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(54) COMPOUND FOR ORGANIC OPTOELECTRONIC DEVICE, ORGANIC LIGHT EMITTING DIODE INCLUDING SAME, AND DISPLAY DEVICE INCLUDING ORGANIC LIGHT EMITTING DIODE

VERBINDUNG FÜR EINE ORGANISCHE OPTOELEKTRONISCHE VORRICHTUNG, ORGANISCHE LICHTEMITTIERENDE DIODE DAMIT UND ANZEIGEVORRICHTUNG MIT DER ORGANISCHEN LICHTEMITTIERENDEN DIODE

COMPOSÉ POUR DISPOSITIF OPTOÉLECTRONIQUE ORGANIQUE, DIODE ÉLECTROLUMINESCENTE ORGANIQUE COMPRENANT LEDIT COMPOSÉ, ET DISPOSITIF D'AFFICHAGE COMPRENANT UNE DIODE ÉLECTROLUMINESCENTE ORGANIQUE

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(56) References cited:
WO-A1-03/078541
WO-A1-03/080760
WO-A1-2006/066685
WO-A1-2008/090912
WO-A1-2011/019156
WO-A1-2011/132683
WO-A2-2011/055934
JP-A- 8 003 547
JP-A- 8 003 547
JP-A- 2008 135 498
KR-A- 20100 094 415
US-A1- 2006 046 172

Remarks:
The file contains technical information submitted after the application was filed and not included in this specification

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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and the benefit of Korean Patent Application No. 10-2010-0106077 filed in the Korean Intellectual Property Office on October 28, 2010, and Korean Patent Application No. 10-2010-0041466 filed in the Korean Intellectual Property Office on May 3, 2010.

BACKGROUND OF THE INVENTION

(a) Field of the Invention

[0002] A compound for an organic optoelectronic device, an organic light emitting diode using the compound and having excellent life-span, efficiency, electrochemical stability, and thermal stability, and a display device including the organic light emitting diode are disclosed.

(b) Description of the Related Art

[0003] An organic optoelectronic device is a device for transforming photo-energy to electrical energy or conversely, electrical energy to photo-energy.

[0004] 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).

[0005] 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.

[0006] 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.

[0007] 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.

[0008] 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 (HIL), a hole transport layer (HTL), an emission layer, an electron transport layer (ETL), and an electron injection layer (EIL), in order to improve efficiency and stability of an organic photoelectric device.

[0009] 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 rebonded to generate excitons having high energy. The generated excitons generate light having certain wavelengths while shifting to a ground state.

[0010] Recently, it has become known that a phosphorescent light emitting material can be used for a light emitting material of an organic light emitting diode in addition to the fluorescent light emitting material. Such a phosphorescent material emits lights by transporting the electrons from a ground state to an exited 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.

[0011] 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.

[0012] 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.

[0013] 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.

[0014] In order to implement excellent performance of an 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 photoelectric devices.

[0015] 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.

[0016] 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 characteristic 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.

[0017] 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, they keep being rapidly larger such as a 40-inch organic light emitting diode panel.

[0018] 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.

[0019] 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.

[0020] WO 2008/090912 A1 refers to a method for manufacturing an organic electroluminescent device being described to have high external quantum efficiency and low driving voltage. Also disclosed are an organic electroluminescent device manufactured by such a production method, an illuminating device and a display device.

[0021] JP 8003547 A describes a luminous element containing a compound having a structure in which two carbazoyl skeletons are bound to each other through a single bond

KR 2010 0094415 A describes cycloalkyl derivatives being provided to have superior color purity, power efficiency, and luminous efficiency and to obtain an organic electroluminescent device having a lifespan which is remarkably improved. In order to achive this, it is described that cycloalkyl derivatives are marked by a distinct chemical formula. The organic electroluminescent device comprises an anode, a cathode, and a layer which is placed between the anode and the cathode and includes the cycloalkyl derivatives. The cycloalkyl derivatives are included in an electroluminescent layer between the anode and the cathode. The thickness of the electroluminescent layer is 50-2,000 angstroms.

SUMMARY OF THE INVENTION

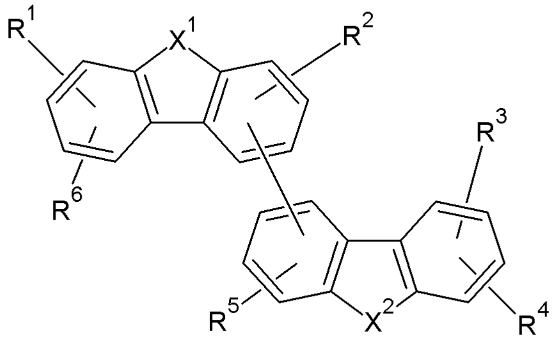
[0022] The present invention is defined by the subject-matters of the independent claims.

[0023] A compound for an organic optoelectronic device that may act as light emission, or electron injection and/or transport material, and also act as a light emitting host along with an appropriate dopant is provided.

[0024] An organic light emitting diode having excellent life-span, efficiency, driving voltage, electrochemical stability, and thermal stability is provided.

[0025] According to one aspect (not forming part of the present invention), a compound for an organic optoelectronic device represented by the following Chemical Formula 1 is provided.

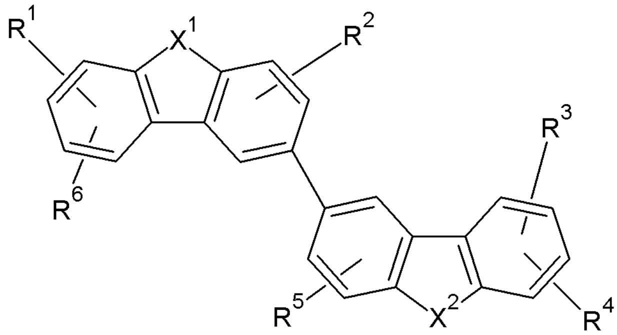
[Chemical Formula 1]



In Chemical Formula 1, X^1 and X^2 are the same or different and are independently selected from the group consisting of -NR'-, -O-, -Se-, -P-, and - S- wherein R' is selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, and at least one of R^1 to R^6 or R' is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties.

[0026] The compound for an organic optoelectronic device may be represented by the following Chemical Formula 2.

[Chemical Formula 2]



In Chemical Formula 2, X^1 and X^2 are the same or different and are independently selected from the group consisting of -NR'-, -O-, -Se-, -P-, and - S- wherein R' is selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, and at least one of R^1 to R^6 or R' is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties.

[0027] The X^1 may be -NR'-.

[0028] The R' may be selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties.

[0029] The R' may be a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties.

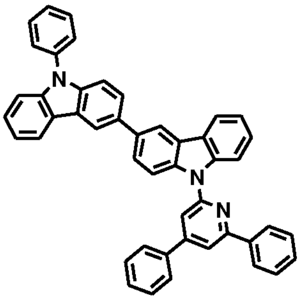
[0030] X^1 may be -NR'-, wherein R' is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, and a substituted or unsubstituted C6 to C30 aryl group.

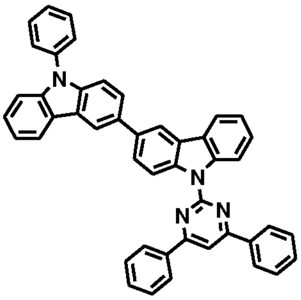
[0031] The substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties may be selected from the group consisting of a substituted or unsubstituted imidazolyl group, a substituted or unsubstituted triazolyl group, a substituted or unsubstituted tetrazolyl group, a substituted or unsubstituted oxadiazolyl group, a substituted or unsubstituted oxatriazolyl group, a substituted or unsubstituted thiatriazolyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted benzotriazolyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted pyrazinyl group, a substituted or unsubstituted pyridazinyl group, a substituted or unsubstituted quinolinyl group, a substituted or unsubstituted isoquinolinyl group, a substituted or unsubstituted phthalazinyl group, a substituted or unsubstituted naphpyridinyl group, a substituted or unsubstituted quinoxalinyl group, a substituted or unsubstituted quinazolinyl group, a substituted or unsubstituted acridinyl group, a substituted or unsubstituted phenanthrolinyl group, and a substituted or unsubstituted phenazinyl group.

[0032] According to another aspect, a compound for an organic optoelectronic device represented by one of the following Chemical Formulae 3 to 51 is provided.

[0033] Only compounds represented by Chemical Formulae 3, 6 to 48, 50 to 52 and 54 are forming part of the present invention.

[Chemical Formula 3] [Chemical Formula 4]





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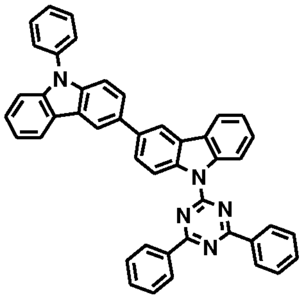
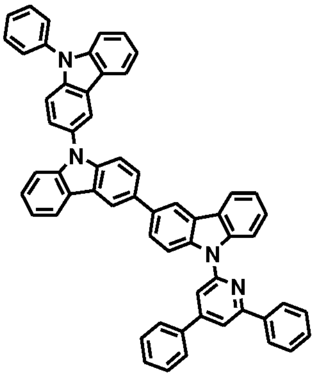
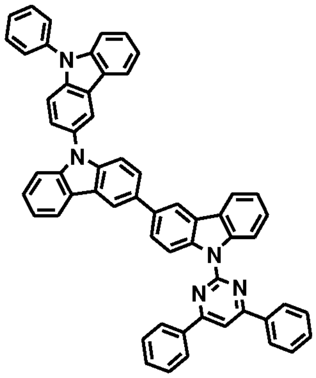
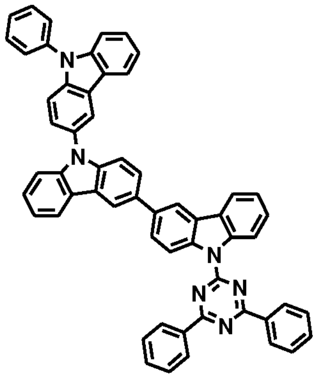


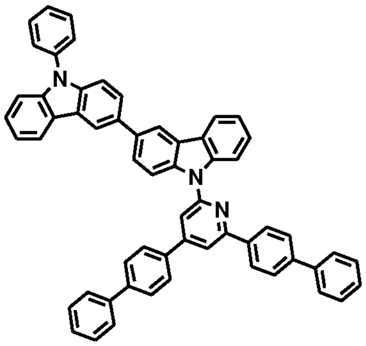


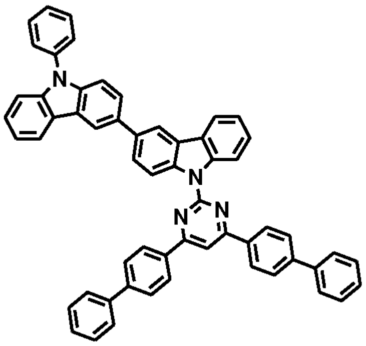
[Chemical Formula 7] [Chemical Formula 8]



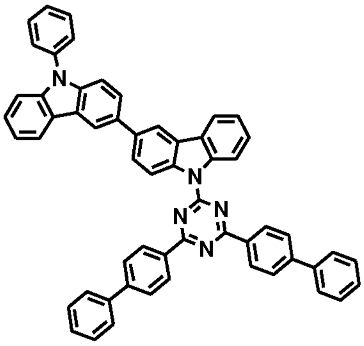


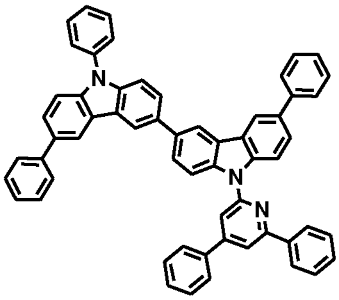
[Chemical Formula 9] [Chemical Formula 10]





[Chemical Formula 11] [Chemical Formula 12]





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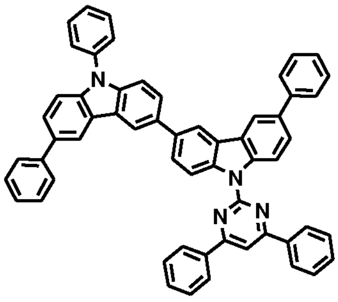

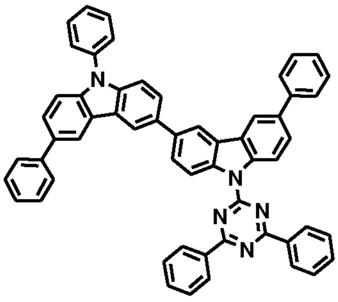

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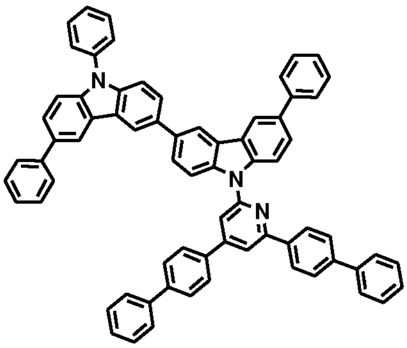

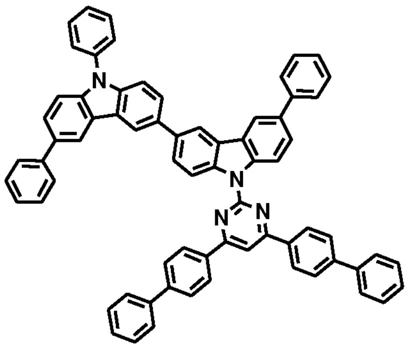

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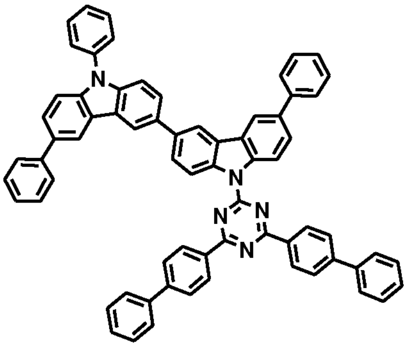

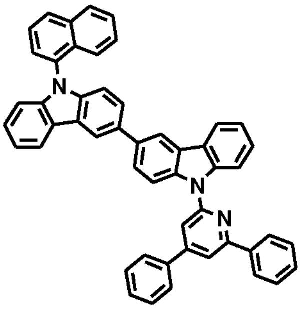

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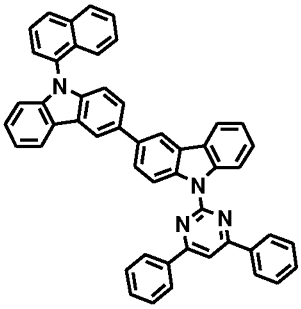

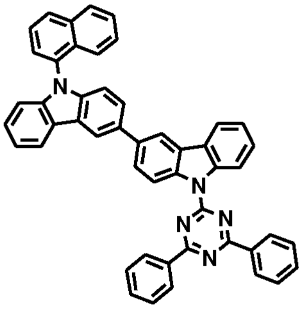

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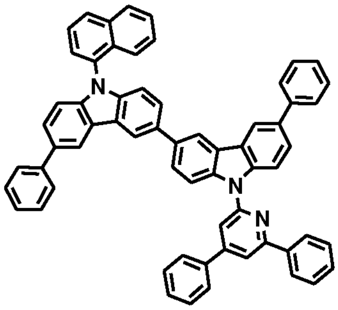

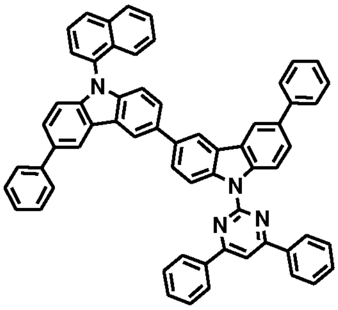

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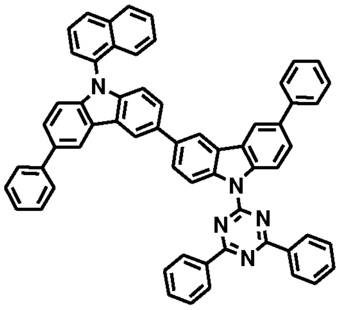

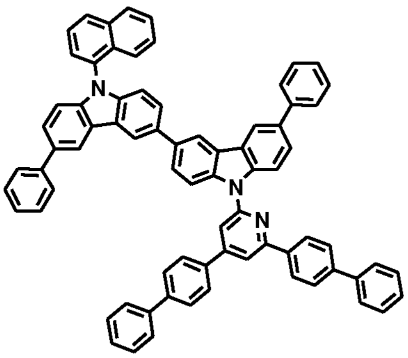

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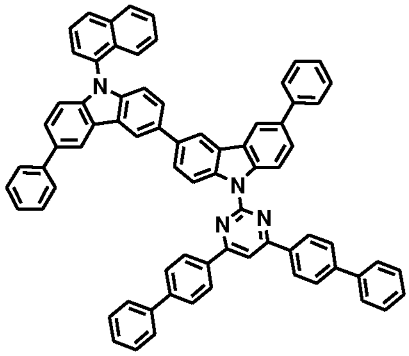

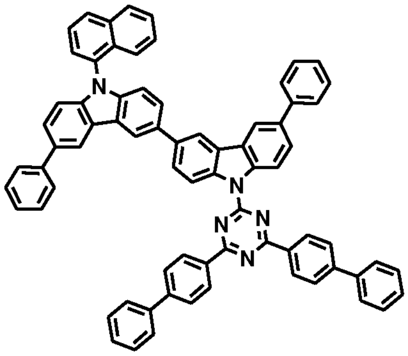

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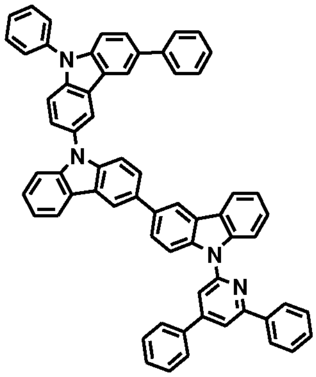

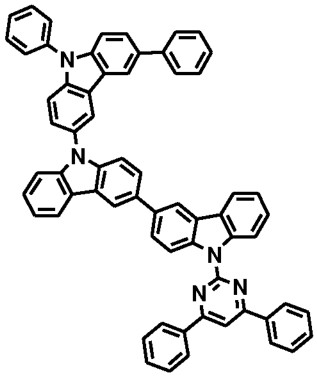

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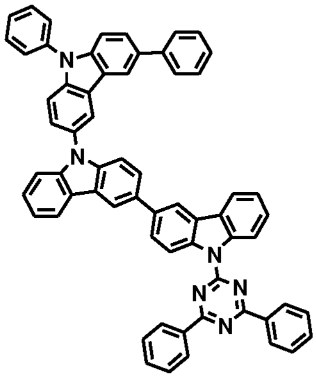

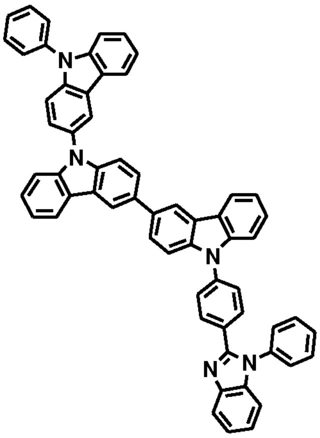

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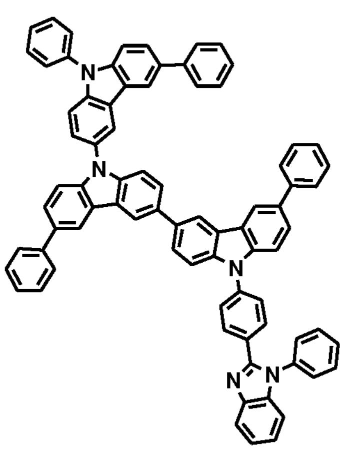

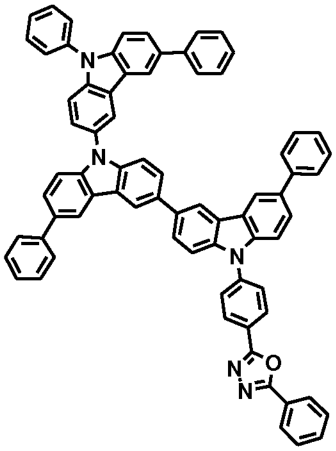

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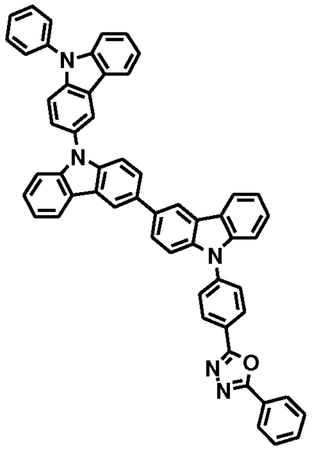

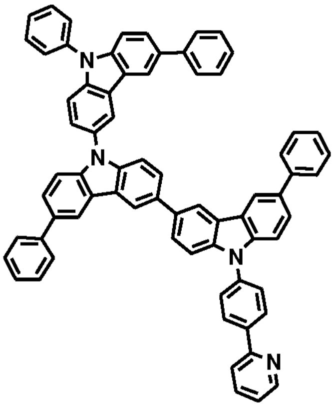

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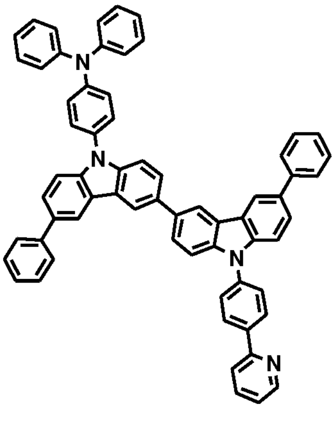
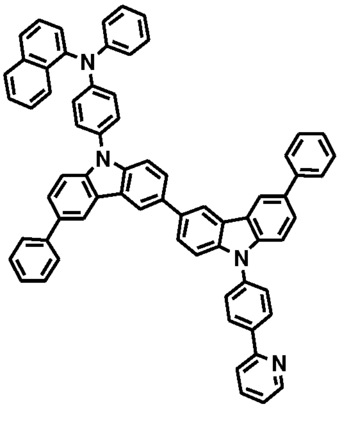
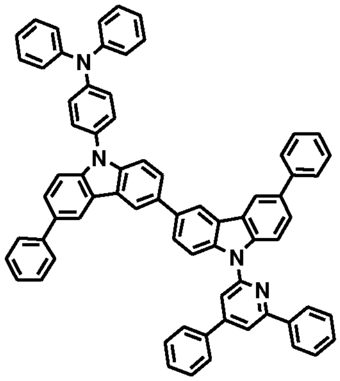
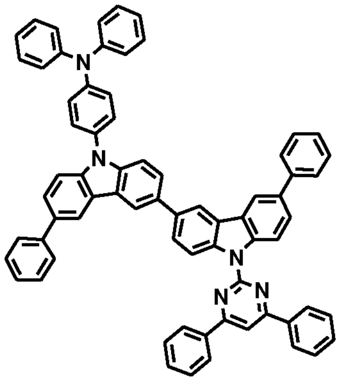


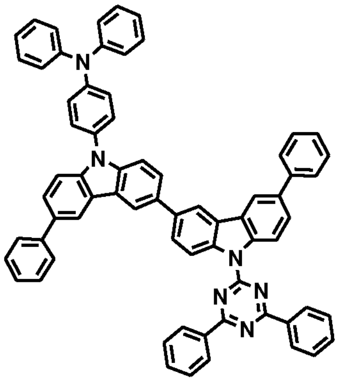


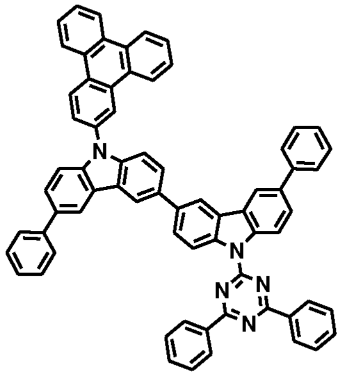
[Chemical Formula 37] [Chemical Formula 38]



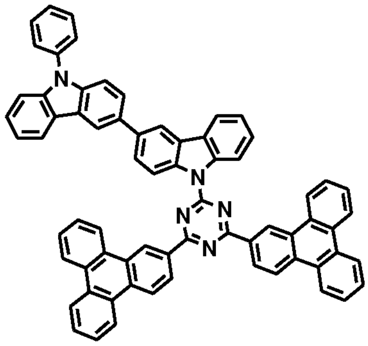


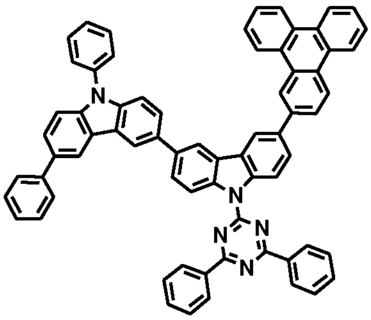
[Chemical Formula 39] [Chemical Formula 40]



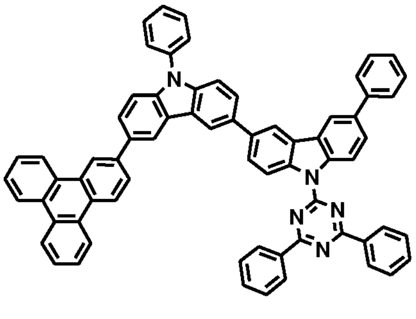


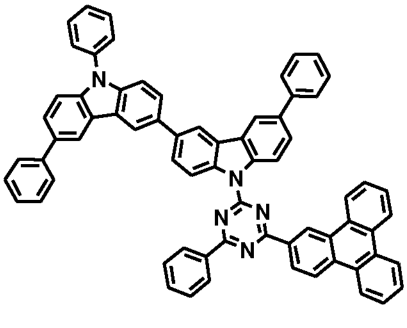
[Chemical Formula 41] [Chemical Formula 42]



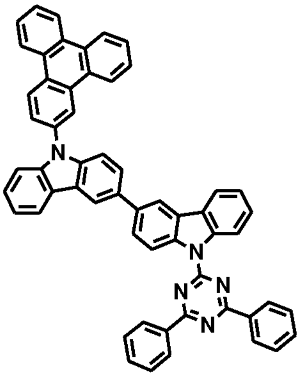


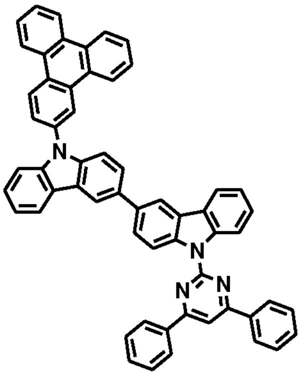
[Chemical Formula 43] [Chemical Formula 44]



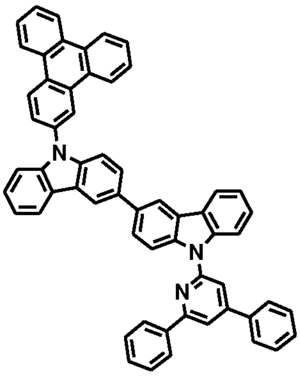


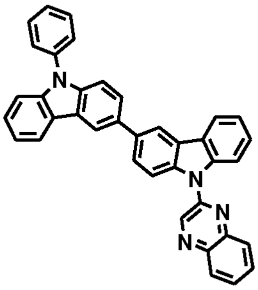
[Chemical Formula 45] [Chemical Formula 46]



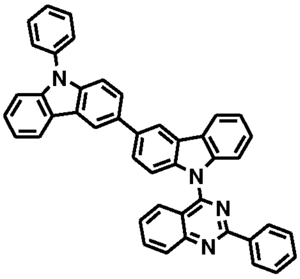


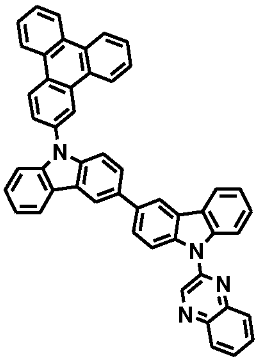
[Chemical Formula 47] [Chemical Formula 48]



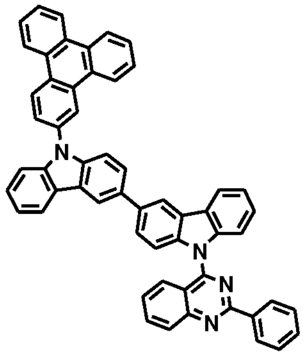


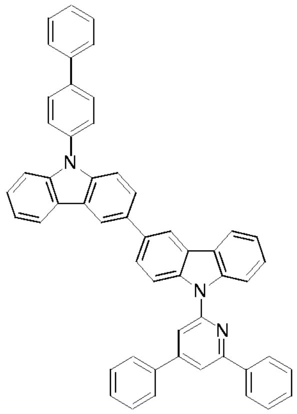
[Chemical Formula 49] [Chemical Formula 50]



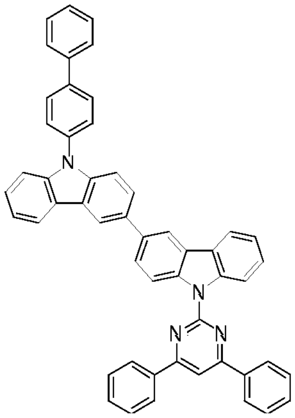


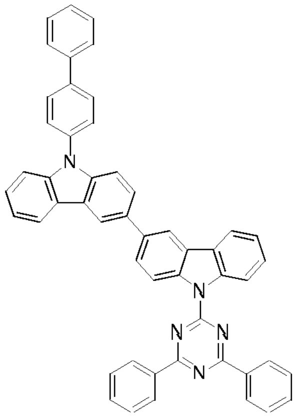
[Chemical Formula 51] [Chemical Formula 52]





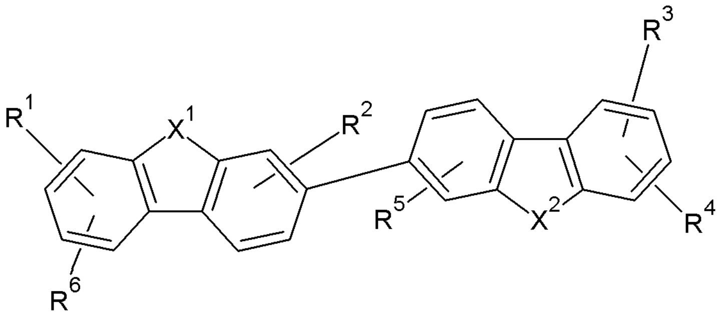
[Chemical Formula 53] [Chemical Formula 54]



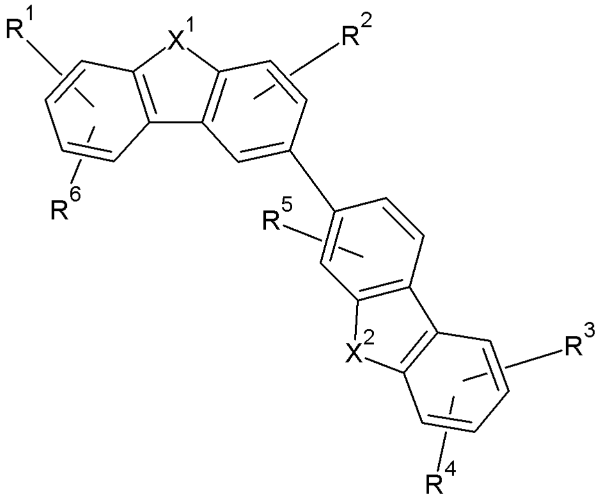


[0034] A compound for an organic optoelectronic device may be represented by the following Chemical Formula A or A-1.

[Chemical Formula A]



[Chemical Formula A-1]



In Chemical Formulae A and A-1, X^1 and X^2 are the same or different and are independently selected from the group consisting of -NR'-, -O-, -Se-, -P-, and -S- wherein R' is selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, and at least one of R^1 to R^6 or R' is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties.

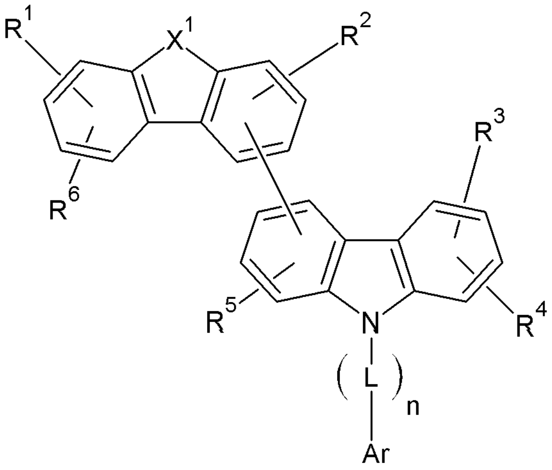
[0035] At least one of X^1 or X^2 is -NR'-, wherein R' is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, and a substituted or unsubstituted C6 to C30 aryl group.

[0036] At least one of X^1 or X^2 is -NR'-, wherein R' is a substituted or unsubstituted triphenylenyl group.

[0037] The substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties is selected from the group consisting of a substituted or unsubstituted imidazolyl group, a substituted or unsubstituted triazolyl group, a substituted or unsubstituted tetrazolyl group, a substituted or unsubstituted oxadiazolyl group, a substituted or unsubstituted oxatriazolyl group, a substituted or unsubstituted thiatriazolyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted benzotriazolyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted pyrazinyl group, a substituted or unsubstituted pyridazinyl group, a substituted or unsubstituted furinyl group, a substituted or unsubstituted quinolinyl group, a substituted or unsubstituted isoquinolinyl group, a substituted or unsubstituted phthalazinyl group, a substituted or unsubstituted naphpyridinyl group, a substituted or unsubstituted quinoxalinyl group, a substituted or unsubstituted quinazolinyl group, a substituted or unsubstituted acridinyl group, a substituted or unsubstituted phenanthrolinyl group, and a substituted or unsubstituted phenazinyl group.

[0038] A compound for an organic optoelectronic device may be represented by the following Chemical Formula B.

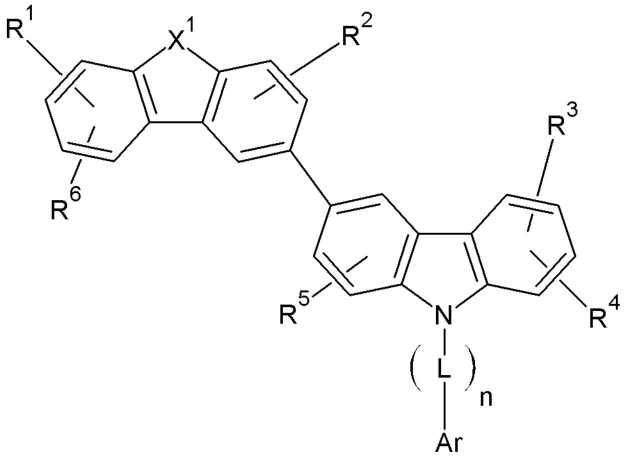
[Chemical Formula B]



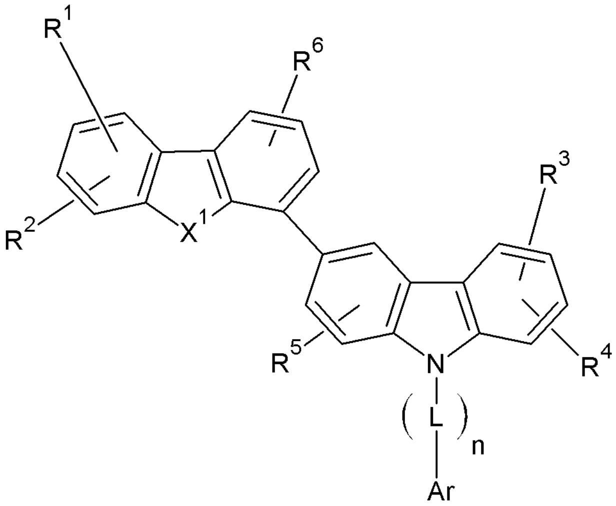
In Chemical Formula B, X^1 is selected from the group consisting of -O-, - Se-, -P-, and -S-, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group, Ar is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, L is a single bond, a substituted or unsubstituted C2 to C10 alkenylene group, a substituted or unsubstituted C2 to C10 alkynylene group, a substituted or unsubstituted C6 to C30 arylene group, and a substituted or unsubstituted C2 to C30 heteroarylene group, and n is an integer of 0 to 2.

[0039] A compound for an organic optoelectronic device may be represented by the following Chemical Formula B-1 or B-2.

[Chemical Formula B-1]



[Chemical Formula B-2]

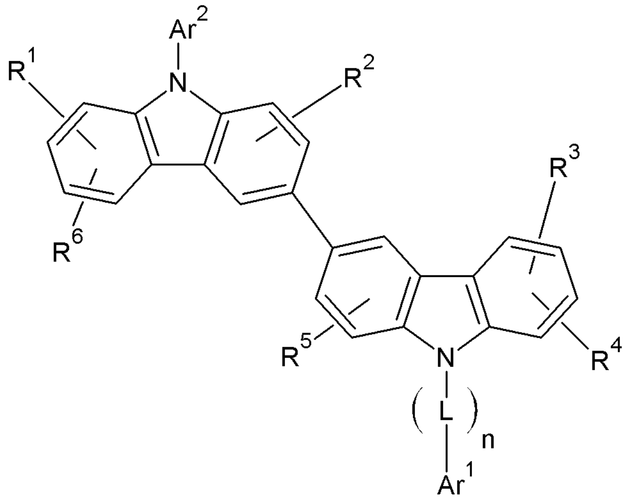


In Chemical Formulae B-1 and B-2, X^1 is selected from the group consisting of -O-, -Se-, -P-, and -S-, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group, Ar is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, L is selected from the group consisting of a single bond, a substituted or unsubstituted C2 to C10 alkenylene group, a substituted or unsubstituted C2 to C10 alkynylene group, a substituted or unsubstituted C6 to C30 arylene group, and a substituted or unsubstituted C2 to C30 heteroarylene group, and n is an integer of 0 to 2.

[0040] The substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties may be selected from the group consisting of a substituted or unsubstituted imidazolyl group, a substituted or unsubstituted triazolyl group, a substituted or unsubstituted tetrazolyl group, a substituted or unsubstituted oxadiazolyl group, a substituted or unsubstituted oxatriazolyl group, a substituted or unsubstituted thiatriazolyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted benzotriazolyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted pyrazinyl group, a substituted or unsubstituted pyridazinyl group, a substituted or unsubstituted furinyl group, a substituted or unsubstituted quinolinyl group, a substituted or unsubstituted isoquinolinyl group, a substituted or unsubstituted phthalazinyl group, a substituted or unsubstituted naphpyridinyl group, a substituted or unsubstituted quinoxalinyl group, a substituted or unsubstituted quinazolinyl group, a substituted or unsubstituted acridinyl group, a substituted or unsubstituted phenanthrolinyl group, and a substituted or unsubstituted phenazinyl group.

[0041] A compound for an organic optoelectronic device may be represented by the following Chemical Formula C.

[Chemical Formula C]



In Chemical Formula C, R^1 to R^6 and Ar^2 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group, Ar^1 is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, L is selected from the group consisting of a single bond, a substituted or unsubstituted C2 to C10 alkenylene group, a substituted or unsubstituted C2 to C10 alkynylene group, a substituted or unsubstituted C6 to C30 arylene group and substituted or unsubstituted C2 to C30 heteroarylene group, and n is1 or 2.

[0042] The Ar^2 may be a substituted or unsubstituted triphenylenyl group.

[0043] The substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties may be selected from the group consisting of a substituted or unsubstituted imidazolyl group, a substituted or unsubstituted triazolyl group, a substituted or unsubstituted tetrazolyl group, a substituted or unsubstituted oxadiazolyl group, a substituted or unsubstituted oxatriazolyl group, a substituted or unsubstituted thiatriazolyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted benzotriazolyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted pyrazinyl group, a substituted or unsubstituted pyridazinyl group, a substituted or unsubstituted furinyl group, a substituted or unsubstituted quinolinyl group, a substituted or unsubstituted isoquinolinyl group, a substituted or unsubstituted phthalazinyl group, a substituted or unsubstituted naphpyridinyl group, a substituted or unsubstituted quinoxalinyl group, a substituted or unsubstituted quinazolinyl group, a substituted or unsubstituted acridinyl group, a substituted or unsubstituted phenanthrolinyl group, and a substituted or unsubstituted phenazinyl group.

[0044] The organic optoelectronic device may be selected from the group consisting of an organic optoelectronic device, 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.

[0045] According to yet another aspect, an organic light emitting diode including an anode, a cathode, and at least one or more organic thin layer between the anode and the cathode is provided. At least one of the organic thin layer includes the compound for an organic optoelectronic device described above.

[0046] The organic thin layer may be selected from the group consisting of an emission layer, a hole transport layer (HTL), a hole injection layer (HIL), an electron transport layer (ETL), an electron injection layer (EIL), a hole blocking layer, and a combination thereof.

[0047] The compound for an organic optoelectronic device may be included in an electron transport layer (ETL) or an electron injection layer (EIL).

[0048] The compound for an organic optoelectronic device may be included in an emission layer.

[0049] The compound for an organic optoelectronic device may be used as a phosphorescent or fluorescent host material in an emission layer.

[0050] The compound for an organic optoelectronic device may be used as a fluorescent blue dopant material in an emission layer.

[0051] According to still another aspect, a display device including the organic light emitting diode is provided.

[0052] An organic light emitting diode having excellent electrochemical and thermal stability and life-span characteristics, and high luminous efficiency at a low driving voltage may be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0053] FIGS. 1 to 5 are cross-sectional views showing organic light emitting diodes according to various embodiments including compound for an organic optoelectronic device.

DETAILED DESCRIPTION

[0054] Exemplary embodiments will hereinafter be described in detail. However, these embodiments are only exemplary, and the present invention is not limited thereto but rather is defined by the scope of the appended claims.

[0055] As used herein, when specific definition is not otherwise provided, the term "substituted" refers to one substituted with deuterium, a halogen, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C3 to C40 silyl group, a C1 to C30 alkyl group, a C1 to C10 an alkylsilyl group, a C3 to C30 cycloalkyl group, a C6 to C30 aryl group, a C1 to C20 alkoxy group, a fluoro group, a C1 to C10 trifluoro alkyl group such as trifluoromethyl group, or a cyano group, instead of hydrogen of a compound.

[0056] As used herein, when specific definition is not otherwise provided, the term "hetero" refers to one including 1 to 3 hetero atoms selected from the group consisting of N, O, S, and P, and remaining carbons in one functional group.

[0057] As used herein, when a definition is not otherwise provided, the term "combination thereof" refers to at least two substituents bound to each other by a linker, or at least two substituents condensed to each other.

[0058] As used herein, when a definition is not otherwise provided, the term "alkyl group" refers to an aliphatic hydrocarbon group. The alkyl group may be a "saturated alkyl group" that does not include a double bond or triple bond. In addition, the alkyl group may be branched, linear, or cyclic.

[0059] 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.

[0060] For example, a C1 to C4 alkyl group may have 1 to 4 carbon atoms and may be selected from the group consisting of methyl, ethyl, propyl, iso-propyl, n-butyl, iso-butyl, sec-butyl, and t-butyl.

[0061] For example, the alkyl group may be 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 prophenyl group, a butenyl group, a cyclopropyl group, a cyclobutyl group, a cyclopentyl group, a cyclohexyl group, and the like.

[0062] "Aromatic group" is a cyclic functional group where all elements have p-orbitals, and these p-orbitals forms conjugation. Specific examples are an aryl group and a heteroaryl group.

[0063] "Aryl group" includes monocyclic or fused ring polycyclic (i.e., rings sharing adjacent pairs of carbon atoms) groups.

[0064] "Heteroaryl group" may refer to an aryl group including 1 to 3 hetero atoms selected from the group consisting of N, O, S, and P, and remaining carbons. The aryl group may be a fused ring cyclic group where each cycle may include the 1 to 3 heteroatoms.

[0065] "Spiro structure" may refer 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.

[0066] In this specification, hole properties refer to characteristic that hole formed in the positive electrode is easily injected into the emission layer and transported in the emission layer due to conductive characteristic according to HOMO level.

[0067] In this specification, electronic properties refer to characteristic that electron formed in the negative electrode is easily injected into the emission layer and transported in the emission layer due to conductive characteristics according to LUMO level.

[0068] A compound for an organic optoelectronic device according to one embodiment includes a core part including two carbazole or carbazole-based derivatives bonded to each other and a substituent selectively bonded to the core part.

[0069] At least one of the substituents bonded to the core part may be a substituent having excellent electronic properties.

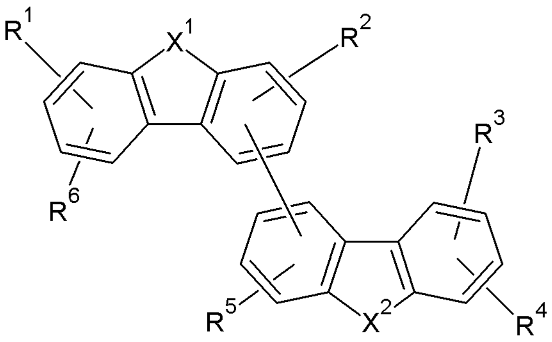
[0070] Accordingly, the compound may satisfy requirements of an emission layer by complementing excellent hole properties of its carbazole structure with electronic properties. Specifically, the compound may be used as a host material for an emission layer.

[0071] The compound for an organic optoelectronic device includes a core part and various substituents for substituting the core part and thus may have various energy band gaps. The compound may be used in an electron injection layer (EIL) and transport layer or a hole injection layer (HIL) and transport layer.

[0072] The compound may have an appropriate energy level depending on the substituents and thus, may fortify electron transport capability of an organic photoelectric device and bring about excellent effects on efficiency and driving voltage and also, have excellent electrochemical and thermal stability and thus, improve life-span characteristic during the operation of the organic photoelectric device.

[0073] A compound for an organic optoelectronic device represented by the following Chemical Formula 1 is provided.

[Chemical Formula 1]



In Chemical Formula 1, X^1 and X^2 are the same or different and are independently selected from the group consisting of -NR'-, -O-, -Se-, -P-, and - S-.

[0074] The R' is selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties.

[0075] In other words, the compound represented by the above Chemical Formula 1 may have a carbazole or carbazole-based derivative having excellent bi-polar characteristic as a core.

[0076] R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, and at least one of R^1 to R^6 or R' is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties.

[0077] A substituent having a pi-bond of the R^1 to R^6 and R' increases a triplet energy band gap by controlling the total π-conjugation length of compound, so as to be very usefully applied to the emission layer of organic photoelectric device as phosphorescent host.

[0078] In addition, an appropriate combination of the substituents may provide a compound having excellent thermal stability or resistance against oxidation.

[0079] An appropriate combination of the substituents may provide a compound having an asymmetric bipolar characteristic. The asymmetric bipolar characteristic may improve hole and electron transport capability and thus, luminous efficiency and performance of a device.

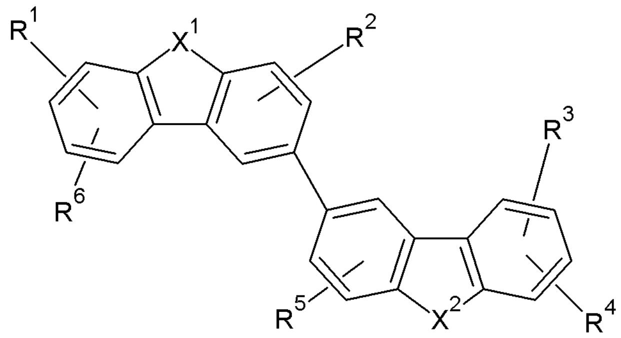
[0080] In addition, the substituents may be adjusted to make the structure of a compound bulky and thus, decrease crystallinity of the compound. Accordingly, the compound having low crystallinity may improve life-span of a device.

[0081] As aforementioned, one of the substituents of the compound is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties.

[0082] The substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties may include a substituted or unsubstituted imidazolyl group, a substituted or unsubstituted triazolyl group, a substituted or unsubstituted tetrazolyl group, a substituted or unsubstituted oxadiazolyl group, a substituted or unsubstituted oxatriazolyl group, a substituted or unsubstituted thiatriazolyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted benzotriazolyl group, a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted pyrazinyl group, a substituted or unsubstituted pyridazinyl group, a substituted or unsubstituted quinolinyl group, a substituted or unsubstituted isoquinolinyl group, a substituted or unsubstituted phthalazinyl group, a substituted or unsubstituted naphpyridinyl group, a substituted or unsubstituted quinoxalinyl group, a substituted or unsubstituted quinazolinyl group, a substituted or unsubstituted acridinyl group, a substituted or unsubstituted phenanthrolinyl group, and a substituted or unsubstituted phenazinyl group, and the like.

[0083] The compound represented by the above Chemical Formula 1 for an organic optoelectronic device may be represented by the following Chemical Formula 2.

[Chemical Formula 2]



[0084] In other words, a carbazole or carbazole-based derivative as a core may be bonded as shown in the above Chemical Formula 2. The carbazole or carbazole-based derivative is bonded where a compound good reactivity, which may be advantageous for synthesis of the compound.

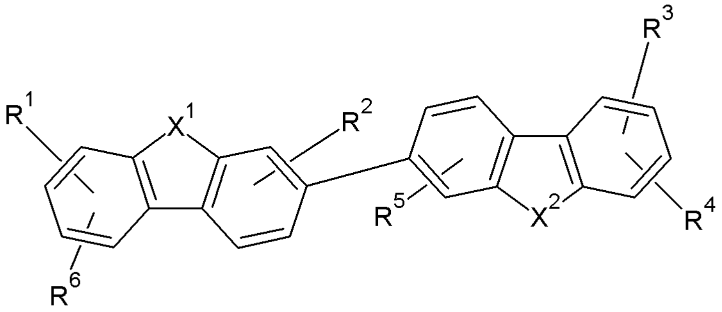
[0085] In the above Chemical Formula 1 or 2, X^1 and X^2 may be the aforementioned hetero atoms and the same or different. Specifically, X^1 and X^2 may be -NR'-.

[0086] In the above Chemical Formula 1 or 2, the substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties may be bonded at R' when X^1 is -NR'-.

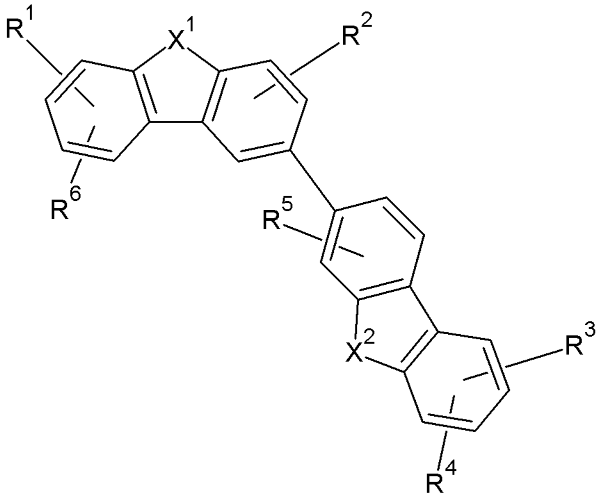
[0087] The substituted or unsubstituted C2 to C30 heteroaryl group is bonded at the R' and thus, may minimize change of the conjugation length of the compound that may change energy band and introduce a substituent having electron transfer/transport characteristic into the compound.

[0088] The compound for an organic optoelectronic device may be represented by the following Chemical Formula A or A-1.

[Chemical Formula A]



[Chemical Formula A-1]



In the above Chemical Formulae A and A-1, X^1 and X^2 are the same or different and are independently selected from the group consisting of -NR'-, -O-, -Se-, -P-, and -S- wherein R' is selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, and at least one of R^1 to R^6 or R' is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties.

[0089] The compound has a different structure from the aforementioned compound represented by Chemical Formula 1 for an organic optoelectronic device, when both of carbazolyl groups are bonded at different positions. The structure of the compound causes non-planarization of molecular structures and limits the conjugation length of the compound and thus, improves band gaps and triplet energy band gaps of the compound.

[0090] At least one of X^1 or X^2 is -NR'-, wherein R' is selected from the group consisting of a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, and a substituted or unsubstituted C6 to C30 aryl group.

[0091] At least one of X^1 or X^2 is -NR'-, wherein R' is a substituted or unsubstituted triphenylenyl group.

[0092] In the compound, the triphenylenyl group has a bulky structure and causes a resonance effect and thus, may suppress a side reaction possibly occurring in a solid state and improve performance of an organic light emitting diode.

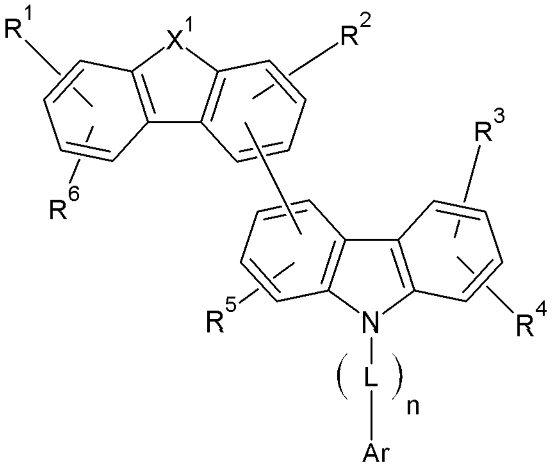
[0093] In addition, the triphenylenyl group makes the compound bulky and thus, may have an effect on lowering crystallinity and increasing life-span.

[0094] The triphenylenyl group has a wider band gap and high triplet excitation energy unlike different substitutents and thus, is bonded with carbazole but does not decrease the band gap or triplet excitation energy of the compound.

[0095] The specific substituent of the above Chemical Formula A and A-1 is similar to one in the aforementioned Chemical Formula 1 and will not be described.

[0096] A compound for an organic optoelectronic device according to the present invention is represented by the following Chemical Formula B.

[Chemical Formula B]

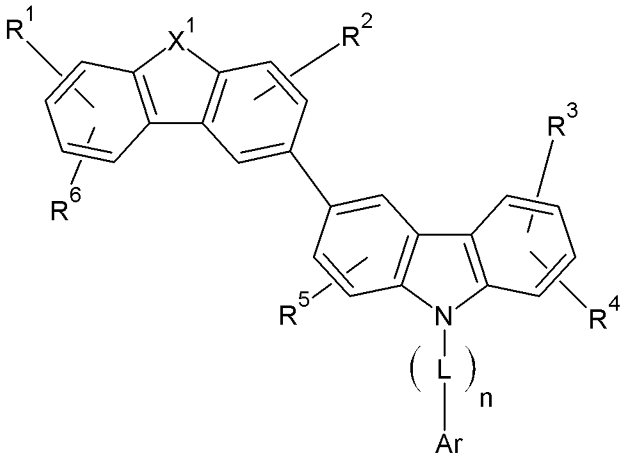


In Chemical Formula B, X^1 is selected from the group consisting of -O-, and -S-, R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group, Ar is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, L is selected from the group consisting of a single bond, a substituted or unsubstituted C2 to C10 alkenylene group, a substituted or unsubstituted C2 to C10 alkynylene group, a substituted or unsubstituted C6 to C30 arylene group, and a substituted or unsubstituted C2 to C30 heteroarylene group, and n is an integer ranging from 0 to 2.

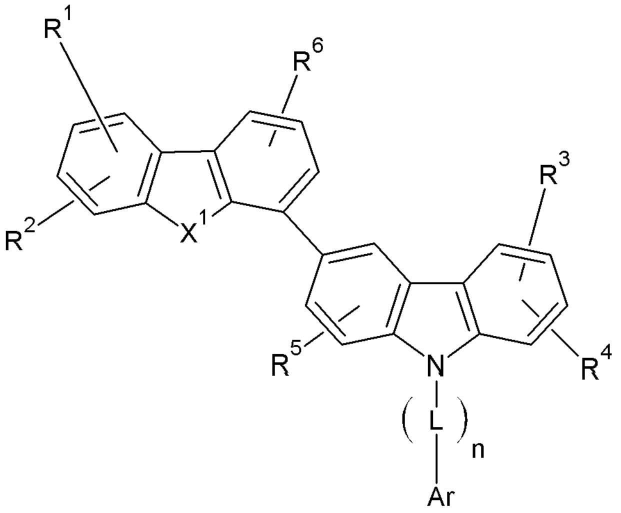
[0097] The compound represented by the above Chemical Formula B includes carbazole as one of both of the carbazole-based derivatives in the compound represented by the aforementioned Chemical Formula 1 and a carbazolyl-based derivative as the other carbazole-based derivative except for the carbazole. In addition, a substituent having electronic properties is bonded to N of the carbazole. This structure has no influence on conjugation length of the compound but includes a substituent having electronic properties.

[0098] The compound for an organic optoelectronic device may be represented by the following Chemical Formula B-1 or B-2.

[Chemical Formula B-1]



[Chemical Formula B-2]

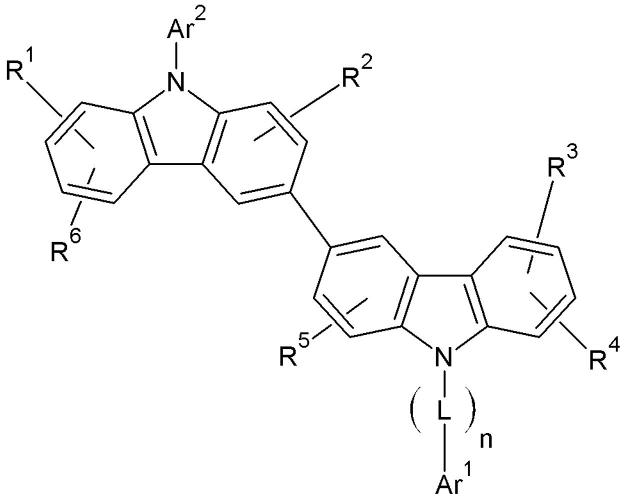


The Chemical Formulas B-1 and B-2 is obtained by limiting positions of both carbazolyl-based derivatives in the above Chemical Formula B. This core structure may appropriately adjust HOMO energy of a compound and bring about easy synthesis of the compound.

[0099] Other substituents in the above Chemical Formulas B, B-1, and B-2 are similar to the ones in the aforementioned Chemical Formula 1 and thus, will not be described.

[0100] A compound for an organic optoelectronic device may be represented by the following Chemical Formula C.

[Chemical Formula C]



In Chemical Formula C, R^1 to R^6 and Ar^2 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group, Ar^1 is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, L is selected from the group consisting of a single bond, a substituted or unsubstituted C2 to C10 alkenylene group, a substituted or unsubstituted C2 to C10 alkynylene group, a substituted or unsubstituted C6 to C30 arylene group, and a substituted or unsubstituted C2 to C30 heteroarylene group, and n is 1 or 2.

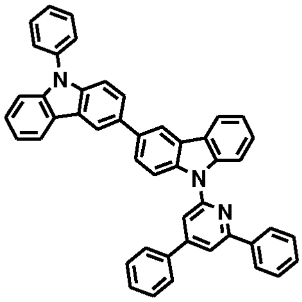
[0101] The above Chemical Formula C has a structure limiting to carbazole from both of the carbazole-based derivatives and also, the position of the carbazole in the above Chemical Formula 1. In addition, a substituent having electronic properties is bonded with the nitrogen of carbazole through a linking group. This structure has an advantage of more widely and uniformly distributing LUMO energy and thus, improving stability of the substituent having electronic properties and lowering LUMO energy band.

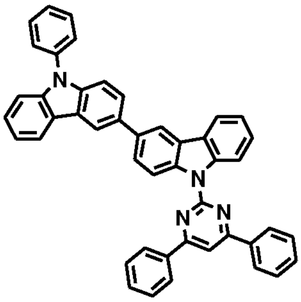
[0102] Ar^2 may be a substituted or unsubstituted triphenylenyl group. The triphenylenyl group is the same as aforementioned and will not be illustrated.

[0103] In addition, other substituents are the same as aforementioned in Chemical Formula 1 and will be omitted.

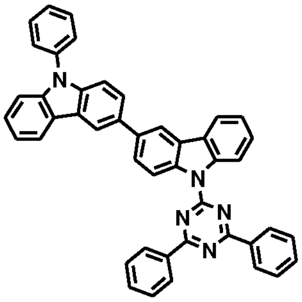
[0104] The compound for an organic optoelectronic device according to the present invention is represented by the following Chemical Formulae 3, 6 to 48, 50 to 52 and 54.

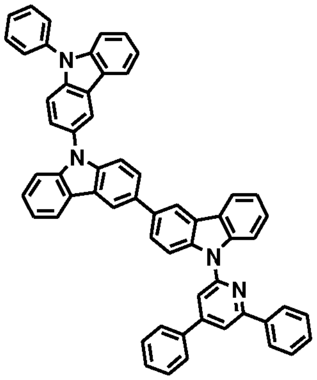
[Chemical Formula 3] [Chemical Formula 4]



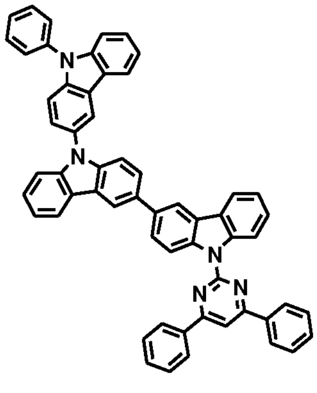


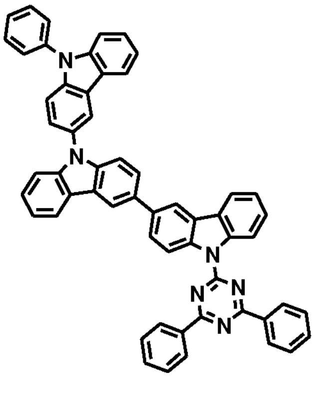
[Chemical Formula 5] [Chemical Formula 6]



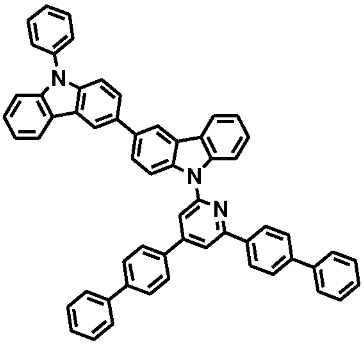


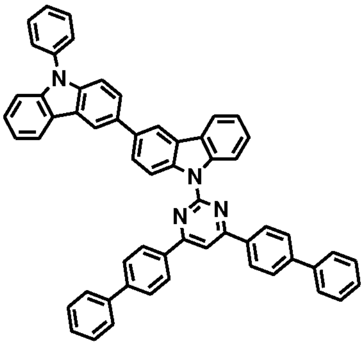
[Chemical Formula 7] [Chemical Formula 8]



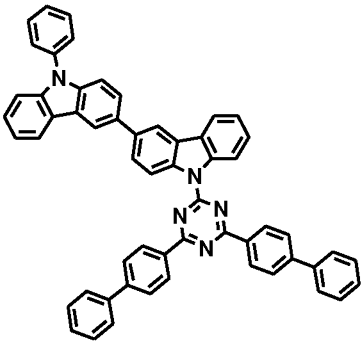


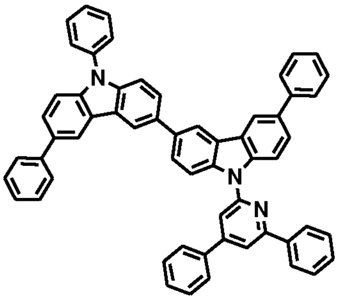
[Chemical Formula 9] [Chemical Formula 10]



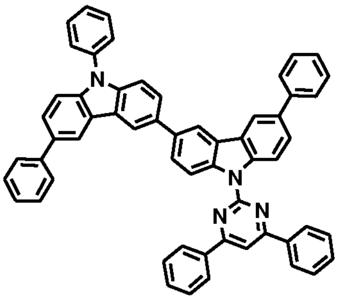


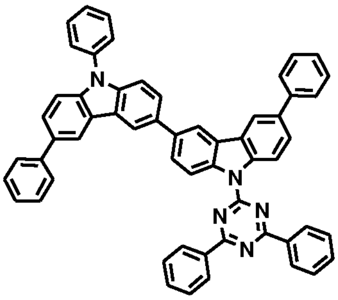
[Chemical Formula 11] [Chemical Formula 12]



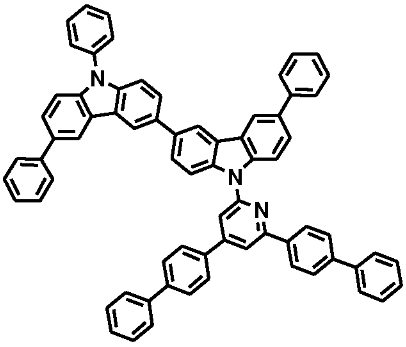


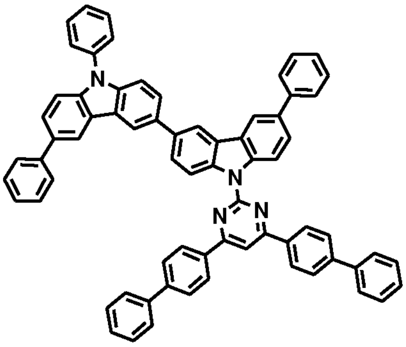
[Chemical Formula 13] [Chemical Formula 14]





[Chemical Formula 15] [Chemical Formula 16]





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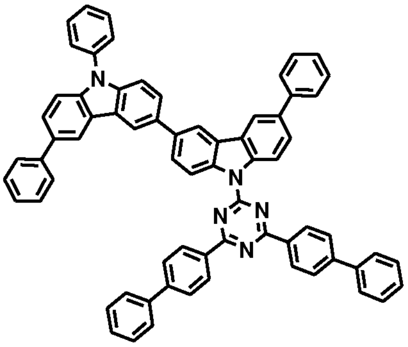

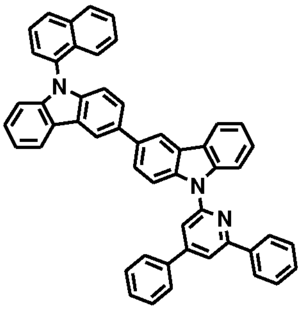

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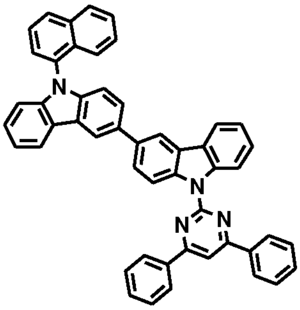
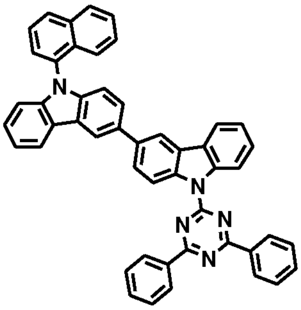
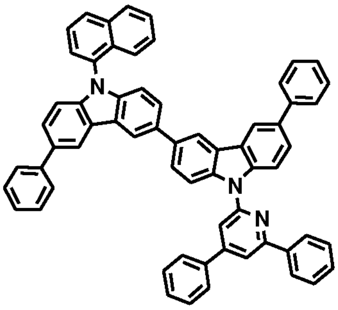
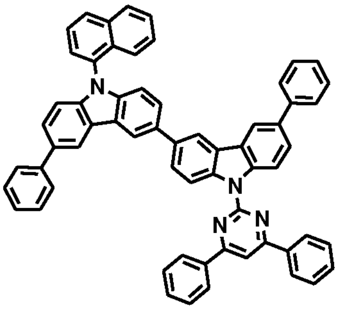




[Chemical Formula 21] [Chemical Formula 22]





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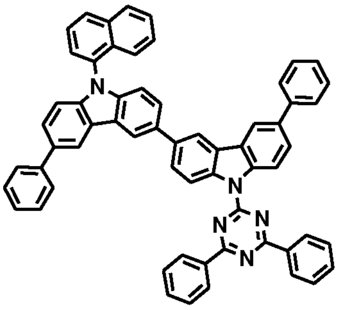
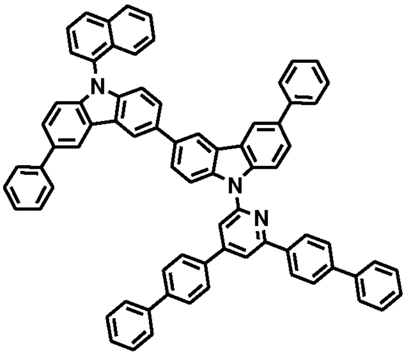
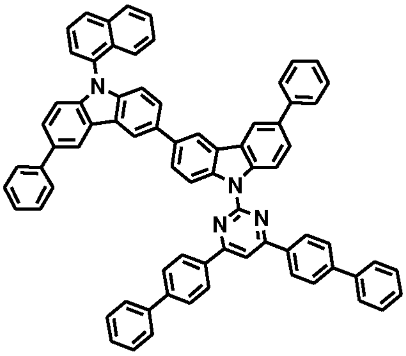
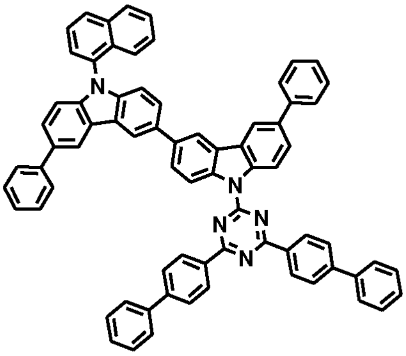


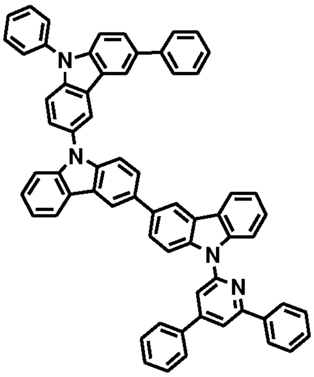


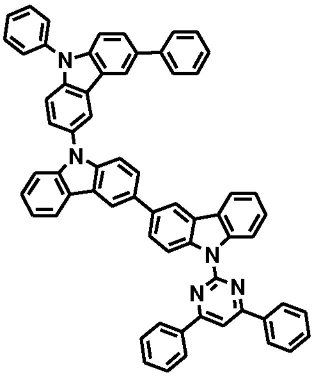
[Chemical Formula 25] [Chemical Formula 26]



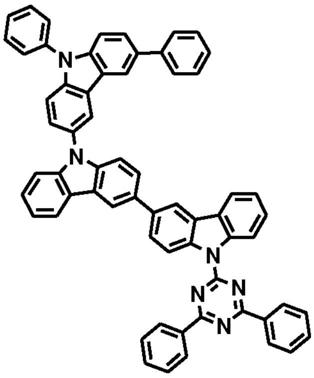


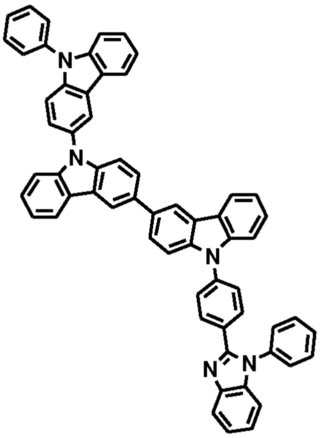
[Chemical Formula 27] [Chemical Formula 28]



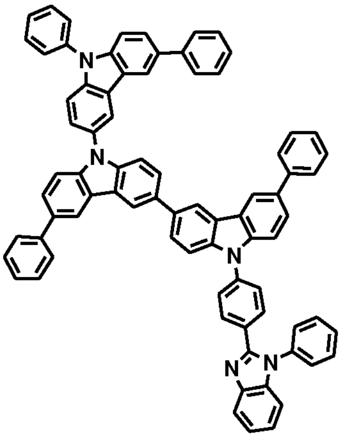


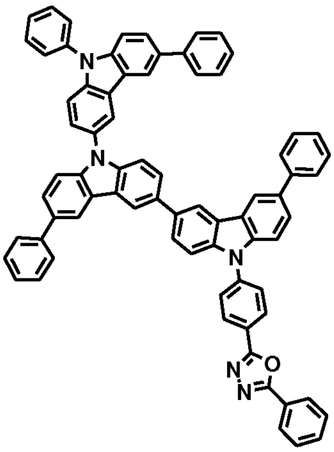
[Chemical Formula 29] [Chemical Formula 30]





[Chemical Formula 31] [Chemical Formula 32]





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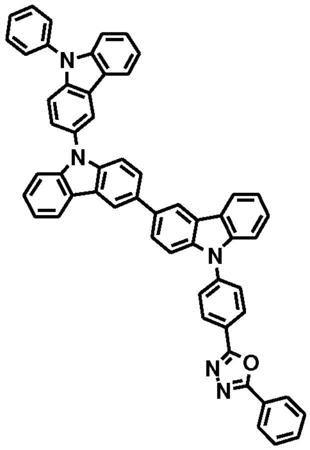

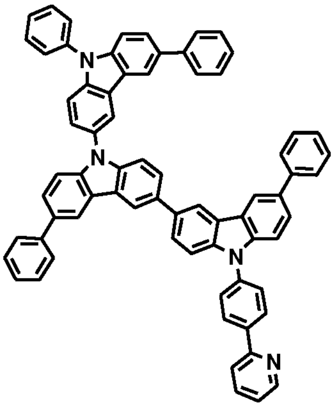

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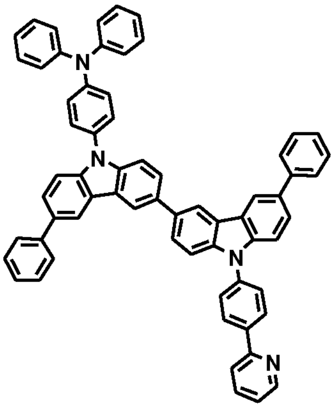

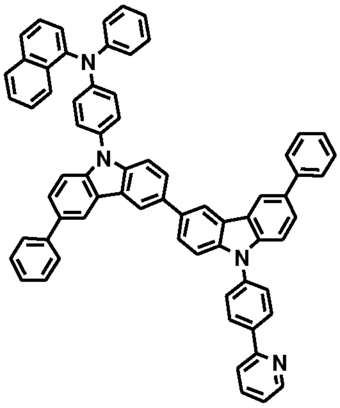

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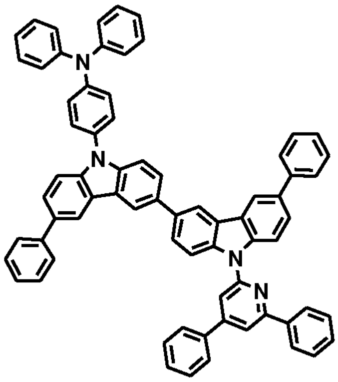
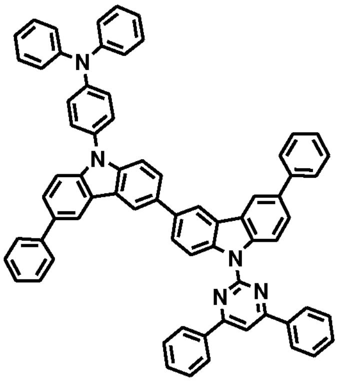
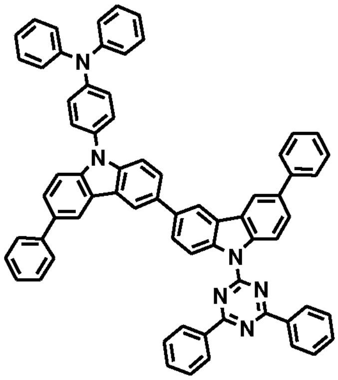
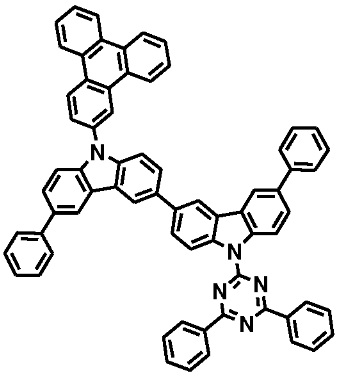


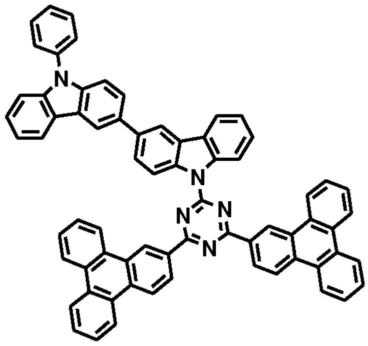


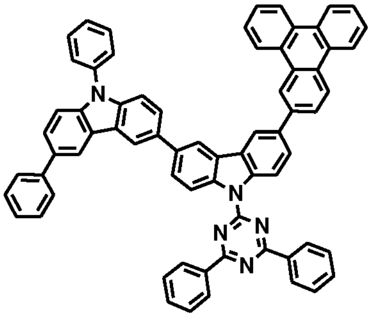
[Chemical Formula 39] [Chemical Formula 40]



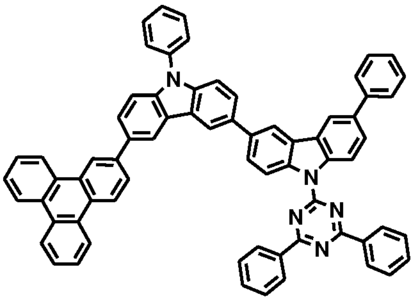


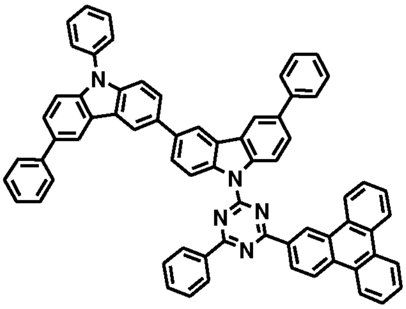
[Chemical Formula 41] [Chemical Formula 42]



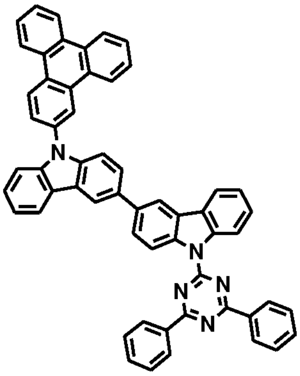


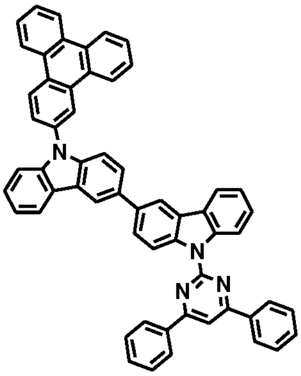
[Chemical Formula 43] [Chemical Formula 44]



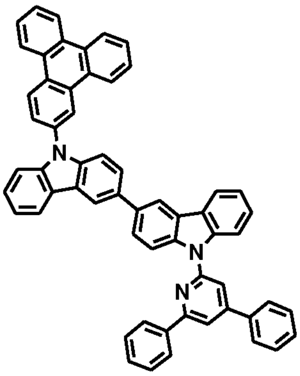


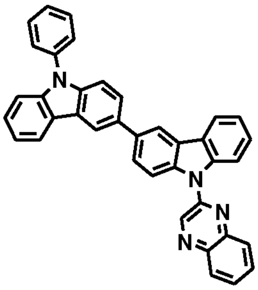
[Chemical Formula 45] [Chemical Formula 46]



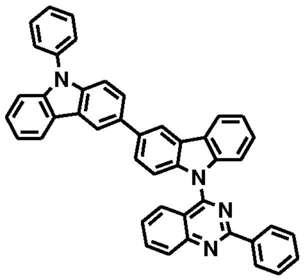


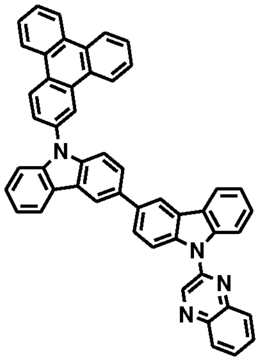
[Chemical Formula 47] [Chemical Formula 48]



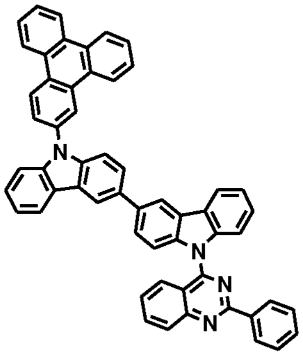


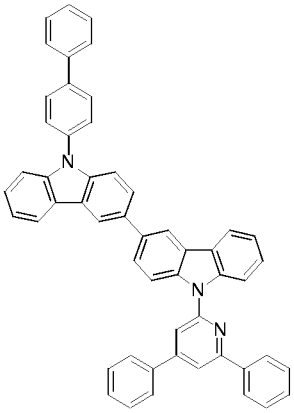
[Chemical Formula 49] [Chemical Formula 50]



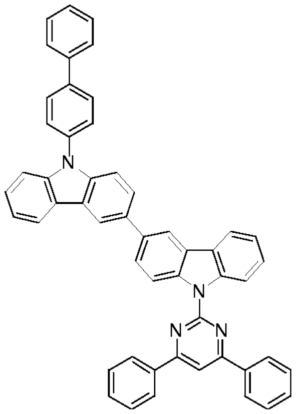


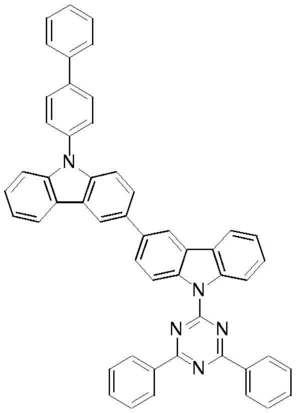
[Chemical Formula 51] [Chemical Formula 52]





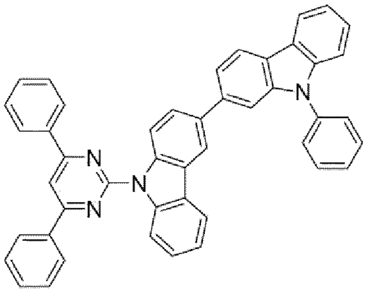
[Chemical Formula 53] [Chemical Formula 54]

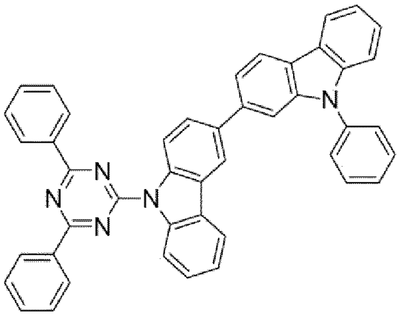




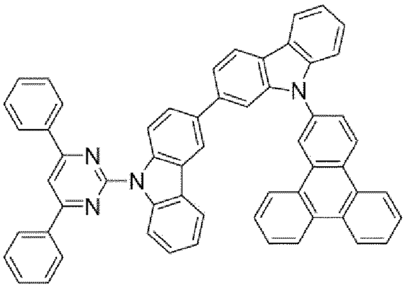
[0105] A compound for an organic optoelectronic device may be represented by one of the following Chemical Formulae A-2 to A-26, but is not limited thereto.

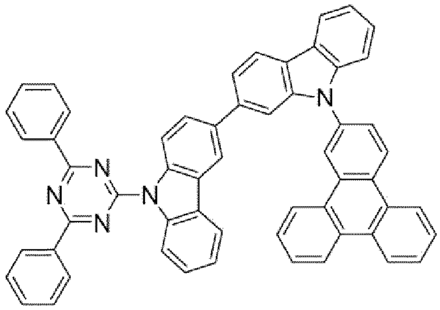
[Chemical Formula A-2] [Chemical Formula A-3]



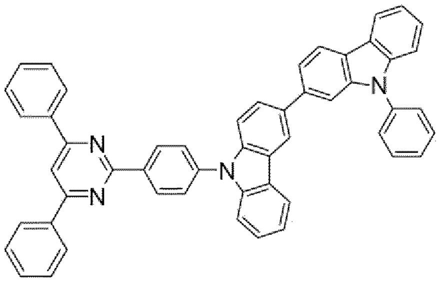


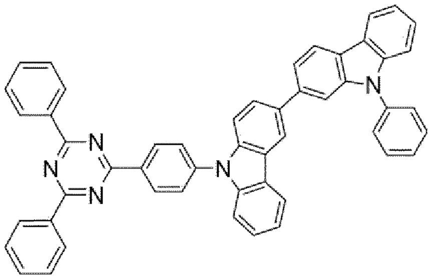
[Chemical Formula A-4] [Chemical Formula A-5]



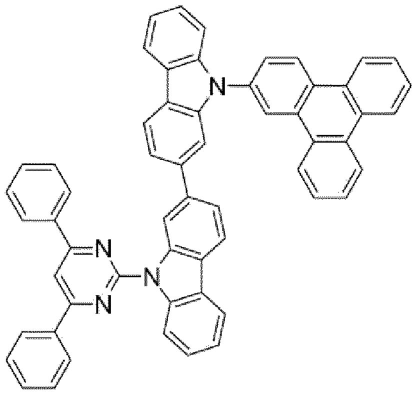


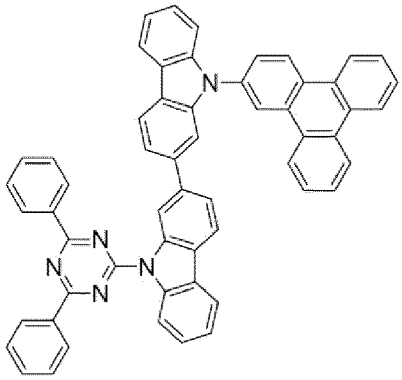
[Chemical Formula A-6] [Chemical Formula A-7]



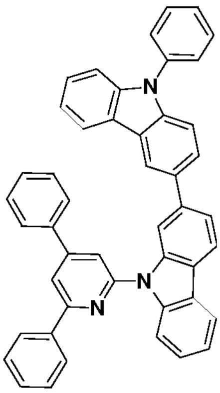


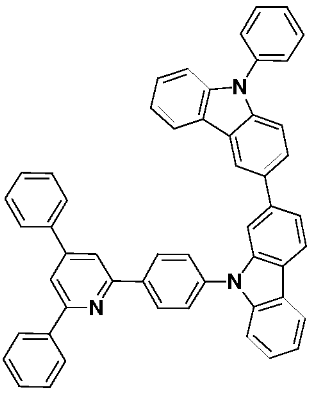
[Chemical Formula A-8] [Chemical Formula A-9]



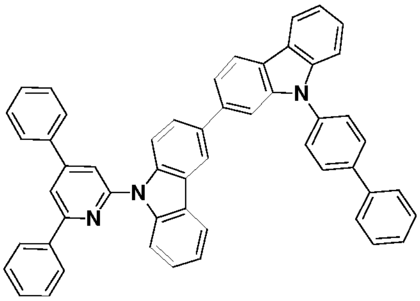


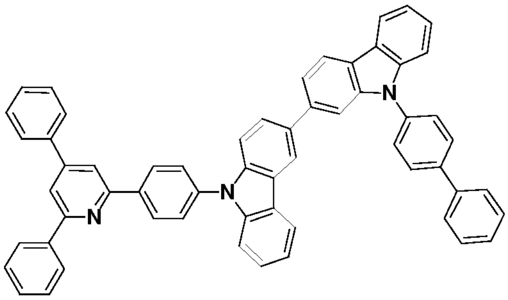
[Chemical Formula A-10] [Chemical Formula A-11]





[Chemical Formula A-12] [Chemical Formula A-13]





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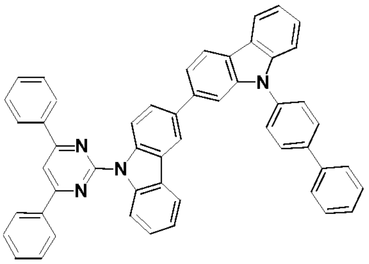
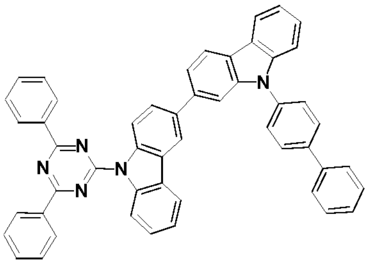
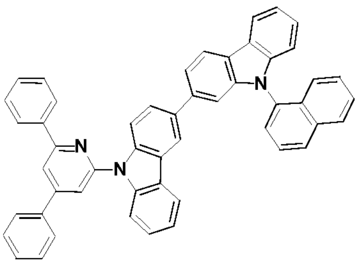
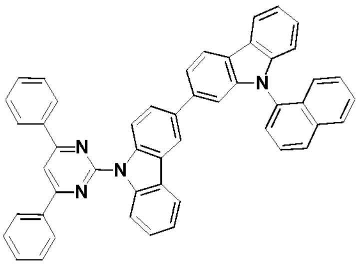


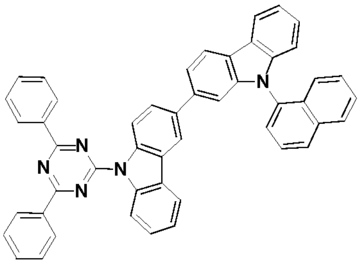


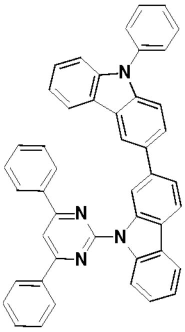
[Chemical Formula A-16] [Chemical Formula A-17]



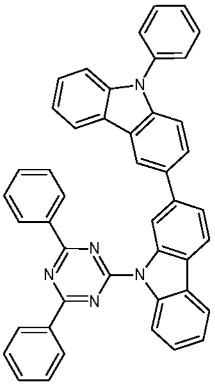


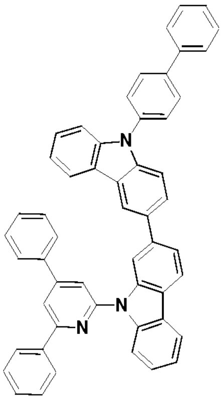
[Chemical Formula A-18] [Chemical Formula A-19]



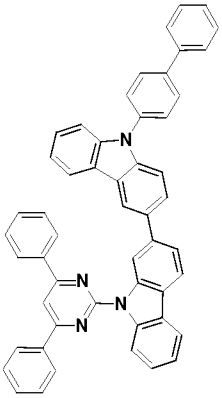


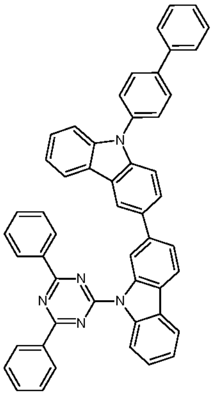
[Chemical Formula A-20] [Chemical Formula A-21]



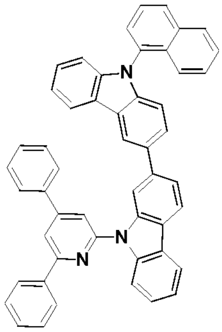


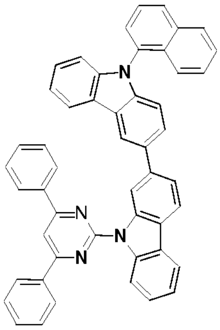
[Chemical Formula A-22] [Chemical Formula A-23]



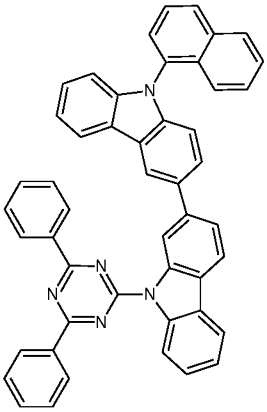


[Chemical Formula A-24] [Chemical Formula A-25]



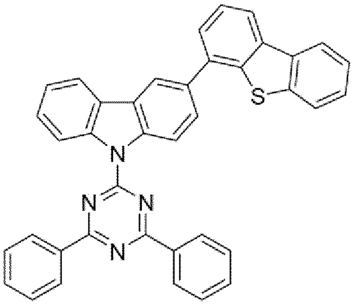


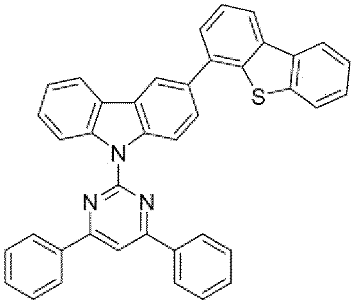
[Chemical Formula A-26]

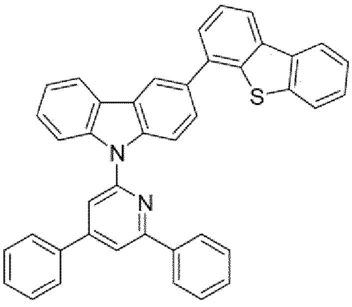


[0106] The compound for an organic optoelectronic device according to the present invention is represented by one of the following Chemical Formulae B-3 to B-8, B-12 to B-17 and B-19 to B-22.

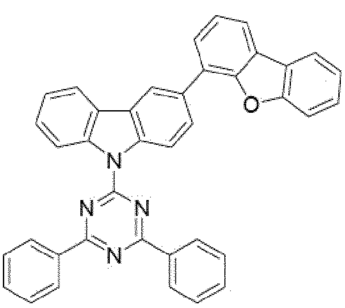
[Chemical Formula B-3] [Chemical Formula B-4] [Chemical Formula B-5]

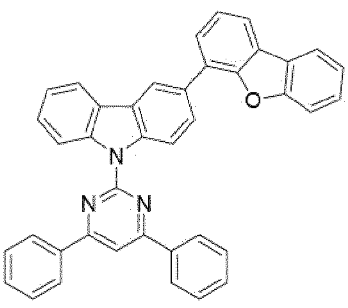


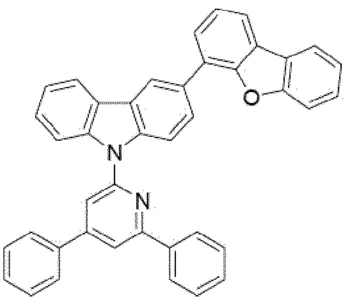




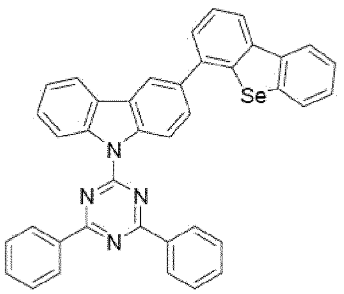
[Chemical Formula B-6] [Chemical Formula B-7] [Chemical Formula B-8]

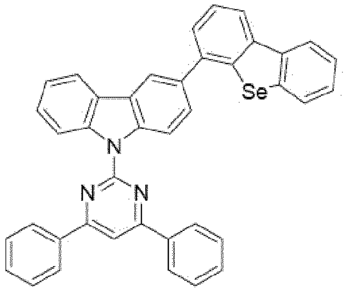


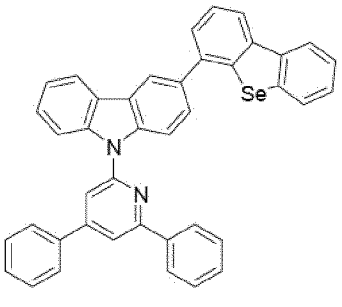




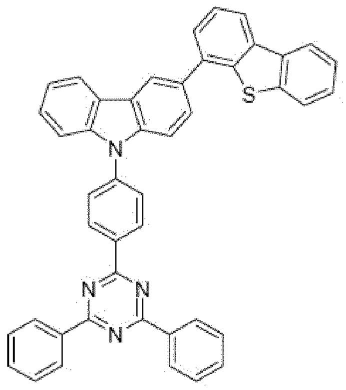
[Chemical Formula B-9] [Chemical Formula B-10] [Chemical Formula B-11]

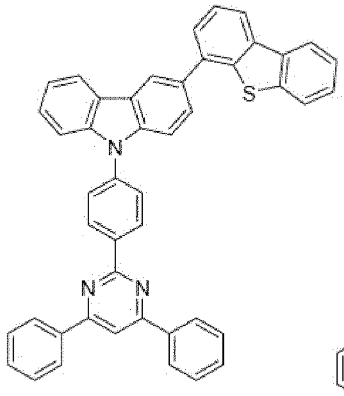


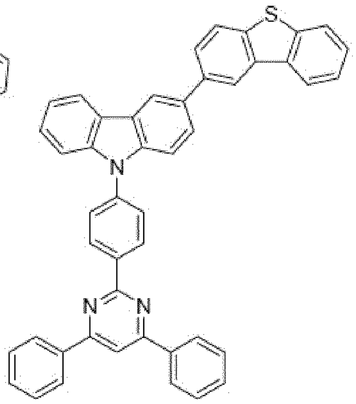




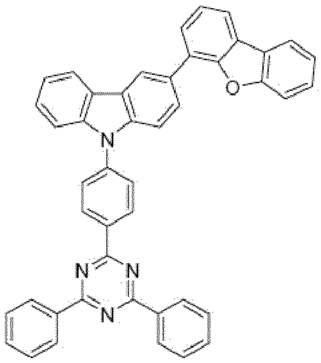
[Chemical Formula B-12] [Chemical Formula B-13] [Chemical Formula B-14]

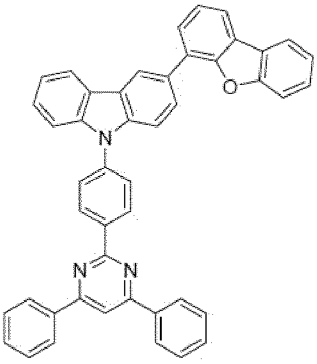


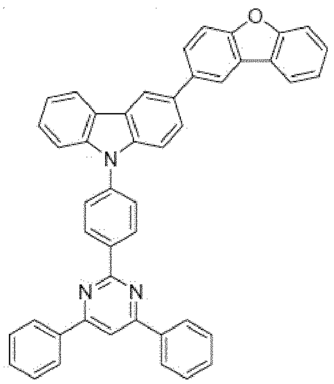




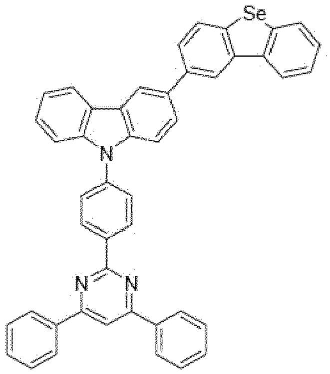
[Chemical Formula B-15] [Chemical Formula B-16] [Chemical Formula B-17]

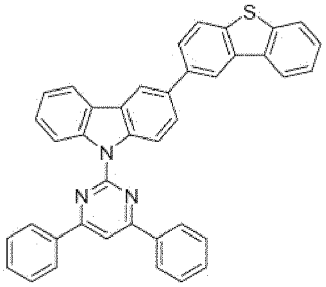


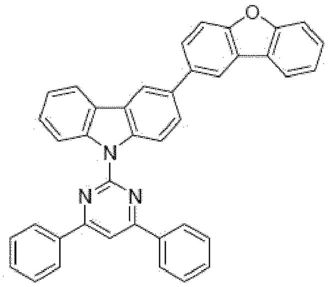




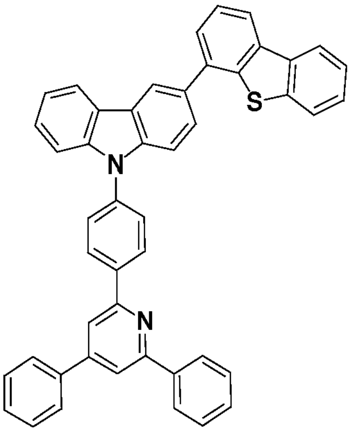
[Chemical Formula B-18] [Chemical Formula B-19] [Chemical Formula B-20]

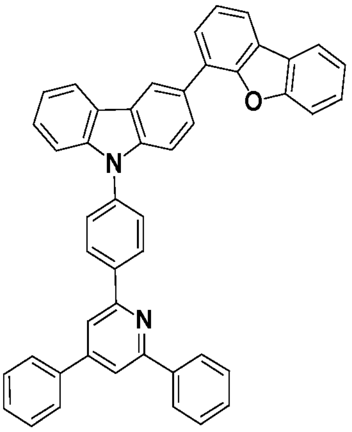






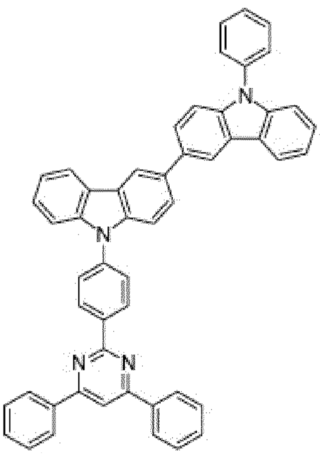
[Chemical Formula B-21] [Chemical Formula B-22]

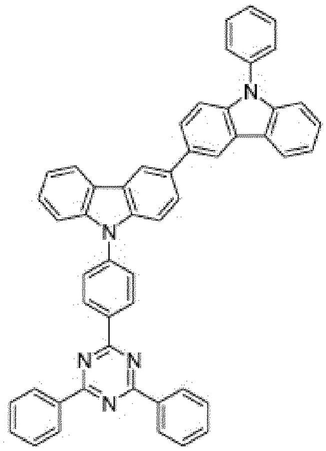


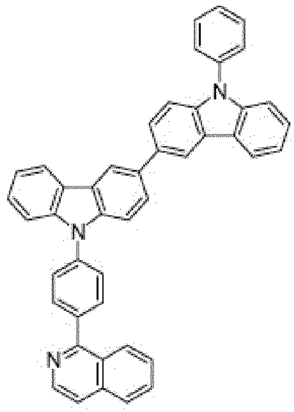


[0107] The compound for an organic optoelectronic device according to the present invention is represented by one of the following Chemical Formulae C-3, C-6 to C-13 and C-15 to C-18.

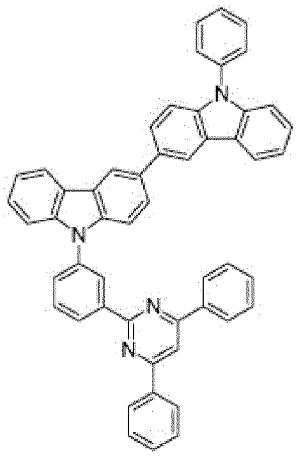
[Chemical Formula C-1] [Chemical Formula C-2] [Chemical Formula C-3]

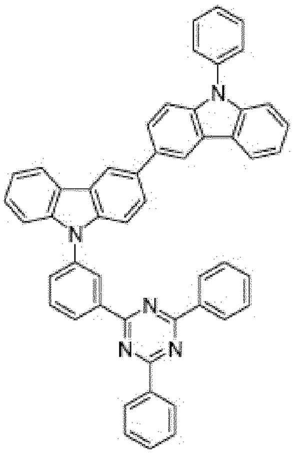


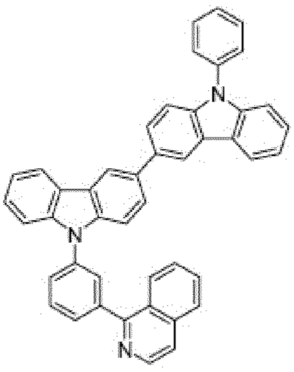




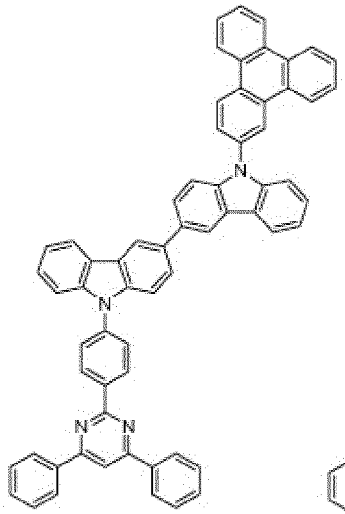
[Chemical Formula C-4] [Chemical Formula C-5] [Chemical Formula C-6]

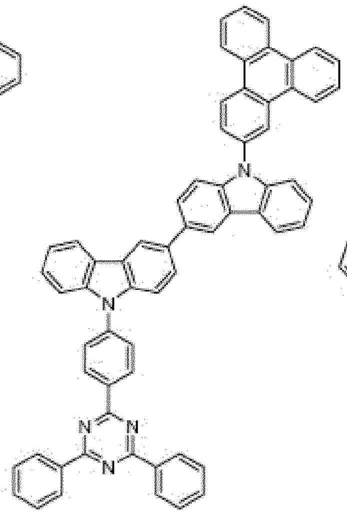


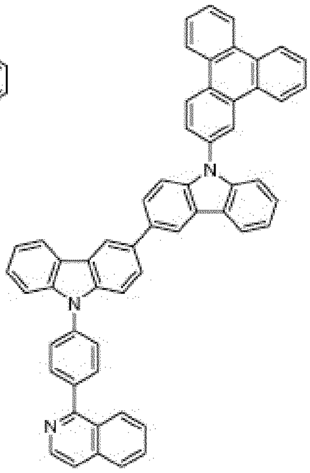




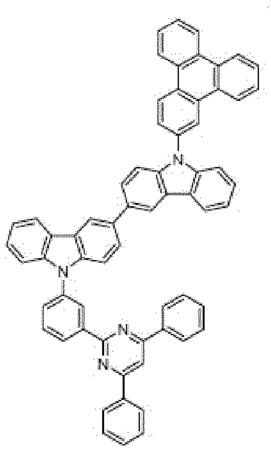
[Chemical Formula C-7] [Chemical Formula C-8] [Chemical Formula C-9]

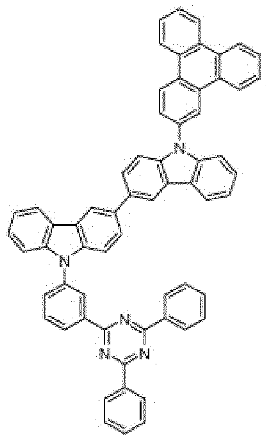


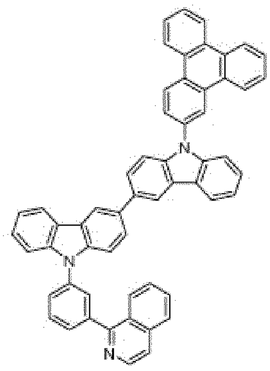




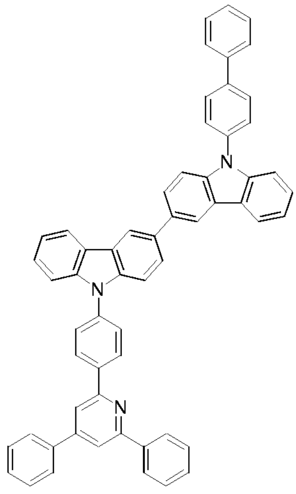
[Chemical Formula C-10] [Chemical Formula C-11] [Chemical Formula C-12]

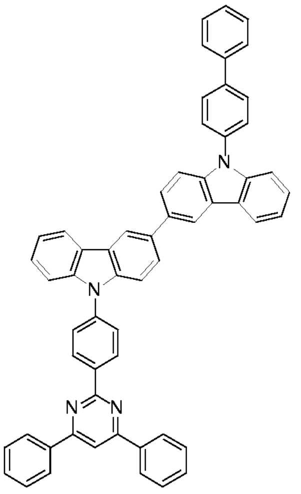


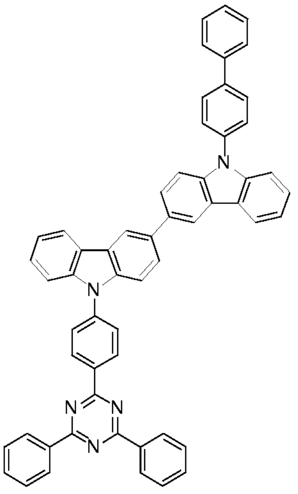




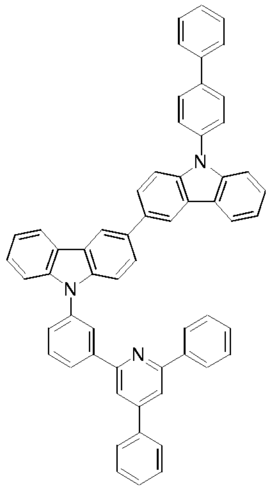
[Chemical Formula C-13] [Chemical Formula C-14] [Chemical Formula C-15]

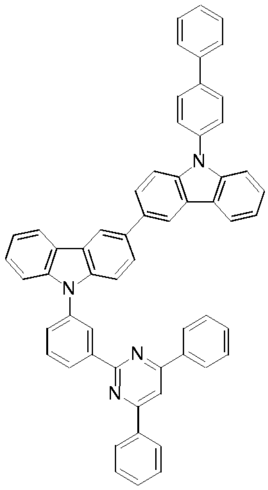


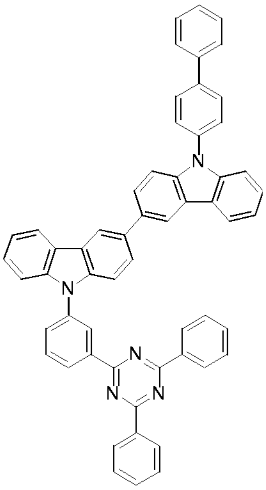




[Chemical Formula C-16] [Chemical Formula C-17] [Chemical Formula C-18]







[0108] 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.

[0109] 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 dopantIn 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.

[0110] The compound for an organic optoelectronic device according to one embodiment is used for an organic thin layer, and it may improve the life-span characteristic, efficiency characteristic, electrochemical stability, and thermal stability of an organic photoelectric device and decrease the driving voltage.

[0111] 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.

[0112] Hereinafter, an organic light emitting diode is described.

[0113] According to another embodiment, an organic light emitting diode 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 layer may include the compound for an organic optoelectronic device according to one embodiment.

[0114] The organic thin layer that may include the compound for an organic optoelectronic device may include a layer selected from the group consisting of an emission layer, a hole transport layer (HTL), a hole injection layer (HIL), an electron transport layer (ETL), an electron injection layer (EIL), 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 (ETL) or an electron injection layer (EIL). 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.

[0115] 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.

[0116] 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.

[0117] The anode 120 includes an anode material laving 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 bonded metal and oxide such as ZnO:Al or SnO_2: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.

[0118] 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, LiO_2/Al, LiF/Ca, LiF/Al, and BaF_2/Ca, but is not limited thereto. It is preferable to include a metal electrode including aluminum as a cathode.

[0119] Referring to FIG. 1, the organic light emitting diode 100 includes an organic thin layer 105 including only an emission layer 130.

[0120] 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 (ETL), and a hole transport layer (HTL) 140. As shown in FIG. 2, the organic thin layer 105 includes a double layer of the emission layer 230 and hole transport layer (HTL) 140. The emission layer 130 also functions as an electron transport layer (ETL), and the hole transport layer (HTL) 140 layer has an excellent binding property with a transparent electrode such as ITO or an excellent hole transport capability.

[0121] Referring to FIG. 3, a three-layered organic light emitting diode 300 includes an organic thin layer 105 including an electron transport layer (ETL) 150, an emission layer 130, and a hole transport layer (HTL) 140. The emission layer 130 is independently installed, and layers having an excellent electron transport capability or an excellent hole transport capability are separately stacked.

[0122] As shown in FIG. 4, a four-layered organic light emitting diode 400 includes an organic thin layer 105 including an electron injection layer (EIL) 160, an emission layer 130, a hole transport layer (HTL) 140, and a hole injection layer (HIL) 170 for adherence with the cathode of ITO.

[0123] As shown in FIG. 5, a five layered organic light emitting diode 500 includes an organic thin layer 105 including an electron transport layer (ETL) 150, an emission layer 130, a hole transport layer (HTL) 140, and a hole injection layer (HIL) 170, and further includes an electron injection layer (EIL) 160 to achieve a low voltage.

[0124] In FIGS. 1 to 5, the organic thin layer 105 including at least one selected from the group consisting of an electron transport layer (ETL) 150, an electron injection layer (EIL) 160, emission layers 130 and 230, a hole transport layer (HTL) 140, a hole injection layer (HIL) 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 (ETL) 150 including the electron transport layer (ETL) 150 or electron injection layer (EIL) 160. When it is used for the electron transport layer (ETL), it is possible to provide an organic photoelectric device having a more simple structure because it does not require an additional hole blocking layer (not shown).

[0125] Furthermore, when the compound for an organic photoelectric device is included in the emission layers 130 and 230, the material for the organic photoelectric device may be included as a phosphorescent or fluorescent host or a fluorescent blue dopant.

[0126] The organic light emitting diode may be fabricated 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.

[0127] Another embodiment provides a display device including the organic light emitting diode according to the above embodiment.

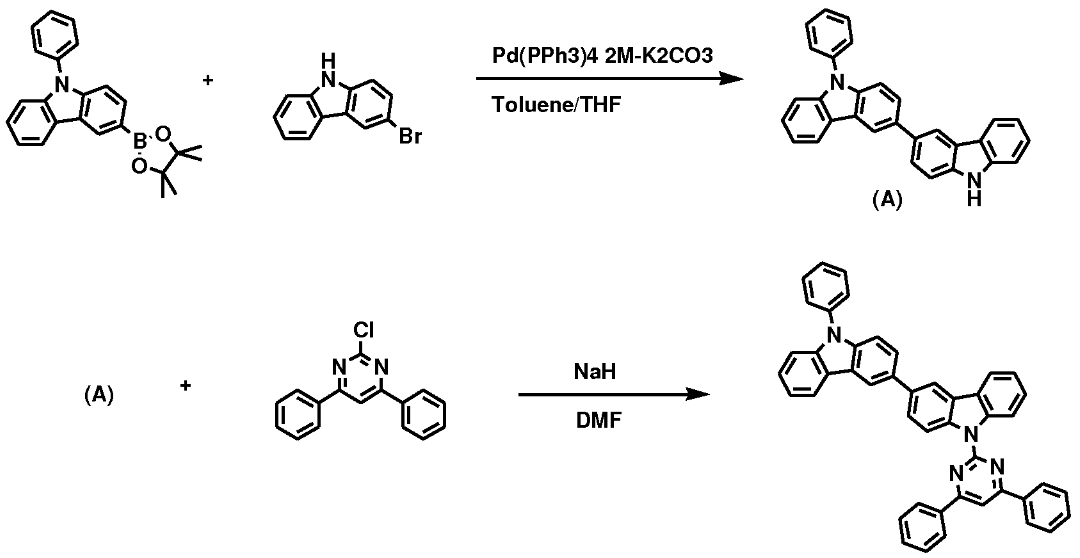
[0128] Hereinafter, the embodiments are illustrated in more detail with reference to examples. However, the following are exemplary embodiments and are not limiting.

Preparation of Compound for Organic optoelectronic device

Example 1: Synthesis of Compound represented by Chemical Formula 4 (not forming part of the present invention)

[0129] A compound represented by the above Chemical Formula 4 as a compound for an organic optoelectronic device was synthesized according to the following Reaction Scheme 1.

[Reaction Scheme 1]



First step: Synthesis of Compound A

[0130] 5 g (20mmol) of a 3-bromo-carbazole compound and 9 g (24 mmol) of N-phenyl-carbazole boronic acid pinacolate were mixed with 100 mL of tetrahydrofuran and a 2M- potassium carbonate aqueous solution in a 250 mL round-bottomed flask. The mixture was heated and refluxed for 12 hours under a nitrogen flow. When the reaction was complete, hexane was poured into the reactant. Then, a produced solid was filtered and dissolved in a mixed solution prepared by mixing toluene and tetrahydrofuran in a volume ratio of 50:50, and activated carbon and anhydrous magnesium sulfate were added thereto. The resulting mixture was agitated. The agitated solution was filtered and recrystallized using dichloromethane and hexane, obtaining 7.8 g of a compound A (yield=60%).

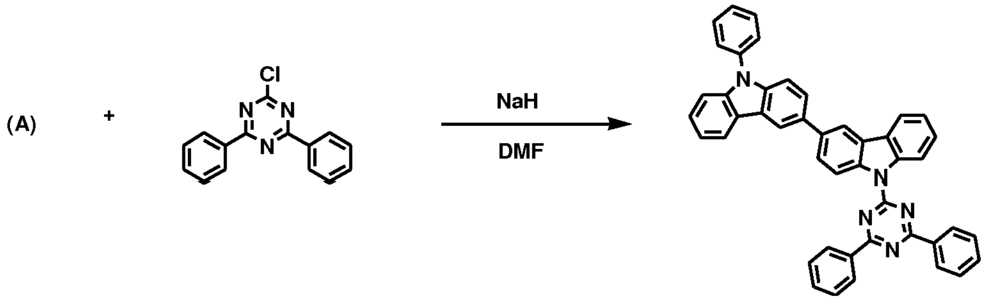
[0131] Second Step: Synthesis of Compound represented by Chemical Formula 4
3.5 g (8.55 mmol) of an intermediate product marked as the compound A, 2.74 g (10.26 mmol) of 2-chloro-4,6-diphenylpyrimidine, NaH, and dimethylformamide were put in a 100 mL round flask and then, agitated at room temperature under a nitrogen flow. Next, an organic solvent therein was distillated and removed under a reduced pressure and treated through a column chromatography, separating and obtaining a compound represented by Chemical Formula 4 3.823 g (yield: 70 %).

[0132] The compound represented by Chemical Formula 4 was element-analyzed. The result is as follows.
calcd. $C_{46}H_{30}N_4$: C, 86.49; H, 4.73; N, 8.77; found: C, 86.24; H, 4.89; N, 8.55

Example 2: Synthesis of Compound represented by Chemical Formula 5 (not forming part of the present invention)

[0133] A compound represented by the above Chemical Formula 5 as a compound for an organic optoelectronic device was synthesized according to the following Reaction Scheme 2.

[Reaction Scheme 2]



Synthesis of Compound represented by Chemical Formula 5

[0134] 3.5 g (8.55 mmol) of an intermediate product marked as the compound A, 2.74 g (10.26 mmol) of 2-chloro-4,6-

dibiphenyl-pyrimidine, NaH, and dimethylformamide were put in a 100 mL round flask and then agitated at room temperature under a nitrogen flow. Then, an organic solvent therein was distilled and removed under a reduced pressure and treated through a column chromatography, separating and obtaining 4.1 g (yield: 75 %) of a compound 6.

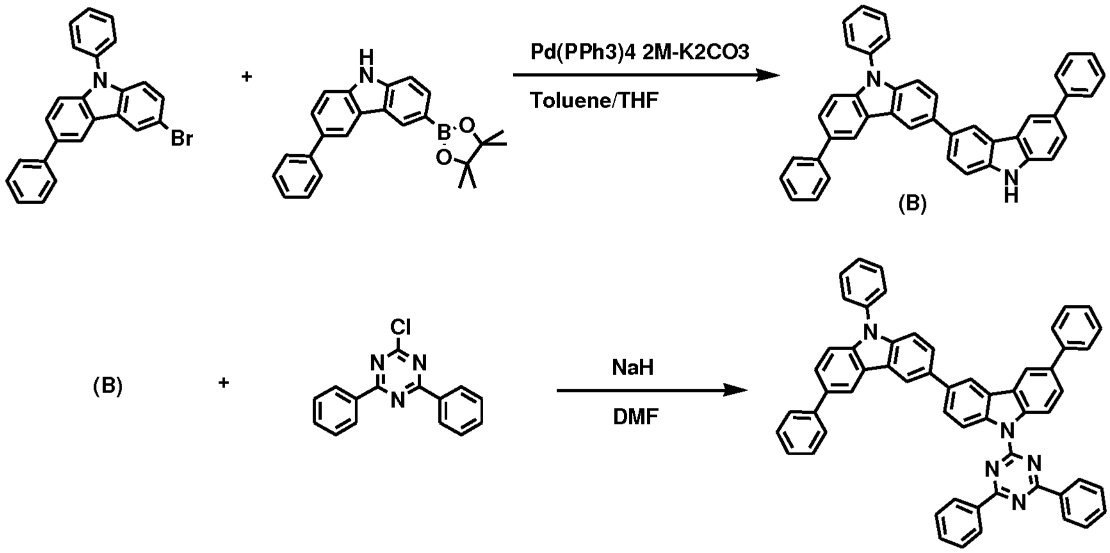
[0135] The compound represented by Chemical Formula 5 was element-analyzed. The result is as follows.

[0136] calcd. $C_{45}H_{29}N_5$: C, 84.48; H, 4.57; N, 10.95; found: C, 84.24; H, 4.65; N, 10.55

Example 3: Synthesis of Compound represented by Chemical Formula 14

[0137] A compound represented by the above Chemical Formula 14 as a compound for an organic optoelectronic device was synthesized according to the following Reaction Scheme 3.

[Reaction Scheme 3]



First Step: Synthesis of Compound B

[0138] 5 g (12.6mmol) of a 3-bromo-N-phenyl-6-phenylcarbazole compound and 5.56 g (15 mmol) of 3-phenylcarbazole boronic acid pinacolate were mixed with 100 mL of tetrahydrofuran and a 2M- potassium carbonate aqueous solution in a 250 mL round-bottomed flask having an agitator of a nitrogen atmosphere and then, heated and refluxed under a nitrogen flow for 12 hours. When the reaction was complete, hexane was poured into the reactant. Then, a solid produced therein was filtered and dissolved in a solution prepared by mixing toluene and tetrahydrofuran in a volume ratio of 50:50, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using dichloromethane and hexane, obtaining 6.5 g (yield of 65%) of a compound B.

Second Step: Synthesis of Compound represented by Chemical Formula 14

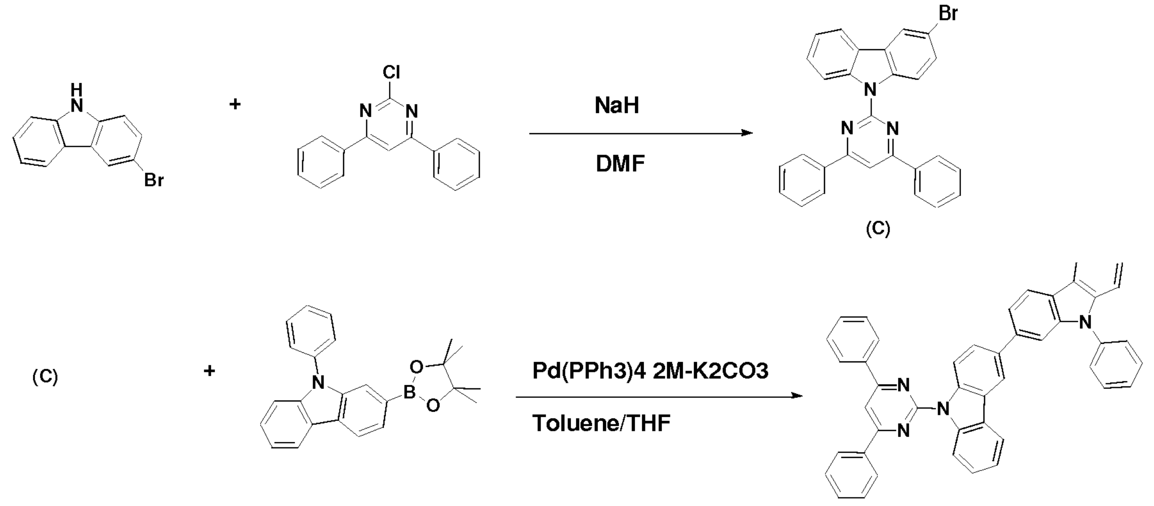
[0139] 6 g (10.5 mmol) of an intermediate product marked as the compound B and 3.44 g (12.84 mmol) of 2-chloro-4,6-diphenyl-triazine were mixed with NaH and dimethylformamide in a 250 mL round flask. The mixture was agitated at room temperature under a nitrogen flow. Next, an organic solvent was distilled and removed under a reduced pressure and treated through a column chromatography, separating and obtaining 3.825 g (yield: 70 %) of a compound represented by Chemical Formula 14.

[0140] The compound represented by Chemical Formula 14 was element-analyzed. The result is as follows. clad. $C_{57}H_{37}N_5$: C, 86.45; H, 4.71; N, 8.84; found: C, 86.15; H, 4.57; N, 8.57

Example 4: Synthesis of Compound represented by Chemical Formula A-2 (not forming part of the present invention)

[0141] A compound represented by the above Chemical Formula A-2 as an exemplary compound for an organic optoelectronic device was synthesized according to the following Reaction Scheme 4.

[Reaction Scheme 4]



First Step: Synthesis of Compound C

[0142] 28.4 g (115.46 mmol) of 3-bromocarbazole, 36.95 g (138.55 mmol) of 2-chloro-4,6-diphenyl-pyrimidine, and 6.93 g of NaH were mixed with dimethylformamide in a1000 mL round flask, and the mixture was agitated at room temperature for 12 hours under a nitrogen flow. The reactant was put in distilled water for crystallization. The crystallized solid was filtered and recrystallized with monochlorobenzene and hexane, obtaining 53 g (yield: 96 %) of an intermediate compound C.

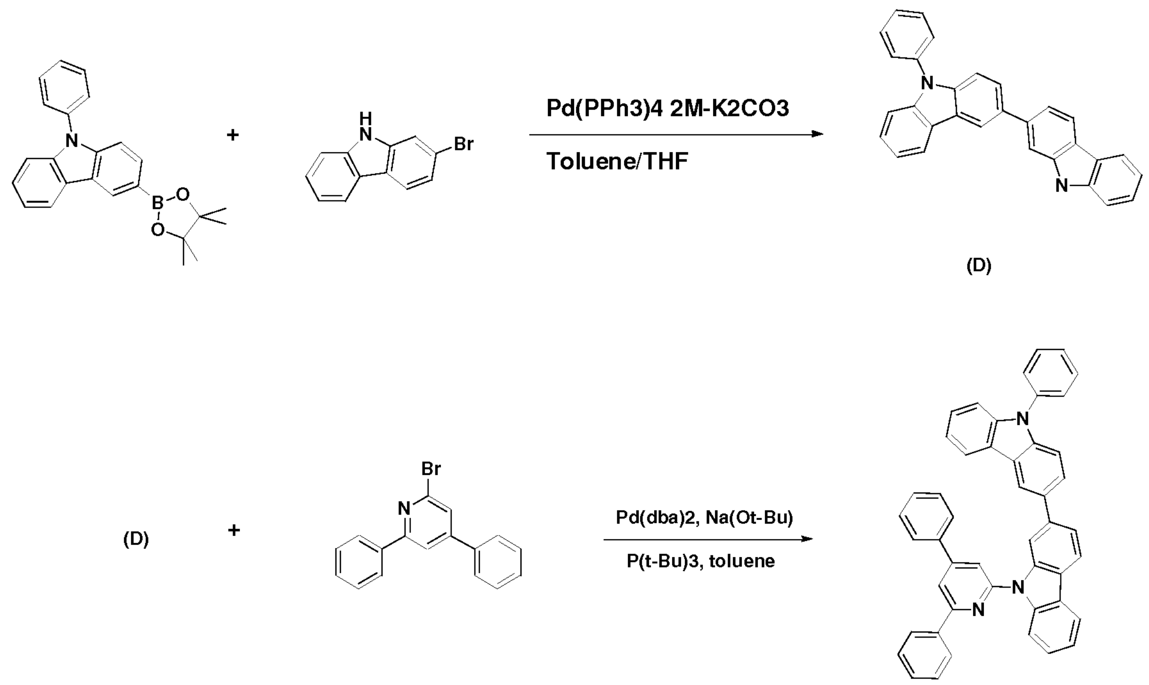
Second Step: Synthesis of Compound represented by Chemical Formula A-2

[0143] 22.26 g (46.7 mmol) of the compound C and 20.71 g (56.1 mmol) of N-phenyl-carbazole boronic acid pinacolate were mixed with 200 mL of tetrahydrofuran, 200ml of toluene, and 200ml of a 2M-carbonatepotassium aqueous solution in a 1,000 mL round-bottomed flask having an agitator of a nitrogen atmosphere, and the mixture was heated and agitated under a nitrogen flow for 12 hours. When the reaction was complete, hexane was poured into the reactant. Then, a solid produced therein was filtered and dissolved in a solution prepared by mixing toluene and tetrahydrofuran in a volume ratio of 50:50, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 20 g (yield of 70%) of a compound A-2. The result is as follows.
calcd. $C_{46}H_{30}N_4$: C, 86.49; H, 4.73; N, 8.77; found: C, 86.44; H, 4.74; N, 8.75

Example 5: Synthesis of Compound represented by Chemical Formula A-10 (not forming part of the present invention)

[0144] A compound represented by the above Chemical Formula A-10 as an exemplary compound for an organic optoelectronic device was synthesized according to the following Reaction Scheme 5.

[Reaction Scheme 5]



First Step: Synthesis of Compound represented by Chemical Formula D

[0145] 17.66 g (71.7 mmol) of a 2-bromo-carbazole compound and 22.08 g (59.8 mmol) of N-phenyl-carbazole boronic acid pinacolate were mixed with 100 mL of tetrahydrofuran and 100ml of a 2M-carbonatepotassium aqueous solution, and the mixture was heated and refluxed under a nitrogen flow for 12 hours in a 500 mL round-bottomed flask having an agitator of an nitrogen atmosphere. When the reaction was complete, hexane was poured into the reactant. Then, a solid produced therein was filtered and dissolved in a solution prepared by mixing toluene and tetrahydrofuran in a volume ratio of 50:50, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using dichloromethane and hexane, obtaining 19 g (yield of 65%) of a compound D.

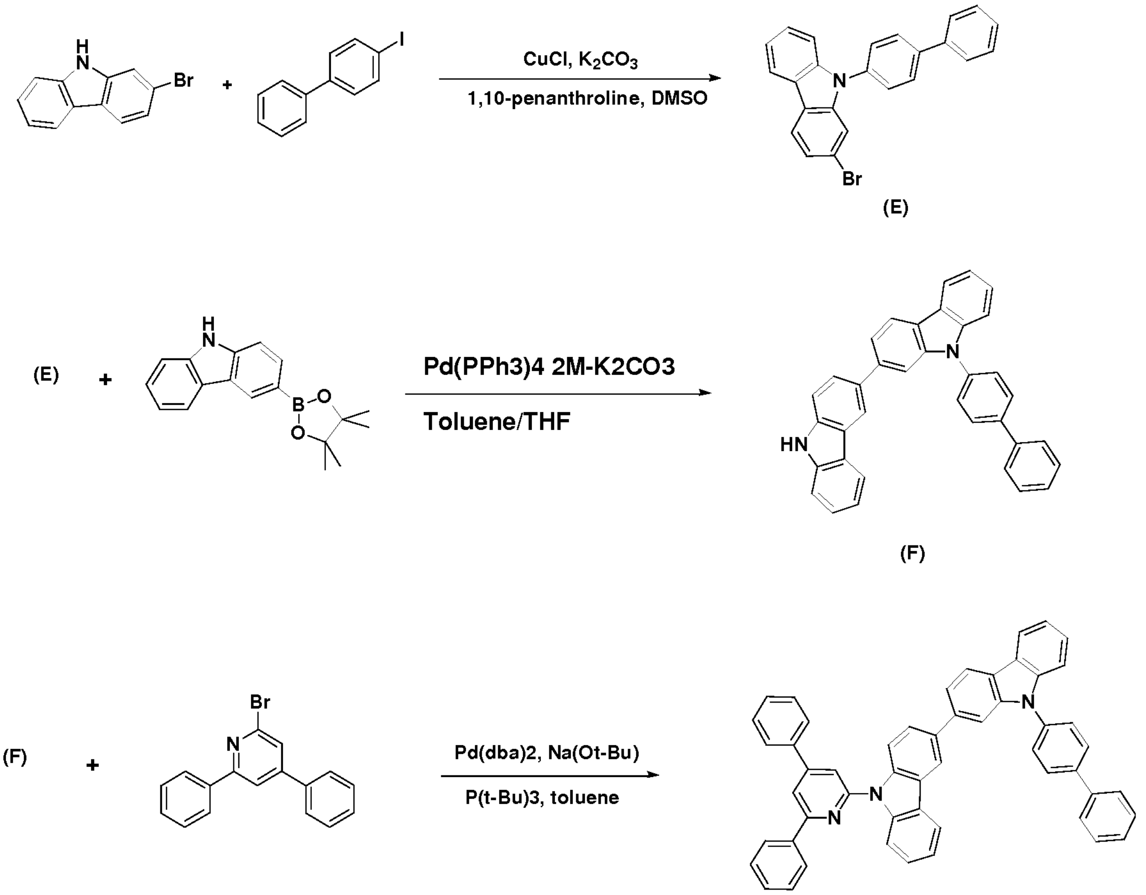
Second Step: Synthesis of Compound represented by Chemical Formula A-10

[0146] 8.3 g (20.53 mmol) of the compound D, 7.64 g (24.64 mmol) of 2-bromo-4,6-diphenylpyridine, and 3.35 g (34.9 mmol) of tertiarybutoxysodium were dissolved in 200ml of toluene, and 0.47 g (0.51 mmol) of palladium dibenzylideneamine and 0.77ml (1.54 mmol) of tertiarybutyl phosphorous were added thereto in a dropwise fashion in a 500 mL round-bottomed flask having an agitator of a nitrogen atmosphere. The reaction solution was heated and agitated under a nitrogen flow for 12 hours at 110°C. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 11g (yield of 84%) of a compound A-10.
calcd. $C_{47}H_{31}N_3$: C, 88.51; H, 4.90; N, 6.59; found: C, 88.49; H, 4.91; N, 6.61

Example 6: Synthesis of Compound represented by Chemical Formula A-12 (not forming part of the present invention)

[0147] A compound represented by the above Chemical Formula A-12 as an exemplary compound for an organic optoelectronic device was synthesized according to the following Reaction Scheme 3.

[Reaction Scheme 6]



First Step: Synthesis of Compound E

[0148] 22.22 g (90.3 mmol) of a 2-bromocarbazole compound, 37.94 g (135.5 mmol) of 4-iodobiphenyl and 18.72 g (135.5 mmol) of potassium carbonate were dissolved in 400ml of dimethylsulfoxide, and 3.26 g (135.47 mmol) of 1,10-phenanthroline and 1.79 g (18.06 mmol) of copper chloride (I) were added therein in a dropwise fashion in a 1,000 mL round-bottomed flask having an agitator of a nitrogen atmosphere. The reaction solution was agitated under a nitrogen flow for 12 hours at 150°C. When the reaction was complete, distilled water was poured into the reactant. Then, a solid produced therein was dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 25 g (yield=70%) of a compound E.

Second Step: Synthesis of Compound represented by Chemical Formula F

[0149] compound 18.2 g (46.7 mmol) of the compound E and 16.4 g (56.1 mmol) of 3-carbazole boronic acid pinacolate were mixed with 200 mL of tetrahydrofuran, 200ml of toluene, and 200ml of 2M-potassium carbonate aqueous solution, and the mixture was heated and refluxed under a nitrogen flow for 12 hours in a 1,000 mL round-bottomed flask having an agitator of a nitrogen atmosphere. When the reaction was complete, hexane was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 19.0 g (yield 64%) of a compound F.

Third Step: Synthesis of Compound represented by Chemical Formula A-12

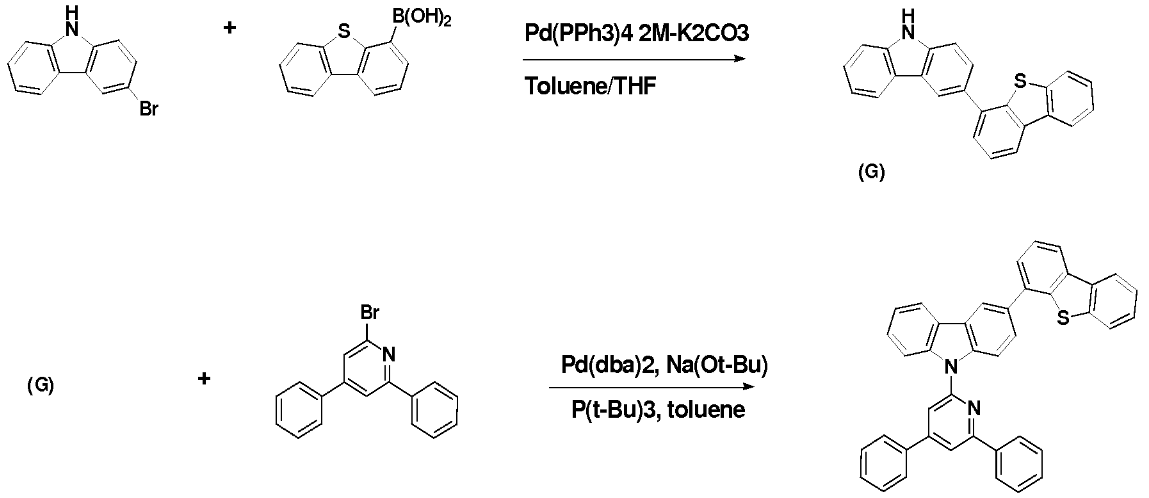
[0150] 9.73 g (20.1 mmol) of the compound F, 7.47 g (24.10 mmol) of 2-bromo-4,6-diphenylpyridine, and 3.28 g (34.1 mmol) of tertiarybutoxy sodium were dissolved in 180ml of toluene, and 0.46 g (0.5 mmol) of palladium dibenzylideneamine and 0.75ml (1.51 mmol) of tertiarybutyl phosphorous were added thereto in a dropwise fashion in a 500 mL round-bottomed flask having an agitator of a nitrogen atmosphere. The reaction solution was heated and agitated under a nitrogen flow for 12 hours at 110°C. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was dissolved in chlorobenzene, and anhydrous magnesium sulfate was added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 9.9 g (yield of 70%) of a compound A-12.

calcd. $C_{53}H_{35}N_3$: C, 89.17; H, 4.94; N, 5.89; found: C, 89.29; H, 4.96; N, 5.82.

Example 7: Synthesis of Compound represented by Chemical Formula B-5

[0151] A compound represented by the above Chemical Formula B-5 as an exemplary compound for an organic optoelectronic device was synthesized according to the following Reaction Scheme 7.

[Reaction Scheme 7]



First Step: Synthesis of Compound G

[0152] 18.53 g (75.3 mmol) of a 3-bromo-carbazole compound, 22.3 g (97.9 mmol) of 4-dibenzothiophene boronic acid, 100 mL of tetrahydrofuran, and 100ml of a 2M- potassium carbonate aqueous solution were mixed in a 500 mL round-bottomed flask and then, heated and refluxed for 12 hours under a nitrogen flow. When the reaction was complete, hexane was poured into the reactant. Then, a solid produced therein was filtered and dissolved in a solution prepared by mixing toluene and tetrahydrofuran in a volume ratio of 50:50, and activated carbon and anhydrous magnesium sulfate were added thereto. The solution was filtered and recrystallized using dichloromethane and hexane, obtaining 15 g (yield of 60%) of a compound D.

Second Step: Synthesis of Compound represented by Chemical Formula B-5

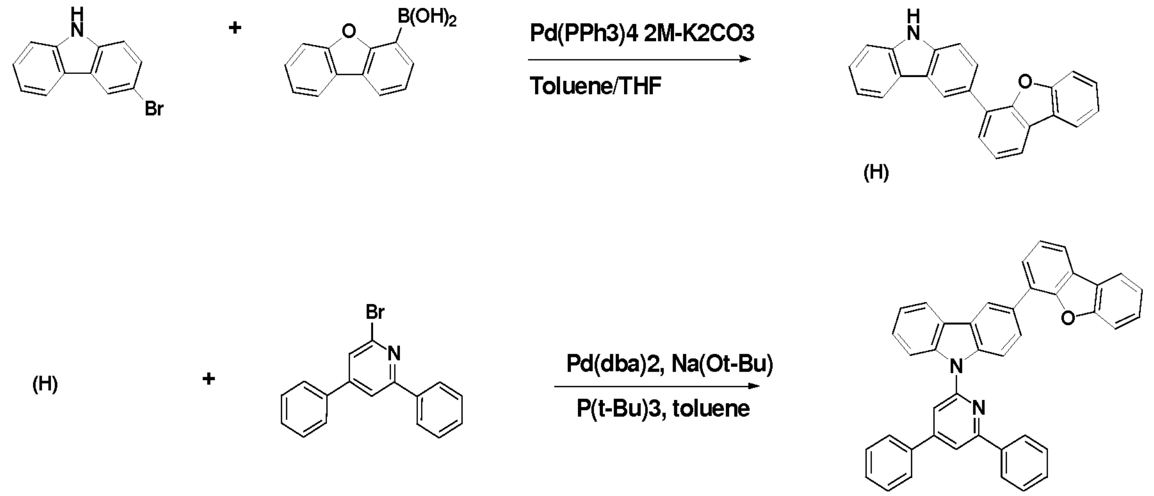
[0153] 10 g (28.80mmol) of the compound G, 11.6 g (37.4 mmol) of 2-bromo-4,6-diphenylpyridine, and 5.53 g (57.6 mmol) of tertiarybutoxysodium were dissolved in 160ml of toluene, and 1.32 g (1.44 mmol) of palladium dibenzylideneamine and 0.87ml (4.32 mmol) of tertiarybutyl phosphorous were added in a dropwise fashion in a 500 mL round-bottomed flask having an agitator of a nitrogen atmosphere. The reaction solution was heated and agitated under a nitrogen flow for 12 hours at 12 at 110°C. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 14g (yield of 85%) of a compound B-5.

calcd. $C_{41}H_{26}N_2S$: C, 85.09; H, 4.53; N, 4.84; S, 5.54; found: C, 85.11; H, 4.50; N, 4.80; S, 5.50

Example 8: Synthesis of Compound represented by Chemical Formula B-8

[0154] A compound represented by the above Chemical Formula B-8 as an exemplary compound for an organic optoelectronic was synthesized according to the following Reaction Scheme 8.

[Reaction Scheme 8]



First Step: Synthesis of Compound H

[0155] 9.84g (39.99mmol) of a 3-bromo-carbazol compound, 10.17g (47.99mmol) of 4-dibenzofuran boronic acid, 100 mL of tetrahydrofuran, and 100ml of a 2M- potassium carbonate aqueous solution were mixed and then, heated and refluxed under a nitrogen flow for 12 hours in a 500 mL round-bottomed flask having an agitator of a nitrogen atmosphere. When the reaction was complete, hexane was poured into the reactant. Then, a solid produced therein was dissolved in a solution prepared by mixing toluene and tetrahydrofuran in a volume ratio of 50:50, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using dichloromethane and hexane, obtaining 11 g (yield of 83%) of a compound H.

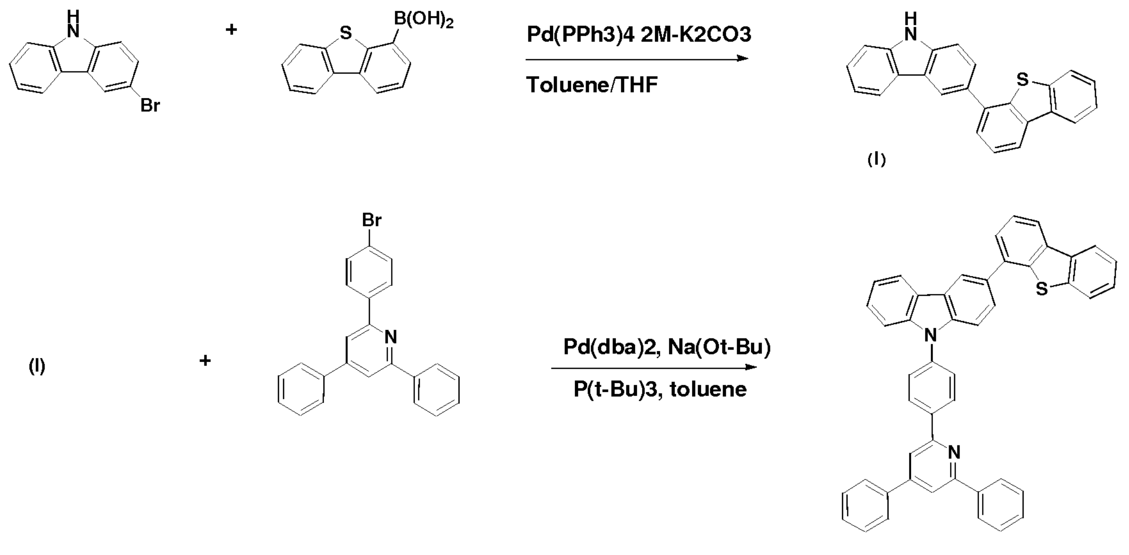
Second Step: Synthesis of Compound represented by Chemical Formula B-8

[0156] 10.8 g (32.58mmol) of the compound H, 11.6 g (37.4 mmol) of 2-bromo-4,6-diphenylpyridine, and 5.53 g (57.6 mmol) of tertiarybutoxy sodium were dissolved in 160ml of toluene, and 1.32 g (1.44 mmol) of palladium dibenzylideneamine and 0.87ml (4.32 mmol) of tertiarybutyl phosphorous were added thereto in a dropwise fashion in a 500 mL round-bottomed flask having an agitator of a nitrogen atmosphere. The reaction solution was heated and agitated under a nitrogen flow for 12 hours at 110°C. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 14g (yield of 85%) of a compound B-8.
calcd. $C_{41}H_{26}N_2O$: C, 87.52; H, 4.66; N, 4.98; O, 2.84; found: C, 87.50; H, 4.68; N, 4.96; O, 2.82

Example 9: Synthesis of Compound represented by Chemical Formula B-21

[0157] A compound represented by the above Chemical Formula B-21 as an exemplary compound for an organic optoelectronic device was synthesized according to the Reaction Scheme 9.

[Reaction Scheme 9]



First Step: Synthesis of Compound I

[0158] 18.53 g (75.3 mmol) of a 3-bromo-carbazole compound, 22.3 g (97.9 mmol) of 4-dibenzothiophene boronic acid, 100 mL of tetrahydrofuran, and 100ml of a 2M-potassium carbonate aqueous solution were mixed and then, heated and refluxed under a nitrogen flow for 12 hours in a 500 mL round-bottomed flask having an agitator of a nitrogen atmosphere. When the reaction was complete, hexane was poured into the reactant. Then, a solid produced therein was dissolved in a solution prepared by mixing toluene and tetrahydrofuran in a volume ratio of 50:50, and activated carbon and anhydrous magnesium sulfate were added thereto. The solution was filtered and recrystallized using dichloromethane and hexane, obtaining 15 g (yield of 60%) of a compound I.

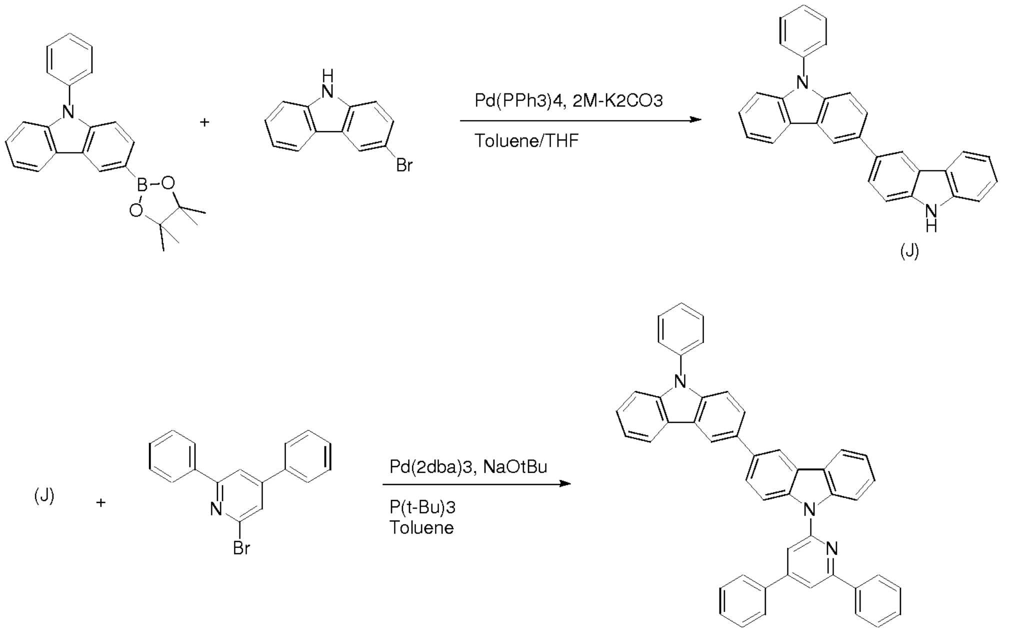
Second Step: Synthesis of Compound represented by Chemical Formula B-21

[0159] 10 g (28.80mmol) of the compound G, 14.43 g (37.4 mmol) of 2-(4-bromophenyl)-4,6-diphenylpyridine, and 5.53 g (57.6 mmol) of tertiarybutoxysodium were dissolved in 160ml of toluene, and 1.32 g (1.44 mmol) of palladium dibenzylideneamine and 0.87ml (4.32 mmol) of tertiarybutyl phosphorous were added thereto in a dropwise fashion in a 500 mL round-bottomed flask having an agitator of a nitrogen atmosphere. The reaction solution was heated and agitated under a nitrogen flow for 12 hours at 110°C. When the reaction was complete, methanol was added to the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 10g (yield of 60%) of a compound B-21.
calcd. $C_{47}H_{30}N_2S$: C, 86.21; H, 4.62; N, 4.28; S, 4.90; found: C, 86.20; H, 4.60; N, 4.26; S, 4.88

Example 10: Synthesis of Compound represented by Chemical Formula 3

[0160] A compound represented by the above Chemical Formula 3 as an exemplary compound for an organic optoelectronic device was synthesized according to the following Reaction Scheme 10.

[Reaction Scheme 10]



First Step: Synthesis of Compound J

[0161] 26.96 g (81.4 mmol) of N-phenyl carbazole-3-boronic acid pinacolate, 23.96 g (97.36 mmol) of carbazole-3-boronic acid, 230 mL of tetrahydrofuran, and 100ml of a 2M-carbonatepotassium aqueous solution were mixed and then, heated and refluxed under a nitrogen flow for 12 hours in a 500 mL round-bottomed flask having an agitator of a nitrogen atmosphere. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 22.6 g (yield of 68%) of a compound J.

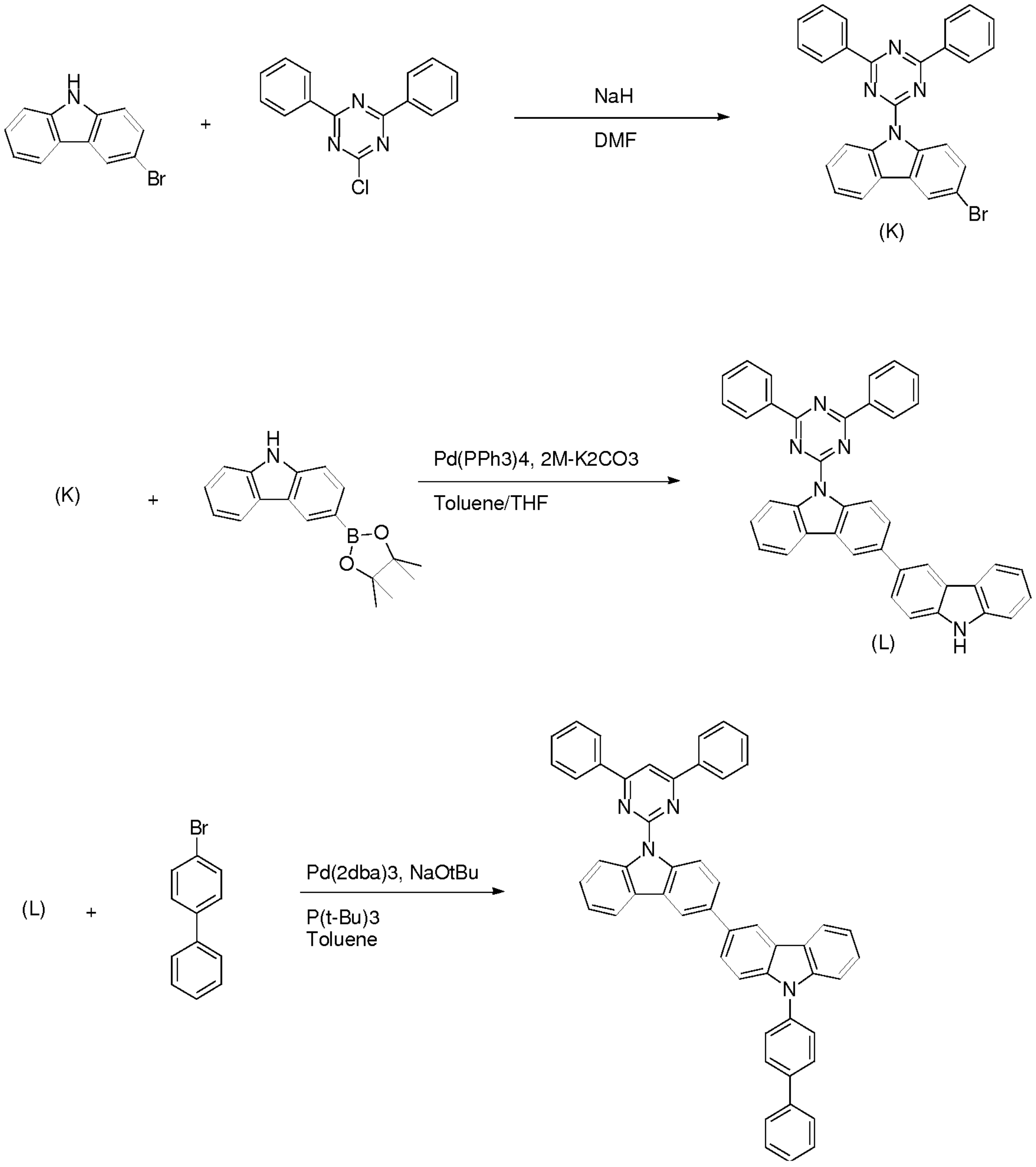
Second Step: Synthesis of Compound represented by Chemical Formula 3

[0162] 22.42 g (54.88 mmol) of the compound J, 20.43 g (65.85 mmol) of 2-bromo-4,6-diphenyl pyridine, and 7.92 g (82.32 mmol) of tertiarybutoxysodium were dissolved in 400ml of toluene, and 1.65 g (1.65 mmol) of palladium dibenzylideneamine and 1.78 g (4.39 mmol) of tertiarybutyl phosphorous were added thereto in a dropwise fashion in a 500 mL round-bottomed flask having an agitator of a nitrogen atmosphere. The reaction solution was agitated under a nitrogen flow for 12 hours at 110°C. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. When the solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 28.10 g (a yield of 80%) of a compound 3.
calcd. $C_{47}H_{31}N_3$: C, 88.51; H, 4.90; N, 6.59; found: C, 88.62; H, 4.80; N, 6.47

Example 11: Synthesis of Compound represented by Chemical Formula 54

[0163] A compound represented by the above Chemical Formula 54 as an exemplary compound for an organic optoelectronic device was synthesized according to the following Reaction Scheme 11.

[Reaction Scheme 11]



First Step: Synthesis of Compound K

[0164] 42.97 g (174.57 mmol) of 3-bromocarbazole, 56.1 g (209.5 mmol) of 2-chloro-4,6-diphenyl-triazine, and 10.48 g (261.86 mmol) of NaH were put in dimethylformamide. The mixture was agitated under a nitrogen flow at room temperature for 12 hours in a 1000 mL round flask. The reactant was put in distilled water for crystallization. The crystallized solid was filtered and recrystallized using monochlorobenzene and hexane, obtaining 82 g (yield: 98 %) of an intermediate compound K.

Second Step: Synthesis of Compound L

[0165] 70.57 g (147.85 mmol) of the compound K and 52.01 g (177.42 mmol) of carbazole-3-boronic acid pinacolate were mixed with 800 mL of a solution prepared by mixing tetrahydrofuran and toluene in a volume ratio of 1:1 and 400mL of a 2M-potassium carbonate aqueous solution. The mixture was heated and refluxed under a nitrogen flow for 12 hours in a 2L round-bottomed flask having an agitator of a nitrogen atmosphere. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 66 g (yield: 79%) of a compound L.

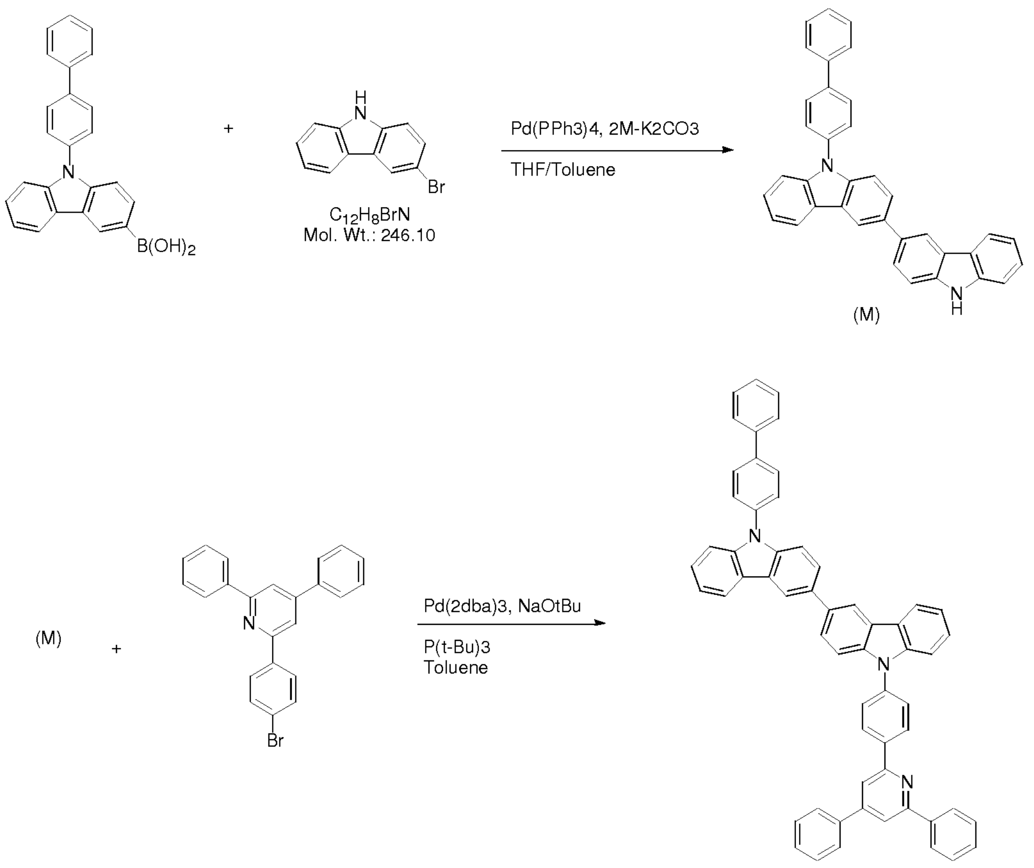
Third Step: Synthesis of Compound represented by Chemical Formula 54

[0166] 10.1 g (17.88 mmol) of the compound L, 5 g (21.46 mmol) of 2-bromobiphenyl, and 3.44 g (35.76 mmol) of tertiarybutoxysodium were dissolved in 400ml of toluene, and 1.03 g (1.79 mmol) of palladium dibenzylideneamine and 2.17 g (5.36 mmol) of tertiarybutyl phosphorous were added in a dropwise fashion in a 1 L round-bottomed flask having an agitator of a nitrogen atmosphere. The reaction solution was heated and agitated under a nitrogen flow for 12hours at 110°C. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 9.40 g(yield: 73%) of a compound 54.
calcd. $C_{52}H_{34}N_4$: C, 87.37; H, 4.79; N, 7.84; found: C, 87.47; H, 4.80; N, 7.78

Example 12: Synthesis of Compound represented by Chemical Formula C-13

[0167]

[Reaction Scheme 12]



First step: Synthesis of Compound M

[0168] 19.3 g (53.06 mmol) of N-biphenyl-3-carbazole boronic acid, 10.9 g (44.22 mmol) of 3-bromo carbazole, 140 mL of a solution prepared by mixing tetrahydrofuran and toluene in a volume ratio of 1:1, and 80 mL of a 2M-potassium carbonate aqueous solution were mixed and then, heated and refluxed under a nitrogen flow for 12 hours in a 500mL round-bottomed flask having an agitator of a nitrogen atmosphere. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized, obtaining 13.7 g (yield : 64%) of a compound M.

Second Step: Synthesis of Compound represented by Chemical Formula C-13

[0169] 9.6 g (19.82 mmol) of the compound M, 9.2 g (23.8 mmol) of 2-(4-bromophenyl)-4,6-diphenylpyridine, and 3.2 g (33.7 mmol) of tertiarybutoxysodium were dissolved in 160mL of toluene, and 0.454 g (0.5 mmol) of palladium dibenzylideneamine and 0.6 g (1.49 mmol) of tertiarybutyl phosphorous were added thereto in a dropwise fashion in a 500mL round-bottomed flask having an agitator of a nitrogen atmosphere. The reaction solution was heated and agitated under a nitrogen flow for 12 hours at 110°C. When the reaction was complete, methanol was poured into the reactant. Then, a solid produced therein was filtered and dissolved in chlorobenzene, and activated carbon and anhydrous magnesium sulfate were added thereto. The mixture was agitated. The solution was filtered and recrystallized using chlorobenzene and methanol, obtaining 14 g (yield: 89%) of a compound C-13.
calcd. $C_{59}H_{39}N_3$: C, 89.70; H, 4.98; N, 5.32; found: C, 89.57; H, 4.83; N, 5.65

Fabrication of Organic light emitting diode

Example 13 (not forming part of the present invention)

[0170] An organic light emitting diode was fabricated by using the compound according to Example 1 and $Ir(PPy)_3$ as a dopant. Herein, 1000 A-thick ITO was used as a positive electrode, while 1000 A-thick aluminum (Al) was used as a cathode.

[0171] Specifically, a method of manufacturing the organic light emitting diode included cutting an ITO glass substrate having sheet resistance of 15 Ω/cm^2 into a size of 50 mm × 50 mm × 0.7 mm and ultrasonic wave-cleaning it in acetone, isopropylalcohol, and pure water for 15 minutes respectively and then, UV-ozone cleaning it for 30 minutes.

[0172] On the substrate, a 800 A-thick hole transport layer (HTL) was formed by depositing N,N'-di(1-naphthyl)-N,N'-diphenylbenzidine (NPB) (70 nm) and 4,4',4"-tri(N-carbazolyl)triphenylamine (TCTA) (10 nm) under conditions of a vacuum degree of 650×10^{-7} Pa and a deposition rate of 0.1 to 0.3 nm/s.

[0173] Then, a 300 A-thick emission layer was formed thereon using the compound according to Example 2 under the same vacuum deposit conditions, and $Ir(PPy)_3$ as a phosphorescence dopant was simultaneously deposited. Herein, the deposition rate of the phosphorescence dopant was adjusted to include 7 wt% of the phosphorescence dopant based on 100 wt% of the emission layer.

[0174] On the emission layer, bis(8-hydroxy-2-methylquinolinolato)-aluminumbiphenoxide (BAlq) was deposit to form a 50 A-thick hole-blocking layer under the same vacuum deposit conditions.

[0175] Next, a 200 A-thick electron transport layer (ETL) was formed thereon by depositing Alq_3 under the same vacuum deposit conditions.

[0176] On the electron transport layer (ETL), LiF and Al were sequentially deposited to form a cathode, fabricating an organic photoelectric device.

[0177] The organic photoelectric device had a structure of ITO/ NPB (70 nm)/ TCTA (10 nm)/ EML (the compound of Example 1 (93 wt%) + $Ir(PPy)_3$ (7 wt%), 30 nm)/ Balq (5 nm)/ Alq_3 (20 nm)/ LiF (1 nm) / Al (100 nm).

Example 14 (not forming part of the present invention)

[0178] An organic light emitting diode was fabricated according to the same method as Example 13 except for using the compound according to Example 2 as a host for an emission layer instead of the compound according to Example 1.

Example 15 (not forming part of the present invention)

[0179] An organic light emitting diode was fabricated according to the same method as Example 13 except for using the compound according to Example 4 as a host for an emission layer instead of the compound according to Example 1.

Example 16 (not forming part of the present invention)

[0180] An organic light emitting diode was fabricated according to the same method as Example 13 except for using the compound according to Example 6 as a host for an emission layer instead of the compound according to Example 1.

Example 17

[0181] An organic light emitting diode was fabricated according to the same method as Example 13 except for using the compound according to Example 7 as a host for an emission layer instead of the compound according to Example 1.

Example 18

[0182] An organic light emitting diode was fabricated according to the same method as Example 13 except for using the compound according to Example 10 as a host for an emission layer instead of the compound according to Example 1.

Example 19

[0183] An organic light emitting diode was fabricated according to the same method as Example 13 except for using the compound according to Example 12 as a host for an emission layer instead of the compound according to Example 1.

Example 20

[0184] An organic light emitting diode was fabricated according to the same method as Example 13 except for using the compound according to Example 12 as a host for an emission layer instead of the compound according to Example 1.

Comparative Example 1

[0185] An organic light emitting diode was fabricated according to the same method as Example 13 except for using 4,4-N,N-dicarbazolebiphenyl (CBP) as a host for an emission layer instead of the compound according to Example 2.

Comparative Example 2

[0186] An organic light emitting diode fabricated using bis[9-(4-methoxyphenyl)carbazol-3-yl] (Jib796-04k) according to Example 6 of Korean Patent Laid Open No. 10-2005-0100673 was compared with a device fabricated using the compound according to the present invention regarding light emitting characteristics.

Performance Measurement of Organic light emitting diode

Experimental Example

[0187] Each organic light emitting diode according to Examples 13 to 20 and Comparative Examples 1 and 2 was measured regarding current density and luminance changes depending on voltage and luminous efficiency. The measurements were specifically performed in the following method. The results are provided in the following Table 1.

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

[0188] The fabricated 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 area to provide the result.

(2) Measurement of Luminance change depending on Voltage change

[0189] The fabricated organic light emitting diodes were measured for luminance while increasing the voltage form 0V to 10V using a luminance meter (Minolta Cs-1000A).

(3) Measurement of Luminous efficiency

[0190] Current efficiency (cd/A) and electric power efficiency (lm/W) at the same luminance (9000cd/m^2) were calculated by using luminance and current density from the item (1) and (2) and voltage.

[Table 1]

	Host material of emission layer	Threshold voltage (V)	9000 cd/m^2	
			Luminous efficiency (cd/A)	life-span (h, T97%)
Comparative Example 13	Example 1	4.1	87.9	50

(continued)

	Host material of emission layer	Threshold voltage (V)	9000 cd/m^2	
			Luminous efficiency (cd/A)	life-span (h, T97%)
Comparative Example 14	Example 2	4.3	88.7	50
Comparative Example 15	Example 4	4.1	83.8	45
Comparative Example 16	Example 6	4.7	73.7	20
Example 17	Example 7	5.1	73.6	10
Example 18	Example 10	4.8	78.7	60
Example 19	Example 11	4.0	68.2	10
Example 20	Example 12	5.3	69.5	5
Comparative Example 1	CBP	4.8	31.4	< 1
Comparative Example 2	bis[9-(4- methoxyphenyl) carbazol-3-yl]	-	30 to 35	-

[0191] Referring to Table 1, a device fabricated using a material according to the present invention had excellent driving voltage and efficiency compared with one fabricated using CBP, a reference material in terms of luminous efficiency. In addition, life-span was evaluated by measuring time until 3% luminous efficiency decreased. The device fabricated using CBP had a very short life-span of less than one hour, while the device fabricated using the compound of the present invention had a life-span ranging from 10 hours to 60 hours at most.

[0192] On the other hand, the device according to Comparative Example 2 had luminous efficiency ranging from 30 to 35 cd/A, which was remarkably lower than the ones according to Examples 13 to 20. Compared with the aforementioned two compounds of Comparative Examples, the compound according to the present invention may be well applied to an organic light emitting diode.

<Description of symbols>

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

Claims

1. Compound for an organic optoelectronic device, in particular for an organic photoelectric device, an organic light emitting diode, an organic solar cell, an organic transistor, an organic photo conductor drum, or an organic memory device, represented by one of the following Chemical Formulae 3, 6 to 48, 50 to 52, 54, C-3, C-6 to C-13 and C-15 to C-18:

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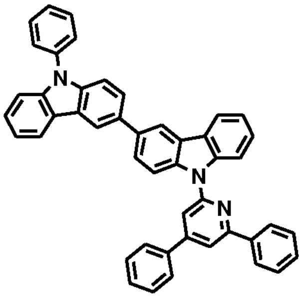

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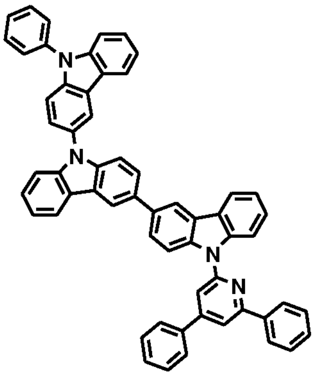

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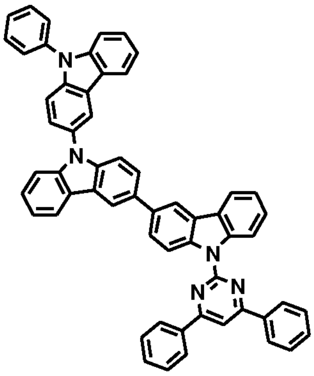

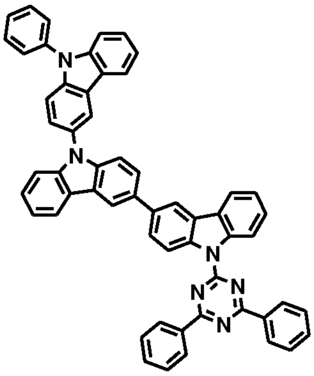

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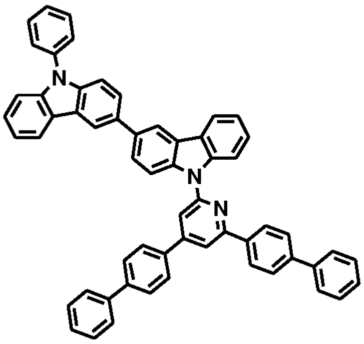

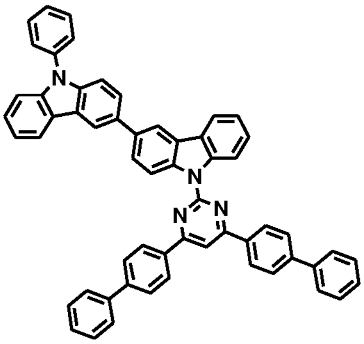

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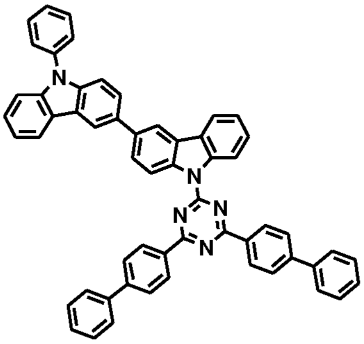

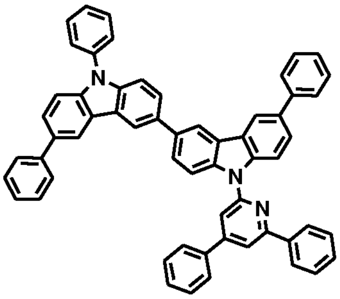

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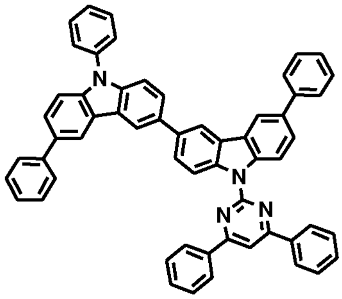

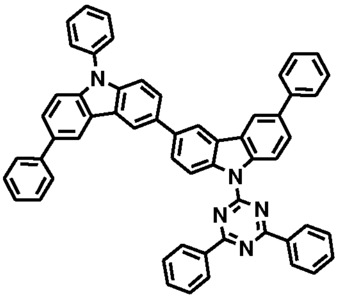

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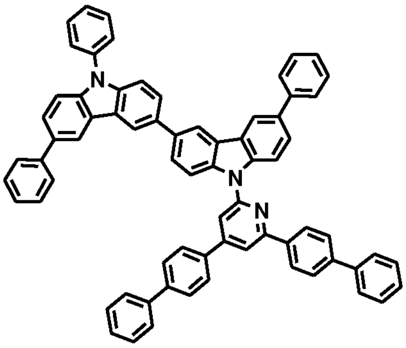

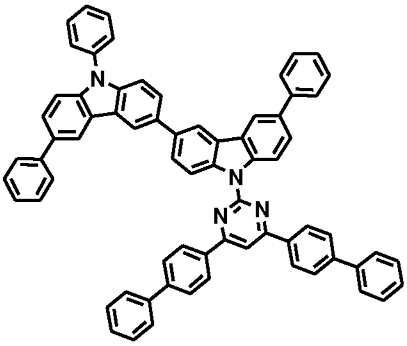

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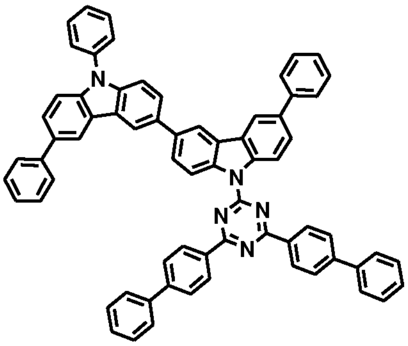

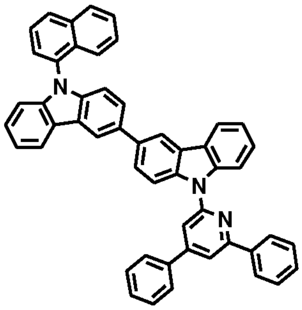

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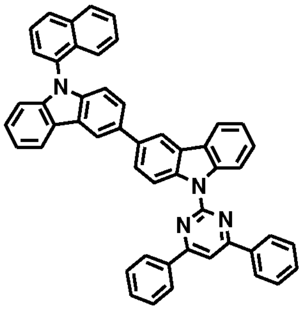

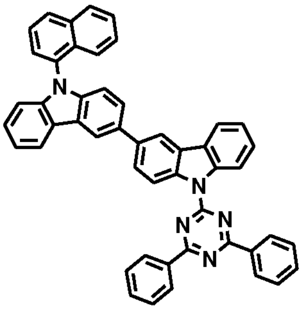

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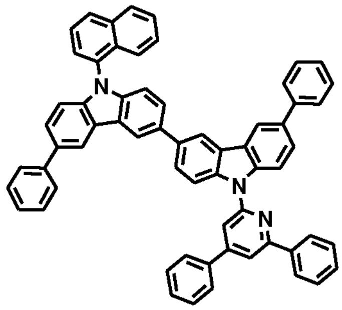

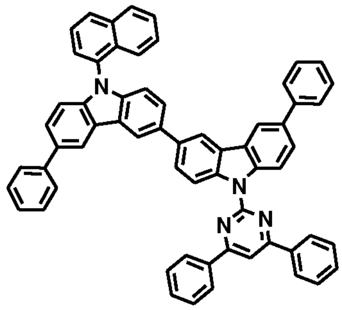

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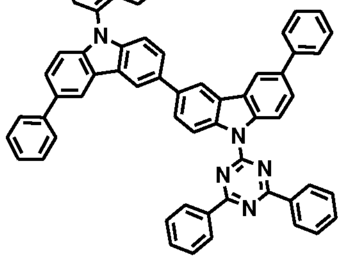

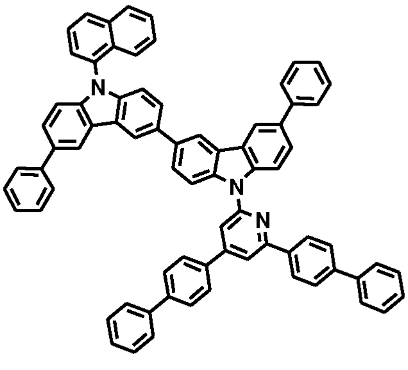

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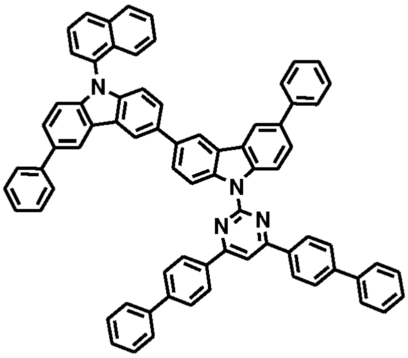

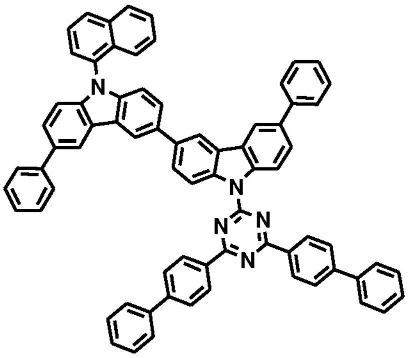

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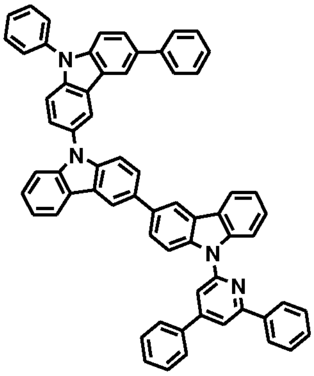

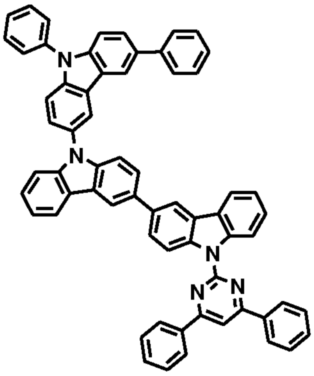

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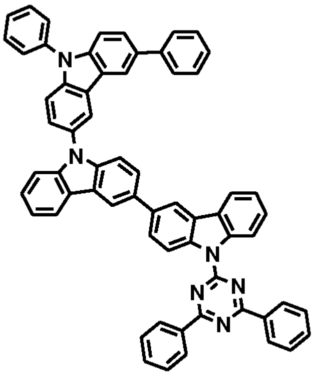

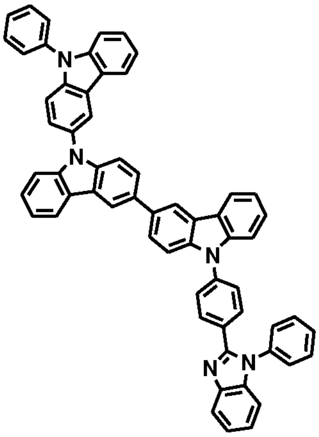

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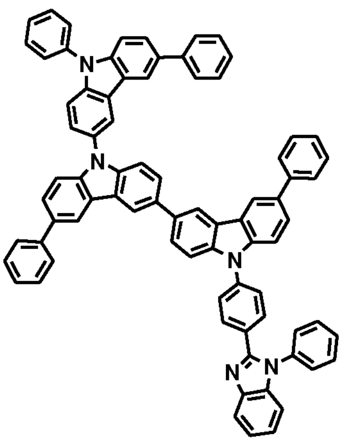

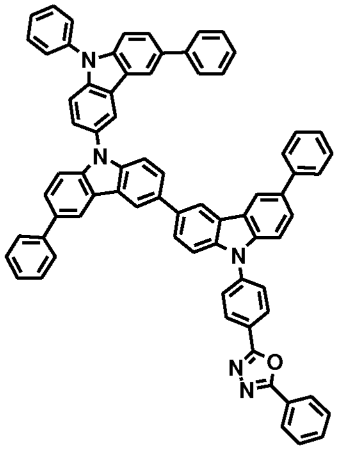

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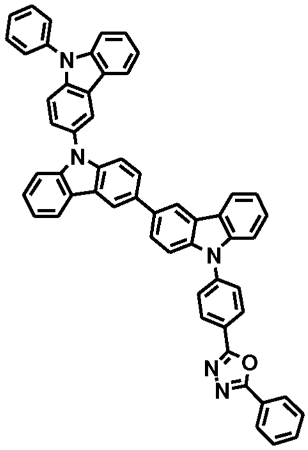

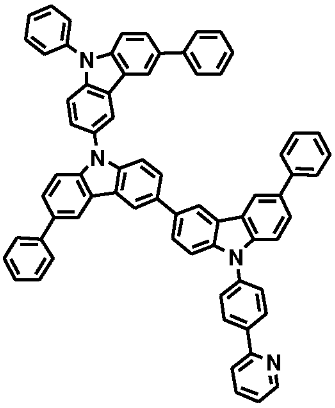

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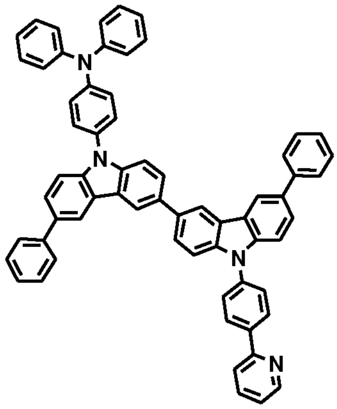

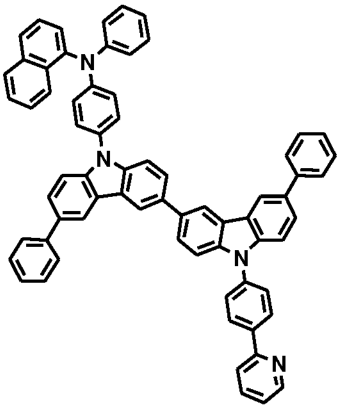

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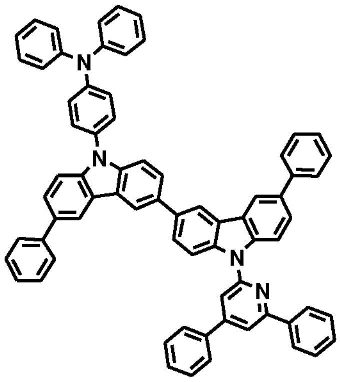

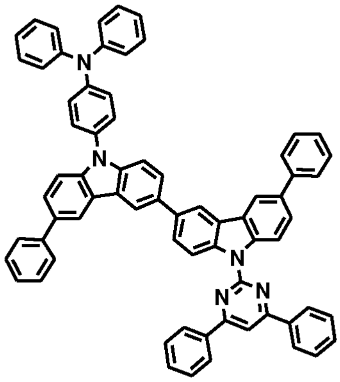

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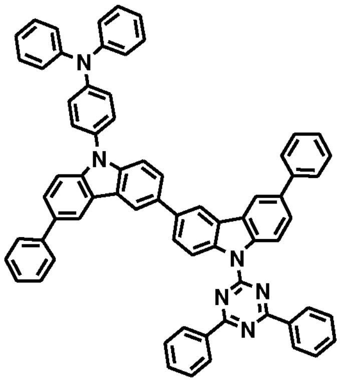

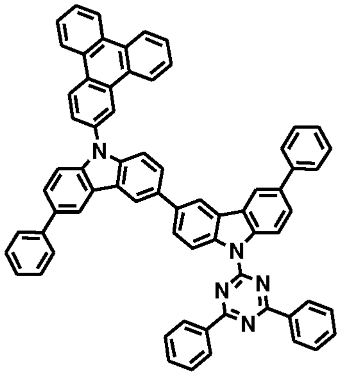

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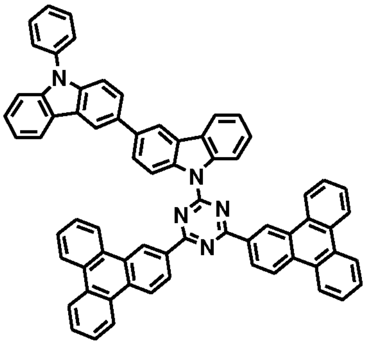

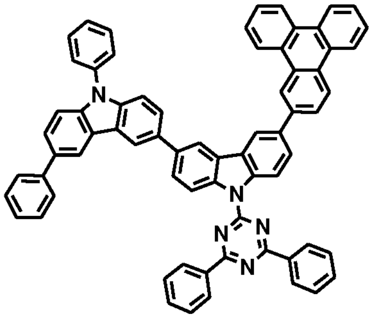

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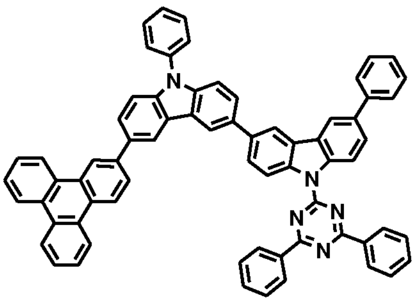

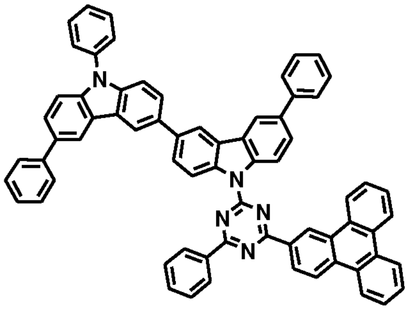

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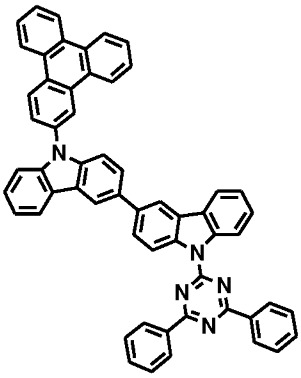

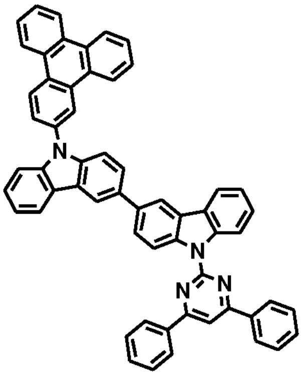

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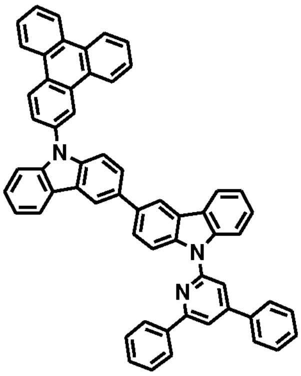

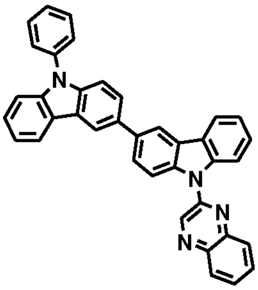

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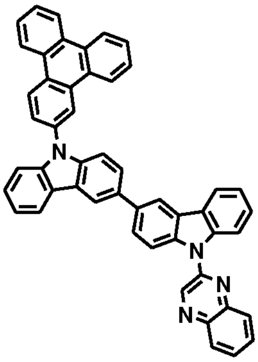

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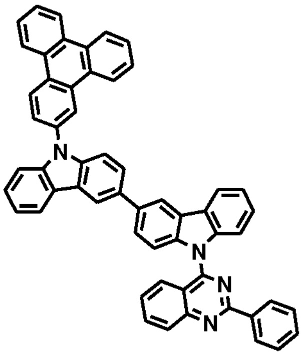

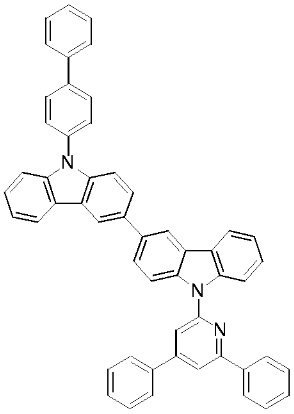

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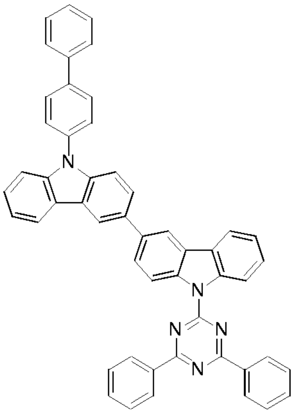
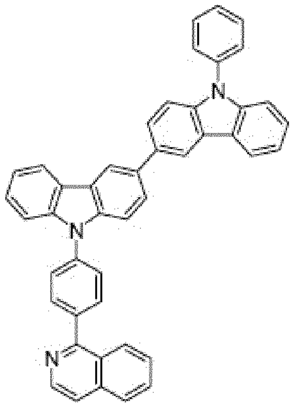
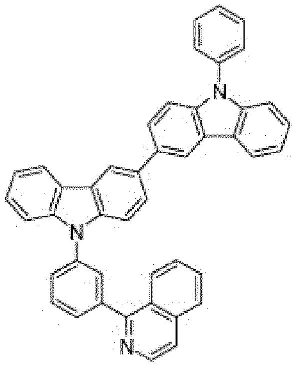
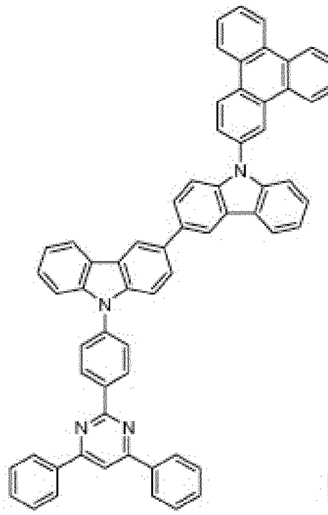


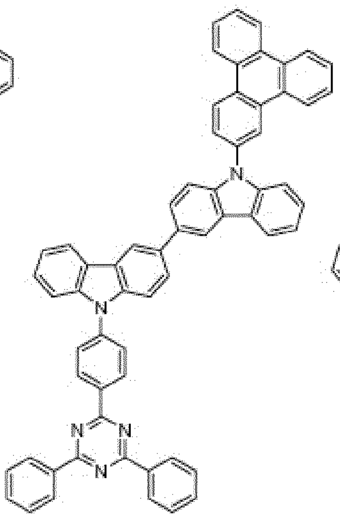
[Chemical Formula C-3] [Chemical Formula C-6]

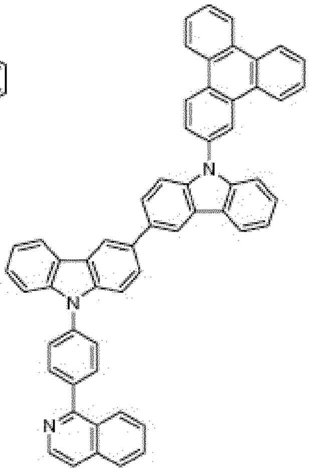




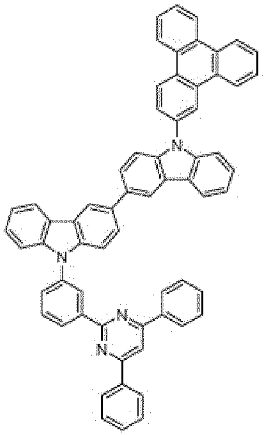
[Chemical Formula C-7] [Chemical Formula C-8] [Chemical Formula C-9]

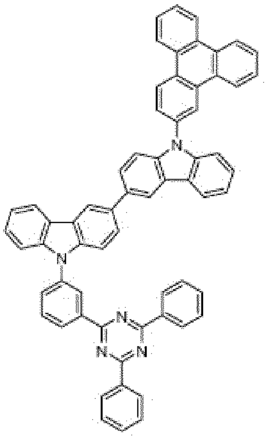


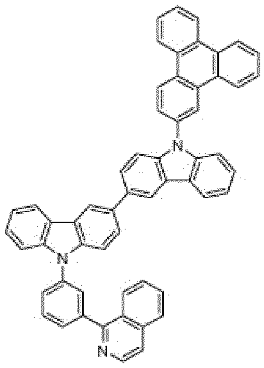




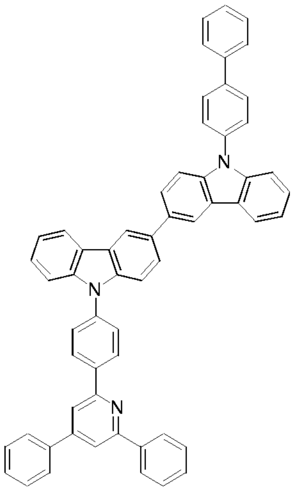
[Chemical Formula C-10] [Chemical Formula C-11] [Chemical Formula C-12]

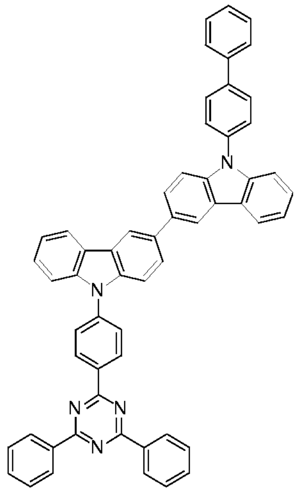




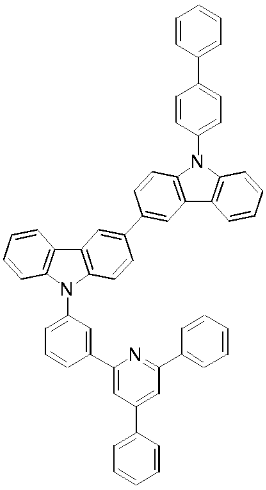


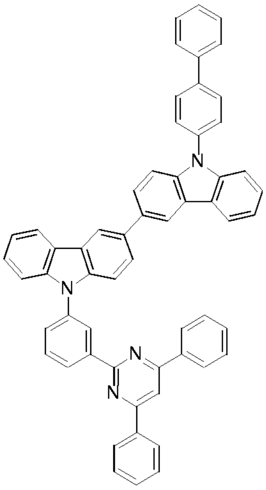
[Chemical Formula C-13] [Chemical Formula C-15]

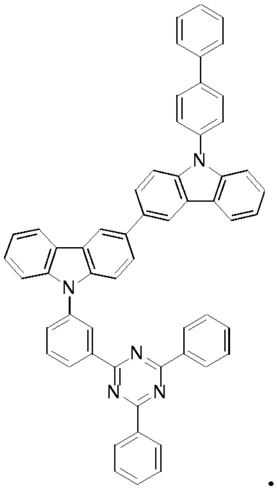




[Chemical Formula C-16] [Chemical Formula C-17] [Chemical Formula C-18]



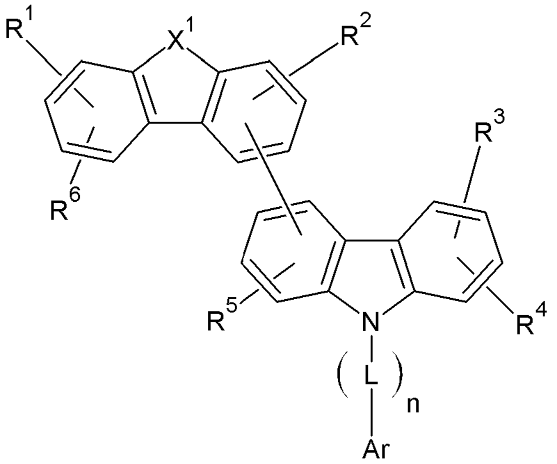




.

2. Compound for an organic optoelectronic device, in particular for an organic photoelectric device, an organic light emitting diode, an organic solar cell, an organic transistor, an organic photo conductor drum, or an organic memory device, wherein the compound for an organic optoelectronic device is represented by the following Chemical Formula B:

[Chemical Formula B]

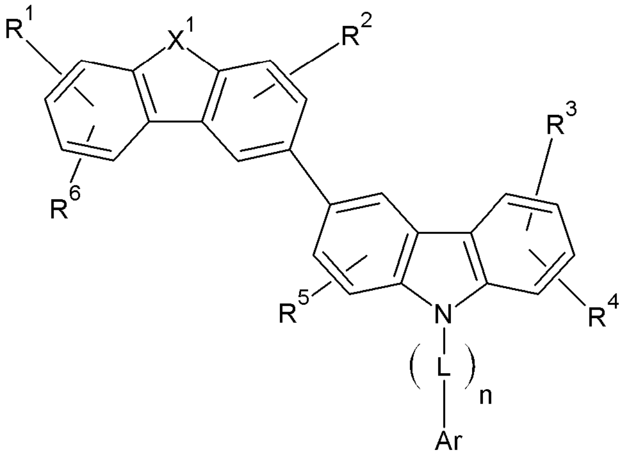


wherein, in Chemical Formula B,

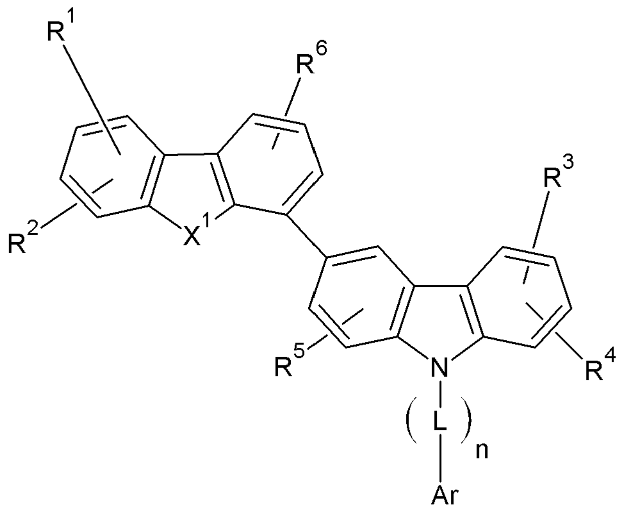
X^1 is selected from the group consisting of -O-, and -S-,
R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group,
Ar is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, wherein the substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties is selected from a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, and a substituted or unsubstituted triazinyl group,
L is selected from the group consisting of a single bond, a substituted or unsubstituted C2 to C10 alkenylene group, a substituted or unsubstituted C2 to C10 alkynylene group, a substituted or unsubstituted C6 to C30 arylene group and substituted or unsubstituted C2 to C30 heteroarylene group, and n is an integer ranging from 0 to 2.

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

[Chemical Formula B-1]



[Chemical Formula B-2]

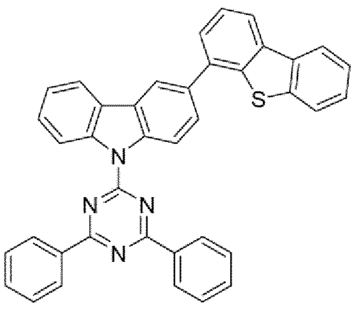


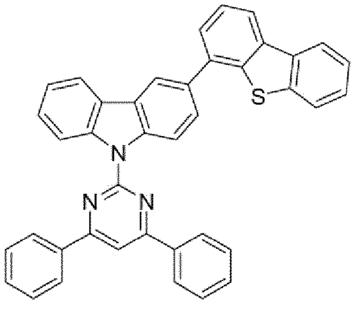
wherein, in Chemical Formulae B-1 and B-2,

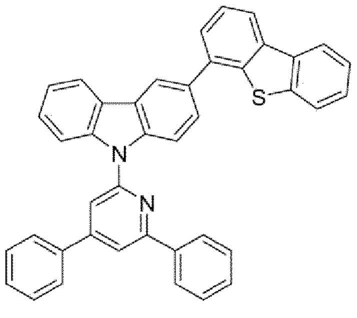
- X^1 is selected from the group consisting of -O-, and -S-,
- R^1 to R^6 are the same or different and are independently selected from the group consisting of hydrogen, deuterium, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, and a substituted or unsubstituted C2 to C30 heteroaryl group,
- Ar is a substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties, wherein the substituted or unsubstituted C2 to C30 heteroaryl group having electronic properties is selected from a substituted or unsubstituted pyridinyl group, a substituted or unsubstituted pyrimidinyl group, and a substituted or unsubstituted triazinyl group,
- L is a single bond, a substituted or unsubstituted C2 to C10 alkenylene group, a substituted or unsubstituted C2 to C10 alkynylene group, a substituted or unsubstituted C6 to C30 arylene group, and a substituted or unsubstituted C2 to C30 heteroarylene group, and
- n is an integer ranging from 0 to 2.

4. Compound for an organic optoelectronic device of claim 2 or 3, wherein the compound for an organic optoelectronic device is represented by one of the following Chemical Formulae B-3 to B-8, B-12 to B-17 and B-19 to B-22.

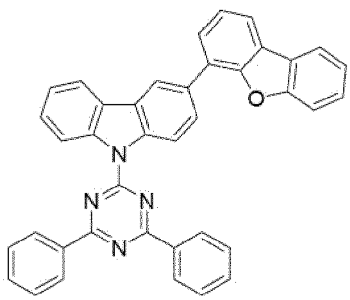
[Chemical Formula B-3] [Chemical Formula B-4] [Chemical Formula B-5]

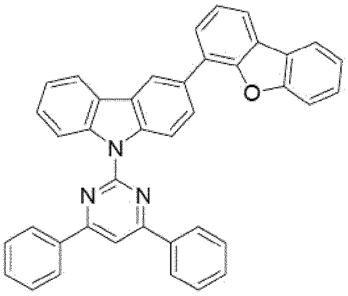


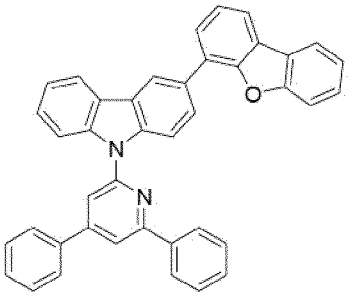




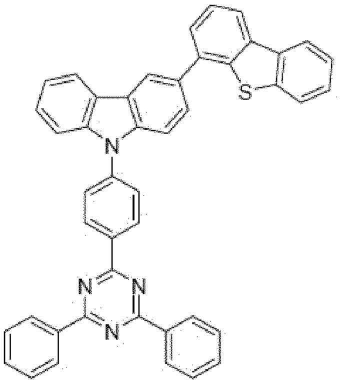
[Chemical Formula B-6] [Chemical Formula B-7] [Chemical Formula B-8]

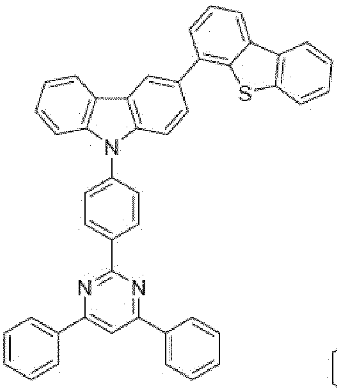


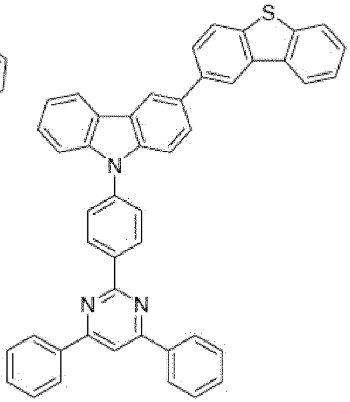




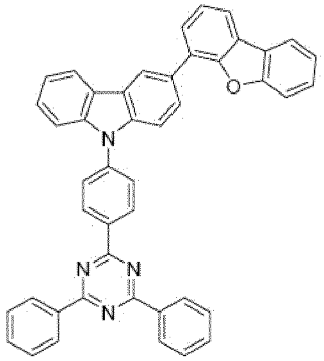
[Chemical Formula B-12] [Chemical Formula B-13] [Chemical Formula B-14]

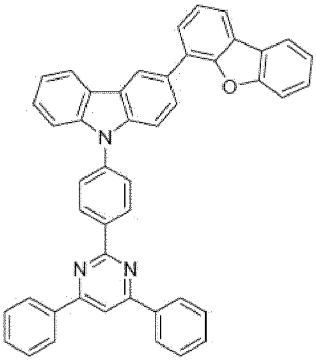


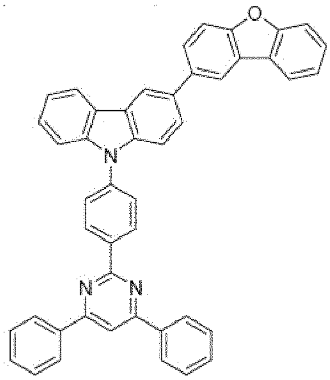




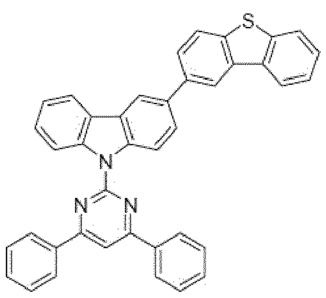
[Chemical Formula B-15] [Chemical Formula B-16] [Chemical Formula B-17]

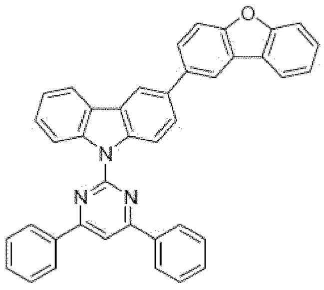




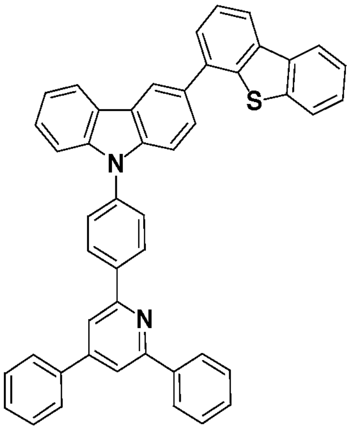


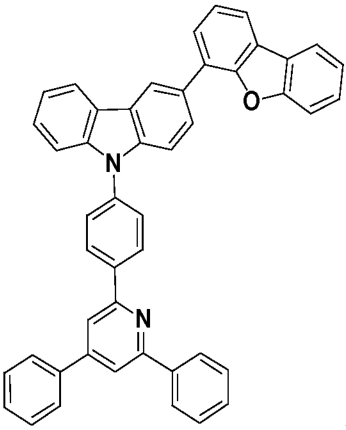
[Chemical Formula B-19] [Chemical Formula B-20]





[Chemical Formula B-21] [Chemical Formula B-22]





.

5. Organic light emitting diode, comprising an organic light emitting diode including 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, particularly one of an emission layer, a hole transport layer (HTL), a hole injection layer (HIL), an electron transport layer (ETL), an electron injection layer (EIL), a hole blocking layer, and a combination thereof, comprises the compound for an organic optoelectronic device according to any of claims 1 to 4.

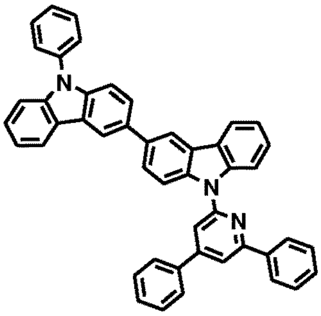
6. Organic light emitting diode of claim 5, wherein the compound for an organic optoelectronic device is used as a phosphorescent or fluorescent host material in an emission layer or as fluorescent blue dopant material in an emission layer.

7. Display device comprising the organic light emitting diode according to claim 5 or 6.

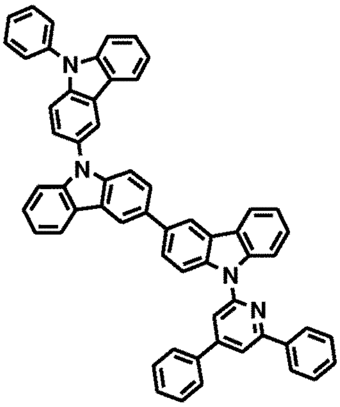
Patentansprüche

1. Verbindung für ein organisches optoelektronisches Bauelement, insbesondere für ein organisches fotoelektrisches Bauelement, eine organische Leuchtdiode, eine organische Solarzelle, einen organischen Transistor, eine organische Fotoleitertrommel oder ein organisches Speicherbauelement, die dargestellt ist durch eine der folgenden chemischen Formeln 3, 6 bis 48, 50 bis 52, 54, C-3, C-6 bis C-13 und C-15 bis C-18:

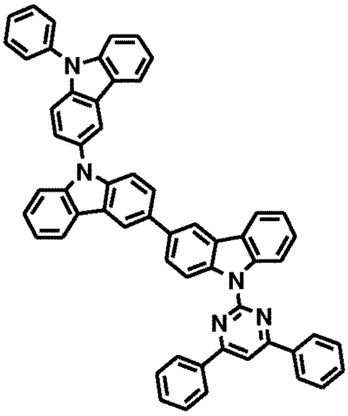
[Chemische Formel 3]



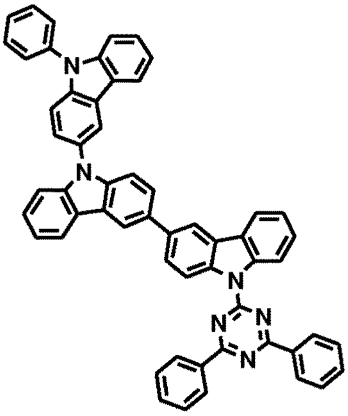
[Chemische Formel 6]



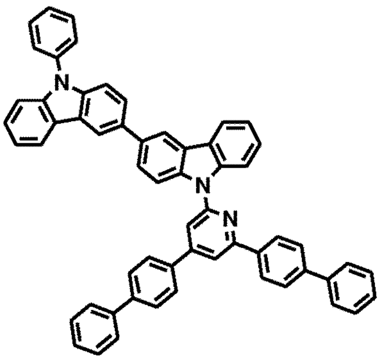
[Chemische Formel 7]



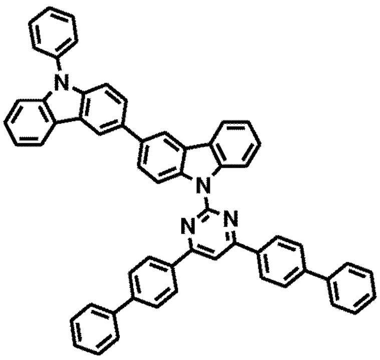
[Chemische Formel 8]



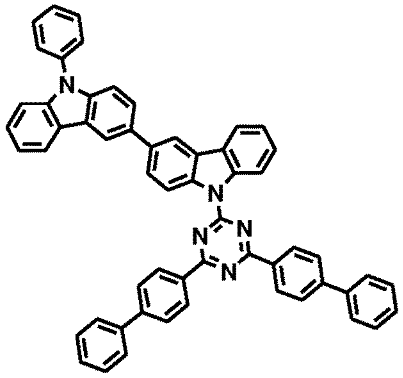
[Chemische Formel 9]



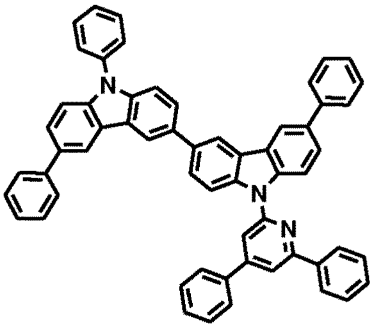
[Chemische Formel 10]



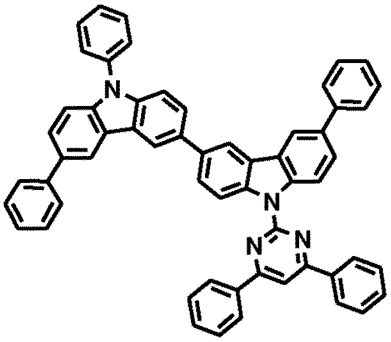
[Chemische Formel 11]



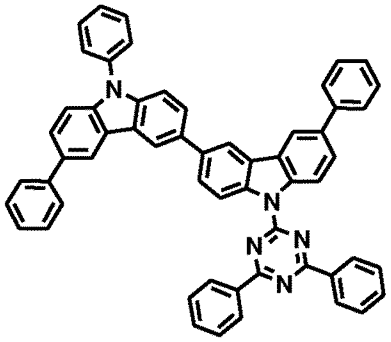
[Chemische Formel 12]



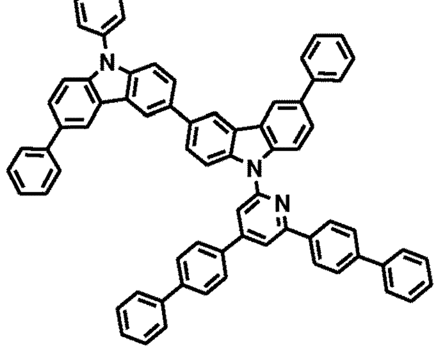
[Chemische Formel 13]



[Chemische Formel 14]



[Chemische Formel 15]



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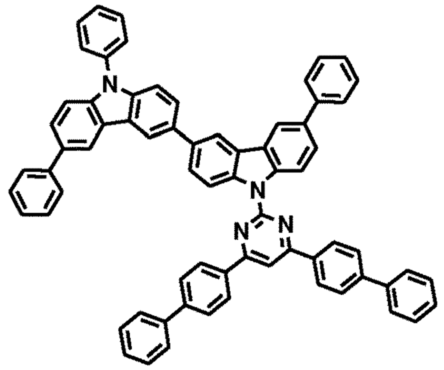

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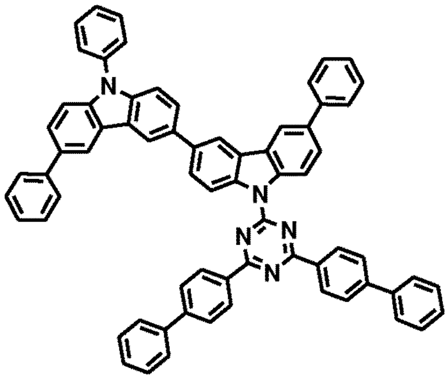

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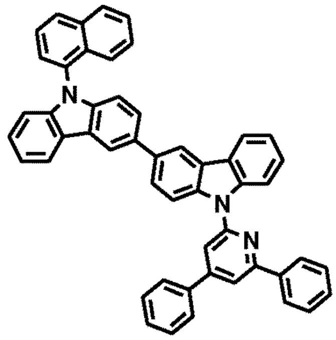

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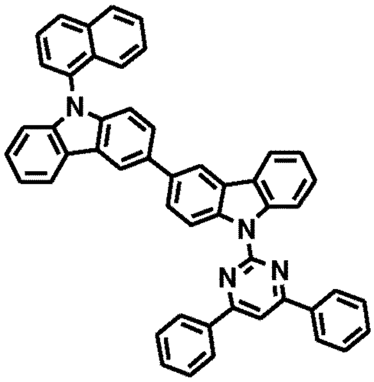
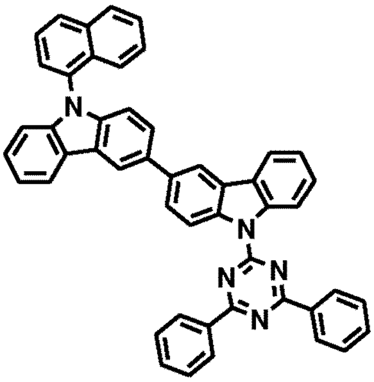


[Chemische Formel 20]



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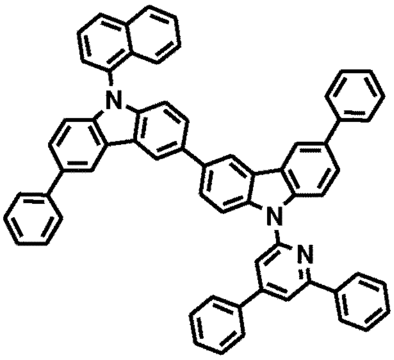

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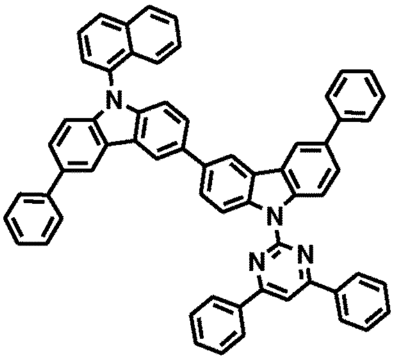

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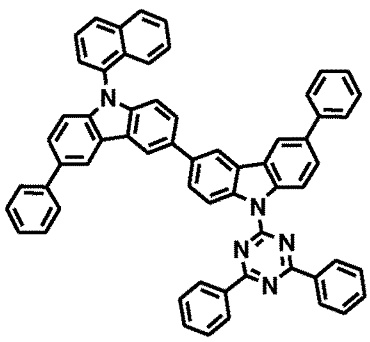

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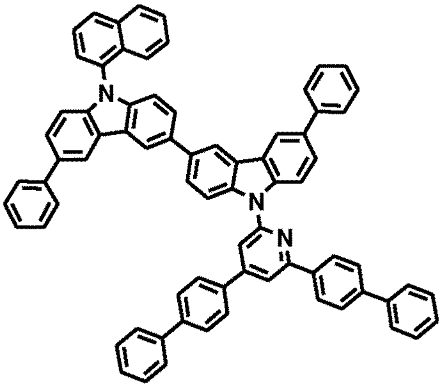
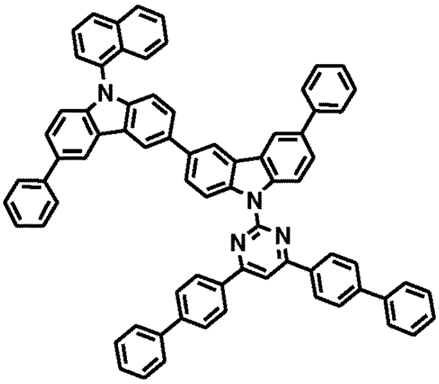


[Chemische Formel 25]



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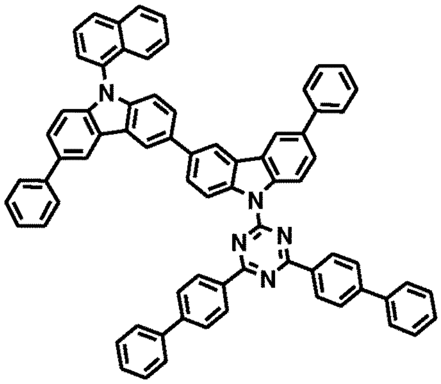

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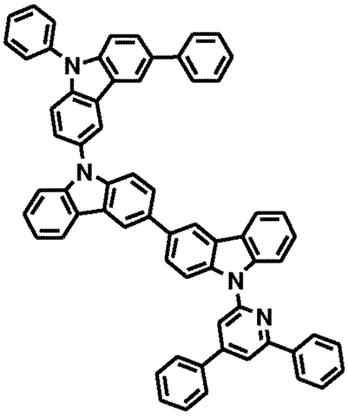

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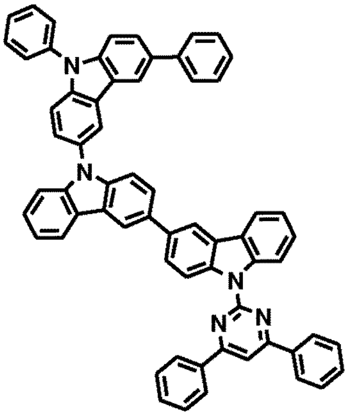
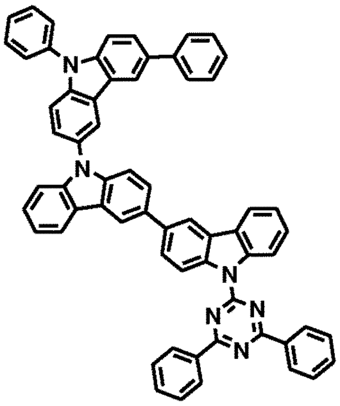
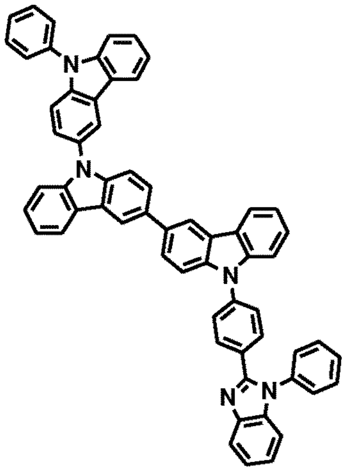
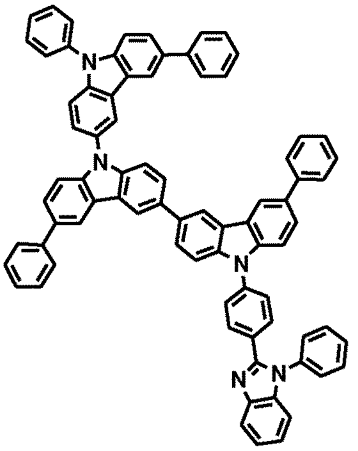


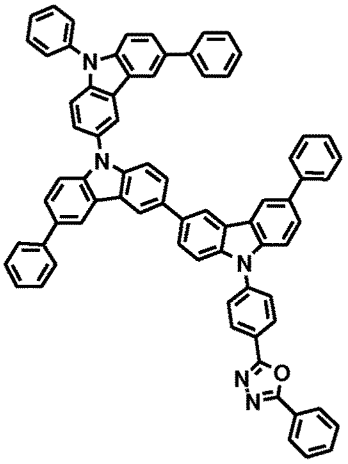
[Chemische Formel 29] [Chemische Formel 30]



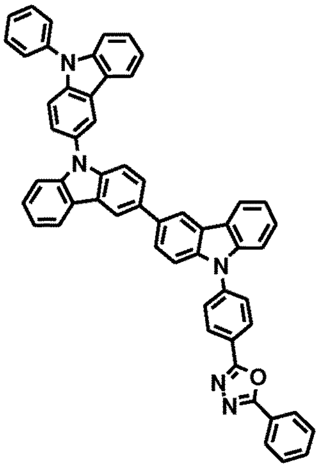


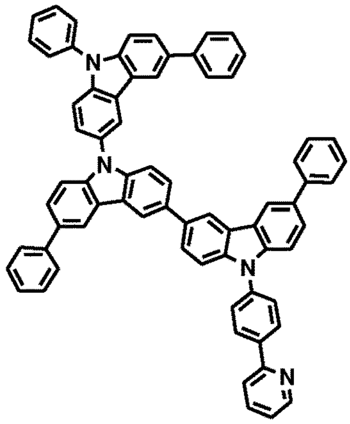
[Chemische Formel 31]   [Chemische Formel 32]



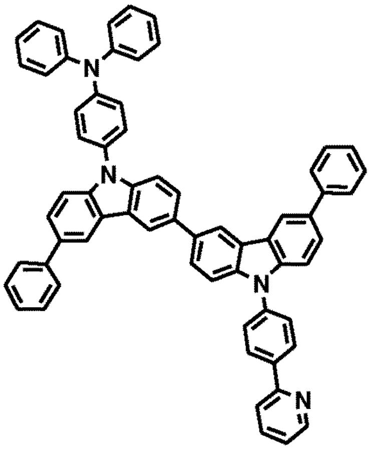


[Chemische Formel 33]   [Chemische Formel 34]

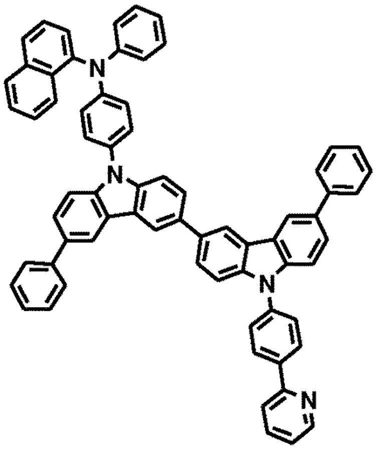




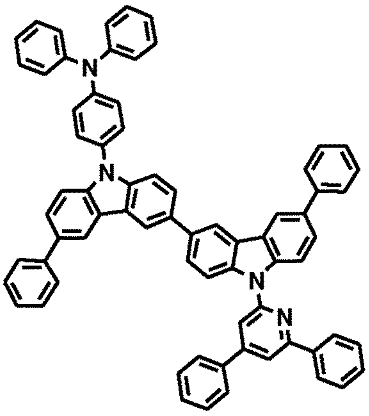
[Chemische Formel 35]



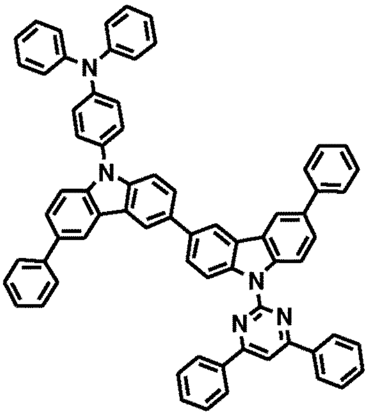
[Chemische Formel 36]



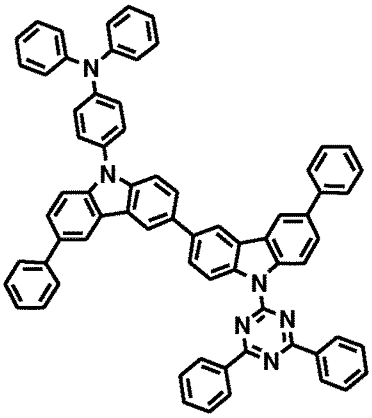
[Chemische Formel 37]



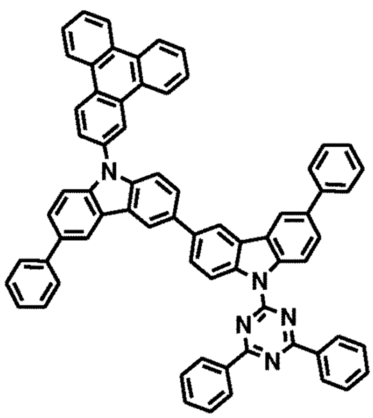
[Chemische Formel 38]



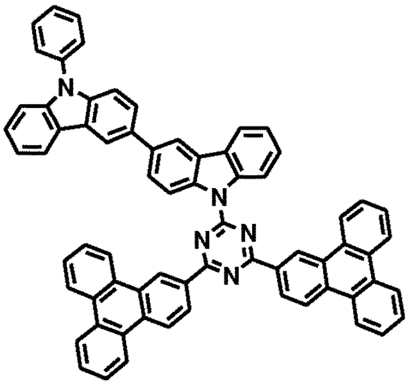
[Chemische Formel 39]



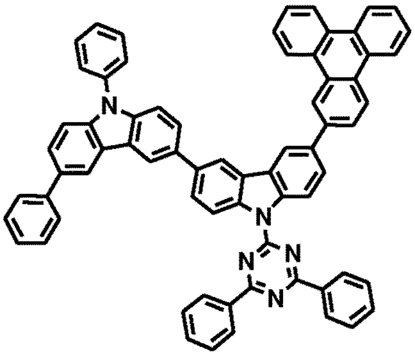
[Chemische Formel 40]



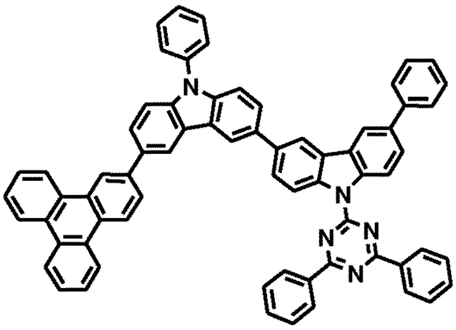
[Chemische Formel 41]



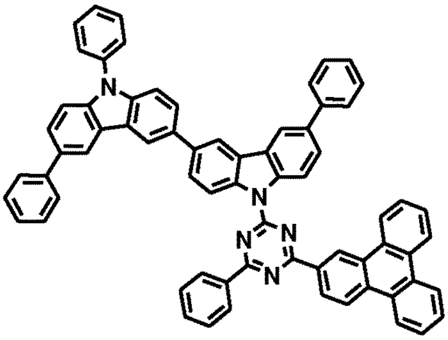
[Chemische Formel 42]



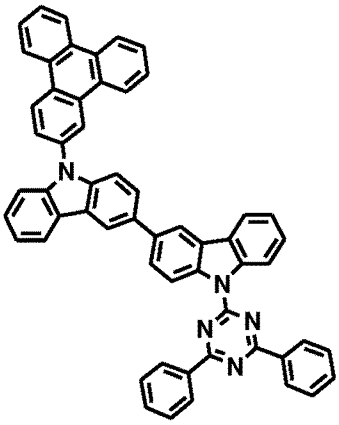
[Chemische Formel 43]



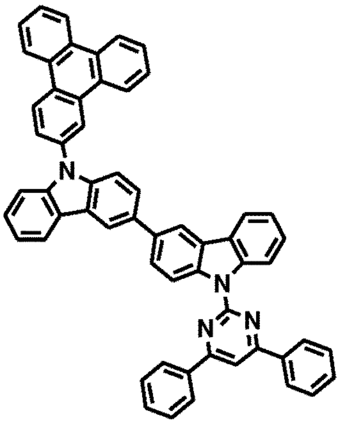
[Chemische Formel 44]



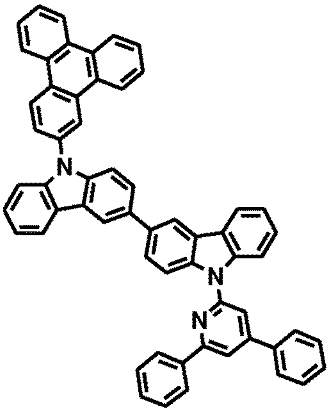
[Chemische Formel 45]



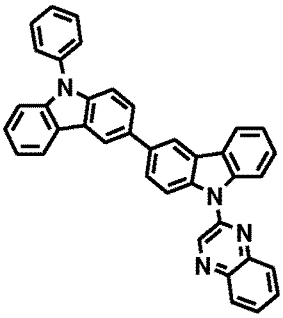
[Chemische Formel 46]



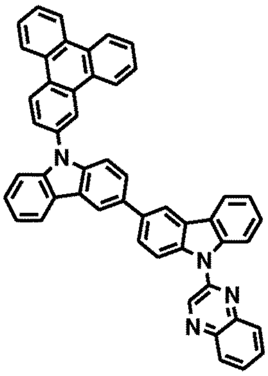
[Chemische Formel 47]



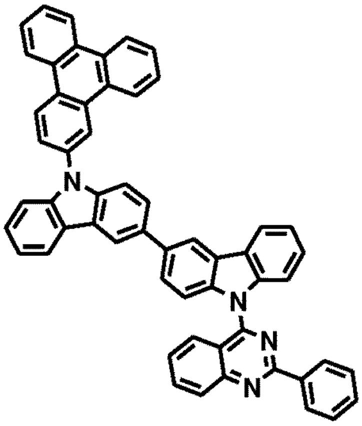
[Chemische Formel 48]



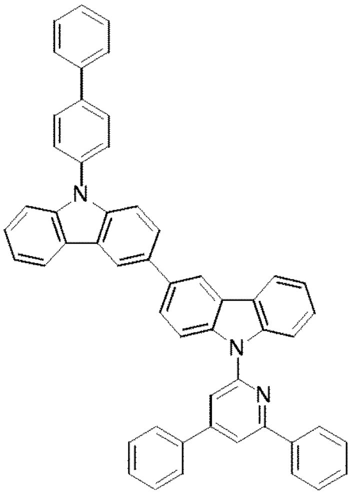
[Chemische Formel 50]



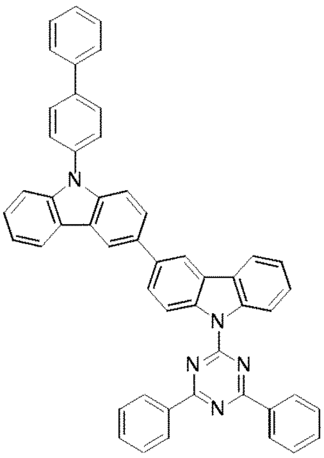
[Chemische Formel 51]



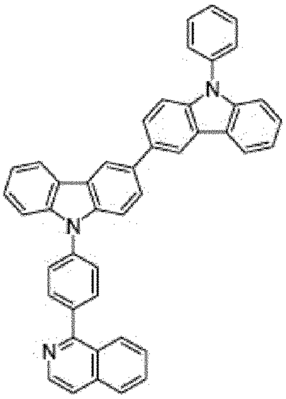
[Chemische Formel 52]

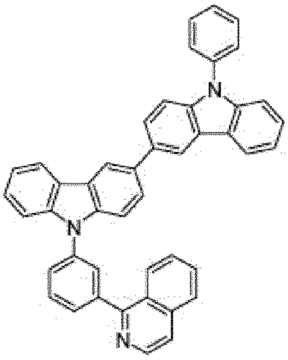


[Chemische Formel 54]

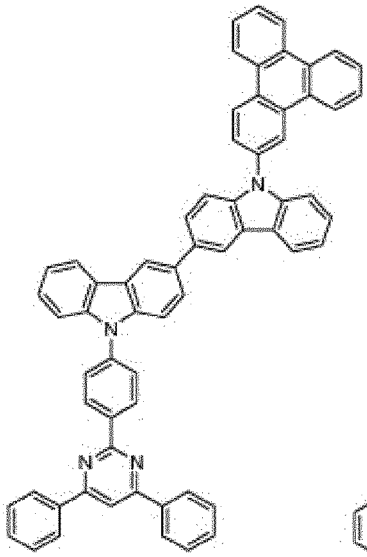


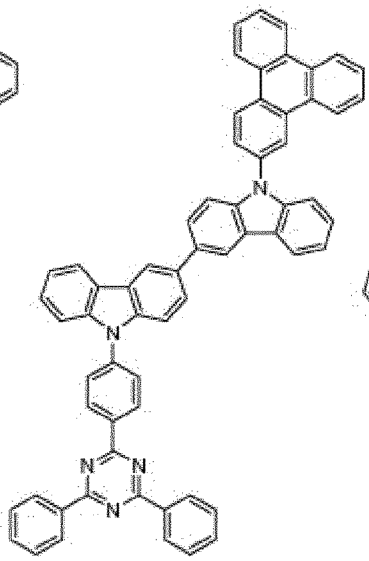
[Chemische Formel C-3] [Chemische Formel C-6]

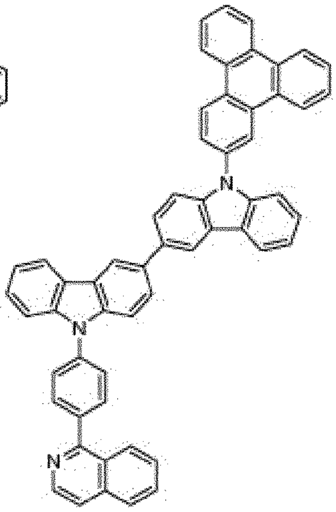




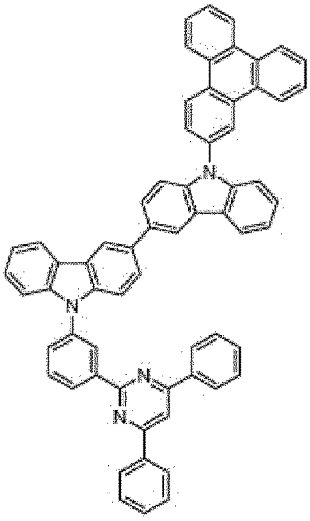
[Chemische Formel C-7] [Chemische Formel C-8] [Chemische Formel C-9]

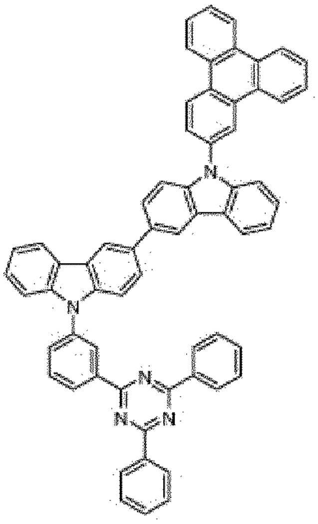


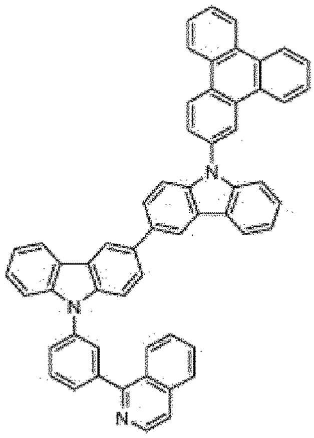




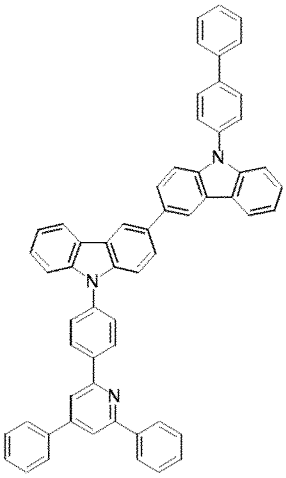
[Chemische Formel C-10] [Chemische Formel C-11] [Chemische Formel C-12]

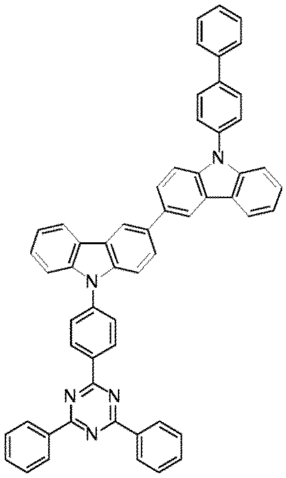




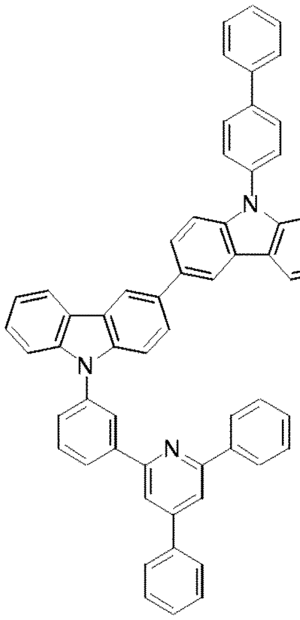


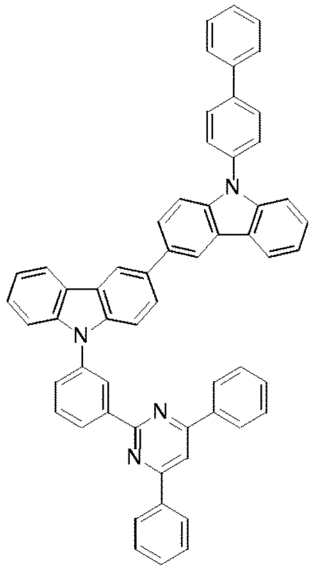
[Chemische Formel C-13] [Chemische Formel C-15]

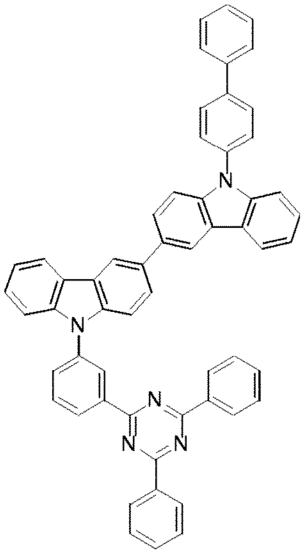




[Chemische Formel C-16] [Chemische Formel C-17] [Chemische Formel C-18]







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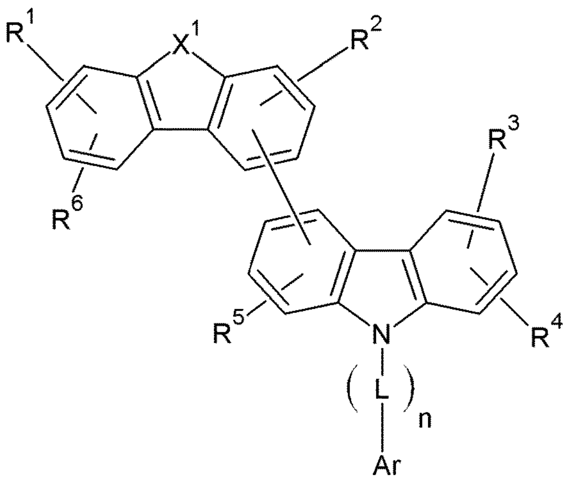
2. Verbindung für ein organisches optoelektronisches Bauelement, insbesondere für ein organisches fotoelektrisches Bauelement, eine organische Leuchtdiode, eine organische Solarzelle, einen organischen Transistor, eine organische Fotoleitertrommel oder ein organisches Speicherbauelement, wobei die Verbindung für ein organisches optoelektronisches Bauelement durch die folgende chemische Formel B dargestellt ist:

[Chemische Formel B]



,

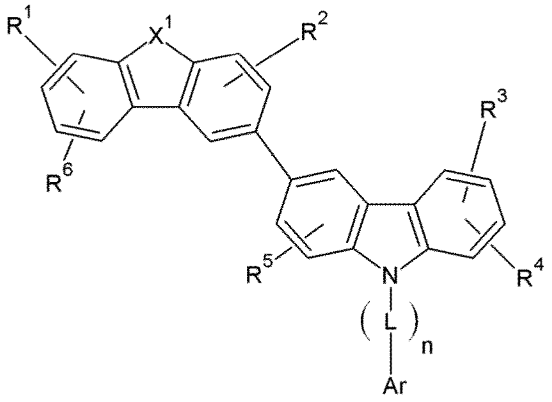
wobei in der chemischen Formel B

X^1 ausgewählt ist aus der Gruppe bestehend aus -O- und -S-
R^1 bis R^6 gleich oder verschieden und unabhängig voneinander ausgewählt sind aus der Gruppe bestehend aus Wasserstoff, Deuterium, einer substituierten oder unsubstituierten C1- bis C20-Alkylgruppe, einer substituierten oder unsubstituierten C6- bis C30-Arylgruppe und einer substituierten oder unsubstituierten C2- bis C30-Heteroarylgruppe,
Ar eine substituierte oder unsubstituierte C2- bis C30-Heteroa-rylgruppe mit elektronischen Eigenschaften ist, wobei die substituierte oder unsubstituierte C2- bis C30-Heteroarylgruppe mit elektronischen Eigenschaften ausgewählt ist aus einer substituierten oder unsubstituierten Pyridinylgruppe, einer substituierten oder unsub-

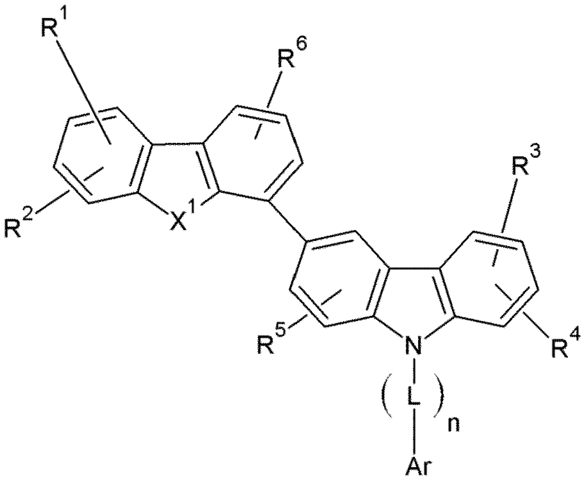
stituierten Pyrimidinylgruppe und einer substituierten oder unsubstituierten Triazinylgruppe,
L ausgewählt ist aus der Gruppe bestehend aus einer Einfachbindung, einer substituierten oder unsubstituierten C2- bis C10-Alkenylengruppe, einer substituierten oder unsubstituierten C2- bis C10-Alkinylengruppe, einer substituierten oder unsubstituierten C6- bis C30-Arylengruppe und einer substituierten oder unsubstituierten C2- bis C30-Heteroarylengruppe, und
n eine ganze Zahl im Bereich von 0 bis 2 ist.

3. Verbindung für ein organisches optoelektronisches Bauelement nach Anspruch 2, wobei die Verbindung für ein organisches optoelektronisches Bauelement durch die folgende chemische Formel B-1 oder B-2 dargestellt ist:

[Chemische Formel B-1]



[Chemische Formel B-2]



,

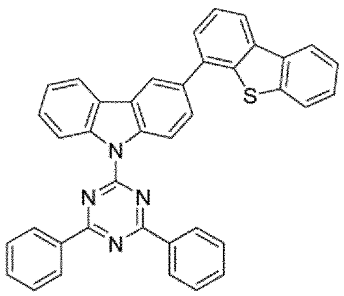
wobei in den chemischen Formeln B-1 und B-2

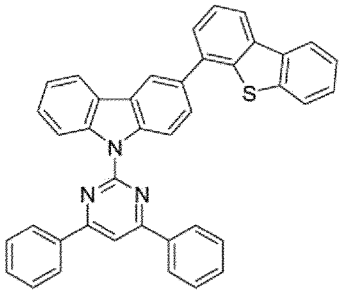
X^1 ausgewählt ist aus der Gruppe bestehend aus -O- und -S-
R^1 bis R^6 gleich oder verschieden und unabhängig voneinander ausgewählt sind aus der Gruppe bestehend aus Wasserstoff, Deuterium, einer substituierten oder unsubstituierten C1- bis C20-Alkylgruppe, einer substituierten oder unsubstituierten C6- bis C30-Arylgruppe und einer substituierten oder unsubstituierten C2- bis C30-Heteroarylgruppe,
Ar eine substituierte oder unsubstituierte C2- bis C30-Heteroarylgruppe mit elektronischen Eigenschaften ist, wobei die substituierte oder unsubstituierte C2- bis C30-Heteroarylgruppe mit elektronischen Eigenschaften ausgewählt ist aus einer substituierten oder unsubstituierten Pyridinylgruppe, einer substituierten oder unsubstituierten Pyrimidinylgruppe und einer substituierten oder unsubstituierte Triazinylgruppe,

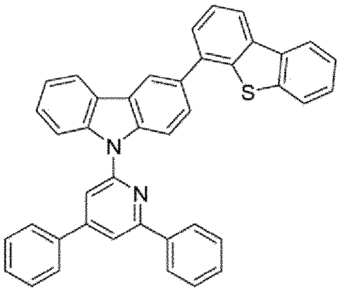
L ausgewählt ist aus einer Einfachbindung, einer substituierten oder unsubstituierten C2- bis C10-Alkenylengruppe, einer substituierten oder unsubstituierten C2- bis C10-Alkinylengruppe, einer substituierten oder unsubstituierten C6- bis C30-Arylengruppe und einer substituierten oder unsubstituierten C2- bis C30-Heteroarylengruppe, und
n eine ganze Zahl im Bereich von 0 bis 2 ist.

4. Verbindung für ein organisches optoelektronisches Bauelement nach Anspruch 2 oder 3, wobei die Verbindung für ein organisches optoelektronisches Bauelement durch eine der folgenden chemischen Formeln B-3 bis B-8, B-12 bis B-17 und B-19 bis B-22 dargestellt ist.

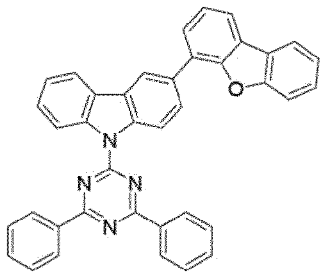
[Chemische Formel B-3] [Chemische Formel B-4] [Chemische Formel B-5]

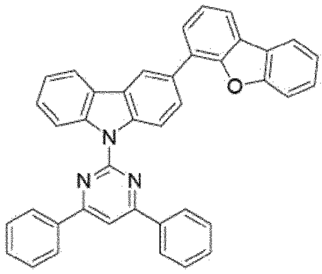


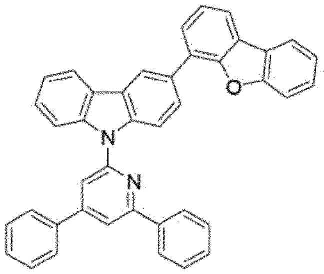




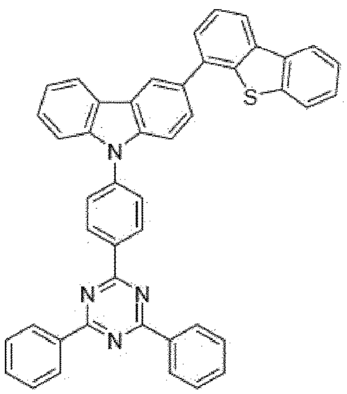
[Chemische Formel B-6] [Chemische Formel B-7] [Chemische Formel B-8]

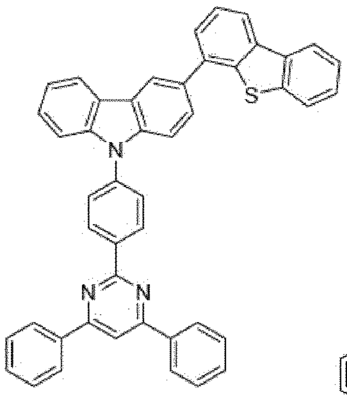


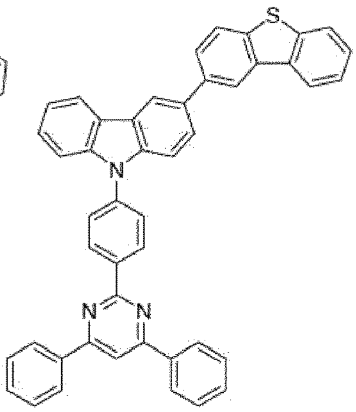




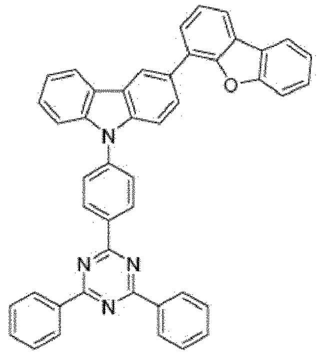
[Chemische Formel B-12] [Chemische Formel B-13] [Chemische Formel B-14]

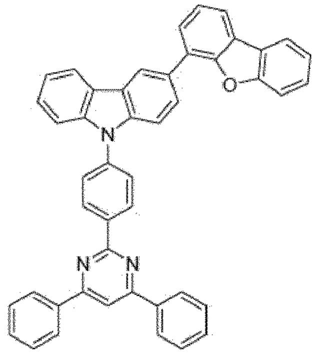


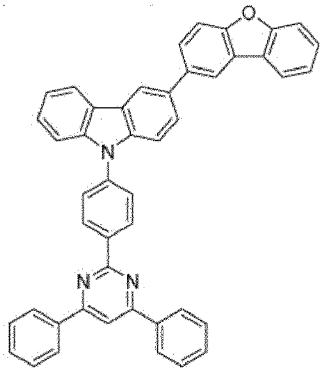




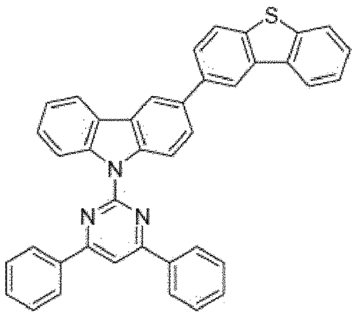
[Chemische Formel B-15] [Chemische Formel B-16] [Chemische Formel B-17]

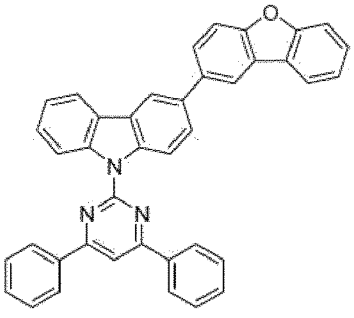




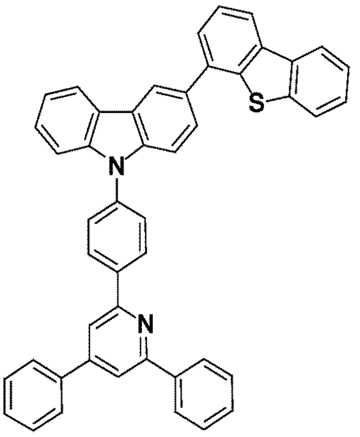


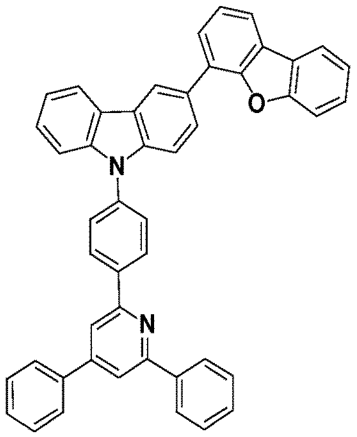
[Chemische Formel B-19] [Chemische Formel B-20]





[Chemische Formel B-21] [Chemische Formel B-22]





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5. Organische Leuchtdiode, umfassend eine organische Leuchtdiode mit einer Anode, einer Kathode und mindestens einer oder mehreren organischen Dünnschichten zwischen der Anode und der Kathode, wobei mindestens eine der organischen Dünnschichten, insbesondere eine Schicht unter einer Emissionsschicht, einer Lochtransportschicht (HTL), einer Lochinjektionsschicht (HIL), einer Elektronentransportschicht (ETL), einer Elektroneninjektionsschicht (EIL), einer Lochblockierschicht oder eine Kombination davon, die Verbindung für ein organisches optoelektronisches Bauelement nach einem der Ansprüche 1 bis 4 aufweist.

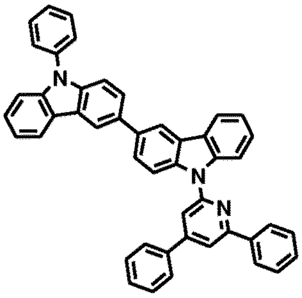
6. Organische Leuchtdiode nach Anspruch 5, wobei die Verbindung für ein organisches optoelektronisches Bauelement als phosphoreszierendes oder fluoreszierendes Wirtsmaterial in einer Emissionsschicht oder als fluoreszierendes blaues Dotiermaterial in einer Emissionsschicht verwendet wird.

7. Anzeigevorrichtung mit der organischen Leuchtdiode nach Anspruch 5 oder 6.

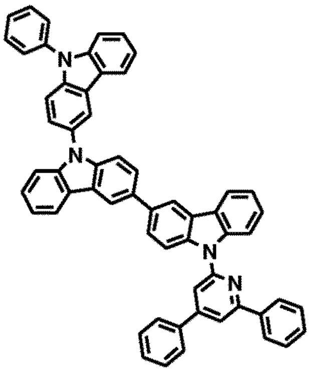
Revendications

1. Composé destiné à un dispositif optoélectronique organique, en particulier, destiné à un dispositif photoélectrique organique, une diode émettant une lumière organique, une cellule solaire organique, un transistor organique, un tambour de conducteur photo organique, ou un dispositif de mémoire organique, représenté par une des formules chimiques suivantes 3, 6 à 48, 50 à 52, 54, C-3, C-6 à C-13 et C-15 à C-18 :

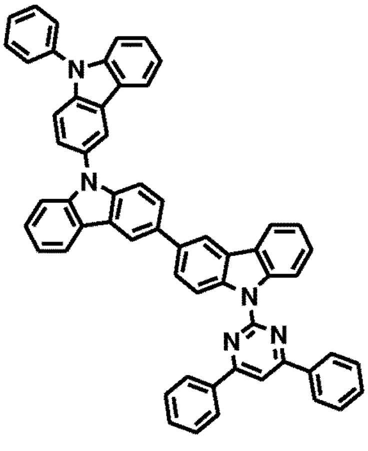
[Formule chimique 3]

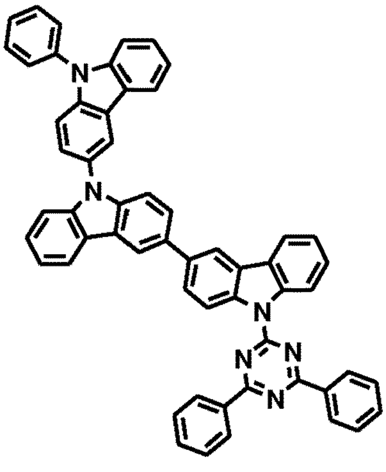


[Formule chimique 6]

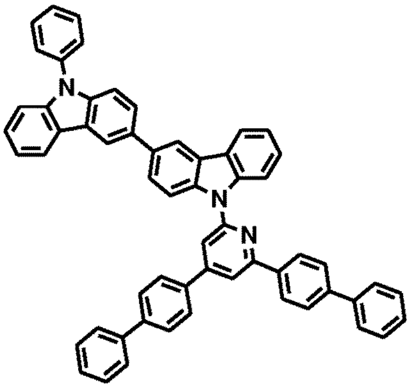


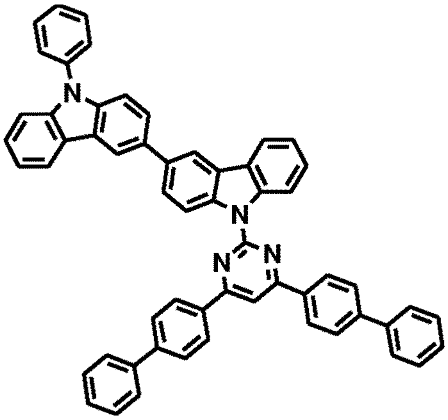
[Formule chimique 7] [Formule chimique 8]



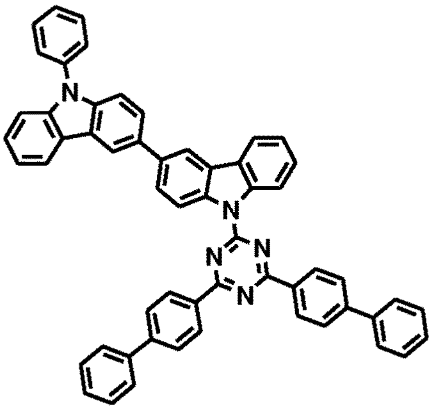


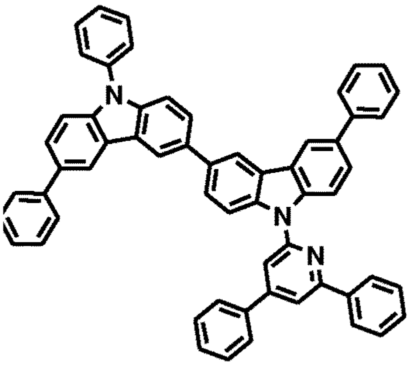
[Formule chimique 9] [Formule chimique 10]



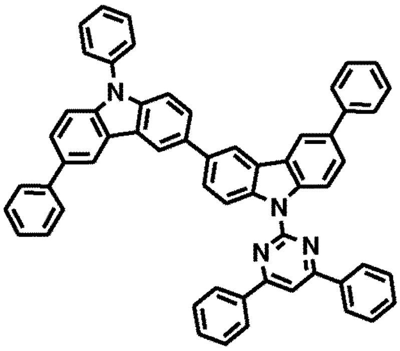


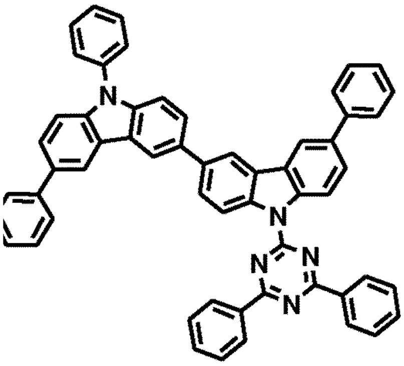
[Formule chimique 11] [Formule chimique 12]



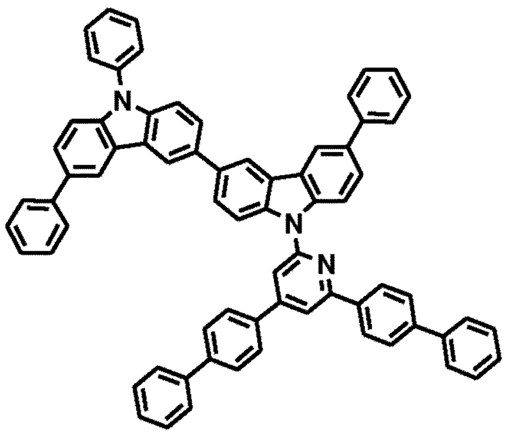


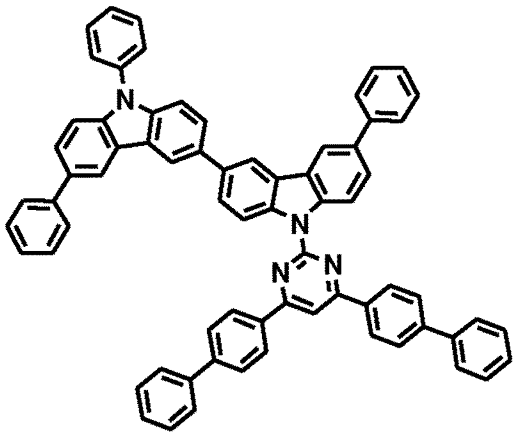
[Formule chimique 13] [Formule chimique 14]



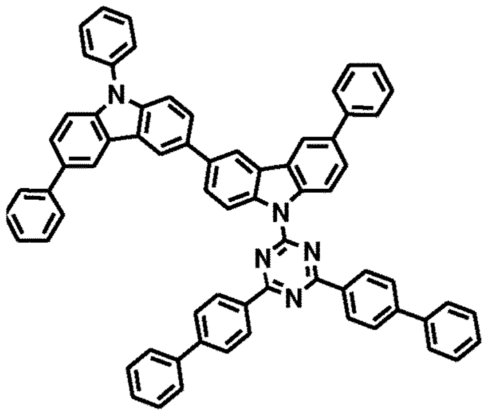


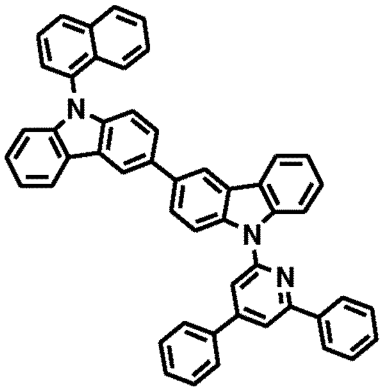
[Formule chimique 15] [Formule chimique 16]



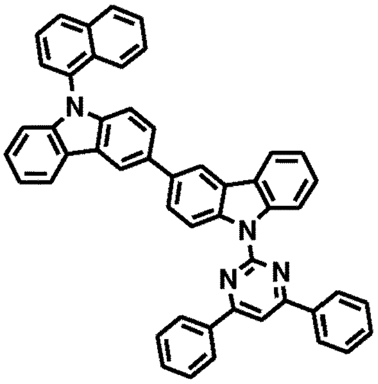


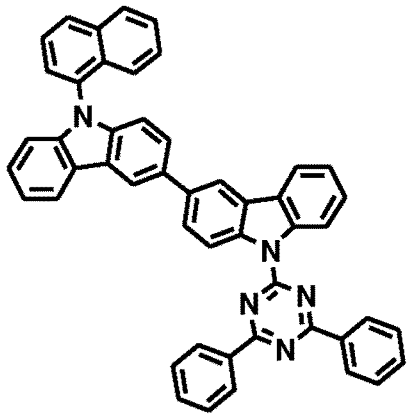
[Formule chimique 17] [Formule chimique 18]



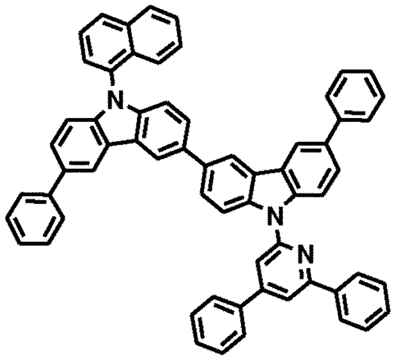


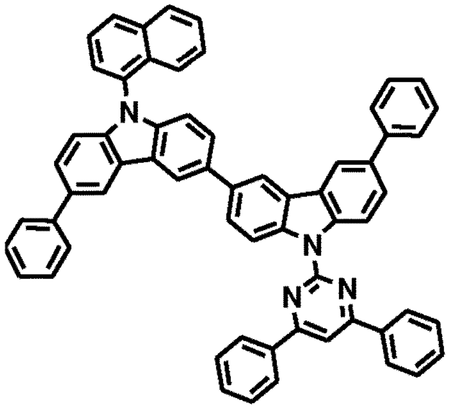
[Formule chimique 19] [Formule chimique 20]



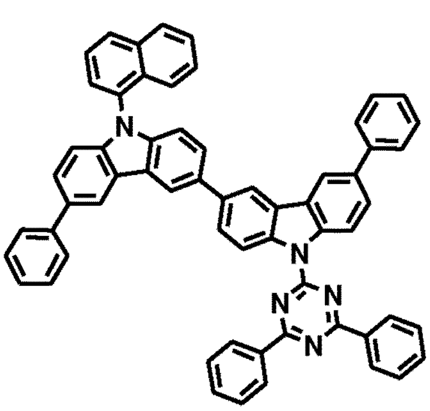


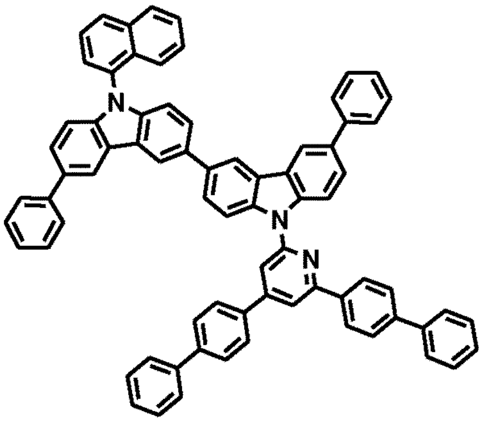
[Formule chimique 21] [Formule chimique 22]



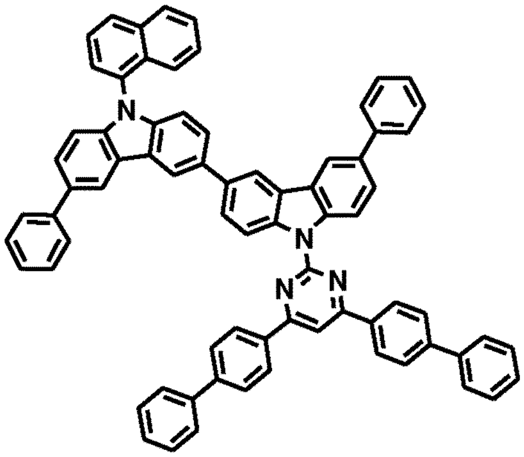


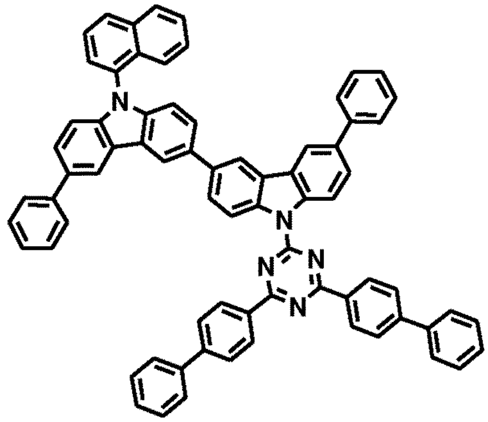
[Formule chimique 23] [Formule chimique 24]



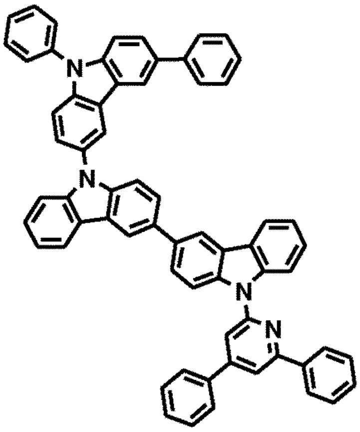


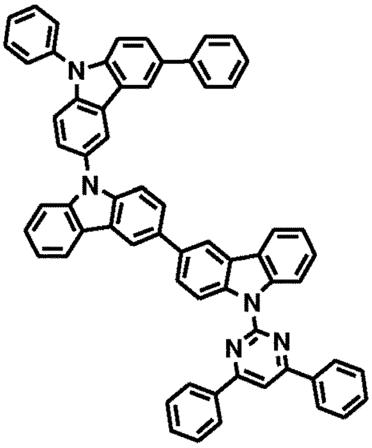
[Formule chimique 25] [Formule chimique 26]



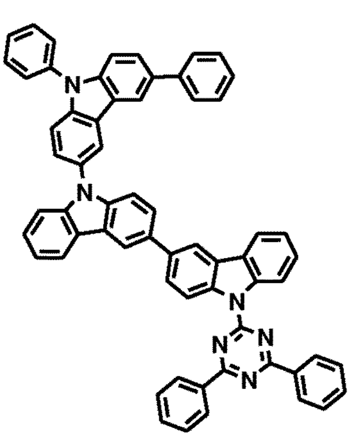


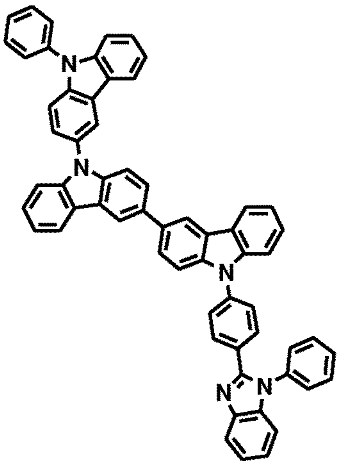
[Formule chimique 27] [Formule chimique 28]



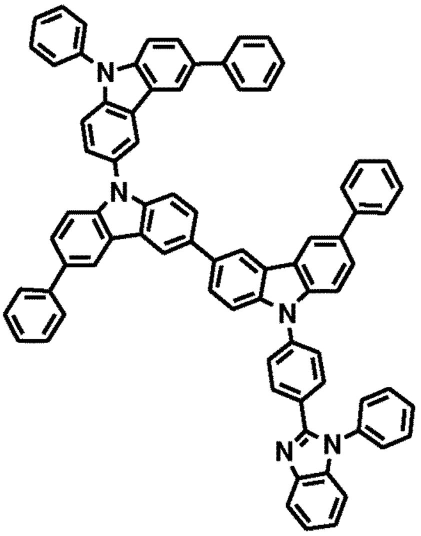


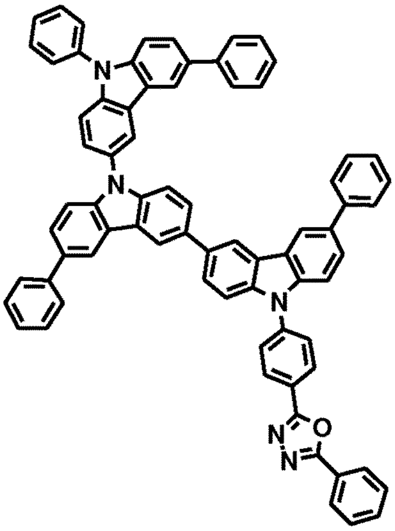
[Formule chimique 29] [Formule chimique 30]



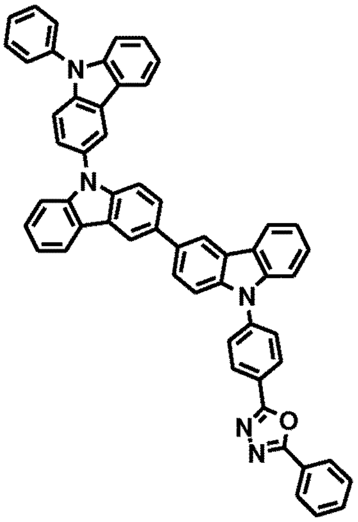


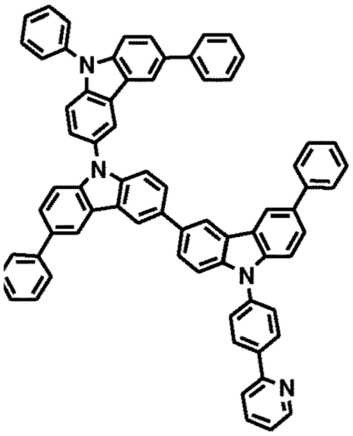
[Formule chimique 31] [Formule chimique 32]



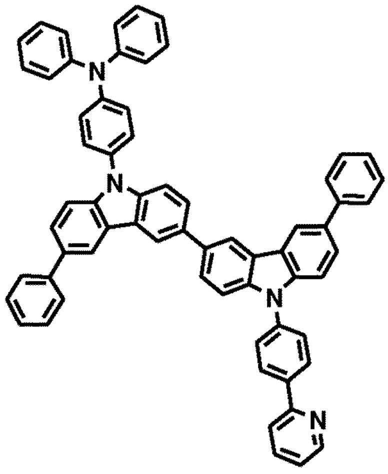


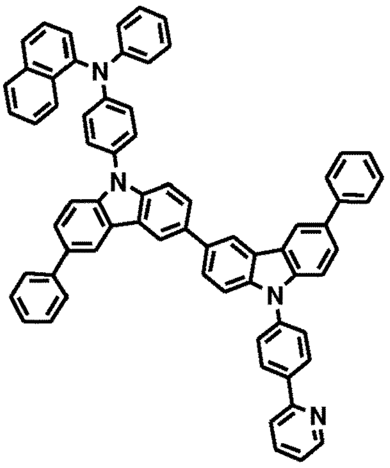
[Formule chimique 33] [Formule chimique 34]



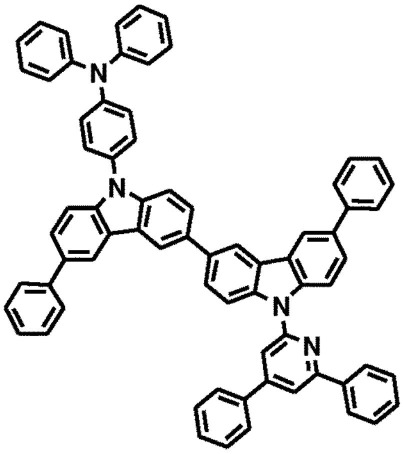


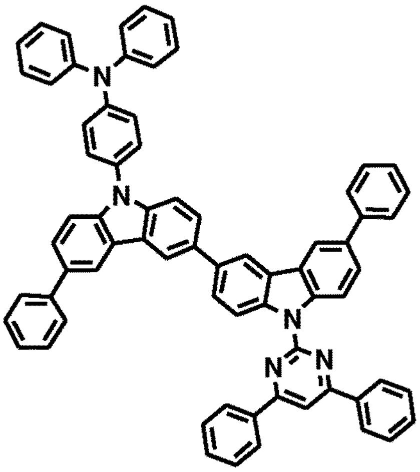
[Formule chimique 35] [Formule chimique 36]



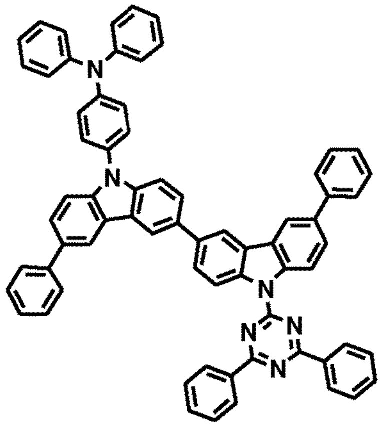


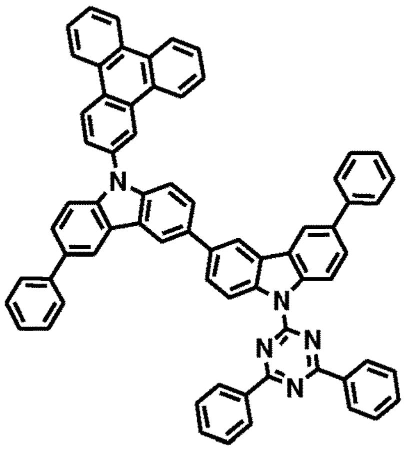
[Formule chimique 37] [Formule chimique 38]



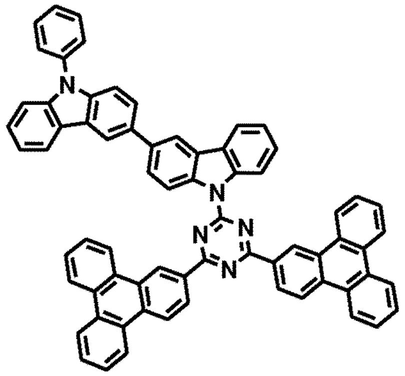


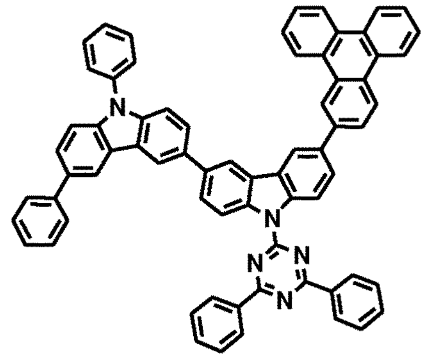
[Formule chimique 39] [Formule chimique 40]



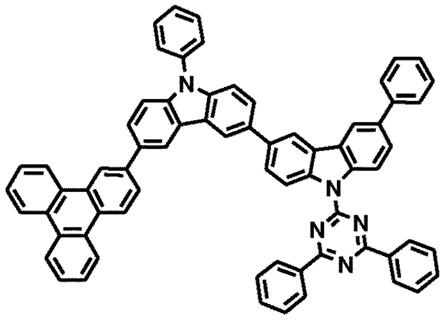


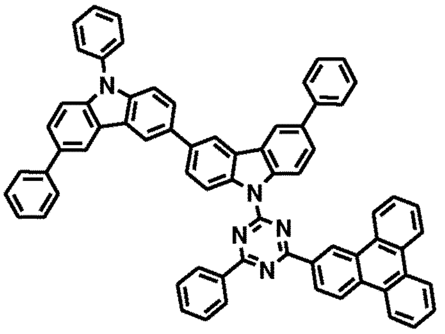
[Formule chimique 41] [Formule chimique 42]



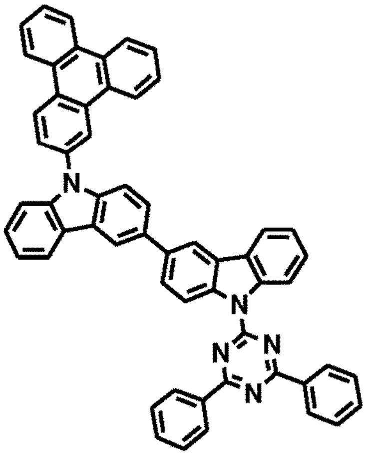


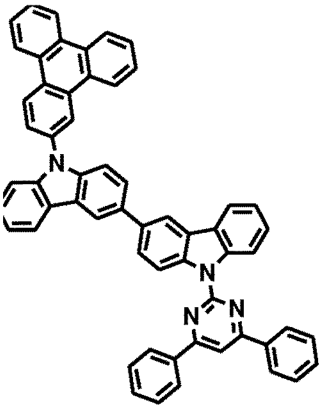
[Formule chimique 43] [Formule chimique 44]



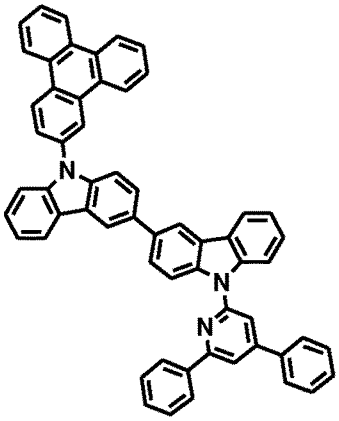


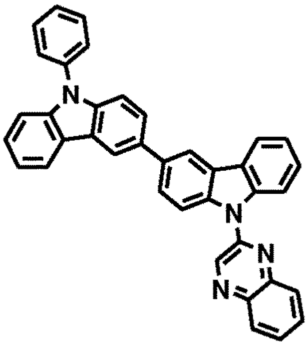
[Formule chimique 45] [Formule chimique 46]



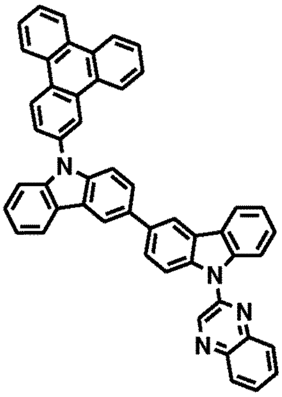


[Formule chimique 47] [Formule chimique 48]

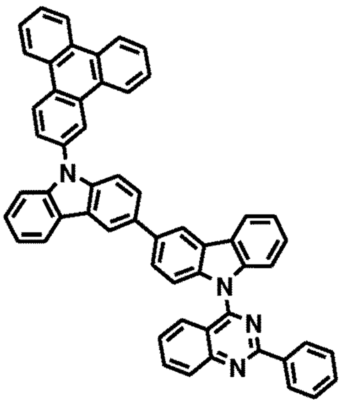


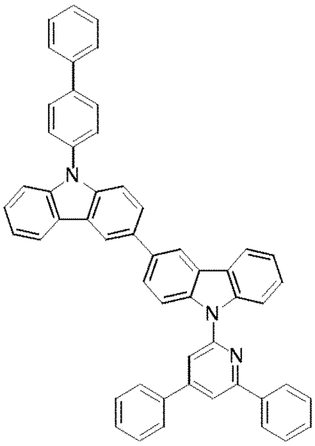


[Formule chimique 50]

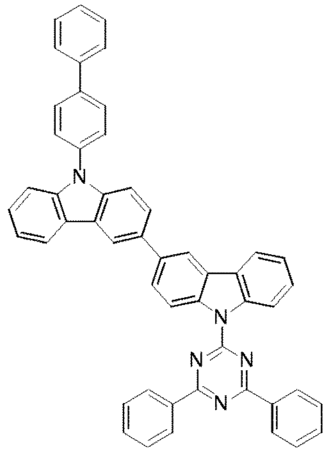


[Formule chimique 51] [Formule chimique 52]

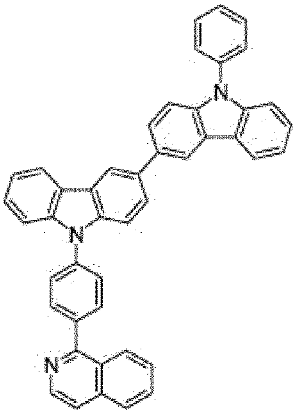


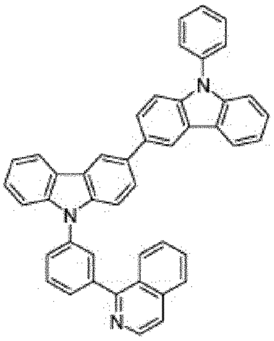


[Formule chimique 54]

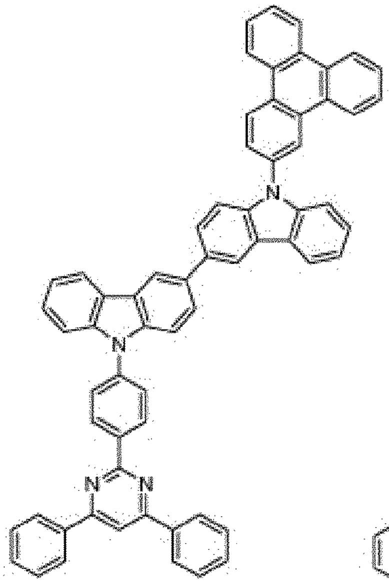


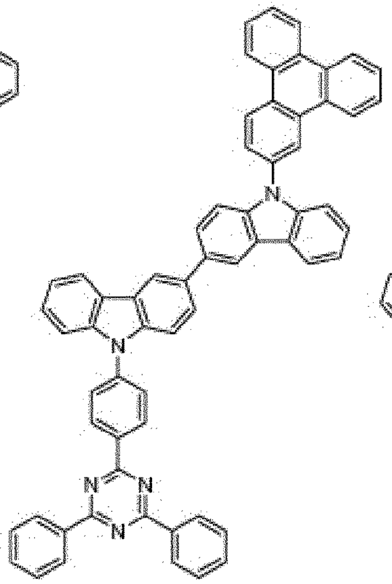
[Formule chimique C-3] [Formule chimique C-6]

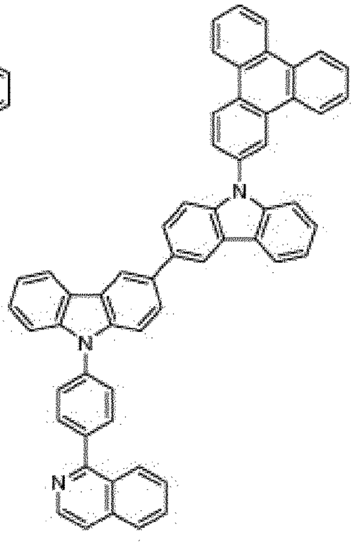




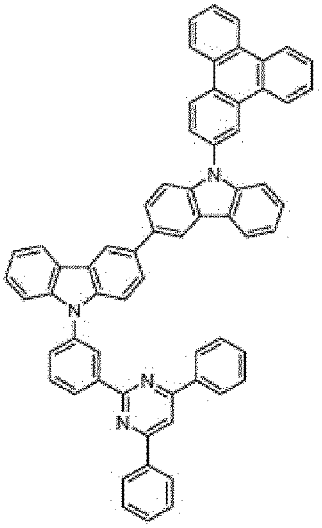
[Formule chimique C-7] [Formule chimique C-8] [Formule chimique C-9]

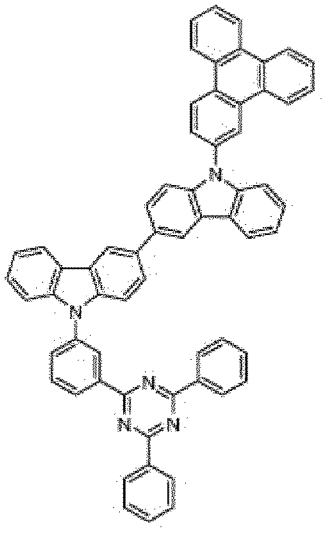


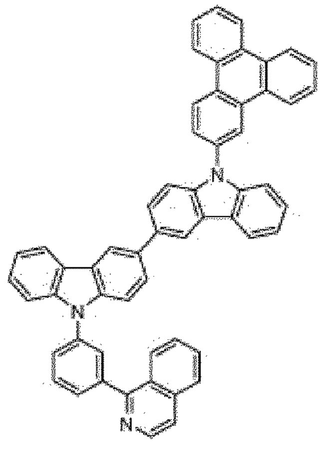




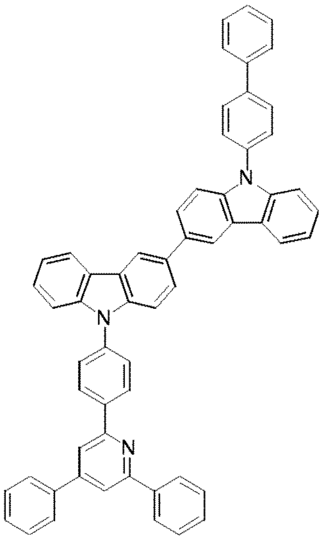
[Formule chimique C-10] [Formule chimique C-11] [Formule chimique C-12]

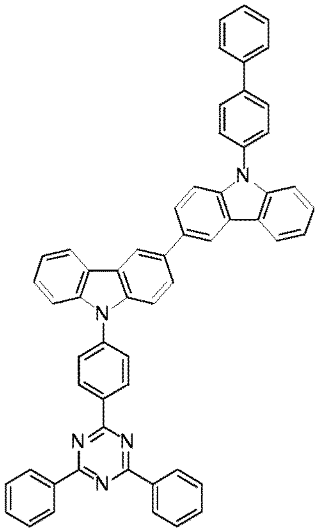




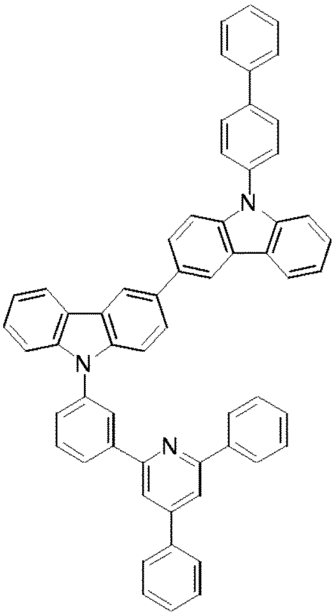


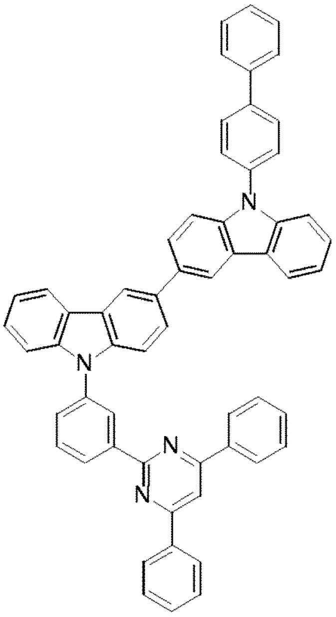
[Formule chimique C-13] [Formule chimique C-15]

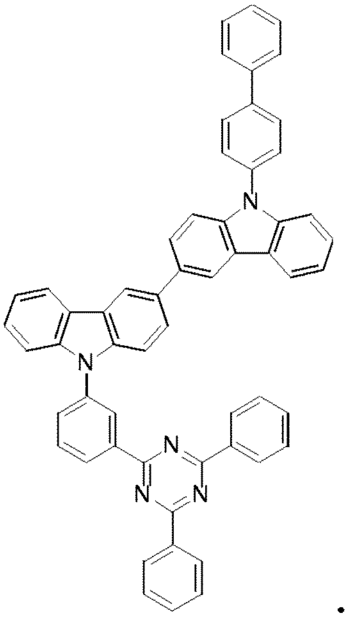




[Formule chimique C-16] [Formule chimique C-17] [Formule chimique C-18]



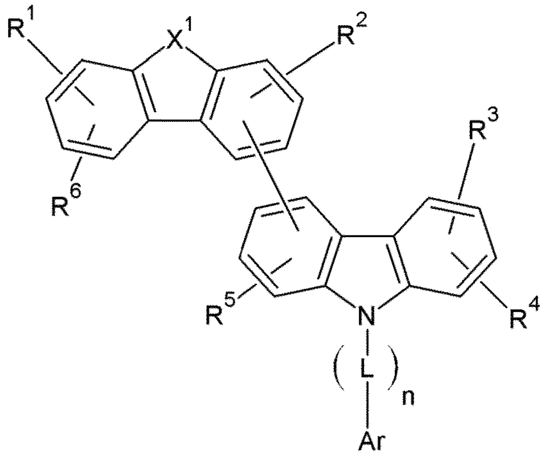




.

2. Composé destiné à un dispositif optoélectronique organique, en particulier, destiné à un dispositif photoélectrique organique, une diode émettant une lumière organique, une cellule solaire organique, un transistor organique, un tambour de conducteur photo organique, ou un dispositif de mémoire organique, où le composé destiné à un dispositif optoélectronique est représenté par la formule chimique suivante B :

[Formule chimique B]

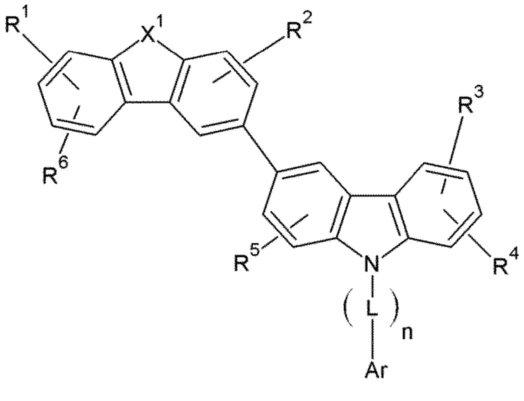


où, dans la formule chimique B,

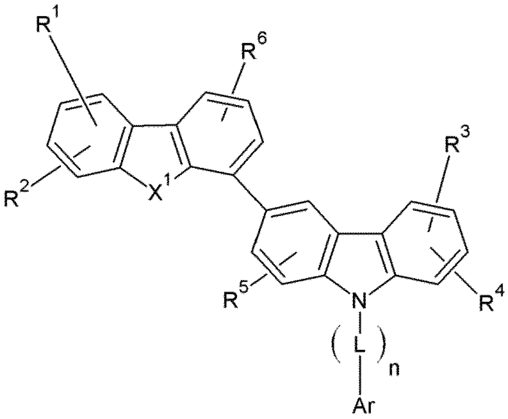
X^1 est choisi dans le groupe constitué de -O- et -S-,
les groupes R^1 à R^6 sont identiques ou différents et sont indépendamment choisis dans le groupe constitué d'atomes d'hydrogène, de deutérium, d'un groupe alkyle en C1 à C20 substitué ou non substitué, d'un groupe aryle en C6 à C30 substitué ou non substitué, et d'un groupe hétéroaryle en C2 à C30 substitué ou non substitué,
Ar est un groupe hétéroaryle en C2 à C30 substitué ou non substitué ayant des propriétés électroniques, où le groupe hétéroaryle en C2 à C30 substitué ou non substitué ayant des propriétés électroniques est choisi parmi un groupe pyridinyle substitué ou non substitué, un groupe pyrimidyle substitué ou non substitué et un groupe triazinyle substitué ou non substitué,
L est choisi dans le groupe constitué d'une liaison simple, d'un groupe alcénylène en C2 à C10 substitué ou non substitué, d'un groupe alcynylène en C2 à C10 substitué ou non substitué, d'un groupe arylène en C6 à C30 substitué ou non substitué et d'un groupe hétéroarylène en C2 à C30 substitué ou non substitué, et n est un nombre entier allant de 0 à 2.

3. Composé destiné à un dispositif optoélectronique organique selon la revendication 2, où le composé destiné à un dispositif optoélectronique est représenté par les formules chimiques suivantes B-1 ou B-2 :

[Formule chimique B-1]



[Formule chimique B-2]

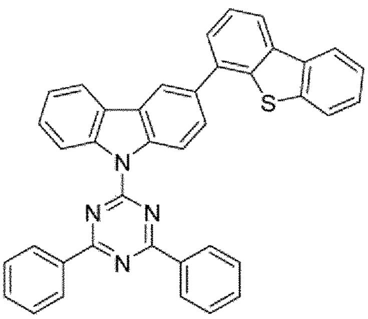


où, dans les formules chimiques B-1 et B-2,

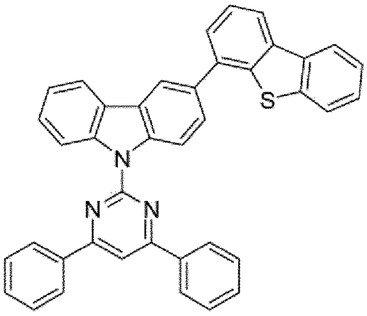
X^1 est choisi dans le groupe constitué de -O- et -S-,
les groupes R^1 à R^6 sont identiques ou différents et sont indépendamment choisis dans le groupe constitué d'atomes d'hydrogène, de deutérium, d'un groupe alkyle en C1 à C20 substitué ou non substitué, d'un groupe aryle en C6 à C30 substitué ou non substitué, et d'un groupe hétéroaryle en C2 à C30 substitué ou non substitué,
Ar est un groupe hétéroaryle en C2 à C30 substitué ou non substitué ayant des propriétés électroniques, où le groupe hétéroaryle en C2 à C30 substitué ou non substitué ayant des propriétés électroniques est choisi parmi un groupe pyridinyle substitué ou non substitué, un groupe pyrimidyle substitué ou non substitué et un groupe triazinyle substitué ou non substitué,
L est une liaison simple, un groupe alcénylène en C2 à C10 substitué ou non substitué, un groupe alcynylène en C2 à C10 substitué ou non substitué, un groupe arylène en C6 à C30 substitué ou non substitué et un groupe hétéroarylène en C2 à C30 substitué ou non substitué, et
n est un nombre entier allant de 0 à 2.

4. Composé destiné à un dispositif optoélectronique organique selon la revendication 2 ou la revendication 3, où le composé destiné à un dispositif optoélectronique organique est représenté par une des formules chimiques suivantes B-3 à B-8, B-12 à B-17 et B-19 à B-22.

[Formule chimique B-3]



[Formule chimique B-4]



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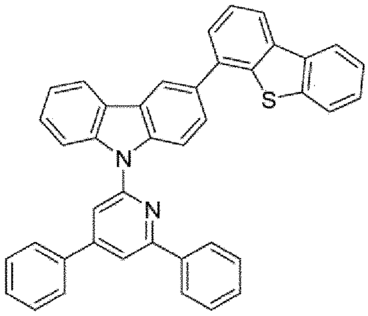

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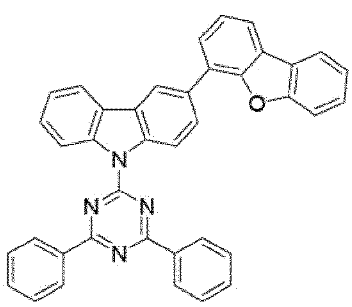

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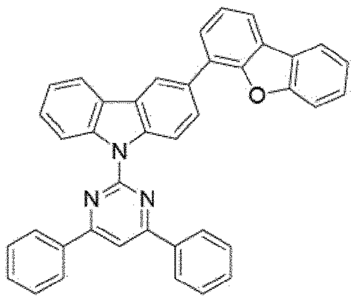

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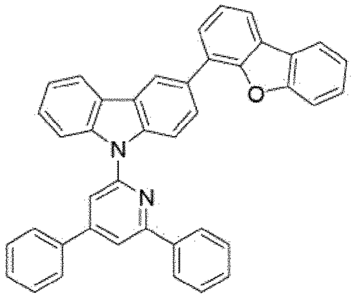

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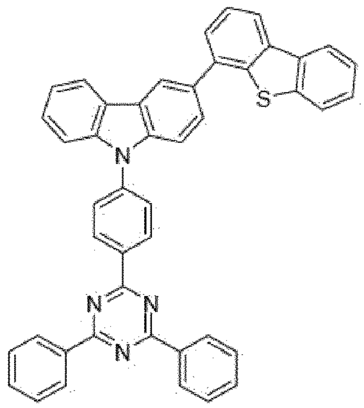

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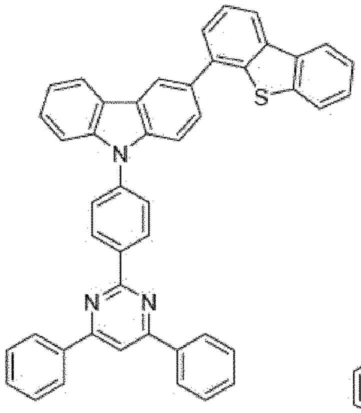

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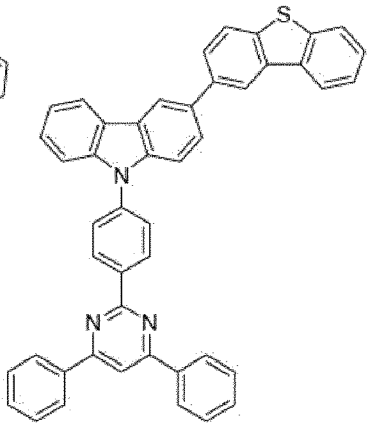

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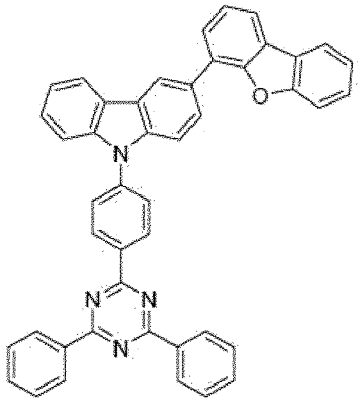

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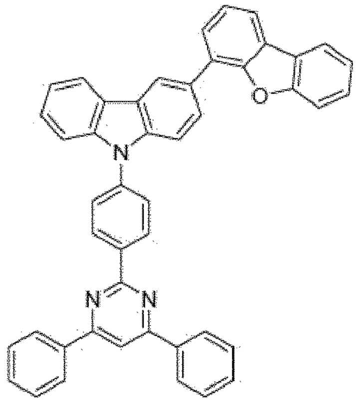

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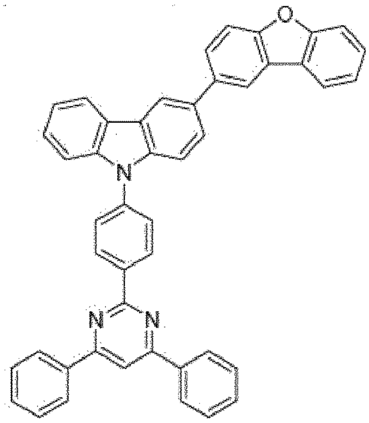
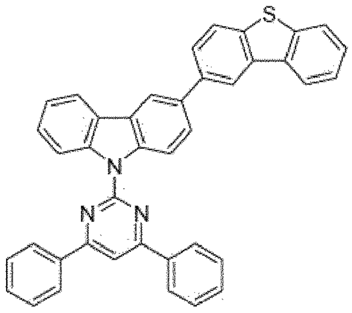
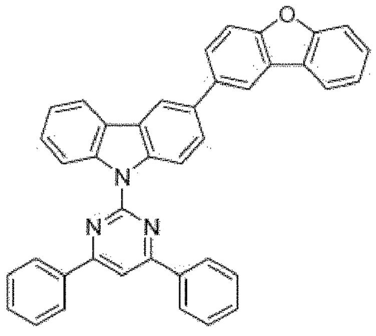
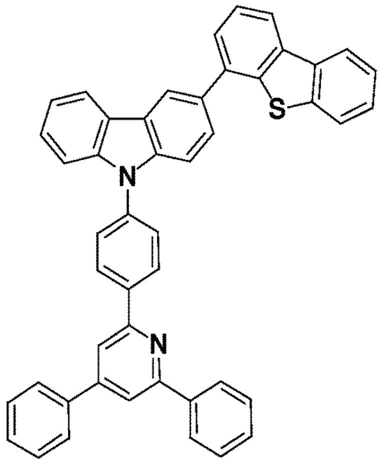


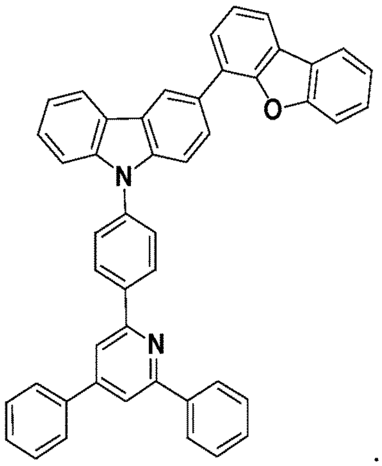
[Formule chimique B-19] [Formule chimique B-20]





[Formule chimique B-21] [Formule chimique B-22]





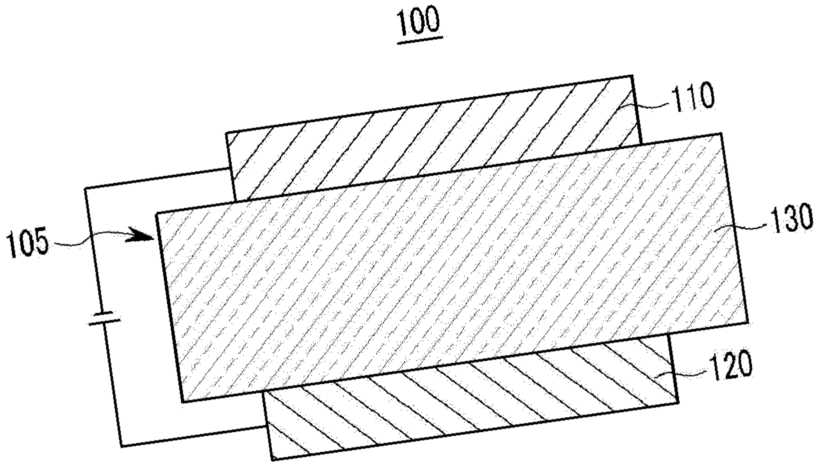
.

5. Diode émettant une lumière organique, comprenant une diode émettant de la lumière organique incluant une anode, une cathode et au moins une ou plusieurs couches fines organiques entre l'anode et la cathode, où l'au moins une couche fine organique, particulièrement l'une parmi une couche d'émission, une couche de transport de trous (HTL), une couche d'injection de trous (HIL), une couche de transport d'électrons (ETL), une couche d'injection d'électrons (EIL), une couche de blocage de trous, et une combinaison de celles-ci, comprend le composé destiné à un dispositif optoélectronique selon l'une quelconque des revendications 1 à 4.

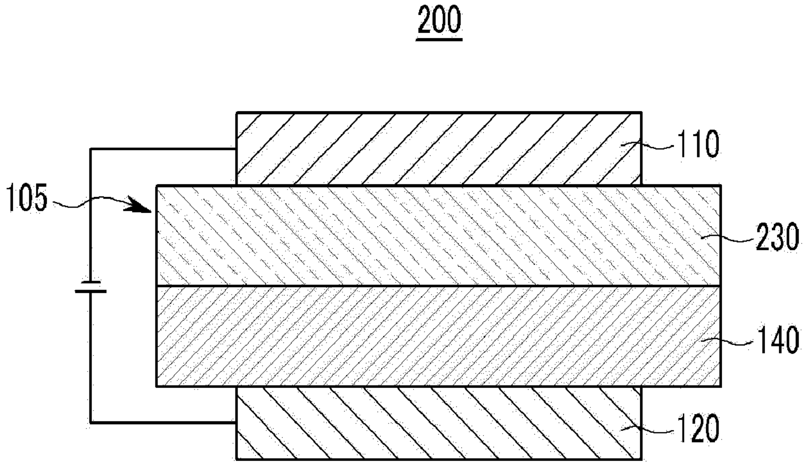
6. Diode émettant une lumière organique selon la revendication 5, dans laquelle le composé destiné à un dispositif optoélectronique est utilisé en tant que matériau hôte phosphorescent ou fluorescent dans une couche d'émission ou en tant que matériau dopant bleu fluorescent dans une couche d'émission.

7. Dispositif d'affichage comprenant la diode émettant une lumière organique selon la revendication 5 ou la revendication 6.

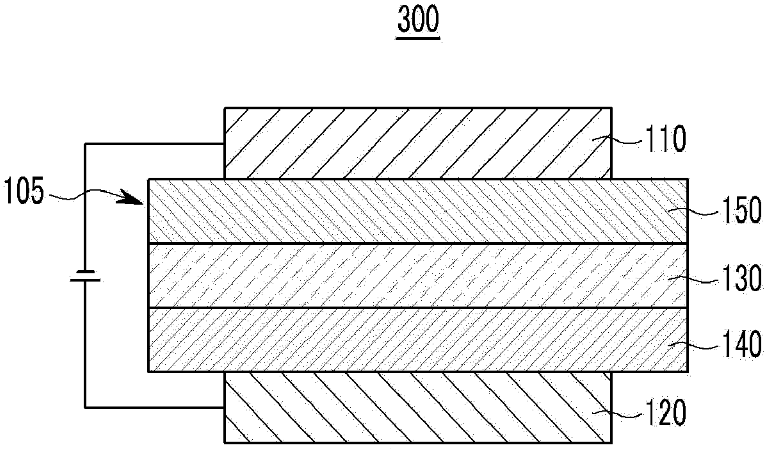
【FIG. 1】



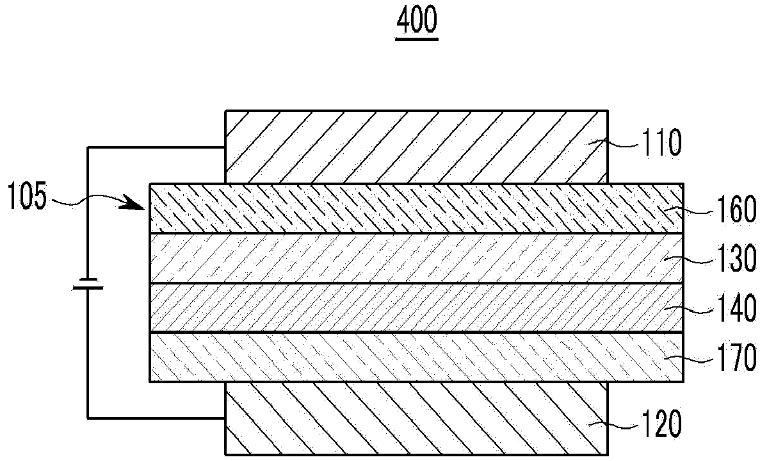
【FIG. 2】



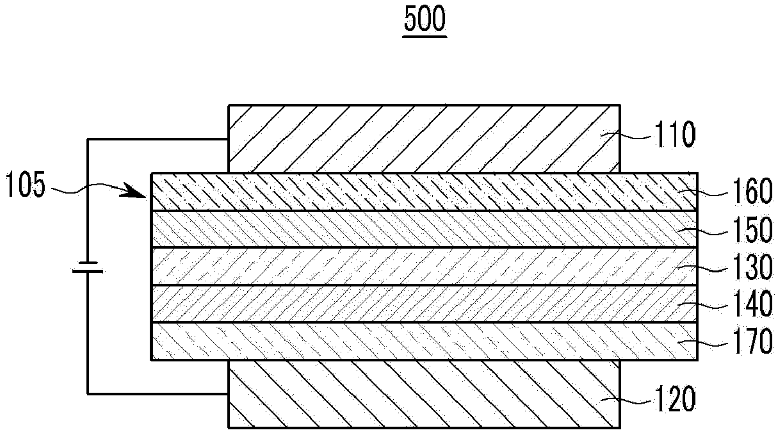
【FIG. 3】



【FIG. 4】



【FIG. 5】



REFERENCES CITED IN THE DESCRIPTION

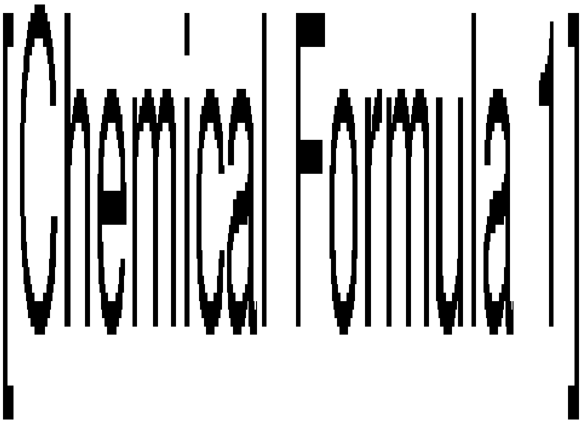
Patent documents cited in the description

- KR 1020100106077 **[0001]**
- KR 1020100041466 **[0001]**
- WO 2008090912 A1 **[0020]**
- JP 8003547 A **[0021]**
- KR 20100094415 A **[0021]**
- KR 1020050100673 **[0186]**

专利名称(译)	有机光电装置的连接，因此有有机发光二极管，并与有机发光二极管一起显示装置		
公开(公告)号	EP2568030B1	公开(公告)日	2019-12-25
申请号	EP2011777536	申请日	2011-04-29
[标]申请(专利权)人(译)	第一毛织株式会社		
申请(专利权)人(译)	第一毛织INC.		
当前申请(专利权)人(译)	第一毛织INC.		
[标]发明人	KIM HYUNG SUN YU EUN SUN CHAE MI YOUNG LEE HO JAE MIN SOO HYUN		
发明人	KIM, HYUNG-SUN YU, EUN-SUN CHAE, MI-YOUNG LEE, HO-JAE MIN, SOO-HYUN		
IPC分类号	H01L51/54 C09K11/06 C07D405/14 C07D413/14 C07D421/14 C07D401/14 C07D403/14 C07D409/14		
CPC分类号	C07D401/14 C07D403/14 C07D405/14 C07D409/14 C07D413/14 C07D421/14 C09B57/00 C09K11/06 C09K2211/1022 C09K2211/1029 C09K2211/1044 C09K2211/1059 H01L51/0067 H01L51/0072 H01L51/5012 Y02E10/549 H05B33/14		
优先权	1020100106077 2010-10-28 KR 1020100041466 2010-05-03 KR		
其他公开文献	EP2568030A2 EP2568030A4		
外部链接	Espacenet		

摘要(译)

提供了用于有机光电装置的化合物和包括该化合物的有机光电装置。 提供由化学式1表示的用于有机光电装置的化合物，以制造具有优异的电化学和热稳定性以及寿命特性以及在低驱动电压下具有高发光效率的有机光电装置。


[Chemical Formula 1]