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Kang et al.

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(54) **COMPOUND FOR ORGANIC ELECTROLUMINESCENT DEVICE AND ORGANIC ELECTROLUMINESCENT DEVICE INCLUDING THE SAME**

(71) Applicant: **SK CHEMICALS CO., LTD.**, Seongnam-si, Gyeonggi-do (KR)

(72) Inventors: **Ju-Sik Kang**, Hwaseong-si (KR); **Jeong Ho Park**, Seongnam-si (KR); **Suk Woon Jun**, Suwon-si (KR); **Yong-Jun Shin**, Seoul (KR); **Yu-Mi Chang**, Gwangju-si (KR); **Nam-Choul Yang**, Seoul (KR); **Jae-Kyun Park**, Incheon (KR); **Song Lee**, Seoul (KR)

(73) Assignee: **SK CHEMICALS CO., LTD.**, Seongnam-si (KR)

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CPC ***H01L 51/0059*** (2013.01); ***C07C 211/54*** (2013.01); ***C07D 209/86*** (2013.01);
(Continued)

(58) **Field of Classification Search**
None
See application file for complete search history.

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Primary Examiner — Robert S Loewe
(74) *Attorney, Agent, or Firm* — STIP Law Group, LLC

(57) **ABSTRACT**

This invention relates to a compound for an organic electroluminescent device and to an organic electroluminescent device including the same. This compound for an organic electroluminescent device including the same is improved in thermal stability and light emission efficiency. When this compound is used as a hole transport layer material, a triplet
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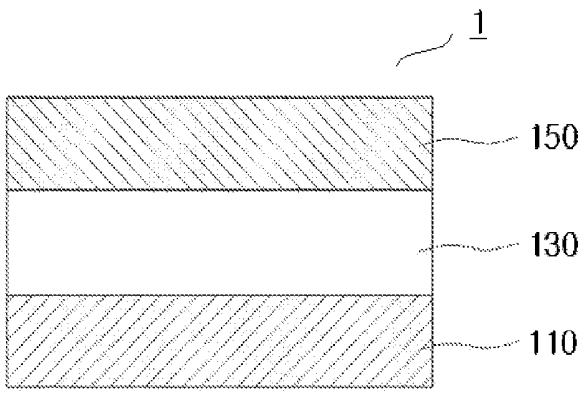

energy of a phosphorescent light emitting material is increased, thus improving the efficiency of the organic electroluminescent device.

12 Claims, 1 Drawing Sheet

(51) **Int. Cl.**

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C07D 209/86	(2006.01)
C07D 219/02	(2006.01)
C07D 401/10	(2006.01)
C07D 405/12	(2006.01)
C07D 307/91	(2006.01)
H01L 51/50	(2006.01)
H01L 51/52	(2006.01)

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CPC ***C07D 219/02*** (2013.01); ***C07D 307/91*** (2013.01); ***C07D 401/10*** (2013.01); ***C07D 405/12*** (2013.01); ***C09K 11/06*** (2013.01); ***H01L 51/0072*** (2013.01); ***H01L 51/0073*** (2013.01); *C09K 2211/1007* (2013.01); *C09K 2211/1014* (2013.01); *C09K 2211/1029* (2013.01); *C09K 2211/1088* (2013.01); *H01L 51/0054* (2013.01); *H01L 51/0074* (2013.01); *H01L 51/0081* (2013.01); *H01L 51/0085* (2013.01); *H01L 51/5004* (2013.01); *H01L 51/5056* (2013.01); *H01L 51/5221* (2013.01)

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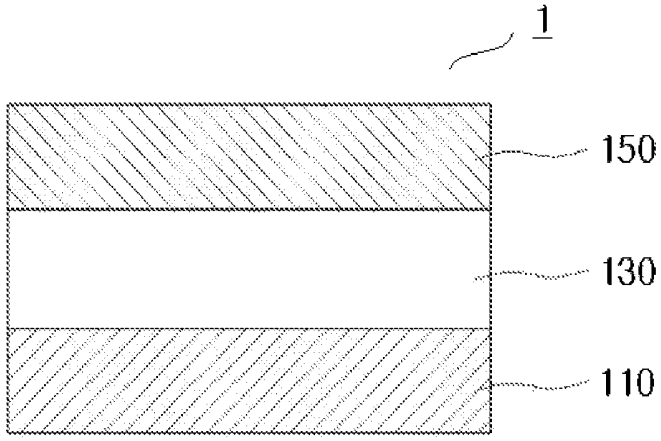


FIG. 1

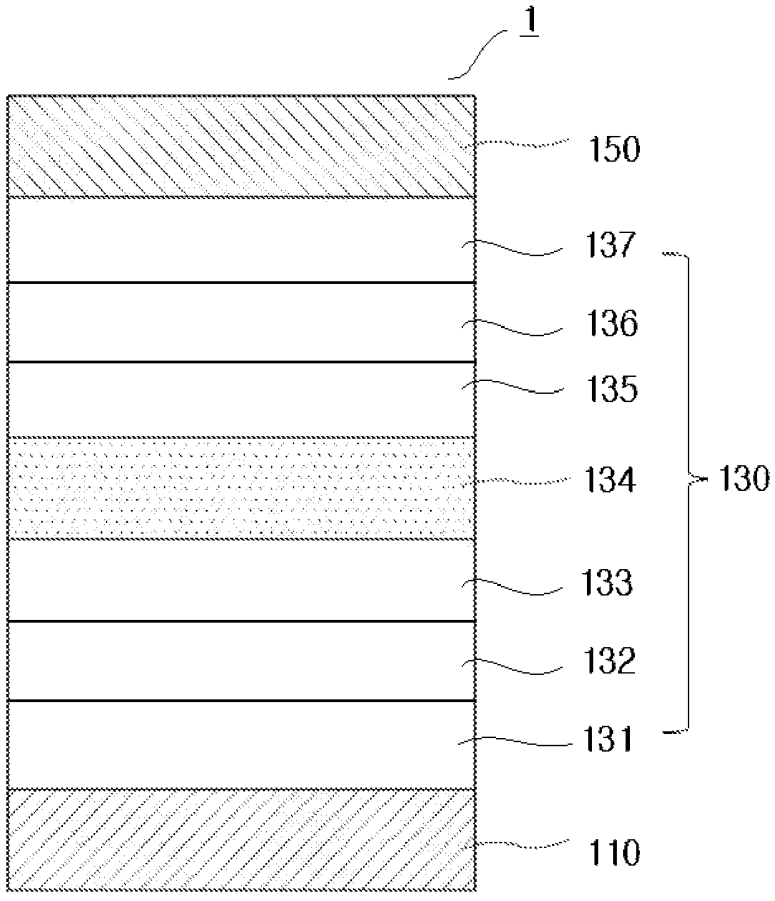


FIG. 2

COMPOUND FOR ORGANIC ELECTROLUMINESCENT DEVICE AND ORGANIC ELECTROLUMINESCENT DEVICE INCLUDING THE SAME

This is a U.S. national stage application of PCT Application No. PCT/KR2013/008866 under 35 U.S.C. 371, filed Oct. 4, 2013 in English, claiming the priority benefit of Korean Application No. 10-2012-0126545, filed Nov. 9, 2012 and Korean Application No. 10-2013-0104023, filed Aug. 30, 2013, which are hereby incorporated by reference.

TECHNICAL FIELD

The present invention relates to a compound for an organic electroluminescent device and an organic electroluminescent device including the same, and more particularly, to an amine-based compound for an organic electroluminescent device, having high light emission efficiency, and to an organic electroluminescent device including the same.

BACKGROUND ART

Organic electroluminescent (EL) devices have a simpler structure, various processing advantages, higher brightness, superior viewing angle properties, quicker response rate, and a lower driving voltage compared to other flat panel displays such as liquid crystal displays (LCDs), plasma display panels (PDPs), field emission displays (FEDs), etc., and are thus being thoroughly developed so as to be utilized as light sources of flat panel displays such as wall-mountable TVs, etc. or backlight units of the displays, illuminators, advertisement boards and so on.

Typically, when a direct-current voltage is applied to an organic EL device, holes injected from an anode and electrons injected from a cathode recombine to form electron-hole pairs, namely, excitons. While the excitons return to a stable ground state, energy corresponding thereto is transferred to a light emitting material and is thereby converted into light.

In order to increase efficiency and stability of an organic EL device, since C. W. Tang et al. of Eastman Kodak Company made an organic EL device operating at low voltage by forming a tandem organic thin film between two opposite electrodes (C. W. Tang, S. A. Vanslyke, Applied Physics Letters, vol. 51, pp. 913, 1987), extensive and intensive research into organic materials for organic EL devices having a multilayered thin-film structure has been ongoing. The efficiency and lifetime of such a tandem organic EL device are closely related to the molecular structure of a material for the thin film. For example, quantum efficiency may greatly vary depending on the structure of the material for the thin film, particularly a host material, a hole transport layer material or an electron transport layer material. When thermal stability of the material decreases, the material may be crystallized at a high temperature or a driving temperature, undesirably shortening the lifetime of the device.

Hole transport materials for use in organic EL devices, which have been known to date, are problematic because thin films formed therefrom using vacuum deposition are thermally and electrically unstable, and thus may rapidly crystallize due to heat generated upon device driving and also the film materials may change, undesirably deteriorating the light emission efficiency of the devices. Further,

non-emission parts referred to as dark spots may increasingly occur, and the voltage may increase upon constant-current driving, undesirably damaging the devices.

Also, organic EL devices using a phosphorescent light emitting material do not confine a triplet exciton produced in the light emitting material of a light emitting layer due to low triplet energy, undesirably lowering the light emission efficiency of the devices.

Technical Problem

Accordingly, an object of the present invention is to provide a compound for an organic EL device, which may have high thermal stability, high triplet energy and hole transport capability.

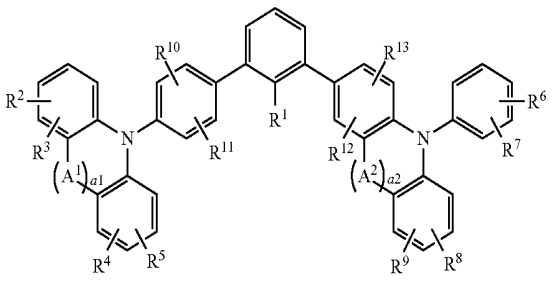
Another object of the present invention is to provide an organic EL device, which includes the compound as above and is thus improved in thermal stability and light emission efficiency, and in which the above compound is used as a hole transport layer material contact with light emitting layer, thereby raising triplet energy, ultimately improving efficiency of the organic EL device.

However, the Technical Problems of the present invention are not limited to the above-mentioned Problems, and another Problems which were not mentioned can be obviously understood to those skilled in the art from the following description.

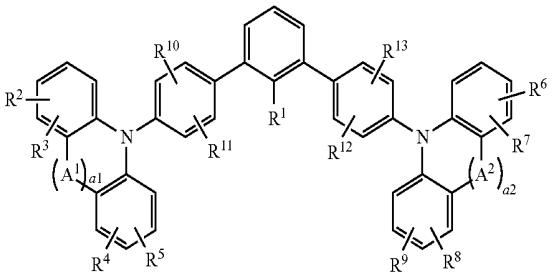
Technical Solution

In order to accomplish the above objects, an aspect of the present invention provides a compound for an organic EL device is represented by any one selected from among Chemical Formulas 1 to 6 below.

[Chemical Formula 1]



Chemical Formula 2]



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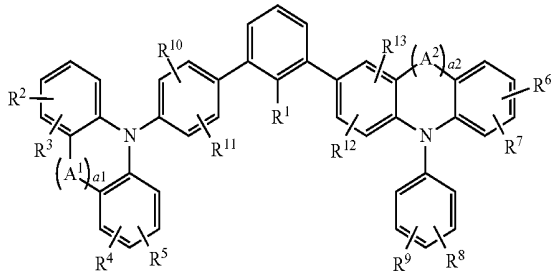
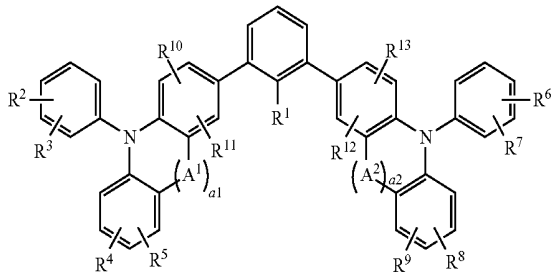
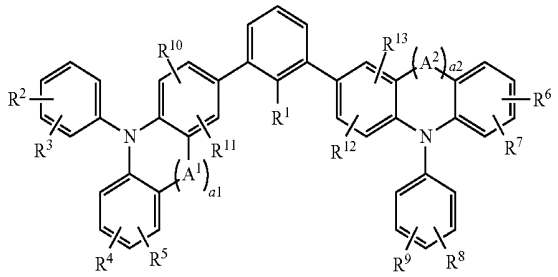
[Chemical Formula 3]



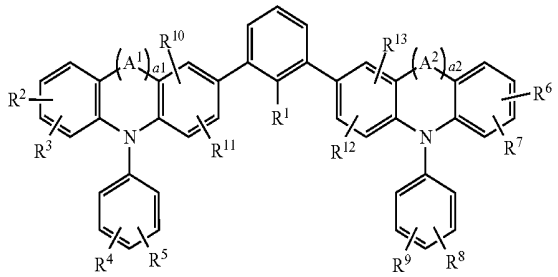
[Chemical Formula 4]



[Chemical Formula 5]



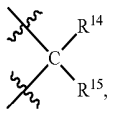
[Chemical Formula 6]



In Chemical Formulas 1 to 6, wherein R^1 is a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^2 to R^{13} are identical to or different from each other, and R^2 to R^{13} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or at least one of R^2 to R^{13} is further coupled with a carbon atom adjacent to a carbon atom linked therewith to form a substituted or unsubstituted fused C3 to C30 cycloalkyl group, a substituted or unsubstituted fused C1 to C30 heterocycloalkyl group, a substituted or unsubstituted fused C6 to C30 aryl group, or a substituted or unsubstituted fused C1 to C30 heteroaryl group,

A^1 and A^2 are identical to or different from each other, and A^1 and A^2 are each independently a valence bond or



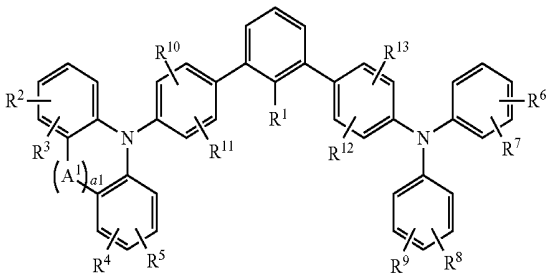
R^{14} and R^{15} are identical to or different from each other, and R^{14} and R^{15} are each independently a hydrogen atom or a substituted or unsubstituted C1 to C30 alkyl group,

a1 is 0 or 1,

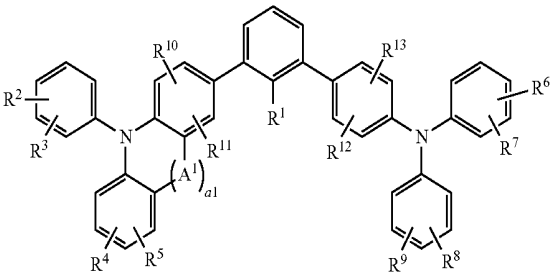
a2 is 0 or 1.

According to a preferred embodiment of the present invention, the compound for an organic EL device is represented by any one selected from among Chemical Formulas 7 to 9 below.

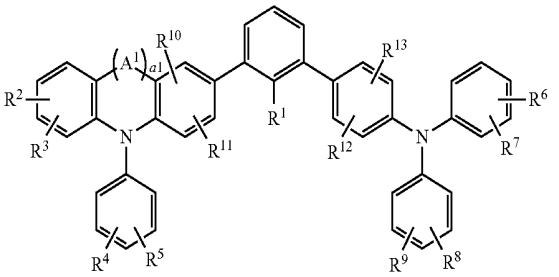
[Chemical Formula 7]



[Chemical Formula 8]



[Chemical Formula 9]

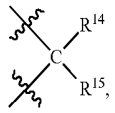


In Chemical Formulas 7 to 9, wherein R^1 is a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^2 to R^{13} are identical to or different from each other, and R^2 to R^{13} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl

group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or at least one of R^2 to R^{13} is further coupled with a carbon atom adjacent to a carbon atom linked therewith to form a substituted or unsubstituted fused C3 to C30 cycloalkyl group, a substituted or unsubstituted fused C1 to C30 heterocycloalkyl group, a substituted or unsubstituted fused C6 to C30 aryl group, or a substituted or unsubstituted fused C1 to C30 heteroaryl group,

A^1 is a valence bond or

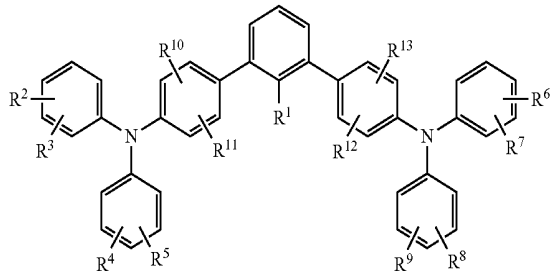


R^{14} and R^{15} are identical to or different from each other, and R^{14} and R^{15} are each independently a hydrogen atom or a substituted or unsubstituted C1 to C30 alkyl group,

a1 is 0 or 1.

According to a preferred embodiment of the present invention, the compound for an organic EL device is represented by Chemical Formula 10 below.

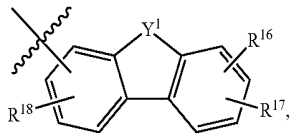
[Chemical Formula 10]



In Chemical Formula 10, wherein R^1 is a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^2 to R^{13} are identical to or different from each other, and R^2 to R^{13} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or at least one of R^2 to R^{13} is further coupled with a carbon atom adjacent to a carbon atom linked therewith to form a substituted or unsubstituted fused C3 to C30 cycloalkyl group, a substituted or unsubstituted fused C1 to C30 heterocycloalkyl group, a substituted or unsubstituted fused C6 to C30 aryl group, or a substituted or unsubstituted fused C1 to C30 heteroaryl group.

According to a preferred embodiment of the present invention, R^1 is a hydrogen atom,



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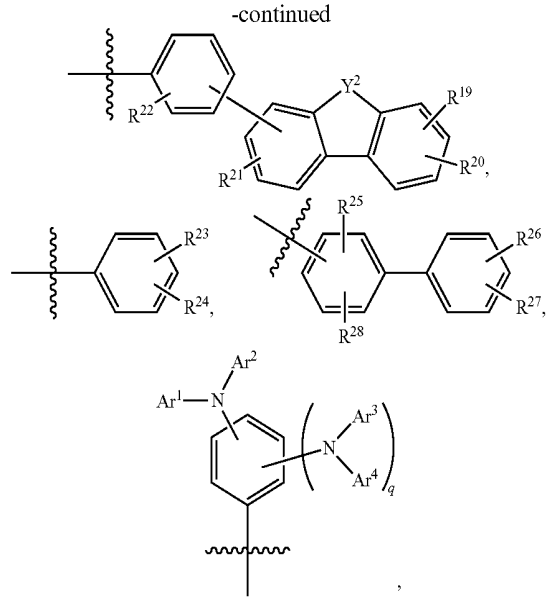
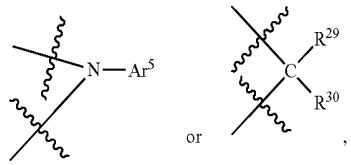


a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, or a substituted or unsubstituted C1 to C30 heterocycloalkyl group,

Y^1 and Y^2 are identical to or different from each other, and Y^1 and Y^2 are each independently an oxygen atom, a sulfur atom,



Ar^5 is a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^{29} and R^{30} are identical to or different from each other, and R^{29} and R^{30} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

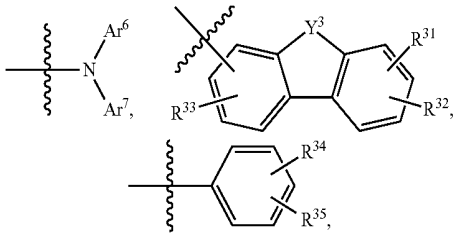
Ar^1 to Ar^4 are identical to or different from each other, and Ar^1 to Ar^4 are each independently a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or Ar^1 and Ar^2, and Ar^3 and Ar^4, respectively, are linked to form a substituted or unsubstituted C1 to C30 heterocycloalkyl group or a substituted or unsubstituted C1 to C30 heteroaryl group, together with a nitrogen atom therebetween, or at least one of Ar^1 to Ar^4 is further coupled with a carbon atom on the β position of a nitrogen atom linked therewith to form a substituted or unsubstituted C1 to C30 heterocycloalkyl

group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

q is 0 or 1,

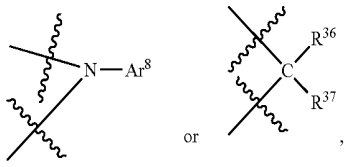
R^{16} to R^{28} are identical to or different from each other, and R^{16} to R^{28} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group.

According to a preferred embodiment of the present invention, wherein R^2 to R^{13} are identical to or different from each other, and R^2 to R^{13} are each independently a hydrogen atom,



a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group,

Y^3 is an oxygen atom, a sulfur atom,



Ar^8 is a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^{36} and R^{37} are identical to or different from each other, and R^{36} and R^{37} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

Ar^6 and Ar^7 are identical to or different from each other, and Ar^6 and Ar^7 are each independently a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or Ar^6 and Ar^7 are linked to form a substituted or unsubstituted C1 to C30 heterocycloalkyl group or a substituted or unsubstituted C1 to C30 heteroaryl group, together with a nitrogen atom therebetween, or at least one of Ar^6 and Ar^7 is further coupled with a carbon atom on the β position of a nitrogen atom linked therewith to form a substituted or unsubstituted C1 to C30 heterocycloalkyl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^{31} to R^{35} are identical to or different from each other, and R^{31} to R^{35} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group.

According to a preferred embodiment of the present invention, wherein Ar^6 and Ar^7 are identical to or different from each other, and Ar^6 and Ar^7 are each independently a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group.

Examples of the substituted or unsubstituted C6 to C30 aryl group may include a substituted or unsubstituted phenyl group, a substituted or unsubstituted biphenyl group, a substituted or unsubstituted terphenyl group, a substituted or unsubstituted naphthalenyl group, a substituted or unsubstituted anthracenyl group, a substituted or unsubstituted phenanthrenyl group, a substituted or unsubstituted fluorenyl group, a substituted or unsubstituted spirofluorenyl group, a substituted or unsubstituted pyrenyl group, or a substituted or unsubstituted perylenyl group.

Examples of the substituted or unsubstituted C1 to C30 heteroaryl group may include a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted thiophenyl group, a substituted or unsubstituted pyrrolyl group, a substituted or unsubstituted benzothiophenyl group, a substituted or unsubstituted indolyl group, a substituted or unsubstituted imidazo[1,2-a]pyridinyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted indazolyl group, a substituted or unsubstituted phenothiazinyl group, a substituted or unsubstituted phenazinyl group, a substituted or unsubstituted carbazolyl group, a substituted or unsubstituted dibenzothiophenyl group, a substituted or unsubstituted imidazolyl group, a substituted or unsubstituted triazolyl group, a substituted or unsubstituted tetrazolyl group, a substituted or unsubstituted oxadiazolyl group, a substituted or unsubstituted oxatriazolyl group, a substituted or unsubstituted thiatriazolyl group, a substituted or unsubstituted benzotriazolyl group, a substituted or unsubstituted pyrazinyl group, a substituted or unsubstituted pyridazinyl group, a substituted or unsubstituted purinyl group, a substituted or unsubstituted quinolinyl group, a substituted or unsubstituted isoquinolinyl group, a substituted or unsubstituted phthalazinyl group, a substituted or unsubstituted naphpyridinyl group, a substituted or unsubstituted quinoxalinyl group, a substituted or unsubstituted quinazolinyl group, a substituted or unsubstituted acridinyl group, or a substituted or unsubstituted phenanthrolinyl group. Preferably useful is a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted thiophenyl group, a substituted or unsubstituted pyrrolyl group, a substituted or unsubstituted benzothiophenyl group, a substituted or unsubstituted indolyl group, a substituted or unsubstituted imidazo[1,2-a]pyridinyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted indazolyl group, a substituted or unsubstituted

phenothiazinyl group, a substituted or unsubstituted phenazinyl group, a substituted or unsubstituted carbazolyl group, or a substituted or unsubstituted dibenzothiophenyl group.

According to a preferred embodiment of the present invention, the compound for an organic EL device may be any one selected from among Compounds 1 to 35 represented by the following chemical formulas.

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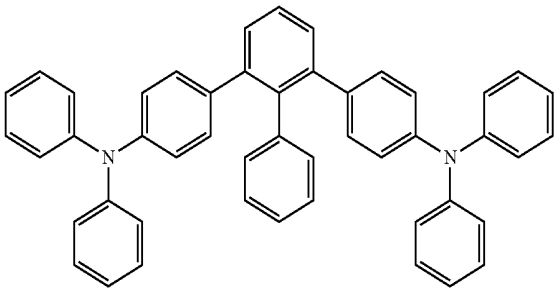

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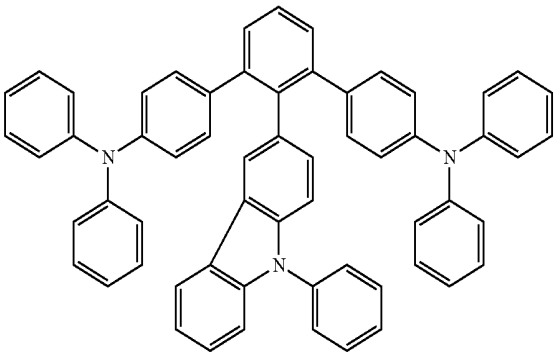

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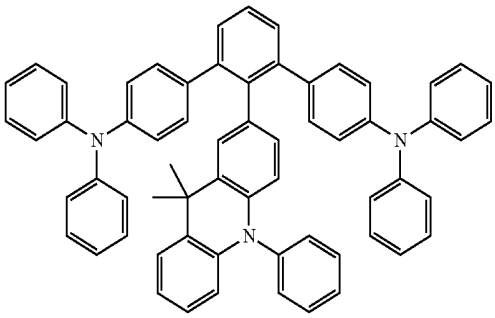

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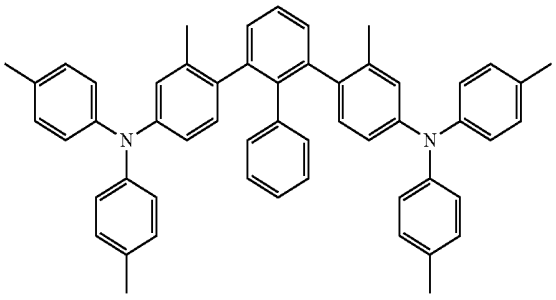

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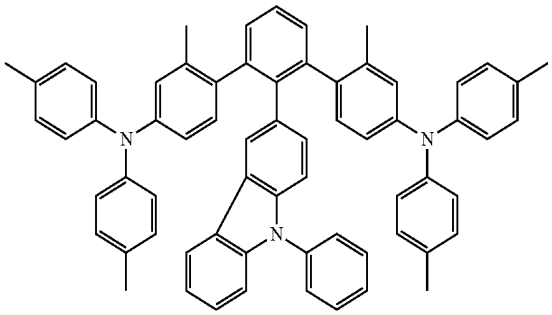

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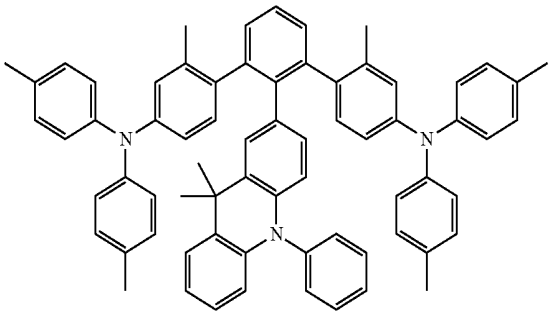

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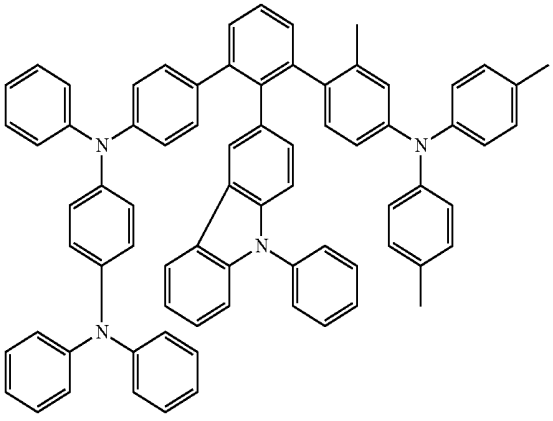

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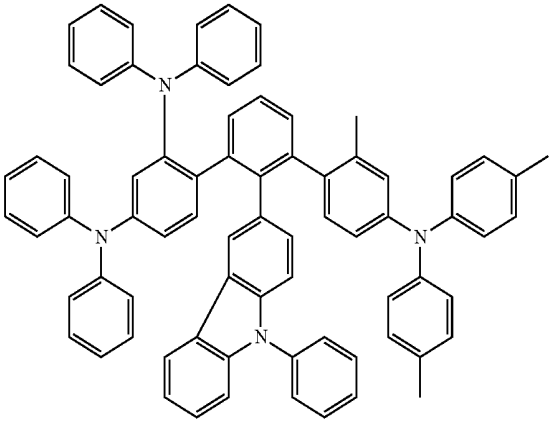

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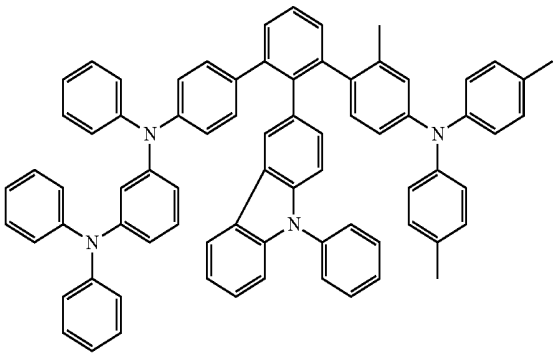

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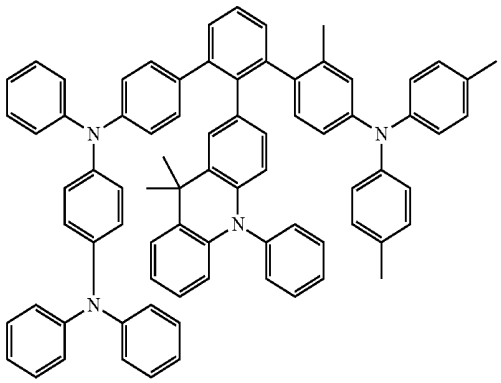

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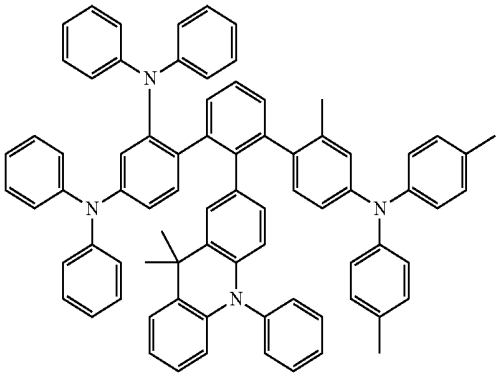

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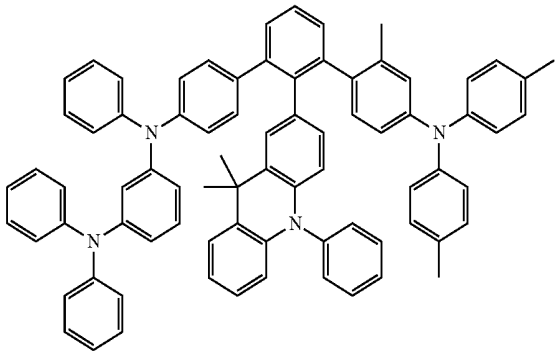

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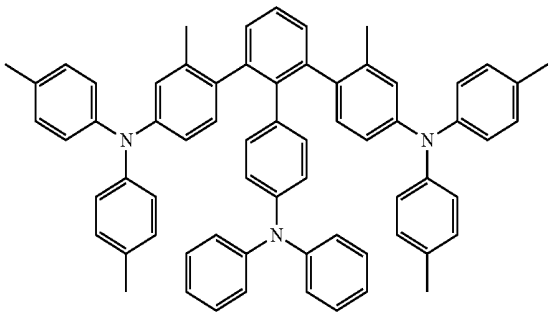

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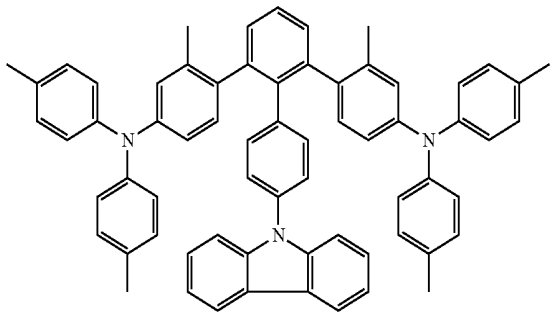

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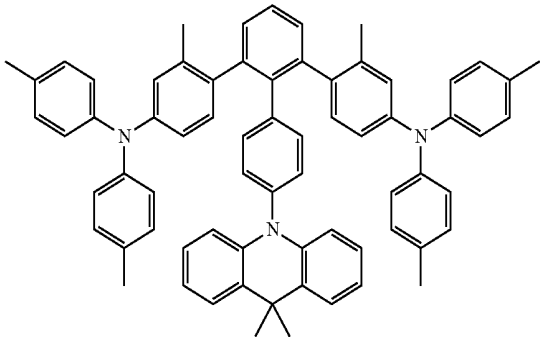

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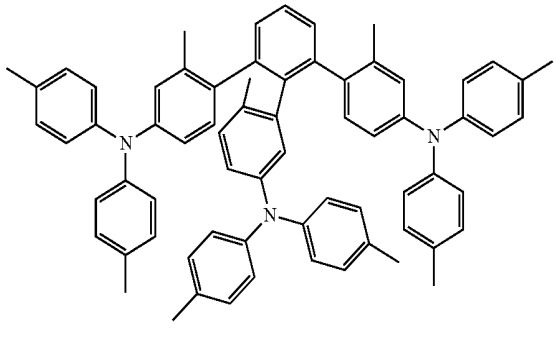

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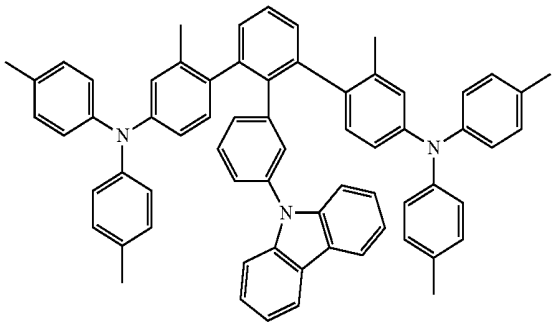

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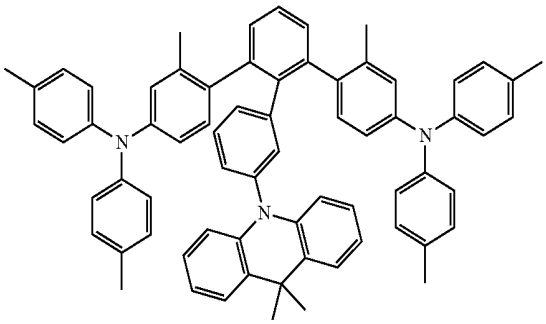

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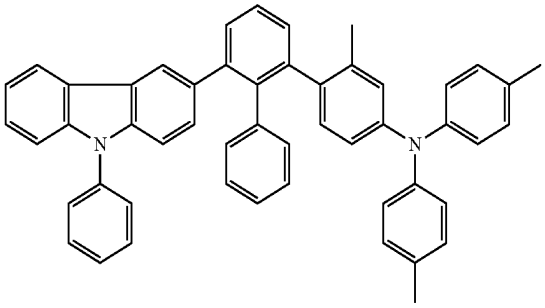

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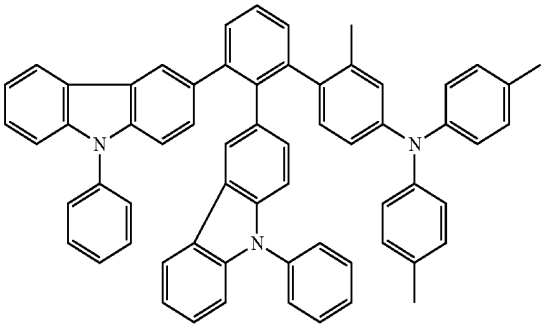

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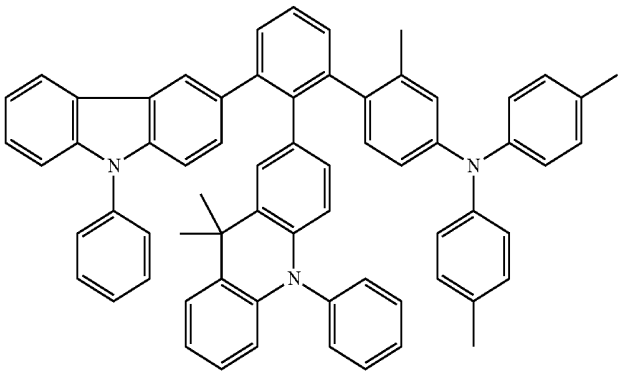

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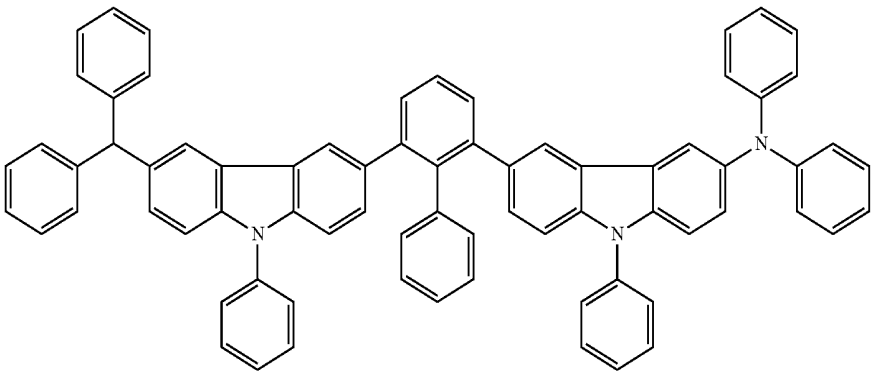

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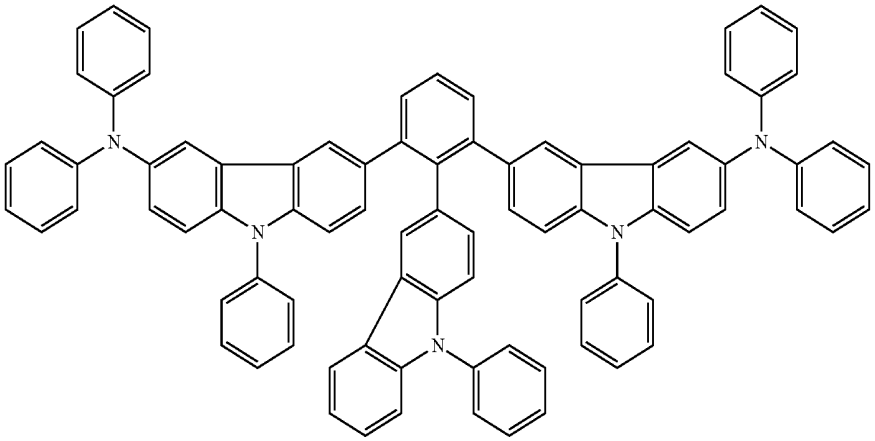

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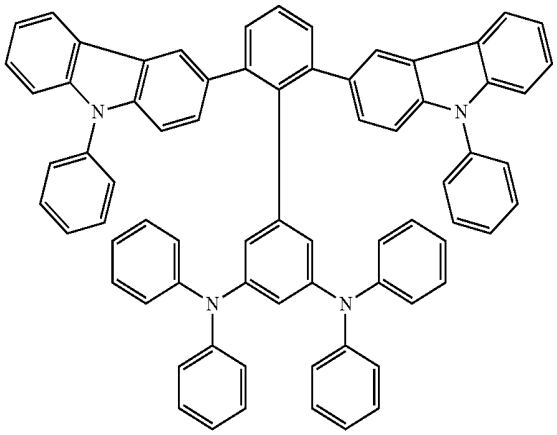

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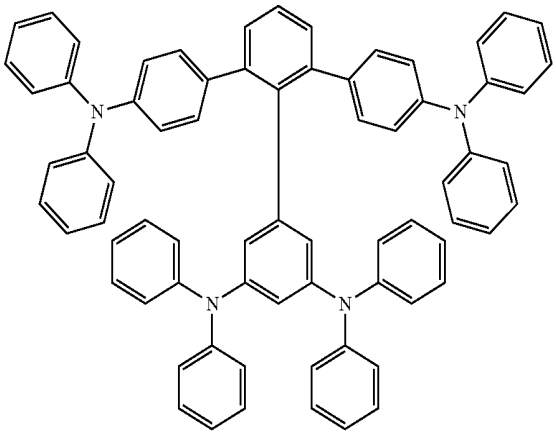

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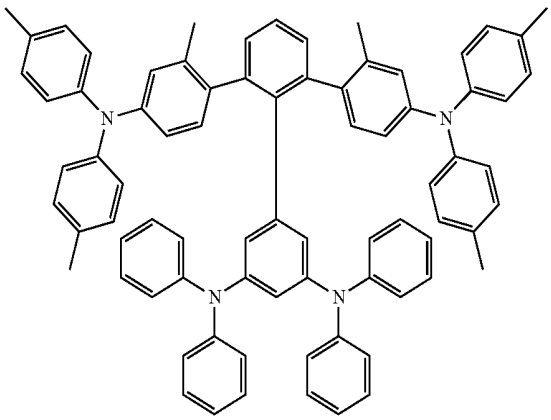

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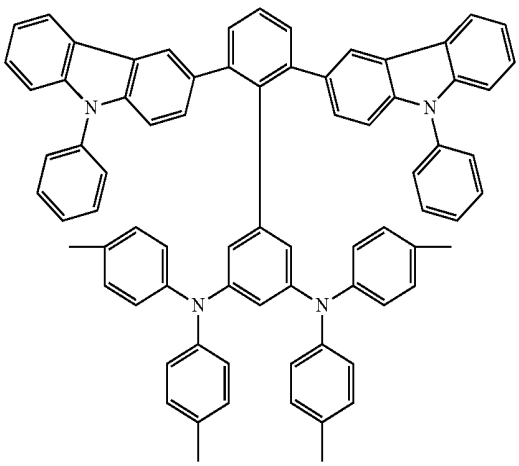

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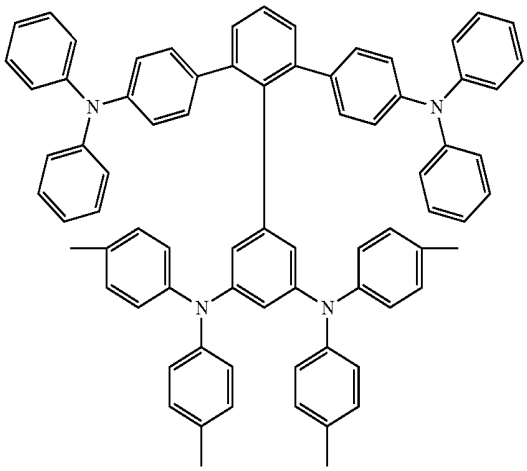

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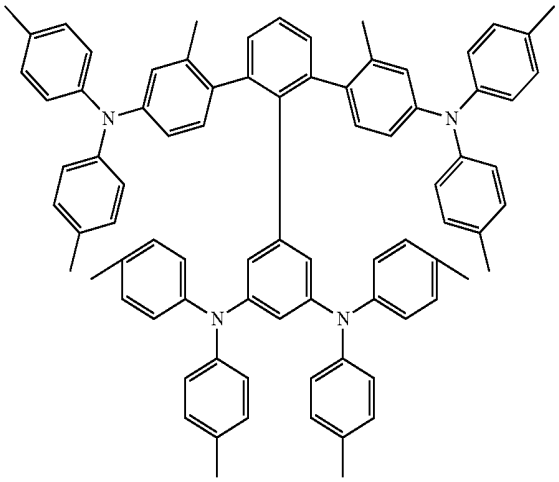

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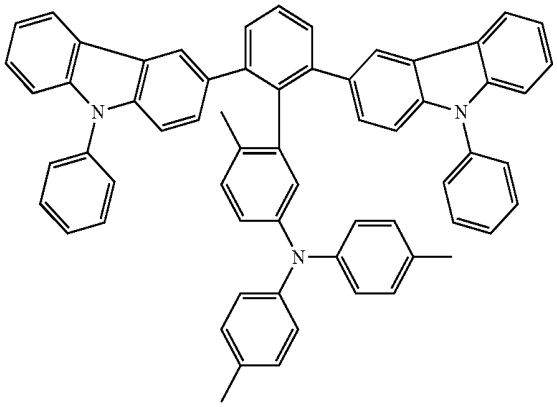

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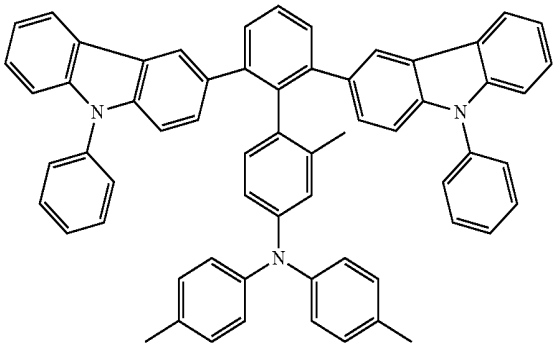

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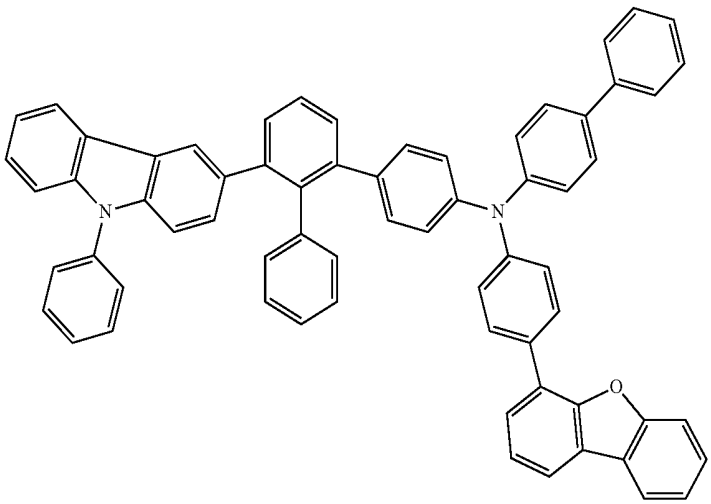

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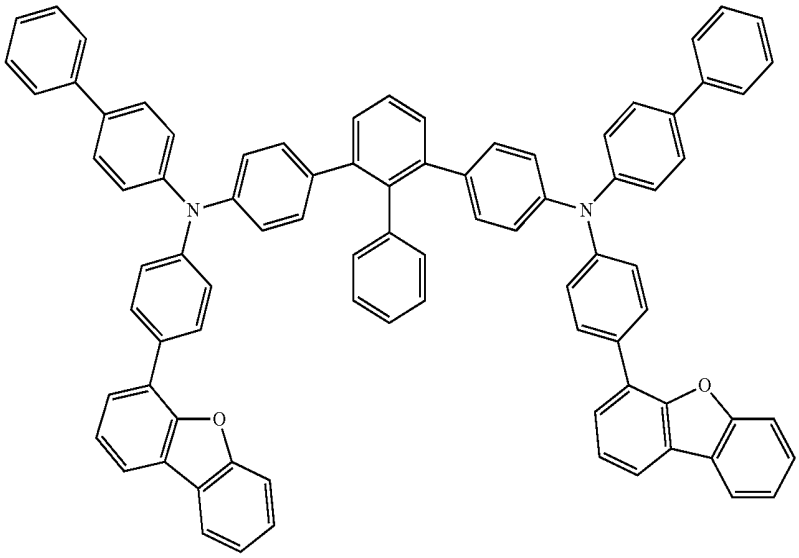

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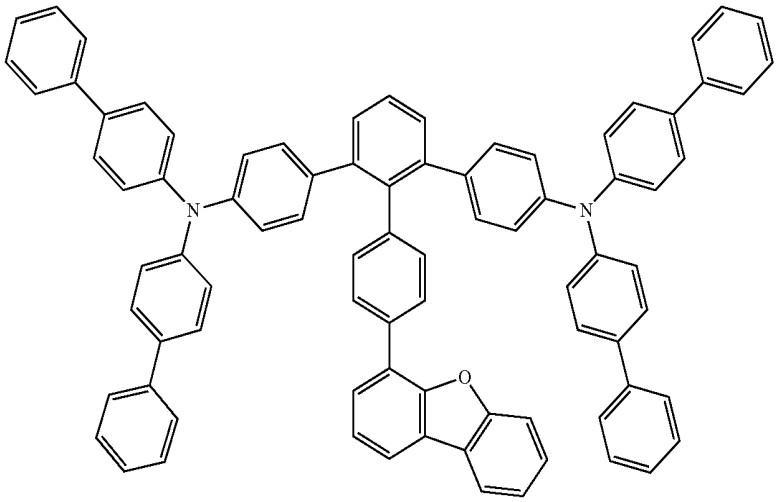

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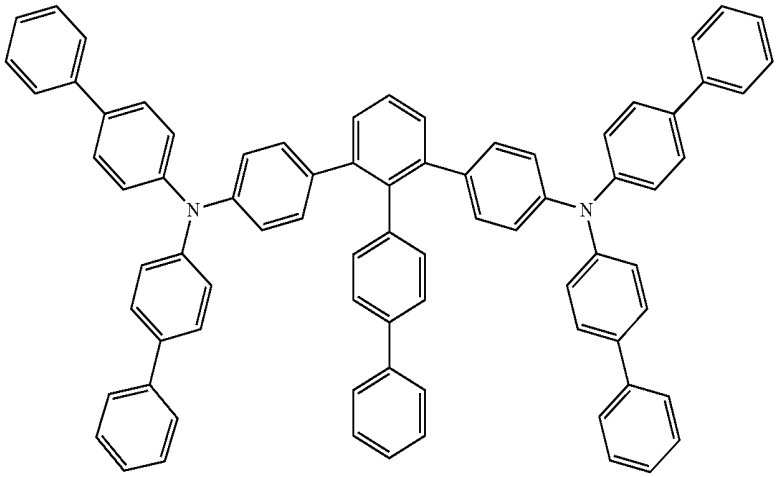


According to an embodiment of the present invention, an organic electroluminescent (EL) device including the compound for an organic EL device according to the present invention may be provided.

According to an embodiment of the present invention, an organic EL device may include a first electrode, a second electrode, and a single organic layer or a plurality of organic layers between the first electrode and the second electrode, and one or more organic layers selected from among the single organic layer or the plurality of organic layers may include the compound for an organic EL device according to the present invention.

According to an embodiment of the present invention, the single organic layer or the plurality of organic layers may include a light emitting layer.

According to an embodiment of the present invention, the plurality of organic layers may include a light emitting layer, and the plurality of organic layers may further include one or more selected from among an electron injection layer, an electron transport layer, a hole blocking layer, an electron blocking layer, a hole transport layer and a hole injection layer.

According to an embodiment of the present invention, the light emitting layer may include a host and a dopant.

Advantageous Effects

According to an embodiment of the present invention, two phenyl groups were combined on the meta position of benzene ring at the center, and diaryl amine is combined on para position of the each phenyl group to show excellent HOMO and LUMO energy level in the compound of the present invention, consequently obtaining a compound for an organic electroluminescent (EL) device with a high triplet energy.

Moreover, thermal stability and light emission efficiency of the organic EL device using the compound can be improved, and the use of the compound as a hole transport layer material enables a triplet energy of a phosphorescent light emitting material to be raised, consequently improving the efficiency of the organic EL device.

BRIEF DESCRIPTION OF DRAWINGS

The above and other objects, features and advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a cross-sectional view illustrating an organic EL device according to an embodiment of the present invention; and

FIG. **2** is a cross-sectional view illustrating an organic EL device according to another embodiment of the present invention.

MODE FOR INVENTION

The present invention may be variously modified, and may have a variety of embodiments, and is intended to illustrate specific embodiments. However, the following description does not limit the present invention to specific embodiments, and should be understood to include all variations, equivalents or substitutions within the spirit and scope of the present invention. Furthermore, in the description of the present invention, when it is determined that the detailed description of the related art would obscure the gist of the present invention, the description thereof will be omitted.

Also, in the following description, the terms "first," "second" and the like are used to differentiate a certain component from other components, but the configuration of such components should not be construed to be limited by the terms. For example, a first component may be referred to as a second component, and a second component may be referred to as a first component, within the scope of the present invention.

Also, when any one component is mentioned to be "formed" or "stacked" on another component, it may be directly attached to the entire surface or one surface of another component, or a further component may be additionally interposed therebetween.

Unless otherwise stated, the singular expression includes a plural expression. In this application, the terms "include" and "have" are used to designate the presence of features, numbers, steps, operations, components, parts or combinations thereof described in the specification, not intending to exclude the presence or additional possibility of one or more different features, numbers, steps, operations, components, parts or combinations thereof are not excluded.

As used herein, unless otherwise defined, the term "valence bond" means a single bond, a double bond or a triple bond.

As used herein, unless otherwise defined, the term "substituted" means that at least one hydrogen on a substituent or a compound is substituted with deuterium, a halogen group, a hydroxyl group, an amino group, a C1 to C30 amine group, a nitro group, a C1 to C30 silyl group, a C1 to C30 alkyl group, a C1 to C30 alkylsilyl group, a C3 to C30 cycloalkyl group, a C1 to C30 heterocycloalkyl group, a C6 to C30 aryl group, a C1 to C30 heteroaryl group, a C1 to C20 alkoxy group, a C1 to C10 trifluoroalkyl group or a cyano group.

Further, among the halogen group, the hydroxyl group, the amino group, the C1 to C30 amine group, the C3 to C30 silyl group, the C1 to C30 alkyl group, the C1 to C30 alkylsilyl group, the C3 to C30 cycloalkyl group, the C6 to C30 aryl group, the C1 to C20 alkoxy group, the C1 to C10 trifluoroalkyl group or the cyano group, which is substituted, two adjacent substituents may be fused to form a ring.

As used herein, unless otherwise defined, the term "hetero" means a functional group containing 1~4 heteroatoms selected from the group consisting of N, O, S and P, the remainder being carbon.

As used herein, unless otherwise defined, the term "combination thereof" means that two or more substituents are coupled with each other by a linker or two or more substituents are condensed to each other.

As used herein, unless otherwise defined, the term "hydrogen" means hydrogen, deuterium or tritium.

As used herein, unless otherwise defined, the term "alkyl group" means an aliphatic hydrocarbon group.

The alkyl group may be a "saturated alkyl group" without any double bond or triple bond.

The alkyl group may be an "unsaturated alkyl group" with at least one double bond or triple bond.

The term "alkenylene group" means a functional group having at least one carbon-carbon double bond between at least two carbon atoms, and the term "alkynylene group" means a functional group having at least one carbon-carbon triple bond between at least two carbon atoms. The alkyl group may be branched, linear or cyclic, regardless of whether it is saturated or unsaturated.

The alkyl group may be a C1 to C30 alkyl group, preferably a C1 to C20 alkyl, more preferably a C1 to C10 alkyl group, and much more preferably a C1 to C6 alkyl group.

For example, a C1 to C4 alkyl group indicates an alkyl chain containing 1~4 carbon atoms, particularly an alkyl chain which is selected from the group consisting of methyl, ethyl, propyl, iso-propyl, n-butyl, iso-butyl, sec-butyl and t-butyl.

Specific examples of the alkyl group include a methyl group, an ethyl group, a propyl group, an isopropyl group, a butyl group, an isobutyl group, a t-butyl group, a pentyl group, a hexyl group, an ethenyl group, a propenyl group, a butenyl group, a cyclopropyl group, a cyclobutyl group, a cyclopentyl group, a cyclohexyl group, etc.

The "amine group" includes an arylamine group, an alkylamine group, an arylalkylamine group, or an alkylarylamine group.

The term "cycloalkyl group" refers to a monocyclic or fused-ring polycyclic (i.e., rings which share adjacent pairs of carbon atoms) functional group.

The term "heterocycloalkyl group" means a cycloalkyl group containing 1~4 heteroatoms selected from the group consisting of N, O, S and P, the remainder being carbon. In the case where the heterocycloalkyl group is a fused ring, at least one ring may contain 1~4 heteroatoms.

The term "aromatic group" means a cyclic functional group where all ring atoms have p-orbitals, and these p-orbitals form conjugation. Specific examples thereof include an aryl group and a heteroaryl group.

The term "aryl group" refers to a monocyclic or fused-ring polycyclic (i.e., rings which share adjacent pairs of carbon atoms) functional group.

The term "heteroaryl group" means an aryl group containing 1~4 heteroatoms selected from the group consisting of N, O, S and P, the remainder being carbon. In the case where the heteroalkyl group is a fused ring, at least one ring may contain 1~4 heteroatoms.

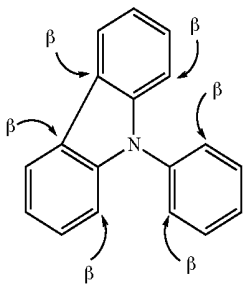
In the aryl group and the heteroaryl group, the number of ring atoms is the sum of the number of carbons and the number of non-carbon atoms.

When alkyl and aryl are used in combination as in "alkylaryl group" or "arylalkyl group," "alkyl" and "aryl" respectively have the meanings as above.

The term "arylalkyl group" means an aryl substituted alkyl radical such as benzyl, and is incorporated in the alkyl group.

The term "alkylaryl group" means an alkyl substituted aryl radical, and is incorporated in the aryl group.

The term "carbon atom at the β position" of any one atom refers to a carbon atom adjacent to another atom linked with the one atom. For example, the carbon atom at the β position of a nitrogen atom is a carbon atom indicated by the arrow in the following chemical formula.



Below is a description of embodiments of the present invention with reference to the appended drawings, wherein the same or similar components are designated by the same reference numerals and the overlapping description thereof is omitted.

With reference to FIGS. **1** and **2**, according to an embodiment of the present invention, an organic EL device **1** including the compound for an organic EL device according to the present invention may be provided.

According to another embodiment of the present invention, an organic EL device includes a first electrode **110**, a second electrode **150**, and a single organic layer or a plurality of organic layers **130** between the first electrode and the second electrode, and one or more organic layers selected from among the single organic layer or the plurality of organic layers **130** may include the compound for an organic EL device according to the present invention.

As such, the single organic layer or the plurality of organic layers **130** may include a light emitting layer **134**.

Also, The plurality of organic layers **130** include a light emitting layer **134**, and the plurality of organic layers **130** may further include one or more selected from among an electron injection layer **131**, an electron transport layer **132**, a hole blocking layer **133**, an electron blocking layer **135**, a hole transport layer **136** and a hole injection layer **137**.

The light emitting layer **134** may include a host and a dopant.

The organic EL device is preferably supported by a transparent substrate. The material for the transparent substrate is not particularly limited so long as it has good mechanical strength, thermal stability and transparency. Specific examples thereof may include glass, a transparent plastic film, etc.

The anode material of the organic EL device according to the present invention may include a metal, an alloy, an electrically conductive compound or a mixture thereof, having a work function of 4 eV or more. Specific examples thereof may include Au metal or a transparent conductive material such as CuI, ITO (indium tin oxide), SnO_2 and ZnO. The thickness of the anode film is preferably set to 10~200 nm.

The cathode material of the organic EL device according to the present invention may include a metal, an alloy, an electrically conductive compound or a mixture thereof, having a work function of less than 4 eV. Specific examples thereof may include Na, a Na—K alloy, calcium, magnesium, lithium, a lithium alloy, indium, aluminum, a magnesium alloy, or an aluminum alloy. In addition, aluminum/AlO_2, aluminum/lithium, magnesium/silver or magnesium/indium may be used. The thickness of the cathode film is preferably set to 10~200 nm.

In order to increase light emission efficiency of the organic EL device, one or more electrodes preferably have a light transmittance of 10% or more. The sheet resistance of the electrodes is preferably hundreds of Q/mm or less. The thickness of the electrodes falls in the range of 10 nm~1 μm, and preferably 10~400 nm. Such electrodes may be manufactured in the form of a thin film using the above electrode material via vapor deposition such as chemical vapor deposition (CVD), physical vapor deposition (PVD) or the like, or sputtering.

When the compound for an organic EL device according to the present invention is used so as to be adapted for the purposes of the present invention, a hole transport material, a hole injection material, a light emitting layer material, a host material for a light emitting layer, an electron transport material, and an electron injection material, which are known, may be used alone in each organic layer, or may be used in selective combination with the compound for an organic EL device according to the present invention.

Examples of the hole transport material may include porphyrin compound derivatives including N,N-dicarbazolyl-3,5-benzene (mCP), poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS), N,N'-di(1-naphthyl)-N,N'-diphenylbenzidine (NPD), N,N'-diphenyl-N,N'-di(3-methylphenyl)-4,4'-diaminobiphenyl (TPD), N,N'-diphenyl-N,N'-dinaphthyl-4,4'-diaminobiphenyl, N,N,N',N'-tetra-p-tolyl-4,4'-diaminobiphenyl, N,N,N'N'-tetraphenyl-4,4'-diaminobiphenyl, 1,10,15,20-tetraphenyl-21H,23H-porphyrin copper(II), etc., triarylamine derivatives including polymers having an aromatic tertiary amine in the

main chain or side chain thereof, 1,1-bis(4-di-p-tolylaminophenyl)cyclohexane, N,N,N-tri(p-tolyl)amine and 4,4',4'-tris[N-(3-methylphenyl)-N-phenylamino]triphenylamine, carbazole derivatives including N-phenylcarbazole and polyvinylcarbazole, phthalocyanine derivatives including metal-free phthalocyanine and copper phthalocyanine, starburst amine derivatives, enaminestilbene-based derivatives, aromatic tertiary amine-containing styrylamine compound derivatives, polysilane, etc.

Examples of the electron transport material may include diphenylphosphine oxide-4-(triphenylsilyl)phenyl (TSPO1), Alq_3, 2,5-diaryl sylol derivatives (PyPySPyPy), perfluorinated compounds (PF-6P), octasubstituted cyclooctatetraene compounds (COTs), etc.

In the organic EL device according to the present invention, an electron injection layer, an electron transport layer, a hole transport layer and a hole injection layer may be provided in the form of a single layer containing one or more kinds of the above compound, or may be provided in the form of a plurality of stacked layers containing different kinds of compounds.

The light emitting material may include, for example, photoluminescent fluorescent materials, fluorescent brighteners, laser dyes, organic scintillators and fluorescence analysis reagents. Specific examples thereof include carbazole-based compounds, phosphine oxide-based compounds, carbazole-based phosphine oxide compounds, polyaromatic compounds including bis((3,5-difluoro-4-cyanophenyl)pyridine)iridium picolinate (FCNIrpic), tris(8-hydroxyquinoline)aluminum (Alq_3), anthracene, phenanthrene, pyrene, chrysene, perylene, coronene, rubrene and quinacridone, oligophenylene compounds including quaterphenyl, scintillators for liquid scintillation including 1,4-bis(2-methylstyryl)benzene, 1,4-bis(4-methylstyryl)benzene, 1,4-bis(4-methyl-5-phenyl-2-oxazolyl)benzene, 1,4-bis(5-phenyl-2-oxazolyl)benzene, 2,5-bis(5-t-butyl-2-benzoxazolyl) thiophene, 1,4-diphenyl-1,3-butadiene, 1,6-diphenyl-1,3,5-hexatriene and 1,1,4,4-tetraphenyl-1,3-butadiene, metal complexes of oxine derivatives, coumarine dyes, dicyanomethylenepyran dyes, dicyanomethylenethiopyran dyes, polymethine dyes, oxobenzanthracene dyes, xanthene dyes, carbostyryl dyes, perylene dyes, oxazine compounds, stilbene derivatives, spiro compounds, oxadiazole compounds, etc.

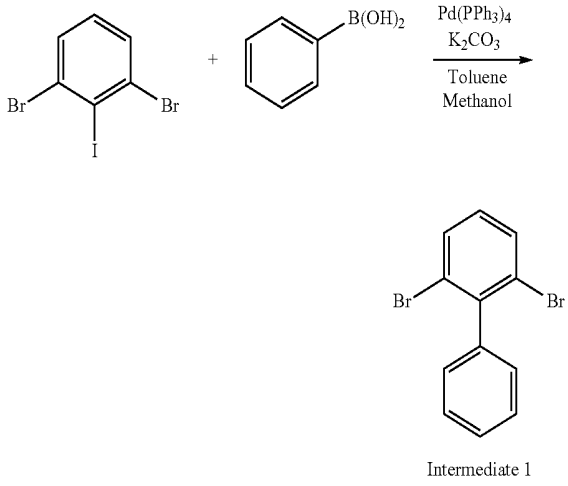
Each layer of the organic EL device according to the present invention may be provided in the form of a thin film using a known process such as vacuum deposition, spin coating or casting, or may be manufactured using each layer material. The thickness of each layer is not particularly limited, but may be appropriately set depending on the material properties, and may be typically determined in the range of 2~5,000 nm.

Because the compound for an organic EL device according to the present invention may be subjected to vacuum deposition, a thin film formation process is simple and a uniform thin film which does not substantially have pin holes may be easily obtained.

A better understanding of the present invention regarding the synthesis of the compound for an organic EL device and the manufacture of the organic EL device including the same may be obtained through the following examples which are set forth to illustrate, but are not to be construed as limiting, the present invention.

EXAMPLE

Preparation Example 1. Synthesis of Intermediate 1

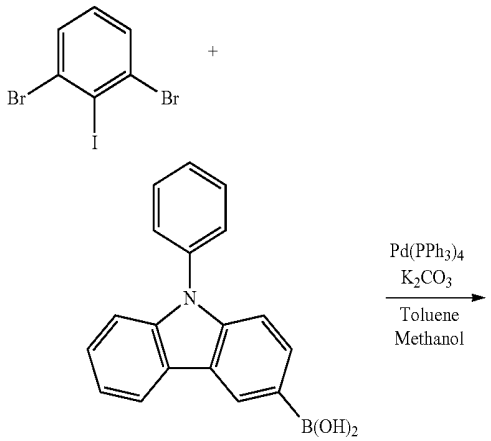


Intermediate 1

In a 250 mL round-bottom three-neck flask in a nitrogen atmosphere, 6 g of 1,3-dibromo-2-iodobenzene, 2.2 g of phenylboronic acid, 1.5 g of tetrakis(triphenyl phosphine) palladium(0), 4.6 g of potassium carbonate, 60 ml of toluene and 20 ml of methanol were placed, and stirred at 65° C. for hrs. The reaction solution was cooled, and extracted with dichloromethane and water. The extracted solution was concentrated, then subjected to column chromatography using the mixture solvent of dichloromethane and n-hexane, and concentrated, thus obtaining 6.08 g of 2,6-dibromobiphenyl of Intermediate 1 (Yield: 70%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.64-7.62 (d, 2H), 7.47-7.44 (dd, 2H), 7.43-7.42 (d, 1H), 7.21-7.20 (dd, 2H), 7.08-7.04 (dd, 1H)

Preparation Example 2. Synthesis of Intermediate 2



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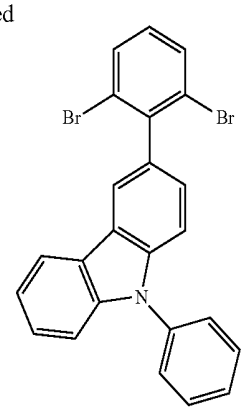
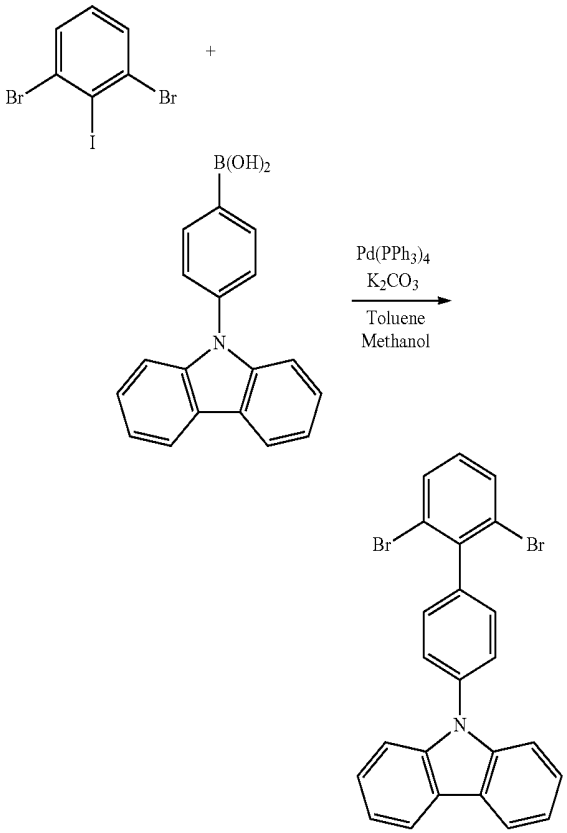


Intermediate 2

3.6 g of 3-(2,6-dibromophenyl)-9-phenyl-9H-carbazole of Intermediate 2 was obtained in the same manner as in Preparation Example 1, with the exception that 4.7 g of 9-phenyl-9H-carbazol-3-yl-3-boronic acid was used instead of phenylboronic acid (Yield: 56%).

^{1}H NMR ($CDCl_3$, 600 MHz) δ 8.13-8.12 (d, 1H), 7.98 (s, 1H), 7.68-7.66 (d, 2H), 7.63-7.60 (m, 4H), 7.49-7.47 (m, 2H), 7.42-7.40 (m, 2H), 7.33-7.23 (m, 2H), 7.10-7.071 (dd, 1H)

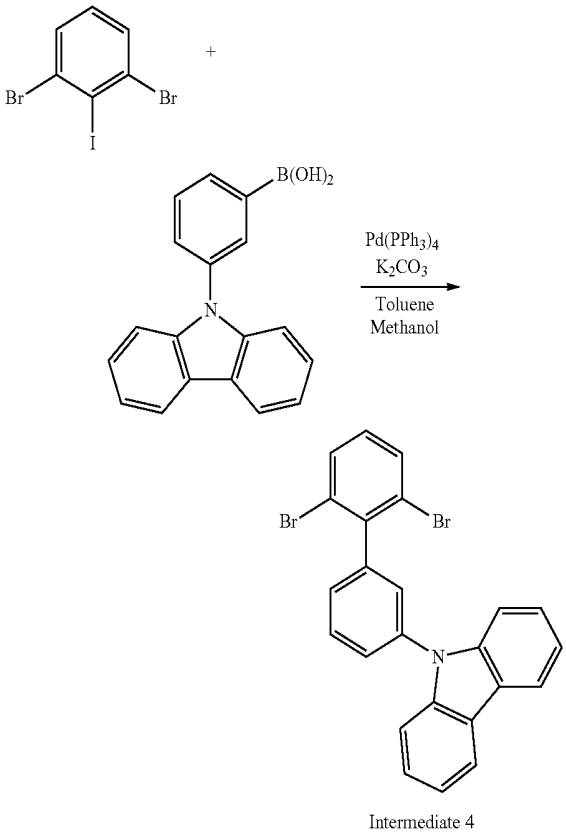
Preparation Example 3. Synthesis of Intermediate 3



Intermediate 3

3.5 g of 3-(2,6-dibromobiphenyl-4-yl)-9H-carbazole of Intermediate 3 was obtained in the same manner as in Preparation Example 3, with the exception that 4.7 g of 4-(9H-carbazol-9-yl)phenylboronic acid was used instead of phenylboronic acid (Yield: 44%).

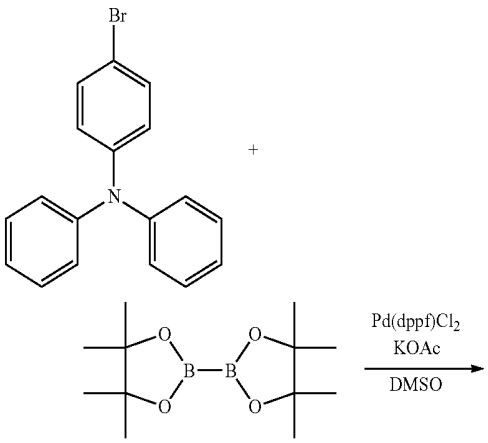
Preparation Example 4. Synthesis of Intermediate 4



Intermediate 4

3.5 g of 3-(2,6-dibromobiphenyl-3-yl)-9H-carbazole of Intermediate 4 was obtained in the same manner as in Preparation Example 2, with the exception that 4.7 g of 3-(9H-carbazol-9-yl)phenylboronic acid was used instead of phenylboronic acid (Yield: 44%).

Preparation Example 5. Synthesis of Intermediate 5



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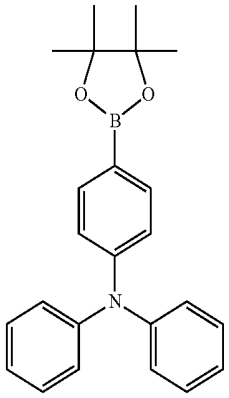
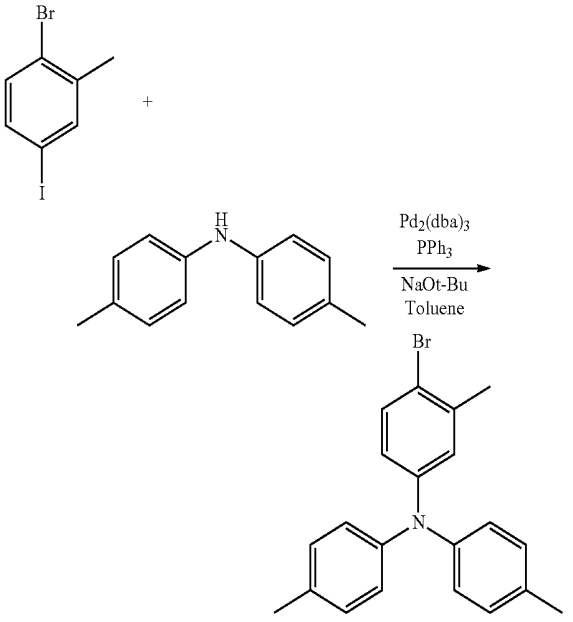


Intermediate 5

In a round-bottom three-neck flask in a nitrogen atmosphere, 10 g of N-(4-bromophenyl)-N-phenylbenzenamine, 11.7 g of Bis(pinacolato)diboron, 9.1 g of potassium acetate, 0.76 g of [1,1'-Bis(diphenylphosphino)ferrocene]dichloropalladium(II) and 100 ml of DMSO were placed, and stirred at 80° C. for 10 hr. The reaction solution was cooled, and extracted with dichloromethane and water. The extracted solution was concentrated, then subjected to column chromatography using the mixture solvent of dichloromethane and n-hexane, and concentrated, thus obtaining 3.9 g of N-(4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-N-phenylbenzenamine of Intermediate 5 (Yield: 38%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.57 (s, 1H), 7.49-7.48 (d, 1H), 7.26-7.24 (dd, 1H), 7.22-7.20 (m, 4H), 7.17 (d, 1H), 7.07-7.03 (d 4H), 6.98-6.95 (dd, 2H), 1.31-1.28 (m, 12H)

Preparation Example 6. Synthesis of Intermediate 6

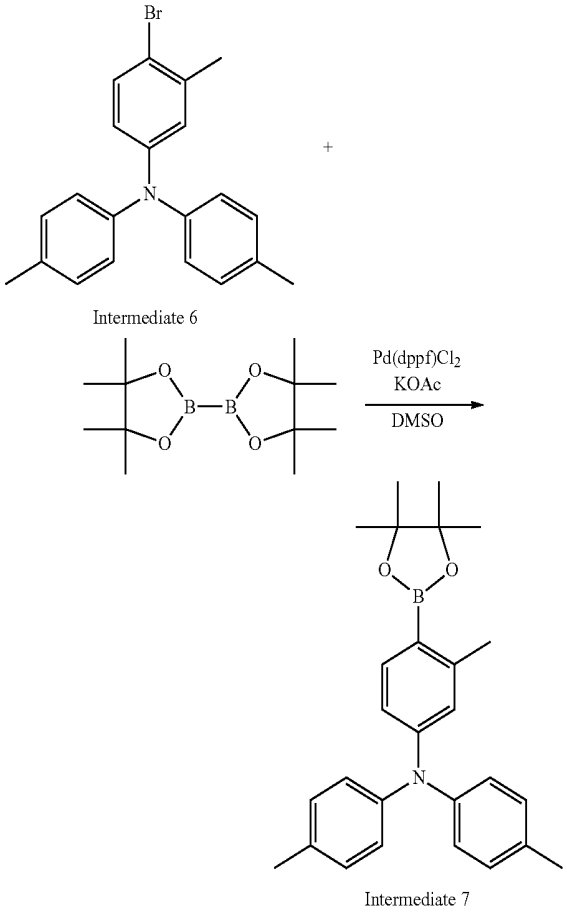


Intermediate 6

In a round-bottom three-neck flask in a nitrogen atmosphere, 20 g of 2-bromo-5-iodo toluene, 12.6 g of diphenylamine, 19.4 g of t-butoxy sodium, 0.5 g of tris(dibenzylidineacetone)dipalladium(0), 0.3 g of triphenyl phosphine and 200 ml of toluene were placed, and stirred at 80. After completion of the reaction, the reaction solution was extracted with dichloromethane and water, concentrated, then subjected to column chromatography using the mixture solvent of dichloromethane and n-hexane, and concentrated, thus obtaining 17 g of 4-bromo-3-methyl-N,N-diphenyl benzenamine of Intermediate 6 (Yield: 74%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.31-7.29 (d, 1H), 7.05-7.04 (d, 4H), 6.96-6.94 (d, 4H), 6.89 (s, 1H), 6.71-6.69 (dd, 1H)

Preparation Example 7. Synthesis of Intermediate 7

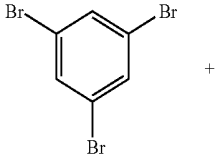


Intermediate 7

10 g of 4-methyl-N-(3-methyl-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-N-p-tolylbenzenamine of Intermediate 7 was obtained in the same manner as in Preparation Example 5, with the exception that Intermediate 6 was used instead of N-(4-bromophenyl)-N-phenylbenzenamine (Yield: 52%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.79-7.78 (d, 1H), 7.12-7.16 (dd, 1H), 7.06-6.94 (m, 9H), 2.31-2.20 (m, 9H)

Preparation Example 8. Synthesis of Intermediate 8



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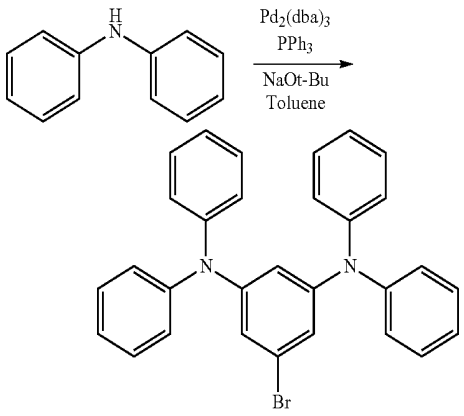
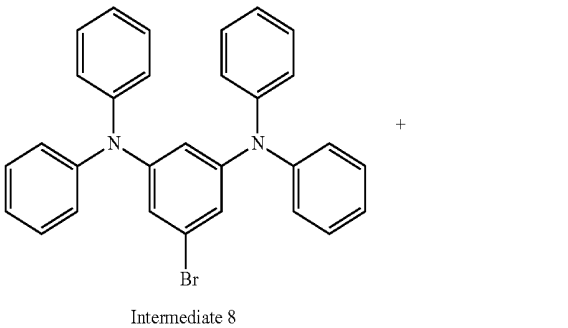


Intermediate 8

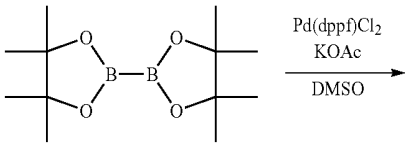
5 g of 3,5-bis(diphenylamine)-1-bromobenzene of Intermediate 8 was obtained using 9 g of 1,3,5-tribromobenzene and 8 g of diphenylamine in the same manner as in Preparation Example 6 (Yield: 35%).

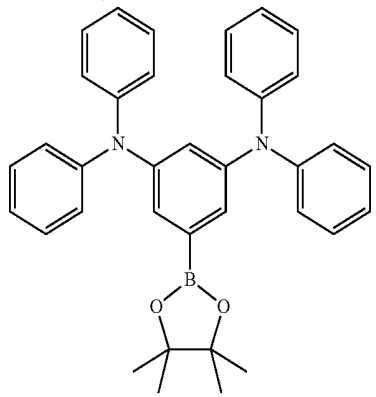
1H NMR ($CDCl_3$, 600 MHz) δ 7.24-7.21 (t, 8H), 7.08-7.06 (d, 8H), 7.02-7.00 (t, 4H), 6.75-6.74 (d, 2H), 6.71-6.70 (d, 1H)

Preparation Example 9. Synthesis of Intermediate 9



Intermediate 8



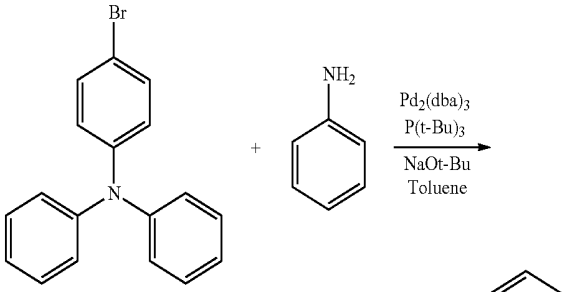


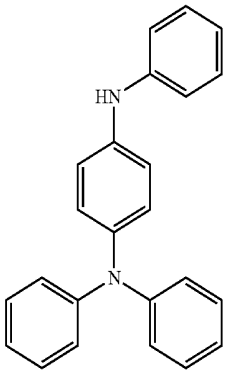
Intermediate 9

5 g of 3,5-bis(diphenylamine)-1-Pinacolatoboronbenzene of Intermediate 9 was obtained in the same manner as in Preparation Example 7, with the exception that 10 g of 3,5-bis(diphenylamine)-1-bromobenzene of Intermediate 8 was used (Yield: 35%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.20-7.19 (d, 2H), 7.19-7.16 (t, 8H), 7.02-7.01 (d, 8H), 6.94-6.91 (m, 5H), 1.26 (s, 12H)

Preparation Example 10. Synthesis of Intermediate 10

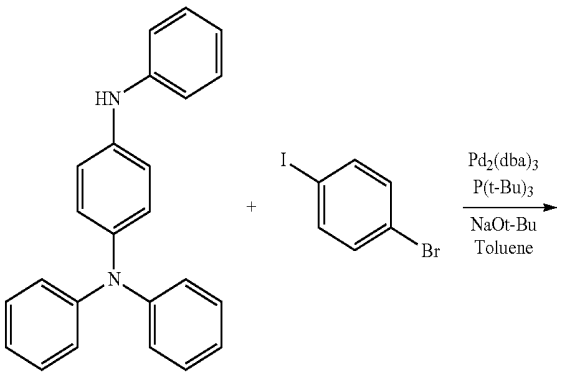




Intermediate 10

In a 250 ml round-bottom three-neck flask in a nitrogen atmosphere, 10 g of 4-bromo-N,N-diphenylbenzeneamine, 4.4 g of aniline, 6 g of t-butoxy sodium, 0.8 g of tris(dibenzylidineacetone)dipalladium(0), 0.4 g of tris(t-butyl) phosphine and 100 ml of toluene were placed, and stirred for 12 hours at 90° C. After completion of the reaction, the reaction solution was extracted with dichloromethane, and concentrated. then subjected to column chromatography using the mixture solvent of dichloromethane and n-hexane, and concentrated, thus obtaining 6.6 g of N,N,N'-triphenyl-benzene-1,4-diamine of Intermediate 10 (Yield: 65%).

Preparation Example 11. Synthesis of Intermediate 11



Intermediate 10

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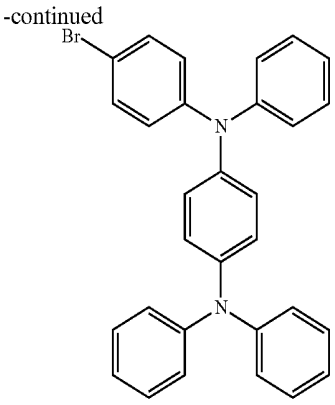
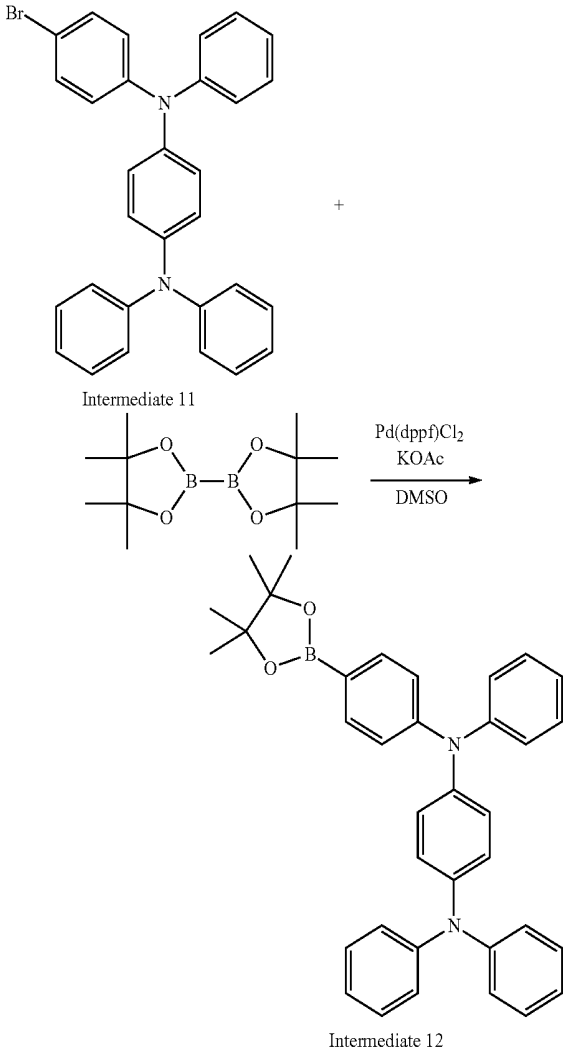


Intermediate 11

4.6 g of N-(4-bromophenyl)-N,N',N'-triphenylbenzene-1,4-diamine of Intermediate 11 was obtained in the same manner as in Preparation Example 10 using 6.6 g of Intermediate 10 prepared in Preparation Example 10 and 4.6 g of 4-bromo-iodobenzene (Yield: 50%).

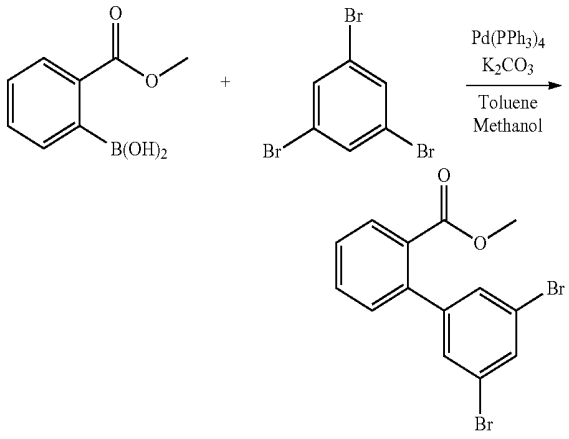
Preparation Example 12. Synthesis of Intermediate 12



Intermediate 12

2.2 g of N1-(4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-N1,N4,N4-triphenylbenzene-1,4-diamine of Intermediate 12 was obtained in the same manner as in Preparation Example 7 using 4.6 g of Intermediate 11 (Yield: 50%).

Preparation Example 13. Synthesis of Intermediate 13

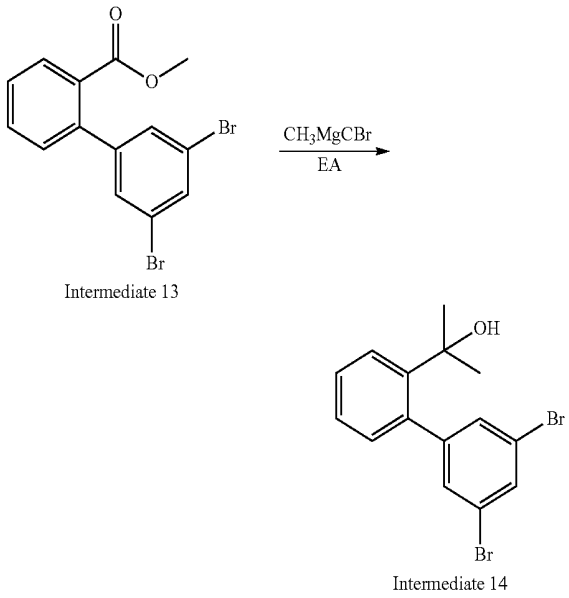


Intermediate 13

11 g of 2-methoxycarbonyl-3',5'-dibromobiphenyl of Intermediate 13 was obtained in the same manner as in Preparation Example 1 using 10 g of 2-(methoxycarbonyl) phenylboronic acid and 19 g of 1,3,5-tribromobenzene (Yield: 54%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.91-7.88 (d, 1H), 7.65 (s, 1H), 7.54-7.52 (t, 1H), 7.46-7.44 (t, 1H), 7.39-7.38 (s, 2H), 7.30-7.29 (d, 1H)

Preparation Example 14. Synthesis of Intermediate 14



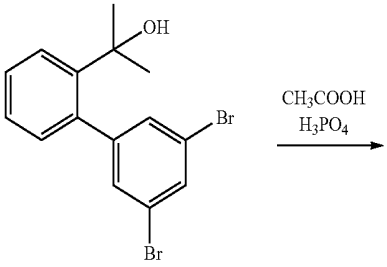
Intermediate 14

Intermediate 13 synthesized in Preparation Example 13, was dissolved in THF, then 40 ml of methylmagnesium

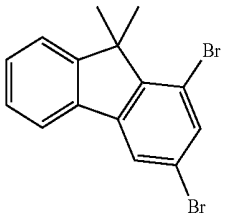
bromide solution (3.0 M in THF) was added dropwise and stirred for 12 hours at 60° C. The reaction mixture was cooled, extracted with ethyl acetate and water, subjected to column chromatography using the mixture solvent of dichloromethane and n-hexane, and concentrated, thus obtaining 11 g of 2-(3',5'-dibromobiphenyl-2-yl)-propane-2-ol of Intermediate 14 (Yield: 82%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.64-7.60 (m, 2H), 7.40 (s, 2H), 7.37-7.34 (t, 1H), 7.25-7.23 (m, 1H), 7.01 (d, 1H), 1.50 (s, 1H)

Preparation Example 15. Synthesis of Intermediate 15



Intermediate 14

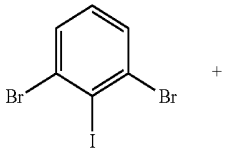


Intermediate 15

Intermediate 14 synthesized in Preparation Example 14, was dissolved in 200 ml of acetic acid and 300 ml of phosphoric acid, and then stirred for 12 hours at 120° C. The reaction solution was cooled, washed with water, extracted with ethyl acetate, subjected to column chromatography using the mixture solvent of dichloromethane and n-hexane, and concentrated, thus obtaining 5 g of 1,3-dibromo-9,9-dimethyl-9H-fluorene of Intermediate 15 (Yield: 44%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.79 (s, 1H), 7.65-7.64 (d, 1H), 7.593 (s, 1H), 7.43-7.42 (d, 1H), 7.40-7.32 (m, 2H), 1.62 (s, 6H)

Preparation Example 16. Synthesis of Intermediate 16



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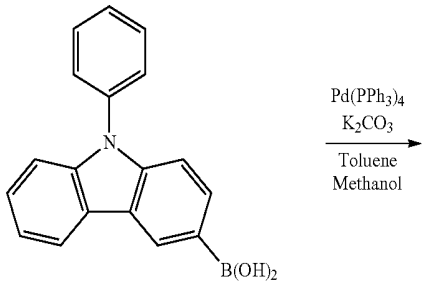
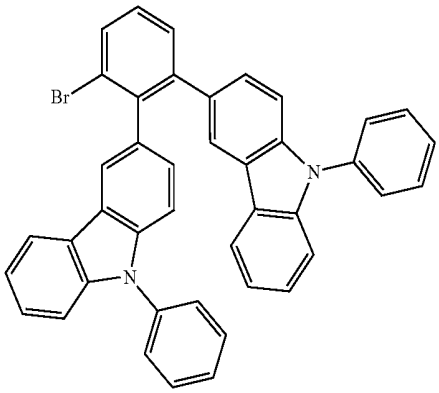


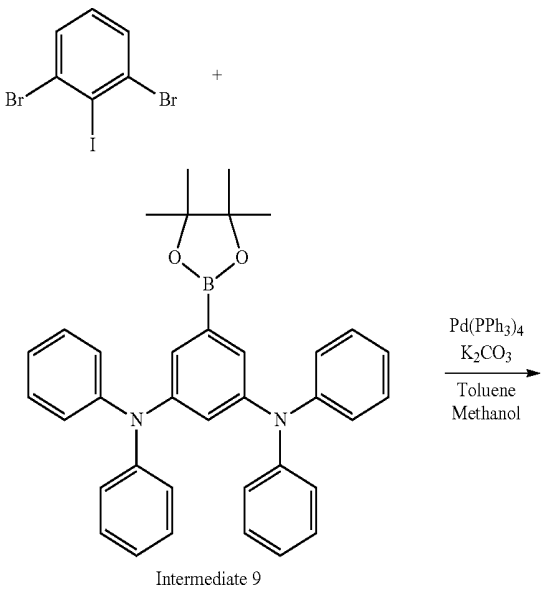


Intermediate 16

3.5 g of 3-(2-bromo-6-(9-phenyl-9H-carbazol-3-yl)phenyl)-9-phenyl-9H-carbazole of Intermediate 16 was obtained in the same manner as in Preparation Example 2, with the exception that 10 g of 9-phenyl-9H-carbazol-3-yl-3-boronic acid was used (Yield: 33%).

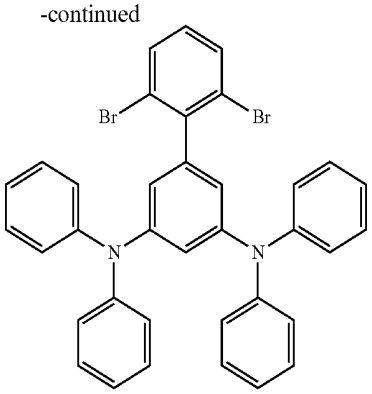
1H NMR ($CDCl_3$, 600 MHz) δ 8.02-8.01 (d, 1H), 7.97-7.96 (t, 3H), 7.74-7.73 (d, 1H), 7.53-7.49 (m, 7H), 7.45-7.39 (d, 2H), 7.38-7.30 (m, 7H), 7.23-7.19 (m, 3H), 7.16-7.14 (d, 1H), 7.08-7.04 (m, 2H)

Preparation Example 17. Synthesis of Intermediate 17



Intermediate 9

-continued

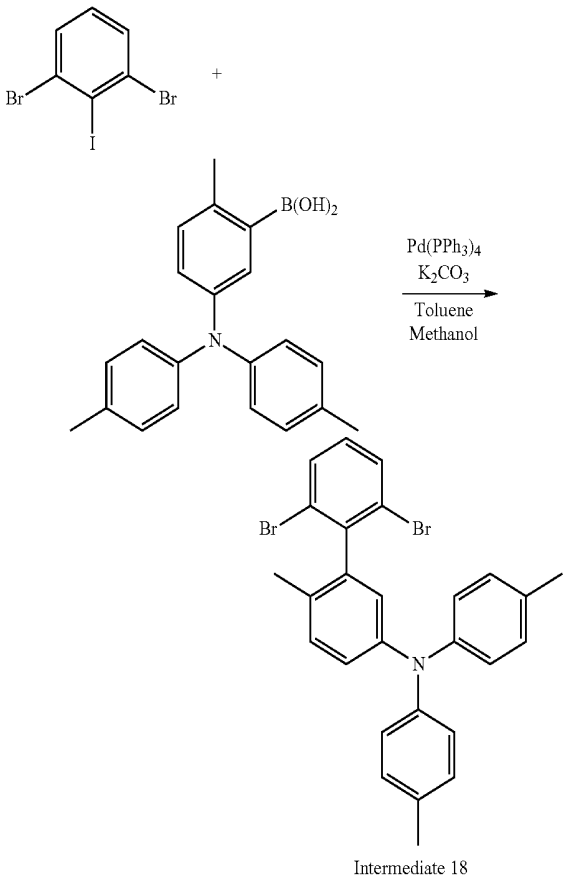


Intermediate 17

3 g of 5-(2,6-dibromophenyl)-N1,N1,N3,N3-tetraphenylbenzene-1,3-diamine of Intermediate 17 was obtained in the same manner as in Preparation Example 2, with the exception that Intermediate 9 prepared in Preparation Example 9 was used instead of phenyl boronic acide (Yield: 30%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.54-7.47 (d, 2H), 7.21-7.19 (m, 8H), 7.14-7.09 (m, 8H), 6.83-6.82 (t, 1H), 6.54-6.52 (d, 2H)

Preparation Example 18. Synthesis of Intermediate 18

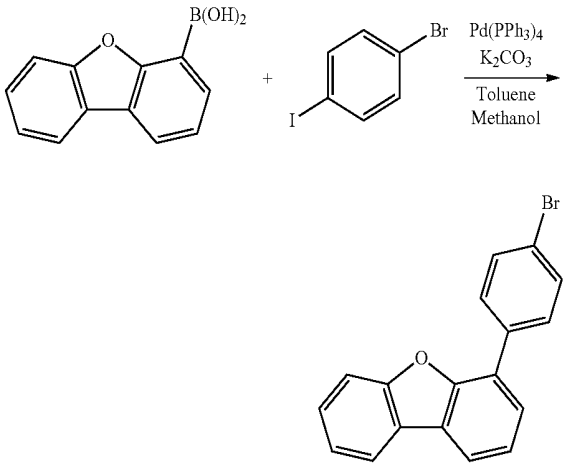


Intermediate 18

2.4 g of N-(3-(2,6-dibromophenyl)-4-methylphenyl)-4-methyl-N-p-tolylbenzenamine of Intermediate 18 was obtained in the same manner as in Preparation Example 1, with the exception that 5.5 g of 5-(dip-tolylamino)-2-methylphenylboronic acid was used instead of 1,3-dibromo-2-iodobenzene (Yield: 28%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.59-7.53 (d, 2H), 7.13-7.12 (d, 1H), 7.03-7.00 (m, 9H), 6.98-6.96 (dd, 1H), 6.81-6.80 (s, 1H), 2.29-2.28 (s, 9H)

Preparation Example 19. Synthesis of Intermediate 19

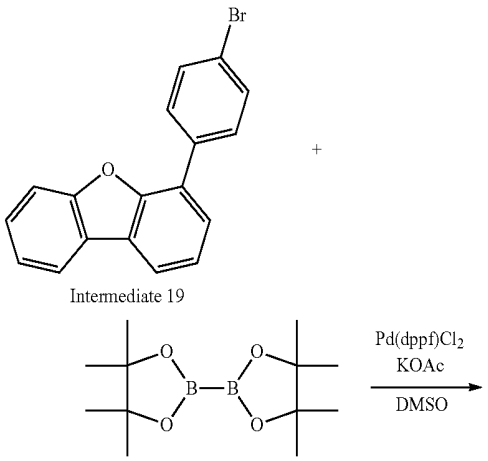


Intermediate 19

14.1 g of Intermediate 19 was obtained by the reaction of 10 g of dibenzofurane-4-boronic acid and 20 g of 4-bromo iodobenzene (Yield: 94%).

1H NMR ($CDCl_3$, 600 MHz) δ 8.00-7.98 (d, 1H), 7.95-7.94 (d, 1H), 7.80-7.79 (d, 2H), 7.67-7.65 (d, 2H), 7.60-7.58 (d, 1H), 7.57-7.55 (d, 1H), 7.47-7.46 (t, 1H), 7.43-7.41 (t, 1H), 7.38-7.35 (t, 1H)

Preparation Example 20. Synthesis of Intermediate 20



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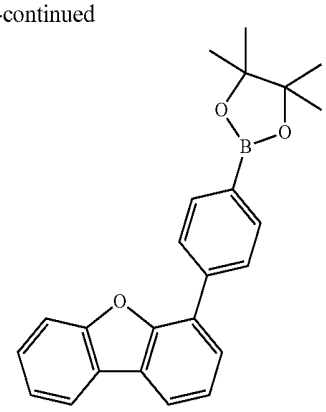
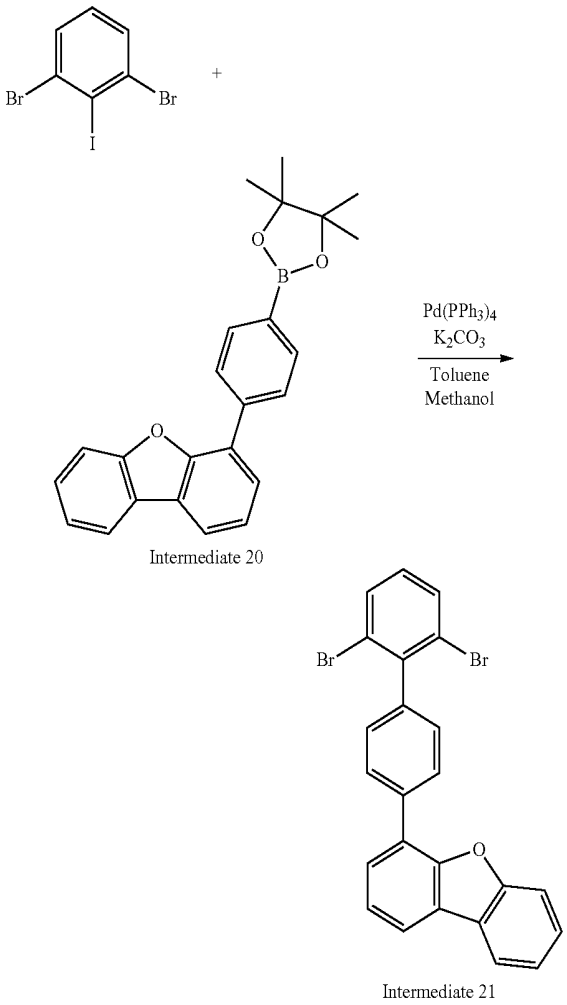


Intermediate 20

7.7 g of Intermediate 20 was obtained in the same manner as in Preparation Example 5 using 8 g of Intermediate 19 (Yield: 84%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.99-7.97 (d, 3H), 7.95-7.94 (d, 1H), 7.92-7.91 (d, 2H), 7.62-7.61 (d, 1H), 7.59-7.58 (d, 1H), 7.47-7.45 (t, 1H), 7.44-7.41 (t, 1H), 7.37-7.34 (t, 1H), 1.35 (s, 12H)

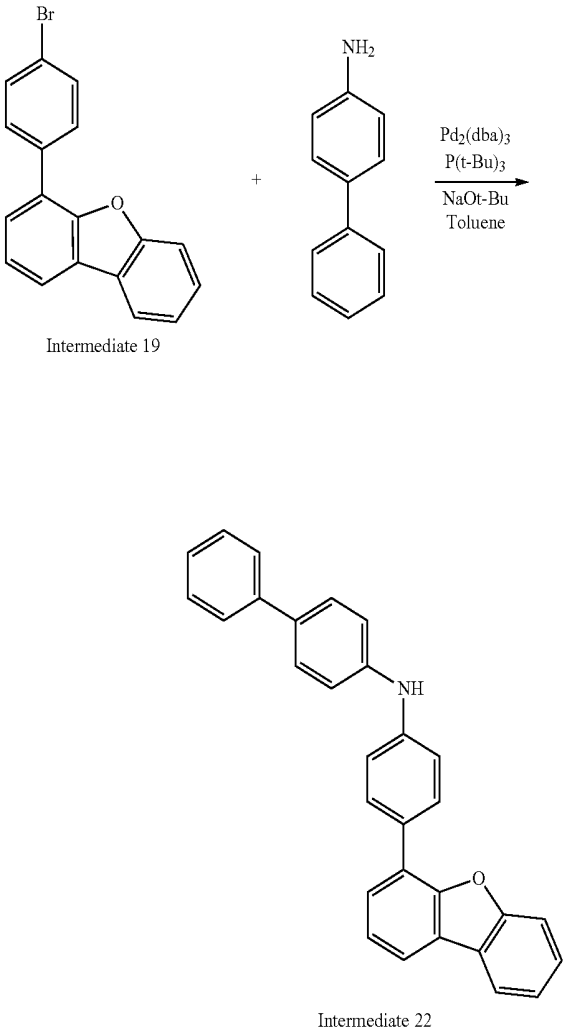
Preparation Example 21. Synthesis of Intermediate 21



2 g of Intermediate 21 was obtained in the same manner as in Preparation Example 1 using 4 g of Intermediate 20 and 4 g of 1,3-dibromo-2-iodobenzene (Yield: 40%).

1H NMR ($CDCl_3$, 600 MHz) δ 8.07-8.05 (d, 2H), 8.01-7.99 (d, 1H), 7.96-7.95 (d, 1H), 7.72-7.71 (d, 1H), 7.68-7.66 (d, 2H), 7.65-7.64 (d, 1H), 7.49-7.44 (m, 2H), 7.39-7.38 (m, 3H), 7.11-7.08 (t, 1H)

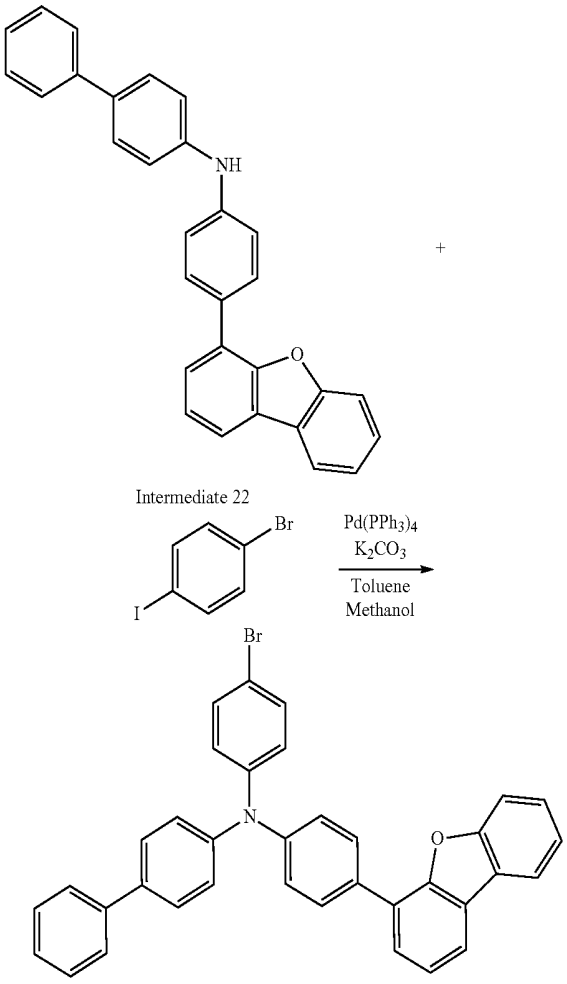
Preparation Example 22. Synthesis of Intermediate 22



5.8 g of Intermediate 22 was obtained in the same manner as in Preparation Example 6, with the exception that 6 g of Intermediate 19 prepared in Preparation Example 19 and 3.5 g of 4-biphenylamine were used (Yield: 76%).

1H NMR ($CDCl_3$, 600 MHz) δ 8.01-7.98 (d, 1H), 7.91-7.87 (m, 3H), 7.61-7.55 (m, 6H), 7.47-7.40 (m, 4H), 7.38-7.35 (t, 1H), 7.33-7.30 (t, 1H), 7.28-7.23 (m, 4H), 5.93 (s, 1H)

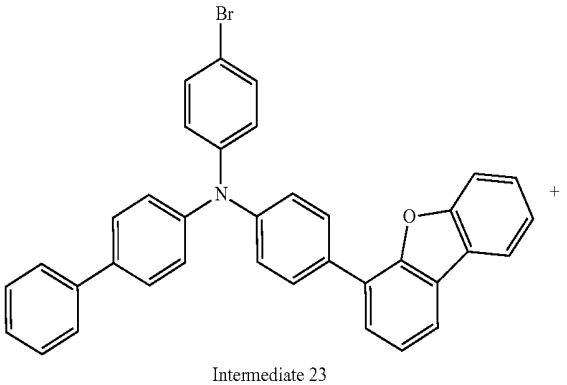
Preparation Example 23. Synthesis of Intermediate 23



4.5 g of Intermediate 23 was obtained in the same manner as in Preparation Example 22, with the exception that 5.8 g of Intermediate 22 prepared in Preparation Example 22 and 6 g of 1-bromo-4-iodobenzene were used (Yield: 59%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.99-7.98 (d, 1H), 7.92-7.90 (d, 1H), 7.87-7.85 (d, 2H), 7.61-7.58 (t, 4H), 7.54-7.52 (d, 2H), 7.46-7.32 (m, 8H), 7.27-7.22 (m, 4H), 7.11-7.09 (d, 2H)

Preparation Example 24. Synthesis of Intermediate 24



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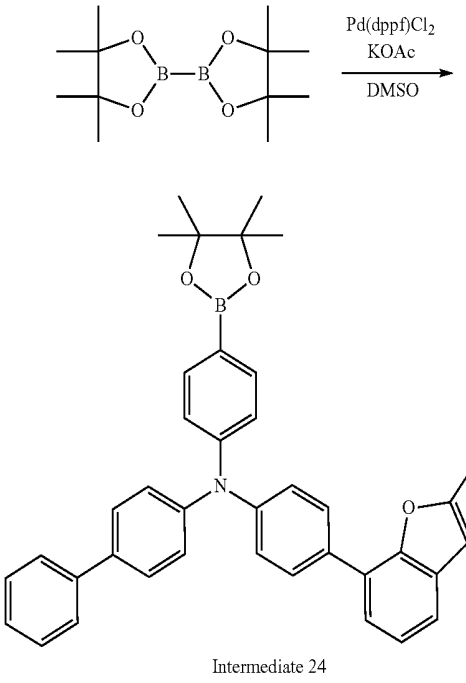
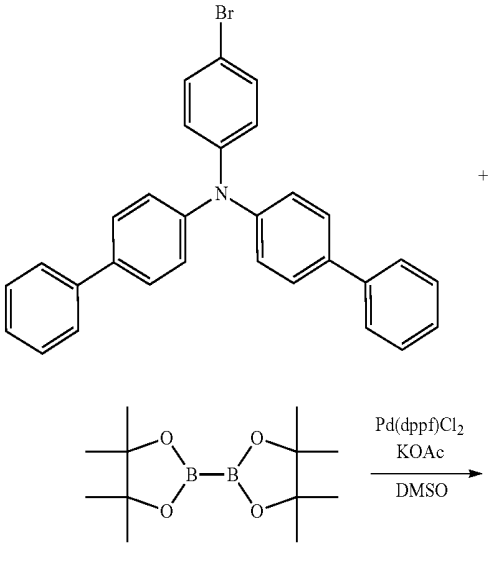


4.1 g of Intermediate 24 was obtained in the same manner as in Preparation Example 7, with the exception that 4.4 g of Intermediate 23 prepared in Preparation Example 23 was used (Yield: 87%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.99-7.98 (d, 1H), 7.91-7.90 (d, 1H), 7.86-7.85 (d, 2H), 7.74-7.73 (d, 2H), 7.61-7.59 (m, 4H), 7.54-7.52 (d, 2H), 7.46-7.40 (m, 4H), 7.36-7.25 (m, 6H), 7.20-7.15 (d, 2H), 1.34 (s, 12H)

Preparation Example 25. Synthesis of Intermediate 25



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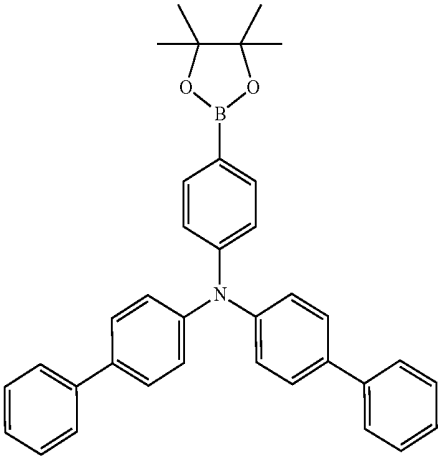
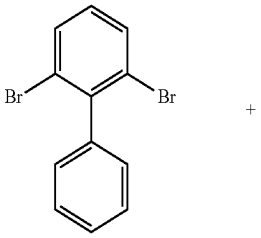


Intermediate 25

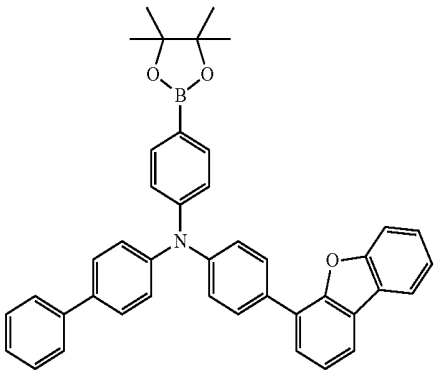
10 g of Intermediate 25 was obtained in the same manner as in Preparation Example 24 using 10 g of N-(biphenyl-4-yl)-N-(4-bromophenyl)-biphenyl-4-amine (Yield: 94%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.72-7.71 (d, 2H), 7.59-7.58 (d, 4H), 7.51-7.50 (d, 4H), 7.44-7.41 (t, 4H), 7.33-7.30 (t, 2H), 7.21-7.20 (d, 4H), 7.14-7.13 (d, 2H), 1.36 (s, 12H)

Preparation Example 26. Synthesis of Intermediate 26

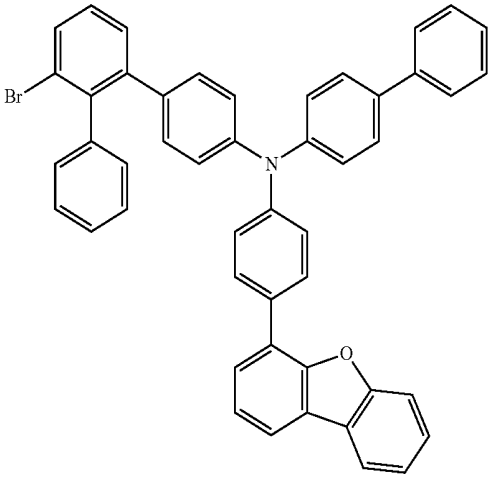


Intermediate 1



Intermediate 24

-continued

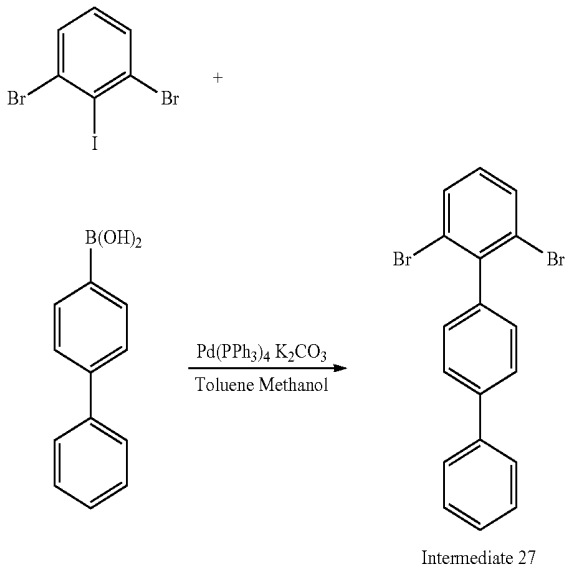


Intermediate 26

2.1 g of Intermediate 26 was obtained in the same manner as in Preparation Example 21 using 1.8 g of Intermediate 1 and 3.5 g of Intermediate 24 (Yield: 51%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.99-7.98 (d, 1H), 7.91-7.90 (d, 1H), 7.84-7.82 (d, 2H), 7.68-7.67 (d, 1H), 7.61-7.58 (m, 4H), 7.50-7.41 (m, 7H), 7.33-7.32 (t, 1H), 7.30-7.27 (m, 5H), 7.18-7.12 (m, 6H), 6.98-6.93 (m, 4H)

Preparation Example 27. Synthesis of Intermediate 27

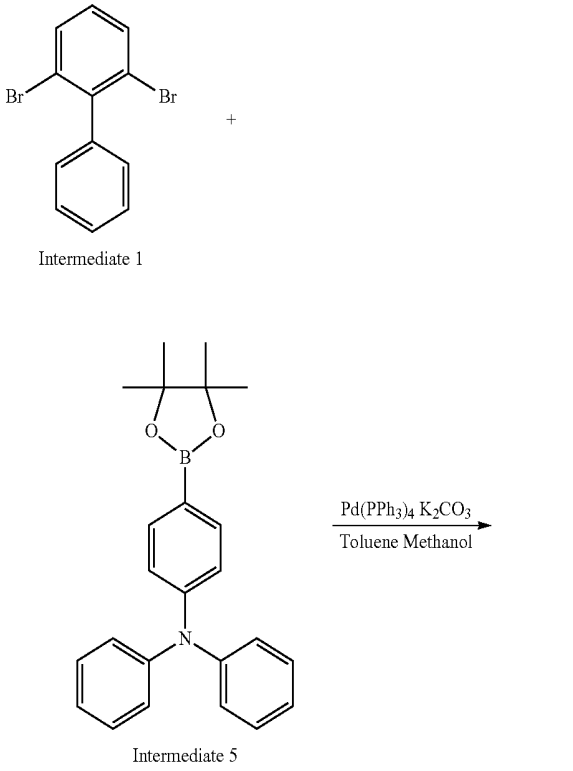


Intermediate 27

1.1 g of Intermediate 27 was obtained in the same manner as in Preparation Example 21, with the exception that 2.7 g of 4-biphenyl boronic acid was used instead of Intermediate 21 (Yield: 21%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.70-7.67 (t, 4H), 7.65-7.64 (d, 2H), 7.47-7.44 (t, 2H), 7.37-7.35 (t, 1H), 7.29-7.28 (d, 2H), 7.09-7.06 1H)

Example 1. Synthesis of Compound 1

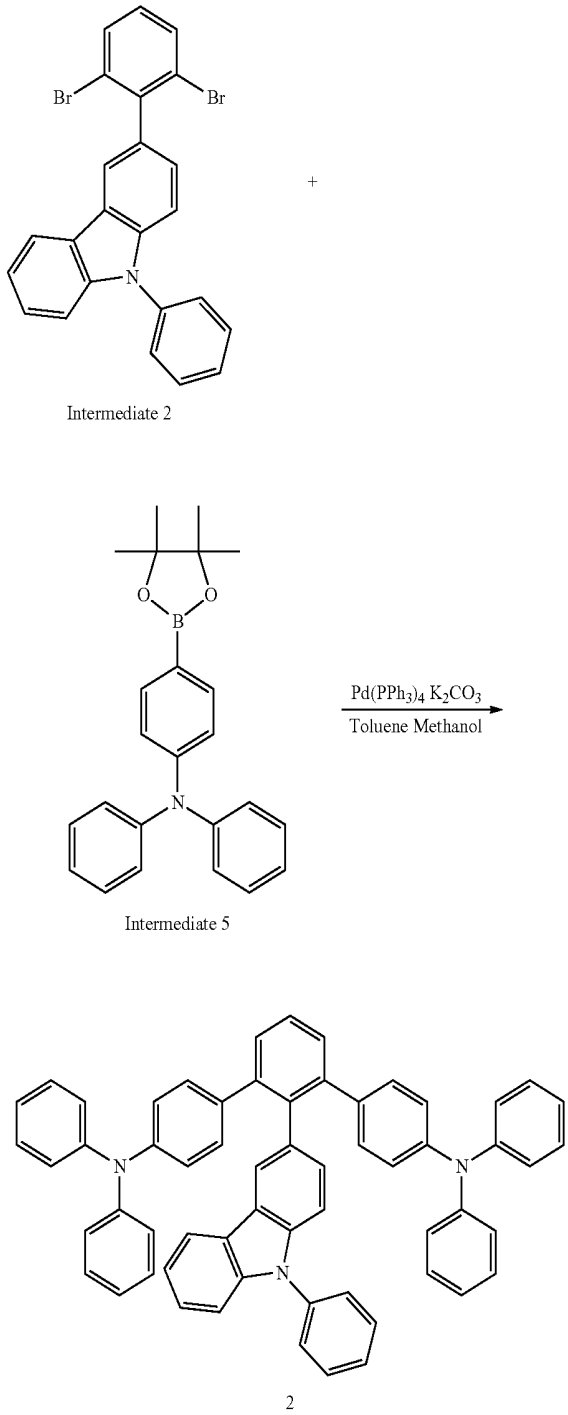


In a 250 ml round-bottom three-neck flask in a nitrogen atmosphere, 2.3 g of Intermediate 1, 4.7 g of Intermediate 5, 0.7 g of Tetrakis(triphenyl phosphine)palladium(0), 2.5 g of Potassium carbonate, 25 ml of Toluene and 10 ml of Methanol were placed, and stirred at 65 for 4 hr. The reaction solution was cooled, and extracted with dichloromethane and water. The extracted solution was concentrated, then subjected to column chromatography using the mixture solvent of dichloromethane and n-hexane, and concentrated, and recrystallized, thus obtaining 2 g of Compound 1 (Yield: 43%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.45-7.43 (t, 2H), 7.23-7.19 (t, 10H), 7.06-7.01 (m, 14H), 6.98-6.95 (t, 3H), 6.93-6.91 (t, 3H), 6.86-6.84 (d, 4H)

LC/Mass[M+H]$^+$: 640.9

Example 2. Synthesis of Compound 2



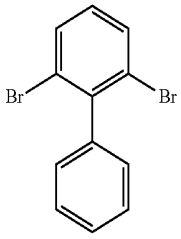
2.6 g of Compound 2 was prepared in the same manner as in Example 1 with the exception that Intermediate 2 was used instead of Intermediate 1 (Yield: 43%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.89-7.84 (d, 2H), 7.60-7.57 (m, 5H), 7.44-7.38 (m, 13H), 7.27-7.25 (d, 1H), 7.02-7.00 (d, 1H), 6.89-6.73 (m, 20H), 6.63-6.59 (s, 1H)

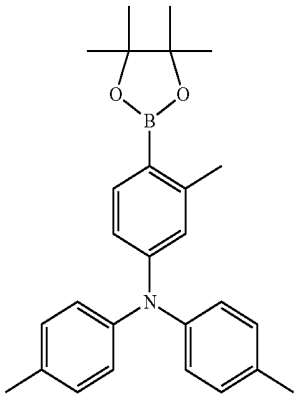
Tg: 103° C.

LC/Mass[M+H]$^+$: 805.9

Example 3. Synthesis of Compound 4

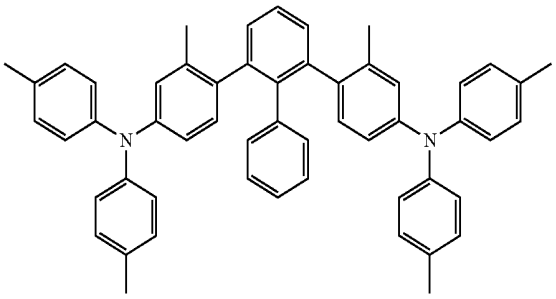


Intermediate 1



Intermediate 7

$Pd(PPh_3)_4$ K_2CO_3
Toluene Methanol



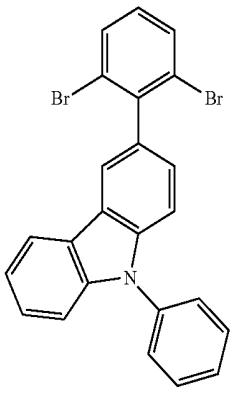
4

2.4 g of Compound 4 was prepared in the same manner as in Example 1 with the exception that 6.5 g of Intermediate 7 was used instead of Intermediate 5 (Yield: 52%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.42-7.38 (dd, 1H), 7.33-7.32 (d, 2H), 7.01-7.00 (d, 9H), 6.95-6.93 (t, 3H), 6.88-6.86 (dd, 8H), 6.81-6.77 (m, 2H), 6.72-6.71 (d, 3H), 6.67-6.64 (dd, 2H), 2.28 (s, 18H)

LC/Mass[M+H]$^+$: 725.4

Example 4. Synthesis of Compound 5



Intermediate 2

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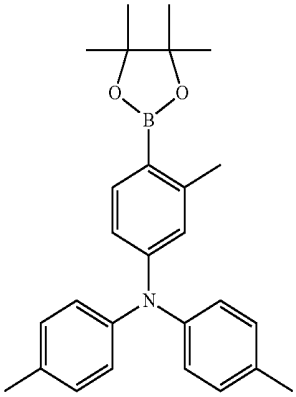
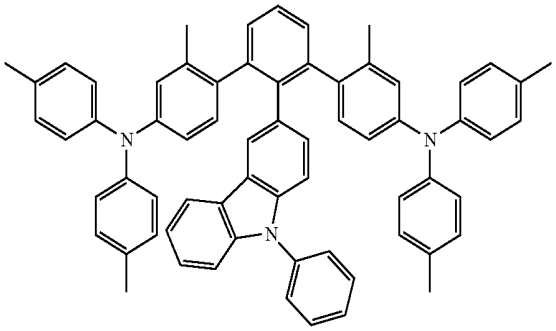


Intermediate 7

$Pd(PPh_3)_4$ K_2CO_3
Toluene Methanol



5

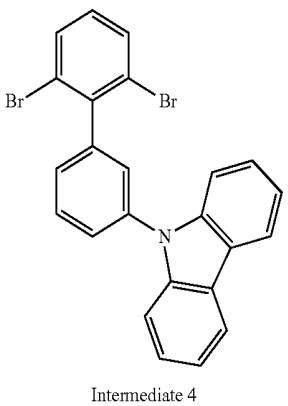
1.4 g of Compound 5 was prepared in the same manner as in Example 2 with the exception that Intermediate 7 was used instead of Intermediate 5 (Yield: 45%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.89-7.84 (d, 2H), 7.60-7.57 (m, 5H), 7.44-7.38 (m, 7H), 7.27-7.25 (d, 1H), 7.02-7.00 (d, 1H), 6.89-6.73 (m, 20H), 6.63-6.59 (s, 1H), 2.22 (s, 18H)

Tg: 133° C.

LC/Mass[M+H]$^+$: 890.4

Example 5. Synthesis of Compound 17



Intermediate 4

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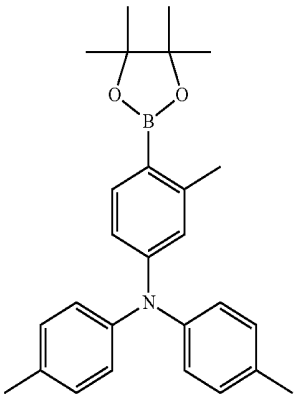
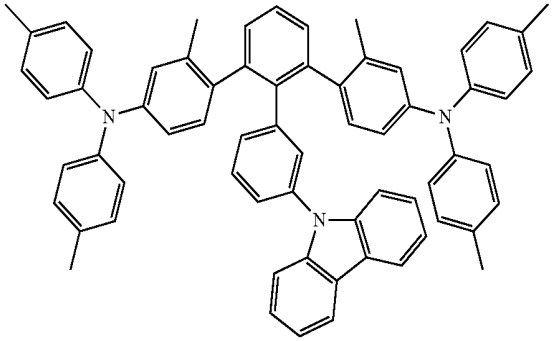


Intermediate 7



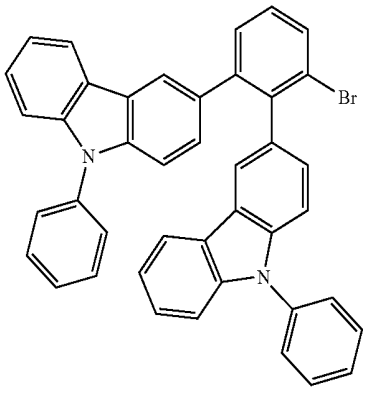
17

1 g of Compound 17 was prepared in the same manner as in Example 4 with the exception that Intermediate 4 was used instead of Intermediate 2 (Yield: 32%).

1H NMR ($CDCl_3$, 600 MHz) δ 8.09-8.07 (d, 2H), 7.42-7.40 (d, 1H), 7.33-7.19 (m, 9H), 7.08-7.00 (m, 10H), 6.98-6.88 (m, 12H), 6.84-6.80 (m, 2H), 6.72 (s, 1H), 2.30 (s, 18H)

LC/Mass[M+H]$^+$: 890.9

Example 6. Synthesis of Compound 20



Intermediate 16

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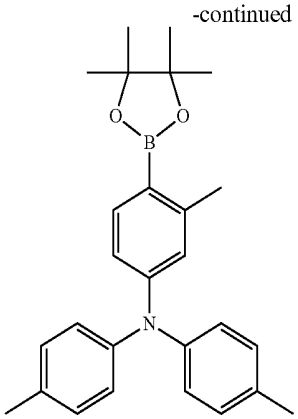
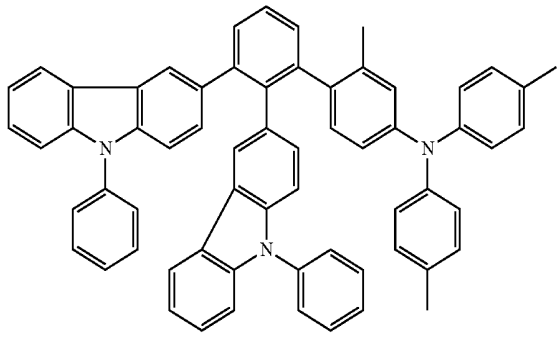


Intermediate 7



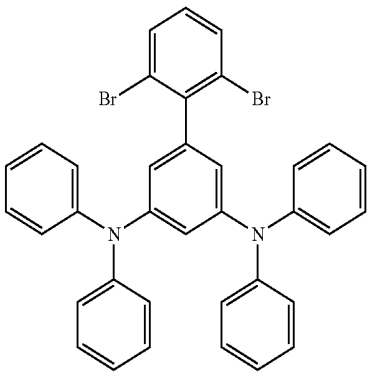
20

1 g of Compound 20 was prepared in the same manner as in Example 4 with the exception that 1.6 of Intermediate 16 was used instead of Intermediate 2 (Yield: 63%).

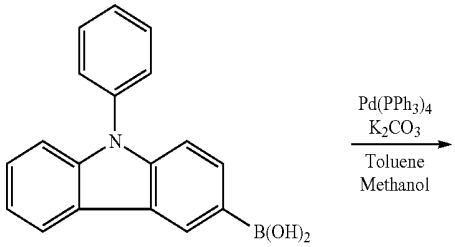
1H NMR ($CDCl_3$, 600 MHz) δ 8.10 (s, 1H), 8.01-8.00 (d, 1H), 7.64-7.61 (d, 1H), 7.52-7.32 (m, 24H), 7.25-7.21 (t, 2H), 7.08 (s, 2H), 6.81-6.71 (m, 7H)

LC/Mass[M+H]$^+$: 846.8

Example 7. Synthesis of Compound 24



Intermediate 17



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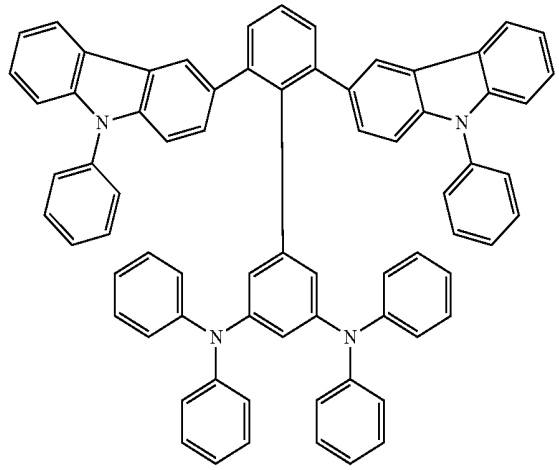


24

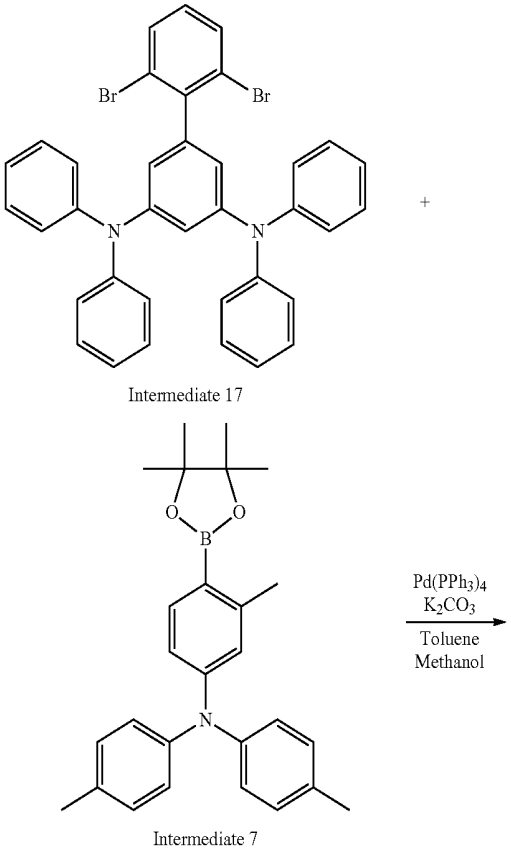
1.6 g of Compound 24 was prepared in the same manner as in Example 6 with the exception that 2.5 of Intermediate 17 and 2.5 g of 9-phenyl-9H-carbazol-3-yl-3-boronic acid were used instead of Intermediate 16 and Intermediate 17 (Yield: 43%).

1H NMR ($CDCl_3$, 600 MHz) δ 8.07-8.06 (d, 2H), 7.88 (s, 2H), 7.63-7.62 (t, 4H), 7.58-7.57 (d, 4H), 7.50-7.47 (m, 10H), 7.36-7.34 (m, 4H), 7.27 (s, 1H), 6.74-6.71 (t, 8H), 6.66-6.64 (t, 4H), 6.56-6.54 (d, 8H), 6.43 (s, 2H), 6.30 (s, 1H)

Tg: 129° C.

LC/Mass[M+H]$^+$: 971.6

Example 8. Synthesis of Compound 26



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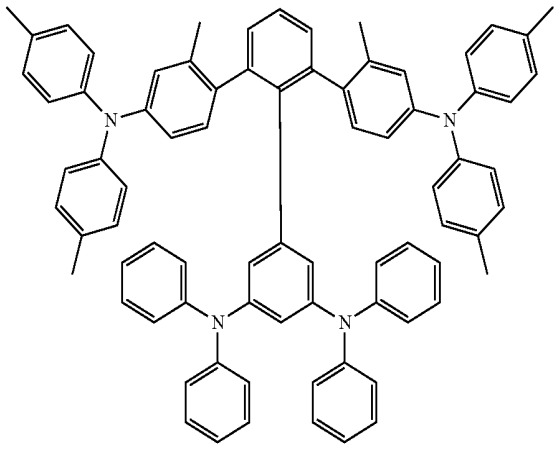


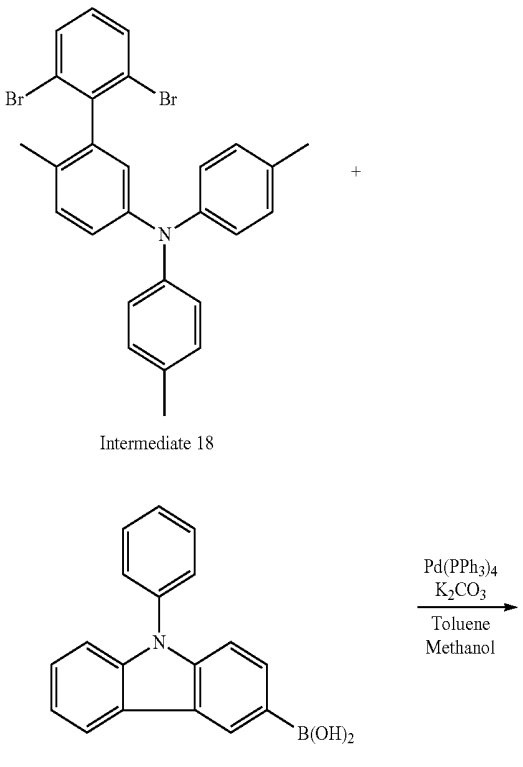
26

0.8 g of Compound 26 was prepared in the same manner as in Example 7 with the exception that 2.6 of Intermediate 7 was used instead of 9-phenyl-9H-carbazol-3-yl-3-boronic acid (Yield: 30%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.59-7.58 (d, 1H), 7.29-7.25 (t, 1H), 7.18-7.16 (d, 2H), 7.06-7.02 (m, 18H), 7.01-6.97 (d, 3H), 6.85-6.75 (m, 21H), 6.58 (s, 1H), 6.30 (s, 1H), 2.30 (s, 18H)

LC/Mass[M+H]$^+$: 1059

Example 9. Synthesis of Compound 30



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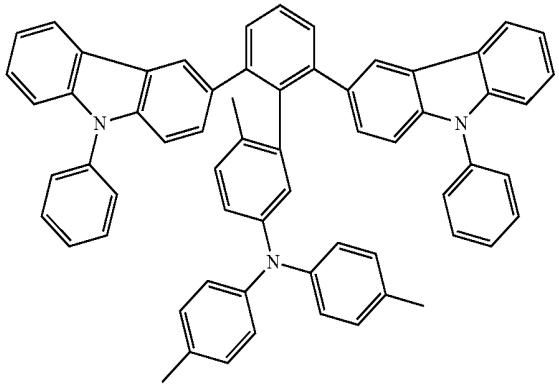


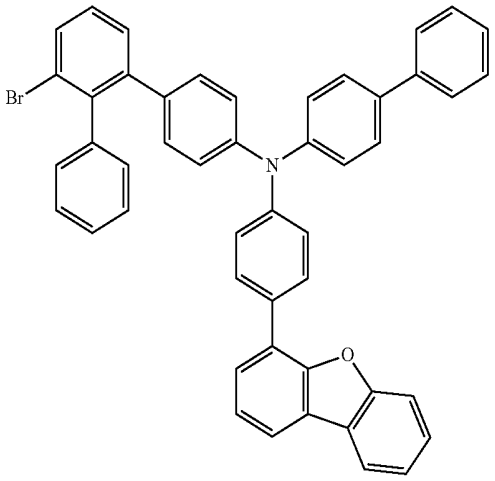
30

1.4 g of Compound 30 was prepared in the same manner as in Example 7 with the exception that 2.4 of Intermediate 18 was used instead of Intermediate 17 (Yield: 37%).

1H NMR ($CDCl_3$, 600 MHz) 8.07-8.06 (d, 2H), 7.88 (s, 2H), 7.63-7.62 (t, 4H), 7.58-7.57 (d, 4H), 7.50-7.47 (m, 10H), 7.29-7.25 (t, 1H), 7.18-7.16 (d, 2H), 7.01-6.97 (d, 3H), 6.85-6.75 (m, 10H), 2.30 (s, 9H) Tg: 138° C.

LC/Mass$[M+H]^+$: 846.7

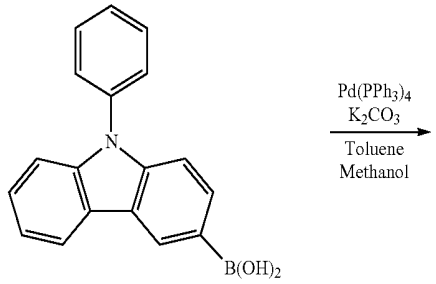
Example 10. Synthesis of Compound 32

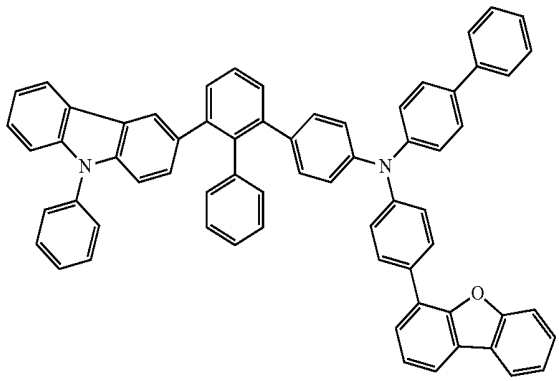


Intermediate 26

+

-continued





32

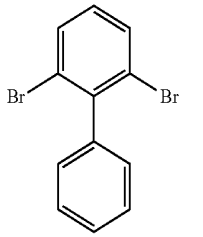
1.1 g of Compound 32 was prepared in the same manner as in Example 9 with the exception that 1.7 of Intermediate 26 was used instead of Intermediate 18 (Yield: 55%).

1H NMR ($CDCl_3$, 600 MHz): 8.07-8.06 (d, 2H), 7.99-7.98 (d, 2H), 7.91-7.89 (d, 2H), 7.88 (s, 2H), 7.83-7.82 (d, 4H), 7.61-7.58 (m, 4H), 7.51-7.49 (d, 4H), 7.47-7.40 (m, 8H), 7.37-7.30 (m, 4H), 7.22-7.18 (m, 4H), 7.11 (s, 2H), 7.01 (s, 4H), 6.93-6.92 (t, 2H)

Tg: 148.6° C.

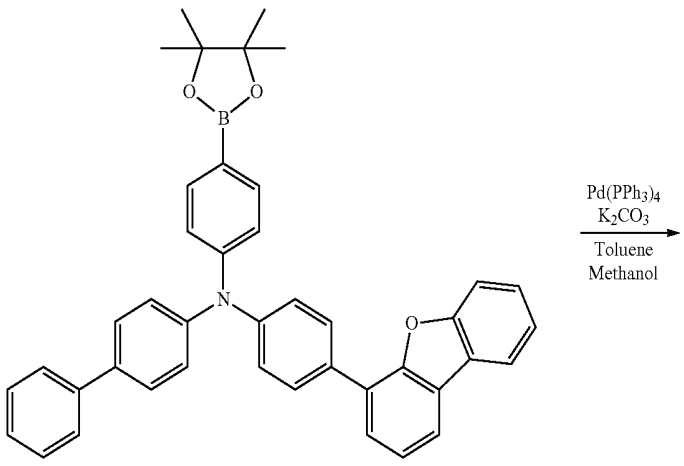
LC/Mass$[M+H]^+$: 880.8

Example 11. Synthesis of Compound 33



Intermediate 1

+



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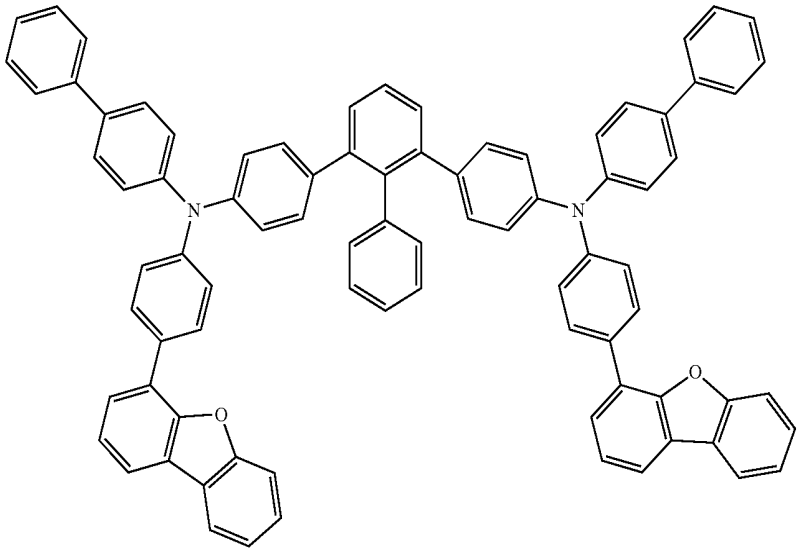


33

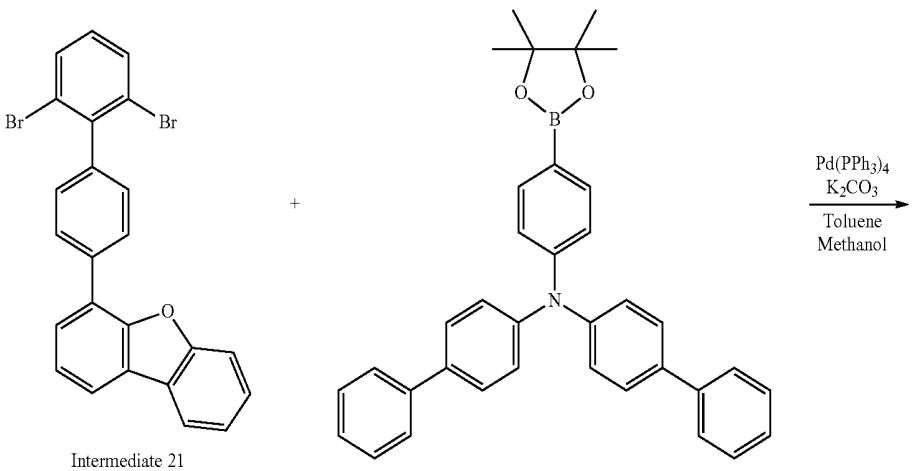
3.8 g of Compound 33 was prepared in the same manner as in Example 1 with the exception that 7 g of Intermediate 24 was used instead of Intermediate 5 (Yield: 60%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.99-7.98 (d, 2H), 7.91-7.89 (d, 2H), 7.83-7.82 (d, 4H), 7.61-7.58 (m, 8H), 7.51-7.49 (d, 6H), 7.47-7.40 (m, 8H), 7.37-7.30 (m, 4H), 7.22-7.18 (m, 10H), 7.11 (s, 2H), 7.01 (s, 8H), 6.93-6.92 (t, 2H)

Tg: 151.6° C.

LC/Mass[M+H]$^+$: 1125.1

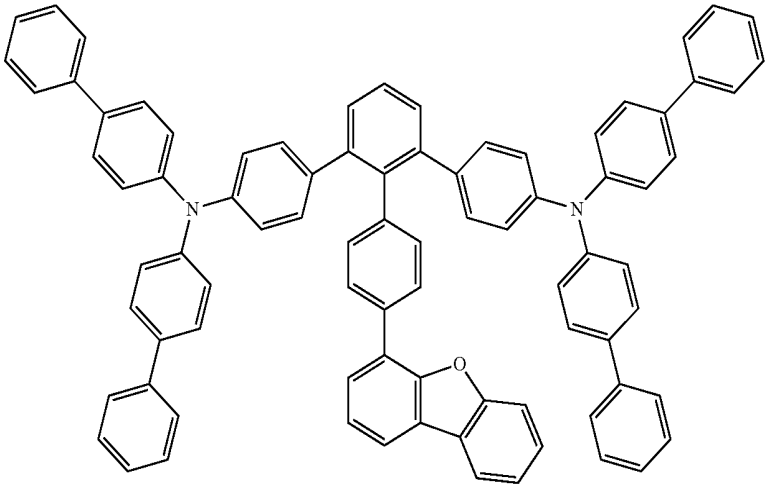
Example 12. Synthesis of Compound 34



Intermediate 21

Intermediate 25

-continued



34

2.2 g of Intermediate 34 was obtained in the same manner as in Preparation Example 1 using 2.1 g of Intermediate 21 and 4.6 g of

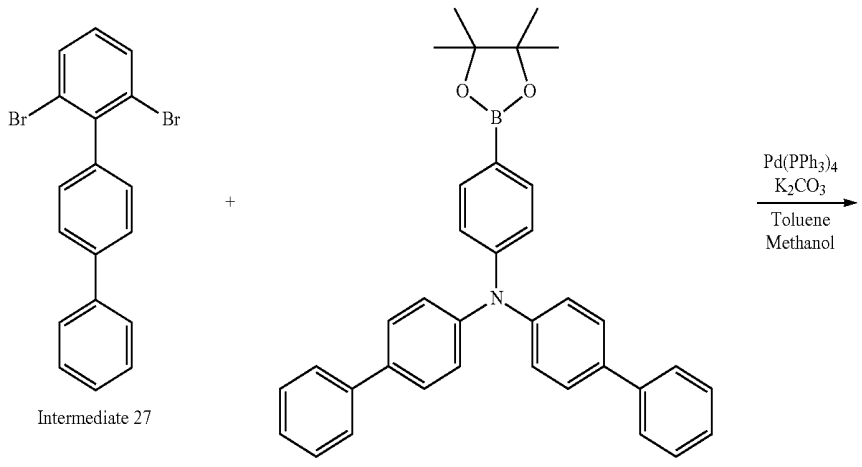
Intermediate 25 (Yield: 45%).

1H NMR ($CDCl_3$, 600 MHz) δ 8.00-7.99 (d, 1H), 7.90-7.89 (d, 1H), 7.80-7.79 (d, 2H), 7.67-7.66 (d, 1H), 7.59-7.57 (d, 1H), 7.53 (s, 3H), 7.43-7.41 (d, 8H), 7.39 (s, 1H), 7.36-7.34 (m, 18H), 7.28-7.27 (d, 4H), 7.12-7.11 (d, 8H), 7.08-7.05 (t, 6H), 7.00-6.99 (d, 4H)

Tg: 142.9° C.

LC/Mass[M+H]$^+$: 1110.7

Example 13. Synthesis of Compound 35



Intermediate 27

Intermediate 25

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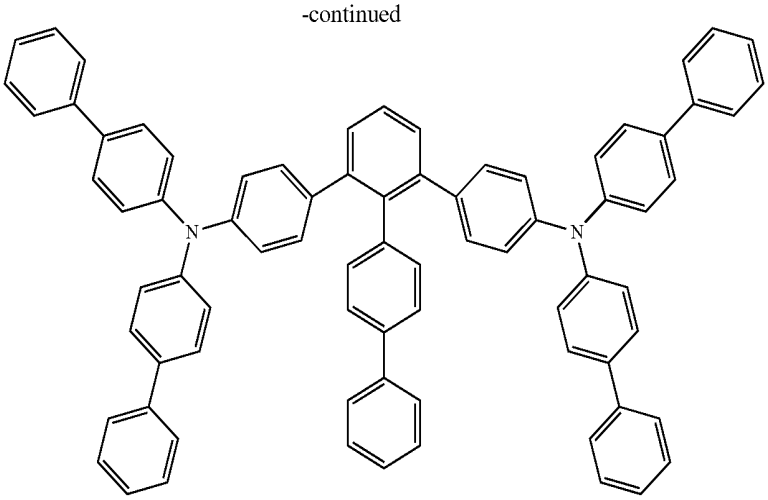


35

2.5 g of Compound 35 was prepared in the same manner as in Example 12 with the exception that 1.1 g of Intermediate 27 was used instead of Intermediate 21 (Yield: 89%).

1H NMR ($CDCl_3$, 600 MHz) δ 7.63-7.61 (d, 2H), 7.51-7.50 (d, 10H), 7.41-7.38 (m, 18H), 7.37 (s, 2H), 7.34-7.33 (d, 2H), 7.31-7.29 (t, 4H), 7.11-7.10 (d, 8H), 7.03-7.01 (d, 4H), 6.97-6.93 (m, 6H)

Tg: 139.8° C.

LC/Mass[M+H]$^+$: 1020.4

Device Example 1. Manufacture of Organic EL Device Including Compound 1 as Second Hole Transport Layer Material

A glass substrate coated with an ITO (indium tin oxide) thin film having a thickness of 100 nm was ultrasonically washed with an isopropyl alcohol solvent, dried, placed in a plasma cleaning system so that the substrate was cleaned using oxygen plasma for 5 min, and then transferred into a vacuum deposition system.

The ITO transparent electrode thus prepared was used as an anode, and DNTPD [N,N'-diphenyl-N,N'-bis-[4-(phenyl-m-tolylamino)-phenyl]-biphenyl-4,4'-diamine] was vacuum deposited on the ITO substrate, thus forming a hole injection layer having a thickness of 50 nm. Subsequently, TBDB [N,N,N',N'-tetra(4-biphenyl)-diaminobiphenylene] was vacuum deposited to a thickness of 30 nm, thus forming a first hole transport layer, and a second hole transport layer was formed to a thickness of 10 nm using compound 5 on the first hole transport layer. GH1 as a host and 6 vol % of GD1 as a dopant were vacuum deposited to a thickness of 30 nm on the second hole transport layer, thus forming a light emitting layer.

Thereafter, a hole blocking layer was formed to a thickness of 10 nm using GH1 on the light emitting layer, and an electron transport layer was formed to a thickness of 20 nm using Alq_3 (tris(8-quinolinolato)-aluminum (III)) on the hole blocking layer. 2 nm thick Liq [lithium quinolate] and 100 nm thick Al were sequentially vacuum deposited on the electron transport layer to form a cathode, thereby manufacturing an organic EL device.

Device Example 2 to 4

An organic EL device of Device Example 2 to 4 was manufactured in the same manner as in Device Example 1, with the exception that Compounds of represented by the following Table 1 were used as a second hole transport layer instead of Compound 5.

Comparative Device Example 1. Manufacture of Organic EL Device Including TBDB as Second Hole Transport Layer Material

An organic EL device was manufactured in the same manner as in Device Example 1, with the exception that TBDB as second hole transport layer was used instead of Compound 5.

Device Example 5. Manufacture of Organic EL Device Including Compound 32 as Second Hole Transport Layer Material

A glass substrate coated with an ITO (indium tin oxide) thin film having a thickness of 100 nm was ultrasonically washed with an isopropyl alcohol solvent, dried, placed in a plasma cleaning system so that the substrate was cleaned using oxygen plasma for 5 min, and then transferred into a vacuum deposition system.

The ITO transparent electrode thus prepared was used as an anode, and DNTPD [N,N'-diphenyl-N,N'-bis-[4-(phenyl-m-tolylamino)-phenyl]-biphenyl-4,4'-diamine] was vacuum deposited on the ITO substrate, thus forming a hole injection layer having a thickness of 30 nm. Subsequently, HATCN [1,4,5,8,9,11-hexaazatriphenylene-hexacarbonitrile] was vacuum deposited to a thickness of 5 nm, thus forming a middle layer, and TBDB [N,N,N',N'-tetra(4-biphenyl)-diaminobiphenylene] was vacuum deposited to a thickness of 20 nm, thus forming a first hole transport layer, and a second hole transport layer was formed to a thickness of 40 nm using compound 32 on the first hole transport layer. 1:3 vol % of mixture of GH1 and GH2 as a host and 11.5 vol ratio of GD1 as a dopant were vacuum deposited to a thickness of 40 nm on the hole transport layer, thus forming a light emitting layer.

Thereafter, an electron transport layer was formed on the light emitting layer to a thickness of 20 nm using DNABI [2-[4-(9,10-Di-naphthalen-2-yl-anthracen-2-yl)-phenyl]-1-phenyl-1H-benzoimidazole] on the hole blocking layer. 2 nm thick Liq [lithium quinolate] and 100 nm thick Al were

sequentially vacuum deposited on the electron transport layer to form a cathode, thereby manufacturing an organic EL device.

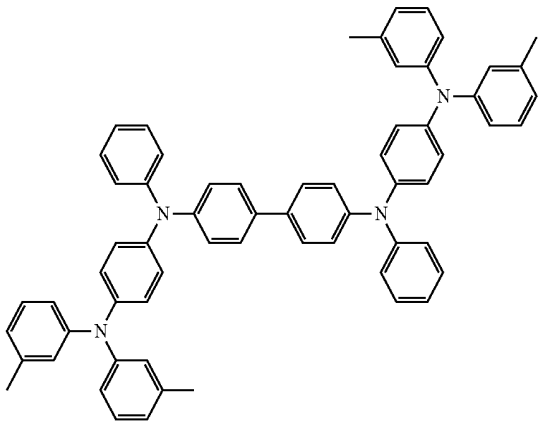
Device Examples 6 to 8

An organic EL device of Device Example 6 to 8 was manufactured in the same manner as in Device Example 5, with the exception that Compounds of represented by the following Table 2 were used as a second hole transport layer instead of Compound 32.

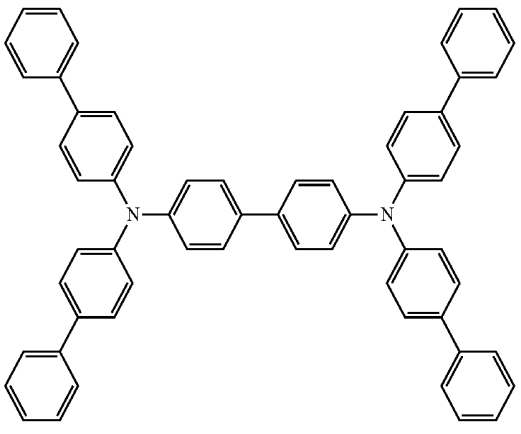
Comparative Device Example 2. Manufacture of Organic EL Device Including TBDB as Second Hole Transport Layer Material

An organic EL device was manufactured in the same manner as in Device Example 5, with the exception that TBDB as second hole transport layer was used instead of Compound 32.

The chemical formulas of DNTPD, TBDB, GH1, GH2, GD1, Alq_3 and DNABI used in the Device Example and Comparative Device Example are represented below.



DNTPD



TBDB

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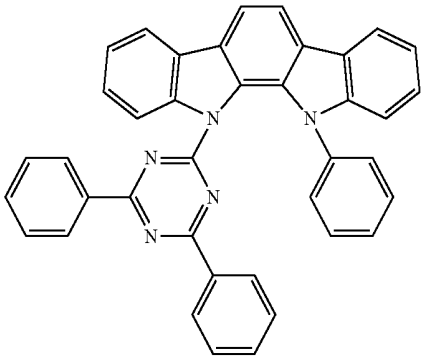
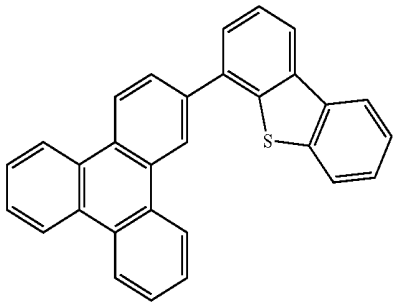
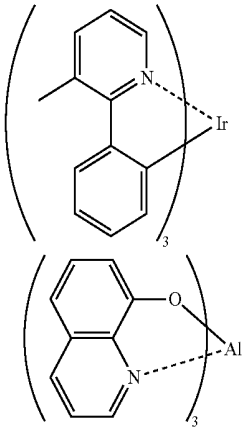
GH1



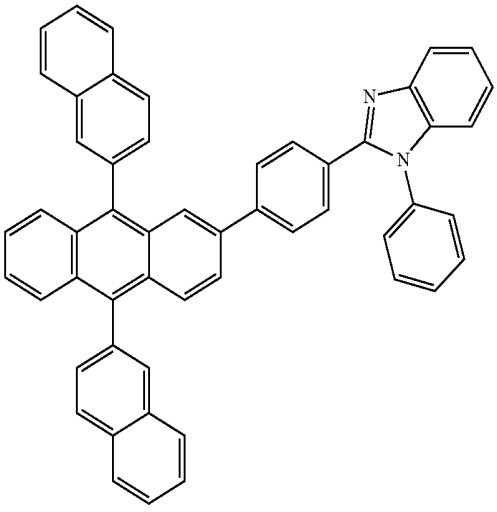
GH2



GD1



Alq_3



DNABI

Evaluation of Properties of Organic EL Device

The properties of the devices of Device Examples 1 to 4 and Comparative Device Examples 1 were evaluated at a brightness of 1000 cd/m^2. The results are shown in Table 1 below.

Also, The properties of the devices of Device Examples 5 to and Comparative Device Examples 2 were evaluated at a brightness of 1000 cd/m^2. The results are shown in Table 2 below.

TABLE 1

	2nd Hole transport layer material	Current density (mA/cm^2)	Brightness efficiency (cd/A)	Color coordinates CIE (x, y)
Device Ex. 1	Compound 5	2.61	38.50	0.32, 0.62
Device Ex. 2	Compound 20	2.33	43.10	0.33, 0.62
Device Ex. 3	Compound 24	1.96	51.14	0.33, 0.62
Device Ex. 4	Compound 30	2.41	41.88	0.33, 0.62
Comp. Device Ex. 1	TBDB	3.53	30.34	0.33, 0.62

TABLE 2

	2nd Hole transport layer material	Current density (mA/cm^2)	Brightness efficiency (cd/A)	Color coordinates CIE (x, y)
Device Ex. 5	Compound 32	2.2	46.8	0.34, 0.61
Device Ex. 6	Compound 33	2.2	48.0	0.34, 0.62
Device Ex. 7	Compound 34	2.0	49.7	0.34, 0.61
Device Ex. 8	Compound 35	2.2	49.6	0.33, 0.62
Comp. Device Ex. 2	TBDB	2.2	43.0	0.33, 0.62

Current density was in the manufactured organic EL devices, while a voltage was increased from 0 V to 10 V, current of each unit device was measured using a current-voltage meter (Keithley 2635 A Source Meter), and the measured current value was divided by the area, thus obtaining current density.

Brightness efficiency was In the manufactured organic EL devices, while a voltage was increased from 0 V to 10 V, the brightness was measured using a brightness meter (Minolta CS-2000), and the measured brightness value was divided by the current value, thus obtaining brightness efficiency.

According to Table 1 and 2, as is apparent from the results of manufacturing organic EL devices using the compounds according to the present invention as the material for the second hole transport layer, all of the devices exhibited superior properties decreasing Current density and increasing Brightness efficiency compared to when using TBDB as a conventional material.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

INDUSTRIAL APPLICABILITY

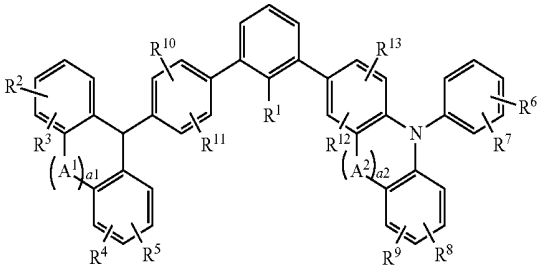
According to an embodiment of the present invention, two phenyl groups were combined on the meta position of benzene ring at the center, and diaryl amine is combined on para position of the each phenyl group to show excellent HOMO and LUMO energy level in the compound of the present invention, consequently obtaining a compound for an organic electroluminescent (EL) device with a high triplet energy.

Moreover, thermal stability and light emission efficiency of the organic EL device using the compound can be improved, and the use of the compound as a hole transport layer material enables a triplet energy of a phosphorescent light emitting material to be raised, consequently improving the efficiency of the organic EL device.

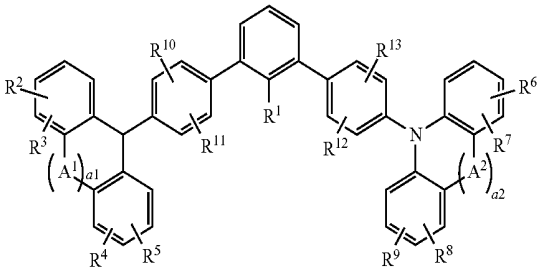
The invention claimed is:

1. A compound for an organic electroluminescent device, which is represented by any one selected from among Chemical Formulas 1 to 6 below:

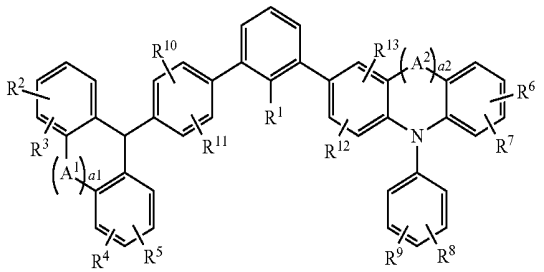
[Chemical Formula 1]



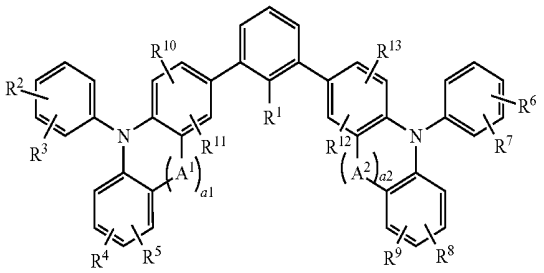
[Chemical Formula 2]



[Chemical Formula 3]



[Chemical Formula 4]



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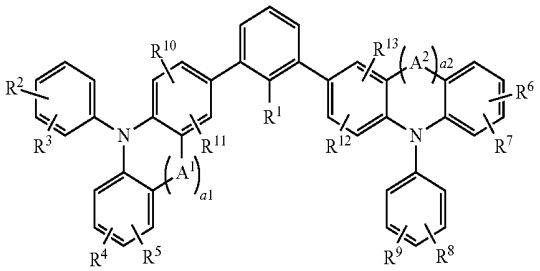
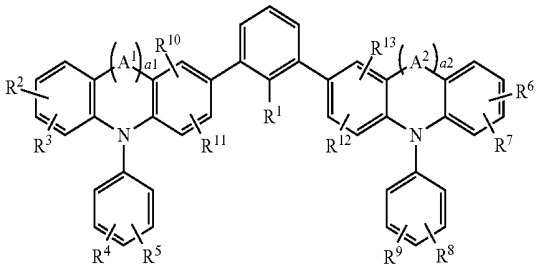
[Chemical Formula 5]



[Chemical Formula 6]



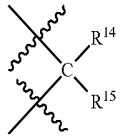
wherein R^1 is a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^2 to R^{13} are identical to or different from each other, and R^2 to R^{13} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or at least one of R^2 to R^{13} is further coupled with a carbon atom adjacent to a carbon atom linked therewith to form a substituted or unsubstituted fused C3 to C30 cycloalkyl group, a substituted or unsubstituted fused C1 to C30 heterocycloalkyl group, a substituted or unsubstituted fused C6 to C30 aryl group, or a substituted or unsubstituted fused C1 to C30 heteroaryl group,

A^1 being equal to H, H when a1 is 0,

A^2 being equal to H, H when a2 is 0, and

A^1 and A^2 being equal to or different from each other and each independently a valence bond or

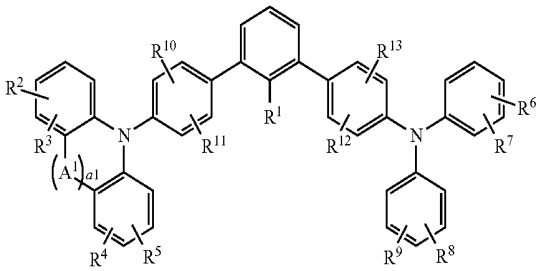


when a1 and a2 are 1, 1, and

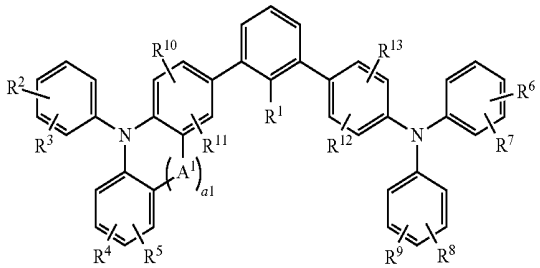
wherein R^{14} and R^{15} are identical to or different from each other, and R^{14} and R^{15} are each independently a hydrogen atom or a substituted or unsubstituted C1 to C30 alkyl group.

2. The compound of claim **1**, which is represented by any one selected from among Chemical Formulas 7 to 9 below:

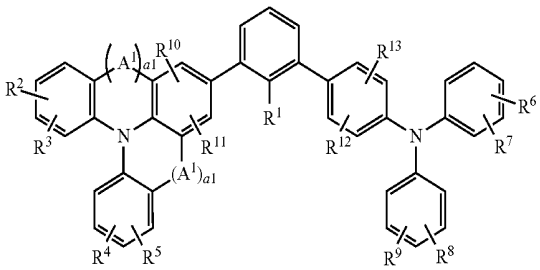
[Chemical Formula 7]



[Chemical Formula 8]



[Chemical Formula 9]

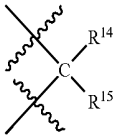


wherein R^1 is a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^2 to R^{13} are identical to or different from each other, and R^2 to R^{13} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or at least one of R^2 to R^{13} is further coupled with a carbon atom adjacent to a carbon atom linked therewith to form a substituted or unsubstituted fused C3 to C30 cycloalkyl group, a substituted or unsubstituted fused C1 to C30 heterocycloalkyl group, a substituted or unsubstituted fused C6 to C30 aryl group, or a substituted or unsubstituted fused C1 to C30 heteroaryl group,

A^1 being equal to H, H when a1 is 0, and

A^1 being equal to a valence bond or

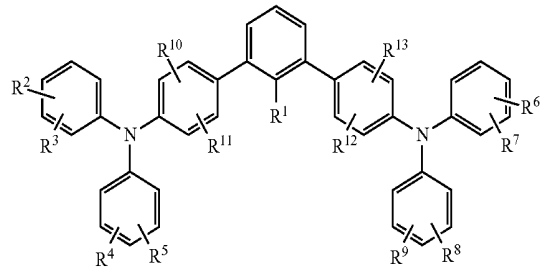


when a1 is 1,

wherein R^{14} and R^{15} are identical to or different from each other, and R^{14} and R^{15} are each independently a hydrogen atom or a substituted or unsubstituted C1 to C30 alkyl group.

3. The compound of claim 1, which is represented by Chemical Formula 10 below:

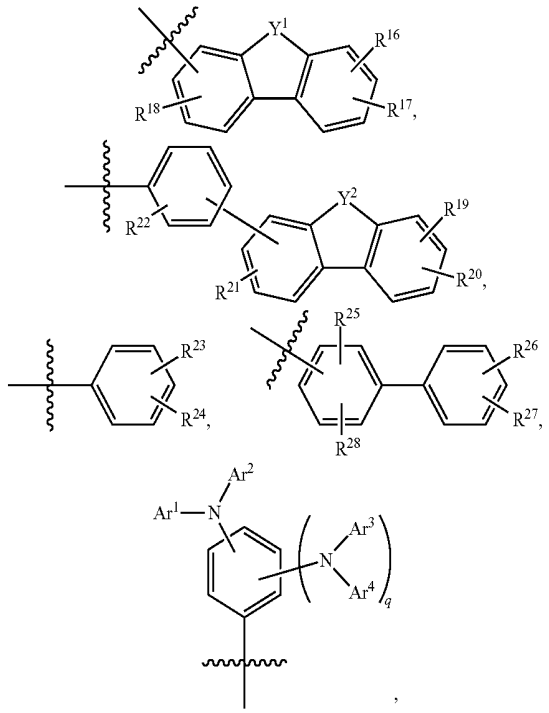
[Chemical Formula 10]



wherein R^1, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

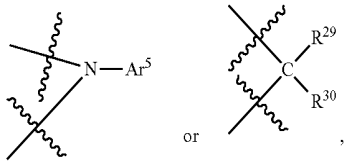
R^2 to R^{13} are identical to or different from each other, and R^2 to R^{13} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or at least one of R^2 to R^{13} is further coupled with a carbon atom adjacent to a carbon atom linked therewith to form a substituted or unsubstituted fused C3 to C30 cycloalkyl group, a substituted or unsubstituted fused C1 to C30 heterocycloalkyl group, a substituted or unsubstituted fused C6 to C30 aryl group, or a substituted or unsubstituted fused C1 to C30 heteroaryl group.

4. The compound of claim 1, wherein R^1 is



a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, or a substituted or unsubstituted C1 to C30 heterocycloalkyl group,

Y^1 and Y^2 are identical to or different from each other, and Y^1 and Y^2 are each independently an oxygen atom, a sulfur atom,



Ar^5 is a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

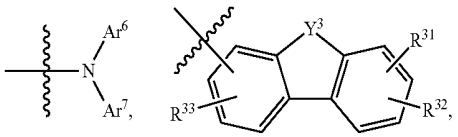
R^{29} and R^{39} are identical to or different from each other, and R^{29} and R^{39} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

Ar^1 to Ar^4 are identical to or different from each other, and Ar^1 to Ar^4 are each independently a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or Ar^1 and Ar^2, and Ar^3 and Ar^4, respectively, are linked to form a substituted or unsubstituted C1 to C30 heterocycloalkyl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, together with a nitrogen atom therebetween, or at least one of Ar^1 to Ar^4 is further coupled with a carbon atom on the β position of a nitrogen atom linked therewith to form a substituted or unsubstituted C1 to C30 heterocycloalkyl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

q is 0 or 1,

R^{16} to R^{28} are identical to or different from each other, and R^{16} to R^{28} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group.

5. The compound of claim 1, wherein R^2 to R^{13} are identical to or different from each other, and R^2 to R^{13} are each independently a hydrogen atom,



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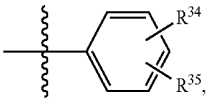
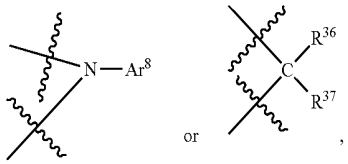


a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, or a substituted or unsubstituted C1 to C30 heterocycloalkyl group,

Y^3 is an oxygen atom, a sulfur atom,



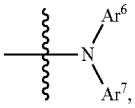
Ar^8 is a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^{36} and R^{37} are identical to or different from each other, and R^{36} and R^{37} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group,

Ar^6 and Ar^7 are identical to or different from each other, and Ar^6 and Ar^7 are each independently a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group, or Ar^6 and Ar^7 are linked to form a substituted or unsubstituted C1 to C30 heterocycloalkyl group or a substituted or unsubstituted C1 to C30 heteroaryl group, together with a nitrogen atom therebetween, or at least one of Ar^6 and Ar^7 is further coupled with a carbon atom on the β position of a nitrogen atom linked therewith to form a substituted or unsubstituted C1 to C30 heterocycloalkyl group or a substituted or unsubstituted C1 to C30 heteroaryl group,

R^{31} to R^{35} are identical to or different from each other, and R^{31} to R^{35} are each independently a hydrogen atom, a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group.

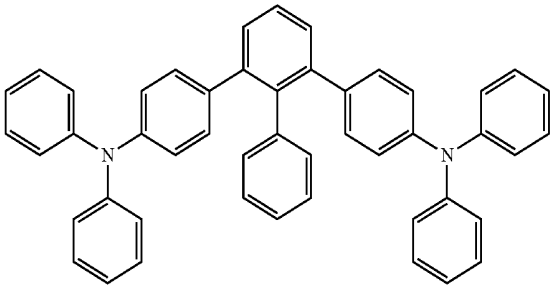
6. The compound of claim **5**, wherein at least one of R^2 to R^{13} are



and Ar^6 and AC are identical to or different from each other, and Ar^6 and Ar^7 are each independently a substituted or unsubstituted C1 to C30 alkyl group, a substituted or unsubstituted C3 to C30 cycloalkyl group, a substituted or unsubstituted C1 to C30 heterocycloalkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C1 to C30 heteroaryl group.

7. The compound of claim **1**, which is any one selected from among Compounds 1 to 35 represented by the following chemical formulas:

1



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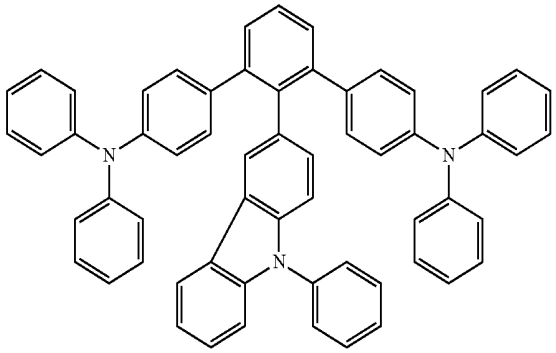

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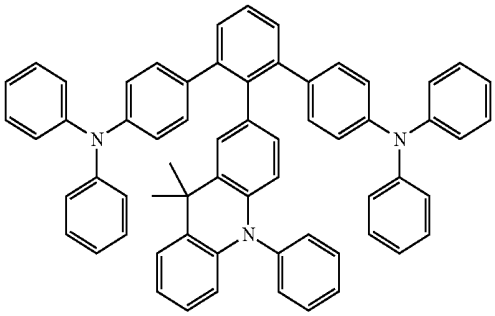

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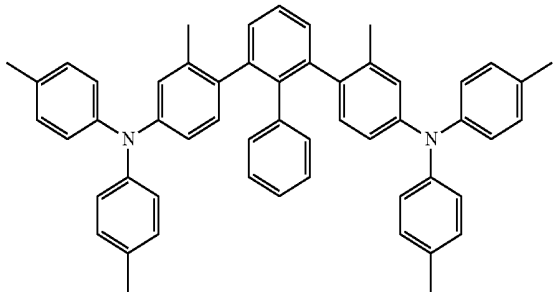

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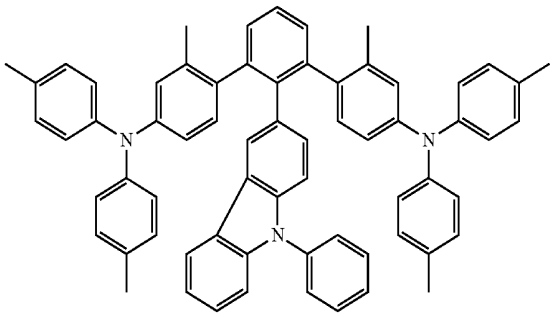

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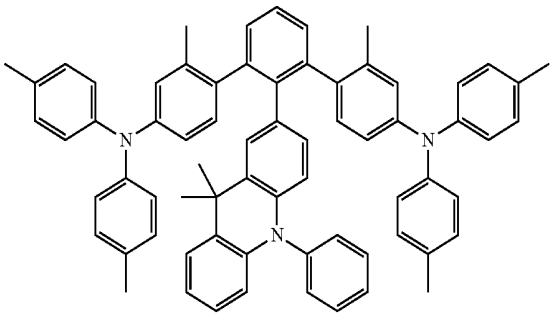

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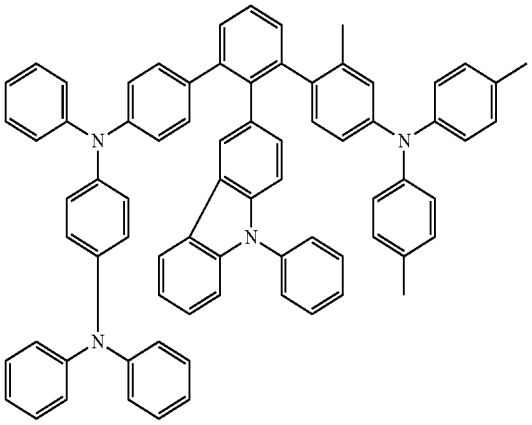

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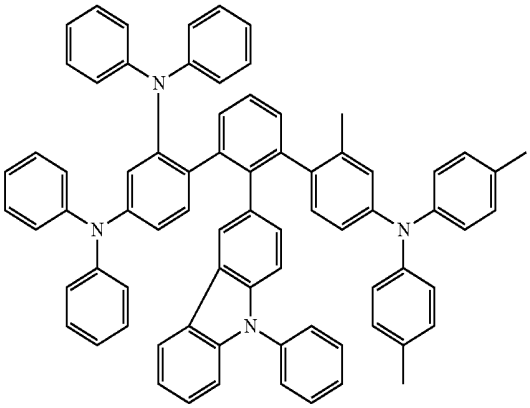

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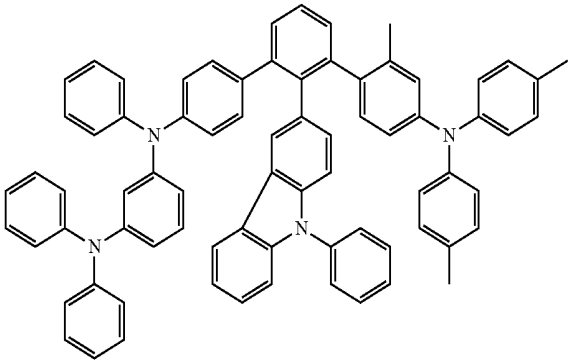

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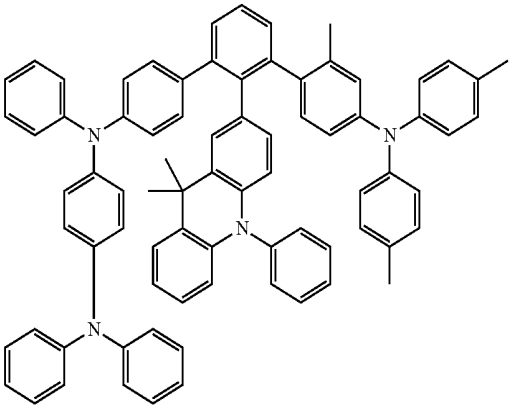

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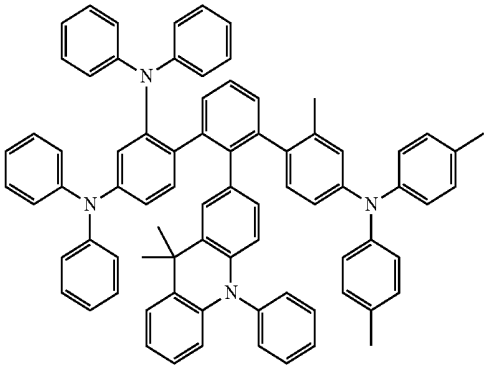

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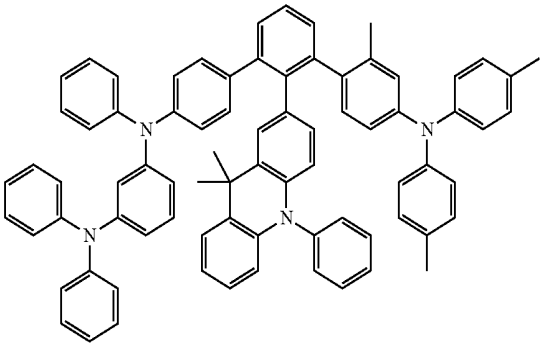

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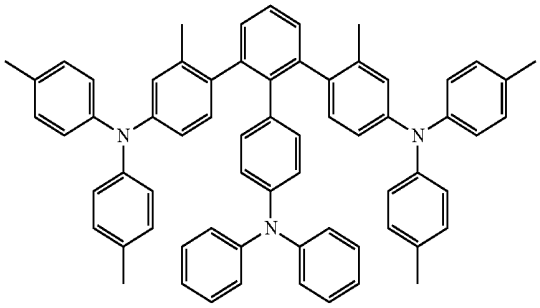

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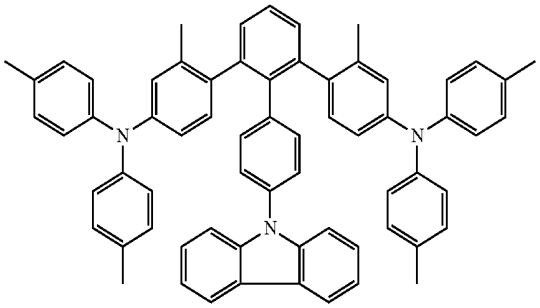

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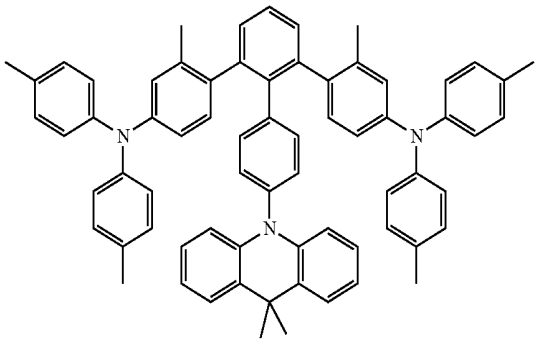

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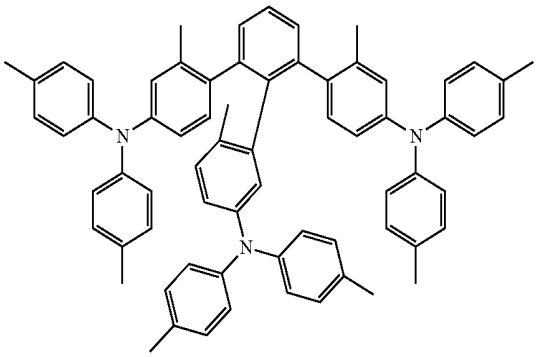

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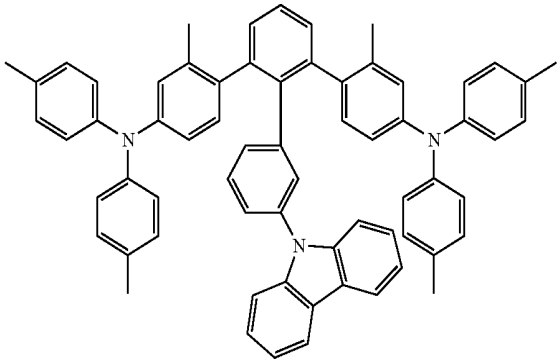

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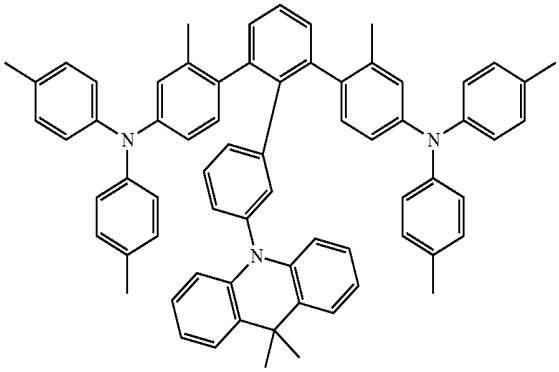

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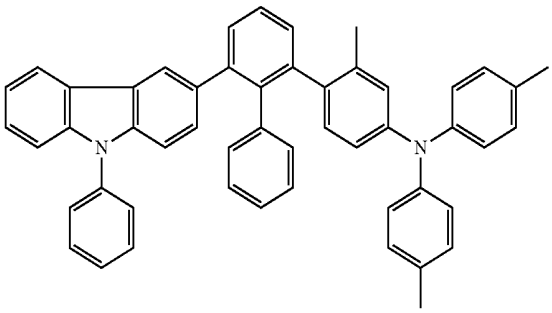

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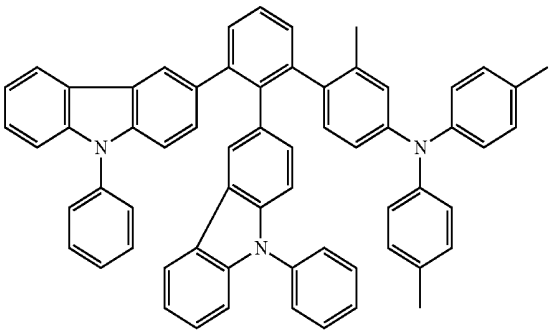

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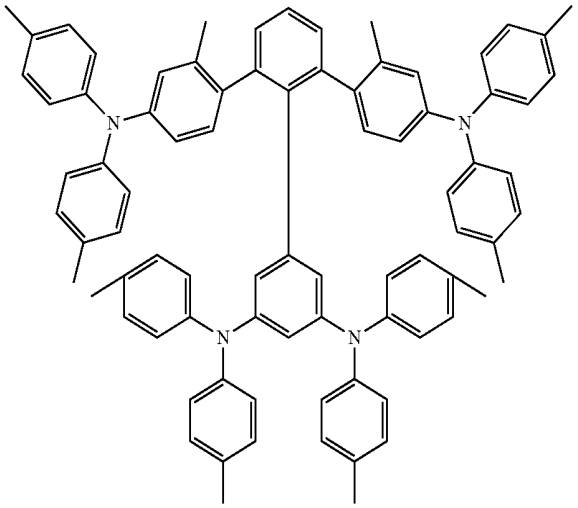

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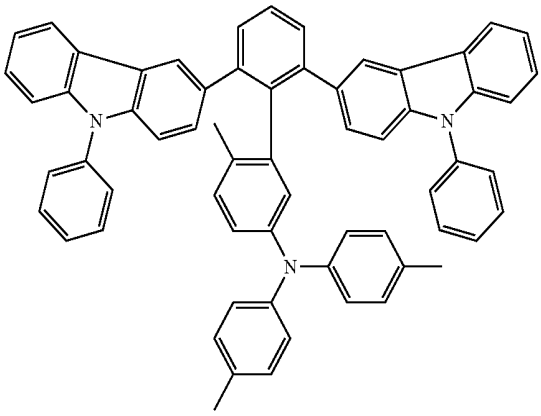

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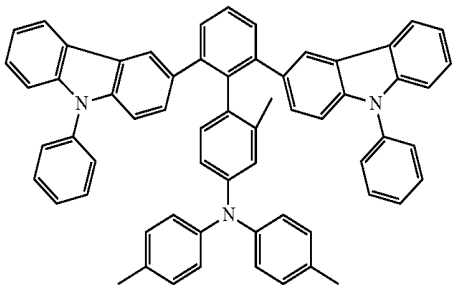

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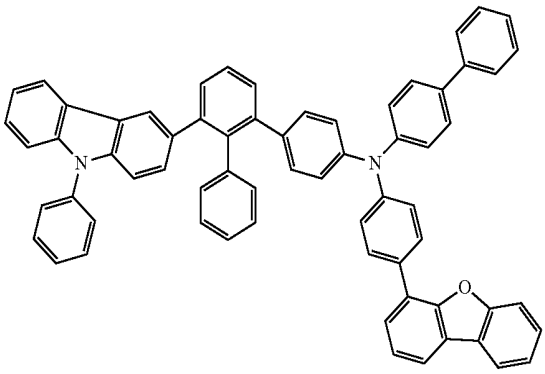

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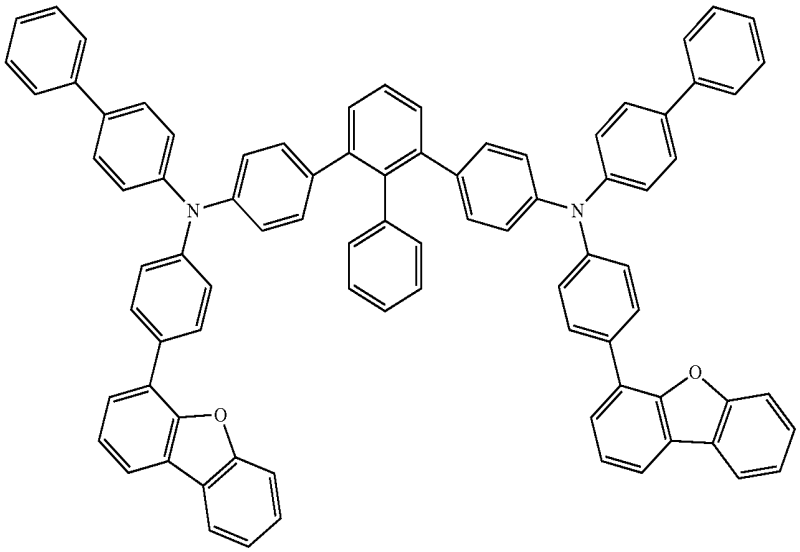

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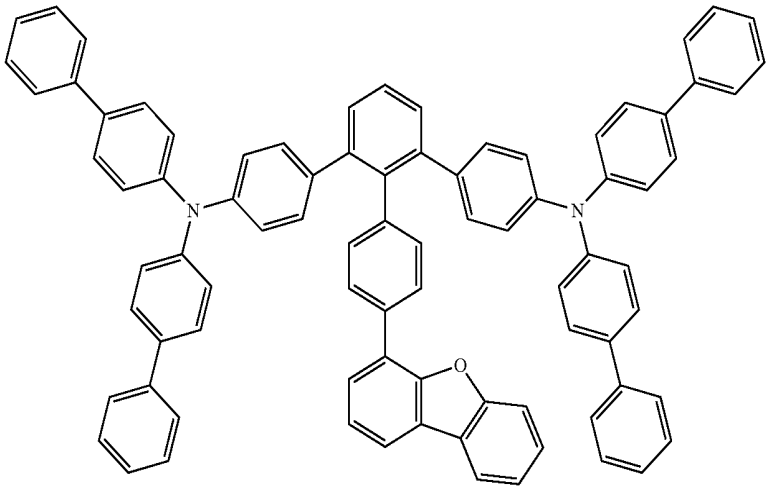

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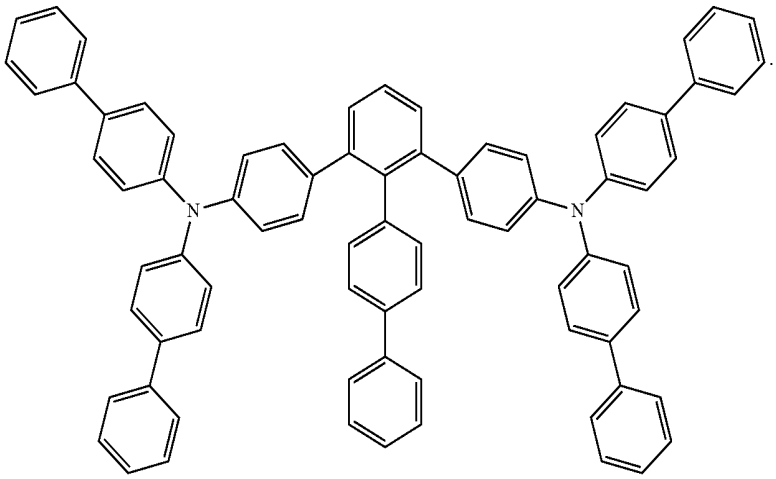


8. An organic electroluminescent device, including the compound of claim **1**.

9. An organic electroluminescent device, comprising a first electrode, a second electrode, and a single organic layer or a plurality of organic layers between the first electrode and the second electrode, wherein one or more organic layers selected from among the single organic layer or the plurality of organic layers include the compound of claim **1**.

10. The organic electroluminescent device of claim **9**, wherein the single organic layer or the plurality of organic layers include a light emitting layer.

11. The organic electroluminescent device of claim **10**, wherein the light emitting layer includes a host and a dopant.

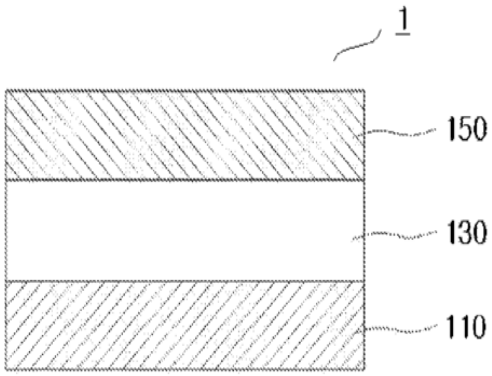
12. The organic electroluminescent device of claim **9**, wherein the plurality of organic layers include a light emitting layer, and the plurality of organic layers further include one or more selected from among an electron injection layer, an electron transport layer, a hole blocking layer, an electron blocking layer, a hole transport layer and a hole injection layer.

* * * * *

专利名称(译)	用于有机电致发光器件的化合物和包括其的有机电致发光器件		
公开(公告)号	US9917256	公开(公告)日	2018-03-13
申请号	US14/441921	申请日	2013-10-04
[标]申请(专利权)人(译)	SK化学株式会社		
申请(专利权)人(译)	SK CHEMICALS CO.，LTD.		
当前申请(专利权)人(译)	SK CHEMICALS CO.，LTD.		
[标]发明人	KANG JU SIK PARK JEONG HO JUN SUK WOON SHIN YONG JUN CHANG YU MI YANG NAM CHOUL PARK JAE KYUN LEE SONG		
发明人	KANG, JU-SIK PARK, JEONG HO JUN, SUK WOON SHIN, YONG-JUN CHANG, YU-MI YANG, NAM-CHOUL PARK, JAE-KYUN LEE, SONG		
IPC分类号	H01L51/00 C07D401/10 C07D219/02 C07D209/86 C09K11/06 C07C211/54 C07D405/12 C07D307/91 H01L51/52 H01L51/50		
CPC分类号	H01L51/0059 C07D209/86 C07D219/02 C07D307/91 C07D401/10 C07D405/12 C09K11/06 H01L51/0072 H01L51/0073 C07C211/54 H01L51/5221 C09K2211/1007 C09K2211/1014 C09K2211/1029 C09K2211/1088 H01L51/0054 H01L51/0074 H01L51/0081 H01L51/0085 H01L51/5004 H01L51/5056		
审查员(译)	LOEWE，ROBERT小号		
优先权	1020120126545 2012-11-09 KR 1020130104023 2013-08-30 KR		
其他公开文献	US20150270492A1		
外部链接	Espacenet USPTO		

摘要(译)

有机电致发光元件用化合物及有机电致发光元件技术领域本发明涉及有机电致发光元件用化合物及含有其的有机电致发光元件。该含有该化合物的有机电致发光元件用化合物的热稳定性和发光效率提高。当该化合物用作空穴传输层材料时，磷光发光材料的三线态能量增加，因此提高了有机电致发光器件的效率。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150
130
110