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(54) **ORGANIC OPTOELECTRONIC DEVICE COMPOUND AND ORGANIC LIGHT-EMITTING ELEMENT INCLUDING SAME**

ORGANISCHE OPTOELEKTRONISCHE VORRICHTUNG UND ORGANISCHES
LICHEMITTIERENDES ELEMENT DAMIT

COMPOSÉ POUR DISPOSITIF OPTOÉLECTRONIQUE ORGANIQUE ET ÉLÉMENT
ÉLECTROLUMINESCENT ORGANIQUE LE COMPRENANT

(84) Designated Contracting States:
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GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(56) References cited:
**WO-A1-2004/080975 JP-A- 2000 095 766
JP-A- 2002 047 274 KR-A- 20070 023 676
KR-A- 20100 099 459**

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- **DING J ET AL: "HIGHLY EFFICIENT GREEN-EMITTING PHOSPHORESCENT IRIIDIUM DENDRIMERS BASED ON CARBAZOLE DENDRONS", ADVANCED FUNCTIONAL MATERIALS, WILEY - V C H VERLAG GMBH & CO. KGAA, DE, vol. 16, no. 4, 3 March 2006 (2006-03-03), pages 575-581, XP001241777, ISSN: 1616-301X, DOI: 10.1002/ADFM.200500591**
- **TAKIZAWA, S. ET AL.: 'phenylbenzimidazole-Based New Bipolar Host Materials for Efficient Phosphorescent Organic Light-Emitting Diodes' CHEM. MATER. vol. 21, no. 12, 11 May 2009, pages 2452 - 2458, XP055130769**
- **CHEN, C.-H. ET AL.: 'Versatile, Benzimidazole/Amine-Based Ambipolar Compounds for Electroluminescent Applications: Single-Layer, Blue, Fluorescent OLEDs, Hosts for Single-Layer, Phosphorescent OLEDs' ADV. FUNCT. MATER. vol. 19, no. 16, 24 August 2009, pages 2661 - 2670, XP001548772**

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Description**[Technical Field]**

5 **[0001]** A compound for an organic optoelectronic device being capable of providing an organic optoelectronic device having excellent life-span, efficiency, electrochemical stability, and thermal stability, an organic light emitting diode including the compound, and a display device including the organic light emitting diode are disclosed.

[Background Art]

10 **[0002]** An organic optoelectronic device is a device requiring a charge exchange between an electrode and an organic material by using holes or electrons.

15 **[0003]** An organic optoelectronic device may be classified as follows in accordance with its driving principles. A first organic optoelectronic device is an electronic device driven as follows: excitons are generated in an organic material layer by photons from an external light source; the excitons are separated into electrons and holes; and the electrons and holes are transferred to different electrodes as a current source (voltage source).

20 **[0004]** A second organic optoelectronic device is an electronic device driven as follows: a voltage or a current is applied to at least two electrodes to inject holes and/or electrons into an organic material semiconductor positioned at an interface of the electrodes, and the device is driven by the injected electrons and holes.

25 **[0005]** Examples of an organic optoelectronic device include an organic photoelectric device, an organic light emitting diode, an organic solar cell, an organic photo conductor drum, an organic transistor, and the like, which require a hole injecting or transport material, an electron injecting or transport material, or a light emitting material.

30 **[0006]** Particularly, an organic light emitting diode (OLED) has recently drawn attention due to an increase in demand for flat panel displays. In general, organic light emission refers to conversion of electrical energy into photo-energy.

35 **[0007]** Such an organic light emitting diode converts 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 cathode. The organic material layer includes a multi-layer including different materials, for example a hole injection layer, a hole transport layer, an emission layer, an electron transport layer, and an electron injection layer, in order to improve efficiency and stability of an organic optoelectronic device.

40 **[0008]** In such an organic light emitting diode, when a voltage is applied between an anode and a cathode, holes from the anode and electrons from the cathode are injected to an organic material layer and recombined to generate excitons having high energy. The generated excitons generate light having certain wavelengths while shifting to a ground state.

45 **[0009]** Recently, it has become known that a phosphorescent light emitting material may be used for a light emitting material of an organic optoelectronic device in addition to the fluorescent light emitting material. Such a phosphorescent material emits lights by transporting the electrons from a ground state to an excited state, non-radiance transiting of a singlet exciton to a triplet exciton through intersystem crossing, and transiting a triplet exciton to a ground state to emit light.

50 **[0010]** As described above, in an organic light emitting diode, an organic material layer includes a light emitting material and a charge transport material, for example a hole injection material, a hole transport material, an electron transport material, an electron injection material, and the like.

55 **[0011]** The light emitting material is classified as blue, green, and red light emitting materials according to emitted colors, and yellow and orange light emitting materials to emit colors approaching natural colors.

60 **[0012]** When one material is used as a light emitting material, a maximum light emitting wavelength is shifted to a long wavelength or color purity decreases because of interactions between molecules, or device efficiency decreases because of a light emitting quenching effect. Therefore, a host/dopant system is included as a light emitting material in order to improve color purity and increase luminous efficiency and stability through energy transfer.

65 **[0013]** In order to implement excellent performance of an organic light emitting diode, a material constituting an organic material layer, for example a hole injection material, a hole transport material, a light emitting material, an electron transport material, an electron injection material, and a light emitting material such as a host and/or a dopant, should be stable and have good efficiency. However, development of an organic material layer forming material for an organic light emitting diode has thus far not been satisfactory and thus there is a need for a novel material. This material development is also required for other organic optoelectronic devices.

70 **[0014]** 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 has an advantage of low initial cost and being large-sized.

75 **[0015]** Both low molecular organic light emitting and polymer organic light emitting diodes have an advantage of self-light emitting, high speed response, wide viewing angle, ultra-thin, high image quality, durability, large driving temperature range, and the like. In particular, they have good visibility due to self-light emitting characteristics compared with a conventional LCD (liquid crystal display) and have an advantage of decreasing thickness and weight of LCD up to a

third, because they do not need a backlight.

[0016] In addition, since they have a response speed 1000 time faster microsecond unit than LCD, they can realize a perfect motion picture without after-image. Based on these advantages, they have been remarkably developed to have 80 times efficiency and more than 100 times life-span since they come out for the first time in the late 1980s. Recently,

[0017] They are simultaneously required to have improved luminous efficiency and life-span in order to be larger. Herein, their luminous efficiency need smooth combination between holes and electrons in an emission layer. However, since an organic material in general has slower electron mobility than hole mobility, it has a drawback of inefficient combination between holes and electrons. Accordingly, while increasing electron injection and mobility from a cathode and simultaneously preventing movement of holes is required.

[0018] In order to improve life-span, a material crystallization caused by Joule heats generated during device operating is required to be prevented. Accordingly, there has been a strong need for an organic compound having excellent electron injection and mobility, and high electrochemical stability.

[DISCLOSURE]

[Technical Problem]

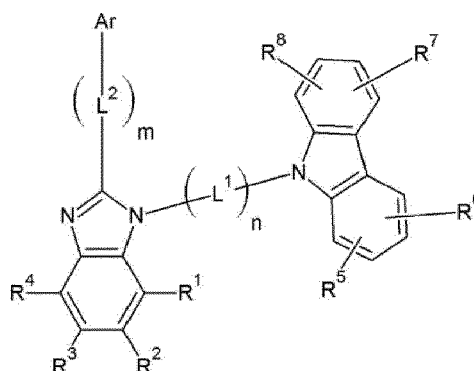
[0019] A compound for an organic optoelectronic device that may act as a hole injection and transport material or an electron injection and transport material, and also act as a light emitting host along with an appropriate dopant is provided.

[0020] An organic light emitting diode having excellent life-span, efficiency, driving voltage, electrochemical stability, and thermal stability and a display device including the same are provided.

[Technical Solution]

[0021] In one aspect of the present invention, a compound for an organic Compounds for optoelectronic devices are inter alia described in Ding et al., Advanced Functional Materials 2006, 575-581 and in KR 2010 99459 A. optoelectronic device represented by the following Chemical Formula 1 is provided.

[Chemical Formula 1]

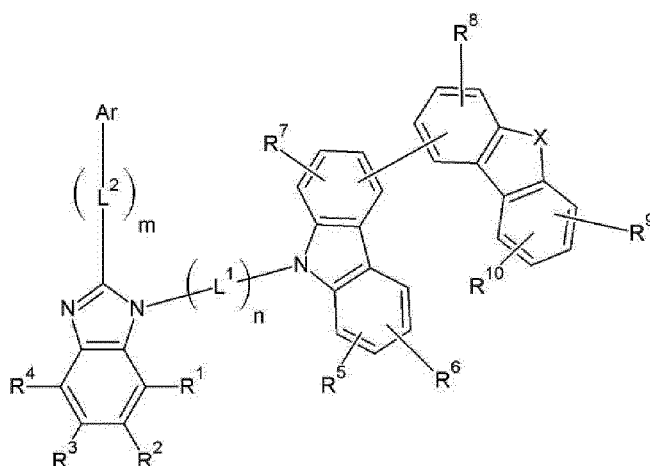


[0022] In the above Chemical Formula 1, L^1 and L^2 are the same or different and are independently a single bond, a substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination thereof, n and m are the same or different and are independently integers ranging from 0 to 3, Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, R^1 to R^8 are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and at least one of R^5 to R^8 is a substituted or unsubstituted C3 to C30 heteroaryl group having hole characteristics; a substituted or unsubstituted C6 to C30 aryl group having hole characteristics; a substituted or unsubstituted arylamine group having hole characteristics; or a combination thereof.

[0023] At least one of the R^5 to R^8 may be a substituted or unsubstituted triphenylenyl group.

[0024] The compound for an organic optoelectronic device may be represented by the following Chemical Formula 2.

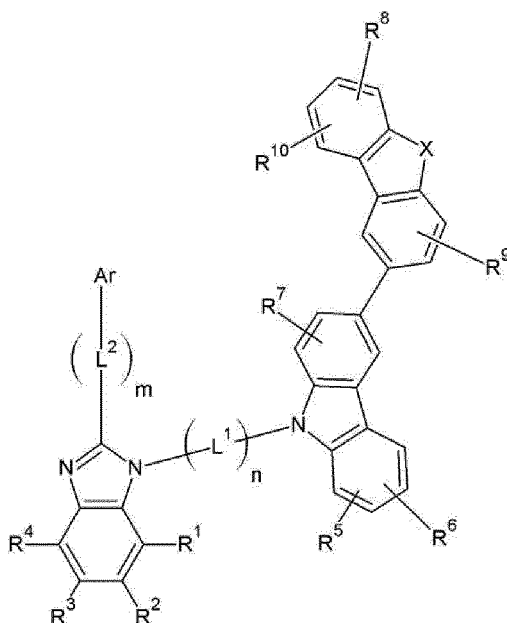
[Chemical Formula 2]



[0025] In the above Chemical Formula 2, L^1 and L^2 are the same or different and are independently a single bond, a substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination thereof, n and m are the same or different and are independently integers ranging from 0 to 3, Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, R^1 to R^{10} are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and X is NR' , O or S , wherein R' is hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

[0026] The compound for an organic optoelectronic device may be represented by the following Chemical Formula 3.

[Chemical Formula 3]

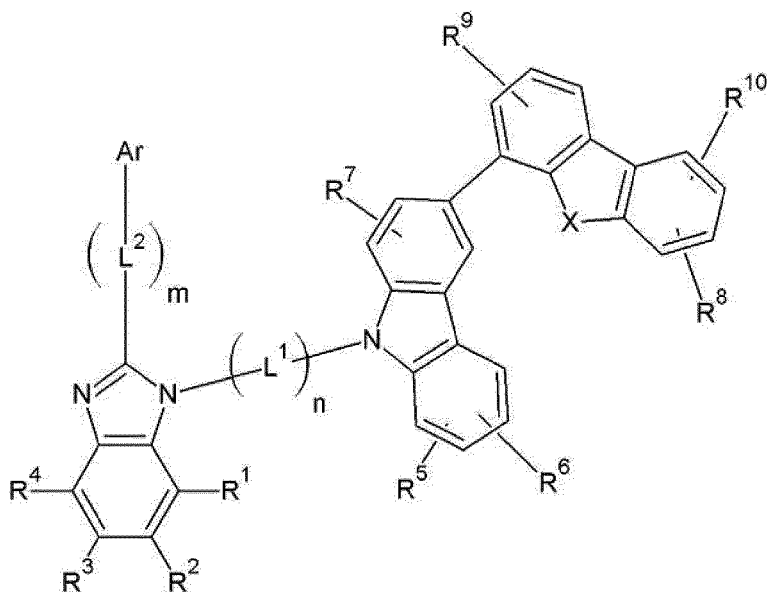


[0027] In the above Chemical Formula 3, L^1 and L^2 are the same or different and are independently a single bond, a substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination

thereof, n and m are the same or different and are independently integers ranging from 0 to 3, Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, R¹ to R¹⁰ are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and X is NR', O or S, wherein R' is hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

[0028] The compound for an organic optoelectronic device may be represented by the following Chemical Formula 4.

[Chemical Formula 4]



[0029] In the above Chemical Formula 4, L¹ and L² are the same or different and are independently a single bond, a substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination thereof, n and m are the same or different and are independently integers ranging from 0 to 3, Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, R¹ to R¹⁰ are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and X is NR', O, or S, wherein the R' is hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

[0030] The Ar is a substituted or unsubstituted biphenyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, or a combination thereof.

[0031] The L¹ may be a substituted or unsubstituted phenylene group.

[0032] The n may be 1, and the m may be 0 or 1.

[0033] The substituted or unsubstituted C3 to C30 heteroaryl group having hole characteristics may be a substituted or unsubstituted carbazolyl-based derivative, a substituted or unsubstituted dibenzofuranyl-based derivative, a substituted or unsubstituted dibenzothiophenyl-based derivative or a combination thereof.

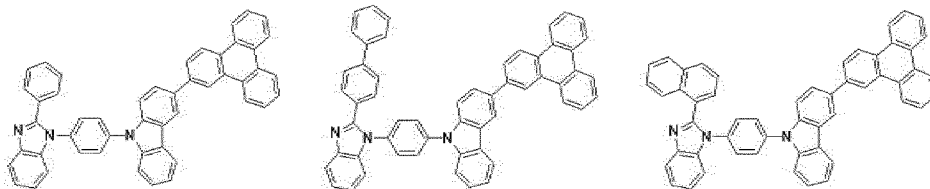
[0034] The substituted or unsubstituted C6 to C30 aryl group having hole characteristics may be a substituted or unsubstituted fluorenyl group, a substituted or unsubstituted spiro-fluorenyl group, or a combination thereof.

[0035] The substituted or unsubstituted arylamine group having hole characteristics includes a single aryl group or a plurality of aryl group, and the single aryl group or a plurality of aryl group may be the same or different, and is independently a substituted or unsubstituted phenyl group, a substituted or unsubstituted naphthyl group, a substituted or unsubstituted anthracenyl group, a substituted or unsubstituted phenanthryl group, a substituted or unsubstituted naphthacenyl group, a substituted or unsubstituted pyrenyl group, a substituted or unsubstituted biphenyl group, a substituted or unsubstituted p-terphenyl group, a substituted or unsubstituted m-terphenyl group, a substituted or unsubstituted chrysenyl group, a substituted or unsubstituted triphenylenyl group, a substituted or unsubstituted perylenyl group, a substituted or un-

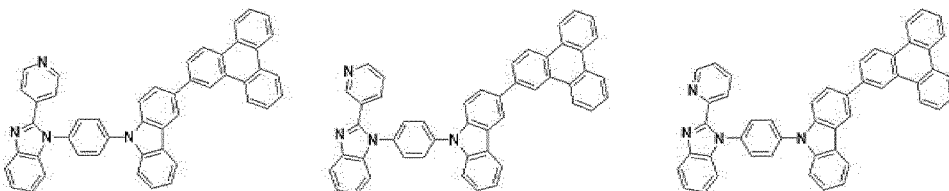
substituted indenyl group, or a combination thereof.

[0036] The compound for an organic optoelectronic device may be represented by one of the following Chemical Formulae A1 to A21.

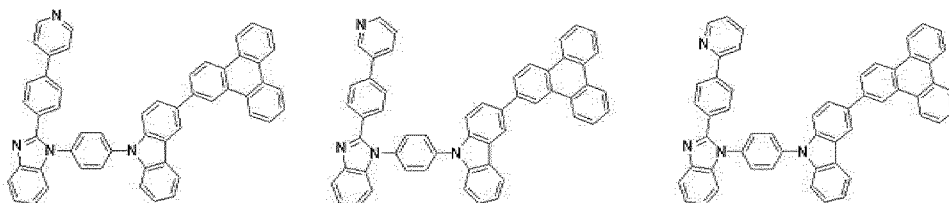
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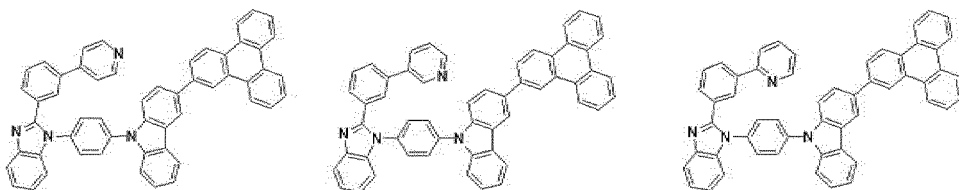
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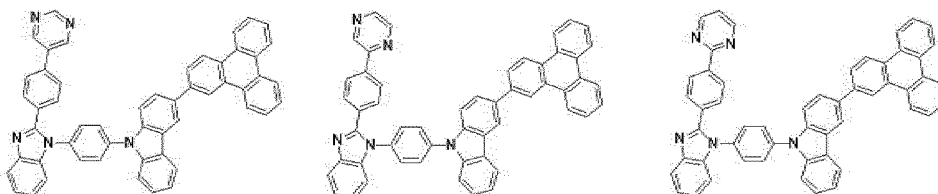
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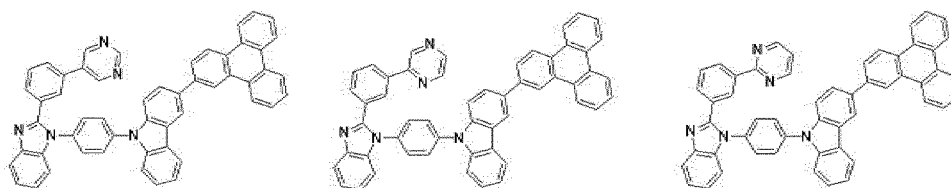
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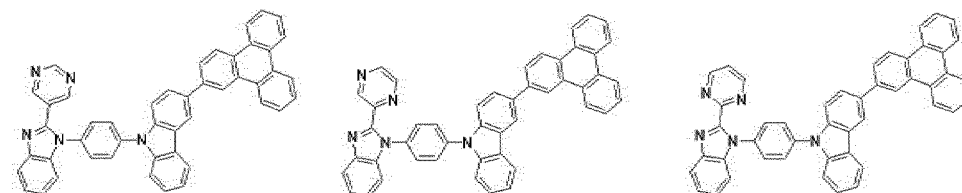
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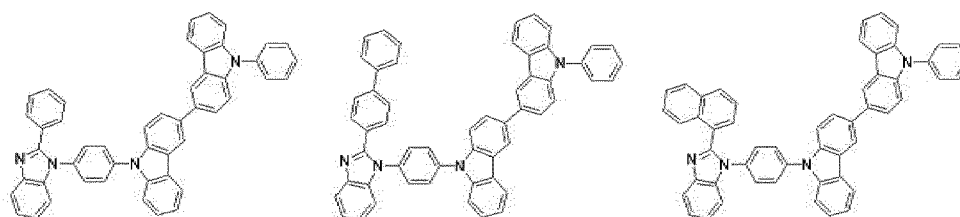


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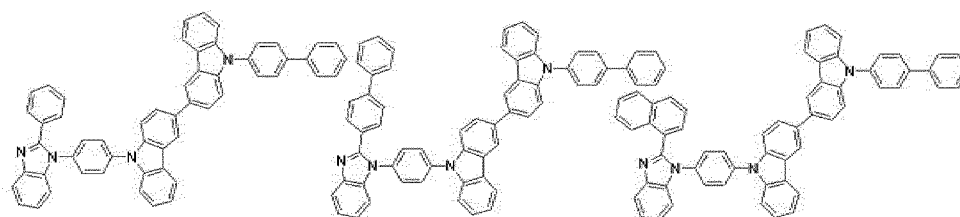


[0037] The compound for an organic optoelectronic device may be represented by one of the following Chemical Formulae B1 to B42.

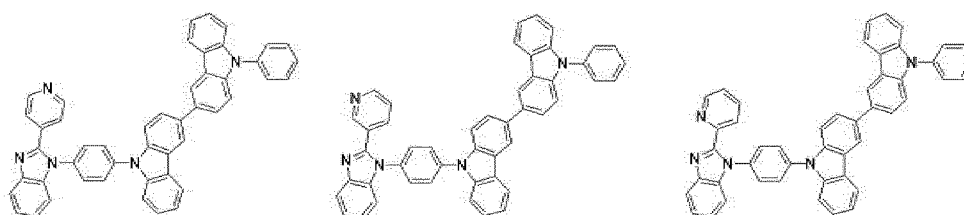
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[Chemical Formula B4] [Chemical Formula B5] [Chemical Formula B6]



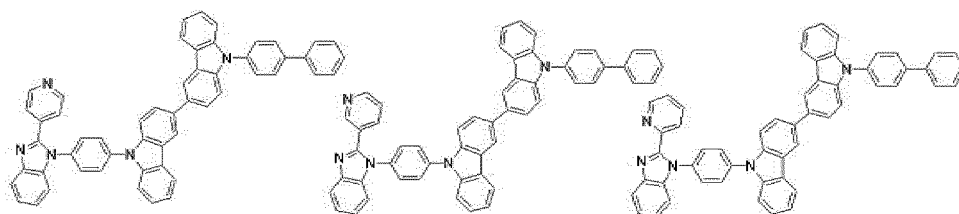
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[Chemical Formula B10] [Chemical Formula B11] [Chemical Formula B12]

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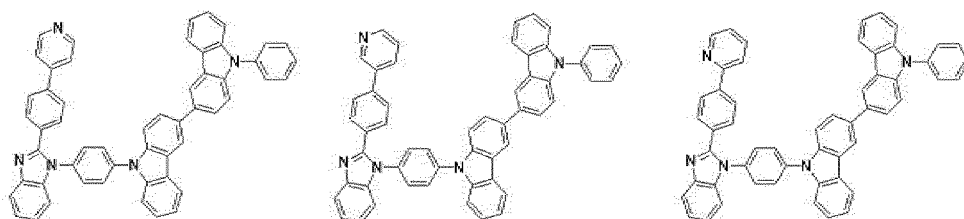
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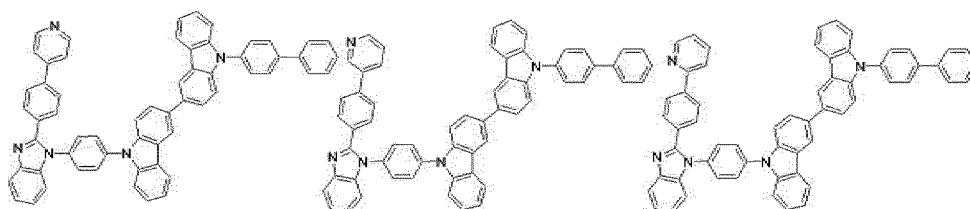
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[Chemical Formula B16] [Chemical Formula B17] [Chemical Formula B18]

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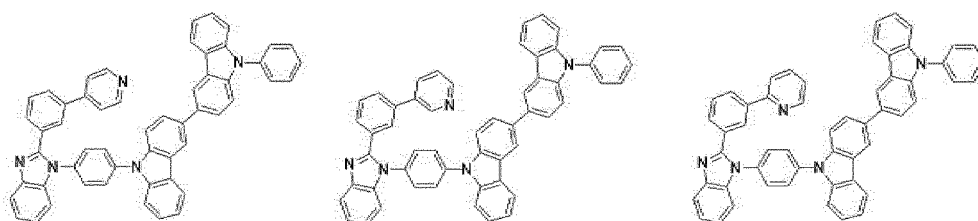
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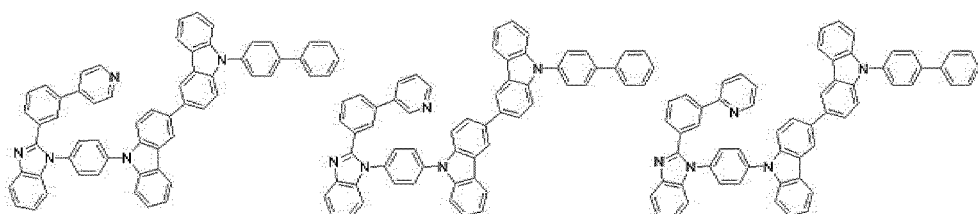


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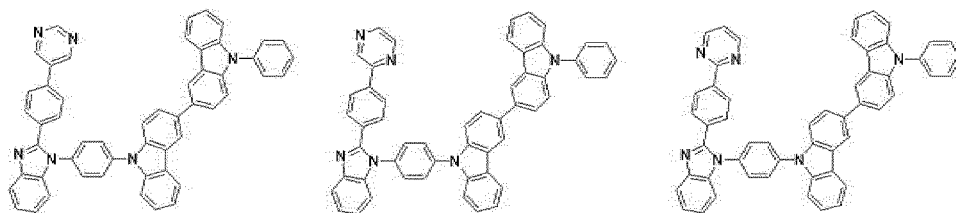
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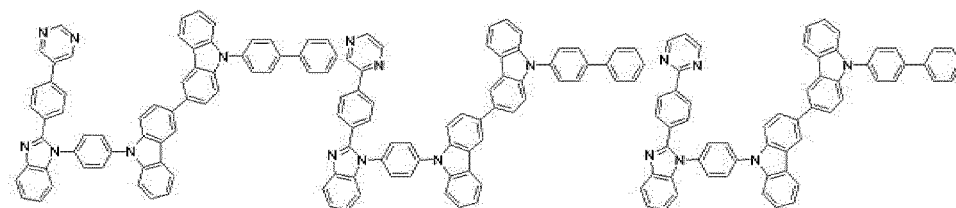
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[Chemical Formula B28] [Chemical Formula B29] [Chemical Formula B30]

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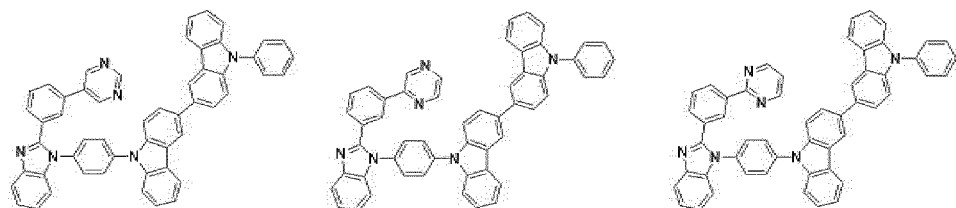
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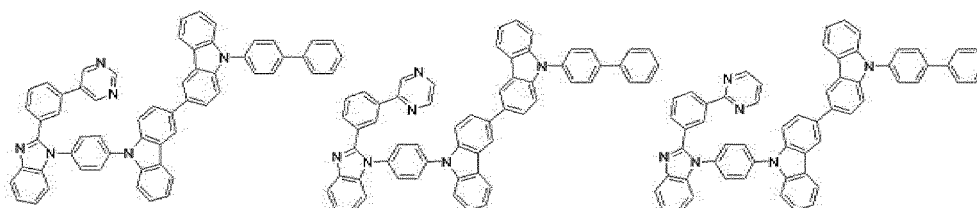
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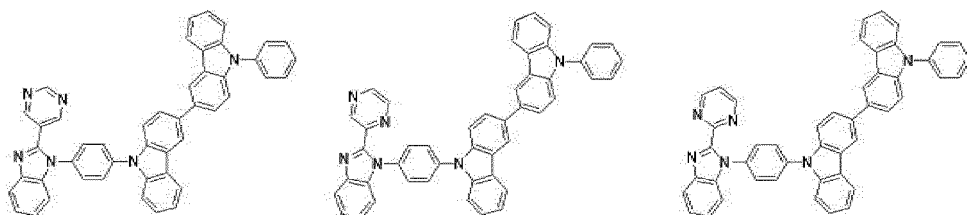


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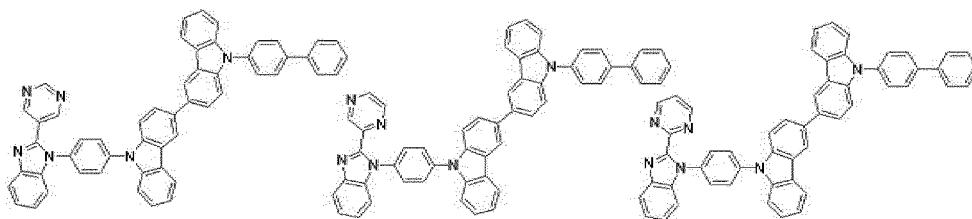
[Chemical Formula B37] [Chemical Formula B38] [Chemical Formula B39]

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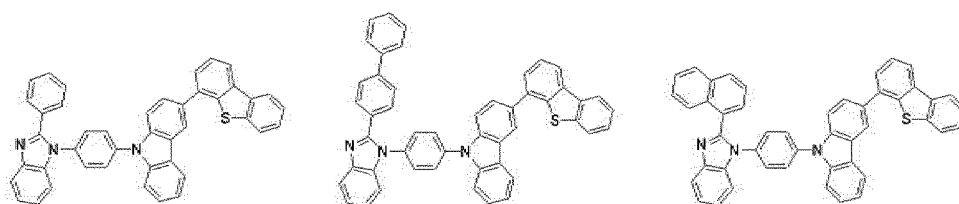


[Chemical Formula B40] [Chemical Formula B41] [Chemical Formula B42]

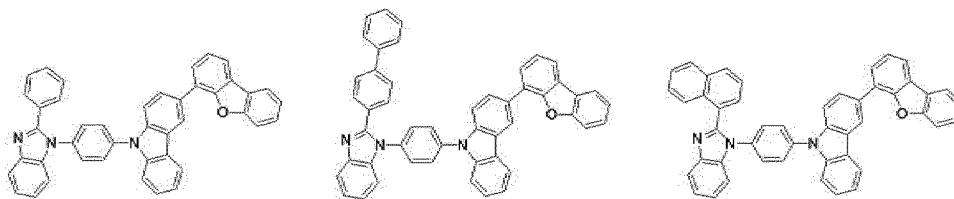


[0038] The compound for an organic optoelectronic device may be represented by one of the following Chemical Formulae C1 to C42.

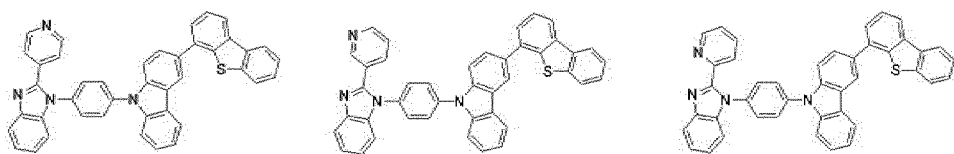
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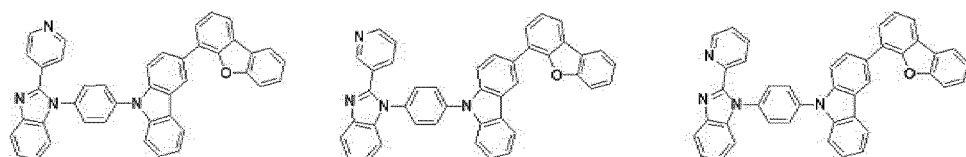
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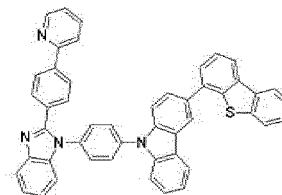
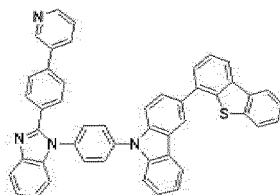
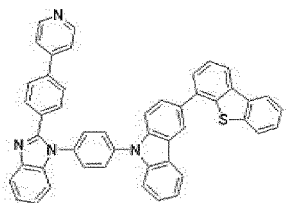
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[Chemical Formula C13] [Chemical Formula C14] [Chemical Formula C15]

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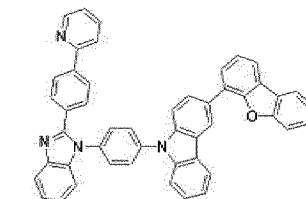
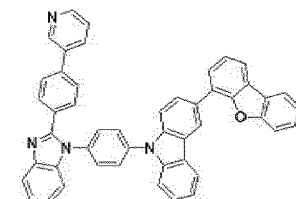
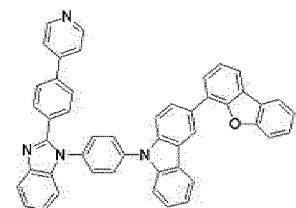
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[Chemical Formula C16] [Chemical Formula C17] [Chemical Formula C18]

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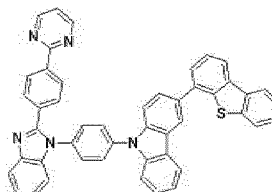
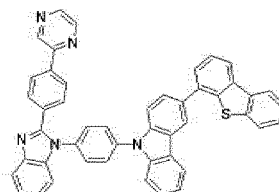
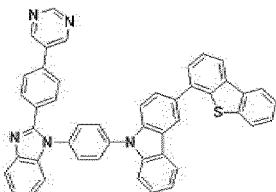
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[Chemical Formula C19] [Chemical Formula C20] [Chemical Formula C21]

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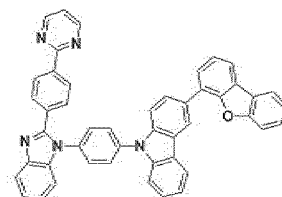
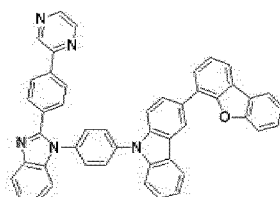
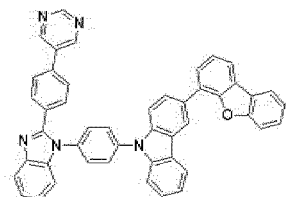
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[Chemical Formula C22] [Chemical Formula C23] [Chemical Formula C24]

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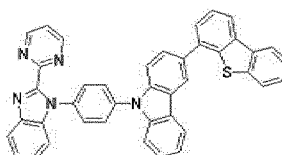
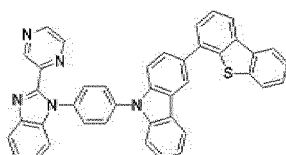
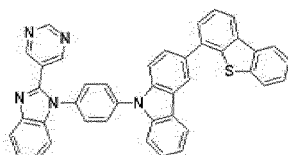
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[Chemical Formula C25] [Chemical Formula C26] [Chemical Formula C27]

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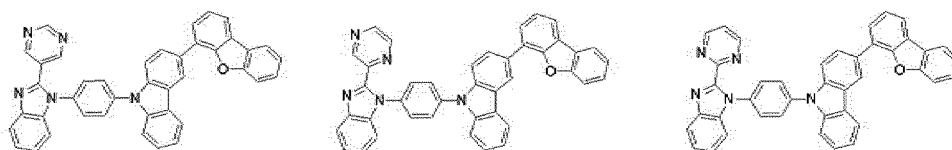
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[Chemical Formula C28] [Chemical Formula C29] [Chemical Formula C30]

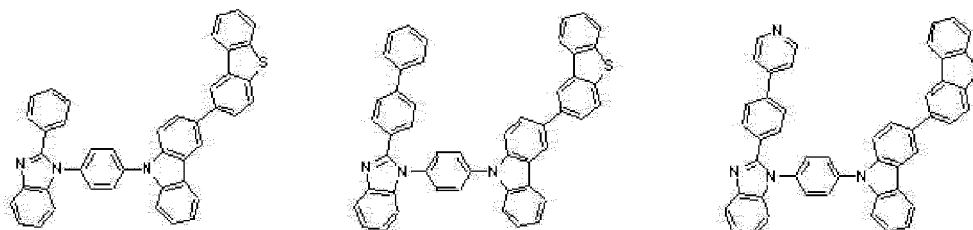
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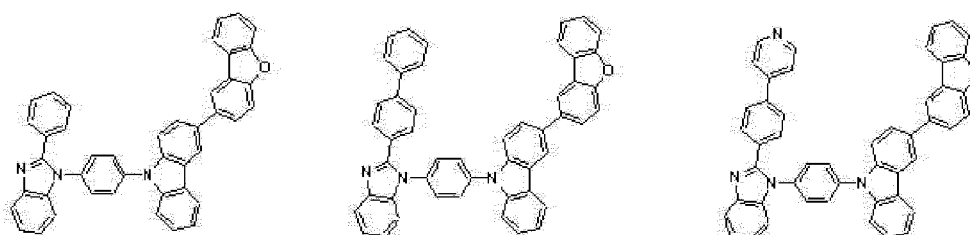
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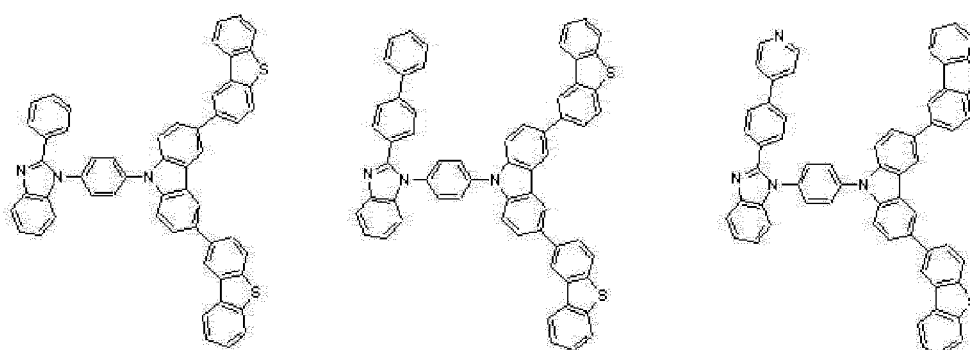
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[Chemical Formula C37] [Chemical Formula C38] [Chemical Formula C39]

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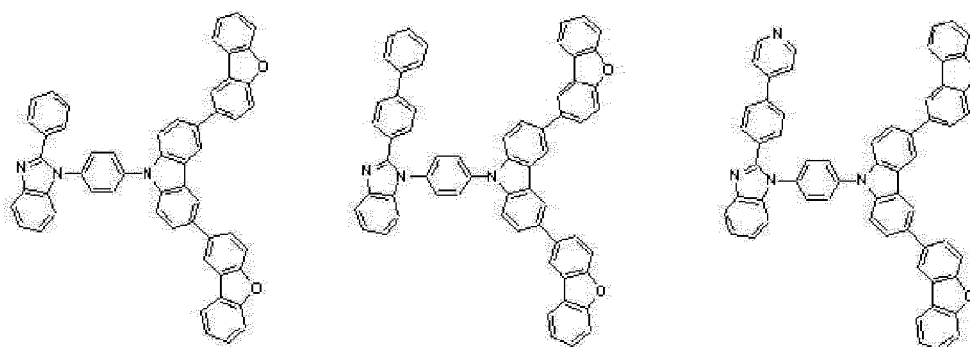
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[Chemical Formula C40] [Chemical Formula C41] [Chemical Formula C42]



[0039] The organic optoelectronic device may be selected from an organic photoelectric device, an organic light emitting diode, an organic solar cell, an organic transistor, an organic photo-conductor drum, and an organic memory device.

[0040] In another embodiment of the present invention, provided is an organic light emitting diode including an anode, a cathode, and at least one organic thin layer interposed between the anode and cathode, wherein at least one of the organic thin layer includes the above compound for an organic optoelectronic device.

[0041] The organic thin layer may be selected from an emission layer, a hole transport layer, a hole injection layer, an electron transport layer, an electron injection layer, a hole blocking layer, and a combination thereof.

[0042] The compound for an organic optoelectronic device may be included in an emission layer.

[0043] The compound for an organic optoelectronic device may be used as a phosphorescent or fluorescent host material in an emission layer.

[0044] The compound for an organic optoelectronic device may be used in a material of a hole transport layer, a hole injection layer, an electron transport layer, an electron injection layer, or a hole blocking layer.

[0045] The compound for an organic optoelectronic device may be used as a fluorescent blue dopant material in an emission layer.

[Advantageous Effects]

[0046] A compound having high hole or electron transport properties, film stability, thermal stability, and high triplet exciton energy may be provided. Such a compound may be used as a hole injection/transport material, host material, or electron injection/transport material of an emission layer.

[0047] An organic optoelectronic device using the same may use the compounds singularly or in a mixture thereof, and has high luminous efficiency at a low driving voltage due to excellent electrochemical and thermal stability.

[Description of the Drawings]

[0048] FIGS. 1 to 5 are cross-sectional views showing organic light emitting diodes according to various embodiments of the present invention including compound for an organic optoelectronic device according to one embodiment of the present invention.

[Mode for Invention]

[0049] Hereinafter, embodiments of the present invention are described in detail. However, these embodiments are exemplary, and this disclosure is not limited thereto.

[0050] In the present specification, when specific definition is not otherwise provided, "substituted" refers to one substituted with a C1 to C30 alkyl group, a C1 to C10 alkylsilyl group, a C3 to C30 cycloalkyl group, a C6 to C30 aryl group, a C1 to C10 alkoxy group, a fluoro group, a C1 to C10 trifluoroalkyl group such as a trifluoromethyl group and the like, or a cyano group.

[0051] In the present specification, when specific definition is not otherwise provided, "hetero" refers to one including 1 to 3 hetero atoms selected from N, O, S, and P, and remaining carbons in one compound or substituent.

[0052] In the present specification, when a definition is not otherwise provided, "combination thereof" refers to at least two substituents bound to each other by a linker, or at least two substituents condensed to each other.

[0053] In the present specification, when a definition is not otherwise provided, "alkyl group" refers to an aliphatic

hydrocarbon group. The alkyl group may be "a saturated alkyl group" that does not any alkene group or alkyne group. The alkyl group may be "an unsaturated alkyl group" that includes at least one alkene group or alkyne group. The "alkene group" refers to a functional group of at least one carbon-carbon double bond of at least two carbons, and the "alkyne group" refers to a functional group of at least one carbon-carbon triple bond of at least two carbons. Regardless of being saturated or unsaturated, the alkyl group may be branched, linear or cyclic.

[0054] The alkyl group may be a C1 to C20 alkyl group. The alkyl group may be a C1 to C10 medium-sized alkyl group. The alkyl group may be a C1 to C6 lower alkyl group.

[0055] For example, a C1 to C4 alkyl group may have 1 to 4 carbon atoms in a alkyl chain which may be selected from methyl, ethyl, propyl, iso-propyl, n-butyl, iso-butyl, sec-butyl, and t-butyl.

[0056] Typical examples of alkyl group may be individually and independently a functional group substituted with one or more selected from a methyl group, an ethyl group, a propyl group, an isopropyl group, a butyl group, an isobutyl group, a t-butyl group, a pentyl group, a hexyl group, an ethenyl group, a propenyl group, a butenyl group, a cyclopropyl group, a cyclobutyl group, a cyclopentyl group, a cyclohexyl group, and the like.

[0057] "Aromatic group" refers to a cyclic functional group where all elements have p-orbitals, and these p-orbitals forms conjugation. Specific examples are aryl group and a heteroaryl group.

[0058] "Aryl group" includes monocyclic or fused ring polycyclic (i.e., rings sharing adjacent pairs of carbon atoms) groups.

[0059] "Heteroaryl group" refers to aryl group including 1 to 3 hetero atoms selected from N, O, S, and P, and remaining carbons.

[0060] "Spiro structure" refers to a plurality of cyclic structures having a contact point of one carbon. The spiro structure may include a compound having a spiro structure or a substituent having a spiro structure.

[0061] In the present specification, an organic optoelectronic device may include an organic compound and a device to convert light into electricity and and/or a device to convert electricity into light.

[0062] A compound for an organic optoelectronic device according to one embodiment of the present invention has a structure where a core including a substituted or unsubstituted imidazole group and a substituted or unsubstituted carbazolyl group and a substituent having hole characteristics bonded with the core.

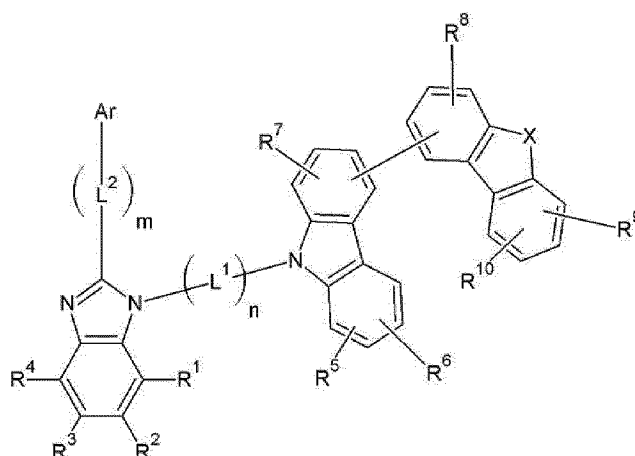
[0063] Therefore, the compound includes a core structure having excellent electron characteristics and selectively reinforced by hole characteristics, and thus may satisfy a condition required for an emission layer. More specifically, the compound may be used as a host material of an emission layer.

[0064] The compound for an organic optoelectronic device includes a core part and various substituents for a substituent for substituting the core part and thus may have various energy bandgaps. The compound may be used in a hole transport layer, a hole injection layer, an electron transport layer, an electron injection layer, or a hole blocking layer.

[0065] The compound may have an appropriate energy level depending on the substituents and thus, may fortify electron transfer capability of an organic optoelectronic device and bring about excellent effects on efficiency and driving voltage and also, have excellent electrochemical and thermal stability and thus, improve life-span characteristics during the operation of the organic optoelectronic device.

[0066] According to one embodiment of the present invention, a compound for an organic optoelectronic device represented by the following Chemical Formula 2 is provided.

[Chemical Formula 2]



[0067] In the above Chemical Formula 2, L^1 and L^2 are the same or different and are independently a single bond, a

substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination thereof, n and m are the same or different and are independently integers ranging from 0 to 3, Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, R¹ to R¹⁰ are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and X is NR', O, or S, wherein the R' is hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

[0068] The compound represented by the above Chemical Formula 2 may be a structure including a substituted or unsubstituted carbazole-based derivative, a substituted or unsubstituted dibenzofuranyl-based derivative, or a substituted or unsubstituted dibenzothiophenyl-based derivative.

[0069] In the present specification, the carbazoyl-based derivative includes more than two substituents bonded with a carbazoyl group and forming a fused ring. This concept may be applied to the dibenzofuranyl-based derivative and the dibenzothiophenyl-based derivative.

[0070] When the carbazoyl-based derivative, dibenzofuranyl-based derivative, or dibenzothiophenyl-based derivative is included in a compound, bi-polar characteristics of the entire compound may be improved.

[0071] The compound represented by the above Chemical Formula 2 may include the carbazole-based derivative and thus, may have hole characteristics used for an organic optoelectronic device.

[0072] The L¹ and L² may be more specifically the same or different and are independently substituted or unsubstituted ethynylene, a substituted or unsubstituted ethynylene, a substituted or unsubstituted phenylene, a substituted or unsubstituted biphenylene, a substituted or unsubstituted naphthalene, a substituted or unsubstituted pyridinylene, a substituted or unsubstituted pyrimidinylene, a substituted or unsubstituted triazinylene, and the like.

[0073] A substituent having a pi-bond of the substituents increases a triplet energy bandgap by controlling the total π -conjugation length of compound, so as to be very usefully applied to the emission layer of organic optoelectronic device as a phosphorescent host. Because the n and m are independently 0, the linking groups such as the L¹ and L² may not be present.

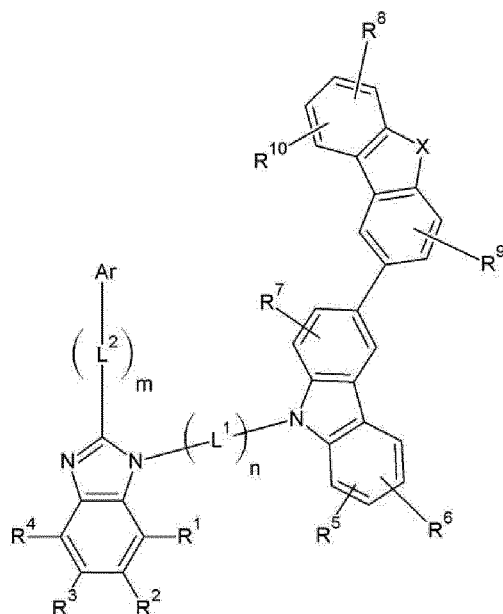
[0074] The n may be 1, and the m may be 0 or 1. When such a combination of n and m satisfy the above, the compound for an organic optoelectronic device according to one embodiment of the present invention may have various energy levels.

[0075] In addition, the L¹ and L² may be more specifically a substituted or unsubstituted carbazoyl-based derivative, a substituted or unsubstituted dibenzothiophenyl-based derivative, a substituted or unsubstituted dibenzofuranyl-based derivative, and the like. The substituent may further reinforce the hole characteristics of the entire compound, since a linking group itself has hole characteristics. In addition, energy bandgap of the entire compound may be easily adjusted, since a pi bond may be selectively adjusted depending on bonding position of the carbazoyl-based derivative.

[0076] The L¹ may be a substituted or unsubstituted phenylene group. When the L¹ is a substituted or unsubstituted phenylene group, the compound for an organic optoelectronic device according to one embodiment of the present invention may be easily synthesized.

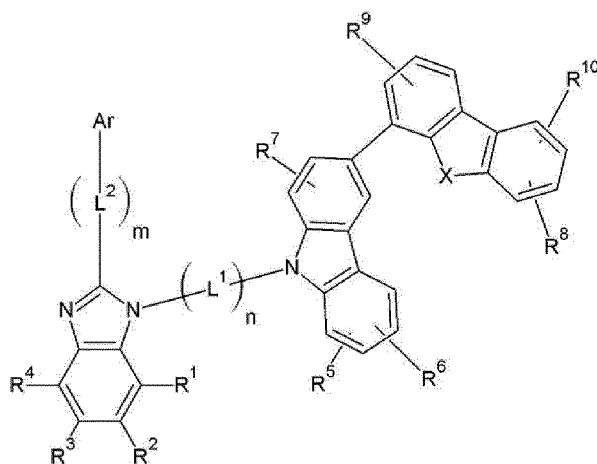
[0077] The compound for an organic optoelectronic device may be represented by the following Chemical Formula 3 or 4.

[Chemical Formula 3]



[0078] In the above Chemical Formula 3, L^1 and L^2 are the same or different and are independently a single bond, a substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination thereof, n and m are the same or different and are independently integers ranging from 0 to 3, Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, R^1 to R^{10} are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and X is NR' , O , or S , wherein the R' is hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

[Chemical Formula 4]



[0079] In the above Chemical Formula 4, L^1 and L^2 are the same or different and are independently a single bond, a substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination thereof, n and m are the same or different and are independently integers ranging from 0 to 3, Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, R^1 to R^{10} are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and X is NR' , O , or S , wherein the R' is hydrogen, deuterium, a substituted or unsubstituted

C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

[0080] The Ar may be a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

[0081] Specifically, the Ar may be a substituted or unsubstituted phenyl group, a substituted or unsubstituted naphthyl group, a substituted or unsubstituted anthracenyl group, a substituted or unsubstituted phenanthrenyl group, a substituted or unsubstituted pyrenyl group, a substituted or unsubstituted biphenyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted triazinyl group, or a combination thereof.

[0082] More specifically, the Ar may be a substituted or unsubstituted biphenyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, or a combination thereof.

[0083] For example, when the Ar is a substituted or unsubstituted biphenyl group, the compound for an organic optoelectronic device has an appropriate energy level and thermal stability.

[0084] For example, when the Ar is a substituted or unsubstituted pyridinyl group, electron mobility of the compound may be controlled according to a substitution position of the pyridinyl group, and a device including the compound including the pyridinyl group may have improved efficiency characteristics.

[0085] For example, when the Ar is a substituted or unsubstituted triazinyl group, the compound for an organic optoelectronic device may have improved electron mobility characteristics.

[0086] The substituted or unsubstituted C3 to C30 heteroaryl group having hole characteristics may be a substituted or unsubstituted carbazolyl-based derivative, a substituted or unsubstituted dibenzofuranyl-based derivative, a substituted or unsubstituted dibenzothiophenyl-based derivative, or a combination thereof.

[0087] The substituted or unsubstituted C6 to C30 aryl group having hole characteristics may be a substituted or unsubstituted fluorenyl group, a substituted or unsubstituted spiro-fluorenyl group, or a combination thereof.

[0088] The substituted or unsubstituted arylamine group having hole characteristics includes a single aryl group or a plurality of aryl group, and the single aryl group or a plurality of aryl group may be the same or different, and is independently a substituted or unsubstituted phenyl group, a substituted or unsubstituted naphthyl group, a substituted or unsubstituted anthracenyl group, a substituted or unsubstituted phenanthryl group, a substituted or unsubstituted naphthacenyl group, a substituted or unsubstituted pyrenyl group, a substituted or unsubstituted biphenyl group, a substituted or unsubstituted p-terphenyl group, a substituted or unsubstituted m-terphenyl group, a substituted or unsubstituted chrysenyl group, a substituted or unsubstituted triphenylenyl group, a substituted or unsubstituted perylenyl group, a substituted or unsubstituted indenyl group, or a combination thereof. Such arylamine group has more improved hole characteristics.

[0089] Through control of the substituent, energy bandgap of a compound may be controlled. For example, a compound having appropriate characteristics for an emission layer of an organic light emitting diode may be prepared.

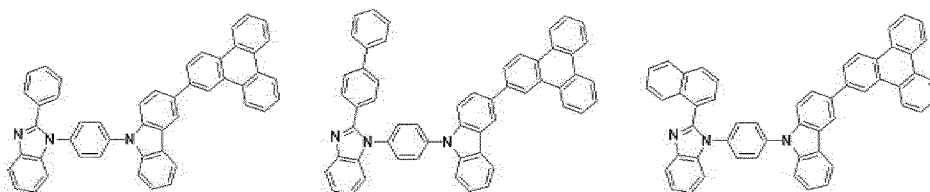
[0090] In addition, an appropriate combination of the substituents may provide a compound having excellent thermal stability or resistance against oxidation.

[0091] An appropriate combination of the substituents may provide a compound having asymmetric bipolar characteristics. The asymmetric bipolar characteristics may improve hole and electron transport capability and thus, luminous efficiency and performance of a device.

[0092] In addition, the substituents may be adjusted to make the structure of a compound bulky and thus, decrease crystallinity of the compound. Accordingly, the compound having low crystallinity may improve life-span of a device.

[0093] The compound for an organic optoelectronic device may be represented by the following Chemical Formulae A1 to A21. However, the present invention is not limited to the following compounds.

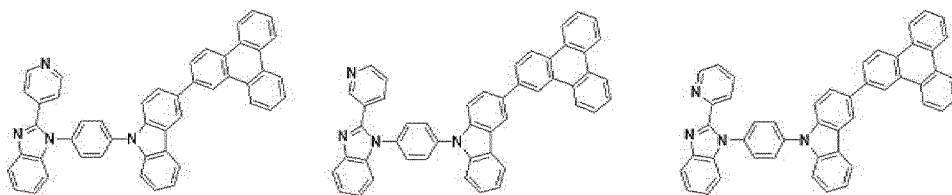
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[Chemical Formula A4] [Chemical Formula A5] [Chemical Formula A6]

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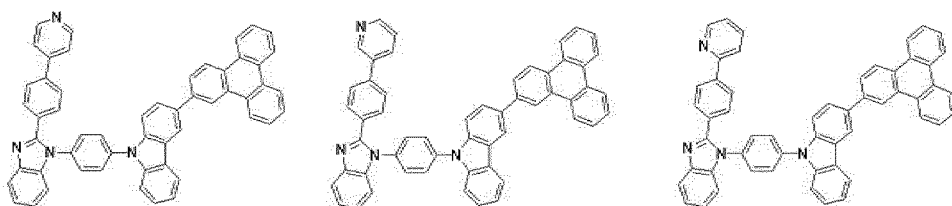
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[Chemical Formula A7] [Chemical Formula A8] [Chemical Formula A9]

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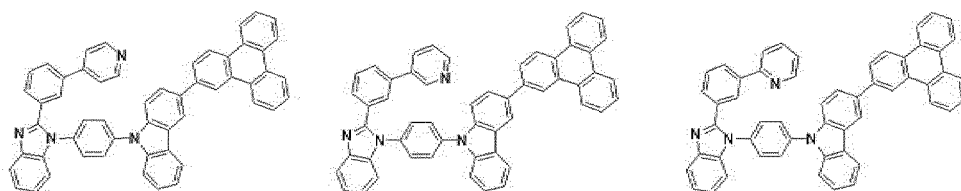
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[Chemical Formula A10] [Chemical Formula A11] [Chemical Formula A12]

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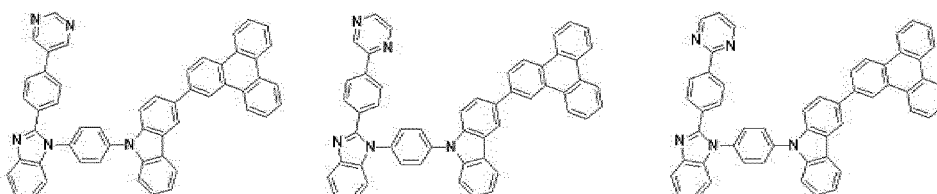
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[Chemical Formula A13] [Chemical Formula A14] [Chemical Formula A15]

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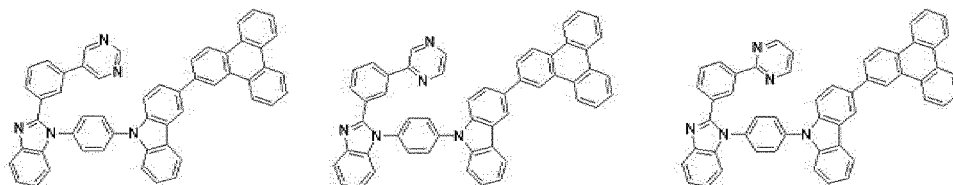


[Chemical Formula A16] [Chemical Formula A17] [Chemical Formula A18]

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[Chemical Formula A19] [Chemical Formula A20] [Chemical Formula A21]

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[0094] The compound for an organic optoelectronic device may be represented by the following Chemical Formulae B1 to B42. However, the present invention is not limited to the following compounds.

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[Chemical Formula B1] [Chemical Formula B2] [Chemical Formula B3]

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[Chemical Formula B4] [Chemical Formula B5] [Chemical Formula B6]

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[Chemical Formula B7] [Chemical Formula B8] [Chemical Formula B9]

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[Chemical Formula B10] [Chemical Formula B11] [Chemical Formula B12]

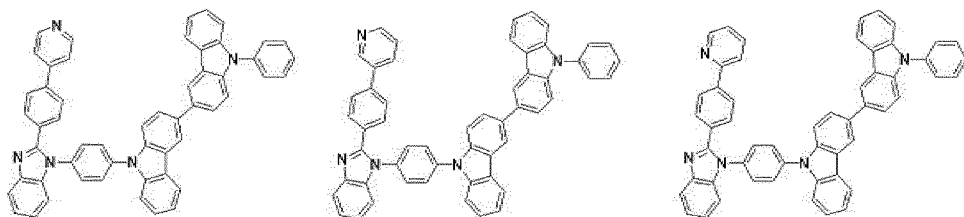
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[Chemical Formula B13] [Chemical Formula B14] [Chemical Formula B15]

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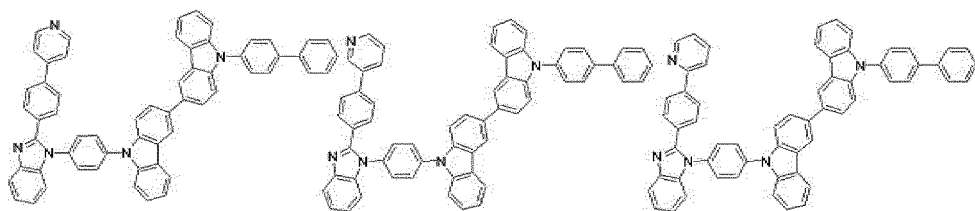
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[Chemical Formula B16] [Chemical Formula B17] [Chemical Formula B18]

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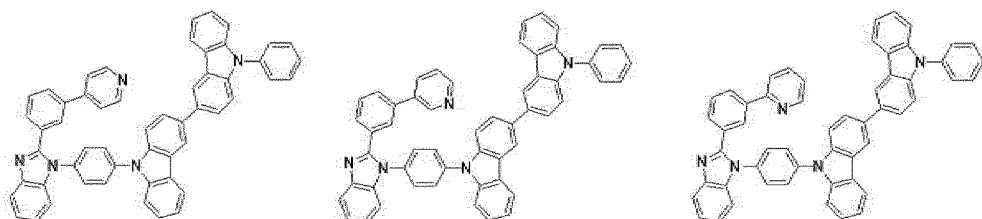
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[Chemical Formula B19] [Chemical Formula B20] [Chemical Formula B21]

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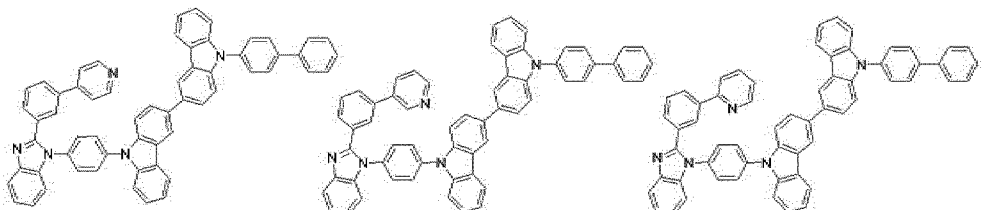


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[Chemical Formula B22] [Chemical Formula B23] [Chemical Formula B24]

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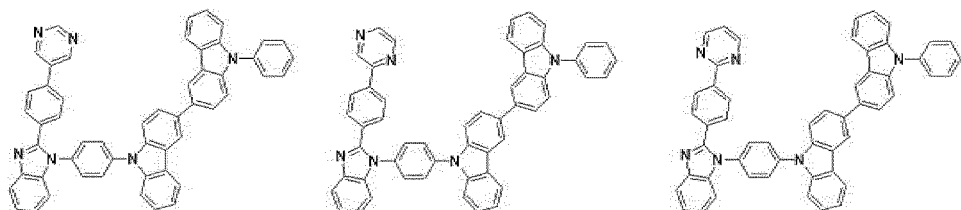
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[Chemical Formula B25] [Chemical Formula B26] [Chemical Formula B27]

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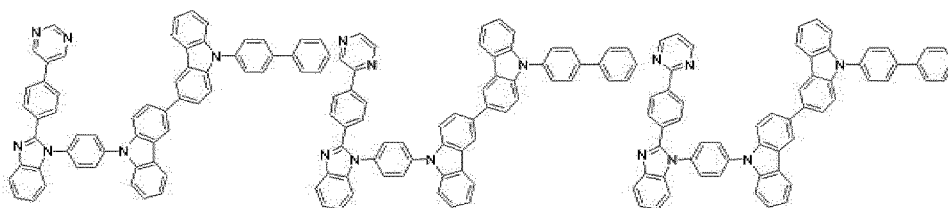
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[Chemical Formula B28] [Chemical Formula B29] [Chemical Formula B30]

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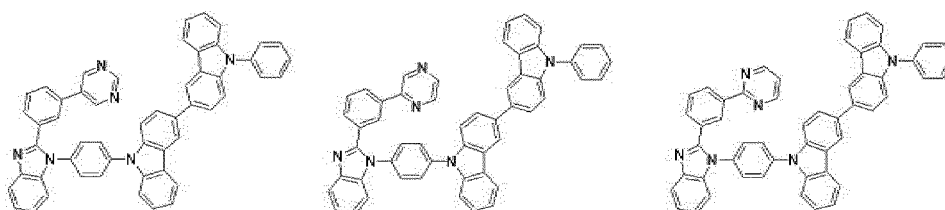
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[Chemical Formula B31] [Chemical Formula B32] [Chemical Formula B33]

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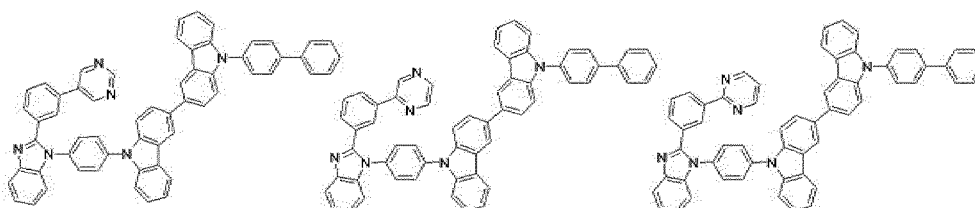
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[Chemical Formula B34] [Chemical Formula B35] [Chemical Formula B36]

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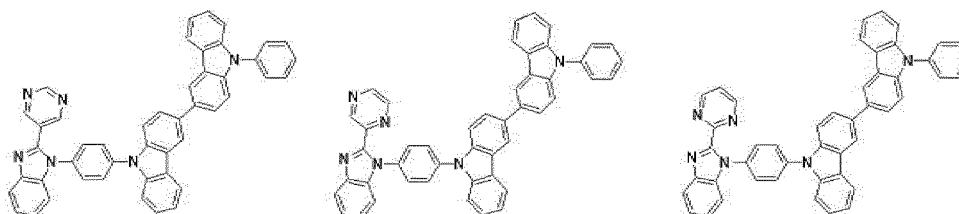
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[Chemical Formula B37] [Chemical Formula B38] [Chemical Formula B39]

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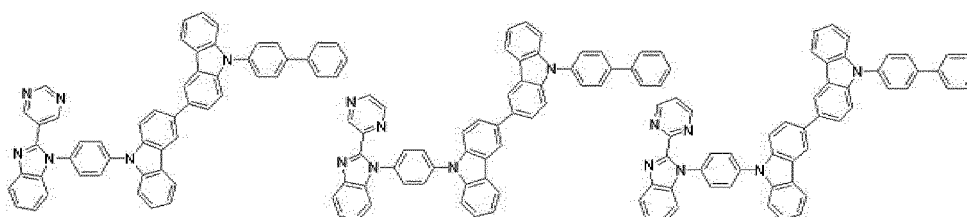


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[Chemical Formula B40] [Chemical Formula B41] [Chemical Formula B42]

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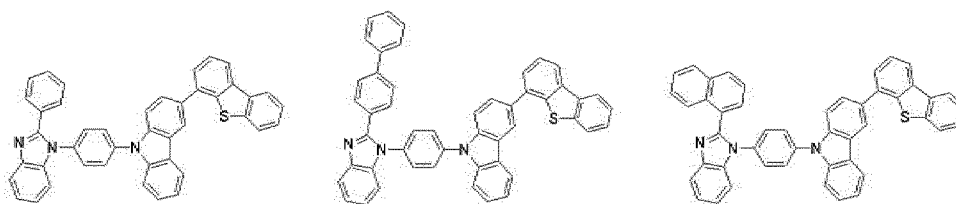


[0095] The compound for an organic optoelectronic device may be represented by the following Chemical Formulae C1 to C42. However, the present invention is not limited to the following compounds.

[Chemical Formula C1] [Chemical Formula C2] [Chemical Formula C3]

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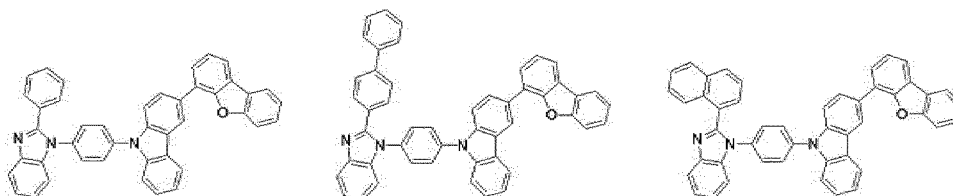
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[Chemical Formula C4] [Chemical Formula C5] [Chemical Formula C6]

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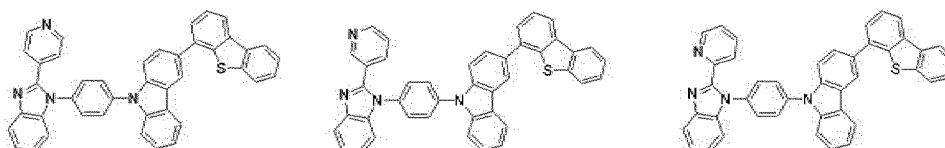
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[Chemical Formula C7] [Chemical Formula C8] [Chemical Formula C9]

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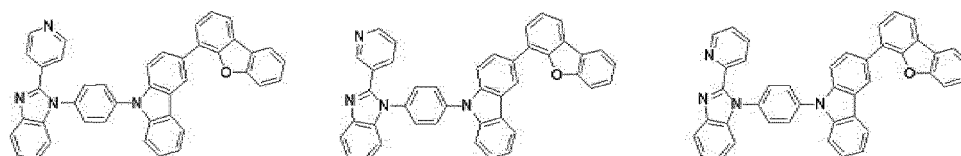
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[Chemical Formula C10] [Chemical Formula C11] [Chemical Formula C12]

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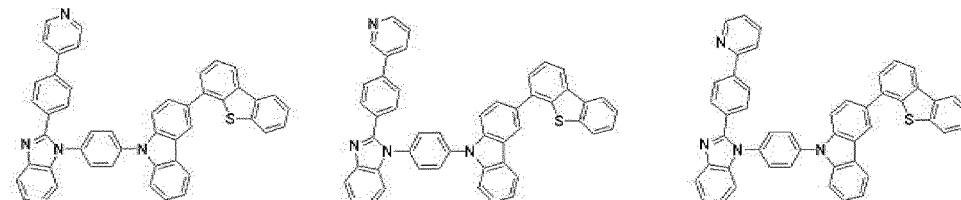
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[Chemical Formula C13] [Chemical Formula C14] [Chemical Formula C15]

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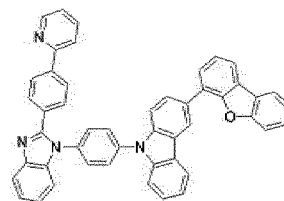
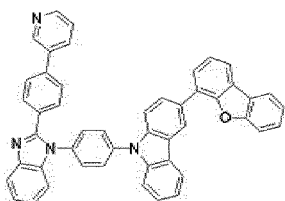
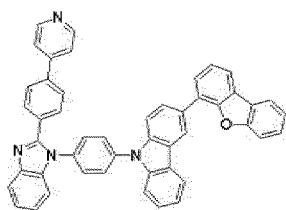


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[Chemical Formula C16] [Chemical Formula C17] [Chemical Formula C18]

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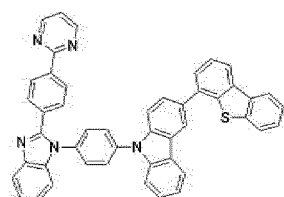
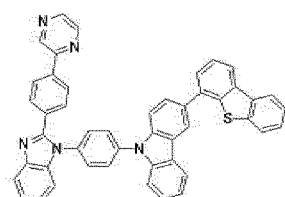
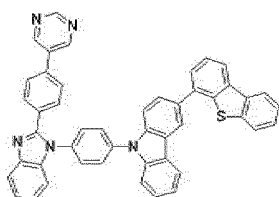
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[Chemical Formula C19] [Chemical Formula C20] [Chemical Formula C21]

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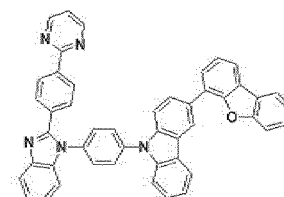
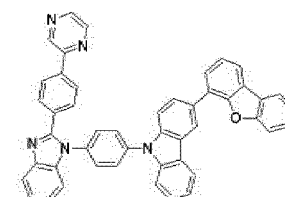
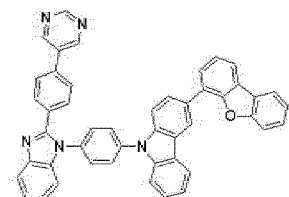
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[Chemical Formula C22] [Chemical Formula C23] [Chemical Formula C24]

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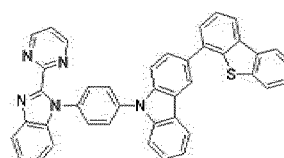
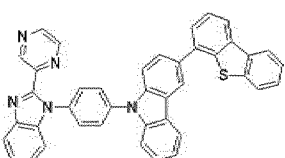
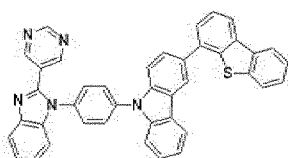
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[Chemical Formula C25] [Chemical Formula C26] [Chemical Formula C27]

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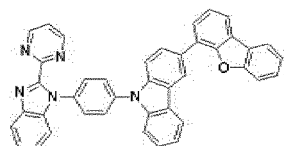
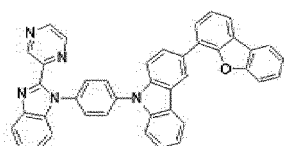
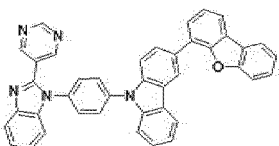
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[Chemical Formula C28] [Chemical Formula C29] [Chemical Formula C30]

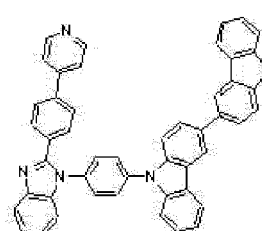
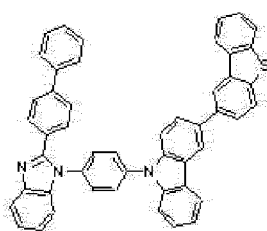
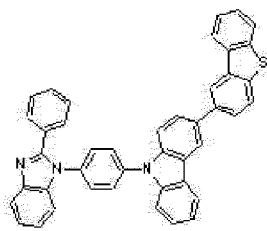
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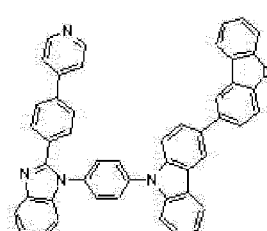
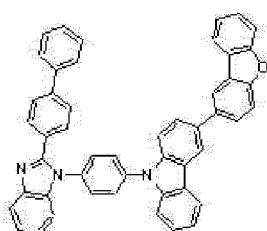
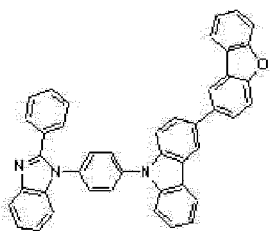


[Chemical Formula C31] [Chemical Formula C32] [Chemical Formula C33]

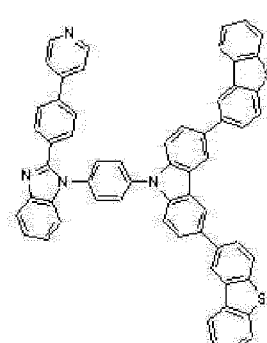
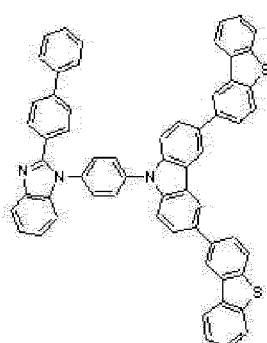
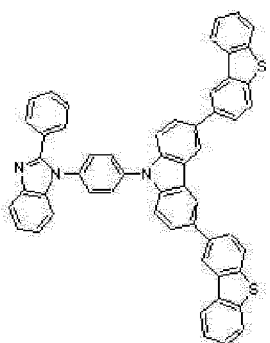
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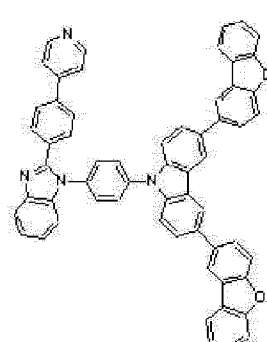
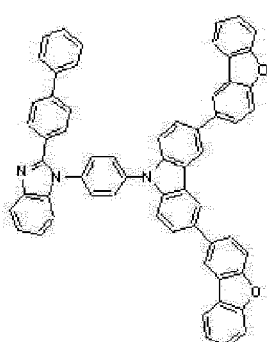
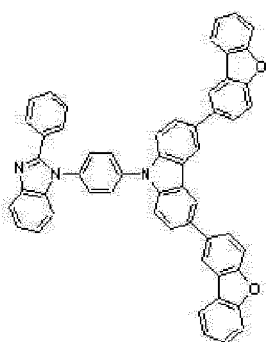
[Chemical Formula C34] [Chemical Formula C35] [Chemical Formula C36]



[Chemical Formula C37] [Chemical Formula C38] [Chemical Formula C39]



[Chemical Formula C40] [Chemical Formula C41] [Chemical Formula C42]



[0096] When the compound according to the above embodiment of the present invention is required of both of electron and hole characteristics, a functional group having the electron characteristics may be introduced to improve life-span of an organic light emitting diode and decrease its driving voltage.

[0097] The compound according to the above-described one embodiment of the present invention may have a maximum light emitting wavelength ranging from about 320 to 500 nm and triplet exciton energy (T1) of greater than or equal to 2.0 eV and specifically, ranging from 2.0 to 4.0 eV.

[0098] Since a host material having high triplet exciton energy may well transport a charge to a dopant and increase

luminous efficiency, the compound may be usefully used as a host material or a charge transport material due to its advantage of decreasing a driving voltage by freely adjusting HOMO and LUMO energy levels.

[0099] The compound for an organic optoelectronic device including the above compounds has a glass transition temperature of greater than or equal to 110°C and a thermal decomposition temperature of greater than or equal to 400°C, indicating improved thermal stability. Thereby, it is possible to produce an organic optoelectronic device having a high efficiency.

[0100] The compound for an organic optoelectronic device including the above compounds may play a role for emitting light or injecting and/or transporting electrons, and also act as a light emitting host with an appropriate dopant. In other words, the compound for an organic optoelectronic device may be used as a phosphorescent or fluorescent host material, a blue light emitting dopant material, or an electron transport material.

[0101] The compound for an organic optoelectronic device according to one embodiment of the present invention is used for an organic thin layer, and it may improve the life-span characteristics, efficiency characteristics, electrochemical stability, and thermal stability of an organic optoelectronic device and decrease the driving voltage.

[0102] Therefore, according to another embodiment, an organic optoelectronic device that includes the compound for an organic optoelectronic device is provided. The organic optoelectronic device may include an organic photoelectric device, an organic light emitting diode, an organic solar cell, an organic transistor, an organic photo-conductor drum, an organic memory device, and the like. For example, the compound for an organic optoelectronic device according to one embodiment may be included in an electrode or an electrode buffer layer in the organic solar cell to improve the quantum efficiency, and it may be used as an electrode material for a gate, a source-drain electrode, or the like in the organic transistor.

[0103] Another embodiment of the present invention includes an anode, a cathode, and at least one or more organic thin layer between the anode and the cathode, and at least one of the organic thin layers may include the compound for an organic optoelectronic device according to one embodiment of the present invention.

[0104] The organic thin layer including the compound for an organic optoelectronic device may include a layer selected from an emission layer, a hole transport layer, a hole injection layer, an electron transport layer, an electron injection layer, a hole blocking layer, and a combination thereof. The at least one layer includes the compound for an organic optoelectronic device according to one embodiment. Particularly, the compound for an organic optoelectronic device according to one embodiment may be included in an electron transport layer or electron injection layer. In addition, when the compound for an organic optoelectronic device is included in the emission layer, the compound for an organic optoelectronic device may be included as a phosphorescent or fluorescent host, and particularly, as a fluorescent blue dopant material.

[0105] FIGS. 1 to 5 are cross-sectional views showing organic light emitting diodes including the compound for an organic optoelectronic device according to one embodiment of the present invention.

[0106] Referring to FIGS. 1 to 5, organic light emitting diodes 100, 200, 300, 400, and 500 according to one embodiment include at least one organic thin layer 105 interposed between an anode 120 and a cathode 110.

[0107] The anode 120 includes an anode material having a large work function 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 combination of 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), polypyrrole, and polyaniline, but is not limited thereto. It is preferable to include a transparent electrode including indium tin oxide (ITO) as an anode.

[0108] The cathode 110 includes a cathode material having a small work function to help electron injection into an organic thin layer. The cathode 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. It is preferable to include a metal electrode including aluminum as a cathode.

[0109] First, referring to FIG. 1, the organic light emitting diode 100 includes an organic thin layer 105 including only an emission layer 130.

[0110] Referring to FIG. 2, a double-layered organic light emitting diode 200 includes an organic thin layer 105 including an emission layer 230 including an electron transport layer, and a hole transport layer 140. As shown in FIG. 2, the organic thin layer 105 includes a double layer of the emission layer 230 and hole transport layer 140. The emission layer 130 also functions as an electron transport layer, and the hole transport layer 140 layer has an excellent binding property with a transparent electrode such as ITO or an excellent hole transport capability.

[0111] Referring to FIG. 3, a three-layered organic light emitting diode 300 includes an organic thin layer 105 including an electron transport layer 150, an emission layer 130, and a hole transport layer 140. The emission layer 130 is independently installed, and layers having an excellent electron transport capability or an excellent hole transport capability are separately stacked.

[0112] Referring to FIG. 4, a four-layered organic light emitting diode 400 includes an organic thin layer 105 including

an electron injection layer 160, an emission layer 130, a hole transport layer 140, and a hole injection layer 170 for adherence with the cathode of ITO.

[0113] Referring to FIG. 5, a five-layered organic light emitting diode 500 includes an organic thin layer 105 including an electron transport layer 150, an emission layer 130, a hole transport layer 140, and a hole injection layer 170, and further includes an electron injection layer 160 to achieve a low voltage.

[0114] In FIGS. 1 to 5, the organic thin layer 105 including at least one selected from an electron transport layer 150, an electron injection layer 160, emission layers 130 and 230, a hole transport layer 140, a hole injection layer 170, and combinations thereof includes a compound for an organic optoelectronic device. The compound for an organic optoelectronic device may be used for an electron transport layer 150 including the electron transport layer 150 or electron injection layer 160. When it is used for the electron transport layer, it is possible to provide an organic optoelectronic device having a more simple structure because it does not require an additional hole blocking layer (not shown).

[0115] Furthermore, when the compound for an organic optoelectronic device is included in the emission layers 130 and 230, the compound for the organic optoelectronic device may be included as a phosphorescent or fluorescent host or a fluorescent blue dopant.

[0116] The organic light emitting diode may be manufactured by: forming an anode on a substrate; forming an organic thin layer in accordance with 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; and providing a cathode thereon.

[0117] Another embodiment of the present invention provides a display device including the organic light emitting diode according to the above embodiment.

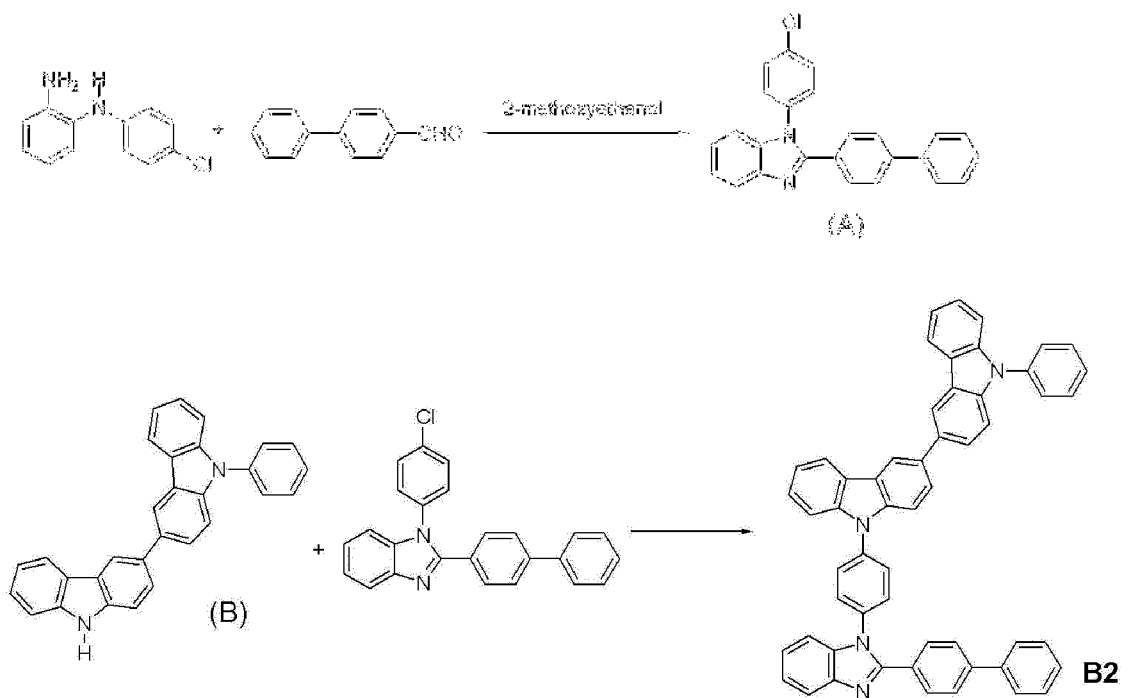
[0118] Hereinafter, the embodiments are illustrated in more detail with reference to examples. These examples, however, are not in any sense to be interpreted as limiting the scope of the invention.

(Preparation of Compound for Organic Optoelectronic Device)

Example 1: Synthesis of Compound Represented by Chemical Formula B2

[0119] A compound represented by the above Chemical Formula B2 as a specific example of a compound for an organic optoelectronic device according to the present invention was synthesized according to the following Reaction Scheme 1.

[Reaction Scheme 1]



First Step: Synthesis of Compound A

[0120] 41.6 g (160 mmol) of N-(4-chlorophenyl)-1,2-phenylene diamine and 33 g (180 mmol) of biphenyl-4-carboxaldehyde was agitated with 300 ml of 2-methoxy ethanol in a 2000 mL round flask, and the agitated mixture kept being agitated for 24 hours after increasing the temperature of the reaction vessel to a reflux temperature. The reaction solution was treated with methylene chloride and to obtain an organic layer, and anhydrous magnesium sulfate was used to remove moisture from the organic layer. 30 g of a compound (A) (40% of a yield) was obtained by columnizing the reactant after removing the solvent therefrom.

[0121] The compound (A) was atomically analyzed, and the results are provided.

[0122] calcd. C₂₅H₁₇ClN₂: C, 78.84; H, 4.50; N, 7.36; found: C, 78.80; H, 4.52; N, 7.40

Second Step: Synthesis of Compound B2

[0123] 16 g (40 mmol) of the compound (A), 15 g (40 mmol) of 9-phenyl-9H,9'H-[3,3']bicarbazol-yl (B), 7.6 g (55 mmol) of potassium carbonate were suspended in 250 ml of DMSO, 1 g (7 mmol) of 1,10-phenanthroline and 1 g (7 mmol) of copper chloride were added thereto, and the mixture was heated and refluxed under a nitrogen stream for 12 hours. The reaction solution was added to 1000 ml of MeOH to obtain a crystallized solid, the crystallized solid was filtered and dissolved in monochlorobenzene, and the solution was filtered with silica gel/Celite. The appropriate amount of the organic solvent in the filtered solution was removed, and the remnant was recrystallized in MeOH, obtaining 15 g of a compound B2 (56% of a yield).

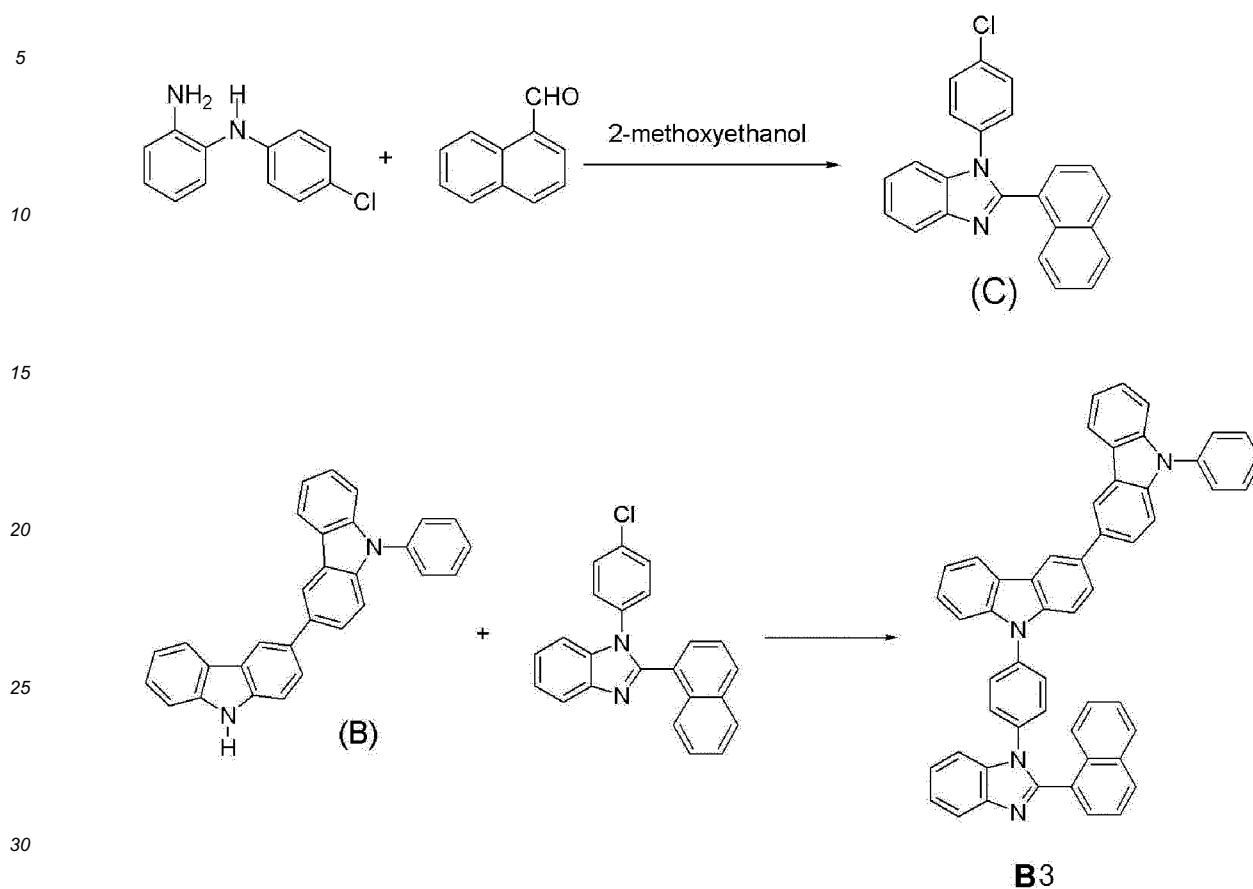
[0124] The compound B2 was atomically analyzed, and the results are provided as follows.

[0125] calcd. C₅₅H₃₆N₄: C, 87.74; H, 4.82; N, 7.44; found: C, 87.76; H, 4.81; N, 7.39

Example 2: Synthesis of Compound Represented by Chemical Formula B3

[0126] A compound represented by the above Chemical Formula B3 as a specific example for an organic optoelectronic device according to the present invention was synthesized according to a method of the following Reaction Scheme 2.

[Reaction Scheme 2]

First Step: Synthesis of Compound (C)

[0127] 48.5 g (210 mmol) of N-(4-chlorophenyl)-1,2-phenylenediamine and 33 g (210 mmol) of 1-naphthaldehyde were agitated with 300 ml of 2-methoxy ethanol in a 2000 mL round flask, and the agitated reactant kept being agitated for 24 hours after increasing the temperature of the reaction vessel to a reflux temperature. The reaction solution was treated with methylene chloride and water to obtain an organic layer, and anhydrous magnesium sulfate was used to remove moisture from the organic layer. 30 g of a compound (C) (40% of a yield) was obtained by columnizing the reactant after removing a solvent therefrom.

[0128] Atomic analysis of the obtained compound (C) was performed, and the results are provided as follows.

[0129] calcd. C₂₃H₂₅ClN₂: C, 77.85; H, 4.26; N, 7.89; found: C, 77.79; H, 4.21; N, 7.79

[0130] The obtained compound (C) was analyzed with a Nuclear Magnetic Resonance analyzer (NMR), and the results are provided as follows.

[0131] 300 MHz (CDCl₃, ppm) : 8.05 (1H, t), 7.95 (1H, d), 7.82 (2H, m), 7.35 (7H, m), 7.18 (d, 2H), 7.05 (d, 2H)

Second Step: Synthesis of Compound B3

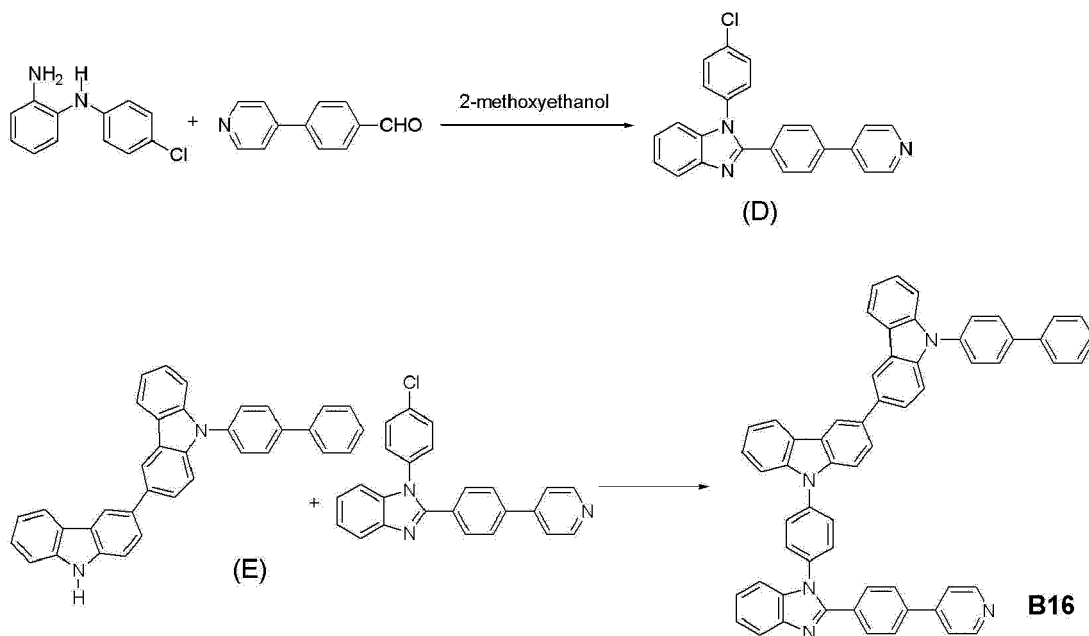
[0132] 14.5 g (40 mmol) of the compound (C), 14.5 g (40 mmol) of 9-phenyl-9H,9'H-[3,3']bicarbazol-yl (B), and 7.5 g (53 mmol) of potassium carbonate were suspended in 250 ml of DMSO, 1 g (7 mmol) of 1,10-phenanthroline and 1 g (7 mmol) of copper chloride were added thereto, and the mixture was heated and refluxed under a nitrogen stream for 12 hours. The reaction solution was added to 1000ml of MeOH to obtain a crystallized solid, then, the crystallized solid was filtered and dissolved in monochlorobenzene, and the solution was filtered with silica gel/Celite. The appropriate amount of an organic solvent therein was removed, and the remnant was recrystallized in MeOH, obtaining 16.5 g of a compound B3 (65% of a yield).

[0133] Atomic analysis of the compound B3 was performed, and the results are provided as follows.

[0134] calcd. C₅₃H₃₄N₄: C, 87.58; H, 4.71; N, 7.71; found: C, 87.60; H, 4.68; N, 7.65

Example 3: Synthesis of Compound Represented by Chemical Formula B16

[0135] The compound represented by the above Chemical Formula B16 as a specific example of a compound for an organic optoelectronic device according to the present invention was synthesized according to the following Reaction Scheme 3.

[Reaction Scheme 3]**First Step: Synthesis of Compound (D)**

[0136] 25 g (110 mmol) of N-(4-chlorophenyl)-1,2-phenylenediamine and 20 g (110 mmol) of biphenyl-4-carboxaldehyde were agitated with 300 ml of 2-methoxy ethanol in a 2000 mL round flask, the temperature of the reaction vessel was increased up to a reflux temperature, and the agitated resultant was agitated for 24 hours. The reaction solution was treated with methylene chloride and water to obtain an organic layer, and anhydrous magnesium sulfate was used to remove moisture from the organic layer. 12 g of a compound (D) (28% of a yield) was obtained by columnizing the resultant after removing a solvent therefrom.

[0137] Atomic analysis of the compound (D) was performed, and the results are provided as follows.

[0138] calcd. C₂₄H₁₆ClN₃: C, 75.49; H, 4.22; N, 11; found: C, 75.79; H, 4.11; N, 11.8

Second step: Synthesis of Compound B16

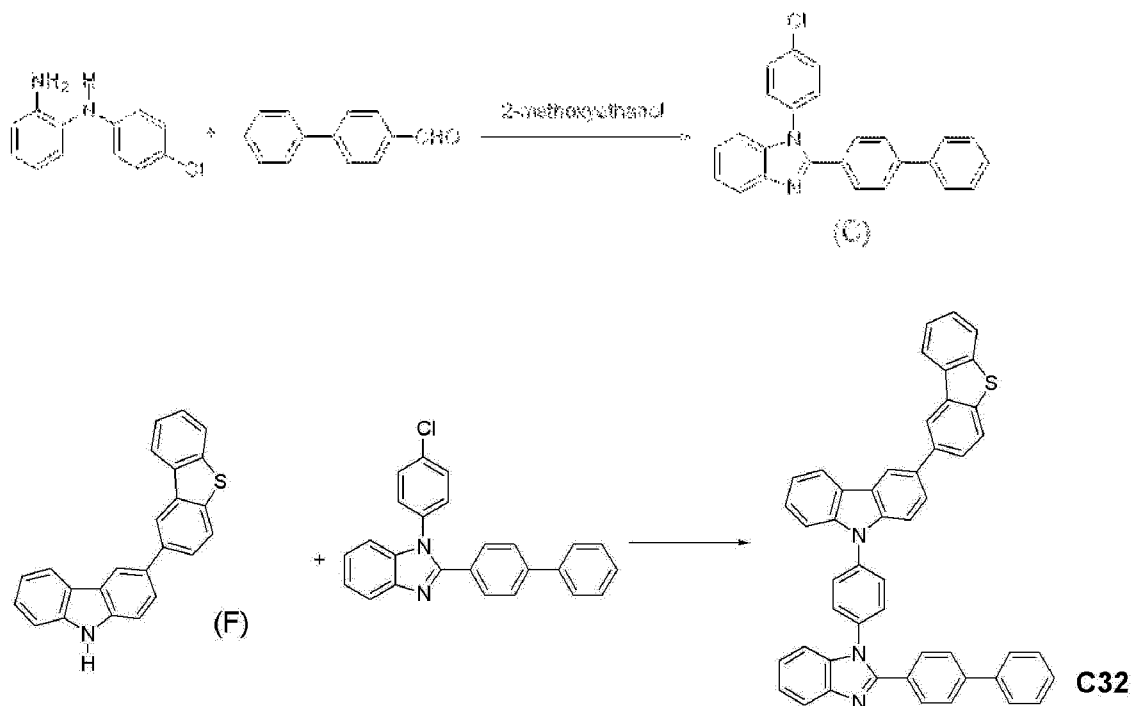
[0139] 12 g (31 mmol) of the compound (D), 15 g (31 mmol) of 9-biphenyl-9H,9'H-[3,3']bicarbazol-yl (E), and 6.5 g (47 mmol) of potassium carbonate were suspended in 250 ml of DMSO, 1 g (7 mmol) of 1,10-phenanthroline and 1 g (7 mmol) of copper chloride were added thereto, and the mixture was heated and refluxed under a nitrogen stream for 12 hours. The reaction solution was added to 1000 ml of MeOH to crystallize a solid, the solid was dissolved in monochlorobenzene and then, filtered with silica gel/Celite. 15.6 g of a compound B16 (60% of a yield) was obtained by conducting recrystallization with MeOH after removing the appropriate amount of an organic solvent.

[0140] Atomic analysis of the compound B16 was performed, and the results are provided as follows.

Example 4: Synthesis of Compound Represented by Chemical Formula C32

[0141] A compound represented by the above Chemical Formula C32 as a specific example of a compound for an organic optoelectronic device according to the present invention was synthesized according to the following Reaction Scheme 4.

[Reaction Scheme 4]

First Step: Synthesis of Compound (C)

[0142] While 41.6 g (160 mmol) of N-(4-chlorophenyl)-1,2-phenylenediamine and 33 g (180 mmol) of biphenyl-4-carboxaldehyde were agitated with 300 ml of 2-methoxy ethanol in a 2000 mL round flask, the temperature of the reaction vessel was increased to a reflux temperature, and the agitated resultant was agitated for 24 hours. The reaction solution was treated with methylene chloride and water to obtain an organic layer, and anhydrous magnesium sulfate was used to remove moisture from the organic layer. 30 g of a compound (C) (40% of a yield) was obtained by columnizing the resultant after removing a solvent therefrom.

[0143] Atomic analysis of the compound (C) was performed, and the results are provided as follows.

[0144] calcd. C₂₅H₁₇ClN₂: C, 78.84; H, 4.50; N, 7.36; found: C, 78.80; H, 4.52; N, 7.40

Second Step: Synthesis of Compound C32

[0145] 16 g (40 mmol) of the compound (C), 14 g (40 mmol) of 3-dibenzothiophen-2-yl-9H-carbazole (F), and 7.6 g (55 mmol) of potassium carbonate were suspended in 250 ml of DMSO, 1 g (7 mmol) of 1,10-phenanthroline and 1 g (7 mmol) of copper chloride were added thereto, and the mixture was heated and refluxed under a nitrogen stream for 12 hours. The reaction solution was added to 1000 ml of MeOH to crystallize a solid, the solid was filtered and dissolved in monochlorobenzene, and the solution was filtered with silica gel/Celite. 15.5 g of a compound C32 (56% of a yield) was obtained by conducting recrystallization with MeOH after removing the appropriate amount of an organic solvent therein.

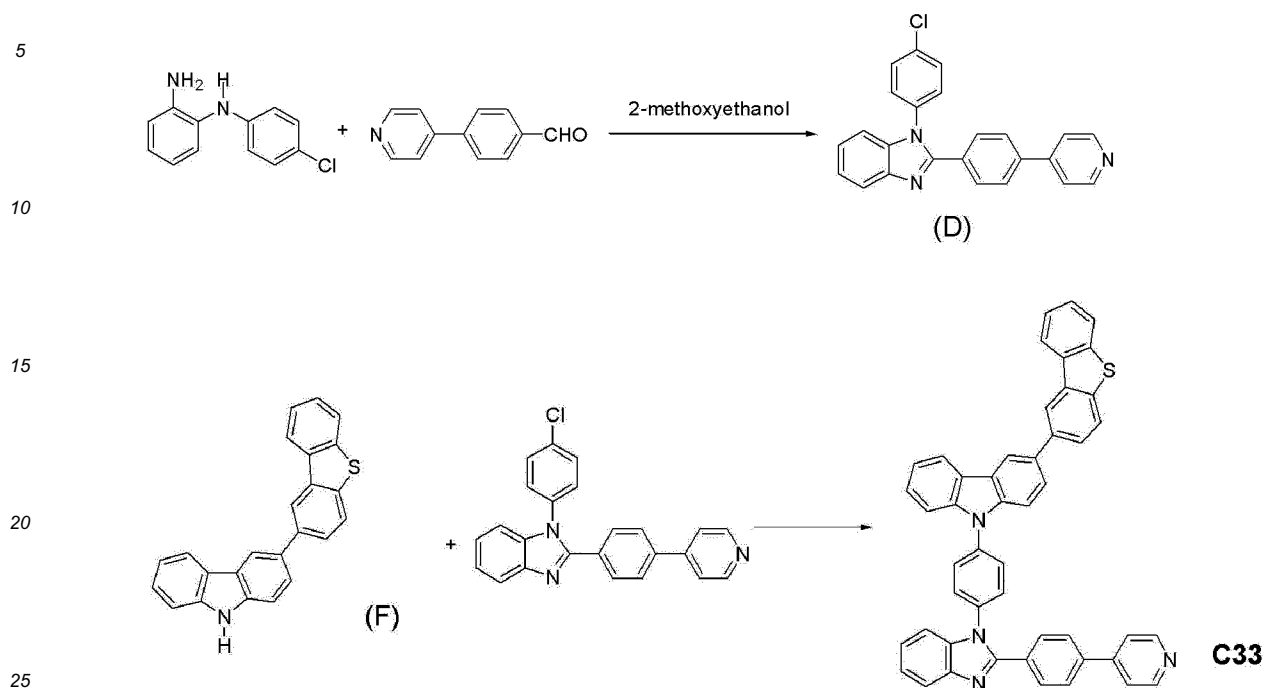
[0146] Atomic analysis of the obtained compound C32 was performed, and the results are provided as follows.

[0147] calcd. C₄₉H₃₁N₃S: C, 84.82; H, 4.50; N, 6.06; S, 4.62; found: C, 84.79; H, 4.54; N, 6.02

Example 5: Synthesis of Compound Represented by Chemical Formula C33

[0148] A compound represented by the above Chemical Formula C33 as a specific example of a compound for an organic optoelectronic device according to the present invention was synthesized according to the following Reaction Scheme 5.

[Reaction Scheme 5]

First Step: Synthesis of Compound (D)

[0149] While 25 g (110 mmol) of N-(4-chlorophenyl)-1,2-phenylenediamine and 20 g (110 mmol) of biphenyl-4-carboxaldehyde were agitated with 300 ml of 2-methoxy ethanol in a 2000 mL round flask, the temperature of the reaction vessel was increased to a reflux temperature, and the resultant was agitated for 24 hours. The reaction solution was treated with methylene chloride and water to obtain an organic layer, and anhydrous magnesium sulfate was used to remove moisture from the organic layer. 12 g of a compound (D) (28% of a yield) was obtained by columnizing the resultant after removing a solvent therefrom.

[0150] Atomic analysis of the compound (D) was performed, and the results are provided as follows.

[0151] calcd. C₂₄H₁₆ClN₃: C, 75.49; H, 4.22; N, 11; found: C, 75.79; H, 4.11; N, 11.8

Second Step: Synthesis of Compound C33

[0152] 12 g (31 mmol) of the compound (D), 15 g (31 mmol) of 3-dibenzothiophen-2-yl-9-H-carbazole (F), and 6.5 g (47 mmol) of potassium carbonate were suspended in 250 ml of DMSO, 1 g (7 mmol) of 1,10-phenanthroline and 1 g (7 mmol) of copper chloride were added thereto, and the mixture was heated and refluxed under a nitrogen stream for 12 hours. The reaction solution was added to 1000 ml of MeOH to crystallize a solid, the solid was filtered and dissolved in monochlorobenzene, and the solution was filtered with silica gel/Celite. 13 g of a compound C33 (60% of a yield) was obtained by conducting recrystallization in MeOH after removing the appropriate amount of an organic solvent therefrom.

[0153] Atomic analysis of the compound C33 was performed, and the results are provided as follows.

[0154] calcd. C₄₈H₃₀N₄S: C, 82.97; H, 4.35; N, 8.06; S, 4.61; found: C, 83.01; H, 4.40; N, 8.01

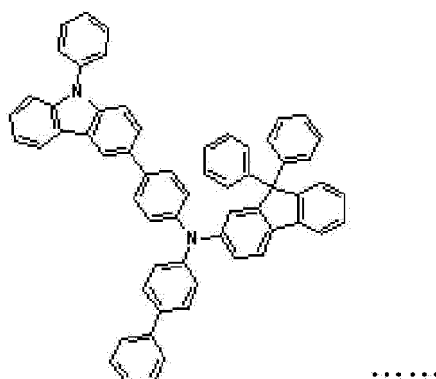
(Manufacture of Organic Light Emitting Diode)

Example 6

[0155] Specifically, a method of manufacturing the organic light emitting diode is illustrated as follows; an anode was manufactured by cutting an ITO glass substrate having sheet resistance of 15 Ω/cm^2 into a size of 50 mm x 50 mm x 0.7 mm, cleaning the ITO glass substrate with an ultrasonic wave in acetone, isopropylalcohol, and pure water respectively for 15 minutes and then, with a UV ozone for 30 minutes.

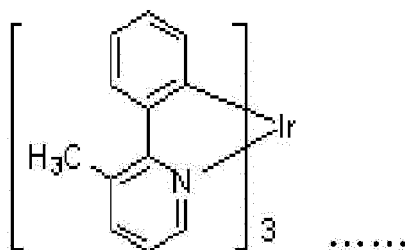
[0156] The ITO transparent electrode was used as an anode, and the following HTM compound was vacuum-deposited to form a 1200 Å-thick hole injection layer on the ITO substrate.

[HTM]



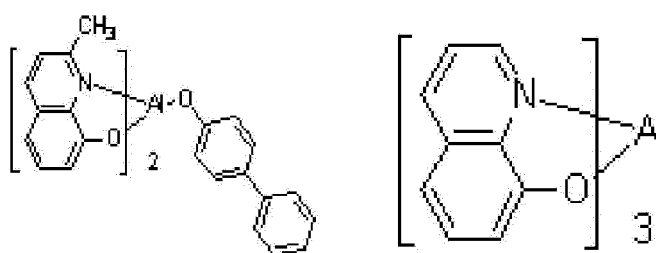
[0157] The compound according to Example 1 as a host was doped with 7 wt% of the following PhGD compound as a phosphorescent green dopant, and the doped compound was vacuum-deposited to form a 300 Å-thick emission layer. A 1000 Å-thick ITO was used as an anode, and a 1000 Å-thick aluminum (Al) was used as a cathode.

[PhGD]



[0158] Subsequently, BAlq [bis (2-methyl-8-quinolinolato-N1,O8)-(1,1'-biphenyl-4-olato)aluminum] and Alq3 [tris (8-hydroxyquinolinato)aluminium] were sequentially deposited to be 50 Å thick and 250 Å thick on the emission layer upper to form an electron transport layer. On the electron transport layer upper, LiF and Al were sequentially vacuum-deposited to be 5 Å and 1000 Å thick to form a cathode, manufacturing an organic light emitting diode.

[BAlq] [Alq3]



Example 7

[0159] An organic light emitting diode was manufactured according to the same method as Example 6 except for using the compound according to Example 3 instead of the compound according to Example 6.

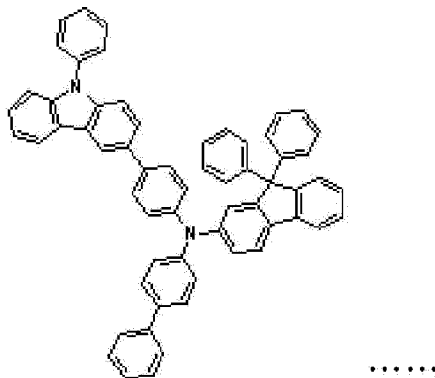
Example 8

[0160] Specifically, according to a method of manufacturing the organic light emitting diode, an anode was manufactured by cutting an ITO glass substrate having 15 Ω/cm² of sheet resistance into a size of 50 mm x 50 mm x 0.7 mm and then, cleaning the ITO glass substrate with an ultrasonic wave in acetone, isopropylalcohol, and pure water respec-

tively for 15 minutes and with a UV ozone for 30 minutes.

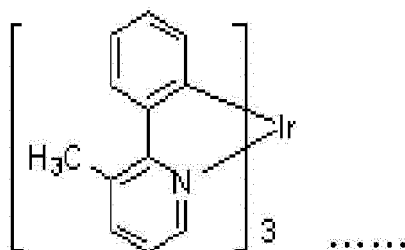
[0161] This ITO transparent electrode was used as an anode, and a 1200 Å-thick hole injection layer was formed on the ITO substrate upper by vacuum-depositing the following HTM compound and the compound according to Example 1.

[HTM]



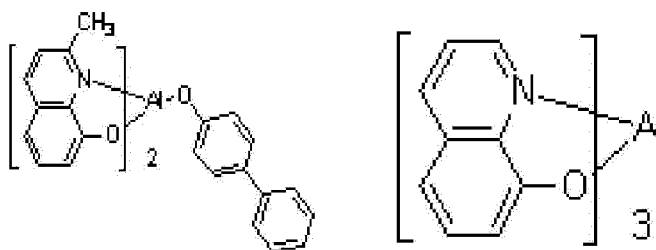
[0162] 4,4-N,N-dicarbazolebiphenyl (CBP) as a host for an emission layer was doped with 7 wt% of the following PhGD compound as a phosphorescence green dopant and then, vacuum-deposited to form a 300 Å-thick emission layer. An anode was a 1000 Å-thick ITO, and a cathode was 1000 Å-thick aluminum (Al).

[PhGD]



[0163] Subsequently, BAlq [bis(2-methyl-8-quinolinolato-N1,O8)-(1,1'-biphenyl-4-olato)aluminum] and Alq3 [tris (8-hydroxyquinolinato)aluminium] were sequentially deposited to be respectively 50 Å and 250 Å thick on the emission layer to form an electron transport layer. On the electron transport layer, LiF and Al were sequentially vacuum-deposited to be respectively 5 Å and 1000 Å thick to form a cathode, manufacturing an organic light emitting diode.

[BAlq] [Alq3]



Example 9

[0164] An organic light emitting diode was manufactured according to the same method as Example 8 except for using the compound according to Example 3 instead of the compound according to Example 1.

Comparative Example 1

[0165] An organic light emitting diode was manufactured according to the same method as Example 6 except for using 4,4-N,N-dicarbazolebiphenyl (CBP) as a host for an emission layer instead of the compound according to Example 1.

(Performance Measurement of Organic Light Emitting Diode)

[0166] Current density and luminance changes depending on voltage and luminous efficiency of each organic light emitting diode according to Examples 6 to 9 and Comparative Example 1 were measured. The measurements were specifically performed in the following method, and the results were provided in the following Tables 1 and 2.

(1) Measurement of Current density Change depending on Voltage Change

[0167] The manufactured organic light emitting diodes were measured for current value flowing in the unit device, while increasing the voltage from 0V to 10V using a current-voltage meter (Keithley 2400), and the measured current value was divided by an area to provide the results.

(2) Measurement of Luminance Change depending on Voltage Change

[0168] The organic light emitting diodes were measured for luminance, while increasing the voltage from 0V to 10V using a luminance meter (Minolta Cs-1000A).

(3) Measurement of Luminous Efficiency

[0169] Current efficiency (cd/A) and power efficiency (lm/W) at the same current density (10 mA/cm²) were calculated by using the luminance, current density, and voltages from the items (1) and (2).

(Table 1)

	Driving voltage (Vd, V)	Current efficiency (cd/A)	Power efficiency (lm/W)	Luminance (cd/m ²)	Color coordinate (CIEx)	Color coordinate (CIEx)
Comparative Example 1	4.90	44.8	28.7	3000	0.329	0.626
Example 6	5.07	48.8	30.2	3000	0.325	0.629
Example 7	5.14	49.0	30.0	3000	0.330	0.625

[0170] The organic light emitting diodes according to Examples 6 and 7 showed improved efficiency compared with the organic light emitting diodes manufactured by applying CBP as a host for an emission layer according to Comparative Example 1.

(Table 2)

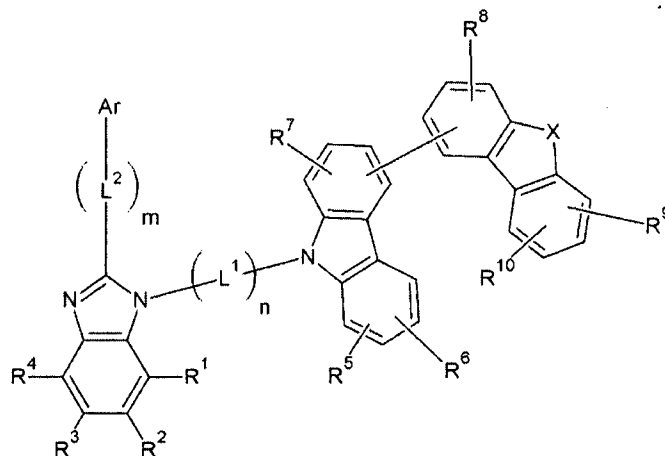
	Driving voltage (Vd, V)	Current efficiency (cd/A)	Power efficiency (lm/W)	Luminance (cd/m ²)	Color coordinate (CIEx)	Color coordinate (CIEx)
Comparative Example 1	4.90	44.8	28.7	3000	0.329	0.626
Example 8	4.75	62.4	41.2	3000	0.295	0.674
Example 9	5.10	68.4	42.1	3000	0.322	0.654

[0171] The organic light emitting diodes including an intermediate layer according to Examples 8 and 9 showed improved efficiency compared with the organic light emitting diode using CBP as a single host for an emission layer according to Comparative Example 1.

Claims

1. A compound for an organic optoelectronic device represented by the following Chemical Formula 2:

[Chemical Formula 2]



wherein, in the above Chemical Formula 2,

L^1 and L^2 are the same or different and are independently a single bond, a substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination thereof,

n and m are the same or different and are independently integers ranging from 0 to 3,

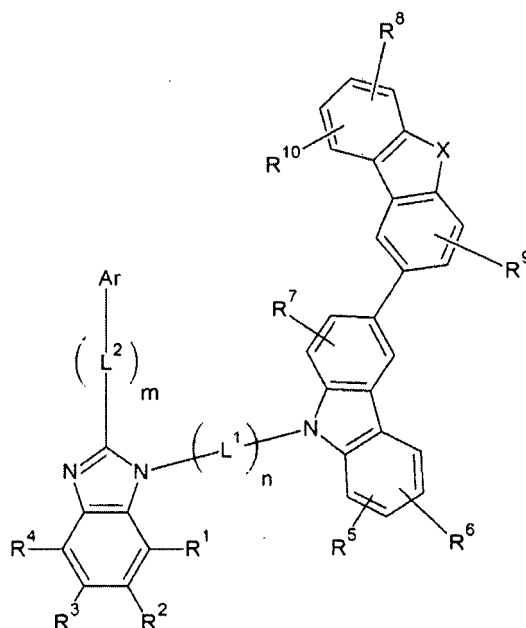
Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof,

R^1 to R^{10} are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and

X is NR' , O, or S, wherein the R' is hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

2. The compound for an organic optoelectronic device of claim 1, wherein the compound for an organic optoelectronic device is represented by the following Chemical Formula 3:

[Chemical Formula 3]



wherein, in the above Chemical Formula 3,

L^1 and L^2 are the same or different and are independently a single bond, a substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination thereof,

n and m are the same or different and are independently integers ranging from 0 to 3,

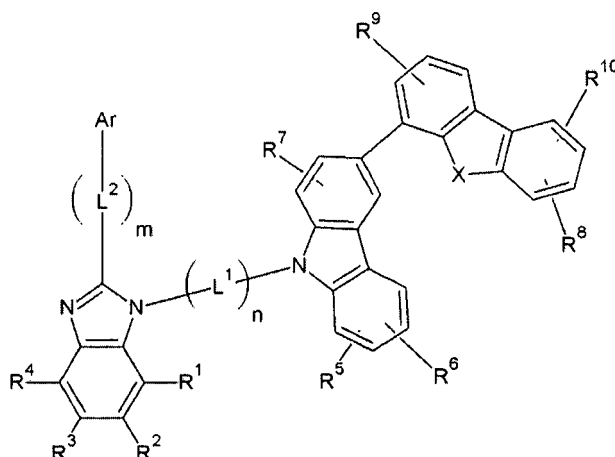
Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof,

R^1 to R^{10} are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and

X is NR' , O , or S , wherein the R' is hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

3. The compound for an organic optoelectronic device of claim 1, wherein the compound for an organic optoelectronic device is represented by the following Chemical Formula 4:

[Chemical Formula 4]



wherein, in the above Chemical Formula 4,

L^1 and L^2 are the same or different and are independently a single bond, a substituted or unsubstituted C2 to C6 alkenyl group, a substituted or unsubstituted C2 to C6 alkynyl group, a substituted or unsubstituted C6 to C30 arylene group, a substituted or unsubstituted C3 to C30 heteroarylene group, or a combination thereof,

n and m are the same or different and are independently integers ranging from 0 to 3,

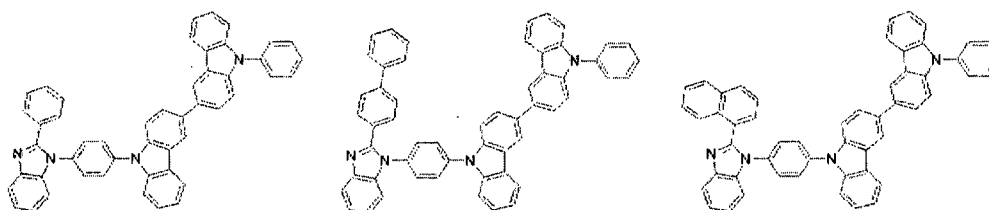
Ar is a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof,

R^1 to R^{10} are the same or different and are independently hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof, and

X is NR^1 , O, or S, wherein the R^1 is hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C3 to C30 heteroaryl group, or a combination thereof.

4. The compound for an organic optoelectronic device of any of the claims 1 to 3, wherein the Ar is a substituted or unsubstituted biphenyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, or a combination thereof.
5. The compound for an organic optoelectronic device of any of the claims 1 to 4, wherein the L^1 is a substituted or unsubstituted phenylene group.
6. The compound for an organic optoelectronic device of any of the claims 1 to 5, wherein the n is 1, and the m is 0 or 1.
7. A compound for an organic optoelectronic device according to any of the claims 1 to 6, represented by one of the following Chemical Formulae B1 to B42:

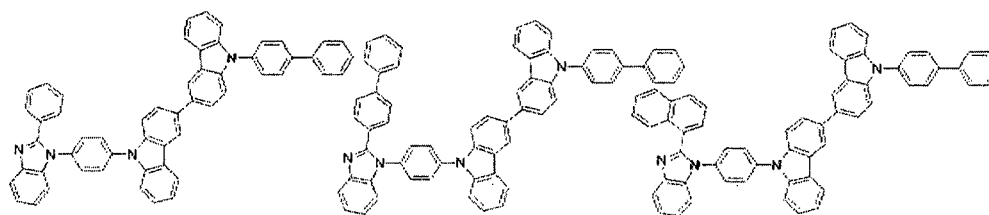
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[Chemical Formula B4] [Chemical Formula B5] [Chemical Formula B6]

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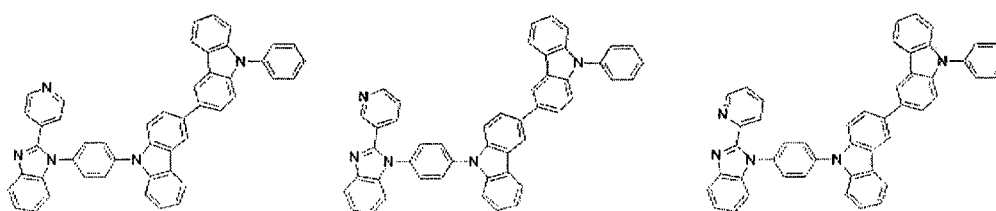
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[Chemical Formula B7] [Chemical Formula B8] [Chemical Formula B9]

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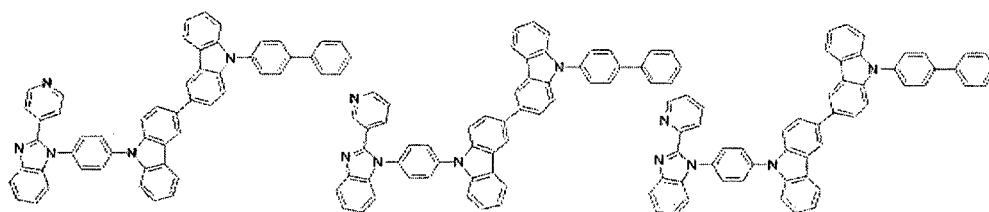
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[Chemical Formula B10] [Chemical Formula B11] [Chemical Formula B12]

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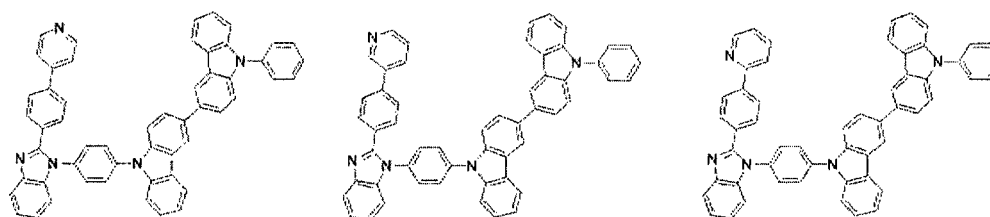
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[Chemical Formula B13] [Chemical Formula B14] [Chemical Formula B15]

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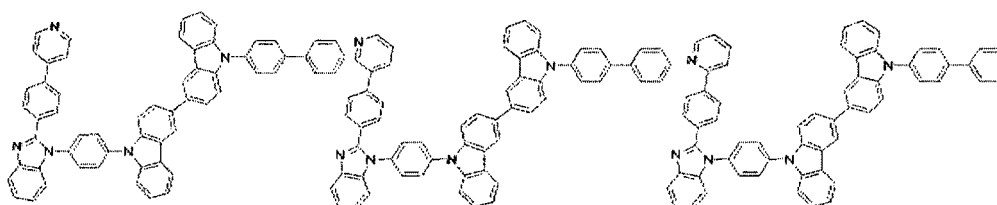


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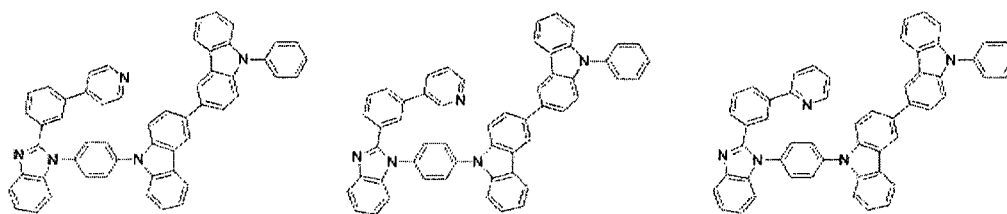
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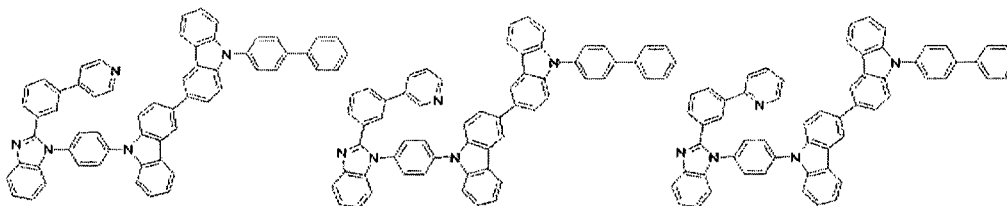
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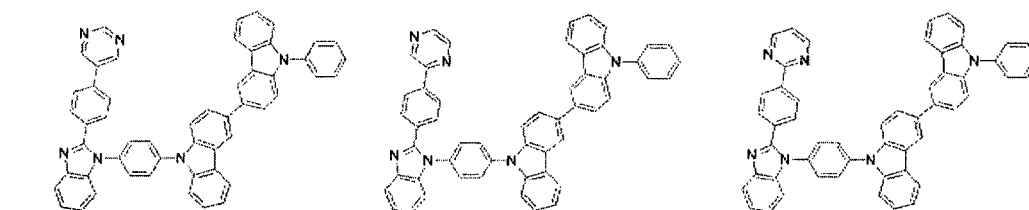
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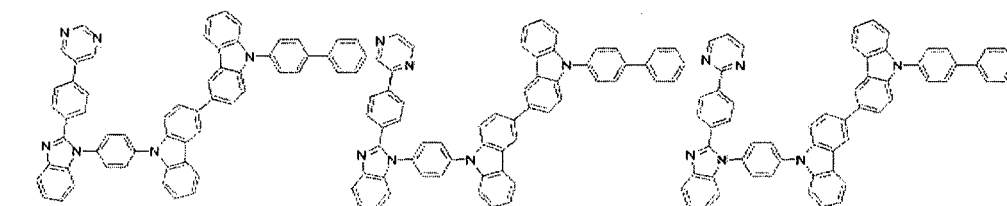
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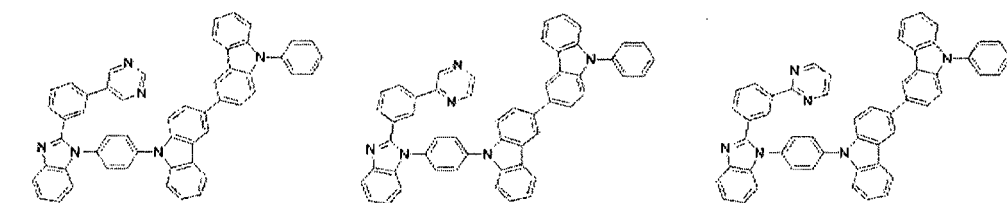
[Chemical Formula B25] [Chemical Formula B26] [Chemical Formula B27]



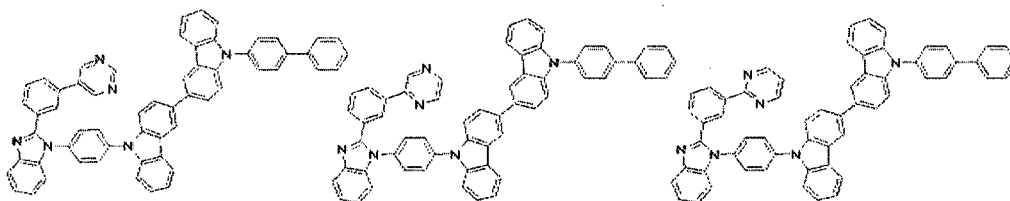
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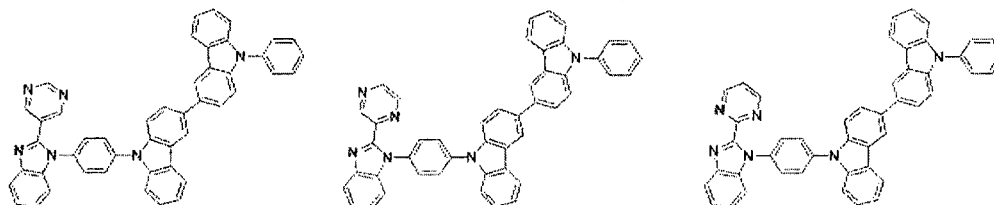
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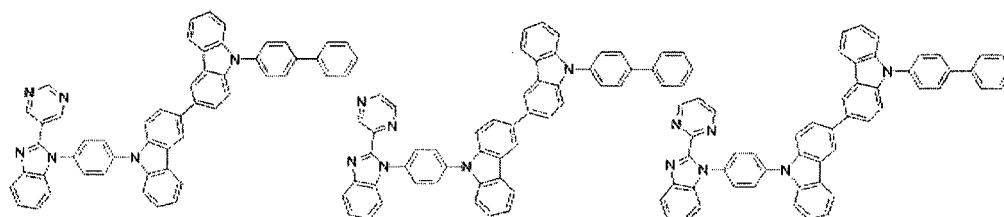
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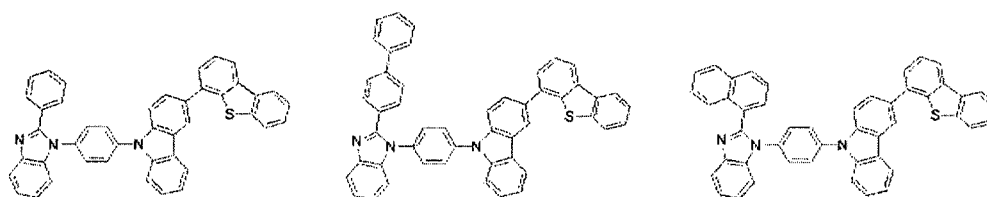


[Chemical Formula B40] [Chemical Formula B41] [Chemical Formula B42]

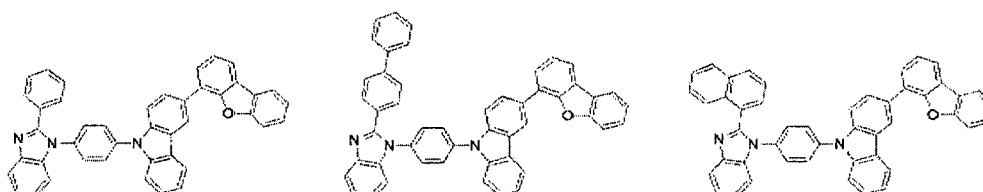


8. A compound for an organic optoelectronic device according to any of the claims 1 to 7, represented by one of the following Chemical Formulae C1 to C42:

[Chemical Formula C1] [Chemical Formula C2] [Chemical Formula C3]

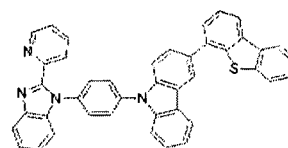
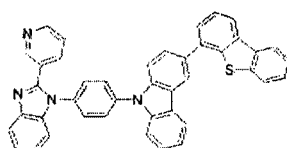
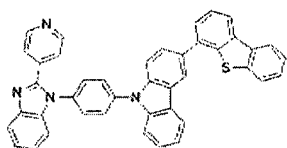


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[Chemical Formula C7] [Chemical Formula C8] [Chemical Formula C9]

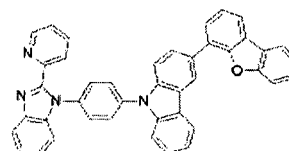
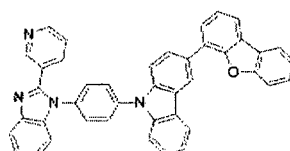
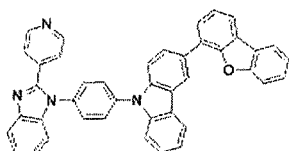
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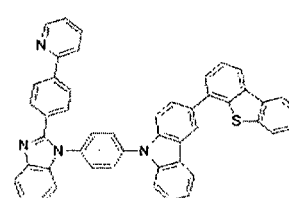
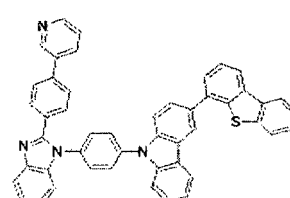
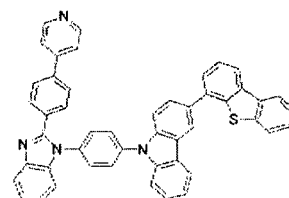
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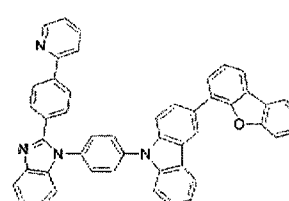
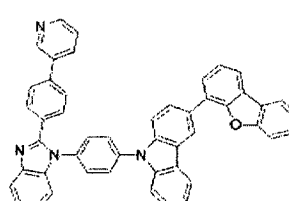
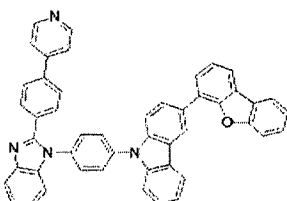
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[Chemical Formula C16] [Chemical Formula C17] [Chemical Formula C18]

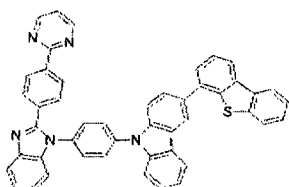
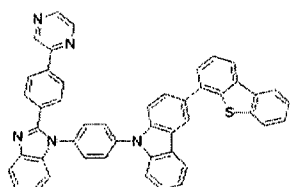
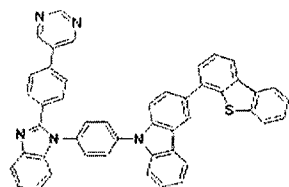
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[Chemical Formula C19] [Chemical Formula C20] [Chemical Formula C21]

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[Chemical Formula C22] [Chemical Formula C23] [Chemical Formula C24]

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[Chemical Formula C25] [Chemical Formula C26] [Chemical Formula C27]

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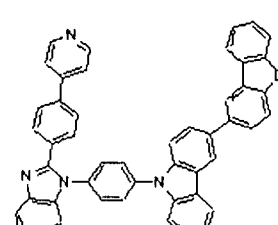
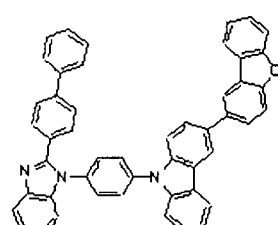
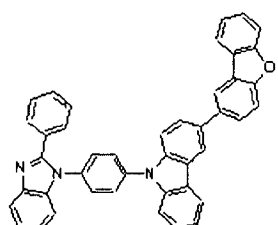
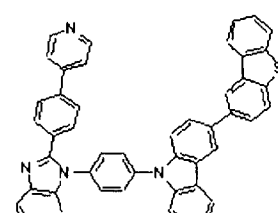
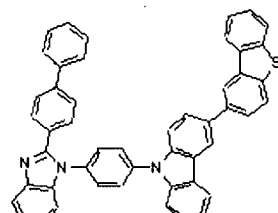
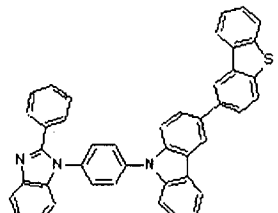
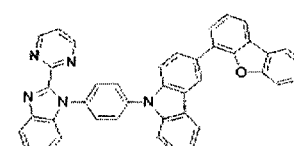
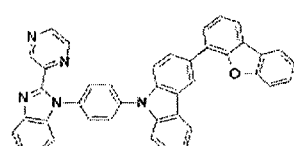
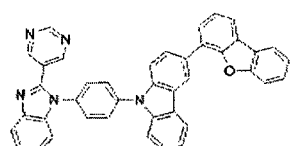
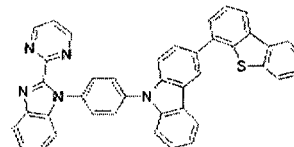
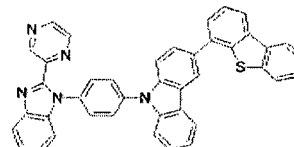
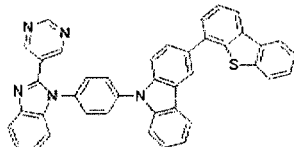
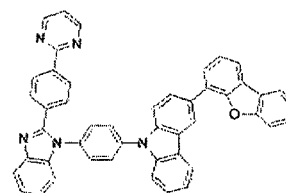
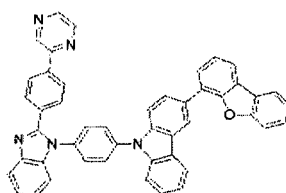
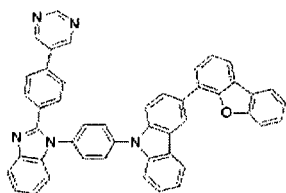
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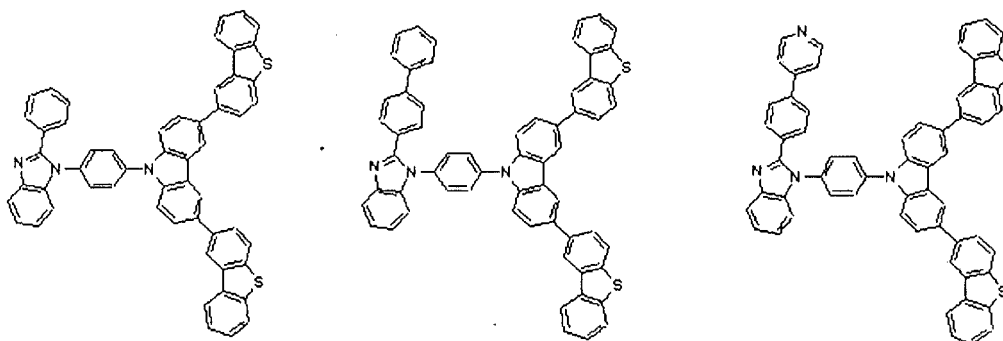
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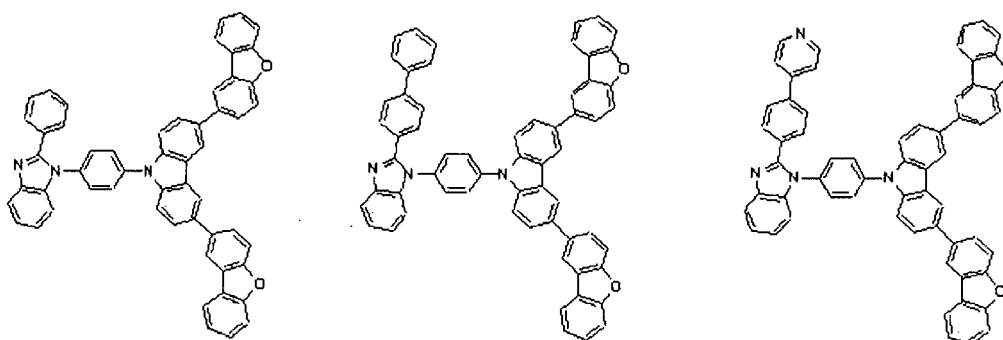
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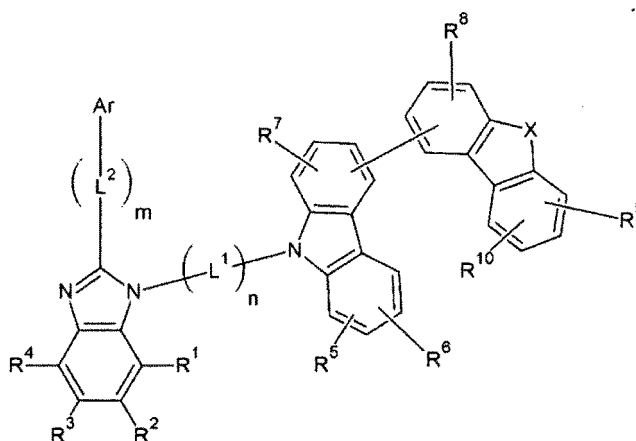


9. An organic light emitting diode, comprising an anode, a cathode, and at least one or more organic thin layer between the anode and the cathode, wherein at least one of the organic thin layer comprises the compound for an organic optoelectronic device according to any one of claims 1 to 8.

Patentansprüche

1. Verbindung für eine organische optoelektronische Vorrichtung, die durch die folgende chemische Formel 2 dargestellt wird:

[chemische Formel 2]

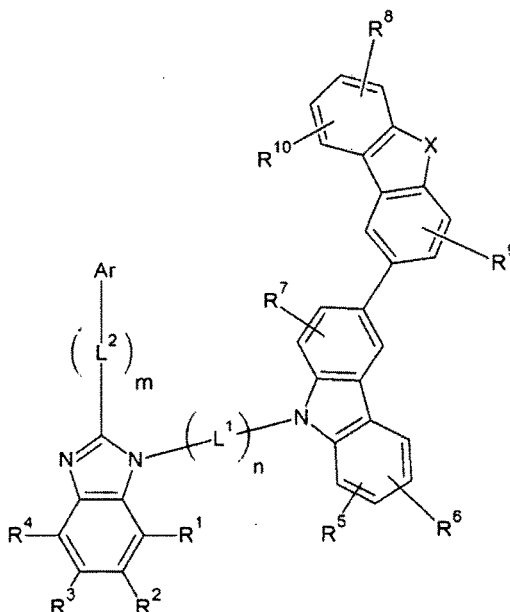


wobei in der vorstehenden chemischen Formel 2,

L^1 und L^2 gleich oder verschieden sind und unabhängig voneinander eine Einfachbindung, eine substituierte oder unsubstituierte C2- bis C6-Alkenylgruppe, eine substituierte oder unsubstituierte C2- bis C6-Alkynylgruppe, eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon sind, n und m gleich oder verschieden sind und unabhängig voneinander ganze Zahlen im Bereich von 0 bis 3 sind, Ar eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon ist, R^1 bis R^{10} gleich oder verschieden sind und unabhängig voneinander Wasserstoff, Deuterium, eine substituierte oder unsubstituierte C1- bis C20-Alkylgruppe, eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon sind, und X NR' , O oder S ist, wobei R' Wasserstoff, Deuterium, eine substituierte oder unsubstituierte C1- bis C20-Alkylgruppe, eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon ist.

2. Verbindung nach Anspruch 1, wobei die Verbindung für eine organische optoelektronische Vorrichtung durch die folgende chemische Formel 3 dargestellt wird:

[chemische Formel 3]

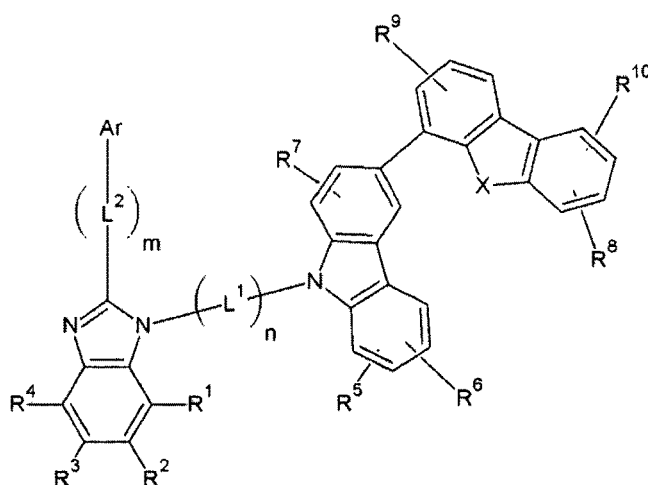


wobei in der vorstehenden chemischen Formel 3

L^1 und L^2 gleich oder verschieden sind und unabhängig voneinander eine Einfachbindung, eine substituierte oder unsubstituierte C2- bis C6-Alkenylgruppe, eine substituierte oder unsubstituierte C2- bis C6-Alkynylgruppe, eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon sind, n und m gleich oder verschieden sind und unabhängig voneinander ganze Zahlen im Bereich von 0 bis 3 sind, Ar eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon ist, R^1 bis R^{10} gleich oder verschieden sind und unabhängig voneinander Wasserstoff, Deuterium, eine substituierte oder unsubstituierte C1- bis C20-Alkylgruppe, eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon sind, und X NR' , O oder S ist, wobei R' Wasserstoff, Deuterium, eine substituierte oder unsubstituierte C1- bis C20-Alkylgruppe, eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon ist.

3. Verbindung nach Anspruch 1, wobei die Verbindung für eine organische optoelektronische Vorrichtung durch die folgende chemische Formel 4 dargestellt wird:

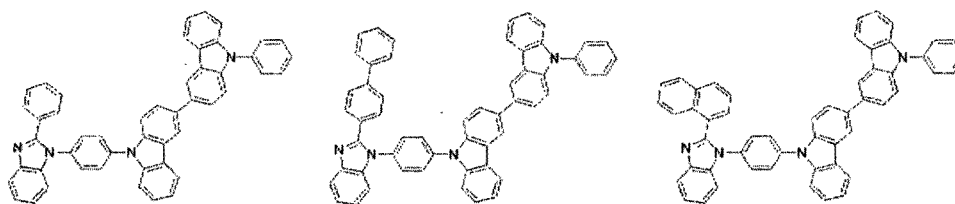
[chemische Formel 4]



wobei in der vorstehenden chemischen Formel 4

- L¹ und L² gleich oder verschieden sind und unabhängig voneinander eine Einfachbindung, eine substituierte oder unsubstituierte C2- bis C6-Alkenylgruppe, eine substituierte oder unsubstituierte C2- bis C6-Alkynylgruppe, eine substituierte oder unsubstituierte C6- bis C30-Arylengruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylengruppe oder eine Kombination davon sind,
n und m gleich oder verschieden sind und unabhängig voneinander ganze Zahlen im Bereich von 0 bis 3 sind,
Ar eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon ist,
R¹ bis R¹⁰ gleich oder verschieden sind und unabhängig voneinander Wasserstoff, Deuterium, eine substituierte oder unsubstituierte C1- bis C20-Alkylgruppe, eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon sind, und
X NR', O oder S ist, wobei R' Wasserstoff, Deuterium, eine substituierte oder unsubstituierte C1- bis C20-Alkylgruppe, eine substituierte oder unsubstituierte C6- bis C30-Arylgruppe, eine substituierte oder unsubstituierte C3- bis C30-Heteroarylgruppe oder eine Kombination davon ist.
4. Verbindung nach einem der Ansprüche 1 bis 3, wobei Ar eine substituierte oder unsubstituierte Biphenylgruppe, eine substituierte oder unsubstituierte Pyridinylgruppe, eine substituierte oder unsubstituierte Pyrimidinylgruppe, eine substituierte oder unsubstituierte Triazinylgruppe oder eine Kombination davon ist.
5. Verbindung nach einem der Ansprüche 1 bis 4, wobei L¹ eine substituierte oder unsubstituierte Phenylengruppe ist.
6. Verbindung nach einem der Ansprüche 1 bis 5, wobei n = 1 und m = 0 oder 1 ist.
7. Verbindung nach einem der Ansprüche 1 bis 6, dargestellt durch eine der folgenden Formeln B1 bis B42

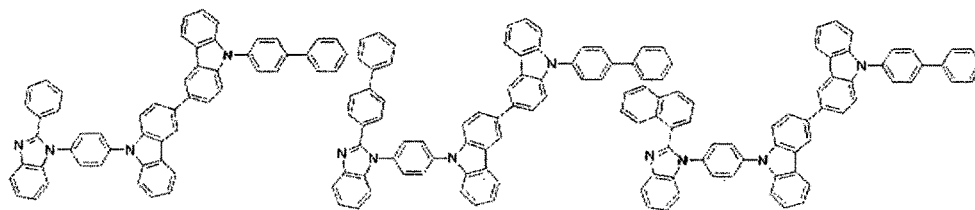
[chemische Formel B1] [chemische Formel B2] [chemische Formel B3]



[chemische Formel B4] [chemische Formel B5] [chemische Formel B6]

5

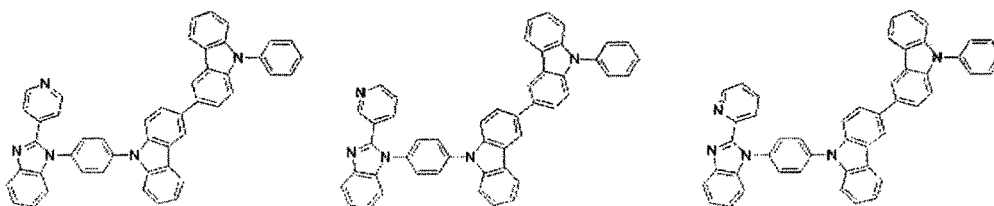
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[chemische Formel B7] [chemische Formel B8] [chemische Formel B9]

15

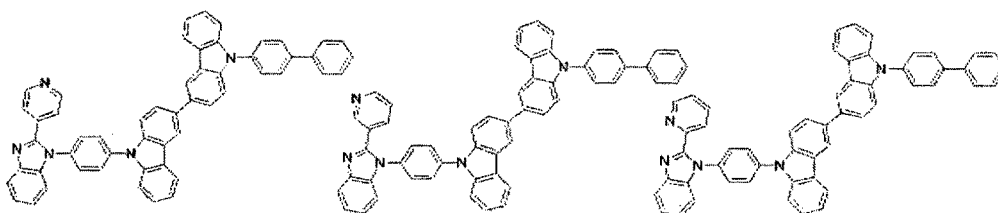
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[chemische Formel B10] [chemische Formel B11] [chemische Formel B12]

25

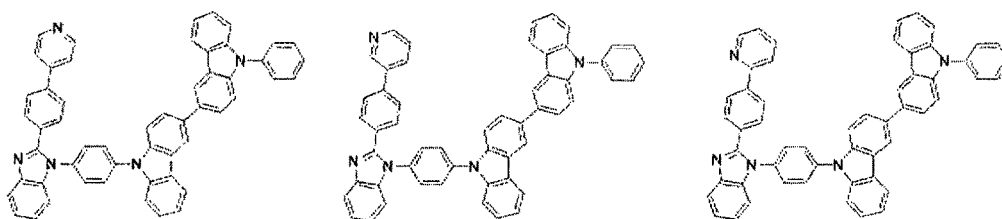
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[chemische Formel B13] [chemische Formel B14] [chemische Formel B15]

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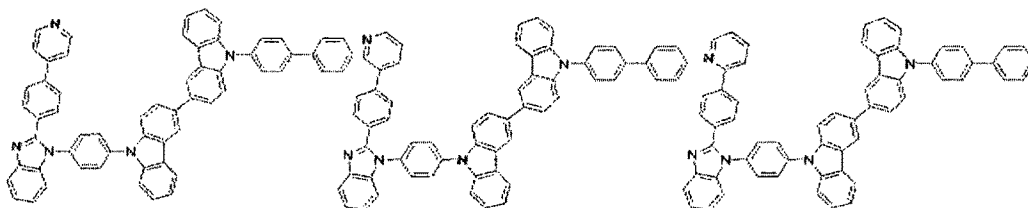


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[chemische Formel B16] [chemische Formel B17] [chemische Formel B18]

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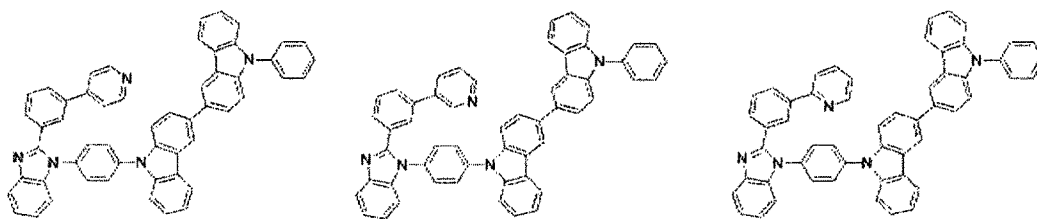
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[chemische Formel B19] [chemische Formel B20] [chemische Formel B21]

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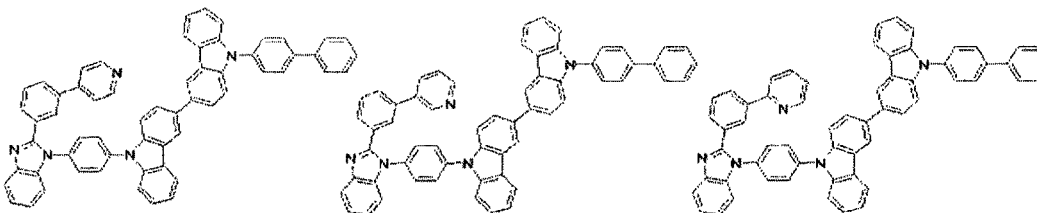
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[chemische Formel B22] [chemische Formel B23] [chemische Formel B24]

15

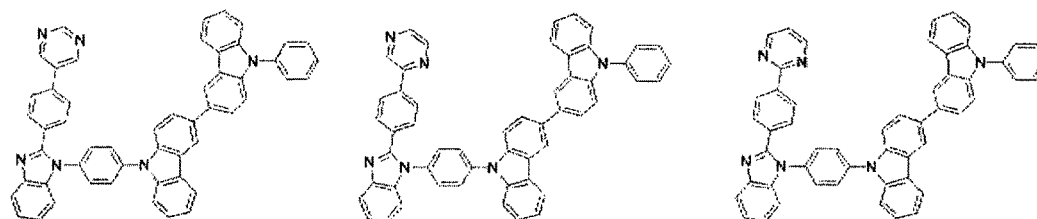
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[chemische Formel B25] [chemische Formel B26] [chemische Formel B27]

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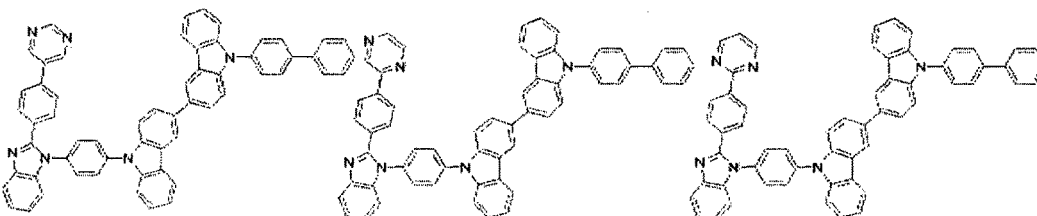
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[chemische Formel B28] [chemische Formel B29] [chemische Formel B30]

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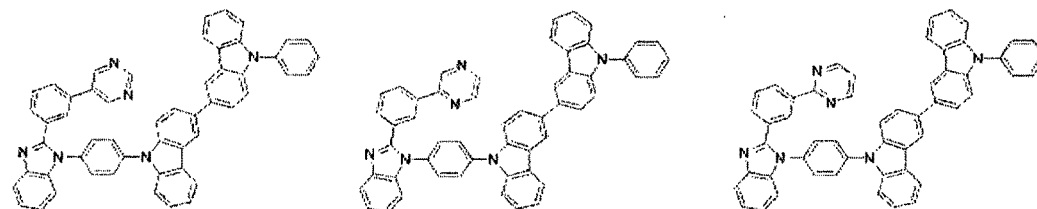


[chemische Formel B31] [chemische Formel B32] [chemische Formel B33]

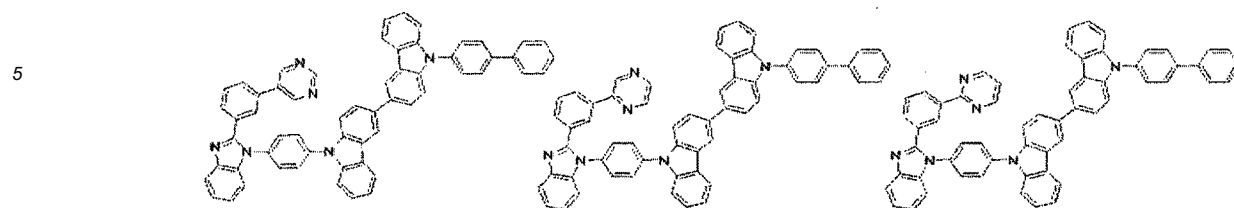
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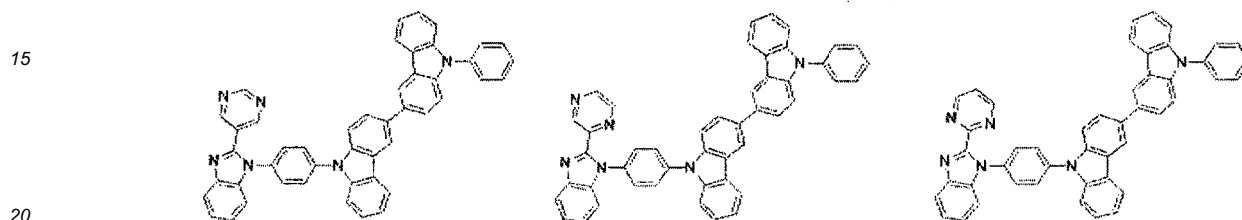
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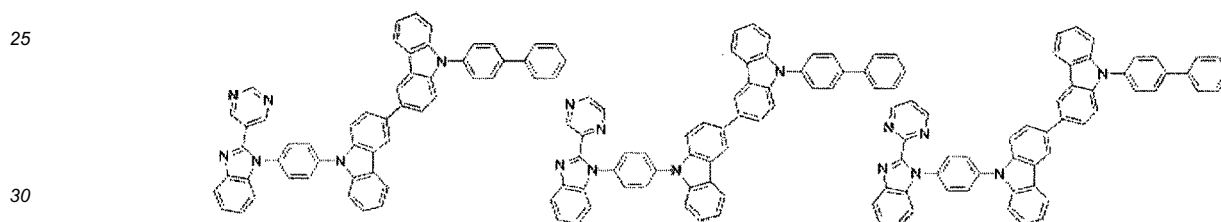
[chemische Formel B34] [chemische Formel B35] [chemische Formel B36]



[chemische Formel B37] [chemische Formel B38] [chemische Formel B39]

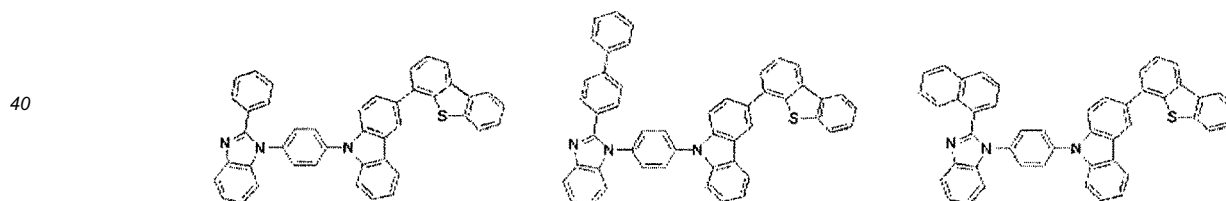


[chemische Formel B40] [chemische Formel B41] [chemische Formel B42]

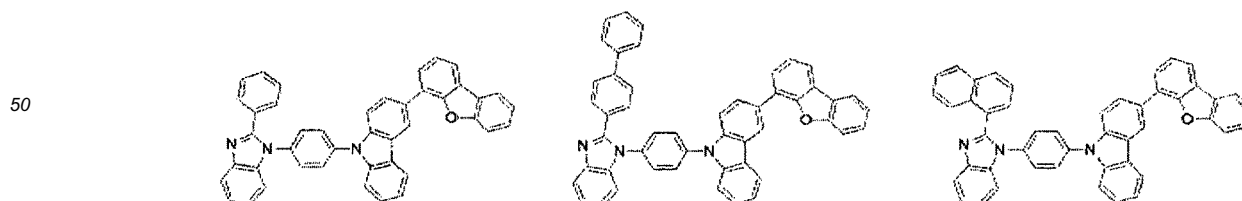


8. Verbindung nach einem der Ansprüche 1 bis 7, dargestellt durch eine der folgenden Formeln C1 bis C42

[chemische Formel C1] [chemische Formel C2] [chemische Formel C3]

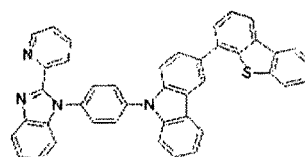
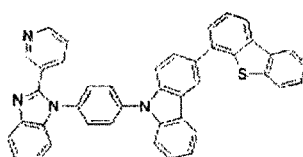
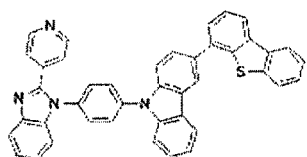


[chemische Formel C4] [chemische Formel C5] [chemische Formel C6]

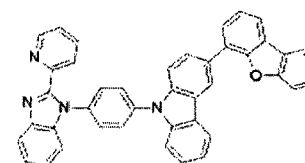
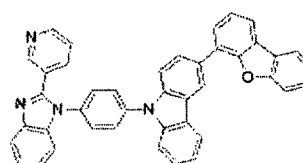
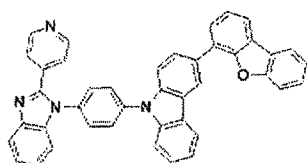


[chemische Formel C7] [chemische Formel C8] [chemische Formel C9]

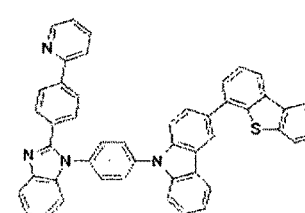
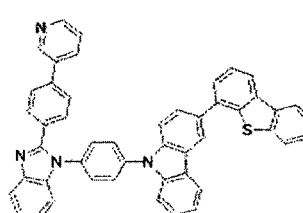
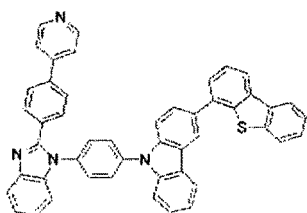




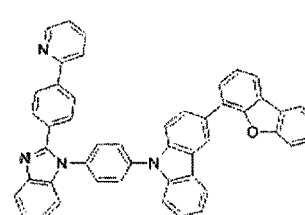
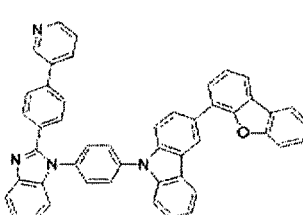
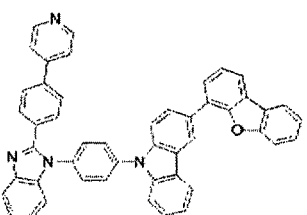
[chemische Formel C10] [chemische Formel C11] [chemische Formel C12]



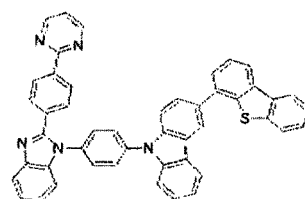
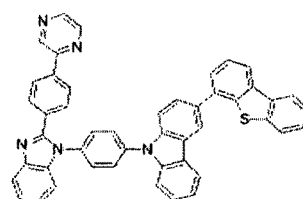
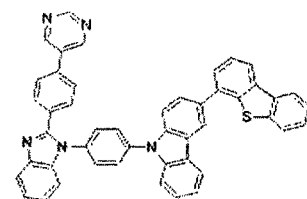
[chemische Formel C13] [chemische Formel C14] [chemische Formel C15]



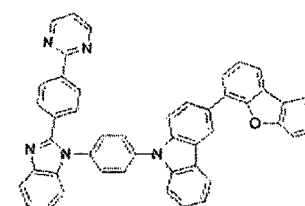
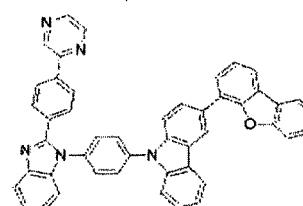
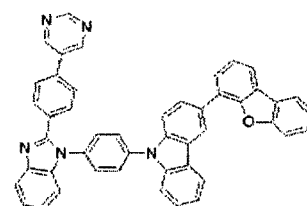
[chemische Formel C16] [chemische Formel C17] [chemische Formel C18]



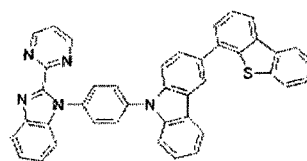
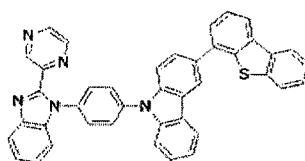
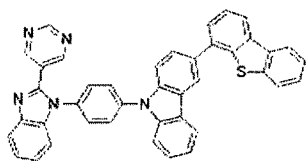
[chemische Formel C19] [chemische Formel C20] [chemische Formel C21]



[chemische Formel C22] [chemische Formel C23] [chemische Formel C24]

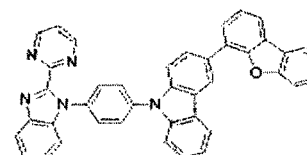
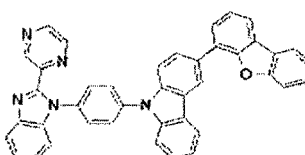
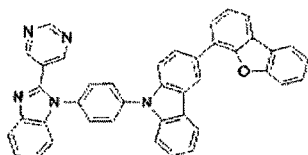


[chemische Formel C25] [chemische Formel C26] [chemische Formel C27]



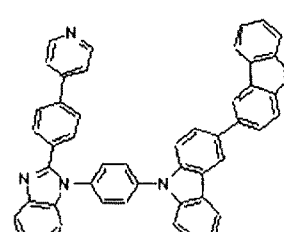
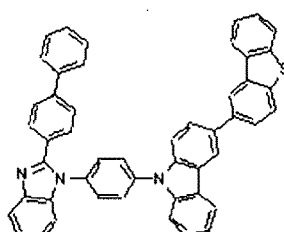
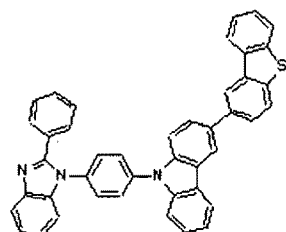
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[chemische Formel C28] [chemische Formel C29] [chemische Formel C30]



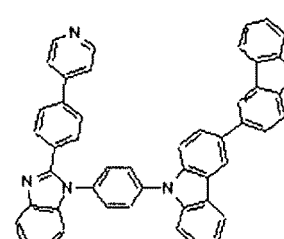
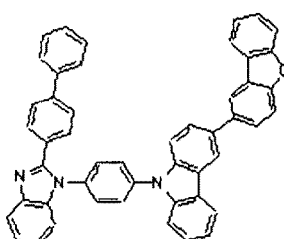
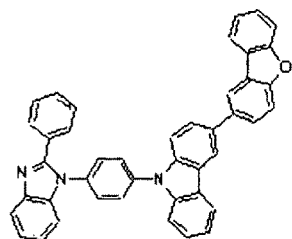
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[chemische Formel C31] [chemische Formel C32] [chemische Formel C33]



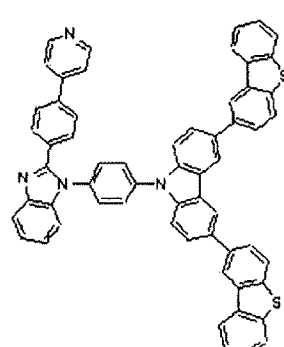
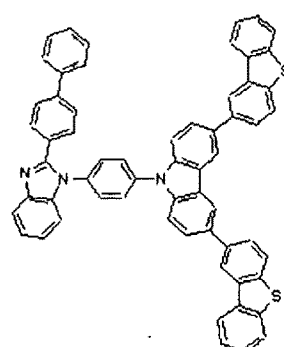
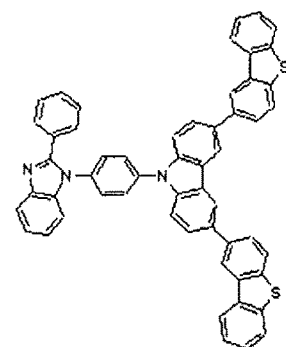
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[chemische Formel C34] [chemische Formel C35] [chemische Formel C36]

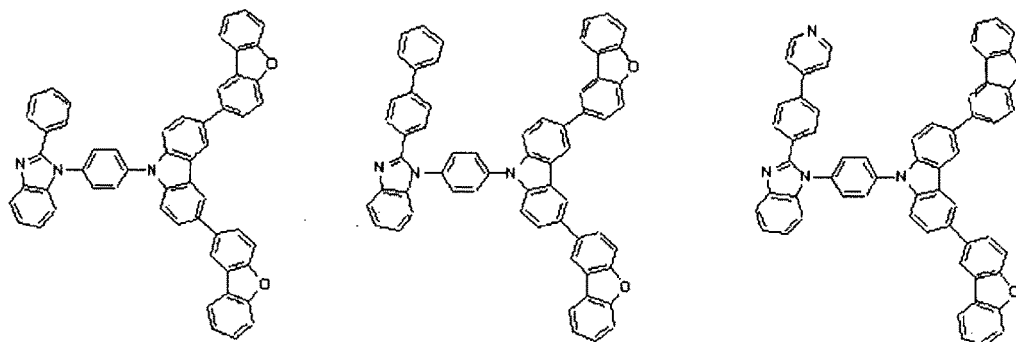


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[chemische Formel C37] [chemische Formel C38] [chemische Formel C39]



[chemische Formel C40] [chemische Formel C41] [chemische Formel C42]



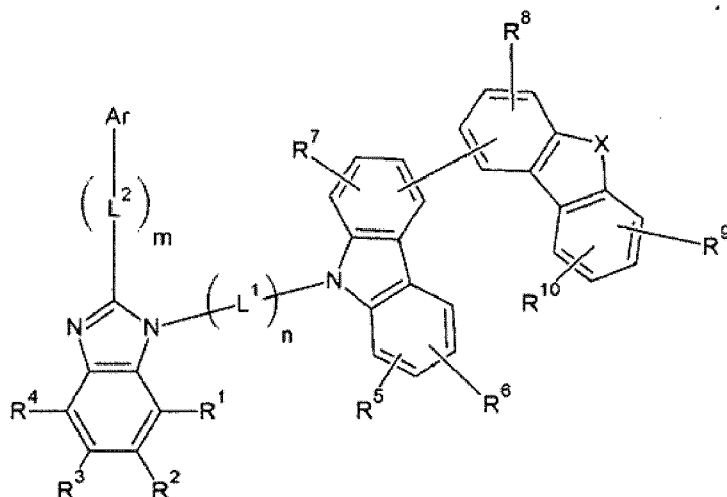
9. Organische Leuchtdiode mit

einer Anode, einer Kathode und mindestens einer organischen Dünnschicht zwischen der Anode und der Kathode,
wobei mindestens eine der organischen Dünnschichten die Verbindung für eine organische optoelektronische Vorrichtung nach einem der Ansprüche 1 bis 8 aufweist.

Revendications

1. Composé pour un dispositif optoélectronique organique représenté par la Formule Chimique 2 suivante:

[Formule Chimique 2]



dans lequel, dans la Formule Chimique 2 ci-dessus,

L^1 et L^2 sont identiques ou différents et sont indépendamment une liaison simple, un groupe alcényle C2 à C6 substitué ou non substitué, un groupe alcynyle C2 à C6 substitué ou non substitué, un groupe arylène C6 à C30 substitué ou non substitué, un groupe hétéroarylène C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci,

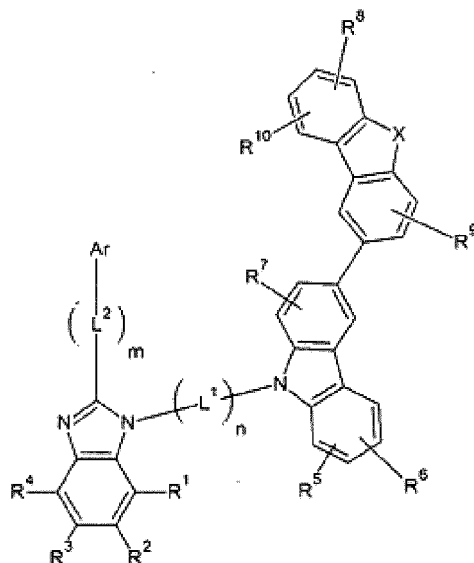
n et m sont identiques ou différents et sont indépendamment des nombres entiers allant de 0 à 3,

Ar est un groupe aryle C6 à C30 substitué ou non substitué, un groupe hétéroaryle C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci,

R^1 à R^{10} sont identiques ou différents et sont indépendamment de l'hydrogène, du deutérium, un groupe alkyle C1 à C20 substitué ou non substitué, un groupe aryle C6 à C30 substitué ou non substitué, un groupe hétéroaryle C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci, et
 X est NR', O ou S, dans lequel le R' est de l'hydrogène, du deutérium, un groupe alkyle C1 à C20 substitué ou non substitué, un groupe aryle C6 à C30 substitué ou non substitué, un groupe hétéroaryle C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci.

2. Composé pour un dispositif optoélectronique organique selon la revendication 1, dans lequel le composé pour un dispositif optoélectronique organique est représenté par la Formule Chimique 3 suivante:

[Formule Chimique 3]



dans lequel, dans la Formule Chimique 3 ci-dessus,

L^1 et L^2 sont identiques ou différents et sont indépendamment une liaison simple, un groupe alcényle C2 à C6 substitué ou non substitué, un groupe alcynyle C2 à C6 substitué ou non substitué, un groupe arylène C6 à C30 substitué ou non substitué, un groupe hétéroarylène C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci,

n et m sont identiques ou différents et sont indépendamment des nombres entiers allant de 0 à 3,

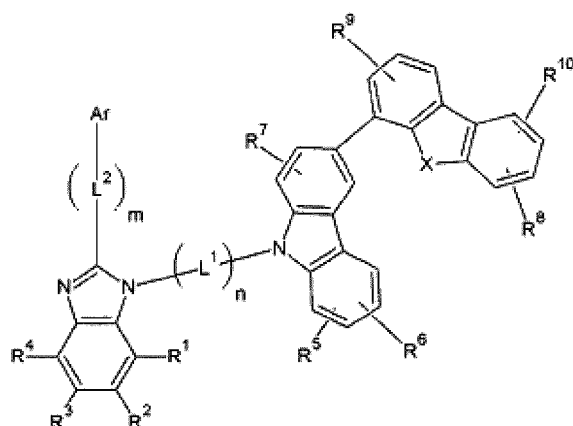
Ar est un groupe aryle C6 à C30 substitué ou non substitué, un groupe hétéroaryle C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci,

R^1 à R^{10} sont identiques ou différents et sont indépendamment de l'hydrogène, du deutérium, un groupe alkyle C1 à C20 substitué ou non substitué, un groupe aryle C6 à C30 substitué ou non substitué, un groupe hétéroaryle C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci, et

X est NR', O ou S, dans lequel le R' est de l'hydrogène, du deutérium, un groupe alkyle C1 à C20 substitué ou non substitué, un groupe aryle C6 à C30 substitué ou non substitué, un groupe hétéroaryle C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci.

3. Composé pour un dispositif optoélectronique organique selon la revendication 1, dans lequel le composé pour un dispositif optoélectronique organique est représenté par la Formule Chimique 4 suivante :

[Formule Chimique 4]



dans lequel, dans la Formule Chimique 4 ci-dessus,

L^1 et L^2 sont identiques ou différents et sont indépendamment une liaison simple, un groupe alcényle C2 à C6 substitué ou non substitué, un groupe alcynyle C2 à C6 substitué ou non substitué, un groupe arylène C6 à C30 substitué ou non substitué, un groupe hétéroarylène C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci,

n et m sont identiques ou différents et sont indépendamment des nombres entiers allant de 0 à 3,

Ar est un groupe aryle C6 à C30 substitué ou non substitué, un groupe hétéroaryle C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci,

R^1 à R^{10} sont identiques ou différents et sont indépendamment de l'hydrogène, du deutérium, un groupe alkyle C1 à C20 substitué ou non substitué, un groupe aryle C6 à C30 substitué ou non substitué, un groupe hétéroaryle C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci, et

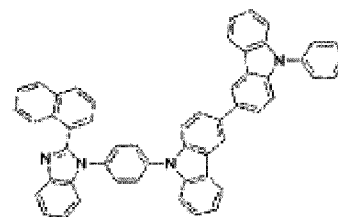
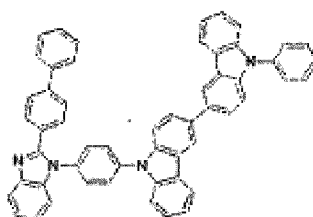
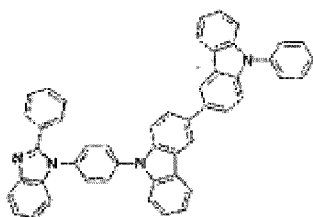
X est NR' , O ou S, dans lequel le R' est de l'hydrogène, du deutérium, un groupe alkyle C1 à C20 substitué ou non substitué, un groupe aryle C6 à C30 substitué ou non substitué, un groupe hétéroaryle C3 à C30 substitué ou non substitué ou une combinaison de ceux-ci.

4. Composé pour un dispositif optoélectronique organique selon l'une quelconque des revendications 1 à 3, dans lequel l'Ar est un groupe biphenyle substitué ou non substitué, un groupe pyridinyle substitué ou non substitué, un groupe pyrimidinyle substitué ou non substitué, un groupe triazinyle substitué ou non substitué ou une combinaison de ceux-ci.
5. Composé pour un dispositif optoélectronique organique selon l'une quelconque des revendications 1 à 4, dans lequel le L^1 est un groupe phénylène substitué ou non substitué.
6. Composé pour un dispositif optoélectronique organique selon l'une quelconque des revendications 1 à 5, dans lequel le n est 1 et le m est 0 ou 1.
7. Composé pour un dispositif optoélectronique organique selon l'une quelconque des revendications 1 à 6, représenté par une des Formules Chimiques B1 à B42 suivantes:

[Formule Chimique B1]

[Formule Chimique B2]

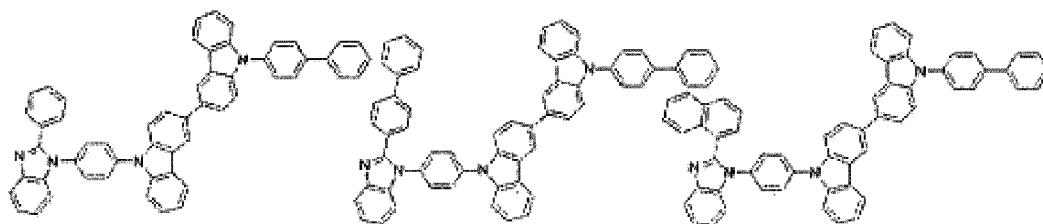
[Formule Chimique B3]



[Formule Chimique B4]

[Formule Chimique B5]

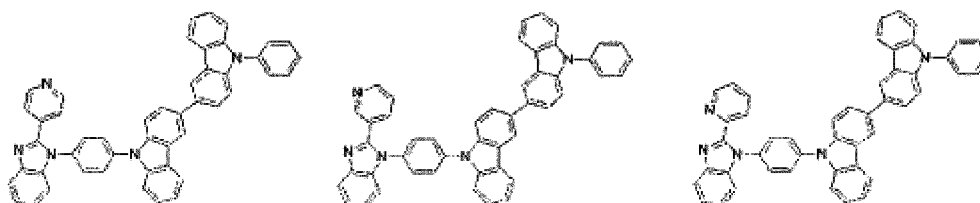
[Formule Chimique B6]



[Formule Chimique B7]

[Formule Chimique B8]

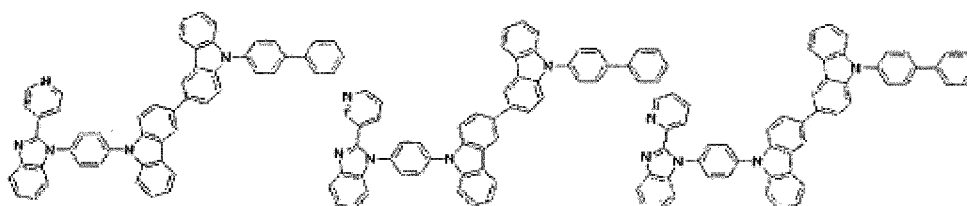
[Formule Chimique B9]



[Formule Chimique B10]

[Formule Chimique B11]

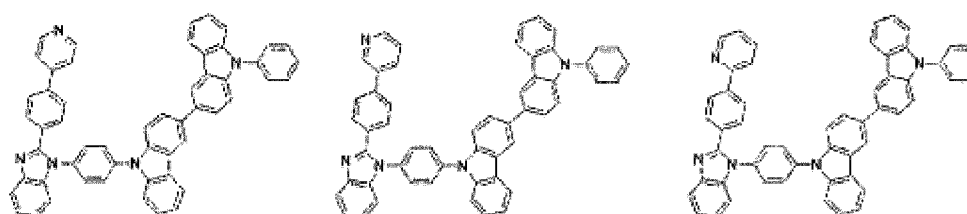
[Formule Chimique B12]



[Formule Chimique B13]

[Formule Chimique B14]

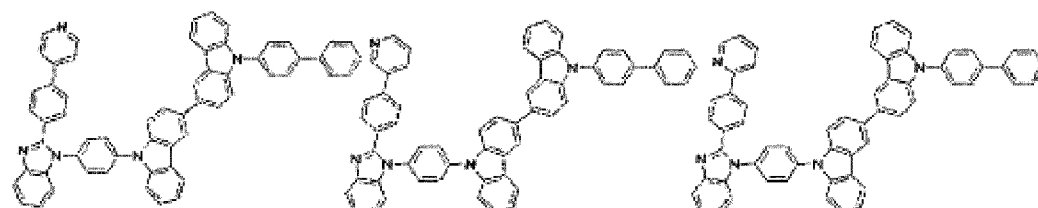
[Formule Chimique B15]



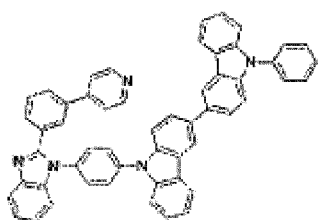
[Formule Chimique B16]

[Formule Chimique B17]

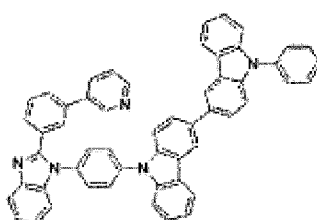
[Formule Chimique B18]



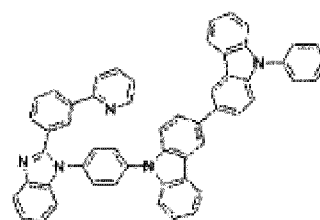
[Formule Chimique B19]



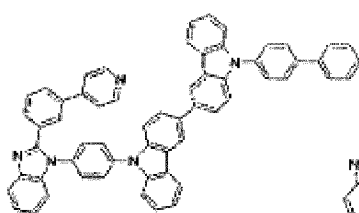
[Formule Chimique B20]



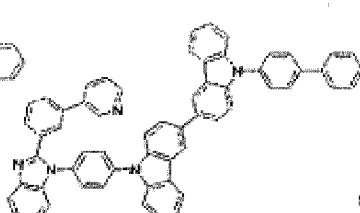
[Formule Chimique B21]



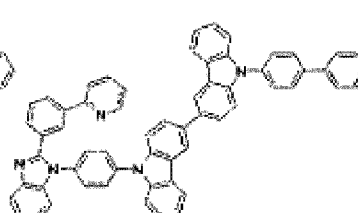
[Formule Chimique B22]



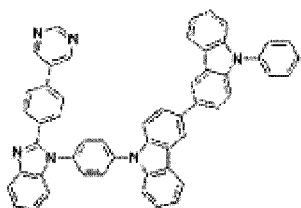
[Formule Chimique B23]



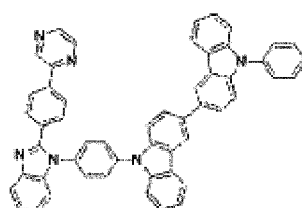
[Formule Chimique B24]



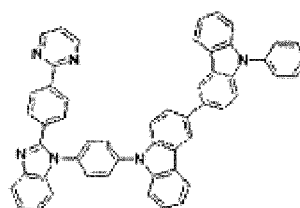
[Formule Chimique B25]



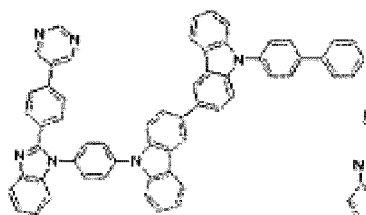
[Formule Chimique B26]



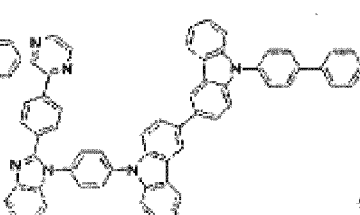
[Formule Chimique B27]



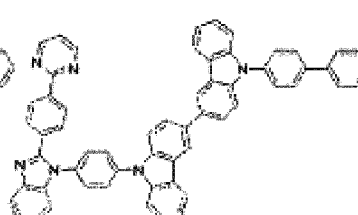
[Formule Chimique B28]



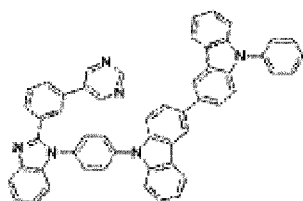
[Formule Chimique B29]



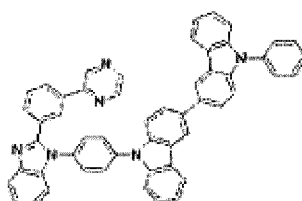
[Formule Chimique B30]



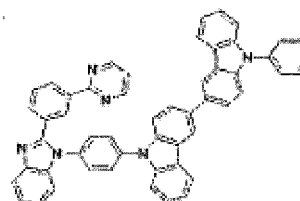
[Formule Chimique B31]



[Formule Chimique B32]



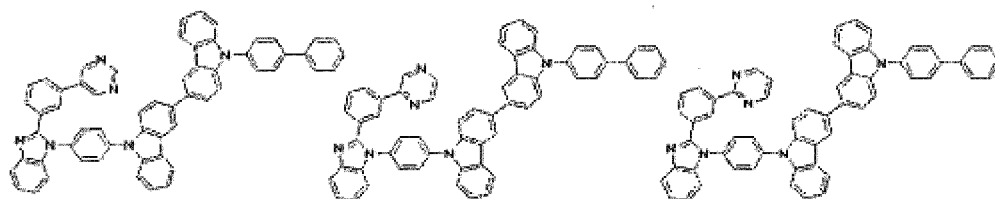
[Formule Chimique B33]



[Formule Chimique B34]

[Formule Chimique B35]

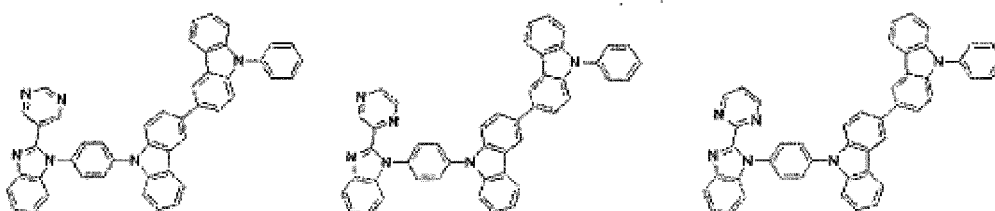
[Formule Chimique B36]



[Formule Chimique B37]

[Formule Chimique B38]

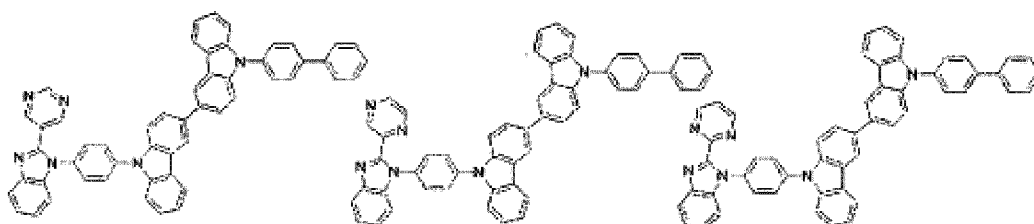
[Formule Chimique B39]



[Formule Chimique B40]

[Formule Chimique B41]

[Formule Chimique B42]

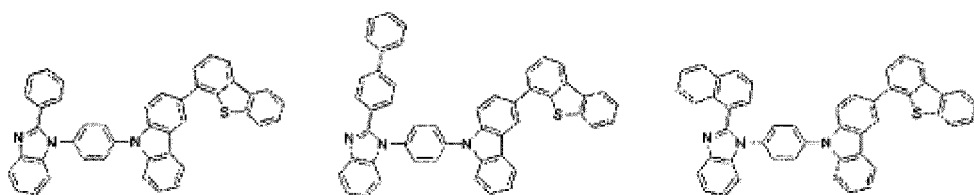


8. Composé pour un dispositif optoélectronique organique selon l'une quelconque des revendications 1 à 7, représenté par une des Formules Chimiques C1 à C42 suivantes:

[Formule Chimique C1]

[Formule Chimique C2]

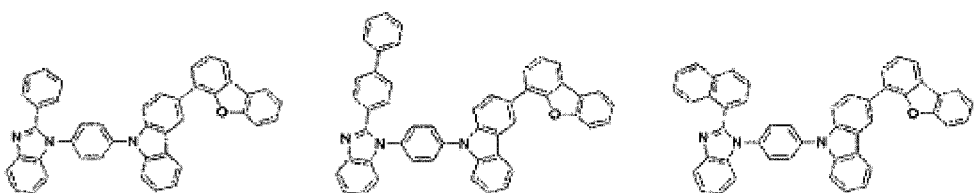
[Formule Chimique C3]



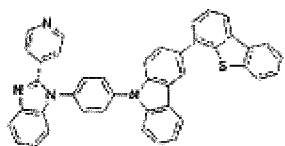
[Formule Chimique C4]

[Formule Chimique C5]

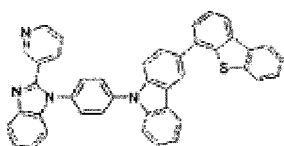
[Formule Chimique C6]



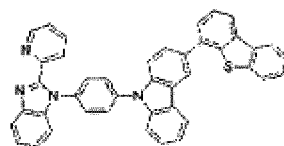
[Formule Chimique C7]



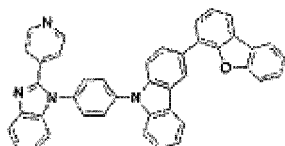
[Formule Chimique C8]



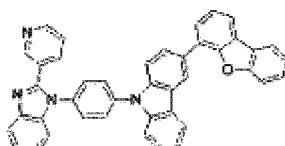
[Formule Chimique C9]



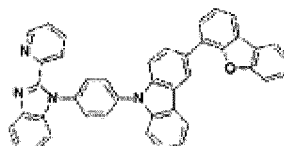
[Formule Chimique C10]



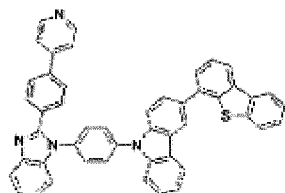
[Formule Chimique C11]



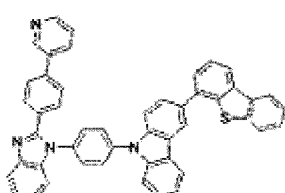
[Formule Chimique C12]



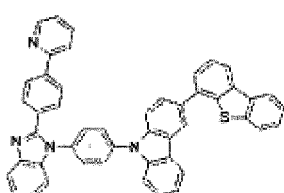
[Formule Chimique C13]



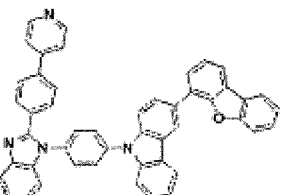
[Formule Chimique C14]



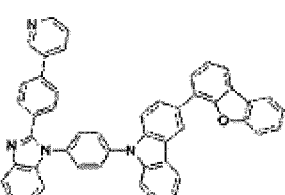
[Formule Chimique C15]



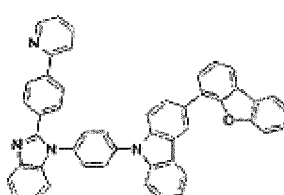
[Formule Chimique C16]



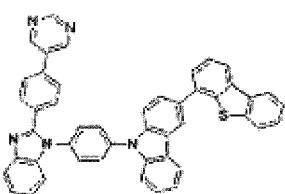
[Formule Chimique C17]



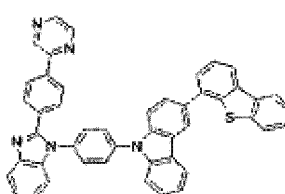
[Formule Chimique C18]



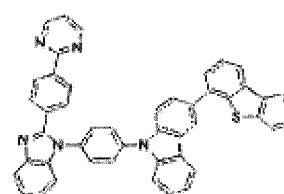
[Formule Chimique C19]



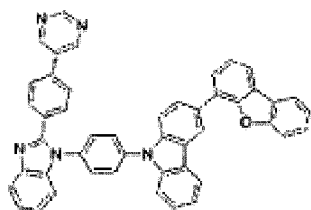
[Formule Chimique C20]



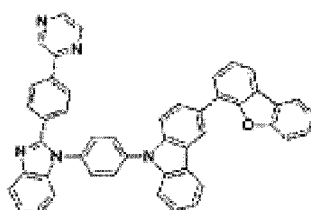
[Formule Chimique C21]



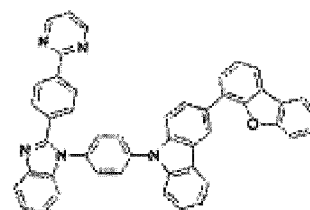
[Formule Chimique C22]



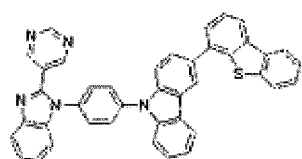
[Formule Chimique C23]



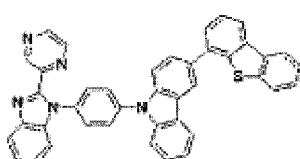
[Formule Chimique C24]



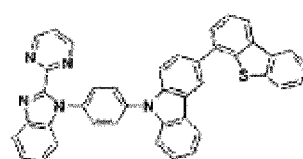
[Formule Chimique C25]



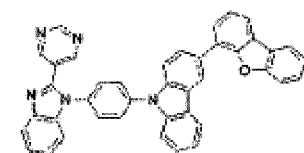
[Formule Chimique C26]



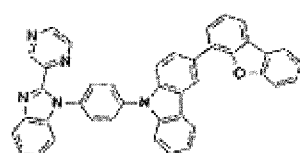
[Formule Chimique C27]



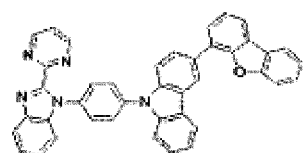
[Formule Chimique C28]



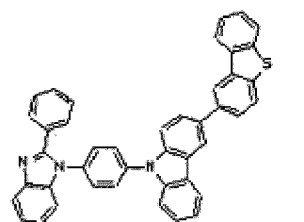
[Formule Chimique C29]



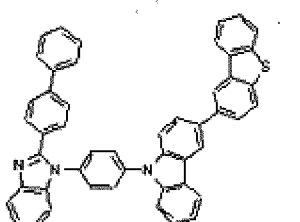
[Formule Chimique C30]



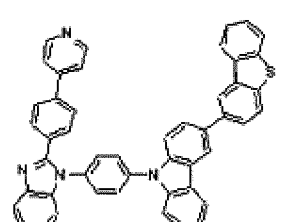
[Formule Chimique C31]



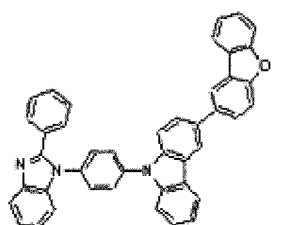
[Formule Chimique C32]



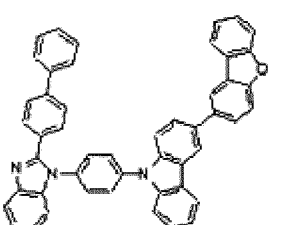
[Formule Chimique C33]



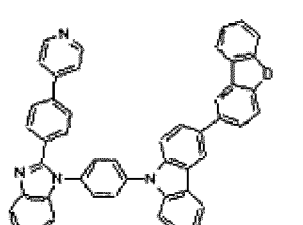
[Formule Chimique C34]



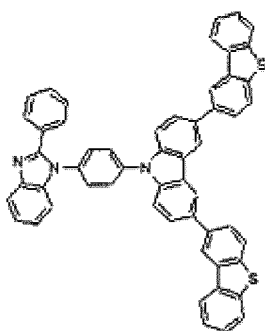
[Formule Chimique C35]



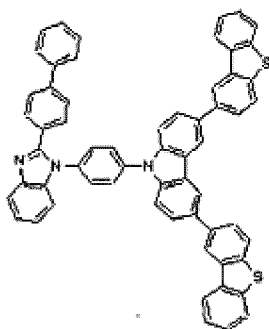
[Formule Chimique C36]



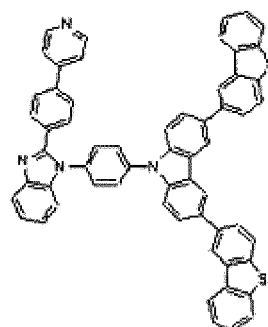
[Formule Chimique C37]



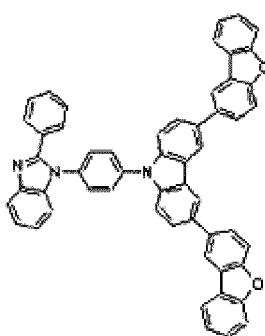
[Formule Chimique C38]



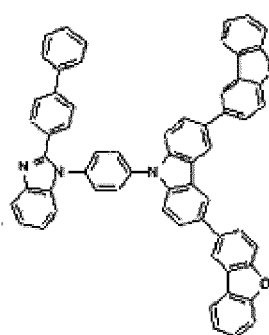
[Formule Chimique C39]



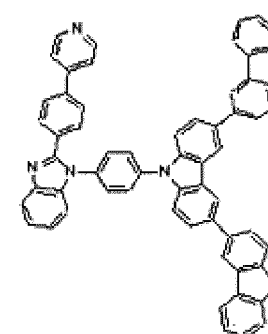
[Formule Chimique C40]



[Formule Chimique C41]



[Formule Chimique C42]



9. Diode électroluminescente organique, comprenant :

une anode, une cathode et au moins une ou plusieurs couches minces organiques entre l'anode et la cathode, dans laquelle au moins une de la couche mince organique comprend le composé pour un dispositif optoélectronique organique selon l'une quelconque des revendications 1 à 8.

FIG. 1

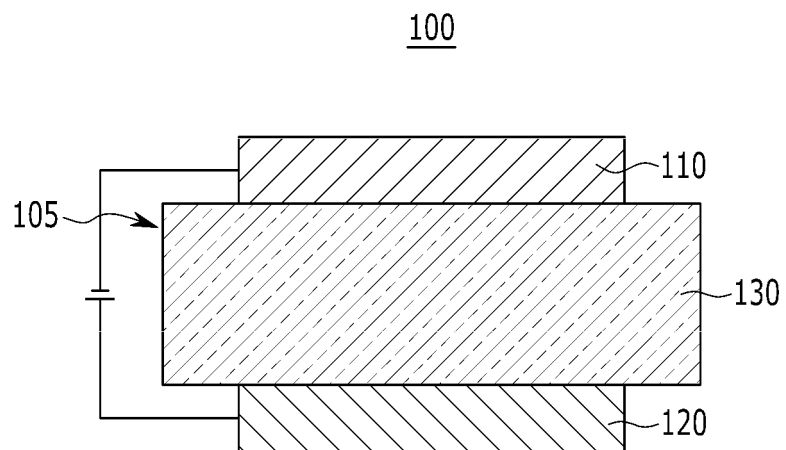


FIG. 2

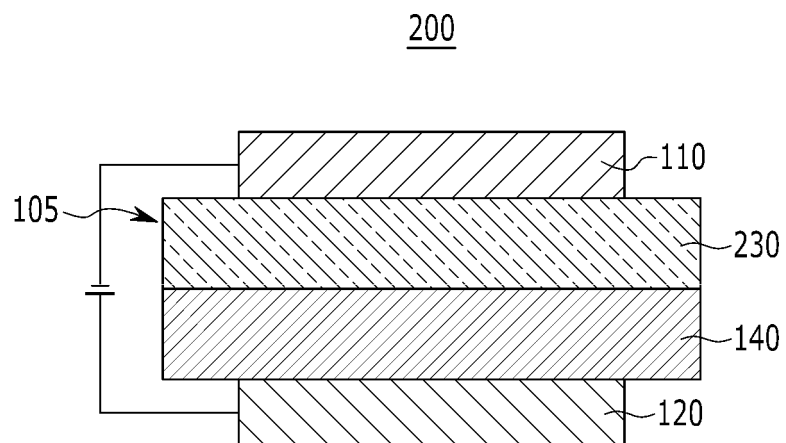


FIG. 3

300

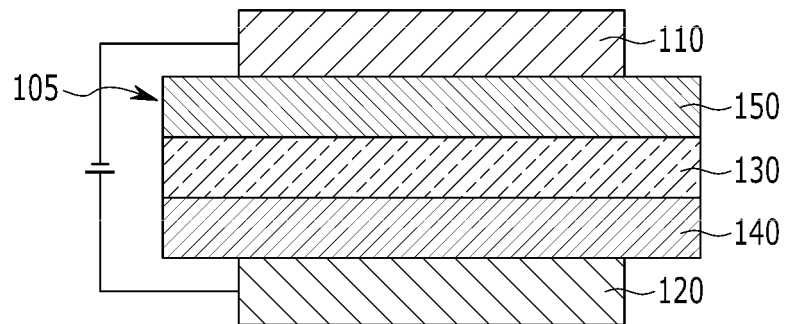


FIG. 4

400

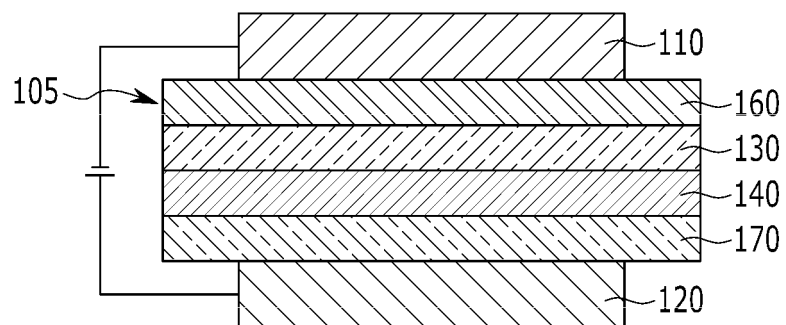
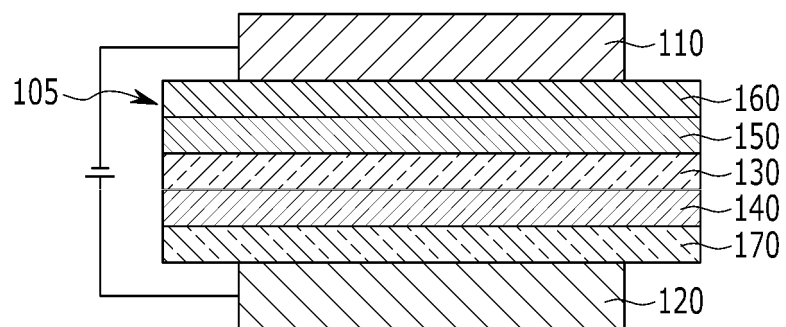


FIG. 5

500



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 201099459 A [0021]

Non-patent literature cited in the description

- **DING et al.** *Advanced Functional Materials*, 2006, 575-581 [0021]

专利名称(译)	有机光电器件化合物和包括其的有机发光元件		
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摘要(译)

本发明公开了一种用于有机光电子器件的化合物和包含该化合物的有机发光二极管，并且提供了由化学式1表示的用于有机光电子器件的化合物，以制造具有优异的电化学和热稳定性以及寿命的有机光电子器件。跨度特性，低驱动电压下的高发光效率。

[Chemical Formula 1]

