(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 September 2007 (27.09.2007)

PCT

(10) International Publication Number
WO 2007/108666 A1

(51) International Patent Classification:
C07C 211/54 (2006.01)

(21) International Application Number:
PCT/KR2007/001448

(22) International Filing Date: 23 March 2007 (23.03.2007)

(25) Filing Language: Korean

(26) Publication Language: English

(30) Priority Data:
10-2006-0026468 23 March 2006 (23.03.2006) KR

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN,

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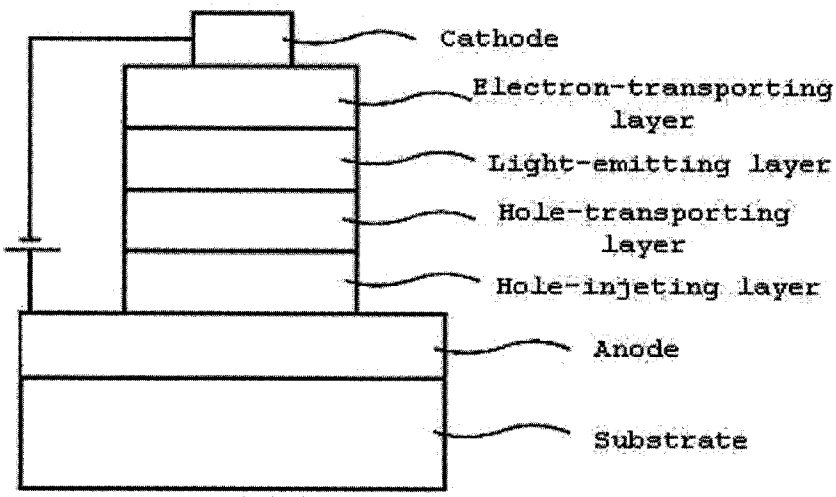
(54) Title: NEW DIAMINE DERIVATIVES, PREPARATION METHOD THEREOF AND ORGANIC ELECTRONIC DEVICE USING THE SAME



(57) Abstract: The present invention relates to a novel diamine derivative, a method for preparation thereof, and an organic electronic device using the same. The diamine derivative according to the present invention can serve as a hole injecting, hole transporting, electron injecting, electron transporting, or light emitting material in an organic electronic device including an organic light emitting device. Particularly, it can be used as a light emitting material as used alone, and also serve as a light emitting host, or a light emitting dopant, in particular, a blue light emitting dopant. The organic electronic device according to the present invention exhibits excellent characteristics in terms of efficiency, drive voltage, life time, and stability.

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IS, JP, KE, KG, KM, KN, KP, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report*

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【DESCRIPTION】

【Invention Title】

NEW DIAMINE DERIVATIVES, PREPARATION METHOD THEREOF AND ORGANIC ELECTRONIC DEVICE USING THE SAME

【Technical Field】

The present invention relates to a novel diamine derivative, a method for preparation thereof, and an organic electronic device using the same.

This application claims priority benefits from Korean Patent Application No. 10-2006-0026468, filed on March 23, 2006, the entire contents of which are fully incorporated herein by reference.

【Background Art】

The organic electronic device refers to a device which requires charge exchange between an electrode and an organic material using holes and electrons. The organic electronic device can be largely classified into two types according to its operation principle as follows. One type is an electronic device having a configuration in which an exciton is formed in an organic material layer by photons flown from an external light source into the device and the exciton is separated into an electron and a hole, the formed electron and hole are transported to a different

electrode, respectively and used as a current source (voltage source), and the other type is an electronic device having a configuration in which a hole and/or electron are/is injected into an organic material semiconductor forming an interface with an electrode by applying a voltage or current to two or more electrodes to allow the device to operate by means of the injected electron and hole.

Examples of the organic electronic device include an organic light emitting device, an organic solar cell, an organic photoconductor (OPC) drum and an organic transistor, which all require a hole injecting or hole transporting material, an electron injecting or electron transporting material, or a light emitting material for driving the device.

Hereinafter, the organic light emitting device will be mainly and specifically described, but in the above-mentioned organic electronic devices, the hole injecting or hole transporting material, the electron injecting or electron transporting material, or the light emitting material injection functions according to a similar principle.

In general, the term "organic light emitting phenomenon" refers to a phenomenon in which electric energy is converted to light energy by means of an organic material. The organic light emitting device using the organic light emitting phenomenon has a structure usually comprising an

anode, a cathode and an organic material layer interposed therebetween. Herein, the organic material layer may be mostly formed in a multilayer structure comprising layers of different materials, for example, the hole injecting layer, the hole transporting layer, the light emitting layer, the electron transporting layer, the electron injecting layer and the like, in order to improve efficiency and stability of the organic light emitting device. In the organic light emitting device having such a structure, when a voltage is applied between two electrodes, holes from the anode and electrons from a cathode are injected into the organic material layer, the holes and the electrons injected are combined together to form excitons. Further, when the excitons drop to a ground state, lights are emitted. Such the organic light emitting device is known to have characteristics such as self-luminescence, high brightness, high efficiency, low drive voltage, wide viewing angle, high contrast and high-speed response.

The materials used for the organic material layer of the organic light emitting device can be classified into a light emitting material and a charge transporting material, for example, a hole injecting material, a hole transporting material, an electron transporting material and an electron injecting material, according to their functions. The light emitting material can be classified into a high molecular weight type and

a low molecular weight type, according to their molecular weight, and divided into a fluorescent material from singlet excited states and a phosphorescent material from triplet excited states according to their light emitting mechanism. Further, the light emitting material can be classified into a blue, green or red light emitting material and a yellow or orange light emitting material required for giving more natural color, according to a light emitting color.

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

kind of the dopant.

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

【Disclosure】

【Technical Problem】

The present inventors found a novel diamine derivative, and further found that the diamine derivative can be used as a hole injecting, hole transporting, electron injecting, electron transporting or light emitting material, and exhibit effects of increased efficiency, lower operating voltage, increased life-time, and higher stability of an organic electronic device when forming an organic material layer of the organic

electronic device.

【Technical Solution】

Therefore, it is an object of the present invention to provide a novel diamine derivative, a method for preparation thereof, and an organic electronic device using the same.

【Advantageous Effects】

The diamine derivative according to the present invention can serve as a hole injecting, hole transporting, electron injecting, electron transporting, or light emitting material in an organic electronic device including an organic light emitting device. Particularly, it can be used as a light emitting material as used alone, and also serve as a light emitting host, or a light emitting dopant, in particular, a blue light emitting dopant. The organic electronic device according to the present invention exhibits excellent characteristics in terms of efficiency, drive voltage, life time, and stability.

【Description of Drawings】

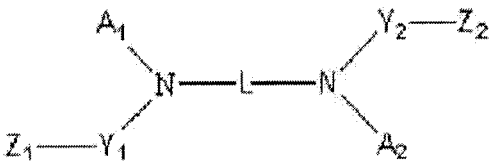
Fig. 1 illustrates the structure of the organic light emitting device according to one embodiment of the present invention.

【Best Mode】

The present invention provides a diamine derivative represented by

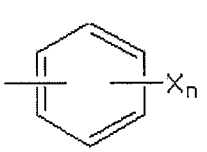
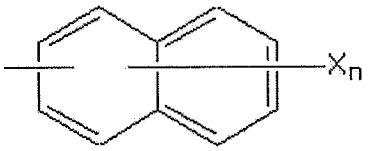
the following formula 1.

【Formula 1】



wherein

L is a C_6 to C_{30} aryl group,

A_1 and A_2 are the same or different from each other, and are each  or ,

wherein n is an integer from 1 to 5, and

at least one of Xs is selected from -GeRR'R", -SiRR'R" and deuterium (D), and the others are each independently selected from the group of consisting of hydrogen, CN, NO_2, a C_6 to C_{20} arylamine group, a C_6 to C_{20} arylthiophene group, a C_3 to C_{20} cycloalkyl group, -OR, -SR, -SeR, -TeR, -BRR', -AlRR', -SnRR'R", a C_6 to C_{20} aryl group, a C_8 to C_{20} arylalkenyl group, and a C_4 to C_{20} alkylene group which formed a fused ring with the phenyl group or the naphthyl group,

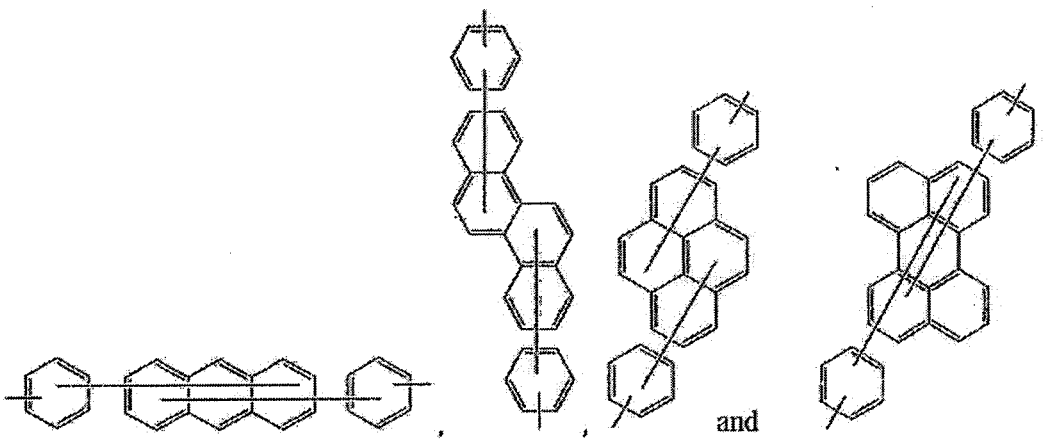
Y_1 and Y_2 are the same or different from each other, and are each a C_6 to C_{20} arylene group or a divalent C_5 to C_{20} heterocyclic group,

Z_1 and Z_2 are the same or different from each other, and are each hydrogen, halogen, deuterium, CN, NO_2, a C_1 to C_{20} alkyl group, a C_1 to C_{20} alkoxy group, a C_6 to C_{20} aryl group, a C_6 to C_{20} arylamine group, a C_6 to C_{20} arylthiophene group, a C_3 to C_{20} cycloalkyl group, -OR, -SR, -SeR, -TeR, -BRR', -AlRR', -SiRR'R", -GeRR'R", -SnRR'R", a C_6 to C_{20} aryl group, a C_8 to C_{20} arylalkenyl group, and a C_4 to C_{20} alkylene group which formed a fused ring with the phenyl group or the naphthyl group, and

R, R' and R" are the same or different from each other, and are each hydrogen, a C_1 to C_{20} alkyl group, a C_3 to C_{20} cycloalkyl group, a C_6 to C_{20} aryl group, or a C_5 to C_{20} heterocyclic group.

In the formula 1,

L is preferably selected from, for example, anthracenyl, phenanthrenyl, pyrenyl, perylenyl, crycenyl,



and

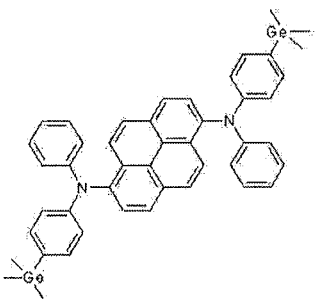
Y_1 and Y_2 are preferably selected from, for example, phenyl, biphenyl,

naphthalenyl, tetralinyl, anthracenyl, stilbenyl, phenanthrenyl, pyrenyl, perylenyl, crycenyl and carbazolyl,

Z_1 and Z_2 are preferably selected from, for example, hydrogen, a C_6 to C_{20} aryl group, a C_6 to C_{20} arylamine group, -BRR', -SiRR'R", -GeRR'R" and a C_4 to C_{20} alkylene group which formed a fused ring with the phenyl group or the naphthyl group, and

R, R' and R" are each preferably, for example, a C_1 to C_{20} alkyl group, or a C_6 to C_{20} aryl group.

Specific examples of the compound of the formula 1 according to the present invention are shown in the following compounds, but are not limited thereto.



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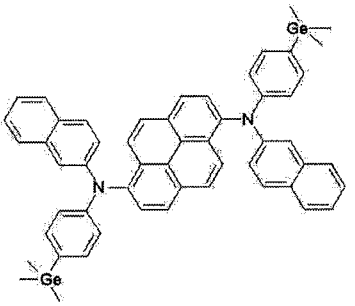

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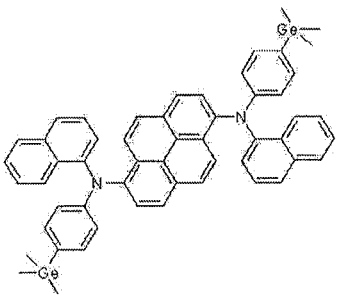

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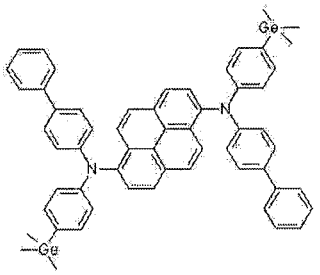

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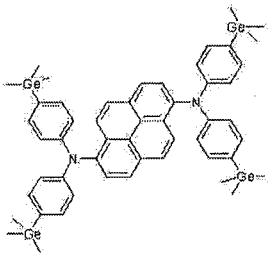

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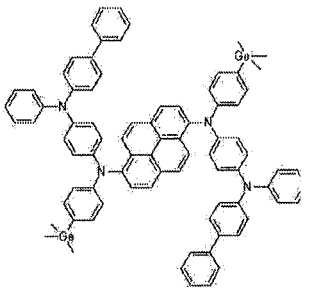

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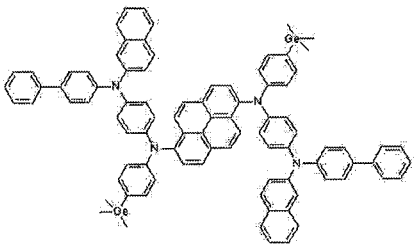

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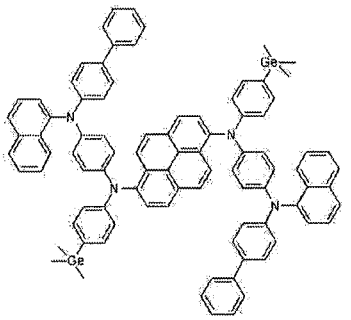

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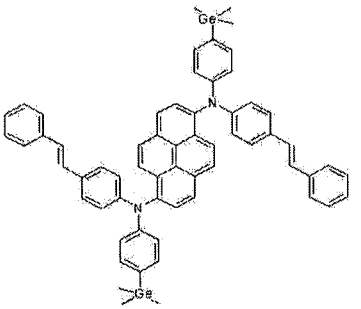

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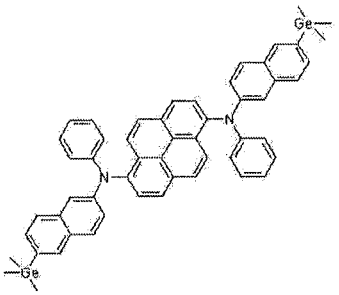

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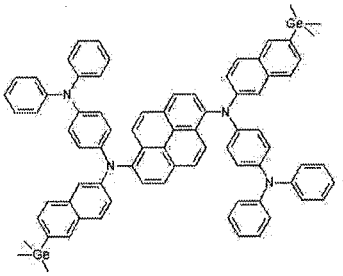

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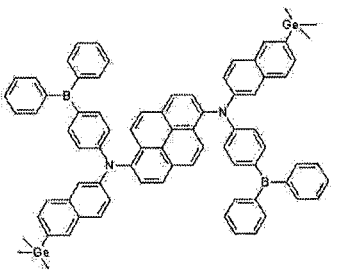

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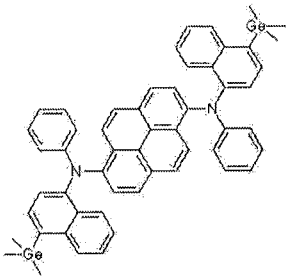

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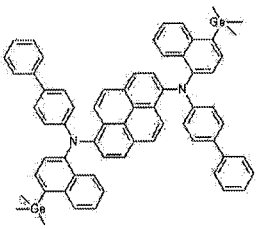

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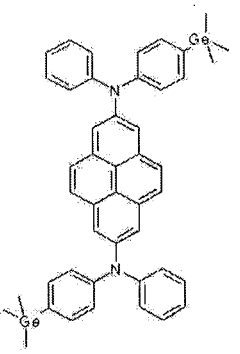

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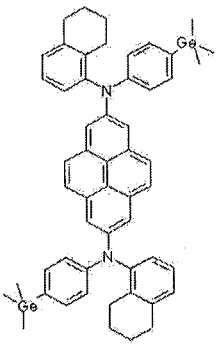

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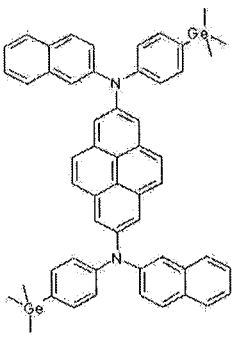

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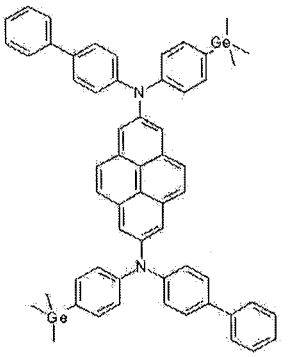

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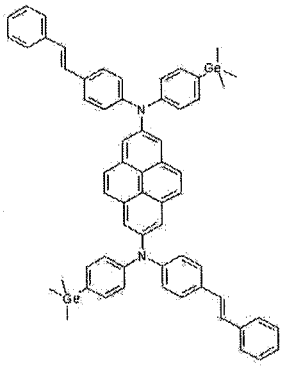

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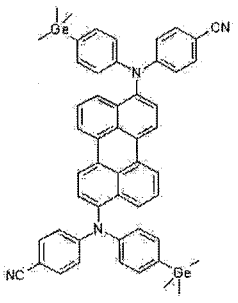

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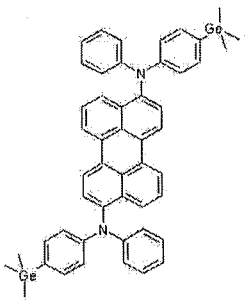

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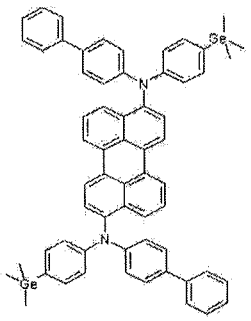

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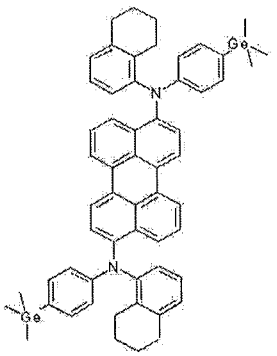

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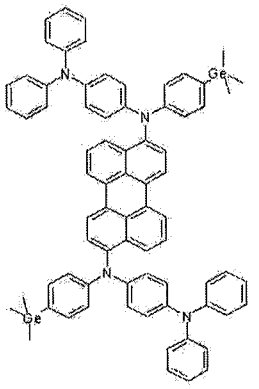

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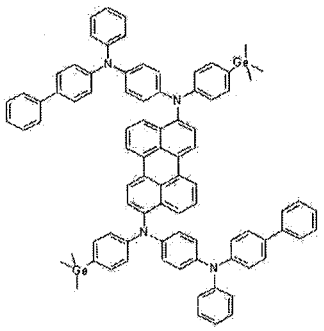

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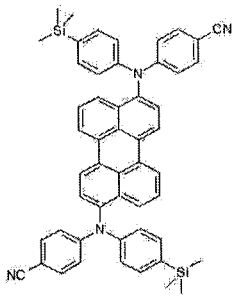

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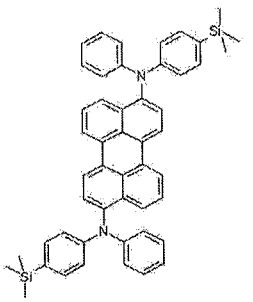
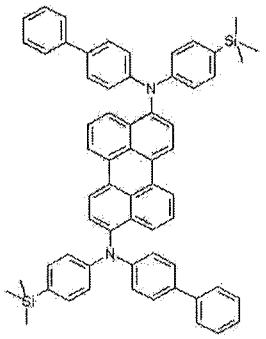


[Compound 27]



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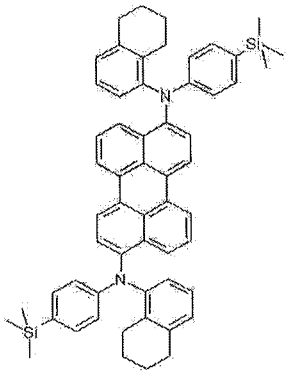

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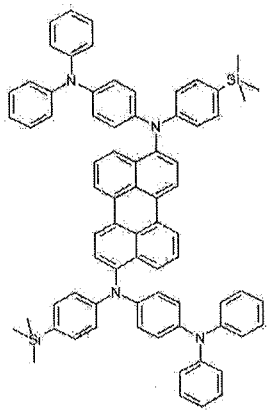

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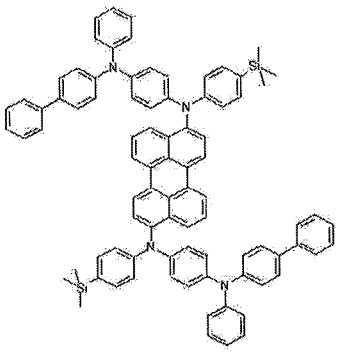

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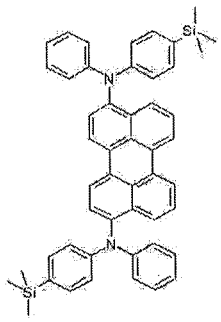

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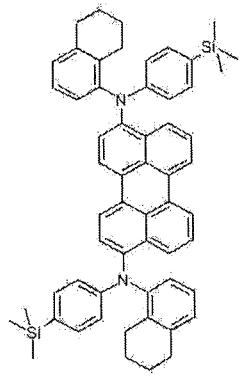

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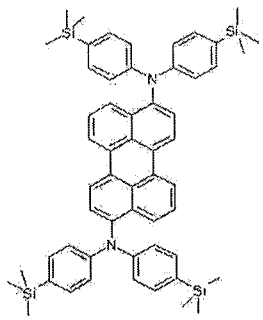

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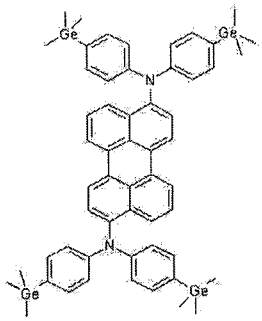

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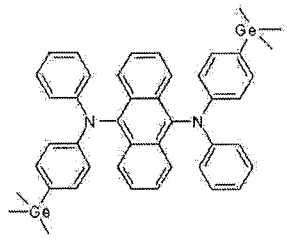

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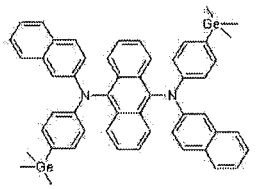

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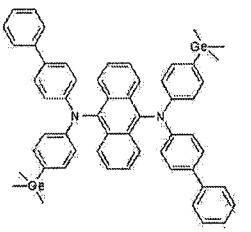

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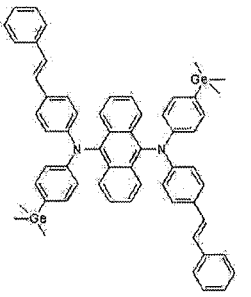

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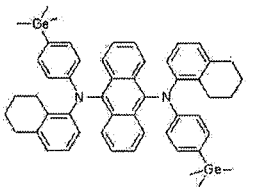

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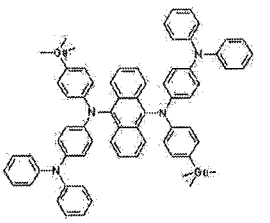

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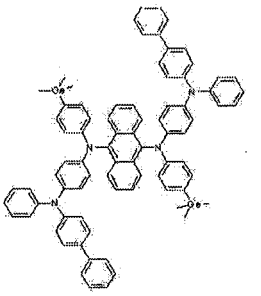

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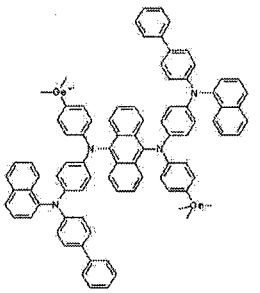

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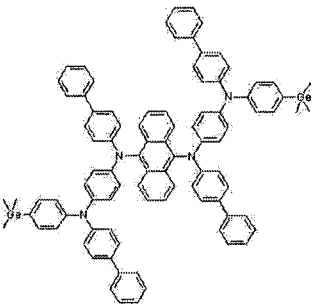

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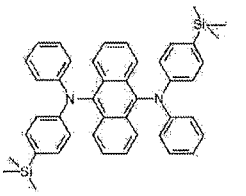

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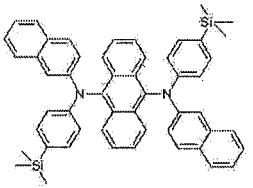

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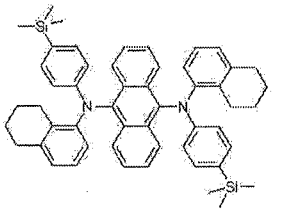

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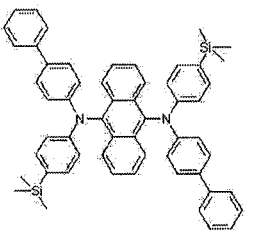

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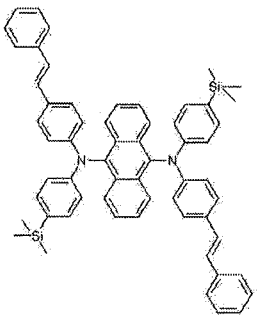

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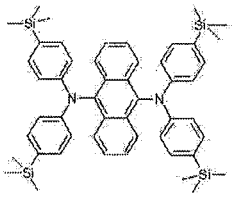

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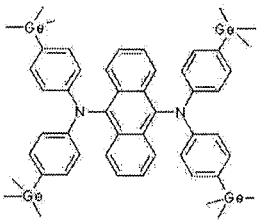

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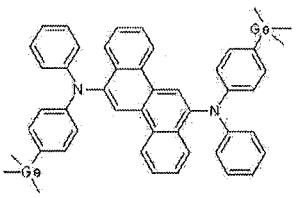

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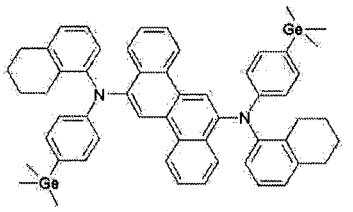

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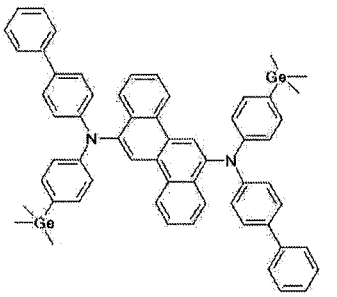

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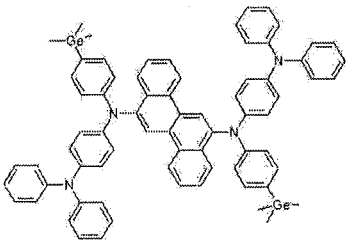

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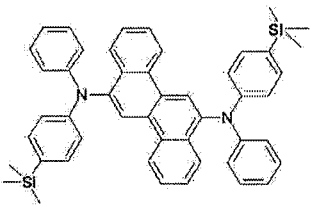

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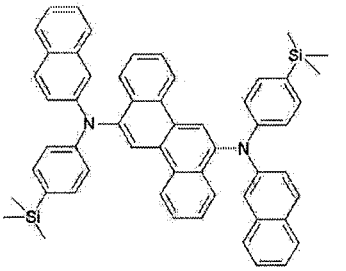

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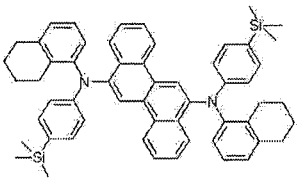

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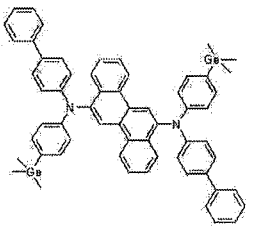

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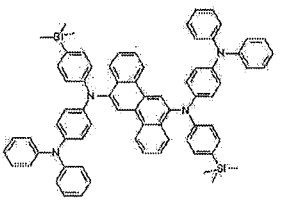

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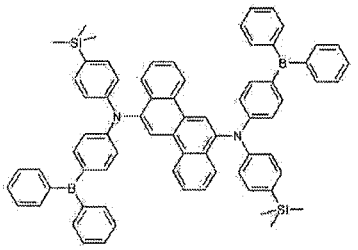

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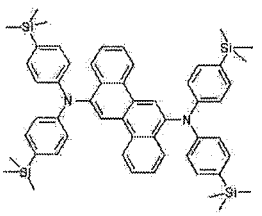

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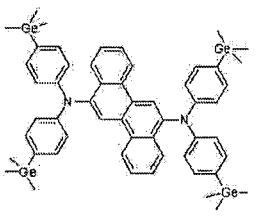

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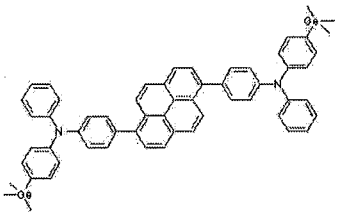

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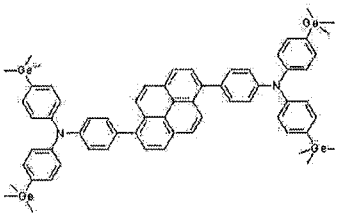

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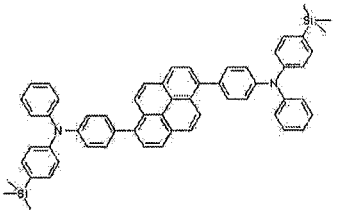

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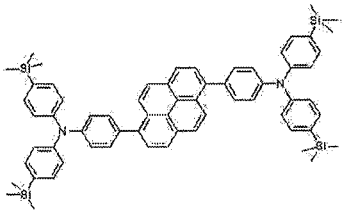

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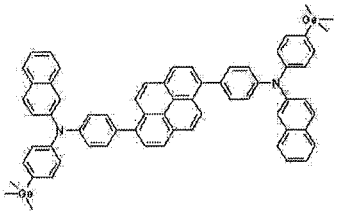

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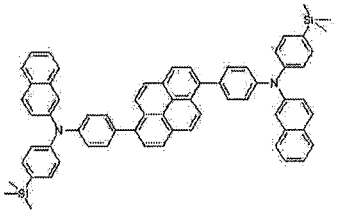

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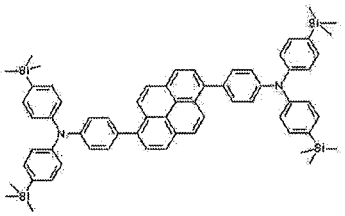

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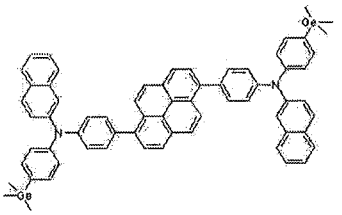

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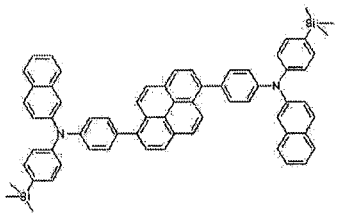

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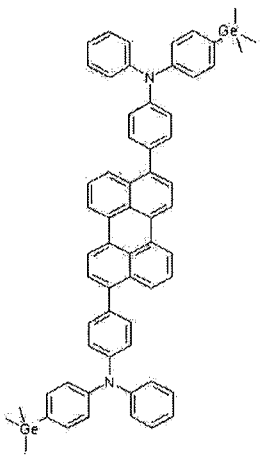

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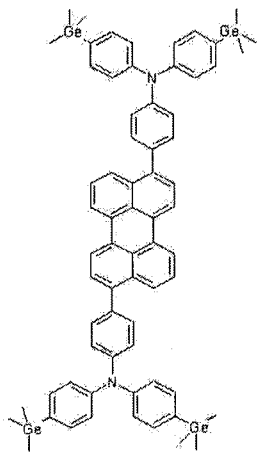

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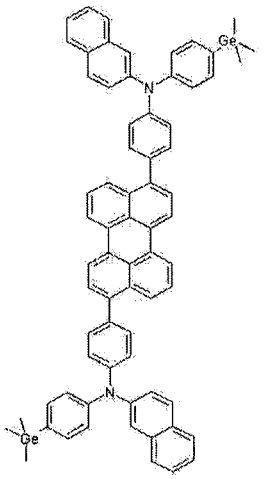

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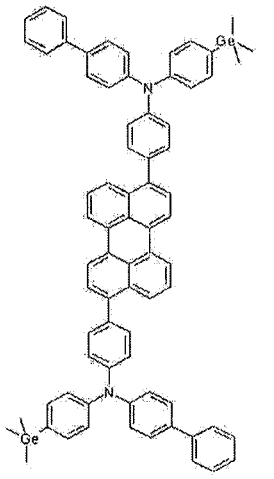

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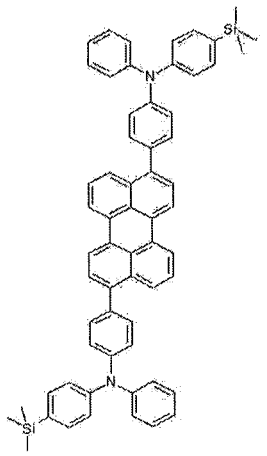

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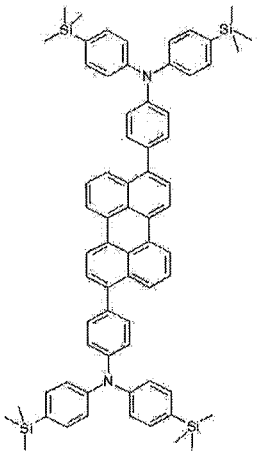

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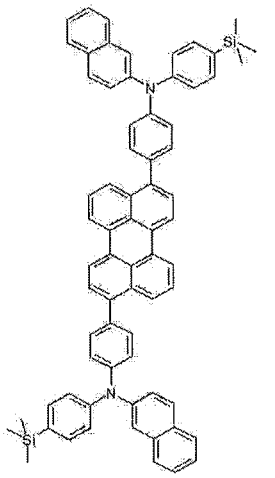

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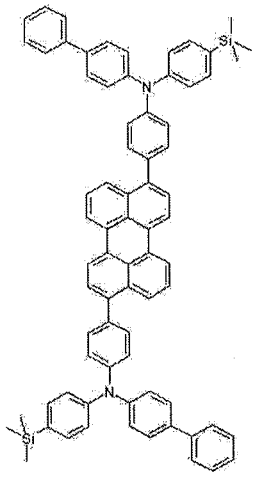

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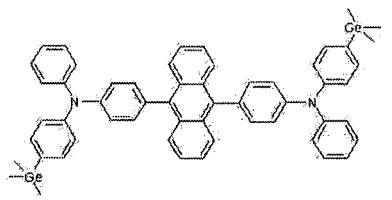

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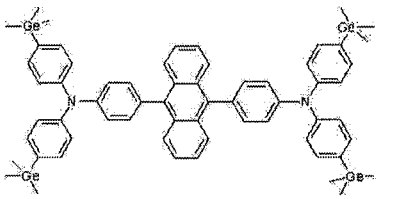

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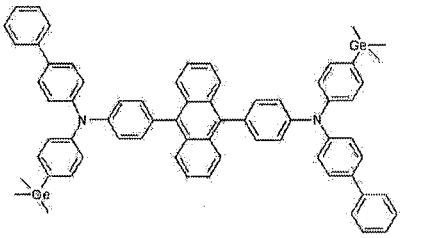

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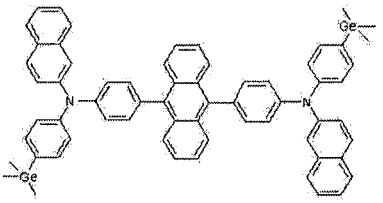

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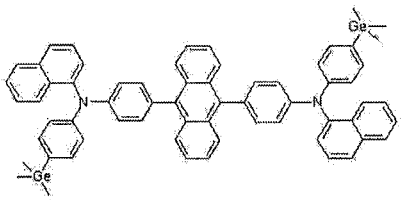
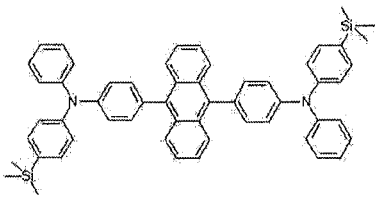


[Compound 85]



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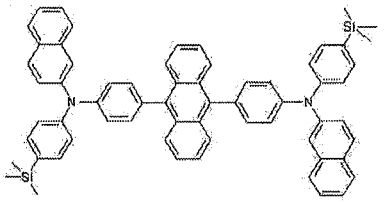

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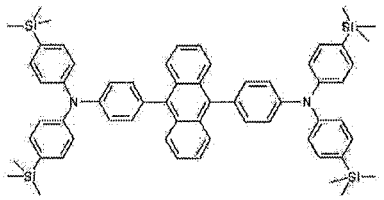

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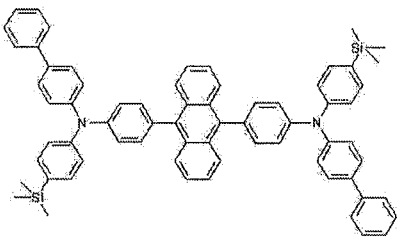

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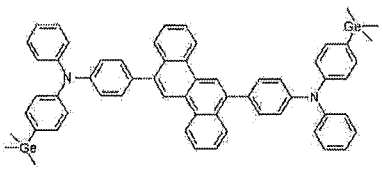

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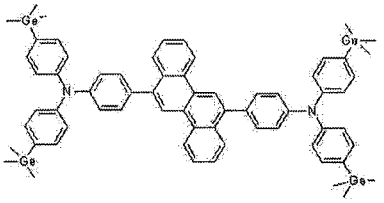

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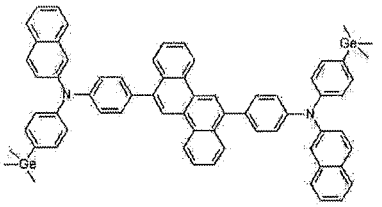

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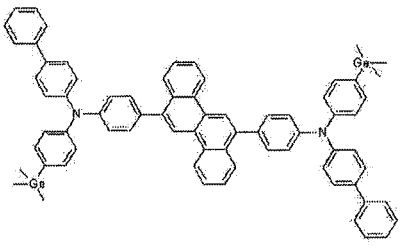

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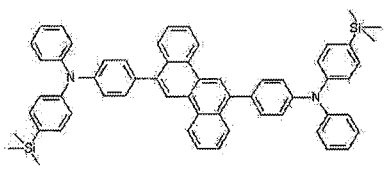

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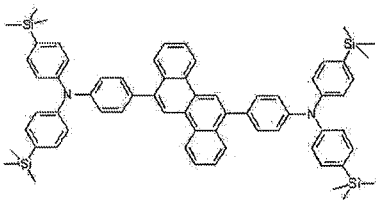

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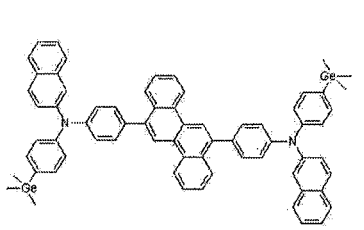

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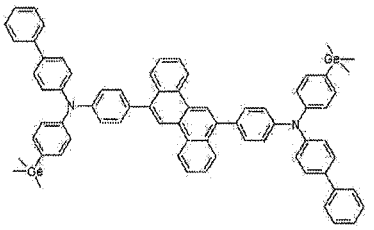

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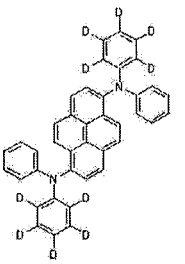

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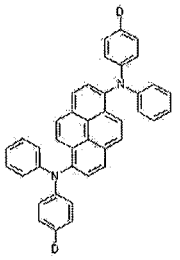

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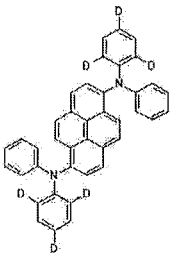

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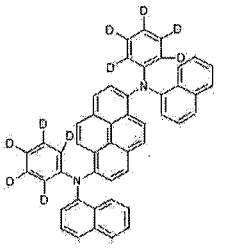

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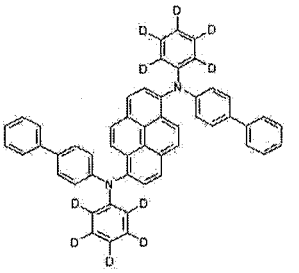

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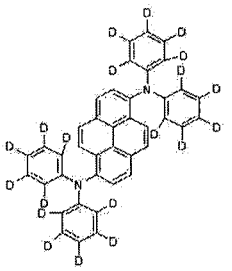

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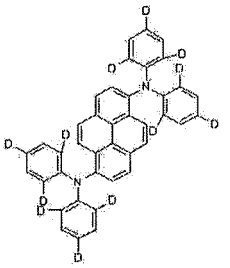

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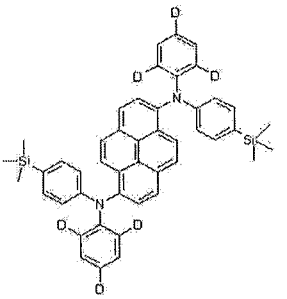

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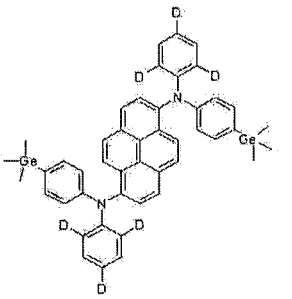

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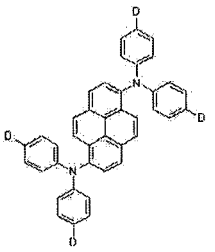

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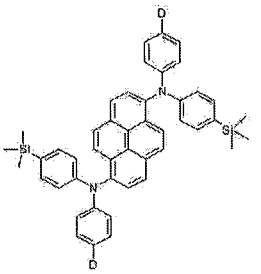

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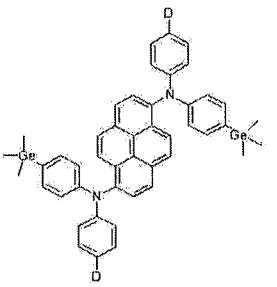

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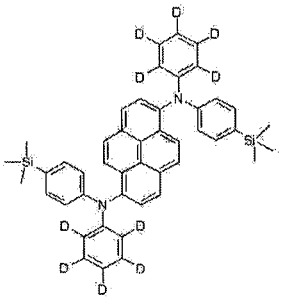

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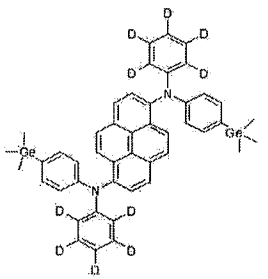

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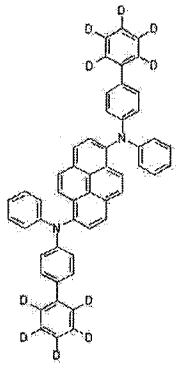

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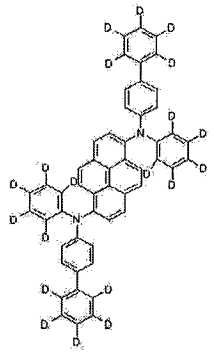

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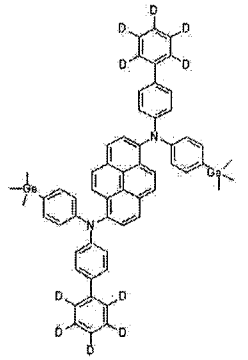

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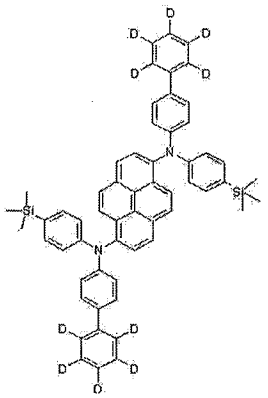

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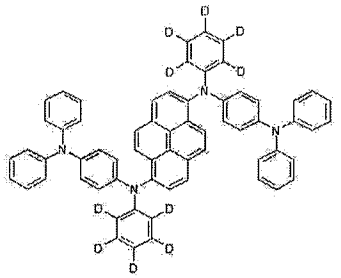

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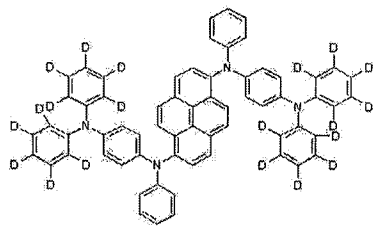

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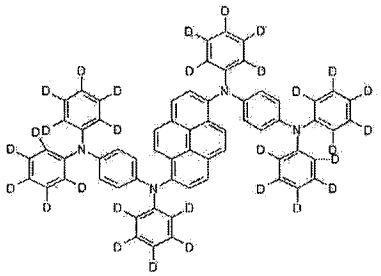

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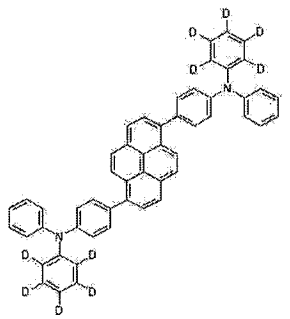

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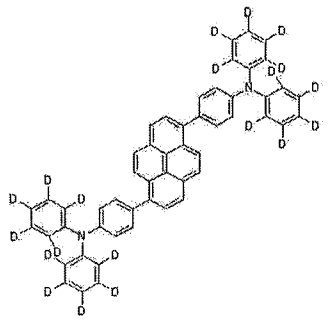

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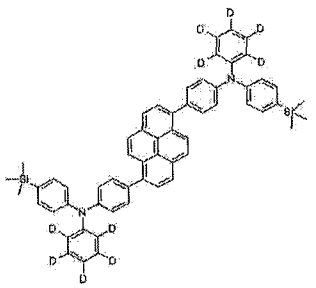

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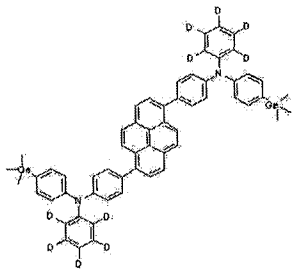

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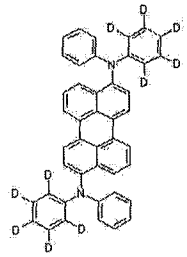

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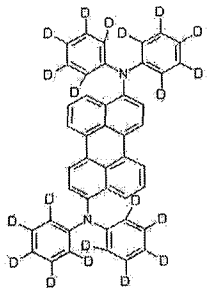

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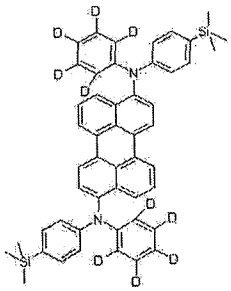

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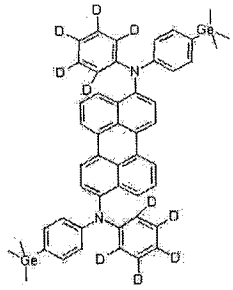

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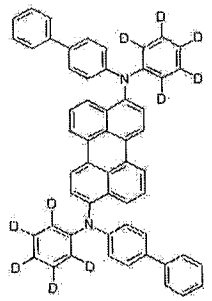

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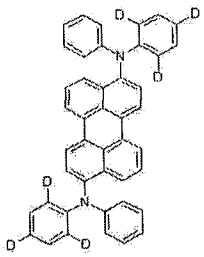

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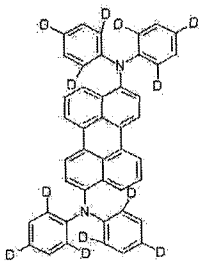

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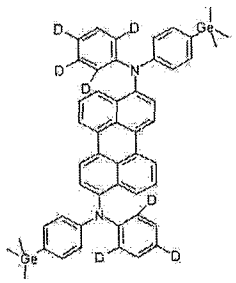

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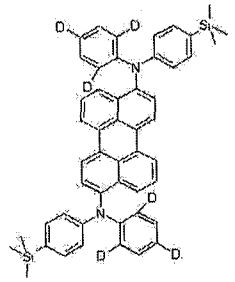

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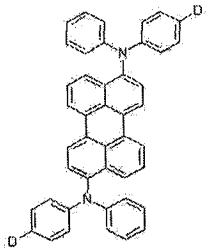

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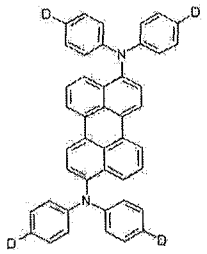

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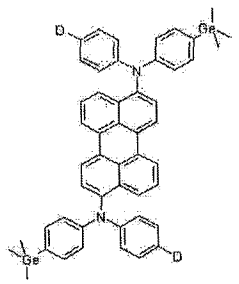

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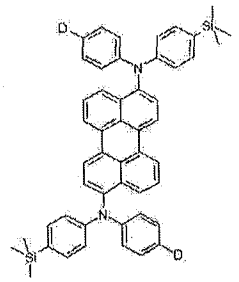

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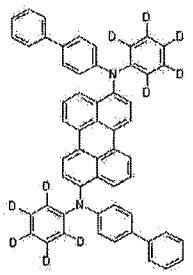

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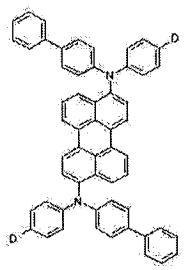

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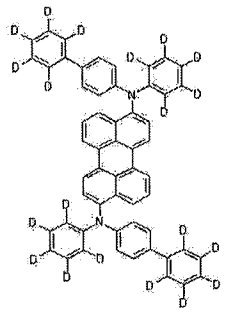

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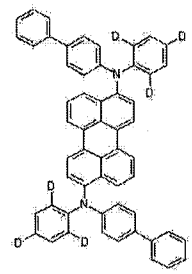

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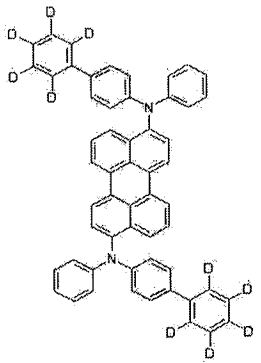

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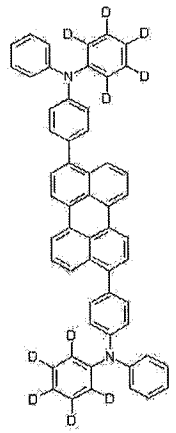

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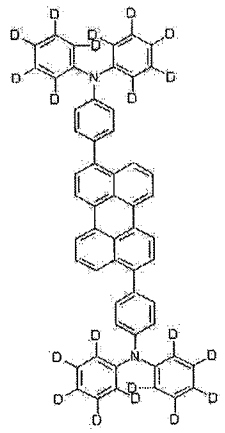

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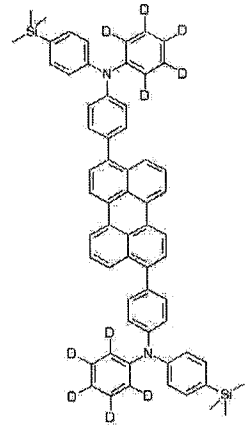
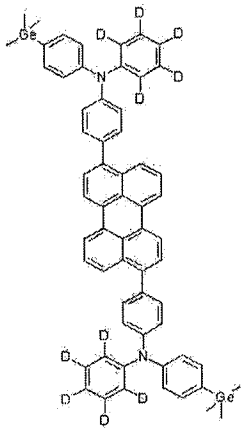


[Compound 143]



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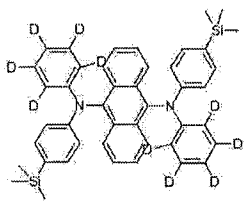

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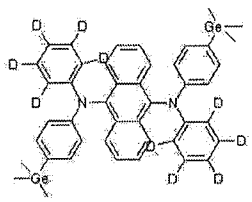

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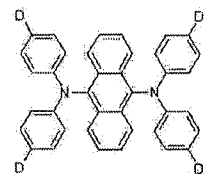

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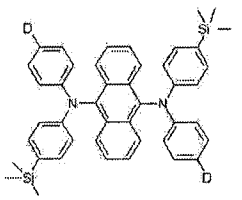

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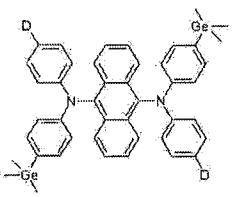

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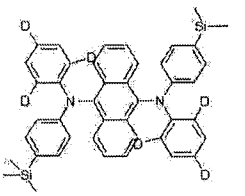

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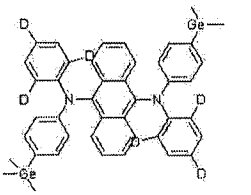

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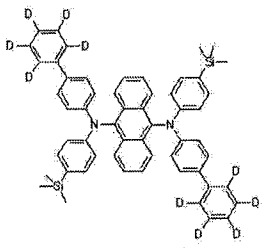

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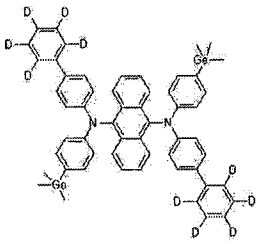

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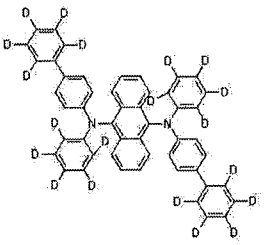

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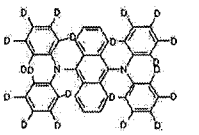

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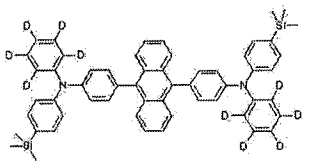

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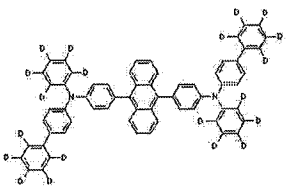

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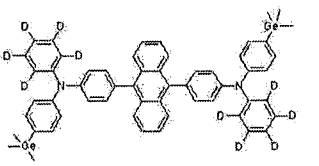

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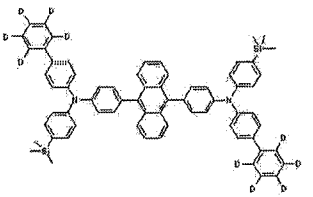

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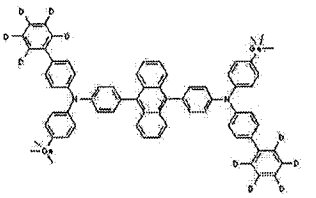

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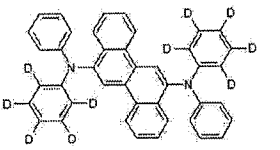

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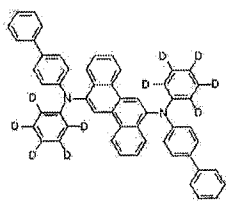

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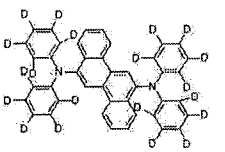

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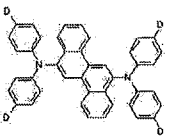

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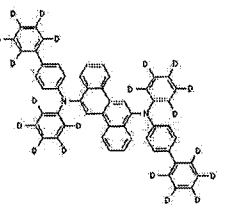

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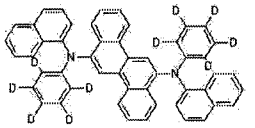

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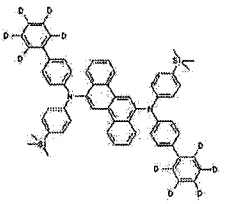

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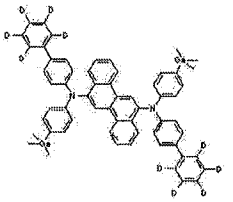

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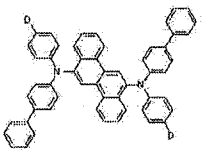

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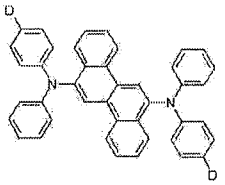

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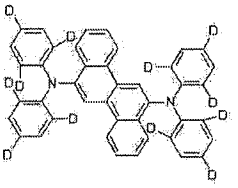

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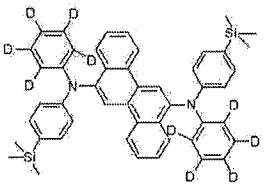

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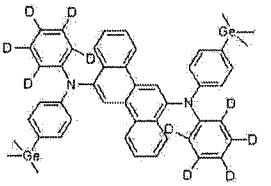

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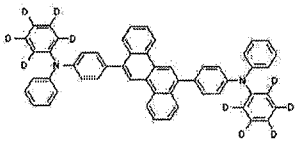

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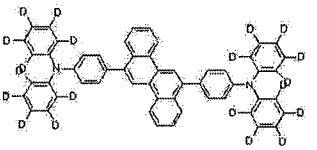

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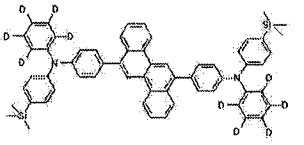

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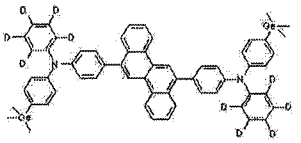

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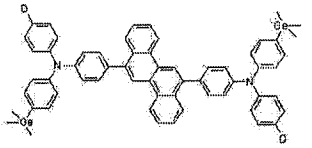

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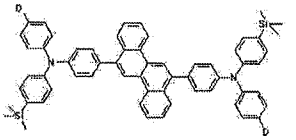

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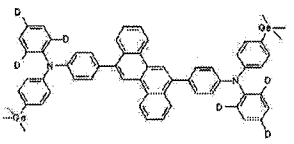

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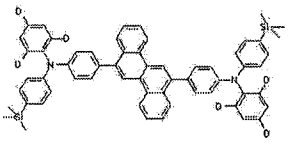

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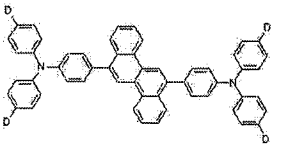

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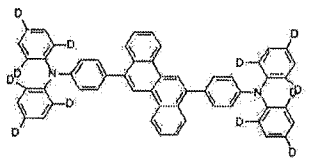

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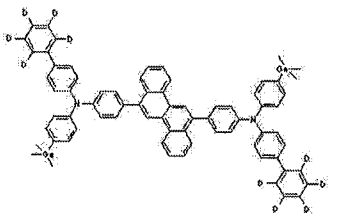

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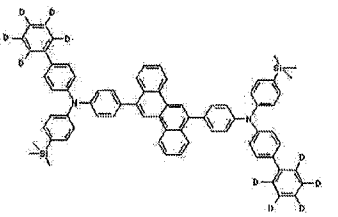

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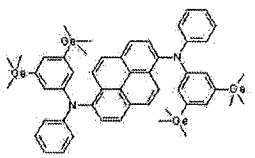

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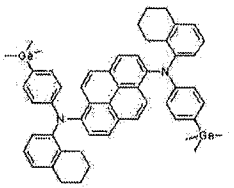

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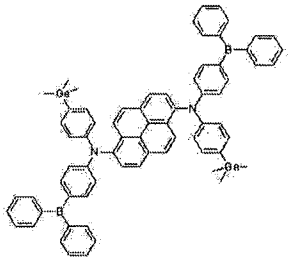

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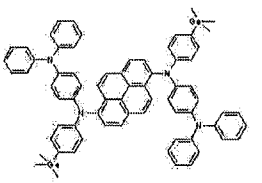

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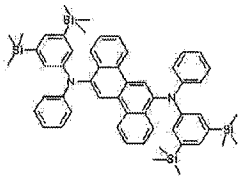

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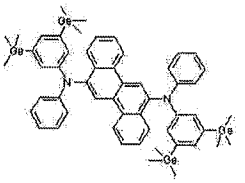

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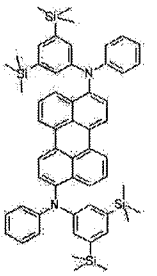

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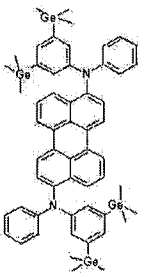

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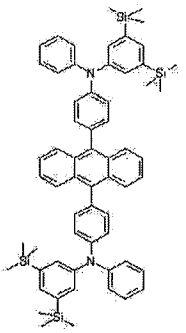

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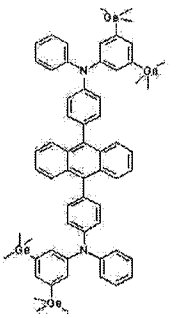

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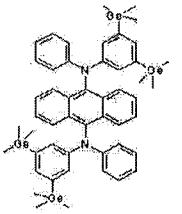
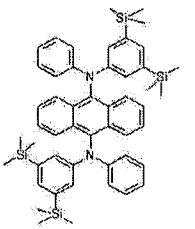


[Compound 196]



[Compound 197]

Further, the present invention provides a method for preparing the

diamine derivative represented by the formula 1.

The diamine derivative according to the present invention can be prepared by reacting a dibromoaryl compound with an arylamine compound in the presence of a palladium catalyst.

The arylamine compound preferably contains at least one selected from a germanium group, a silyl group, and deuterium.

Further, the present invention provides an organic electronic device using the compound of the formula 1.

The organic electronic device of the present invention can be prepared by usual methods and materials for preparing an organic electronic device, except that the above-described compounds are used to form at least one organic material layer.

Hereinbelow, the organic light emitting device will be exemplified.

The above-described compounds can serve as a hole injecting, hole transporting, electron injecting, electron transporting, or light emitting material, and particularly serve as a light emitting material as used alone, as well as a light emitting host with an appropriate light emitting dopant or a light emitting dopant, in particular a blue dopant with an appropriate light emitting host.

In one embodiment of the present invention, the organic light

emitting device may have a structure that comprises a first electrode, a second electrode and organic material layers interposed therebetween, and can be prepared by usual methods and materials for preparing an organic light emitting device, except that the above-described compound according to the present invention is used to form at least one of the organic material layers in an organic light emitting device.

The structure of the organic light emitting device according to the present invention is shown in Fig. 1.

For example, the organic light emitting device according to the present invention can be prepared by method using a PVD (physical vapor deposition) process such as sputtering and e-beam evaporation, said method comprising:

depositing a metal, a metal oxide having conductivity or an alloy thereof on a substrate to form an anode; forming an organic material layer comprising a hole injecting layer, a hole transporting layer, a light emitting layer, and an electron transporting layer on said anode; and depositing a material, which can be used as a cathode, thereon. Alternatively, the organic light emitting device can be prepared by sequentially depositing a cathode material, an organic material layer, and an anode material on a substrate.

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

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

The cathode material is preferably a material having a small work function to facilitate electron injection usually to an organic material layer. Specific examples of the cathode material include metals such as

magnesium, calcium, sodium, potassium, titanium, indium, yttrium, lithium, gadolinium, aluminum, silver, tin and lead, or an alloy thereof; multilayer structure materials such as LiF/Al and LiO_2/Al, but not limited thereto.

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

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

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

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

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

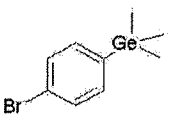
The compound according to the invention can function in an organic

electronic device including an organic solar cell, an organic photoconductor and an organic transistor, according to a principle similar to that applied to the organic light emitting device.

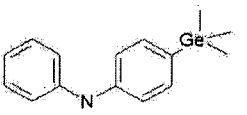
【Mode for Invention】

Hereinbelow, the preferred Examples of the present invention will be presented for further understanding the present invention. However, the following Examples are presented merely for illustrative purpose, and thus do not limit the scope of the present invention.

The compound of the formula I according to the present invention can be prepared in multi-step chemical reactions. The preparation of the compound is described by way of Examples below. As will be clear in Examples, a certain intermediate compound is first prepared, and then the intermediate compound is used to prepare the compound of the formula I. Exemplary intermediate compounds are listed below as Compounds A through M. In these compounds, "Br" may be substituted with any other reactive atoms or functional groups.



[Compound A]



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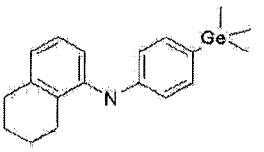

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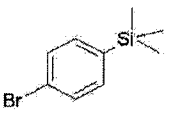

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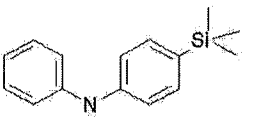

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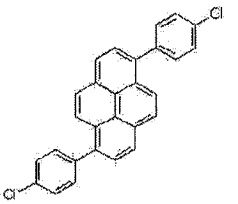

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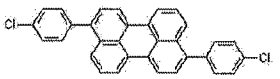
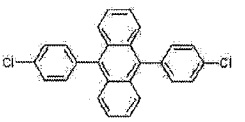
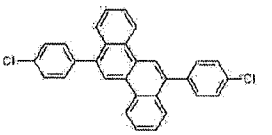


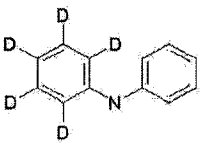
[Compound G]



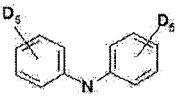
[Compound H]



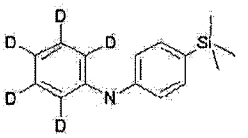
[Compound I]



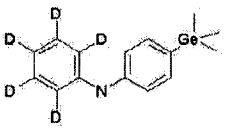
[Compound J]



[Compound K]



[Compound L]



[Compound M]

Preparation Example 1: Preparation of compound A

Dibromobenzene (20 g, 84.78 mmol) was dissolved in anhydrous tetrahydrofuran (THF, 200 mL) at room temperature under nitrogen atmosphere. The solution was cooled to -78℃. n-butyllithium (34 mL, 2.5 M pentane solution) was added slowly to the solution at -78℃, and the temperature of the mixture was slowly raised to 0℃ for about 1 hour.

To the mixture, trimethylgerumanium bromide (18 ml, 101.74 mmol) was added, and the temperature of the mixture was raised to room temperature over 1 hour. After confirmation of completion of the reaction, the mixture was extracted from ethyl acetate, dried over magnesium sulfate, and distilled off under reduced pressure to obtain a compound A (20 g, 90%). MS (M+) 273

Preparation Example 2: Preparation of compound B

The compound A (18 g, 65.45 mmol), aniline (6.6 ml, 72 mmol), $pd(dba)_2$ (0.125 g, 0.13 mmol), $P(t\text{-}Bu)_3$ (0.04 g, 0.2 mmol) and sodium t-butoxide (1.80 g, 18.7 mmol) were added to toluene (200 mL) under nitrogen atmosphere, and the mixture was refluxed for about 3 hours. After completion of the reaction, the mixture was cooled to room temperature, and the reaction mixture was added to a mixed solution of THF and H_2O. The organic layer was separated, dried over magnesium sulfate, and then concentrated. The residue was separated by column chromatography to obtain a compound B (16 g, 85%). MS [M] = 286

Preparation Example 3: Preparation of compound C

A compound C (17 g, 78%) was prepared in the same manner as in

Preparation Example 2, except that 5,6,7,8-tetrahydro-1-naphthylamine (10.6 g, 72 mmol) was used instead of aniline (6.6 ml, 72 mmol) in Preparation Example 2. MS [M] = 340

Preparation Example 4: Preparation of compound D

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

Preparation Example 5: Preparation of compound E

The compound D (15 g, 65.45 mmol), aniline (6.6 ml, 72 mmol), $pd(dba)_2$ (0.125 g, 0.13 mmol), $P(t\text{-}Bu)_3$ (0.04 g, 0.2 mmol) and sodium t-butoxide

(1.80 g, 18.7 mmol) were added to toluene (200 mL) under nitrogen atmosphere, and the mixture was refluxed for about 3 hours. After completion of the reaction, the mixture was cooled to room temperature, and the reaction mixture was added to a mixed solution of THF and H_2O. The organic layer was separated, dried over magnesium sulfate, and then concentrated. The residue was separated by column chromatography to obtain a compound E (15 g, 86%). MS [M] = 143

Preparation Example 6: Preparation of compound F

1,6-Dibromopyrene (3 g, 8.5 mmol), 4-chlorophenylboronic acid (2.9 g, 18.7 mmol), and $Pd(PPh_3)_4$ (0.29 g, 0.26 mmol) were added to an aqueous 2 M K_2CO_3 solution (20 mL) and THF (80 mL) under nitrogen atmosphere. The mixture was refluxed under stirring for about 12 hours. After completing the reaction, the mixture was cooled to room temperature. The organic layer was separated from the reaction mixture, dried over magnesium sulfate, and distilled under reduced pressure. The residue was purified by column chromatography to prepare a compound F (2.5 g, 70%). MS [M+H]+ = 422

Preparation Example 7: Preparation of compound G

3,9-Dibromoperylene (3.5 g, 8.5 mmol), 4-chlorophenylboronic acid (2.9 g, 18.7 mmol), and $Pd(PPh_3)_4$ (0.29 g, 0.26 mmol) were added to an aqueous 2 M K_2CO_3 solution (20 mL) and THF (80 mL) under nitrogen atmosphere. The mixture was refluxed under stirring for about 12 hours. After completing the reaction, the mixture was cooled to room temperature. The organic layer was separated from the reaction mixture, dried over magnesium sulfate, and distilled under reduced pressure. The residue was purified by column chromatography to prepare a compound G (3.0 g, 75%).

MS [M+H]+ = 472

Preparation Example 8: Preparation of compound H

9,10-Dibromoanthracene (2.86 g, 8.5 mmol), 4-chlorophenylboronic acid (2.9 g, 18.7 mmol), and $Pd(PPh_3)_4$ (0.29 g, 0.26 mmol) were added to an aqueous 2 M K_2CO_3 solution (20 mL) and THF (80 mL) under nitrogen atmosphere. The mixture was refluxed under stirring for about 12 hours. After completing the reaction, the mixture was cooled to room temperature. The organic layer was separated from the reaction mixture, dried over magnesium sulfate, and distilled under reduced pressure. The residue was purified by column chromatography to prepare a compound H (3.0 g, 90%).

MS [M+H]+ = 398

Preparation Example 9: Preparation of compound I

9,10-Dibromocrysene (3.28 g, 8.5 mmol), 4-chlorophenylboronic acid (2.9 g, 18.7 mmol), and $Pd(PPh_3)_4$ (0.29 g, 0.26 mmol) were added to an aqueous 2 M K_2CO_3 solution (20 mL) and THF (80 mL) under nitrogen atmosphere. The mixture was refluxed under stirring for about 12 hours. After completing the reaction, the mixture was cooled to room temperature. The organic layer was separated from the reaction mixture, dried over magnesium sulfate, and distilled under reduced pressure. The residue was purified by column chromatography to prepare a compound I (2.9 g, 75%).
MS [M+H]+ = 448

Preparation Example 10: Preparation of compound J

Bromobenzene-d_5 (10.6 g, 65.45 mmol), aniline (6.6 ml, 72 mmol), $pd(dba)_2$ (0.125 g, 0.13 mmol), P(t-Bu)$_3$ (0.04 g, 0.2 mmol) and sodium t-butoxide (1.80 g, 18.7 mmol) were added to toluene (80 mL) under nitrogen atmosphere, and the mixture was refluxed for about 3 hours. After completion of the reaction, the mixture was cooled to room temperature, and the reaction mixture was added to a mixed solution of THF and H_2O. The organic layer was separated, dried over magnesium sulfate, and then

concentrated. The residue was separated by column chromatography to obtain a compound J (16 g, 85%). MS [M] = 174

Preparation Example 11: Preparation of compound K

Bromobenzene-d_5 (10.6 g, 65.45 mmol), aniline-2,3,4,5,6-D5 (6.6 ml, 72 mmol), pd(dba)$_2$ (0.125 g, 0.13 mmol), P(t-Bu)$_3$ (0.04 g, 0.2 mmol) and sodium t-butoxide (1.80 g, 18.7 mmol) were added to toluene (80 mL) under nitrogen atmosphere, and the mixture was refluxed for about 3 hours. After completion of the reaction, the mixture was cooled to room temperature, and the reaction mixture was added to a mixed solution of THF and H_2O. The organic layer was separated, dried over magnesium sulfate, and then concentrated. The residue was separated by column chromatography to obtain a compound K (16 g, 85%). MS [M] = 179

Preparation Example 12: Preparation of compound L

The compound D of Preparation Example 4 (15 g, 65.45 mmol), aniline-2,3,4,5,6-D5 (6.6 ml, 72 mmol), pd(dba)$_2$ (0.125 g, 0.13 mmol), P(t-Bu)$_3$ (0.04 g, 0.2 mmol) and sodium t-butoxide (1.80 g, 18.7 mmol) were added to toluene (80 mL) under nitrogen atmosphere, and the mixture was refluxed for about 3 hours. After completion of the reaction, the mixture

was cooled to room temperature, and the reaction mixture was added to a mixed solution of THF and H_2O. The organic layer was separated, dried over magnesium sulfate, and then concentrated. The residue was separated by column chromatography to obtain a compound L (16 g, 85%). MS [M] = 246

Preparation Example 13: Preparation of compound M

The compound A of Preparation Example 1 (18 g, 65.45 mmol), aniline-2,3,4,5,6-D5 (6.6 ml, 72 mmol), $pd(dba)_2$ (0.125 g, 0.13 mmol), $P(t\text{-}Bu)_3$ (0.04 g, 0.2 mmol) and sodium t-butoxide (1.80 g, 18.7 mmol) were added to toluene (80 mL) under nitrogen atmosphere, and the mixture was refluxed for about 3 hours. After completion of the reaction, the mixture was cooled to room temperature, and the reaction mixture was added to a mixed solution of THF and H_2O. The organic layer was separated, dried over magnesium sulfate, and then concentrated. The residue was separated by column chromatography to obtain a compound M (16 g, 85%). MS [M] = 291

Example 1: Preparation of compound 1

1,6-Dibromopyrene (3.0 g, 8.5 mmol), the compound B (5.83 g, 20.4 mmol), $Pd(dba)_2$ (0.097 g, 0.17 mmol), $P(t\text{-}Bu)_3$ (0.05 g, 0.255 mmol) and sodium t-butoxide (2.45 g, 25.5 mmol) were added to toluene (100 mL) under

nitrogen atmosphere, and the mixture was refluxed for about 2 hours. After completion of the reaction, the mixture was cooled to room temperature, and the reaction mixture was added to a mixed solution of THF and H_2O. The organic layer was separated, dried over $MgSO_4$, and then concentrated. The residue was separated by column chromatography to obtain a compound 1 (4.06 g, 62%). MS [M] = 770

Example 2: Preparation of compound 21

A compound 21 (4.18 g, 60%) was prepared in the same manner as in Example 1, except that 3,9-dibromoperylene (3.5 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol) in Example 1. MS [M] = 820

Example 3: Preparation of compound 23

A compound 23 (5.05 g, 64%) was prepared in the same manner as in Example 1, except that 3,9-dibromoperylene (3.5 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound C (6.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 928

Example 4: Preparation of compound 27

A compound 27 (3.85 g, 62%) was prepared in the same manner as in Example 1, except that 3,9-dibromoperylene (3.5 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound E (2.92 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 730

Example 5: Preparation of compound 36

A compound 36 (4.12 g, 65%) was prepared in the same manner as in Example 1, except that 9,10-dibromoanthracene (2.86 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol) in Example 1. MS [M] = 746

Example 6: Preparation of compound 40

A compound 40 (3.42 g, 65%) was prepared in the same manner as in Example 1, except that 9,10-dibromoanthracene (2.86 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound C (6.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 620

Example 7: Preparation of compound 45

A compound 45 (3.63 g, 65%) was prepared in the same manner as in Example 1, except that 9,10-dibromoanthracene (2.86 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound E (4.55 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 656

Example 8: Preparation of compound 53

A compound 53 (2.00 g, 61%) was prepared in the same manner as in Example 1, except that 9,10-dibromocrysene (3.28 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound C (6.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 386

Example 9: Preparation of compound 56

A compound 56 (3.9 g, 65%) was prepared in the same manner as in Example 1, except that 9,10-dibromocrysene (3.28 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound E (2.92 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 706

Example 10: Preparation of compound 64

A compound 64 (4.86 g, 62%) was prepared in the same manner as in Example 1, except that the compound F(3.6 g, 8.5 mmol) synthesized in Preparation Example 6 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol) in Example 1. MS [M] = 922

Example 11: Preparation of compound 73

A compound 73 (5.37 g, 65%) was prepared in the same manner as in Example 1, except that the compound G(4.0 g, 8.5 mmol) synthesized in Preparation Example 7 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol) in Example 1. MS [M] = 972

Example 12: Preparation of compound 77

A compound 77 (4.87 g, 65%) was prepared in the same manner as in Example 1, except that the compound G(4.0 g, 8.5 mmol) synthesized in Preparation Example 7 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound E (2.92 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 882

Example 13: Preparation of compound 81

A compound 81 (4.96 g, 65%) was prepared in the same manner as in Example 1, except that the compound H(3.4 g, 8.5 mmol) synthesized in Preparation Example 8 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol) in Example 1. MS [M] = 898

Example 14: Preparation of compound 86

A compound 86 (4.46 g, 65%) was prepared in the same manner as in Example 1, except that the compound H(3.4 g, 8.5 mmol) synthesized in Preparation Example 8 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound E (2.92 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 808

Example 15: Preparation of compound 90

A compound 90 (5.24 g, 65%) was prepared in the same manner as in Example 1, except that the compound I(3.4 g, 8.5 mmol) synthesized in Preparation Example 9 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol) in Example 1. MS [M] = 948

Example 16: Preparation of compound 94

A compound 94 (4.74 g, 65%) was prepared in the same manner as in Example 1, except that the compound I(3.4 g, 8.5 mmol) synthesized in Preparation Example 9 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound E (2.92 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 858

Example 17: Preparation of compound 98

A compound 98 (3.02 g, 65%) was prepared in the same manner as in Example 1, except that the compound J (3.55 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 546

Example 18: Preparation of compound 103

A compound 103 (2.93 g, 62%) was prepared in the same manner as in Example 1, except that the compound K (3.66 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 556

Example 19: Preparation of compound 110

A compound 110 (3.046 g, 59%) was prepared in the same manner as in Example 1, except that the compound L (5.07 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 690

Example 20: Preparation of compound 111

A compound 111 (4.04 g, 61%) was prepared in the same manner as in Example 1, except that the compound M (5.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 780

Example 21: Preparation of compound 119

A compound 119 (3.68 g, 62%) was prepared in the same manner as in Example 1, except that the compound F(3.6 g, 8.5 mmol) synthesized in Preparation Example 6 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound J (3.55 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 698

Example 22: Preparation of compound 120

A compound 120 (3.61 g, 60%) was prepared in the same manner as in Example 1, except that the compound F(3.6 g, 8.5 mmol) synthesized in Preparation Example 6 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound K (3.66 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 708

Example 23: Preparation of compound 121

A compound 121 (4.43 g, 62%) was prepared in the same manner as in Example 1, except that the compound F(3.6 g, 8.5 mmol) synthesized in Preparation Example 6 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound L (5.07 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 842

Example 24: Preparation of compound 122

A compound 122 (4.75 g, 60%) was prepared in the same manner as in Example 1, except that the compound F(3.6 g, 8.5 mmol) synthesized in Preparation Example 6 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound M (5.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 932

Example 25: Preparation of compound 123

A compound 123 (3.14 g, 62%) was prepared in the same manner as in Example 1, except that 3,9-dibromoperylene (3.5 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound J (3.55 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 596

Example 26: Preparation of compound 124

A compound 124 (2.63 g, 60%) was prepared in the same manner as in Example 1, except that 3,9-dibromoperylene (3.5 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound K (3.66 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 606

Example 27: Preparation of compound 125

A compound 125 (3.96 g, 63%) was prepared in the same manner as in Example 1, except that 3,9-dibromoperylene (3.5 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound L (5.07 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 740

Example 28: Preparation of compound 126

A compound 126 (4.23 g, 60%) was prepared in the same manner as in Example 1, except that 3,9-dibromoperylene (3.5 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound M (5.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in

Example 1. MS [M] = 830

Example 29: Preparation of compound 141

A compound 141 (3.94 g, 62%) was prepared in the same manner as in Example 1, except that the compound G(4.0 g, 8.5 mmol) synthesized in Preparation Example 7 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound J (3.55 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 748

Example 30: Preparation of compound 142

A compound 142 (3.87 g, 60%) was prepared in the same manner as in Example 1, except that the compound G(4.0 g, 8.5 mmol) synthesized in Preparation Example 7 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound K (3.66 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 758

Example 31: Preparation of compound 143

A compound 143 (4.78 g, 63%) was prepared in the same manner as in Example 1, except that the compound G(4.0 g, 8.5 mmol) synthesized in Preparation Example 7 was used instead of 1,6-dibromopyrene (3.0 g, 8.5

mmol), and the compound L (5.07 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 892

Example 32: Preparation of compound 144

A compound 144 (5.00 g, 60%) was prepared in the same manner as in Example 1, except that the compound G(4.0 g, 8.5 mmol) synthesized in Preparation Example 7 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound M (5.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 982

Example 33: Preparation of compound 145

A compound 145 (3.57 g, 63%) was prepared in the same manner as in Example 1, except that 9,10-dibromoanthracene (2.86 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound L (5.07 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 666

Example 34: Preparation of compound 146

A compound 146 (3.86 g, 60%) was prepared in the same manner as in Example 1, except that 9,10-dibromoanthracene (2.86 g, 8.5 mmol) was used

instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound M (5.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 756

Example 35: Preparation of compound 156

A compound 156 (4.39 g, 63%) was prepared in the same manner as in Example 1, except that the compound H(3.4 g, 8.5 mmol) synthesized in Preparation Example 8 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound L (5.07 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 818

Example 36: Preparation of compound 158

A compound 158 (4.86 g, 63%) was prepared in the same manner as in Example 1, except that the compound H(3.4 g, 8.5 mmol) synthesized in Preparation Example 8 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound M (5.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 908

Example 37: Preparation of compound 161

A compound 161 (3.01 g, 62%) was prepared in the same manner as in

Example 1, except that 9,10-dibromocrysene(3.28 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound J (3.55 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 572

Example 38: Preparation of compound 163

A compound 163 (2.97 g, 60%) was prepared in the same manner as in Example 1, except that 9,10-dibromocrysene(3.28 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound K (3.66 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 582

Example 39: Preparation of compound 172

A compound 172 (3.83 g, 63%) was prepared in the same manner as in Example 1, except that 9,10-dibromocrysene(3.28 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound L (5.07 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 716

Example 40: Preparation of compound 173

A compound 173 (4.11 g, 60%) was prepared in the same manner as in Example 1, except that 9,10-dibromocrysene(3.28 g, 8.5 mmol) was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound M (5.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 806

Example 41: Preparation of compound 174

A compound 174 (3.82 g, 62%) was prepared in the same manner as in Example 1, except that the compound I(3.4 g, 8.5 mmol) synthesized in Preparation Example 9 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound J (3.55 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 724

Example 42: Preparation of compound 175

A compound 175 (4.00 g, 60%) was prepared in the same manner as in Example 1, except that the compound I(3.4 g, 8.5 mmol) synthesized in Preparation Example 9 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound K (3.66 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 734

Example 43: Preparation of compound 176

A compound 176 (4.65 g, 63%) was prepared in the same manner as in Example 1, except that the compound I(3.4 g, 8.5 mmol) synthesized in Preparation Example 9 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound L (5.07 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 868

Example 44: Preparation of compound 177

A compound 177 (4.89 g, 60%) was prepared in the same manner as in Example 1, except that the compound I(3.4 g, 8.5 mmol) synthesized in Preparation Example 9 was used instead of 1,6-dibromopyrene (3.0 g, 8.5 mmol), and the compound M (5.94 g, 20.4 mmol) was used instead of the compound B (5.83 g, 20.4 mmol) in Example 1. MS [M] = 958

Experimental Example 1:

A glass substrate (Corning 7059 glass), on which a thin film of ITO (indium tin oxide) was coated to a thickness of 1000 Å, was immersed in distilled water having a detergent dissolved therein to wash the substrate with ultrasonic waves. The detergent as used herein was a product commercially available from Fisher Co. and the distilled water was one

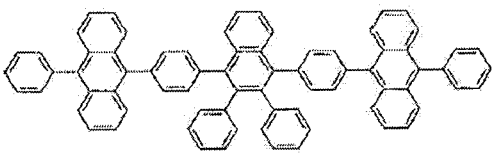
which had been twice filtered by using a filter commercially available from Millipore Co. ITO was washed for 30 minutes, and then washing with ultrasonic waves was repeated twice for 10 minutes by using distilled water. After the completion of washing with distilled water, washing with ultrasonic waves was carried out by using solvents such as isopropyl alcohol, acetone and methanol. The resultant product was dried, and then transported to a plasma washing machine. The substrate was washed for 5 minutes using an oxygen plasma, and then transported to a vacuum depositing machine.

On the ITO electrode, 3,6-bis-2-naphthylphenylamino-N-[4-(2-naphthylphenyl)aminophenyl]carbazole (800 Å), and 4,4'-bis[N-(1-naphthyl)-N-phenyl amino]biphenyl (NPB) (300 Å) were sequentially deposited to form a hole injecting layer and a hole transporting layer, respectively. The compound 1 (2 wt%) prepared in the Example 1 was deposited thereon with the following compound N (300 Å) to form a light emitting layer, and then 9,10-bis-2-naphthyl-2-[4-(N-phenylbenzoimidazoyl)phenyl]anthracene (300 Å) was coated by thermal vacuum deposition to form an electron transporting layer.

Lithium fluoride (LiF) and aluminum were sequentially deposited on the electron transporting layer to thicknesses of 12 Å and 2000 Å

respectively, to form a cathode, thereby obtaining an organic light emitting device. In the above process, the deposition rate of the organic material was maintained at 0.4 to 0.7 Å/sec and the deposition rate of lithium fluoride on the cathode was maintained at 0.3 Å/sec and the deposition rate of aluminum was maintained at 2 Å/sec. The degree of vacuum upon deposition was maintained at 2×10^{-7} to 5×10^{-8} torr.

When a forward electric field of 7.8 V was applied to the organic light emitting device as prepared above, blue light emission of 4.9 cd/A, which corresponds to x = 0.170, and y = 0.150 based on the 1931 CIE color coordinate, was observed at a current density of 100 mA/㎠.



[Compound N]

Experimental Example 2:

An organic light emitting device was prepared in the same manner as in Experimental Example 1, except that the compound 56 was used instead of the compound 1 in Experimental Example 1.

When a forward electric field of 7.9 V was applied to the organic light emitting device as prepared above, blue light emission of 4.7 cd/A, which

corresponds to x = 0.170, and y = 0.151 based on the 1931 CIE color coordinate, was observed at a current density of 100 mA/㎠.

Experimental Example 3:

An organic light emitting device was prepared in the same manner as in Experimental Example 1, except that the compound 86 was used instead of the compound 1 in Experimental Example 1.

When a forward electric field of 7.7 V was applied to the organic light emitting device as prepared above, blue light emission of 4.8 cd/A, which corresponds to x = 0.171, and y = 0.153 based on the 1931 CIE color coordinate, was observed at a current density of 100 mA/㎠.

Experimental Example 4:

An organic light emitting device was prepared in the same manner as in Experimental Example 1, except that the compound 111 was used instead of the compound 1 in Experimental Example 1.

When a forward electric field of 7.7 V was applied to the organic light emitting device as prepared above, blue light emission of 4.9 cd/A, which corresponds to x = 0.171, and y = 0.153 based on the 1931 CIE color coordinate, was observed at a current density of 100 mA/㎠.

Experimental Example 5:

An organic light emitting device was prepared in the same manner as in Experimental Example 1, except that the compound 156 was used instead of the compound 1 in Experimental Example 1.

When a forward electric field of 7.8 V was applied to the organic light emitting device as prepared above, blue light emission of 4.8 cd/A, which corresponds to x = 0.172, and y = 0.153 based on the 1931 CIE color coordinate, was observed at a current density of 100 mA/㎠.

Experimental Example 6:

An organic light emitting device was prepared in the same manner as in Experimental Example 1, except that the compound 173 was used instead of the compound 1 in Experimental Example 1.

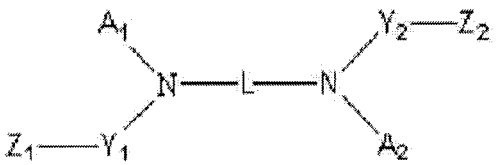
When a forward electric field of 7.9 V was applied to the organic light emitting device as prepared above, blue light emission of 4.9 cd/A, which corresponds to x = 0.173, and y = 0.152 based on the 1931 CIE color coordinate, was observed at a current density of 100 mA/㎠.

【CLAIMS】

【Claim 1】

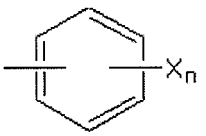
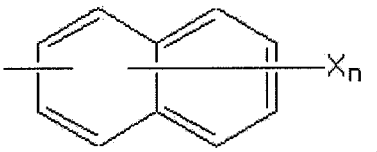
A diamine derivative represented by the following formula 1:

[Formula 1]



wherein

L is a C_6 to C_{30} aryl group,

A_1 and A_2 are the same or different from each other, and are each  or ,

wherein n is an integer from 1 to 5, and

at least one of Xs is selected from the group consisting of -GeRR'R", -SiRR'R" and deuterium (D), and the others are each independently selected from the group consisting of hydrogen, CN, NO_2, a C_6 to C_{20} arylamine group, a C_6 to C_{20} arylthiophene group, a C_3 to C_{20} cycloalkyl group, -OR, -SR, -SeR, -TeR, -BRR', -AlRR', -SnRR'R", a C_6 to C_{20} aryl group, a C_8 to C_{20} arylalkenyl group, and a C_4 to C_{20} alkylene group which formed a fused ring with the phenyl group or the naphthyl group,

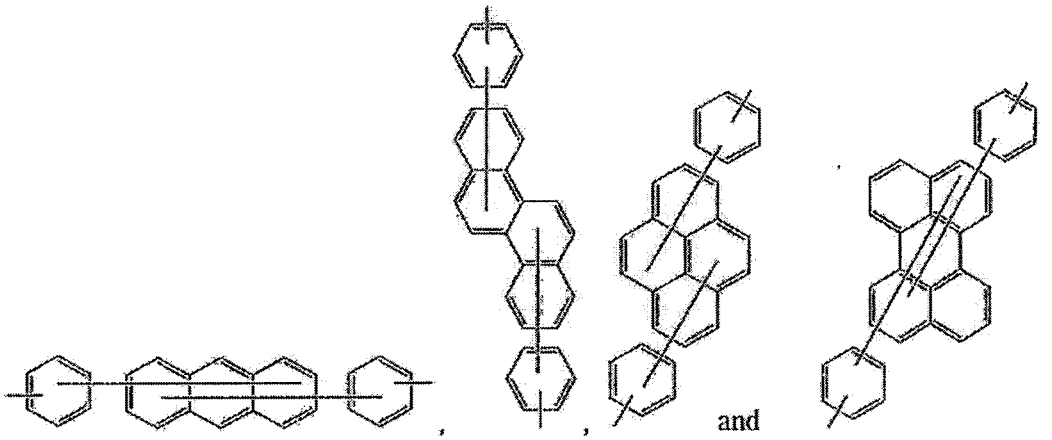
Y_1 and Y_2 are the same or different from each other, and are each a C_6 to C_{20} arylene group or a divalent C_5 to C_{20} heterocyclic group,

Z_1 and Z_2 are the same or different from each other, and are each hydrogen, halogen, deuterium, CN, NO_2, a C_1 to C_{20} alkyl group, a C_1 to C_{20} alkoxy group, a C_6 to C_{20} aryl group, a C_6 to C_{20} arylamine group, a C_6 to C_{20} arylthiophene group, a C_3 to C_{20} cycloalkyl group, -OR, -SR, -SeR, -TeR, -BRR', -AlRR', -SiRR'R", -GeRR'R", -SnRR'R", a C_6 to C_{20} aryl group, a C_8 to C_{20} arylalkenyl group, and a C_4 to C_{20} alkylene group which formed a fused ring with the phenyl group or the naphthyl group, and

R, R' and R" are the same or different from each other, and are each hydrogen, a C_1 to C_{20} alkyl group, a C_3 to C_{20} cycloalkyl group, a C_6 to C_{20} aryl group, or a C_5 to C_{20} heterocyclic group.

【Claim 2】

The diamine derivative according to claim 1, wherein L is selected from the group consisting of anthracenyl, phenanthrenyl, pyrenyl, perylenyl, crycenyl,

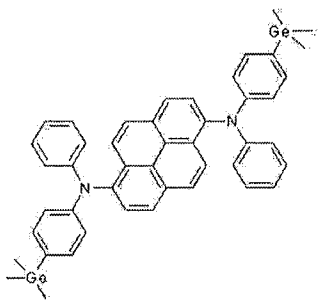

and

【Claim 3】

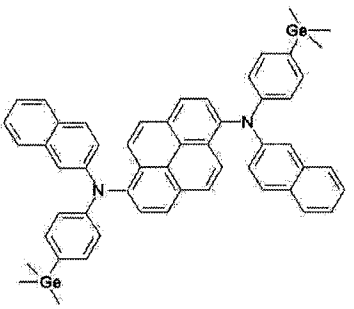
The diamine derivative according to claim 1, wherein Y_1 and Y_2 are selected from the group consisting of phenyl, biphenyl, naphthalenyl, tetralinyl, anthracenyl, stilbenyl, phenanthrenyl, pyrenyl, perylenyl, crycenyl and carbazolyl.

【Claim 4】

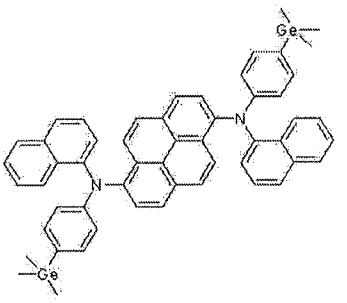
The diamine derivative according to claim 1, wherein the compound of the formula 1 is selected from the group consisting of the following compounds:



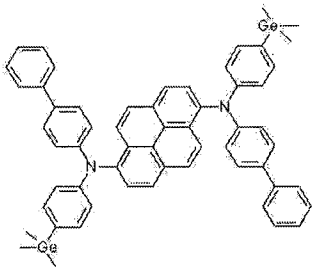
[Compound 1]



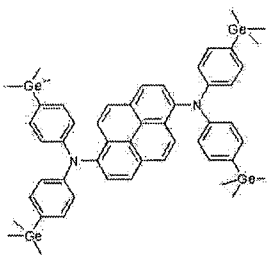
[Compound 2]



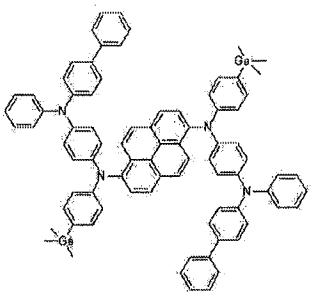
[Compound 3]



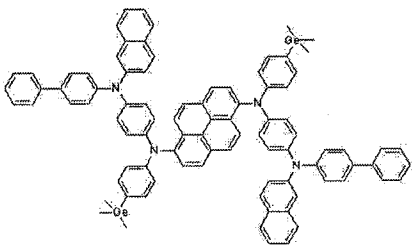
[Compound 4]



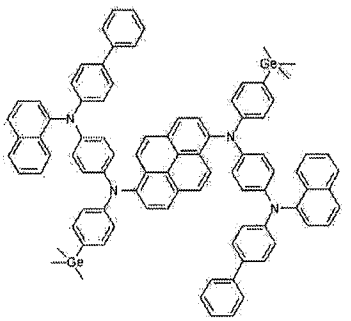
[Compound 5]



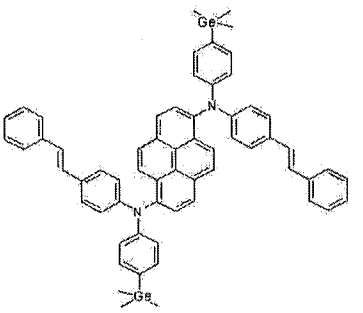
[Compound 6]



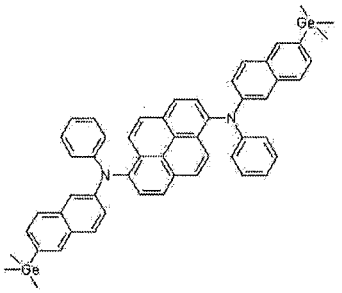
[Compound 7]



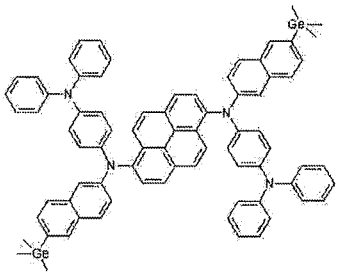
[Compound 8]



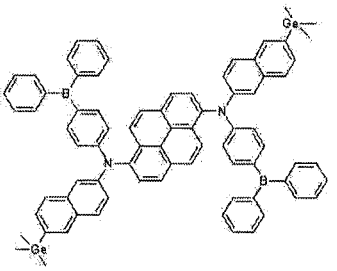
[Compound 9]



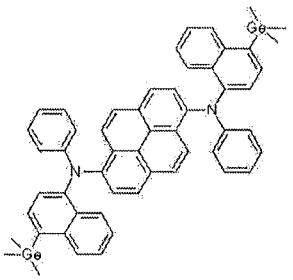
[Compound 10]



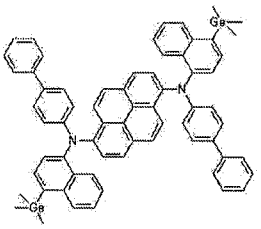
[Compound 11]



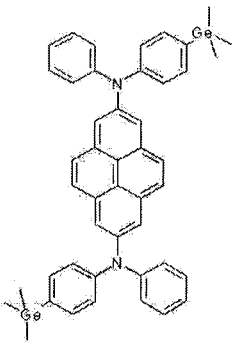
[Compound 12]



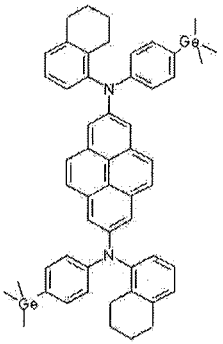
[Compound 13]



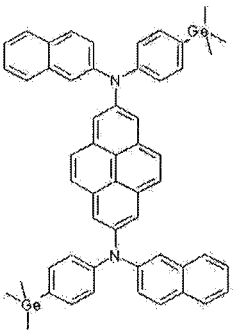
[Compound 14]



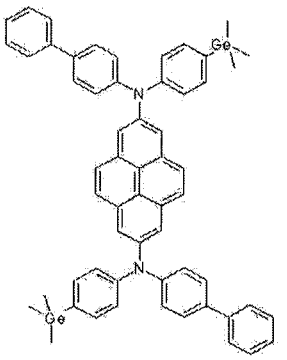
[Compound 15]



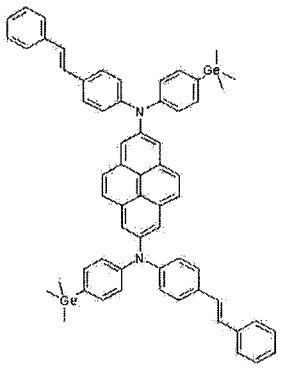
[Compound 16]



[Compound 17]



[Compound 18]



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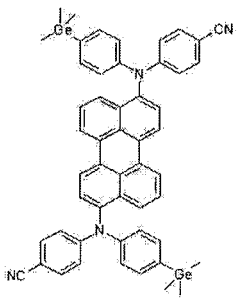
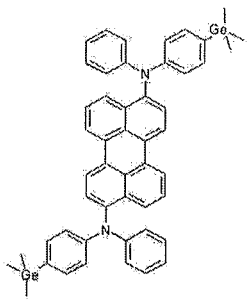
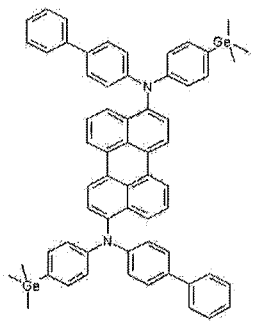


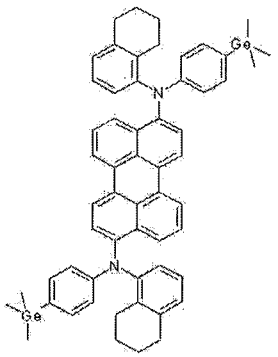
[Compound 20]



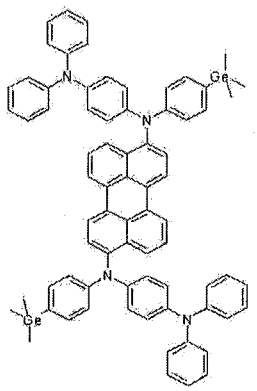
[Compound 21]



[Compound 22]



[Compound 23]



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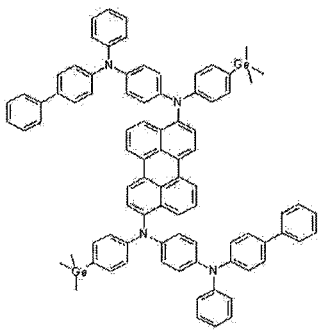

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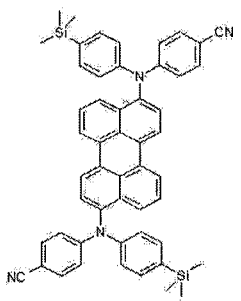

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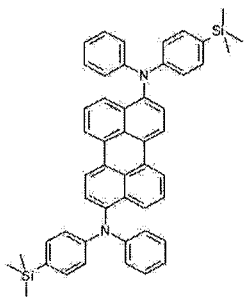

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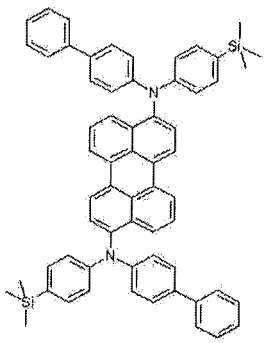

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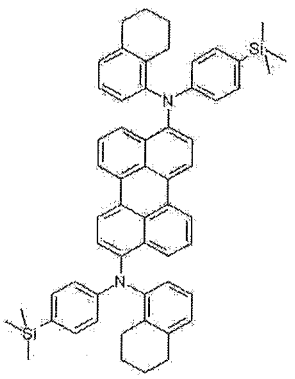

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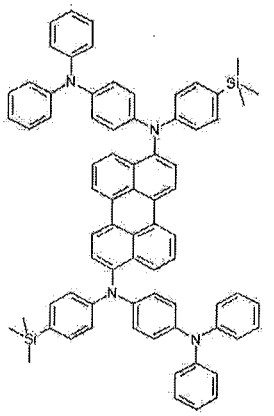

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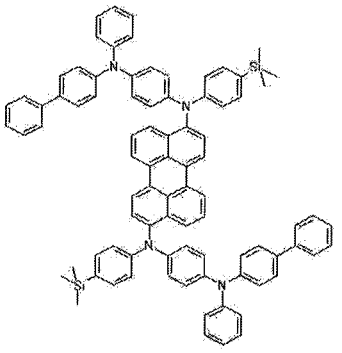

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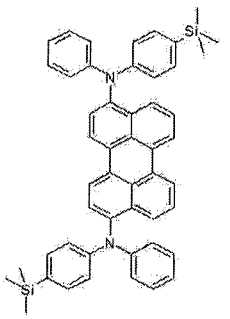

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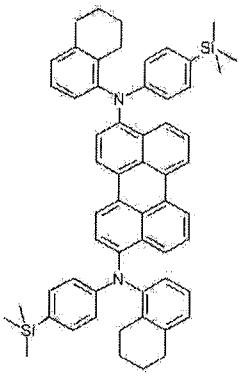

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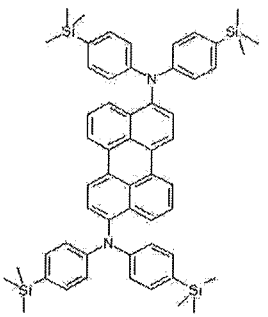

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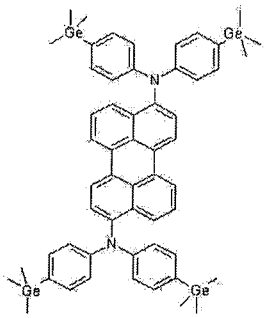

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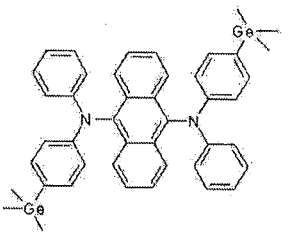

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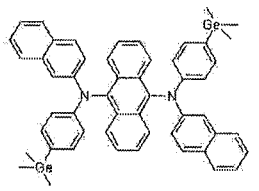

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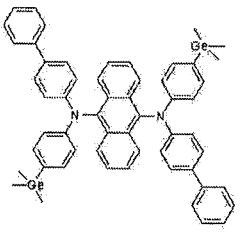

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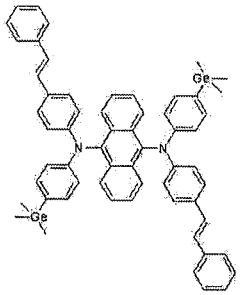

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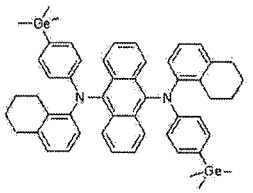

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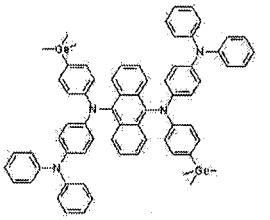

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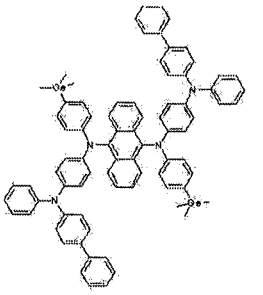

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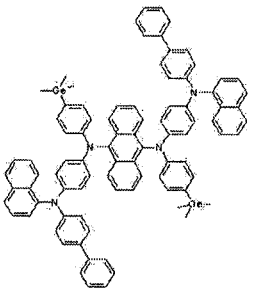

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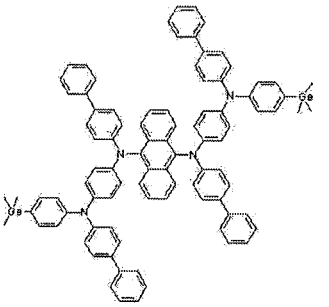

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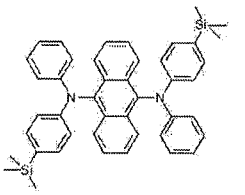

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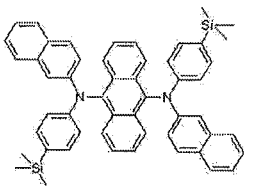

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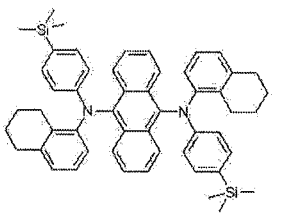

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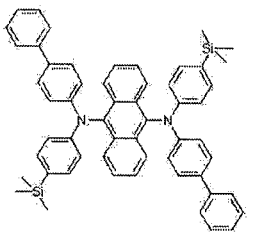

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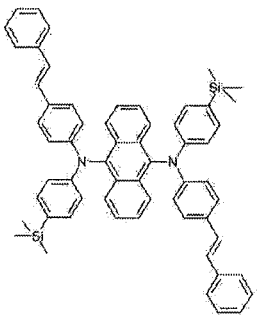

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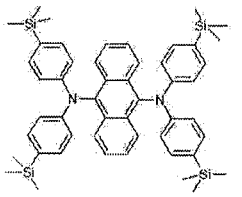

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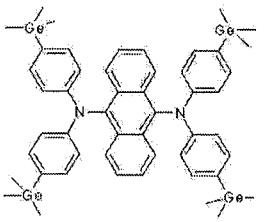

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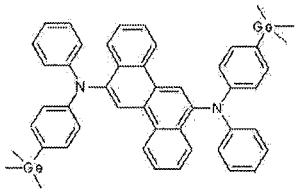

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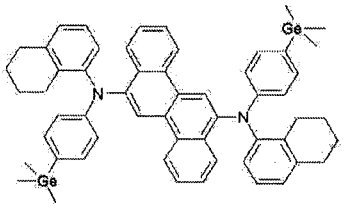

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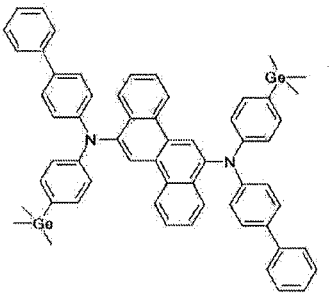

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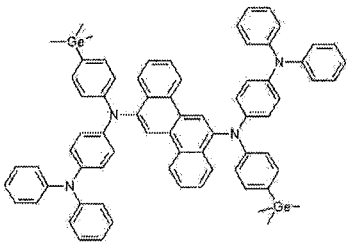

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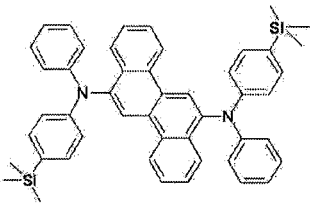

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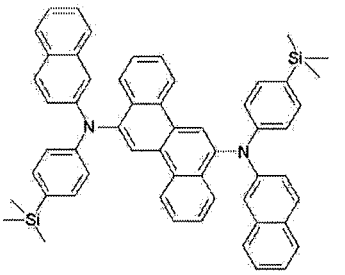

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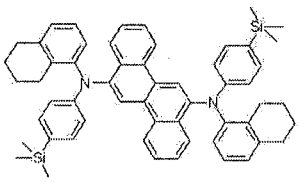

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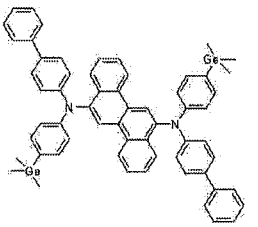

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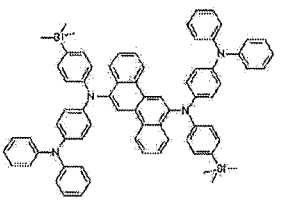

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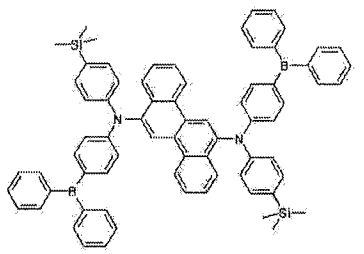

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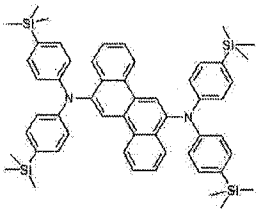

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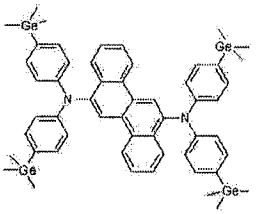

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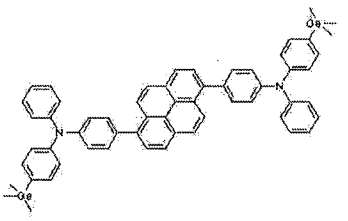

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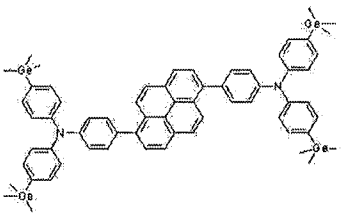

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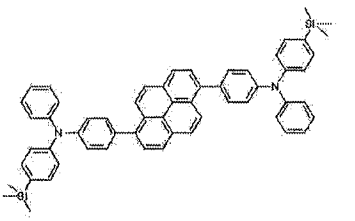

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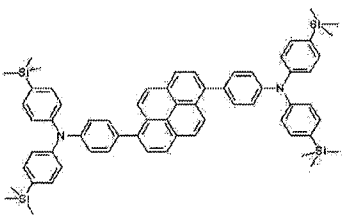

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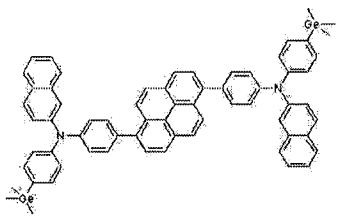

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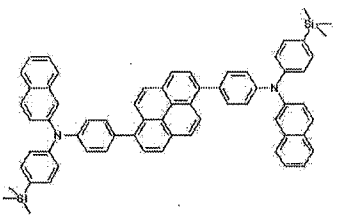

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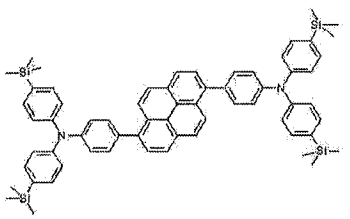

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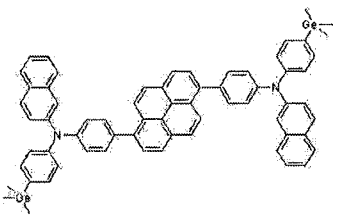

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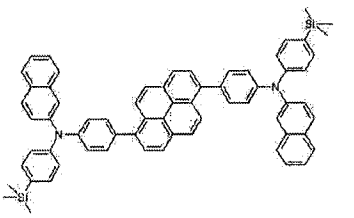

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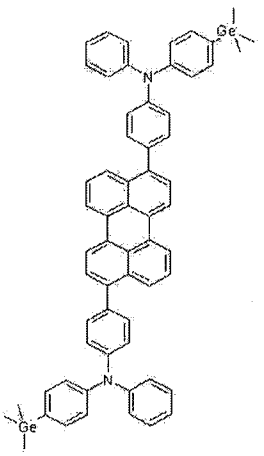

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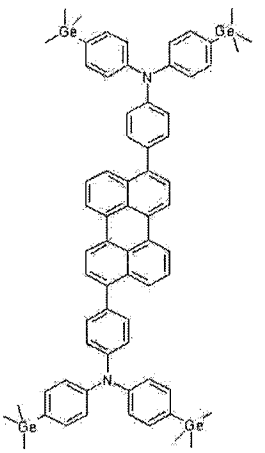

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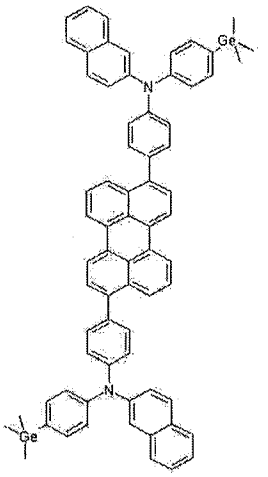

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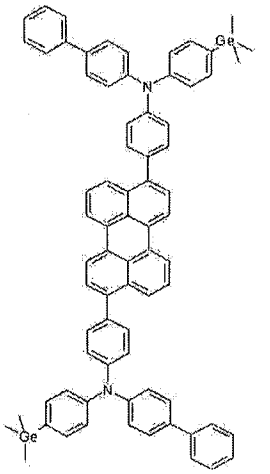

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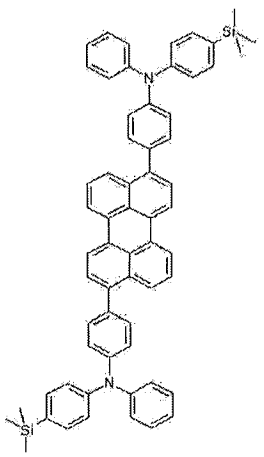

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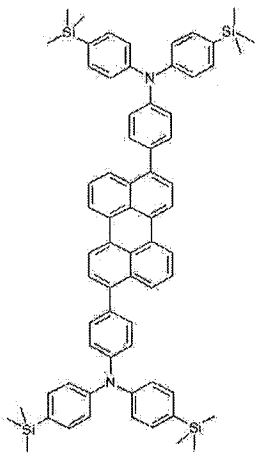

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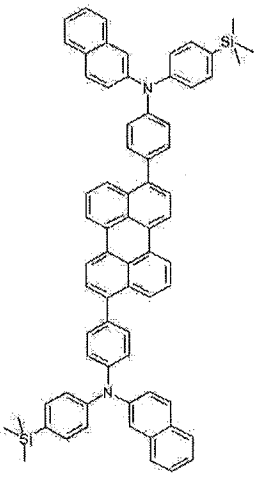

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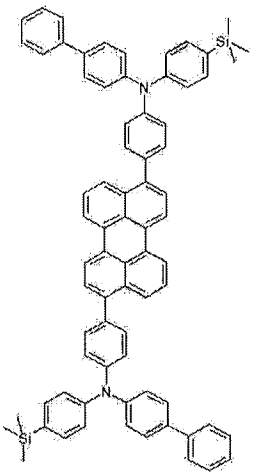

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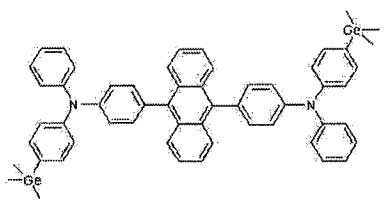

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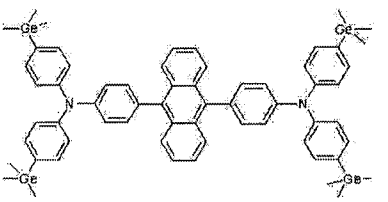
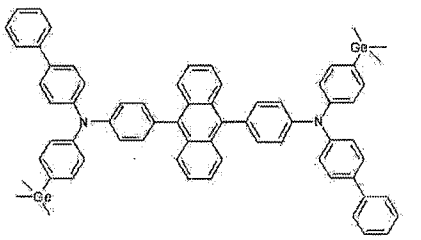


[Compound 82]



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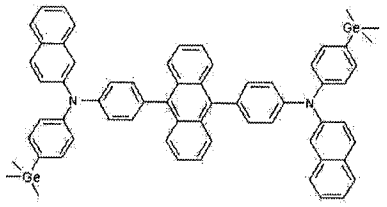

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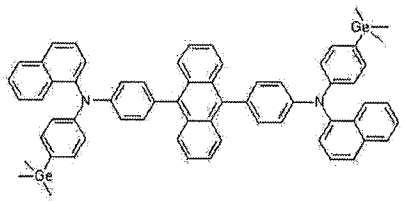

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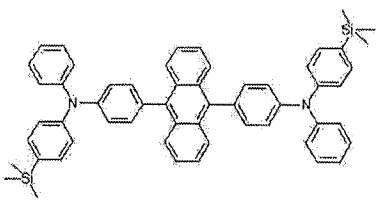

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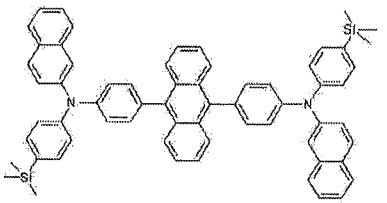

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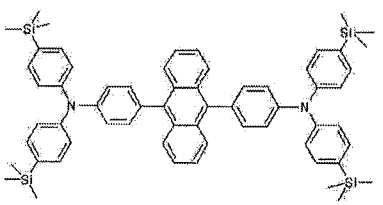

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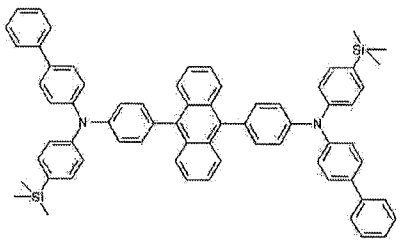

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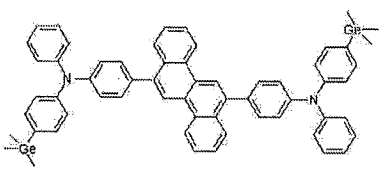

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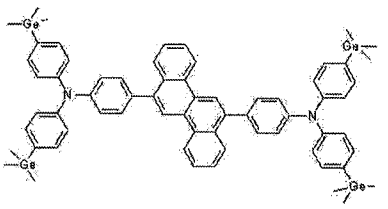

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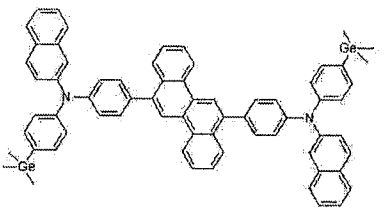

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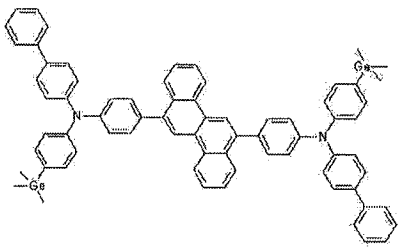

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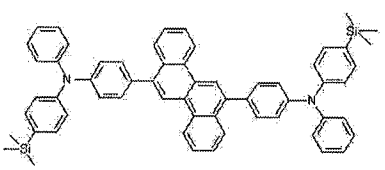

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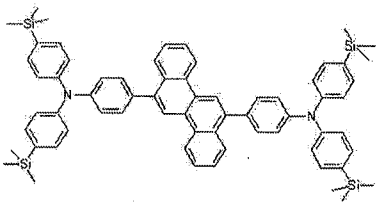

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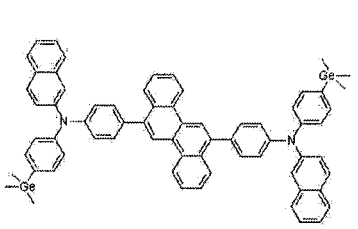

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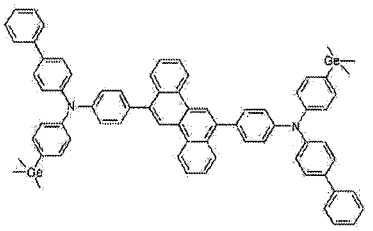

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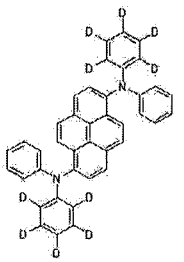

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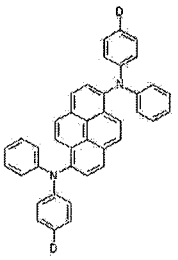

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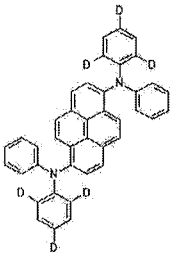

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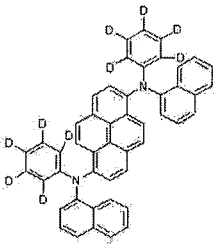

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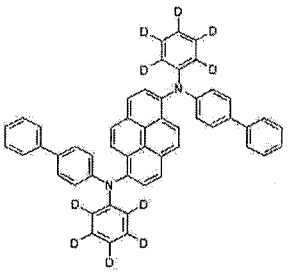

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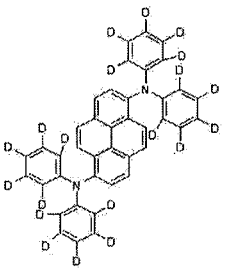

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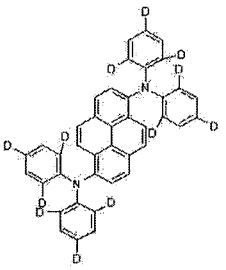

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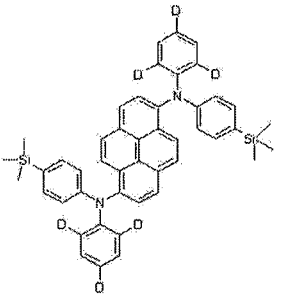

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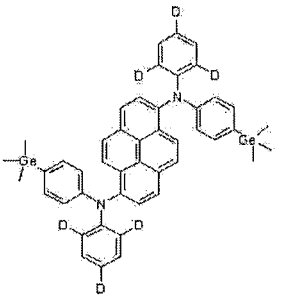

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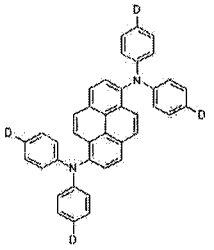

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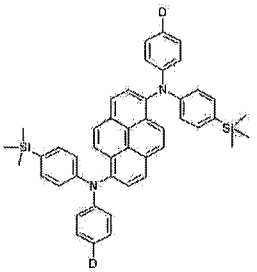

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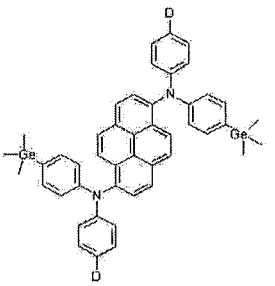

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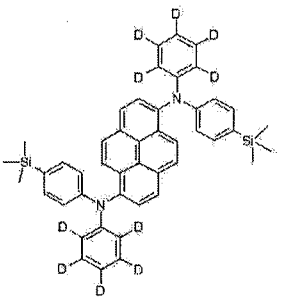

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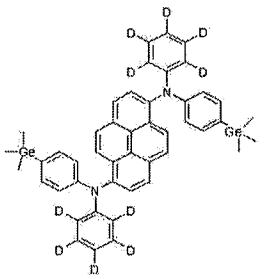

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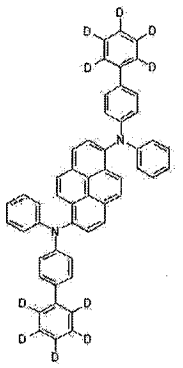

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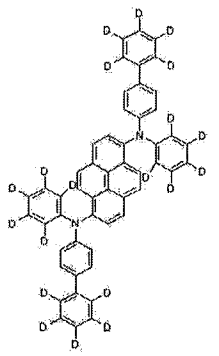

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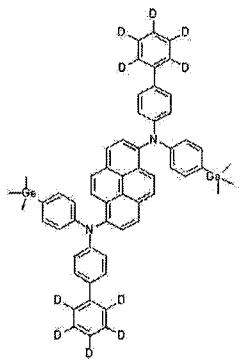

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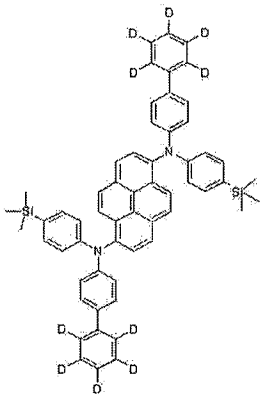

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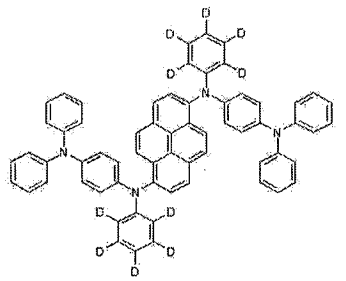

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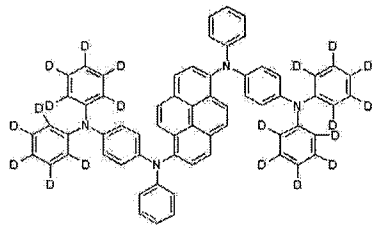

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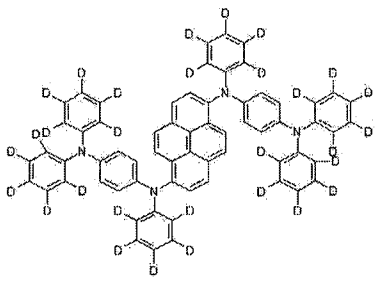

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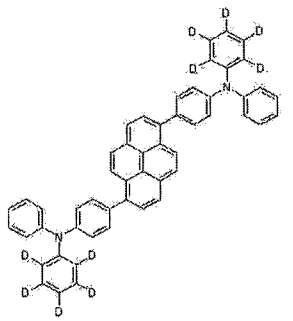

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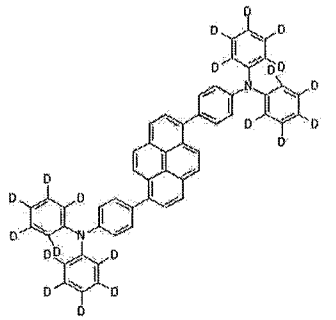

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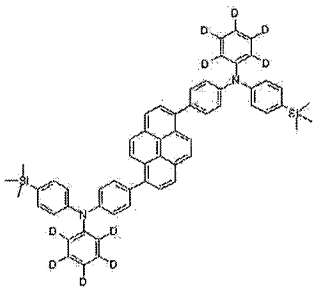

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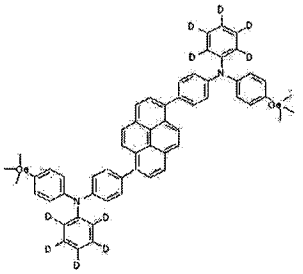

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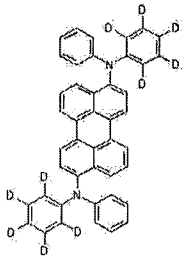

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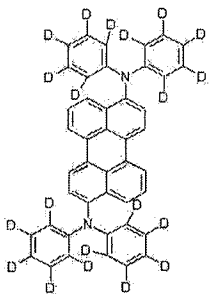

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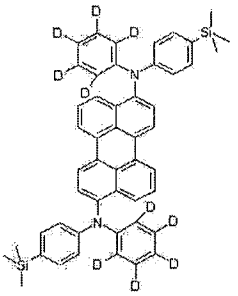

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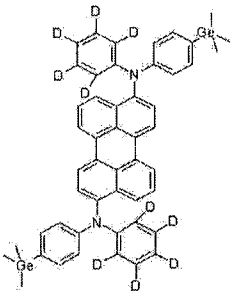

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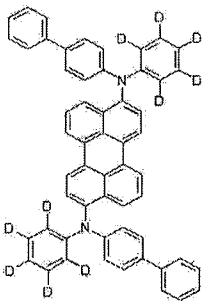

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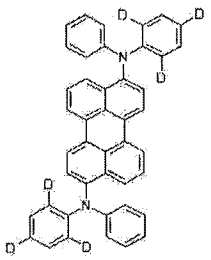

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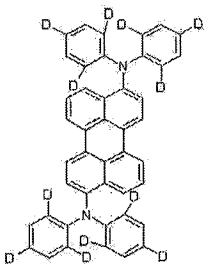

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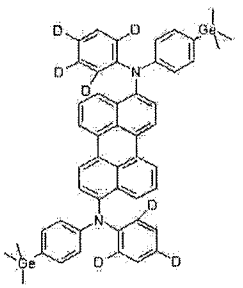

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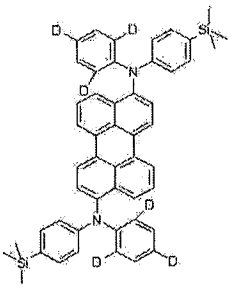

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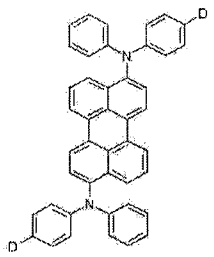

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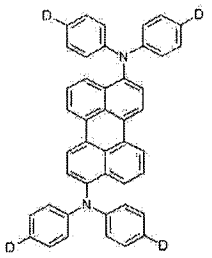

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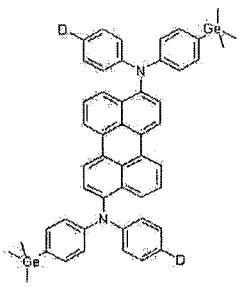

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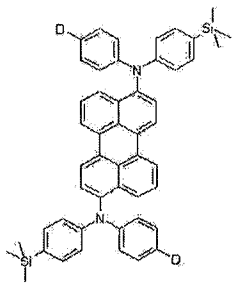

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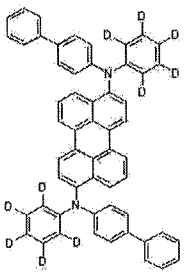

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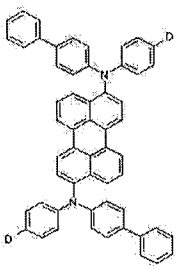

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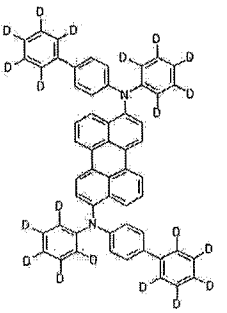

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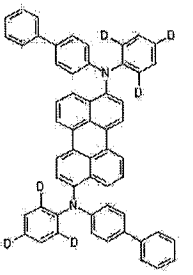

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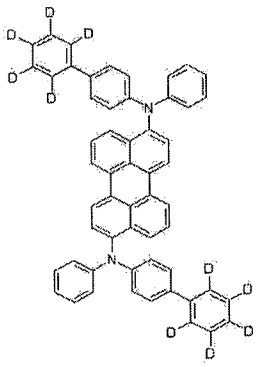
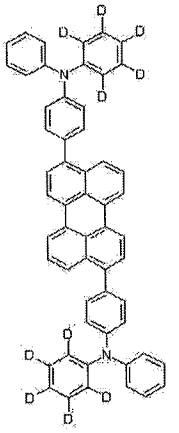


[Compound 140]



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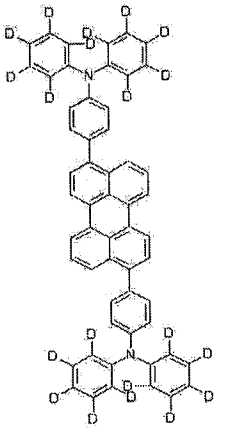

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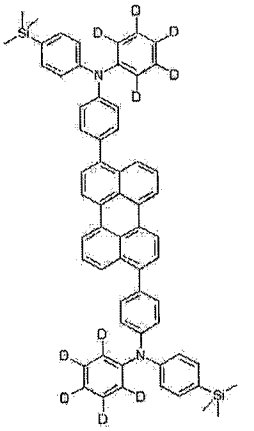

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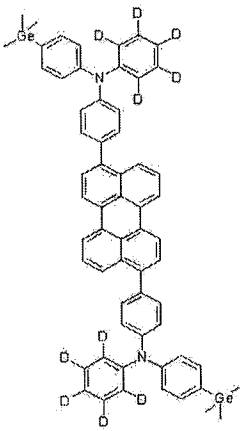

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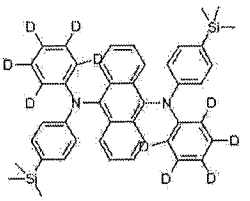

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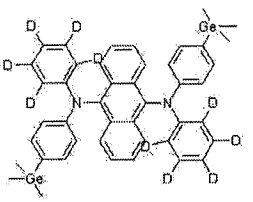

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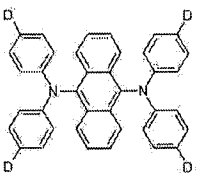

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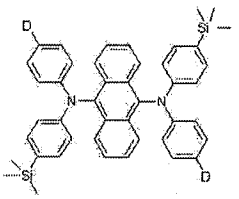

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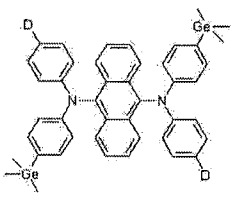

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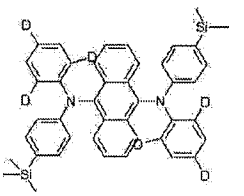

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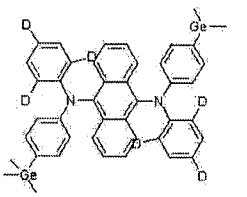

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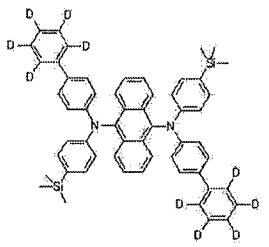

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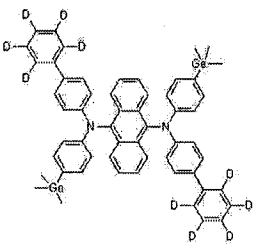

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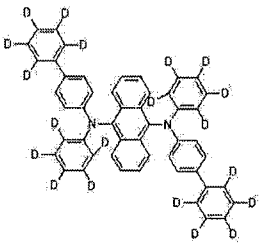

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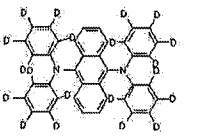

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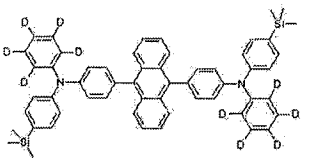

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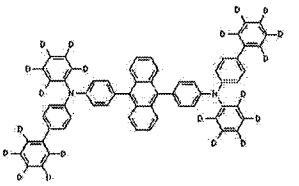

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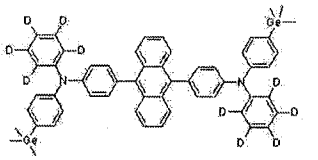

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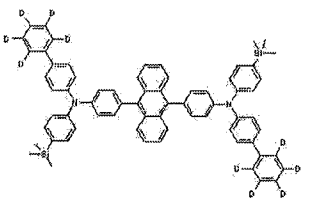

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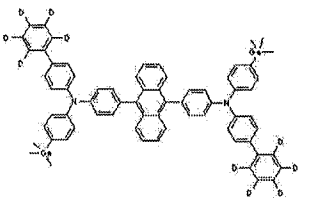

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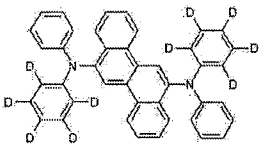

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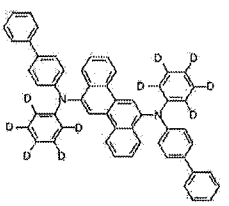

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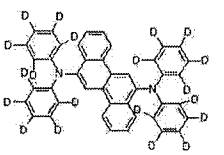

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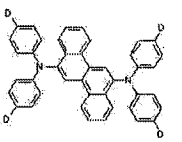

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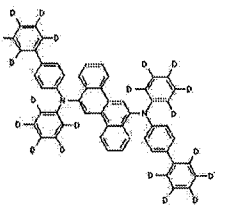

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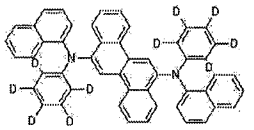

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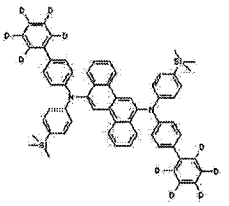

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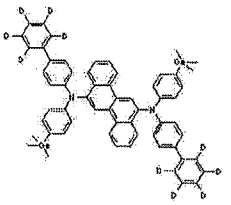

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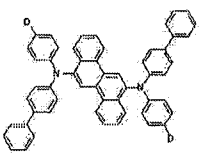

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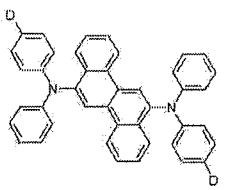

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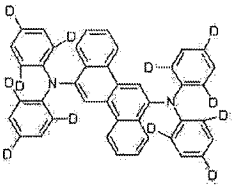

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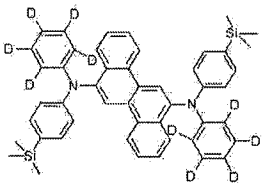

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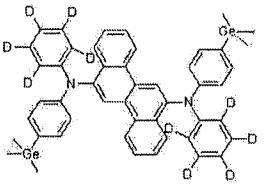

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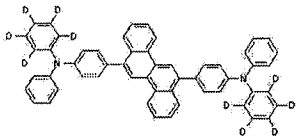

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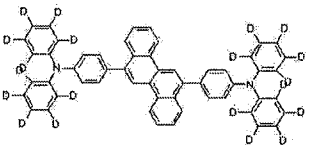

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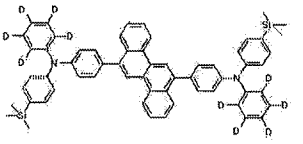

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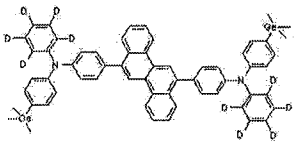

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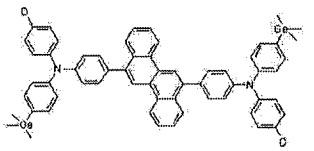

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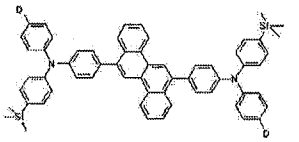

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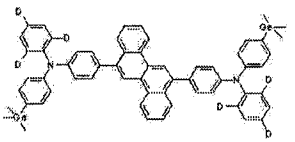

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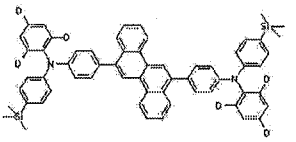

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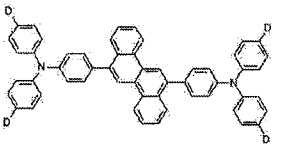

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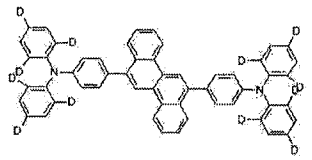

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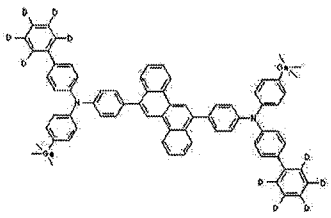

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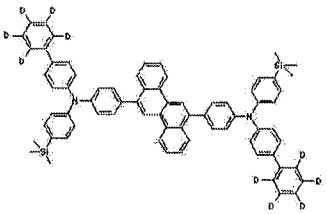

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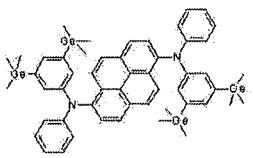

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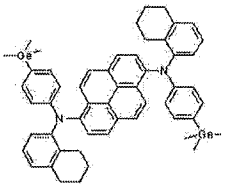

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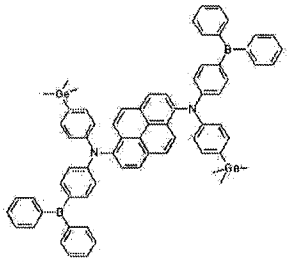

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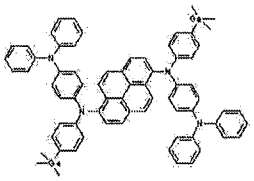

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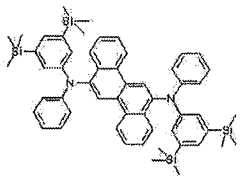

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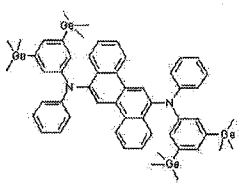

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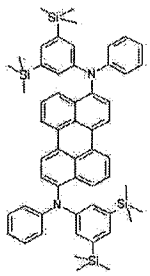

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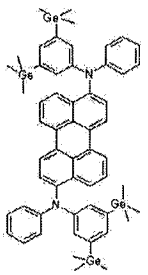

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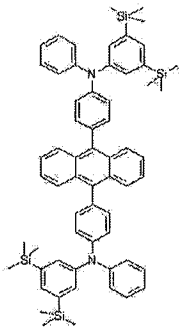

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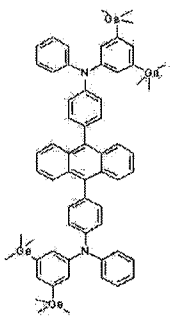

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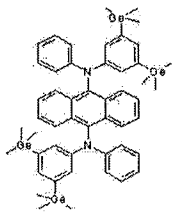

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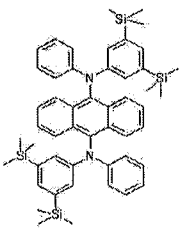


[Compound 197]

【Claim 5】

A method for preparing the diamine derivative of claim 1, comprising the step of reacting a dibromoaryl compound with an arylamine compound in the presence of a palladium catalyst.

【Claim 6】

The method for preparing the diamine derivative according to claim 5, wherein the arylamine compound contains at least one selected from the group consisting of a germanium group, a silyl group, and deuterium.

【Claim 7】

An organic electronic device comprising a first electrode, a second electrode, and at least one organic material layer interposed between the first electrode and the second electrode, wherein at least one layer of the organic material layers comprises the compound according to any one of claims 1 to 4.

【Claim 8】

The organic electronic device according to claim 7, wherein the organic material layer comprises at least one of a hole injecting layer, a hole transporting layer, and a hole injecting and hole transporting layer, and one of the layers comprise the compound according to any one of claims 1 to 4.

【Claim 9】

The organic electronic device according to claim 7, wherein the organic material layer comprises a light emitting layer, and the light emitting layer comprises the compound according to any one of claims 1 to 4.

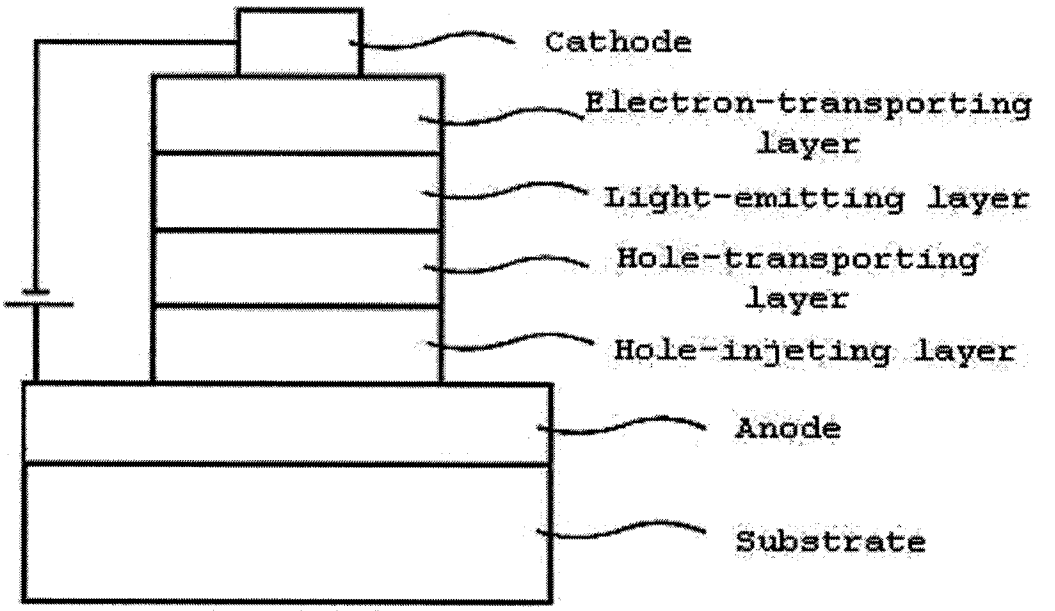
【Claim 10】

The organic electronic device according to claim 7, wherein the organic material layer comprises an electron transporting layer, and the electron transporting layer comprises the compound according to any one of claims 1 to 4.

【Claim 11】

The organic electronic device according to claim 7, wherein the organic electronic device is selected from the group consisting of an organic light emitting device, an organic photovoltaic cell, an organic photoconductor (OPC) and an organic transistor.

[Fig. 1]


Cathode
Electron-transporting layer
Light-emitting layer
Hole-transporting layer
Hole-injeting layer
Anode
Substrate

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2007/001448

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 8-10
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required addtional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2007/001448

A. CLASSIFICATION OF SUBJECT MATTER

C07C 211/54(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8: C07C, C09K, H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS, PAJ, Registry(STN), CA(STN)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	KR1020060115951 A(DOOSAN CORPORATION) 13 November 2006 pages 3-5, claims 1, 7, 8	1-3, 5-11
A	JP2004253298 A(Konica Minolta Holdings INC.) 9 September 2004 pages 176, 242-245, 352-366, 516-532	1-11
A	JP2003238534 A(Idemitsu Kosan Co. Ltd.) 27 August 2003 see whole document	1-11
A	JP2003213002 A(Mitsubishi Chemical Corp.) 30 July 2003 see whole document	1-11
A	JP2002184575 A(TDK Corporation) 28 June 2002 see whole document	1-11

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 JUNE 2007 (21.06.2007)	**21 JUNE 2007 (21.06.2007)**

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Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2007/001448

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR20061159951A	13.11.2006	WO2006121237A1	16.11.2006
JP2004253298A	09.09.2004	NONE	
JP2003238534A	27.08.2003	NONE	
JP2003213002A	30.07.2003	NONE	
JP2002184575A	28.06.2002	NONE	