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(54) # EMITTING MATERIALS AND ORGANIC LIGHT EMITTING DEVICE USING THE SAME

EMITTIERENDE MATERIALIEN UND ORGANISCHE LICHTEMITTIERENDE VORRICHTUNG DAMIT

MATÉRIAUX ÉLECTROLUMINESCENTS ET DISPOSITIF ÉLECTROLUMINESCENT ORGANIQUE FAISANT INTERVENIR LESDITS MATÉRIAUX

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Description

[Technical Field]

[0001] The present invention relates to a novel structure of a light emitting material and to an organic light emitting device using the same.

[0002] This application claims priority benefits from Korean Patent Application No. 10-2006-0003883, filed on January 13, 2006.

[Background Art]

[0003] In general, the term "organic light emitting phenomenon" refers to a phenomenon in which electric energy is converted to light energy by means of an organic material. The organic light emitting device using the organic light emitting phenomenon has a structure usually comprising an anode, a cathode, and an organic material layer interposed therebetween. Herein, the organic material layer may be mostly formed in a multilayer structure comprising the layers consisting of different materials, for example, a hole injecting layer, a hole transporting layer, a light emitting layer, an electron transporting layer, and an electron injecting layer, in order to improve efficiency and stability of the organic light emitting device. In the organic light emitting device having such a structure, when a voltage is appl ied between two electrodes, holes from the anode and electrons from a cathode are injected into the organic material layer, the holes and the electrons injected are combined together to form excitons. Further, when the excitons drop to a ground state, light is emitted. Such the organic light emitting device is known to have characteristics such as self-luminescence, high brightness, high efficiency, low drive voltage, wide viewing angle, high contrast and high-speed response.

[0004] The materials used for the organic material layer of the organic light emitting device can be classified into light emitting materials and charge-transporting materials, for example, a hole injecting material, a hole transporting material, an electron transporting material and an electron injecting material, according to their functions. The light emitting materials can be classified into high molecular weight materials and low molecular weight materials, according to their molecular weights. The light emitting materials can be classified into fluorescent materials derived from the singlet excited state and phosphorescent materials derived from the triplet excited state. The light emitting materials can be divided into blue, green and red light emitting materials, and yellow and orange light emitting materials required for giving more natural colors, according to the colors of the emitted light.

[0005] On the other hand, an efficiency of a device is lowered owing to maximum luminescence wavelength moved to a longer wavelength due to the interact ion between the molecules, the deterioration of color purity and the reduction in light emitting efficiency when only one material is used for the light emitting material, and therefore a host/dopant system can be used as the light emitting material for the purpose of enhancing the color purity and the light emitting efficiency through energy transfer. It is based on the principle that if a small amount of a dopant having a smaller energy band gap than a host forming a light emitting layer is mixed in the light emitting layer, excitons which are generated in the light emitting layer are transported to the dopant, thus emitting a light with a high efficiency. Here, since the wavelength of the host is moved into the wavelength range of the dopant, a light having a desired wavelength can be obtained according to the kind of the dopant.

[0006] WO 02/088274 A1 discloses double-spiro organic compounds and electroluminescent devices, the compounds having a configuration or structure including at least three planar moieties, which are substantially linearly configured such that one planar moiety is interveningly located between two neighboring planar moieties and that the intervening planar moiety shares an atom with each of the two neighboring planar moieties.

[0007] In order to allow the organic light emitting device to fully exhibit the above-mentioned excellent characteristics, a material constituting the organic material layer in the device, for example, a hole injecting material, a hole transporting material, a light emitting material, an electron transporting material and an electron injecting material should be essentially composed of stable and efficient materials. However, the development of stable and efficient organic material layer materials for the organic light emitting device has not yet been fully realized. According, the development of new materials is continuously desired.

[Disclosure]

[Technical Problem]

[0008] The present inventors have found a novel structure of a light emitting material, and then have found that the light emitting material efficiently serves as a light emitting material in an organic light emitting device.

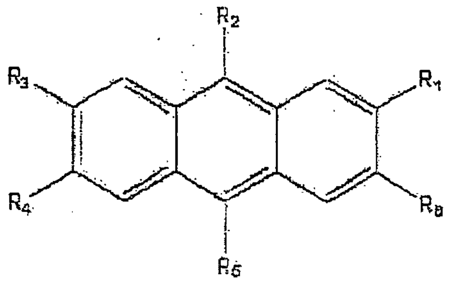
[0009] Therefore, it is an object of the present invention to provide a novel structure of a light emitting material and an organic light emitting device using the same.

[Technical Solution]

[0010] This object is achieved by the subject-matter of the independent claims. Preferred embodiments result from the sub claims.

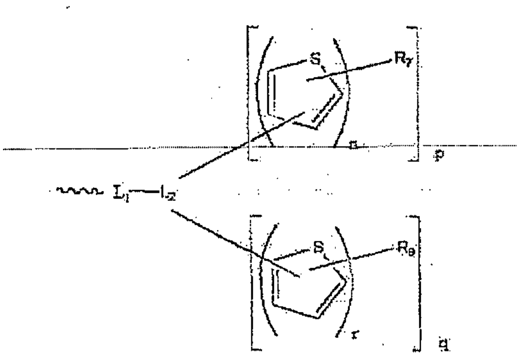
[0011] The present invention provides a compound represented by the following formula 1:

[Formula 1]



wherein at least one of R_1, R_3, R_4 and R_6 in the formula 1 is a group represented by the following formula 2:

[Formula 2]



wherein n and p are each integers of 1 to 10, and q and r are each integers of 0 to 10,
L_1 is a direct bond, or a substituted or unsubstituted C_5 to C_{20} aryl group, or a substituted or unsubstituted $\mathbf{C_5}$ to C_{20} heterocyclic group,
L_2 is a C_5 to C_{20} aryl group, and
R_1, R_3, R_4 and R_6, which are not represented by the formula 2, in the formula 1, R_2 and R_5 in formula 1 and R_7 and R_8 in the formula 2 are each independently the identical or different substituents, and each selected from the group consisting of hydrogen; halogen; hydroxyl; mercapto; cyano; nitro; carbonyl; carboxyl; formyl; substituted or unsubstituted C_1-C_{20} alkyl; substituted or unsubstituted C_2-C_{10} alkenyl; substituted or unsubstituted C_2-C_7 alkynyl; substituted or unsubstituted C_6-C_{32} aryl; substituted or unsubstituted heteroaryl; substituted or unsubstituted C_3-C_7 cycloalkyl in which a carbon atom in the ring may be substituted by an oxygen, nitrogen, or sulfur atom; C_4-C_7 cycloalkenyl in which a carbon atom in the ring may be substituted by an oxygen, nitrogen, or sulfur atom; substituted or unsubstituted C_1-C_{20} alkoxy; substituted or unsubstituted C_2-C_{10} alkenyloxy; substituted or unsubstituted C_2-C_7 alkynyloxy; substituted or unsubstituted aryloxy; substituted or unsubstituted C_1-C_{20} alkylamine; substituted or unsubstituted C_2-C_{10} alkenylamine; substituted or unsubstituted C_2-C_7 alkynylamine; substituted or unsubstituted arylamine; substituted or unsubstituted alkylarylamine; substituted or unsubstituted C_1-C_{20} alkylsilyl; substituted or unsubstituted C_2-C_{10} alkenylsilyl; substituted or unsubstituted C_2-C_7 alkynylsilyl; substituted or unsubstituted arylsilyl; substituted or unsubstituted alkylarylsilyl; substituted or unsubstituted C_1-C_{20} alkylboranyl; substituted or unsubstituted C_2-C_{10} alkenylboranyl; substituted or unsubstituted C_2-C_7 alkynylboranyl; substituted or unsubstituted arylboranyl; substituted or unsubstituted alkylarylboranyl; substituted or unsubstituted C_1-C_{20} alkylthio; substituted or unsubstituted C_2-C_{10} alkenylthio; substituted or unsubstituted C_2-C_7 alkynylthio; and substituted or unsubstituted arylthio groups.

[0012] Preferably, R_1, R_3, R_4 and R_6, which are not represented by the formula 2, in the formula 1, R_2 and R_5 in formula

1 and R_7 and R_8 in the formula 2 are each independently the identical or different substituents, and each can be selected from the group consisting of hydrogen, cyano, nitro, substituted or unsubstituted C_1-C_{20} alkyl, substituted or unsubstituted C_{27}-C_{10} alkenyl, substituted or unsubstituted C_3-C_7 cycloalkyl, substituted or unsubstituted C_4-C_7 cycloalkenyl, substituted or unsubstituted C_6-C_{32} aryl, substituted or unsubstituted heteroaryl, substituted or unsubstituted C_1-C_{20} alkoxy, substituted or unsubstituted aryloxy, substituted or unsubstituted C_1-C_{20} alkylamine, substituted or unsubstituted arylamine, substituted or unsubstituted alkylarylamine, substituted or unsubstituted C_1-C_{20} alkylsilyl; substituted or unsubstituted C_1-C_{20} alkylboranyl, substituted or unsubstituted arylboranyl, substituted or unsubstituted alkylarylboranyl, substituted or unsubstituted C_1-C_{20} alkylthio, and substituted or unsubstituted arylthio groups.

[0013] R_1, R_3, R_4 and R_6, which are not represented by the formula 2, in the formula 1, R_2 and R_5 in formula 1 and R_7 and R_8 in the formula 2 can be each independently mono- or poly-substituted with the identical or different substituents selected from the group consisting of:

halogen, hydroxyl, mercapto, cyano, nitro, amino, carbonyl, carboxyl, formyl, C_1-C_{20} alkyl, C_2-C_{10} alkenyl, C_2-C_7 alkynyl, aryl, heteroaryl, C_3-C_7 cycloalkyl, a saturated or unsaturated 3- to 7-membered heterocyclic ring, acryl, C_1-C_{20} alkoxy, C_2-C_{10} alkenyloxy, C_2-C_7 alkynyloxy, C_1-C_{20} alkylamine, C_2-C_{10} alkenylamine, C_2-C_7 alkynylamine, arylamine, alkylarylamine, C_1-C_{20} alkylsilyl, C_2-C_{10} alkenylsilyl, C_2-C_7 alkynylsilyl, aldoxysilyl, arylsilyl, alkylarylsilyl, C_1-C_{20} alkylboranyl, C_2-C_{10} alkenylboranyl, C_2-C_7 alkynylboranyl, arylboranyl, alkylarylboranyl, C_1-C_{20} alkylthio, C_2-C_{10} alkenylthio, C_2-C_7 alkynylthio, and arylthio groups.

[0014] Preferably, R_1, R_3, R_4 and R_6, which are not represented by the formula 2, in the formula 1, R_2 and R_5 in formula 1 and R_7 and R_8 in the formula 2 may be each independently mono- or ploy-substituted with the identical or different substituents selected from the group consisting of:

cyano, nitro, formyl, methyl, ethyl, propyl, phenyl, naphthyl, biphenyl, anthracenyl, imidazolyl, thiazolyl, oxazolyl, thiophenyl, pyridyl, pyrimidyl, pyrrolyl, cyclobutenyl, cyclopentenyl, methoxy, ethoxy, propoxy, phenoxy, napththoxy, methylamine, ethylamine, propylamine, phenylamine, naphthylamine, methylphenylamine, ethylphenylamine, ethylnaphthylamine, dimethylboranyl, diethylboranyl, dipropylboranyl, diphenylboranyl, dinaphthylboranyl, phenylnaphthylboranyl, phenylmethylboranyl, naphthylmethylboranyl, naphthylethylboranyl, trimethylsilyl, triethylsilyl, tripropylsilyl, triphenylsilyl, trinaphthylsilyl, dimethylphenylsilyl, diethylphenylsilyl, diphenylmethylsilyl, methylthio, ethylthio, propylthio, butylthio, phenylthio and naphthylthio groups.

[0015] The substituted or unsubstituted C_3-C_7 cycloalkyl in which a carbon atom in the ring may be substituted by an oxygen, nitrogen, or sulfur atom, or the C_4-C_7 cycloalkenyl in which a carbon atom in the ring may be substituted by an oxygen, nitrogen, or sulfur atom, is a 5- or 6-membered substituted or unsubstituted, saturated or unsaturated ring.

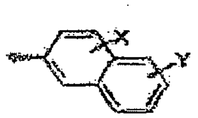
[0016] R_1, R_3, R_4 and R_6, which are not represented by the formula 2, in the formula 1, R_2 and R_5 in formula 1 and R_7 and R_8 in the formula 2 are each independently the identical or different substituent, and each can be selected from the group consist ing of methyl, ethyl, propyl, butyl, isopropyl, n-butyl, t-butyl, isobutyl, n-pentyl, neo-pentyl, n-hexy, ethenyl, propenyl, butenyl, pentenyl, hexenyl, 2-methyl-ethenyl, 2-methyl-propenyl, 2-methyl-butenyl, 2-methyl-pentenyl, 2-methyl-hexenyl, imidazolyl, thiazolyl, oxazolyl, thiophenyl, pyridyl, pyrimidyl, pyrrolyl, 2-methylimidazolyl, 2-methylthiazolyl, 2-methyloxazolyl, phenyl, naphthyl, anthracenyl, biphenyl, terphenyl, tetracenyl, 3-methyl-phenyl, 4-methyl-naphthyl, 9-methyl-anthracenyl, 4-methyl-tetracenyl, 2-methyl-imidazolyl, 2-methyl-oxazolyl, 2-methyl-thiazolyl, 2-methyl-furanyl, 2-methyl-thiophenyl, 2-methyl-pyrazolyl, 2-methyl-pyridyl, 2-methyl-pyrimidinyl, methoxy, ethoxy, propoxy, butoxy, pentoxy, hexoxy, isopropoxy, isobutoxy, t-butoxy, neo-pentoxy, phenoxy, napththoxy, biphenoxy, 3-methyl-phenoxy, 4-methyl-napththoxy, 2-methyl-biphenoxy, methylamine, ethylamine, propylamine, butylamine, pentylamine, hexylamine, heptylamine, isopropylamine, isobutylamine, t-butylamine, 2-pentylamine, neo-pentylamine, phenylamine, naphthylamine, biphenylamine, anthracenylamine, 3-methyl-phenylamine, 4-methyl-naphthylamine, 2-methyl-biphenylamine, 9-methyl-anthracenylamine, phenylmethylamine, phenylethylamine, naphthylmethylamine, naphthylethylamine, biphenylmethylamine, 3-methyl-phenyl methylamine, phenyl isopropylamine, naphthylisopropylamine, naphthylisobutylamine, biphenyl isopropylamine, trimethylsilyl, triethylsilyl, tributylsilyl, tri(isopropyl)silyl, tri(isobutyl)silyl, tri(t-butyl)silyl, tri(2-butyl)silyl, triphenylsilyl, trinaphthylsilyl, tribiphenylsilyl, tri(3-methylphenyl)silyl, tri(4-methylnaphthyl)silyl, tri(2-methylbiphenyl)silyl, phenyl methylsilyl, phenyl ethylsilyl, naphthylmethylsilyl, naphthylethylsilyl, biphenyl methylsilyl, 3-methyl-phenyl methylsilyl, phenyl isopropylsilyl, naphthylisopropylsilyl, naphthylisobutylsilyl, biphenyl isopropylsilyl, dimethylboranyl, diethylboranyl, dipropylamine, dibutylamine, dipentylamine, diisopropylboranyl, diisobutylboranyl, di(t-butyl)boranyl, isopropylisobutylamine, diphenylboranyl, dinaphthylboranyl, dibiphenylboranyl, di(3-methylphenyl)boranyl, di(4-methylnaphthyl)boranyl, di(2-methylbiphenyl)boranyl, phenylmethylboranyl, phenylethylboranyl, naphthylmethylboranyl, naphthylethylboranyl, biphenylmethylboranyl, 3-methyl-phenylmethylboranyl, phenylisopropylboranyl, methylthio, ethylthio, propylthio, butylthio, pentylthio, hexylthio, tri(isopropyl)thio, tri(isobutyl)thio, tri(t-butyl)thio, tri(2-butyl)thio, phenylthio, naphthylthio, biphenylthio, (3-methylphenyl)thio, (4-methylnaphthyl)thio and (2-methylbiphenyl)thio groups.

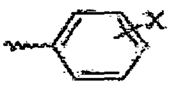
[0017] Preferably, R_1, R_3, R_4 and R_6, which are not represented by the formula 2, in the formula 1, R_2 and R_5 in formula 1 and R_7 and R_8 in the formula 2 may be each independently the identical or different substituent, and each can be selected from the group consist ing of methyl, ethyl, isopropyl , t-butyl, ethenyl, propenyl, 2-methyl-ethenyl, 2-methyl-propenyl, imidazolyl, thiazolyl, oxazolyl, 2-methylimidazolyl, 2-methylthiazolyl, 2-methyloxazolyl, phenyl, naphthyl, biphenyl, terphenyl, anthracenyl, 3-methyl-phenyl, 4-methyl-naphthyl, methoxy, ethoxy, isopropoxy, isobutoxy, phenoxy, napththoxy, 3-methyl-phenoxy, 4-methyl-napththoxy, methylamine, ethylamine, isopropylamine, isobutylamine, t-butylamine, phenylamine, naphthylamine, 3-methyl-phenylamine, 4-methyl-naphthylamine, phenyl methylamine, phenyl ethylamine, naphthylmethylamine, 3-methyl-phenyl methylamine, phenyl isopropylamine, trimethylsilyl, triethylsilyl, tri(isopropyl)silyl, tri(isobutyl)silyl, triphenyl silyl, trinaphthylsilyl, tri(3-methylphenyl)silyl, tri(4-methylnaphthyl)silyl, phenyl methylsilyl, phenyl ethylsilyl, 3-methyl-phenyl methylsilyl, phenyl isopropylsilyl, dimethylboranyl, diethylboranyl, diisopropylboranyl, diisobutylboranyl, diphenylboranyl, dinaphthylboranyl, di(3-methylphenyl)boranyl, di(4-methylnaphthyl)boranyl, phenylmethylboranyl, phenylethylboranyl, 3-methyl-phenylmethylboranyl, phenylisopropylboranyl, methylthio, ethylthio, tri(isopropyl)thio, tri(isobutyl)thio, phenylthio, naphthylthio, (3-methylphenyl)thio and (4-methylnaphthyl)thio groups.

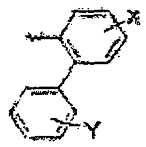
[0018] R_1, R_3, R_4 and R_6, which are not represented by the formula 2, in the formula 1, R_2 and R_5 in formula 1 and R_7 and R_8 in the formula 2 may be each independently the identical or different substituent, and each can be selected from the group consisting of substituted or unsubstituted phenyl, substituted or unsubstituted naphthyl, substituted or unsubstituted biphenyl, substituted or unsubstituted terphenyl, and substituted or unsubstituted anthracenyl.

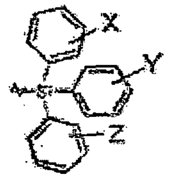
[0019] The substituted phenyl, naphthyl, biphenyl, terphenyl and anthracenyl can be substituted with at least one selected from the group consist ing of cyano, nitro, formyl, substituted or unsubstituted C_1-C_{20} alkyl, aryl, heteroaryl, C_4-C_7 cycloalkenyl, substituted or unsubstituted C_2-C_{20} alkoxy, aryloxy, C_1-C_{20} alkylamine, arylamine, alkylarylamine, C_1-C_{20} silyl, arylsilyl, alkylarylsilyl, C_1-C_{20} alkylboranyl, arylboranyl, alkylarylboranyl, C_1-C_{20} alkylthio and arylthio groups.

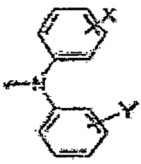
[0020] Preferably, at least one of R_1, R_3, R_4 and R_6 is represented by the formula 2, and the remaining R_1 to R_6 can be selected from the group consisting of:

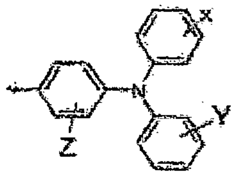


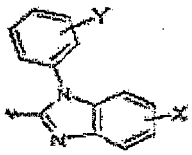


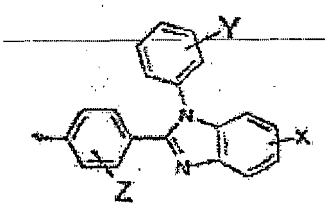


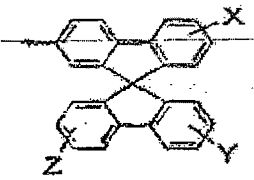


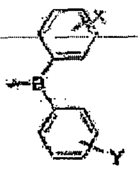


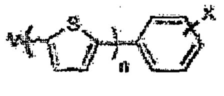


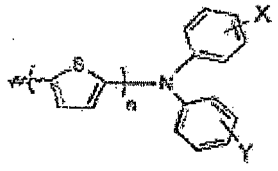


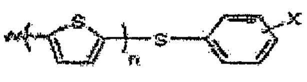


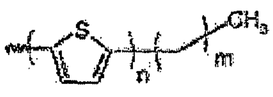


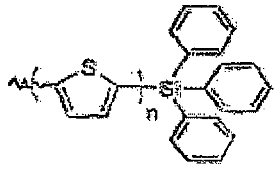


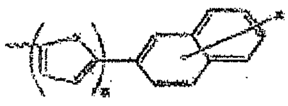












wherein X, Y and Z are each independently the identical or different substituents and each ring moiety to which X, Y or Z can be attached can be substituted with one or more of the identical or different substituents, such as X, Y and Z.

[0021] X, Y and Z are each independent ly selected from the group consisting of cyano, nitro, formyl, substituted or unsubstituted C_1-C_{20} alkyl, aryl, heteroaryl, C_4-C_7 cycloalkenyl, substituted or unsubstituted C_1-C_{20} alkoxy, aryloxy, C_1-C_{20} alkylamine, arylamine, alkylarylamine, C_1-C_{20} silyl, arylsilyl, alkylarylsilyl, C_1-C_{20} alkylboranyl, arylboranyl, alkylarylboranyl, C_1-C_{20} alkylthio and arylthio. It is preferable that X, Y and Z are each independently selected from the group consisting of cyano, nitro, methyl, ethyl, isopropyl, t-butyl, methoxy, ethoxy, propoxy, methylthio, imidazolyl, pyridyl, thiazolyl, oxazolyl, furanyl, thiophenyl, pyrrolyl, pyridyl and pyrimidyl.

[0022] In the formula 1, only one of R_1, R_3, R_4 and R_6 can be represented by the formula 2, or two of R_1, R_3, R_4 and R_6 can be represented by the formula 2. Three of R_1, R_3, R_4 and R_6 can be represented by the formula 2, and all four of R_1, R_3, R_4 and R_6 can be represented by the formula 2.

[0023] According to still another embodiment of the present invention, there is provided a compound, wherein in the formula 1, one of R1 and R6 and one of R3 and R4 are the same substituents represented by the formula 2.

[0024] According to still another embodiment of the present invention, there is provided a compound, wherein in the formula 1, one of R1 and R6 and one of R3 and R4 are the different substituents represented by the formula 2, and one among them is a substituent represented by the formula 2 with L1 being a direct bond, phenyl, naphthyl or carbazole.

[0025] Preferably, in the formula 2, L_1 is a direct bond, phenyl, naphthyl or carbazole, and L_2 is phenyl, naphthyl or anthracenyl.

[0026] The terms, as used in R_1 to R_8 of the formulae 1 and 2 according to the present invention are as follows.

[0027] The term, "C_1-C_{20} alkyl" or "unsubstituted C_1-C_{20} alkyl", whether as part of another term or not, refers to a linear or branch chained saturated hydrocarbon such as methyl, ethyl, n-propyl, n-butyl, n-pentyl, n-hexyl, n-decanyl, n-eicosanyl. The term, "substituted C_1-C_{20} alkyl" is the C_1-C_{20} alkyl which is mono- or poly-substituted with the identical or different substituent, such as halogen, hydroxyl, mercapto, cyano, nitro, amino, carbonyl, carboxyl, formyl, C_1-C_{20} alkyl, C_2-C_{10} alkenyl, C_2-C_7 alkynyl, aryl, heteroaryl, C_3-C_7 cycloalkyl, a saturated or unsaturated 3- to 7-membered heterocyclic ring, acryl, C_1-C_{20} alkoxy, C_2-C_{10} alkenyloxy, C_2-C_7 alkynyloxy, C_1-C_{20} alkylamine, C_2-C_{10} alkenylamine, C_2-C_7 alkynylamine, arylamine, alkylarylamine, C_1-C_{20} alkylsilyl, C_2-C_{10} alkenylsilyl, C_2-C_7 alkynylsilyl, arylsilyl, alkylarylsilyl, C_1-C_{20} alkylboranyl, C_2-C_{10} alkenylboranyl, C_2-C_7 alkynylboranyl, arylboranyl, alkylarylboranyl, C_1-C_{20} alkylthio, C_2-C_{10} alkenylthio, C_2-C_7 alkynylthio or arylthio (hereinafter, collectively referred to as "the listed substituent"). The term, "heterocyclic" refers to a ring structure in which at least one backbone carbon is replaced by an oxygen, nitrogen or sulfur atom.

[0028] The term, "C_2-C_{10} alkenyl" or "unsubstituted C_2-C_{10} alkenyl", whether as part of another term or not, refers to a linear or branch chained hydrocarbon radical having at least one double bond between the adjacent carbon atoms. Examples of the C_2-C_{10} alkenyl group include vinyl, allyl, but-2-enyl, pent-2-enyl, hept-3-enyl, and dec-1,3-dien-yl. The term, "substituted C_2-C_{10} alkenyl" refers to a C_2-C_{10} alkenyl group, which is mono- or poly-substituted with one or more of the identical or different substituent selected from the above-listed substituents. Examples of the substituted C_2-C_{10} alkenyl group include isoprop-2-enyl, isobutenyl, t-butenyl, and 2-methyl-2-decenyl.

[0029] The term, "C_2-C_7 alkynyl" or "unsubstituted C_2-C_7 alkynyl", whether as part of another term or not, refers to a linear or branch chained hydrocarbon radical having at least one triple bond between the adjacent carbon atoms. Examples of the C_2-C_7 alkynyl group include ethynyl, prop-1-ynyl, hex-2-ynyl, and hept-3-ynyl. The term, "substituted C_2-C_7 alkynyl" refers to a C_2-C_7 alkynyl group, which is mono- or poly-substituted with one or more of the identical or different substituent selected from the above-listed substituents. Examples of the substituted C_2-C_7 alkynyl group include 2-methylethynyl, 2-methylpropynyl, 2-methylbutynyl, and 3-methoxyheptynyl.

[0030] The term, "aryl" or "unsubstituted aryl", whether as part of another term or not, refers to a single or multiple, aromatic hydrocarbon rings. In the case of the multiple rings, two or more rings are fused or linked without an intervening aliphatic chain. For example, the aryl group refers to phenyl, biphenyl, terphenyl, naphthyl, anthracenyl, rubrenyl, and perylenyl. The term, "substituted aryl" refers to an aryl group, which is mono- or poly-substituted with one or more of the identical or different non-aryl substituents selected from the above-listed substituents. Examples of the substituted aryl groups are methylphenyl, methoxyphenyl, methylbiphenyl, methylterphenyl, methylnaphthyl, methoxynaphthyl, and methylanthracenyl.

[0031] The term, "heteroaryl" or "unsubstituted heteroaryl", whether as part of another term or not, refers to single or multiple, aromatic hydrocarbon rings, in which at least one backbone carbon atom is replaced by an oxygen, nitrogen or sulfur atom. In the cases of mult iple rings, two or more rings are fused, including optionally benzo-fused, or linked without an intervening aliphatic chain. The term, "substituted heteroaryl" refers to a heteroaryl group, which is mono- or poly-substituted with one or more of the identical or different non-heteroaryl substituents selected from the above-listed substituents. For example, the substituted aryl groups are 2-methyl-oxazolyl, 2-methyl-imidazolyl, 2-methyl-thiazolyl, 3,4-dimethyl-thiophenyl, 2-methyl-furanyl, 2-methyl-pyridyl, 2-methyl-pyrimidyl, and 2-methyl-pyrrolyl.

[0032] The "C_3-C_7 cycloalkyl" or "unsubstituted C_3-C_7 cycloalkyl" refers to a saturated closed ring structure having 3 to 7 carbon atoms in the ring. One or more carbon atoms in the ring can be optionally replaced by an oxygen, nitrogen or sulfur atom, which is also referred to as "saturated heterocyclic ring". Examples of the C_3-C_7 cycloalkyl groups are cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, and cycloheptyl. The term, "substituted C_3-C_7 cycloalkyl" refers to a C_3-C_7 cycloalkyl group having one or more substitution at the carbon or non-carbon ring member with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted C_3-C_7 cycloalkyl groups are methylcyclopropyl, methylcyclobutyl, methylcyclopentyl, methylcyclohexyl, and methylcycloheptyl.

[0033] The term, "C_4-C_7 cycloalkenyl" or "unsubstituted C_4-C_7 cycloalkenyl" refers to a ring structure having 4 to 7 carbon atoms with at least one double bond. One or more carbon atoms in the ring can be optionally replaced by an oxygen, nitrogen or sulfur atom, which is also referred to as an "unsaturated heterocyclic ring". For example, the C_4-C_7 cycloalkenyl groups refer to 3-cyclopentenyl, 4-cyclohexenyl, and 5-cycloheptenyl. The term, "substituted C_4-C_7 cycloalkenyl" refers to a C_4-C_7 cycloalkenyl group having one or more substitution at the carbon or non-carbon ring member with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted C_4-C_7 cycloalkenyl groups refer to 3-methyl-3-cyclopentenyl, 2-methyl-4-cyclohexenyl, and 2-methyl-cycloheptenyl.

[0034] The term, "C_1-C_{20} alkoxy" or "unsubstituted C_1-C_{20} alkoxy" refers to an oxygen radical subst ituted with a C_1-C_{20} alkyl group. Examples of the C_1-C_{20} alkoxy groups are methoxy, ethoxy, n-propoxy, n-butoxy, n-decanoxy, n-dodecanoxy, and n-eicosanoxy. The term, "substituted C_1-C_{20} alkoxy" refers to a C_1-C_{20} alkoxy group, wherein alkyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted C_1-C_{20} alkoxy groups are 1-methylethoxy, 1-methyl-n-propoxy, 1-methyl-n-butoxy, 5-methoxydecanoxy, 3-methyl-dodecanoxy, and 3-phenylicosanoxy.

[0035] The term, "C_2-C_{10} alkenyloxy" or "unsubstituted C_2-C_{10} alkenyloxy" refers to an oxygen radical substituted with a C_2-C_{10} alkenyl group. For example, the C_2-C_{10} alkenyloxy groups refer to ethenyloxy, prop-1-enyloxy, but-1-enyloxy, hept-3-enyloxy, dec-2-enyloxy and the like. The term, "substituted C_2-C_{10} alkenyloxy" refers to a C_2-C_{10} alkenyloxy group, wherein the alkenyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted C_2-C_{10} alkenyloxy groups are 1-methylethenyloxy, 1-methyl-1-propenyloxy, 1-methyl-1-butenyloxy, 2-methyl-1-heptyloxy, and 2-methyl-1-decenyloxy.

[0036] The term, "C_2-C_7 alkynyloxy" or "unsubstituted C_2-C_7 alkynyloxy" refers to an oxygen radical substituted with a C_2-C_7 alkynyl group. Examples of the C_2-C_7 alkynyloxy groups are ethynyloxy, 1-propynyloxy, 1-butynyloxy, 1,3-heptdiynyloxy and the like. The term, "substituted C_2-C_7 alkynyloxy" refers to a C_2-C_7 alkynyloxy group, wherein the alkynyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted C_2-C_7 alkynyloxy groups are 2-methyl-ethynyloxy, 2-methyl-1-propynyloxy, 2-methyl-1-butynyloxy, and 3-methoxy-1-heptynyloxy.

[0037] The term, "aryloxy" or "unsubstituted aryloxy" refers to the groups having an oxygen radical substituted with an aryl group. For example, the aryloxy groups are phenyloxy, naphthyloxy, anthracenyl, biphenyloxy, rubrenyloxy, perylenyloxy and the like. The term, "substituted aryloxy" refers to an aryloxy group, wherein the aryl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted aryloxy groups refer to 2-methyl-phenyloxy, 4-methyl-naphthyl-2-oxy, 9-methyl-anthracenyl-1-oxy, 2-methyl-biphenyloxy, 2-methyl-rubrenyloxy, 2-methyl-perylenyloxy.

[0038] The term, "C_1-C_{20} alkylamine" or "unsubstituted C_1-C_{20} alkylamine" refers to a nitrogen radical substituted with one or two identical or different C_1-C_{20} alkyl groups. For example, the C_1-C_{20} alkylamine groups include methylamine, ethylamine, propylamine, butylamine, pentylamine, heptylamine, heptadecanylamine and eicosanylamine. The term, "substituted C_1-C_{20} alkylamine" refers to a C_1-C_{20} alkylamine group, wherein the alkyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted C_1-C_{20} alkylamine groups include isopropylamine, N-propyl-N-(2-methoxy)butylamine, 2-methylbutylamine, N-butyl-N-(2-methyl)heptylamine and N-2-butyl-N-(2-methyl)heptadecanylamine.

[0039] The term, "C_2-C_{10} alkenylamine" or "unsubstituted C_2-C_{10} alkenylamine" refers to a nitrogen radical substituted with one or two identical or different C_2-C_{10} alkenyl groups, in which a C_1-C_{20} alkyl can also be attached to the nitrogen atom in case that only one C_2-C_{10} alkenyl group is attached to the nitrogen atom. Examples of the C_2-C_{10} alkenylamine groups are ethenylamine, 1-propenylamine, 1-butenylamine, 1-heptenylamine, and 1-decenylamine. The term, "substituted C_2-C_{10} alkenylamine" refers to a C_2-C_{10} alkenylamine group, wherein the a alkenyl or alkyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted C_2-C_{10} alkenylamine groups are 1-methyl-ethenylamine, 1-methyl-1-propenylamine 1-methyl-1-butenylamine, 1-methyl-1-heptenylamine, and 2-methyl-1-decenylamine.

[0040] The term, "C_2-C_7 alkynylamine" or "unsubstituted C_2-C_7 alkynylamine" refers to a nitrogen radical substituted with one or two identical or different C_2-C_7 alkynyl groups, in which a C_1-C_{20} alkyl or C_2-C_{10} alkenyl can also be attached to the nitrogen atom in case only one C_2-C_{10} alkenyl group is attached to the nitrogen atom. Examples of the C_2-C_{10} alkynylamine groups are ethynylamine, 1-propynylamine, 1-butynylamine, 2-heptynylamine, 1-decynylamine and the like. The term, "substituted C_2-C_7 alkynylamine" refers to a C_2-C_7 alkynylamine group, wherein one or more of the alkyl, alkenyl and alkynyl parts are mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of substituted C_2-C_7 alkynylamine groups are isopropynylamine, 2-methyl-1-butynylamine, 3-methyl-2-hepynylamine, and 2-methyl-1-decynylamine.

[0041] The term, "arylamine" or "unsubstituted arylamine" refers to a nitrogen radical substituted with one or two identical or different aryl or heteroaryl groups. Examples of the arylamine groups are phenylamine, 1-naphthylamine, 9-anthracenylamine, biphenylamine, rubrenylamine, andperylenylamine. The term, "substituted arylamine" refers to an arylamine group, wherein the ring part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted arylamine groups are 3-methylphenylamine, and 9-methoxyanthracenylamine.

[0042] The term, "alkylarylamine", "arylalkylamine", "unsubstituted arylakylamine" or "unsubstituted alkylarylamine" refers to a nitrogen radical substituted with both an aryl or heteroaryl group and one of the C_1-C_{20} alkyl, C_2-C_{10} alkenyl, C_2-C_7 alkynyl, C_1-C_{20} alkoxy, C_2-C_{10} alkenyloxy, C_2-C_7 alkynyloxy groups. Examples of the alkylarylamine groups are N-methyl-N-phenylamine, N-ethyl-N-phenylamine, N-ethyl-N-(1-naphthyl)amine, N-methyl-N-(9-anthracenyl)amine, N-ethenyl-N-phenylamine, N-ethenyl-N-(1-naphthyl)amine, N-ethynyl-N-phenylamine, and N-ethynyl-N-(1-naphthyl)amine. The term, "substituted alkylarylamine" or "substituted arylalkylamine" refers to an alkylarylamine group, wherein the ring part, non-ring part or both parts are mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted alkylarylamine groups are N-isopropyl-N-phenylamine, and N-phenyl-N-(4-propyl-1-naphthyl)amine.

[0043] The term, "C_1-C_{20} alkylsilyl" or "unsubstituted C_1-C_{20} alkylsilyl" refers to a silicon radical substituted with one or more identical or different C_1-C_{20} alkyl groups. For example, the alkylsilyl groups include trimethylsilyl, triethylsilyl, tripropylsilyl, tridecanylsilyl and trieicosanylsilyl. The term, "substituted C_1-C_{20} alkylsilyl" refers to a C_1-C_{20} alkylsilyl group, wherein one or more of the C_1-C_{20} alkyl parts are mono- or poly-substituted with one or more of the same or different substituents selected from the above-listed substituents. For example, the substituted alkylsilyl groups include diisopropylmethylsilyl, di(isobutyl)methylsilyl, di(decanyl)isopropylsilyl and di(eicosanyl)methylsilyl.

[0044] The term, "C_2-C_{10} alkenylsilyl" or "unsubstituted C_2-C_{10} alkenylsilyl" refers to a silicon radical substituted with one or more identical or different C_2-C_{10} alkenyl groups, in which one or more C_1-C_{20} alkyl groups can also be attached to the silicon. For example, the alkenylsilyl groups include triethenylsilyl, tripropenylsilyl, tributenylsilyl, triheptenylsilyl and tridecenylsilyl. The term, "substituted C_1-C_{20} alkenylsilyl" refers to a C_2-C_{10} alkenylsilyl group, wherein the alkyl or alkenyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted C_2-C_{10} alkenylsilyl groups include tri(2-methylethenyl)silyl, tri(2-methylpropenyl)silyl, tri(2-methylheptenyl)silyl and tri(2-methyldecenyl)silyl.

[0045] The term, "C_2-C_7 alkynylsilyl" or "unsubstituted C_2-C_7 alkynylsilyl" refers to a silicon radical substituted with one or more identical or different C_2-C_{10} alkynyl groups, in which one or more of the C_1-C_{20} alkyl and C_2-C_{10} alkenyl groups can also be attached to the silicon. For example, the alkynylsilyl groups include triethynylsilyl, tripropynylsilyl, tributynylsilyl, triheptenylsilyl and tridecenylsilyl. The term, "substituted C_2-C_7 alkynylsilyl" refers to a C_2-C_7 alkynylsilyl group, wherein the alkyl, alkenyl or alkynyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. The substituted C_2-C_7 alkynylsilyl groups include, for example, tri(2-methylethynyl)silyl, tri(2-methylpropynyl)silyl, tri(2-methylbutynyl)silyl, tri(2-methylheptynyl)silyl and tri(2-methyldecenyl)silyl.

[0046] The term, "arylsilyl" or "unsubstituted arylsilyl" refers to a silicon radical substituted with one or more identical or different aryl or heteroaryl groups. For example, the arylsilyl groups include triphenylsilyl, trinaphthylsilyl and tribiphenylsilyl. The term, "substituted arylsilyl" refers to an arylsilyl group, wherein the aryl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted arylsilyl groups include tri(2-methylphenyl)silyl, tri(4-methylnaphthyl)silyl and tri(2-methylbiphenyl)silyl.

[0047] The term, "alkylarylsilyl", "arylalkylsilyl", "unsubstituted arylalkylsilyl" or "unsubstiuted alkylarylsilyl" refers to a silicon radical substituted with one or more identical or different aryl or heteroaryl groups and at the same time one of the C_1-C_{20} alkyl, C_2-C_{10} alkenyl, C_2-C_7 alkynyl, C_1-C_{20} alkoxy, C_2-C_{10} alkenyloxy and C_2-C_7 alkynyloxy groups. Examples of the alkylarylsilyl groups are diphenylmethylsilyl, dinaphthylmethylsilyl, diphenylethylsilyl, dinaphthylethenylsilyl, dianthracenylethynylsilyl and the like. The term, "substituted alkylarylsilyl" refers to an alkylarylsilyl group, wherein the ring part, non-ring part or both parts are mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted alkylarylsilyl groups are di(2-methylphenyl)methylsilyl, and di(4-methylnaphthyl)methylsilyl.

[0048] The term, "C_1-C_{20} alkylboranyl" or " unsubstituted C_1-C_{20} alkylboranyl" refers to a boron radical substituted with one or more identical or different C_1-C_{20} alkyl groups. For example, the alkylboranyl groups include dimethylboranyl, diethylboranyl, dipropylboranyl, diheptylboranyl, didecanylboranyl and di(eicosanyl)boranyl. The term, "substituted C_1-C_{20} alkylboranyl" refers to a C_1-C_{20} alkylboranyl group, wherein one or more of the C_1-C_{20} alkyl parts are mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted alkylboranyl groups include di(isopropyl)boranyl, di(isobutyl)boranyl, di(2-methylheptynyl)boranyl, di(2-methyldecanyl)boranyl, and di(2-methyleicosanyl)boranyl.

[0049] The term, "C_2-C_{10} alkenylboranyl" or "unsubstituted C_2-C_{10} alkenylboranyl" refers to aboron radical substituted with one or more identical or different C_2-C_{10} alkenyl groups, in which a C_1-C_{20} alkyl groups can also be attached to the boron atom in case only one C_2-C_{10} alkenyl group is attached to the boron. For example, the alkenylboranyl groups include diethenylboranyl, dipropenylboranyl, dibutenylboranyl, diheptenylboranyl and didecanylboranyl. The term, "substituted C_2-C_{10} alkenylboranyl" refers to a C_2-C_{10} alkenylboranyl group, wherein the alkyl or alkenyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted alkenylboranyl groups are di(1-methylethenyl)boranyl and di(1-methylprop-1-enyl)boranyl, di(2-methlheptenyl)boranyl, and di(2-methyldecanyl)boranyl.

[0050] The term, "C_2-C_7 alkynylboranyl" or "unsubstituted C_2-C_7 alkynylboranyl" refers to a boron radical substituted with one or more identical or different C_2-C_7 alkynyl groups, in which a C_1-C_{20} alkyl or C_2-C_{10} alkenyl group can also be attached to the boron atom in case only one C_2-C_7 alkynyl group is attached to the boron. For example, the alkynylboranyl groups include diethynylboranyl, dipropynylboranyl, dibutynylboranyl, dihexynylboranyl and diheptylboranyl. The term, "substituted C_2-C_7 alkynylboranyl" refers to a C_2-C_7 alkynylboranyl group, wherein the alkyl, alkenyl or alkynyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. The substituted C_2-C_7 alkynylboranyl groups include, for example, di(2-methylethynyl)boranyl, di(2-methylpropynyl)boranyl, di(2-methylbutynyl)boranyl, di(2-methylhexynyl)boranyl and di(2-methylheptyl)boranyl.

[0051] The term, "arylboranyl" or "unsubstituted arylboranyl" refers to a boron radical substituted with one or more identical or different aryl or heteroaryl groups. Examples of the arylboranyl groups are diphenylboranyl, naphthylboranyl, dinaphthylboranyl, dibiphenylboranyl, rubrenylboranyl, and perylenylboranyl. The term, "substituted arylboranyl" refers to an arylboranyl group, wherein the aryl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted arylboranyl groups are di(3-methylphenyl)boranyl, di(4-methylnaphth-1-yl)boranyl, and di(2-methylbiphenyl)boranyl.

[0052] The term, "alkylarylboranyl", "arylalkylboranyl", "unsubstituted arylalkylboranyl" or "unsubstituted alkylarylboranyl" refers to a boron radical substituted with an aryl or heteroaryl group and at the same time one of the C_1-C_{20}. alkyl, C_2-C_{10}) alkenyl, C_2-C_7 alkynyl, C_1-C_{20} alkoxy, C_2-C_{10} alkenyloxy and C_2-C_7 alkynyloxy groups. Examples of the alkylarylboranyl groups are ethylphenylboranyl, methylnaphthylboranyl, methylbiphenylboranyl, ethenylnaphthylboranyl, and ethynylphenylboranyl. The term, "substituted alkylarylboranyl" refers to an alkylarylboranyl group, wherein the ring part, non-ring part or both parts are mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. Examples of the substituted alkylarylboranyl groups are methyl(4-methylnaphthyl)boranyl, ethyl(2-methylphenyl)boranyl, and methyl(2-methylbiphenyl)boranyl.

[0053] The term, "C_1-C_{20} alkylthio" or "unsubstituted C_1-C_{20} alkylthio" refers to a sulfur radical substituted with a C_1-C_{20} alkyl group. For example, the alkylthio groups include methylthio, ethylthio, n-propylthio, n-butylthio, n-heptylthio, n-decanylthio and n-eicosanylthio. The term, "substituted C_1-C_{20} alkylthio" refers to a C_1-C_{20} alkylthio group, wherein one or more of the C_1-C_{20} alkyl parts are mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted alkylthio groups include isopropylthio, isobutylthio, neo-pentylthio, 2-methylheptylthio, 2-methyldecanylthio and 2-methyleicosanylthio.

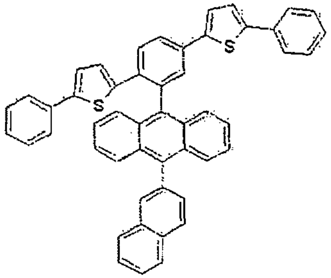
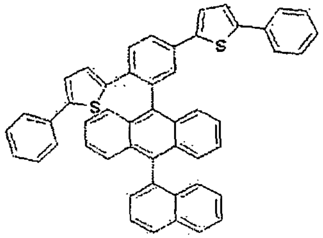
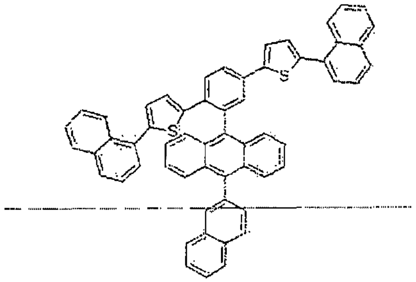
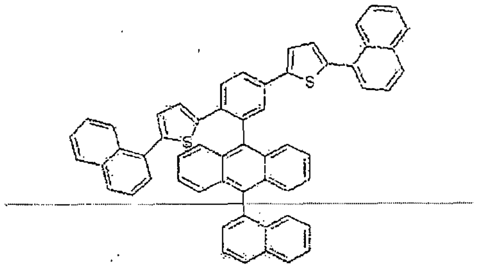
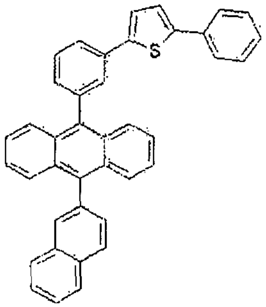
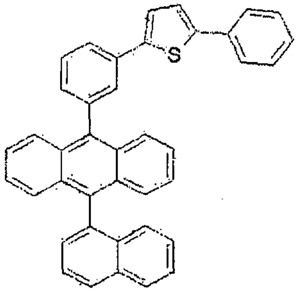
[0054] The term, "C_2-C_{10} alkenylthio" or "unsubstituted C_2-C_{10} alkenylthio" refers to groups having a sulfur radical substituted with a C_2-C_{10} alkenyl group. For example, the alkenylthio groups include ethenylthio, propenylthio, butenylthio and decenylthio. The term, "substituted C_2-C_{10} alkenylthio" refers to a C_2-C_{10} alkenylthio group, wherein the alkenyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted alkylthio groups include 1-methylethenylthio, 1-methyl-2-propenylthio, and 1-methyl-2-butenylthio.

[0055] The term, "C_2-C_7 alkynylthio" or "unsubstituted C_2-C_7 alkynylthio" refers to groups having a sulfur radical substituted with a C_2-C_7 alkynyl group. For example, the alkynylthio groups include ethynylthio, propynylthio, butynylthio and heptynylthio. The term, "substituted C_2-C_7 alkynylthio" refers to a C_2-C_7 alkynylthio group, wherein the alkynyl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. The substituted C_2-C_7 alkynylthio groups include, for example, 2-methyl-ethynylthio, 2-methylpropynyl, 2-methylbutynylthio and 2-methylheptynylthio.

[0056] The term, "arylthio" or "unsubstituted arylthio" refers to groups having a sulfur atom substituted with an aryl groups. For example, the arylthio group includes phenylthio, naphthylthio, anthracenylthio and biphenylthio. The term, "substituted arylthio" refers to an arylthio group, wherein the aryl part is mono- or poly-substituted with one or more of the identical or different substituents selected from the above-listed substituents. For example, the substituted arylthio groups include 3-methylphenylthio, 4-methylnaphthylthio and 2-methylbiphenylthio.

[0057] Specific examples of the compound of the formula 1 according to the invention are shown in the following Table 1 including compounds 13 to 18, 22 to 25, 44, and 54 to 70 but not limited thereto. The remaining compounds are for comparative purpose.

[Table 1]

Compound	Structural Formula	Compound	Structural Formula
1		2	
3		4	
5		6	

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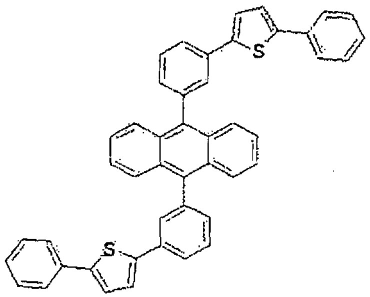
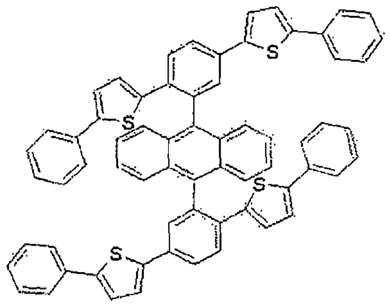
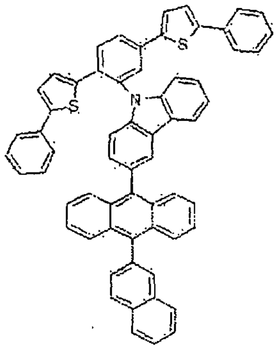
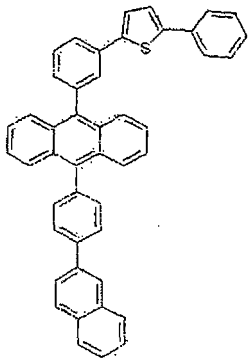
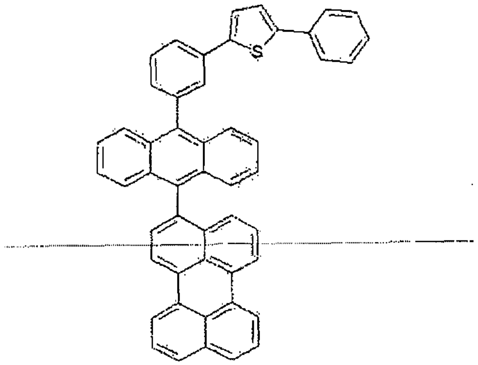
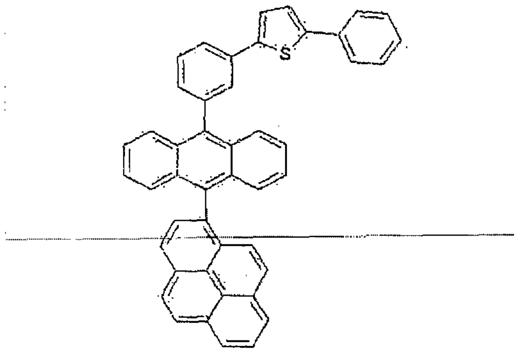
Compound	Structural Formula	Compound	Structural Formula
7		8	
9		10	
11		12	

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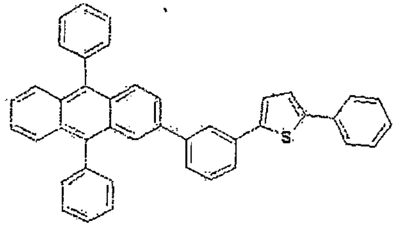
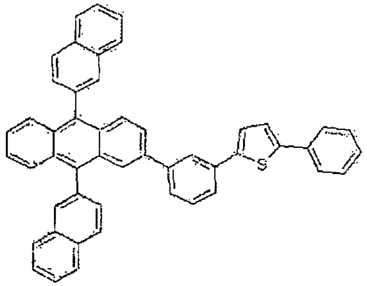
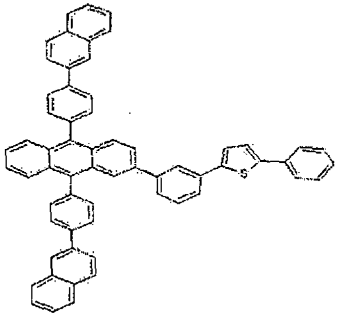
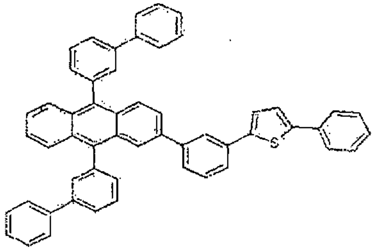
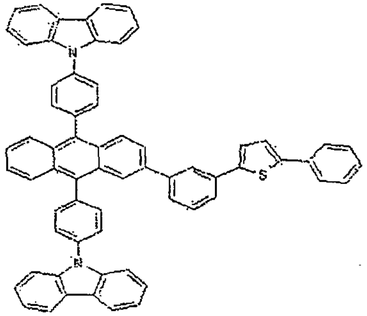
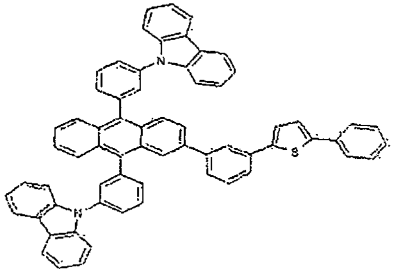
13		14	
15		16	
17		18	

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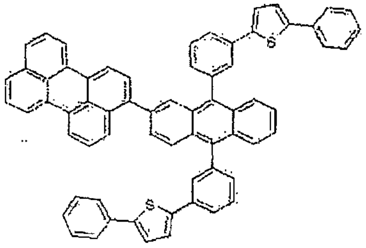
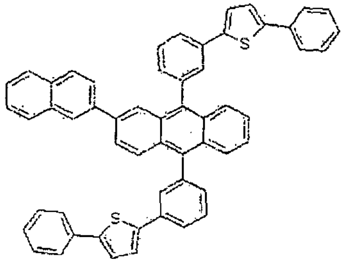
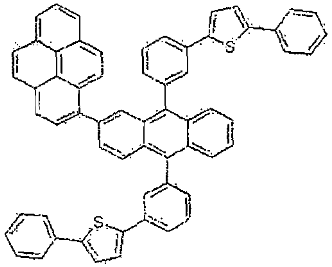
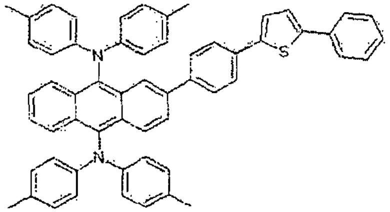
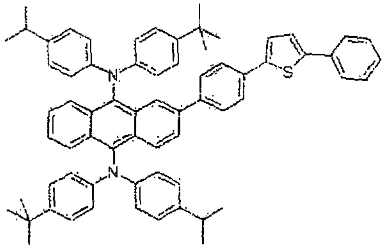
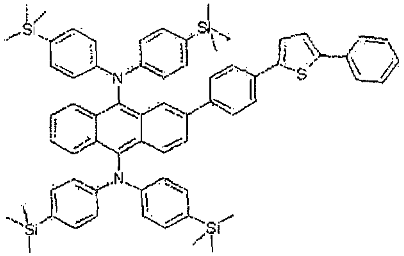
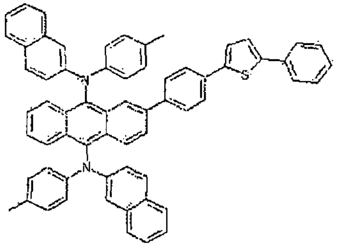
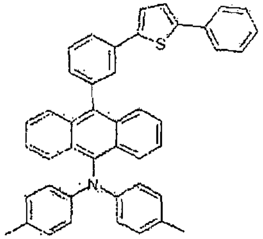
19		20	
21		22	
23		24	
25		26	

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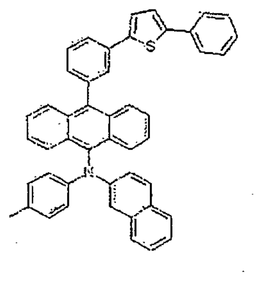
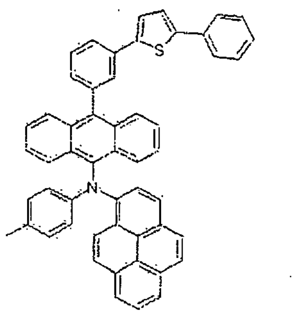
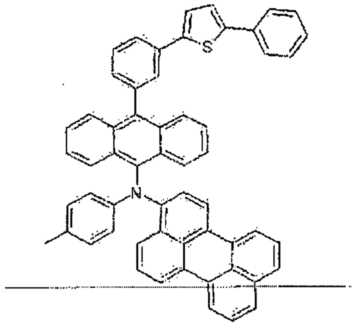
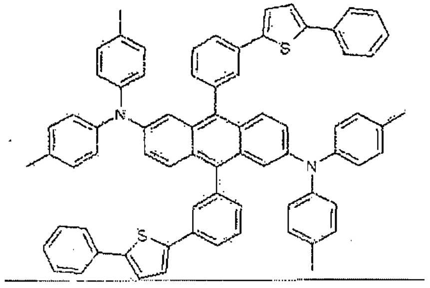
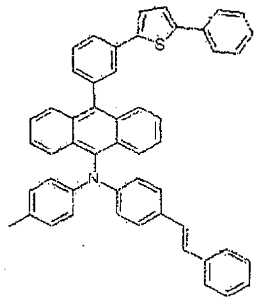
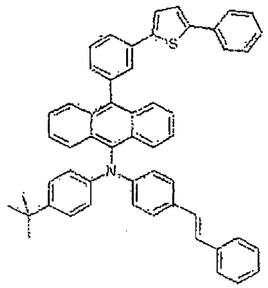
Compound	Structural Formula	Compound	Structural Formula
27		28	
29		30	
3.1		32	

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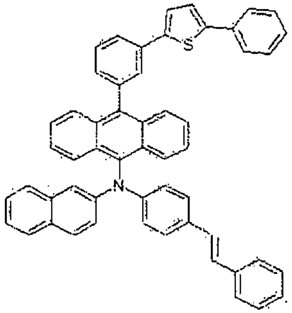
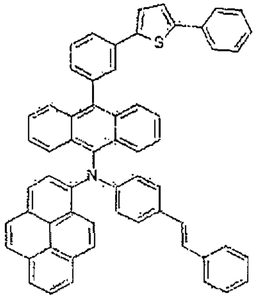
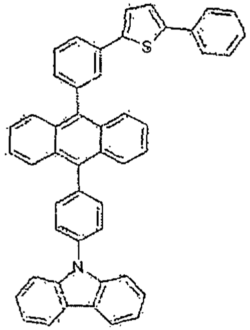
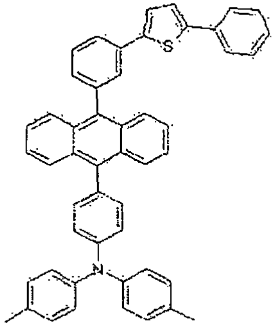
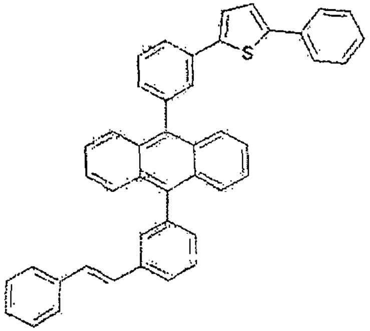
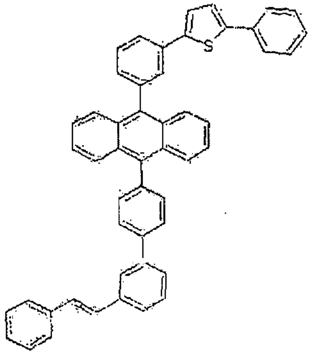
Compound	Structural Formula	Compound	Structural Formula
33		34	
35		36	
37		38	

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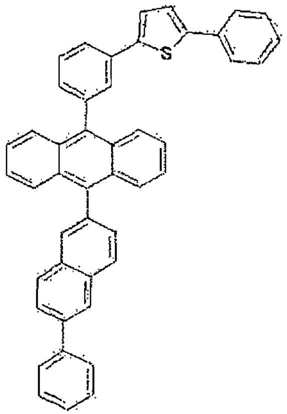
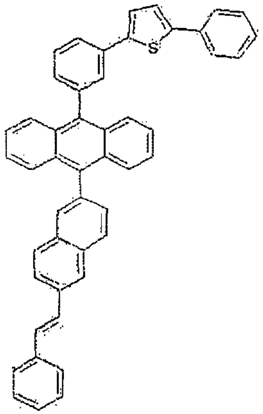
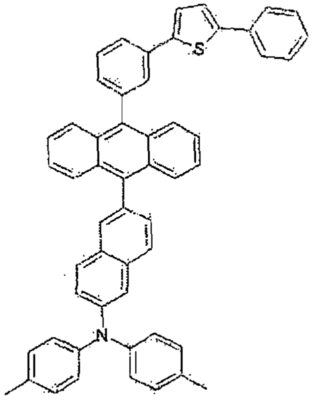
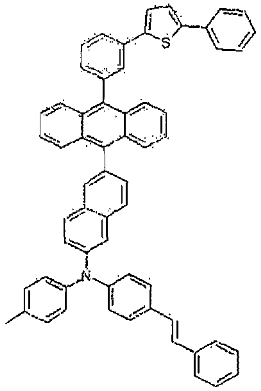
39		40	
41		42	

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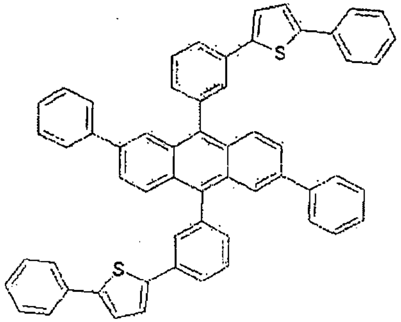
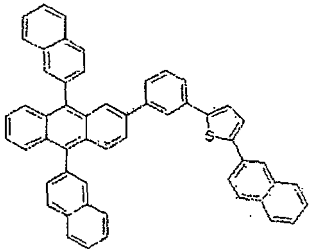
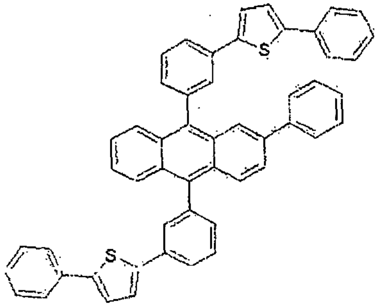
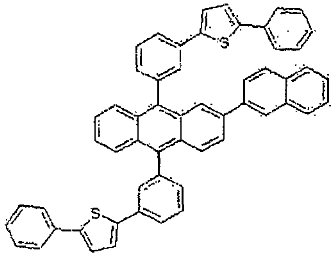
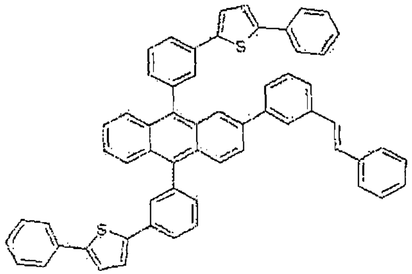
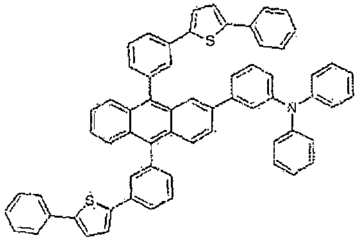
43		44	
45		46	
47		48	

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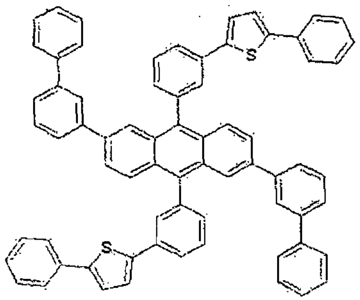
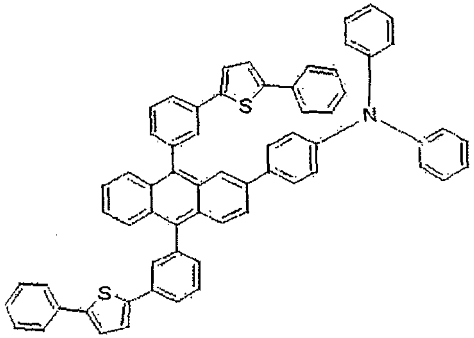
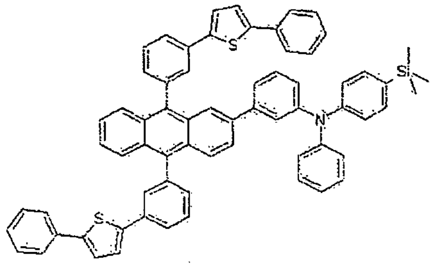
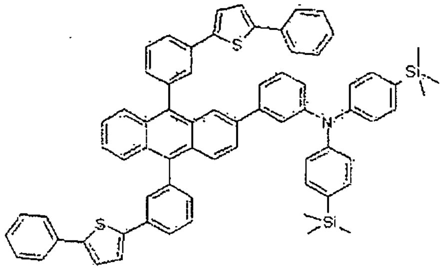
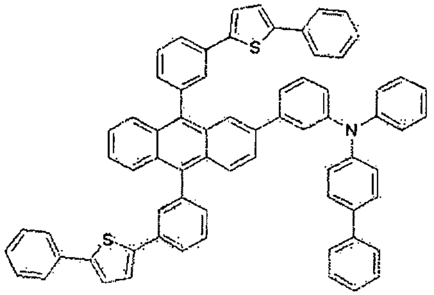
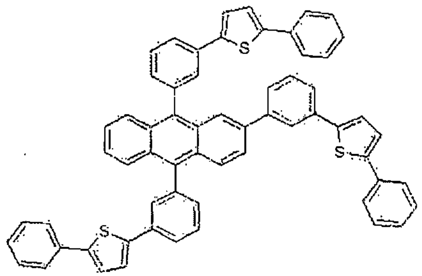
Compound	Structural Formula	Compound	Structural Formula
49		50	
51		52	
53		54	

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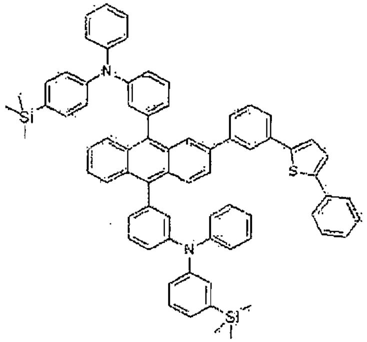
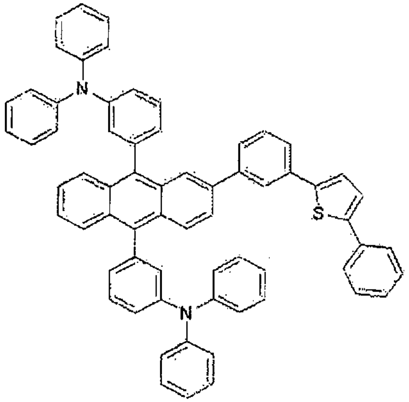
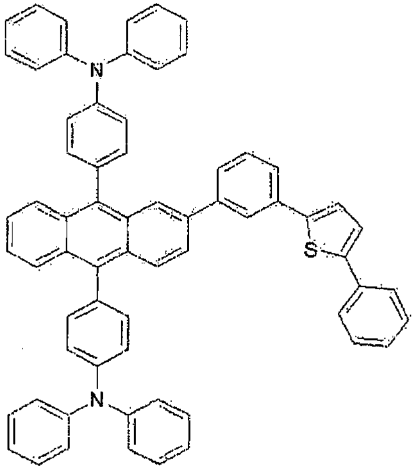
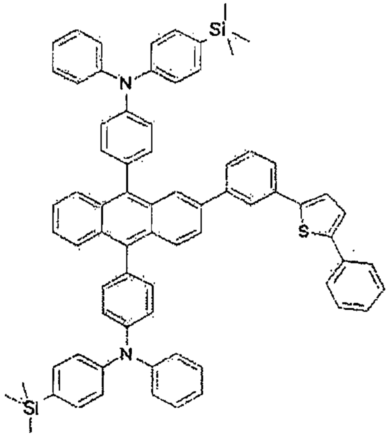
Compound	Structural Formula	Compound	Structural Formula
55		56	
57		58	

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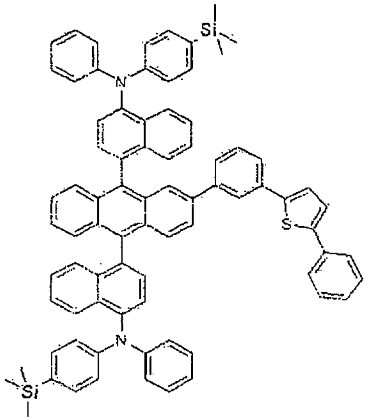
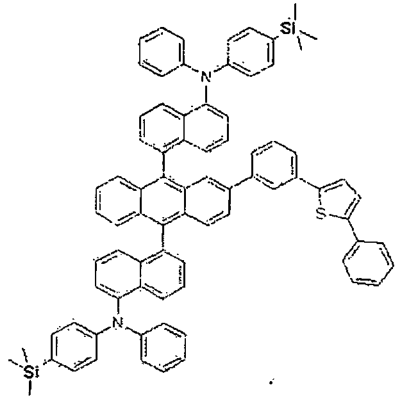
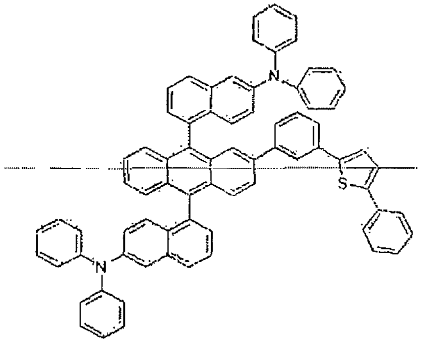
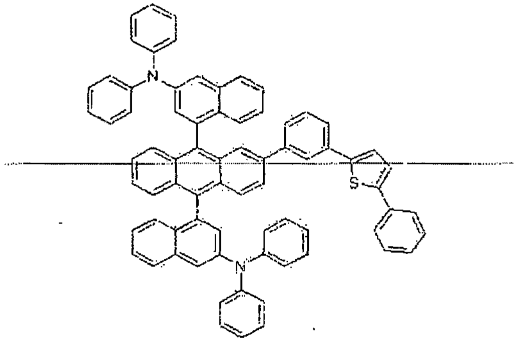
Compound	Structural Formula	Compound	Structural Formula
59		60	
61		62	

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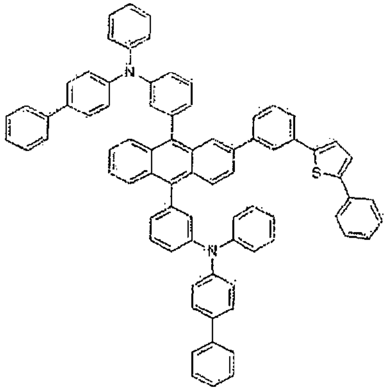
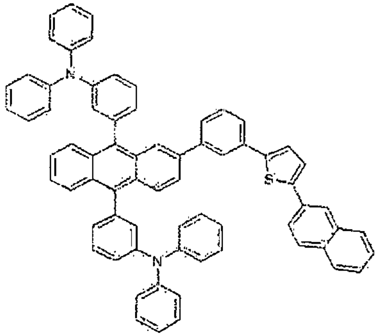
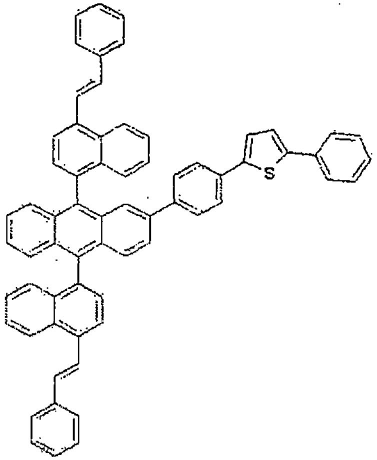
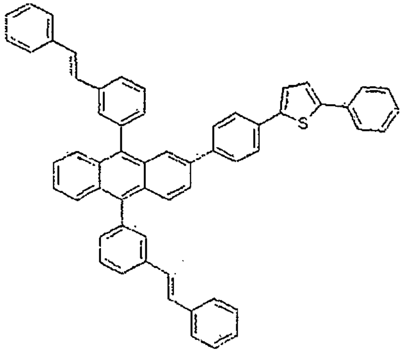
Compound	Structural Formula	Compound	Structural Formula
63	 	64	
65	 	66	

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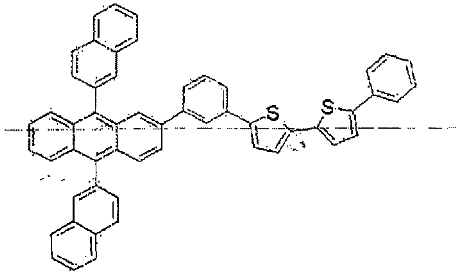
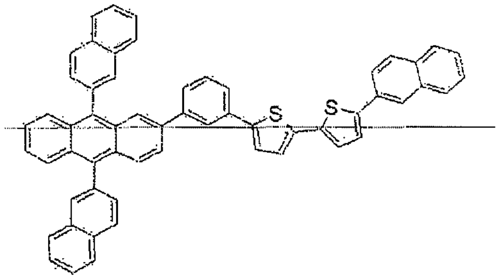
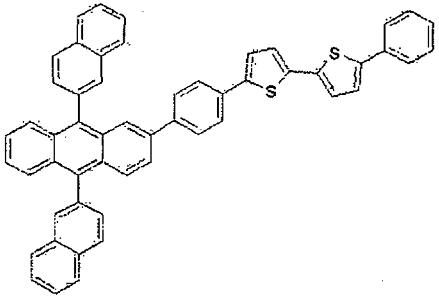
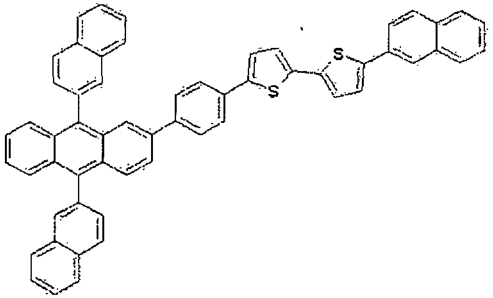
Compound	Structural Formula	Compound	Structural Formula
67		68	
69		70	

[0058] In the compounds of the formula 1, the compound of the formula 1 according to the present invention has a characteristic structure in which the anthracene derivative contains thiophene. The compound with such the structure containing thiophene has greatly increased light emission efficiency (quantum efficiency), as compared with that of the similar structure containing no thiophene. This is one of the critical characteristics which are required by both of the host and the dopant of the light emitting layer. Therefore, the light emitting efficiency of the device can be greatly improved by a novel structure represented by the formula 1. In particular, absolute light emitting efficiency of the dopant can be enhanced. Fig. 1 is a diagram showing a spectrum obtained by measuring the photoluminescences (PL) of the compound 5 (comparative) solution and the comparative compound 1 solution (concentration: $1*10^{-5}$ M, solvent : toluene) at an exciting wavelength of 360 nm. The areas (energies) obtained by integrating the intensities of the spectrum at wavelengths of 360 to 600 nm were 1.0xE10, 1.8xE10, respectively. As shown in Fig. 1, the compound 5 showed about 2-times stronger light emitting characteristics than those of the comparative compound 1.

[0059] Specifically, in the structure of the compound 1 of the formula 1, for example, the thiophene-substituted phenyl moiety and the 9-(2-naphthyl)anthracene moiety are twisted at an angle of about 90 degree, and thus they are chemically bonded to each other, but do not greatly affect the conjugation, respectively. Accordingly, they can show independently light emission spectrum at the same or similar wavelength band.

[0060] The compound of the formula 1 can be prepared by using bromobenzene with a heterocyclic group being substituted and anthracene boronic acid as starting materials, and introducing a substituent thereto using an aryl-aryl coupling method. Specific methods for preparing the compound of the formula 1 are shown in Examples.

[0061] Further, the present invention provides an organic light emitting device comprising a first electrode, a second electrode, and at least one organic material layer interposed between the first electrode and the second electrode, wherein at least one layer of the organic material layers comprises the compound of the formula 1.

[0062] The above-described compounds of the present invention can singly serve as a light emitting material in the organic light emitting device, as well as serve as a light emitting dopant in combination of a suitable light emitting host, or as a light emitting host in combination of a suitable light emitting dopant.

[0063] The organic light emitting device of the present invention can be prepared by usual methods and materials for preparing an organic light emitting device, except that the above-described compounds according to the present invention are used to form at least one layer of the organic material layers, in particular a light emitting layer.

[0064] In one embodiment of the present invention, the organic light emitting device can have a structure comprising a first electrode, a second electrode, and organic material layers interposed therebetween. The structure of the organic light emitting device according to the present invention is illustrated in Fig. 3.

[0065] For example, the organic light emitting device according to the present invention can be prepared by depositing a metal,or a conductive metal oxide or an alloy thereof on a substrate using a PVD (physical vapor deposition) process such as sputtering and e-beam evaporation to form an anode; forming organic material layers comprising a hole injecting layer, a hole transporting layer, a light emitting layer and an electron transporting layer on the anode; and deposit ing a material, which can be used as a cathode, thereon. As an alternat ive, a cathode material, an organic material layer, and an anode material can be sequentially deposited on a substrate to prepare an organic light emitting device (see International Patent Application Publication No. 2003/012890).

[0066] The organic material layer may have a multi layer structure containing a hole injecting layer, a hole transporting layer, a light emitting layer, an electron transporting layer, and the like, but not limited thereto, and may have a monolayer structure. Further, the organic material layer can be produced to have a fewer number of layers, by using various polymer materials, by means of a solvent process, such as spin coating, dip coating, doctor blading, screen printing, ink jet printing, and heat transfer processes, instead of deposit process.

[0067] Preferably, the anode material is usually a material having a large work function to facilitate hole injection to the organic material layers. Specific examples of the anode material which can be used in the present invention include metals such as vanadium, chromium, copper, zinc and gold, or an alloy thereof; metal oxides such as zinc oxide, indium oxide, indium-tin oxide (ITO), and indium zinc oxide (IZO); a combination of a metal and an oxide such as ZnO:Al and SnO_2:Sb; conductive polymers such as poly(3-methylthiophene), poly[3,4-(ethylene-1,2-dioxy)thiophene] (PEDT), polypyrrole and polyaniline, but not limited thereto.

[0068] The cathode material is preferably a material having a small work function to facilitate electron inject ion usually to the organic material layers. Specific examples of the cathode material include metals such as magnesium, calcium, sodium, potassium, titanium, indium, yttrium, lithium, gadolinium, aluminum, silver, tin and lead, or an alloy thereof; multilayer structure materials such as LiF/Al and LiO_2/Al, but not limited thereto.

[0069] The hole injecting material is a material facilitating hole injection from an anode at low voltage. The HOMO (highest occupied molecular orbital) level of the hole injecting material is preferably located between the work function of the anode materials and the HOMO level of its neighboring organic material layer. Specific examples of the hole inject ing material include organic materials of metal porphyrin, oligothiophene and arylamine series, organic materials of hexanitrile hexaazatriphenylene and quinacridone series, organic materials of perylene series, and conductive polymers of anthraquinone, polyaniline, and polythiophene series, but are not limited thereto.

[0070] The hole transport ing material is a material having high hole mobility, which can transfer holes from the anode or the hole injecting layer toward the light emitting layer. Specific examples thereof include organic materials of arylamine series, conductive polymers and block copolymers having both conjugated portions and non-conjugated portions, but are not limited thereto.

[0071] The light emitting material is capable of emittingvisible light by accepting and recombining holes from the hole transporting layer and electrons from the electron transporting layer, preferably a material having high quantum efficiency for fluorescence or phosphorescence. Specific examples thereof include 8-hydroxyquinoline aluminum complex (Alq_3); compounds of carbazole series; dimerized styryl compounds; BAlq; 10-hydroxybenzoquinoline-metal compounds; compounds of benzoxazole, benzthiazole and benzimidazole series; polymers of poly(p-phenylenevinylene) (PPV) series; spiro compounds; polyfluorene and rubrene, but are not limited thereto.

[0072] The electron transporting material is suitably a material having high electron mobility, which can transfer electrons from the cathode to the light emitting layer. Specific examples thereof include Al complexes of 8-hydroxyquinoline; complexes including Alq_3; organic radical compounds; and hydroxyflavone-metal complexes, but are not limited thereto.

[0073] The organic light emitting device according to the invention may be of a front-side, backside or double-sided light emission according to the materials used.

[0074] The compound according to the invent ion can funct ion in an organic electronic device including an organic solar cell, an organic photoconductor and an organic transistor, according to a principle similar to that applied to the organic light emitting device.

[Advantageous Effects]

[0075] The compound of the present invention is a novel structure of an anthracene derivative, and it can singly serve as a light emitting material in the organic light emitting device, as well as serve as a light emitting host in combination of a suitable dopant, or as a light emitting dopant in combination of a suitable host.

[Description of Drawings]

[0076]

Fig. 1 is a diagram showing a spectrum obtained by measuring the photoluminescences (PL) of the compound 5 solution and the comparative compound 1 solution(concentration: 1*10^{-5} M, solvent : toluene) at an exciting wavelength of 360 nm.

Fig. 2 is a diagram showing a spectrum obtained by measuring the photoluminescence of the compound 12 solution at an exciting wavelength of 434 nm.

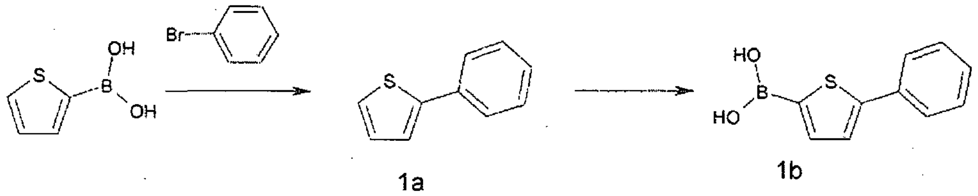
Fig. 3 is a diagram illustrating the structure of the organic light emitting device according to one embodiment of the present invention.

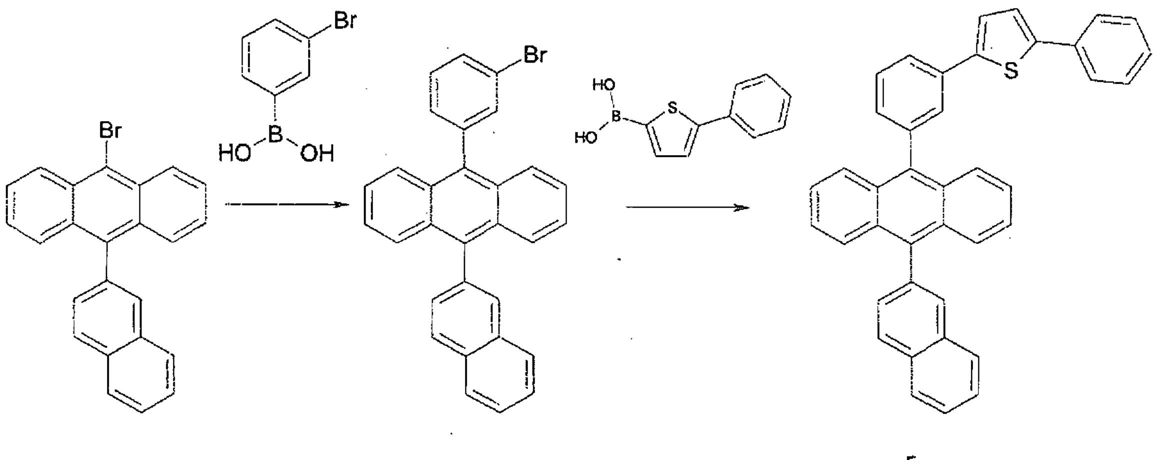
[Mode for Invention]

[0077] Hereinafter, the present invention will be described in more detail by means of Examples and Experimental Examples, but the scope of the invention is not limited thereto.

Example 1 : Preparation of Compound 5 (comparative)

[0078]





1c

5

1-A. Preparation of Compound 1a

[0079] A compound of 2-thiophene boronic acid (10 g, 78.1 mmol) and bromobenzene (7.48 mL, 70.3 mmol) was dissolved in anhydrous THF (300 mL), $Pd(PPh_3)_4$ (4.51 g, 3.91 mmol) and an aqueous K_2CO_3 solut ion (156 mL, 312.4mmol) were then added thereto, and the mixture was refluxed for 3 hours. The organic layer was extracted with ethyl acetate, and water was removed over magnesium sulfate. The organic layer was filtered under reduced pressure, concentrated to remove the solvent, purified by column chromatography, and then recrystallized with THF and ethanol to obtain a white solid compound 1a (10 g, 80%). MS [M+H] = 161

1-B. Preparation of Compound 1b

[0080] The compound 1a (5 g, 31.3 mmol) prepared in the step of 1-A was dissolved in anhydrous THF (200 mL), and the solution was cooled to -10°C, and n-butyllithium (15 mL, 37.5 mmol) was slowly added dropwise thereto. The mixture was stirred for 1 hour, and cooled to -78°C again, boronic acid trimethylester (10.5 mL, 93.75 mmol) was slowly added thereto, and the mixture was stirred for 12 hours. The mixture was cooled to 0°C, a 10wt% of an aqueous sulfuric acid solution (16 mL) was added thereto, and the mixture was stirred to obtain a white precipitate. The organic layer was extracted with THF, dried over magnesium sulfate, and then filtered under reduced pressure. This filtrate was concentrated to remove the solvent, dissolved in THF, an excessive amount of a 2 M aqueous NaOH solution was added thereto, and the organic layer was separated with dimethylchloromethane. To the separated aqueous solution layer, an aqueous hydrochloric acid solution was added, and the resulting precipitate was produced and filtered to obtain a compound 1b (2.7 g, 42%).

1-C. Preparation of Compound 1c

[0081] The compound 1b (2 g, 5.2 mmol) prepared in the step of 1-B and 3-bromophenyl boronic acid (1.04 g, 5.2 mmol) were dissolved in anhydrous THF (60 mL), and sequentially $Pd(PPh_3)_4$ (0.3 g, 0.26 mmol) and K_2CO_3 (1.0 g, 7.8 mmol) dissolved in H_2O (60 mL) were added thereto. The mixture was refluxed under stirring. Three hours later, the mixture was washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and separated by column chromatography to obtain a compound 1c (1.2 g, 50%). MS [M] = 459

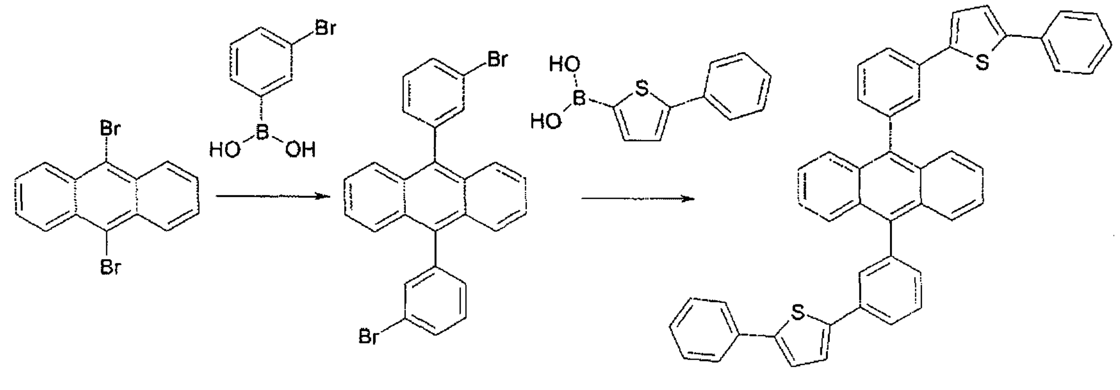
1-D. Preparation of Compound 5

[0082] The compound 1c (1 g, 2.18 mmol) prepared in the step of 1-C, the compound 1b (0.53 g, 2.6 mmol) prepared in the step of 1-B and $Pd(PPh_3)_4$ (0.13 g, 0.11 mmol) were dissolved in anhydrous THF (50 mL), and a 2M aqueous K_2CO_3 solution (50 mL) were added thereto, and then the mixture was refluxed under stirring for 3 hours. After completion of the reaction, the organic layer of the reaction solution was extracted with ethyl acetate, water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated, and then separated by column chromatography to obtain a compound 5 (0.9 g, 80%). MS [M] = 538

[0083] The spectrum obtained by measuring the photoluminescences (PL) of the compound 5 solution (concentration: $1*10^{-5}$ M, solvent : toluene) at an exciting wavelength of 360 nm is shown in Fig. 1.

Example 2 : **Preparation of Compound 7 (comparative)**

[0084]



2a

7

2-A. Preparation of Compound 2a

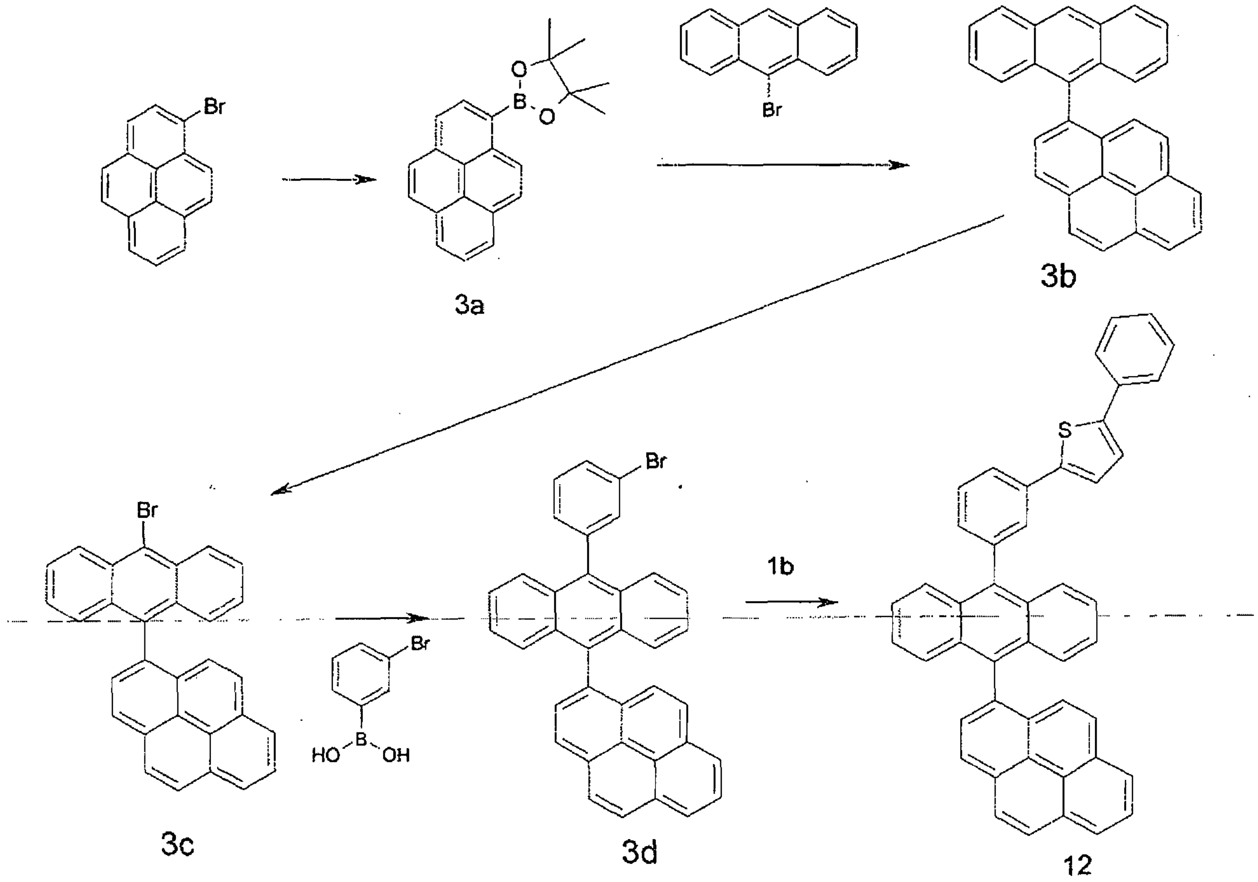
[0085] 9,10-Dibromoanthracene (2g, 5.95 mmol) and 3-bromophenyl boronic acid (2.4 g, 11.9 mmol) were dissolved in anhydrous THF (60 mL), and sequentially Pd(PPh_3)$_4$ (0.34 g, 0.30 mmol) and K_2CO_3 (1.8 g, 13.09 mmol) dissolved in H_2O (60 mL) were added thereto, and then the mixture was refluxed under stirring. Three hours later, the mixture was washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and separated by column chromatography to obtain a compound 2a (1.5 g, 50%). MS [M] = 488

2-B. Preparation of Compound 7

[0086] The compound 2a (1.5 g, 3.07 mmol) prepared in the step of 2-A, the compound 1b (1.36 g, 6.76 mmol) prepared in the step of 1-B, and Pd(PPh_3)$_4$ (0.18 g, 0.15 mmol) were dissolved in anhydrous THF (50 mL) and then a 2 M aqueous K_2CO_3 solution (50 mL) was added thereto, and the mixture was refluxed under stirring for 3 hours. After completion of the reaction, the organic layer of the reaction solution was extracted with ethyl acetate, water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated, and separated by column chromatography to obtain a compound 7 (1.7 g, 85%). MS [M] = 646

Example 3 : **Preparation of Compound 12 (comparative)**

[0087]



3-A. Preparation of Compound 3a

[0088] 1-Bromo-pyrene (5 g, 17.8 mmol) was dissolved in anhydrous THF (60 mL), the solution was cooled to -78°C, and n-butyllithium (9.7 mL, 23.2 mmol) was slowly added dropwise thereto. The mixture was stirred for 30 minutes, 2-isopropyl-4,4,5,5-tetramethyl-[1,3,2]dioxaboron (4.8 mL, 23.1 mmol) was slowly added dropwise thereto, and the mixture was stirred for 12 hours. The reaction mixture was washed with an ammonium chloride solution, further washed with distilled water twice, and dried over magnesium sulfate to remove water. The residue was dissolved in THF, and recrystallized with EtOH to obtain a compound 3a (3.27 g, 56%).

3-B. Preparation of Compound 3b

[0089] The compound 3a (1.34 g, 4.08 mmol) prepared in the step of 3-A, and 9-bromoanthracene (1.05 g, 4.08 mmol) were dissolved in THF (30 mL), and $Pd(PPh_3)_4$ (0.24 g, 0.20 mmol) and then a 2 M aqueous K_2CO_3 solution (8.2 mL, 16.3 mmol) were added thereto, and the mixture was refluxed under stirring for 3 hours. The organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, and then concentrated to remove the solvent. The residue was dissolved in THF, and recrystallized with ether to obtain a compound 3b (1.08 g, 70%). MS [M+H] = 379

3-C. Preparation of Compound 3c

[0090] The compound 3b (1.08 g, 2.86 mmol) prepared in the step of 3-B was dissolved in DMF, and then N-bromosuccinimide (0.6 g, 3.43 mmol) was added thereto, and the mixture was stirred for 3 hours. To the solution, H_2O was added, and the resulting precipitate was produced, filtered under reduced pressure, dissolved in THF, and then recrystallized with ether to obtain a compound 3c (0.54 g, 41%). MS [M+H] = 458

3-D. Preparation of Compound 3d

[0091] The compound 3c (0.54 g, 1.18 mmol) prepared in the step of 3-C and 3-bromophenyl boronic acid (0.24 g, 1.18 mmol) were dissolved in anhydrous THF (10 mL), and $Pd(PPh_3)_4$ (68 mg, 0.059 mmol) and a 2 M aqueous K_2CO_3 solution (2.4 mL, 4.72 mmol) were added thereto sequentially, and then the mixture was refluxed under stirring for 3 hours. The organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and then separated by column chromatography to obtain a compound 3d (0.24 g, 38%). MS [M] = 533

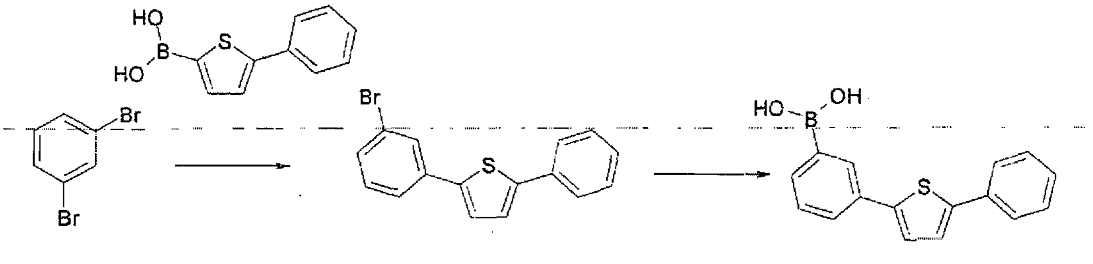
3-E. Preparation of Compound 12

[0092] The compound 3d (0.24 g, 0.45 mmol) prepared in the step of 3-D and the compound 1b (0.11 g, 0.54 mmol) prepared in the step of 1-B of Example 1 were dissolved in anhydrous THF (10 mL), and $Pd(PPh_3)_4$ (26 mg, 0.03 mmol) and a 2 M aqueous K_2CO_3 solution (0.9 mL, 1.8 mmol) were added thereto sequentially, and then the mixture was refluxed under stirring for 3 hours. The organic layer of the react ion solution was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and then separated by column chromatography to obtain a compound 12 (0.12 g, 43%). MS [M+H] =613.

[0093] The spectrum obtained by measuring the photoluminescences (PL) of the compound 12 solution (concentration: $1*10^{-5}$ M, solvent : toluene) at an exciting wavelength of 434 nm is shown in Fig. 2.

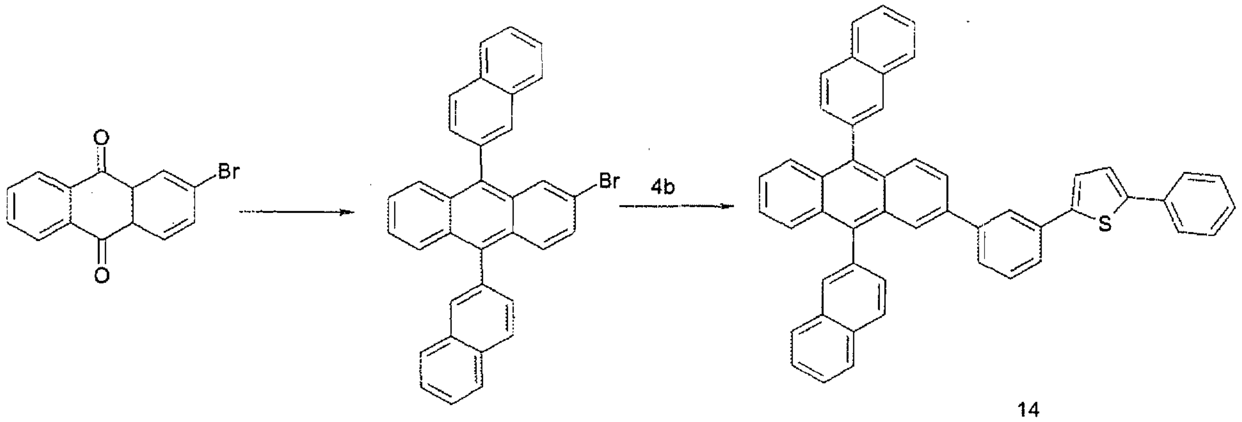
Example 4 : Preparation of Compound 14

[0094]



4a

4b



4c

14

4-A. Preparation of Compound 4a

[0095] 1,3-Dibromophenyl (5 g, 21.2 mmol) and the compound 1b (4.3 g, 21.2 mmol) prepared in the step of 1-B were dissolved in anhydrous THF (100 mL), and $Pd(PPh_3)_4$ (1.2 g, 1.06 mmol) and K_2CO_3 (3.2 g, 23.3 mmol) dissolved in H_2O (50 mL) were added thereto sequentially, and then the mixture was refluxed under stirring. Three hours later, washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and then separated by column chromatography to obtain a compound 4a (3.7 g, 55%). MS [M] = 315

4-B. Preparation of Compound 4b

[0096] The compound 4a (3.7 g, 11.7 mmol) prepared in the step of 4-A was dissolved in anhydrous THF (70 mL), and then cooled to -10°C, and n-butyllithium (3.2 mL, 2.5 hexane solution) was slowly added dropwise thereto. The mixture was stirred for 1 hour, and then cooled to -78°C again, boronic acid trimethylester (2.4 mL, 21.1 mmol) was added slowly thereto, and the mixture was stirred for 12 hours. The mixture was cooled to 0°C, a 10 wt% aqueous sulfuric acid solution (10 mL) was added thereto and stirred to obtain a white precipitate. The organic layer was extracted with THF, dried over magnesium sulfate, and then filtered under reduced pressure. This filtrate was concentrated to remove the solvent, dissolved in THF, an excessive amount of a 2 M aqueous NaOH solution was added thereto, and the organic layer was separated with dimethylchloromethane. To the separated aqueous solution layer, an aqueous hydrochloric acid solution was added, and the resulting precipitate was produced and filtered to obtain a compound 4b (1.8 g, 55%).

4-C. Preparation of Compound 4c

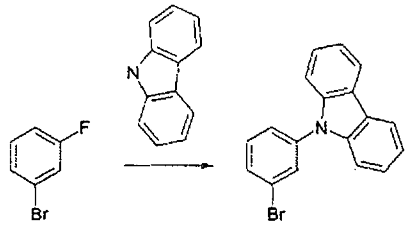
[0097] 2-Bomonaphthalene (11.0 g, 53.1 mmol) was dissolved in anhydrous THF (100 mL) under a nitrogen atmosphere, the solution was cooled to -78°C, t-butyllithium (46.8 mL, 1.7 M pentane solut ion) was slowly added thereto, the solution was stirred at the same temperature for 1 hour, and then 2-bromoanthraquinone (6.36 g, 22.0 mmol) was added thereto. The cooling vessel was removed, and the mixture was stirred at normal temperature for 3 hours. To the reaction mixture, an aqueous ammonium chloride solut ion was added, and the mixture was extracted with methylene chloride. The organic layer was dried over anhydrous magnesium sulfate to remove the solvent. The resulting mixture was dissolved in a small amount of ethyl ether, and petroleum ether was added to the solution, and the mixture was stirred for several hours to obtain a solid compound. The solid compound was filtered, and then dried in vacuo to obtain dinaphthyl dialcohol (11.2 g, 93%). The dinaphtyl dialcohol (11.2g, 20.5mmol) was dispersed in 200 mL of acetic acid under anitrogen atmosphere, to which potassium iodide (34 g, 210 mmol) and sodium hypophosphite hydrate (37 g, 420 mmol) were added. The resulting mixture was stirred under boiling for 3 hours. After cool ing to normal temperature, the mixture was filtered and washed with water and methanol, and then dried in vacuo to obtain a pale yellow compound 4c (7.2 g, 64%). MS [M] = 509

4-D. Preparation of Compound 14

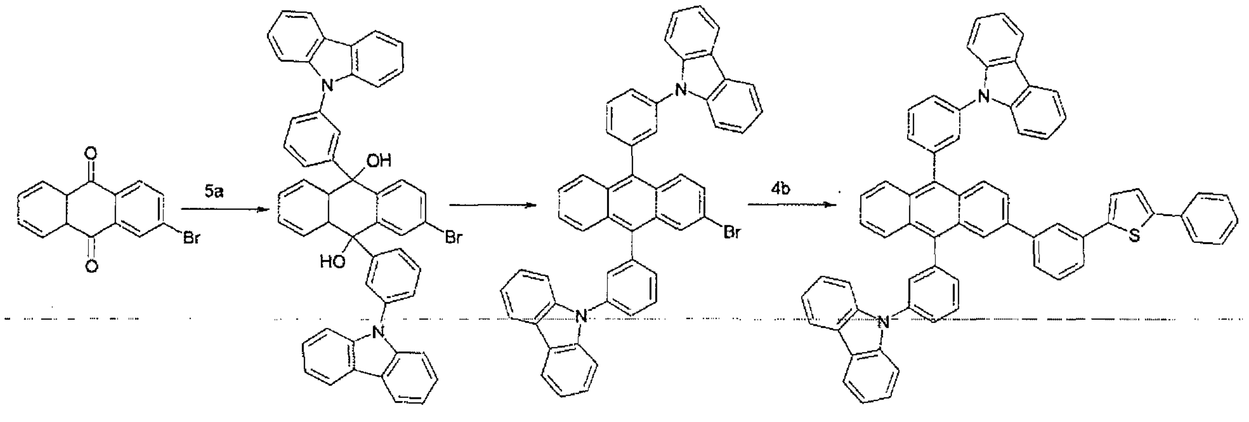
[0098] The compound 4c (2.7 g, 5.4 mmol) prepared in the step of 4-C and the compound 4b (1.8 g, 6.4 mmol) prepared in the step of 4-B were dissolved in anhydrous THF (70 mL), and $Pd(PPh_3)_4$ (0.3 g, 0.27 mmol) and a 2 M aqueous K_2CO_3 solution (20 mL) were added thereto sequentially, and then the mixture was refluxed under stirring for 12 hours. The organic layer of the reaction solution was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, dissolved in THF, and crystallized with ethanol to obtain a compound 14 (2.9 g, 82%). MS [M+H] = 665

Example 5 : Preparation of Compound 18

[0099]



5a



5b

18

5-A. Preparation of Compound 5a

[0100] 1-Bromo-3-fluorobenzene (6.3 g, 35.9 mmol), carbazole (5 g, 29.9 mmol), potassium fluoride-alumina (40 wt%, 8.65 g, 59.8 mmol), and 18-crown-6 (0.8 g, 2.99 mmol) were dissolved in dimethylsulfoxide (DMSO, 75 mL), and the solution was stirred at a temperature above 150°C for 12 hours. The reaction solution was cooled, and then alumina was filtered over magnesium sulfate. The filtrate was subject to phase separation with methyl t-butyl ether (300 mL) and then washed with water. The organic layer was distilled off under reduced pressure, and then separated by column chromatography (solvent:hexane solution) to obtain a compound 5a (3 g, 26%). MS [M] = 322

5-B. Preparation of Compound 5b

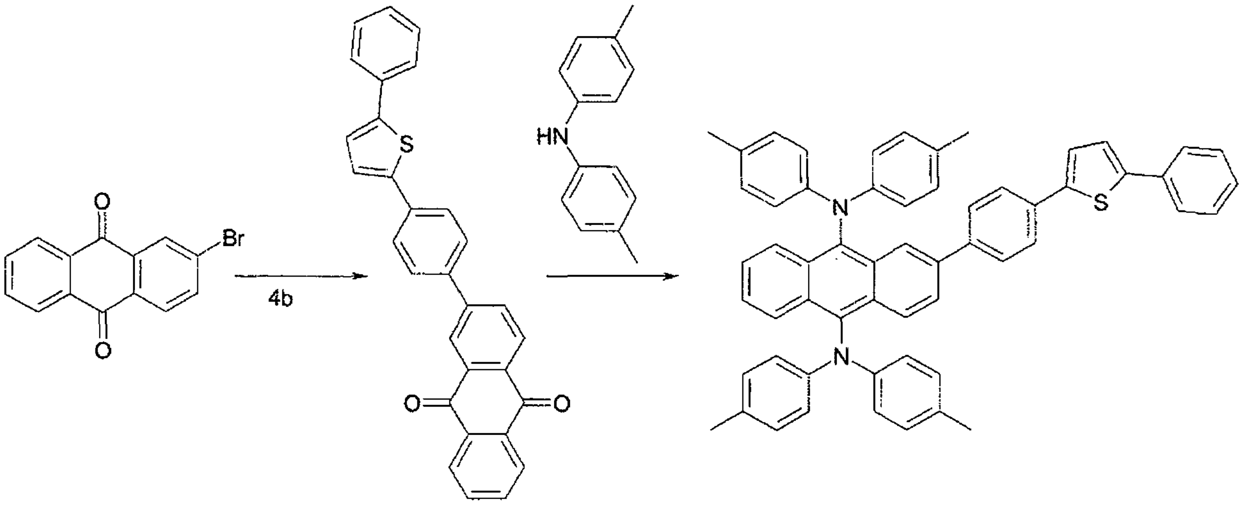
[0101] The compound 5a (3.0 g, 9.3 mmol) prepared in the step of 5-A was dissolved in anhydrous THF (100 mL) under a nitrogen atmosphere, the solution was cooled to -78°C, t-butyllithium (8 mL, 1.7 M pentane solution) was slowly added thereto, the solution was stirred at the same temperature for 1 hour, and then 2-bromoanthraquinone (1.22 g, 4.2 mmol) was added thereto. The cooling vessel was removed, and the mixture was stirred at normal temperature for 3 hours. To the reaction mixture, an aqueous ammonium chloride solution was added, and the mixture was extracted with methylene chloride. The organic layer was dried over anhydrous magnesium sulfate to remove the solvent. The resulting mixture was dissolved in a small amount of ethyl ether, and petroleum ether was added to the solution, and then the mixture was stirred for several hours to obtain a solid compound. The solid compound was filtered, and then dried in vacuo to obtain dicarbazolephenyl dialcohol (2.9 g, 90%). The dicarbazolephenyl dialcohol (2.9 g, 3.8 mmol) was dispersed in 50 mL of acetic acid under a nitrogen atmosphere, to which potassium iodide (6.5 g, 39 mmol) and sodium hypophosphite hydrate (6.87 g, 78 mmol) were added. The resulting mixture was stirred under boiling for 3 hours. After cooling to normal temperature, the mixture was filtered and washed with water and methanol, and then dried in vacuo to obtain a compound 5b (1.9 g, 67%). MS [M] = 739

5-C. Preparation of Compound 18

[0102] The compound 5b (1.9 g, 2.6 mmol) prepared in the step of 5-B and the compound 4b (0.87 g, 3.1 mmol) prepared in the step of 4-B of Example 4 were dissolved in anhydrous THF (70 mL), and $Pd(PPh_3)_4$ (0.15 g, 0.13 mmol) and a 2 M aqueous K_2CO_3 solution (20 mL) were added thereto sequentially, and then the mixture was ref luxed under stirring for 12 hours. The organic layer of the reaction solution was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated, and the recrystallized with THF and ethanol to obtain a compound 18 (1.9 g, 85%). MS [M+H] = 895

Example 6 : Preparation of Compound 22

[0103]



6a

22

6-A. Preparation of Compound 6a

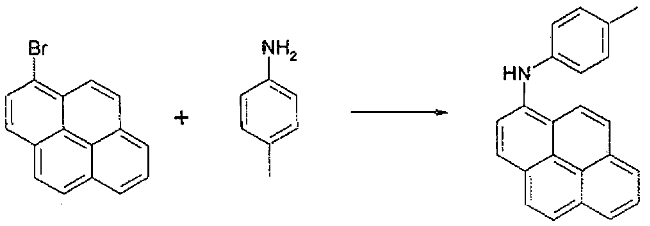
[0104] 2-Bromoanthraquinone (3 g, 10.4 mmol) and compound 4b (4.4 g, 15.7 mmol) prepared in the step of 4-B of Example 4 were dissolved in anhydrous THF (100 mL), and $Pd(PPh_3)_4$ (0.36 g, 0.31 mmol) and a 2 M aqueous K_2CO_3 solution (70 mL) were added thereto sequentially, and then the mixture was refluxed under stirring for 12 hours. The organic layer of the reaction solution was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated, and the recrystallized with THF and ethanol to obtain a compound 6a (3.8 g, 83%). MS [M] = 442

6-B. Preparation of Compound 22

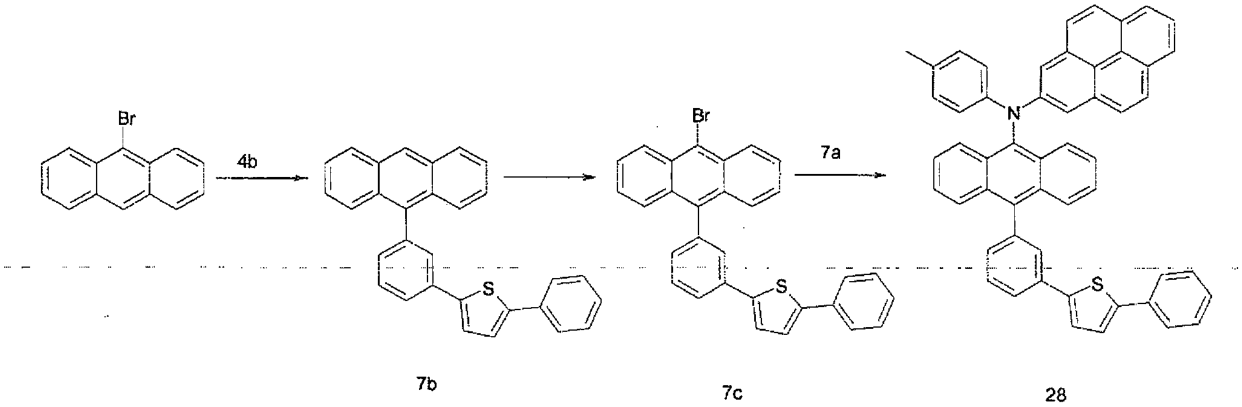
[0105] The compound 6a (3 g, 7.1 mmol) prepared in the step of 6-A, p-tolylamine (5.6 g, 28.4 mmol), and pyridine (2.3 mL, 28.4 mmol) were dissolved in benzene (100 mL), and then titanium tetrachloride (5.4 g, 28.4 mmol) was added dropwise thereto at 10°C, and the mixture was stirred at room temperature for 20 hours. Then, the mixture was diluted with water (100 mL), neutralized with an aqueous sodium oxide solution, extracted with ethyl acetate, and then concentrated. The residue was separated by column chromatography to obtain a compound 22 (1.7 g, 30%). MS [M] = 802

-<u>Example 7 :</u> Preparation of Compound 28 (comparative)

[0106]



7a



7-A. Preparation of Compound 7a

[0107] 1-Bromopyrene (2 g, 7.1 mmol) and p-tolidine (1 g, 9.2 mmol) were dissolved in toluene (80 mL) under a nitrogen atmosphere, and then NaOtBu (1.7 g, 17.8 mmol) was added thereto, and the mixture was stirred for about 10 minutes. $Pd(dba)_2$ (81 mg, 0.14 mmol) and tri-t-butylphosphine (0.07 mL, 0.14 mmol) were added thereto, and the mixture was warmed and refluxed for 30 minutes. The mixture was washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over anhydrous magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and then recrystallized with THF and ethanol to obtain a compound 7a (1.9 g, 91%). MS [M+H] = 294

7-B. Preparation of Compound 7b

[0108] 9-Bromoanthracene (3 g, 11.7 mmol) and the compound 4b (3.9 g, 14 mmol) prepared in the step of 4-B were dissolved in anhydrous THF (100 mL), and $Pd(PPh_3)_4$ (0.68 g, 0.59 mmol) and a 2 M aqueous K_2CO_3 solution (70 mL) were added thereto, and then the mixture was refluxed under stirring for 12 hours. The organic layer of the reaction solution was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated, dissolved in THF, and then crystallized with ethanol to obtain a compound 7b (4.1 g, 85%). MS [M] = 412

7-C. Preparation of Compound 7c

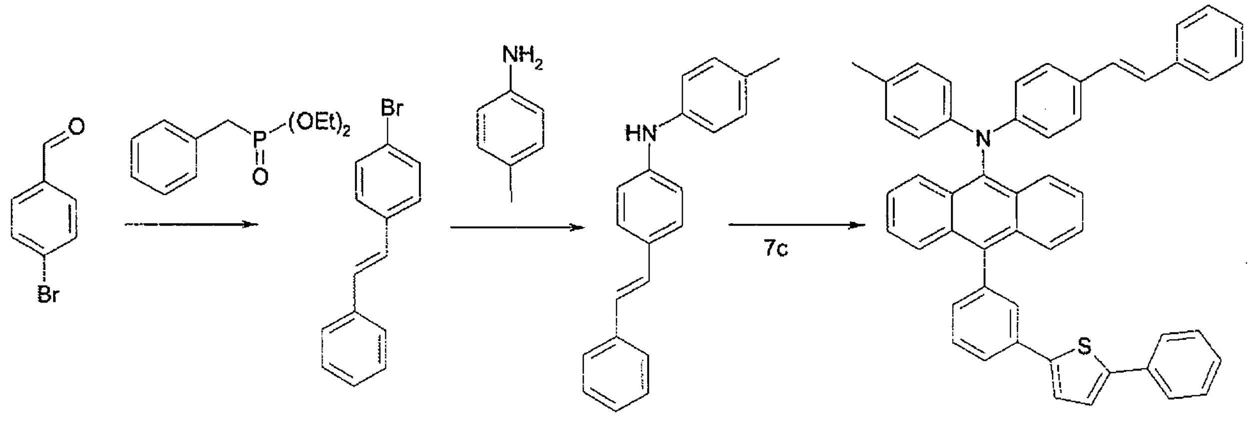
[0109] The compound 7b (4 g, 9.7 mmol) prepared in the step of 7-B was dissolved in $CHCl_3$ (100 mL), and acetic acid (100 mL) was added thereto, and then Br_2 (0.55 mL, 10.7 mmol) was added dropwise to the mixture at 0°C. The mixture was warmed to room temperature, and the mixture was stirred for 5 hours. After completion of the reaction, the reaction solution was concentrated, and recrystallized with ETOH to obtain a compound 7c (3.5 g, 71%). MS [M] = 491

7-D. Preparation of Compound 28

[0110] The compound 7c (3.5 g, 7.1 mmol) prepared in the step of 7-C and the compound 7a (1 g, 9.2 mmol) prepared in the step of 7-A were dissolved in toluene (80 mL) under a nitrogen atmosphere, and then NaOtBu (1.7 g, 17.8 mmol) was added thereto, and the mixture was stirred for about 10 minutes. $Pd(dba)_2$ (81 mg, 0.14 mmol) and tri-t-butylphosphine (0.07 mL, 0.14 mmol) were added thereto, and the mixture was warmed and refluxed for 30 minutes. The mixture was washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over anhydrous magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and then recrystallized with THF and ethanol to obtain a compound 28 (1.9 g, 91%). MS [M+H] = 704

Example 8 : Preparation of Compound 31 (comparative)

[0111]



8a 8b 31

8-A. Preparation of Compound 8a

[0112] NaH (3 g, 75 mmol) and 18-crown-6 (1.43 g, 5.4 mmol) were dissolved in THF (100 mL) under a nitrogen atmosphere, and benzyl phosphonic acid diethyl ester (13.5 mL, 65 mmol) was added thereto. Under cooling the mixture (0°C), 4-bromobenzenealdehyde (10 g, 54 mmol) was added slowly thereto. The mixture was stirred for 4 hours at normal temperature. To the reaction solution, water was added, and the mixture was extracted with ether, dried over magnesium sulfate, distilled off under reduced pressure, and recrystallized with ethanol to obtain a compound 8a (10 g, 75%). MS [M] = 295

8-B. Preparation of Compound 8b

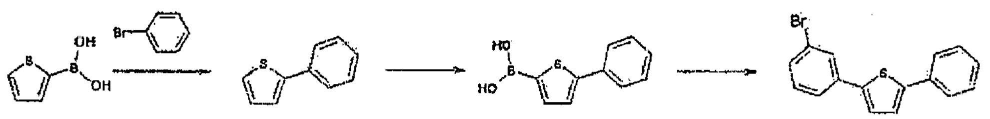
[0113] The compound 8a (5 g, 16.9 mmol) prepared in the step of 8-A, and p-tolidine (2.2 g, 20.3 mmol) were dissolved in toluene (80 mL) under a nitrogen atmosphere, and then NaOtBu (4.8 g, 50.7 mmol) was added thereto, and the mixture was stirred for about 10 minutes. Pd(dba)$_2$ (0.31 g, 0.34 mmol) and tri-t-butylphosphine (0.15 g, 0.5 mmol) were added thereto, and the mixture was warmed and refluxed for 30 minutes. The mixture was washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over anhydrous magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and then recrystallized with THF and ethanol to obtain a compound 8b (4.4 g, 92%). MS [M+H] = 286

8-C. Preparation of Compound 31

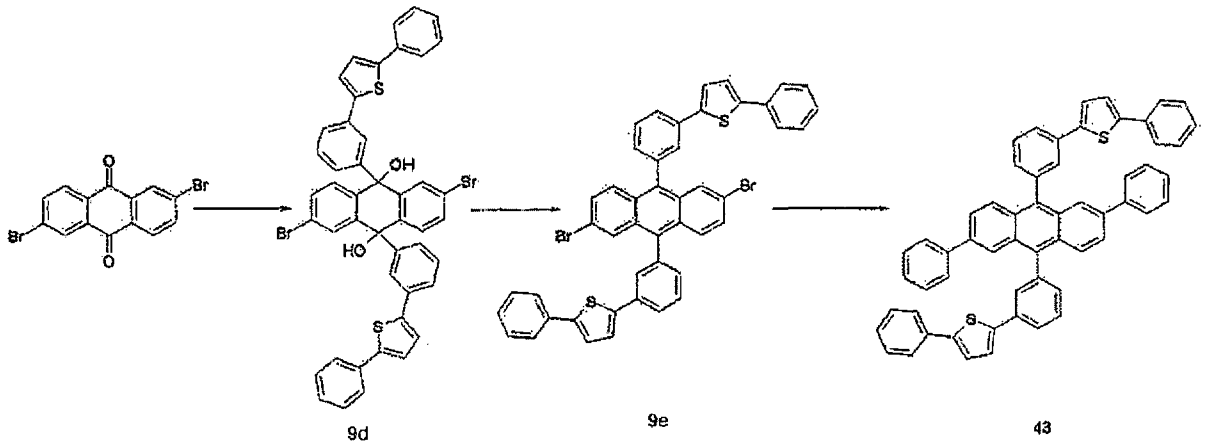
[0114] The compound 7c (3.5 g, 7.1 mmol) prepared in the step of 7-C, and the compound 8b (2.6 g, 9.2 mmol) prepared in the step of 8-B were dissolved in toluene (80 mL) under a nitrogen atmosphere, and then NaOtBu (2.0 g, 21.3 mmol) was added thereto, and the mixture was stirred for about 10 minutes. Pd(dba)$_2$ (0.13 g, 0.14 mmol) and tri-t-butylphosphine (0.07 mL, 0.14 mmol) were added thereto, and the mixture was warmed and ref luxed for 30 minutes. The mixture was washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over anhydrous magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and then recrystallized with THF and ethanol to obtain a compound 31 (1.9 g, 91%). MS [M+H] = 696

Example 9: Preparation of Compound 43 (comparative)

[0115]



9a 9b 9c



9-A. Synthesis of Compound 9a

[0116] 2-thiophene boronic acid (10 g, 78.1 mmol) and bromobenzene (7.48 mL, 70.3 mmol) were dissolved in anhydrous THF (300 mL), and $Pd(PPh_3)_4$ (4.51 g, 3.91 mmol) and an aqueous K_2CO_3 solution (156 mL, 312.4 mmol) were added thereto sequentially, and then the mixture was refluxed for 3 hours. The organic layer was extracted with ethyl acetate, and water was removed over magnesium sulfate. The organic layer was filtered under reduced pressure, concentrated to remove the solvent, purified by column chromatography, and then recrystallized with THF and ethanol to obtain a white solid compound 9a (10 g, 80%). MS [M+H] 161

9-B. Synthesis of Compound 9b

[0117] The compound 9a (5 g, 31.3 mmol) prepared in the step of 9-A was dissolved in anhydrous THF (200 mL), and the solution was cooled to -10°C, and n-butyl lithium (15 mL, 37.5 mmol) was slowly added dropwise thereto. After the mixture was stirred for 1 hour, and cooled to -78°C again, boronic acid trimethylester (10.5 mL, 93.75 mmol) was slowly added thereto, and the mixture was stirred for 12 hours. The mixture was cooled to 0°C, a 2 N aqueous hydrochloric acid solution (16 mL) was added thereto, and the mixture was stirred to obtain a white precipitate. The organic layer was extracted with THF, dried over magnesium sulfate, and then filtered under reduced pressure. This filtrate was concentrated to remove the solvent, dissolved in THF, an excessive amount of an aqueous solution was added thereto, and the organic layer was separated with dimethylchloromethane. To the separated aqueous solution layer, an aqueous hydrochloric acid solut ion was added, and the resulting precipitate was produced and filtered to obtain a compound 9b (2.7 g, 42%).

9-C. Synthesis of Compound 9c

[0118] 3-Bromoiodobenzene (3.5 g, 12.3 mmol) and the compound 9b (2.5 g, 12.3 mmol) prepared in the step of 9-B were dissolved in anhydrous THF (100 mL), and $Pd(PPh_3)_4$ (0.71 g, 0.61mmol) and K_2CO_3 (3.4 g, 24.6 mmol) in H_2O (50 mL) were added thereto sequentially. The mixture was refluxed under stirring. Three hours later, washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and then separated by column chromatography to obtain a compound 9c (2.9 g, 75%). MS [M+H]+=315

9-D. Preparation of Compound 9d

[0119] The compound 9c (16.7 g, 53.1 mmol) prepared in the step of 9-C was dissolved in anhydrous THF (100 mL) under a nitrogen atmosphere, the solution was cooled to -78°C, and t-butyllithium (46.8 mL, 1.7 M pentane solution) was slowly added thereto, the solution was stirred at the same temperature for 1 hour, and then 2,6-dibromoanthraquinone (6.36 g, 22.0 mmol) was added thereto. The cooling vessel was removed, and the mixture was stirred at normal temperature for 3 hours. To the reaction mixture, an aqueous ammonium chloride solution was added, and the mixture was extracted with methylene chloride. The organic layer was dried over anhydrous magnesium sulfate to remove the solvent. After the resulting mixture was dissolved in a small amount of ethyl ether, petroleum ether was added to the solution, and the mixture was stirred for several hours to obtain a solid compound. The solid compound was filtered, and then dried in vacuo to obtain a compound 9d (17 g, 90%).

9-E. Preparation of Compound 9e

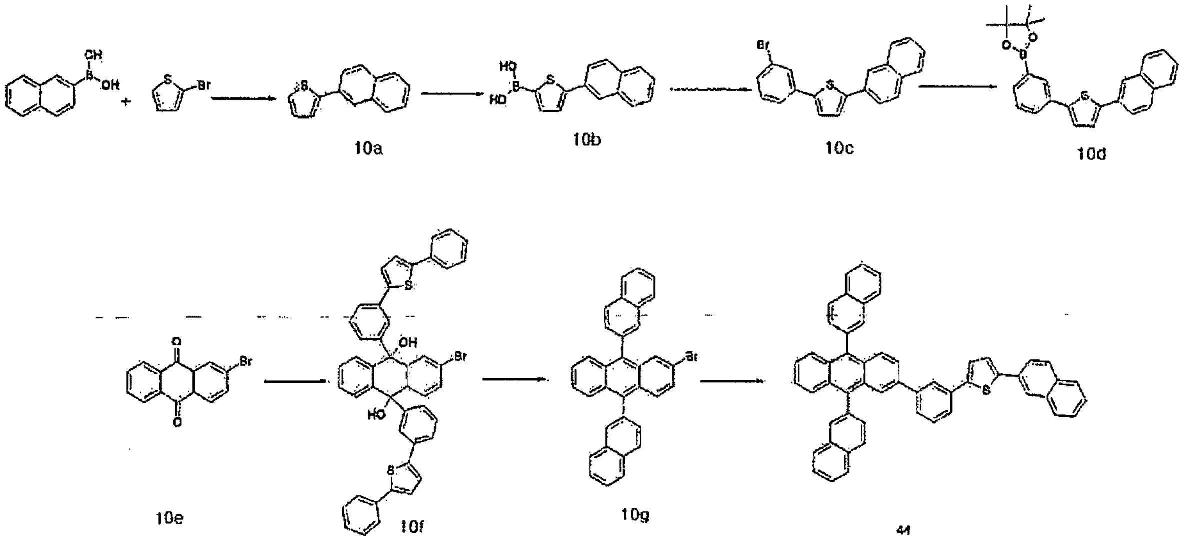
[0120] The compound 9d (17 g, 20.5 mmol) prepared in the step of 9-D was dispersed in acetic acid(200 mL) under a nitrogen atmosphere, to which potassium iodide (34 g, 210 mmol) and sodium hypophosphite hydrate (37 g, 420 mmol) were added. The resulting mixture was stirred under boiling for 3 hours. After cooling to normal temperature, the mixture was filtered and washed with water and methanol, and then dried in vacuo to obtain a pale yellow compound 9e (10 g, 64%). MS [M+H]+ = 804

9-F. Preparation of Compound 43

[0121] The compound 9e (10 g, 12.4 mmol) prepared in the step of 9-E and phenyl boronic acid (3.3 g, 27.3 mmol) were dissolved in anhydrous THF (300 mL) under a nitrogen atmosphere, and $Pd(PPh_3)_4$ (0.7g, 0.62 mmol) and an aqueous K_2CO_3 solution (25 mL, 49.6 mmol) were added thereto sequentially, and then the mixture was refluxed for 5 hours. The organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, purified by column chromatography, and then recrystallized with THF and ethanol to obtain a white solid compound 43 (8 g, 82%). MS [M+H]+ 798

Example 10 : Preparation of Compound 44

[0122]



10-A. Synthesis of Compound 10a

[0123] 2-Naphthalene boronic acid (13.4 g, 78.1 mmol) and 2-bromothiophene (11.5 g, 70.3 mmol)) were dissolved in anhydrous THF (300 mL) under anitrogen atmosphere, and $Pd(PPh_3)_4$ (4.06 g, 3.51 mmol) and an aqueous s K_2CO_3 solution (156 mL, 312.4 mmol) were added thereto sequentially, and then the mixture was refluxed for 5 hours. The organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, purified by column chromatography, and then recrystallized with THF and ethanol to obtain a white solid compound 10a (12.6 g, 85%). MS [M+H]+ = 210

10-B. Synthesis of Compound 10b

[0124] The compound 10a (6.6 g, 31.3 mmol) prepared in the step of 10-A was dissolved in anhydrous THF (200 mL), and the solut ion was cooled to -10°C, and n-butyl lithium (15 mL, 37.5 mmol) was slowly added dropwise thereto. After the mixture was stirred for 1 hour, and cooled to -78°C again, boronic acid trimethylester (10.5 mL, 93.75 mmol) was slowly added thereto, and the mixture was stirred for 12 hours. The mixture was cooled to 0°C, a 2 N aqueous hydrochloric acid solution (16 mL) was added thereto, and the mixture was stirred to obtain a white precipitate. The organic layer was extracted with THF, dried over magnesium sulfate, and then filtered under reduced pressure. This filtrate was concentrated to remove the solvent, dissolved in THF, an excessive amount of an aqueous solution was added thereto, and the organic layer was separated with dimethylchloromethane. To the separated aqueous solution layer, an aqueous hydrochloric acid solution was added, and the resulting precipitate was produced and filtered to obtain a compound 10b (2.7 g, 42%).

10-C. Synthesis of Compound 10c

[0125] 3-Bromoiodobenzene (3.5 g, 12.3mmol) and the compound 10b (3.0 g, 12.3 mmol) prepared in the step of 10-B were dissolved in anhydrous THF (100 mL), and $Pd(PPh_3)_4$ (0.71 g, 0.61 mmol) and K_2CO_3 (3.4 g, 24.6 mmol) dissolved in H_2O (50 mL) were added thereto sequentially. The mixture was refluxed under stirring. Three hours later, the mixture was washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and separated by column chromatography to obtain a compound 10c (2.9 g, 75%). MS [M+H]+=365

10-D. Synthesis of Compound 10d

[0126] The compound 10c(3.6 g, 9.81 mmol) prepared in the step of 10-C, bis(pinacolato)diboron (2.75 g, 10.9 mmol), potassium acetate (2.89 g, 29.4 mmol), and palladium(diphenyl phosphinoferrocene)chloride (0.24 g, 3 mol%) were put into a 250-mL flask under a nitrogen atmosphere. Then, dioxane (50 mL) was added to the mixture, and the mixture was refluxed at 80°C for 6 hours. The mixture was cooled to room temperature, and distilled water (50 mL) was added thereto, and then extracted with methylen chloride(50 mL x 3). Methylene chloride was removed therefrom under reduced pressure to obtain a pale yel low solid. This pale yel low solid was washed with ethanol, and dried to obtain a compound 10d (3.84 g, 95%).

10-E. Synthesis of Compound 10e

[0127] Copper bromide(18 g, 80.0 mmol) and t-butyl nitrite(12mL, 101 mmol) were dispersed in acetonitrile (250 mL) at 65°C, and the mixture was stirred, to which 2-amino anthraquinone (15 g, 67.2 mmol) was then slowly added dropwise over 5 minutes. After completion of gas generation, the reaction solution was cooled to normal temperature, and the reaction solution was added to a 20% aqueous hydrochloric acid solution (1 L), and the mixture was extracted with dichloromethane. The organic layer was dried over anhydrous magnesium sulfate to remove the residual water, and then dried under reduced pressure. The residue was separated by column chromatography to obtain a pale yellow compound 10e (14.5 g, 75%).

10-F. Synthesis of Compound 10f

[0128] 2-Bromonaphthalene (11.0 g, 53.1 mmol) was dissolved in anhydrous THF (100 mL) under a nitrogen atmosphere, and t-butyllithium (46.8 mL, 1.7 M pentane solution) was slowly added thereto at -78°C, the solution was stirred at the same temperature for 1 hour, and then the compound 10e (6.36 g, 22.0 mmol) prepared in the step of 10-E was added thereto. The cooling vessel was removed, and the mixture was stirred at normal temperature for 3 hours. To the reaction mixture, an aqueous ammonium chloride solution was added, and the mixture was extracted with methylene chloride. The organic layer was dried over anhydrous magnesium sulfate to remove the solvent. The resulting mixture was dissolved in a small amount of ethyl ether, and then petroleum ether was added to the solution, and the mixture was stirred for several hours to obtain a solid compound. The solid compound was filtered, and then dried in vacuo to obtain a compound 10f (11.2 g, 93%).

10-G. Synthesis of Compound 10g

[0129] The compound 10f (11.2 g, 20.5 mmol) prepared in the step of 10-F was dispersed in acetic acid(200 mL) under a nitrogen atmosphere, to which potassium iodide (34 g, 210 mmol) and sodium hypophosphite hydrate (37 g, 420 mmol) were added. The resulting mixture was stirred under boiling for 3 hours. After cool ing to normal temperature, the mixture was filtered and washed with water and methanol, and then dried in vacuo to obtain a pale yellow compound 10g (7.2 g, 64%). MS [M] = 509

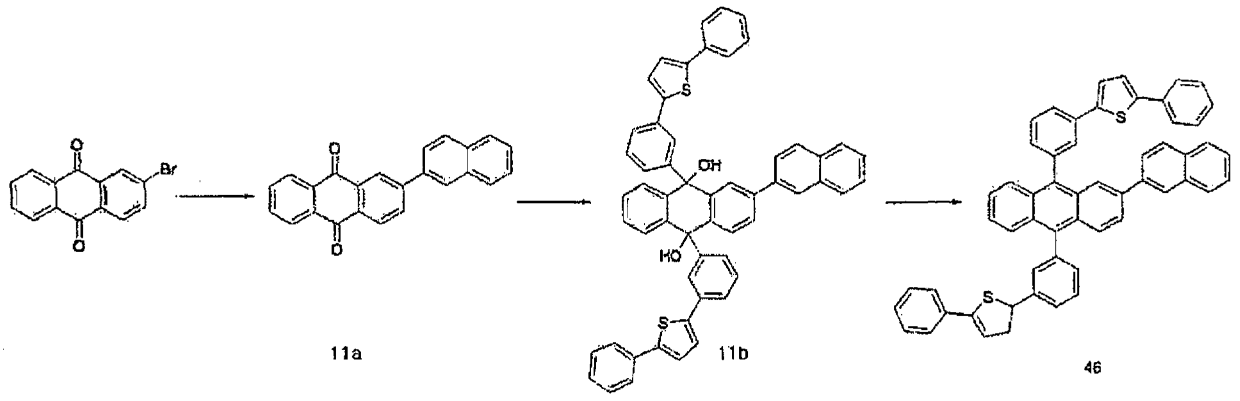
10-H. Synthesis of Compound 44

[0130] The compound 10g (1.3 g, 2.6 mmol) prepared in the step of 10-G and the compound 10d (1.28 g, 3.1 mmol) prepared in the step 10-D were dissolved in anhydrous THF (70 mL), and $Pd(PPh_3)_4$ (0.15 g, 0.13 mmol) and a 2 M aqueous K_2CO_3 solut ion (20 mL) were added thereto sequentially, and then the mixture was ref luxed under stirring for

5 hours. The organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated, and then recrystallized from THF and ethanol to obtain a compound 44 (1.5 g, 83%). MS [M+H] = 714

Example 11: Preparation of Compound 46 (comparative)

[0131]



11-A. Synthesis of Compound 11a

[0132] The compound 10e (3.6 g, 12.3 mmol) prepared in the step of 10-E and 2-naphthalene boronic acid (2.3 g, 13.5 mmol) were dissolved in anhydrous THF (100 mL) under a nitrogen atmosphere, and $Pd(PPh_3)_4$ (0.71 g, 0.61 mmol), and K_2CO_3 (3.4 g, 24.6 mmol) dissolved in H_2O (50 mL) were added thereto sequentially, and then the mixture was refluxed under stirring. Three hours later, the mixture was washed with brine, and the organic layer was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated to remove the solvent, and separated by column chromatography to obtain a compound 11a (3.2 g, 78%). MS [M+H]+=334

11-B. Synthesis of Compound 11b

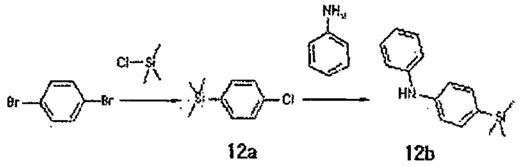
[0133] The compound 9c (6.46 g, 17.7 mmol) prepared in the step of 9-C was dissolved in anhydrous THF (100 mL) under a nitrogen atmosphere, and t-butyllithium (15.6 mL, 1.7 M pentane solution) was slowly added thereto at -78°C, the solution was stirred at the same temperature for 1 hour, and then the compound 11a (2.44 g, 7.3 mmol) prepared in the step of 11-A was added thereto. The cooling vessel was removed, and the mixture was stirred at normal temperature for 3 hours. To the react ion mixture, an aqueous ammonium chloride solution was added, and the mixture was extracted with methylene chloride. The organic layer was dried over anhydrous magnesium sulfate to remove the solvent. The resulting mixture was dissolved in a small amount of ethyl ether, and petroleum ether was added to the solution, and then the mixture was stirred for several hours to obtain a solid compound. The solid compound was filtered, and then dried in vacuo to obtain a compound 11b (5.1 g, 88%).

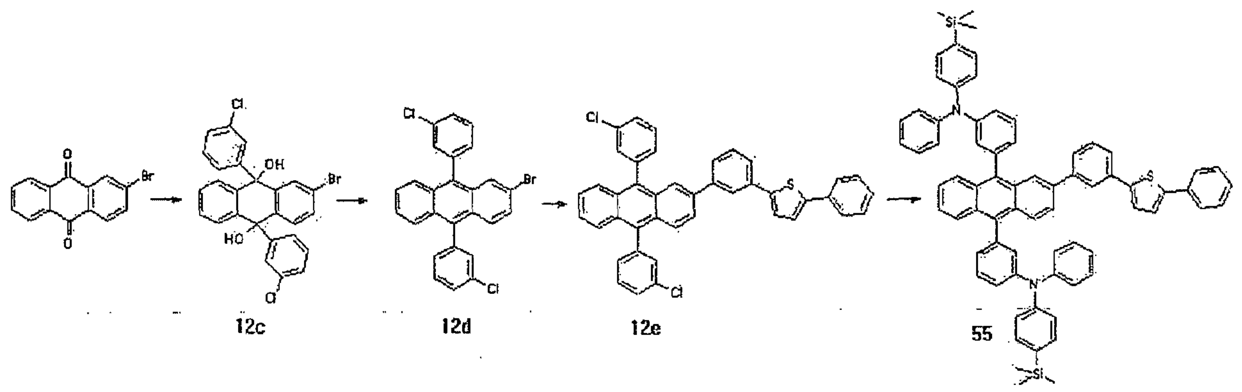
11-C. Synthesis of Compound 46

[0134] The compound 11b (4.15 g, 5.13 mmol) prepared in the step of 11-B was dispersed in acetic acid(50 mL) under a nitrogen atmosphere, to which potassium iodide (8.5 g, 52.5 mmol) and sodium hypophosphite hydrate (9.3 g, 105 mmol) were added. The resulting mixture was stirred under boiling for 3 hours. After cooling to normal temperature, the mixture was filtered and washed with water and methanol, and then dried in vacuo to obtain a pale yellow compound 46 (2.4 g, 60%). MS [M+H]+ = 788

Example 12 : Preparation of Compound 55

[0135]





12-A. Synthesis of Compound 12a

[0136] Dibromobenzene (20 g, 84.78 mmol) was dissolved in anhydrous tetrahydrofuran (THF, 200 mL) at room temperature under a nitrogen atmosphere. The solution was cooled to -78°C. N-butyllithium (34 mL, 2.5 M pentane solution) was added slowly to the solution at -78°C, and the temperature of the mixture was slowly raised to 0°C for about 1 hour. To the mixture, chlorotrimethylsilane (13 ml, 101.74 mmol) was added, and the temperature of the mixture was raised to normal temperature over 1 hour. After completion of the reaction, the mixture was extracted with ethyl acetate, dried over magnesium sulfate, and distilled off under reduced pressure to obtain a compound 12a (18 g, 93%). MS (M+) 229

12-B. Synthesis of Compound 12b

[0137] The compound 12a (15 g, 65.45 mmol) prepared in the step of 12-A, aniline (6.6 ml, 72 mmol), pd(dba)$_2$ (0.125 g, 0.13 mmol), P(t-Bu)$_3$ (0.04 g, 0.2 mmol) and sodium t-butoxide (1.80 g, 18.7 mmol) were added to toluene (200 mL), and the mixture was refluxed for about 3 hours. After completion of the reaction, the mixture was cooled to normal temperature, and the reaction mixture was added to a mixed solut ion of THF and H_2O. The organic layer was subject to phase separation, dried over $MgSO_4$, concentrated, and then separated by column chromatography to obtain a compound 12b (15 g, 86%). MS [M] = 143

12-C. Synthesis of Compound 12c

[0138] 1-Bromo-3-chlorobenzene (10 g, 53.1 mmol) was dissolved in anhydrous THF (100 mL) under a nitrogen atmosphere. t-butyllithium (46.8 mL, 1.7 M pentane solution) was added slowly to the solution at -78°C, and the solution was stirred at the same temperature for 1 hour, and then the compound 10e (6.36 g, 22.0 mmol) prepared in the step of 10-E was added thereto. The cooling vessel was removed, and the mixture was stirred at normal temperature for 3 hours. To the reaction mixture, an aqueous ammonium chloride solution was added, and the mixture was extracted with methylene chloride. The organic layer was dried over anhydrous magnesium sulfate to remove the solvent. The resulting mixture was dissolved in a small amount of ethyl ether, and petroleum ether was added to the solution, and then the mixture was stirred for several hours to obtain a solid compound. The solid compound was filtered, and then dried in vacuo to obtain a compound 12c (10 g, 90%).

12-D. Synthesis of Compound 12d

[0139] The compound 12c (10 g, 20.5 mmol)prepared in the step of 12-C was dispersed in acetic acid(200 mL) under a nitrogen atmosphere, to which potassium iodide (34 g, 210 mmol) and sodium hypophosphite hydrate (37 g, 420 mmol) were added. The resulting mixture was stirred under boiling for 3 hours. After cooling to normal temperature, the mixture was filtered and washed with water and methanol, and then dried in vacuo to obtain a pale yellow compound 12d (7.2

g, 64%). MS [M] = 477

12-E. Synthesis of Compound 12e

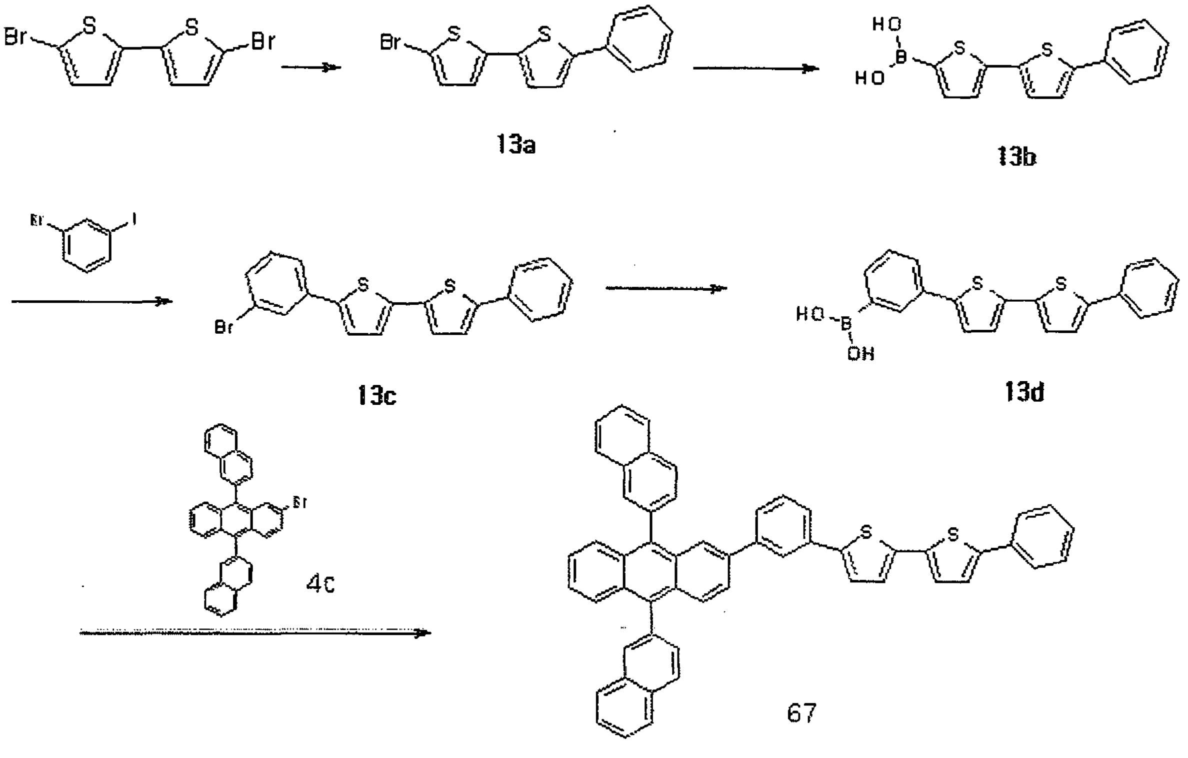
[0140] The compound 12d (1.24 g, 2.6 mmol) prepared in the step of 12-D and the compound 9c (1.28 g, 3.1 mmol) prepared in the step of 9-C were dissolved in anhydrous THF (70 mL) under a nitrogen atmosphere, and $Pd(PPh_3)_4$ (0.15 g, 0.13 mmol) and a 2 M aqueous K_2CO_3 solution (20 mL) were added thereto sequentially, and then the mixture was refluxed under stirring for 5 hours. The organic layer of the reaction solution was extracted with ethyl acetate. Water was removed over magnesium sulfate, and the residue was filtered under reduced pressure, concentrated, and then recrystallized with THF and ethanol to obtain a compound 12e (1.4 g, 85%). MS [M+H]+ = 632

12-F. Synthesis of Compound 55

[0141] The compound 12b (5.4 g, 8.5 mmol) prepared in the step of 12-B, the compound 12e (4.9 g, 20.4 mmol) prepared in the step of 12-E, $Pd(dba)_2$ (0.097 g, 0.17 mmol), $P(t\text{-}Bu)_3$ (0.05 g, 0.255 mmol) and sodium t-butoxide (2.45 g, 25.5 mmol) were added to toluene (100 mL), and the mixture was refluxed for about 5 hours. After completion of the reaction, the mixture was cooled to normal temperature, and the reaction mixture was added to a mixed solution of THF and H_2O. The organic layer was subject to phase separation, dried over $MgSO_4$, concentrated, and then separated by column chromatography to obtain a compound 55 (7.7 g, 87%). MS [M+H]+ = 1042

Example 13 : Preparation of Compound 67

[0142]



13-A. Synthesis of Compound 13a

[0143] 5,5'-Dibromo-2,2'-bithiophene (15.43 mmol, 5.0 g), phenyl boronic acid (16.97 mmol, 2.07 g), 2 M potassium carbonate (15 ml), tetrakis(triphenyl phosphine)palladium(0) (0.46 mmol, 0.5 g) and THF (30 ml) were put into a 100-ml round flask, and the mixture was refluxed under stirring for 24 hours. After completion of the react ion, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sulfate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven to obtain a compound 13a (2.8 g, 56.5%).

13-B. Synthesis of Compound 13b

[0144] The compound 13a (6.23 mmol, 2.0 g) prepared in the step of 13-A was dissolved in anhydrous THF(50 ml), and a 1.7 M solution of *t*-butyllithium (9.35 mmol, 6.23 ml) was very slowly added thereto at -78°C. One hour later, trimethyl borate (12.46 mmol, 1.4 ml) was added thereto. 30 minutes later, dry ice was removed, and the mixture was reacted at normal temperature for 3 hours. After completion of the react ion, the resultant was quenched with HCl, ethyl ether was added thereto, and the mixture was stirred for about 1 hour. Thus, a solid was generated, and this solid was filtered while washing with pet-ether, and dried in a vacuum oven to obtain a compound 13b (1.08 g, 60.6%).

13-C. Synthesis of Compound 13c

[0145] 1-Bromo-3-iodobenzene (3.77 mmol, 1.06g), the compound 13b (3.77 mmol, 1.08 g) prepared in Example 13-B, 2 M potassium carbonate(15 ml), tetrakis(triphenyl phosphine)palladium(0) (0.11 mmol, 0.13 g), and THF(30 ml) were put into a 100-ml round flask, and the mixture was refluxed for 24 hours. After completion of the reaction, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sulfate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven to obtain a compound 13c (1.2 g, 80%).

13-D. Synthesis of Compound 13d

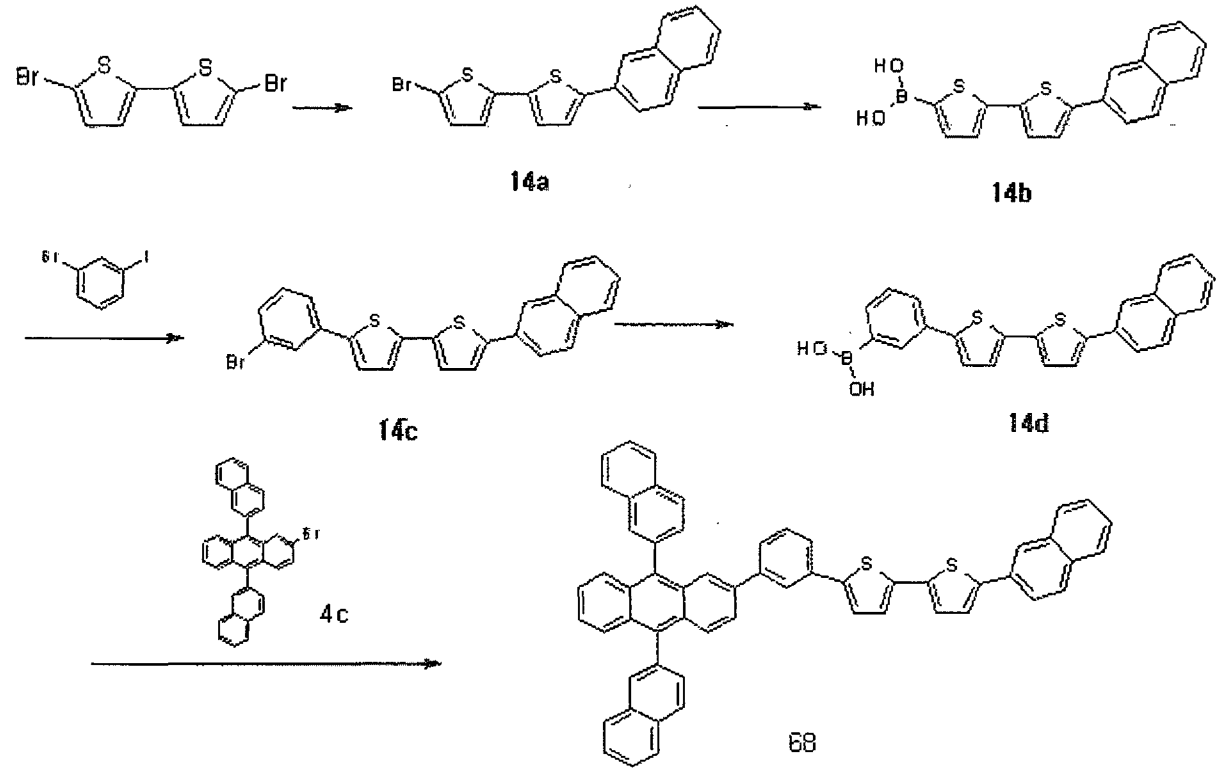
[0146] The compound 13c (3.01 mmol, 1.2 g) prepared in the step of 13-C was dissolved in 50 ml of anhydrous THF, and a 1.7 M solution of *t*-butyllithium (4.5 mmol, 2.65 ml) was very slowly added thereto at -78°C. One hour later, trimethyl borate (6.02 mmol, 7.3 ml) was added thereto. 30 minutes later, dry ice was removed, and the mixture was reacted at normal temperature for 3 hours. After completion of the reaction, the resultant was quenched with HCl, ethyl ether was added thereto, and the mixture was stirred for about 1 hour. Thus, a solid was generated, and this solid was filtered while washing with pet-ether, and dried in a vacuum oven to obtain a compound 13d (0.76 g, 75%).

13-E. Synthesis of Compound 67

[0147] The compound 4c (2.1 mmol, 1.07 g) prepared in the step of 4-C in Example 4, the compound 13d (2.1 mmol, 0.76 g) synthesized in Example 13-d, 2 M potassium carbonate (15ml), tetrakis(triphenyl phosphine)palladium(0) (0.06 mmol, 0.07 g) and THF (30 ml) were put into a 100-ml round flask, and the mixture was refluxed for 24 hours. After completion of the reaction, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sulfate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven to obtain a compound 67 (1.11 g, 71%).

Example 14 : Synthesis of Compound 68

[0148]



14-A. Synthesis of Compound 14a

[0149] 5,5'-Dibromo-2,2'-bithiophene (15.43 mmol, 5.0 g), 2-naphthalene boronic acid (16.97 mmol, 2.92 g), 2 M potassium carbonate (15 ml), tetrakis(triphenyl phosphine)palladium(0) (0.46 mmol, 0.5 g) and THF (30 ml) were put into a 100-ml round flask, and the mixture was refluxed for 24 hours. After completion of the reaction, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sulfate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven to obtain a compound 14a (4.3 g, 75%).

14-B. Synthesis of Compound 14b

[0150] The compound 14a (6.23 mmol, 2.3 g) prepared in the step of 14-A was dissolved in anhydrous THF (50 ml), and a 1.7 M solution of *t*-butyllithium (9.35 mmol, 6.23 ml) was very slowly added thereto at -78°C. One hour later, trimethyl borate (12.46 mmol, 1.4 ml) was added thereto. 30 minutes later, dry ice was removed, and the mixture was reacted at normal temperature for 3 hours. After completion of the react ion, the resultant was quenched with HCl, ethyl ether was added thereto, and the mixture was stirred for about 1 hour. Thus, a solid was generated, and this solid was filtered while washing with pet-ether, and dried in a vacuum oven to obtain a compound 14b (1.42 g, 68%).

14-C. Synthesis of Compound 14c

[0151] 1-Bromo-3-iodobenzene (3.77 mmol, 1.06 g), the compound 14b (3.77 mmol, 1.27 g) synthesize in Example 14-B, 2 M potassium carbonate (15 ml), tetrakis(triphenyl phosphine)palladium(0) (0.11 mmol, 0.13 g), and THF(30 ml) were put into a 100-ml round flask, and the mixture was refluxed for 24 hours. After completion of the react ion, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sul fate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven to obtain a compound 14c (1.43 g, 85%).

14-D. Synthesis of Compound 14d

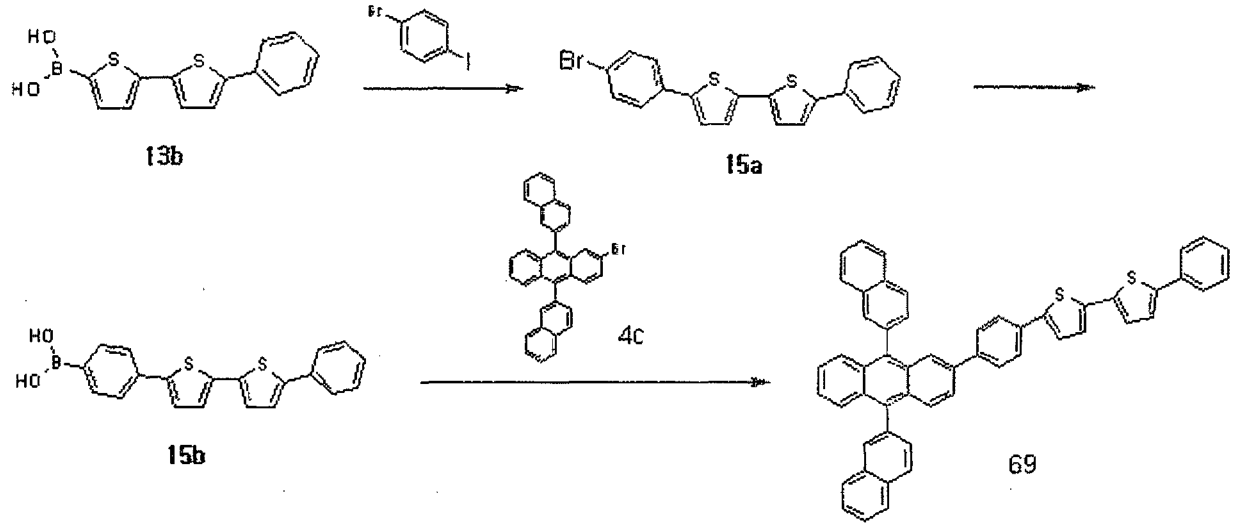
[0152] The compound 14c (3.01 mmol, 1.35 g) prepared in the step of 14-C was dissolved in anhydrous THF(50 ml), and a 1.7 M solution of *t*-butyllithium (4.5 mmol, 2.65 ml) was very slowly added thereto at -78°C. One hour later, trimethyl borate (6.02 mmol), 7.3 ml) was added thereto. 30 minutes later, dry ice was removed, and the mixture was reacted at normal temperature for 3 hours. After completion of the reaction, the resultant was quenched with HCl, ethyl ether was added thereto, and the mixture was stirred for about 1 hour. Thus, a solid was generated, and this solid was filtered while washing with pet-ether, and dried in a vacuum oven to obtain a compound 14d (0.98 g, 79%).

14-E. Synthesis of Compound 68

[0153] The compound 4c (2.1 mmol, 1.07 g) prepared in the step of 4-C in Example 4, the compound 14d (2.1 mmol, 0.86 g), synthesized in Example 14-d, 2 M potassium carbonate (15 ml), tetrakis(triphenyl phosphine) palladium(0) (0.06 mmol, 0.07 g) and THF (30 ml) were put into a 100-ml round flask, and the mixture was refluxed for 24 hours. After completion of the reaction, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sulfate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven. The yield of the resulting powder was 1.26 g (1.58 mmol, 75%).

Example 15 : Preparation of Compound 69

[0154]



15-A. Synthesis of Compound 15a

[0155] 1-Bromo-4-iodobenzene (3.77 mmol, 1.06 g), the compound 13b (3.77 mmol, 1.08 g) synthesized in the step of 13-b in Example 13, 2 M potassium carbonate (15 ml), tetrakis(triphenyl phosphine)palladium(0) (0.11 mmol, 0.13 g) and THF (30 ml) were put into a 100-ml round flask, and the mixture was refluxed for 24 hours. After completion of the reaction, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sulfate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven to obtain a compound 15a (1.23 g, 82%).

15-B. Synthesis of Compound 15b

[0156] The compound 15a (3.01 mmol, 1.2 g)prepared in Example 15-A was dissolved in anhydrous THF(50 ml), and a 1.7 M solution of *t*-butyllithium (4.5 mmol, 2.65 ml) was very slowly added thereto at -78°C. One hour later, trimethyl borate (6.02 mmol, 7.3 ml) was added thereto. 30 minutes later, dry ice was removed, and the mixture was reacted at normal temperature for 3 hours. After completion of the react ion, the resultant was quenched with HCl, ethyl ether was added thereto, and the mixture was stirred for about 1 hour. Thus, a solid was generated, and this solid was filtered while washing with pet-ether, and dried in a vacuum oven to obtain a compound 15b (0.87 g, 80%).

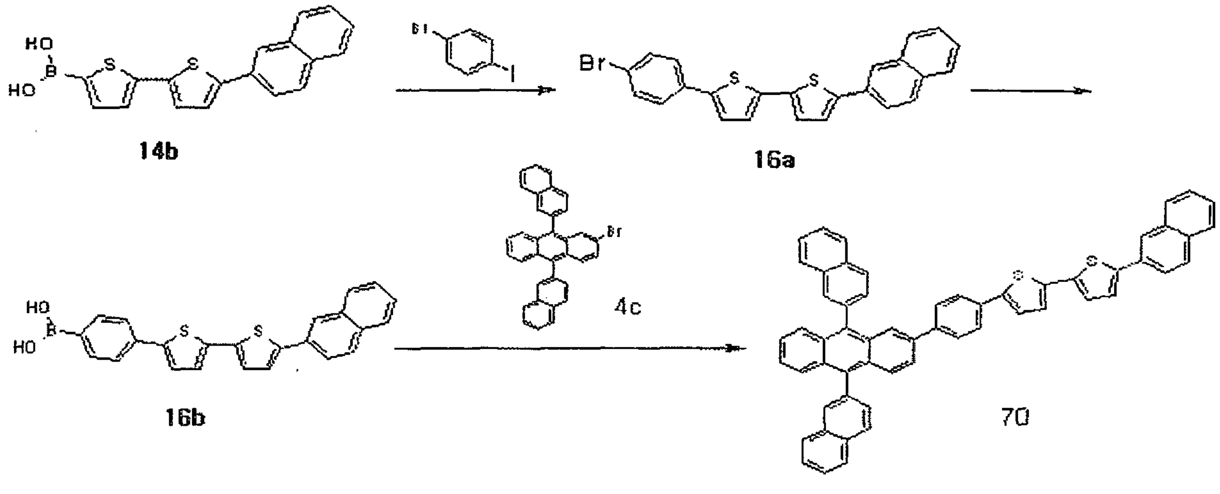
15-C. Synthesis of Compound 69

[0157] The compound 4c (2.1 mmol, 1.07 g) synthesize in the step of 4-C in Example 4, the compound 15b (2.1 mmol, 0.76 g) synthesize in Example 15-B, 2M potassium carbonate (15 ml), tetrakis(triphenyl phosphine)pal ladium(O) (0.06

mmol, 0.07 g), and THF(30 ml) were put into a 100-ml round flask, and the mixture was refluxed for 24 hours. After completion of the reaction, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sulfate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven to obtain a compound 69 (1.23 g, 79%).

Example 16 : Synthesis of Compound 70

[0158]



16-A. Synthesis of Compound 16a

[0159] 1-Bromo-4-iodobenzene (3.77 mmol, 1.06 g), the compound 14b (3.77 mmol, 1.27 g) synthesized in the step of 14-b in Example 14, 2 M potassium carbonate (15 ml), tetrakis(triphenyl phosphine)pal ladium(0) (0.11 mmol , 0.13 g) and THF (30 ml) were put into a 100-ml round flask, and the mixture was refluxed for 24 hours. After completion of the react ion, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sulfate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven to obtain a compound 16a (1.47 g, 87%).

16-B. Synthesis of Compound 16b

[0160] The compound 16a (3.01 mmol, 1.35 g) prepared in Example 16-A was dissolved in anhydrous THF(50 ml), and a 1.7 M solution of *t*-butyllithium (4.5 mmol, 2.65 ml) was very slowly added thereto at -78°C. One hour later, trimethyl borate (6.02 mmol, 7.3 ml) was added thereto. 30 minutes later, dry ice was removed, and the mixture was reacted at normal temperature for 3 hours. After completion of the react ion, the resultant was quenched with HCl, ethyl ether was added thereto, and the mixture was stirred for about 1 hour. Thus, a solid was generated, and this solid was filtered while washing with pet-ether, and dried in a vacuum oven to obtain a compound 16b (1.01 g, 82%).

16-C. Synthesis of Compound 70

[0161] The compound 4c (2.1 mmol, 1.07 g) prepared in the step of 4-C in Example 4, the compound 16b (2.1 mmol, 0.86 g) pepared in Example 16-b, 2 M potassium carbonate(15 ml), tetrakis(triphenyl phosphine)palladium(O) (0.06 mmol, 0.07 g), and THF(30 ml) were put into a 100-ml round flask, and the mixture was refluxed for 24 hours. After completion of the reaction, the mixture was cooled to normal temperature, extracted with chloroform, and washed with water several times. The mixture was dried over magnesium sulfate, and evaporated. The crude product was purified by column chromatography (*n*-hexane), evaporated, and then dried in a vacuum oven to obtain a compound 70 (1.42 g, 85%).

Experimental Example 1 to 4

[0162] A glass substrate (Corning 7059 glass) on which a thin film of ITO (indium tin oxide) was coated to a thickness of 1000 A was immersed in distilled water having a detergent dissolved therein to wash the substrate with ultrasonic waves. The detergent as used herein was a product commercially available from Fisher Co. and the distilled water was one which had been twice filtered by using a filter commercially available from Millipore Co. ITO was washed for 30 minutes, and then washing with ultrasonic waves was repeated twice for 10 minutes by using distilled water. After the completion of washing with distilled water, washing with ultrasonic waves was carried out by using isopropyl alcohol, acetone and methanol in this order as the solvents, followed by drying.

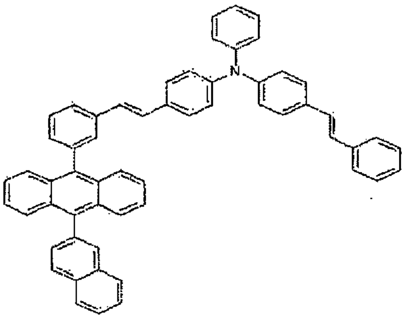
[0163] On the ITO electrode, 3,6-bis-2-naphthylphenylamino-N-[4-(2-naphthylphenyl)aminophenyl]carbazole (800 Å), 4,4'-bis[N-(1-naphthyl)-N-phenyl amino]biphenyl (NPB) (300 Å, host material (300 Å) as described in the following Table 2), and 9,10-bis-2-naphthyl-2- [4-(N-phenylbenzoimidazoyl)phenyl]anthracene (300 Å) were sequentially coated by thermal vacuum deposition to sequentially form a hole injecting layer, a hole transporting layer, a light emitting layer, and an electron transporting layer. In the light emitting layer, as the dopant material, a styrylamine compound (D1) and a compound (D2) were used.

[0164] Lithium fluoride (LiF) and aluminum were sequentially deposited on the electron transporting layer to thicknesses of 12 Å and 2000 Å respectively, to form a cathode, thereby obtaining an organic light emitting device.

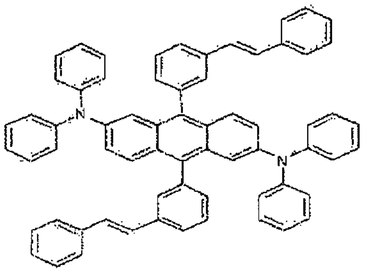
[0165] In the above process, the deposition rate of the organic material was maintained at 0.4 to 0.7 Å/sec and the deposition rate of lithium fluoride was maintained at 0.3 Å/sec and the deposition rate of aluminum was maintained at 2 Å/sec, respectively. The degree of vacuum upon deposition was maintained at 2 x 10^{-7} to 5 x 10^{-8} torr.

[Table 2]

Experimental Example No._Host material_Dopant Material_Doping Concentration			
Experimental Example No.	Host material	Dopant Material	Doping Concentration (wt%)
1	Compound 5 (comparative Example)	None	0
2	Compound 5 (comparative Example)	D1	8
3	Compound 7 (comparative Example)	D1	8
4	Compound 14	D2	4



(D1)



(D2)

[0166] In Experimental Example 1, when a forward electric field of 6 V was applied to the device as prepared above, 1700 nit of blue light emission was observed. When the current was applied to the devices prepared in Experimental Examples 2 to 4, the results as shown in the following Table 3 were obtained.

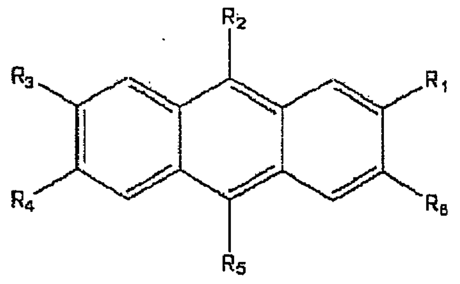
[Table 3]

Experimental Example	Host material	Dopant material	Doping concentration(wt%)	Voltage (V)	Current efficiency (cd/A)	Luminous efficiency (lm/W)	Color coordinate (x,y)
2	Compound 5 (comparative Example)	D1	8	8.2	3.4	1.4	(0.148, 0.133)
3	Compound 7 (comparative Example)	D1	8	7.9	4.0	1.5	(0.147, 0.120)
4	Compound 14	D2	4	8.0	19.4	7.7	(0.321, 0.631)

Claims

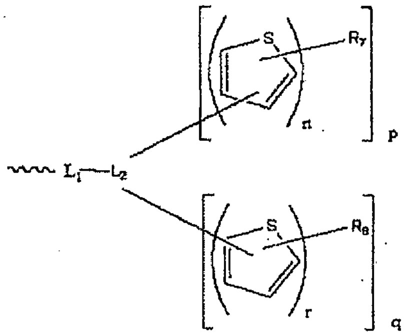
1. A compound represented by the following formula 1:

[Formula 1]



wherein at least one of R_1, R_3, R_4 and R_6 in the formula 1 is a group represented by the formula 2;

[Formula 2]



wherein n and p are each integers of 1 to 10, and q and r are each integers of 0 to 10,
L_1 is a direct bond, or a substituted or unsubstituted C_5 to C_{20} aryl group, or a substituted or unsubstituted C_5 to C_{20} heterocyclic group,
L_2 is a C_5 to C_{20} aryl group, and
R_1, R_3, R_4 and R_6 which are not represented by the formula 2, in the formula 1, R_2, R_5 in formula 1 and R_7 and R_8 in the formula 2 are each independently the identical or different substituents, and each selected from the group consisting of hydrogen; halogen; hydroxyl; mercapto; cyano; nitro; carbonyl; carboxyl; formyl; substituted or unsubstituted C_1-C_{20} alkyl; substituted or unsubstituted C_2-C_{10} alkenyl; substituted or unsubstituted C_2-C_7 alkynyl; substituted or unsubstituted C_6-C_{32} aryl; substituted or unsubstituted heteroaryl; substituted or unsubstituted C_3-C_7 cycloalkyl in which a carbon atom in the ring may be substituted by an oxygen, nitrogen, or sulfur atom; C_4-C_7 cycloalkenyl in which a carbon atom in the ring may be substituted by an oxygen, nitrogen, or sulfur atom; substituted or unsubstituted C_1-C_{20} alkoxy; substituted or unsubstituted C_2-C_{10} alkenyloxy; substituted or unsubstituted C_2-C_7 alkynyloxy; substituted or unsubstituted aryloxy; substituted or unsubstituted C_1-C_{20} alkylamine; substituted or unsubstituted C_2-C_{10} alkenylamine; substituted or unsubstituted C_2-C_7 alkynylamine; substituted or unsubstituted arylamine; substituted or unsubstituted alkylarylamine; substituted or unsubstituted C_1-C_{20} alkylsilyl; substituted or unsubstituted C_2-C_{10} alkenylsilyl; substituted or unsubstituted C_2-C_7 alkynylsilyl; substituted or unsubstituted arylsilyl; substituted or unsubstituted alkylarylsilyl; substituted or unsubstituted C_1-C_{20} alkylboranyl; substituted or unsubstituted C_2-C_{10} alkenylboranyl; substituted or unsubstituted C_2-C_7 alkynylboranyl; substituted or unsubstituted arylboranyl; substituted or unsubstituted alkylarylboranyl; substituted or unsubstituted C_1-C_{20} alkylthio; substituted or unsubstituted C_2-C_{10} alkenylthio; substituted or unsubstituted C_2-C_7 alkynylthio; and substituted or unsubstituted arylthio groups.

2. The compound according to claim 1, wherein R_1, R_3, R_4 and R_6 which are not represented by the formula 2, in the formula 1, R_2, R_5 in formula 1 and R_7 and R_8 in the formula 2 are each independently the identical or different

substituents, and each can be selected from the group consisting of hydrogen, cyano, nitro, substituted or unsubstituted C_1-C_{20} alkyl, substituted or unsubstituted C_2-C_{10} alkenyl, substituted or unsubstituted C_3-C_7 cycloalkyl, substituted or unsubstituted C_4-C_7 cycloalkenyl, substituted or unsubstituted C_6-C_{32} aryl, substituted or unsubstituted heteroaryl, substituted or unsubstituted C_1-C_{20} alkoxy, substituted or unsubstituted aryloxy, substituted or unsubstituted C_1-C_{20} alkylamine, substituted or unsubstituted arylamine, substituted or unsubstituted alkylarylamine, substituted or unsubstituted C_1-C_{20} alkylsilyl; substituted or unsubstituted C_1-C_{20} alkylboranyl, substituted or unsubstituted arylboranyl, substituted or unsubstituted alkylarylboranyl, substituted or unsubstituted C_1-C_{20} alkylthio, and substituted or unsubstituted arylthio groups.

3. The compound according to claim 1, wherein R_1, R_3, R_4 and R_6 which are not represented by the formula 2, in the formula 1, R_2, R_5 in formula 1 and R_7 and R_8 in the formula 2 are each independently mono- or poly-substituted with the identical or different substituents selected from the group consisting of:

halogen, hydroxyl, mercapto, cyano, nitro, amino, carbonyl, carboxyl, formyl, C_1-C_{20} alkyl, C_2-C_{10} alkenyl, C_2-C_7 alkynyl, aryl, heteroaryl, C_3-C_7 cycloalkyl, a saturated or unsaturated 3- to 7-membered heterocyclic ring, acryl, C_1-C_{20} alkoxy, C_2-C_{10} alkenyloxy, C_2-C_7 alkynyloxy, C_1-C_{20} alkylamine, C_2-C_{10} alkenylamine, C_2-C_7 alkynylamine", arylamine, alkylarylamine, C_1-C_{20} alkylsilyl, C_2-C_{10} alkenylsilyl, C_2-C_7 alkynylsilyl, alkoxysilyl, arylsilyl, allcylarylsilyl, C_1-C_{20} alkylboranyl, C_2-C_{10} alkenylboranyl, C_2-C_7 alkynylboranyl, arylboranyl, alkylarylboranyl, C_1-C-$_{20}$ alkylthio, C_2-C_{10} alkenylthio, C_2-C_7 alkynylthio, and arylthio groups.

4. The compound according to claim 1, wherein R_1, R_3, R_4 and R_6 which are not represented by the formula 2, in the formula 1, R_2, R_5 in formula 1 and R_7 and R_8 in the formula 2 are each independently mono- or poly-substituted with the identical or different substituents selected from the group consisting of:

cyano, nitro, formyl, methyl, ethyl, propyl, phenyl, naphthyl, biphenyl, anthracenyl, imidazolyl, thiazolyl, oxazolyl, thiophenyl, pyridyl, pyrimidyl, pyrrolyl, cyclobutenyl, cyclopentenyl, methoxy, ethoxy, propoxy, phenoxy, napththoxy, methylamine, ethylamine, propylamine, phenylamine, naphthylamine, methylphenylamine, ethylphenylamine, ethylnaphthylamine, dimethylboranyl, diethylboranyl, dipropylboranyl, diphenylboranyl, dinaphthylboranyl, phenyl naphthylboranyl, phenyl methylboranyl, naphthylmethylboranyl, naphthylethylboranyl, trimethylsilyl, triethylsilyl, tripropylsilyl, triphenyl silyl, trinaphthylsilyl, dimethylphenyl silyl, diethylphenyl silyl, diphenyl methylsilyl, methylthio, ethylthio, propylthio, butylthio, phenylthio and naphthylthio groups.

5. The compound according to claim 1, wherein the substituted or unsubstituted C_3-C_7 cycloalkyl in which a carbon atom in the ring may be substituted by an oxygen, nitrogen, or sulfur atom, or the C_4-C_7 cycloalkenyl in which a carbon atom in the ring may be substituted by an oxygen, nitrogen, or sulfur atom, is a 5- or 6-membered substituted or unsubstituted, saturated and unsaturated ring.

6. The compound according to claim 1, wherein R_1, R_3, R_4 and R_6 which are not represented by the formula 2, in the formula 1, R_2, R_5 in formula 1 and R_7 and R_8 in the formula 2 are each independently the identical or different substituent, and each can be selected from the group consisting of methyl, ethyl, propyl, butyl, isopropyl, n-butyl, t-butyl, isobutyl, n-pentyl, neo-pentyl, n-hexyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, 2-methyl-ethenyl, 2-methyl-propenyl, 2-methyl-butenyl, 2-methyl-pentenyl, 2-methyl-hexenyl, imidazolyl, thiazolyl, oxazolyl, thiophenyl, pyridyl, pyrimidyl, pyrrolyl, 2-methylimidazolyl, 2-methylthiazolyl, 2-methyloxazolyl, phenyl, naphthyl, anthracenyl, biphenyl, terphenyl, double spiro, tetracenyl, 3-methyl-phenyl, 4-methyl-naphthyl, 9-methyl-anthracenyl, 4-methyl-tetracenyl, 2-methyl-imidazolyl, 2-methyl-oxazolyl, 2-methyl-thiazolyl, 2-methyl-furanyl, 2-methyl-thiophenyl, 2-methyl-pyrazolyl, 2-methyl-pyridyl, 2-methyl-pyrimidinyl, methoxy, ethoxy, propoxy, butoxy, pentoxy, hexoxy, isopropoxy, isobutoxy, t-butoxy, neo-pentoxy, phenoxy, napththoxy, biphenoxy, 3-methyl-phenoxy, 4-methyl-napththoxy, 2-methyl-biphenoxy, methylamine, ethylamine, propylamine, butylamine, pentylamine, hexylamine, heptylamine, isopropyl amine, isobutylamine, t-butylamine, 2-pentylamine, neo-pentylamine, phenylamine, naphthylamine, biphenylamine, anthracenylamine, 3-methylphenylamine, 4-methyl-naphthylamine, 2-methyl-biphenylamine, 9-methyl-anthracenylamine, phenyl methylamine, phenyl ethylamine, naphthylmethylamine, naphthylethylarnine, biphenyl methylamine, 3-methyl-phenyl methylamine, phenyl isopropylamine, naphthylisopropylamine, naphthylisobutylamine, biphenyl isopropylamine, trimethylsilyl, triethylsilyl, tributylsilyl, tri(isopropyl)silyl, tri(isobutyl)silyl, tri(t-butyl)silyl, tri(2-butyl)silyl, triphenyl silyl, trinaphthylsilyl, tribiphenyl silyl, tri(3-methylphenyl)silyl, tri(4-methylnaphthyl)silyl, tri(2-methylbiphenyl)silyl, phenyl methylsilyl, phenyl ethylsilyl, naphthylmethylsilyl, naphthylethylsilyl, biphenyl methylsilyl, 3-methyl-phenyl methylsilyl, phenyl isopropylsilyl, naphthylisopropylsilyl, naphthylisobutylsilyl, biphenyl isopropylsilyl, dimethylboranyl, diethylboranyl, dipropylamine, dibutylamine, dipentylamine, diisopropylboranyl, diisobutylboranyl, di(t-butyl)boranyl, isopropylisobutylamine, diphenylboranyl, dinaphthylboranyl, dibiphenylboranyl, di(3-methylphenyl)boranyl, di(4-methylnaphthyl)boranyl, di(2-methylbiphenyl)boranyl, phenyl methylboranyl, phenyl ethylboranyl, naphthylmethylboranyl, naphthylethylboranyl, biphenyl methylboranyl, 3-methyl-phenyl methylboranyl, phenyl isopropylboranyl, methylthio, ethylthio, propylthio, butylthio, pentylthio, hexylthio, tri(isopropyl)thio, tri(isobutyl)thio, tri(t-butyl)thio, tri(2-butyl)thio, phenylthio, naphthylthio, biphenylthio, (3-methylphenyl)thio, (4-methylnaphthyl)thio and (2-methylbiphenyl)thio groups.

7. The compound according to claim 1, wherein R_1, R_3, R_4 and R_6 which are not represented by the formula 2, in the formula 1, R_2, R_5 in formula 1 and R_7 and R_8 in the formula 2 are each independently the identical or different substituent, and each can be selected from the group consisting of methyl, ethyl, isopropyl, t-butyl, ethenyl, propenyl, 2-methyl-ethenyl, 2-methyl-propenyl, imidazolyl, thiazolyl, oxazolyl, 2-methylimidazolyl, 2-methylthiazolyl, 2-methyloxazolyl, phenyl, naphthyl, biphenyl, anthracenyl, terphenyl, 3-methyl-phenyl, 4-methyl-naphthyl, methoxy, ethoxy, isopropoxy, isobutoxy, phenoxy, napththoxy, 3-methyl-phenoxy, 4-methyl-napththoxy, methylamine, ethylamine, isopropylamine, isobutylamine, t-butylamine, phenylamine, naphthylamine, 3-methylphenylamine, 4-methyl-naphthylamine, phenyl methylamine, phenyl ethylamine, naphthylmethylamine, 3-methyl-phenyl methylamine, phenyl isopropylamine, trimethylsilyl, triethylsilyl, tri(isopropyl)silyl, tri(isobutyl)silyl, triphenyl silyl, trinaphthylsilyl, tri(3-methylphenyl)silyl, tri(4-methylnaphthyl)silyl, phenyl methylsilyl, phenyl ethylsilyl, 3-methyl-phenyl methylsilyl, phenyl isopropylsilyl, dimethylboranyl, diethylboranyl, diisopropylboranyl, diisobutylboranyl, diphenylboranyl, dinaphthylboranyl, di(3-methylphenyl)boranyl, di(4-methylnaphthyl)boranyl, phenyl methylboranyl, phenyl ethylboranyl, 3-methylphenyl methylboranyl, phenyl isopropylboranyl, methylthio, ethylthio, tri(isopropyl)thio, tri(isobutyl)thio, phenylthio, naphthylthio, (3-methylphenyl)thio and (4-methylnaphthyl)thio groups.

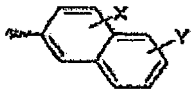
8. The compound according to claim 1, wherein R_1, R_3, R_4 and R_6 which are not represented by the formula 2, in the formula 1, R_2, R_5 in formula 1 and R_7 and R_8 in the formula 2 are each independently the identical or different substituent, and each can be selected from the group consisting of substituted or unsubstituted phenyl, substituted or unsubstituted naphthyl, substituted or unsubstituted biphenyl, substituted or unsubstituted terphenyl, and substituted or unsubstituted anthracenyl groups.

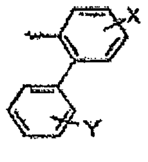
9. The compound according to claim 8, wherein the substituted phenyl, naphthyl, biphenyl, terphenyl and anthracenyl are substituted with at least one selected from the group consisting of cyano, nitro, formyl, substituted or unsubstituted C_1-C_{20} alkyl, aryl, heteroaryl, C_4-C_7 cycloalkenyl, substituted or unsubstituted C_1-C_{20} alkoxy, aryloxy, C_1-C_{20} alkylamine, arylamine, alkylarylamine, C_1-C_{20} silyl, arylsilyl, alkylarylsilyl, C_1-C_{20} alkylboranyl, arylboranyl, alkylarylboranyl, C_1-C_{20} alkylthio and arylthio groups.

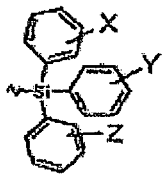
10. The compound according to claim 1, wherein in the formula 1, one of R1 and R6 and one of R3 and R4 are the same substituents represented by the formula 2.

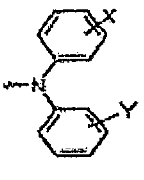
11. The compound according to claim 1, wherein in the formula 1, one of R1 and R6 and one of R3 and R4 are the different substituents represented by the formula 2, and one among them is a substituent represented by the formula 2 with L1 being a direct bond, phenyl, naphthyl or carbazole.

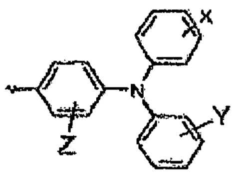
12. The compound according to claim 1, wherein at least one of R_1, R_3, R_4 and R_6 is represented by the formula 2, and the remaining of R_1, R_3, R_4 and R_6 R_2 and R_5 can be selected from the group consisting of:

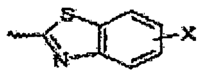


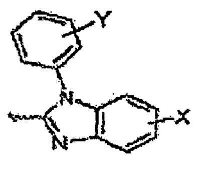


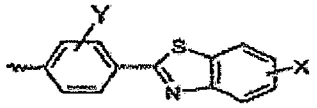


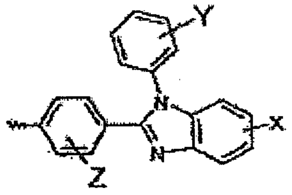


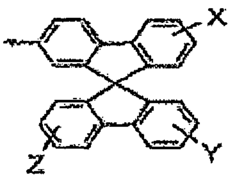


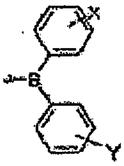


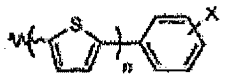


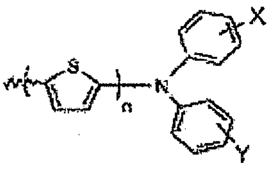


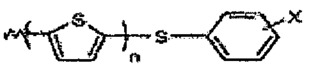


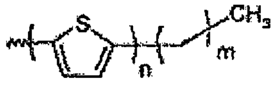


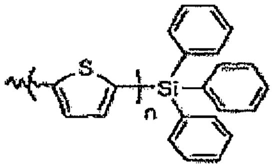


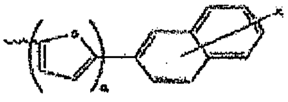












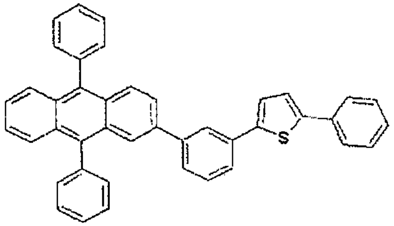
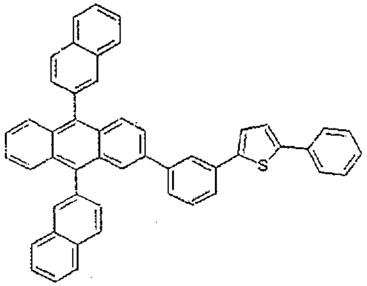
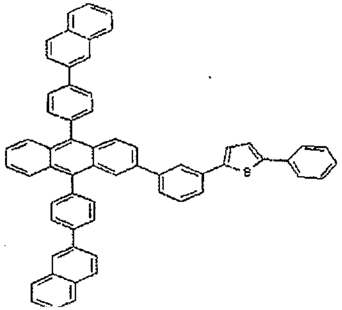
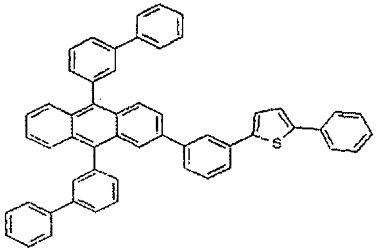
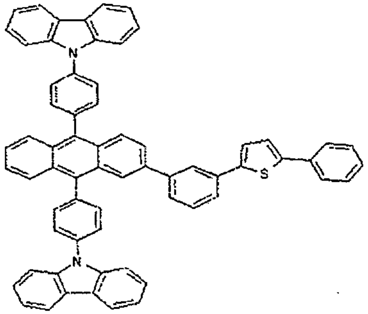
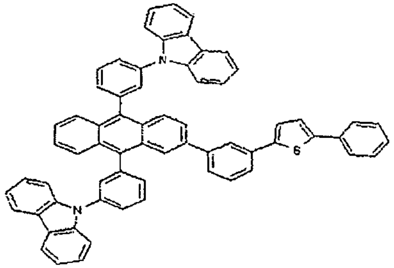
wherein X, Y and Z are each independently the identical or different substituents and each ring moiety to which X, Y or Z can be attached can be substituted with one or more of the identical or different substituents, such as X, Y and Z, and

X, Y and Z are each independently selected from the group consisting of cyano, nitro, formyl, substituted or unsubstituted C_1-C_{20} alkyl, aryl, heteroaryl, C_4-C_7 cycloalkenyl, substituted or unsubstituted C_1-C_{20} alkoxy, aryloxy, C_1-C_{20} alkylamine, arylamine, alkylarylamine, C_1-C_{20} silyl, arylsilyl, alkylarylsilyl, C_1-C_{20} alkylboranyl, arylboranyl, alkylarylboranyl, C_1-C_{20} alkylthio and arylthio.

13. The compound according to claim 12, wherein X, Y and Z are each independently selected from the group consisting of cyano, nitro, methyl, ethyl, isopropyl, t-butyl, methoxy, ethoxy, propoxy, methylthio, imidazolyl, pyridyl, thiazolyl, oxazolyl, furanyl, thiophenyl, pyrrolyl, pyridyl and pyrimidyl.

14. The compound according to claim 1, wherein in the formula 2, L_1 is a direct bond, or phenyl, naphthyl or carbazole, and L_2 is phenyl, naphthyl or anthracenyl.

15. The compound according to claim 1, wherein the compound is selected from the group consisting of:

Compound	Structural Formula	Compound	Structural Formula
13		14	
15		16	
17		18	

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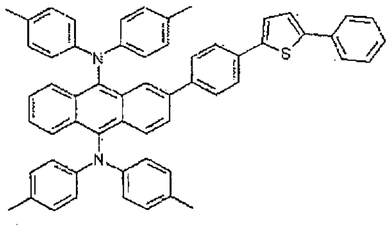
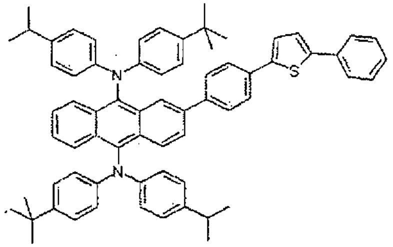
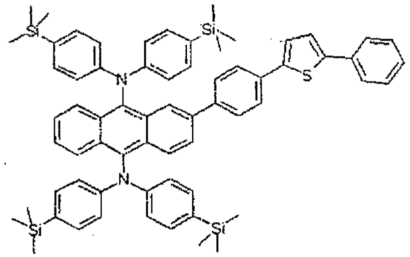
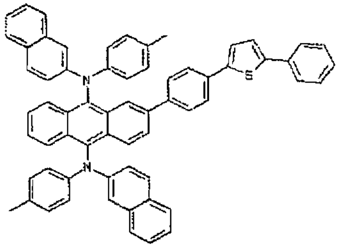
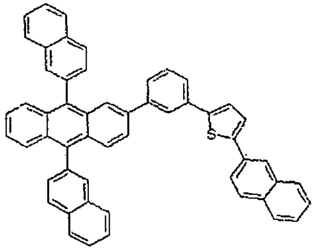
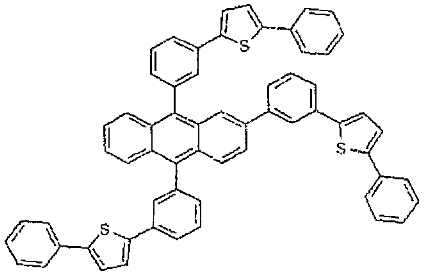
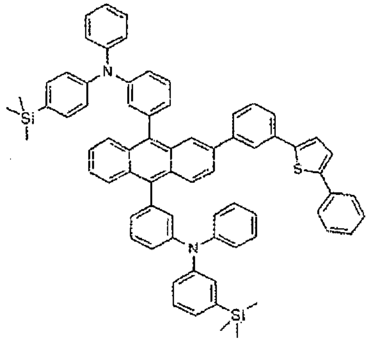
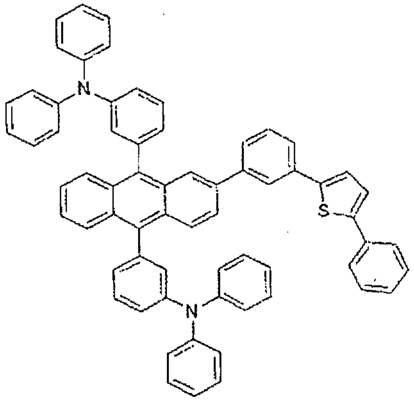
Compound	Structural Formula	Compound	Structural Formula
		22	
23		24	
25			
		44	

(continued)

Compound	Structural Formula	Compound	Structural Formula
		54	
55		56	

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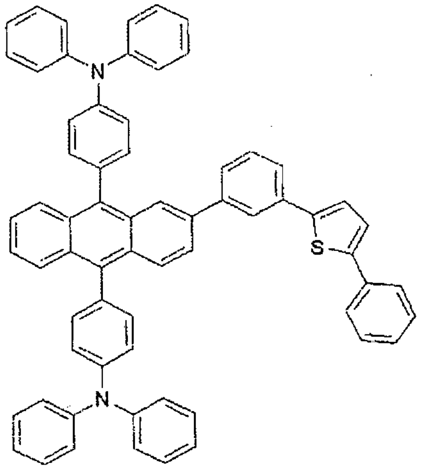
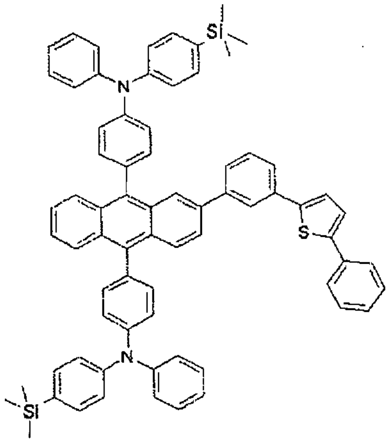
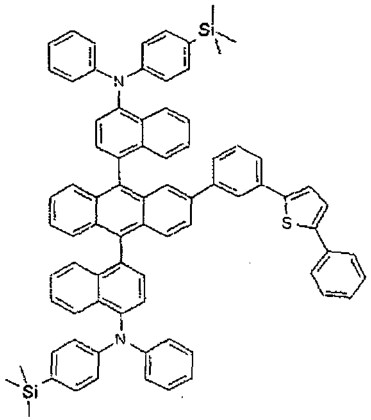
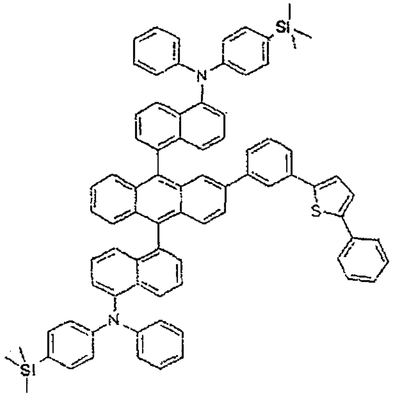
Compound	Structural Formula	Compound	Structural Formula
57		58	
59		60	

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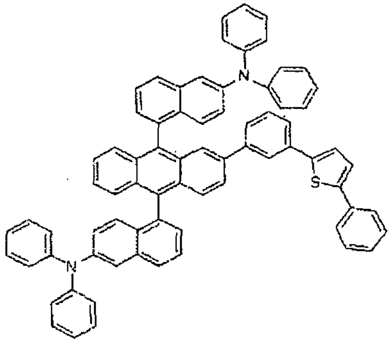
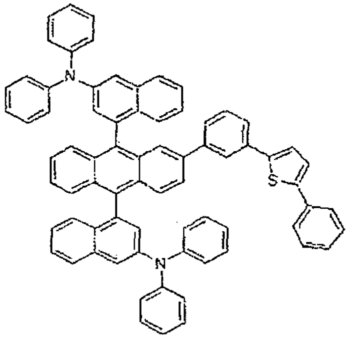
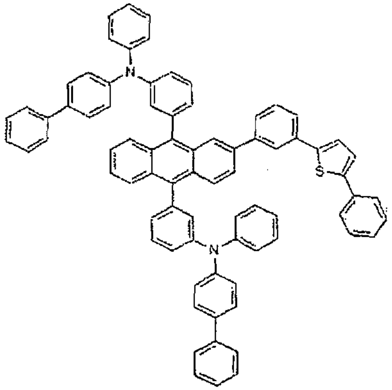
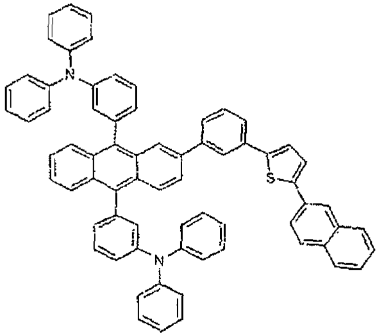
Compound	Structural Formula	Compound	Structural Formula
61		62	
63		64	

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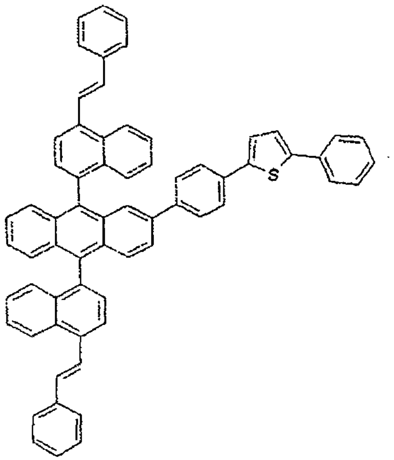
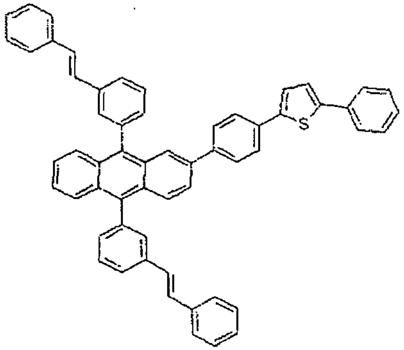
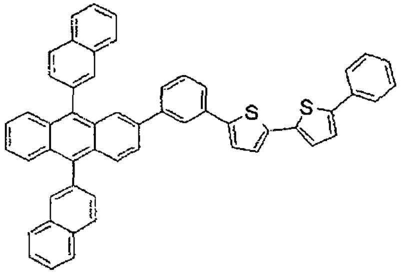
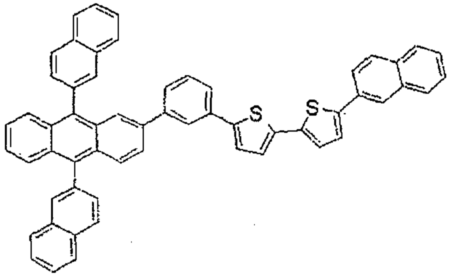
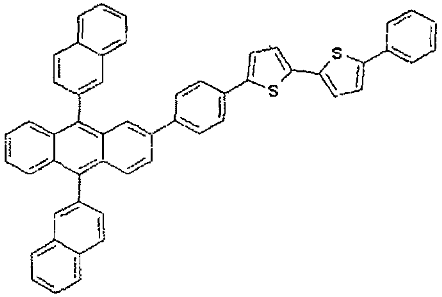
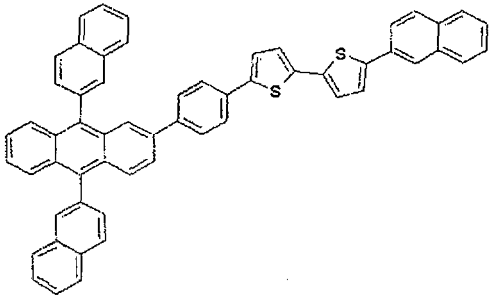
Compound	Structural Formula	Compound	Structural Formula
65		66	
67		68	
69		70	

16. An organic light emitting device comprising a first electrode, a second electrode, and at least one organic material layer interposed between the first electrode and the second electrode, wherein at least one layer of the organic material layers comprises the compound according to claim 1.

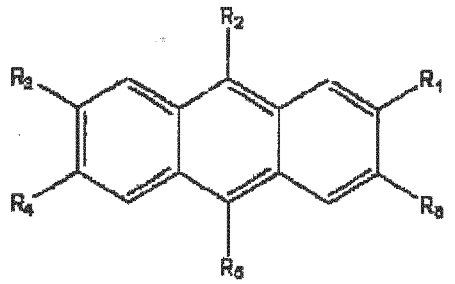
17. The organic light emitting device according to claim 16, wherein the organic material layers include a light emitting layer, and the light emitting layer comprises the compound according to claim 1.

18. The organic light emitting device according to claim 16, wherein the organic material layers include at least one selected from the group consisting of a hole injecting layer, a hole transporting layer, and an electron transporting layer.

Patentansprüche

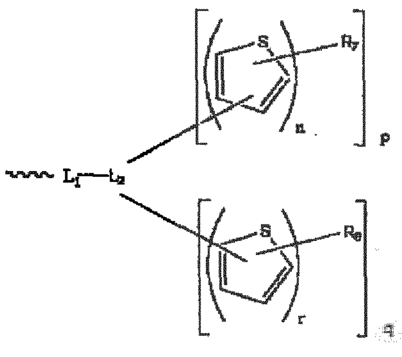
1. Verbindung, dargestellt durch die folgende Formel 1:

[Formel 1]



wobei wenigstens eines von R_1, R_3, R_4 und R_6 in der Formel 1 eine Gruppe ist, die dargestellt ist durch die Formel 2:

[Formel 2]



wobei n und p jeweils ganze Zahlen von 1 bis 10 sind und q und r jeweils ganze Zahlen von 0 bis 10 sind,
L_1 eine direkte Bindung oder eine substituierte oder unsubstituierte C_5-C_{20}-Arylgruppe oder eine substituierte oder unsubstituierte heterocyclische C_5-C_{20}-Gruppe ist,
L_2 eine C_5-C_{20}-Arylgruppe ist, und
R_1, R_3, R_4 und R_6, die nicht durch die Formel 2 dargestellt sind, in der Formel 1, R_2, R_5 in Formel 1 und R_7 und R_8 in der Formel 2 jeweils unabhängig die identischen oder unterschiedlichen Substituenten sind und jeweils ausgewählt sind aus der Gruppe bestehend aus Wasserstoff; Halogen; Hydroxyl; Mercapto; Cyano; Nitro; Carbonyl; Carboxyl; Formyl; substituiertem oder unsubstituiertem C_1-C_{20}-Alkyl; substituiertem oder unsubstituiertem C_2-C_{10}-Alkenyl; substituiertem oder unsubstituiertem C_2-C_7-Alkinyl; substituiertem oder unsubstituiertem C_6-C_{32}-Aryl; substituiertem oder unsubstituiertem Heteroaryl; substituiertem oder unsubstituiertem

C_3-C_7-Cycloalkyl, wobei ein Kohlenstoffatom in dem Ring substituiert sein kann durch ein Sauerstoff-, Stickstoff- oder Schwefelatom; C_4-C_7-Cycloalkenyl, wobei ein Kohlenstoffatom in dem Ring substituiert sein kann durch ein Sauerstoff-, Stickstoff- oder Schwefelatom; substituiertem oder unsubstituiertem C_1-C_{20}-Alkoxy; substituiertem oder unsubstituiertem C_2-C_{10}-Alkenyloxy; substituiertem oder unsubstituiertem C_2-C_7-Alkinyloxy; substituiertem oder unsubstituiertem Aryloxy; substituiertem oder unsubstituiertem C_1-C_{20}-Alkylamin; substituiertem oder unsubstituiertem C_2-C_{10}-Alkenylamine; substituiertem oder unsubstituiertem C_2-C_7-Alkinylamin; substituiertem oder unsubstituiertem Arylamin,; substituiertem oder unsubstituiertem Alkylarylamin; substituiertem oder unsubstituiertem C_1-C_{20}-Alkylsilyl; substituiertem oder unsubstituiertem C_2-C_{10}-Alkenylsilyl; substituiertem oder unsubstituiertem C_2-C_7-Alkinylsilyl; substituiertem oder unsubstituiertem Arylsilyl; substituiertem oder unsubstituiertem Alkylarylsilyl; substituiertem oder unsubstituiertem C_1-C_{20}-Alkylboranyl; substituiertem oder unsubstituiertem C_2-C_{10}-Alkenylboranyl; substituiertem oder unsubstituiertem C_2-C_7-Alkinylboranyl; substituiertem oder unsubstituiertem Arylboranyl; substituiertem oder unsubstituiertem Alkylarylboranyl; substituiertem oder unsubstituiertem C_1-C_{20}-Alkylthio; substituiertem oder unsubstituiertem C_2-C_{10}-Alkenylthio; substituiertem oder unsubstituiertem C_2-C_7-Alkinylthio; und substituiertem oder unsubstituiertem Arylthio.

2. Verbindung nach Anspruch 1, wobei R_1, R_3, R_4 und R_6, die nicht durch die Formel 2 dargestellt sind, in der Formel 1, R_2, R_5 in Formel 1 und R_7 und R_8 in der Formel 2 jeweils unabhängig die identischen oder unterschiedlichen Substituenten sind, und jeweils ausgewählt sind aus der Gruppe bestehend aus Wasserstoff, Cyano, Nitro, substituiertem oder unsubstituiertem C_1-C_{20}-Alkyl, substituiertem oder unsubstituiertem C_2-C_{10}-Alkenyl, substituiertem oder unsubstituiertem C_3-C_7-Cycloalkyl; substituiertem oder unsubstituiertem C_4-C_7-Cycloalkenyl, substituiertem oder unsubstituiertem C_6-C_{32}-Aryl, substituiertem oder unsubstituiertem Heteroaryl, substituiertem oder unsubstituiertem C_1-C_{20}-Alkoxy, substituiertem oder unsubstituiertem Aryloxy, substituiertem oder unsubstituiertem C_1-C_{20}-Alkylamin, substituiertem oder unsubstituiertem Arylamin, substituiertem oder unsubstituiertem Alkylarylamin, substituiertem oder unsubstituiertem C_1-C_{20}-Alkylsilyl; substituiertem oder unsubstituiertem C_1-C_{20}-Alkylboranyl, substituiertem oder unsubstituiertem Arylboranyl, substituiertem oder unsubstituiertem Alkylarylboranyl, substituiertem oder unsubstituiertem C_1-C_{20}-Alkylthio und substituiertem oder unsubstituiertem Arylthio.

3. Verbindung nach Anspruch 1, wobei R_1, R_3, R_4 und R_6, die nicht durch die Formel 2 dargestellt sind, in der Formel 1, R_2, R_5 in Formel 1 und R_7 und R_8 in der Formel 2 jeweils unabhängig mono- oder poly-substituiert sind mit den identischen oder unterschiedlichen Substituenten ausgewählt aus der Gruppe bestehend aus:

Halogen, Hydroxyl, Mercapto, Cyano, Nitro, Amino, Carbonyl, Carboxyl, Formyl, C_1-C_{20}-Alkyl, C_2-C_{10}-Alkenyl, C_2-C_7-Alkinyl, Aryl, Heteroaryl, C_3-C_7-Cycloalkyl, einem gesättigten oder ungesättigten 3- bis 7-gliedrigen heterocyclischen Ring, Acryl, C_1-C_{20}-Alkoxy, C_2-C_{10}-Alkenyloxy, C_2-C_7-Alkinyloxy, C_1-C_{20}-Alkylamin, C_2-C_{10}-Alkenylamin, C_2-C_7-Alkinylamin, Arylamin, Alkylarylamin, C_1-C_{20}-Alkylsilyl, C_2-C_{10}-Alkenylsilyl, C_2-C_7-Alkinylsilyl, Alkoxysilyl, Arylsilyl, Alkylarylsilyl, C_1-C_{20}-Alkylboranyl, C_2-C_{10}-Alkenylboranyl, C_2-C_7-Alkinylboranyl, Arylboranyl, Alkylarylboranyl, C_1-C_{20}-Alkylthio, C_2-C_{10}-Alkenylthio, C_2-C_7-Alkinylthio und Arylthio.

4. Verbindung nach Anspruch 1, wobei R_1, R_3, R_4 und R_6, die nicht durch die Formel 2 dargestellt sind, in der Formel 1, R_2, R_5 in Formel 1 und R_7 und R_8 in der Formel 2 jeweils unabhängig mono- oder poly-substituiert sind mit den identischen oder unterschiedlichen Substituenten ausgewählt aus der Gruppe bestehend aus:

Cyano, Nitro, Formyl, Methyl, Ethyl, Propyl, Phenyl, Naphthyl, Biphenyl, Anthracenyl, Imidazolyl, Thiazolyl, Oxazolyl, Thiophenyl, Pyridyl, Pyrimidyl, Pyrrolyl, Cyclobutenyl, Cyclopentenyl, Methoxy, Ethoxy, Propoxy, Phenoxy, Naphthoxy, Methylamin, Ethylamin, Propylamin, Phenylamin, Naphthylamin, Methylphenylamin, Ethylphenylamin, Ethylnaphthylamin, Dimethylboranyl, Diethylboranyl, Dipropylboranyl, Diphenylboranyl, Dinaphthylboranyl, Phenylnaphthylboranyl, Phenylmethylboranyl, Naphthylmethylboranyl, Naphthylethylboranyl, Trimethylsilyl, Triethylsilyl, Tripropylsilyl, Triphenylsilyl, Trinaphthylsilyl, Dimethylphenylsilyl, Diethylphenylsilyl, Diphenylmethylsilyl, Methylthio, Ethylthio, Propylthio, Butylthio, Phenylthio und Naphthylthio.

5. Verbindung nach Anspruch 1, wobei das substituierte oder unsubstituierte C_3-C_7-Cycloalkyl, bei dem ein Kohlenstoffatom in dem Ring durch ein Sauerstoff-, Stickstoff- oder Schwefelatom substituiert sein kann, oder das C_4-C_7-Cycloalkenyl, bei dem ein Kohlenstoffatom in dem Ring durch ein Sauerstoff-, Stickstoff- oder Schwefelatom substituiert sein kann, ein 5- oder 6-gliedriger substituierter oder unsubstituierter, gesättigter und ungesättigter Ring sein kann.

6. Verbindung nach Anspruch 1, wobei R_1, R_3, R_4 und R_6, die nicht durch die Formel 2 dargestellt sind, in der Formel 1, R_2, R_5 in Formel 1 und R_7 und R_8 in der Formel 2 jeweils unabhängig der identische oder unterschiedliche Substituent sind, und jeweils ausgewählt sind aus der Gruppe bestehend aus Methyl, Ethyl, Propyl, Butyl, Isopropyl, n-Butyl, t-Butyl, Isobutyl, n-Pentyl, neo-Pentyl, n-Hexyl, Ethenyl, Propenyl, Butenyl, Pentenyl, Hexenyl, 2-Methylethenyl, 2-Methylpropenyl, 2-Methylbutenyl, 2-Methylpentenyl, 2-Methylhexenyl, Imidazolyl, Thiazolyl, Oxazolyl, Thiophenyl, Pyridyl, Pyrimidyl, Pyrrolyl, 2-Methylimidazolyl, 2-Methylthiazolyl, 2-Methyloxazolyl, Phenyl, Naphthyl, Anthracenyl, Biphenyl, Terphenyl, Doppelspiro, Tetracenyl, 3-Methylphenyl, 4-Methylnaphthyl, 9-Methylanthracenyl, 4-Methyltetracenyl, 2-Methylimidazolyl, 2-Methyloxazolyl, 2-Methylthiazolyl, 2-Methylfuranyl, 2-Methylthiophenyl, 2-Methylpyrazolyl, 2-Methylpyridyl, 2-Methylpyrimidinyl, Methoxy, Ethoxy, Propoxy, Butoxy, Pentoxy, Hexoxy, Isopropoxy, Isobutoxy, t-Butoxy, neo-Pentoxy, Phenoxy, Naphthoxy, Biphenoxy, 3-Methylphenoxy, 4-Methylnapththoxy, 2-Methylbiphenoxy, Methylamin, Ethyl amin, Propylamin, Butylamin, Pentylamin, Hexylamin, Heptylamin, Isopropylamin, Isobutylamin, t-Butylamin, 2-Pentylamin, neo-Pentylamin, Phenylamin, Naphthylamin, Biphenylamin, Anthracenylamin, 3-Methylphenylamin, 4-Methylnaphthylamin, 2-Methylbiphenylamin, 9-Methylanthracenylamin, Phenylmethylamin, Phenylethylamin, Naphthylmethylamin, Naphthylethylamin, Biphenylmethylamin, 3-Methylphenylmethylamin, Phenylisopropylamin, Naphthylisopropylamin, Naphthylisobutylamin, Biphenylisopropylamin, Trimethylsilyl, Triethylsilyl, Tributylsilyl, Tri(isopropyl)silyl, Tri(isobutyl)silyl, Tri(t-butyl)silyl, Tri(2-butyl)silyl, Triphenylsilyl, Trinaphthylsilyl, Tribiphenylsilyl, Tri(3-methylphenyl)silyl, Tri(4-methylnaphthyl)silyl, Tri(2-methylbiphenyl)silyl, Phenylmethylsilyl, Phenylethylsilyl, Naphthylmethylsilyl, Naphthylethylsilyl, Biphenylmethylsilyl, 3-Methylphenylmethylsilyl, Phenylisopropylsilyl, Naphthylisopropylsilyl, Naphthylisobutylsilyl, Biphenylisopropylsilyl, Dimethylboranyl, Diethylboranyl, Dipropylamin, Dibutylamin, Dipentylamin, Diisopropylboranyl, Diisobutylboranyl, Di(t-butyl)boranyl, Isopropylisobutylamin, Diphenylboranyl, Dinaphthylboranyl, Dibiphenylboranyl, Di(3-methylphenyl)boranyl, Di(4-methylnaphthyl)boranyl, Di(2-methylbiphenyl)boranyl, Phenylmethylboranyl, Phenylethylboranyl, Naphthylmethylboranyl, Naphthylethylboranyl, Biphenylmethylboranyl, 3-Methylphenylmethylboranyl, Phenylisopropylboranyl, Methylthio, Ethylthio, Propylthio, Butylthio, Pentylthio, Hexylthio, Tri(isopropyl)thio, Tri(isobutyl)thio, Tri(t-butyl)thio, Tri(2-butyl)thio, Phenylthio, Naphthylthio, Biphenylthio, (3-Methylphenyl)thio, (4-Methylnaphthyl)thio und (2-Methylbiphenyl)thio.

7. Verbindung nach Anspruch 1, wobei R_1, R_3, R_4 und R_6, die nicht durch die Formel 2 dargestellt sind, in der Formel 1, R_2, R_5 in Formel 1 und R_7 und R_8 in der Formel 2 jeweils unabhängig der identische oder unterschiedliche Substituent sind, und jeweils ausgewählt sind aus der Gruppe bestehend aus Methyl, Ethyl, Isopropyl, t-Butyl, Ethenyl, Propenyl, 2-Methylethenyl, 2-Methylpropenyl, Imidazolyl, Thiazolyl, Oxazolyl, 2-Methylimidazolyl, 2-Methylthiazolyl, 2-Methyloxazolyl, Phenyl, Naphthyl, Biphenyl, Anthracenyl, Terphenyl, 3-Methylphenyl, 4-Methylnaphthyl, Methoxy, Ethoxy, Isopropoxy, Isobutoxy, Phenoxy, Napththoxy, 3-Methylphenoxy, 4-Methylnapththoxy, Methylamin, Ethylamin, Isopropylamin, Isobutylamin, t-Butylamin, Phenylamin, Naphthylamin, 3-Methylphenylamin, 4-Methylnaphthylamin, Phenylmethylamin, Phenylethylamin, Naphthylmethylamin, 3-Methylphenylmethylamin, Phenylisopropylamin, Trimethylsilyl, Triethylsilyl, Tri(isopropyl)silyl, Tri(isobutyl)silyl, Triphenylsilyl, Trinaphthylsilyl, Tri(3-methylphenyl)silyl, Tri(4-methylnaphthyl)silyl, Phenylmethylsilyl, Phenylethylsilyl, 3-Methylphenylmethylsilyl, Phenylisopropylsilyl, Dimethylboranyl, Diethylboranyl, Diisopropylboranyl, Diisobutylboranyl, Diphenylboranyl, Dinaphthylboranyl, Di(3-methylphenyl)boranyl, Di(4-methylnaphthyl)boranyl, Phenylmethylboranyl, Phenylethylboranyl, 3-Methylphenylmethylboranyl, Phenylisopropylboranyl, Methylthio, Ethylthio, Tri(isopropyl)thio, Tri(isobutyl)thio, Phenylthio, Naphthylthio, (3-Methylphenyl)thio und (4-Methylnaphthyl)thio.

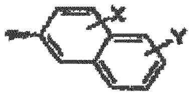
8. Verbindung nach Anspruch 1, wobei R_1, R_3, R_4 und R_6, die nicht durch die Formel 2 dargestellt sind, in der Formel 1, R_2, R_5 in Formel 1 und R_7 und R_8 in der Formel 2 jeweils unabhängig der identische oder unterschiedliche Substituent sind, und jeweils ausgewählt sind aus der Gruppe bestehend aus substituiertem oder unsubstituiertem Phenyl, substituiertem oder unsubstituiertem Naphthyl, substituiertem oder unsubstituiertem Biphenyl, substituiertem oder unsubstituiertem Terphenyl und substituiertem oder unsubstituiertem Anthracenyl.

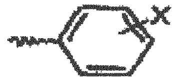
9. Verbindung nach Anspruch 8, wobei das substituierte Phenyl, Naphthyl, Biphenyl, Terphenyl und Anthracenyl mit wenigstens einem substituiert sind ausgewählt aus der Gruppe bestehend aus Cyano, Nitro, Formyl, substituiertem oder unsubstituiertem C_1-C_{20}-Alkyl, Aryl, Heteroaryl, C_4-C_7-Cycloalkenyl, substituiertem oder unsubstituiertem C_1-C_{20}-Alkoxy, Aryloxy, C_1-C_{20}-Alkylamin, Arylamin, Alkylarylamin, C_1-C_{20}-Silyl, Arylsilyl, Alkylarylsilyl, C_1-C_{20}-Alkylboranyl, Arylboranyl, Alkylarylboranyl, C_1-C_{20}-Alkylthio und Arylthio.

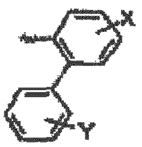
10. Verbindung nach Anspruch 1, wobei in der Formel 1 eines von R1 und R6 und eines von R3 und R4 die gleichen Substituenten sind, die durch Formel 2 dargestellt sind.

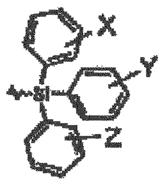
11. Verbindung nach Anspruch 1, wobei in der Formel 1 eines von R1 und R6 und eines von R3 und R4 die unterschiedlichen Substituenten sind, die durch Formel 2 dargestellt sind, und eines von diesen ein Substituent dargestellt durch die Formel 2 ist, wobei L1 eine direkte Bindung, Phenyl, Naphthyl oder Carbazol ist.

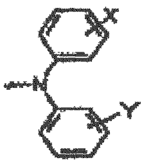
12. Verbindung nach Anspruch 1, wobei wenigstens eines von R_1, R_3, R_4 und R_6 durch Formel 2 dargestellt ist, und bei den verbleibenden R_1, R_3, R_4 und R_6 R_2 und R_5 ausgewählt sein können aus der Gruppe bestehend aus:

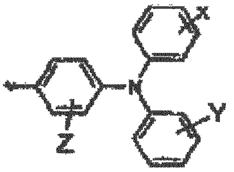


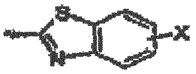


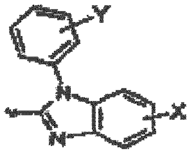


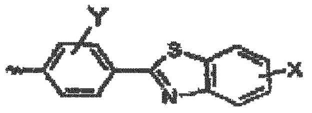


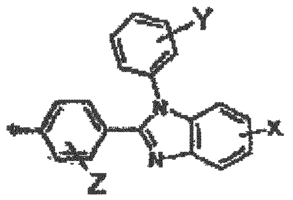


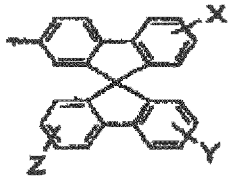


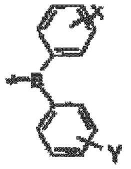


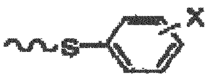


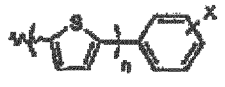


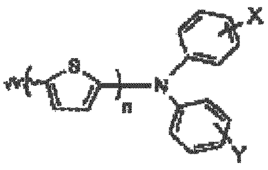


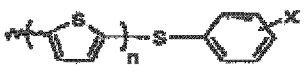


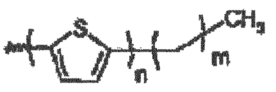


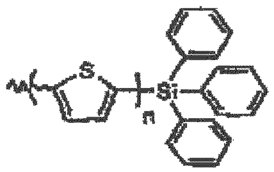


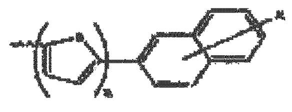












,

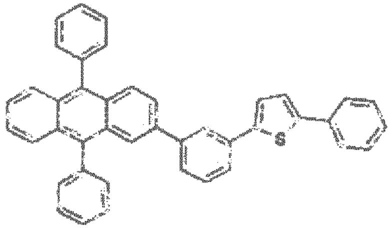
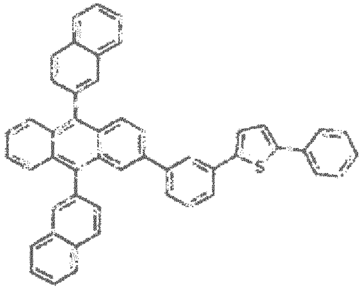
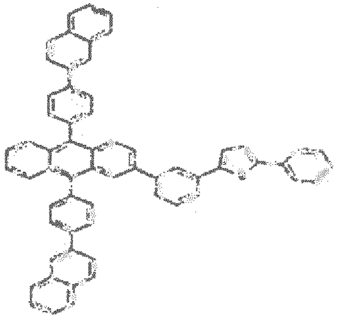
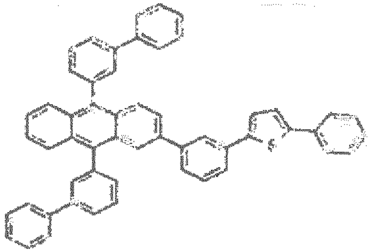
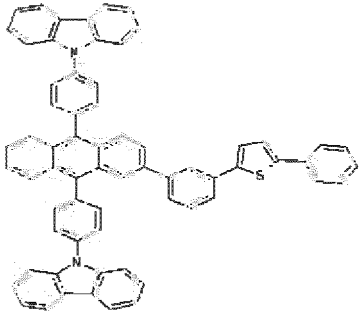
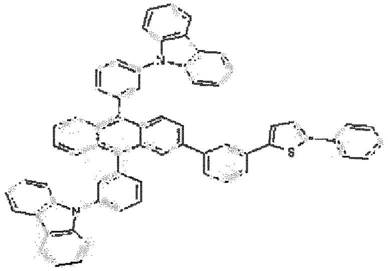
wobei X, Y und Z jeweils unabhängig die identischen oder unterschiedlichen Substituenten sind und jede Ringeinheit, an die X, Y oder Z angefügt sein kann, mit einem oder mehreren der identischen oder unterschiedlichen Substituenten substituiert sein kann, wie X, Y und Z, und

wobei X, Y und Z jeweils unabhängig ausgewählt sind aus der Gruppe bestehend aus Cyano, Nitro, Formyl, substituiertem oder unsubstituiertem C_1-C_{20}-Alkyl, Aryl, Heteroaryl, C_4-C_7-Cycloalkenyl, substituiertem oder unsubstituiertem C_1-C_{20}-Alkoxy, Aryloxy, C_1-C_{20}-Alkylamin, Arylamin, Alkylarylamin, C_1-C_{20}-Silyl, Arylsilyl, Alkylarylsilyl, C_1-C_{20}-Alkylboranyl, Arylboranyl, Alkylarylboranyl, C_1-C_{20}-Alkylthio und Arylthio.

13. Verbindung nach Anspruch 12, wobei X, Y und Z jeweils unabhängig ausgewählt sind aus der Gruppe bestehend aus Cyano, Nitro, Methyl, Ethyl, Isopropyl, t-Butyl, Methoxy, Ethoxy, Propoxy, Methylthio, Imidazolyl, Pyridyl, Thiazolyl, Oxazolyl, Furanyl, Thiophenyl, Pyrrolyl, Pyridyl und Pyrimidyl.

14. Verbindung nach Anspruch 1, wobei in der Formel 2 L_1 eine direkte Bindung oder Phenyl, Naphthyl oder Carbazol ist und L_2 Phenyl, Naphthyl oder Anthracenyl ist.

15. Verbindung nach Anspruch 1, wobei die Verbindung ausgewählt ist aus der Gruppe bestehend aus:

Verbindung	Strukturformel	Verbindung	Strukturformel
13		14	
15		16	
17		13	

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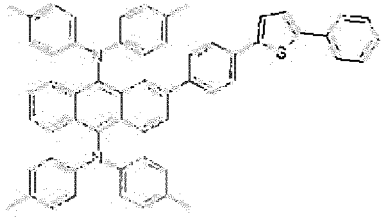
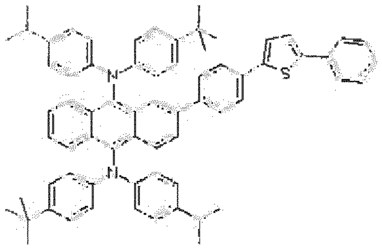
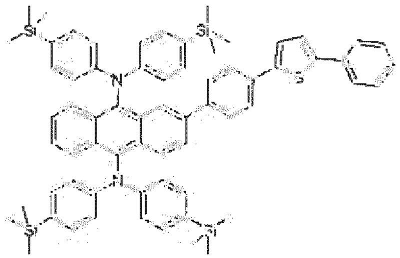
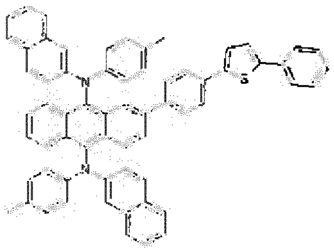
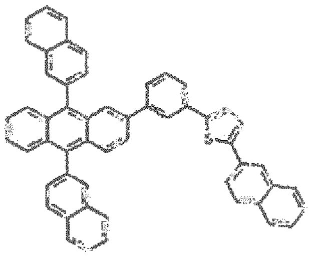
Verbindung	Strukturformel	Verbindung	Strukturformel
		22	
23		24	
25			
		44	

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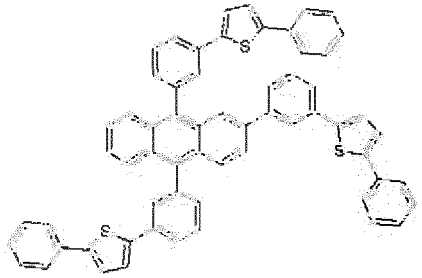
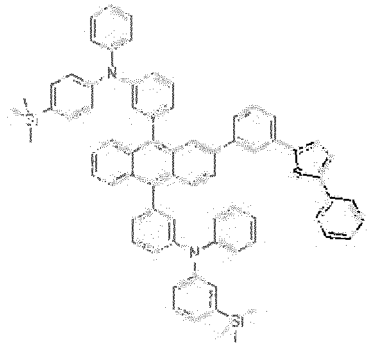
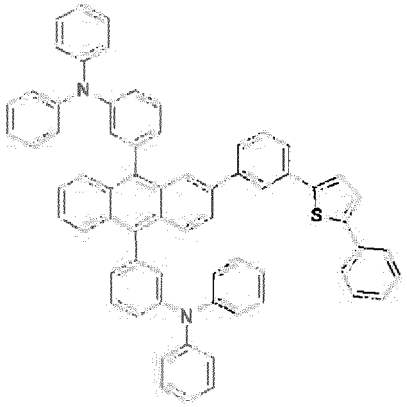
Verbindung	Strukturformel	Verbindung	Strukturformel
		54	
55		56	

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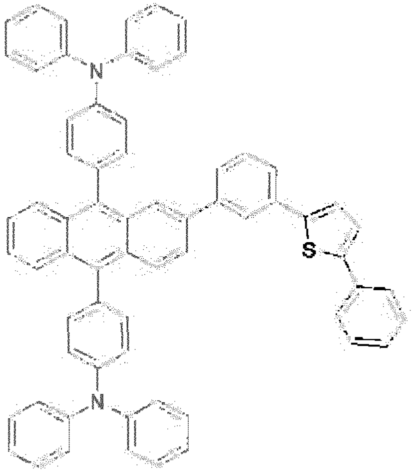
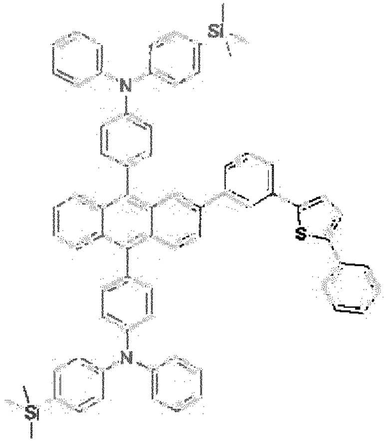
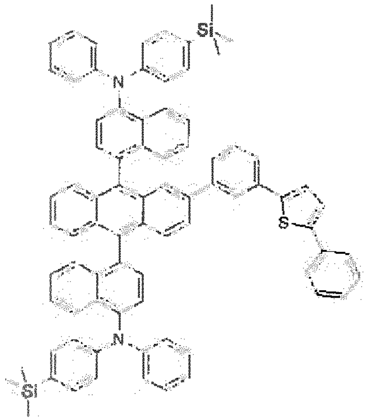
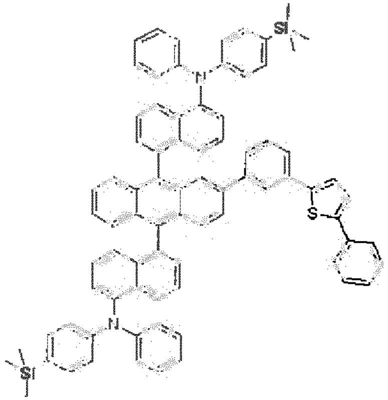
Verbindung	Strukturformel	Verbindung	Strukturformel
57		58	
59		60	

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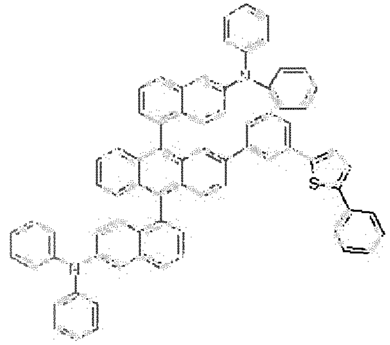
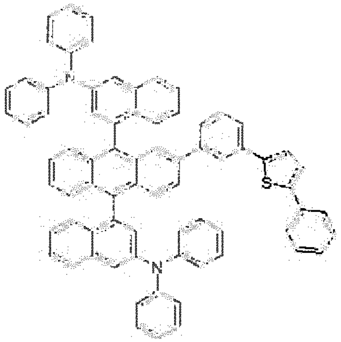
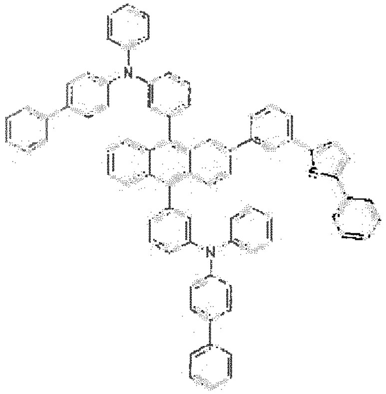
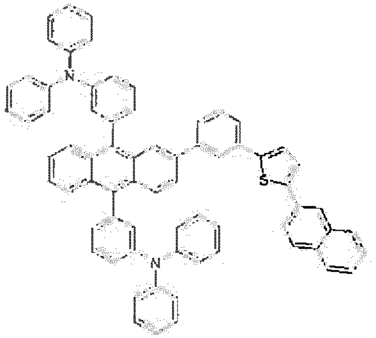
Verbindung	Strukturformel	Verbindung	Strukturformel
61		62	
63		64	

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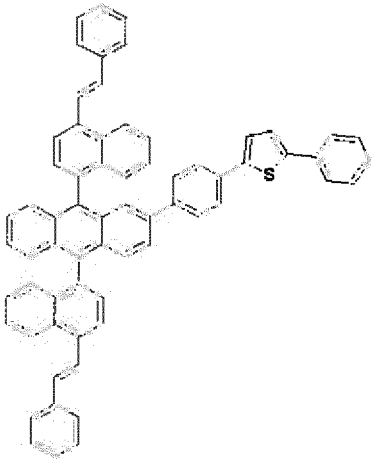
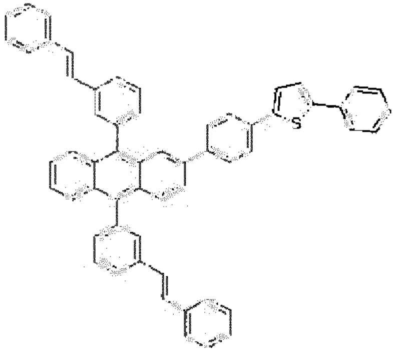
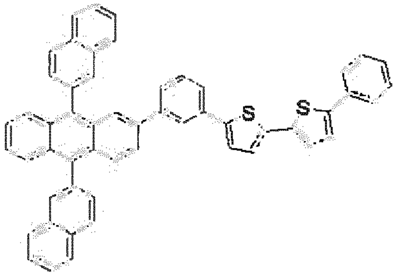
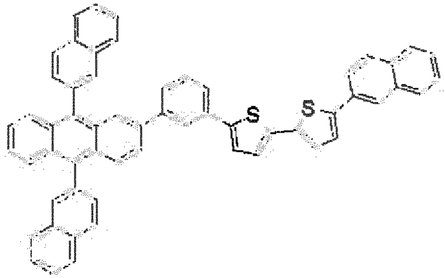
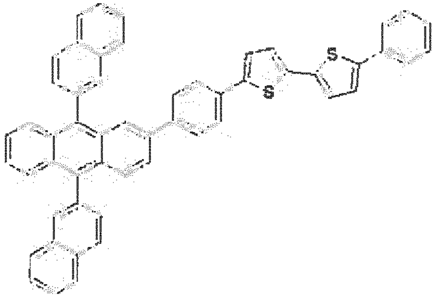
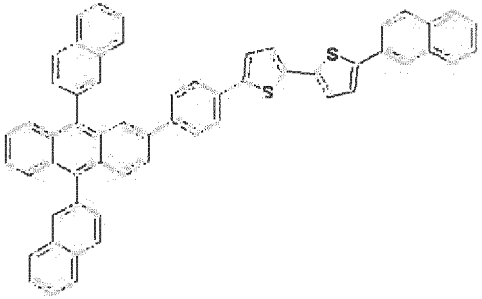
Verbindung	Strukturformel	Verbindung	Strukturformel
65		66	
67		68	
69		70	

16. Organisches lichtemittierendes Bauelement umfassend eine erste Elektrode, eine zweite Elektrode und wenigstens eine organische Materialschicht, die zwischen der ersten Elektrode und der zweiten Elektrode eingefügt ist, wobei wenigstens eine Schicht der organischen Materialschichten die Verbindung nach Anspruch 1 umfasst.

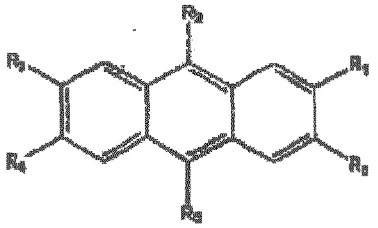
17. Organisches lichtemittierendes Bauelement nach Anspruch 16, wobei die organischen Materialschichten eine lichtemittierende Schicht einschließen und die lichtemittierende Schicht die Verbindung nach Anspruch 1 umfasst.

18. Organisches lichtemittierendes Bauelement nach Anspruch 16, wobei die organischen Materialschichten wenigstens eine einschließen, die ausgewählt ist aus der Gruppe bestehend aus einer Lochinjektionsschicht, einer Lochtransportschicht und einer Elektronentransportschicht.

Revendications

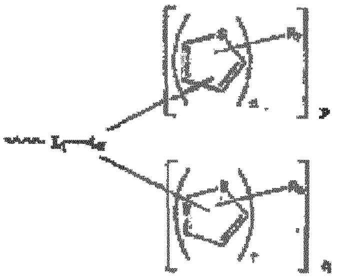
1. Composé représenté par la formule 1 suivante :

[Formule 1]



dans laquelle au moins l'un de R_1, R_3, R_4 et R_6 dans la formule 1 représente un groupe représenté par la formule 2 ;

[Formule 2]



dans laquelle n et p représentent chacun des nombres entiers allant de 1 à 10, et q et r représentent chacun des nombres entiers allant de 0 à 10,
L_1 est une liaison directe ou un groupe aryle en C_5 à C_{20} substitué ou non substitué, ou un groupe hétérocyclique en C_5 à C_{20} substitué ou non substitué,
L2 représente un groupe aryle en C_5 à C_{20}, et
R_1, R_3, R_4 et R_6, qui ne sont pas représentés par la formule 2, dans la formule 1, R_2, R_5 dans la formule 1 et R_7 et R_8 dans la formule 2 représentent chacun indépendamment les substituants identiques ou différents et chacun est sélectionné dans le groupe constitué des groupes hydrogène ; halogène ; hydroxyle ; mercapto ; cyano ; nitro ; carbonyle ; carboxyle ; formyle ; alkyle en C_1 à C_{20} substitué ou non substitué ; alkényle en C_2 à C_{10} substitué ou non substitué, alkynyle en C_2 à C_7 substitué ou non substitué ; aryle en C_6 à C_{32} substitué ou non substitué ; hétéroaryle substitué ou non substitué ; cycloalkyle en C_3 à C_7 substitué ou non substitué dans lequel un atome de carbone dans le cycle peut être substitué par un atome d'oxygène, d'azote ou de soufre ; cycloalkényle en C_4 à C_7 dans lequel un atome de carbone dans le cycle peut être substitué par un atome d'oxygène, d'azote ou de soufre ; alcoxy en C_1 à C_{20} substitué ou non substitué, akényloxy en C_2 à C_{10} substitué ou non substitué ; alkynyloxy en C_2 à C_7 substitué ou non substitué, aryloxy substitué ou non substitué, alkylamine en C_1 à C_{20} substituée ou non substituée, alkénylamine en C_2 à C_{10} substituée ou non substituée ;

alkynylamine en C_2 à C_7 substituée ou non substituée ; arylamine substituée ou non substituée ; alkylarylamine substituée ou non substituée, alkylsilyle en C_1 à C_{20} substitué ou non substitué ; alkénylesilyle en C_2 à C_{10} substitué ou non substitué, alkynylsilyle en C_2 à C_7 substitué ou non substitué ; arylsilyle substitué ou non substitué ; alkylarylsilyle substitué ou non substitué ; alkylboranyle en C_1 à C_{20} substitué ou non substitué ; alkénylboranyle en C_2 à C_{10} substitué ou non substitué ; alkynylboranyle en C_2 à C_7 substitué ou non substitué ; arylboranyle substitué ou non substitué ; alkylarylboranyle substitué ou non substitué ; alkylthio en C_1 à C_{20} substitué ou non substitué ; alkénylthio en C_2 à C_{10} substitué ou non substitué ; alkynylthio en C_2 à C_7 substitué ou non substitué ; et arylthio substitué ou non substitué.

2. Composé selon la revendication 1, dans lequel R_1, R_3, R_4 et qui ne sont pas représentés par la formule 2, dans la formule 1, R_2, R_5 dans la formule 1 et R_7 et R_8 dans la formule 2, sont chacun indépendamment les substituants uniques ou différents, et chacun peut être sélectionné dans le groupe constitué des groupes hydrogène, cyano, nitro, alkyle en C_1 à C_{20} substitué ou non substitué, alkényle en C_2 à C_{10} substitué ou non substitué, cycloalkyle en C_3 à C_7 substitué ou non substitué, cycloalkényle en C_4 à C_7 substitué ou non substitué ; aryle en C_6 à C_{32} substitué ou non substitué, hétéroaryle substitué ou non substitué, alcoxy en C_1 à C_{20} substitué ou non substitué, aryloxy substitué ou non substitué, alkylamine en C_1 à C_{20} substituée ou non substituée, arylamine substituée ou non substituée, alkylarylamine substituée ou non substituée, alkylsilyle en C_1 à C_{20} substitué ou non substitué, alkylboranyle en C_1 à C_{20} substitué ou non substitué, arylboranyle substitué ou non substitué, alkylarylboranyle substitué ou non substitué, alkylthio en C_1 à C_{20} substitué ou non substitué et arylthio substitué ou non substitué.

3. Composé selon la revendication 1, dans lequel R_1, R_3, R_4 et R_6 qui ne sont pas représentés par la formule 2, dans la formule 1, R_2, R_5 dans la formule 1 et R_7 et R_8 dans la formule 2 sont chacun indépendamment mono- ou polysubstitués par les substituants identiques ou différents sélectionnés dans le groupe constitué :

des groupes halogène, hydroxyle, mercapto, cyano, nitro, amino, carbonyle, carboxyle, formyle, alkyle en C_1 à C_{20}, alkényle en C_2 à C_{10}, alkynyle en C_2 à C_7, aryle, hétéroaryle, cycloalkyle en C_3 à C_7, hétérocycle saturé ou insaturé à 3 à 7 chaînons, acryle, alcoxy en C_1 à C_{20}, alkényloxy en C_2 à C_{10}, alkynyloxy en C_2 à C_7, alkylamine en C_1 à C_{20}, alkynylamine en C_2 à C_{10}, alkynylamine en C_2 à C_7, arylamine, alkylarylamine, alkylsilyle en C_1 à C_{20}, alkénylsilyle en C_2 à C_{10}, alkynylsilyle en C_2 à C_7, alcoxysilyle, arylsilyle, alkylarylsilyle, alkylboranyle en C_1 à C_{20}, alkénylboranyle en C_2 à C_{10}, alkynylboranyle en C_2 à C_7, arylboranyle, alkylaryboranyle, alkylthio en C_1 à C_{20}, alkénylthio en C_2 à C_{10}, alkynylthio en C_2 à C_7.

4. Composé selon la revendication 1, dans lequel R_1, R_3, R_4 et R_6 qui ne sont pas représentés par la formule 2, dans la formule 1, R_2, R_5 dans la formule 1 et R_7 et R_8 dans la formule 2 sont chacun indépendamment mono- ou polysubstitués par les substituants identiques ou différents sélectionnés dans le groupe constitué :

des groupes cyano, nitro, formyle, méthyle, éthyle, propyle, phényle, naphtyle, biphényle, anthracényle, imidazolyle, thiazolyle, oxazolyle, thiophényle, pyridyle, pyrimidyle, pyrrolyle, cyclobutényle, cyclopentényle, méthoxy, éthoxy, propoxy, phénoxy, naphtoxy, méthylamine, éthylamine,, propylamine, phénylamine, naphtylamine, méthylphénylamine, éthylphénylamine, éthylnaphtylamine, diméthylboranyle, diéthylboranyle, dipropylboranyle, diphénylboranyle, dinaphtylboranyle, phényl naphtylboranyle, phényl méthylboranyle, naphtylméthylboranyle, naphtyléthylboranyle, triméthylsilyle, triéthylsilyle, tripropylsilyle, triphényl silyle, trinaphtylsilyle, diméthylphényle silyle, diéthylphényle silyle, diphényle méthylsilyle, méthylthio, éthylthio, propylthio, butylthio, phénylthio et naphtylthio.

5. Composé selon la revendication 1, dans lequel le cycloalkyle en C_3 à C_7 substitué ou non substitué dans lequel un atome de carbone dans le cycle peut être substitué par un atome d'oxygène, d'azote ou de soufre, ou le cycloalkényle en C_4 à C_7 dans lequel un atome de carbone dans le cycle peut être substitué par un atome d'oxygène, d'azote ou de soufre, est un cycle saturé ou insaturé, substitué ou non substitué, à 5 ou 6 chaînons.

6. Composé selon la revendication 1, dans lequel R_1, R_3, R_4 et R_6 qui ne sont pas représentés par la formule 2, dans la formule 1, R_2, R_5 dans la formule 1 et R_7 et R_8 dans la formule 2 représentent chacun indépendamment le substituant identique ou différent, et chacun peut être sélectionné dans le groupe constitué des groupes méthyle, éthyle, propyle, butyle, isopropyle, n-butyl, t-butyl, isobutyle, n-pentyle, néo-pentyle, n-hexyle, éthényle, propényle, buténylе, penténylе, hexénylе, 2-méthyle-éthényle, 2-méthyl-propényle, 2-méthyle-buténylе, 2-méthyle-penténylе, 2-méthyl-hexénylе, imidazolyle, thiazolyle, oxazolyle, thiophényle, pyridyle, pyrimidyle, pyrrolyle, 2-méthylimixazolyle, 2-méthylthiazolyle, 2-méthyloxadolyle, phényle, naphtyle, anthracényle, biphényle, terphényle, double spiro, tétranyle, 3-méthyl-phényle, 4-méthyl-naphtyle, 9-méthyl-anthracényle, 4-méthyl-tétracényle, 2-méthyl-imidazolyle, 2-méthyl-oxazolyle, 2-méthyl-thiazolyle, 2-méthyl-furanyle, 2-méthyl-thiophényle, 2-méthyl-pyrazolyle, 2-méthyl-pyridyle, 2-méthyl-pyrimidinyle, méthoxy, éthoxy, propoxy, butoxy, pentoxy, hexoxy, isopropoxy, isobutoxy, t-butoxy, néopentoxy, phénoxy, naphtoxy, biphénoxy, 3-méthyl-phénoxy, 4-méthyl-naphtoxy, 2-méthyl-biphénoxy, méthylamine, éthylamine, propylamine, butylamine, pentylamine, hexylamine, heptylamine, isopropylamine, isobutylamine, t-butylamine, 2-pentylamine, néopentylamine, phénylamine, naphtylamine, biphénylamine, anthracénylamine, 3-méthyl-phénylamine, 4-méthyl-naphtylamine, 2-méthyl-biphénylamine, 9-méthyl-anthracénylamine" phényl méthylamine, phényl éthylamine, naphtylméthylamine, naphtyléthylamine, biphényl méthylamine, 3-méthyl-phényle méthylamine, phényl isopropylamine, naphtylisopropylamine, naphtylisobutylamine, biphényl isopropylanyle, triméthylsilyle, triéthylsilyle, tributylsilyle, tri(isopropyl)silyle, tri(isobutyl)silyle, tri-t-butyl)silyle, tri(2-butyl)silyle, triphényl silyle, trinaphtylsilyle, tribiphényl silyle, tri(3-méthylphényl)silyle, tri(4-méthylnaphtyl)silyle, tri(2-méthylbiphényl)silyle, phényl méthylsilyle, phényl éthylsilyle, naphtylméthylsilyle, naphtyléthylsilyle, biphényl méthylsilyle, 3-méthyl-phényl méthylsilyle, phényl isopropylsilyle, naphtylisopropylsilyle, naphtylisobutylsilyle, biphényl isopropylsilyle, diméthylboranyle, diétylboranyle, dipropylamine, dibutylamine, dipentylamine, diisopropylboranyle, diisobutylboranyle, di(t-butyl)boranyle, isopropylisobutylamine, diphénylboranyle, dinaphtylboranyle, dibiphénylboranyle, di(3-méthylphényl)boranyle, di(4-méthylnaphtyl)boranyle, di(2-méthylbiphényl)boranyle, phényl méthylboranyle, phényl éthylboranyle, naphtylméthylboranyle, naphtyléthylboranyle, biphényl méthylboranyl, 3-méthyl-phényl méthylboranyle, phényl isopropylboranyle, méthylthio, éthylthio, propylthio, butylthio, pentylthio, hexylthio, tri(isopropyl)thio, tri(isobutyl)thio, tri(t-butyl)thio, tri(2-butyl)thio, phénylthio, naphtylthio, biphénylthio, (3-méthylphényl)thio, (4-méthylnaphtyl)thio et (2-méthylphényl)thio.

7. Composé selon la revendication 1, dans lequel R_1, R_3, R_4 et R_6 qui ne sont pas représentés par la formule 2, dans la formule 1, R_2, R_5 dans la formule 1 et R_7 et R_8 dans la formule 2 représentent chacun indépendamment le substituant identique ou différent, et chacun peut être sélectionné dans le groupe constitué des groupes méthyle, éthyle, isopropyle, t-butyle, éthényle, propényle, 2-méthyl-éthényle, 2-méthyle-propényle, imidazolyle, thiazolyle, oxazolyle, 2-méthylimidazolyle, 2-méthylthiazolyle, 2-méthyloxazolyle, phényle, naphtyle, biphényle, anthracényle, terphényle, 3-méthyl-phényle, 4-méthyl-naphtyle, méthoxy, éthoxy, isopropoxy, isobutoxy, phénoxy, naphtoxy, 3-méthyl-phénoxy, 4-méthyl-naphtoxy, méthylamine, éthylamine, isopropylamine, isobutylamine, t-butylamine, phénylamine, naphtylamine, 3-méthyl-phénylamine, 4-méthylnaphtylamine, phényl méthylamine, phényl éthylamine, naphtylméthylamine, 3-méthyl-phényl méthylamine, phényl isopropylamine, triméthylsilyle, triéthylsilyle, tri(isopropyl)silyle, tri(isobutyl)silyle, triphényl silyle, trinaphtylsilyle, tri(3-méthylphényl)silyle, tri(4-méthylnaphtyl)silyle, phényl méthylsilyle, phényl éthylsilyle, 3-méthyl-phényle méthylsilyle, phényle isopropylsilyle, diméthylboranyle, diéthylboranyle, diisopropylboranyle, diisobutylboranyle, diphénylboranyle, dinaphtylboranyle, di(3-méthylphénylboranyle, di(4-méthylnaphtyle)boranyle, phényl méthylboranyle, phényl éthylboranyle, 3-méthyl-phényl méthylboranyle, phényl isopropylboranyle, méthylthio, éthylthio, tri(isopropyl)thio, tri(isobutyl)thio, phénylthio, naphtylthio, 3(-méthylphényl)thio et (4-méthylnaphtyl)thio.

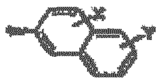
8. Composé selon la revendication 1, dans lequel R_1, R_3, R_4 et R_6 qui ne sont pas représentés par la formule 2, dans la formule 1, R_2, R_5 dans la formule 1 et R_7 et R_8 dans la formule 2 représentent chacun indépendamment le substituant identique ou différent, et chacun peut être sélectionné dans le groupe constitué des groupes phényle substitué ou non substitué, naphtyle substitué ou non substitué, biphényle substitué ou non substitué, terphényle substitué ou non substitué et anthracényle substitué ou non substitué.

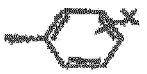
9. Composé selon la revendication 8, dans lequel le phényle, le naphtyle, le biphényle, le terphényle et l'anthracényle substitués sont substitués par au moins un composé sélectionné dans le groupe constitué des groupes cyano, nitro, formyle, alkyle en C_1 à C_{20} substitué ou non substitué, aryle, hétéroaryle, cycloalkényle en C_4 à C_7, alcoxy en C_1 à C_{20} substitué ou non substitué, aryloxy, alkylamine en C_1 à C_{20}, arylamine, alkylarylamine, silyle en C_1 à C_{20}, arylsilyle, alkylarylsilyle, alkylboranyle en C_1 à C_{20}, arylboranyle, alkylboranyle, alkylthio en C_1 à C_{20} et arylthio.

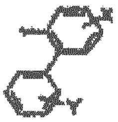
10. Composé selon la revendication 1, dans lequel dans la formule 1, l'un de R_1 et R_6 et l'un de R_3 et R_4 sont les même substituants que ceux représentés par la formule 2.

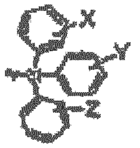
11. Composé selon la revendication 1, dans lequel dans la formule 1, l'un de R_1 et R_6 et l'un de R_3 et R_4 sont les substituants différents représentés par la formule 2 et l'un parmi eux est un substituant représenté par la formule 2 avec L_1 représentant une liaison directe, le phényle, le naphtyle ou le carbazole.

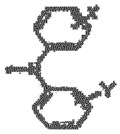
12. Composé selon la revendication 1, dans lequel au moins l'un de R_1, R_3, R_4 et R_6 est représenté par la formule 2 et le reste composé de R_1, R_3, R_4 et R_6, R_2 et R_5 peut être sélectionné dans le groupe constitué de :

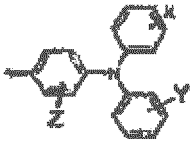


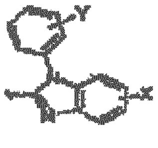


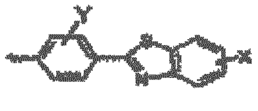


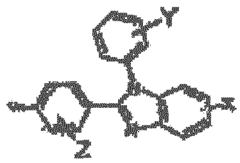


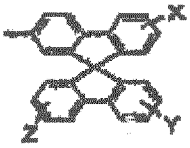


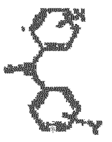


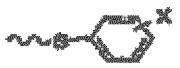


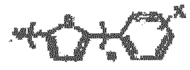


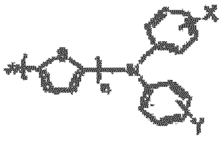


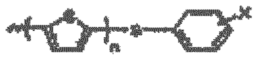


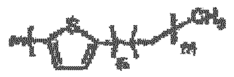


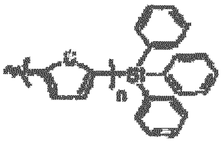


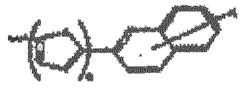










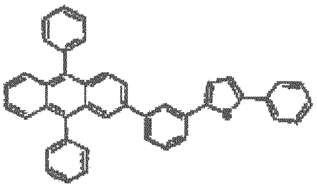
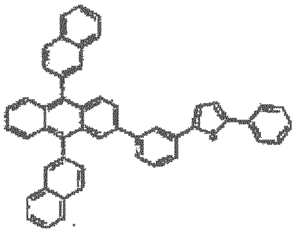
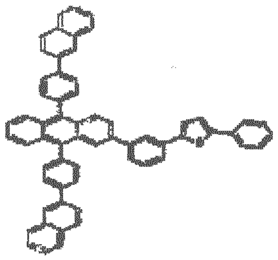
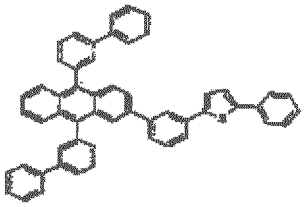
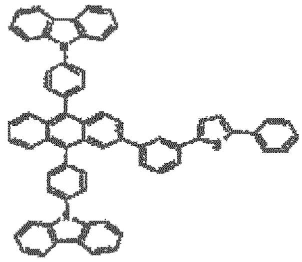
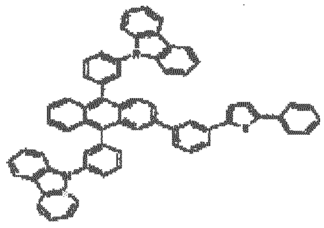
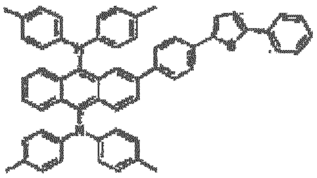
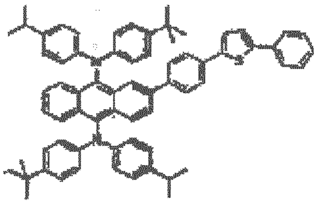
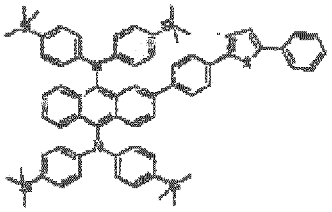
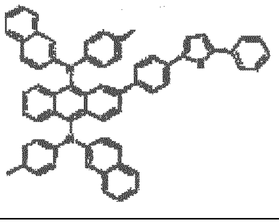
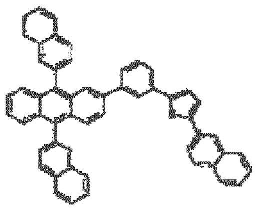


dans lequel X, Y et Z représentent chacun indépendamment les substituants identiques ou différents et chaque groupement cyclique auquel X, Y ou Z peut être rattaché peut être substitué par un ou plusieurs des substituants identiques ou différents, tels que X, Y et Z, et
X, Y et Z sont chacun indépendamment sélectionnés dans le groupe constitué de cyano, nitro, formyle, alkyle en C_1 à C_{20} substitué ou non substitué, aryle, hétéroaryle, cycloalkényle en C_4 à C_7, alcoxy en C_1 à C_{20} substitué ou non substitué, aryloxy, alkylamine en C_1 à C_{20}, arylamine, alkylarylamine, silyle en C_1 à C_{20}, arylsilyle, alkylarylsilyle, alkylboranyle en C_1 à C_{20}, arylboranyle, alkylarylboranyle, alkylthio an C_1 à C_{20} et arylthio.

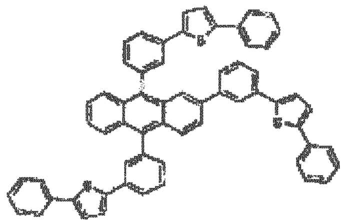
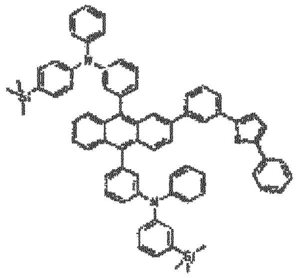
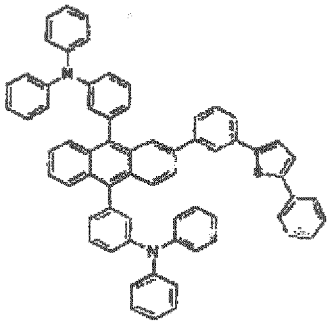
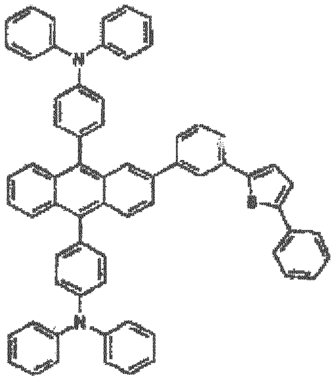
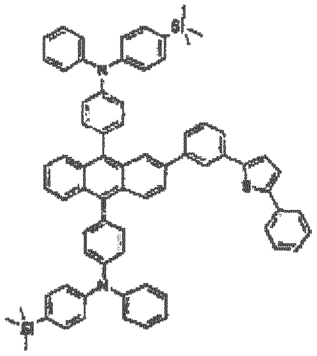
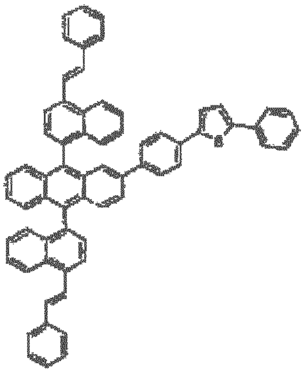
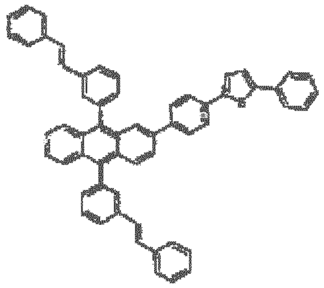
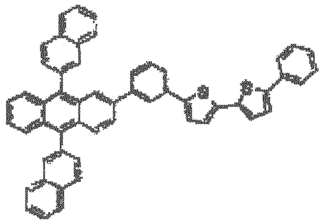
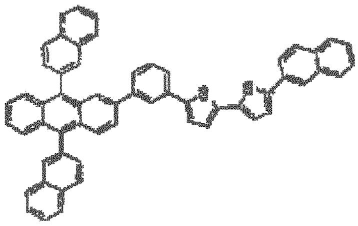
13. Composé selon la revendication 12, dans lequel X, Y et Z sont chacun indépendamment sélectionnés dans le groupe constitué de cyano, nitro, méthyle, éthyle, isopropyle, t-butyle, méthoxy, éthoxy, propoxy, méthylthio, inidazolyle, pyridyle, thiazolyle, oxazolyle, furanyle, thiophényle, pyrrolyle, pyridyle et pyrimidyle.

14. Composé selon la revendication 1, lequel dans la formule 2, L_1 représente une liaison directe ou le phényle, le naphtyle ou le carbazole et L_2 représente le phényle, le naphtyle ou l'anthracényle.

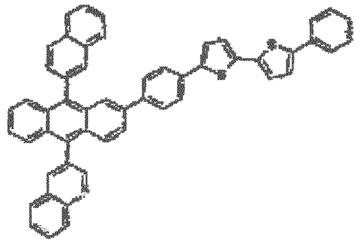
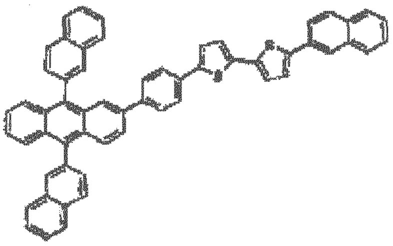
15. Composé selon la revendication 1, lequel composé est sélectionné parmi le groupe constitué de :

Composé	Formule structurelle	Composé	Formule structurelle
13		14	
15		16	
17		16	
		22	
23		24	
25			
		46	

(suite)

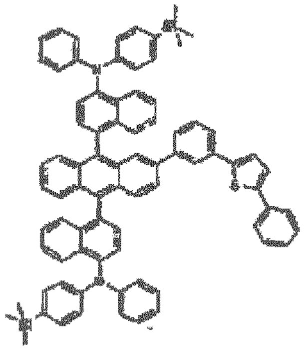
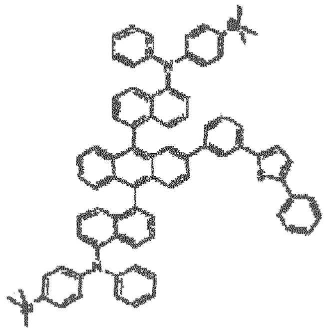
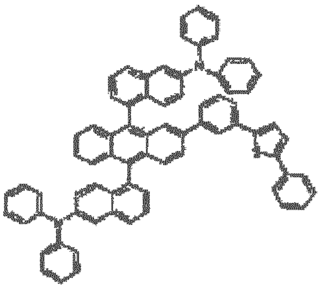
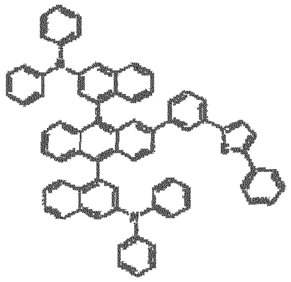
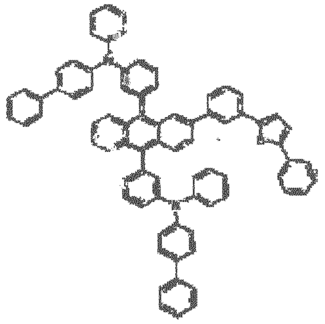
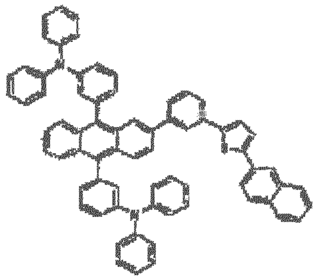
Composé	Formule structurelle	Composé	Formule structurelle
		54	
55		56	
57		58	
65		66	
67		68	

(suite)

Composé	Formule structurelle	Composé	Formule structurelle
69		70	

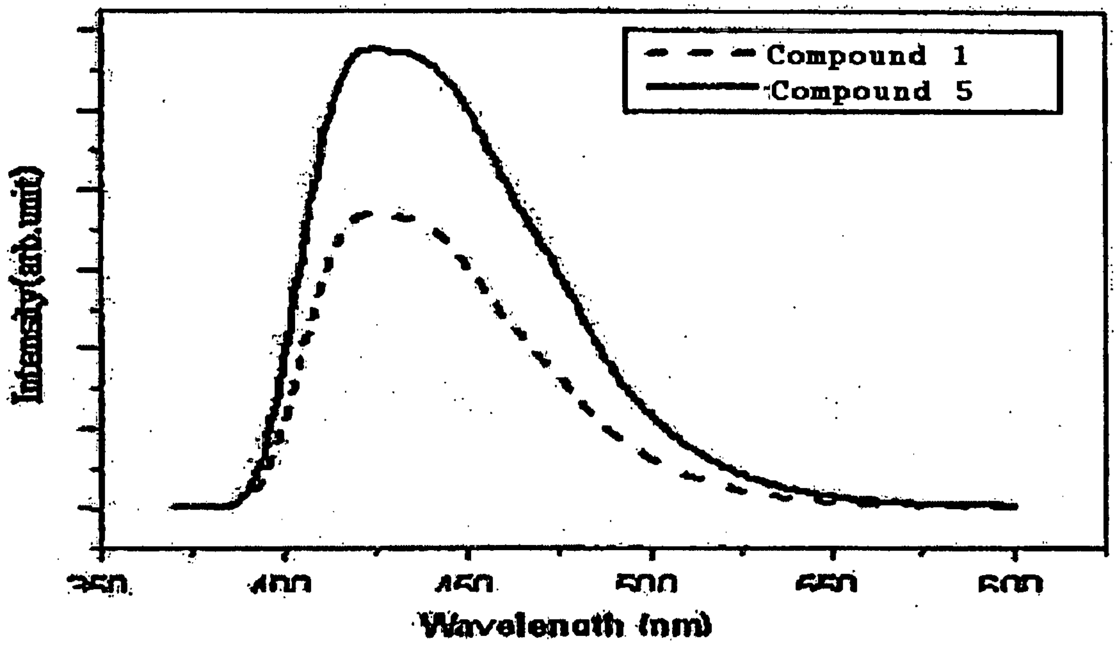
16. Dispositif électroluminescent organique comprenant une première électrode, une deuxième électrode et au moins une couche de matériau organique interposée entre la première électrode et la deuxième électrode, dans lequel au moins une couche des couches de matériau organique renferme le composé selon la revendication 1.

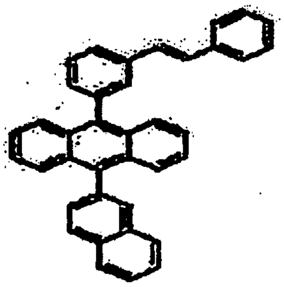
17. Dispositif électroluminescent selon la revendication 16, dans lequel les couches de matériau organique renferment une couche électroluminescente et la couche électroluminescente renferme le composé selon la revendication 1.

59		60	
61		62	
63		64	

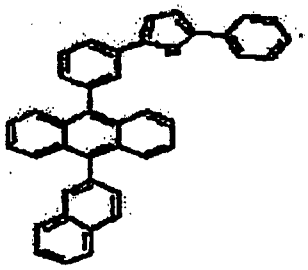
18. Dispositif électroluminescent selon la revendication 16, dans lequel les couches de matériau organique comprennent au moins un composé sélectionné dans le groupe constitué d'une couche d'injection de trous, d'une couche de transport de trous et d'une couche de transport d'électrons.

【Figure 1】



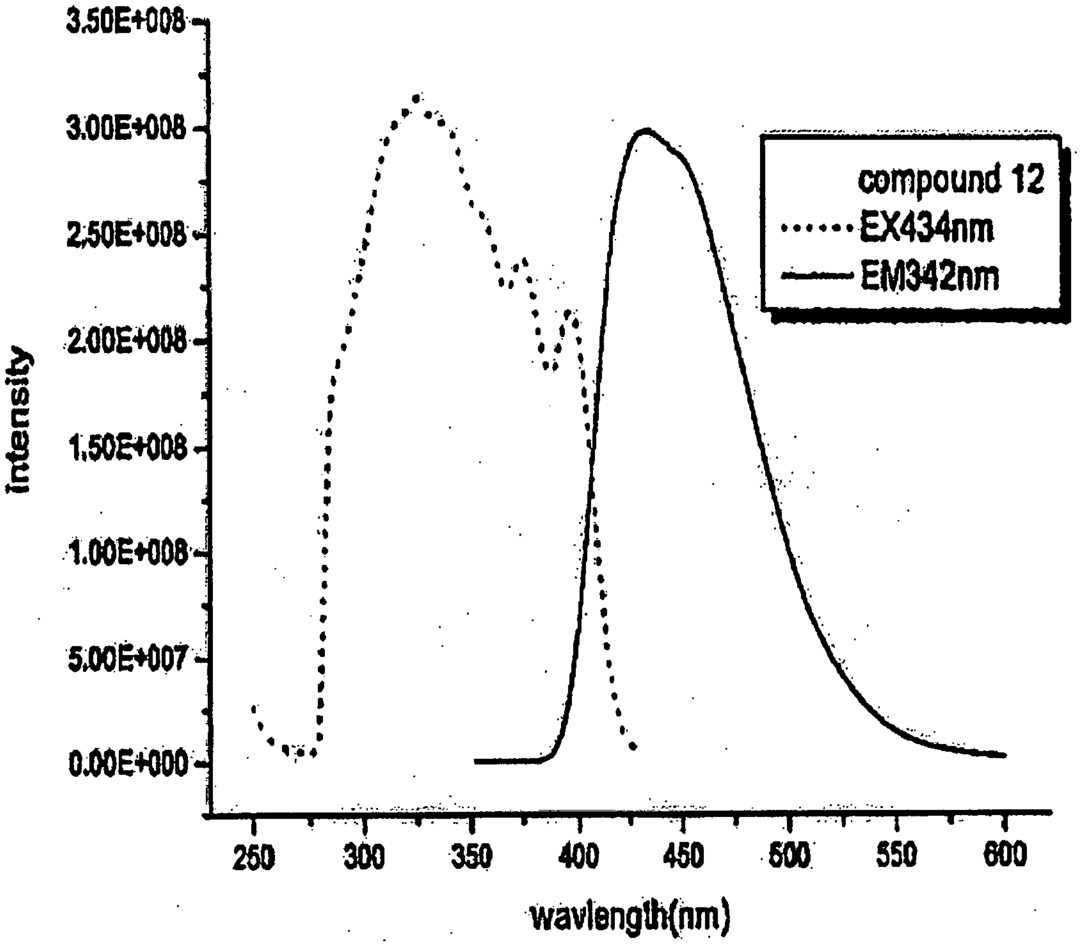


Comparative compound 1

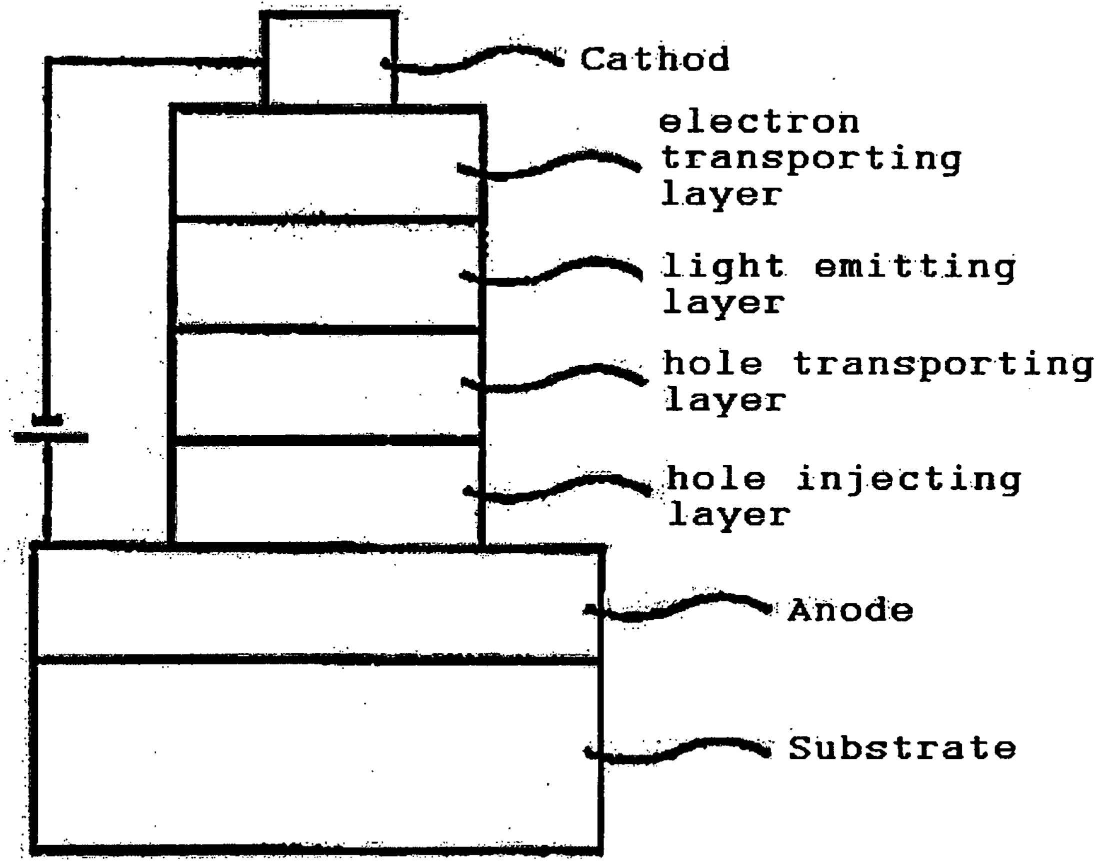


Compound 5

【Figure 2】


3.50E+008
3.00E+008
2.50E+008
2.00E+008
1.50E+008
1.00E+008
5.00E+007
0.00E+000
Intensity
250
300
350
400
450
500
550
600
wavlength(nm)
compound 12
EX434nm
EM342nm

【Figure 3】


Cathod
electron transporting layer
light emitting layer
hole transporting layer
hole injecting layer
Anode
Substrate

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- KR 1020060003883 **[0002]**
- WO 02088274 A1 **[0006]**
- WO 2003012890 A **[0065]**

专利名称(译)	发光材料和使用其的有机发光器件		
公开(公告)号	EP1971664B1	公开(公告)日	2015-09-09
申请号	EP2007700956	申请日	2007-01-12
[标]申请(专利权)人(译)	乐金化学股份有限公司		
申请(专利权)人(译)	LG化学有限公司.		
当前申请(专利权)人(译)	LG化学有限公司.		
[标]发明人	KIM KONG KYEOM C O LG CHEM LTD RES PARK JANG HYE YOUNG		
发明人	KIM, KONG-KYEOM C/O LG CHEM. LTD., RESEARCH PARK, JANG, HYE-YOUNG		
IPC分类号	C09K11/06 C07D333/08 C07D333/18 C07D409/14 H01L51/50 C07D409/10		
CPC分类号	C09K11/06 C07D333/08 C07D333/18 C07D409/10 C07D409/14 C09K2211/1011 C09K2211/1014 C09K2211/1029 C09K2211/1092 H01L51/5012 H01L51/5048 H01L51/5088 H05B33/14		
优先权	1020060003883 2006-01-13 KR		
其他公开文献	EP1971664A4 EP1971664A1		
外部链接	Espacenet		

摘要(译)

本发明提供一种新型发光材料和使用该发光材料的有机发光器件。

[Formula 1]