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(71) Applicant (for all designated States except US): **CHEIL INDUSTRIES INC.** [KR/KR]; 290, Kongdan-dong, Kumi-city, Kyungsangbuk-do 730-030 (KR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **JUNG, Ho-Kuk** [KR/KR]; 2-401, Dongnam Apt., Galsan-dong, Bupyeong-gu, Incheon, 403-080 (KR). **KANG,**

Myeong-Soon [KR/KR]; 206-705, Maetan Seongil Apt., 810-4, Maetan 4-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-717 (KR). **PARK, Jin-Seong** [KR/KR]; 1212, Sebang Global City, 1595, Gwangyang-dong, Dong-gu, Anyang-si, Gyeonggi-do, 431-060 (KR). **KIM, Nam-Soo** [KR/KR]; 101-503, Obok Town, 565-3, Ojeong-dong, Ojeong-gu, Bucheon-si, Gyeonggi-do, 421-815 (KR). **IN, Kyu-Yeol** [KR/KR]; Cheil Industries Inc., 332-2, Gocheon-dong, Uiwang-si, Gyeonggi-do, 437-711 (KR). **KANG, Eui-Su** [KR/KR]; 1-512, Pyeongchon Sharmang Officetel, Burim-dong, Dong-gu, Anyang-si, Gyeonggi-do, 431-785 (KR). **CHAE, Mi-Young** [KR/KR]; 203-1803, Dongcheon Hyundai 2-cha, Hometown Apt., Dongcheon-dong, Suji-gu, Yon-gin-si, Gyeonggi-do, 448-511 (KR).

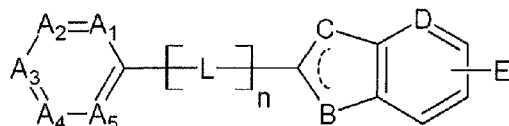
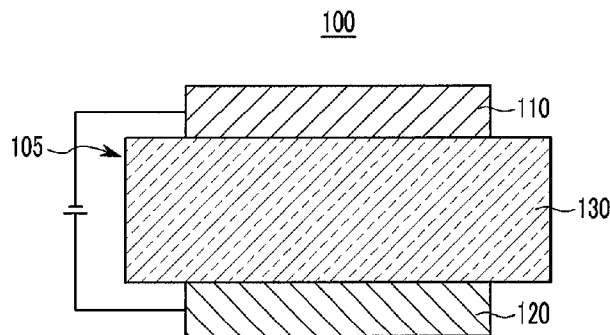
(74) Agent: **PANKOREA PATENT AND LAW FIRM;** Se-olim Bldg., 649-10, Yoksam-dong, Kangnam-ku, Seoul, 135-080 (KR).

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(54) Title: NOVEL COMPOUND FOR ORGANIC PHOTOELECTRIC DEVICE AND ORGANIC PHOTOELECTRIC DEVICE INCLUDING THE SAME

FIG. 1



(57) Abstract: The present invention relates to a novel compound for an organic photoelectric device and an organic photoelectric device including the same. The compound is represented by the following Formula 1 : [Chemical Formula 1] B- In the above Formula 1, A1 to A5, B, C, D, E, L, and n are the same as defined in the specification. The novel compound according to one embodiment of the present invention can act as a hole injection, hole transport, light emitting, or electron injection and/or transport material, and also acts as a light emitting host along with an appropriate dopant. The novel compounds are applied to an organic photoelectric device such as an organic light emitting diode, and thus provide an organic photoelectric device having a low driving voltage and improved life-span and efficiency.



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【Invention Title】**NOVEL COMPOUND FOR ORGANIC PHOTOELECTRIC DEVICE AND
ORGANIC PHOTOELECTRIC DEVICE INCLUDING THE SAME****【Technical Field】**

5 The present invention relates to a novel compound for an organic photoelectric device and an organic photoelectric device including the same. More particularly, the present invention relates to a material for an organic photoelectric device that decreases a driving voltage of an organic photoelectric device due to excellent thermal stability and improves life-span and efficiency
10 and an organic photoelectric device including the same.

【Background Art】

 An organic photoelectric device transforms electrical energy into light by applying current to an organic light emitting material. It has a structure in which a functional organic material layer is interposed between an anode and a
15 cathode.

 The organic light emitting diode has similar electrical characteristics to those of light emitting diodes (LEDs) in which holes are injected from an anode and electrons are injected from a cathode, then the holes and electrons move to opposite electrodes and are recombined to form excitons having high energy.
20 The formed excitons generate light having a certain wavelength while shifting to a ground state.

 Light emission of an anthracene organic material was firstly found in 1960, but there is a demerit of a high driving voltage. In 1980, C.W Tang et al.,

of Eastman Kodak, Inc., firstly developed a device realizing a low driving voltage. Thereafter, in 1990, Cambridge University developed a polymer light emitting diode using poly(p-phenylenevinylene) (PPV). Research has been conducted on a low molecular light emitting element (SMOLED) and a polymer organic light emitting diode (PLED). The low molecular organic light emitting diode is manufactured as a thin film in a vacuum deposition method, and can have good efficiency and life-span performance. A polymer organic light emitting diode is manufactured in an Inkjet or spin coating method and has an advantage of low initial cost and being large-sized.

Both low molecular organic light emitting and polymer organic light emitting diodes have advantages of being self-light emitting and ultrathin, and having a high speed response, a wide viewing angle, high image quality, durability, a large driving temperature range, and the like. In particular, they have good visibility due to the self-light emitting characteristic compared with a conventional LCD (liquid crystal display) and have an advantage of decreasing thickness and weight of LCD by up to a third, because they do not need a backlight. In addition, since they have a response speed of a few microseconds that is 1000 times faster than an LCD, they can realize a perfect motion picture without an after-image. Based on these advantages, they have been remarkably developed to have 80 times the efficiency and more than 100 times the life-span since they were first developed in the late 1980s. Recently, these diodes have been used in displays that are rapidly becoming larger, such as for a 40-inch organic light emitting diode panel.

These displays must simultaneously have improved luminous efficiency

and life-span in order to be larger. In order to increase the luminous efficiency, smooth combination between holes and electrons in an emission layer is needed. However, since an organic material in general has slower electron mobility than hole mobility, it has a drawback of inefficient combination between
5 holes and electrons. Accordingly, a novel compound that increases electron injection and mobility from a cathode and simultaneously prevents movement of holes is desperately required.

In addition, the device may have a decreased life-span since the material therein may be crystallized due to Joule heat generated when it is
10 driven. In order to solve this problem, 2-(4-biphenyl)-5- (4-t-butylphenyl)-1,3,4-oxadiazole (PBD) (Jpn. J. Appl. Phys., 27, L269 1988) with a rapid transfer speed has been suggested, but it lacks thermal stability and thereby still has a problem of crystallization when a device is driven. In addition, BCP and an aluminum mixed coordination complex (BALq, bis(2-methyl-8-
15 quinolinolate)-4-(phenylphenolate)aluminum), which is known to be excellent in lowering hole mobility, have been actively researched. However, these materials have excellent characteristic in lowering hole mobility but a problem of deteriorating the electron injection characteristic and being crystallized when a device is driven, and accordingly do not satisfy device characteristics.

20 Therefore, there is a strong need for an organic compound having excellent electron injection and mobility and high thermal stability and that prevents crystallization when a device is driven.

【Disclosure】

【Technical Problem】

An exemplary embodiment of the present invention provides a novel compound that can act as a hole injection, hole transport, light emitting, or electron injection and/or transport material, and also as a light emitting host along with an appropriate dopant.

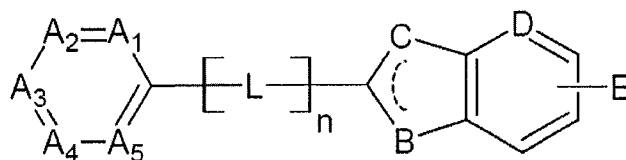
Another embodiment of the present invention provides an organic photoelectric device including the material for an organic photoelectric device, and having decreased driving voltage and increased life-span and efficiency.

The embodiments of the present invention are not limited to the above technical purposes, and a person of ordinary skill in the art can understand other technical purposes.

【Technical Solution】

According to one embodiment of the present invention, provided is a compound represented by the following Formula 1 for an organic photoelectric device.

[Chemical Formula1]



In the above Formula 1,

A₁ to A₅ are the same or different, and CR₁ to CR₅ are N, provided that three or less of A₁ to A₅ are N.

When one of A₁ to A₅ is N, the remaining four of A₁ to A₅ are respectively selected from the group consisting of CR₁ to CR₅, provided that at

least two of R_1 to R_5 are not hydrogen, and

when A_1 to A_5 are respectively CR_1 to CR_5 , at least two of R_1 to R_5 are not hydrogen.

B is selected from the group consisting of O, S, Se, and NR'' .

5 C and D are the same or different, and are independently selected from the group consisting of CR' and N, provided that when B is not NR'' , C is N.

R_1 to R_5 , R' , and R'' are independently selected from the group consisting of hydrogen, a halogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, an ester, a substituted or unsubstituted alkyl, a substituted or
10 unsubstituted alkoxy, a substituted or unsubstituted alkenyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted arylamine, a substituted or unsubstituted heteroarylamine, a substituted or unsubstituted heterocycle, a substituted or unsubstituted amino, BR_6R_7 , and $SiR_6R_7R_8$,

15 R_6 to R_8 are the same or different, and are independently selected from the group consisting of a substituted or unsubstituted alkyl, and a substituted or unsubstituted aryl.

E is selected from the group consisting of hydrogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or
20 unsubstituted fluoroalkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted heterocycle, and SO_2R_9 , and

R_9 is selected from the group consisting of a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or

unsubstituted cycloalkyl, a substituted or unsubstituted aryl, and a substituted or unsubstituted heterocycle.

L is selected from the group consisting of a substituted or unsubstituted aryl and a substituted or unsubstituted heteroaryl, and

5 n is 0 or 1.

According to another embodiment of the present invention, provided is an organic photoelectric device of the present invention that includes an anode, a cathode, and at least one organic thin layer between the anode and cathode. The organic thin layer includes the compound for an organic photoelectric
10 device.

According to a further of the present invention, provided is a display device including the organic photoelectric device.

Hereinafter, further embodiments of the present invention will be described in detail.

15 **【Advantageous Effects】**

According to one embodiment of the present invention, a compound for an organic photoelectric device is largely asymmetric. The asymmetric structure reinforces an amorphous characteristic and thereby suppresses crystallization, improving thermal stability of the compound for an organic
20 photoelectric device. Accordingly, when an organic photoelectric device is driven, the compound can decrease its driving voltage and improve life-span and efficiency.

The novel compound according to one embodiment of the present invention can act as a hole injection, hole transport, light emitting, or electron

inject ion and/or transport material, and also as a light emitting host along with an appropriate dopant.

【Description of Drawings】

FIGS. 1 to 5 are cross-sectional views showing organic photoelectric devices including organic compounds according to various embodiments of the present invention.

FIG. 6 shows a ^1H NMR spectrum of the compound according to Example 1 according to the present invention.

FIG. 7 shows a ^1H NMR spectrum of the compound according to Example 2 according to the present invention.

FIG. 8 shows a ^1H NMR spectrum of the compound according to Example 3 according to the present invention.

FIG. 9 shows a ^1H NMR spectrum of the compound according to Example 4 according to the present invention.

FIG. 10 shows a ^1H NMR spectrum of the compound according to Example 5 according to the present invention.

FIG. 11 shows a ^1H NMR spectrum of the compound according to Example 6 according to the present invention.

FIG. 12 shows a ^1H NMR spectrum of the compound according to Example 7 according to the present invention.

FIG. 13 shows a ^1H NMR spectrum of the compound according to Example 8 according to the present invention.

FIG. 14 shows a ^1H NMR spectrum of the compound according to Example 9 according to the present invention.

FIG. 15 shows a ^1H NMR spectrum of the compound according to Example 10 according to the present invention.

FIG. 16 shows a ^1H NMR spectrum of the compound according to Example 11 according to the present invention.

5 FIG. 17 shows a ^1H NMR spectrum of the compound according to Example 12 according to the present invention.

FIG. 18 shows a thermal characteristic of the compound according to Example 5.

10 FIG. 19 shows a thermal characteristic of the compound according to Example 10.

FIG. 20 shows a thermal characteristic of the compound according to Comparative Example 1.

FIG. 21 shows voltage-luminescence characteristics of the organic light emitting diodes according to Examples 13 to 16 and Comparative Example 2.

15 FIG. 22 shows voltage-luminescence characteristics of the organic light emitting diodes according to Examples 17 to 19 and Comparative Example 2.

FIG. 23 shows electrical power efficiency of the organic light emitting diodes according to Examples 13 to 16 and Comparative Example 2.

20 FIG. 24 shows electrical power efficiency of the organic light emitting diodes according to Examples 17 to 19 and Comparative Example 2.

FIG. 25 shows electrical power efficiency of the organic light emitting diodes according to Examples 20 and 22 and Comparative Example 3.

FIG. 26 shows current density characteristics of the organic light emitting diode according to Examples 20 to 23 and Comparative Example 3.

<Description of Reference Numerals Indicating Primary Elements in the Drawings>

	100: organic photoelectric device	110: cathode
	120: anode	105: organic thin layer
5	130: emission layer	140: hole transport layer (HTL)
	150: electron transport layer (ETL)	160: electron injection layer (EIL)
	170: hole injection layer (HIL)	230: emission layer + electron transport layer (ETL)

【Best Mode】

10 Exemplary embodiments of the present invention will hereinafter be described in detail. However, these embodiments are only exemplary, and the present invention is not limited thereto but rather is defined by scope of the appended claims.

As used herein, when specific definition is not provided, “an alkyl” refers
 15 to a C1-C30 alkyl, and preferably a C1-C20 alkyl, and more preferably a C1 to C15 alkyl; “an alkoxy” refers to a C1 to C30 alkoxy, and preferably C1 to C20 alkoxy, and more preferably a C1 to C15 alkoxy; “an alkenyl” refers to a C2 to C30 alkenyl, and preferably a C2 to C20 alkenyl, and more preferably a C2 to C15 alkenyl; “a cycloalkyl” refers to a C3 to C30 cycloalkyl, and preferably a C3
 20 to C20 cycloalkyl, and more preferably a C3 to C15 cycloalkyl; “an aryl” refers to a C6 to C50 aryl, and preferably a C6 to C40 aryl, and more preferably a C6 to C25 aryl; “an arylamine” refers to a C7 to C50 arylamine, and preferably a C7 to C25 arylamine; “a heteroarylamine” refers to a C7 to C50 heteroarylamine, and preferably a C7 to C25 heteroarylamine; “a heterocycle” refers to a C2 to C50

heterocycle, and preferably a C2 to C25 heterocycle, and more preferably a C2 to C20 heterocycle; and "a fluoroalkyl" refers to a C1 to C10 fluoroalkyl.

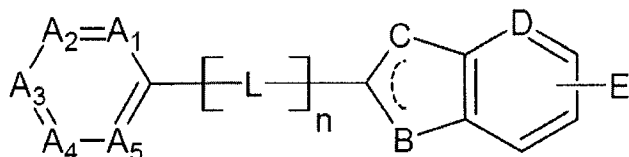
As used herein, when specific definition is not provided, the term "substituted" refers to one substituted with at least a substituent selected from the group consisting of a halogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, an acetylene, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkenyl, a substituted or unsubstituted alkoxy, a substituted or unsubstituted arylamine, a substituted or unsubstituted aryl, a substituted or unsubstituted arylalkyl, a substituted or unsubstituted arylalkenyl, a substituted or unsubstituted heterocycle, a substituted or unsubstituted amine, a substituted or unsubstituted cycloalkyl, BR_6R_7 , and $SiR_6R_7R_8$, where R_6 to R_8 are the same or different and are independently selected from the group consisting of a substituted or unsubstituted C1 to C30 alkyl and a substituted or unsubstituted C6 to C50 aryl.

As used herein, when specific definition is not provided, the term "hetero" refers to one including 1 to 3, including N, O, S, P, or Si, in one ring.

As used herein, when specific definition is not provided, the term "heterocycle", refers to one selected from the group consisting of a C3 to C50 heteroaryl, a C2 to C50 heterocycloalkyl, a C3 to C50 heterocycloalkenyl, a C3 to C50 heterocycloalkynyl, and fused rings thereof. The heterocycle preferably includes 1 to 20 heteroatoms, and more preferably 1 to 15 heteroatoms.

Another embodiment of the present invention provides a compound for an organic photoelectric device, represented by the following Formula 1.

[Chemical Formula1]



In the above Formula 1,

A_1 to A_5 are the same or different, and CR_1 to CR_5 are N, provided that
 5 three or less of A_1 to A_5 are N.

When one of A_1 to A_5 is N, the remaining four of A_1 to A_5 are respectively selected from the group consisting of CR_1 to CR_5 , provided that at least two of R_1 to R_5 are not hydrogen, and

when A_1 to A_5 are respectively CR_1 to CR_5 , at least two of R_1 to R_5 are
 10 not hydrogen.

B is selected from the group consisting of O, S, Se, and NR'' .

C and D are the same or different, and are independently selected from the group consisting of CR' and N, provided that when B is not NR'' , C is N.

R_1 to R_5 , R' , and R'' are independently selected from the group
 15 consisting of hydrogen, a halogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, an ester, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkoxy, a substituted or unsubstituted alkenyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted arylamine, a substituted or unsubstituted heteroarylamine, a
 20 substituted or unsubstituted heterocycle, a substituted or unsubstituted amino, BR_6R_7 , and $SiR_6R_7R_8$,

R_6 to R_8 are the same or different, and are independently selected from

the group consisting of a substituted or unsubstituted alkyl, and a substituted or unsubstituted aryl.

E is selected from the group consisting of hydrogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or unsubstituted fluoroalkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted heterocycle, and SO_2R_9 ,

R_9 is selected from the group consisting of a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, and a substituted or unsubstituted heterocycle.

L is selected from the group consisting of a substituted or unsubstituted aryl, and a substituted or unsubstituted heteroaryl, and

n is 0 or 1.

The novel compound for an organic photoelectric device of the above Formula 1 includes a part including A_1 to A_5 , a linking group of L including an aryl group or a heteroaryl group, and a functional substitute including a five-member ring.

In the above Formula 1 A_1 to A_5 are the same or different, and CR_1 to CR_5 are N, provided that three or less of A_1 to A_5 are N.

When any one among A_1 to A_5 is at least N, it can lower the LUMO (lowest unoccupied molecular orbital) energy level and increase electron affinity of a molecule, and thereby improve injection and transfer characteristics of electrons. Accordingly, it can reduce voltage required for driving an organic light emitting diode and improve electric power efficiency.

However, when more than four among A_1 to A_5 are N, it can generate too low LUMO energy level, such that it is hard to inject electrons.

In particular, when any one among A_1 to A_5 is at least N, more than four among A_1 to A_5 are respectively selected from the group consisting of CR_1 to CR_5 . Herein, at least two among the R_1 to R_5 are not hydrogen. When at least one among the R_1 to R_5 is not hydrogen but is a substituent, it can increase rigidity of the compound and easily cause crystallization. When the R_1 to R_5 are all hydrogen, it may decrease thermal stability, and it may also be hard to inject electrons.

When A_1 to A_5 is all substituted with N, A_1 to A_5 are selected from the group consisting of CR_1 to CR_5 . Herein, at least two among the R_1 to R_5 are not hydrogen. When at least one among the R_1 to R_5 is not hydrogen but is a substituent, it may increase rigidity of the compound. When the R_1 to R_5 are all hydrogen, it may decrease thermal stability, and it may also be hard to inject electrons.

In particular, when at least two among the R_1 to R_5 are not hydrogen but are a substituent, it can increase the amorphous characteristic by introducing a different substituent into a position of the substituent. Accordingly, it can suppress crystallization caused by the Joule heat generated from a device during the operation, and thereby improve the life-span characteristic of an organic light emitting diode.

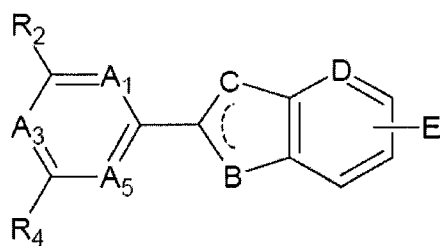
The linking group, L, including an aryl group or a heteroaryl group, can increase interaction among molecules, and thereby improve thermal stability. In addition, it can adjust the π -conjugation length and also light emitting in a

visual region. Accordingly, a compound for an organic photoelectric device according to the present invention can be usefully applied to an emission layer.

In addition, B in a functional substituent including a five-member ring is selected from the group consisting of O, S, Se, and NR^{''}, and C and D are different or the same each other. They are independently selected from the group consisting of CR['] and N. However, when B is not NR^{''}, C is N. The functional substituent including a five-member ring may make the structure a compound for an organic photoelectric device generally asymmetric and can thereby endow the compound with thermal stability.

A compound for an organic photoelectric device according to one embodiment of the present invention is represented by the following Formula 2.

[Chemical Formula 2]



In the above Formula 2, A₁, A₃, and A₅ are the same or different, and are CR₁, CR₃, and CR₅, or N, where R₁, R₃, and R₅ are the same or different and are selected from the group consisting of hydrogen and a substituted or unsubstituted alkyl.

B is selected from the group consisting of O, S, Se, and NR^{''}.

C and D are the same or different, and are independently selected from the group consisting of CR['] and N, provided that when B is not NR^{''}, C is N. R['] and R^{''} are the same or different, and are independently selected from the group

consisting of a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, and a substituted or unsubstituted heterocycle.

R_2 and R_4 are the same or different, and are independently selected
5 from the group consisting of hydrogen, a halogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, an ester, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkoxy, a substituted or unsubstituted alkenyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted arylamine, a substituted or unsubstituted heteroarylamine, a
10 substituted or unsubstituted heterocycle, a substituted or unsubstituted amino, BR_6R_7 , and $SiR_6R_7R_8$,

where R_6 to R_8 are the same or different, and are independently selected from the group consisting of a substituted or unsubstituted alkyl, and a substituted or unsubstituted aryl,

15 provided that R_2 and R_4 are not simultaneously hydrogen.

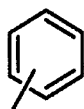
It is preferable that R_2 and R_4 are the same or different, and are independently selected from the group consisting of a nitrile, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkenyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted arylamine, a substituted or unsubstituted
20 heterocycle, BR_6R_7 , and $SiR_6R_7R_8$, and

R_6 to R_8 are the same or different, and are independently selected from the group consisting of a substituted or unsubstituted alkyl and a substituted or unsubstituted aryl.

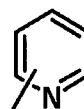
It is more preferable that R_2 and R_4 are functional groups having excellent electron injection characteristics or functional groups being capable of improving thermal stability. R_2 and R_4 are not simultaneously hydrogen, and preferably R_2 and R_4 are not the same.

5 Examples of R_2 in the above Formula 2 include the compounds represented by the following Formulae 3 to 23, but are not limited thereto.

[Chemical Formula 3]

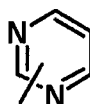


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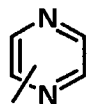


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[Chemical Formula 5]

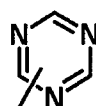


[Chemical Formula 6]



15

[Chemical Formula 7]



[Chemical Formula 8]



[Chemical Formula 9]

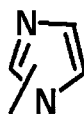


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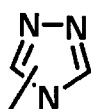
[Chemical Formula 10]



[Chemical Formula 11]

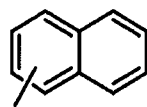


[Chemical Formula 12]

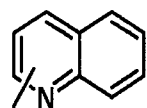


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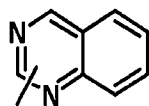
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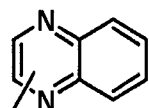
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[Chemical Formula 15]

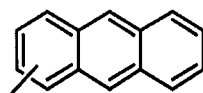


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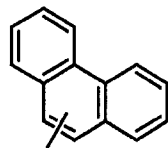


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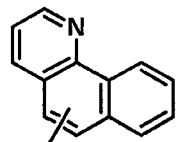
[Chemical Formula 17]



[Chemical Formula 18]

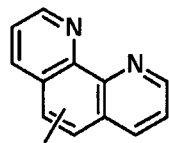


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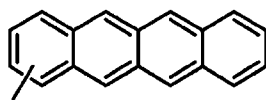


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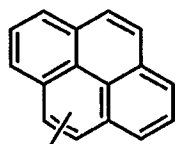
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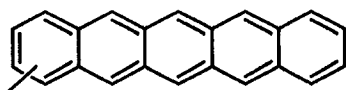
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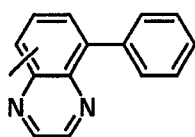


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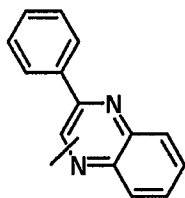


5 Examples of R₄ in the above Formula 2 include the compounds represented by the above Formulae 3 to 23 or the compounds represented by the following Formulae 24 to 65, but are not limited thereto.

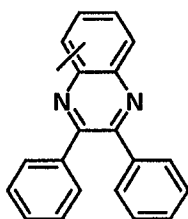
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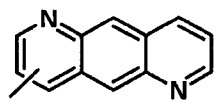
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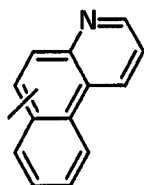
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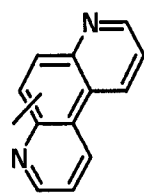


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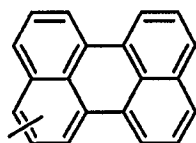


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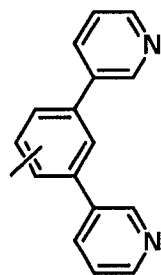
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[Chemical Formula 30]

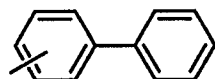


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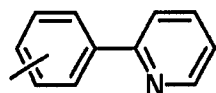


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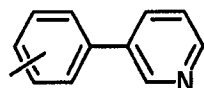


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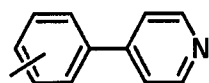


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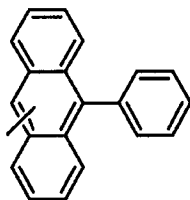
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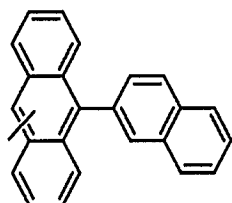


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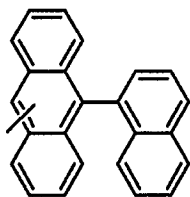


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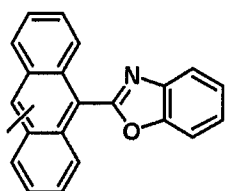
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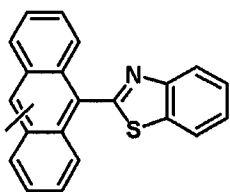


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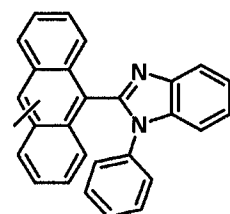


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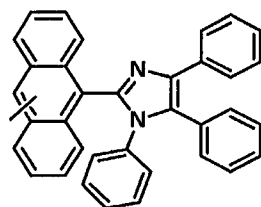
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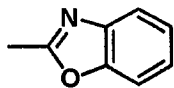


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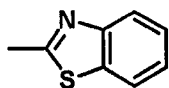


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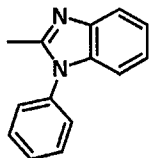


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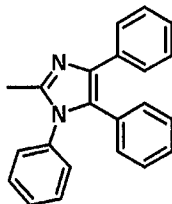


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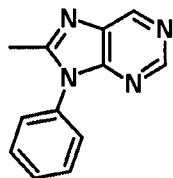
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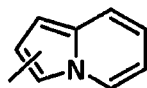


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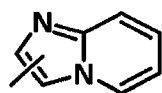


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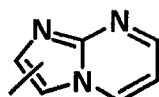
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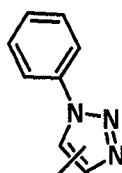


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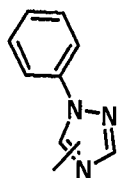


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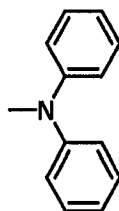
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[Chemical Formula 52]

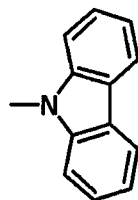


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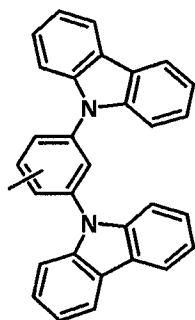


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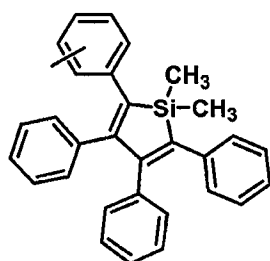
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[Chemical Formula 55]

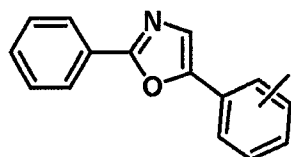


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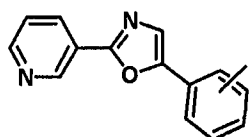


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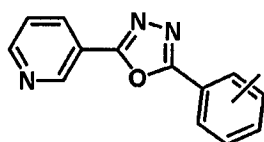
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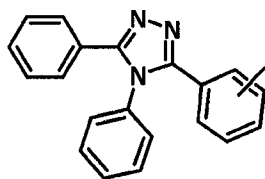
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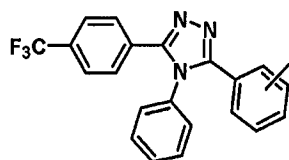
[Chemical Formula 59]



[Chemical Formula 60]

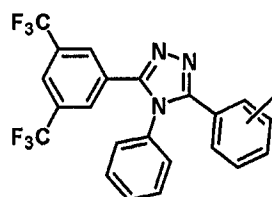


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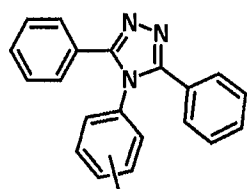


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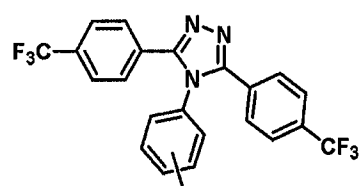
[Chemical Formula 62]



[Chemical Formula 63]

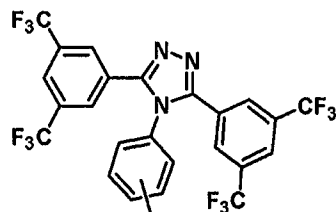


[Chemical Formula 64]



10

[Chemical Formula 65]



E in the above Formula 2 is selected from the group consisting of hydrogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or
 5 unsubstituted alkyl, a substituted or unsubstituted fluoroalkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted heterocycle, and SO_2R_9 . R_9 is selected from the group consisting of a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or
 10 unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, and a substituted or unsubstituted heterocycle.

The compound according to one embodiment of the present invention has an asymmetric structure where upper and lower substituents are different from each other with respect to the axis including A_3 . This asymmetric structure can fortify the amorphous characteristic and suppress its
 15 crystallization, and thereby improve the life-span characteristic when an organic photoelectric device is driven. In addition, it can decrease the driving voltage of the organic photoelectric device and can provide an organic photoelectric device having excellent effects in terms of efficiency and thermal stability. On the contrary, a symmetric compound can be easily crystallized, decreasing the
 20 life-span characteristic when an organic light emitting diode is driven.

In the compound represented by the above Formula 1 according to one

embodiment of the present invention, the A_1 and A_5 are different from each other, and A_2 and A_4 are different. In addition, R_2 and R_4 in a compound for an organic photoelectric device represented by the above Formula 2 may be different from each other. In particular, the R_2 and R_4 cannot simultaneously
5 be hydrogen. When the R_2 and $R_{\text{quadrivalent}}$ are not the same, they can increase the amorphous characteristic and selectively impart hole injection/transfer capability and electron injection/transfer capability to the compound, which makes efficient hole-electron combination in an emission layer possible.

In the above Formulae 1 and 2, R_1 to R_5 , R' , and R'' are independently
10 aryls, and it is preferable that the aryls are substituted or unsubstituted C₆ to C₄₀ aryls. When the aryls are monocyclic aryls such as phenyl, biphenyl, terphenyl, styrene, and so on, or polycyclic aryls such as naphthyl, anthracenyl, phenanthrenyl, pyrenyl, peryenyl, and so on, the compound may be useful for a material of an emission layer. Particularly, when the aryls are an aryl such as
15 anthracene, peryene, pyrene, stilbene, and so on, it is more useful for a material of an emission layer.

In the above Formulae 1 and 2, it is more preferable that R_1 to R_5 , R' , and R'' are independently an arylamine. The arylamine is preferably selected from the group consisting of diphenyl amine, dinaphthyl amine, dibiphenyl
20 amine, phenyl naphthyl amine, phenyl diphenyl amine, ditolyl amine, phenyl tollyl amine, carbazole, and triphenyl amine.

In the above Formulae 1 and 2, when R_1 to R_5 , R' , and R'' are independently a substituted or unsubstituted heterocycle, the heterocycle is selected from the group consisting of thiophene, furan, pyrrol, imidazolyl,

thiazolyl, oxazolyl, oxadiazolyl, triazolyl, pyridinyl, pyridazine, quinolinyl, isoquinoline, arcidinyl, imidazopyridinyl, and imidazopyrimidinyl,.

When the substituted or unsubstituted heterocycle is imidazole or triazole, the substituent linked to nitrogen (N) of the imidazole or triazole is
5 selected from the group consisting of a substituted or unsubstituted alkyl such as a substituted or unsubstituted methyl, a substituted or unsubstituted ethyl, a substituted or unsubstituted propyl, a substituted or unsubstituted isopropyl, a substituted or unsubstituted butyl, a substituted or unsubstituted t-butyl, a substituted or unsubstituted pentyl, a substituted or unsubstituted hexyl, and a
10 substituted or unsubstituted heptyl; a substituted or unsubstituted cycloalkyl such as a substituted or unsubstituted cyclopentyl, a substituted or unsubstituted cyclohexyl, and so on; a substituted or unsubstituted aryl such as a substituted or unsubstituted phenyl, a substituted or unsubstituted biphenyl, a substituted or unsubstituted naphthyl, and so on; and a substituted or
15 unsubstituted heterocycle. The heterocycle is preferably a heteroaryl such as pyridyl, bipyridyl, quinolyl, isoquinolyl, and so on.

In the above Formulae 1 and 2, it is preferable that R_1 to R_5 , R' , and R'' are functional groups having excellent electron injection characteristics or functional groups being capable of improving thermal stability. The functional
20 groups can selectively endow the compounds with hole injection/transport capabilities and electron injection/transport capabilities, and thus enable efficient hole-electron combination in an emission layer.

For example, in the above Formulae 1 and 2, when one selected from R_1 to R_5 , R' , and R'' includes a substituent selected from the group consisting of

an amine substituted alkyl, an amine substituted cycloalkyl, an amine substituted aryl, and an amine substituted heterocycle, the compound is useful for a material of a hole injection layer (HIL) and a hole transport layer (HTL). A Preferable amine substituted heterocycle is an amine substituted heteroaryl.

5 In the above Formulae 1 and 2, when one selected from R_1 to R_5 , R' , and R'' includes a substituent having excellent electron affinity selected from the group consisting of a nitrile, a nitro, an amide, a carbonyl, and a heterocycle, the compound is useful for a material of an electron injection layer (EIL) or an electron transport layer (ETL). A preferable heterocycle is a heteroaryl.

10 In the above Formulae 1 and 2, when one selected from R_1 to R_5 , R' , and R'' includes a substituent selected from the group consisting of an amine substituted alkyl, an amine substituted cycloalkyl, an amine substituted aryl, and an amine substituted heterocycle, one selected from R_1 to R_5 , R' , and R'' includes a substituent having excellent electron affinity selected from the group
15 consisting of a nitrile, a nitro, an amide, a carbonyl, and a heterocycle, the compound has both hole transport and electron transport capabilities. A preferable amine substituted heterocycle is an amine substituted heteroaryl, and a preferable heterocycle is a heteroaryl.

 In the above Formulae 1 and 2, when E and R'' of B independently
20 include both a substituent selected from the group consisting of an amine substituted alkyl, an amine substituted cycloalkyl, an amine substituted aryl, and an amine substituted heterocycle, and a substituent selected from the group consisting of a nitrile, a nitro, an amide, a carbonyl, and a heterocycle, amorphous characteristics are more improved, and hole and electron transport

characteristics can be finely controlled.

In the above Formulae 1 and 2, when one selected from E and R" of B includes a substituent selected from the group consisting of an amine substituted alkyl, an amine substituted cycloalkyl, an amine substituted aryl, and
5 an amine substituted heterocycle, and the other of E and R" of B includes a nitrile, a nitro, an amide, a carbonyl, and a heterocycle, amorphous characteristics are more improved, and hole and electron transport characteristics can be finely controlled.

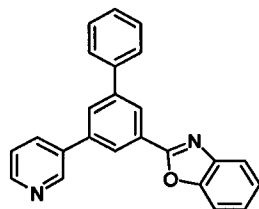
A preferable amine substituted heterocycle is an amine substituted
10 heteroaryl, and a preferable heterocycle is a heteroaryl.

In the above Formula 1, L is preferably selected from the group consisting of a substituted or unsubstituted C6 to C30 aryl and a substituted or unsubstituted C5 to C30 heteroaryl.

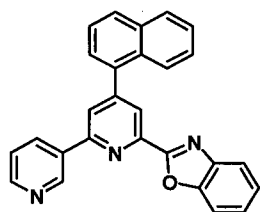
The various substituents of the above-described compound represented
15 by the above Formula 1 does not change principal properties of the compound for an organic photoelectric device according to one embodiment.

Examples of the compounds for an organic photoelectric device according to one embodiment of the present invention include the compounds represented by the following Formulae 66 to 175, but are not limited thereto.

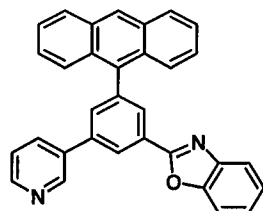
20 [Chemical Formula 66]



[Chemical Formula 67]

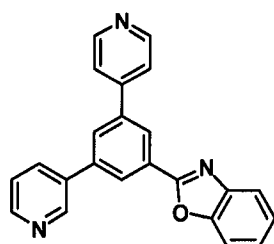


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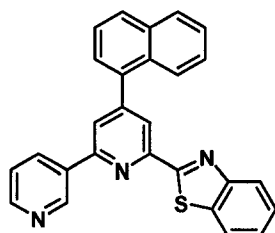


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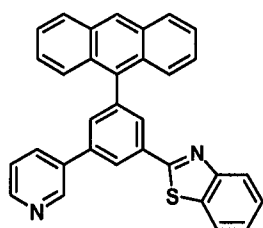
[Chemical Formula 69]



[Chemical Formula 70]

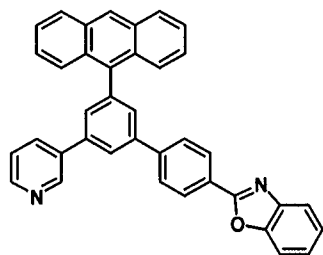


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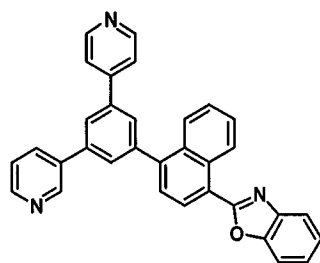


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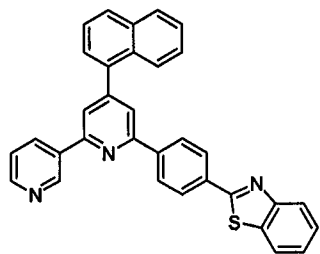


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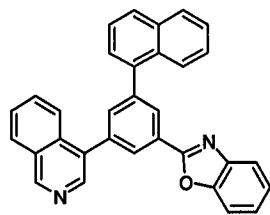


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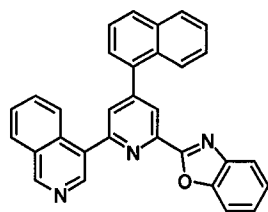
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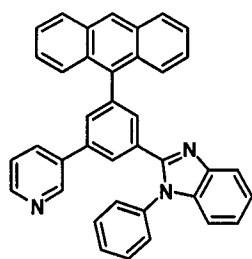
[Chemical Formula 75]



[Chemical Formula 76]

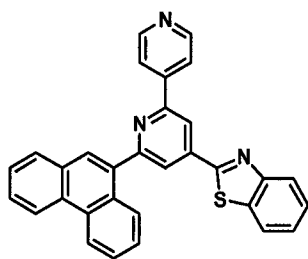


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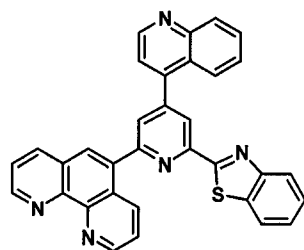


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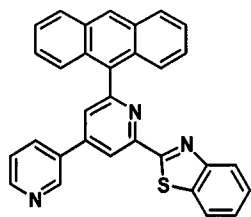
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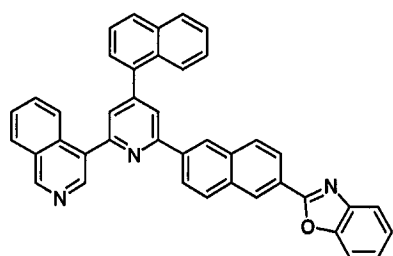
[Chemical Formula 79]



[Chemical Formula 80]

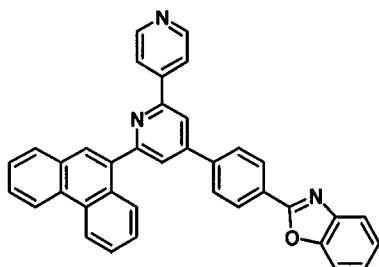


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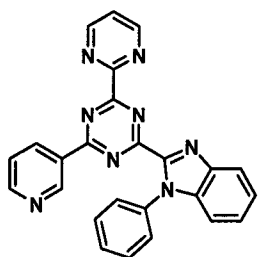


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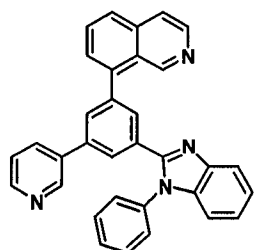
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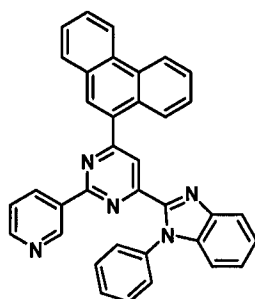
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[Chemical Formula 84]

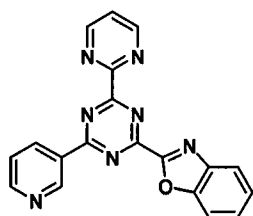


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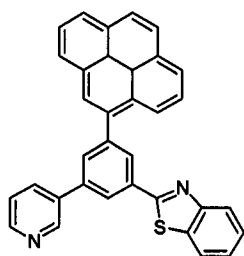


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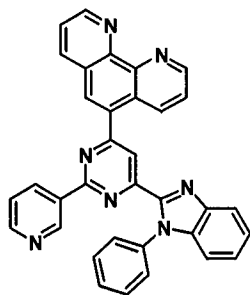
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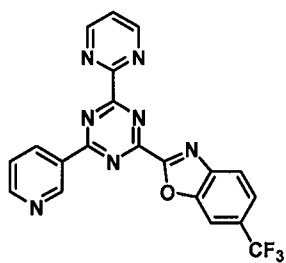
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[Chemical Formula 88]

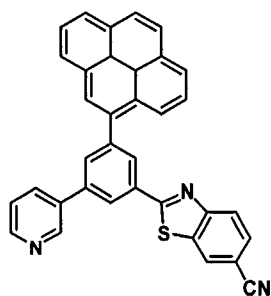


[Chemical Formula 89]

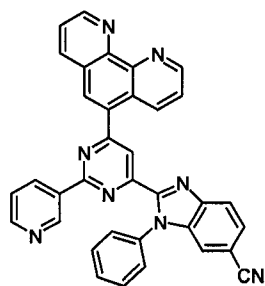


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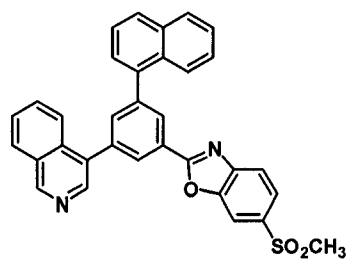
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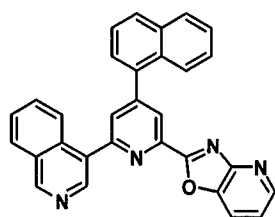
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[Chemical Formula 92]

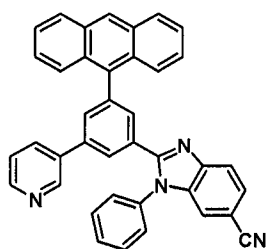


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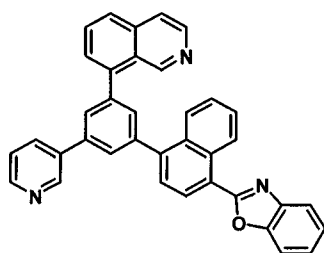


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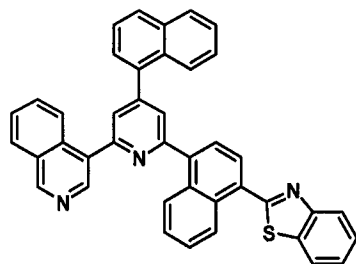
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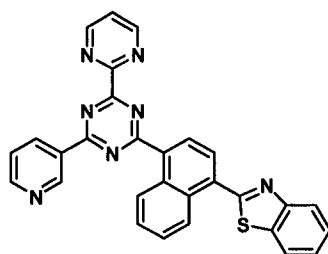
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[Chemical Formula 96]

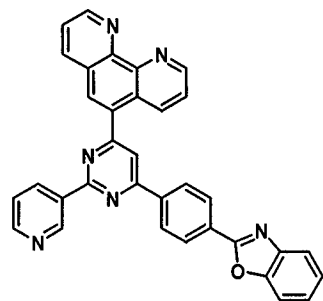


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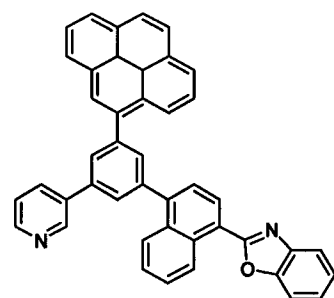


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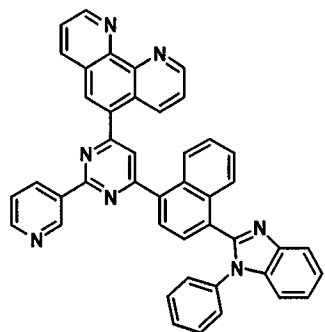
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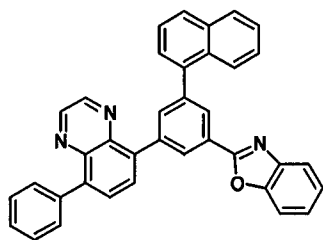
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[Chemical Formula 100]

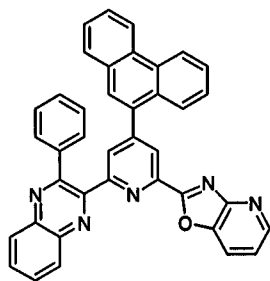


[Chemical Formula 101]

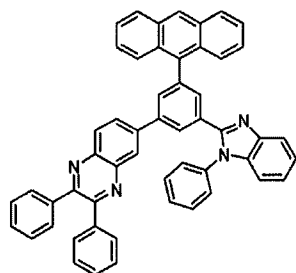


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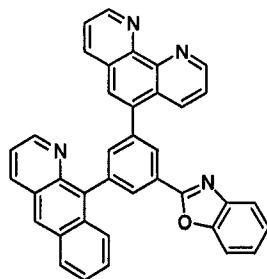
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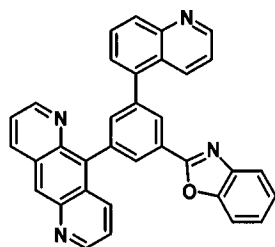
[Chemical Formula 103]



[Chemical Formula 104]

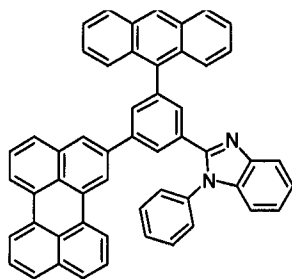


[Chemical Formula 105]

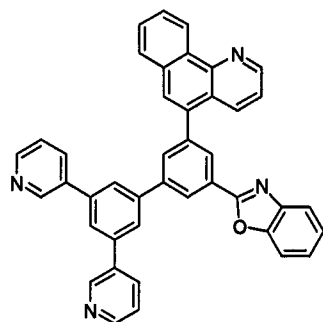


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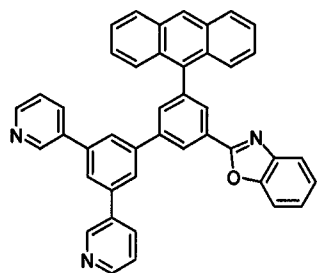
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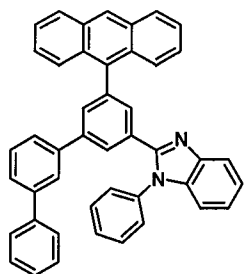
[Chemical Formula 107]



[Chemical Formula 108]

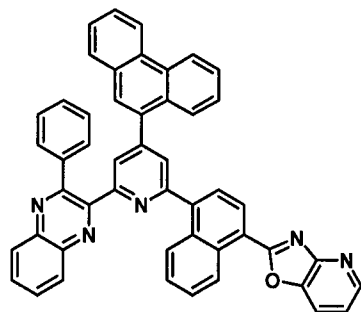


[Chemical Formula 109]

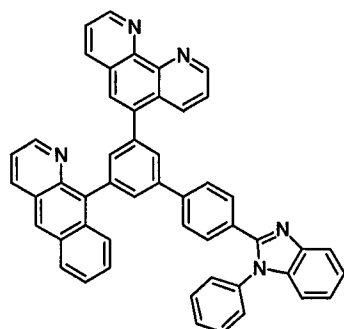


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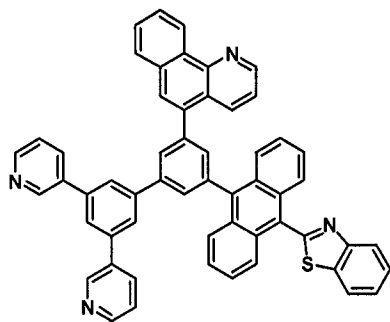
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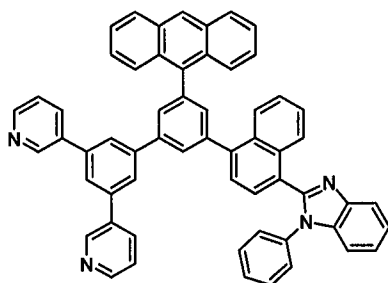
[Chemical Formula 111]



[Chemical Formula 112]

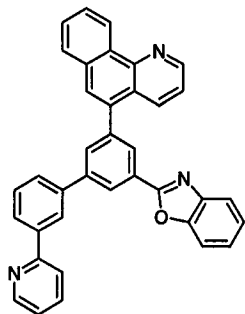


[Chemical Formula 113]

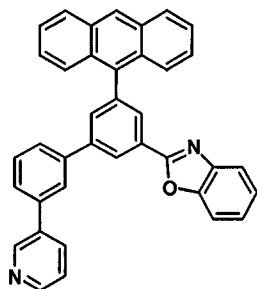


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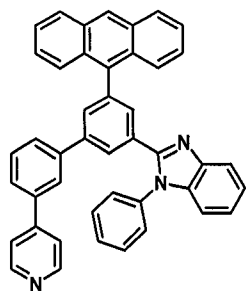
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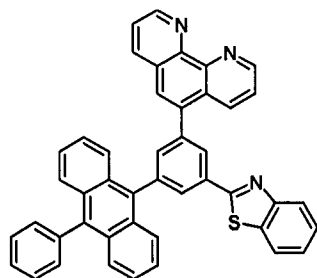
[Chemical Formula 115]



[Chemical Formula 116]

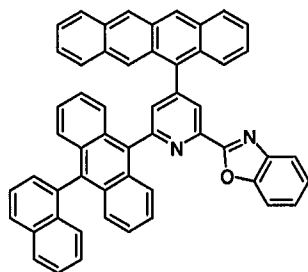


[Chemical Formula 117]

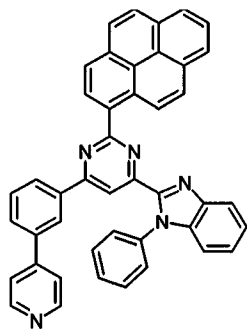


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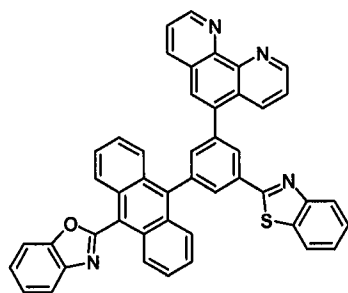
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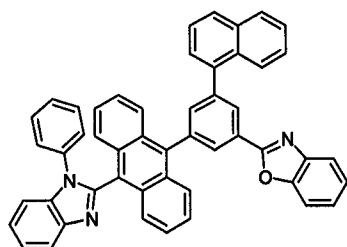
[Chemical Formula 119]



[Chemical Formula 120]

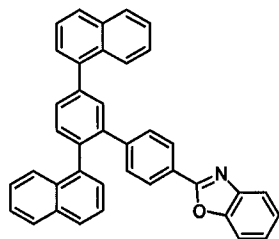


[Chemical Formula 121]

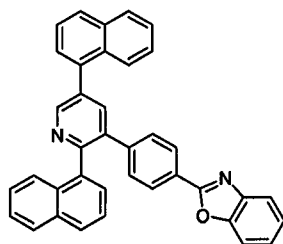


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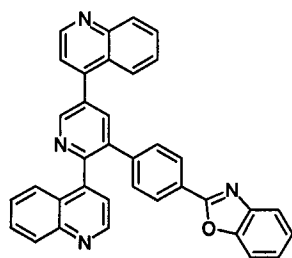
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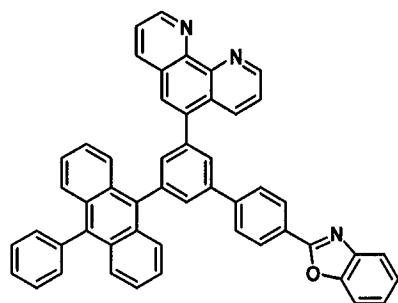
[Chemical Formula 123]



[Chemical Formula 124]

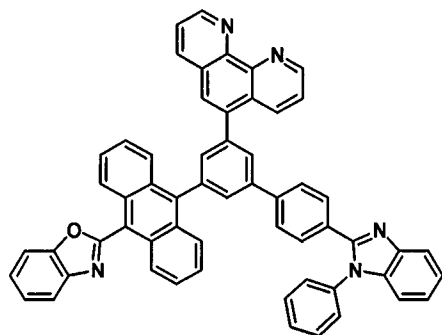


[Chemical Formula 125]

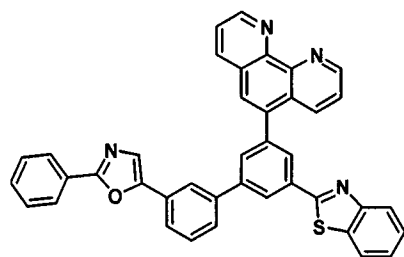


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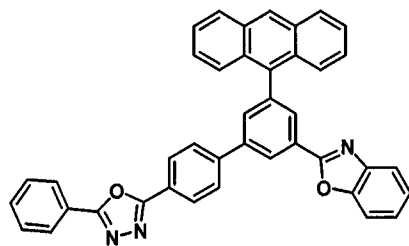
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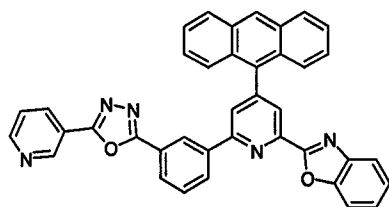
[Chemical Formula 127]



[Chemical Formula 128]

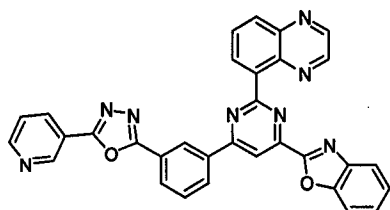


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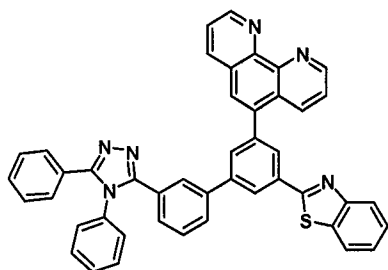


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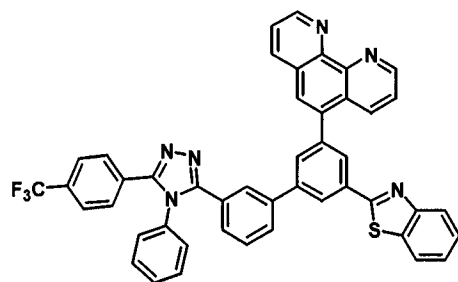
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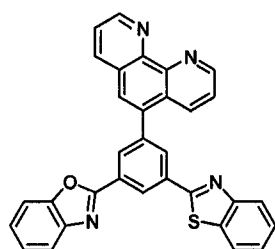
[Chemical Formula 131]



[Chemical Formula 132]

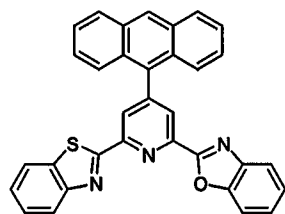


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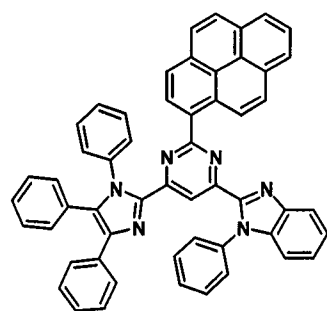


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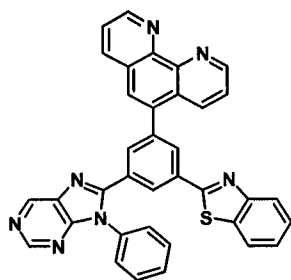
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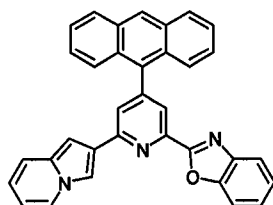
[Chemical Formula 135]



[Chemical Formula 136]

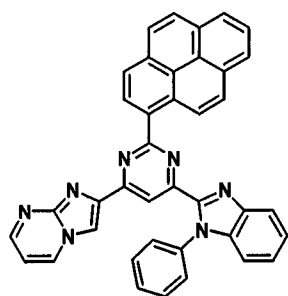


[Chemical Formula 137]

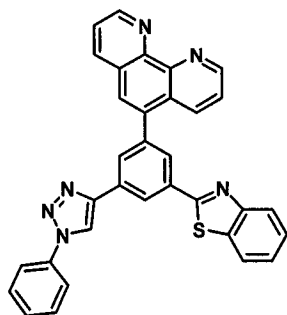


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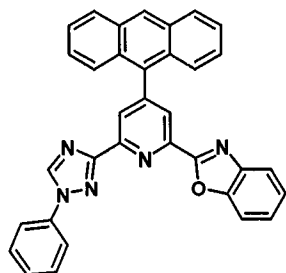
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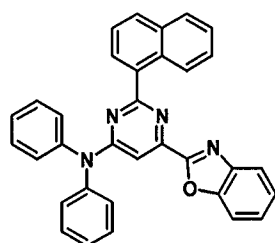
[Chemical Formula 139]



[Chemical Formula 140]

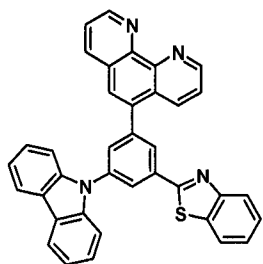


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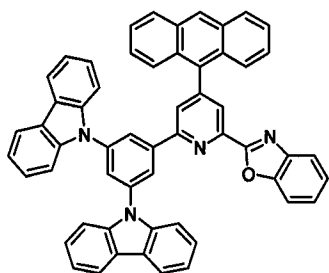


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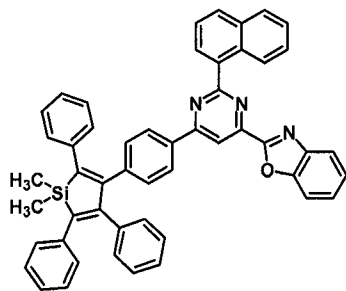
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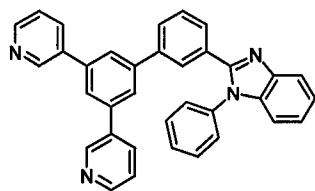
[Chemical Formula 143]



[Chemical Formula 144]

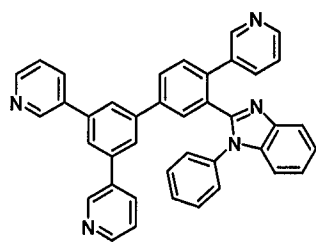


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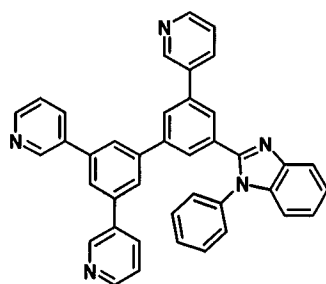


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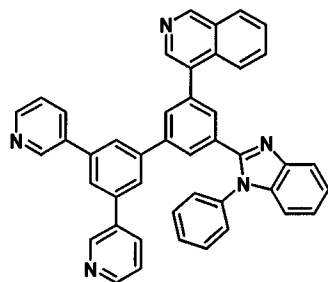
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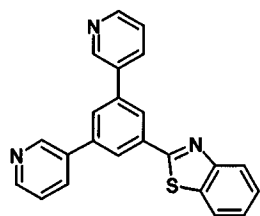
[Chemical Formula 147]



[Chemical Formula 148]

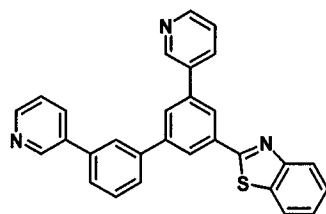


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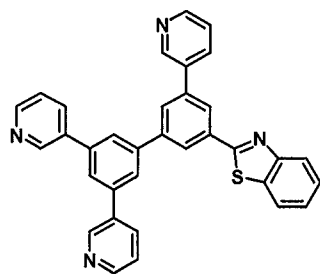


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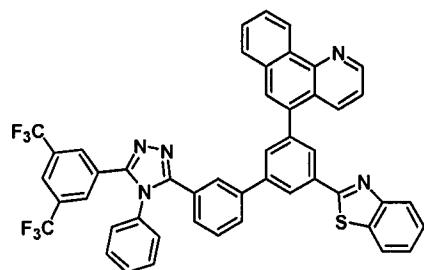
[Chemical Formula 150]



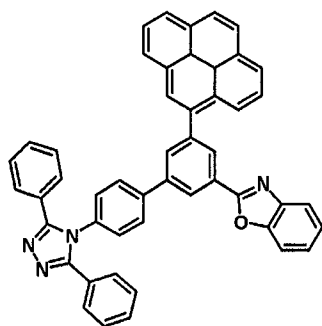
[Chemical Formula 151]



[Chemical Formula 152]

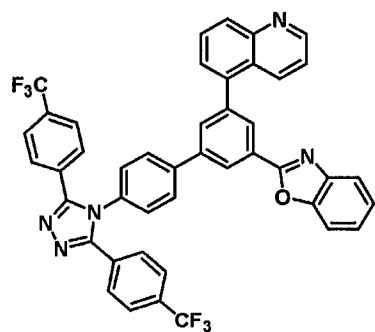


[Chemical Formula 153]

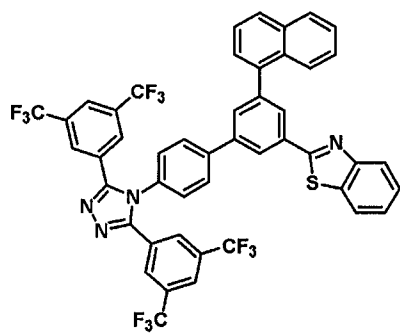


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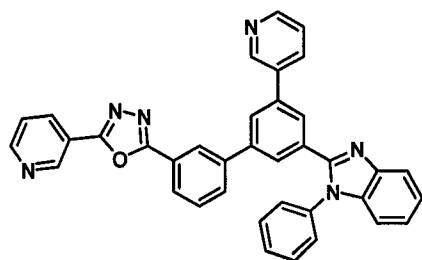
[Chemical Formula 154]



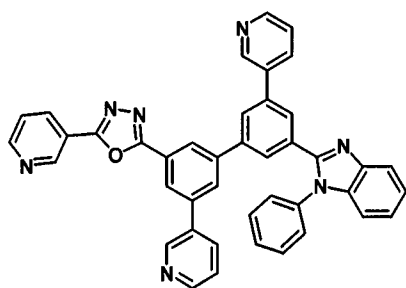
[Chemical Formula 155]



[Chemical Formula 156]

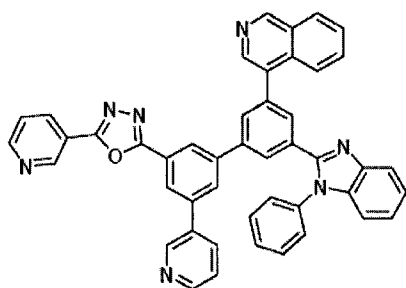


[Chemical Formula 157]

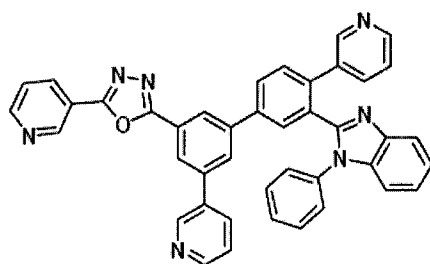


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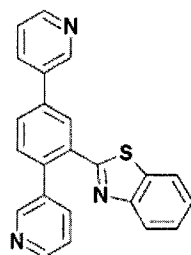
[Chemical Formula 158]



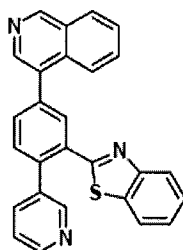
[Chemical Formula 159]



[Chemical Formula 160]

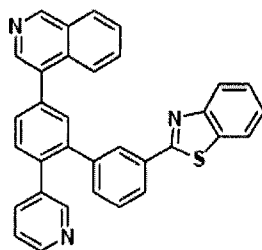


[Chemical Formula 161]

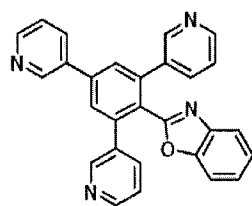


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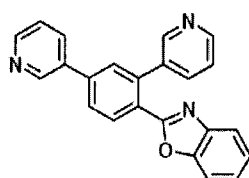
[Chemical Formula 162]



[Chemical Formula 163]

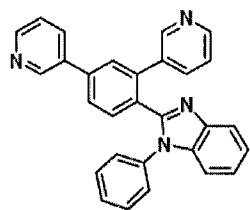


[Chemical Formula 164]

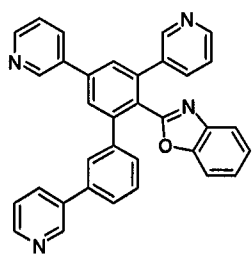


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[Chemical Formula 165]

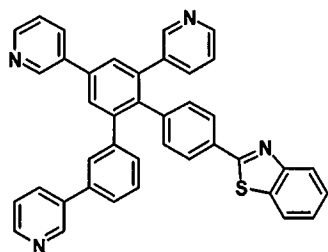


[Chemical Formula 166]

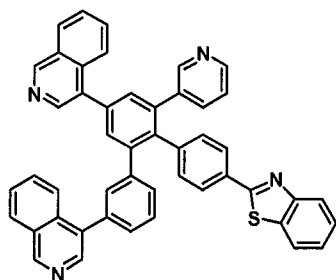


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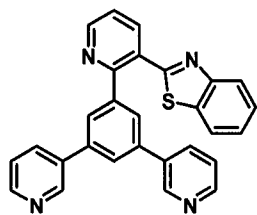
[Chemical Formula 167]



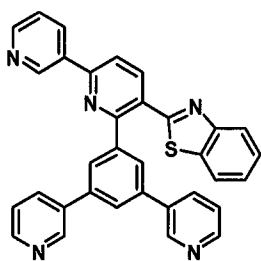
[Chemical Formula 168]



[Chemical Formula 169]

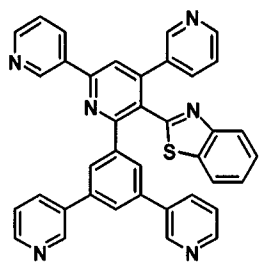


[Chemical Formula 170]

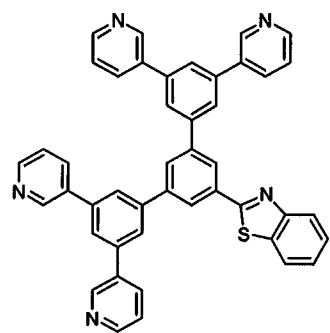


5

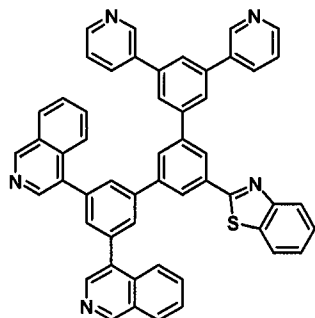
[Chemical Formula 171]



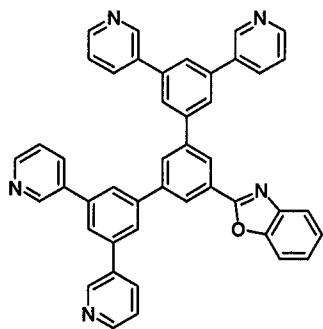
[Chemical Formula 172]



[Chemical Formula 173]

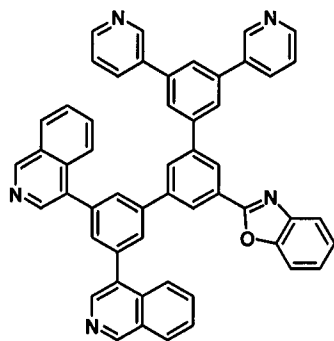


[Chemical Formula 174]



5

[Chemical Formula 175]



A compound for an organic photoelectric device including the above compound can play a role of hole injection, hole transport, light emitting, or electron injection and/or transport, and also as a light emitting host with an appropriate dopant. According to the embodiment of the present invention, a compound for an organic photoelectric device can improve thermal stability and

decrease driving voltage for improving life-span and efficiency characteristics of an organic photoelectric device when included in an organic thin layer.

The new compound for an organic photoelectric device can be usefully used for a host material or a charge transfer material. Herein, the organic photoelectric device may include an organic light emitting diode, an organic solar cell, an organic transistor, an organic memory device, and the like.

As for an organic solar cell, the new compound of the present invention is included in an electrode or an electrode buffer layer and can thereby improve quantum efficiency. As for an organic transistor, it can be used as an electrode material in a gate, a source-drain electrode, and the like.

Hereinafter, an organic light emitting diode is illustrated in more detail. According to another embodiment of the present invention, provided is an organic photoelectric device including the compound for an organic photoelectric device in at least one layer among organic thin layers, when an organic photoelectric device in general includes an anode, a cathode, and at least one organic thin layer disposed between the anode and cathode.

An organic light emitting diode includes a new compound having various energy band gaps, and thereby satisfies various conditions required for a hole injection layer (HIL), a hole transport layer (HTL), an emission layer, an electron injection layer (EIL), an electron transport layer (ETL), and the like. Accordingly, the organic light emitting diode can realize a low driving voltage and high luminous efficiency.

The organic thin layer can include one selected from the group consisting of an emission layer, an electron transport layer (ETL), an electron

injection layer (EIL), a hole transport layer (HTL), a hole injection layer (HIL), and a hole blocking layer. At least one layer includes a compound for an organic photoelectric device according to the present invention. At least one of the organic thin layers can include the compound for an organic photoelectric
5 device and a reducing dopant. The reducing dopant is selected from the group consisting of an alkaline metal, an alkaline earth metal, a rare earth element metal, an oxide of an alkaline metal, a halide of an alkaline metal, an organic complex of an alkaline metal, an oxide of an alkaline earth metal, a halide of an alkaline earth metal, an organic complex of an alkaline earth metal, an oxide of
10 an alkaline earth metal, a halide of an alkaline earth metal, an organic complex of an alkaline earth metal, an oxide of a rare earth element metal, a halide of a rare earth element metal, and an organic complex of a rare earth element metal.

FIGS. 1 to 5 are cross-sectional views showing organic photoelectric devices including the novel organic compounds according to various
15 embodiments of the present invention.

Referring to FIGS. 1 to 5, the organic photoelectric devices 100, 200, 300, 400, and 500 according to one embodiment includes at least one organic thin layer 105 interposed between an anode 120 and a cathode 110.

The anode 120 includes an anode material having a large work function
20 to help hole injection into an organic thin layer. The anode material includes a metal such as nickel, platinum, vanadium, chromium, copper, zinc, and gold, or alloys thereof; a metal oxide such as zinc oxide, indium oxide, indium tin oxide (ITO), and indium zinc oxide (IZO); a combined metal and oxide such as ZnO:Al or SnO₂:Sb; or a conductive polymer such as poly(3-methylthiophene), poly[3,4-

(ethylene-1,2-dioxy)thiophene] (PEDT), polypyrrol, and polyaniline, but is not limited thereto.

The cathode 110 includes a cathode material having a small work function to help electron injection into an organic thin layer. The cathode
5 material includes a metal such as magnesium, calcium, sodium, potassium, titanium, indium, yttrium, lithium, gadolinium, aluminum, silver, tin, and lead, or alloys thereof; or a multi-layered material such as LiF/Al, Liq/Al, LiO₂/Al, LiF/Ca, LiF/Al, and BaF₂/Ca, but is not limited thereto.

Referring to FIG. 1, the organic photoelectric device 100 includes an
10 organic thin layer 105 including only an emission layer 130.

Referring to FIG. 2, a double-layered organic photoelectric device 200 includes an organic thin layer 105 including an emission layer 230 including an electron transport layer (ETL), and a hole transport layer (HTL) 140. The emission layer 130 also functions as an electron transport layer (ETL), and the
15 hole transport layer (HTL) 140 layer has an excellent binding property with a transparent electrode such as ITO or an excellent hole transporting property.

Referring to FIG. 3, a three-layered organic photoelectric device 300 includes an organic thin layer 105 including an electron transport layer (ETL) 150, an emission layer 130, and a hole transport layer (HTL) 140. The
20 emission layer 130 is independently installed, and layers having an excellent electron transporting property or an excellent hole transporting property are separately stacked.

As shown in FIG. 4, a four-layered organic photoelectric device 400 includes an organic thin layer 105 including an electron injection layer (EIL) 160,

an emission layer 130, a hole transport layer (HTL) 140, and a hole injection layer (HIL) 170 for binding with the cathode of ITO.

As shown in FIG. 5, a five layered organic photoelectric device 500 includes an organic thin layer 105 including an electron transport layer (ETL) 150, an emission layer 130, a hole transport layer (HTL) 140, and a hole injection layer (HIL) 170, and further includes an electron injection layer (EIL) 160 to achieve a low voltage.

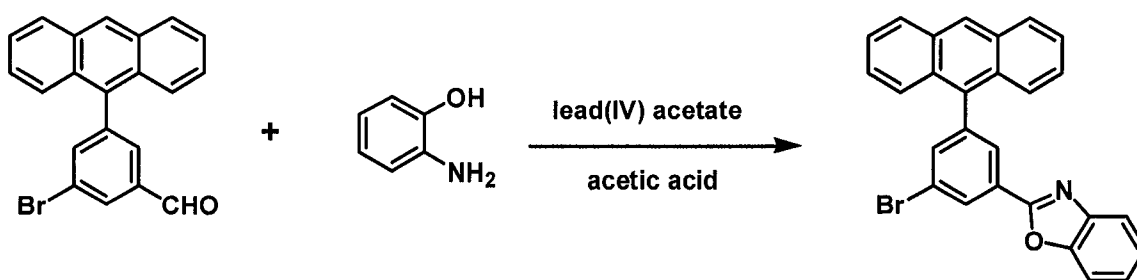
The organic photoelectric device can be fabricated by forming an anode on a substrate, forming an organic thin layer, and forming a cathode thereon. The organic thin layer can be formed by a dry coating method such as evaporation, sputtering, plasma plating, and ion plating, or a wet coating method such as spin coating, dipping, and flow coating.

Another embodiment of the present invention provides a display device including the organic photoelectric device according to the above embodiment.

The following examples illustrate the present invention in more detail. However, it is understood that the present invention is not limited by these examples.

Synthesis Example 1: Synthesis of 2-(3-(anthracen-9-yl)-5-bromophenyl)benzo[d]oxazole

[Reaction Scheme 1]



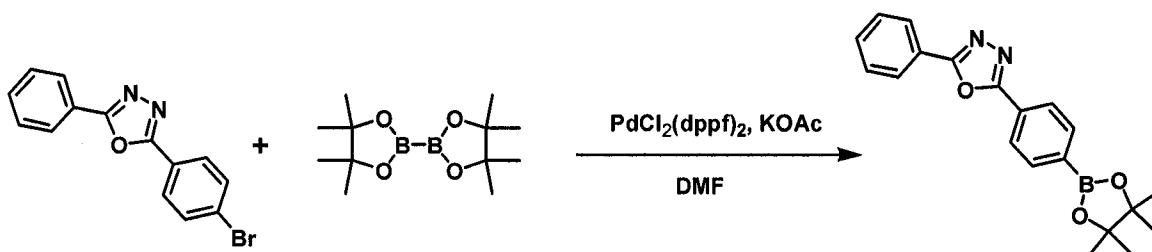
5

10 g (27.7 mmol) of 3-(anthracen-9-yl)-5-bromobenzaldehyde and 3.6 g (33.2 mmol) of 2-aminophenol were dissolved in 100 ml of acetic acid, and then agitated at room temperature for 30 minutes. Next, 14.7 g (33.2 mmol) of lead (IV) acetate was added thereto. The resulting mixture was agitated at 50°C for 1 hour. Then, water was poured therein. The resulting product was treated with ethylacetate to perform extraction, and then the solvent was removed under reduced pressure. The extract was separated through a column and dried, gaining 4.5 g (Y=33 %) of a white solid.

Synthesis Example 2: Synthesis of 2-(4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-5-phenyl-1,3,4-oxadiazole

15

[Reaction Scheme 2]



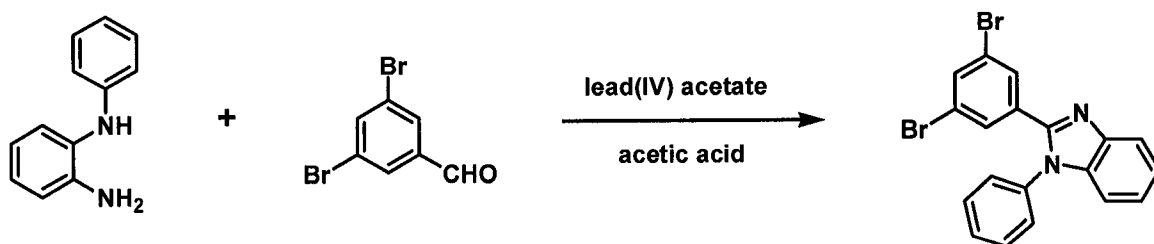
5 g (16.6 mmol) of 2-(4-bromophenyl)-5-phenyl-1,3,4-oxadiazole, 5.1 g

(19.9 mmol) of bis(pinacolato)diboron, 0.41 g (3 mol%) of a complex of [1,1'-bis(diphenylphosphino)ferrocene]dichloro-palladium (II) with dichloromethane, and 4.9 g (49.8 mmol) of potassium acetate were dissolved in 100 ml of dimethylformamide (DMF). The solution was reacted at 80°C for 12 hours.

- 5 The reactant was extracted with ethylacetate. The extract was treated under reduced pressure to remove the solvent and separated through a column, obtaining 3.1 g (Y=53 %) of a light yellow solid.

Synthesis Example 3: Synthesis of 2-(3,5-dibromophenyl)-1-phenyl-1H-benzo[d]imidazole

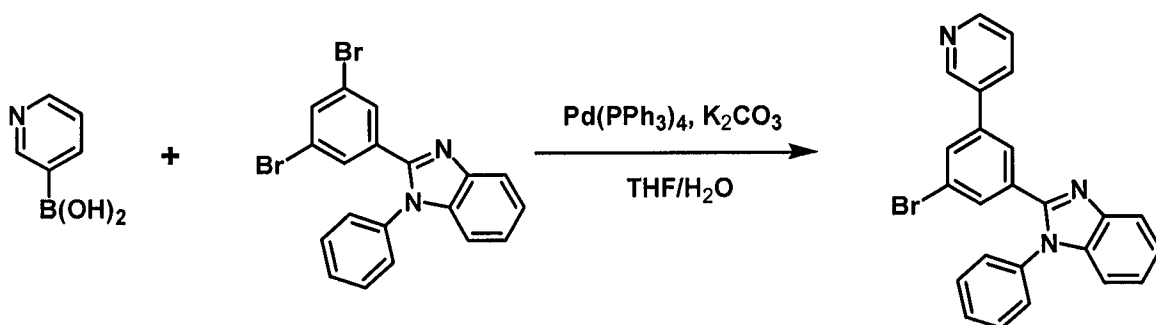
10 [Reaction Scheme 3]



- 20 g (75.8 mmol) of 3,5-dibromobenzaldehyde and 16.8 g (90.9 mmol) of N-phenyl-o-phenylenediamine were dissolved in 150 mL of acetic acid. The solution was agitated at room temperature for 30 minutes. Next, 37 g (83.4 mmol) of lead(IV) acetate was added thereto. The resulting product was agitated at 50° C for 1 hour. Then, water was poured into the acquired reactant. The resulting product was treated with ethylacetate to perform extraction and the solvent was removed under reduced pressure. The extract was separated through a column and dried, gaining 9.5 g (Y=29 %) of a yellow solid.

Synthesis Example 4: Synthesis of 2-(3-bromo-5-(pyridin-3-yl)phenyl)-1-phenyl-1H-benzo[d]imidazole

[Reaction Scheme 4]

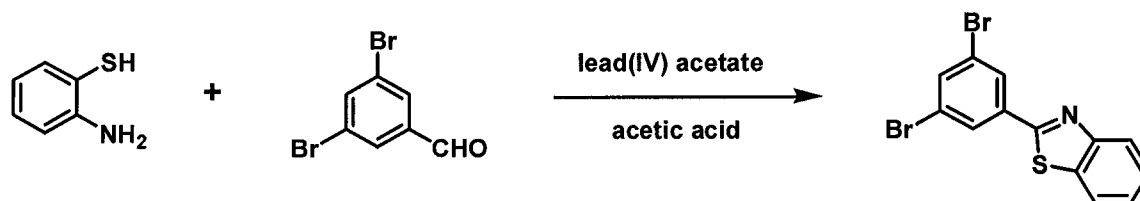


5

9.4 g (22.0 mmol) of 2-(3,5-dibromophenyl)-1-phenyl-1H-benzo[d]imidazole according to Synthesis Example 3, 2.7 g (22.0 mmol) of pyridine-3-boronic acid, 0.76 g (3 mol%) of tetrakis(triphenylphosphine)palladium (0), and 6.1 g (44.0 mmol) of potassium carbonate were dissolved in 300 ml of tetrahydrofuran/ H_2O mixed in a volume ratio of 2/1. The solution was reacted at 80°C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent therein. The reactant was separated through a column and dried, obtaining 5.15 g (Y=54 %) of a yellow solid.

Synthesis Example 5: Synthesis of (2-(3,5-dibromophenyl)benzo[d]thiazole

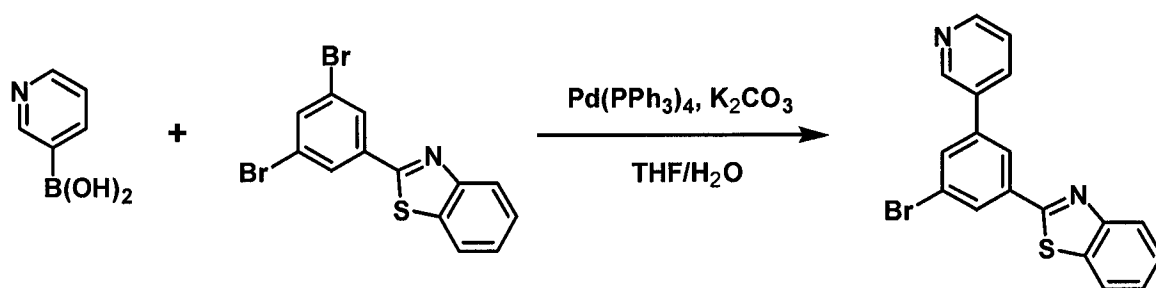
[Reaction Scheme 5]



5.03 g (19.1 mmol) of 3,5-dibromobenzaldehyde and 3.1 mL (28.6 mmol) of 2-aminothiophenol were dissolved in 60 mL of acetic acid. The solution was agitated at room temperature for 30 minutes. 9.78 g (21.0 mmol) of lead(IV) acetate was added thereto. The resulting mixture was agitated at 50° C for 1 hour. Then, water was poured into the reactant. It was extracted with ethylacetate. The extract was separated through a column and dried, obtaining 4.74 g (Y=67 %) of a white solid.

Synthesis Example 6: Synthesis of 2-(3-bromo-5-(pyridin-3-yl)phenyl)benzo[d]thiazole

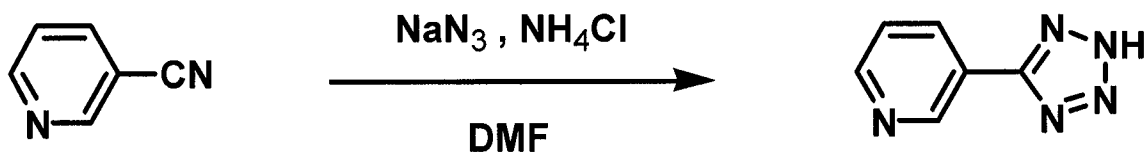
[Reaction Scheme 6]



4.74 g (12.8 mmol) of 2-(3,5-dibromophenyl)benzo[d]thiazole) according to Synthesis Example 5, 1.89 g (15.4 mmol) of pyridine-3-boronic acid, 0.44 g (3 mol%) of tetrakis(triphenylphosphine)palladium (0), and 5.31 g (38.4 mmol) of potassium carbonate were dissolved in 50 ml of tetrahydrofuran/H₂O mixed in a volume ratio of 4/1. The solution was reacted at 80° C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 2.54 g (Y=54 %) of a white solid.

Synthesis Example 7: Synthesis of 3-(2H-tetrazol-5-yl)pyridine

[Reaction Scheme 7]

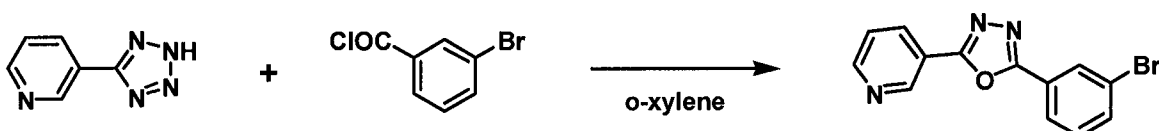


5 30 g (288 mmol) of 3-pyridinecarbonitrile, 28.1 g (432 mmol) of sodium azide (NaN_3), and 23.1 g (432 mmol) of ammonium chloride were dissolved in 200 mL of DMF. The solution was reacted at 100° C for 24 hours. Then, water was added to the acquired reactant. The resulting product was neutralized with hydrochloric acid and then filtered, obtaining 19.6 g (Y=46 %) of a white solid.

10

Synthesis Example 8: Synthesis of 3-(5-(3-bromophenyl)-1,3,4-oxadiazol-2-yl)pyridine

[Reaction Scheme 8]

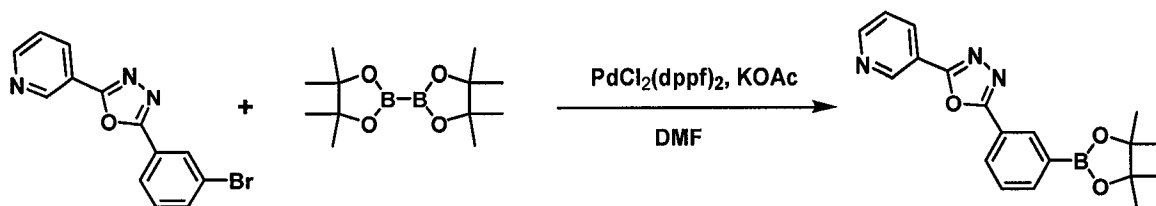


15 16.8 g (114 mmol) of 3-(2H-tetrazol-5-yl)pyridine according to Synthesis Example 7 and 25 g (114 mmol) of 3-bromobenzoylchloride were dissolved in 180 mL of o-xylene . The solution was reacted at 150° C for 8 hours. The acquired reactant was purified under reduced pressure and washed with methanol, obtaining 30 g (Y=87 %) of a white solid.

20

Synthesis Example 9: Synthesis of 3-(5-(3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-1,3,4-oxadiazol-2-yl)pyridine

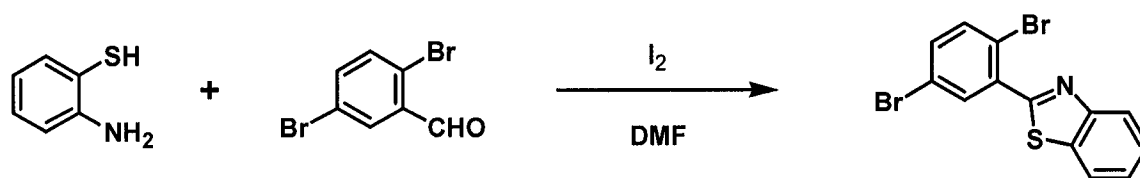
[Reaction Scheme 9]



12 g (40 mmol) of 3-(5-(3-bromophenyl)-1,3,4-oxadiazol-2-yl)pyridine
 5 according to Synthesis Example 8, 12.2 g (48 mmol) of bis(pinacolato)diboron,
 0.98 g (3 mol%) of a complex of [1,1'-bis(diphenylphosphino)ferrocene]dichloro-
 palladium(II) with dichloromethane, 5.9 g (60 mmol) of potassium acetate were
 dissolved in 250 ml of dimethylformamide (DMF). The solution was reacted at
 80 °C for 12 hours. The acquired reactant was extracted with ethylacetate and
 10 treated under reduced pressure to remove the solvent. The extract was
 separated through a column and dried, obtaining 10 g (Y=71 %) of a white solid.

Synthesis Example 10: Synthesis of 2-(2,5-dibromophenyl)benzo[d]thiazole

[Reaction Scheme 10]

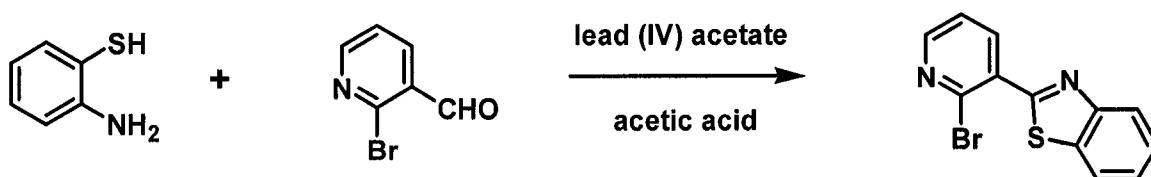


15

5 g (18.5 mmol) of 2,5-dibromobenzaldehyde, 3 mL (27.7 mmol) of 2-
 aminothiophenol, and 2.35 g (9.25 mmol) of iodine (Iodine) were dissolved in
 100 mL of DMF. The solution was reacted at 100° C for 1 hour. The
 20 acquired reactant was purified through a column, obtaining 4.64 g (Y=68 %) of
 a white solid.

Synthesis Example 11: Synthesis of 2-(2-bromopyridin-3-yl)benzo[d]thiazole

[Reaction Scheme 11]



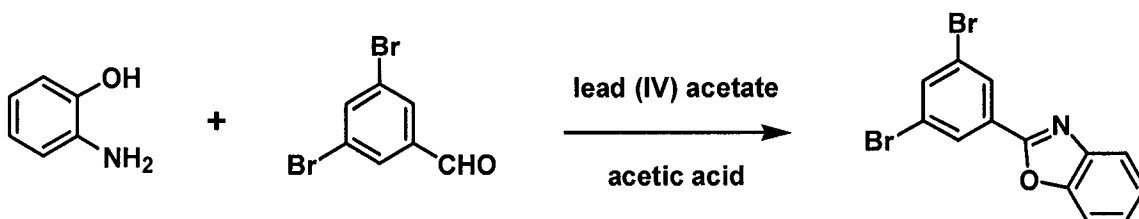
5

6.58 g (34.0 mmol) of 2-bromo-3-pyridinecarboxaldehyde and 5.5 mL (50.9 mmol) of 2-aminothiophenol were dissolved in 150 mL of acetic acid. The solution was agitated at room temperature for 30 minutes. Next, 19.0 g (40.8 mmol) of lead(IV) acetate was added thereto. The resulting product was agitated at 50° C for 1 hour. Then, water was added to the acquired reactant. The mixture was extracted with ethylacetate and treated under reduced pressure to remove the solvent, obtaining 5.55 g (Y=55 %) of a white solid.

10

Synthesis Example 12: Synthesis of 2-(3,5-dibromophenyl)benzo[d]oxazole

[Reaction Scheme 12]



15

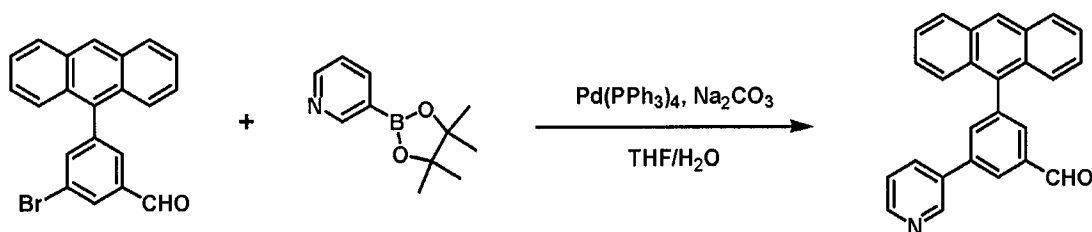
10 g (37.9 mmol) of 3,5-dibromobenzaldehyde and 5 g (45.5 mmol) of 2-aminophenol were dissolved in 200 mL of acetic acid. The solution was agitated at room temperature for 30 minutes. Next, 20.2 g (45.5 mmol) of

20

lead(IV) acetate was added thereto. The resulting product was agitated at 50° C for 1 hour. Then, water was added to the acquired reactant. The mixture was extracted with ethylacetate and treated under reduced pressure to remove the solvent, obtaining 5.7 g (Y=42 %) of a white solid.

5 **Synthesis Example 13: Synthesis of 3-(anthracen-9-yl)-5-(pyridin-3-yl)benzaldehyde**

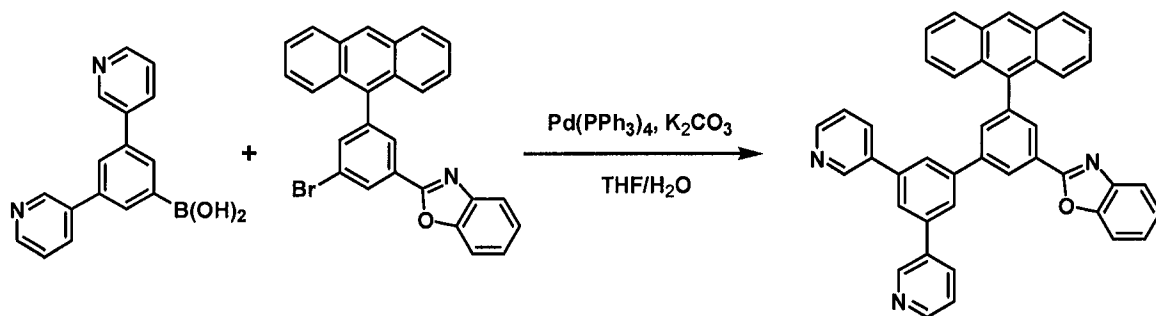
[Reaction Scheme 13]



7.9 g (21.9 mmol) of 3-(anthracen-9-yl)-5-bromobenzaldehyde, 5 g (24.4
10 mmol of pyridine-3-boronic acid neopentylglycol ester, 0.85 g (3 mol%) of
tetrakis(triphenylphosphine) palladium (0), and 5.17 g (48.8 mmol) of sodium
carbonate were dissolved in 90 ml of tetrahydrofuran/H₂O in a volume ratio of
2/1. The solution was reacted at 80° C for 12 hours. The acquired reactant
was extracted with ethylacetate and treated under reduced pressure to remove
15 the solvent. The extract was separated through a column, obtaining 7.24g (Y=
91%) of a white solid.

Example 1: Synthesis of a compound of Chemical Formula 108

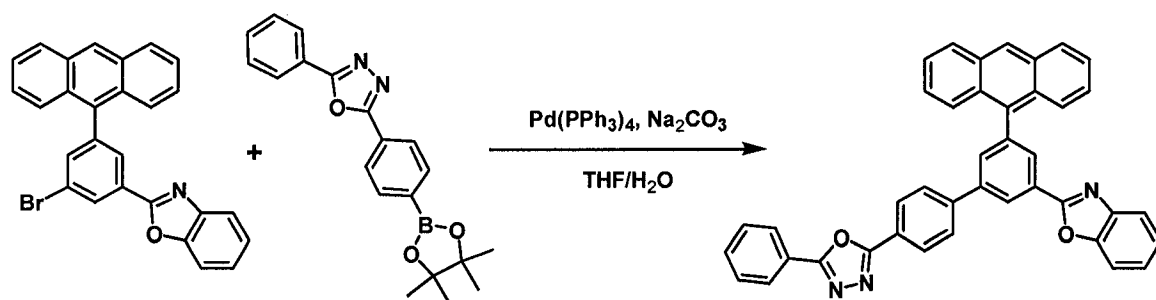
[Reaction Scheme 14]



5 5 g (18.1 mmol) of 3,5-di-(3-pyridinyl)-benzene boronic acid), 8.16 g (18.1 mmol) of 2-(3-(anthracen-9-yl)-5-bromophenyl)benzo[d]oxazole according to Synthesis Example 1, 0.63 g (3 mol%) of tetrakis(triphenylphosphine)palladium (0), and 5 g (36.2 mmol) of potassium carbonate were dissolved in 450 ml of a solvent of tetrahydrofuran/ H_2O mixed in
 10 a volume ratio of 2/1. The solution was reacted at 80°C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 6 g (Y=55 %) of a white solid.

Example 2: Synthesis of a compound of Chemical Formula 128

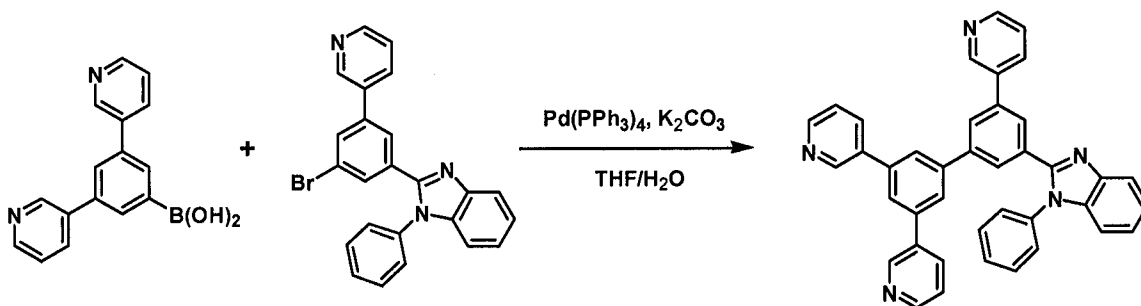
15 [Reaction Scheme 15]



2.32 g (6.7 mmol) of (2-(4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-5-phenyl-1,3,4-oxadiazole according to Synthesis Example 2, 2.5 g (5.5 mmol) of 2-(3-(anthracen-9-yl)-5-bromophenyl)benzo[d]oxazole according to Synthesis Example 1, 0.19 g (3 mol%) of tetrakis(triphenylphosphine)palladium (0), and 1.2 g (11.1 mmol) of sodium carbonate were dissolved in 90 ml of a solvent of tetrahydrofuran/H₂O mixed in a volume ratio of 2/1. The solution was reacted at 80° C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 2.6 g (Y=79 %) of a white solid.

Example 3: Synthesis of a compound of Chemical Formula 147

[Reaction Scheme 16]

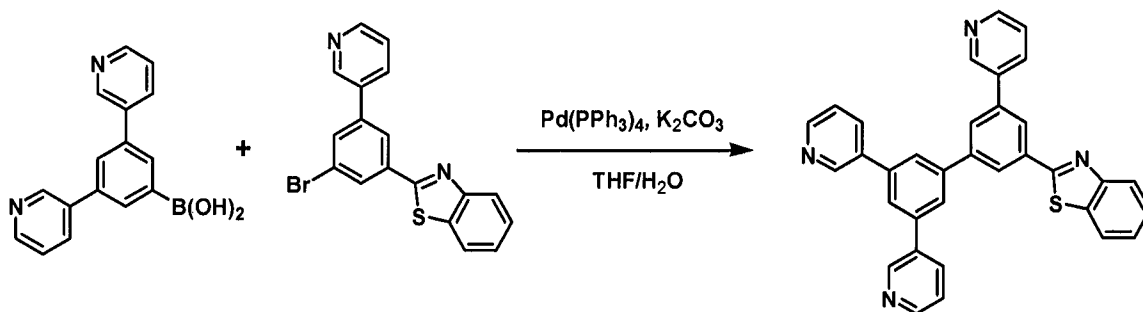


4.14 g (15.0 mmol) of 3,5-di(3-pyridinyl)-benzene boronic acid, 6.4 g (15.0 mmol) of 2-(3-bromo-5-(pyridin-3-yl)phenyl)-1-phenyl-1H-benzo[d]imidazole according to Synthesis Example 4, 0.52 g (3 mol%) of tetrakis(triphenylphosphine)palladium (0), and 4.15 g (30.0 mmol) of potassium carbonate were dissolved in 300 ml of a solvent of tetrahydrofuran/H₂O mixed in a volume ratio of 2/1. The solution was reacted at 80° C for 12 hours. The

acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 1.2 g (Y=13 %) of a white solid.

Example 4: Synthesis of a compound of Chemical Formula 151

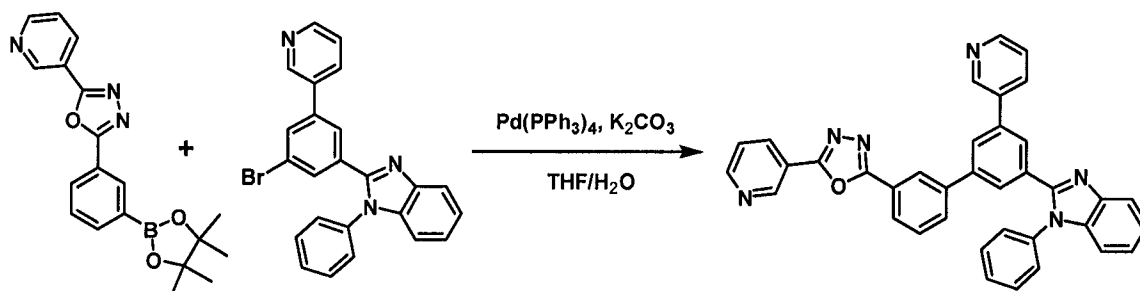
5 [Reaction Scheme 17]



0.84 g (3.1 mmol) of 3,5-di-(3-pyridinyl)-benzene boronic acid), 1.0 g (2.8 mmol) of 2-(3-bromo-5-(pyridin-3-yl)phenyl)benzo[d]thiazole according to
 10 Synthesis Example 6, 0.14 g (5 mol%) of tetrakis(triphenylphosphine)palladium (0), and 1.15 g (8.34 mmol) of potassium carbonate were dissolved in 25 mL of a solvent of tetrahydrofuran/ H_2O mixed in a volume ratio of 4/1. The solution was reacted at 80°C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The
 15 extract was separated through a column and dried, obtaining 1.35 g (Y=92 %) of a white solid.

Example 5: Synthesis of a compound of Chemical Formula 156

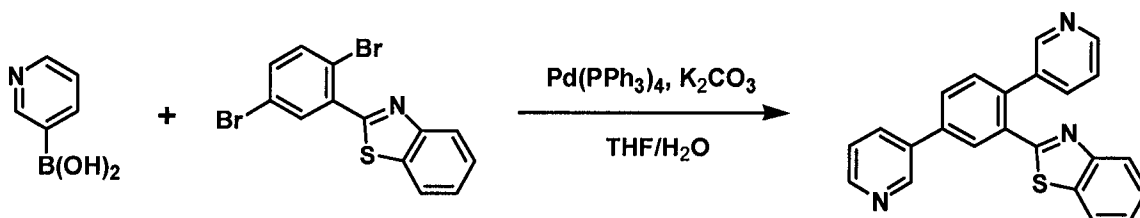
[Reaction Scheme 18]



5 4.63 g (13.3 mmol) of 3-(5-(3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-1,3,4-oxadiazol-2-yl)pyridine according to Synthesis Example 9, 5.15 g (12.1 mmol) of 2-(3-bromo-5-(pyridin-3-yl)phenyl)-1-phenyl-1H-benzo[d]imidazole) according to Synthesis Example 4, 0.47 g (3 mol%) of tetrakis(triphenylphosphine)palladium (0), and 3.3 g (24.2 mmol) of potassium carbonate were dissolved in 300 mL of a solvent tetrahydrofuran/H₂O mixed in a volume ratio of 4/1. The solution was reacted at 80° C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 2 g (Y=33 %) of a white solid.

Example 6: Synthesis of a compound of Chemical Formula 160

[Reaction Scheme 19]

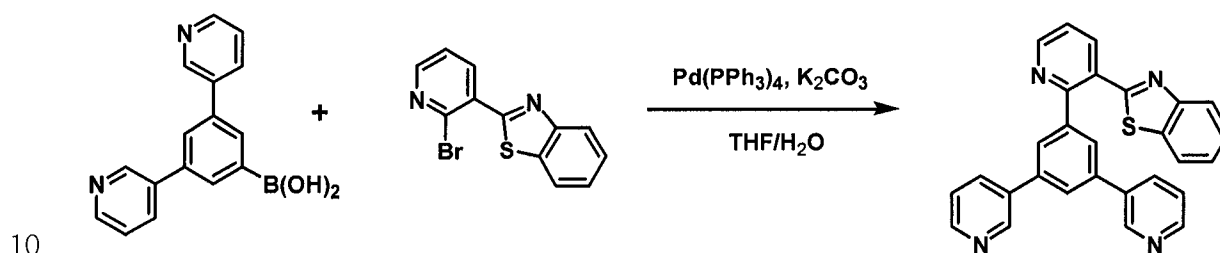


1 g (2.76 mmol) of 2-(2,5-dibromophenyl)benzo[d]thiazole according to

Synthesis Example 10, 0.85 g (6.9 mmol) of pyridine-3-boronic acid, 0.28 g (10 mol%) of tetrakis(triphenylphosphine)palladium (0), and 2.3 g (16.6 mmol) of potassium carbonate were dissolved in 25 mL of a solvent of tetrahydrofuran/H₂O mixed in a volume ratio of 4/1. The solution was reacted
 5 at 80° C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 0.8 g (Y=79 %) of a white solid.

Example 7: Synthesis of a compound of Chemical Formula 169

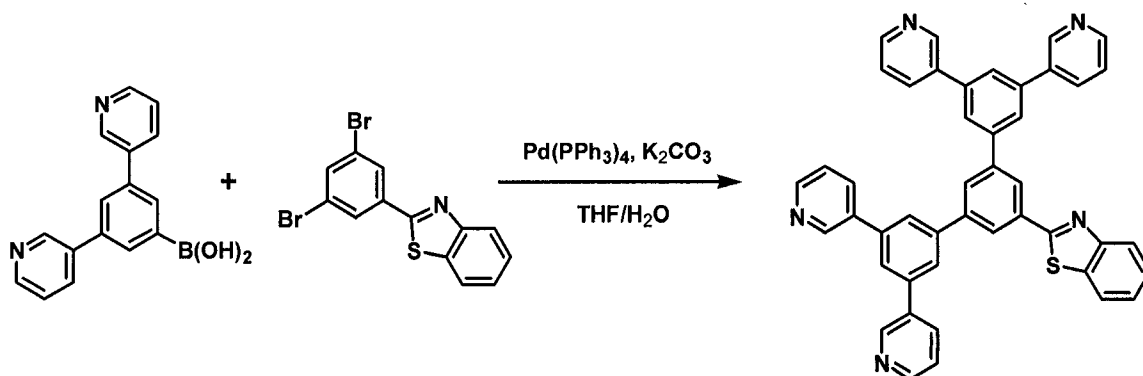
[Reaction Scheme 20]



1.33 g (4.8mmol) of 3,5-di-(3-pyridinyl)-benzene boronic acid, 1.7 g (5.8 mmol) of 2-(2-bromopyridine-3-yl)benzo[d]thiazole according to Synthesis Example 11, 0.28 g (5 mol%) of tetrakis(triphenylphosphine)palladium (0), and
 15 2.0 g (14.4 mmol) of potassium carbonate were dissolved in 30 mL of a solvent of tetrahydrofuran/H₂O mixed in a volume ratio of 4/1. The solution was reacted at 80° C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 2.28 g (Y=88 %)
 20 of a white solid.

Example 8: Synthesis of a compound of Chemical Formula 172

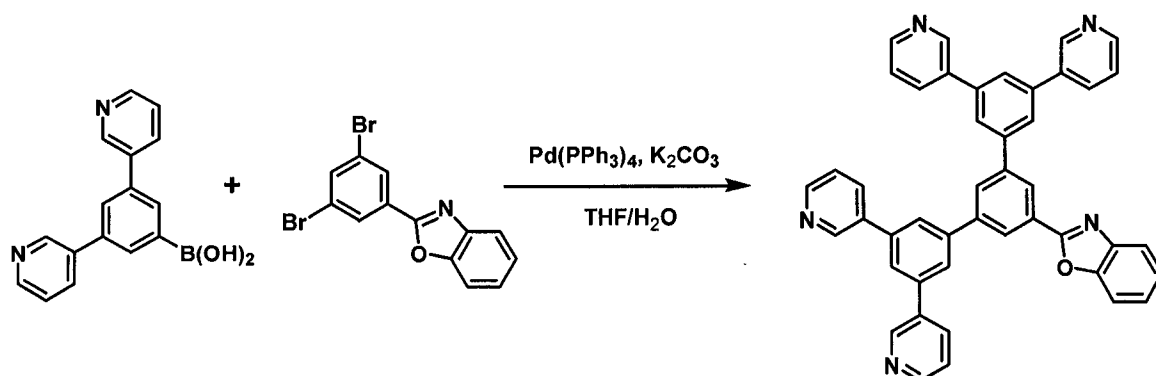
[Reaction Scheme 21]



- 2.3 g (8.4 mmol) of 3,5-di-(3-pyridinyl)-benzene boronic acid, 1.5 g (4.0 mmol) of 2-(3,5-dibromophenyl)benzo[d]thiazole according to Synthesis Example 5, 0.46 g (10 mol%) of tetrakis(triphenylphosphine)palladium (0), and 3.3 g (23.9 mmol) of potassium carbonate were dissolved in 50 mL of a solvent of tetrahydrofuran/ H_2O mixed in a volume ratio of 4/1. The solution was reacted at 80°C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 2.04 g (Y=75 %) of a white solid.

Example 9: Synthesis of a compound of Chemical Formula 174

[Reaction Scheme 22]

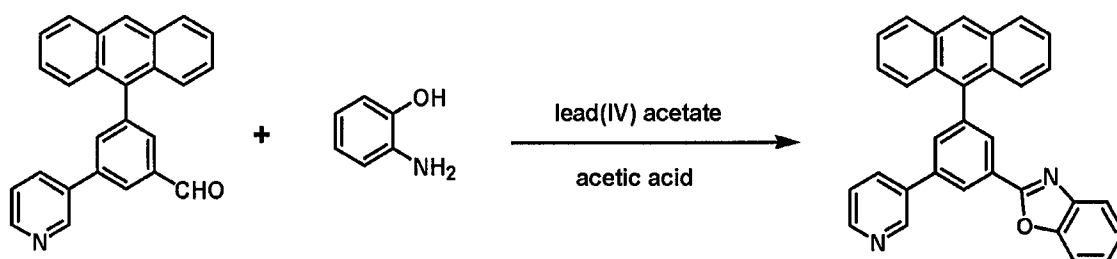


5 4.3 g (15.6 mmol) of 3,5-di-(3-pyridinyl)-benzene boronic acid, 2.5 g (7.1 mmol) of 2-(3,5-dibromophenyl)benzo[d]oxazole according to Synthesis Example 12, 0.82 g (10 mol%) of tetrakis(triphenylphosphine)palladium (0), and 5.9 g (42.7 mmol) of potassium carbonate were dissolved in 100 mL of a solvent of tetrahydrofuran/ H_2O mixed in a volume ratio of 4/1. The solution

10 was reacted at 80°C for 12 hours. The acquired reactant was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 3.37 (Y=72 %) of a white solid.

Example 10: Synthesis of a compound of Chemical Formula 68

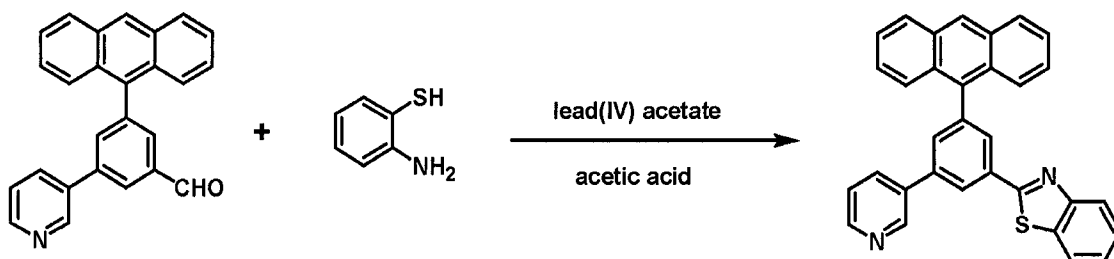
15 [Reaction Scheme 23]



3 g (8.3 mmol) of 3-(anthracen-9-yl)-5-(pyridin-3-yl)benzaldehyde according to Synthesis Example 13 and 0.91 g (8.3 mmol) of 2-aminophenol were dissolved in 80 ml of acetic acid. The solution was agitated at room temperature for 30 minutes. Next, 4.4 g (9.96 mmol) of lead(IV) acetate was added thereto. The resulting product was agitated at 50° C for 1 hour. Then, water was poured into the acquired reactant. The mixture was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, obtaining 2.17 g (Y=58 %) of a white solid.

Example 11: Synthesis of a compound of Chemical Formula 71

[Reaction Scheme 24]

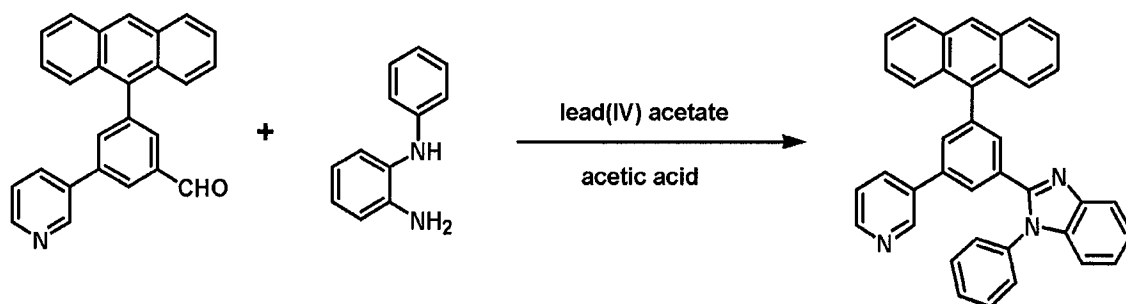


3 g (8.3 mmol) of 3-(anthracen-9-yl)-5-(pyridin-3-yl)benzaldehyde according to Synthesis Example 13 and 1.25 g (10 mmol) of 2-aminothiophenol were dissolved in 40 ml of acetic acid. The solution was agitated at room temperature for 30 minutes. Next, 4.4 g (9.96 mmol) of lead(IV) acetate was added thereto. The resulting mixture was agitated at 50° C for 1 hour. Then, water was added to the acquired product. The resulting mixture was extracted with ethylacetate. The extract was treated under reduced pressure to remove the solvent, and then separated through a column and dried, obtaining 2.74 g

(Y=71 %) of a white solid.

Example 12: Synthesis of a compound of Chemical Formula 77

[Reaction Scheme 25]



0.36 g (1 mmol) of 3-(anthracen-9-yl)-5-(pyridin-3-yl)benzaldehyde according to Synthesis Example 13 and 0.22 g (1.2 mmol) of N-phenyl-o-phenylenediamine were dissolved in 30 ml of acetic acid. The solution was agitated at room temperature for 30 minutes. Next, 0.53 g (1.2 mmol) of lead(IV) acetate was added thereto. The resulting mixture was agitated at 50° C for 1 hour. Then, water was poured into the acquired reactant. The resulting product was extracted with ethylacetate and treated under reduced pressure to remove the solvent. The extract was separated through a column and dried, gaining 0.27 g (Y=51 %) of a white solid.

The compounds according to Examples 1 to 12 were analyzed through ¹H NMR (nuclear magnetic resonance spectroscopy). The results are respectively provided in FIGs. 6 to 17.

Comparative Example 1: 2-(4-biphenyl)-5-(4-t-butylphenyl)-1,3,4-oxadiazole (PBD)

2-(4-biphenyl)-5-(4-t-butylphenyl)-1,3,4-oxadiazole(PBD), which is

conventionally known to have an excellent charge transfer capability (Jpn. J. Appl. Phys., 27, L269 1988), was prepared.

Example 13: Fabrication of an organic light emitting diode

A 15 Ω/cm^2 (120 nm) ITO glass substrate (Corning Inc.) was prepared to
5 have a size of 25 mm x 25 mm x 0.7 mm, and was respectively washed in isopropyl alcohol and pure water for 5 minutes, and was then cleaned again with UV and ozone.

Next, a 40 nm-thick N,N'-di(4-(N,N'-diphenyl-amino)-phenyl)-N,N'-diphenylbenzidine (DNTPD) hole injection layer (HIL) was formed on the
10 substrate.

Then, N,N'-bis(naphthalene-1-yl)-N,N'-bis(phenyl)benzidine (NPB) was vacuum-deposited to form a 10 nm-thick hole transport layer (HTL) on the hole injection layer (HIL).

EB-46 and EB-512 (e-Ray Optoelectronics Technology Co., Ltd.) as a
15 light emitting material were vacuum-deposited in a weight ratio of 94:6 to form a 40 nm-thick emission layer on the hole transport layer (HTL).

The compound according to Example 2 as an electron transport material was vacuum-deposited to form a 10 nm-thick electron transport layer (ETL) on the emission layer.

20 On the electron transport layer (ETL), LiF 0.5 nm/Al 100 nm were respectively and sequentially vacuum-deposited to form a cathode including LiF/Al, fabricating an organic light emitting diode of Example 13.

Example 14: Fabrication of an organic light emitting diode

An organic light emitting diode was fabricated according to the same

method as Example 13, except for using a compound according to Example 3 to form an electron transport layer (ETL).

Example 15: Fabrication of an organic light emitting diode

5 An organic light emitting diode was fabricated according to the same method as Example 13, except for using a compound according to Example 4 to form an electron transport layer (ETL).

Example 16: Fabrication of an organic light emitting diode

10 An organic light emitting diode was fabricated according to the same method as Example 13, except for using a compound according to Example 5 to form an electron transport layer (ETL).

Example 17: Fabrication of an organic light emitting diode

An organic light emitting diode was fabricated according to the same method as Example 13, except for using a compound according to Example 7 to form an electron transport layer (ETL).

15 **Example 18: Fabrication of an organic light emitting diode**

An organic light emitting diode was fabricated according to the same method as Example 13, except for using a compound according to Example 8 to form an electron transport layer (ETL).

Example 19: Fabrication of an organic light emitting diode

20 An organic light emitting diode was fabricated according to the same method as Example 13, except for using a compound according to Example 9 to form an electron transport layer (ETL).

Comparative Example 2: Fabrication of an organic light emitting diode

An organic light emitting diode was fabricated according to the same

method as Example 13, except for using an electron transport material of Alq₃ to form an electron transport layer (ETL).

Example 20: Fabrication of an organic light emitting diode

A 15 Ω/cm^2 (120 nm) ITO glass substrate (Corning Inc.) was prepared to
5 have a size of 25 mm x 25 mm x 0.7 mm, and was respectively cleaned in isopropyl alcohol and pure water for 5 minutes, and then with UV and ozone for 30 minutes.

Next, a 40 nm-thick hole transport layer (HTL) was formed by vacuum-depositing N,N'-di(1-naphthyl)-N,N'-diphenylbenzidine (NPD) on the substrate.

10 On the hole transport layer (HTL), 4,4'-bis(carbazol-9-yl)biphenyl (CBP) as a phosphorescent host and tris(phenylpyridine)iridium as a phosphorescent dopant were vacuum-deposited in a weight ratio of 90:10 to form a 30 nm-thick emission layer.

Then, a 5 nm-thick hole blocking layer was formed by vacuum-
15 depositing BAlq on the emission layer.

On the hole blocking layer, the compound of Example 1 as an electron transport material was vacuum-deposited to form a 20 nm-thick electron transport layer (ETL).

Then, LiF 5 nm/Al 100 nm were respectively and sequentially vacuum-
20 deposited to form a cathode including LiF/Al on the electron transport layer (ETL), fabricating an organic light emitting diode of Example 20.

Example 21: Fabrication of an organic light emitting diode

An organic light emitting diode was fabricated according to the same method as Example 20, except for using a compound of Example 2 to form an

electron transport layer (ETL).

Example 22: Fabrication of an organic light emitting diode

An organic light emitting diode was fabricated according to the same method as Example 20, except for using a compound represented by Chemical
5 Formula 96 according to Example 10 to form an electron transport layer (ETL).

Example 23: Fabrication of an organic light emitting diode

An organic light emitting diode was fabricated according to the same method as Example 20, except for using a compound represented by Chemical Formula 119 according to Example 11 to form an electron transport layer (ETL).

10 **Comparative Example 3: Fabrication of an organic light emitting diode**

An organic light emitting diode was fabricated according to the same method as Example 20, except for using an electron transport material of Alq₃ to form an electron transport layer (ETL).

Property measurement and analysis

15 **1) Thermal stability measurement**

The compounds according to Examples 1 to 12 were analyzed in a differential scanning calorimetry method (DSC), and then secondarily analyzed in the same method. The analysis results of the compounds according to Examples 5 and 10 and Comparative Example 1 are shown in FIGS. 18 to 20.
20 Referring to FIGS. 18 to 20, the compounds of Examples 5 and 10 had some or no fusing point peak in the primary analysis, but no fusing point peak in the secondary analysis. On the contrary, 2-(4-biphenyl)-5-(4-t-butylphenyl)-1,3,4-oxadiazole(PBD) according to Comparative Example 1 had a fusing point peak at 138° C in both primary and secondary analyses and a crystallizing

temperature at 65° C in the secondary analysis. The compounds of Examples 5 and 10 were identified to stably exist as amorphous compared with a conventional material. Therefore, the organic light emitting diodes including the compound of the present invention turned out to reduce influence of Joule heat generated during the operation, and thereby can have an improved life-span characteristic compared with a conventional organic light emitting diode.

2) Measurement of driving voltage, luminance, and luminous efficiency

The organic light emitting diode of Examples 13 to 23 and Comparative Examples 2 to 3 were measured regarding driving voltage (Vd) required to produce brightness of 1000 nit, and current efficiency (cd/A) and electric power efficiency (lm/W) at the same brightness. The results are shown in the following Table 1.

[Table 1]

Device	At 1000 cd/m ²			Von	Max	
	Vd (V)	cd/A	lm/W		cd/A	lm/W
Comparative Example 2	7.40	4.68	1.99	3.60	4.72	2.88
Example 13	6.20	5.19	2.63	3.20	5.35	3.25
Example 14	7.20	5.29	2.31	3.80	5.32	2.77
Example 15	6.40	5.00	2.45	3.00	5.32	3.34
Example 16	7.40	4.99	2.12	3.20	5.32	3.37
Example 17	6.40	5.80	2.85	3.00	5.88	3.51
Example 18	7.20	5.56	2.43	3.40	5.66	3.54
Example 19	6.00	6.04	3.16	3.20	6.32	4.14
Comparative Example 3	8.00	21.60	8.48	3.40	22.92	8.6
Example 20	6.40	25.14	12.34	3.20	25.80	12.85
Example 21	7.00	-	-	3.00	-	-
Example 22	7.40	29.80	12.60	3.00	29.93	16.89
Example 23	6.60	-	-	3.00	-	-

Referring to Table 1 and FIGS. 21 to 26, the organic light emitting diodes of Examples 13 to 23 had a sharply lower driving voltage than those of Comparative Examples 2 and 3. In addition, the organic light emitting diode of Examples 13 to 23 had a sharply low driving voltage but superbly high current

efficiency and electric power efficiency.

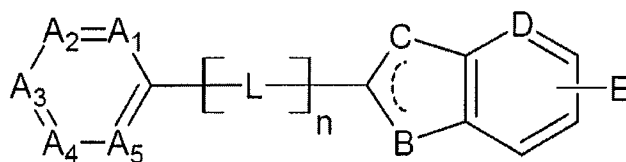
These measurement results of the organic light emitting diodes come from combination balance of holes and electrons in the emission layer. The compounds of Examples 13 to 23 turned out to have excellent electron injection
5 and transport characteristics compared with Alq₃, a general electron transport material.

While this invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but,
10 on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

【CLAIMS】**【Claim 1】**

A compound for an organic photoelectric device, represented by the following Formula 1:

5 [Chemical Formula1]



wherein, in the above Formula 1,

A₁ to A₅ are the same or different, and CR₁ to CR₅ are N, provided that three or less of A₁ to A₅ are N,

10 when one of A₁ to A₅ is N, the remaining four of A₁ to A₅ are respectively selected from the group consisting of CR₁ to CR₅, provided that at least two of R₁ to R₅ are not hydrogen, and

when A₁ to A₅ are respectively CR₁ to CR₅, at least two of R₁ to R₅ are not hydrogen,

15 B is selected from the group consisting of O, S, Se, and NR^{''},

C and D are the same or different, and are independently selected from the group consisting of CR['] and N, provided that when B is not NR^{''}, C is N,

R₁ to R₅, R['], and R^{''} are independently selected from the group consisting of hydrogen, a halogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, an ester, a substituted or unsubstituted alkyl, a substituted or
20 unsubstituted alkoxy, a substituted or unsubstituted alkenyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or

unsubstituted arylamine, a substituted or unsubstituted heteroarylamine, a substituted or unsubstituted heterocycle, a substituted or unsubstituted amino, BR_6R_7 , and $SiR_6R_7R_8$,

where R_6 to R_8 are the same or different, and are independently
5 selected from the group consisting of a substituted or unsubstituted alkyl, and a substituted or unsubstituted aryl,

E is selected from the group consisting of hydrogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or unsubstituted fluoroalkyl, a substituted or unsubstituted cycloalkyl, a substituted
10 or unsubstituted aryl, a substituted or unsubstituted heterocycle, and SO_2R_9 ,

where R_9 is selected from the group consisting of a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, and a substituted or unsubstituted heterocycle,

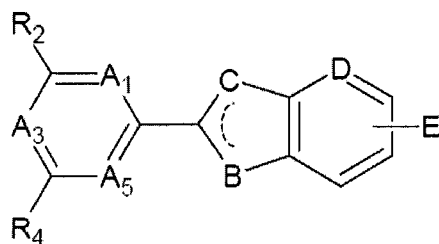
15 L is selected from the group consisting of a substituted or unsubstituted aryl and a substituted or unsubstituted heteroaryl, and

n is 0 or 1.

【Claim 2】

20 The compound of claim 1, wherein the compound is represented by the following Formula 2:

[Chemical Formula2]



wherein, in the above Formula 2,

A₁, A₃, and A₅ are the same or different, and are CR₁, CR₃, and CR₅, or
 5 N, where R₁, R₃, and R₅ are the same or different and are selected from the group consisting of hydrogen and a substituted or unsubstituted alkyl,

B is selected from the group consisting of O, S, Se, and NR^{''},

C and D are the same or different, and are independently selected from the group consisting of CR['] and N, provided that when B is not NR^{''}, C is N,

10 where R['] and R^{''} are the same or different, and are independently selected from the group consisting of a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, and a substituted or unsubstituted heterocycle,

15 R₂ and R₄ are the same or different, and are independently selected from the group consisting of hydrogen, a halogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, an ester, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkoxy, a substituted or unsubstituted alkenyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or
 20 unsubstituted arylamine, a substituted or unsubstituted heteroarylamine, a substituted or unsubstituted heterocycle, a substituted or unsubstituted amino,

BR_6R_7 , and $SiR_6R_7R_8$,

where R_6 to R_8 are the same or different, and are independently selected from the group consisting of a substituted or unsubstituted alkyl, and a substituted or unsubstituted aryl, and

5 E is selected from the group consisting of hydrogen, a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or unsubstituted fluoroalkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted heterocycle, and SO_2R_9 ,

10 where R_9 is selected from the group consisting of a nitrile, a cyano, a nitro, an amide, a carbonyl, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, and a substituted or unsubstituted heterocycle.

【Claim 3】

15 The compound of claim 2, wherein R_2 and R_4 of the above Formula 2 are different from each other.

【Claim 4】

20 The compound of claim 1, wherein the compound has an asymmetric structure where upper and lower substituents are different from each other with respect to the axis including A_3 .

【Claim 5】

The compound of claim 1, wherein the A₁ and A₅ are different from each other, and A₂ and A₄ are different.

5 **【Claim 6】**

The compound of claim 1, wherein R₁ to R₅, R', and R'' of the above Formula 1 are independently a substituted or unsubstituted C6 to C40 aryl.

【Claim 7】

10 The compound of claim 1, wherein R₁ to R₅, R', and R'' are independently an arylamine selected from the group consisting of diphenyl amine, dinaphthyl amine, dibiphenyl amine, phenyl naphthyl amine, phenyl diphenyl amine, ditolyl amine, phenyl tolyl amine, carbazole, and triphenyl amine.

15

【Claim 8】

The compound of claim 1, wherein R₁ to R₅, R', and R'' are a substituted or unsubstituted heterocycle selected from the group consisting of thiophene, furan, pyrrol, imidazolyl, thiazolyl, oxazolyl, oxadiazolyl, triazolyl, pyridinyl, pyridazine, quinolinyl, isoquinoline, arcidyl, imidazopyridinyl, and
20 imidazopyrimidinyl.

【Claim 9】

The compound of claim 8, wherein when the substituted or unsubstituted heterocycle is imidazole or triazole, the substituent linked to nitrogen (N) of the imidazole or triazole is selected from the group consisting of
5 a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted aryl, and a substituted or unsubstituted heterocycle.

【Claim 10】

The compound of claim 1, wherein:

10 one selected from R_1 to R_5 , R' , and R'' of B of the Formula 1 includes a substituent selected from the group consisting of an amine substituted alkyl, an amine substituted cycloalkyl, an amine substituted aryl, and an amine substituted heterocycle, and

the other from R_1 to R_5 , R' , and R'' of B of the Formula 1 includes a
15 substituent selected from the group consisting of a nitrile, a nitro, an amide, a carbonyl, and a substituted or unsubstituted heterocycle.

【Claim 11】

An organic photoelectric device comprising an anode, a cathode, and at
20 least one organic thin layer interposed between the anode and cathode,

wherein at least one of the organic thin layer comprises a compound for an organic photoelectric device according to one of claims 1 to 10.

【Claim 12】

The organic photoelectric device of claim 11, wherein the compound for an organic photoelectric device is a host material or a charge transport material.

5 **【Claim 13】**

The organic photoelectric device of claim 11, wherein the organic thin layer is selected from the group consisting of an emission layer, a hole transport layer (HTL), a hole injection layer (HIL), an electron transport layer (ETL), and an electron injection layer (EIL).

10

【Claim 14】

The organic photoelectric device of claim 11, wherein at least one of the organic thin layers comprises the compound for an organic photoelectric device and a reducing dopant.

15

【Claim 15】

The organic photoelectric device of claim 14, wherein the reducing dopant is selected from the group consisting of an alkaline metal, an alkaline earth metal, a rare earth element metal, an oxide of an alkaline metal, a halide of an alkaline metal, an organic complex of an alkaline metal, an oxide of an alkaline earth metal, a halide of an alkaline earth metal, an organic complex of an alkaline earth metal, an oxide of an alkaline earth metal, a halide of an alkaline earth metal, an organic complex of an alkaline earth metal, an oxide of

a rare earth element metal, a halide of a rare earth element metal, and an organic complex of a rare earth element metal.

【Claim 16】

- 5 A display device comprising the organic photoelectric device according to claim 11.

【Drawing】

FIG. 1

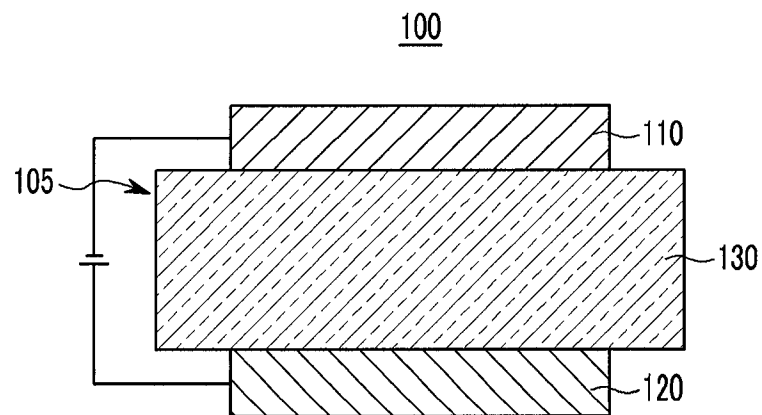


FIG. 2

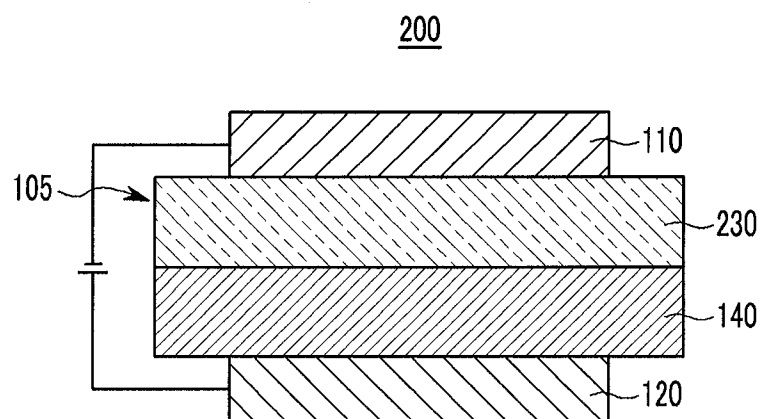


FIG. 3

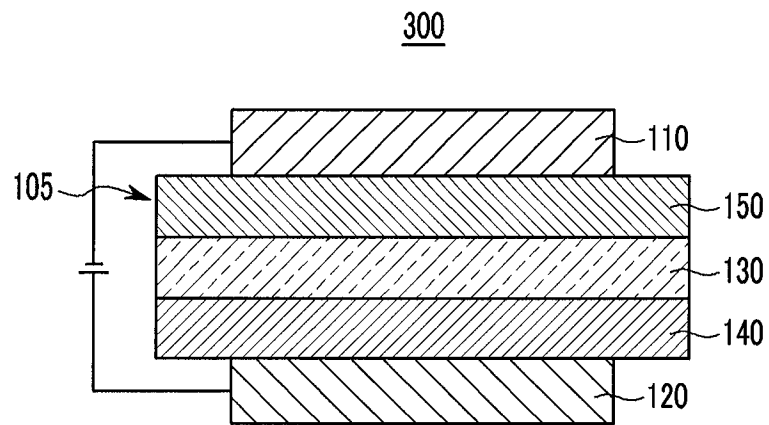


FIG. 4

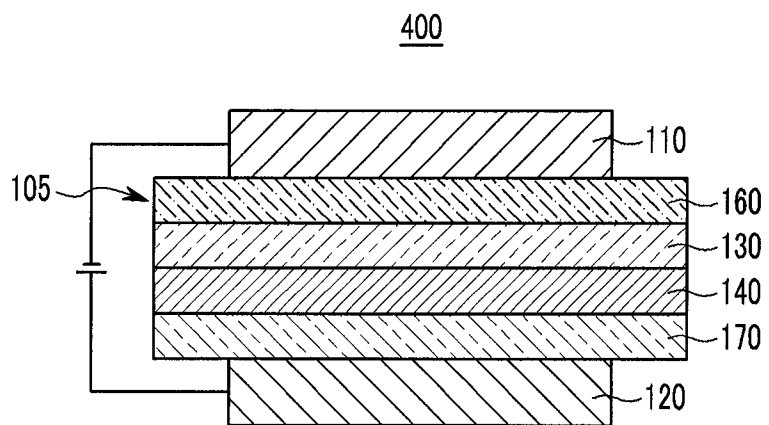


FIG. 5

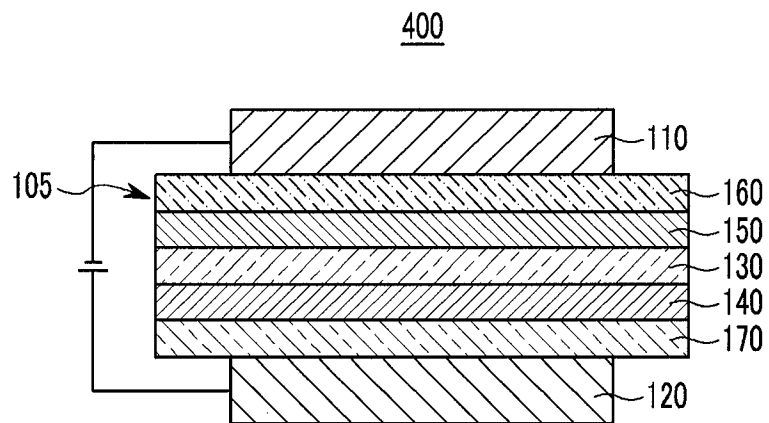


FIG. 6

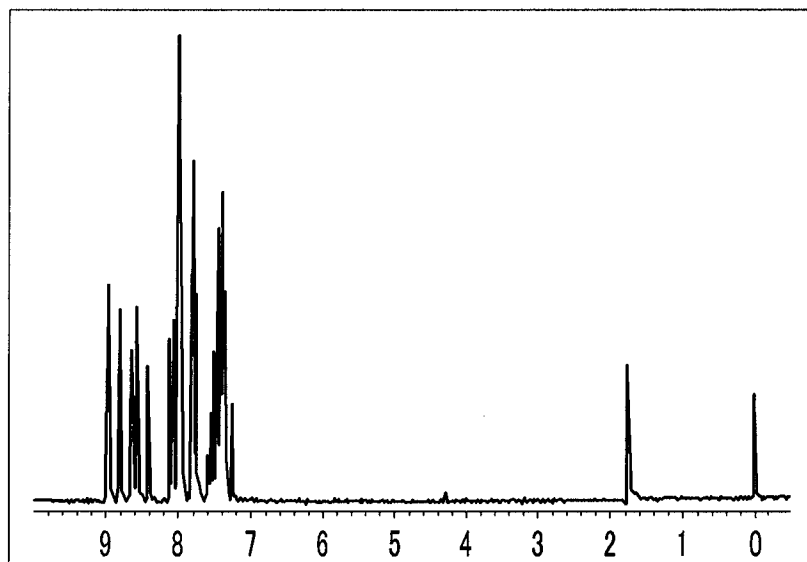


FIG. 7

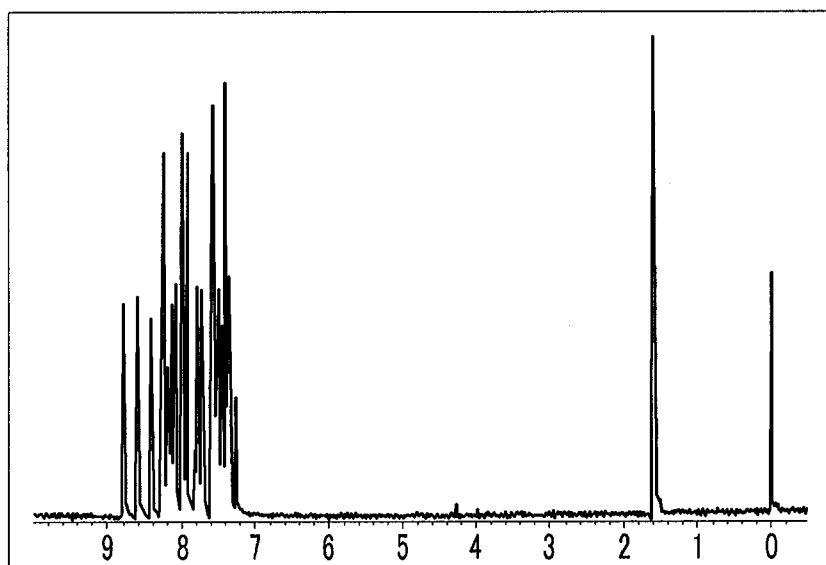


FIG. 8

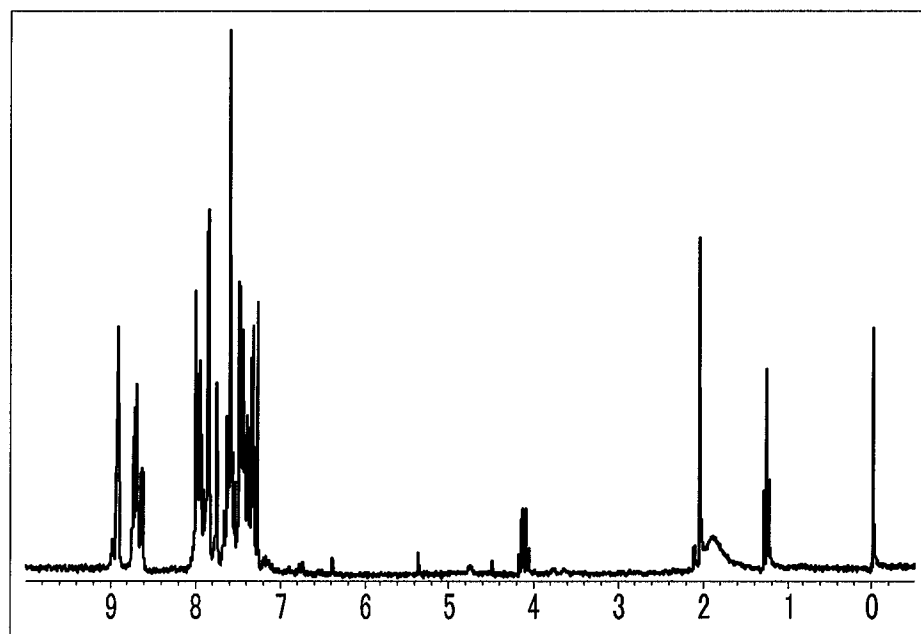


FIG. 9

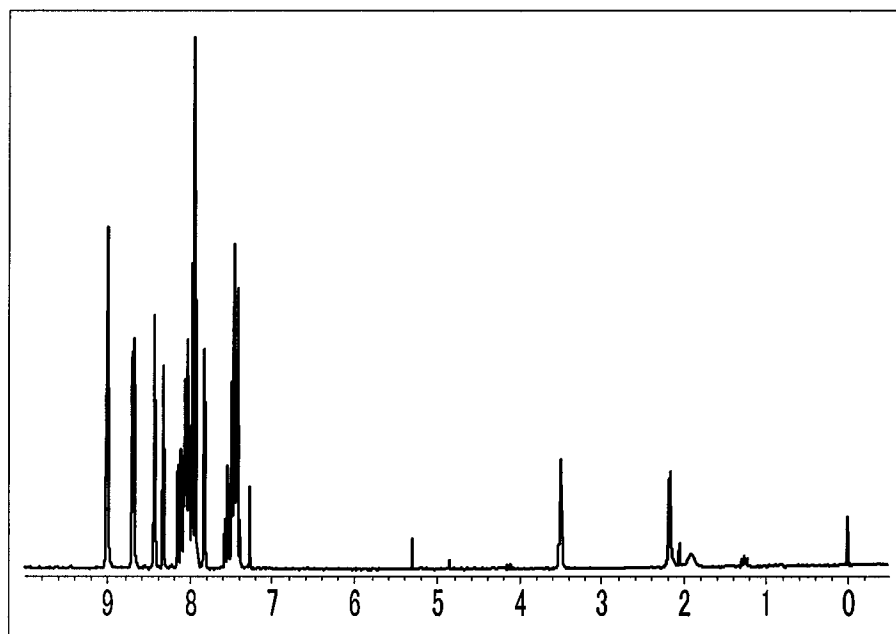


FIG. 10

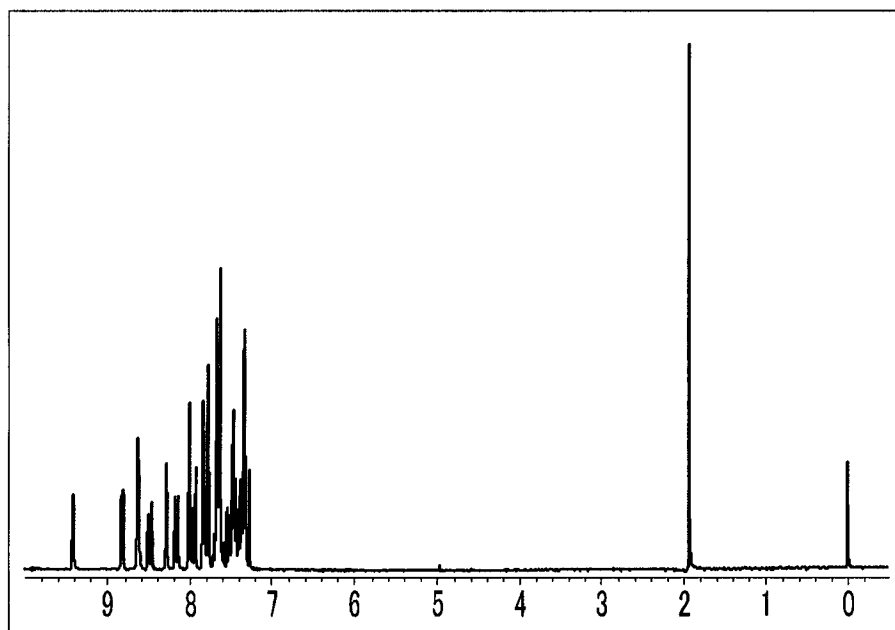


FIG. 11

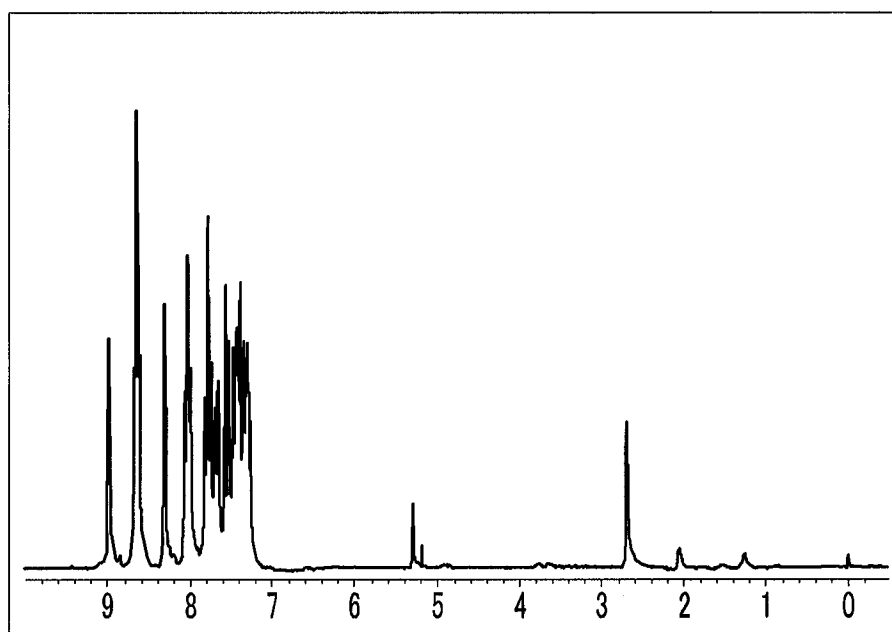


FIG. 12

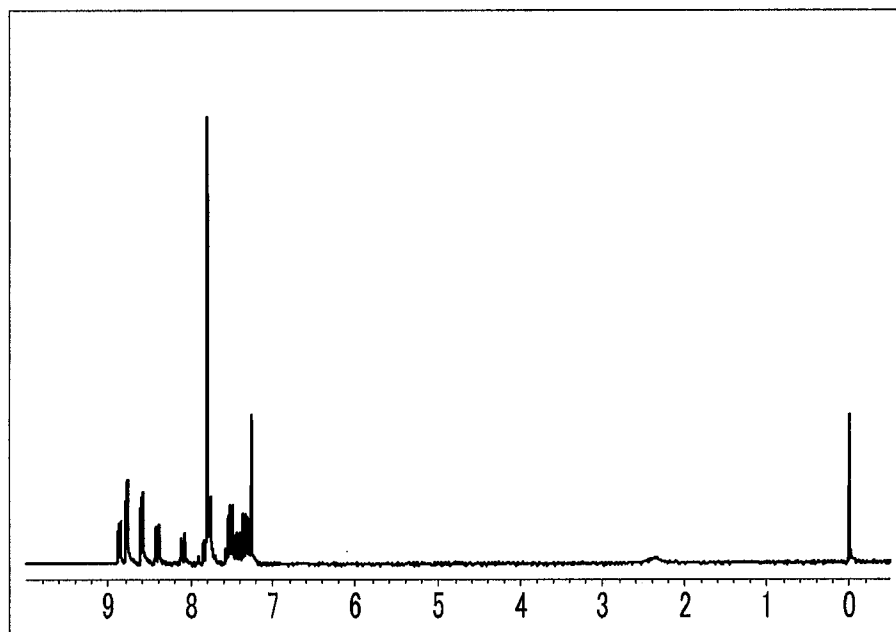


FIG. 13

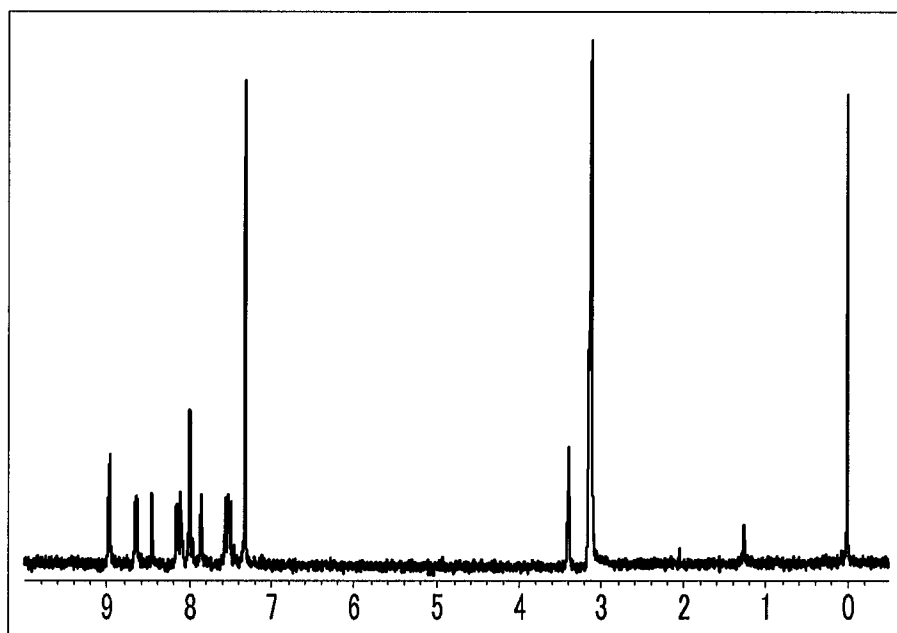


FIG. 14

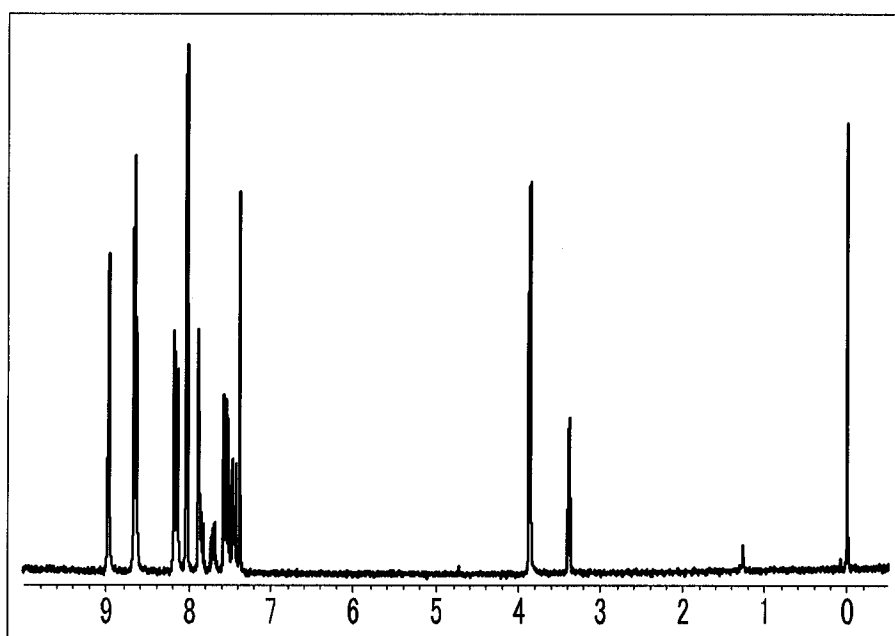


FIG. 15

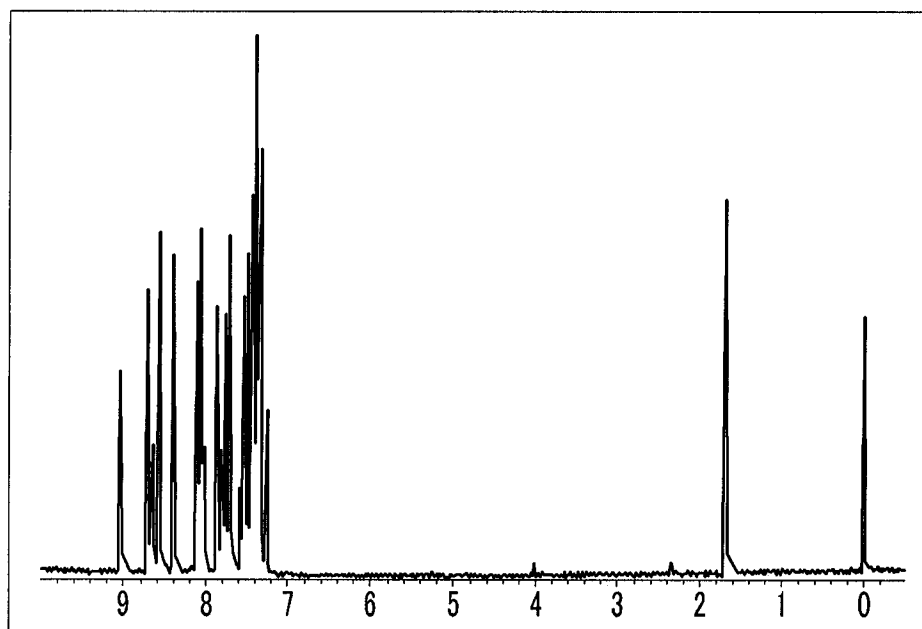


FIG. 16

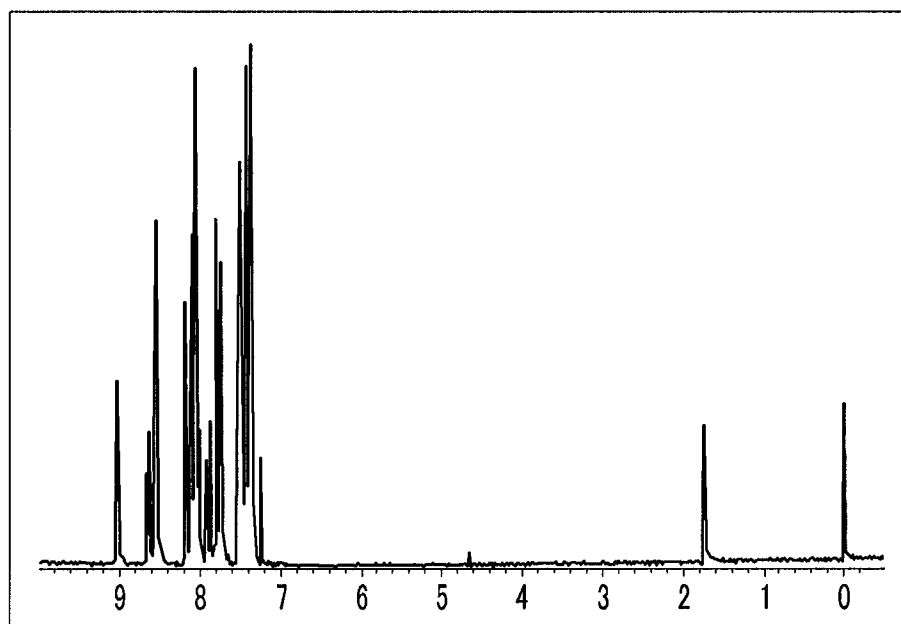


FIG. 17

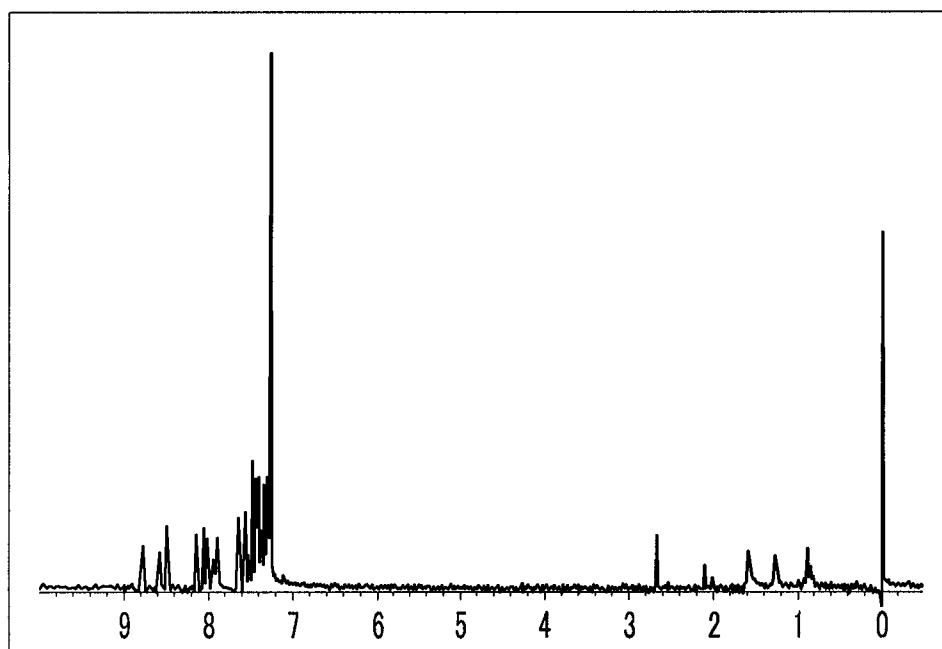


FIG. 18

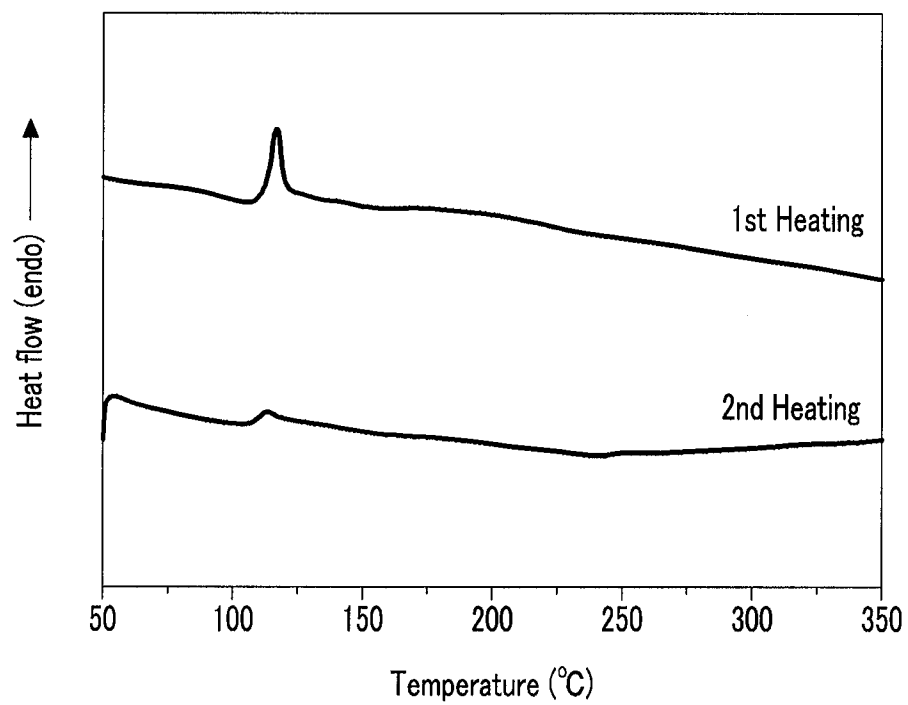


FIG. 19

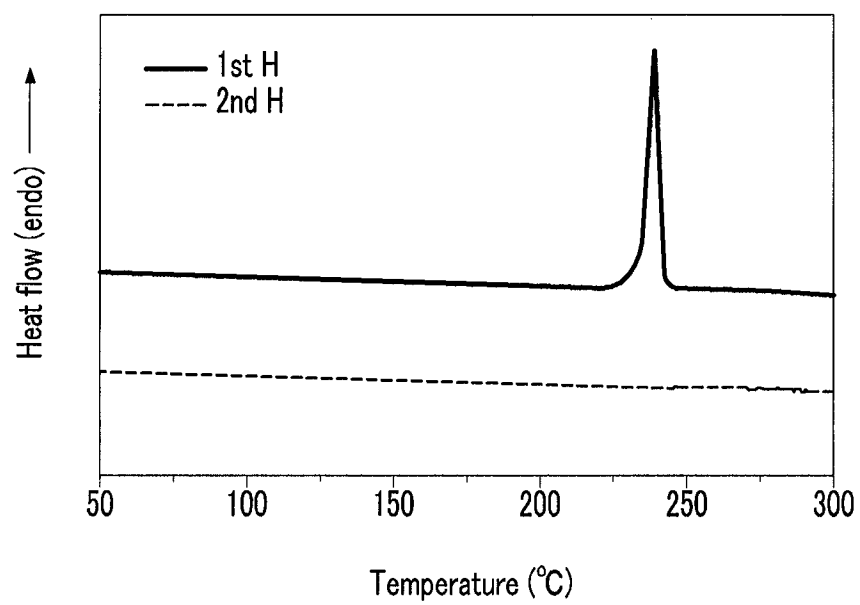


FIG. 20

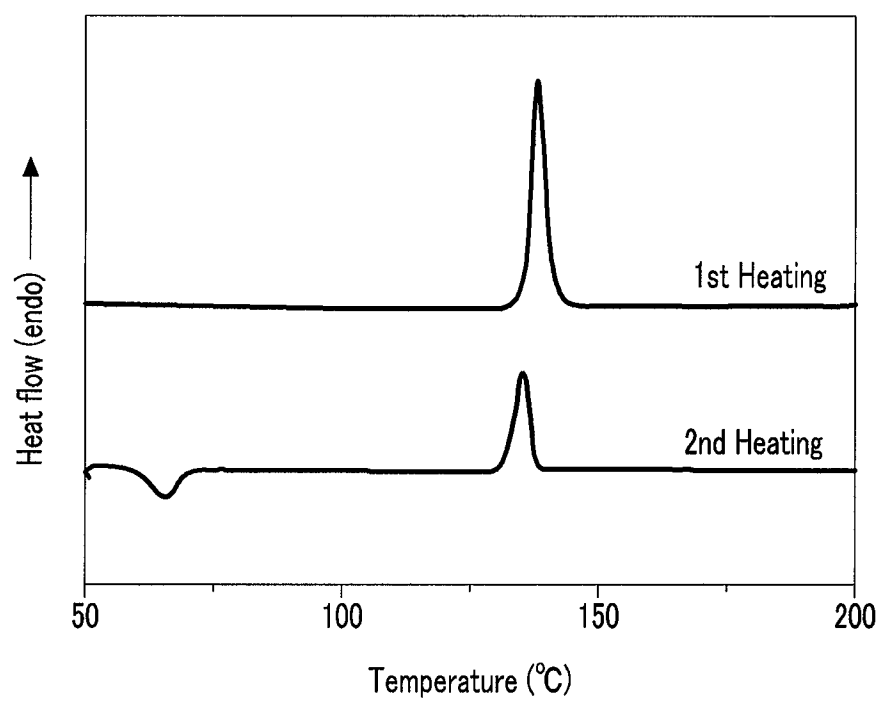


FIG. 21

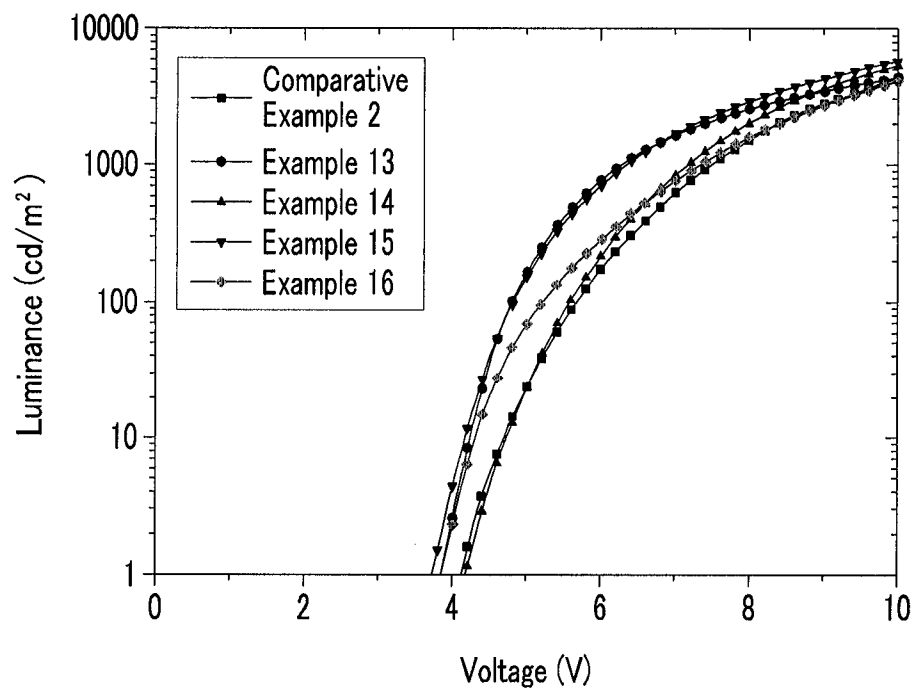


FIG. 22

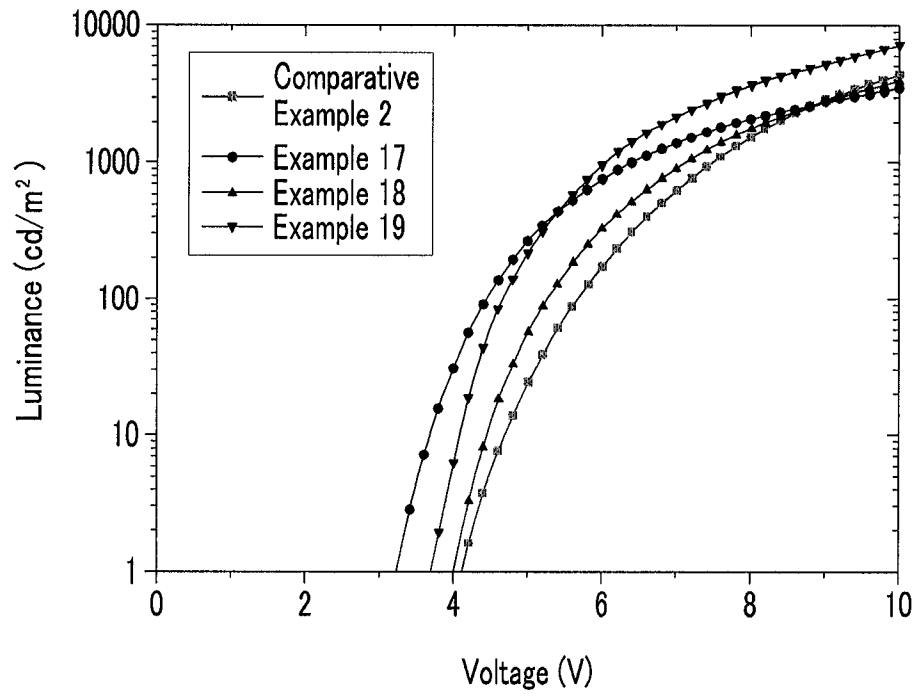


FIG. 23

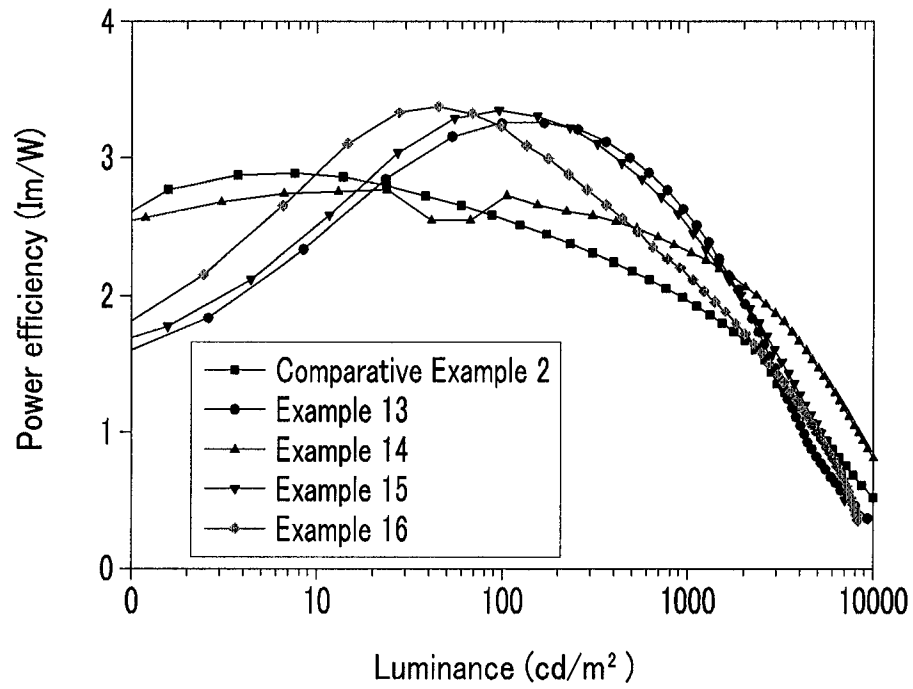


FIG. 24

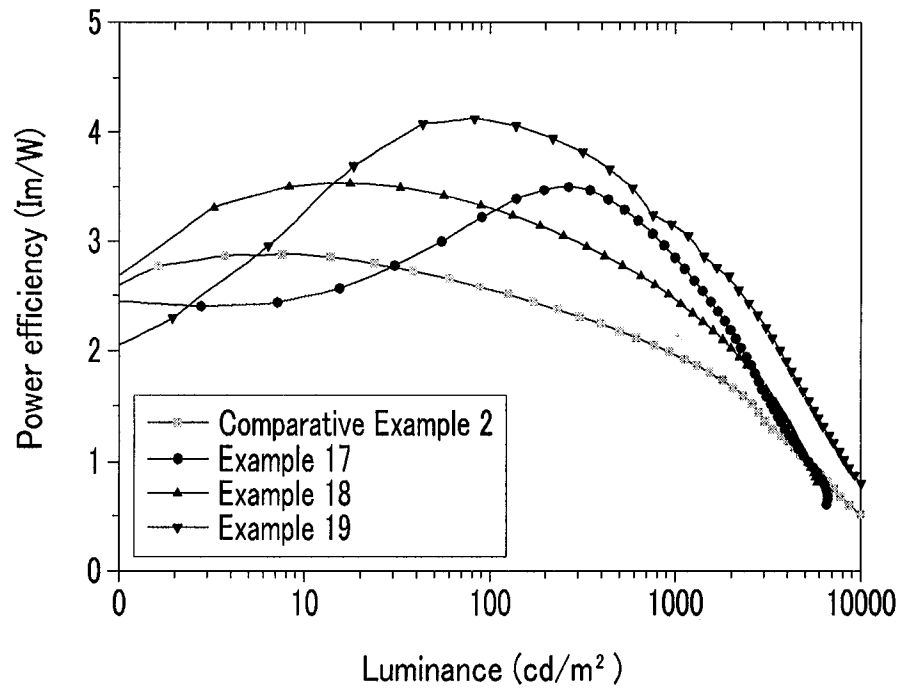


FIG. 25

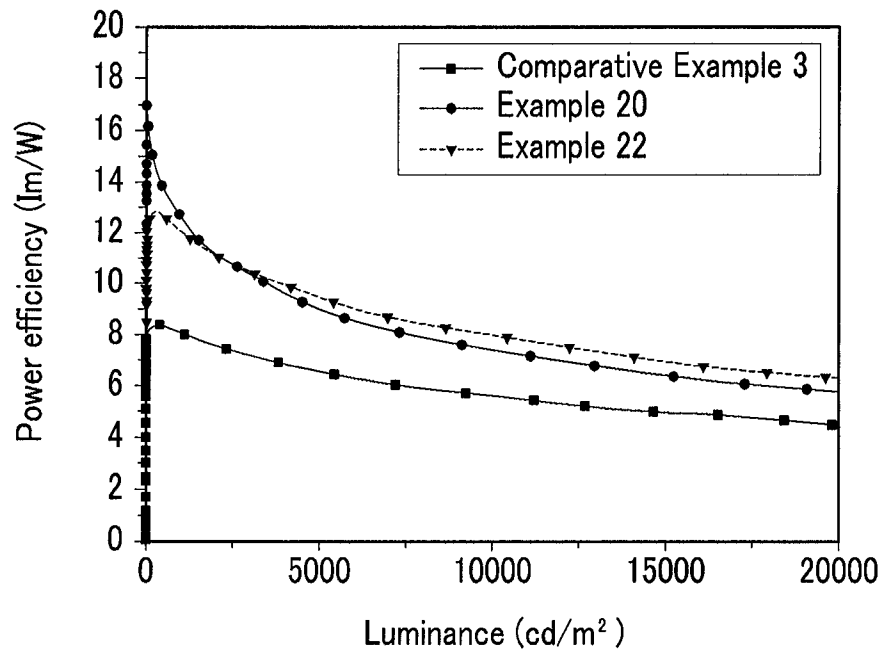


FIG. 26

