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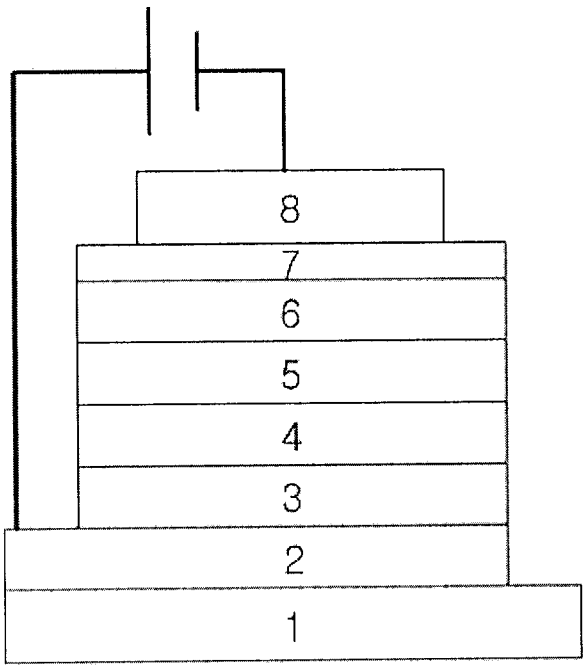
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[Continued on next page]

(54) Title: ORGANIC LUMINESCENT MATERIAL AND ORGANIC LIGHT EMITTING DEVICE USING THE SAME

【Figure 1】



(57) Abstract: The present invention relates to novel organic electroluminescent materials and organic light emitting devices comprising the same. Since the organic electroluminescent materials according to the invention have good luminous efficiency and life property as an electroluminescent material, OLED's having very good operation lifetime can be produced.

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Published:
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【DESCRIPTION】

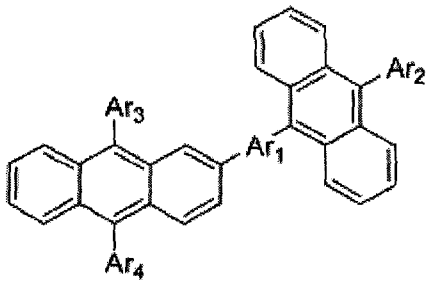
【Invention Title】

ORGANIC LUMINESCENT MATERIAL AND ORGANIC LIGHT EMITTING DEVICE USING THE SAME

【Technical Field】

The present invention relates to organic electroluminescent materials having the structure represented by Chemical Formula (1) and organic light emitting devices comprising the same.

[Chemical Formula 1]



wherein, Ar_1 is a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused, provided that Ar_1 is not anthracenyl;

Ar_2 through Ar_4 independently represent a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused; and

the aromatic ring or the fused polycyclic aromatic ring with two or more aromatic rings having been fused of Ar_1

through Ar_4 may be further substituted by one or more substituent(s) selected from (C_1-C_{20})alkyl, (C_1-C_{20})alkoxy, halogen, tri(C_1-C_{20})alkylsilyl, tri(C_6-C_{20})arylsilyl, a (C_5-C_{20}) aromatic ring and a fused polycyclic aromatic ring with two or more aromatic rings having been fused.

【Background Art】

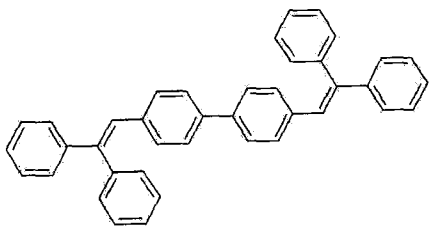
The most important factor to develop an organic electroluminescent (EL) device having high efficiency and long lifetime is development of an electroluminescent material having high performances.

In case of blue light, it becomes advantageous from the aspect of the luminous efficiency, if the light emitting wavelength is shifted a little toward longer wavelength. However, it is not easy to apply the material to a display of high quality because of unsatisfactory pure blue color. In addition, there are problems of color purity, efficiency and thermal stability.

For blue materials, a number of materials have been developed and commercialized since the development of DPVBi (Chemical Formula a) was disclosed in European Patent Laid-Open Publication No. 1063869 by Idemitsu-Kosan Company Limited. The distyryl compound system by Idemitsu-Kosan, which has been known to have the highest efficiency up to now, has 6 lm/W of

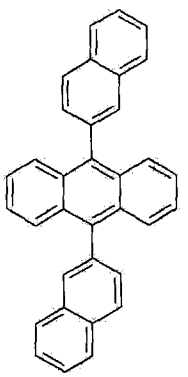
power efficiency and beneficial device lifetime of more than 30,000 hr. However, when it is applied to a full-colored display, owing to the reduction of color purity over operation time, the lifetime is merely several thousand hours.

[Compound a]



In the meanwhile, the dinaphthylanthracene compound (Compound b) disclosed in US Patent No. 6,465,115 by Kodak is claimed as HTL material, which has been also utilized as a blue electroluminescent compound. However, the compound still has problems to be solved in view of luminous efficiency and color purity.

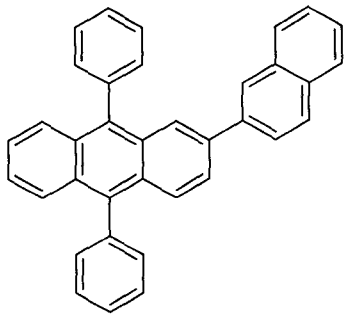
[Compound b]



Recently, the electroluminescent derivatives (Compound c) within the similar scope of Compound (b) have been disclosed

in WO2006/25700 by LG Chem. However, those Compounds (c) also have limitations in luminous efficiency and color purity.

[Compound c]

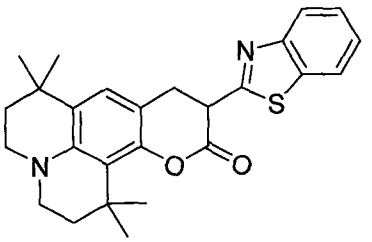


In the meanwhile, as a green fluorescent material, a system wherein a coumarine derivative (Compound d, C545T), a quinacridone derivative (Compound e), DPT (Compound f) or the like is doped as a dopant to Alq (a host), in a concentration from several % to not more than 20 % has been developed and widely used. However, the conventional electroluminescent materials suffer from significant problem in view of lifetime with noticeable reduction of initial efficiency, though they show good performance in view of initial luminous efficiency at the level of practical use. Thus, the materials have limitations to be employed for a high performance panel of larger screen.

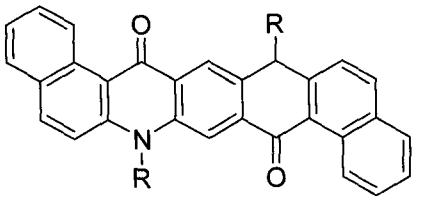
It has been reported that this is resulted from short life of cationic species of Alq which was used as a host. In order to overcome the problem, development of a host with amphoteric property, which simultaneously has stability to

cationic species and anionic species, is very urgent.

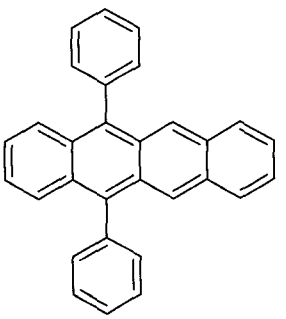
[Compound d]



[Compound e]



[Compound f]



【Disclosure】

【Technical Problem】

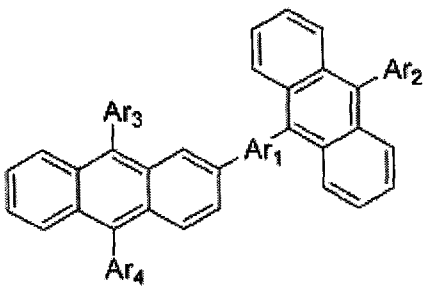
The object of the invention is to overcome the problems as described above, and to provide electroluminescent compounds having noticeably improved properties of the host which serves as a solvent or an energy carrier in the electroluminescent material, as compared to those of the

conventional materials. In addition, the object of the invention is to provide a blue or green electroluminescent material with improved luminous efficiency and lifetime of the device, and an organic light emitting device comprising the same.

【Technical Solution】

The present invention relates to organic electroluminescent compounds represented by Chemical Formula 1:

[Chemical Formula 1]



wherein, Ar_1 is a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused, provided that Ar_1 is not anthracenyl;

Ar_2 through Ar_4 independently represent a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused; and

the aromatic ring or the fused polycyclic aromatic ring with two or more aromatic rings having been fused of Ar_1

through Ar_4 may be further substituted by one or more substituent(s) selected from (C_1-C_{20})alkyl, (C_1-C_{20})alkoxy, halogen, tri(C_1-C_{20})alkylsilyl, tri(C_6-C_{20})arylsilyl, a (C_5-C_{20}) aromatic ring and a fused polycyclic aromatic ring with two or more aromatic rings having been fused.

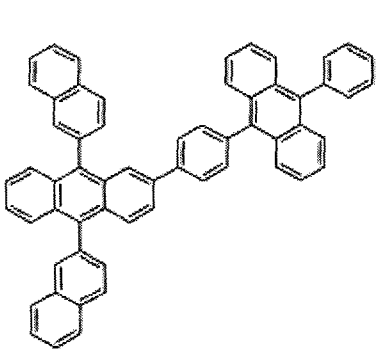
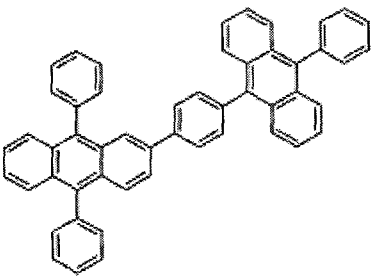
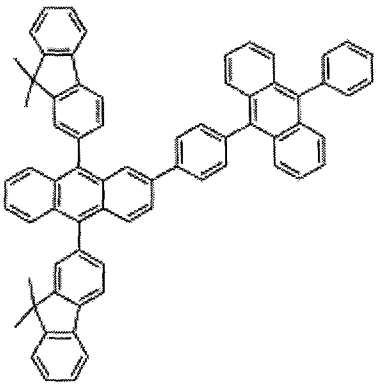
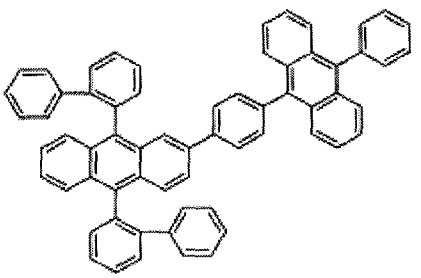
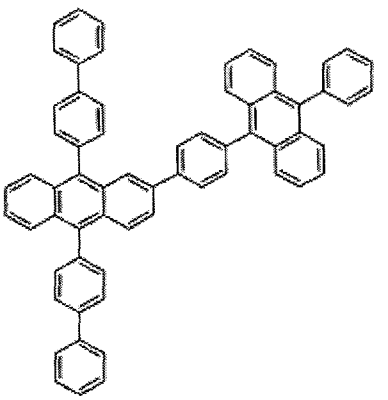
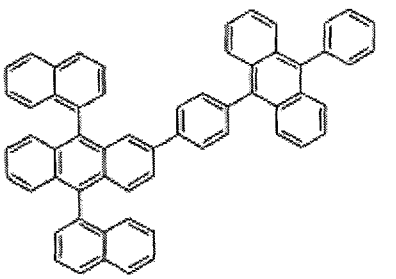
Since the organic electrolumescent material according to the invention has good luminous efficiency and life property as an electroluminescent material, OLED's having very good operation lifetime can be produced.

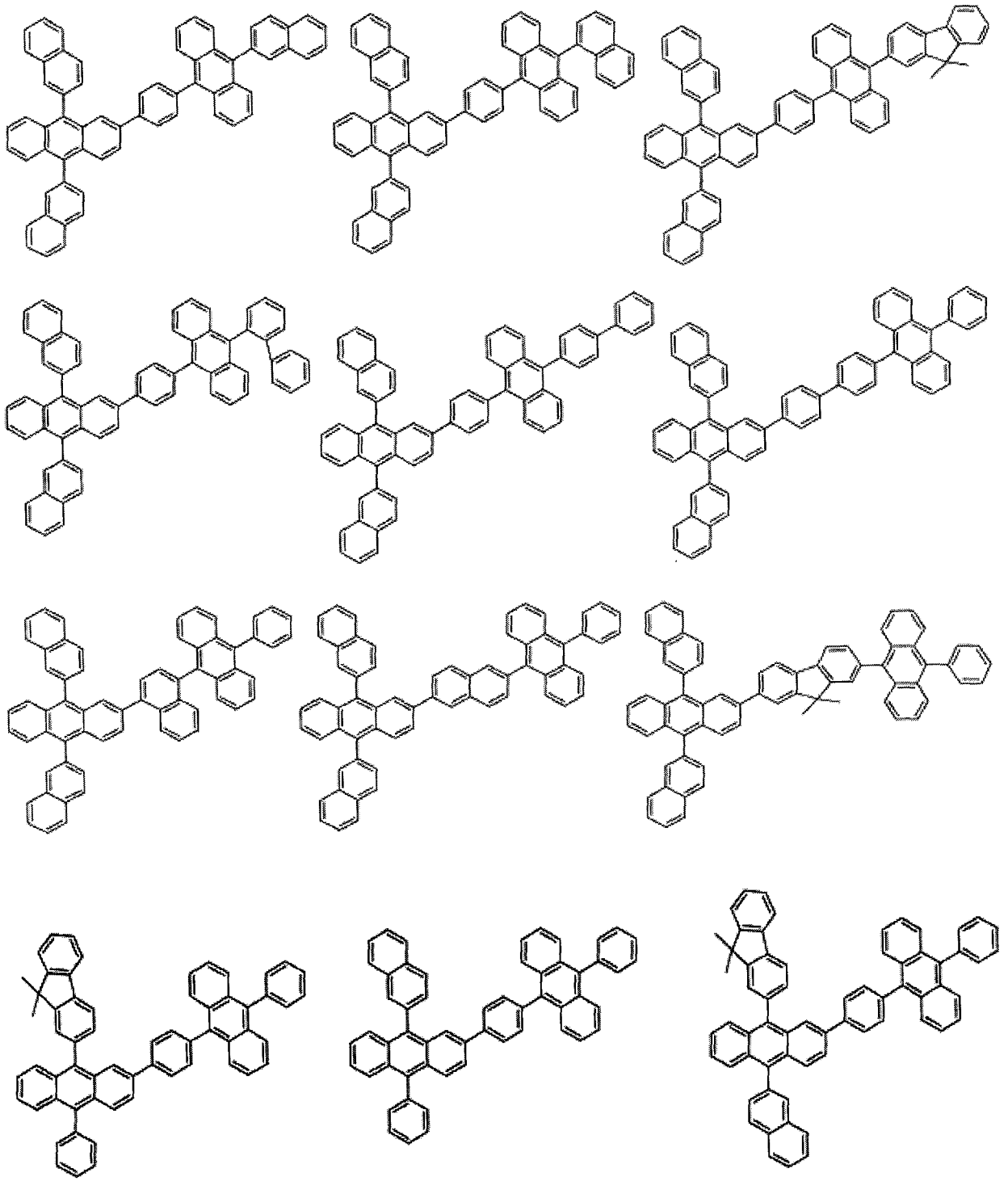
The electroluminescent materials mentioned in the present specification include, in a broad sense, any material employed as the organic substance in an organic light emitting device comprised of a first electrode, a second electrode and an organic substance interposed between the first and the second electrode; while they imply, in a narrow sense, what is applied to an electroluminescent host which serves as an electroluminescent medium in an electroluminescent layer.

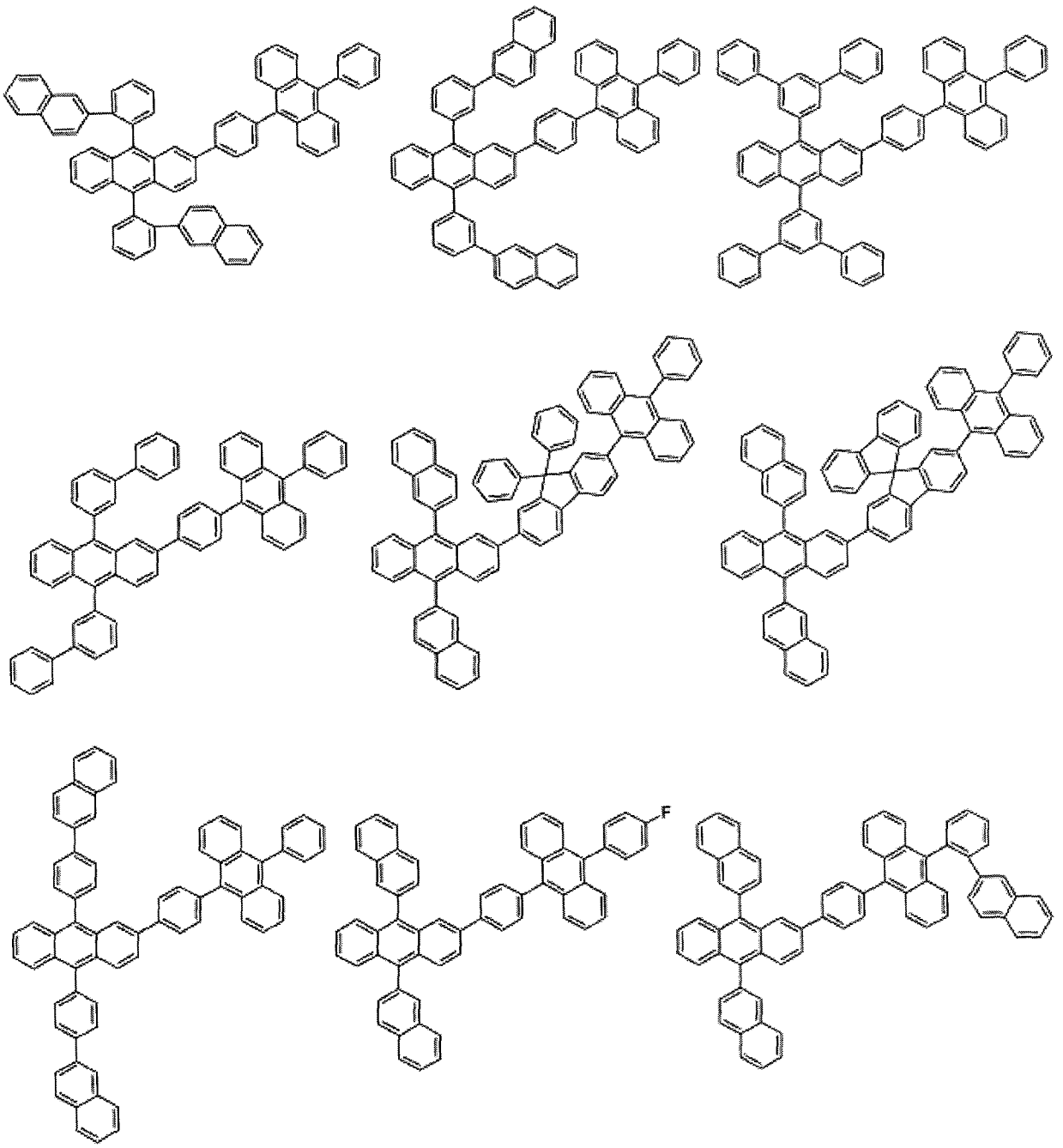
In the compound represented by Chemical Formula (1) according to the present invention, Ar_1 represents phenylene, biphenylene, naphthylene, fluorenylene, spirobifluorenylene, phenanthrylene, triphenylenylene, pyrenylene, chrysenylene or naphthacenylene, and Ar_1 may be further substituted by (C_1-C_{20})alkyl or phenyl; Ar_2 through Ar_4 independently represent phenyl, naphthyl, anthryl, biphenyl, fluorenyl, phenanthryl,

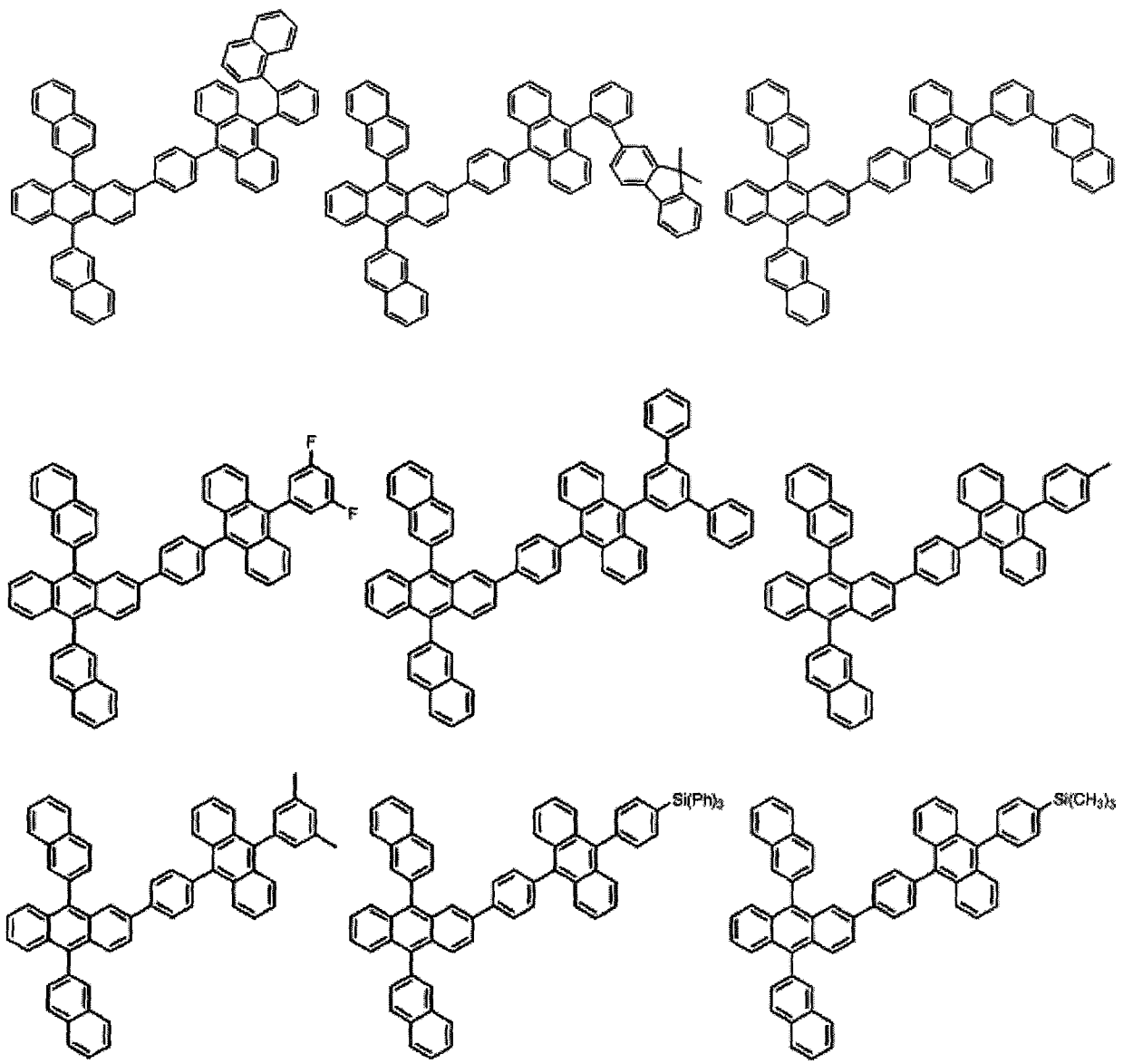
triphenylenyl, pyrenyl, chrysenyl or naphthacenyl, and Ar_2 through Ar_4 may be further substituted by one or more substitutent(s) selected from (C_1-C_{20})alkyl, (C_1-C_{20})alkoxy, halogen, tri(C_1-C_{20})alkylsilyl, tri(C_6-C_{20})arylsilyl, phenyl, naphthyl, anthryl, fluorenyl, 9,9-dimethyl-fluoren-2-yl and 9,9-diphenyl-fluoren-2-yl.

The organic electroluminescent material represented by Chemical Formula (1) according to the present invention may be specifically exemplified by the following compounds, without being restricted thereto.

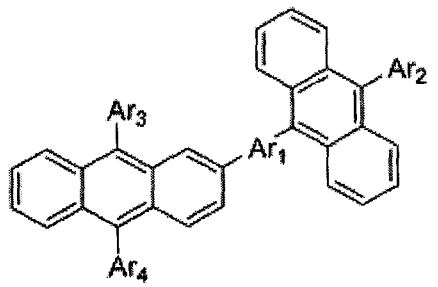



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The present invention also provides an organic light emitting device comprised of a first electrode; a second electrode; and one or more organic layer(s) interposed between the first electrode and the second electrode, wherein the organic layer comprises one or more compound(s) represented by Chemical Formula (1):

[Chemical Formula 1]



wherein, Ar_1 is a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused, provided that Ar_1 is not anthracenyl;

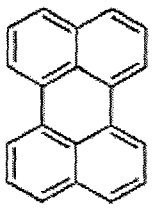
Ar_2 through Ar_4 independently represent a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused; and

the aromatic ring or the fused polycyclic aromatic ring with two or more aromatic rings having been fused of Ar_1 through Ar_4 may be further substituted by one or more substituent(s) selected from (C_1-C_{20})alkyl, (C_1-C_{20})alkoxy, halogen, tri(C_1-C_{20})alkylsilyl, tri(C_6-C_{20})arylsilyl, a (C_5-C_{20}) aromatic ring and a fused polycyclic aromatic ring with two or more aromatic rings having been fused.

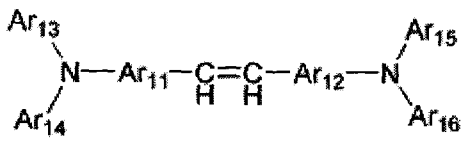
The organic light emitting device according to the present invention is characterized in that the organic layer comprises EL region which comprises one or more EL dopant with one or more compound(s) represented by Chemical Formula (1) as an EL host. The EL dopants applied to the organic light emitting device of the invention are not particularly

restricted, but exemplified, in case of blue color, by the compounds represented by one of Chemical Formulas (2) to (4):

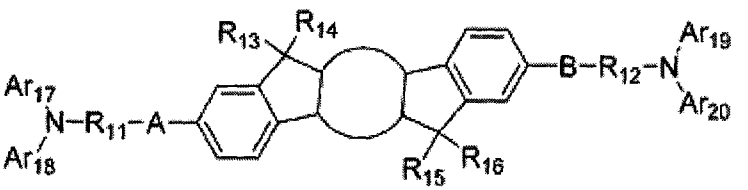
[Chemical Formula 2]



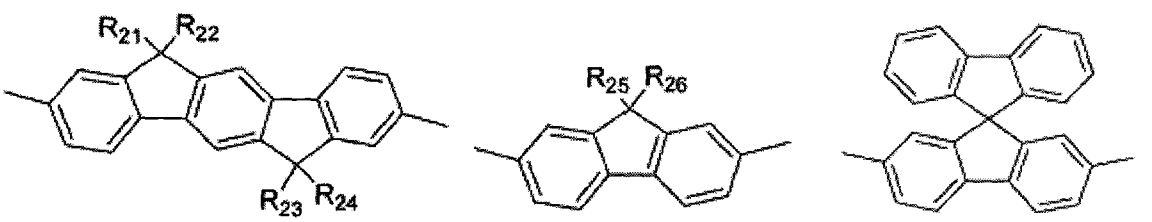
[Chemical Formula 3]



[Chemical Formula 4]



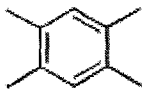
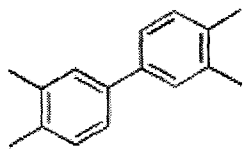
In the Chemical Formula (3) or (4), Ar_{11} and Ar_{12} are independently selected from indenofluorenylene, fluorenylene and spiro-fluorenylene, represented by following chemical formulas:



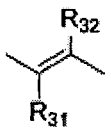
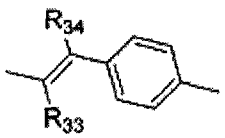
wherein Ar_{13} through Ar_{16} are independently selected from

(C_5-C_{20}) aromatic or polycyclic aromatic rings; provided that Ar_{11} and Ar_{12} are identical, Ar_{13} and Ar_{15} are identical, and Ar_{14} and Ar_{16} are identical.

Ar_{17} through Ar_{20} independently represent a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused;

group  represents  or  ;

A and B independently represent a chemical bond, or group

 or  ;

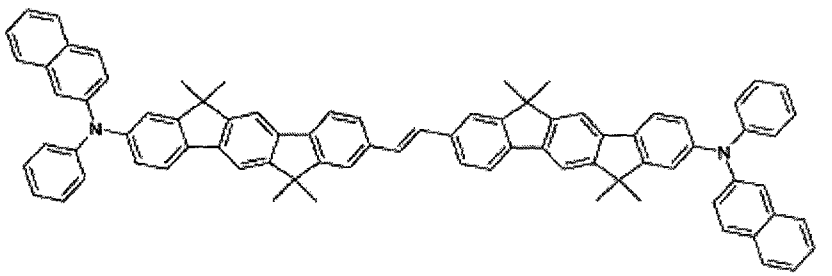
R_{11} and R_{12} independently represent a (C_5-C_{20}) aromatic ring or a polycyclic aromatic ring with two or more aromatic rings having been fused;

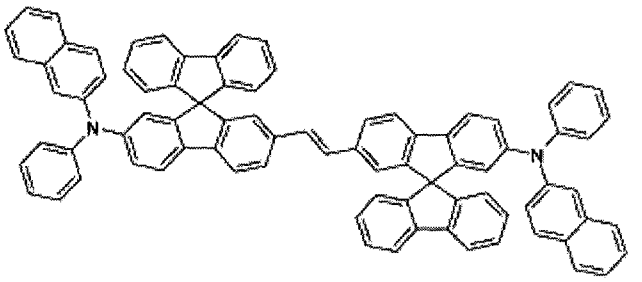
R_{13} through R_{16} independently represent a linear or branched (C_1-C_{20}) alkyl group with or without halogen substituent(s);

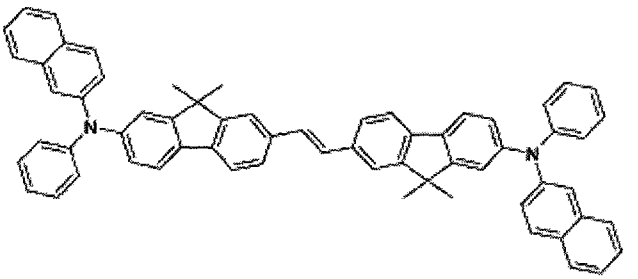
R_{21} through R_{26} are independently selected from (C_1-C_{20}) alkyl, and phenyl or naphthyl with or without (C_1-C_5)alkyl substituent(s); and

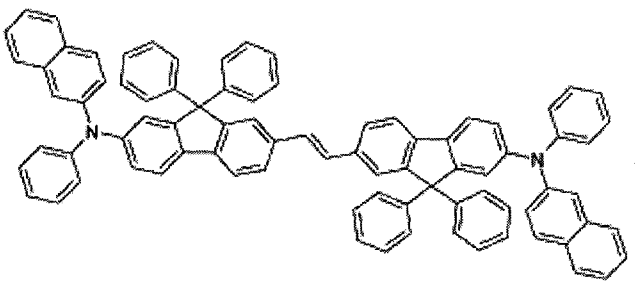
R_{31} through R_{34} independently represent hydrogen or a (C_5-C_{20}) aromatic group.

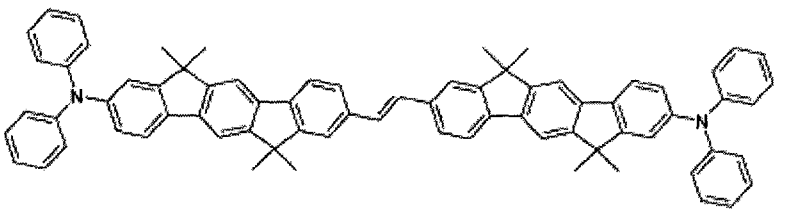
The compounds of Chemical Formula (3) or (4) may be specifically exemplified by the compounds represented by one of the following formulas:

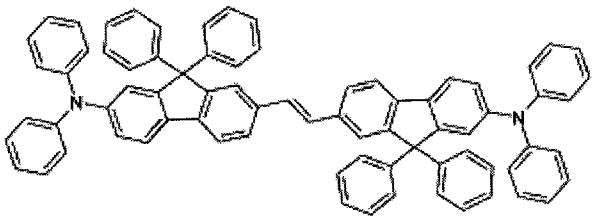


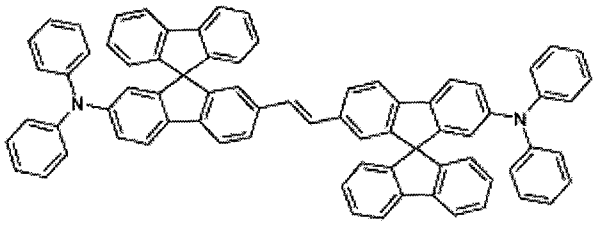


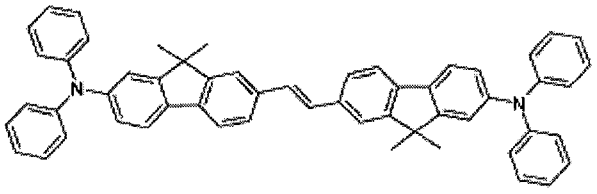


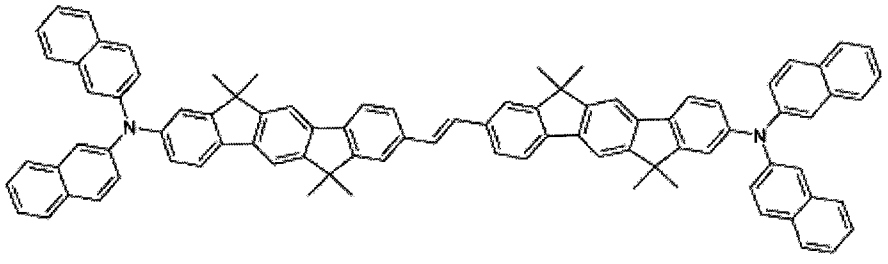


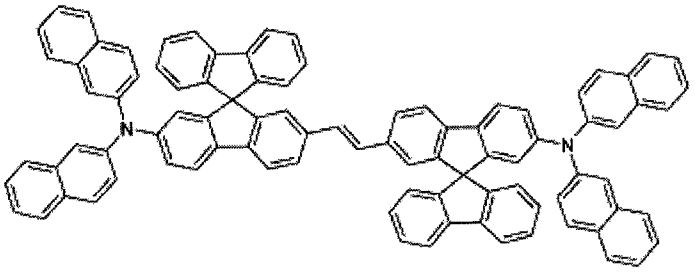




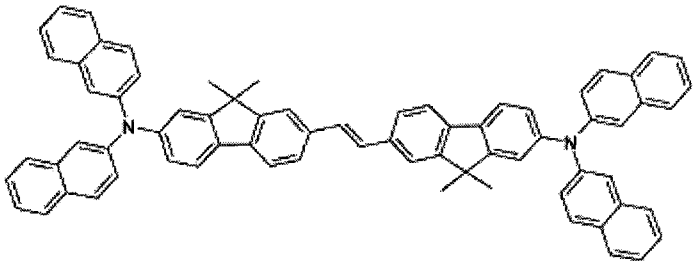


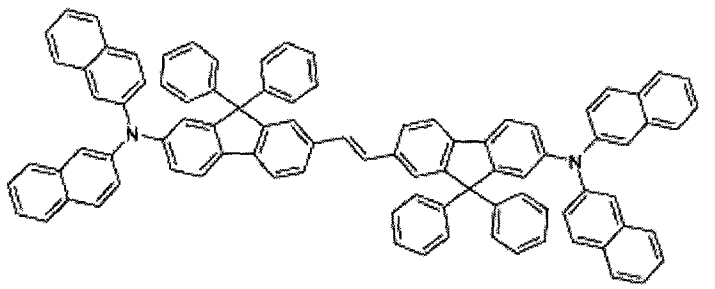


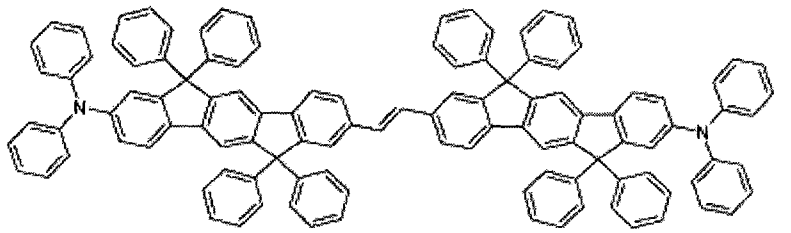


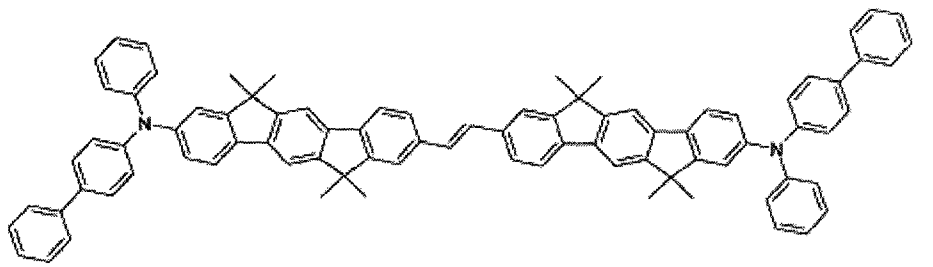


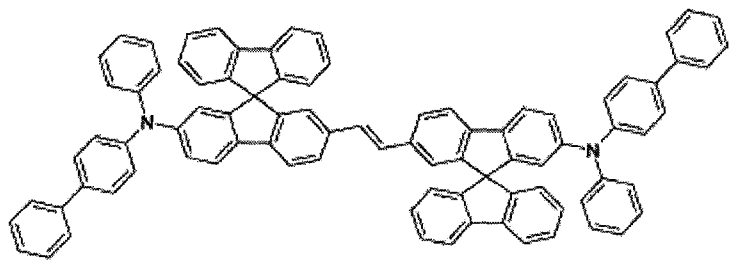
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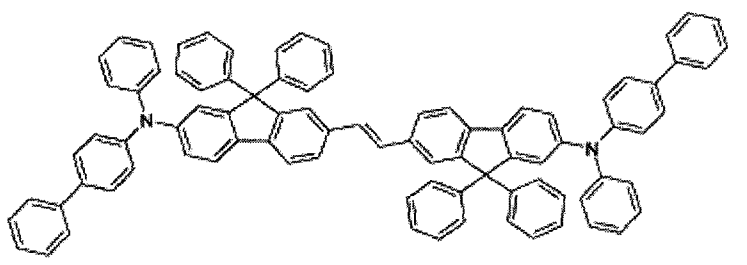


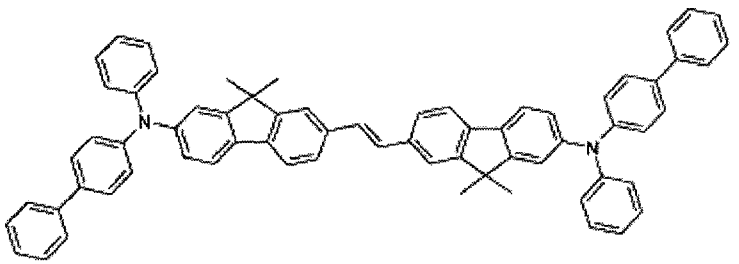


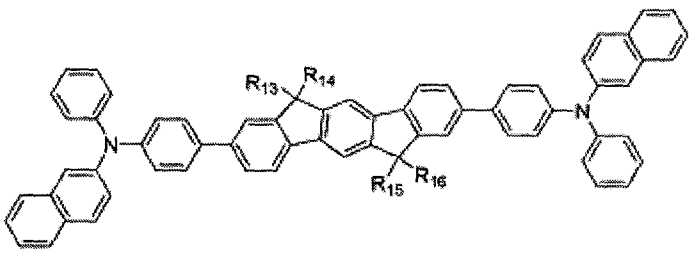


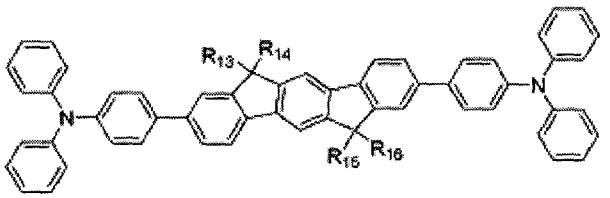


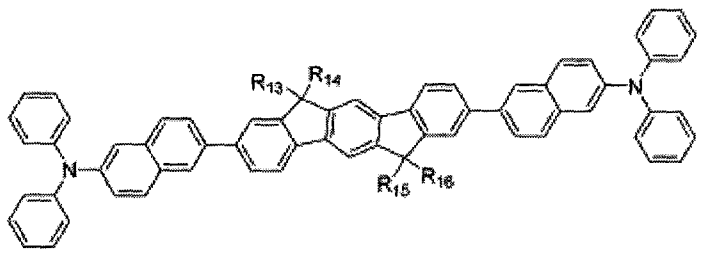


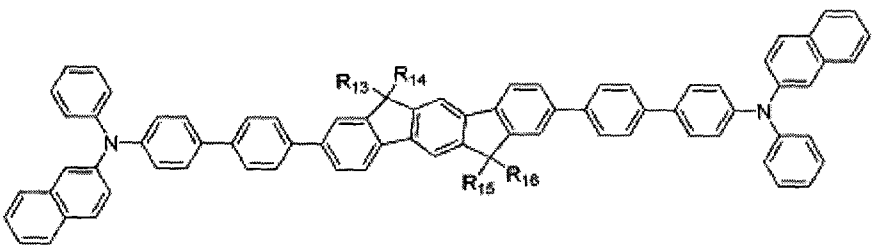


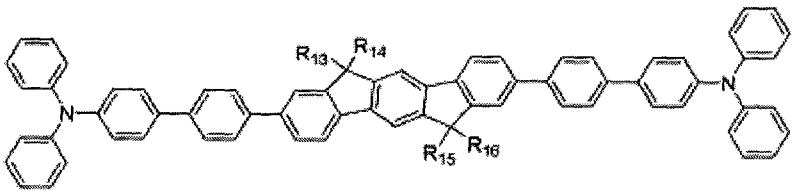


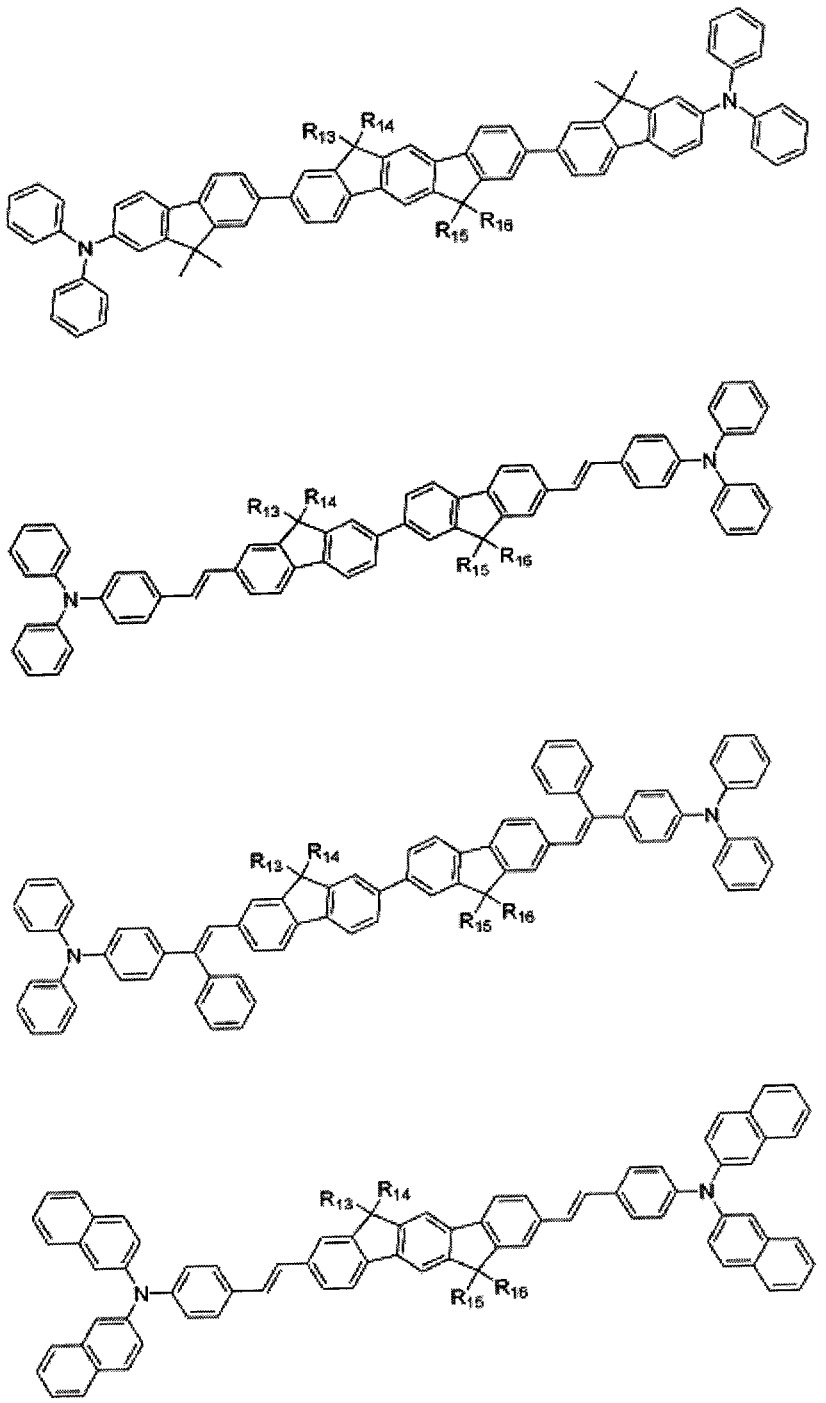


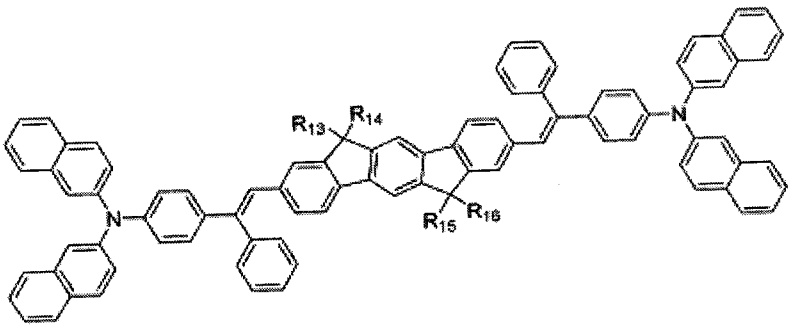


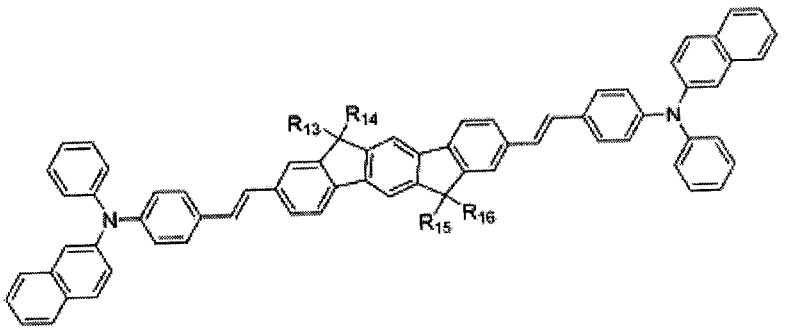


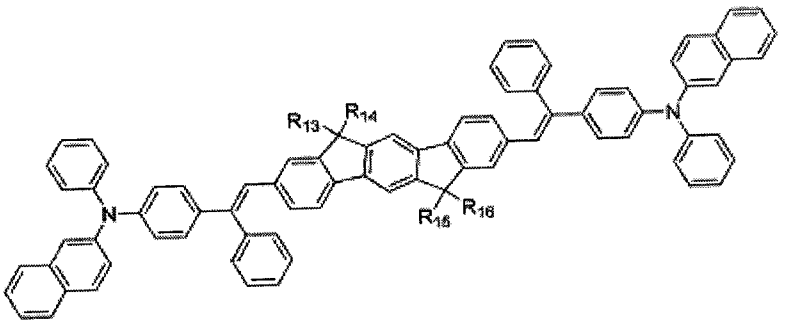


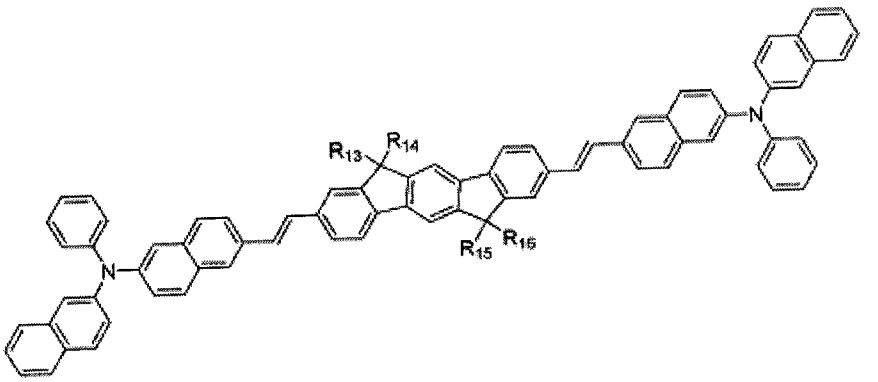


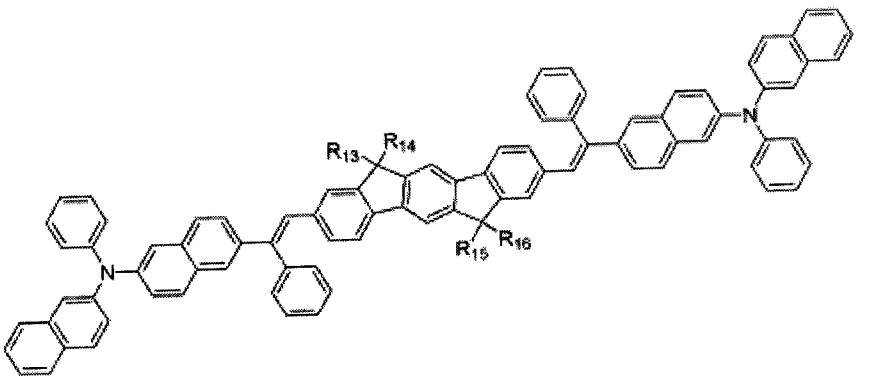

R13
R14
R15
R16
N

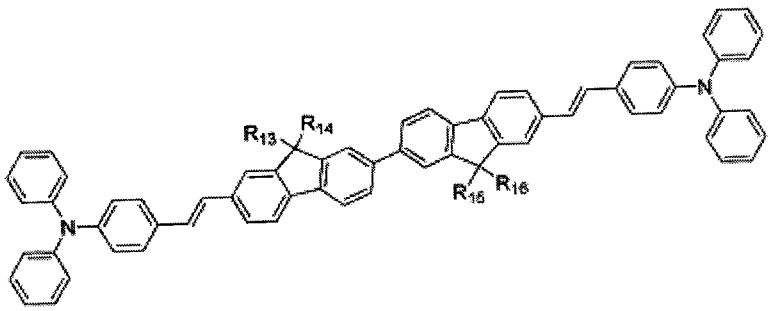

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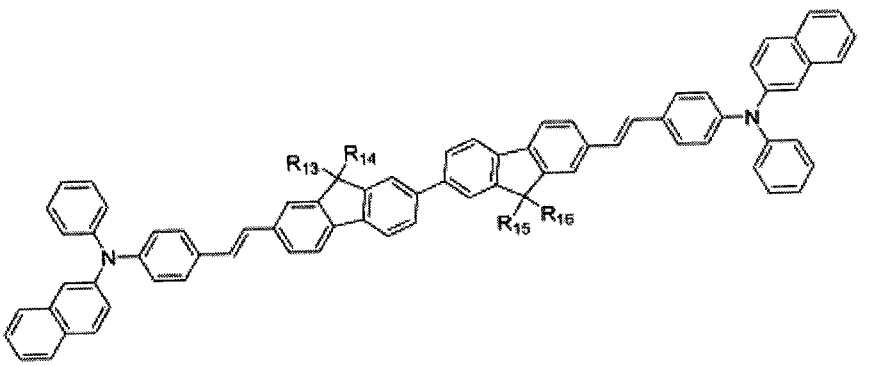

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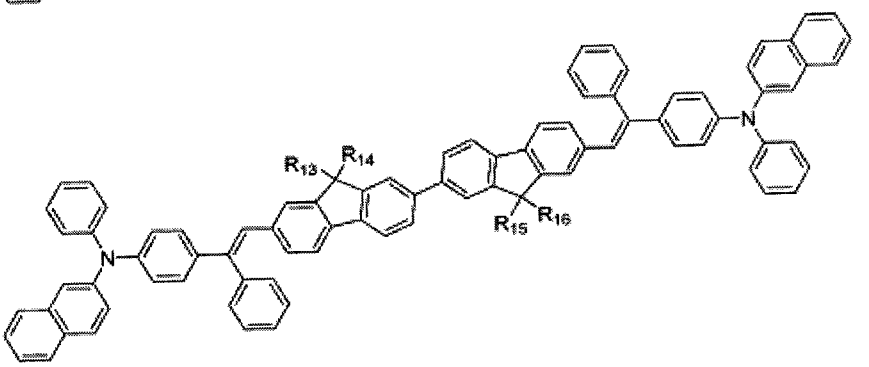

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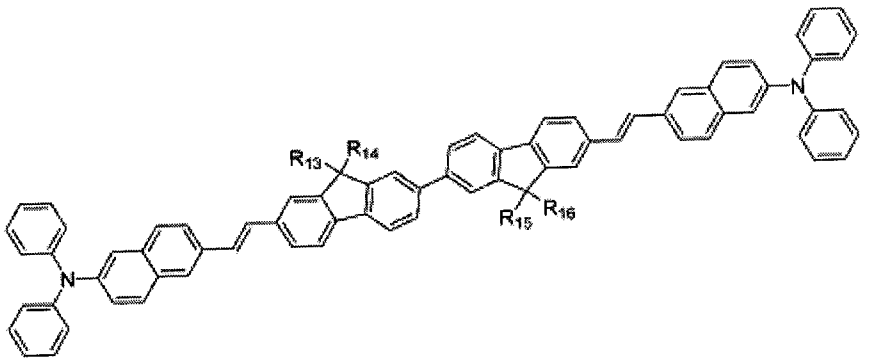

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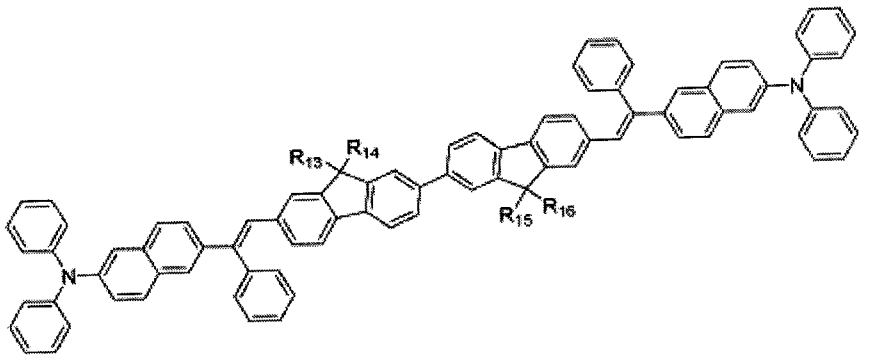

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R14
R15
R16
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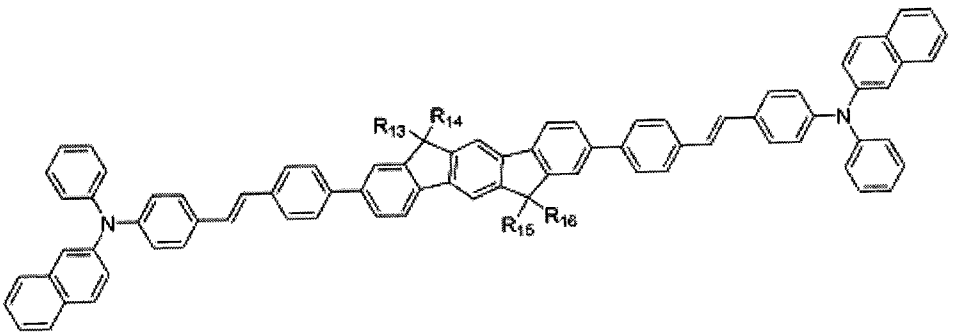

R13
R14
R15
R16
N

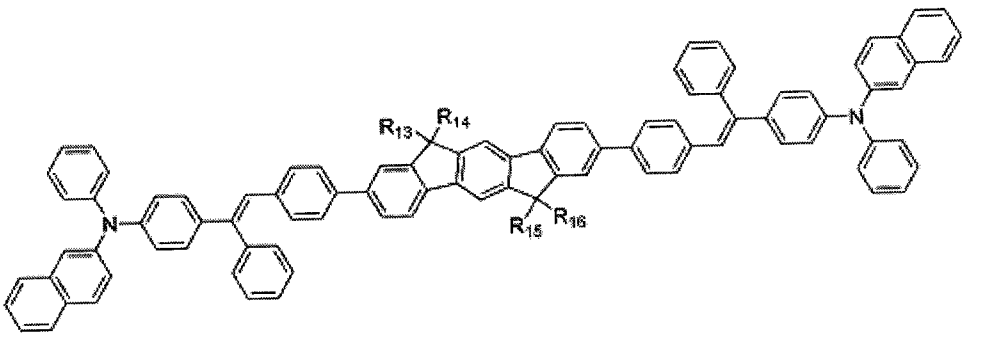

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R15
R16
N

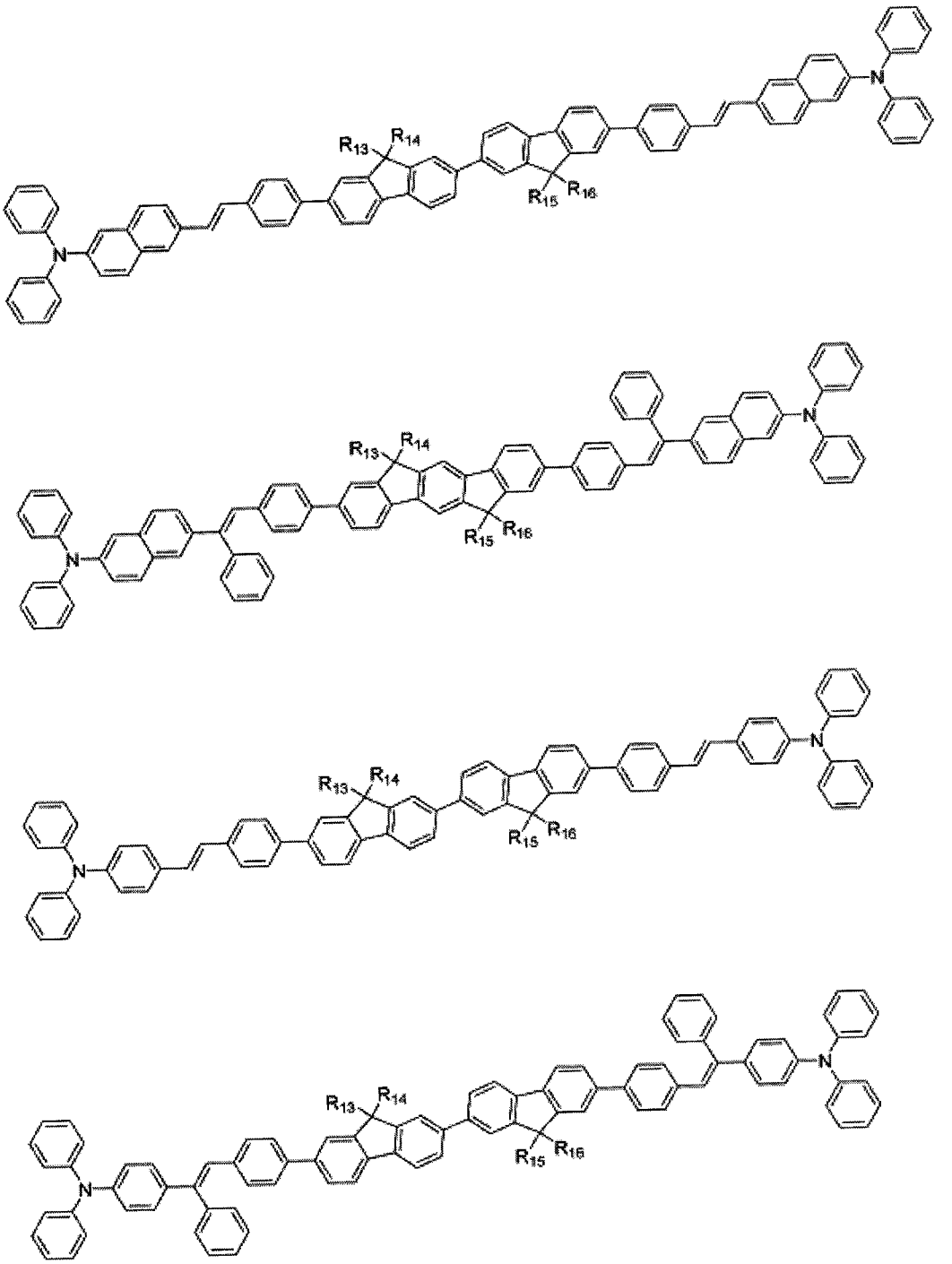

R13
R14
R15
R16
N


R13
R14
R15
R16
N


R13
R14
R15
R16
N


R13
R14
R15
R16
N

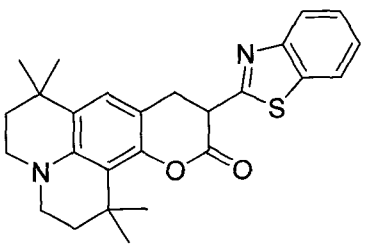

R13
R14
R15
R16
N



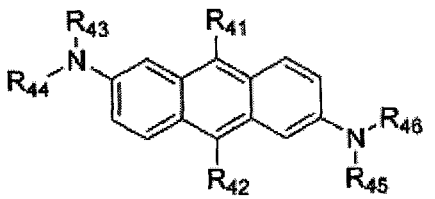
wherein, R_{13} through R_{16} independently represent methyl or ethyl group.

For green EL material, the electroluminescent dopant can be exemplified by the compounds selected from one of Chemical Formulas (5) to (7):

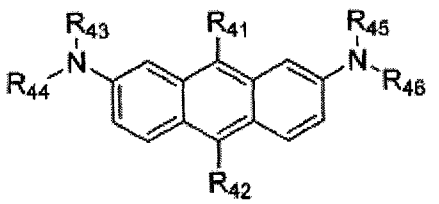
[Chemical Formula 5]



[Chemical Formula 6]



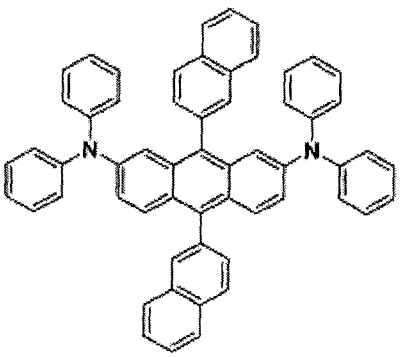
[Chemical Formula 7]

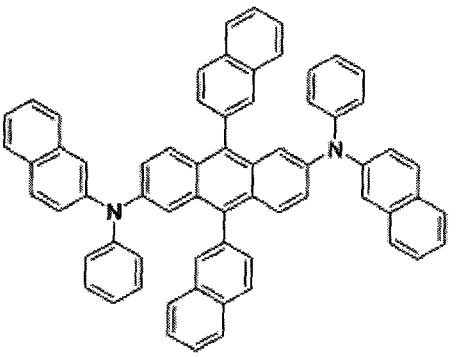


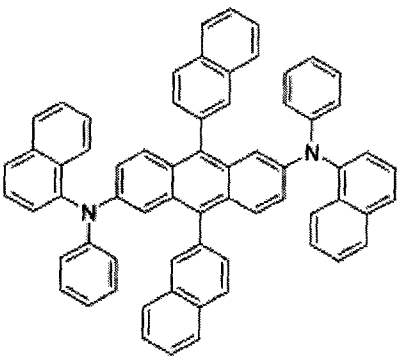
In Chemical Formulas (6) or (7), R_{41} and R_{42} independently represent a polycyclic aromatic ring with two more (C_5-C_{20}) aromatic rings having been fused; R_{43} through R_{46} independently represent a (C_5-C_{20}) aromatic ring; and each aromatic ring of R_{41} through R_{46} may be further substituted by (C_1-C_{20}) alkyl or (C_5-C_{20}) aryl group(s).

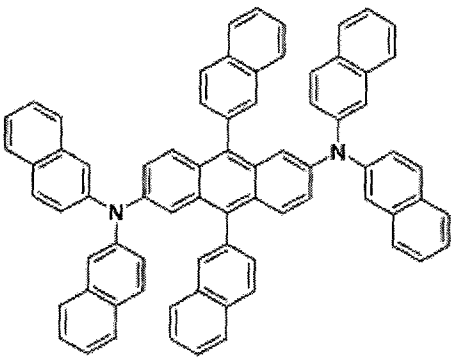
The compounds of Chemical Formulas (6) or (7) can be specifically exemplified by the compounds represented by one

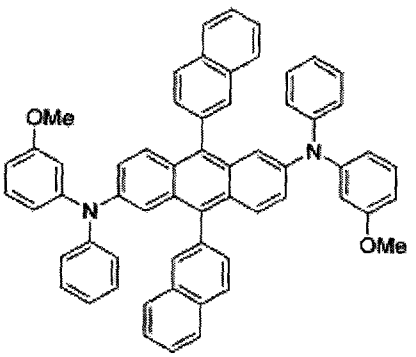
of the following structures:

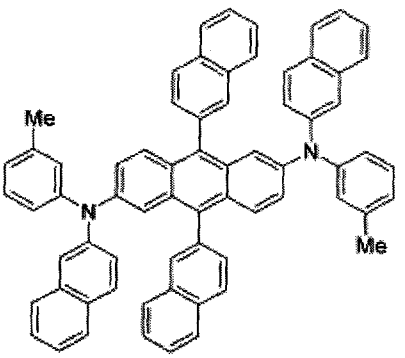


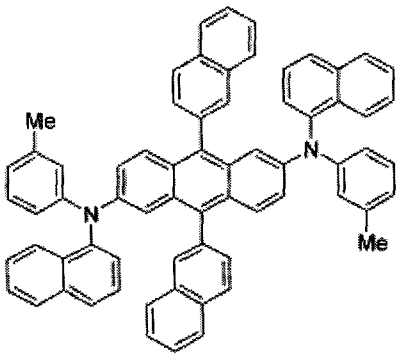


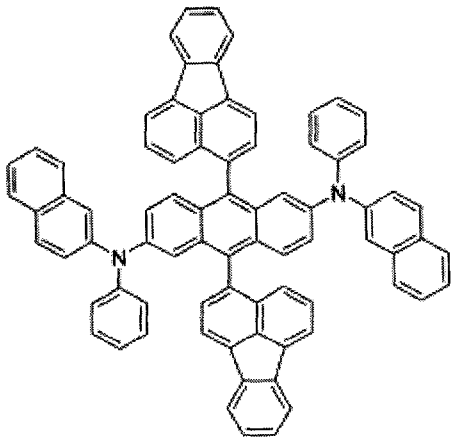


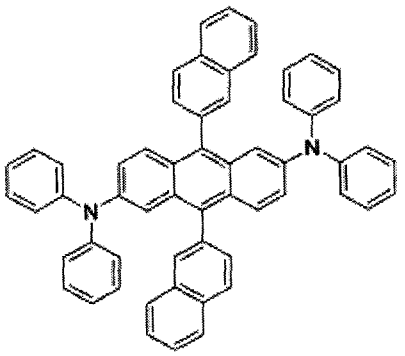


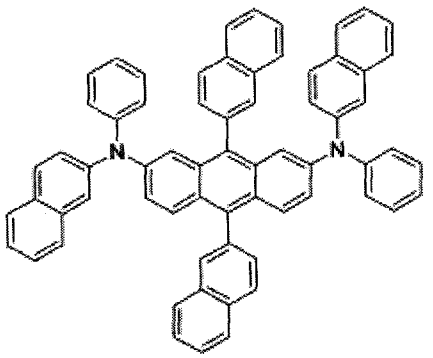


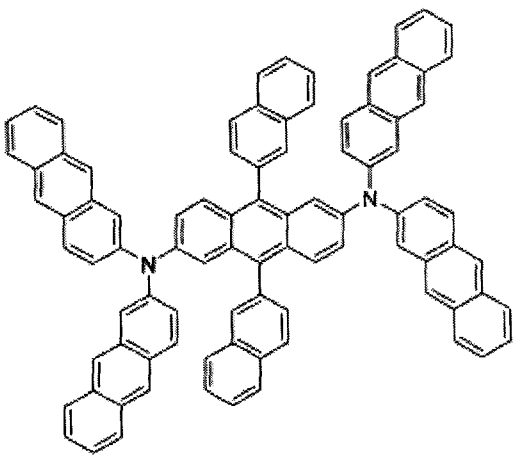


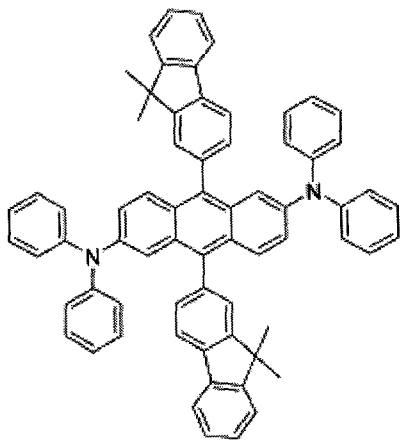

Me
N
N
Me

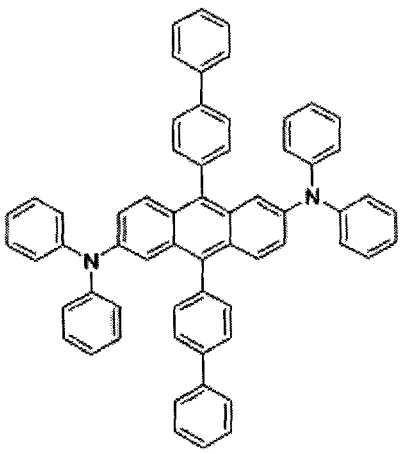

N
N

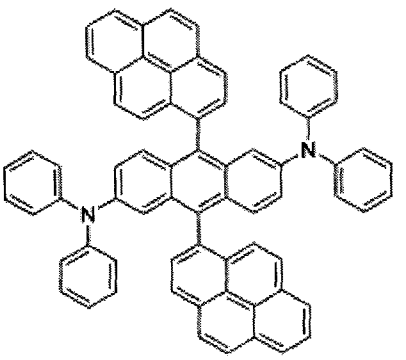

N
N


N
N


N
N


N
N





【Brief Description of Drawings】

Fig. 1 is a cross-sectional view of an OLED;

<Description of symbols of significant parts of the drawings>

1: Glass

2: Transparent electrode

3: Hole injection layer

4: Hole transportation layer

5: Electroluminescent layer

6: Electron transportation layer

7: Electron injection layer

8: Al cathode

【Advantageous Effects】

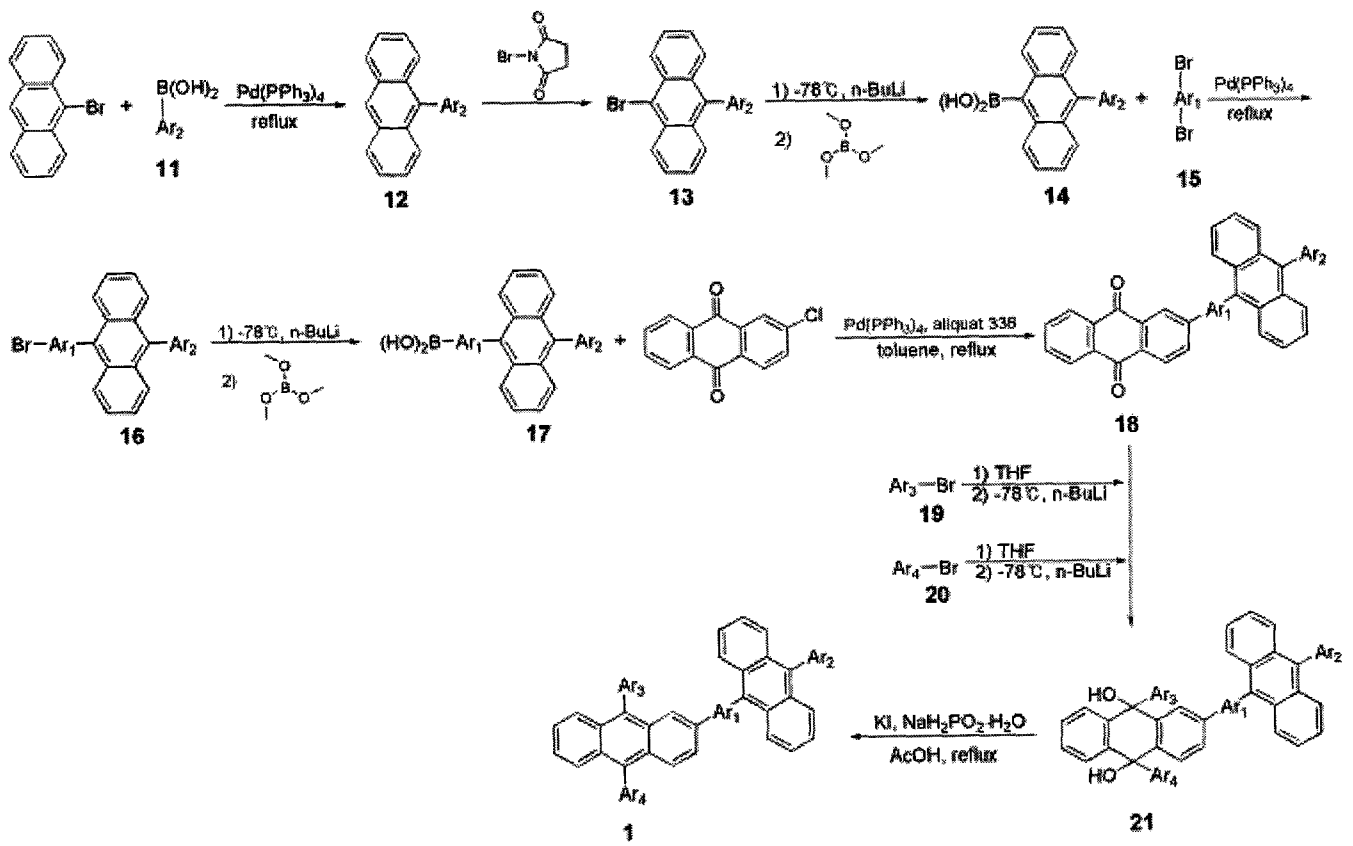
Since the organic electroluminescent compounds according to the invention have good luminous efficiency and life

property as an electroluminescent material, OLED's having very good operation lifetime can be produced.

【Best Mode】

The present invention is further described with respect to the processes for preparing organic electroluminescent compounds according to the invention by referring to Examples, which are provided for illustration only but are not intended to limit the scope of the invention by any means.

[Preparation Examples] Preparation of compound of Chemical Formula (1)



Preparation of Compound (12)

In a mixed solution of toluene and ethanol (2:1 by volume), dissolved were 9-bromoanthracene (58.3 mmol), boronic derivative (Compound 11) (70.0 mmol) and tetrakis palladium (0) triphenylphosphine ($Pd(PPh_3)_4$) (5.8 mmol). Aqueous 2M sodium carbonate solution was added to the solution, and the mixture was stirred at 120℃ under reflux for 5 hours. Then the temperature was lowered to 25℃, and distilled water was added thereto to quench the reaction. The reaction mixture was extracted with ethyl acetate, and the extract was dried under reduced pressure. Recrystallization from tetrahydrofuran and methanol gave Compound (12).

Preparation of Compound (13)

Compound (12) (46.0 mmol) obtained as above and N-bromosuccinimide (50.6 mmol) were dissolved in dichloromethane under nitrogen atmosphere, and the solution was stirred at 25℃ for 5 hours. Then distilled water was added to quench the reaction. The reaction mixture was extracted with dichloromethane, and the extract was dried under reduced pressure. Recrystallization from tetrahydrofuran and methanol gave Compound (13).

Preparation of Compound (14)

Compound (13) (39.0 mmol) obtained as above was dissolved in thoroughly purified tetrahydrofuran under nitrogen

atmosphere, and the solution was chilled to -78℃. To the solution, n-butyl lithium (1.6 M in hexane) (46.8 mmol) was slowly added dropwise, and the mixture was stirred for 1 hour. Then trimethylborate (78.0 mmol) was added thereto. The temperature was slowly raised, and the reaction mixture was stirred at 25℃ for one day. Aqueous 1M HCl solution was added thereto, and the resultant mixture was stirred at ambient temperature. After quenching the reaction, the mixture was extracted with ethyl acetate, and the extract was dried under reduced pressure. Recrystallization from methylene chloride and hexane gave Compound (14).

Preparation of Compound (16)

In a mixed solution of toluene and ethanol (2:1 by volume), dissolved were Compound (14) (32.1 mmol) obtained as above, the dibromo derivative of Compound (15) (32.1 mmol) and tetrakis palladium (0) triphenylphosphine ($Pd(PPh_3)_4$) (3.2 mmol). Aqueous 2M sodium carbonate solution was added to the solution, and the mixture was stirred at 120℃ under reflux for 5 hours. Then the temperature was lowered to 25℃, and distilled water was added thereto to quench the reaction. The reaction mixture was extracted with ethyl acetate, and the extract was dried under reduced pressure. Recrystallization from tetrahydrofuran and methanol gave Compound (16).

Preparation of Compound (17)

Compound (16) (26.1 mmol) obtained as above was dissolved in thoroughly purified tetrahydrofuran under nitrogen atmosphere, and the solution was chilled to -78℃. To the solution, n-butyl lithium (1.6 M in hexane) (31.3 mmol) was slowly added dropwise, and the mixture was stirred for 1 hour. Then trimethylborate (31.3 mmol) was added thereto. The temperature was slowly raised, and the reaction mixture was stirred at 25℃ for one day. Aqueous 1M HCl solution was added thereto, and the resultant mixture was stirred at ambient temperature. After quenching the reaction, the mixture was extracted with ethyl acetate, and the extract was dried under reduced pressure. Recrystallization from methylene chloride and hexane gave Compound (17).

Preparation of Compound (18)

In toluene, dissolved were 2-chloro-9,10-anthraquinone (18.0 mmol), Compound (19) (21.5 mmol), tetrakis palladium (0) triphenylphosphine ($Pd(PPh_3)_4$) (2.2 mmol) and Aliquat 336 (3.0 mmol). Aqueous 2M potassium carbonate solution was added to the solution, and the mixture was stirred under reflux for 3 hours. Then the temperature was lowered to 25℃, and distilled water was added thereto to quench the reaction. The reaction mixture was extracted with ethyl acetate, and the extract was dried under reduced pressure. Recrystallization from methanol and tetrahydrofuran gave Compound (18).

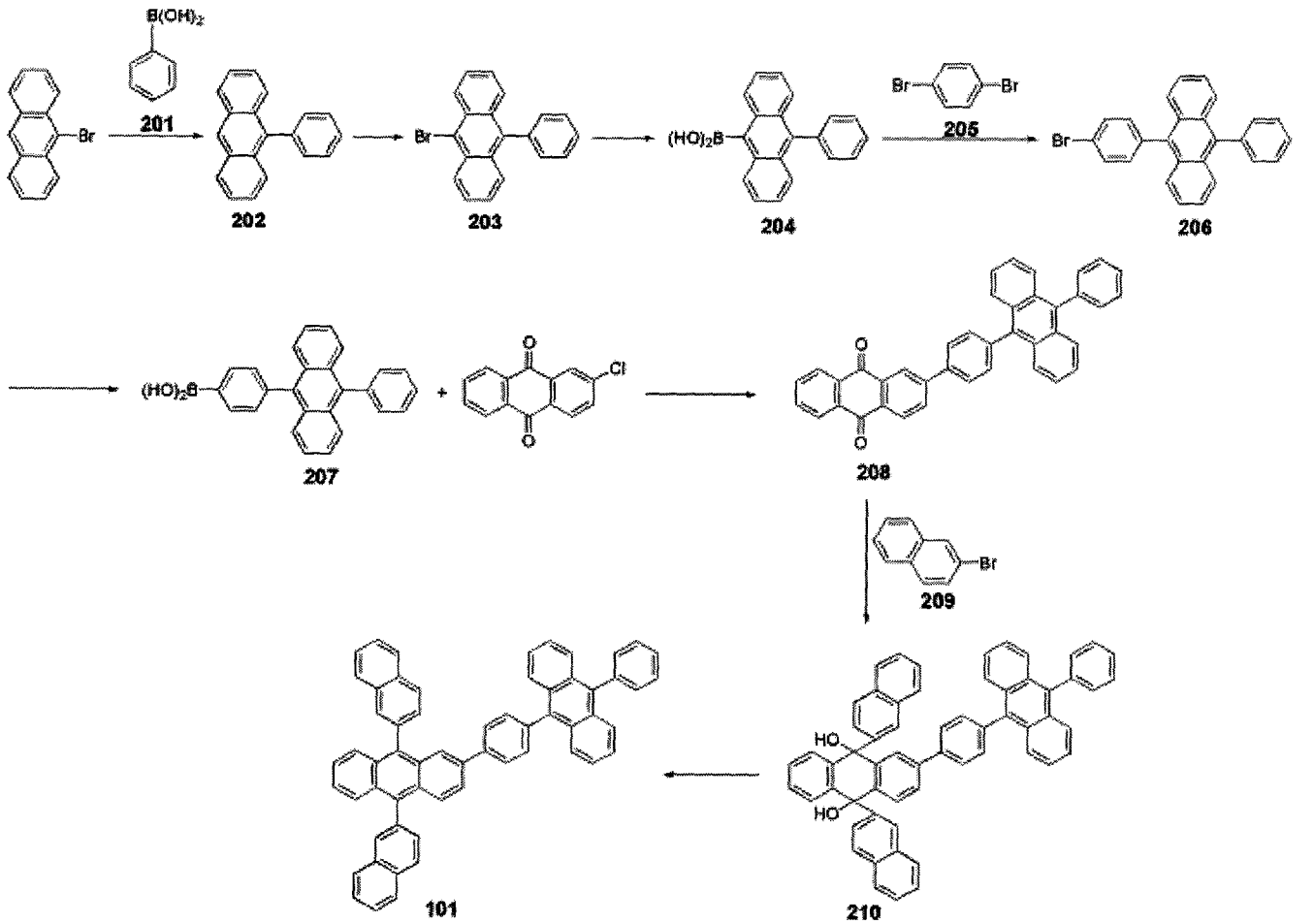
Preparation of Compound (21)

To the bromo compound (Compound 19 or 20) (30.3 mmol), tetrahydrofuran was added, and the mixture was stirred at 25℃ for 10 minutes to achieve complete dissolution. The temperature was then lowered to -72℃, and n-butyl lithium (2.5 M in hexane) (36.3 mmol) was slowly added dropwise thereto. After 1 hour, Compound (18) (12.1 mmol) was added, and the temperature was slowly raised to 25℃. After stirring the mixture for 26 hours at the same temperature, saturated aqueous ammonium chloride solution was added, and the resultant mixture was stirred for 1 hour. The organic layer separated after filtration under reduced pressure was evaporated to obtain Compound (21).

Preparation of Compound (1)

Compound (21) (9.9 mmol) obtained as above, potassium iodide (KI) (39.6 mmol) and sodium phosphate monohydrate ($NaH_2PO_2 \cdot H_2O$) (59.3 mmol) were dissolved in acetic acid, and the solution was stirred under reflux for 21 hours. After cooling to 25℃, water was added to the reaction mixture, and the resultant mixture was stirred. Solid produced was filtered and washed sequentially with methanol, ethyl acetate and tetrahydrofuran to obtain the target compound (1) as light ivory product.

[Preparation Example 1] Preparation of Compound (101)



Preparation of Compound (202)

In a mixed solution of toluene (300 mL) and ethanol (150 mL), dissolved were 9-bromoanthracene (15.0 g, 58.3 mmol), phenylboronic acid (Compound 201) (8.5 g, 70.0 mmol) and tetrakis palladium (0) triphenylphosphine ($Pd(PPh_3)_4$) (6.7 g, 5.8 mmol). After adding aqueous 2M sodium carbonate solution (145 mL) thereto, the resultant mixture was stirred under reflux at 120℃ for 5 hours. Then, the temperature was lowered to 25℃, and the reaction was quenched by adding distilled

water (150 mL). The reaction mixture was extracted with ethyl acetate (200 mL), and the extract was dried under reduced pressure. Recrystallization from tetrahydrofuran (10 mL) and methanol (300 mL) gave Compound (202) (12.0 g, 47.2 mmol, 81.0%).

Preparation of Compound (203)

Under nitrogen atmosphere, Compound (202) (11.7 g, 46.0 mmol) and N-bromosuccinimide (9.0 g, 50.6 mmol) were dissolved in dichloromethane (360 mL). The resultant solution was then stirred at 25℃ for 5 hours. The reaction was quenched by adding distilled water (300 mL), and the reaction mixture was extracted with dichloromethane (200 mL). The extract was dried under reduced pressure, and recrystallized from tetrahydrofuran (20 mL) and methanol (200 mL) to obtain the target compound (203) (13.0 g, 39.0 mmol, 84.8%).

Preparation of Compound (204)

In thoroughly purified tetrahydrofuran (200 mL), Compound (203) (13.0 g, 39.0 mmol) was dissolved. The resultant solution was chilled to -78℃, and n-butyl lithium (1.6 M in hexane) (29.3 mL, 46.8 mmol) was slowly added thereto. After stirring the mixture for 1 hour, added was trimethyl borate (8.7 mL, 78.0 mmol). The temperature was slowly raised to 25℃, and the mixture was stirred at the same temperature for one day. Aqueous 1 M HCl solution (200 mL) was added thereto, and

the mixture was stirred at ambient temperature for 5 hours. The reaction was quenched, and the reaction mixture was extracted with ethyl acetate (300 mL) and the extract was dried under reduced pressure. Recrystallization from methylene chloride (20 mL) and hexane (200 mL) gave the target compound (204) (9.6 g, 32.1 mmol, 82.3%).

Preparation of Compound (206)

In a mixed solution of toluene (300 mL) and ethanol (150 mL), dissolved were 1,4-dibromobenzene (7.6 g, 32.1 mmol), Compound (204) (9.6 g, 32.1 mmol) and tetrakis palladium (0) triphenylphosphine ($Pd(PPh_3)_4$) (3.7 g, 3.2 mmol). After adding aqueous 2M sodium carbonate solution (145 mL) thereto, the resultant mixture was stirred under reflux at 120℃ for 5 hours. Then, the temperature was lowered to 25℃, and the reaction was quenched by adding distilled water (150 mL). The mixture was extracted with ethyl acetate (200 mL), and the extract was dried under reduced pressure. Recrystallization from tetrahydrofuran (20 mL) and methanol (300 mL) gave the target compound (206) (10.7 g, 26.1 mmol, 81.3%).

Preparation of Compound (207)

In thoroughly purified tetrahydrofuran (200 mL), Compound (206) (10.7 g, 26.1 mmol) was dissolved. The resultant solution was chilled to -78℃, and n-butyl lithium (1.6 M in hexane) (19.6 mL, 31.3 mmol) was slowly added thereto. After

stirring the mixture for 1 hour, added was trimethyl borate (3.50 mL, 31.3 mmol). The temperature was slowly raised to 25℃, and the mixture was stirred at the same temperature for one day. Aqueous 1 M HCl solution (200 mL) was added thereto, and the mixture was stirred at ambient temperature for 5 hours. The reaction was quenched, and the reaction mixture was extracted with ethyl acetate (300 mL). The extract was dried under reduced pressure. Recrystallization from methylene chloride (20 mL) and hexane (200 mL) gave the target compound (207) (8.04 g, 21.5 mmol, 82.4%).

Preparation of Compound (208)

In toluene (300 mL), dissolved were 2-chloro-9,10-anthraquinone (3.7 g, 18.0 mmol), Compound (207) (8.0 g, 21.5 mmol), tetrakis palladium (0) triphenylphosphine ($Pd(PPh_3)_4$) (2.5 g, 2.2 mmol) and Aliquat 336 (1.4 mL, 3.0 mmol). After adding aqueous 2M potassium carbonate solution (150 mL) thereto, the resultant mixture was stirred under reflux for 3 hours. Then, the temperature was lowered to 25℃, and the reaction was quenched by adding distilled water (100 mL). The mixture was extracted with ethyl acetate (200 mL), and the extract was dried under reduced pressure. Recrystallization from methanol (200 mL) and tetrahydrofuran (50 mL) gave the target compound (208) (6.5 g, 12.1 mmol, 67.2%).

Preparation of Compound (210)

Tetrahydrofuran (250 mL) was added to 2-bromonaphthalene (Compound 209) (6.3 g, 30.3 mmol), and the mixture was stirred at 25℃ for 10 minutes to achieve complete dissolution. After chilling to -72℃, n-butyl lithium (2.5 M in hexane) (14.5 mL, 36.3 mmol) was slowly added dropwise. After 1 hour, Compound (208) (6.5 g, 12.1 mmol) was added thereto, and the temperature was slowly raised to 25℃. After stirring the reaction mixture for 26 hours, saturated aqueous ammonium chloride solution was added thereto, and the resultant mixture was stirred for 1 hour. Filtration under reduced pressure, separation of organic layer, and evaporation gave the target compound (210) (7.8 g, 9.9 mmol, 81.7%).

Preparation of Compound (101)

Compound (210) (7.8 g, 9.9 mmol), potassium iodide (KI) (6.6 g, 39.6 mmol) and sodium phosphate monohydrate ($NaH_2PO_2 \cdot H_2O$) (6.3 g, 59.3 mmol) were dissolved in acetic acid (150 mL), and the solution was stirred under reflux for 21 hours. After cooling the solution to 25℃, water (200 mL) was added with stirring, and the solid generated was filtered. The solid obtained was washed sequentially with methanol (300 mL), ethyl acetate (100 mL) and tetrahydrofuran (50 mL), to provide the target compound (101) (5.3 g, 7.0 mmol, 71.2%) as light ivory product.

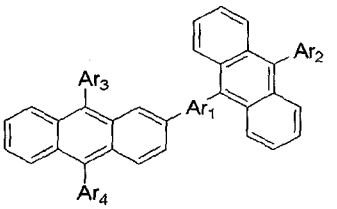
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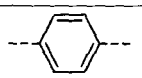
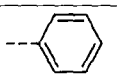
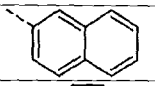
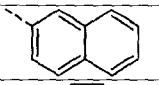
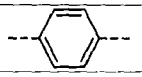
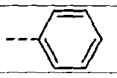
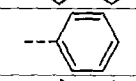
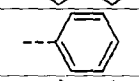
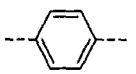
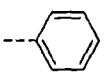
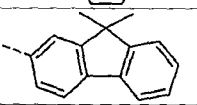
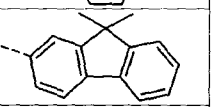
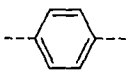
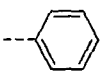
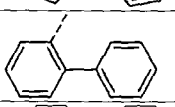
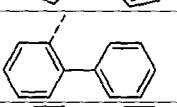
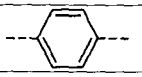
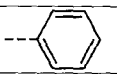
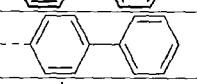
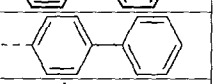
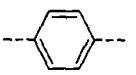
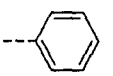
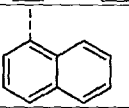
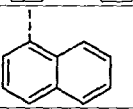
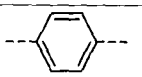
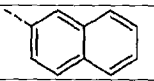
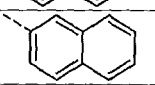
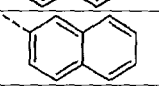
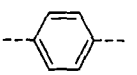
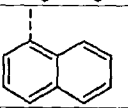
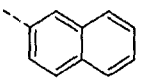
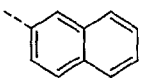
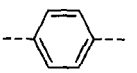
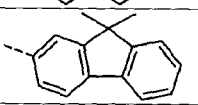
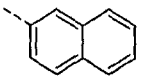
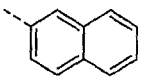
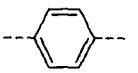
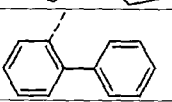
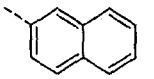
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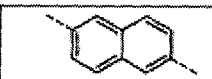
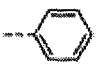
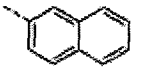
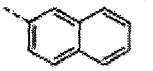
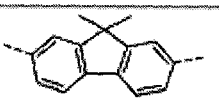
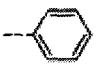
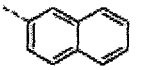
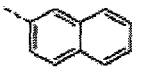
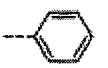
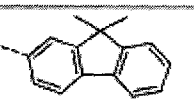
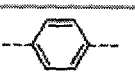
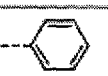
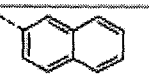
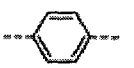
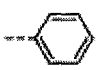
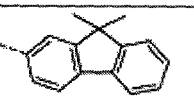
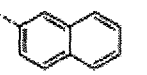
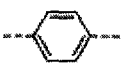
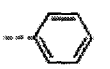
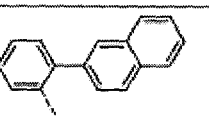
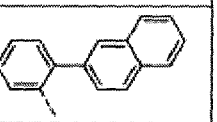
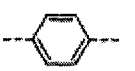
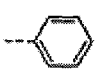
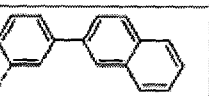
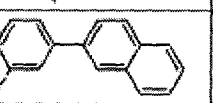
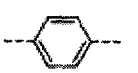
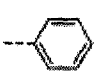
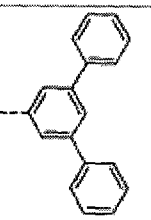
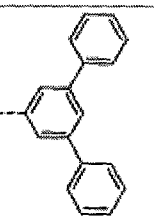
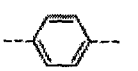
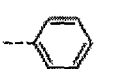
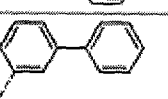
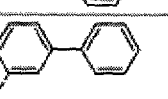
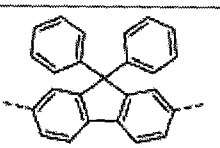
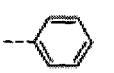
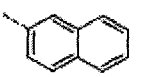
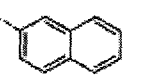
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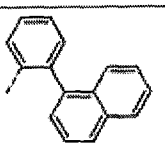
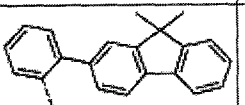
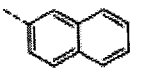
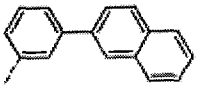
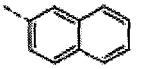
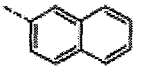
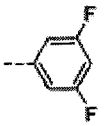
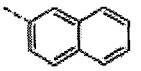
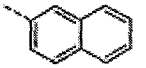
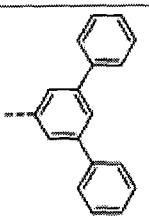
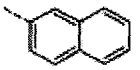
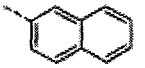
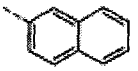
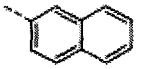
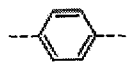
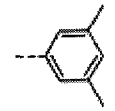
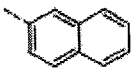
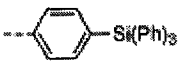
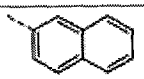
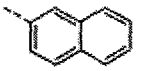
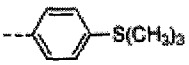
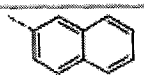
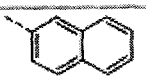
The organic electroluminescent compounds listed in Table 1 were prepared according to the procedures described in Preparation Example 1, and the ^{1}H NMR and MS/FAB data of the compounds are shown in Table 2.

[Table 1]



Preparation Ex.	Compound No.	Ar_1	Ar_2	Ar_3	Ar_4
1	101				
2	102				
3	103				
4	104				
5	105				
6	106				
7	107				
8	108				
9	109				
10	110				
11	111				
12	112				
13	113				

14	114				
15	115				
16	116				
17	117				
18	118				
19	119				
20	120				
21	121				
22	122				
23	123				
24	124				
25	125				
26	126				
27	127				

28	128				
29	129				
30	130				
31	131				
32	132				
33	133				
34	134				
35	135				
36	136				

[Table 2]

Compound No.	^{1}H NMR ($CDCl_3$, 300 MHz)	MS/FAB	
		found	calculated
101	δ = 7.23(m, 3H), 7.32-7.35(m, 12H), 7.48-7.54(m, 5H), 7.67-7.73(m, 13H), 7.89-7.93 (m, 5H).	759.2	758.2
102	δ = 7.23(m, 2H), 7.32-7.35(m, 8H), 7.48-7.54(m, 6H), 7.67-7.73(m, 13H), 7.89-7.93 (m, 5H)	659.2	658.2
103	δ = 1.67 (s, 12H), 7.23(m, 4H), 7.32-7.35(m, 8H), 7.48-7.54(m, 8H), 7.67-7.73(m, 13H), 7.89-7.93 (m, 5H)	891.3	890.3
104	δ = 7.23(m, 6H), 7.32-7.35(m, 12H), 7.48-7.54(m, 6H), 7.67-7.73(m, 13H), 7.89-7.93 (m, 5H)	811.3	810.3
105	δ = 7.23(m, 2H), 7.32-7.35(m, 8H), 7.48-7.54(m, 10H), 7.67-7.73(m, 17H), 7.89-7.93 (m, 5H)	811.3	810.3

106	δ = 7.23(m, 2H), 7.32-7.35(m, 12H), 7.48-7.54(m, 6H), 7.67-7.73(m, 13H), 7.89-7.93 (m, 5H).	759.2	758.2
107	δ = 7.23(m, 3H), 7.32-7.35(m, 14H), 7.48-7.54(m, 5H), 7.67-7.73(m, 13H), 7.89-7.93 (m, 5H).	809.3	808.3
108	δ = 7.22(m, 2H), 7.34(m, 14H), 7.49(m, 6H), 7.71(m, 13H), 7.91(m, 5H).	809.3	808.3
109	δ = 1.71(s, 6H), 7.21(m, 2H), 7.37(m, 12H), 7.48(m, 8H), 7.71(m, 11H), 7.91(m, 7H).	875.3	874.3
110	δ = 7.22(m, 4H), 7.39(m, 12H), 7.51(m, 8H), 7.69(m, 11H), 7.88(m, 7H).	835.3	834.3
111	δ = 7.22(m, 2H), 7.39(m, 10H), 7.51(m, 8H), 7.62(m, 11H), 7.73(m, 4H), 7.88(m, 7H).	835.3	834.3
112	δ = 7.23(m, 3H), 7.32-7.35(m, 10H), 7.48-7.54(m, 11H), 7.67-7.73(m, 13H), 7.89-7.93 (m, 5H).	835.3	834.3
113	δ = 7.23(m, 3H), 7.37(m, 10H), 7.51(m, 9H), 7.69(m, 13H), 7.88(m, 5H).	809.3	808.3
114	δ = 7.22(m, 2H), 7.43(m, 11H), 7.56(m, 7H), 7.71(m, 15H), 7.93(m, 5H).	809.3	808.3
115	δ = 1.72(s, 6H), 7.24(m, 2H), 7.42~7.45(m, 9H), 7.53~7.57(m, 9H), 7.70-7.74(m, 11H), 7.85(m, 4H), 7.94(m, 5H).	8754.3	874.3
116	δ = 1.68(s, 6H), 7.22~7.38(m, 14H), 7.48~7.55(m, 10H), 7.60~7.67(m, 7H), 7.73~7.77(m, 2H), 7.84~7.90(m, 3H).	774.3	774.9
117	δ = 7.22(m, 2H), 7.32(m, 12H), 7.48~7.54(m, 10H), 7.67(m, 8H), 7.73(m, 2H), 7.89(m, 2H).	708.3	708.9
118	δ = 1.67(s, 6H), 7.22~7.28(m, 2H), 7.32~7.38(m, 11H), 7.48~7.55(m, 9H), 7.60~7.67(m, 9H), 7.73~7.77(m, 3H), 7.84~7.90(m, 4H).	824.3	825.0
119	δ = 7.22~7.28(m, 5H), 7.32(m, 12H), 7.48~7.54(m, 13H), 7.67(m, 10H), 7.73(m, 3H), 7.89(m, 3H).	910.3	911.4
120	δ = 7.22(m, 2H), 7.32~7.38(m, 14H), 7.44~7.48(m, 5H), 7.54(m, 7H), 7.67(m, 10H), 7.73~7.70(m, 5H), 7.89(m, 3H).	910.3	911.4
121	δ = 7.22(m, 5H), 7.32(m, 16H), 7.48(m, 10H), 7.54(m, 5H), 7.66~7.67(m, 12H), 7.73(m, 1H), 7.89(m, 1H).	962.4	963.2
122	δ = 7.22(m, 3H), 7.32~7.38(m, 14H), 7.44~7.48(m, 10H), 7.54(m, 5H), 7.67(m, 6H), 7.70~7.73(m, 3H), 7.89(m, 1H).	810.3	811.0
123	δ = 7.06~7.07(m, 6H), 7.14(m, 4H), 7.22(m, 1H), 7.32(m, 12H), 7.48~7.54(m, 5H), 7.60~7.67(m, 12H), 7.73~7.77(m, 5H), 7.89~7.90(m, 5H).	998.4	999.2
124	δ = 7.16~7.19(m, 4H), 7.22(m, 1H), 7.32~7.35(m, 14H), 7.48~7.54(m, 5H), 7.60~7.67(m, 12H), 7.72~7.77(m, 7H), 7.89~7.90(m, 5H).	996.4	997.2

125	δ = 7.22(m, 1H), 7.32(m, 12H), 7.48(m, 2H), 7.54(m, 15H), 7.67(m, 10H), 7.73(m, 3H), 7.89(m, 3H).	910.4	911.1
126	δ = 7.03(m, 2H), 7.32(m, 10H), 7.46(m, 2H), 7.54(m, 7H), 7.67(m, 10H), 7.73(m, 3H), 7.89(m, 3H).	776.3	776.9
127	δ = 7.28~7.32(m, 14H), 7.54(m, 10H), 7.67(m, 12H), 7.73(m, 4H), 7.89(m, 4H).	884.3	885.1
128	δ = 7.28(m, 2H), 7.32~7.38(m, 13H), 7.54(m, 10H), 7.63~7.67(m, 13H), 7.73(m, 3H), 7.89(m, 3H).	884.3	885.1
129	δ = 1.68(s, 6H), 7.28(m, 3H), 7.32~7.38(m, 11H), 7.54~7.55(m, 10H), 7.60~7.67(m, 11H), 7.73~7.77(m, 4H), 7.84~7.90(m, 5H).	950.4	951.2
130	δ = 7.32~7.38(m, 13H), 7.44(m, 2H), 7.54(m, 8H), 7.67(m, 12H), 7.70~7.73(m, 5H), 7.89(m, 4H).	884.3	885.1
131	δ = 6.64(t, 1H), 6.96(m, 2H), 7.32(m, 10H), 7.54(m, 7H), 7.67(m, 10H), 7.73(m, 3H), 7.89(m, 3H).	794.2	794.9
132	δ = 7.22(m, 2H), 7.32(m, 14H), 7.48(m, 4H), 7.54(m, 7H), 7.66~7.67(m, 13H), 7.73(m, 3H), 7.89(m, 3H).	910.4	911.1
133	δ = 2.35(s, 3H), 7.12(m, 2H), 7.32~7.36(m, 12H), 7.54(m, 7H), 7.67(m, 10H), 7.73(m, 3H), 7.89(m, 3H).	772.3	773.0
134	δ = 2.35(s, 6H), 6.82(s, 1H), 7.09(d, 2H), 7.32(m, 10H), 7.54(m, 7H), 7.67(m, 10H), 7.73(m, 3H), 7.89(m, 3H).	786.3	787.0
135	δ = 7.32~7.36(m, 19H), 7.54~7.58(m, 15H), 7.60~7.67(m, 12H), 7.73(m, 3H), 7.89(d, 3H).	1016.4	1017.3
136	δ = 0.66(s, 9H), 7.32(m, 10H), 7.46(m, 2H), 7.54(m, 9H), 7.60~7.67(m, 10H), 7.73(m, 3H), 7.89(d, 3H).	830.3	831.1

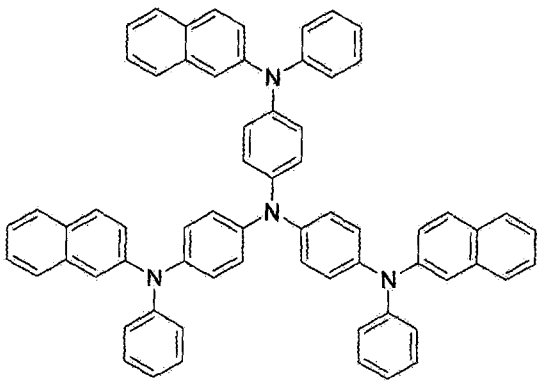
[Examples 1-7] Manufacture of OLED's using the compounds according to the invention

OLED's were manufactured by using the electroluminescent materials according to the invention.

First, a transparent electrode ITO thin film (2) (15 Ω/□) obtained from glass (1) for OLED was subjected to ultrasonic washing with trichloroethylene, acetone, ethanol and distilled water, sequentially, and stored in isopropanol before use.

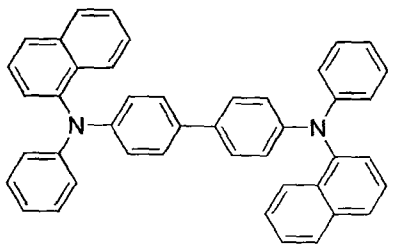
Then, an ITO substrate was equipped in a substrate folder

of a vacuum vapor-deposit device, and 4,4',4"-tris(N,N-(2-naphthyl)-phenylamino)triphenylamine (2-TNATA) was placed in a cell of the vacuum vapor-deposit device, which was then vented to reach 10^{-6} torr of vacuum in the chamber. Electric current was applied to the cell to evaporate 2-TNATA to vapor-deposit a hole injection layer (3) with a thickness of 60 nm on the ITO substrate.



2-TNATA

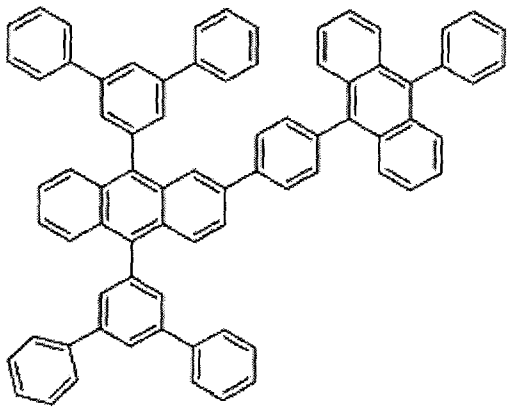
Then, another cell of the vacuum vapor-deposit device was charged with N,N'-bis(α-naphthyl)-N,N'-diphenyl-4,4'-diamine (NPB), and electric current was applied to the cell to evaporate NPB to vapor-deposit a hole transportation layer (4) with a thickness of 20 nm on the hole injection layer.



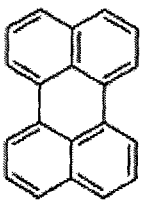
NPB

After formation of the hole injection layer and the hole

transportation layer, an electroluminescent layer was vapor-deposited as follows. One cell of the vacuum vapor-deposit device was charged with a compound according to the present invention (for example, Compound 121), while another cell of said device was charged with perylene (having the structure shown below) as a dopant material. Two substances were doped by evaporating with different rates to vapor-deposit an electroluminescent layer (5) with a thickness of 35 nm on the hole transportation layer, in a doping concentration of 1 to 2 mol% of perylene.



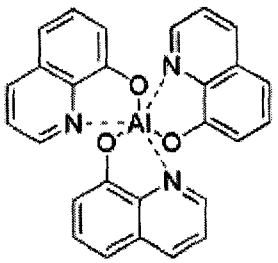
121



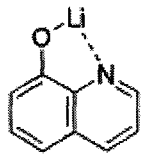
perylene

Then, tris(8-hydroxyquinoline)-aluminum (III) (Alq) having the structure shown below was vapor-deposited with a thickness of 20 nm as an electron transportation layer (6), followed by lithium quinolate (Liq) having the structure shown below with a thickness of 1~2 nm as an electron injection layer (7). An Al cathode (8) was vapor-deposited by using another vacuum vapor-deposit device with a thickness of 150 nm,

to manufacture an OLED.



Alq

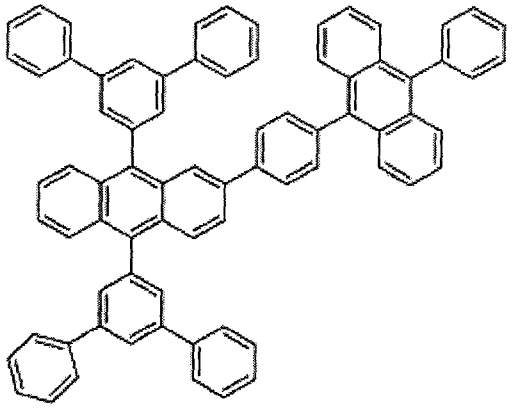


Liq

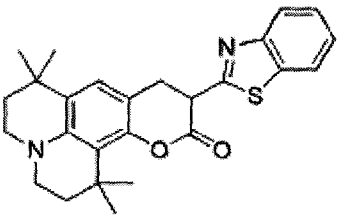
Each compound employed for an OLED was purified by vacuum sublimation under 10^{-6} torr, and employed as an electroluminescent material for an OLED.

[Examples 8-14] Manufacture of OLED's using the compounds according to the invention

After formation of a hole injection layer and a hole transportation layer as described in Example 1, an electroluminescent layer was vapor-deposited as follows. One cell of the vacuum vapor-deposit device was charged with a compound according to the invention (for example, Compound 121), while another cell of said device was charged with Coumarin 545T (C545T) having the structure shown below, respectively. The two substances were evaporated at different rates to carry out doping at a concentration of 1 to 2 mol% of Coumarin 545T (C545T) to provide an electroluminescent layer with a thickness of 35 nm on the hole transportation layer.



121

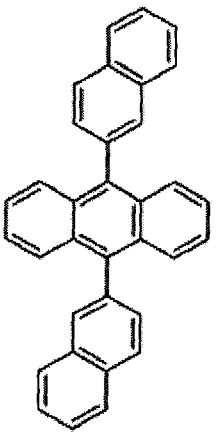


C545T

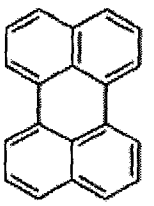
Then, an electron transportation layer and an electron injection layer were vapor-deposited according to the same procedure as described in Example 1, and an Al cathode was vapor-deposited with a thickness of 150 nm by using another vacuum vapor-deposit device to manufacture an OLED.

[Comparative Example 1] Manufacture of an OLED using a conventional EL material

After formation of a hole injection layer and a hole transportation layer as described in Example 1, one cell of the vacuum deposition device was charged with dinaphthylanthracene (DNA) as a blue electroluminescent material, and another cell was charged with perylene as a blue EL material. With a vapor-deposition rate of 100:1, an electroluminescent layer with a thickness of 35 nm was vapor-deposited on the hole transportation layer.



DNA



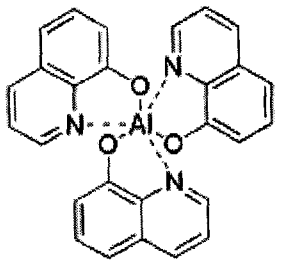
perylene

Then, an electron transportation layer and an electron injection layer were vapor-deposited according to the same procedure as described in Example 1, an Al cathode was vapor-deposited by using another vacuum vapor-deposit device with a thickness of 150 nm, to manufacture an OLED.

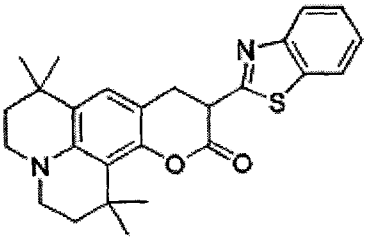
[Comparative Example 2] Manufacture of an OLED using a conventional EL material

After formation of a hole injection layer and a hole transportation layer as described in Example 1, another cell of the vacuum vapor-deposit device was charged with tris(8-hydroxyquinoline)aluminum (III) (Alq) as an electroluminescent host material, and still another cell was charged with Coumarin 545T (C545T). Two substances were doped by evaporation at different rates to vapor-deposit an electroluminescent layer with a thickness of 30 nm on the hole

transportation layer. Preferable doping concentration is from 1 to 2 mol% on the basis of Alq.



Alq



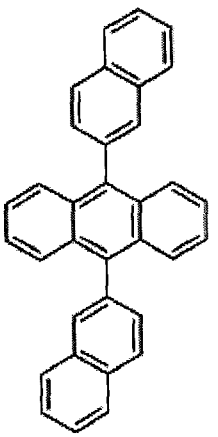
C545T

Then, an electron transportation layer and an electron injection layer were vapor-deposited according to the same procedure as described in Example 1, and an Al cathode was vapor-deposited by using another vacuum vapor-deposit device with a thickness of 150 nm, to manufacture an OLED.

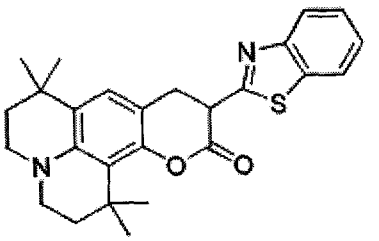
[Comparative Example 3] Manufacture of an OLED using a conventional EL material

After formation of a hole injection layer and a hole transportation layer as described in Example 1, another cell of the vacuum deposition device was charged with dinaphthylanthracene (DNA) as a blue electroluminescent material, and still another cell was charged with Coumarin 545T (C545T) having the structure shown below. Two substances were doped by evaporation at different rates to vapor-deposit an electroluminescent layer with a thickness of 30 nm on the hole transportation layer. Preferable doping concentration is

from 1 to 2 mol% on the basis of Alq.



DNA



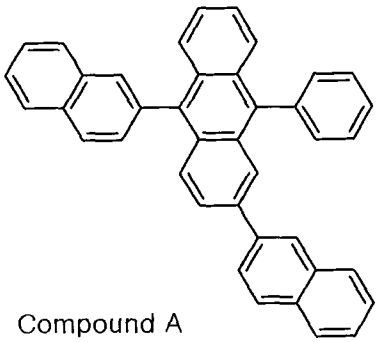
C545T

Then, an electron transportation layer and an electron injection layer were vapor-deposited according to the same procedure as described in Example 1, and an Al cathode was vapor-deposited by using another vacuum vapor-deposit device with a thickness of 150 nm, to manufacture an OLED.

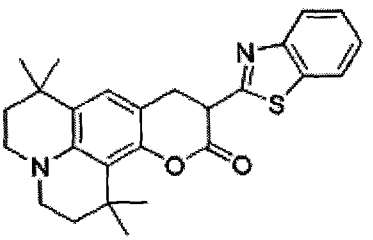
[Comparative Example 4] Manufacture of an OLED using a conventional EL material

After formation of a hole injection layer and a hole transportation layer as described in Example 1, another cell of the vacuum deposition device was charged with Compound (A) from US Patent Publication No. 20060046097A1 as a blue electroluminescent material, and still another cell was charged with Coumarin 545T (C545T) having the structure shown below. Two substances were doped by evaporation at different rates to vapor-deposit an electroluminescent layer with a

thickness of 30 nm on the hole transportation layer. Preferable doping concentration is from 1 to 2 mol% on the basis of Alq.



Compound A



C545T

Then, an electron transportation layer and an electron injection layer were vapor-deposited according to the same procedure as described in Example 1, and an Al cathode was vapor-deposited by using another vacuum vapor-deposit device with a thickness of 150 nm, to manufacture an OLED.

[Experimental Example 1] Blue and green electroluminescent properties of OLED's manufactured

Blue luminous efficiencies of OLED's comprising the organic electroluminescent compounds of the invention prepared from Examples 1~7 and a conventional electroluminescent (Comparative Example 1), and green luminous efficiencies of OLED's comprising the organic electroluminescent compounds of the invention prepared from Examples 8 to 14 and conventional electroluminescent compounds (Comparative Examples 2 to 4)

were determined at 10,000 cd/m^2. The results are shown in Tables 3 and 4.

[Table 3]

No.	Host	Dopant	Doping conc. (mol%)	Luminous efficiency (cd/A)@10,000 cd/m^2	EL color
Ex. 1	Compound 101	Perylene	2.0	4.5	Blue
Ex. 2	Compound 103	Perylene	2.0	4.8	Blue
Ex. 3	Compound 109	Perylene	2.0	4.7	Blue
Ex. 4	Compound 113	Perylene	2.0	4.2	Blue
Ex. 5	Compound 121	Perylene	2.0	4.9	Blue
Ex. 6	Compound 130	Perylene	2.0	4.2	Blue
Ex. 7	Compound 135	Perylene	2.0	4.6	Blue
Comp.Ex. 1	DNA	Perylene	2.0	2.4	Blue

[Table 4]

No.	Host	Dopant	Doping conc. (mol%)	Luminous efficiency (cd/A)@10,000 cd/m^2	EL color
Ex. 8	Compound 101	C545T	2.0	17.8	Green
Ex. 9	Compound 103	C545T	2.0	18.2	Green
Ex. 10	Compound 109	C545T	2.0	18.4	Green
Ex. 11	Compound 113	C545T	2.0	18.1	Green
Ex. 12	Compound 121	C545T	2.0	19.8	Green
Ex. 13	Compound 130	C545T	2.0	18.6	Green
Ex. 14	Compound 135	C545T	2.0	17.8	Green

Comp.Ex. 2	Alq	C545T	2.0	8.0	Green
Comp.Ex. 3	DNA	C545T	2.0	12.0	Green
Comp.Ex. 4	Compound A	C545T	2.0	12.7	Green

Tables 3 and 4 exhibit the results of properties obtained when the electroluminescent materials of the present invention were applied to blue and green light-emitting devices. For both blue and green light-emitting devices, superior properties at high luminance could be commonly confirmed as compared to conventional electroluminescent materials.

The luminous efficiency was improved by 100% or more as compared to Alq host, and by 40% or more as compared to the conventional host in Comparative Example 3. These results elucidate definite overcome of limitation of conventional green electroluminescent materials. In particular, it is estimated that the excellent improvement of performance at high luminance sufficiently enables the compounds to be used in practical use for large screen OLED's, or manual OLED's of 2-inch level which require critical properties.

The EL material according to the present invention can be applied to both a blue OLED and a green OLED, and showed excellent results in view of performances. Those results show prominent characteristics as excellent EL materials. The

invention of the material having those characteristics leads simplification of the structure of an OLED panel, to result in subsidiary result of reducing the production cost of an OLED. Due to the excellent features, innovative results may occur in development in the field of OLED's.

【Industrial Applicability】

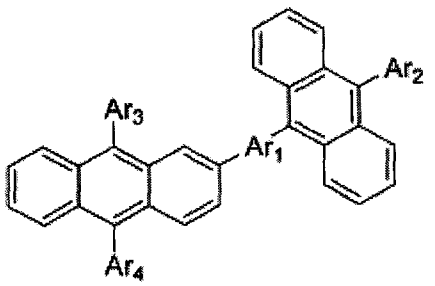
The organic electroluminescent compounds according to the invention are advantageous in that they exhibit high luminous efficiency and excellent life property as an electroluminescent material, so that blue and green electroluminescent materials with very good operation lifetime of devices and organic light-emitting devices comprising the same can be obtained.

【CLAIMS】

【Claim 1】

An organic electroluminescent material represented by Chemical Formula (1):

[Chemical Formula 1]



wherein, Ar_1 is a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused, provided that Ar_1 is not anthracenyl;

Ar_2 through Ar_4 independently represent a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused; and

the aromatic ring or the fused polycyclic aromatic ring with two or more aromatic rings having been fused of Ar_1 through Ar_4 may be further substituted by one or more substituent(s) selected from (C_1-C_{20})alkyl, (C_1-C_{20})alkoxy, halogen, tri(C_1-C_{20})alkylsilyl, tri(C_6-C_{20})arylsilyl, a (C_5-C_{20}) aromatic ring and a fused polycyclic aromatic ring with two or more aromatic rings having been fused.

【Claim 2】

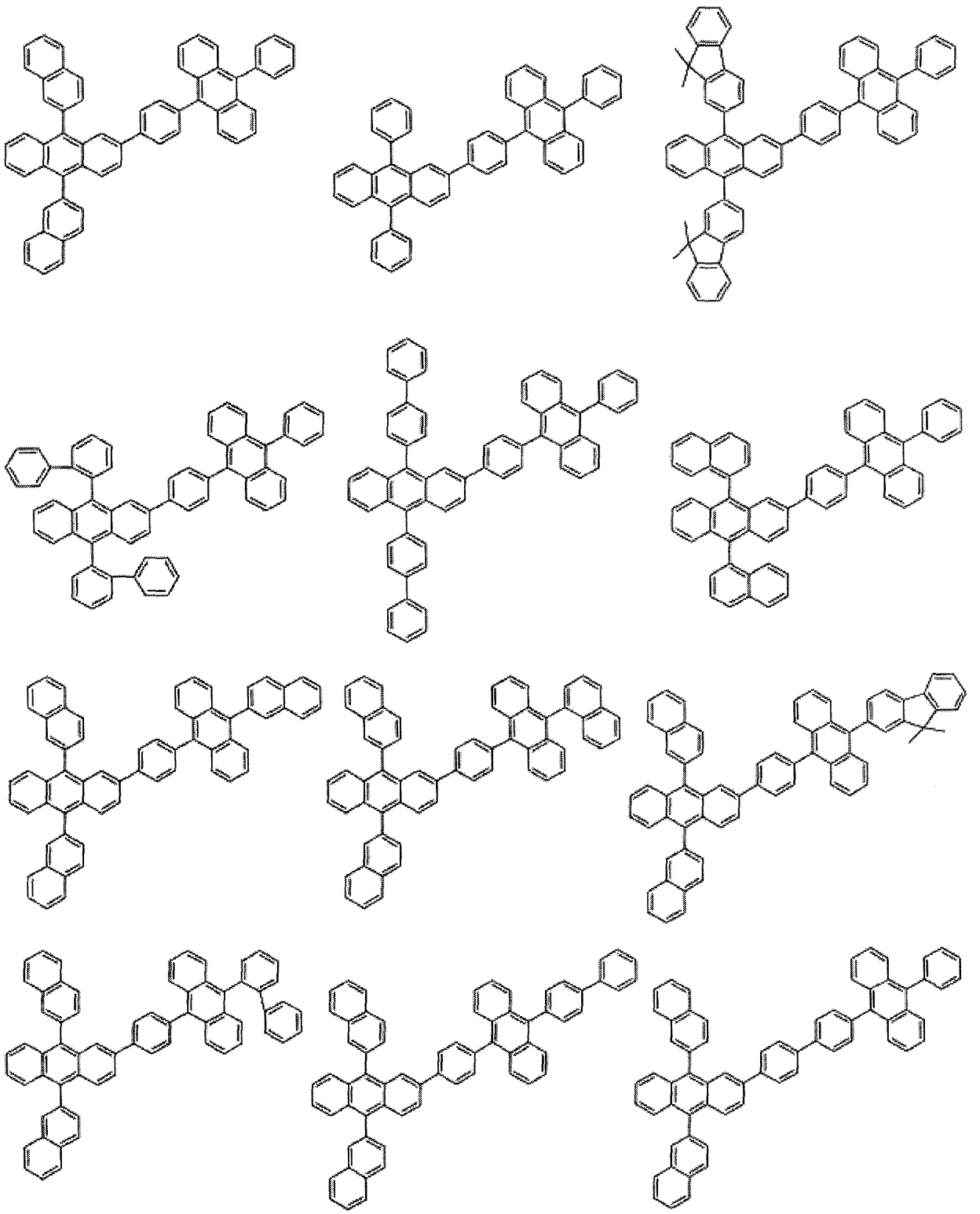
An organic electroluminescent material according to claim 1, wherein

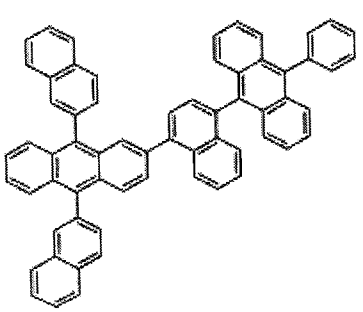
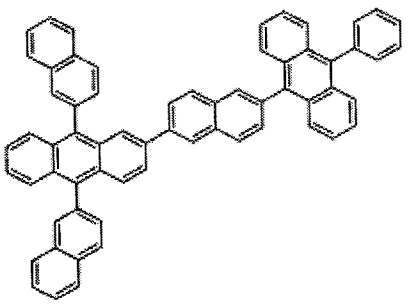
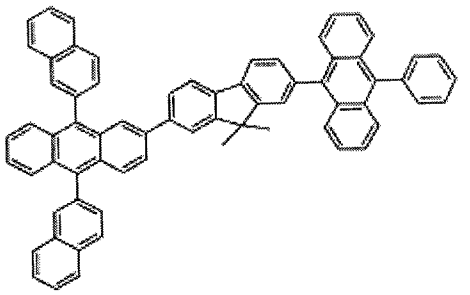
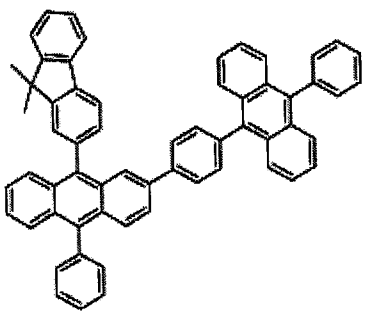
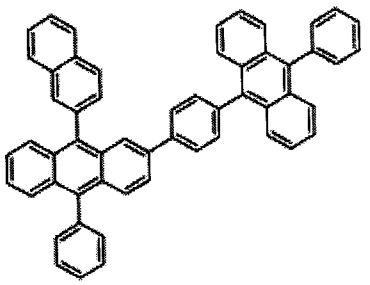
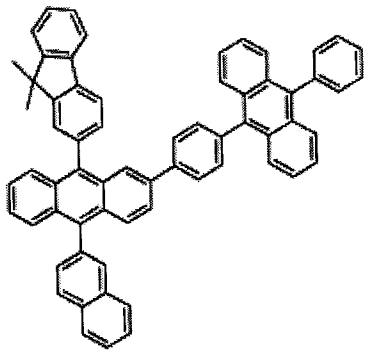
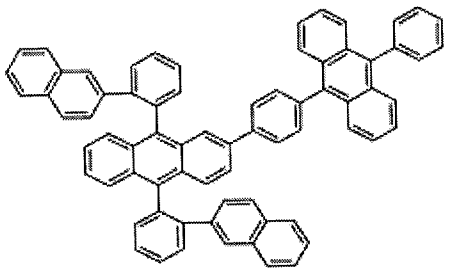
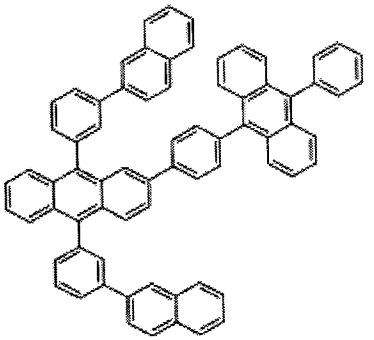
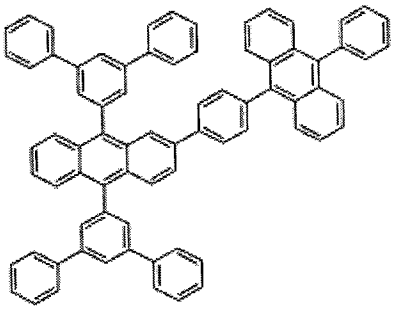
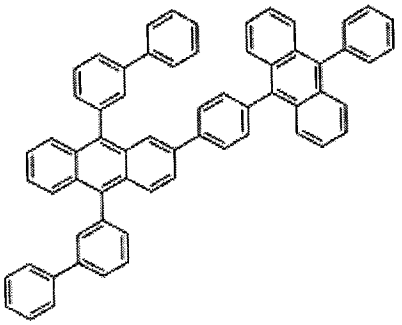
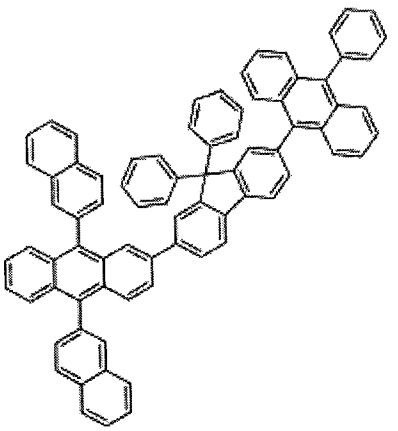
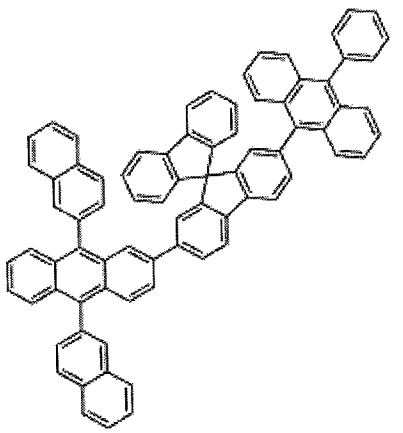
Ar_1 represents phenylene, biphenylene, naphthylene, fluorenylene, spirobifluorenylene, phenanthrylene, triphenylenylene, pyrenylene, chrysenylene or naphthacenylene, and Ar_1 may be further substituted by (C_1-C_{20})alkyl or phenyl; and

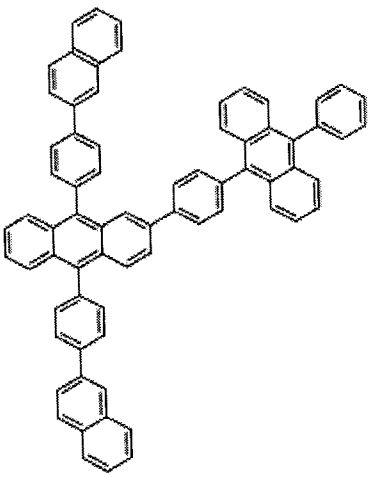
Ar_2 through Ar_4 independently represent phenyl, naphthyl, anthryl, biphenyl, fluorenyl, phenanthryl, triphenylenyl, pyrenyl, chrysenyl or naphthacenyl, and Ar_2 through Ar_4 may be further substituted by one or more substitutent(s) selected from (C_1-C_{20})alkyl, (C_1-C_{20})alkoxy, halogen, tri(C_1-C_{20})alkylsilyl, tri(C_6-C_{20})arylsilyl, phenyl, naphthyl, anthryl, fluorenyl, 9,9-dimethyl-fluoren-2-yl and 9,9-diphenyl-fluoren-2-yl.

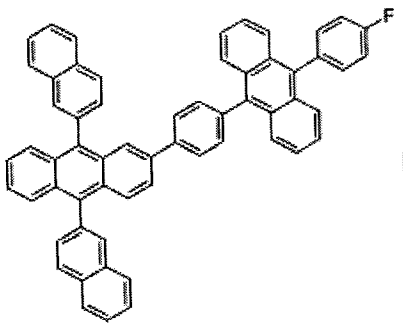
【Claim 3】

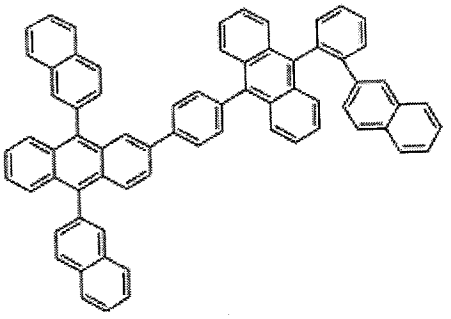
An organic electroluminescent compound according to claim 2, which is selected from the compounds represented by one of the following chemical formulas:

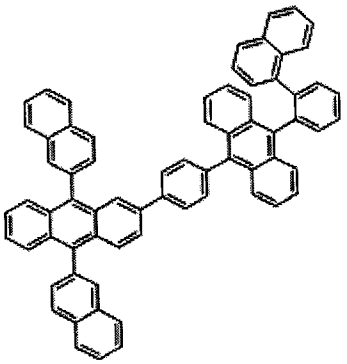


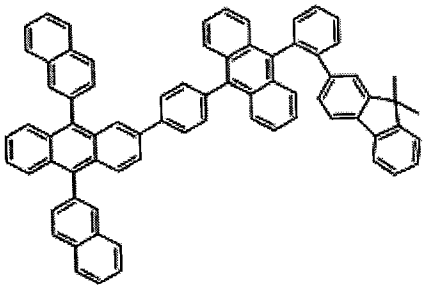













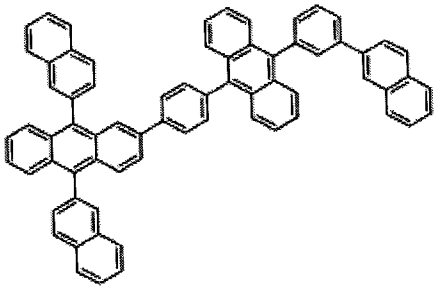


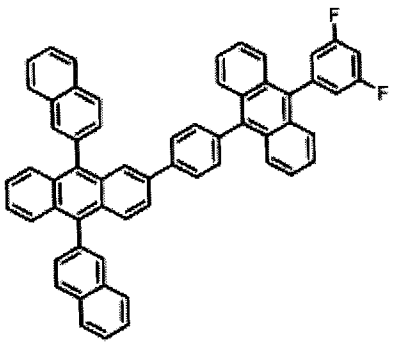

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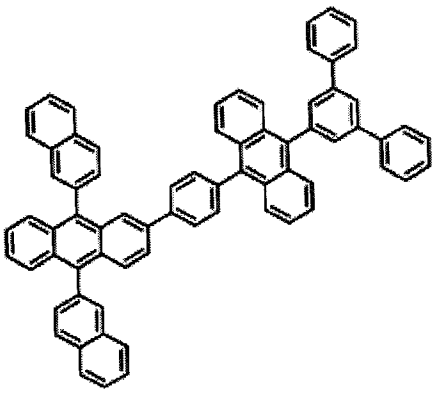


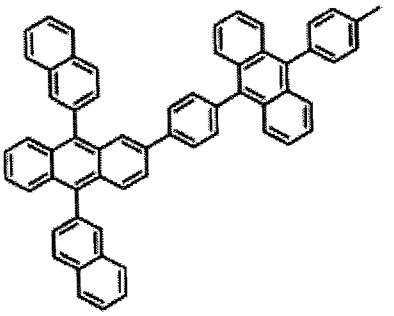


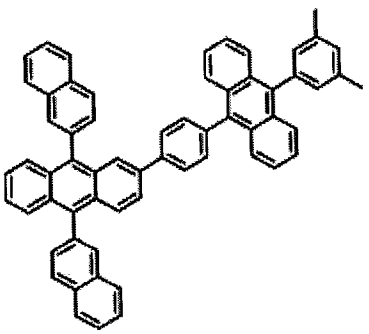


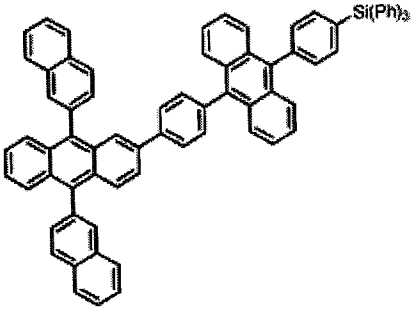


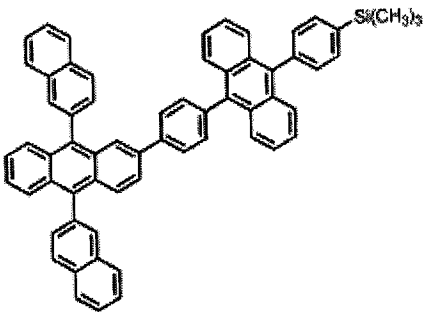

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Si(Ph)3


Si(CH3)3

【Claim 4】

An organic light emitting device consisting of

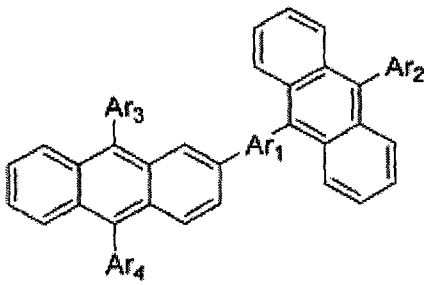
a first electrode;

a second electrode; and

at least one organic layer(s) interposed between the first electrode and the second electrode;

wherein the organic layer comprises one or more organic compound(s) represented by Chemical Formula (1):

[Chemical Formula 1]



wherein, Ar_1 is a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused, provided that Ar_1 is not anthracenyl;

Ar_2 through Ar_4 independently represent a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused; and

the aromatic ring or the fused polycyclic aromatic ring with two or more aromatic rings having been fused of Ar_1 through Ar_4 may be further substituted by one or more substituent(s) selected from (C_1-C_{20})alkyl, (C_1-C_{20})alkoxy,

halogen, tri(C_1-C_{20})alkylsilyl, tri(C_6-C_{20})arylsilyl, a (C_5-C_{20}) aromatic ring and a fused polycyclic aromatic ring with two or more aromatic rings having been fused.

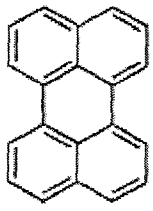
【Claim 5】

An organic light emitting device according to claim 4, wherein the organic layer comprises electroluminescent (EL) region, which comprises one or more compound(s) represented by Chemical Formula (1) and one or more EL dopant(s).

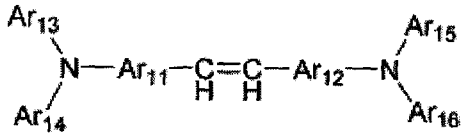
【Claim 6】

An organic light emitting device according to claim 5, wherein the EL dopant is selected from the compounds represented by one of Chemical Formulas' (2) to (4):

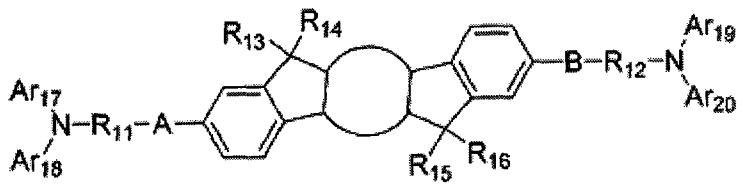
[Chemical Formula 2]



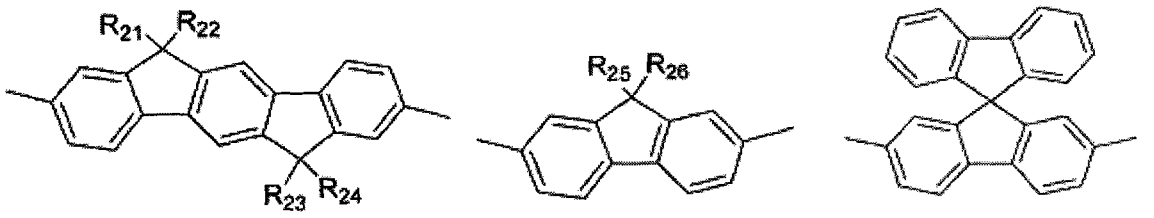
[Chemical Formula 3]



[Chemical Formula 4]

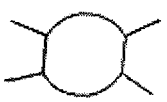
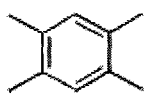
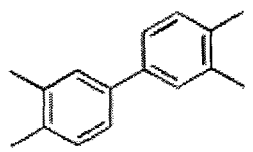


wherein, Ar_{11} or Ar_{12} is preferably selected from indenofluorenylene, fluorenylene and spiro-fluorenylene, represented by following chemical formulas:

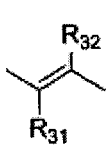
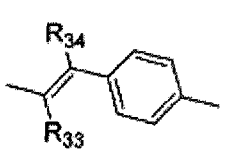


wherein Ar_{13} through Ar_{16} are independently selected from (C_5-C_{20}) aromatic or polycyclic aromatic rings; provided that Ar_{11} and Ar_{12} are identical, Ar_{13} and Ar_{15} are identical, and Ar_{14} and Ar_{16} are identical.

Ar_{17} through Ar_{20} independently represent a (C_5-C_{20}) aromatic ring or a fused polycyclic aromatic ring with two or more aromatic rings having been fused;

group  represents  or  ;

A and B independently represent a chemical bond, or group

 or  ;

R_{11} and R_{12} independently represent a (C_5-C_{20}) aromatic ring or a polycyclic aromatic ring with two or more aromatic rings having been fused;

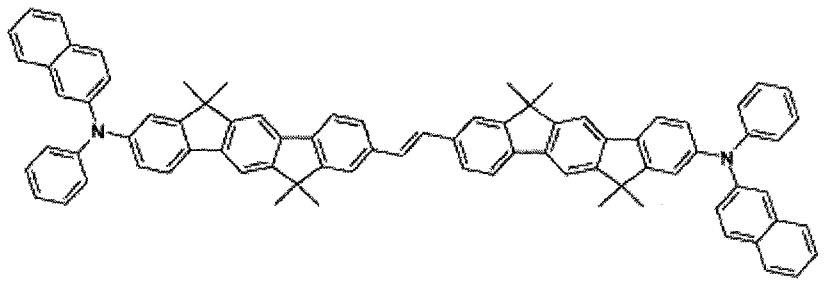
R_{13} through R_{16} independently represent a linear or branched (C_1-C_{20}) alkyl group with or without halogen substituent(s);

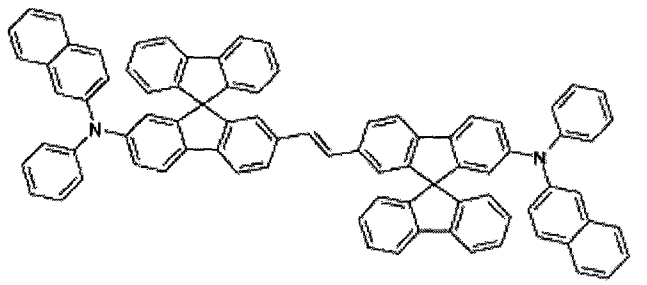
R_{21} through R_{26} are independently selected from (C_1-C_{20}) alkyl, and phenyl or naphthyl with or without (C_1-C_5)alkyl substituent(s); and

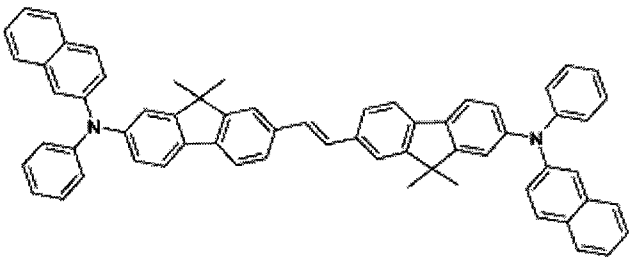
R_{31} through R_{34} independently represent hydrogen or a (C_5-C_{20}) aromatic group.

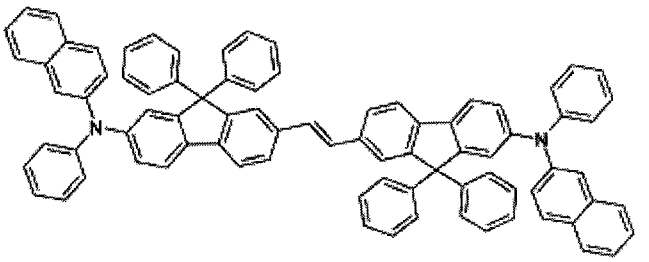
【Claim 7】

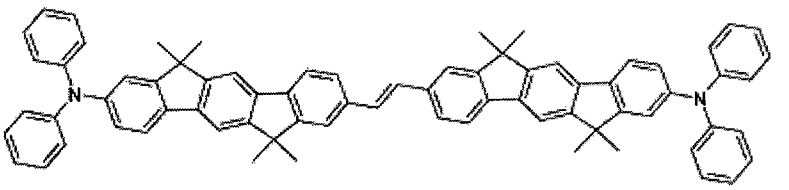
An organic light emitting device according to claim 6, wherein the EL dopant is selected from the compounds represented by one of the following formulas:

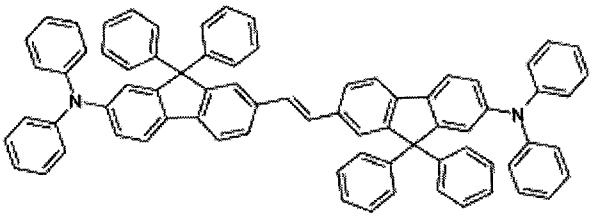


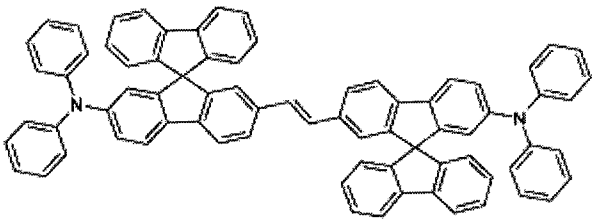


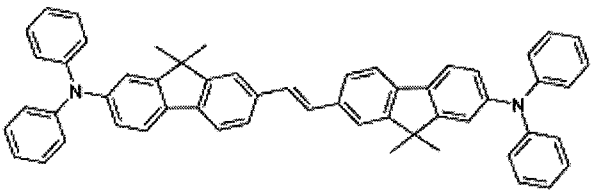


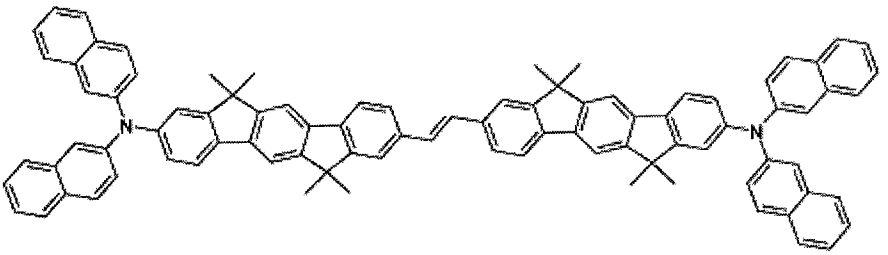


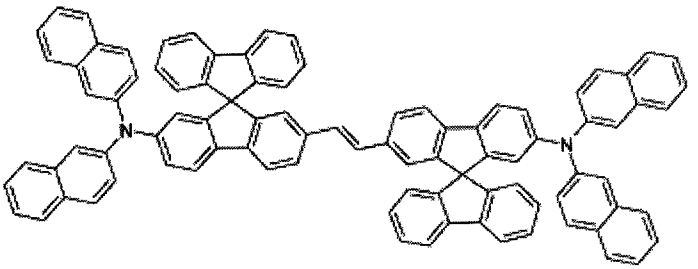


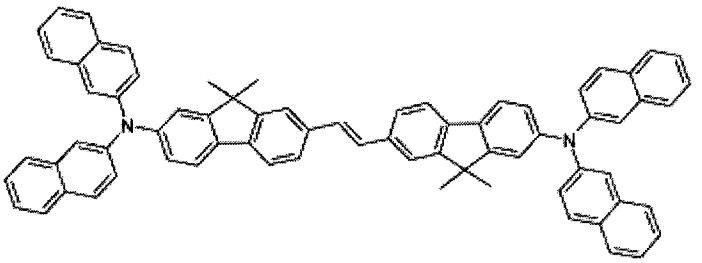


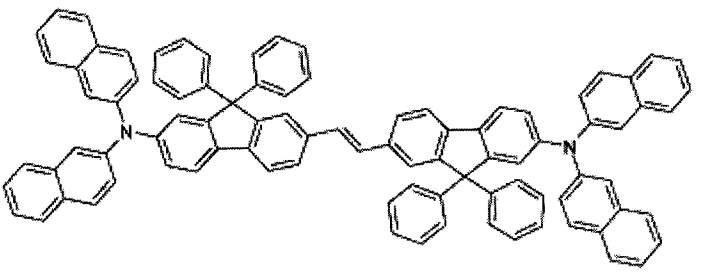


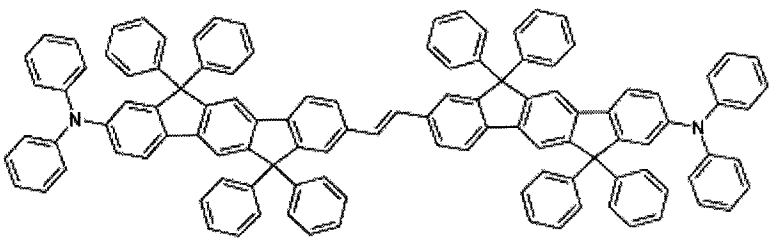


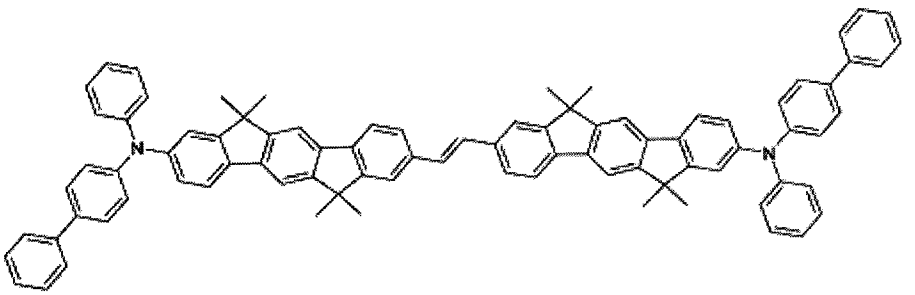


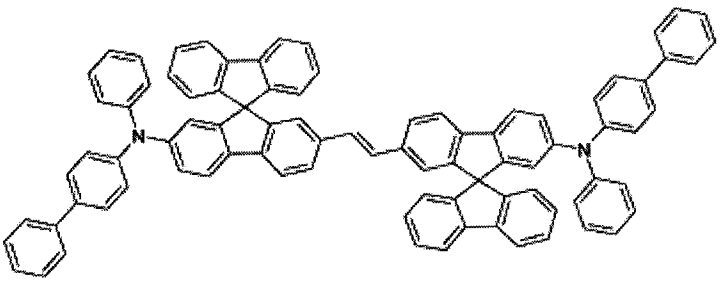


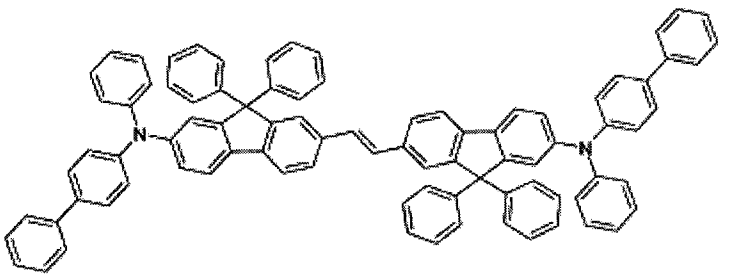


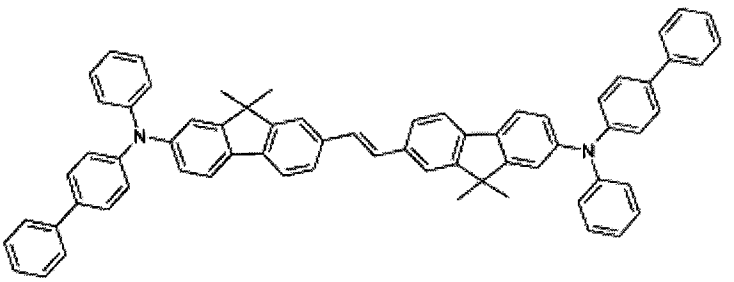


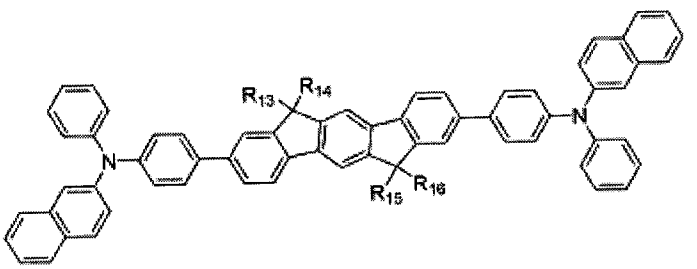


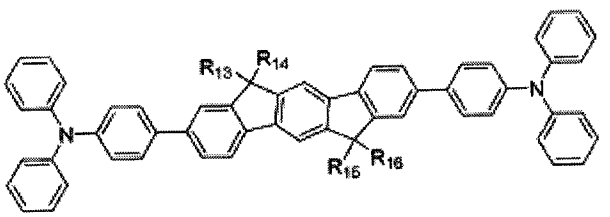


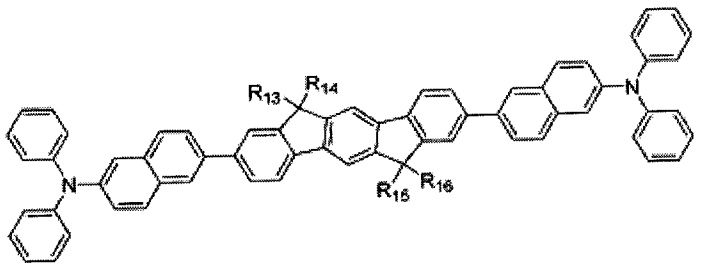


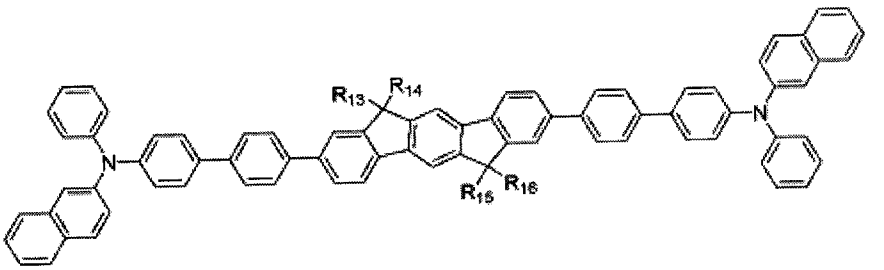


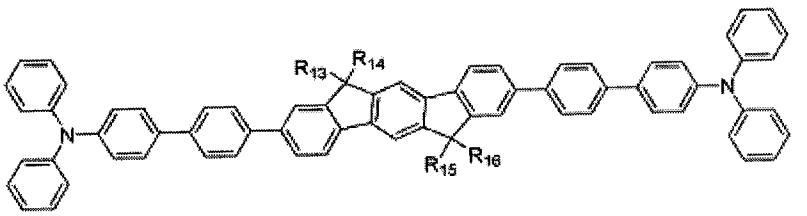


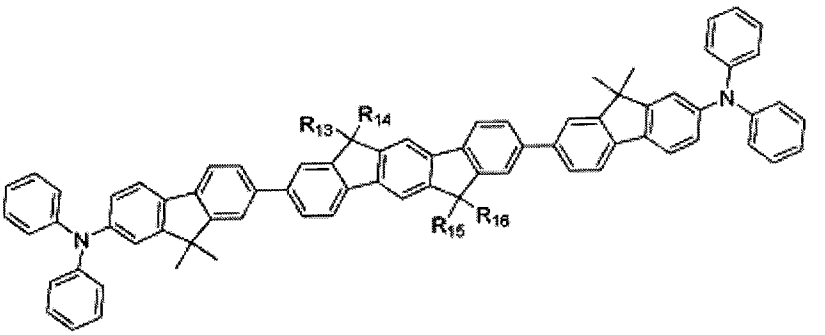

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R16

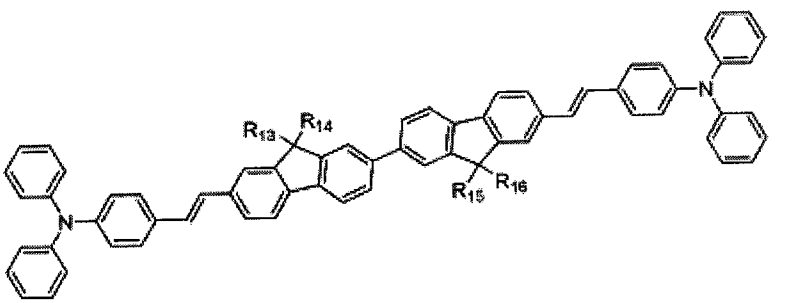

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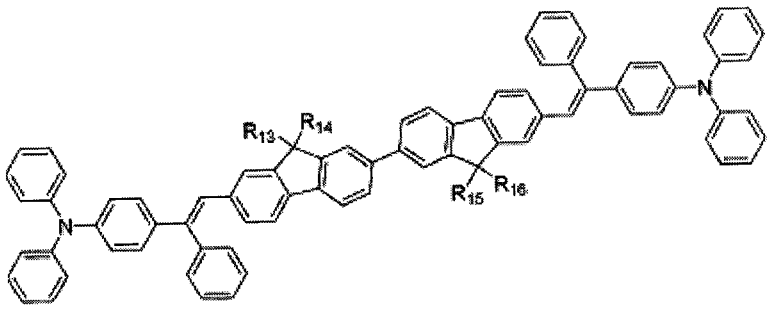

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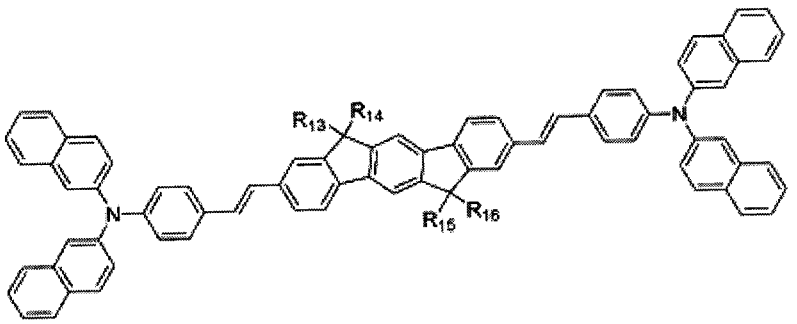

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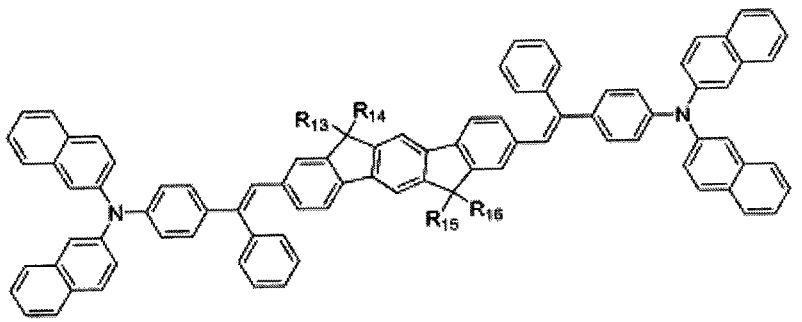

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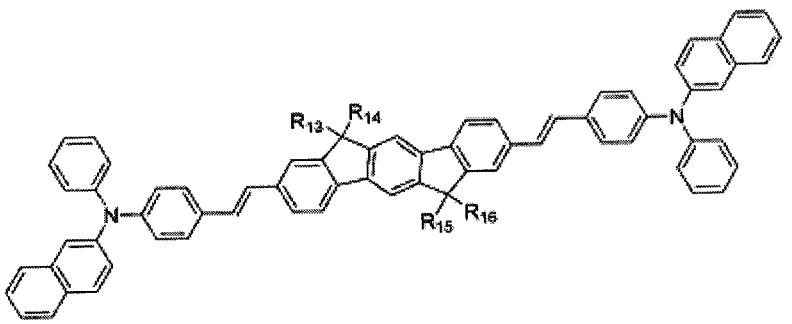

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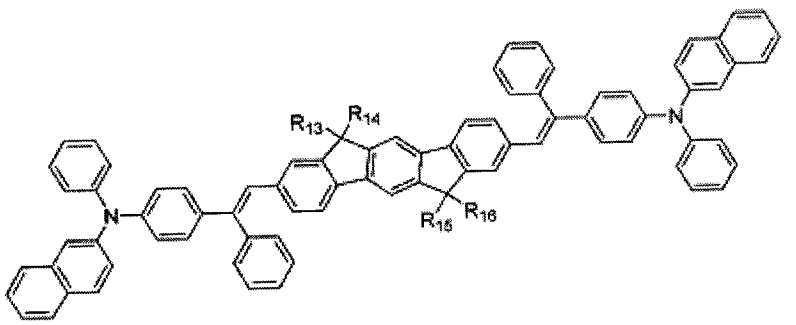

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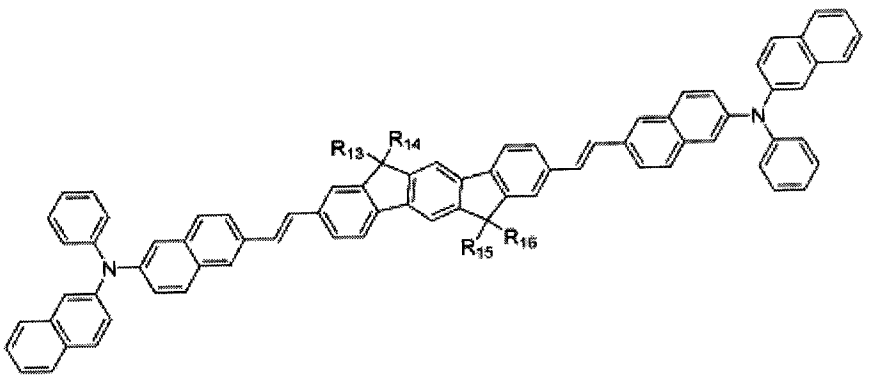

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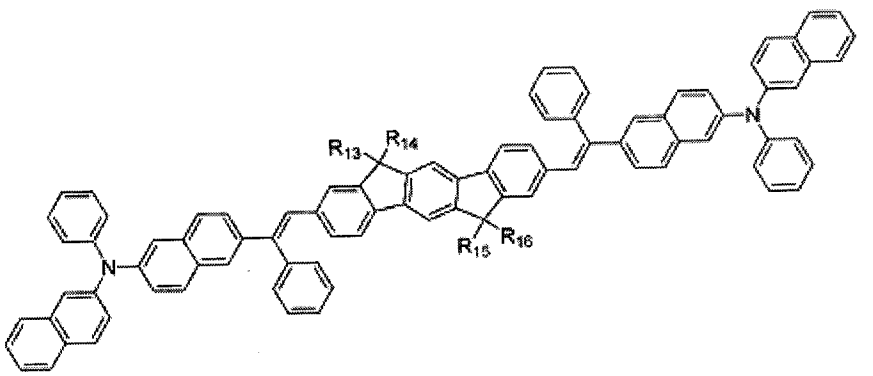

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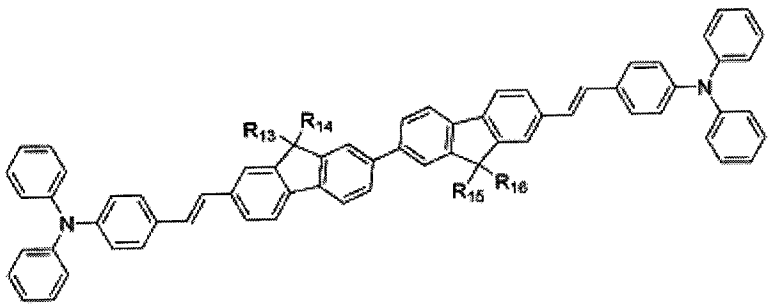

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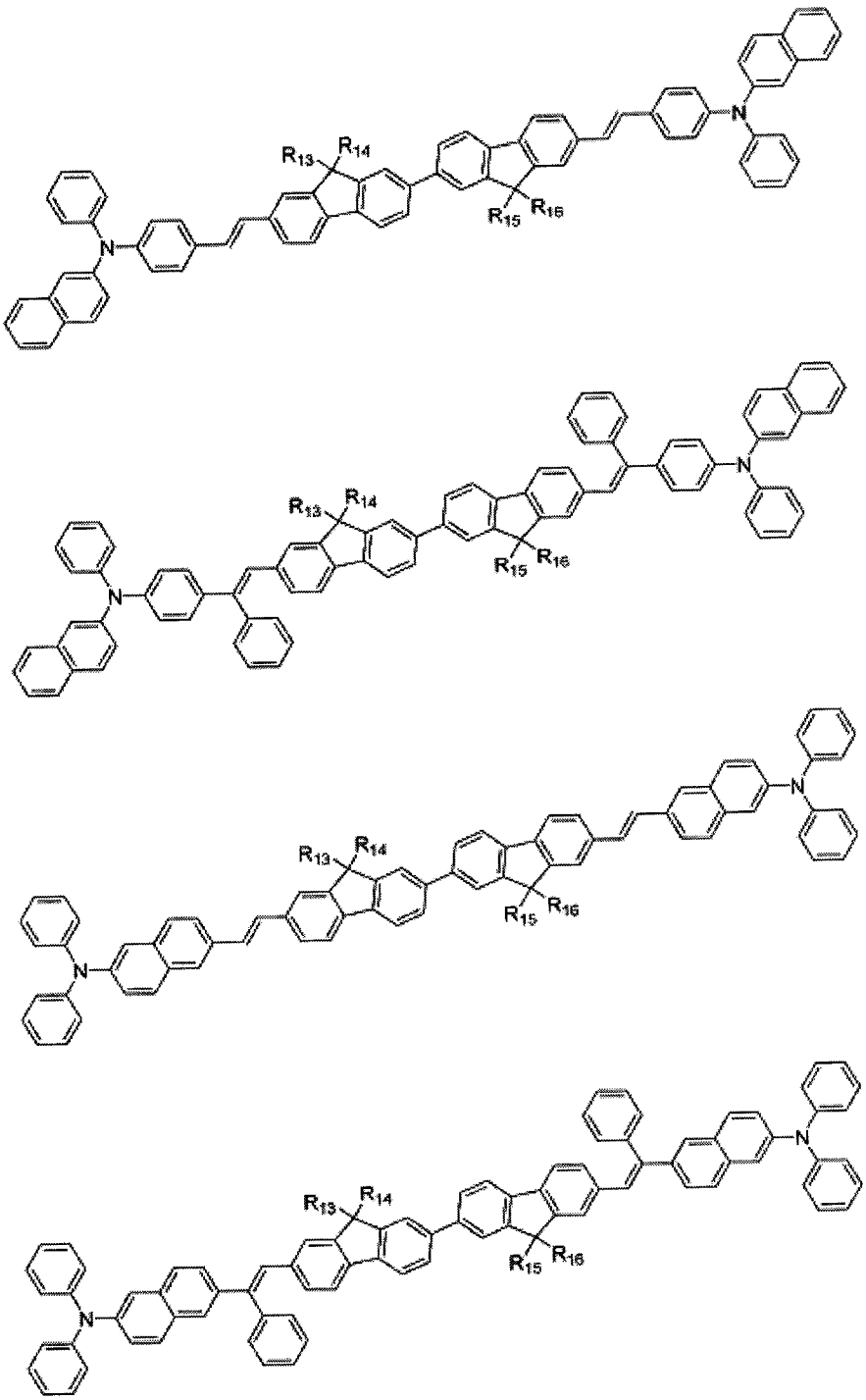

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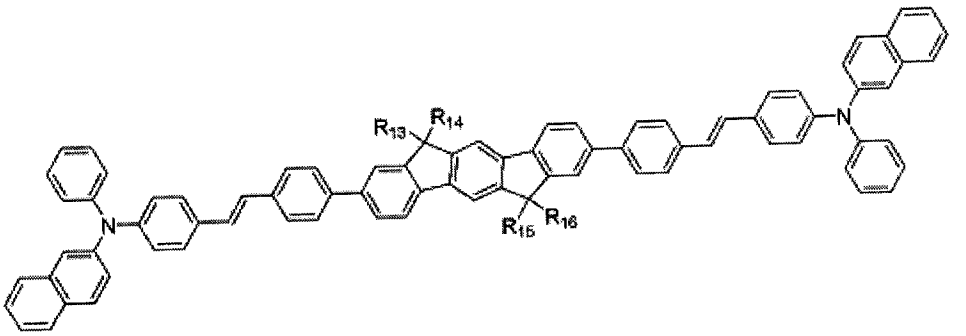

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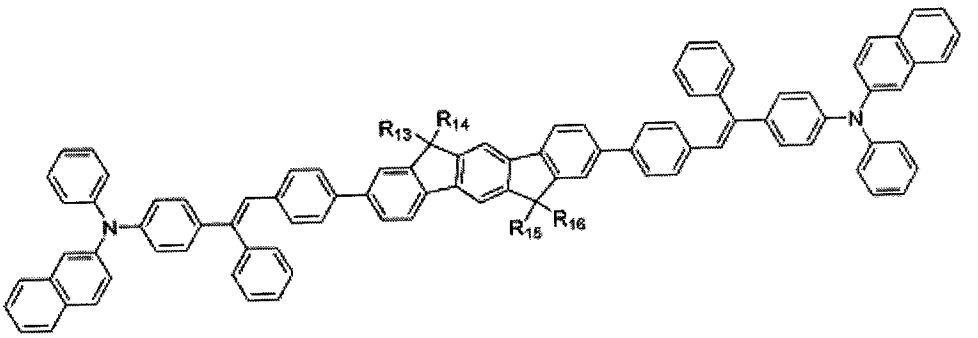

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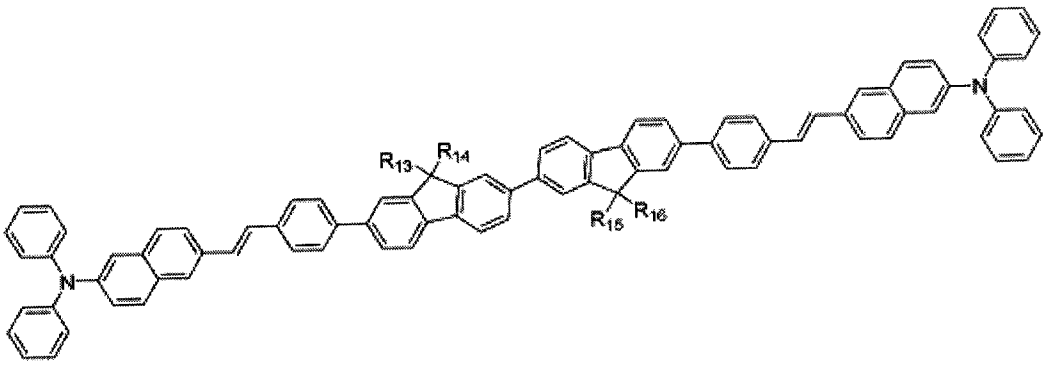

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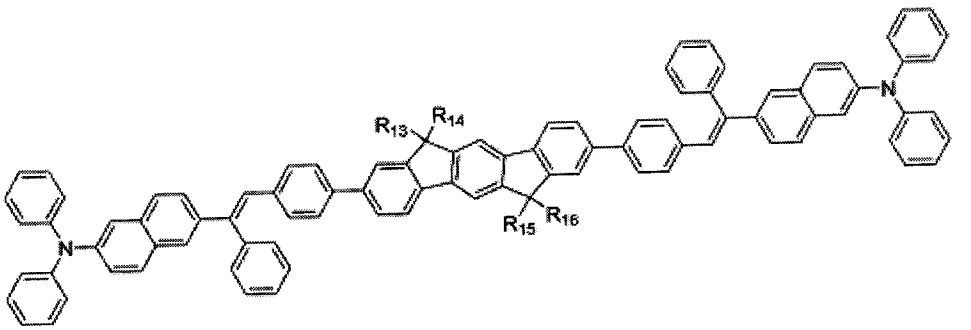

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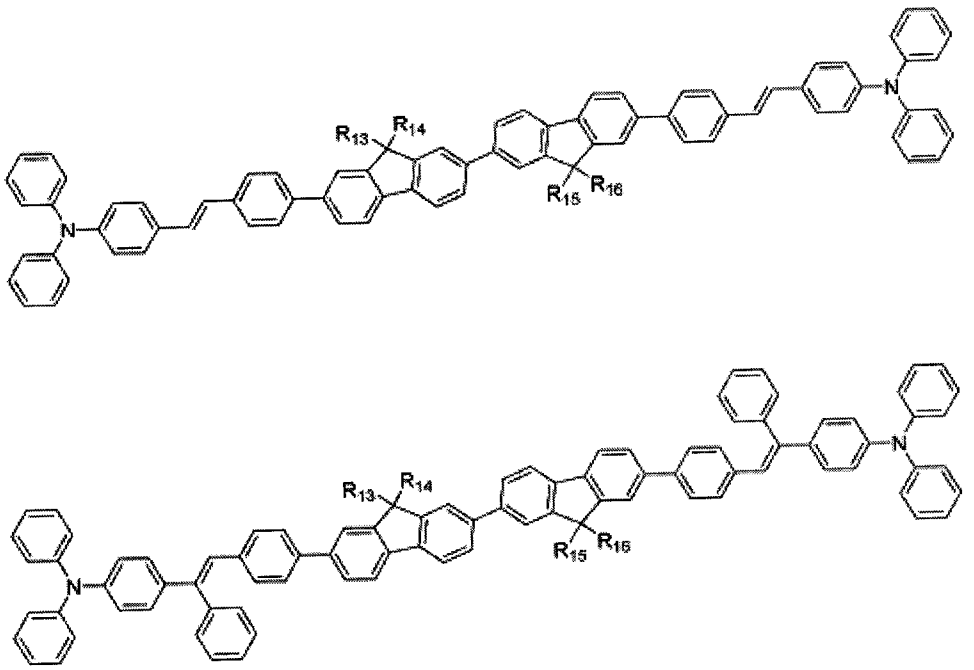



R13
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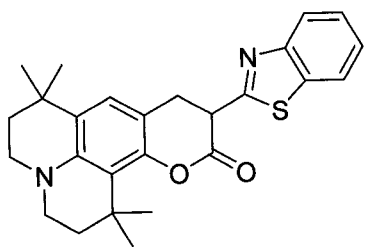


wherein, R_{13} through R_{16} represent methyl or ethyl group.

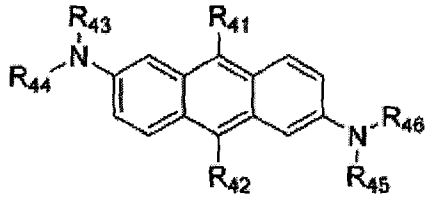
【Claim 8】

An organic light emitting device according to claim 5, wherein the EL dopant is selected from the compounds represented by one of Chemical Formulas (5) to (7):

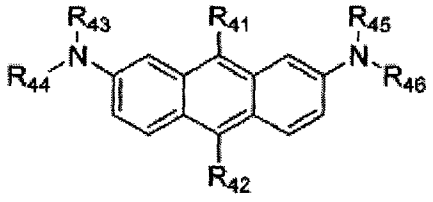
[Chemical Formula 5]



[Chemical Formula 6]



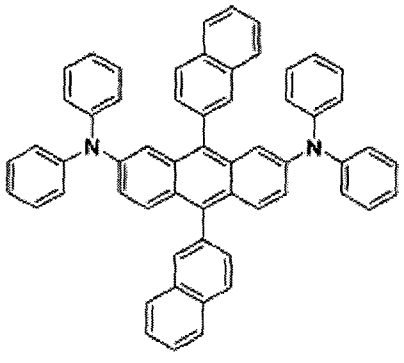
[Chemical Formula 7]

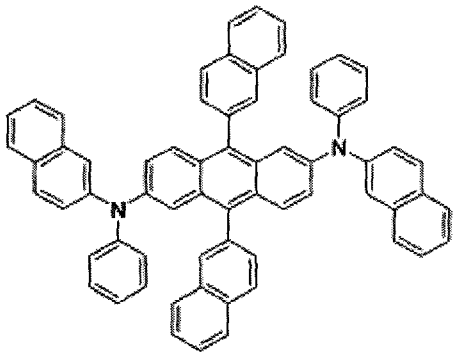


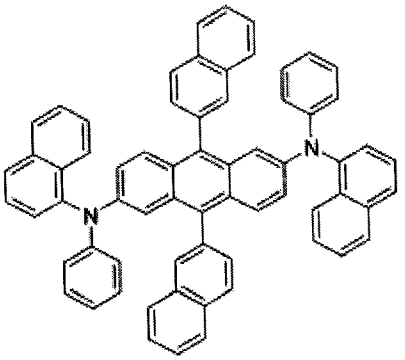
wherein, R_{41} and R_{42} independently represent a polycyclic aromatic ring with two more aromatic rings having been fused; R_{43} through R_{46} independently represent a (C_5-C_{20}) aromatic ring; and each aromatic ring of R_{41} through R_{46} may be further substituted by (C_1-C_{20}) alkyl or (C_5-C_{20}) aryl group(s).

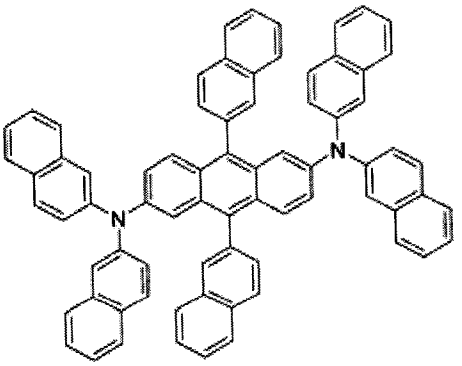
【Claim 9】

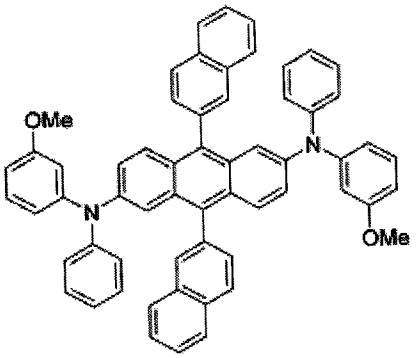
An organic light emitting device according to claim 8, wherein the EL dopant is selected from the compounds represented by one of the following formulas:

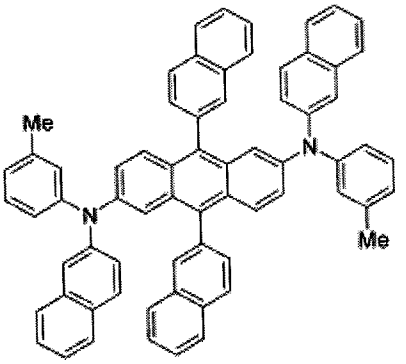


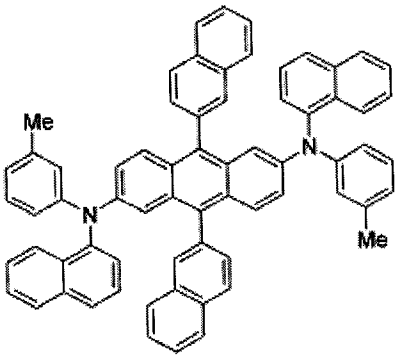


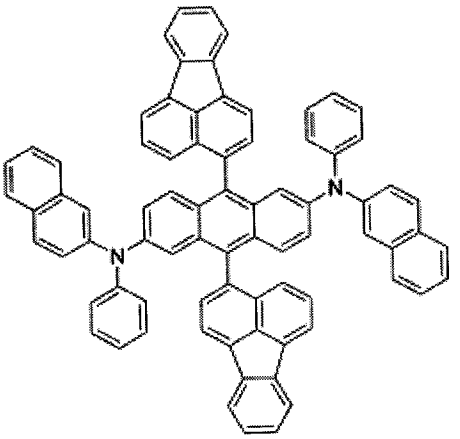


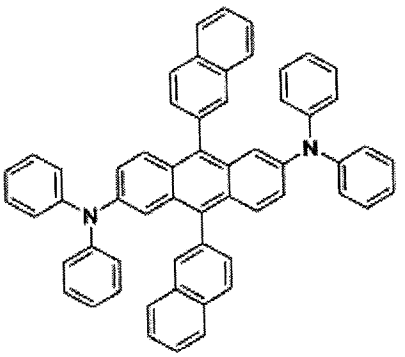


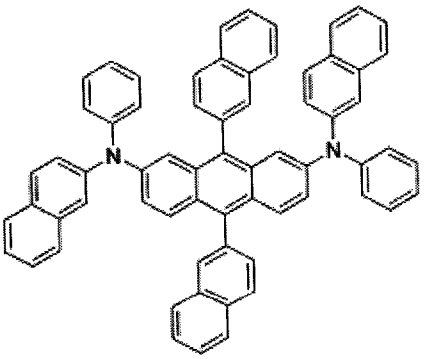

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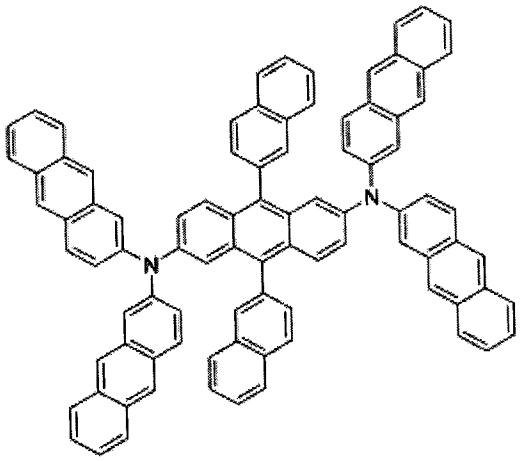

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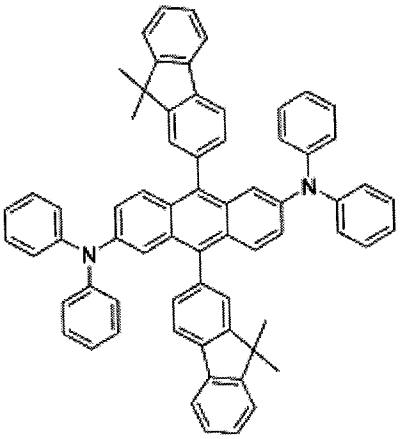

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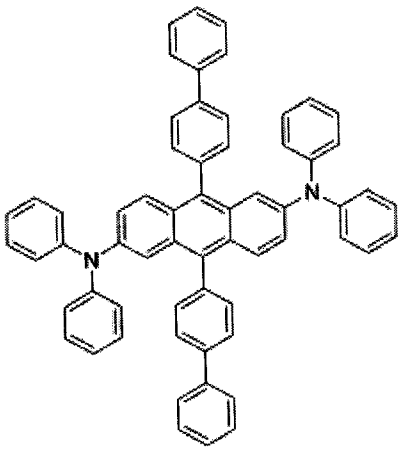


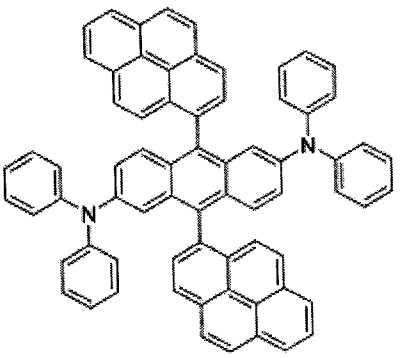






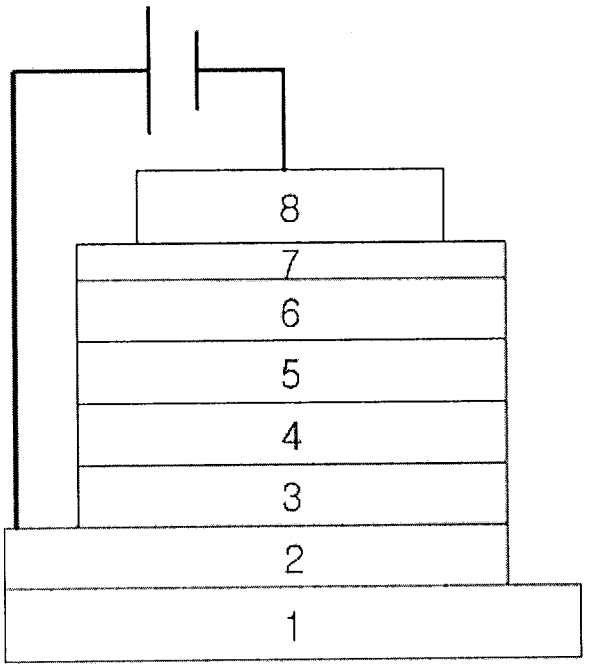






【DRAWINGS】

【Figure 1】



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2008/003917

A. CLASSIFICATION OF SUBJECT MATTER

C09K 11/06(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 : 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 (KIPO internal), USPAT, PAJ, REGISTRY and CAPLUS (STN)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2006-025700 A1 (LG CHEM. LTD.) 09.03.2006 See abstract and claims.	1-9
A	WO 2003-060956 A2 (LG CHEM, LTD.) 24.07.2003 See abstract and claims.	1-9
A	US 6638644 B (ZHENG et al.) 28.10.2003 See abstract and claims.	1-9
PX	US 2007-205412 A1 (BAE et al.) 06.09.2007 See abstract and claims.	1-9

☐ 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
06 AUGUST 2008 (06.08.2008)	**06 AUGUST 2008 (06.08.2008)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

OH, Se Zu

Telephone No. 82-42-481-8156

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2008/003917

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		WO 2007-102683 A1	13.09.2007