US 20120168739A1

(19) **United States**

(12) **Patent Application Publication**

KAMATANI et al.

(10) **Pub. No.: US 2012/0168739 A1**

(43) **Pub. Date: Jul. 5, 2012**

(54) **FLUORENE COMPOUND AND ORGANIC ELECTROLUMINESCENCE DEVICE**

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(21) Appl. No.: **13/415,160**

(22) Filed: **Mar. 8, 2012**

Related U.S. Application Data

(62) Division of application No. 11/914,406, filed on Nov. 14, 2007, now Pat. No. 8,158,835, filed as application No. PCT/JP2006/325451 on Dec. 14, 2006.

(30) **Foreign Application Priority Data**

Dec. 20, 2005 (JP) 2005-366205
Apr. 14, 2006 (JP) 2006-111726
Dec. 5, 2006 (JP) 2006-327780

Publication Classification

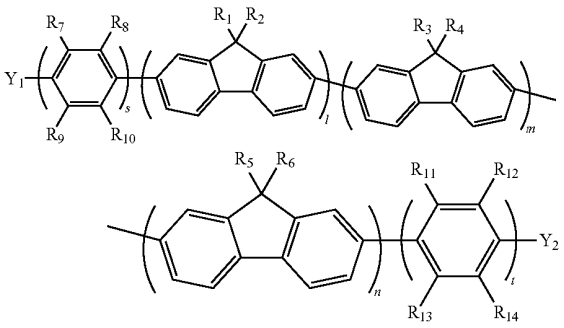
(51) **Int. Cl.**
H01L 51/54 (2006.01)
C07C 13/66 (2006.01)

(52) **U.S. Cl.** **257/40**; 585/27; 257/E51.026

(57) **ABSTRACT**

Provided is a novel fluorene compound, which is represented by the following general formula (1):

(1)



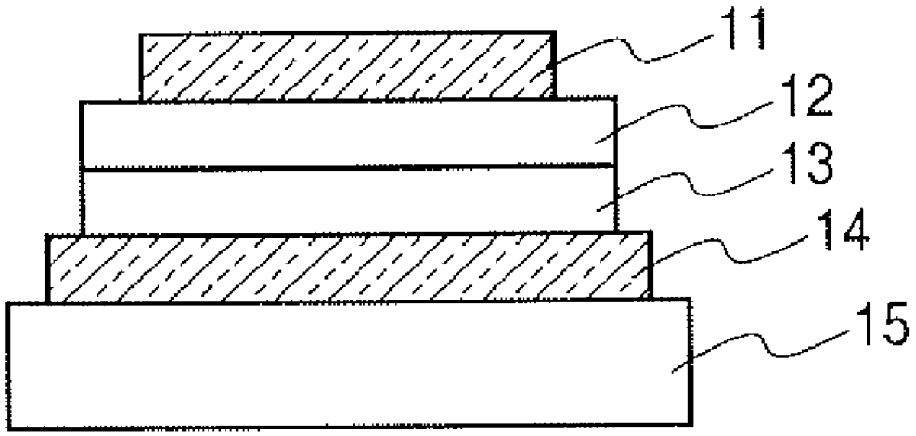


FIG. 1A

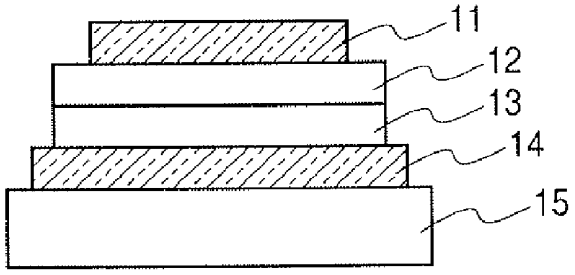


FIG. 1B

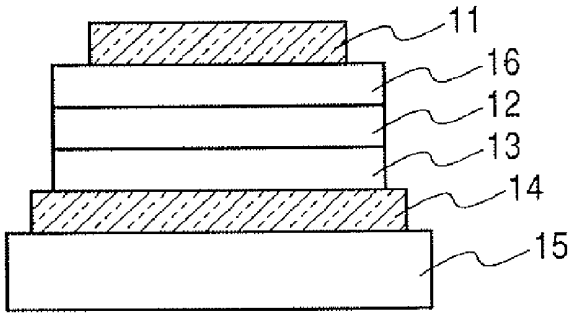
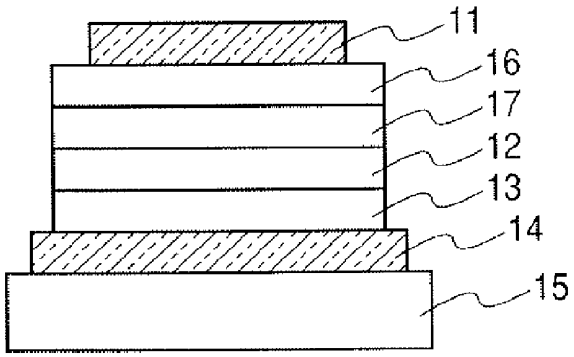


FIG. 1C



FLUORENE COMPOUND AND ORGANIC ELECTROLUMINESCENCE DEVICE

TECHNICAL FIELD

[0001] The present invention relates to a fluorene compound, and an organic electroluminescence device (organic EL device) using the fluorene compound.

BACKGROUND ART

[0002] The recent progress of an organic light emitting device is significant, and the device suggests its potential to find use in a wide variety of applications because of the following reasons. The device shows a high luminance at a low applied voltage. In addition, the device has a variety of emission wavelengths. Furthermore, the device can be a thin, light-weight light emitting device with high-speed responsiveness.

[0003] However, at present, an optical output with additionally high luminance, or additionally high conversion efficiency has been needed. In addition, the organic light emitting device still has many problems in terms of durability. For example, the device changes over time owing to long-term use, and deteriorates owing to an atmospheric gas containing oxygen, humidity, or the like. Further, in the case where it is assumed that the device is applied to, for example, a full-color display, the device must emit blue light, green light, and red light each having good color purity. However, problems concerning the color purity of each of the blue light, the green light, and the red light have not been sufficiently solved yet.

[0004] In addition, research has been conducted on a large number of aromatic compounds and condensed polycyclic aromatic compounds as fluorescent organic compounds each of which is used in, for example, an electron transport layer or a light emitting layer. However, it is hard to say that a compound capable of sufficiently satisfying emission luminance or durability has been obtained.

[0005] Japanese Patent Application Laid-Open No. 2004-43349, International Publication No. 99/54385, and Japanese Patent Application Laid-Open No. 2003-229273 each disclose the application of a fluorene compound to an organic EL. In addition, Journal of Fluorescence, Vol. 5, No. 3, 295 (1995) reports a fluorene compound to be applied to a laser dye.

DISCLOSURE OF THE INVENTION

[0006] The application of an organic EL device to a display apparatus such as a display requests the organic EL device to have an optical output with high efficiency and high luminance, and, at the same time, to secure high durability sufficiently. However, it cannot be said that problems concerning the optical output and the durability have already been sufficiently solved.

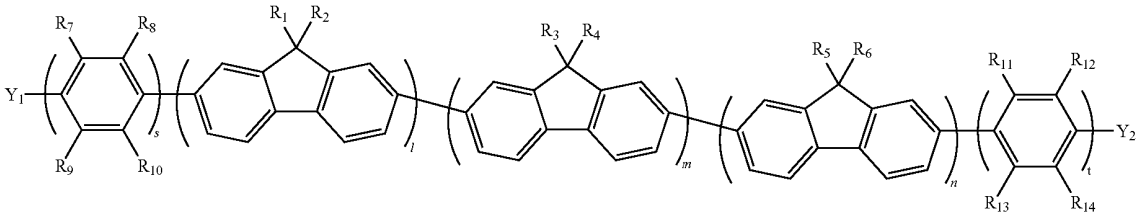
[0007] An object of the present invention is to provide a novel fluorene compound.

[0008] Another object of the present invention is to provide an organic EL device using the fluorene compound and having an optical output with high efficiency and high luminance. Another object of the present invention is to provide an organic EL device having high durability. Another object of the present invention is to provide an organic EL device that can be easily produced at a relatively low cost.

[0009] That is, according to the present invention, there are provided fluorene compounds as follows.

[0010] A fluorene compound represented by the following general formula (1):

(1)



wherein:

[0011] R_1 to R_{14} are each independently selected from the group consisting of

[0012] a hydrogen atom,

[0013] a halogen atom,

[0014] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group which may have a substituent or a divalent heterocyclic group which may have a substituent, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

[0015] an amino group which may have a substituent,

[0016] a silyl group which may have a substituent,

[0017] an aryl group which may have a substituent, and

[0018] a heterocyclic group which may have a substituent;

[0019] Y_1 is composed of a condensed ring structure which is constituted only of SP^2 carbon and hydrogen and which may have a substituent;

[0020] Y_2 is composed of a hydrogen atom, or a condensed ring structure which is constituted only of SP^2 carbon and hydrogen and which may have a substituent provided that Y_2 is composed of a hydrogen atom when t=0;

[0021] l, m, and n each represent an integer of 0 to 10, and a total of l, m, and n represents an integer of 1 to 20, s represents an integer of 1 to 10, and t represents an integer of 0 to 10; and

[0022] substituents each appearing in a phrase "may have a substituent" are each independently selected from the group consisting of

[0023] a halogen atom,

[0024] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

[0025] an amino group,

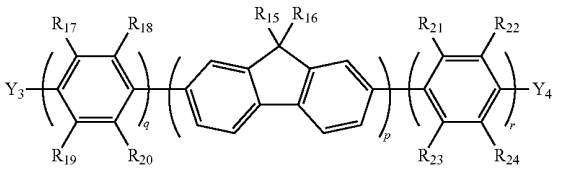
[0026] a silyl group,

[0027] an aryl group, and

[0028] a heterocyclic group.

[0029] A fluorene compound represented by the following general formula (2):

(2)



wherein:

[0030] R_{15} to R_{24} are each independently selected from the group consisting of

[0031] a hydrogen atom,

[0032] a halogen atom,

[0033] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group which may have a substituent or a divalent heterocyclic group which may have a substituent, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

[0034] an amino group which may have a substituent,

[0035] a silyl group which may have a substituent,

[0036] an aryl group which may have a substituent, and

[0037] a heterocyclic group which may have a substituent;

[0038] Y_3 is composed of a condensed ring structure which is constituted only of SP^2 carbon and hydrogen and which may have a substituent;

[0039] Y_4 is composed of a hydrogen atom, or a condensed ring structure which is constituted only of SP^2 carbon and hydrogen and which may have a substituent provided that Y_4 is composed of a hydrogen atom when r=0;

[0040] p represents an integer of 1 to 20;

[0041] q represents an integer of 1 to 10, and r represents an integer of 0 to 10; and

[0042] substituents each appearing in a phrase "may have a substituent" are each independently selected from the group consisting of

[0043] a halogen atom,

[0044] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

[0045] a diphenylamino group,

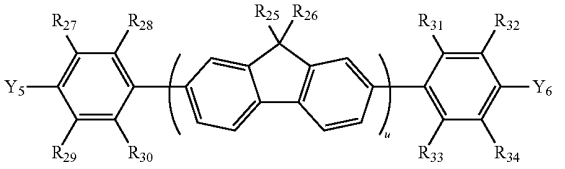
[0046] a triphenylsilyl group,

[0047] an aryl group, and

[0048] a heterocyclic group.

[0049] A fluorene compound represented by the following general formula (3):

(3)



wherein:

[0050] R_{25} to R_{34} are each independently selected from the group consisting of

[0051] a hydrogen atom,

[0052] a halogen atom,

[0053] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group which may have a substituent or a divalent heterocyclic group which may have a substituent, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

[0054] an amino group which may have a substituent,

[0055] a silyl group which may have a substituent,

[0056] an aryl group which may have a substituent, and

[0057] a heterocyclic group which may have a substituent;

[0058] Y_5 and Y_6 are composed of a condensed ring structure which is constituted only of SP^2 carbon and hydrogen and which may have a substituent;

[0059] u represents an integer of 1 to 20; and

[0060] substituents each appearing in a phrase "may have a substituent" are each independently selected from the group consisting of

[0061] a halogen atom,

[0062] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

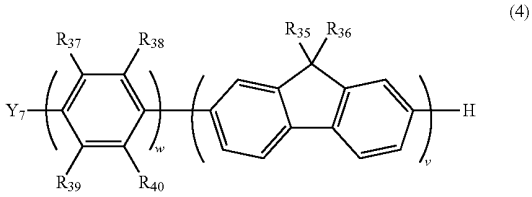
[0063] a diphehylamino group,

[0064] a triphenylsilyl group,

[0065] an aryl group, and

[0066] a heterocyclic group.

[0067] A fluorene compound represented by the following general formula (4):



(4)

wherein:

[0068] R_{35} to R_{40} are each independently selected from the group consisting of

[0069] a hydrogen atom,

[0070] a halogen atom,

[0071] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group which may have a substituent or a divalent heterocyclic group which may have a substituent, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

[0072] an amino group which may have a substituent,

[0073] a silyl group which may have a substituent,

[0074] an aryl group which may have a substituent, and

[0075] a heterocyclic group which may have a substituent;

[0076] Y_7 is composed of a condensed ring structure which is constituted only of SP^2 carbon and hydrogen and which may have a substituent;

[0077] v represents an integer of 1 to 20;

[0078] w represents an integer of 1 to 10; and

[0079] substituents each appearing in a phrase "may have a substituent" are each independently selected from the group consisting of

[0080] a halogen atom,

[0081] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

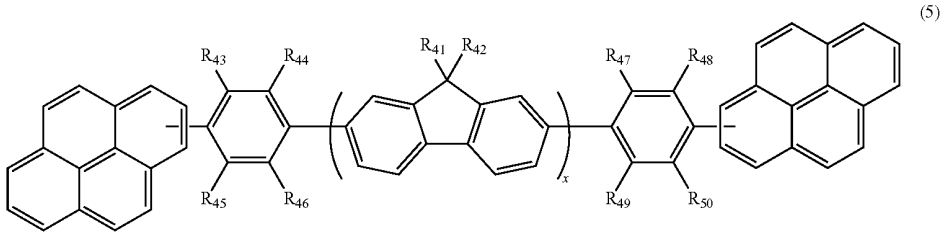
[0082] a diphenylamino group,

[0083] a triphenylsilyl group,

[0084] an aryl group, and

[0085] a heterocyclic group.

[0086] A fluorene compound represented by the following general formula (5):



(5)

wherein:

[0087] R_{41} to R_{50} are each independently selected from the group consisting of a hydrogen atom, a halogen atom, and a linear or branched alkyl group having 1 to 20 carbon atoms provided that at least one of R_{43} to R_{50} represents a linear or branched alkyl group having 1 to 20 carbon atoms when a pyrenyl group has no substituent;

[0088] x represents an integer of 1 to 20; and

[0089] the pyrenyl group may have substituents, and the substituents are each independently selected from the group consisting of

[0090] a halogen atom,

[0091] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

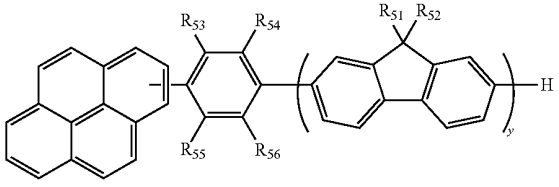
[0092] a diphenylamino group,

[0093] a triphenylsilyl group,

[0094] an aryl group, and

[0095] a heterocyclic group.

[0096] A fluorene compound represented by the following general formula (6):



(6)

wherein:

[0097] R_{51} to R_{56} are each independently selected from the group consisting of a hydrogen atom, a halogen atom, and a linear or branched alkyl group having 1 to 20 carbon atoms;

[0098] y represents an integer of 1 to 20; and

[0099] a pyrenyl group may have substituents, and the substituents are each independently selected from the group consisting of

[0100] a halogen atom,

[0101] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

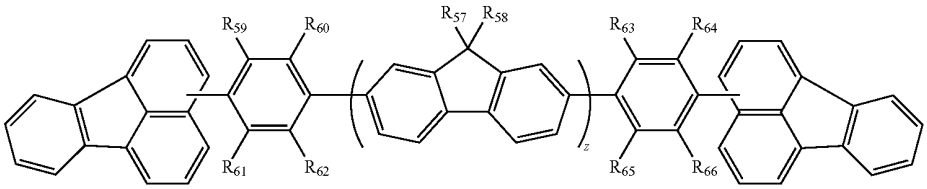
[0102] a diphenylamino group,

[0103] a triphenylsilyl group,

[0104] an aryl group, and

[0105] a heterocyclic group.

[0106] A fluorene compound represented by the following general formula (7):



(7)

wherein:

[0107] R_{57} to R_{66} are each independently selected from the group consisting of a hydrogen atom, a halogen atom, and a linear or branched alkyl group having 1 to 20 carbon atoms;

[0108] z represents an integer of 1 to 20; and

[0109] the fluoranthenyl group may have substituents, and the substituents are each independently selected from the group consisting of

[0110] a halogen atom,

[0111] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or one or two or more methylene groups each may be substituted by an arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

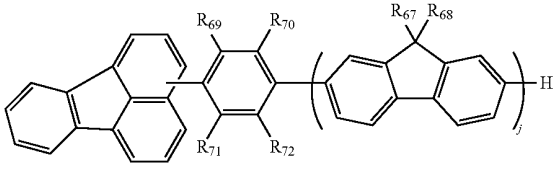
[0112] a diphenylamino group,

[0113] a triphenylsilyl group,

[0114] an aryl group, and

[0115] a heterocyclic group.

[0116] A fluorene compound represented by the following general formula (8):



(8)

wherein:

[0117] R_{67} to R_{72} are each independently selected from the group consisting of a hydrogen atom, a halogen atom, and a linear or branched alkyl group having 1 to 20 carbon atoms;

[0118] j represents an integer of 1 to 20; and

[0119] the fluoranthenyl group may have substituents, and the substituents are each independently selected from the group consisting of

[0120] a halogen atom,

[0121] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

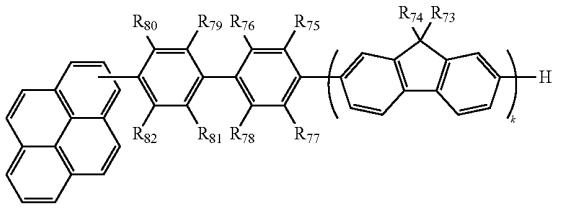
[0122] a diphenylamino group,

[0123] a triphenylsilyl group,

[0124] an aryl group, and

[0125] a heterocyclic group.

[0126] A fluorene compound represented by the following general formula (9):



(9)

wherein:

[0127] R_{73} to R_{82} are each independently selected from the group consisting of a hydrogen atom, a halogen atom, and a linear or branched alkyl group having 1 to 20 carbon atoms;

[0128] k represents an integer of 1 to 20; and

[0129] the pyrenyl group may have substituents, and

[0130] the substituents are each independently selected from the group consisting of

[0131] a halogen atom,

[0132] a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—; —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an

arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom,

[0133] a diphenylamino group,

[0134] a triphenylsilyl group,

[0135] an aryl group, and

[0136] a heterocyclic group.

[0137] A light emitting device of the present invention using the fluorene compound of the present invention, in particular, a light emitting device of the present invention using the compound as a host for a light emitting layer is an excellent device because the device can not only emit light with high efficiency but also maintain high luminance for a longer time period than that of a compound conventionally used. In addition, the device shows a larger current value than that of a conventional device at the same voltage value, and hence can be expected to be driven at a low voltage.

BRIEF DESCRIPTION OF THE DRAWINGS

[0138] FIGS. **1**A, **1**B, and **1**C are views each showing an example of a light emitting device of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0139] First, a fluorene compound of the present invention will be described.

[0140] When a light emitting layer is composed of a host material and a guest each having carrier transport property, light emission mainly involves the following several processes:

1. the transport of an electron or a hole in the light emitting layer;
2. the generation of an exciton of the host;
3. the transfer of excitation energy between host molecules; and
4. the transfer of excitation energy from the host to the guest.

[0141] Desired energy transfer or light emission in each process occurs in competition with various deactivation processes.

[0142] It goes without saying that an improvement in luminous efficiency of an EL device requests a material itself that is mainly responsible for light emission to have a large light emission quantum efficiency. However, how efficiently energy can be transferred between host molecules or between a host and a guest is also of great concern. In addition, no cause for the degradation of light emission due to energization has been revealed at present. However, the degradation is assumed to be related to at least the material itself that is mainly responsible for light emission or a change in environment surrounding the luminescent material due to a molecule around the material.

[0143] In view of the foregoing, the inventors of the present invention have made various studies, and have found the following by using a fluorene compound represented by any one of the general formulae (1) to (8) in a charge transport layer or light emitting layer of an organic EL device, or preferably by using the compound as a host or guest for the light emitting layer. That is, the inventors have found that, when the compound is used, the device emits light with high efficiency, maintains high luminance for a long time period, and shows small degradation of light emission due to energization.

[0144] The mobility of the host for the light emitting layer is an example of the causes for the degradation of light emission due to energization. When the shape of a molecule of the light emitting layer is such that the degree to which the conjugate surfaces of molecules overlap each other is small, the mobility reduces, and the voltage at which the device is driven increases. In addition, the foregoing may cause a reduction in injection property. From this viewpoint, it is probably necessary to design molecules in such a manner that there is a skeleton where the molecules overlap each other. However, the site where the molecules overlap each other lengthens a conjugation length. In view of the foregoing, the conjugation length of a site serving as a core must not be significantly shortened.

[0145] In view of the overlapping of molecules and a conjugation length, the fluorene compound of the present invention preferably uses a para-phenyl group to connect a site serving as a central skeleton (one or more connected fluorenyl groups) and a site having overlapping (condensed ring structure composed only of hydrocarbon). When a phenyl group does not use to combine a condensed ring skeleton with a fluorenyl group, conjugation spreads and therefore, control of movility comes to be difficult. In contrast, in the present invention, since a phenyl group is used, control of electron transportability comes to be easy. Accordingly, an optimum charge amount can be controlled in the organic EL device, whereby high ruminance can be maintained for a long time period and small degradation of light emission due to energization can be realized. In this case, however, when the compound has phenyl groups on both of its sides, the number of phenyl groups is two, and the number of condensed ring structures is two, so the molecular weight of the compound is apt to increase. This point adversely affects sublimation property. Accordingly, a phenyl group or a condensed ring structure is preferably present only on one side, though phenyl groups or condensed ring structures may be present on both sides. When phenyl groups are present on both sides, a condensed ring structure on one side is preferably as simple as naphthalene. In the case of, for example, a pyrenyl group, in order that an intermolecular force may be suppressed to improve sublimation property, the pyrenyl group preferably has a substituent, or, when the pyrenyl group has no substituent, an adjacent phenyl group preferably has a substituent such as a methyl group. In addition, when an alkyl group at 9-position of a fluorenyl group of the central skeleton becomes long, the glass transition temperature and melting point of the compound tend to reduce. Accordingly, the alkyl group at 9-position of the fluorenyl group is preferably a methyl group, but a long-chain alkyl group such as an ethyl group, a propyl group, and a butyl group is also permitted. In addition, the chain lengths of 9-positions of the respective fluorenyl groups are preferably identical to each other from the viewpoint of synthesis, but may be different from each other. In addition, the substituent of the phenyl group is preferably a hydrogen atom from the viewpoint of conductivity, but an alkyl group such as a methyl group and an ethyl group is also permitted from the viewpoints of a conjugation length and crystallinity.

[0146] In addition, a guest molecule must have a skeleton having a high quantum efficiency, and a skeleton having a high quantum efficiency must be introduced into a condensed ring portion. On the basis of those points, when the compound of the present invention is used in the light emitting layer of a fluorescent light emitting device, the compound can be used

as each of a host material and a guest material each having a color ranging from a blue color to a red color, or mainly from a blue color to a green color because the compound has a condensed ring structure. A light emitting device having high efficiency can be realized by using, in a condensed ring portion, a skeleton a condensed ring of which is formed of SP^2 carbon credited with a high quantum efficiency and high charge transport property such as pyrene, anthracene, fluoranthane, benzofluoranthane, perylene, tetracene, chrysene, or picene. In addition, the device can be similarly realized by using a skeleton such as a fluorenyl group.

[0147] In addition, the charge transport property of a molecule can be controlled by: separately using a compound having condensed ring structures of this type on both sides and a compound having a condensed ring structure of this type on one side; adjusting the number of phenyl groups; or introducing a substituent to be possessed by a phenyl group. The adjustment of the number of condensed ring structures or the number of phenyl groups has an effect on the establishment of the carrier balance of a device, so improvements in lifetime and efficiency can be expected from the adjustment.

[0148] Further, when the material is used as a host material, the use of a guest material having a condensed ring plus amine skeleton as a luminescent material can provide a combination of the host material having high electron transport property and the guest material having hole transport property. In this case, a charge balance in the light emitting layer can be established, so light emission with high efficiency and a long lifetime can be expected. Of course, even when each of a host and a guest has a skeleton composed only of hydrocarbon, the use of the compound of the present invention can realize high efficiency and a long lifetime.

[0149] As described above, the use of the compound of the present invention in a light emitting layer is effective; the use of the compound in an electron transport layer, a hole transport layer, an electron blocking layer, a hole blocking layer, an electron injection layer, or a hole injection layer is also effective.

[0150] Hereinafter, specific structural formulae of organic compounds to be used in the present invention are shown below. However, the formulae merely exemplify representative examples, and the present invention is not limited to them.

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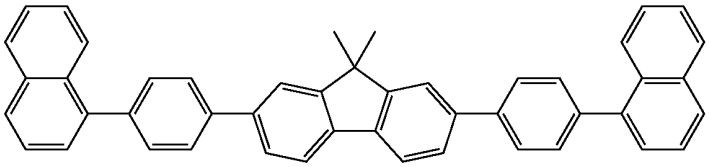

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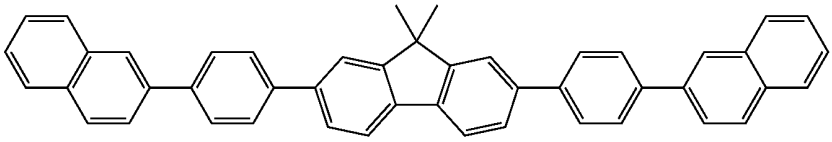

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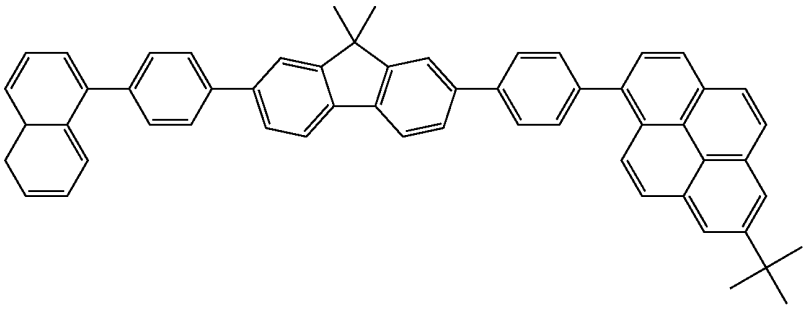

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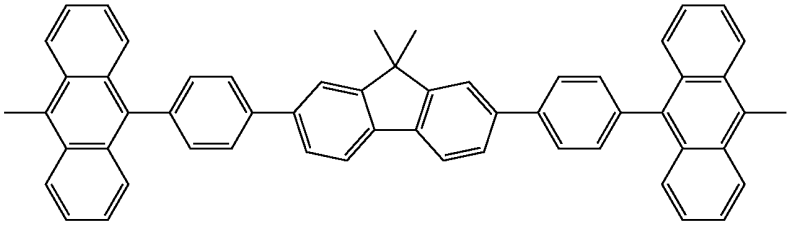

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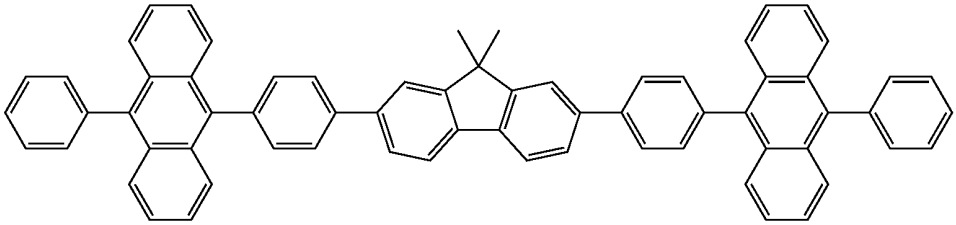

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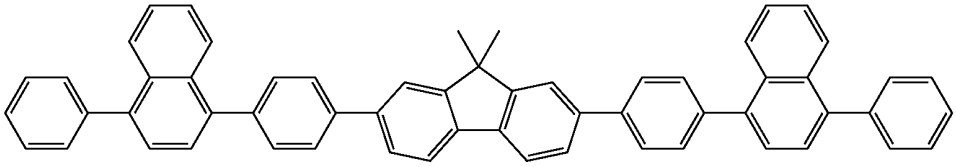

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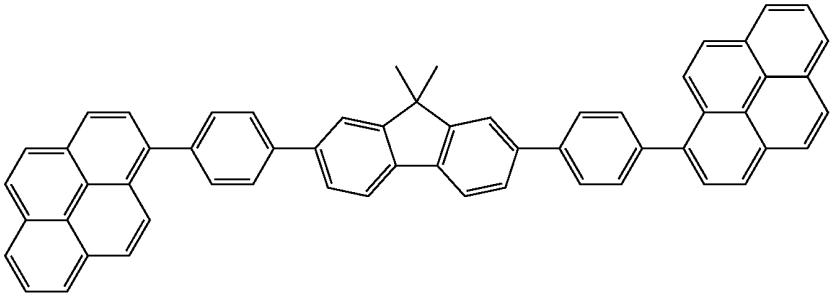

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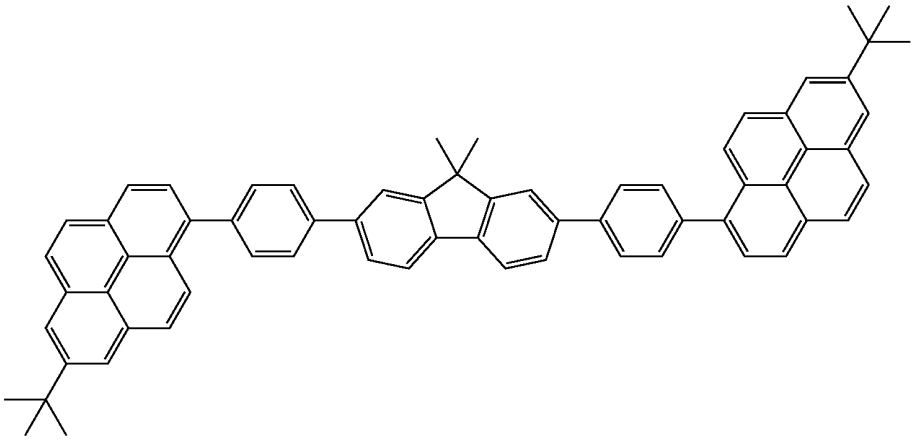

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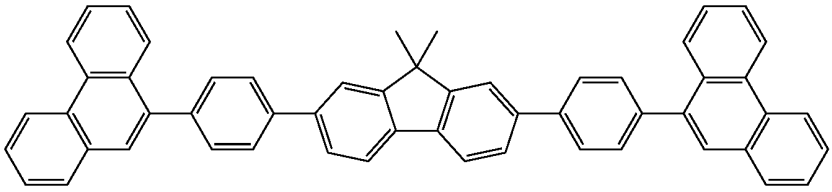

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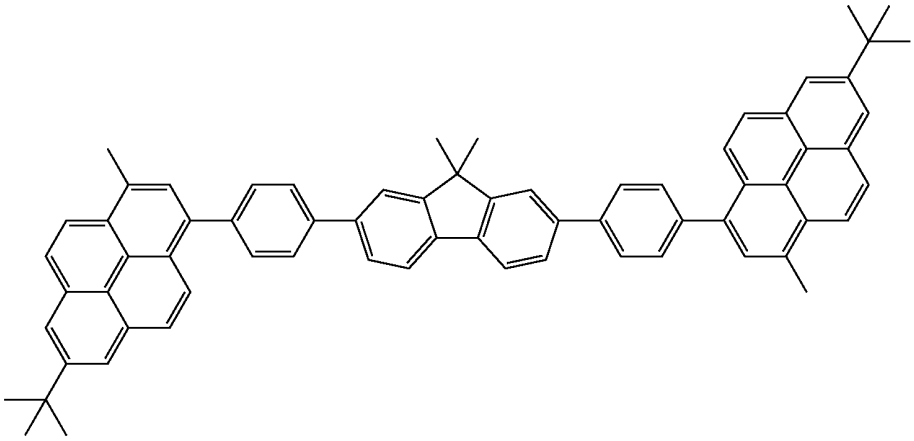

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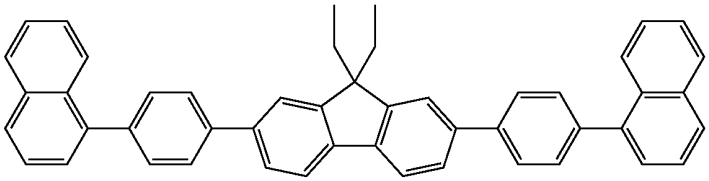

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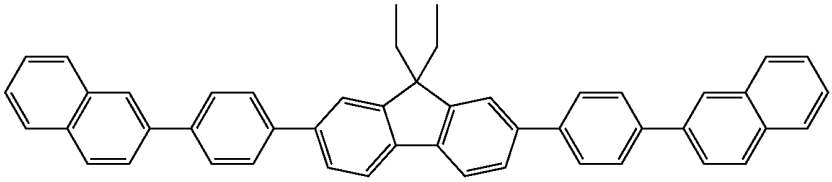

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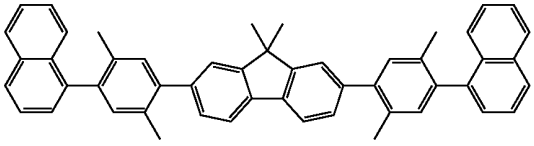

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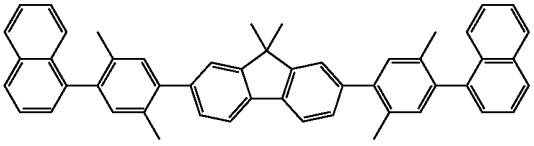

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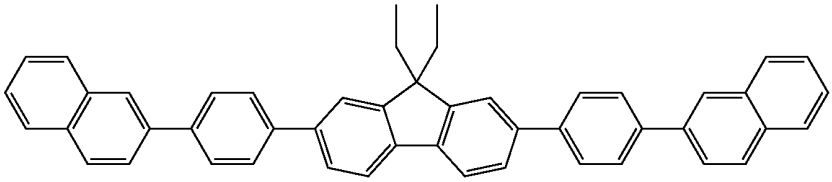

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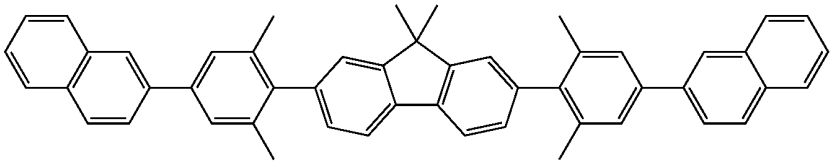

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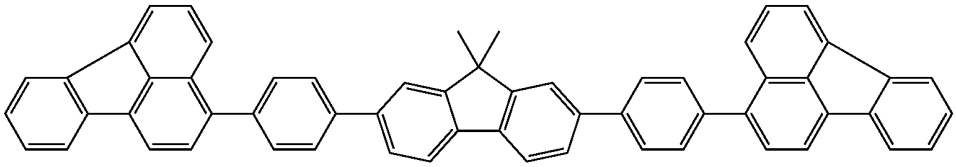

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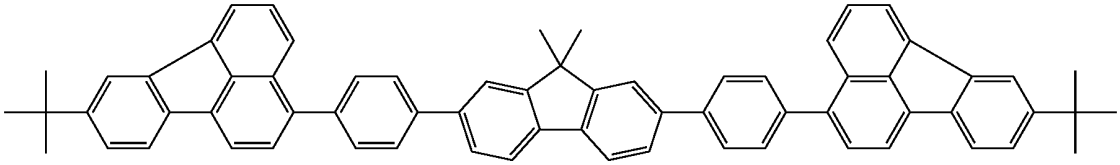

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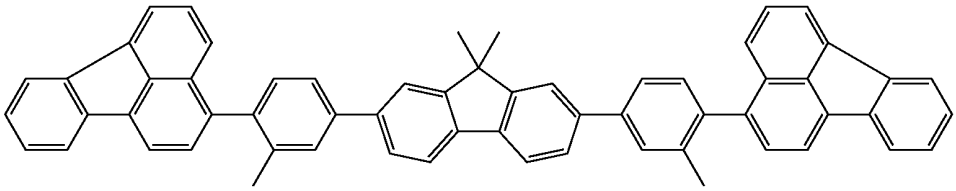

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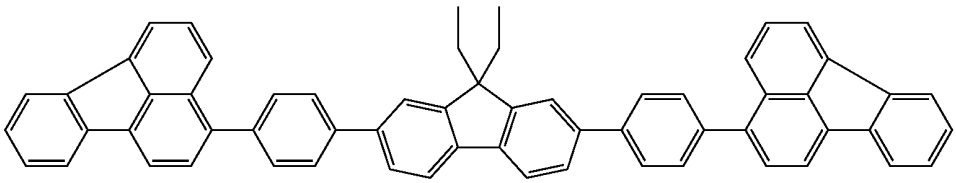

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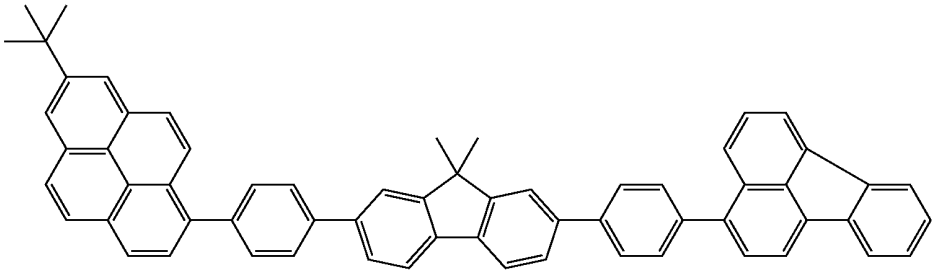

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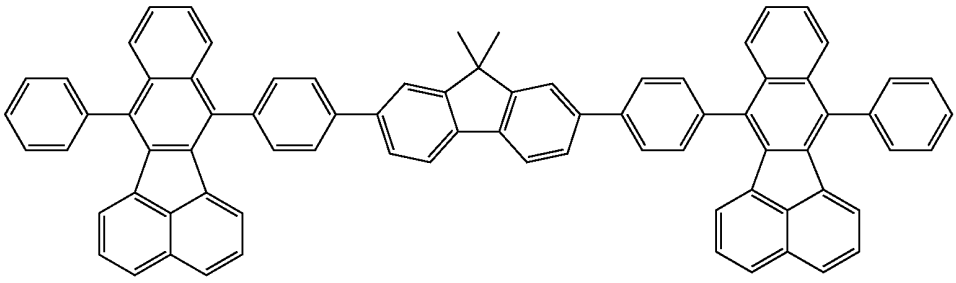

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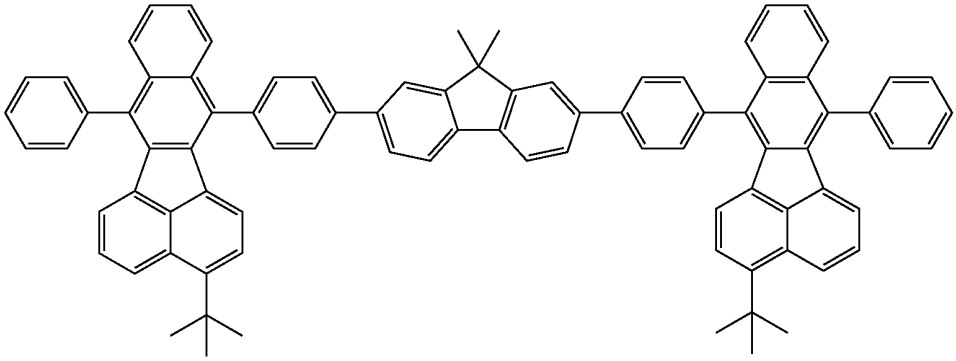

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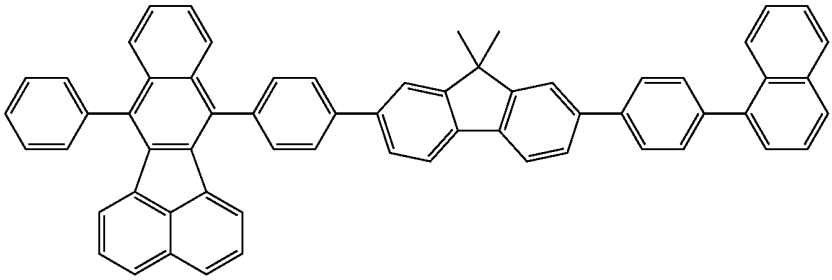

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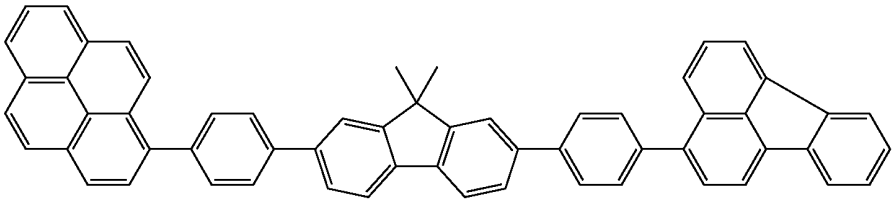

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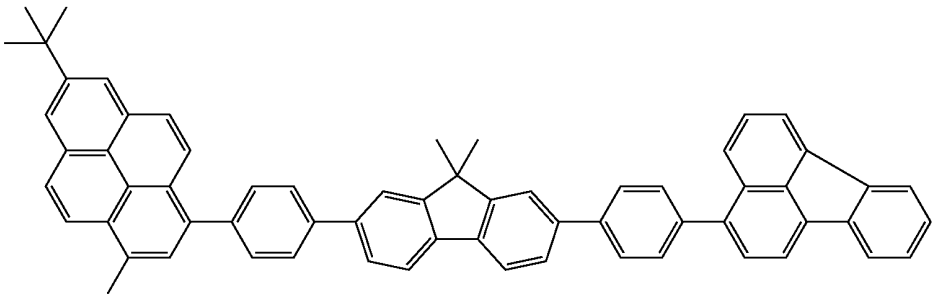

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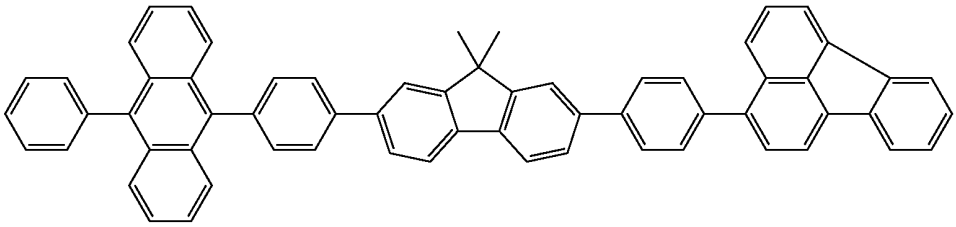

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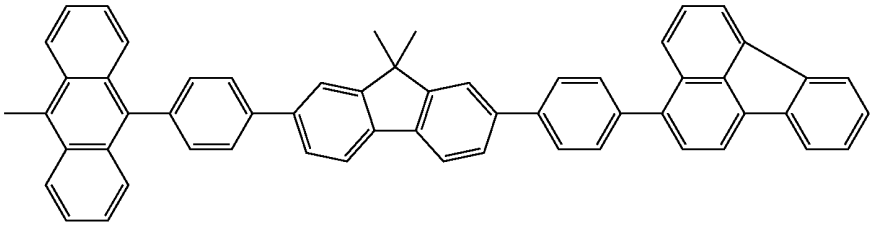

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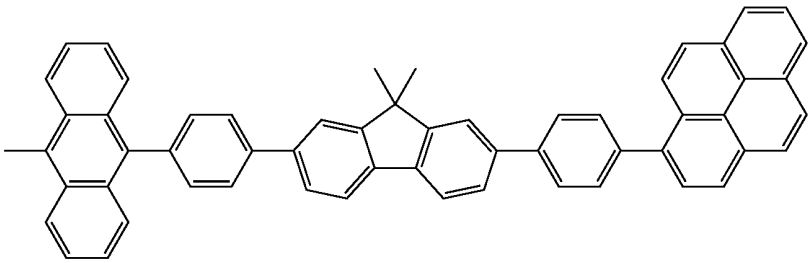

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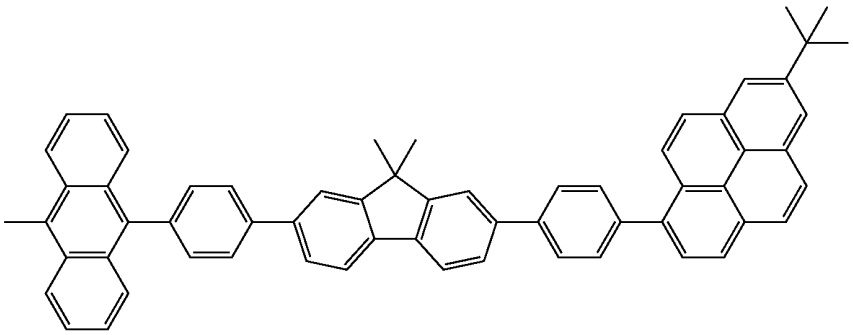

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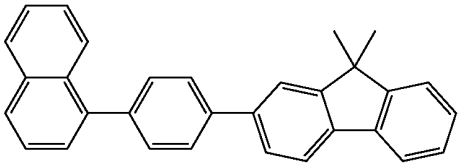

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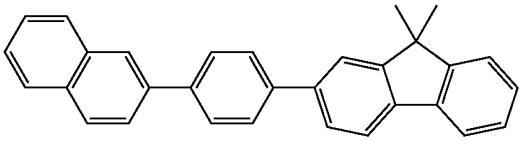

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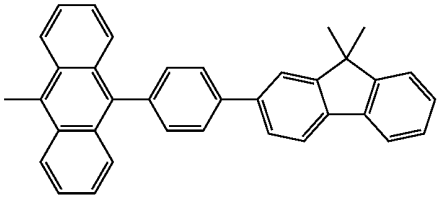

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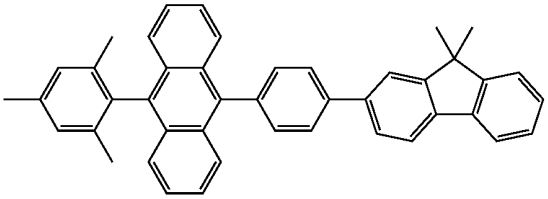

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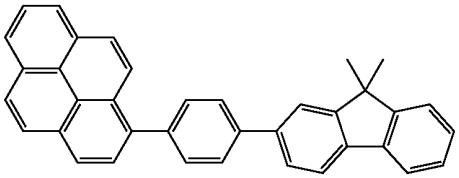

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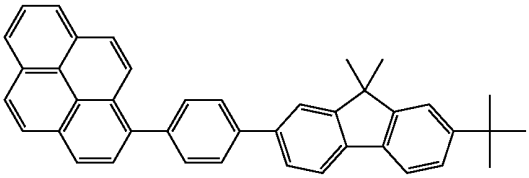

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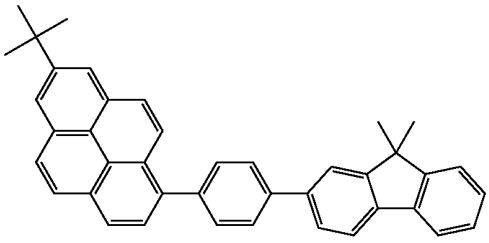

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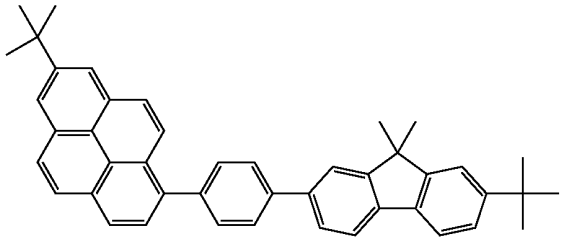

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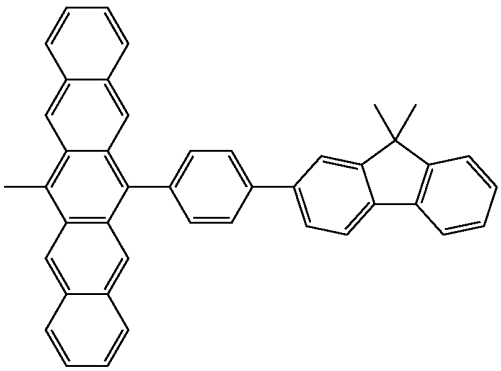

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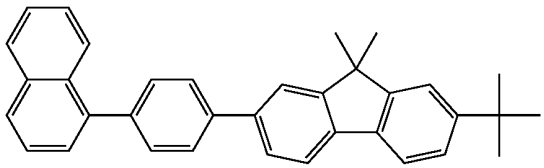

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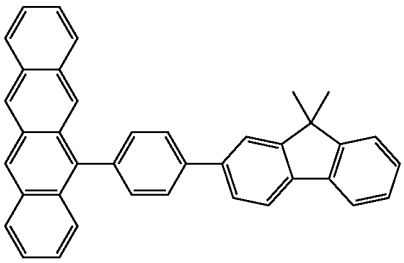

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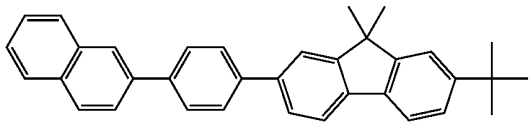

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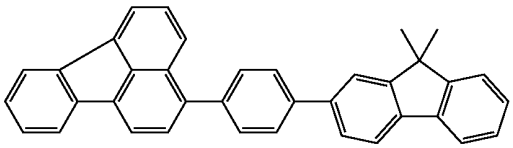

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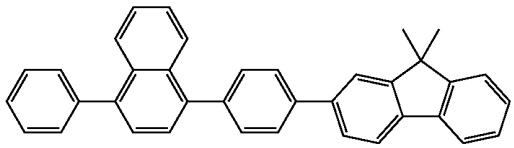

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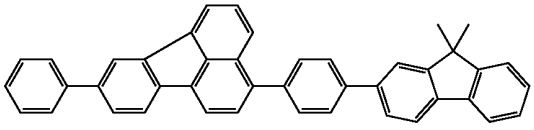

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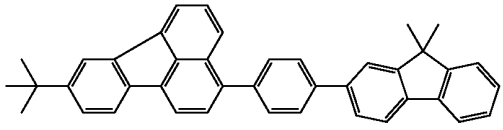

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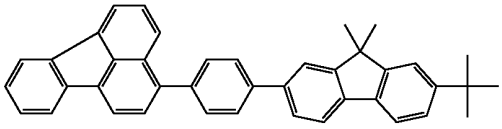

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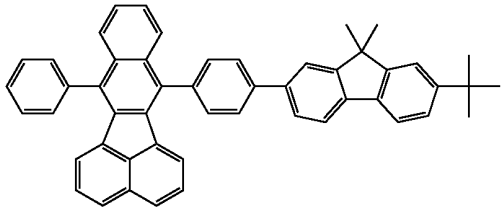

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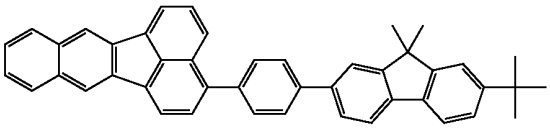

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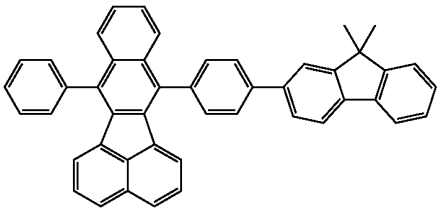

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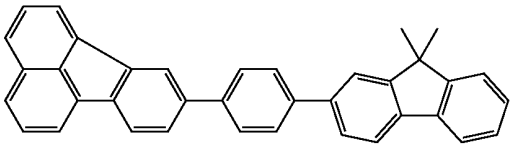

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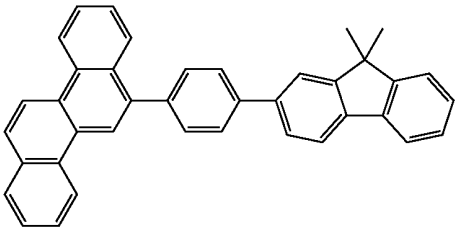

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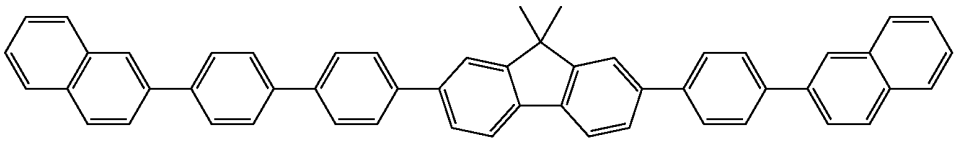

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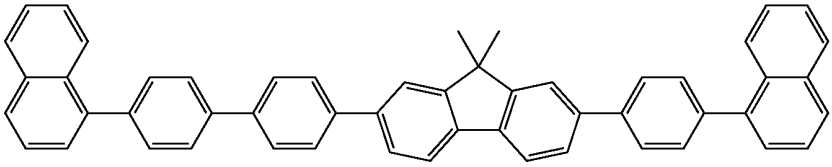

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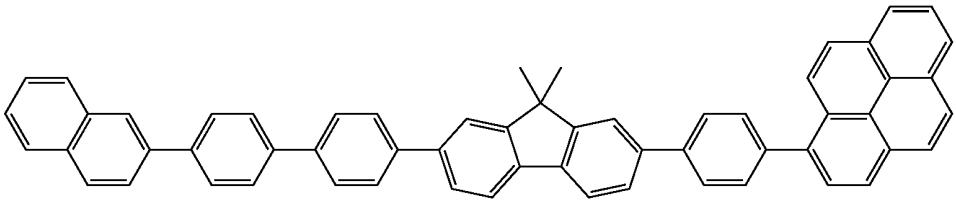

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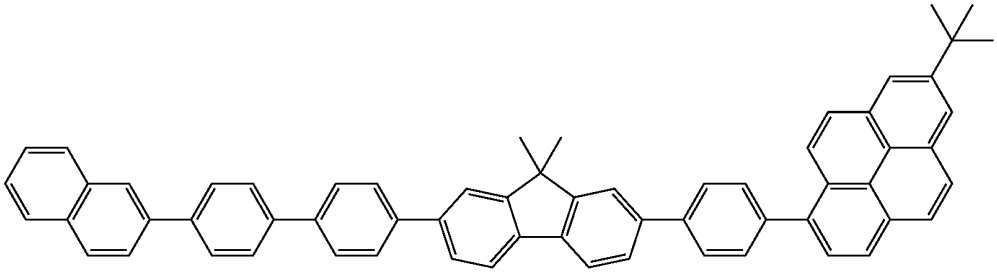

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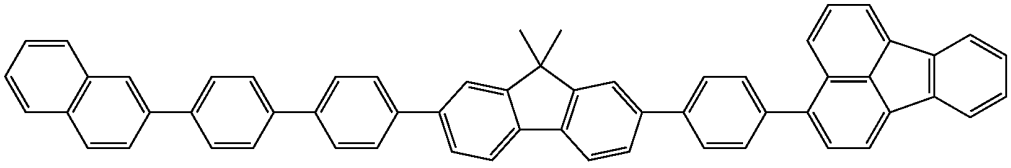

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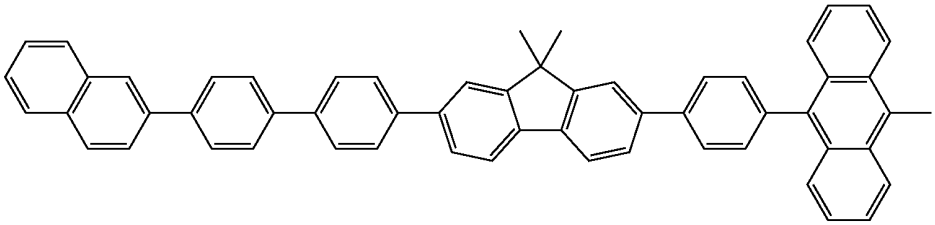

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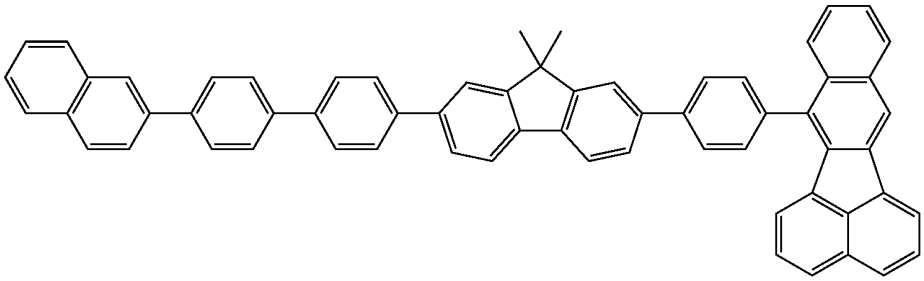

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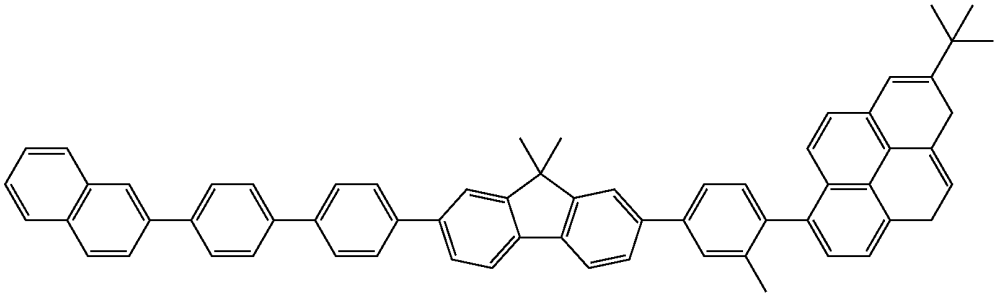

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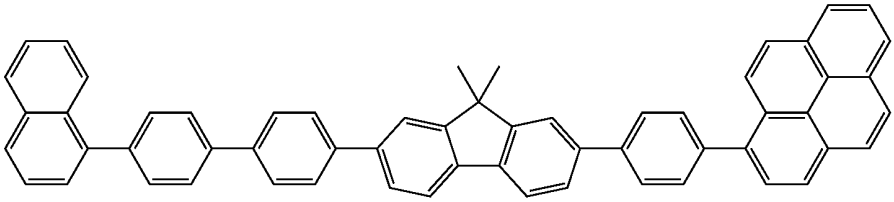

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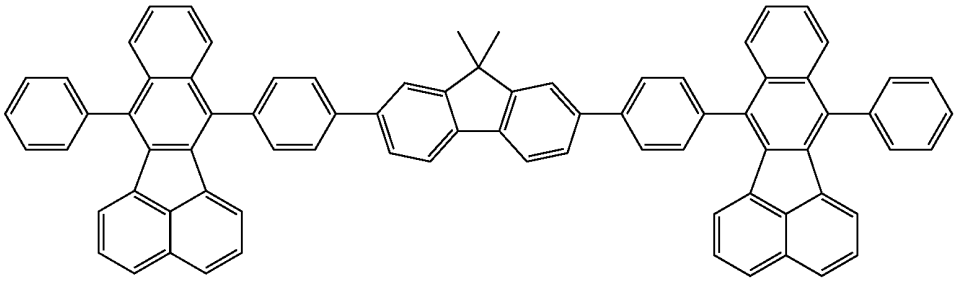

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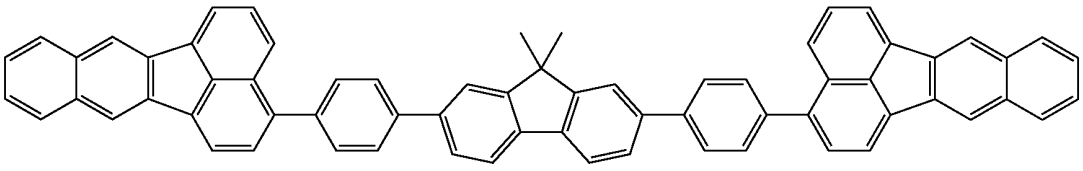

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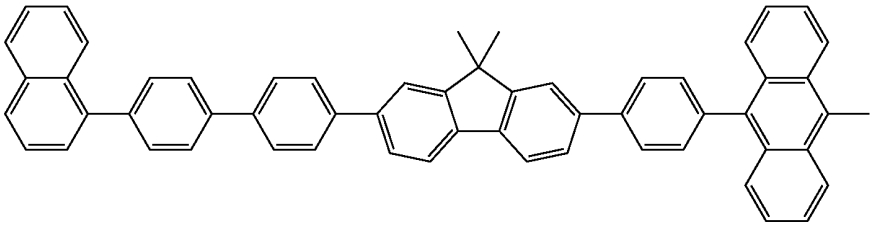

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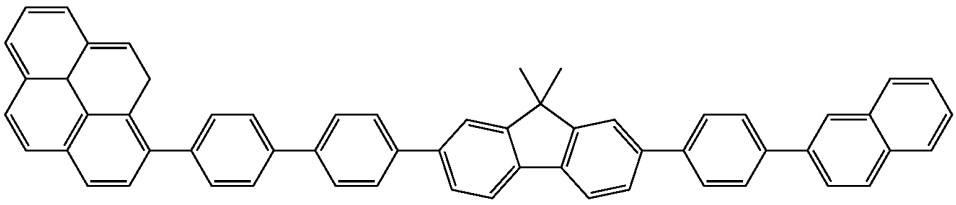

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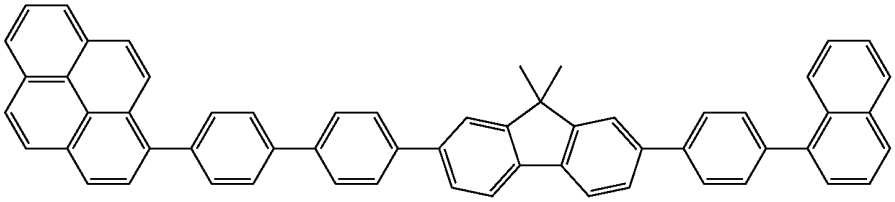

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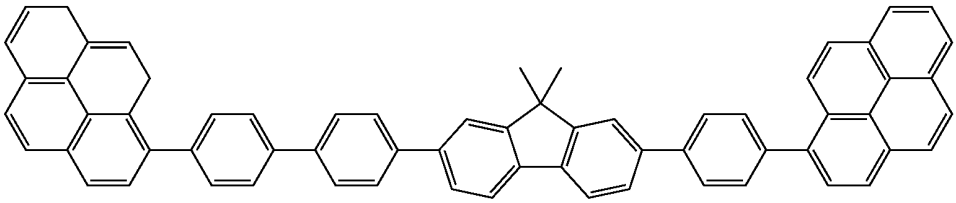

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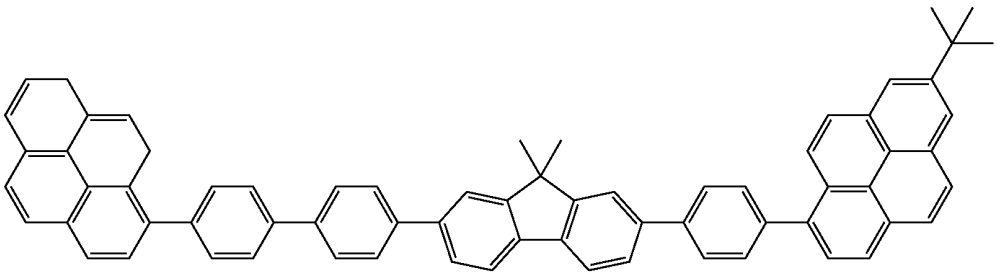

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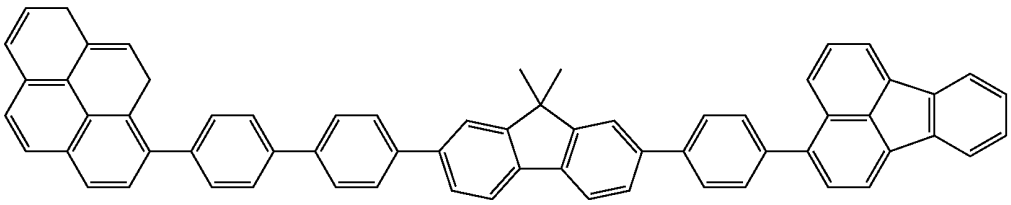

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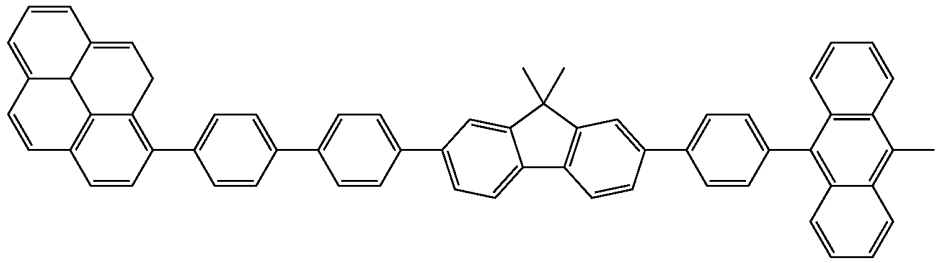

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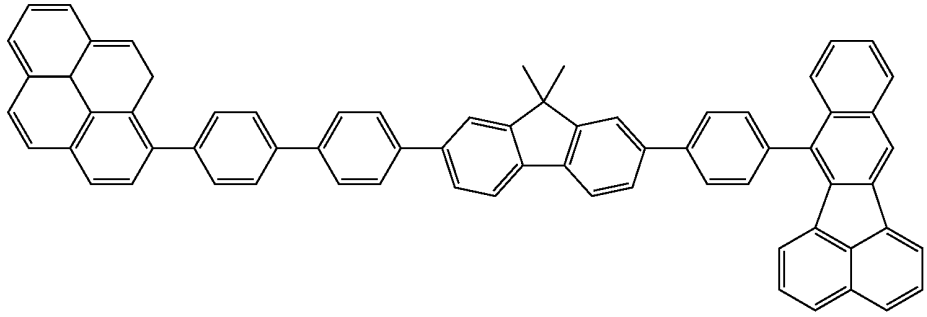

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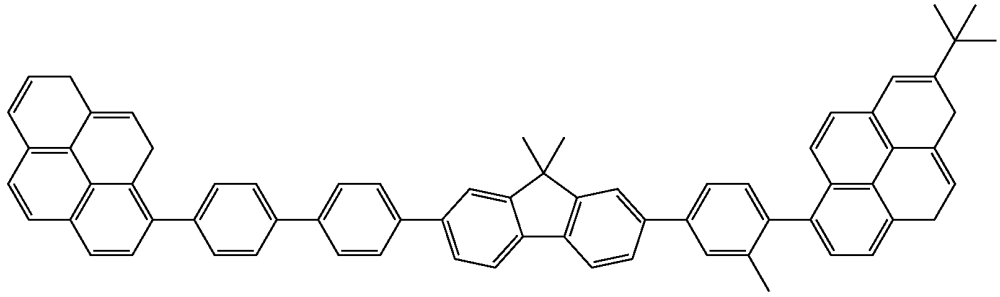

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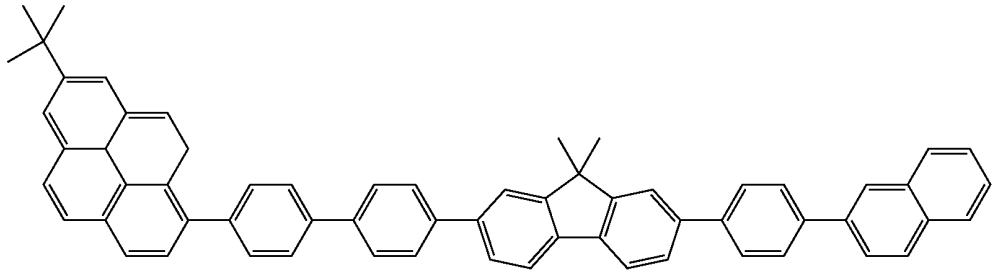

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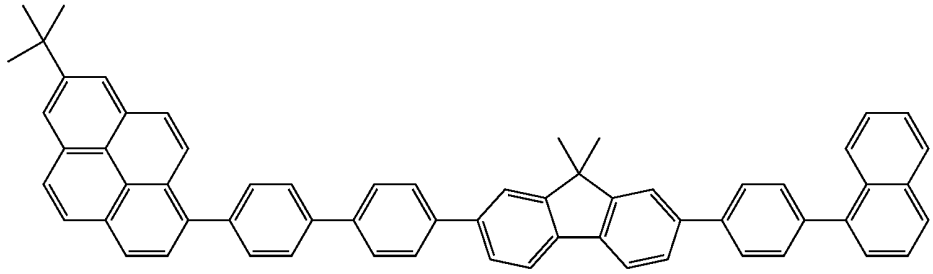

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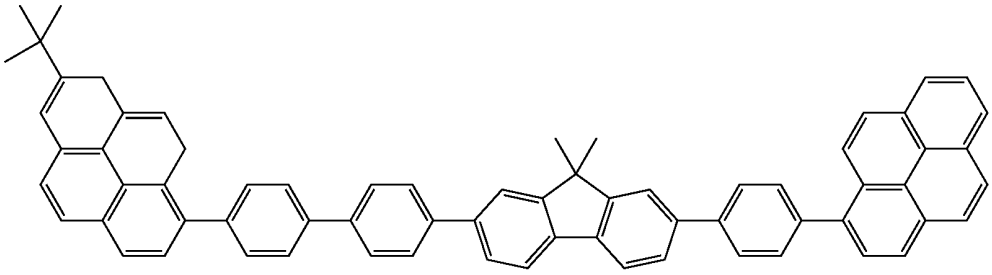

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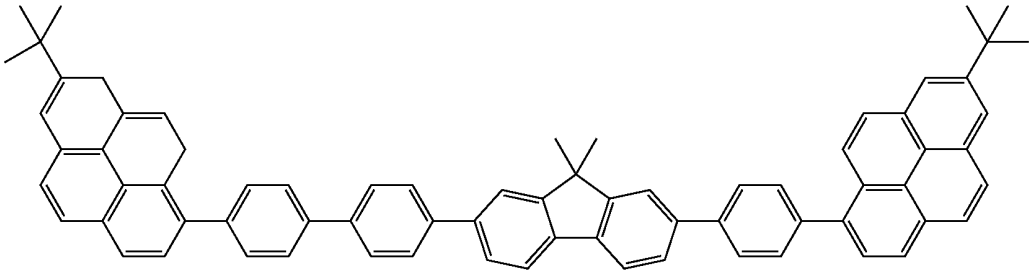

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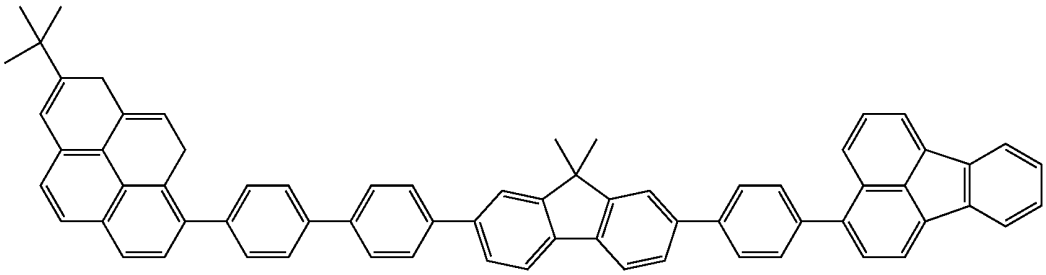

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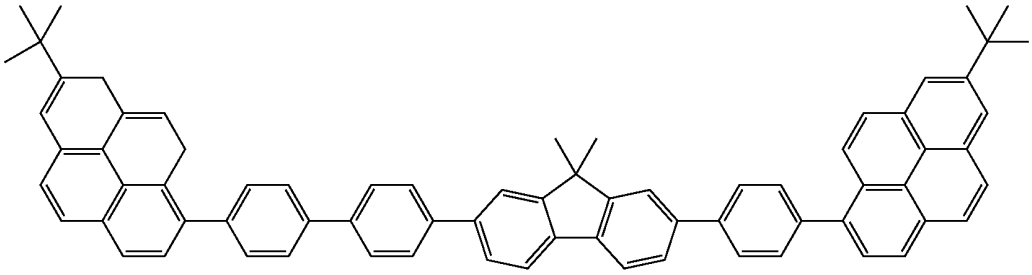

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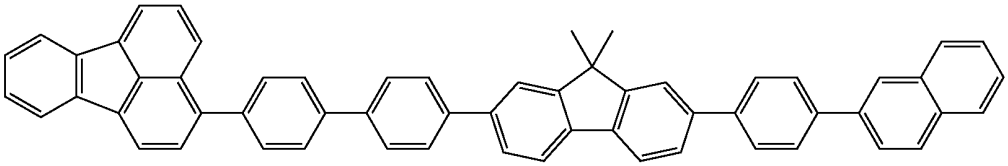

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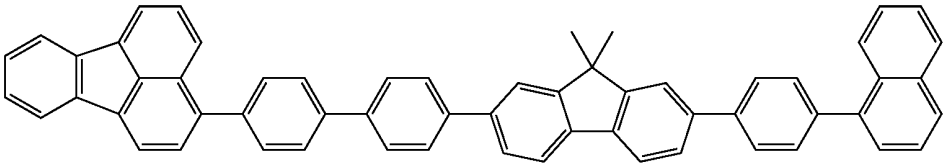

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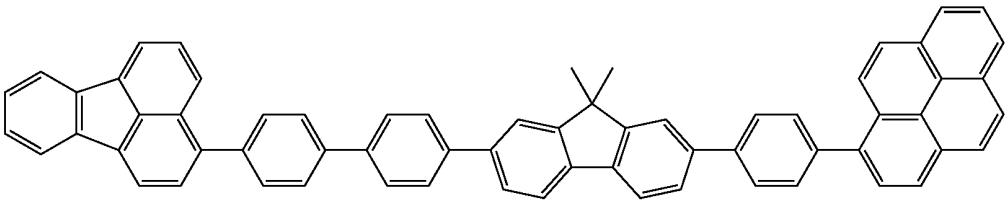

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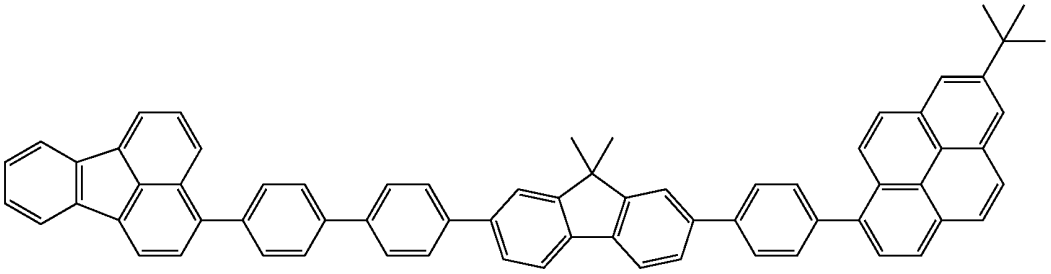

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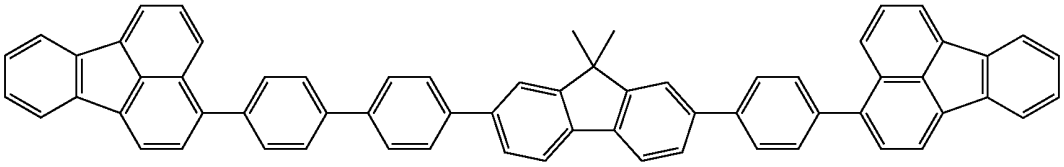

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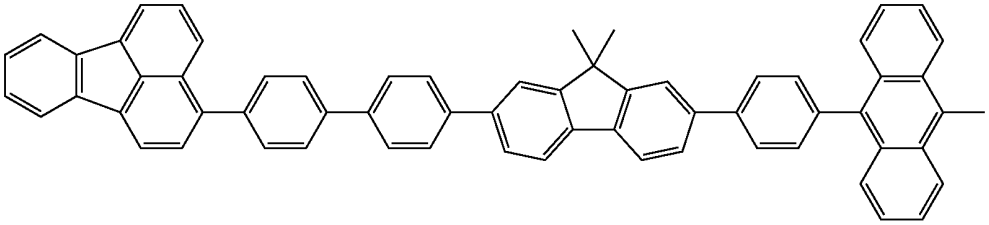

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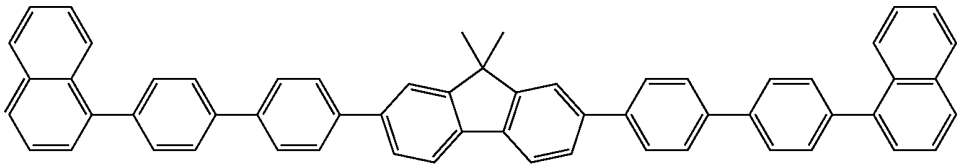

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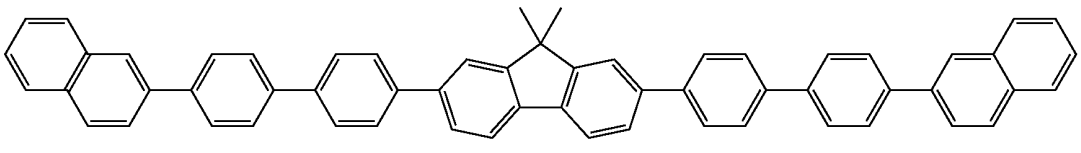

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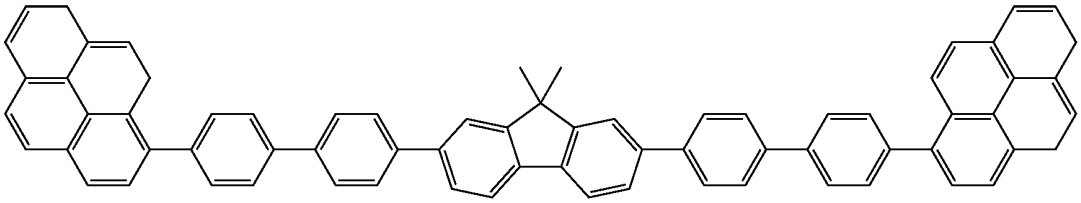

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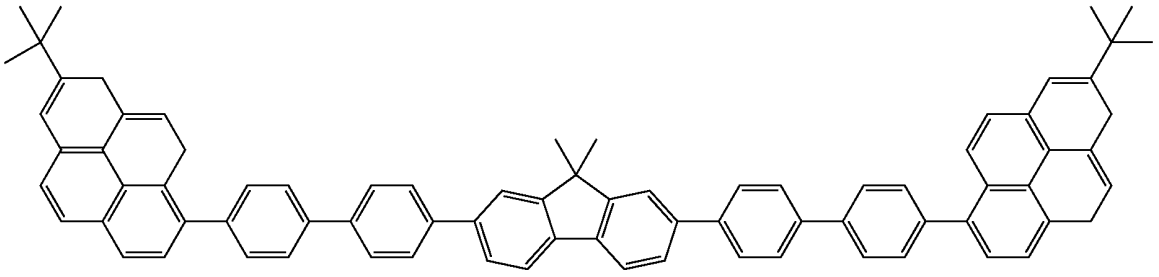

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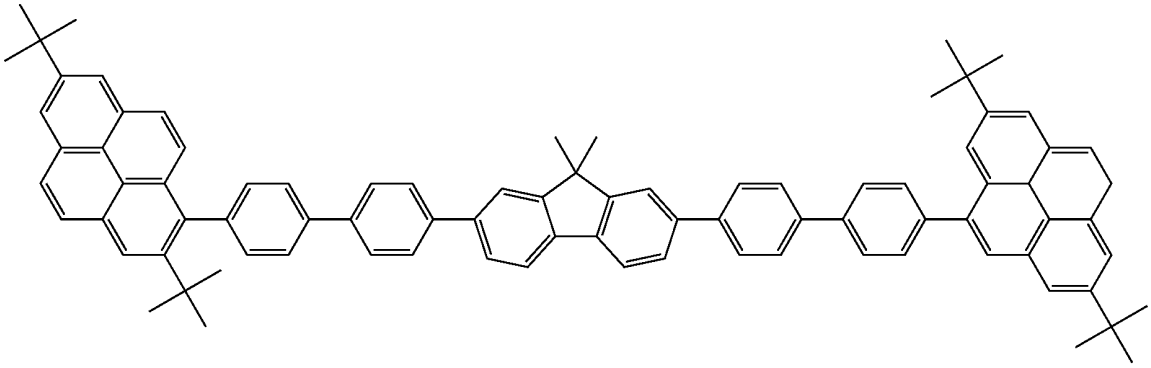

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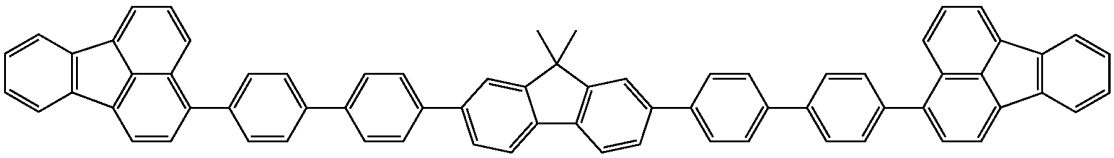

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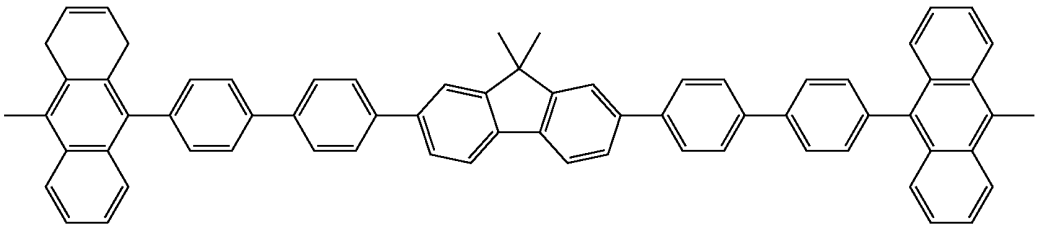

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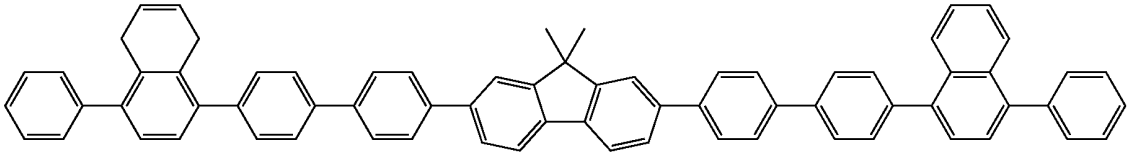

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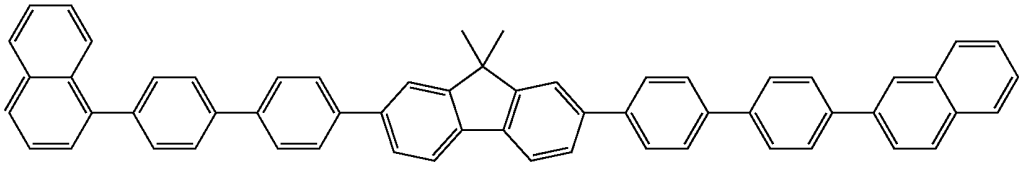

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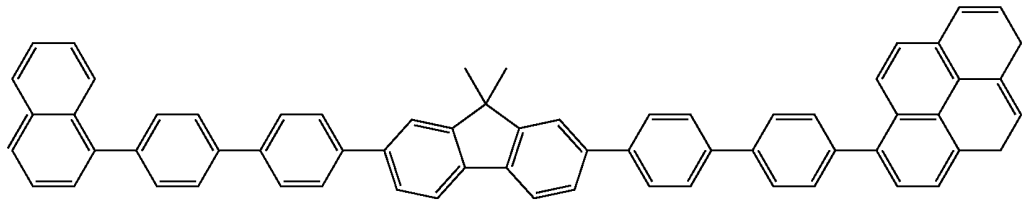

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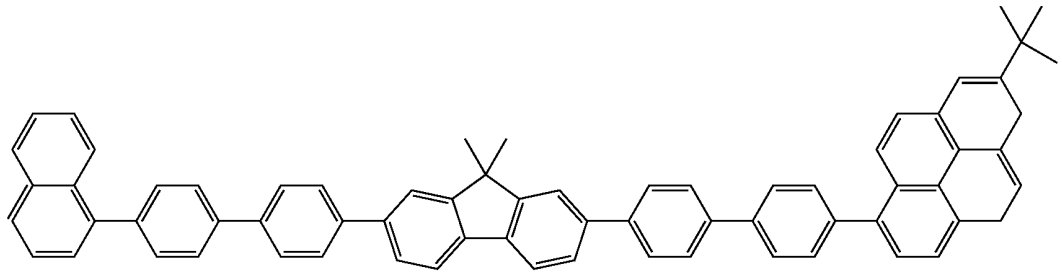

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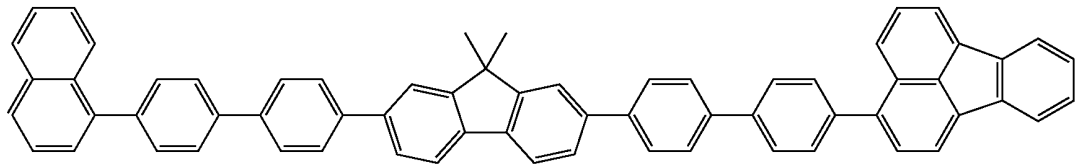

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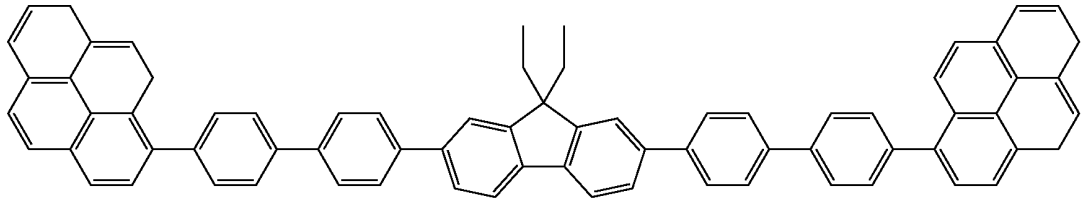

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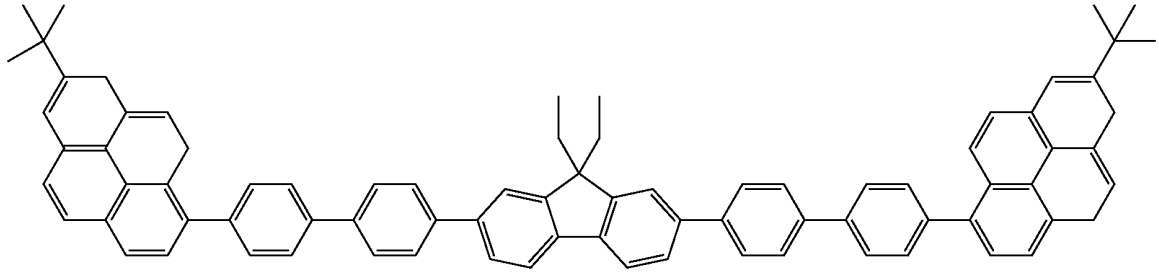

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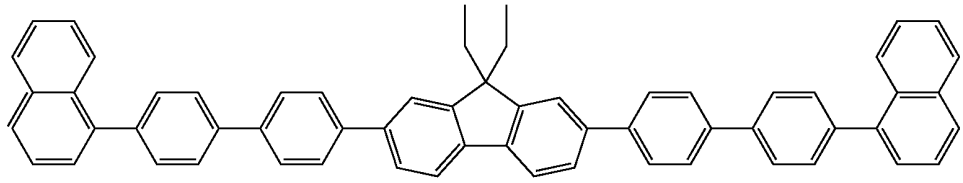

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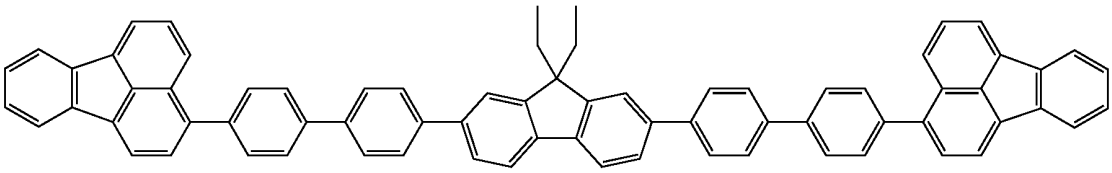

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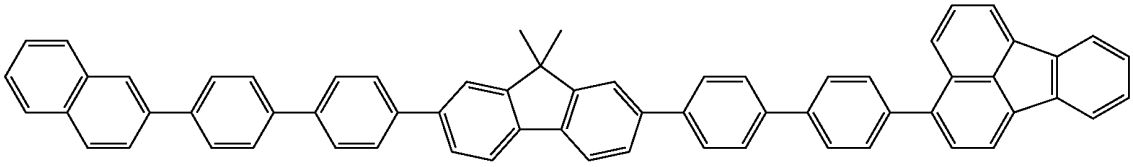

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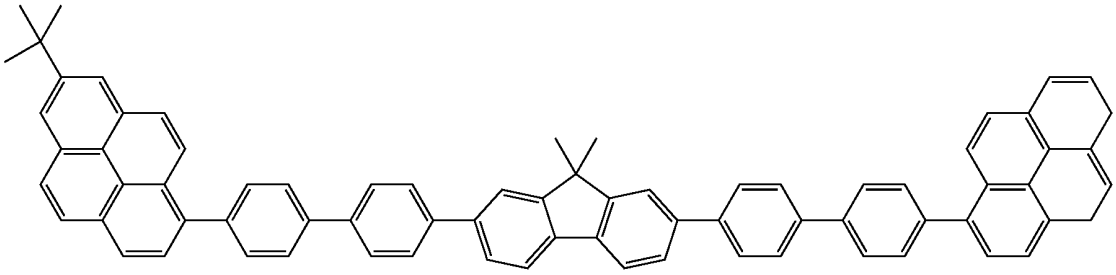

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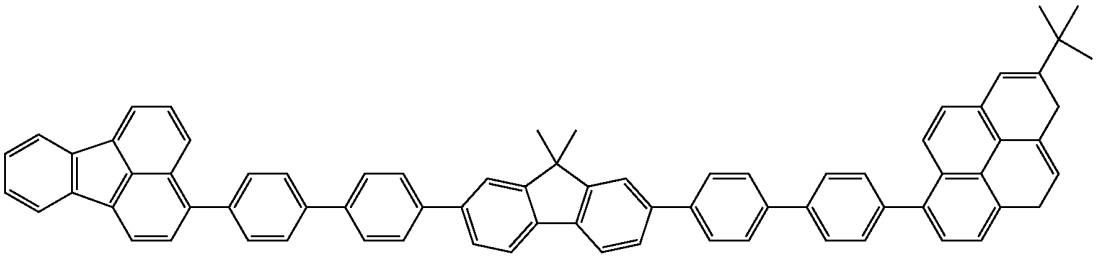

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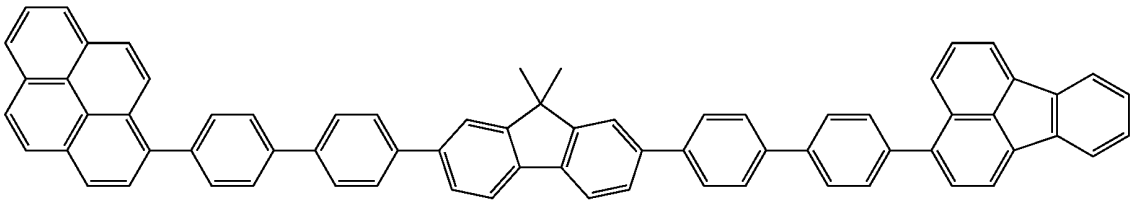

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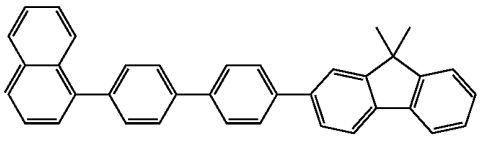

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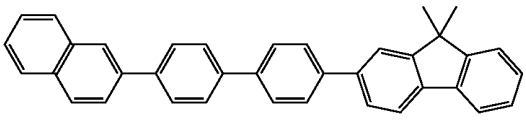

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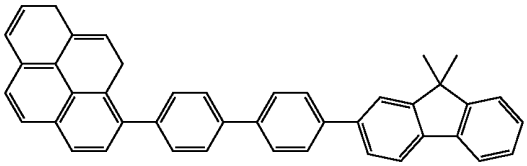

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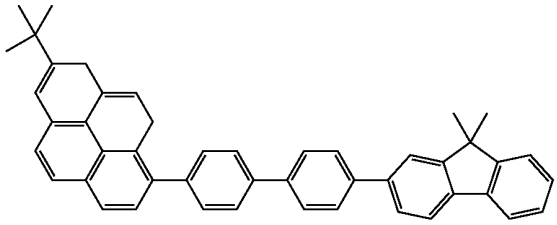

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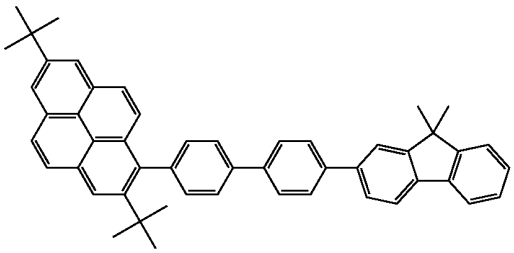

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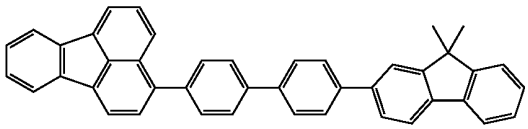

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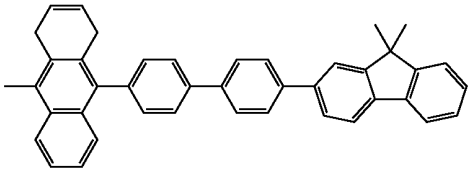

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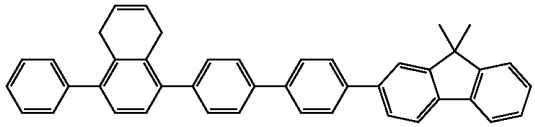

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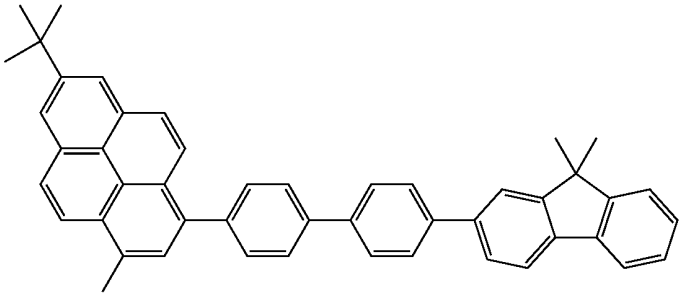

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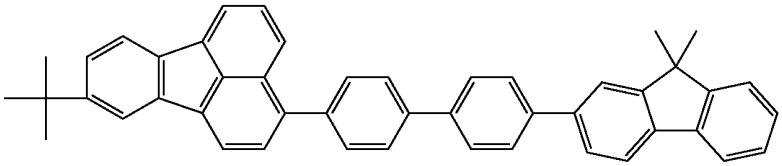

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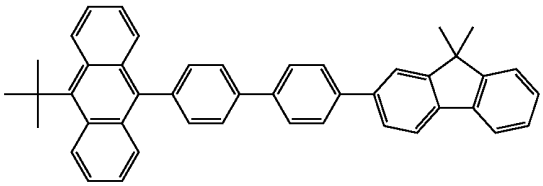

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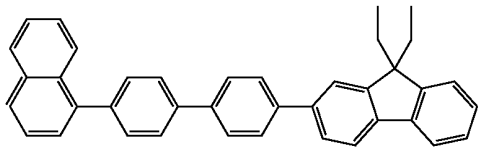

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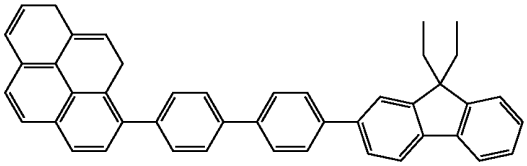

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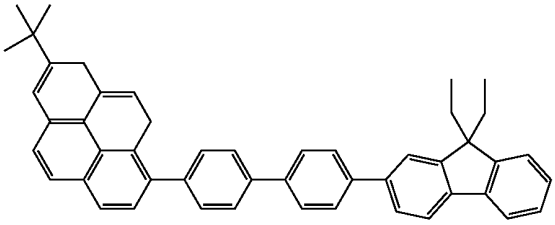

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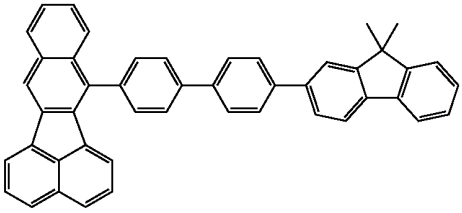

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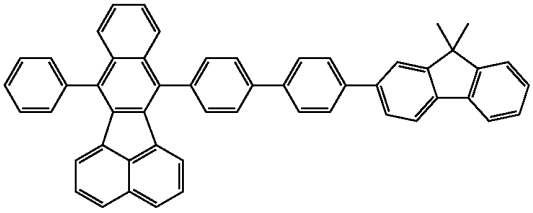

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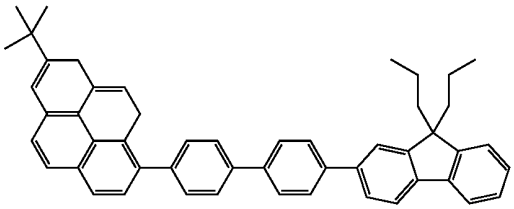

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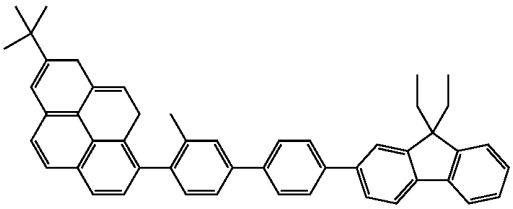

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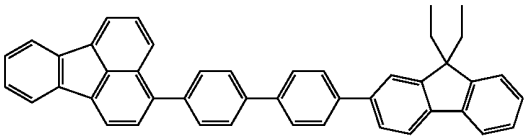

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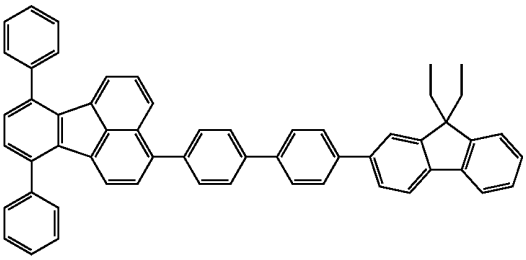

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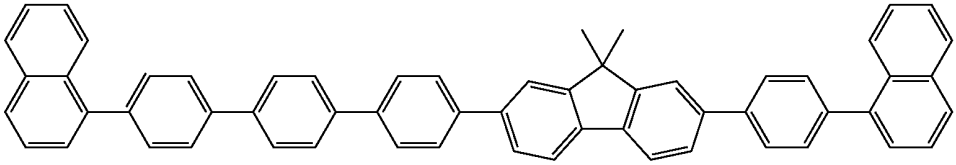

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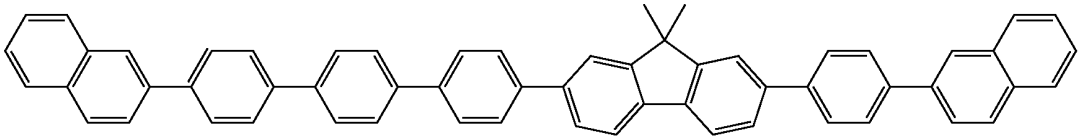

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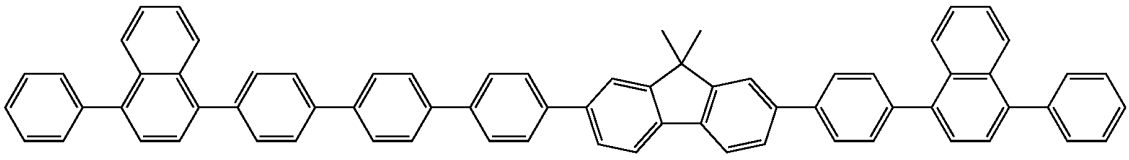

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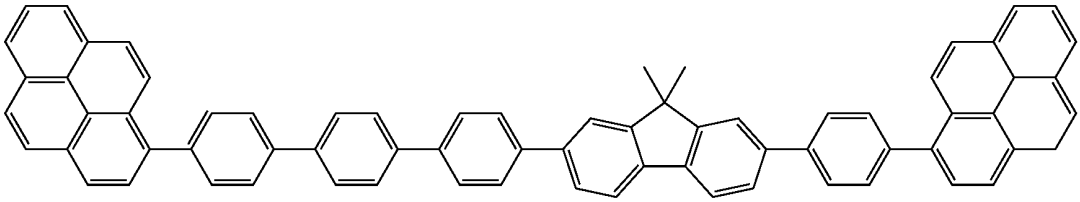

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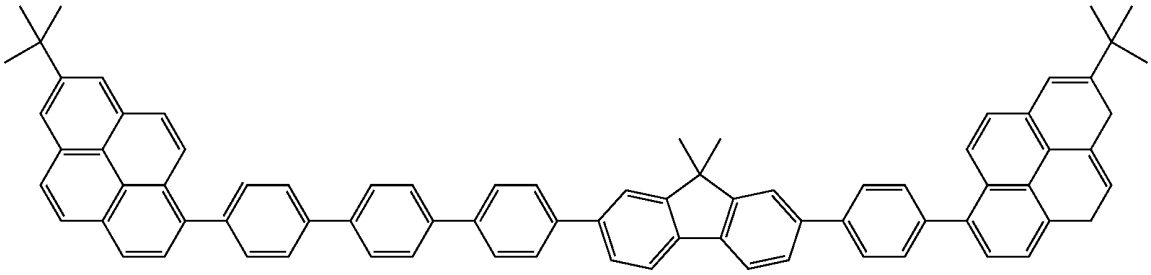

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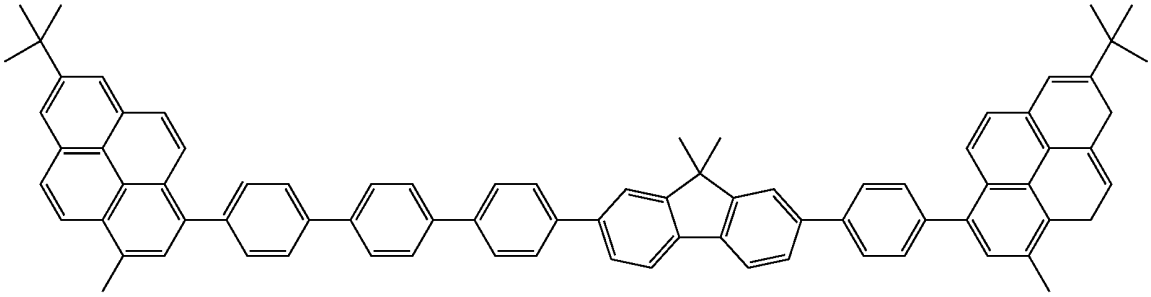

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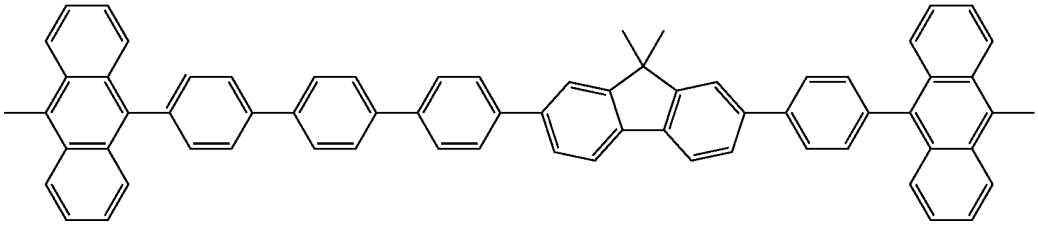

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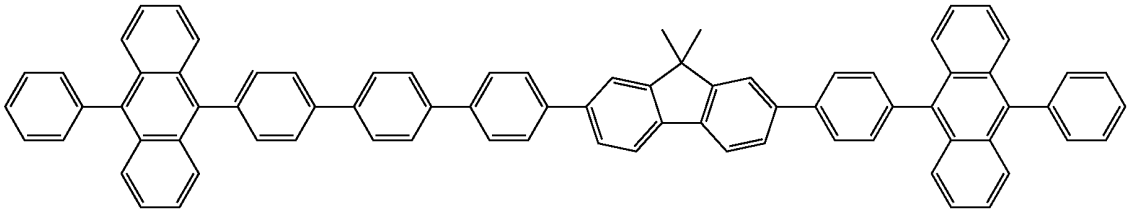

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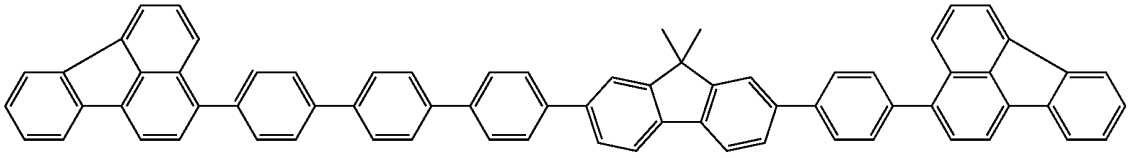

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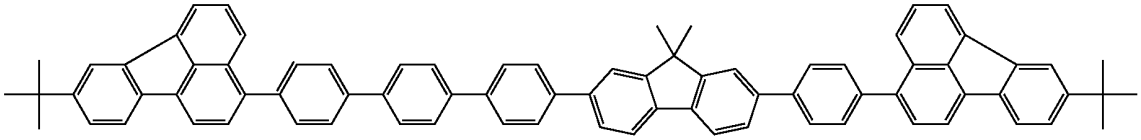

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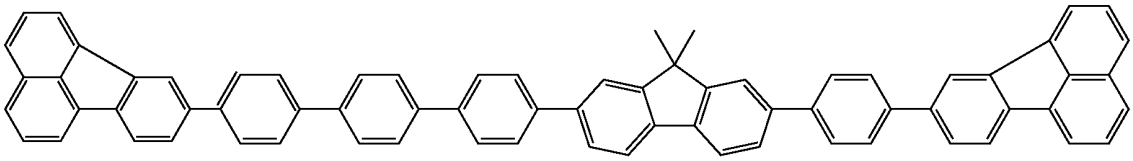

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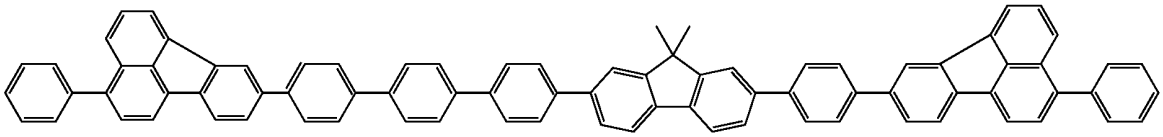

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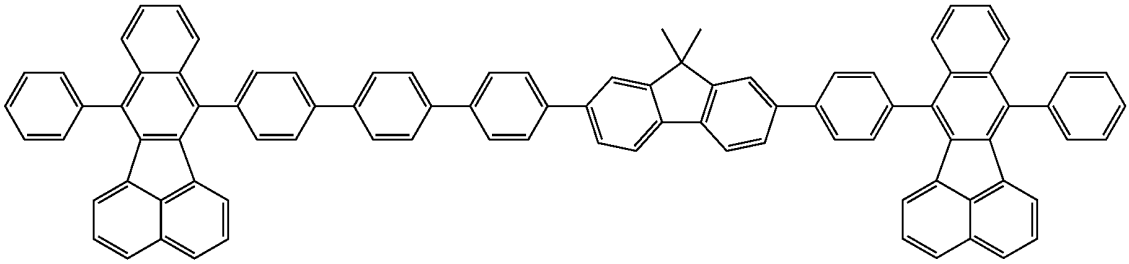

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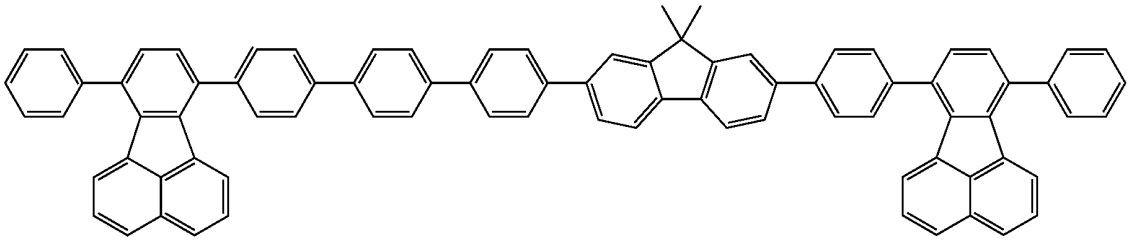

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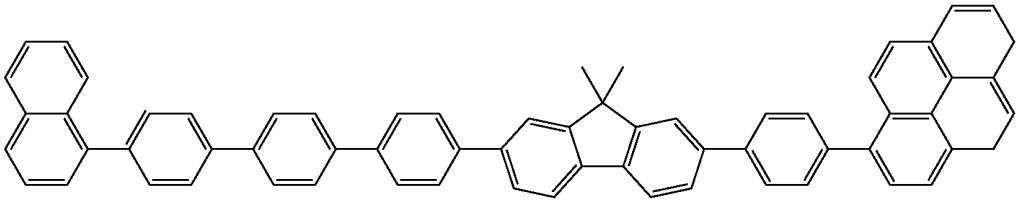

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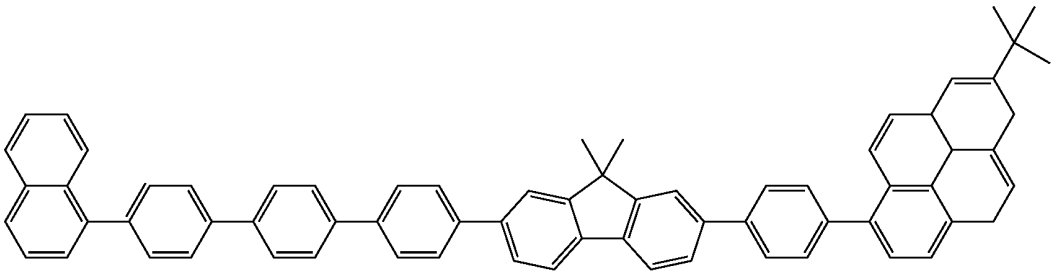

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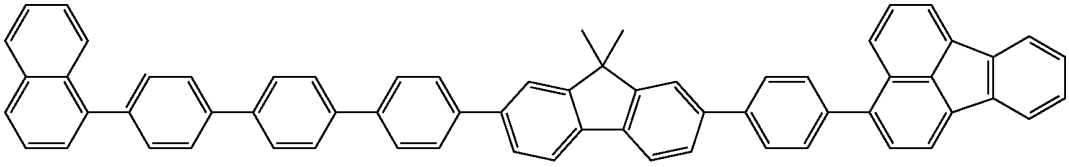

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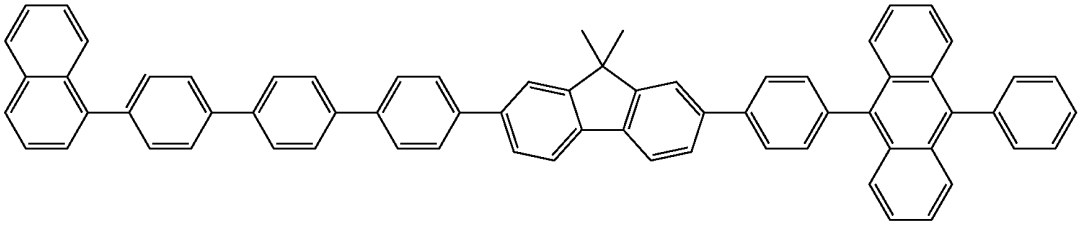

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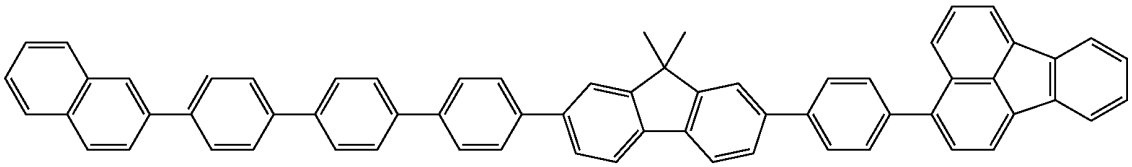

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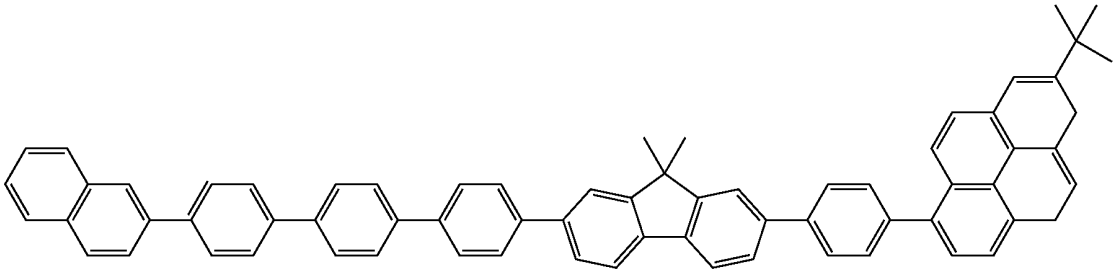

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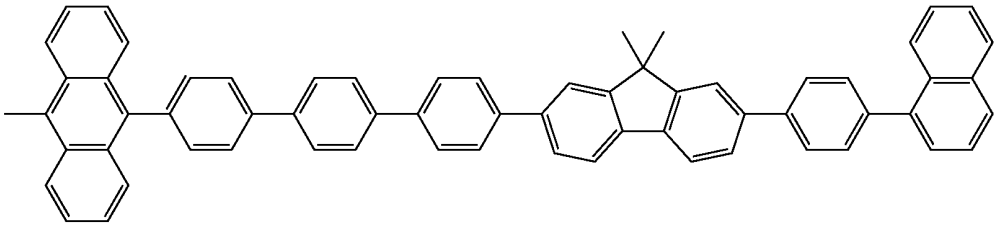

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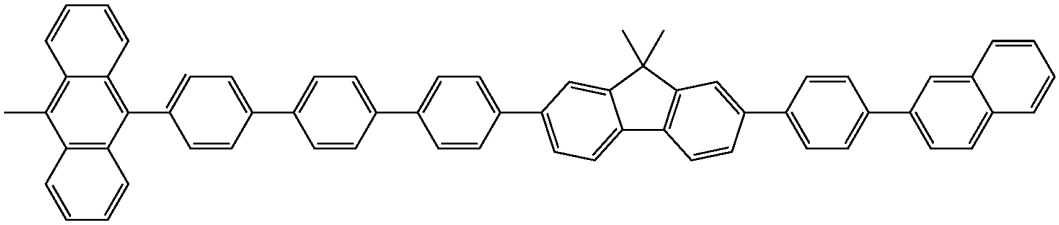

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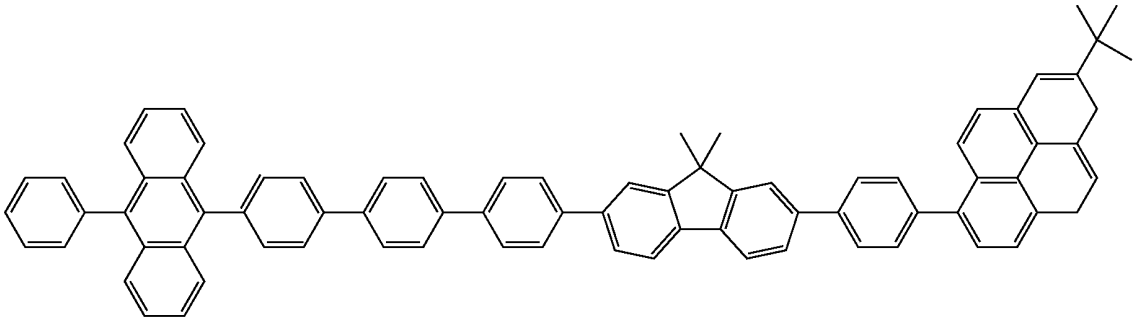

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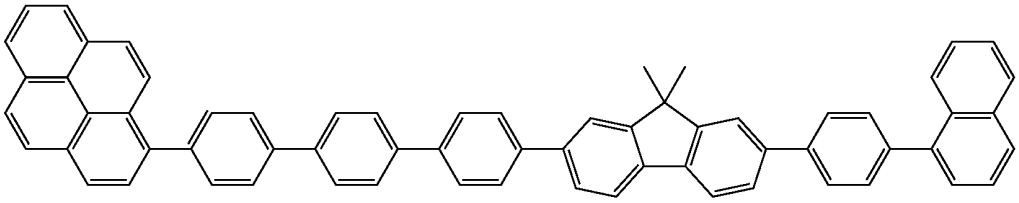

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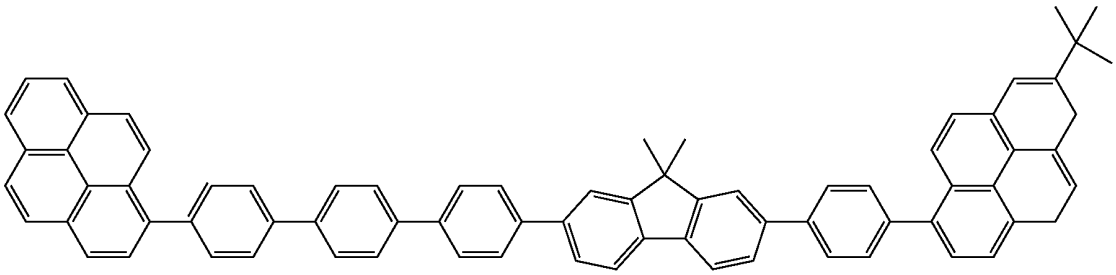

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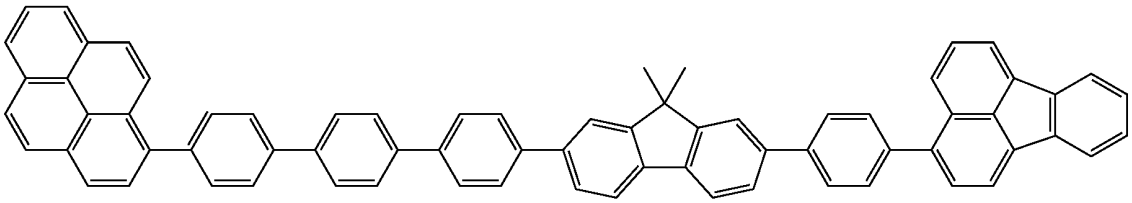

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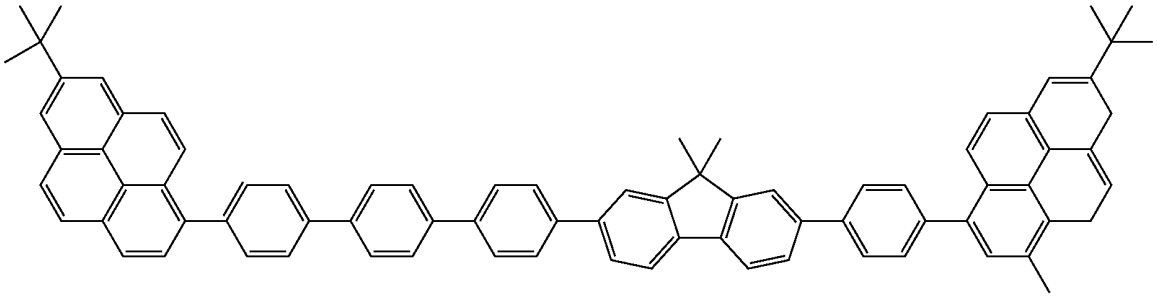

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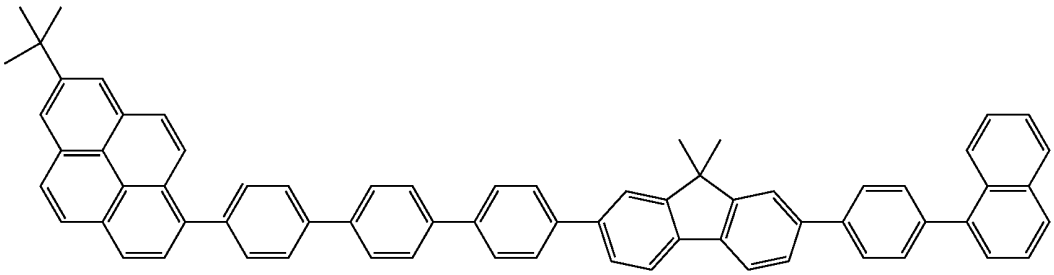

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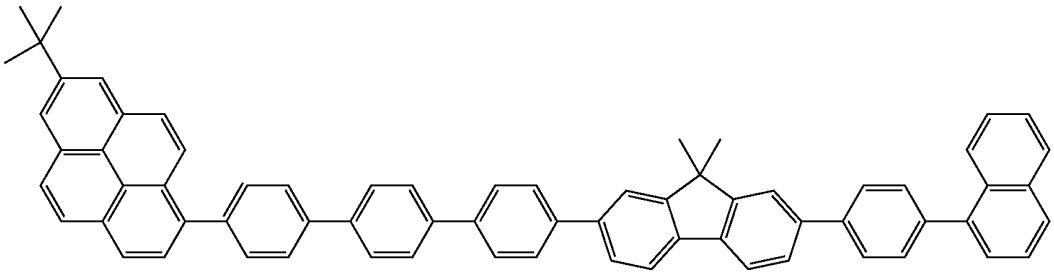

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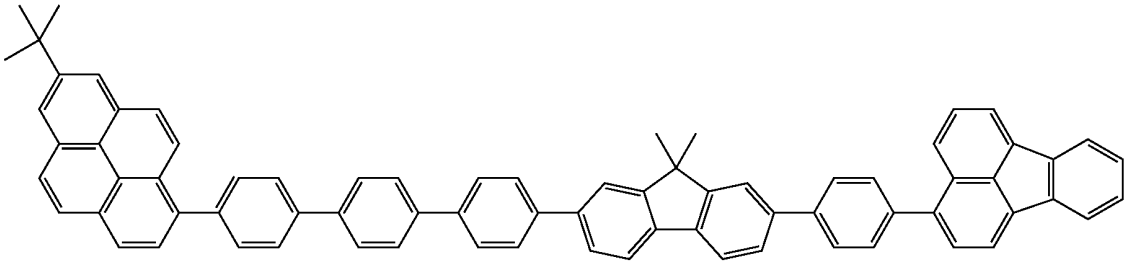

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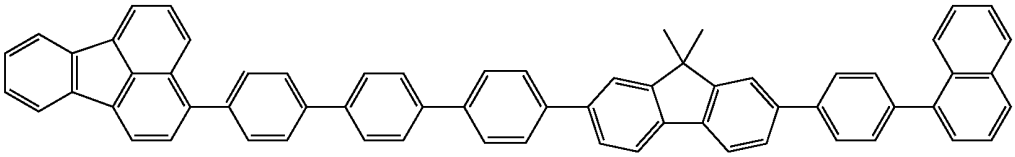

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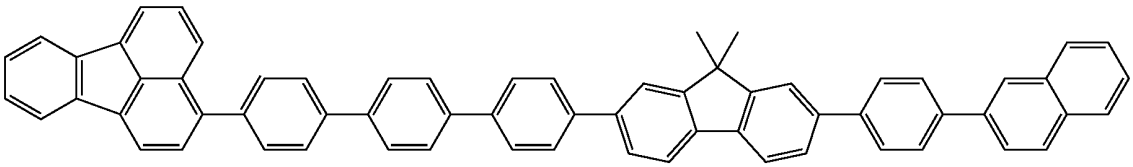

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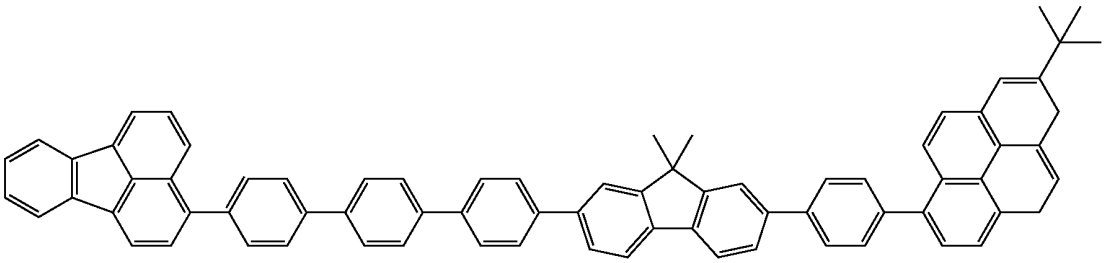

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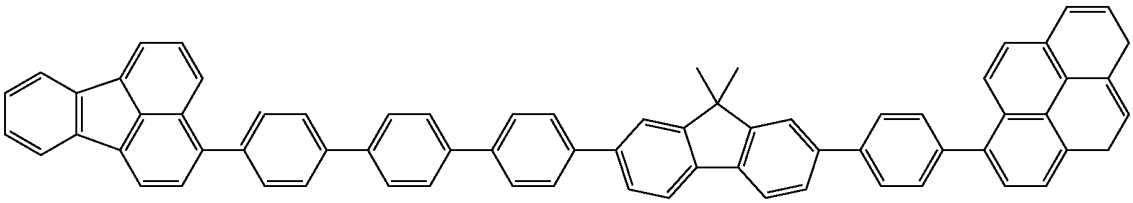

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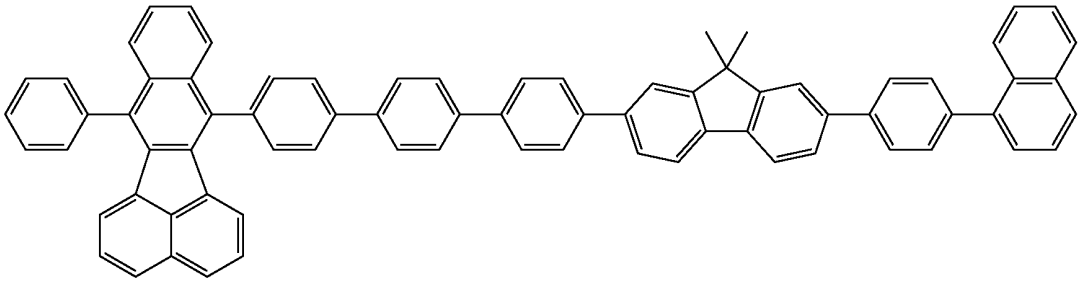

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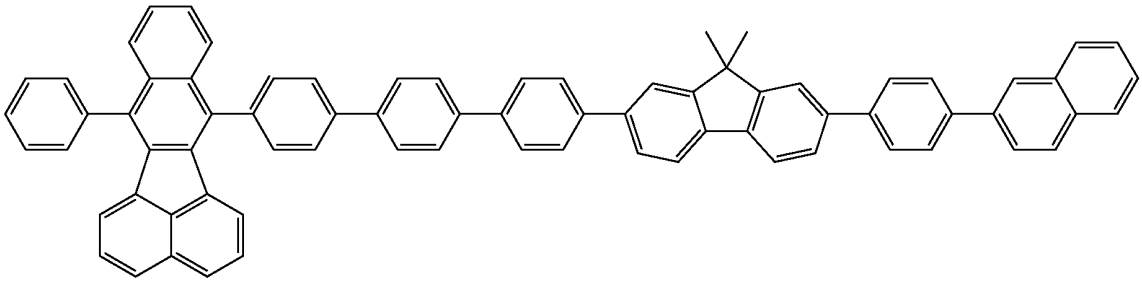

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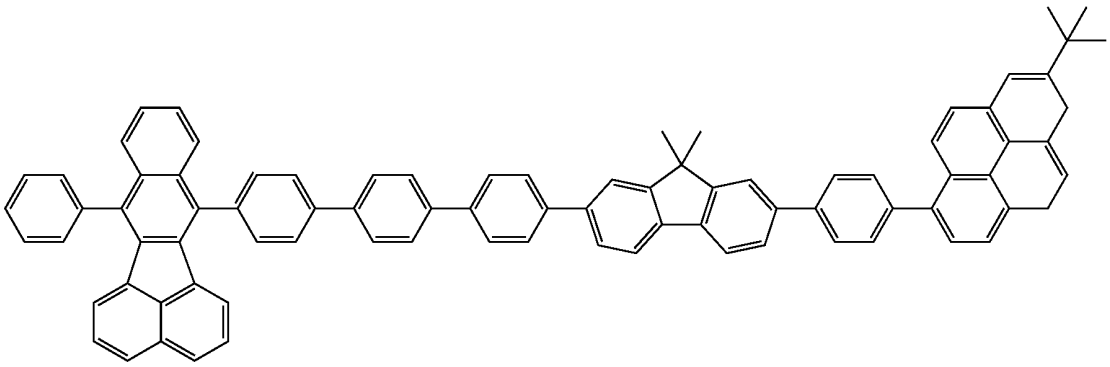

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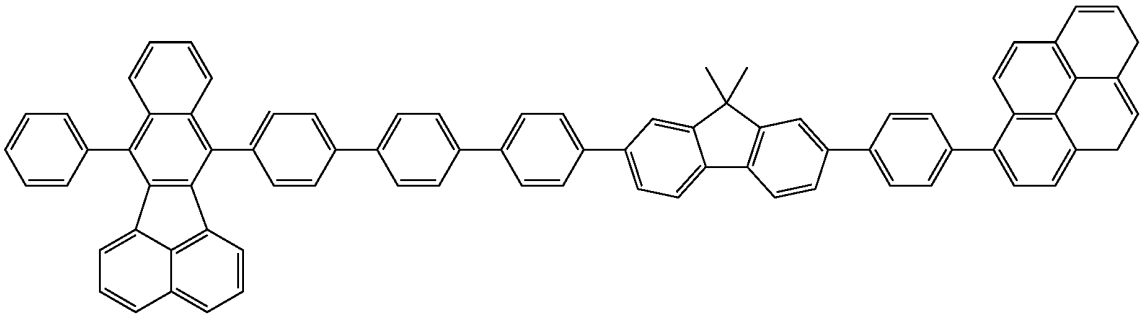

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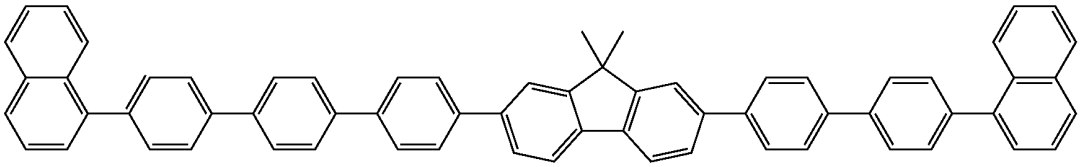

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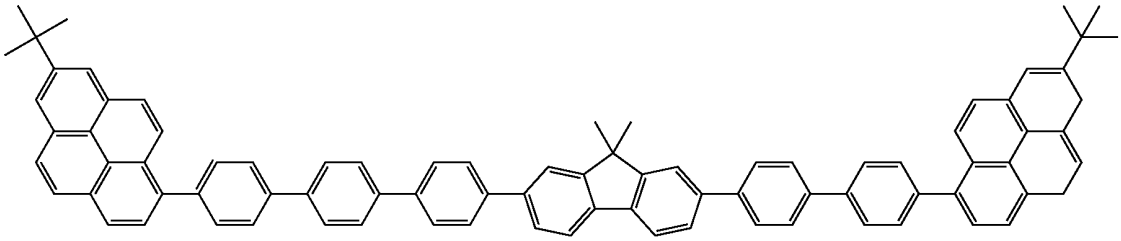

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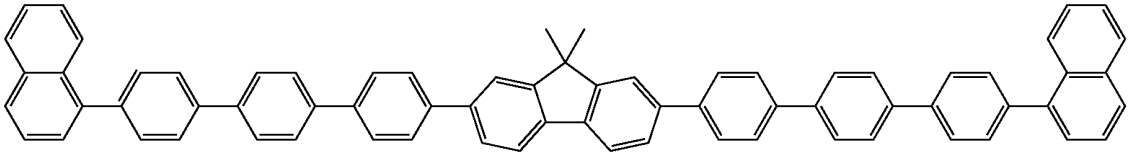

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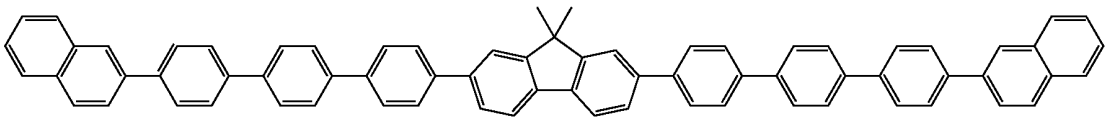

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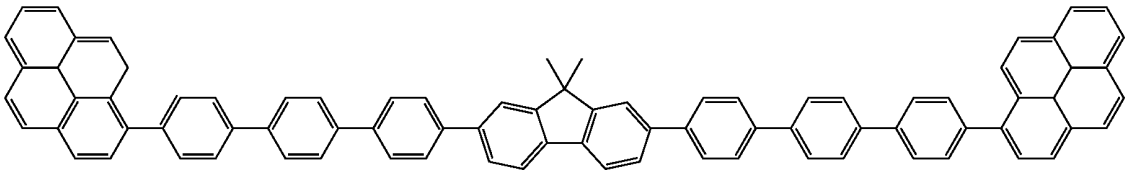

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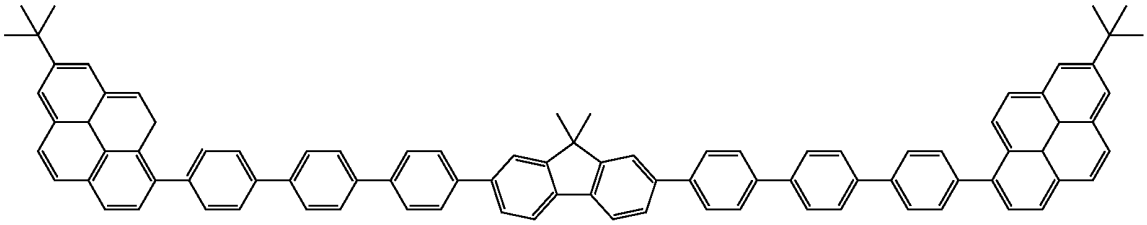

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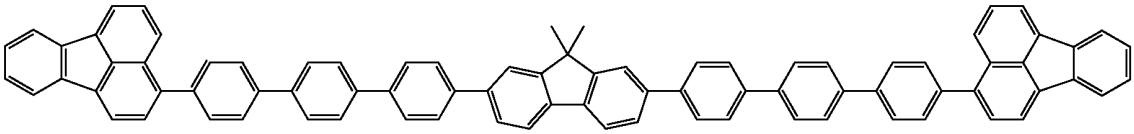

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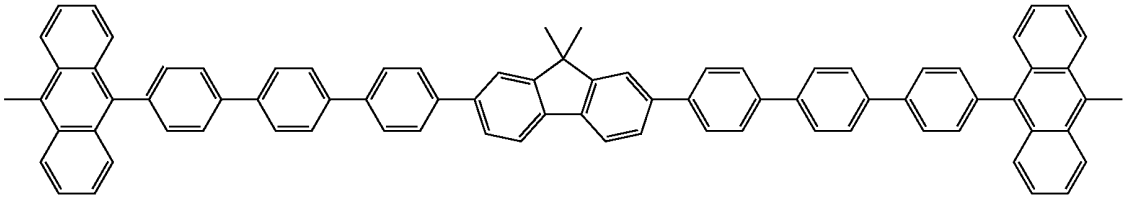

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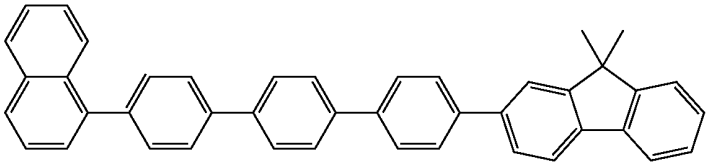

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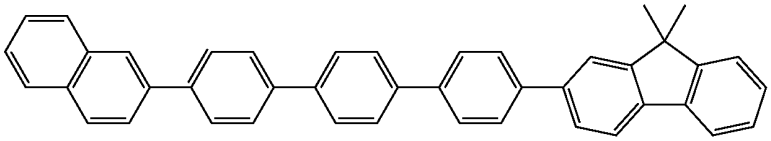

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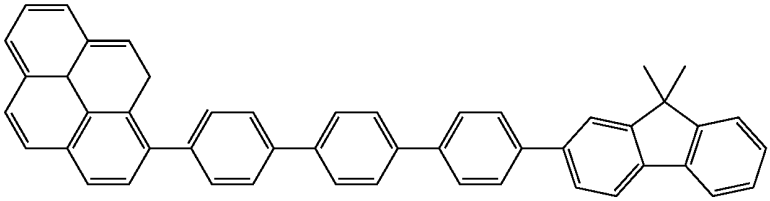

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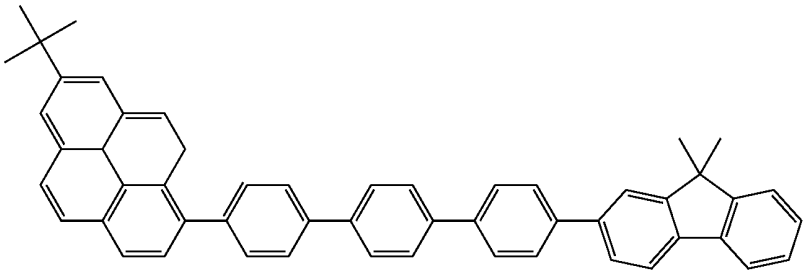

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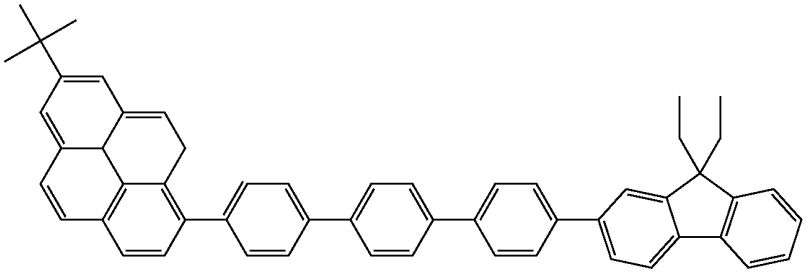

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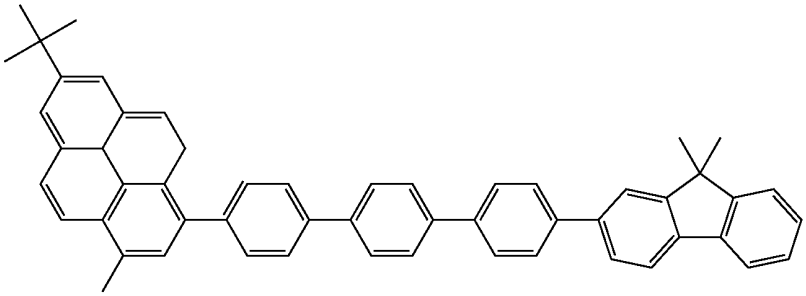

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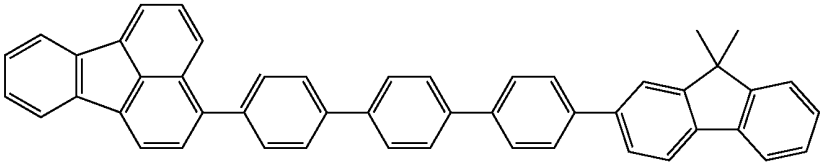

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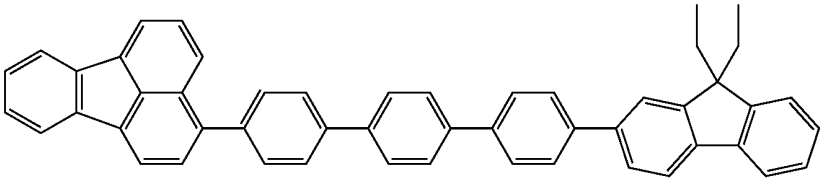

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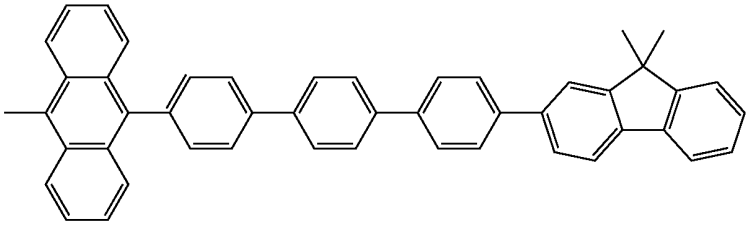

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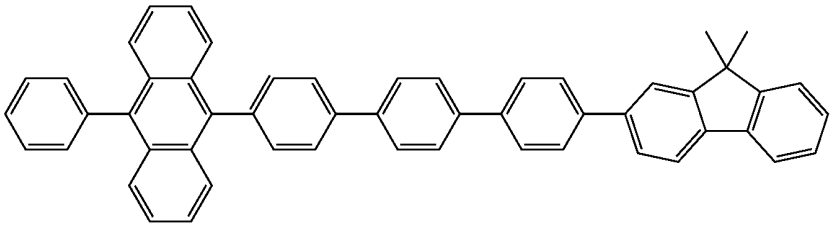

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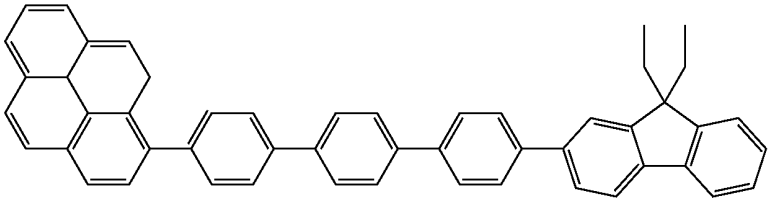

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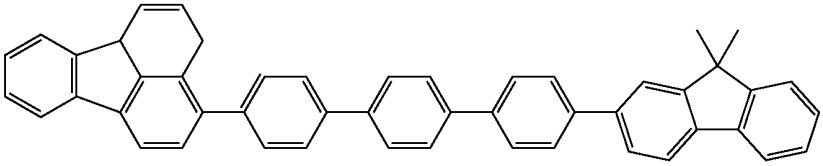

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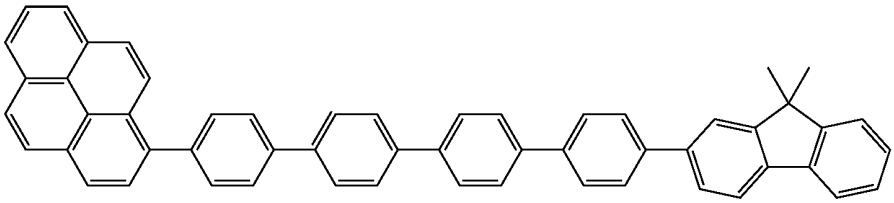

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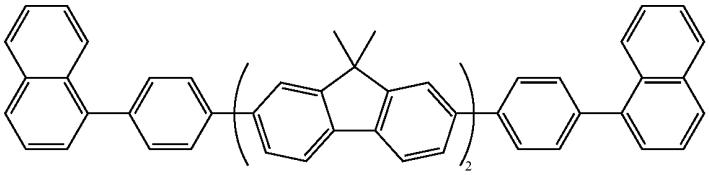

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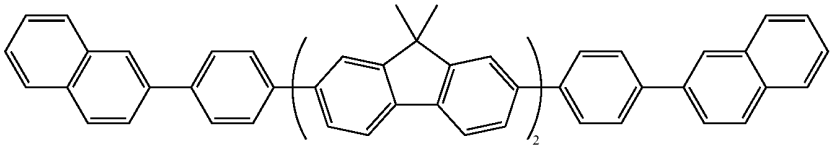

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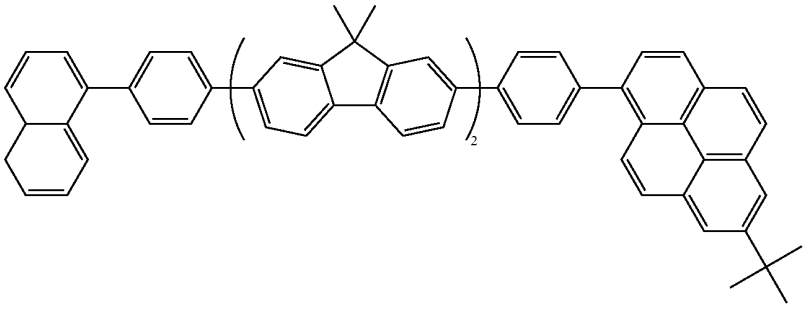

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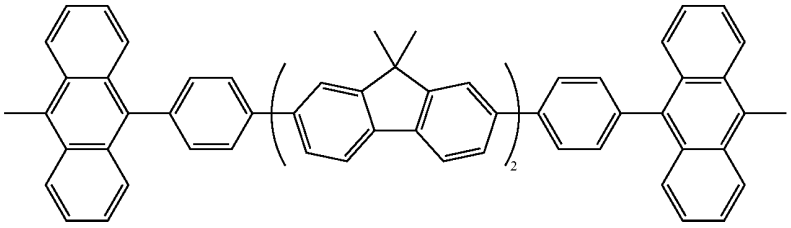

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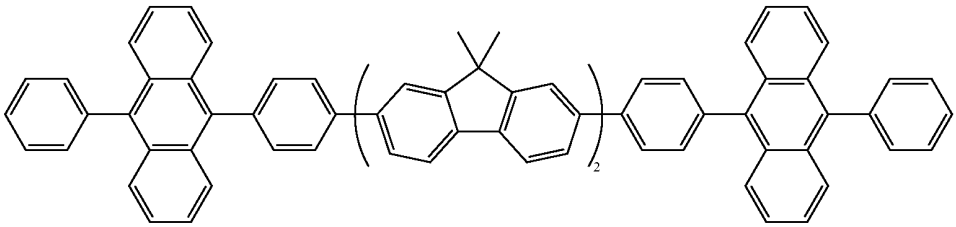

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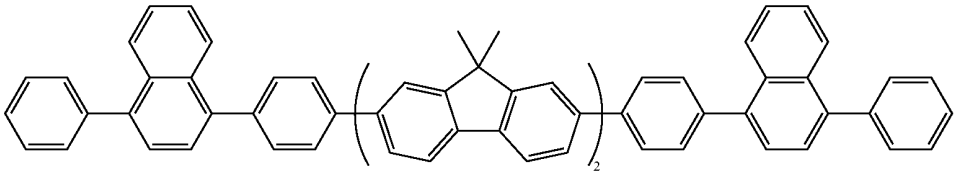

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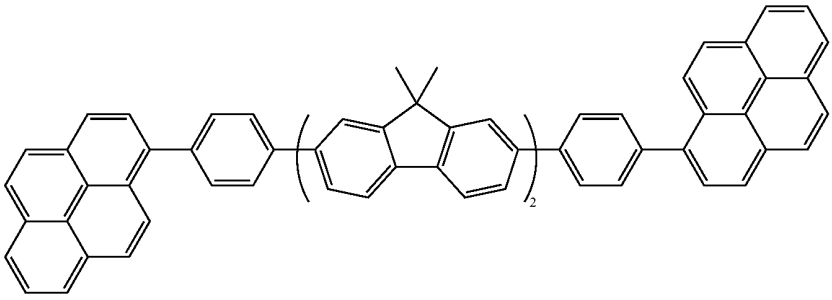

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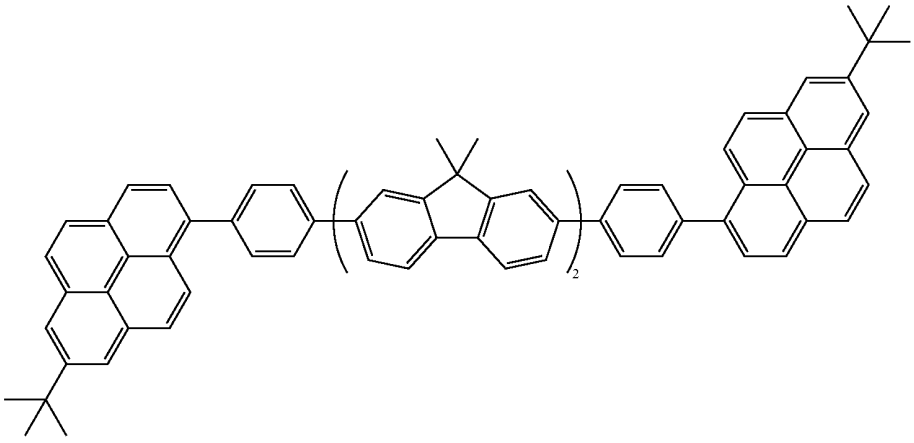

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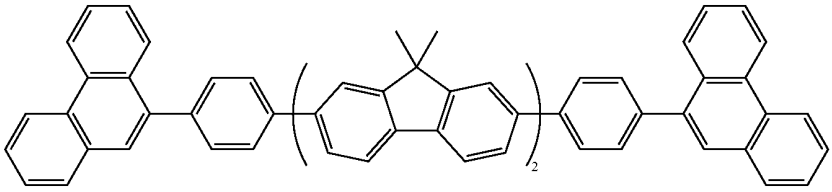

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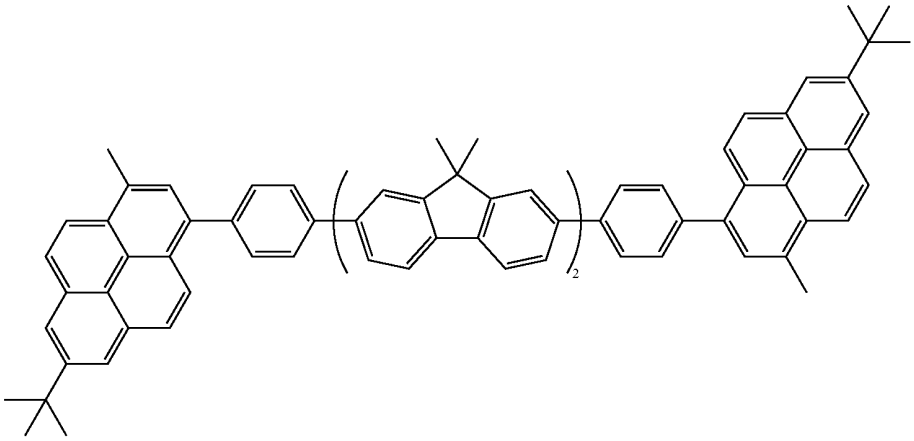

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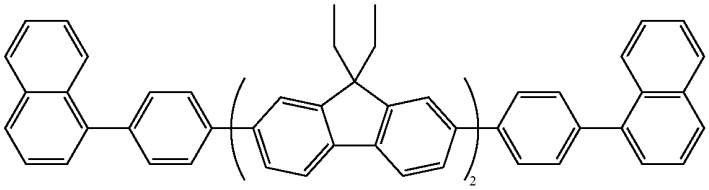

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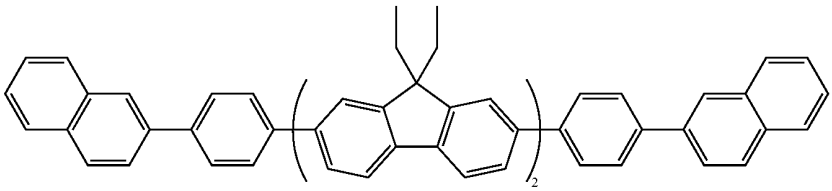

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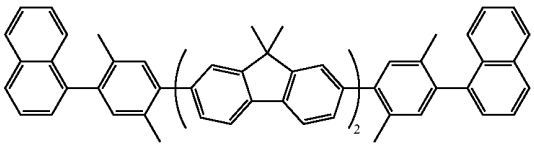

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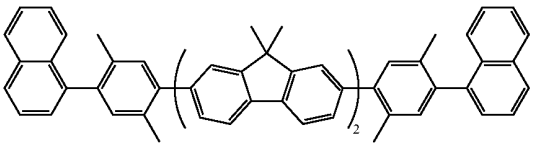

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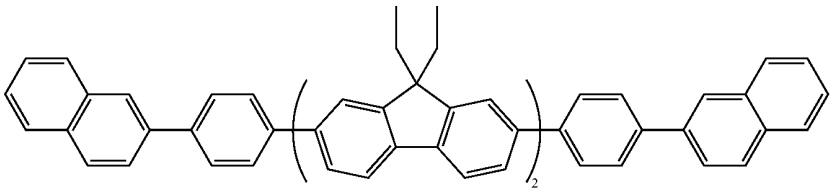

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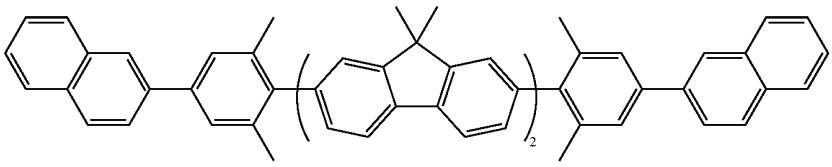

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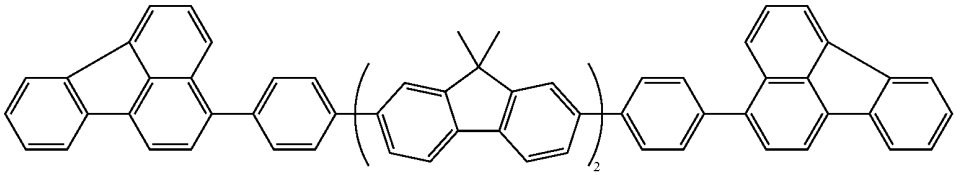

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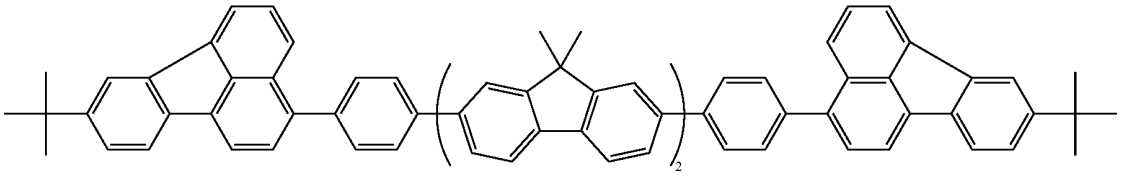

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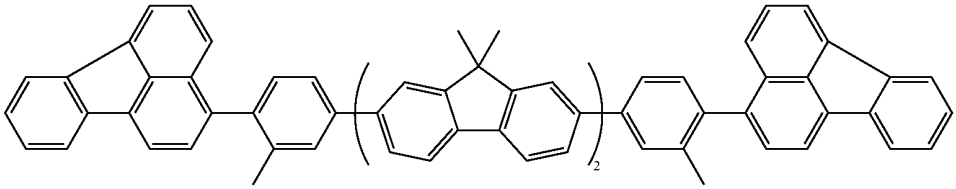

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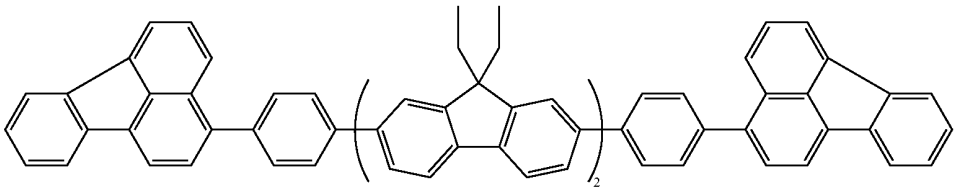

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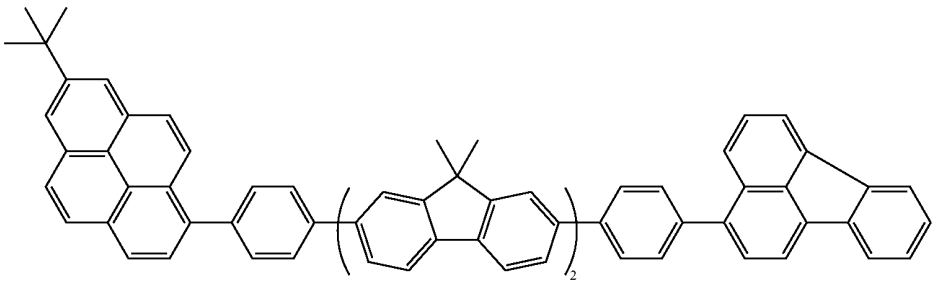

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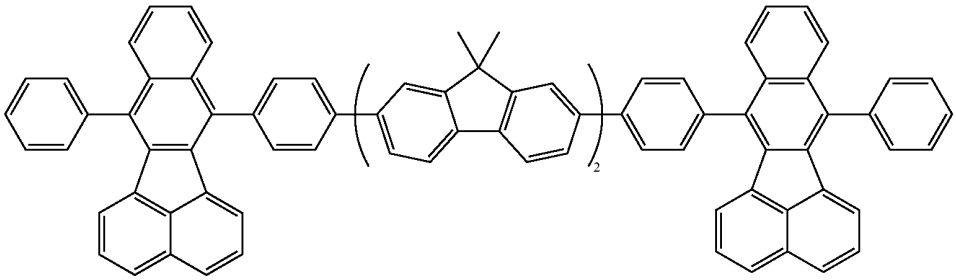

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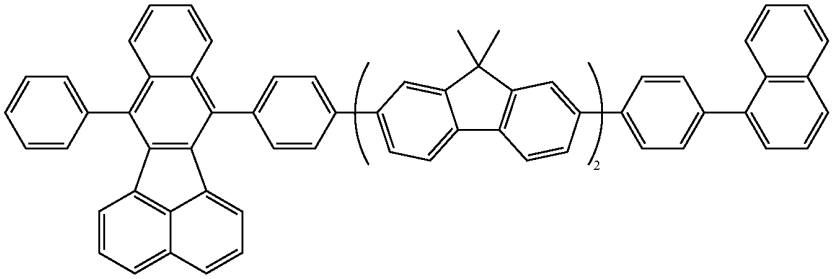

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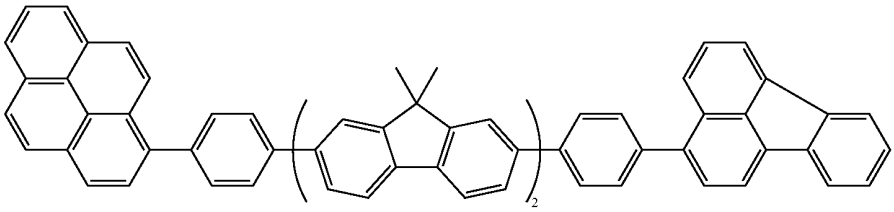

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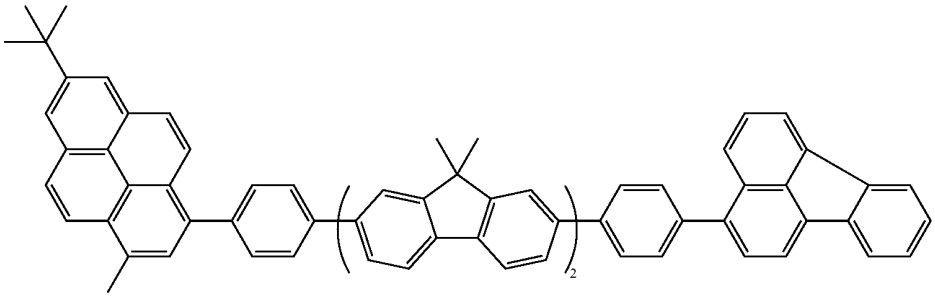

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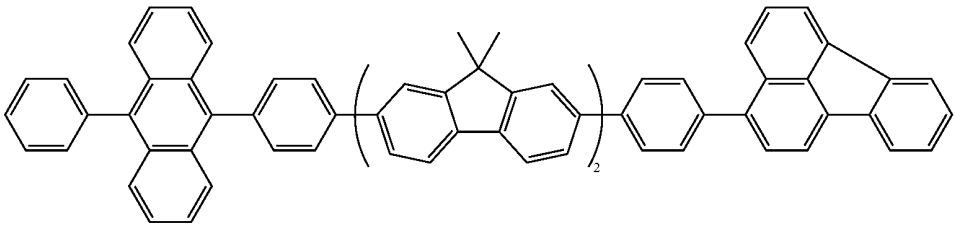

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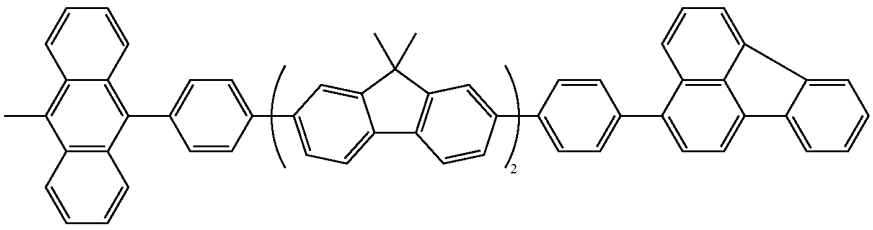

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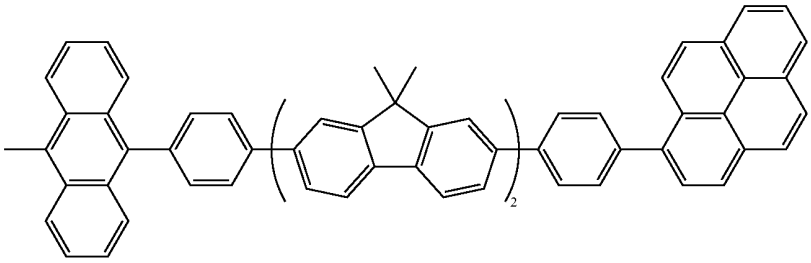

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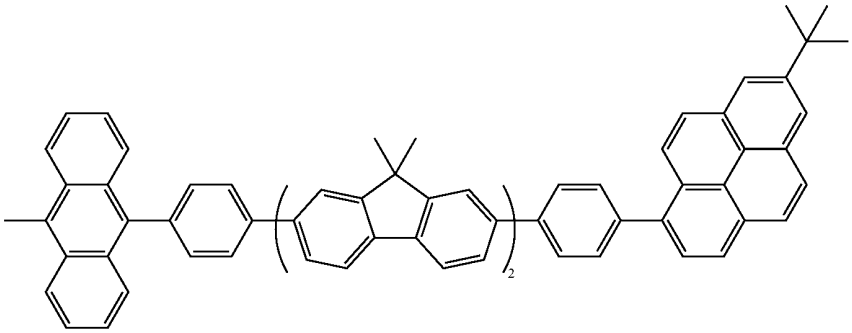

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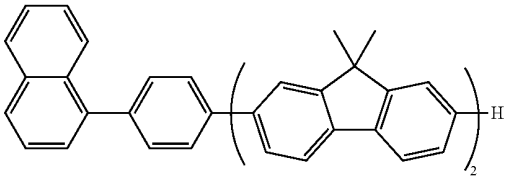

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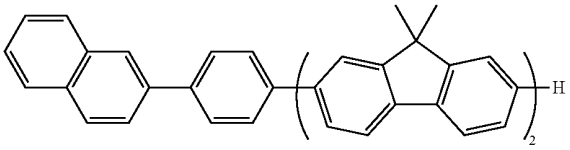

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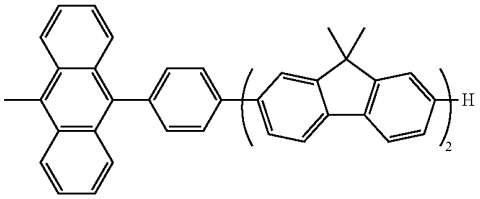

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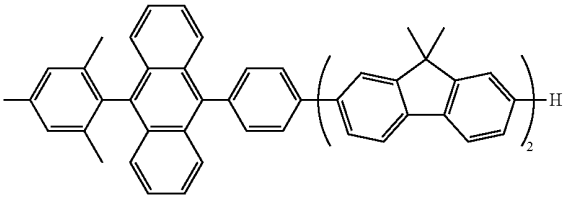

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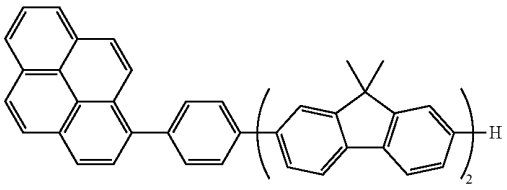

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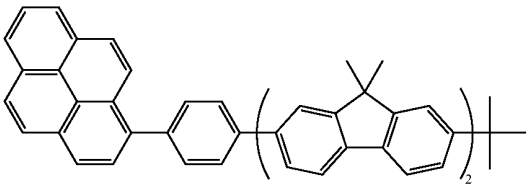

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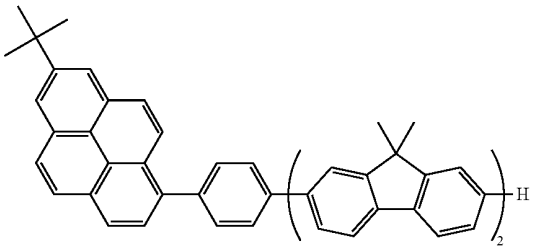

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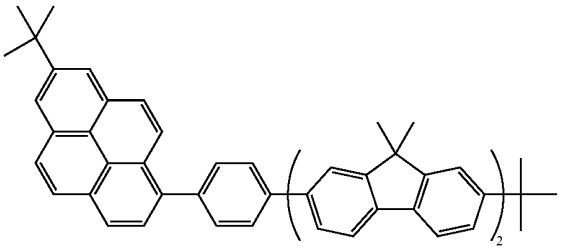

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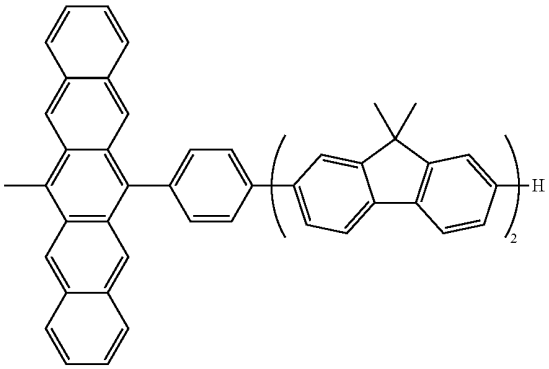

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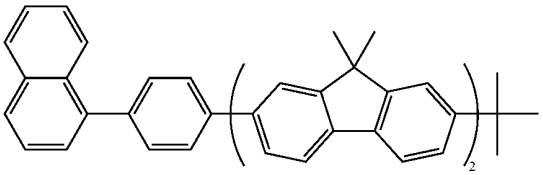

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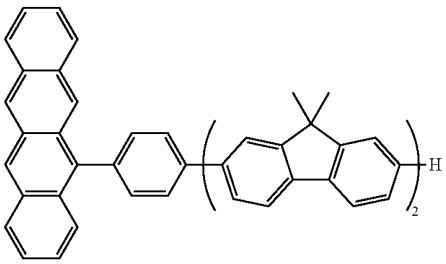

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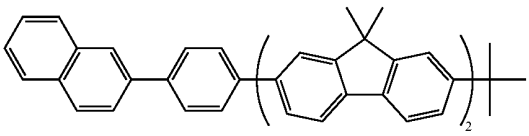

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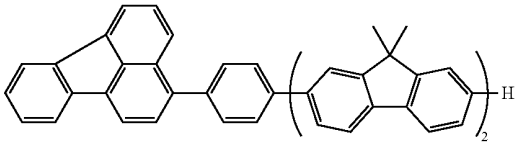

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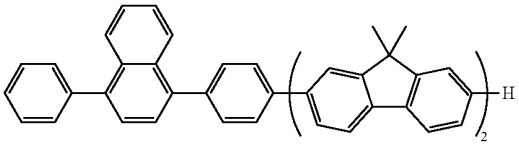

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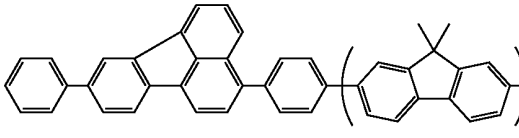

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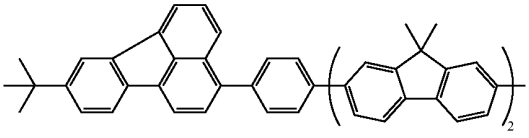

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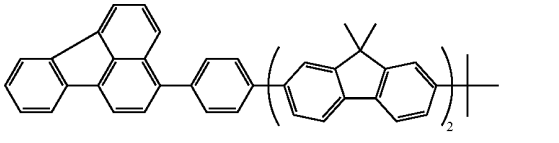

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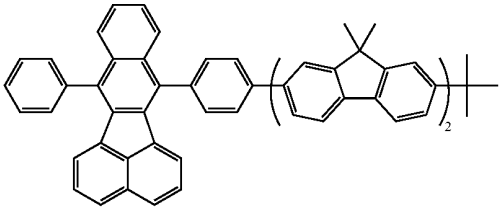

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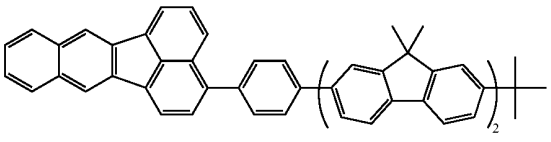

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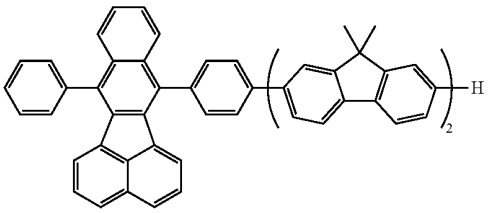

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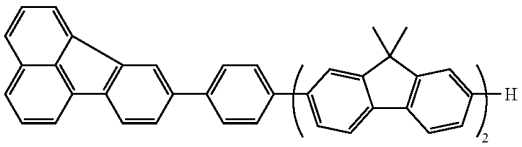

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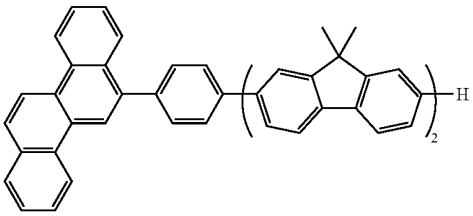

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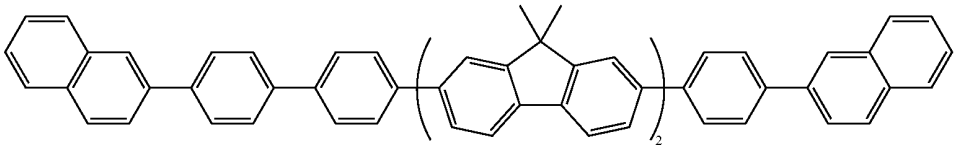

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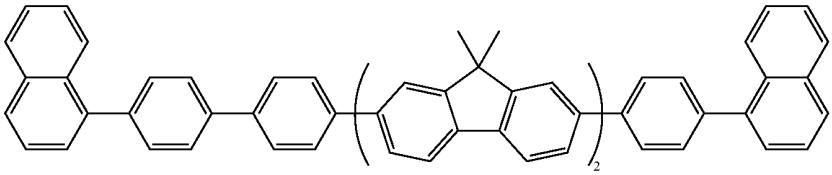

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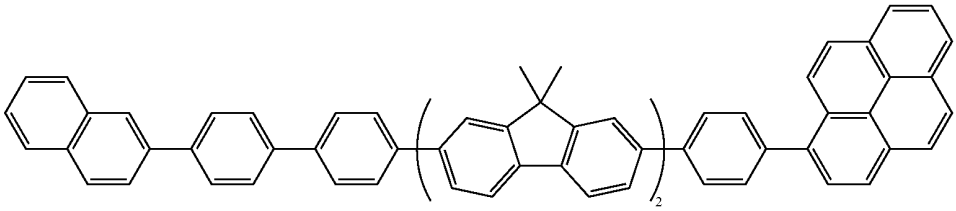

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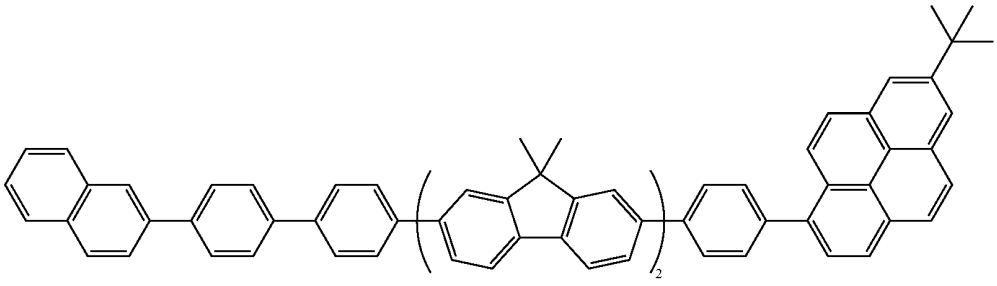

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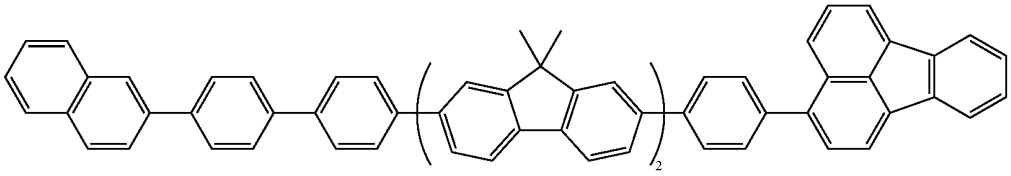

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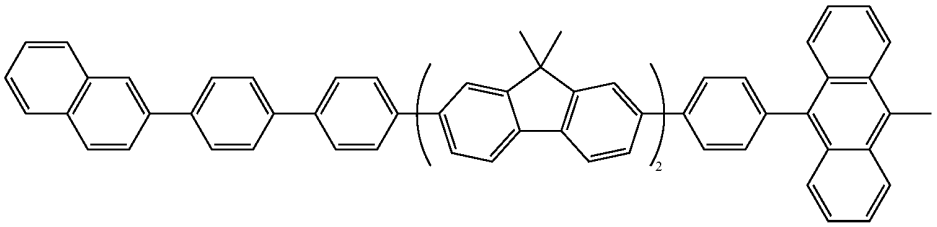

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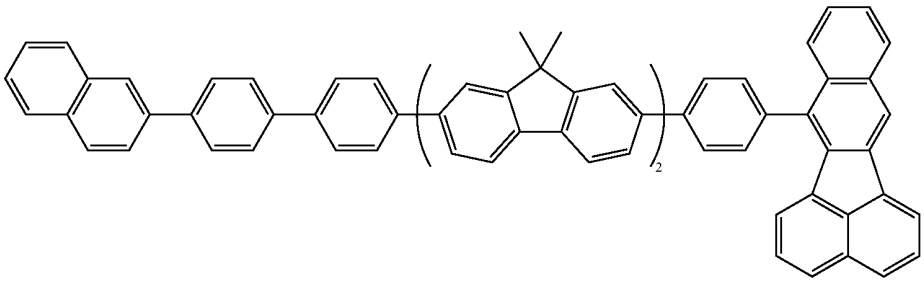

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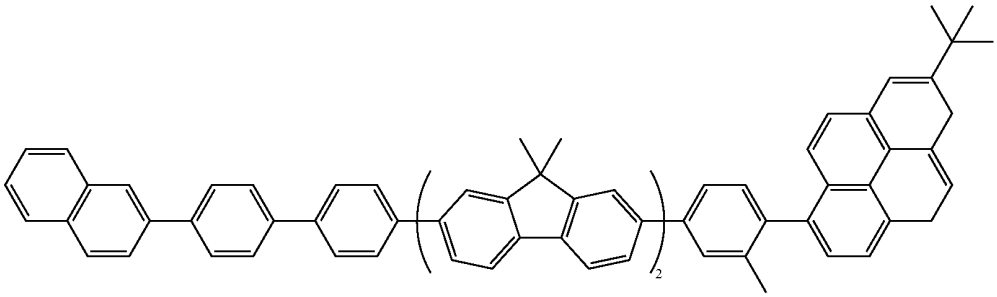

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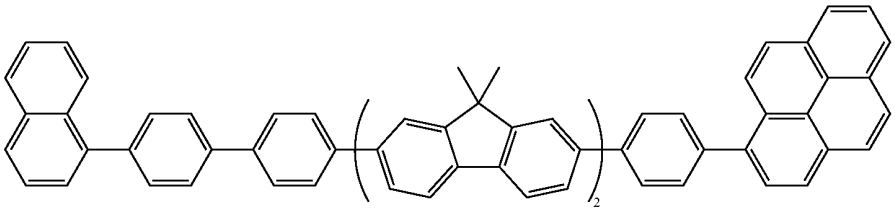

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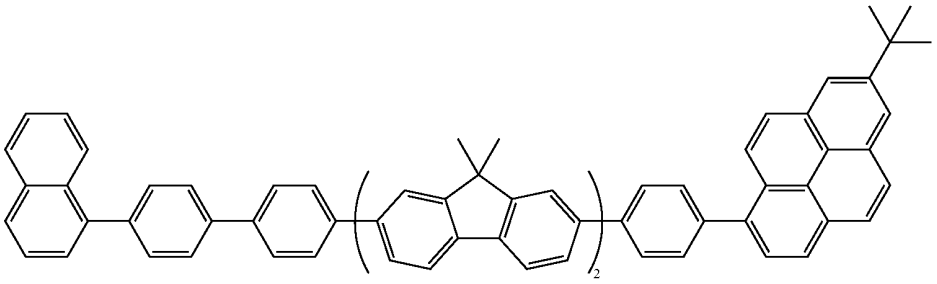

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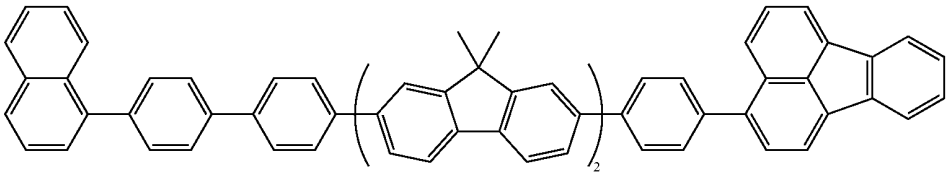

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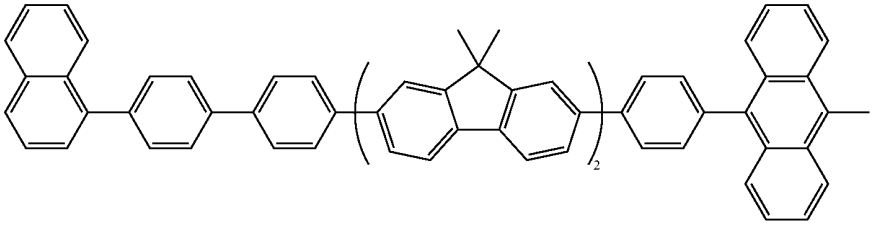

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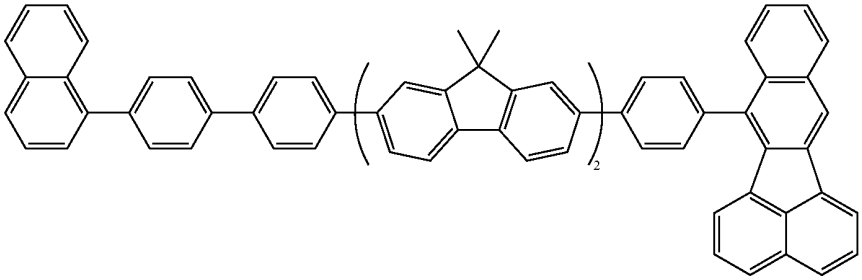

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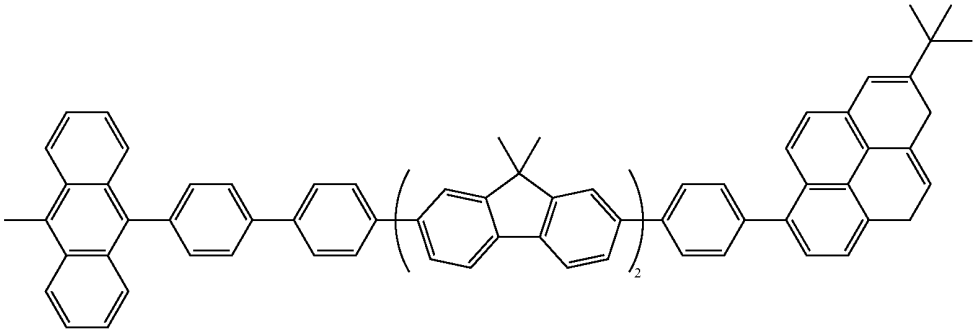

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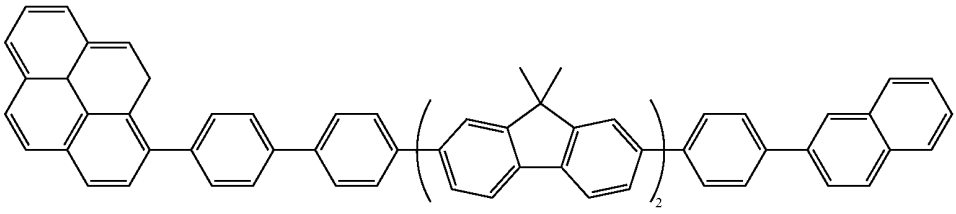

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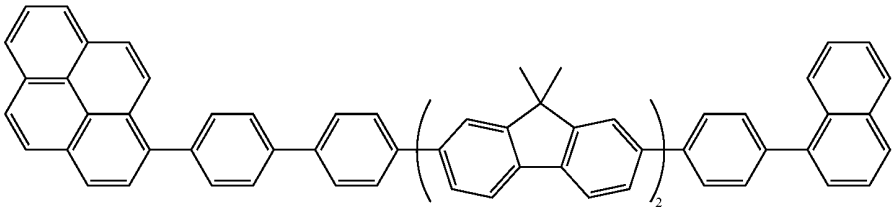

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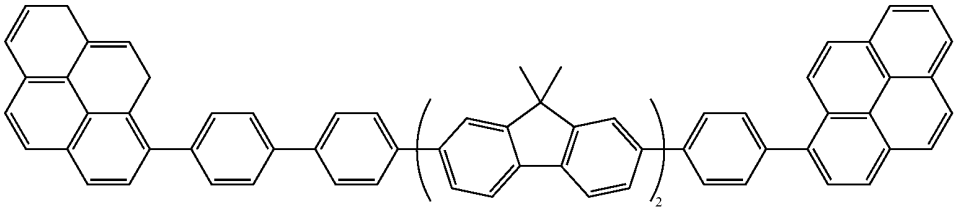

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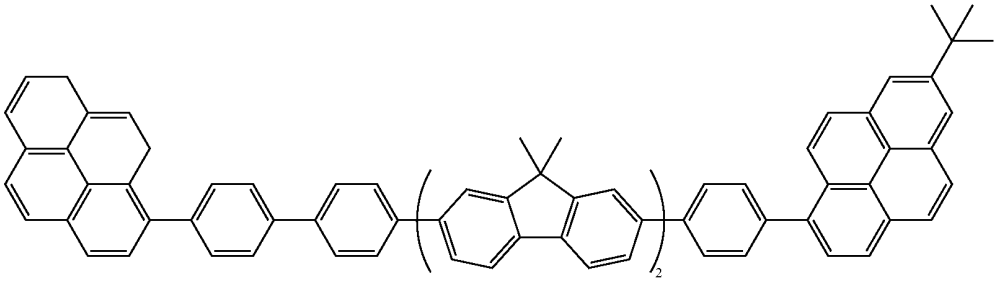

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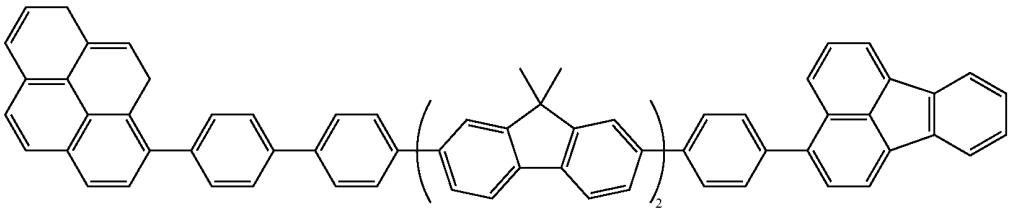

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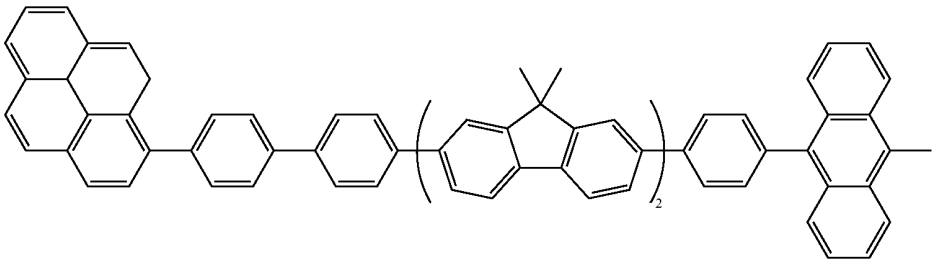

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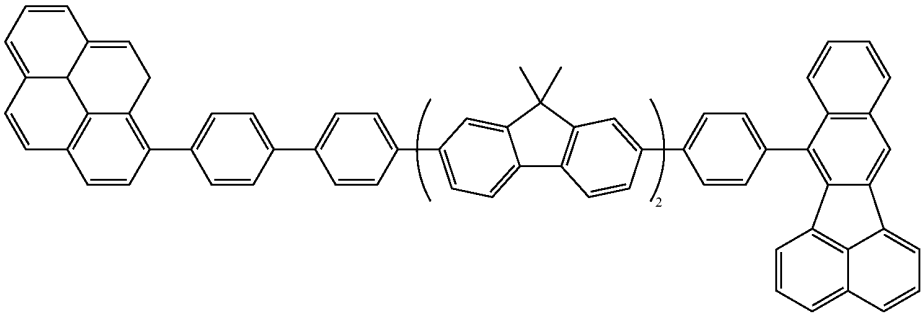

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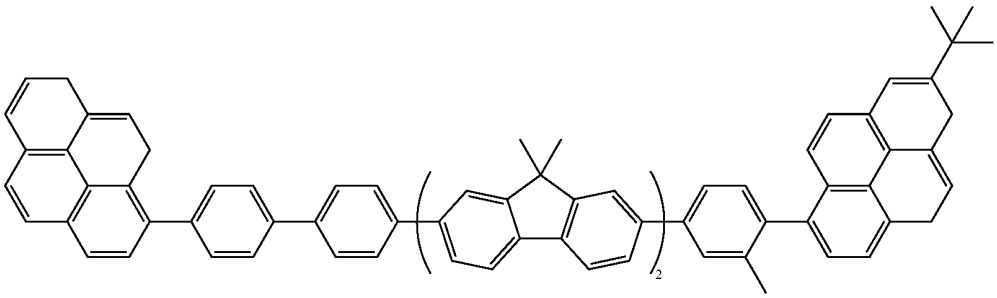

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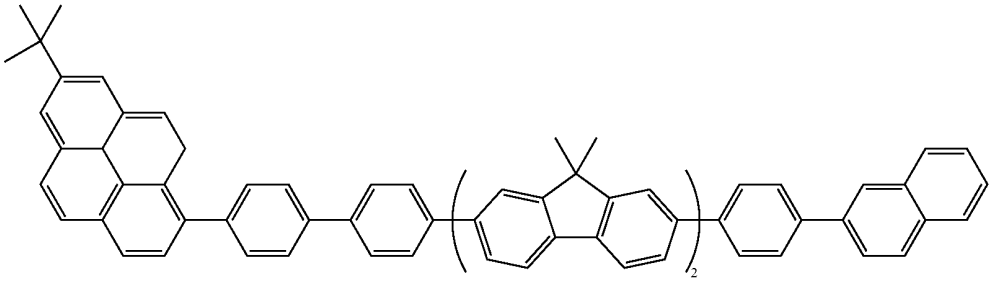

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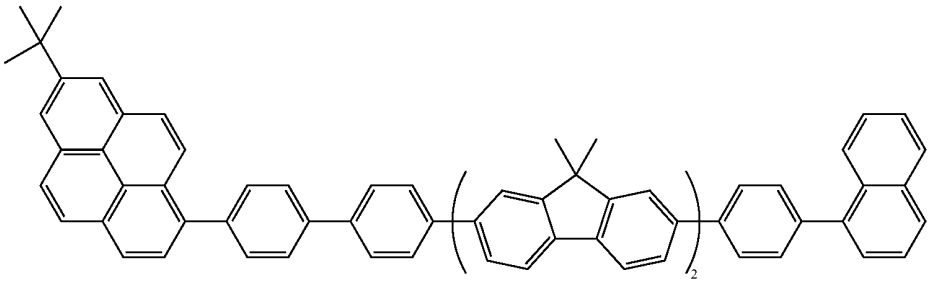

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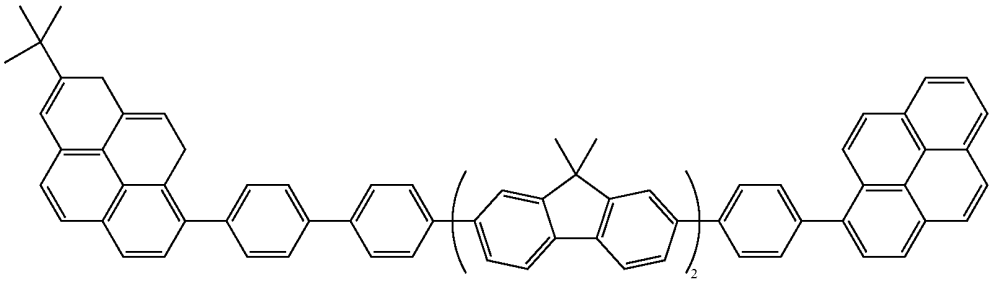

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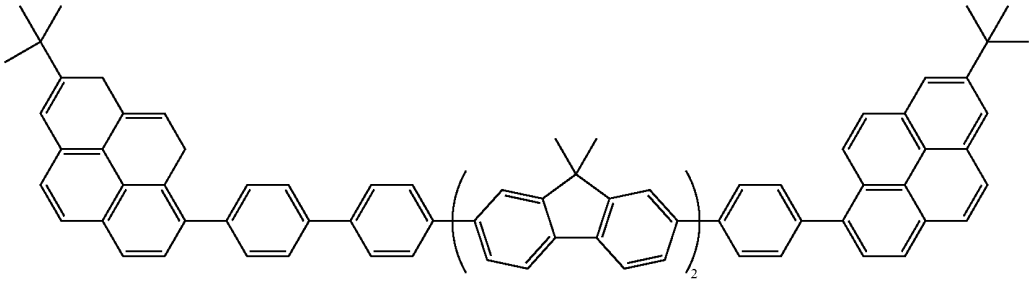

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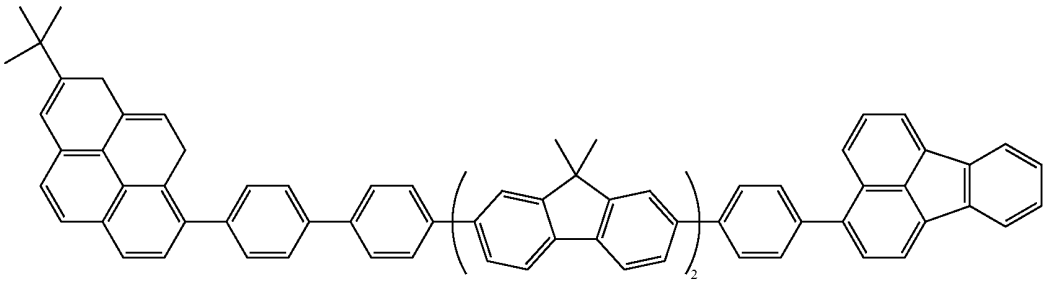

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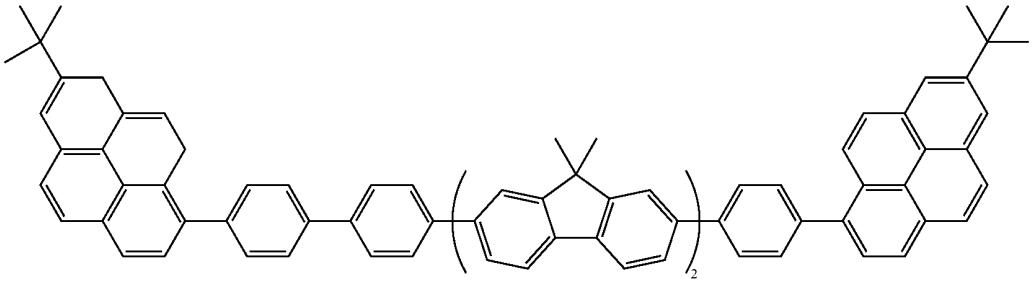

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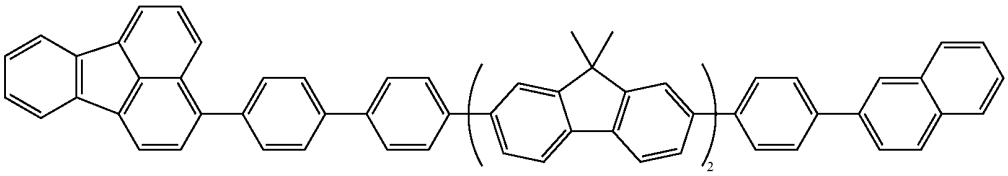

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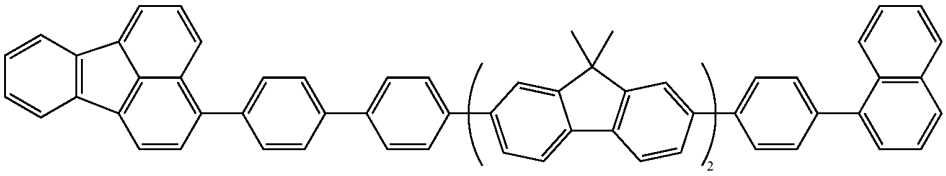

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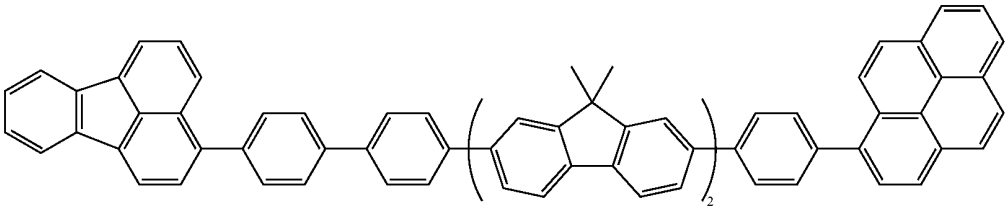

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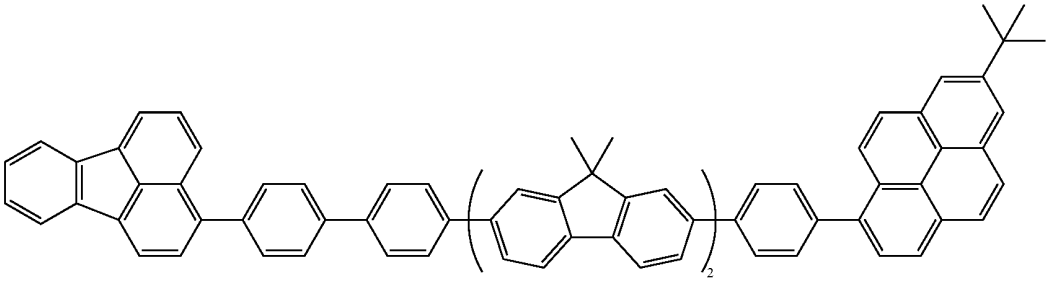

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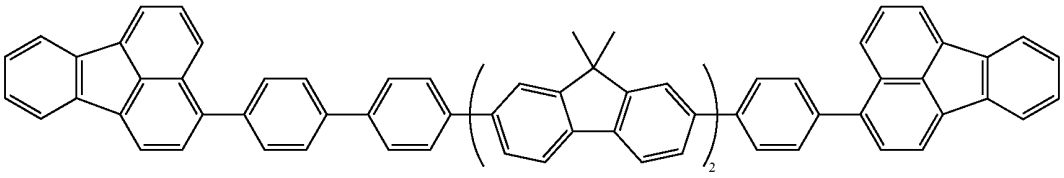

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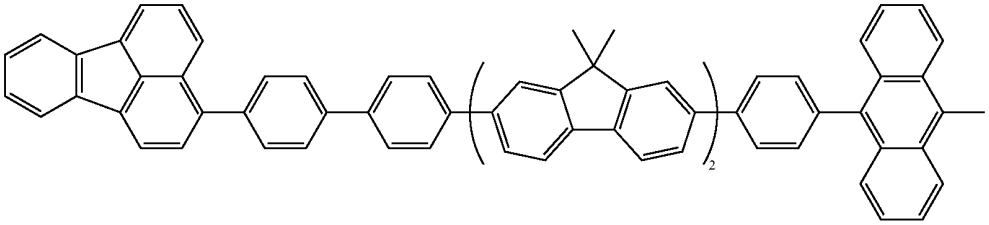

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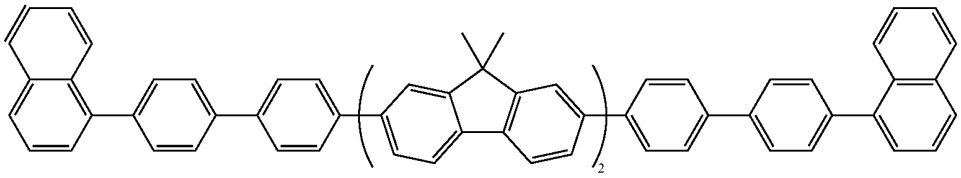

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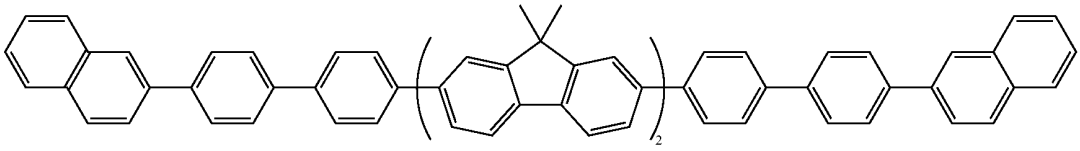

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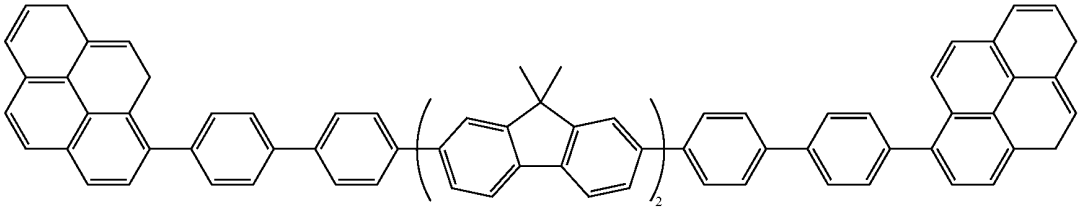

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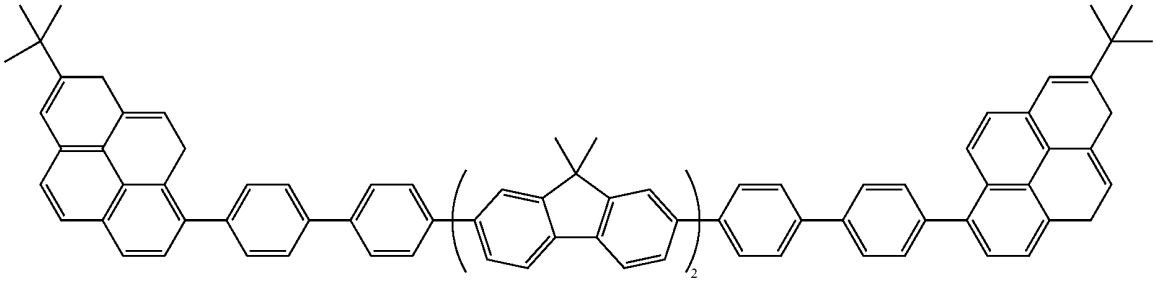

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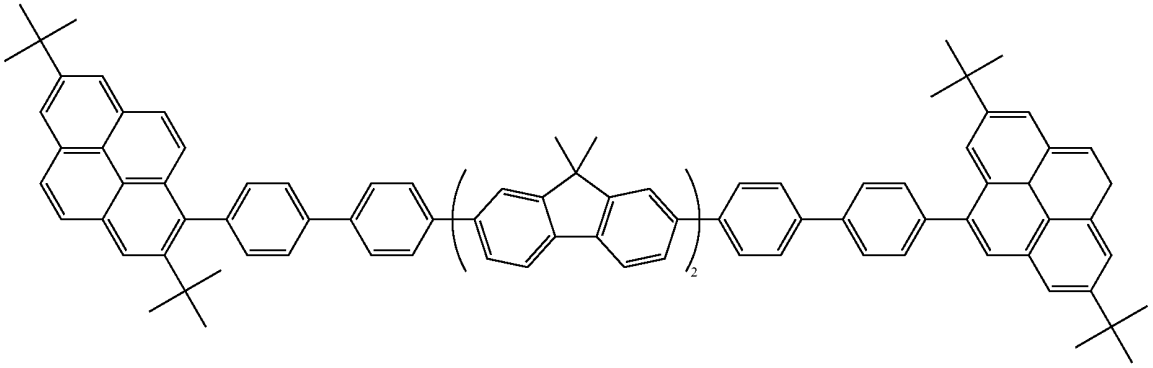

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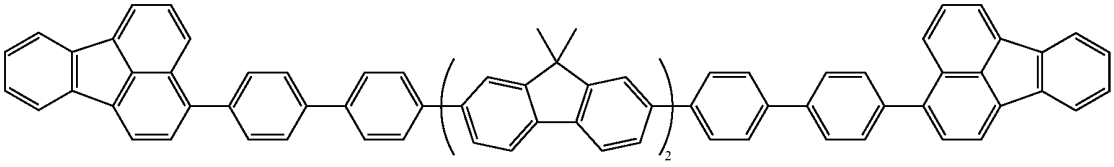

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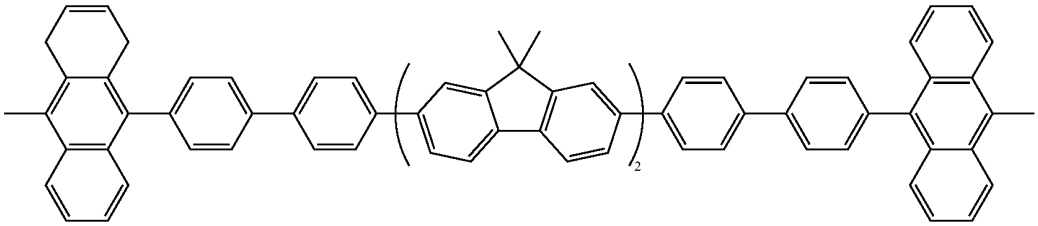

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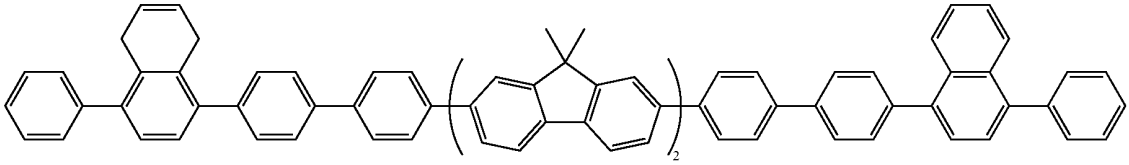

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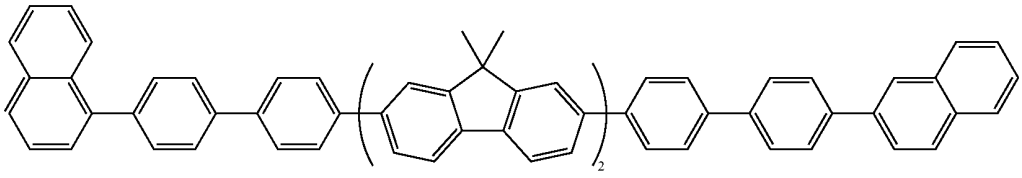

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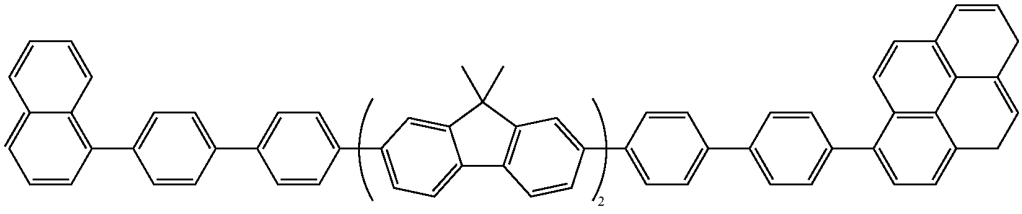

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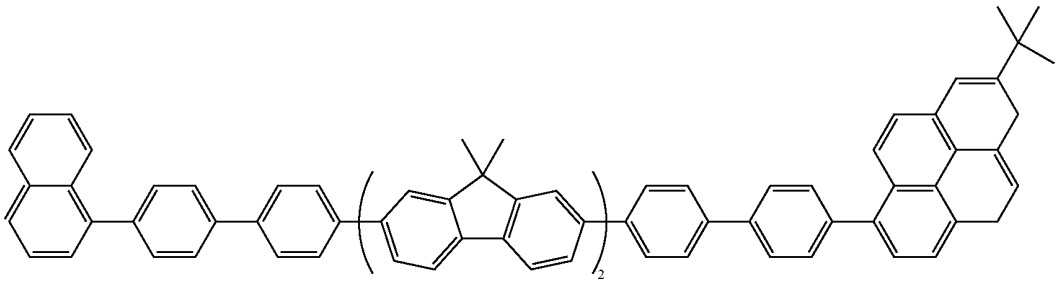

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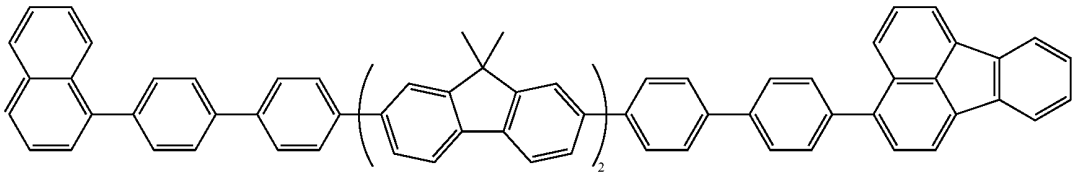

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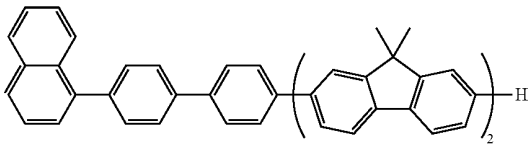

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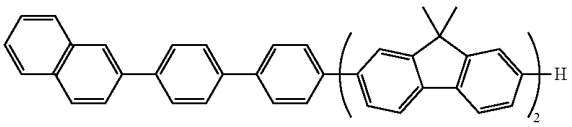

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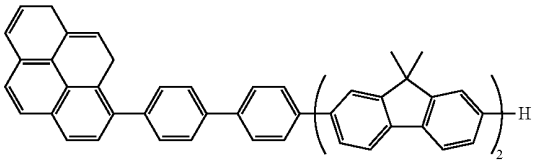

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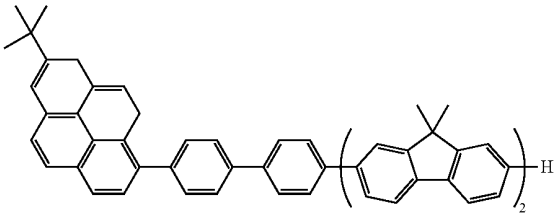

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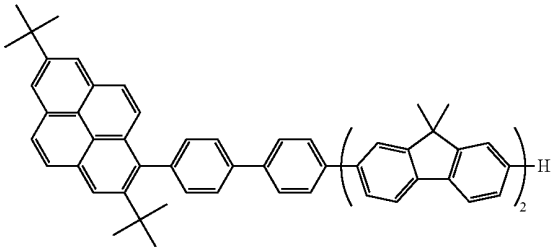

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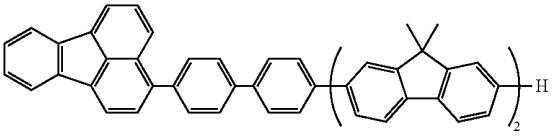

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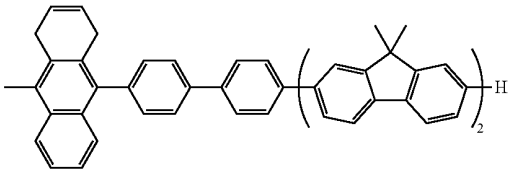

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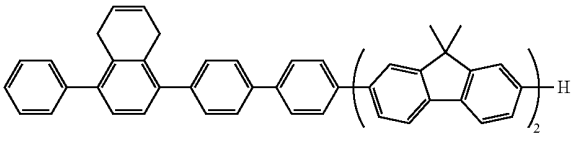

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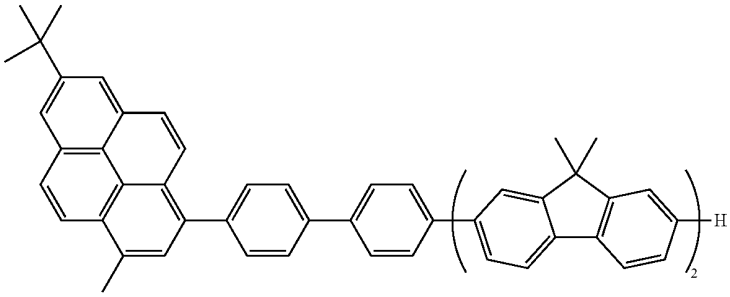

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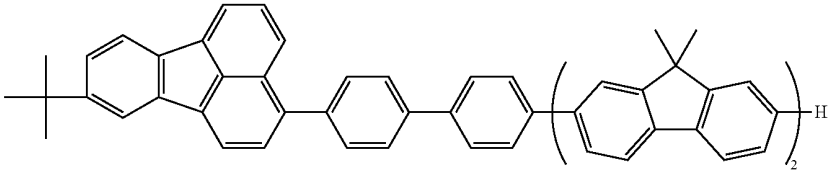

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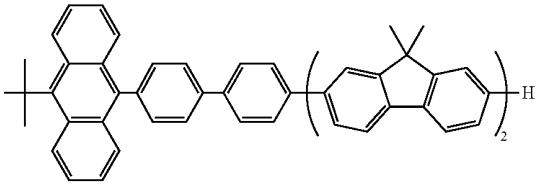

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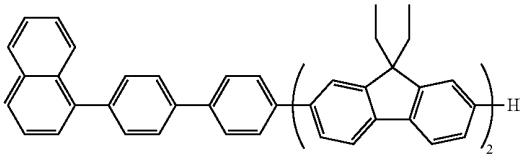

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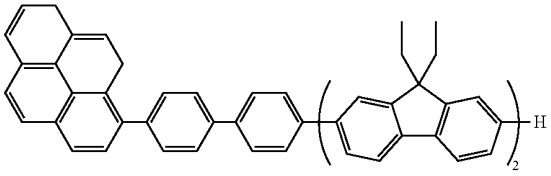

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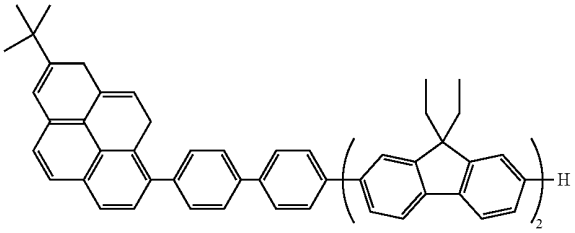

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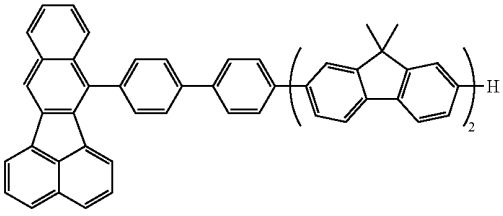

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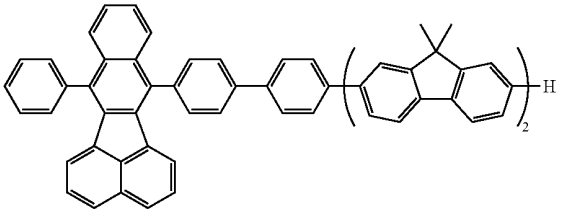

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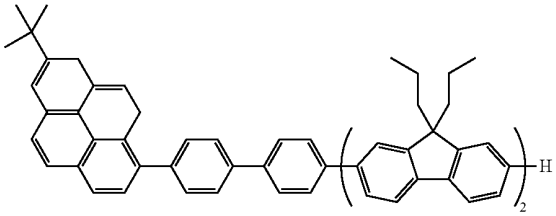

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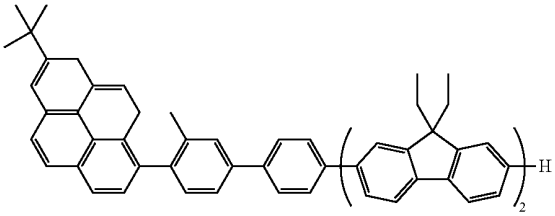

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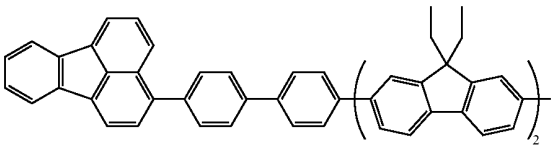
H-298



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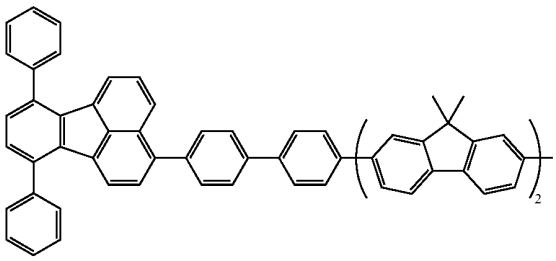

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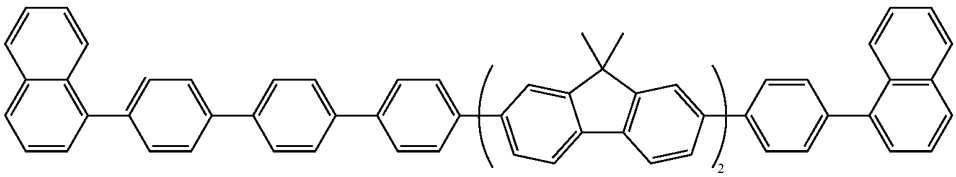

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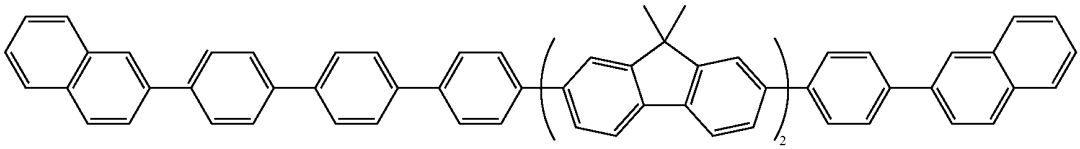

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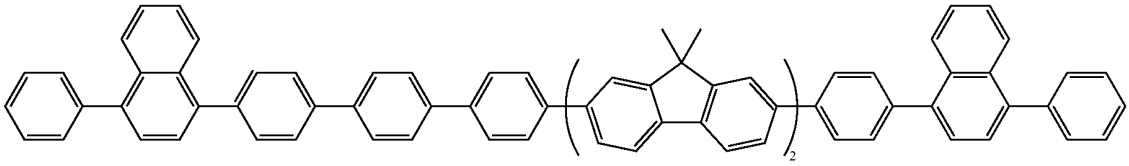

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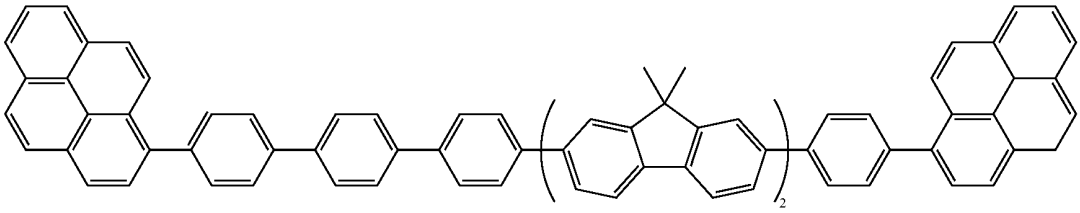

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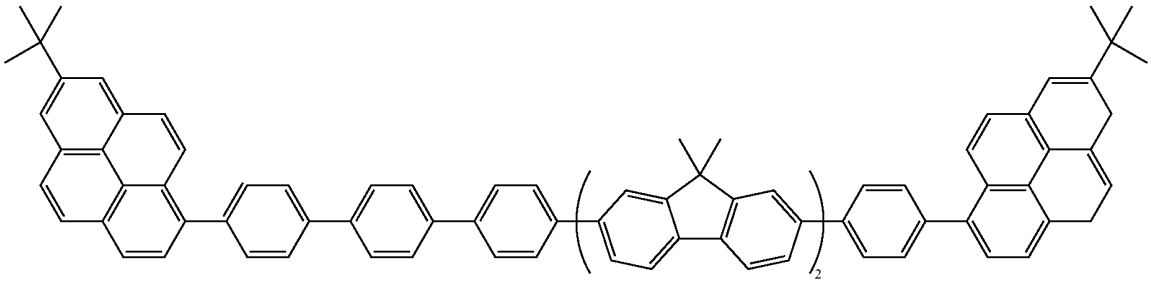

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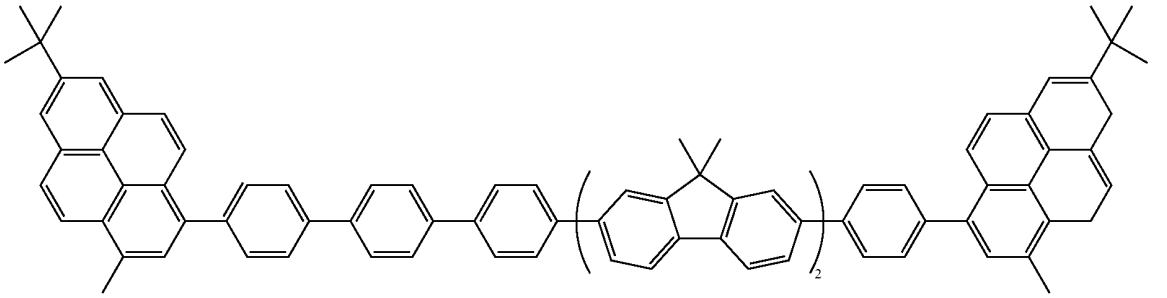

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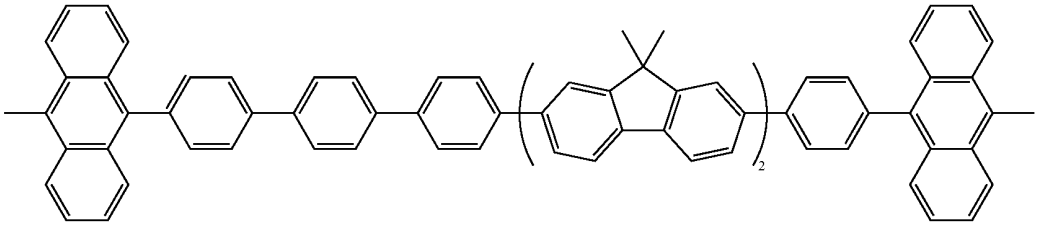

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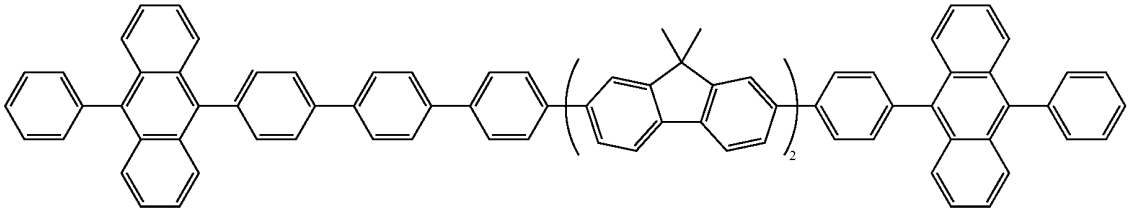

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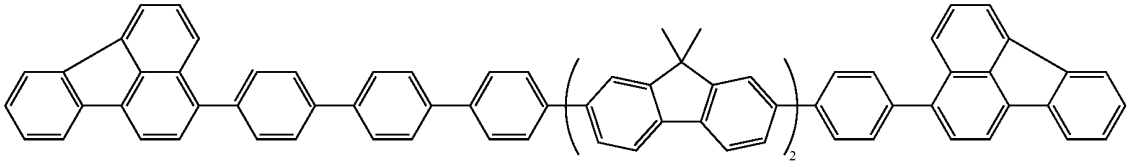

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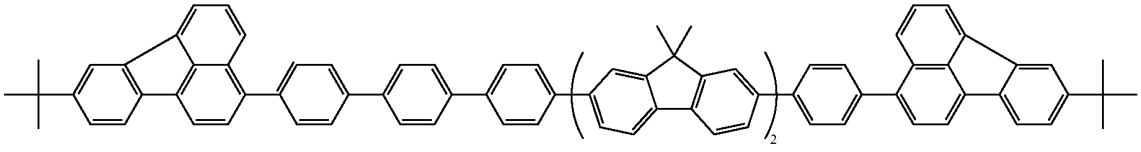

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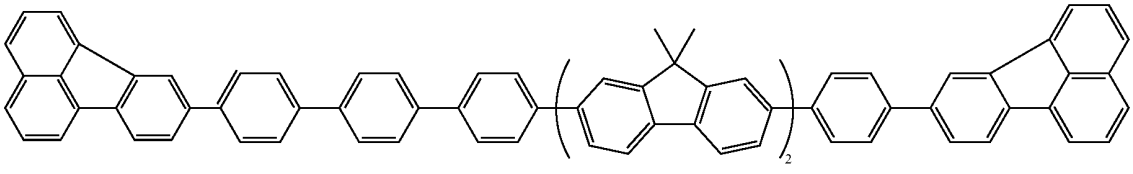

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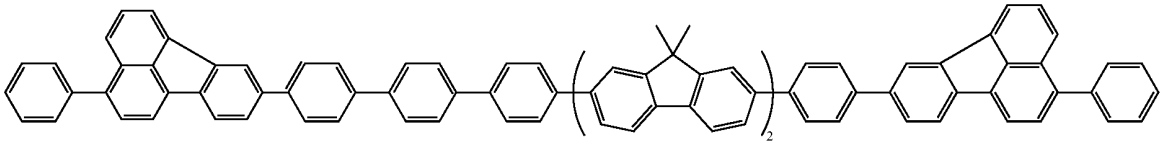

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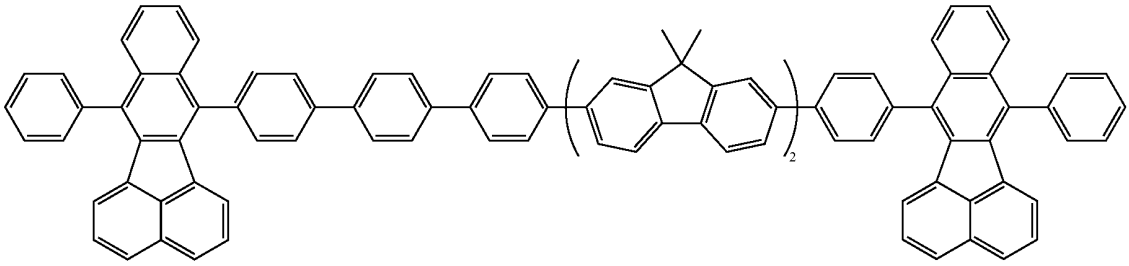

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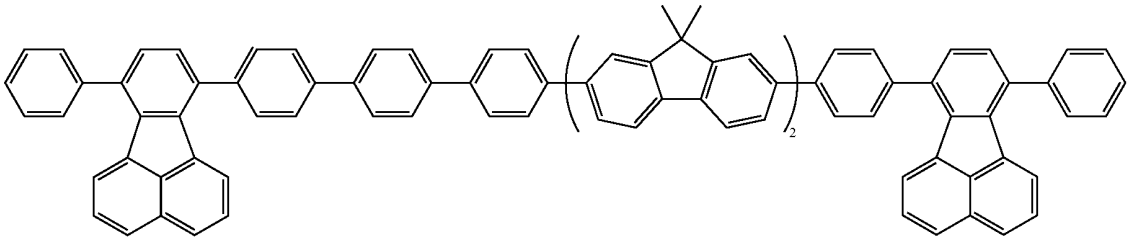

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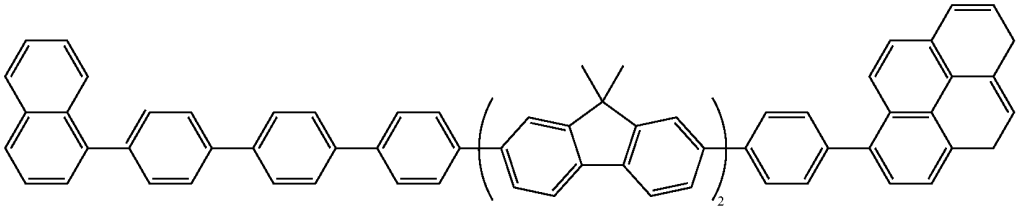

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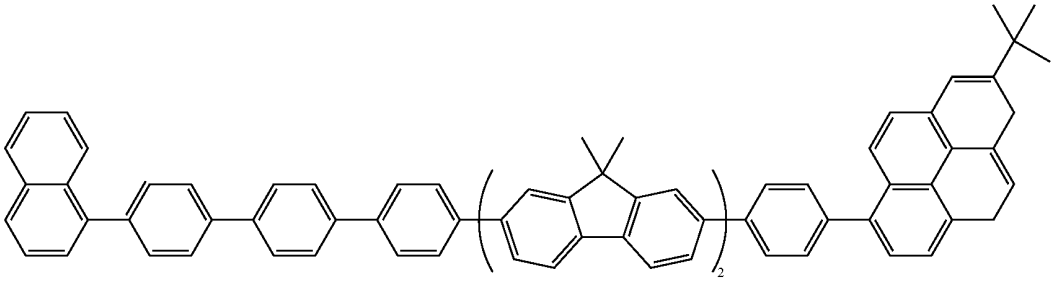

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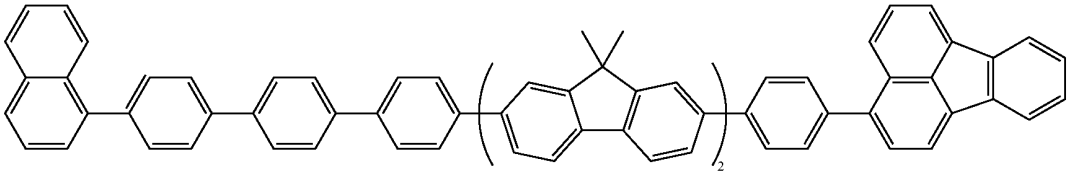

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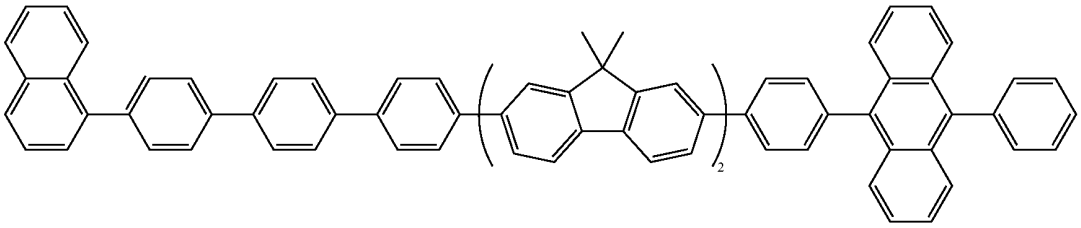

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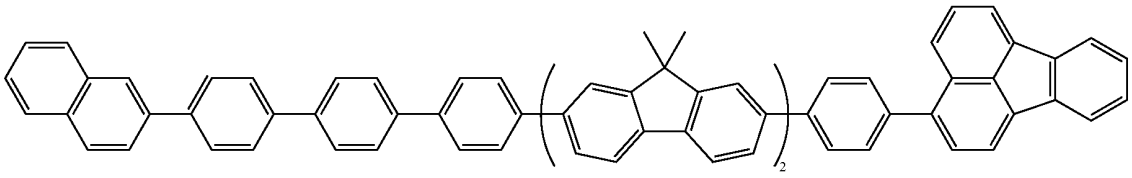

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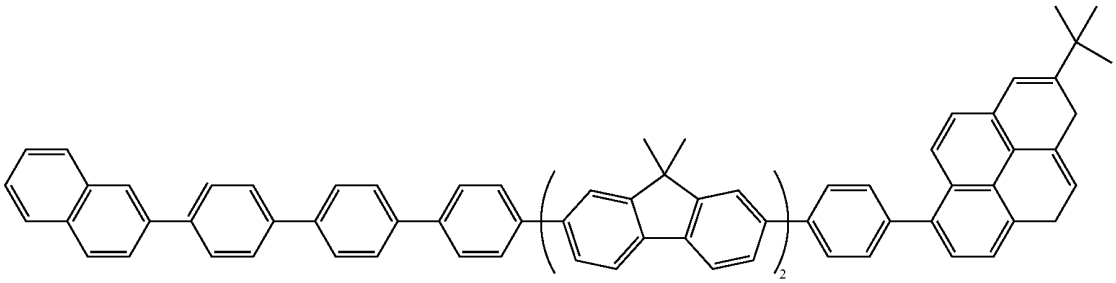

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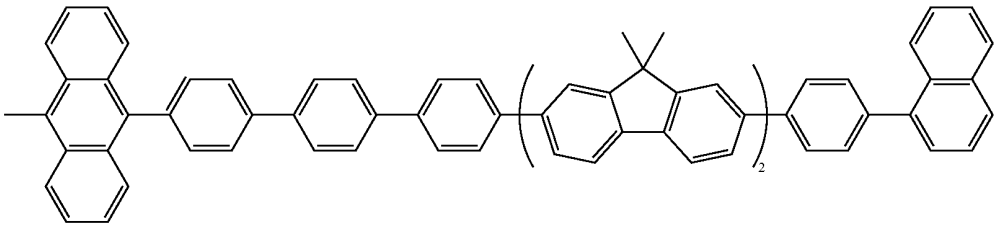

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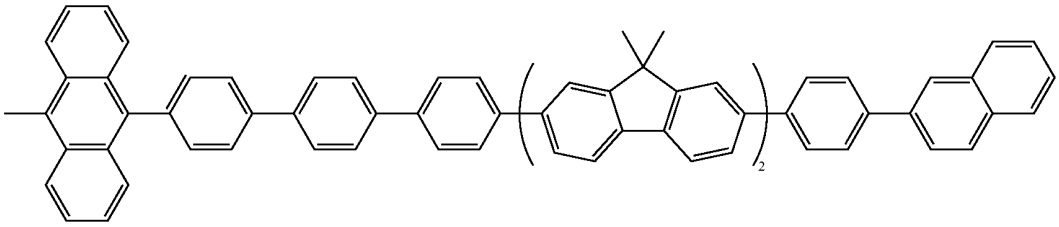

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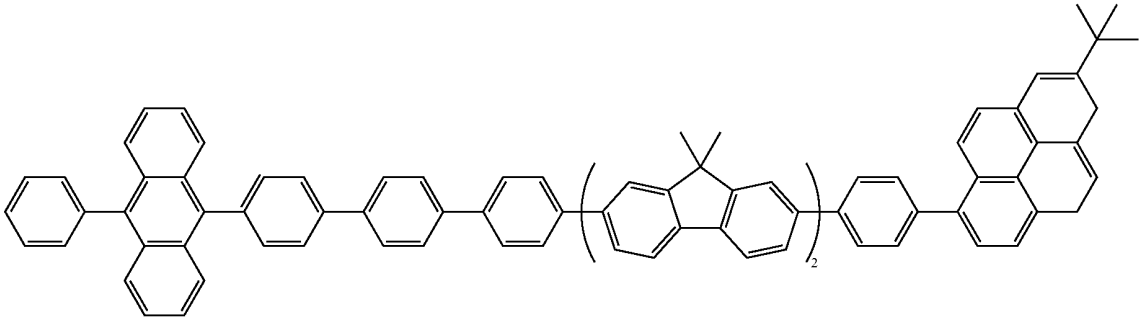

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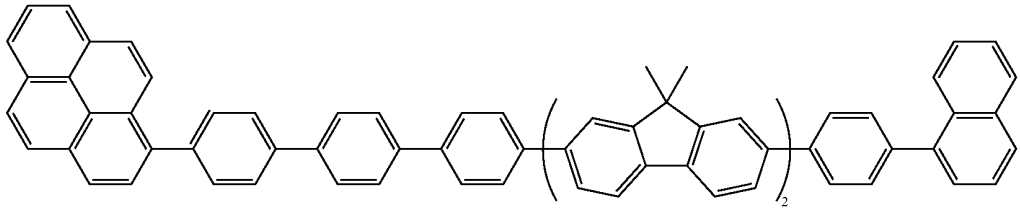

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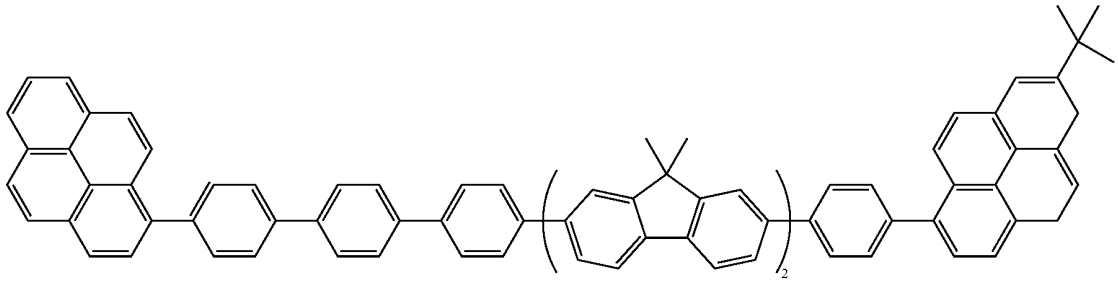

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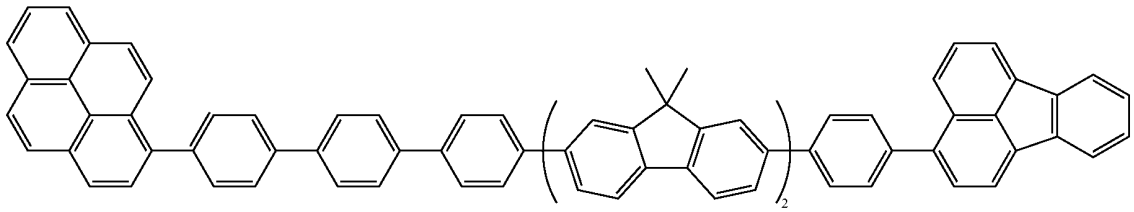

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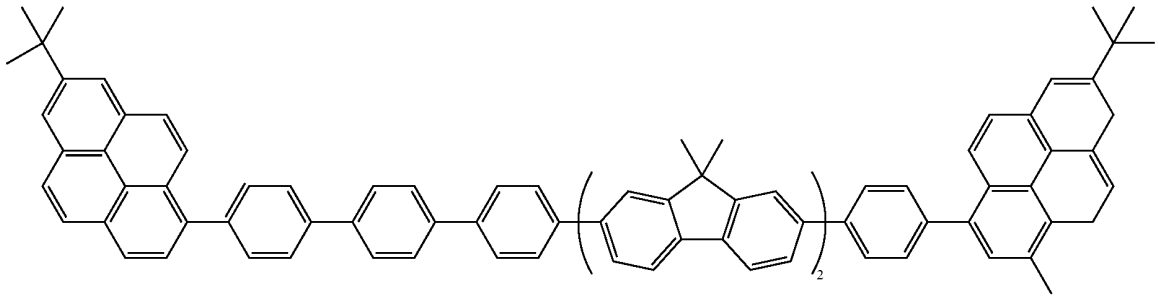

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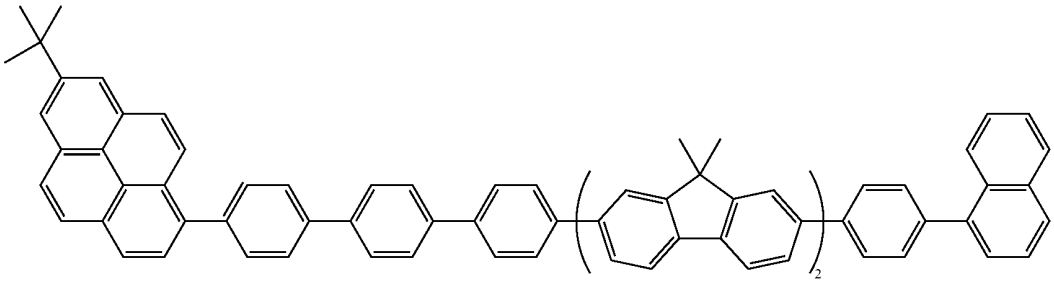

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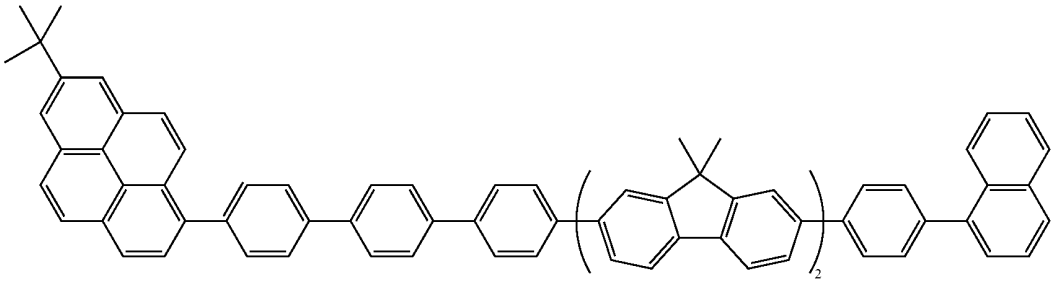

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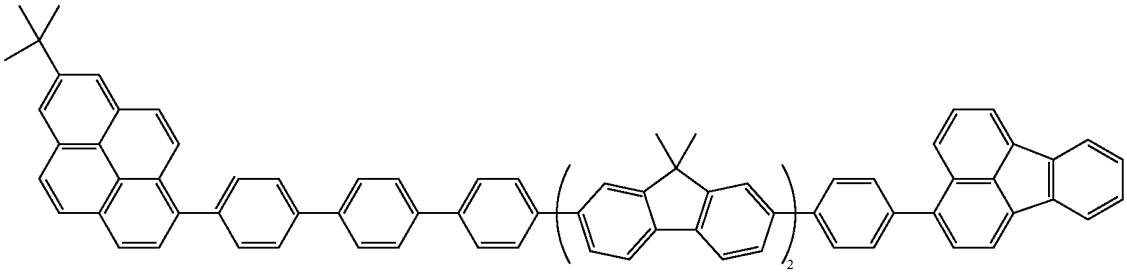

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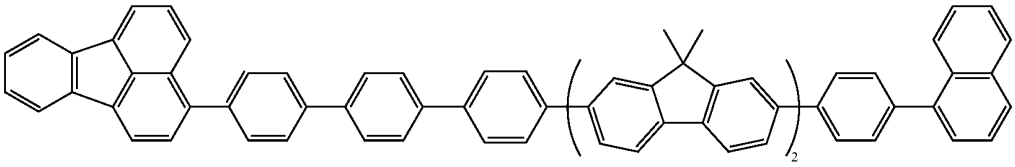

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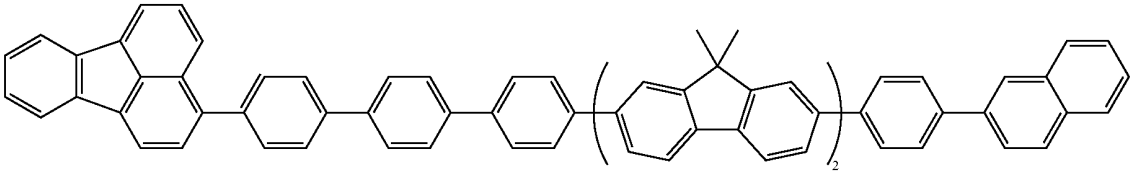

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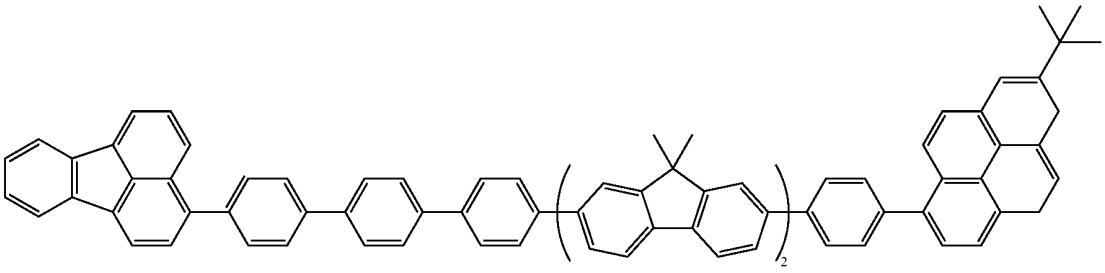

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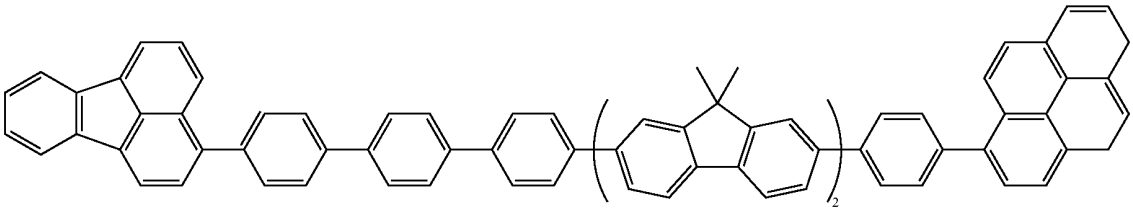

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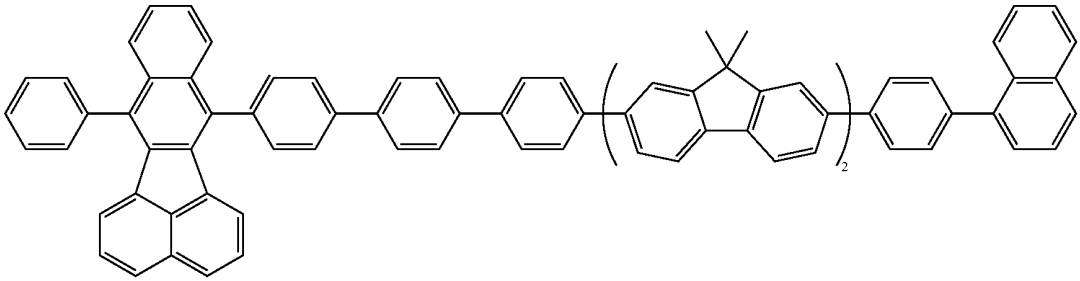

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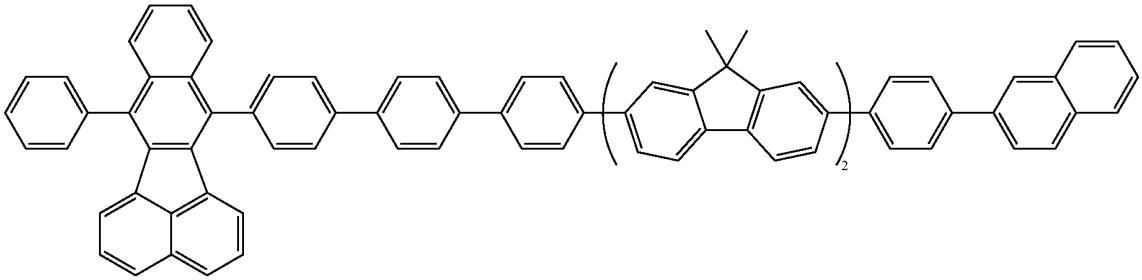

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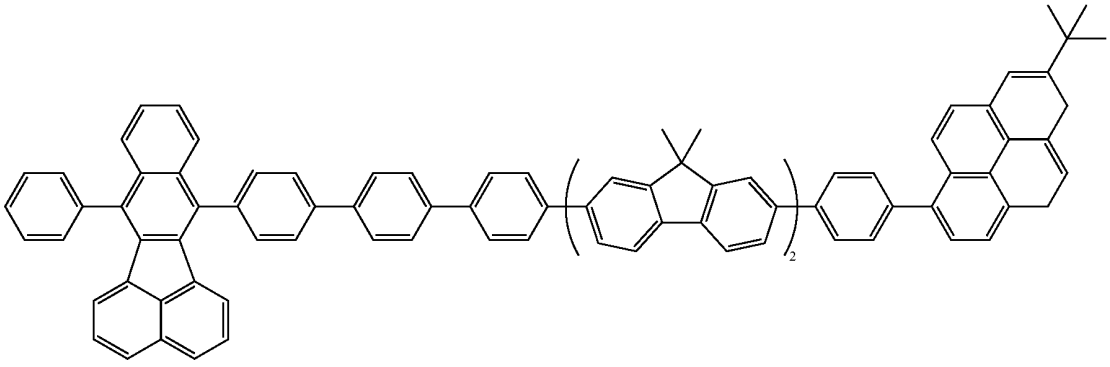

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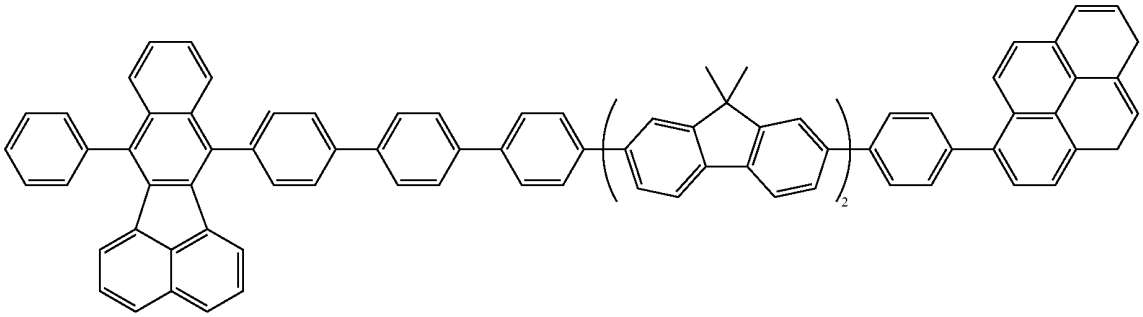

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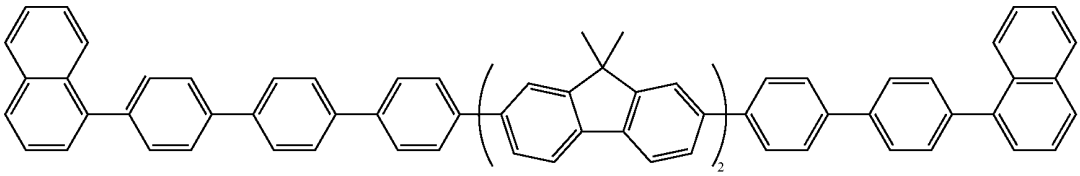

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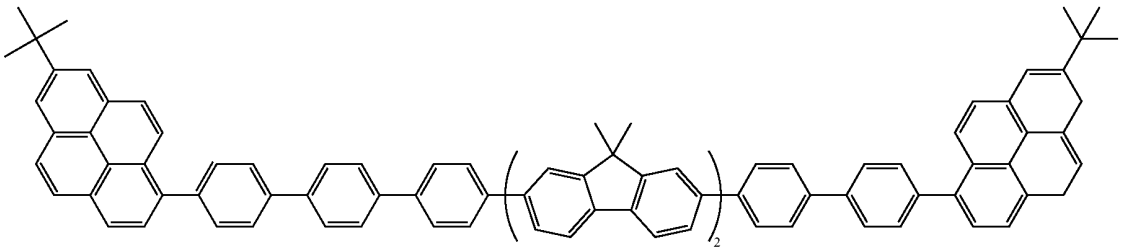

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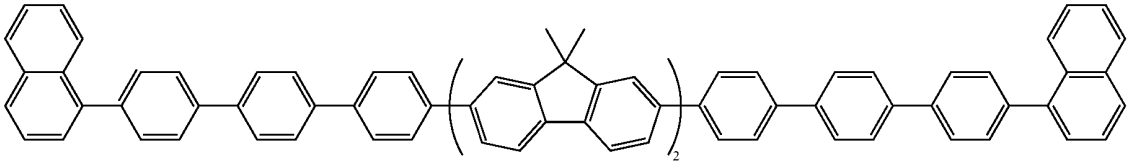

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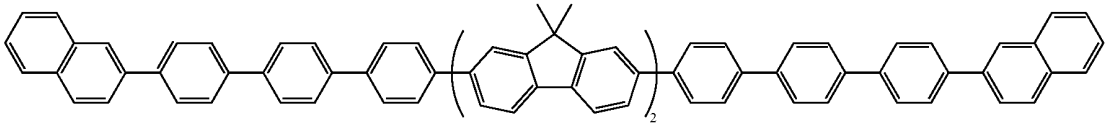

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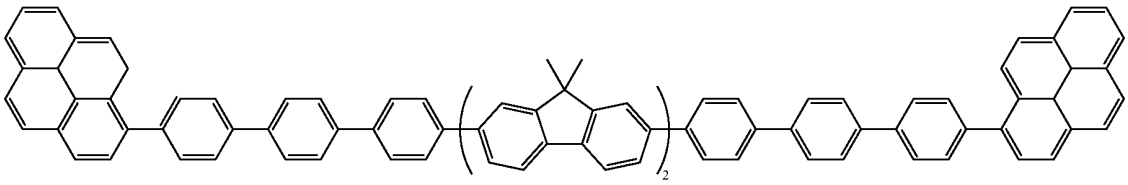

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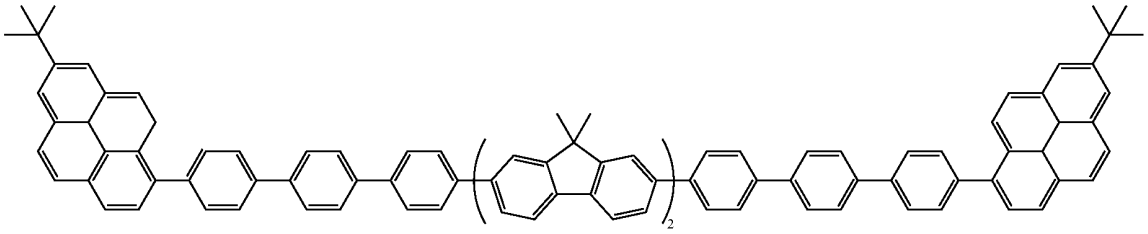

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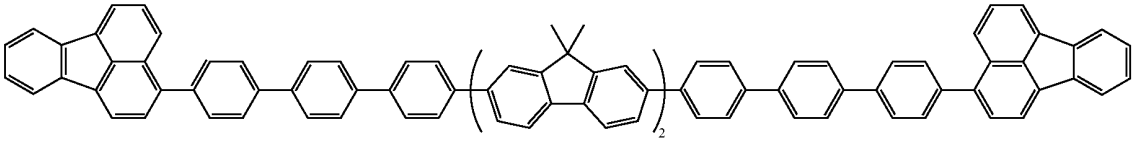

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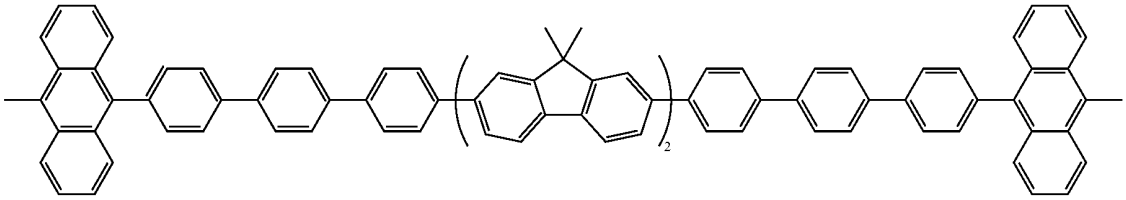

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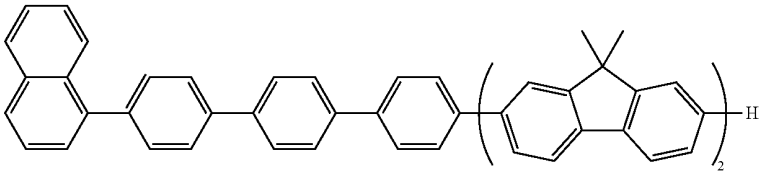

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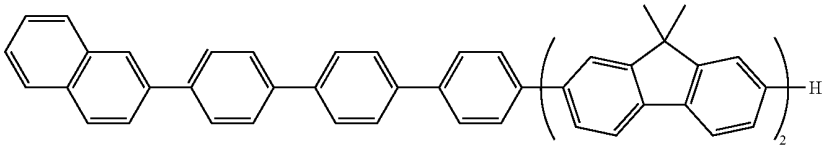

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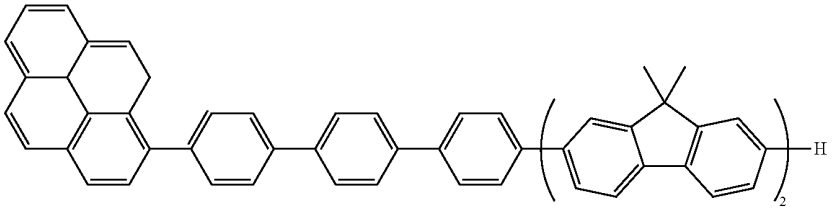

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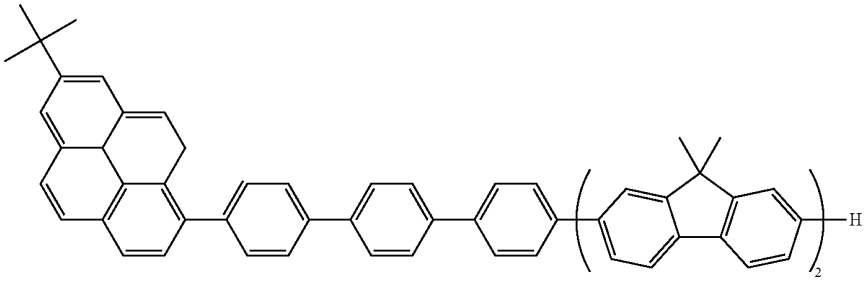

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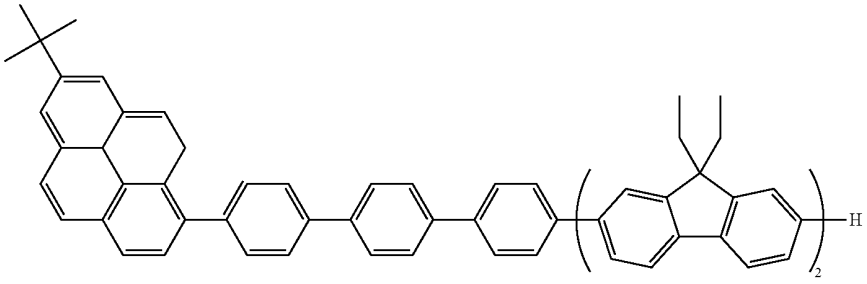

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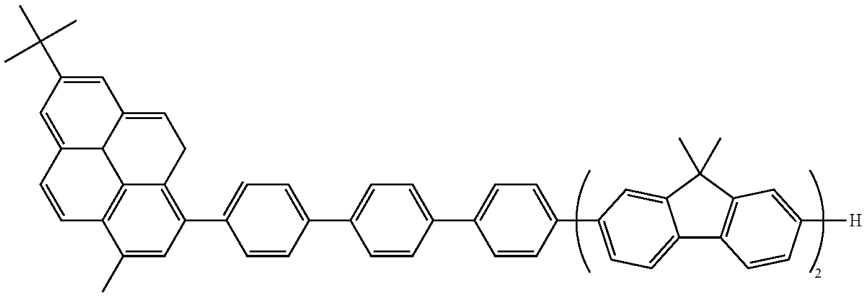

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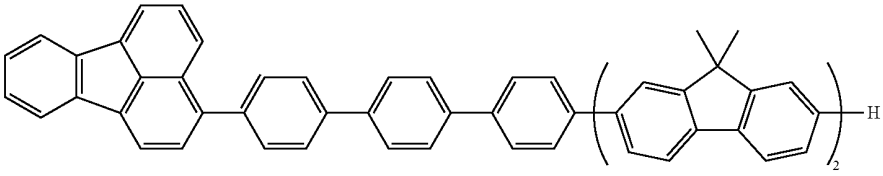

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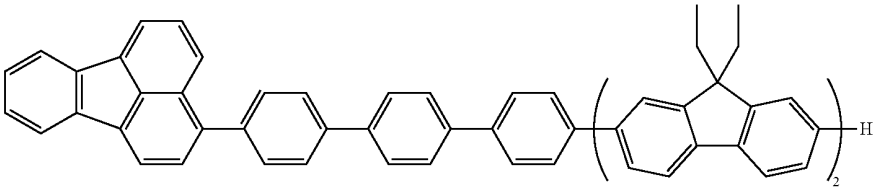

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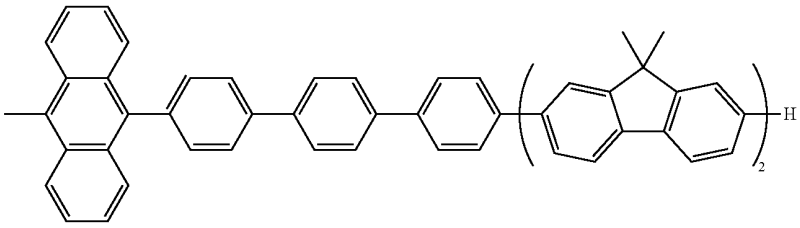

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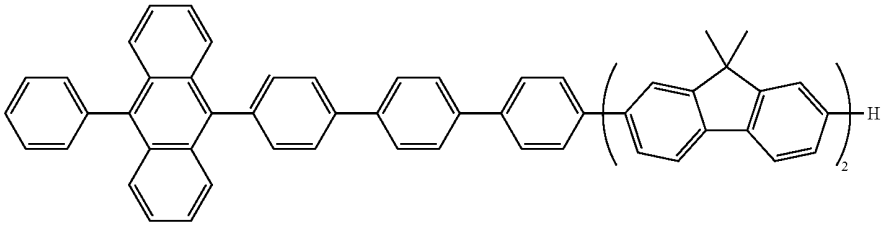

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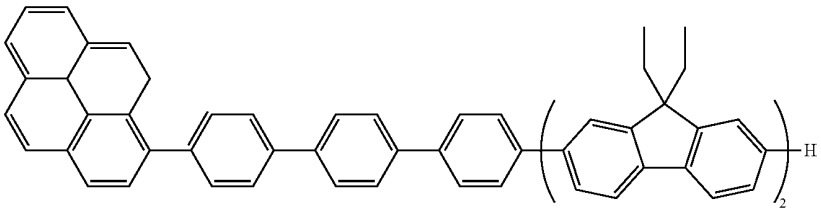

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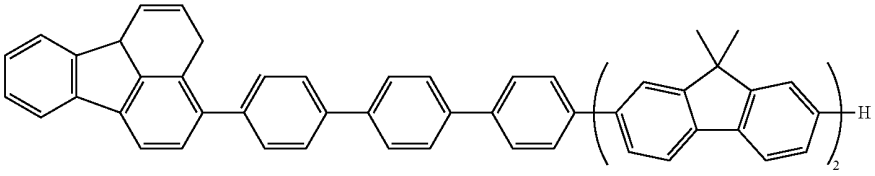

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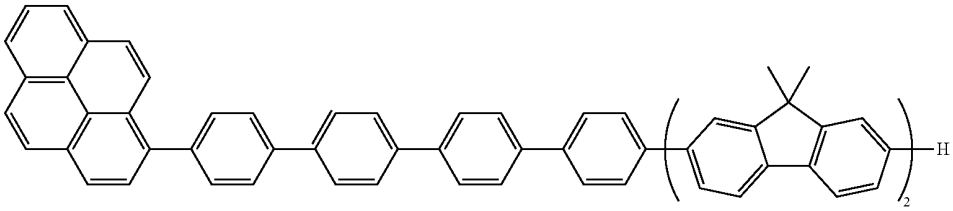

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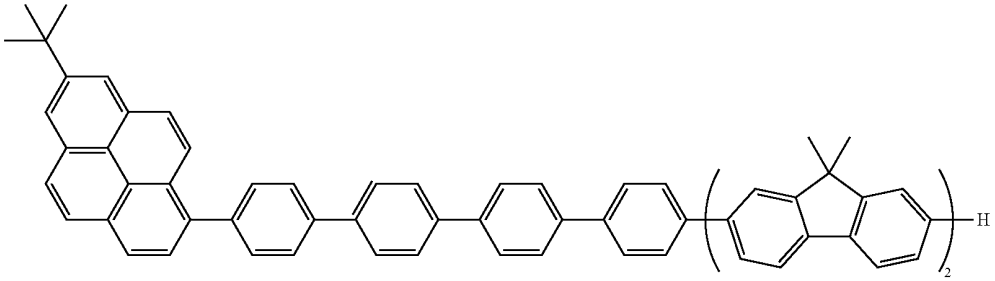

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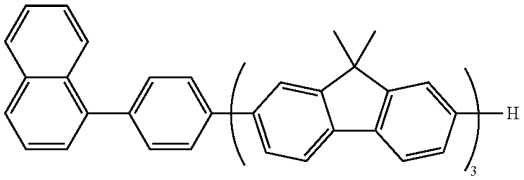
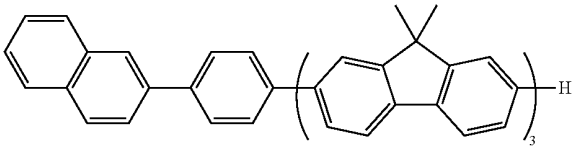
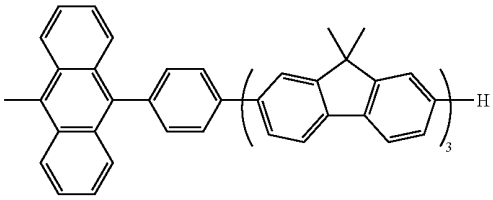


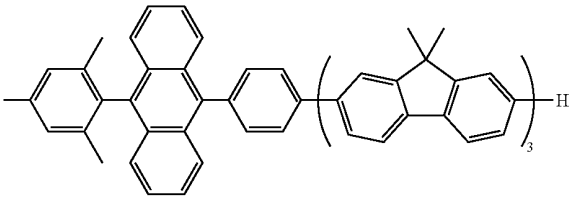
H-361



H-362



H-363



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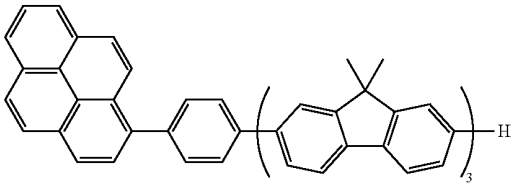

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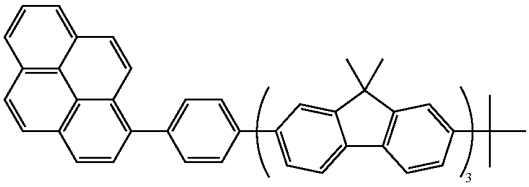

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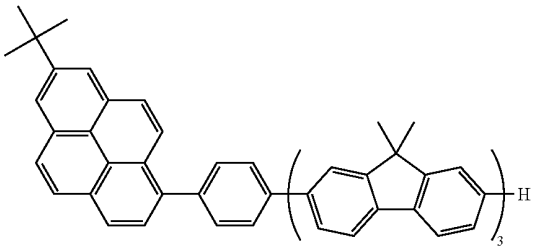

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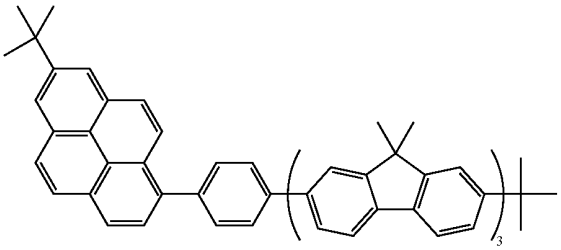

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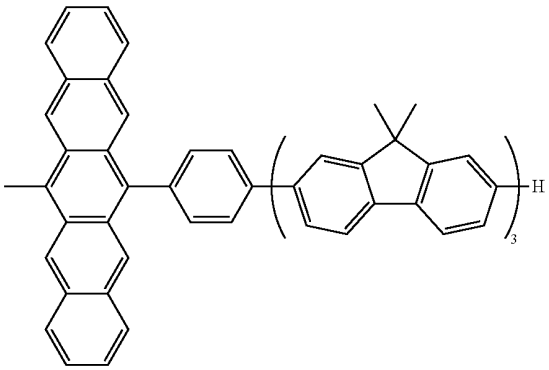

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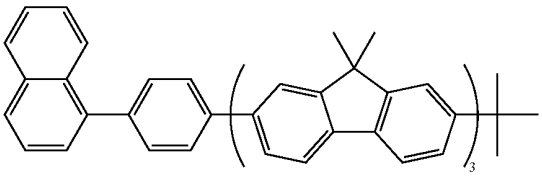

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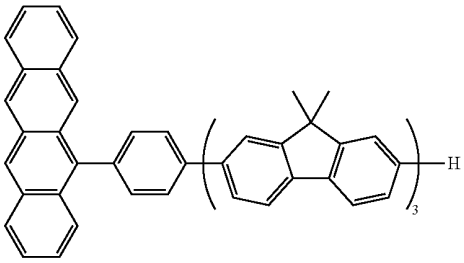
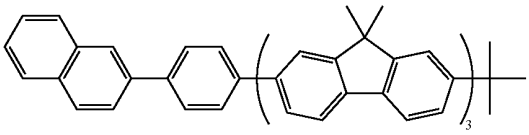
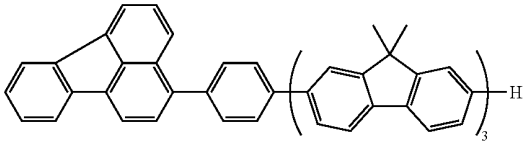


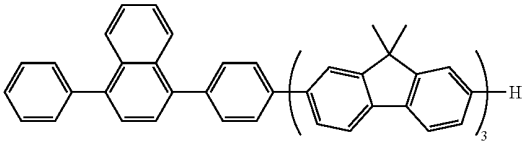
H-371



H-372



H-373



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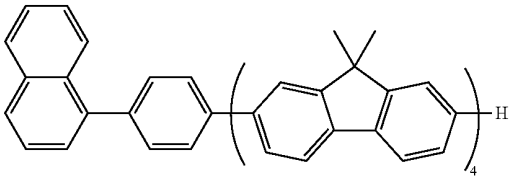
H-374



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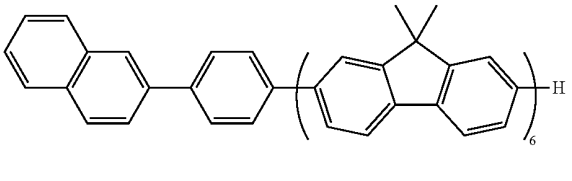

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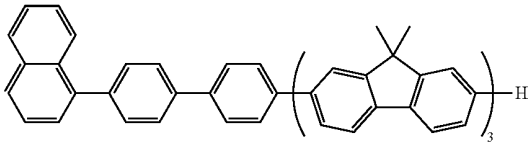

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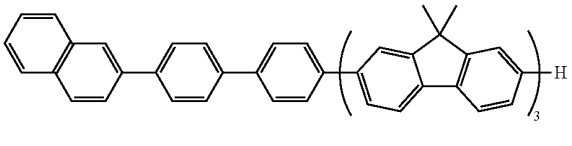

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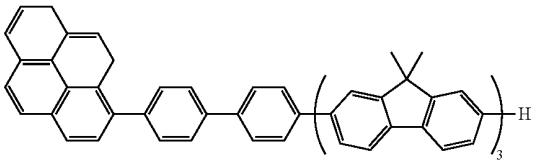

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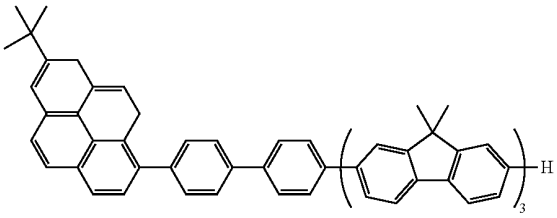

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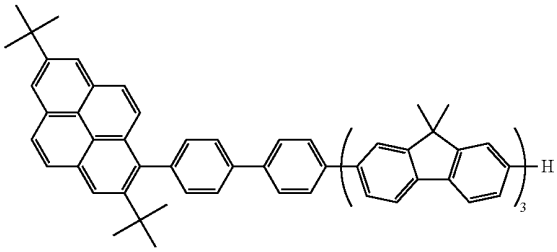

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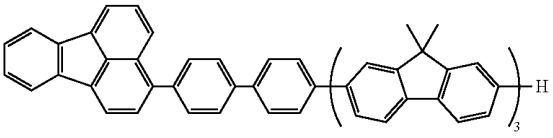

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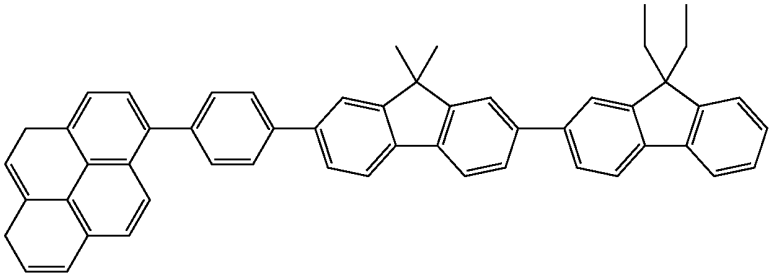

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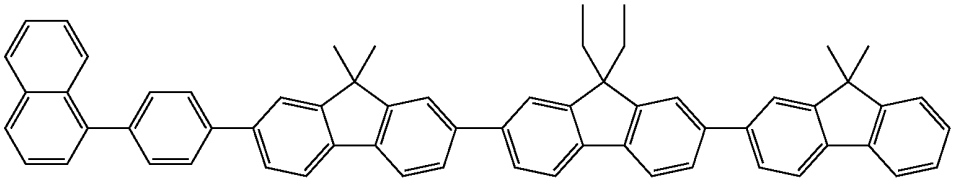

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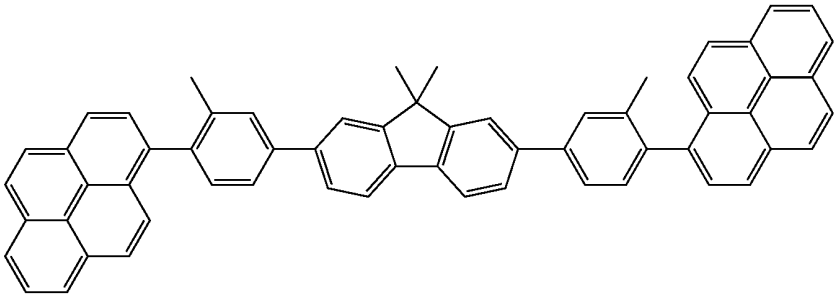

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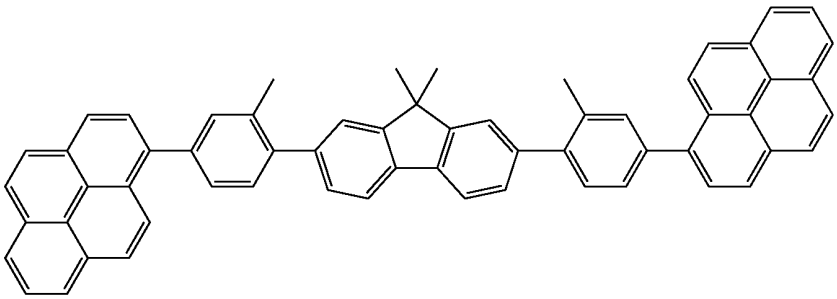

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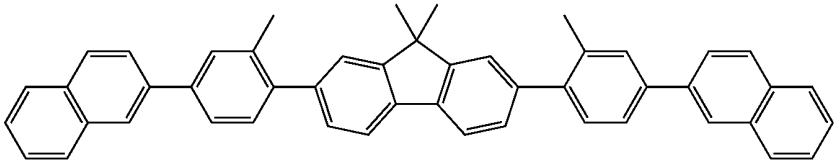

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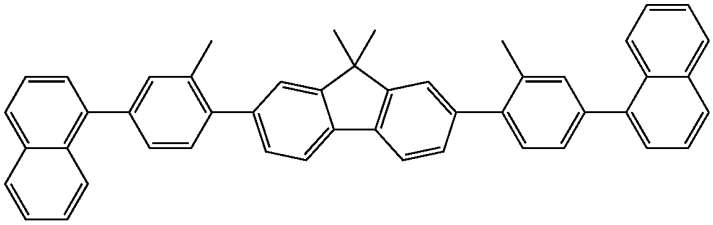
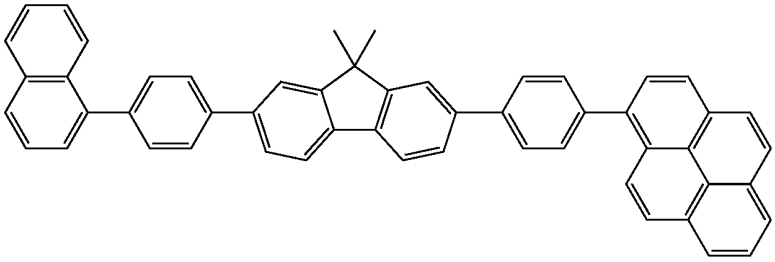


H388



[0151] The fluorene compound of the present invention can be synthesized by a Suzuki coupling reaction by appropriately combining a fluorene derivative, a halogenated benzene derivative, and a benzene boric acid derivative.

[0152] Next, an organic electroluminescence device of the present invention will be described.

[0153] The device of the present invention is an organic electroluminescence device including a layer containing an organic compound, the layer being interposed between a pair of electrodes. The layer containing an organic compound, or preferably a light emitting layer is a layer containing the above-mentioned fluorene compound of the present invention.

[0154] It is preferable that: the light emitting layer be composed of two or more compounds including a host and a guest; and the host be the fluorene compound of the present inven-

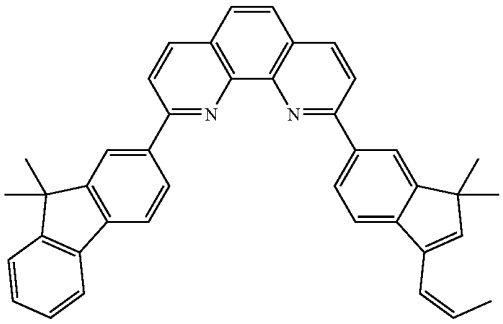
tion. A generally known fluorescent material or phosphorescent material can be used as a guest molecule in this case. In order that a light emitting device having high efficiency may be obtained, a metal coordination compound known to emit phosphorescence such as an Ir complex, a Pt complex, an Re complex, a Cu complex, an Eu complex, or an Rh complex is preferable, and an Ir coordination compound known to emit strong phosphorescence is more preferable. Further, a plurality of phosphorescent materials can be incorporated into the light emitting layer for the purposes of causing the light emitting layer to emit plural light beams different from each other in color and aiding the transmission of an exciton or charge.

[0155] In addition, in the device of the present invention, the light emitting layer may be composed of two or more compounds including a host and a guest, and the guest may be the fluorene compound of the present invention. In this case, light emitted from the guest is preferably fluorescence. Further, plural fluorescent materials can be incorporated into the light emitting layer for the purposes of causing the light emitting layer to emit plural light beams different from each other in color and aiding the transmission of an exciton or charge.

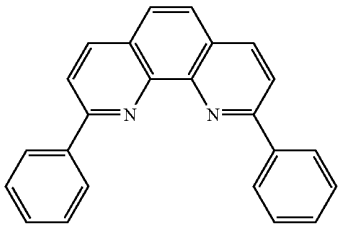
[0156] An organic layer containing the fluorene compound of the present invention can be produced by, for example, a vacuum deposition method, a cast method, an application method, a spin coating method, an ink-jet method, or a laminate method.

[0157] Examples of an electron transport material, a hole transport material, and the like are shown below. However, the electron transport material, the hole transport material, and the like are not limited to the examples.

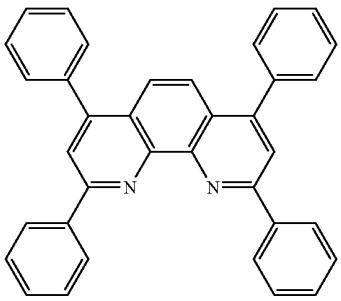
E-1



E-2



E-3



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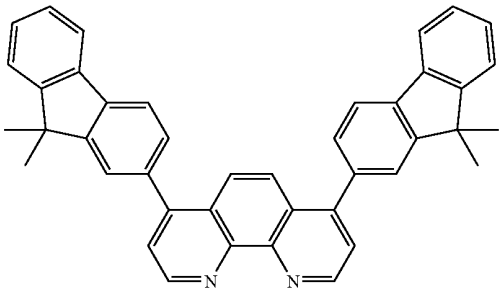
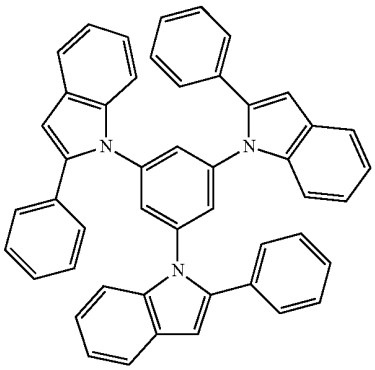
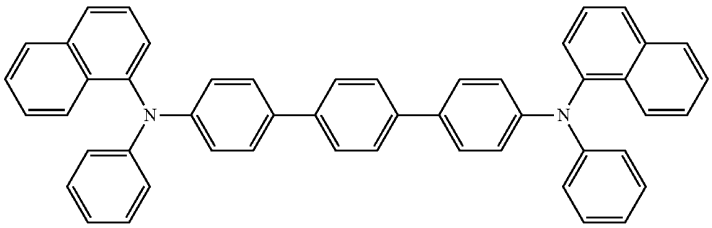
E-4



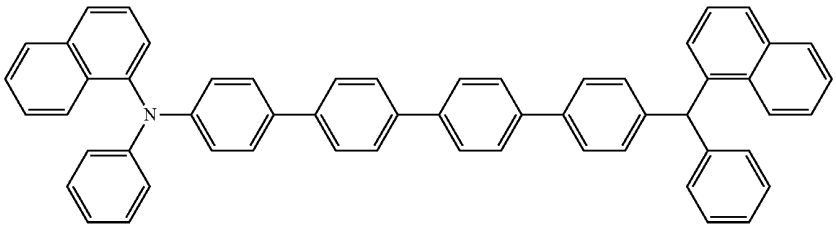
E-5



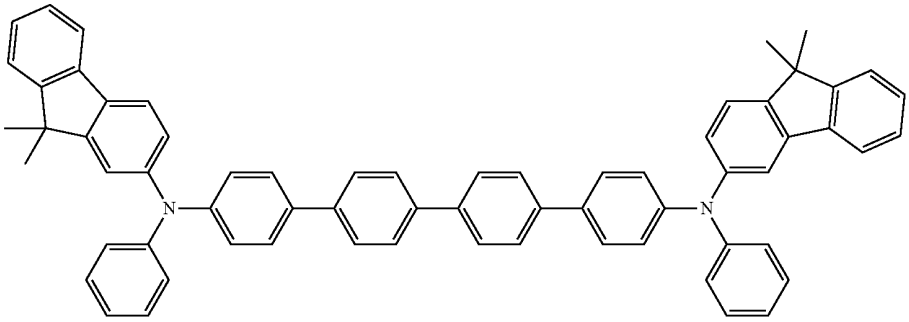
HT-1



HT-2



HT-3



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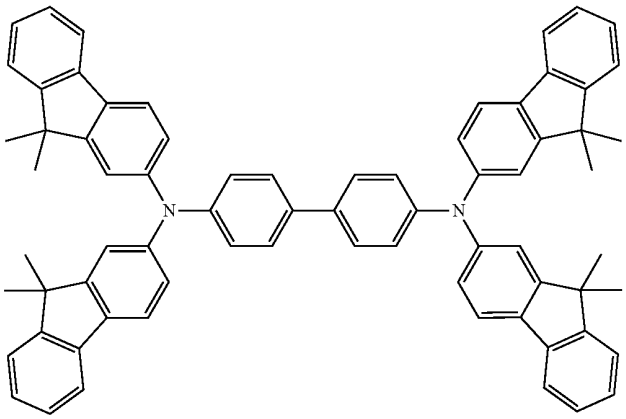
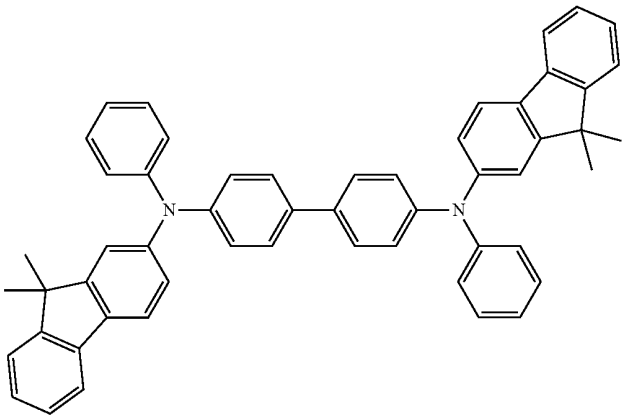
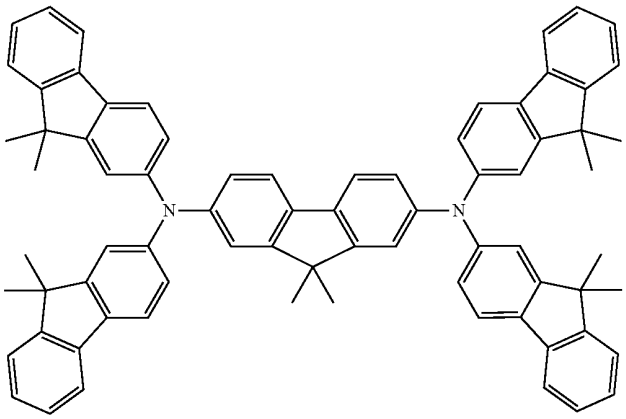
HT-4



HT-5



HT-6



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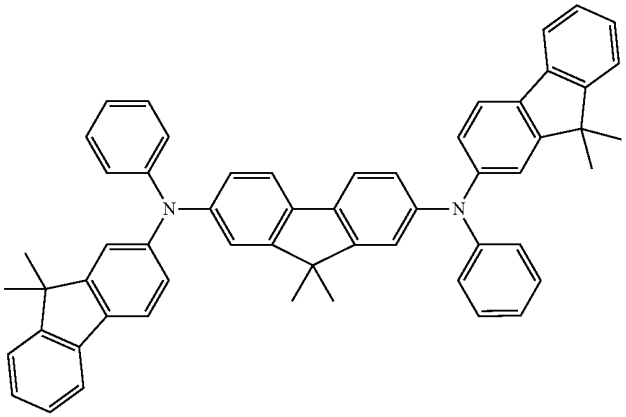
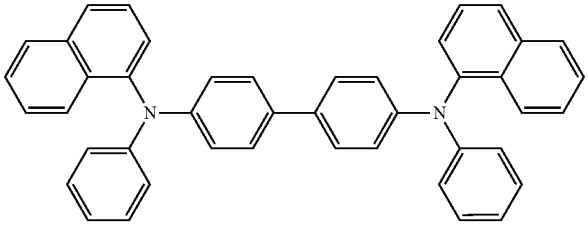
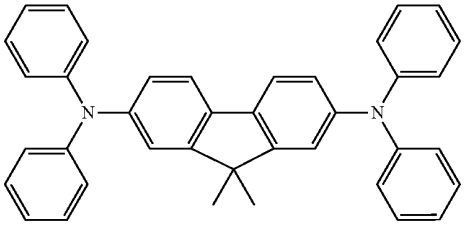
HT-7



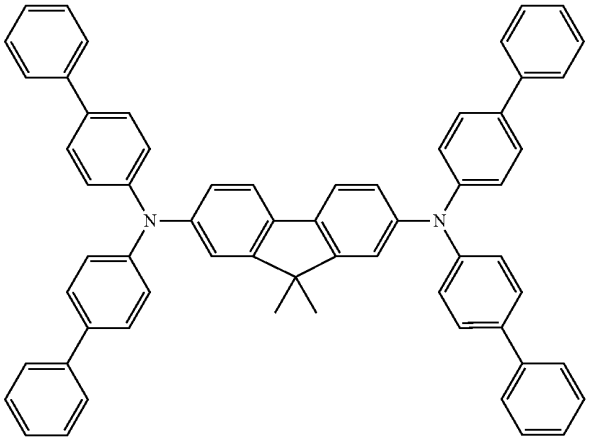
HT-8



HT-9



HT-10



[0158] In addition, examples of a luminescent dopant that can be used in combination with the compound of the present invention are shown below. However, the luminescent dopant is not limited to the examples.

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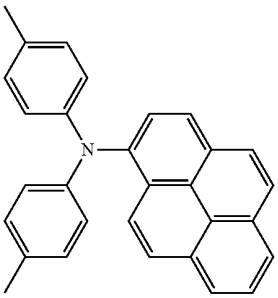
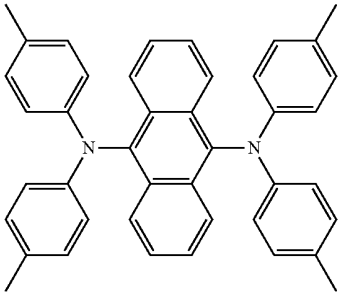
D-1



D-2



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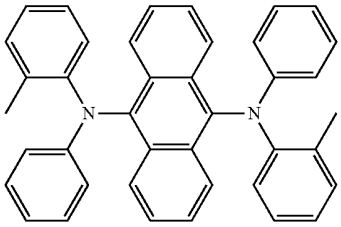

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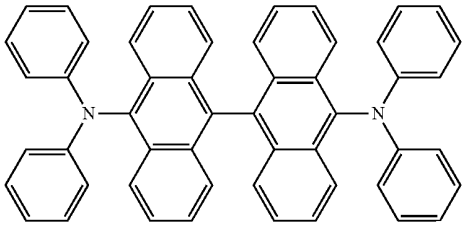

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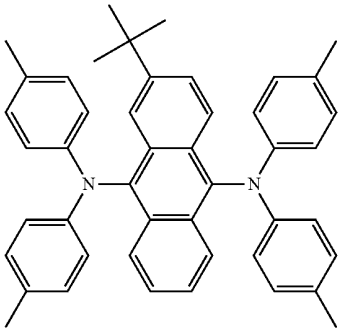

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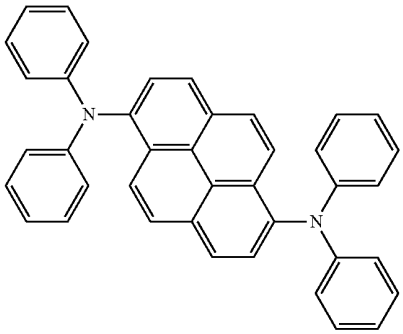
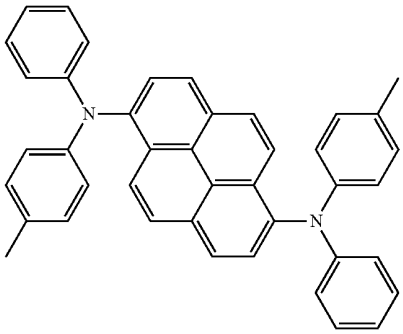
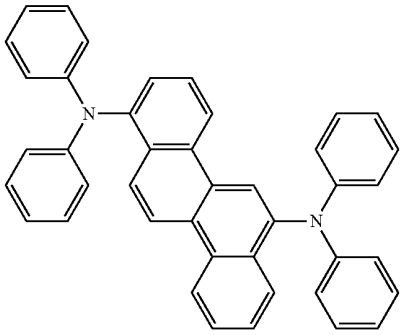


D-7



D-8



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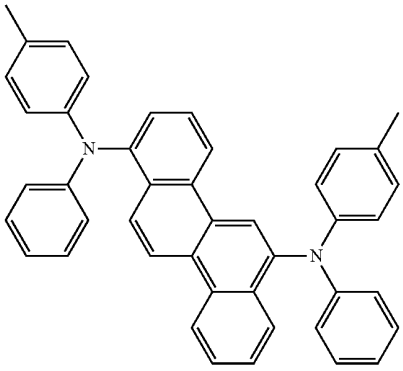

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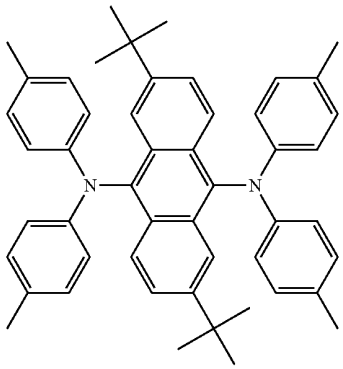

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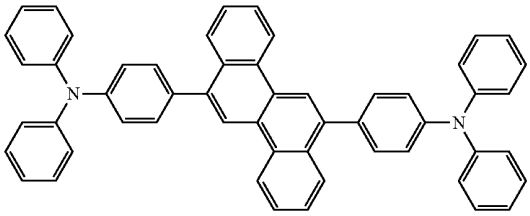
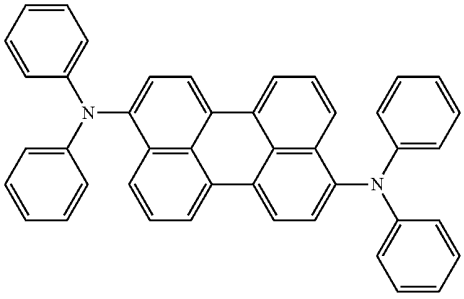


D-12



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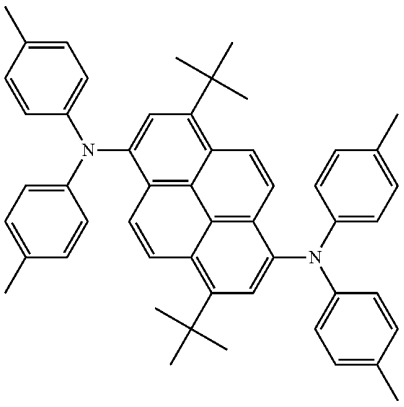

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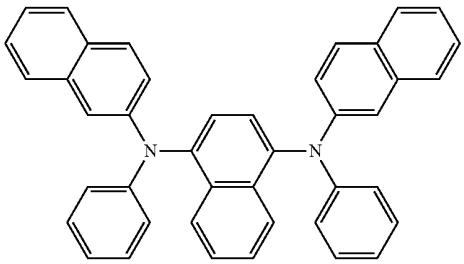

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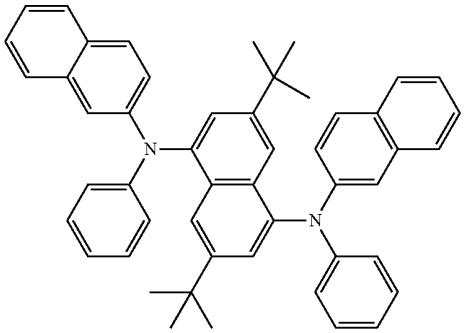

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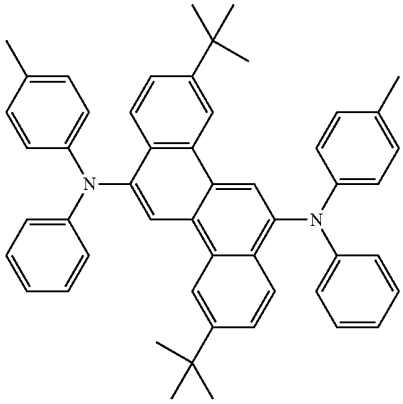

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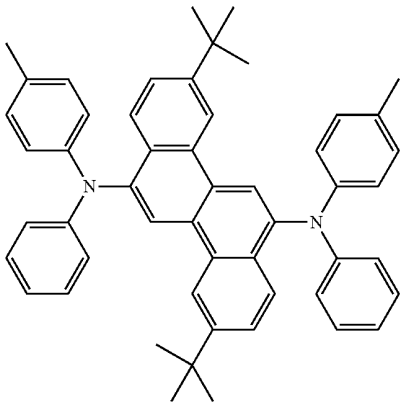

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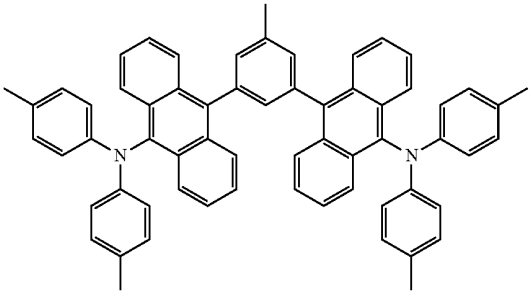

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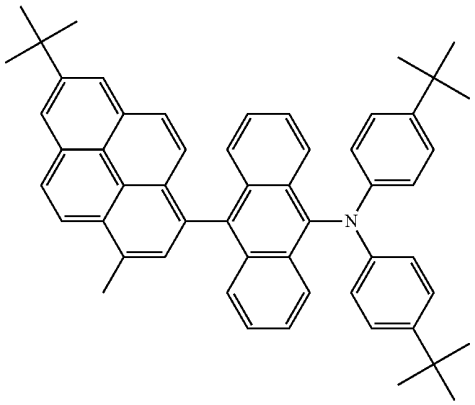

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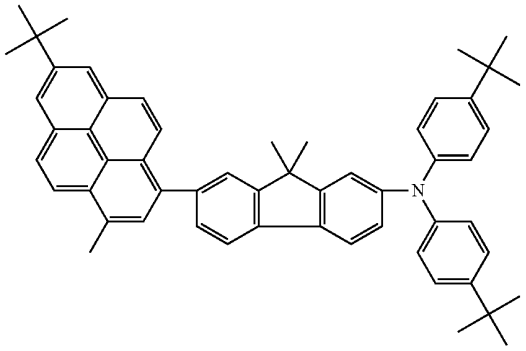

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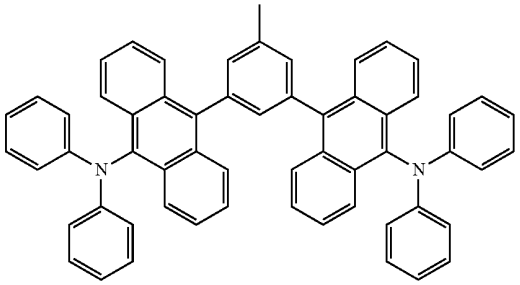

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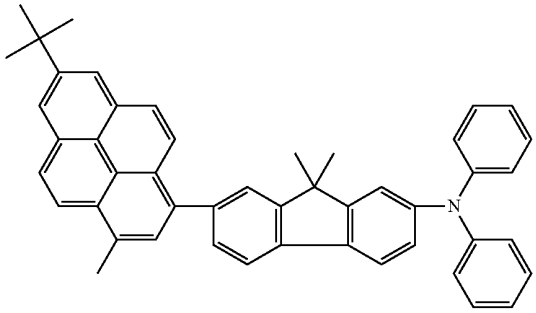

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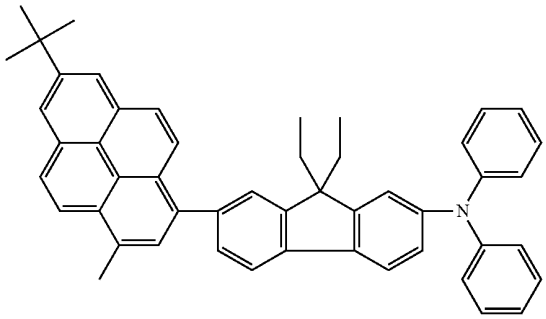

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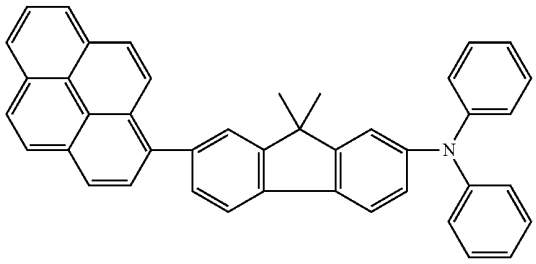

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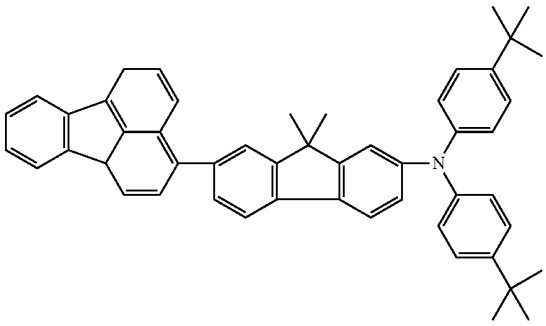

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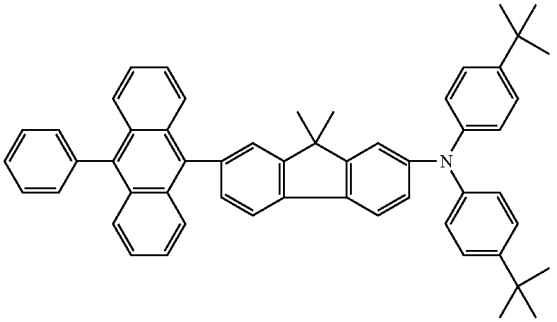

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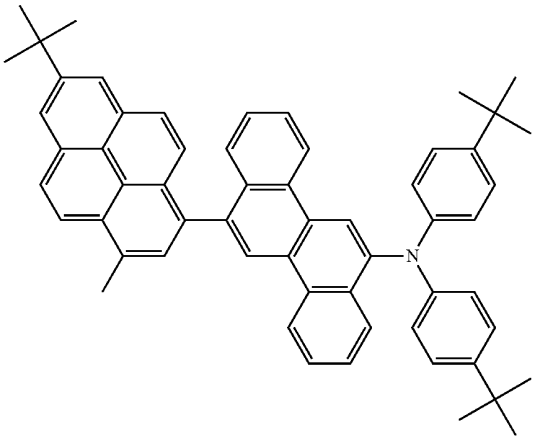

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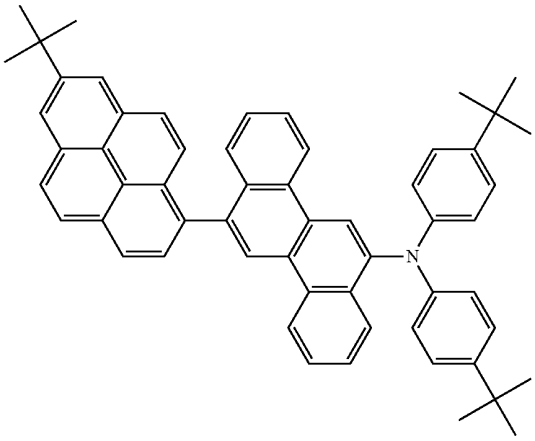

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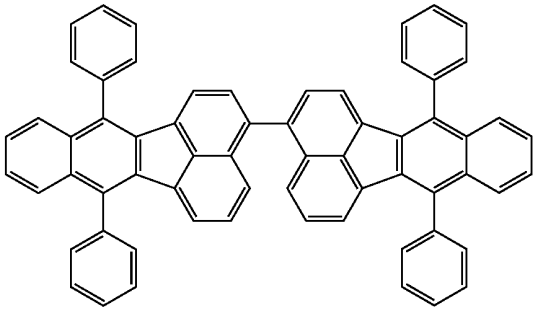

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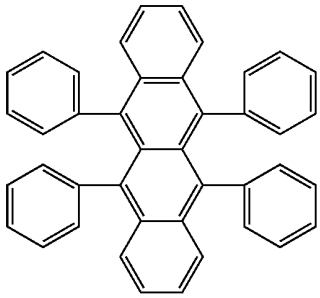

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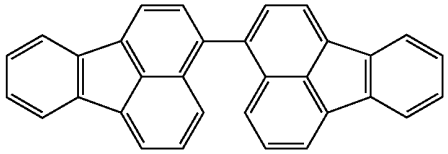

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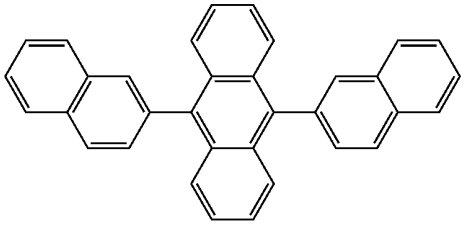

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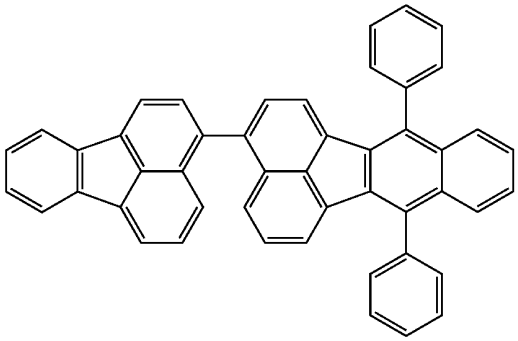

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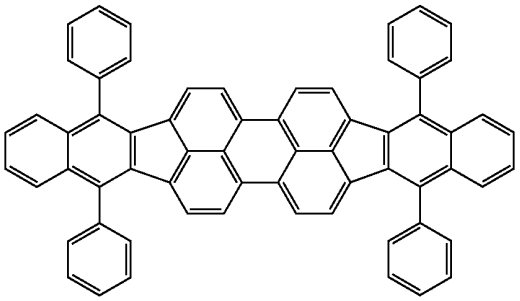

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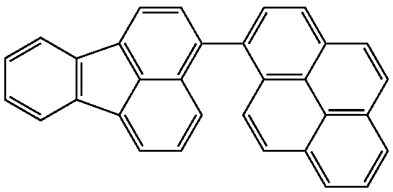

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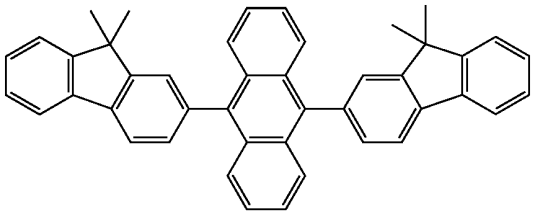

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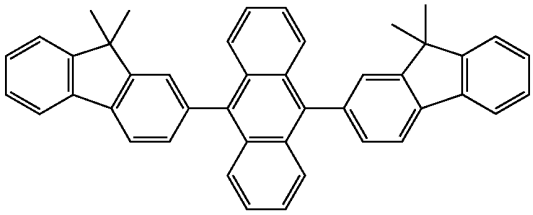

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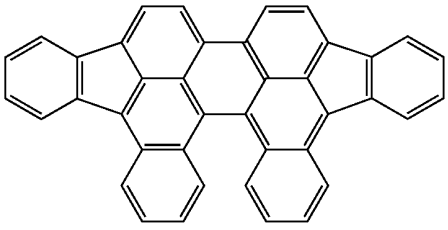

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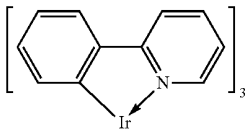

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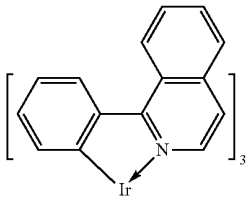

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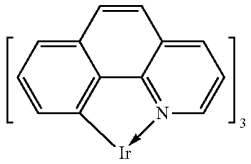

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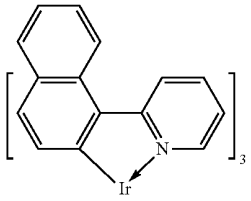

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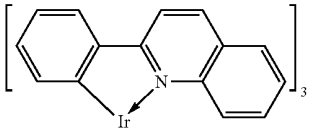

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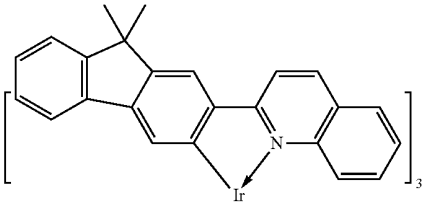

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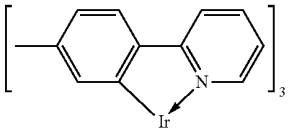

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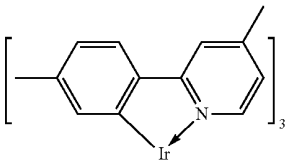

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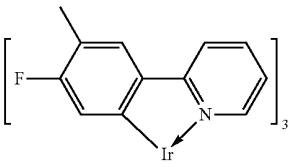

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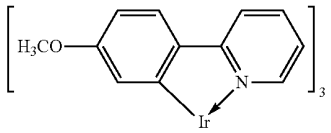

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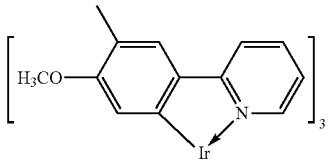

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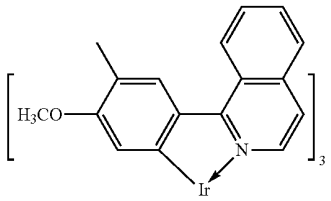

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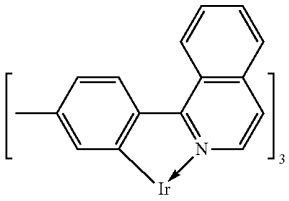

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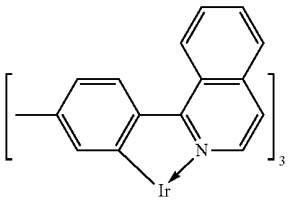

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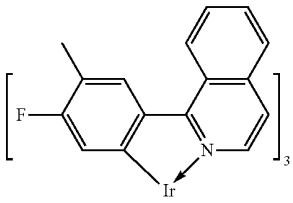

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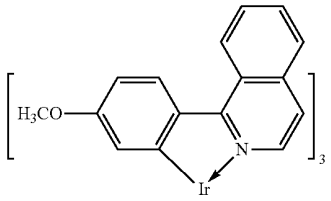

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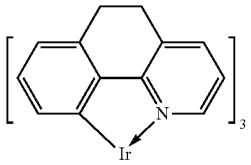

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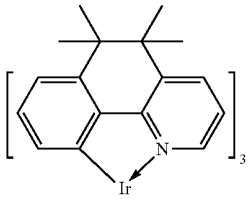

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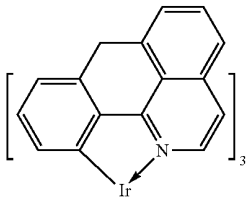

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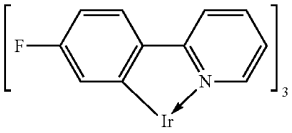


[0159] FIGS. **1**A to **1**C each show an example of the constitution of the device of the present invention.

[0160] FIG. **1**A shows an example in which organic layers are composed of a light emitting layer **12** and a hole transport layer **13**.

[0161] ITO or the like having a large work function is used in a transparent electrode **14**, thereby facilitating the injection of a hole from the transparent electrode **14** into the hole transport layer **13**. A metal material having a small work function such as aluminum, magnesium, or an alloy using any one of them is used in a metal electrode **11**, thereby facilitating the injection of an electron into each organic layer.

[0162] The fluorene compound of the present invention is preferably used in the light emitting layer **12**. A material having electron donating property such as a triphenyldiamine derivative typified by α-NPD can be appropriately used in the hole transport layer **13**.

[0163] The device constituted as described above shows electrical rectifying property. When an electric field is applied in such a manner that the metal electrode **11** serves as a cathode and the transparent electrode **14** serves as an anode, an electron is injected from the metal electrode **11** into the light emitting layer **12**, and a hole is injected from a transparent substrate **15**.

[0164] The injected hole and the injected electron recombine in the light emitting layer **12** to generate an exciton, whereby light is emitted. In this case, the hole transport layer **13** serves as an electron blocking layer. As a result, the efficiency with which a hole and an electron recombine at an

interface between the light emitting layer **12** and the hole transport layer **13** is improved, whereby luminous efficiency is improved.

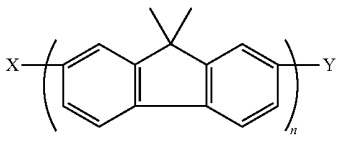
[0165] Further, in FIG. **1**B, an electron transport layer **16** is provided between the metal electrode **11** and the light emitting layer **12** shown in FIG. **1**A. Luminous efficiency is improved by separating a light emission function, and an electron transport function and a hole transport function to provide a constitution additionally effective in blocking a carrier. An oxadiazole derivative or the like can be used in the electron transport layer **16**. It should be noted that the same reference numeral in another figure represents the same member.

[0166] In addition, a four-layer constitution shown in FIG. **1**C is also desirable, which is composed of the hole transport layer **13**, the light emitting layer **12**, an exciton diffusion preventing layer **17**, the electron transport layer **16**, and the metal electrode **11** laminated in the stated order from the side of the transparent electrode **14** as an anode.

[0167] Hereinafter, the present invention will be described specifically by way of examples. However, the present invention is not limited to these examples.

[0168] It should be noted that an intermediate used in the synthesis of the fluorene compound of the present invention was synthesized in accordance with the following procedure.

[0169] That is, 2-halogeno-9H-fluorene and 2,7-dihalogeno-9H-fluorene were synthesized with reference to "Bull. Chem. Soc. Jpn. 62 (1989) 439" (Document 1). Next, the dimethylation of 9-positions of the fluorenes was performed in DMF by using CH_3Cl and $NaOCH_3$, whereby 2-halogeno-9-dimethylfluorene and 2,7-dihalogeno-9-dimethylfluorene were obtained. Further, boric acid or pinacol borate was synthesized with reference to "ORGANIC SYNTHESES VIA BORANES Volume 3" (Document 2). The resultant compound was subjected to an appropriate combination of Suzuki coupling (Document 2), halogenation (Document 1), and the synthesis of boric acid, whereby the following reaction intermediate (where n represents an integer of 1 to 5) was synthesized.



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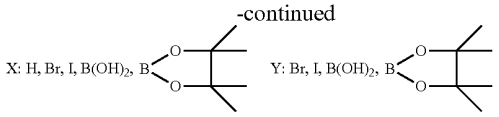
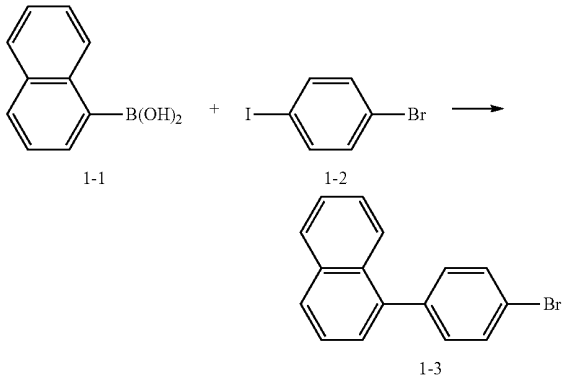


EXAMPLE 1

Synthesis of Exemplified Compound No. H-184

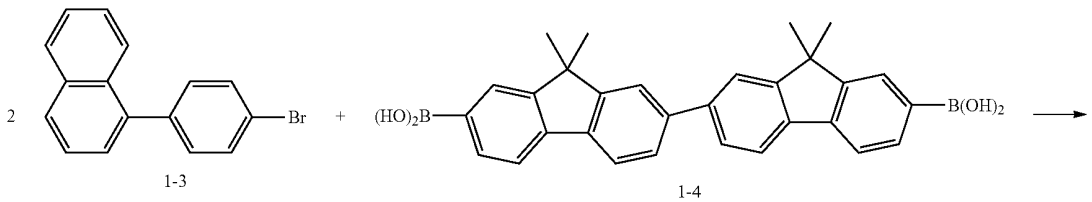
[0170]



[0171] The following components were loaded into a 100-ml recovery flask, and the whole was stirred in a stream of nitrogen at 40° C. for 8 hours.

Compound 1-1 (manufactured by SIGMA-ALDRICH):	344 mg (2 mmole)
Compound 1-2 (manufactured by TOKYO CHEMICAL INDUSTRY, CO., LTD.):	566 mg (2 mmole)
Pd $(PPh_3)_4$:	0.1 g
Toluene:	10 ml
Ethanol:	5 ml
2-M aqueous solution of sodium carbonate:	10 ml

[0172] After the completion of the reaction, the crystal was separated by filtration, and was washed with water, ethanol, and toluene. The resultant crystal was dried in a vacuum at 120° C., and then, 340 mg of Compound 1-3 were obtained (yield: 60%).



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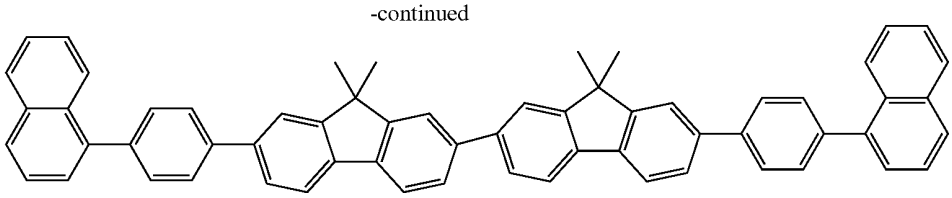


H-184

[0173] The following components were loaded into a 100-ml recovery flask, and the whole was stirred in a stream of nitrogen at 80° C. for 8 hours.

Compound 1-3:	283 mg (1 mmole)
Compound 1-4:	237 mg (0.5 mmole)
$Pd(PPh_3)_4$:	0.05 g
Toluene:	10 ml
Ethanol:	5 ml
2-M aqueous solution of sodium carbonate:	10 ml

[0174] After the completion of the reaction, the crystal was separated by filtration, and was washed with water, ethanol, and toluene. The resultant crystal was dried in a vacuum at 120° C. and then subjected to sublimation purification, whereby 250 mg of Exemplified Compound No. H-184 were obtained (yield: 63%).

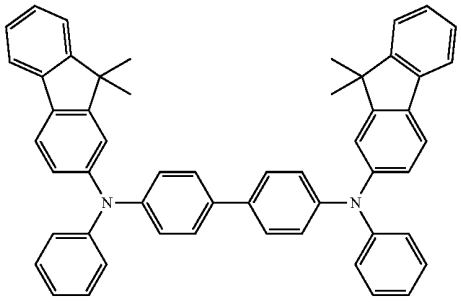
[0175] Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) confirmed that the M^+ of the compound was 790.3.

EXAMPLE 2

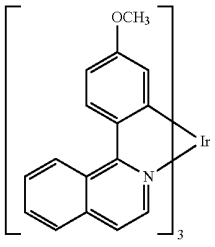
[0176] A device having three organic layers as shown in FIG. **1**B was produced.

[0177] ITO having a thickness of 100 nm (transparent electrode **14**) was patterned on a glass substrate (transparent substrate **15**). The following organic layers and electrode layers were continuously formed on the ITO substrate by vacuum deposition based on resistance heating in a vacuum chamber having a pressure of 10^{-5} Pa in such a manner that the area in which the electrodes were opposed to each other would be 3 mm^2.

Hole transport layer 13 (40 nm):	Compound A
Light emitting layer 12 (50 nm):	Exemplified Compound No. H-184: Compound B (16% in weight ratio):Compound C (4% in weight ratio)
Electron transport layer 16 (25 nm):	Bphen
Metal electrode 11-1 (1 nm):	KF
Metal electrode 11-2 (100 nm):	Al

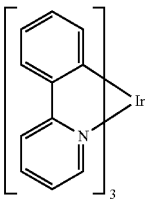


Compound A



Compound B

-continued



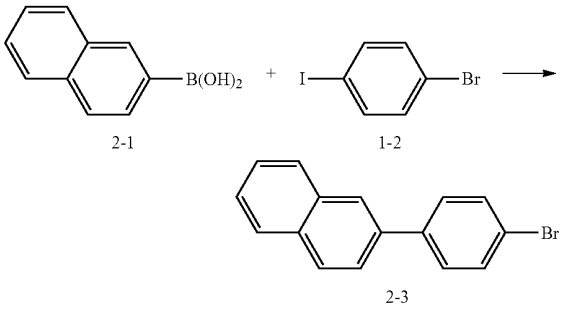
Compound C

[0178] The current-voltage characteristics of the EL device were measured with a microammeter "4140 B" (manufactured by Hewlett-Packard Development Company, L.P.), and the emission luminance of the device was measured with a "BM 7" (manufactured by TOPCON CORPORATION). The efficiency of the device of this example was such that the device showed a light intensity of 14.4 cd/A and a luminance of 12.9 m/W (600 cd/m^2). In addition, the application of a voltage of 4 V caused the device to show a current value of 215 mA/cm^2.

EXAMPLE 3

Synthesis of Exemplified Compound No. H-185

[0179]

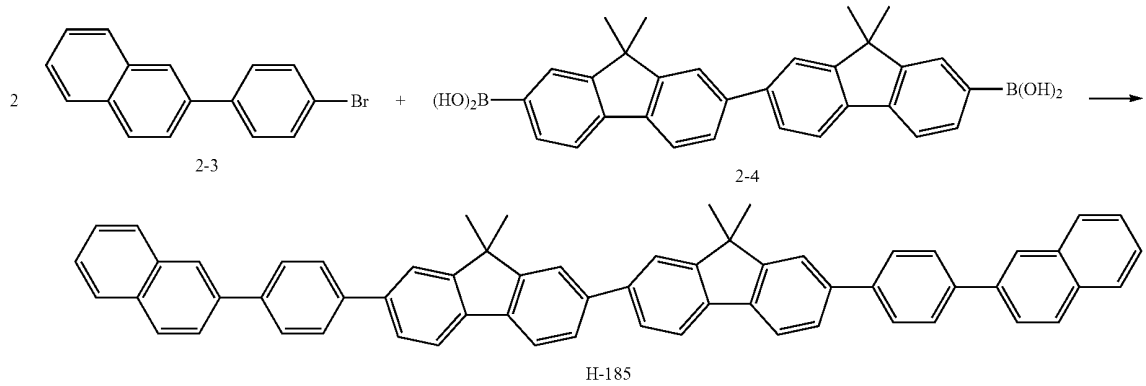


2-1 1-2 2-3

[0180] The following components were loaded into a 100-ml recovery flask, and the whole was stirred in a stream of nitrogen at 40° C. for 8 hours.

Compound 2-1 (manufactured by SIGMA-ALDRICH):	344 mg (2 mmole)
Compound 2-2 (manufactured by TOKYO CHEMICAL INDUSTRY, CO., LTD.):	566 mg (2 mmole)
Pd $(PPh_3)_4$:	0.1 g
Toluene:	10 ml
Ethanol:	5 ml
2-M aqueous solution of sodium carbonate:	10 ml

[0181] After the completion of the reaction, the crystal was separated by filtration, and was washed with water, ethanol, and toluene. The resultant crystal was dried in a vacuum at 120° C., and then, 355 mg of Compound 2-3 were obtained (yield: 75%).



2-3 2-4 H-185

[0182] The following components were loaded into a 100-ml recovery flask, and the whole was stirred in a stream of nitrogen at 80° C. for 8 hours.

Compound 2-3:	283 mg (1 mmole)
Compound 2-4:	237 mg (0.5 mmole)
Pd $(PPh_3)_4$:	0.05 g
Toluene:	10 ml
Ethanol:	5 ml
2-M aqueous solution of sodium carbonate:	10 ml

[0183] After the completion of the reaction, the crystal was separated by filtration, and was washed with water, ethanol, and toluene. The resultant crystal was dried in a vacuum at 120° C. and then subjected to sublimation purification, whereby 270 mg of Exemplified Compound No. H-185 were obtained (yield: 68%).

[0184] Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) confirmed that the M^+ of the compound was 790.3.

EXAMPLE 4

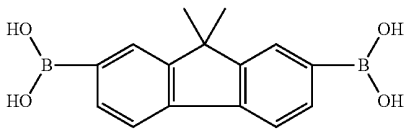
[0185] A device was produced in the same manner as in Example 2 except that Exemplified Compound No. H-185 was used instead of Exemplified Compound No. H-184, and the device was evaluated in the same manner as in Example 2. The efficiency of the device of this example was such that the device showed a light intensity of 10.6 cd/A and a luminance of 9.3 μm/W (600 cd/m^2). In addition, the application of a voltage of 4 V caused the device to show a current value of 13.0 mA/cm^2.

EXAMPLE 5

Synthesis of Exemplified Compound No. H-1

[0186] Exemplified Compound No. H-1 was synthesized in the same manner as in Example 1 except that Compound 5-1 was used instead of Compound 1-4.

Compound 5-1



EXAMPLE 6

Synthesis of Exemplified Compound No. H-2

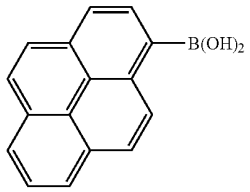
[0187] Exemplified Compound No. H-2 was synthesized in the same manner as in Example 3 except that Compound 5-1 was used instead of Compound 2-4.

EXAMPLE 7

Synthesis of Exemplified Compound No. H-7

[0188] Exemplified Compound No. H-7 was synthesized in the same manner as in Example 1 except that: Compound 7-1 (pyrene boric acid) was used instead of Compound 1-1; and Compound 5-1 was used instead of Compound 1-4.

Compound 7-1

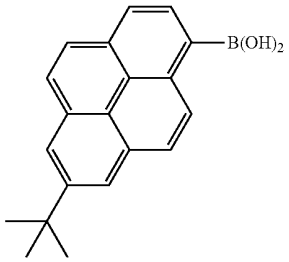


EXAMPLE 8

Synthesis of Exemplified Compound No. H-8

[0189] Exemplified Compound No. H-8 was synthesized in the same manner as in Example 1 except that: Compound 8-1 was used instead of Compound 1-1; and Compound 5-1 was used instead of Compound 1-4.

Compound 8-1

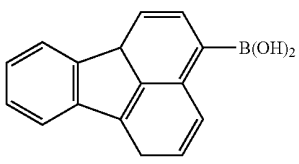


EXAMPLE 9

Synthesis of Exemplified Compound No. H-17

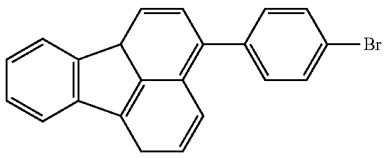
[0190] A reaction was performed by using 783 mg (3 mmol) of Compound 9-1 instead of Compound 1-1 of Example 1 and 1,018 mg (3.6 mmol) of Compound 1-2. After the completion of the reaction, the resultant was washed with water. After having been concentrated, the resultant was purified by means of silica gel chromatography (heptane:toluene=10:1), whereby 540 mg of Compound 9-2 were obtained. A reaction was performed in the same manner as in Example 1 except that 350 mg (1 mmol) of Compound 5-2 mentioned above and 450 mg (0.45 mmol) of Compound 5-1 instead of Compound 1-4 were used. After the reaction, 20 ml of water were added, and the whole was stirred for 10 minutes. After that, the resultant was filtered, and the resultant crystal was dissolved in chlorobenzene and subjected to hot filtration. The filtrate was recrystallized and subjected to sublimation purification, whereby 150 mg of Exemplified Compound No. H-17 were synthesized.

Compound 9-1



-continued

Compound 9-2

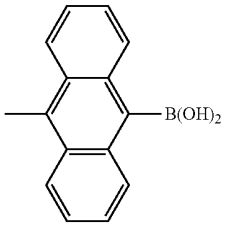


EXAMPLE 10

Synthesis of Exemplified Compound No. H-4

[0191] Exemplified Compound No. H-4 was synthesized in the same manner as in Example 1 except that: Compound 10-1 was used instead of Compound 1-1 of Example 1; and Compound 5-1 was used instead of Compound 1-4.

Compound 10-1

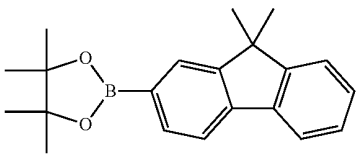


EXAMPLE 11

Synthesis of Exemplified Compound No. H-33

[0192] Exemplified Compound No. H-33 was synthesized in the same manner as in Example 1 except that: Compound 10-1 was used instead of Compound 1-1 of Example 1; and Compound 11-1 was used instead of Compound 1-4.

Compound 11-1

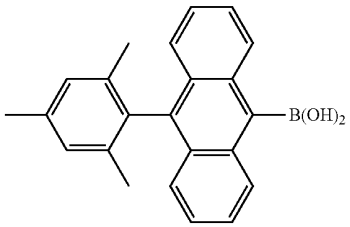


EXAMPLE 12

Synthesis of Exemplified Compound No. H-34

[0193] Exemplified Compound No. H-34 was synthesized in the same manner as in Example 1 except that: Compound 12-1 was used instead of Compound 1-1 of Example 1; and Compound 11-1 was used instead of Compound 1-4.

Compound 12-1



EXAMPLE 13

Synthesis of Exemplified Compound No. H-35

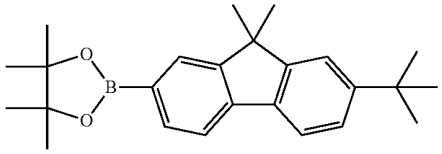
[0194] Exemplified Compound No. H-35 was synthesized in the same manner as in Example 1 except that: Compound 7-1 was used instead of Compound 1-1 of Example 1; and Compound 11-1 was used instead of Compound 1-4.

EXAMPLE 14

Synthesis of Exemplified Compound No. H-36

[0195] Exemplified Compound No. H-36 was synthesized in the same manner as in Example 1 except that: Compound 7-1 was used instead of Compound 1-1 of Example 1; and Compound 14-1 was used instead of Compound 1-4.

Compound 14-1



EXAMPLE 15

Synthesis of Exemplified Compound No. H-37

[0196] Exemplified Compound No. H-37 was synthesized in the same manner as in Example 1 except that: Compound 8-1 was used instead of Compound 1-1 of Example 1; and Compound 11-1 was used instead of Compound 1-4.

[0197] The maximum luminous wavelength in a toluene solution was 413 nm. Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) confirmed that the M^+ of the compound was 527.3.

EXAMPLE 16

Synthesis of Exemplified Compound No. H-43

[0198] Exemplified Compound No. H-43 was synthesized in the same manner as in Example 1 except that: Compound 9-1 was used instead of Compound 1-1 of Example 1; and Compound 11-1 was used instead of Compound 1-4.

[0199] The maximum luminous wavelength in a toluene solution was 464 nm. Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) confirmed that the De of the compound was 471.2

[0200] The structure of the compound was confirmed by means of NMR measurement.

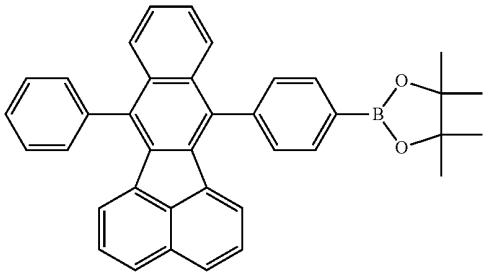
[0201] ^{1}H NMR ($CDCl_3$, 400 MHz) σ (ppm): 8.03-8.02 (d, 2H), 8.00-7.98 (d, 1H), 7.95-9.94 (dd, 2H), 7.84-7.83 (d, 3H), 7.78-7.64 (m, 7H), 7.48-7.47 (d, 1H), 7.42-7.34 (m, 4H), 6.97 (s, 6H)

EXAMPLE 17

Synthesis of Exemplified Compound No. H-50

[0202] Exemplified Compound No. H-50 was synthesized in the same manner as in Example 1 except that: Compound 17-1 was used instead of Compound 1-1 of Example 1; and Compound 11-1 was used instead of Compound 1-4.

Compound 17-1



EXAMPLE 18

Synthesis of Exemplified Compound No. H-62

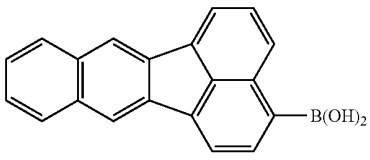
[0203] Exemplified Compound No. H-62 was synthesized in the same manner as in Example 1 except that: Compound 17-1 was used instead of Compound 1-1 of Example 1; and Compound 5-1 was used instead of Compound 1-4.

EXAMPLE 19

Synthesis of Exemplified Compound No. H-63

[0204] Exemplified Compound No. H-62 was synthesized in the same manner as in Example 1 except that: Compound 19-1 was used instead of Compound 1-1 of Example 1; and Compound 5-1 was used instead of Compound 1-4.

Compound 19-1

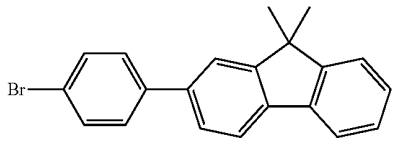


EXAMPLE 20

Synthesis of Exemplified Compound No. H-106

[0205] Exemplified Compound No. H-106 was synthesized in the same manner as in Example 1 except that Compound 20-1 was used instead of Compound 2-4 of Example 3.

Compound 20-1



EXAMPLE 21

Synthesis of Exemplified Compound No. H-107

[0206] Exemplified Compound No. H-107 was synthesized in the same manner as in Example 1 except that: Compound 7-1 was used instead of Compound 1-1 of Example 1; and Compound 20-1 was used instead of Compound 1-4.

EXAMPLE 22

Synthesis of Exemplified Compound No. H-108

[0207] Exemplified Compound No. H-108 was synthesized in the same manner as in Example 1 except that: Compound 8-1 was used instead of Compound 1-1 of Example 1; and Compound 20-1 was used instead of Compound 1-4.

EXAMPLE 23

Synthesis of Exemplified Compound No. H-105

[0208] Exemplified Compound No. H-105 was synthesized in the same manner as in Example 1 except that Compound 20-1 was used instead of Compound 1-1 and Compound 1-4 of Example 1.

EXAMPLE 24

Synthesis of Exemplified Compound No. H-110

[0209] Exemplified Compound No. H-110 was synthesized in the same manner as in Example 1 except that: Compound 9-1 was used instead of Compound 1-1 of Example 1; and Compound 20-1 was used instead of Compound 1-4.

EXAMPLE 25

Synthesis of Exemplified Compound No. H-111

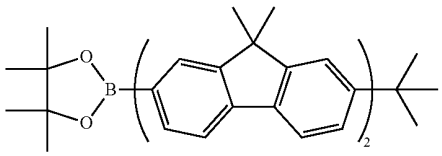
[0210] Exemplified Compound No. H-111 was synthesized in the same manner as in Example 1 except that: Compound 10-1 was used instead of Compound 1-1 of Example 1; and Compound 20-1 was used instead of Compound 1-4.

EXAMPLE 26

Synthesis of Exemplified Compound No. H-219

[0211] Exemplified Compound No. H-219 was synthesized in the same manner as in Example 1 except that: Compound 8-1 was used instead of Compound 1-1 of Example 1; and Compound 27-1 was used instead of Compound 1-4.

Compound 27-1

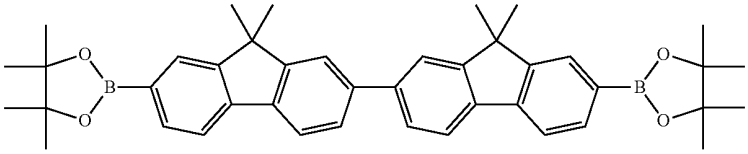


EXAMPLE 27

Synthesis of Exemplified Compound No. H-191

[0212] Exemplified Compound No. H-191 was synthesized in the same manner as in Example 1 except that: Compound 8-1 was used instead of Compound 1-1 of Example 1; and Compound 28-1 was used instead of Compound 1-4.

Compound 28-1



EXAMPLE 28

Synthesis of Exemplified Compound No. H-200

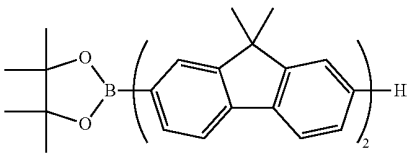
[0213] Exemplified Compound No. H-200 was synthesized in the same manner as in Example 1 except that: Compound 9-1 was used instead of Compound 1-1 of Example 1; and Compound 28-1 was used instead of Compound 1-4.

EXAMPLE 29

Synthesis of Exemplified Compound No. H-212

[0214] Exemplified Compound No. H-212 was synthesized in the same manner as in Example 1 except that Compound 30-1 was used instead of Compound 1-1 and Compound 1-4 of Example 1.

Compound 30-1



EXAMPLE 30

Synthesis of Exemplified Compound No. H-214

[0215] Exemplified Compound No. H-214 was synthesized in the same manner as in Example 1 except that: Compound 10-1 was used instead of Compound 1-1 of Example 1; and Compound 30-1 was used instead of Compound 1-4.

EXAMPLE 31

Synthesis of Exemplified Compound No. H-216

[0216] Exemplified Compound No. H-216 was synthesized in the same manner as in Example 1 except that: Compound 7-1 was used instead of Compound 1-1 of Example 1; and Compound 30-1 was used instead of Compound 1-4.

[0217] The maximum luminous wavelength in a toluene solution was 431 nm. Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) confirmed that the M^+ of the compound was 661.3.

EXAMPLE 32

Synthesis of Exemplified Compound No. H-218

[0218] Exemplified Compound No. H-218 was synthesized in the same manner as in Example 1 except that: Compound 8-1 was used instead of Compound 1-1 of Example 1; and Compound 30-1 was used instead of Compound 1-4.

[0219] The maximum luminous wavelength in a toluene solution was 448 nm. Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) confirmed that the M^+ of the compound was 719.3.

[0220] The structure of the compound was confirmed by means of NMR measurement.

[0221] ^{1}H NMR ($CDCl_3$, 400 MHz) σ (ppm): 8.27-8.21 (m, 4H), 8.01 (s, 2H), 8.05-8.01 (dd, 2H), 7.90-7.85 (dd, 4H), 7.83-7.81 (d, 2H), 7.78-7.72 (m, 6H), 7.70-7.66 (t, 2H), 7.48-7.47 (d, 1H), 7.39-7.34 (s, 2H), 1.66-1.49 (m, 21H)

EXAMPLE 33

Synthesis of Exemplified Compound No. H-224

[0222] Exemplified Compound No. H-224 was synthesized in the same manner as in Example 1 except that: Compound 9-1 was used instead of Compound 1-1 of Example 1; and Compound 30-1 was used instead of Compound 1-4.

EXAMPLE 34

Synthesis of Exemplified Compound No. H-213

[0223] Exemplified Compound No. H-213 was synthesized in the same manner as in Example 1 except that: Compound 30-1 was used instead of Compound 2-1 and Compound 2-4 of Example 3.

EXAMPLE 35

Synthesis of Exemplified Compound No. H-228

[0224] Exemplified Compound No. H-228 was synthesized in the same manner as in Example 1 except that: Compound

9-1 was used instead of Compound 1-1 of Example 1; and Compound 27-1 was used instead, of Compound 1-4.

EXAMPLE 36

Synthesis of Exemplified Compound No. H-230

[0225] Exemplified Compound No. H-230 was synthesized in the same manner as in Example 1 except that: Compound 19-1 was used instead of Compound 1-1 of Example 1; and Compound 27-1 was used instead of Compound 1-4.

EXAMPLE 37

Synthesis of Exemplified Compound No. H-231

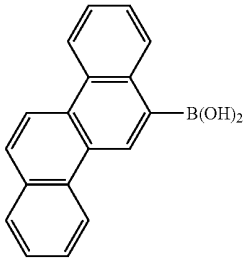
[0226] Exemplified Compound No. H-231 was synthesized in the same manner as in Example 1 except that: Compound 17-1 was used instead of Compound 1-1 of Example 1; and Compound 30-1 was used instead of Compound 1-4.

EXAMPLE 38

Synthesis of Exemplified Compound No. H-233

[0227] Exemplified Compound No. H-233 was synthesized in the same manner as in Example 1 except that: Compound 39-1 was used instead of Compound 1-1 of Example 1; and Compound 30-1 was used instead of Compound 1-4.

Compound 39-1



EXAMPLE 39

Synthesis of Exemplified Compound No. H-232

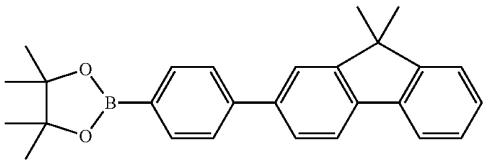
[0228] Exemplified Compound No. H-232 was synthesized in the same manner as in Example 1 except that: Compound 9-1 was used instead of Compound 1-1 of Example 1; and Compound 30-1 was used instead of Compound 1-4.

EXAMPLE 40

Synthesis of Exemplified Compound No. H-107

[0229] Exemplified Compound No. H-282 was synthesized in the same manner as in Example 1 except that: Compound 7-1 was used instead of Compound 1-1 of Example 1; and Compound 40-1 obtained by turning bromine of Compound 20-1 into pinacolborane was used instead of Compound 1-4. The maximum luminous wavelength in toluene was 437 nm. Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) confirmed that the M^+ of the compound was 545.2.

Compound 40-1

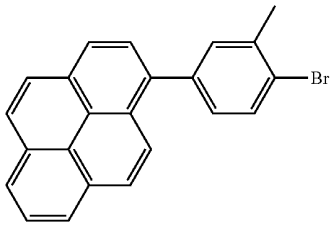


EXAMPLE 41

Synthesis of Exemplified Compound No. H-385

[0230] Exemplified Compound No. H-385 was synthesized in the same manner as in Example 1 except that: Compound 41-1 was used instead of Compound 1-1 of Example 1; and Compound 5-1 was used instead of Compound 1-4.

Compound 41-1



EXAMPLE 42

Synthesis of Exemplified Compound No. H-388

[0231] Exemplified Compound No. H-385 was synthesized by: causing Compound 1-3 instead of Compound 1-1 of Example 1 and Compound 5-1 instead of Compound 1-4 equal to each other in used amount to react with each other; and causing the resultant intermediate to react with Compound 41-1 in the same manner as in Example 1.

EXAMPLE 43 to 140

[0232] A device having three organic layers as shown in FIG. **1**B was produced.

[0233] ITO having a thickness of 100 nm (transparent electrode **14**) was patterned on a glass substrate (transparent substrate **15**). The following organic layers and electrode layers were continuously formed on the ITO substrate by vacuum deposition based on resistance heating in a vacuum chamber having a pressure of 10^{-5} Pa in such a manner that the area in which the electrodes were opposed to each other would be 3 mm^2.

[0234] Hole transport layer **13** (40 nm): Compound HTL Light emitting layer **12** (50 nm): Exemplified Compound HOST 1: Compound HOST 2 (20% or 0% in weight ratio): Compound GUEST (5% in weight ratio) Electron transport layer **16** (25 nm): Compound ETL Metal electrode **11-1** (1 nm): KF Metal electrode **11-2** (100 nm): Al

[0235] The compound numbers of HTL, HOST 1, HOST 2, GUEST, and ETL of each of the above constitutions, and the luminescent color and half lifetime of a device produced by using them are shown below.

	Compound name					Half lifetime	Initial luminance	Luminescent
Example	ETL	HOST1	HOST2	GUEST	HTL	(hour)	(cd/m2)	color
43	E1	H-8	—	D-3	HT-4	1250	1000	green
44	E1	H-3	—	D-20	HT-3	2000	300	blue
45	E1	H-3	—	H-20	HT-10	800	300	blue
46	E1	H-13	D53	D-39	HT-5	1000	1500	green
47	E1	H-10	HT-6	D-26	HT-5	1000	500	blue
48	E1	H-10	—	D-31	HT-1	800	700	blue
49	E1	H-10	HT-7	D-18	HT-5	1200	1200	green
50	E1	H-10	HT-6	D-20	HT-10	1800	1500	green
51	E1	H-36	HT-4	D-21	HT-7	2500	1500	green
52	E1	H-37	—	H-43	HT-10	1700	600	blue
53	E1	H-55	—	D-8	HT-3	1500	250	blue
54	E1	H-53	—	D-40	HT-5	2500	600	red
55	E1	H-53	—	D-52	HT-5	1500	500	red
56	E1	H-60	—	D-40	HT-1	3500	500	red
57	E1	H-74	HT-7	D-19	HT-1	1500	1000	green
58	E1	H-85	D-39	D-53	HT-3	2500	300	red
59	E1	H-107	—	D-31	HT-2	2000	500	blue
60	E1	H-107	—	D-33	HT-3	2500	600	blue
61	E1	H-108	—	D-27	HT-5	2500	300	blue
62	E1	H-116	D-41	D-57	HT-6	700	600	red
63	E1	H-122	—	D-40	HT-10	1000	400	red
64	E1	H-145	D-18	D-34	HT-6	2500	500	red
65	E1	H-173	—	D-7	HT-5	1500	200	blue
66	E1	H-174	—	D-20	HT-5	2000	300	blue
67	E1	H-184	—	D-3	HT-6	1000	1200	green
68	E1	H-184	—	D-40	HT-5	2000	600	red
69	E1	H-184	—	D-54	HT-8	2500	500	red
70	E1	H-187	—	D-2	HT-7	3000	1200	green
71	E1	H-212	—	D-40	HT-3	2200	500	red
72	E1	H-213	D-39	D-40	HT-10	6000	500	red
73	E1	H-213	—	D-23	HT-5	3000	300	blue
74	E1	H-216	—	D-19	HT-3	2400	1000	green
75	E1	H-216	HT-4	D-19	HT-3	3000	1000	green
76	E1	H-218	HT-4	D-18	HT-5	2500	1200	green
77	E1	H-225	HT-4	D-27	HT-3	1500	300	blue
78	E1	H-225	—	D-18	HT-4	1200	1500	green
79	E1	H-225	—	D-20	HT-1	800	300	blue
80	E1	H-213	HT-6	D-21	HT-3	1000	1200	green
81	E1	H-223	HT-4	D-19	HT-3	1500	1000	green
82	E1	H-223	—	D-28	HT-3	2300	600	blue
83	E1	H-223	—	D-2	HT-10	2000	1200	green
84	E1	H-223	—	D-31	HT-7	1700	350	blue
85	E1	H-218	—	D-18	HT-3	2300	1200	green
86	E1	H-216	—	D-18	HT-5	2500	1000	green
87	E1	H-218	HT-7	D-4	HT-5	3200	1500	green
88	E1	H-281	D-39	D-40	HT-10	3000	500	red
89	E1	H-281	—	D-53	HT-5	4000	350	red
90	E1	H-281	—	D-9	HT-10	2500	300	blue
91	E1	H-281	—	D-25	HT-5	1300	500	blue
92	E1	H-282	—	D-33	HT-3	3000	500	blue
93	E1	H-282	—	D-4	HT-4	1500	1000	green
94	E1	H-282	—	D-19	HT-3	1800	1200	green
95	E1	H-284	—	D-18	HT-5	2500	1200	green
96	E1	H-284	—	D-27	HT-5	2500	300	blue
97	E1	H-285	—	D-34	HT-6	1000	500	red
98	E1	H-300	—	D-38	HT-2	3000	800	yellow
99	E1	H-223	—	D-21	HT-5	2600	1500	green
100	E1	H-360	D-39	D-40	HT-5	4000	500	red
101	E1	H-361	—	D-40	HT-5	3500	500	red
102	E1	H-360	D-39	D-52	HT-8	4500	500	red
103	E1	H-361	D-55	D-53	HT-8	2500	500	red
104	E1	H-361	—	D-18	HT-10	3000	1200	green
105	E1	H-364	—	D-3	HT-1	1500	500	green
106	E1	H-364	—	D-33	HT-5	3500	300	blue
107	E1	H-384	—	D-20	HT-5	1500	1000	blue

-continued

Example	Compound name ETL	HOST1	HOST2	GUEST	HTL	Half lifetime (hour)	Initial luminance (cd/m2)	Luminescent color
108	E1	H-387	—	D-56	HT-3	1000	1200	green
109	E1	H-388	—	D-18	HT-5	2500	1500	green
110	E2	H-1	—	D-20	HT-5	500	500	blue
111	E2	H-8	—	H-17	HT-10	1200	300	blue
112	E2	H-223	—	D-3	HT-10	2000	1300	green
113	E2	H-195	—	D-40	HT-5	3000	500	red
114	E3	H-37	—	D-31	HT-8	1500	200	blue
115	E3	H-223	—	D-17	HT-5	1000	200	blue
116	E3	H-379	—	D-18	HT-6	2200	1000	green
117	E3	H-361	—	D-53	HT-3	1000	500	red
118	E3	H-361	HT-6	D-40	HT-5	800	600	red
119	E3	H-382	HT-4	D-19	HT-3	650	1000	green
120	E3	H-385	—	D-31	HT-9	2200	200	blue
121	E4	H-53	D-41	D-57	HT-2	3500	400	red
122	E4	H-107	—	D-27	HT-5	1000	300	blue
123	E4	H-109	HT-10	D-34	HT-5	2000	500	red
124	E4	H-223	—	D-29	HT-5	1600	200	blue
125	E5	H-3	—	D-26	HT-7	500	500	blue
126	E5	H-19	—	D-23	HT-5	700	400	blue
127	E5	H-19	HT-4	D-18	HT-5	2000	1000	green
128	E5	H-99	D-41	D-57	HT-1	2500	500	red
129	E5	H-223	—	D-31	HT-5	2000	300	blue
130	E5	H-281	—	D-33	HT-7	1500	500	blue
131	E6	H-13	—	D-39	HT-8	1500	1000	green
132	E6	H-13	—	D-56	HT-5	2000	1500	green
133	E6	H-107	HT-4	D-18	HT-3	1000	1500	green
134	E6	H-213	—	D-40	HT-5	3000	500	red
135	E6	H-216	HT-4	D-19	HT-3	1500	1000	green
136	E6	H-223	—	D-25	HT-5	800	300	blue
137	E6	H-223	—	D-40	HT-5	3500	400	red
138	E6	H-291	—	D-40	HT-8	3000	400	red
139	E6	H-364	—	D-33	HT-3	1000	200	blue
140	E6	H-382	—	D-17	HT-7	1500	200	blue

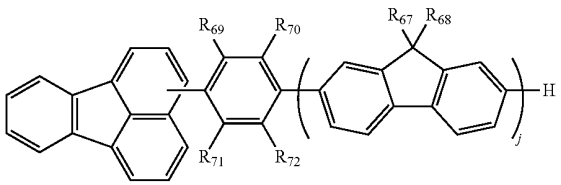
[0236] Each of those devices was able to provide light emission having a long lifetime in a favorable manner by using the compound of the present invention.

[0237] This application claims priority from Japanese Patent Application Nos. 2005-366205 filed on Dec. 20, 2005, 2006-111726 filed on Apr. 14, 2006, and 2006-327780 filed on Dec. 5, 2006, which are hereby incorporated by reference herein.

1.-**7**. (canceled)

8. A fluorene compound represented by the following general formula (8):

(8)



wherein R_{67} to R_{72} are each independently selected from the group consisting of a hydrogen atom, a halogen atom, and a linear or branched alkyl group having 1 to 20 carbon atoms;

wherein j represents an integer of 1 to 20; and

wherein the fluoranthenyl group may have substituents, and the substituents are each independently selected from the group consisting of a halogen atom, a linear or branched alkyl group having 1 to 20 carbon atoms, in which one methylene group or two or more non-adjacent methylene groups each may be substituted by —O—, —S—, —CO—, —CO—O—, —O—CO—, —CH═CH—, or —C≡C—, one or two or more methylene groups each may be substituted by an arylene group or a divalent heterocyclic group, and a hydrogen atom in the alkyl group may be substituted by a fluorine atom, a diphenylamino group, a triphenylsilyl group, an aryl group, and a heterocyclic group.

9.-**16**. (canceled)

17. An organic electroluminescence device comprising a layer containing an organic compound, the layer being interposed between a pair of electrodes, wherein the layer containing an organic compound comprises a layer containing the fluorene compound according to claim **8**.

18. (canceled)

19. The organic electroluminescence device according to claim **17**, wherein the layer containing the fluorene compound is a light emitting layer.

20. The organic electroluminescence device according to claim **19**, wherein the light emitting layer comprises a host and a guest, and the fluorene compound is the host.

21. The organic electroluminescence device according to claim **20**, wherein the guest is a metal coordination compound.

22. A full-color display comprising the organic electroluminescence device according to claim **21**.

* * * * *

专利名称(译)	芴化合物和有机电致发光器件		
公开(公告)号	US20120168739A1	公开(公告)日	2012-07-05
申请号	US13/415160	申请日	2012-03-08
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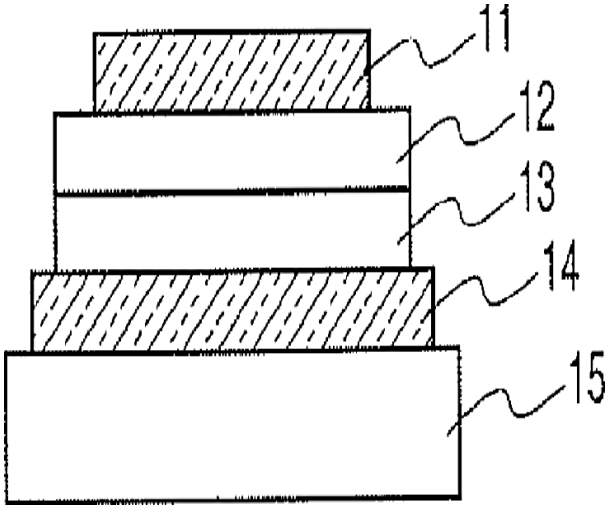
IPC分类号	H01L51/54 C07C13/66		
CPC分类号	C07C13/567 C09K2211/1416 C07C13/62 C07C13/66 C07C2103/18 C07C2103/24 C07C2103/26 C07C2103/40 C07C2103/44 C07C2103/48 C07C2103/50 C07C2103/52 H01L51/0039 H01L51/0054 H01L51/0058 H01L51/006 H01L51/0071 H01L51/5012 H01L51/5016 C09K11/06 H05B33/14 C07C13/573 C07C2603/18 C07C2603/24 C07C2603/26 C07C2603/40 C07C2603/44 C07C2603/48 C07C2603/50 C07C2603/52		
优先权	2006111726 2006-04-14 JP 2005366205 2005-12-20 JP PCT/JP2006/325451 2006-12-14 WO 2006327780 2006-12-05 JP		
外部链接	Espacenet USPTO		

摘要(译)

本发明提供一种新型芴化合物，其由下述通式（1）表示：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