하기 BD-1로 표시되는 디스티릴 주조를 갖는 화합물로 도펀트 물질만을 달리하여 유기전계발광소자를 제작하였다.

[0132] 

BD-1

[0133] 상기 실시예 1 내지 5 및 비교예에 따라 제조된 유기전계발광소자의 전압, 전류, 휘도, 전류효율, 전력효율 및 색좌표를 측정하여 하기 표 1에 나타내었다.

표 1

[0134]

	전압(v)	전류(mA)	휘도 (cd/㎡)	전류효율 (cd/A)	전력효율 (lm/W)	색좌표	
						CIE(X)	CIE(Y)
실시예1	5.2	0.9	779	7.8	4.71	0.137	0.177
실시예2	5.3	0.9	730	7.3	4.32	0.129	0.163
실시예3	5.7	0.9	848	8.5	4.67	0.137	0.187
실시예4	5.7	0.9	896	8.9	4.93	0.138	0.193
실시예5	5.7	0.9	778	7.8	4.28	0.136	0.195
비교예1	6.7	0.9	526	5.26	2.47	0.136	0.188

[0135] 상기 표 1에 나타나는 바와 같이, 본 실시예 1 내지 5에 따라 제조된 유기전계발광소자는 비교예에 준하는 색좌표를 나타내는 것을 알 수 있고, 전압, 휘도, 전류효율 및 전력효율이 비교예에 비해 현저하게 향상된 것을 알

수 있다.

[0136] 따라서, 본 발명의 일 실시 예에 따른 청색 발광 화합물 및 이를 포함하는 유기전계발광소자는 종래 유기전계발광소자에 비해 전압, 휘도, 전류효율 및 전력효율을 향상시킬 수 있는 이점이 있다.

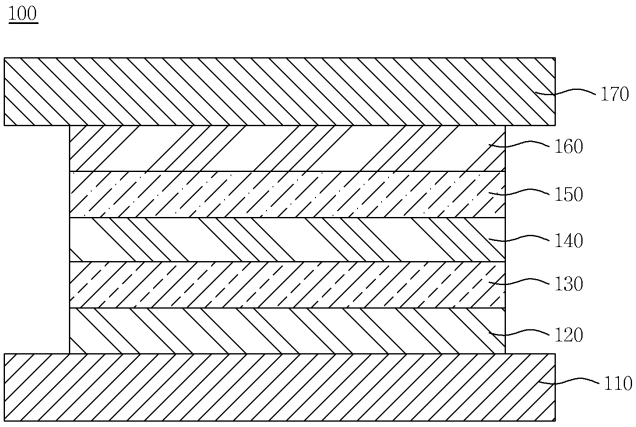
[0137] 이상 첨부된 도면을 참조하여 본 발명의 실시예를 설명하였지만, 상술한 본 발명의 기술적 구성은 본 발명이 속하는 기술 분야의 당업자가 본 발명의 그 기술적 사상이나 필수적 특징을 변경하지 않고서 다른 구체적인 형태로 실시될 수 있다는 것을 이해할 수 있을 것이다. 그러므로 이상에서 기술한 실시 예들은 모든 면에서 예시적인 것이며 한정적인 것이 아닌 것으로서 이해되어야 한다. 아울러, 본 발명의 범위는 상기 상세한 설명보다는 후술하는 특허청구범위에 의하여 나타내어진다. 또한, 특허청구범위의 의미 및 범위 그리고 그 등가 개념으로부터 도출되는 모든 변경 또는 변형된 형태가 본 발명의 범위에 포함되는 것으로 해석되어야 한다.

도면의 간단한 설명

[0138] 도 1은 본 발명의 일 실시 예에 따른 유기전계발광소자를 나타낸 도면.

도면

도면1



专利名称(译)	蓝色发光化合物和含有它们的有机电致发光器件		
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摘要(译)

本发明涉及发蓝光发光化合物和包含其的有机电致发光器件，提供由以下化学式1表示的发光发光化合物。化学式1中的A 1和A 2和A 3可分别为，氢，取代或未取代的芳族基团，和选自二态性连接基团或脂族基团中的任何一种。掺杂剂和有机电致发光器件。