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Nishide et al.

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(54) **ORGANIC ELECTROLUMINESCENT DEVICE COMPRISING DELAYED FLUORESCENT MATERIALS**

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H01L 51/50 (2006.01)
H01L 51/00 (2006.01)

(52) **U.S. Cl.**
CPC ***H01L 51/504*** (2013.01); ***H01L 51/5028*** (2013.01); ***H01L 51/5036*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H01L 51/5024
See application file for complete search history.

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Assistant Examiner — Christopher M Roland
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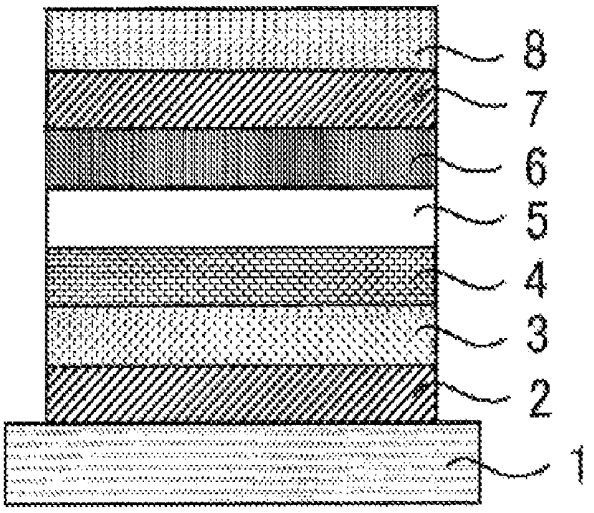
(57) **ABSTRACT**

An organic electroluminescent device containing a cathode, an anode, and one or more organic layers containing plural light emitting materials between the cathode and the anode, wherein the organic electroluminescent device is a multiple wavelength light emitting organic electroluminescent device emitting light from the plural light emitting materials, and which is designed so that light that has the shortest wavelength contains delayed fluorescent light can improve light emission efficiency of a short wavelength light and color tone and has a large degree of freedom in design and a simple structure.

17 Claims, 11 Drawing Sheets



(52) **U.S. Cl.**
CPC *H01L 51/005* (2013.01); *H01L 51/006* (2013.01); *H01L 51/0058* (2013.01); *H01L 51/0067* (2013.01); *H01L 51/0071* (2013.01); *H01L 51/0072* (2013.01); *H01L 51/0074* (2013.01); *H01L 51/5024* (2013.01); *H01L 51/5056* (2013.01); *H01L 51/5072* (2013.01); *H01L 51/5088* (2013.01); *H01L 51/5092* (2013.01); *H01L 51/5096* (2013.01)

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Fig. 1

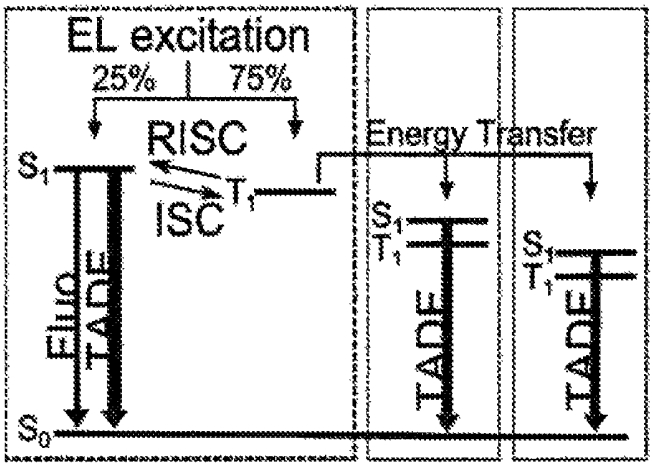

Fig. 2

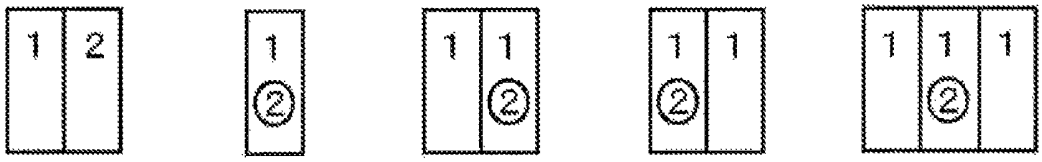

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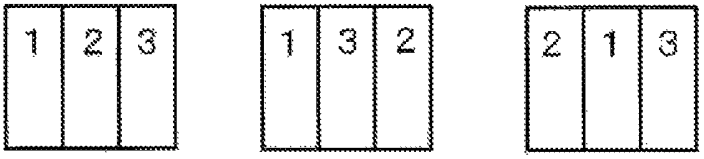
Fig. 3



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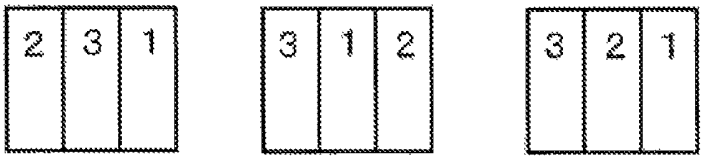
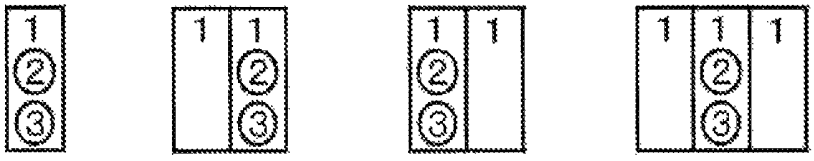


(2-4) (2-5) (2-6)

Fig. 4



(3-1) (3-2) (3-3) (3-4)

Fig. 5

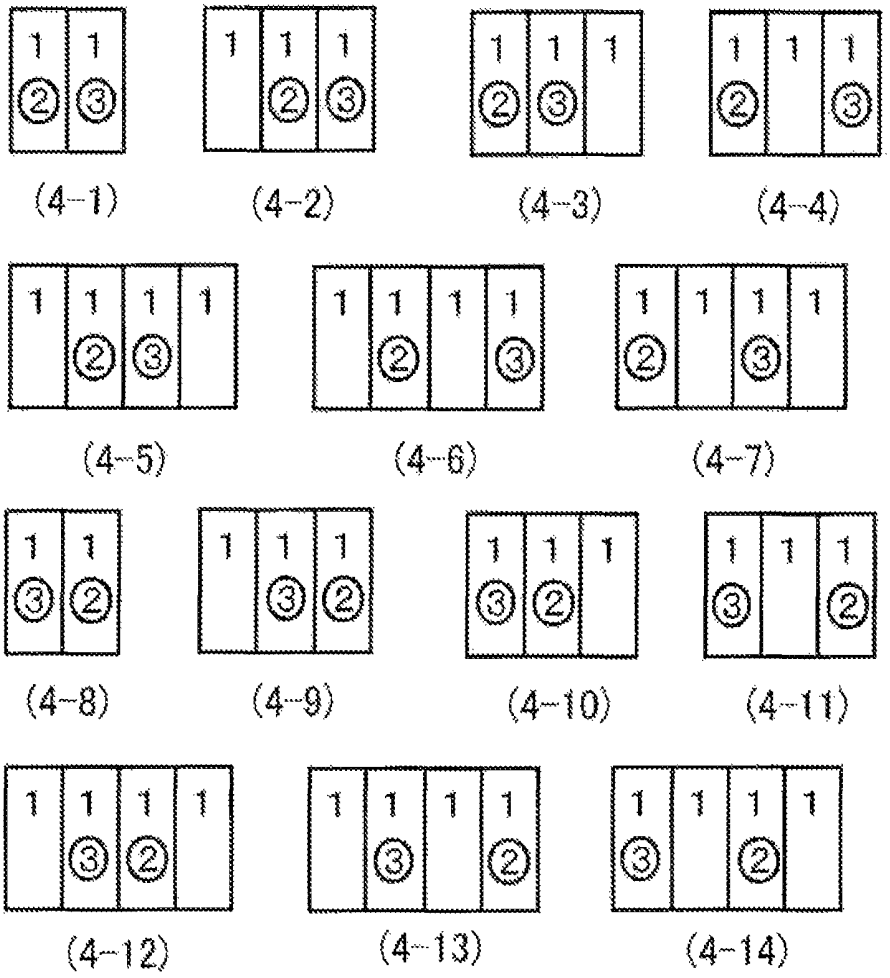


Fig. 6

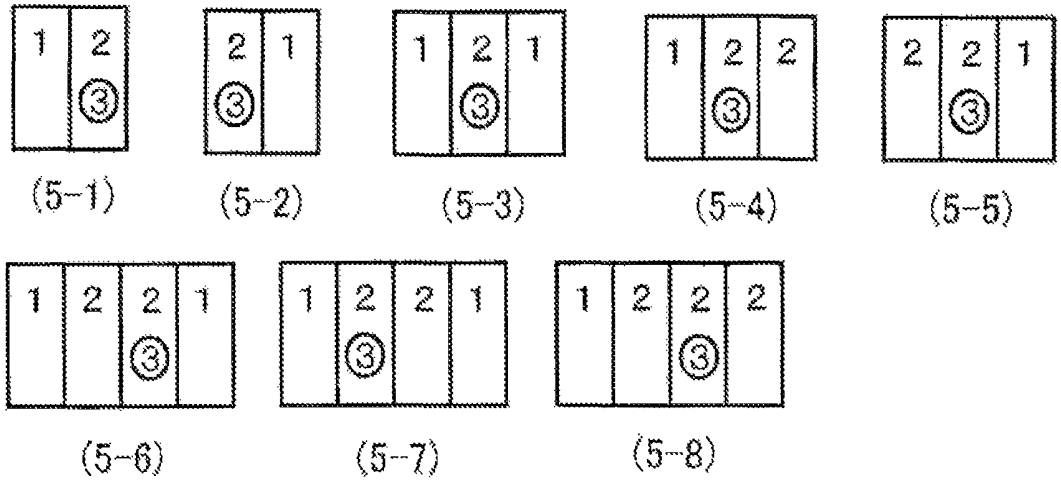


Fig. 7

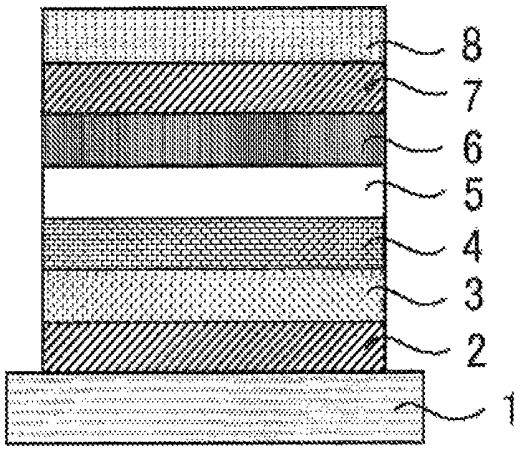

8
7
6
5
4
3
2
1

Fig. 8

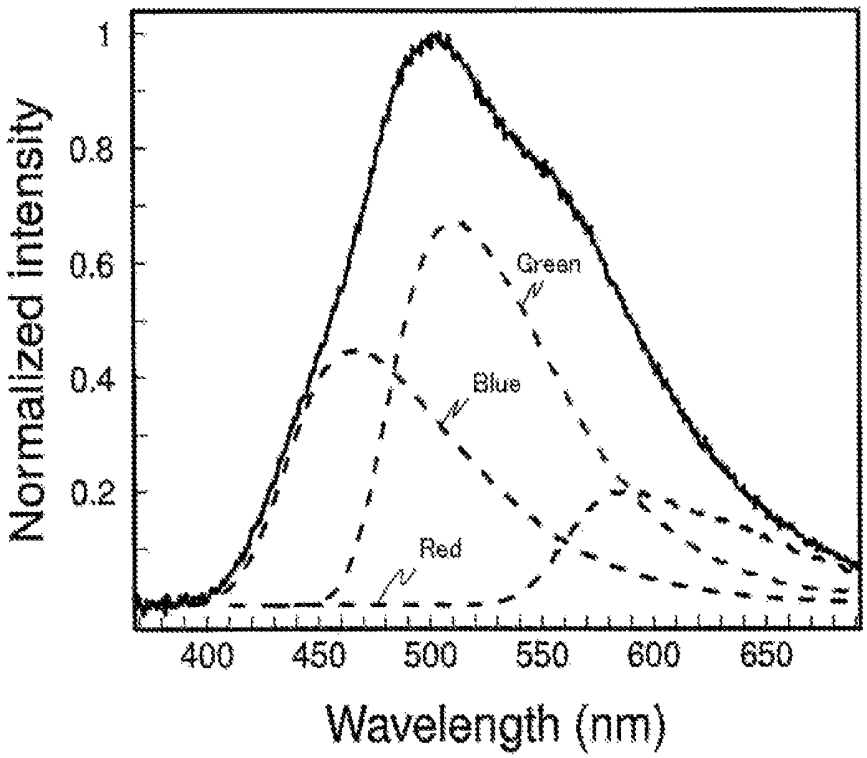

Normalized intensity
1
0.8
0.6
0.4
0.2
Green
Blue
Red
400
450
500
550
600
650
Wavelength (nm)

Fig. 9

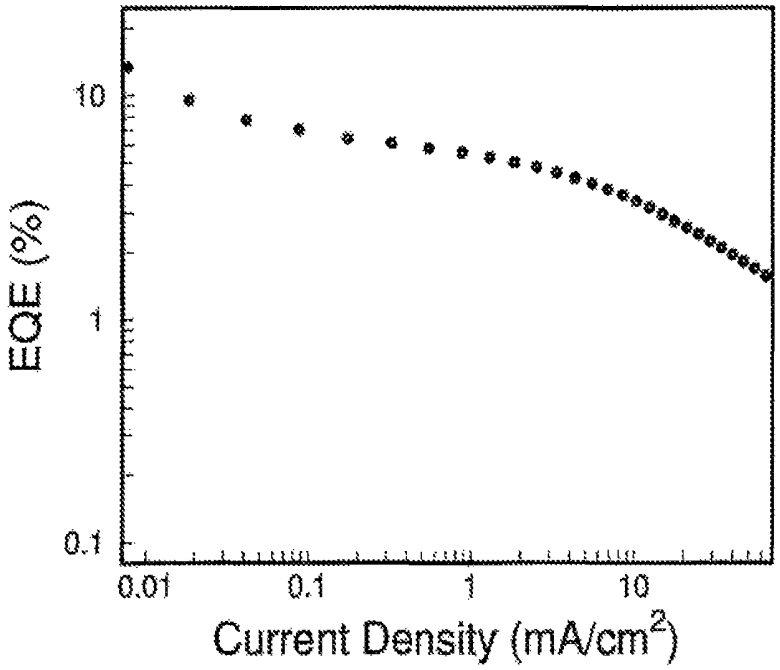

10
1
0.1
EQE (%)
0.01
0.1
1
10
Current Density (mA/cm2)

Fig. 10

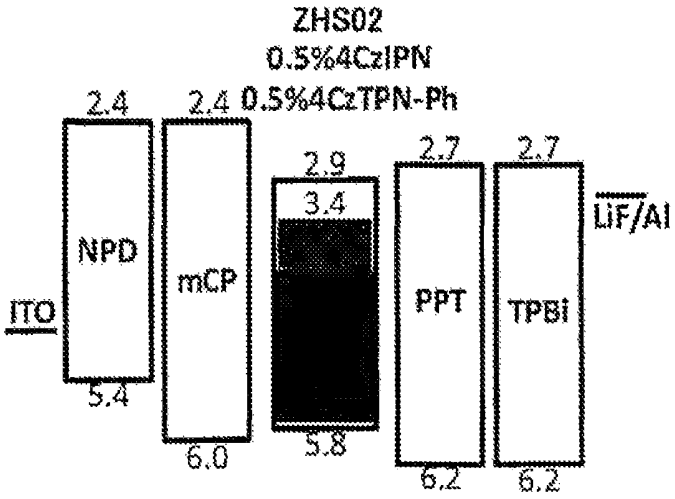

ZHS02
0.5%4CzIPN
0.5%4CzTPN-Ph
2.4
2.4
2.9
3.4
2.7
2.7
NPD
mCP
PPT
TPBi
LiF/Al
ITO
5.4
6.0
5.8
6.2
6.2

Fig. 11

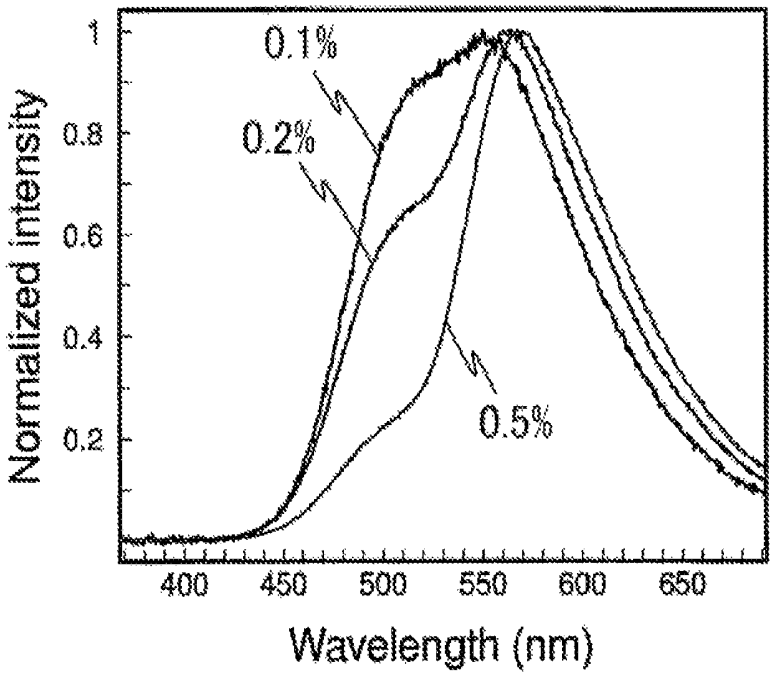

Normalized intensity
1
0.8
0.6
0.4
0.2
0.1%
0.2%
0.5%
400
450
500
550
600
650
Wavelength (nm)

Fig. 12

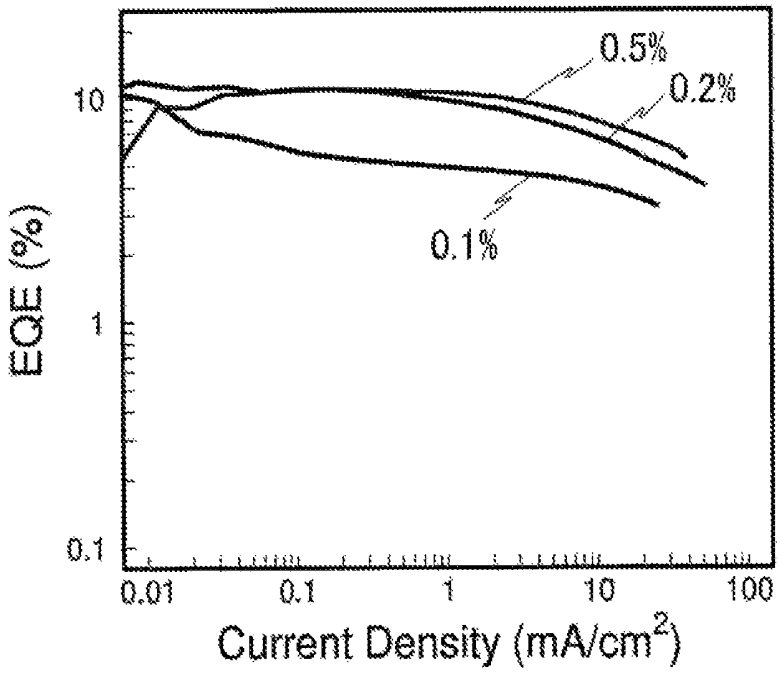

EQE (%)
10
1
0.1
0.5%
0.2%
0.1%
0.01
0.1
1
10
100
Current Density (mA/cm^2)

Fig. 13

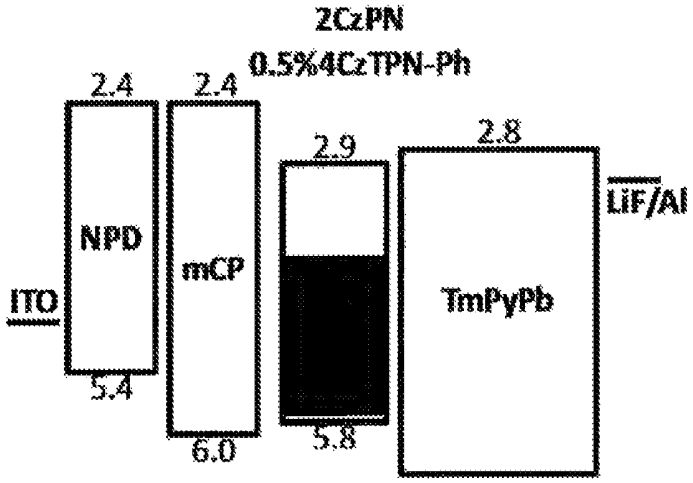

2CzPN
0.5%4CzTPN-Ph
2.4
2.4
2.9
2.8
NPD
mCP
TmPyPb
LiF/Al
ITO
5.4
6.0
5.8

Fig. 14

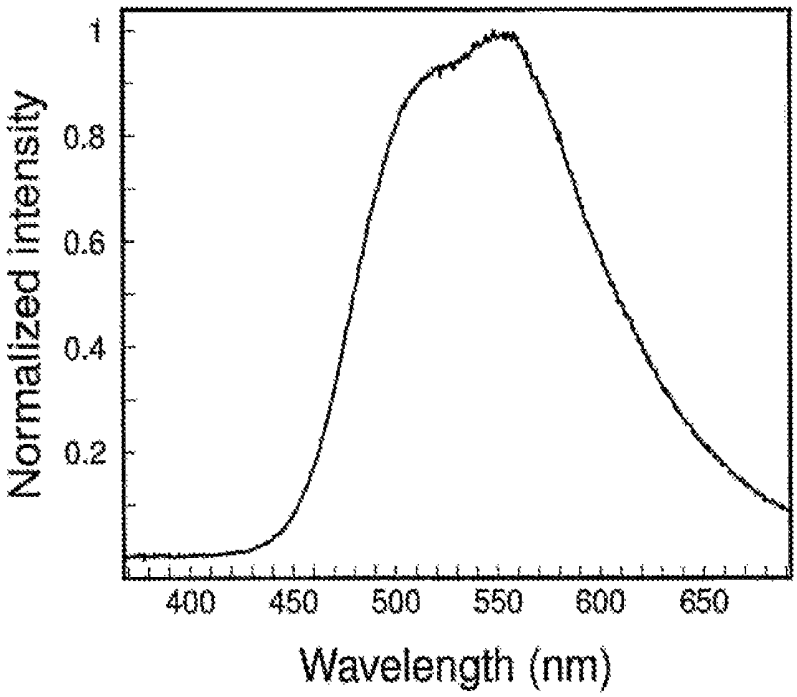

Normalized intensity
1
0.8
0.6
0.4
0.2
400
450
500
550
600
650
Wavelength (nm)

Fig. 15

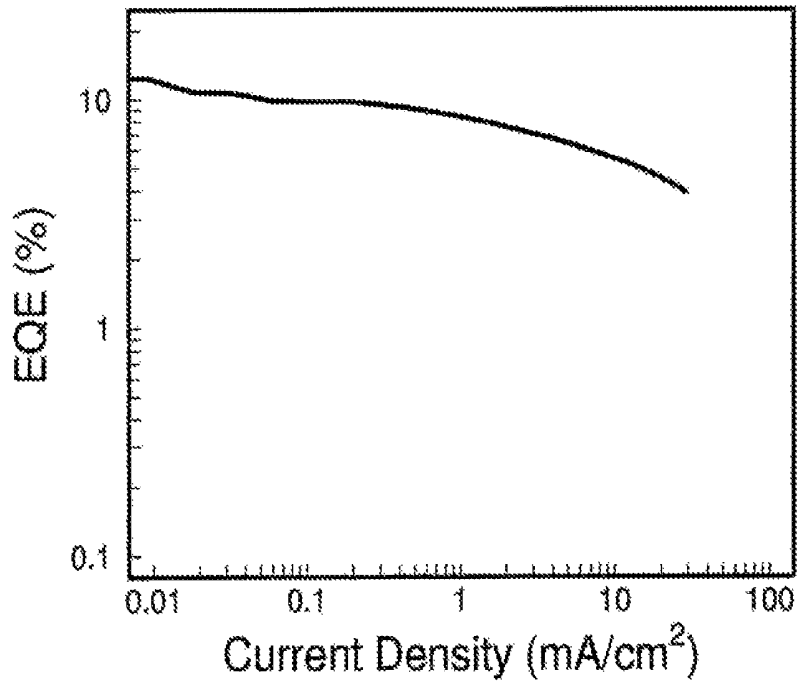

EQE (%)
10
1
0.1
0.01
0.1
1
10
100
Current Density (mA/cm^2)

Fig. 16

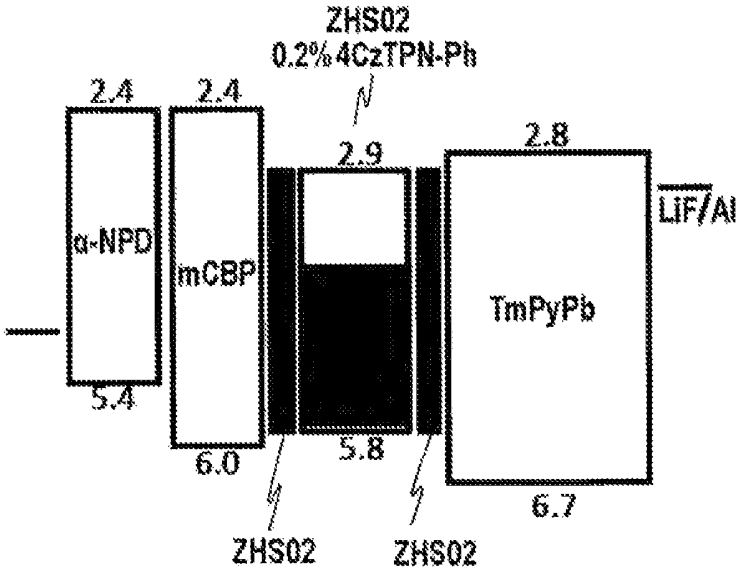

ZHS02
0.2% 4CzTPN-Ph
2.4
2.4
2.9
2.8
α-NPD
mCBP
TmPyPb
LiF/Al
5.4
6.0
5.8
6.7
ZHS02
ZHS02

Fig. 17

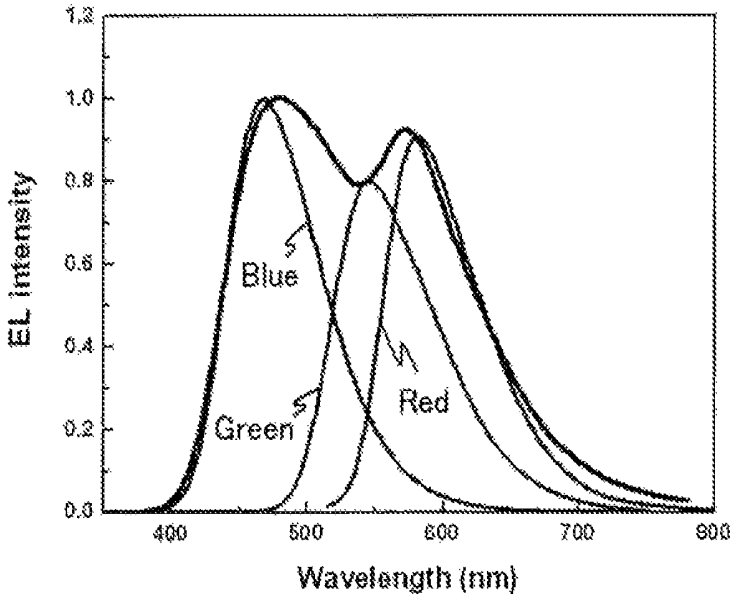

EL intensity
Wavelength (nm)
Blue
Green
Red

Fig. 18

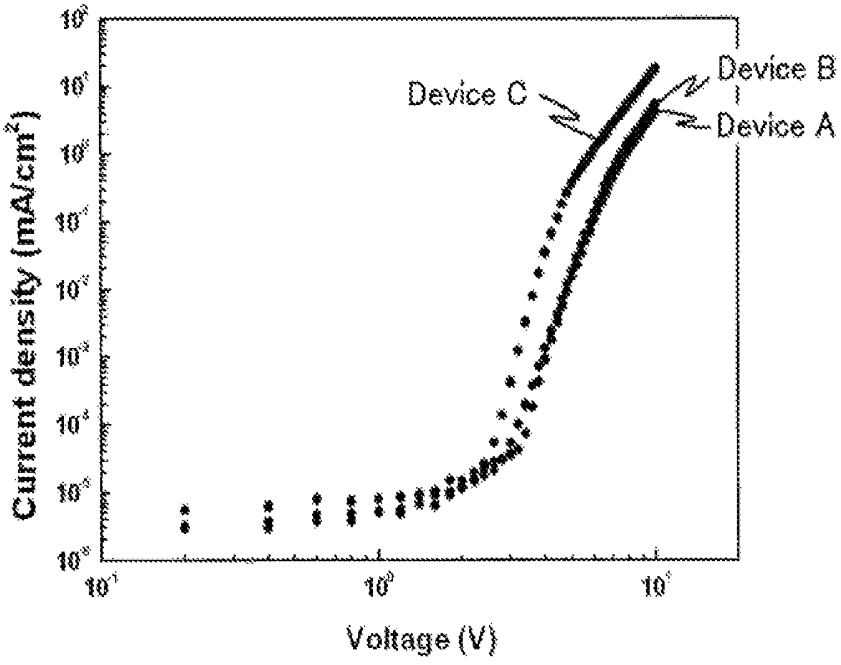

Current density (mA/cm²)
Voltage (V)
Device C
Device B
Device A

Fig. 19

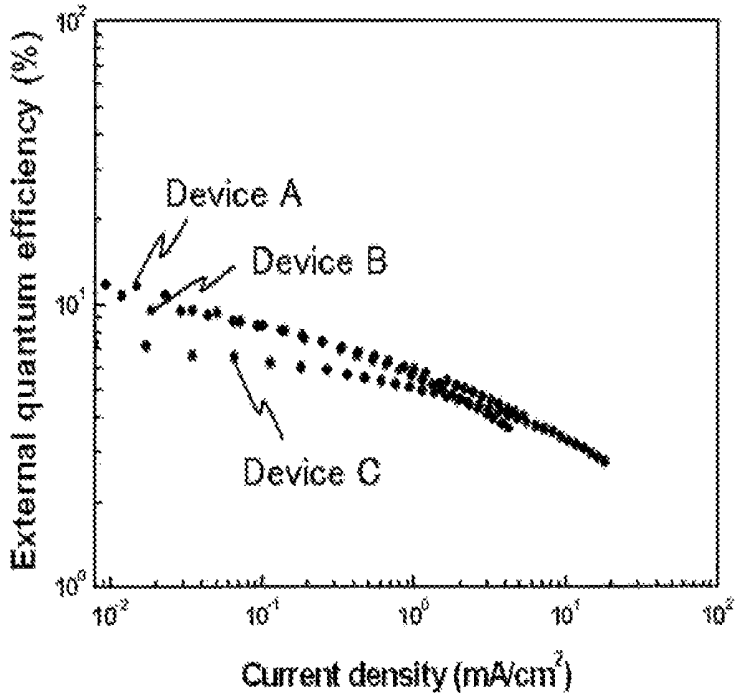

External quantum efficiency (%)
Device A
Device B
Device C
Current density (mA/cm²)

Fig. 20

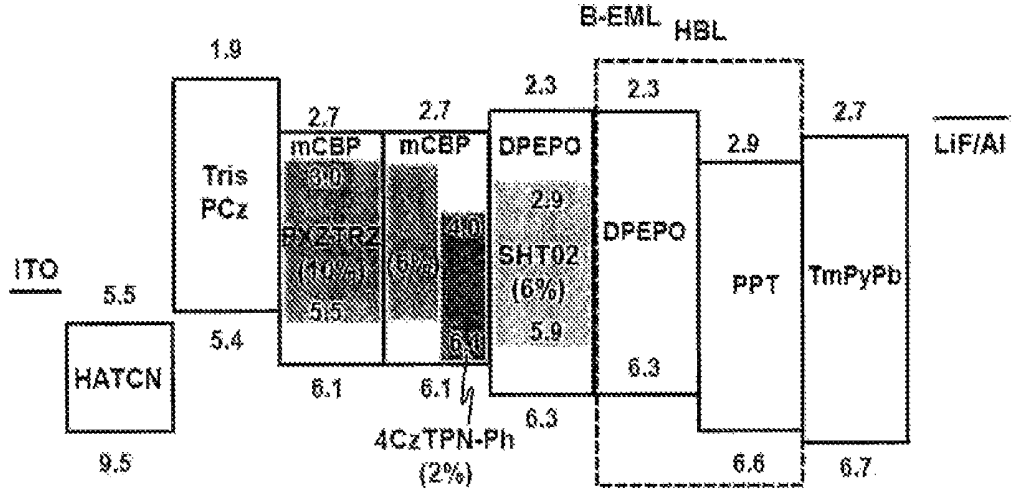

B-EML
HBL
ITO
HATCN
Tris PCz
mCBP
mCBP
RXZTRZ (10%)
4CzTPN-Ph (2%)
DPEPO
SHT02 (6%)
DPEPO
PPT
TmPyPb
LiF/Al
1.9
5.5
5.4
9.5
2.7
2.7
5.5
6.1
6.1
2.3
2.3
2.9
6.3
6.3
6.6
2.7
6.7

Fig. 21

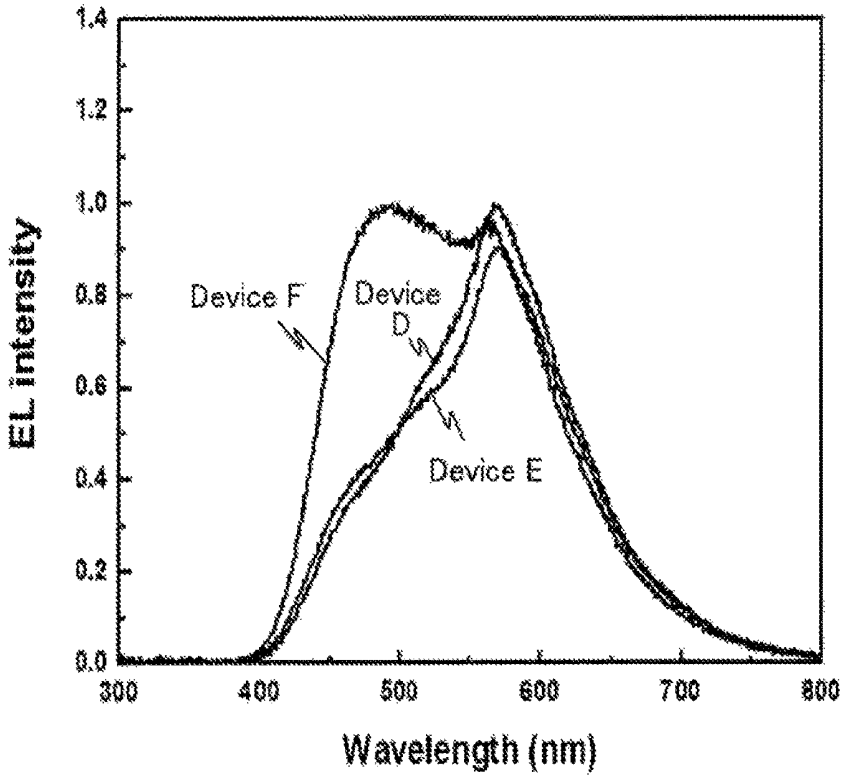

EL intensity
Wavelength (nm)
Device F
Device D
Device E
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
300
400
500
600
700
800

Fig. 22

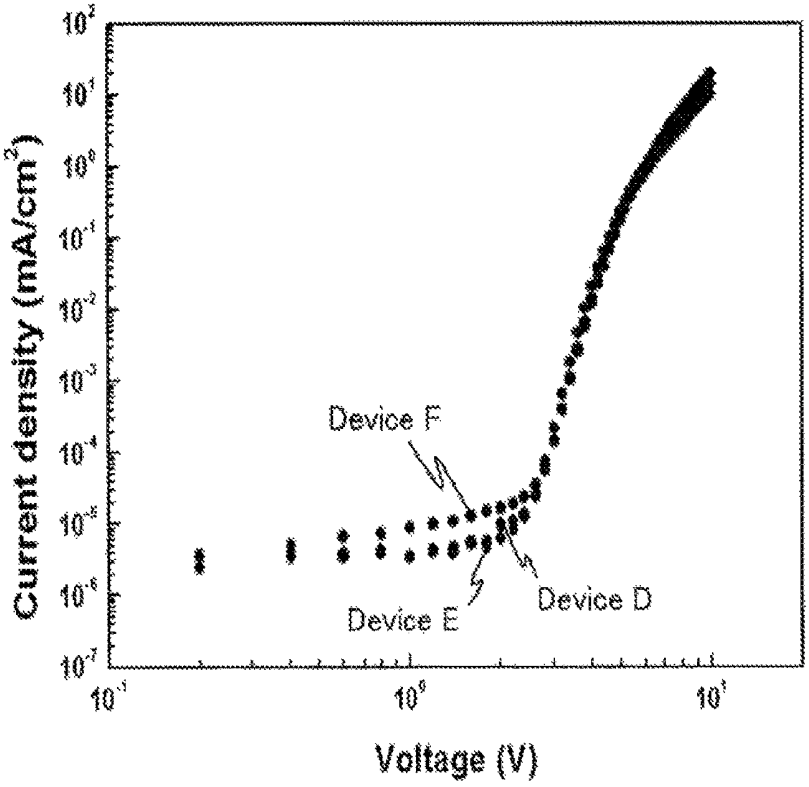
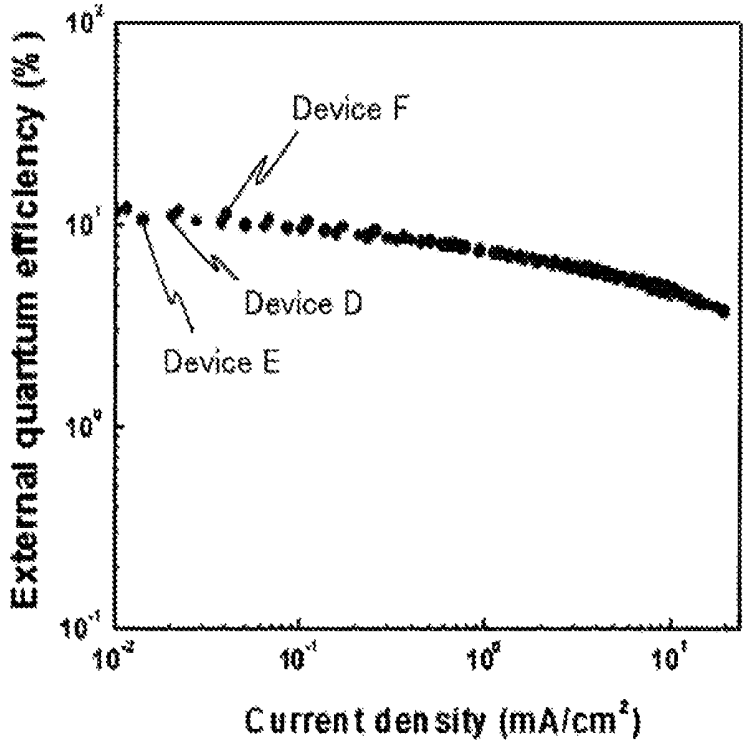

Current density (mA/cm^2)
Voltage (V)
Device F
Device D
Device E

Fig. 23


External quantum efficiency (%)
Current density (mA/cm²)
Device F
Device D
Device E

ORGANIC ELECTROLUMINESCENT DEVICE COMPRISING DELAYED FLUORESCENT MATERIALS

TECHNICAL FIELD

The present invention relates to a multiple wavelength light emitting organic electroluminescent device.

BACKGROUND ART

Studies have been actively performed on an organic electroluminescent device having a structure containing a cathode, an anode, and a light emitting layer containing a light emitting material that is formed between the anode and the cathode. Most of the studies are to develop a monochrome light emitting organic electroluminescent device by adding one light emitting material having a particular light emission wavelength to the light emitting layer, and some of them are to develop a multiple wavelength light emitting organic electroluminescent device by using plural light emitting materials that have different light emission wavelengths. For example, such one has been studied that a light emitting layer containing a blue light emitting material, a light emitting layer containing a green light emitting material and a light emitting layer containing a red light emitting material are formed, and white light emission is to be achieved by mixing light emission from the light emitting materials.

Patent Document 1 describes an organic electroluminescent device having a light emitting layer containing a blue or blue-green fluorescent light emitting material and a light emitting layer containing a phosphorescent light emitting material other than blue, in which the lowest excitation triplet energy level of the fluorescent light emitting material is larger than the lowest excitation triplet energy level of the phosphorescent light emitting material. In the examples thereof, such an organic electroluminescent device is described that contains an anode, a hole transporting layer, a hole-side intermediate layer, an orange-red light emitting layer, a blue light emitting layer, a green light emitting layer, an electron-side intermediate layer, an electron transporting layer, and a cathode, which are formed in this order. The blue light emitting layer is formed of α-NPD, the orange-red light emitting layer is doped with iridium(III) bis(2-methyldibenzo[f,h]quinoxaline (acetylacetonate) as a light emitting material, and the green light emitting layer is doped with fac-tris(2-phenylpyridine) iridium ($(Ir(ppy)_3)$). However, Patent Document 1 does not describe the use of a delayed fluorescent material.

Patent Document 2 describes an organic electroluminescent device having a light emitting layer containing a green light emitting layer containing a green delayed fluorescent material formed in contact with a hole transporting layer, a red phosphorescent light emitting layer containing a red light emitting material formed in contact with the green light emitting layer, and a blue light emitting layer containing a blue light emitting material formed in contact with the red light emitting layer. The organic electroluminescent device is designed in such a manner that the HOMO of the green delayed fluorescent material is deeper than the HOMO of the material of the hole transporting layer and is shallower than the HOMO of the red phosphorescent light emitting material. Patent Document 2 described that according to the design, the barrier between the HOMOs of the hole transporting layer and the green light emitting layer is reduced, and thus red phosphorescent light may be emitted with a high efficiency.

CITATION LIST

Patent Documents

Patent Document 1: JP-A-2012-89513
Patent Document 2: JP-A-2010-114070

SUMMARY OF INVENTION

Technical Problem

As described above, some studies have been made to develop a multiple wavelength light emitting organic electroluminescent device by using plural light emitting materials having different light emission wavelengths. However, the organic electroluminescent device described in Patent Document 1 fails to make the internal quantum efficiency of blue fluorescent light from the blue fluorescent material exceeding 25%, and thus has a problem of an insufficient blue light intensity. This is the principled limitation, and thus the problem cannot be solved as long as the constitution of Patent Document 1 is employed. On the other hand, the organic electroluminescent device described in Patent Document 2 may enhance the light emission efficiency of red phosphorescent light, but there is no suggestion relating to the effective enhancement of the light emission efficiency of light having a short wavelength, such as blue light. Furthermore, there are many structural limitations, for example, the green light emitting layer is necessarily formed on the most anode-side.

Under the current technical situation, the present inventors have made investigations for providing a multiple wavelength light emitting organic electroluminescent device that is improved in color tone through the enhancement of the light emission efficiency of light having a relatively short wavelength, such as blue light, and has a large degree of freedom in design to achieve a simple structure.

Solution to Problem

As a result of earnest investigations performed, the inventors have found that the intended multiple wavelength light emitting organic electroluminescent device may be provided by utilizing delayed fluorescent light to satisfy the particular condition. The organic electroluminescent device developed by the inventors is based on the unprecedented technological concept and has high practical usefulness due to the large degree of freedom thereof. Based on the knowledge, the inventors thus provide the invention described below as a measure for solving the problem.

(1) An organic electroluminescent device containing a cathode, an anode, and one or more organic layers containing plural light emitting materials between the cathode and the anode, wherein the organic electroluminescent device is a multiple wavelength light emitting organic electroluminescent device emitting light from the plural light emitting materials, and in the light thus emitted from the light emitting materials, light that has the shortest wavelength contains delayed fluorescent light.

(2) The organic electroluminescent device according to the item (1), wherein the light emitting material that emits

light having the shortest wavelength also functions as a host material of another light emitting material, or forms one of the organic layers alone.

(3) The organic electroluminescent device according to the item (1) or (2), wherein the light emitting material that emits light having the shortest wavelength has an energy difference (ΔE_{ST}) between the lowest excitation triplet energy level and the lowest excitation singlet energy level at 5 K of 0.3 eV or less.

(4) The organic electroluminescent device according to any one of the items (1) to (3), wherein the light emitting material that emits light, having the shortest wavelength is a blue light emitting material.

(5) The organic electroluminescent device according to any one of the items (1) to (4), wherein the light emitting material that emits light having the shortest wavelength has a light emission intensity of more than 20% based on the total light emission.

(6) The organic electroluminescent device according to any one of the items (1) to (5), wherein one of the organic layers contains the light emitting material that emits light having the shortest wavelength and at least one kind of a light emitting material that emits light having a different wavelength, and the light emitting material that emits light having the shortest wavelength also functions as a host material.

(7) The organic electroluminescent device according to any one of the items (1) to (5), wherein one of the organic layers contains the light emitting material that emits light having the shortest wavelength and at least two kinds of light emitting materials that each emit light having a different wavelength, and the light emitting material that emits light having the shortest wavelength also functions as a host material.

(8) The organic electroluminescent device according to any one of the items (1) to (7), wherein the light emitting material that emits light having the shortest wavelength forms at least one layer of the organic layers alone.

(9) The organic electroluminescent device according to any one of the items (1) to (8), wherein the organic electroluminescent device contains two or more layers each containing a light emitting material, and among the layers, a layer that is the closest to the cathode and a layer that is the closest to the anode each contain the light emitting material that emits light having the shortest wavelength.

(10) The organic electroluminescent device according to the claim (9), wherein the organic electroluminescent device, contains a layer that contains the light emitting material that emits light having the shortest wavelength as a host material between the layer that is the closest to the cathode and the layer that is the closest to the anode.

(11) The organic electroluminescent device according to any one of the items (1) to (10), wherein the organic electroluminescent device contains a layer containing a blue light emitting material doped with a green light emitting material or a red light emitting material.

(12) The organic electroluminescent device according to any one of the items (1) to (10), wherein the organic electroluminescent device contains a laminate of a layer containing a blue light emitting material, a layer containing a blue light emitting material doped with a green light emitting material or a red light emitting material, and a layer containing a blue light emitting material.

(13) The organic electroluminescent device according to any one of the items (1) to (12), wherein the plural light emitting materials contain a blue light emitting material, a green light emitting material, and a red light emitting material.

(14) The organic electroluminescent device according to any one of the items (1) to (13), wherein the organic electroluminescent device contains a layer containing a blue tight emitting material doped with a green light emitting material and a red light emitting material.

(15) The organic electroluminescent device according to any one of the items (1) to (14), wherein the organic electroluminescent device contains a laminate of a layer containing a green light emitting material, a layer containing a green light emitting material doped with a red light emitting material, and a layer containing a blue light emitting material.

(16) The organic electroluminescent device according to any one of the items (1) to (15), wherein all the plural light emitting materials emit delayed fluorescent light.

(17) The organic electroluminescent device according to any one of the items (1) to (15), wherein at least one of the plural light emitting materials emits phosphorescent light.

(18) The organic electroluminescent device according to any one of the items (1) to (17), wherein the organic electroluminescent device emits white light through color mixing of light emitted from the plural light emitting materials.

Advantageous Effects of Invention

In the multiple wavelength light emitting organic electroluminescent device of the invention, the light emitting material that emits light having the shortest wavelength also emits delayed fluorescent light. Accordingly, the color tone may be improved even though the light emission efficiency of the light having a short wavelength, such as blue light, is enhanced. According to the organic electroluminescent device, of the invention, the intended multiple wavelength light emitting organic electroluminescent device may be produced due to the large degree of freedom in design and the simple structure thereof.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a schematic illustration showing the mechanism of light emission in the invention.

FIG. **2** is a schematic cross sectional illustration showing examples of the structure of the light emitting layer of the organic electroluminescent device of the invention.

FIG. **3** is a schematic cross sectional illustration showing examples of the structure of the light emitting layer of the organic electroluminescent device of the invention.

FIG. **4** is a schematic cross sectional illustration showing examples of the structure of the light emitting layer of the organic electroluminescent device of the invention.

FIG. **5** is a schematic cross sectional illustration showing examples of the structure of the light emitting layer of the organic electroluminescent device of the invention.

FIG. **6** is a schematic cross sectional illustration showing examples of the structure of the light emitting layer of the organic electroluminescent device of the invention.

FIG. **7** is a schematic cross sectional illustration showing an example of the layer structure of the organic electroluminescent device.

FIG. **8** is a graph showing the light emission spectra of the organic electroluminescent device of Example 1.

FIG. **9** is a graph showing the electric current density-external quantum efficiency characteristics of the organic electroluminescent device of Example 1.

FIG. **10** is a graph showing the energy band diagram of the organic electroluminescent device of Example 1.

FIG. **11** is a graph showing the light emission spectra of the organic electroluminescent devices of Examples 2 to 4.

FIG. **12** is a graph showing the electric current density-external quantum efficiency characteristics of the organic electroluminescent devices of Examples 2 to 4.

FIG. **13** is a graph showing the energy band diagram of the organic electroluminescent devices of Examples 2 to 4.

FIG. **14** is a graph showing the light emission spectrum of the organic electroluminescent device of Example 5.

FIG. **15** is a graph showing the electric current density-external quantum efficiency characteristics of the organic electroluminescent device of Example 5.

FIG. **16** is a graph showing the energy band diagram of the organic electroluminescent device of Example 5.

FIG. **17** is a graph showing the light, emission spectra of the organic electroluminescent device A of Example 6.

FIG. **18** is a graph showing the voltage-electric current density characteristics of the organic electroluminescent devices A to C of Examples 6 to 8.

FIG. **19** is a graph showing the electric current density-external quantum efficiency characteristics of the organic electroluminescent devices A to G of Examples 6 to 8.

FIG. **20** is a graph showing the energy band diagram of the organic electroluminescent devices of Examples 6 to 8.

FIG. **21** is a graph showing the light emission spectra of the organic electroluminescent devices D to F of Examples 9 to 11.

FIG. **22** is a graph showing the voltage-electric current density characteristics of the organic electroluminescent devices D to F of Examples 9 to 11.

FIG. **23** is a graph showing the electric current density-external quantum efficiency characteristics of the organic electroluminescent devices D to F of Examples 9 to 11.

DESCRIPTION OF EMBODIMENTS

The contents of the invention will be described in detail below. The constitutional elements may be described below with reference to representative embodiments and specific examples of the invention, but the invention is not limited to the embodiments and the examples. In the description, a numerical range expressed with reference to the expressions, an upper limit or less and/or a lower limit or more, means a range that includes the upper limit and/or the lower limit.

Basic Structure of Organic Electroluminescent Device

The multiple wavelength light emitting organic electroluminescent device of the invention contains at least a cathode, an anode, and one or more organic layers intervening therebetween. The one or more organic layers formed may contain at least one layer, and the one or more organic layers contain plural light emitting materials. The plural light emitting materials may be contained in different organic layers or may be contained in the same organic layer. For example, in the case where three kinds of light emitting materials, i.e., a blue light emitting material, a green light emitting material and a red light emitting material, are used, the three light emitting materials may be contained in one light, emitting layer, or may be contained in each of three organic layers, respectively. Furthermore, a particular light emitting material may be contained in plural organic layers. In the organic electroluminescent device of the invention, the plural light emitting materials each emit light, and thus the device functions as a multiple wavelength light emitting device.

In the description of the invention, a light emitting material that has a maximum light emission wavelength in a range of 400 nm or more and 490 nm or less is referred to as a blue light emitting material, a light emitting material that has a maximum light emission wavelength in a range of more than 490 nm and 580 nm or less is referred to as a green light emitting material, and a light emitting material that has a maximum light emission wavelength in a range of more than 580 nm and 700 nm or less is referred to as a red light emitting material.

Delayed Fluorescent Light

In the organic electroluminescent device of the invention, the light that has the shortest wavelength in the light emitted from the light emitting materials contained in the device contains delayed fluorescent light. The delayed fluorescent light may be emitted by selecting a light emitting material that emits delayed fluorescent light (i.e., a delayed fluorescent material) as a light emitting material, and using the material in the organic electroluminescent device. The use of the delayed fluorescent material may enhance the light emission efficiency at the fluorescent wavelength of the delayed fluorescent material. The principle of the features may be described as follows.

In an organic electroluminescent device, carriers are injected from an anode and a cathode, to a light emitting material to form an excited state for the light emitting material, with which light is emitted. In the case of a carrier injection type organic electroluminescent device, in general, excitons that are excited to the excited singlet state are 25% of the total excitons generated, and the remaining 75% thereof are excited to the excited triplet state. Accordingly, the use of phosphorescence, which is light emission from the excited triplet state, provides a high energy use efficiency. However, the excited triplet state has a long lifetime and thus causes saturation of the excited state and deactivation of energy through mutual action with the excitons in the excited triplet state, and therefore the quantum yield of phosphorescence may generally be often not high. A delayed fluorescent material emits fluorescent light through the mechanism that the energy of excitons transits to the excited triplet state through intersystem crossing or the like, and then transits to the excited singlet state through reverse intersystem crossing due to triplet-triplet annihilation or absorption of thermal energy, thereby emitting fluorescent light. It is considered that among the materials, a thermal activation type delayed fluorescent material emitting light through absorption of thermal energy is particularly useful for an organic electroluminescent device. In the case where a delayed fluorescent material is used in an organic electroluminescent device, the excitons in the excited singlet state normally emit fluorescent light. On the other hand, the excitons in the excited triplet state emit fluorescent light through intersystem crossing to the excited singlet state by absorbing the heat generated by the device. At this time, the light emitted through reverse intersystem crossing from the excited triplet state to the excited single state has the same wavelength as fluorescent light since it is light emission from the excited single state, but has a longer lifetime (light emission lifetime) than the normal fluorescent light and phosphorescent light, and thus the light is observed as fluorescent light that is delayed from the normal fluorescent light and phosphorescent light. The light may be defined as delayed fluorescent light. The use of the thermal activation type exciton transition mechanism may raise the proportion of the compound in the excited single state, which is generally formed in a proportion only of 25%, to 25% or more through the absorption of the thermal energy after the carrier injection. A compound that emits strong fluorescent light and delayed fluorescent light at a low temperature of lower than 100° C. undergoes the intersystem crossing from

the excited triplet state to the excited singlet state sufficiently with the heat of the device, thereby emitting delayed fluorescent light, and thus the use of the compound may drastically enhance the light emission efficiency. The delayed fluorescent material preferably has an energy difference (ΔE_{ST}) between the lowest excitation triplet energy level and the lowest excitation singlet energy level at 77° K of 0.2 eV or less, and more preferably 0.1 eV or less.

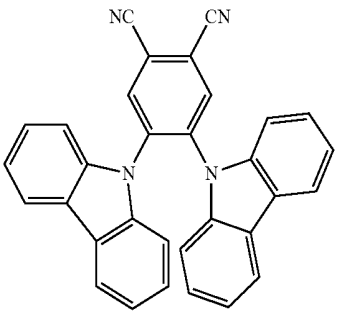
In the organic electroluminescent device of the invention, such a light emitting material that emits delayed fluorescent light is selected as the light emitting material that emits light having the shortest wavelength. According to the procedure, not only the light emission efficiency at the light emission wavelength thereof is drastically enhanced, but also an advantage is obtained that the excitons in the excited triplet state are transferred to the excited triplet state of another (second) light emitting material emitting light having a longer wavelength, so as to enhance the light emission efficiency of the second light emitting material as shown in FIG. **1**. The second light emitting material may be one emitting phosphorescent light and may be one emitting fluorescent light, and in the case where the second light emitting material is a delayed fluorescent material, the second light emitting material may emit delayed fluorescent light. In the case where a delayed fluorescent material is selected as the second light emitting material, the light emission efficiency of the second light emitting materials may be drastically enhanced through the same mechanism as described above. As the second light emitting material referred herein, not only one kind thereof but also two or more kinds thereof may be used.

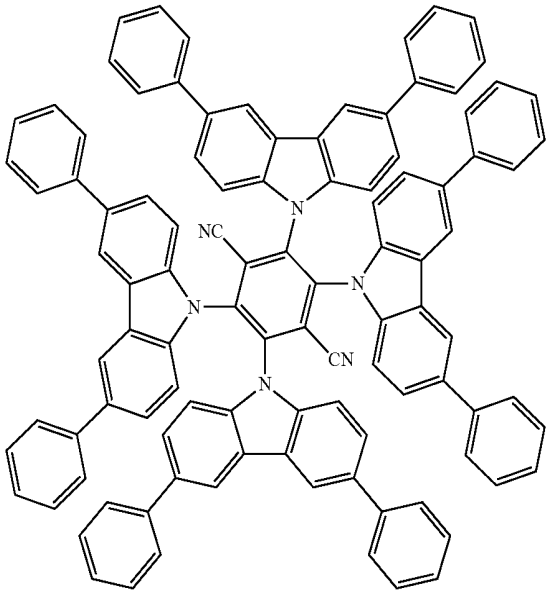
FIG. **1** is an illustration showing, as one example, an embodiment using three light emitting materials, i.e., a blue light emitting material, a green light emitting material and a red light emitting material. In the embodiment described herein, all the three light emitting materials are delayed fluorescent materials, but in the invention, it is sufficient that only the blue light emitting material, which is the light emitting material emitting light having a shortest wavelength, is a delayed fluorescent material. In other words, the green light emitting material and the red light emitting material may be an ordinary phosphorescent light emitting material, and one of them may be a delayed fluorescent material, whereas the other may be a phosphorescent light emitting material. In the embodiment shown in FIG. **1**, a delayed fluorescent material is used as the blue light emitting material, and thus blue delayed fluorescent light (TADF) is emitted, along with ordinary blue fluorescent light (Fluo), thereby the blue light emission efficiency is drastically enhanced. Furthermore, the excitons in the excited triplet state of the blue light emitting material are transferred to the excited triplet state of the green light emitting material and the excited triplet state of the red light emitting material, and thereby the light emitting materials each emit phosphorescent light and delayed fluorescent light. According to the embodiment employed, the blue color tone may be improved while enhancing the quantum efficiency. The blue light emission, the green light emission and the red light emission may be recognized as white light emission through color mixing.

The kind of the delayed fluorescent material that may be used in the invention is not particularly limited, and may be selected from ones capable of emitting delayed fluorescent light in consideration of the light emission wavelength. A delayed fluorescent material generally has a structure containing an acceptor moiety (A) and a donor moiety (D) bonded to each other. The numbers of the acceptor moiety and the donor moiety each may be one or more, and the number of the acceptor moiety and the number of the donor moiety in one molecule may be the same as or different from each other. For example, there are delayed fluorescent materials having various structures, such as an A-D type, an A-$(D)_n$ type, an $(A)_n$-D type and an -$(A\text{-}D)_n$-type, wherein n represents an integer of 2 or more, and may be, for example, an integer of from 2 to 6.

The molecular weight of the delayed fluorescent material is preferably 1,500 or less, more preferably 1,200 or less, further preferably 1,000 or less, and still further preferably 800 or less, in the case where a light emitting layer is intended to be formed as a film by a vapor deposition method. The delayed fluorescent material may be formed into a fills by a coating method irrespective of the molecular weight thereof. The compound that has a relatively large molecular weight may be formed into a film by a coating method.

Specific examples of the preferred delayed fluorescent material that may be used in the invention are shown below, but the delayed fluorescent material that may be used in the invention is not construed as being limited to the examples.





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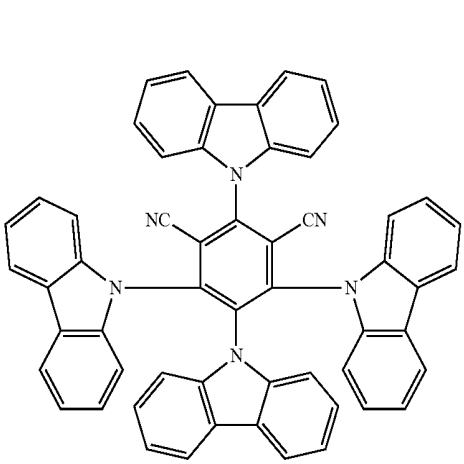

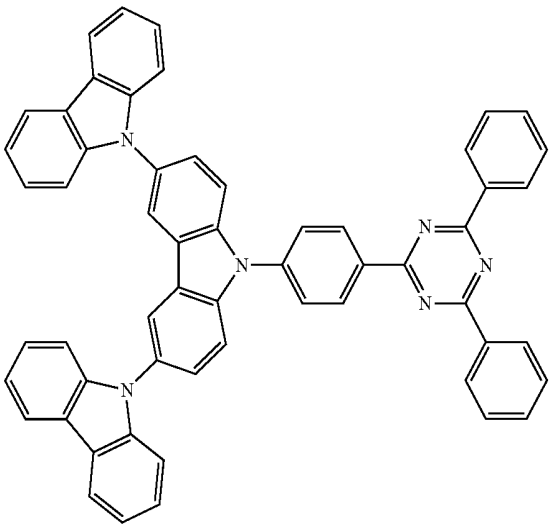

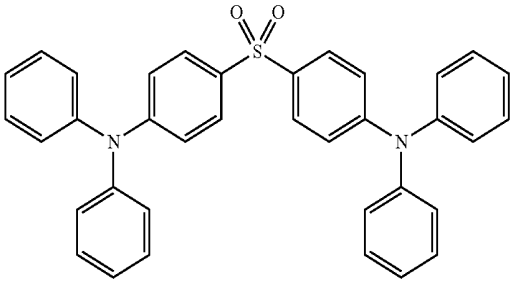

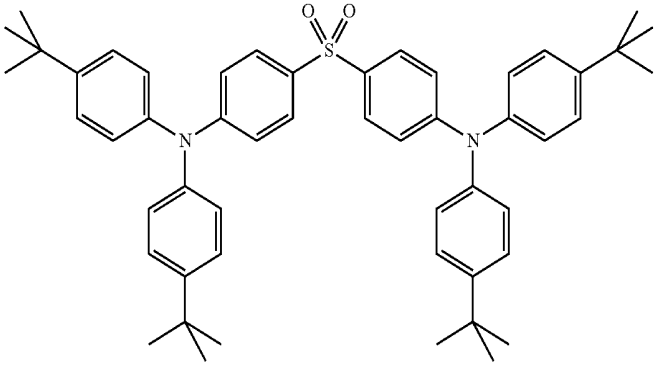

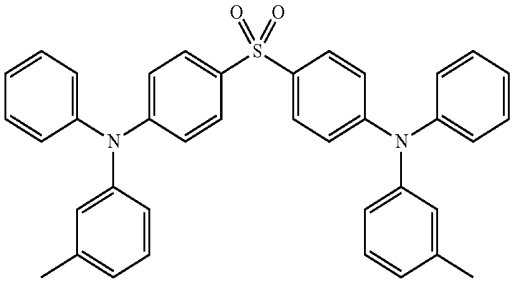

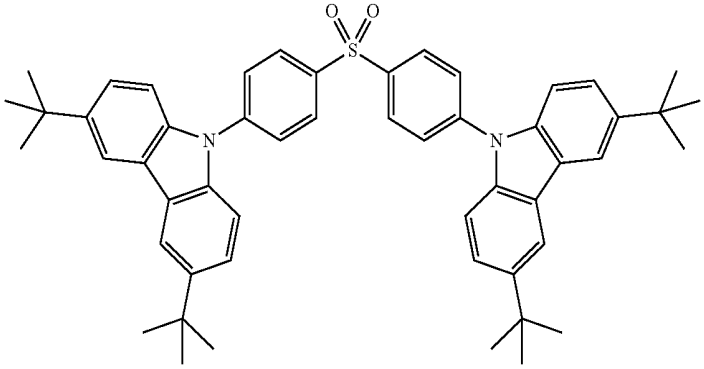

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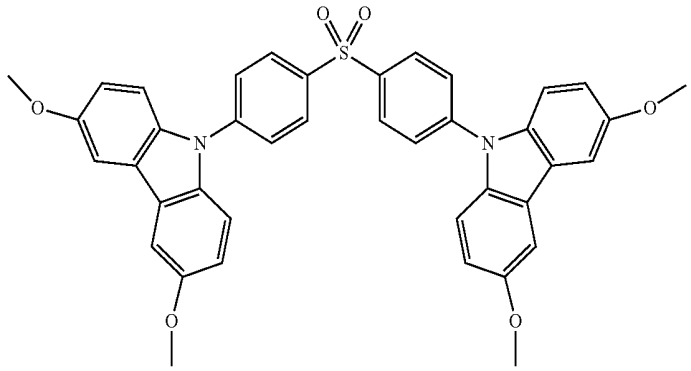

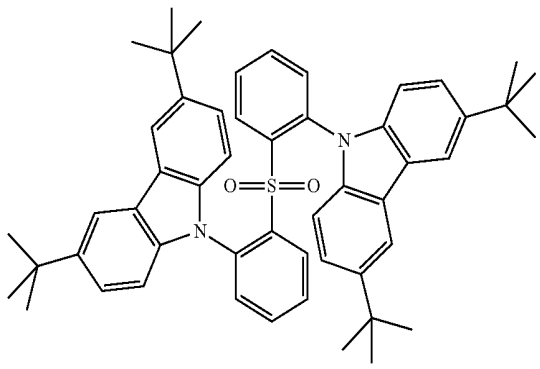

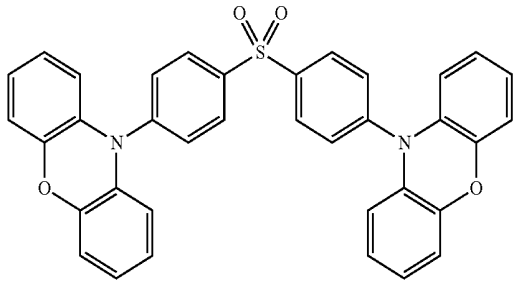

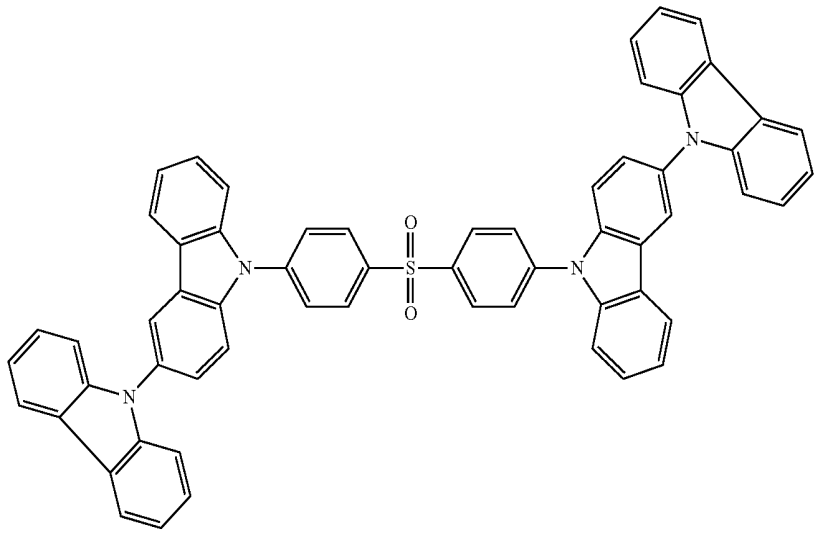

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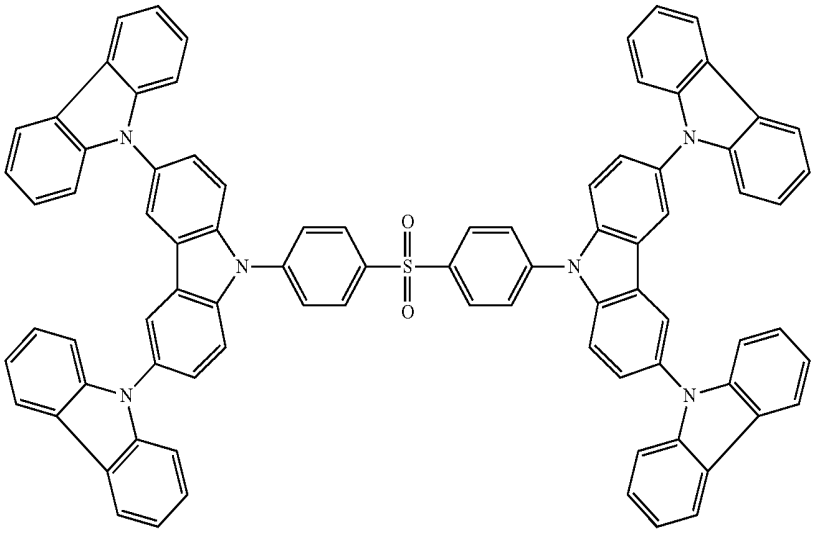

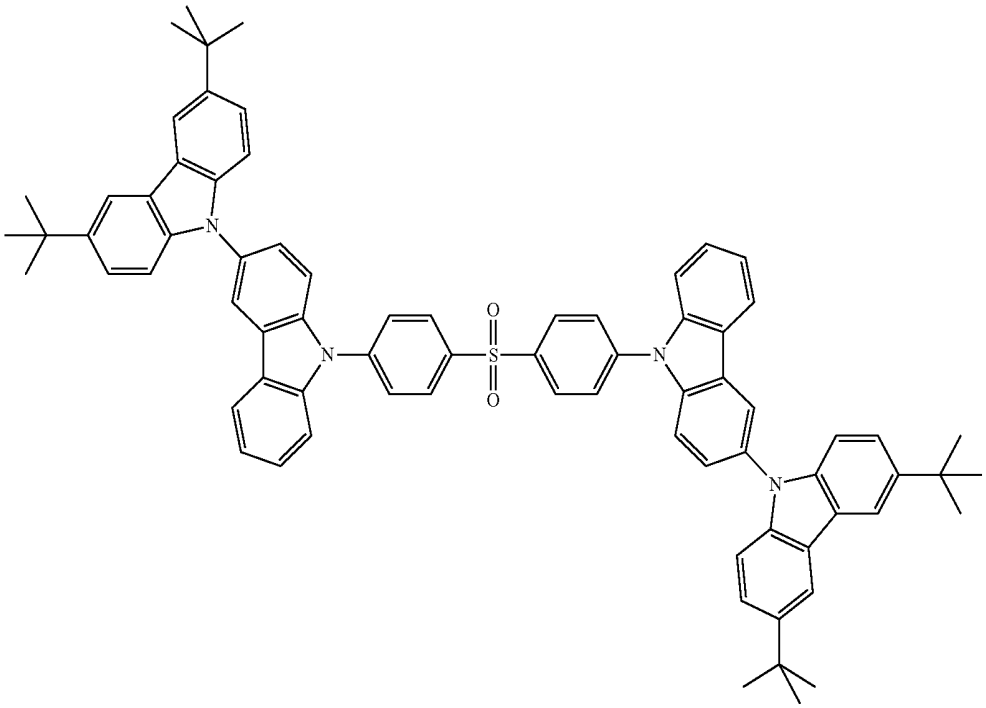

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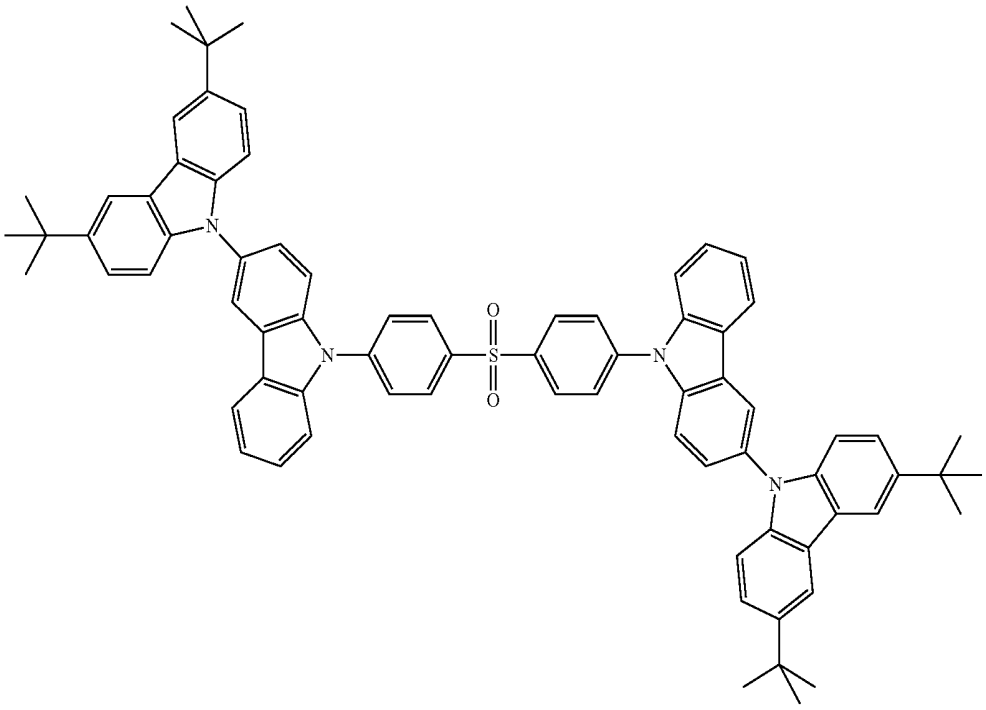

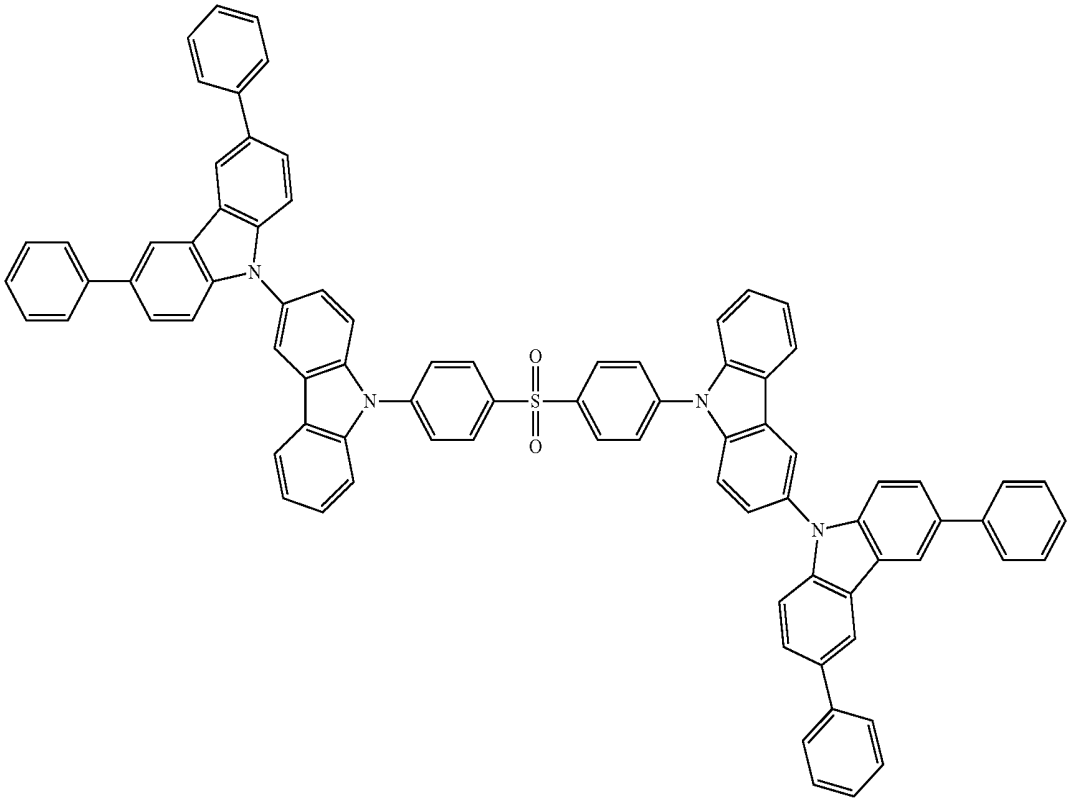

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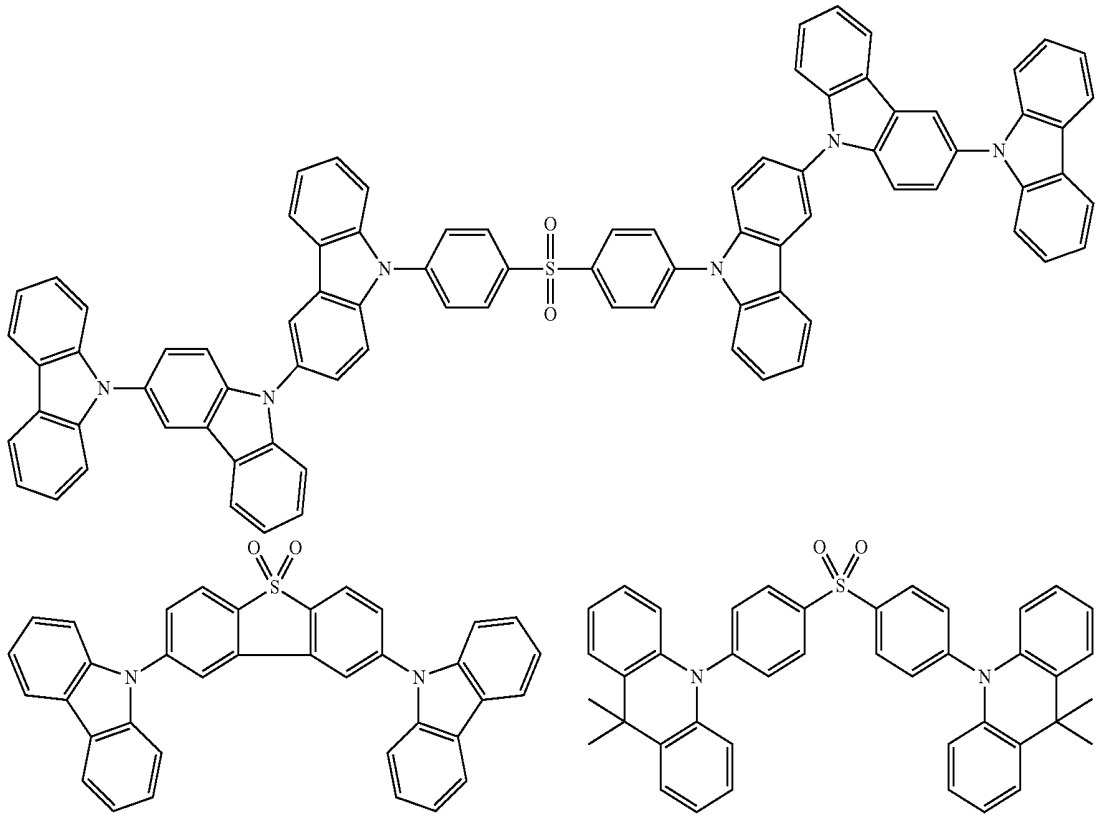
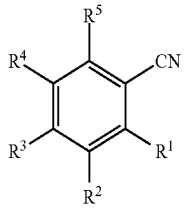


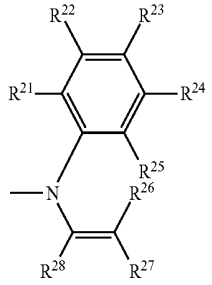
Examples of the preferred light emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formula (101). The entire description of WO 2013/154064 including the paragraphs 0008 to 0048 and 0095 to 0133 is incorporated herein by reference.

General Formula (101)



wherein in the general formula (101), at least one of R^1 to represents a cyano group, at least one of R^1 to R^5 represents a group represented by the following general formula (111), and the balance of R^1 to R^5 each represent a hydrogen atom or a substituent,

General Formula (111)



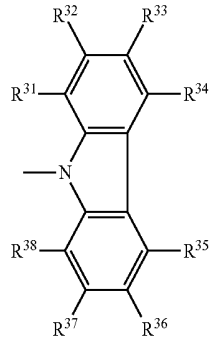
wherein in the general formula (111), R^{21} to R^{28} each Independently represent, a hydrogen atom or a substituent, provided that at least one of the following conditions (A) and (B) is satisfied:

(A) R^{25} and R^{26} together form a single bond, and

(B) R^{27} and R^{28} together represent an atomic group that is necessary for forming a substituted or unsubstituted benzene ring.

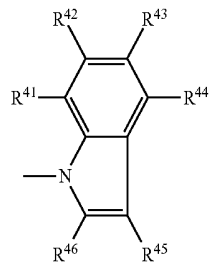
In the general formula (101), at least one of R^1 to R^5 preferably represents a group represented by any one of the following general formulae (112) to (115).

General Formula (112)



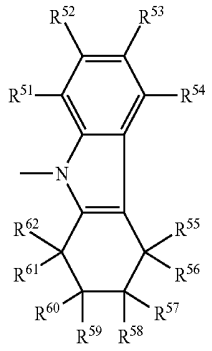
wherein in the general formula (112), to R^{31} to R^{38} each independently represent a hydrogen atom or a substituent.

General Formula (113)



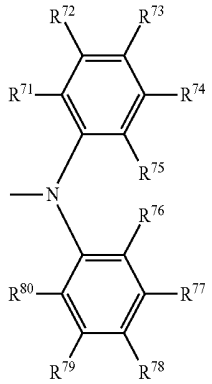
wherein in the general formula (113), R^{41} to R^{46} each independently represent a hydrogen atom or a substituent,

General Formula (114)



wherein in the general formula (114), R^{51} to R^{62} each independently represent a hydrogen atom or a substituent,

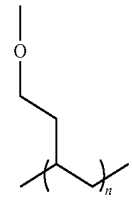
General Formula (115)



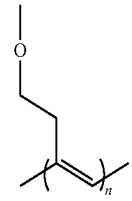
wherein in the general formula (115), R^{71} to R^{80} each independently represent a hydrogen atom or a substituent.

Specific examples of the compounds include the compounds shown in the following tables. In the case where two or more groups represented by any one of the general formulae (112) to (115) are present in the molecule of the following example compounds, all the groups have the same structure. The formulae (121) to (124) in the tables represent the following formulae, respectively, and n represents the number of the repeating units.

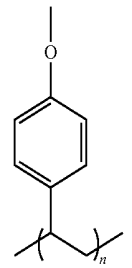
Formula (121)



Formula (122)



Formula (123)



Formula (124)

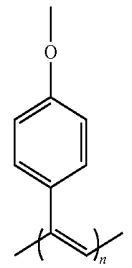


TABLE 1-1

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
1	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	H	H	H
2	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	CH_3	H	H
3	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	CH_3O	H	H
4	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	H	CH_3	H
5	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	H	CH_3O	H
6	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	H	t-C_4H_9	H
7	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	H	Cl	H
8	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	H	F	H
9	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	H	H	CH_3
10	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	H	H	CH_3O

TABLE 1-1-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
11	General formula (112)	General formula (112)	CN	General formula (112)	H	H	H	H	H
12	General formula (112)	General formula (112)	CN	General formula (112)	H	H	CH_3	H	H
13	General formula (112)	General formula (112)	CN	General formula (112)	H	H	CH_3O	H	H
14	General formula (112)	General formula (112)	CN	General formula (112)	H	H	H	CH_3	H
15	General formula (112)	General formula (112)	CN	General formula (112)	H	H	H	CH_3O	H
16	General formula (112)	General formula (112)	CN	General formula (112)	H	H	H	t-C_4H_9	H
17	General formula (112)	General formula (112)	CN	General formula (112)	H	H	H	Cl	H
18	General formula (112)	General formula (112)	CN	General formula (112)	H	H	H	F	H
19	General formula (112)	General formula (112)	CN	General formula (112)	H	H	H	H	CH_3
20	General formula (112)	General formula (112)	CN	General formula (112)	H	H	H	H	CH_3O
21	General formula (112)	General formula (112)	CN	H	H	H	H	H	H
22	General formula (112)	General formula (112)	CN	H	H	H	CH_3	H	H
23	General formula (112)	General formula (112)	CN	H	H	H	CH_3O	H	H
24	General formula (112)	General formula (112)	CN	H	H	H	H	CH_3	H
25	General formula (112)	General formula (112)	CN	H	H	H	H	CH_3O	H
26	General formula (112)	General formula (112)	CN	H	H	H	H	t-C_4H_9	H
27	General formula (112)	General formula (112)	CN	H	H	H	H	Cl	H
28	General formula (112)	General formula (112)	CN	H	H	H	H	F	H
29	General formula (112)	General formula (112)	CN	H	H	H	H	H	CH_3
30	General formula (112)	General formula (112)	CN	H	H	H	H	H	CH_3O
31	General formula (112)	H	CN	General formula (112)	H	H	H	H	H
32	General formula (112)	H	CN	General formula (112)	H	H	CH_3	H	H
33	General formula (112)	H	CN	General formula (112)	H	H	CH_3O	H	H
34	General formula (112)	H	CN	General formula (112)	H	H	H	CH_3	H
35	General formula (112)	H	CN	General formula (112)	H	H	H	CH_3O	H
36	General formula (112)	H	CN	General formula (112)	H	H	H	t-C_4H_9	H
37	General formula (112)	H	CN	General formula (112)	H	H	H	Cl	H
38	General formula (112)	H	CN	General formula (112)	H	H	H	F	H
39	General formula (112)	H	CN	General formula (112)	H	H	H	H	CH_3
40	General formula (112)	H	CN	General formula (112)	H	H	H	H	CH_3O
41	General formula (112)	H	CN	H	General formula (112)	H	H	H	H
42	General formula (112)	H	CN	H	General formula (112)	H	CH_3	H	H
43	General formula (112)	H	CN	H	General formula (112)	H	CH_3O	H	H
44	General formula (112)	H	CN	H	General formula (112)	H	H	CH_3	H
45	General formula (112)	H	CN	H	General formula (112)	H	H	CH_3O	H
46	General formula (112)	H	CN	H	General formula (112)	H	H	t-C_4H_9	H
47	General formula (112)	H	CN	H	General formula (112)	H	H	Cl	H
48	General formula (112)	H	CN	H	General formula (112)	H	H	F	H

TABLE 1-1-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
49	General formula (112)	H	CN	H	General formula (112)	H	H	H	CH_3
50	General formula (112)	H	CN	H	General formula (112)	H	H	H	CH_3O
51	General formula (112)	H	CN	H	H	H	H	H	H
52	General formula (112)	H	CN	H	H	H	CH_3	H	H
53	General formula (112)	H	CN	H	H	H	CH_3O	H	H
54	General formula (112)	H	CN	H	H	H	H	CH_3	H
55	General formula (112)	H	CN	H	H	H	H	CH_3O	H
56	General formula (112)	H	CN	H	H	H	H	t-C_4H_9	H
57	General formula (112)	H	CN	H	H	H	H	Cl	H
58	General formula (112)	H	CN	H	H	H	H	F	H
59	General formula (112)	H	CN	H	H	H	H	H	CH_3
60	General formula (112)	H	CN	H	H	H	H	H	CH_3O

TABLE 1-2

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
61	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	H	H
62	General formula (112)	General formula (112)	CN	General formula (112)	F	H	CH_3	H	H
63	General formula (112)	General formula (112)	CN	General formula (112)	F	H	CH_3O	H	H
64	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	CH_3	H
65	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	CH_3O	H
66	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	t-C_4H_9	H
67	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	Cl	H
68	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	F	H
69	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	H	CH_3
70	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	H	CH_3O
71	General formula (112)	General formula (112)	CN	F	F	H	H	H	H
72	General formula (112)	General formula (112)	CN	F	F	H	CH_3	H	H
73	General formula (112)	General formula (112)	CN	F	F	H	CH_3O	H	H
74	General formula (112)	General formula (112)	CN	F	F	H	H	CH_3	H
75	General formula (112)	General formula (112)	CN	F	F	H	H	CH_3O	H
76	General formula (112)	General formula (112)	CN	F	F	H	H	t-C_4H_9	H
77	General formula (112)	General formula (112)	CN	F	F	H	H	Cl	H
78	General formula (112)	General formula (112)	CN	F	F	H	H	F	H
79	General formula (112)	General formula (112)	CN	F	F	H	H	H	CH_3
80	General formula (112)	General formula (112)	CN	F	F	H	H	H	CH_3O
81	General formula (112)	F	CN	General formula (112)	F	H	H	H	H

TABLE 1-2-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
82	General formula (112)	F	CN	General formula (112)	F	H	CH_3	H	H
83	General formula (112)	F	CN	General formula (112)	F	H	CH_3O	H	H
84	General formula (112)	F	CN	General formula (112)	F	H	H	CH_3	H
85	General formula (112)	F	CN	General formula (112)	F	H	H	CH_3O	H
86	General formula (112)	F	CN	General formula (112)	F	H	H	t-C_4H_9	H
87	General formula (112)	F	CN	General formula (112)	F	H	H	Cl	H
88	General formula (112)	F	CN	General formula (112)	F	H	H	F	H
89	General formula (112)	F	CN	General formula (112)	F	H	H	H	CH_3
90	General formula (112)	F	CN	General formula (112)	F	H	H	H	CH_3O
91	General formula (112)	F	CN	F	General formula (112)	H	H	H	H
92	General formula (112)	F	CN	F	General formula (112)	H	CH_3	H	H
93	General formula (112)	F	CN	F	General formula (112)	H	CH_3O	H	H
94	General formula (112)	F	CN	F	General formula (112)	H	H	CH_3	H
95	General formula (112)	F	CN	F	General formula (112)	H	H	CH_3O	H
96	General formula (112)	F	CN	F	General formula (112)	H	H	t-C_4H_9	H
97	General formula (112)	F	CN	F	General formula (112)	H	H	Cl	H
98	General formula (112)	F	CN	F	General formula (112)	H	H	F	H
99	General formula (112)	F	CN	F	General formula (112)	H	H	H	CH_3
100	General formula (112)	F	CN	F	General formula (112)	H	H	H	CH_3O
101	General formula (112)	F	CN	F	F	H	H	H	H
102	General formula (112)	F	CN	F	F	H	CH_3	H	H
103	General formula (112)	F	CN	F	F	H	CH_3O	H	H
104	General formula (112)	F	CN	F	F	H	H	CH_3	H
105	General formula (112)	F	CN	F	F	H	H	CH_3O	H
106	General formula (112)	F	CN	F	F	H	H	t-C_4H_9	H
107	General formula (112)	F	CN	F	F	H	H	Cl	H
108	General formula (112)	F	CN	F	F	H	H	F	H
109	General formula (112)	F	CN	F	F	H	H	H	CH_3
110	General formula (112)	F	CN	F	F	H	H	H	CH_3O

TABLE 1-3

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
111	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	H	H	H
112	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	CH_3	H	H
113	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	CH_3O	H	H
114	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	H	CH_3	H

TABLE 1-3-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
115	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	H	CH_3O	H
116	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	H	t-C_4H_9	H
117	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	H	Cl	H
118	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	H	F	H
119	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	H	H	CH_3
120	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	H	H	CH_3O
121	General formula (112)	General formula (112)	CN	OH	OH	H	H	H	H
122	General formula (112)	General formula (112)	CN	OH	OH	H	CH_3	H	H
123	General formula (112)	General formula (112)	CN	OH	OH	H	CH_3O	H	H
124	General formula (112)	General formula (112)	CN	OH	OH	H	H	CH_3	H
125	General formula (112)	General formula (112)	CN	OH	OH	H	H	CH_3O	H
126	General formula (112)	General formula (112)	CN	OH	OH	H	H	t-C_4H_9	H
127	General formula (112)	General formula (112)	CN	OH	OH	H	H	Cl	H
128	General formula (112)	General formula (112)	CN	OH	OH	H	H	F	H
129	General formula (112)	General formula (112)	CN	OH	OH	H	H	H	CH_3
130	General formula (112)	General formula (112)	CN	OH	OH	H	H	H	CH_3O
131	General formula (112)	OH	CN	General formula (112)	OH	H	H	H	H
132	General formula (112)	OH	CN	General formula (112)	OH	H	CH_3	H	H
133	General formula (112)	OH	CN	General formula (112)	OH	H	CH_3O	H	H
134	General formula (112)	OH	CN	General formula (112)	OH	H	H	CH_3	H
135	General formula (112)	OH	CN	General formula (112)	OH	H	H	CH_3O	H
136	General formula (112)	OH	CN	General formula (112)	OH	H	H	t-C_4H_9	H
137	General formula (112)	OH	CN	General formula (112)	OH	H	H	Cl	H
138	General formula (112)	OH	CN	General formula (112)	OH	H	H	F	H
139	General formula (112)	OH	CN	General formula (112)	OH	H	H	H	CH_3
140	General formula (112)	OH	CN	General formula (112)	OH	H	H	H	CH_3O
141	General formula (112)	OH	CN	OH	General formula (112)	H	H	H	H
142	General formula (112)	OH	CN	OH	General formula (112)	H	CH_3	H	H
143	General formula (112)	OH	CN	OH	General formula (112)	H	CH_3O	H	H
144	General formula (112)	OH	CN	OH	General formula (112)	H	H	CH_3	H
145	General formula (112)	OH	CN	OH	General formula (112)	H	H	CH_3O	H
146	General formula (112)	OH	CN	OH	General formula (112)	H	H	t-C_4H_9	H
147	General formula (112)	OH	CN	OH	General formula (112)	H	H	Cl	H
148	General formula (112)	OH	CN	OH	General formula (112)	H	H	F	H
149	General formula (112)	OH	CN	OH	General formula (112)	H	H	H	CH_3
150	General formula (112)	OH	CN	OH	General formula (112)	H	H	H	CH_3O
151	General formula (112)	OH	CN	OH	OH	H	H	H	H
152	General formula (112)	OH	CN	OH	OH	H	CH_3	H	H

TABLE 1-3-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
153	General formula (112)	OH	CN	OH	OH	H	CH_3O	H	H
154	General formula (112)	OH	CN	OH	OH	H	H	CH_3	H
155	General formula (112)	OH	CN	OH	OH	H	H	CH_3O	H
156	General formula (112)	OH	CN	OH	OH	H	H	t-C_4H_9	H
157	General formula (112)	OH	CN	OH	OH	H	H	Cl	H
158	General formula (112)	OH	CN	OH	OH	H	H	F	H
159	General formula (112)	OH	CN	OH	OH	H	H	H	CH_3
160	General formula (112)	OH	CN	OH	OH	H	H	H	CH_3O
161	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	H	H	H
162	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	CH_3	H	H
163	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	CH_3O	H	H
164	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	H	CH_3	H
165	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	H	CH_3O	H
166	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	H	t-C_4H_9	H
167	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	H	Cl	H
168	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	H	F	H
169	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	H	H	CH_3
170	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	H	H	CH_3O
171	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	H	H
172	General formula (112)	General formula (112)	CN	General formula (112)	F	H	CH_3	H	H
173	General formula (112)	General formula (112)	CN	General formula (112)	F	H	CH_3O	H	H
174	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	CH_3	H
175	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	CH_3O	H

TABLE 1-4

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
176	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	t-C_4H_9	H
177	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	Cl	H
178	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	F	H
179	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	H	CH_3
180	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	H	CH_3O
181	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	H	H	H
182	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	CH_3	H	H
183	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	CH_3O	H	H
184	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	H	CH_3	H
185	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	H	CH_3O	H

TABLE 1-4-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
186	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	H	t-C_4H_9	H
187	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	H	Cl	H
188	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	H	F	H
189	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	H	CH_3
190	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	H	CH_3O
191	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	H	H
192	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	CH_3	H	H
193	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	CH_3O	H	H
194	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	CH_3	H
195	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	CH_3O	H
196	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	t-C_4H_9	H
197	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	Cl	H
198	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	F	H
199	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	H	CH_3
200	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_5O	H	H	H	CH_3O
201	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	H	H	H
202	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	CH_3	H	H
203	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	CH_3O	H	H
204	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	H	CH_3	H
205	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	H	CH_3O	H
206	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	H	t-C_4H_9	H
207	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	H	Cl	H
208	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	H	F	H
209	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	H	H	CH_3
210	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	H	H	CH_3O
211	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	H	H	H
212	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	CH_3	H	H
213	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	CH_3O	H	H
214	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	H	CH_3	H
215	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	H	CH_3O	H
216	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	H	t-C_4H_9	H
217	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	H	Cl	H
218	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	H	F	H
219	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	H	H	CH_3
220	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	H	H	CH_3O
221	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	H	H	H
222	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	CH_3	H	H
223	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	CH_3O	H	H

TABLE 1-4-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
224	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	H	CH_3	H
225	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	H	CH_3O	H
226	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	H	t-C_4H_9	H
227	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	H	Cl	H
228	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	H	F	H
229	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	H	H	CH_3
230	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	H	H	CH_3O
231	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	H	H	H
232	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	CH_3	H	H
233	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	CH_3O	H	H
234	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	H	CH_3	H
235	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	H	CH_3O	H
236	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	H	t-C_4H_9	H
237	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	H	Cl	H
238	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	H	F	H
239	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	H	H	CH_3
240	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	H	H	CH_3O

TABLE 1-5

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
241	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	H	H	H
242	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	CH_3	H	H
243	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	CH_3O	H	H
244	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	H	CH_3	H
245	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	H	CH_3O	H
246	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	H	t-C_4H_9	H
247	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	H	Cl	H
248	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	H	F	H
249	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	H	H	CH_3
250	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	H	H	CH_3O
251	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	C_6H_5	H	H
252	General formula (112)	General formula (112)	CN	General formula (112)	General formula (112)	H	H	C_5H_6	H
253	General formula (112)	General formula (112)	CN	General formula (112)	H	H	C_6H_5	H	H
254	General formula (112)	General formula (112)	CN	General formula (112)	H	H	H	C_5H_6	H
255	General formula (112)	General formula (112)	CN	H	H	H	C_6H_5	H	H
256	General formula (112)	General formula (112)	CN	H	H	H	H	C_6H_5	H

TABLE 1-5-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
257	General formula (112)	H	CN	General formula (112)	H	H	C_6H_5	H	H
258	General formula (112)	H	CN	General formula (112)	H	H	H	C_6H_5	H
259	General formula (112)	H	CN	H	General formula (112)	H	C_6H_5	H	H
260	General formula (112)	H	CN	H	General formula (112)	H	H	C_6H_5	H
261	General formula (112)	H	CN	H	H	H	C_6H_5	H	H
262	General formula (112)	H	CN	H	H	H	H	C_6H_5	H
263	General formula (112)	General formula (112)	CN	General formula (112)	F	H	C_6H_5	H	H
264	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	C_6H_5	H
265	General formula (112)	General formula (112)	CN	F	F	H	C_6H_5	H	H
266	General formula (112)	General formula (112)	CN	F	F	H	H	C_6H_5	H
267	General formula (112)	F	CN	General formula (112)	F	H	C_6H_5	H	H
268	General formula (112)	F	CN	General formula (112)	F	H	H	C_6H_5	H
269	General formula (112)	F	CN	F	General formula (112)	H	C_6H_5	H	H
270	General formula (112)	F	CN	F	General formula (112)	H	H	C_6H_5	H
271	General formula (112)	F	CN	F	F	H	C_6H_5	H	H
272	General formula (112)	F	CN	F	F	H	H	C_6H_5	H
273	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	C_6H_5	H	H
274	General formula (112)	General formula (112)	CN	General formula (112)	OH	H	H	C_6H_5	H
275	General formula (112)	General formula (112)	CN	OH	OH	H	C_6H_5	H	H
276	General formula (112)	General formula (112)	CN	OH	OH	H	H	C_6H_5	H
277	General formula (112)	OH	CN	General formula (112)	OH	H	C_6H_5	H	H
278	General formula (112)	OH	CN	General formula (112)	OH	H	H	C_6H_5	H
279	General formula (112)	OH	CN	OH	General formula (112)	H	C_6H_5	H	H
280	General formula (112)	OH	CN	OH	General formula (112)	H	H	C_6H_5	H
281	General formula (112)	OH	CN	OH	OH	H	C_6H_5	H	H
282	General formula (112)	OH	CN	OH	OH	H	H	C_6H_5	H
283	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	C_6H_5	H	H
284	General formula (112)	General formula (112)	CN	General formula (112)	Cl	H	H	C_6H_5	H
285	General formula (112)	General formula (112)	CN	General formula (112)	F	H	C_6H_5	H	H
286	General formula (112)	General formula (112)	CN	General formula (112)	F	H	H	C_6H_5	H
287	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	C_6H_5	H	H
288	General formula (112)	General formula (112)	CN	General formula (112)	CH_3O	H	H	C_6H_5	H
289	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_3O	H	C_6H_5	H	H
290	General formula (112)	General formula (112)	CN	General formula (112)	C_2H_3O	H	H	C_6H_5	H
291	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	C_6H_5	H	H
292	General formula (112)	General formula (112)	CN	General formula (112)	C_6H_5O	H	H	C_6H_5	H
293	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	C_6H_5	H	H
294	General formula (112)	General formula (112)	CN	General formula (112)	Formula (121)	H	H	C_6H_5	H

TABLE 1-5-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
295	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	C_6H_5	H	H
296	General formula (112)	General formula (112)	CN	General formula (112)	Formula (122)	H	H	C_6H_5	H
297	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	C_6H_5	H	H
298	General formula (112)	General formula (112)	CN	General formula (112)	Formula (123)	H	H	C_6H_5	H
299	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	C_6H_5	H	H
300	General formula (112)	General formula (112)	CN	General formula (112)	Formula (124)	H	H	C_6H_5	H

TABLE 2-1

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
301	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	H
302	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	CH_3	H	H
303	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	CH_3O	H	H
304	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3	H
305	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3O	H
306	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	H	t-C_4H_9	H
307	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	H	Cl	H
308	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	H	F	H
309	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	CH_3
310	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	CH_3O
311	General formula (112)	CN	General formula (112)	General formula (112)	H	H	H	H	H
312	General formula (112)	CN	General formula (112)	General formula (112)	H	H	H	CH_3	H
313	General formula (112)	CN	General formula (112)	General formula (112)	H	H	H	CH_3O	H
314	General formula (112)	CN	General formula (112)	H	General formula (112)	H	H	H	H
315	General formula (112)	CN	General formula (112)	H	General formula (112)	H	H	CH_3	H
316	General formula (112)	CN	General formula (112)	H	General formula (112)	H	H	CH_3O	H
317	General formula (112)	CN	H	General formula (112)	General formula (112)	H	H	H	H
318	General formula (112)	CN	H	General formula (112)	General formula (112)	H	H	CH_3	H
319	General formula (112)	CN	H	General formula (112)	General formula (112)	H	H	CH_3O	H
320	H	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	H
321	H	CN	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3	H
322	H	CN	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3O	H
323	General formula (112)	CN	General formula (112)	H	H	H	H	H	H
324	General formula (112)	CN	General formula (112)	H	H	H	H	CH_3	H
325	General formula (112)	CN	General formula (112)	H	H	H	H	CH_3O	H
326	General formula (112)	CN	H	General formula (112)	H	H	H	H	H
327	General formula (112)	CN	H	General formula (112)	H	H	H	CH_3	H

TABLE 2-1-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
328	General formula (112)	CN	H	General formula (112)	H	H	H	CH_3O	H
329	H	CN	General formula (112)	General formula (112)	H	H	H	H	H
330	H	CN	General formula (112)	General formula (112)	H	H	H	CH_3	H
331	H	CN	General formula (112)	General formula (112)	H	H	H	CH_3O	H
332	General formula (112)	CN	H	H	General formula (112)	H	H	H	H
333	General formula (112)	CN	H	H	General formula (112)	H	H	CH_3	H
334	General formula (112)	CN	H	H	General formula (112)	H	H	CH_3O	H
335	H	CN	General formula (112)	H	General formula (112)	H	H	H	H
336	H	CN	General formula (112)	H	General formula (112)	H	H	CH_3	H
337	H	CN	General formula (112)	H	General formula (112)	H	H	CH_3O	H
338	H	CN	H	General formula (112)	General formula (112)	H	H	H	H
339	H	CN	H	General formula (112)	General formula (112)	H	H	CH_3	H
340	H	CN	H	General formula (112)	General formula (112)	H	H	CH_3O	H
341	General formula (112)	CN	H	H	H	H	H	H	H
342	General formula (112)	CN	H	H	H	H	H	CH_3	H
343	General formula (112)	CN	H	H	H	H	H	CH_3O	H
344	H	CN	General formula (112)	H	H	H	H	H	H
345	H	CN	General formula (112)	H	H	H	H	CH_3	H
346	H	CN	General formula (112)	H	H	H	H	CH_3O	H
347	H	CN	H	General formula (112)	H	H	H	H	H
348	H	CN	H	General formula (112)	H	H	H	CH_3	H
349	H	CN	H	General formula (112)	H	H	H	CH_3O	H
350	General formula (112)	CN	General formula (112)	General formula (112)	F	H	H	H	H
351	General formula (112)	CN	General formula (112)	General formula (112)	F	H	H	CH_3	H
352	General formula (112)	CN	General formula (112)	General formula (112)	F	H	H	CH_3O	H
353	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	H	H
354	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	CH_3	H
355	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	CH_3O	H
356	General formula (112)	CN	F	General formula (112)	General formula (112)	H	H	H	H
357	General formula (112)	CN	F	General formula (112)	General formula (112)	H	H	CH_3	H
358	General formula (112)	CN	F	General formula (112)	General formula (112)	H	H	CH_3O	H
359	F	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	H
360	F	CN	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3	H

TABLE 2-2

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
361	F	CN	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3O	H
362	General formula (112)	CN	General formula (112)	F	F	H	H	H	H
363	General formula (112)	CN	General formula (112)	F	F	H	H	CH_3	H
364	General formula (112)	CN	General formula (112)	F	F	H	H	CH_3O	H
365	General formula (112)	CN	F	General formula (112)	F	H	H	H	H
366	General formula (112)	CN	F	General formula (112)	F	H	H	CH_3	H
367	General formula (112)	CN	F	General formula (112)	F	H	H	CH_3O	H
368	F	CN	General formula (112)	General formula (112)	F	H	H	H	H
369	F	CN	General formula (112)	General formula (112)	F	H	H	CH_3	H
370	F	CN	General formula (112)	General formula (112)	F	H	H	CH_3O	H
371	General formula (112)	CN	F	F	General formula (112)	H	H	H	H
372	General formula (112)	CN	F	F	General formula (112)	H	H	CH_3	H
373	General formula (112)	CN	F	F	General formula (112)	H	H	CH_3O	H
374	F	CN	General formula (112)	F	General formula (112)	H	H	H	H
375	F	CN	General formula (112)	F	General formula (112)	H	H	CH_3	H
376	F	CN	General formula (112)	F	General formula (112)	H	H	CH_3O	H
377	F	CN	F	General formula (112)	General formula (112)	H	H	H	H
378	F	CN	F	General formula (112)	General formula (112)	H	H	CH_3	H
379	F	CN	F	General formula (112)	General formula (112)	H	H	CH_3O	H
380	General formula (112)	CN	F	F	F	H	H	H	H
381	General formula (112)	CN	F	F	F	H	H	CH_3	H
382	General formula (112)	CN	F	F	F	H	H	CH_3O	H
383	F	CN	General formula (112)	F	F	H	H	H	H
384	F	CN	General formula (112)	F	F	H	H	CH_3	H
385	F	CN	General formula (112)	F	F	H	H	CH_3O	H
386	F	CN	F	General formula (112)	F	H	H	H	H
387	F	CN	F	General formula (112)	F	H	H	CH_3	H
388	F	CN	F	General formula (112)	F	H	H	CH_3O	H
389	General formula (112)	CN	General formula (112)	General formula (112)	OH	H	H	H	H
390	General formula (112)	CN	General formula (112)	General formula (112)	OH	H	H	CH_3	H
391	General formula (112)	CN	General formula (112)	General formula (112)	OH	H	H	CH_3O	H
392	General formula (112)	CN	General formula (112)	OH	General formula (112)	H	H	H	H
393	General formula (112)	CN	General formula (112)	OH	General formula (112)	H	H	CH_3	H
394	General formula (112)	CN	General formula (112)	OH	General formula (112)	H	H	CH_3O	H
395	General formula (112)	CN	General formula (112)	OH	General formula (112)	H	H	$t\text{-}C_4H_9$	H
396	General formula (112)	CN	General formula (112)	OH	General formula (112)	H	H	Cl	H
397	General formula (112)	CN	General formula (112)	OH	General formula (112)	H	H	F	H
398	General formula (112)	CN	OH	General formula (112)	General formula (112)	H	H	H	H

TABLE 2-2-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
399	General formula (112)	CN	OH	General formula (112)	General formula (112)	H	H	CH_3	H
400	General formula (112)	CN	OH	General formula (112)	General formula (112)	H	H	CH_3O	H
401	OH	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	H
402	OH	CN	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3	H
403	OH	CN	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3O	H
404	General formula (112)	CN	General formula (112)	OH	OH	H	H	H	H
405	General formula (112)	CN	General formula (112)	OH	OH	H	H	CH_3	H
406	General formula (112)	CN	General formula (112)	OH	OH	H	H	CH_3O	H
407	General formula (112)	CN	OH	General formula (112)	OH	H	H	H	H
408	General formula (112)	CN	OH	General formula (112)	OH	H	H	CH_3	H
409	General formula (112)	CN	OH	General formula (112)	OH	H	H	CH_3O	H
410	OH	CN	General formula (112)	General formula (112)	OH	H	H	H	H
411	OH	CN	General formula (112)	General formula (112)	OH	H	H	CH_3	H
412	OH	CN	General formula (112)	General formula (112)	OH	H	H	CH_3O	H
413	General formula (112)	CN	OH	OH	General formula (112)	H	H	H	H
414	General formula (112)	CN	OH	OH	General formula (112)	H	H	CH_3	H
415	General formula (112)	CN	OH	OH	General formula (112)	H	H	CH_3O	H
416	OH	CN	General formula (112)	OH	General formula (112)	H	H	H	H
417	OH	CN	General formula (112)	OH	General formula (112)	H	H	CH_3	H
418	OH	CN	General formula (112)	OH	General formula (112)	H	H	CH_3O	H
419	OH	CN	OH	General formula (112)	General formula (112)	H	H	H	H
420	OH	CN	OH	General formula (112)	General formula (112)	H	H	CH_3	H
421	OH	CN	OH	General formula (112)	General formula (112)	H	H	CH_3O	H
422	General formula (112)	CN	OH	OH	OH	H	H	H	H
423	General formula (112)	CN	OH	OH	OH	H	H	CH_3	H
424	General formula (112)	CN	OH	OH	OH	H	H	CH_3O	H
425	OH	CN	General formula (112)	OH	OH	H	H	H	H

TABLE 2-3

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
426	OH	CN	General formula (112)	OH	OH	H	H	CH_3	H
427	OH	CN	General formula (112)	OH	OH	H	H	CH_3O	H
428	OH	CN	OH	General formula (112)	OH	H	H	H	H
429	OH	CN	OH	General formula (112)	OH	H	H	CH_3	H
430	OH	CN	OH	General formula (112)	OH	H	H	CH_3O	H
431	OH	CN	OH	OH	General formula (112)	H	H	H	H

TABLE 2-3-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
432	OH	CN	OH	OH	General formula (112)	H	H	CH_3	H
433	OH	CN	OH	OH	General formula (112)	H	H	CH_3O	H
434	General formula (112)	CN	General formula (112)	Cl	General formula (112)	H	H	H	H
435	General formula (112)	CN	General formula (112)	Cl	General formula (112)	H	H	CH_3	H
436	General formula (112)	CN	General formula (112)	Cl	General formula (112)	H	H	CH_3O	H
437	General formula (112)	CN	General formula (112)	Cl	General formula (112)	H	H	t-C_4H_9	H
438	General formula (112)	CN	General formula (112)	Cl	General formula (112)	H	H	Cl	H
439	General formula (112)	CN	General formula (112)	Cl	General formula (112)	H	H	F	H
440	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	H	H
441	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	CH_3	H
442	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	CH_3O	H
443	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	t-C_4H_9	H
444	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	Cl	H
445	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	F	H
446	General formula (112)	CN	General formula (112)	CH_3O	General formula (112)	H	H	H	H
447	General formula (112)	CN	General formula (112)	CH_3O	General formula (112)	H	H	CH_3	H
448	General formula (112)	CN	General formula (112)	CH_3O	General formula (112)	H	H	CH_3O	H
449	General formula (112)	CN	General formula (112)	CH_3O	General formula (112)	H	H	t-C_4H_9	H
450	General formula (112)	CN	General formula (112)	CH_3O	General formula (112)	H	H	Cl	H
451	General formula (112)	CN	General formula (112)	CH_3O	General formula (112)	H	H	F	H
452	General formula (112)	CN	General formula (112)	C_2H_5O	General formula (112)	H	H	H	H
453	General formula (112)	CN	General formula (112)	C_2H_5O	General formula (112)	H	H	CH_3	H
454	General formula (112)	CN	General formula (112)	C_2H_5O	General formula (112)	H	H	CH_3O	H
455	General formula (112)	CN	General formula (112)	C_2H_5O	General formula (112)	H	H	t-C_4H_9	H
456	General formula (112)	CN	General formula (112)	C_2H_5O	General formula (112)	H	H	Cl	H
457	General formula (112)	CN	General formula (112)	C_2H_5O	General formula (112)	H	H	F	H
458	General formula (112)	CN	General formula (112)	C_6H_5O	General formula (112)	H	H	H	H
459	General formula (112)	CN	General formula (112)	C_6H_5O	General formula (112)	H	H	CH_3	H
460	General formula (112)	CN	General formula (112)	C_6H_5O	General formula (112)	H	H	CH_3O	H
461	General formula (112)	CN	General formula (112)	C_6H_5O	General formula (112)	H	H	t-C_4H_9	H
462	General formula (112)	CN	General formula (112)	C_6H_5O	General formula (112)	H	H	Cl	H
463	General formula (112)	CN	General formula (112)	C_6H_5O	General formula (112)	H	H	F	H
464	General formula (112)	CN	General formula (112)	Formula (121)	General formula (112)	H	H	H	H
465	General formula (112)	CN	General formula (112)	Formula (121)	General formula (112)	H	H	CH_3	H
466	General formula (112)	CN	General formula (112)	Formula (121)	General formula (112)	H	H	CH_3O	H
467	General formula (112)	CN	General formula (112)	Formula (121)	General formula (112)	H	H	t-C_4H_9	H
468	General formula (112)	CN	General formula (112)	Formula (121)	General formula (112)	H	H	Cl	H
469	General formula (112)	CN	General formula (112)	Formula (121)	General formula (112)	H	H	F	H

TABLE 2-3-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
470	General formula (112)	CN	General formula (112)	Formula (122)	General formula (112)	H	H	H	H
471	General formula (112)	CN	General formula (112)	Formula (122)	General formula (112)	H	H	CH_3	H
472	General formula (112)	CN	General formula (112)	Formula (122)	General formula (112)	H	H	CH_3O	H
473	General formula (112)	CN	General formula (112)	Formula (122)	General formula (112)	H	H	t-C_4H_9	H
474	General formula (112)	CN	General formula (112)	Formula (122)	General formula (112)	H	H	Cl	H
475	General formula (112)	CN	General formula (112)	Formula (122)	General formula (112)	H	H	F	H
476	General formula (112)	CN	General formula (112)	Formula (123)	General formula (112)	H	H	H	H
477	General formula (112)	CN	General formula (112)	Formula (123)	General formula (112)	H	H	CH_3	H
478	General formula (112)	CN	General formula (112)	Formula (123)	General formula (112)	H	H	CH_3O	H
479	General formula (112)	CN	General formula (112)	Formula (123)	General formula (112)	H	H	t-C_4H_9	H
480	General formula (112)	CN	General formula (112)	Formula (123)	General formula (112)	H	H	Cl	H
481	General formula (112)	CN	General formula (112)	Formula (123)	General formula (112)	H	H	F	H
482	General formula (112)	CN	General formula (112)	Formula (124)	General formula (112)	H	H	H	H
483	General formula (112)	CN	General formula (112)	Formula (124)	General formula (112)	H	H	CH_3	H
484	General formula (112)	CN	General formula (112)	Formula (124)	General formula (112)	H	H	CH_3O	H
485	General formula (112)	CN	General formula (112)	Formula (124)	General formula (112)	H	H	t-C_4H_9	H
486	General formula (112)	CN	General formula (112)	Formula (124)	General formula (112)	H	H	Cl	H
487	General formula (112)	CN	General formula (112)	Formula (124)	General formula (112)	H	H	F	H

TABLE 2-4

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
488	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	C_6H_5	H	H
489	General formula (112)	CN	General formula (112)	General formula (112)	General formula (112)	H	H	C_6H_5	H
490	General formula (112)	CN	General formula (112)	General formula (112)	H	H	C_6H_5	H	H
491	General formula (112)	CN	General formula (112)	General formula (112)	H	H	H	C_6H_5	H
492	General formula (112)	CN	General formula (112)	H	General formula (112)	H	C_6H_5	H	H
493	General formula (112)	CN	General formula (112)	H	General formula (112)	H	H	C_6H_5	H
494	General formula (112)	CN	H	General formula (112)	General formula (112)	H	C_6H_5	H	H
495	General formula (112)	CN	H	General formula (112)	General formula (112)	H	H	C_6H_5	H
496	H	CN	General formula (112)	General formula (112)	General formula (112)	H	C_6H_5	H	H
497	H	CN	General formula (112)	General formula (112)	General formula (112)	H	H	C_6H_5	H
498	General formula (112)	CN	General formula (112)	H	H	H	C_6H_5	H	H
499	General formula (112)	CN	General formula (112)	H	H	H	H	C_6H_5	H
500-1	General formula (112)	CN	H	General formula (112)	H	H	C_6H_5	H	H
500-2	General formula (112)	CN	H	General formula (112)	H	H	H	C_6H_5	H
500-3	H	CN	General formula (112)	General formula (112)	H	H	C_6H_5	H	H

TABLE 2-4-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
500-4	H	CN	General formula (112)	General formula (112)	H	H	H	C_6H_5	H
500-5	General formula (112)	CN	H	H	General formula (112)	H	C_6H_5	H	H
500-6	General formula (112)	CN	H	H	General formula (112)	H	H	C_6H_5	H
500-7	H	CN	General formula (112)	H	General formula (112)	H	C_6H_5	H	H
500-8	H	CN	General formula (112)	H	General formula (112)	H	H	C_6H_5	H
500-9	H	CN	H	General formula (112)	General formula (112)	H	C_6H_5	H	H
500-10	H	CN	H	General formula (112)	General formula (112)	H	H	C_6H_5	H
500-11	General formula (112)	CN	H	H	H	H	C_6H_5	H	H
500-12	General formula (112)	CN	H	H	H	H	H	C_6H_5	H
500-13	H	CN	General formula (112)	H	H	H	C_6H_5	H	H
500-14	H	CN	General formula (112)	H	H	H	H	C_6H_5	H
500-15	H	CN	H	General formula (112)	H	H	C_6H_5	H	H
500-16	H	CN	H	General formula (112)	H	H	H	C_6H_5	H
500-17	General formula (112)	CN	General formula (112)	General formula (112)	F	H	H	C_6H_5	H
500-18	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	C_6H_5	H
500-19	General formula (112)	CN	F	General formula (112)	General formula (112)	H	H	C_6H_5	H
500-20	F	CN	General formula (112)	General formula (112)	General formula (112)	H	H	C_6H_5	H
500-21	General formula (112)	CN	General formula (112)	F	F	H	H	C_6H_5	H
500-22	General formula (112)	CN	F	General formula (112)	F	H	H	C_6H_5	H
500-23	F	CN	General formula (112)	General formula (112)	F	H	H	C_6H_5	H
500-24	General formula (112)	CN	F	F	General formula (112)	H	H	C_6H_5	H
500-25	F	CN	General formula (112)	F	General formula (112)	H	H	C_6H_5	H
500-26	F	CN	F	General formula (112)	General formula (112)	H	H	C_6H_5	H
500-27	General formula (112)	CN	F	F	F	H	H	C_6H_5	H
500-28	F	CN	General formula (112)	F	F	H	H	C_6H_5	H
500-29	F	CN	F	General formula (112)	F	H	H	C_6H_5	H
500-30	General formula (112)	CN	General formula (112)	General formula (112)	OH	H	H	C_6H_5	H
500-31	General formula (112)	CN	General formula (112)	OH	General formula (112)	H	H	C_6H_5	H
500-32	General formula (112)	CN	OH	General formula (112)	General formula (112)	H	H	C_6H_5	H
500-33	OH	CN	General formula (112)	General formula (112)	General formula (112)	H	H	C_6H_5	H
500-34	General formula (112)	CN	General formula (112)	OH	OH	H	H	C_6H_5	H
500-35	General formula (112)	CN	OH	General formula (112)	OH	H	H	C_6H_5	H
500-36	OH	CN	General formula (112)	General formula (112)	OH	H	H	C_6H_5	H
500-37	General formula (112)	CN	OH	OH	General formula (112)	H	H	C_6H_5	H
500-38	OH	CN	General formula (112)	OH	General formula (112)	H	H	C_6H_5	H
500-39	OH	CN	OH	General formula (112)	General formula (112)	H	H	C_6H_5	H
500-40	General formula (112)	CN	OH	OH	OH	H	H	C_6H_5	H
500-41	OH	CN	General formula (112)	OH	OH	H	H	C_6H_5	H

TABLE 2-4-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
500-42	OH	CN	OH	General formula (112)	OH	H	H	C_6H_5	H
500-43	OH	CN	OH	OH	General formula (112)	H	H	C_6H_5	H
500-44	General formula (112)	CN	General formula (112)	Cl	General formula (112)	H	H	C_6H_5	H
500-45	General formula (112)	CN	General formula (112)	F	General formula (112)	H	H	C_6H_5	H
500-46	General formula (112)	CN	General formula (112)	CH_3O	General formula (112)	H	H	C_6H_5	H
500-47	General formula (112)	CN	General formula (112)	C_2H_5O	General formula (112)	H	H	C_6H_5	H
500-48	General formula (112)	CN	General formula (112)	C_6H_5O	General formula (112)	H	H	C_6H_5	H
500-49	General formula (112)	CN	General formula (112)	Formula (121)	General formula (112)	H	H	C_6H_5	H
500-50	General formula (112)	CN	General formula (112)	Formula (122)	General formula (112)	H	H	C_6H_5	H
500-51	General formula (112)	CN	General formula (112)	Formula (123)	General formula (112)	H	H	C_6H_5	H
500-52	General formula (112)	CN	General formula (112)	Formula (124)	General formula (112)	H	H	C_6H_5	H

TABLE 3-1

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
501	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	H	H	H
502	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	CH_3	H	H
503	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	CH_3O	H	H
504	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3	H
505	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	H	CH_3O	H
506	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	H	t-C_4H_9	H
507	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	H	Cl	H
508	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	H	F	H
509	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	H	H	CH_3
510	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	H	H	CH_3O
511	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	H	H
512	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	CH_3	H
513	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	CH_3O	H
514	CN	General formula (112)	General formula (112)	H	General formula (112)	H	H	H	H
515	CN	General formula (112)	General formula (112)	H	General formula (112)	H	H	CH_3	H
516	CN	General formula (112)	General formula (112)	H	General formula (112)	H	H	CH_3O	H
517	CN	General formula (112)	General formula (112)	H	H	H	H	H	H
518	CN	General formula (112)	General formula (112)	H	H	H	H	CH_3	H
519	CN	General formula (112)	General formula (112)	H	H	H	H	CH_3O	H
520	CN	General formula (112)	H	General formula (112)	H	H	H	H	H
521	CN	General formula (112)	H	General formula (112)	H	H	H	CH_3	H
522	CN	General formula (112)	H	General formula (112)	H	H	H	CH_3O	H

TABLE 3-1-continued

Compound	General formula (1)					General formula (112)			
No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
523	CN	H	General formula (112)	General formula (112)	H	H	H	H	H
524	CN	H	General formula (112)	General formula (112)	H	H	H	CH_3	H
525	CN	H	General formula (112)	General formula (112)	H	H	H	CH_3O	H
526	CN	General formula (112)	H	H	General formula (112)	H	H	H	H
527	CN	General formula (112)	H	H	General formula (112)	H	H	CH_3	H
528	CN	General formula (112)	H	H	General formula (112)	H	H	CH_3O	H
529	CN	General formula (112)	H	H	H	H	H	H	H
530	CN	General formula (112)	H	H	H	H	H	CH_3	H
531	CN	General formula (112)	H	H	H	H	H	CH_3O	H
532	CN	H	General formula (112)	H	H	H	H	H	H
533	CN	H	General formula (112)	H	H	H	H	CH_3	H
534	CN	H	General formula (112)	H	H	H	H	CH_3O	H
535	CN	General formula (112)	General formula (112)	General formula (112)	F	H	H	H	H
536	CN	General formula (112)	General formula (112)	General formula (112)	F	H	H	CH_3	H
537	CN	General formula (112)	General formula (112)	General formula (112)	F	H	H	CH_3O	H
538	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	H	H
539	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	CH_3	H
540	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	CH_3O	H
541	CN	General formula (112)	General formula (112)	F	F	H	H	H	H
542	CN	General formula (112)	General formula (112)	F	F	H	H	CH_3	H
543	CN	General formula (112)	General formula (112)	F	F	H	H	CH_3O	H
544	CN	General formula (112)	F	General formula (112)	F	H	H	H	H
545	CN	General formula (112)	F	General formula (112)	F	H	H	CH_3	H
546	CN	General formula (112)	F	General formula (112)	F	H	H	CH_3O	H
547	CN	F	General formula (112)	General formula (112)	F	H	H	H	H
548	CN	F	General formula (112)	General formula (112)	F	H	H	CH_3	H
549	CN	F	General formula (112)	General formula (112)	F	H	H	CH_3O	H
550	CN	General formula (112)	F	F	General formula (112)	H	H	H	H
551	CN	General formula (112)	F	F	General formula (112)	H	H	CH_3	H
552	CN	General formula (112)	F	F	General formula (112)	H	H	CH_3O	H
553	CN	General formula (112)	F	F	F	H	H	H	H
554	CN	General formula (112)	F	F	F	H	H	CH_3	H
555	CN	General formula (112)	F	F	F	H	H	CH_3O	H
556	CN	F	General formula (112)	F	F	H	H	H	H
557	CN	F	General formula (112)	F	F	H	H	CH_3	H
558	CN	F	General formula (112)	F	F	H	H	CH_3O	H

TABLE 3-2

	General formula (1)					General formula (112)			
Compound No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
559	CN	General formula (112)	General formula (112)	General formula (112)	OH	H	H	H	H
560	CN	General formula (112)	General formula (112)	General formula (112)	OH	H	H	CH_3	H
561	CN	General formula (112)	General formula (112)	General formula (112)	OH	H	H	CH_3O	H
562	CN	General formula (112)	General formula (112)	OH	General formula (112)	H	H	H	H
563	CN	General formula (112)	General formula (112)	OH	General formula (112)	H	H	CH_3	H
654	CN	General formula (112)	General formula (112)	OH	General formula (112)	H	H	CH_3O	H
565	CN	General formula (112)	General formula (112)	OH	General formula (112)	H	H	Cl	H
566	CN	General formula (112)	General formula (112)	OH	General formula (112)	H	H	F	H
567	CN	General formula (112)	General formula (112)	OH	OH	H	H	H	H
568	CN	General formula (112)	General formula (112)	OH	OH	H	H	CH_3	H
569	CN	General formula (112)	General formula (112)	OH	OH	H	H	CH_3O	H
570	CN	General formula (112)	OH	General formula (112)	OH	H	H	H	H
571	CN	General formula (112)	OH	General formula (112)	OH	H	H	CH_3	H
572	CN	General formula (112)	OH	General formula (112)	OH	H	H	CH_3O	H
573	CN	OH	General formula (112)	General formula (112)	OH	H	H	H	H
574	CN	OH	General formula (112)	General formula (112)	OH	H	H	CH_3	H
575	CN	OH	General formula (112)	General formula (112)	OH	H	H	CH_3O	H
576	CN	General formula (112)	OH	OH	General formula (112)	H	H	H	H
577	CN	General formula (112)	OH	OH	General formula (112)	H	H	CH_3	H
578	CN	General formula (112)	OH	OH	General formula (112)	H	H	CH_3O	H
579	CN	General formula (112)	OH	OH	OH	H	H	H	H
580	CN	General formula (112)	OH	OH	OH	H	H	CH_3	H
581	CN	General formula (112)	OH	OH	OH	H	H	CH_3O	H
582	CN	OH	General formula (112)	OH	OH	H	H	H	H
583	CN	OH	General formula (112)	OH	OH	H	H	CH_3	H
584	CN	OH	General formula (112)	OH	OH	H	H	CH_3O	H
585	CN	General formula (112)	General formula (112)	Cl	General formula (112)	H	H	H	H
586	CN	General formula (112)	General formula (112)	Cl	General formula (112)	H	H	CH_3	H
587	CN	General formula (112)	General formula (112)	Cl	General formula (112)	H	H	CH_3O	H
588	CN	General formula (112)	General formula (112)	Cl	General formula (112)	H	H	t-C_4H_9	H
589	CN	General formula (112)	General formula (112)	Cl	General formula (112)	H	H	Cl	H
590	CN	General formula (112)	General formula (112)	Cl	General formula (112)	H	H	F	H
591	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	H	H
592	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	CH_3	H
593	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	CH_3O	H
594	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	t-C_4H_9	H
595	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	Cl	H
596	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	F	H

TABLE 3-2-continued

	General formula (1)					General formula (112)			
Compound No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
597	CN	General formula (112)	General formula (112)	CH_3O	General formula (112)	H	H	H	H
598	CN	General formula (112)	General formula (112)	CH_3O	General formula (112)	H	H	CH_3	H
599	CN	General formula (112)	General formula (112)	CH_3O	General formula (112)	H	H	CH_3O	H
600	CN	General formula (112)	General formula (112)	CH_3O	General formula (112)	H	H	t-C_4H_9	H
601	CN	General formula (112)	General formula (112)	CH_3O	General formula (112)	H	H	Cl	H
602	CN	General formula (112)	General formula (112)	CH_3O	General formula (112)	H	H	F	H
603	CN	General formula (112)	General formula (112)	C_2H_5O	General formula (112)	H	H	H	H
604	CN	General formula (112)	General formula (112)	C_2H_5O	General formula (112)	H	H	CH_3	H
605	CN	General formula (112)	General formula (112)	C_2H_5O	General formula (112)	H	H	CH_3O	H
606	CN	General formula (112)	General formula (112)	C_2H_5O	General formula (112)	H	H	t-C_4H_9	H
607	CN	General formula (112)	General formula (112)	C_2H_5O	General formula (112)	H	H	Cl	H
608	CN	General formula (112)	General formula (112)	C_2H_5O	General formula (112)	H	H	F	H
609	CN	General formula (112)	General formula (112)	C_6H_5O	General formula (112)	H	H	H	H
610	CN	General formula (112)	General formula (112)	C_6H_5O	General formula (112)	H	H	CH_3	H
611	CN	General formula (112)	General formula (112)	C_6H_5O	General formula (112)	H	H	CH_3O	H
612	CN	General formula (112)	General formula (112)	C_6H_5O	General formula (112)	H	H	t-C_4H_9	H
613	CN	General formula (112)	General formula (112)	C_6H_5O	General formula (112)	H	H	Cl	H
614	CN	General formula (112)	General formula (112)	C_6H_5O	General formula (112)	H	H	F	H
615	CN	General formula (112)	General formula (112)	formula (121)	General formula (112)	H	H	H	H
616	CN	General formula (112)	General formula (112)	formula (121)	General formula (112)	H	H	CH_3	H
617	CN	General formula (112)	General formula (112)	formula (121)	General formula (112)	H	H	CH_3O	H
618	CN	General formula (112)	General formula (112)	formula (121)	General formula (112)	H	H	t-C_4H_9	H
619	CN	General formula (112)	General formula (112)	formula (121)	General formula (112)	H	H	Cl	H
620	CN	General formula (112)	General formula (112)	formula (121)	General formula (112)	H	H	F	H

TABLE 3-3

	General formula (1)					General formula (112)			
Compound No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
621	CN	General formula (112)	General formula (112)	formula (122)	General formula (112)	H	H	H	H
622	CN	General formula (112)	General formula (112)	formula (122)	General formula (112)	H	H	CH_3	H
623	CN	General formula (112)	General formula (112)	formula (122)	General formula (112)	H	H	CH_3O	H
624	CN	General formula (112)	General formula (112)	formula (122)	General formula (112)	H	H	t-C_4H_9	H
625	CN	General formula (112)	General formula (112)	formula (122)	General formula (112)	H	H	Cl	H
626	CN	General formula (112)	General formula (112)	formula (122)	General formula (112)	H	H	F	H
627	CN	General formula (112)	General formula (112)	formula (123)	General formula (112)	H	H	H	H
628	CN	General formula (112)	General formula (112)	formula (123)	General formula (112)	H	H	CH_3	H
629	CN	General formula (112)	General formula (112)	formula (123)	General formula (112)	H	H	CH_3O	H

TABLE 3-3-continued

	General formula (1)					General formula (112)			
Compound No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
630	CN	General formula (112)	General formula (112)	formula (123)	General formula (112)	H	H	t-C_4H_9	H
631	CN	General formula (112)	General formula (112)	formula (123)	General formula (112)	H	H	Cl	H
632	CN	General formula (112)	General formula (112)	formula (123)	General formula (112)	H	H	F	H
633	CN	General formula (112)	General formula (112)	formula (124)	General formula (112)	H	H	H	H
634	CN	General formula (112)	General formula (112)	formula (124)	General formula (112)	H	H	CH_3	H
635	CN	General formula (112)	General formula (112)	formula (124)	General formula (112)	H	H	CH_3O	H
636	CN	General formula (112)	General formula (112)	Formula (124)	General formula (112)	H	H	t-C_4H_9	H
637	CN	General formula (112)	General formula (112)	Formula (124)	General formula (112)	H	H	Cl	H
638	CN	General formula (112)	General formula (112)	Formula (124)	General formula (112)	H	H	F	H
639	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	C_6H_5	H	H
640	CN	General formula (112)	General formula (112)	General formula (112)	General formula (112)	H	H	C_6H_5	H
641	CN	General formula (112)	General formula (112)	General formula (112)	H	H	C_6H_5	H	H
642	CN	General formula (112)	General formula (112)	General formula (112)	H	H	H	C_6H_5	H
643	CN	General formula (112)	General formula (112)	H	General formula (112)	H	C_6H_5	H	H
644	CN	General formula (112)	General formula (112)	H	General formula (112)	H	H	C_6H_5	H
645	CN	General formula (112)	General formula (112)	H	H	H	C_6H_5	H	H
646	CN	General formula (112)	General formula (112)	H	H	H	H	C_6H_5	H
647	CN	General formula (112)	H	General formula (112)	H	H	C_6H_5	H	H
648	CN	General formula (112)	H	General formula (112)	H	H	H	C_6H_5	H
649	CN	H	General formula (112)	General formula (112)	H	H	C_6H_5	H	H
650	CN	H	General formula (112)	General formula (112)	H	H	H	C_6H_5	H
651	CN	H	H	General formula (112)	General formula (112)	H	C_6H_5	H	H
652	CN	H	H	General formula (112)	General formula (112)	H	H	C_6H_5	H
653	CN	General formula (112)	H	H	H	H	C_6H_5	H	H
654	CN	General formula (112)	H	H	H	H	H	C_6H_5	H
655	CN	H	General formula (112)	H	H	H	C_6H_5	H	H
656	CN	H	General formula (112)	H	H	H	H	C_6H_5	H
657	CN	General formula (112)	General formula (112)	General formula (112)	F	H	H	C_6H_5	H
658	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	C_6H_5	H
659	CN	General formula (112)	General formula (112)	F	F	H	H	C_6H_5	H
660	CN	General formula (112)	F	General formula (112)	F	H	H	C_6H_5	H
661	CN	F	General formula (112)	General formula (112)	F	H	H	C_6H_5	H
662	CN	F	F	General formula (112)	General formula (112)	H	H	C_6H_5	H
663	CN	General formula (112)	F	F	F	H	H	C_6H_5	H
664	CN	F	General formula (112)	F	F	H	H	C_6H_5	H
665	CN	General formula (112)	General formula (112)	General formula (112)	OH	H	H	C_6H_5	H
666	CN	General formula (112)	General formula (112)	OH	General formula (112)	H	H	C_6H_5	H
667	CN	General formula (112)	General formula (112)	OH	OH	H	H	C_6H_5	H

TABLE 3-3-continued

	General formula (1)					General formula (112)			
Compound No.	R^1	R^2	R^3	R^4	R^5	R^{31}, R^{38}	R^{32}, R^{37}	R^{33}, R^{36}	R^{34}, R^{35}
668	CN	General formula (112)	OH	General formula (112)	OH	H	H	C_6H_5	H
669	CN	OH	General formula (112)	General formula (112)	OH	H	H	C_6H_5	H
670	CN	OH	OH	General formula (112)	General formula (112)	H	H	C_6H_5	H
671	CN	General formula (112)	OH	OH	OH	H	H	C_6H_5	H
672	CN	OH	General formula (112)	OH	OH	H	H	C_6H_5	H
673	CN	General formula (112)	General formula (112)	Cl	General formula (112)	H	H	C_6H_5	H
674	CN	General formula (112)	General formula (112)	F	General formula (112)	H	H	C_6H_5	H
675	CN	General formula (112)	General formula (112)	CH_3O	General formula (112)	H	H	C_6H_5	H
676	CN	General formula (112)	General formula (112)	C_2H_5O	General formula (112)	H	H	C_6H_5	H
677	CN	General formula (112)	General formula (112)	C_6H_5O	General formula (112)	H	H	C_6H_5	H
678	CN	General formula (112)	General formula (112)	Formula (121)	General formula (112)	H	H	C_6H_5	H
679	CN	General formula (112)	General formula (112)	Formula (122)	General formula (112)	H	H	C_6H_5	H
680	CN	General formula (112)	General formula (112)	Formula (123)	General formula (112)	H	H	C_6H_5	H
681	CN	General formula (112)	General formula (112)	Formula (124)	General formula (112)	H	H	C_6H_5	H

TABLE 4-1

Compound	General formula (1)					General formula (113)	
No.	R^1	R^2	R^3	R^4	R^5	R^{41}	R^{42}
701	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
702	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	CH_3
703	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	CH_3O
704	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
705	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
706	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
707	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
708	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
709	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
710	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
711	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
712	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
713	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
714	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
715	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
716	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
717	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
718	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H

TABLE 4-1-continued

719	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
720	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
721	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
722	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
723	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
724	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
725	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
726	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
727	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
728	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
729	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
730	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
731	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
732	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
733	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
734	General formula (113)	General formula (113)	CN	General formula (113)	General formula (113)	H	H
735	General formula (113)	General formula (113)	CN	General formula (113)	H	H	H
736	General formula (113)	General formula (113)	CN	H	General formula (113)	H	H
737	General formula (113)	General formula (113)	CN	H	H	H	H
738	General formula (113)	H	CN	General formula (113)	H	H	H
739	H	General formula (113)	CN	General formula (113)	H	H	H
740	General formula (113)	H	CN	H	H	H	H
741	General formula (113)	General formula (113)	CN	General formula (113)	F	H	H
742	General formula (113)	General formula (113)	CN	F	General formula (113)	H	H
743	General formula (113)	General formula (113)	CN	F	F	H	H
744	General formula (113)	F	CN	General formula (113)	F	H	H
745	F	General formula (113)	CN	General formula (113)	F	H	H
746	General formula (113)	F	CN	F	F	H	H
747	General formula (113)	General formula (113)	CN	General formula (113)	OH	H	H
748	General formula (113)	General formula (113)	CN	OH	General formula (113)	H	H
749	General formula (113)	General formula (113)	CN	OH	OH	H	H
750	General formula (113)	OH	CN	General formula (113)	OH	H	H
751	OH	General formula (113)	CN	General formula (113)	OH	H	H
752	General formula (113)	OH	CN	OH	OH	H	H
753	General formula (113)	General formula (113)	CN	Cl	General formula (113)	H	H
754	General formula (113)	General formula (113)	CN	Cl	General formula (113)	H	H
755	General formula (113)	General formula (113)	CN	Cl	General formula (113)	H	H
756	General formula (113)	General formula (113)	CN	Cl	General formula (113)	H	H
757	General formula (113)	General formula (113)	CN	Cl	General formula (113)	H	H
758	General formula (113)	General formula (113)	CN	Cl	General formula (113)	H	H

TABLE 4-1-continued

759	General formula (113)	General formula (113)	CN	F	General formula (113)	H	H
760	General formula (113)	General formula (113)	CN	F	General formula (113)	H	H
761	General formula (113)	General formula (113)	CN	F	General formula (113)	H	H
762	General formula (113)	General formula (113)	CN	F	General formula (113)	H	H
763	General formula (113)	General formula (113)	CN	F	General formula (113)	H	H
764	General formula (113)	General formula (113)	CN	F	General formula (113)	H	H
765	General formula (113)	General formula (113)	CN	CH_3O	General formula (113)	H	H

Compound	General formula (113)			
No.	R^{43}	R^{44}	R^{45}	R^{46}
701	H	H	H	H
702	H	H	H	H
703	H	H	H	H
704	CH_3	H	H	H
705	CH_3O	H	H	H
706	t-C_4H_9	H	H	H
707	Cl	H	H	H
708	F	H	H	H
709	H	CH_3	H	H
710	H	CH_3O	H	H
711	H	H	CH_3	H
712	H	H	CH_3O	H
713	H	H	t-C_4H_9	H
714	H	H	Cl	H
715	H	H	F	H
716	H	H	C_6H_5	H
717	H	H	p-$CH_3C_6H_4$	H
718	H	H	2,4,6-$(CH_3)_3C_6H_2$	H
719	H	H	p-$CH_3OC_6H_4$	H
720	H	H	p-$(CH_3)_2NC_6H_4$	H
721	H	H	p-FC_6H_4	H
722	H	H	p-CNC_6H_4	H
723	H	H	H	CH_3
724	H	H	H	CH_3O
725	H	H	H	t-C_4H_9
726	H	H	H	Cl
727	H	H	H	F
728	H	H	H	C_6H_5
729	H	H	H	p-$CH_3C_6H_4$
730	H	H	H	2,4,6-$(CH_3)_3C_6H_2$
731	H	H	H	p-$CH_3OC_6H_4$
732	H	H	H	p-$(CH_3)_2NC_6H_4$
733	H	H	H	p-FC_6H_4
734	H	H	H	p-CNC_6H_4
735	H	H	H	H
736	H	H	H	H
737	H	H	H	H
738	H	H	H	H
739	H	H	H	H
740	H	H	H	H
741	H	H	H	H
742	H	H	H	H
743	H	H	H	H
744	H	H	H	H
745	H	H	H	H
746	H	H	H	H
747	H	H	H	H
748	H	H	H	H
749	H	H	H	H
750	H	H	H	H
751	H	H	H	H
752	H	H	H	H
753	H	H	H	H
754	CH_3	H	H	H
755	CH_3O	H	H	H
756	t-C_4H_8	H	H	H
757	Cl	H	H	H
758	F	H	H	H
759	H	H	H	H
760	CH_3	H	H	H
761	CH_3O	H	H	H

TABLE 4-1-continued

762	t-C_4H_8	H	H	H
763	Cl	H	H	H
764	F	H	H	H
765	H	H	H	H

TABLE 4-2

Compound	General formula (1)					General formula (113)					
No.	R^1	R^2	R^3	R^4	R^5	R^{41}	R^{42}	R^{43}	R^{44}	R^{45}	R^{46}
766	General formula (113)	General formula (113)	CN	CH_3O	General formula (113)	H	H	CH_3	H	H	H
767	General formula (113)	General formula (113)	CN	CH_3O	General formula (113)	H	H	CH_3O	H	H	H
768	General formula (113)	General formula (113)	CN	CH_3O	General formula (113)	H	H	t-C_4H_8	H	H	H
769	General formula (113)	General formula (113)	CN	CH_3O	General formula (113)	H	H	Cl	H	H	H
770	General formula (113)	General formula (113)	CN	CH_3O	General formula (113)	H	H	F	H	H	H
771	General formula (113)	General formula (113)	CN	C_2H_5O	General formula (113)	H	H	H	H	H	H
772	General formula (113)	General formula (113)	CN	C_2H_5O	General formula (113)	H	H	CH_3	H	H	H
773	General formula (113)	General formula (113)	CN	C_2H_5O	General formula (113)	H	H	CH_2O	H	H	H
774	General formula (113)	General formula (113)	CN	C_2H_5O	General formula (113)	H	H	t-C_4H_8	H	H	H
775	General formula (113)	General formula (113)	CN	C_2H_5O	General formula (113)	H	H	Cl	H	H	H
776	General formula (113)	General formula (113)	CN	C_2H_5O	General formula (113)	H	H	F	H	H	H
777	General formula (113)	General formula (113)	CN	C_6H_5O	General formula (113)	H	H	H	H	H	H
778	General formula (113)	General formula (113)	CN	C_6H_5O	General formula (113)	H	H	CH_3	H	H	H
779	General formula (113)	General formula (113)	CN	C_6H_5O	General formula (113)	H	H	CH_3O	H	H	H
780	General formula (113)	General formula (113)	CN	C_6H_5O	General formula (113)	H	H	t-C_4H_9	H	H	H
781	General formula (113)	General formula (113)	CN	C_6H_5O	General formula (113)	H	H	Cl	H	H	H
782	General formula (113)	General formula (113)	CN	C_6H_5O	General formula (113)	H	H	F	H	H	H
783	General formula (113)	General formula (113)	CN	Formula (121)	General formula (113)	H	H	H	H	H	H
784	General formula (113)	General formula (113)	CN	Formula (121)	General formula (113)	H	H	CH_3	H	H	H
785	General formula (113)	General formula (113)	CN	Formula (121)	General formula (113)	H	H	CH_3O	H	H	H
786	General formula (113)	General formula (113)	CN	Formula (121)	General formula (113)	H	H	t-C_4H_9	H	H	H
787	General formula (113)	General formula (113)	CN	Formula (121)	General formula (113)	H	H	Cl	H	H	H
788	General formula (113)	General formula (113)	CN	Formula (121)	General formula (113)	H	H	F	H	H	H
789	General formula (113)	General formula (113)	CN	Formula (122)	General formula (113)	H	H	H	H	H	H
790	General formula (113)	General formula (113)	CN	Formula (122)	General formula (113)	H	H	CH_3	H	H	H
791	General formula (113)	General formula (113)	CN	Formula (122)	General formula (113)	H	H	CH_3O	H	H	H
792	General formula (113)	General formula (113)	CN	Formula (122)	General formula (113)	H	H	t-C_4H_9	H	H	H
793	General formula (113)	General formula (113)	CN	Formula (122)	General formula (113)	H	H	Cl	H	H	H
794	General formula (113)	General formula (113)	CN	Formula (122)	General formula (113)	H	H	F	H	H	H
795	General formula (113)	General formula (113)	CN	Formula (123)	General formula (113)	H	H	H	H	H	H
796	General formula (113)	General formula (113)	CN	Formula (123)	General formula (113)	H	H	CH_3	H	H	H
797	General formula (113)	General formula (113)	CN	Formula (123)	General formula (113)	H	H	CH_3O	H	H	H
798	General formula (113)	General formula (113)	CN	Formula (123)	General formula (113)	H	H	t-C_4H_9	H	H	H

TABLE 4-2-continued

Compound	General formula (1)					General formula (113)					
No.	R^1	R^2	R^3	R^4	R^5	R^{41}	R^{42}	R^{43}	R^{44}	R^{45}	R^{46}
799	General formula (113)	General formula (113)	CN	Formula (123)	General formula (113)	H	H	Cl	H	H	H
800	General formula (113)	General formula (113)	CN	Formula (123)	General formula (113)	H	H	F	H	H	H
801	General formula (113)	General formula (113)	CN	Formula (124)	General formula (113)	H	H	H	H	H	H
802	General formula (113)	General formula (113)	CN	Formula (124)	General formula (113)	H	H	CH_3	H	H	H
803	General formula (113)	General formula (113)	CN	Formula (124)	General formula (113)	H	H	CH_3O	H	H	H
804	General formula (113)	General formula (113)	CN	Formula (124)	General formula (113)	H	H	t-C_4H_9	H	H	H
805	General formula (113)	General formula (113)	CN	Formula (124)	General formula (113)	H	H	Cl	H	H	H
806	General formula (113)	General formula (113)	CN	Formula (124)	General formula (113)	H	H	F	H	H	H

TABLE 5-1

Compound	General formula (1)					General formula (114)	
No.	R^1	R^2	R^3	R^4	R^5	R^{52}	R^{53}
901	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
902	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	CH_3	H
903	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	CH_3O	H
904	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	CH_3
905	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	CH_3O
906	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	t-C_4H_9
907	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	Cl
908	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	F
909	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
910	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
911	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
912	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
913	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
914	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
915	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
916	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
917	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
918	General formula (114)	General formula (114)	CN	General formula (114)	General formula (114)	H	H
919	General formula (114)	General formula (114)	CN	General formula (114)	H	H	H
920	General formula (114)	General formula (114)	CN	H	General formula (114)	H	H
921	General formula (114)	General formula (114)	CN	H	H	H	H
922	General formula (114)	H	CN	General formula (114)	H	H	H
923	H	General formula (114)	CN	General formula (114)	H	H	H
924	General formula (114)	H	CN	H	H	H	H

TABLE 5-1-continued

925	General formula (114)	General formula (114)	CN	General formula (114)	F	H	H
926	General formula (114)	General formula (114)	CN	F	General formula (114)	H	H
927	General formula (114)	General formula (114)	CN	F	F	H	H
928	General formula (114)	F	CN	General formula (114)	F	H	H
929	F	General formula (114)	CN	General formula (114)	F	H	H
930	General formula (114)	F	CN	F	F	H	H
931	General formula (114)	General formula (114)	CN	General formula (114)	OH	H	H
932	General formula (114)	General formula (114)	CN	OH	General formula (114)	H	H
933	General formula (114)	General formula (114)	CN	OH	OH	H	H
934	General formula (114)	OH	CN	General formula (114)	OH	H	H
935	OH	General formula (114)	CN	General formula (114)	OH	H	H
936	General formula (114)	OH	CN	OH	OH	H	H
937	General formula (114)	General formula (114)	CN	Cl	General formula (114)	H	H
938	General formula (114)	General formula (114)	CN	Cl	General formula (114)	H	CH_3
939	General formula (114)	General formula (114)	CN	Cl	General formula (114)	H	CH_3O
940	General formula (114)	General formula (114)	CN	Cl	General formula (114)	H	t-C_4H_9
941	General formula (114)	General formula (114)	CN	Cl	General formula (114)	H	Cl
942	General formula (114)	General formula (114)	CN	Cl	General formula (114)	H	F
943	General formula (114)	General formula (114)	CN	F	General formula (114)	H	H
944	General formula (114)	General formula (114)	CN	F	General formula (114)	H	CH_3
945	General formula (114)	General formula (114)	CN	F	General formula (114)	H	CH_3O
946	General formula (114)	General formula (114)	CN	F	General formula (114)	H	t-C_4H_9
947	General formula (114)	General formula (114)	CN	F	General formula (114)	H	Cl
948	General formula (114)	General formula (114)	CN	F	General formula (114)	H	F
949	General formula (114)	General formula (114)	CN	CH_3O	General formula (114)	H	H
950	General formula (114)	General formula (114)	CN	CH_3O	General formula (114)	H	CH_3
951	General formula (114)	General formula (114)	CN	CH_3O	General formula (114)	H	CH_3O
952	General formula (114)	General formula (114)	CN	CH_3O	General formula (114)	H	t-C_4H_9
953	General formula (114)	General formula (114)	CN	CH_3O	General formula (114)	H	Cl
954	General formula (114)	General formula (114)	CN	CH_3O	General formula (114)	H	F
955	General formula (114)	General formula (114)	CN	C_2H_5O	General formula (114)	H	H
956	General formula (114)	General formula (114)	CN	C_2H_5O	General formula (114)	H	CH_3
957	General formula (114)	General formula (114)	CN	C_2H_5O	General formula (114)	H	CH_3O
958	General formula (114)	General formula (114)	CN	C_2H_5O	General formula (114)	H	t-C_4H_9
959	General formula (114)	General formula (114)	CN	C_2H_5O	General formula (114)	H	Cl
960	General formula (114)	General formula (114)	CN	C_2H_5O	General formula (114)	H	F
961	General formula (114)	General formula (114)	CN	C_6H_5O	General formula (114)	H	H
962	General formula (114)	General formula (114)	CN	C_6H_5O	General formula (114)	H	CH_3
963	General formula (114)	General formula (114)	CN	C_6H_5O	General formula (114)	H	CH_3O
964	General formula (114)	General formula (114)	CN	C_6H_5O	General formula (114)	H	t-C_4H_9

TABLE 5-1-continued

965	General formula (114)	General formula (114)	CN	C_6H_5O		General formula (114)	H	Cl

	General formula (114)					
Compound No.	R^{54}	R^{56}	R^{57}	R^{58}	R^{61}	R^{51}, R^{56}, R^{58}, R^{60}, R^{62}
901	H	H	H	H	H	H
902	H	H	H	H	H	H
903	H	H	H	H	H	H
904	H	H	H	H	H	H
905	H	H	H	H	H	H
906	H	H	H	H	H	H
907	H	H	H	H	H	H
908	H	H	H	H	H	H
909	CH_3	H	H	H	H	H
910	CH_3O	H	H	H	H	H
911	H	CH_3	H	H	H	H
912	H	CH_3O	H	H	H	H
913	H	H	CH_3	H	H	H
914	H	H	CH_3O	H	H	H
915	H	H	H	CH_3	H	H
916	H	H	H	CH_3O	H	H
917	H	H	H	H	CH_3	H
918	H	H	H	H	CH_3O	H
919	H	H	H	H	H	H
920	H	H	H	H	H	H
921	H	H	H	H	H	H
922	H	H	H	H	H	H
923	H	H	H	H	H	H
924	H	H	H	H	H	H
925	H	H	H	H	H	H
926	H	H	H	H	H	H
927	H	H	H	H	H	H
928	H	H	H	H	H	H
929	H	H	H	H	H	H
930	H	H	H	H	H	H
931	H	H	H	H	H	H
932	H	H	H	H	H	H
933	H	H	H	H	H	H
934	H	H	H	H	H	H
935	H	H	H	H	H	H
936	H	H	H	H	H	H
937	H	H	H	H	H	H
938	H	H	H	H	H	H
939	H	H	H	H	H	H
940	H	H	H	H	H	H
941	H	H	H	H	H	H
942	H	H	H	H	H	H
943	H	H	H	H	H	H
944	H	H	H	H	H	H
945	H	H	H	H	H	H
946	H	H	H	H	H	H
947	H	H	H	H	H	H
948	H	H	H	H	H	H
949	H	H	H	H	H	H
950	H	H	H	H	H	H
951	H	H	H	H	H	H
952	H	H	H	H	H	H
953	H	H	H	H	H	H
954	H	H	H	H	H	H
955	H	H	H	H	H	H
956	H	H	H	H	H	H
957	H	H	H	H	H	H
958	H	H	H	H	H	H
959	H	H	H	H	H	H
960	H	H	H	H	H	H
961	H	H	H	H	H	H
962	H	H	H	H	H	H
963	H	H	H	H	H	H
964	H	H	H	H	H	H
965	H	H	H	H	H	H

TABLE 5-2

Compound	General formula (1)					General formula (114)							
No.	R^1	R^2	R^3	R^4	R^5	R^{52}	R^{53}	R^{54}	R^{56}	R^{57}	R^{58}	R^{61}	R^{51}, R^{56}, R^{58}, R^{60}, R^{62}
966	General formula (114)	General formula (114)	CN	C_6H_5O	General formula (114)	H	F	H	H	H	H	H	H
967	General formula (114)	General formula (114)	CN	Formula (121)	General formula (114)	H	H	H	H	H	H	H	H
968	General formula (114)	General formula (114)	CN	Formula (121)	General formula (114)	H	CH_3	H	H	H	H	H	H
969	General formula (114)	General formula (114)	CN	Formula (121)	General formula (114)	H	CH_3O	H	H	H	H	H	H
970	General formula (114)	General formula (114)	CN	Formula (121)	General formula (114)	H	t-C_4H_9	H	H	H	H	H	H
971	General formula (114)	General formula (114)	CN	Formula (121)	General formula (114)	H	Cl	H	H	H	H	H	H
972	General formula (114)	General formula (114)	CN	Formula (121)	General formula (114)	H	F	H	H	H	H	H	H
973	General formula (114)	General formula (114)	CN	Formula (122)	General formula (114)	H	H	H	H	H	H	H	H
974	General formula (114)	General formula (114)	CN	Formula (122)	General formula (114)	H	CH_3	H	H	H	H	H	H
975	General formula (114)	General formula (114)	CN	Formula (122)	General formula (114)	H	CH_3O	H	H	H	H	H	H
976	General formula (114)	General formula (114)	CN	Formula (122)	General formula (114)	H	t-C_4H_9	H	H	H	H	H	H
977	General formula (114)	General formula (114)	CN	Formula (122)	General formula (114)	H	Cl	H	H	H	H	H	H
978	General formula (114)	General formula (114)	CN	Formula (122)	General formula (114)	H	F	H	H	H	H	H	H
989	General formula (114)	General formula (114)	CN	Formula (123)	General formula (114)	H	H	H	H	H	H	H	H
980	General formula (114)	General formula (114)	CN	Formula (123)	General formula (114)	H	CH_3	H	H	H	H	H	H
981	General formula (114)	General formula (114)	CN	Formula (123)	General formula (114)	H	CH_3O	H	H	H	H	H	H
982	General formula (114)	General formula (114)	CN	Formula (123)	General formula (114)	H	t-C_4H_9	H	H	H	H	H	H
983	General formula (114)	General formula (114)	CN	Formula (123)	General formula (114)	H	Cl	H	H	H	H	H	H
984	General formula (114)	General formula (114)	CN	Formula (123)	General formula (114)	H	F	H	H	H	H	H	H
985	General formula (114)	General formula (114)	CN	Formula (124)	General formula (114)	H	H	H	H	H	H	H	H
986	General formula (114)	General formula (114)	CN	Formula (124)	General formula (114)	H	CH_3	H	H	H	H	H	H
987	General formula (114)	General formula (114)	CN	Formula (124)	General formula (114)	H	CH_3O	H	H	H	H	H	H
988	General formula (114)	General formula (114)	CN	Formula (124)	General formula (114)	H	t-C_4H_9	H	H	H	H	H	H
989	General formula (114)	General formula (114)	CN	Formula (124)	General formula (114)	H	Cl	H	H	H	H	H	H
990	General formula (114)	General formula (114)	CN	Formula (124)	General formula (114)	H	F	H	H	H	H	H	H

TABLE 6-1

Compound	General formula (1)					General formula (115)				
No.	R^1	R^2	R^3	R^4	R^5	R^{71}, R^{80}	R^{72}, R^{79}	R^{73}, R^{78}	R^{74}, R^{77}	R^{75}, R^{76}
1001	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	H	H	H	H
1002	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	CH_3	H	H	H
1003	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	CH_3O	H	H	H
1004	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	C_6H_5	H	H	H
1005	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	CH_3	H	CH_3	H
1006	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	CH_3O	H	CH_3O	H

TABLE 6-1-continued

Compound	General formula (1)					General formula (115)				
No.	R^1	R^2	R^3	R^4	R^5	R^{71}, R^{80}	R^{72}, R^{79}	R^{73}, R^{78}	R^{74}, R^{77}	R^{75}, R^{76}
1007	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	C_6H_5	H	C_6H_5	H
1008	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	H	CH_3	H	H
1009	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	H	CH_3O	H	H
1010	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	H	t-C_4H_9	H	H
1011	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	H	Cl	H	H
1012	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	H	F	H	H
1013	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	H	C_6H_5	H	H
1014	General formula (115)	General formula (115)	CN	General formula (115)	General formula (115)	H	H	p-C_6H_5—C_6H_4	H	H
1015	General formula (115)	General formula (115)	CN	General formula (115)	H	H	H	H	H	H
1016	General formula (115)	General formula (115)	CN	H	General formula (115)	H	H	H	H	H
1017	General formula (115)	General formula (115)	CN	H	H	H	H	H	H	H
1018	General formula (115)	H	CN	General formula (115)	H	H	H	H	H	H
1019	H	General formula (115)	CN	General formula (115)	H	H	H	H	H	H
1020	General formula (115)	H	CN	H	H	H	H	H	H	H
1021	General formula (115)	General formula (115)	CN	General formula (115)	F	H	H	H	H	H
1022	General formula (115)	General formula (115)	CN	F	General formula (115)	H	H	H	H	H
1023	General formula (115)	General formula (115)	CN	F	F	H	H	H	H	H
1024	General formula (115)	F	CN	General formula (115)	F	H	H	H	H	H
1025	F	General formula (115)	CN	General formula (115)	F	H	H	H	H	H
1026	General formula (115)	F	CN	F	F	H	H	H	H	H
1027	General formula (115)	General formula (115)	CN	General formula (115)	OH	H	H	H	H	H
1028	General formula (115)	General formula (115)	CN	OH	General formula (115)	H	H	H	H	H
1029	General formula (115)	General formula (115)	CN	OH	OH	H	H	H	H	H
1030	General formula (115)	OH	CN	General formula (115)	OH	H	H	H	H	H
1031	OH	General formula (115)	CN	General formula (115)	OH	H	H	H	H	H
1032	General formula (115)	OH	CN	OH	OH	H	H	H	H	H
1033	General formula (115)	General formula (115)	CN	Cl	General formula (115)	H	H	H	H	H
1034	General formula (115)	General formula (115)	CN	Cl	General formula (115)	H	H	CH_3	H	H
1035	General formula (115)	General formula (115)	CN	Cl	General formula (115)	H	H	CH_3O	H	H
1036	General formula (115)	General formula (115)	CN	Cl	General formula (115)	H	H	t-C_4H_9	H	H
1037	General formula (115)	General formula (115)	CN	Cl	General formula (115)	H	H	Cl	H	H
1038	General formula (115)	General formula (115)	CN	Cl	General formula (115)	H	H	F	H	H
1039	General formula (115)	General formula (115)	CN	F	General formula (115)	H	H	H	H	H
1040	General formula (115)	General formula (115)	CN	F	General formula (115)	H	H	CH_3	H	H
1041	General formula (115)	General formula (115)	CN	F	General formula (115)	H	H	CH_3O	H	H
1042	General formula (115)	General formula (115)	CN	F	General formula (115)	H	H	t-C_4H_9	H	H
1043	General formula (115)	General formula (115)	CN	F	General formula (115)	H	H	Cl	H	H
1044	General formula (115)	General formula (115)	CN	F	General formula (115)	H	H	F	H	H

TABLE 6-1-continued

Compound	General formula (1)					General formula (115)				
No.	R^1	R^2	R^3	R^4	R^5	R^{71}, R^{80}	R^{72}, R^{79}	R^{73}, R^{78}	R^{74}, R^{77}	R^{75}, R^{76}
1045	General formula (115)	General formula (115)	CN	CH_3O	General formula (115)	H	H	H	H	H
1046	General formula (115)	General formula (115)	CN	CH_3O	General formula (115)	H	H	CH_3	H	H
1047	General formula (115)	General formula (115)	CN	CH_3O	General formula (115)	H	H	CH_3O	H	H
1048	General formula (115)	General formula (115)	CN	CH_3O	General formula (115)	H	H	t-C_4H_9	H	H
1049	General formula (115)	General formula (115)	CN	CH_3O	General formula (115)	H	H	Cl	H	H
1050	General formula (115)	General formula (115)	CN	CH_3O	General formula (115)	H	H	F	H	H
1051	General formula (115)	General formula (115)	CN	C_2H_5O	General formula (115)	H	H	H	H	H
1052	General formula (115)	General formula (115)	CN	C_2H_5O	General formula (115)	H	H	CH_3	H	H
1053	General formula (115)	General formula (115)	CN	C_2H_5O	General formula (115)	H	H	CH_3O	H	H
1054	General formula (115)	General formula (115)	CN	C_2H_5O	General formula (115)	H	H	t-C_4H_9	H	H
1055	General formula (115)	General formula (115)	CN	C_2H_5O	General formula (115)	H	H	Cl	H	H
1056	General formula (115)	General formula (115)	CN	C_2H_5O	General formula (115)	H	H	F	H	H
1057	General formula (115)	General formula (115)	CN	C_6H_5O	General formula (115)	H	H	H	H	H
1058	General formula (115)	General formula (115)	CN	C_6H_5O	General formula (115)	H	H	CH_3	H	H
1059	General formula (115)	General formula (115)	CN	C_6H_5O	General formula (115)	H	H	CH_3O	H	H
1060	General formula (115)	General formula (115)	CN	C_6H_5O	General formula (115)	H	H	t-C_4H_9	H	H

TABLE 6-2

Compound	General formula (1)					General formula (115)				
No.	R^1	R^2	R^3	R^4	R^5	R^{71}, R^{80}	R^{72}, R^{79}	R^{73}, R^{78}	R^{74}, R^{77}	R^{75}, R^{76}
1061	General formula (115)	General formula (115)	CN	C_6H_5O	General formula (115)	H	H	Cl	H	H
1062	General formula (115)	General formula (115)	CN	C_6H_5O	General formula (115)	H	H	F	H	H
1063	General formula (115)	General formula (115)	CN	Formula (121)	General formula (115)	H	H	H	H	H
1064	General formula (115)	General formula (115)	CN	Formula (121)	General formula (115)	H	H	CH_3	H	H
1065	General formula (115)	General formula (115)	CN	Formula (121)	General formula (115)	H	H	CH_3O	H	H
1066	General formula (115)	General formula (115)	CN	Formula (121)	General formula (115)	H	H	t-C_4H_9	H	H
1067	General formula (115)	General formula (115)	CN	Formula (121)	General formula (115)	H	H	Cl	H	H
1068	General formula (115)	General formula (115)	CN	Formula (121)	General formula (115)	H	H	F	H	H
1069	General formula (115)	General formula (115)	CN	Formula (122)	General formula (115)	H	H	H	H	H
1070	General formula (115)	General formula (115)	CN	Formula (122)	General formula (115)	H	H	CH_3	H	H
1071	General formula (115)	General formula (115)	CN	Formula (122)	General formula (115)	H	H	CH_3O	H	H
1072	General formula (115)	General formula (115)	CN	Formula (122)	General formula (115)	H	H	t-C_4H_9	H	H
1073	General formula (115)	General formula (115)	CN	Formula (122)	General formula (115)	H	H	Cl	H	H
1074	General formula (115)	General formula (115)	CN	Formula (122)	General formula (115)	H	H	F	H	H
1075	General formula (115)	General formula (115)	CN	Formula (123)	General formula (115)	H	H	H	H	H
1076	General formula (115)	General formula (115)	CN	Formula (123)	General formula (115)	H	H	CH_3	H	H
1077	General formula (115)	General formula (115)	CN	Formula (123)	General formula (115)	H	H	CH_3O	H	H

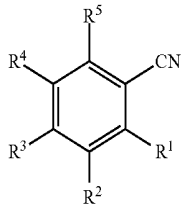
TABLE 6-2-continued

Compound	General formula (1)					General formula (115)				
No.	R^1	R^2	R^3	R^4	R^5	R^{71}, R^{80}	R^{72}, R^{79}	R^{73}, R^{78}	R^{74}, R^{77}	R^{75}, R^{76}
1078	General formula (115)	General formula (115)	CN	Formula (123)	General formula (115)	H	H	t-C_4H_9	H	H
1079	General formula (115)	General formula (115)	CN	Formula (123)	General formula (115)	H	H	Cl	H	H
1080	General formula (115)	General formula (115)	CN	Formula (123)	General formula (115)	H	H	F	H	H
1081	General formula (115)	General formula (115)	CN	Formula (124)	General formula (115)	H	H	H	H	H
1082	General formula (115)	General formula (115)	CN	Formula (124)	General formula (115)	H	H	CH_3	H	H
1083	General formula (115)	General formula (115)	CN	Formula (124)	General formula (115)	H	H	CH_3O	H	H
1084	General formula (115)	General formula (115)	CN	Formula (124)	General formula (115)	H	H	t-C_4H_9	H	H
1085	General formula (115)	General formula (115)	CN	Formula (124)	General formula (115)	H	H	Cl	H	H
1086	General formula (115)	General formula (115)	CN	Formula (124)	General formula (115)	H	H	F	H	H

Examples of the preferred light, emitting material capable of emitting delayed fluorescent light include the following compounds.

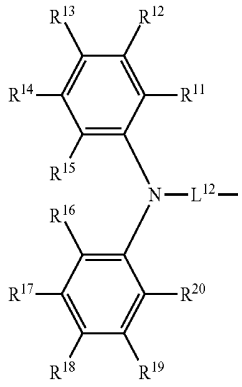
(1) A compound represented by the following general formula (131):

General Formula (131)



wherein in the general formula (131), from 0 to 1 of R^1 to R^5 represents a cyano group, from 1 to 5 of R^1 to R^5 each represent a group represented by the following general formula (132), and the balance of R^1 to R^5 each represent a hydrogen atom or a substituent other than the above,

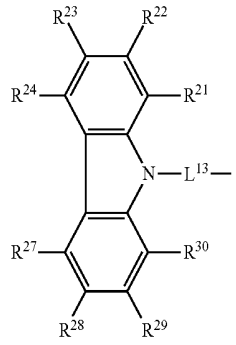
General Formula (132)



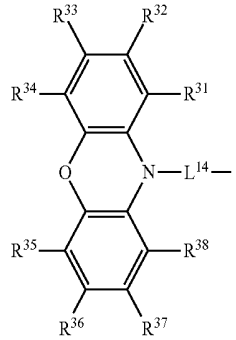
wherein in the general formula (132), R^{11} to R^{20} each independently represent a hydrogen atom or a substituent, provided that R^{11} and R^{12}, R^{12} and R^{13}, R^{13} and R^{14}, R^{14} and R^{15}, R^{15} and R^{16}, R^{16} and R^{17}, R^{17} and R^{18}, R^{18} and R^{19}, and R^{19} and R^{20} each may be bonded to each other to form a ring structure; and L^{12} represents a substituted or unsubstituted arylene group or a substituted or unsubstituted heteroarylene group.

(2) The compound according to the item (1), wherein the group represented by the general formula (132) is a group represented by any one of the following general formulae (133) to (138):

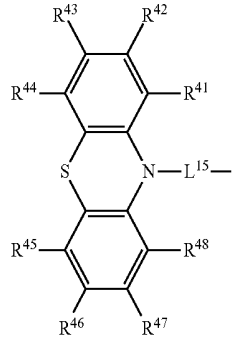
General Formula (133)



General Formula (134)



General Formula (135)



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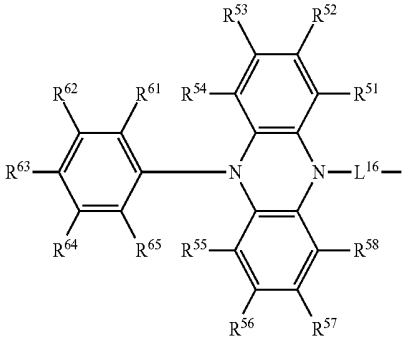
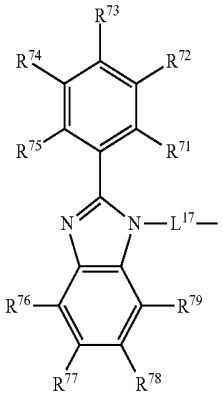
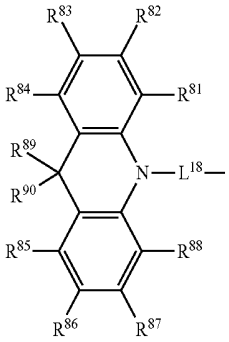
General Formula (136)



General Formula (137)



General Formula (138)



wherein in the general formulae (133) to (138), R^{21} to R^{24}, R^{27} to R^{38}, R^{41} to R^{48}, R^{51} to R^{56}, R^{61} to R^{65}, R^{71} to R^{79}, R^{81} to R^{90} each independently represent a hydrogen atom or a substituent, provided that R^{21} to R^{22}, R^{22} to R^{23}, R^{23} to R^{24}, R^{27} and R^{28}, R^{28} and R^{29}, R^{29} and R^{30}, R^{31} and R^{32}, R^{32} and R^{33}, R^{33} and R^{34}, R^{35} and R^{36}, R^{36} and R^{37}, R^{37} and R^{38}, R^{41} and R^{42}, R^{42} and R^{43}, R^{43} and R^{44}, R^{45} and R^{46}, R^{46} and R^{47}, R^{47} and R^{48}, R^{51} and R^{52}, R^{52} and R^{53}, R^{53} and R^{54}, R^{55} and R^{56}, R^{56} and R^{57}, R^{57} and R^{58}, R^{61} and R^{62}, R^{62} and R^{63}, R^{63} and R^{64}, R^{64} and R^{65}, R^{54} and R^{61}, R^{55} and R^{66}, R^{71} and R^{62}, R^{72} and R^{73}, R^{73} and R^{74}, R^{74} and R^{75}, R^{76} and R^{77}, R^{77} and R^{78}, R^{78} and R^{79}, R^{81} and R^{82}, R^{82} and R^{83}, R^{83} and R^{84}, R^{85} and R^{86}, R^{86} and R^{87}, R^{87} and R^{88}, and R^{89} and R^{90} each may be bonded to each other to form a ring structure; and L^{13} to L^{18} each independently represent a substituted or unsubstituted arylene group or a substituted or unsubstituted heteroarylene group.

(3) The compound according to the item (1) or (2), wherein in the general formula (131), R^3 represents a cyano group.

(4) The compound according to any one of the items (1) to (3), wherein in the general formula (131), R^1 and R^4 each represent a group represented by the general formula (132).

(5) The compound according to any one of the items (1) to (4), wherein in the general formula (132), represents a phenylene group.

(6) The compound according to any one of the items (1) to (5), wherein the group represented by the general formula (132) is a group represented by the general formula (133).

(7) the compound according to the item (6), wherein in the general formula (133), L^{13} represents a 1,3-phenylene group.

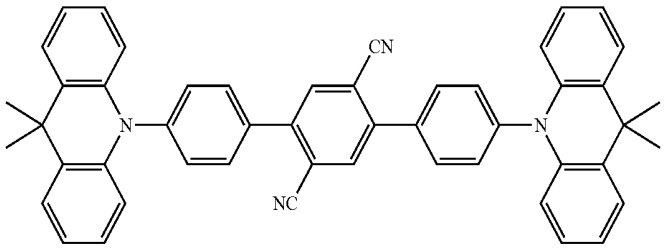
(8) The compound according to any one of the items (1) to (5), wherein the group represented by the general formula (132) is a group represented by the general formula (134).

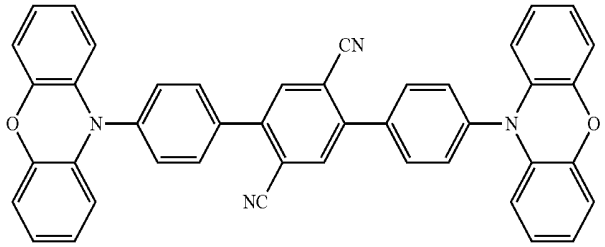
(9) The compound according to the item (8), wherein in the general formula (134), L^{14} represents a 1,4-phenylene group.

(10) The compound according to any one of the items (1) to (5), wherein the group represented by the general formula (132) is a group represented by the general formula (138).

(11) The compound according to the item (10), wherein in the general formula (138), represents a 1,4-phenylene group.

Examples of the compound include the following compounds.





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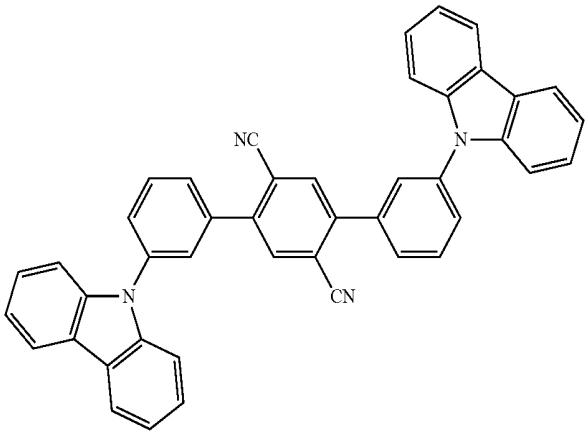

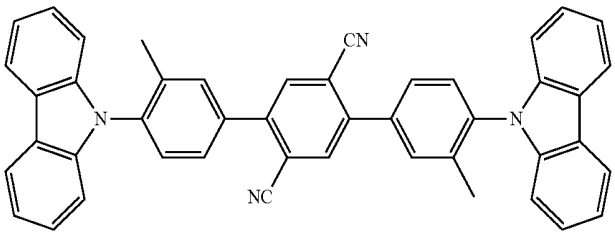

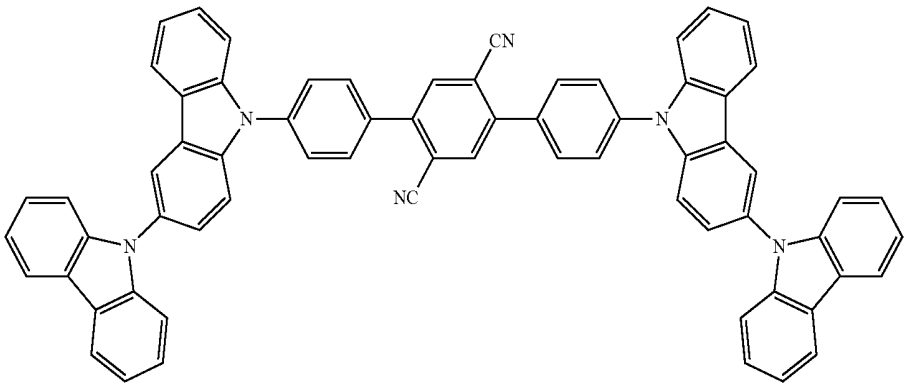

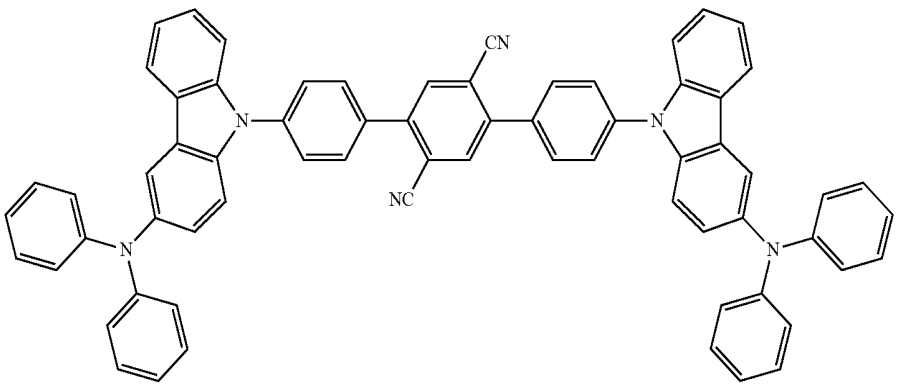

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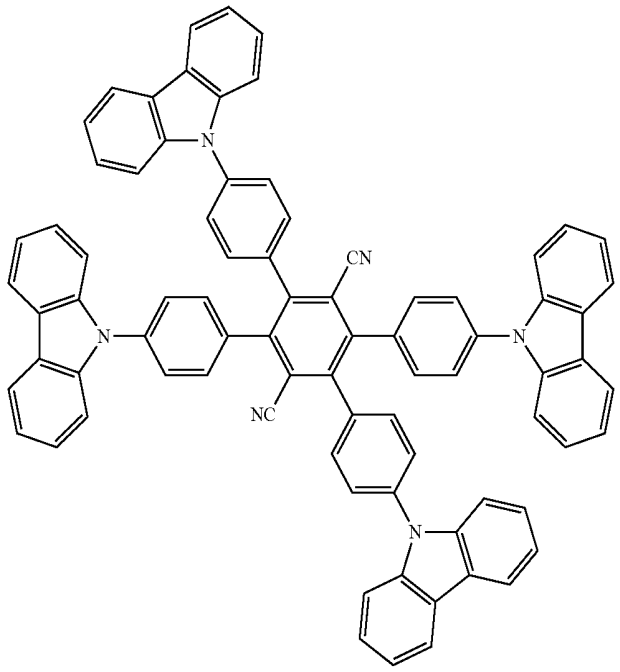

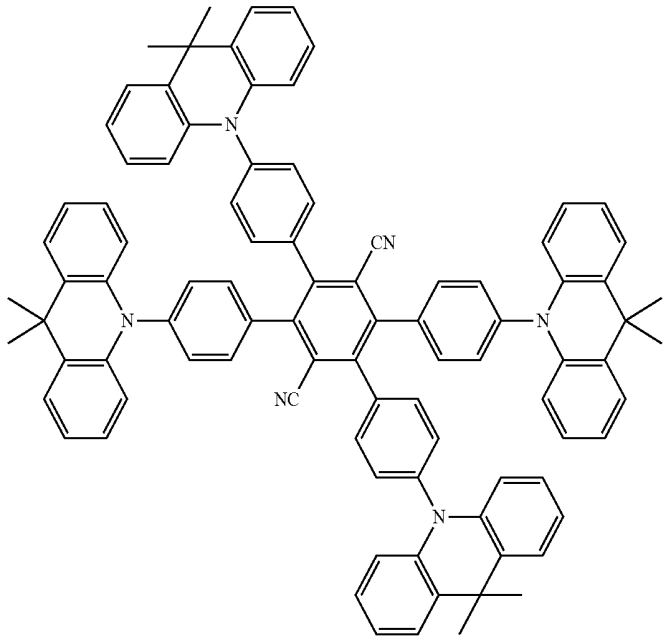

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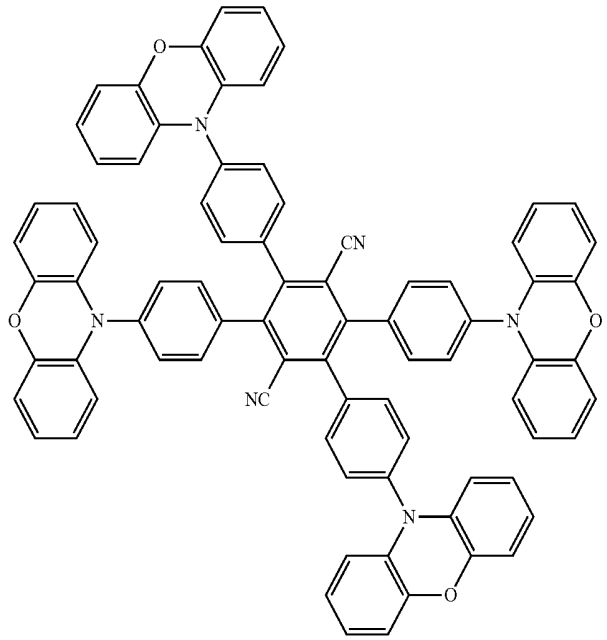

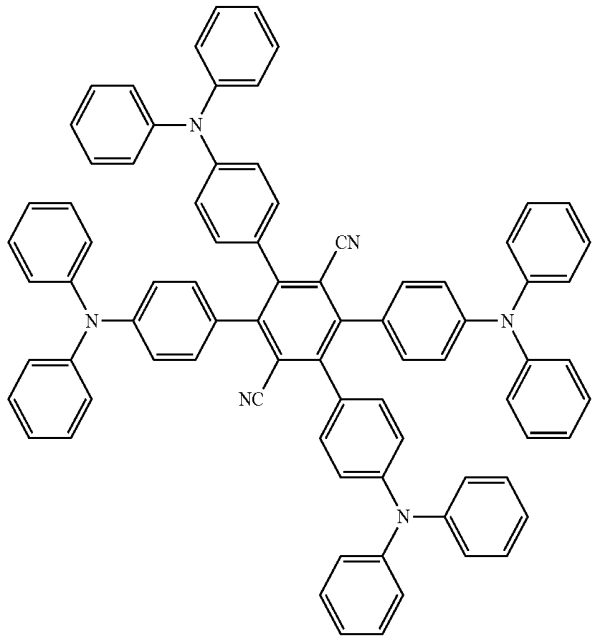

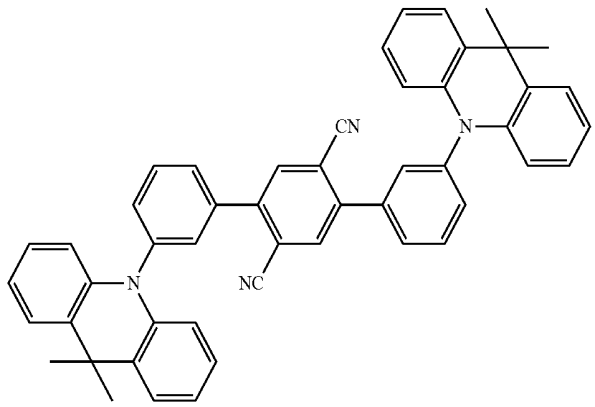

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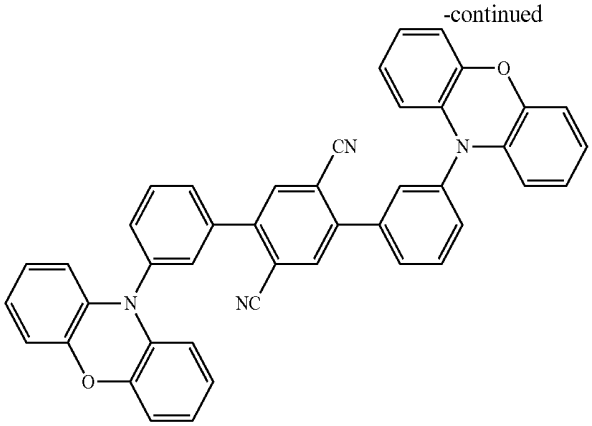

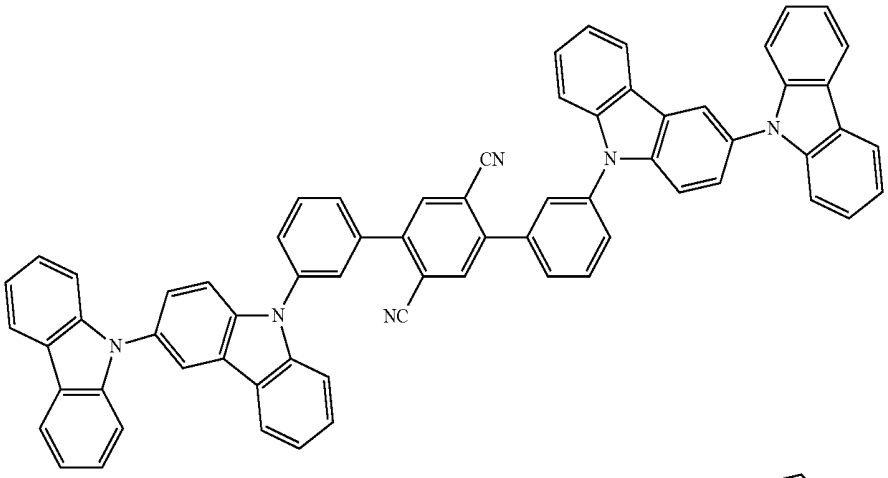

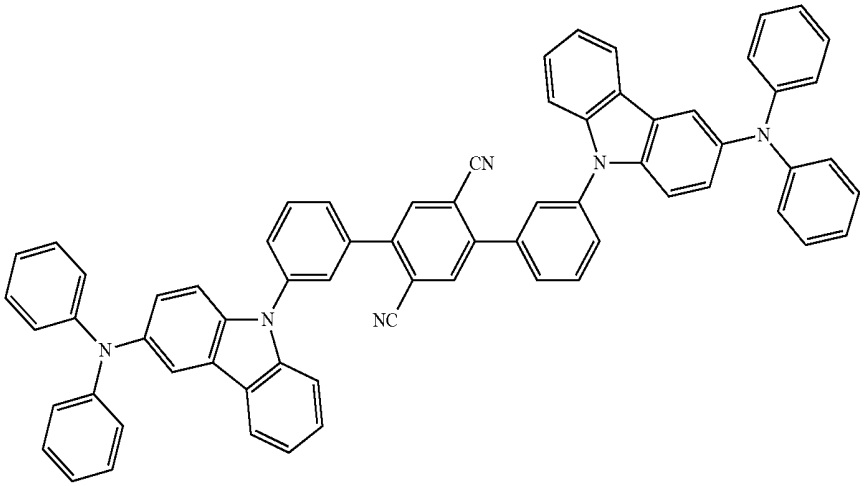

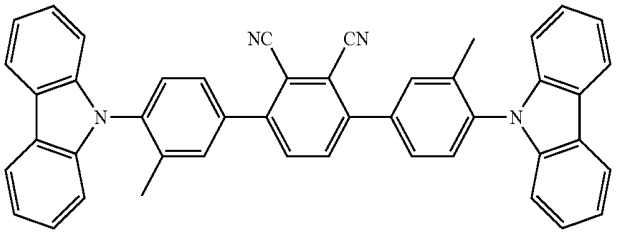

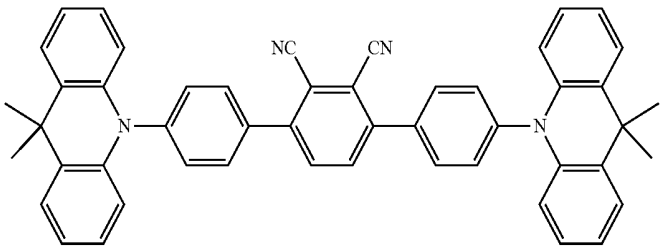

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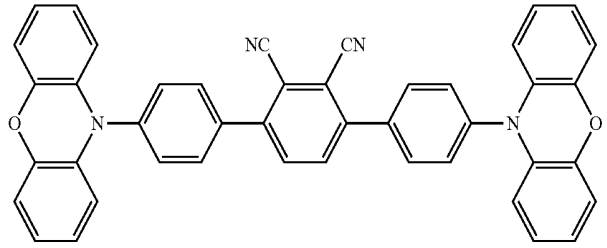

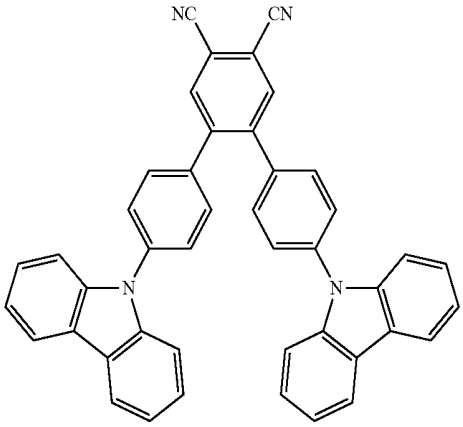

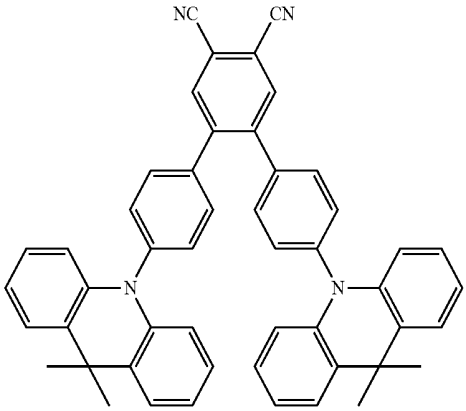

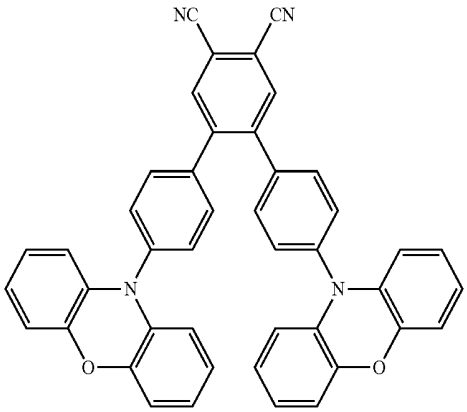

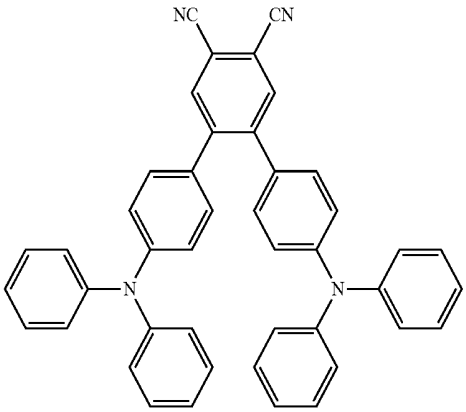

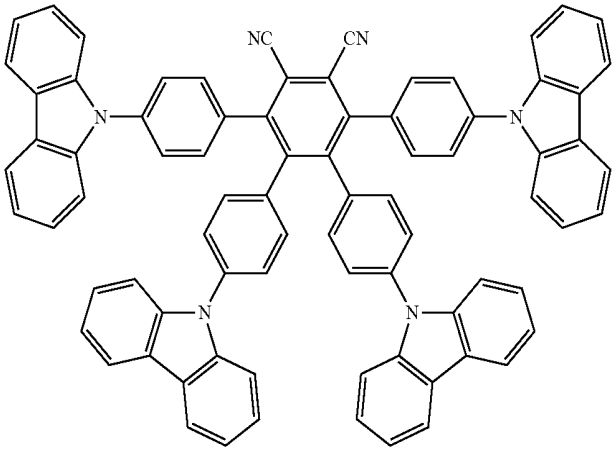

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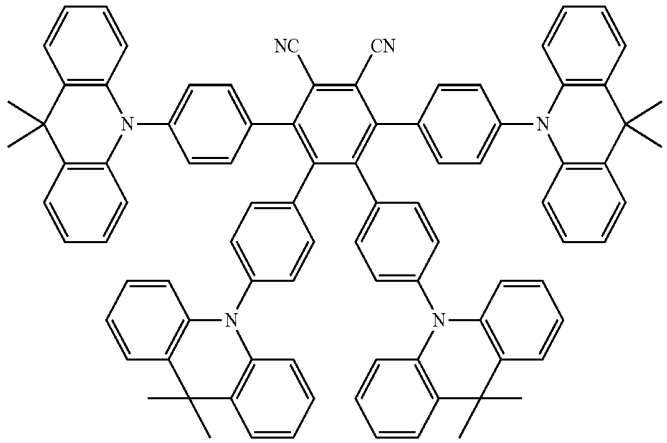

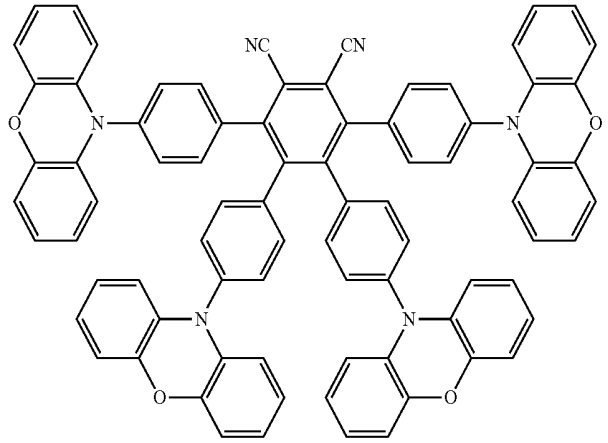

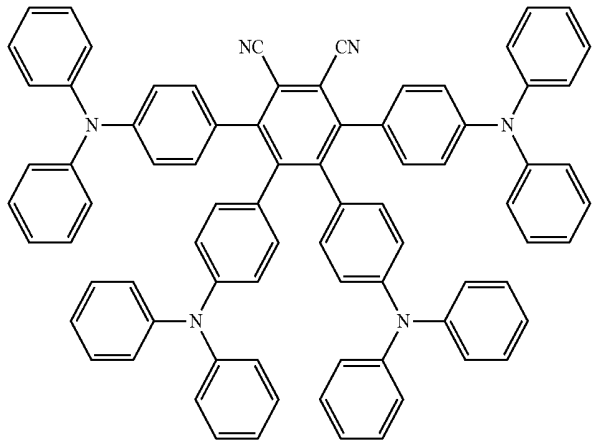

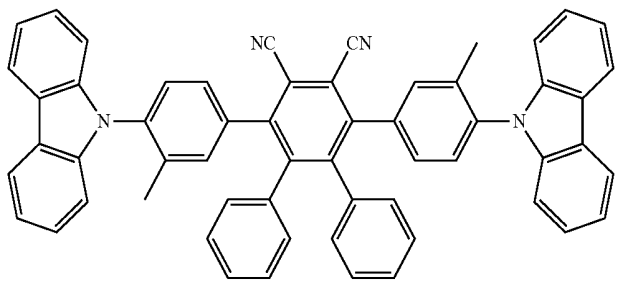

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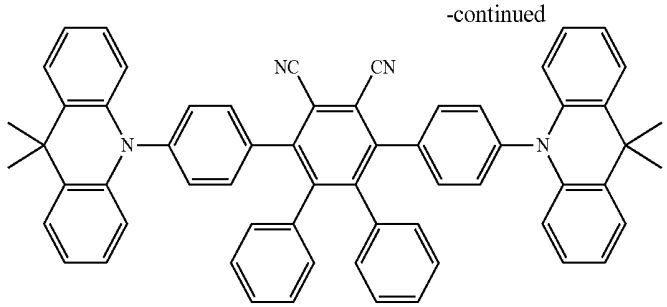
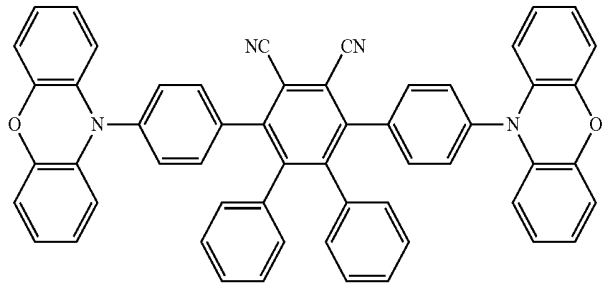
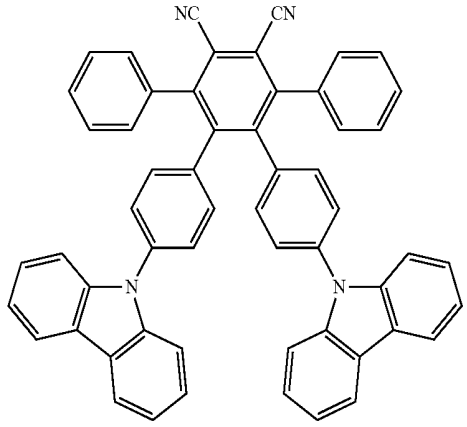
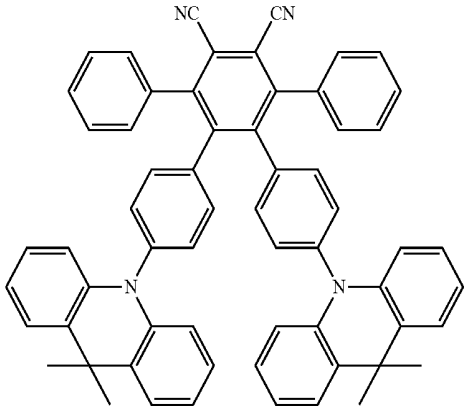
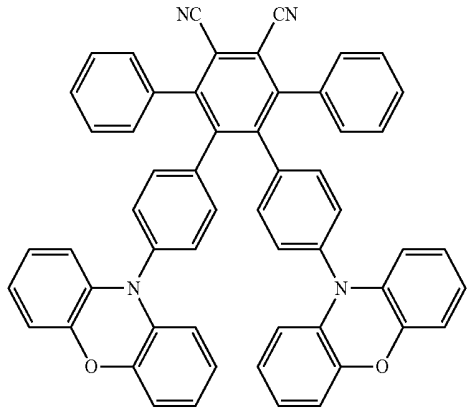
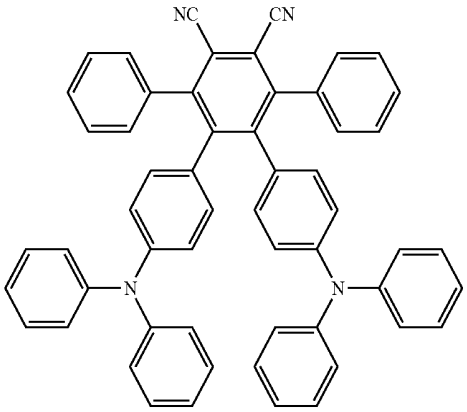






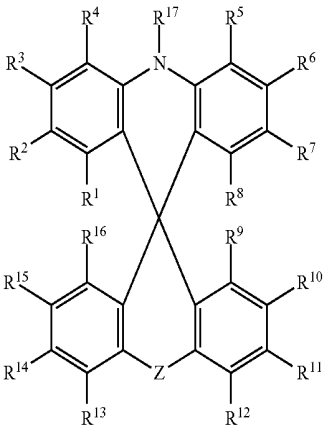






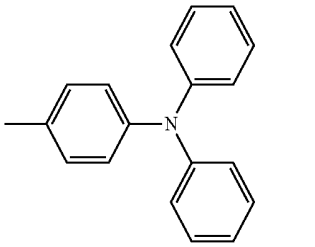
Examples of the preferred light emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formula (141), The entire description of WO 2013/011954 including the paragraphs 0007 to 0047 and 0073 to 0085 is incorporated herein by reference.

General Formula (141)

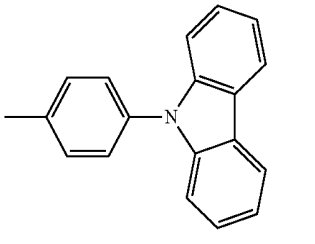


wherein in the general formula (141), R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8 and R^{17} each independently represent a hydrogen atom or an electron donating group, provided that at least one thereof represents an electron donating group; R^9, R^{10}, R^{11}, R^{12}, R^{13}, R^{14}, R^{15} and R^{16} each independently represent a hydrogen atom or an electron withdrawing group having no unshared electron pair at the α-position; and Z represents a single bond or >C═Y, wherein Y represents O, S, $C(CN)_2$ or $C(COOH)_2$, provided that when Z represents a single bond, at least one of R^9, R^{10}, R^{11}, R^{12}, R^{13}, R^{14}, R^{15} and R^{16} represents an electron withdrawing group having no unshared electron pair at the α-position.

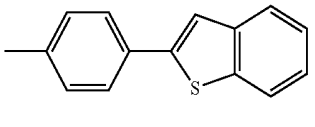
Specific examples of the compounds include the compounds shown in the following tables. In the tables, D1 to D3 represent the following aryl groups substituted by an electron donating group, respectively; A1 to A5 represent the following electron withdrawing groups, respectively; H represents a hydrogen atom; and Ph represents a phenyl group.



D1



D2

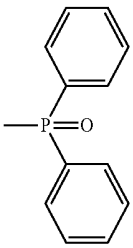


D3

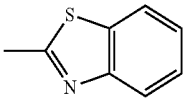
A1

-continued

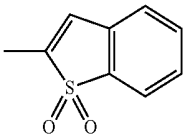
A2



A3



A4



A5

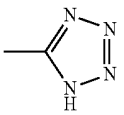


TABLE 7

Compound No.	R^2	R^7	R^{10}	R^{15}	R^{17}	Z	Other Rs
2001	H	H	A1	A1	Ph	single bond	H
2002	H	D1	A1	A1	Ph	single bond	H
2003	H	D2	A1	A1	Ph	single bond	H
2004	H	D3	A1	A1	Ph	single bond	H
2005	H	H	A2	A2	Ph	single bond	H
2006	H	D1	A2	A2	Ph	single bond	H
2007	H	D2	A2	A2	Ph	single bond	H
2008	H	D3	A2	A2	Ph	single bond	H
2009	H	H	A3	A3	Ph	single bond	H
2010	H	D1	A3	A3	Ph	single bond	H
2011	H	D2	A3	A3	Ph	single bond	H
2012	H	D3	A3	A3	Ph	single bond	H
2013	H	H	A4	A4	Ph	single bond	H
2014	H	D1	A4	A4	Ph	single bond	H
2015	H	D2	A4	A4	Ph	single bond	H
2016	H	D3	A4	A4	Ph	single bond	H
2017	H	H	A5	A5	Ph	single bond	H
2018	H	D1	A5	A5	Ph	single bond	H
2019	H	D2	A5	A5	Ph	single bond	H
2020	H	D3	A5	A5	Ph	single bond	H
2021	D1	D1	A1	A1	Ph	single bond	H
2022	D2	D2	A1	A1	Ph	single bond	H
2023	D3	D3	A1	A1	Ph	single bond	H
2024	D1	D1	A2	A2	Ph	single bond	H
2025	D2	D2	A2	A2	Ph	single bond	H
2026	D3	D3	A2	A2	Ph	single bond	H
2027	D1	D1	A3	A3	Ph	single bond	H
2028	D2	D2	A3	A3	Ph	single bond	H
2029	D3	D3	A3	A3	Ph	single bond	H
2030	D1	D1	A4	A4	Ph	single bond	H
2031	D2	D2	A4	A4	Ph	single bond	H
2032	D3	D3	A4	A4	Ph	single bond	H
2033	D1	D1	A5	A5	Ph	single bond	H
2034	D2	D2	A5	A5	Ph	single bond	H
2035	D3	D3	A5	A5	Ph	single bond	H

TABLE 8

Compound No.	R^2	R^6	R^{11}	R^{14}	R^{17}	Z	Other Rs
2036	H	H	H	A1	Ph	single bond	H
2037	H	D1	H	A1	Ph	single bond	H

TABLE 8-continued

Compound No.	R^2	R^6	R^{11}	R^{14}	R^{17}	Z	Other Rs
2038	H	D2	H	A1	Ph	single bond	H
2039	H	D3	H	A1	Ph	single bond	H
2040	H	H	H	A2	Ph	single bond	H
2041	H	D1	H	A2	Ph	single bond	H
2042	H	D2	H	A2	Ph	single bond	H
2043	H	D3	H	A2	Ph	single bond	H
2044	H	H	H	A3	Ph	single bond	H
2045	H	D1	H	A3	Ph	single bond	H
2046	H	D2	H	A3	Ph	single bond	H
2047	H	D3	H	A3	Ph	single bond	H
2048	H	H	H	A4	Ph	single bond	H
2049	H	D1	H	A4	Ph	single bond	H
2050	H	D2	H	A4	Ph	single bond	H
2051	H	D3	H	A4	Ph	single bond	H
2052	H	H	H	A5	Ph	single bond	H
2053	H	D1	H	A5	Ph	single bond	H
2054	H	D2	H	A5	Ph	single bond	H
2055	H	D3	H	A5	Ph	single bond	H
2056	D1	D1	H	A1	Ph	single bond	H
2057	D2	D2	H	A1	Ph	single bond	H
2058	D3	D3	H	A1	Ph	single bond	H
2059	D1	D1	H	A2	Ph	single bond	H
2060	D2	D2	H	A2	Ph	single bond	H
2061	D3	D3	H	A2	Ph	single bond	H
2062	D1	D1	H	A3	Ph	single bond	H
2063	D2	D2	H	A3	Ph	single bond	H
2064	D3	D3	H	A3	Ph	single bond	H
2065	D1	D1	H	A4	Ph	single bond	H
2066	D2	D2	H	A4	Ph	single bond	H
2067	D3	D3	H	A4	Ph	single bond	H
2068	D1	D1	H	A5	Ph	single bond	H
2069	D2	D2	H	A5	Ph	single bond	H
2070	D3	D3	H	A5	Ph	single bond	H

TABLE 9

Compound No.	R^2	R^7	R^{10}	R^{15}	R^{17}	Z	Other Rs
2071	H	H	A1	A1	Ph	C═O	H
2072	H	D1	A1	A1	Ph	C═O	H
2073	H	D2	A1	A1	Ph	C═O	H
2074	H	D3	A1	A1	Ph	C═O	H
2075	H	H	A2	A2	Ph	C═O	H
2076	H	D1	A2	A2	Ph	C═O	H
2077	H	D2	A2	A2	Ph	C═O	H
2078	H	D3	A2	A2	Ph	C═O	H
2079	H	H	A3	A3	Ph	C═O	H
2080	H	D1	A3	A3	Ph	C═O	H
2081	H	D2	A3	A3	Ph	C═O	H
2082	H	D3	A3	A3	Ph	C═O	H
2083	H	H	A4	A4	Ph	C═O	H
2084	H	D1	A4	A4	Ph	C═O	H
2085	H	D2	A4	A4	Ph	C═O	H
2086	H	D3	A4	A4	Ph	C═O	H
2087	H	H	A5	A5	Ph	C═O	H
2088	H	D1	A5	A5	Ph	C═O	H
2089	H	D2	A5	A5	Ph	C═O	H
2090	H	D3	A5	A5	Ph	C═O	H
2091	D1	D1	A1	A1	Ph	C═O	H
2092	D2	D2	A1	A1	Ph	C═O	H
2093	D3	D3	A1	A1	Ph	C═O	H
2094	D1	D1	A2	A2	Ph	C═O	H
2095	D2	D2	A2	A2	Ph	C═O	H
2096	D3	D3	A2	A2	Ph	C═O	H
2097	D1	D1	A3	A3	Ph	C═O	H
2098	D2	D2	A3	A3	Ph	C═O	H
2099	D3	D3	A3	A3	Ph	C═O	H
2100	D1	D1	A4	A4	Ph	C═O	H
2101	D2	D2	A4	A4	Ph	C═O	H
2102	D3	D3	A4	A4	Ph	C═O	H
2103	D1	D1	A5	A5	Ph	C═O	H
2104	D2	D2	A5	A5	Ph	C═O	H
2105	D3	D3	A5	A5	Ph	C═O	H

TABLE 10

Compound No.	R^3	R^6	R^{11}	R^{14}	R^{17}	Z	Other Rs
2106	H	H	H	A1	Ph	C═O	H
2107	H	D1	H	A1	Ph	C═O	H
2108	H	D2	H	A1	Ph	C═O	H
2109	H	D3	H	A1	Ph	C═O	H
2110	H	H	H	A2	Ph	C═O	H
2111	H	D1	H	A2	Ph	C═O	H
2112	H	D2	H	A2	Ph	C═O	H
2113	H	D3	H	A2	Ph	C═O	H
2114	H	H	H	A3	Ph	C═O	H
2115	H	D1	H	A3	Ph	C═O	H
2116	H	D2	H	A3	Ph	C═O	H
2117	H	D3	H	A3	Ph	C═O	H
2118	H	H	H	A4	Ph	C═O	H
2119	H	D1	H	A4	Ph	C═O	H
2120	H	D2	H	A4	Ph	C═O	H
2121	H	D3	H	A4	Ph	C═O	H
2122	H	H	H	A5	Ph	C═O	H
2123	H	D1	H	A5	Ph	C═O	H
2124	H	D2	H	A5	Ph	C═O	H
2125	H	D3	H	A5	Ph	C═O	H
2126	D1	D1	H	A1	Ph	C═O	H
2127	D2	D2	H	A1	Ph	C═O	H
2128	D3	D3	H	A1	Ph	C═O	H
2129	D1	D1	H	A2	Ph	C═O	H
2130	D2	D2	H	A2	Ph	C═O	H
2131	D3	D3	H	A2	Ph	C═O	H
2132	D1	D1	H	A3	Ph	C═O	H
2133	D2	D2	H	A3	Ph	C═O	H
2134	D3	D3	H	A3	Ph	C═O	H
2135	D1	D1	H	A4	Ph	C═O	H
2136	D2	D2	H	A4	Ph	C═O	H
2137	D3	D3	H	A4	Ph	C═O	H
2138	D1	D1	H	A5	Ph	C═O	H
2139	D2	D2	H	A5	Ph	C═O	H
2140	D3	D3	H	A5	Ph	C═O	H
2141	H	H	H	H	Ph	C═O	H

TABLE 11

Compound No.	R^2	R^7	R^{10}	R^{15}	R^{17}	Z	Other Rs
2142	H	H	A1	A1	Ph	C═S	H
2143	H	D1	A1	A1	Ph	C═S	H
2144	H	D2	A1	A1	Ph	C═S	H
2145	H	D3	A1	A1	Ph	C═S	H
2146	H	H	A2	A2	Ph	C═S	H
2147	H	D1	A2	A2	Ph	C═S	H
2148	H	D2	A2	A2	Ph	C═S	H
2149	H	D3	A2	A2	Ph	C═S	H
2150	H	H	A3	A3	Ph	C═S	H
2151	H	D1	A3	A3	Ph	C═S	H
2152	H	D2	A3	A3	Ph	C═S	H
2153	H	D3	A3	A3	Ph	C═S	H
2154	H	H	A4	A4	Ph	C═S	H
2155	H	D1	A4	A4	Ph	C═S	H
2156	H	D2	A4	A4	Ph	C═S	H
2157	H	D3	A4	A4	Ph	C═S	H
2158	H	H	A5	A5	Ph	C═S	H
2159	H	D1	A5	A5	Ph	C═S	H
2160	H	D2	A5	A5	Ph	C═S	H
2161	H	D3	A5	A5	Ph	C═S	H
2162	D1	D1	A1	A1	Ph	C═S	H
2163	D2	D2	A1	A1	Ph	C═S	H
2164	D3	D3	A1	A1	Ph	C═S	H
2165	D1	D1	A2	A2	Ph	C═S	H
2166	D2	D2	A2	A2	Ph	C═S	H
2167	D3	D3	A2	A2	Ph	C═S	H
2168	D1	D1	A3	A3	Ph	C═S	H
2169	D2	D2	A3	A3	Ph	C═S	H
2170	D3	D3	A3	A3	Ph	C═S	H
2171	D1	D1	A4	A4	Ph	C═S	H
2172	D2	D2	A4	A4	Ph	C═S	H
2173	D3	D3	A4	A4	Ph	C═S	H
2174	D1	D1	A5	A5	Ph	C═S	H

TABLE 11-continued

Compound No.	R^2	R^7	R^{10}	R^{15}	R^{17}	Z	Other Rs
2175	D2	D2	A5	A5	Ph	C═S	H
2176	D3	D3	A5	A5	Ph	C═S	H

TABLE 12

Compound No.	R^3	R^6	R^{11}	R^{14}	R^{17}	Z	Other Rs
2177	H	H	H	A1	Ph	C═S	H
2178	H	D1	H	A1	Ph	C═S	H
2179	H	D2	H	A1	Ph	C═S	H
2180	H	D3	H	A1	Ph	C═S	H
2181	H	H	H	A2	Ph	C═S	H
2182	H	D1	H	A2	Ph	C═S	H
2183	H	D2	H	A2	Ph	C═S	H
2184	H	D3	H	A2	Ph	C═S	H
2185	H	H	H	A3	Ph	C═S	H
2186	H	D1	H	A3	Ph	C═S	H
2187	H	D2	H	A3	Ph	C═S	H
2188	H	D3	H	A3	Ph	C═S	H
2189	H	H	H	A4	Ph	C═S	H
2190	H	D1	H	A4	Ph	C═S	H
2191	H	D2	H	A4	Ph	C═S	H
2192	H	D3	H	A4	Ph	C═S	H
2193	H	H	H	A5	Ph	C═S	H
2194	H	D1	H	A5	Ph	C═S	H
2195	H	D2	H	A5	Ph	C═S	H
2196	H	D3	H	A5	Ph	C═S	H
2197	D1	D1	H	A1	Ph	C═S	H
2198	D2	D2	H	A1	Ph	C═S	H
2199	D3	D3	H	A1	Ph	C═S	H
2200	D1	D1	H	A2	Ph	C═S	H
2201	D2	D2	H	A2	Ph	C═S	H
2202	D3	D3	H	A2	Ph	C═S	H
2203	D1	D1	H	A3	Ph	C═S	H
2204	D2	D2	H	A3	Ph	C═S	H
2205	D3	D3	H	A3	Ph	C═S	H
2206	D1	D1	H	A4	Ph	C═S	H
2207	D2	D2	H	A4	Ph	C═S	H
2208	D3	D3	H	A4	Ph	C═S	H
2209	D1	D1	H	A5	Ph	C═S	H
2210	D2	D2	H	A5	Ph	C═S	H
2211	D3	D3	H	A5	Ph	C═S	H
2212	H	H	H	H	Ph	C═S	H

TABLE 13

Compound No.	R^2	R^7	R^{10}	R^{15}	R^{17}	Z	Other Rs
2213	H	H	A1	A1	Ph	$C═C(CN)_2$	H
2214	H	D1	A1	A1	Ph	$C═C(CN)_2$	H
2215	H	D2	A1	A1	Ph	$C═C(CN)_2$	H
2216	H	D3	A1	A1	Ph	$C═C(CN)_2$	H
2217	H	H	A2	A2	Ph	$C═C(CN)_2$	H
2218	H	D1	A2	A2	Ph	$C═C(CN)_2$	H
2219	H	D2	A2	A2	Ph	$C═C(CN)_2$	H
2220	H	D3	A2	A2	Ph	$C═C(CN)_2$	H
2221	H	H	A3	A3	Ph	$C═C(CN)_2$	H
2222	H	D1	A3	A3	Ph	$C═C(CN)_2$	H
2223	H	D2	A3	A3	Ph	$C═C(CN)_2$	H
2224	H	D3	A3	A3	Ph	$C═C(CN)_2$	H
2225	H	H	A4	A4	Ph	$C═C(CN)_2$	H
2226	H	D1	A4	A4	Ph	$C═C(CN)_2$	H
2227	H	D2	A4	A4	Ph	$C═C(CN)_2$	H
2228	H	D3	A4	A4	Ph	$C═C(CN)_2$	H
2229	H	H	A5	A5	Ph	$C═C(CN)_2$	H
2230	H	D1	A5	A5	Ph	$C═C(CN)_2$	H
2231	H	D2	A5	A5	Ph	$C═C(CN)_2$	H
2232	H	D3	A5	A5	Ph	$C═C(CN)_2$	H
2233	D1	D1	A1	A1	Ph	$C═C(CN)_2$	H
2234	D2	D2	A1	A1	Ph	$C═C(CN)_2$	H
2235	D3	D3	A1	A1	Ph	$C═C(CN)_2$	H
2236	D1	D1	A2	A2	Ph	$C═C(CN)_2$	H
2237	D2	D2	A2	A2	Ph	$C═C(CN)_2$	H

TABLE 13-continued

Compound No.	R^2	R^7	R^{10}	R^{15}	R^{17}	Z	Other Rs
2238	D3	D3	A2	A2	Ph	$C═C(CN)_2$	H
2239	D1	D1	A3	A3	Ph	$C═C(CN)_2$	H
2240	D2	D2	A3	A3	Ph	$C═C(CN)_2$	H
2241	D3	D3	A3	A3	Ph	$C═C(CN)_2$	H
2242	D1	D1	A4	A4	Ph	$C═C(CN)_2$	H
2243	D2	D2	A4	A4	Ph	$C═C(CN)_2$	H
2244	D3	D3	A4	A4	Ph	$C═C(CN)_2$	H
2245	D1	D1	A5	A5	Ph	$C═C(CN)_2$	H
2246	D2	D2	A5	A5	Ph	$C═C(CN)_2$	H
2247	D3	D3	A5	A5	Ph	$C═C(CN)_2$	H

TABLE 14

Compound No.	R^3	R^6	R^{11}	R^{14}	R^{17}	Z	Other Rs
2248	H	H	H	A1	Ph	$C═C(CN)_2$	H
2249	H	D1	H	A1	Ph	$C═C(CN)_2$	H
2250	H	D2	H	A1	Ph	$C═C(CN)_2$	H
2251	H	D3	H	A1	Ph	$C═C(CN)_2$	H
2252	H	H	H	A2	Ph	$C═C(CN)_2$	H
2253	H	D1	H	A2	Ph	$C═C(CN)_2$	H
2254	H	D2	H	A2	Ph	$C═C(CN)_2$	H
2255	H	D3	H	A2	Ph	$C═C(CN)_2$	H
2256	H	H	H	A3	Ph	$C═C(CN)_2$	H
2257	H	D1	H	A3	Ph	$C═C(CN)_2$	H
2258	H	D2	H	A3	Ph	$C═C(CN)_2$	H
2259	H	D3	H	A3	Ph	$C═C(CN)_2$	H
2260	H	H	H	A4	Ph	$C═C(CN)_2$	H
2261	H	D1	H	A4	Ph	$C═C(CN)_2$	H
2262	H	D2	H	A4	Ph	$C═C(CN)_2$	H
2263	H	D3	H	A4	Ph	$C═C(CN)_2$	H
2264	H	H	H	A5	Ph	$C═C(CN)_2$	H
2265	H	D1	H	A5	Ph	$C═C(CN)_2$	H
2266	H	D2	H	A5	Ph	$C═C(CN)_2$	H
2267	H	D3	H	A5	Ph	$C═C(CN)_2$	H
2268	D1	D1	H	A1	Ph	$C═C(CN)_2$	H
2269	D2	D2	H	A1	Ph	$C═C(CN)_2$	H
2270	D3	D3	H	A1	Ph	$C═C(CN)_2$	H
2271	D1	D1	H	A2	Ph	$C═C(CN)_2$	H
2272	D2	D2	H	A2	Ph	$C═C(CN)_2$	H
2273	D3	D3	H	A2	Ph	$C═C(CN)_2$	H
2274	D1	D1	H	A3	Ph	$C═C(CN)_2$	H
2275	D2	D2	H	A3	Ph	$C═C(CN)_2$	H
2276	D3	D3	H	A3	Ph	$C═C(CN)_2$	H
2277	D1	D1	H	A4	Ph	$C═C(CN)_2$	H
2278	D2	D2	H	A4	Ph	$C═C(CN)_2$	H
2279	D3	D3	H	A4	Ph	$C═C(CN)_2$	H
2280	D1	D1	H	A5	Ph	$C═C(CN)_2$	H
2281	D2	D2	H	A5	Ph	$C═C(CN)_2$	H
2282	D3	D3	H	A5	Ph	$C═C(CN)_2$	H
2283	H	H	H	H	Ph	$C═C(CN)_2$	H

TABLE 15

Compound No.	R^2	R^7	R^{10}	R^{15}	R^{17}	Z	Other Rs
2284	H	H	A1	A1	Ph	$C═C(COOH)_2$	H
2285	H	D1	A1	A1	Ph	$C═C(COOH)_2$	H
2286	H	D2	A1	A1	Ph	$C═C(COOH)_2$	H
2287	H	D3	A1	A1	Ph	$C═C(COOH)_2$	H
2288	H	H	A2	A2	Ph	$C═C(COOH)_2$	H
2289	H	D1	A2	A2	Ph	$C═C(COOH)_2$	H
2290	H	D2	A2	A2	Ph	$C═C(COOH)_2$	H
2291	H	D3	A2	A2	Ph	$C═C(COOH)_2$	H
2292	H	H	A3	A3	Ph	$C═C(COOH)_2$	H
2293	H	D1	A3	A3	Ph	$C═C(COOH)_2$	H
2294	H	D2	A3	A3	Ph	$C═C(COOH)_2$	H
2295	H	D3	A3	A3	Ph	$C═C(COOH)_2$	H
2296	H	H	A4	A4	Ph	$C═C(COOH)_2$	H
2297	H	D1	A4	A4	Ph	$C═C(COOH)_2$	H
2298	H	D2	A4	A4	Ph	$C═C(COOH)_2$	H
2299	H	D3	A4	A4	Ph	$C═C(COOH)_2$	H

TABLE 15-continued

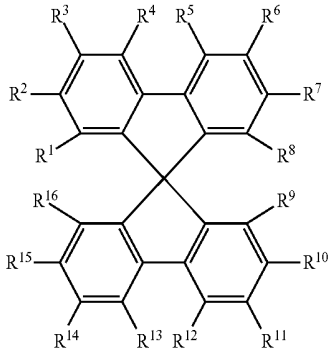
Compound No.	R^2	R^7	R^{10}	R^{15}	R^{17}	Z	Other Rs
2300	H	H	A5	A5	Ph	C=C(COOH)$_2$	H
2301	H	D1	A5	A5	Ph	C=C(COOH)$_2$	H
2302	H	D2	A5	A5	Ph	C=C(COOH)$_2$	H
2303	H	D3	A5	A5	Ph	C=C(COOH)$_2$	H
2304	D1	D1	A1	A1	Ph	C=C(COOH)$_2$	H
2305	D2	D2	A1	A1	Ph	C=C(COOH)$_2$	H
2306	D3	D3	A1	A1	Ph	C=C(COOH)$_2$	H
2307	D1	D1	A2	A2	Ph	C=C(COOH)$_2$	H
2308	D2	D2	A2	A2	Ph	C=C(COOH)$_2$	H
2309	D3	D3	A2	A2	Ph	C=C(COOH)$_2$	H
2310	D1	D1	A3	A3	Ph	C=C(COOH)$_2$	H
2311	D2	D2	A3	A3	Ph	C=C(COOH)$_2$	H
2312	D3	D3	A3	A3	Ph	C=C(COOH)$_2$	H
2313	D1	D1	A4	A4	Ph	C=C(COOH)$_2$	H
2314	D2	D2	A4	A4	Ph	C=C(COOH)$_2$	H
2315	D3	D3	A4	A4	Ph	C=C(COOH)$_2$	H
2316	D1	D1	A5	A5	Ph	C=C(COOH)$_2$	H
2317	D2	D2	A5	A5	Ph	C=C(COOH)$_2$	H
2318	D3	D3	A5	A5	Ph	C=C(COOH)$_2$	H

TABLE 16

Compound No.	R^3	R^6	R^{11}	R^{14}	R^{17}	Z	Other Rs
2319	H	H	H	A1	Ph	C=C(COOH)$_2$	H
2320	H	D1	H	A1	Ph	C=C(COOH)$_2$	H
2321	H	D2	H	A1	Ph	C=C(COOH)$_2$	H
2322	H	D3	H	A1	Ph	C=C(COOH)$_2$	H
2323	H	H	H	A2	Ph	C=C(COOH)$_2$	H
2324	H	D1	H	A2	Ph	C=C(COOH)$_2$	H
2325	H	D2	H	A2	Ph	C=C(COOH)$_2$	H
2326	H	D3	H	A2	Ph	C=C(COOH)$_2$	H
2327	H	H	H	A3	Ph	C=C(COOH)$_2$	H
2328	H	D1	H	A3	Ph	C=C(COOH)$_2$	H
2329	H	D2	H	A3	Ph	C=C(COOH)$_2$	H
2330	H	D3	H	A3	Ph	C=C(COOH)$_2$	H
2331	H	H	H	A4	Ph	C=C(COOH)$_2$	H
2332	H	D1	H	A4	Ph	C=C(COOH)$_2$	H
2333	H	D2	H	A4	Ph	C=C(COOH)$_2$	H
2334	H	D3	H	A4	Ph	C=C(COOH)$_2$	H
2335	H	H	H	A5	Ph	C=C(COOH)$_2$	H
2336	H	D1	H	A5	Ph	C=C(COOH)$_2$	H
2337	H	D2	H	A5	Ph	C=C(COOH)$_2$	H
2338	H	D3	H	A5	Ph	C=C(COOH)$_2$	H
2339	D1	D1	H	A1	Ph	C=C(COOH)$_2$	H
2340	D2	D2	H	A1	Ph	C=C(COOH)$_2$	H
2341	D3	D3	H	A1	Ph	C=C(COOH)$_2$	H
2342	D1	D1	H	A2	Ph	C=C(COOH)$_2$	H
2343	D2	D2	H	A2	Ph	C=C(COOH)$_2$	H
2344	D3	D3	H	A2	Ph	C=C(COOH)$_2$	H
2345	D1	D1	H	A3	Ph	C=C(COOH)$_2$	H
2346	D2	D2	H	A3	Ph	C=C(COOH)$_2$	H
2347	D3	D3	H	A3	Ph	C=C(COOH)$_2$	H
2348	D1	D1	H	A4	Ph	C=C(COOH)$_2$	H
2349	D2	D2	H	A4	Ph	C=C(COOH)$_2$	H
2350	D3	D3	H	A4	Ph	C=C(COOH)$_2$	H
2351	D1	D1	H	A5	Ph	C=C(COOH)$_2$	H
2352	D2	D2	H	A5	Ph	C=C(COOH)$_2$	H
2353	D3	D3	H	A5	Ph	C=C(COOH)$_2$	H
2354	H	H	H	H	Ph	C=C(COOH)$_2$	H

Examples of the preferred light emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formula (151). The entire description of WO 2013/011955 including the paragraphs 0007 to 0033 and 0059 to 0066 is incorporated herein by reference.

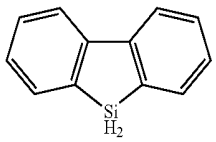
General Formula (151)



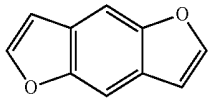
wherein in the general formula (151), R^1, R^2, R^3, R^4, R^5, R^6, R^7, and R^8 each independently represent a hydrogen atom or an electron donating group, provided that at least one thereof represents an electron donating group; R^9, R^{10}, R^{11}, R^{12}, R^{13}, R^{14}, R^{15} and R^{16} each independently represent a hydrogen atom or an electron withdrawing group, provided, that, at least one thereof represents an electron withdrawing group.

Specific examples of the compounds include the compounds shown in the following tables. In the tables, D1 to D10 represent the unsubstituted electron donating groups having the following structures, respectively.

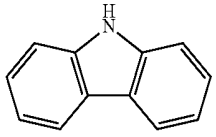
D1



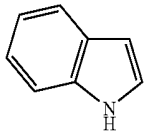
D2



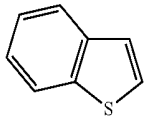
D3



D4



D5



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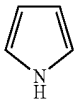
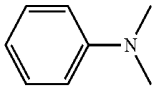
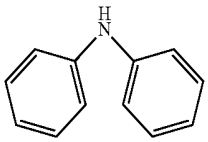
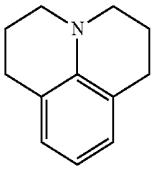








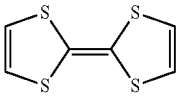
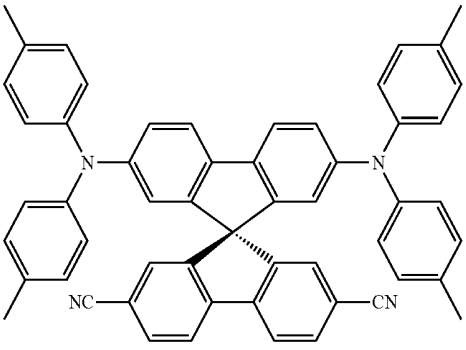


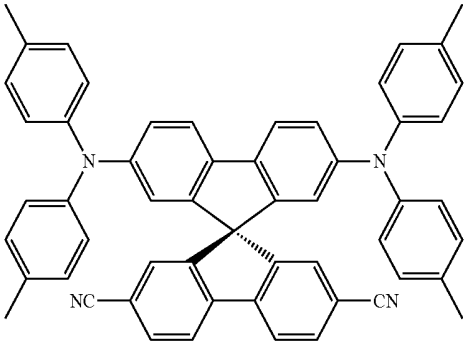
TABLE 17



Compound 3001

Compound No.	R^2	R^7	R^{10}	R^{15}	Other Rs
3002	D1	D1	CN	CN	H
3003	D2	D2	CN	CN	H

TABLE 17-continued



Compound 3001

Compound No.	R^2	R^7	R^{10}	R^{15}	Other Rs
3004	D3	D3	CN	CN	H
3005	D4	D4	CN	CN	H
3006	D5	D5	CN	CN	H
3007	D6	D6	CN	CN	H
3008	D7	D7	CN	CN	H
3009	D8	D8	CN	CN	H
3010	D9	D9	CN	CN	H
3011	D10	D10	CN	CN	H
3012	H	D1	H	CN	H
3013	H	D2	H	CN	H
3014	H	D3	H	CN	H
3015	H	D4	H	CN	H
3016	H	D5	H	CN	H
3017	H	D6	H	CN	H
3018	H	D7	H	CN	H
3019	H	D8	H	CN	H
3020	H	D9	H	CN	H
3021	H	D10	H	CN	H

TABLE 18

Compound No.	R^3	R^6	R^{11}	R^{14}	Other Rs
3022	D1	D1	CN	CN	H
3023	D2	D2	CN	CN	H
3024	D3	D3	CN	CN	H
3025	D4	D4	CN	CN	H
3026	D5	D5	CN	CN	H
3027	D6	D6	CN	CN	H
3028	D7	D7	CN	CN	H
3029	D8	D8	CN	CN	H
3030	D9	D9	CN	CN	H
3031	D10	D10	CN	CN	H
3032	H	D1	H	CN	H
3033	H	D2	H	CN	H
3034	H	D3	H	CN	H
3035	H	D4	H	CN	H
3036	H	D5	H	CN	H
3037	H	D6	H	CN	H
3038	H	D7	H	CN	H
3039	H	D8	H	CN	H
3040	H	D9	H	CN	H
3041	H	D10	H	CN	H

TABLE 19

Compound No.	R^2, R^7	R^3, R^6 R^{10}, R^{15}	R^{11}, R^{14}	Other Rs
3042	diphenylamino group	H CN	H	H
3043	bis(2-methylphenyl)amino group	H CN	H	H
3044	bis(3-methylphenyl)amino group	H CN	H	H
3045	bis(2,4-dimethylphenyl)amino group	H CN	H	H

TABLE 19-continued

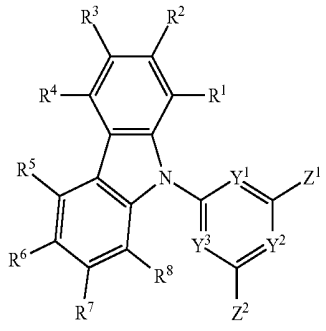
Compound No.	R^2, R^7	R^3, R^6	R^{10}, R^{15}	R^{11}, R^{14}	Other Rs
3046	bis(2,6-dimethylphenyl)amino group	H	CN	H	H
3047	bis(3,5-dimethylphenyl)amino group	H	CN	H	H
3048	bis(2,4,6-trimethylphenyl)amino group	H	CN	H	H
3049	bis(4-ethylphenyl)amino group	H	CN	H	H
3050	bis(4-propylphenyl)amino group	H	CN	H	H
3051	diphenylamino group	H	H	CN	H
3052	bis(2-methylphenyl)amino group	H	H	CN	H
3053	bis(3-methylphenyl)amino group	H	H	CN	H
3054	bis(4-methylphenyl)amino group	H	H	CN	H
3055	bis(2,4-dimethylphenyl)amino group	H	H	CN	H
3056	bis(2,6-dimethylphenyl)amino group	H	H	CN	H
3057	bis(3,5-dimethylphenyl)amino group	H	H	CN	H
3058	bis(2,4,6-trimethylphenyl)amino group	H	H	CN	H
3059	bis(4-ethylphenyl)amino group	H	H	CN	H
3060	bis(4-propylphenyl)amino group	H	H	CN	H

TABLE 20

Compound No.	R^2, R^7	R^3, R^8	R^{10}, R^{15}	R^{11}, R^{14}	Other Rs
3061	H	diphenylamino group	CN	H	H
3062	H	bis(2-methylphenyl)amino group	CN	H	H
3063	H	bis(3-methylphenyl)amino group	CN	H	H
3064	H	bis(4-methylphenyl)amino group	CN	H	H
3065	H	bis(2,4-dimethylphenyl)amino group	CN	H	H
3066	H	bis(2,6-dimethylphenyl)amino group	CN	H	H
3067	H	bis(3,5-dimethylphenyl)amino group	CN	H	H
3068	H	bis(2,4,6-trimethylphenyl)amino group	CN	H	H
3069	H	bis(4-ethylphenyl)amino group	CN	H	H
3070	H	bis(4-propylphenyl)amino group	CN	H	H
3071	H	diphenylamino group	H	CN	H
3072	H	bis(2-methylphenyl)amino group	H	CN	H
3073	H	bis(3-methylphenyl)amino group	H	CN	H
3074	H	bis(4-methylphenyl)amino group	H	CN	H
3075	H	bis(2,4-dimethylphenyl)amino group	H	CN	H
3076	H	bis(2,6-dimethylphenyl)amino group	H	CN	H
3077	H	bis(3,5-dimethylphenyl)amino group	H	CN	H
3078	H	bis(2,4,6-trimethylphenyl)amino group	H	CN	H
3079	H	bis(4-ethylphenyl)amino group	H	CN	H
3080	H	bis(4-propylphenyl)amino group	H	CN	H

Examples of the preferred light emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formula (161). The entire description of WO 2013/081088 including the paragraphs 0006 to 0071 and 0118 to 0133 is incorporated, herein by reference.

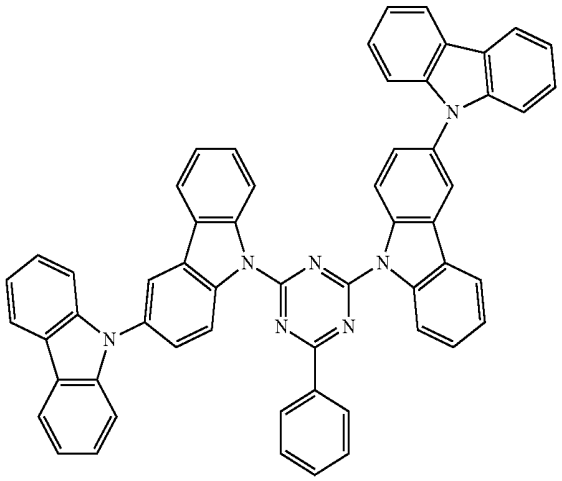
General Formula (161)



wherein in the general formula (161), any two or Y^1, Y^2 and Y^3 each represent a nitrogen atom, and the balance thereof represents a methane group, of all Y^1, Y^2 and Y^3 each represent a nitrogen atom; Z^1 and Z^2 each independently represent a hydrogen atom or a substituent; and R^1 to R^8 each independently represent, a hydrogen atom or a substituent, provided that at least one of R^1 to R^8 represents a substituted or unsubstituted diarylamino group or a substituted or unsubstituted carbazolyl group. The compound represented by the general, formula (161) has at least two carbazole structures in the molecule thereof.

Examples of the compound include the following compounds.

1



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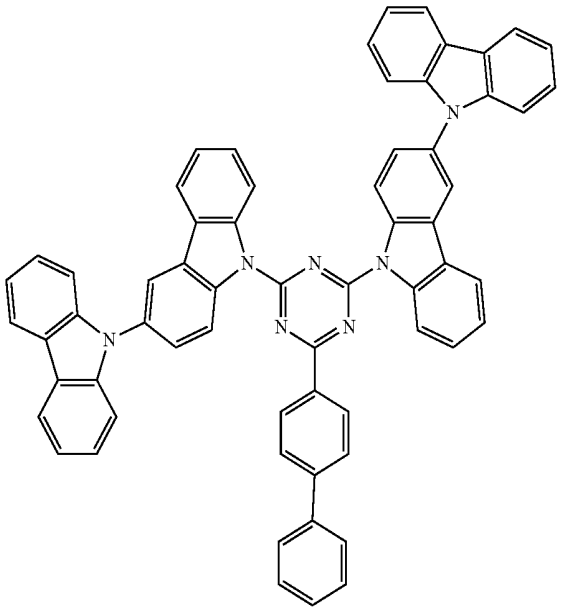
2



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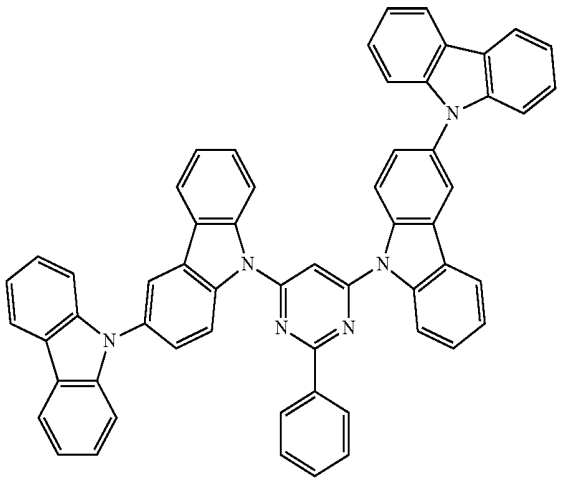

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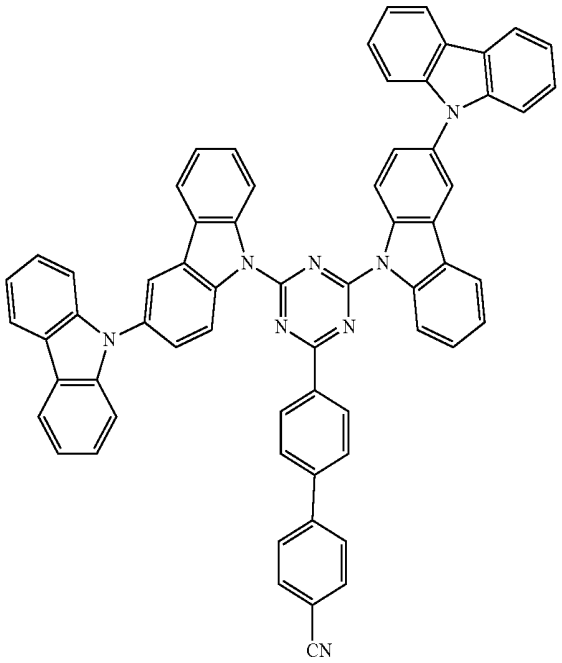

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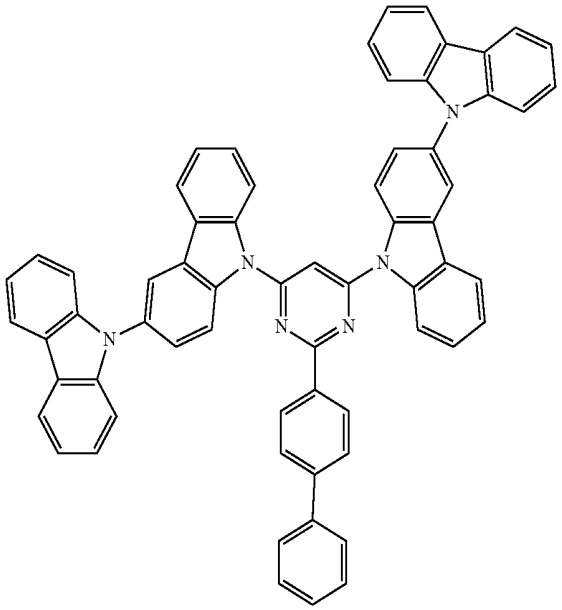

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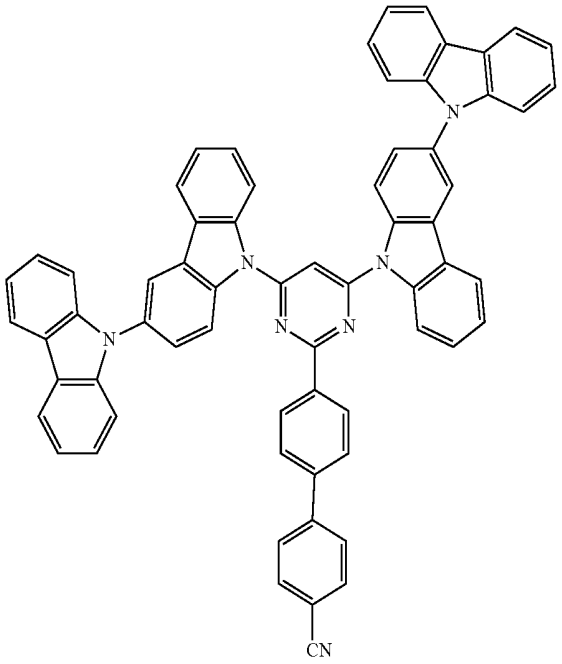
6



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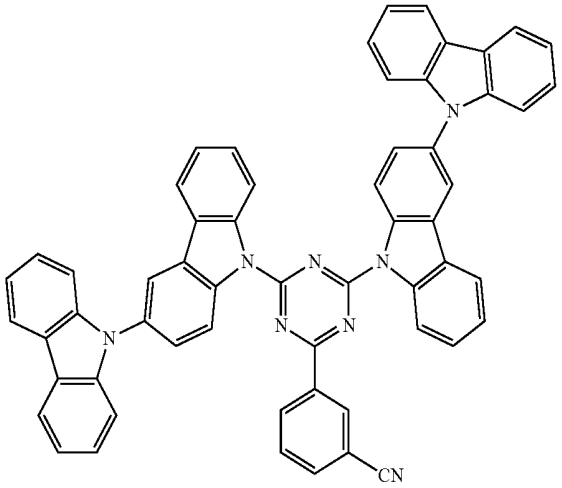

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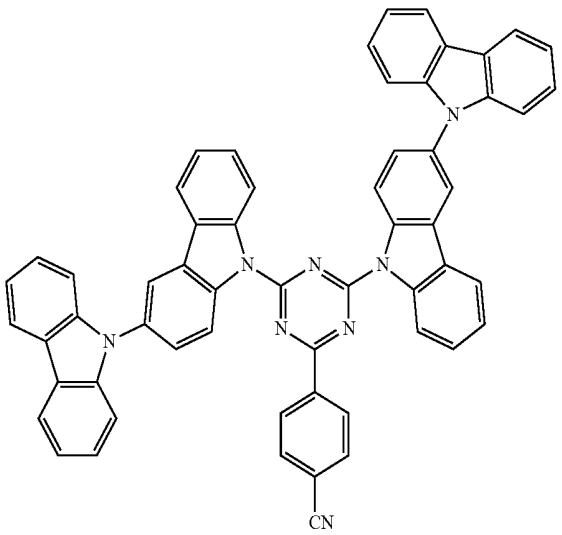

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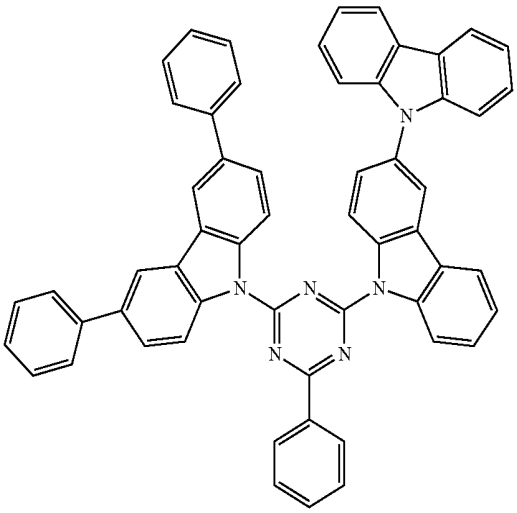
9



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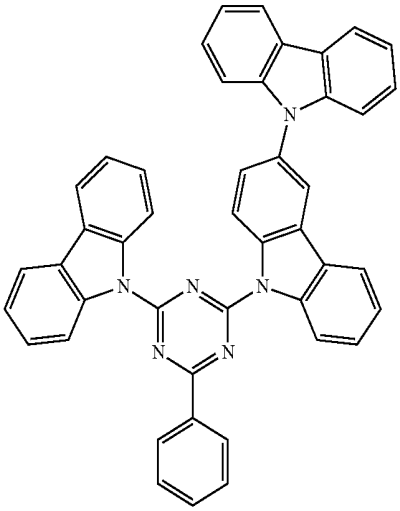

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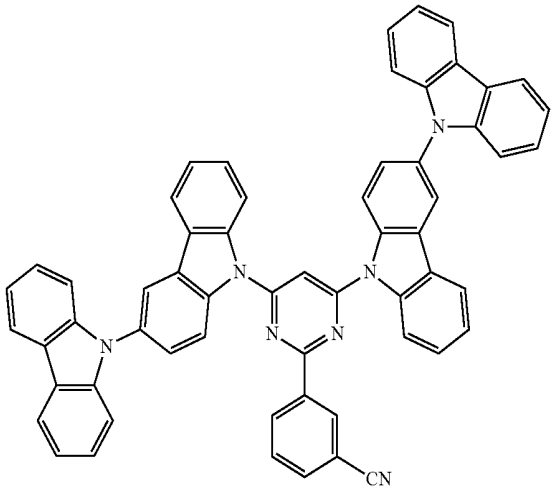

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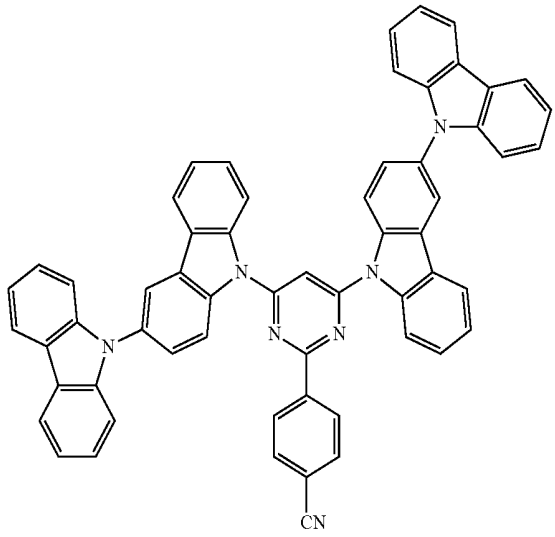

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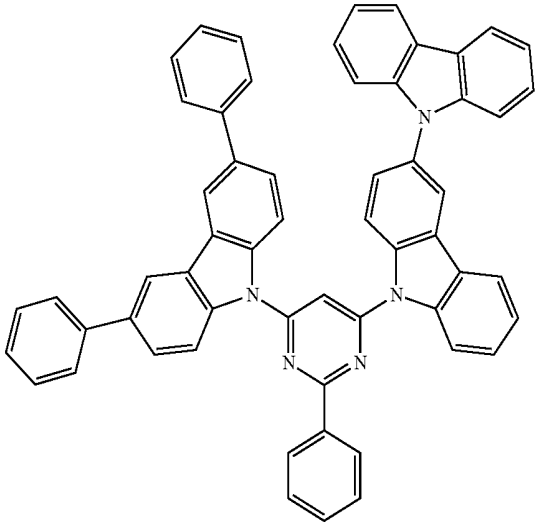

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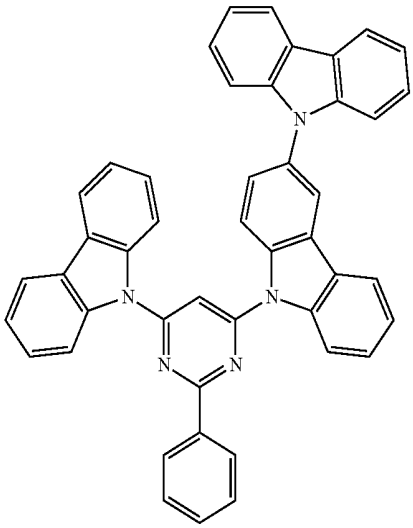

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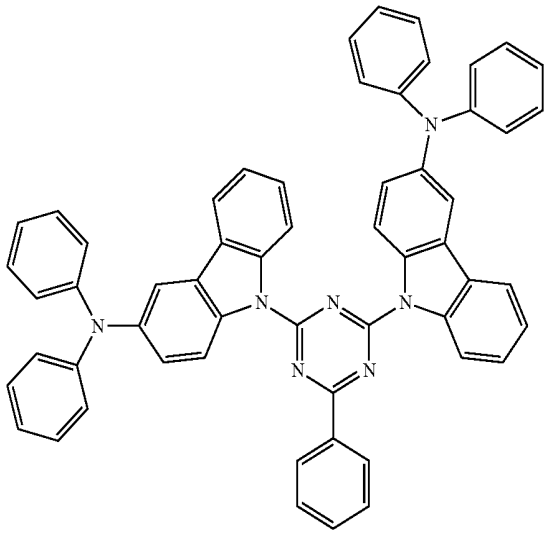

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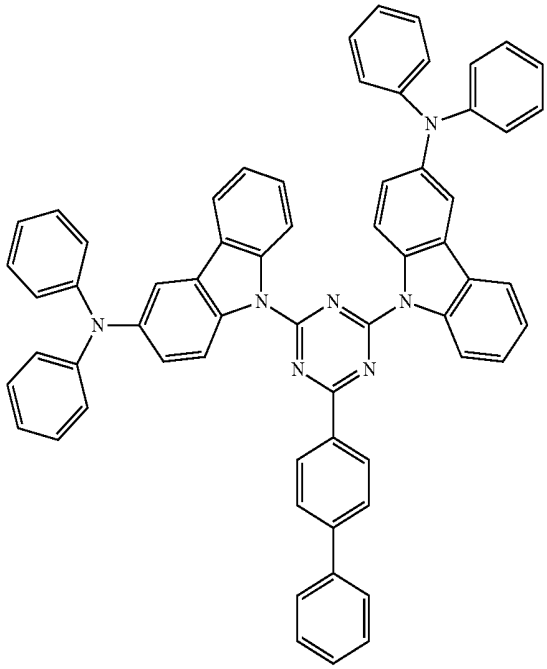

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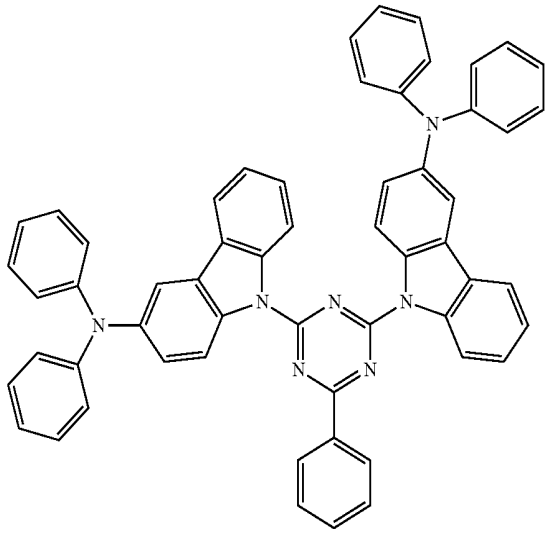

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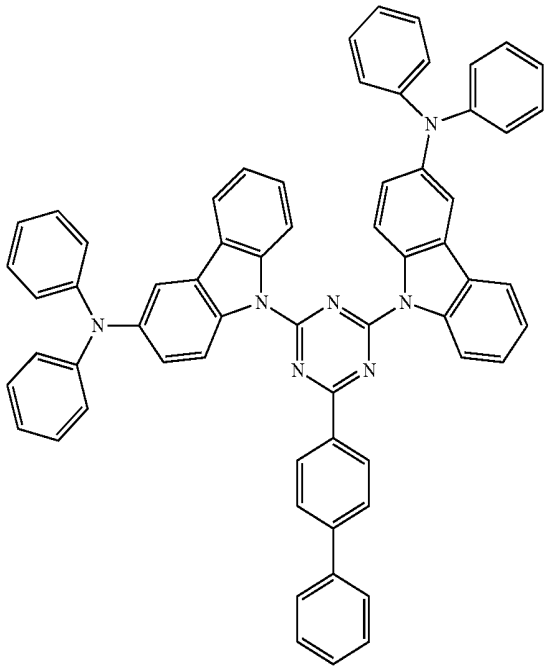

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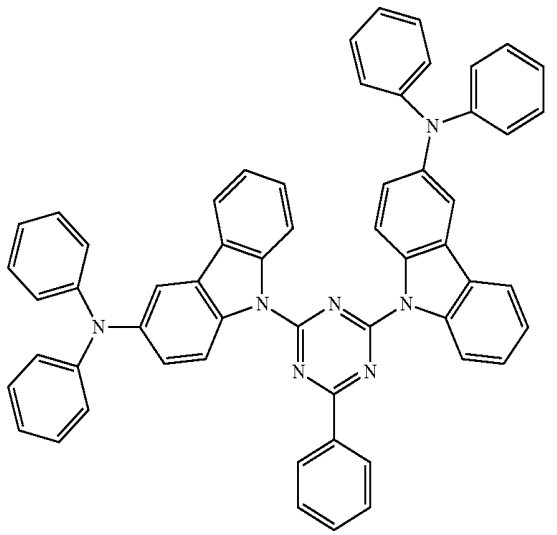

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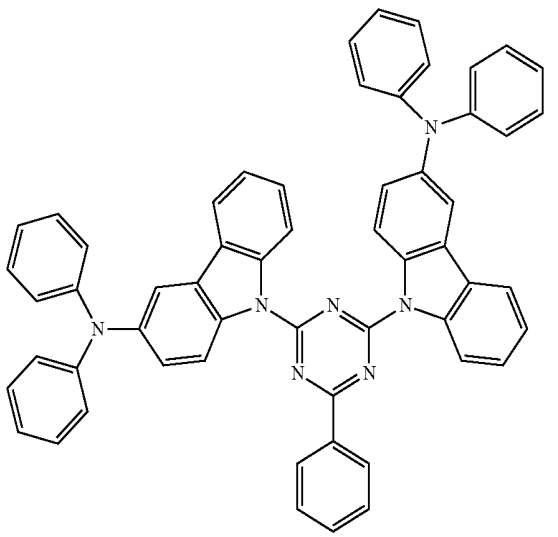

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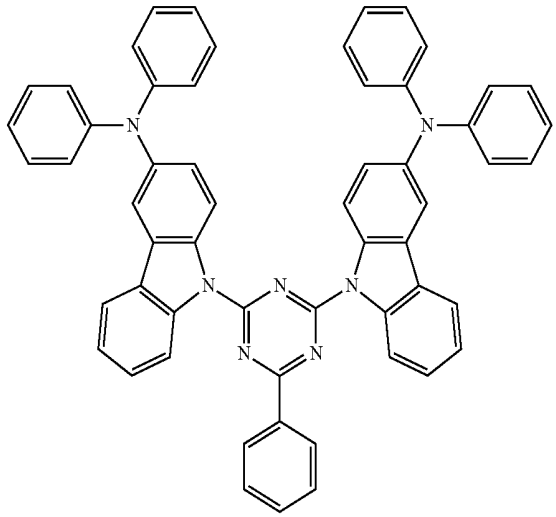

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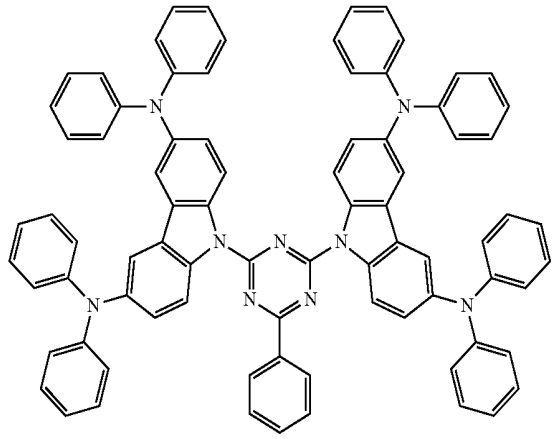

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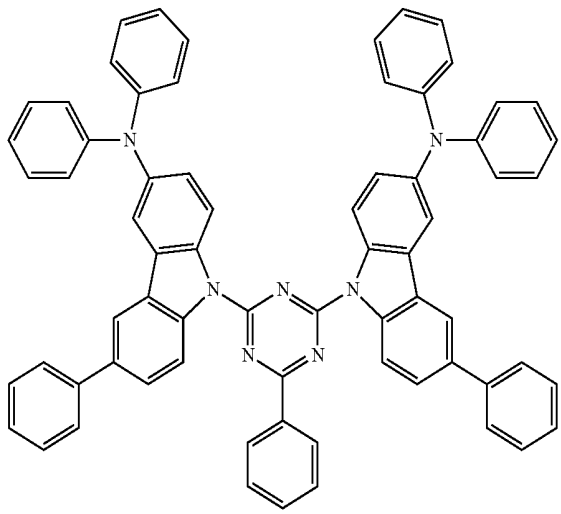

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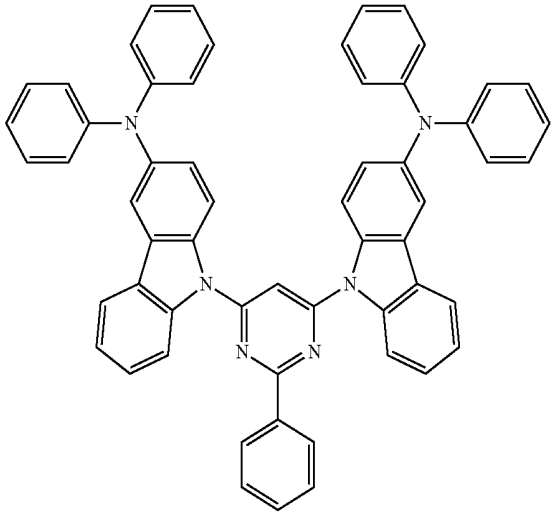

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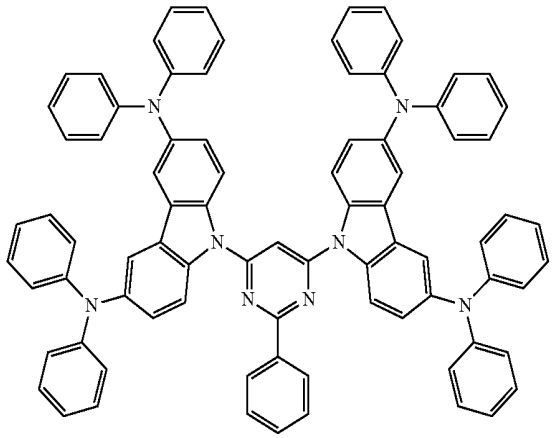

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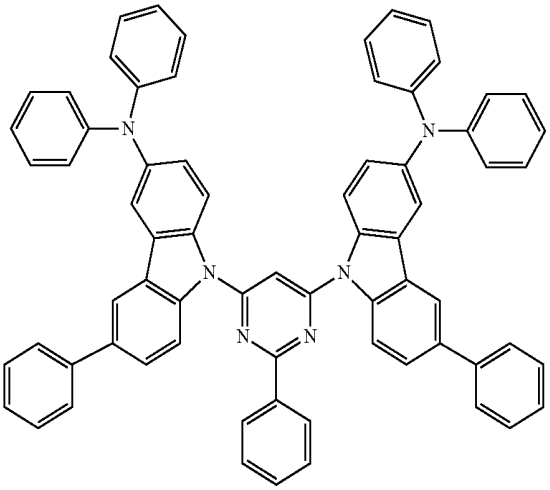

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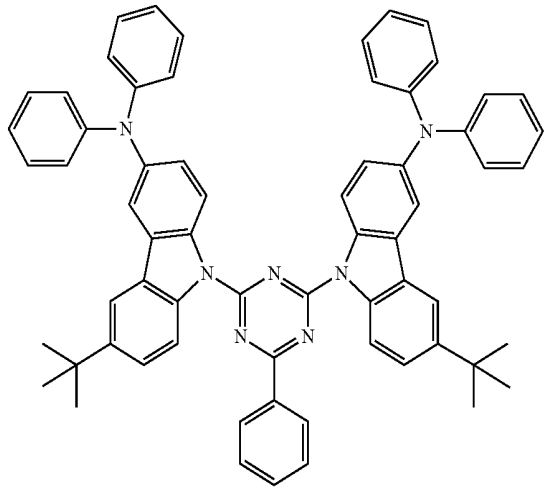

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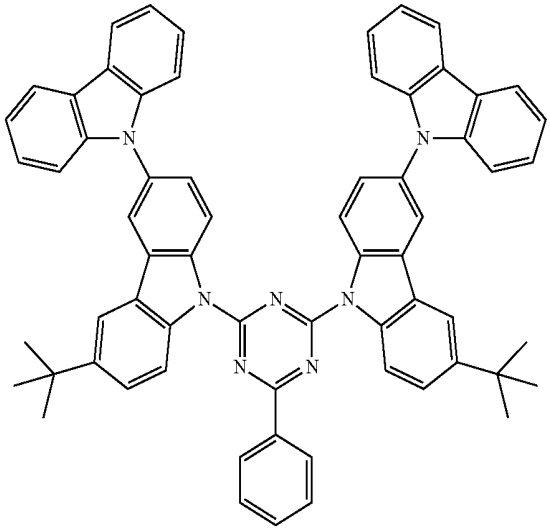

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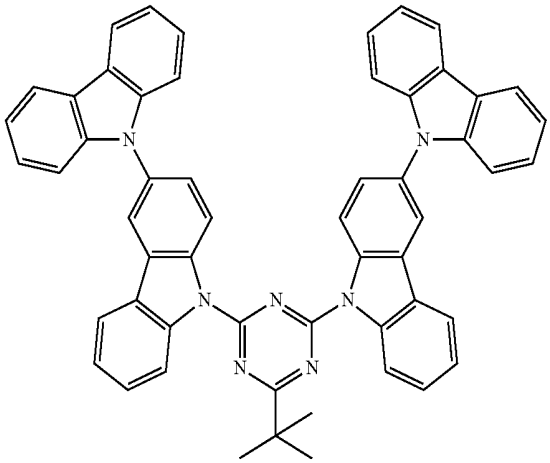

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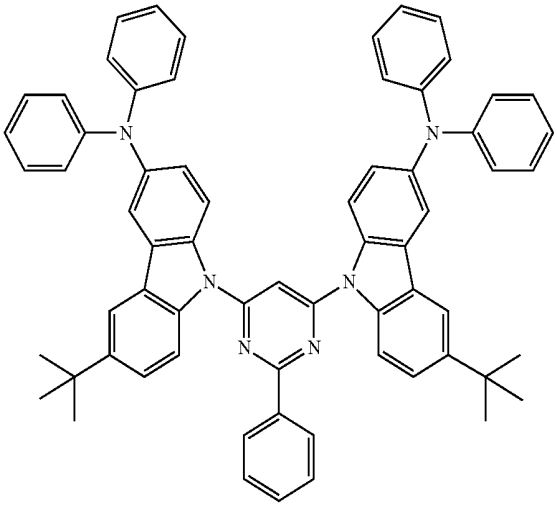

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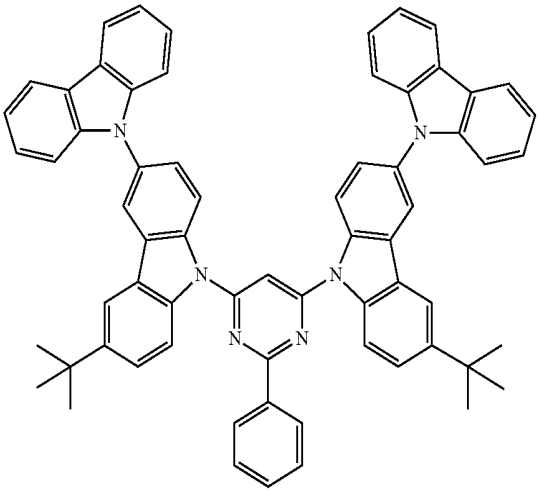

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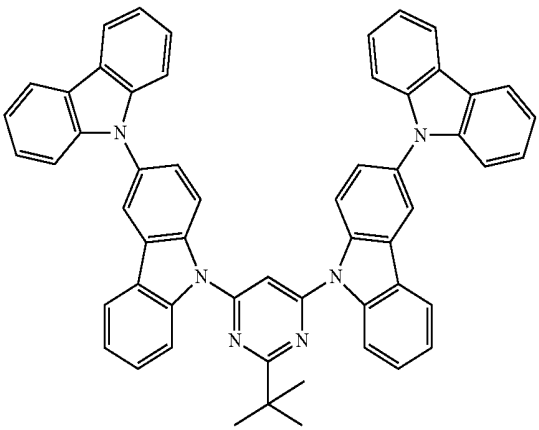

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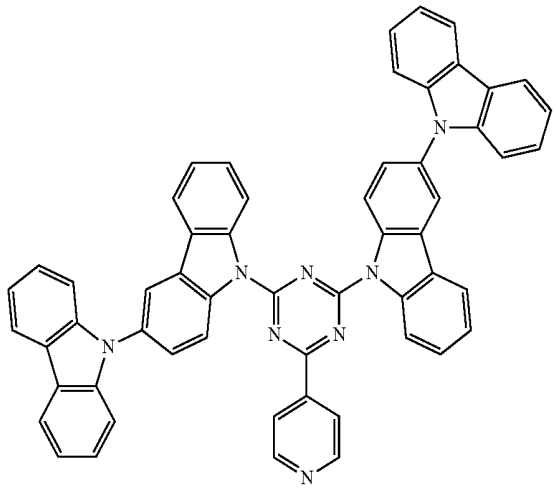

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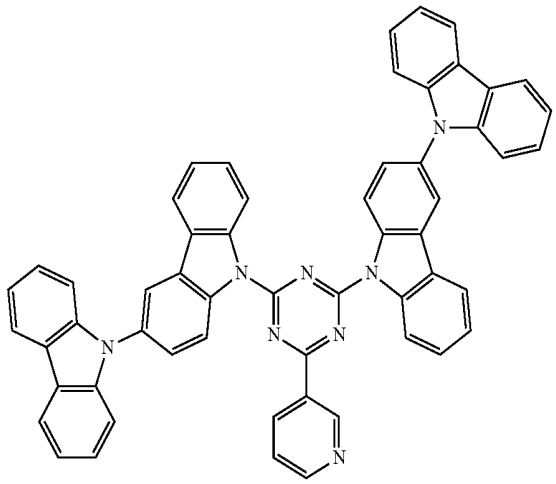

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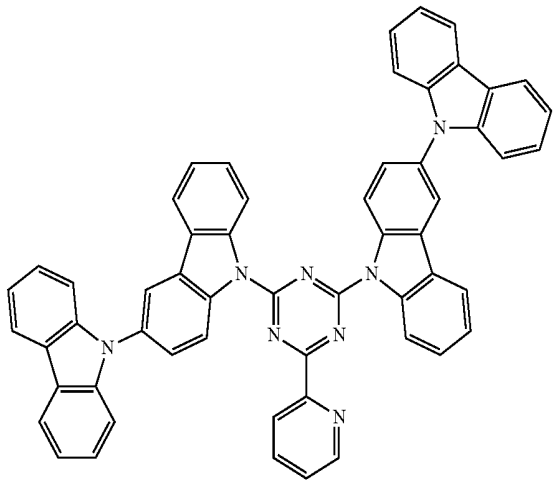

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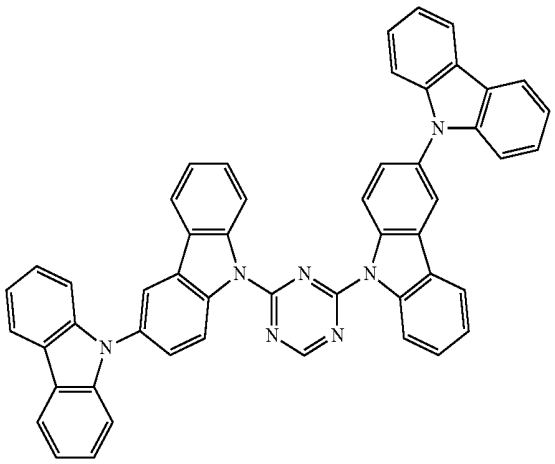

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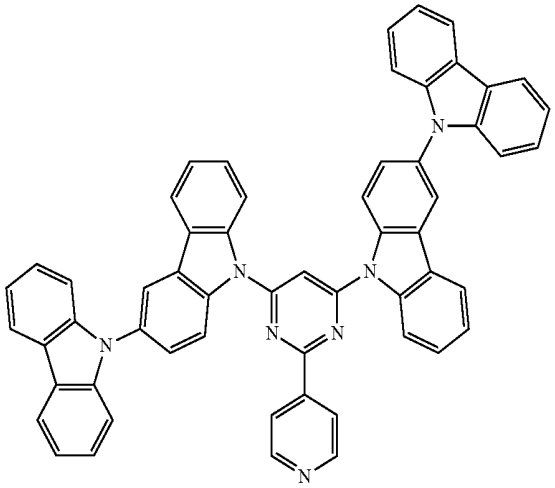

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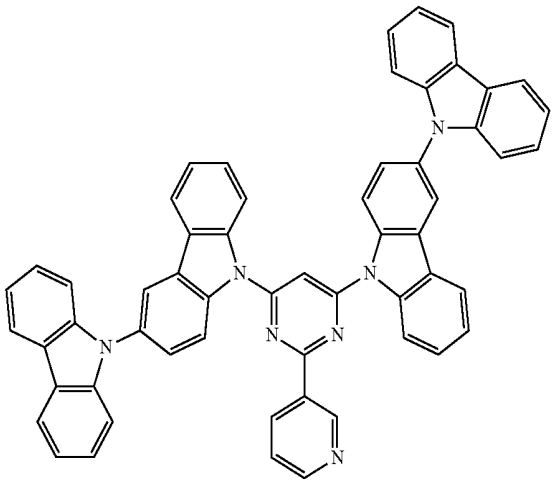

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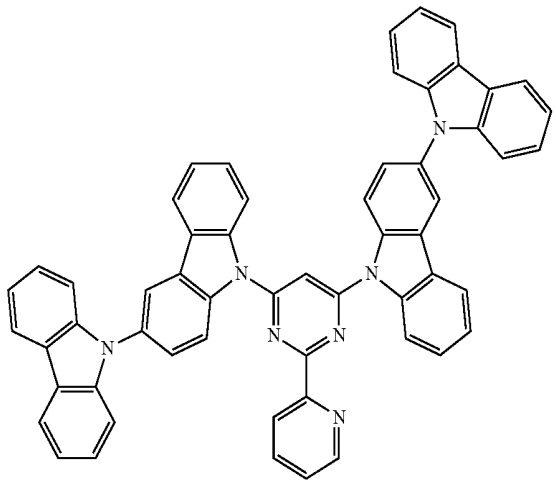

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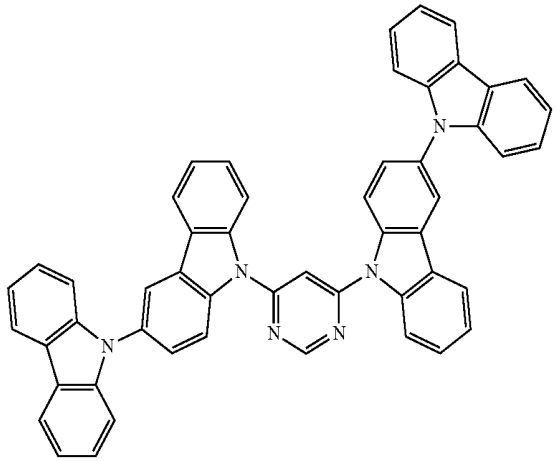

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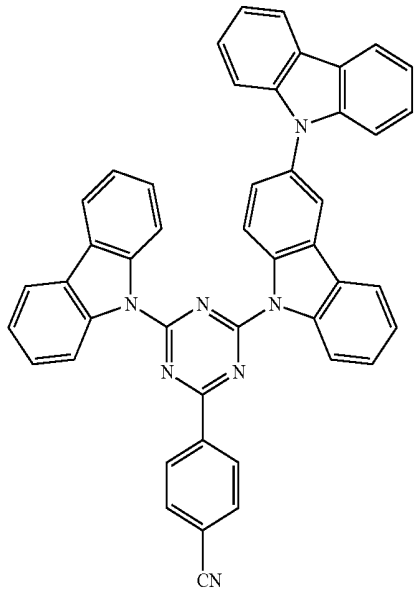

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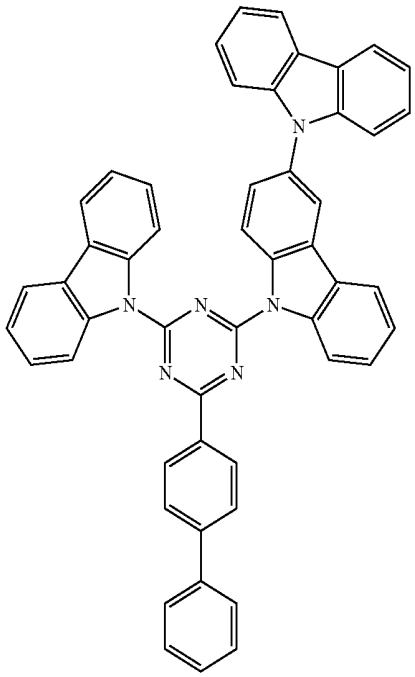

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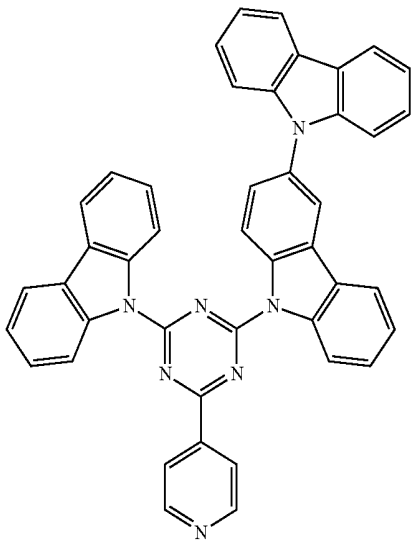

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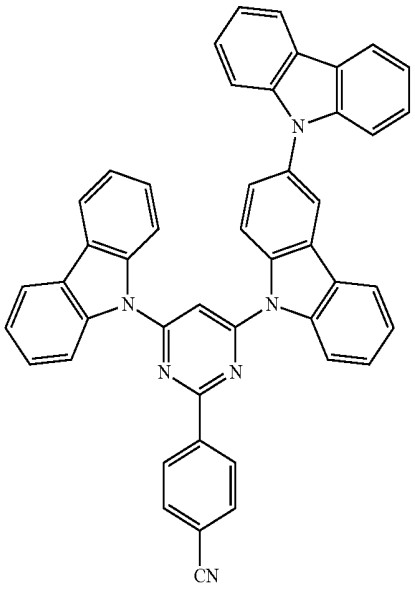

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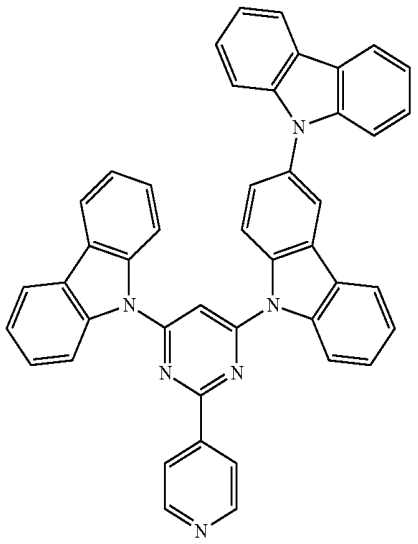

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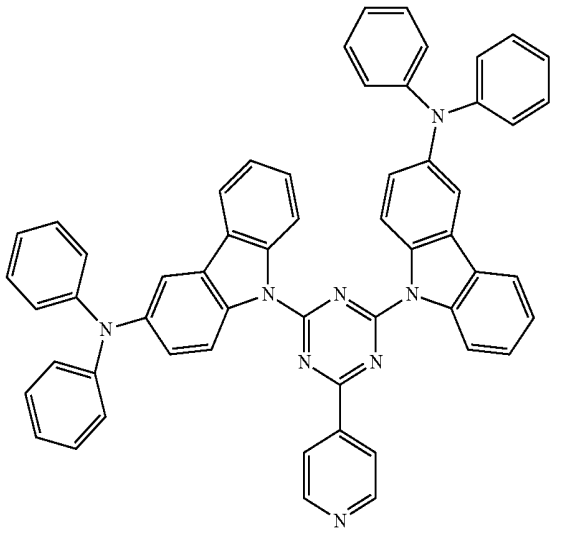

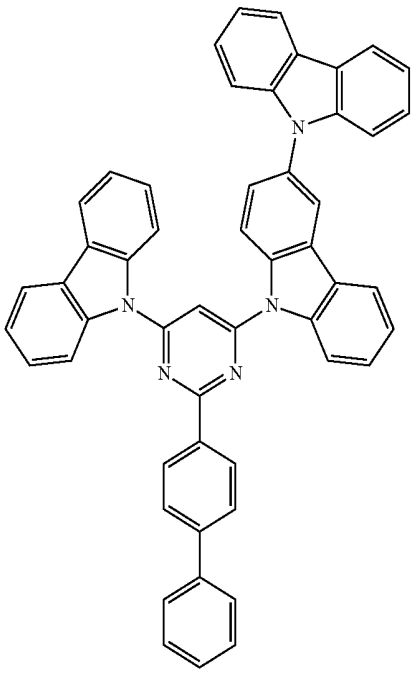

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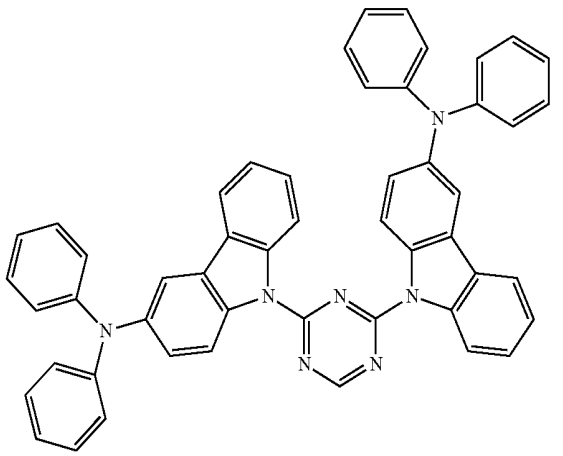

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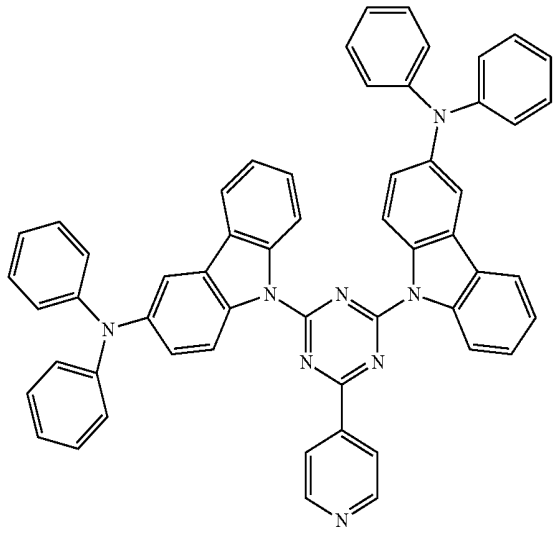

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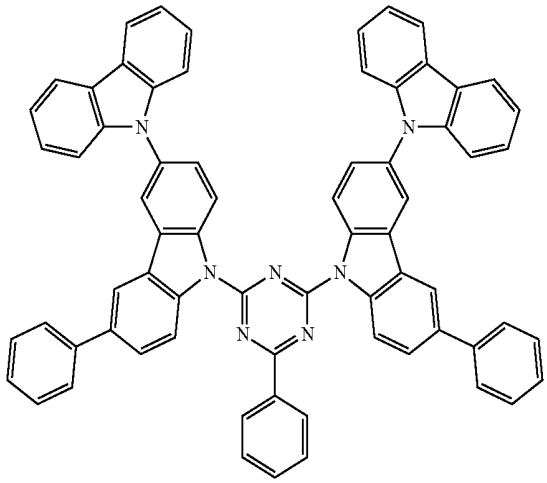

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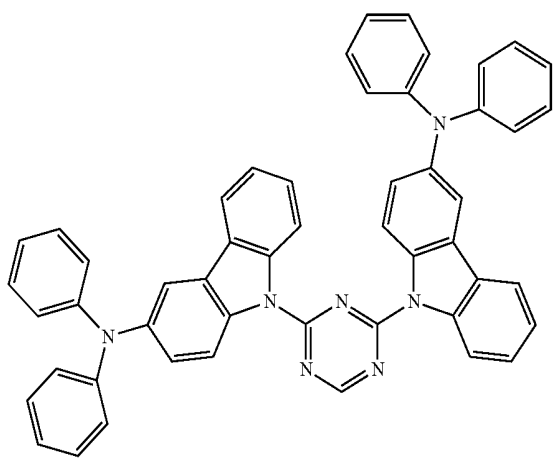

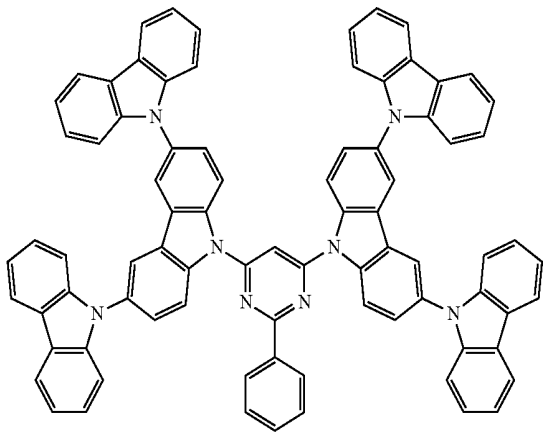

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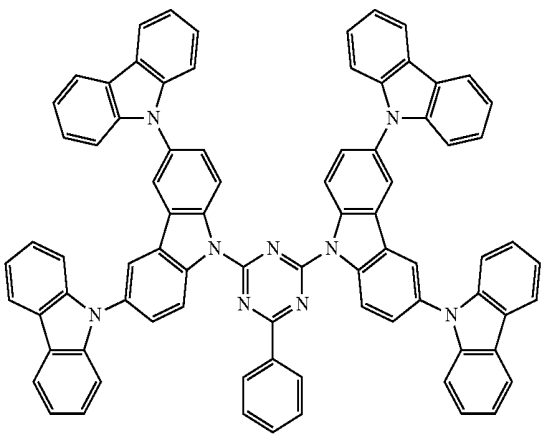

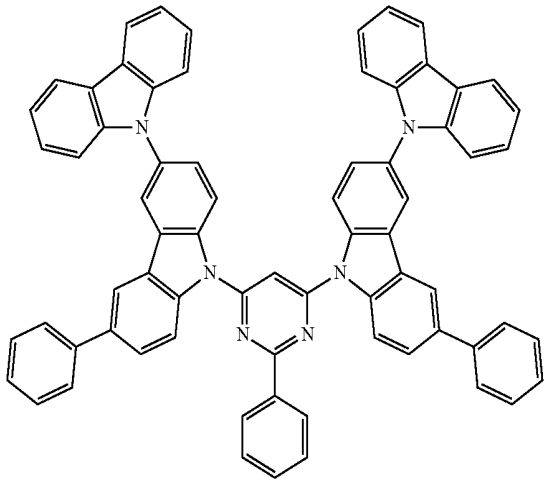

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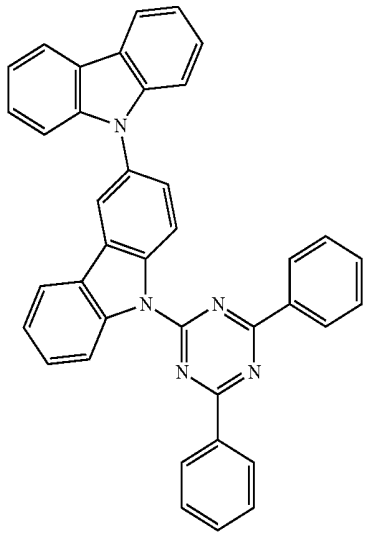

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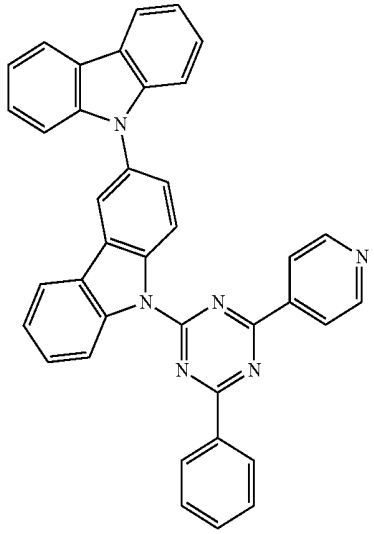

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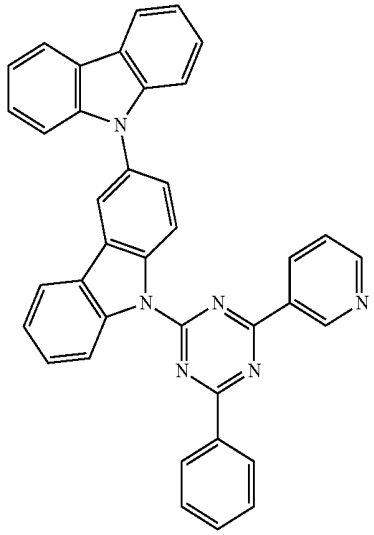

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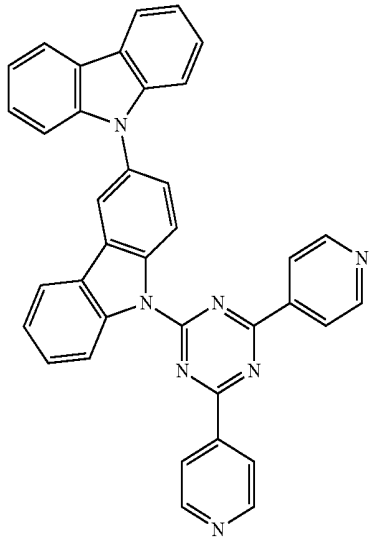

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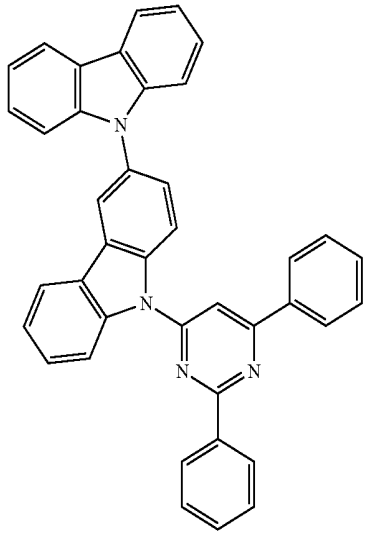

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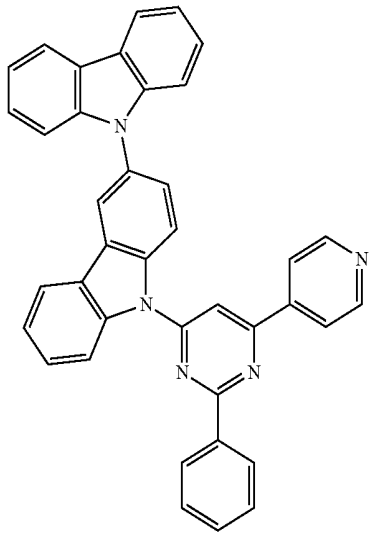

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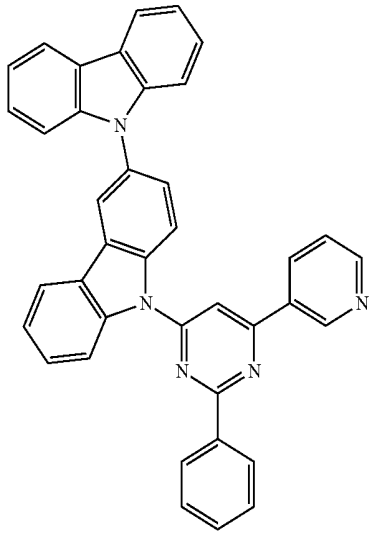

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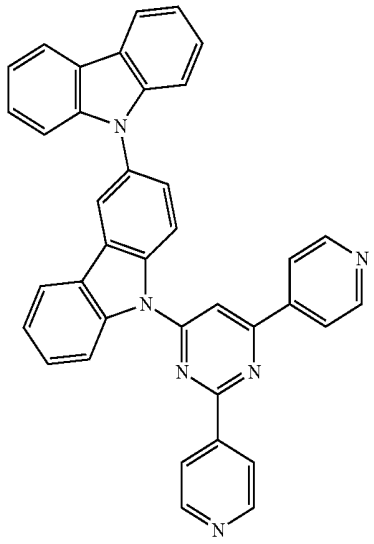

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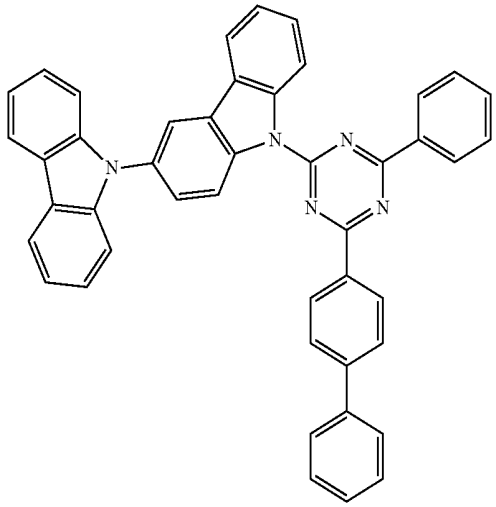

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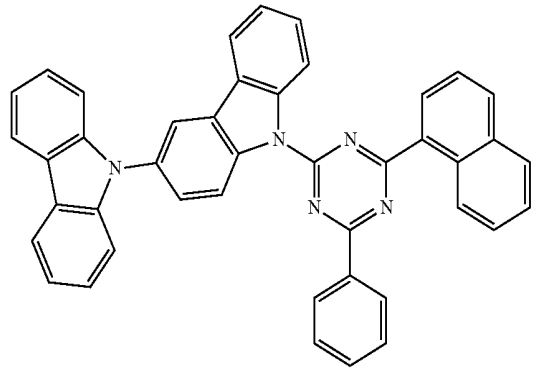

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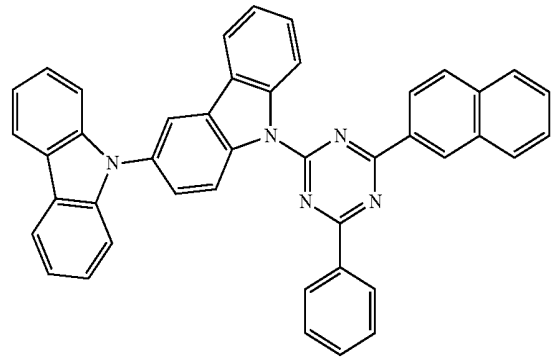

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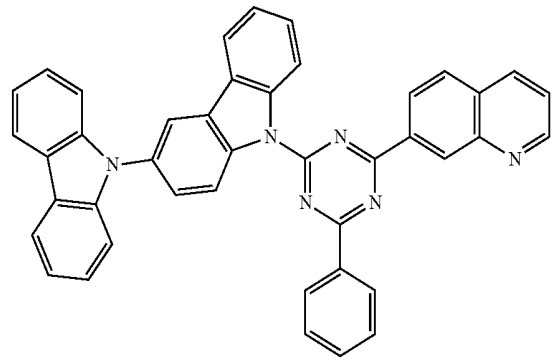

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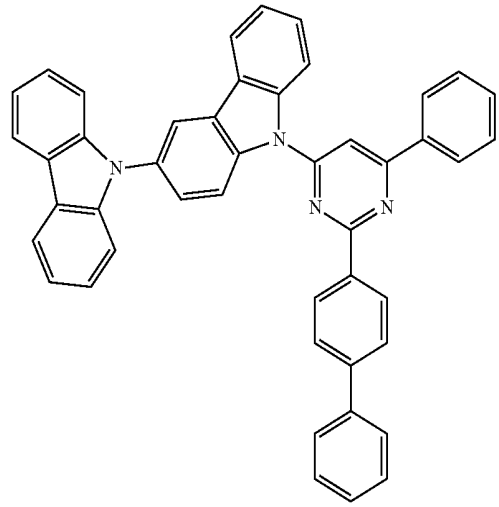

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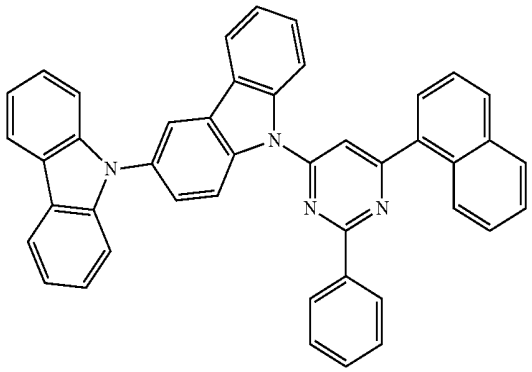

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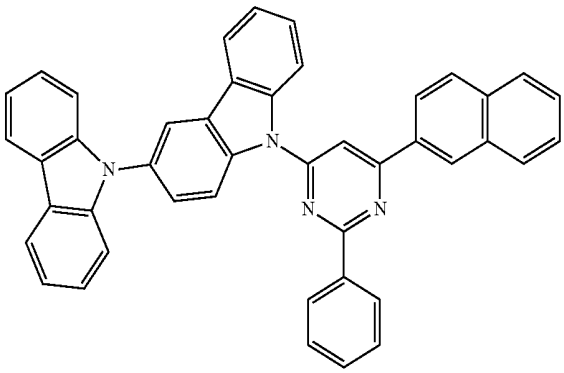

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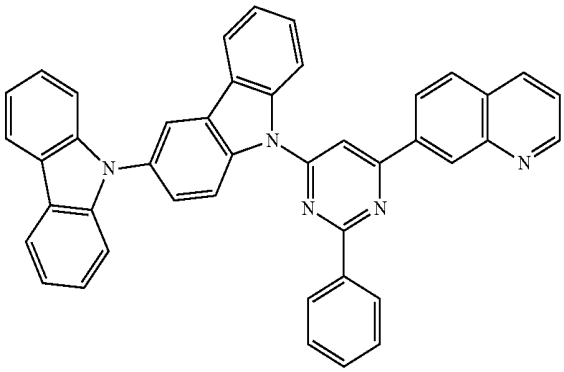

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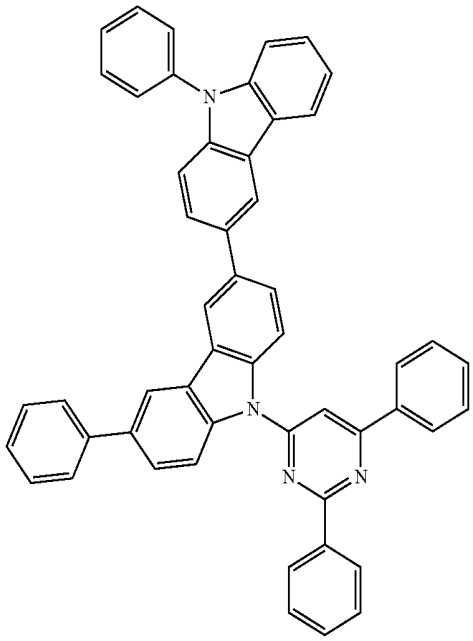
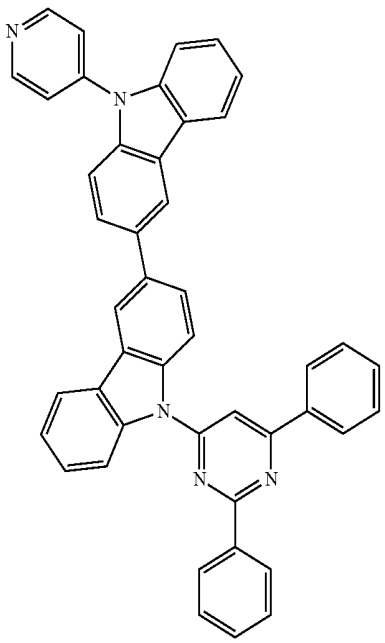
71



72



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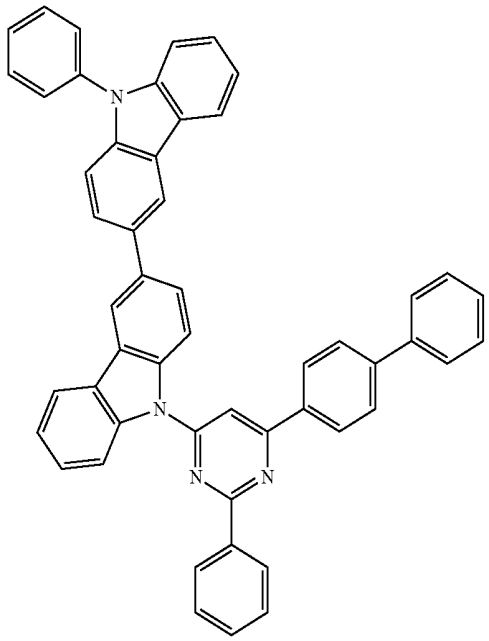
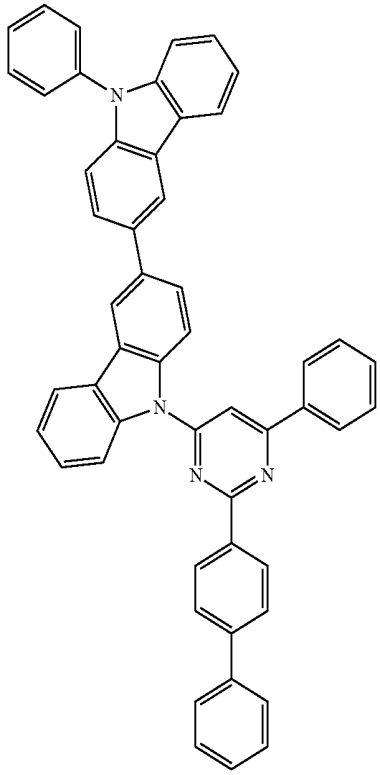
73



74



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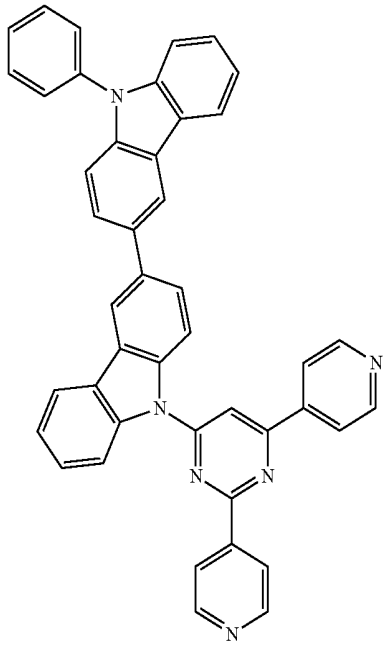
75



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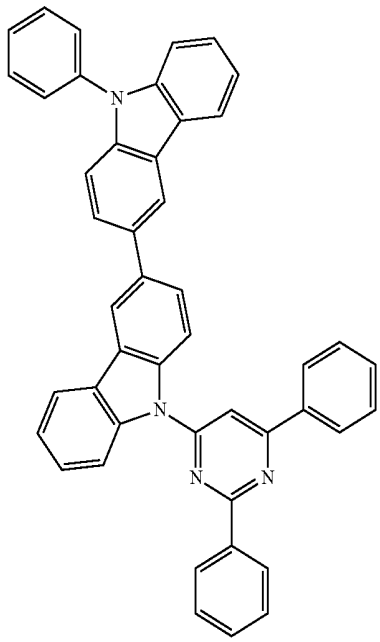

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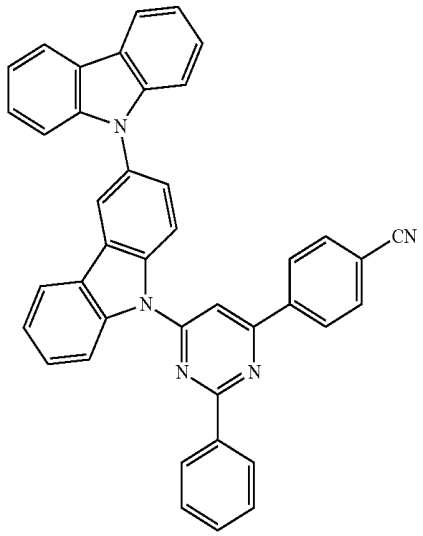
77



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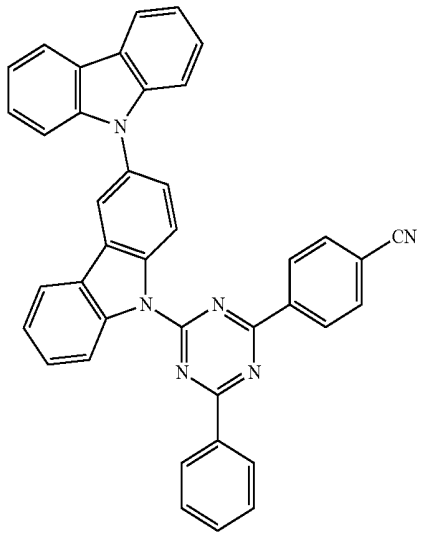

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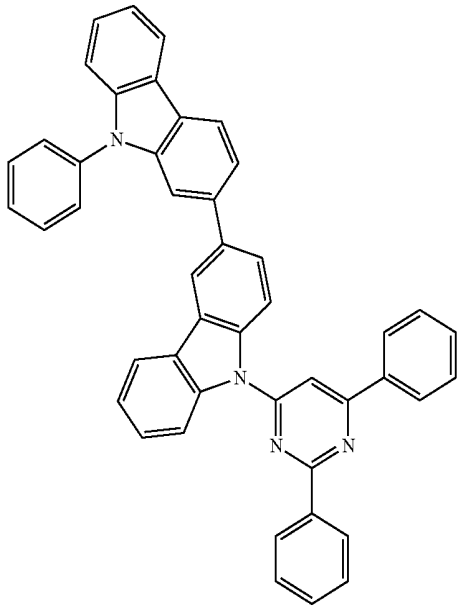

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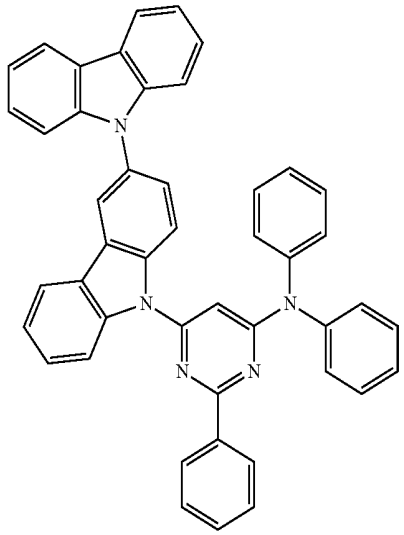
80



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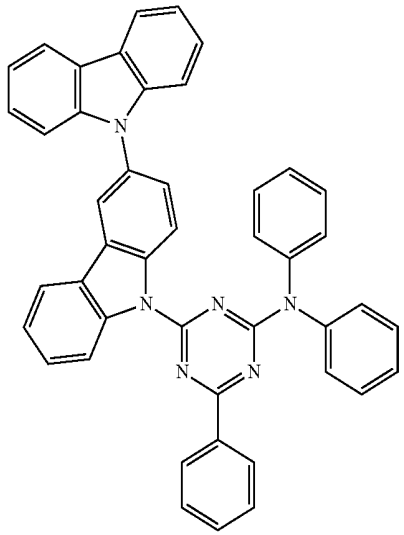

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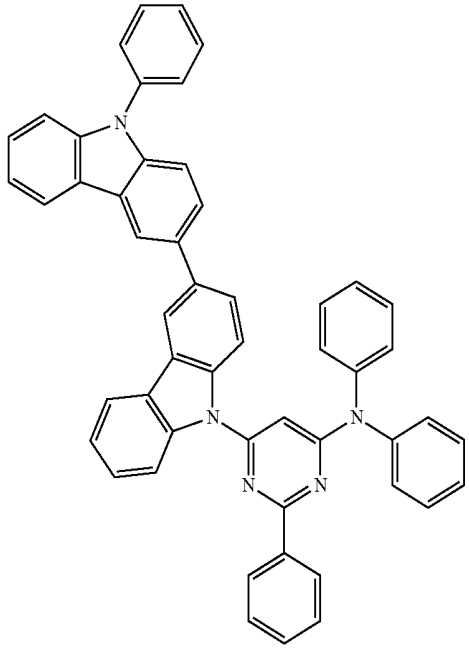

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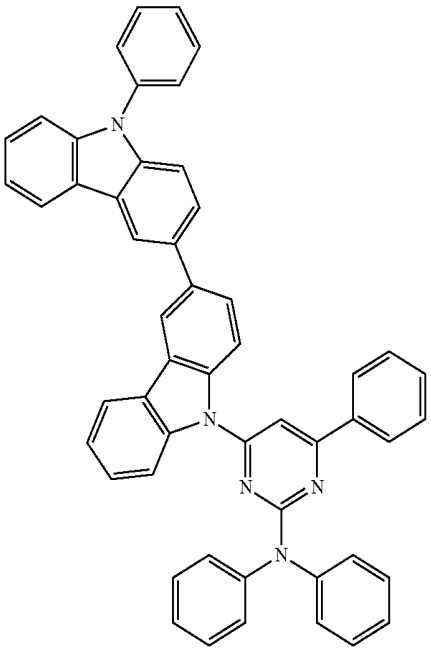
83



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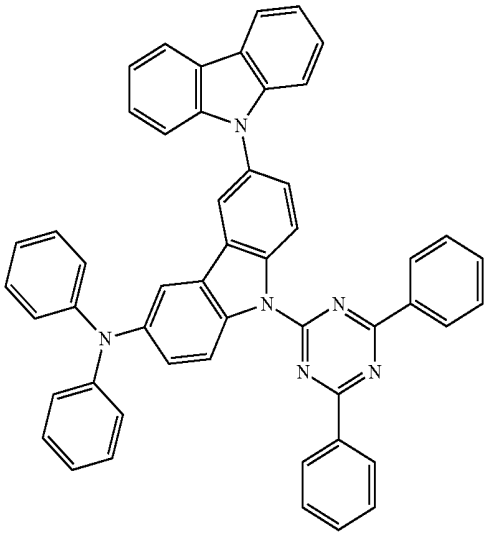
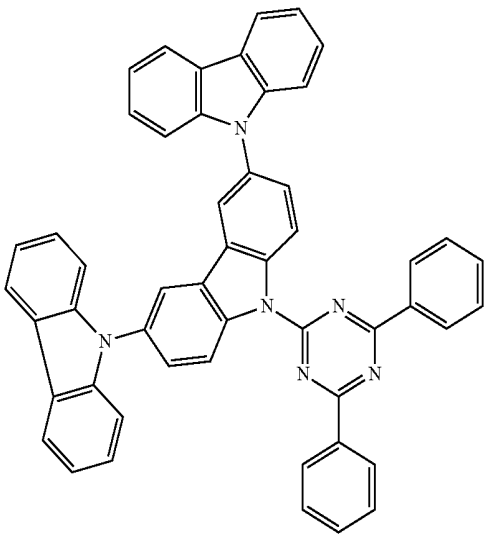


85



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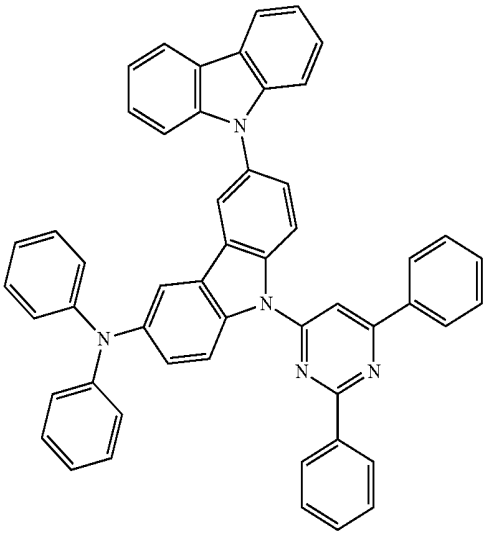
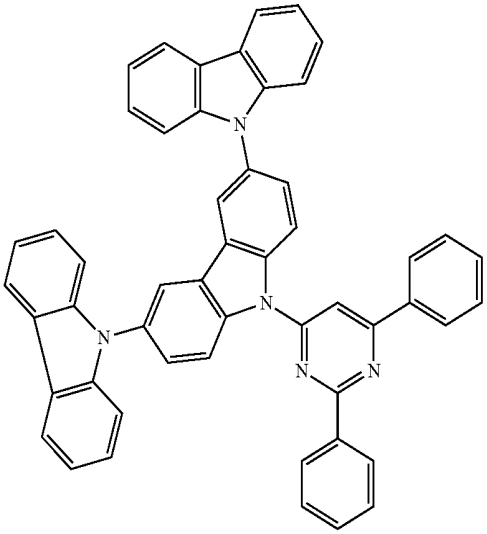
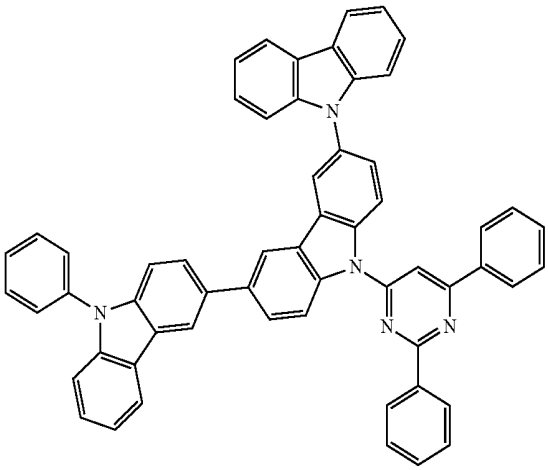
86



87



88



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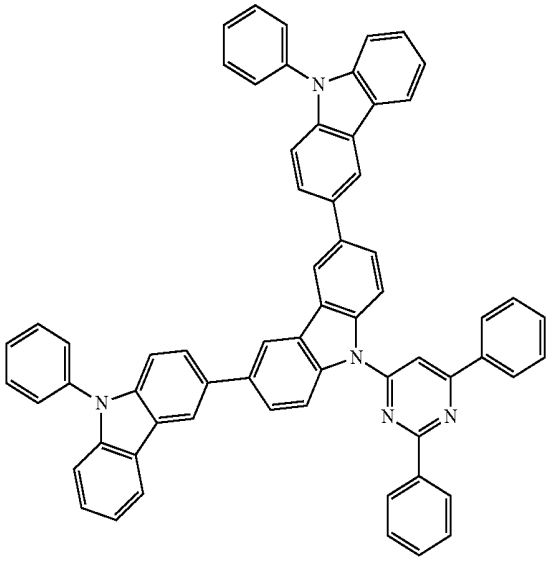
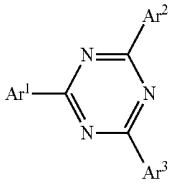
89



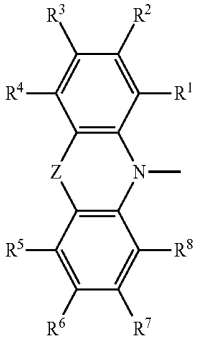
Examples of the preferred light emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formula (171). The entire description of JP-A-2013-256490 including the paragraphs 0009 to 0046 and 0093 to 0134 is incorporated herein by reference.

General Formula (171)



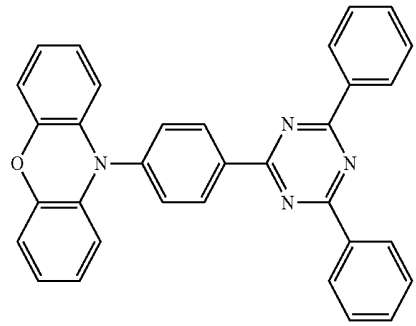
wherein in the general formula (171), Ar^1 to Ar^3 each independently represent a substituted or unsubstituted aryl group, provided that at least one thereof represents an aryl group substituted by a group represented by the following general formula (172):

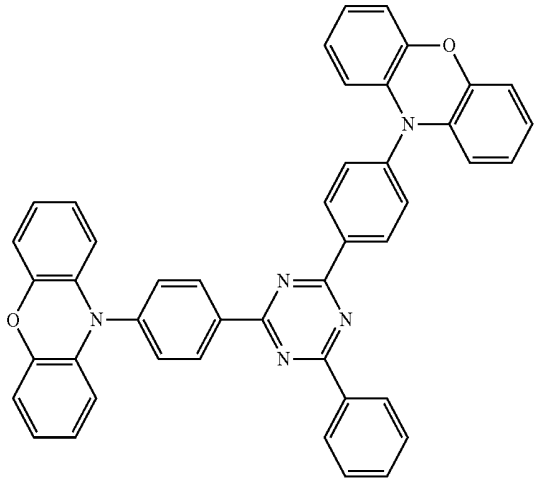
General Formula (172)

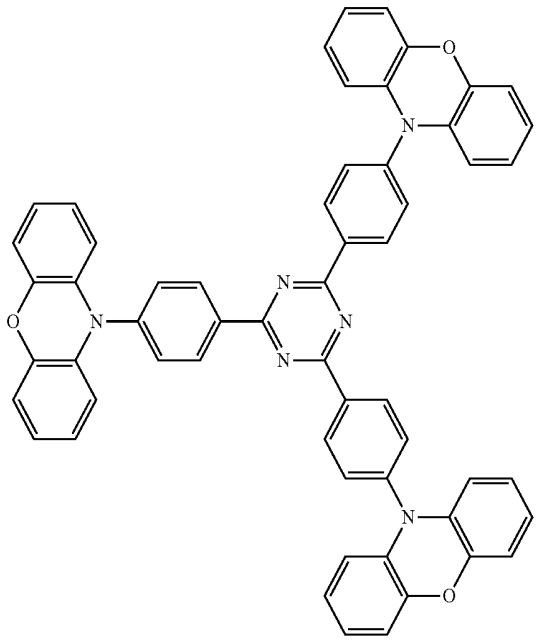


wherein in the general formula (172), R^1 to R^8 each independently represent, a hydrogen atom or a substituent; Z represents O, S, O=C or Ar^4—N; and Ar^4 represents a substituted or unsubstituted aryl group, provided that R^1 and R^2, R^2 and R^3, R^3 and R^4, R^5 and R^6, R^6 and R^7, and R^7 and R^8 each may be bonded to each other to form a ring structure.

Examples of the compound include the following compounds.







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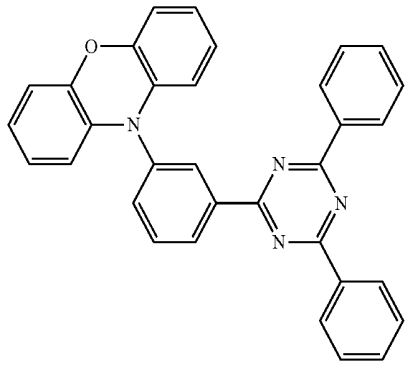

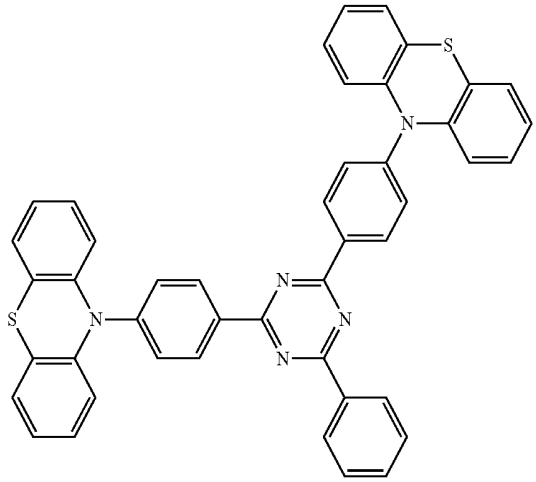

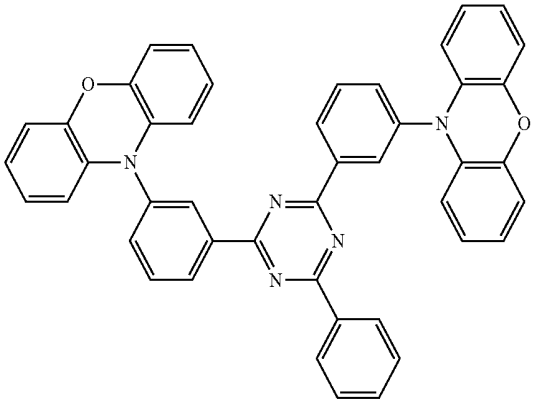

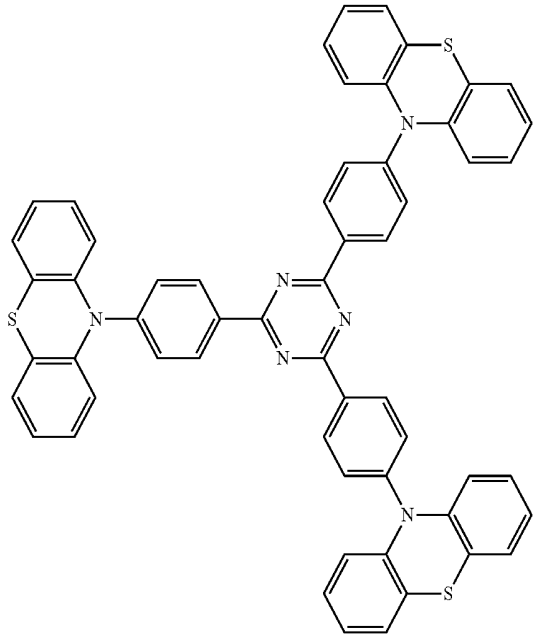

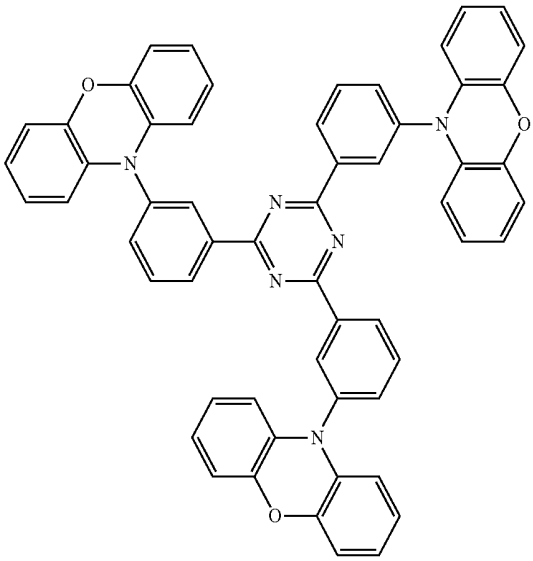

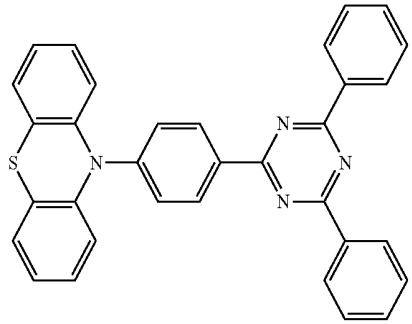

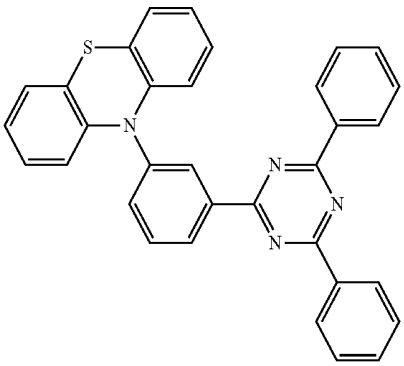

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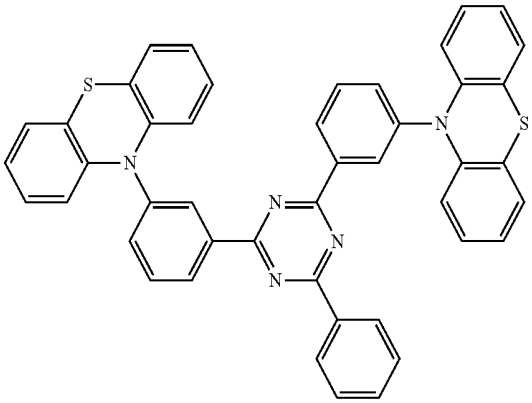

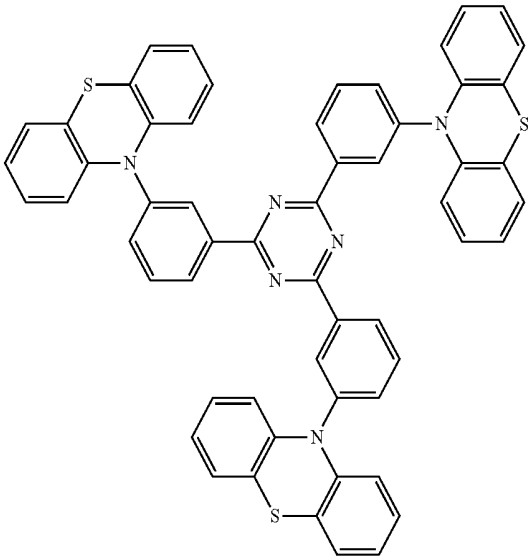

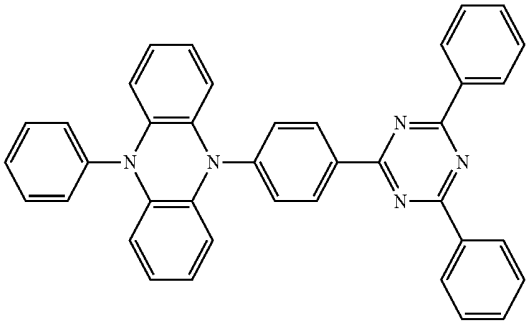

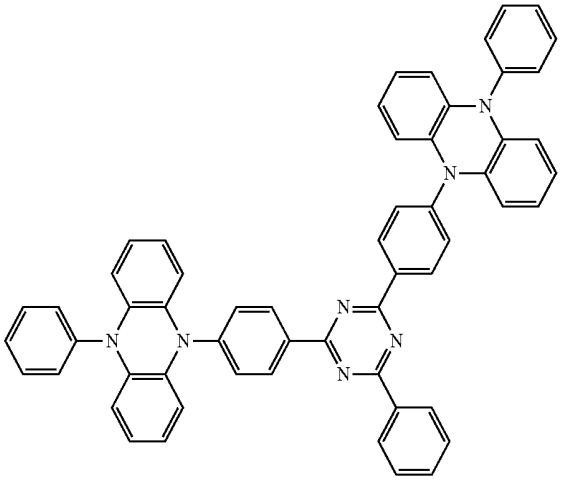

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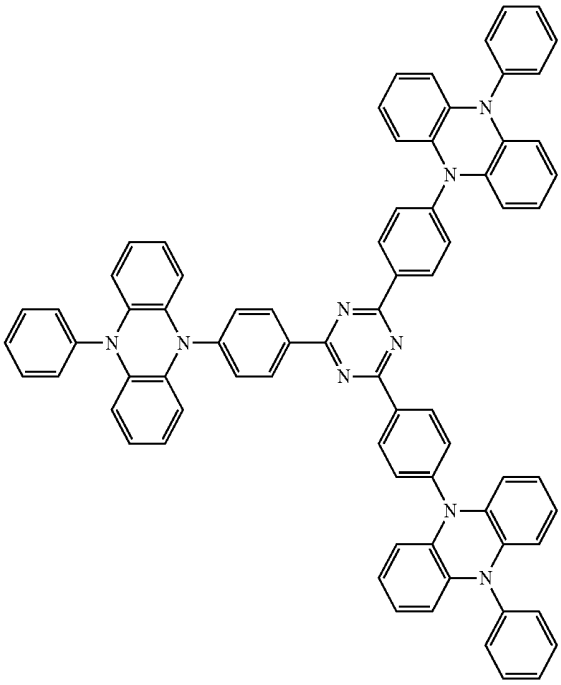

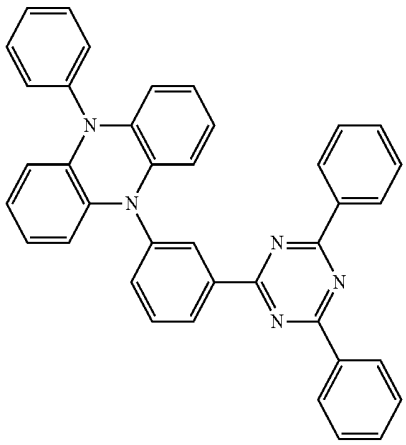

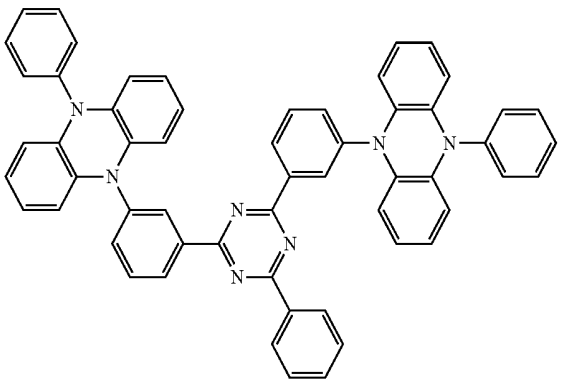

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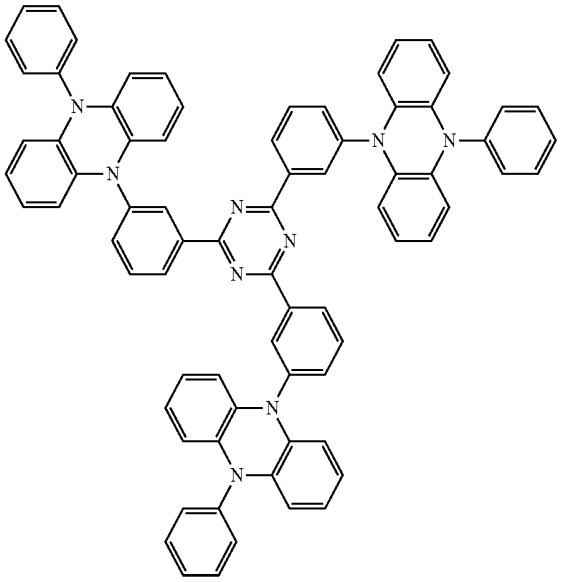

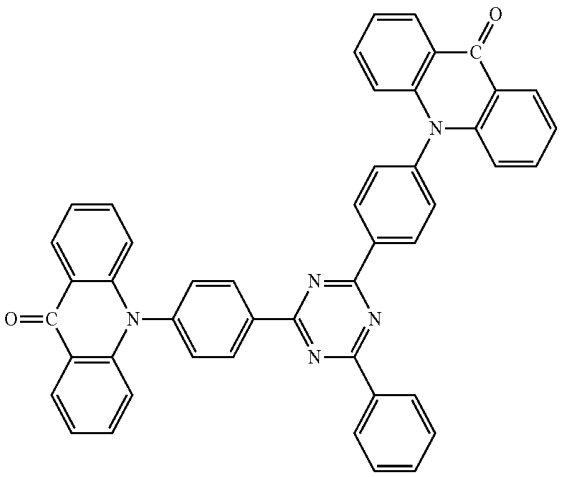

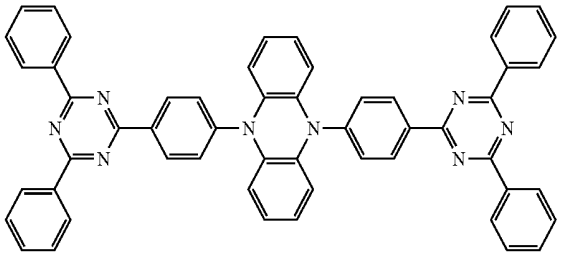

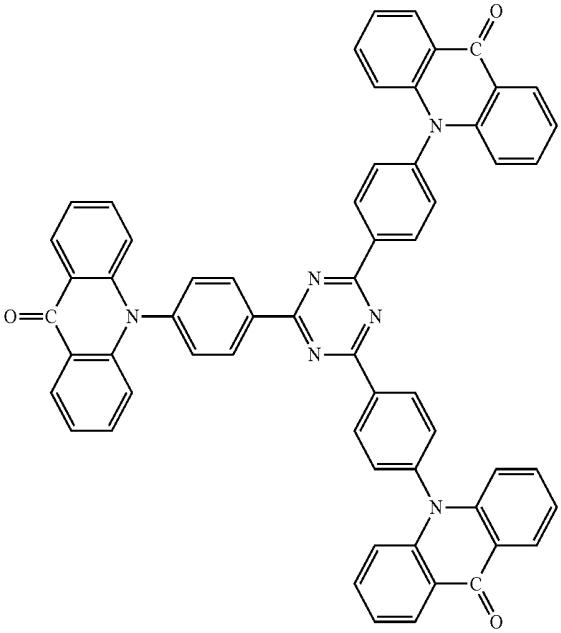

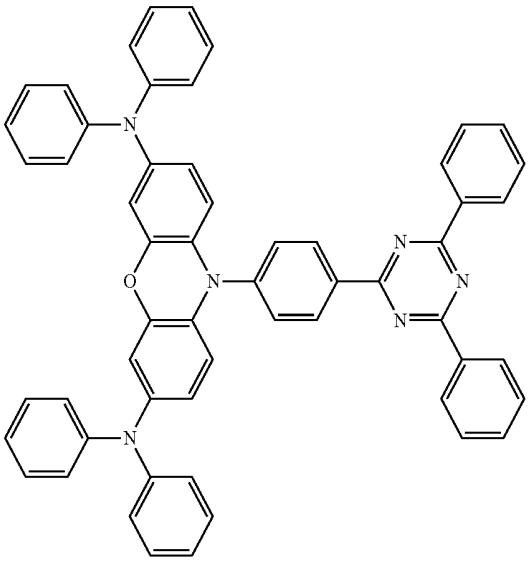

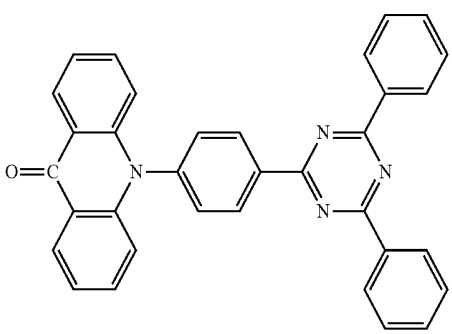

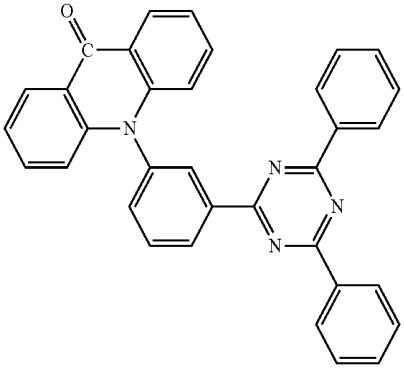

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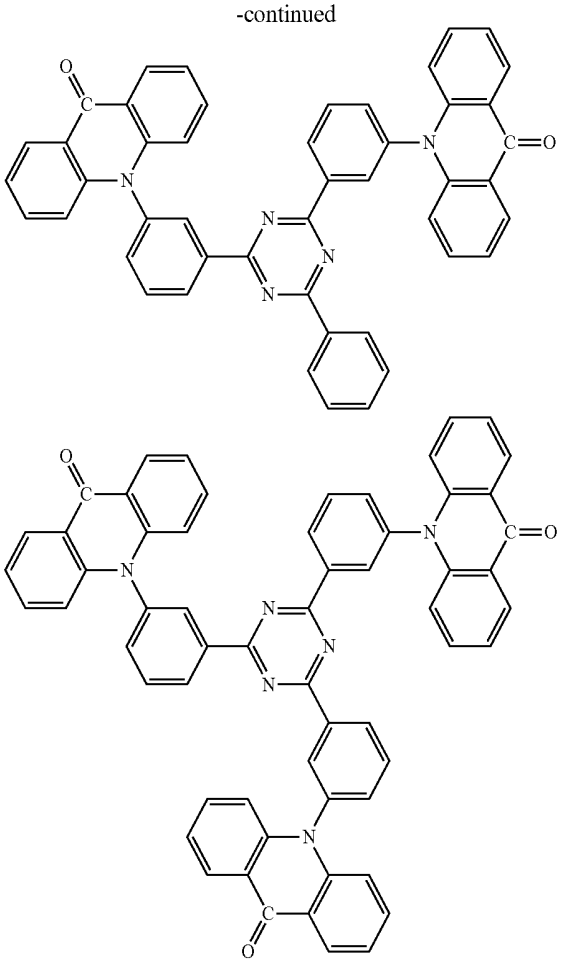
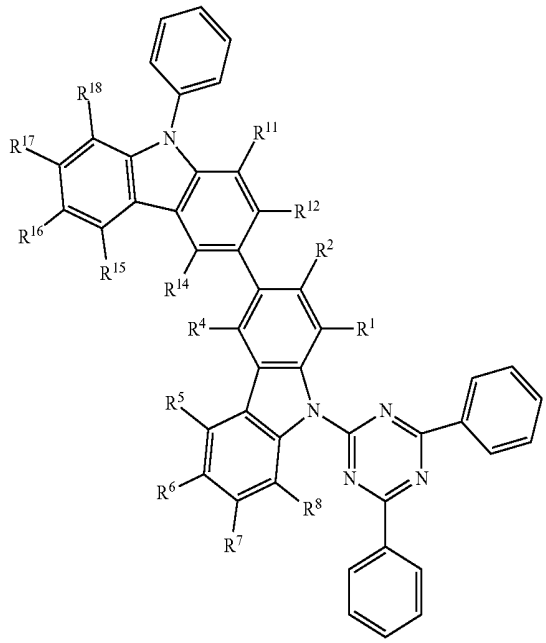


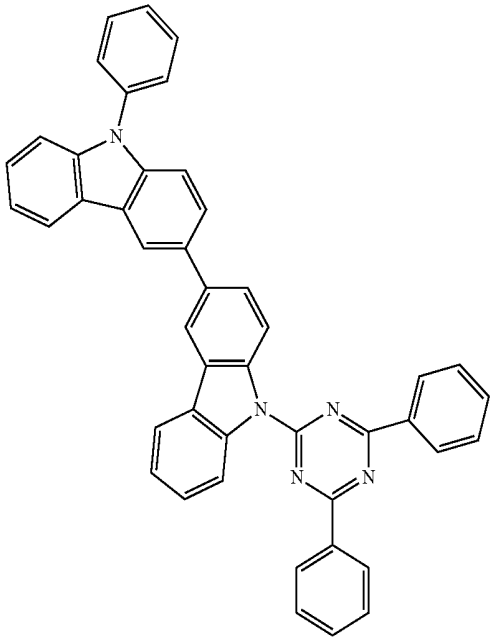
Examples of the preferred light emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formula (181). The entire description of JP-A-2013-116975 including the paragraphs 0008 to 0020 and 0038 to 0040 is incorporated herein by reference.

General Formula (181)



wherein in the general formula (181), R^1, R^2, R^4 to R^8, R^{11}, R^{12} and R^{14} to R^{18} each independently represent a hydrogen atom or a substituent.

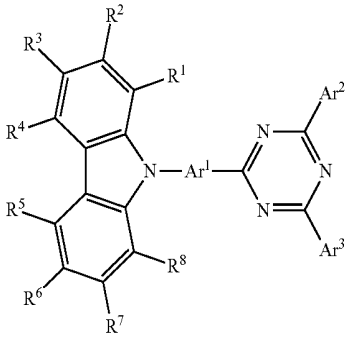
Examples of the compound include the following compound.



Examples of the preferred light emitting material capable of emitting delayed fluorescent light include the following compounds.

(1) A compound represented by the following general formula (191):

General Formula (191)



wherein in the general formula (191), Ar^1 represents a substituted or unsubstituted arylene group; Ar^2 and Ar^3 each independently represent a substituted or unsubstituted aryl group; and R^1 to R^8 each independently represent a hydrogen atom or a substituent, provided that at least one of R^1 to R^8 represents a substituted or unsubstituted diarylamino group, and R^1 and R^2, R^2 and R^3, R^3 and R^4, R^5 and R^6, R^6 and R^7, and R^7 and R^8 each may be bonded to each other to form a cyclic structure.

(2) The compound according to the item (1), wherein in the general formula (191), at least one of R^1 to R^4 represents

a substituted or unsubstituted diarylamino group, and at least, one of R^5 to R^8 represents a substituted or unsubstituted diarylamino group.

(3) The compound according to the item (2), wherein in the general formula (191), R^3 and R^6 each represent a substituted or unsubstituted diarylamino group.

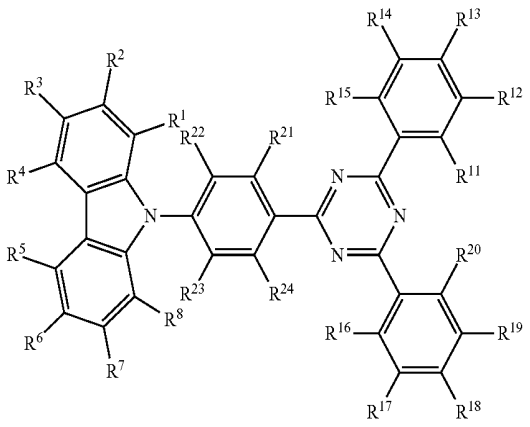
(4) The compound according to any one of the items (1) to (3), wherein in the general formula (191), at least one of R^1 to R^8 represents a substituted or unsubstituted diphenylamino group.

(5) The compound according to any one of the items (1) to (4), wherein in the general formula (191), Ar^2 and Ar^3 each independently represent a substituted or unsubstituted phenyl group.

(6) The compound according to any one of the items (1) to (5), wherein in the general formula (191), Ar^1 represents a substituted or unsubstituted phenylene group, a substituted or unsubstituted naphthylene group or a substituted or unsubstituted anthracenylene group.

(7) The compound according to the item (1), wherein the compound has a structure represented by the following general formula (192):

General Formula (192)

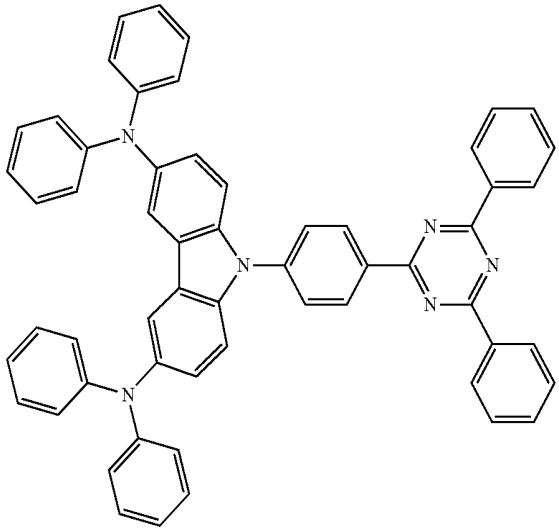


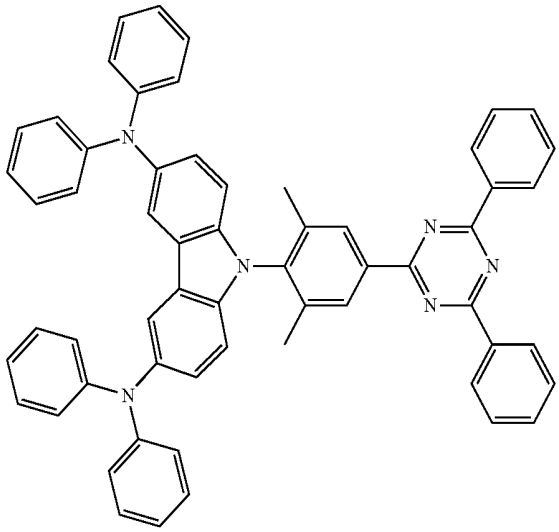
wherein in the general formula (192), R^1 to R^8 and R^{11} to R^{24} each independently represent a hydrogen atom or a substituent, provided that at least one of R^1 to R^8 represents a substituted or unsubstituted diarylamino group, and R^1 and R^2, R^2 and R^3, R^3 and R^4, R^5 and R^6, R^6 and R^7, R^7 and R^8, R^{11} and R^{12}, R^{12} and R^{13}, R^{13} and R^{14}, R^{14} and R^{15}, R^{16} and R^{17}, R^{17} and R^{18}, R^{18} and R^{19}, R^{19} and R^{20}, R^{21} and R^{22}, and R^{23} and R^{24}, each may be bonded to each other to form a ring structure.

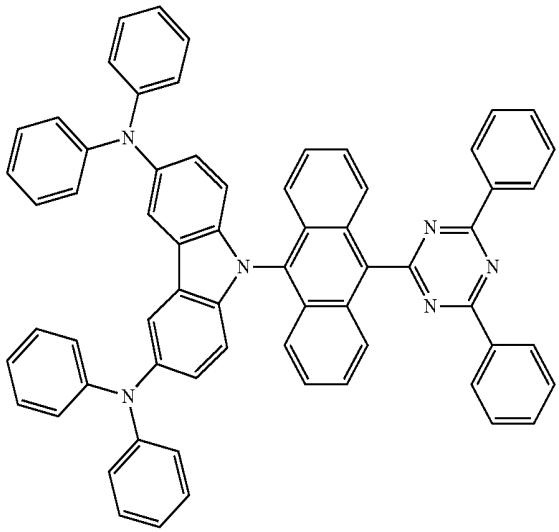
(8) The compound according to the item (7), wherein in the general formula (192), at least one of R^1 to R^4 represents a substituted or unsubstituted diarylamino group, and at least one of R^5 to R^6 represents a substituted or unsubstituted diarylamino group.

(9) The compound according to the item (8), wherein in the general formula (192), R^3 and R^6 each represent a substituted or unsubstituted diarylamino group.

Specific examples of the compound include the following compounds. Ph represents a phenyl group.







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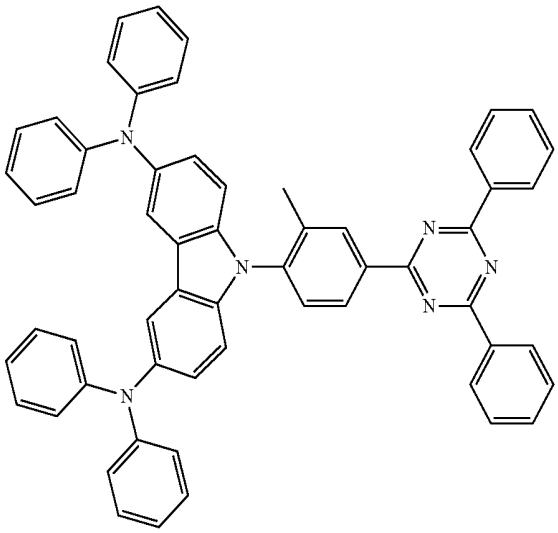

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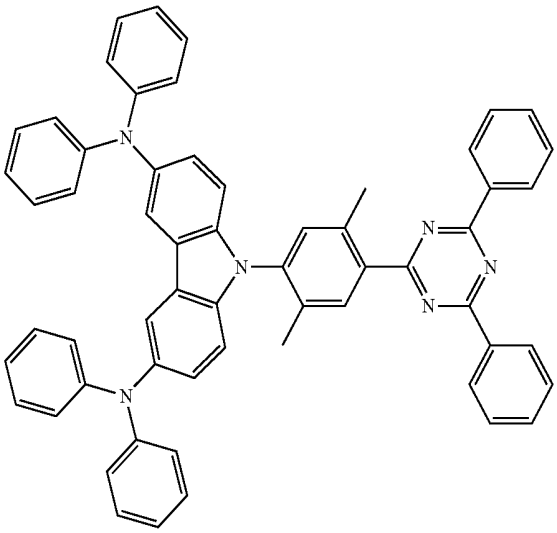

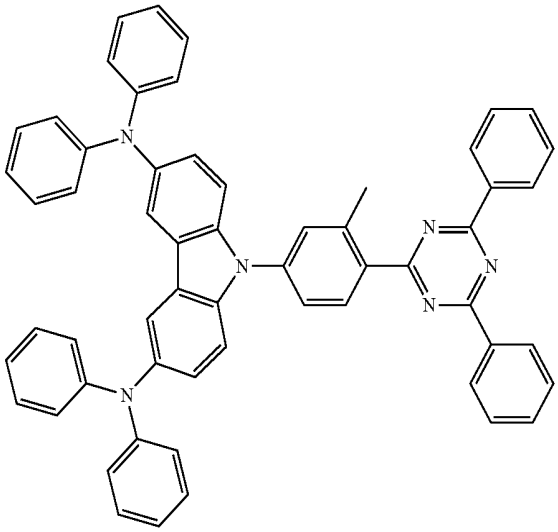

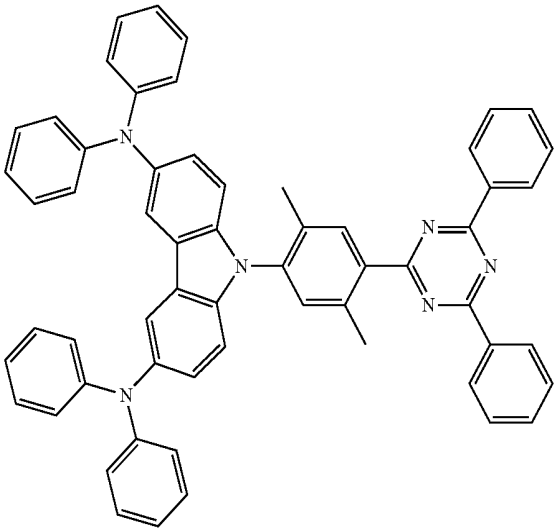

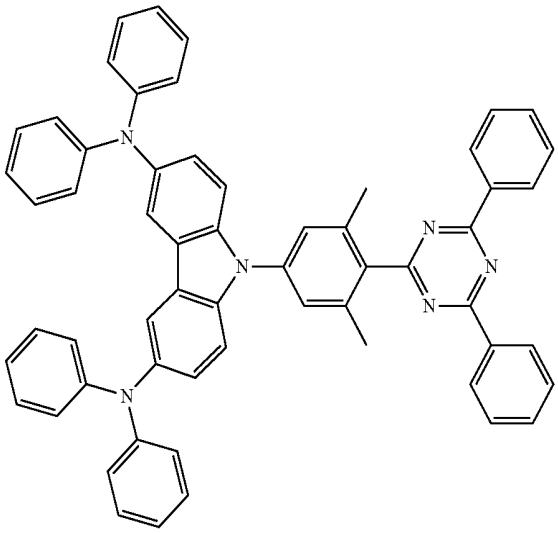

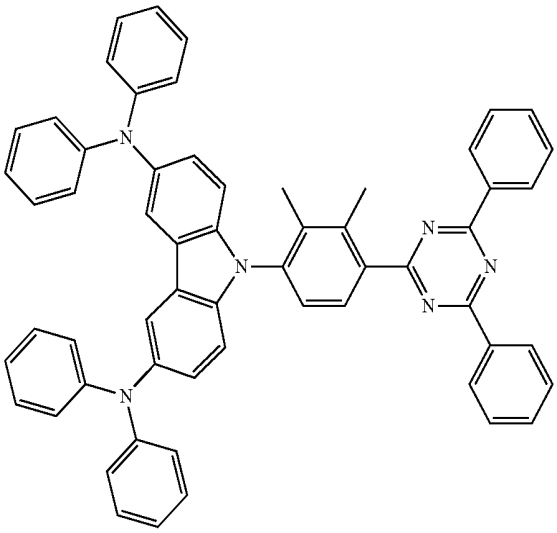

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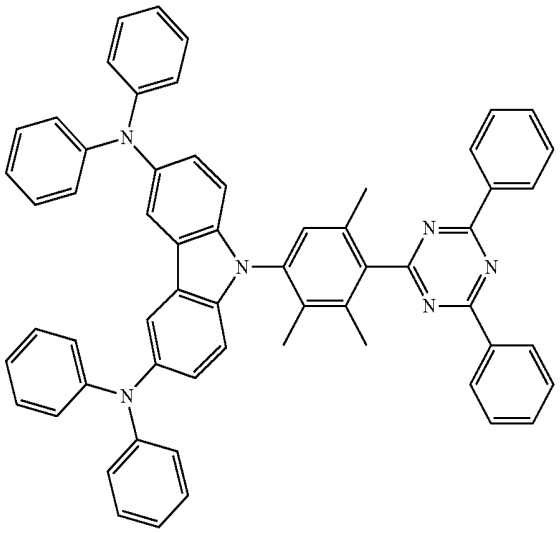
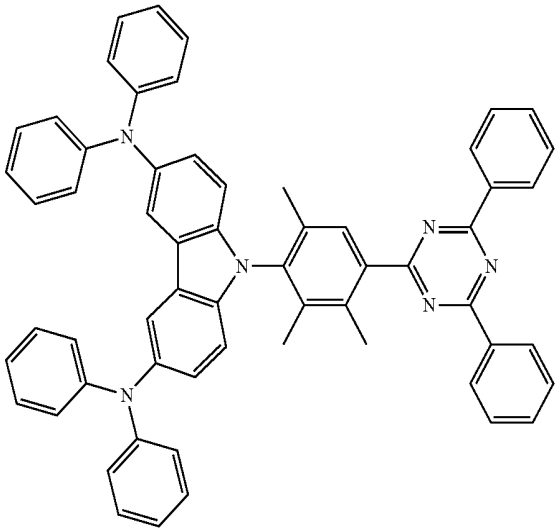
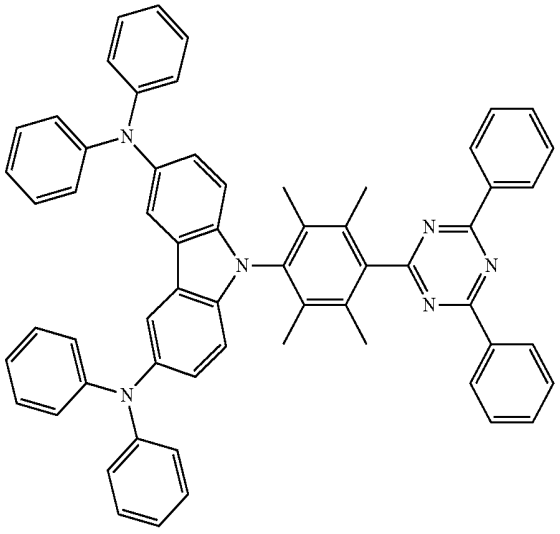


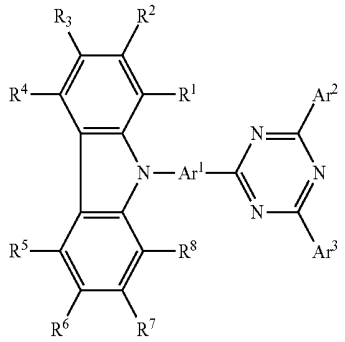




Examples of the preferred light emitting material capable of emitting delayed fluorescent light include the following compounds.

(1) A compound represented by the following general formula (201):

General Formula (201)



wherein in the general formula (201), R^1 to R^8 each independently represent a hydrogen atom or a substituent, provided that at least one of R^1 to R^8 represents a substituted or unsubstituted carbazolyl group; and Ar^1 to Ar^3 each independently represent a substituted or unsubstituted aromatic ring or a heteroaromatic ring.

(2) The compound according to the item (1), wherein in the general formula (201), at least one of R^3 and R^6 represents a substituted or unsubstituted carbazolyl group.

(3) The compound according to the item (1) or (2), wherein the carbazolyl group is a 1-carbazolyl group, a 2-carbazolyl group, a 3-carbazolyl group or a 4-carbazolyl group.

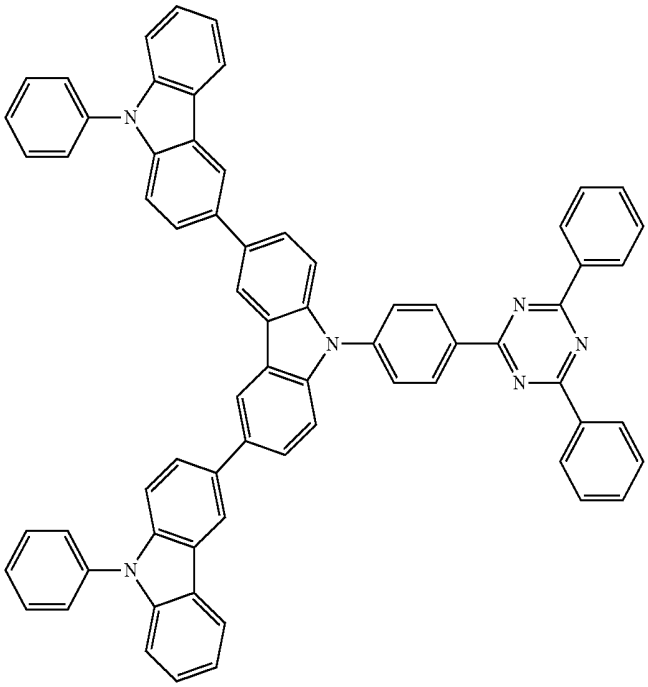
(4) The compound according to any one of the items (1) to (3), wherein the carbazolyl group has a substituent on the nitrogen atom in the carbazole ring structure.

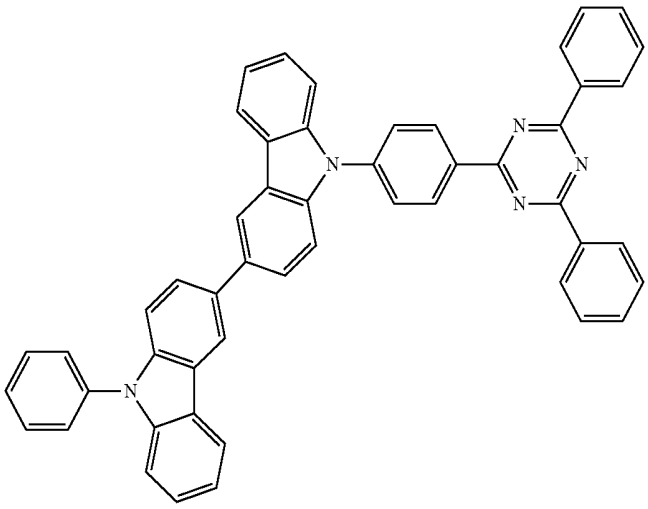
(5) The compound according to any one of the items (1) to (4), wherein in the general formula (201), at least one of Ar^1, Ar^2 and Ar^3 represents a benzene ring or a naphthalene ring.

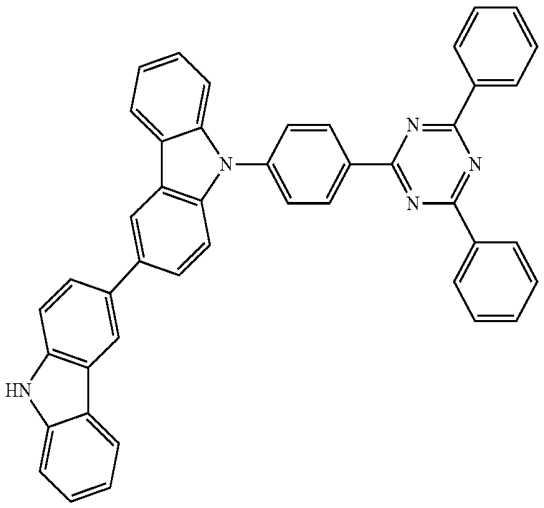
(6) The compound according to any one of the items (1) to (5), wherein in the general formula (201), Ar^1, Ar^2 and Ar^3 each represent the same aromatic ring or the same heteroaromatic ring.

(7) The compound according to any one of the items (1) to (6), wherein in the general formula (201), Ar^1, Ar^2 and Ar^3 each represent a benzene ring.

Specific examples of the compound include the following compounds.







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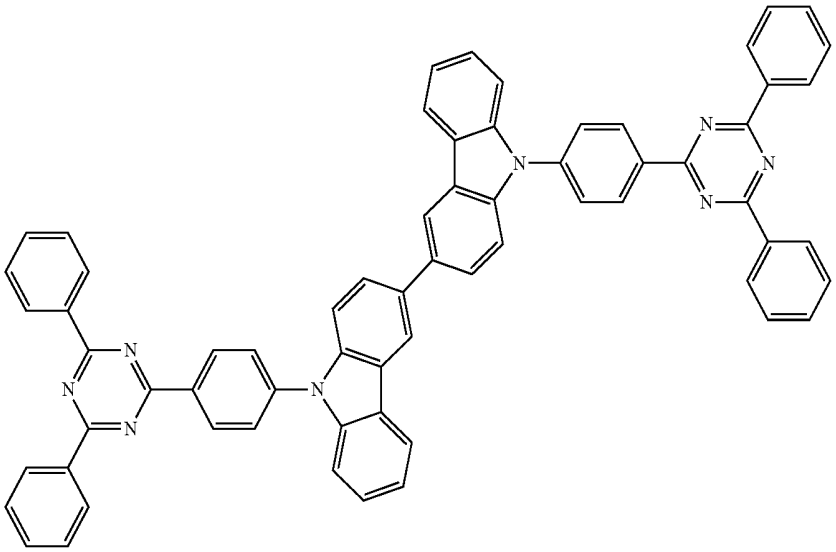

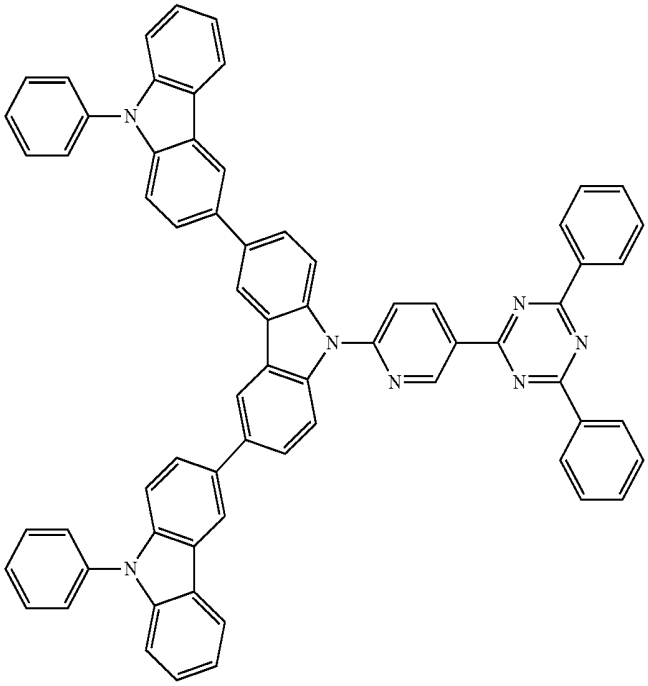

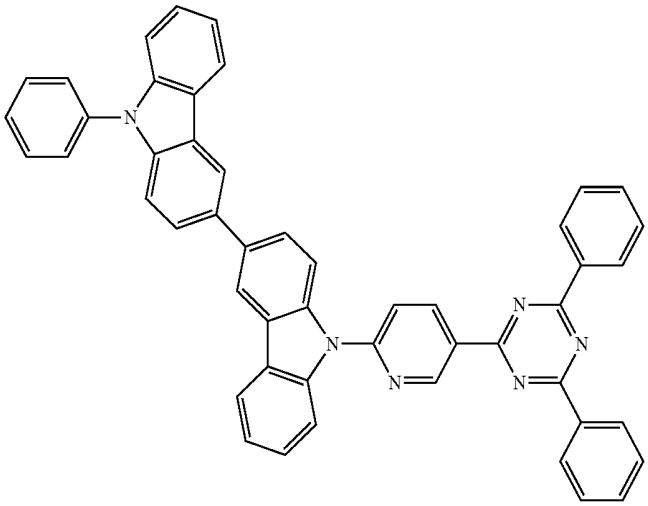

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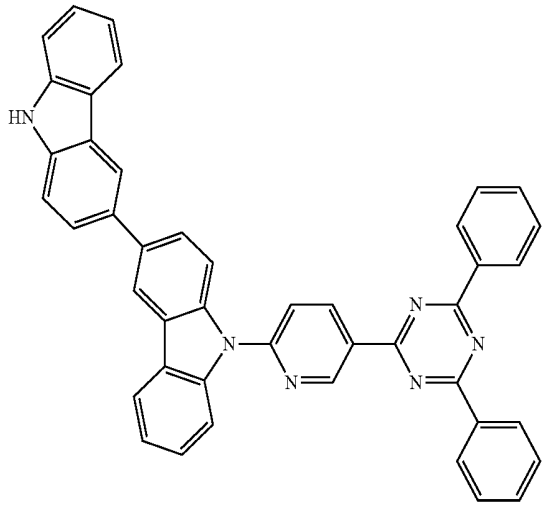

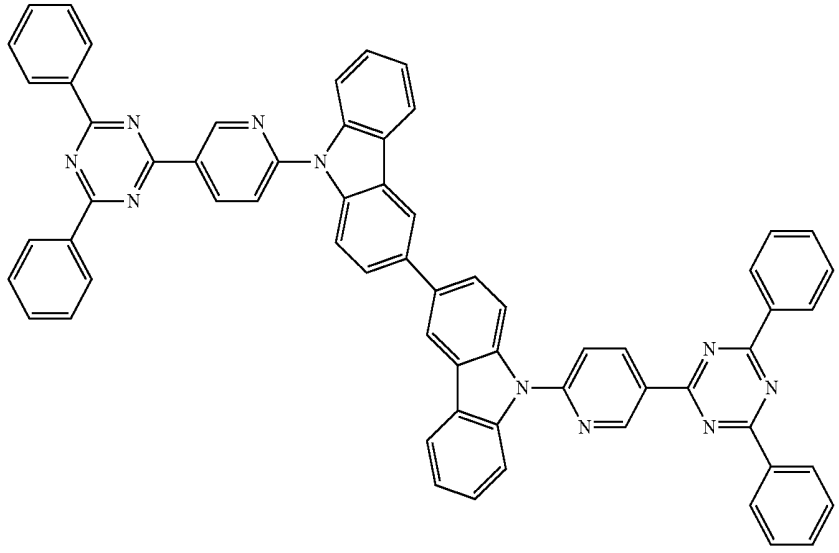

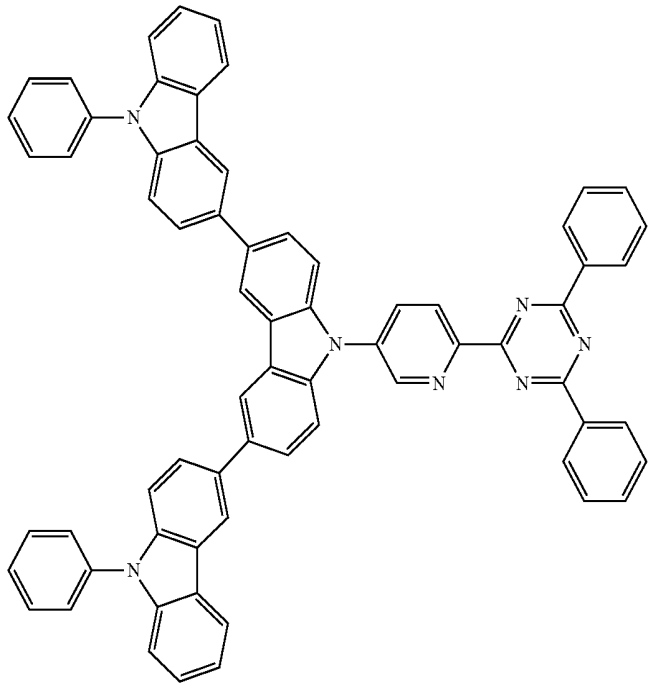

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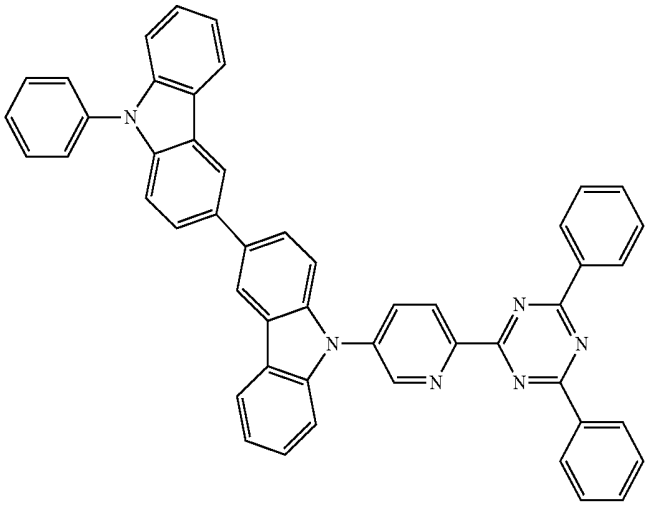

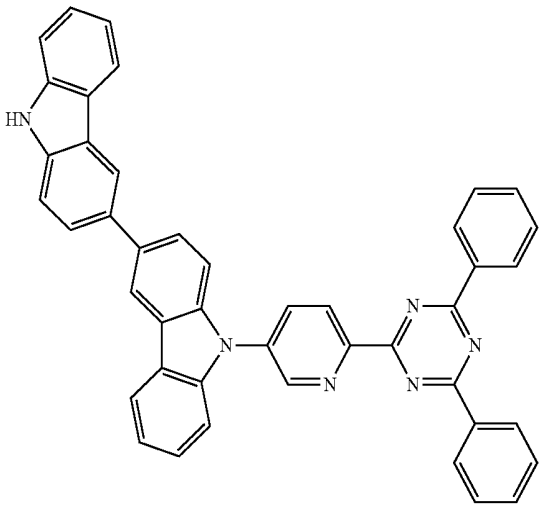

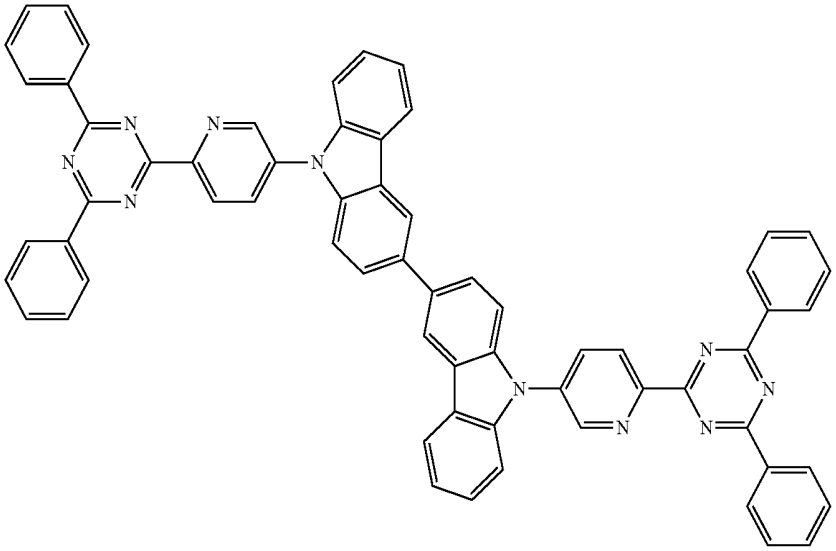

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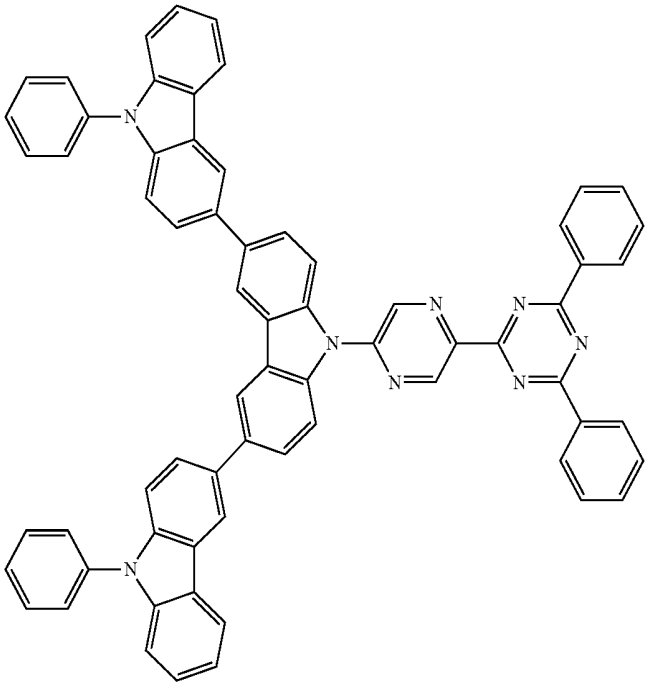

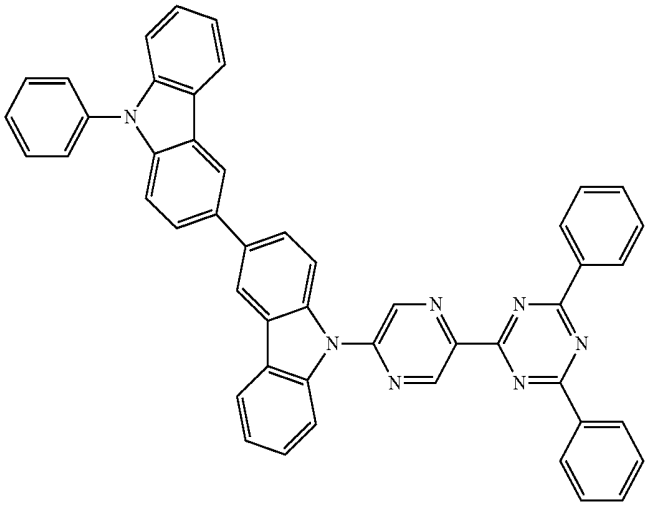

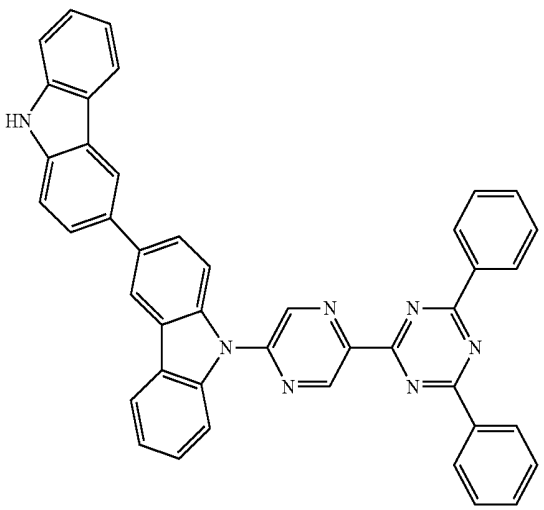

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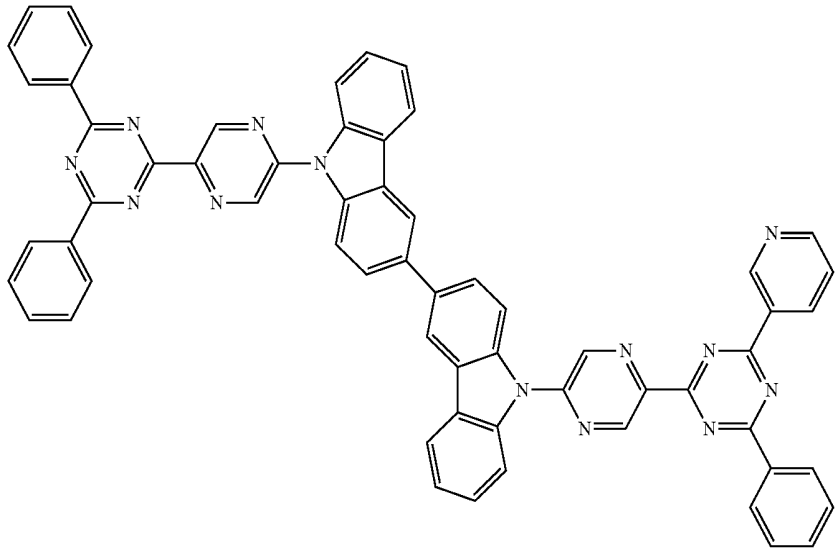

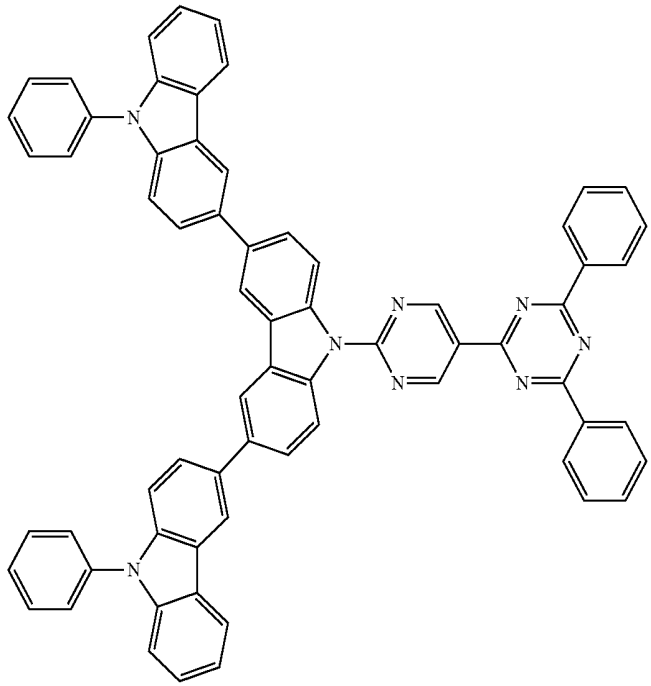

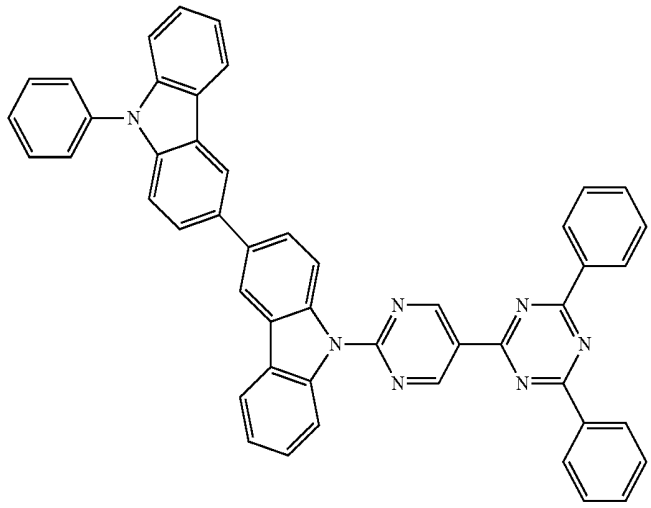

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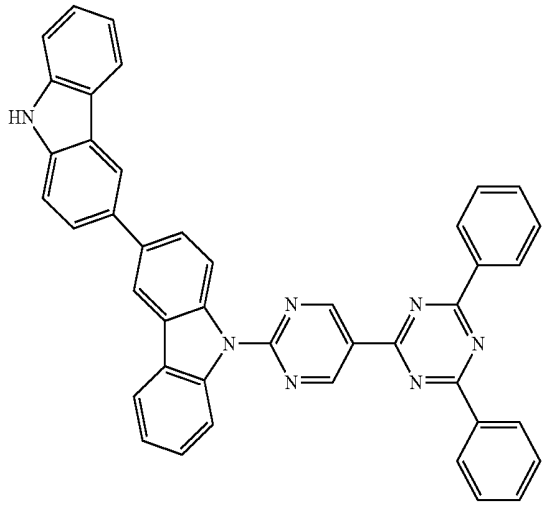

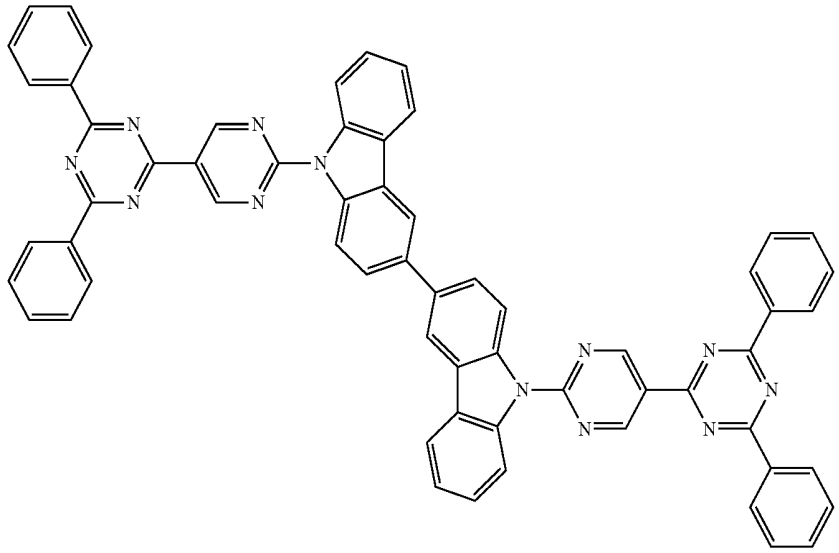

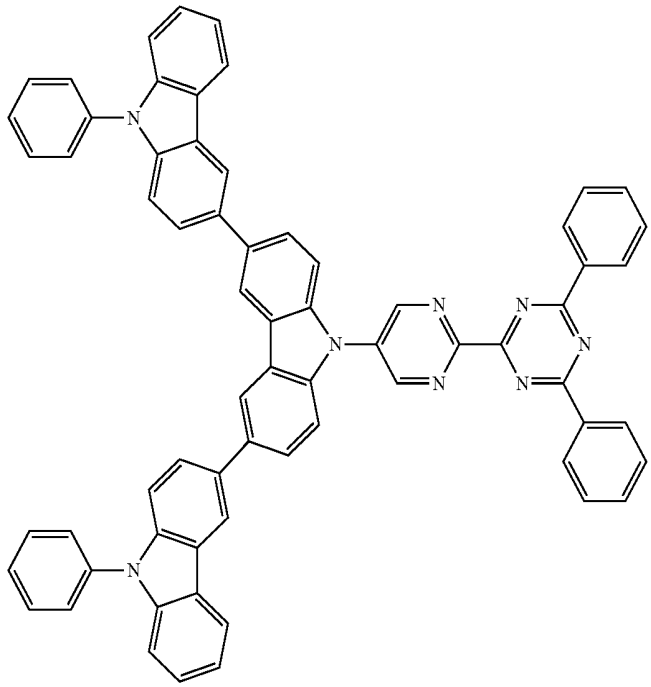

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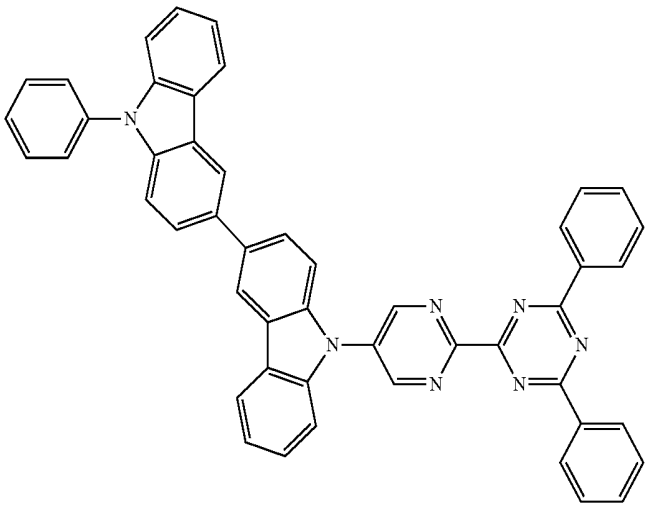

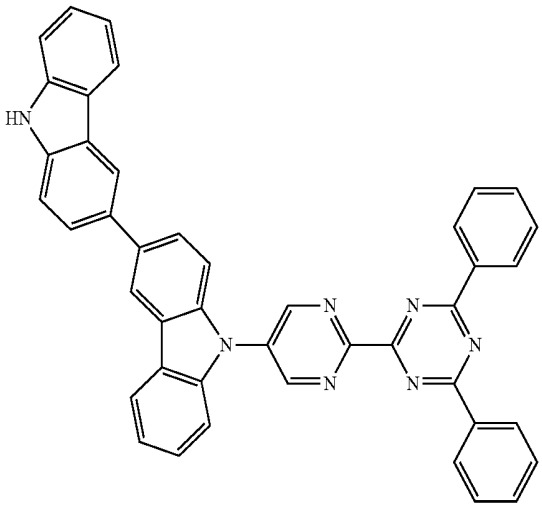

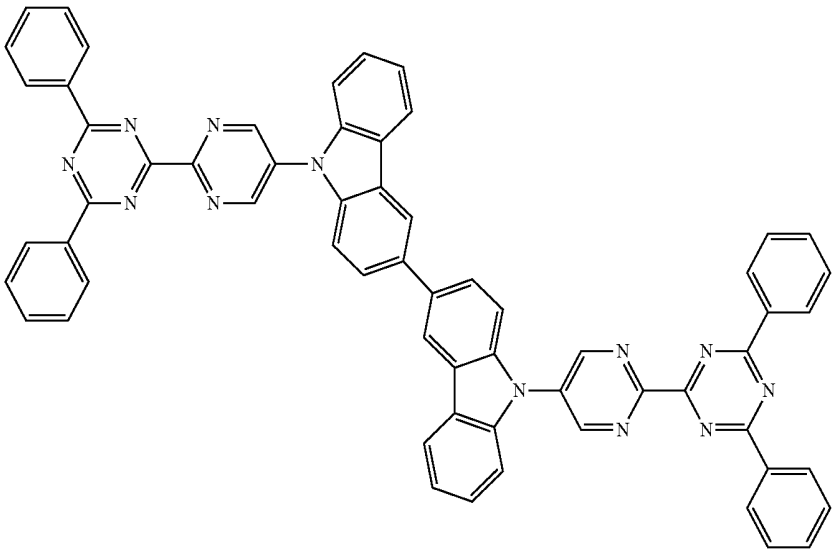

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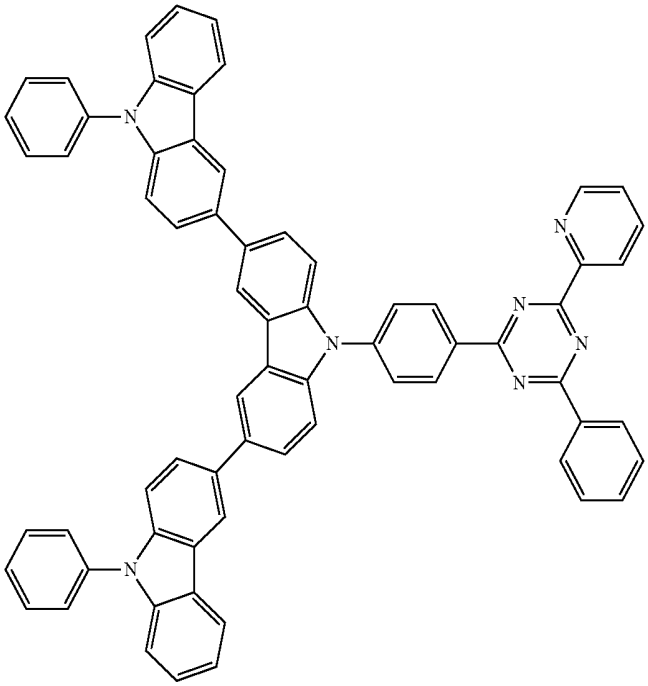

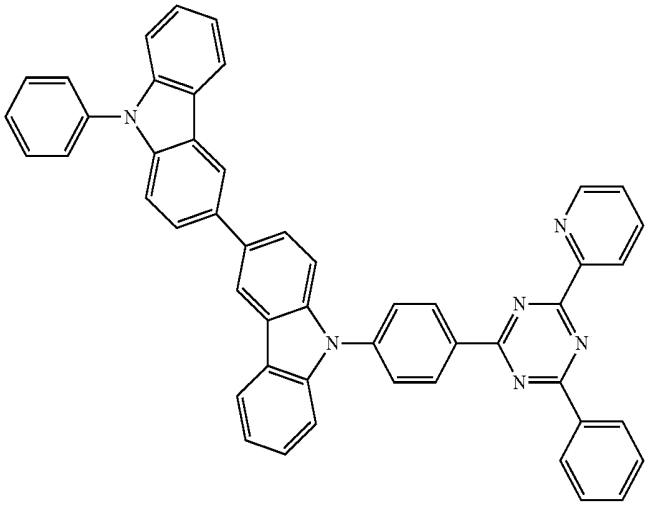

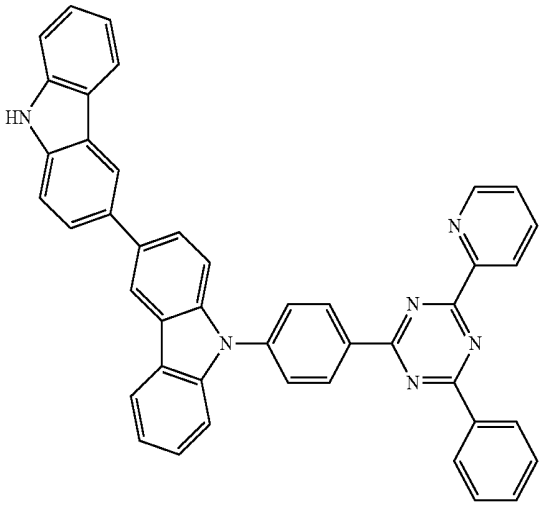

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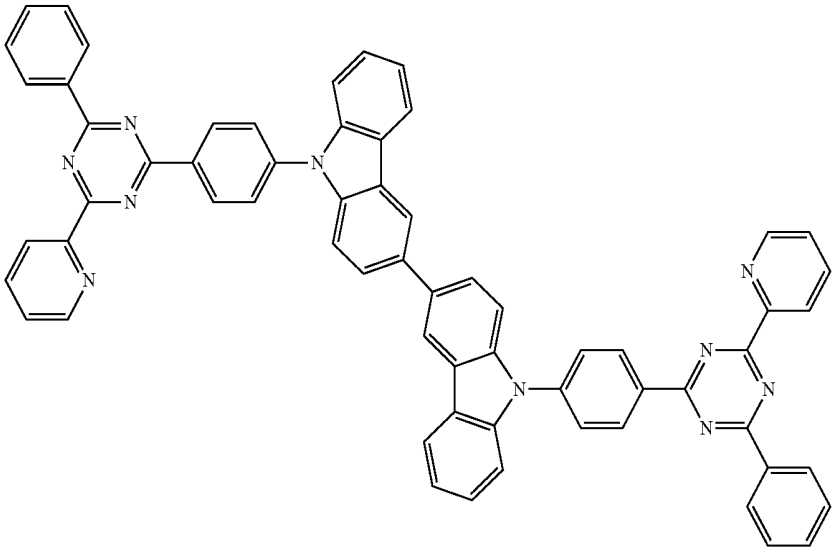

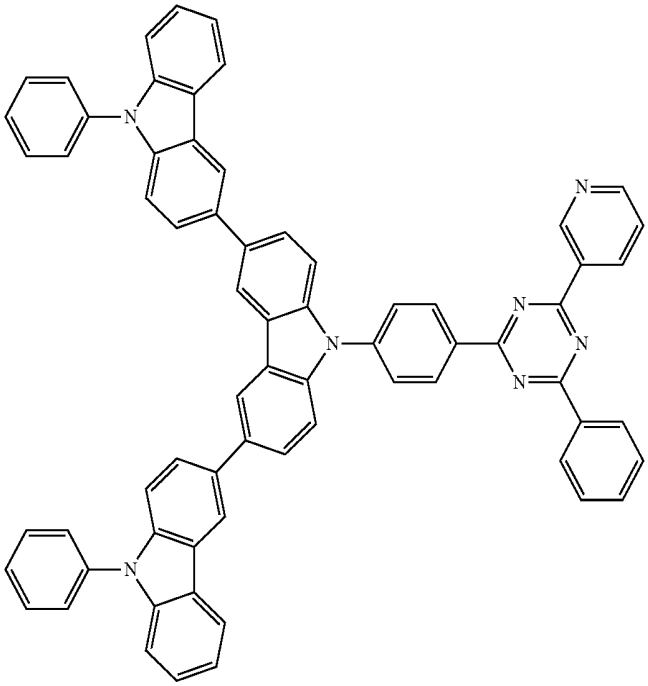

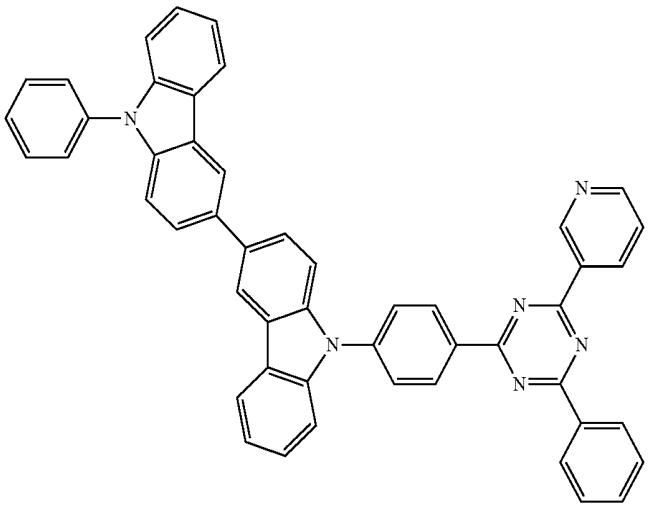

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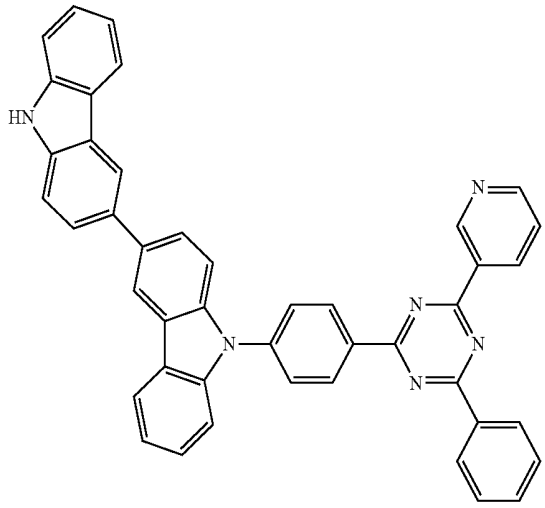

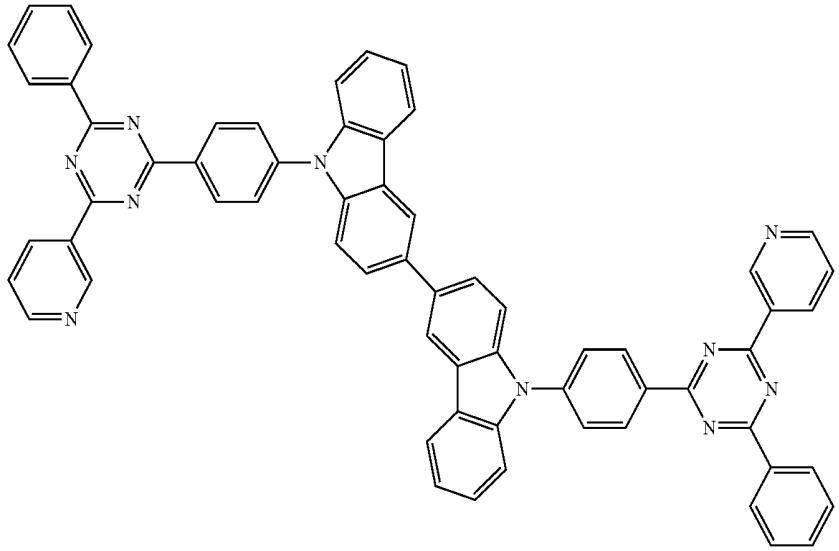

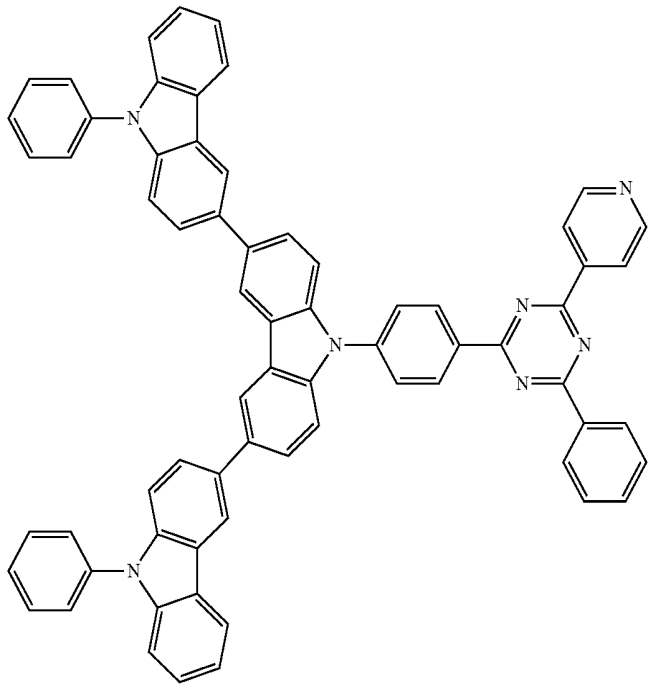

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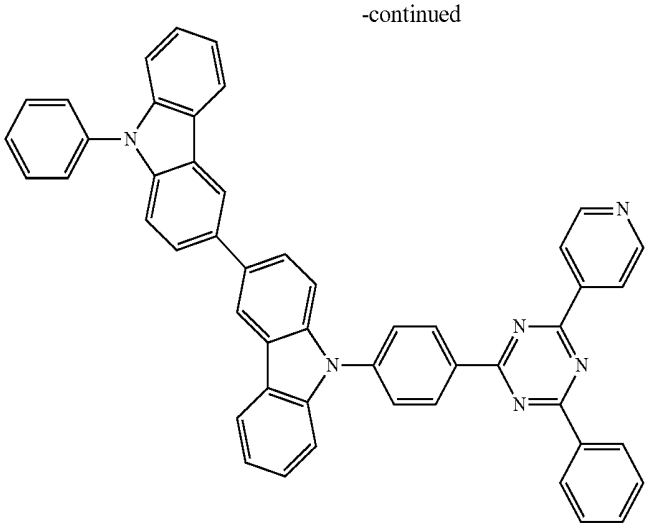

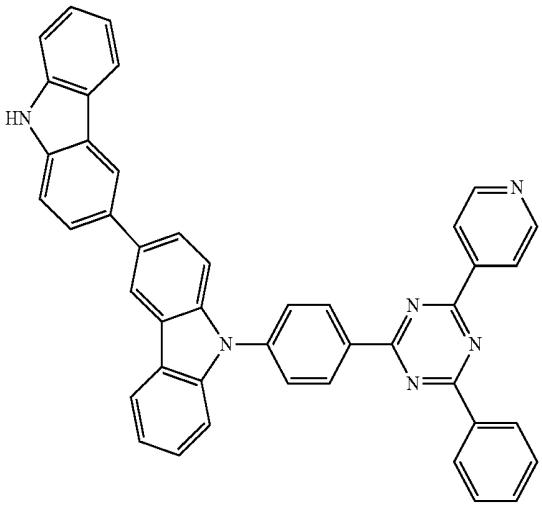

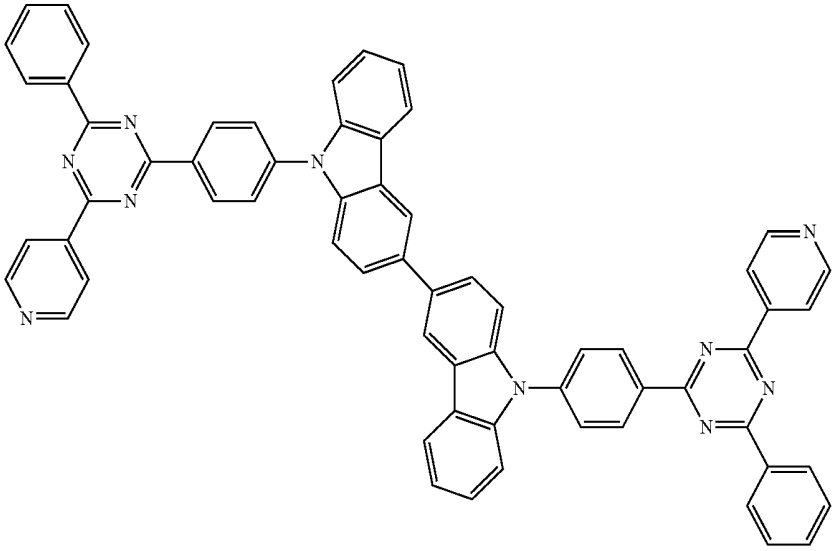

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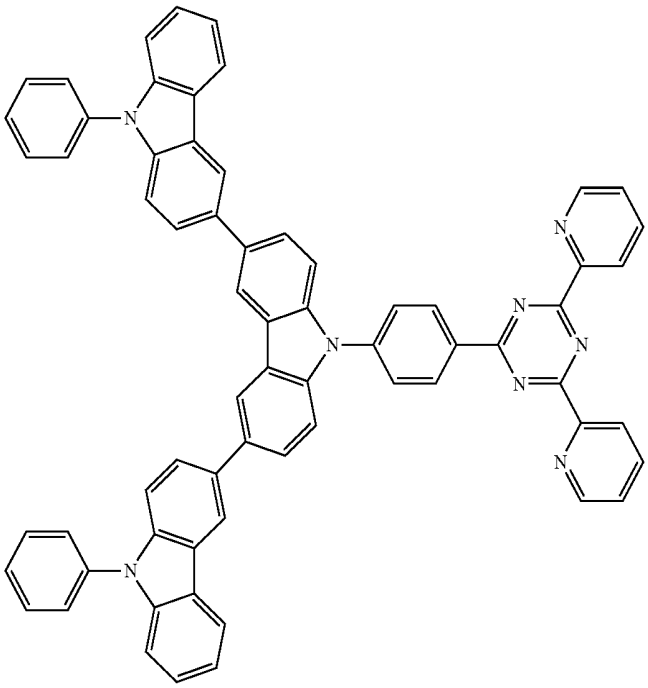

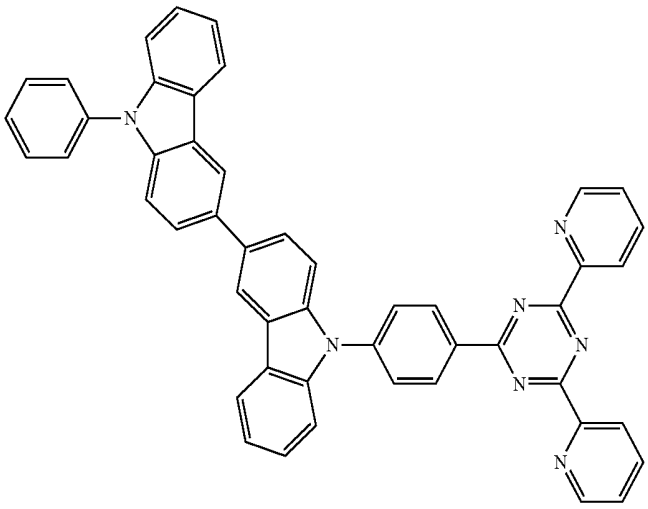

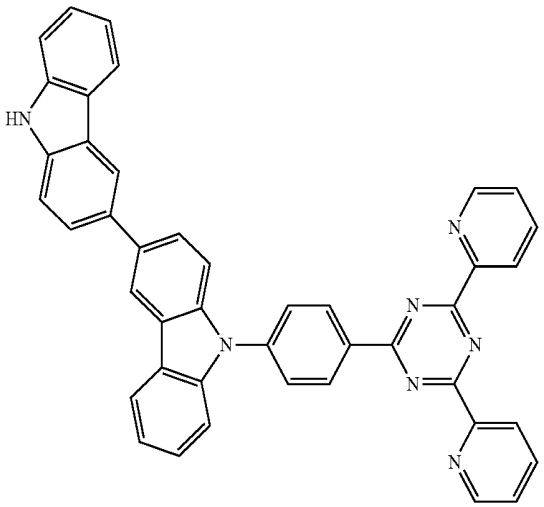

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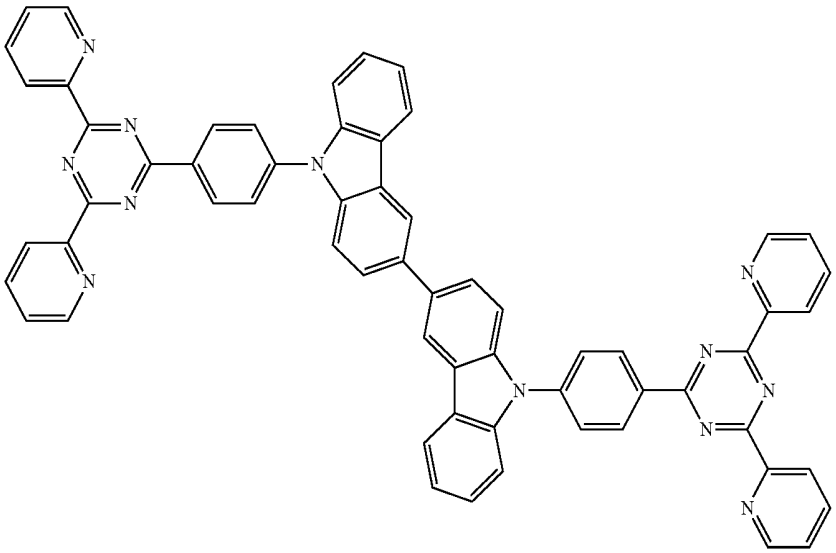

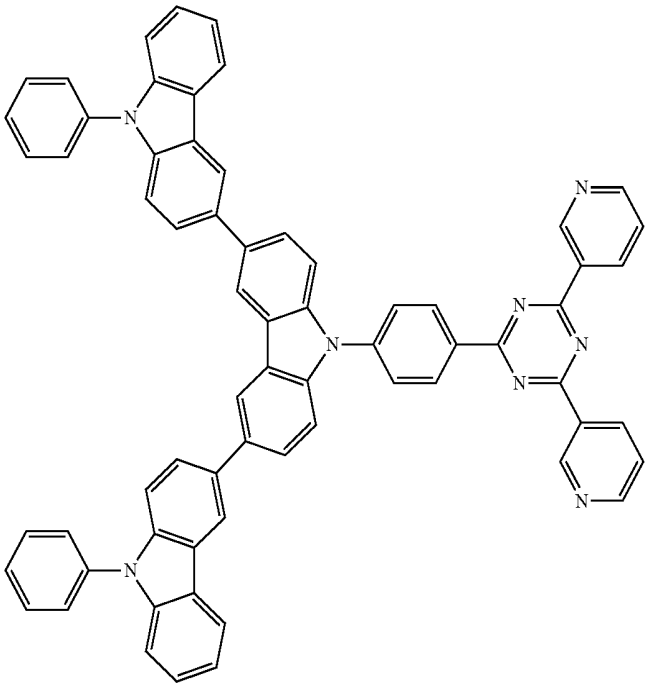

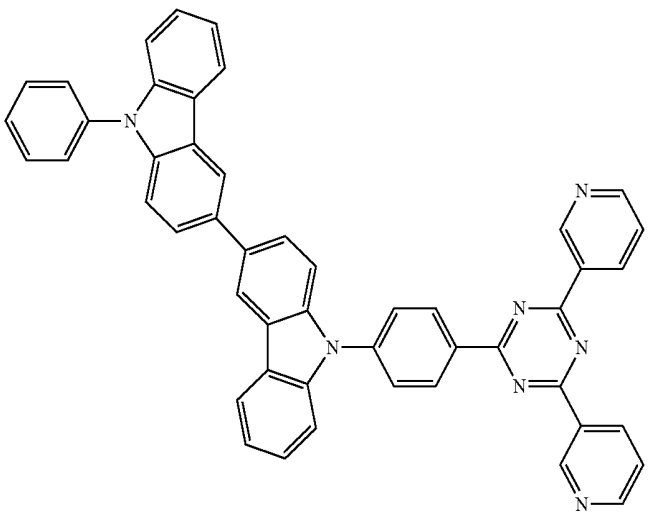

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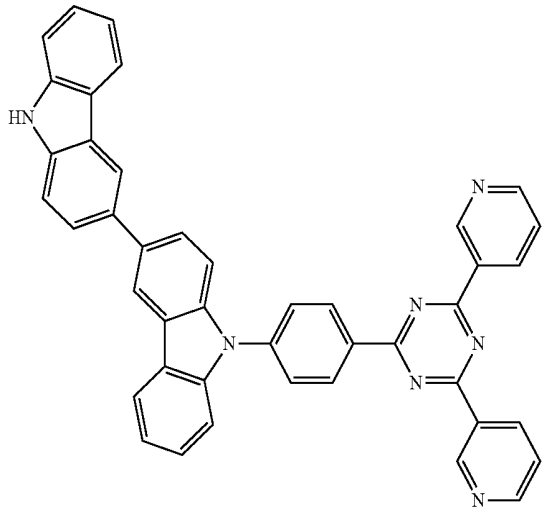

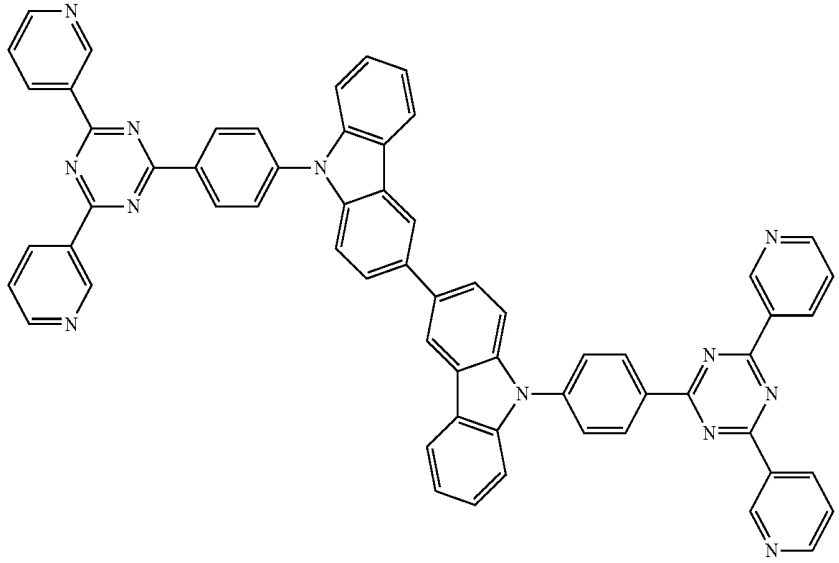

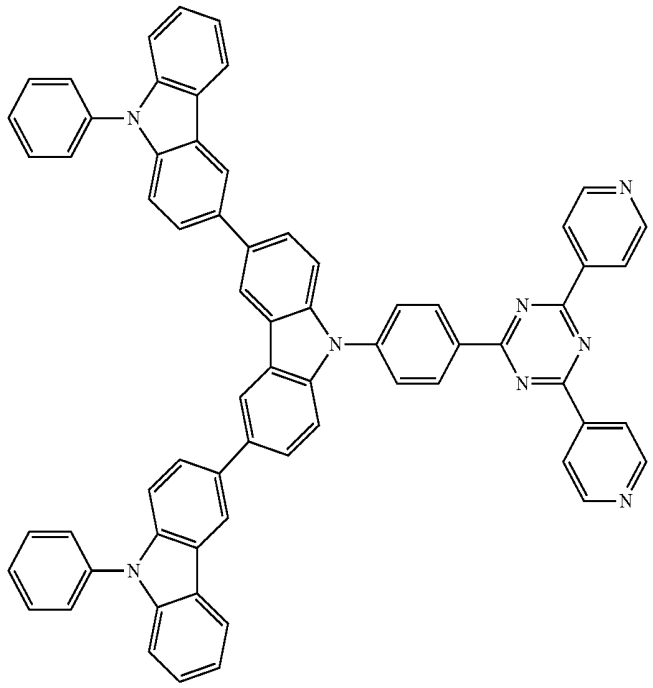

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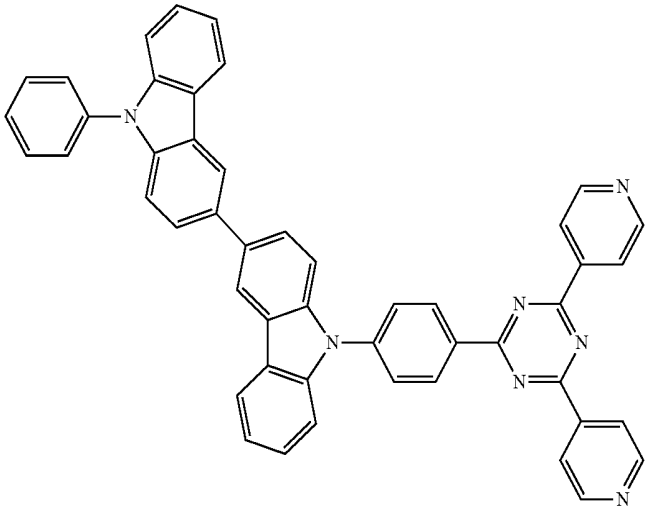

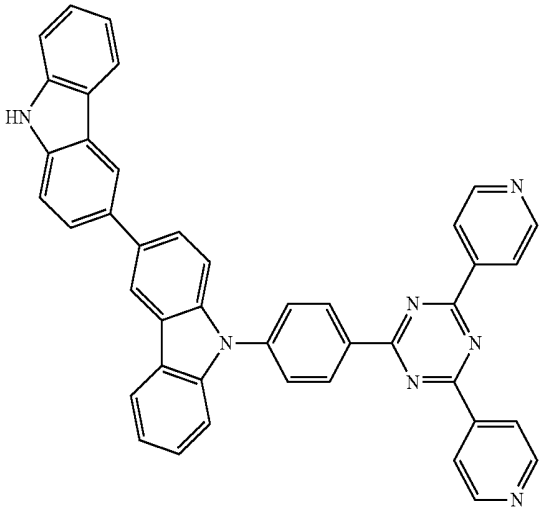

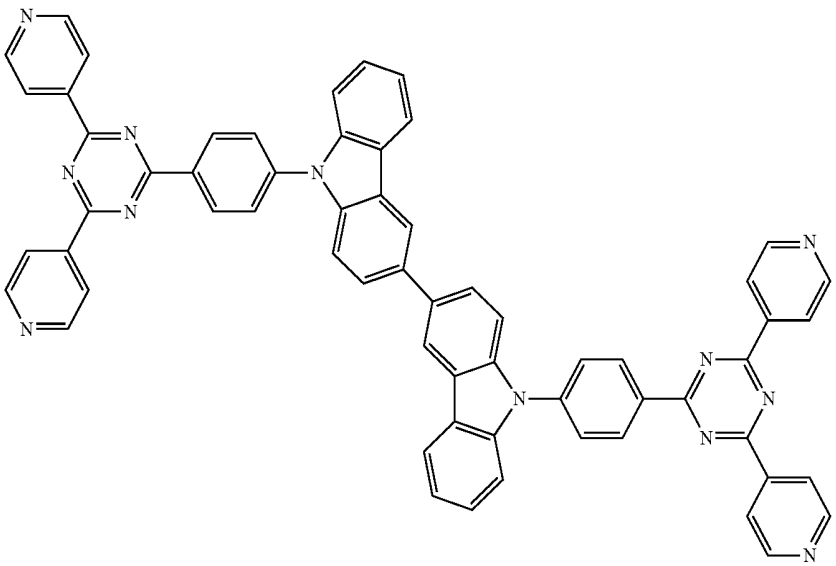

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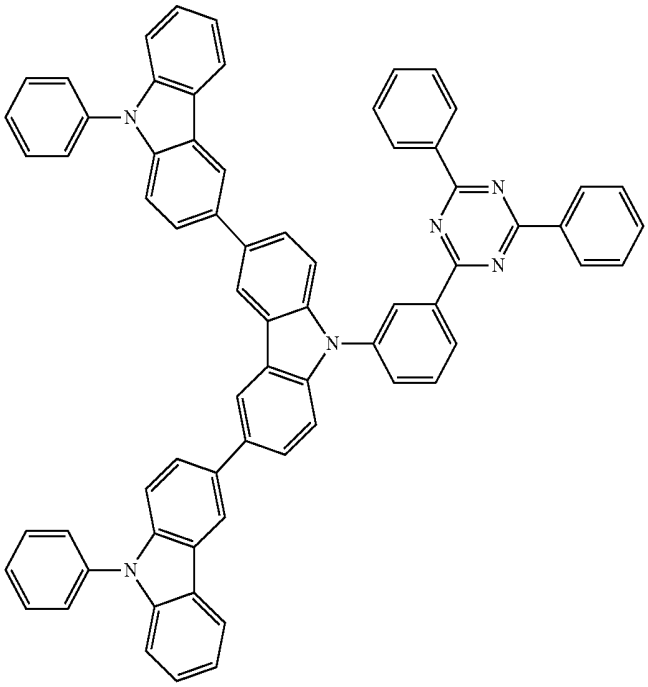

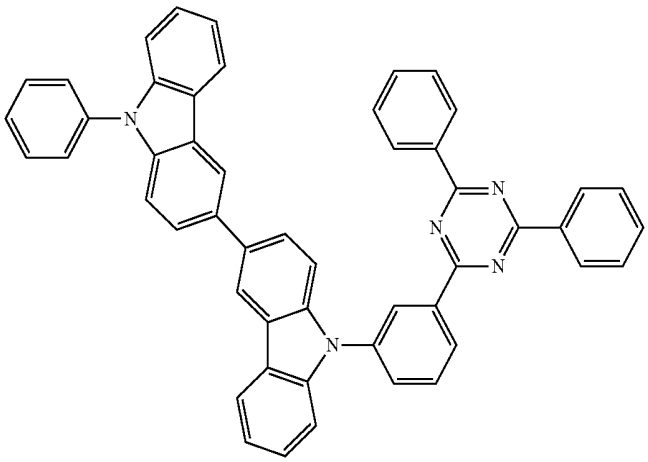

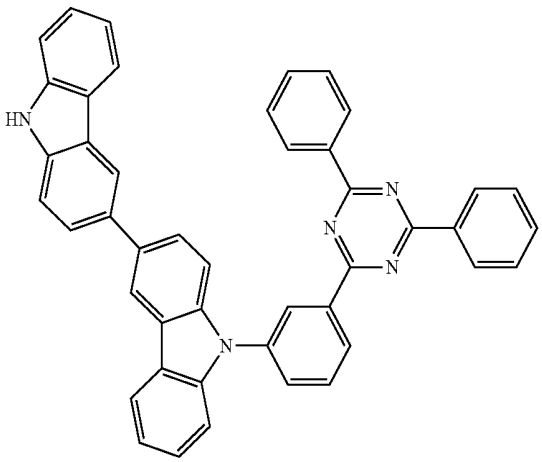

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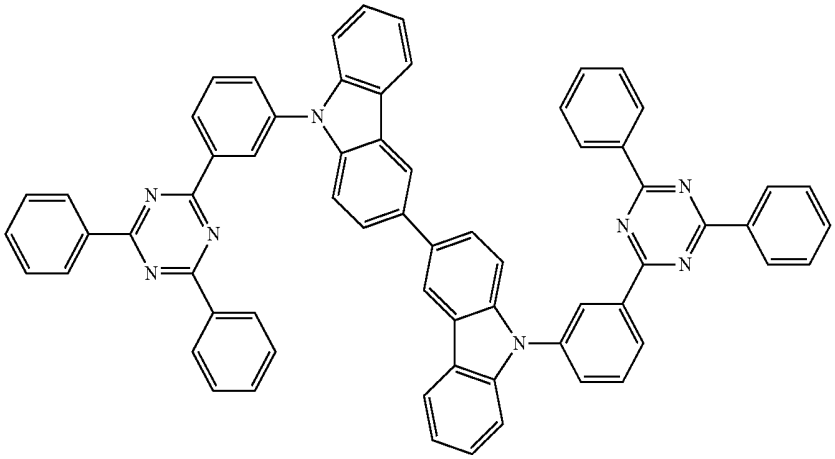

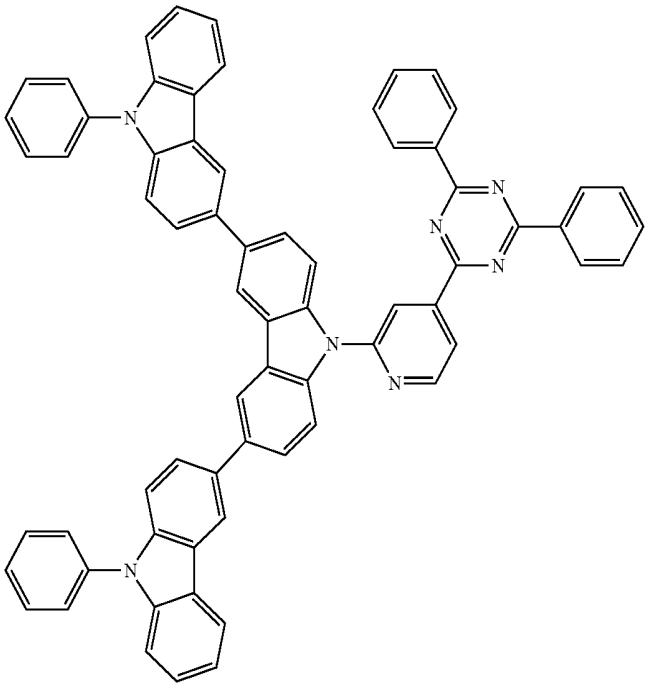

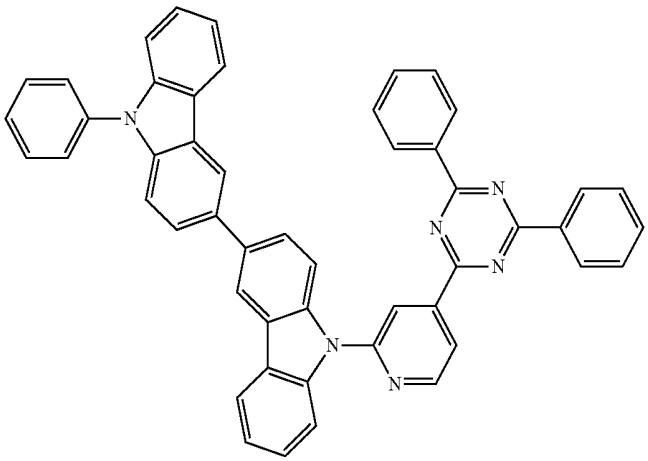

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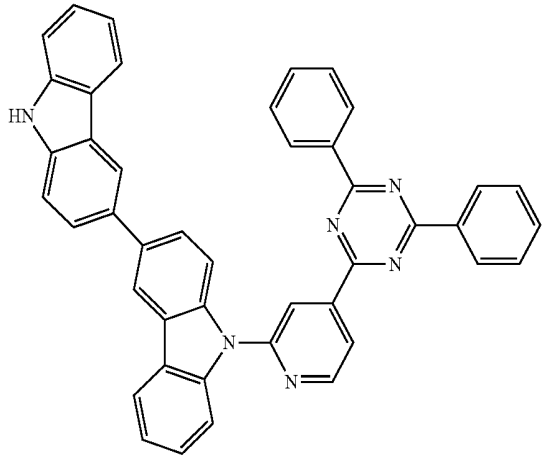

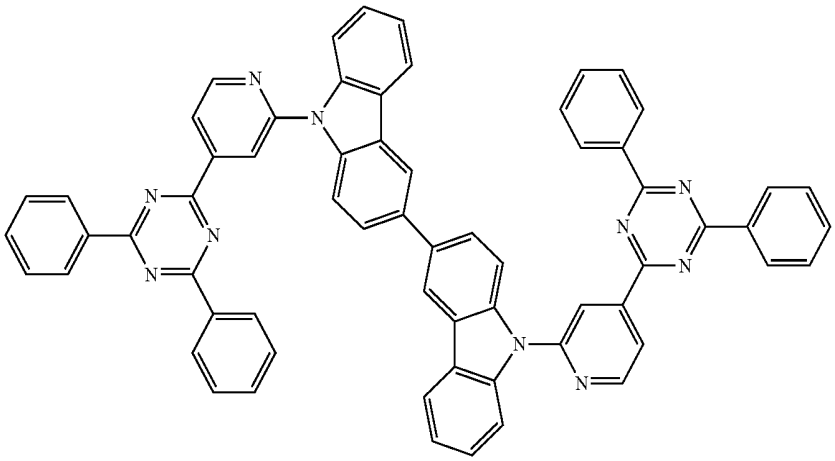

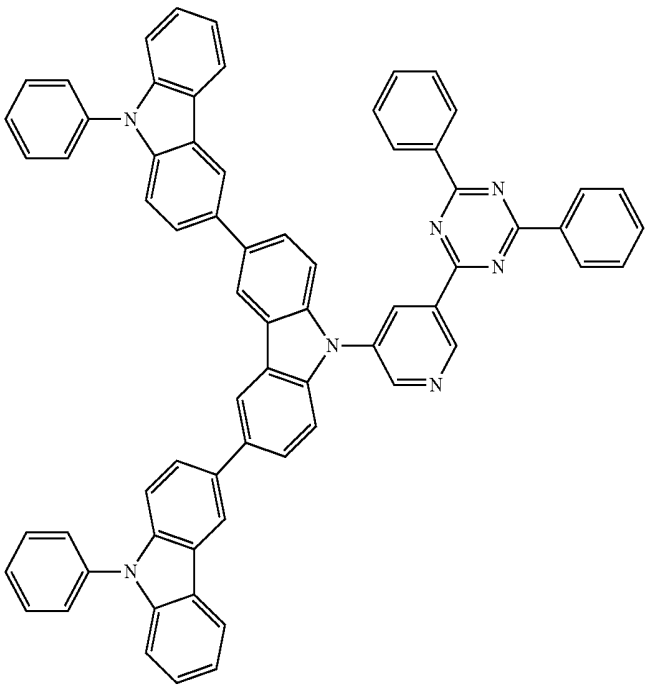

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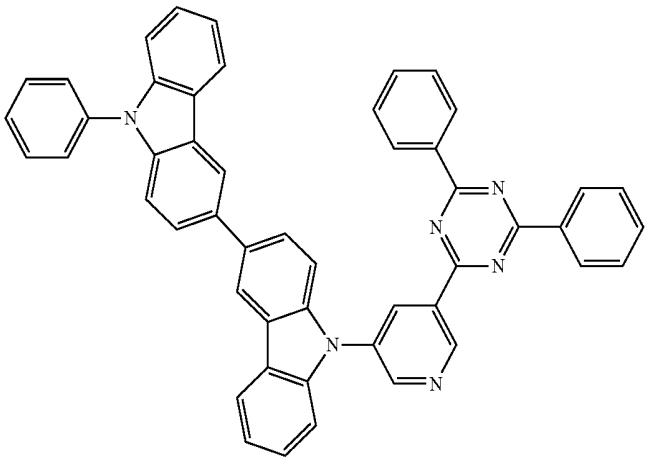

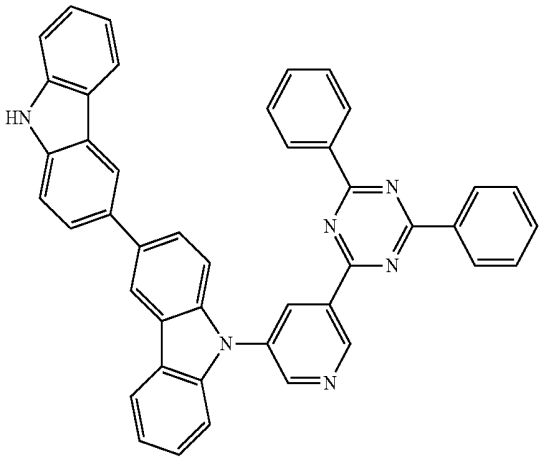

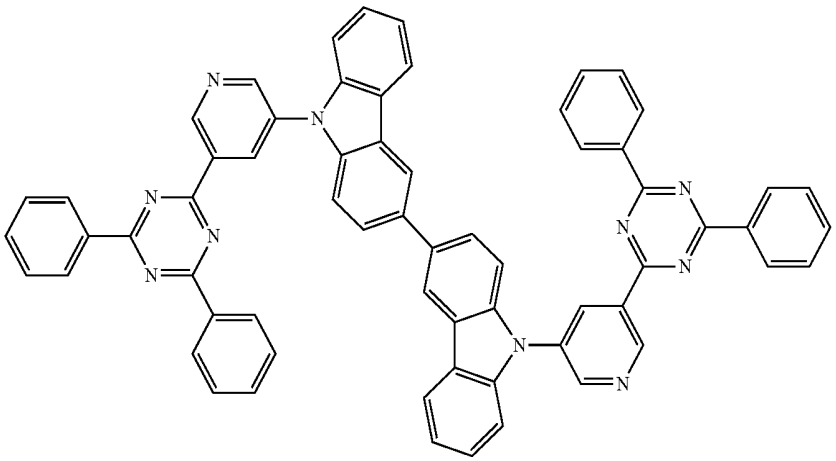

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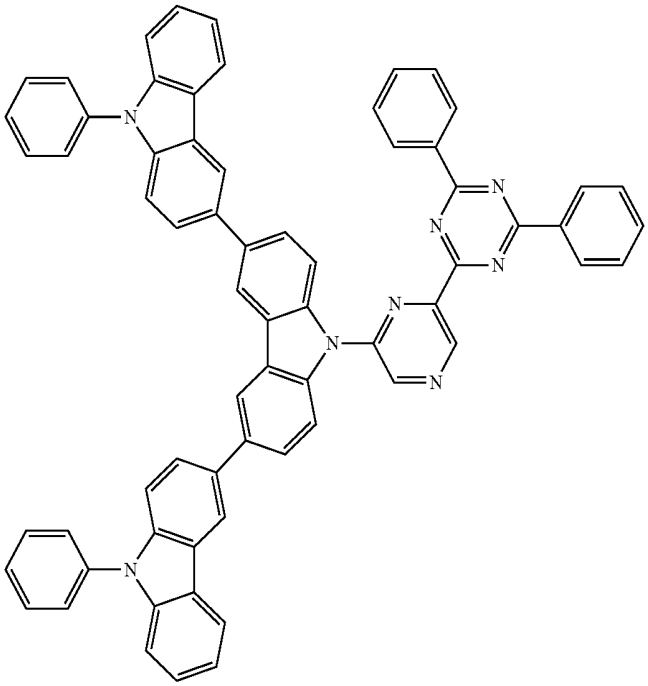

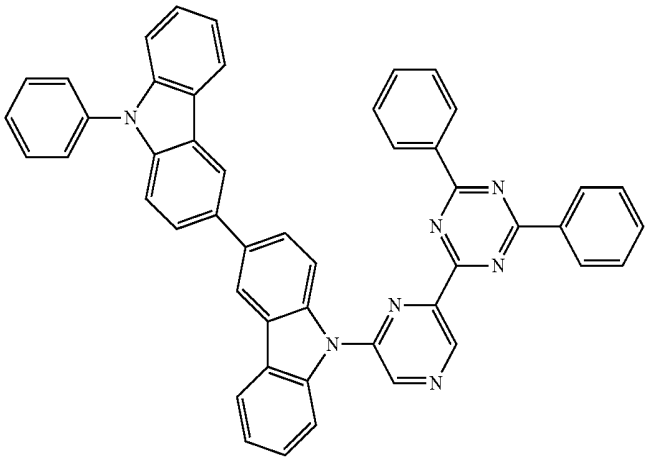

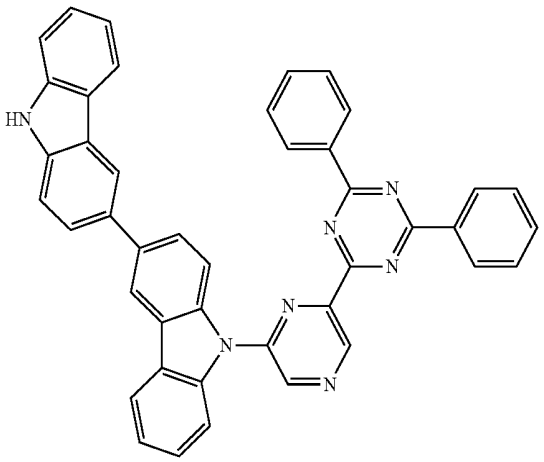

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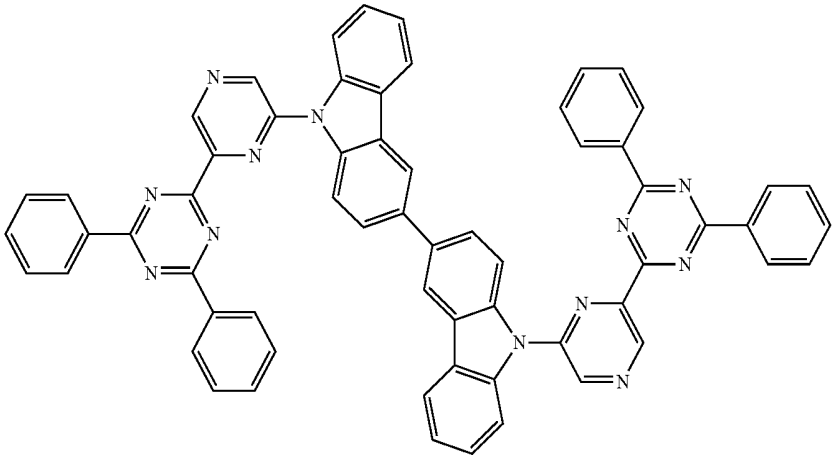

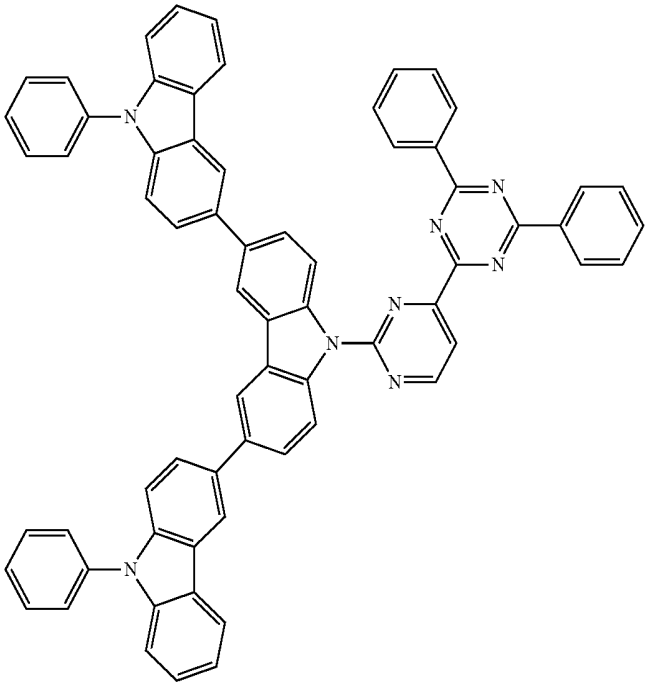

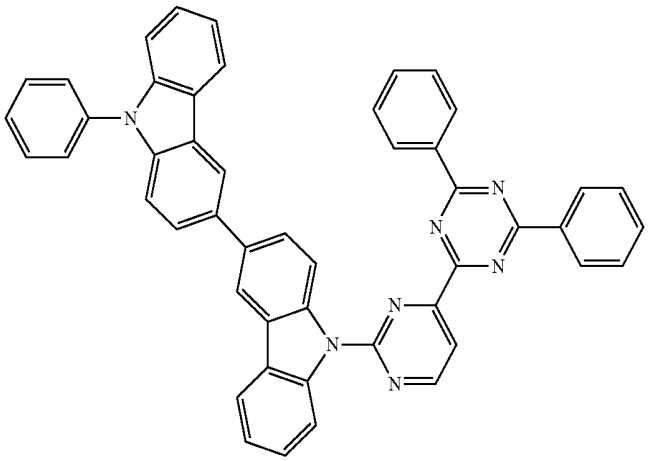

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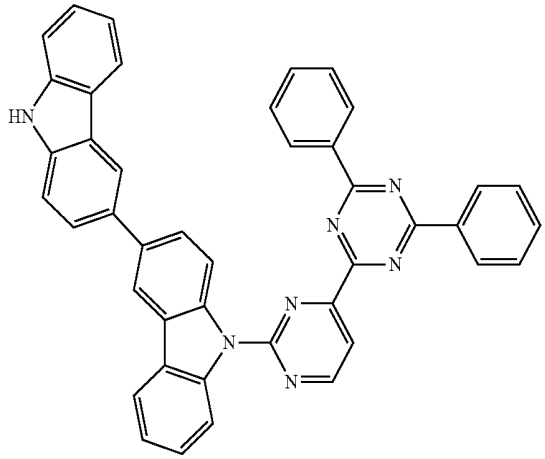

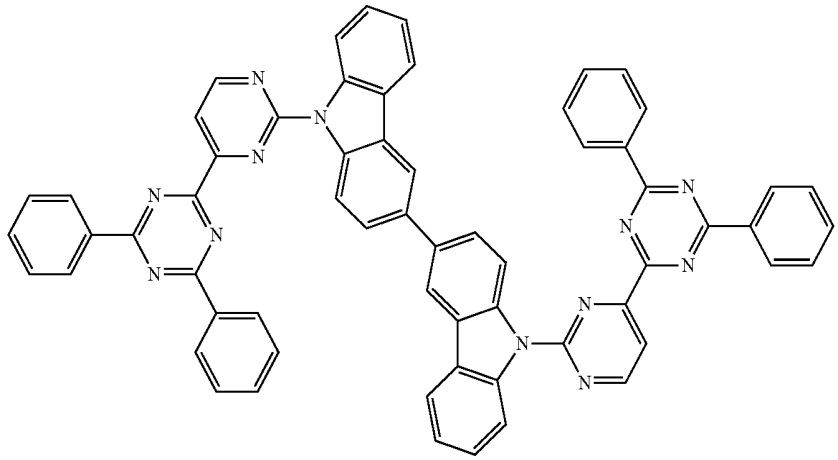

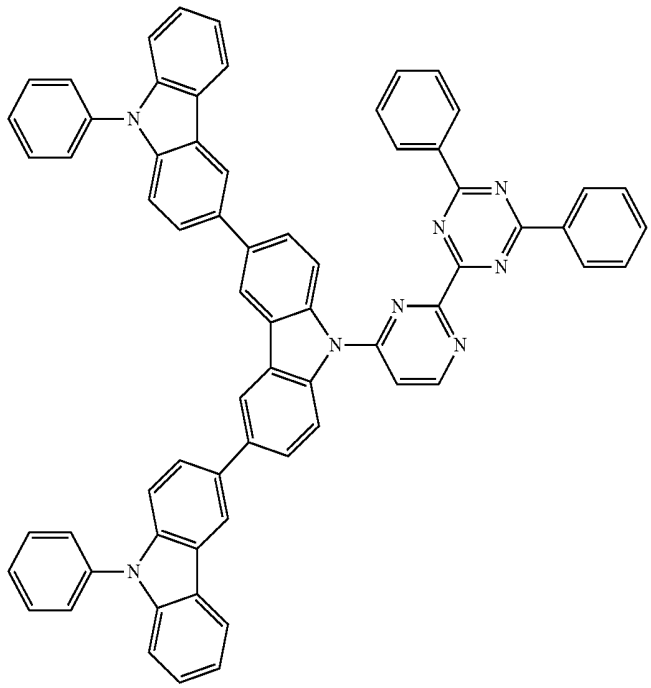

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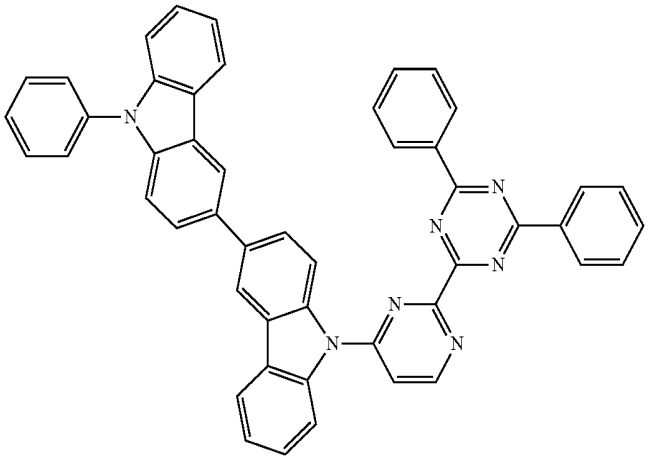

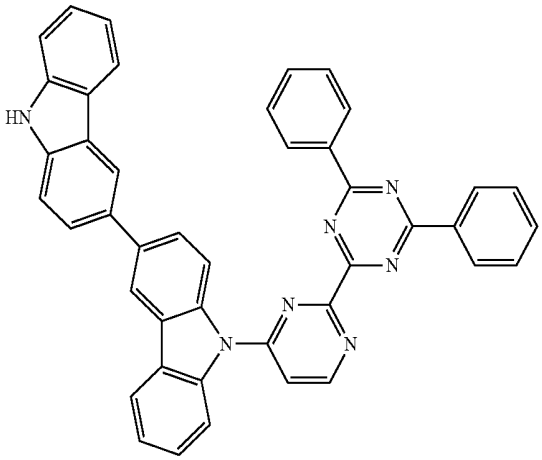

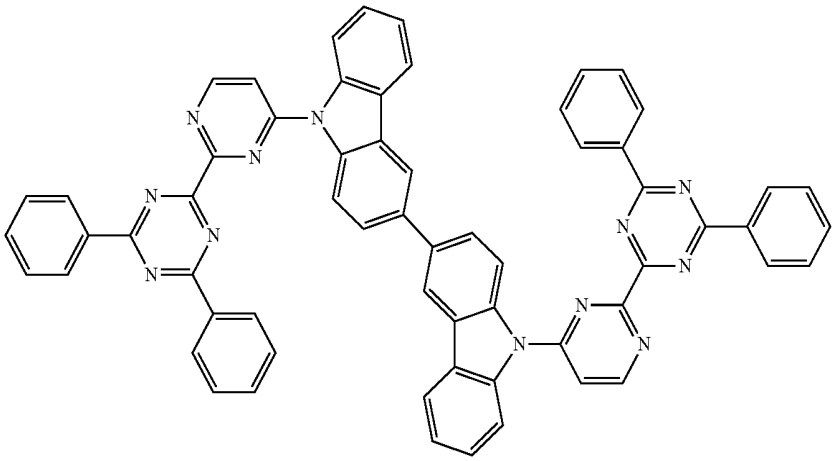

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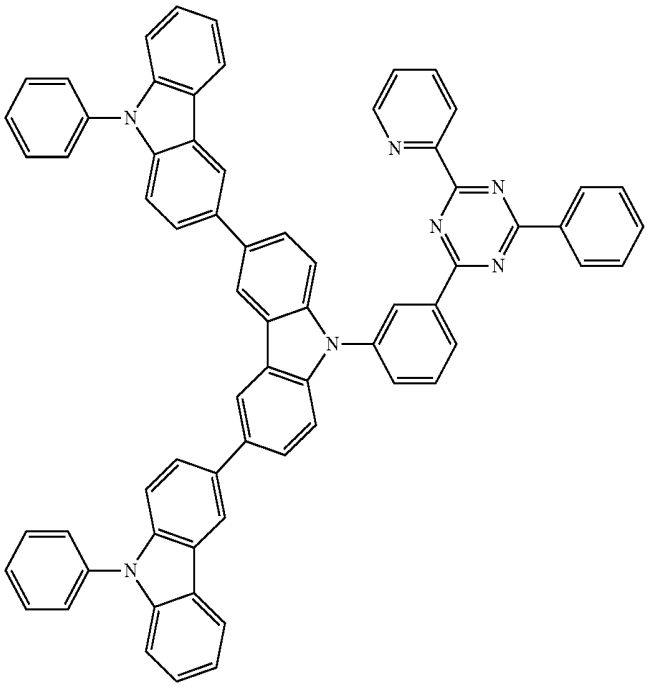

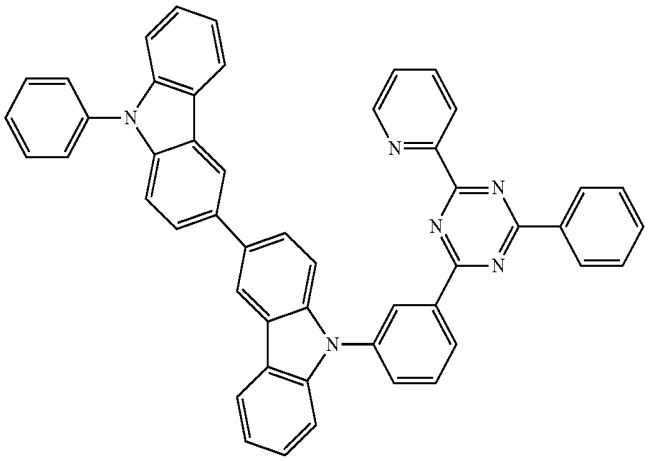

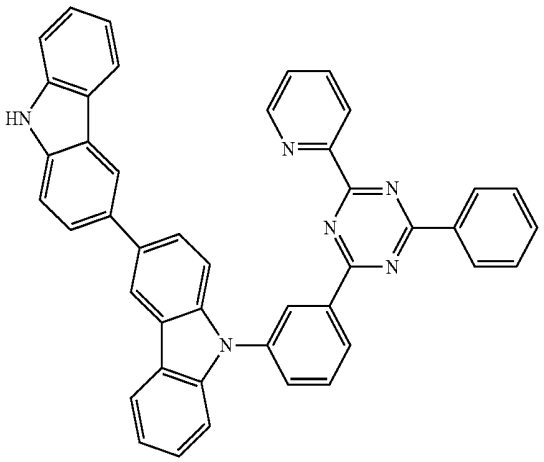

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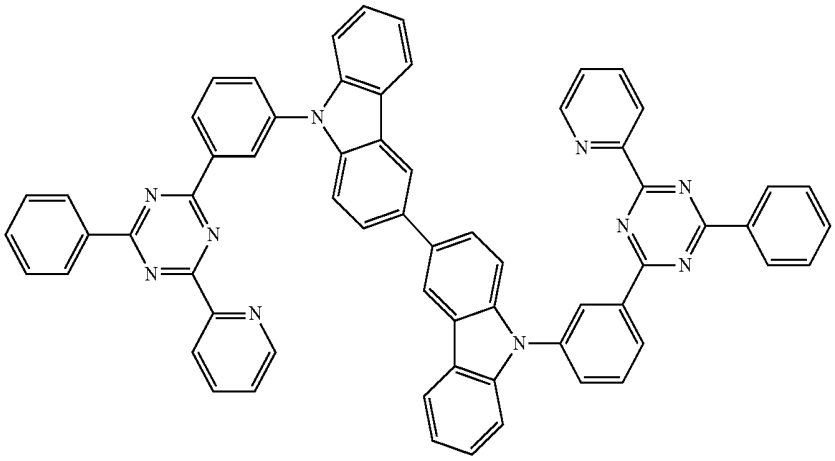

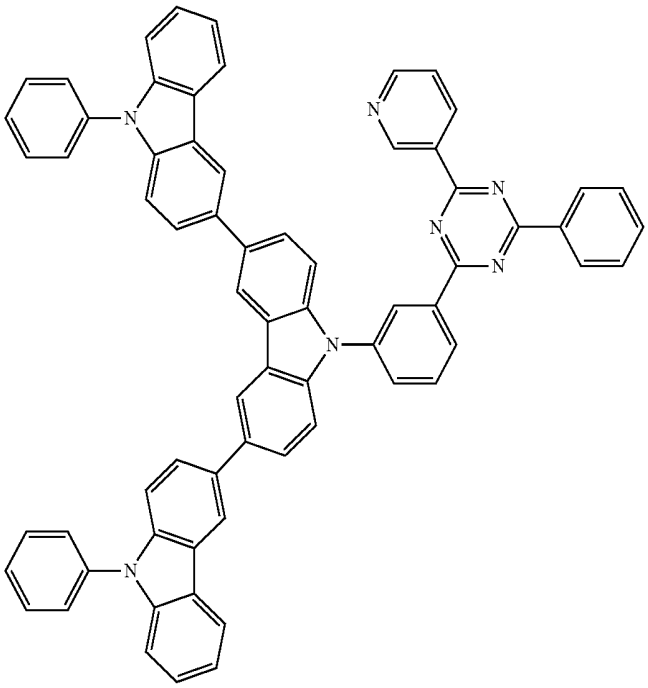

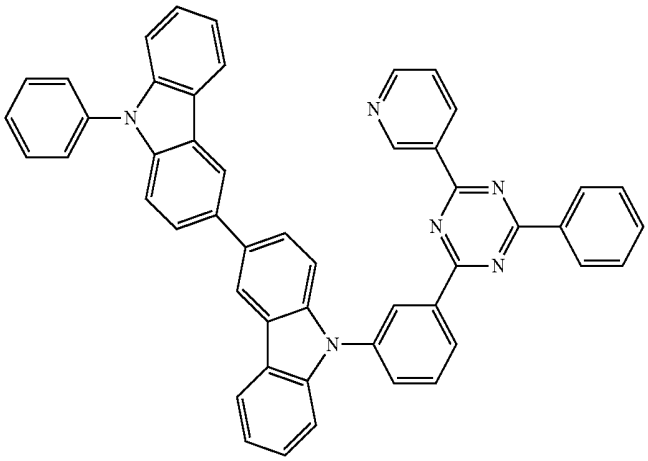

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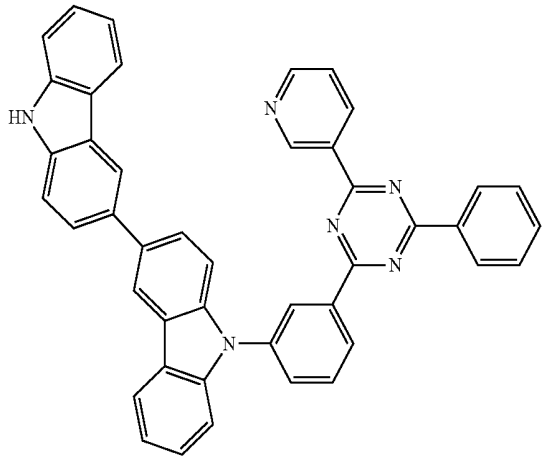

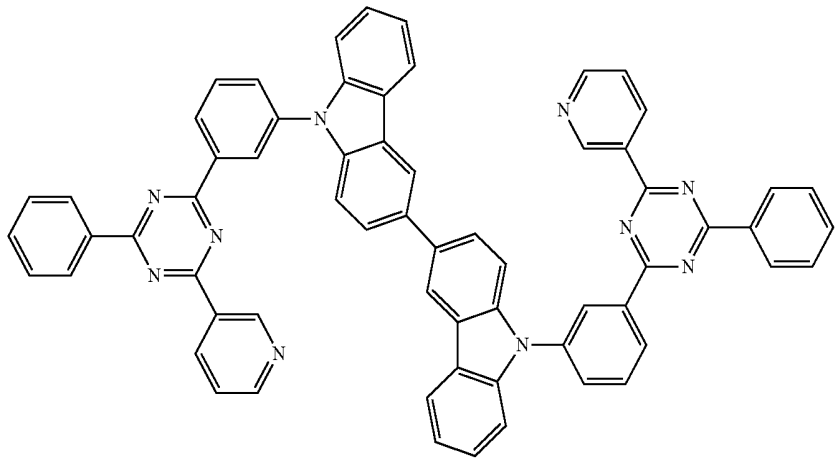

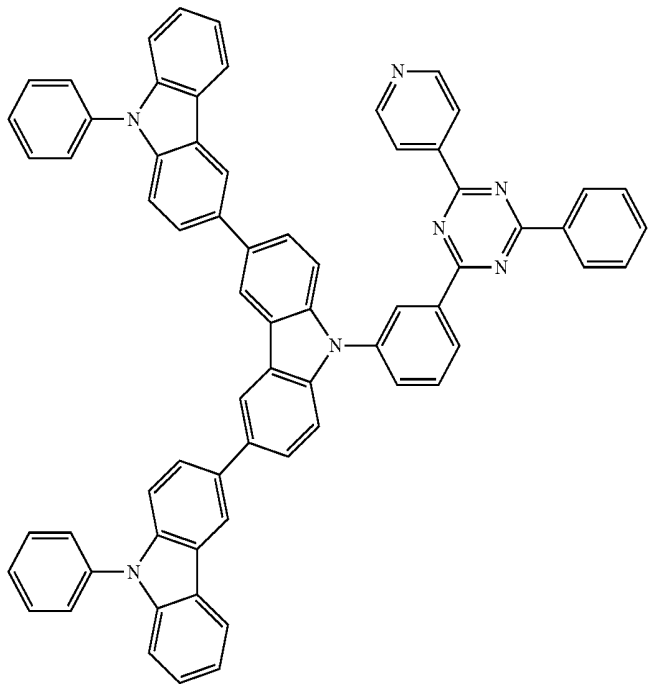

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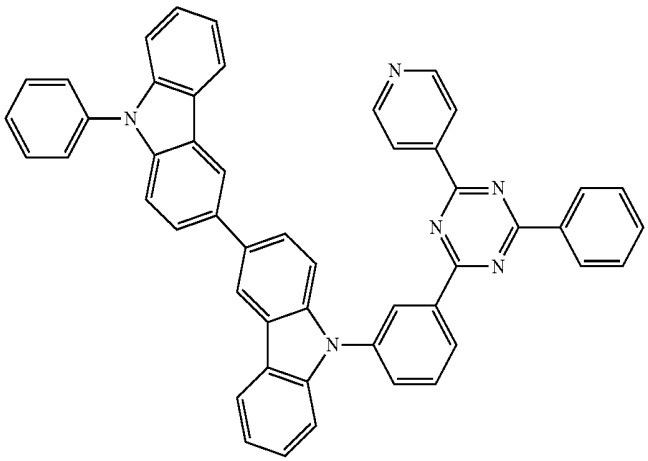

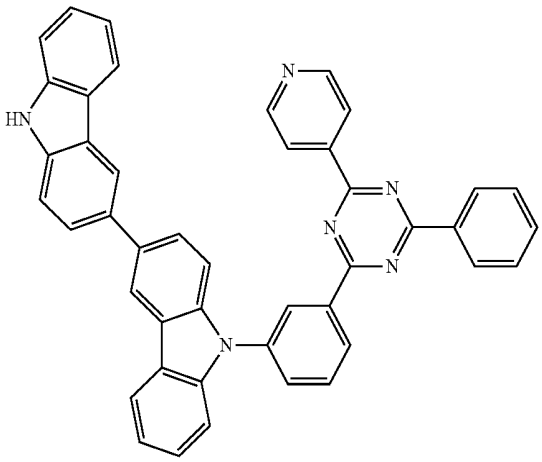

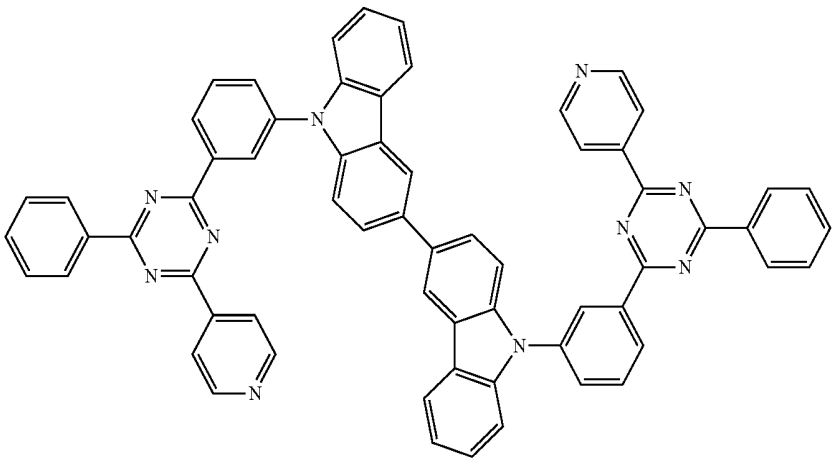

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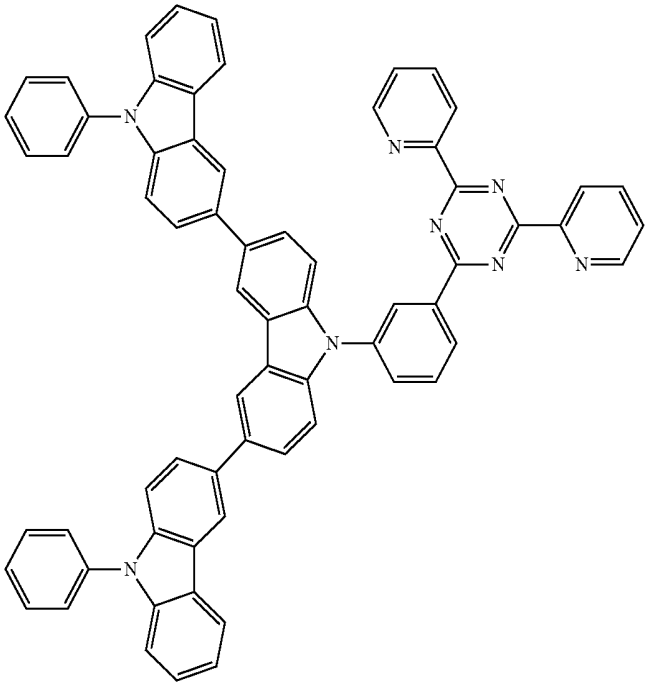

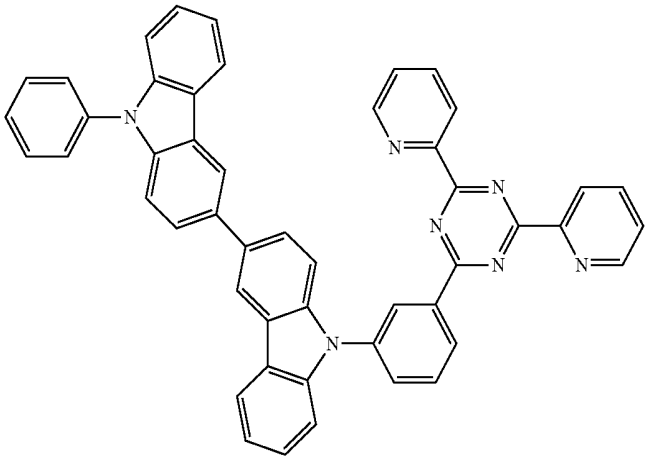

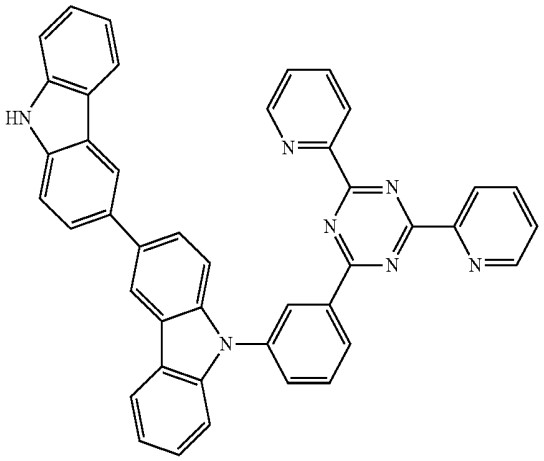

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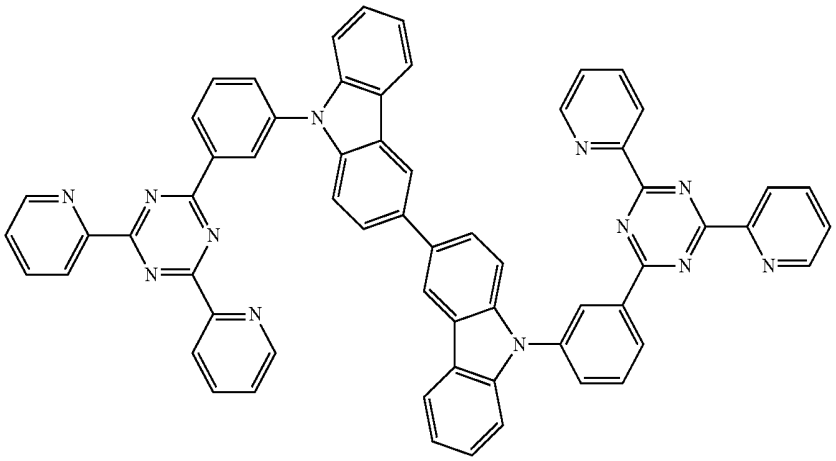

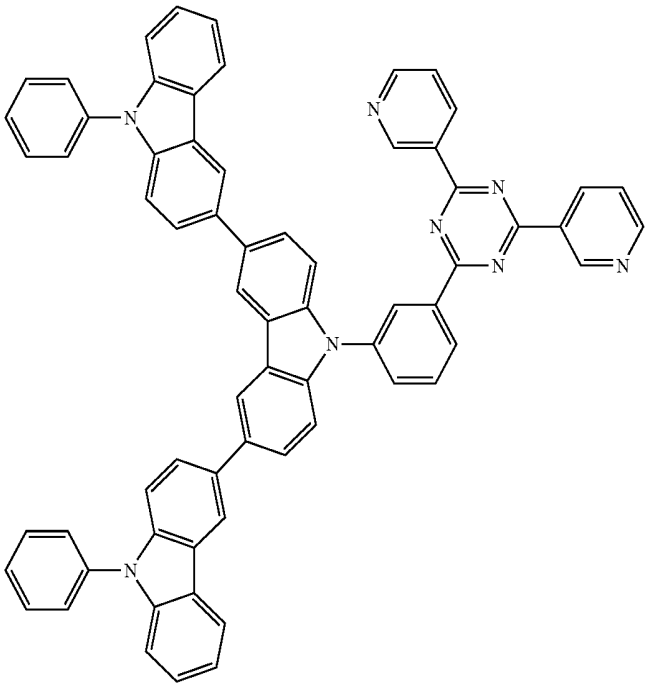

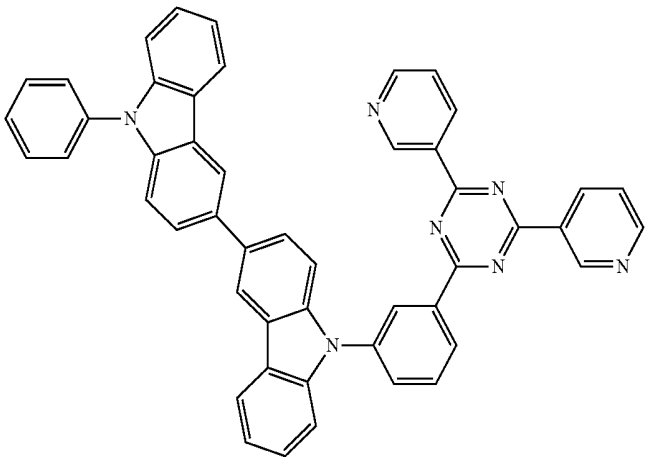

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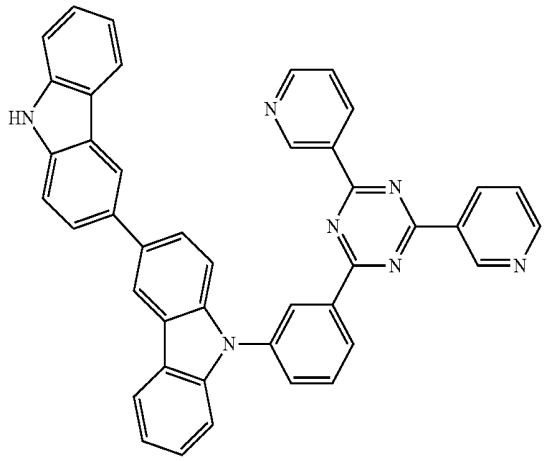

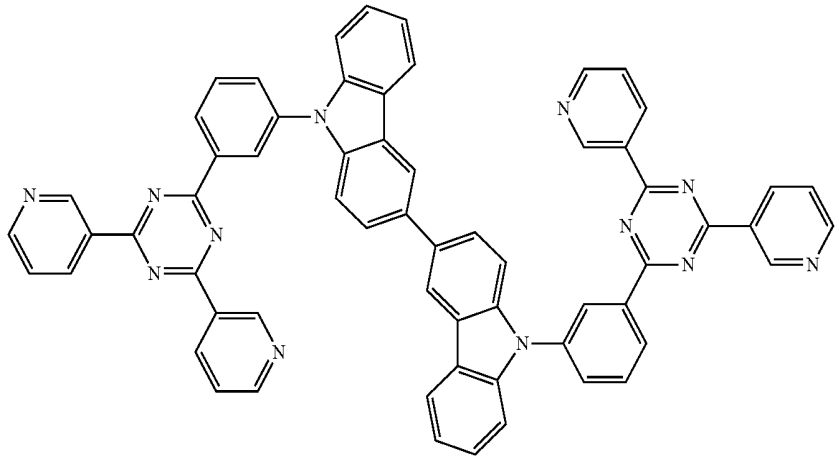

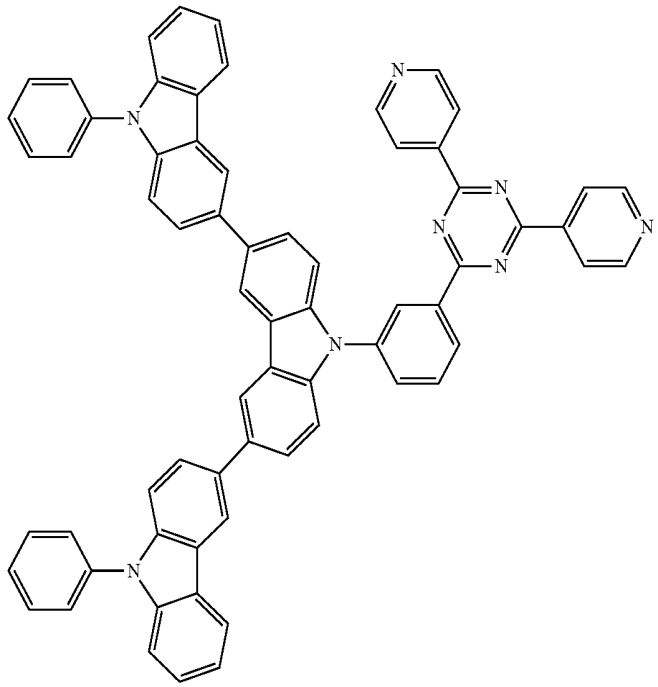

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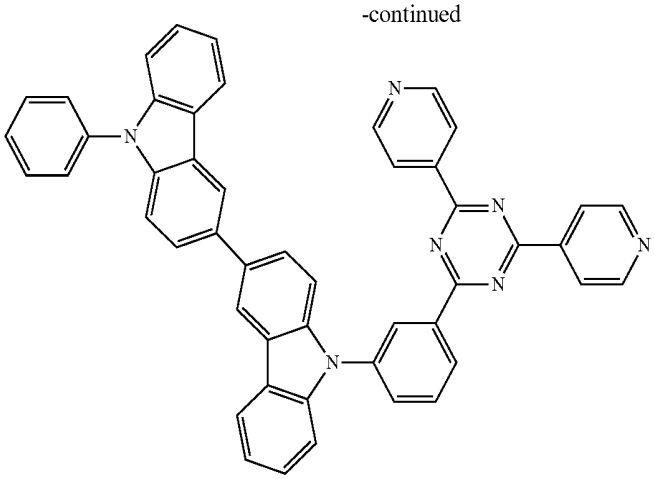
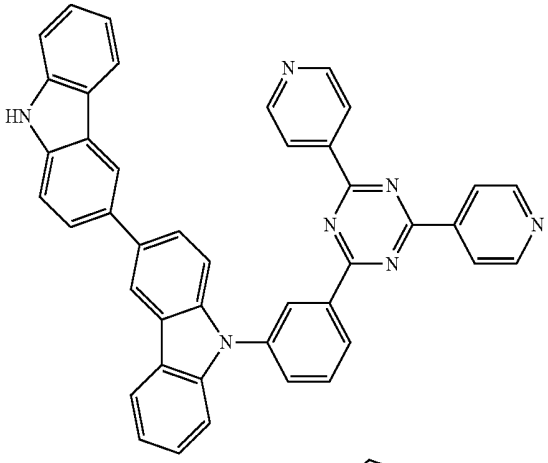
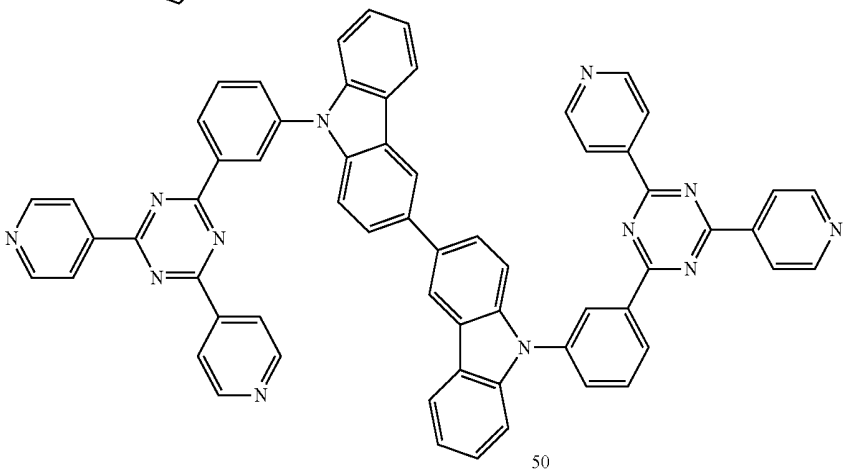
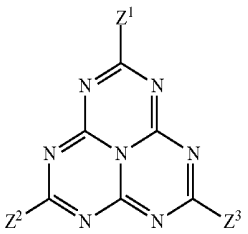






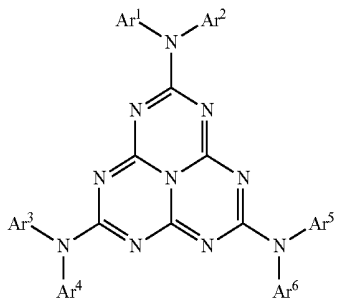
Examples of the preferred light emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formulae (211) and (212). The entire description of WO 2013/133359 including the paragraphs 0007 to 0032 and 0079 to 0084 is incorporated herein by reference.

General Formula (211)



wherein in the general formula (211), Z^1, Z^2 and Z^3 each independently represent a substituent.

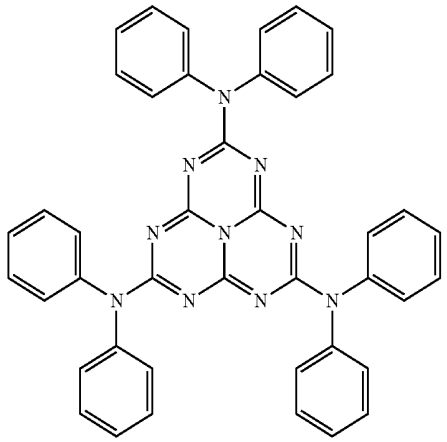
General Formula (212)



wherein in the general formula (212), Ar^1, Ar^2, Ar^3, Ar^4, Ar^5 and Ar^6 each independently represent a substituted or unsubstituted aryl group.

Specific examples of the compound represented by the general formula (212) include the compound represented by the following structural formula.

Compound 4001



Specific examples of the compound represented by the general formula (212) include the compounds shown in the following table. In the compounds shown in the table, Ar^1, Ar^2, Ar^3, Ar^4, Ar^5 and Ar^6 are the same as each other, and are expressed by Ar.

TABLE 21

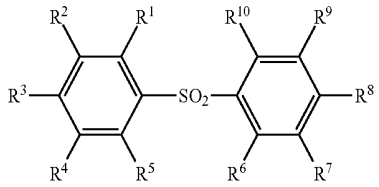
Compound No.	Ar
4002	4-fluorophenyl
4003	3-fluorophenyl
4004	2-fluorophenyl
4005	3,5-difluorophenyl
4006	2,4,6-trifluorophenyl
4007	4-methylphenyl
4008	3-methylphenyl
4009	2-methylphenyl
4010	3,5-dimethylphenyl
4011	2,4,6-trimethylphenyl

TABLE 21-continued

Compound No.	Ar
4012	4-ethylphenyl
4013	3-ethylphenyl
4014	2-ethylphenyl
4015	3,5-diethyphenyl
4016	4-propylphenyl
4017	3-propylphenyl
4018	3,5-dipropylphenyl
4019	4-tert-butylphenyl
4020	3-tert-butylphenyl
4021	3,5-di-tert-butylphenyl
4022	1-naphthyl
4023	2-naphthyl

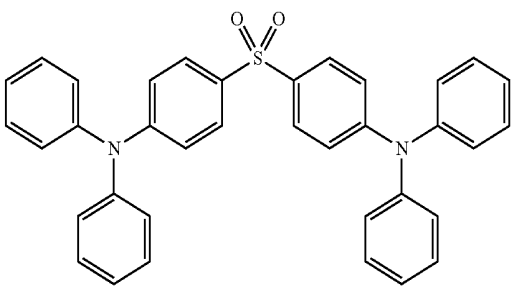
Examples of the preferred light emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formula (221). The entire description of WO 2013/161437 including the paragraphs 0008 to 0054 and 0101 to 0121 is incorporated, herein by reference.

General Formula (221)



wherein in the general formula (221), R^1 to R^{10} each independently represent a hydrogen atom or a substituent, provided that at least one of R^1 to R^{10} represents a substituted or unsubstituted aryl group, a substituted or unsubstituted diarylamino group or a substituted or unsubstituted 9-carbazolyl group, and R^1 and R^2, R^2 and R^3, R^3 and R^4, R^4 and R^5, R^5 and R^6, R^6 and R^7, R^7 and R^8, R^8 and R^9, and R^9 and R^{10} each may be bonded to each other to form a ring structure.

Specific examples of the compound include the following compounds.



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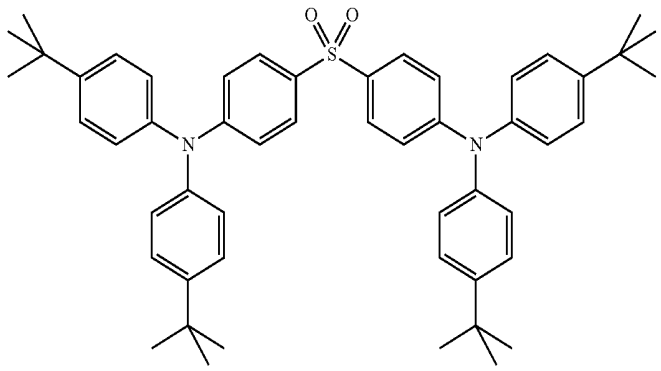

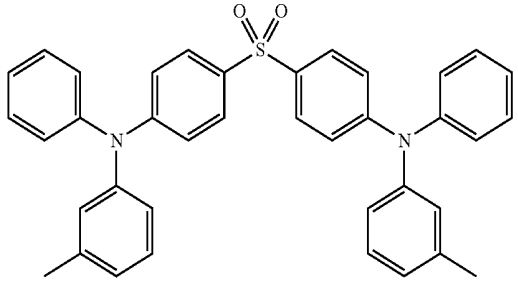

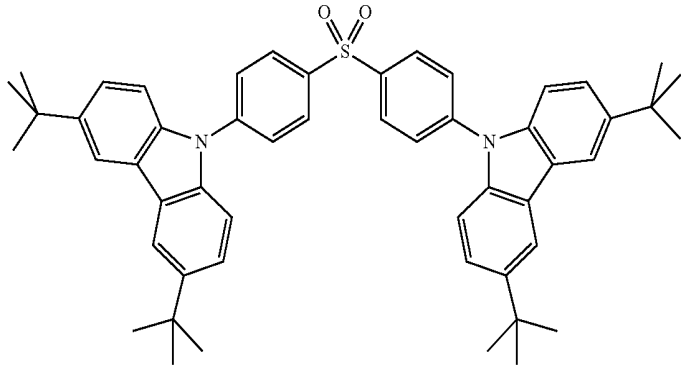

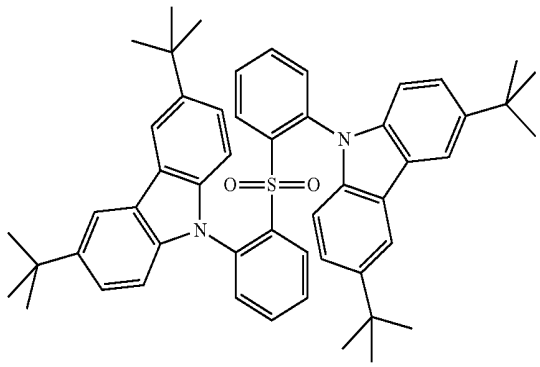

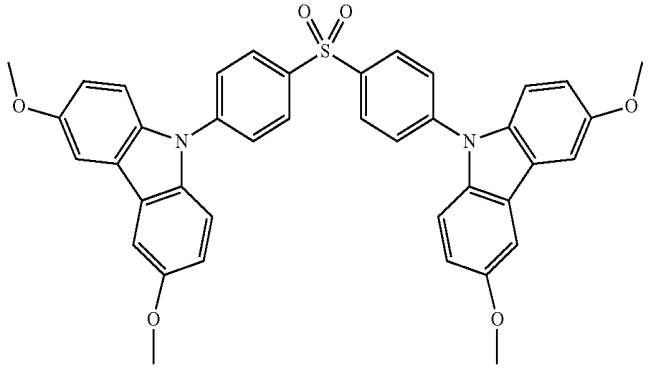

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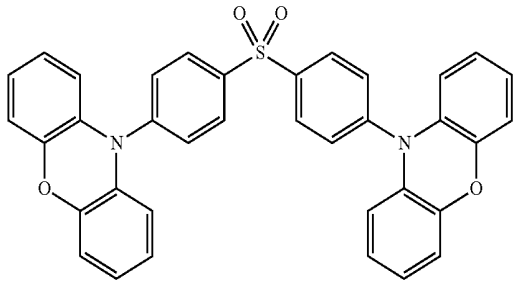

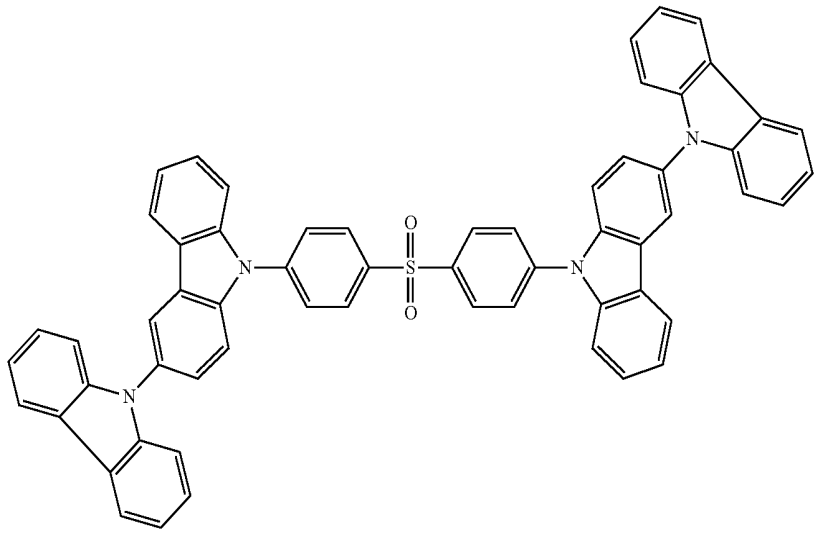

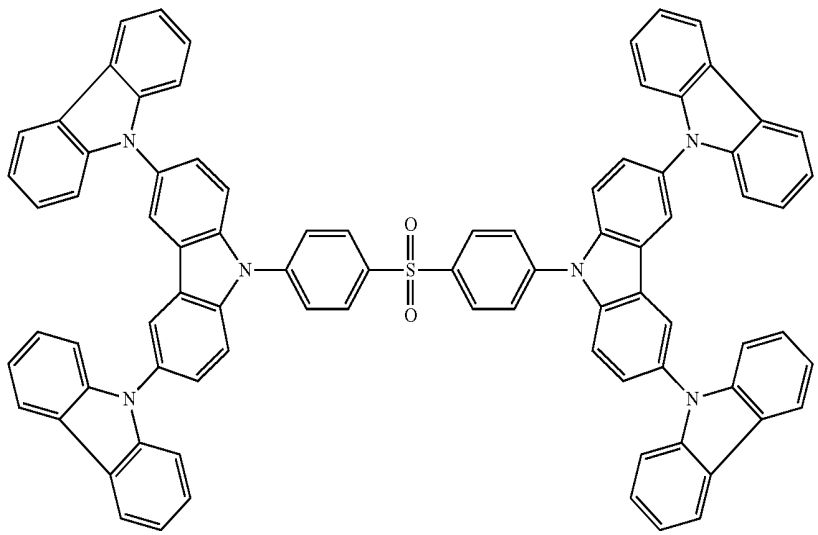

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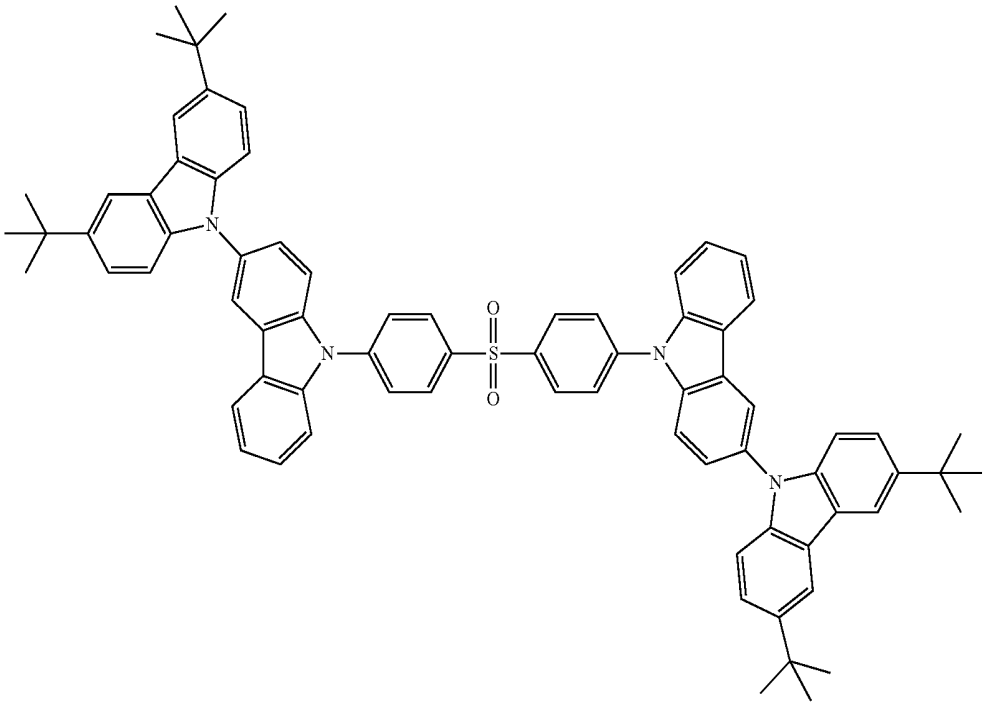

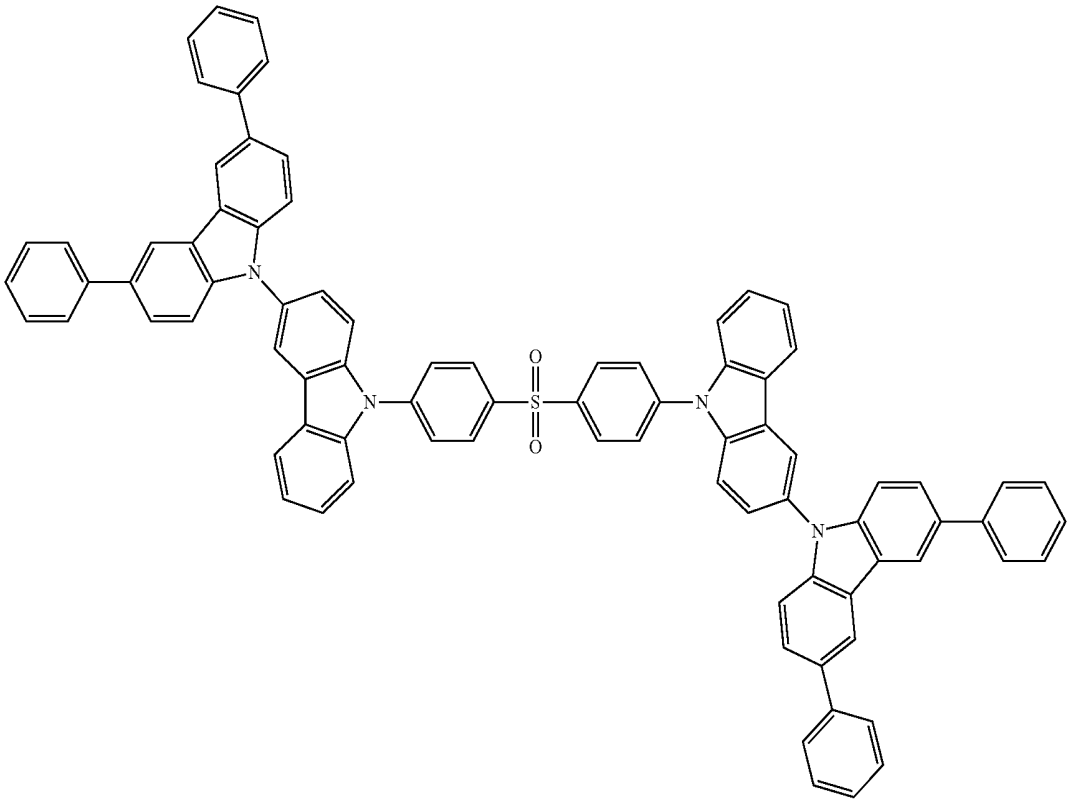

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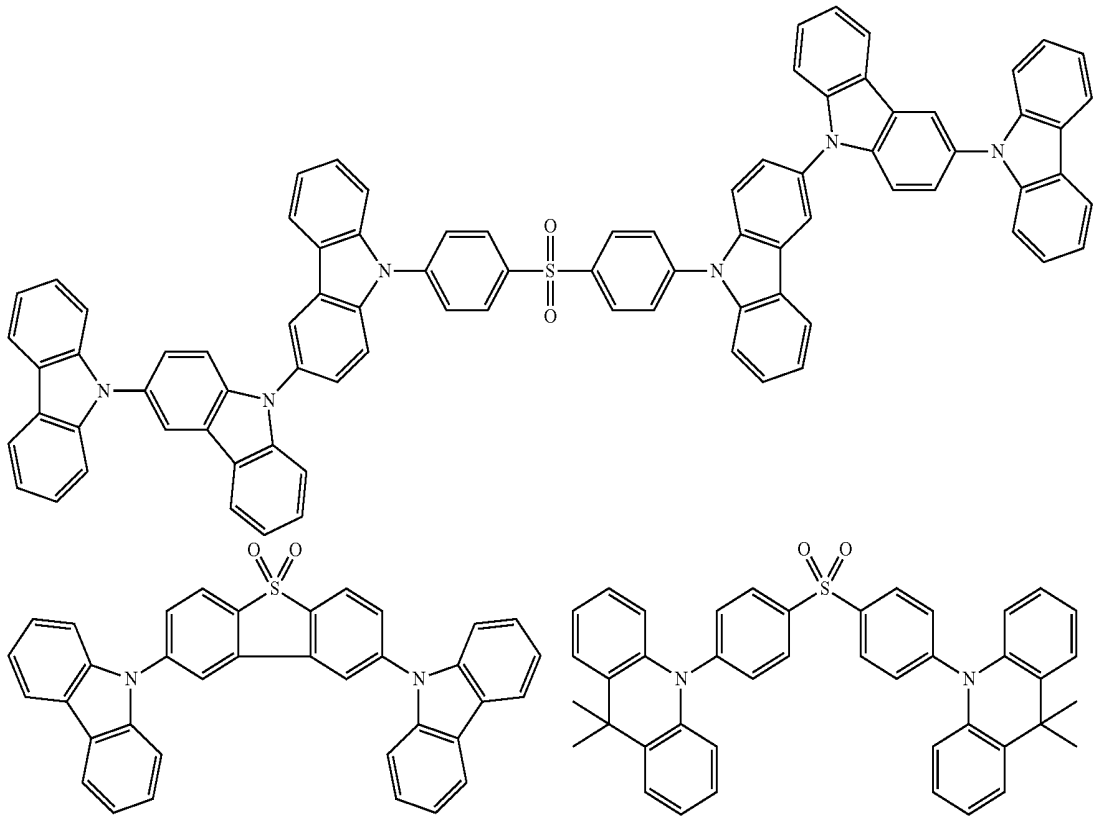
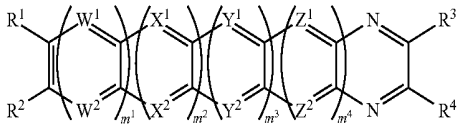


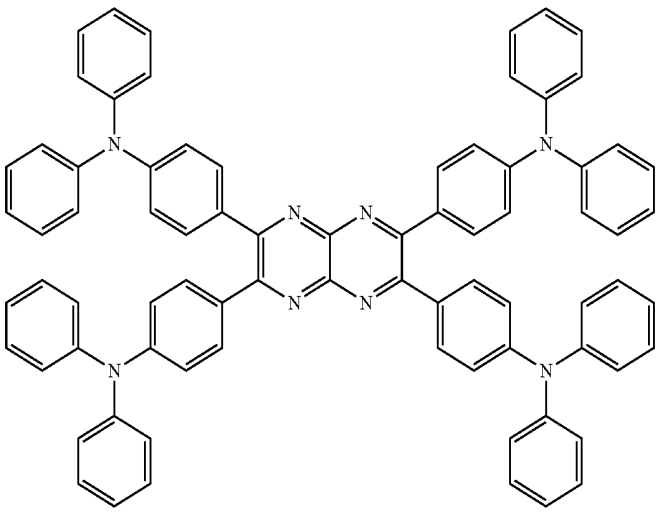
Examples of the preferred light, emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formula (231). The entire description of JP-A-2014-9352 including the paragraphs 0007 to 0041 and 0060 to 0069 is incorporated herein by reference.

General Formula (231)



wherein in the general formula (231), R^1 to R^4 each independently represent a hydrogen atom or a substituted or unsubstituted (N,N-diarylamino)aryl group, provided that at least one of R^1 to R^4 represents a substituted or unsubstituted (N,N-diarylamino)aryl group, and two aryl groups constituting the diarylamino moiety of the (N,N-diarylamino)aryl group may be bonded to each other; W^1, W^2, X^1, X^2, Y^1, Y^2, Z^1 and Z^2 each independently represent a carbon atom or a nitrogen atom; and m^1 to m^4 each independently represent 0, 1 or 2.

Specific examples of the compound include the following compounds.



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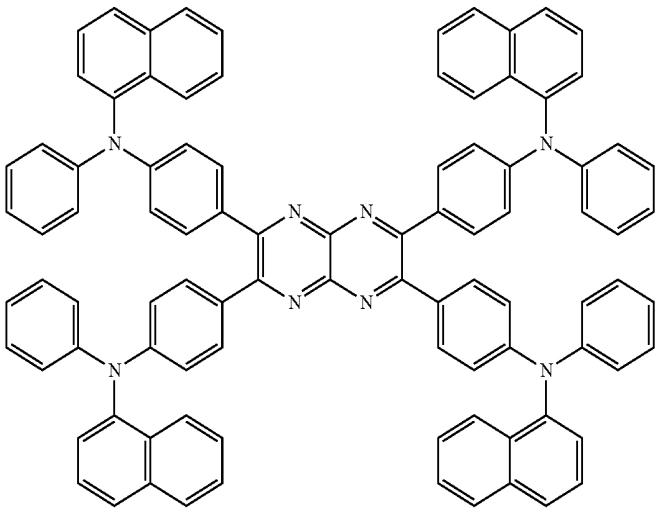

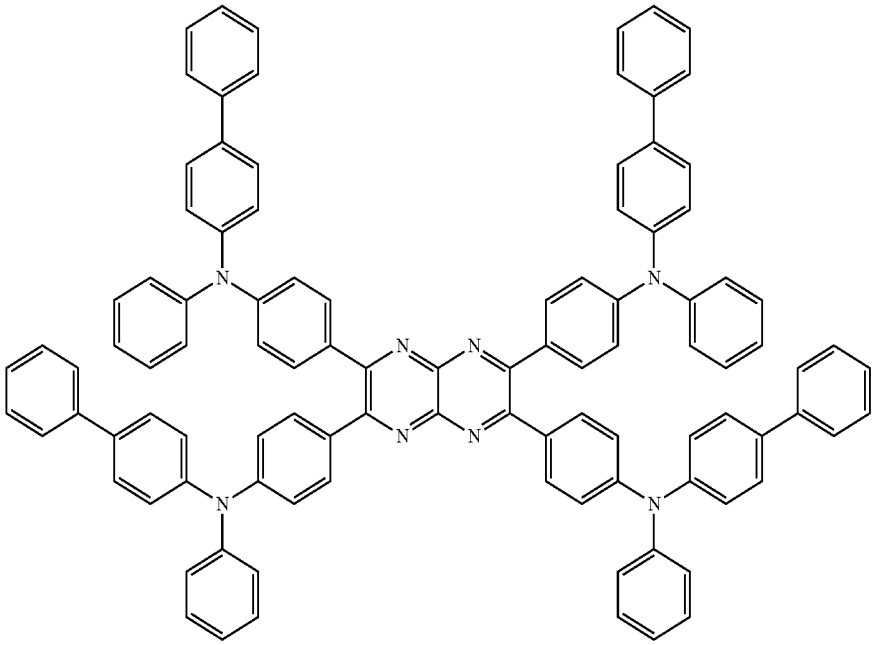

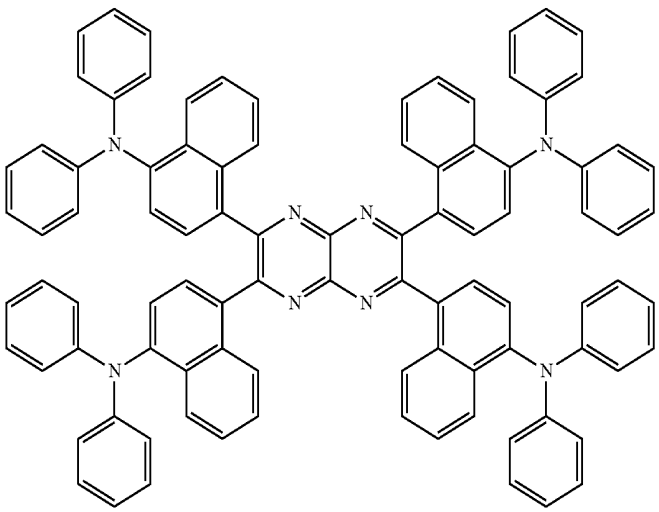

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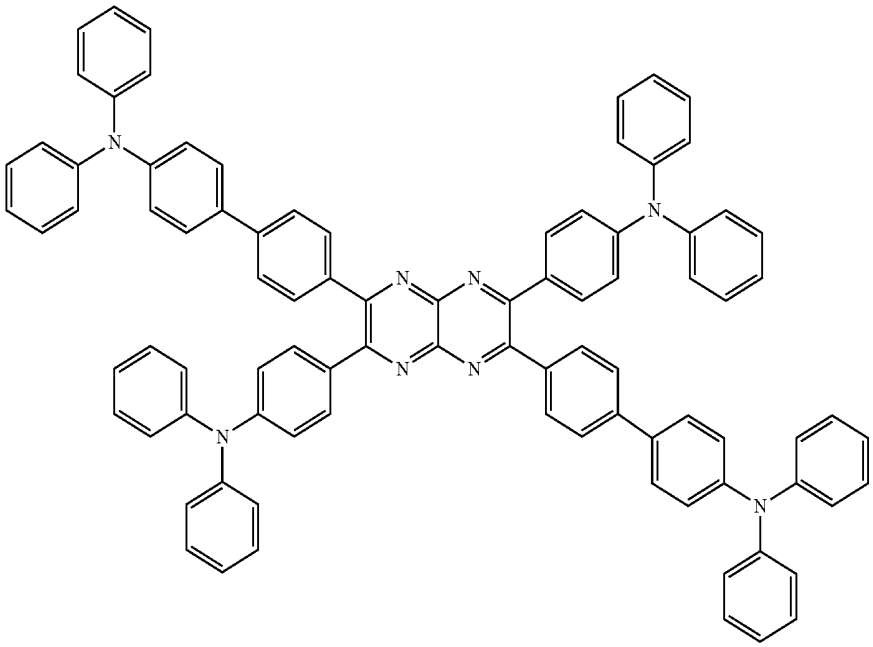

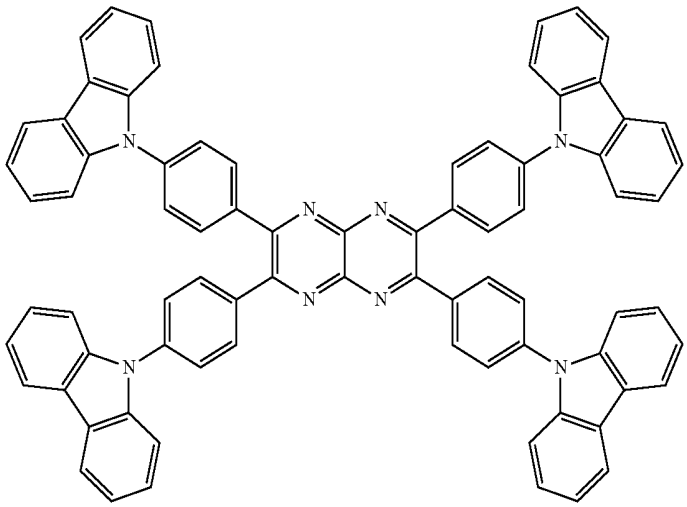

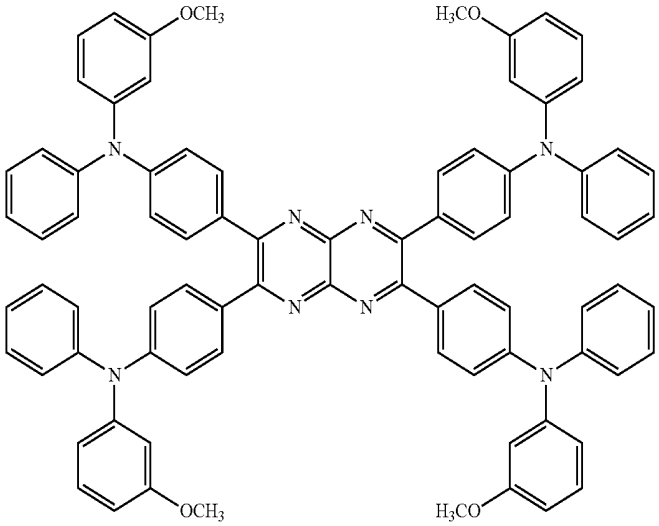

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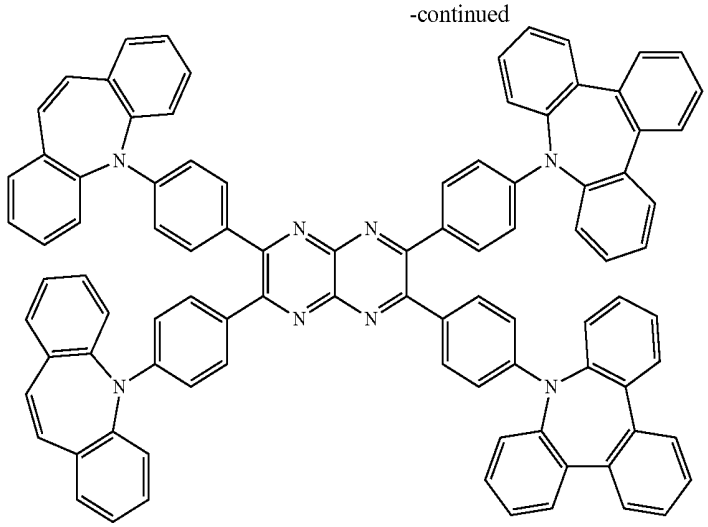

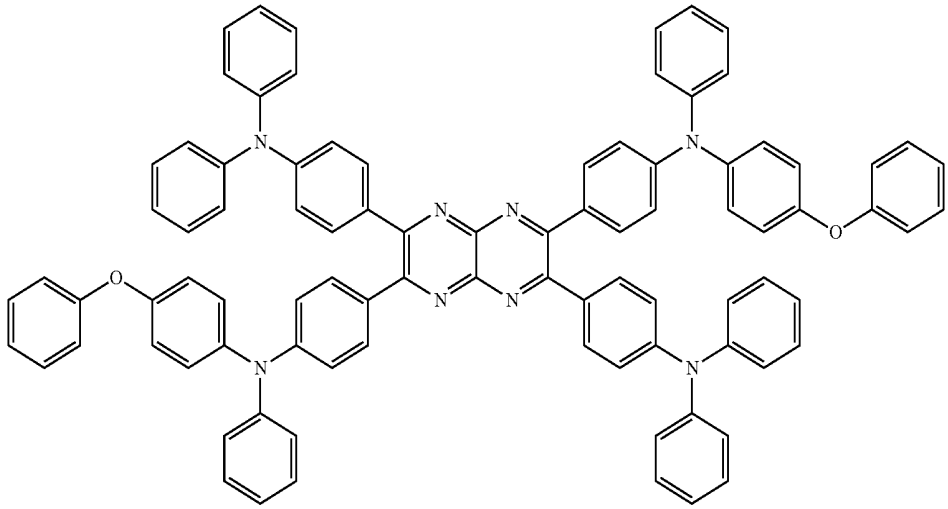

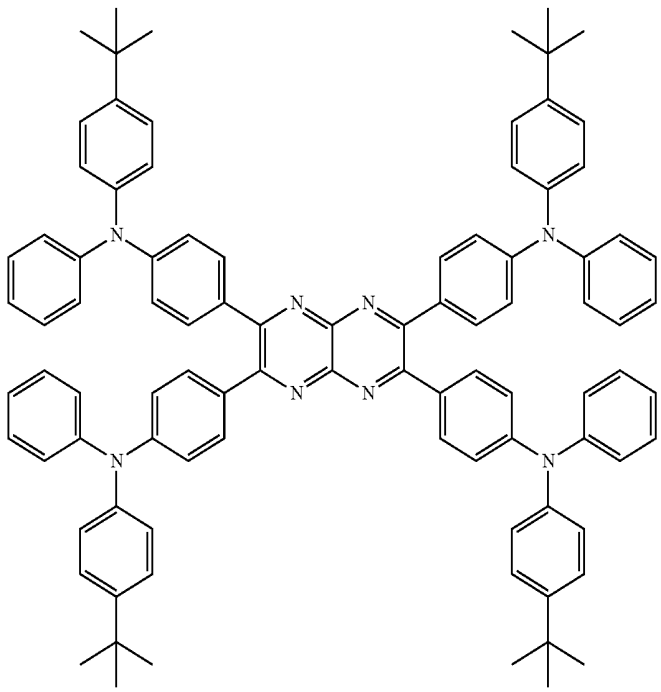

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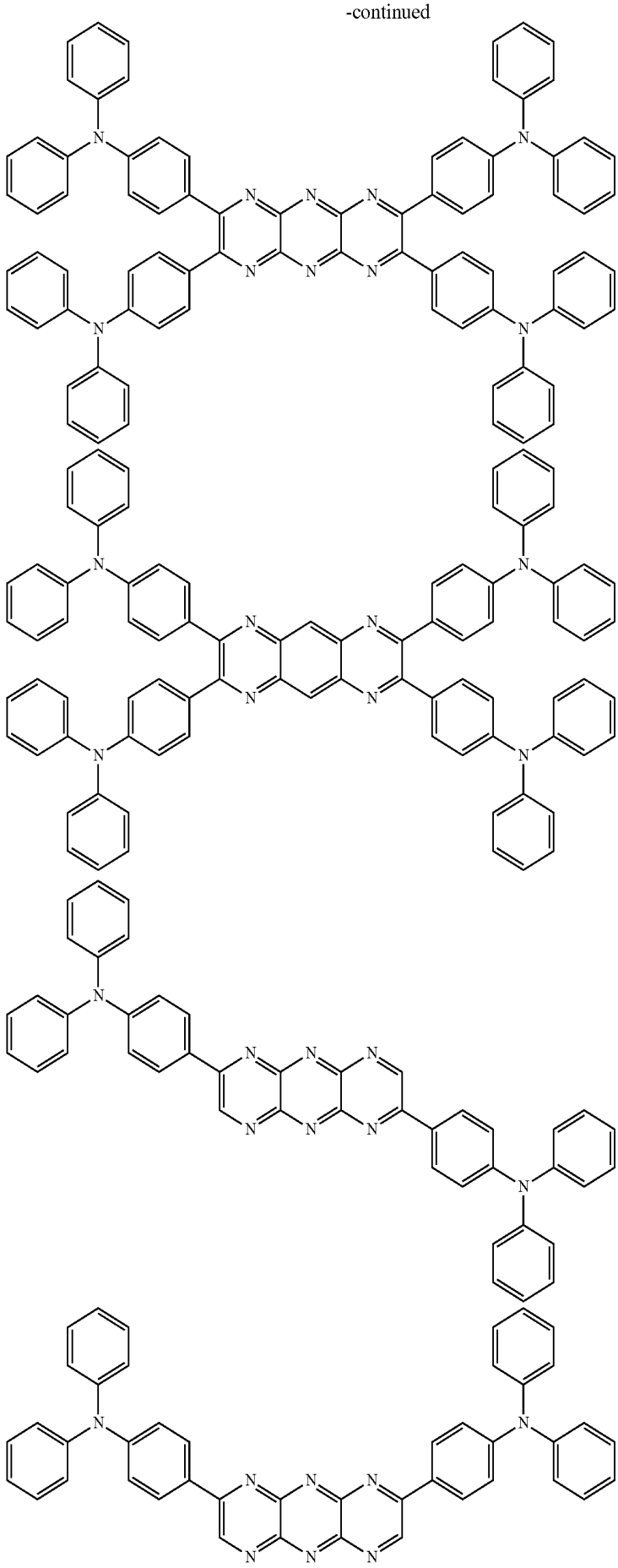

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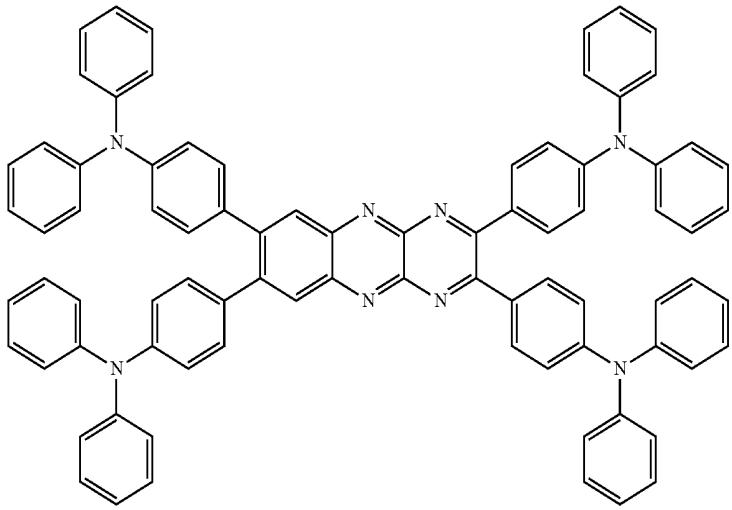

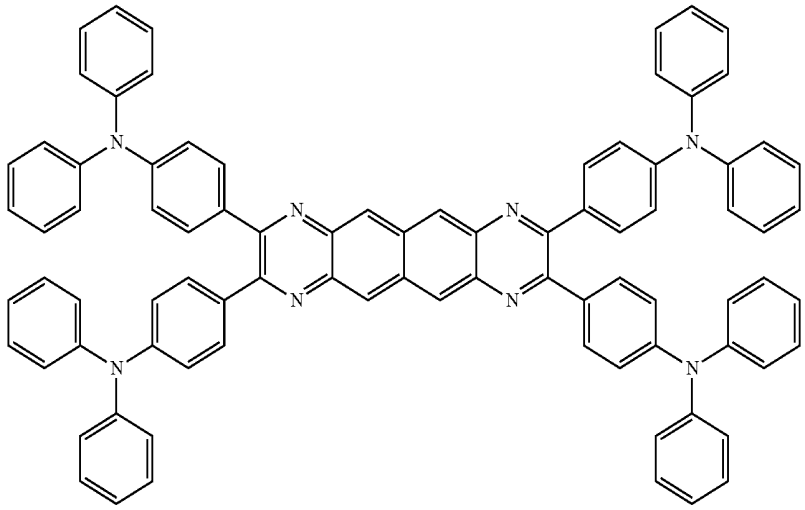

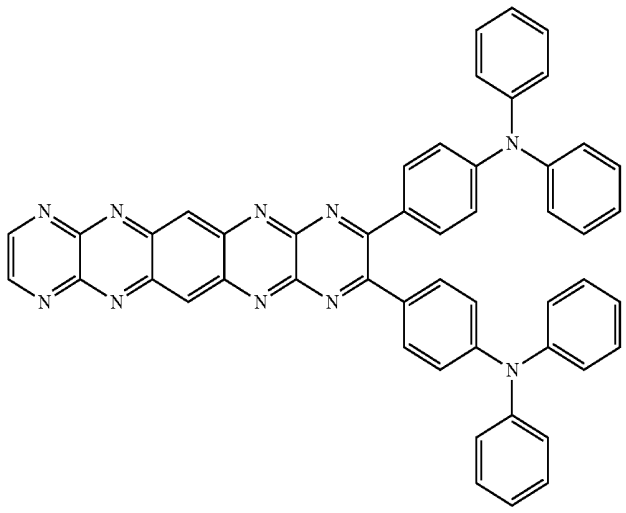

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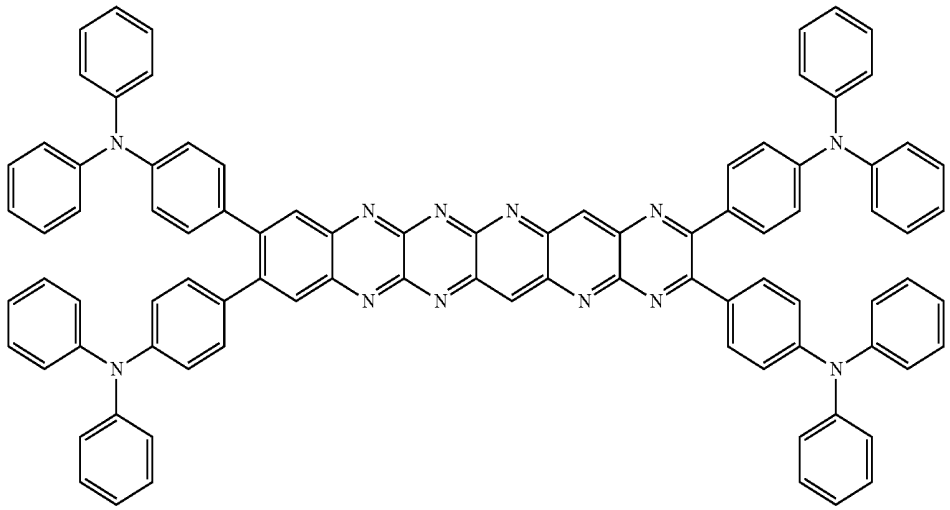
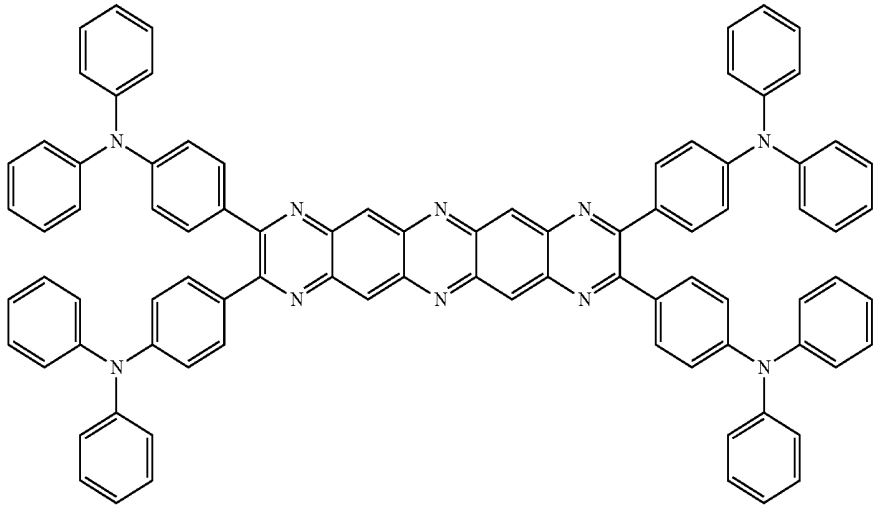
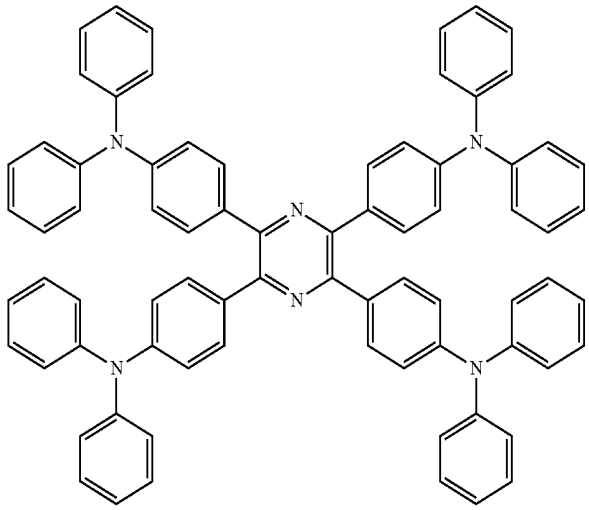
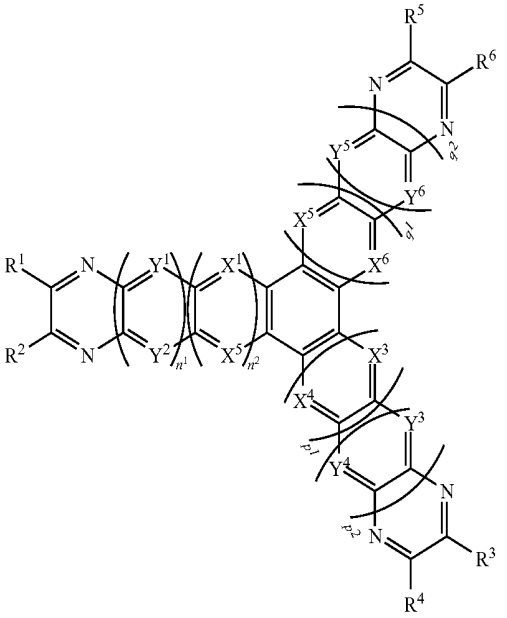






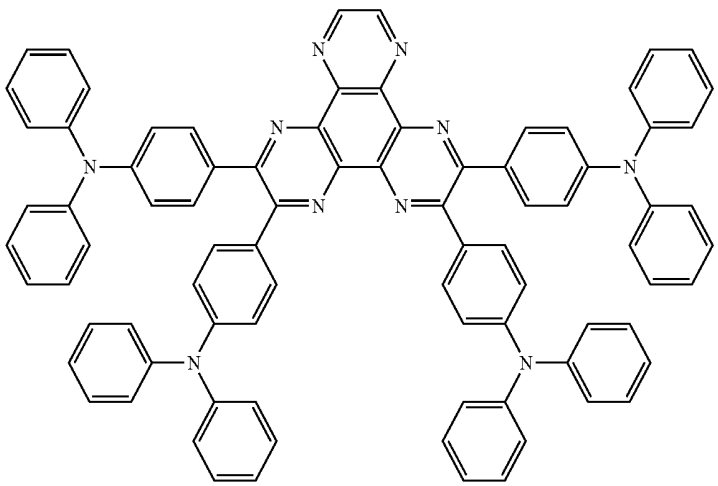
Examples of the preferred light emitting material capable of emitting delayed fluorescent light include compounds represented by the following general formula (241). The entire description of JP-A-2014-9224 including the paragraphs 0008 to 0048 and 0067 to 0076 is incorporated herein by reference.

General Formula (241)



wherein in the general formula (241), R^1 to R^6 each independently represent a hydrogen atom or a substituent, provided that at least one of R^1 to R^6 represents a substituted or unsubstituted (N/N-diarylamino)aryl group, and two aryl groups constituting the diarylamino moiety of the (N,N-diarylamino)aryl group may be bonded to each other; X^1 to X^6 and Y^1 to Y^6 each independently represent a carbon atom or a nitrogen atom; and n^1, n^2, p^1, p^2, q^1 and q^2 each independently represent 0, 1 or 2.

Specific examples of the compound include the following compounds.



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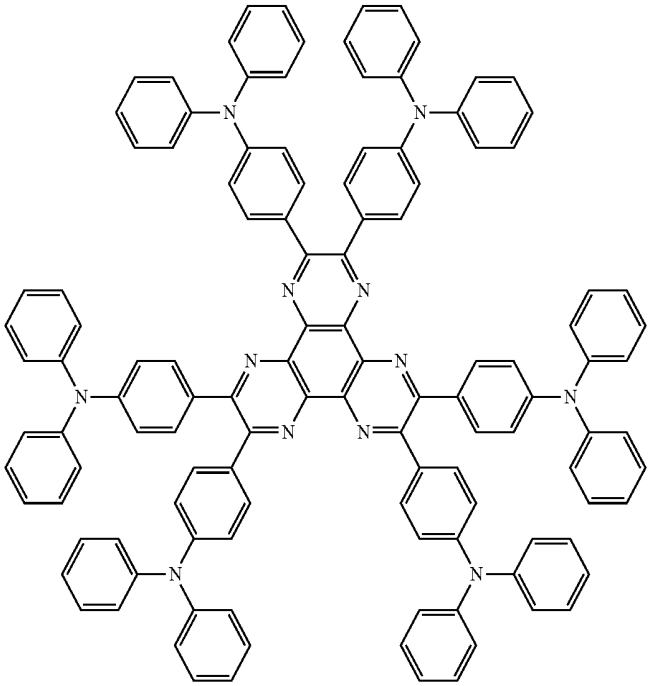

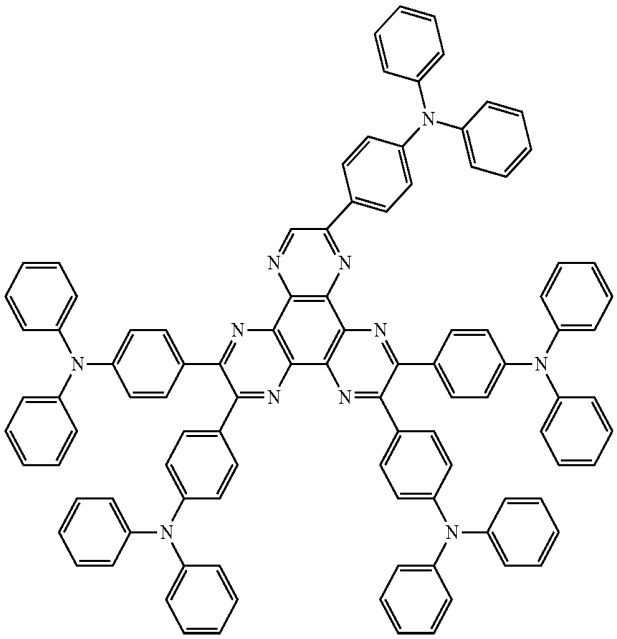

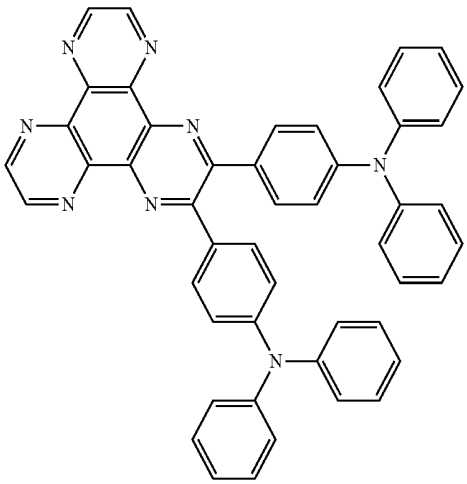

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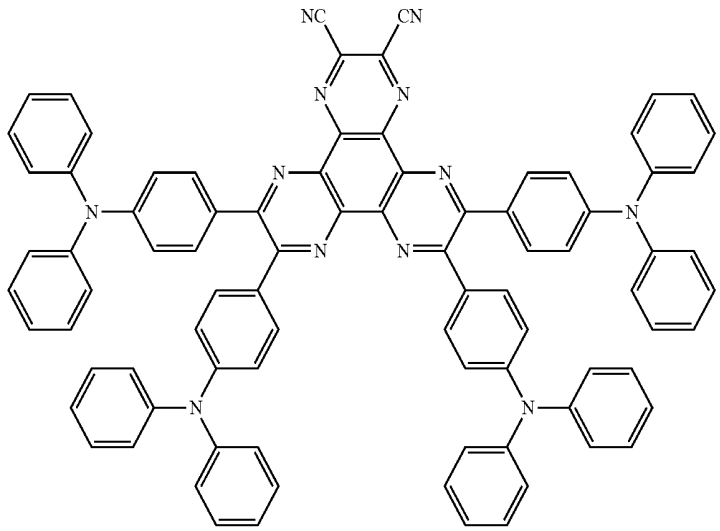

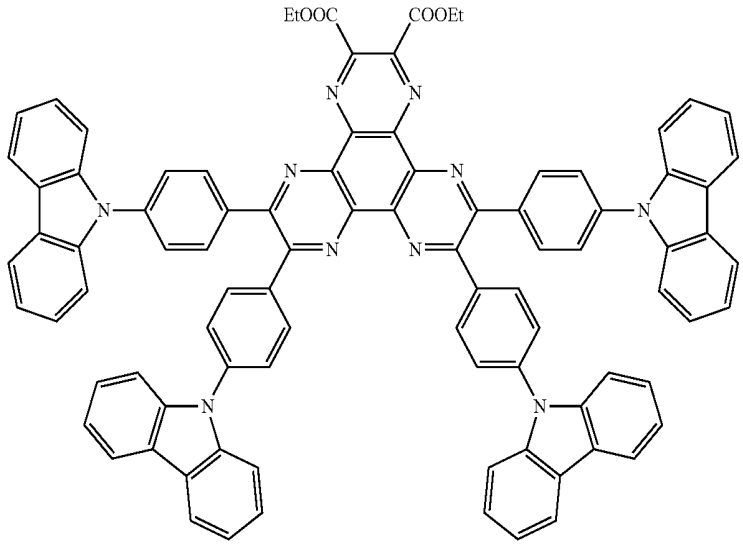

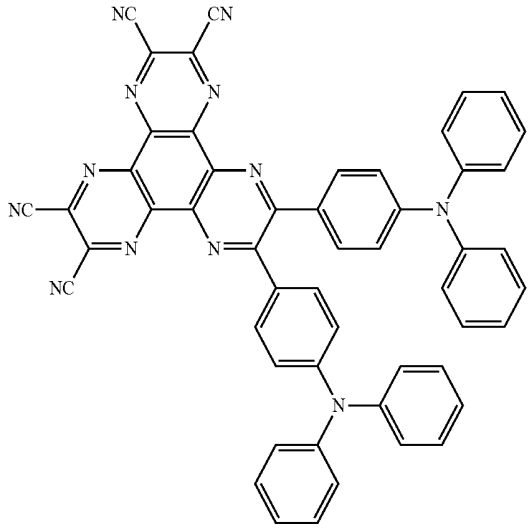

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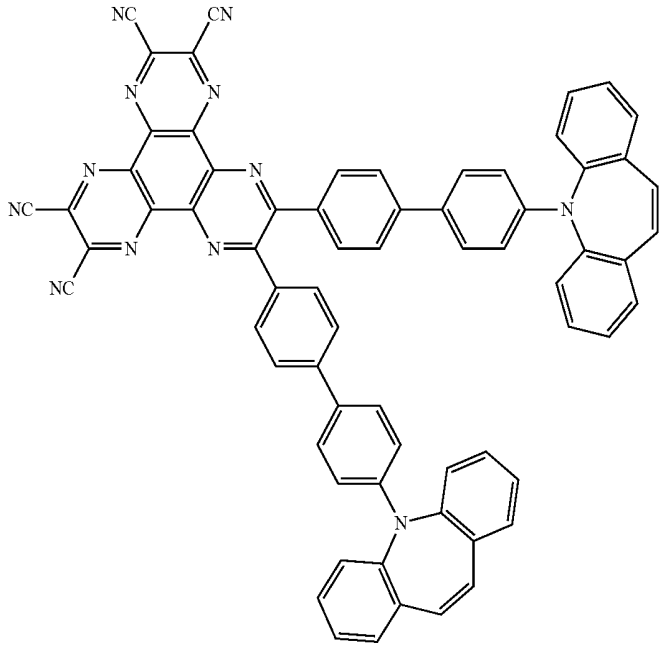

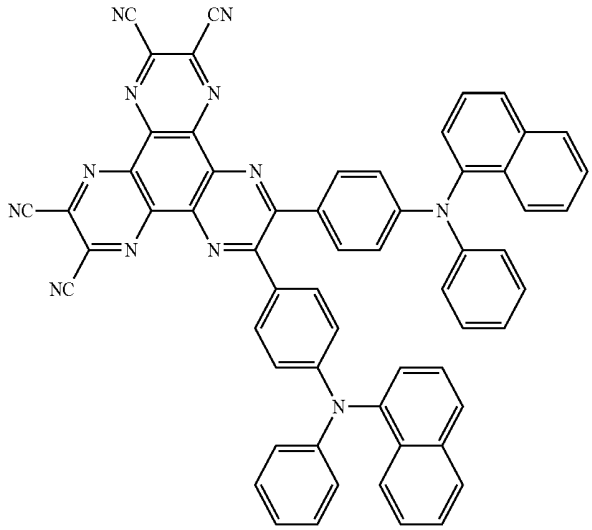

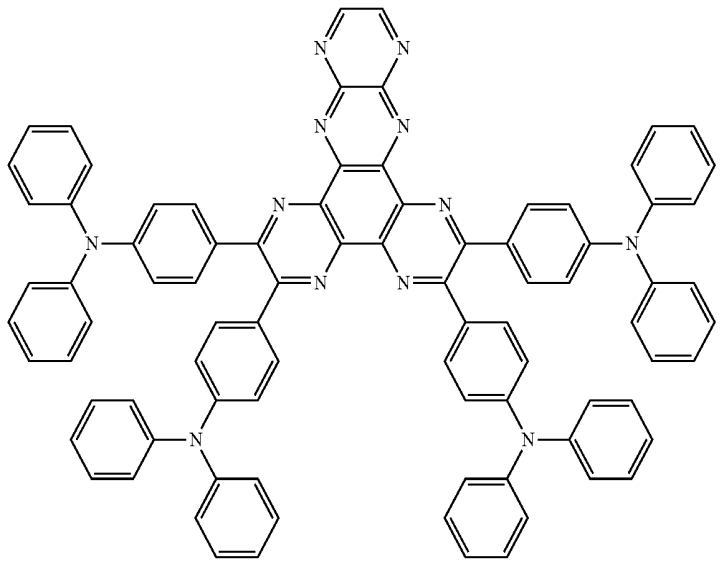

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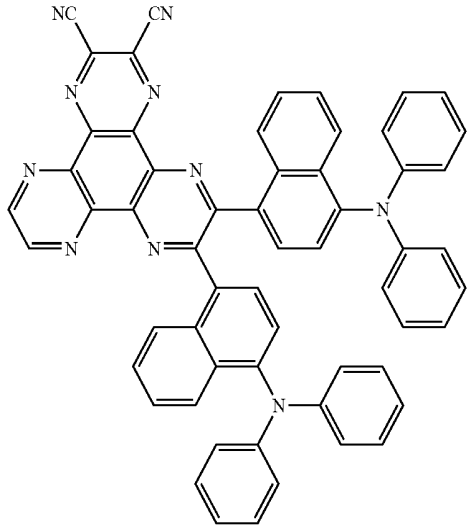

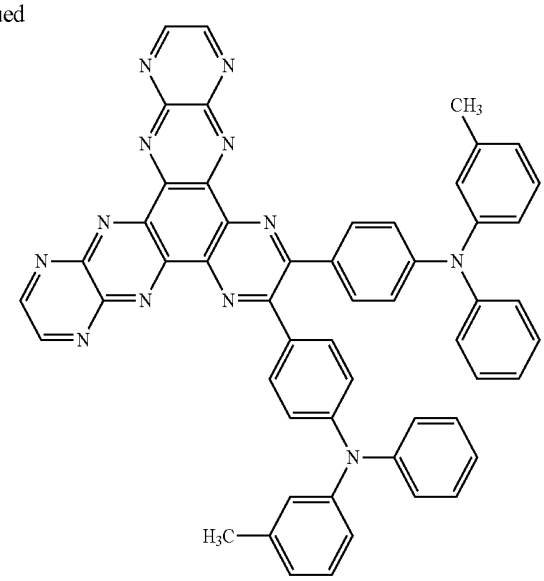

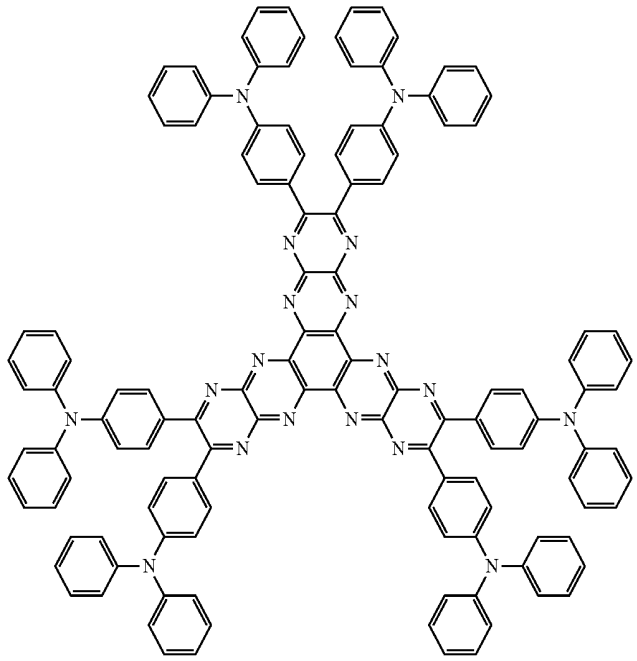

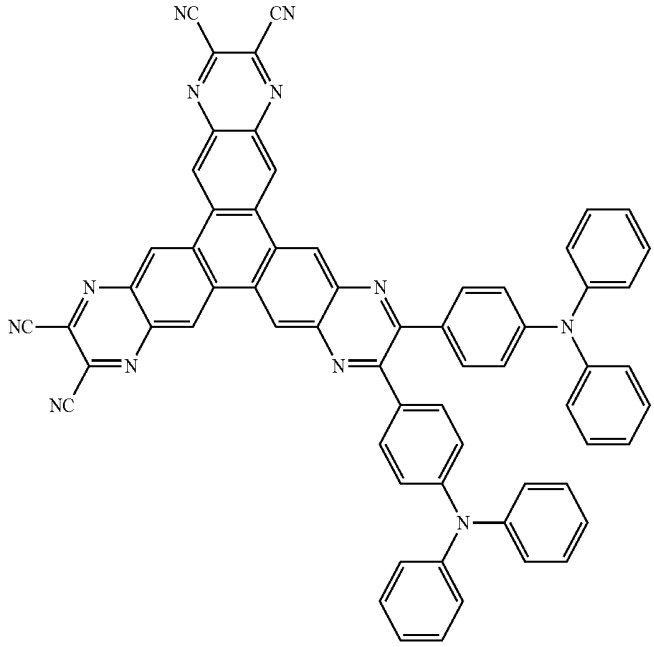

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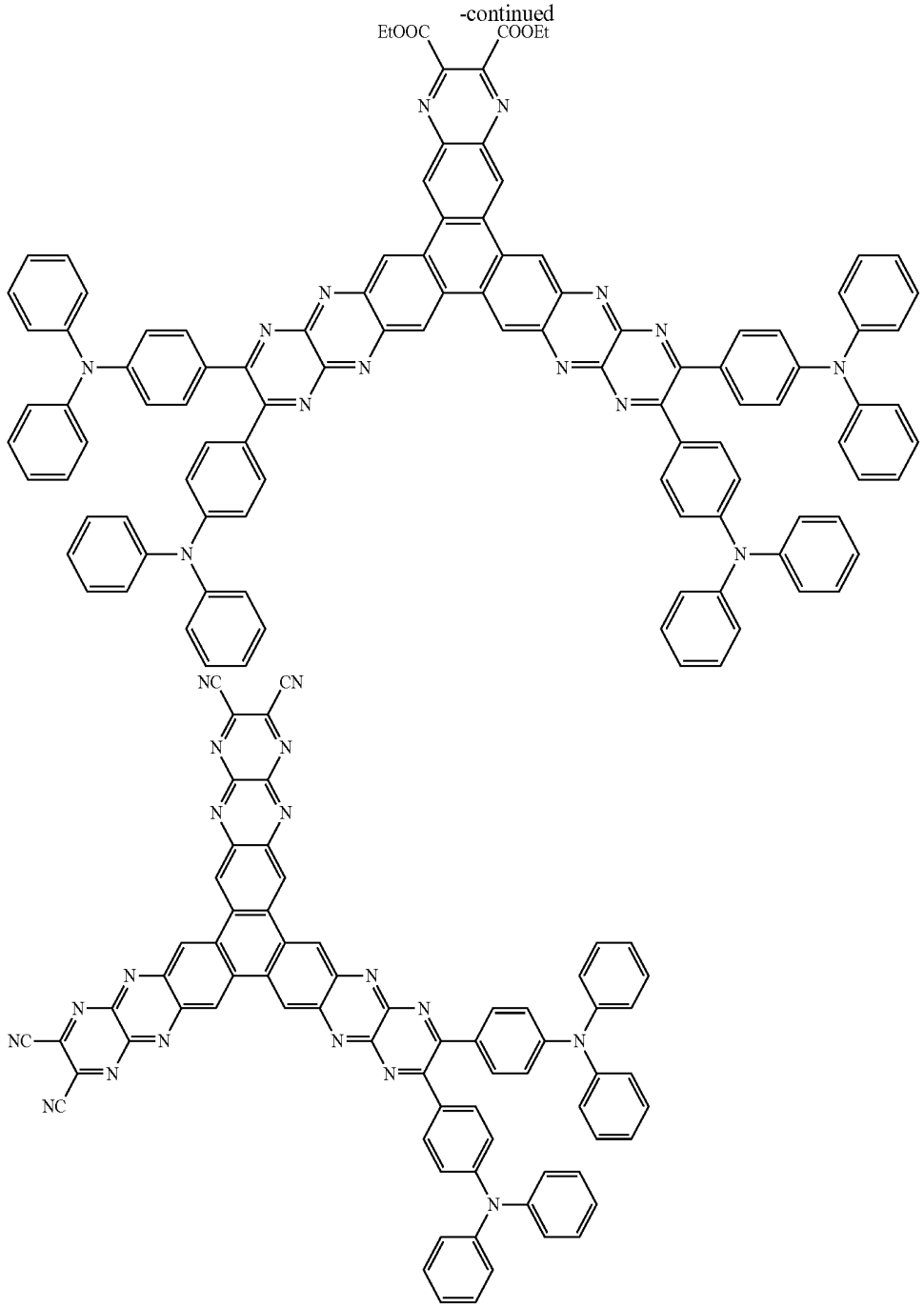


Structure of Light Emitting Layer

The structure of the light emitting layer in the organic electroluminescent device of the invention will be described.

The organic electroluminescent device of the invention uses plural light emitting materials. The light emitting materials may be contained together in one light emitting layer, or may be contained separately in different light emitting layers. The organic electroluminescent device of the invention may contain a light emitting layer that contain two or more light emitting materials and a light emitting layer that contains only one light emitting material.

For example, examples of the structure of the light emitting layers in the case where two kinds of light emitting materials ere used are shown in FIG. **2**. Examples of the two kinds of light emitting materials include a combination of a blue light emitting material and a red light emitting material, and a combination of a blue light emitting material and a green light emitting material, but the light emitting materials are not limited to the combinations. It is necessary herein that at least the blue light emitting material that emits light having a short wavelength is a delayed fluorescent material. In FIG. **2**, the numeral **1** denotes a light, emitting material that emits light having the shortest wavelength, and the numeral **2** denotes a light emitting material that emits light having a longer wavelength. In FIG. **2**, the encircled numeral means that the light emitting material corresponding to the numeral that is not encircled is doped with the light emitting material corresponding to the encircled numeral. In FIG. **2**, the anode is on the left side, and the cathode is on the right side.

For example, in the case where a blue light emitting material is selected as the light emitting material **1**, and a red

light emitting material is selected as the light emitting material **2**, the type (**1-1**) in FIG. **2** means that a light emitting layer formed solely of the blue light emitting material and a light emitting layer formed solely of the red light emitting material are formed in this order from the anode side. The type (**1-2**) shows an embodiment, in which the blue light emitting material is doped with the red light emitting material in one light emitting layer. Herein, the blue light emitting material functions as a light emitting material that emits fluorescent light containing delayed fluorescent light, and also functions as a host material of the red light emitting material. The types (**1-3**) and (**1-4**) each show an embodiment, in which a light emitting layer formed solely of the blue light emitting material and a light emitting layer containing the blue light emitting material doped with the red light emitting material are laminated. The type (**1-5**) shows an embodiment, in which a light emitting layer containing the blue light emitting material doped with the red light emitting material is laminated between two layers each formed solely of the blue light emitting material. The invention may use the patterns of all the embodiments, and preferably uses the types (**1-2**) to (**1-4**), and more preferably the type (**1-2**), from the standpoint of the achievement of a high efficiency with a simple structure.

Examples of the structure of the light emitting layer in the case where three kinds of light emitting materials are used are shown in FIGS. **3** to **6**. Examples of the three kinds of light emitting materials include a combination of a blue light emitting material, a green light emitting material and a red light emitting material, but the light emitting materials are not limited to the combination. It is necessary herein that at least the blue light emitting material that emits light having a shortest wavelength is a delayed fluorescent material. In FIG. **3**, the numeral **1** denotes a light emitting material that emits light having the shortest wavelength, the numeral **2** denotes a light emitting material that emits light having the next shortest wavelength, and the numeral **3** denotes a light emitting material that emits light having the longest wavelength. In FIGS. **3** to **6**, the encircled numeral means that the light emitting material corresponding to the numeral that is not encircled is doped with the light emitting material corresponding to the encircled numeral. In FIGS. **3** to **6**, the anode is on the left side, and the cathode is on the right side.

The types (**2-1**) to (**2-6**) each show an embodiment, in which the three light emitting materials are solely contained in separate light emitting layers respectively. Types (**3-1**) to (**3-4**) each show an embodiment having a light emitting layer that contains all the three light emitting materials. In the type (**3-1**) for example, the blue light emitting material functions as a light emitting that emits fluorescent light containing delayed fluorescent light, and also functions as a host material of the green light emitting material and the red light emitting material. The types (**4-1**) to (**4-14**) each show an embodiment having a light emitting layer containing the light emitting material **1** doped with the light emitting material **2**, and a light emitting layer containing the light emitting material **1** doped with the light emitting material **3**. The types (**5-1**) to (**5-9**) each show an embodiment having a light emitting layer containing the light emitting material **2** doped with the light emitting material **3**, and a light emitting layer formed solely of the light emitting material **1**.

In the invention, as represented by the types (**3-4**) and (**4-5**) both the light emitting layer that is the closest to the cathode and the light emitting layer that is the closest to the anode may be layers that, are formed of the light emitting material that emits light having the shortest wavelength. The light emitting layer containing the light emitting material that emits light having the shortest wavelength as a host material may be disposed between the light emitting layer that is the closest to the cathode and the light emitting layer that the closest to the anode. The structure may provide such an advantage that the light emission efficiency may be further enhanced.

The types (**3-1**) to (**3-3**) are preferably used, and the type (**3-1**) is more preferably used, from the standpoint of the achievement of a high efficiency with a simple structure.

The concentration of the light emitting material, with which the light emitting layer is doped, is preferably 0.01% by weight or more, and more preferably 0.1% by weight or more, is preferably 50% by weight or less, more preferably 20% by weight or less, and further preferably 10% by weight, or less, and may be, for example 1% by weight or less.

In the case where the light emitting layer is doped with the light emitting material, the host material may not be the aforementioned light emitting material. A host material that has been used for an ordinary light emitting material may be appropriately selected and used. In order that the organic electroluminescent device of the invention exhibits a high light emission efficiency, it is important that the singlet excitons and the triplet excitons formed in the light emitting material are confined in the light emitting material. The host material used may be an organic compound having excited singlet energy and excited triplet energy, at least one of which is higher than the light emitting material to be doped. As a result, the singlet excitons and the triplet excitons formed in the light emitting material can be confined in the molecule of the light emitting material, and thereby the light emission efficiency thereof may be sufficiently exploited. However, even though the singlet excitons and the triplet excitons cannot be sufficiently confined, there are cases where a high light emission efficiency is obtained, and therefore a host material that is capable of achieving a high light emission efficiency may be used in the invention without any particular limitation. In general, the host material preferably an organic compound that has a hole transporting function or an electron transporting function, prevents the light emission wavelength from being prolonged, and has a high glass transition temperature.

In the organic electroluminescent device of the invention, the light emission intensity of the light emitting material that emits light having the shortest wavelength is preferably 20% or more, more preferably 25% or more, and further preferably 30% or more, based on the total light emission. In particular, the blue light emission intensity is preferably 20% or more, more preferably 25% or more, and further preferably 30% or more, based on the total light emission.

Structure of Organic Electroluminescent Device

The organic electroluminescent, device of the invention has a structure containing at least an anode, a cathode, and one or more organic layers formed between the anode and the cathode. The one or more organic layers contain a light emitting layer, and may be formed only of a light emitting layer, or may have one or more organic layers in addition to the light emitting layer. Examples of the one or more organic layers include a hole transporting layer, a hole injection layer, an electron barrier layer, a hole barrier layer, an electron injection layer, an electron transporting layer and an exciton barrier layer. The hole transporting layer may be a hole injection and transporting layer having a hole injection function, and the electron transporting layer may be an electron injection and transporting layer having an electron injection function. A specific structural example of an organic electroluminescent device is shown in FIG. **7**. In

FIG. 7, the numeral 1 denotes a substrate, 2 denotes an anode, 3 denotes a hole injection layer, 4 denotes a hole transporting layer, 5 denotes a light, emitting layer, 6 denotes an electron transporting layer, 7 denotes an electron injection layer, and 8 denotes a cathode.

The members and the layers of the organic electroluminescent device will be described below. For the light emitting layer, reference may be made to the aforementioned description relating to the light emitting layer.

Substrate

The organic electroluminescent device of the invention is preferably supported by a substrate. The substrate is not particularly limited and may be those that have been commonly used in an organic electroluminescent device, and examples thereof used include those formed of glass, transparent plastics, quartz and silicon.

Anode

The anode of the organic electroluminescent device used is preferably formed of as an electrode material a metal, an alloy or an electroconductive compound each having a large work function (4 eV or more), or a mixture thereof. Specific examples of the electrode material include a metal, such as Au, and an electroconductive transparent material, such as CuI, indium tin oxide (ITO), SnO_2 and ZnO. A material that is amorphous and is capable of forming a transparent electroconductive film, such as IDIXO (In_2O_3—ZnO), may also be used. The anode may be formed in such a manner that the electrode material is formed into a thin film by such a method as vapor deposition or sputtering, and the film is patterned into a desired pattern by a photolithography method, or in the case where the pattern may not require high accuracy (for example, approximately 100 μm or more), the pattern may be formed with a mask having a desired shape on vapor deposition or sputtering of the electrode material. In alternative, in the case where a material capable of being applied as a coating, such as an organic electroconductive compound, is used, a wet film forming method, such as a printing method and a coating method, may be used. In the case where emitted light is to be taken out through the anode, the anode preferably has a transmittance of more than 10%, and the anode preferably has a sheet resistance of several hundred ohm per square or less. The thickness thereof may be generally selected from a range of from 10 to 1,000 nm, and preferably from 10 to 200 nm, while depending on the material used.

Cathode

The cathode is preferably formed of as an electrode material a metal having a small work function (4 eV or less) (referred to as an electron injection metal), an alloy or an electroconductive compound each having a small work function (4 eV or less), or a mixture thereof. Specific examples of the electrode material include sodium, a sodium-potassium alloy, magnesium, lithium, a magnesium-cupper mixture, a magnesium-silver mixture, a magnesium-aluminum mixture, a magnesium-indium mixture, an aluminum-aluminum oxide (Al_2O_3) mixture, indium, a lithium-aluminum mixture, and a rare earth metal. Among these, a mixture of an electron injection metal and a second metal that is a stable metal having a larger work function than the electron injection metal, for example, a magnesium-silver mixture, a magnesium-aluminum mixture, a magnesium-indium mixture, an aluminum-aluminum oxide (Al_2O_3) mixture, a lithium-aluminum mixture, and aluminum, are preferred from the standpoint of the electron injection property and the durability against oxidation and the like. The cathode may be produced by forming the electrode material into a thin film by such a method as vapor deposition or sputtering. The cathode preferably has a sheet resistance of several hundred ohm per square or less, and the thickness thereof may be generally selected from a range of from 10 nm to 5 μm, and preferably from 50 to 200 nm. For transmitting the emitted light, any one of the anode and the cathode of the organic electroluminescent device is preferably transparent or translucent, thereby enhancing the light emission luminance.

The cathode may be formed with the electroconductive transparent materials described for the anode, thereby forming a transparent or translucent cathode, and by applying the cathode, a device having an anode and a cathode, both of which have transmittance, may be produced.

Injection Layer

The injection layer is a layer that is provided between the electrode and the organic layer, for decreasing the driving voltage and enhancing the light emission luminance, and includes a hole injection layer and an electron injection layer, which may be provided between the anode and the light emitting layer or the hole transporting layer and between the cathode and the light emitting layer or the electron transporting layer. The injection layer may be provided depending on necessity.

Barrier Layer

The barrier layer is a layer that is capable of inhibiting charges (electrons or holes) and/or excitons present in the light emitting layer from being diffused outside the light emitting layer. The electron barrier layer may be disposed between the light emitting layer and the hole transporting layer, and inhibits electrons from passing through the light emitting layer toward the hole transporting layer. Similarly, the hole barrier layer may be disposed between the light emitting layer and the electron transporting layer, and inhibits holes from passing through the light emitting layer toward the electron transporting layer. The barrier layer may also be used for inhibiting excitons from being diffused outside the light emitting layer. Thus, the electron barrier layer and the hole barrier layer each may also have a function as an exciton barrier layer. The term "the electron barrier layer" or "the exciton barrier layer" referred herein is intended to include a layer that has both the functions of an electron barrier layer and an exciton barrier layer by one layer.

Hole Barrier Layer

The hole barrier layer has the function of an electron transporting layer in a broad sense. The hole barrier layer has a function of inhibiting holes from reaching the electron transporting layer while transporting electrons, and thereby enhances the recombination probability of electrons and holes in the light emitting layer. As the material for the hole barrier layer, the materials for the electron transporting layer described later may be used depending on necessity.

Electron Barrier Layer

The electron barrier layer has the function of transporting holes in a broad sense. The electron barrier layer has a function of inhibiting electrons from reaching the hole transporting layer while transporting holes, and thereby enhances the recombination probability of electrons and holes in the light emitting layer.

Exciton Barrier Layer

The exciton barrier layer is a layer for inhibiting excitons generated through recombination of holes and electrons in the light emitting layer from being diffused to the charge transporting layer, and the use of the layer inserted enables effective confinement of excitons in the light emitting layer, and thereby enhances the light emission efficiency of the device. The exciton barrier layer may be inserted adjacent to the light emitting layer on any of the side of the anode and the side of the cathode, and on both the sides. Specifically, in the case where the exciton barrier layer Is present on the side of the anode, the layer may be inserted between the hole transporting layer and the light emitting layer and adjacent to the light emitting layer, and in the case where the layer is inserted on the side of the cathode, the layer may be inserted between the light emitting layer and the cathode and adjacent to the light emitting layer. Between the anode and the exciton barrier layer that is adjacent to the light emitting layer on the side of the anode, a hole injection layer, an electron barrier layer and the like may be provided, and between the cathode and the exciton barrier layer that is adjacent to the light emitting layer on the side of the cathode, an electron injection layer, an electron transporting layer, a hole barrier layer and the like may be provided. In the case where the barrier layer is provided, the material used for the barrier layer preferably has excited singlet energy and excited triplet energy, at least one of which is higher than the excited singlet energy and the excited triplet energy of the light emitting material, respectively.

Hole Transporting Layer

The hole transporting layer is formed of a hole transporting material having a function of transporting holes, and the hole transporting layer may be provided as a single layer or plural layers.

The hole transporting material has one of injection or transporting property of holes and barrier property of electrons, and may be any of an organic material and an inorganic material. Examples of known hole transporting materials that may be used herein include a triazole derivative, an oxadiazole derivative, an imidazole derivative, a carbazole derivative, an indolocarbazole derivative, a polyarylalkane derivative, a pyrazoline derivative, a pyrazolone derivative, a phenylenediamine derivative, an arylamine derivative, an amino-substituted chalcone derivative, an oxazole derivative, a styrylanthracene derivative, a fluorenone derivative, a hydrazone derivative, a stilbene derivative, a silazane derivative, an aniline copolymer and an electroconductive polymer oligomer, particularly a thiophene oligomer. Among these, a porphyrin compound, an aromatic tertiary amine compound and a styrylamine compound are preferably used, and an aromatic tertiary amine compound is more preferably used.

Electron Transporting Layer

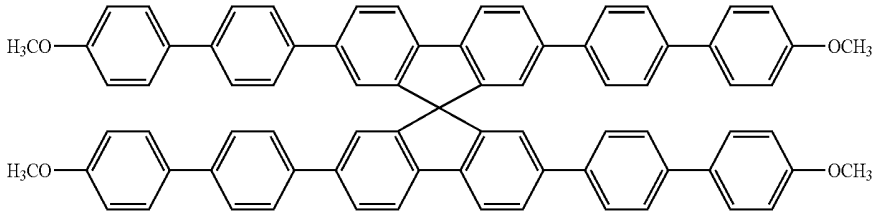
The electron transporting layer is formed of a material having a function of transporting electrons, and the electron transporting layer may be provided as a single layer or plural layers.

The electron transporting material (which may also function as a hole barrier material in some cases) needs only to have a function of transporting electrons, which are injected from the cathode, to the light emitting layer. Examples of the electron transporting layer that may be used herein include a nitro-substituted fluorene derivative, a diphenylquinone derivative, a thiopyran dioxide derivative, carbodiimide, a fluorenylidene methane derivative, anthraquinodimethane and anthrone derivatives, and an oxadiazole derivative. The electron transporting material used may be a thiadiazole derivative obtained by replacing the oxygen atom of the oxadiazole ring of the oxadiazole derivative by a sulfur atom, or a quinoxaline derivative having a quinoxaline ring, which is known as an electron attracting group. Furthermore, polymer materials having these materials introduced to the polymer chain or having these materials used as the main chain of the polymer may also be used.

In the production of the organic electroluminescent device, the compound represented by the general formula (1) not only may be used in the light emitting layer, but also may be used in the other layers than the light emitting layer. In this case, the compound represented by the general formula (1) used in the light emitting layer and the compound represented by the general formula (1) used in the other layers than the light emitting layer may be the same as or different from each other. For example, the compound represented by the general formula (1) may be used in the injection layer, the barrier layer, the hole barrier layer, the electron barrier layer, the exciton barrier layer, the hole transporting layer, the electron transporting layer and the like described above. The film forming method of the layers are not particularly limited, and the layers may be produced by any of a dry process and a wet process.

Specific examples of preferred materials that may be used in the organic electroluminescent device are shown below, but the materials that may be used in the invention are not construed as being limited to the example compounds. The compound that is shown as a material having a particular function may also be used as a material having another function. In the structural formulae of the example compounds, R, R' and R_1 to R_{10} each independently represent a hydrogen atom or a substituent, X represents a carbon atom or a hetero atom constituting the ring skeleton, n represents an integer of from 3 to 5, Y represents a substituent, and m represents an integer of 0 or more.

Preferred examples of a compound that may be used as the host material of the light emitting layer are shown below.



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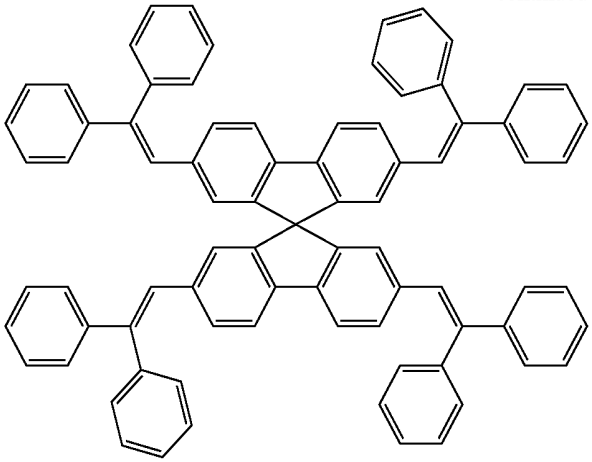

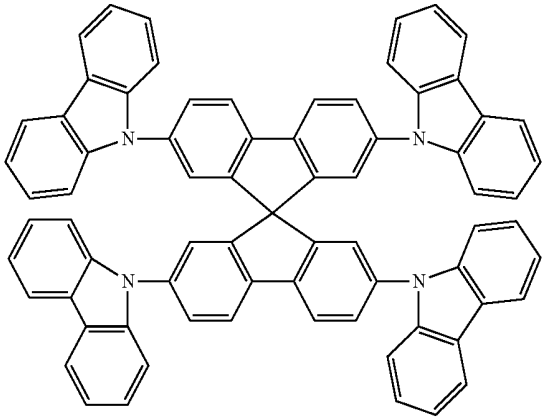

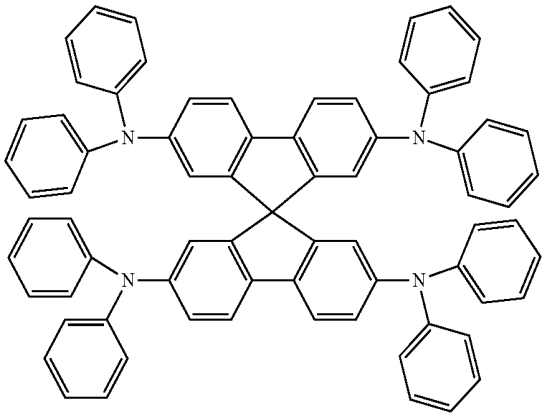

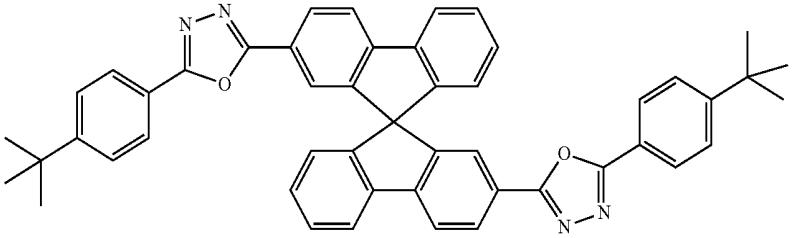

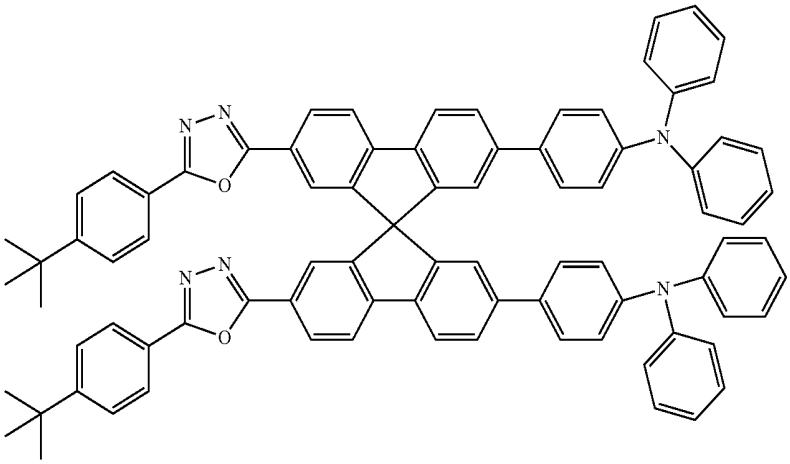

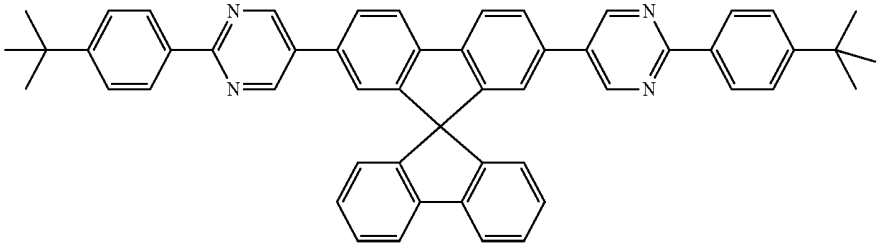

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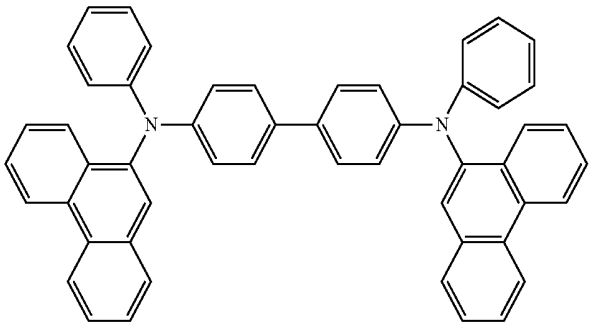

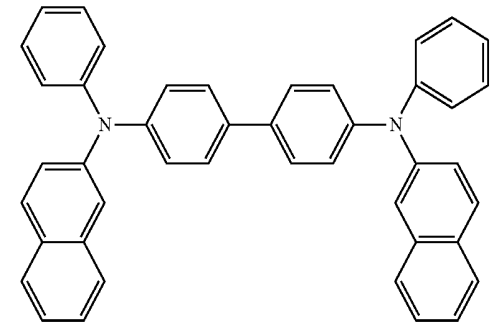

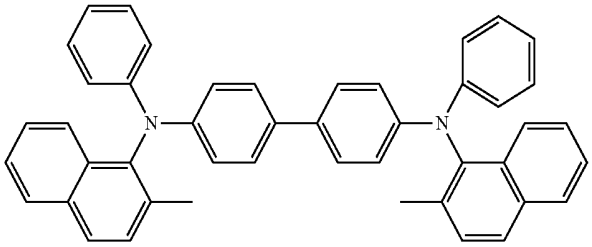

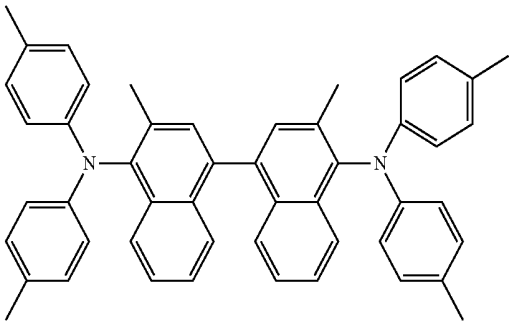

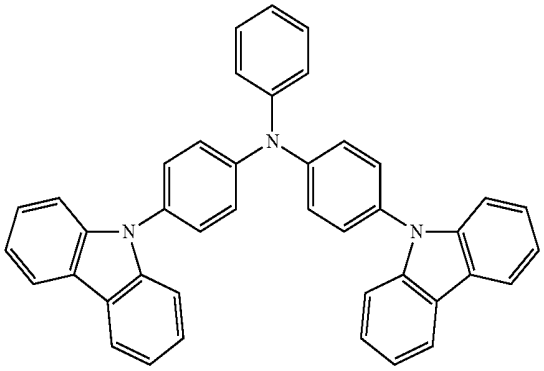

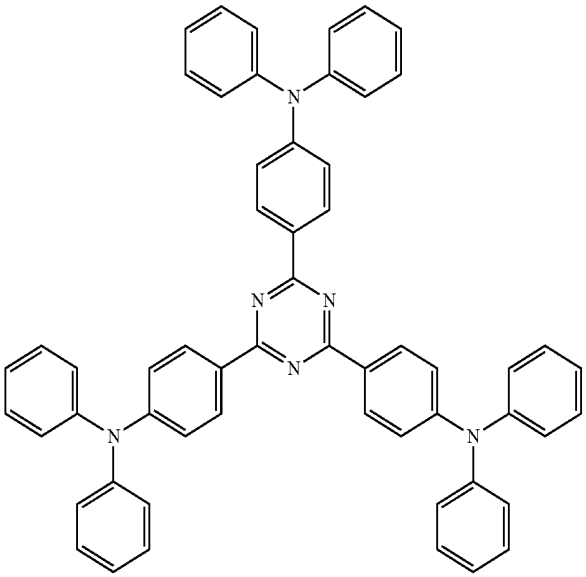

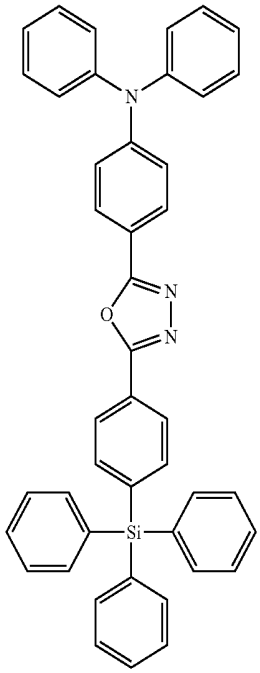

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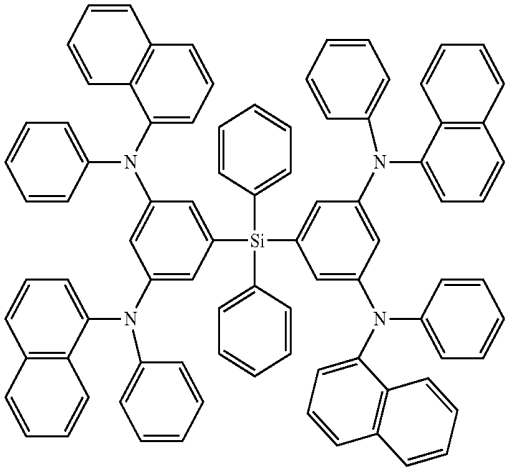

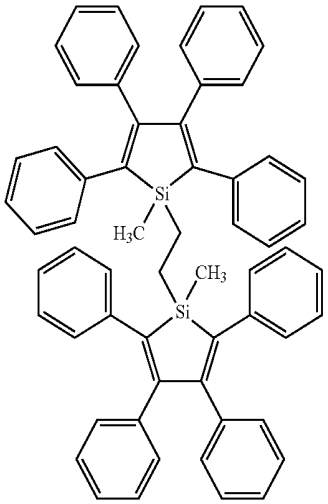

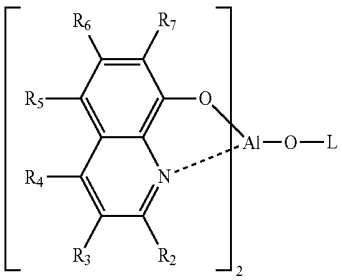

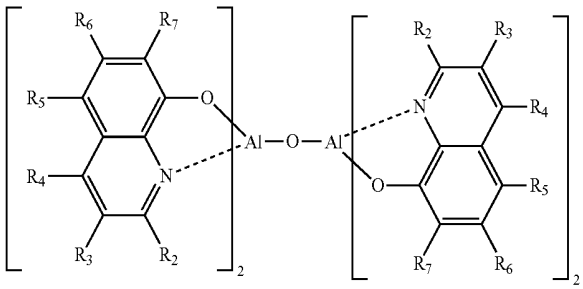

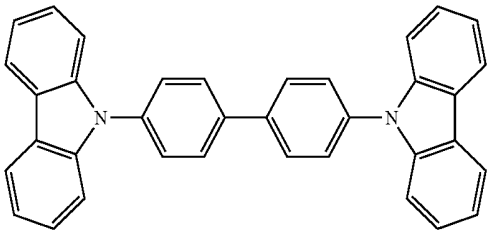

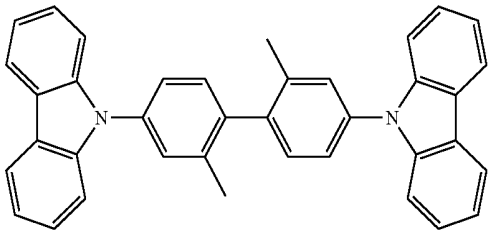

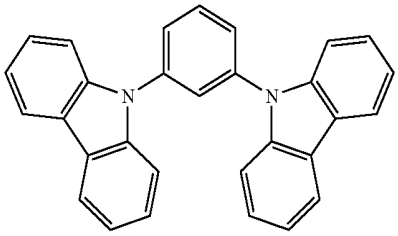

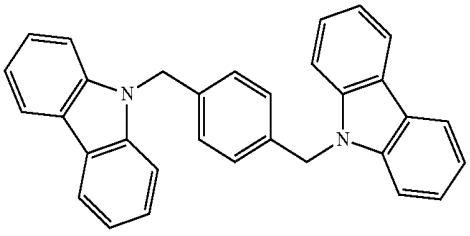

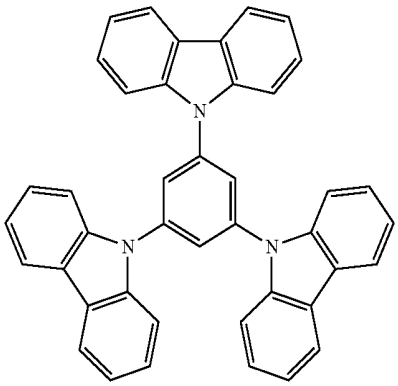

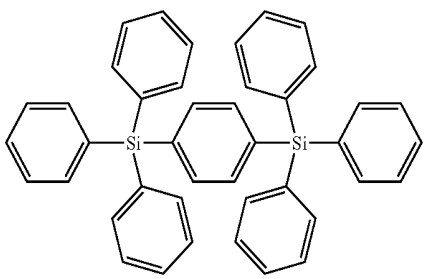

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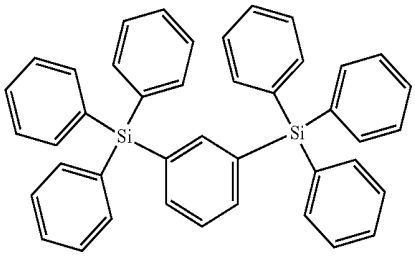

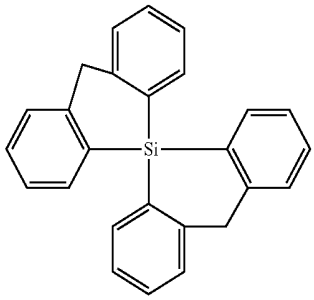

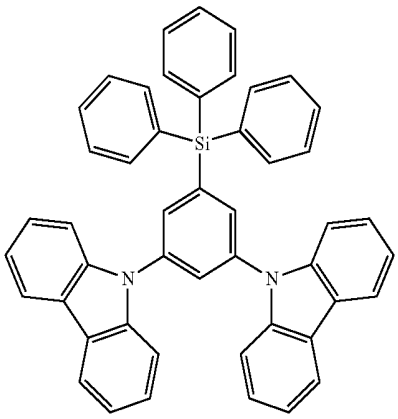

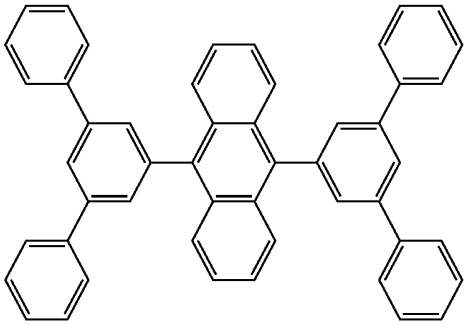

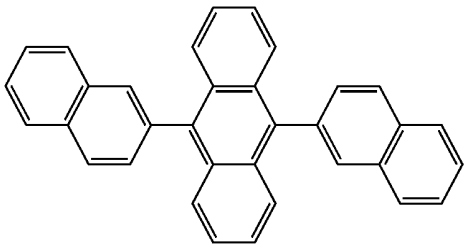

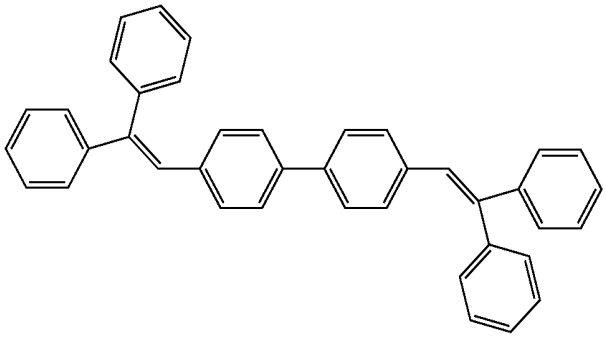

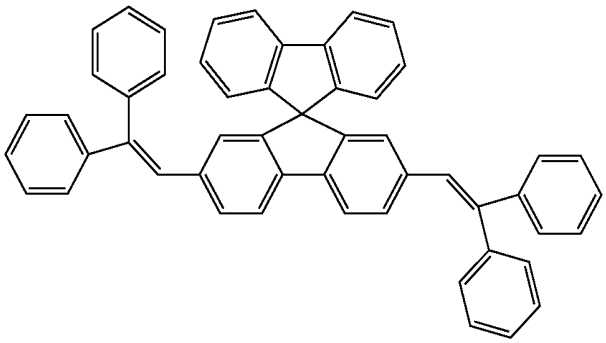

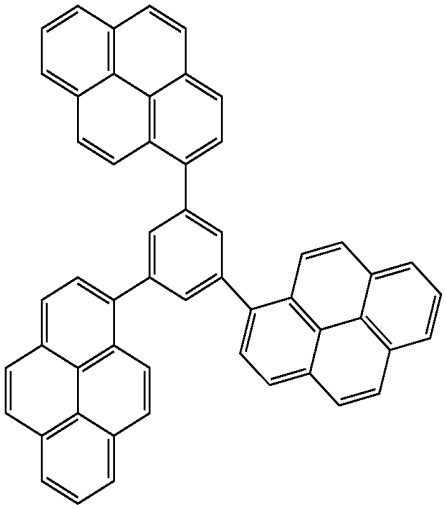

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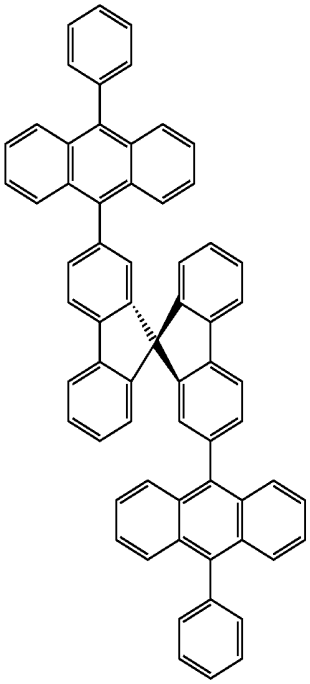

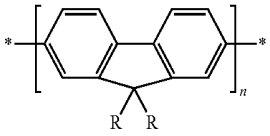

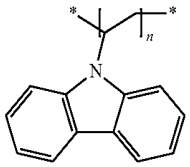

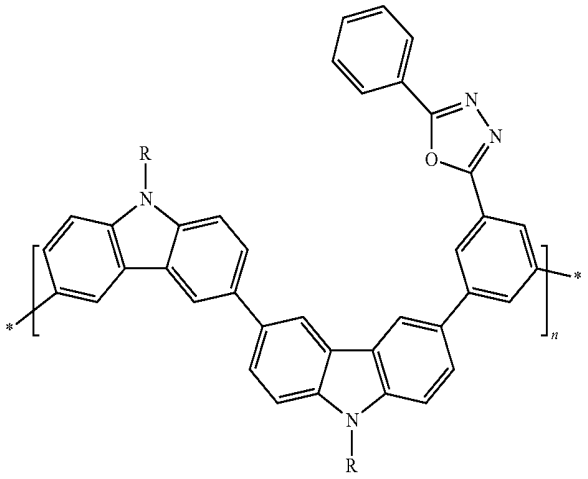

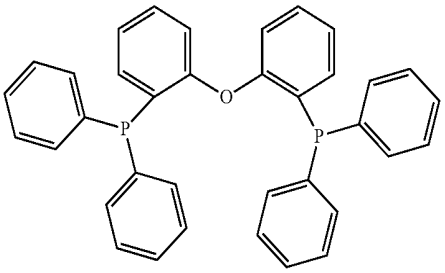

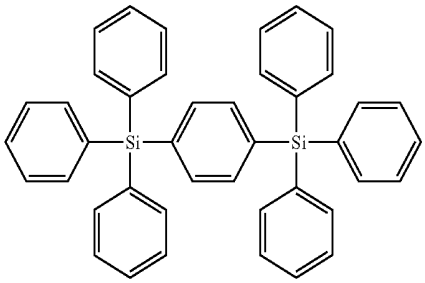

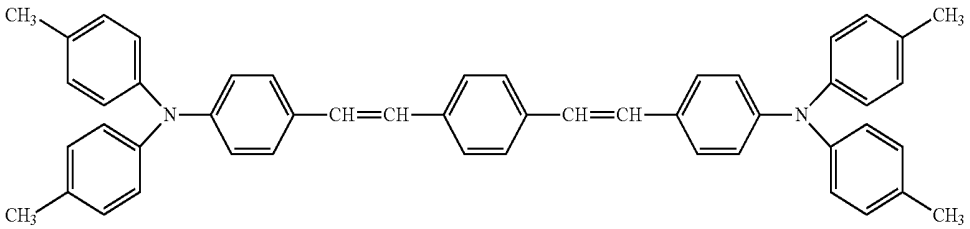

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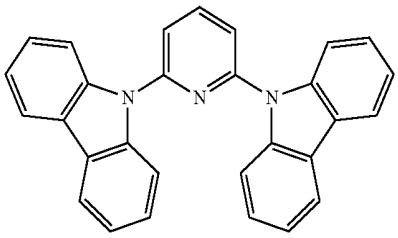
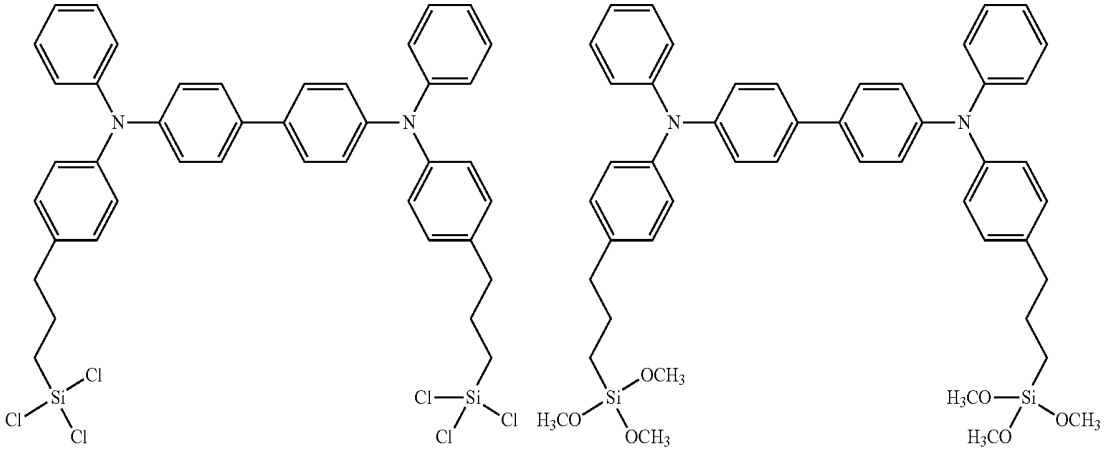
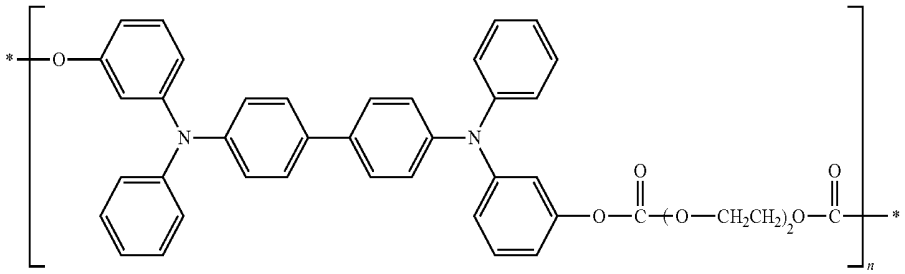
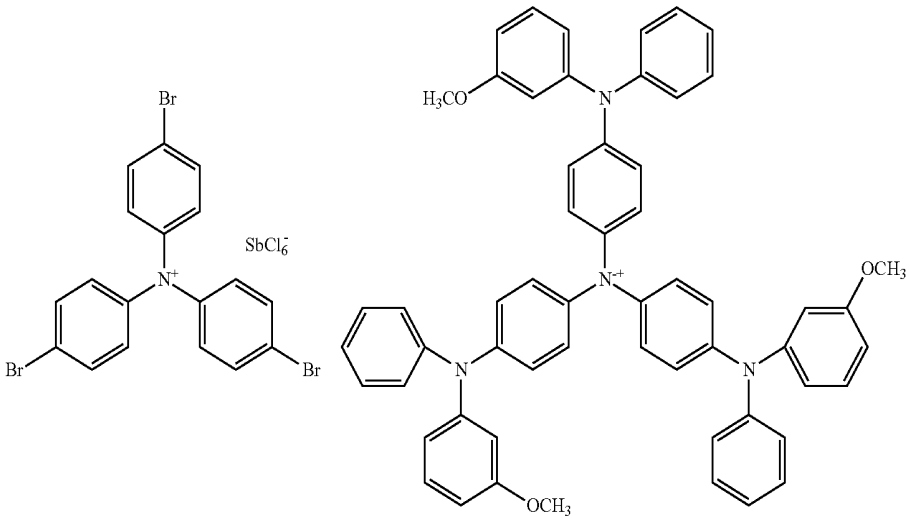


Preferred examples of a compound that may be used as the hole injection material are shown below.







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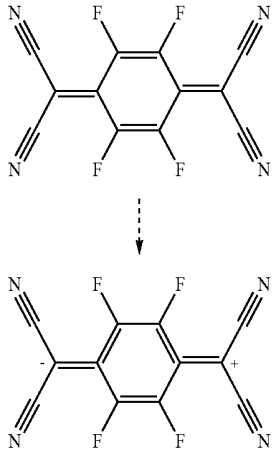
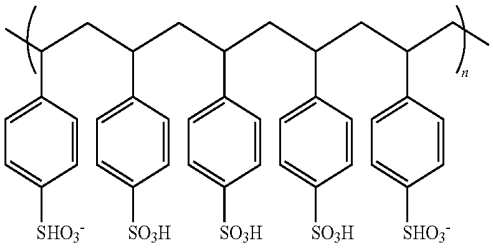
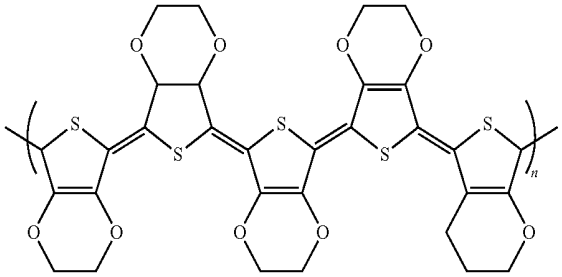
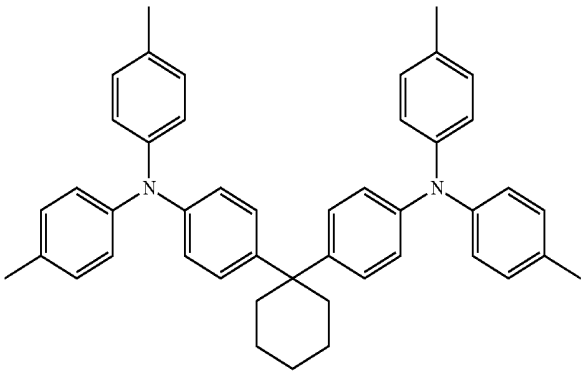
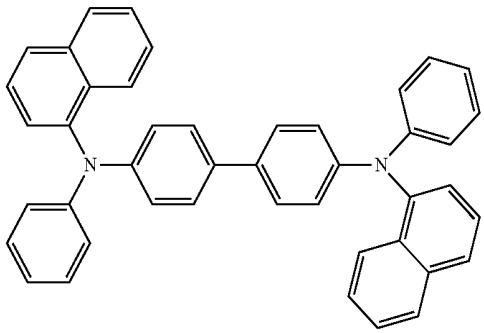


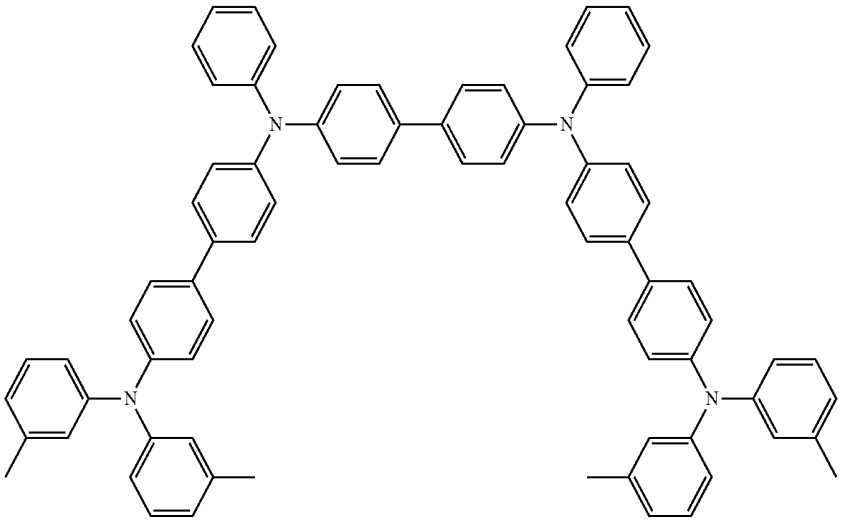




Preferred examples of a compound that may be used as the hole transporting material are shown below.







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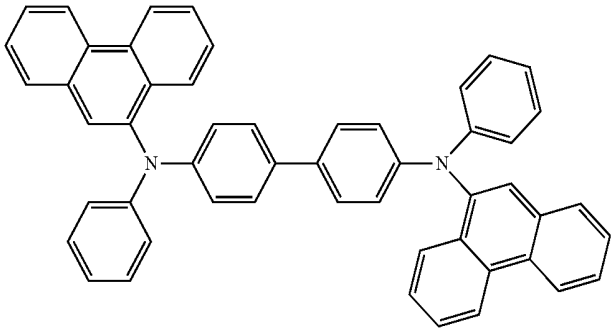

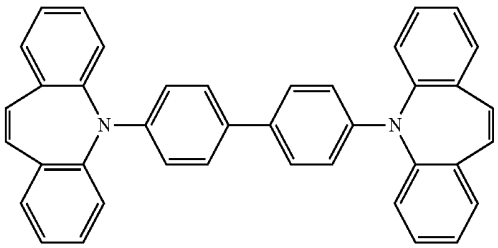

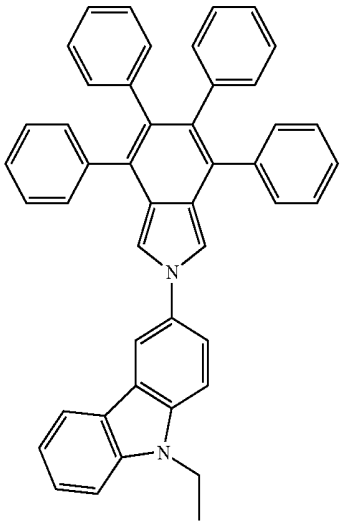

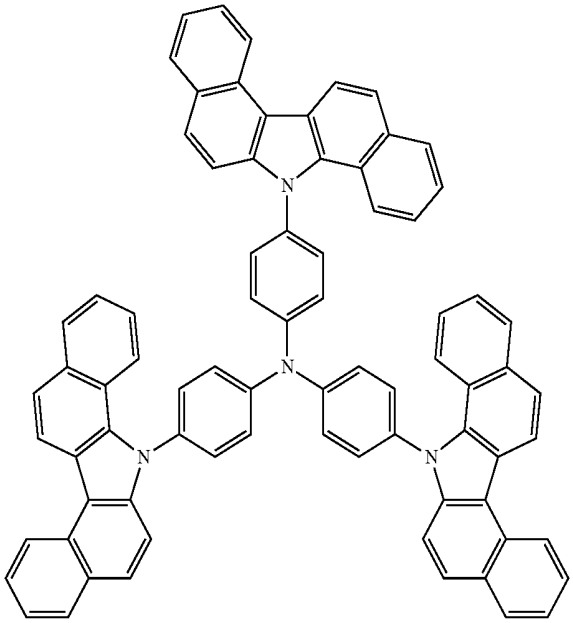

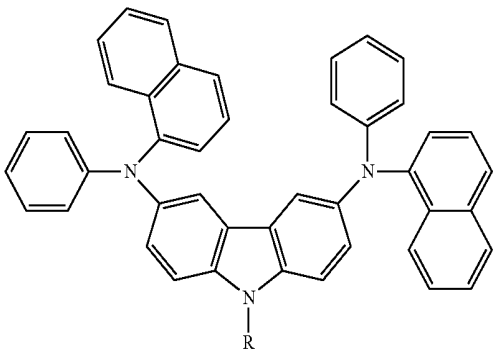

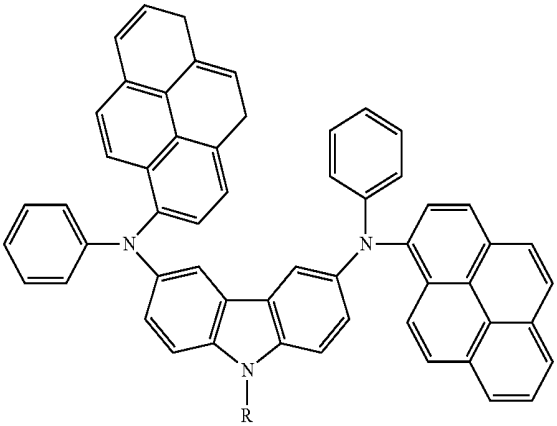

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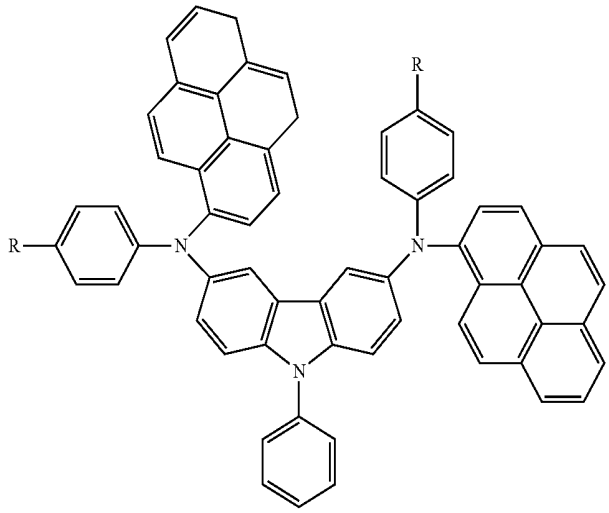

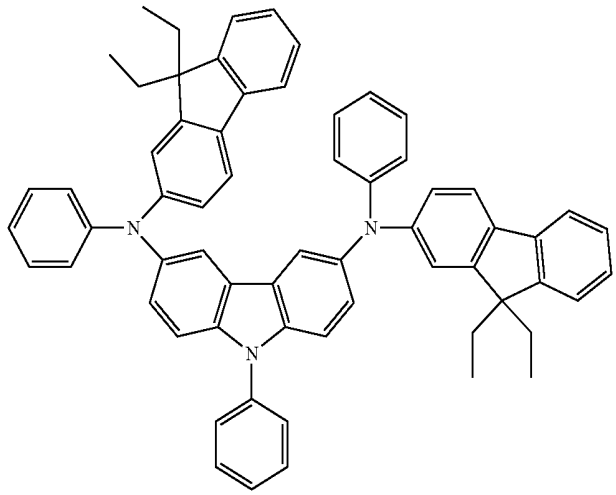

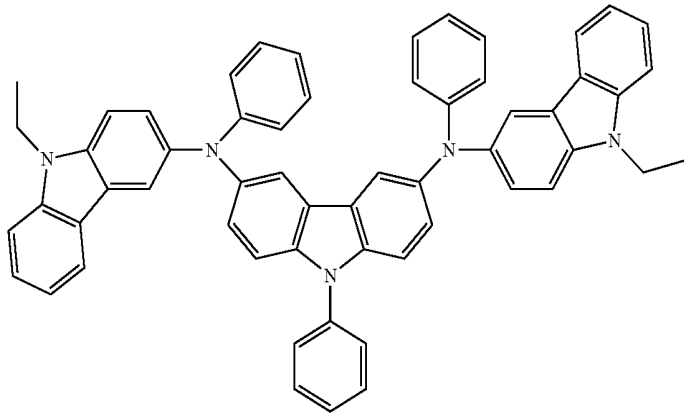

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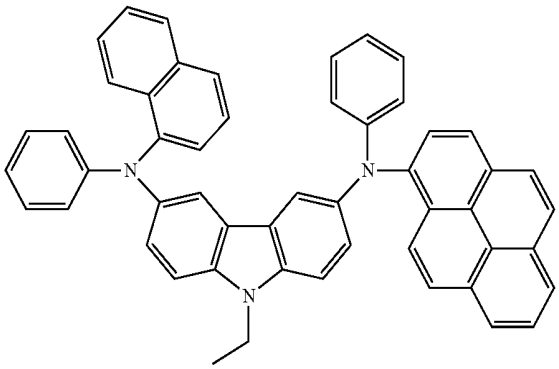

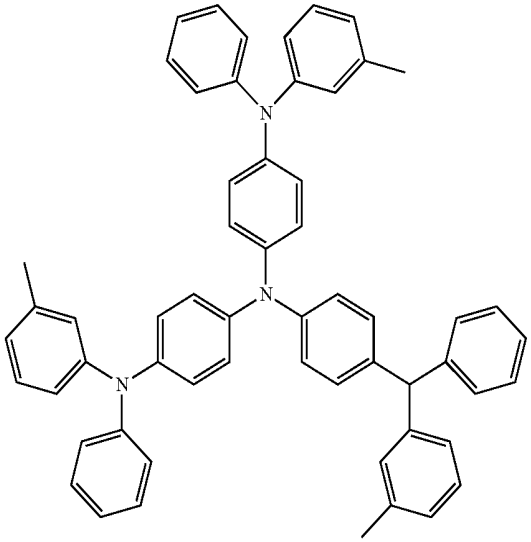

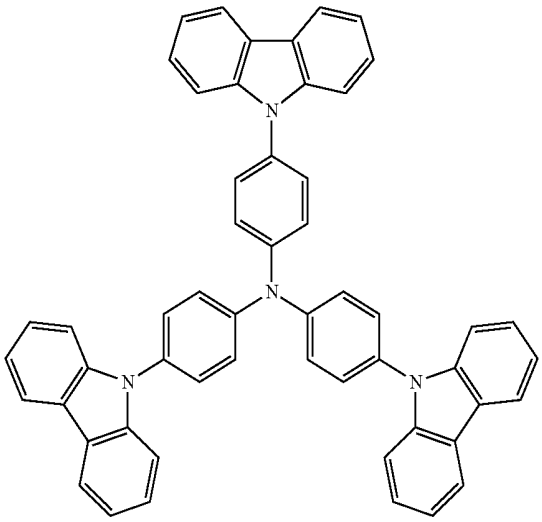

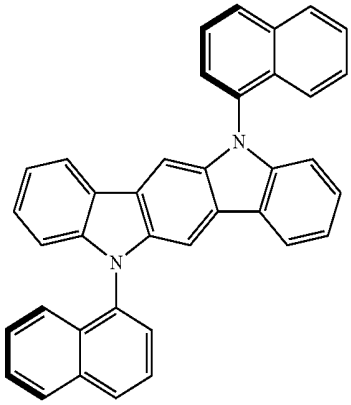

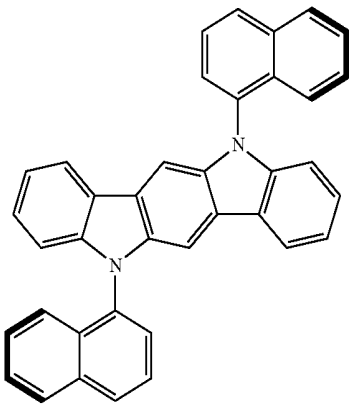

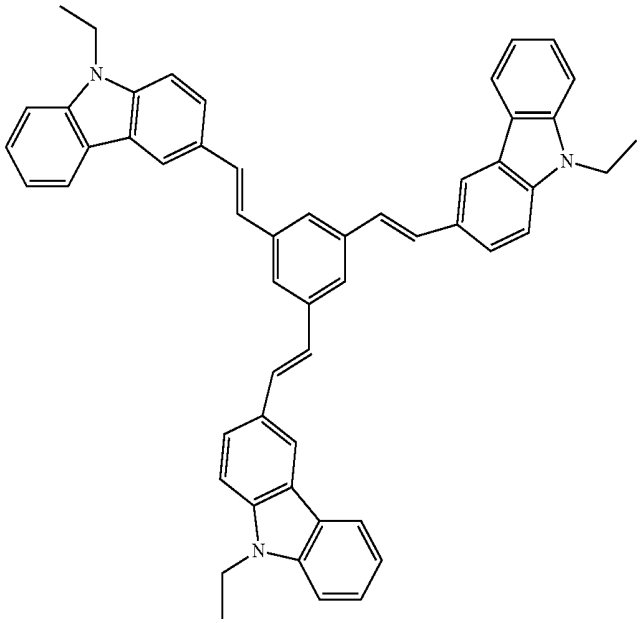

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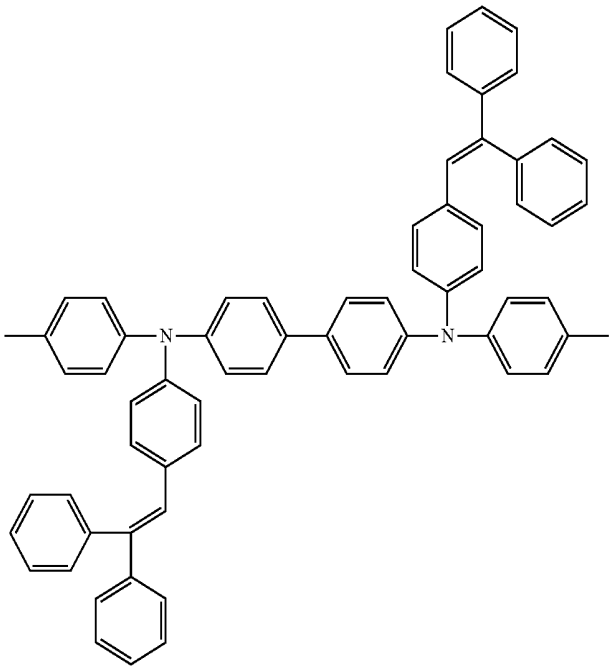

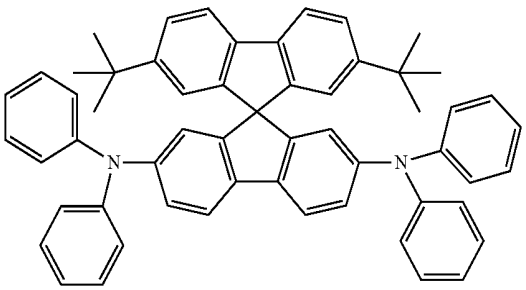

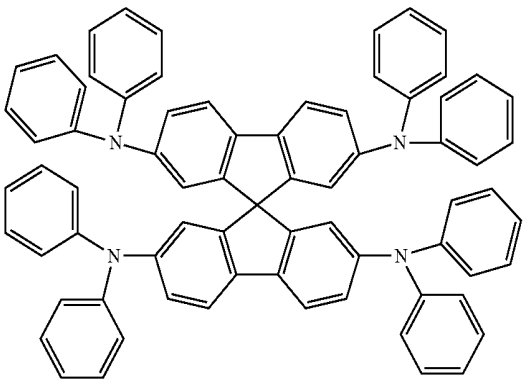

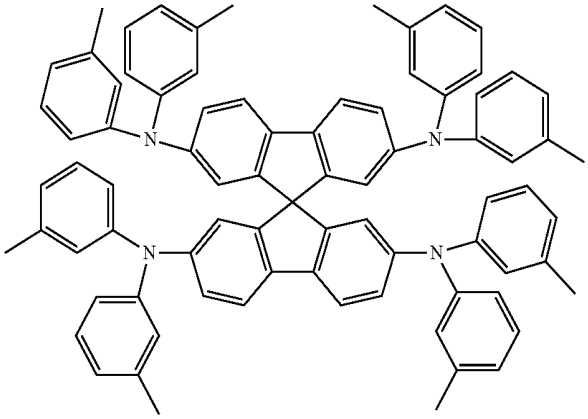

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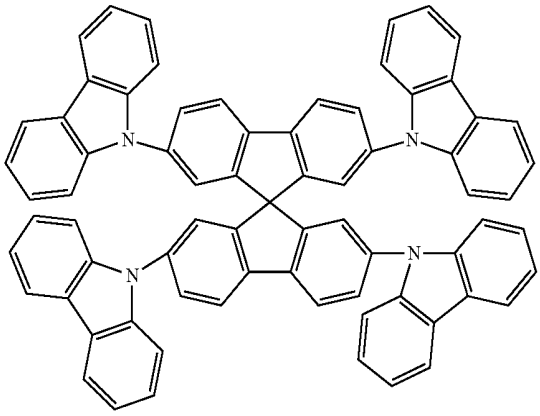

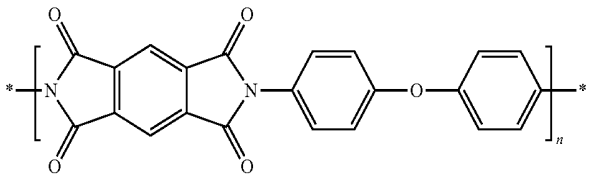

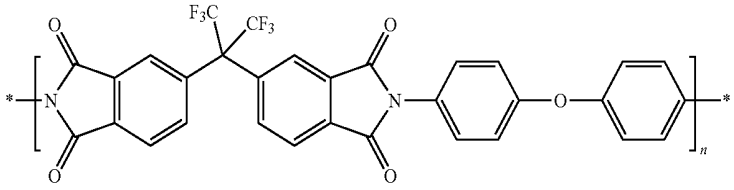

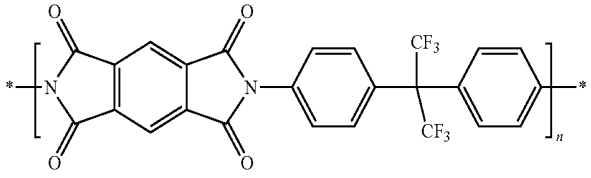

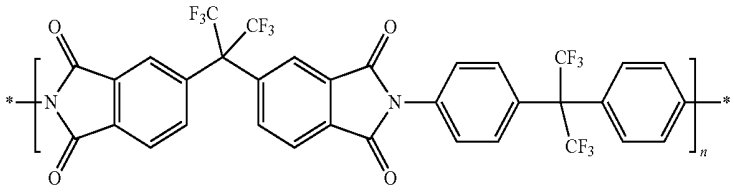

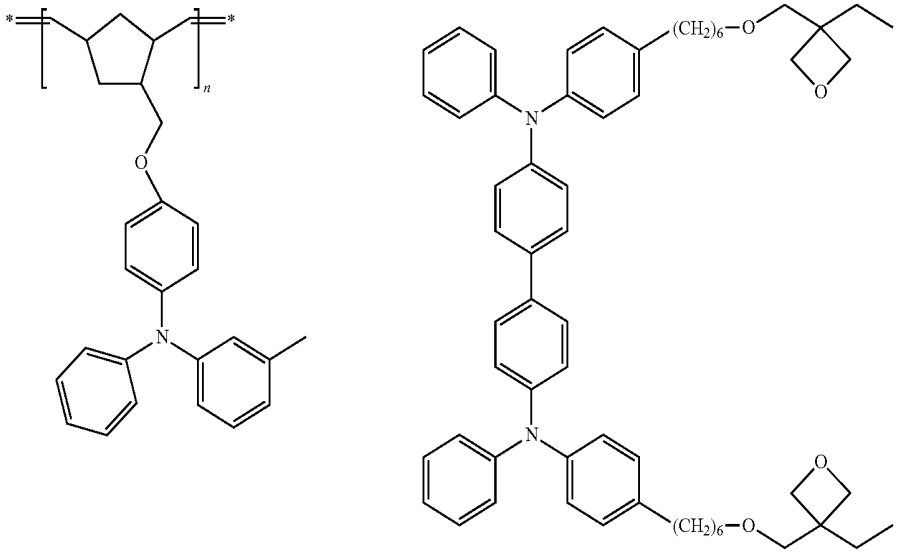

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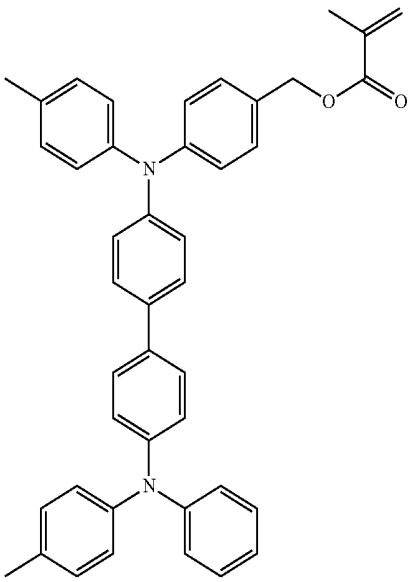

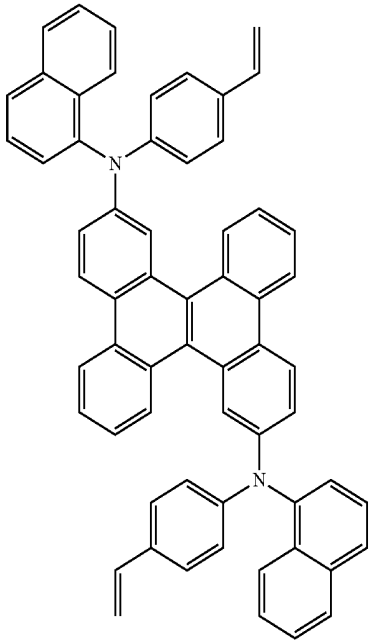

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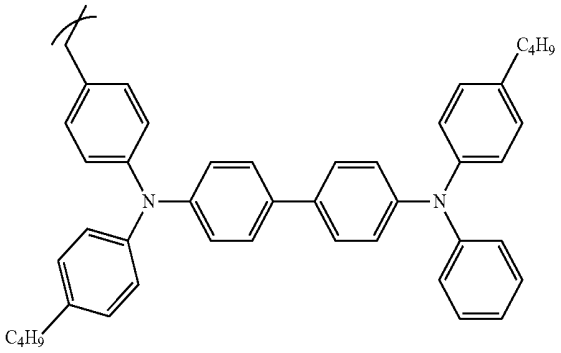

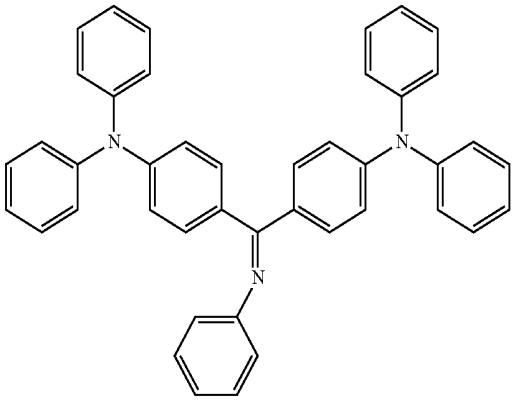

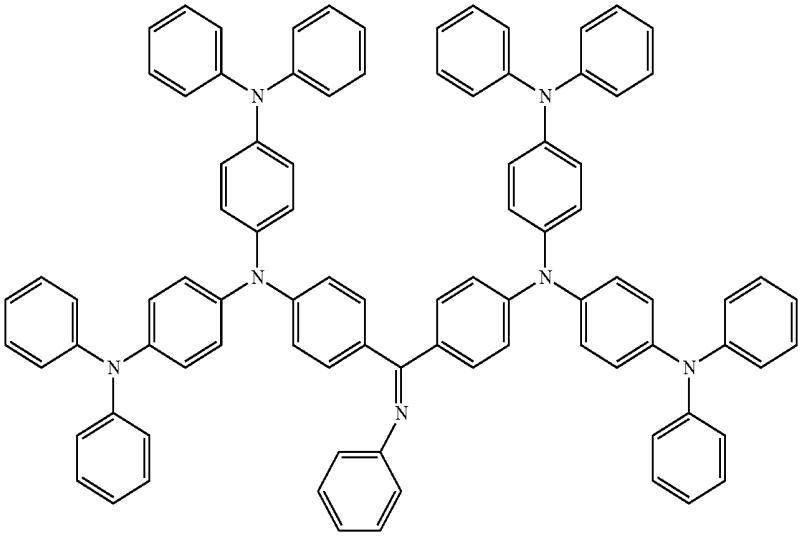

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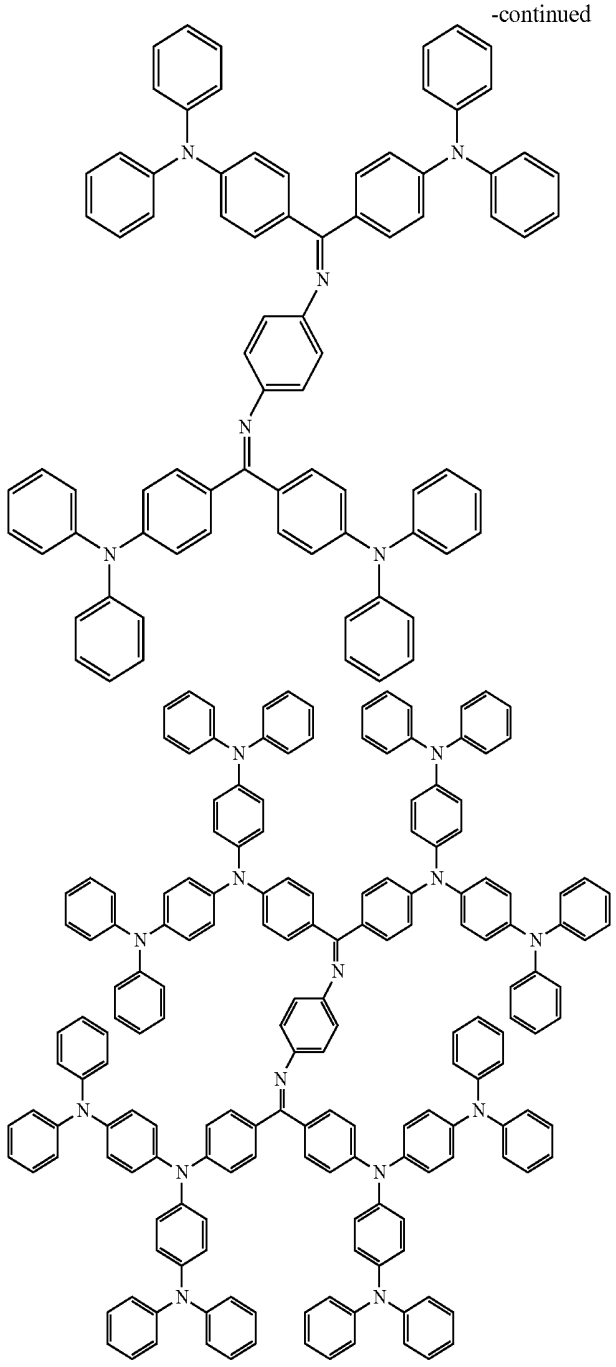
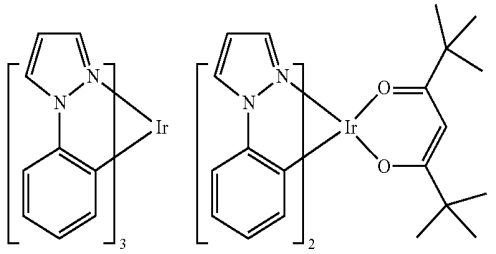


Preferred examples of a compound that may be used as the electron barrier material are shown below.



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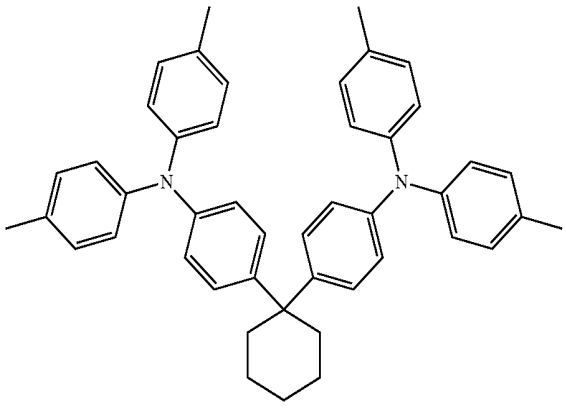

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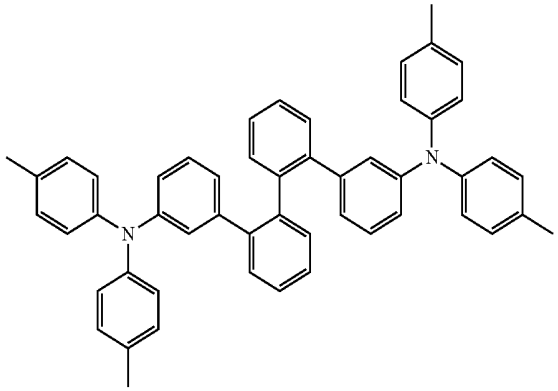
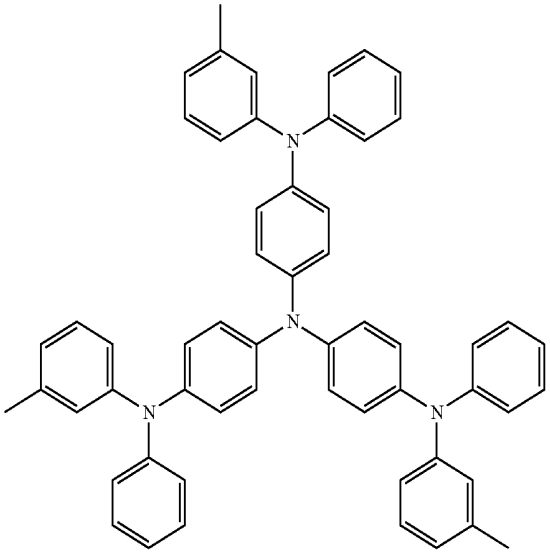
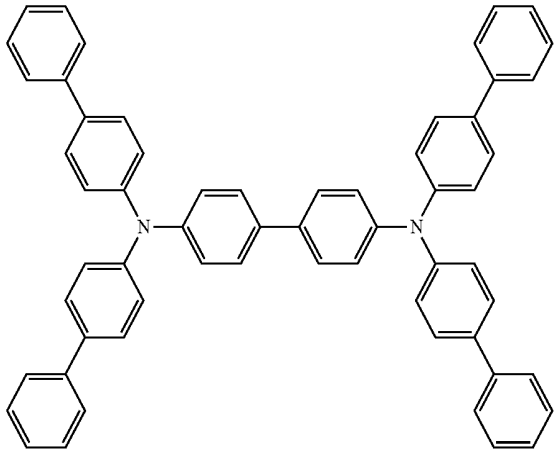
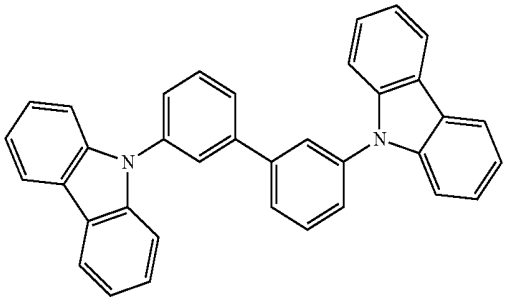
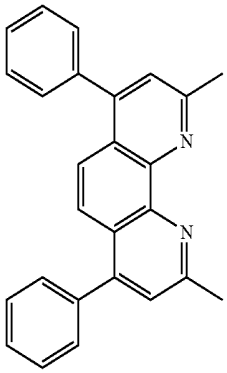


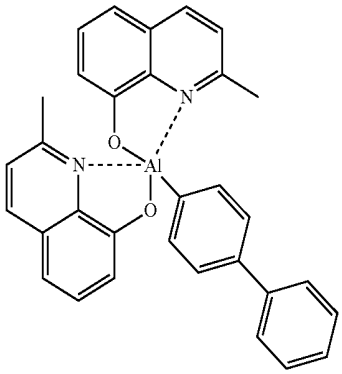


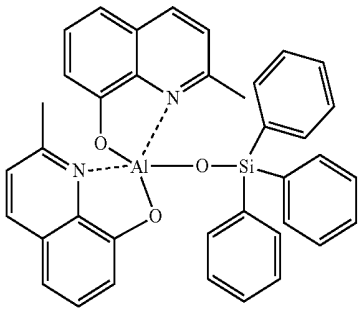


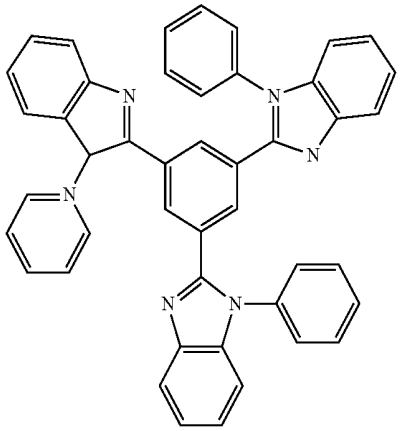


Preferred examples of a compound that may be used as the hole barrier material are shown below.









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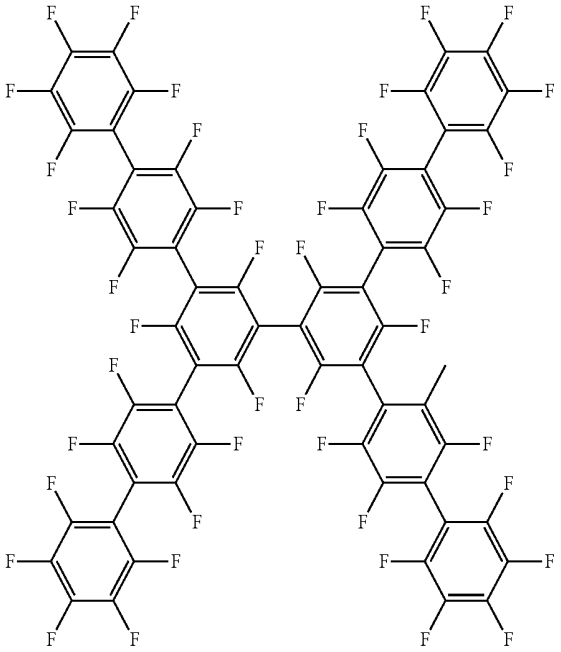

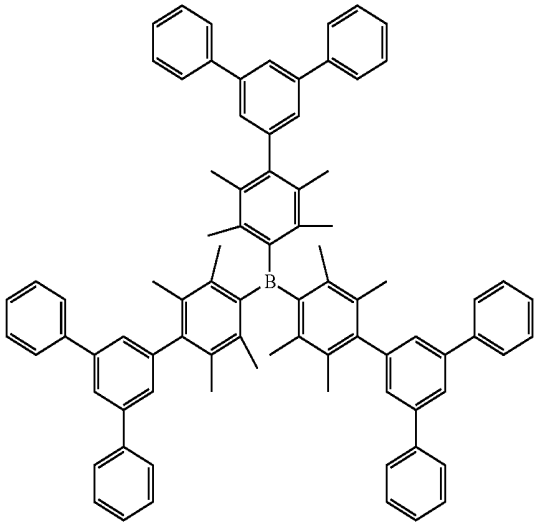

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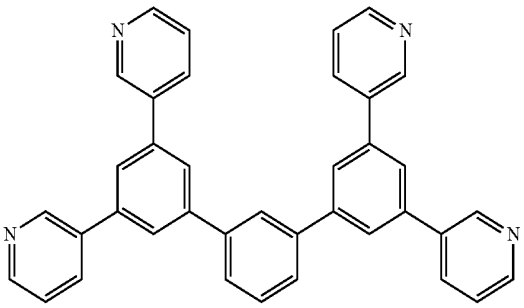
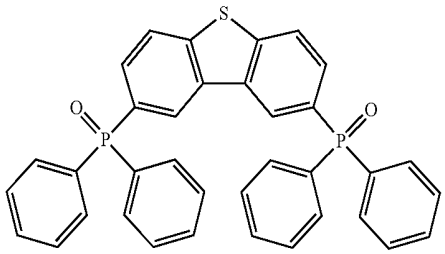
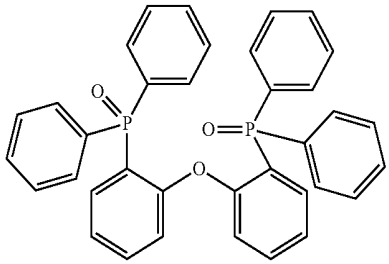
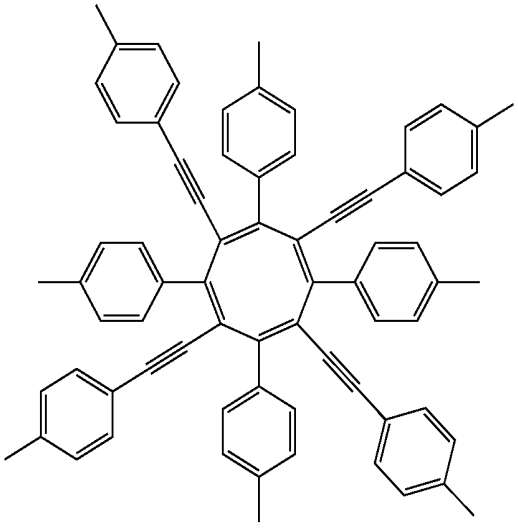






Preferred examples of a compound that may be used as the electron transporting material are shown below.



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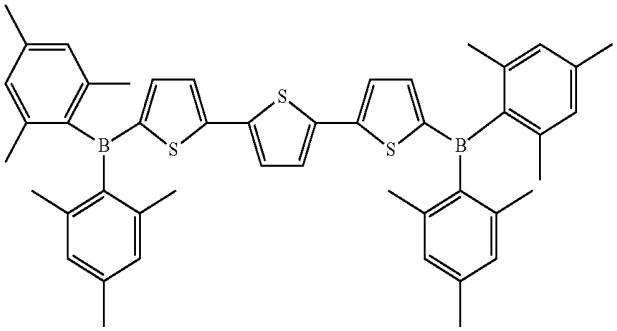

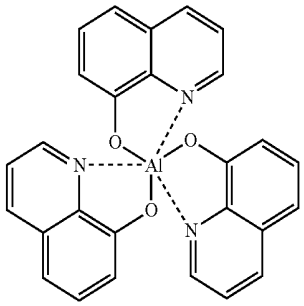

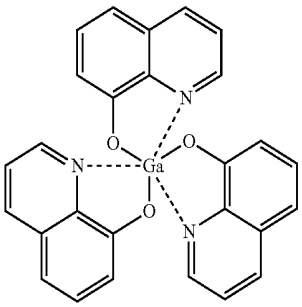

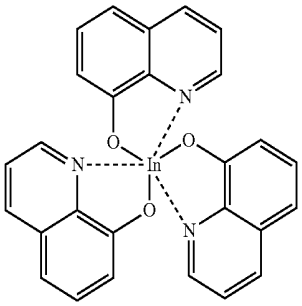

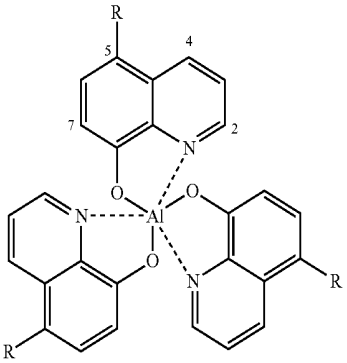

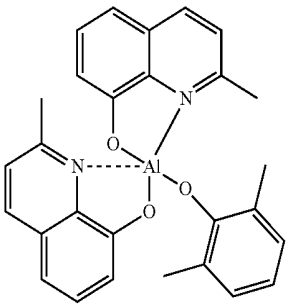

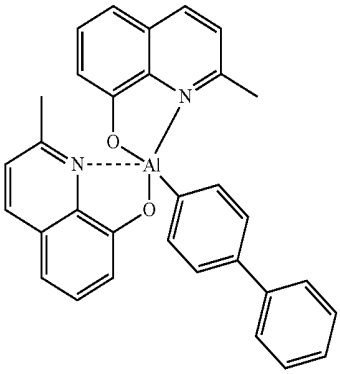

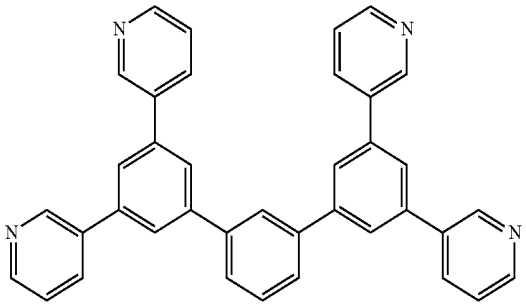

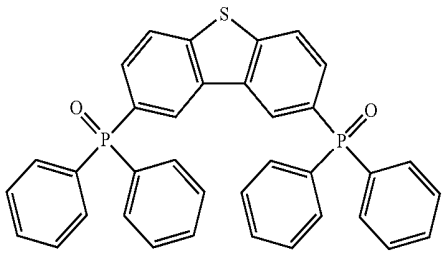

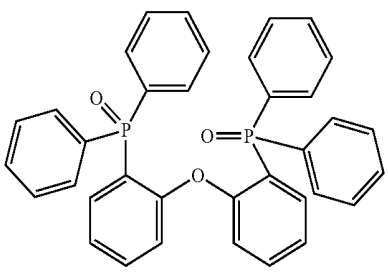

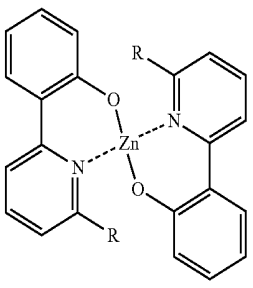

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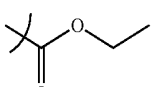

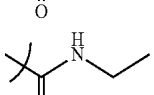

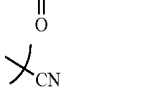

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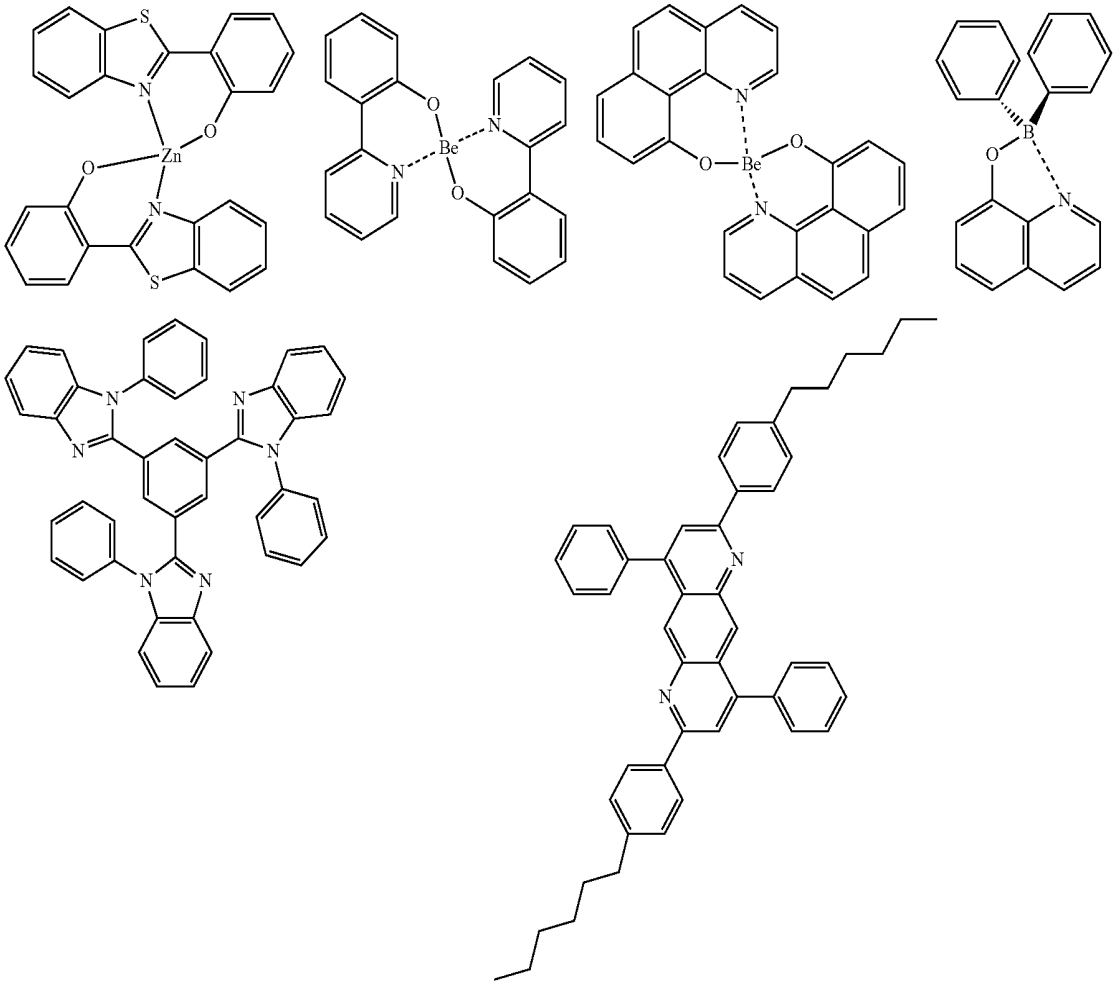

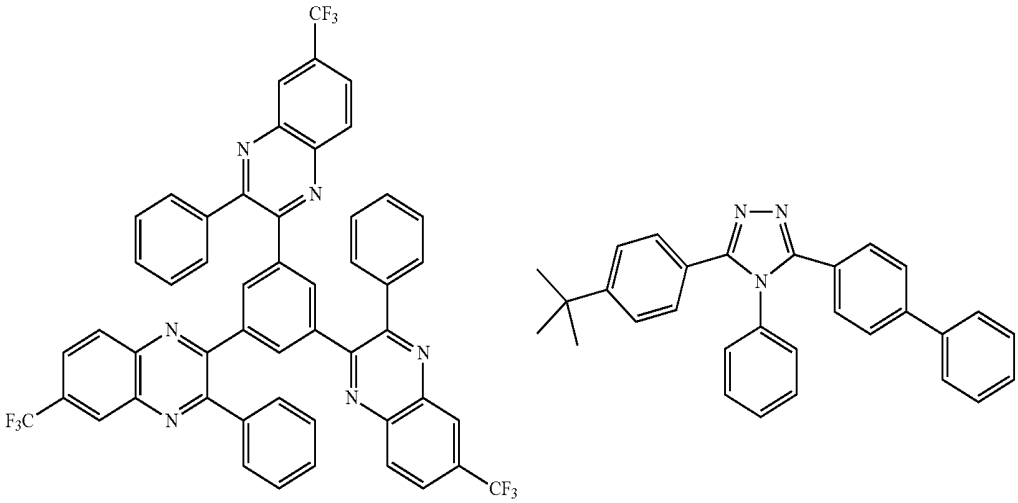

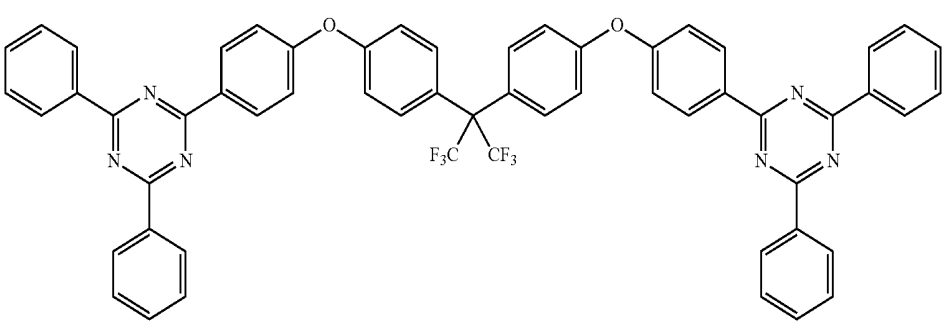

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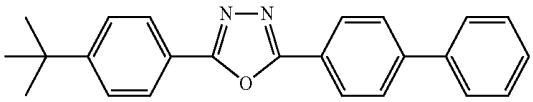

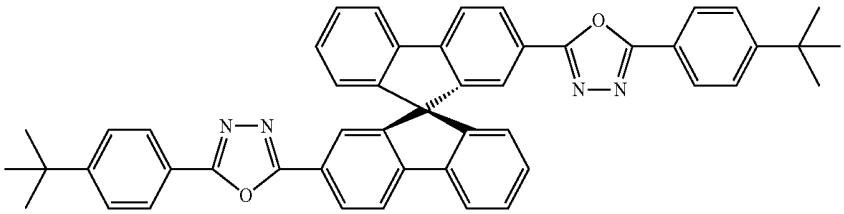

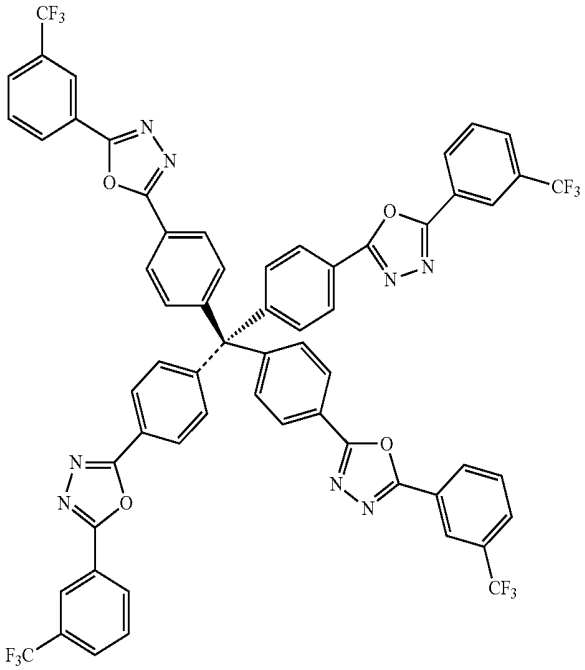

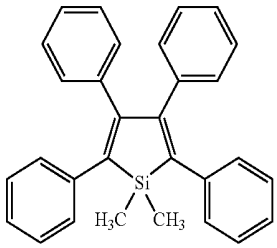

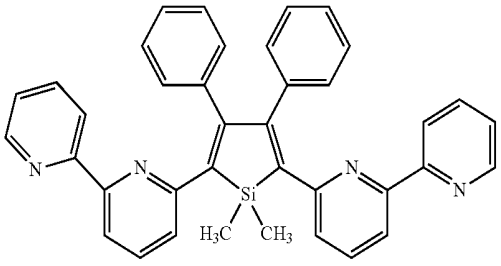

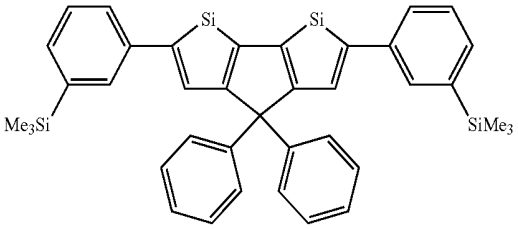

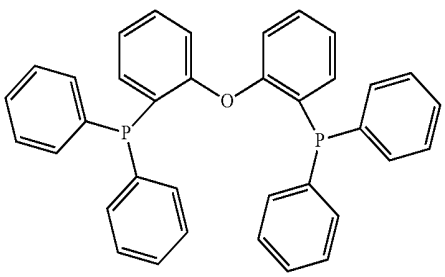

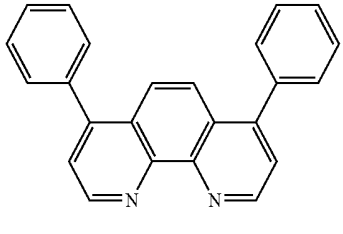

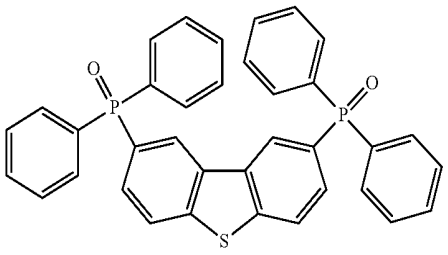

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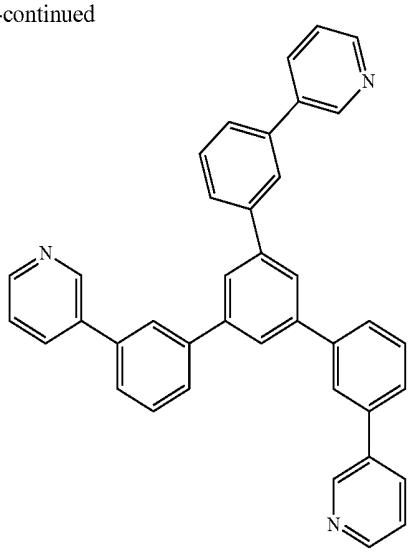
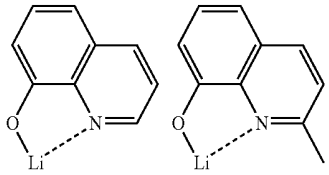
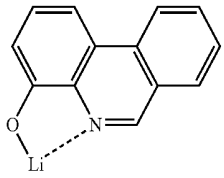
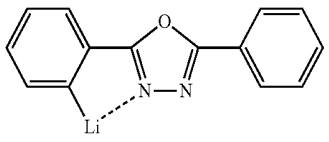


Preferred examples of a compound that may be used as the electron Injection material are shown below.







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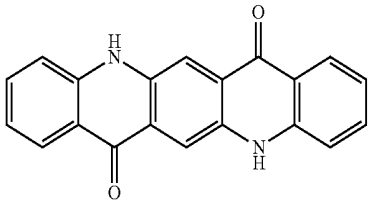
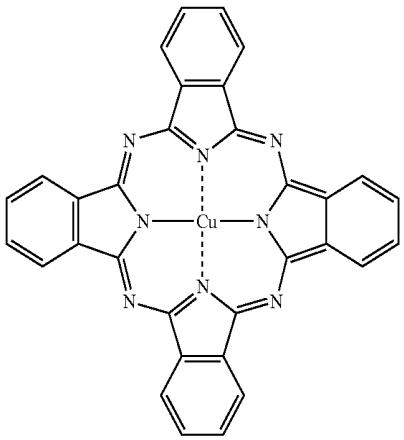
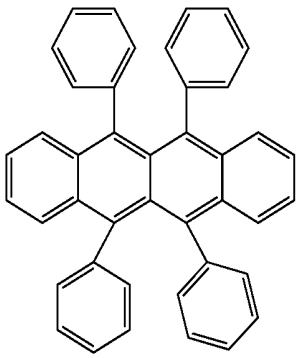
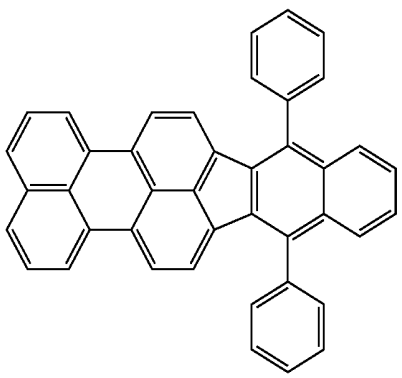




Preferred examples of a compound as a material that may be added are shown below. For example, the compound may be added as a stabilizing material.





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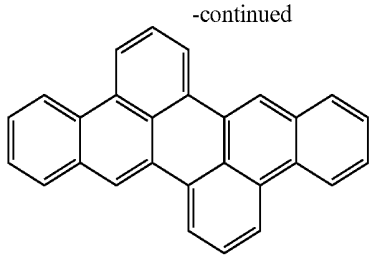


The organic electroluminescent device thus produced by the aforementioned method emits light on application of an electric field between the anode and the cathode of the device. In this case, when the light emission is caused by the excited single energy, light having a wavelength that corresponds to the energy level thereof may be confirmed as fluorescent light and delayed fluorescent light. When the light emission is caused by the excited triplet energy, light hawing a wavelength that corresponds to the energy level thereof may be confirmed as phosphorescent light. The normal fluorescent light has a shorter light emission lifetime than the delayed fluorescent light, and thus the light emission lifetime may be distinguished between the fluorescent light and the delayed fluorescent light.

The organic electroluminescent device of the invention may be applied to any of a single device, a structure with plural devices disposed in an array, and a structure having anodes and cathodes disposed in an X-Y matrix. According to the invention, an organic light emitting device that is largely improved in light emission efficiency may be obtained. The organic light emitting device, such as the organic electroluminescent device, of the invention may be applied to a further wide range of purposes. For example, an organic electroluminescent display apparatus may be produced with the organic electroluminescent, device of the invention, and for the details thereof, reference may be made to S. Tokito, C. Adachi and H. Murata, "Yuki EL Display" (Organic EL Display) (Ohmsha, Ltd.). In particular, the organic electroluminescent device of the invention may be applied to organic electroluminescent illumination and backlight which are highly demanded.

EXAMPLE

The features of the invention will be described more specifically with reference to examples below. The materials, processes, procedures and the like shown below may be appropriately modified unless they deviate from the substance of the invention. Accordingly, the scope of the invention is not construed as being limited to the specific examples shown below. The organic, electroluminescent devices were measured by using Semiconductor Parameter Analyzer (E5273A, produced by Agilent Technologies, Inc.), Optical Power Meter (1930C, produced by Newport Corporation) and Fiber Optic Spectrometer (USB2000, produced by Ocean Optics, Inc.).

Test Example 1

The difference (ΔE_{ST}) between the singlet energy (E_{S1}) and the triplet energy (E_{T1}) of the light emitting materials used in the following examples was obtained in such a manner that the singlet energy (E_{S1}) and the triplet energy (E_{T1}) were measured in the following manners, and the difference (ΔE_{ST}) was obtained by the expression, $\Delta E_{ST}=E_{S1}-E_{T1}$. The measurement results are shown in Table 22.

(1) Singlet Energy E_{S1}

The compound to be measured and DPEPO were vapor-co-deposited to a thickness of 100 nm on a Si substrate to make a concentration of the compound to be measured of 6% by weight, which was designated as a specimen. The specimen was measured for a fluorescent spectrum at ordinary temperature (300 K). The light emission was accumulated from immediately after the incidence of excitation light to 100 nsec after the incidence, thereby providing a fluorescent, spectrum with the fluorescence intensity as the ordinate and the wavelength as the abscissa. In the fluorescent spectrum, the ordinate is the light emission, and the abscissa is the wavelength. A tangent line was drawn for the downfalling part of the light emission spectrum on the short wavelength side, and the wavelength λedge (nm) of the intersection point of the tangent line and the abscissa was obtained. The wavelength value was converted to an energy value according to the following conversion expression to provide the singlet energy E_{S1}.

E_{S1} (eV)=1239.85/λedge Conversion Expression

The light emission spectrum was measured with a nitrogen laser (MNL200, produced by Lasertechnik Berlin GmbH) as an excitation light source and a streak camera (C4334, produced by Hamamatsu Photonics K.K.) as a detector.

(2) Triplet Energy E_{T1}

The same specimen as used for the singlet energy E_{S1} was cooled to 5 K, the specimen for measuring phosphorescent light was irradiated with excitation light (337 nm), and the phosphorescence intensity was measured with a streak camera. The light emission was accumulated from 1 msec after the incidence of excitation light to 10 msec after the incidence of excitation light, thereby providing a phosphorescent spectrum with the phosphorescence intensity as the ordinate and the wavelength as the abscissa. A tangent line was drawn for the upstanding part of the phosphorescent spectrum on the short wavelength side, and the wavelength λedge (nm) of the intersection point of the tangent line and the abscissa was obtained. The wavelength value was converted to an energy value according to the following conversion expression to provide the singlet energy E_{T1}.

E_{T1} (eV)=1239.85/λedge Conversion Expression

The tangent line for the upstanding part of the phosphorescent spectrum on the short wavelength side was drawn in the following manner. Over the range in the phosphorescent spectrum curve of from the short wavelength end to the maximum peak value closest to the short wavelength end among the maximum peak values of the spectrum, a tangent line was assumed while moving within the range toward the long wavelength side. The gradient of the tangent line was increased while the curve was standing up (i.e., the value of the ordinate was increased). The tangent line that was drawn at the point where the gradient thereof became maximum was designated as the tangent line for the upstanding part of the phosphorescent spectrum on the short wavelength side.

A maximum peak having a peak intensity that was 10% or less of the maximum peak point intensity of the spectrum was not included in the maximum peak values and thus was not designated as the maximum peak value closest to the short wavelength end, and the tangent line that was drawn, at the point where the gradient became maximum that was closest to the maximum peak, value closest to the short

wavelength end was designated as the tangent line for the upstanding part of the phosphorescent spectrum on the short wavelength side.

TABLE 22

Light emitting material	ΔE_{ST} (eV)
ZHS02	0.22
2CzPN	0.25
4CzIPN	0.11
4CzTPN-Ph	0.06

Example 1

In this example, a multiple wavelength light emitting organic, electroluminescent device containing light emitting materials of three colors, i.e., a blue light emitting material, a green light emitting material and a red light emitting material, that were mixed in one light emitting layer was produced and evaluated.

Thin films were laminated on a glass substrate having formed thereon an anode formed of indium tin oxide (ITO) having a thickness of 100 nm, by a vacuum vapor deposition method at a vacuum degree of 5×10^{-4} Pa or less. Firstly, α-NPD was formed to a thickness of 35 nm on ITO, and thereon mCBP was formed to a thickness of 10 nm. ZHS02 as a blue light emitting material, 4CzIPN as a green light emitting material and 4CzTPN-Ph as a red light emitting material were vapor-co-deposited from separate vapor deposition sources to form a layer having a thickness of 15 nm, which was designated as a light emitting layer. At this time, the concentrations of 4CzIPN and 4CzTPN-Ph each were 0.1% by weight, and the balance was ZHS02. PPT was then formed to a thickness of 10 nm, TPBi was formed to a thickness of 40 nm, then lithium fluoride (LiF) was vacuum vapor-deposited to a thickness of 0.8 nm, and then aluminum (Al) was vapor-deposited to a thickness of 100 nm to form a cathode, thereby producing an organic electroluminescent device.

The light emission spectrum of the organic electroluminescent device thus produced is shown in FIG. **8**, the electric current density-external quantum efficiency characteristics thereof are shown in FIG. **9**, and the energy band diagram thereof is shown in FIG. **10**. The external quantum efficiency and the chromaticity thereof thus obtained were as shown in Table 23. The light emission intensity ratio was 32% for blue light emission, 49% for green light emission and 19% for red light emission. The intensity ratio of blue light emission was enhanced by the blue delayed fluorescent light, and thereby both favorable blue color and a high light emission efficiency were simultaneously achieved.

Examples 2 to 4

In these examples, multiple wavelength light emitting organic electroluminescent devices each containing light emitting materials of two colors, i.e., a blue light emitting material and a red light emitting material, that were mixed in one light emitting layer at three different concentrations were produced and evaluated.

Thin films were laminated on a glass substrate having formed thereon an anode formed of indium tin oxide (ITO) having a thickness of 100 nm, by a vacuum vapor deposition method at a vacuum degree of 5×10−4 Pa or less. Firstly, α-NPD was formed to a thickness of 35 nm on ITO, and thereon mCBP was formed to a thickness of 10 nm. 2CzPN as a blue light emitting material and 4CzTPN-Ph as a red light emitting material were vapor-co-deposited from separate vapor deposition sources to form a layer having a thickness of 15 nm, which was designated as a light emitting layer. At this time, the concentration of 4CzTPS-Ph was 0.1% by weight (Example 2), 0.2% by weight (Example 3) or 0.5% by weight (Example 4). TmPyPb was then formed to a thickness of 50 nm, then lithium fluoride (LiF) was vacuum vapor-deposited to a thickness of 0.8 nm, and then aluminum (Al) was vapor-deposited to a thickness of 100 nm to form a cathode, thereby producing an organic electroluminescent device.

The light emission spectra of the organic electroluminescent devices thus produced are shown in FIG. **11**, the electric current density-external quantum efficiency characteristics thereof are shown in FIG. **12**, and the energy band diagram thereof is shown in FIG. **13**. The external quantum efficiency and the chromaticity thereof thus obtained were as shown in Table 23. Both favorable blue color and a high light emission efficiency were simultaneously achieved.

Example 5

In this example, a multiple wavelength, light emitting organic electroluminescent device having a light emitting layer containing a blue light emitting material doped with a red light emitting material that was held between light emitting layers each formed only of a blue light emitting material was produced and evaluated.

Thin films were laminated on a glass substrate having formed thereon an anode formed of indium tin oxide (ITO) having a thickness of 100 nm, by a vacuum vapor deposition method at a vacuum degree of 5×10^{-4} Pa or less. Firstly, α-NPD was formed to a thickness of 35 nm on ITO, then mCBP was formed thereon to a thickness of 10 nm, and ZHS02 as a blue light emitting material was formed to a thickness of 7 nm. ZHS02 and 4CzTPN-Ph as a red light emitting material were vapor-co-deposited from separate vapor deposition sources to form a layer having a thickness of 1 nm, which was designated as a light emitting layer. At this time, the concentration of 4CzTPN-Ph was 0.2% by weight. ZHS02 was then formed to a thickness of 7 nm, TmPyPb was formed to a thickness of 50 nm, then lithium fluoride (LiF) was vacuum vapor-deposited to a thickness of 0.8 nm, and then aluminum (Al) was vapor-deposited to a thickness of 100 nm to form a cathode, thereby producing an organic electroluminescent device.

The light emission spectrum of the organic electroluminescent device thus produced is shown in FIG. **14**, the electric current density-external quantum efficiency characteristics thereof are shown in FIG. **15**, and the energy band diagram thereof is shown in FIG. **16**. The external quantum efficiency and the chromaticity thereof thus obtained were as shown in Table 23. Both favorable blue color and a high light emission efficiency were simultaneously achieved.

TABLE 23

	Maximum external quantum efficiency (%)	External quantum efficiency at 10 mA/cm^2 (%)	Voltage at 10 mA/cm^2 (V)	Chromaticity
Example 1	9.5	3.4	9	0.28, 0.41
Example 2	9.7	4.0	8	0.36, 0.51
Example 3	11.1	6.5	7	0.42, 0.50
Example 4	10.5	7.8	7.8	0.47, 0.49
Example 5	10.77	5.5	7	0.37, 0.51

Examples 6 to 8

In these examples, multiple wavelength light emitting organic electroluminescent devices each containing a blue light emitting material, a green light emitting material and a red light emitting material that were all delayed fluorescent materials were produced and evaluated.

Thin films were laminated on a glass substrate having formed thereon an anode formed of indium tin oxide (ITO) having a thickness of 100 nm, by a vacuum vapor deposition method at a vacuum degree of 5×10^{-4} Pa or less. Firstly, HATCN was formed to a thickness of 10 nm on ITO, and thereon TrisPCz was formed to a thickness of 35 nm. PXZ-TRZ as a green light emitting material and mCBP were vapor-co-deposited from separate vapor deposition sources to form a layer having a thickness of 6 nm, which was designated as a first light emitting layer (the concentration of PXZ-TRZ was 10% by weight). Subsequently, PXZ-TRZ, 4CzTPN-Ph as a red light emitting material, and mCBP were vapor-co-deposited from separate vapor deposition sources to form a layer having a thickness of 3 nm, which was designated as a second light emitting layer (the concentration of PXZ-TRZ was 6% by weight, and the concentration of 4CzTPN-Ph was 2% by weight). SHT02 as a blue light emitting material and DPEPO were vapor-co-deposited from separate vapor deposition sources to form a layer having a thickness of 6 nm, which was designated as a third light emitting layer (the concentration of SHT02 was 6% by weight). DPEPO was then formed to a thickness of 10 nm, and TmPyPb was formed to a thickness of 40 nm. Lithium fluoride (LiF) was vacuum vapor-deposited to a thickness of 0.6 nm, and then aluminum (Al) was vapor-deposited to a thickness of 100 nm to form a cathode, thereby producing an organic electroluminescent device A (Example 6).

An organic electroluminescent device B was produced in the same production process as the organic electroluminescent device A except that a PPT layer having a thickness of 10 nm was formed instead of the DPEPO layer having a thickness of 10 nm (Example 7).

An organic electroluminescent device C was produced in the same production process as the organic electroluminescent device A except that the DPEPO layer having a thickness of 10 nm was not formed (Example 8).

The light emission spectra of the organic electroluminescent device A thus produced are shown in FIG. **17**. The chromaticity thereof was 0.31, 0.36. The voltage-electric current density characteristics of the organic electroluminescent devices A to C are shown in FIG. **18**, the electric current density-external quantum efficiency characteristics thereof are shown in FIG. **19**, and the energy band diagram thereof is shown in FIG. **20**. The organic electroluminescent devices A to C exhibited favorable light emission characteristics as a white light emitting device, and the organic electroluminescent device A achieved an external quantum efficiency of 11.8%.

Examples 9 to 11

In these examples, multiple wavelength light emitting organic electroluminescent devices each containing a blue light, emitting material, a green light emitting material and a red light emitting material that were all delayed fluorescent materials with the use of another green light emitting material were produced and evaluated.

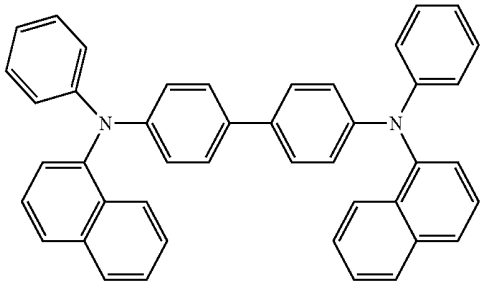
Organic electroluminescent devices D to F were produced in the same production process as the organic electroluminescent device A in Example 6 except that 4CzPN was used as a green light emitting material instead of PXZ-TRZ, and the thicknesses of the first light emitting layer, the second light emitting layer and the third light emitting layer were changed as follows.

Device D: first light emitting layer (6 nm), second light emitting layer (3 nm), third light emitting layer (6 nm)

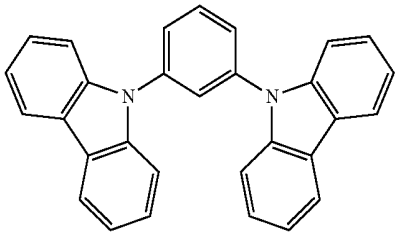
Device E: first light emitting layer (4 nm), second light emitting layer (3 nm), third light emitting layer (8 nm)

Device F: first light emitting layer (3 nm), second light emitting layer (2 nm), third light emitting layer (15 nm)

The light emission spectra of the organic electroluminescent devices D to F thus produced are shown in FIG. **21**. The chromaticity of the organic electroluminescent light emitting device F was 0.30, 0.39. The voltage-electric current density characteristics of the organic electroluminescent devices D to F are shown in FIG. **22**, and the electric current density-external quantum efficiency characteristics thereof are shown in FIG. **23**. The organic electroluminescent device F exhibited favorable light emission characteristics as a white light emitting device and achieved an external, quantum efficiency of 12.1%.

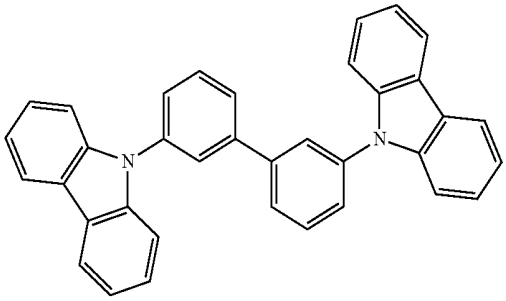


a-NPD

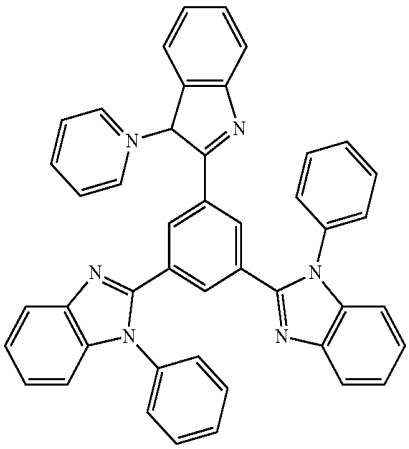


mCP

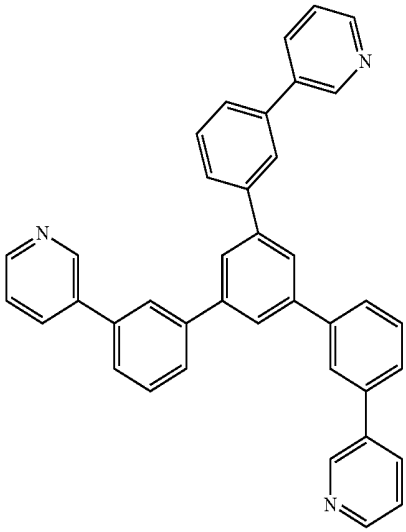
-continued



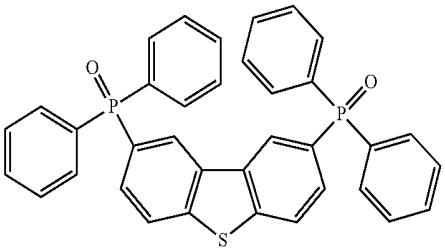
mCBP



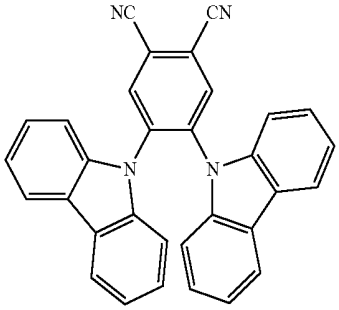
TPBii



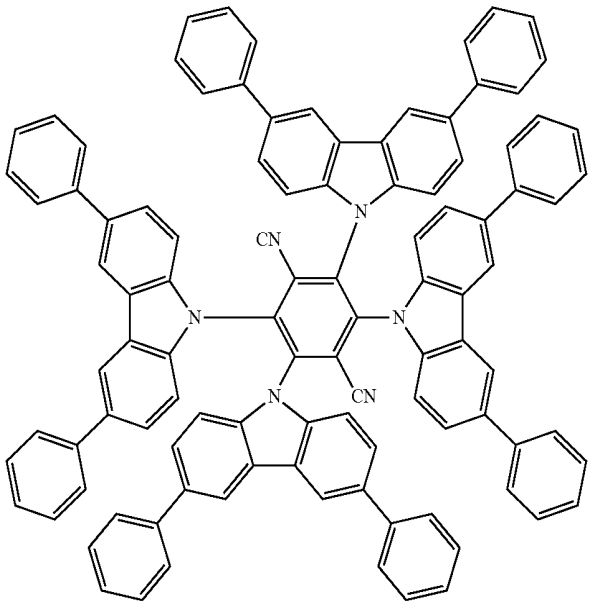
TmPyPb



PPT



2CzPN



4CzTPN-Ph

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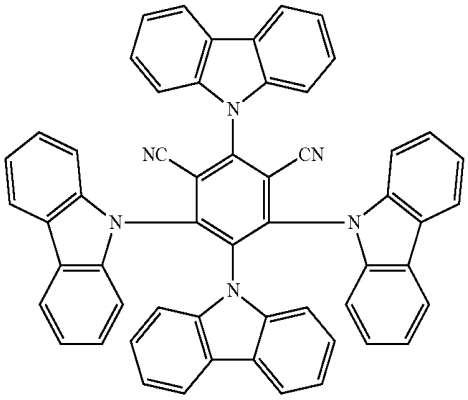
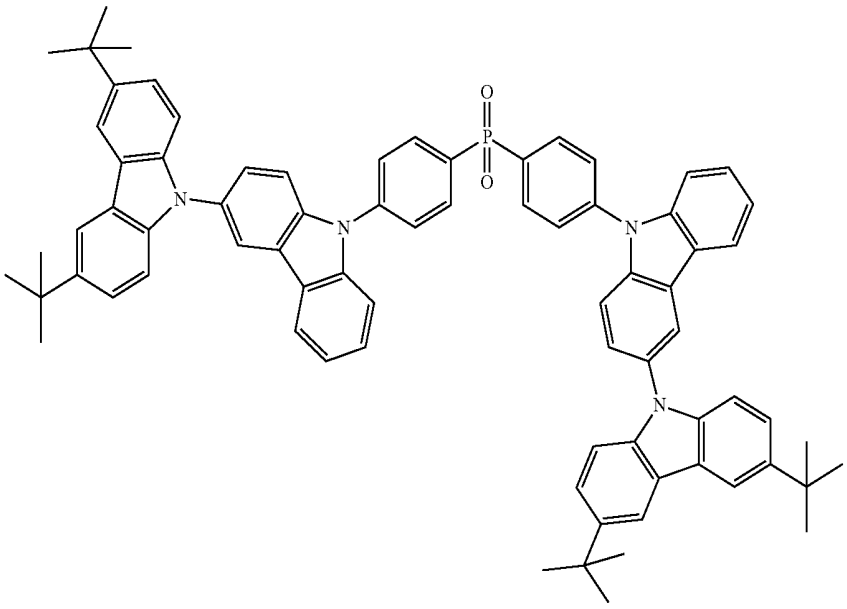
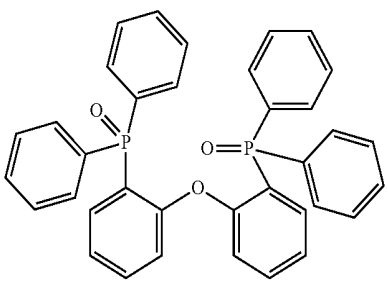


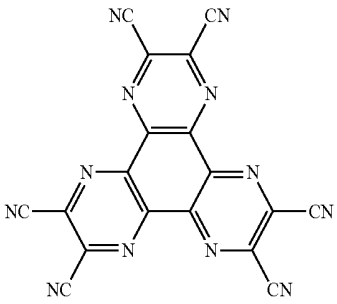
4CzlPN



ZHSO2



DPEPO



HATCN

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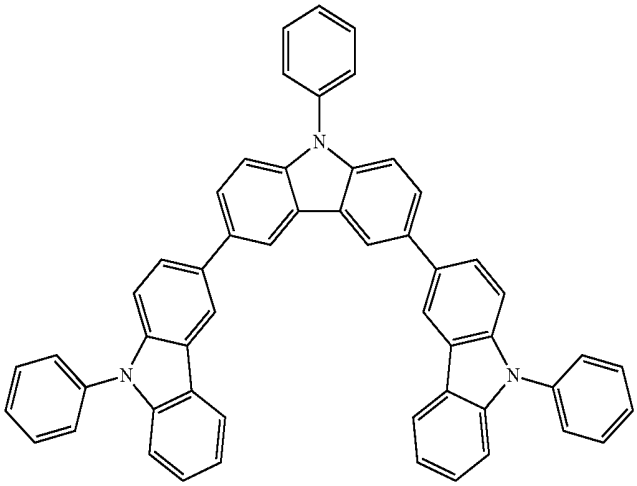
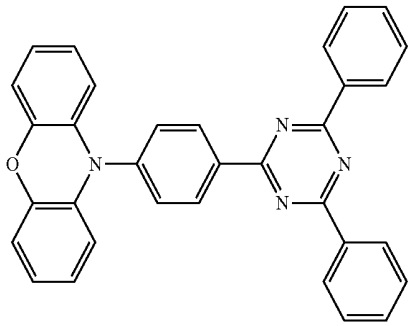
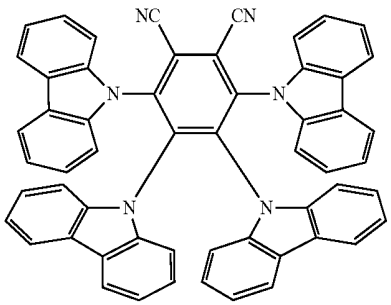


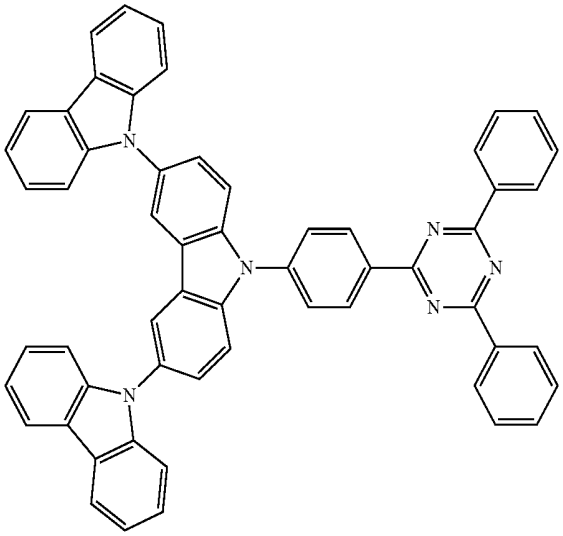
TrisPCz



PXA-TRZ



4CzPN



SHT02

INDUSTRIAL APPLICABILITY

The organic electroluminescent device of the invention is designed in such a manner that in the light emitted from the plural light emitting materials contained in the device, the light that has the shortest wavelength contains delayed fluorescent light. According to the design, the color tone of the device is improved through the enhancement of the light emission efficiency of light having a relatively short wavelength, such as blue light. The organic electroluminescent device of the invention has a large degree of freedom in design to achieve a simple structure, and thereby the intended multiple wavelength light emitting organic electroluminescent device may be produced. Therefore, the invention has high industrial applicability.

REFERENCE SIGNS LIST

1 substrate
2 anode
3 hole injection layer
4 hole transporting layer
5 light emitting layer
6 electron transporting layer
7 electron injection layer
8 cathode

The invention claimed is:

1. An organic electroluminescent device containing a cathode, an anode, and one or more organic layers that include at least one light emitting layer containing plural light emitting materials between the cathode and the anode, provided that when two or more light emitting layers exist, they are laminated to each other, wherein the organic electroluminescent device is a multiple wavelength light emitting organic electroluminescent device emitting light from the plural light emitting materials, which satisfies the following A, B and C:

A. all light emitting materials contained in the layers between the cathode and anode are fluorescent materials,

B. in the light thus emitted from the light emitting materials, light that has the shortest wavelength contains delayed fluorescent light, and

C. the light emitting material that emits light having the shortest wavelength also functions as a host material of another light emitting material; or one of the organic

layers consists of only the material that emits light having the shortest wavelength.

2. The organic electroluminescent device according to claim 1, wherein the light emitting material that emits light having the shortest wavelength has an energy difference (ΔE_{ST}) between the lowest excitation triplet energy level and the lowest excitation singlet energy level at 5 L of 0.3 eV or less.

3. The organic electroluminescent device according to claim 1, wherein the light emitting material that emits light having the shortest wavelength is a blue light emitting material.

4. The organic electroluminescent device according to claim 1, wherein the light emitting material that emits light having the shortest wavelength has a light emission intensity of more than 20% based on the total light emission.

5. The organic electroluminescent device according to claim 1, wherein one of the organic layers contains the light emitting material that emits light having the shortest wavelength and at least one kind of a light emitting material that emits light having a different wavelength, and the light emitting material that emits light having the shortest wavelength also functions as a host material.

6. The organic electroluminescent device according to claim 1, wherein one of the organic layers contains the light emitting material that emits light having the shortest wavelength and at least two kinds of light emitting materials that each emit light having a different wavelength, and the light emitting material that emits light having the shortest wavelength also functions as a host material.

7. The organic electroluminescent device according to claim 1, wherein one of the organic layers consists of only the material that emits light having the shortest wavelength.

8. The organic electroluminescent device according to claim 1, wherein the organic electroluminescent device contains two or more layers each containing a light emitting material, and among the layers, a layer that is the closest to the cathode and a layer that is the closest to the anode each contain the light emitting material that emits light having the shortest wavelength.

9. The organic electroluminescent device according to claim 8, wherein the organic electroluminescent device contains a layer that contains the light emitting material that emits light having the shortest wavelength as a host material between the layer that is the closest to the cathode and the layer that is the closest to the anode.

10. The organic electroluminescent device according to claim 1, wherein the organic electroluminescent device contains a layer containing a blue light emitting material doped with a green light emitting material or a red light emitting material.

11. The organic electroluminescent device according to claim 1, wherein the organic electroluminescent device contains a laminate of a layer containing a blue light emitting material, a layer containing a blue light emitting material doped with a green light emitting material or a red light emitting material, and a layer containing a blue light emitting material.

12. The organic electroluminescent device according to claim 1, wherein the plural light emitting materials contain a blue light emitting material, a green light emitting material, and a red light emitting material.

13. The organic electroluminescent device according to claim 1, wherein the organic electroluminescent device contains a layer containing a blue light emitting material doped with a green light emitting material and a red light emitting material.

14. The organic electroluminescent device according to claim 1, wherein the organic electroluminescent device contains a laminate of a layer containing a green light emitting material, a layer containing a green light emitting material doped with a red light emitting material, and a layer containing a blue light emitting material.

15. The organic electroluminescent device according to claim 1, wherein all the plural light emitting materials emit delayed fluorescent light.

16. The organic electroluminescent device according to claim 1, wherein the organic electroluminescent device emits white light through color mixing of light emitted from the plural light emitting materials.

17. The organic electroluminescent device according to claim 1, wherein the light emitting material that emits light having the shortest wavelength also functions as a host material of another light emitting material; or one of the organic layers consists of only the material that emits light having the shortest wavelength and among the layers containing a light emitting material, a layer that is the closest to the anode is a layer containing the light emitting material that emits light having the shortest wavelength.

* * * * *

专利名称(译)	包含延迟的荧光材料的有机电致发光器件		
公开(公告)号	US10600983	公开(公告)日	2020-03-24
申请号	US14/781083	申请日	2014-03-28
[标]申请(专利权)人(译)	国立大学法人九州大学		
申请(专利权)人(译)	九州大学国立大学法人		
当前申请(专利权)人(译)	KYULUX，INC.		
[标]发明人	NISHIDE JUNICHI MASUI KENSUKE NAKANOTANI HAJIME ADACHI CHIHAYA		
发明人	NISHIDE, JUNICHI MASUI, KENSUKE NAKANOTANI, HAJIME ADACHI, CHIHAYA		
IPC分类号	H01L51/50 H01L51/00		
CPC分类号	H01L51/5036 H01L51/5028 H01L51/504 H01L51/005 H01L51/0071 H01L51/0072 H01L51/5092 H01L51/5096 H01L51/5072 H01L51/0058 H01L51/006 H01L51/0067 H01L51/0074 H01L51/5024 H01L51/5056 H01L51/5088		
审查员(译)	艾哈迈迪MOHSEN		
优先权	2013074419 2013-03-29 JP		
其他公开文献	US20160329512A1		
外部链接	Espacenet		

摘要(译)

一种有机电致发光器件，其包含阴极，阳极以及在该阴极和阳极之间包含一个或多个有机材料的一个或多个有机层，其中该有机电致发光器件是多波长发光有机电致发光器件，其发射来自多个发光体的光。 如此设计的材料，使得具有最短波长的光包含延迟的荧光，可以提高短波长光和色调的发光效率，并且在设计上具有很大的自由度，并且结构简单。