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(54) Title: A NOVEL COMBINATION OF A HOST COMPOUND AND A DOPANT COMPOUND AND AN ORGANIC ELECTROLUMINESCENCE DEVICE COMPRISING THE SAME

(57) Abstract: The present invention relates to a specific combination of a dopant compound and a host compound, and an organic electroluminescent device comprising the same. The organic electroluminescent device of the present invention emits yellow-green light; lowers the driving voltage of the device by improving the current characteristic of the device; and improves power efficiency and operational lifespan.

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Description

Title of Invention: A NOVEL COMBINATION OF A HOST COMPOUND AND A DOPANT COMPOUND AND AN ORGANIC ELECTROLUMINESCENCE DEVICE COMPRISING THE SAME

Technical Field

[1] The present invention relates to a novel combination of a host compound and a dopant compound and an organic electroluminescence device comprising the same.

Background Art

[2] An electroluminescent (EL) device is a self-light-emitting device which has advantages in that it provides a wider viewing angle, a greater contrast ratio, and a faster response time compared to LCDs. An organic EL device was first developed by Eastman Kodak, by using small aromatic diamine molecules, and aluminum complexes as materials for forming a light-emitting layer [Appl. Phys. Lett. 51, 913, 1987].

[3] The most important factor determining luminous efficiency in an organic EL device is the light-emitting material. The electroluminescent material includes a host material and a dopant material for purposes of functionality. Typically, a device that has very superior electroluminescent properties is known to have a structure in which a host is doped with a dopant to form an electroluminescent layer. Recently, the development of an organic EL device having high efficiency and long lifespan is being urgently called for. Particularly, taking into consideration the electroluminescent properties required of medium to large OLED panels, the development of materials very superior to conventional electroluminescent materials is urgent. In order to achieve such, a host material which functions as the solvent in a solid phase and plays a role in transferring energy should be of high purity and must have a molecular weight appropriate to enabling vacuum deposition. Also, the glass transition temperature and heat decomposition temperature should be high to ensure thermal stability, and high electrochemical stability is required to attain a long lifespan, and the formation of an amorphous thin film should become simple, and the force of adhesion to materials of other adjacent layers must be good but interlayer migration should not occur.

[4] Until now, fluorescent materials have been widely used as a light-emitting material. However, in view of electroluminescent mechanisms, developing phosphorescent materials is one of the best methods to theoretically enhance luminous efficiency by four (4) times. Iridium(III) complexes have been widely known as dopant compounds of phosphorescent substances, including

bis(2-(2'-benzothienyl)-pyridinato-N,C3')iridium(acetylacetonate) [(acac)Ir(btp)$_2$], tris(2-phenylpyridine)iridium [Ir(ppy)$_3$] and bis(4,6-difluorophenylpyridinato-N,C2)picolinato iridium [Firpic] as red, green and blue materials, respectively. Until now, 4,4'-N,N'-dicarbazol-biphenyl (CBP) was the most widely known host material for phosphorescent substances. Further, an organic EL device of high efficiency using bathocuproine (BCP) and aluminum(III)bis(2-methyl-8-quinolinate)(4-phenylphenolate) (BAlq) for a hole blocking layer is also known.

[5] However, there were problems affecting power efficiency, operational life span, and luminous efficiency, when applying a light-emitting material comprising conventional dopant and host compounds to an organic EL device. Further, there were difficulties with obtaining a yellow-green light emitting luminous material having excellent performance.

[6] Korean Patent Appln. Laying-Open No. KR 10-2012-0012431 A discloses combinations of iridium complex dopant compounds, and various host compounds. However, this reference does not disclose a luminous material emitting yellow-green light.

[7] The present inventors found that a specific combination of a luminous material containing a dopant compound and a host compound emits yellow-green light, and is suitable for manufacturing organic EL devices having high color purity, high luminance, and a long lifespan.

Disclosure of Invention

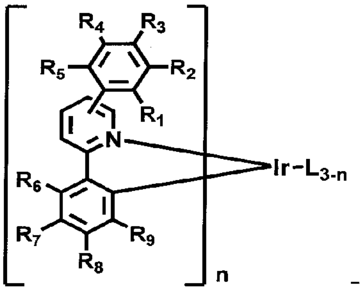
Technical Problem

[8] The objective of the present invention is to provide a novel combination of a dopant compound and a host compound, and an organic electroluminescent device comprising the same which lowers the driving voltage of the device by improving the current characteristic of the device; improves power efficiency and operational lifespan; and emits yellow-green light.

Solution to Problem

[9] In order to achieve said purposes, the present invention provides a combination of one or more dopant compounds represented by the following formula 1, and one or more host compounds represented by the following formula 2:

[10]

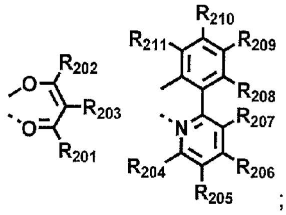


------- (1)

[11] wherein

[12] L is selected from the following structures:

[13]



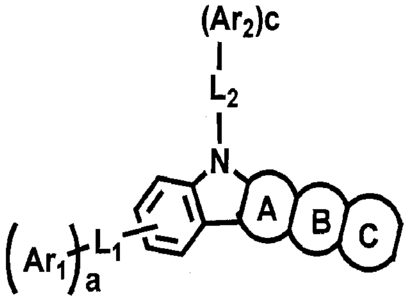
;

[14] Ri to R_9 each independently represent hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (C3-C30)cycloalkyl, a cyano, or a substituted or unsubstituted (Cl-C30)alkoxy;

[15] R_{201} to R_{211} each independently represent hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, or a substituted or unsubstituted (C3-C30)cycloalkyl; and

[16] n represents an integer of 1 to 3;

[17]



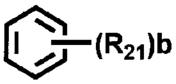
------- (2)

[18] wherein

[19] ring A and ring C each independently represent an aromatic ring represented by the following formula la;

[20] ring B represents a 5-membered ring represented by the following formula lb;

[21]



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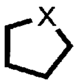
[22]



--------- (1b)

[23] L_1 and L_2 each independently represent a single bond, a substituted or unsubstituted

(C6-C30)arylene, or a substituted or unsubstituted 5- to 30- membered heteroarylene;

[24] Ar_1 and Ar_2 each independently represent hydrogen, deuterium, a halogen, a cyano, a nitro, a hydroxyl, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (Cl-C30)alkoxy, a substituted or unsubstituted (C3-C30)cycloalkyl, a substituted or unsubstituted (C6-C30)aryl, a substituted or unsubstituted tri(Cl-C30)alkylsilyl, a substituted or unsubstituted tri(C6-C30)arylsilyl, or a substituted or unsubstituted 5- to 30-membered heteroaryl; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from nitrogen, oxygen and sulfur;

[25] R_2i represents hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (C6-C30)aryl, a substituted or unsubstituted 5- to 30-membered heteroaryl, -NRnRi $_2$-, -$SiRi_3R_{14}R_{15}$-; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from nitrogen, oxygen and sulfur;

[26] X represents -0-, -S-, -N(R_{22})-, -C($R_{23}R_{24}$)- or -Si($R_{25}R_{26}$)-;

[27] R_{11} to R_{15} and R_{22} to R_{26} each independently represent hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (C6-C30)aryl, or a substituted or unsubstituted 5- to 30-membered heteroaryl; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from nitrogen, oxygen and sulfur;

[28] a and c each independently represent an integer of 0 to 4; where a or c is an integer of 2 or more, each of Ar_1, and each of Ar_2 are same or different; and

[29] b represents an integer of 0 to 2; where b is 2, each of R_{21} are same or different.

Advantageous Effects of Invention

[30] The organic electroluminescent device comprising the dopant and host combination of the present invention emits yellow-green light; lowers the driving voltage of the device by improving the current characteristic of the device; and improves power efficiency and operational lifespan.

Mode for the Invention

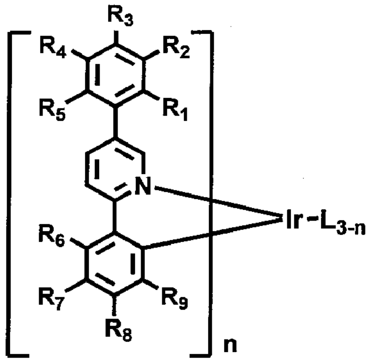
[31] Hereinafter, the present invention will be described in detail. However, the following description is intended to explain the invention, and is not meant in any way to restrict the scope of the invention.

[32] The present invention relates to a combination of one or more dopant compounds represented by formula 1, and one or more host compounds represented by formula 2;

and an organic electroluminescent device comprising the same.

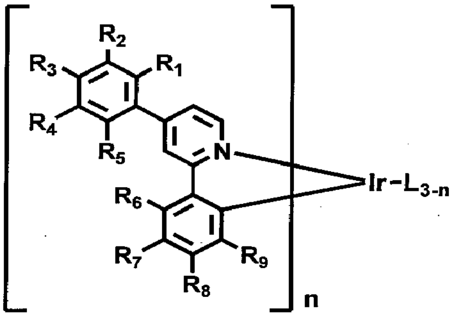
[33] The dopant compound represented by formula 1 is preferably represented by formula 3 or 4:

[34]



---------- (3)

[35]



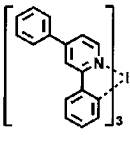
---------- (4)

[36] wherein Ri to R_9, L, and n are as defined in formula 1.

[37] In formulae 1, 3, and 4, Ri to R_9 preferably each independently represent hydrogen, deuterium, a (Cl-ClO)alkyl unsubstituted or substituted with a halogen, an unsubstituted (C3-C7)cycloalkyl, or a (Cl-ClO)alkoxy unsubstituted or substituted with a halogen. R_{20}i to R_2n preferably each independently represent hydrogen, or an unsubstituted (Cl-ClO)alkyl.

[38] The representative compounds of formula 1 include the following compounds, but are not limited thereto:

[39]



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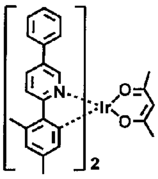

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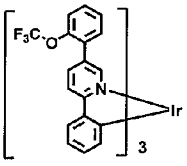

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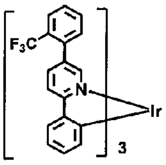

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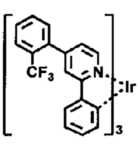

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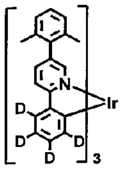

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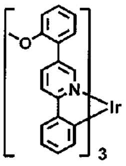

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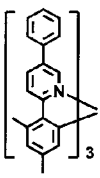

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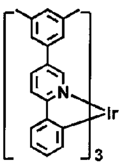

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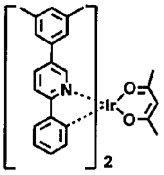

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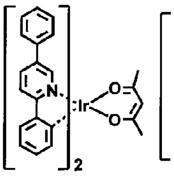

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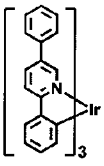

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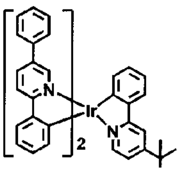

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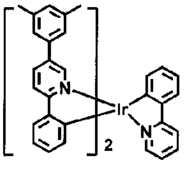

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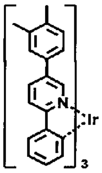
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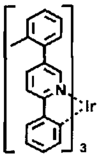
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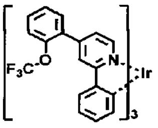
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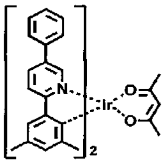
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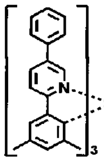
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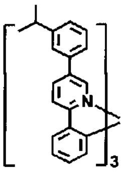
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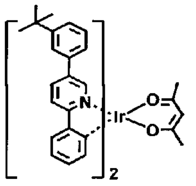
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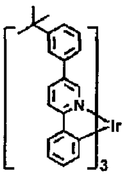
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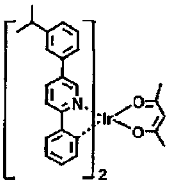
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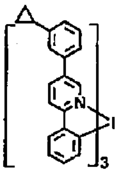
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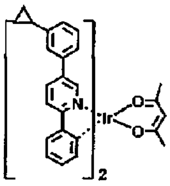
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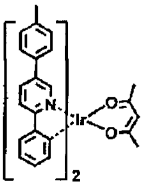
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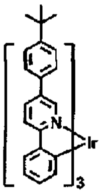
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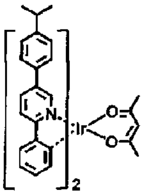
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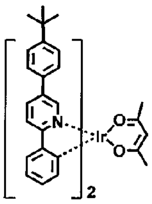
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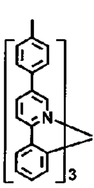
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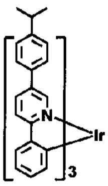
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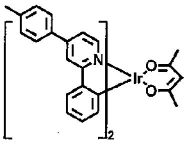
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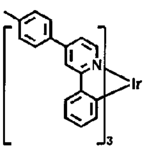
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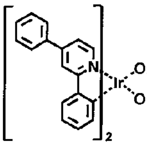
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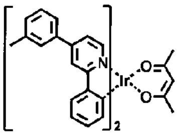
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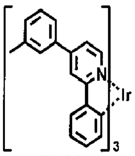
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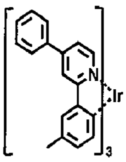
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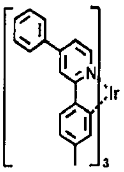
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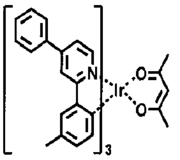
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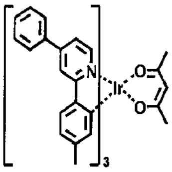
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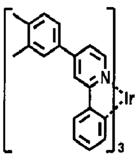
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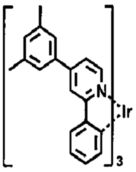
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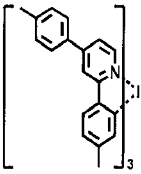
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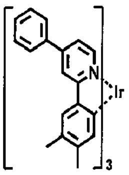
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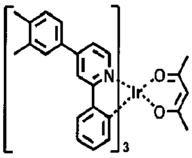
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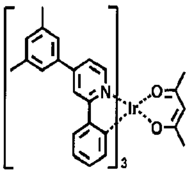
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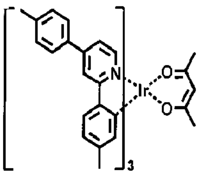
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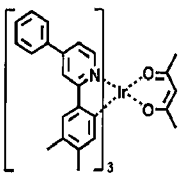
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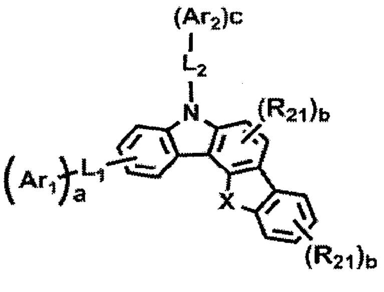
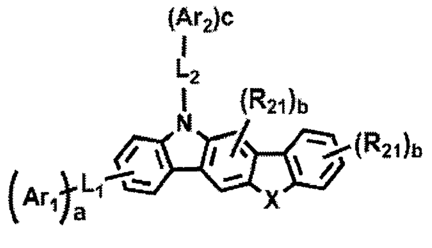
[46] The host compound represented by formula 2 is preferably selected from formulae 5 to 10:

[47]



---------- (5)

[48]



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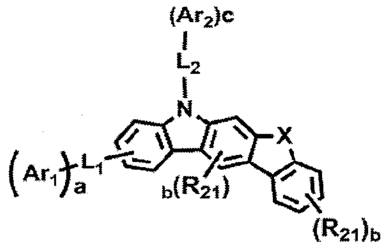
[49] 

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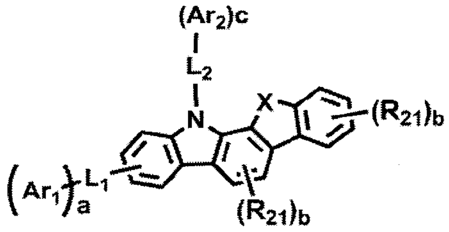
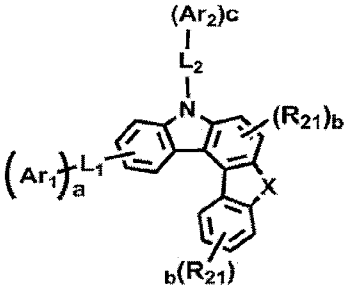
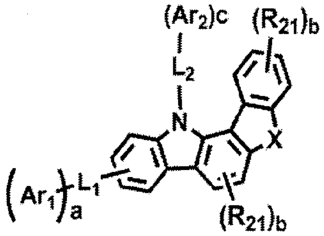
[50] 

---------- (8)

[51] 

---------- (9)

[52] 

---------- (10)

[53] wherein Li, L_2, Ar_1, Ar_2, R_{21}, X, a, b and c are as defined in formula 2.

[54] In formulae 2, and 5 to 10, L_1 and L_2 each independently represent a single bond, a substituted or unsubstituted (C6-C30)arylene, or a substituted or unsubstituted 5- to 30-membered heteroarylene, preferably each independently represent a single bond, a substituted or unsubstituted (C6-C20)arylene, or a substituted or unsubstituted 5- to 22-memebered heteroarylene, and more preferably each independently represent a single bond, a (C6-C20)arylene unsubstituted or substituted with a (Cl-C6)alkyl, or an unsubstituted 5- to 22-memebered heteroarylene.

[55] Ari and Ar_2 each independently represent hydrogen, deuterium, a halogen, a cyano, a nitro, a hydroxyl, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (Cl-C30)alkoxy, a substituted or unsubstituted (C3-C30)cycloalkyl, a substituted or unsubstituted (C6-C30)aryl, a substituted or unsubstituted tri(Cl-C30)alkylsilyl, a substituted or unsubstituted tri(C6-C30)arylsilyl, or a substituted or unsubstituted 5- to 30-membered heteroaryl; or are linked to an adjacent

substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from nitrogen, oxygen and sulfur, preferably each independently represent hydrogen, a substituted or unsubstituted (Cl-C6)alkyl, a substituted or unsubstituted (C6-C20)aryl, a substituted or unsubstituted tri(Cl-C6)alkylsilyl, a substituted or unsubstituted tri(C6-C12)arylsilyl, or a substituted or unsubstituted 5- to 22-membered heteroaryl, and more preferably each independently represent hydrogen; an unsubstituted (Cl-C6)alkyl; a (C6-C20)aryl unsubstituted or substituted with a (Cl-C6)alkyl or a (C6-C20)aryl; an unsubstituted tri(Cl-C6)alkylsilyl; an unsubstituted tri(C6-C12)arylsilyl; or an unsubstituted 5- to 22-membered heteroaryl.

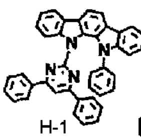
[56] R_2i represents hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (C6-C30)aryl, a substituted or unsubstituted 5- to 30-membered heteroaryl, -NRnRi $_2$, -SiRi$_3$R$_{14}$R$_{15}$; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from nitrogen, oxygen and sulfur, preferably represents hydrogen, a substituted or unsubstituted (C6-C20)aryl, or a substituted or unsubstituted 5- to 22-membered heteroaryl, and more preferably represents hydrogen; an unsubstituted (C6-C20)aryl; or a 5- to 22-membered heteroaryl unsubstituted or substituted with a (C6-C20)aryl.

[57] X represents -0-, -S-, -N(R_{22})-, -C(R_{23})(R_{24})- or -Si(R_{25})(R_{26})-.

[58] R_{11} to R_{15} and R_{22} to R_{26} each independently represent hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (C6-C30)aryl, or a substituted or unsubstituted 5- to 30-membered heteroaryl; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from nitrogen, oxygen and sulfur, preferably each independently represent hydrogen, a substituted or unsubstituted (Cl-C6)alkyl, a substituted or unsubstituted (C6-C20)aryl, or a substituted or unsubstituted 5- to 22-membered heteroaryl; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring, and more preferably each independently represent hydrogen; an unsubstituted (Cl-C6)alkyl; an unsubstituted (C6-C20)aryl; a 5- to 22-membered heteroaryl unsubstituted or substituted with a (C6-C20)aryl; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring.

[59] The representative compounds of formula 2 include the following compounds, but are not limited thereto:

[60]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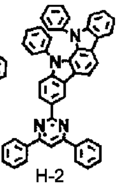
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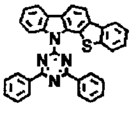
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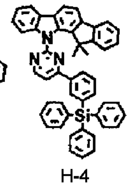
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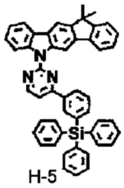
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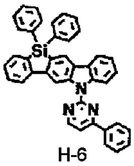
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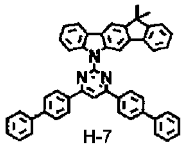
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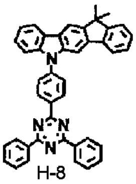
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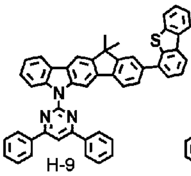
[61]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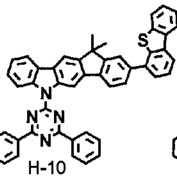
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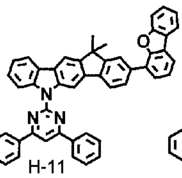
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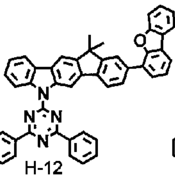
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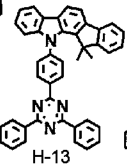
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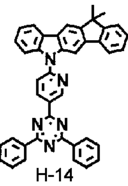
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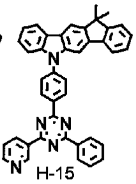
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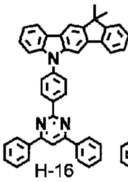
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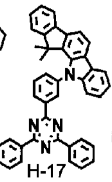
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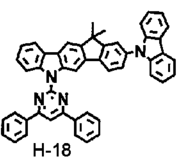
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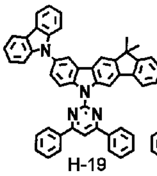
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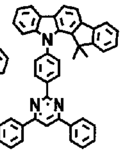
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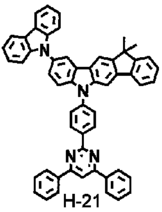
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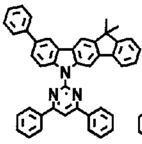
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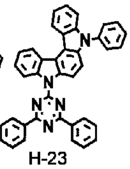
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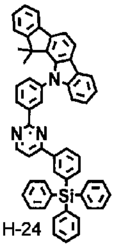
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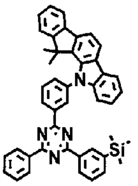
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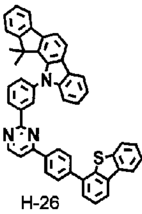
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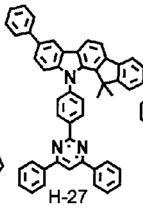
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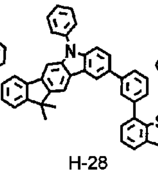
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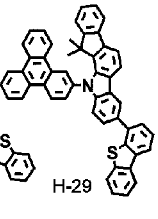
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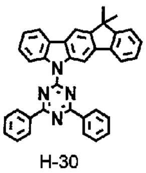
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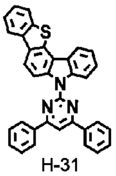
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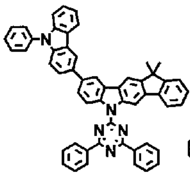
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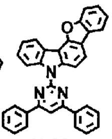
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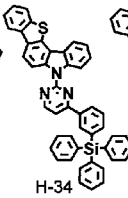
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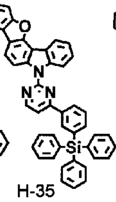
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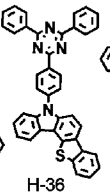
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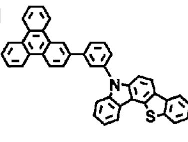
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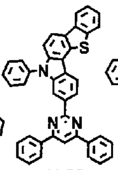
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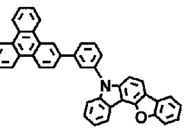
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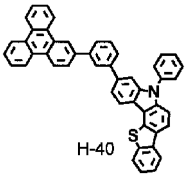
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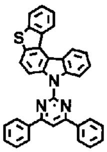
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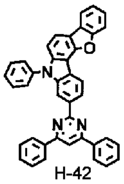
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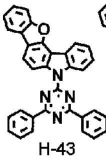
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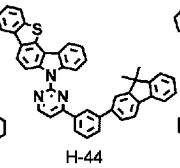
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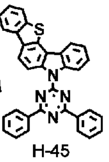
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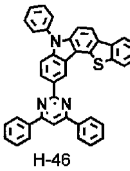
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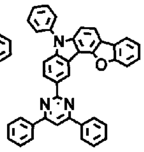
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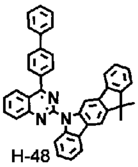
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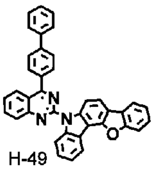
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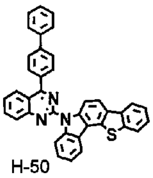
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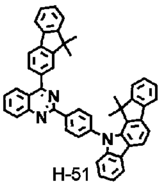
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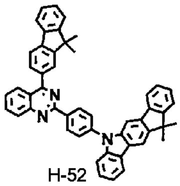
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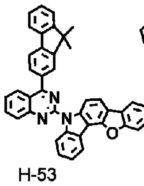
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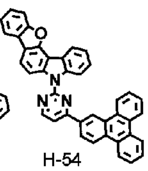
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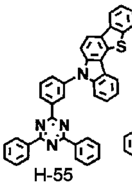
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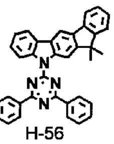
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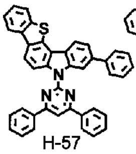
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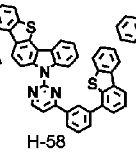
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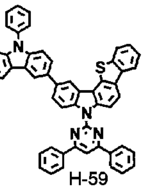
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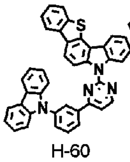
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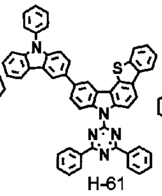
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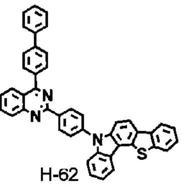
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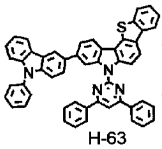
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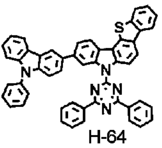
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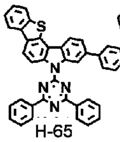
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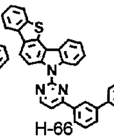
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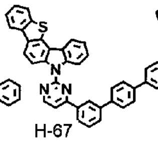
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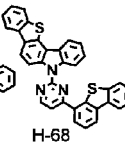
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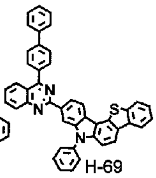
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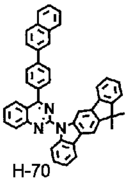
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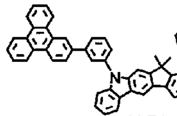
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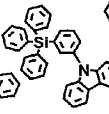
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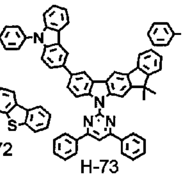
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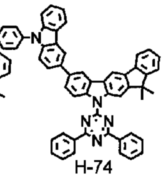
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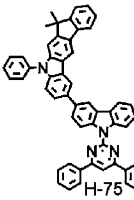
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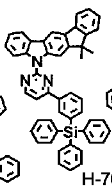
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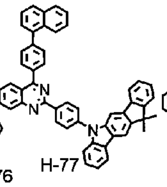
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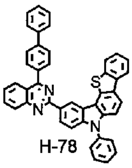
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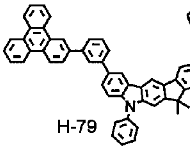
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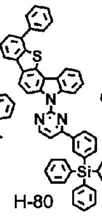
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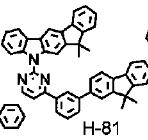
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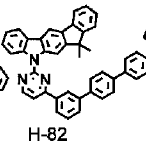
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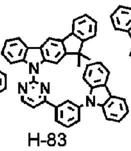
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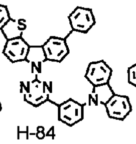
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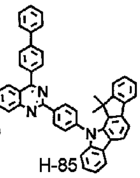
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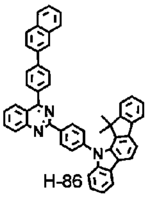
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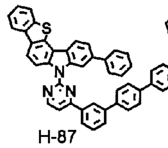
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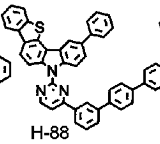
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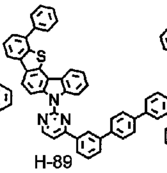
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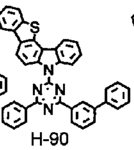
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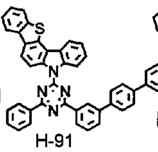
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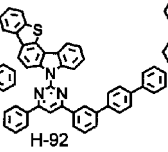
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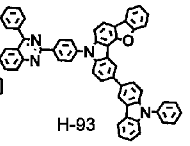
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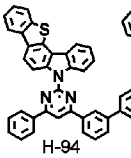
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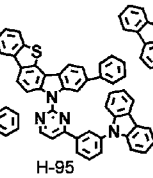
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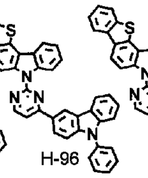
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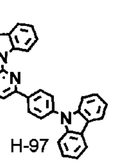
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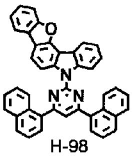
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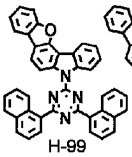
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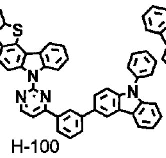
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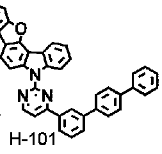
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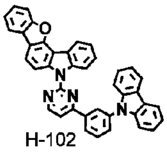
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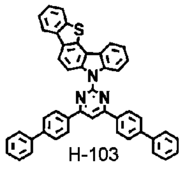
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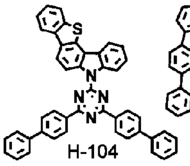
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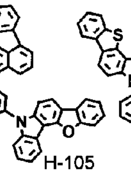
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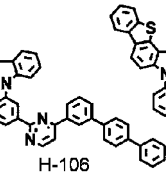
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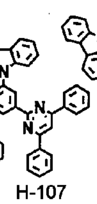
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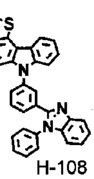
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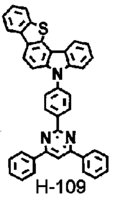
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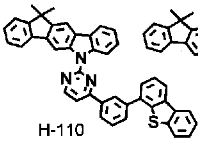
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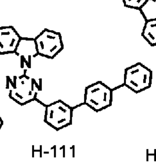
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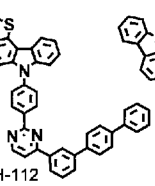
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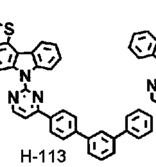
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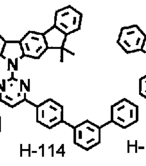
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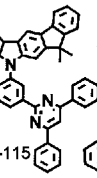
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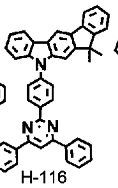
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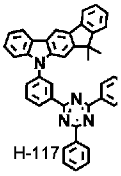
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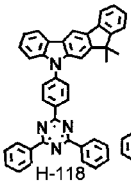
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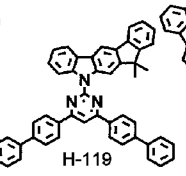
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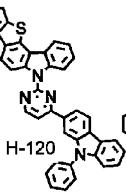
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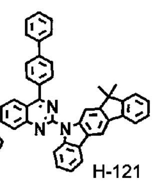
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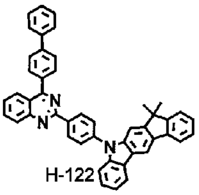
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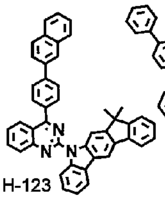
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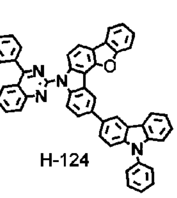
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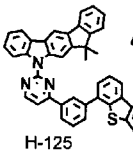
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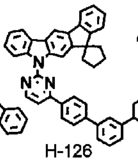
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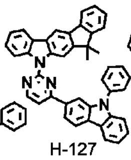
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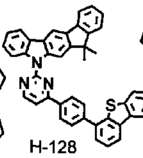
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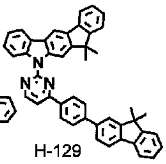
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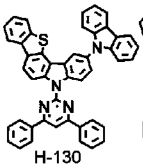
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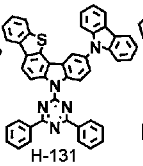
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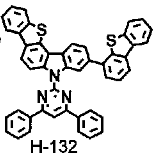
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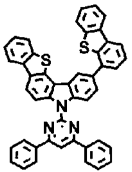
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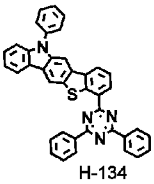
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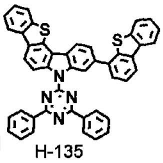
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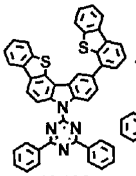
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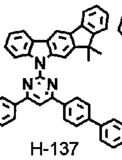
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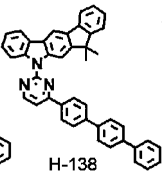
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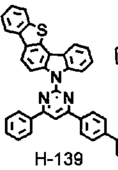
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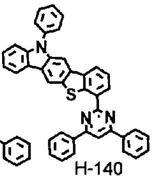
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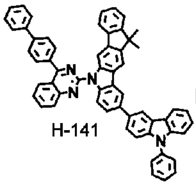
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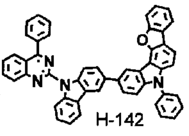
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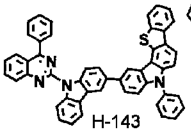
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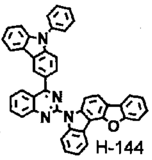
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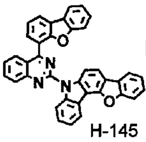
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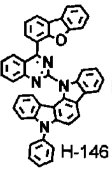
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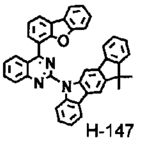
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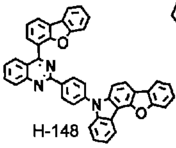
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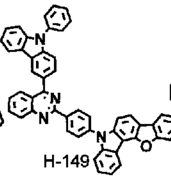
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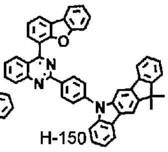
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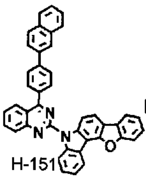
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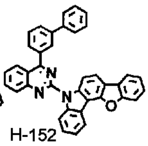
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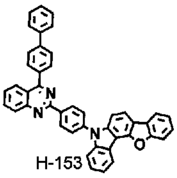
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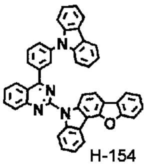
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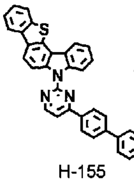
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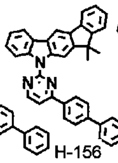
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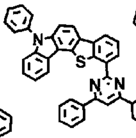
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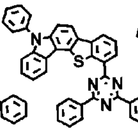
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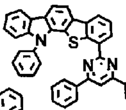
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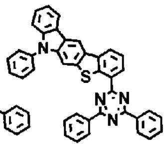
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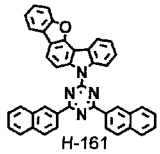
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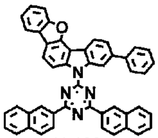
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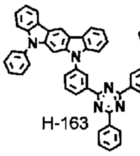
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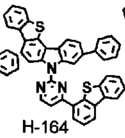
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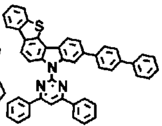
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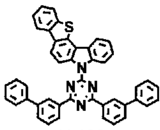
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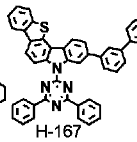
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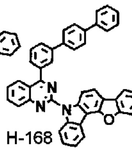
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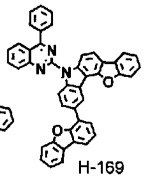
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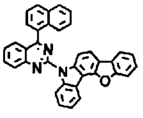
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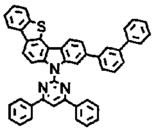
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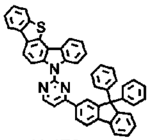
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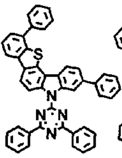
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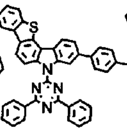
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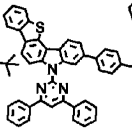
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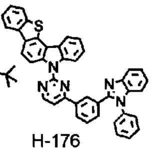
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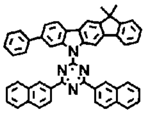
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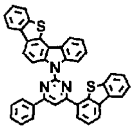
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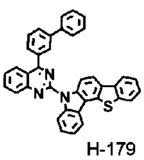
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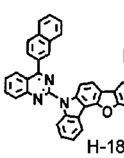
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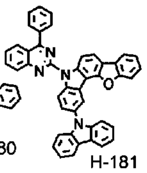
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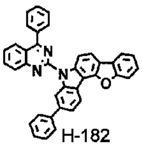
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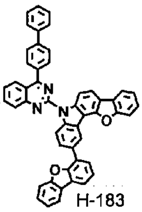
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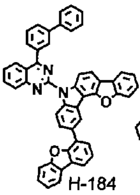
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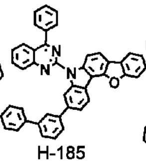
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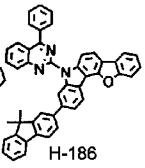
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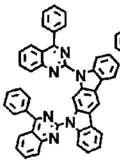
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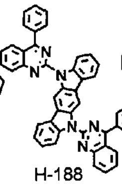
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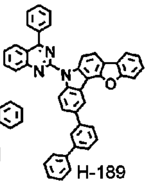
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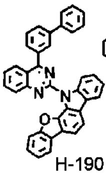
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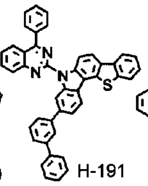
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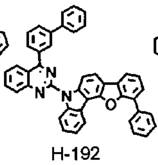
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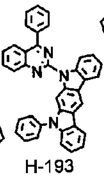
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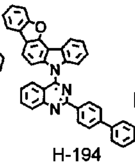
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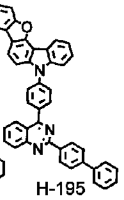
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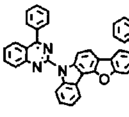
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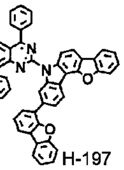
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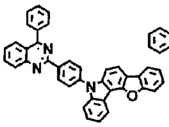
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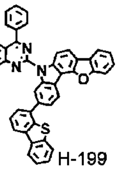
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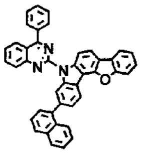
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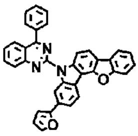
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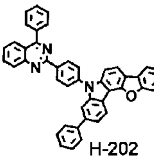
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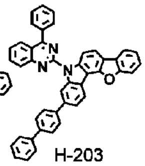
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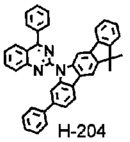
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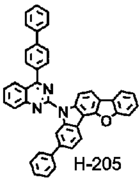
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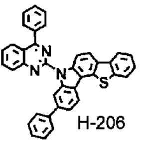
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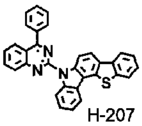
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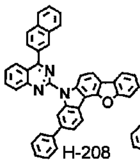
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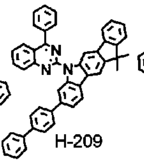
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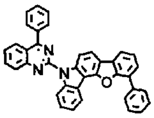
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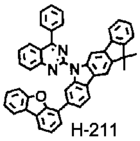
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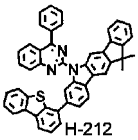
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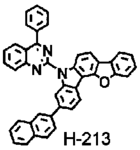
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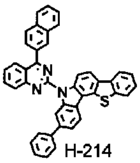
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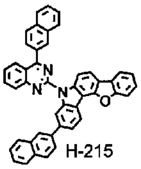
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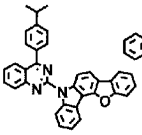
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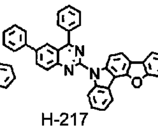
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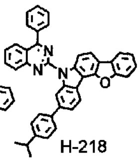
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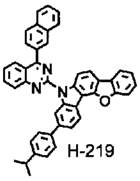
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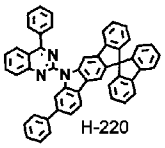
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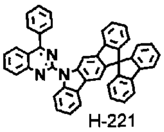
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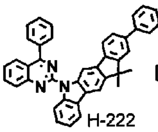
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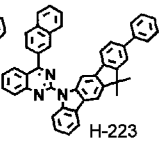
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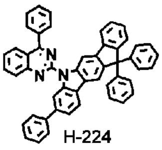
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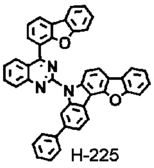
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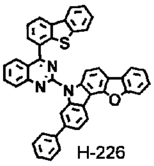
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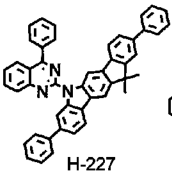
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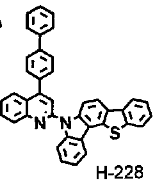
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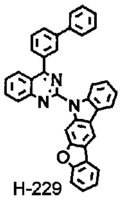
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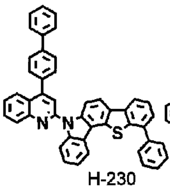
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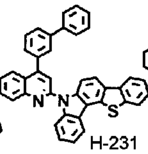
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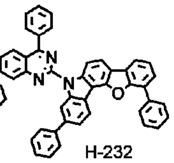
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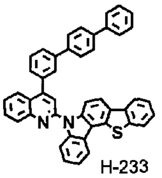
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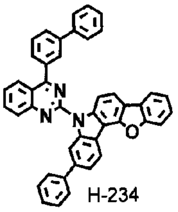
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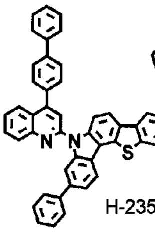
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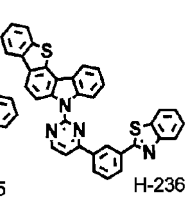
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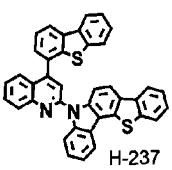
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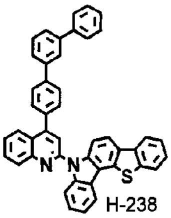

H-238

[91] Herein, "(Cl-C30)alkyl(ene)" is meant to be a linear or branched alkyl(ene) having 1 to 30 carbon atoms, in which the number of carbon atoms is preferably 1 to 20, more preferably 1 to 10, and includes methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl, tert-butyl, etc.; "(C2-C30) alkenyl" is meant to be a linear or branched alkenyl having 2 to 30 carbon atoms, in which the number of carbon atoms is preferably 2 to 20, more preferably 2 to 10, and includes vinyl, 1-propenyl, 2-propenyl, 1-butenyl, 2-butenyl,

3-butenyl, 2-methylbut-2-enyl, etc.; "(C2-C30)alkynyl" is a linear or branched alkynyl having 2 to 30 carbon atoms, in which the number of carbon atoms is preferably 2 to 20, more preferably 2 to 10, and includes ethynyl, 1-propynyl, 2-propynyl, 1-butynyl, 2-butynyl, 3-butynyl, l-methylpent-2-ynyl, etc.; "(C3-C30)cycloalkyl" is a mono- or polycyclic hydrocarbon having 3 to 30 carbon atoms, in which the number of carbon atoms is preferably 3 to 20, more preferably 3 to 7, and includes cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, etc.; "3- to 7-membered heterocycloalkyl" is a cycloalkyl having at least one heteroatom selected from B, N, O, S, P(=0), Si and P, preferably O, S and N, and 3 to 7 ring backbone atoms, and includes tetrahydrofuran, pyrrolidine, thiolan, tetrahydropyran, etc.; "(C6-C30)aryl(ene)" is a monocyclic or fused ring derived from an aromatic hydrocarbon having 6 to 30 carbon atoms, in which the number of carbon atoms is preferably 6 to 20, more preferably 6 to 15, and includes phenyl, biphenyl, terphenyl, naphthyl, fluorenyl, phenanthrenyl, anthracenyl, indenyl, triphenylenyl, pyrenyl, tetracenyl, perylenyl, chrysenyl, naphthacenyl, fluoranthenyl, etc.; "3- to 30-membered heteroaryl(ene)" is an aryl group having at least one, preferably 1 to 4 heteroatom selected from the group consisting of B, N, O, S, P(=0), Si and P, and 3 to 30 ring backbone atoms; is a monocyclic ring, or a fused ring condensed with at least one benzene ring; has preferably 5 to 20, more preferably 5 to 15 ring backbone atoms; may be partially saturated; may be one formed by linking at least one heteroaryl or aryl group to a heteroaryl group via a single bond(s); and includes a monocyclic ring-type heteroaryl such as furyl, thiophenyl, pyrrolyl, imidazolyl, pyrazolyl, thiazolyl, thiadiazolyl, isothiazolyl, isoxazolyl, oxazolyl, oxadiazolyl, triazinyl, tetrazinyl, triazolyl, tetrazolyl, furazanyl, pyridyl, pyrazinyl, pyrimidinyl, pyridazinyl, etc., and a fused ring-type heteroaryl such as benzofuranyl, benzothiophenyl, isobenzofuranyl, dibenzofuranyl, dibenzothiophenyl, benzoimidazolyl, benzothiazolyl, benzoisothiazolyl, benzoisoxazolyl, benzoxazolyl, isoindolyl, indolyl, indazolyl, benzothiadiazolyl, quinolyl, isoquinolyl, cinnolinyl, quinazolinyl, quinoxalinyl, carbazolyl, phenoxazinyl, phenanthridinyl, benzodioxolyl, etc. Further, "halogen" includes F, CI, Br and I.

[92] Herein, "substituted" in the expression "substituted or unsubstituted" means that a hydrogen atom in a certain functional group is replaced with another atom or group, i.e., a substituent.

[93] The substituents of the substituted alkyl(ene), the substituted aryl(ene), the substituted heteroaryl(ene), the substituted cycloalkyl, the substituted alkoxy, the substituted trialkylsilyl, the substituted triarylsilyl, and the substituted heterocycloalkyl in the above formulae each independently are preferably at least one selected from the group consisting of deuterium; a halogen; a (Cl-C30)alkyl unsubstituted or substituted with a halogen; a (C6-C30)aryl unsubstituted or substituted with a 3- to 30- membered

heteroaryl; a 3- to 30- membered heteroaryl unsubstituted or substituted with a (C6-C30)aryl; a 5- to 7- membered heterocycloalkyl; a 5- to 7- membered heterocycloalkyl fused with at least one (C6-C30)aromatic ring; a (C3-C30)cycloalkyl; a (C6-C30)cycloalkyl fused with at least one (C6-C30)aromatic ring; $R_aR_bR_c$Si-; a (C2-C30)alkenyl; a (C2-C30)alkynyl; a cyano; a carbazolyl; -NR_dR_e; -BR_fR_g; -PR_hRi; -P(=0)R_jR_k; a (C6-C30)aryl(Cl-C30)alkyl; a (Cl-C30)alkyl(C6-C30)aryl; ¾Z-; R_mC(=0)-; R_mC(=0)0-; a carboxyl; a nitro; and a hydroxyl, wherein R_a to ¾ each independently represent a (Cl-C30)alkyl, a (C6-C30)aryl, or a 3- to 30- membered heteroaryl; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from the group consisting of nitrogen, oxygen and sulfur; Z represents S or O; and R_m represents a (Cl-C30)alkyl, a (Cl-C30)alkoxy, a (C6-C30)aryl, or a (C6-C30)aryloxy.

[94] Specifically, said organic electroluminescent device comprises a first electrode; a second electrode; and at least one organic layer between said first and second electrodes. Said organic layer comprises a light-emitting layer, and said light-emitting layer comprises a combination of one or more dopant compounds represented by formula 1, and one or more host compounds represented by formula 2.

[95] Said light-emitting layer is a layer which emits light, and it may be a single layer, or it may be a multi layer of which two or more layers are laminated.

[96] The doping concentration, the proportion of the dopant compound to the host compound may be preferably less than 20 wt%.

[97] Another embodiment of the present invention provides a dopant and host combination of one or more dopant compounds represented by formula 1, and one or more host compounds represented by formula 2, and an organic EL device comprising the dopant and host combination .

[98] Still another embodiment of the present invention provides an organic layer consisting of the combination of one or more dopant compounds represented by formula 1, and one or more host compounds represented by formula 2. Said organic layer comprises plural layers. Said dopant compound and said host compound can be comprised in the same layer, or can be comprised in different layers. In addition, the present invention provides an organic EL device comprising the organic layer.

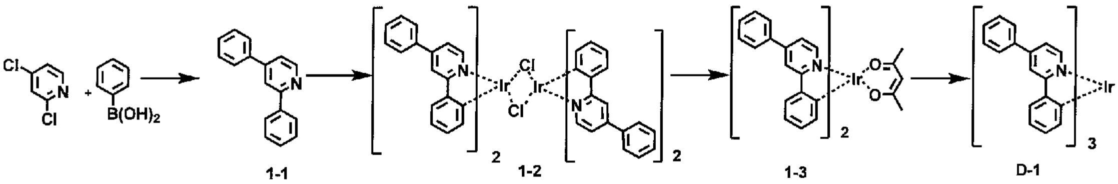
[99] In the organic electroluminescent device according to the present invention, a mixed region of an electron transport compound and an reductive dopant, or a mixed region of a hole transport compound and an oxidative dopant may be placed on at least one surface of a pair of electrodes. In this case, the electron transport compound is reduced to an anion, and thus it becomes easier to inject and transport electrons from the mixed region to an electroluminescent medium. Further, the hole transport compound is

oxidized to a cation, and thus it becomes easier to inject and transport holes from the mixed region to the electroluminescent medium. Preferably, the oxidative dopant includes various Lewis acids and acceptor compounds; and the reductive dopant includes alkali metals, alkali metal compounds, alkaline earth metals, rare-earth metals, and mixtures thereof. A reductive dopant layer may be employed as a charge generating layer to prepare an electroluminescent device having two or more electroluminescent layers and emitting white light.

[100] Hereinafter, the compound, the preparation method of the compound, and the luminescent properties of the device will be explained in detail with reference to the following examples. However, these are just for exemplifying the embodiment of the present invention, so the scope of the present invention cannot be limited thereto.

[101] Example 1: Preparation of compound **D-1**

[102]



[103] Preparation of compound 1-1

[104] After adding 2,4-dichloropyridine 5 g (34 mmol), phenyl boronic acid 16 g (135 mmol), $Pd(PPh_3)_4$ 3.9 g (2.4 mmol), K_2C0_3 23 g (135 mmol), toluene 100 mL, ethanol 50 mL, and H_20 50 mL in a flask, the mixture was stirred at 120°C for 6 hours. Then, the reaction mixture was dried, and separated with a column to obtain compound 1-1 6.4 g (82%).

[105] Preparation of compound 1-2

[106] After adding compound 1-1 4 g (17 mmol), $IrCl_3$ 2.3 g (7.8 mmol), 2-ethoxyethanol 60 mL, and H_20 20 mL (2-ethoxyethanol/ H_20=3/l) in a flask, the mixture was stirred at 120°C for 24 hours under reflux. After completing the reaction, the mixture was washed using H_20/MeOH/Hex, and dried to obtain compound 1-2 3.0 g (56%).

[107] Preparation of compound 1-3

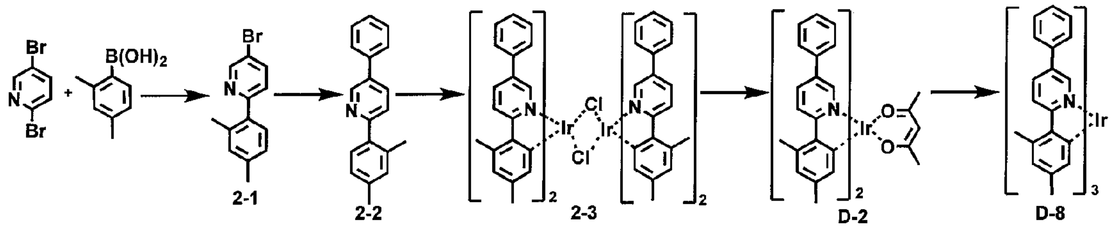
[108] After adding compound 1-2 3.0 g (2.2 mmol), 2,4-pentanedion 0.6 g (6.5 mmol), Na_2C0_3 1.4 g (13 mmol), and 2-ethoxyethanol 10 mL in a flask, the mixture was stirred at 110°C for 12 hours. After completing the reaction, the produced solid was dried, and separated with a column to obtain compound 1-3 3 g (75%).

[109] Preparation of compound **D-1**

[110] After adding compound 1-3 2.44 g (3.25 mmol), and compound 1-1 1.5 g (6.49 mmol) in a flask, glycerol was added to the mixture, and stirred for 16 hours under reflux. After the reaction, the produced solid was filtered, dried, and separated with a column to obtain compound **D-1** 2.5 g (87%).

[111] Example 2: Preparationofcompound **D-2** and **D-8**

[112]



[113] Preparation of compound 2-1

[114] After adding 2,5-dibromopyridine 20 g (84 mmol), 2,4-dimethylphenyl boronic acid 15 g (101 mmol), $Pd(PPh_3)_4$ 4 g (3.4 mmol), Na_2C0_3 27 g (253 mmol), toluene 240 mL, and H_20 120 mL in a flask, the mixture was stirred at 100°C for 12 hours. Then, the reaction mixture was extracted with ethylacetate (EA), and the moisture was removed using MgS04, and distilled under reduced pressure. Then, the reaction mixture was dried, and separated with a column to obtain compound 2-1 18 g (70%).

[115] Preparationofcompound 2-2

[116] Compound 2-2 18 g (99%) was prepared by using compound 2-1 18 g (70 mmol), and phenyl boronic acid 13 g (105 mmol) in a flask in the same manner as the synthetic method of compound 1-1.

[117] Preparationofcompound 2-3

[118] Compound 2-3 13 g (72%) was prepared by using compound 2-2 14 g (54 mmol), and $IrCl_3$ 7.5 g (24.3 mmol) in a flask in the same manner as the synthetic method of compound 1-2.

[119] Preparationofcompound **D-2**

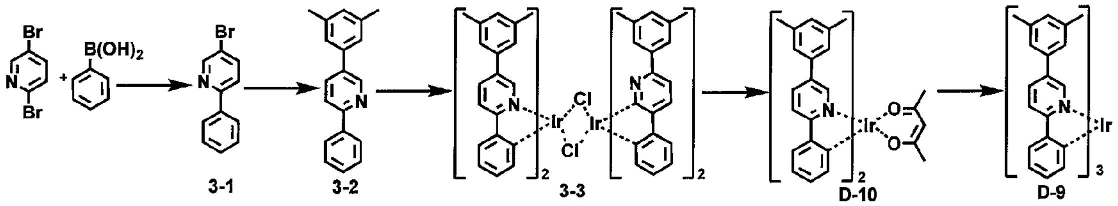
[120] Compound **D-2** 2.4 g (74%) was prepared by using compound 2-3 3 g (2 mmol) in a flask in the same manner as the synthetic method of compound 1-3.

[121] Preparationofcompound **D-8**

[122] Compound **D-8** 1.5 g (50%) was prepared by using compound **D-2** 2.4 g (3 mmol) in a flask in the same manner as the synthetic method of compound **D-l.**

[123] Example 3: Preparationofcompound **D-9** and **D-10**

[124]



[125] Preparation of compound 3-1

[126] Compound 3-1 16 g (79%) was prepared by using 2,5-dibromopyridine 20 g (84 mmol), and phenyl boronic acid 12 g (101 mmol) in a flask in the same manner as the synthetic method of compound 2-1.

[127] Preparationofcompound 3-2

[128] Compound 3-2 17 g (97%) was prepared by using compound 3-1 16 g (67 mmol), and 3,5-dimethylphenyl boronic acid 15 g (101 mmol) in a flask in the same manner as the synthetic method of compound 2-2.

[129] Preparationofcompound 3-3

[130] Compound 3-3 6 g (65%) was prepared by using compound 3-2 7 g (27 mmol), and $IrCl_3$ 3.7 g (12 mmol) in a flask in the same manner as the synthetic method of compound 2-3.

[131] Preparationofcompound **D-10**

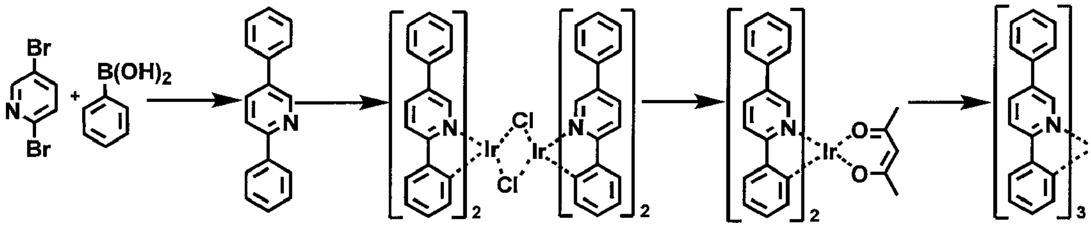
[132] Compound **D-10** 5 g (81%) was prepared by using compound 3-3 6 g (4 mmol), and 2,4-pentanedion 1.2 g (12 mmol) in a flask in the same manner as the synthetic method of compound **D-2**.

[133] Preparationofcompound **D-9**

[134] Compound **D-9** 1.6 g (45%) was prepared by using compound **D-10** 3 g (3.7 mmol), and compound 3-2 2 g (7.4 mmol) in a flask in the same manner as the synthetic method of compound **D-8**.

[135] Example 4: Preparationofcompound **D-11** and **D-12**

[136]



4-1 4-2 D-11 D-12

[137] Preparationofcompound 4-1

[138] Compound 4-1 60 g (87%) was prepared by using 2,5-dibromopyridine 70 g (295.5 mmol), and phenyl boronic acid 83 g (679.6 mmol) in a flask in the same manner as the synthetic method of compound 1-1.

[139] Preparationofcompound 4-2

[140] Compound 4-2 44 g (92%) was prepared by using compound 4-1 40 g (380.5 mmol), and $IrCl_3$ 23.5 g (173 mmol) in a flask in the same manner as the synthetic method of compound 1-2.

[141] Preparationofcompound **D-11**

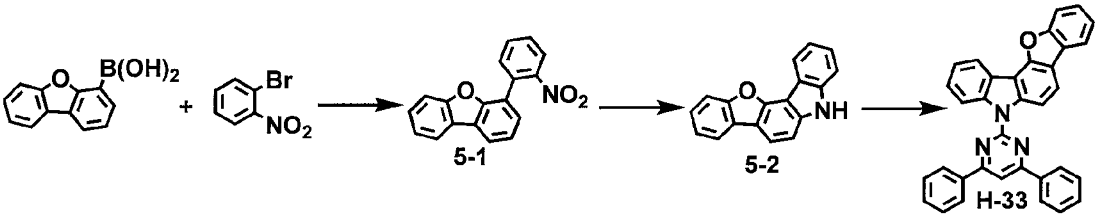
[142] Compound **D-11 42** g (87.4%) was prepared by using compound 4-2 44 g (48 mmol), and 2,4-pentanedion 9.6 g (96 mmol) in a flask in the same manner as the synthetic method of compound 1-3.

[143] Preparationofcompound **D-12**

[144] Compound **D-12 20** g (38%) was prepared by using compound **D-11 42** g (80.5 mmol), and compound 4-1 20 g (161 mmol) in a flask in the same manner as the synthetic method of compound **D-1**.

[145] Example 5: Preparationof compound **H-33**

[146]



[147] Preparation of compound 5-1

[148] After mixing l-bromo-2-nitrobenzene 39 g (0.19 mol), dibenzo[b,d]furan-4-yl boronic acid 45 g (0.21 mol), $Pd(PPh_3)_4$ 11.1 g (0.0096 mol), 2 M K_2C0_3 aqueous solution 290 mL, EtOH 290mL, and toluene 580 mL, the mixture was stirred while heating at 120°C for 4 hours. After completing the reaction, the mixture was washed with distilled water, extracted with EA, and the organic layer was dried with anhydrous $MgS0_4$. Then, solvent was removed with a rotary evaporator, and the remaining product was purified using column chromatography to obtain compound 5-1 47 g (85%).

[149] Preparationofcompound 5-2

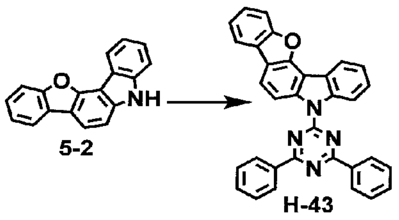
[150] After mixing compound 5-1 47 g (0.16 mol), triethylphosphite 600 mL, and 1,2-dichlorobenzene 300 mL, the mixture was stirred at 150°C for 12 hours. After completing the reaction, unreacted triethylphosphite and 1,2-dichlorobenzene was removed using a distillation apparatus, and the remaining product was washed with distilled water, extracted with EA, and the organic layer was dried with anhydrous $MgS0_4$. Then, solvent was removed with a rotary evaporator, and the remaining product was purified using column chromatography to obtain compound 5-2 39 g (81%).

[151] Preparationofcompound **H-33**

[152] After dissolving NaH 1.9 mg (42.1 mmol) in dimethylformamide (DMF), the mixture was stirred. Then, compound 5-2 7 g (27.2 mmol) was dissolved in DMF, and added to the NaH solution which was being stirred. Then, the mixture was stirred for 1 hour. After dissolving 2-chloro-4,6-diphenylpyrimidine 8.7 g (32.6 mmol) in DMF, the mixture was stirred, and the reactant which was stirred for 1 hour was added to the mixture, and the mixture was stirred at room temperature for 24 hours. After completing the reaction, the produced solid was filtered, washed with ethylacetate, and purified using column chromatography to obtain compound **H-33** 3.5 g (25%).

[153] Example 6: Preparationofcompound **H-43**

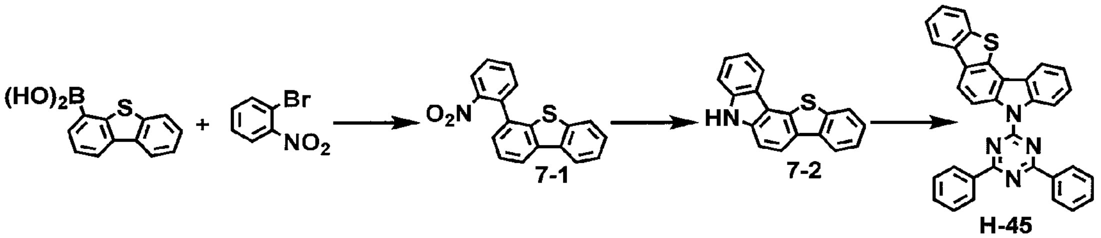
[154]



[155] Compound **H-43** 11.3 g (78%) was prepared by using compound 5-2 7 g (27.2 mmol), and 2-chloro-4,6-diphenyl-l,3,5-triazine 8.2 g (32.6 mmol) in the same manner as the synthetic method of compound **H-33.**

[156] Example 7: Preparationof compound **H-45**

[157]



[158] Preparation of compound 7-1

[159] Compound 7-1 10 g (32.74 mmol, 74.68%) was prepared by using dibenzo[b,d]thiophen-4-yl boronic acid 10 g (43.84 mmol) in the same manner as the synthetic method of compound 5-1.

[160] Preparationofcompound 7-2

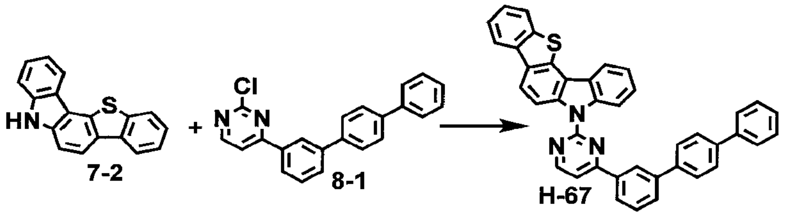
[161] Compound 7-2 7 g (25.60 mmol, 78.19%) was prepared by using compound 7-1 10 g (32.74 mmol) in the same manner as the synthetic method of compound 5-2.

[162] Preparationofcompound **H-45**

[163] Compound **H-45** 5.6 g (40%) was prepared by using compound 7-2 7 g (25.6 mmol), and 2-chloro-4,6-diphenyl-l,3,5-triazine 8.7 g (32.6 mmol) in the same manner as the synthetic method of compound **H-33.**

[164] Example 8: Preparationofcompound **H-67**

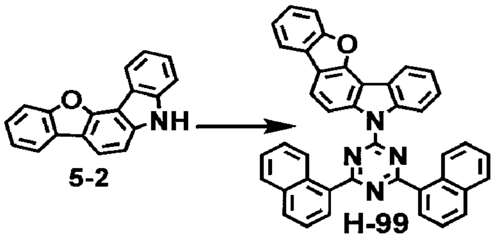
[165]



[166] Compound **H-67** 5.3 g (49%) was prepared by using compound 7-2 7 g (25.6 mmol), and compound 8-1 8.2 g (32.6 mmol) in the same manner as the synthetic method of compound **H-33.**

[167] Example 9: Preparationofcompound **H-99**

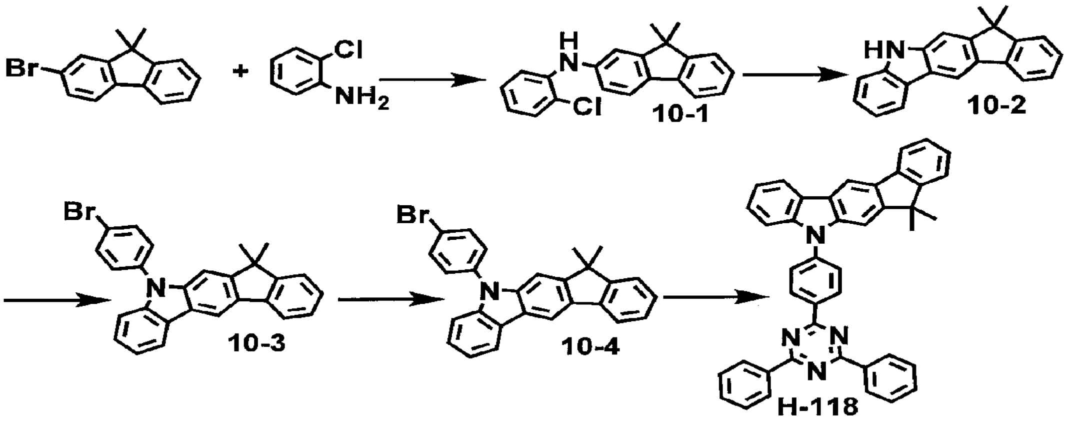
[168]



[169] Compound **H-99** 8.6 g (46%) was prepared by using compound 5-2 7 g (27.2 mmol), and 2-chloro-4,6-di(naphthalen-l-yl)-l,3,5-triazine 15.2 g (32.6 mmol) in the same manner as the synthetic method of compound **H-33.**

[170] Example 10: Preparationofcompound **H-118**

[171]



[172] Preparationofcompound 10-1

[173] After mixing 2-bromo-9,9-dimethyl-9H-fluorene 80 g (291 mmol), 2-chlorobenzeneamine 45 mL (437 mmol), $Pd(OAc)_2$ 2.6 g (12 mmol), $P(t\text{-}Bu)_3$ 12 mL (24 mmol), NaOt-Bu 70 g (728 mmol), and toluene 800 mL, the mixture was stirred while heating at 120°C for 9 hours. After completing the reaction, the mixture was cooled to room temperature, extracted with ethylacetate 1.5 L, and the obtained organic layer was washed with distilled water 400 mL. Then, solvent was removed under reduced pressure, and the obtained solid was washed with hexane, filtered, and dried. Then, the obtained product was separated using silica gel column chromatography and recrystallization to obtain compound 10-1 70 g (75%).

[174] Preparationofcompound _10-2

[175] After mixing compound 10-1 70 g (218 mmol), $Pd(OAc)_2$ 2.4 g (11 mmol), PCy_3 HBF_4 8 g (22 mmol), Na_2C0_3 70 g (654 mmol), and dimethylacetamide (DMA) 1.2 L, the mixture was stirred at 190°C for 3 hours. After completing the reaction, the mixture was extracted with ethylacetate 1 L, the obtained organic layer was washed with distilled water 200 mL, and dried with anhydrous $MgS0_4$. Then, the organic solvent was removed under reduced pressure. Then, the obtained solid was separated using silica gel column chromatography and recrystallization to obtain compound 10-2 22 g (36%).

[176] Preparation of compound 10-3

[177] After mixing compound 10-2 15 g (53 mmol), 1,4-dibromobenzene 32 mL (265 mmol), $Pd(OAc)_2$ 1.2 g (5 mmol), $P(t\text{-}Bu)_3$ 30 mL (64 mmol), NaOt-Bu 25 g (265 mmol), and toluene 300 mL, the mixture was stirred at 120°C for 24 hours. After completing the reaction, the mixture was cooled to room temperature, extracted with ethylacetate 1.5 L, and the obtained organic layer was washed with distilled water 400 mL. Then, solvent was removed under reduced pressure, and the obtained solid was washed with hexane, filtered, and dried. Then, the obtained product was separated using silica gel column chromatography and recrystallization to obtain compound 10-3 7 g (30%).

[178] Preparation of compound 10-4

[179] After dissolving compound 10-3 7 g (16 mmol) in tetrahydrofuran (THF) 100 mL, n-BuLi (2.5 M in hexane) 10 mL (24 mmol) was added to the mixture at -78°C. Then, the mixture was stirred at -78°C for 1 hour, and $B(Oi\text{-}Pr)_3$ 6 mL (24 mmol) was added to the mixture. Then, the mixture was stirred for 2 hours, and the reaction was completed with aqueous ammonium chloride solution 20 mL. Then, the mixture was extracted with ethylacetate 500 mL, the obtained organic layer was washed with distilled water 200 mL, dried with anhydrous $MgS0_4$, and the organic solvent was removed under reduced pressure. Then, the obtained solid was separated by recrystallization to obtain compound 10-4 5 g (75%).

[180] Preparationofcompound **H-118**

[181] After mixing 2-chloro-4,6-diphenyl-l,3,5-triazine 6.5 g (0.03 mol), compound 10-4 19.2 g (0.036 mol), $Pd(PPh_3)_4$ 1.6 g (0.001 mol), K_2C0_3 11 g (0.08 mol), toluene 140 mL, EtOH 35mL, and H_20 40 mL in a flask, the mixture was stirred at 120°C for 12 hours. After completing the reaction, the mixture was extracted using ethylacetate, the organic layer was dried with $MgS0_4$, filtered, and the solvent was removed under reduced pressure. Then, the remaining product was separated with a column to obtain compound **H-118** 5.7 g (27%).

[182] The detailed data of the dopant compounds prepared in Examples 1 to 4, and the dopant compounds easily prepared using Examples 1 to 4 are shown in table 1 below.

[183] **[Table 1]**

[184]

Compound	Yield (%)	Melting Point (°C)	UV spectrum (nm)	PL spectrum (nm)
D-1	87	273	308	459
D-2	82	360	334	550
D-3	81	154	308	541
D-5	62	265	312	534
D-7	35	297	298	568
D-8	34	over 400	320	556
D-9	81	360	326	541
D-10	45	N/A	N/A	N/A
D-11	92	N/A	N/A	N/A
D-12	61	360	326	541
D-18	36	360	334	550
D-32	36	over 400	296	542
D-33	42	380	296	547
D-34	78	over 400	308	545
D-35	82	358	356	545
D-36	14	360	288	561

[185] The detailed data of the host compounds prepared in Examples 5 to 10, and the host compounds easily prepared using Examples 5 to 10 are shown in table 2 below.

[186] **[Table 2]**

[187]

Compound	Yield (%)	Melting Point (°C)	UV spectrum (nm)	PL spectrum (nm)	Mass
H-33	25	260	358	471	488.5
H-34	30	259	336	463	686.9
H-36	26	350	356	429	581.7
H-38	19	329	340	420	580.7
H-41	46	225	338	482	504.3
H-43	78	312	344	385	489.5
H-44	67	249	324	458	610.7
H-45	40	324	352	482	505.7
H-46	16	339	322	411	580.7
H-48	65	253	354	480	564
H-49	50	275	340	498	538
H-50	57	288	322	492	554

[188]

Compound	Yield (%)	Melting Point (°O	UV spectrum (nm)	PL spectrum (nm)	Mass
H-52	60	250	334	428	680
H-53	66	278	345	501	578
H-55	45	255	334	451	581.7
H-57	89	275	320	456	580.7
H-58	72	267	334	459	610.7
H-60	46	270	344	471	593.7
H-63	42	288	370	475	745.9
H-64	28	323	N/A	N/A	746.8
H-65	39	320	325	516	581.7
H-66	38	198	317	461	504.6
H-67	49	274	322	491	580.7
H-70	76	266	370	489	614
H-80	23	270	324	456	763
H-84	49	284	368	474	669.8
H-85	60	212	368	433	640
H-86	31	289	384	436	690
H-88	34	294	N/A	N/A	656.8
H-89	26	245	300	460	656.8
H-91	42	328	343	481	656.8
H-92	32	294	296	467	655.2
H-94	52	241	294	464	581.7
H-95	30	293	344	469	669.8
H-96	23	238	362	429	593.7
H-97	60	280	294	468	593.7
H-99	46	324	324	495	589.7
H-100	82	250	356	448	669.8
H-104	44	357	322	460	655.8
H-109	48	278	344	395	580.7
H-112	48	221	334	396	656.8
H-118	27	240	308	451	590.7

[189]

Compound	Yield (%)	Melting Point (°C)	UV spectrum (nm)	PL spectrum (nm)	Mass
H-120	57	261	344	431	593.7
H-121	70	255	356	521	564
H-122	12	218	358	445	640
H-123	67	261	344	521	614
H-124	47	315.4	314	530	779
H-130	16	347	324	525	669.9
H-131	34	410	258	324	670.8
H-132	36	300	258	487	686.9

[190]

Compound	Yield (%)	Melting Point (°C)	UV spectrum (nm)	PL spectrum (nm)	Mass
H-135	74	375	340	473	687.8
H-139	23	300	336	458	580.7
H-141	36	299	332	386	805
H-144	62	294	336	479	627
H-145	69	269	324	496	552
H-146	55	254	304	532	627
H-147	89	277	336	481	578
H-148	60	306	334	427	628
H-149	22	200	392	421	703
H-150	50	243	332	424	654
H-151	51	291	346	505	588
H-152	49	222	344	497	538
H-153	77	271	308	431	614
H-154	38	251	282	519	627
H-164	24	275	344	467	610.8
H-168	55	242	344	497	614
H-169	53	275	310	495	628
H-170	75	247	360	483	512
H-173	50	305	350	502	656.8
H-174	66	305	306	407	637.8
H-175	22	238	304	465	636.8
H-176	27	274	308	463	620.7
H-179	71	173	292	509	554
H-180	79	255	338	503	512
H-181	49	309	304	427	536
H-182	49	292	290	511	538
H-183	51	256	310	504	703
H-184	77	253	308	486	703
H-185	80	231	308	487	614
H-186	55	274	312	497	654

[191]

Compound	Yield (%)	Melting Point (°C)	UV spectrum (nm)	PL spectrum (nm)	Mass
H-187	48	336	350	508	665
H-189	69	242	310	493	614
H-190	57	190	307	390	538
H-191	47	246	346	497	614
H-192	80	247	308	487	630
H-194	47	197	362	469	538
H-195	24	291	376	447	614
H-196	80	227	344	489	462

[192]

Compound	Yield (%)	Melting Point (°C)	UV spectrum (nm)	PL spectrum (nm)	Mass
H-197	59	283	368	495	628
H-198	26	247	386	429	538
H-199	38	285	310	490	644
H-200	70	249	310	483	588
H-202	25	255	384	423	613
H-203	40	327	310	490	614
H-204	38	280	346	484	564
H-205	68	298	310	496	613
H-206	46	288	310	487	554
H-207	46	247	356	485	478
H-208	45	267	390	501	588
H-209	37	321	384	491	640
H-210	33	267	344	497	538
H-211	47	301	344	483	653
H-212	35	289	372	479	670
H-213	75	276	344	489	588
H-214	72	265	350	386	604
H-215	69	258	324	501	637
H-216	11	217	356	489	504
H-217	57	257	342	491	538
H-218	49	290	308	498	580
H-219	63	275	308	505	630
H-220	63	289	344	479	685
H-221	22	235	336	521	668
H-222	47	298	376	482	563
H-223	49	256	372	487	614
H-225	60	328	358	490	628
H-226	65	330.5	360	507	644
H-227	55	340	324	484	640
H-229	57	227	342	487	538

[193] DeviceExample 1: ProductionofanOLEDdeviceusingtheorganic
[194] electroluminescent compoundaccordingtothepresentinvention

[195] An OLED device was produced using the light emitting material according to the present invention. A transparent electrode indium tin oxide (ITO) thin film (15 Ω/sq) on a glass substrate for an organic light-emitting diode (OLED) device (Samsung Corning, Republic of Korea) was subjected to an ultrasonic washing with trichloroethylene, acetone, ethanol and distilled water, sequentially, and then was stored in isopropanol. Then, the ITO substrate was mounted on a substrate holder of a vacuum vapor depositing apparatus. N^1,N$^{1'}$-([l,l'-biphenyl]-4,4'-diyl)bis(N^1-(naphthalen-l-yl)-N^4,N^4-diphenylbenzen-l,4-diamine) was introduced into a cell of said vacuum vapor depositing apparatus, and then the pressure in the chamber of said

apparatus was controlled to 10^{-6} torr. Thereafter, an electric current was applied to the cell to evaporate the above introduced material, thereby forming a hole injection layer having a thickness of 120 nm on the ITO substrate. Then, N4,N4,N4',N4' -tetra([1,1'-biphenyl]-4-yl)-[1,1'-biphenyl]-4,4'-diamine was introduced into another cell of said vacuum vapor depositing apparatus, and was evaporated by applying an electric current to the cell, thereby forming a hole transport layer having a thickness of 20 nm on the hole injection layer. Thereafter, compound **H-43** was introduced into one cell of the vacuum vapor depositing apparatus, as a host material, and compound **D-9** was introduced into another cell as a dopant. The two materials were evaporated at different rates and were deposited in a doping amount of 12 wt% based on the total amount of the host and dopant to form a light-emitting layer having a thickness of 40 nm on the hole transport layer. Then, 2-(4-(9,10-di(naphthalen-2-yl)anthracen-2-yl)phenyl)-l-phenyl-lH-benzo[<i]imidazole was introduced into one cell and lithium quinolate was introduced into another cell. The two materials were evaporated at the same rate and were deposited in a doping amount of 50 wt% each to form an electron transport layer having a thickness of 30 nm on the light-emitting layer. Then, after depositing lithium quinolate as an electron injection layer having a thickness of 2 nm on the electron transport layer, an Al cathode having a thickness of 150 nm was deposited by another vacuum vapor deposition apparatus on the electron injection layer. Thus, an OLED device was produced. All the materials used for producing the OLED device were purified by vacuum sublimation at 10^{-6} torr prior to use.

[196] The produced OLED device showed a yellow-green emission having a luminance of 1470 cd/m^2 and a current density of 2.5 mA/cm^2.

[197] Device Example 2: Production of an OLED device using the organic

[198] electroluminescent compound according to the present invention

[199] An OLED device was produced in the same manner as in Device Example 1, except for using compound **H-45** as a host, and using compound **D-12** as a dopant of the light emitting material.

[200] The produced OLED device showed a yellow-green emission having a luminance of 3062 cd/m^2 and a current density of 5.07 mA/cm^2.

[201] Device Example 3: Production of an OLED device using the organic

[202] electroluminescent compound according to the present invention

[203] An OLED device was produced in the same manner as in Device Example 1, except for using compound **H-99** as a host, and using compound **D-18** as a dopant of the light emitting material.

[204] The produced OLED device showed a yellow-green emission having a luminance of 4305 cd/m^2 and a current density of 8.61 mA/cm^2.

[205] Device Example 4: Production of an PLED device using the organic

[206] electroluminescent compoundaccordingtothepresentinvention

[207] An OLED device was produced in the same manner as in Device Example 1, except for using compound **H-67** as a host, and using compound **D-9** as a dopant of the light emitting material.

[208] The produced OLED device showed a yellow-green emission having a luminance of 1647 cd/m^2 and a current density of 2.86 mA/cm^2.

[209] DeviceExample 5: ProductionofanOLEDdeviceusingtheorganic

[210] electroluminescent compoundaccordingtothepresentinvention

[211] An OLED device was produced in the same manner as in Device Example 1, except for using compound **H-33** as a host, and using compound **D-12** as a dopant of the light emitting material.

[212] The produced OLED device showed a yellow-green emission having a luminance of 1164 cd/m^2 and a current density of 1.94 mA/cm^2.

[213] DeviceExample 6: ProductionofanOLEDdeviceusingtheorganic

[214] electroluminescent compoundaccordingtothepresentinvention

[215] An OLED device was produced in the same manner as in Device Example 1, except for using compound **H-118** as a host, and using compound **D-18** as a dopant of the light emitting material.

[216] The produced OLED device showed a yellow-green emission having a luminance of 5554 cd/m^2 and a current density of 15.6 mA/cm^2.

[217] DeviceExample 7: ProductionofanOLEDdeviceusingtheorganic

[218] electroluminescent compoundaccordingtothepresentinvention

[219] An OLED device was produced in the same manner as in Device Example 1, except for using compound **H-208** as a host, and using compound **D-34** as a dopant of the light emitting material.

[220] The produced OLED device showed a yellow-green emission having a luminance of 53100 cd/m^2 and a current density of 5.8 mA/cm^2.

[221] As shown above, the organic EL device of the present invention contains a specific combination of a dopant compound and a host compound, and thus emits yellow-green light, and provides excellent current efficiency.

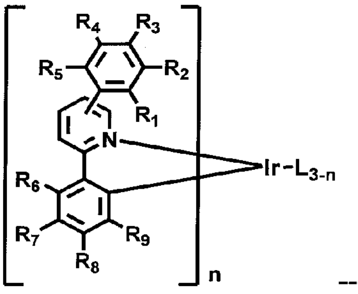
[222] In addition, the organic electroluminescent compounds according to the present invention have high efficiency in transporting electrons to prevent crystallization during a device fabrication. Furthermore, the compounds have good layer formability and improve the current characteristic of the device. Therefore, they can produce an organic electroluminescent device having lowered driving voltages and enhanced power efficiency and operational lifespan.

[223] In general, an organic EL device can emit white light by mixing 3 colors, i.e., red,

green, and blue. On the other hand, when using the dopant compound and the host compound according to the present invention, it is possible to emit white color by bicolor combination with blue light.

Claims

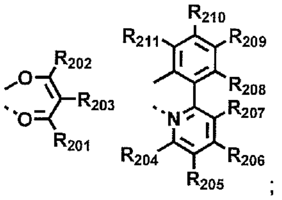
[Claim 1] A combination of one or more dopant compound represented by the following formula 1, and one or more host compound represented by the following formula 2:



-------- (1)

wherein

L is selected from the following structures:

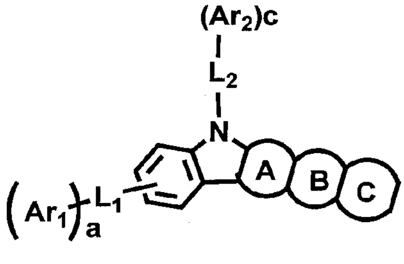


;

R_1 to R_9 each independently represent hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (C3-C30)cycloalkyl, a cyano, or a substituted or unsubstituted (Cl-C30)alkoxy;

R_{201} to R_{2}ii each independently represent hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, or a substituted or unsubstituted (C3-C30)cycloalkyl; and

n represents an integer of 1 to 3;

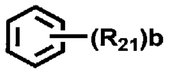


-------- (2)

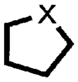
wherein

ring A and ring C each independently represent an aromatic ring represented by the following formula la;

ring B represents a 5-membered ring represented by the following formula lb;



---------- (1a)



---------- (1b)

Li and L_2 each independently represent a single bond, a substituted or unsubstituted (C6-C30)arylene, or a substituted or unsubstituted 5- to 30- membered heteroarylene;

Ar_1 and Ar_2 each independently represent hydrogen, deuterium, a halogen, a cyano, a nitro, a hydroxyl, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (Cl-C30)alkoxy, a substituted or unsubstituted (C3-C30)cycloalkyl, a substituted or unsubstituted (C6-C30)aryl, a substituted or unsubstituted tri(Cl-C30)alkylsilyl, a substituted or unsubstituted tri(C6-C30)arylsilyl, or a substituted or unsubstituted 5- to 30-membered heteroaryl; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from nitrogen, oxygen and sulfur;

R_2i represents hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (C6-C30)aryl, a substituted or unsubstituted 5- to 30-membered heteroaryl, -NRnRi $_2$, -SiRi$_3R_{14}R_{15}$; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from nitrogen, oxygen and sulfur;

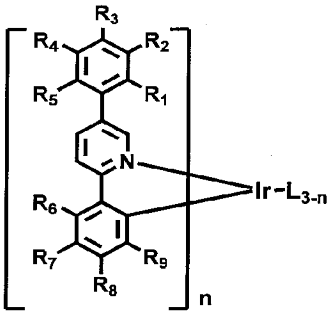
X represents -0-, -S-, -N(R_{22})-, -C(R_{23})(R_{24})- or -Si(R_{25})(R_{26})-;

R_{11} to R_{15} and R_{22} to R_{26} each independently represent hydrogen, deuterium, a halogen, a substituted or unsubstituted (Cl-C30)alkyl, a substituted or unsubstituted (C6-C30)aryl, or a substituted or unsubstituted 5- to 30-membered heteroaryl; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring whose carbon atom(s) may be replaced with at least one hetero atom selected from nitrogen, oxygen and sulfur;

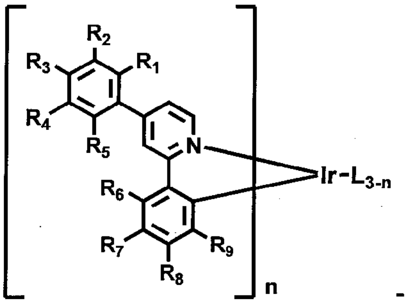
a and c each independently represent an integer of 0 to 4; where a or c is an integer of 2 or more, each of Ar_1, and each of Ar_2 are same or different; and

b represents an integer of 0 to 2; where b is 2, each of R_{21} are same or different.

[Claim 2] The combination according to claim 1, wherein the compound represented by formula 1 is represented by formula 3 or 4:



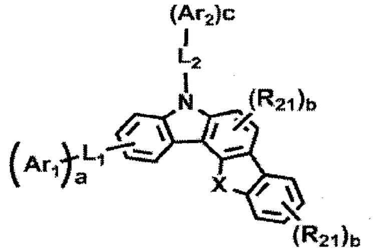
---------- (3)



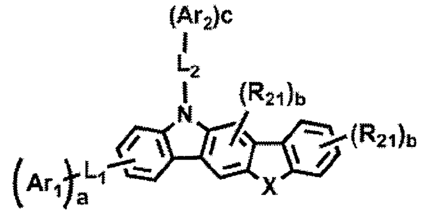
---------- (4)

wherein ¾ to R_9, L, and n are as defined in claim 1.

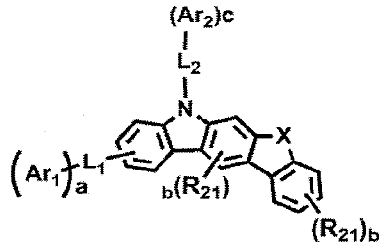
[Claim 3] The combination according to claim 1, wherein the compound represented by formula 2 is represented by any one of the following formulae 5 to 10:



---------- (5)



---------- (6)



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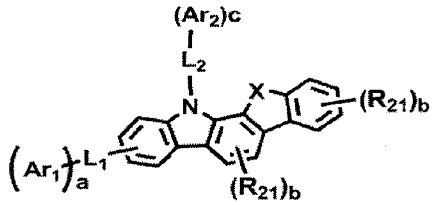
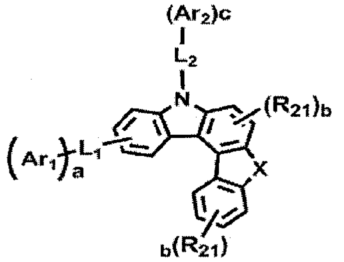


---------- (8)



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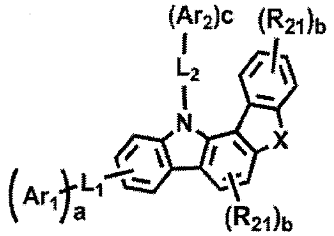


---------- (10)

wherein L_1, L_2, Ar_1, Ar_2, R_2i, X, a, b and c are as defined in claim 1.

[Claim 4] The combination according to claim 1, wherein in formula 1, R_1 to R_9 each independently represent hydrogen, deuterium, a (Cl-ClO)alkyl unsubstituted or substituted with a halogen, an unsubstituted (C3-C7)cycloalkyl, or a (Cl-ClO)alkoxy unsubstituted or substituted with a halogen; and

R_{201} to R_2ii each independently represent hydrogen, or an unsubstituted (Cl-ClO)alkyl.

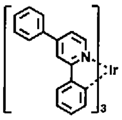
[Claim 5] The combination according to claim 1, wherein in formula 2, L_1 and L_2 each independently represent a single bond, a substituted or unsubstituted (C6-C20)arylene, or a substituted or unsubstituted 5- to 22-memebered heteroarylene;

Ari and Ar_2 each independently represent hydrogen, a substituted or unsubstituted (Cl-C6)alkyl, a substituted or unsubstituted (C6-C20)aryl, a substituted or unsubstituted tri(Cl-C6)alkylsilyl, a substituted or unsubstituted tri(C6-C12)arylsilyl, or a substituted or unsubstituted 5- to 22-membered heteroaryl;

R_2i represents hydrogen, a substituted or unsubstituted (C6-C20)aryl, or a substituted or unsubstituted 5- to 22-membered heteroaryl; and

R_{11} to R_{15} and R_{22} to R_{26} each independently represent hydrogen, a substituted or unsubstituted (Cl-C6)alkyl, a substituted or unsubstituted (C6-C20)aryl, or a substituted or unsubstituted 5- to 22-membered heteroaryl; or are linked to an adjacent substituent(s) to form a mono- or polycyclic, (C3-C30)alicyclic or aromatic ring.

[Claim 6] The combination according to claim 1, wherein the compound represented by formula 1 is selected from the group consisting of: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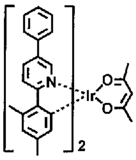
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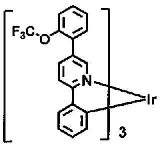
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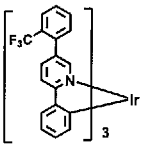
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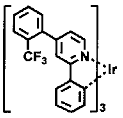
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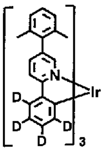
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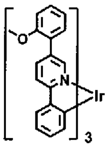
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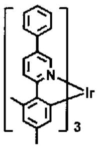
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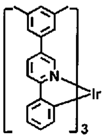
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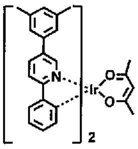
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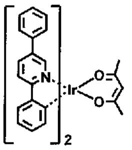
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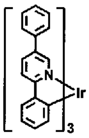
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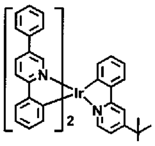
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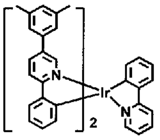
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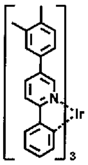
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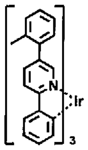
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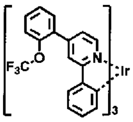
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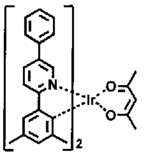
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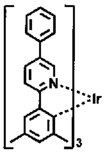
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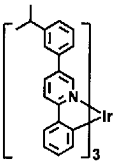
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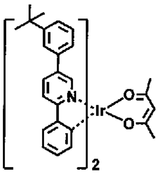
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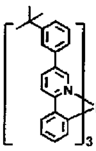
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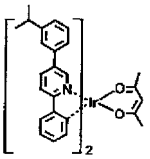
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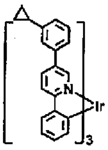
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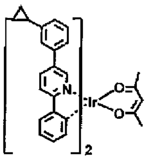
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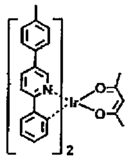
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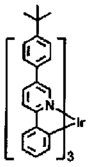
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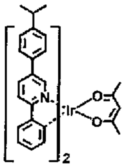
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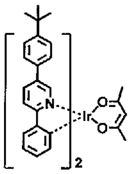
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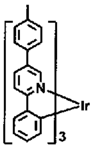
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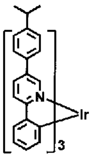
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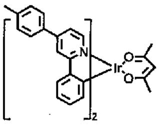
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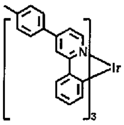
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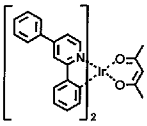
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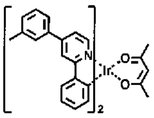
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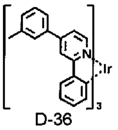
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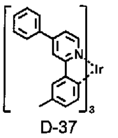
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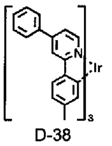
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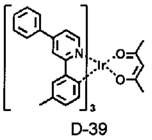
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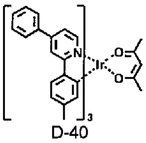
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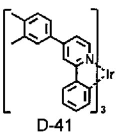
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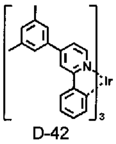
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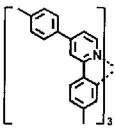
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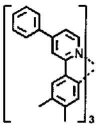
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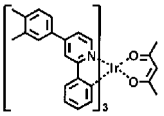
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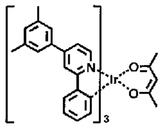
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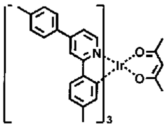
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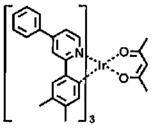
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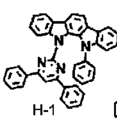
[Claim 7] The combination according to claim 1, wherein the compound represented by formula 2 is selected from the group consisting of: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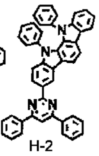
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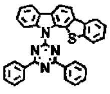
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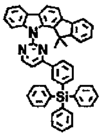
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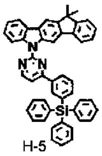
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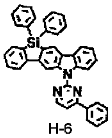
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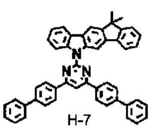
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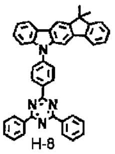
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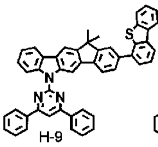
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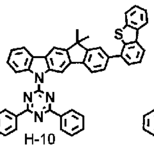
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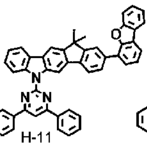
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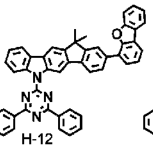
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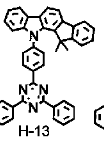
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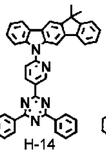
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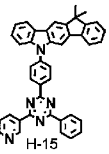
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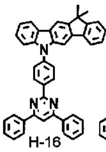
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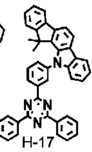
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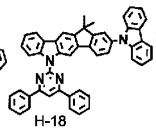
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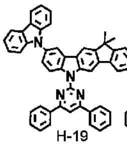
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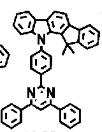
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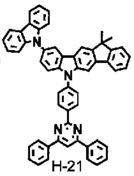
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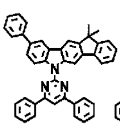
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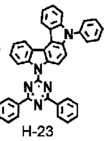
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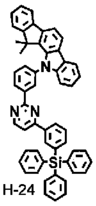
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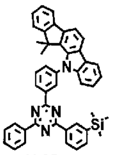
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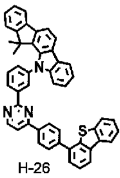
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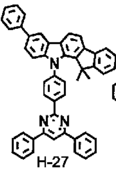
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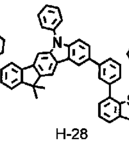
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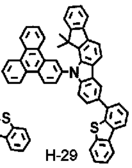
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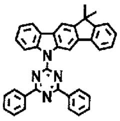
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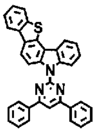
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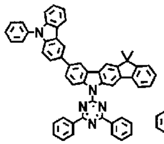
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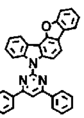
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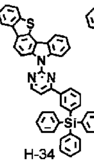
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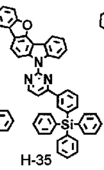
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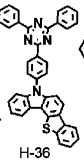
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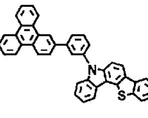
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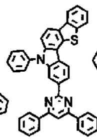
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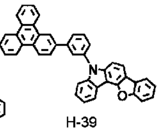
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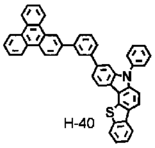
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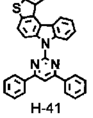
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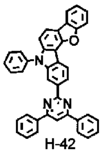
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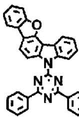
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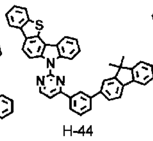
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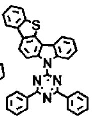
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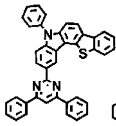
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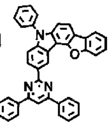
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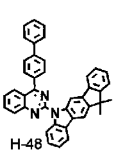
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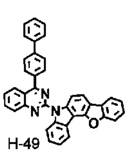
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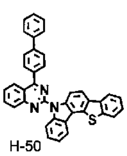
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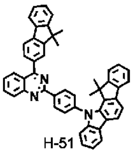
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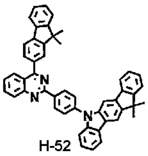
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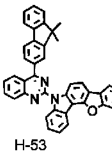
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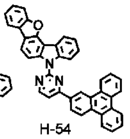
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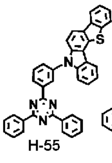
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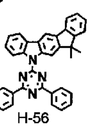
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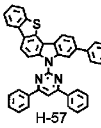
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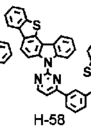
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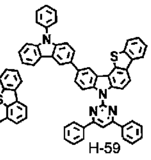
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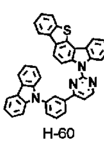
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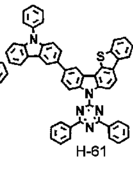
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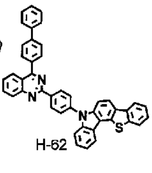
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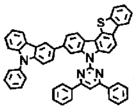
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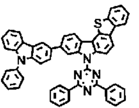
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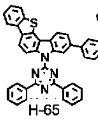
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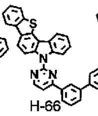
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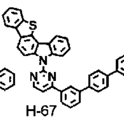
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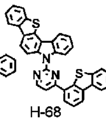
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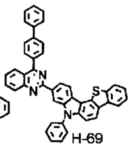
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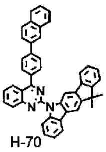
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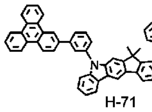
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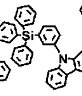
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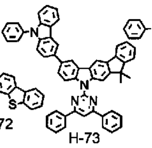
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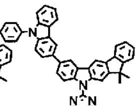
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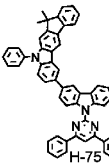
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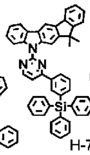
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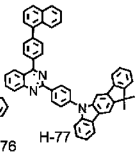
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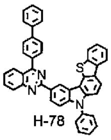
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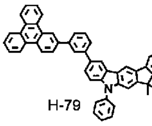
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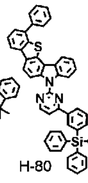
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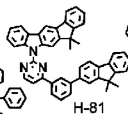
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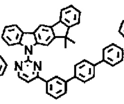
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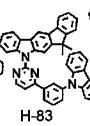
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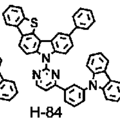
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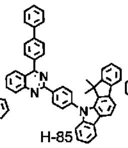
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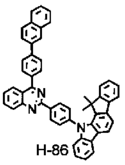
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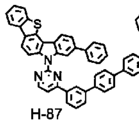
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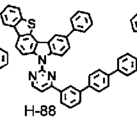
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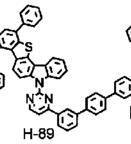
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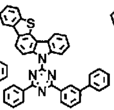
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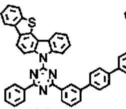
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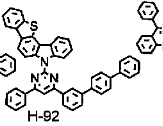
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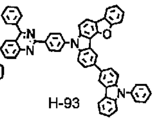
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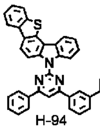
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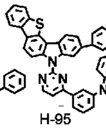
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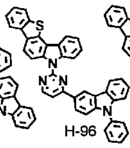
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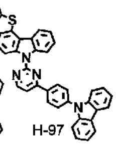
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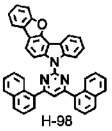
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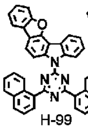
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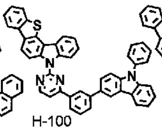
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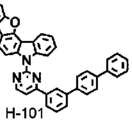
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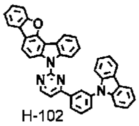
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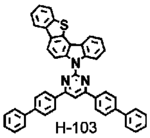
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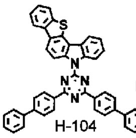
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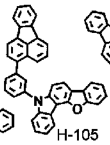
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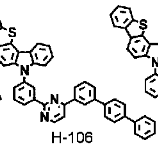
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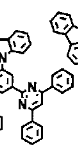
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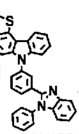
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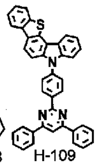
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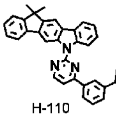
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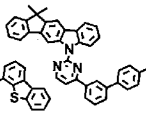
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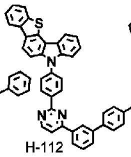
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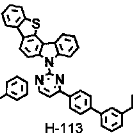
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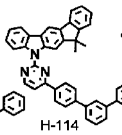
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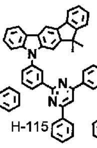
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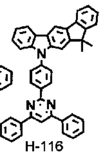
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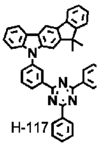
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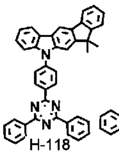
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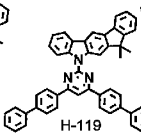
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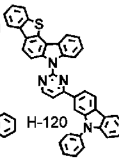
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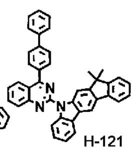
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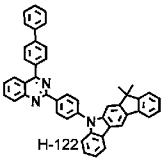
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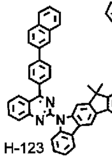
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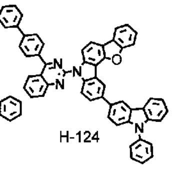
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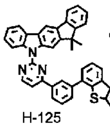
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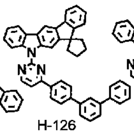
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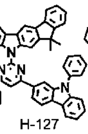
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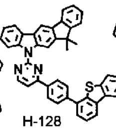
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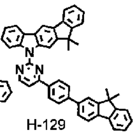
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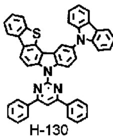
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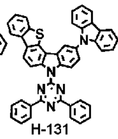
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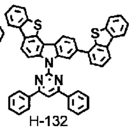
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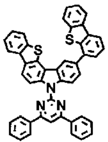
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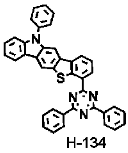
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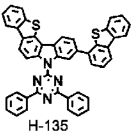
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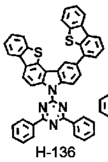
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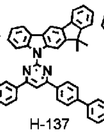
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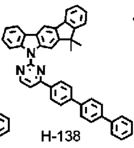
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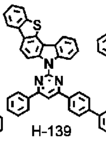
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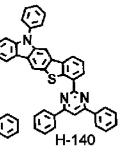
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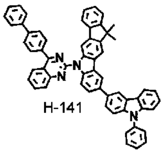
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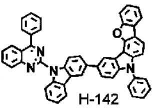
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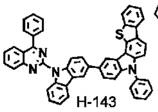
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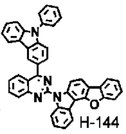
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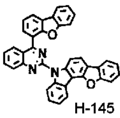
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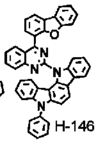
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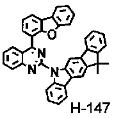
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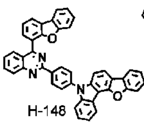
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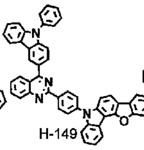
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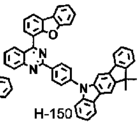
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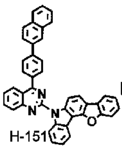
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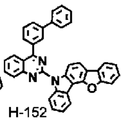
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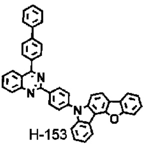
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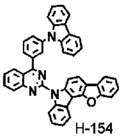
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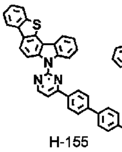
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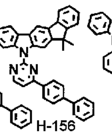
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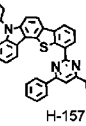
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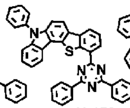
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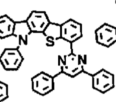
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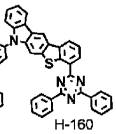
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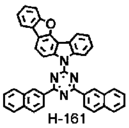
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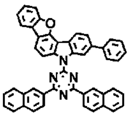
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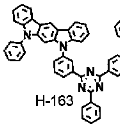
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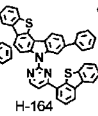
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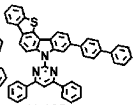
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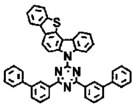
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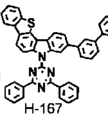
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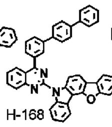
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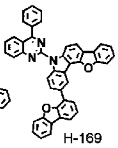
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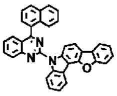
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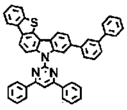
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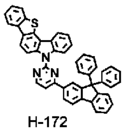
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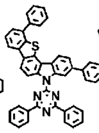
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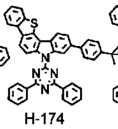
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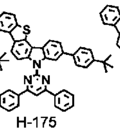
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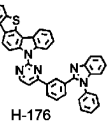
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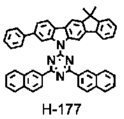
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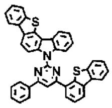
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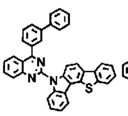
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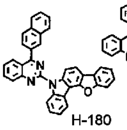
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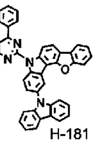
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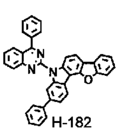
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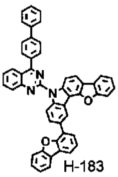
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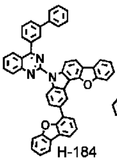
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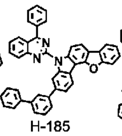
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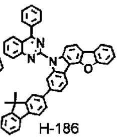
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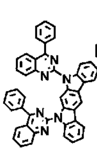
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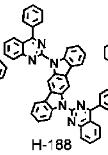
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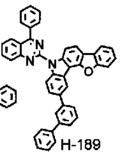
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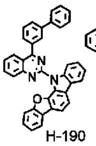
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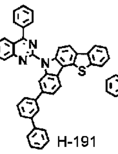
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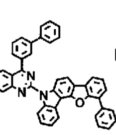
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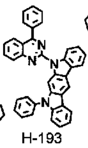
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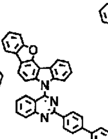
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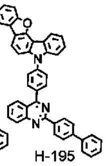
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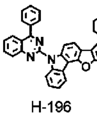
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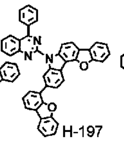
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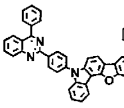
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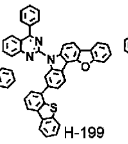
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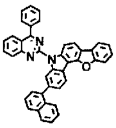
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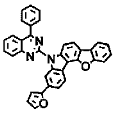
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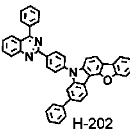
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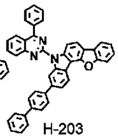
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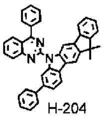
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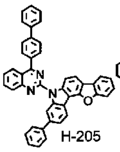
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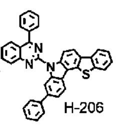
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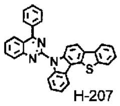
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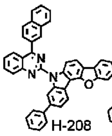
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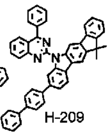
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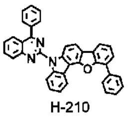
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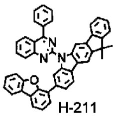
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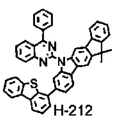
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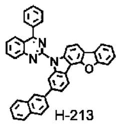
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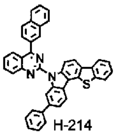
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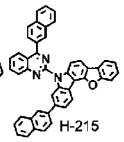
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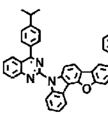
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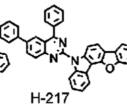
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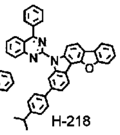
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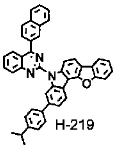
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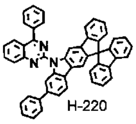
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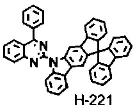
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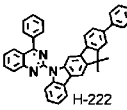
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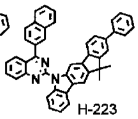
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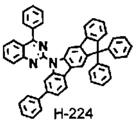
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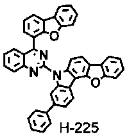
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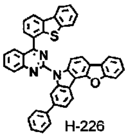
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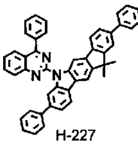
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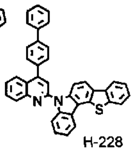
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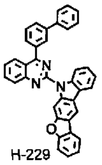
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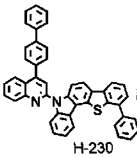
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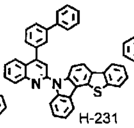
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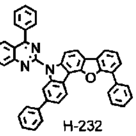
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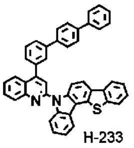
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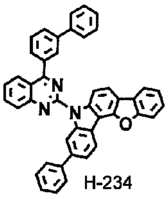
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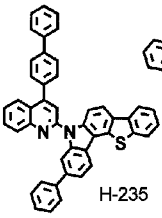
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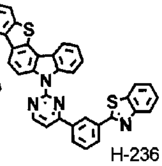
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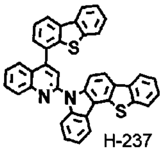
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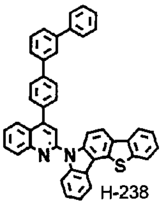
H-238

[Claim 8] An organic electroluminescent device which comprises the combination according to claim 1, and emits yellow-green light.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2013/008021

A. CLASSIFICATION OF SUBJECT MATTER

C09K 11/06 (2006.01) H05B 33/14 (2006.01) H01L 51/54 (2006.01) C07D 495/04 (2006.01) C07D 409/14 (2006.01) C07D 403/14 (2006.01) C07D 491/048 (2006.01) C07D 209/70 (2006.01) C07D 405/14 (2006.01) C07F 15/00 (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
REGISTRY, CAPLUS: Sub-structure search based on present formulae (1) and (2)
Patentscope search: Applicant name search

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

☒ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:

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

Date of **the** actual completion of the international search 13 December 2013	Date of mailing of the international search report 13 December 2013
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au Facsimile No.: +61 2 6283 7999	**Authorised officer** Una Fakhry AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0399359643

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/KR2013/008021**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/015274 A2 (ROHM AND HAAS ELECTRONIC MATERIALS KOREA LTD.) 02 February 2012 & EP259985 1 A2 (English family member equivalent used for translation purposes and referenced here) Abstract; Claim 1; pages 34-37, Examples 1-15; pg 6, [0013]; pg 7, [0014]; pg 19, [0030]; pg 14: Compounds 5 to 8, 10 to 13, 15, 16 & 19; pg 15: Compounds 36, 43, 47 to 50 and 52 to 57; pg 16: Compounds 59 to 65; pg 17: Compounds 94 to 96, 102 & 103; & pgl8: Compounds 104 to 107;	1-8
A	WO 2012/067425 A1 (ROHM AND HAAS ELECTRONIC MATERIALS KOREA LTD.) 24 May 2012 Claims 3, 6, 7; & pages 19-20, [66] to [74];	1-8

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/KR2013/008021**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
WO 2012/015274 A2	02 Feb 2012	EP 2599851 A2	05 Jun 2013
		JP 2013539206 A	17 Oct 2013
		KR 20120012431 A	09 Feb 2012
		TW 201300501 A	01 Jan 2013
		WO 2012015274 A2	02 Feb 2012
WO 2012/067425 A1	24 May 2012	EP 2640726 A1	25 Sep 2013
		KR 20120052879 A	24 May 2012
		TW 201229202 A	16 Jul 2012
		WO 2012067425 A1	24 May 2012

End of Annex

专利名称(译)	主体化合物和掺合物化合物以及包含该化合物的有机电致发光装置的新组合		
公开(公告)号	EP2875093A1	公开(公告)日	2015-05-27
申请号	EP2013835031	申请日	2013-09-05
[标]申请(专利权)人(译)	罗门哈斯电子材料有限公司		
申请(专利权)人(译)	罗门哈斯电子材料KOREA LTD.		
当前申请(专利权)人(译)	罗门哈斯电子材料KOREA LTD.		
[标]发明人	KIM CHI SIK YOON SEOK KEUN KIM HYUN JUNG SO YOUNG KANG HYUN JU LEE KYUNG JOO SHIN HYO NIM KIM NAM KYUN CHO YOUNG JUN KWON HYUCK JOO KIM BONG OK		
发明人	KIM, CHI-SIK YOON, SEOK-KEUN KIM, HYUN JUNG, SO-YOUNG KANG, HYUN-JU LEE, KYUNG-JOO SHIN, HYO-NIM KIM, NAM-KYUN CHO, YOUNG-JUN KWON, HYUCK-JOO KIM, BONG-OK		
IPC分类号	C09K11/06 H05B33/14 H01L51/54 C07D495/04 C07D409/14 C07D403/14 C07D491/048 C07D209/70 C07D405/14 C07F15/00		
CPC分类号	C09K11/025 C07D209/80 C07D401/14 C07D403/04 C07D403/10 C07D403/14 C07D405/14 C07D409/04 C07D409/10 C07D409/14 C07D487/04 C07D491/048 C07D495/04 C07F15/0033 C09K11/06 C09K2211/185 H01L51/0052 H01L51/0054 H01L51/0067 H01L51/0071 H01L51/0072 H01L51/0073 H01L51/0074 H01L51/0085 H01L51/0094 H01L51/5016 H01L51/5036		
代理机构(译)	霍顿MARK PHILLIP		
优先权	1020120099580 2012-09-07 KR		
外部链接	Espacenet		

摘要(译)

本发明涉及掺杂剂化合物和主体化合物的特定组合，以及包含该组合物的有机电致发光器件。本发明的有机电致发光器件发出黄绿色光;通过改善器件的电流特性来降低器件的驱动电压;并提高电源效率和运行寿命。