(19) 대한민국특허청(KR)
(12) 등록특허공보(B1)

(45) 공고일자 2020년06월09일
(11) 등록번호 10-2118689
(24) 등록일자 2020년05월28일

(51) 국제특허분류(Int. Cl.)
H01L 51/00 (2006.01) *C07C 255/35* (2006.01)
H01L 51/50 (2006.01)
(52) CPC특허분류
H01L 51/0072 (2013.01)
C07C 255/35 (2013.01)
(21) 출원번호 10-2018-0123542
(22) 출원일자 2018년10월17일
심사청구일자 2018년10월17일
(65) 공개번호 10-2020-0043025
(43) 공개일자 2020년04월27일
(56) 선행기술조사문헌
KR1020170012404 A

(73) 특허권자
최돈수
서울특별시 관악구 남부순환로159길 42 (신림동)
(72) 발명자
최돈수
서울특별시 관악구 남부순환로159길 42 (신림동)
(74) 대리인
이은철, 이수찬

전체 청구항 수 : 총 9 항 심사관 : 정미나

(54) 발명의 명칭 **유기전자소자용 화합물, 이를 포함하는 유기전자소자 및 유기전자소자를 포함하는 표시장치**

(57) 요 약

본 기재는, 화학식 1로 표시되는 유기전자소자용 화합물 이를 포함하는 유기전자소자 및 유기전자소자를 포함하는 표시장치에 관한 것으로, 화학식 1에 대한 구체적인 내용은 명세서 상에 정의된 것과 같다.

(52) CPC특허분류
H01L 51/0059 (2013.01)
H01L 51/006 (2013.01)
H01L 51/50 (2013.01)

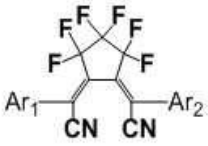
명 세 서

청구범위

청구항 1

하기 화학식 1로 표시되는 유기전자소자용 화합물.

[화학식 1]



상기 화학식 1에서

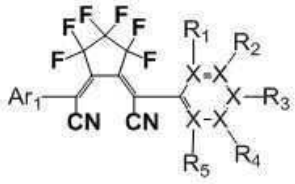
Ar_1과 Ar_2는 각각 서로 독립적으로 치환 또는 비치환된 C6 내지 C30의 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기로 이루어진 군에서 선택된 하나이다.

청구항 2

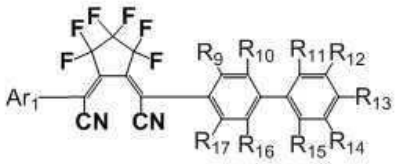
제1항에 있어서,

상기 화학식 1은 하기 화학식 2-1에서 화학식 2-9로 표시되는 화합물 중 선택된 하나의 유기전자소자용 화합물.

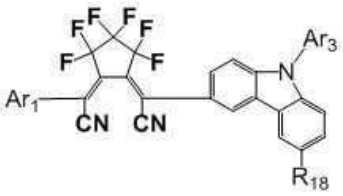
[화학식 2-1]



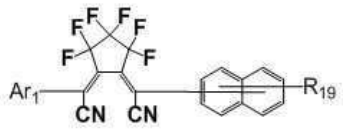
[화학식 2-2]



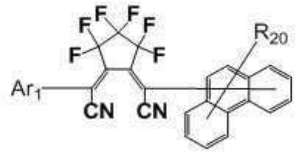
[화학식 2-3]



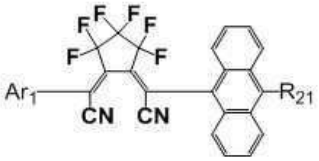
[화학식 2-4]



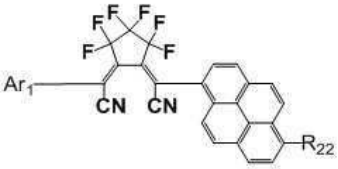
[화학식 2-5]



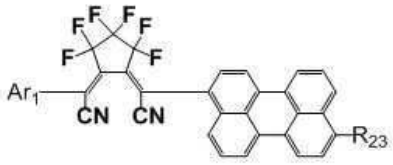
[화학식 2-6]



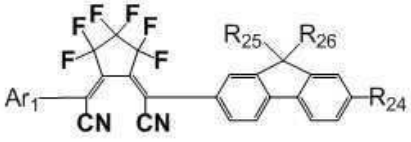
[화학식 2-7]



[화학식 2-8]



[화학식 2-9]



상기 화학식 2-1 내지 화학식 2-9에서,

Ar_1과 Ar_3은 각각 서로 독립적으로 치환 또는 비치환된 C6 내지 C30의 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기로 이루어진 군에서 선택된 하나이다.

X는 탄소 (C) 또는 질소 (N)이며, X가 탄소인 경우,

R_1에서 R_{24}는 각각 서로 독립적으로 수소, 플루오린(F), 시안(CN), 치환 또는 비치환된 C1 내지 C30의 알킬기,

치환 또는 비치환된 C1 내지 C30의 알콕시기, 치환 또는 비치환된 C6 내지 C30 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기로 이루어진 군에서 선택된 하나이다.

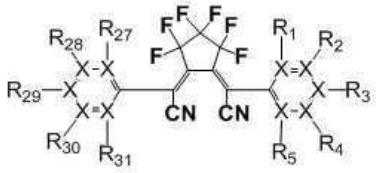
R_{25}와 R_{26}은 각각 서로 독립적으로 수소, 치환 또는 비치환된 C1 내지 C30의 알킬기, 치환 또는 비치환된 C1 내지 C30의 알콕시기, 치환 또는 비치환된 C6 내지 C30 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기이며, 치환 또는 비치환된 C6 내지 C30 아릴기와 치환 또는 비치환된 C4 내지 C30 헤테로아릴기 헤테로아릴기로 이루어진 군에서 선택된 하나이다.

청구항 3

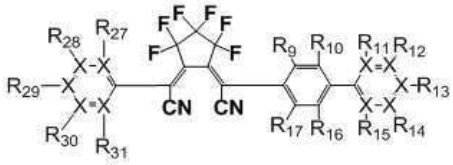
제1항에 있어서,

상기 화학식 1은 하기 화학식 3-1에서 화학식 3-9로 표시되는 화합물 중 선택된 하나의 유기전자소자용 화합물.

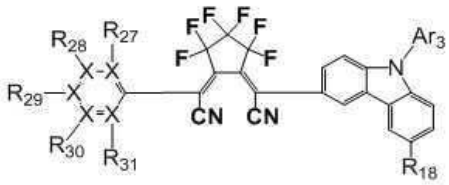
[화학식 3-1]



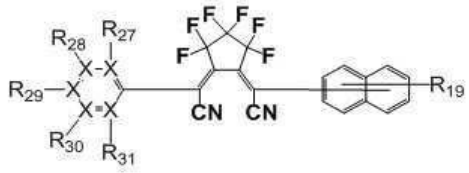
[화학식 3-2]



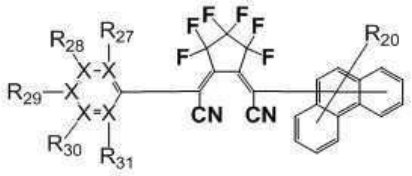
[화학식 3-3]



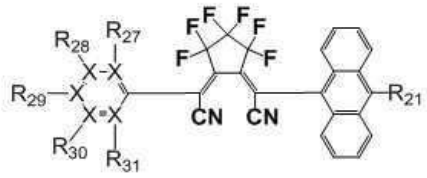
[화학식 3-4]



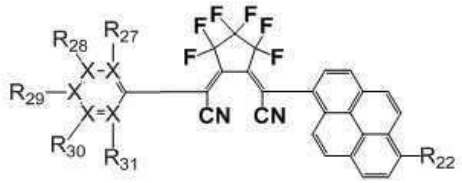
[화학식 3-5]



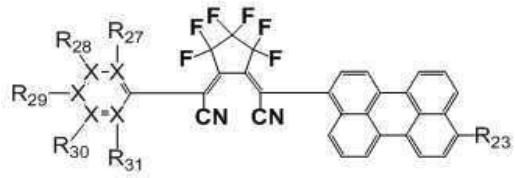
[화학식 3-6]



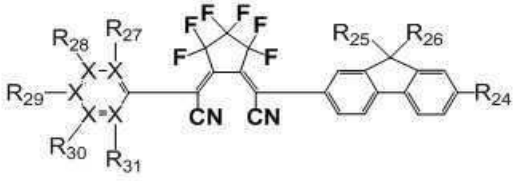
[화학식 3-7]



[화학식 3-8]



[화학식 3-9]

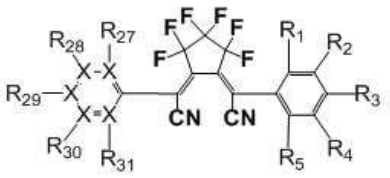


청구항 4

제1항에 있어서,

상기 화학식 1은 하기 화학식 4-1로 표시되는, 유기전자소자용 화합물.

[화학식 4-1]



상기 화학식 4-1에서,

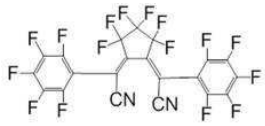
X는 탄소 또는 질소이며,

R_1 내지 R_{31}은 수소, 플루오린 (F), 시안(CN), 트리플로오로메틸(CF_3), 니트로(NO_2), 카복실산(COOH), 치환 또는 비치환된 C1 내지 C30의 알킬기, 치환 또는 비치환된 C2 내지 C30의 알케닐기, 치환 또는 비치환된 C3 내지 C30의 시클로알킬기, 치환 또는 비치환된 C5 내지 C30의 시클로알케닐기, 치환 또는 비치환된 C1 내지 C30의 알콕시기로 이루어진 군에서 선택된 하나이다.

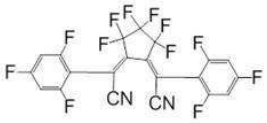
청구항 5

제1항에 있어서,

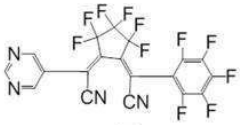
상기 유기전자소자용 화합물은 하기 화학식 G-1 내지 G-109으로 이루어진 군에서 선택된 어느 하나로 표시되는, 유기전자소자용 화합물.



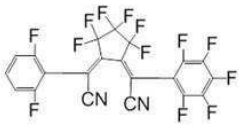
G-1



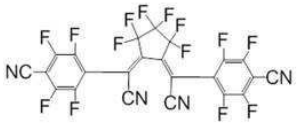
G-2



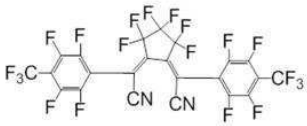
G-3



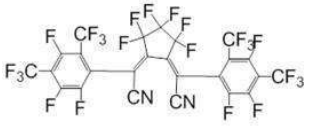
G-4



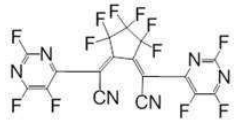
G-5



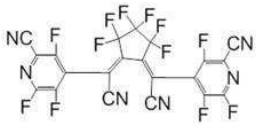
G-6



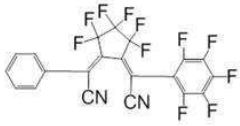
G-7



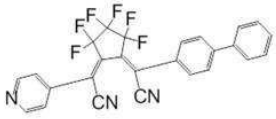
G-8



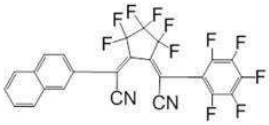
G-9



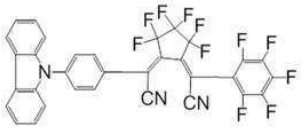
G-10



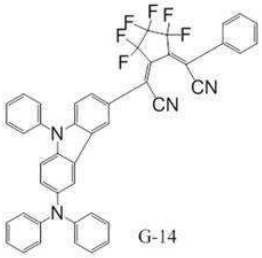
G-11



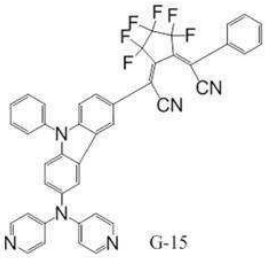
G-12



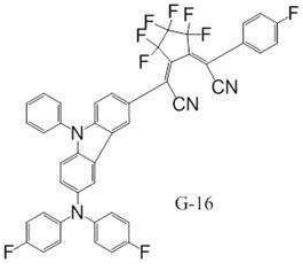
G-13



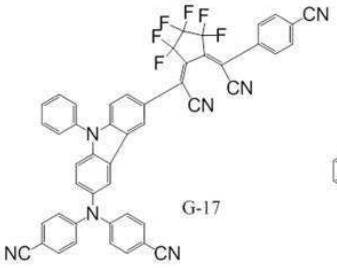
G-14



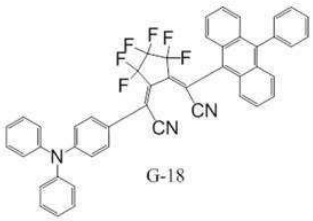
G-15



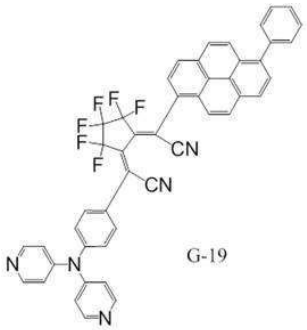
G-16



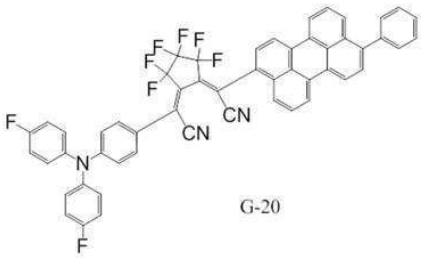
G-17



G-18



G-19



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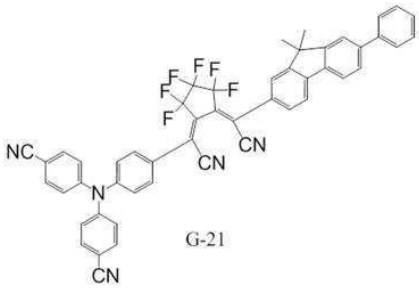

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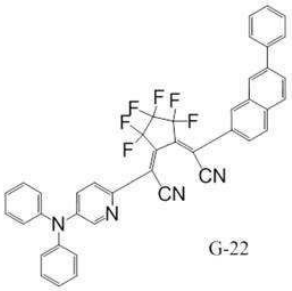

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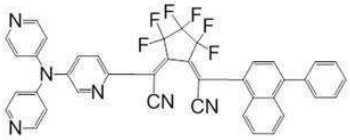

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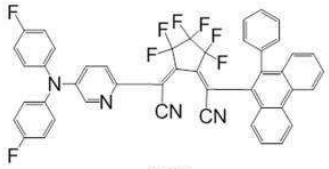

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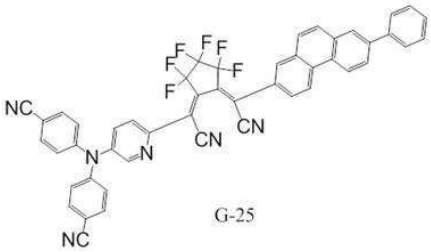

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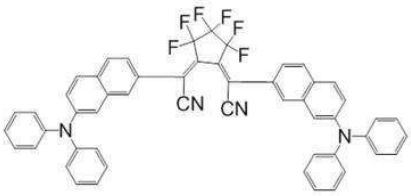

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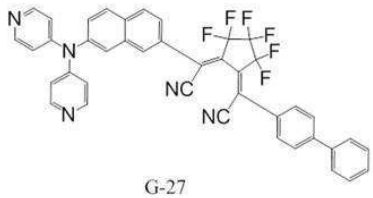

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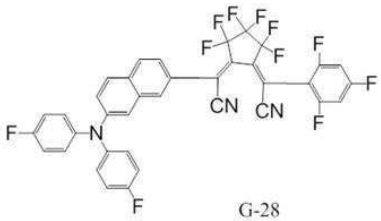

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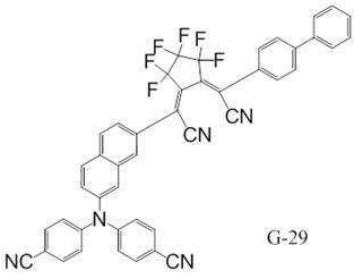

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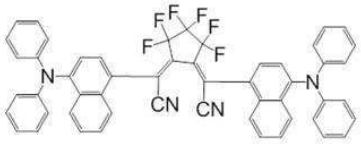

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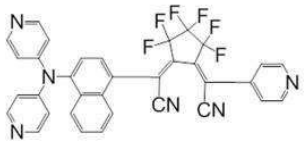

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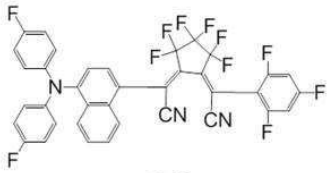

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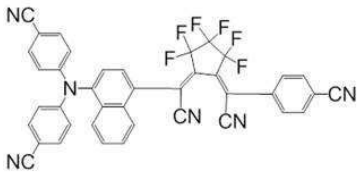

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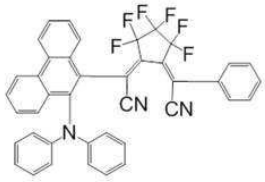

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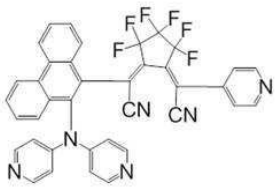

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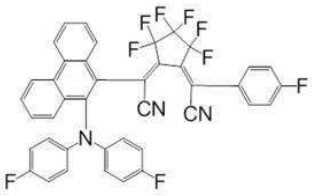

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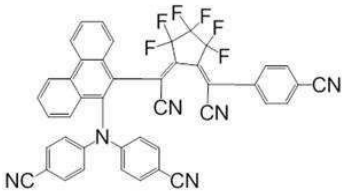

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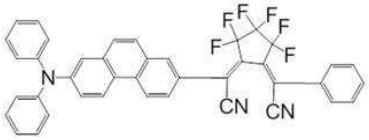

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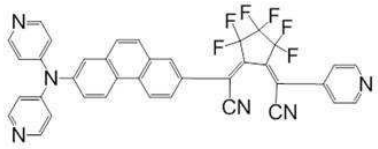

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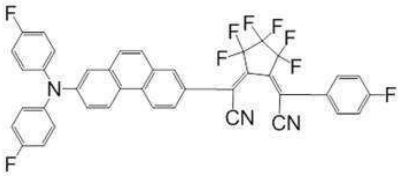

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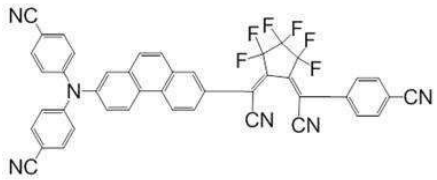

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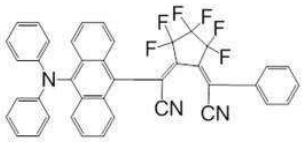

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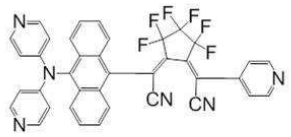

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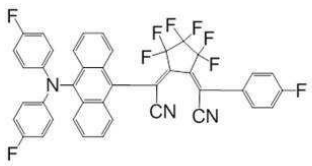

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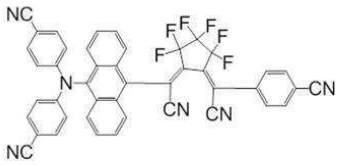

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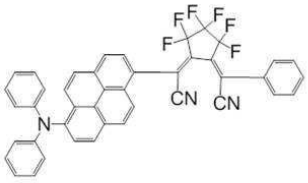

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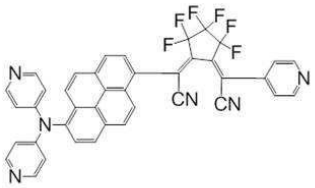

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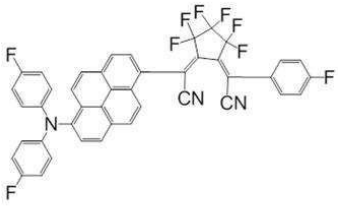

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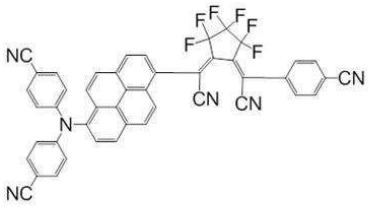

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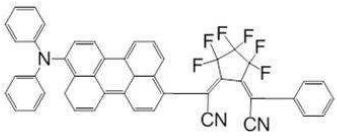

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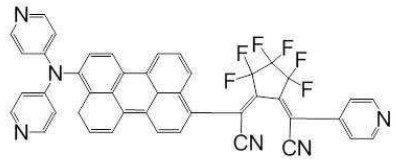

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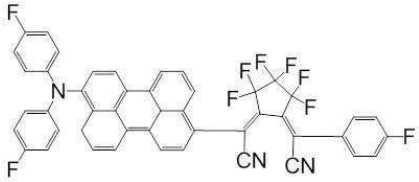

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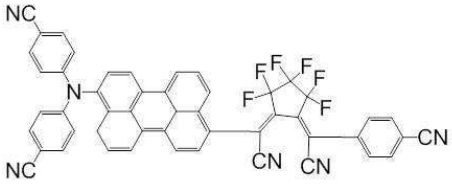

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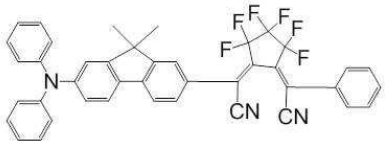

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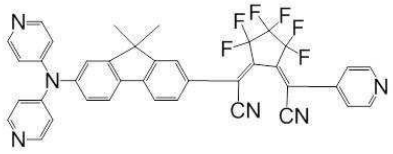

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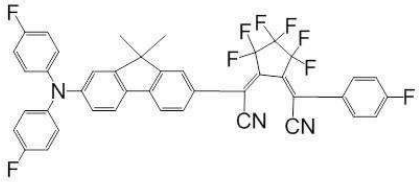

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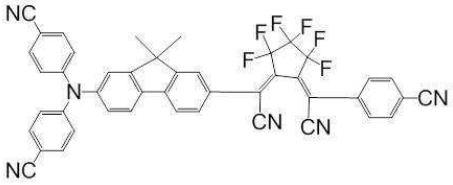

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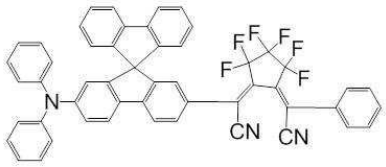

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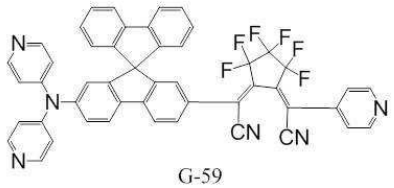

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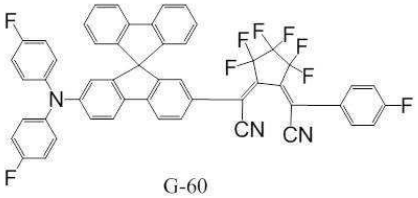

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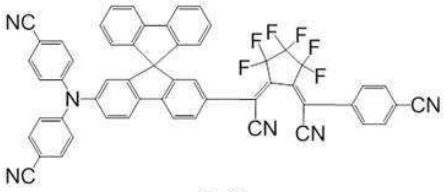

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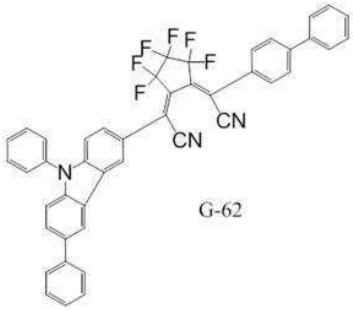

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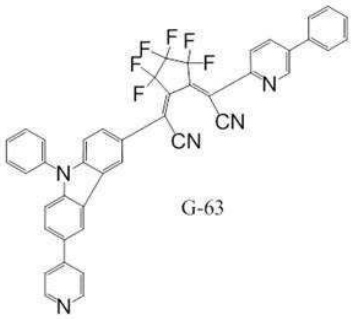

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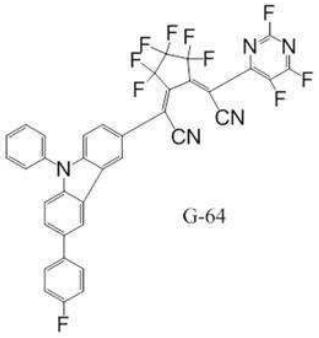

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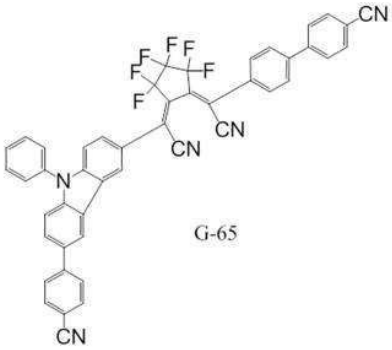

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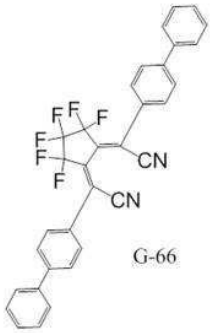

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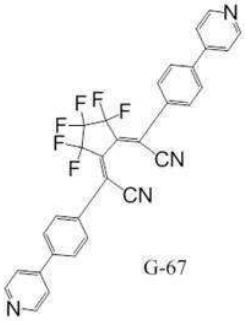

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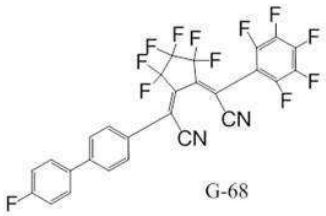

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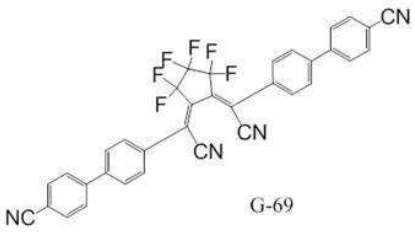

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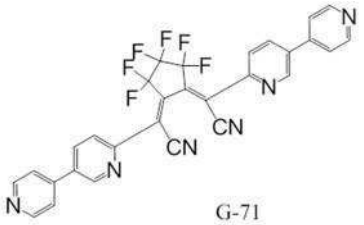

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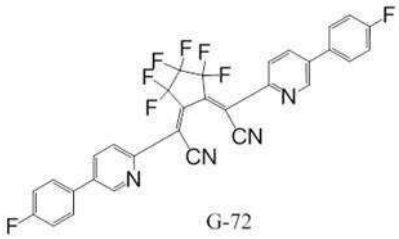

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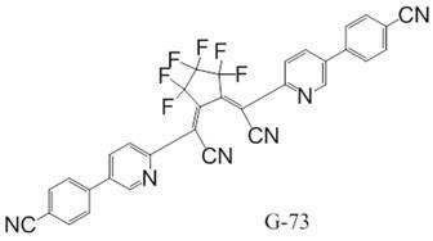

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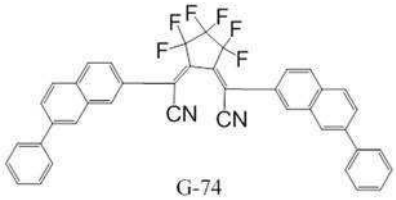

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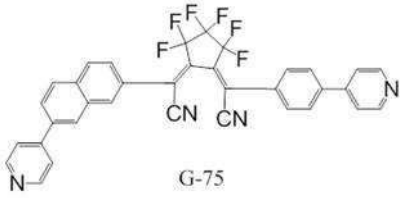

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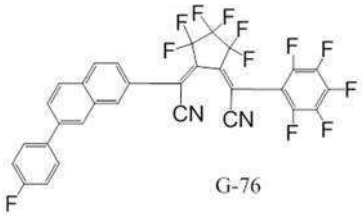

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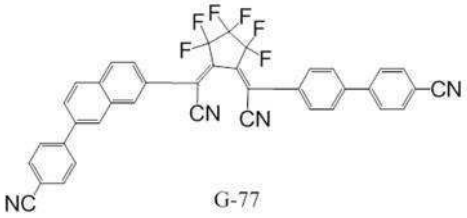

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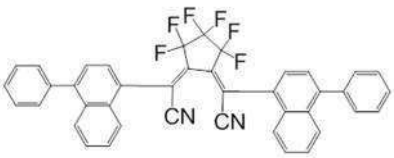

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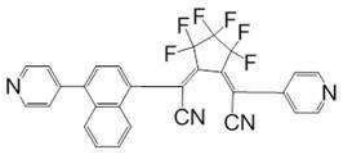

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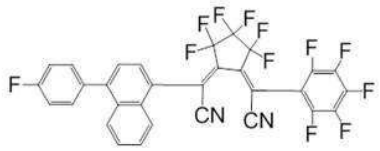

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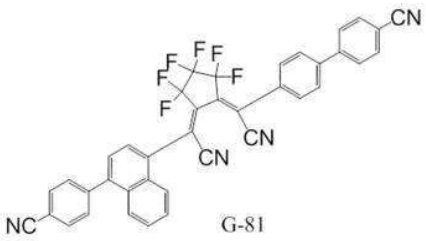

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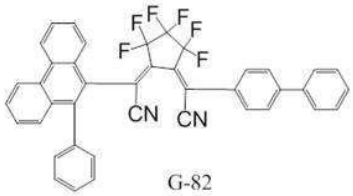

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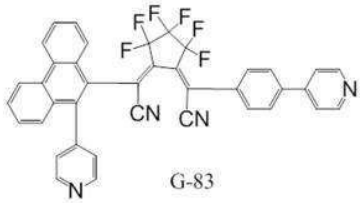

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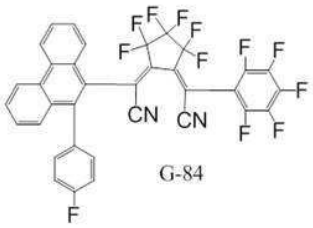

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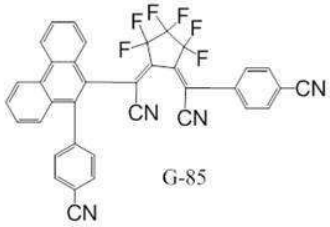

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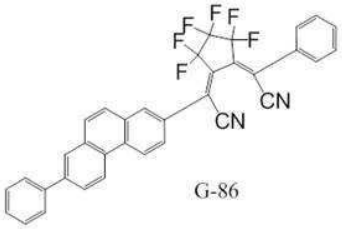

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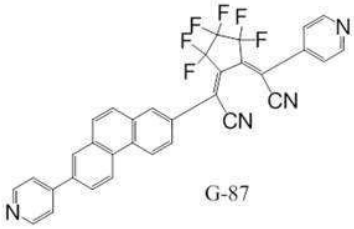

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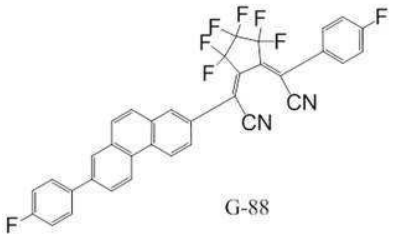

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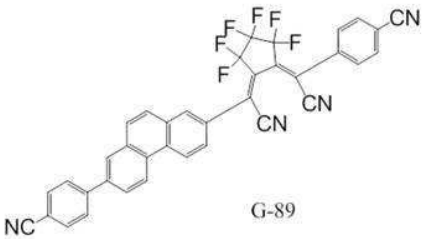

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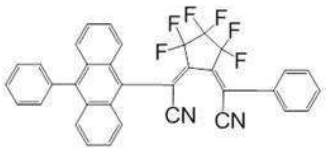

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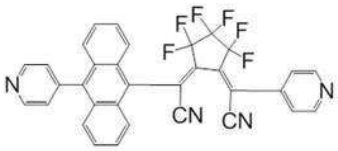

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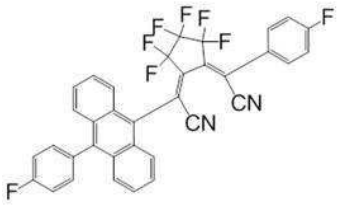

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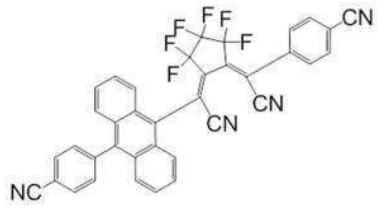

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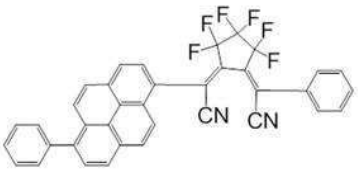

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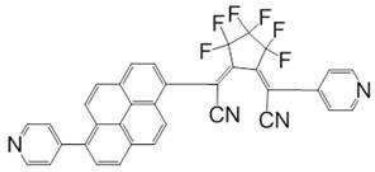

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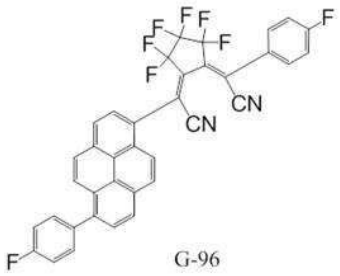

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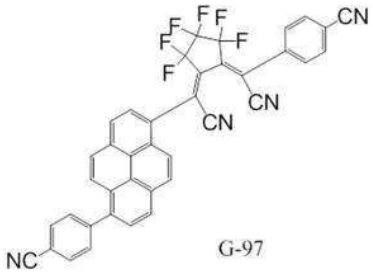

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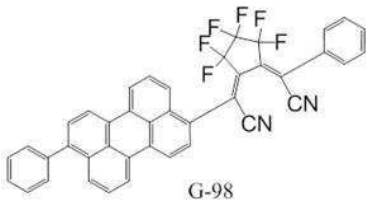

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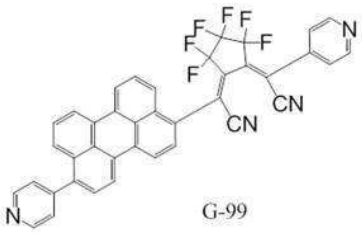

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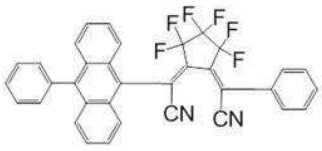

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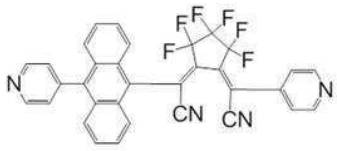

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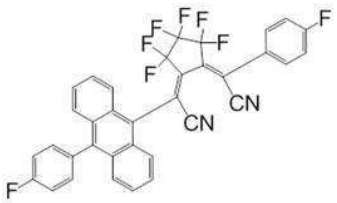

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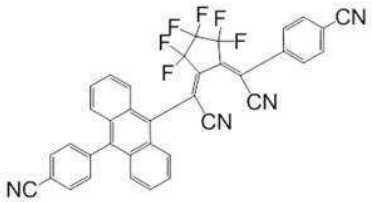

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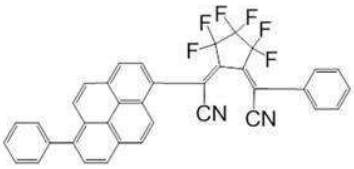

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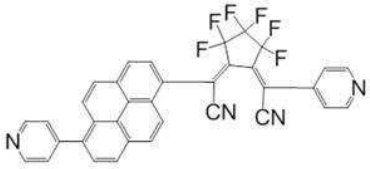

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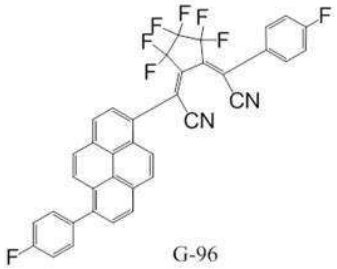

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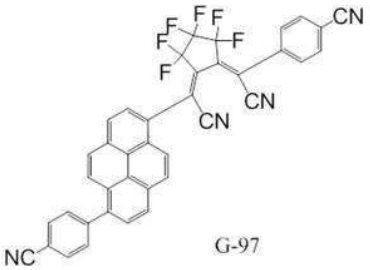

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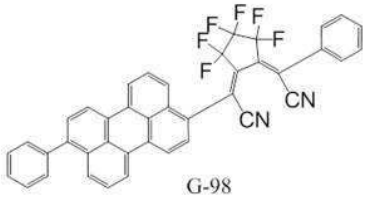

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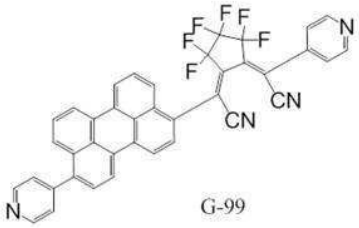

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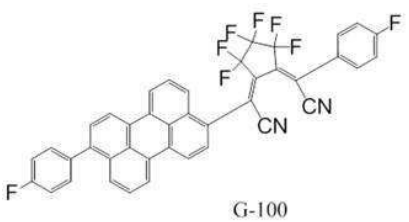

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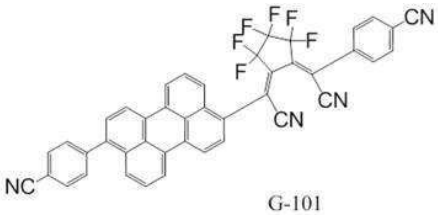

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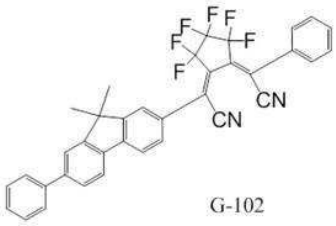

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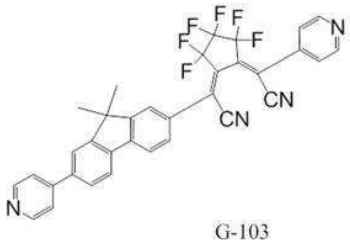

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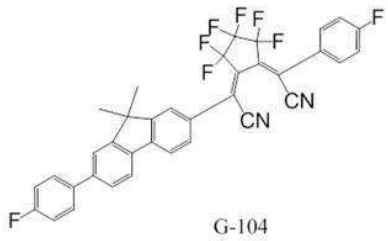

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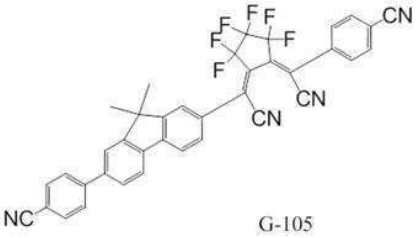

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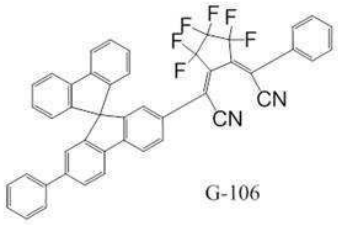

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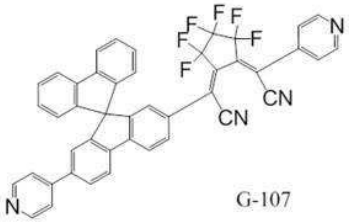

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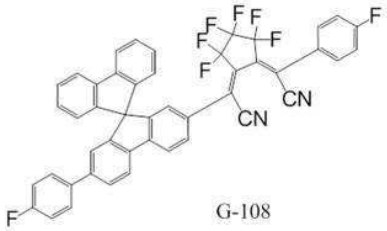

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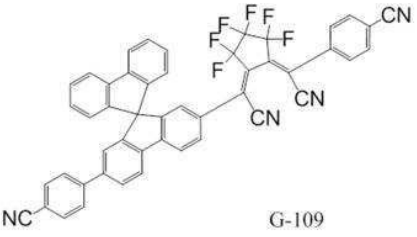


G-109

청구항 6

제1 전극, 제2 전극 및 상기 제1 전극과 상기 제2 전극 사이에 개재되는 하나 이상의 유기물층을 포함하는 유기전자소자에 있어서,

상기 유기물층은 제1항 내지 제5항 중 어느 한 항에 따른 유기전자소자용 화합물을 하나 이상 포함하는, 유기전자소자.

청구항 7

제6항에 있어서,

상기 유기물층은 발광층, 정공수송층, 정공주입층, 전자수송층, 전자주입층, 정공차단층 및 이들의 조합으로 이루어진 군에서 선택된 어느 하나인, 유기전자소자.

청구항 8

제6항에 있어서,

상기 유기전자소자는,

유기광전소자, 유기발광소자, 유기태양전지, 유기트랜지스터, 유기 감광체, 전자종이 및 유기메모리소자로 이루어진 군에서 선택되는 어느 하나인, 유기전자소자.

청구항 9

제6항에 따른 유기전자소자를 포함하는 표시장치.

발명의 설명

기 술 분 야

[0001] 본 기재는 유기전자소자용 화합물, 이를 포함하는 유기전자소자 및 유기전자소자를 포함하는 표시장치에 관한 것이다.

배 경 기 술

[0002] 일반적으로 유기발광 다이오드(OLED: Organic Light Emitting Diodes)는 음극, 양극, 및 음극과 양극 사이에 개재된 유기물층으로 구성되어 있다. 소자의 구성을 전체적으로 보면 투명 ITO 양극, 정공주입층 (HIL), 정공전달층 (HTL), 발광층 (EL), 정공저지층 (HBL), 전자전달층 (ETL), 전자주입층 (EIL), LiAl 등의 음극으로 형성되며, 필요에 따라 유기물층의 1~2 개를 생략하는 경우도 있다. 구성된 양 전극 사이에 전계가 인가되면 음극 측으로 부터 전자가 주입되고 양극 측으로 부터 정공이 주입된다.

[0003] 또한, 이 전자가 발광층에 정공과 재결합하여 여기상태를 생성하고, 여기상태가 기저상태로 되돌아갈 때에 에너지를 빛으로서 방출한다. 이러한 발광 재료는 크게 형광과 인광으로 나뉘며, 발광층 형성방법은 형광 호스트(순수 유기물)에 인광(유기금속)을 도핑하는 방법과 형광 호스트에 형광 도판트(질소 등을 포함하는 유기물)를 도핑하는 방법 및 발광체에 도판트 (DCM, Rubrene, DCJTB 등)를 이용하여 장파장을 구현하는 방법 등이 있다. 이러한 도핑을 통해 발광 파장, 효율, 구동전압, 수명 등을 개선하려 하고 있다. 일반적으로 정공층 재료는 아민기의 중심체와 페닐, 바이페닐, 나프탈렌, 카바졸 등의 조합에 의한 리간드 및 오르소, 메타, 파라 등의 결합 위치 구조들을 갖는다.

[0004] 현재 디스플레이의 화면이 대형화 방향으로 진행되면서 각 층의 고성능 재료들이 요구되고 있다.

발명의 내용

해결하려는 과제

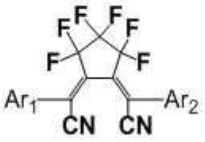
[0005] 본 기재는, 성능이 우수한 대칭 및 비대칭형 구조의 HIL 성능 향상을 제공할 수 있는 유기전자소자용 화합물, 이를 포함하는 유기전자소자 및 유기전자소자를 포함하는 표시장치를 제공하고자 한다.

[0006] 또한, 본 발명이 해결하고자 하는 기술적 과제는 이상에서 언급한 기술적 과제로 제한되지 않으며, 언급되지 않은 또 다른 기술적 과제들은 아래의 기재로부터 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자에게 명확하게 이해될 수 있을 것이다.

과제의 해결 수단

[0007] 본 발명의 구현예에 따른 유기전자소자용 화합물은 하기 화학식 1로 표시된다.

[0008] [화학식 1]



[0009]

[0010] 상기 화학식 1에서

[0011] Ar_1과 Ar_2는 각각 서로 독립적으로 치환 또는 비치환된 C6 내지 C30의 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기로 이루어진 군에서 선택된 하나이다.

[0012] 본 발명의 또 다른 구현예에 따른 표시장치는 전술한 유기전자소자를 포함한다.

발명의 효과

[0013] 본 기재에 의하면, 퍼플루로싸이클로펜탄-1,2-디일리덴 (perfluorocyclopentane-1,2-diylidene) 화합물의 구조를 제공하여 성능이 우수한 유기전자소자용 화합물, 이를 포함하는 유기전자소자 및 유기전자소자를 포함하는 표시장치를 제공할 수 있다.

발명을 실시하기 위한 구체적인 내용

[0014] 이하, 첨부된 도면을 참조하여 본 발명의 실시예들을 상세하게 설명하면 다음과 같다. 다만, 본 기재를 설명함에 있어서, 이미 공지된 기능 혹은 구성에 대한 설명은, 본 기재의 요지를 명료하게 하기 위하여 생략하기로 한다.

[0015] 본 명세서에서 "치환"이란 별도의 정의가 없는 한, 치환기 또는 화합물 중의 적어도 하나의 수소가 중수소, 할로겐기, 히드록시기, 아미노기, 치환 또는 비치환된 아민기, 니트로기, 치환 또는 비치환된 실릴기, C1 내지 C30의 알킬기, C1 내지 C10의 알킬실릴기, C3 내지 C30의 시클로알킬기, C6 내지 C30의 아릴기, C1 내지 C20의 알콕시기, 플루오로기, 트리플루오로메틸기 등의 C1 내지 C10의 트리플루오로알킬기 또는 시아노기로 치환된 것을 의미한다.

[0016] 또한 상기 치환된 할로겐기, 히드록시기, 아미노기, 치환 또는 비치환된 아민기, 니트로기, 치환 또는 비치환된 실릴기, C1 내지 C30의 알킬기, C1 내지 C10의 알킬실릴기, C3 내지 C30의 시클로알킬기, C6 내지 C30의 아릴기, C1 내지 C20의 알콕시기, 플루오로기, 트리플루오로메틸기 등의 C1 내지 C10의 트리플루오로알킬기 또는 시아노기 중 인접한 두 개의 치환기가 융합되어 고리를 형성할 수도 있다.

[0017] 본 명세서에서 "알킬(alkyl)기"이란 별도의 정의가 없는 한, 지방족 탄화수소기를 의미한다. 알킬기는 어떠한 이중결합이나 삼중결합을 포함하고 있지 않은 "포화 알킬(saturated alkyl)기"일 수 있다.

[0018] 알킬기는 C1 내지 C20인 알킬기일 수 있다. 보다 구체적으로 알킬기는 C1 내지 C10인 알킬기 또는 C1 내지 C6인 알킬기일 수도 있다. 예를 들어, C1 내지 C4인 알킬기는 알킬쇄에 C1 내지 C4 개의 탄소원자가 포함되는 것을 의미하며, 메틸, 에틸, 프로필, 이소-프로필, n-부틸, 이소-부틸, sec-부틸 및 t-부틸로 이루어진 군에서 선택됨을 나타낸다.

[0019] 상기 알킬기는 구체적인 예를 들어 메틸기, 에틸기, 프로필기, 이소프로필기, 부틸기, 이소부틸기, t-부틸기, 펜틸기, 헥실기, 시클로프로필기, 시클로부틸기, 시클로펜틸기, 시클로헥실기 등을 의미한다.

[0020] 본 명세서에서, "알콕시기"는 -OR (R은 알킬기)인 1가 그룹으로서, 이는 직쇄상 또는 분지쇄상일 수 있다.

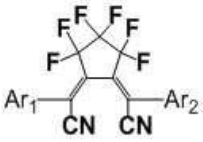
[0021] 본 명세서에 있어서, "아릴(aryl)기"는 환형인 치환기의 모든 원소가 p-오비탈을 가지고 있으며, 이들 p-오비탈이 공액(conjugation)을 형성하고 있는 치환기를 의미한다.

[0022] 본 명세서에 있어서, "헤테로아릴(heteroaryl)기"는 아릴기 내에 N, O, S 및 P로 이루어진 군에서 선택되는 헤테로 원자를 1 내지 4개 함유하고, 나머지는 탄소인 것을 의미한다.

[0023] 본 발명의 일 구현예에 따라, 하기 화학식 1로 표시되는 유기전자소자용 화합물이 제공된다.

[0024] 하기 화학식 1로 표시되는 유기전자소자용 화합물:

[0025] [화학식 1]



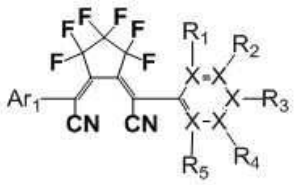
[0026]

[0027] 상기 화학식 1에서

[0028] Ar_1과 Ar_2는 각각 서로 독립적으로 치환 또는 비치환된 C6 내지 C30의 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기로 이루어진 군에서 선택된 하나이다.

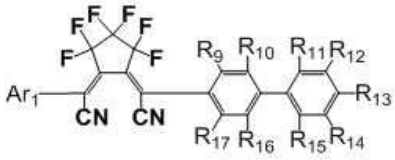
[0029] 상기 화학식 1은 하기 화학식 2-1에서 화학식 2-9으로 표시되는, 유기전자소자용 화합물:

[0030] [화학식 2-1]



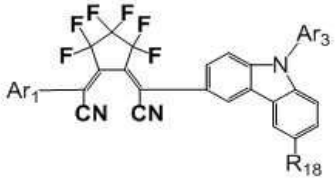
[0031]

[0032] [화학식 2-2]



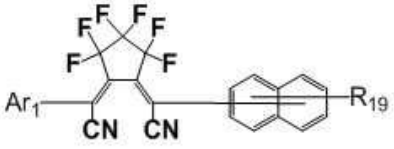
[0033]

[0034] [화학식 2-3]



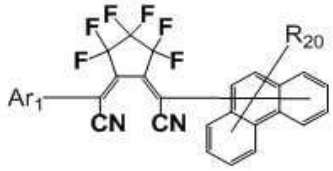
[0035]

[0036] [화학식 2-4]



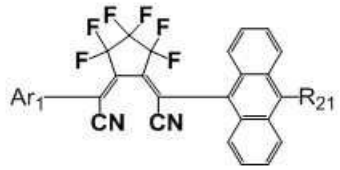
[0037]

[0038] [화학식 2-5]



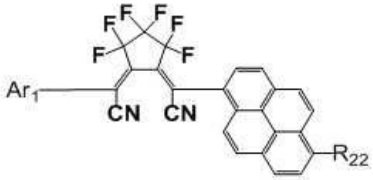
[0039]

[0040] [화학식 2-6]



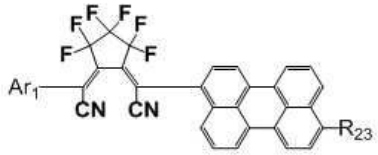
[0041]

[0042] [화학식 2-7]



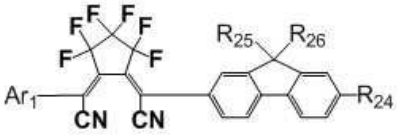
[0043]

[0044] [화학식 2-8]



[0045]

[0046] [화학식 2-9]



[0047]

[0048] 상기 화학식 2-1 내지 화학식 2-9에서,

[0049] Ar_1과 Ar_3은 각각 서로 독립적으로 치환 또는 비치환된 C6 내지 C30의 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기로 이루어진 군에서 선택된 하나이다.

[0050] X는 탄소 (C) 또는 질소 (N)이며, X가 탄소인 경우,

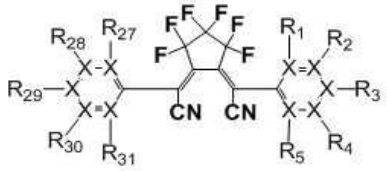
[0051] R_1에서 R_{24}는 각각 서로 독립적으로 수소, 플루오린(F), 시안(CN), 치환 또는 비치환된 C1 내지 C30의 알킬기, 치환 또는 비치환된 C1 내지 C30의 알콕시기, 치환 또는 비치환된 C6 내지 C30 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기로 이루어진 군에서 선택된 하나이다.

[0052] R_{25}와 R_{26}은 각각 서로 독립적으로 수소, 치환 또는 비치환된 C1 내지 C30의 알킬기, 치환 또는 비치환된 C1 내지 C30의 알콕시기, 치환 또는 비치환된 C6 내지 C30 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기이

며, 치환 또는 비치환된 C6 내지 C30 아릴기와 치환 또는 비치환된 C4 내지 C30 헤테로아릴기의 인접하는 기들은 서로 연결되어 지방족 고리, 방향족 고리 또는 헤테로 고리를 포함하는 단환 또는 축합환을 형성할 수 있다.

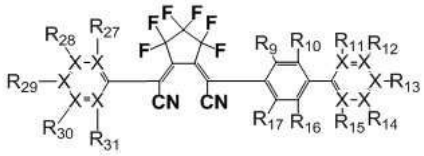
[0053] 상기 화학식 1은 하기 화학식 3-1에서 화학식 3-9로로 표시되는, 유기전자소자용 화합물:

[0054] [화학식 3-1]



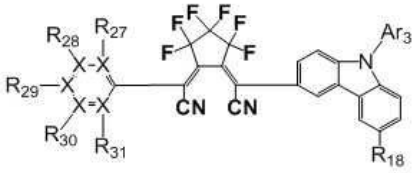
[0055]

[0056] [화학식 3-2]



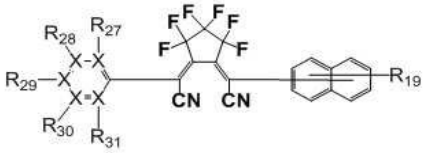
[0057]

[0058] [화학식 3-3]



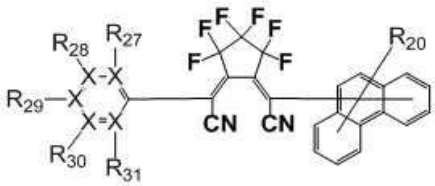
[0059]

[0060] [화학식 3-4]



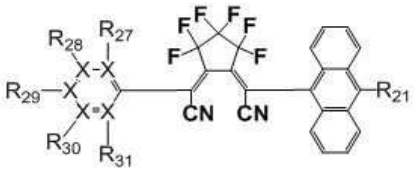
[0061]

[0062] [화학식 3-5]



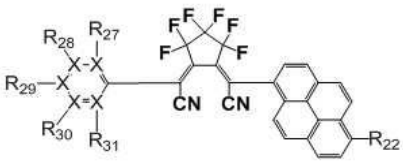
[0063]

[0064] [화학식 3-6]



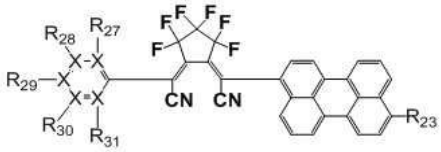
[0065]

[0066] [화학식 3-7]



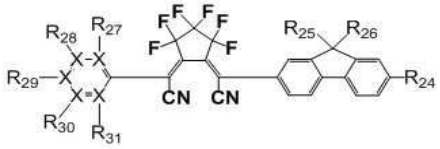
[0067]

[0068] [화학식 3-8]



[0069]

[0070] [화학식 3-9]



[0071]

[0072] 상기 화학식 3-1 내지 화학식 3-9에서,

[0073] Ar_3은 치환 또는 비치환된 C6 내지 C30의 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기이다.

[0074] X는 탄소 (C) 또는 질소 (N)이며, X가 탄소인 경우,

[0075] R_1에서 R_{24}는 각각 서로 독립적으로 수소, 플루오린(F), 시안(CN), 치환 또는 비치환된 C1 내지 C30의 알킬기, 치환 또는 비치환된 C1 내지 C30의 알콕시기, 치환 또는 비치환된 C6 내지 C30 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기로 이루어진 군에서 선택된 하나이다.

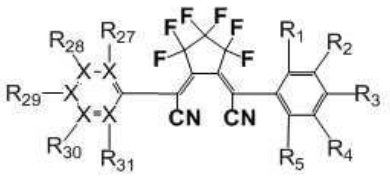
[0076] R_{25}와 R_{26}은 각각 서로 독립적으로 수소, 치환 또는 비치환된 C1 내지 C30의 알킬기, 치환 또는 비치환된 C1 내지 C30의 알콕시기, 치환 또는 비치환된 C6 내지 C30 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기이며, 치환 또는 비치환된 C6 내지 C30 아릴기와 치환 또는 비치환된 C4 내지 C30 헤테로아릴기의 인접하는 기들은 서로 연결되어 지방족 고리, 방향족 고리 또는 헤테로 고리를 포함하는 단환 또는 축합환을 형성할 수 있다.

[0077] X는 탄소 (C) 또는 질소 (N)이며, X가 탄소인 경우,

[0078] R_{27}에서 R_{31}은 각각 서로 독립적으로 수소, 플루오린(F), 시안(CN), 치환 또는 비치환된 C1 내지 C30의 알킬기, 치환 또는 비치환된 C1 내지 C30의 알콕시기, 치환 또는 비치환된 C6 내지 C30 아릴기, 치환 또는 비치환된 C4 내지 C30 헤테로아릴기이며, 치환 또는 비치환된 C6 내지 C30 아릴기와 치환 또는 비치환된 C4 내지 C30 헤테로아릴기의 인접하는 기들은 서로 연결되어 지방족 고리, 방향족 고리 또는 헤테로 고리를 포함하는 단환 또는 축합환을 형성할 수 있다.

[0079] 상기 화학식 1은 하기 화학식 4-1로 표시되는, 유기전자소자용 화합물:

[0080] [화학식 4-1]



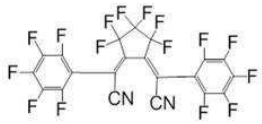
[0081]

[0082] 상기 화학식 4-1에서,

[0083] X는 탄소 또는 질소이며,

[0084] R_1 내지 R_{31}은 수소, 플루오린 (F), 시안(CN), 트리플로오로메틸(CF_3), 니트로(NO_2), 카복실산(COOH), 치환 또는 비치환된 C1 내지 C30의 알킬기, 치환 또는 비치환된 C2 내지 C30의 알케닐기, 치환 또는 비치환된 C3 내지 C30의 시클로알킬기, 치환 또는 비치환된 C5 내지 C30의 시클로알케닐기, 치환 또는 비치환된 C1 내지 C30의 알콕시기로 이루어진 군에서 선택된 하나이다.

[0085] 상기 화학식 1에 따른 유기전자소자용 화합물은 하기 화학식 중 어느 하나로 표시되는, 유기전자소자용 화합물.



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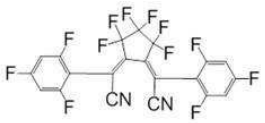

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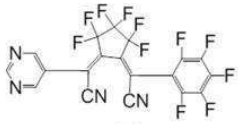

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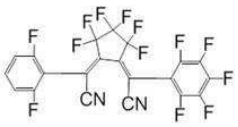

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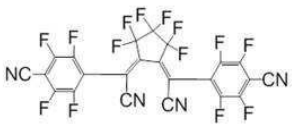

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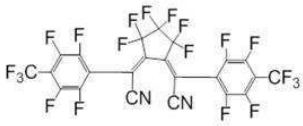

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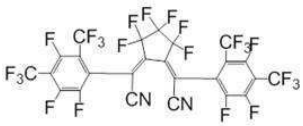

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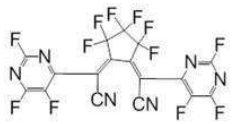

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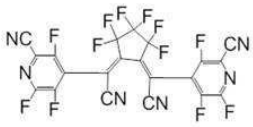

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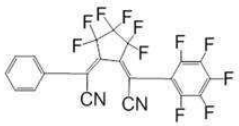

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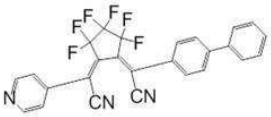

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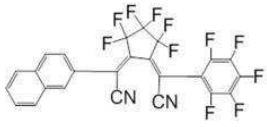

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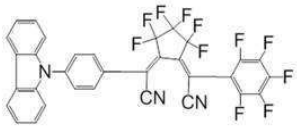

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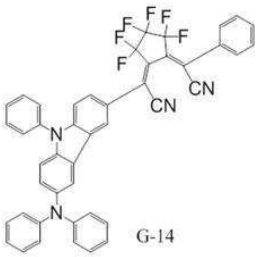

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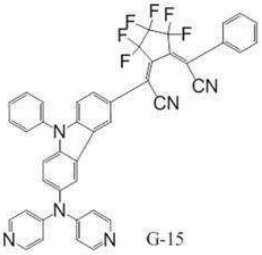

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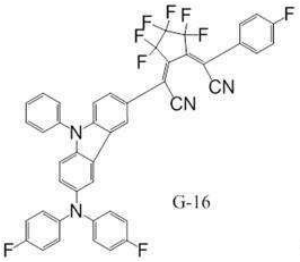

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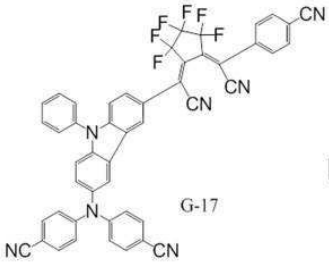

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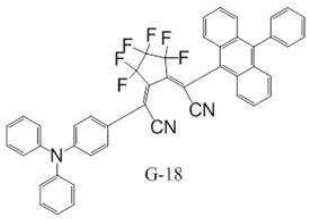

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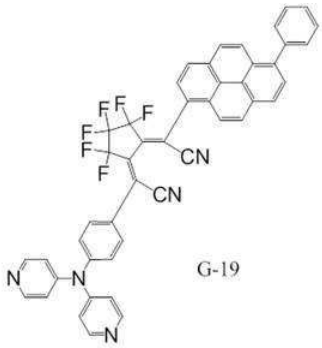
[0086]



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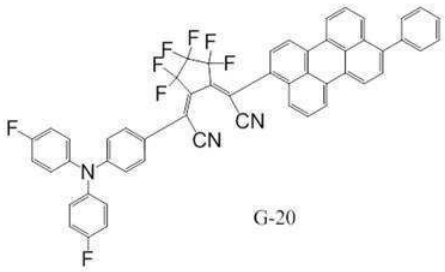

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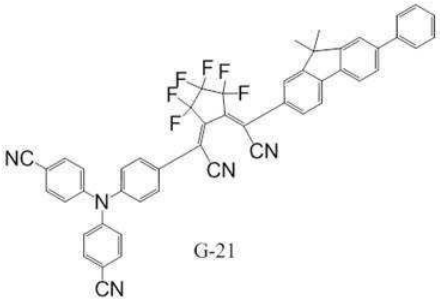

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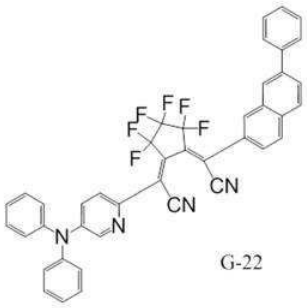

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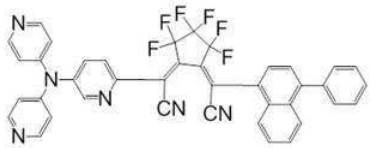

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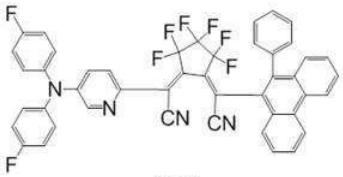

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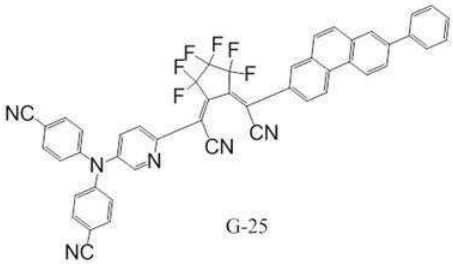

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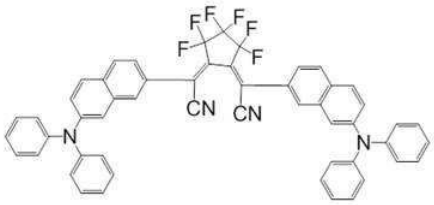

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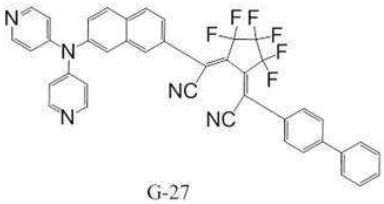
[0087]



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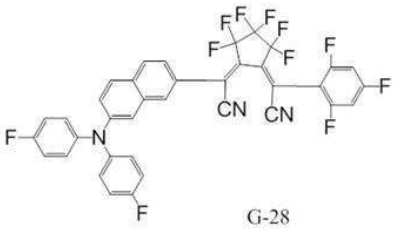

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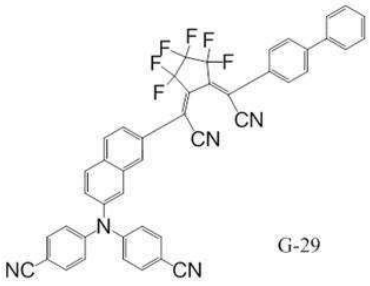

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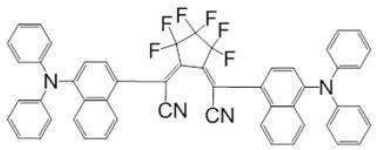

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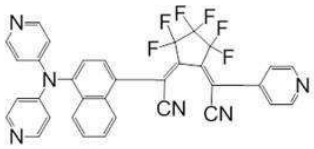

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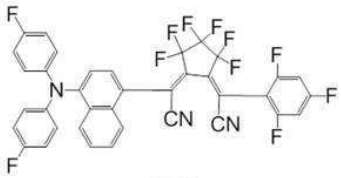

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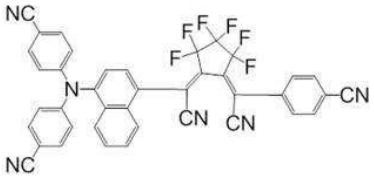

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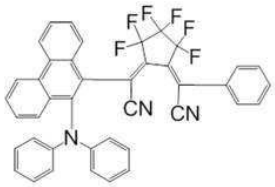

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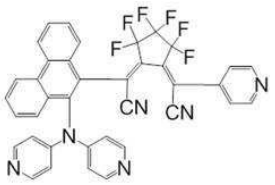
[0088]



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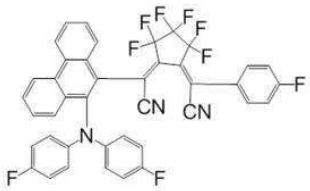

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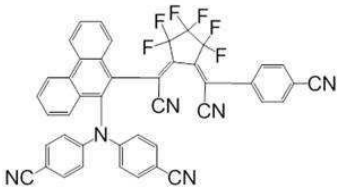

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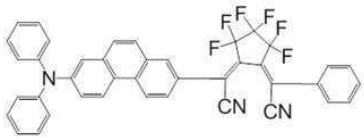

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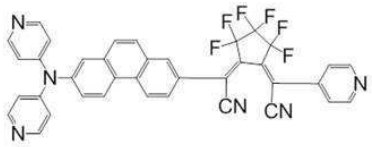

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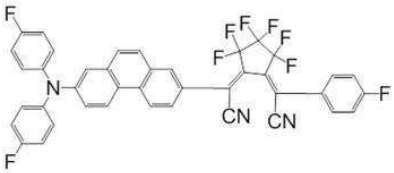

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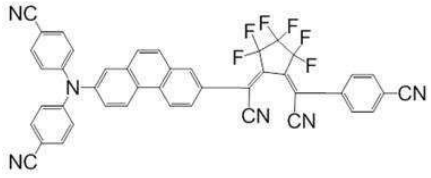

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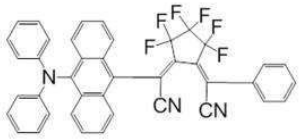

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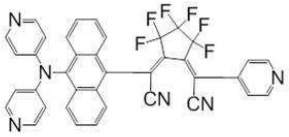

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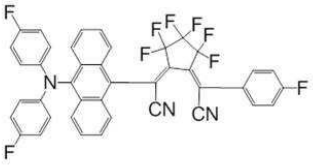

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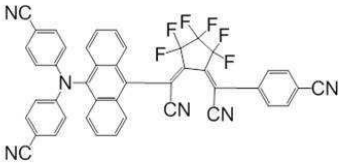

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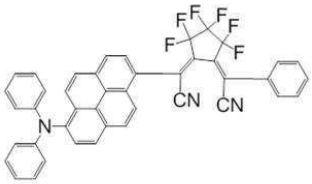

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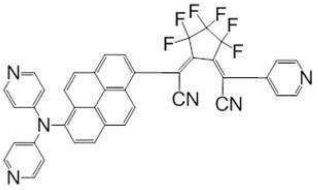

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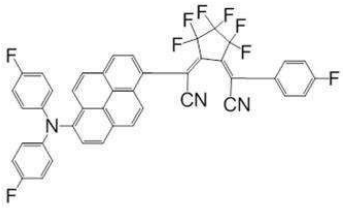

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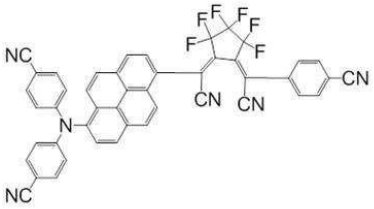

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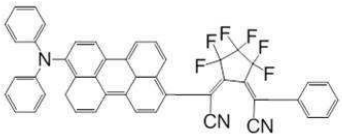
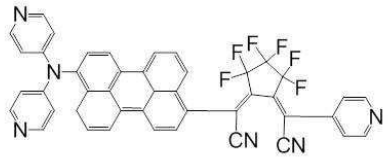


G-50

[0090]



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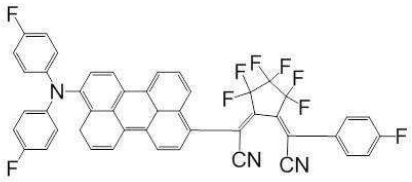

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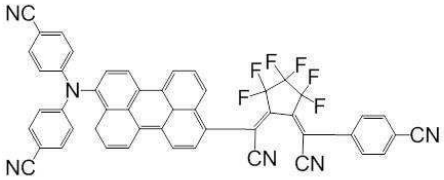

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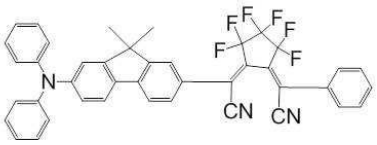

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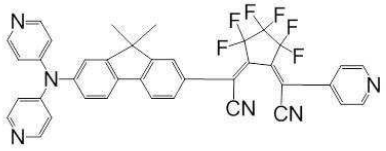

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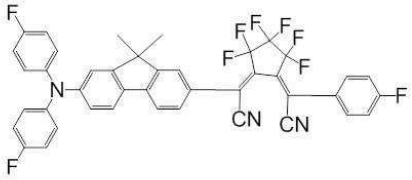

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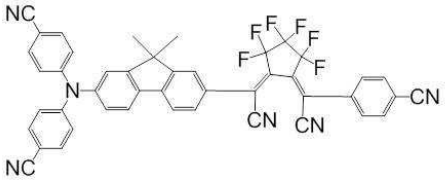
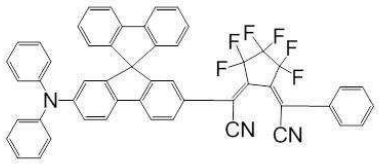


G-57



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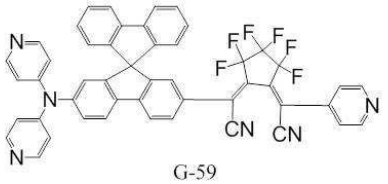

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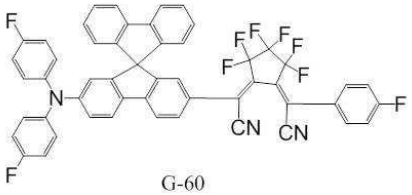

G-60

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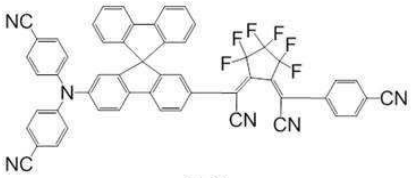

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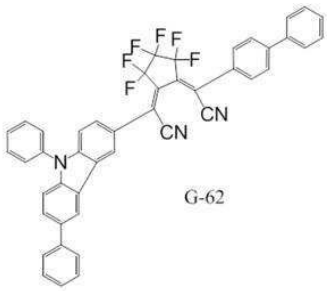

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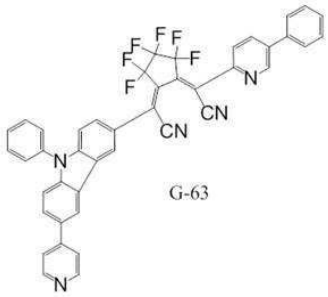

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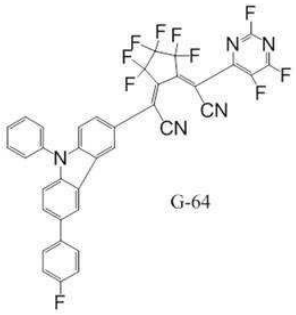

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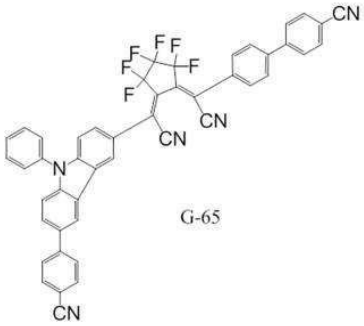

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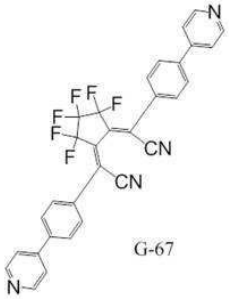
G-66



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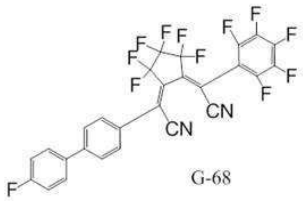

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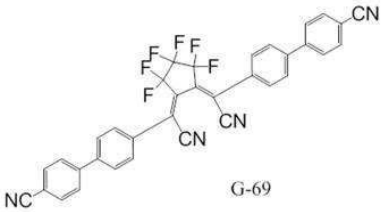

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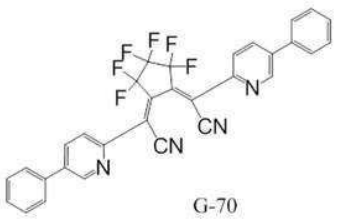

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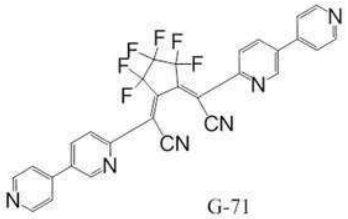

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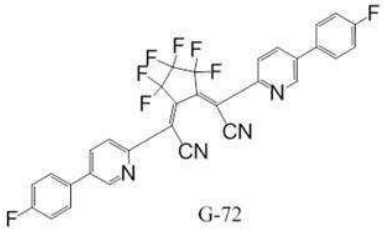

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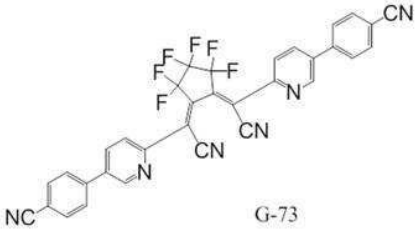

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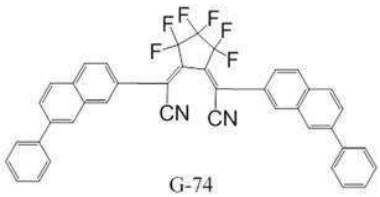

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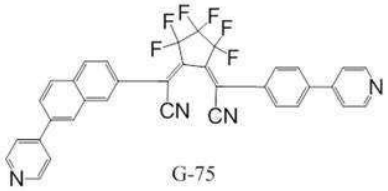

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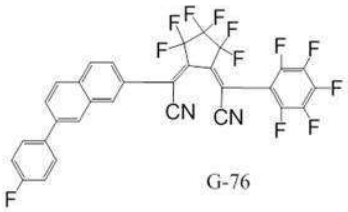

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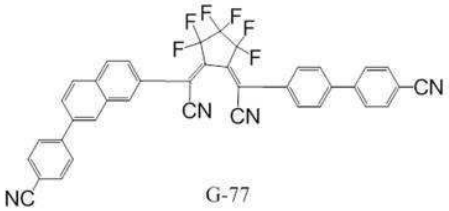

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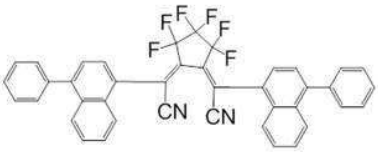

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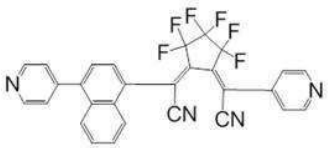

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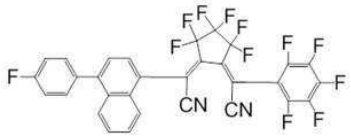
[0093]



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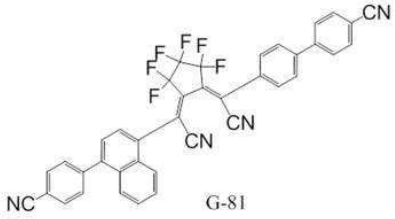

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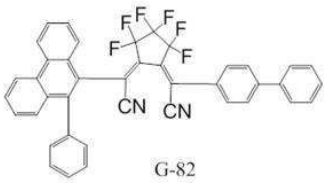

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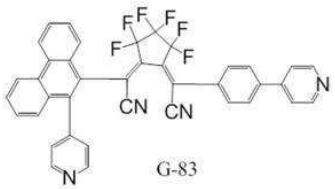

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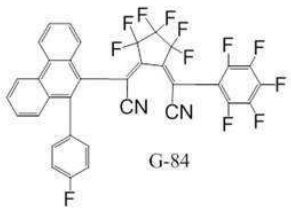

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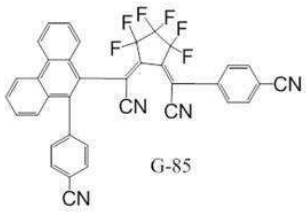

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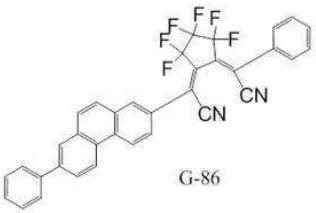

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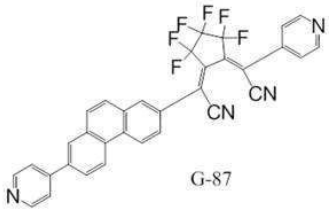

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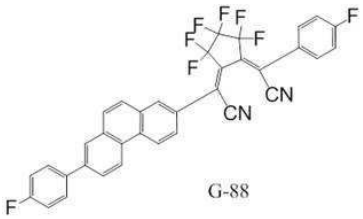

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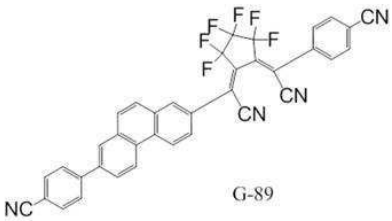

G-89

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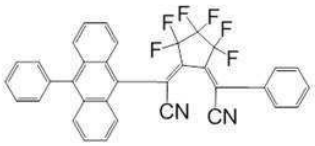

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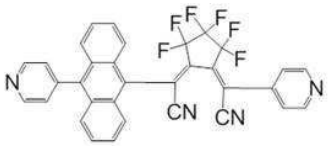

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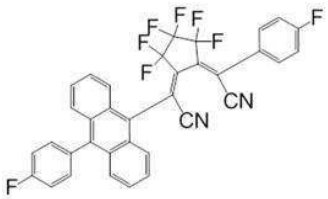

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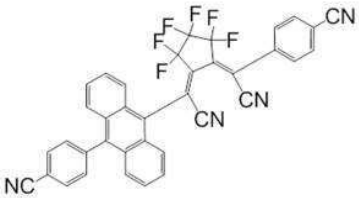

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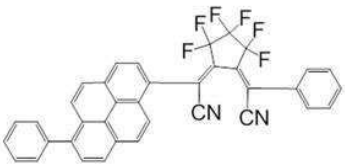

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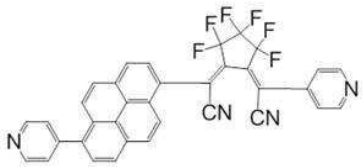

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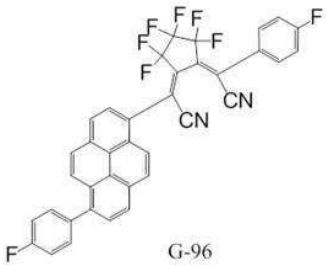

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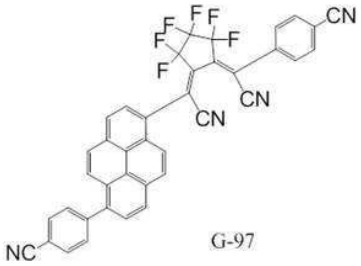

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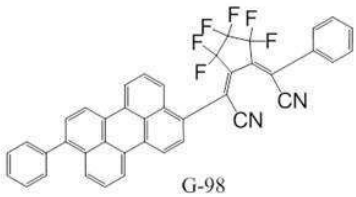

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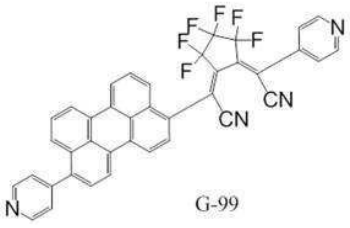

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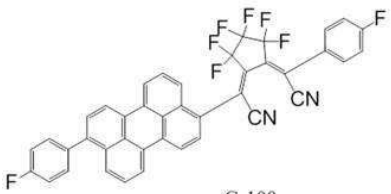
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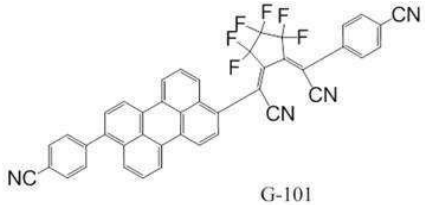
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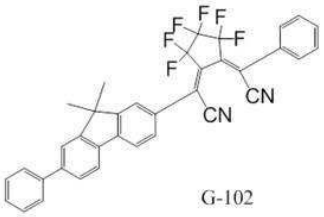
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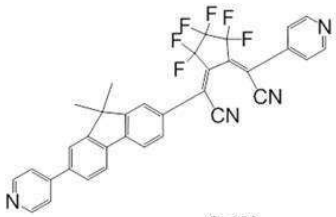
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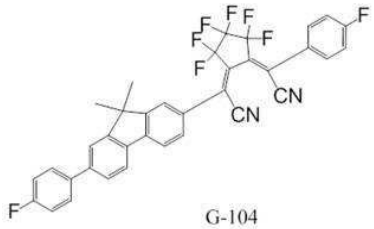
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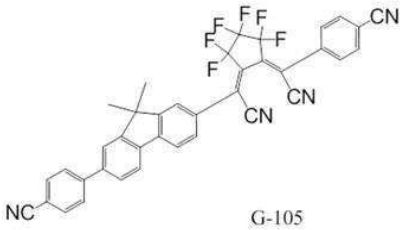
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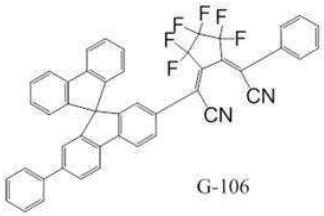
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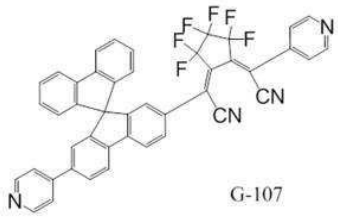
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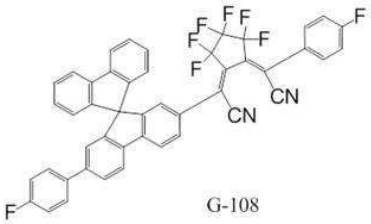
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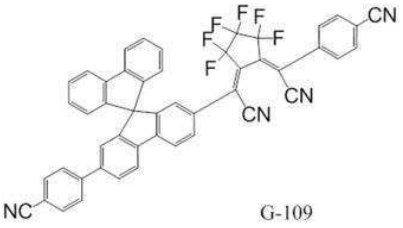

G-109

[0096]

[0097] 본 발명의 다른 일 구현예에 따르면, 제1 전극, 제2 전극 및 상기 제1 전극 및 상기 제2 전극 사이에 개재되는 하나 이상의 유기물층을 포함하는 유기전자소자로서, 상기 유기물층 중 하나 이상은 전술한 상기 화학식 1의 유기전자소자용 화합물을 포함하는 유기전자소자가 제공된다.

[0098] 상기 유기전자소자용 화합물은 단일 물질 또는 서로 다른 물질의 혼합물의 형태로 상기 유기물층에 포함될 수 있다.

[0099] 본 명세서 중 "유기물층"은 유기전자소자 중 제1전극과 제2전극 사이에 개재된 모든 층을 가리키는 용어이다. 상기 유기물층은 정공 특성을 가지는 층 및 전자 특성을 가지는 층일 수 있다. 예를 들어, 상기 유기물층은 정공 주입층, 정공 수송층, 정공 주입 기능 및 정공 수송 기능을 동시에 갖는 기능층, 전자 저지층, 발광층, 정공 저지층, 전자 수송층, 전자 주입층 및 전자 수송 기능 및 전자 주입 기능을 동시에 갖는 기능층 중 하나 이상을 포함할 수 있다.

[0100] 상기 정공 주입층, 상기 정공 수송층 및 상기 정공 주입 기능 및 정공 수송 기능을 동시에 갖는 기능층 중 적어도 하나는, 통상의 정공 주입 물질, 정공 수송 물질 및 정공 주입 및 수송 기능을 동시에 하는 물질 외에, 전하-생성 물질을 더 포함할 수 있다.

[0101] 상기의 본 발명의 제품을 이용한 정공 주입층으로 사용시 도핑은 하기와 같다.

[0102] 도핑은 특히 매트릭스 분자 대 도핑제의 몰비, 또는 유기/무기물에 따른 매트릭스 물질의 질량에 따르며, 도핑제의 비는, 1:100000, 바람직하게는 1:10000, 특히 바람직하게는 1:3 내지 1:1000, 예를 들어 1:10 내지 1:100, 예를 들어 약 1:50 내지 1:100거나 또한 1:25 내지 1:50인 방식으로 일어날 수 있다.

[0103] 예를 들어, 상기 유기물층은 발광층을 포함하고, 상기 발광층은 인광 호스트, 형광 호스트, 인광 도판트 및 형광 도판트 중 하나 이상을 포함할 수 있다. 여기서, 상기 발광층에 상기 유기전자소자용 화합물이 포함되어 있고, i) 상기 형광 호스트가 상기 유기전자소자용 화합물이거나, ii) 상기 형광 도판트가 상기 유기전자소자용 화합물이거나, iii) 상기 형광 호스트 및 형광 도판트 각각이 상기 유기전자소자용 화합물일 수 있다.

[0104] 상기 발광층은 적색, 녹색 또는 청색 발광층일 수 있다. 예를 들어, 상기 발광층은 청색 발광층일 수 있다. 이때, 상기 유기전자소자용 화합물은 청색 호스트 및/또는 청색 도펀트로 사용되어, 고효율, 고휘도, 고색순도, 및 장수명을 갖는 유기전자소자를 제공할 수 있다.

[0105] 또한, 상기 유기물층은 전자 수송층을 포함하고, 상기 전자 수송층에 상기 유기전자소자용 화합물이 포함될 수 있다. 여기서, 상기 전자 수송층은 상기 유기전자소자용 화합물 외에, 금속-함유 화합물을 더 포함할 수 있다.

[0106] 상기 유기물층은 발광층 및 전자 수송층을 모두 포함하고, 상기 발광층 및 전자 수송층 각각에 상기 유기전자소자용 화합물(발광층 및 전자 수송층에 포함된 상기 유기전자소자용 화합물은 서로 동일하거나 상이할 수 있음)가 포함되어 있을 수 있다.

[0107] 상기 유기전자소자는 화학식 1의 유기전자소자용 화합물을 이용하는 것을 제외하고는, 통상의 유기전자소자의 제조방법 및 재료에 의하여 제조될 수 있다.

[0108] 상기 유기전자소자는 유기광전소자, 유기발광소자 (OLED), 유기태양전지 (OSC), 전자종이 (e-Paper), 유기감광체(OPC), 유기트랜지스터 (OTFT) 및 유기메모리소자 중 어느 하나일 수 있다.

[0109] 일 예로, 상기 유기발광소자는 스퍼터링(sputtering)이나 전자빔 증발(e-beam evaporation)과 같은 PVD(physical vapor deposition) 방법을 이용하여, 기판 상에 금속 또는 전도성을 가지는 금속 산화물 또는 이들의 합금을 증착시켜 양극을 형성하고, 그 위에 정공주입층, 정공전달층, 발광층, 정공저지층 및 전자전달층을 포함하는 유기물층을 형성한 후, 그 위에 음극으로 사용할 수 있는 물질을 증착시킴으로써 제조될 수 있다. 이와 같은 방법 외에도, 기판 상에 음극 물질부터 유기물층, 양극 물질을 차례로 증착시켜 유기발광소자를 만들 수도 있다. 상기 유기물층은 정공주입층, 정공전달층, 발광층, 정공저지층 및 전자전달층 등을 포함하는 다층 구조일 수도 있다. 또한, 상기 유기물층은 다양한 고분자 소재를 사용하여 증착법이 아닌 용매 공정(solvent process), 예컨대 스핀 코팅, 딥 코팅, 닥터 블레이딩, 스크린 프린팅, 잉크젯 프린팅 또는 열전사법 등의 방법에 의하여 더 적은 수의 층으로 제조할 수 있다.

[0110] 일 구현예에 따른 유기발광소자는 사용되는 재료에 따라 전면 발광형, 후면 발광형 또는 양면 발광형일 수 있다. 일 구현예에 따른 유기전자소자용 화합물은 유기태양전지, 조명용 OLED, Flexible OLED, 유기감광체, 유기트랜지스터 등을 비롯한 유기전자소자에서도 유기발광소자에 적용되는 것과 유사한 원리로 작용할 수 있다.

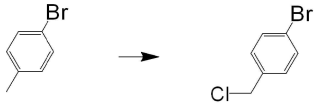
[0111] 이하, 본 발명의 이해를 돕기 위하여 바람직한 실시예를 제시한다. 그러나 하기의 실시예는 본 발명을 보다 쉽게 이해하기 위하여 제공되는 것일 뿐, 이에 의해 본 발명의 내용이 한정되는 것은 아니다.

[0112] 또한, 본 발명의 각 실시예에서 제조방법이 구체적으로 개시되지 않은 화합물은 당업계에 통상적인 방법으로 제조하거나 또는 다른 실시예에 기재된 제조방법을 참고하여 제조함을 이해한다.

[0113]

[0114] <중간체의 제조>

[0115] * 중간체 1-bromo-4-(chloromethyl)benzene (A-1)의 제조



[0116] A-1

[0117] 1-브로모-4-메틸벤젠(8.56g, 50 mmol)을 원추형 플라스크에서 물 (250 mL) 및1-클로로피롤리딘-2,5-디온/NCS (6.74g, 50.5 mmol)를 첨가하였다. 반응 혼합물을 실온에서 500rpm으로 40W 백열전 구에서 24 시간 동안 조사한다. 반응이 끝난 낮은 유기층 분리하고 유기상을 100mL 증류수로 두 번 씻어주고, 유기상을 칼럼 크로마토그래피 (SiO2, 헥산 / EtOAc)하여 A-1를(7.19g,70 %)얻는다. 생성된 화합물은 LC-MS를 통해 확인하였다. 질량스펙트럼 m/z: 205.93(계산치 205.48)

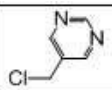
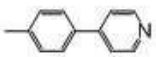
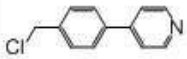
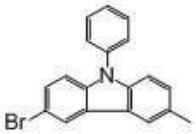
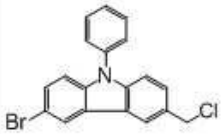
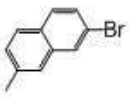
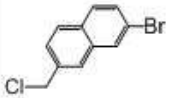
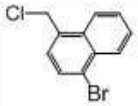
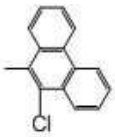
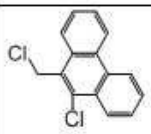
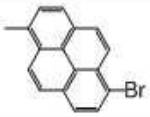
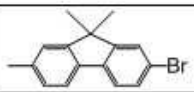
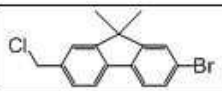
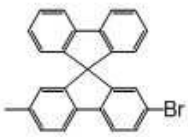
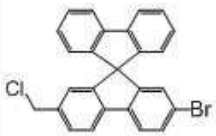
[0118] * 중간체 A-2 내지 A-13의 제조

[0119] 상기 중간체 A-1의 제조 방법으로 하기 [표 1]의 화합물을 얻었다.

표 1

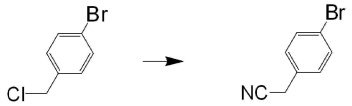
[0120]

	반응물질	생성물질	수율%
A-2			57

A-3			62
A-4			53
A-5			57
A-6			41
A-7			43
A-8			47
A-9			62
A-10			63
A-11			67
A-12			61
A-13			67

[0121]

[0122] * 중간체 2-(4-bromophenyl)acetonitrile (B-1)의 제조



A-1 B-1

[0123]

[0124] A-1 물질에 시안화수소(1.8 : 1)혼합가스를 175℃에서 예열한 다음 혼합 기체를 마이크로 채널 반응기에 넣어 두 물질의 몰 비를 1.8:1.0로 확보한다. 190℃ 및 1.8 MPa 압력 하에서 친 핵성 치환 반응을 진행하여 B-1 및 염화수소를 얻는다. 반응 체류 시간은 120 Sec이며, 반응 물질의 온도는 80℃까지 냉각한 다음 반응을 급냉하고, 생성 물질을 수세 탑에 도입하여. 반응에 의해 생성된 염화수소를 세정하고, 유기물질에 5%의 수산화칼슘 수용액으로 pH 6.5로 조절한 후, 분액장치로 수분을 제거하고 생성물을 260 Pa의 압력하에 정류하여 최종

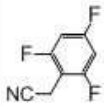
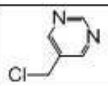
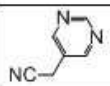
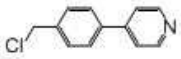
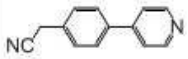
B-1 90.3 %얻는다. 생성된 화합물은 LC-MS를 통해 확인하였다. 질량스펙트럼 m/z: 194.97(계산치 196.04)

[0126] * 중간체 B-2 내지 B-13의 제조

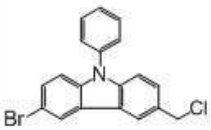
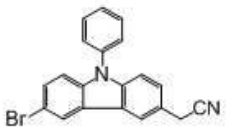
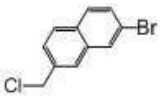
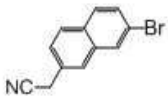
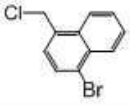
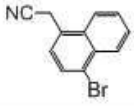
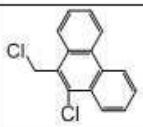
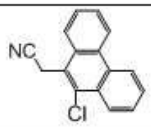
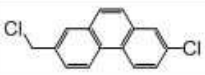
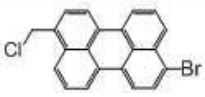
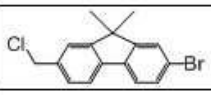
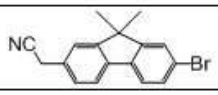
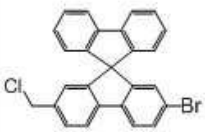
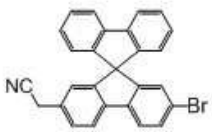
[0127] 상기 중간체 B-1의 제조 방법으로 하기 [표 2]의 화합물을 얻었다.

표 2

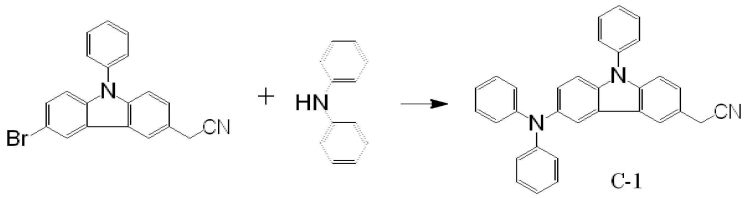
[0128]

	반응물질	생성물질	수율%
B-2			83
B-3			79
B-4			88

[0129]

B-5			85
B-6			89
B-7			88
B-8			75
B-9			89
B-10			91
B-11			90
B-12			92
B-13			91

[0130] * 중간체 2-(6-(diphenylamino)-9-phenyl-9H-carbazol-3-yl)acetonitrile (C-1)의 제조

[0131] 

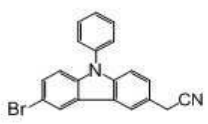
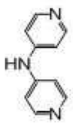
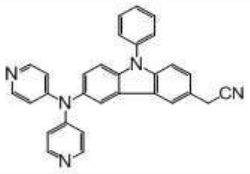
[0132] 3구 플라스크에 질소 조건에서2-(6-브로모-9-페닐-9H-카르바졸-3-일)아세토 니트릴(27.09g,75mmol), 소듐테트라부톡사이드(21.62g,22mmol), 톨루엔(500mL), 다이벤젠아민(12.69g, 75mmol)과 촉매$Pd_2(dba)_3$ (2.06g, 2.25mmol)을 첨가하고, N_2를 3회 대체하고, 트리테트라부틸포스핀 (0.36mL, 15mmol)을 넣고, 혼합물을 110℃에서 1 시간 동안 가열시켰다. 반응 액을 냉각하고, 물로 세정하고, DCM/PE로 재결정하여 황색고체를 얻는다. 다시 툴루엔/EA혼합용액으로45℃에서 2시간 씻어주고 여과하여 C-1(30.34g, 90%)얻는다. 생성된 화합물은 LC-MS를 통해 확인하였다. 질량스펙트럼 m/z: 323.03(계산치 324.21)

[0133] * 중간체 C-2 내지 C-48의 제조

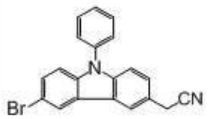
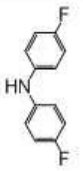
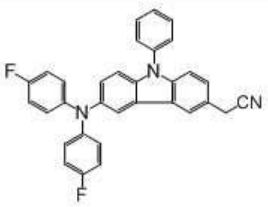
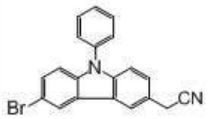
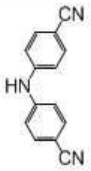
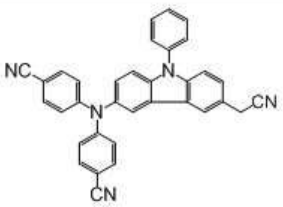
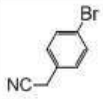
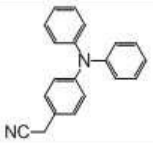
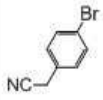
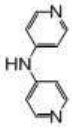
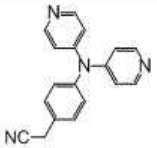
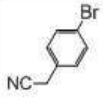
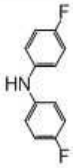
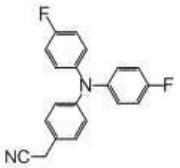
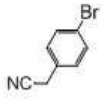
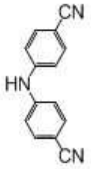
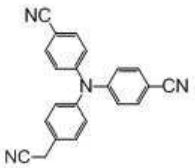
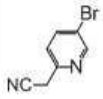
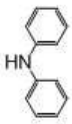
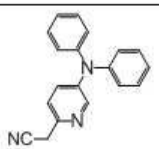
[0134] 상기 중간체 C-1의 제조 방법으로 하기 [표 3]의 화합물을 얻었다.

표 3

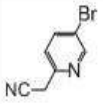
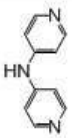
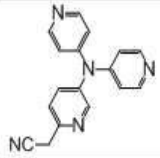
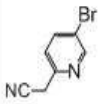
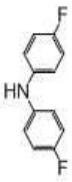
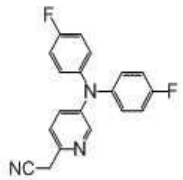
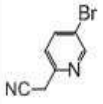
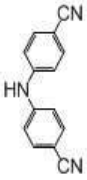
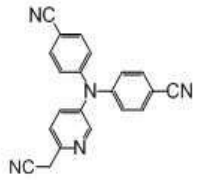
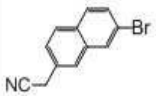
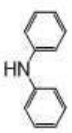
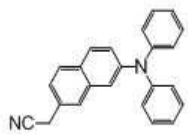
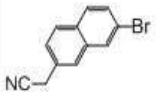
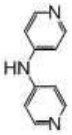
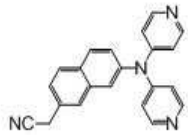
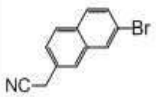
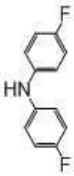
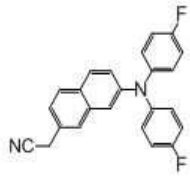
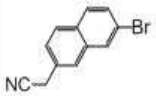
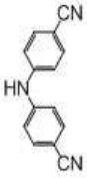
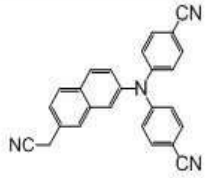
[0135]

	반응물질		생성물질	수율%
C-2				87

[0136]

C-3				79
C-4				75
C-5				92
C-6				90
C-7				79
C-8				78
C-9				90

[0137]

C-10				87
C-11				79
C-12				70
C-13				81
C-14				76
C-15				73
C-16				72

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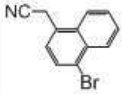
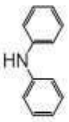
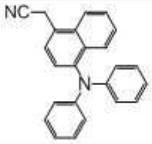
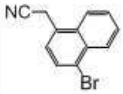
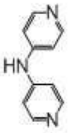
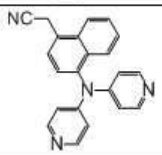
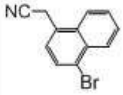
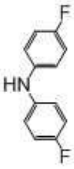
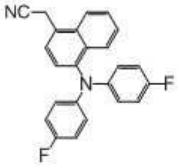
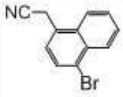
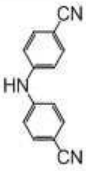
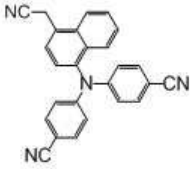
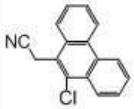
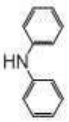
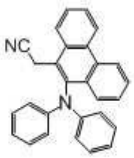
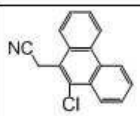
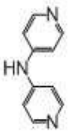
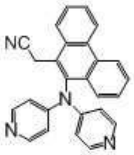
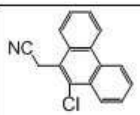
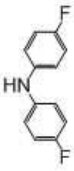
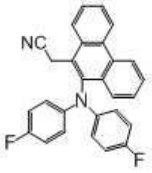
C-17				82
C-18				76
C-19				74
C-20				71
C-21				63
C-22				61
C-23				58

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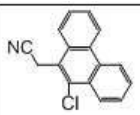
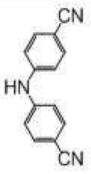
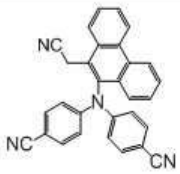
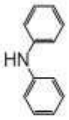
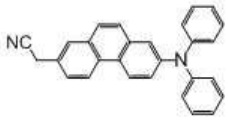
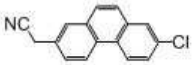
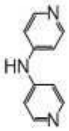
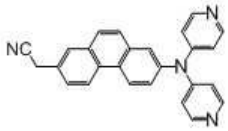
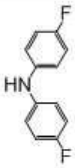
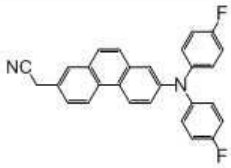
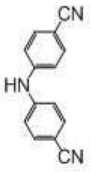
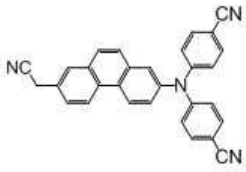
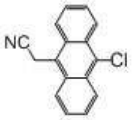
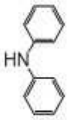
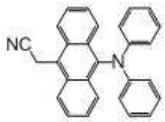
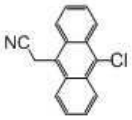
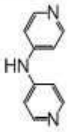
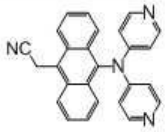
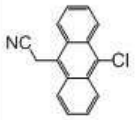
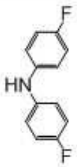
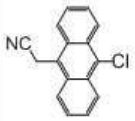
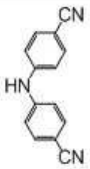
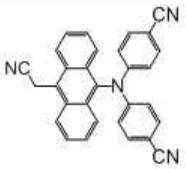
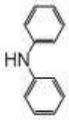
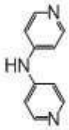
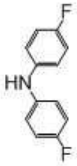
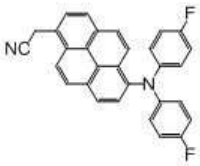
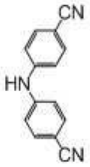
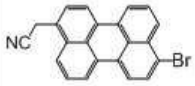
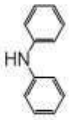
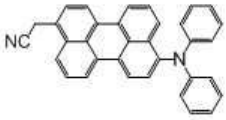
C-24				51
C-25				83
C-26				82
C-27				79
C-28				75
C-29				83
C-30				79

C-31				75
C-32				73
C-33				87
C-34				83
C-35				80
C-36				79
C-37				86

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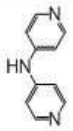
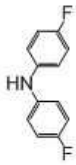
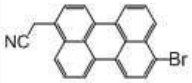
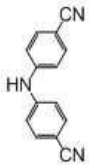
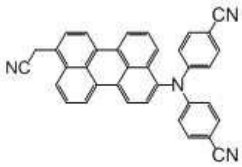
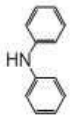
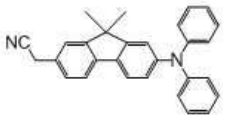
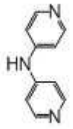
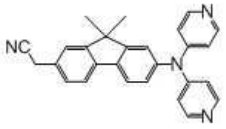
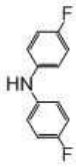
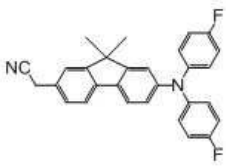
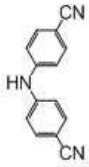
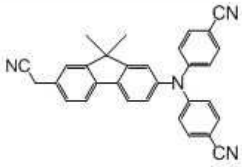
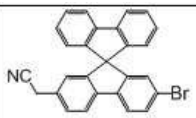
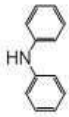
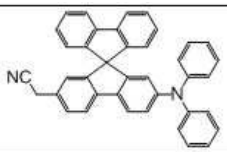
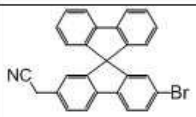
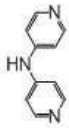
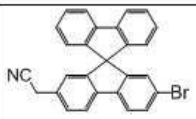
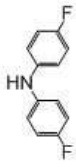
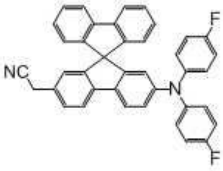
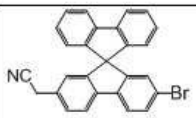
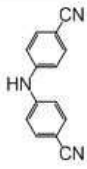
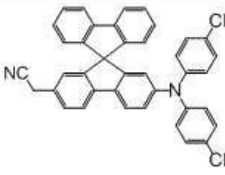
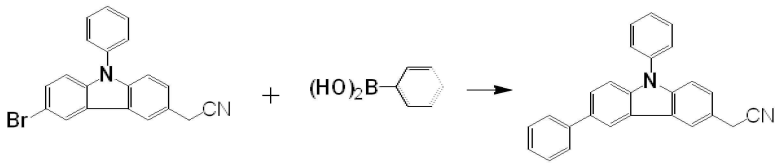
[0141]

C-38				83
C-39				82
C-40				80
C-41				76
C-42				73
C-43				70
C-44				68

C-45				80
C-46				76
C-47				77
C-48				72

[0142]

[0143] * 중간체 2-(6,9-diphenyl-9H-carbazol-3-yl)acetonitrile (D-1)의 제조



D-1

[0144]

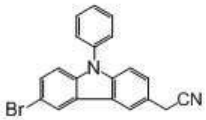
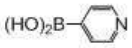
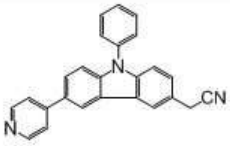
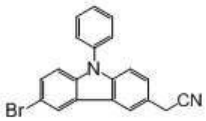
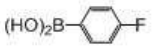
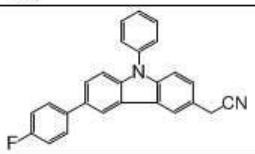
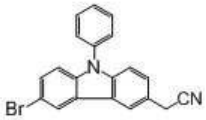
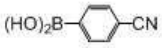
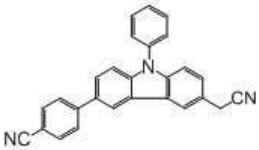
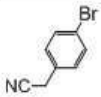
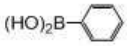
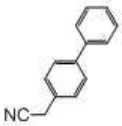
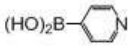
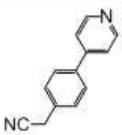
[0145] 3구플라스크(5L)에 페닐보론산(54.87g, 450mmol), 브로모트리페닐아민 (162.55g, 450mmol) , 테트라키스트라이페닐포스핀팔라듐(26g, 22.5mmol) 및 탄산칼륨 (2.2M, 640 ㎖, 1405mmol), 톨루엔(2200㎖), 에탄올(500㎖) 및 물(500 ㎖)을 넣고 15시간 동안 가열하였다. 반응물을 냉각, 여과, 분리하고, 톨루엔층을 건조시켜 황색 오일을 수득 하였다. 소량의 디클로로메탄을 첨가하여 용해시키고, 적절한 양의 석유에테르(PE)를 첨가하여 고체를 D-1(104.84g, 65%)를 얻었다. 생성된 화합물은 LC-MS를 통해 확인하였다. 질량스펙트럼 m/z:358.15(계산치 558.43)

[0146] * 중간체 D-2 내지 D-48의 제조

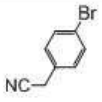
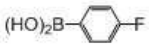
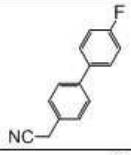
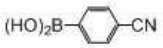
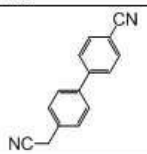
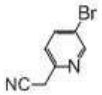
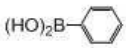
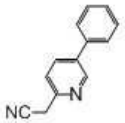
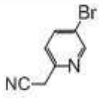
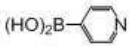
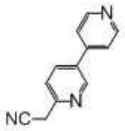
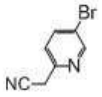
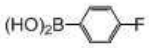
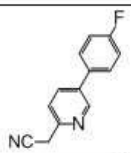
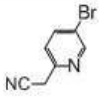
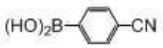
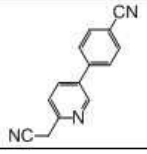
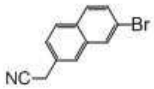
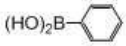
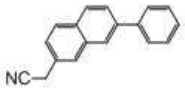
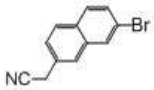
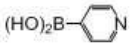
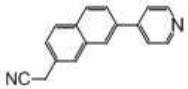
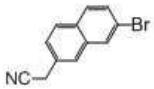
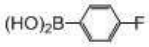
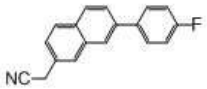
[0147] 상기 중간체 D-1의 제조 방법으로 하기 [표 4]의 화합물을 얻었다.

표 4

[0148]

	반응물질		생성물질	수율%
D-2				60
D-3				58
D-4				53
D-5				76
D-6				73

[0149]

D-7				71
D-8				68
D-9				67
D-10				55
D-11				52
D-12				50
D-13				73
D-14				64
D-15				61

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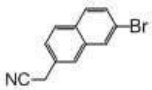
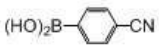
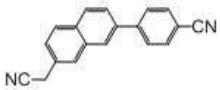
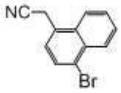
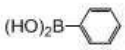
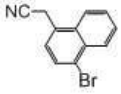
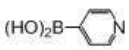
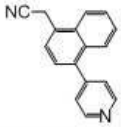
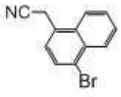
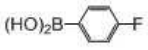
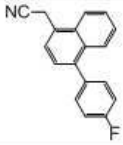
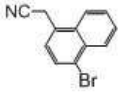
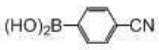
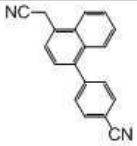
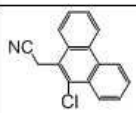
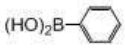
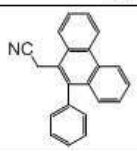
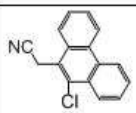
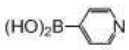
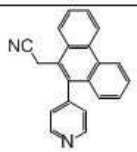
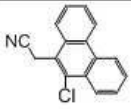
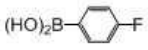
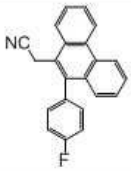
D-16				60
D-17				78
D-18				73
D-19				71
D-20				68
D-21				65
D-22				62
D-23				60

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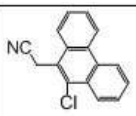
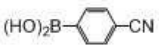
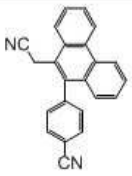
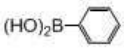
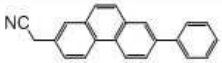
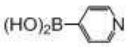
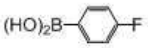
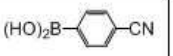
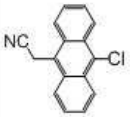
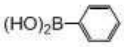
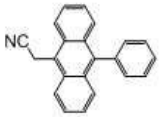
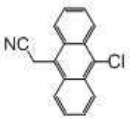
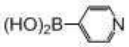
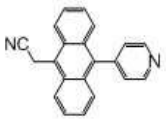
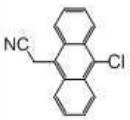
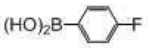
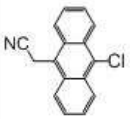
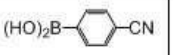
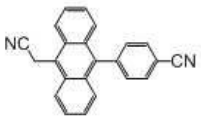
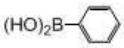
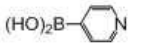
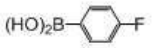
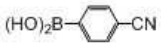
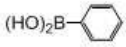
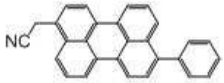
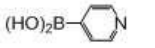
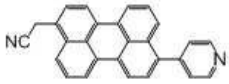
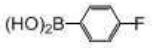
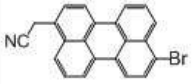
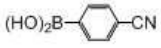
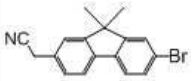
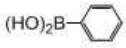
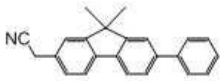
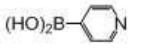
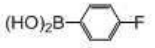
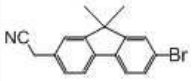
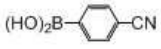
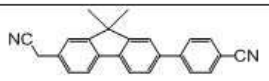
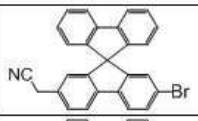
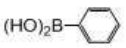
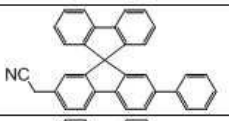
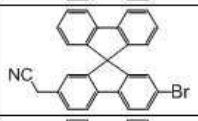
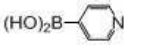
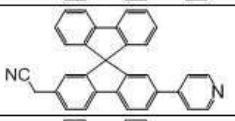
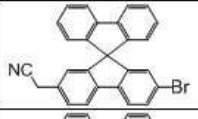
D-24				57
D-25				75
D-26				72
D-27				70
D-28				68
D-29				81
D-30				76
D-31				73
D-32				71
D-33				78

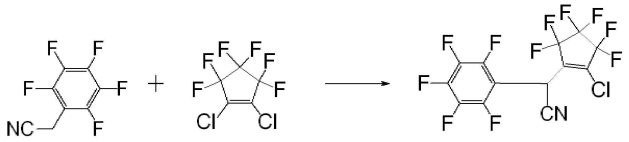
D-34				70
D-35				68
D-36				66
D-37				84
D-38				80
D-39				81
D-40				78
D-41				76
D-42				72
D-43				68
D-44				62

[0152]

D-45				76
D-46				72
D-47				68
D-48				62

[0153]

[0155] * 중간체 2-chloro-2-(2-(cyano(perfluorophenyl)methyl)-3,3,4,4,5,5-hexafluorocyclopent-1-en-1-yl)acetonitrile (E-1)의 제조



E-1

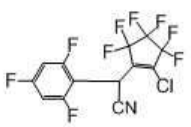
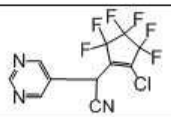
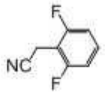
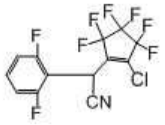
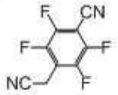
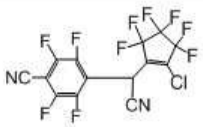
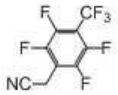
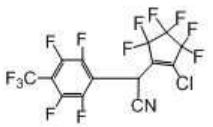
[0156]

[0157] 20L 반응기에 유기 용매 Tetrahydrofuran(THF) 10,000 mL을 넣고 교반 하면서, LiH (28.8g,1.2eq) 넣고 온도를 15℃ 에서 2-(퍼플 루오로 페닐) 아세토 니트릴을 691.1g (1.1eq) THF (4400 mL) 용해시켜, 1시간 동안 넣어준다. 1시간이 지난 후 대량의 기체가 생성된다. 0~5℃에서1,2-디클로로-3,3,4,4,5,5-헥사 플루오로 시클로 펜트-1-엔 (715g,1.0eq, THF 400 mL용해), 넣어주고 실온에서 48시간 교반 한다. 증류수9L, 염산150mL, EA 12L를 넣어주고, 15min동안 교반 한 다음 유기층을 분리하고 용매를 제거한 다음 유기물질(873.4g y=72%)얻는다. 생성된 화합물은 LC-MS를 통해 확인하였다. 질량 스펙트럼 m/z:414.96(계산치415.59)

[0159] * 중간체 E-2 내지 E-109의 제조

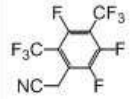
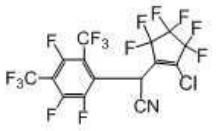
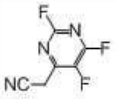
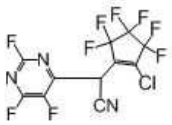
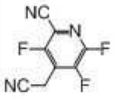
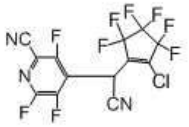
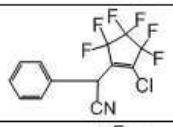
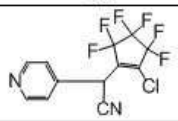
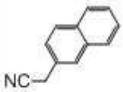
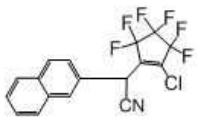
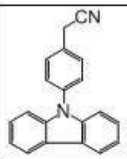
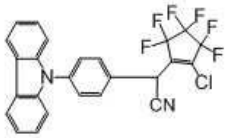
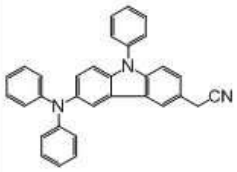
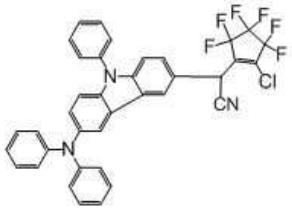
[0160] 상기 중간체 E-1의 제조 방법으로 하기 [표 5]의 화합물을 얻었다.

표 5

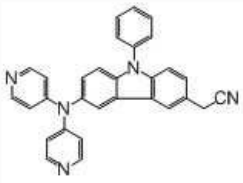
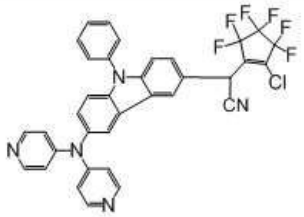
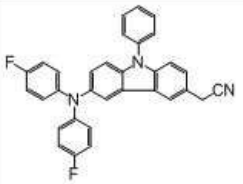
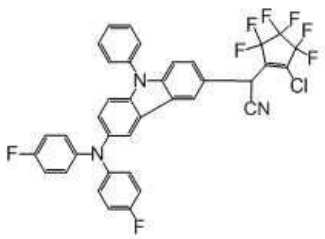
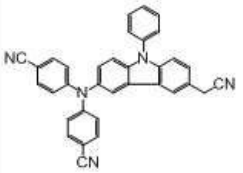
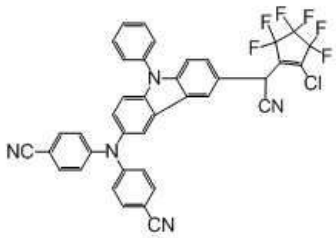
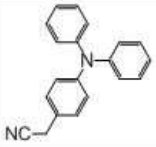
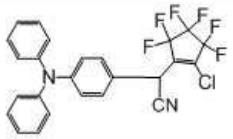
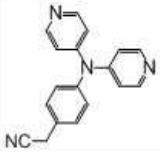
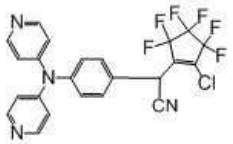
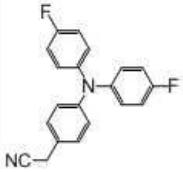
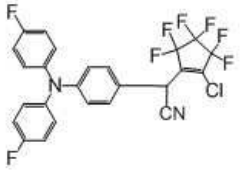
	반응물질		생성물질	수율%
E-2				85
E-3				83
E-4				82
E-5				76
E-6				75

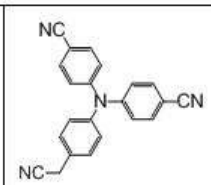
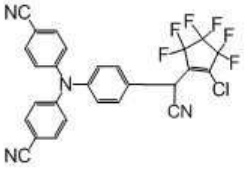
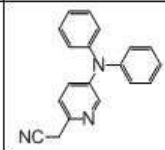
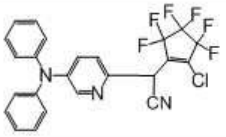
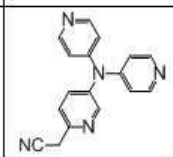
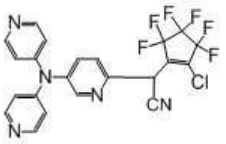
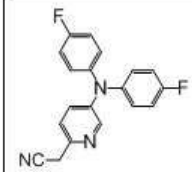
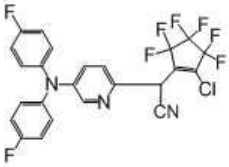
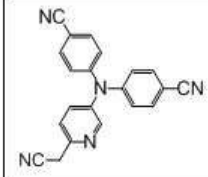
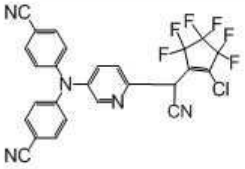
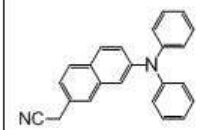
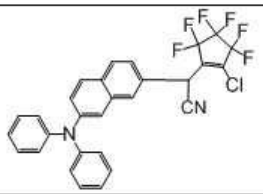
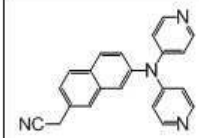
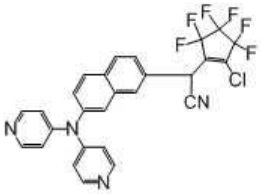
[0161]

[0162]

E-7				74
E-8				71
E-9				79
E-10				85
E-11				83
E-12				87
E-13				72
E-14				69

[0163]

E-15				63
E-16				61
E-17				59
E-18				75
E-19				72
E-20				71

E-21				70
E-22				69
E-23				65
E-24				62
E-25				60
E-26				82
E-27				80

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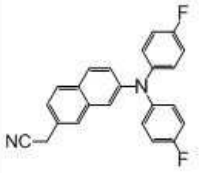
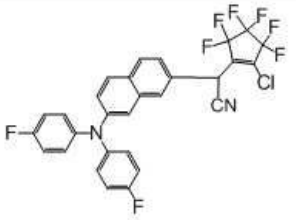
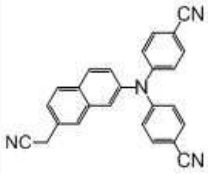
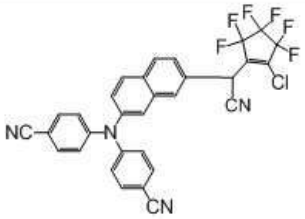
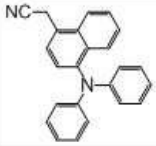
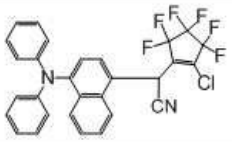
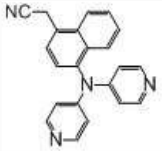
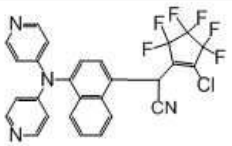
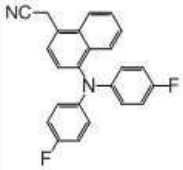
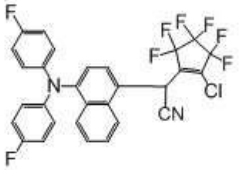
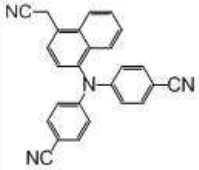
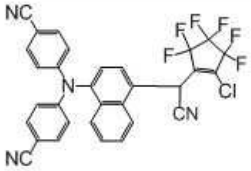
E-28				78
E-29				75
E-30				85
E-31				82
E-32				80
E-33				75

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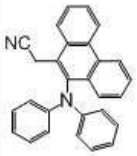
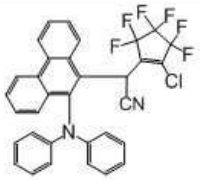
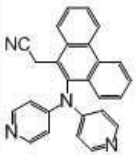
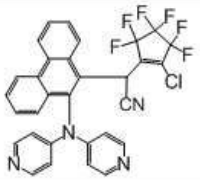
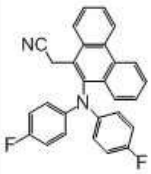
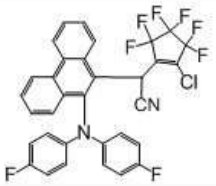
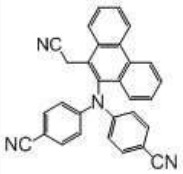
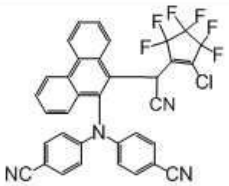
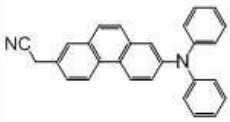
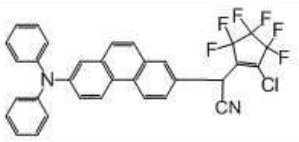
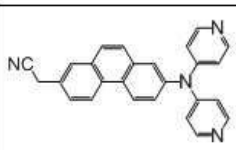
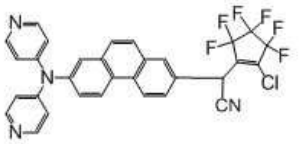
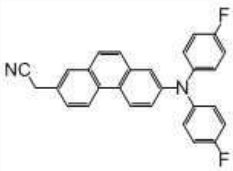
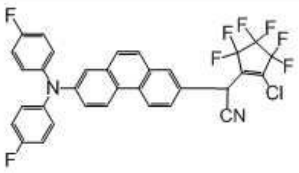
E-34				72
E-35				68
E-36				64
E-37				61
E-38				86
E-39				82
E-40				81

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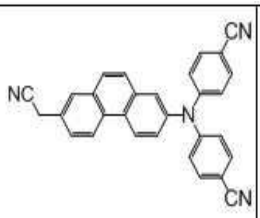
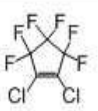
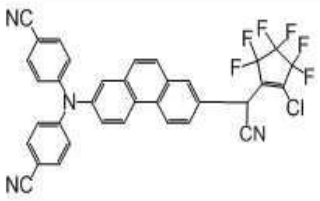
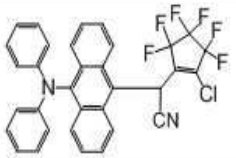
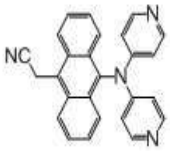
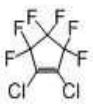
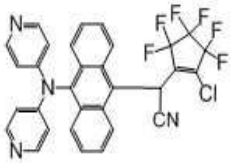
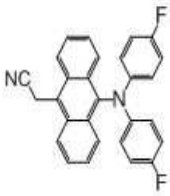
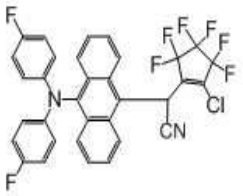
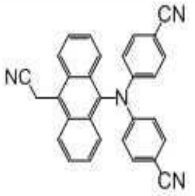
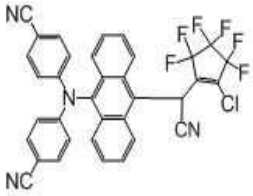
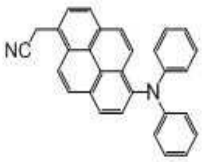
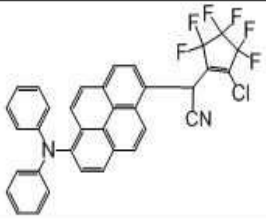
B-41				75
B-42				75
B-43				72
B-44				70
B-45				65
B-46				74

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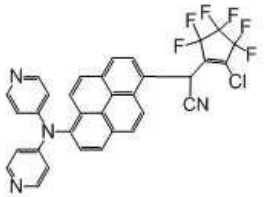
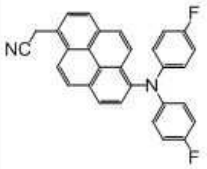
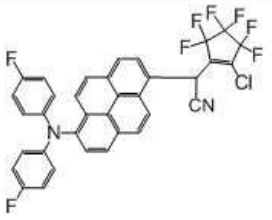
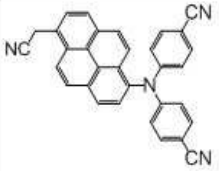
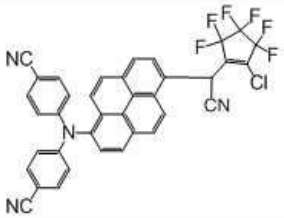
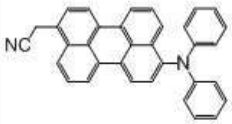
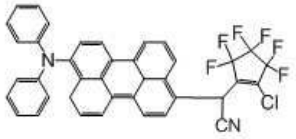
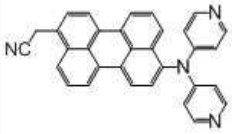
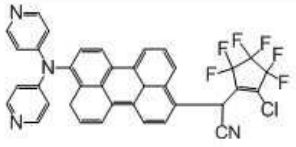
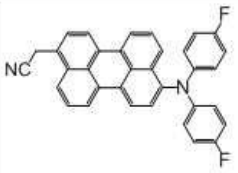
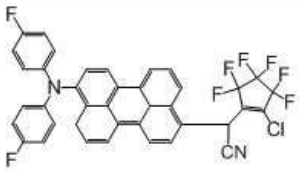
E-47				72
E-48				70
E-49				68
E-50				73
E-51				71
E-52				69

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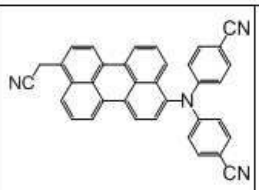
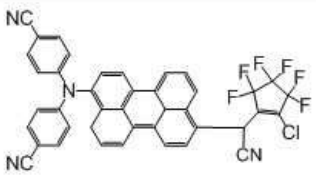
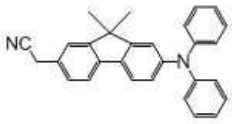
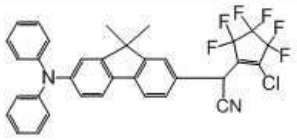
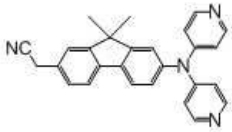
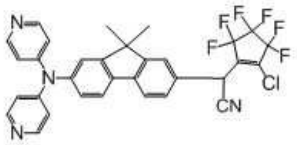
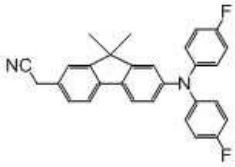
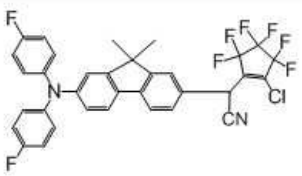
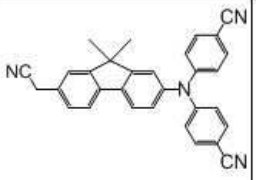
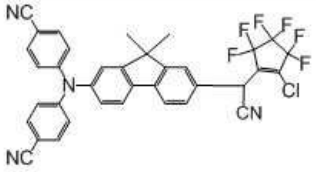
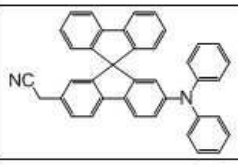
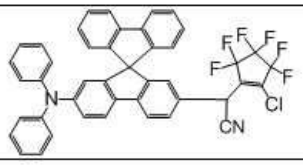
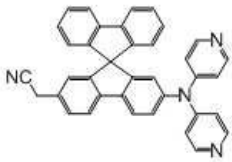
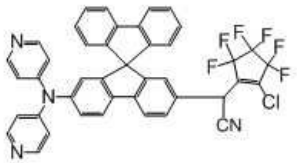
E-53				63
E-54				83
E-55				80
E-56				78
E-57				75
E-58				79
E-59				77

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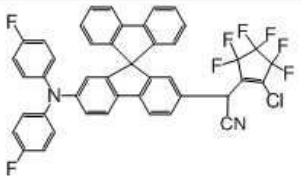
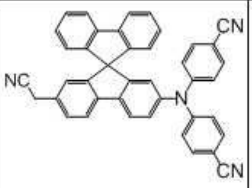
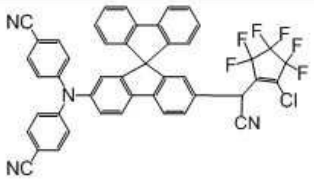
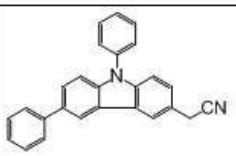
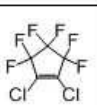
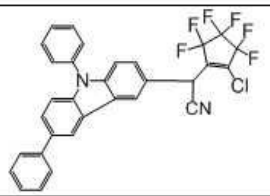
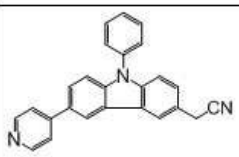
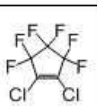
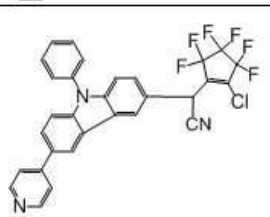
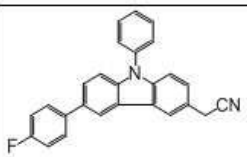
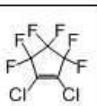
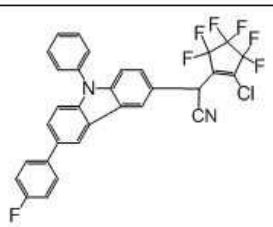
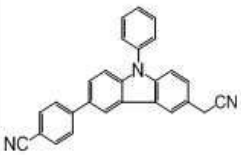
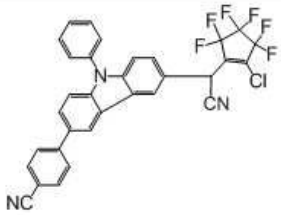
E-60				73
E-61				71
E-62				74
E-63				72
E-64				70
E-65				68

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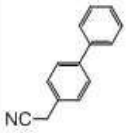
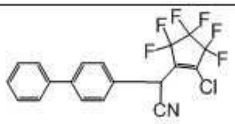
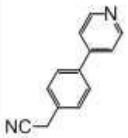
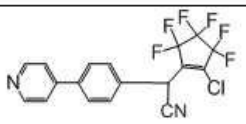
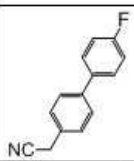
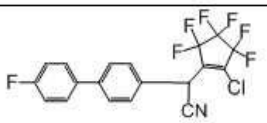
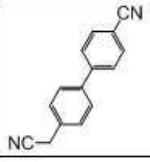
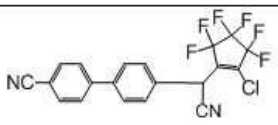
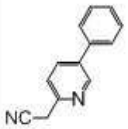
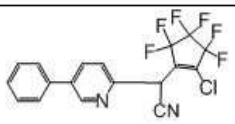
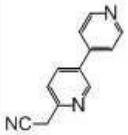
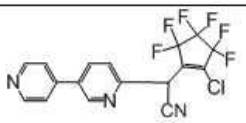
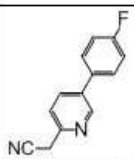
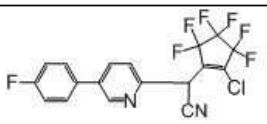
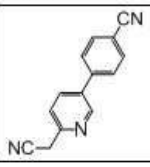
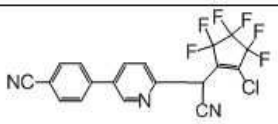
E-66				83
E-67				81
E-68				80
E-69				79
E-70				82
E-71				75
E-72				72
E-73				70

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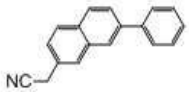
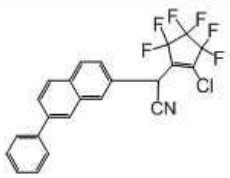
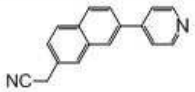
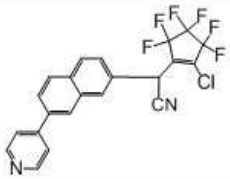
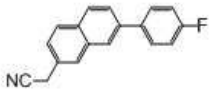
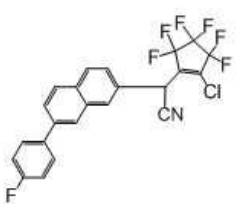
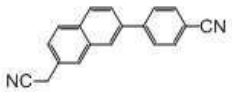
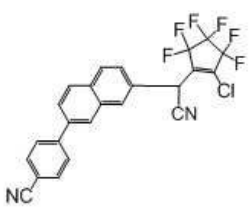
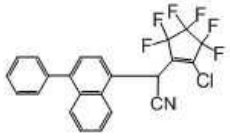
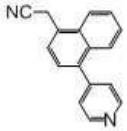
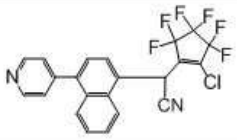
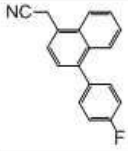
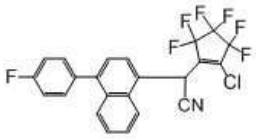
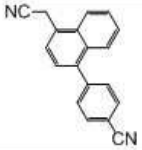
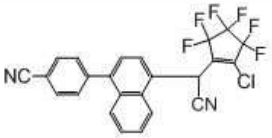
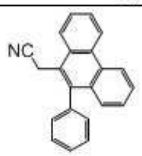
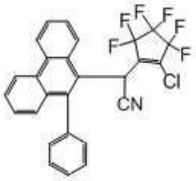
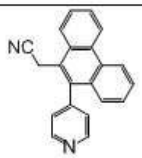
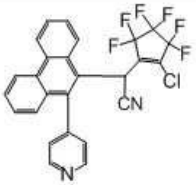
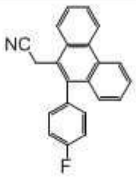
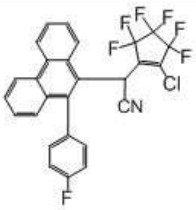
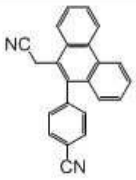
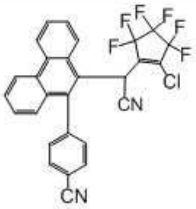
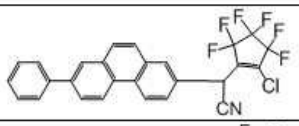
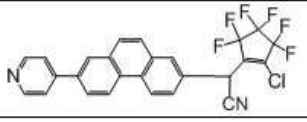
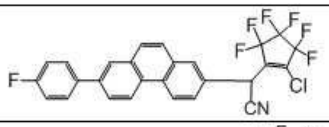
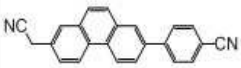
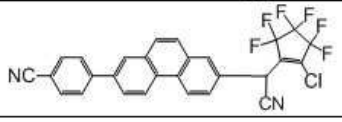
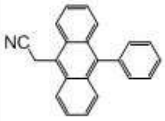
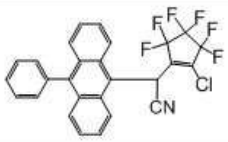
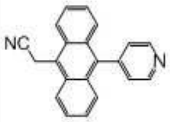
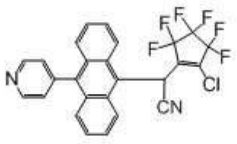
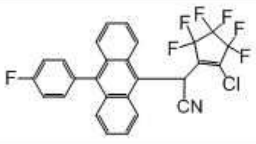
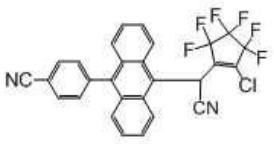
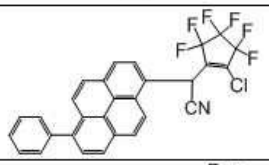
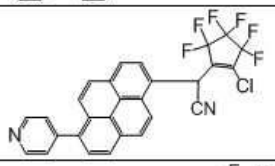
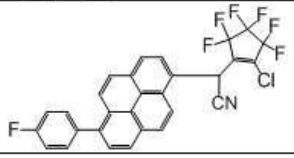
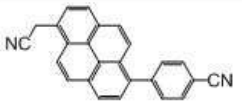
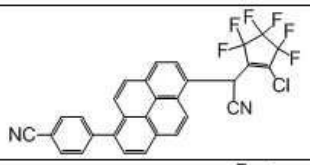
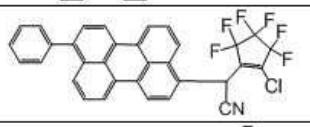
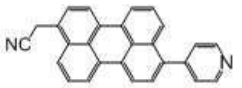
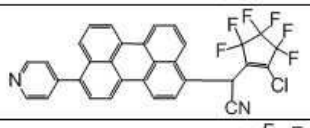
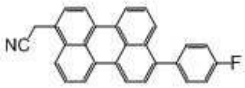
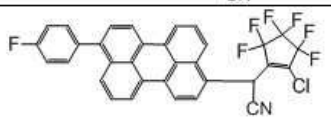
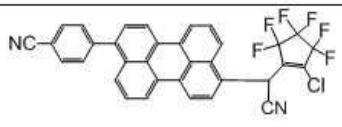
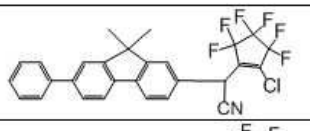
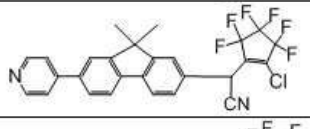
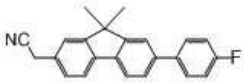
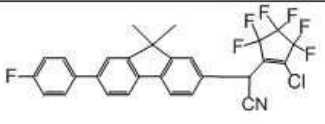
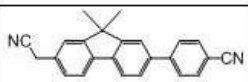
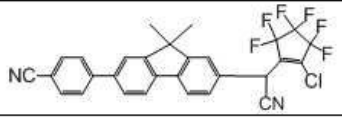
E-74				82
E-75				75
E-76				71
E-77				69
E-78				83
E-79				80
E-80				78

[0173]

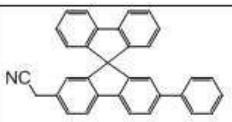
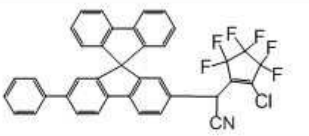
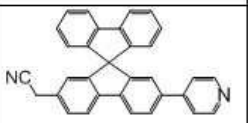
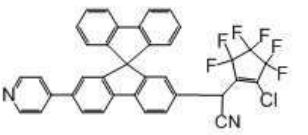
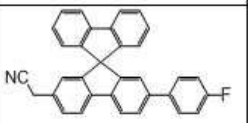
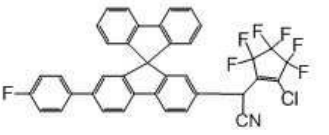
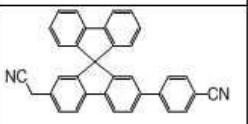
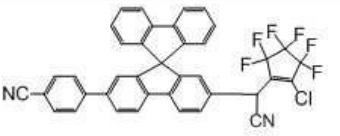
E-81				75
E-82				71
E-83				68
E-84				62
E-85				60
E-86				79
E-87				72

[0174]

E-88				71
E-89				68
E-90				76
E-91				74
E-92				72
E-93				69
E-94				82
E-95				79
E-96				74

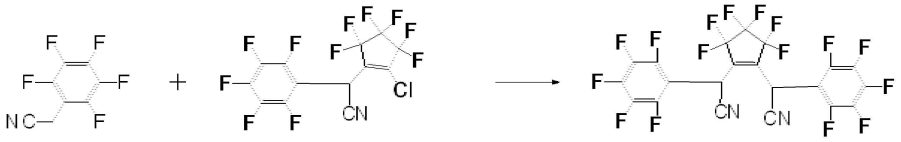
E-97				72
E-98				80
E-99				77
E-100				73
E-101				71
E-102				84
E-103				82
E-104				79
E-105				74

[0175]

E-106				79
E-107				75
E-108				72
E-109				70

[0176]

[0177] * 중간체 2,2'-(perfluorocyclopent-1-ene-1,2-diyl)bis(2-(perfluorophenyl)acetonitrile) (F-1)의 제조



E-1 F-1

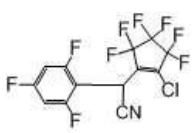
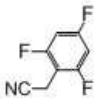
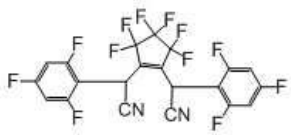
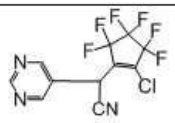
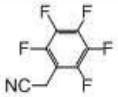
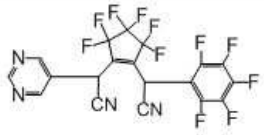
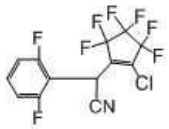
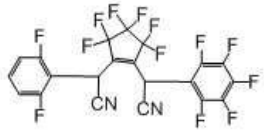
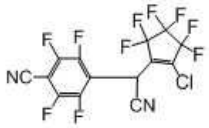
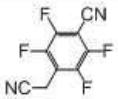
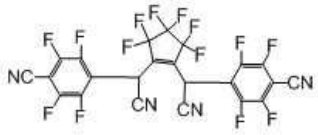
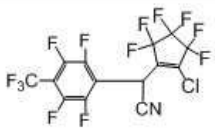
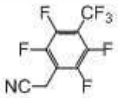
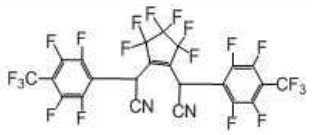
[0178]

[0179] 50L 반응기에 유기 용매 Tetrahydrofuran(THF) 10,000 mL을 넣고 교반 하면서, LiH(28.8g,1.2eq) 넣고 15℃ 이하에서 2-(퍼플 루오로 페닐) 아세토 니트릴(691.1g,1.1eq, THF /4400mL용해) 를 1시간 동안 넣어준다. 1시간이 지난 후 대량의 기체가 생성된다. 0~5℃에서 E-1 (1213g,1.0eq, THF/1000mL용해) , 넣어주고 실온에서 48시간 교반 한다. 증류수9L, 염산150mL, EA 12L를 넣어주고, 15min동안 교반 한 다음 유기층을 분리하고 용매를 제거한 다음 F-1(855g, 50%)를 얻었다. 생성된 화합물은 LC-MS를 통해 확인하였다. 질량스펙트럼 m/z:586.00(계산치 586.23)

[0180] * 중간체 F-2 내지 F-109의 제조

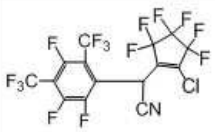
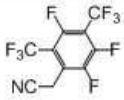
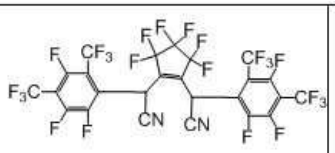
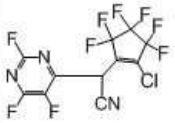
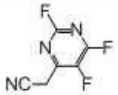
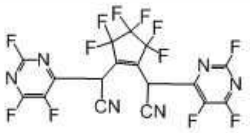
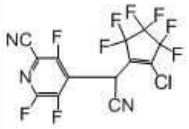
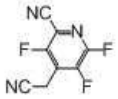
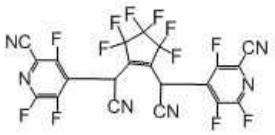
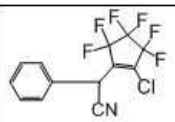
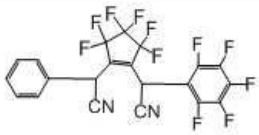
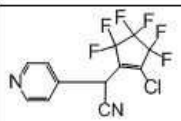
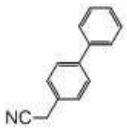
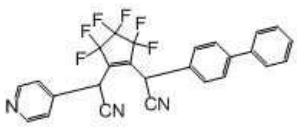
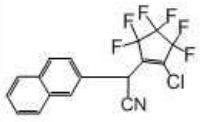
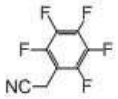
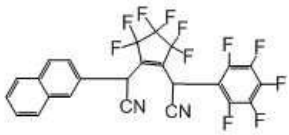
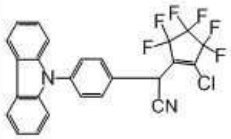
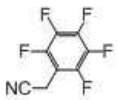
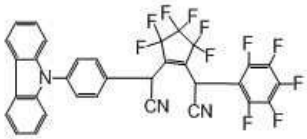
[0181] 상기 중간체 F-1의 제조 방법으로 하기 [표 6]의 화합물을 얻었다.

표 6

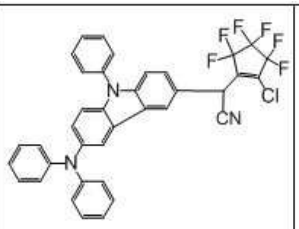
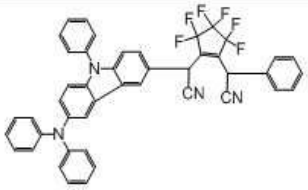
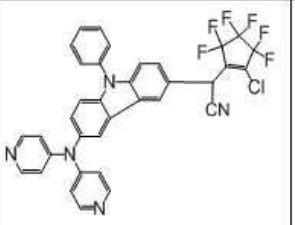
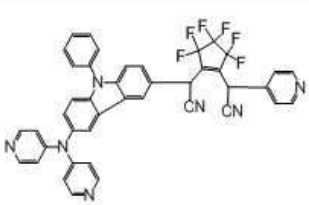
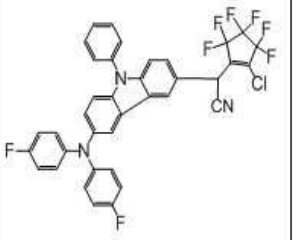
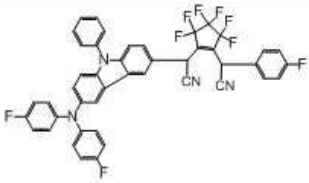
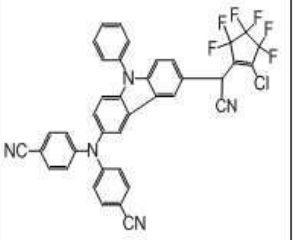
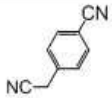
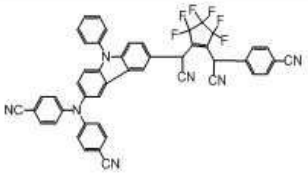
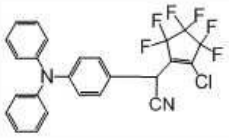
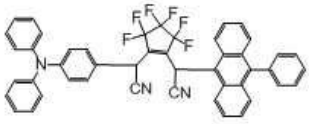
	반응물질		생성물질	수율%
F-2				65
F-3				52
F-4				59
F-5				52
F-6				50

[0182]

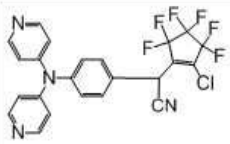
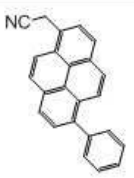
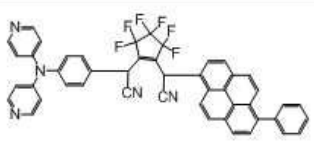
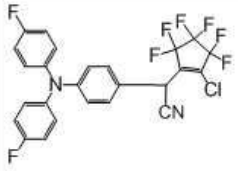
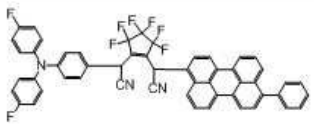
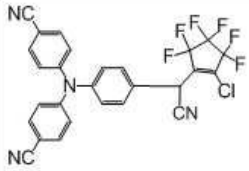
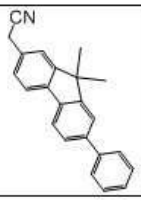
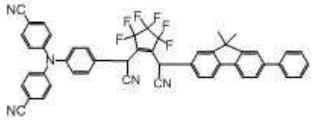
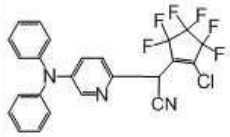
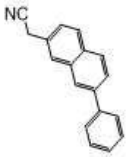
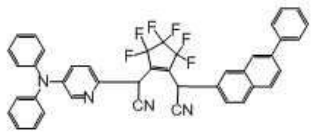
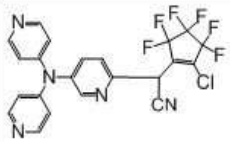
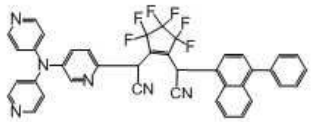
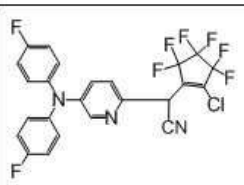
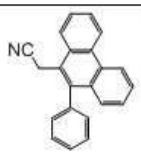
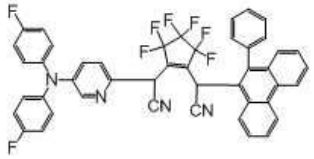
[0183]

F-7				54
F-8				62
F-9				54
F-10				69
F-11				62
F-12				59
F-13				52

[0184]

F-14				51
F-15				49
F-16				47
F-17				45
F-18				65

[0185]

F-19				62
F-20				59
F-21				71
F-22				73
F-23				70
F-24				55

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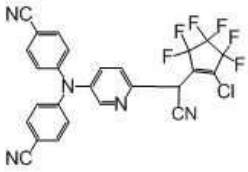
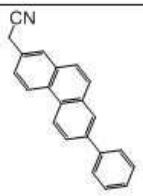
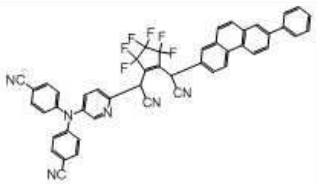
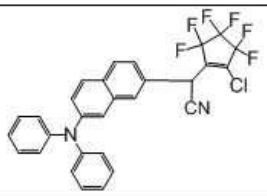
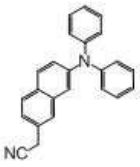
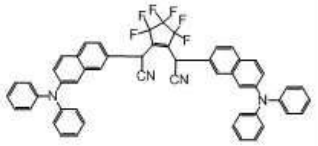
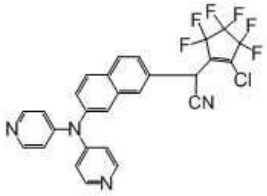
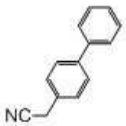
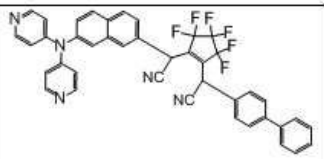
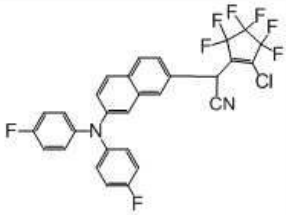
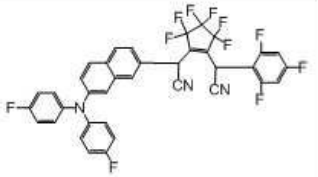
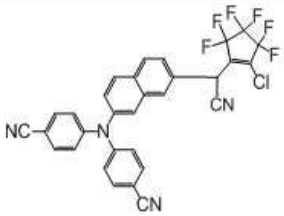
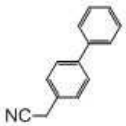
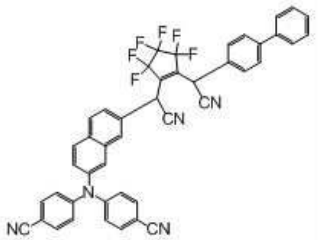
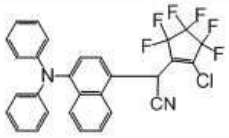
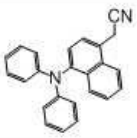
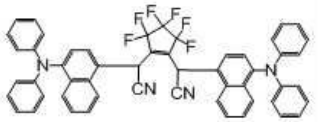
F-25				65
F-26				76
F-27				78
F-28				70
F-29				77
F-30				67

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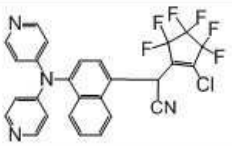
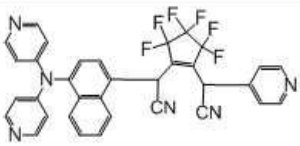
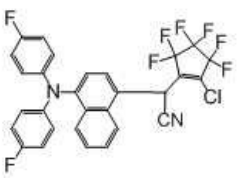
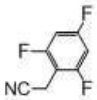
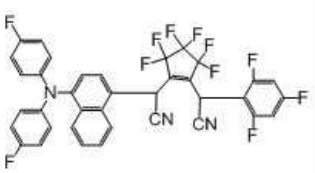
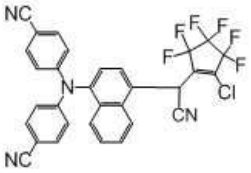
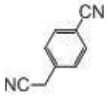
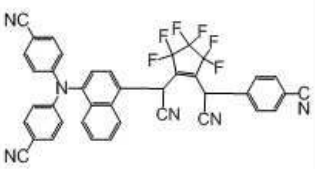
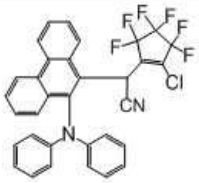
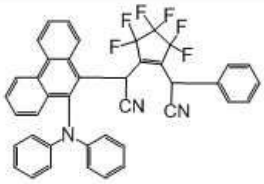
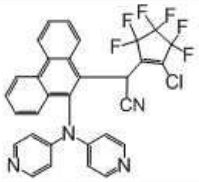
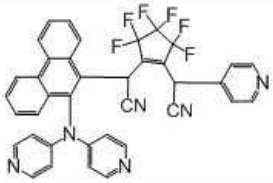
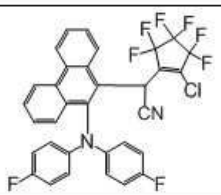
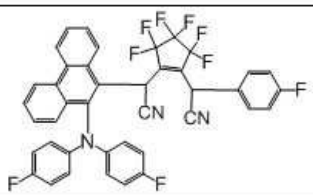
F-31				64
F-32				62
F-33				60
F-34				83
F-35				80
F-36				78

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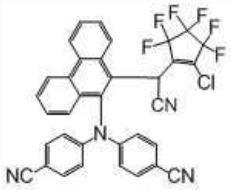
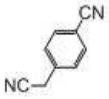
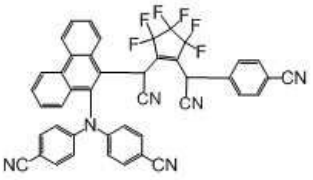
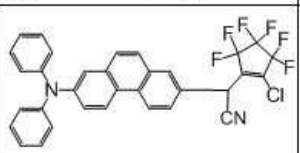
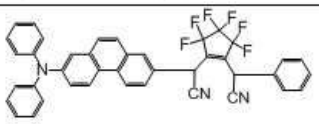
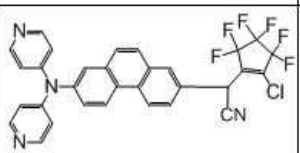
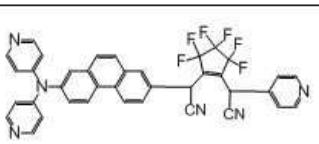
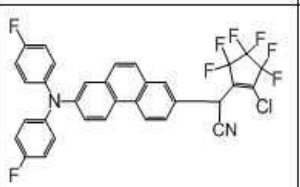
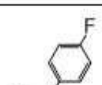
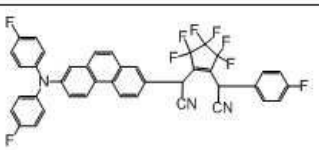
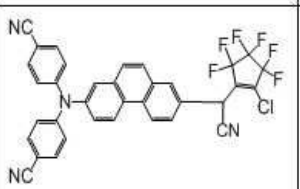
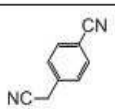
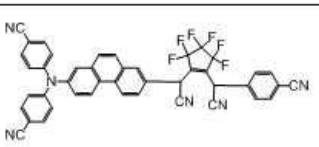
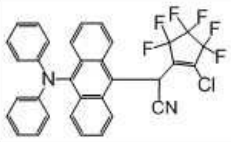
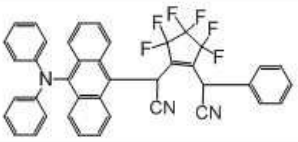
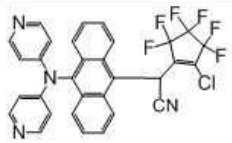
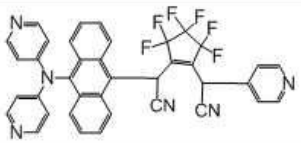
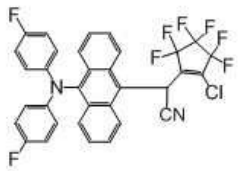
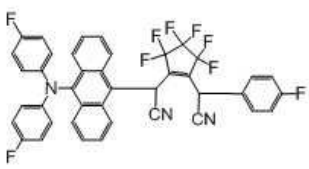
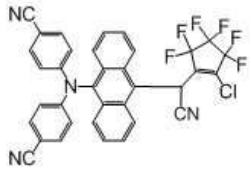
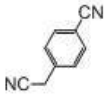
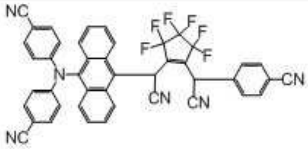
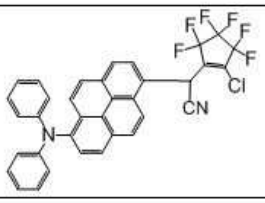
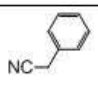
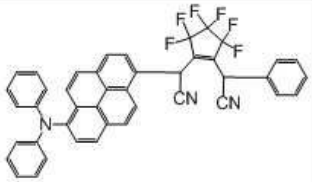
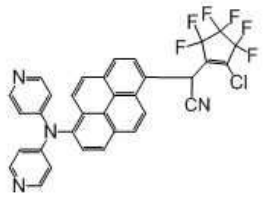
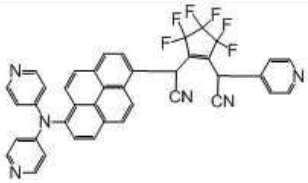
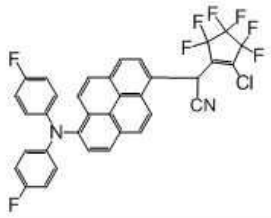
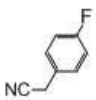
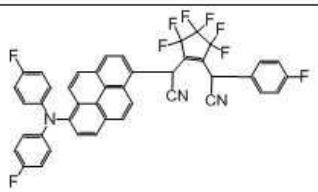
F-37				73
F-38				82
F-39				80
F-40				75
F-41				72
F-42				83

F-43				79
F-44				78
F-45				75
F-46				82
F-47				75
F-48				72

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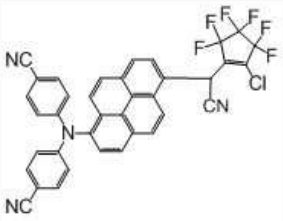
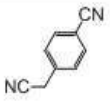
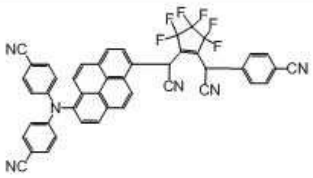
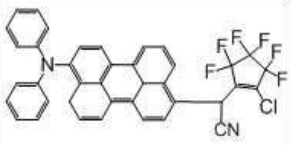
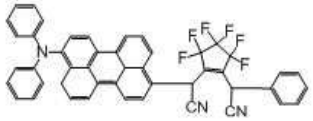
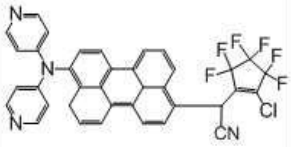
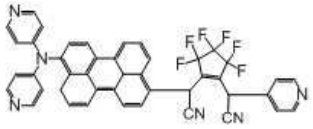
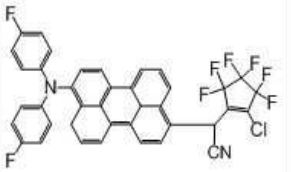
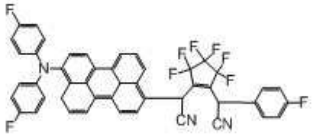
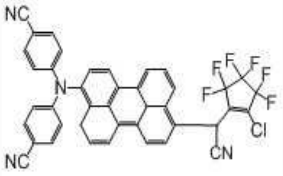
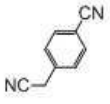
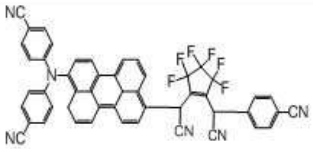
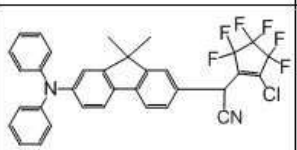
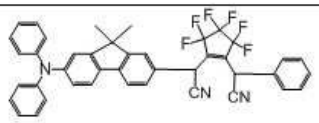
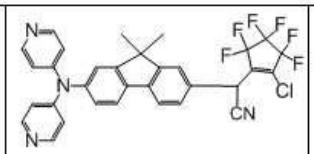
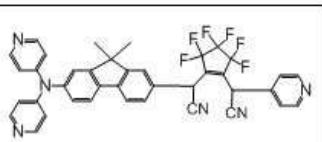
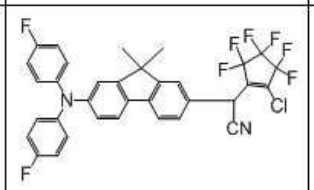
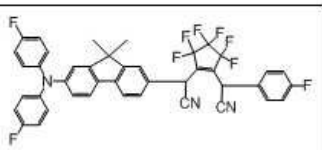
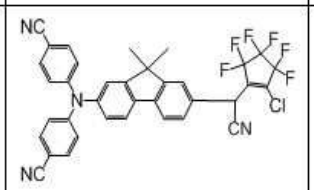
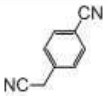
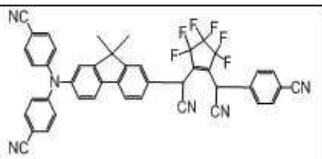
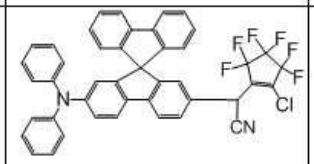
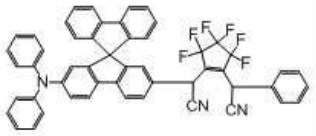
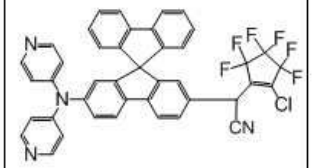
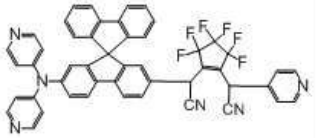
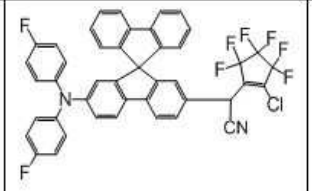
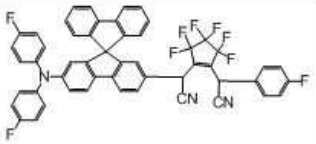
F-49				70
F-50				78
F-51				75
F-52				72
F-53				69
F-54				83

F-55				80
F-56				78
F-57				72
F-58				81
F-59				76
F-60				75

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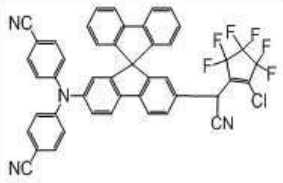
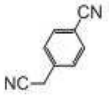
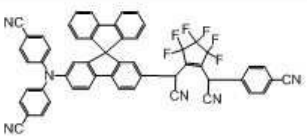
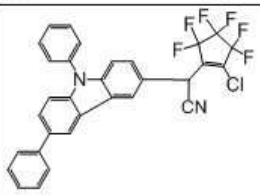
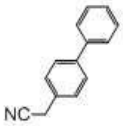
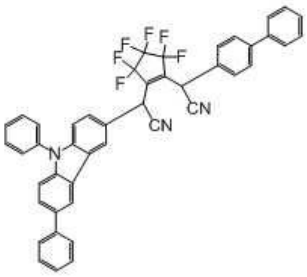
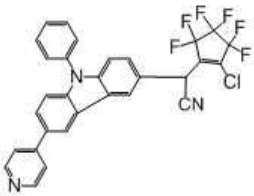
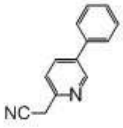
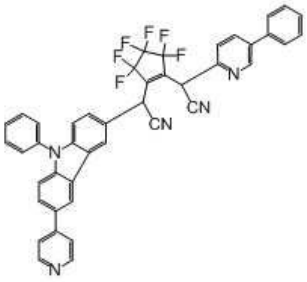
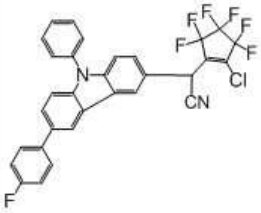
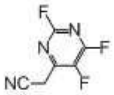
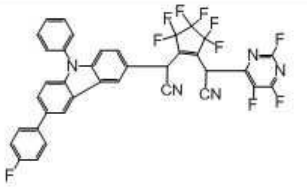
F-61				72
F-62				83
F-63				79
F-64				68

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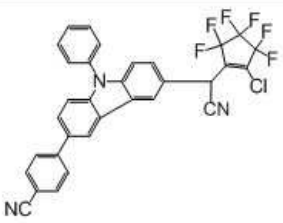
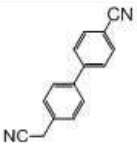
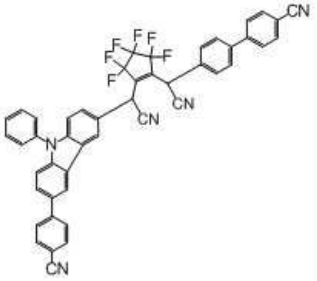
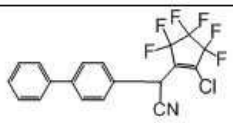
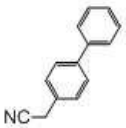
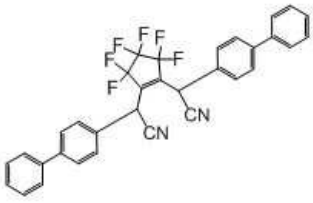
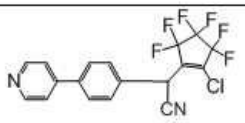
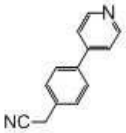
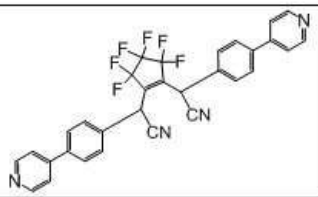
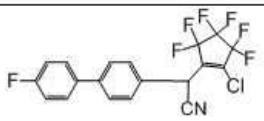
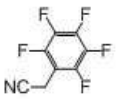
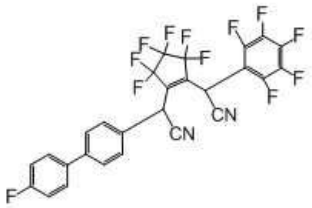
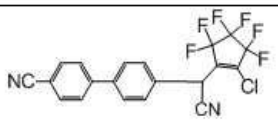
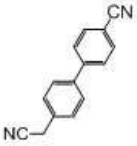
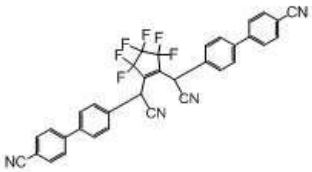
F-65				72
F-66				80
F-67				78
F-68				69
F-69				63

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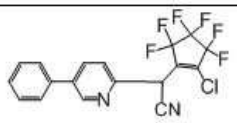
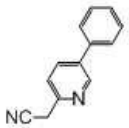
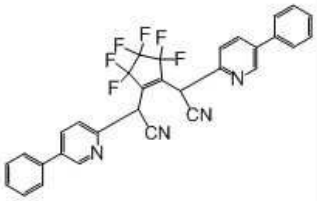
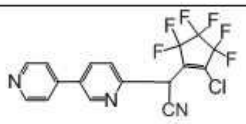
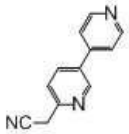
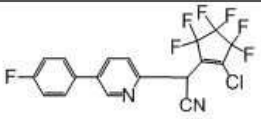
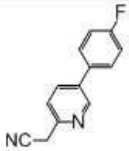
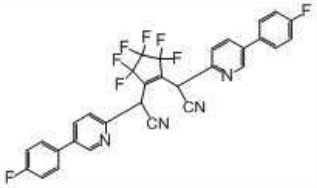
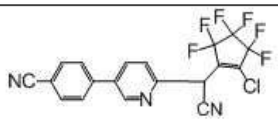
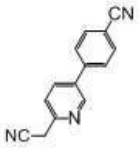
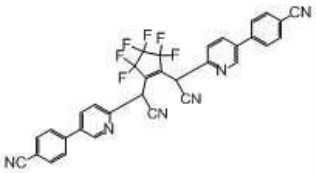
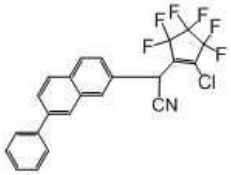
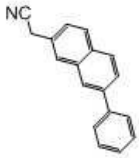
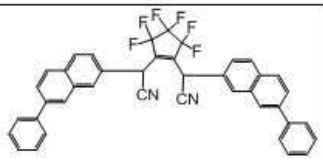
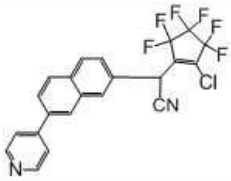
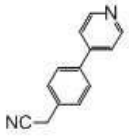
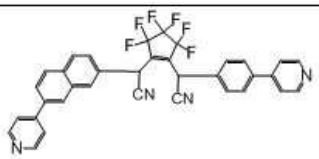
F-70				69
F-71				60
F-72				65
F-73				63
F-74				72
F-75				70

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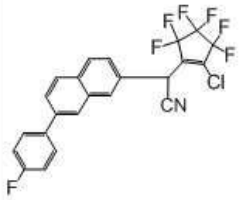
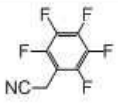
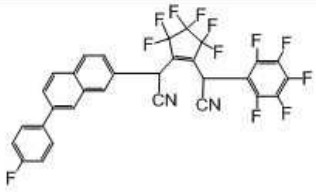
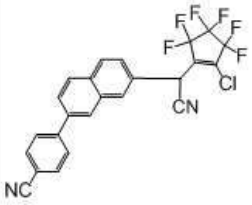
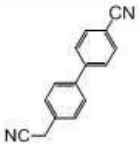
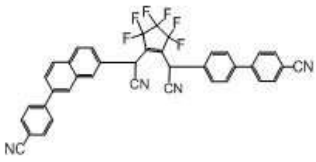
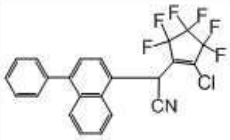
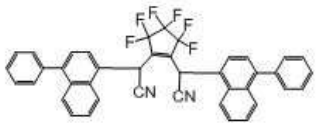
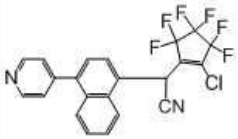
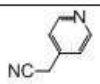
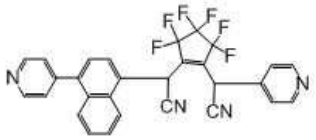
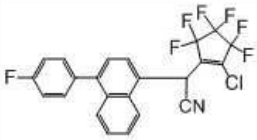
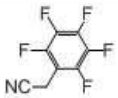
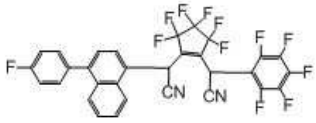
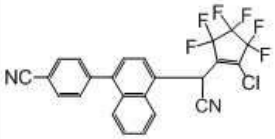
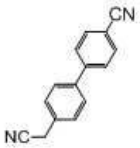
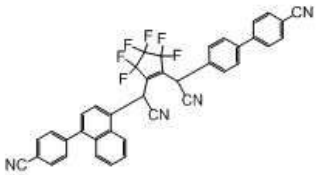
F-76				64
F-77				65
F-78				72
F-79				79
F-80				63
F-81				69

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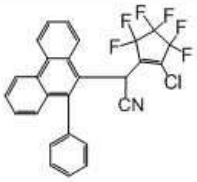
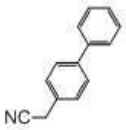
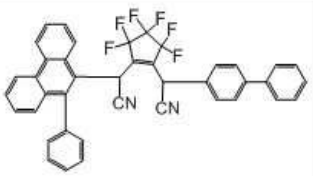
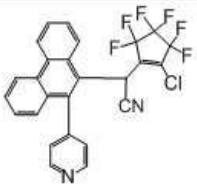
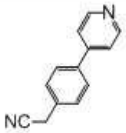
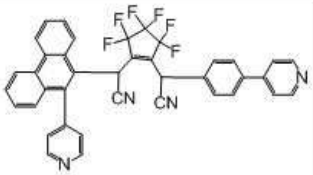
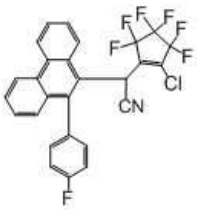
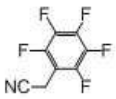
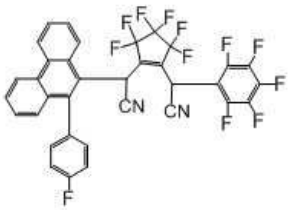
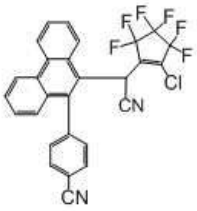
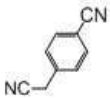
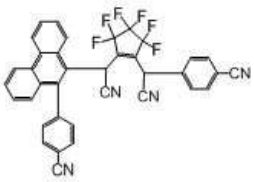
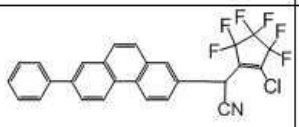
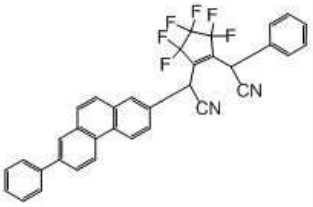
F-82				81
F-83				75
F-84				64
F-85				69
F-86				80

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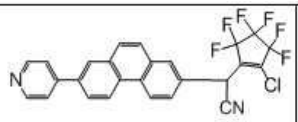
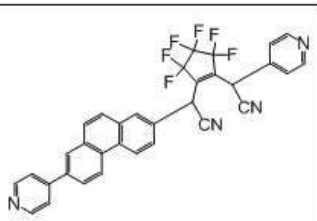
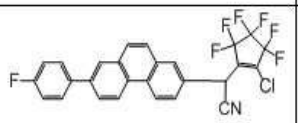
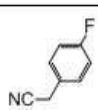
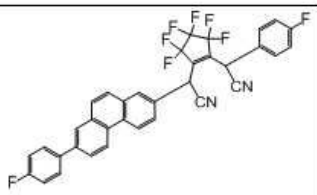
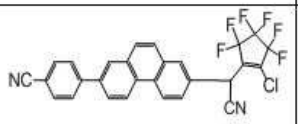
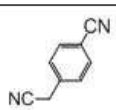
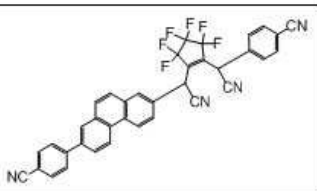
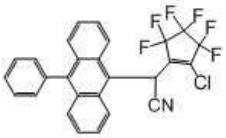
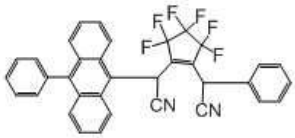
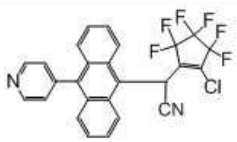
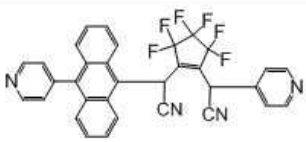
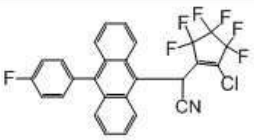
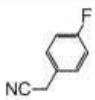
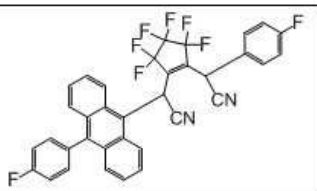
F-87				71
F-88				65
F-89				61
F-90				78
F-91				72
F-92				69

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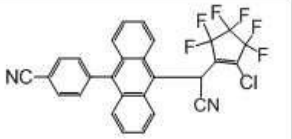
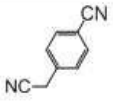
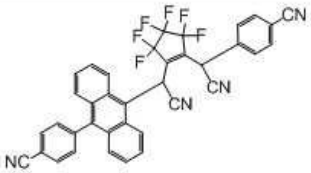
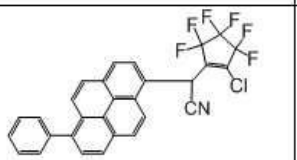
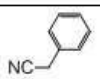
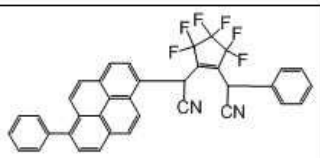
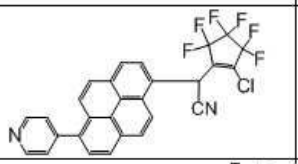
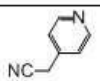
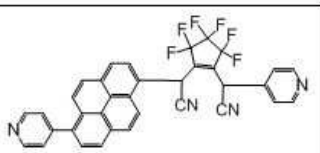
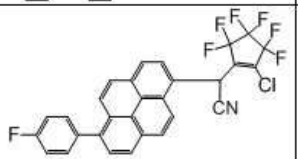
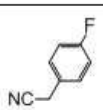
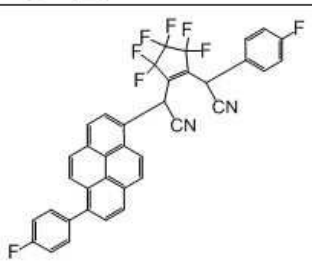
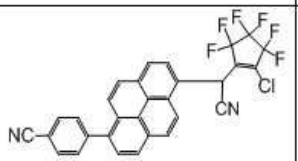
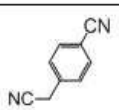
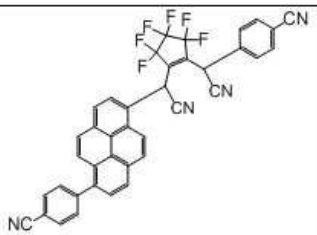
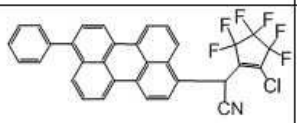
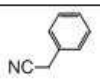
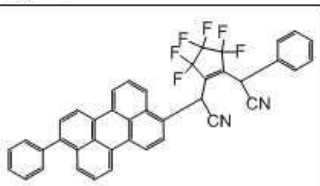
F-93				60
F-94				84
F-95				80
F-96				75
F-97				70
F-98				82

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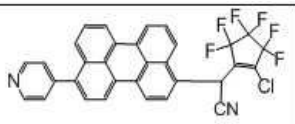
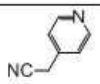
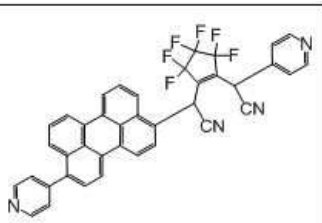
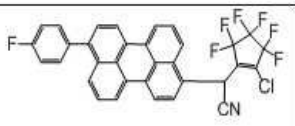
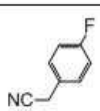
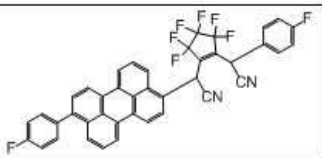
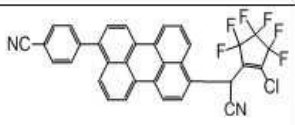
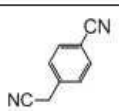
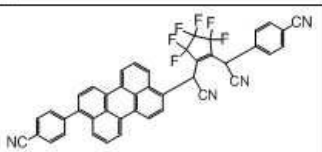
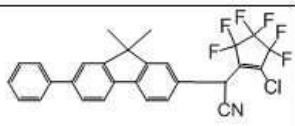
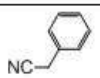
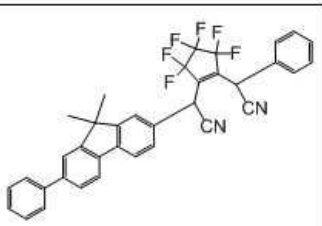
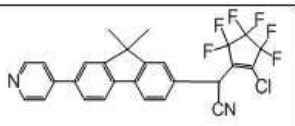
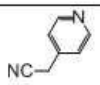
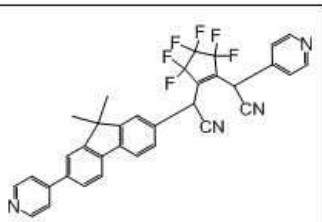
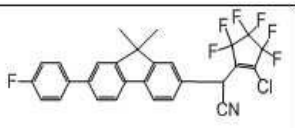
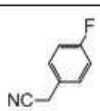
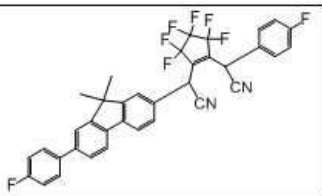
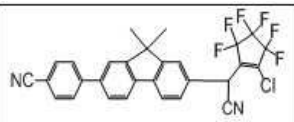
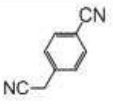
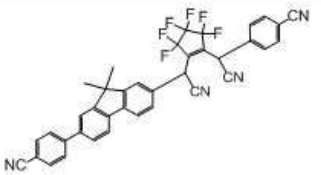
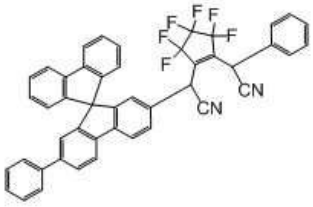
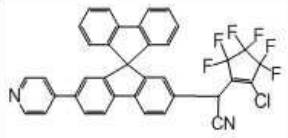
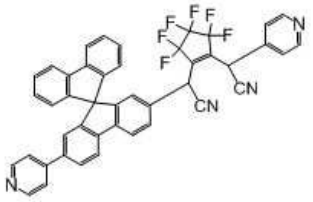
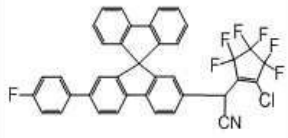
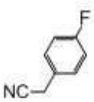
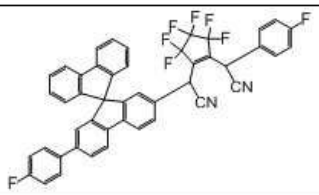
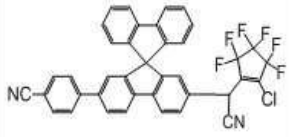
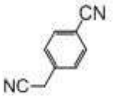
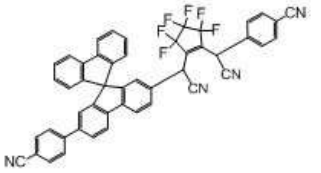
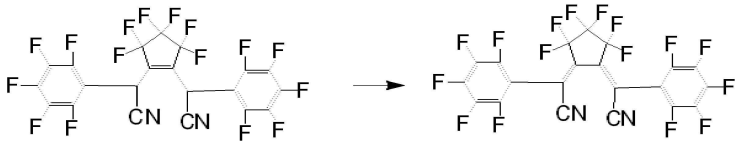
F-99				79
F-100				75
F-101				71
F-102				83
F-103				80
F-104				75

F-105				72
F-106				79
F-107				74
F-108				72
F-109				69

[0200]

[0201] 실시예의 제조

[0203] * 실시예 (2E,2'E)-2,2'-(perfluorocyclopentane-1,2-diylidene)bis(2-(perfluorophenyl)acetonitrile) (G-1)의 제조



F-1 G-1

[0204]

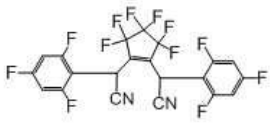
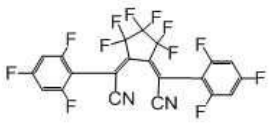
[0205] 50L반응기에, 반응기에 유기 용매 Tetrahydrofuran(THF) 16500 mL, 빙초산11L를 넣어 균일하게 용해한다. F-1(855g) 에 빙초산 11L를 넣어 균일하게 용해하고 50 L반응기에 1시간 동안 첨가하며, 온도 40℃ 이하에서 3h시간 반응한다. 반응액이 주황색으로 변하면,. 증류수를 11L를 넣어 교반 한다. 반응액을 여과하고 고체물질을 에탄올로 씻어준 다음 G-1 (855g, 80%)를 얻었다. 생성된 화합물은 LC-MS를 통해 확인하였다. 질량스펙트럼 m/z:583.98 (계산치 584.21)

[0207] * 중간체 G-2 내지 G-109의 제조

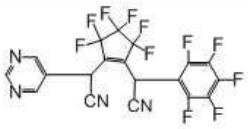
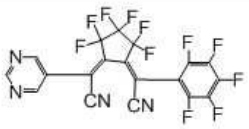
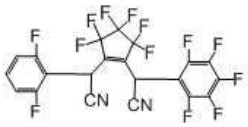
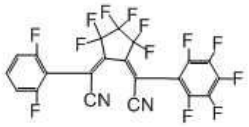
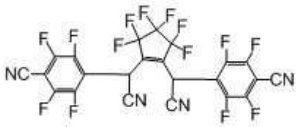
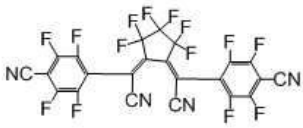
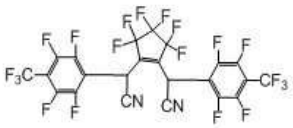
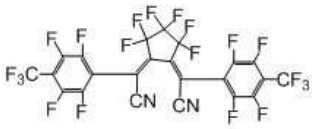
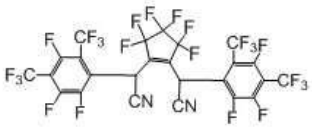
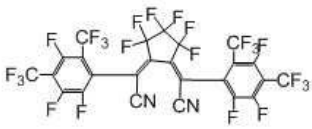
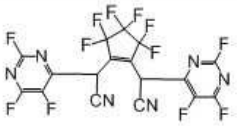
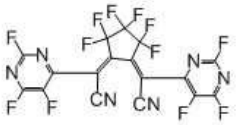
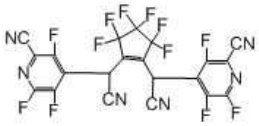
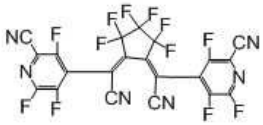
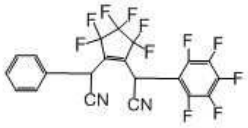
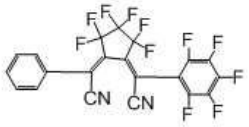
[0208] 상기 중간체 G-1의 제조 방법으로 하기 [표 7]의 화합물을 얻었다.

표 7

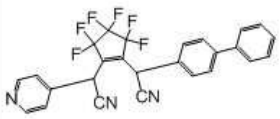
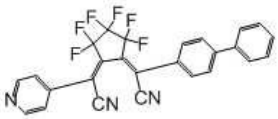
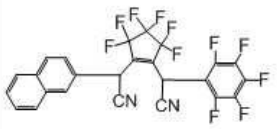
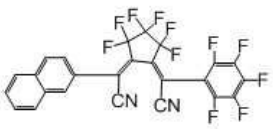
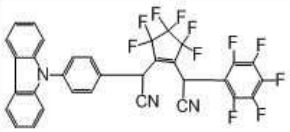
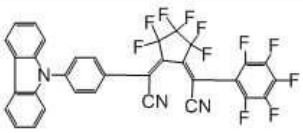
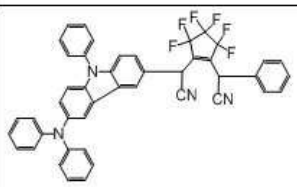
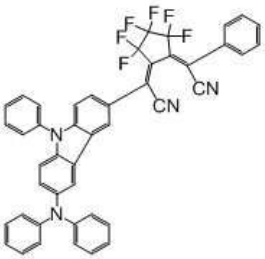
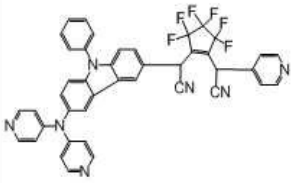
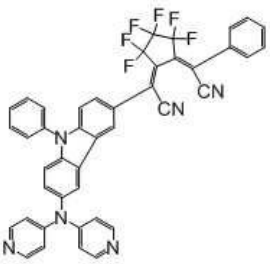
[0209]

	반응물질	생성물질	수율%
G-2			92

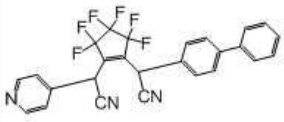
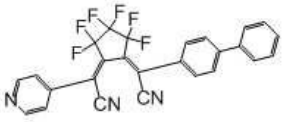
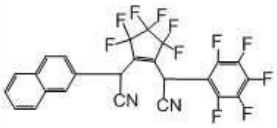
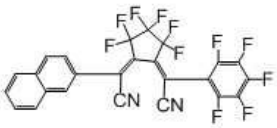
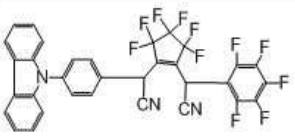
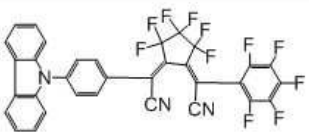
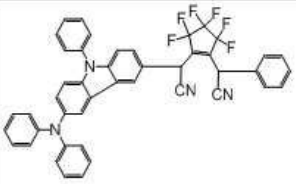
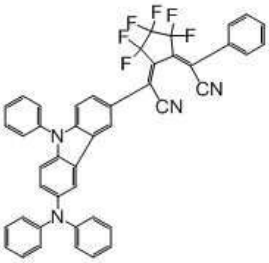
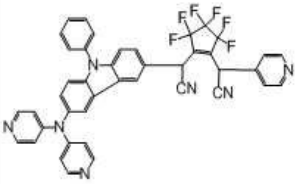
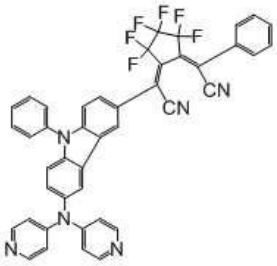
[0210]

G-3			91
G-4			87
G-5			82
G-6			80
G-7			79
G-8			91
G-9			86
G-10			89

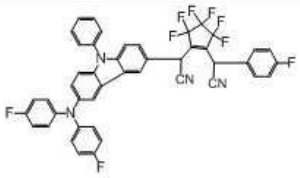
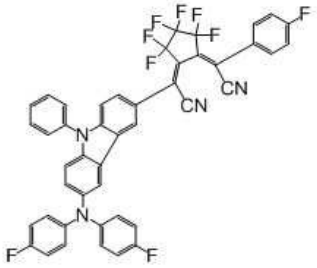
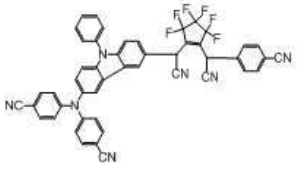
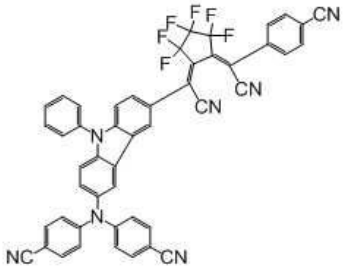
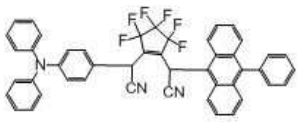
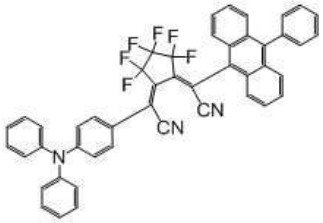
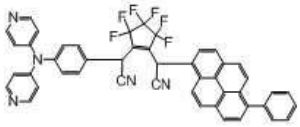
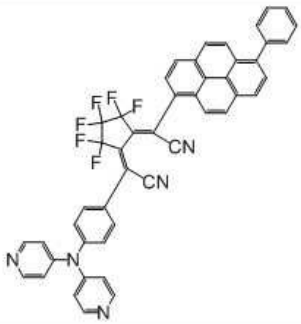
[0211]

G-11			91
G-12			89
G-13			85
G-14			73
G-15			72

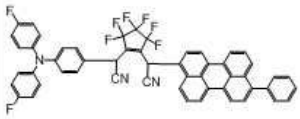
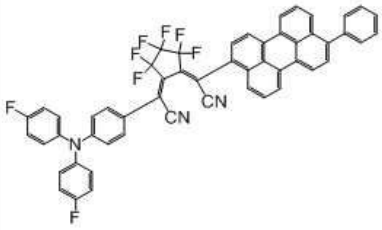
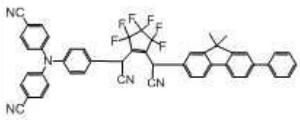
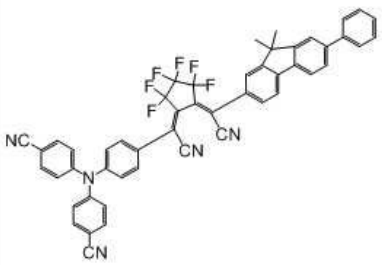
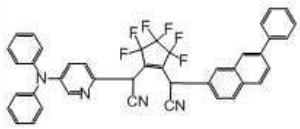
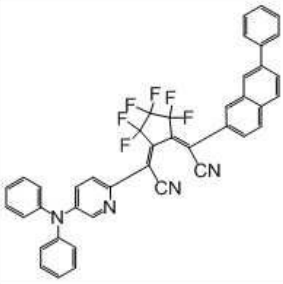
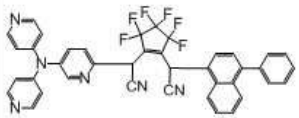
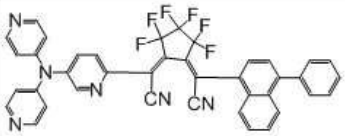
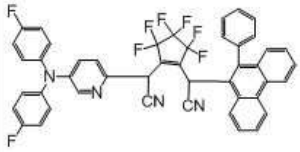
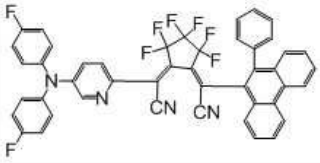
[0212]

G-11			91
G-12			89
G-13			85
G-14			73
G-15			72

[0213]

G-16			78
G-17			74
G-18			83
G-19			79

[0214]

G-20			81
G-21			86
G-22			84
G-23			85
G-24			71

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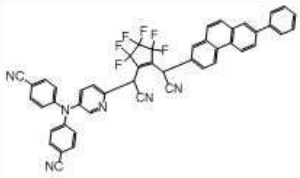
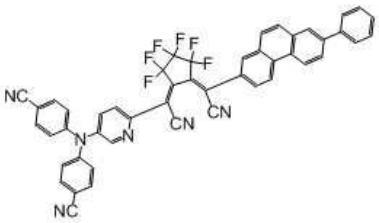
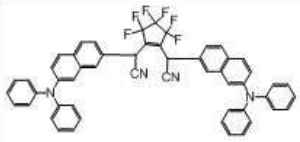
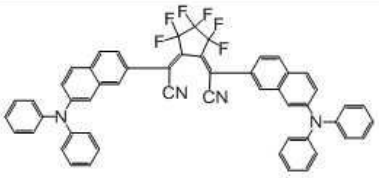
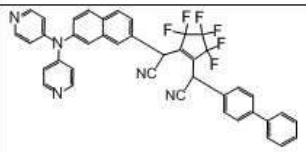
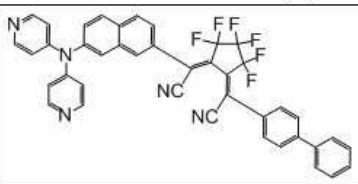
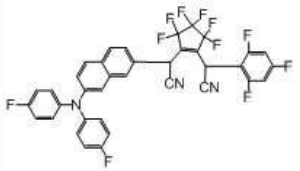
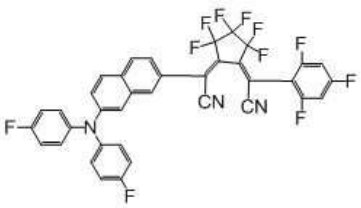
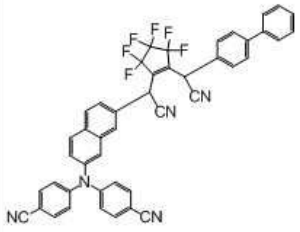
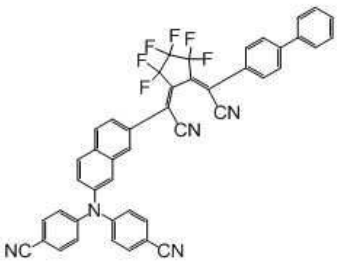
G-25			85
G-26			87
G-27			81
G-28			79
G-29			84

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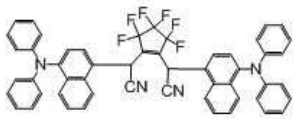
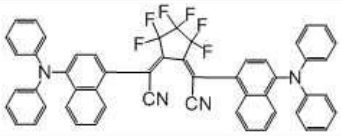
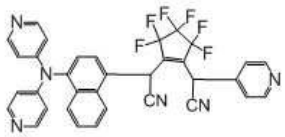
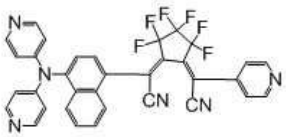
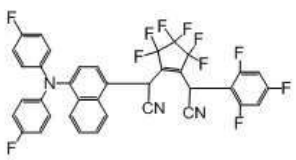
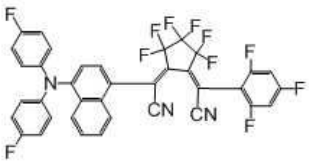
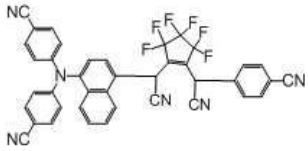
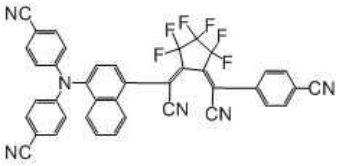
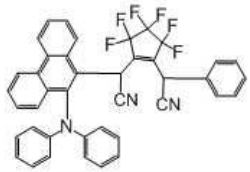
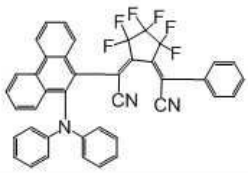
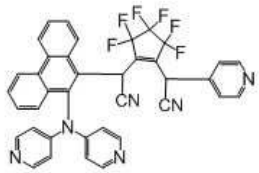
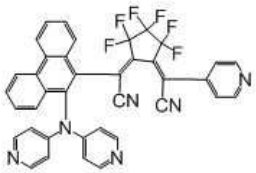
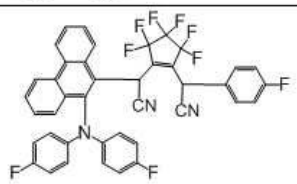
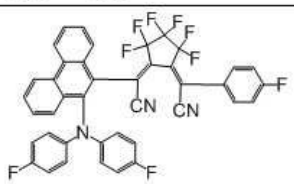
G-30			78
G-31			71
G-32			70
G-33			72
G-34			68
G-35			67
G-36			65

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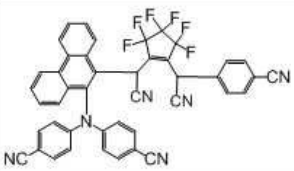
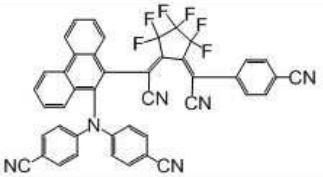
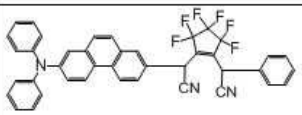
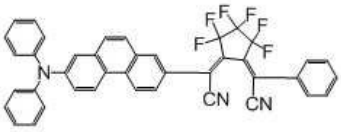
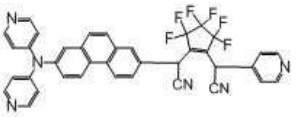
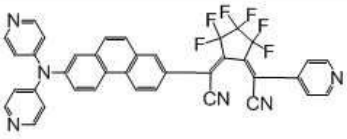
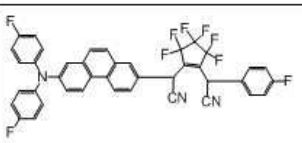
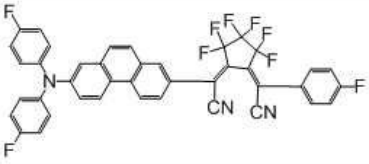
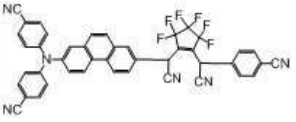
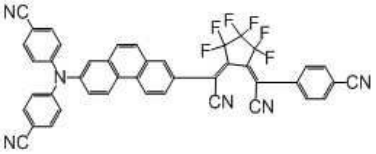
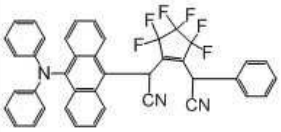
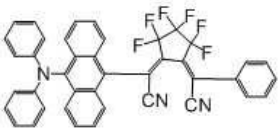
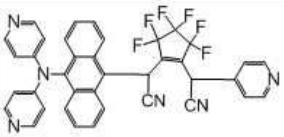
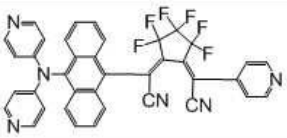
G-37			66
G-38			82
G-39			80
G-40			78
G-41			77
G-42			82
G-43			79

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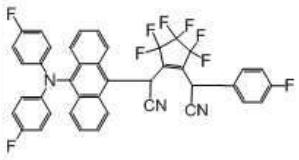
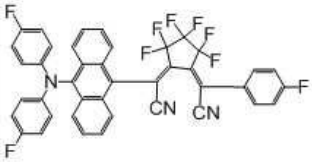
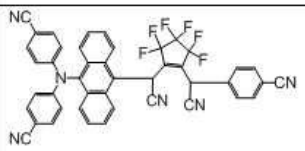
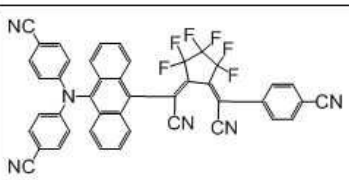
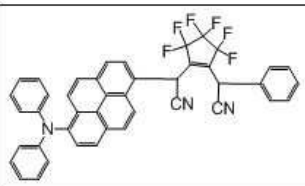
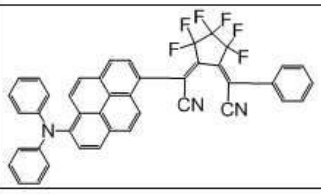
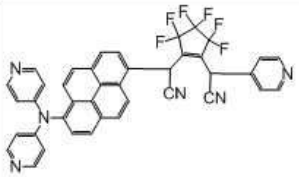
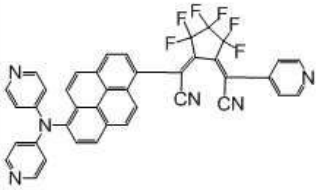
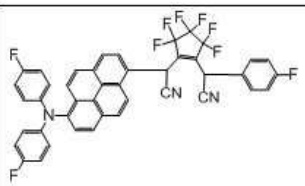
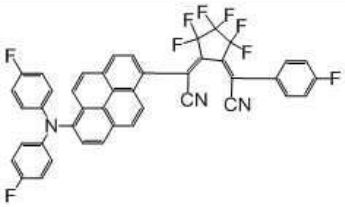
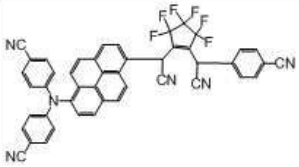
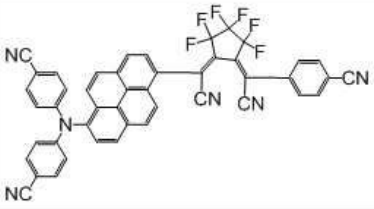
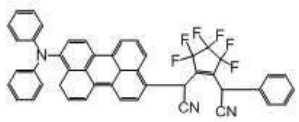
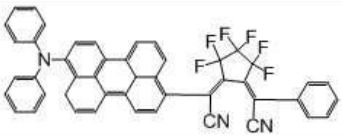
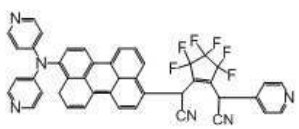
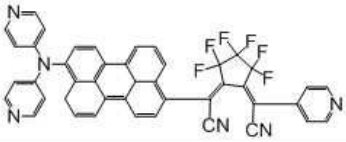
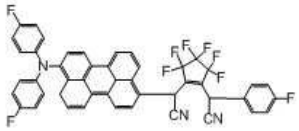
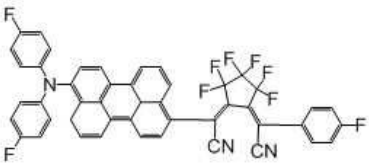
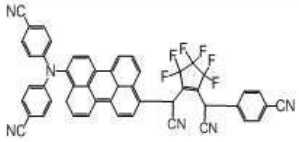
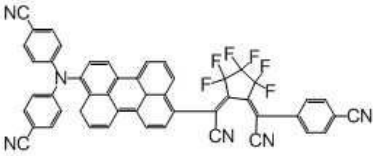
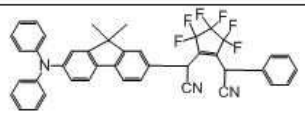
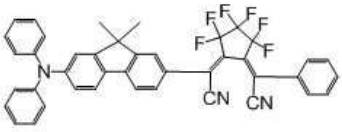
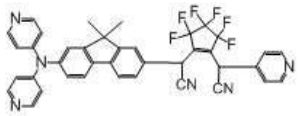
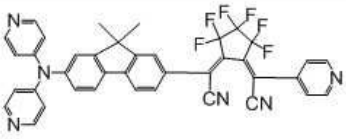
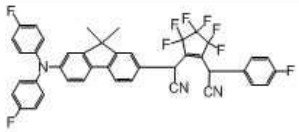
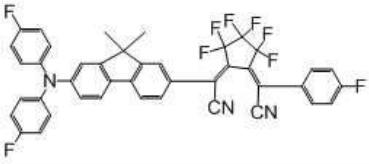
G-44			76
G-45			74
G-46			83
G-47			81
G-48			79
G-49			78

[0219]

G-50			75
G-51			73
G-52			70
G-53			68
G-54			85
G-55			82
G-56			80

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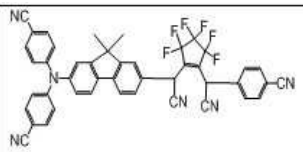
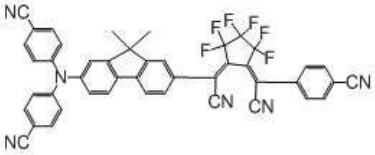
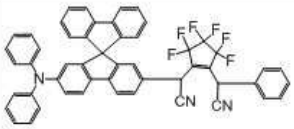
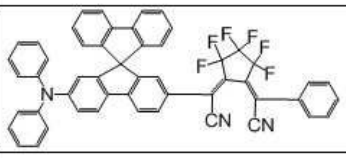
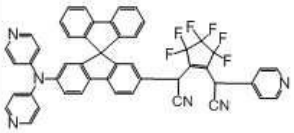
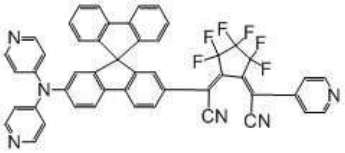
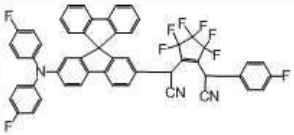
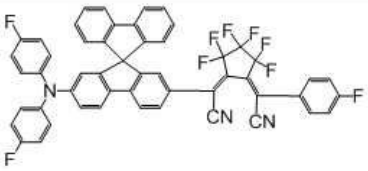
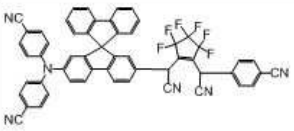
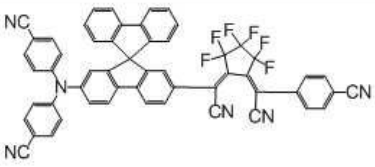
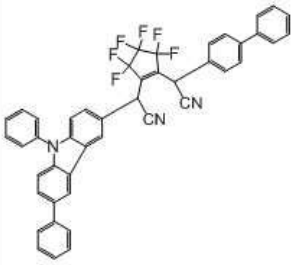
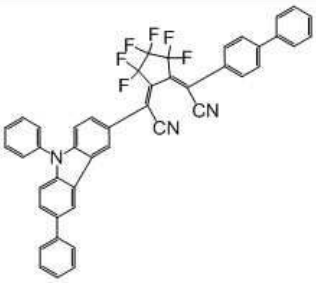
G-57			78
G-58			79
G-59			74
G-60			72
G-61			70
G-62			83

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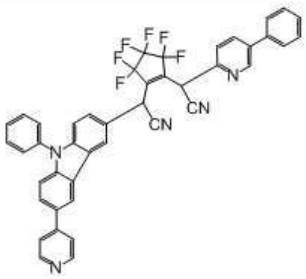
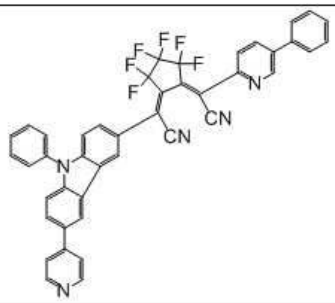
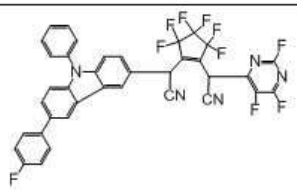
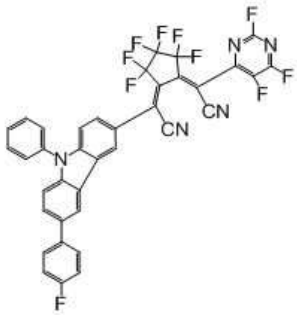
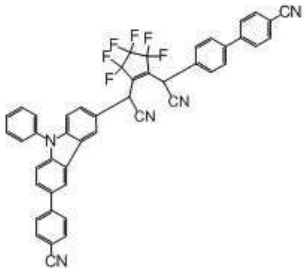
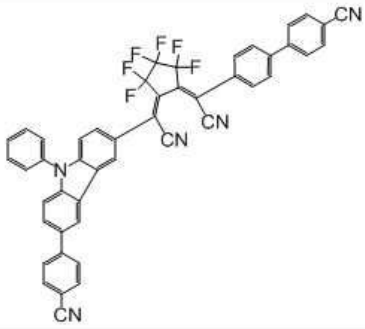
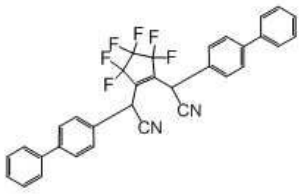
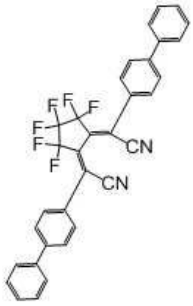
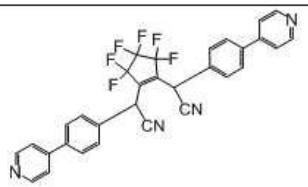
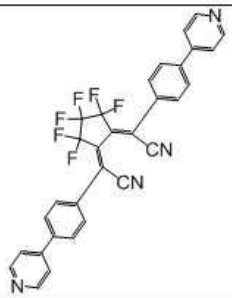
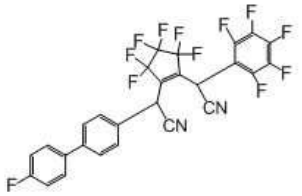
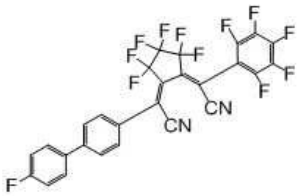
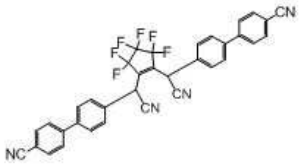
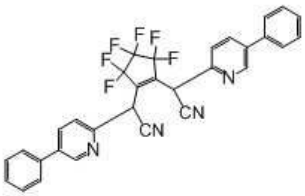
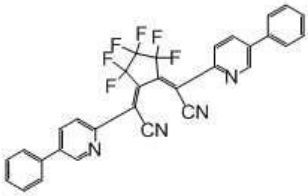
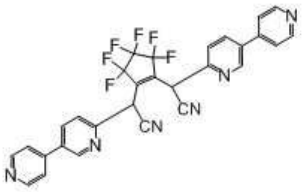
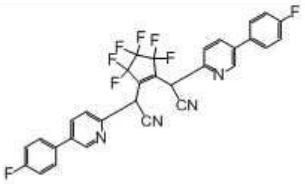
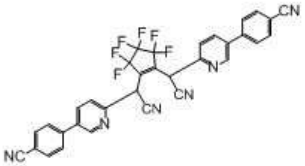
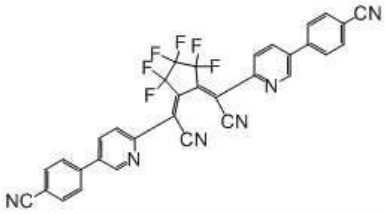
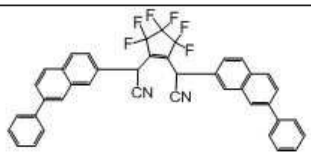
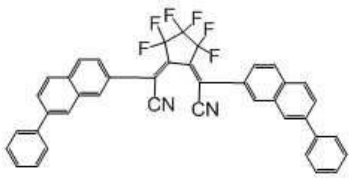
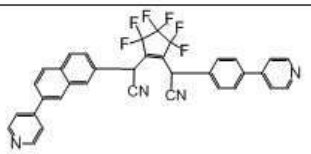
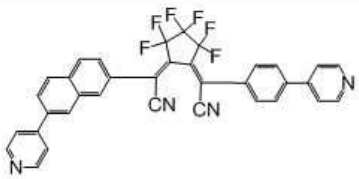
G-63			82
G-64			80
G-65			78

[0222]

G-66			84
G-67			80
G-68			76
G-69			78

[0223]

G-70			68
G-71			62
G-72			73
G-73			70
G-74			81
G-75			76

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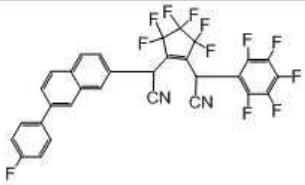
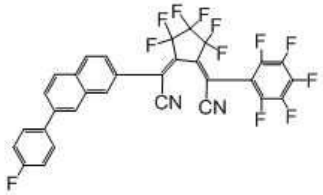
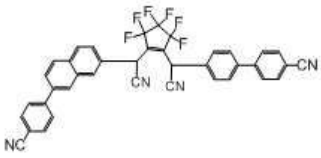
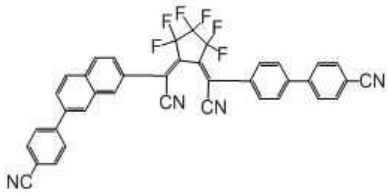
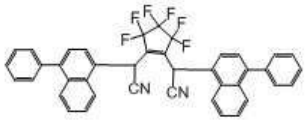
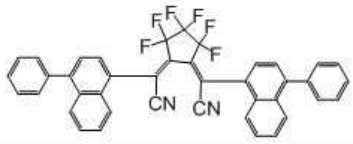
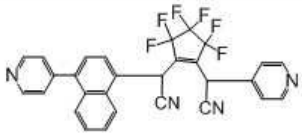
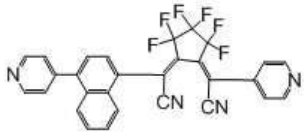
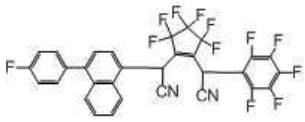
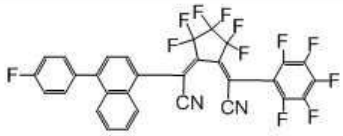
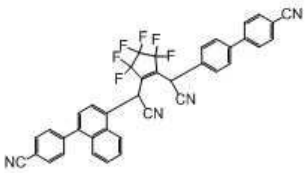
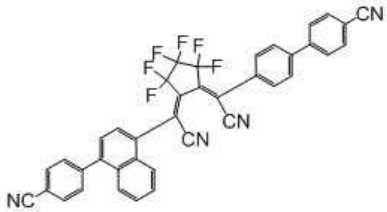
G-76			69
G-77			72
G-78			76
G-79			72
G-80			68
G-81			73

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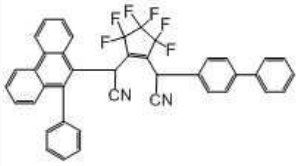
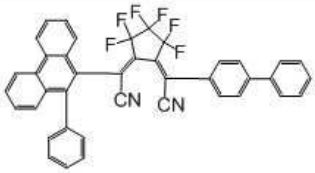
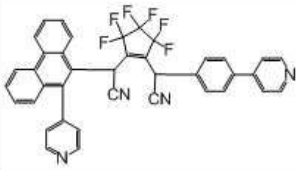
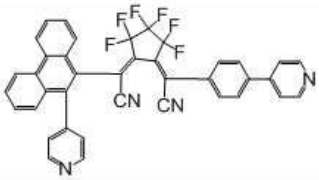
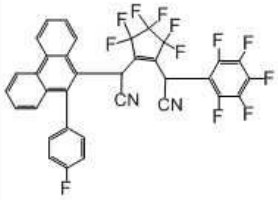
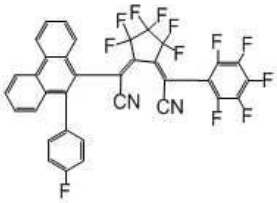
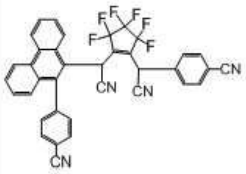
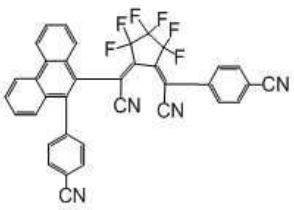
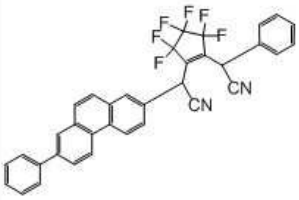
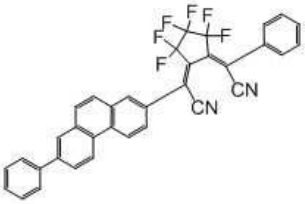
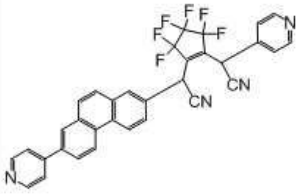
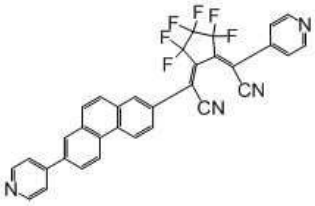
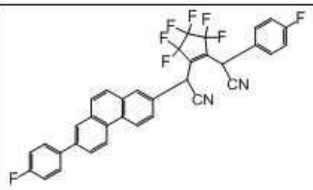
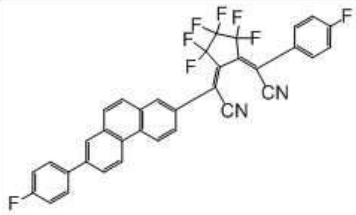
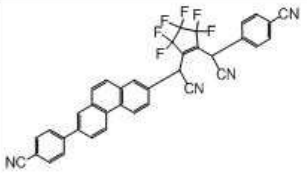
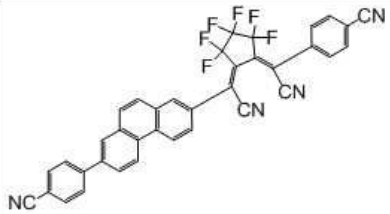
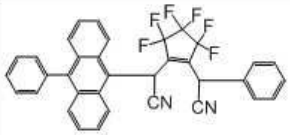
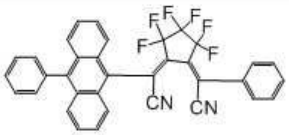
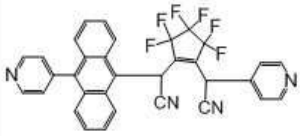
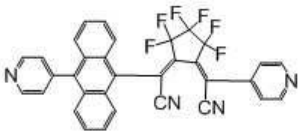
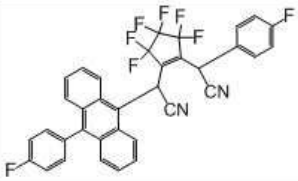
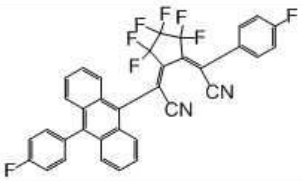
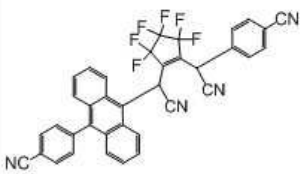
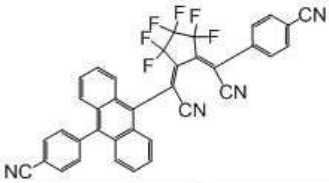
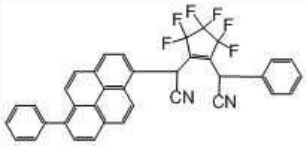
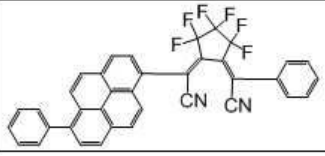
G-82			78
G-83			73
G-84			68
G-85			68
G-86			76
G-87			72

[0226]

G-88			73
G-89			70
G-90			81
G-91			78
G-92			75
G-93			70
G-94			75

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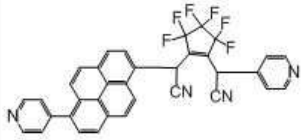
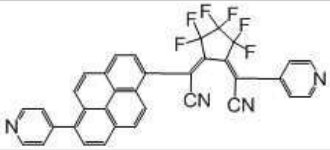
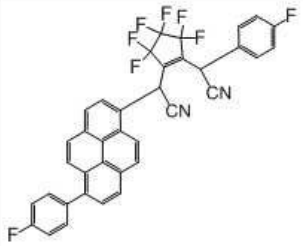
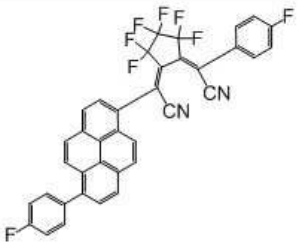
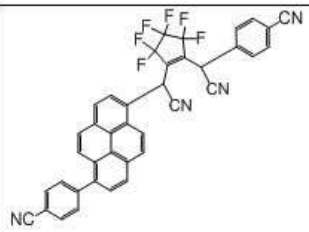
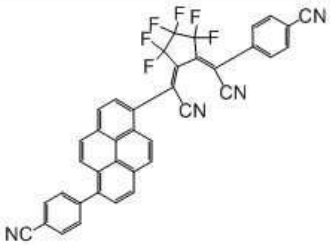
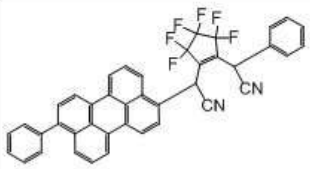
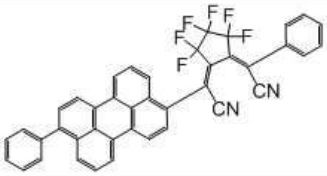
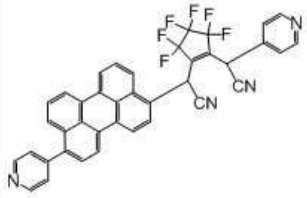
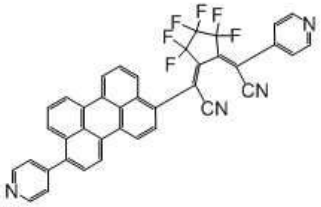
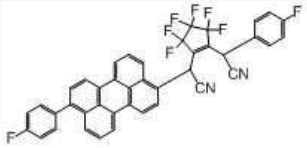
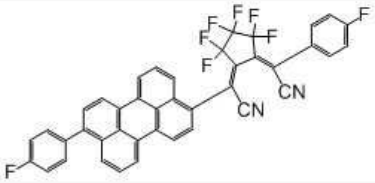
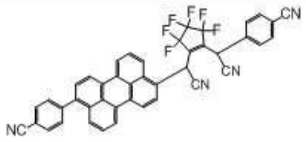
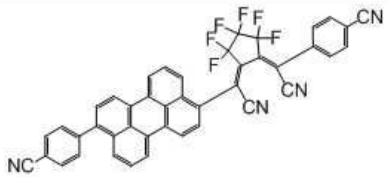
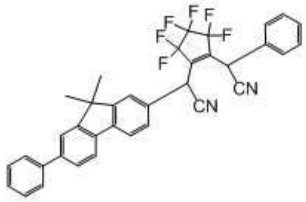
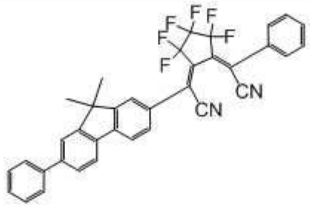
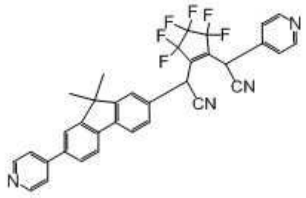
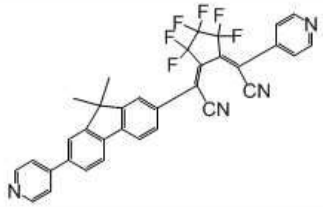
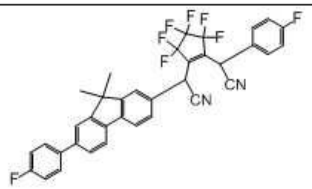
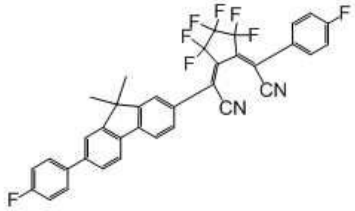
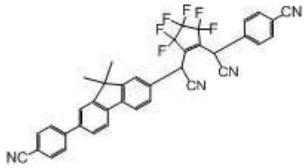
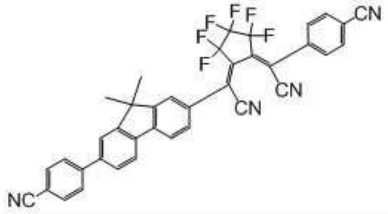
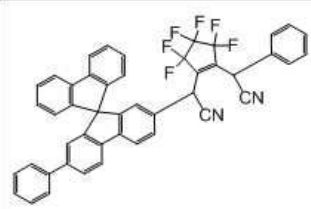
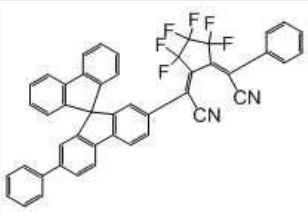
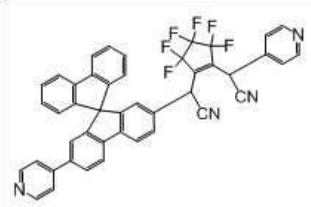
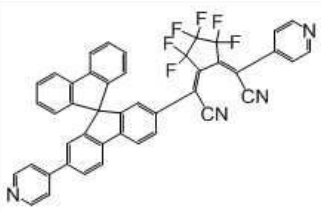
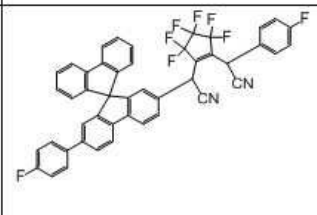
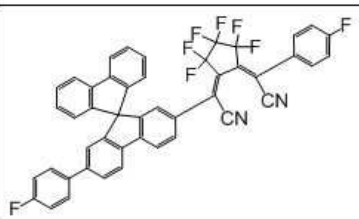
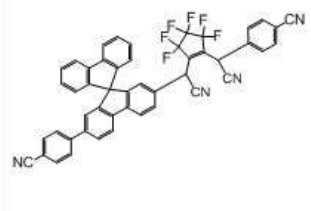
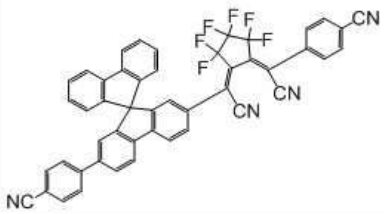
G-95			72
G-96			70
G-97			68
G-98			81
G-99			78
G-100			76

[0228]

G-101			72
G-102			86
G-103			82
G-104			80
G-105			75

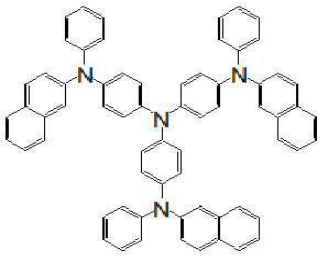
G-106			80
G-107			76
G-108			73
G-109			71

[0229]

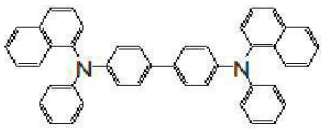
[0230] <실험예>

[0231] ITO가 1500Å의 두께로 박막 코팅된 유리 기판을 피셔사의 세제를 녹인 2차 증류수에 넣고 초음파로 30분간 세척하였다. ITO를 30 분간 세척한 후 증류수로 2 회 반복하여 초음파 세척을 10 분간 진행하였다. 증류수 세척이 끝난 후, 이소프로필알콜, 아세톤, 메탄올의 용제로 초음파 세척하고 건조시킨 후, 플라즈마 세정기로 이송시켜, 산소 플라즈마를 이용하여 상기 기판을 5 분간 세정한 후 진공 증착기로 기판을 이송시켰다.

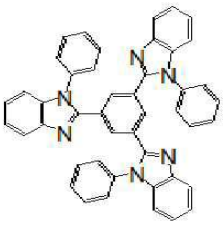
[0232] 이렇게 준비된 ITO 투명 전극 위에 정공주입층으로 2-TNATA (4,4',4"-Tris[2-naphthyl(phenyl)amino]triphenylamine)에 표 7의 물질을 1:50으로 도핑하여 500Å으로 진공증착 후, 정공전달층으로 a-NPD (N,N'-Di(1-naphthyl)-N,N'-diphenyl-(1,1'-biphenyl)-4,4'-diamine) 300Å 진공 증착한 후, AND (9,10-Di(2-naphthyl)anthracene)과 도판트 DPAP-DPPA (6-(4-(diphenylamino)phenyl)-N,N-diphenylpyren-1-amine)을 5% 도핑하여 300Å의 두께로 진공 증착하였으며, 정공저지층 및 정공전달층으로 TPBi (1,3,5-tris(N-phenylbenzimidizol-2-yl)benzene) 물질을 400Å의 두께로 진공증착 하였으며, 순차적으로 LiF 5Å과 Al(알루미늄) 2000Å 증착하여 음극을 형성하였다. 상기의 과정에서 유기물의 증착속도는 1 Å/sec를 유지하였고, LiF 는 0.2 Å/sec, 알루미늄은 3~7Å/sec의 증착속도를 유지하였다.



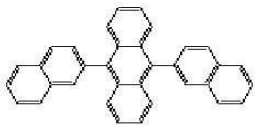
2-TNATA



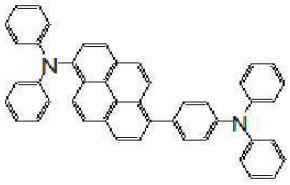
a-NPD



TPBi



ADN



DPAP-DPPA

[0233]

[0234] 상기에서 제조된 유기 발광 소자에 대한 전기적 발광특성을 하기 [표 8]에 나타내었다.

표 8

[0235]

	전류밀도 (mA/cm^2)	색상	효율 (cd/A)	수명 (hrs)
비교실험예 (DPAP-DPPA)	20	청색	4.6	3,100
G-1	20	청색	6.5	7,500
G-2	20	청색	7.4	7,700
G-4	20	청색	6.2	7,00
G-5	20	청색	7.6	6,700
G-6	20	청색	6.3	6,400
G-7	20	청색	6.6	6,300
G-9	20	청색	7.4	6,200
G-10	20	청색	6.2	6,200
G-12	20	청색	7.2	6,400
G-66	20	청색	7.6	6,300
G-68	20	청색	6.2	6,100
G-69	20	청색	6.4	6,200
G-78	20	청색	6.1	6,400
G-102	20	청색	6.3	6,300
G-104	20	청색	6.1	6,200
G-105	20	청색	6.3	6,800

[0236] 상기 표 8의 결과로부터, 본 발명에 따른 유기전자소자용 화합물은 청색의 역할에서 발광 효율 및 수명 특성이 향상됨을 확인할 수 있었다.

[0237] 이상에서와 같이, 본 기재에 의하면, HIL의 도핑 물질을 제공하여 성능이 우수한 유기전자소자용 화합물, 이를 포함하는 유기전자소자 및 유기전자소자를 포함하는 표시장치를 제공할 수 있다.

[0238] 앞에서, 본 발명의 특정한 실시예가 설명되고 도시되었지만 본 발명은 기재된 실시예에 한정되는 것이 아니고, 본 발명의 사상 및 범위를 벗어나지 않고 다양하게 수정 및 변형할 수 있음은 이 기술의 분야에서 통상의 지식을 가진 자에게 자명한 일이다. 따라서, 그러한 수정 예 또는 변형 예들은 본 발명의 기술적 사상이나 관점으로부터 개별적으로 이해되어서는 안되며, 변형된 실시예들은 본 발명의 특허청구범위에 속한다 하여야 할 것이다.

【심사관 직권보정사항】

【직권보정 1】

【보정항목】 청구범위

【보정세부항목】[청구항 6]

【변경전】

상기 제1항

【변경후】

제1항

【직권보정 2】

【보정항목】청구범위

【보정세부항목】[청구항 3]

【변경전】

화학식 3-9로로

【변경후】

화학식 3-9로

专利名称(译)	用于有机电子装置的化合物，包括该化合物的有机电子装置以及包括该有机电子装置的显示装置		
公开(公告)号	KR102118689B1	公开(公告)日	2020-06-09
申请号	KR1020180123542	申请日	2018-10-17
[标]申请(专利权)人(译)	Choedonsu		
申请(专利权)人(译)	Choedonsu		
当前申请(专利权)人(译)	Choedonsu		
[标]发明人	최돈수		
发明人	최돈수		
IPC分类号	H01L51/00 C07C255/35 H01L51/50		
CPC分类号	H01L51/0072 C07C255/35 H01L51/0059 H01L51/006 H01L51/50		
代理人(译)	Yieuncheol 이수찬		
审查员(译)	Jeongmina		
其他公开文献	KR1020200043025A		
外部链接	Espacenet		

摘要(译)

本说明书涉及由式1表示的用于有机电子装置的化合物，包括该化合物的有机电子装置以及包括该有机电子装置的显示装置，并且式1的具体细节如说明书中所定义。