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(74) 대리인

한양특허법인

전체 청구항 수 : 총 8 항

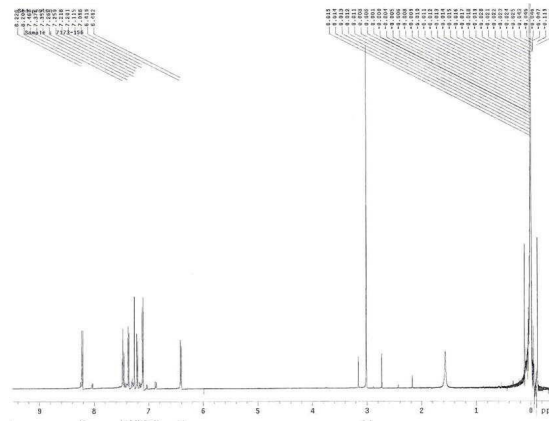
심사관 : 김수미

(54) 유기 금속 착물 유도체 및 이를 이용하는 유기발광소자

(57) 요약

본 발명은 신규한 유기 금속 착물 유도체 및 이를 포함하는 유기발광소자에 관한 것이다.

대표도 - 도1



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대전 서구 만년동 상록수아파트 105동 1406호

김정곤

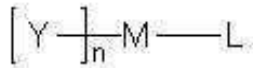
대전 서구 만년동 상록수아파트 102-1212

특허청구의 범위

청구항 1

하기 화학식 1 또는 화학식 2로 표시되는 유기 금속 착물 유도체:

[화학식 1]



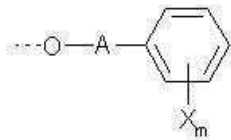
상기 화학식 1에서,

Y는 치환 또는 비치환된 하이드록시아릴-N-헤테로환기를 갖는 리간드로서,

8-하이드록시-2-메틸퀴놀린을 포함하는 리간드이고,

n은 1 또는 2이며,

M은 +2, +3 또는 +4의 산화수를 갖는 금속이고,



L은  이며,

상기 L에서,

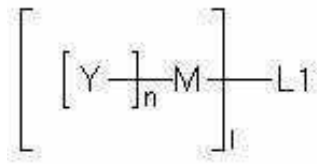
X는 중수소(Deuterium) 또는 불소(Fluorine)이며,

m은 5이고,

O는 산소이며,

A는 상기 X가 치환된 벤젠기가 치환되어 있는 형태로서 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 헤테로시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₂~C₄₀의 알케닐기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 아미노기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₆~C₄₀의 아릴기; 및 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군에서 선택될 수 있고, 인접하는 기와 지방족, 방향족, 헤테로지방족 또는 헤테로방향족의 축합 고리를 형성하거나 스피로 결합을 이룰 수 있다.

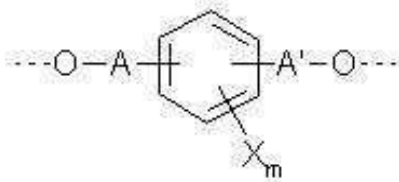
[화학식 2]



상기 화학식 2에서,

Y, n, 및 M은 상기 화학식 1의 정의와 같고,

l은 2이며,



L1은 이고,

상기 L1에서,

X는 중수소(Duetrium) 또는 불소(Fluorine)이고,

m은 4이며,

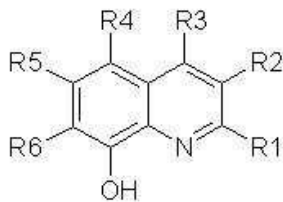
O는 산소이며,

A와 A'는 각각 서로 독립적으로 같거나 다를 수 있으며, 상기 화학식 1에서 정의한 A와 같이 정의된다.

청구항 2

청구항 1에 있어서, 상기 8-하이드록시-2-메틸퀴놀린을 포함하는 리간드는 하기 화학식 3으로 표시되는 것인 유기 금속 착물 유도체:

[화학식 3]



상기 화학식 3에 있어서,

R1 내지 R6은 서로 같거나 상이하고, 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₁~C₄₀의 알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 헤테로시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 헤테로시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로

아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₂~C₄₀의 알케닐기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₁~C₄₀의 알콕시기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 아미노기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₆~C₄₀의 아릴기; 및 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군에서 선택될 수 있고, 인접하는 기와 지방족, 방향족, 헤테로지방족 또는 헤테로방향족의 축합 고리를 형성하거나 스피로 결합을 이룰 수 있다.

청구항 3

삭제

청구항 4

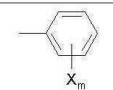
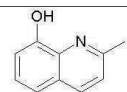
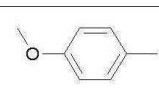
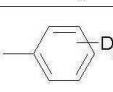
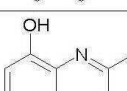
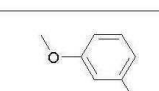
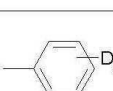
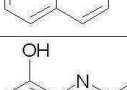
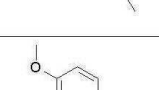
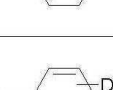
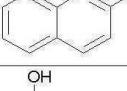
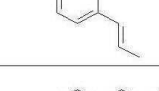
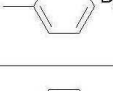
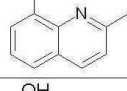
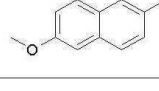
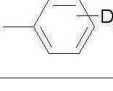
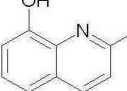
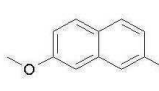
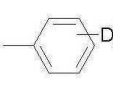
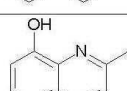
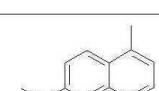

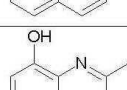
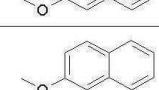
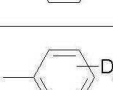
삭제

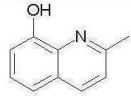
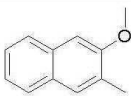
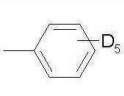
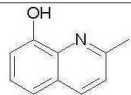
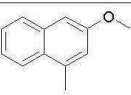
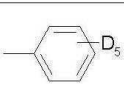
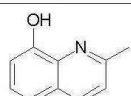
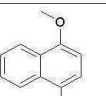
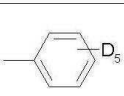
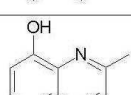
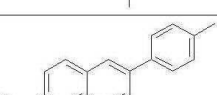
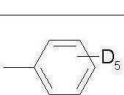
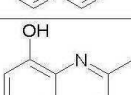
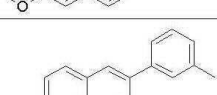
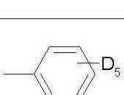
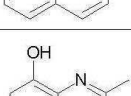
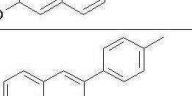
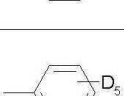
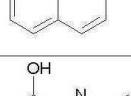
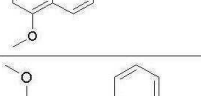
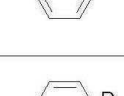
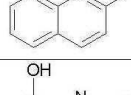
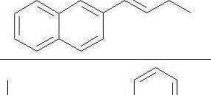
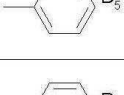
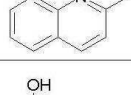
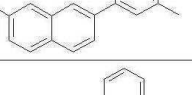
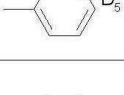
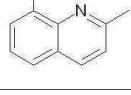
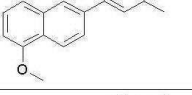
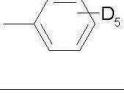
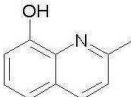
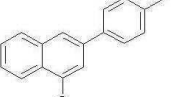
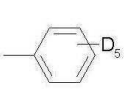
청구항 5

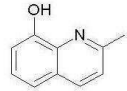
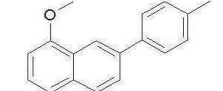
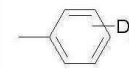
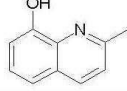
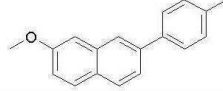
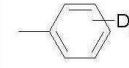
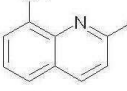
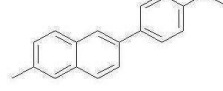
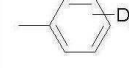
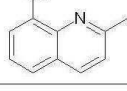
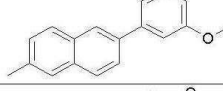
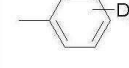
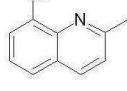
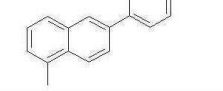

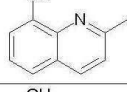
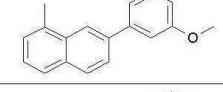

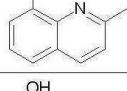
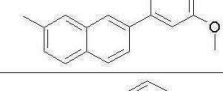
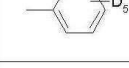
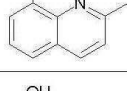
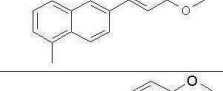
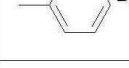
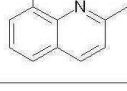
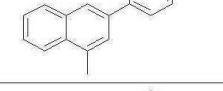
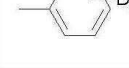
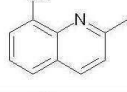
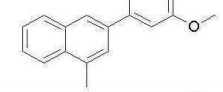

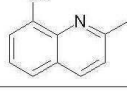
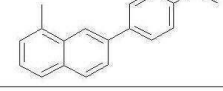
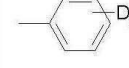
청구항 1에 있어서, 상기 M은 알루미늄, 아연, 지르코늄, 이리듐, 리튬, 갈륨 및 몰리브덴 중에서 선택된 하나인 것인 유기 금속 착물 유도체.

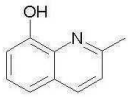
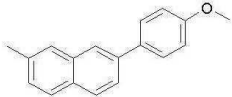
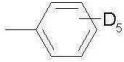
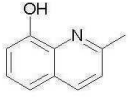
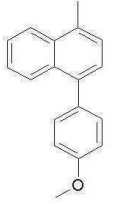

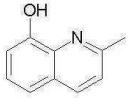
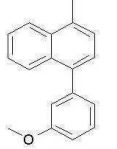

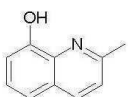
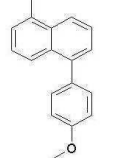
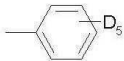
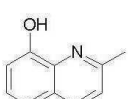
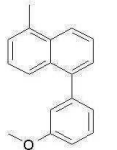

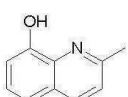
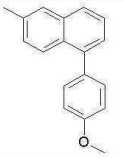
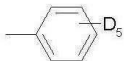
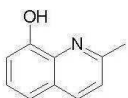
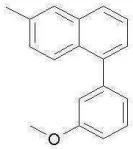
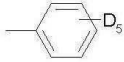
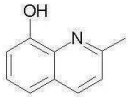
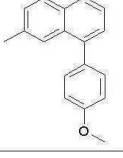

청구항 6

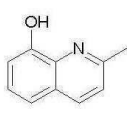
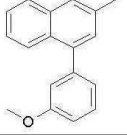
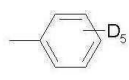
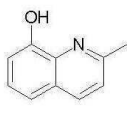
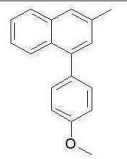
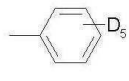
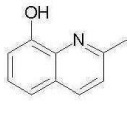
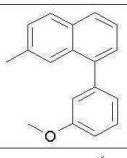
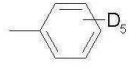
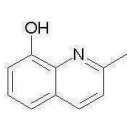
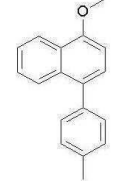
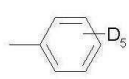
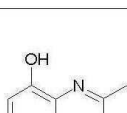
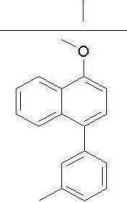
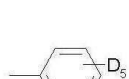
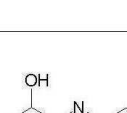
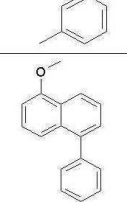

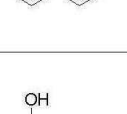
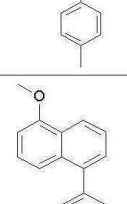

청구항 1에 있어서, 상기 화학식 1로 표시되는 유기 금속 착물 유도체는 하기 화학식 1-1 내지 1-146으로 이루어진 군으로부터 선택되는 것인 유기 금속 착물 유도체:

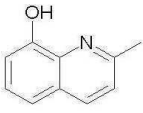
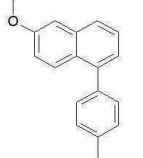
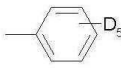
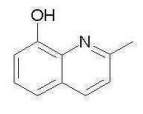
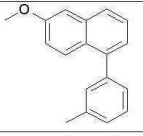
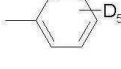
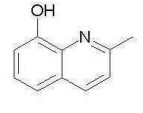
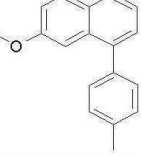
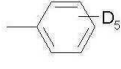
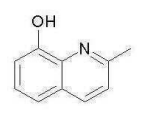
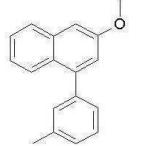
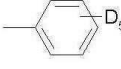
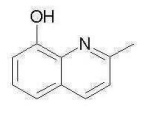
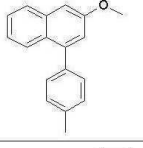
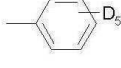
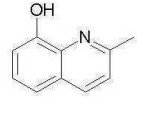
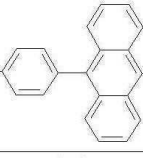
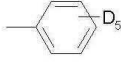
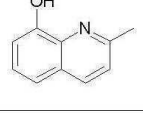
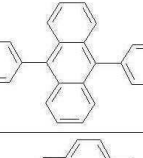
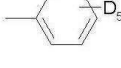
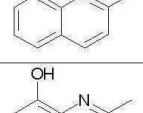
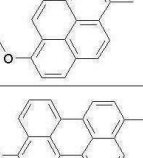
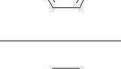
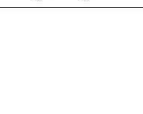
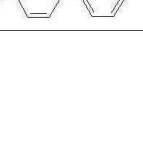

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1-3		2	A1		
1-4		2	A1		
1-5		2	A1		
1-6		2	A1		
1-7		2	A1		
1-8		2	A1		

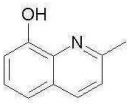
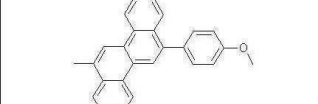
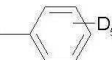
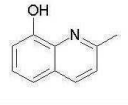
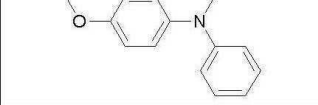

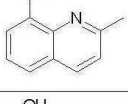
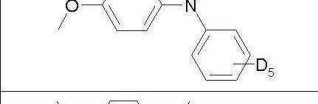
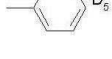
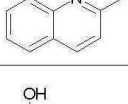
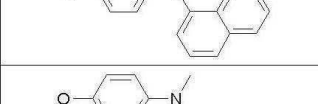
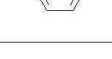
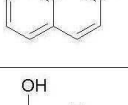
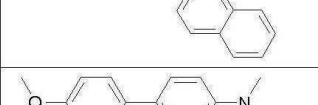

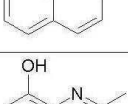
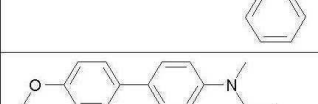

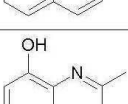
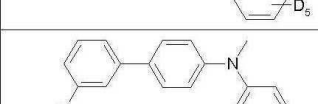

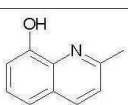
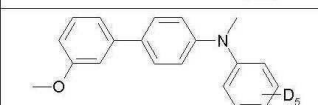

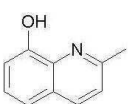
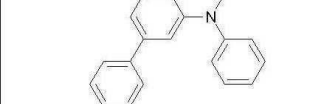




1-9		2	A1		
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1-12		2	A1		
1-13		2	A1		
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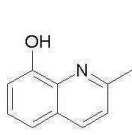
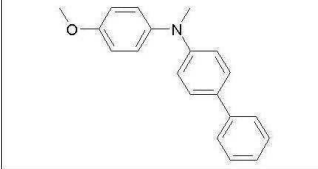
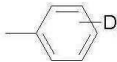
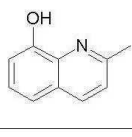
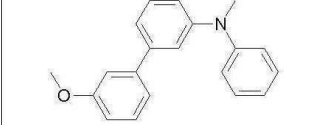
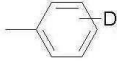
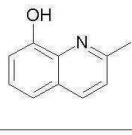
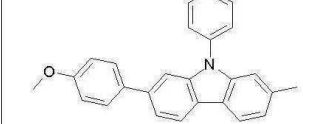
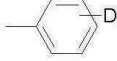
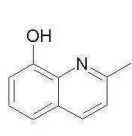
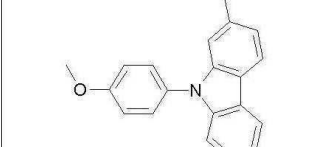
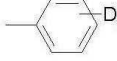
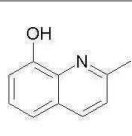
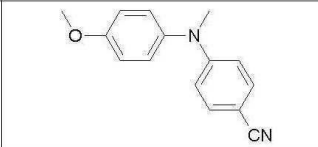
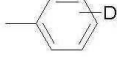
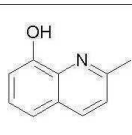
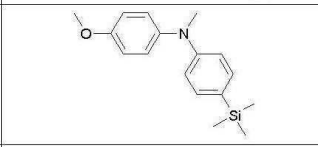
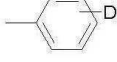
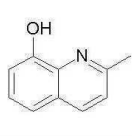
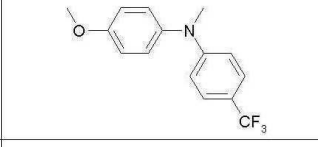
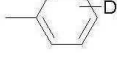
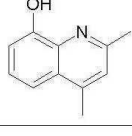
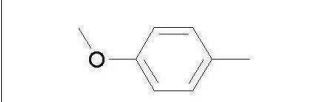
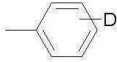
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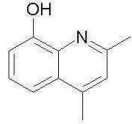
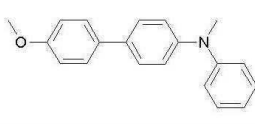
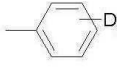
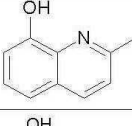
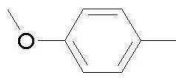
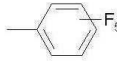
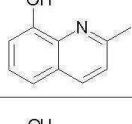
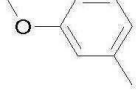
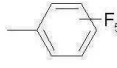
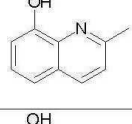
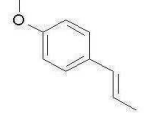
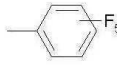
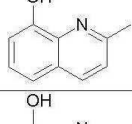
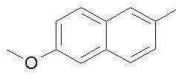
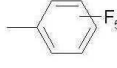
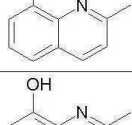
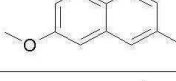
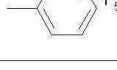
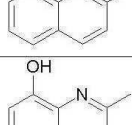
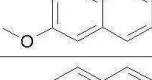
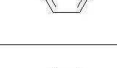
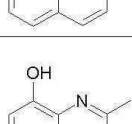
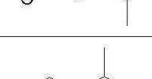

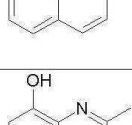
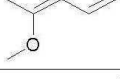

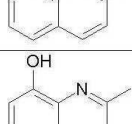
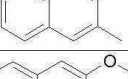
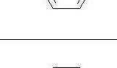
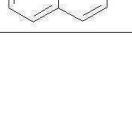


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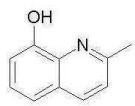
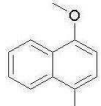

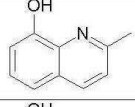
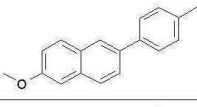
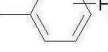
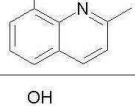
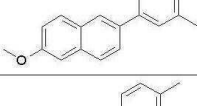
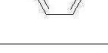
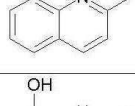
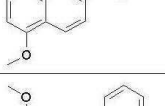
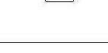
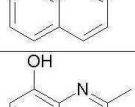
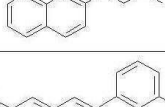

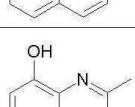
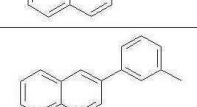

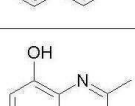
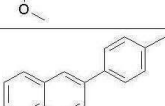

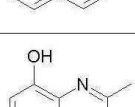
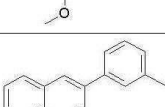

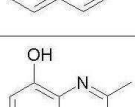
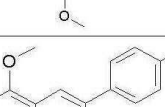

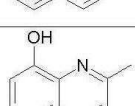
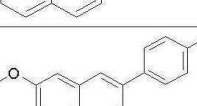
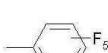



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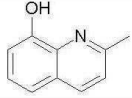
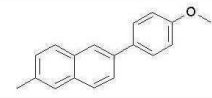
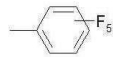
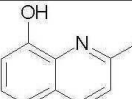
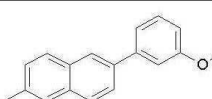
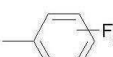
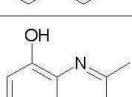
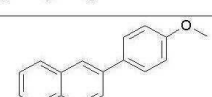

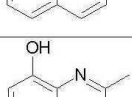
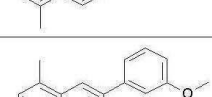

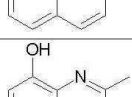
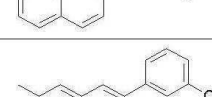

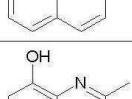
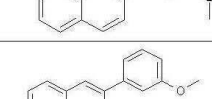

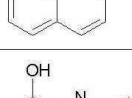
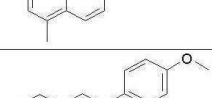

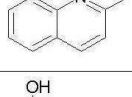
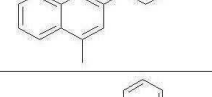
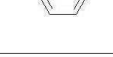
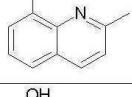
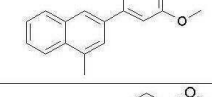
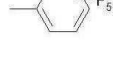
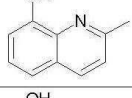
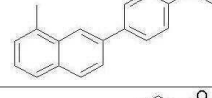
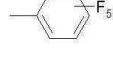
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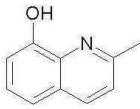
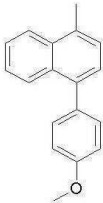
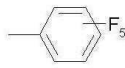
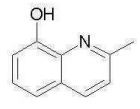
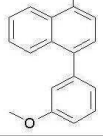
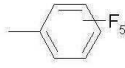
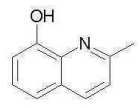
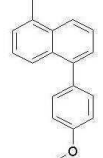
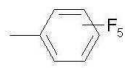
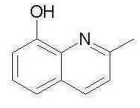
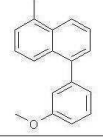
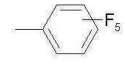
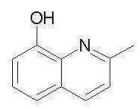
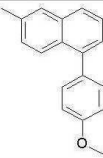
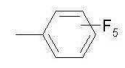
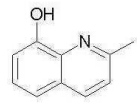
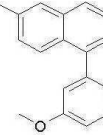
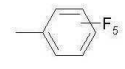
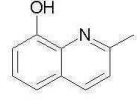
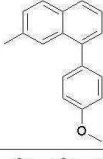
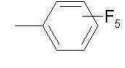
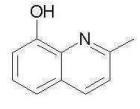
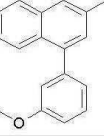
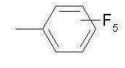
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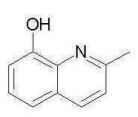
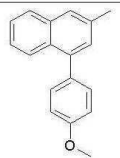
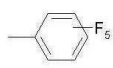
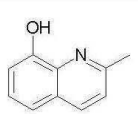
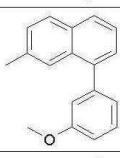
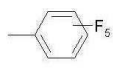
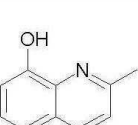
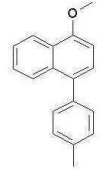
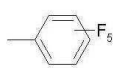
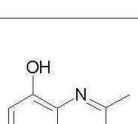
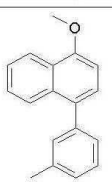
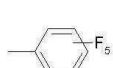
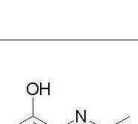
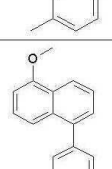

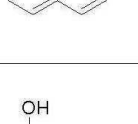
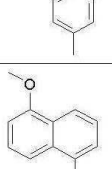

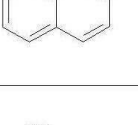
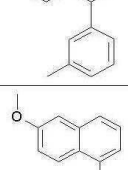

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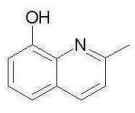
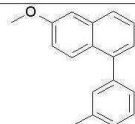
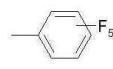
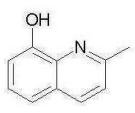
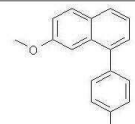
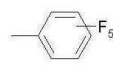
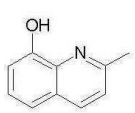
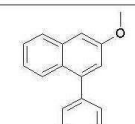
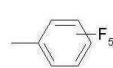
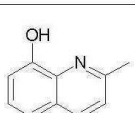
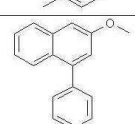
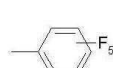
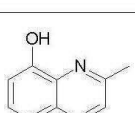
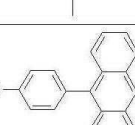

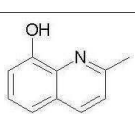
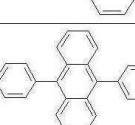
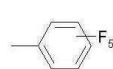
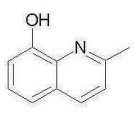
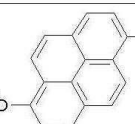
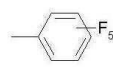
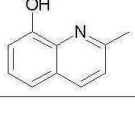
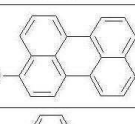
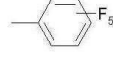
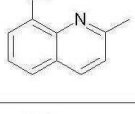

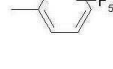
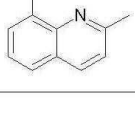
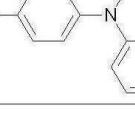
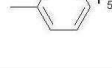
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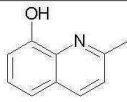
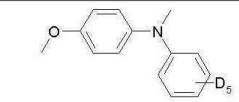
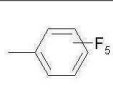
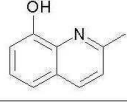
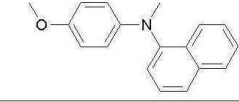
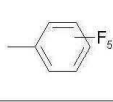
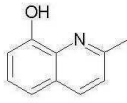
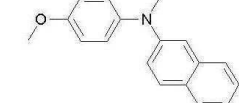
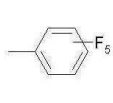
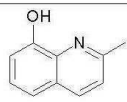
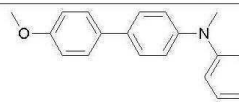
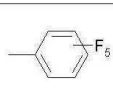
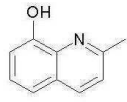
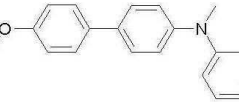
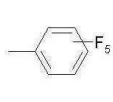
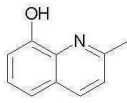
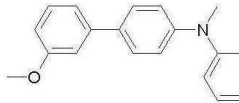
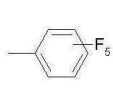
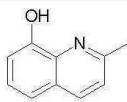
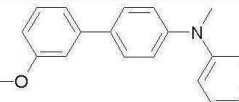
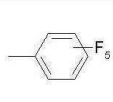
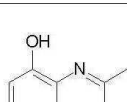
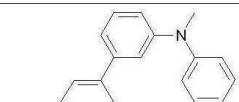
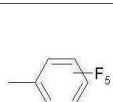
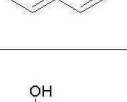
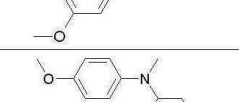

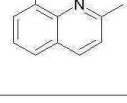
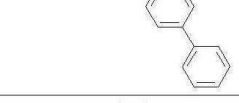
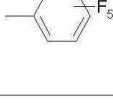
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
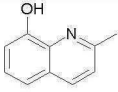



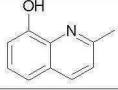



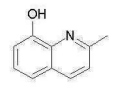
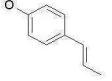
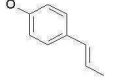

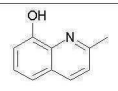
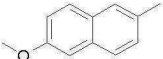
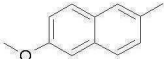

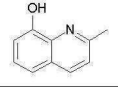
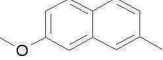
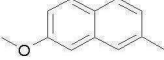

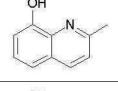
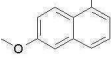
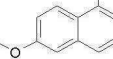

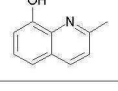
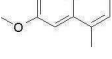
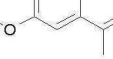

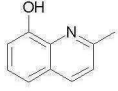



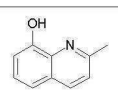
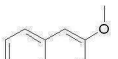
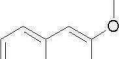

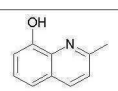
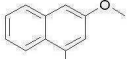
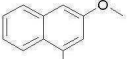

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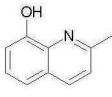


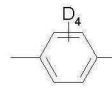
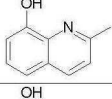
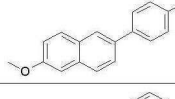
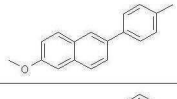
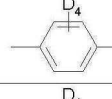
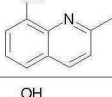
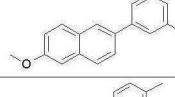
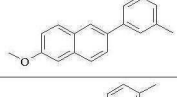
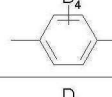
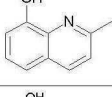
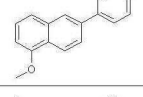
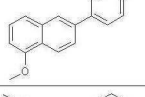
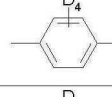
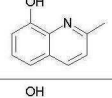
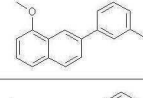
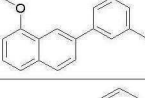
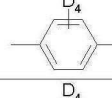
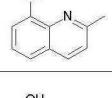
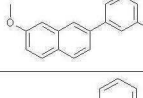
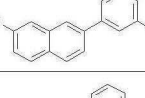
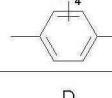
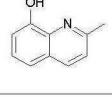
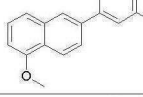
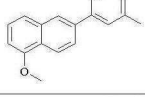
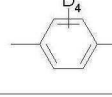
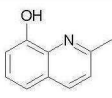
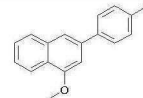
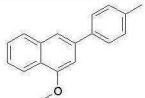
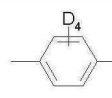
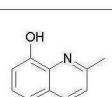
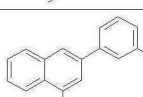
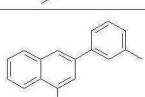
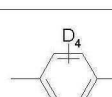
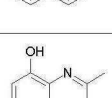
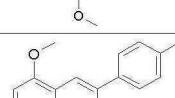
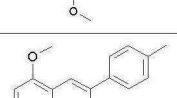
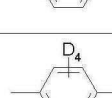
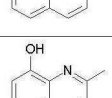
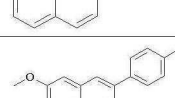
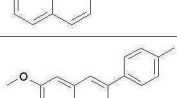
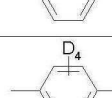
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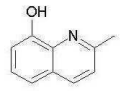
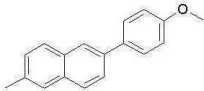
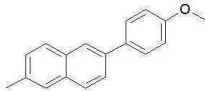
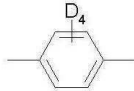
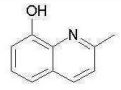
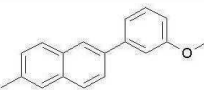
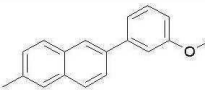
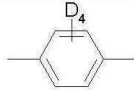
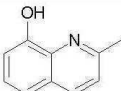
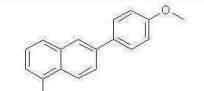
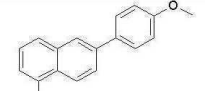
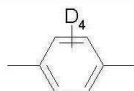
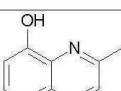
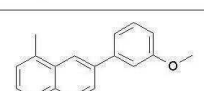
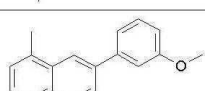
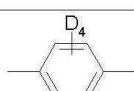
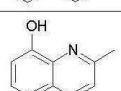
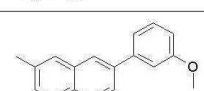
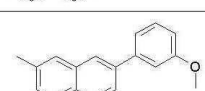
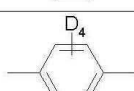
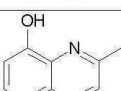
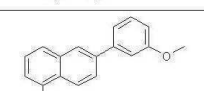
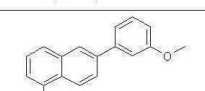
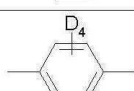
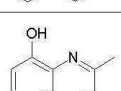
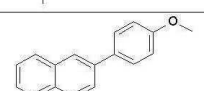
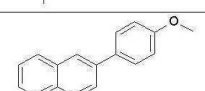
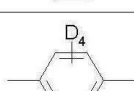
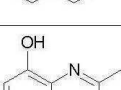
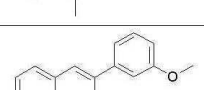
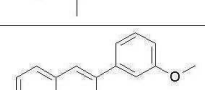
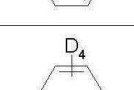
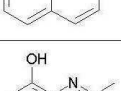
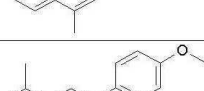
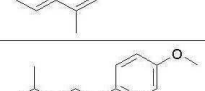
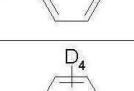
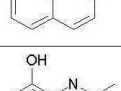
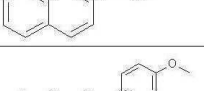
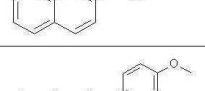
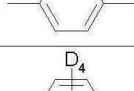
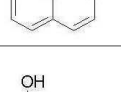
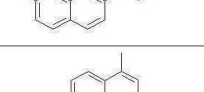
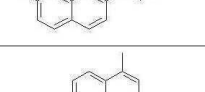
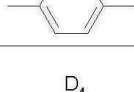
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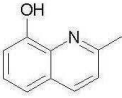
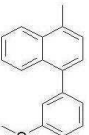
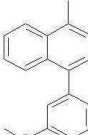
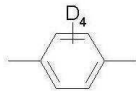
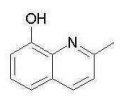
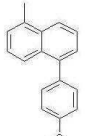
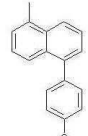
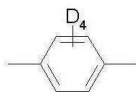
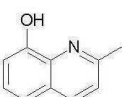
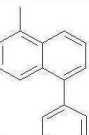
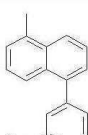
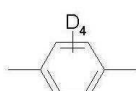
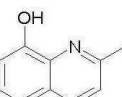
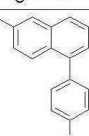
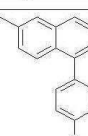
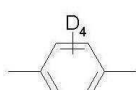
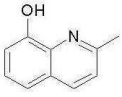
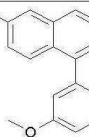
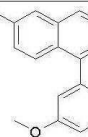
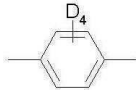
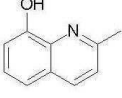
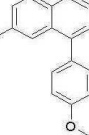
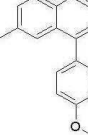
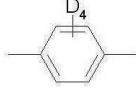
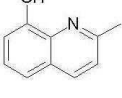
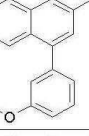
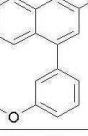
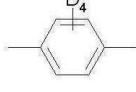
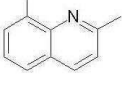
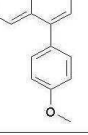
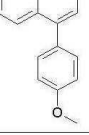
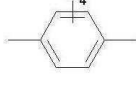
청구항 7

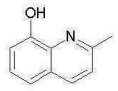
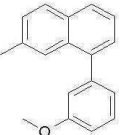
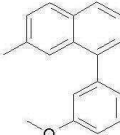
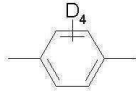
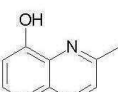
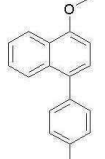
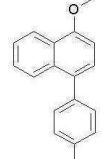
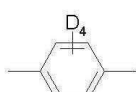
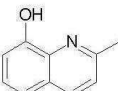
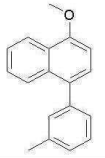
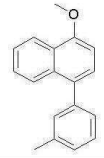
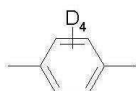
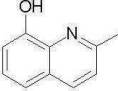
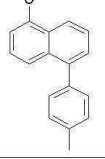
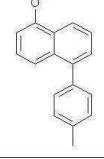
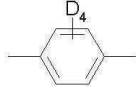
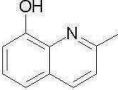
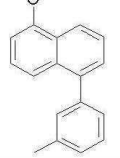
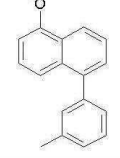
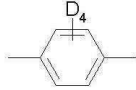
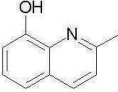
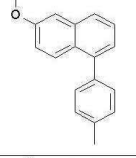
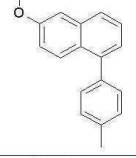
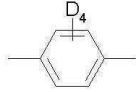
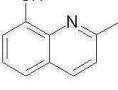
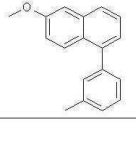
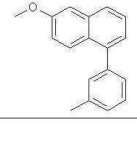
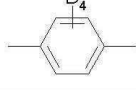
청구항 1에 있어서, 상기 화학식 2로 표시되는 유기 금속 착물 유도체는 하기 화학식 2-1 내지 2-136으로 이루어진 군으로부터 선택되는 것인 유기 금속 착물 유도체:

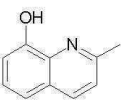
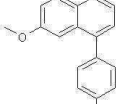
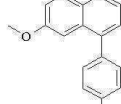
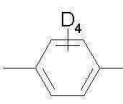
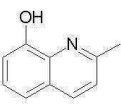
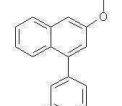
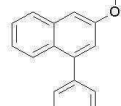
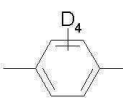
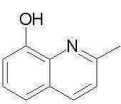
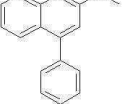
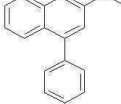
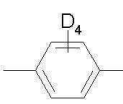
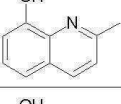
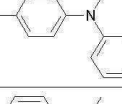
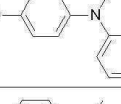
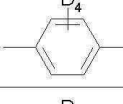
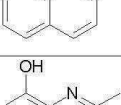
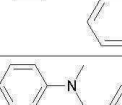
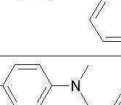
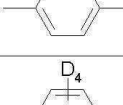
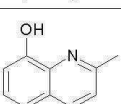
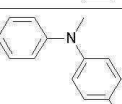
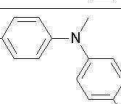
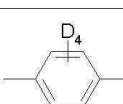
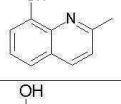
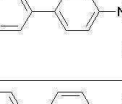
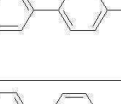
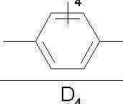
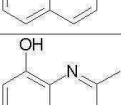
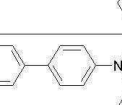
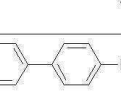
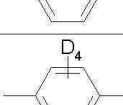
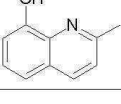
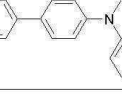
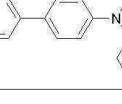
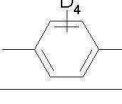








화학식	Y	n	M	-O-A	-O-A'	
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2-2		2	A1			
2-3		2	A1			
2-4		2	A1			
2-5		2	A1			
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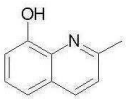
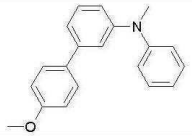
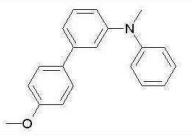
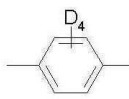
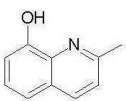
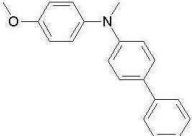
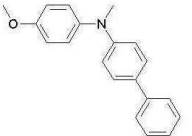
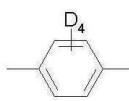
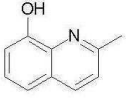
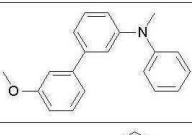
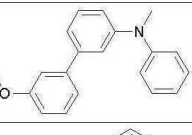
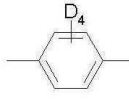
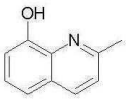
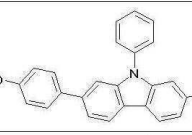
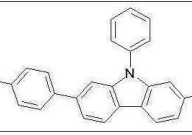
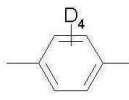
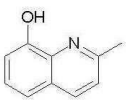
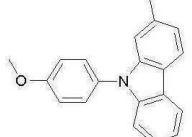
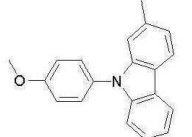
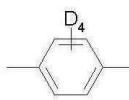
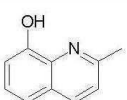
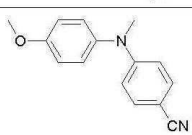
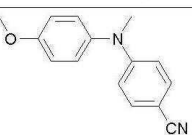
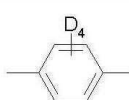
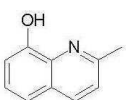
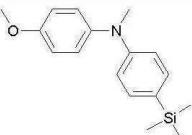
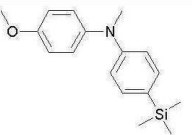
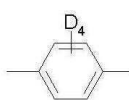
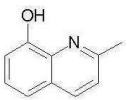
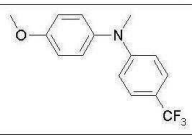
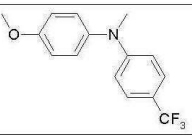
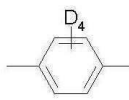
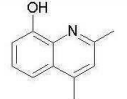
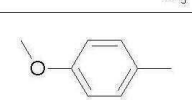
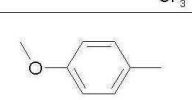
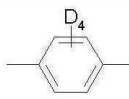
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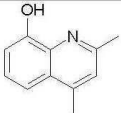
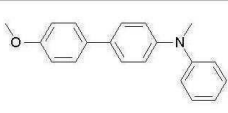
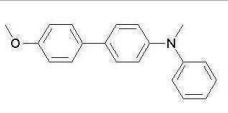
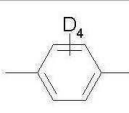
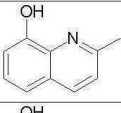
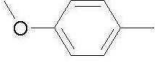

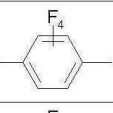
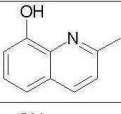
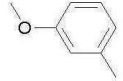
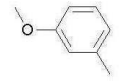
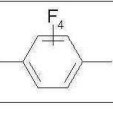
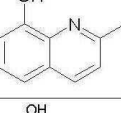
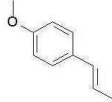
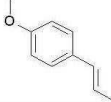
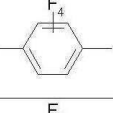
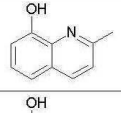
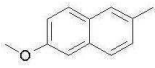
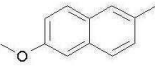
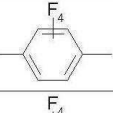
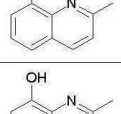
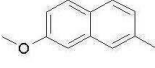
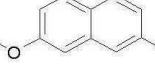
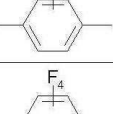
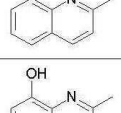
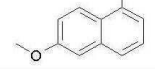
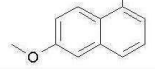
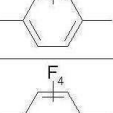
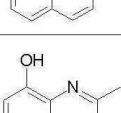

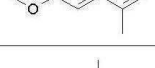
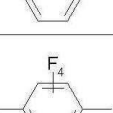
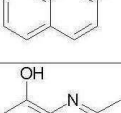
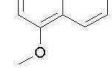
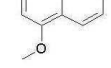
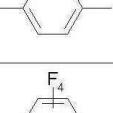
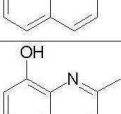
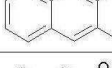
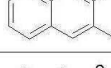
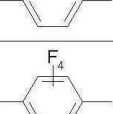
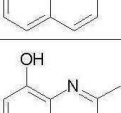
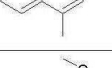
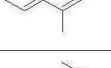
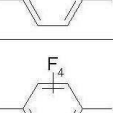
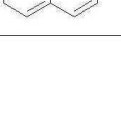
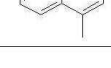
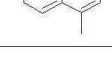
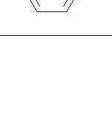
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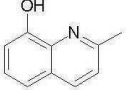
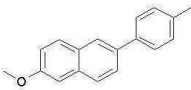
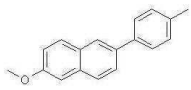
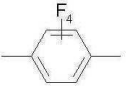
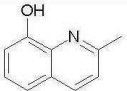
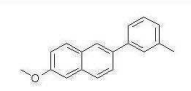
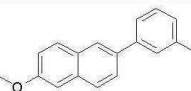
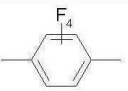
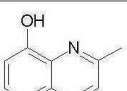
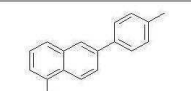
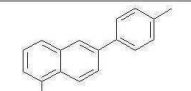
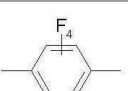
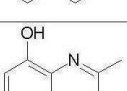
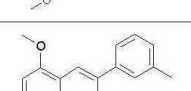
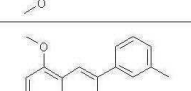
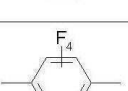
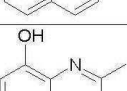
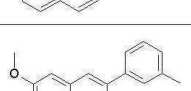
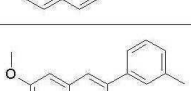
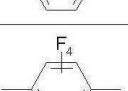
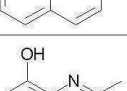
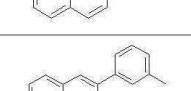
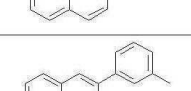
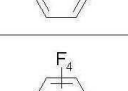
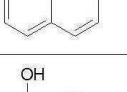
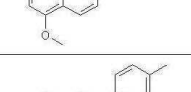
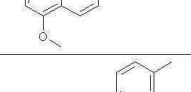
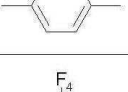
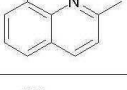
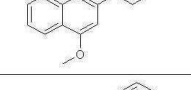
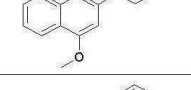
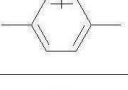
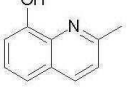
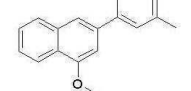
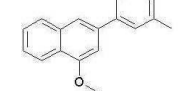
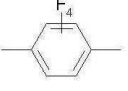
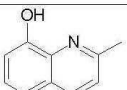
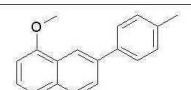
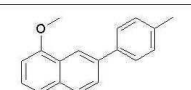
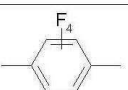
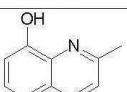
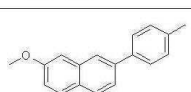
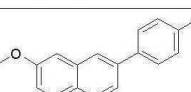
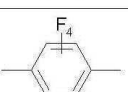
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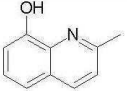
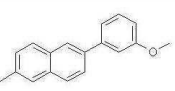
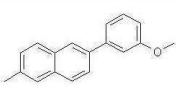
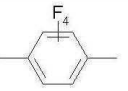
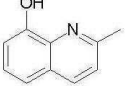
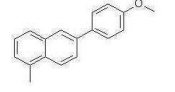
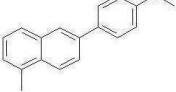
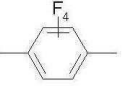
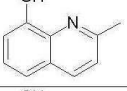
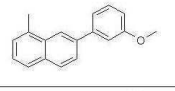
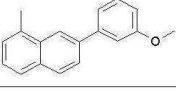
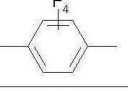
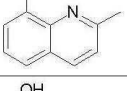
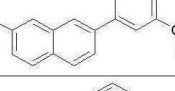
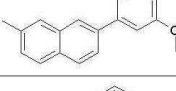
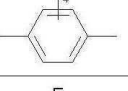
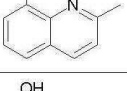
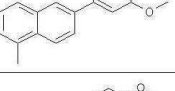
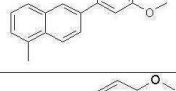
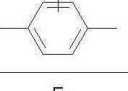
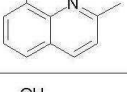
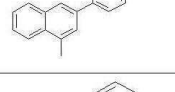
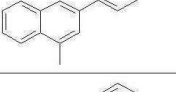
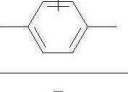
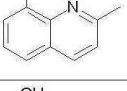
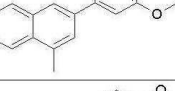
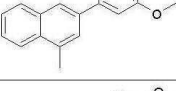
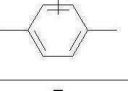
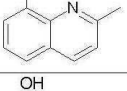
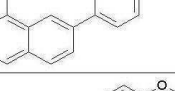
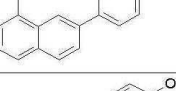
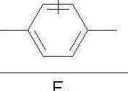
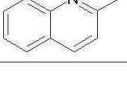
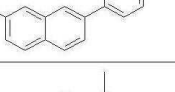
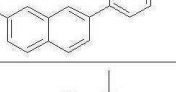
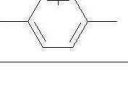
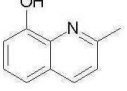
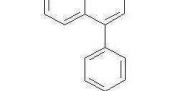
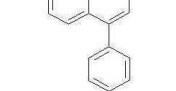
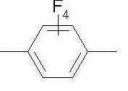
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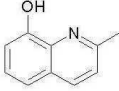
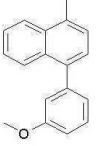
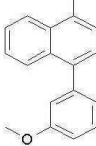
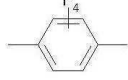
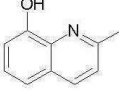
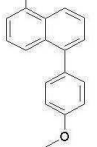
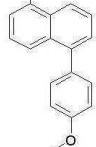
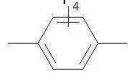
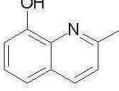
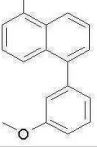
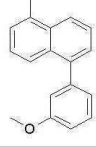
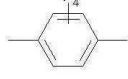
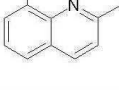
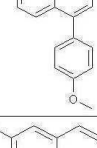
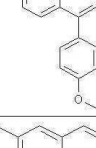
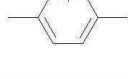
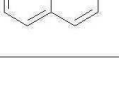
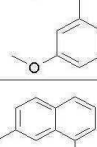
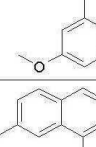

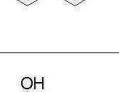
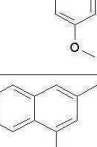
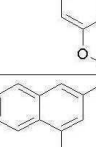
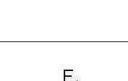


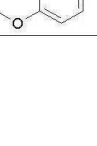

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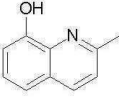
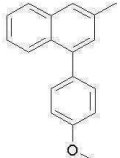
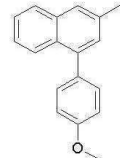
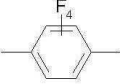
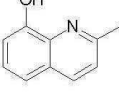
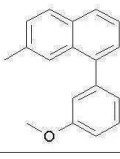
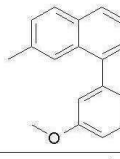
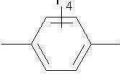
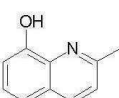
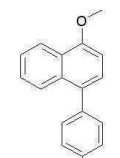
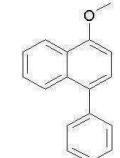
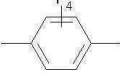
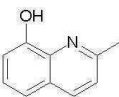
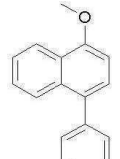
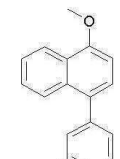
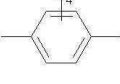
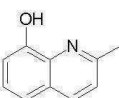
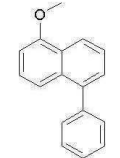
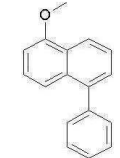
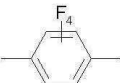
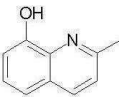
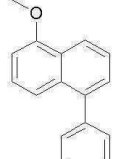
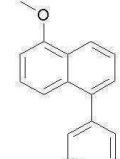

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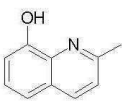
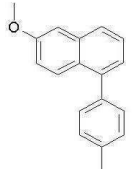
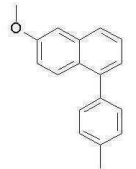
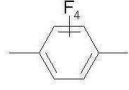
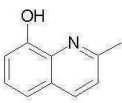
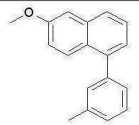
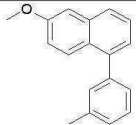
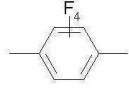
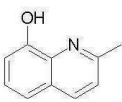
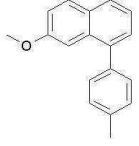
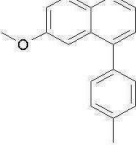
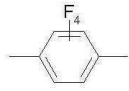
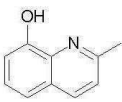
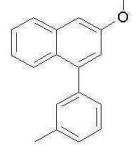
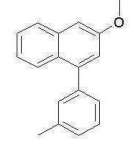
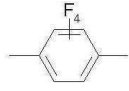
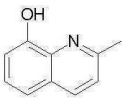
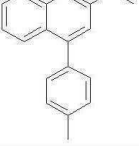
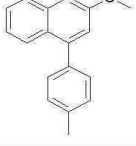
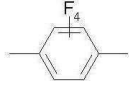
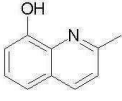
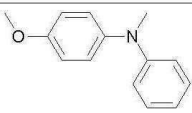
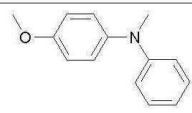
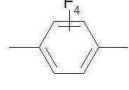
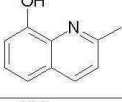
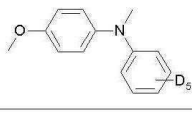
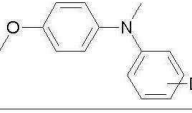
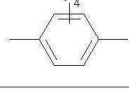
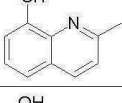
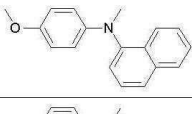
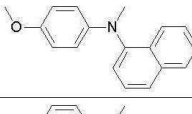
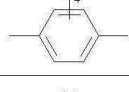
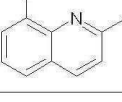
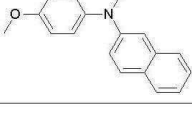
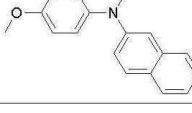
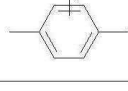
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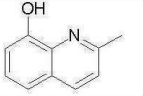
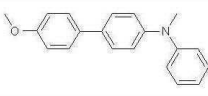
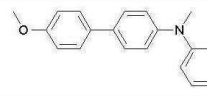

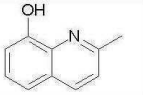
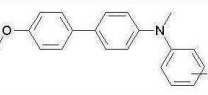
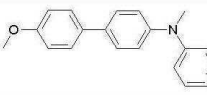
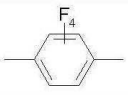
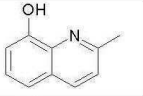
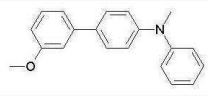
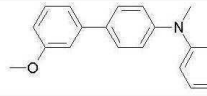
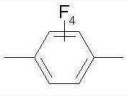
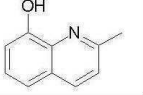
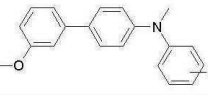
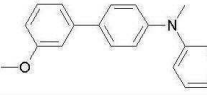
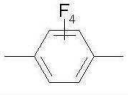
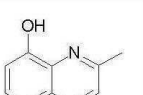
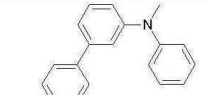
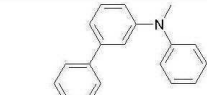
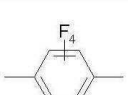
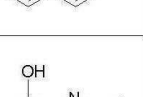
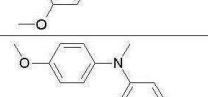
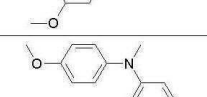
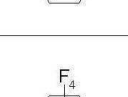
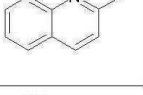


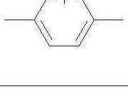
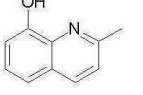
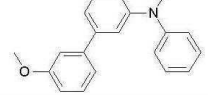
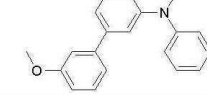
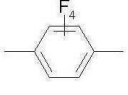
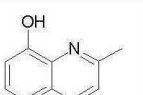
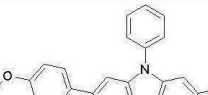
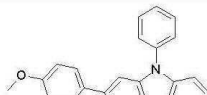
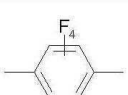
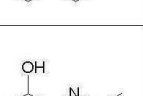


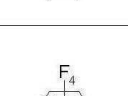
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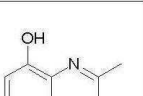
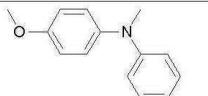
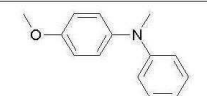
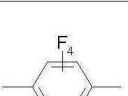
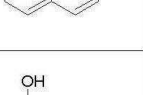
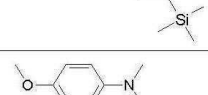
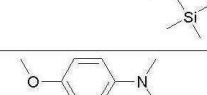
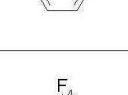
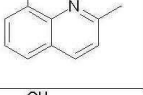
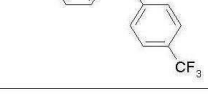

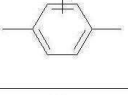
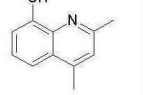
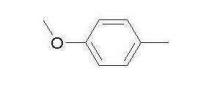
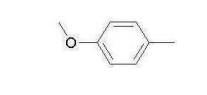
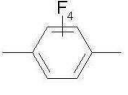
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청구항 8

제1 전극, 제2 전극 및 이들 전극 사이에 배치된 1층 이상의 유기물층을 포함하는 유기전자소자에 있어서, 상기 유기물층 중 적어도 1층 이상이 청구항 1, 2, 5, 6 및 7 중 어느 한 항의 유기 금속 착물 유도체를 포함하는 유기전자소자.

청구항 9

청구항 8에 있어서, 상기 유기전자소자는 유기태양전지, 유기감광체(OPC) 드럼 및 유기 트랜지스터로 이루어진 군으로부터 선택되는 것인 유기전자소자.

청구항 10

기판상에 양극, 1층 이상의 유기물층 및 음극이 순차적으로 적층된 정방향 또는 역방향 구조의 유기발광소자에 있어서, 상기 유기물층 중 적어도 1층 이상이 청구항 1, 2, 5, 6 및 7 중 어느 한 항의 유기 금속 착물 유도체를 포함하는 유기발광소자.

명세서

발명의 상세한 설명

기술분야

[0001] 본 발명은 신규한 유기 금속 착물 유도체 및 이를 포함하는 유기발광소자에 관한 것이다.

배경기술

[0002] 일반적으로 유기 발광 현상이란 유기 물질을 이용하여 전기에너지를 빛에너지로 전환시켜주는 현상을 말한다. 유기 발광 현상을 이용하는 유기발광소자는 통상 양극과 음극 및 이 사이에 유기물층을 포함하는 구조를 가진다. 여기서 유기물층은 유기발광소자의 효율과 안정성을 높이기 위하여 각기 다른 물질로 구성된 다층의 구조로 이루어진 경우가 많으며, 예컨대 정공주입층, 정공수송층, 발광층, 전자수송층, 전자 주입층 등으로 이루어질 수 있다. 이러한 유기발광소자의 구조에서 두 전극 사이에 전압을 걸어주게 되면 양극에서는 정공이, 음극에서는 전자가 유기물층에 주입되게 되고, 주입된 정공과 전자가 만났을 때 엑시톤(exciton)이 형성되며, 이 엑시톤이 다시 바닥상태로 떨어질 때 빛이 나게 된다. 이러한 유기발광소자는 자발광, 고휘도, 고효율, 낮은 구동 전압, 넓은 시야각, 높은 콘트라스트, 고속 응답성 등의 특성을 갖는 것으로 알려져 있다.

[0003] 유기발광소자에서 유기물층으로 사용되는 재료는 기능에 따라, 발광 재료와 전하 수송 재료, 예컨대 정공주입 재료, 정공수송 재료, 전자수송 재료, 전자주입 재료 등으로 분류될 수 있다. 그리고, 상기 발광 재료는 분자량에 따라 고분자형과 저분자형으로 분류될 수 있고, 발광 메커니즘에 따라 전자의 일중항 여기상태로부터 유래되는 형광 재료와 전자의 삼중항 여기상태로부터 유래되는 인광 재료로 분류될 수 있다. 또한, 발광 재료는 발광 색에 따라 청색, 녹색, 적색 발광 재료와 보다 나은 천연색을 구현하기 위해 필요한 노란색 및 주황색 발광 재료로 구분될 수 있다.

[0004] 한편, 발광 재료로서 하나의 물질만 사용하는 경우 분자간 상호 작용에 의하여 최대 발광 파장이 장파장으로 이동하고 색순도가 떨어지거나 발광 감쇄 효과로 소자의 효율이 감소되는 문제가 발생하므로, 색순도의 증가와 에너지 전이를 통한 발광 효율을 증가시키기 위하여 발광 재료로서 호스트/도판트 계를 사용할 수 있다. 그 원리는 발광층을 형성하는 호스트 보다 에너지 대역 간극이 작은 도판트를 발광층에 소량 혼합하면, 발광층에서 발생한 엑시톤이 도판트로 수송되어 효율이 높은 빛을 내는 것이다. 이 때 호스트의 파장이 도판트의 파장대로 이동하므로, 이용하는 도판트의 종류에 따라 원하는 파장의 빛을 얻을 수 있다.

[0005] 진술한 유기발광소자가 갖는 우수한 특징들을 충분히 발휘하기 위해서는 소자내 유기물층을 이루는 물질, 예컨대 정공주입 물질, 정공수송 물질, 발광 물질, 전자수송 물질, 전자주입 물질 등이 안정하고 효율적인 재료에 의하여 뒷받침되는 것이 선행되어야 하나, 아직까지 안정하고 효율적인 유기발광소자용 유기물층 재료의 개발이 충분히 이루어지지 않은 상태이며, 따라서 새로운 재료의 개발이 계속 요구되고 있다.

발명의 내용

해결 하고자하는 과제

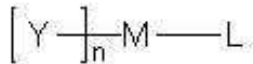
[0006] 본 발명자들은 신규한 구조를 갖는 유기 금속 착물 유도체를 밝혀내었으며, 또한 이 화합물이 유기발광소자에서 저전압, 고효율 장수명의 효과를 나타낼 수 있다는 사실을 밝혀내었다.

[0007] 이에 본 발명은 유기 금속 착물 유도체 및 이를 이용한 유기발광소자를 제공하는 것을 목적으로 한다.

과제 해결수단

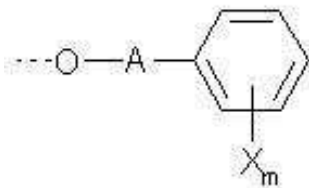
[0008] 본 발명은 하기 화학식 1 또는 화학식 2로 표시되는 유기 금속 착물 유도체를 제공한다.

화학식 1



[0009] 상기 화학식 1에서,
 [0010] Y는 치환 또는 비치환된 하이드록시아릴-N-헤테로환기를 갖는 리간드로서,
 [0011] 8-하이드록시-2-메틸퀴놀린을 포함하는 리간드, 2배위가 가능한 스킵프 염 리간드(Schiff base ligand) 및 4배

[0012] 위가 가능한 스킵프 염 리간드 중에서 선택된 하나이고,
 [0013] n은 1 또는 2이며,
 [0014] M은 +2, +3 또는 +4의 산화수를 갖는 금속이고,



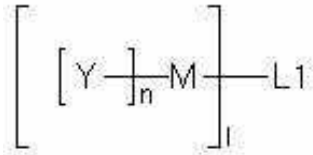
[0015] L은  이며,

[0016] 상기 L에서,
 [0017] X는 중수소(Deuterium) 또는 불소(Fluorine)이며,
 [0018] m은 1 내지 5이고,
 [0019] O는 산소이며,

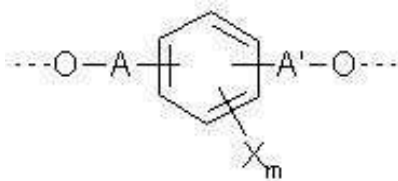
[0020] A는 산소; 및 상기 X가 치환된 벤젠기가 치환되어 있는 형태로서 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃-C₄₀의 시클로알킬렌기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃-C₄₀의 헤테로시클로알킬렌기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₂-C₄₀의 알케닐렌기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 아미노기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및

C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₆~C₄₀의 아릴렌기; 및 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₅~C₄₀의 헤테로아릴렌기로 이루어진 군에서 선택될 수 있고, 인접하는 기와 지방족, 방향족, 헤테로지방족 또는 헤테로방향족의 축합 고리를 형성하거나 스피로 결합을 이룰 수 있다.

화학식 2



- [0021]
- [0022] 상기 화학식 2에서,
- [0023] Y는 치환 또는 비치환된 하이드록시아릴-N-헤테로환기를 갖는 리간드로서,
- [0024] 8-하이드록시-2-메틸퀴놀린을 포함하는 리간드, 2배위가 가능한 스킵프 염 리간드(Schiff base ligand) 및 4배위가 가능한 스킵프 염 리간드 중에서 선택된 하나이고,
- [0025] n은 1 또는 2이고,
- [0026] l 은 2이며,
- [0027] M은 +2, +3 또는 +4의 산화수를 갖는 금속이고,



- [0028] L1은 이며,
- [0029] 상기 L1에서,
- [0030] X는 중수소(Duetrium) 또는 불소(Fluorine)이고,
- [0031] m은 1 내지 4이며,
- [0032] O는 산소이고,
- [0033] A와 A'는 각각 서로 독립적으로 같거나 다를 수 있으며, 상기 화학식 1의 A의 정의와 같다.
- [0034] 또한, 본 발명은 제1 전극, 제2 전극 및 이들 전극 사이에 배치된 1층 이상의 유기물층을 포함하는 유기전자소자에 있어서, 상기 유기물층 중 적어도 1층 이상이 상기 유기 금속 착물 유도체를 포함하는 유기전자소자를 제공한다.
- [0035] 또한, 본 발명은 기관상에 양극, 1층 이상의 유기물층 및 음극이 순차적으로 적층된 정방향 또는 역방향 구조의 유기발광소자에 있어서, 상기 유기물층 중 적어도 1층 이상이 상기 유기 금속 착물 유도체를 포함하는 유기발광소자를 제공한다.

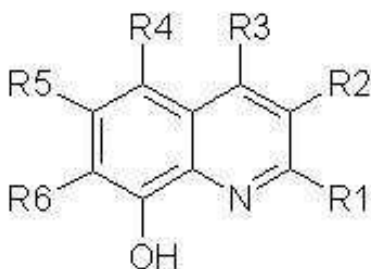
효과

- [0036] 본 발명의 화합물은 신규한 유기 금속 착물 유도체로서, 유기전자소자 및 유기발광소자의 유기물층에 사용될 수 있다.

발명의 실시를 위한 구체적인 내용

- [0037] 이하, 본 발명을 더욱 상세히 설명한다.
- [0038] 상기 화학식 1 또는 화학식 2의 Y에서 하이드록시아릴-N-헤테로환기는 적어도 하나의 질소를 포함한 헤테로환기와 적어도 하나의 하이드록실기를 포함한 아릴기를 포함하고, 이를 포함하는 리간드에 있어서 하이드록실기의 산소와 헤테로환기의 질소는 금속에 5 내지 7각형으로 배위될 수 있다.
- [0039] 또한, 상기 하이드록시아릴-N-헤테로환기는 질소가 포함된 헤테로환기와 하이드록실기가 포함된 아릴기가 각각 단일결합으로 결합되거나 혹은 인접하는 기와 지방족, 방향족, 헤테로지방족 또는 헤테로방향족의 축합 고리를 형성하거나 스피로 결합을 이룰 수 있다.
- [0040] 상기 치환된 하이드록시아릴-N-헤테로환기의 치환기는 수소; 중수소; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₁-C₄₀의 알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃-C₄₀의 시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃-C₄₀의 헤테로시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₂-C₄₀의 알케닐기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₁-C₄₀의 알콕시기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₅-C₄₀의 헤테로아릴기; 및 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁-C₄₀의 알킬기, C₂-C₄₀의 알케닐기, C₁-C₄₀의 알콕시기, C₃-C₄₀의 시클로알킬기, C₃-C₄₀의 헤테로시클로알킬기, C₆-C₄₀의 아릴기 및 C₅-C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₅-C₄₀의 헤테로아릴기로 이루어진 군에서 선택될 수 있고, 인접하는 기와 지방족, 방향족, 헤테로지방족 또는 헤테로방향족의 축합 고리를 형성하거나 스피로 결합을 이룰 수 있다.
- [0041] 상기 화학식 1 또는 화학식 2의 Y에 있어서, Y는 치환 또는 비치환된 하이드록시아릴-N-헤테로환기를 갖는 리간드로서 하기 화학식 3으로 표시되는 화합물인 8-하이드록시-2-메틸퀴놀린을 포함하는 리간드가 바람직하다.

화학식 3



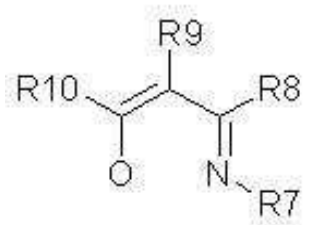
[0042]

[0043] 상기 화학식 3에 있어서,

[0044] R1 내지 R6은 서로 같거나 상이하고, 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₁~C₄₀의 알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 헤테로시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₂~C₄₀의 알케닐기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₁~C₄₀의 알콕시기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₆~C₄₀의 아릴기; 및 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군에서 선택될 수 있고, 인접하는 기와 지방족, 방향족, 헤테로지방족 또는 헤테로방향족의 축합 고리를 형성하거나 스피로 결합을 이룰 수 있다.

[0045] 상기 화학식 1 또는 화학식 2의 Y에 있어서, 상기 2배위가 가능한 스킵프 염 리간드는 하기 화학식 4로 표시되는 화합물을 포함하는 것이 바람직하다.

화학식 4



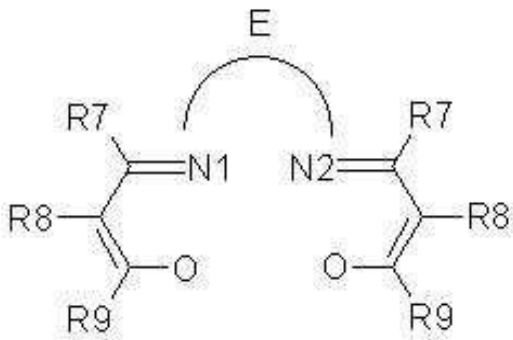
[0046] 상기 화학식 4에 있어서,

[0047] R7 내지 R10은 서로 같거나 상이하고, 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₁~C₄₀의 알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터

터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 헤테로시클로알킬기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₂~C₄₀의 알케닐기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₁~C₄₀의 알콕시기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 아미노기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₆~C₄₀의 아릴기; 및 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₅~C₄₀의 헤테로아릴기로 이루어진 군에서 선택될 수 있고, 인접하는 기와 지방족, 방향족, 헤테로지방족 또는 헤테로방향족의 축합 고리를 형성하거나 스피로 결합을 이룰 수 있다.

[0049] 상기 화학식 1 또는 화학식 2의 Y에 있어서, 상기 4배위가 가능한 스킵프 염 리간드는 하기 화학식 5로 표시되는 화합물인 것이 바람직하다.

화학식 5



[0050]

[0051] 상기 화학식 5에 있어서,

[0052] R7 내지 R9은 상기 화학식 4에서 정의한 바와 같고,

[0053] 상기 E는 N1과 N2를 연결해주는 다리역할을 하는 형태로서 구체적으로는 할로젠, 중수소, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₁~C₄₀의 알킬렌기; 할로젠, 중수소, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₃~C₄₀의 시클로알킬렌기; 할로젠, 중수소, 아미노기, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이

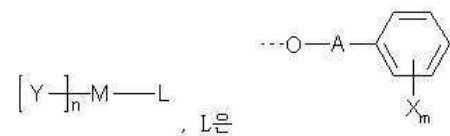
상의 기로 치환되거나 비치환된 C₃~C₄₀의 헤테로시클로알킬렌기; 할로젠, 중수소, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₂~C₄₀의 알케닐렌기; 할로젠, 중수소, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₆~C₄₀의 아릴렌기; 및 할로젠, 중수소, 니트릴기, 니트로기, C₁~C₄₀의 알킬기, C₂~C₄₀의 알케닐기, C₁~C₄₀의 알콕시기, C₃~C₄₀의 시클로알킬기, C₃~C₄₀의 헤테로시클로알킬기, C₆~C₄₀의 아릴기 및 C₅~C₄₀의 헤테로아릴기로 이루어진 군으로부터 선택된 하나 이상의 기로 치환되거나 비치환된 C₅~C₄₀의 헤테로아릴렌기로 이루어진 군에서 선택될 수 있고, 인접하는 기와 지방족, 방향족, 헤테로지방족 또는 헤테로방향족의 축합 고리를 형성하거나 스피로 결합을 이룰 수 있다.

[0054] 상기 화학식 1 또는 화학식 2에 있어서, M은 산화수가 2 내지 4인 금속으로서, 바람직하게는 알루미늄, 아연, 지르코늄, 이리듐, 리튬, 갈륨, 몰리브덴 등을 포함할 수 있다.

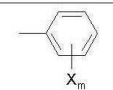
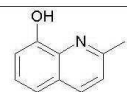
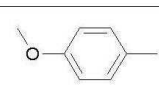
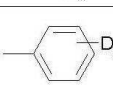
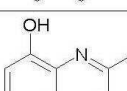
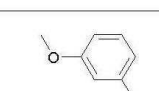
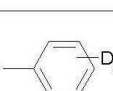
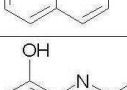
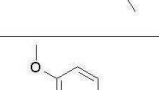
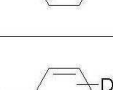
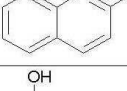
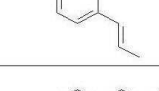
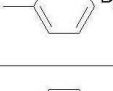
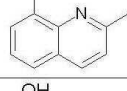
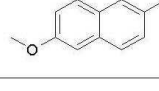
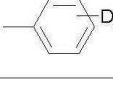
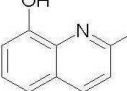
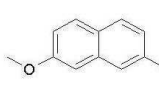
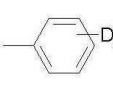
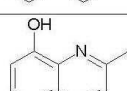
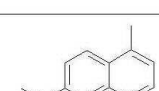

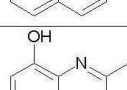
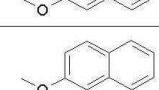
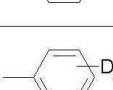
[0055] 본 발명에서, 아릴기는 중수소, -CN, -SiR₃, -CF₃ 등으로 치환될 수 있다.

[0056] 본 발명에 따른 상기 화학식 1 또는 화학식 2로 표시되는 유기 금속 착물 유도체는 하기 표 1 내지 표 2로 이루어진 군으로부터 선택될 수 있으나, 이에 한정되지 않는다.

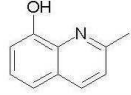
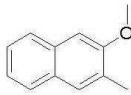

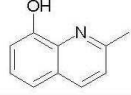
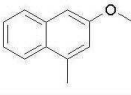
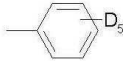
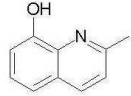

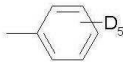
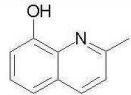
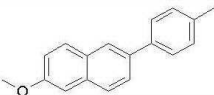

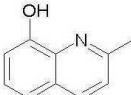
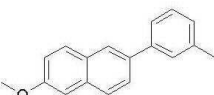
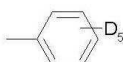
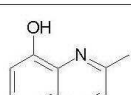
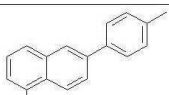

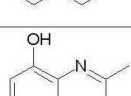
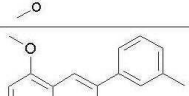

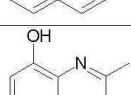
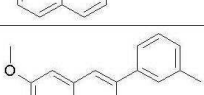

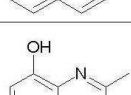
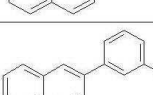

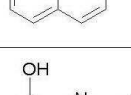
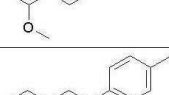

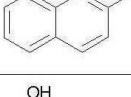
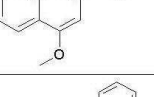
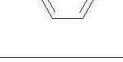
표 1



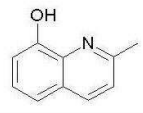
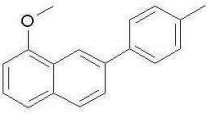
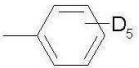
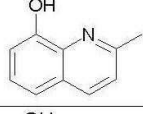
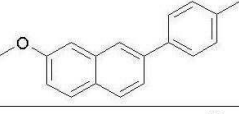

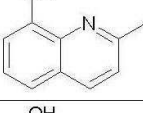
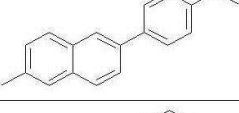
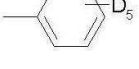
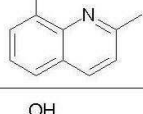
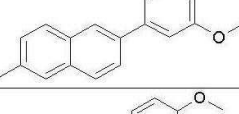
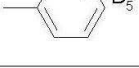
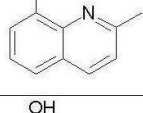
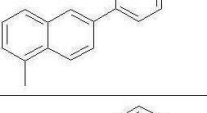
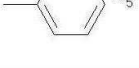
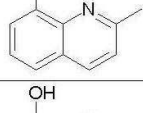
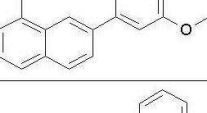
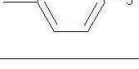
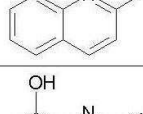
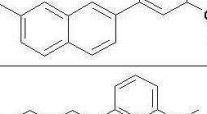
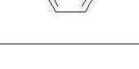
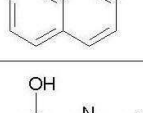
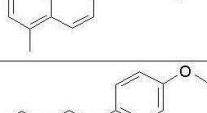
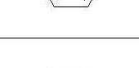
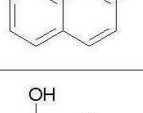
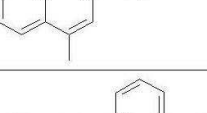

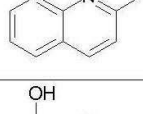
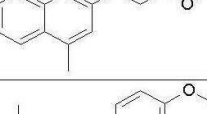
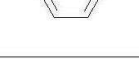
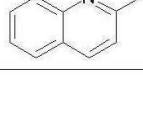
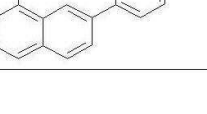
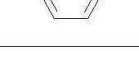
[0057]

화학식	Y	n	M	-O-A	
1-1		2	A1		
1-2		2	A1		
1-3		2	A1		
1-4		2	A1		
1-5		2	A1		
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1-8		2	A1		

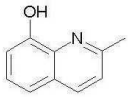
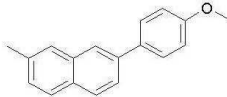

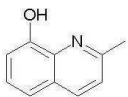
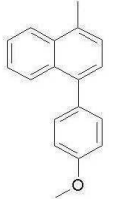
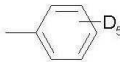
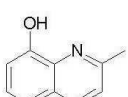
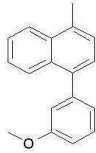
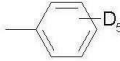
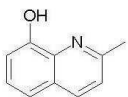
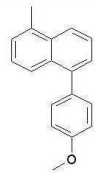
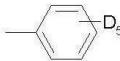
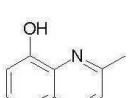
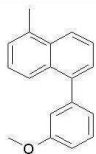

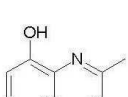
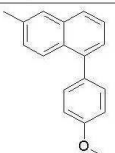
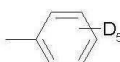
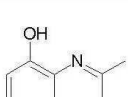
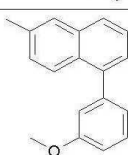

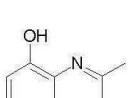
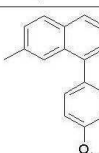

[0058]

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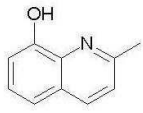
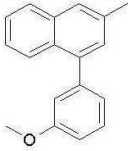
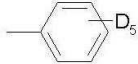
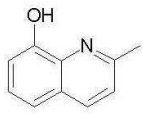
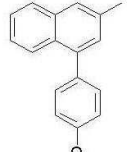
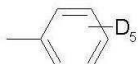
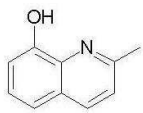
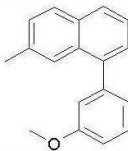
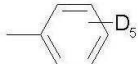
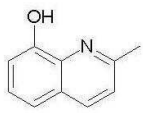
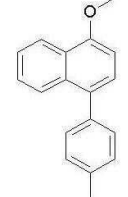
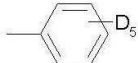
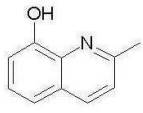
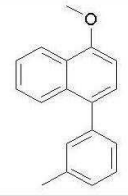

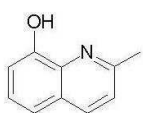
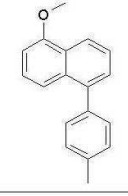

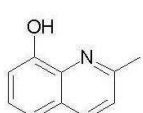
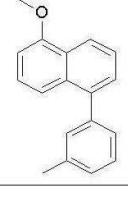

[0059]

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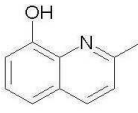
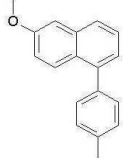
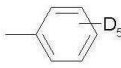
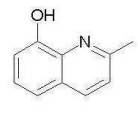
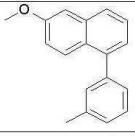
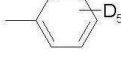
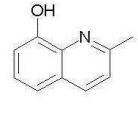
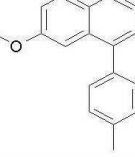
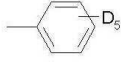
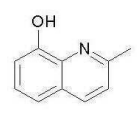
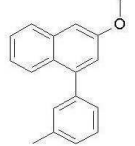
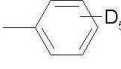
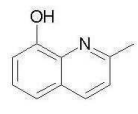
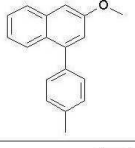
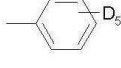
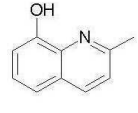
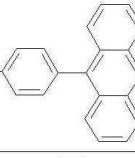
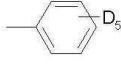
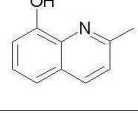
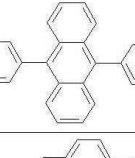
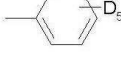
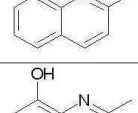
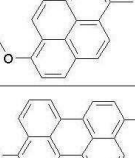

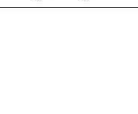
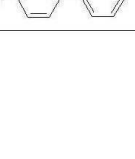

[0060]

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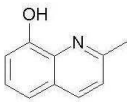
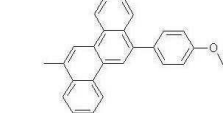
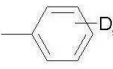
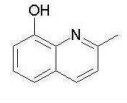
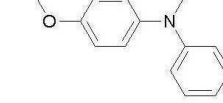

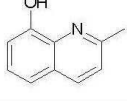
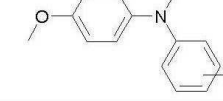
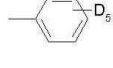
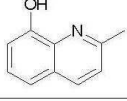
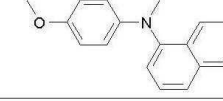
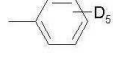
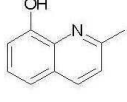
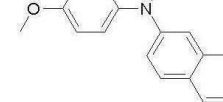
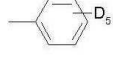
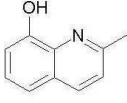
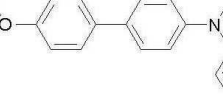
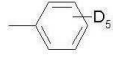
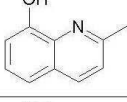
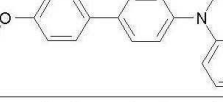
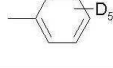
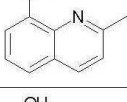
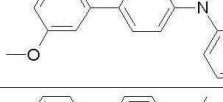
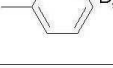
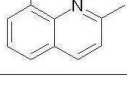

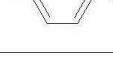
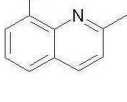
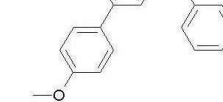
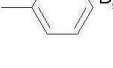
[0061]

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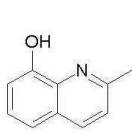
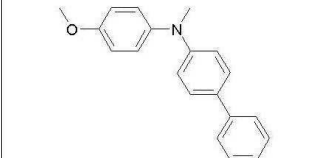
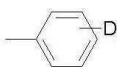
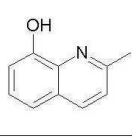
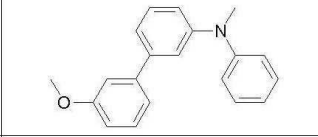
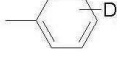
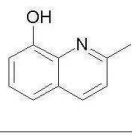
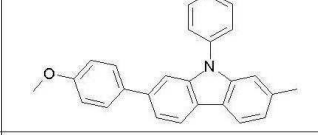
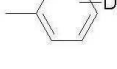
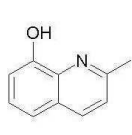
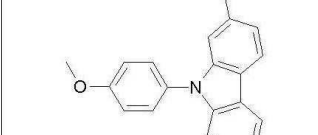
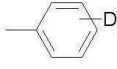
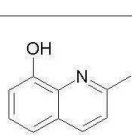
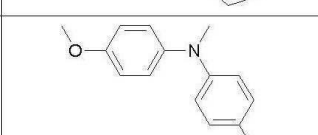
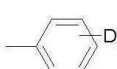
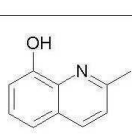
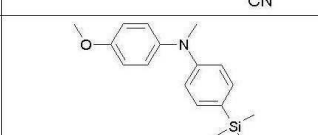
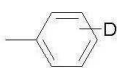
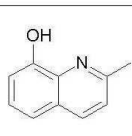
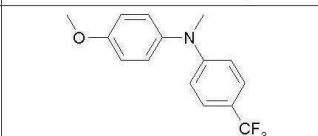
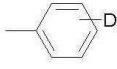
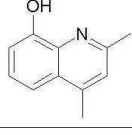
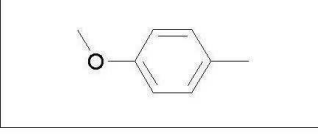
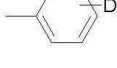
[0062]

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1-54		2	A1		

[0063]

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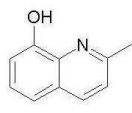
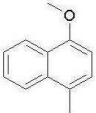

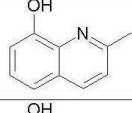
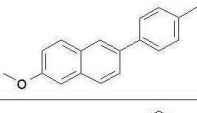
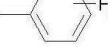
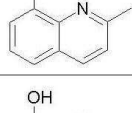
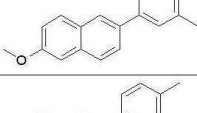
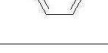
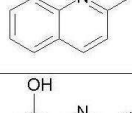
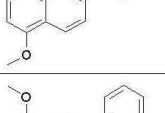
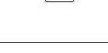
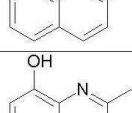
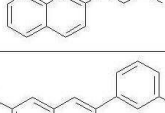

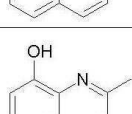
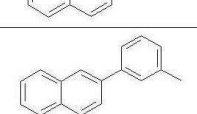

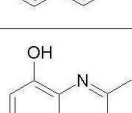
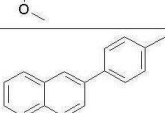

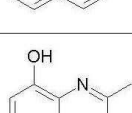
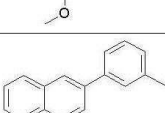

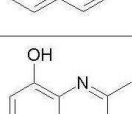
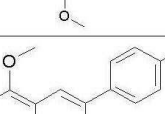

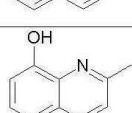
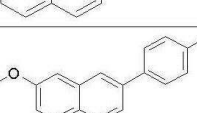
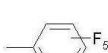



[0064]

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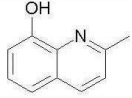
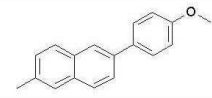
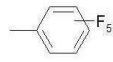
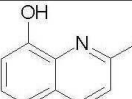
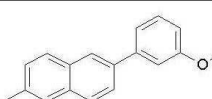

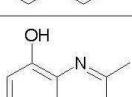
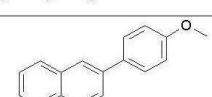

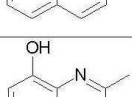
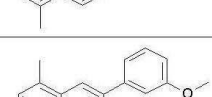

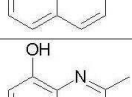
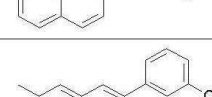

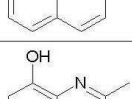
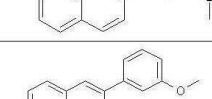

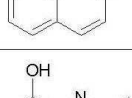
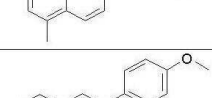

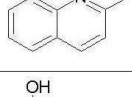
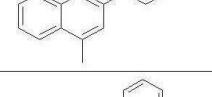

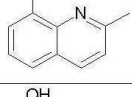
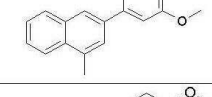
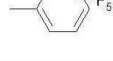
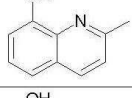
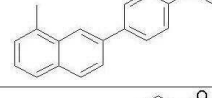
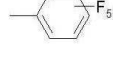
[0065]

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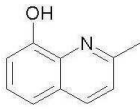
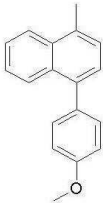

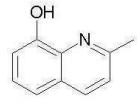
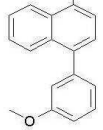
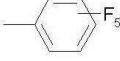
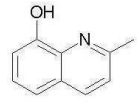
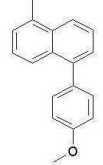
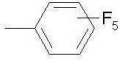
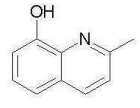
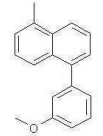
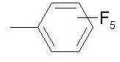
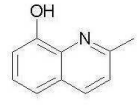
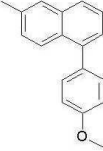
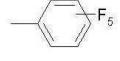
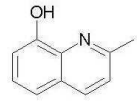
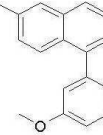
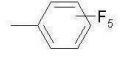
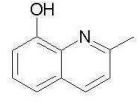
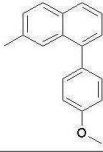
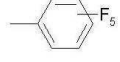
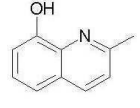
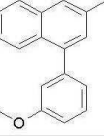
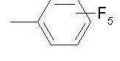
[0066]

1-84		2	A1		
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1-88		2	A1		
1-89		2	A1		
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1-94		2	A1		

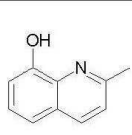
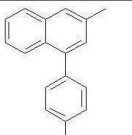
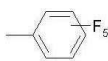
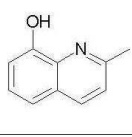
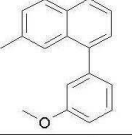
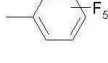
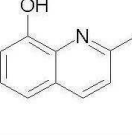
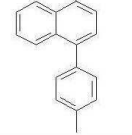
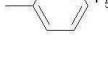
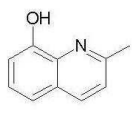
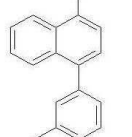
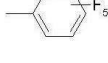
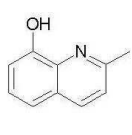
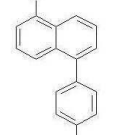
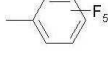
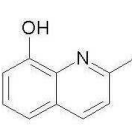
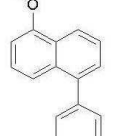
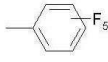
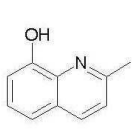
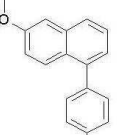
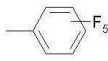
[0067]

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1-98		2	A1		
1-99		2	A1		
1-100		2	A1		
1-101		2	A1		
1-102		2	A1		
1-103		2	A1		
1-104		2	A1		

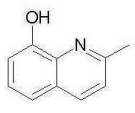
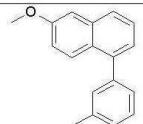
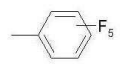
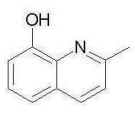
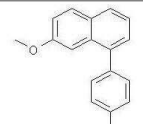
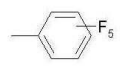
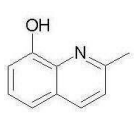
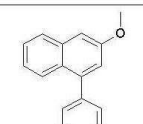
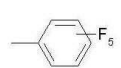
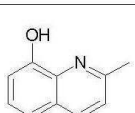
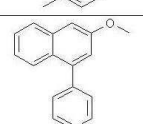

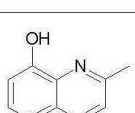
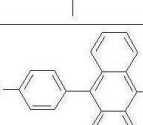

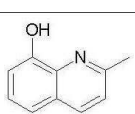
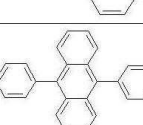
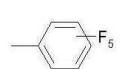
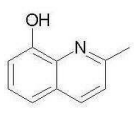
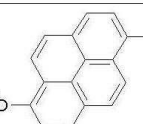
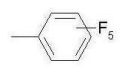
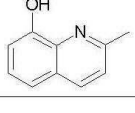
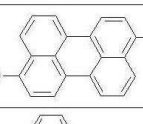
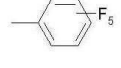
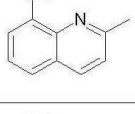

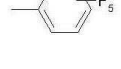
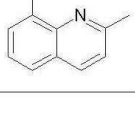
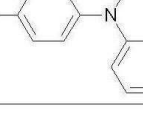
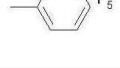
[0068]

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1-108		2	A1		
1-109		2	A1		
1-110		2	A1		
1-111		2	A1		
1-112		2	A1		

[0069]

1-113		2	Al		
1-114		2	Al		
1-115		2	Al		
1-116		2	Al		
1-117		2	Al		
1-118		2	Al		
1-119		2	Al		

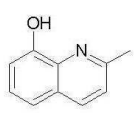
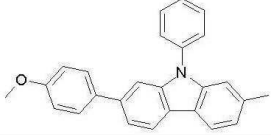
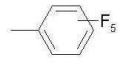
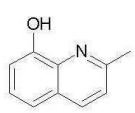
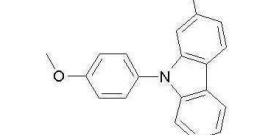
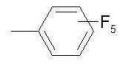
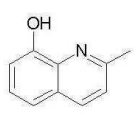
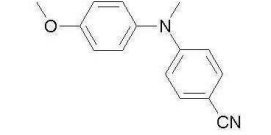
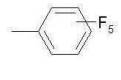
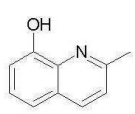
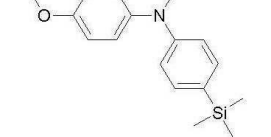
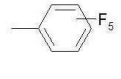
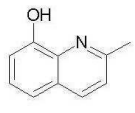
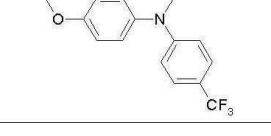
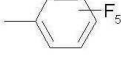
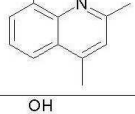
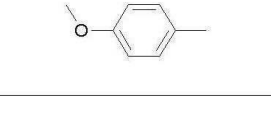
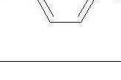
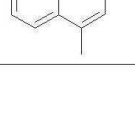


[0070]

1-120		2	AI		
1-121		2	AI		
1-122		2	AI		
1-123		2	AI		
1-124		2	AI		
1-125		2	AI		
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1-127		2	AI		
1-128		2	AI		
1-129		2	AI		

[0071]

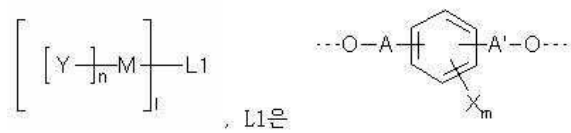
1-130		2	A1		
1-131		2	A1		
1-132		2	A1		
1-133		2	A1		
1-134		2	A1		
1-135		2	A1		
1-136		2	A1		
1-137		2	A1		
1-138		2	A1		
1-139		2	A1		

[0072]

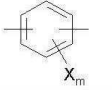
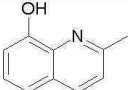


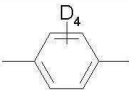
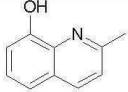
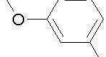
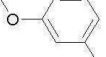
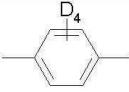
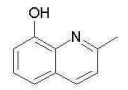
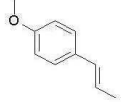
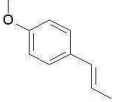
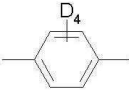
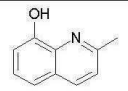
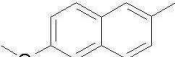
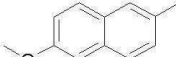
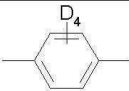
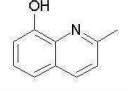
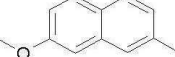
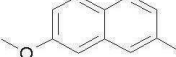
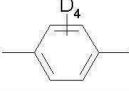
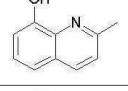
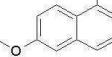
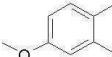
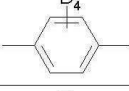
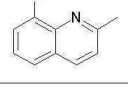
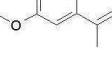
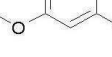
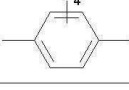
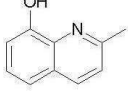


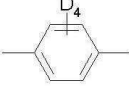
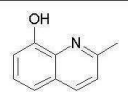
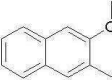
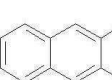
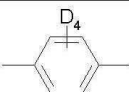
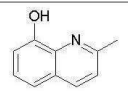
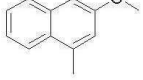
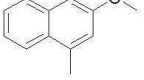
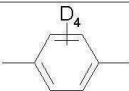
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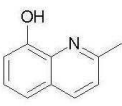
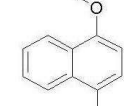
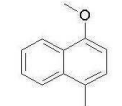
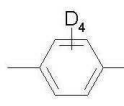
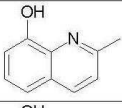
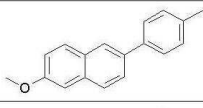
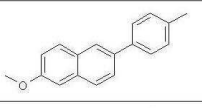
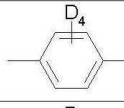
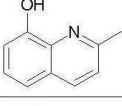
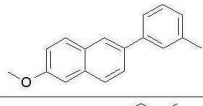
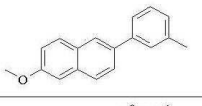
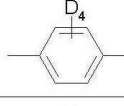
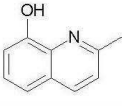
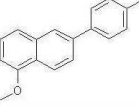
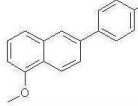
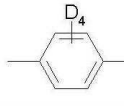
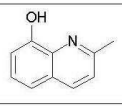
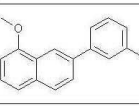
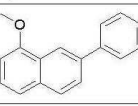
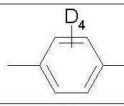
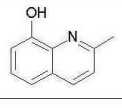
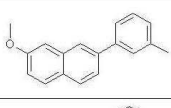
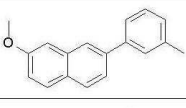
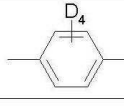
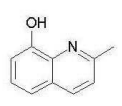
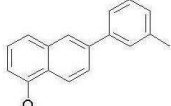
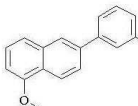
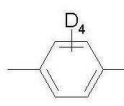
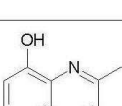
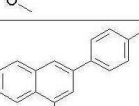
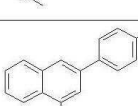
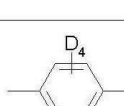
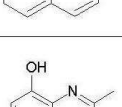
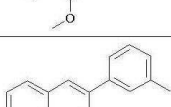
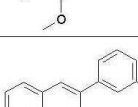
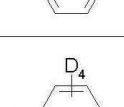
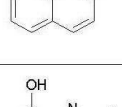
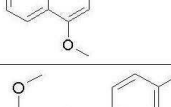
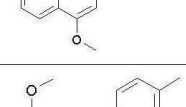
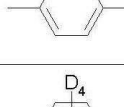
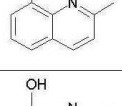
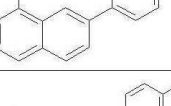
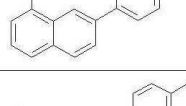
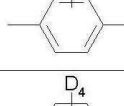
표 2



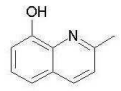
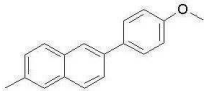
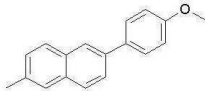
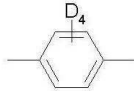
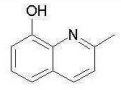
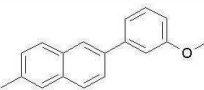
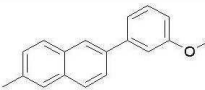
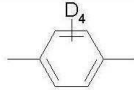
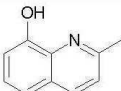
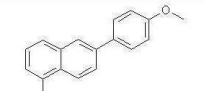
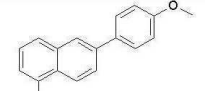
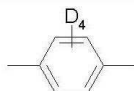
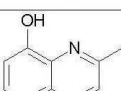
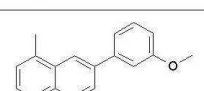
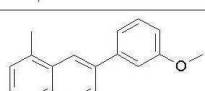
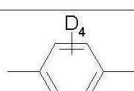
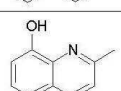
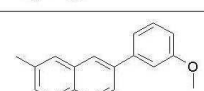
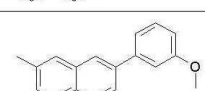
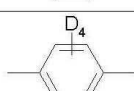
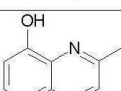
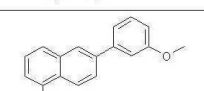
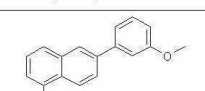
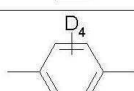
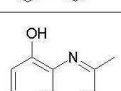
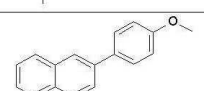
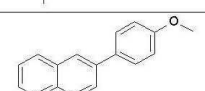
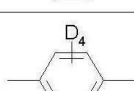
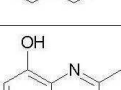
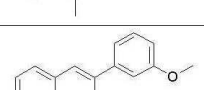
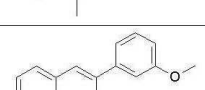
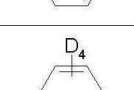
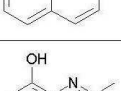
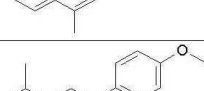
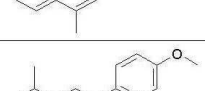
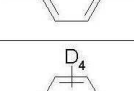
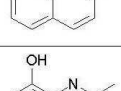
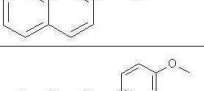
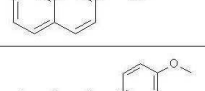
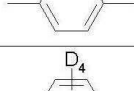
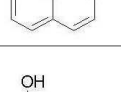
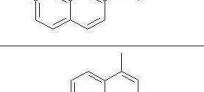
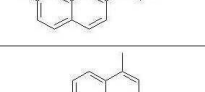
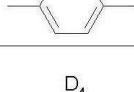
[0074]

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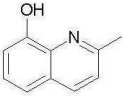
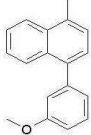
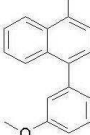
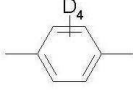
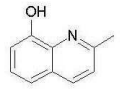
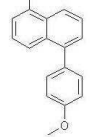
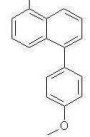
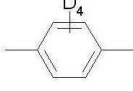
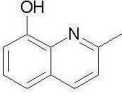
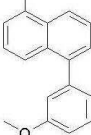
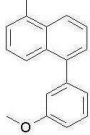
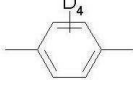
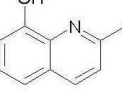
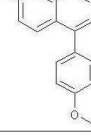
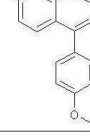
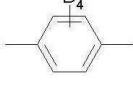
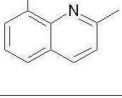
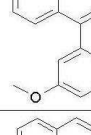
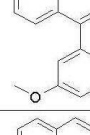
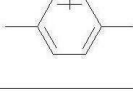
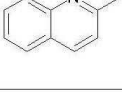
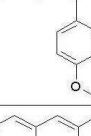
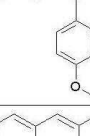
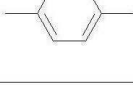
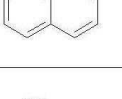
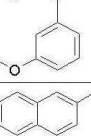
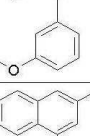
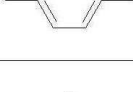
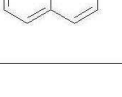
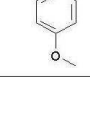
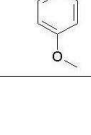
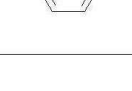
[0075]

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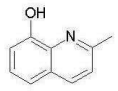
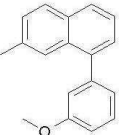
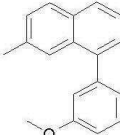
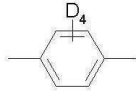
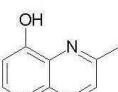
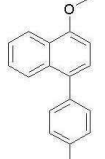
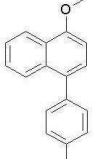
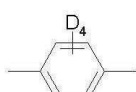
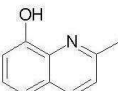
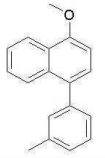
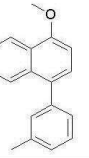
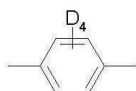
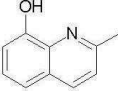
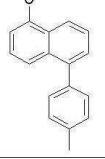
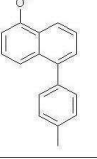
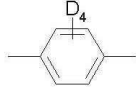
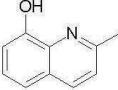
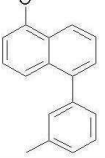
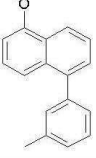
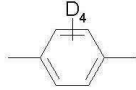
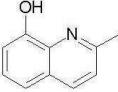
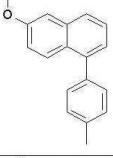
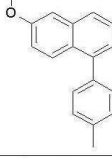
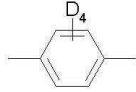
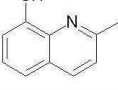
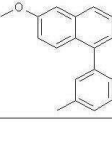
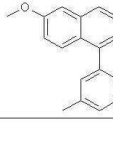
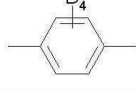
[0076]

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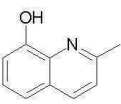
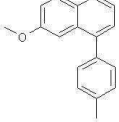
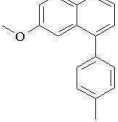
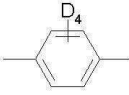
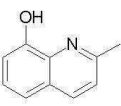
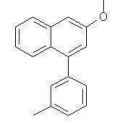
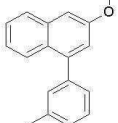
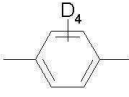
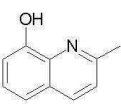
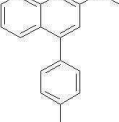
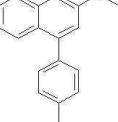
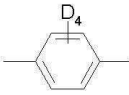
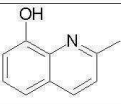
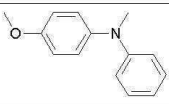
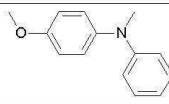
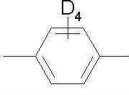
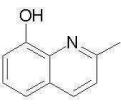
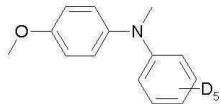
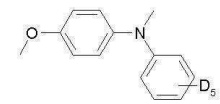
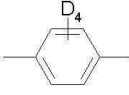
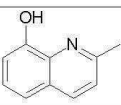
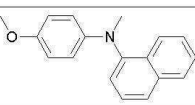
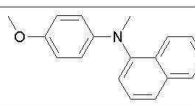
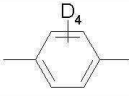
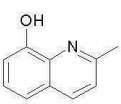
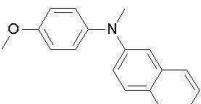
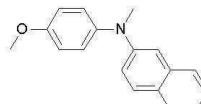
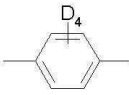
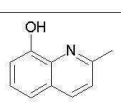
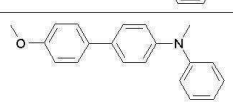
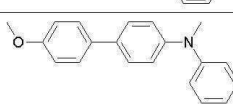
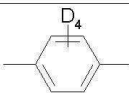
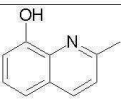
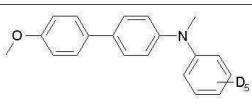
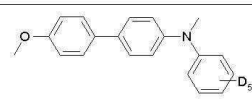
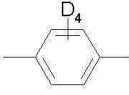
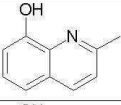
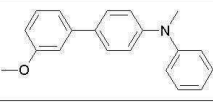
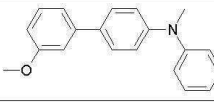
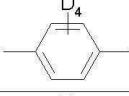
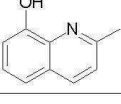
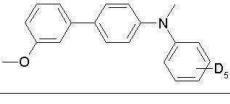
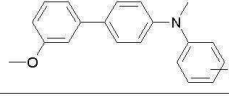
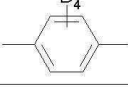
[0077]

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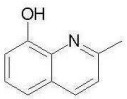
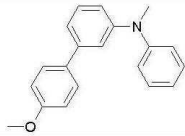
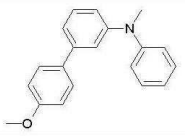
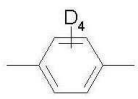
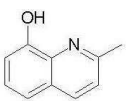
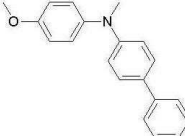
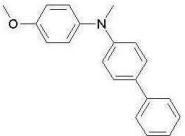
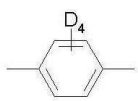
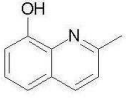
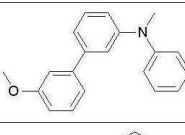
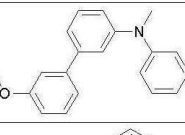
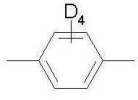
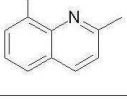
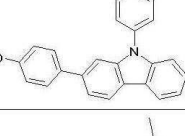
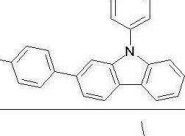
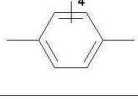
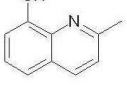
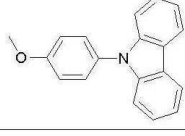
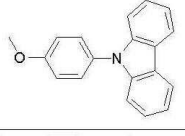
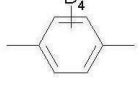
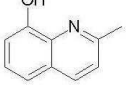
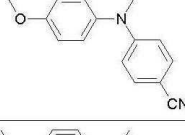
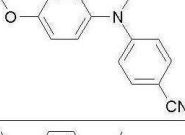
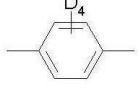
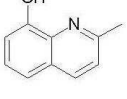
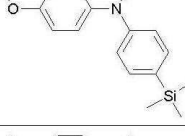
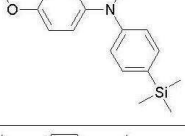
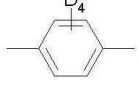
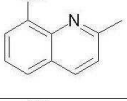
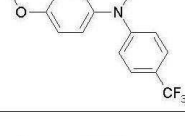
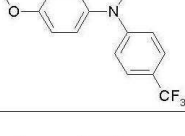
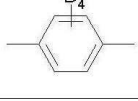
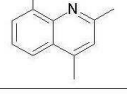
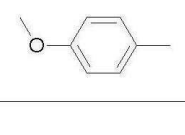
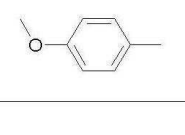
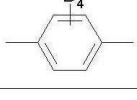
[0078]

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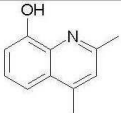
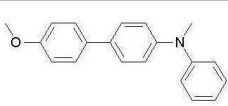
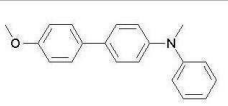
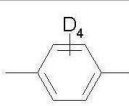
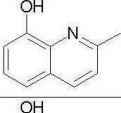
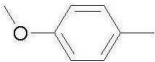

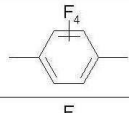
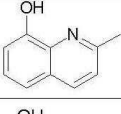
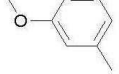
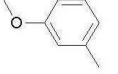
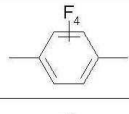
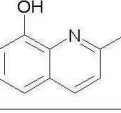
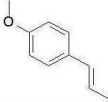
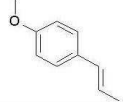
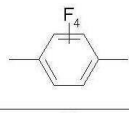
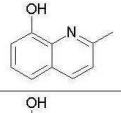
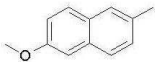
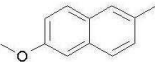
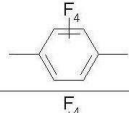
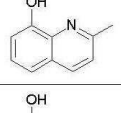
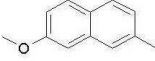
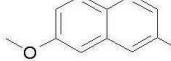
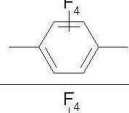
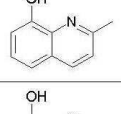
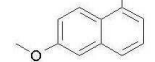
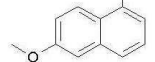
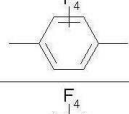
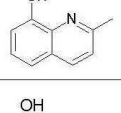
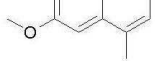
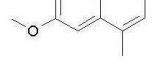
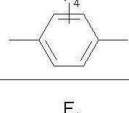
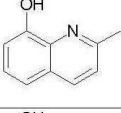
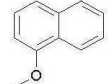
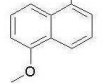
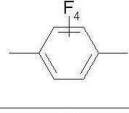
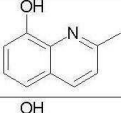
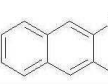
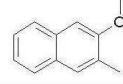
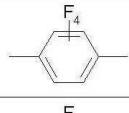
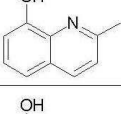
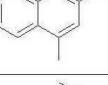
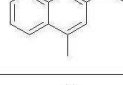
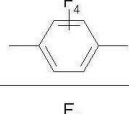
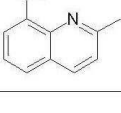
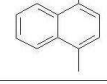
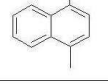
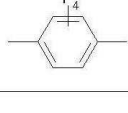
[0079]

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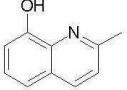
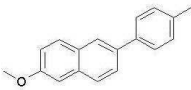
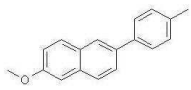
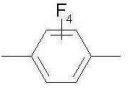
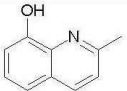
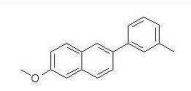
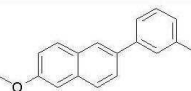
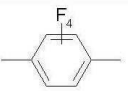
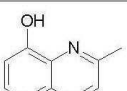
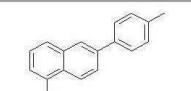
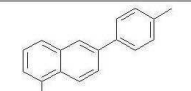
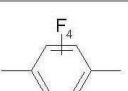
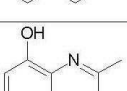
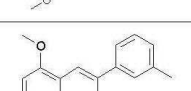
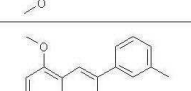
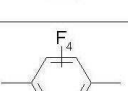
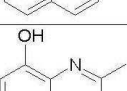
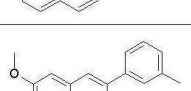
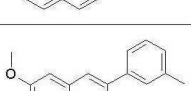
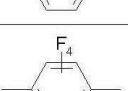
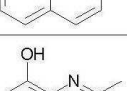
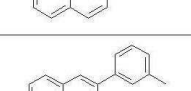
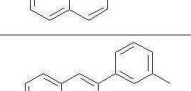
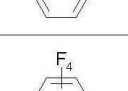
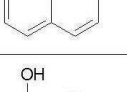
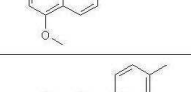
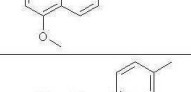
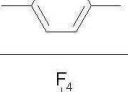
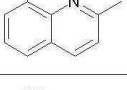
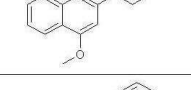
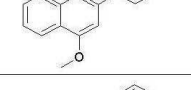
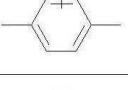
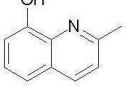
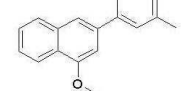
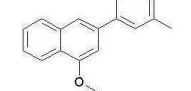
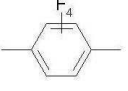
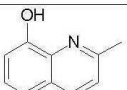
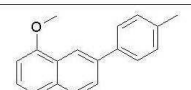
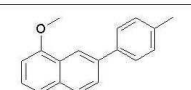
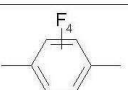
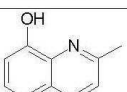
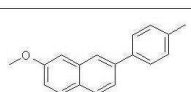
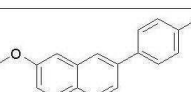
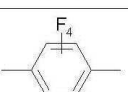
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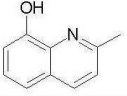
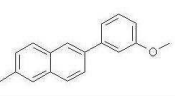
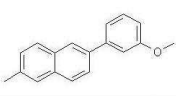
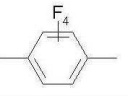
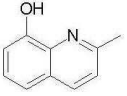
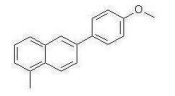
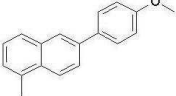
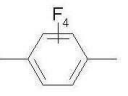
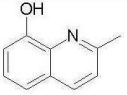
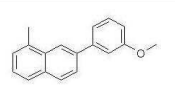
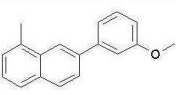
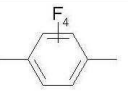
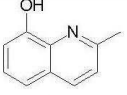
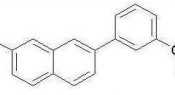
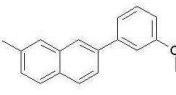
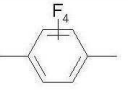
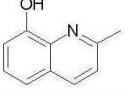
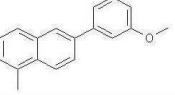
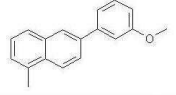
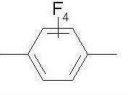
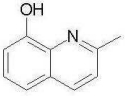
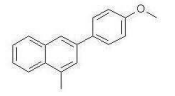
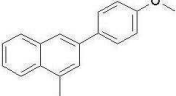
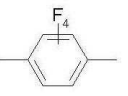
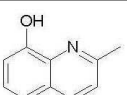
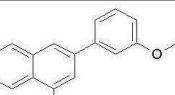
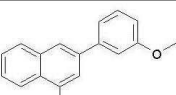
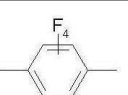
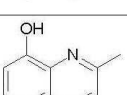
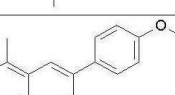
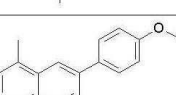
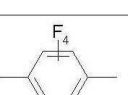
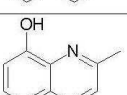
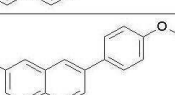
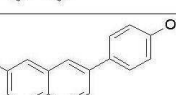
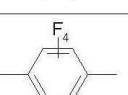
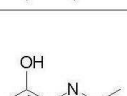
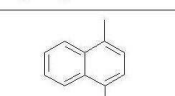
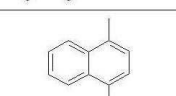
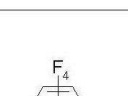
[0081]

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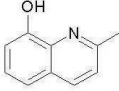
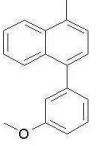
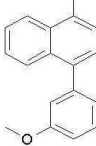
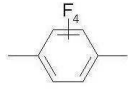
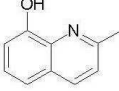
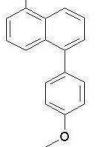
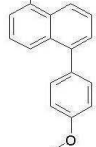
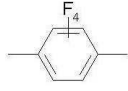
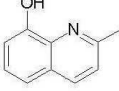
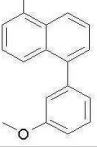
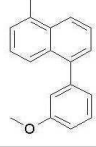
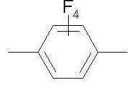
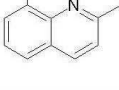
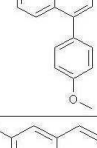
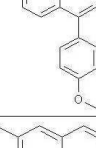
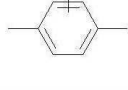
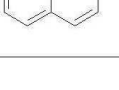
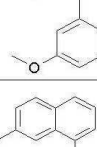
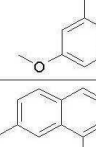
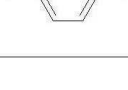
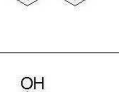
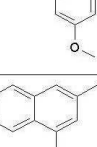
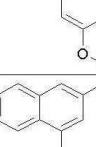



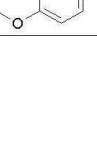

[0082]

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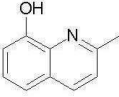
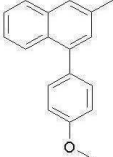
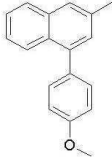

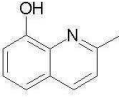
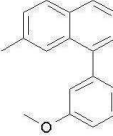
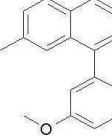
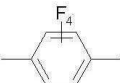
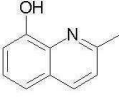
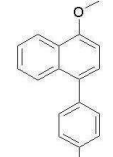
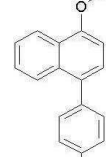
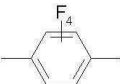
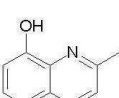
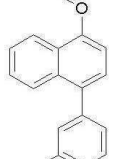
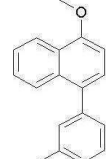
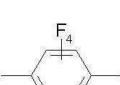
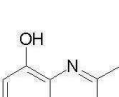
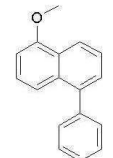
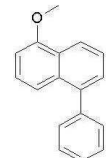
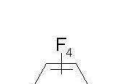
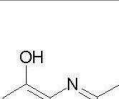
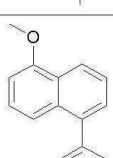
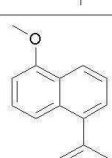
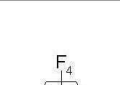
[0083]

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2-96		2	A1			
2-97		2	A1			
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2-99		2	A1			
2-100		2	A1			

[0084]

2-101		2	A1			
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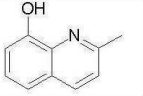
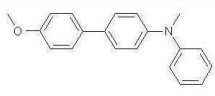
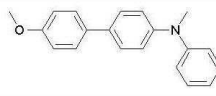

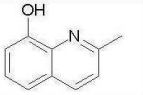
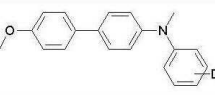
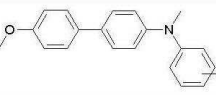
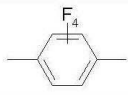
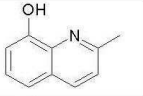
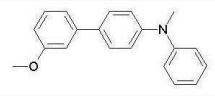
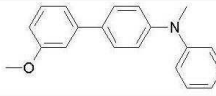
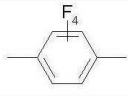
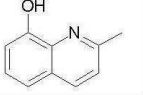
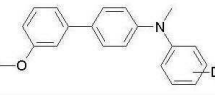
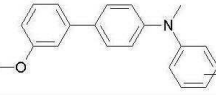
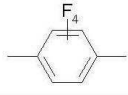
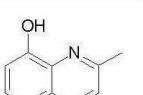
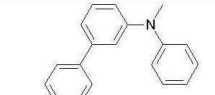
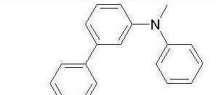

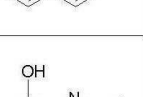
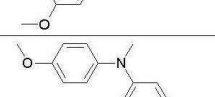
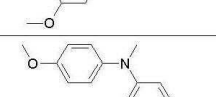
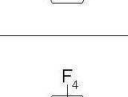
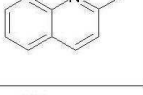


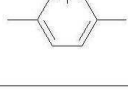
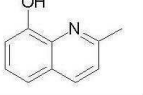
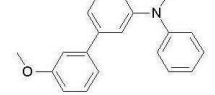
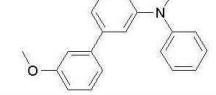
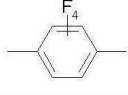
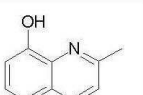
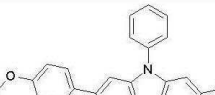
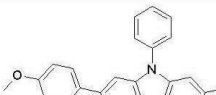
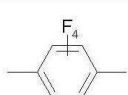
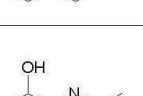


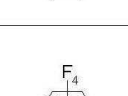
[0085]

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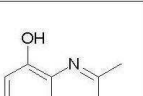
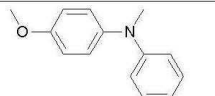
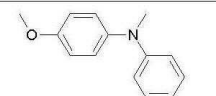
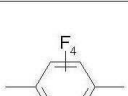
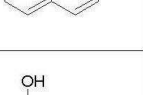
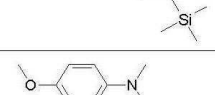
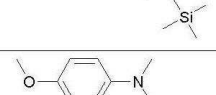
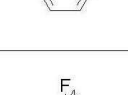
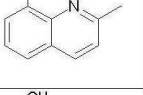
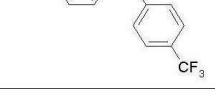
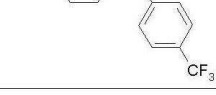
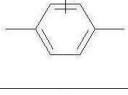
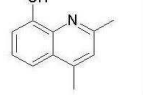
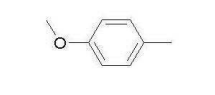
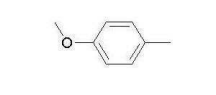

[0086]

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2-118		2	A1			
2-119		2	A1			
2-120		2	A1			
2-121		2	A1			
2-122		2	A1			

[0087]

2-123		2	A1			
2-124		2	A1			
2-125		2	A1			
2-126		2	A1			
2-127		2	A1			
2-128		2	A1			
2-129		2	A1			
2-130		2	A1			
2-131		2	A1			
2-132		2	A1			

[0088]

2-133		2	A1			
2-134		2	A1			
2-135		2	A1			
2-136		2	A1			

[0089]

[0090]

본 발명의 화학식 1 또는 화학식 2의 화합물은 구조적 특이성으로 인하여 유기전자소자 및 유기발광소자에서 유

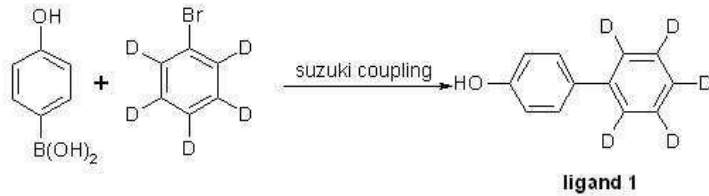
기물층으로 사용될 수 있다.

- [0091] 본 발명의 화합물은 유기발광소자의 통상의 제조 방법에 따라 유기발광소자에 적용할 수 있다.
- [0092] 본 발명의 하나의 실시 상태에 있어서, 유기발광소자는 제1 전극과 제2 전극 및 이 사이에 배치된 유기물층을 포함하는 구조로 이루어질 수 있으며, 본 발명에 따른 화합물을 유기발광소자의 유기물층에 사용한다는 것을 제외하고는 통상의 유기발광소자의 제조 방법 및 재료를 사용하여 제조될 수 있다. 본 발명에 따른 유기발광소자의 구조는 도 2 내지 6에 예시되어 있다.
- [0093] 예컨대, 본 발명에 따른 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, 정공수송층, 발광층, 전자수송층을 포함하는 유기물층을 형성한 후, 그 위에 음극으로 사용할 수 있는 물질을 증착시킴으로써 제조될 수 있다.
- [0094] 이와 같은 방법 외에도, 기판 상에 음극 물질부터 유기물층, 양극 물질을 차례로 증착시켜 유기발광소자를 만들 수도 있다(국제 출원 공개 W02003/012890호). 상기 유기물층은 정공주입층, 정공수송층, 발광층, 전자수송층 등을 포함하는 다층 구조일 수도 있으나, 이에 한정되지 않고 단층 구조일 수 있다. 또한, 상기 유기물층은 다양한 고분자 소재를 사용하여 증착법이 아닌 솔벤트 프로세스(solvent process), 예컨대 스핀 코팅, 딥 코팅, 닥터 블레이딩, 스크린 프린팅, 잉크젯 프린팅, 열 전사법 등의 방법에 의하여 더 적은 수의 층으로 제조할 수 있다.
- [0095] 상기 양극 물질로는 통상 유기물층으로 정공주입이 원활할 수 있도록 일함수가 큰 물질이 바람직하다. 본 발명에서 사용될 수 있는 양극 물질의 구체적인 예로는 바나듐, 크롬, 구리, 아연, 금과 같은 금속 또는 이들의 합금; 아연산화물, 인듐산화물, 인듐주석 산화물(ITO), 인듐아연산화물(IZO)과 같은 금속 산화물; ZnO:Al 또는 SnO₂:Sb와 같은 금속과 산화물의 조합; 폴리(3-메틸티오펜), 폴리[3,4-(에틸렌-1,2-디옥시)티오펜](PEDT), 폴리피롤 및 폴리아닐린과 같은 전도성 고분자 등이 있으나, 이들에만 한정되는 것은 아니다.
- [0096] 상기 음극 물질로는 통상 유기물층으로 전자 주입이 용이하도록 일함수가 작은 물질인 것이 바람직하다. 음극 물질의 구체적인 예로는 마그네슘, 칼슘, 나트륨, 칼륨, 타이타늄, 인듐, 이트륨, 리튬, 가돌리늄, 알루미늄, 은, 주석 및 납과 같은 금속 또는 이들의 합금; LiF/Al 또는 LiO₂/Al과 같은 다층 구조 물질 등이 있으나, 이들에만 한정되는 것은 아니다.
- [0097] 정공주입 물질로는 낮은 전압에서 양극으로부터 정공을 잘 주입받을 수 있는 물질로서, 정공주입 물질의 HOMO(highest occupied molecular orbital)가 양극 물질의 일함수와 주변 유기물층의 HOMO 사이인 것이 바람직하다. 정공주입 물질의 구체적인 예로는 금속 포피린(porphyrine), 올리고티오펜, 아릴아민 계열의 유기물, 헥사니트릴 헥사아자트리페닐렌, 퀴나크리돈(quinacridone) 계열의 유기물, 페릴렌(perylene) 계열의 유기물, 안트라퀴논 및 폴리아닐린과 폴리티오펜 계열의 전도성 고분자 등이 있으나, 이들에만 한정되는 것은 아니다.
- [0098] 정공수송 물질로는 양극이나 정공주입층으로부터 정공을 수송 받아 발광층으로 옮겨줄 수 있는 물질로 정공에 대한 이동성이 큰 물질이 적합하다. 구체적인 예로는 아릴아민 계열의 유기물, 전도성 고분자, 및 공액 부분과 비공액 부분이 함께 있는 블록 공중합체 등이 있으나, 이들에만 한정되는 것은 아니다.
- [0099] 발광 물질로는 정공수송층과 전자수송층으로부터 정공과 전자를 각각 수송받아 결합시킴으로써 가시광선 영역의 빛을 낼 수 있는 물질로서, 형광이나 인광에 대한 양자효율이 좋은 물질이 바람직하다. 구체적인 예로는 8-히드록시-퀴놀린 알루미늄 착물 (Alq₃); 카르바졸 계열 화합물; 이량체화 스티릴(dimerized styryl) 화합물; BAq; 10-히드록시벤조 퀴놀린-금속 화합물; 벤족사졸, 벤즈티아졸 및 벤즈이미다졸 계열의 화합물; 폴리(p-페닐렌비닐렌)(PPV) 계열의 고분자; 스피로(spiro) 화합물; 폴리플루오렌, 루브렌 등이 있으나, 이들에만 한정되는 것은 아니다.
- [0100] 전자수송 물질로는 음극으로부터 전자를 잘 주입 받아 발광층으로 옮겨줄 수 있는 물질로서, 전자에 대한 이동성이 큰 물질이 적합하다. 구체적인 예로는 8-히드록시퀴놀린의 Al 착물; Alq₃를 포함한 착물; 유기 라디칼 화합물; 히드록시플라본-금속 착물 등이 있으나, 이들에만 한정되는 것은 아니다.
- [0101] 본 발명에 따른 유기발광소자는 사용되는 재료에 따라 전면 발광형, 후면 발광형 또는 양면 발광형일 수 있다.
- [0102] 본 발명에 따른 화합물은 유기태양전지, 유기감광체(OPC) 드럼, 유기 트랜지스터 등을 비롯한 유기전자소자에서

도 유기발광소자에 적용되는 것과 유사한 원리로 작용될 수 있다.

[0103] 이하, 본 발명의 실시예를 통해 본 발명에 대해 상세히 설명한다. 그러나, 본 발명의 실시예들은 여러 가지 형태로 변형될 수 있으며, 본 발명의 범위가 아래에서 상술하는 실시예들로 인하여 한정되는 식으로 해석되어서는 안된다. 본 발명의 실시예들은 당업계에서 평균적 지식을 가진 자에게 본 발명을 보다 완전하게 설명하기 위해 제공되는 것이다.

[0104] <제조예 1> 리간드 1의 합성

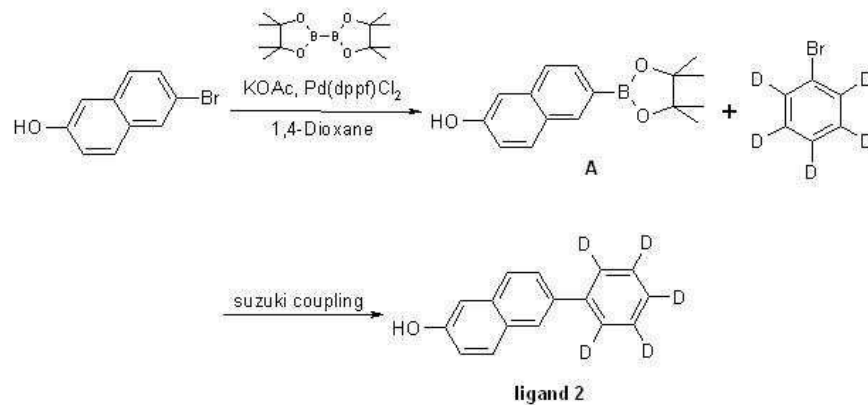


[0105] 1) 리간드 1의 합성

[0107] 4-하이드록시페닐보론산(5 g, 36.3 mmol)과 브로모벤젠-d5(3.8 ml, 36.3 mmol)을 테트라하이드로퓨란(72 mL)에 녹인 후 2M K₂CO₃(72 mL)을 첨가하였다. 50°C로 온도를 올린 후 테트라비스트리페닐포스피노팔라듐 (Pd(PPh₃)₄)(419 mg, 3.6 × 10⁻² mmol)을 넣은 후 65°C로 온도를 올린 후 1시간 교반하였다. 상온으로 온도를 내린 후 물층은 버리고 유기층은 무수황산마그네슘으로 수분을 완전히 제거 후 여과하였다. 여과액의 용매를 감압 증류하여 완전히 제거한 후 컬럼 정제하여 리간드 1(3.8 g)을 60%의 수율로 얻었다.

[0108] MS: [M-H]⁻=174

[0109] <제조예 2> 리간드 2의 합성



[0110] 1) 화합물 A의 합성

[0112] 2-브로모-6-나프톨(2 g, 9.0 mmol)과 비스(피나콜라토)디보론(2.5 g, 9.9 mmol), 아세트산 칼륨(1.8 g, 17.9 mmol)을 1,4-디옥산(50 mL)에 넣고 50°C로 승온한 후, 팔라듐(디페닐포스피노페로센)클로라이드(73 mg, 9.0 × 10⁻² mmol)를 첨가한 후 5 시간 가열 교반하였다. 상온으로 온도를 낮추고 상기 혼합물을 물(50 mL)로 희석하고 디클로로메탄(3 × 50 mL)으로 추출하였다. 유기 추출물을 황산 마그네슘 상에서 건조하고 진공 내 농축하였다. 에탄올로 세척하고 진공 내 건조하여 화합물 A(1.2 g)를 79%의 수율로 얻었다.

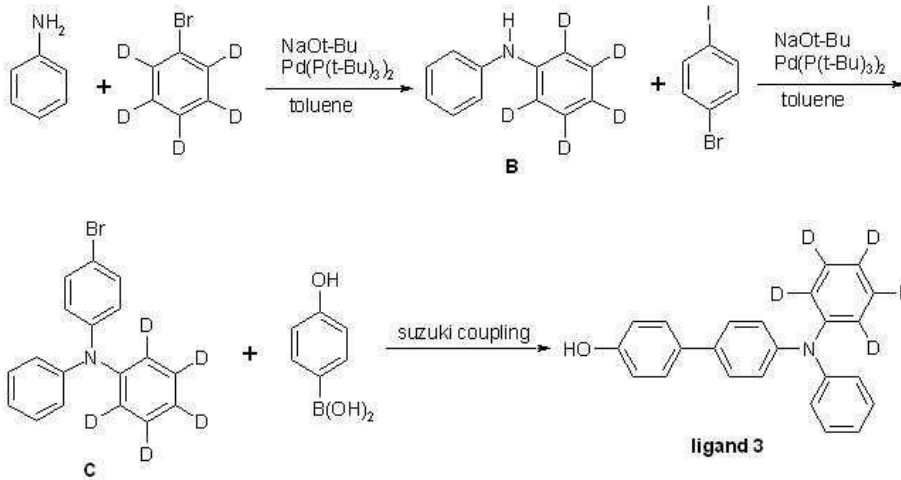
[0113] MS: [M+H]⁺=271

[0114] 3) 리간드 2의 합성

[0115] 4-하이드록시페닐보론산 대신 화합물 A를 사용한 것을 제외하고 상기 제조예 1의 리간드 1의 합성 방법과 동일한 방법으로 리간드 2를 얻었다.

[0116] MS: $[M-H]^- = 224$

[0117] <제조예 3> 리간드 3의 합성



[0118]

[0119] 1) 화합물 B의 합성

[0120] 아닐린(4 mL, 43.9 mmol), 브로모벤젠-d₅(4.6 mL, 43.9 mmol) 그리고 소듐-t-부톡사이드(8.4 g, 87.8 mmol)을 톨루엔(220 mL)에 넣고 50°C로 승온한 후, Pd(P(t-Bu)₃)₂(224 mg, 4.4 × 10⁻² mmol)를 첨가한 후 5 시간 가열 교반하였다. 상온으로 온도를 낮추고 상기 혼합물을 물(50 mL)로 희석하고 디클로로메탄(3 × 50 mL)으로 추출하였다. 유기 추출물을 황산 마그네슘 상에서 건조하고 진공 내 농축하였다. 킬럼 정제를 통하여 화합물 B(6.5 g)를 85%의 수율로 얻었다.

[0121] MS: $[M+H]^+ = 175$

[0122] 2) 화합물 C의 합성

[0123] 아닐린 대신 화합물 B, 브로모벤젠-d₅ 대신 4-브로모아이오도벤젠을 사용한 것을 제외하고 화합물 B의 합성 방법과 동일한 방법으로 화합물 C를 81%의 수율로 얻었다.

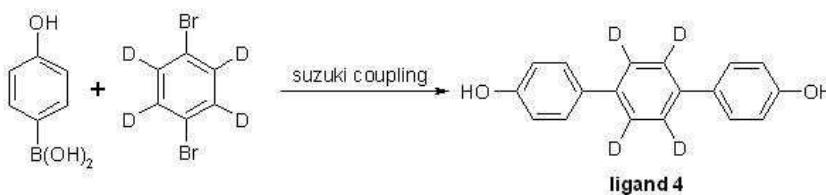
[0124] MS: $[M+H]^+ = 330$

[0125] 3) 리간드 3의 합성

[0126] 브로모벤젠-d₅ 대신 화합물 C를 사용한 것을 제외하고 상기 제조예 1의 리간드 1의 합성 방법과 동일한 방법으로 리간드 3을 얻었다.

[0127] MS: $[M-H]^- = 341$

[0128] <제조예 4> 리간드 4의 합성



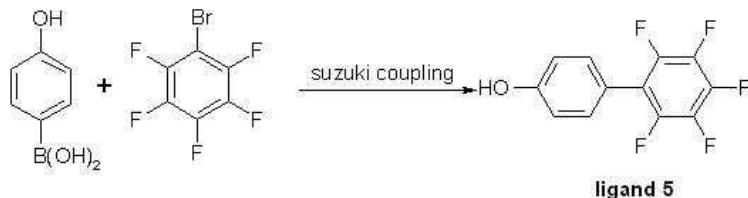
[0129]

[0130] 4-하이드록시페닐보론산(5 g, 36.3 mmol)과 1,4-디브로모벤젠-d₄(4.4 g, 18.2 mmol)를 테트라하이드로퓨란(72 mL)에 녹인 후 2M K₂CO₃(72 mL)을 첨가하였다. 50°C로 온도를 올린 후 테트라비스트리페닐포스피노팔라듐

(Pd(PPh₃)₄)(319 mg, 3.6 × 10⁻² mmol)을 넣은 후 65°C로 온도를 올린 후 1시간 교반하였다. 상온으로 온도를 내린 후 물층은 버리고 유기층은 무수황산마그네슘으로 수분을 완전히 제거 후 여과하였다. 여과액의 용매를 감압 증류하여 완전히 제거한 후 컬럼 정제하여 리간드 4(2 g)를 42%의 수율로 얻었다.

[0131] MS: [M-2H]⁻=264

[0132] <제조예 5> 리간드 5의 합성



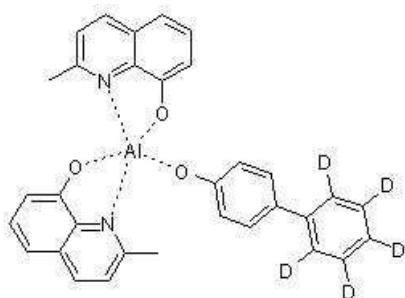
[0133]

[0134] 1) 리간드 5의 합성

[0135] 브로모벤젠-d5 대신 브로모펜타플루오로벤젠, 테트라하이드로퓨란 대신 자일렌을 사용한 것을 제외하고 리간드 1의 합성 방법과 동일한 방법으로 리간드 5를 합성하였다.

[0136] MS: [M-H]⁻=259

[0137] <실시예 1> 화학식 1-1의 합성

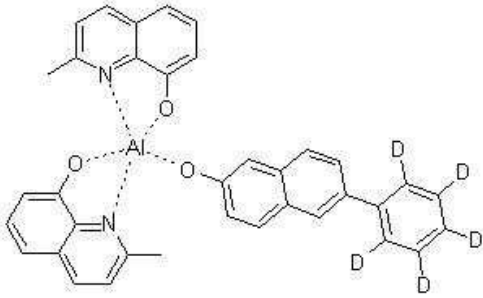


[0138]

[0139] 무수톨루엔에 1.9 M의 농도로 톨루엔에 녹아있는 트리에틸알루미늄(1 당량)을 넣은 후 무수톨루엔에 녹아 있는 8-하이드록시퀴날딘(2 당량)을 천천히 첨가하였다. 첨가가 완료된 후 투명한 노란색 용액이 될 때까지 가열 교반하였다. 무수톨루엔 혹은 무수 테트라하이드로퓨란에 녹아있는 제조예 1에서 합성된 리간드 1(1당량)을 천천히 첨가한 후 1~4 시간 가열 교반한 후 상온으로 온도를 낮추었다. 상온으로 온도를 낮추면 침전물이 생성되고 여기에 에탄올을 첨가하여 침전물이 더 잘 생기도록 한 후 생성된 침전물을 여과하였다. 여과된 고체를 디클로로메탄 혹은 톨루엔과 에탄올을 사용해서 재결정한 후 진공 건조하여 알루미늄 착물을 얻었다. 알루미늄 착물은 NMR 및 MS 분석으로 확인하였다.

[0140] MS: [M-H]⁻=518, [M-L-H]⁻=344, [L-H]⁻=175

[0141] <실시예 2> 화학식 1-4 의 합성



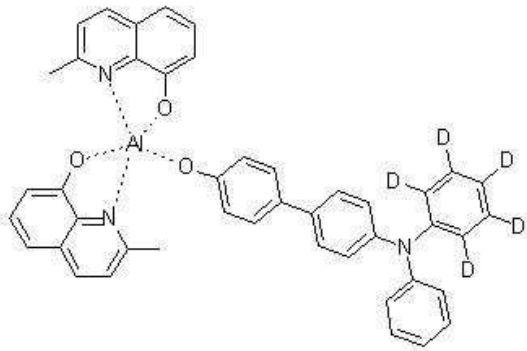
[0142]

[0143] 실시예 1의 리간드 1 대신 제조예 2에서 합성된 리간드 2를 사용하는 것을 제외하고 실시예 1과 동일한 방법으로 화학식 1-4의 알루미늄 착물 화합물을 얻었다.

[0144] 상기 알루미늄 착물은 NMR 및 MS 분석으로 확인하였다.

[0145] MS: $[M-H]^- = 568$, $[M-L-H]^- = 344$, $[L-H]^- = 225$

[0146] <실시예 3> 화학식 1-60 의 합성

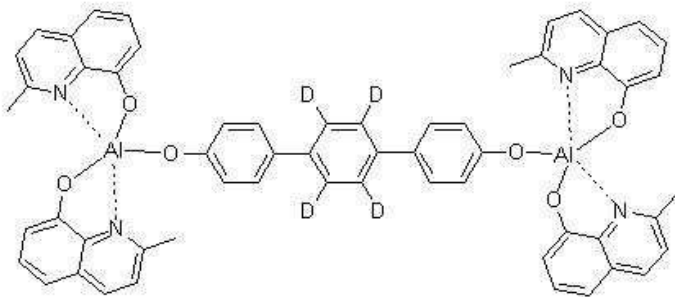


[0147]

[0148] 실시예 1의 리간드 1 대신 제조예 3을 통해 합성된 리간드 3을 사용하는 것을 제외하고는 실시예 1과 동일한 방법으로 화학식 1-60의 알루미늄 착물 화합물을 얻었다.

[0149] MS: $[M-H]^- = 685$, $[M-L-H]^- = 344$, $[L-H]^- = 342$

[0150] <실시예 4> 화학식 2-1 의 합성

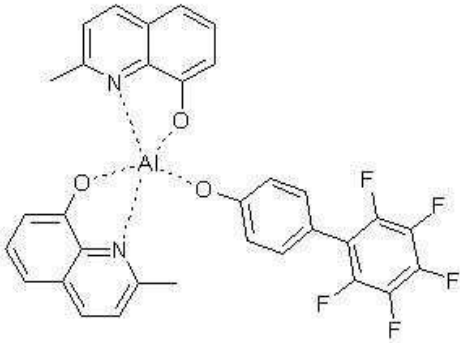


[0151]

[0152] 실시예 1의 리간드 1 대신 제조예 4를 통해 합성된 리간드 4를 0.5 당량 사용하는 것을 제외하고는 실시예 1과 동일한 방법으로 화학식 2-1의 알루미늄 착물 화합물을 얻었다.

[0153] MS: $[M-H]^- = 949$, $[M-L-H]^- = 344$, $[L-2H]^- = 262$

[0154] <실시예 5> 화학식 1-74 의 합성



[0155]

[0156] 실시예 1의 리간드 1 대신 제조예 3을 통해 합성된 리간드 5를 사용하는 것을 제외하고는 실시예 1과 동일한 방법으로 화학식 1-74의 알루미늄 착물 화합물을 얻었다.

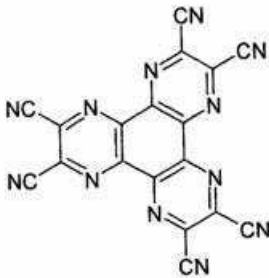
[0157] MS: $[M-H]^- = 603$, $[M-L-H]^- = 344$, $[L-H]^- = 260$

[0158] <실험예 1>

[0159] ITO(인듐주석산화물)가 1000 Å의 두께로 박막 코팅된 유리 기판 (corning 7059 glass)을 분산제를 녹인 증류수에 넣고 초음파로 세척하였다. 세제는 Fischer Co.의 제품을 사용하였으며, 증류수는 Millipore Co. 제품의 필터(Filter)로 2 차 걸러진 증류수를 사용하였다. ITO를 30 분간 세척한 후, 증류수로 2 회 반복하여 초음파 세척을 10 분간 진행하였다. 증류수 세척이 끝난 후 이소프로필알콜, 아세톤, 메탄올 용제 순서로 초음파 세척을 하고 건조시켰다.

[0160] 상기 ITO 전극 위에 하기 헥사니트릴 헥사아자트리페닐렌(HAT)(500 Å)을 진공 증착하여 정공주입층을 형성하였다.

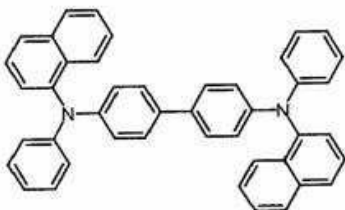
[0161] [HAT]



[0162]

[0163] 상기 정공주입층 위에 하기 4,4'-비스[N-(1-나프틸)-N-페닐아미노] 비페닐(NPB) (400 Å)을 진공 증착하여 정공수송층을 형성하였다.

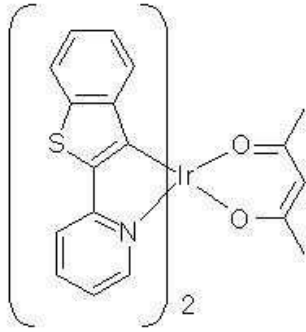
[0164] [NPB]



[0165]

[0166] 상기 정공수송층 위에 화학식 1-1 에 Btp2Ir(acac)을 4% 도핑하여 진공 증착하여 적색 발광층 (300 Å)을 형성시켰다.

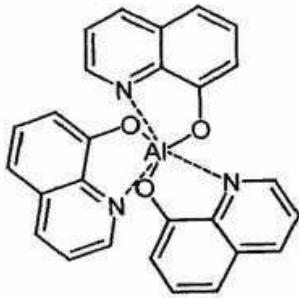
[0167] [Btp2Ir(acac)]



[0168]

[0169] 상기 적색 발광층 위에 순차적으로 200 Å의 Alq₃을 진공 증착하여 전자수송층을 형성시켰다.

[0170] [Alq₃]



[0171]

[0172] 상기 전자수송층 위에 순차적으로 12 Å의 두께의 리튬 플루오라이드(LiF)와 2000 Å의 두께의 알루미늄을 증착하여 음극을 형성하여, 유기발광소자를 제조하였다.

[0173] 상기의 과정에서 유기물의 증착속도는 0.4 ~ 0.7 Å/sec를 유지하였고, 음극의 리튬플루오라이드는 0.3 Å/sec, 알루미늄은 2 Å/sec의 증착 속도를 유지하였으며, 증착시 진공도는 $2 \times 10^{-7} \sim 5 \times 10^{-8}$ torr를 유지하였다.

[0174] 상기에서 제조된 유기발광소자에 10 mA/cm²의 순방향 전류를 가한 결과, 6.1 V의 전압에서 1931 CIE color coordinate 기준으로 x = 0.65, y = 0.34 에 해당하는 16.3 cd/A의 적색 빛이 관찰되었다.

[0175] <실험예 2>

[0176] 실험예 1과 같은 방법으로, ITO 전극 위에 헥사니트릴 헥사아자트리페닐렌(500Å), 4,4'-비스[N-(1-나프틸)-N-페닐아미노] 비페닐(NPB)(400 Å), 화학식 1-34 에 Btp2Ir(acac)을 4% 도핑하여 진공 증착하여 적색 발광층 (300 Å), Alq₃(200 Å)의 화합물을 순차적으로 열 진공 증착하여 정공주입층, 정공수송층, 및 발광층, 전자수송층을 차례로 형성하였다.

[0177] 상기 전자수송층 위에 순차적으로 12 Å의 두께의 리튬 플루오라이드(LiF)와 2000 Å의 두께의 알루미늄을 증착하여 음극을 형성하여, 유기발광소자를 제조하였다.

[0178] 상기 과정에서 유기물의 증착속도는 0.4 ~ 0.7 Å/sec를 유지하였고, 음극의 리튬플루오라이드는 0.3 Å/sec, 알루미늄은 2 Å/sec의 증착 속도를 유지하였으며, 증착시 진공도는 $2 \times 10^{-7} \sim 5 \times 10^{-8}$ torr를 유지하였다.

[0179] 상기에서 제조된 유기발광소자에 10 mA/cm²의 순방향 전류를 가한 결과, 6.3 V의 전압에서 1931 CIE color coordinate 기준으로 x = 0.65, y = 0.34 에 해당하는 14.1 cd/A의 적색 빛이 관찰되었다.

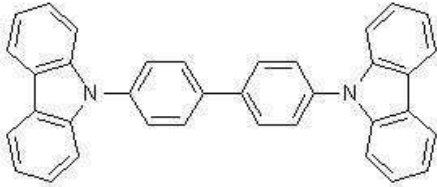
[0180] <비교예 1>

[0181] ITO(인듐주석산화물)가 1000 Å의 두께로 박막 코팅된 유리 기판 (corning 7059 glass)을 분산제를 녹인 증류수

에 넣고 초음파로 세척하였다. 세제는 Fischer Co.의 제품을 사용하였으며, 증류수는 Millipore Co. 제품의 필터(Filter)로 2차 걸러진 증류수를 사용하였다. ITO를 30분간 세척한 후, 증류수로 2회 반복하여 초음파 세척을 10분간 진행하였다. 증류수 세척이 끝난 후 이소프로필알콜, 아세톤, 메탄올 용제 순서로 초음파 세척을 하고 건조시켰다.

[0182] 상기 ITO 전극 위에 헥사니트릴 헥사아자트리페닐렌(500 Å), 4,4'-비스[N-(1-나프틸)-N-페닐아미노]비페닐(NPB) (400 Å), CBP에 Btp2Ir(acac)을 4% 도핑(300 Å), Alq₃ (200 Å)를 순차적으로 열 진공 증착하여 정공주입층, 정공수송층, 발광층, 전자수송층을 차례로 형성시켰다.

[0183] [CBP]



[0184]

[0185] 상기 전자수송층 위에 순차적으로 12 Å의 두께의 리튬 플루오라이드(LiF)와 2000 Å의 두께의 알루미늄을 증착하여 음극을 형성하여, 유기발광소자를 제조하였다.

[0186] 상기의 과정에서 유기물의 증착속도는 0.4 ~ 0.7 Å/sec를 유지하였고, 음극의 리튬플루오라이드는 0.3 Å/sec, 알루미늄은 2 Å/sec의 증착 속도를 유지하였으며, 증착시 진공도는 $2 \times 10^{-7} \sim 5 \times 10^{-8}$ torr를 유지하였다.

[0187] 상기에서 제조된 유기발광소자에 10 mA/cm²의 순방향 전류를 가한 결과, 8.0 V의 전압에서 1931 CIE color coordinate 기준으로 x = 0.66, y = 0.35에 해당하는 10.7 cd/A의 적색 빛이 관찰되었다.

도면의 간단한 설명

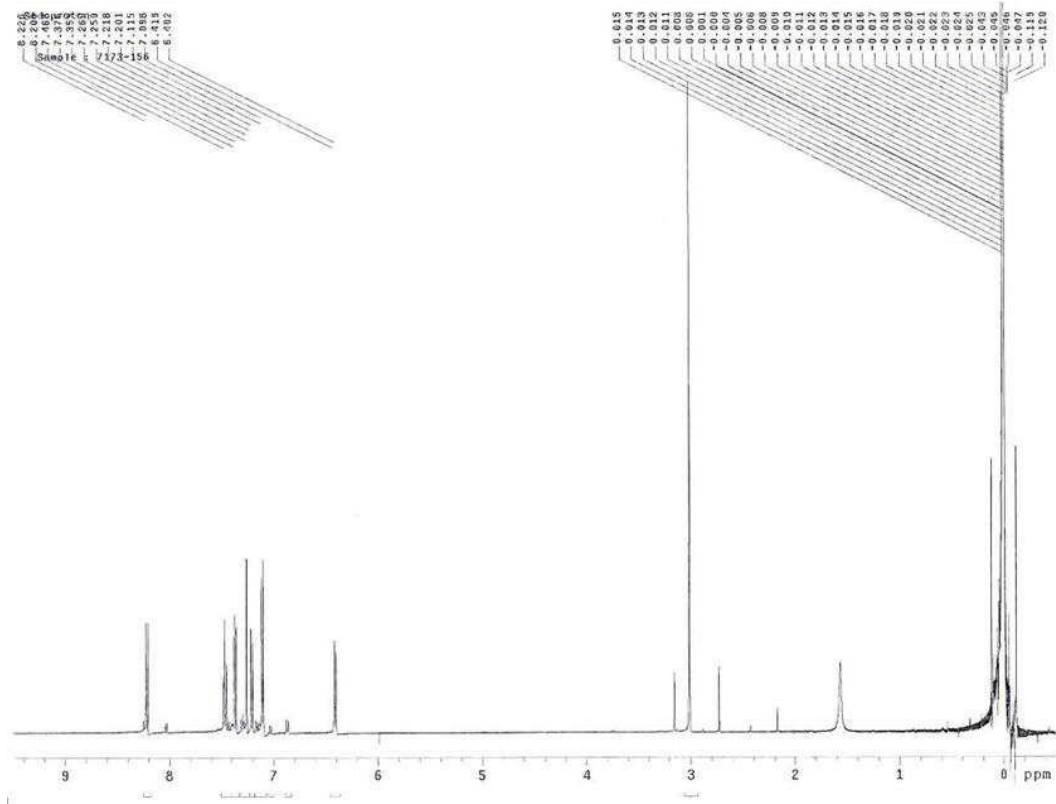
- [0188] 도 1은 본 발명의 화학식 1-1의 전체구조의 ¹H-NMR 그래프이다.
 [0189] 도 2는 본 발명의 화학식 1-1의 중수소가 치환된 아릴기의 ¹H-NMR 그래프이다.
 [0190] 도 3 내지 7은 본 발명에 따른 유기발광소자의 구조를 예시한 단면도이다.

[0191] [도면의 주요 부분에 대한 부호의 설명]

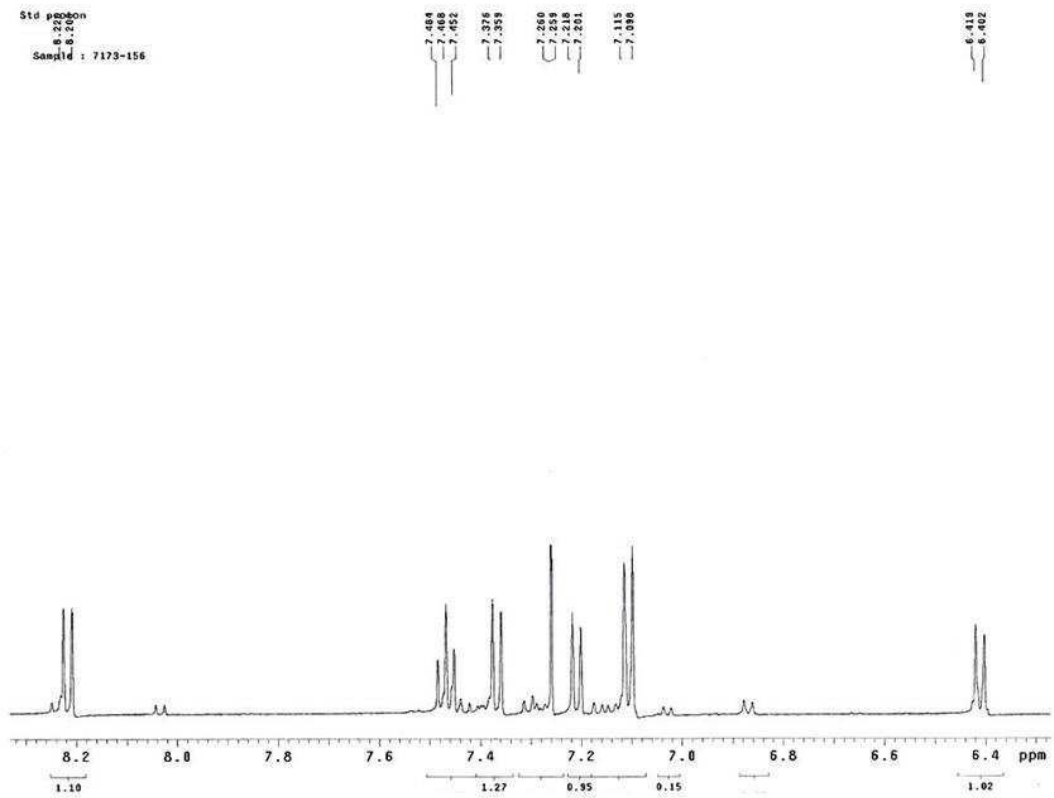
- [0192] 1 : 기관
- [0193] 2 : 양극
- [0193] 3 : 정공주입층
- [0193] 4 : 정공수송층
- [0194] 5 : 발광층
- [0194] 6 : 전자수송층
- [0195] 7 : 음극

도면

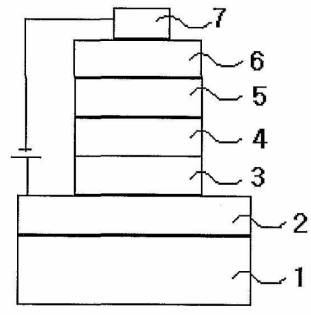
도면1



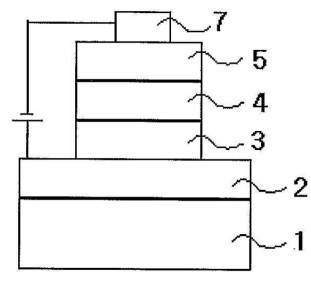
도면2



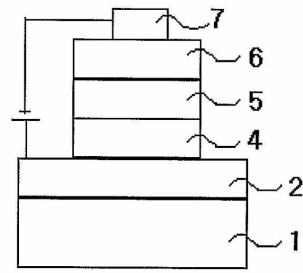
도면3



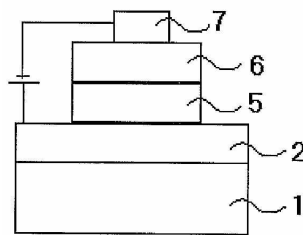
도면4



도면5



도면6



도면7

