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(71) Applicant (for all designated States except US): **CHEIL INDUSTRIES INC.** [KR/KR]; 290, Kongdan-dong, Kumi-city, Kyungsangbuk-do 730-030 (KR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **RYU, Dong-Wan** [KR/KR]; Cheil Industries Inc., 332-2, Gocheon-dong, Uiwang-si, Gyeonggi-do 437-711 (KR). **JUNG, Sung-Hyun** [KR/KR]; Cheil Industries Inc., 332-2, Gocheon-dong, Uiwang-si, Gyeonggi-do 437-711 (KR). **HUH, Dal-Ho** [KR/KR]; Cheil Industries Inc., 332-2, Gocheon-dong, Uiwang-si, Gyeonggi-do 437-711 (KR). **LEE, Kyoung-Mi** [KR/KR]; Cheil Industries Inc., 332-2, Gocheon-dong, Uiwang-si, Gyeonggi-do 437-711 (KR). **LEE, Nam-Heon** [KR/KR]; Cheil Industries Inc., 332-2, Gocheon-dong, Uiwang-si, Gyeonggi-do 437-711 (KR). **CHAE, Mi-Young** [KR/KR]; Cheil Industries Inc.,

(74) Agent: **PANKOREA PATENT AND LAW FIRM**; Se-olim Bldg., 649-10, Yoksam-dong, Kangnam-ku, Seoul 135-080 (KR).

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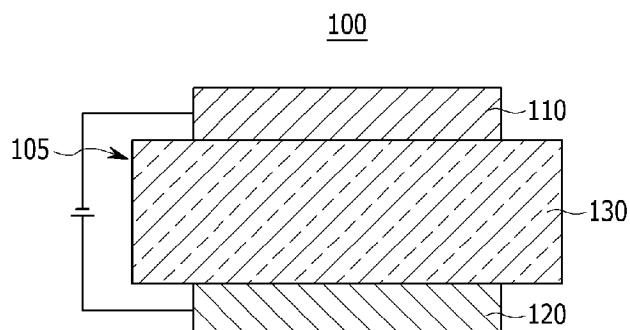
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(54) Title: COMPOUND FOR OPTOELECTRONIC DEVICE, ORGANIC LIGHT EMITTING DIODE INCLUDING THE SAME AND DISPLAY INCLUDING THE ORGANIC LIGHT EMITTING DIODE

FIG. 1



(57) Abstract: A compound for an optoelectronic device and an organic photoelectric device including the same are provided. The compound for an optoelectronic device is represented by a Chemical Formula 1. An organic photoelectric device having excellent electrochemical and thermal stability, thereby having an excellent life-span characteristic and high luminous efficiency at a low driving voltage, is provided.

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Description

Title of Invention: COMPOUND FOR OPTOELECTRONIC DEVICE, ORGANIC LIGHT EMITTING DIODE INCLUDING THE SAME AND DISPLAY INCLUDING THE ORGANIC LIGHT EMITTING DIODE

Technical Field

[1] A compound for an optoelectronic device being capable of providing an optoelectronic device having excellent life-span, efficiency, electrochemical stability, and thermal stability, an organic light emitting diode including the same, and a display including the organic light emitting diode, are disclosed.

[2]

Background Art

[3] A photoelectric device is, in a broad sense, a device for transforming photo-energy to electrical energy, or conversely, a device for transforming electrical energy to photo-energy.

[4] An organic photoelectric device may be classified as follows in accordance with its driving principles. A first organic photoelectric device is an electron device driven as follows: excitons are generated in an organic material layer by photons from an external light source; the excitons are separated to electrons and holes; and the electrons and holes are transferred to different electrodes from each other as a current source (voltage source).

[5] A second organic photoelectric device is an electron device driven as follows: a voltage or a current is applied to at least two electrodes to inject holes and/or electrons into an organic material semiconductor positioned at an interface of the electrodes; and then the device is driven by the injected electrons and holes.

[6] As examples, the organic photoelectric device includes an organic light emitting diode (OLED), an organic solar cell, an organic photo-conductor drum, an organic transistor, an organic memory device, etc., and it requires a hole injecting or transporting material, an electron injecting or transporting material, or a light emitting material.

[7] Particularly, an organic light emitting diode (OLED) has recently drawn attention due to an increase in demand for flat panel displays. In general, organic light emission refers to transformation of electrical energy to photo-energy.

[8] The organic light emitting diode transforms electrical energy into light by applying current to an organic light emitting material. It has a structure in which a functional

organic material layer is interposed between an anode and a cathode. The organic material layer includes multiple layers including different materials from each other, for example a hole injection layer (HIL), a hole transport layer (HTL), an emission layer, an electron transport layer (ETL), and an electron injection layer (EIL), in order to improve efficiency and stability of an organic light emitting diode.

[9] In such an organic light emitting diode, when a voltage is applied between an anode and a cathode, holes from the anode and electrons from the cathode are injected to an organic material layer. The generated excitons generate light having certain wavelengths while shifting to a ground state.

[10] Recently, it is has become known that a phosphorescent light emitting material can be used for a light emitting material of an organic light emitting diode in addition to the fluorescent light emitting material. Such a phosphorescent material emits lights by transiting the electrons from a ground state to an exited state, non-radiance transiting of a singlet exciton to a triplet exciton through intersystem crossing, and transiting a triplet exciton to a ground state to emit light.

[11] As described above, in an organic light emitting diode, an organic material layer includes a light emitting material and a charge transport material, for example a hole injection material, a hole transport material, an electron transport material, an electron injection material, and so on.

[12] The light emitting material is classified as blue, green, and red light emitting materials according to emitted colors, and yellow and orange light emitting materials to emit colors approaching natural colors.

[13] When one material is used as a light emitting material, a maximum light emitting wavelength is shifted to a long wavelength or color purity decreases because of interactions between molecules, or device efficiency decreases because of a light emitting quenching effect. Therefore, a host/dopant system is included as a light emitting material in order to improve color purity and increase luminous efficiency and stability through energy transfer.

[14] In order to implement the above excellent performance of an organic light emitting diode, a material constituting an organic material layer, for example a hole injection material, a hole transport material, a light emitting material, an electron transport material, an electron injection material, and a light emitting material such as a host and/or a dopant should be stable and have good efficiency. However, development of an organic material layer forming material for an organic light emitting diode has not been satisfactory up to now, and thus there is a need for a novel material. This material development is also required for other organic photoelectric devices.

[15] The low molecular organic light emitting diode is manufactured as a thin film in a vacuum deposition method, and can have good efficiency and life-span performance.

A polymer organic light emitting diode manufactured in an Inkjet or spin coating method has an advantage of low initial cost and being large-sized.

[16] Both low molecular organic light emitting and polymer organic light emitting diodes have an advantage of self-light emitting, high speed response, wide viewing angle, ultrathickness, high image quality, durability, a large driving temperature range, and the like. In particular, they have good visibility due to the self-light emitting characteristic compared with a conventional LCD (liquid crystal display) and have an advantage of decreasing thickness and weight of an LCD up to a third, because they do not need a backlight.

[17] In addition, since they have a response speed that is 1000 times faster than an LCD, they can realize a perfect motion picture without an after-image. Based on these advantages, they have been remarkably developed to have 80 times the efficiency and more than 100 times the life-span since they first came out in the late 1980s. Recently, they have kept becoming rapidly larger, such as development of a 40-inch organic light emitting diode panel.

[18] They are simultaneously required to have improved luminous efficiency and life-span in order to be larger. Herein, their luminous efficiency needs a smooth combination between holes and electrons in an emission layer. However, since an organic material in general has slower electron mobility than hole mobility, it has a drawback of inefficient combination between holes and electrons. Accordingly, while increasing electron injection and mobility from a cathode, simultaneous prevention of movement of holes is required.

[19] In order to improve the life-span, material crystallization caused by Joule heat generated during device operation must be prevented. Accordingly, there has been a strong need for an organic compound having excellent electron injection and mobility, and high electrochemical stability.

[20]

Disclosure of Invention

Technical Problem

[21] A compound for an optoelectronic device that may act as hole injection, hole transport, light emitting, or electron injection and/or transport material, and also act as a light emitting host along with an appropriate dopant, is provided.

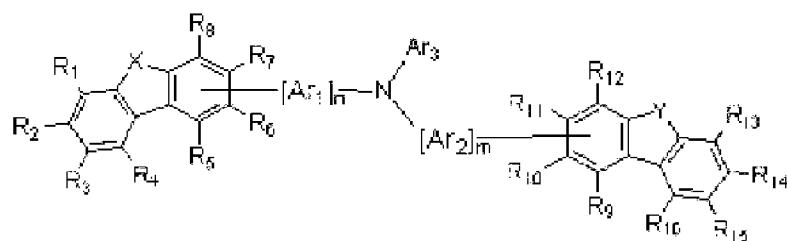
[22] An organic optoelectronic device having excellent life-span, efficiency, driving voltage, electrochemical stability, and thermal stability is provided.

Solution to Problem

[23] According to one embodiment of the present invention, a compound for an optoelectronic device represented by the following Chemical Formula 1 is provided.

[24] [Chemical Formula 1]

[25]



[26] In Chemical Formula 1,

[27] R_1 to R_{16} are the same or different, and are independently selected from hydrogen, deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a carboxyl group, a ferrocenyl group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C2 to C30 heteroaryl group, a substituted or unsubstituted C1 to C20 alkoxy group, a substituted or unsubstituted C6 to C20 aryloxy group, a substituted or unsubstituted C3 to C40 silyloxy group, a substituted or unsubstituted C1 to C20 acyl group, a substituted or unsubstituted C2 to C20 alkoxycarbonyl group, a substituted or unsubstituted C2 to C20 acyloxy group, a substituted or unsubstituted C2 to C20 acylamino group, a substituted or unsubstituted C2 to C20 alkoxycarbonyl amino group, a substituted or unsubstituted C7 to C20 aryloxy carbonyl amino group, a substituted or unsubstituted C1 to C20 sulfamoyl amino group, a substituted or unsubstituted C1 to C20 sulfonyl group, a substituted or unsubstituted C1 to C20 alkylthiol group, a substituted or unsubstituted C6 to C20 arylthiol group, a substituted or unsubstituted C1 to C20 heterocyclothiol group, a substituted or unsubstituted C1 to C20 ureide group, and a substituted or unsubstituted C3 to C40 silyl group,

[28] at least one of R_1 to R_8 represents a bond with Ar_1 ,

[29] at least one of R_9 to R_{16} represents a bond with Ar_2 ,

[30] at least one of R_1 to R_8 is optionally bound to Ar_1 through a sigma bond, at least one of R_9 to R_{16} is optionally bound to Ar_2 through a sigma bond,

[31] X is selected from NR_{17} , O, S and $SO_2(O=S=O)$, R_{17} is a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group and a substituted or unsubstituted C2 to C30 heteroaryl group,

[32] Y is selected from O, S and $SO_2(O=S=O)$,

[33] Ar_1 and Ar_2 are the same or different, and are independently a substituted or unsubstituted C6 to C30 aryl group or a substituted or unsubstituted C2 to C30 heteroaryl group,

[34] n is an integer ranging from 1 to 4,

[35] m is an integer ranging from 0 to 4, and

[36] Ar₃ is a substituted or unsubstituted C6 to C30 aryl group or a substituted or unsubstituted C2 to C30 heteroaryl group,

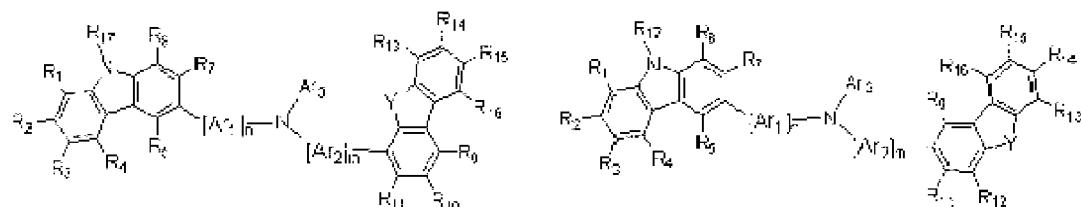
[37] provided that Ar₃ is not a substituted or unsubstituted carbazolyl group, a substituted or unsubstituted dibenzofuranyl group and a substituted or unsubstituted dibenzothiophenyl group, and when X is NR₁₇, Ar₃ is not a fluorenyl group.

[38] X is selected from NR₁₇, O, S, and SO₂(O=S=O), wherein R₁₇ is a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group, and the “substituted” aryl group or heteroaryl group refers to one substituted with at least one substituent selected from deuterium, a halogen, a cyano group, hydroxy group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C1 to C20 alkoxy group, a substituted or unsubstituted C3 to C40 silyl group, and a combination thereof.

[39] The compound for an optoelectronic device may include one of the compounds represented by the following Chemical Formulae 2 to 7.

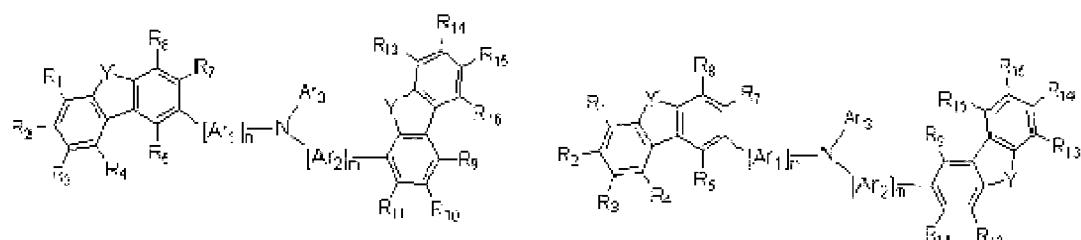
[40] [Chemical Formula 2] [Chemical Formula 3]

[41]



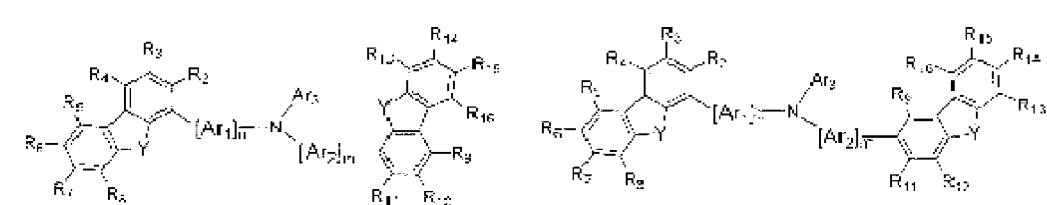
[42] [Chemical Formula 4] [Chemical Formula 5]

[43]



[44] [Chemical Formula 6] [Chemical Formula 7]

[45]



[46] In Chemical Formulae 2 to 7,

[47] R₁ to R₁₆ are the same or different, and are independently selected from hydrogen, deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a carboxyl group, a ferrocenyl

group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C2 to C30 heteroaryl group, a substituted or unsubstituted C1 to C20 alkoxy group, a substituted or unsubstituted C6 to C20 aryloxy group, a substituted or unsubstituted C3 to C40 silyloxy group, a substituted or unsubstituted C1 to C20 acyl group, a substituted or unsubstituted C2 to C20 alkoxy carbonyl group, a substituted or unsubstituted C2 to C20 acylamino group, a substituted or unsubstituted C2 to C20 alkoxy carbonyl amino group, a substituted or unsubstituted C7 to C20 aryloxy carbonyl amino group, a substituted or unsubstituted C1 to C20 sulfamoyl amino group, a substituted or unsubstituted C1 to C20 sulfonyl group, a substituted or unsubstituted C1 to C20 alkylthiol group, a substituted or unsubstituted C6 to C20 arylthiol group, a substituted or unsubstituted C1 to C20 heterocyclothiol group, a substituted or unsubstituted C1 to C20 ureide group, and a substituted or unsubstituted C3 to C40 silyl group,

[48] R_{17} is a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group,

[49] Y is selected from O, S, and $SO_2(O=S=O)$,

[50] Ar_1 and Ar_2 are the same or different, and are independently a substituted or unsubstituted C6 to C30 aryl group or a substituted or unsubstituted C2 to C30 heteroaryl group,

[51] n is an integer ranging from 1 to 4,

[52] m is an integer ranging from 0 to 4, and

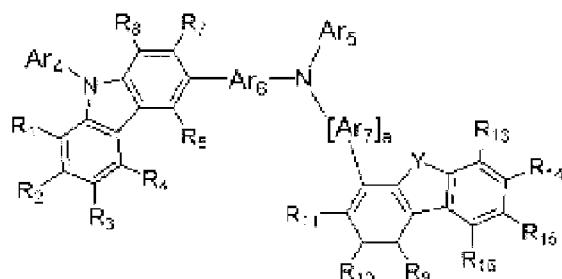
[53] Ar_3 is a substituted or unsubstituted C6 to C30 aryl group or a substituted or unsubstituted C2 to C30 heteroaryl group,

[54] provided that Ar_3 is not a substituted or unsubstituted carbazolyl group, a substituted or unsubstituted dibenzofuranyl group, or a substituted or unsubstituted dibenzothiophenyl group.

[55] The compound for an optoelectronic device may include one of the compounds represented by the following Chemical Formula 8 or 9.

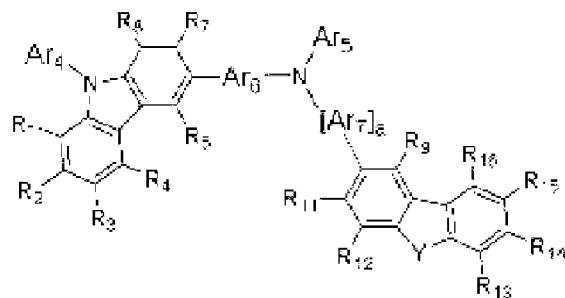
[56] [Chemical Formula 8]

[57]



[58] [Chemical Formula 9]

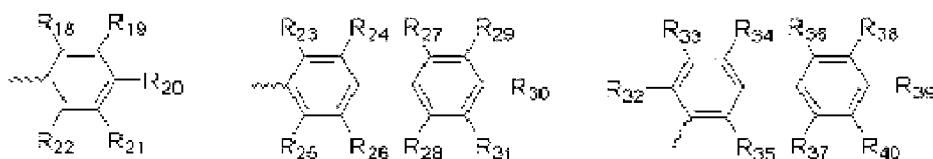
[59]



[60] In Chemical Formulae 8 and 9, Ar₄ and Ar₅ are the same or different, and are independently a substituent selected from the following Chemical Formulae 10 to 18.

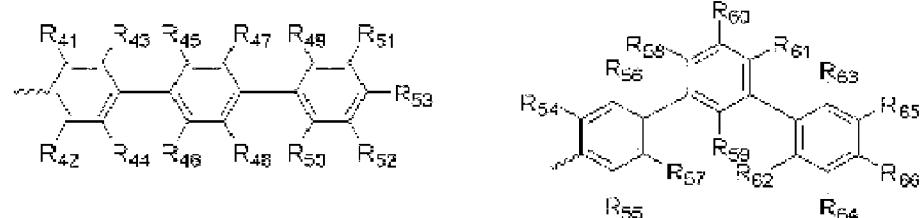
[61] [Chemical Formula 10] [Chemical Formula 11] [Chemical Formula 12]

[62]



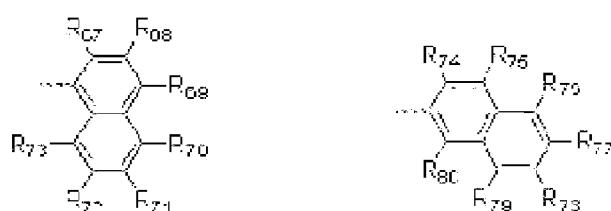
[63] [Chemical Formula 13] [Chemical Formula 14]

[64]



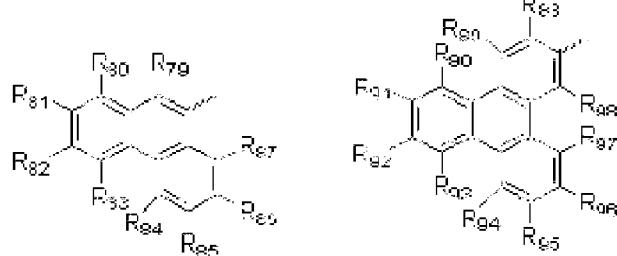
[65] [Chemical Formula 15] [Chemical Formula 16]

[66]



[67] [Chemical Formula 17] [Chemical Formula 18]

[68]



[69]

[70] Herein, R₁ to R₅, R₇ to R₁₆, and R₁₈ to R₉₈ are the same or different, and are independently selected from hydrogen, deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C1 to C20 alkoxy group, and a substituted or unsubstituted C3 to C40 silyl group.

[71]

[72] Ar₆ and Ar₇ are the same or different, and are independently a substituent selected from the above Chemical Formulae 9 to 17, and at least one of R₁₈ to R₉₈ is bound to an adjacent atom, and

[73] a is 0 or 1.

[74] Ar₃ may be selected from a substituted or unsubstituted phenyl group, a substituted or unsubstituted naphthyl group, a substituted or unsubstituted anthracenyl group, a substituted or unsubstituted phenanthryl group, a substituted or unsubstituted naphthacenyl group, a substituted or unsubstituted pyrenyl group, a substituted or unsubstituted biphenylyl group, a substituted or unsubstituted p-terphenyl group, a substituted or unsubstituted m-terphenyl group, a substituted or unsubstituted chrysenyl group, a substituted or unsubstituted triperylenyl group, a substituted or unsubstituted perylenyl group, a substituted or unsubstituted indenyl group, a substituted or unsubstituted furanyl group, a substituted or unsubstituted thiophenyl group, a substituted or unsubstituted pyrrolyl group, a substituted or unsubstituted pyrazolyl group, a substituted or unsubstituted imidazolyl group, a substituted or unsubstituted triazolyl group, a substituted or unsubstituted oxazolyl group, a substituted or unsubstituted thiazolyl group, a substituted or unsubstituted oxadiazolyl group, a substituted or unsubstituted thia-diazolyl group, a substituted or unsubstituted pyridyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted pyrazinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted benzofuranyl group, a substituted or unsubstituted benzothiophenyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted indolyl group, a substituted or unsubstituted quinolinyl group, a substituted or unsubstituted isoquinolinyl group, a substituted or unsubstituted quinazolinyl group, a substituted or unsubstituted naphthydinyl group, a substituted or unsubstituted benzoxazinyl group, a substituted or unsubstituted benzthiazinyl group, a substituted or unsubstituted acridinyl group, a substituted or unsubstituted phenazinyl group, a substituted or unsubstituted phenothiazinyl group, or a substituted or unsubstituted phenoxazinyl group.

[75]

Ar₄ is selected from one of the substituents represented by the above Chemical

Formulae 10 to 18 provided that at least one of R₁₈ to R₉₈ is not hydrogen, and for example it may be selected from deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C1 to C20 alkoxy group, and a substituted or unsubstituted C3 to C40 silyl group.

[76] The compound for an optoelectronic device may include at least one of the compounds represented by the following Chemical Formulae A-1 to A-305, A-414 to A-416, A-457, A-458, or A-469 to A-473.

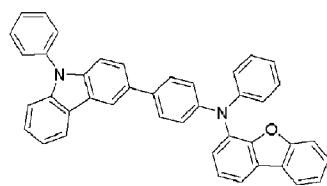
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[A-1]

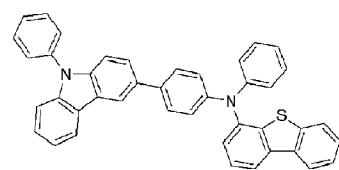
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[A-3]

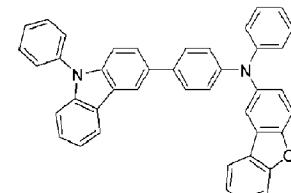
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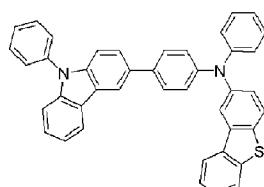
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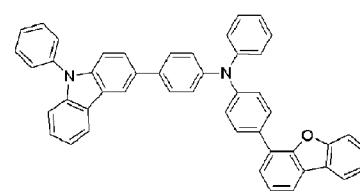
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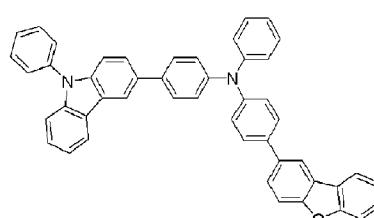
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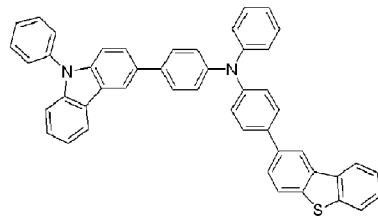
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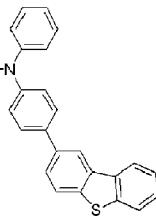
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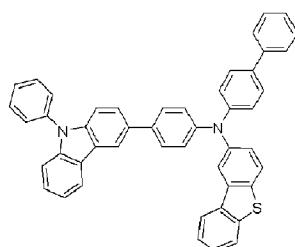
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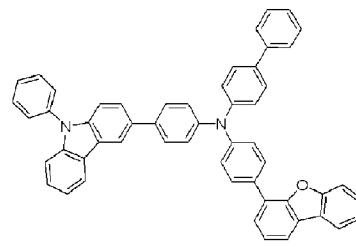
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[A-11]

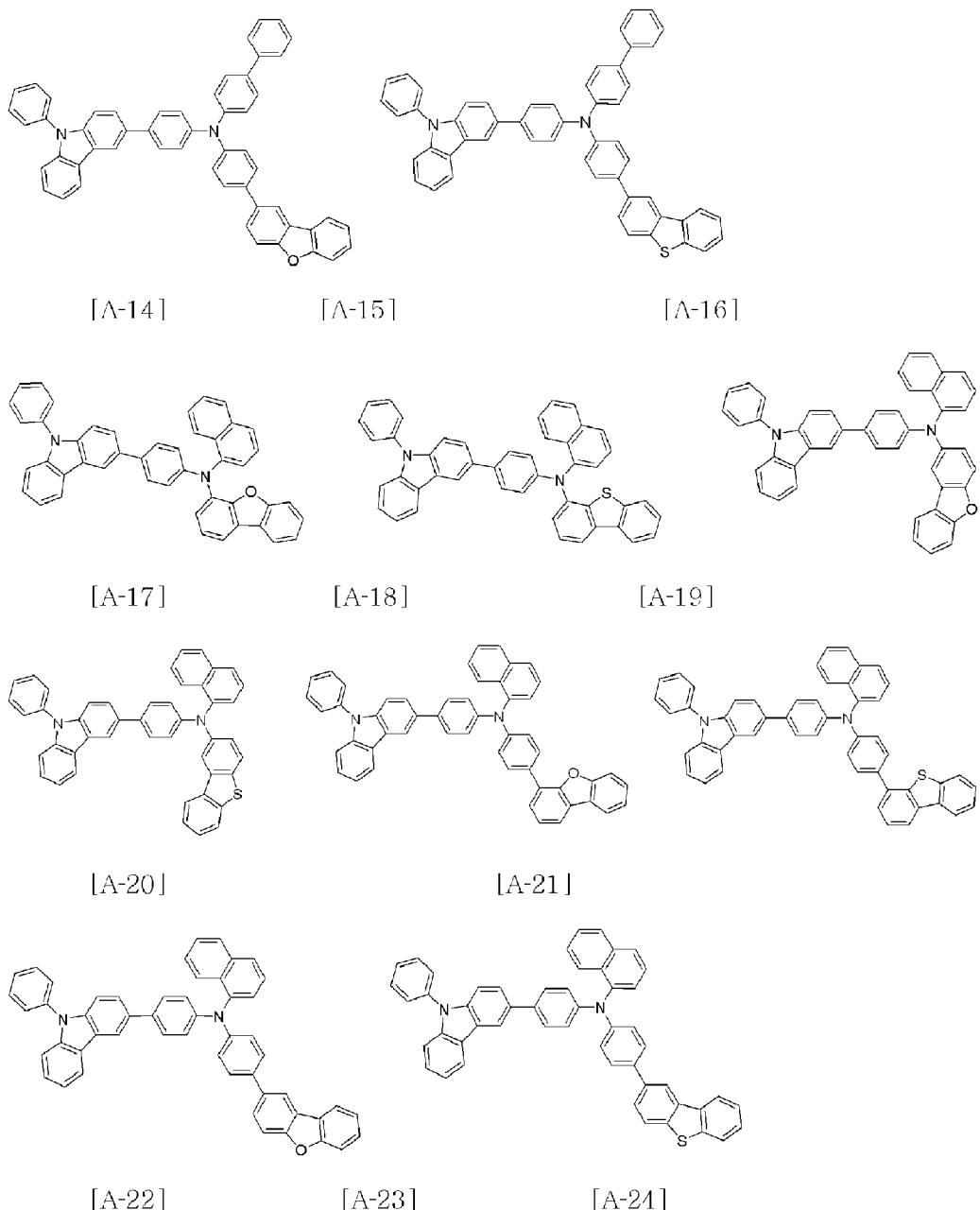


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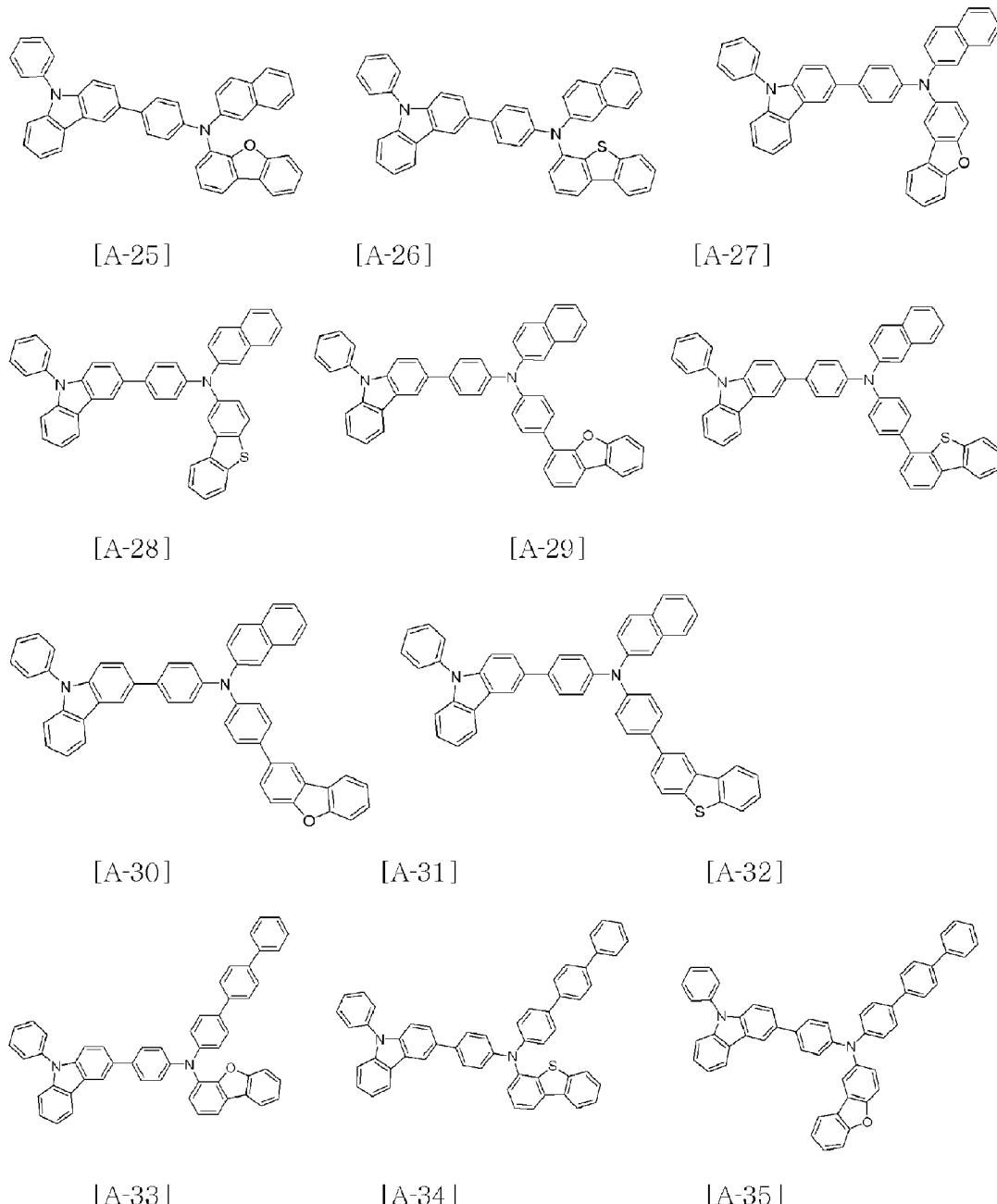


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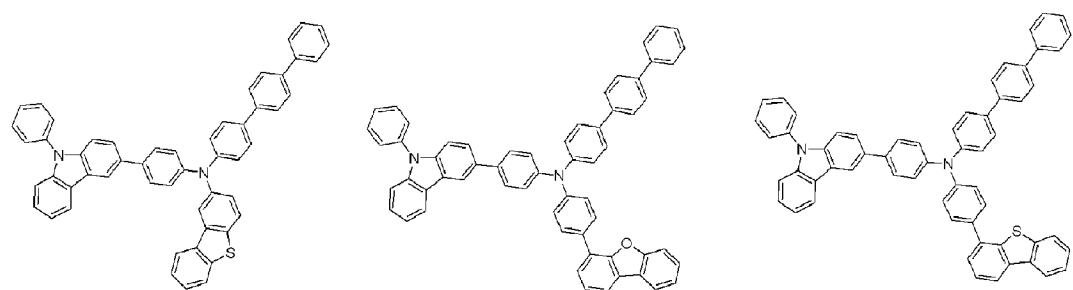
[79]



[80]

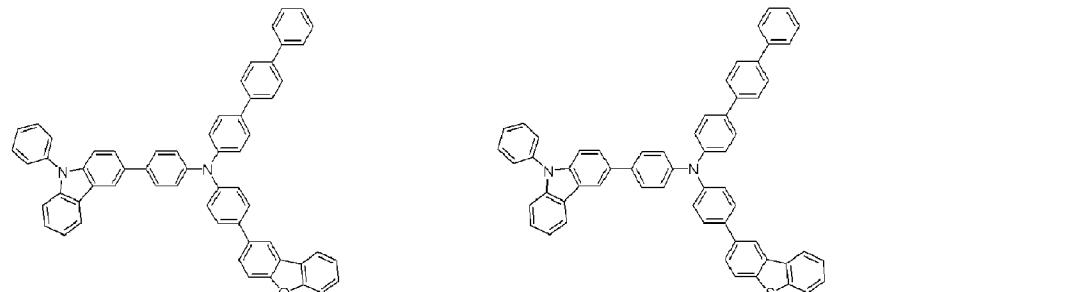


[81]



[A-36]

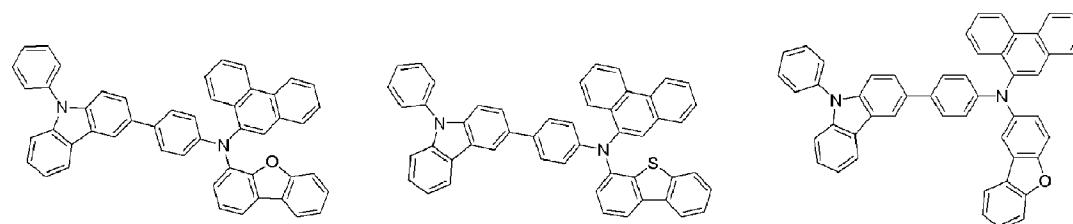
[A-37]



[A-38]

[A-39]

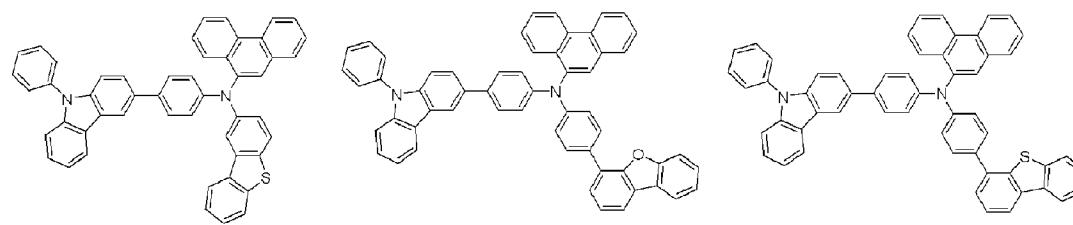
[A-40]



[A-41]

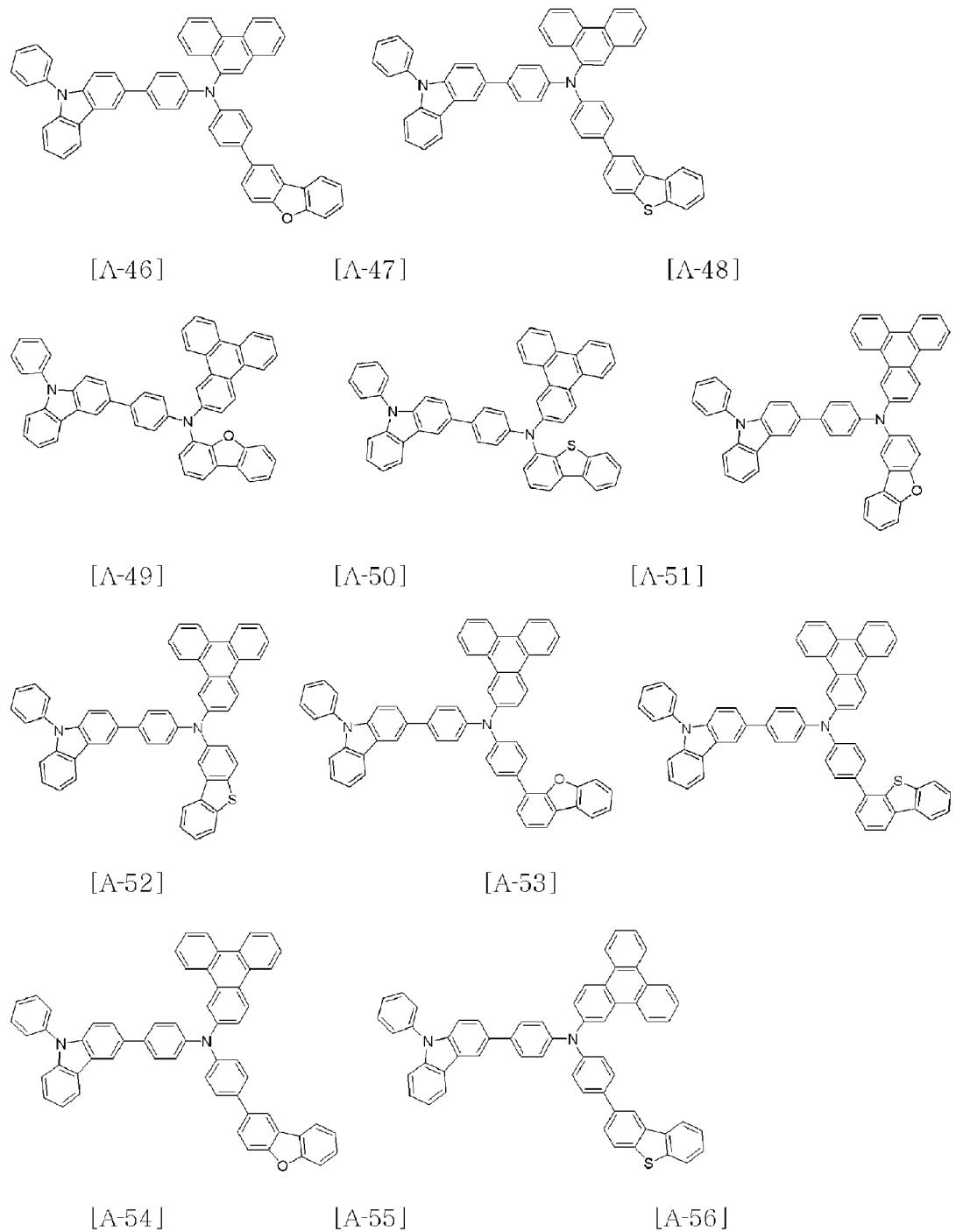
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[A-43]

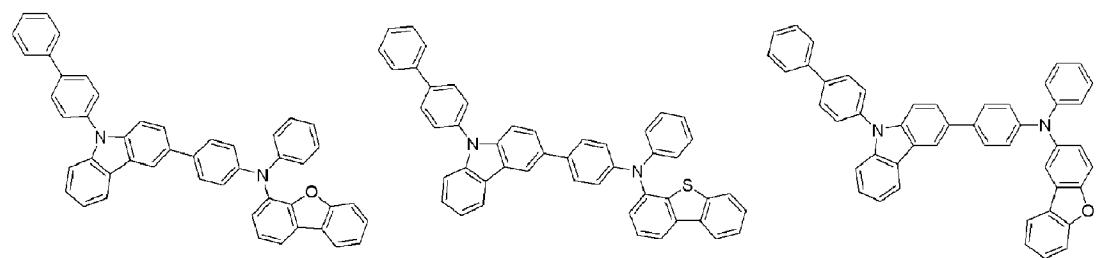


[A-44]

[A-45]



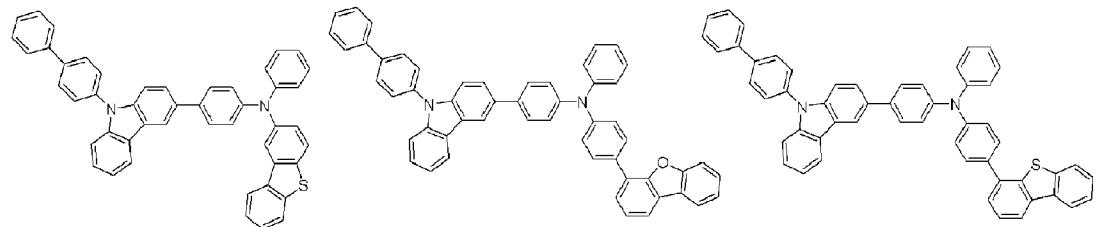
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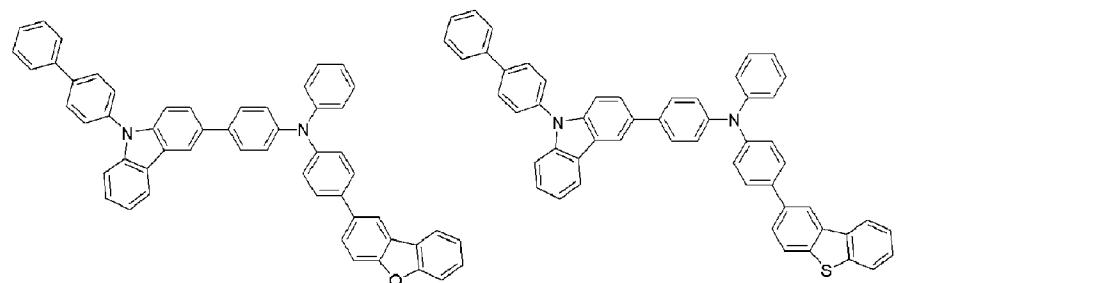
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[A-59]



[A-60]

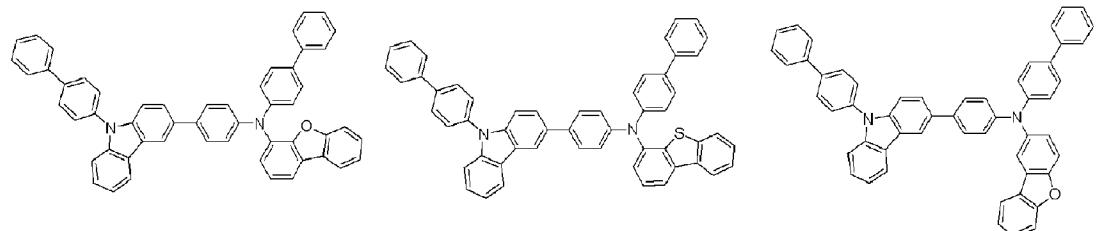
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[A-62]

[A-63]

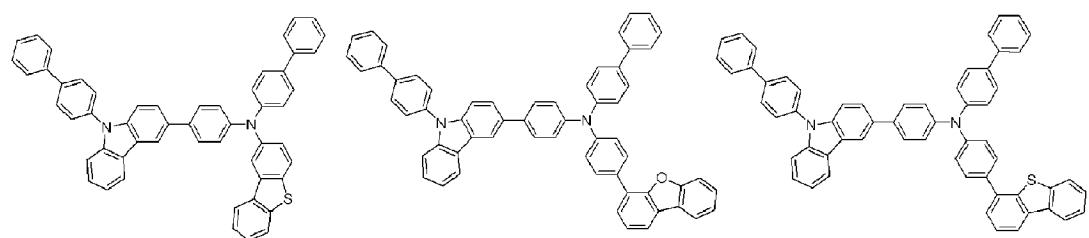
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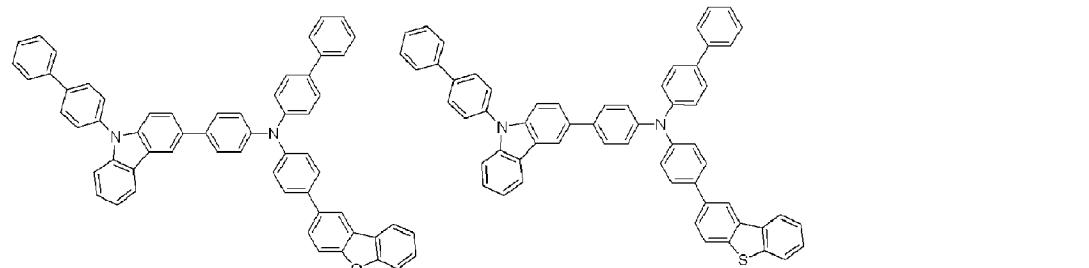
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[A-68]

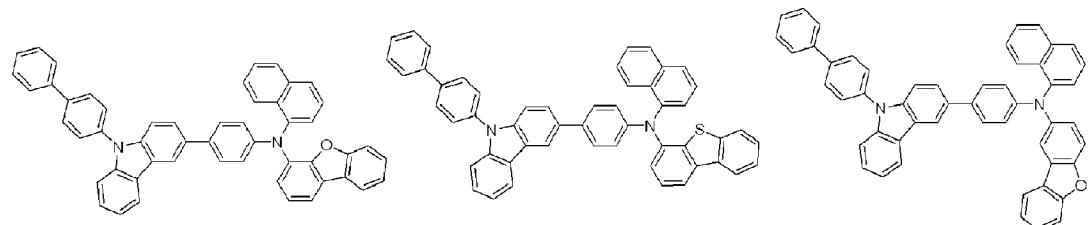
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[A-70]

[A-71]

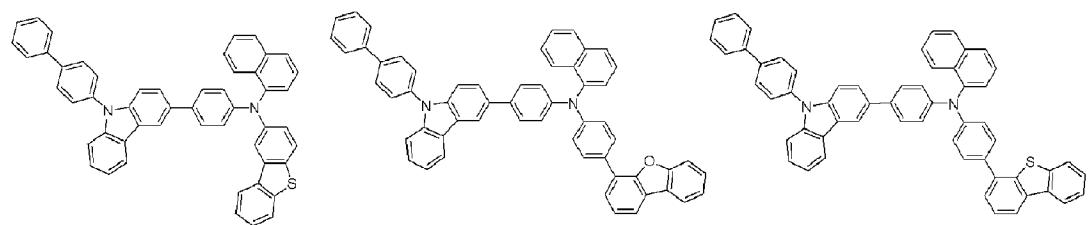
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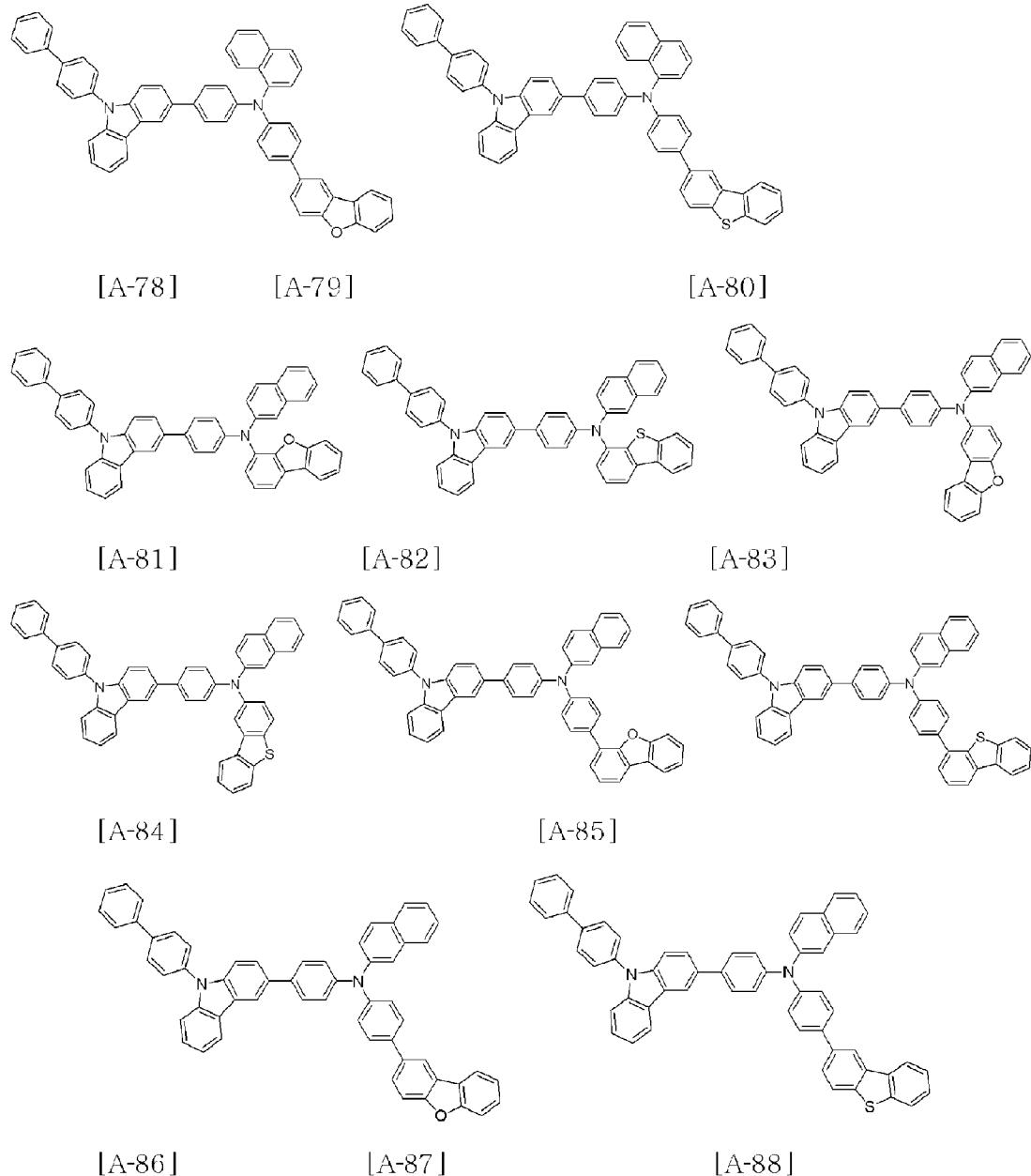
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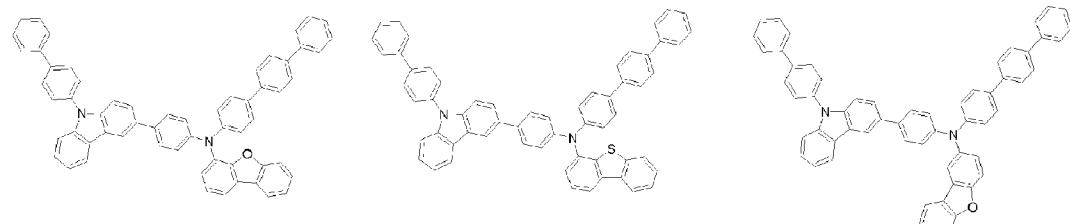


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[A-77]



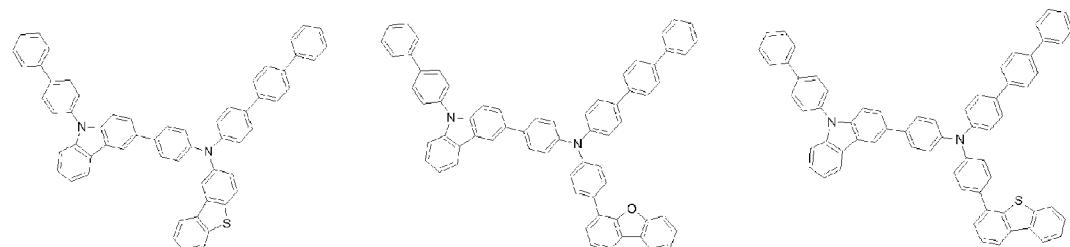
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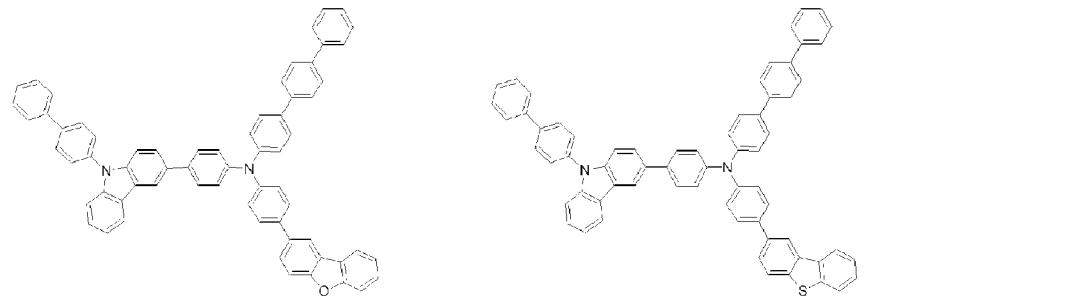
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[A-91]



[A-92]

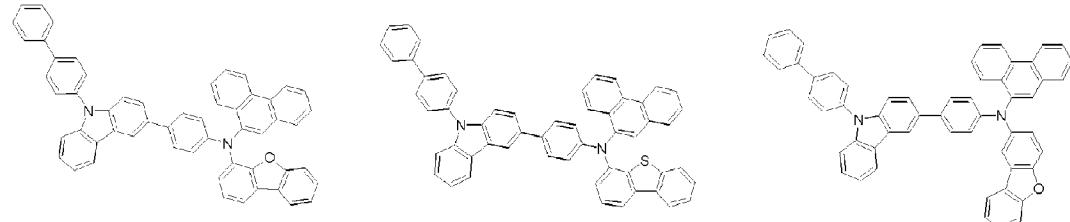
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[A-94]

[A-95]

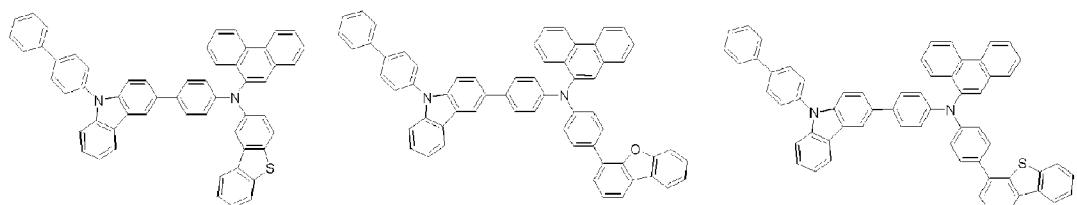
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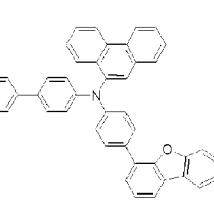
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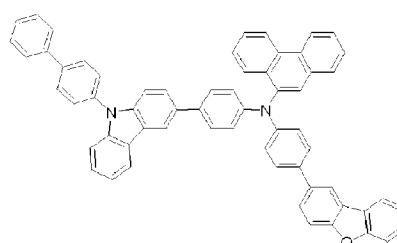
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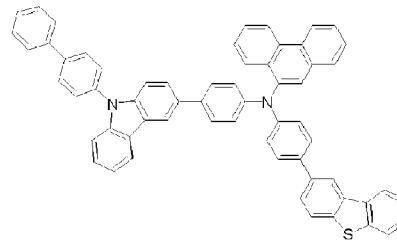
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[A-101]



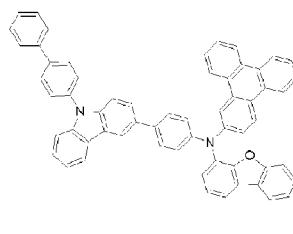
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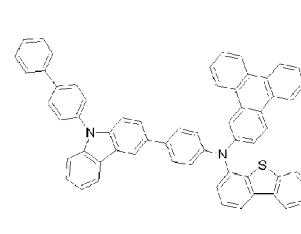
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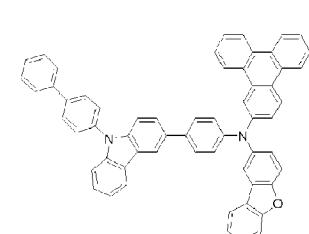
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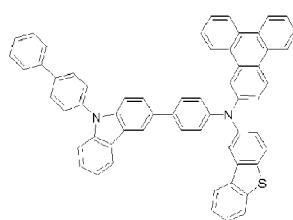
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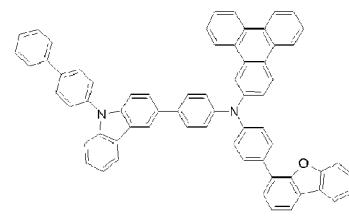
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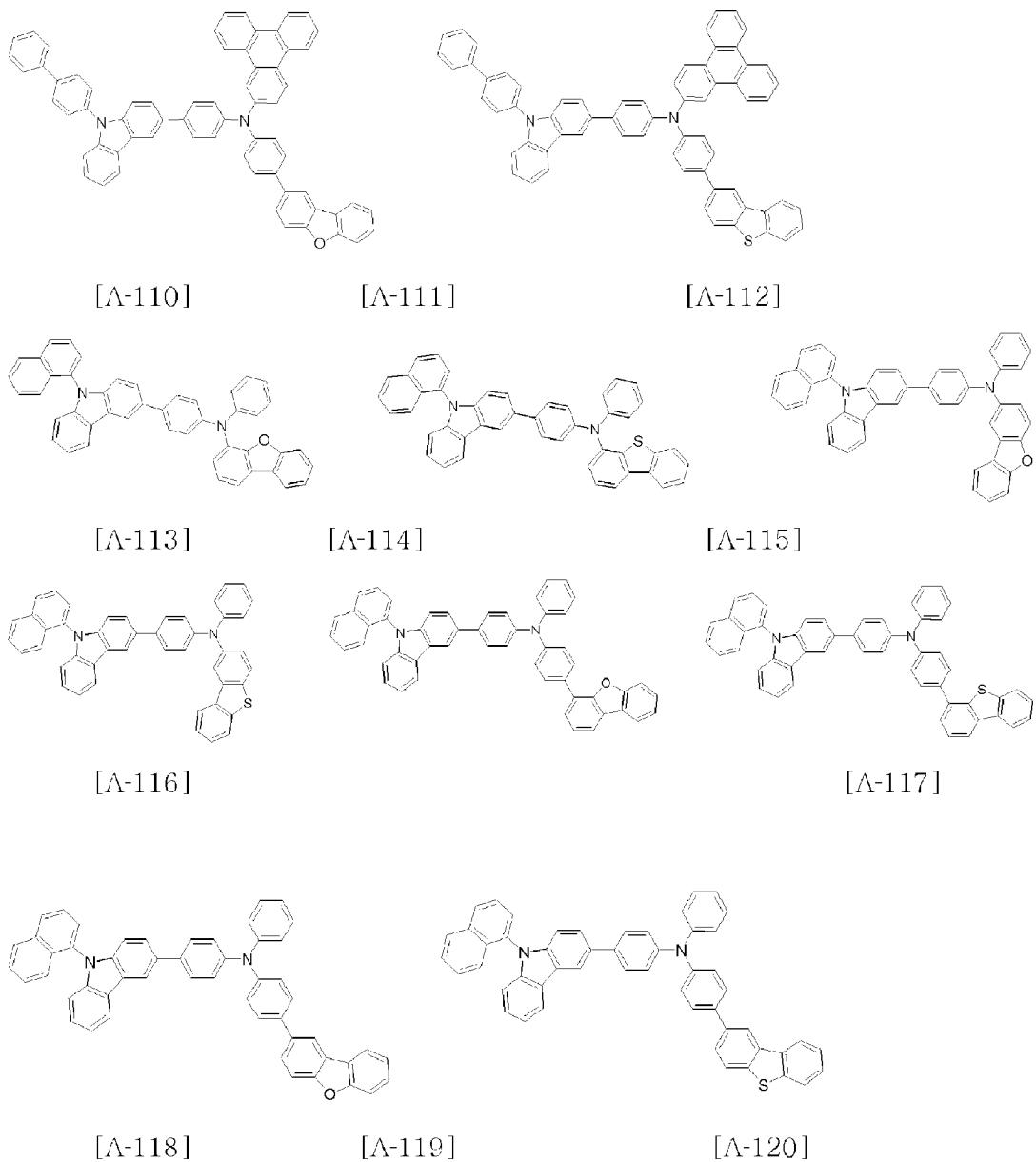
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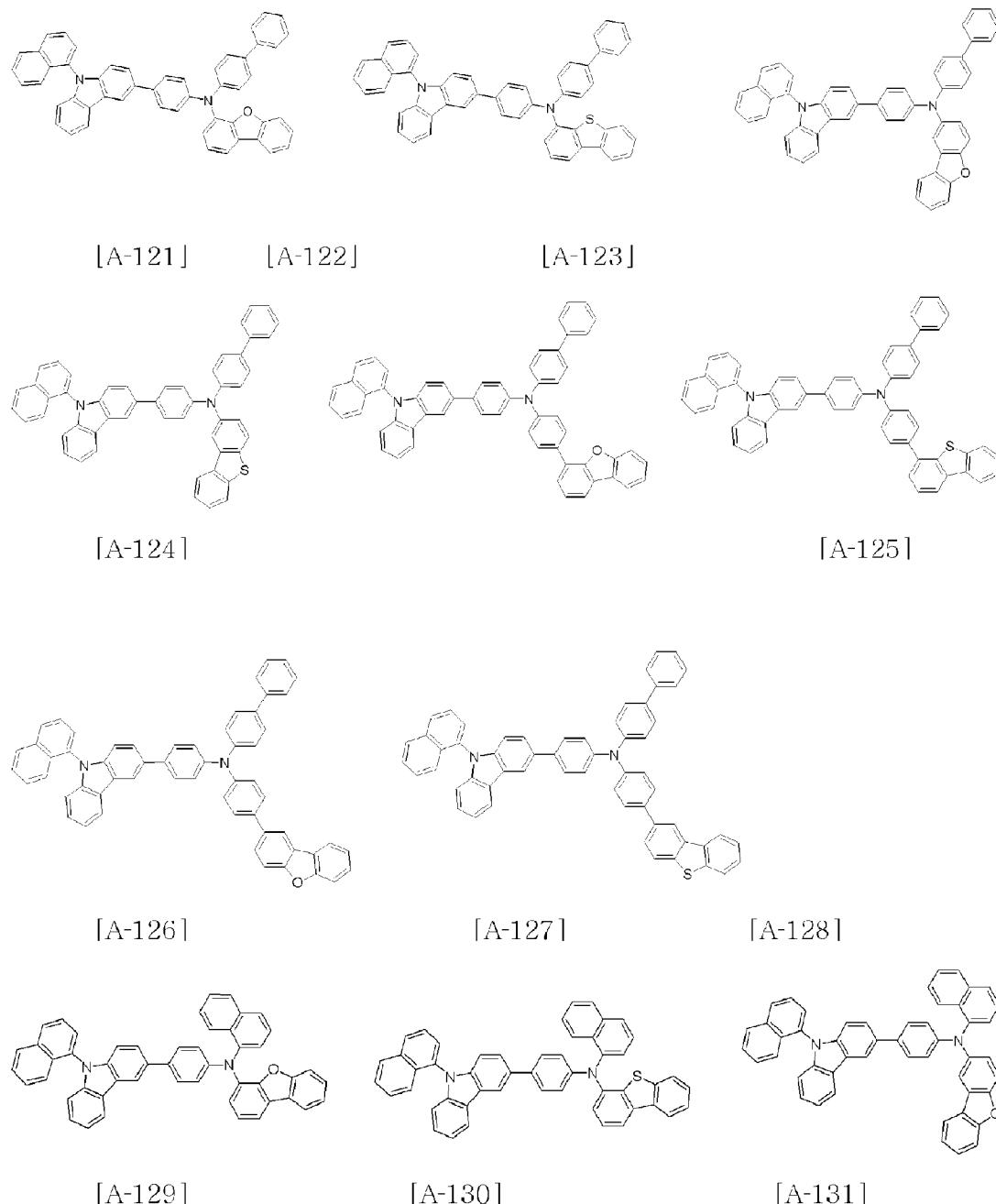
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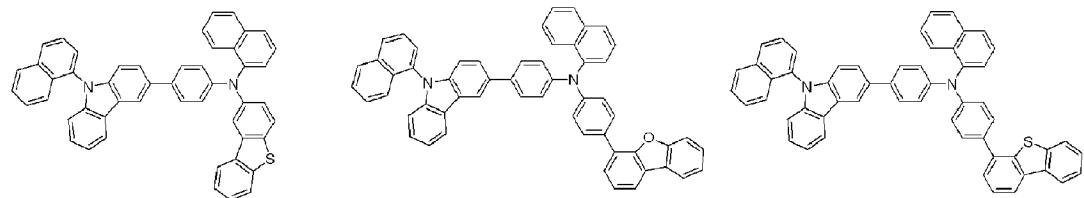
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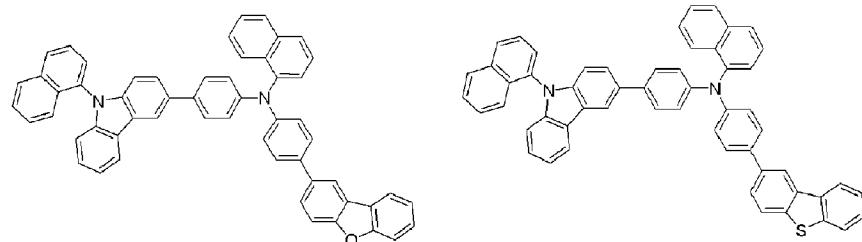


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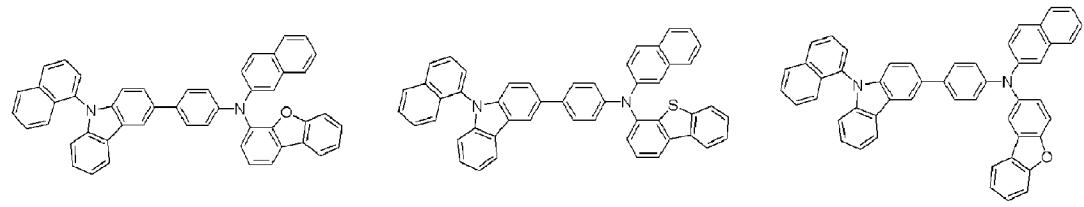
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[A-134]

[A-135]

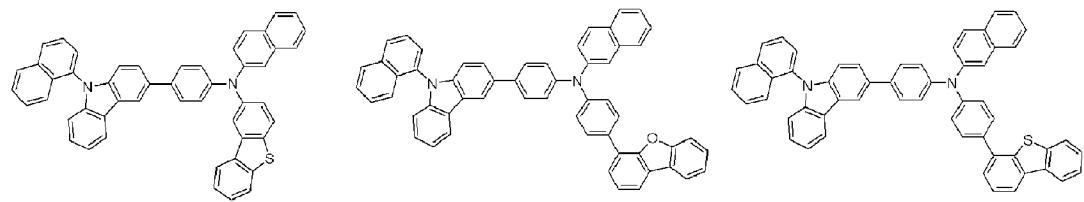
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[A-137]

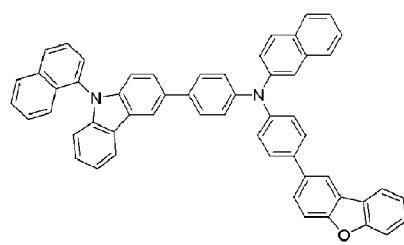
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[A-139]

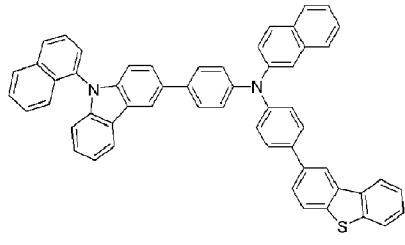


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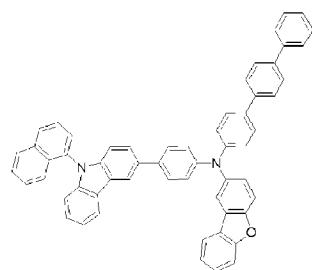
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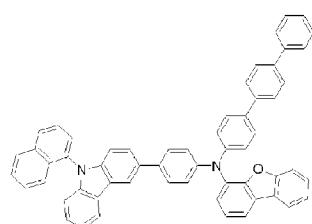
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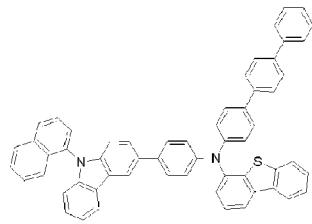
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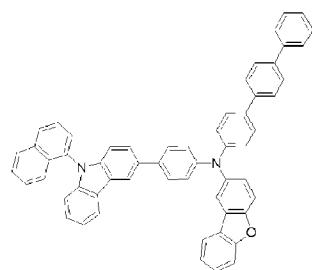
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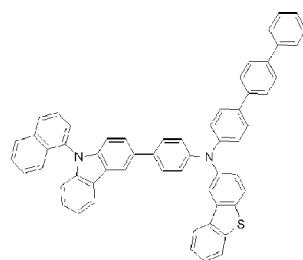
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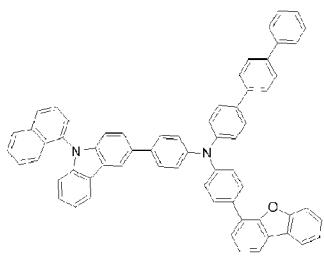
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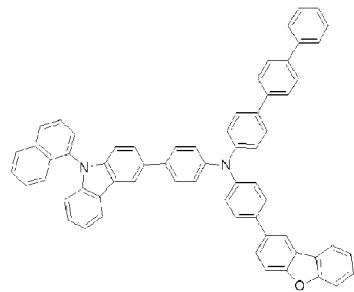
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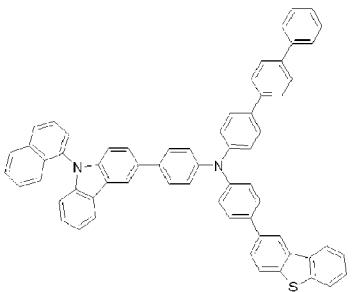
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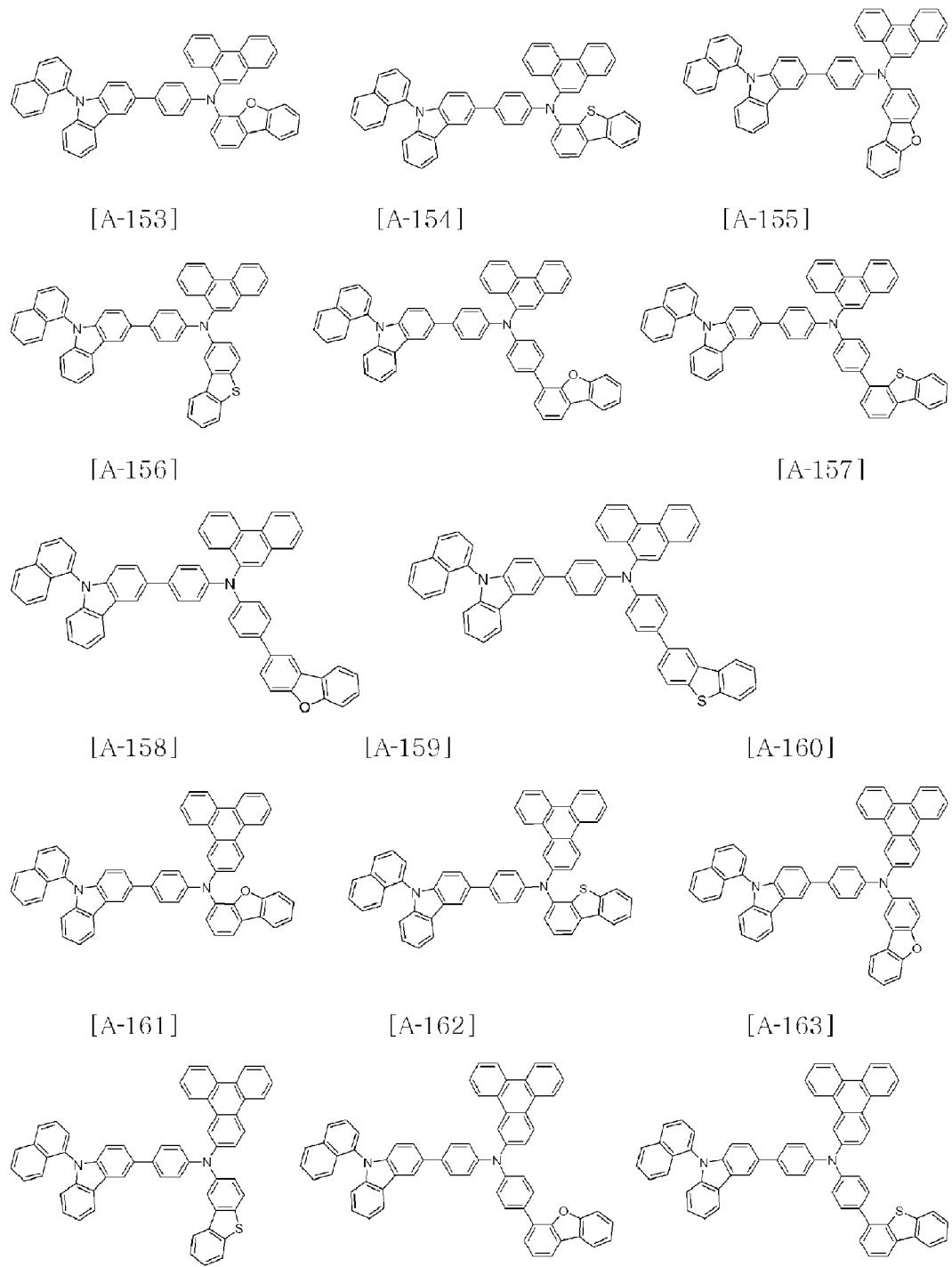
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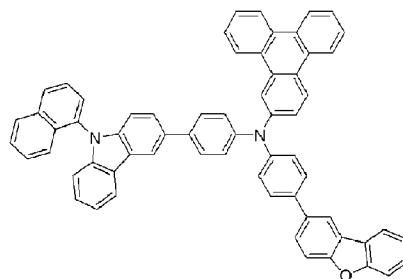


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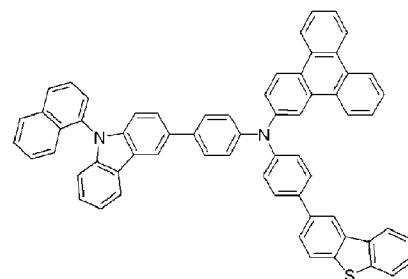


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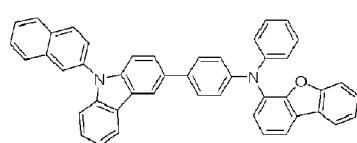
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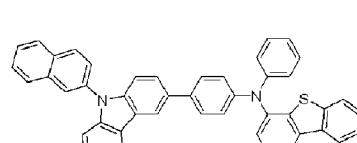
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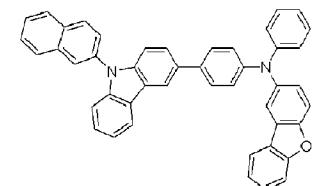
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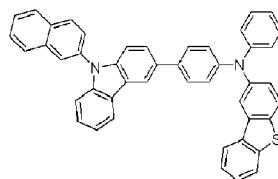
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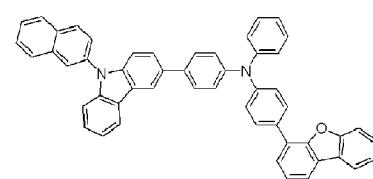
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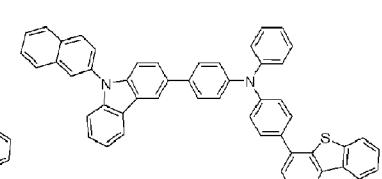
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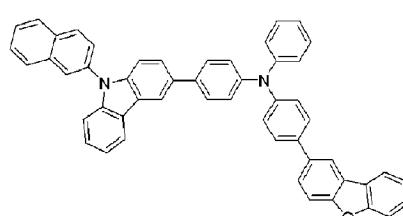
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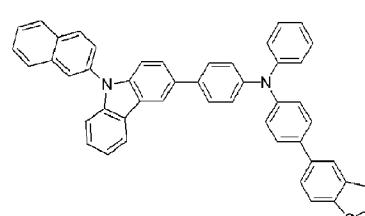
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[A-172]



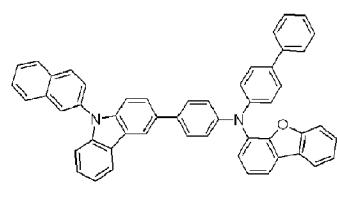
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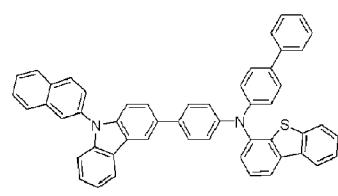
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[A-175]

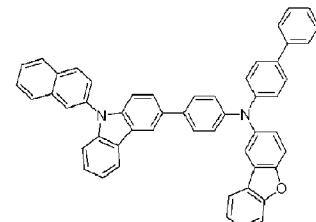
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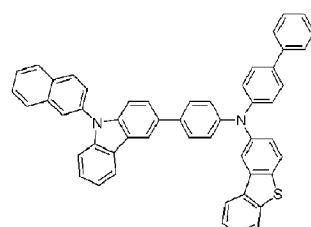
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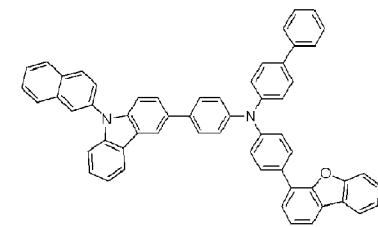
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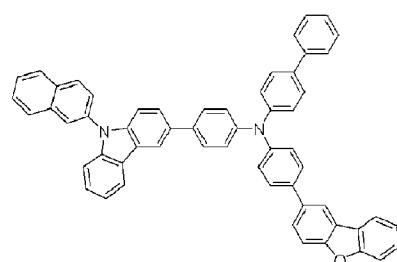
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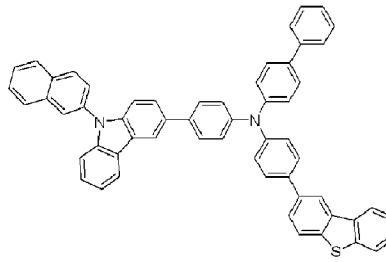
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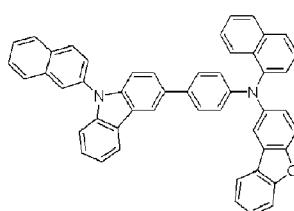
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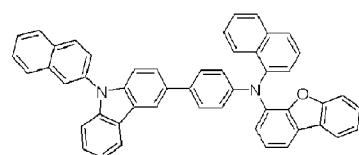
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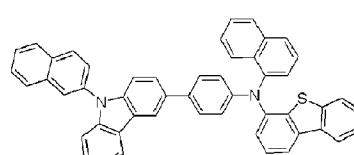
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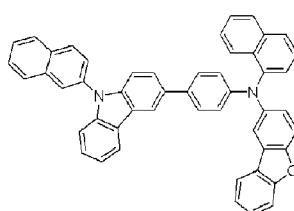
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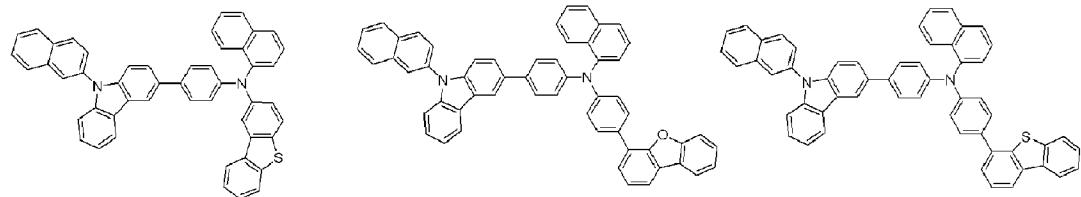
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[A-186]

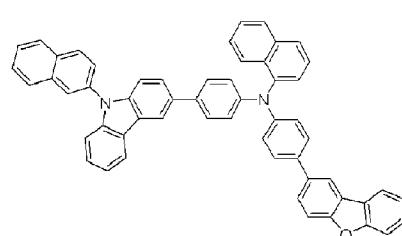


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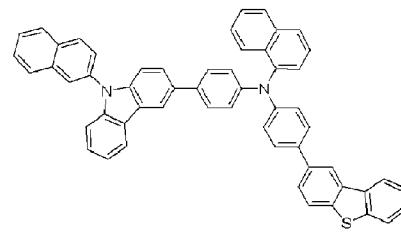


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[A-189]

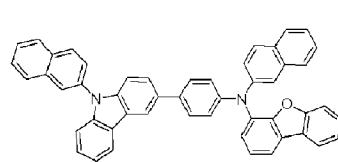


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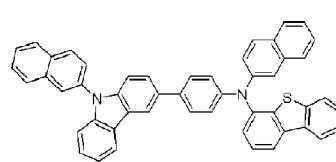


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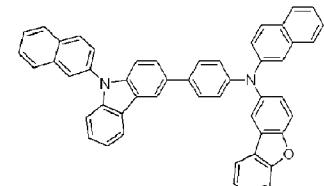
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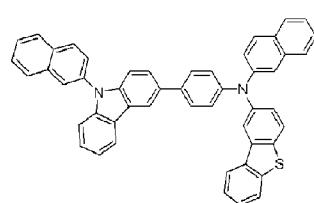
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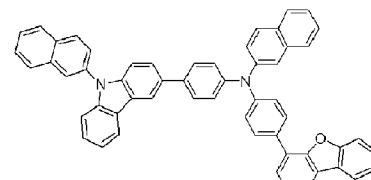
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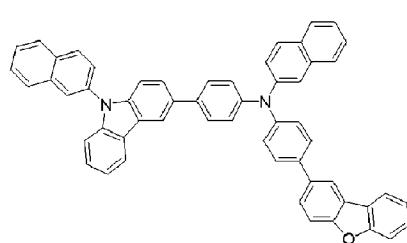
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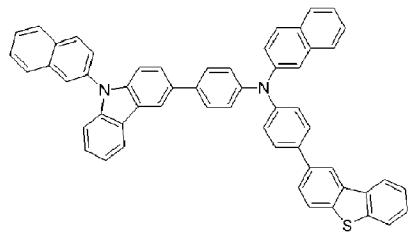
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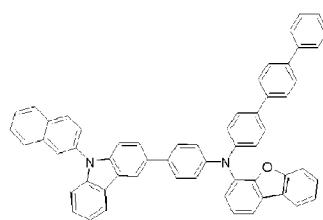


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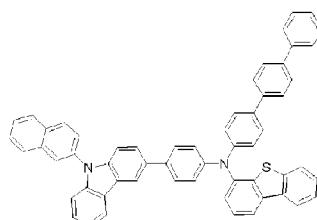


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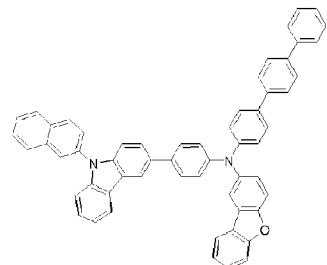
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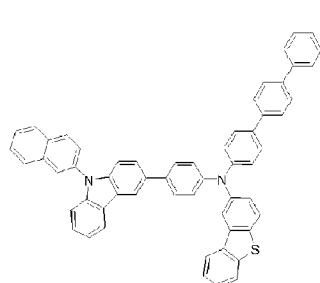
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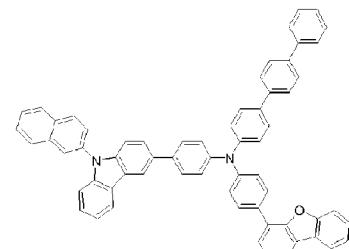
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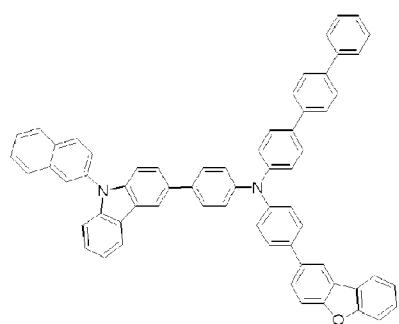
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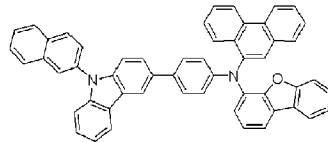


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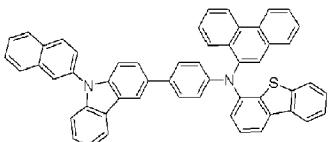


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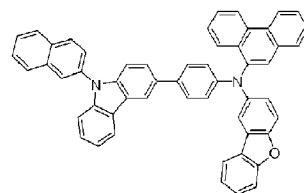
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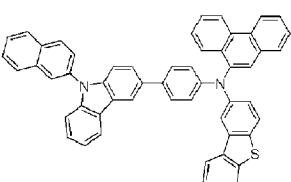
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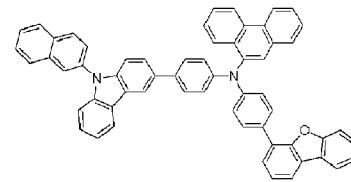
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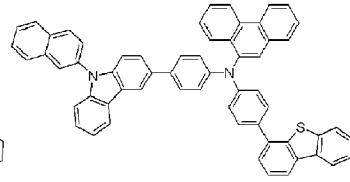
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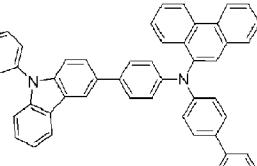
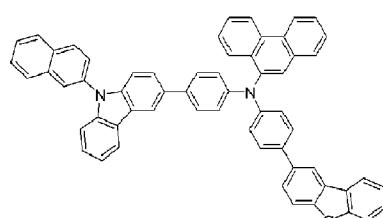
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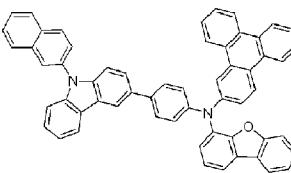


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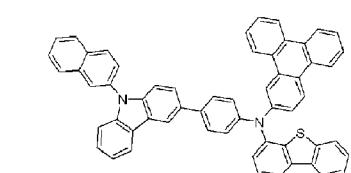


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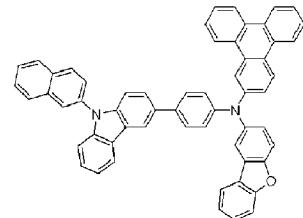
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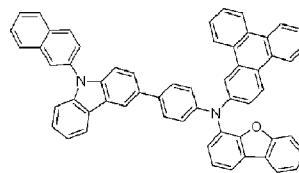
[A-215]



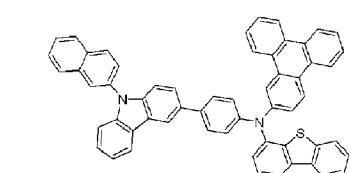
[A-216]



[A-217]

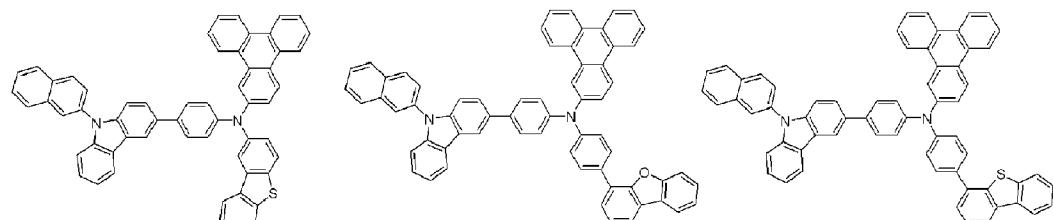


[A-218]



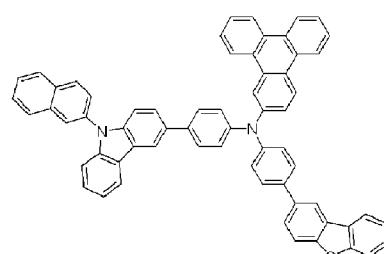
[A-219]

[98]

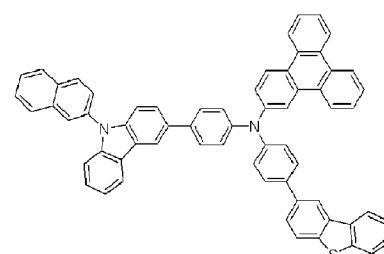


[A-220]

[A-221]



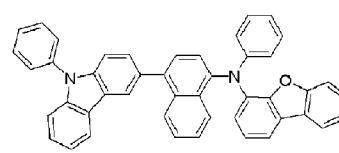
[A-222]



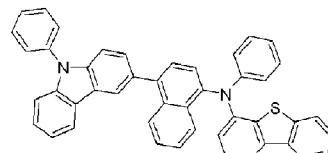
[A-223]



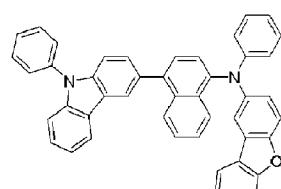
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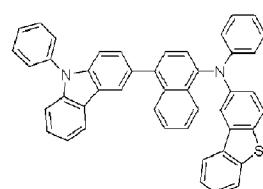
[A-225]



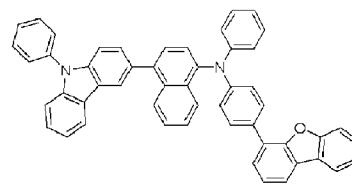
[A-226]



[A-227]

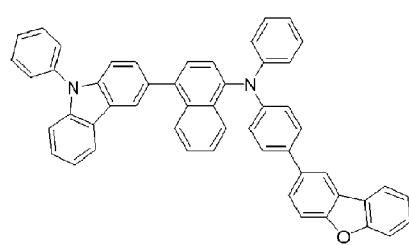


[A-228]

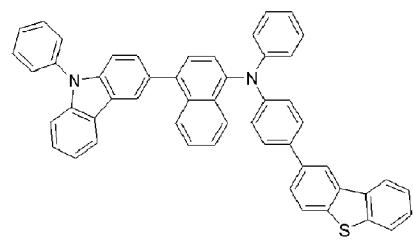


[A-229]

[99]

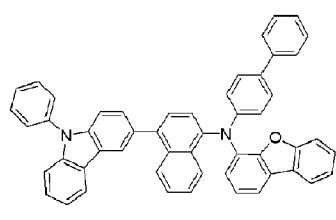


[A-230]

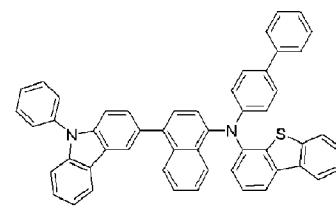


[A-231]

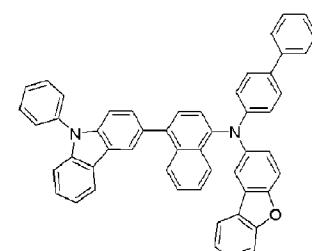
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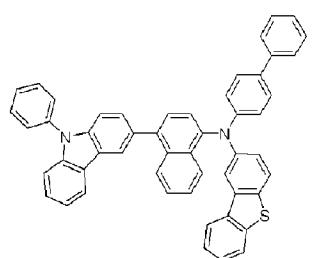
[A-233]



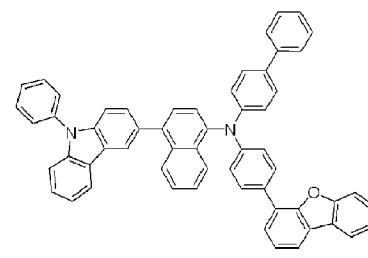
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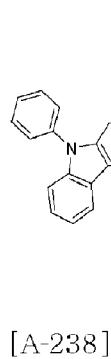
[A-235]



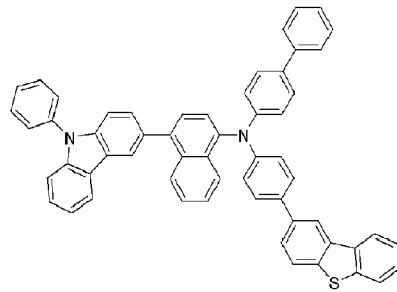
[A-236]



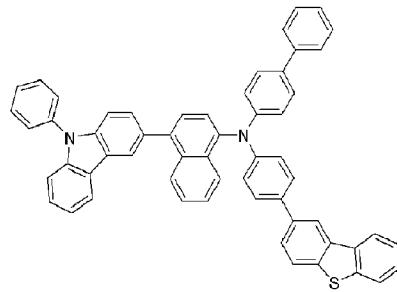
[A-237]



[A-238]

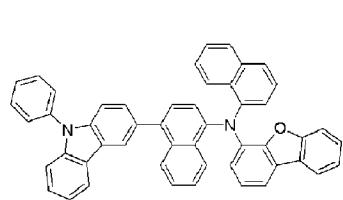


[A-239]

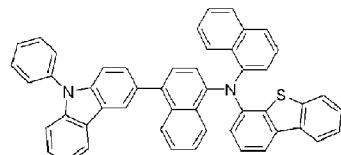


[A-240]

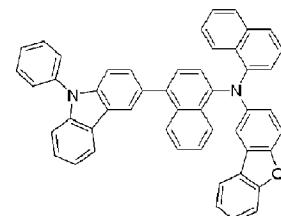
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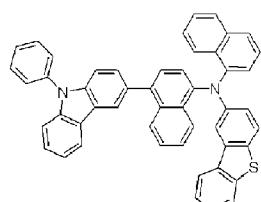
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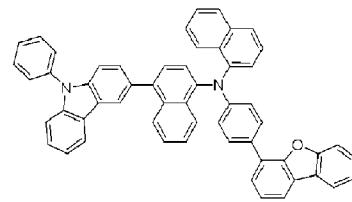
[A-242]



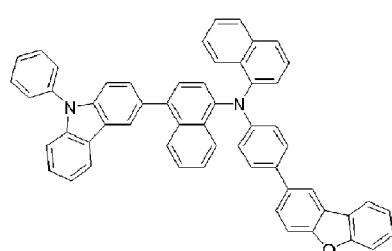
[A-243]



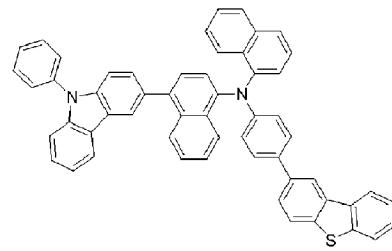
[A-244]



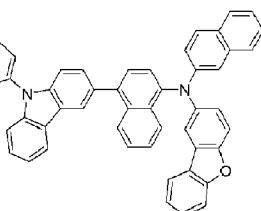
[A-245]



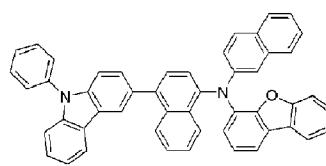
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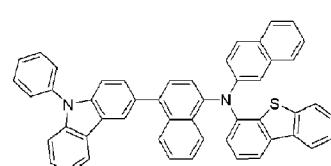
[A-247]



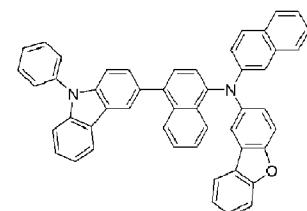
[A-248]



[A-249]

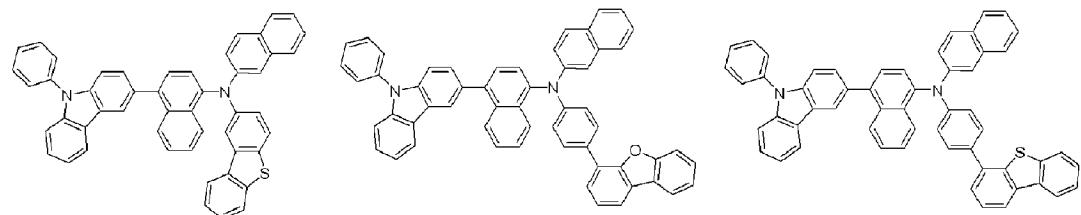


[A-250]



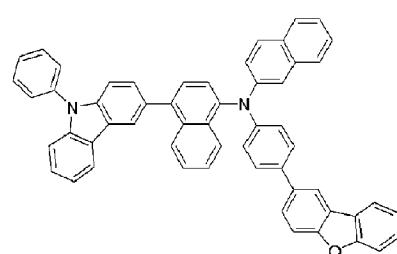
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[101]

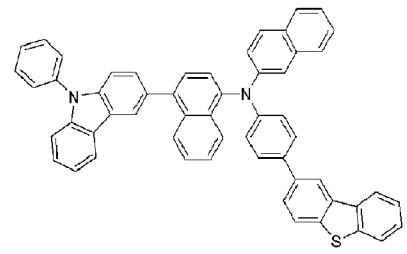


[A-252]

[A-253]

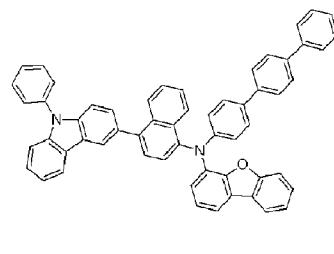


[A-254]

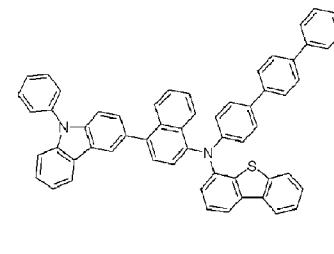


[A-255]

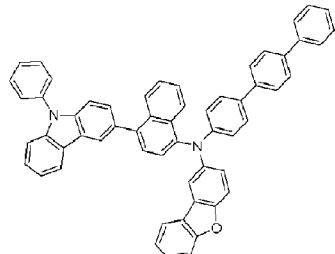
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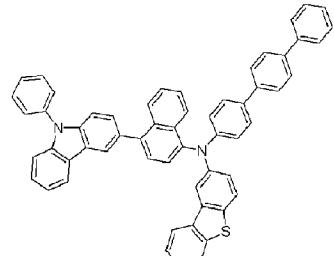
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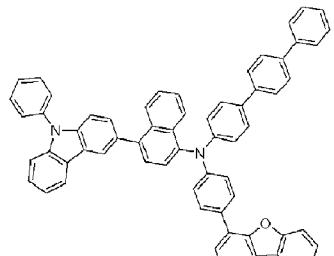
[A-258]



[A-259]

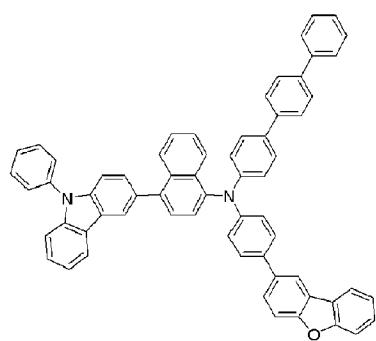


[A-260]

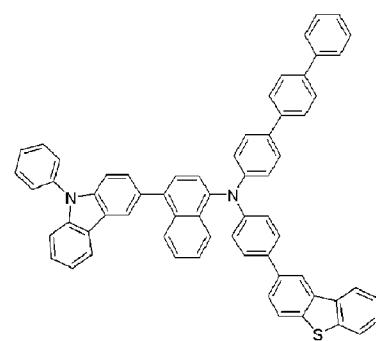


[A-261]

[102]

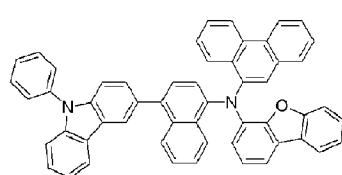


[A-262]

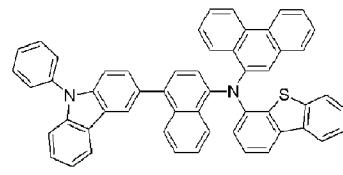


[A-263]

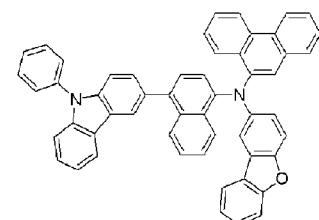
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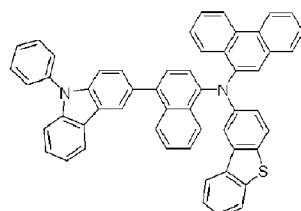
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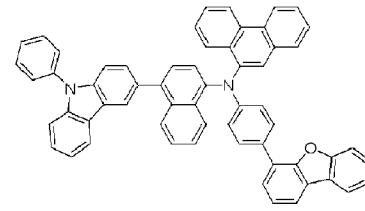
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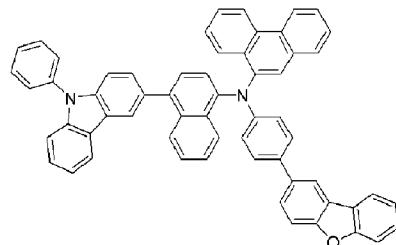
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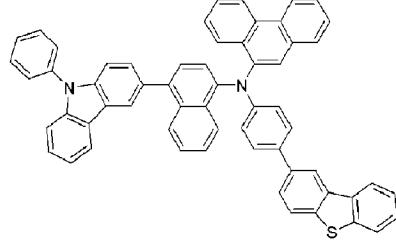
[A-268]



[A-269]



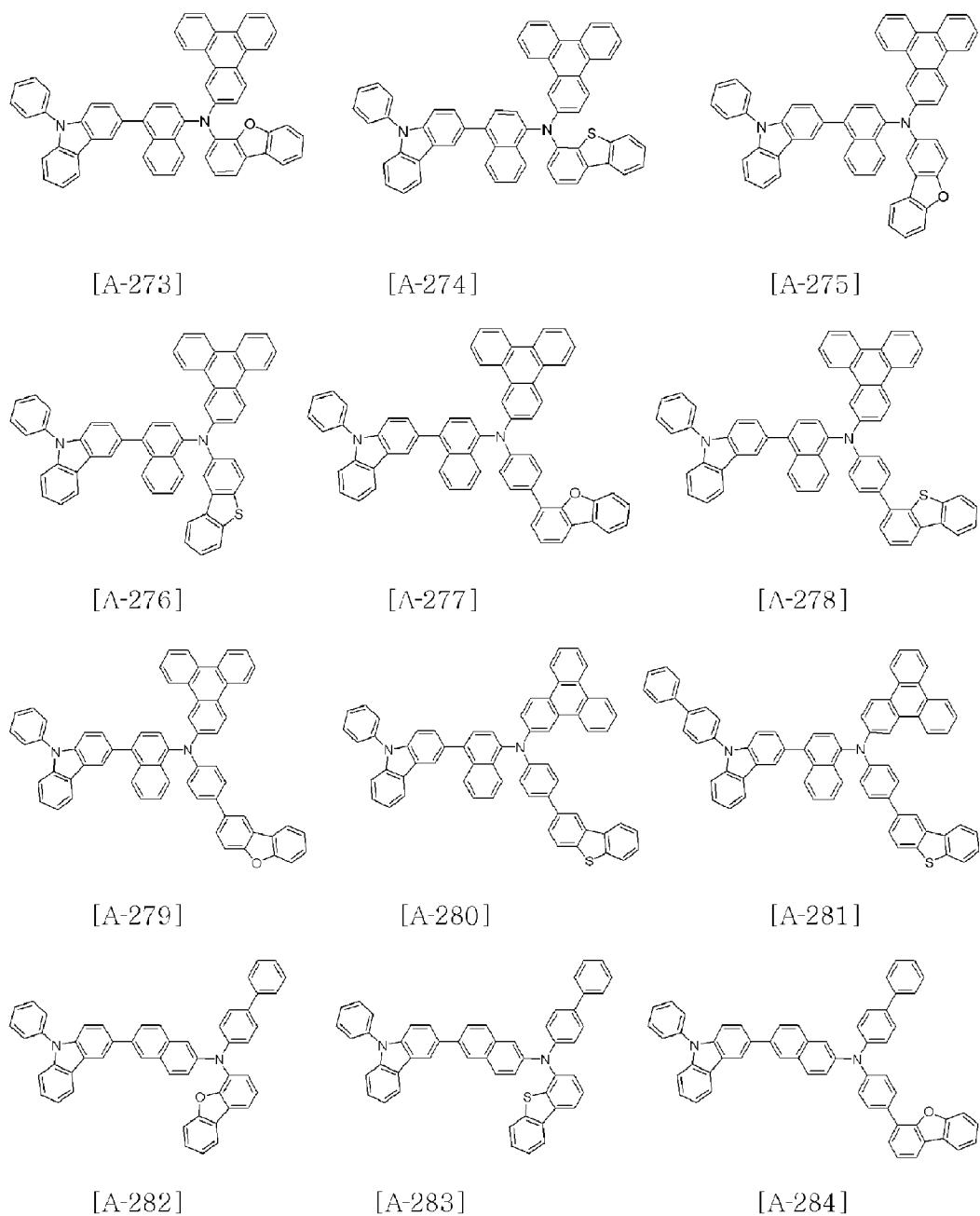
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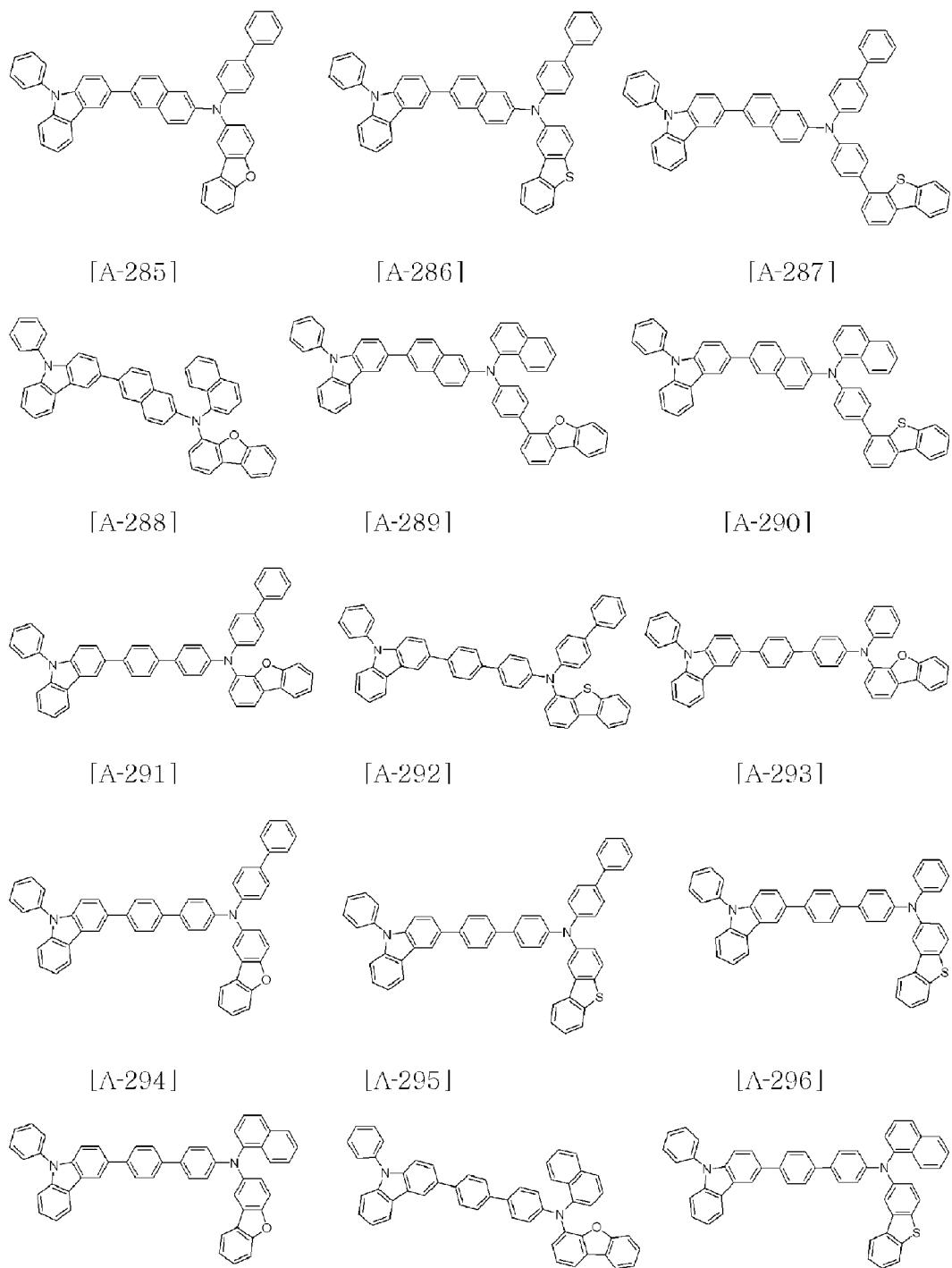
[A-271]

[A-272]

[103]

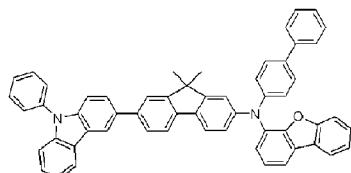


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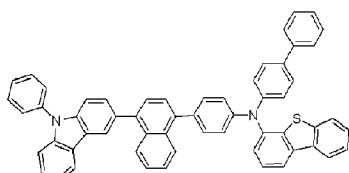


[105]

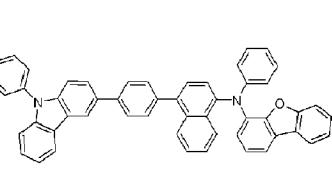
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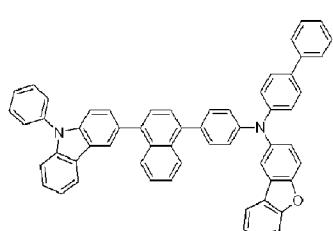
[A-298]



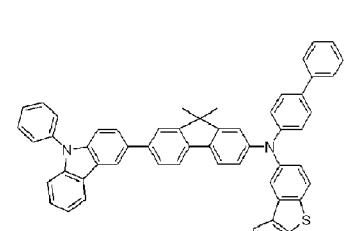
[A-299]



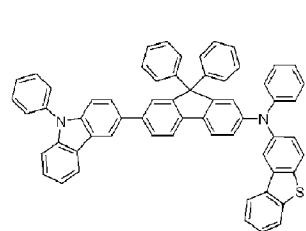
[A-300]



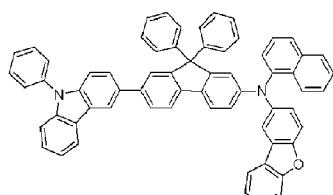
[A-301]



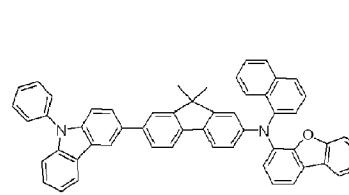
[A-302]



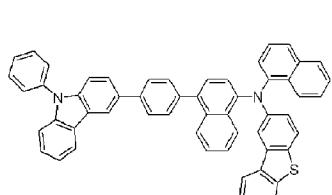
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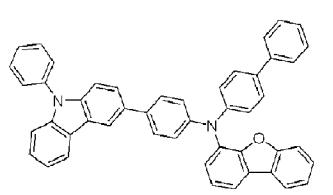
[A-304]



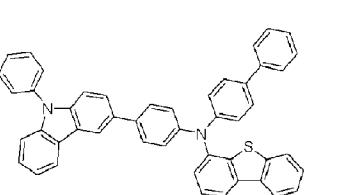
[A-305]



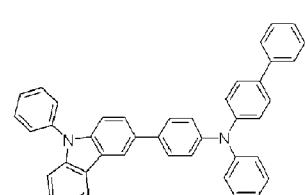
[A-414]



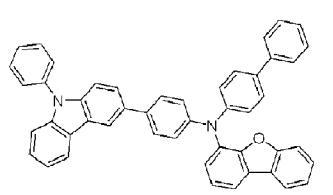
[A-415]



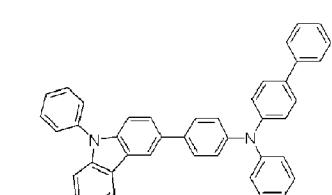
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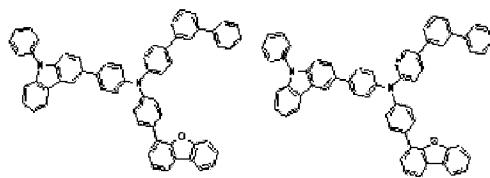
[A-457]



[A-458]

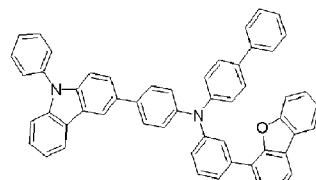


[106]

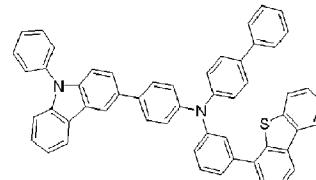


[A-469]

[A-470]

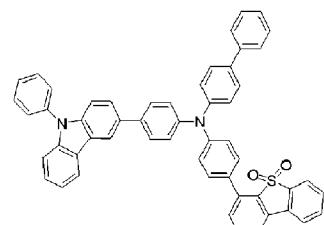
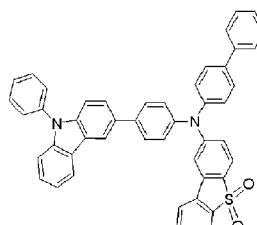
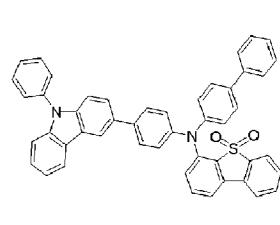


[A-471]



[A-472]

[A-473]



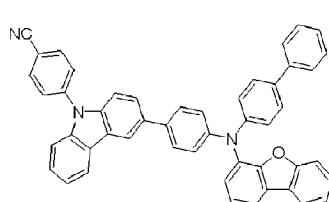
[107] The compound for an optoelectronic device may include at least one of the compounds represented by the following Chemical Formulae A-417 to A-456 or A-459 to A-468.

[108]

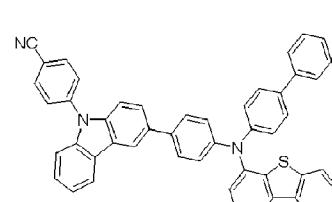
[A-417]

[A-418]

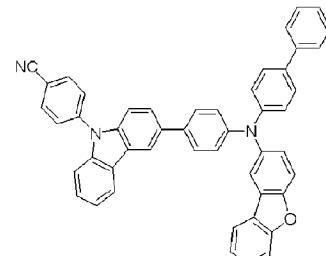
[A-419]



[A-420]

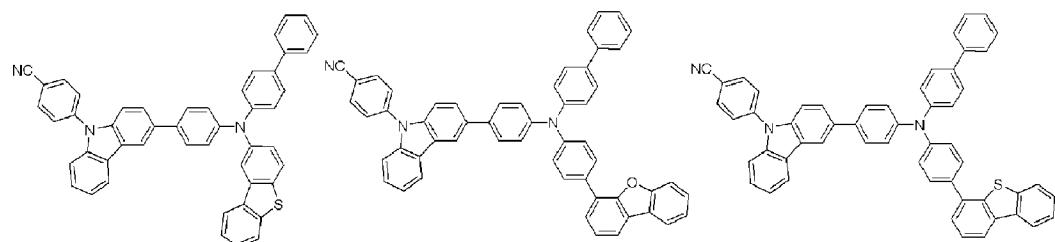


[A-421]

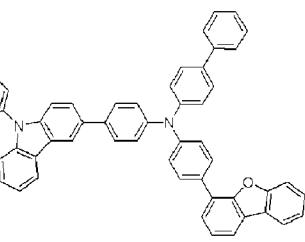


[A-422]

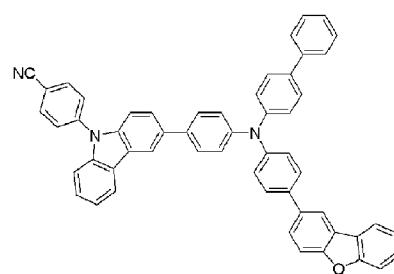
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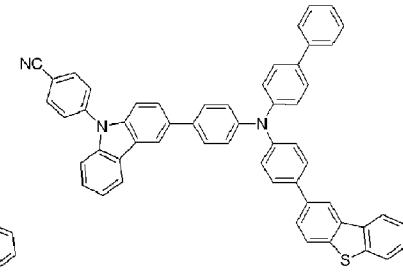
[A-423]



[A-424]



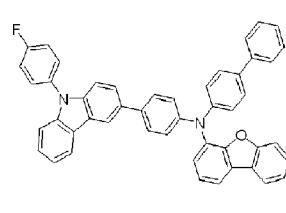
[A-425]



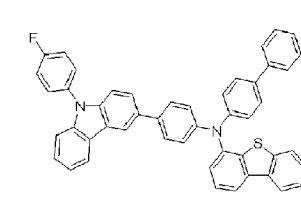
[A-426]



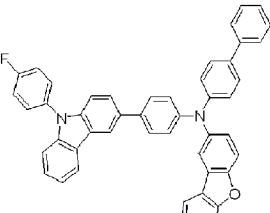
[A-427]



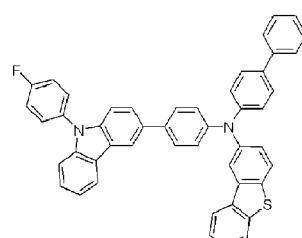
[A-428]



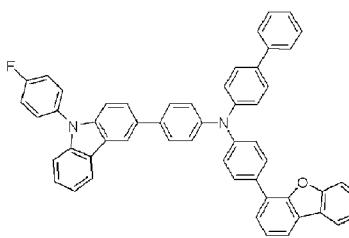
[A-429]



[A-430]

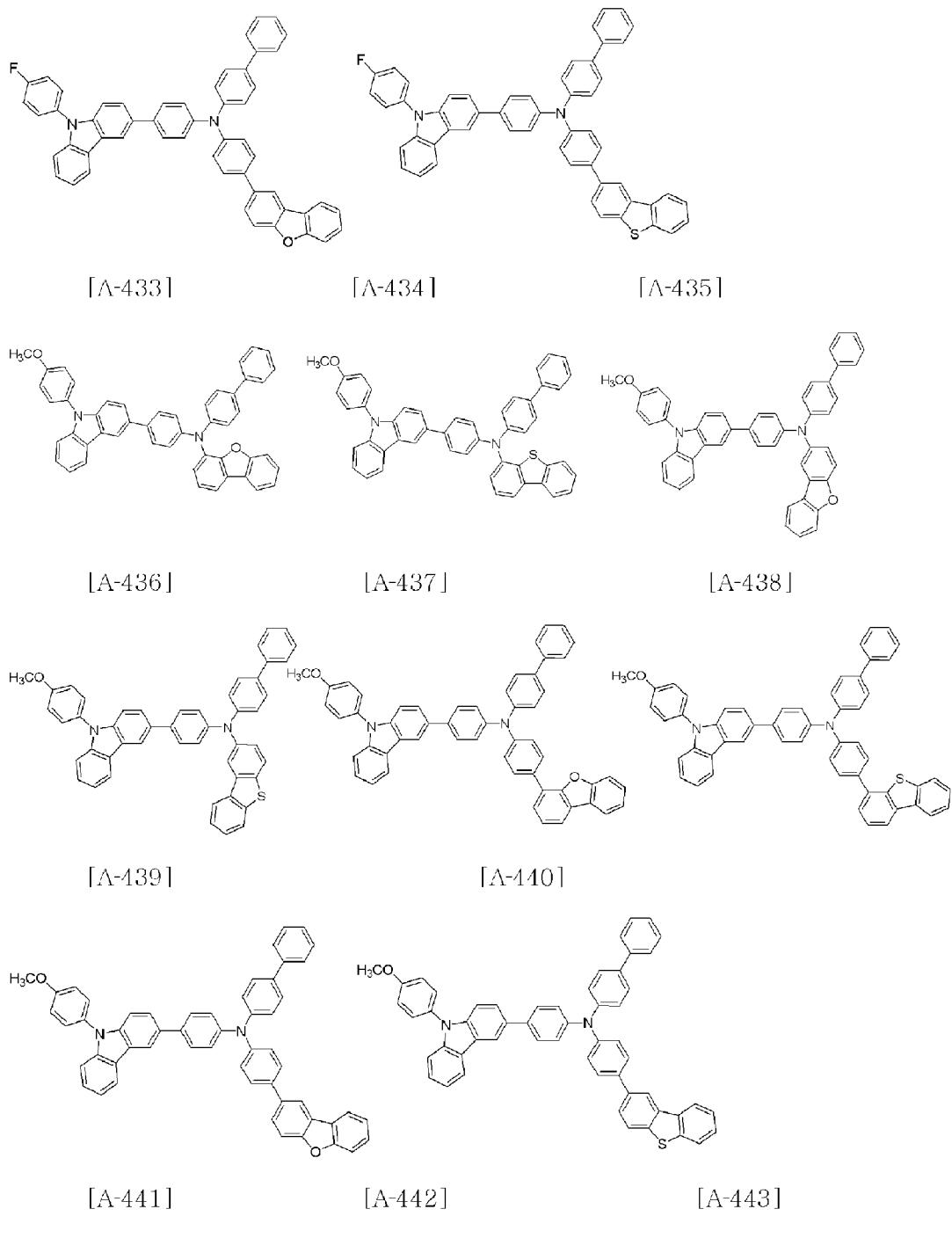


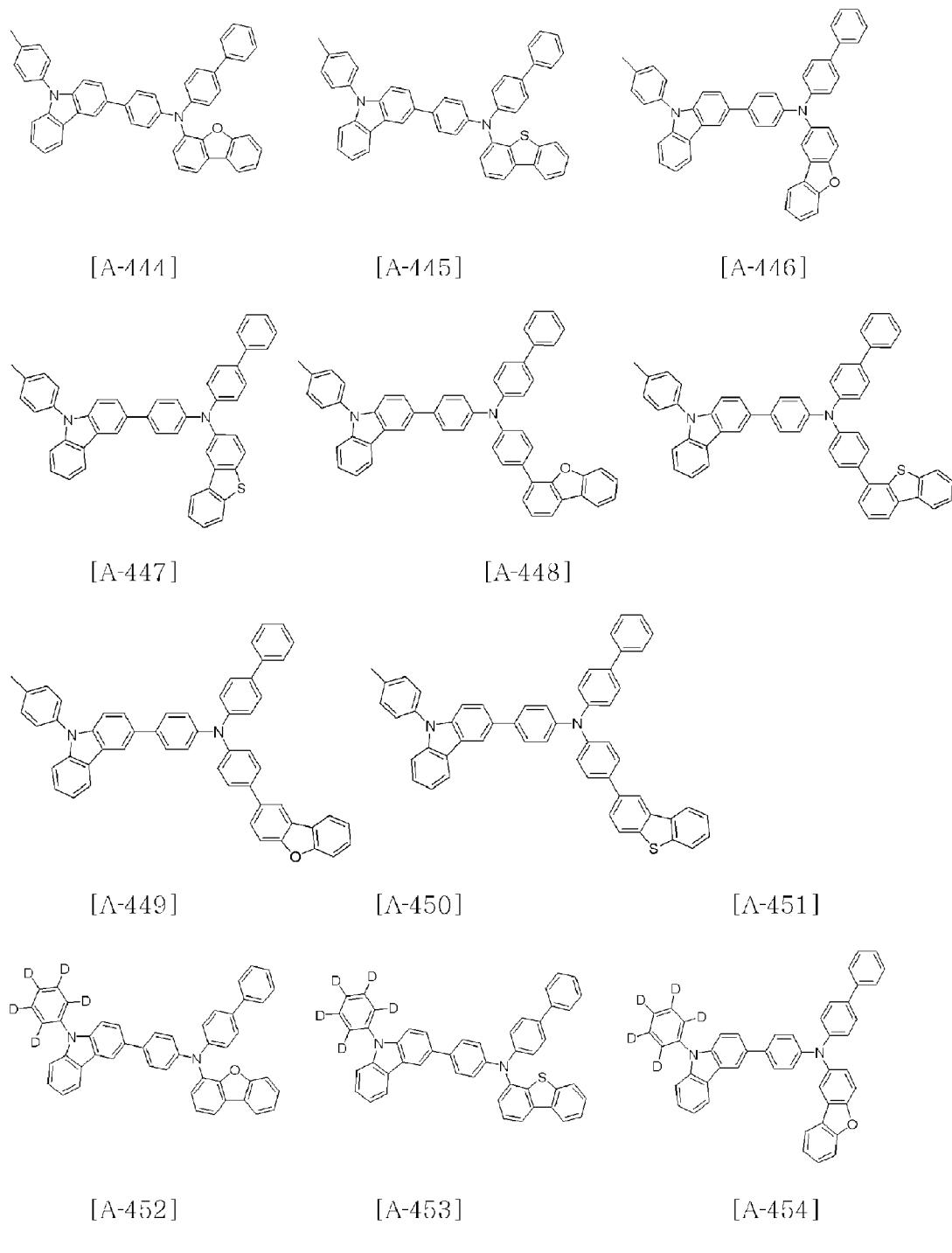
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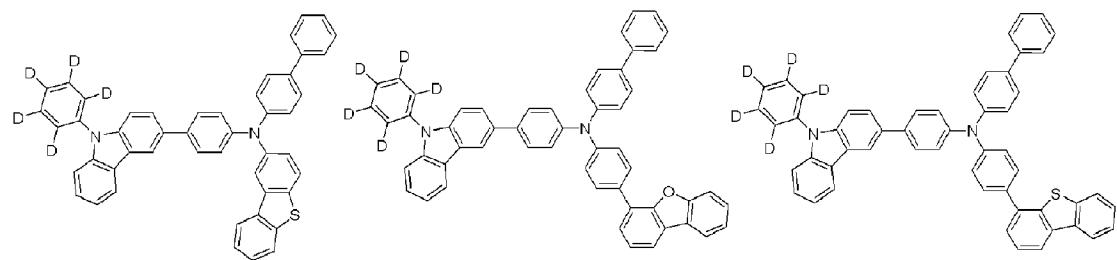
[A-432]

[110]

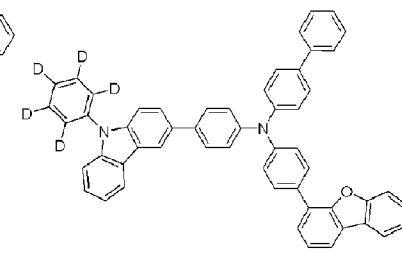




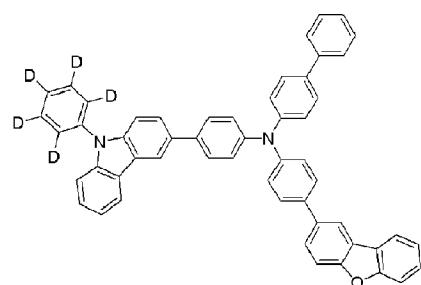
[112]



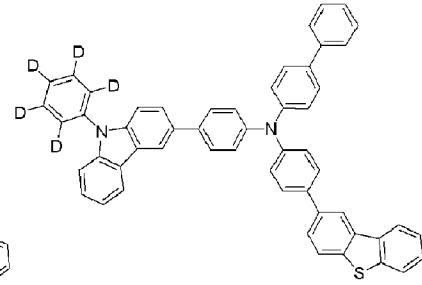
[A-455]



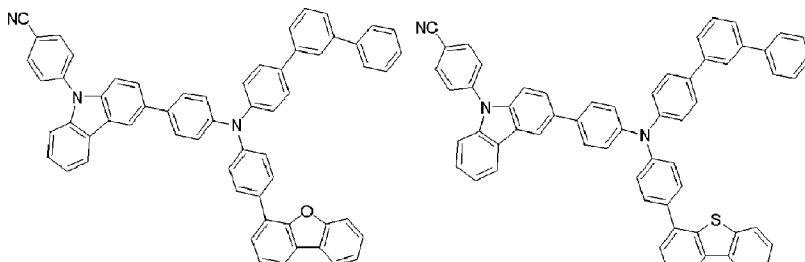
[A-456]



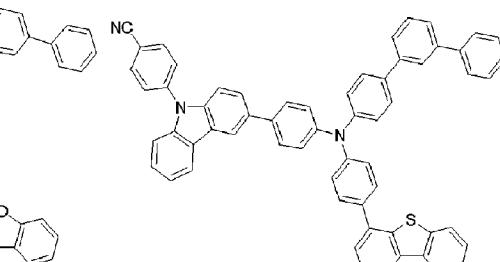
[A-459]



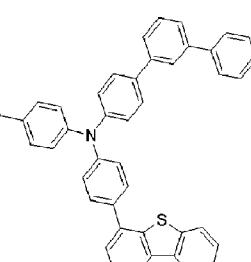
[A-460]



[A-461]



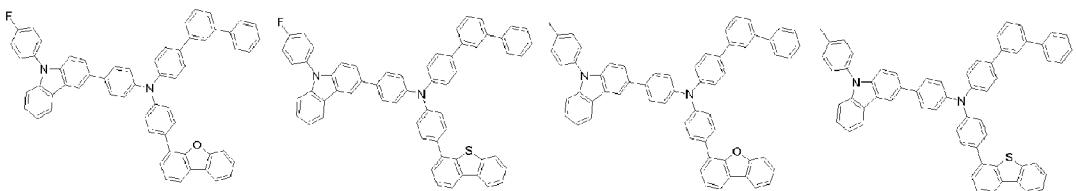
[A-462]



[A-463]



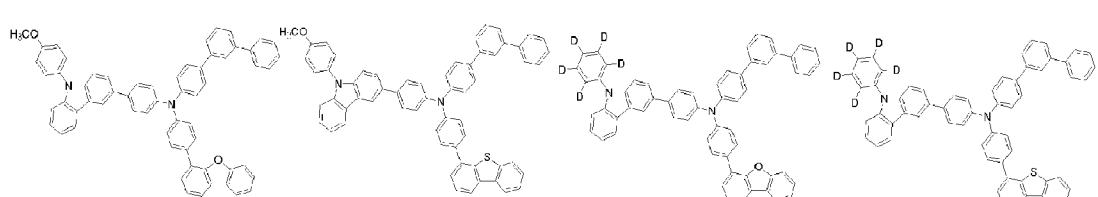
[A-464]



[113]

[A465] [A466] [A467] [A468]

[114]

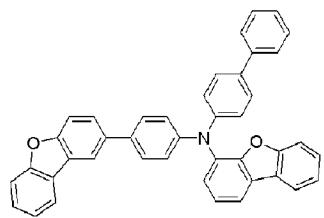


[115]

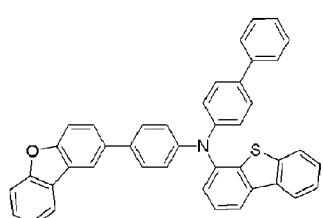
The compound for an optoelectronic device may include at least one of the compounds represented by the following Chemical Formulae A-324 to A-395.

[116]

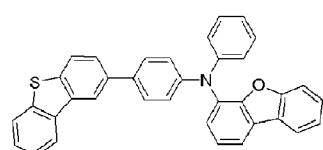
[A-324]



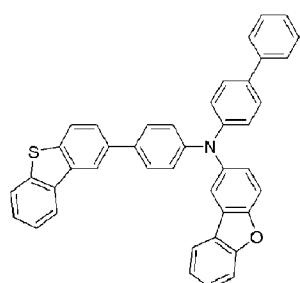
[A-325]



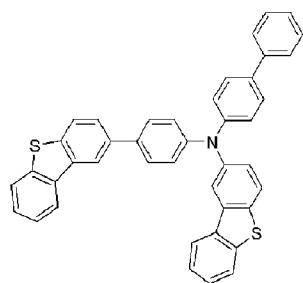
[A-326]



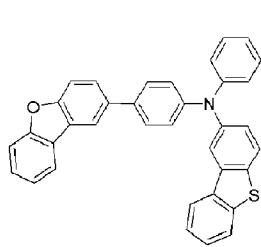
[A-327]



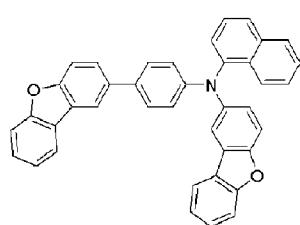
[A-328]



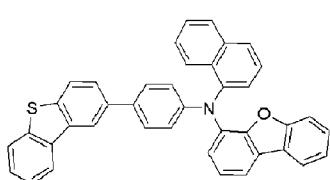
[A-329]



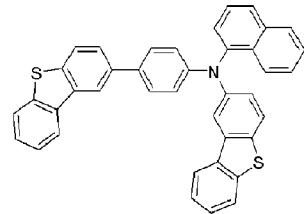
[A-330]



[A-331]



[A-332]

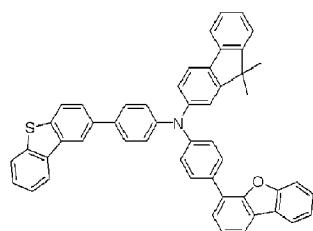


[A-333]

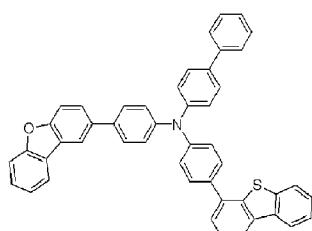
[A-334]

[A-335]

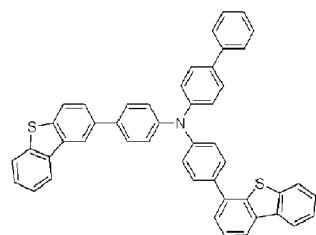
[117]



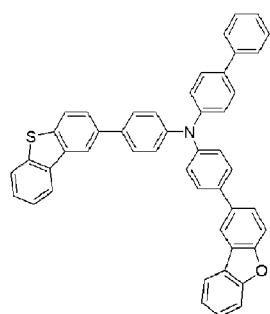
[A-336]



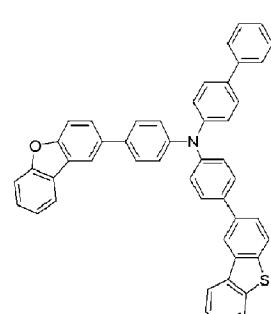
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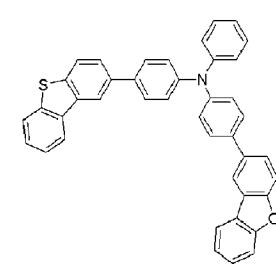
[A-338]



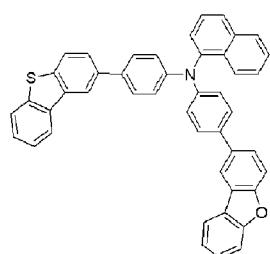
[A-339]



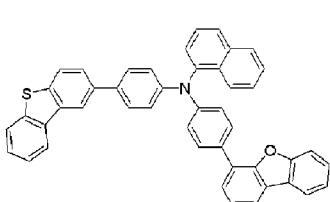
[A-340]



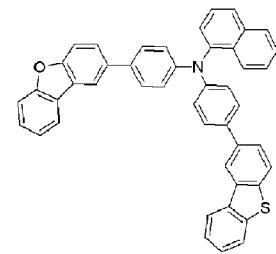
[A-341]



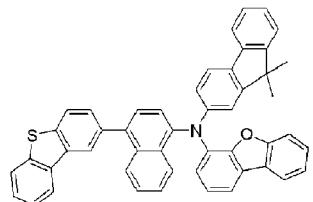
[A-342]



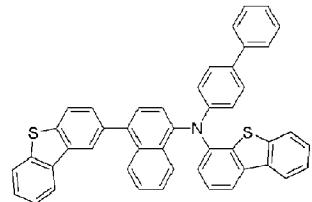
[A-343]



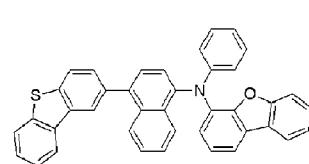
[A-344]



[A-345]

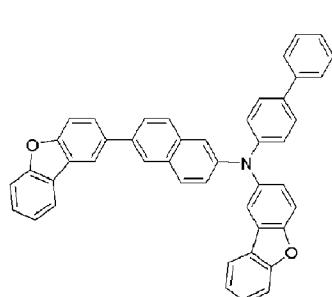


[A-346]

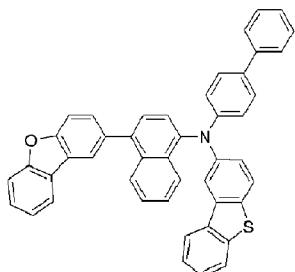


[A-347]

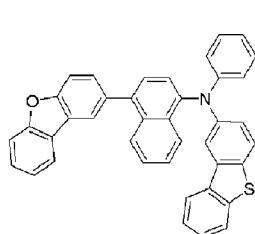
[118]



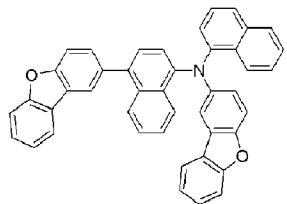
[A-348]



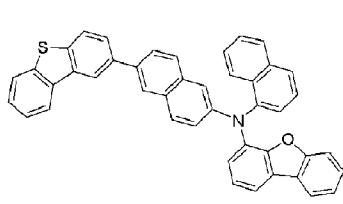
[A-349]



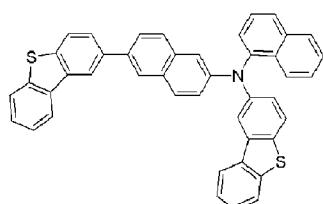
[A-350]



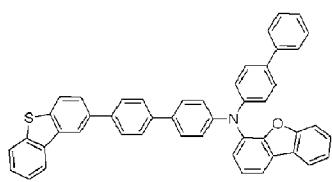
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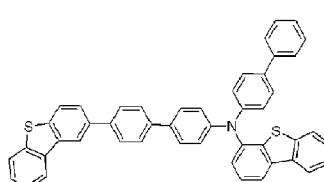
[A-352]



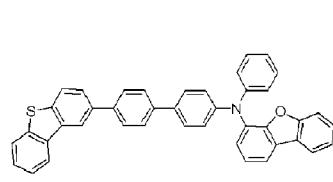
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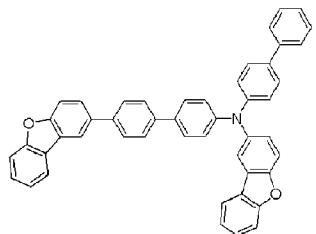
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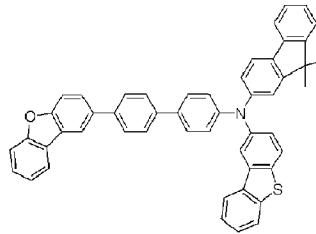
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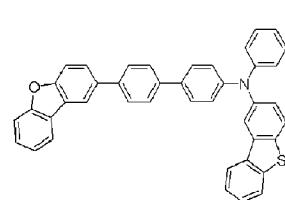
[A-356]



[A-357]

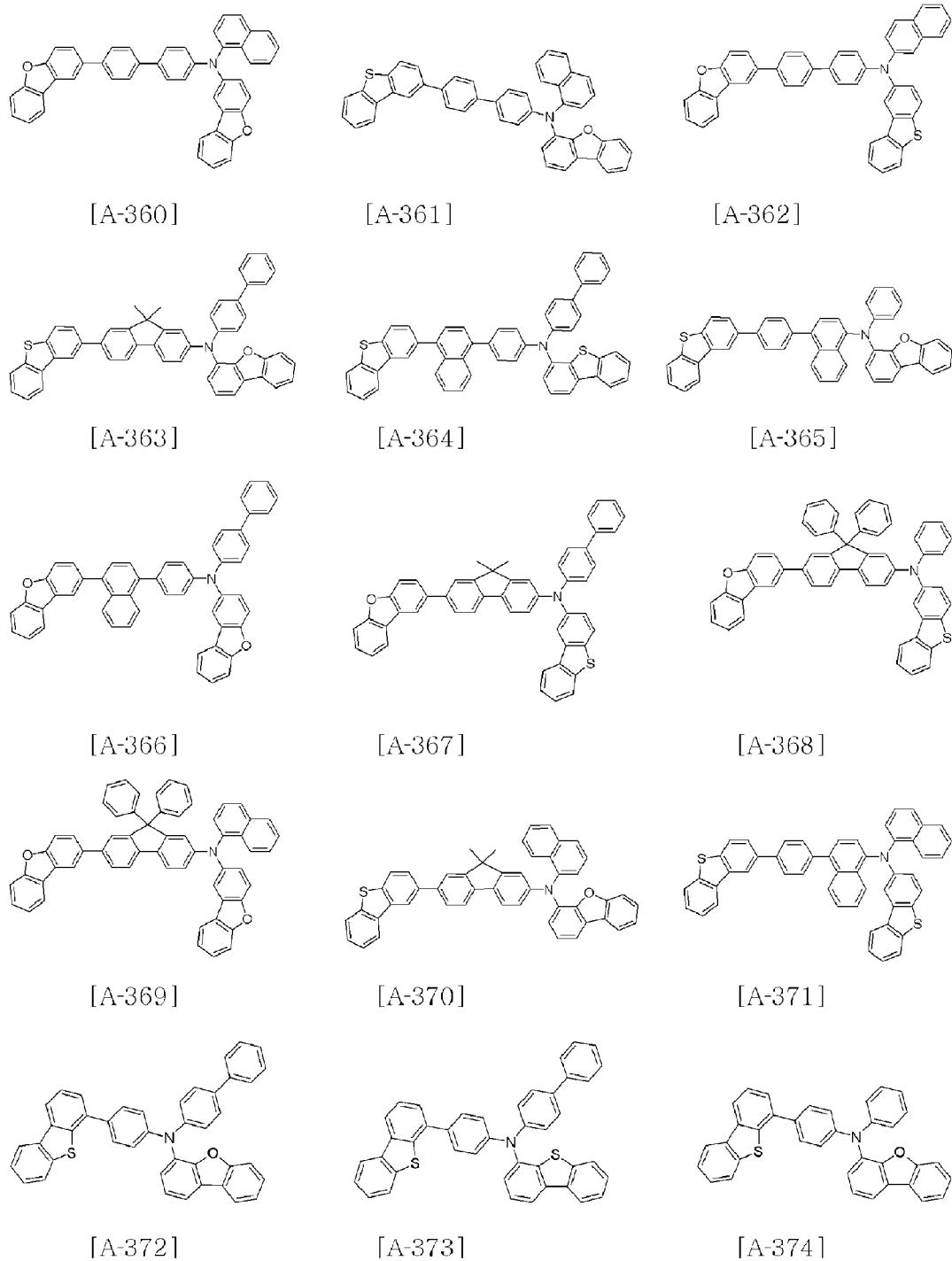


[A-358]

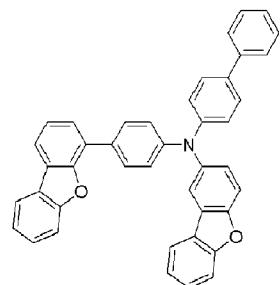


[A-359]

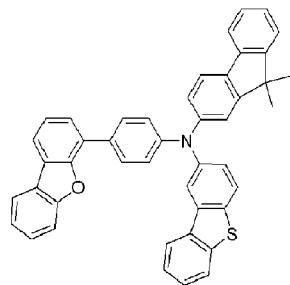
[119]



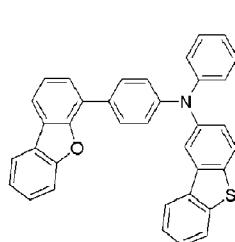
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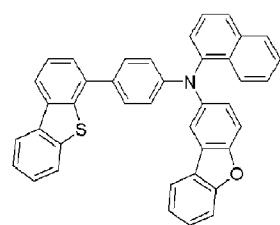
[A-375]



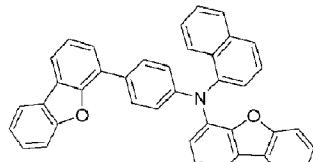
[A-376]



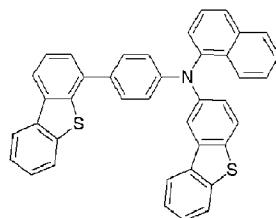
[A-377]



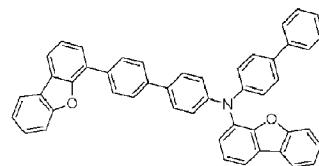
[A-378]



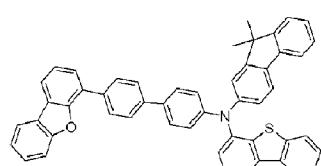
[A-379]



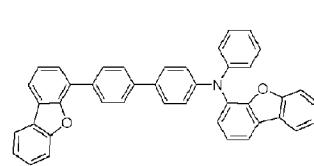
[A-380]



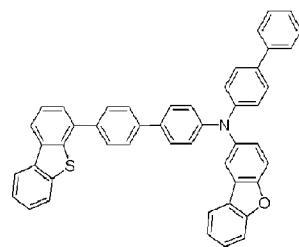
[A-381]



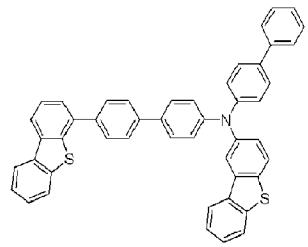
[A-382]



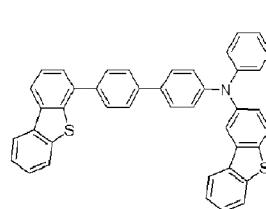
[A-383]



[A-384]

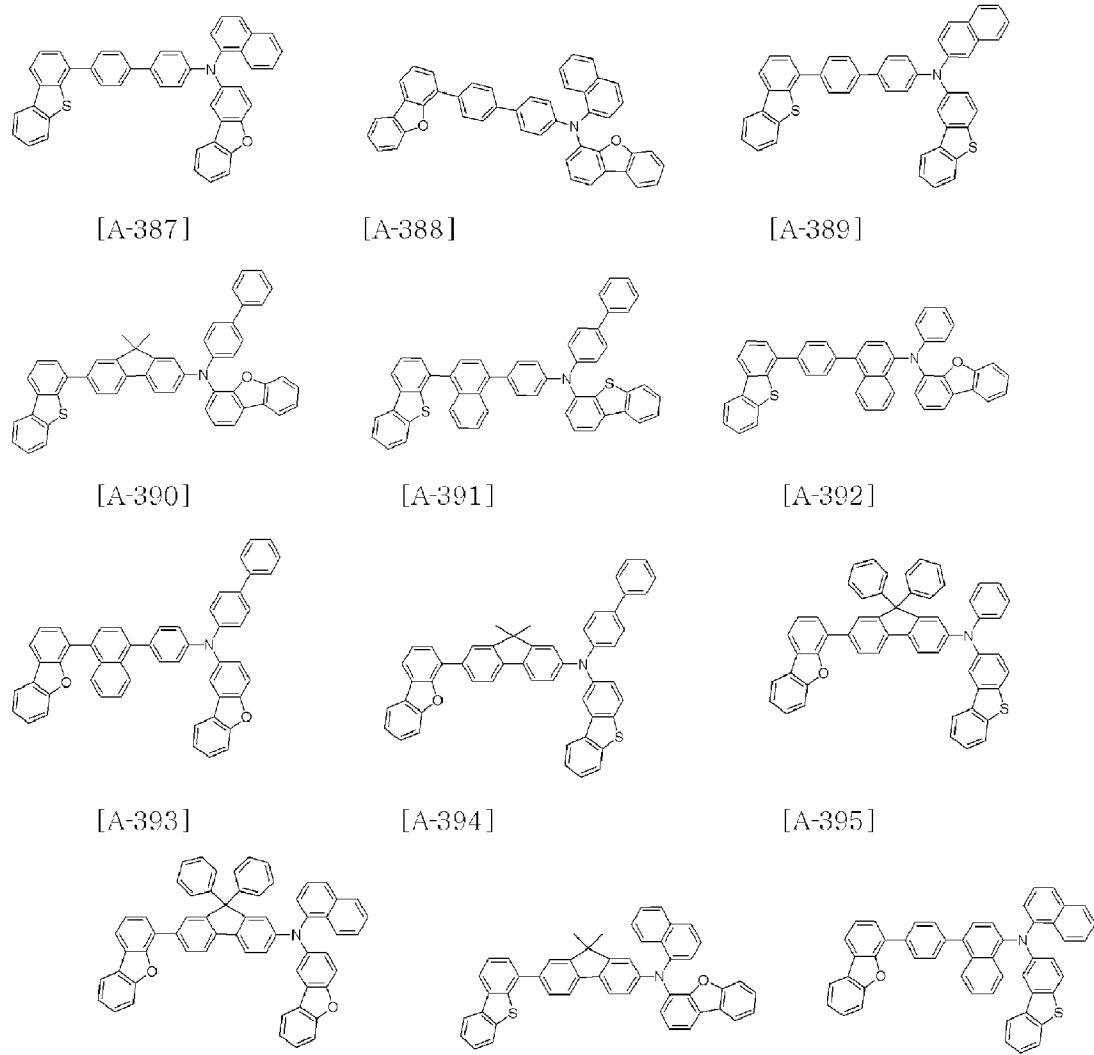


[A-385]



[A-386]

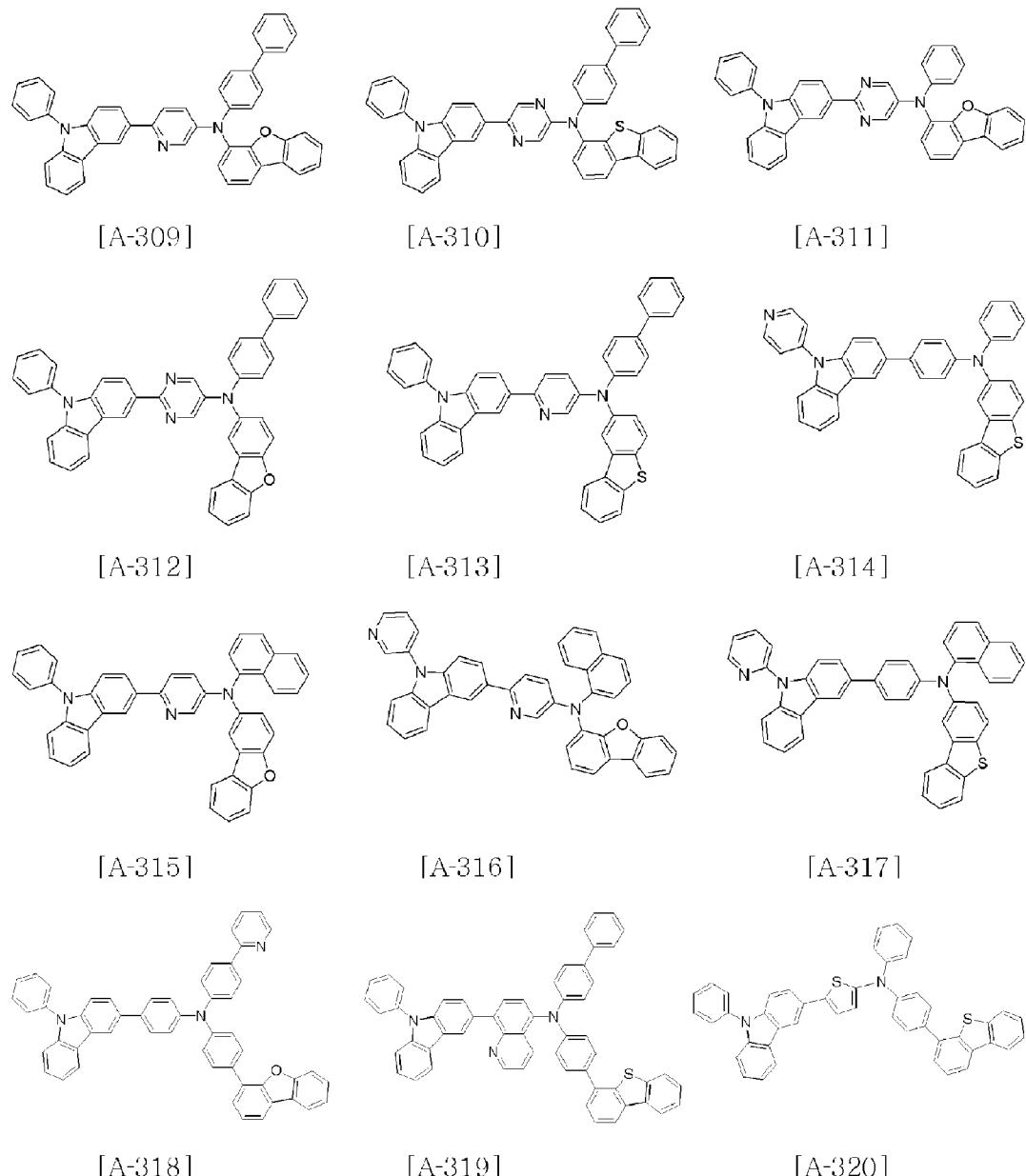
[121]



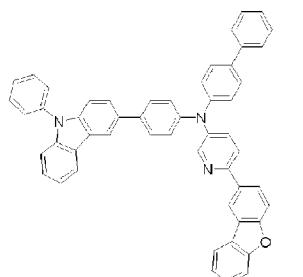
[122] The compound for an optoelectronic device may include at least one of the compounds represented by the following Chemical Formulae A-306 to A-323.

[123] [A-306] [A-307] [A-308]

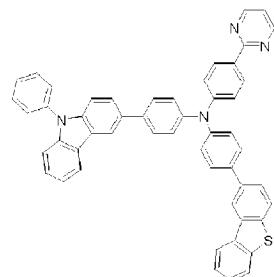
[124]



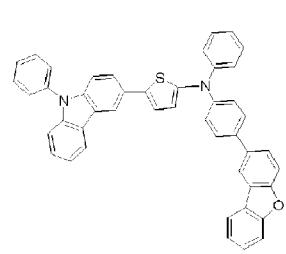
[125]



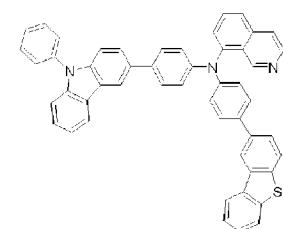
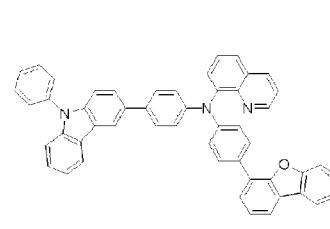
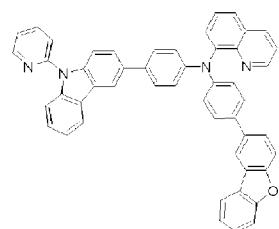
[A-321]



[A-322]



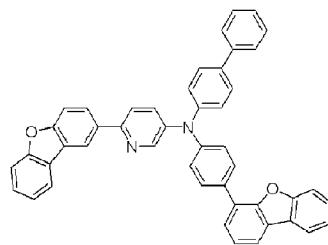
[A-323]



[126] The compound for an optoelectronic device may include at least one of the compounds represented by the following Chemical Formulae A-396 to A-413.

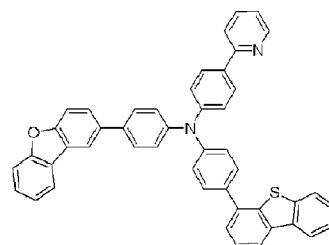
[127]

[A-396]



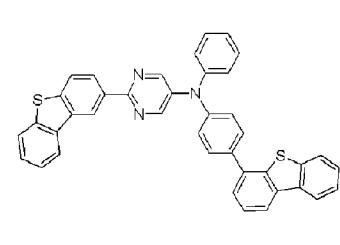
[A-396]

[A-397]



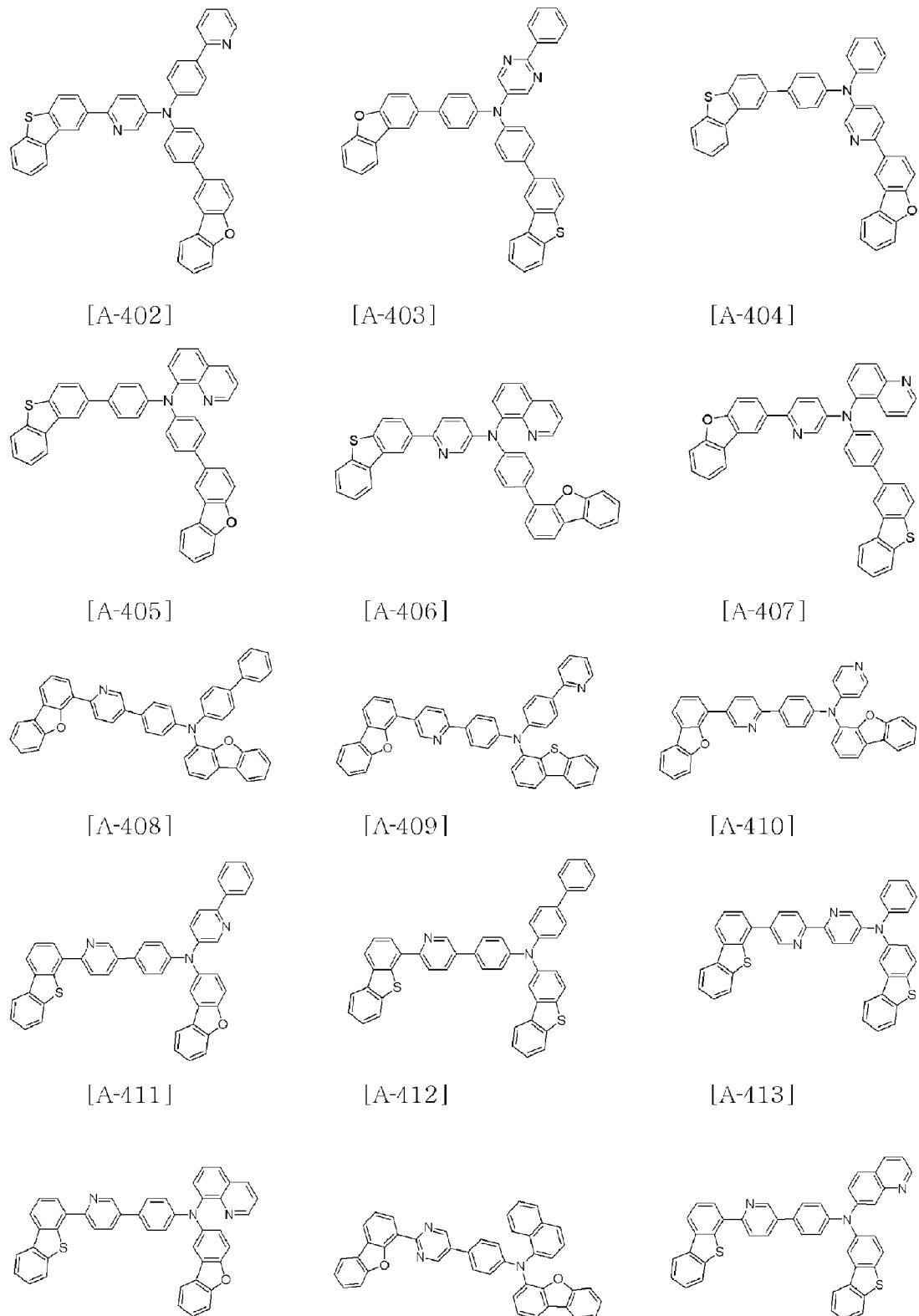
[A-397]

[A-398]



[A-398]

[128]



[130] The compound for an optoelectronic device may be used as a hole transport material or a hole injection material for an organic light emitting diode.

[131] The compound for an optoelectronic device may have triplet exciton energy (T1) of about 2.0eV or higher.

- [132] The optoelectronic device comprises an organic photoelectronic device, an organic light emitting diode, an organic solar cell, an organic transistor, an organic photoconductor drum, an organic memory device, or the like.
- [133] According to another embodiment of the present invention, an organic light emitting device including an anode, a cathode, and at least one or more organic thin layers between the anode and the cathode is provided. At least one of the organic thin layers may include the compound for an optoelectronic device of the present invention.
- [134] The organic thin layer may include an emission layer, a hole transport layer (HTL), a hole injection layer (HIL), an electron transport layer (ETL), an electron injection layer (EIL), a hole blocking layer, or a combination thereof.
- [135] The compound for an optoelectronic device may be included in a hole transport layer (HTL), a hole injection layer (HIL), an electron transport layer (ETL), or an electron injection layer (EIL).
- [136] The compound for an optoelectronic device may be included in an emission layer.
- [137] The compound for an optoelectronic device may be used as a phosphorescent or fluorescent host material in an emission layer.
- [138] The compound for an optoelectronic device may be used as a fluorescent blue dopant material in an emission layer.
- [139] According to another embodiment of the present invention, a display device including the organic light emitting element is provided.
- [140]

Advantageous Effects of Invention

- [141] The compound for an optoelectronic device may include an excellent hole or electron transporting property, high film stability, good thermal stability, and good triplet exciton energy.
- [142] The compound may be used as a hole injection/ transport material of an emission layer, a host material, or an electron injection/ transport material. The organic photoelectric device may have excellent electrochemical and thermal stability, and therefore may have an excellent life-span characteristic and high luminous efficiency at a low driving voltage.
- [143]

Brief Description of Drawings

- [144] FIGS. 1 to 5 are cross-sectional views showing organic light emitting diodes including compounds according to various embodiments of the present invention.
- [145] FIG. 6 shows a ¹H-NMR spectrum of the A-414 compound according to Example 1.
- [146] FIG. 7 shows a ¹H-NMR spectrum of the A-415 compound according to Example 2.
- [147] FIG. 8 shows a ¹H-NMR spectrum of the A-9 compound according to Example 3.

[148] FIG. 9 shows a $^1\text{H-NMR}$ spectrum of the A-10 compound according to Example 4.

[149] FIG. 10 shows a $^1\text{H-NMR}$ spectrum of the A-11 compound according to Example 5.

[150] FIG. 11 shows a $^1\text{H-NMR}$ spectrum of the A-18 compound according to Example 6.

[151] FIG. 12 shows a $^1\text{H-NMR}$ spectrum of the A-19 compound according to Example 7.

[152] FIG. 13 shows a $^1\text{H-NMR}$ spectrum of the A-469 compound according to Example 13.

[153] FIG. 14 shows a $^1\text{H-NMR}$ spectrum of the A-470 compound according to Example 28.

[154] FIG. shows a $^1\text{H-NMR}$ spectrum of the A-457 compound according to Example 29.

[155] FIG. 16 shows a $^1\text{H-NMR}$ spectrum of the A-416 compound according to Example 37.

[156] FIG. 17 shows a $^1\text{H-NMR}$ spectrum of the A-12 compound according to Example 38.

[157] FIG. 18 shows a $^1\text{H-NMR}$ spectrum of the A-13 compound according to Example 39.

[158] FIG. 19 is a graph showing photoluminescence (PL) of the A-9, A-10, and A-11 compounds according to Examples 3 to 5.

[159]

Mode for the Invention

CROSS-REFERENCE TO RELATED APPLICATION

[160] This application claims priority to and the benefit of Korean Patent Application No. 10-2010-0038169 filed in the Korean Intellectual Property Office on April 23, 2010 and US Patent Application No. 61/344,433 filed in the USPTO on July 22, 2010, the entire contents of which are incorporated herein by reference.

[161] Exemplary embodiments of the present invention will hereinafter be described in detail. However, these embodiments are only exemplary, and the present invention is not limited thereto but rather is defined by the scope of the appended claims.

[162] As used herein, when specific definition is not otherwise provided, the term “substituted” refers to one substituted with deuterium, a halogen, a hydroxy group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C3 to C40 silyl group, a C1 to C30 alkyl group, a C1 to C10 alkylsilyl group, a C3 to C30 cyclo alkyl group, a C6 to C30 aryl group, a C1 to C20 alkoxy group, a fluoro group, a C1 to C10 trifluoro alkyl group such as a trifluoromethyl group, or a cyano group, instead of hydrogen.

[163] As used herein, when specific definition is not otherwise provided, the term “hetero” refers to one including 1 to 3 of N, O, S, or P, and remaining carbons in one ring.

[164] As used herein, when a definition is not otherwise provided, the term “combination thereof” refers to at least two substituents bound to each other by a linker, or at least

two substituents condensed to each other.

[166] As used herein, when a definition is not otherwise provided, the term "alkyl" refers to an aliphatic hydrocarbon group. The alkyl may be a saturated alkyl group that does not include any alkene or alkyne. Alternatively, the alkyl may be an unsaturated alkyl group that includes at least one alkene or alkyne. The term "alkyne" refers to a group in which at least two carbon atoms are bound in at least one carbon-carbon double bond, and the term "alkyne" refers to a group in which at least two carbon atoms are bound in at least one carbon-carbon triple bond. Regardless of being saturated or unsaturated, the alkyl may be branched, linear, or cyclic.

[167] The alkyl group may have 1 to 20 carbon atoms. The alkyl group may be a medium-sized alkyl having 1 to 10 carbon atoms. The alkyl group may be a lower alkyl having 1 to 6 carbon atoms.

[168] For example, a C1-C4 alkyl may have 1 to 4 carbon atoms and may be selected from the group consisting of methyl, ethyl, propyl, iso-propyl, n-butyl, iso-butyl, sec-butyl, and t-butyl.

[169] Representative examples of an alkyl group may be selected from a methyl group, an ethyl group, a propyl group, an isopropyl group, a butyl group, an isobutyl group, a t-butyl group, a pentyl group, a hexyl group, an ethenyl group, a propenyl group, a butenyl group, a cyclopropyl group, a cyclobutyl group, a cyclopentyl group, a cyclohexyl group, or the like, which may be individually and independently substituted.

[170] The term "aromatic group" may refer a functional group including a cyclic structure where all elements have p-orbitals that form conjugation. An aryl group and a heteroaryl group may be exemplified.

[171] The term "aryl" may refer to a monocyclic or fused ring-containing polycyclic (i.e., rings sharing adjacent pairs of carbon atoms) group.

[172] The "heteroaryl group" may refer to one including 1 to 3 heteroatoms selected from N, O, S, or P in an aryl group, and remaining carbons. When the heteroaryl group is a fused ring, each ring may include 1 to 3 hetero atoms.

[173] The term "spiro structure" refers to a cyclic structure having a contact point of one carbon. Further, the spiro structure may be used as a compound including the spiro structure or a substituent including the spiro structure.

[174] The compound for an optoelectronic device of one embodiment may have a core structure in which two carbazole-based derivatives are independently bound to a nitrogen atom. In this specification, the carbazole-based derivative refers to a structure in which a nitrogen atom of a substituted or unsubstituted carbazolyl group is substituted with another hetero atom instead of nitrogen. However, the structure including two carbazolyl groups bound to each other is not included in one embodiment.

[175] Since the core structure includes at least two or more carbazole derivatives and has

excellent hole characteristics, it may be used as a hole injection material or a hole transport material of an organic light emitting device.

[176] At least one of the substituent that is bound to the core may be a substituent having excellent electron characteristics.

[177] Therefore, the compound may satisfy requirements of an emission layer by reinforcing electron characteristics to a carbazole structure having excellent hole characteristics. In one embodiment, it may be used as a host material of an emission layer.

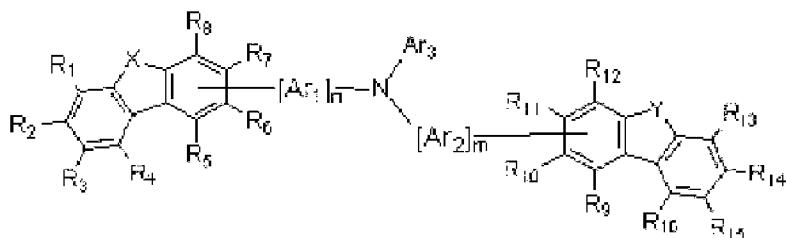
[178] In addition, the compound for an optoelectronic device may be a synthesis of a compound having various energy band gaps by introducing various substituents into the core of a carbazole and two carbazoles bound to the core of the carbazole.

[179] As the organic photoelectric device includes the compound having the appropriate energy level depending upon the substituents, the electron transporting property is enforced to provide excellent efficiency and driving voltage, and the electrochemical and thermal stability are improved to enhance the life-span characteristic while driving the organic photoelectric device.

[180] According to one embodiment of the present invention, a compound for an optoelectronic device represented by the following Chemical Formula 1 is provided.

[181] [Chemical Formula 1]

[182]



[183] In Chemical Formula 1, R₁ to R₁₆ are the same or different, and are independently selected from hydrogen, deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a carboxyl group, a ferrocenyl group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C2 to C30 heteroaryl group, a substituted or unsubstituted C1 to C20 alkoxy group, a substituted or unsubstituted C6 to C20 aryloxy group, a substituted or unsubstituted C3 to C40 silyloxy group, a substituted or unsubstituted C1 to C20 acyl group, a substituted or unsubstituted C2 to C20 alkoxy carbonyl group, a substituted or unsubstituted C2 to C20 acyloxy group, a substituted or unsubstituted C2 to C20 acylamino group, a substituted or unsubstituted C2 to C20 alkoxy carbonyl amino group, a substituted or unsubstituted C7 to C20 aryloxy carbonyl amino group, a substituted or unsubstituted C1 to C20 sulfamoyl amino group, a substituted or unsubstituted C1 to C20 sulfonyl group, a substituted or unsubstituted C1 to C20 alkylthiol group, a substituted

or unsubstituted C6 to C20 arylthiol group, a substituted or unsubstituted C1 to C20 heterocyclothiol group, a substituted or unsubstituted C1 to C20 ureide group, and a substituted or unsubstituted C3 to C40 silyl group.

- [184] In addition, one of R₁ to R₈ is bound to Ar₁, and one of R₉ to R₁₆ is bound to Ar₂. At least one of R₁ to R₈ is bound to Ar₁ through a sigma bond, and at least one of R₉ to R₁₆ is bound to Ar₂ through a sigma bond.
- [185] Through a suitable combination of the substituents, the compound for an opto-electronic device having an excellent hole or electron transporting property, high film stability, thermal stability, and triplet exciton energy (T1) may be provided.
- [186] Also, a compound having improved thermal stability or oxidation resistance through a suitable combination of the substituents may be provided.
- [187] An asymmetrical bipolar structure may be provided through a suitable combination of substituents. Since the asymmetrical bipolar structure improves hole and electron transporting properties, it may improve luminous efficiency and performance of a device.
- [188] A structure of a compound may bulk up by controlling substituents, and therefore crystallinity may be decreased. When the crystallinity of a compound is decreased, the life-span of a device may be improved.
- [189] X is selected from NR₁₇, O, S, or SO₂(O=S=O), R₁₇ is a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group, and Y is O, S, or SO₂(O=S=O).
- [190] In the core structure of the above Chemical Formula 1, the hetero atom of the carbazole derivatives that are both substituents of a nitrogen atom may not simultaneously be N (i.e., carbazole). In other words, two or more carbazolyl groups may not exist as a substituent of nitrogen of a tertiary arylamine in the above Chemical Formula 1. The symmetric compound having the same substituents may increase crystallinity.
- [191] In addition, Ar₁ and Ar₂ are the same or different, and are independently a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group, n is an integer ranging from 1 to 4, and m is an integer ranging from 0 to 4. The p-conjugation length may be controlled by adjusting the length of Ar₁ and Ar₂. Thereby, the triplet exciton energy bandgap is controlled, and may be usefully applied as a phosphorescent host of the emission layer of an organic photoelectric device. In addition, when a heteroaryl group is introduced, a bipolar characteristic of a molecular structure is realized to provide a phosphorescent host of an organic photoelectric device having high efficiency.
- [192] Ar₃ is a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group. When X is NR₁₇, a fluorenyl group is not

included.

[193] Further, Ar₃ is a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group. Also, a substituted or unsubstituted carbazolyl group, a substituted or unsubstituted dibenzofuranyl group, or a substituted or unsubstituted dibenzothiophenyl group may be excluded for Ar₃. When X is NR₁₇, a fluorenyl group may be excluded for Ar₃. When the substituents described above are excluded, the crystallinity may be suppressed by decreasing a symmetric structure in the molecule, and thereby recrystallization may be inhibited in a device.

[194] Examples of Ar₃ may include a substituted or unsubstituted phenyl group, a substituted or unsubstituted naphthyl group, a substituted or unsubstituted anthracenyl group, a substituted or unsubstituted phenanthryl group, a substituted or unsubstituted naphthacenyl group, a substituted or unsubstituted pyrenyl group, a substituted or unsubstituted biphenyl group, a substituted or unsubstituted p-terphenyl group, a substituted or unsubstituted m-terphenyl group, a substituted or unsubstituted chrysenyl group, a substituted or unsubstituted triperylenyl group, a substituted or unsubstituted perylenyl group, a substituted or unsubstituted indenyl group, a substituted or unsubstituted furanyl group, a substituted or unsubstituted thiophenyl group, a substituted or unsubstituted pyrrolyl group, a substituted or unsubstituted pyrazolyl group, a substituted or unsubstituted imidazolyl group, a substituted or unsubstituted triazolyl group, a substituted or unsubstituted oxazolyl group, a substituted or unsubstituted thiazolyl group, a substituted or unsubstituted oxadiazolyl group, a substituted or unsubstituted thiadiazolyl group, a substituted or unsubstituted pyridyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted pyrazinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted benzofuranyl group, a substituted or unsubstituted benzothiophenyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted indolyl group, a substituted or unsubstituted quinolinyl group, a substituted or unsubstituted isoquinolinyl group, a substituted or unsubstituted quinazolinyl group, a substituted or unsubstituted quinoxaliny group, a substituted or unsubstituted naphthydiny group, a substituted or unsubstituted benzoxazinyl group, a substituted or unsubstituted benzthiazinyl group, a substituted or unsubstituted acridinyl group, a substituted or unsubstituted phenazinyl group, a substituted or unsubstituted phenothiazinyl group, or a substituted or unsubstituted phenoxazinyl group.

[195] X is selected from NR₁₇, O, S, or SO₂(O=S=O), where R₁₇ is a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group, wherein the term “substituted” refers to at least one hydrogen of an aryl group or a heteroaryl group substituted with deuterium, a halogen, a cyano group, hydroxy group, an amino group, a

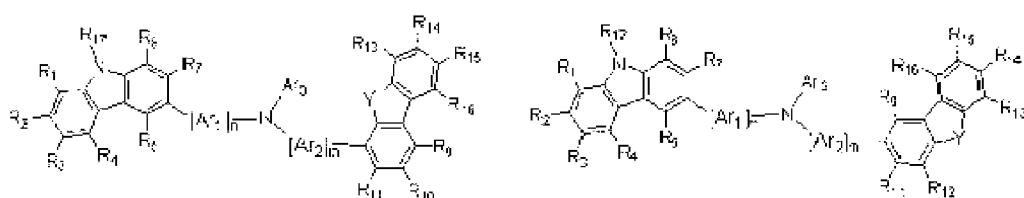
substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C1 to C20 alkoxy group, a substituted or unsubstituted C3 to C40 silyl group, or a combination thereof.

[196] As described above, when one of substituents of R₁₇ is the above substituent instead of hydrogen, electro-optical characteristics and thin film characteristics for maximizing the performance of the material for an optoelectronic device may be finely adjusted while maintaining basic characteristics of the compound.

[197] The Chemical Formula 1 may be represented by one of the Chemical Formulae 2 to 7.

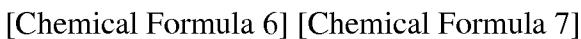
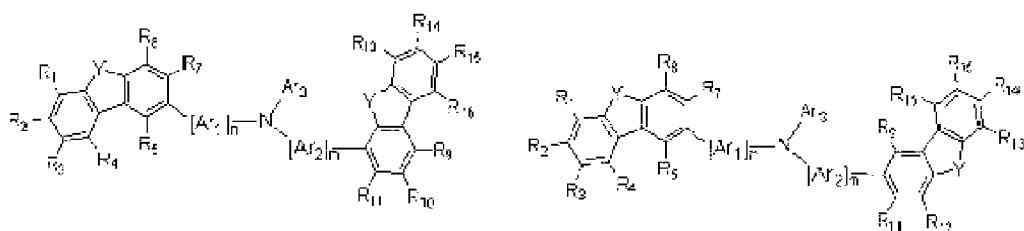
[198] [Chemical Formula 2] [Chemical Formula 3]

[199]



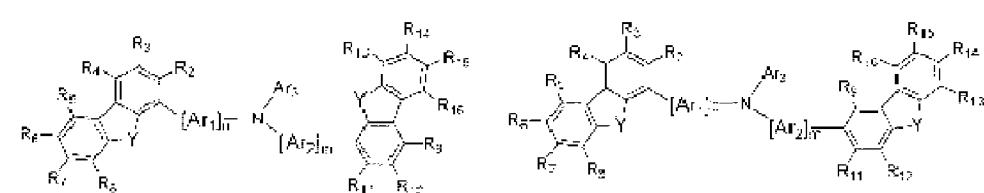
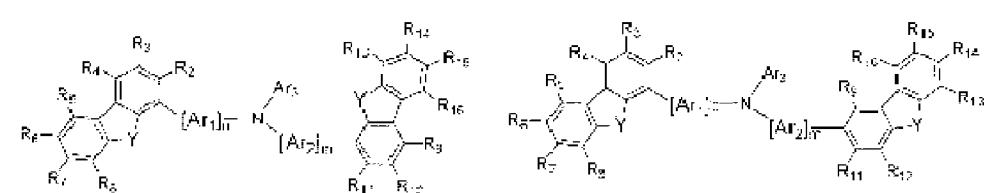
[200] [Chemical Formula 4] [Chemical Formula 5]

[201]



[202] [Chemical Formula 6] [Chemical Formula 7]

[203]

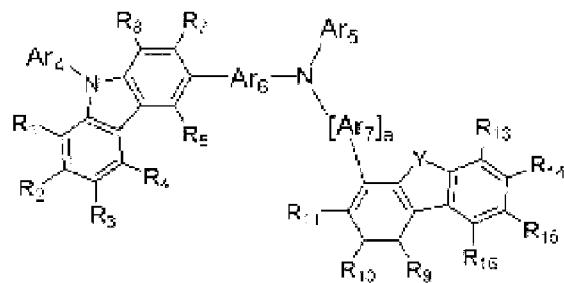


[204] The Chemical Formulae 2 to 7 include fixed positions at which a substituent of a carbazole derivative such as a dibenzofuranyl group or a dibenzothiophenyl group is bound in Chemical Formula 1. When the substituent is bound at fixed positions, substantial synthesis may be advantageously performed.

[205] The compound for an optoelectronic device may include at least one of the compounds represented by the following Chemical Formulae 8 or 9.

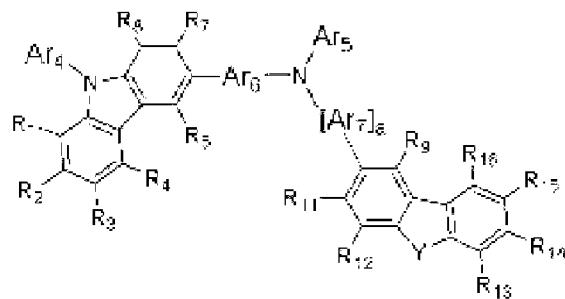
[206] [Chemical Formula 8]

[207]



[208] [Chemical Formula 9]

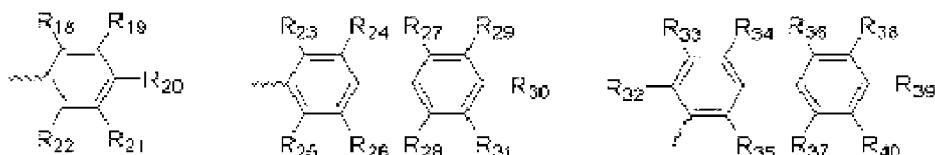
[209]



[210] In Chemical Formulae 8 and 9, Ar₄ and Ar₅ are the same or different, and are independently selected from substituents represented by the following Chemical Formulae 10 to 18.

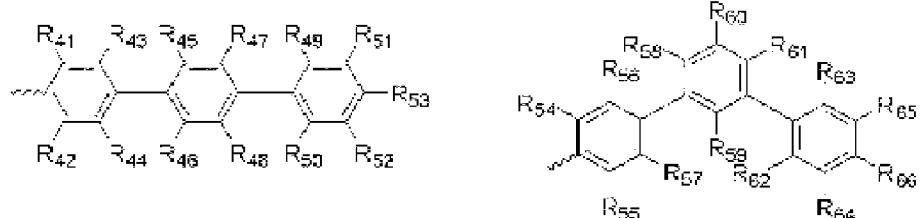
[211] [Chemical Formula 10] [Chemical Formula 11] [Chemical Formula 12]

[212]



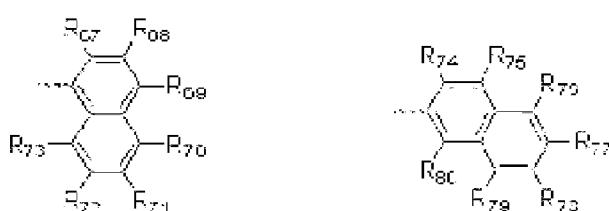
[213] [Chemical Formula 13] [Chemical Formula 14]

[214]



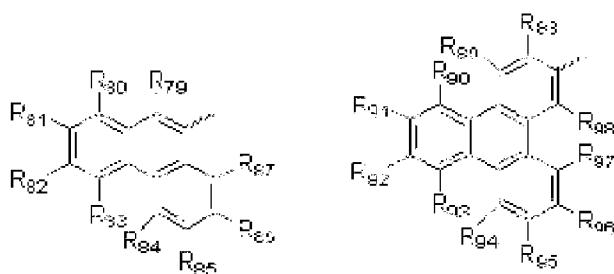
[215] [Chemical Formula 15] [Chemical Formula 16]

[216]



[217] [Chemical Formula 17] [Chemical Formula 18]

[218]



[219] In Chemical Formulae 10 to 18, R₁ to R₅, R₇ to R₁₆, and R₁₈ to R₉₈ are the same or different, and are independently selected from hydrogen, deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C1 to C20 alkoxy group, or a substituted or unsubstituted C3 to C40 silyl group, Ar₆ and Ar₇ are the same or different, and are independently selected from at least one of the substituents represented by the above Chemical Formulae 10 to 18, one of the selected substituents of R₁₈ to R₉₈ is bounded to an adjacent atom, and a is 0 or 1.

[220]

[221] The compound represented by Chemical Formula 8 or 9 includes a substituted or unsubstituted aryl group that is substituted with a substituent including nitrogen bound to a carbazolyl group and/or a substituent bound to an amine group. In this structure, it is hard to be recrystallized due to asymmetrical molecule structure as well as excellent hole transporting properties of a carbazolyl group. Therefore, when the compound is used for a hole injection and hole transport layer (HTL) of an organic light emitting diode, a long life-span and high efficiency can be realized.

[222] Also, Ar₄ is selected from the substituents represented by Chemical Formulae 10 to 18. At least one of the substituents R₁₈ to R₉₈ for Ar₄ may not be hydrogen, and in one embodiment, may be selected from deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C1 to C20 alkoxy group, or a substituted or unsubstituted C3 to C40 silyl group.

[223] In other words, one of the substituents of Ar₄ may be substituted with one of the substituents described above. In this structure, electro-optical characteristics and thin film characteristics for maximizing the performance of the material for an optoelectronic device may be finely adjusted while maintaining basic characteristics of the compound.

[224] The compound for an optoelectronic device according to one embodiment may include at least one of the compounds represented by the following Chemical Formulae

A-1 to A-305, A-414 to A-416, A-457, A-458, or A-469 to A-473. The compounds of the following structures have an excellent hole transport property due to carbazolyl, excellent thin film characteristics due to an asymmetrical molecule, and thermal stability. Therefore when they are used for a hole injection layer and a hole transport layer (HTL) of an organic light emitting diode, a long life-span and high efficiency may be realized.

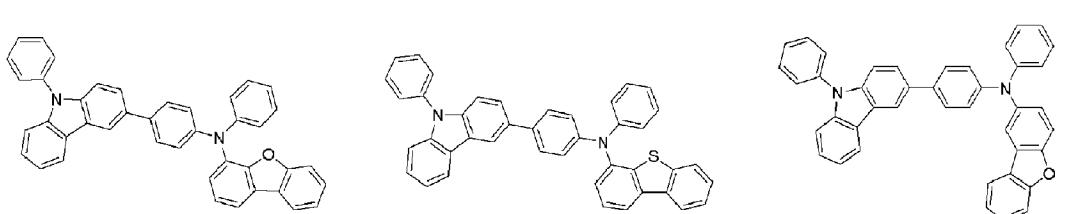
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[A-1]

[A-2]

[A-3]

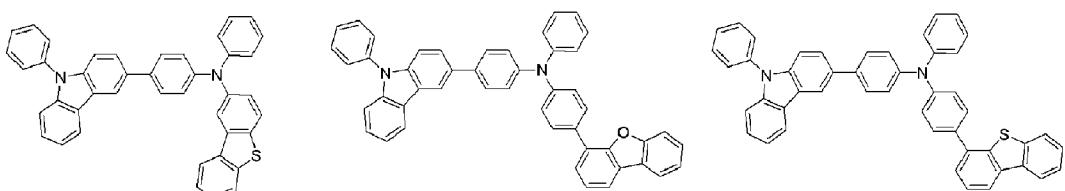
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[A-4]

[A-5]

[A-6]



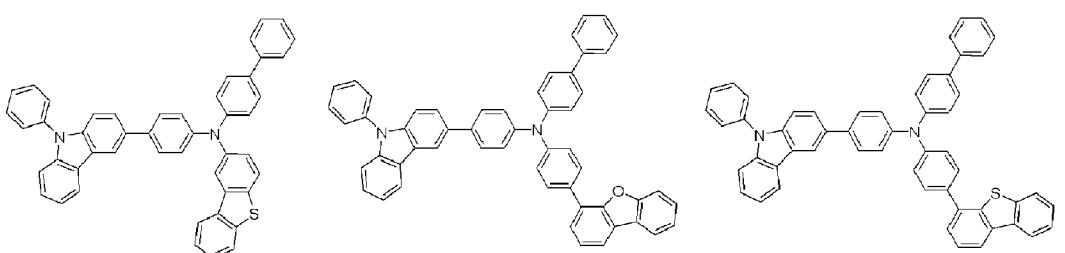
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[A-8]

[A-9]

[A-10]

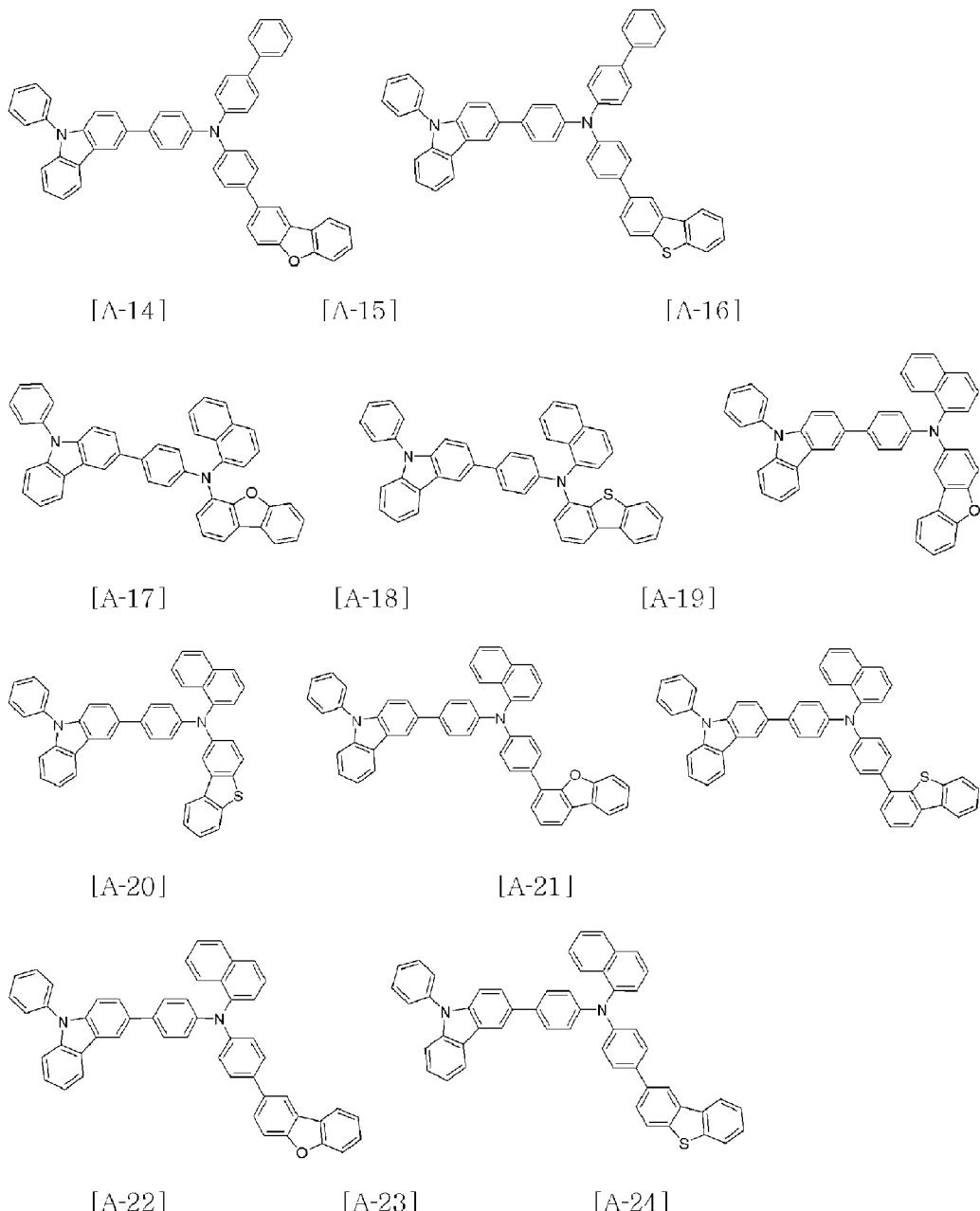
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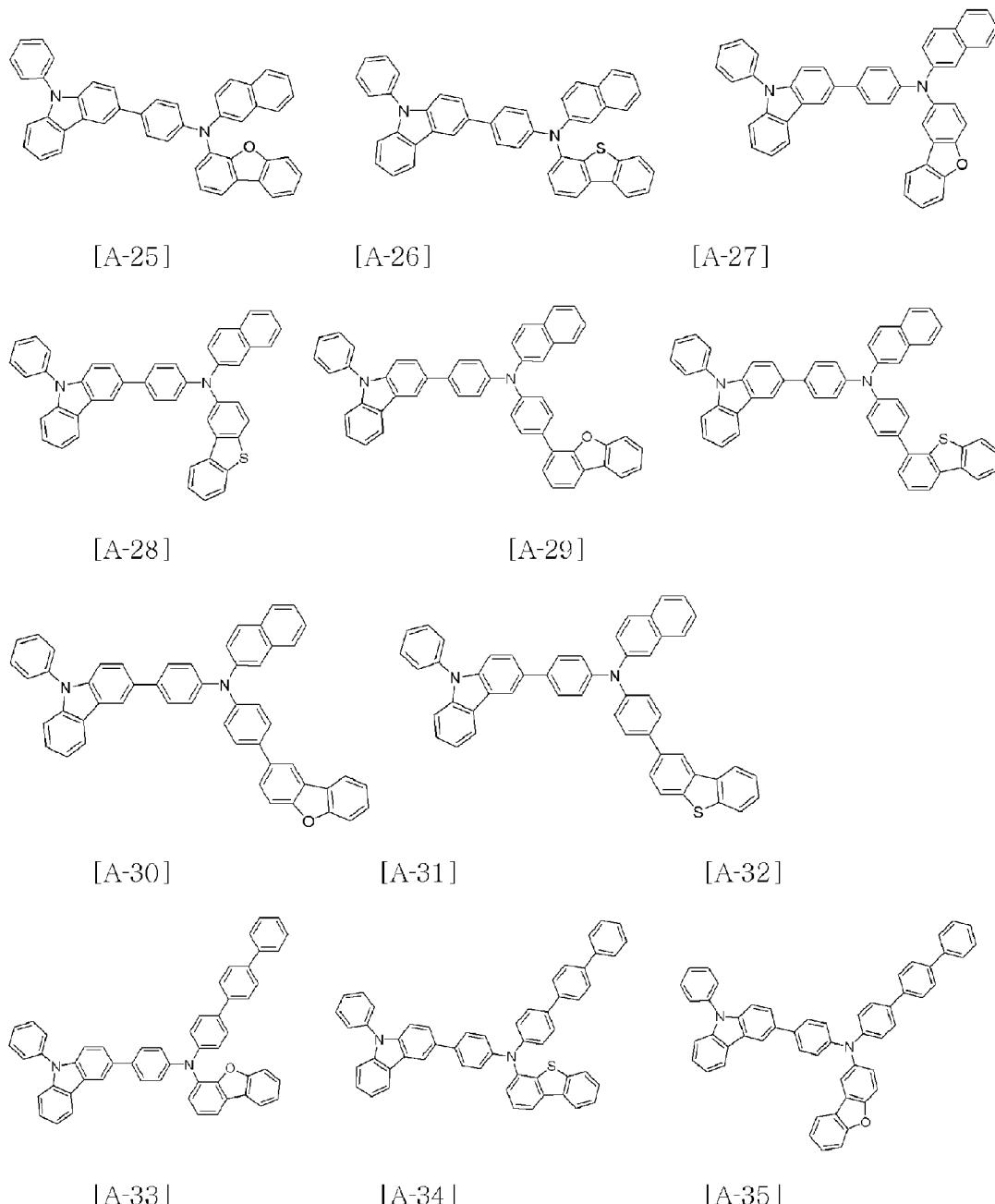
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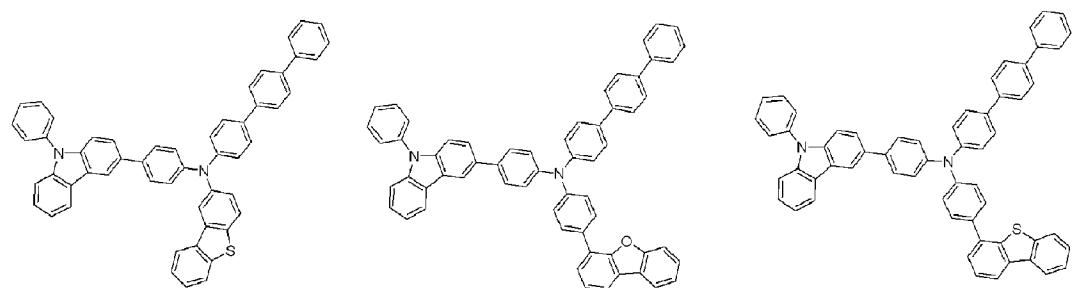
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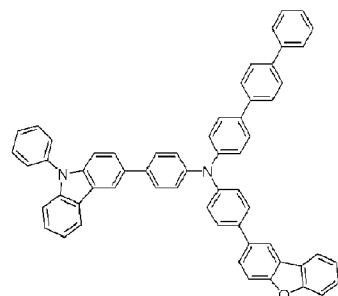


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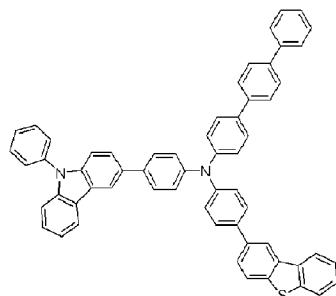


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[A-37]



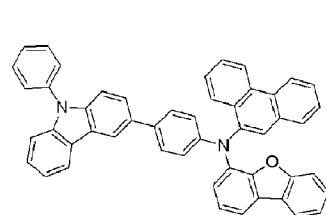
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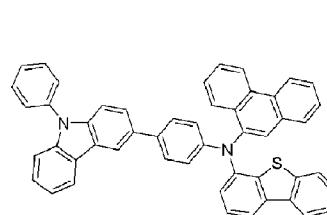
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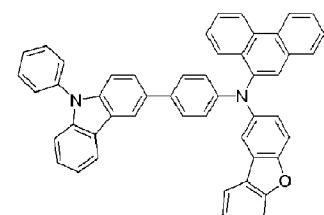
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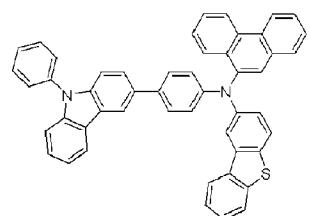
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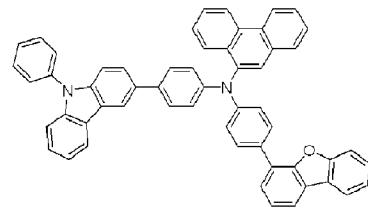
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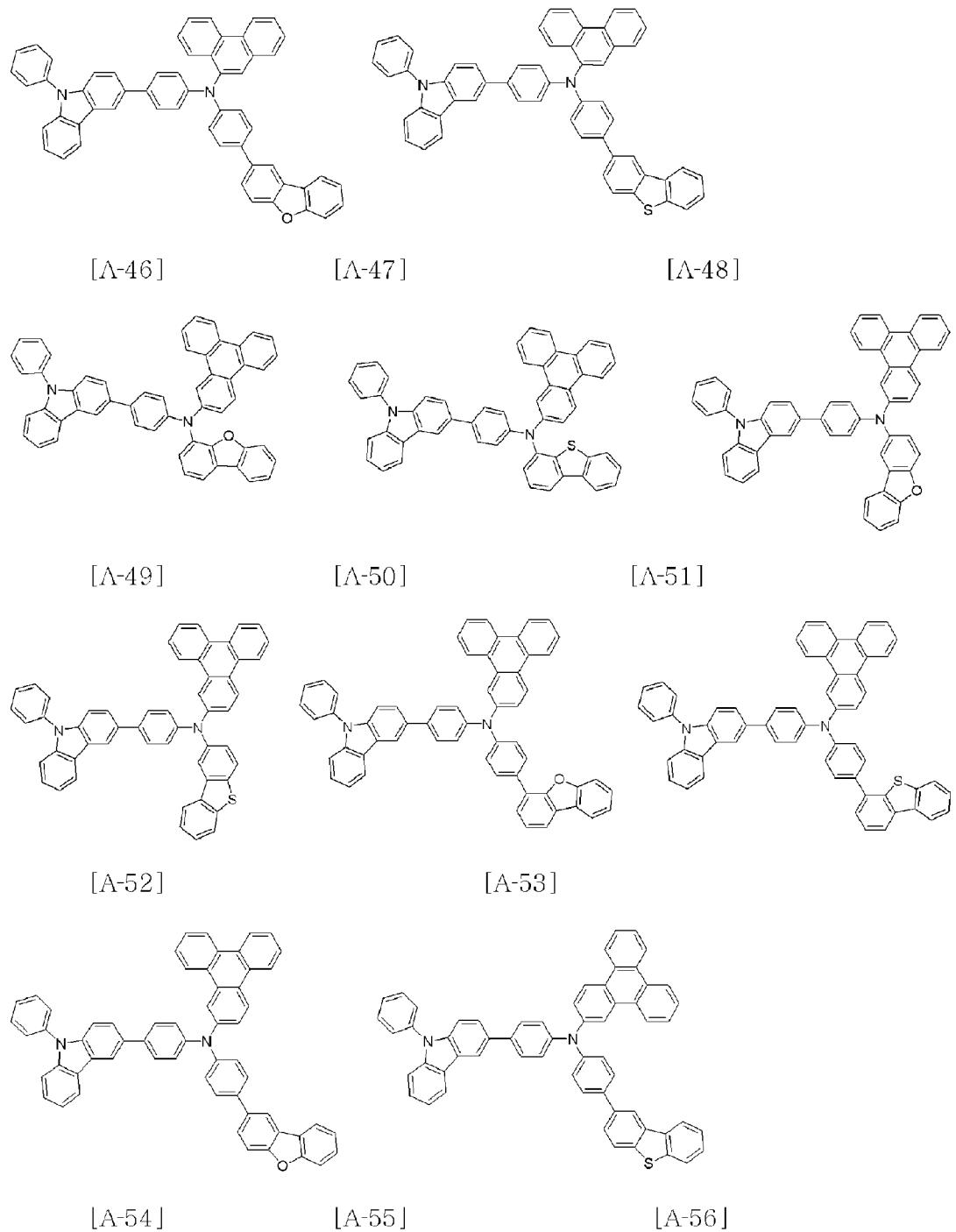


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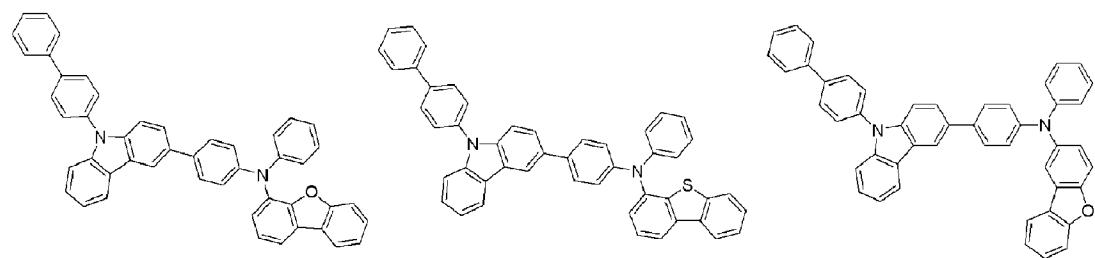


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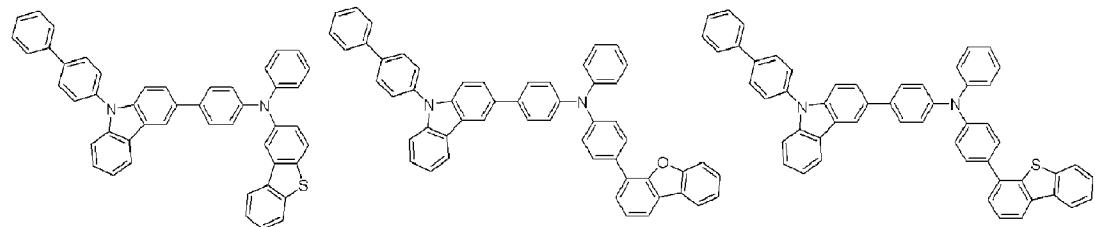
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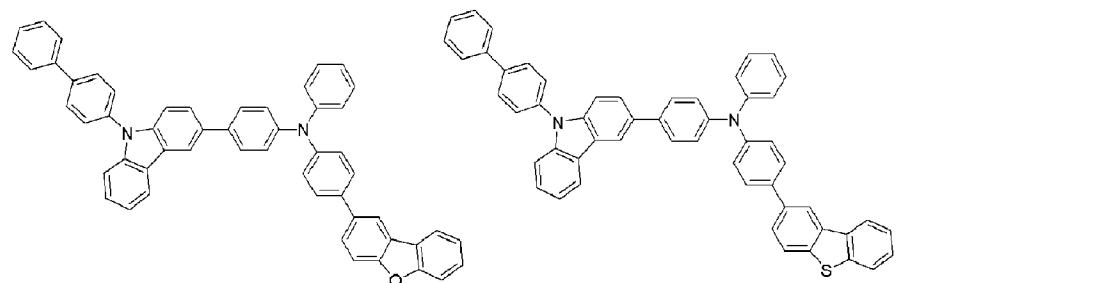
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[A-59]



[A-60]

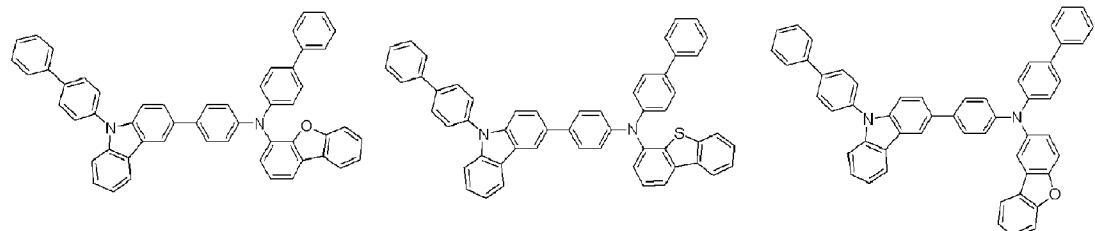
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[A-63]

[A-64]

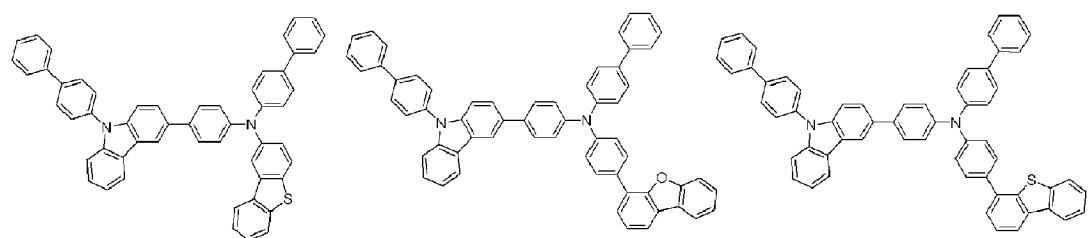
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[A-66]

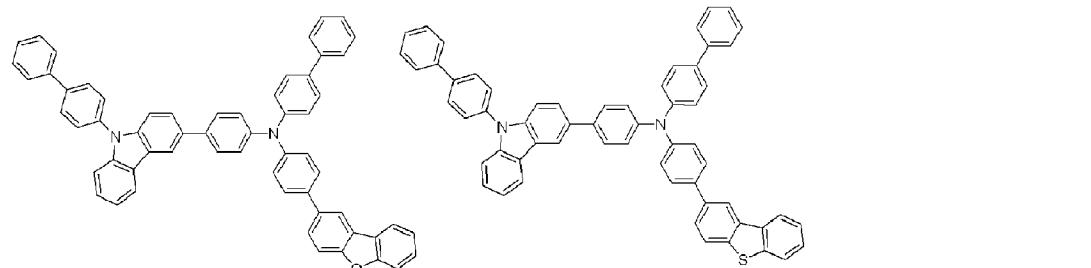
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[232]



[A-68]

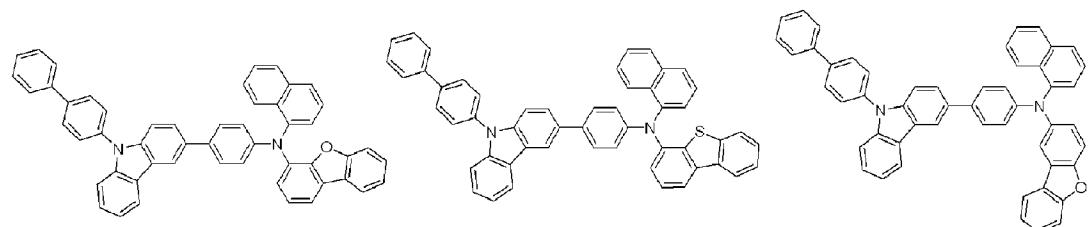
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[A-70]

[A-71]

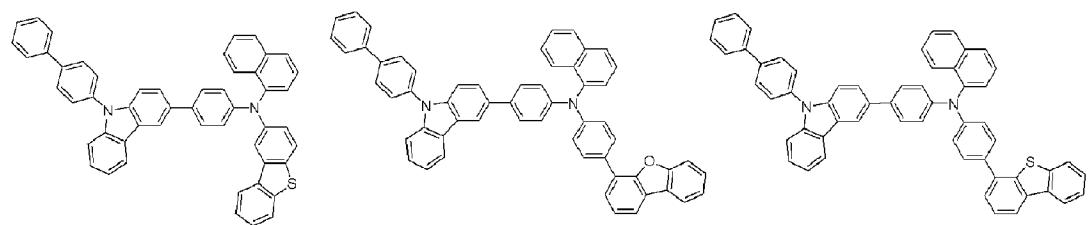
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[A-73]

[A-74]

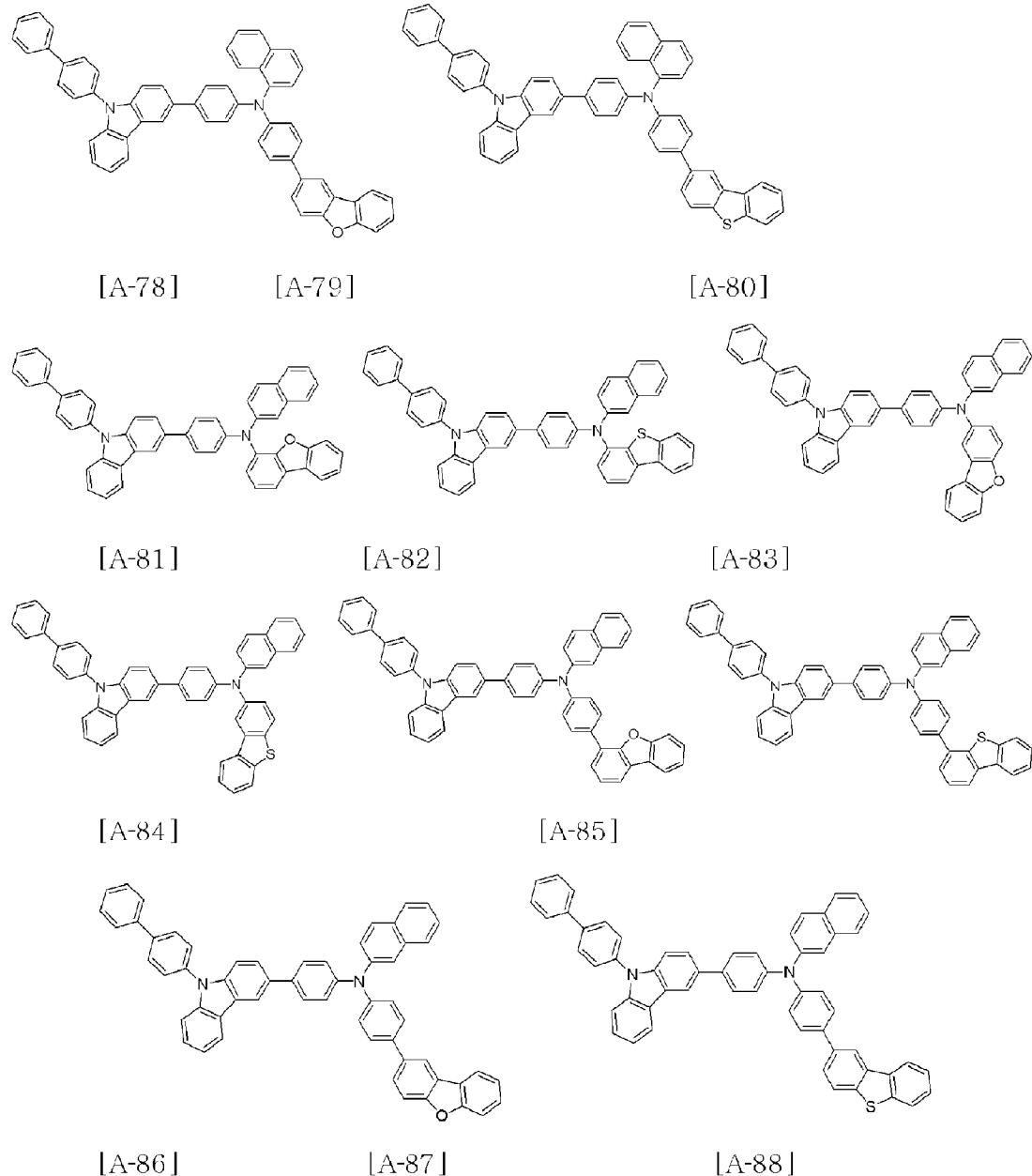
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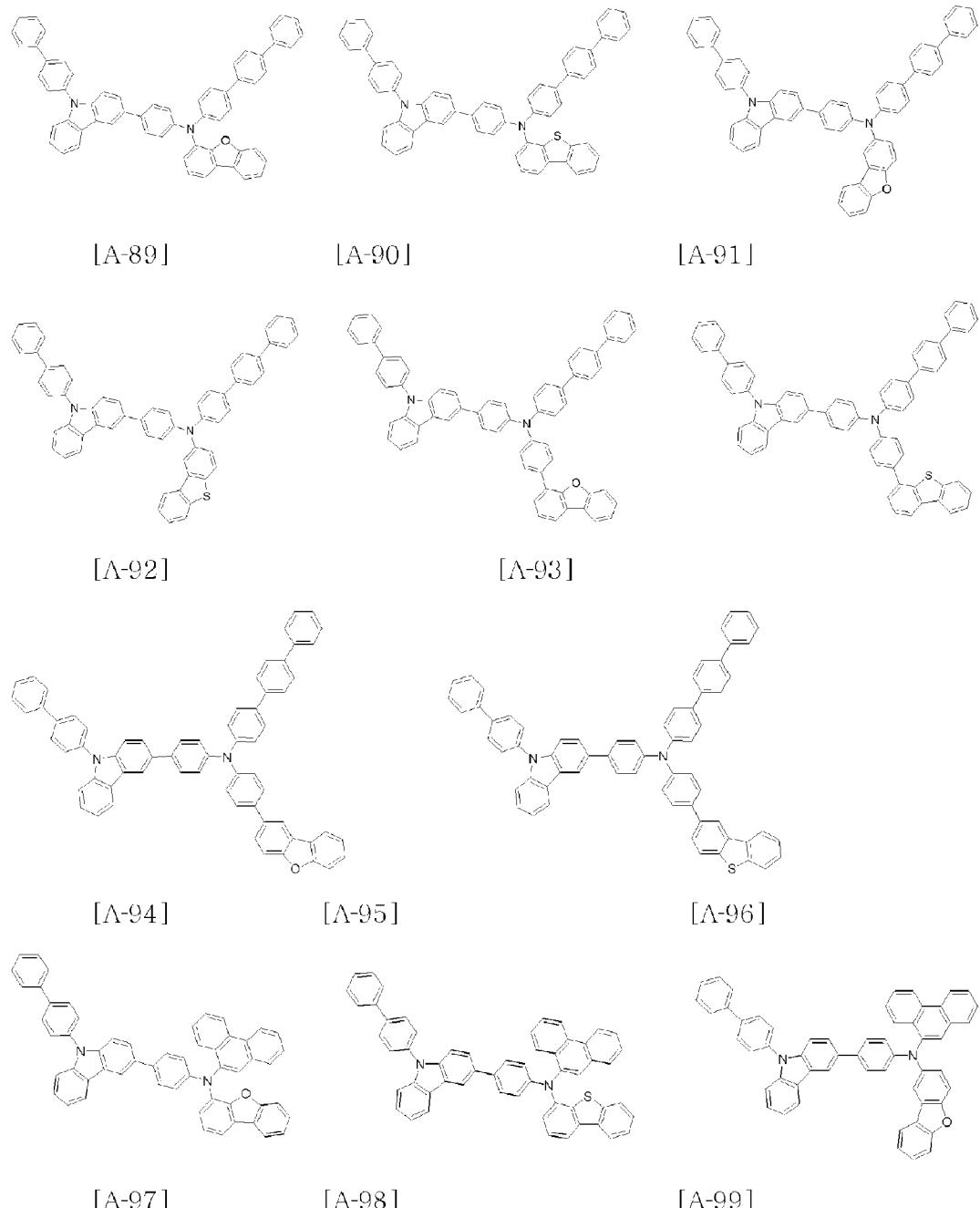
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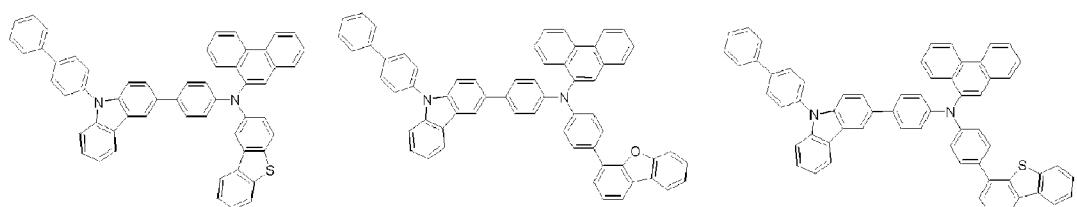
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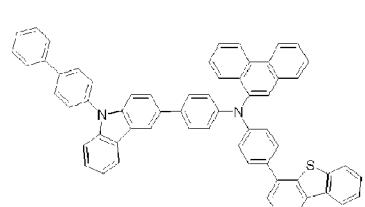
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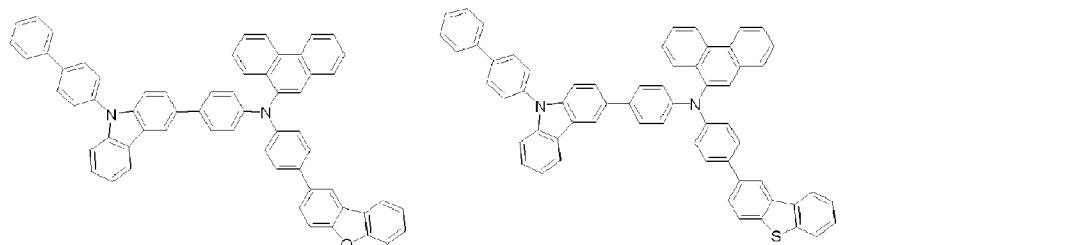
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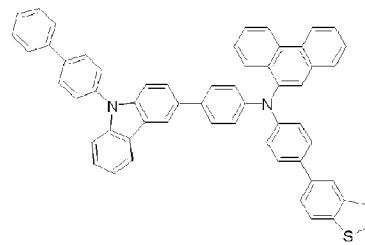
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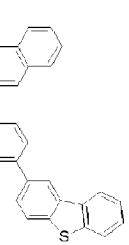
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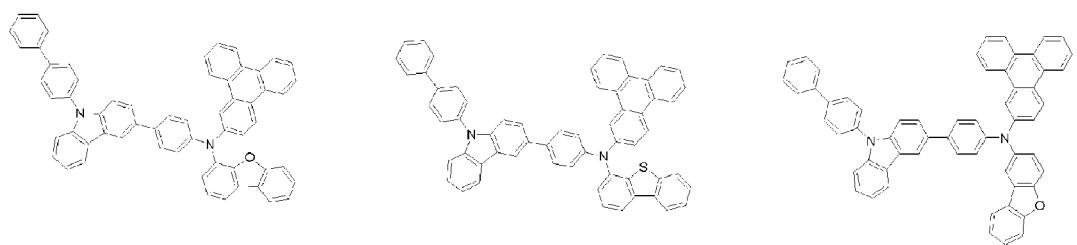
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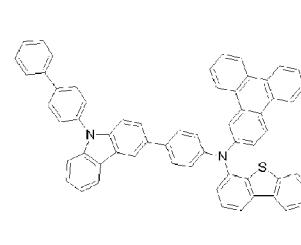
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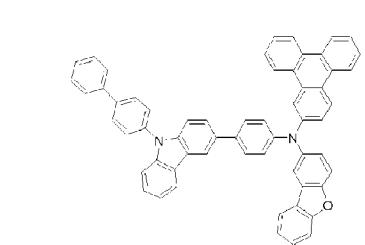
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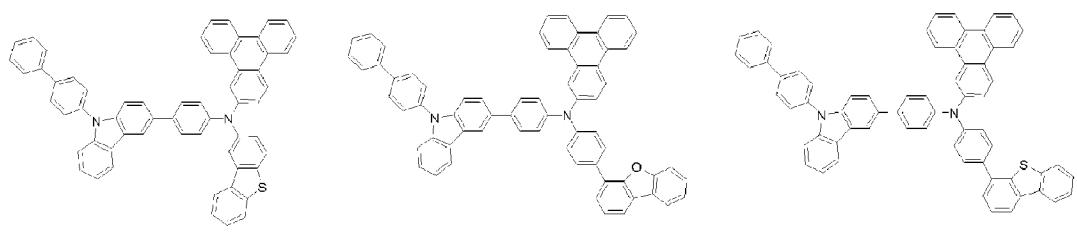
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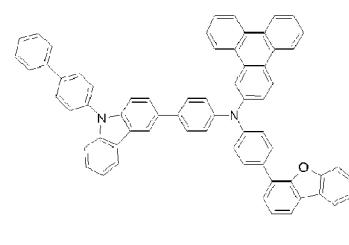
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[A-107]

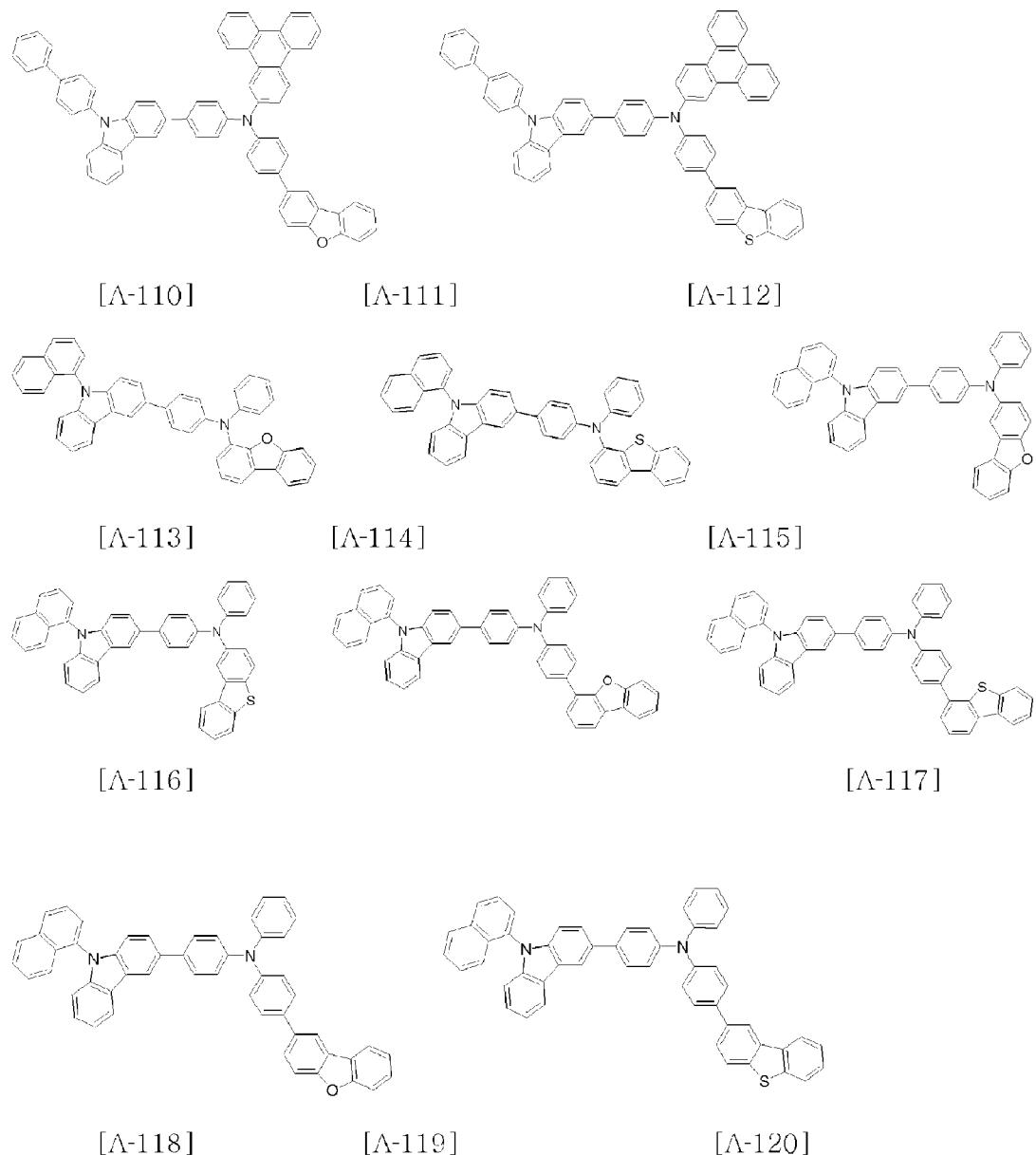


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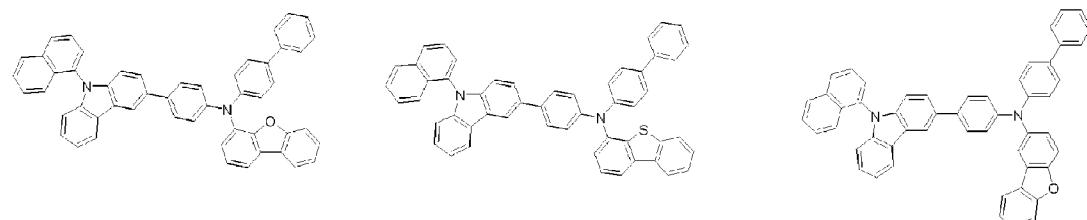


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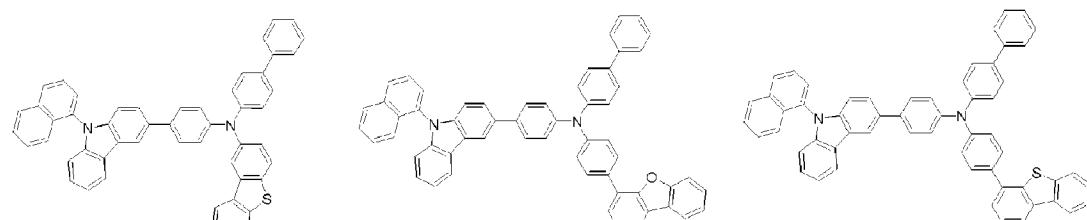
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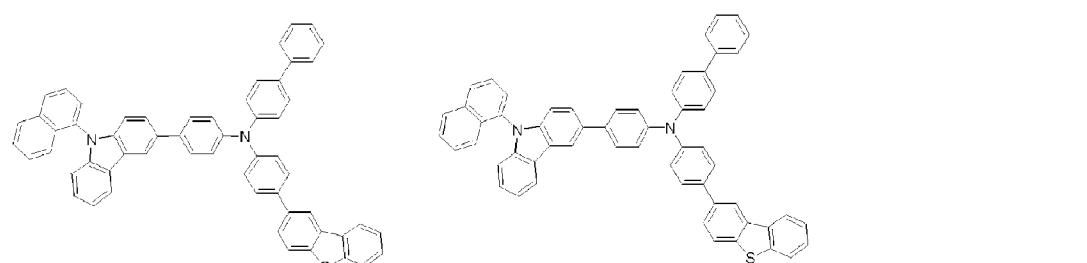
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[A-124]

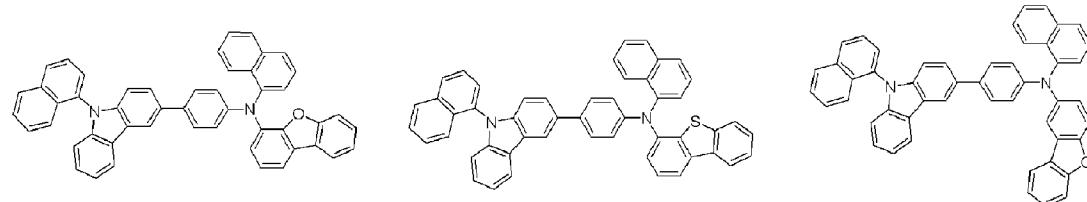
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[A-128]

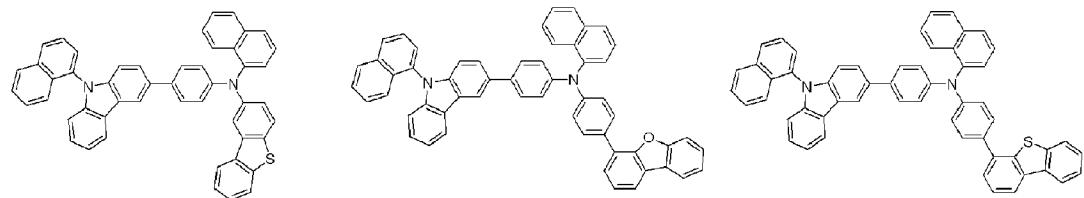


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[A-130]

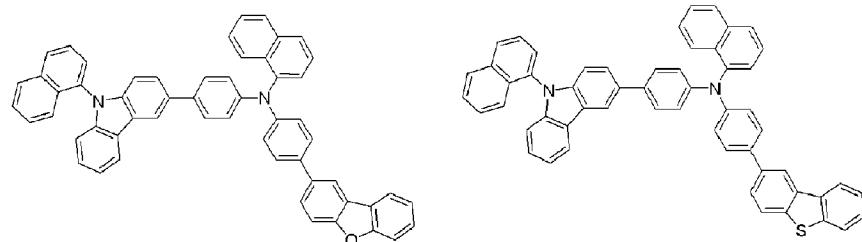
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[238]



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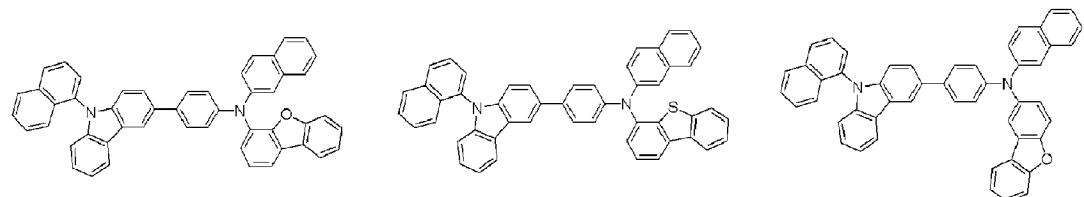
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[A-134]

[A-135]

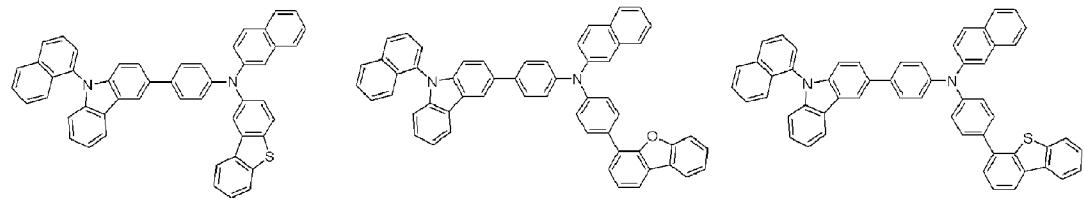
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[A-137]

[A-138]

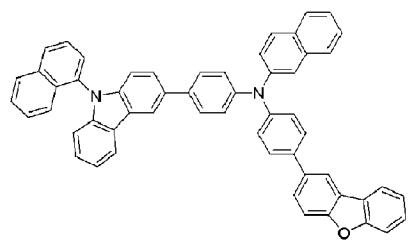
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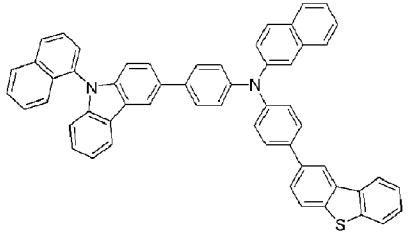
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[A-141]

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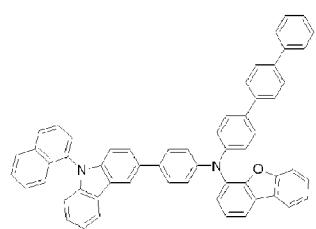


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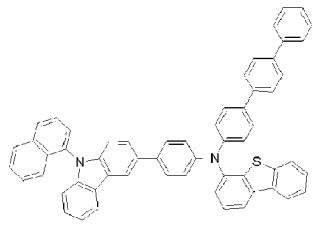


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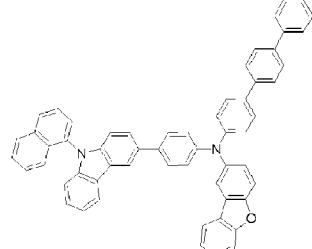
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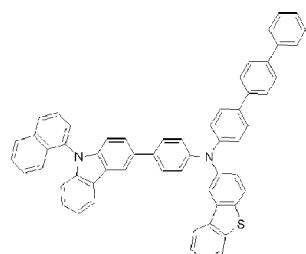
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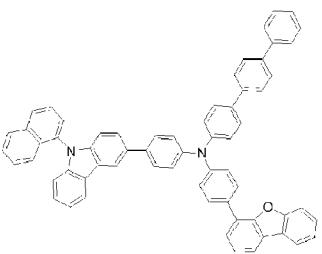
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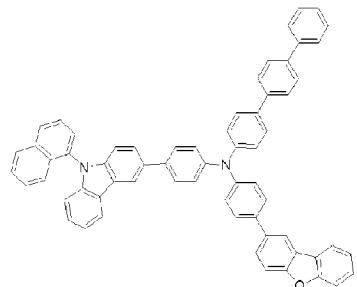
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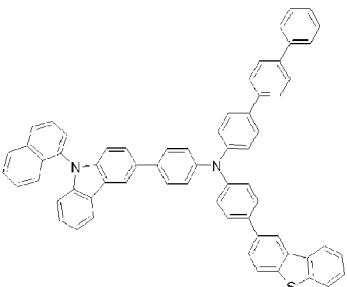
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[A-149]



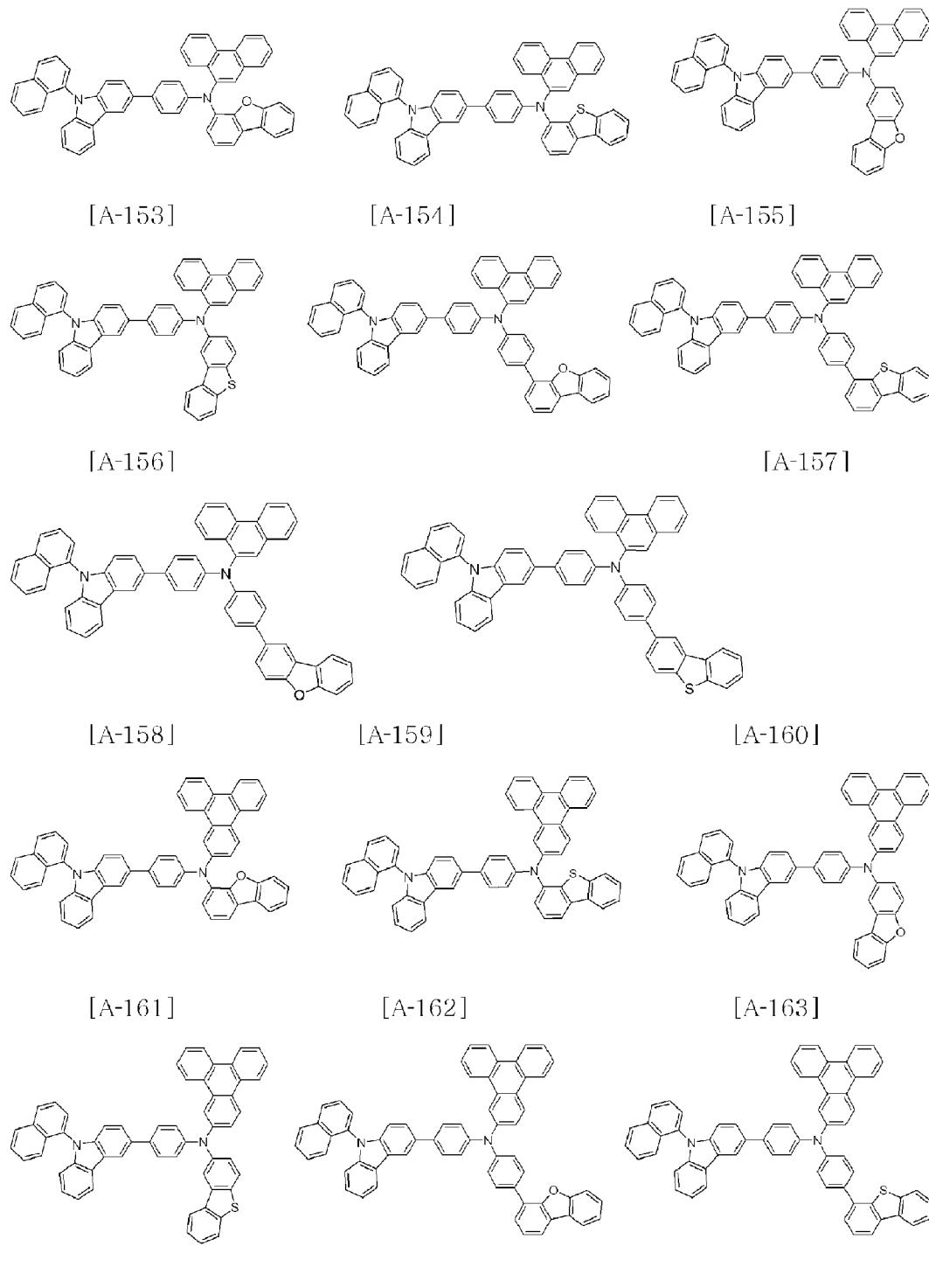
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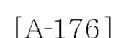
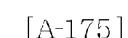
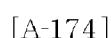
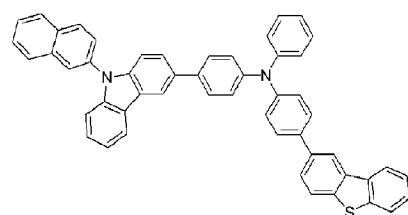
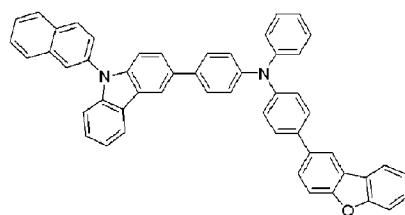
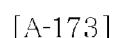
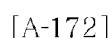
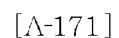
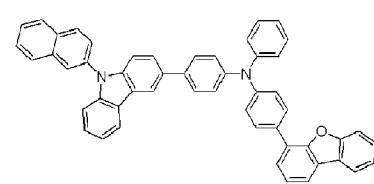
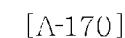
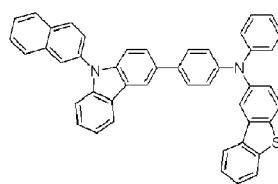
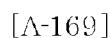
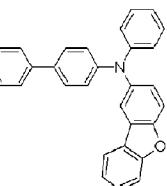
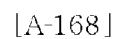
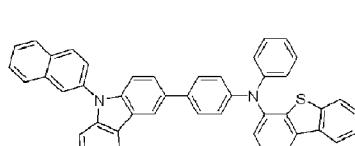
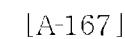
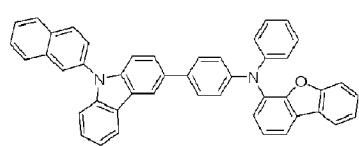
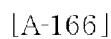
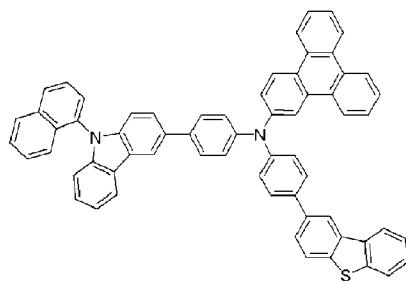
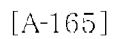
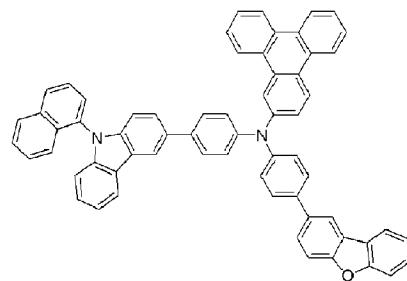
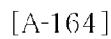
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[A-152]

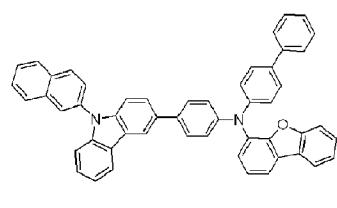
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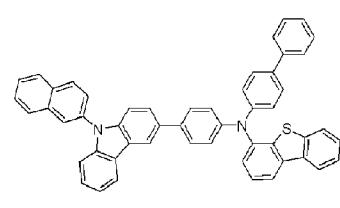
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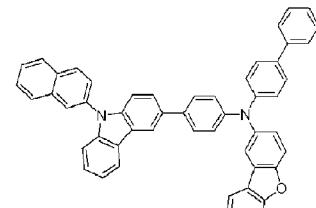
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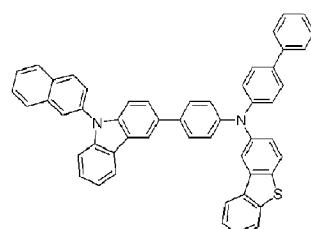
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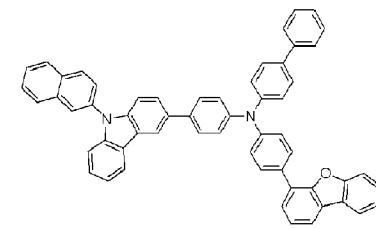
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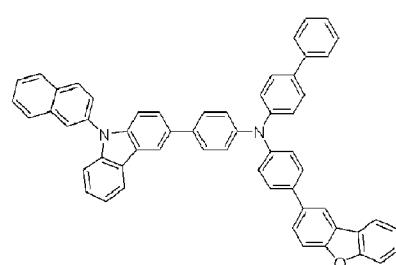
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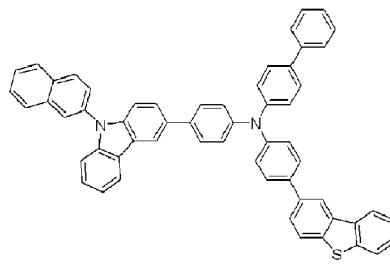
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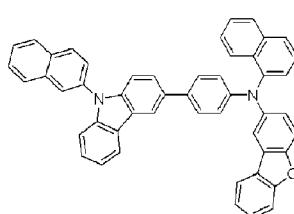
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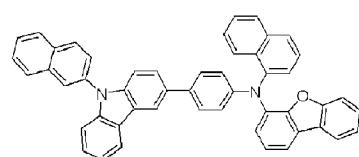
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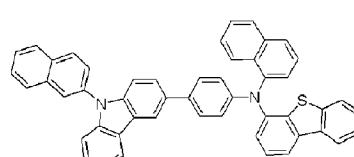
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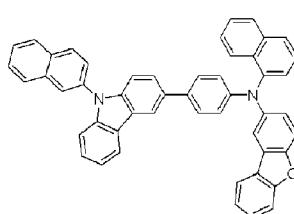
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[A-185]

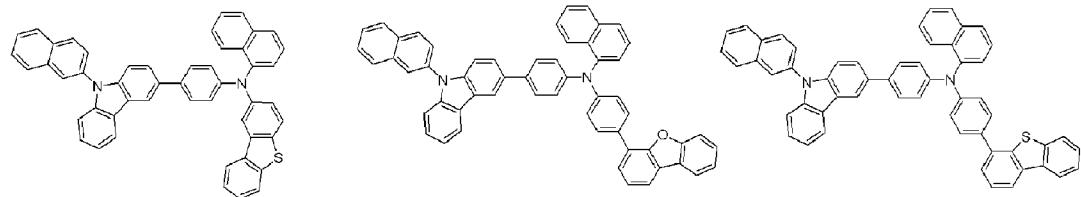


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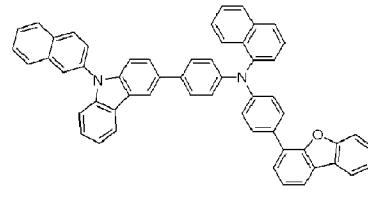


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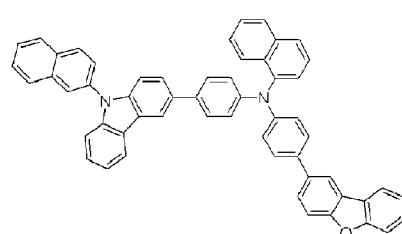
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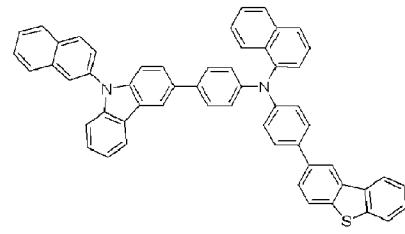
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[A-189]

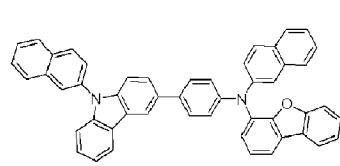


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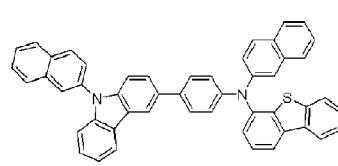


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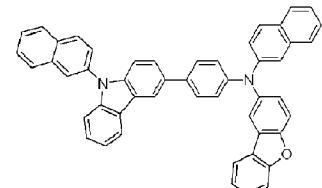
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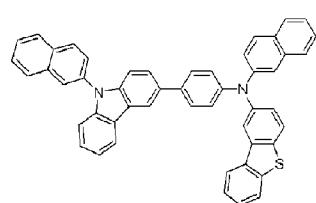
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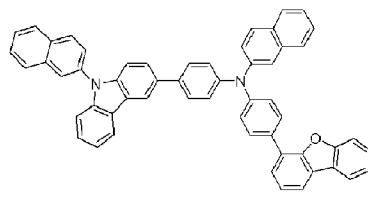
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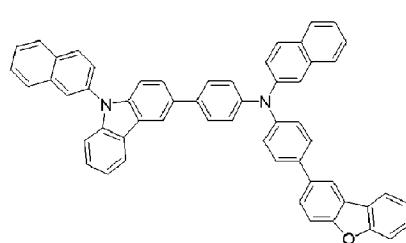


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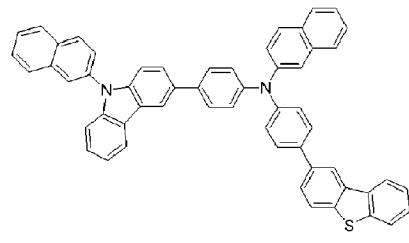


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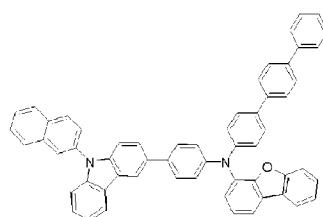


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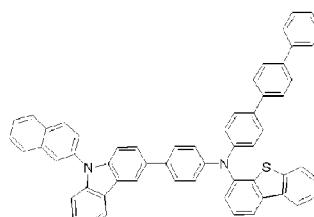


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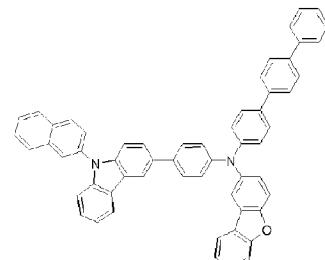
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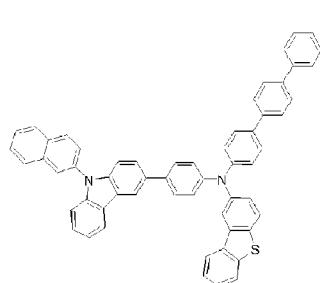
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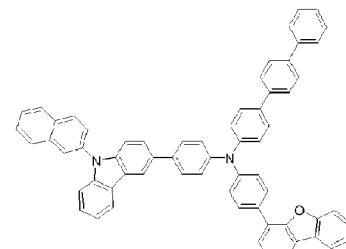
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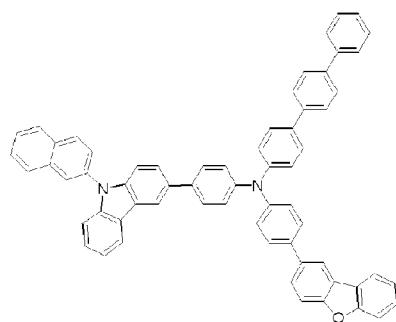
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[A-204]

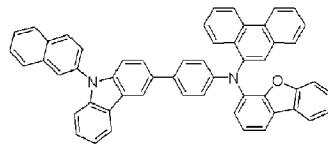


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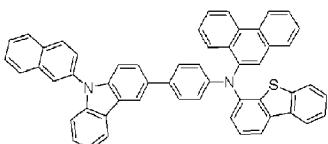


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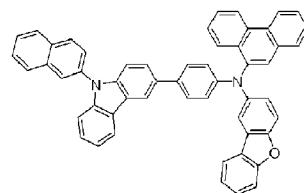
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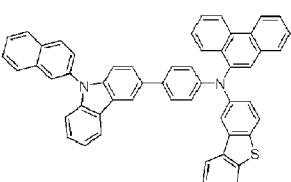
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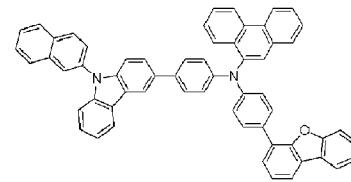
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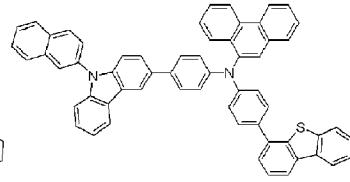
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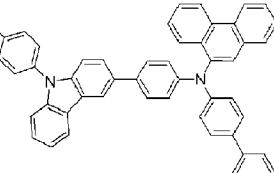
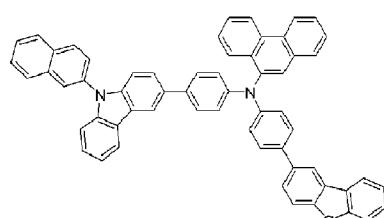
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[A-211]

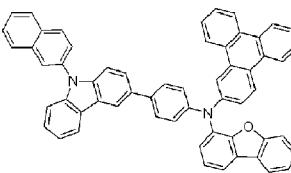


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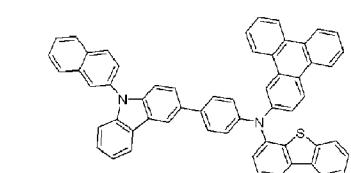


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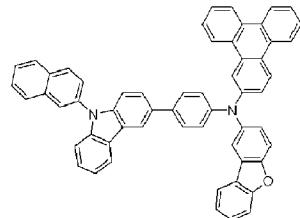
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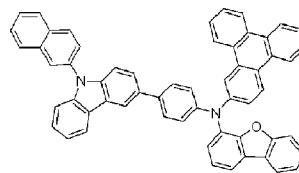
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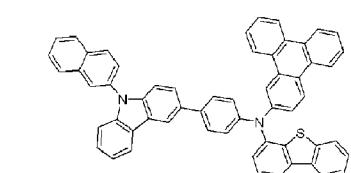
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[A-217]

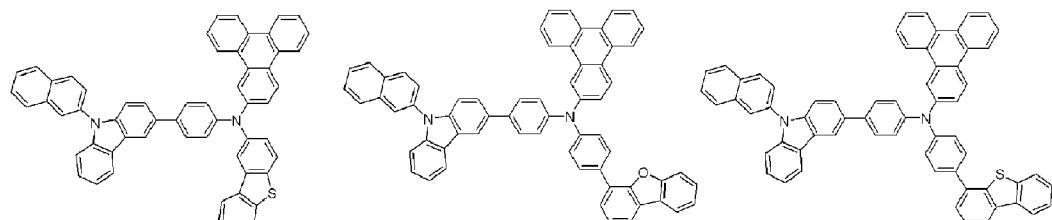


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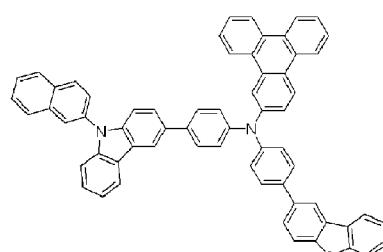
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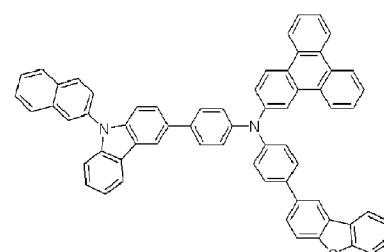


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[A-221]



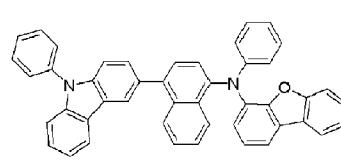
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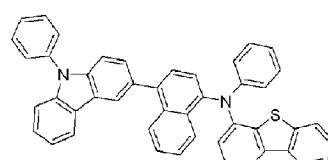
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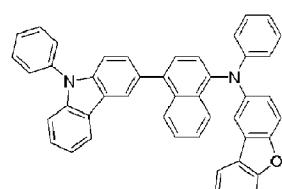
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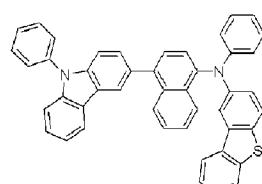
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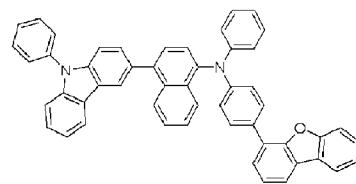
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[A-227]

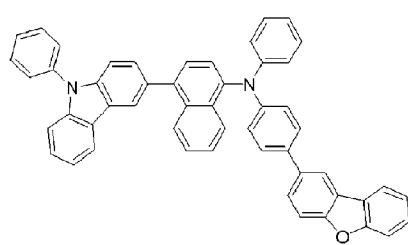


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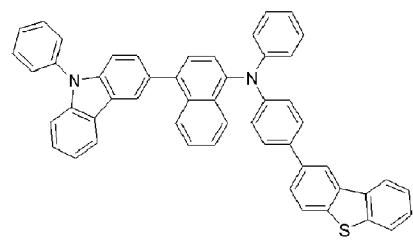


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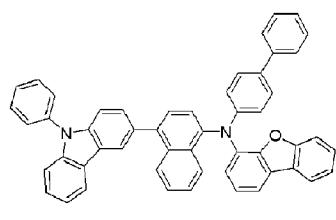


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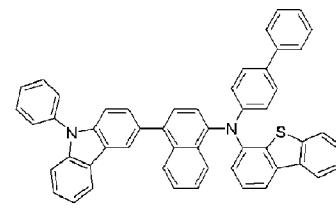


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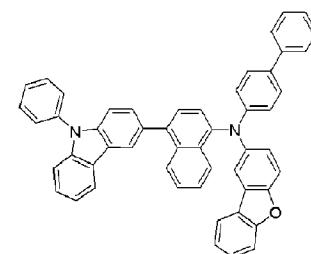
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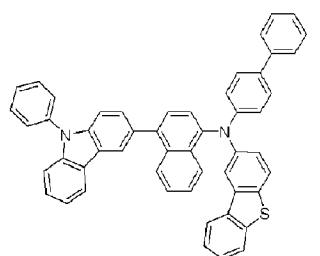
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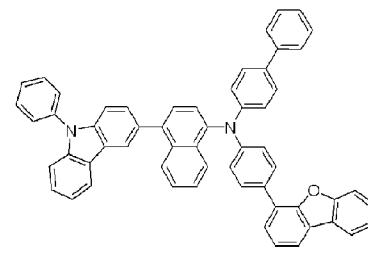
[A-234]



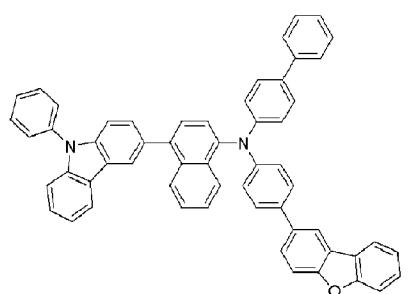
[A-235]



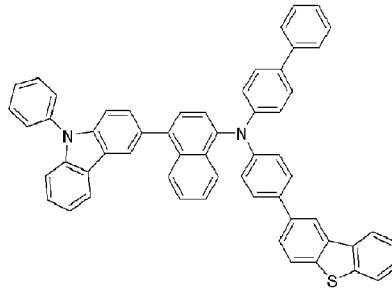
[A-236]



[A-237]



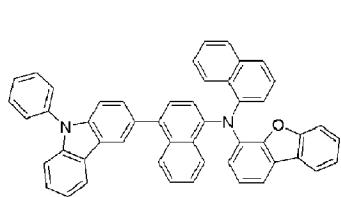
[A-238]



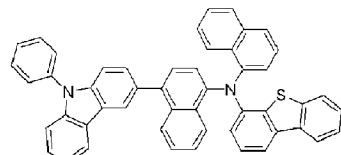
[A-239]

[A-240]

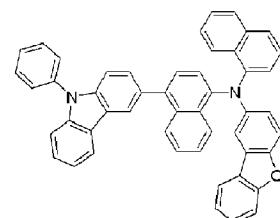
[248]



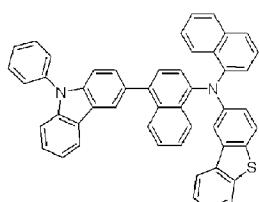
[A-241]



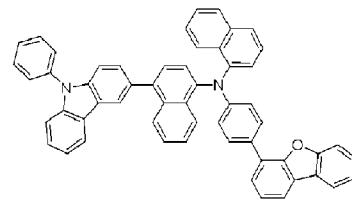
[A-242]



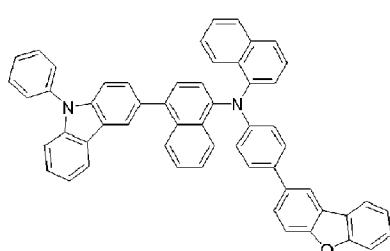
[A-243]



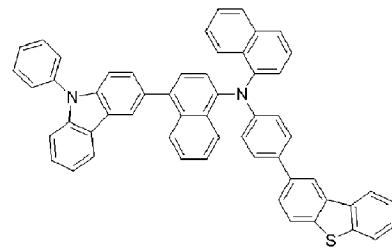
[A-244]



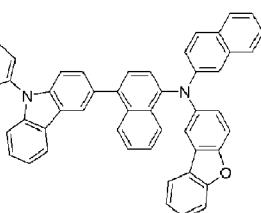
[A-245]



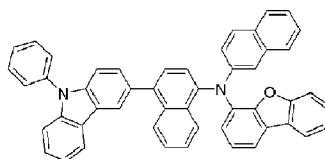
[A-246]



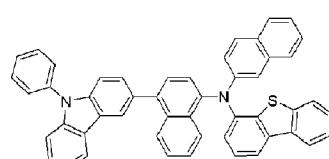
[A-247]



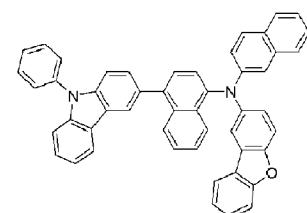
[A-248]



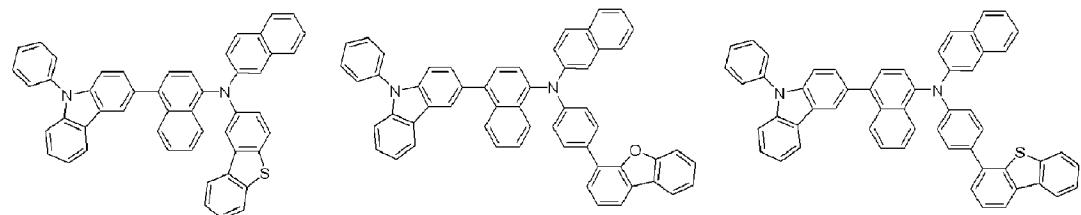
[A-249]



[A-250]

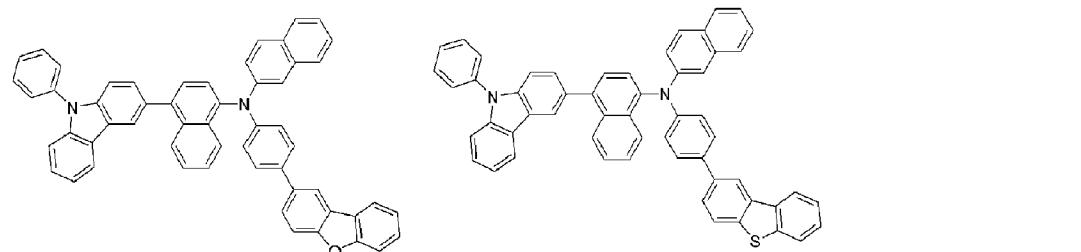


[A-251]



[A-252]

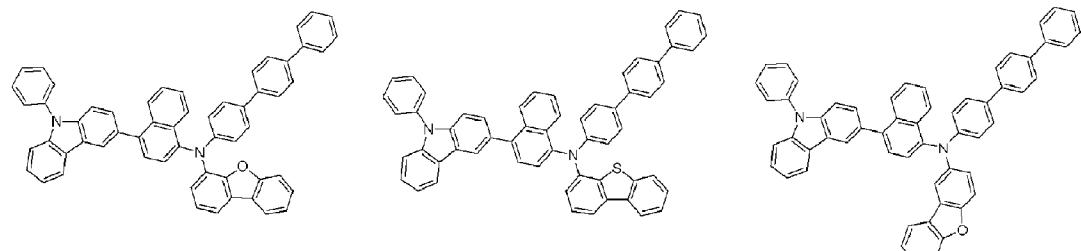
[A-253]



[A-254]

[A-255]

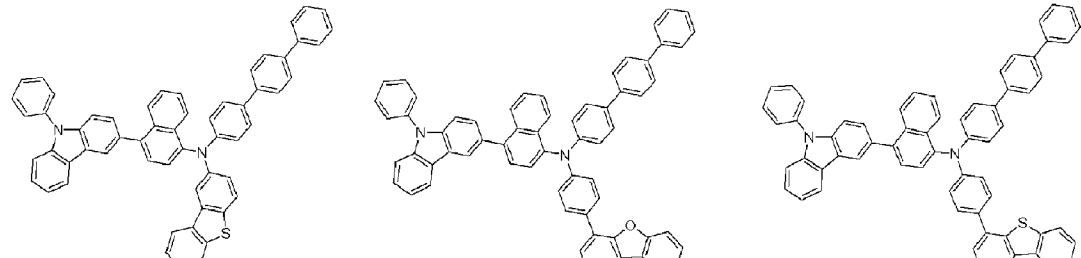
[A-256]



[A-257]

[A-258]

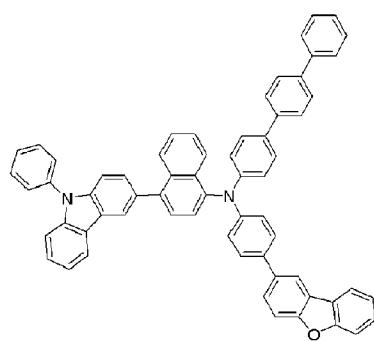
[A-259]



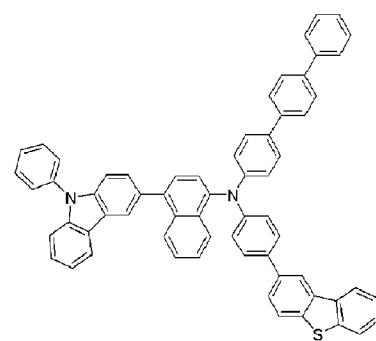
[A-260]

[A-261]

[250]

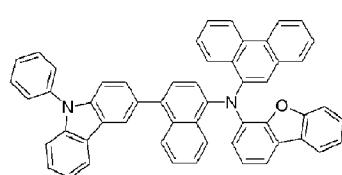


[A-262]

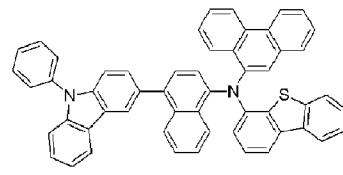


[A-263]

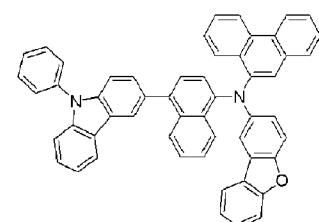
[A-264]



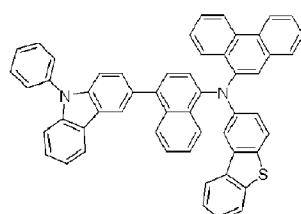
[A-265]



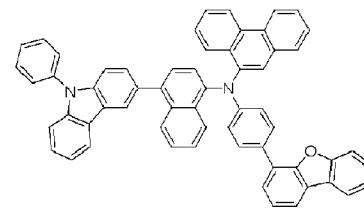
[A-266]



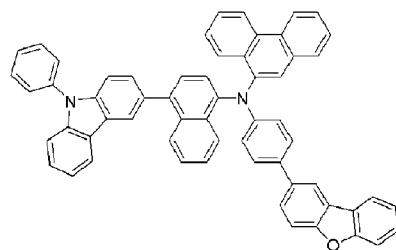
[A-267]



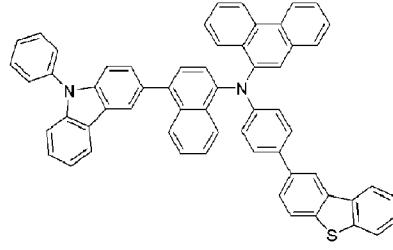
[A-268]



[A-269]



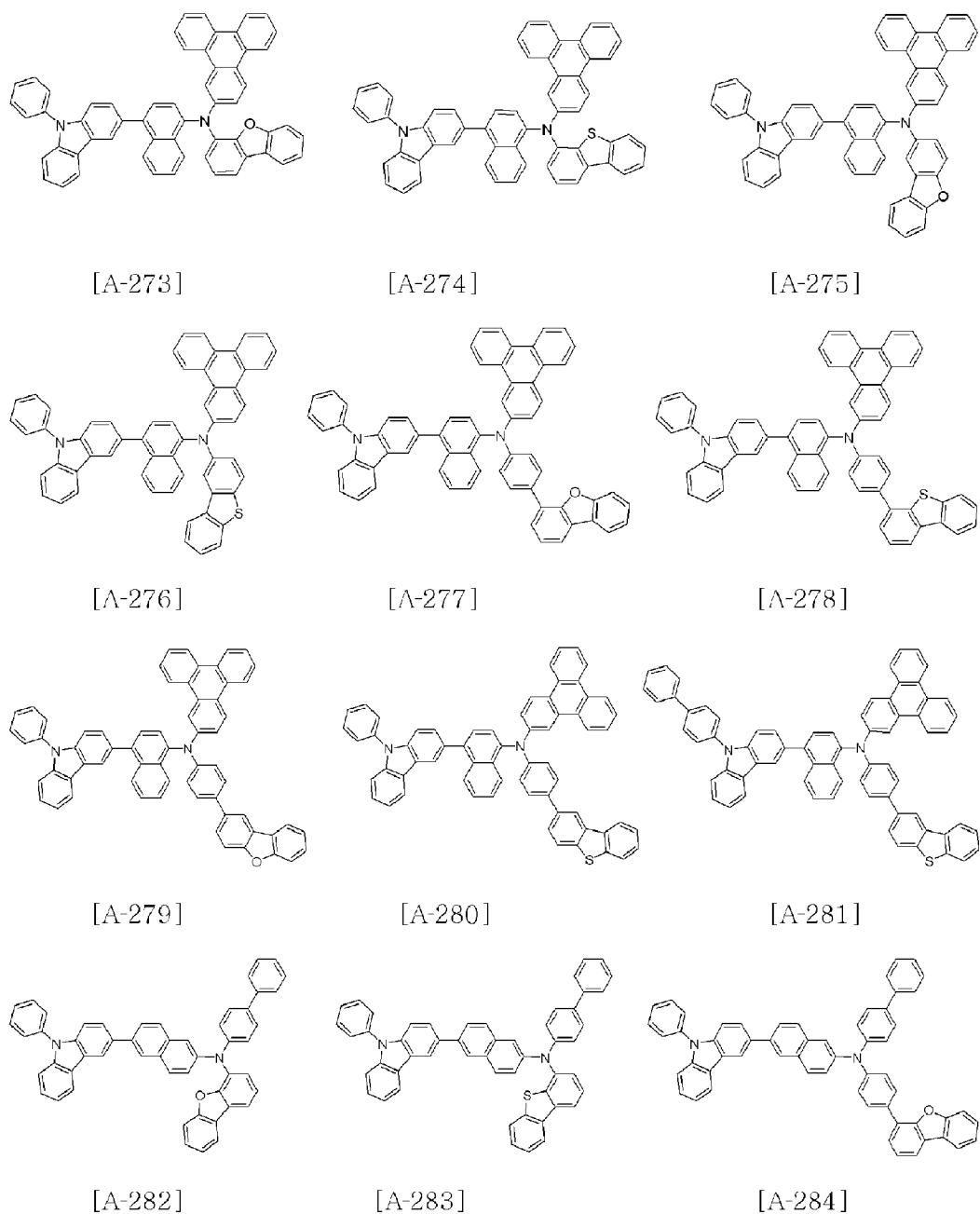
[A-270]



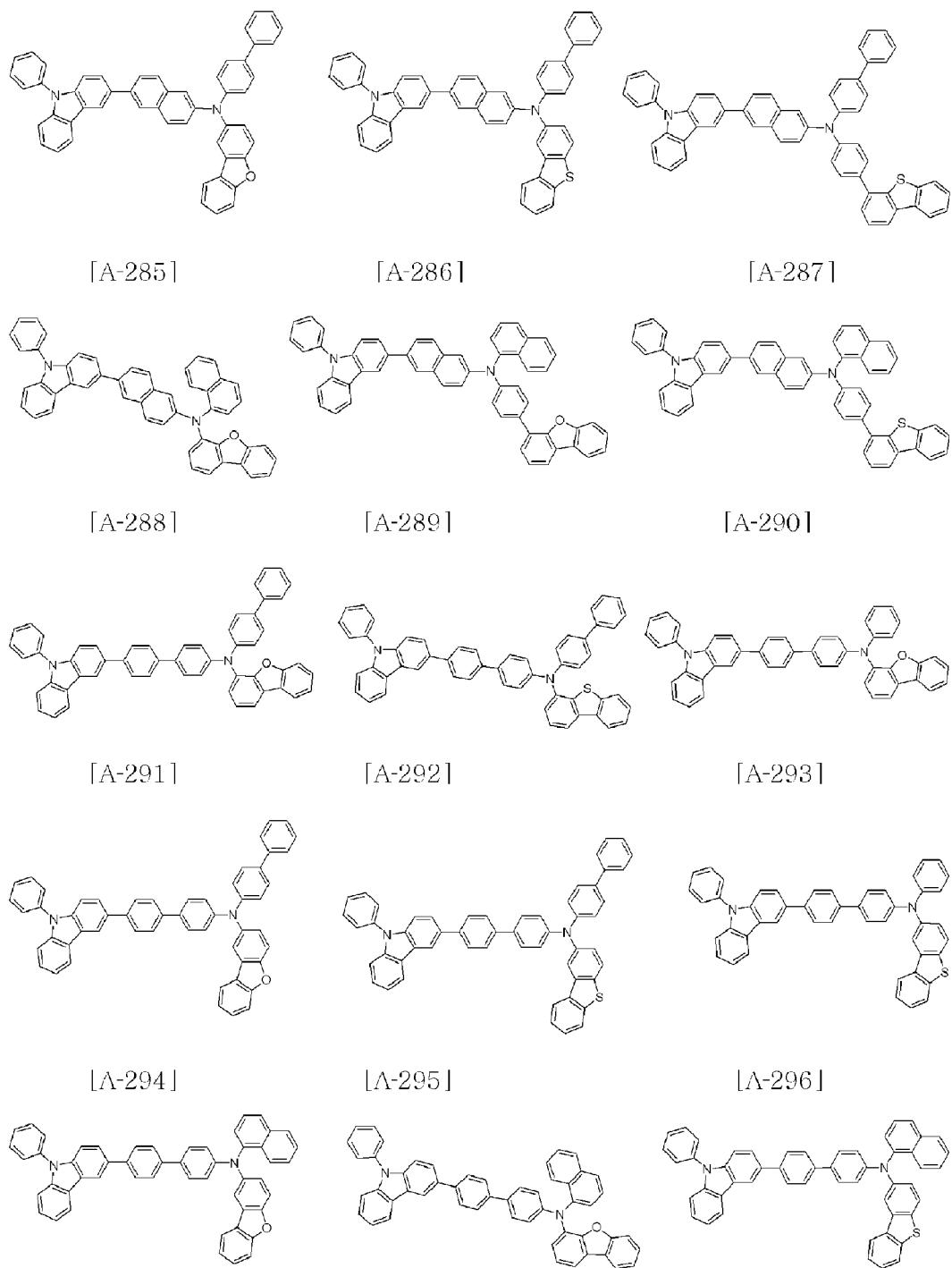
[A-271]

[A-272]

[251]

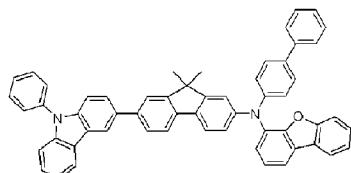


[252]

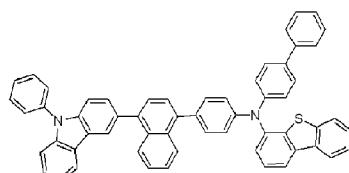


[253]

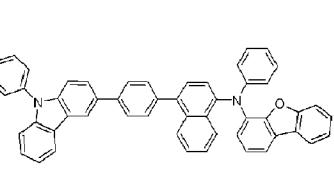
[A-297]



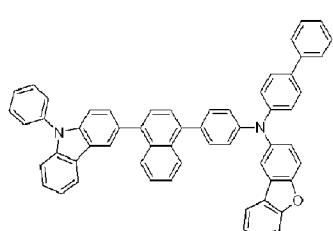
[A-298]



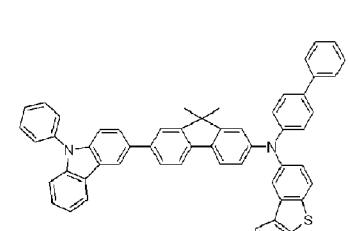
[A-299]



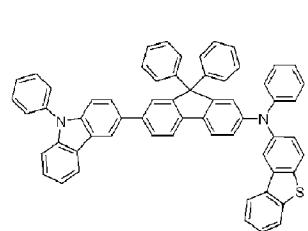
[A-300]



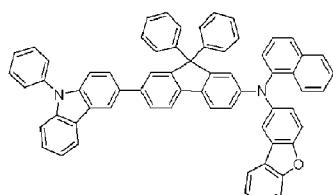
[A-301]



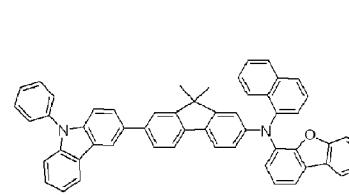
[A-302]



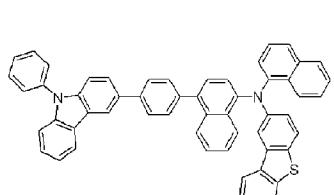
[A-303]



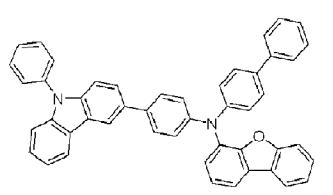
[A-304]



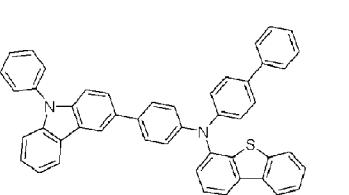
[A-305]



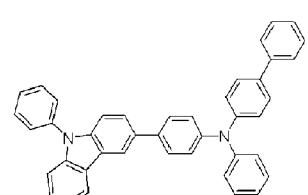
[A-414]



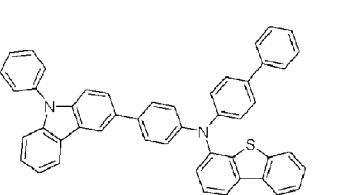
[A-415]



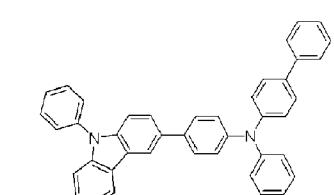
[A-416]



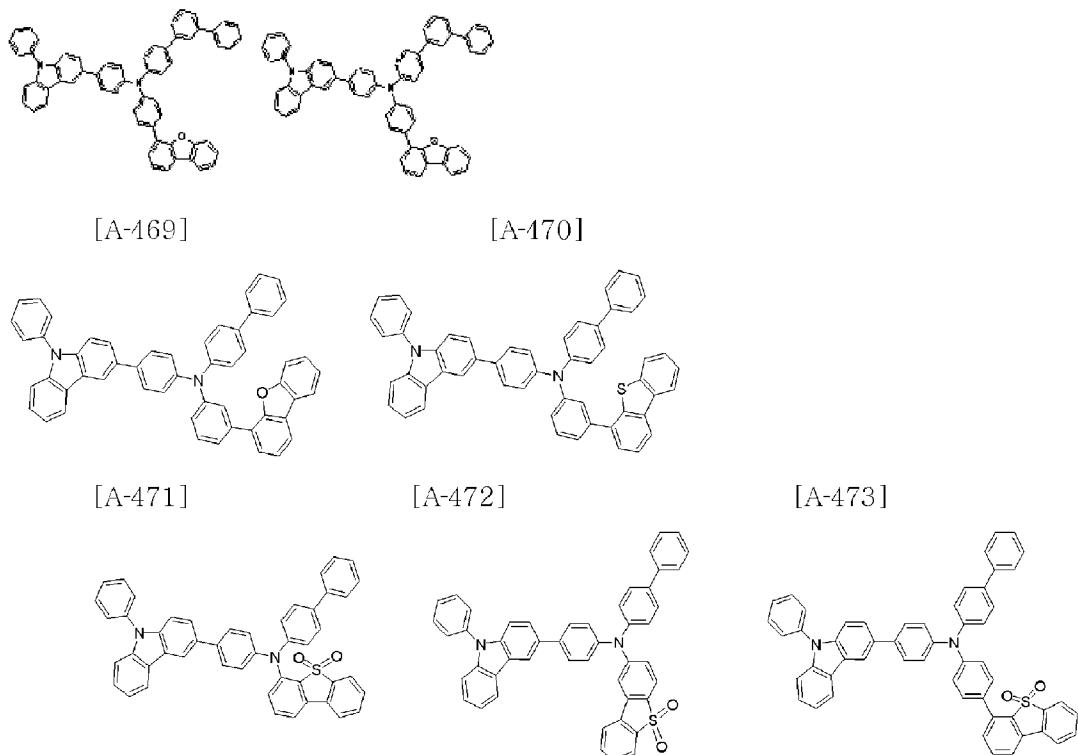
[A-457]



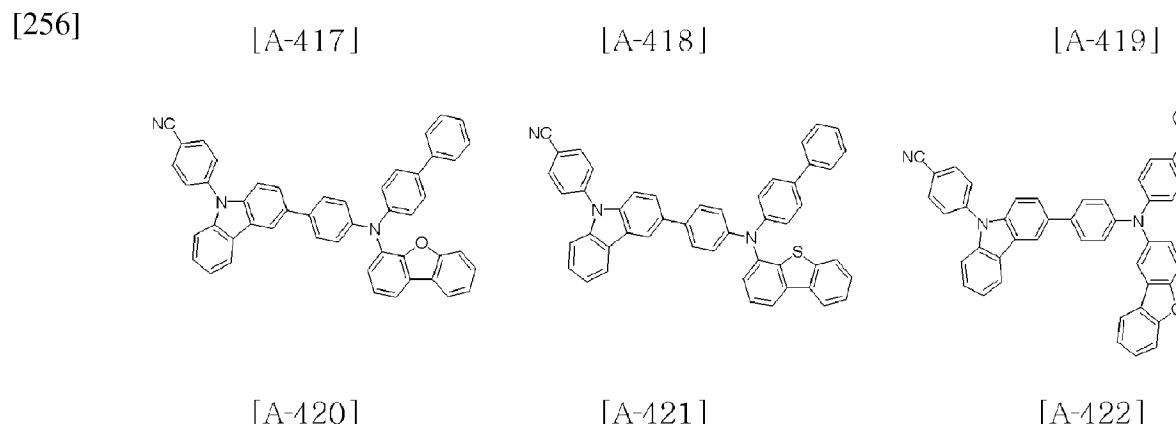
[A-458]



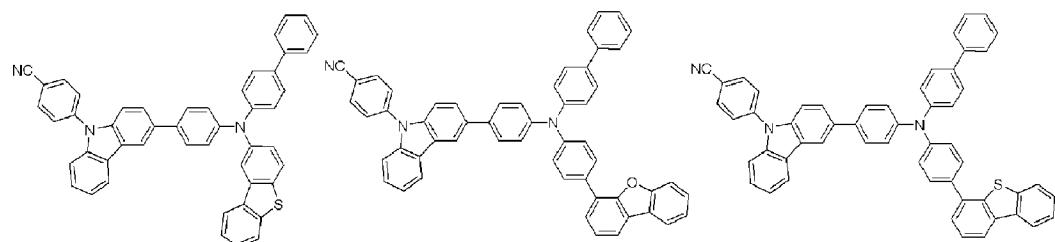
[254]



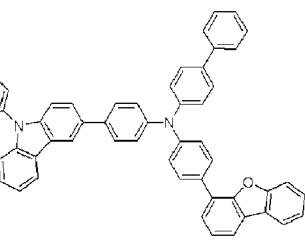
[255] The compound for an optoelectronic device according to one embodiment may include at least one of the compounds represented by the following Chemical Formulae A-417 to A-456, or A-459 to A-468. In the following structure, electro-optical characteristics and thin film characteristics for maximizing the performance of the material for an optoelectronic device may be finely adjusted while maintaining basic characteristics of the compound.



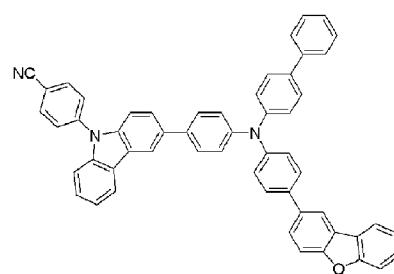
[257]



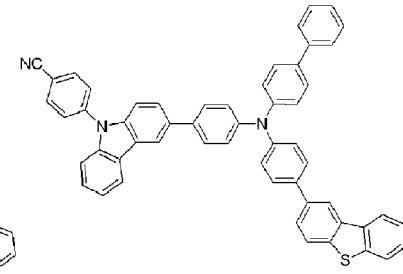
[A-423]



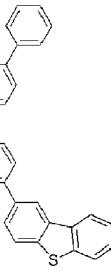
[A-424]



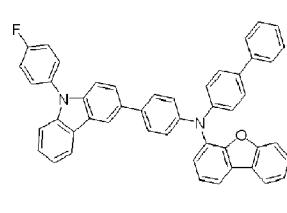
[A-425]



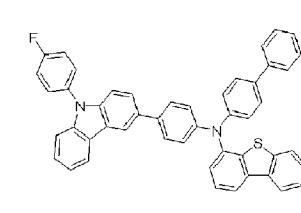
[A-426]



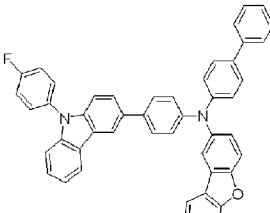
[A-427]



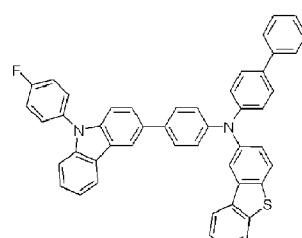
[A-428]



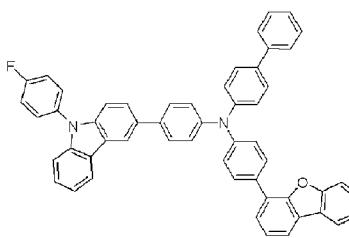
[A-429]



[A-430]

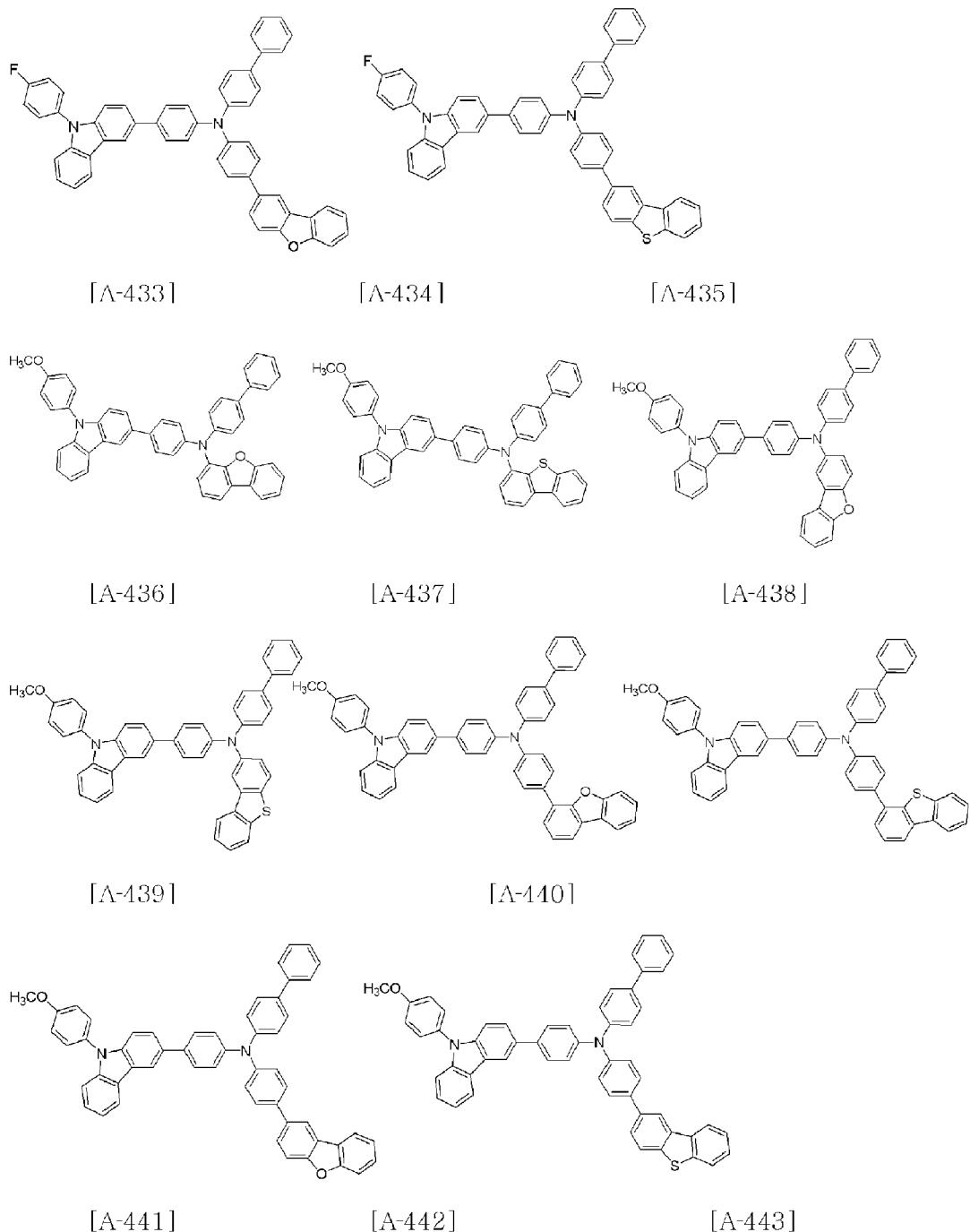


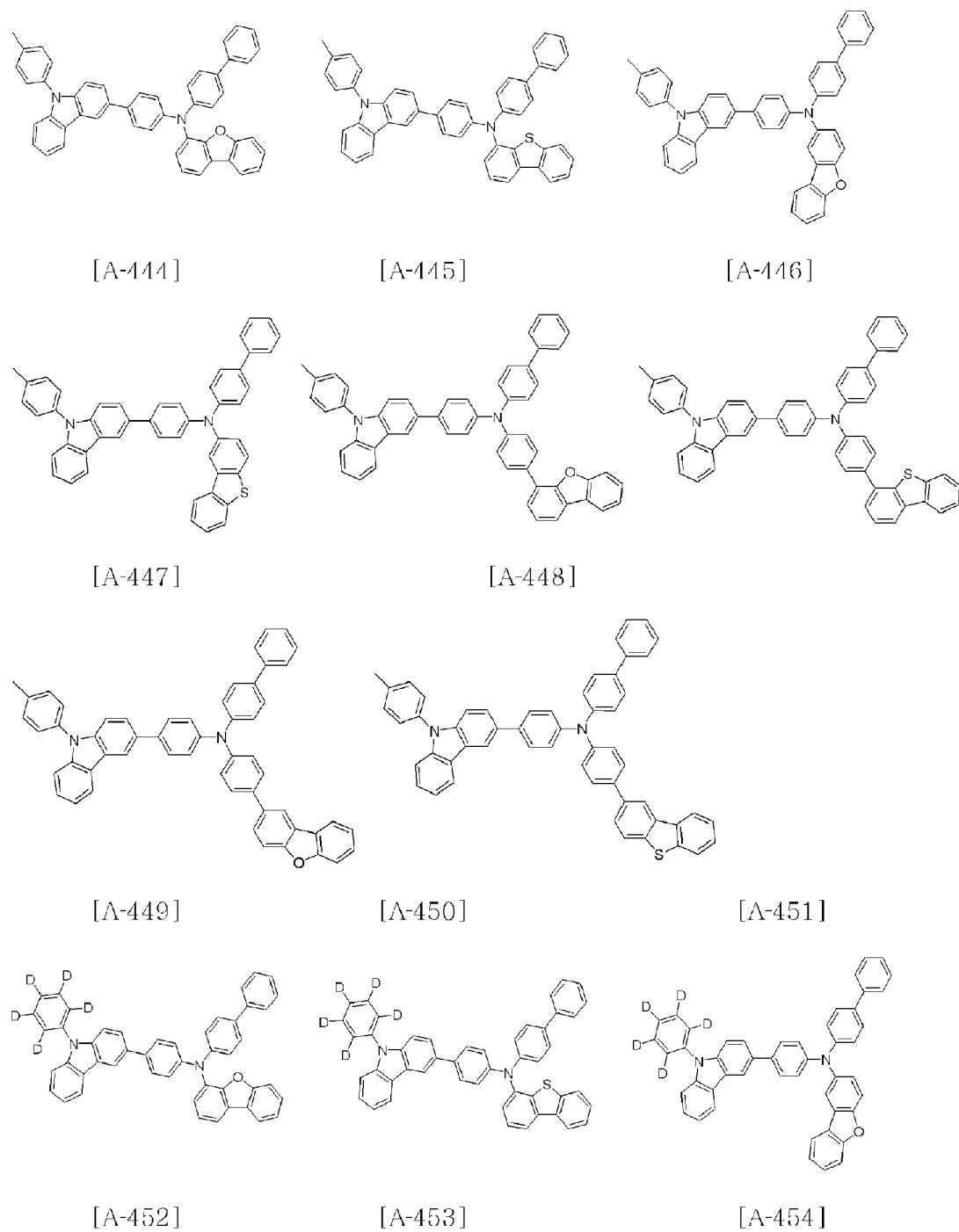
[A-431]

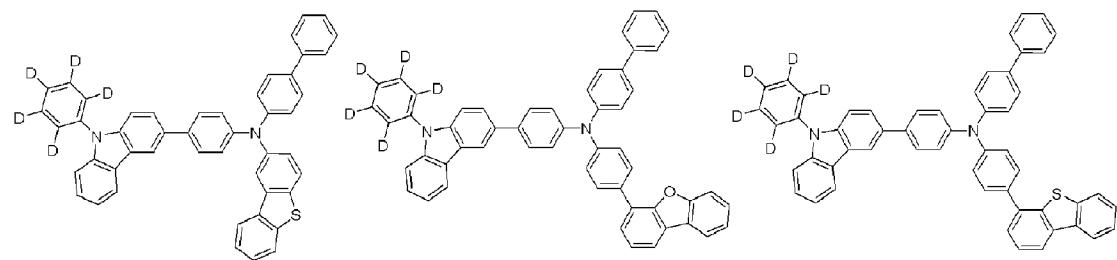


[A-432]

[258]

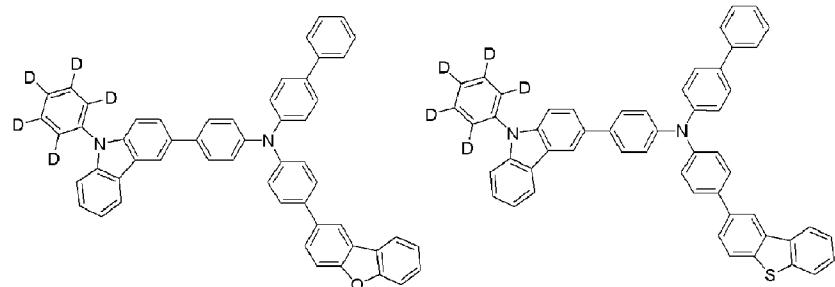






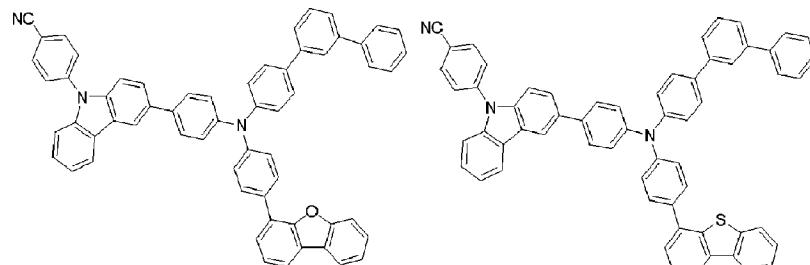
[A-455]

[A-456]



[A-459]

[A-460]

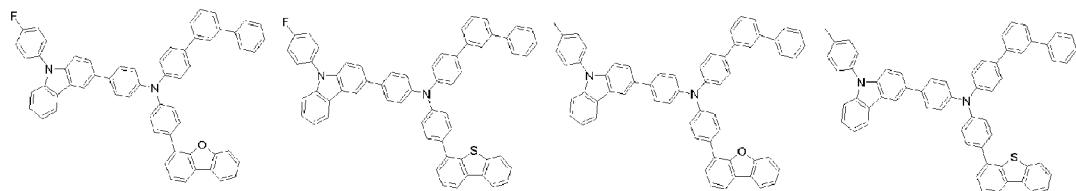


[A-461]

[A-462]

[A-463]

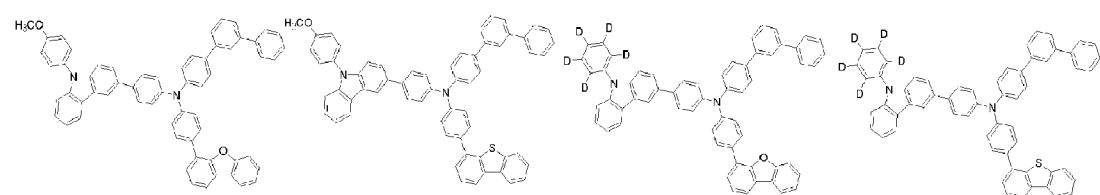
[A-464]



[261]

[A465] [A466] [A467] [A468]

[262]

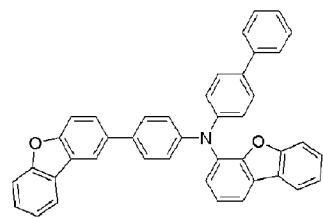


[263] The compound for an optoelectronic device according to one embodiment may include at least one of the compounds represented by the following Chemical Formulae A-324 to A-395. In this structure, since dibenzofuran having a hole transporting property and dibenzothiophene are asymmetrically bound to a tertiary arylamine

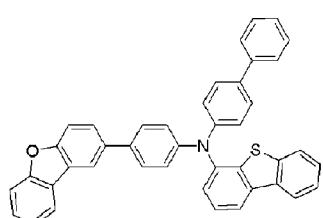
structure, an excellent hole transporting property and thin film stability may be realized.

[264]

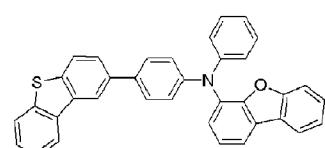
[A-324]



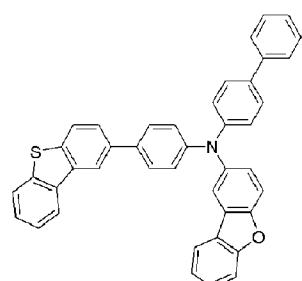
[A-325]



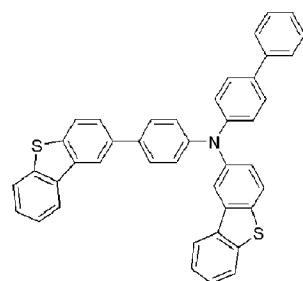
[A-326]



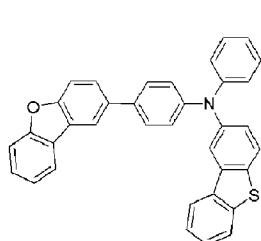
[A-327]



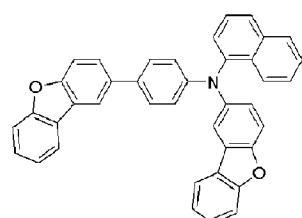
[A-328]



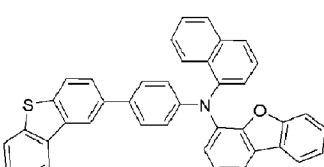
[A-329]



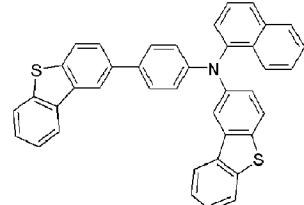
[A-330]



[A-331]



[A-332]

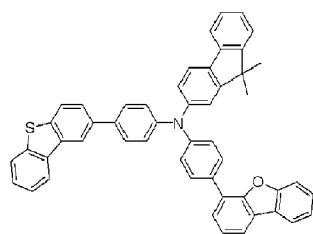


[A-333]

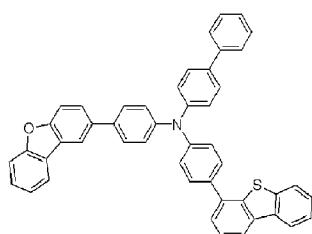
[A-334]

[A-335]

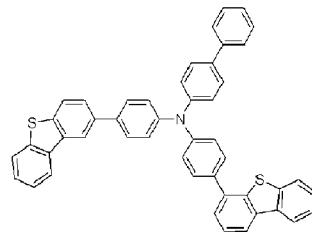
[265]



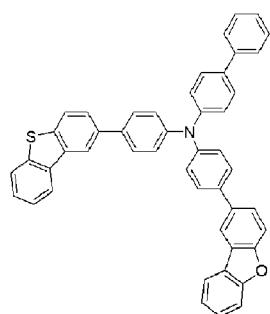
[A-336]



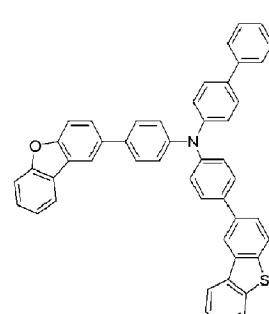
[A-337]



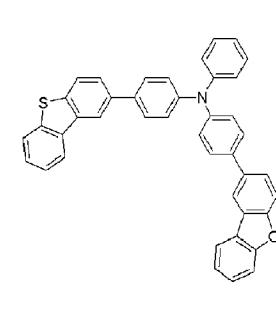
[A-338]



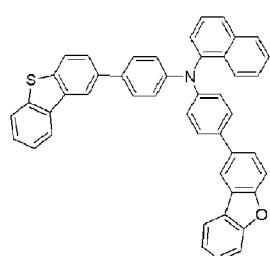
[A-339]



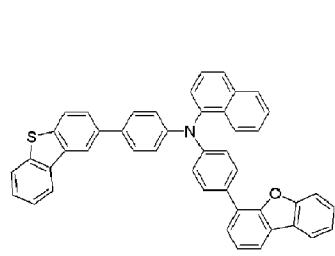
[A-340]



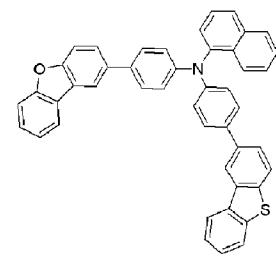
[A-341]



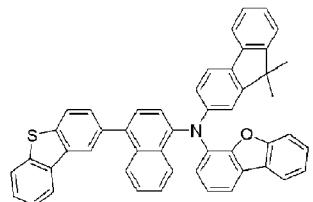
[A-342]



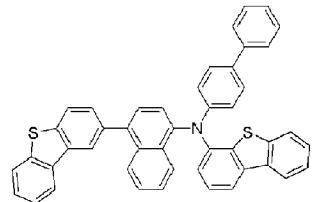
[A-343]



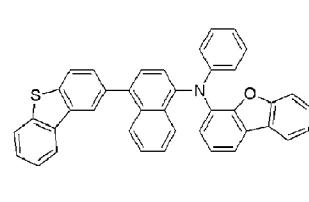
[A-344]



[A-345]

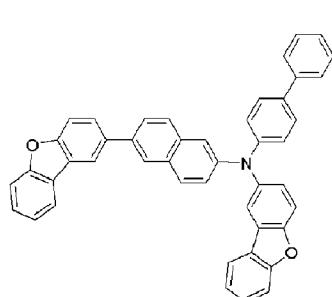


[A-346]

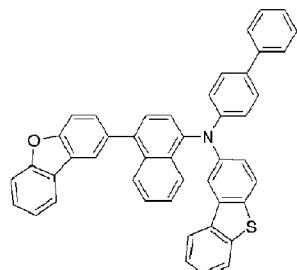


[A-347]

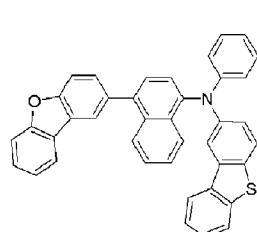
[266]



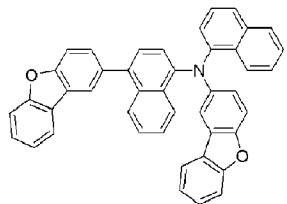
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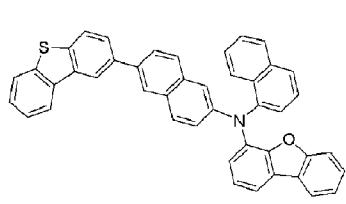
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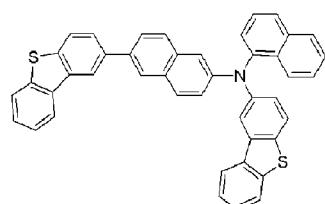
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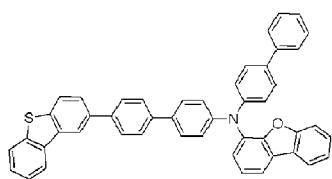
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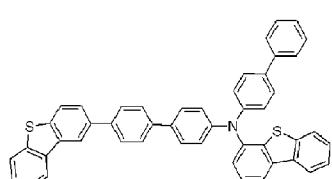
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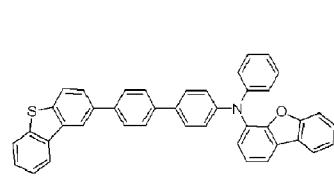
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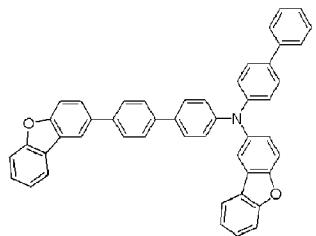
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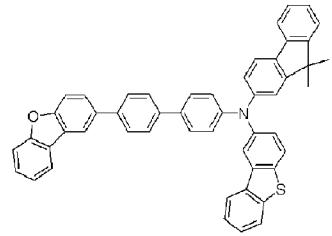
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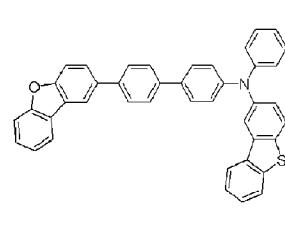
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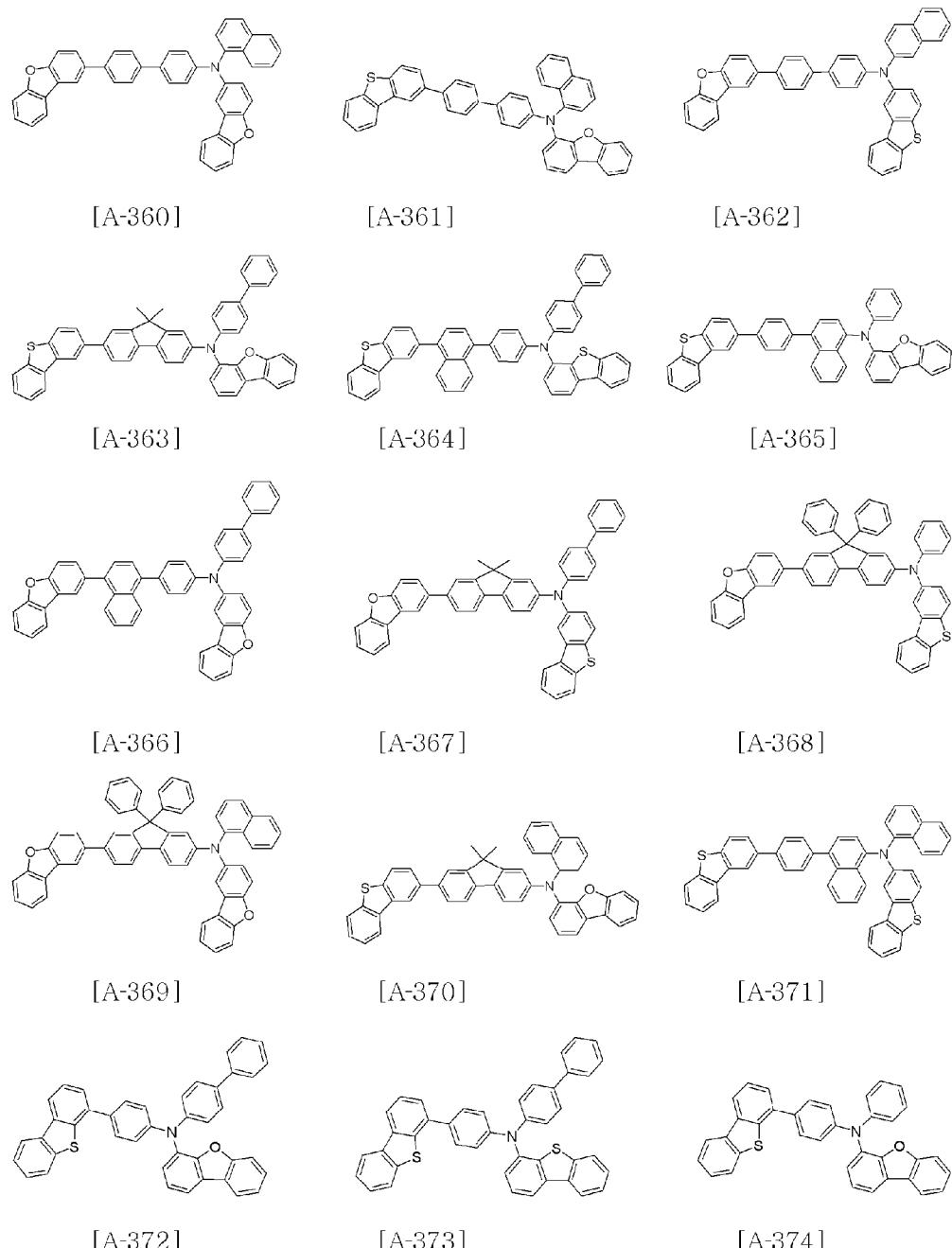


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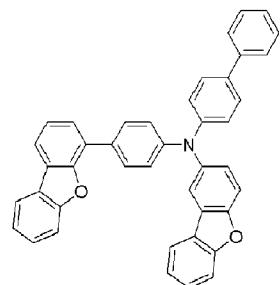


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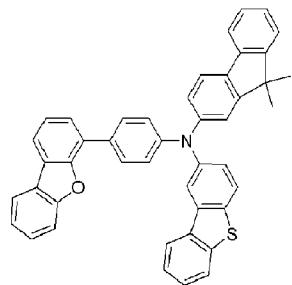
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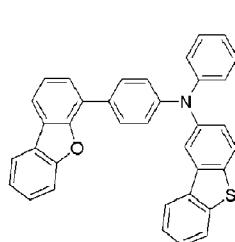
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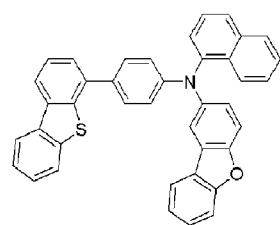
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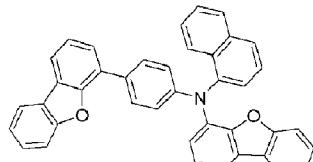
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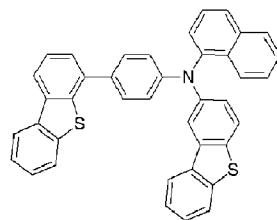
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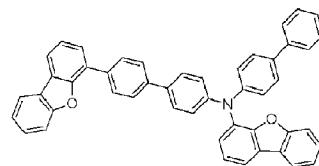
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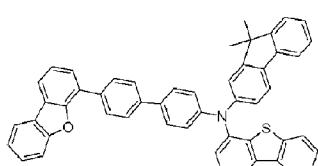
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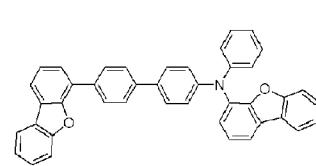
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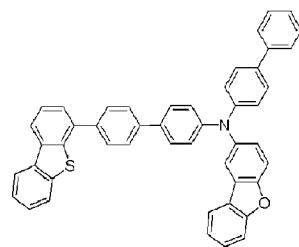
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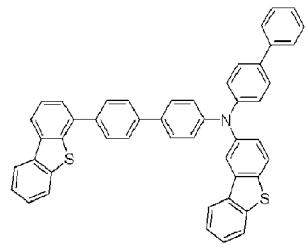
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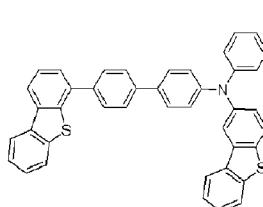
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[A-384]

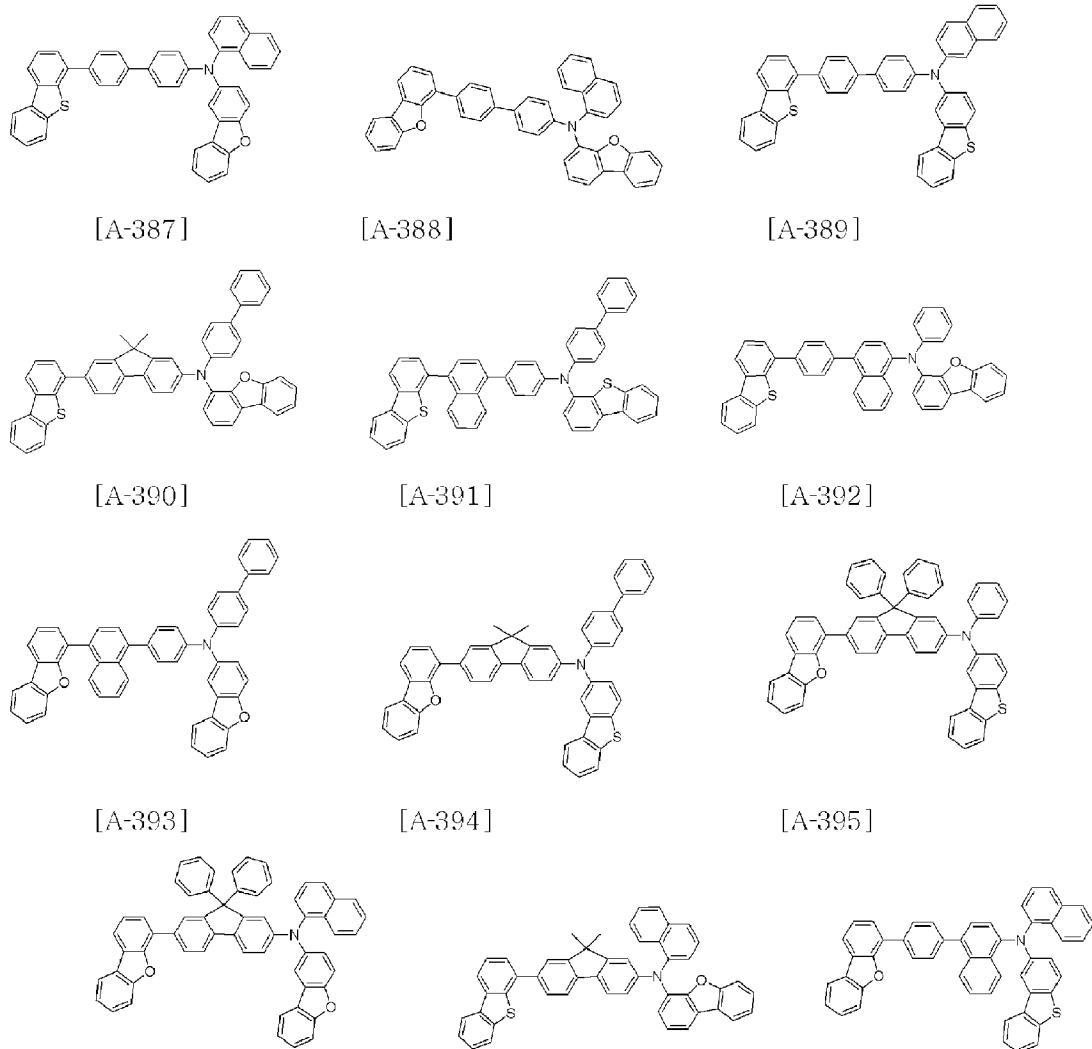


[A-385]



[A-386]

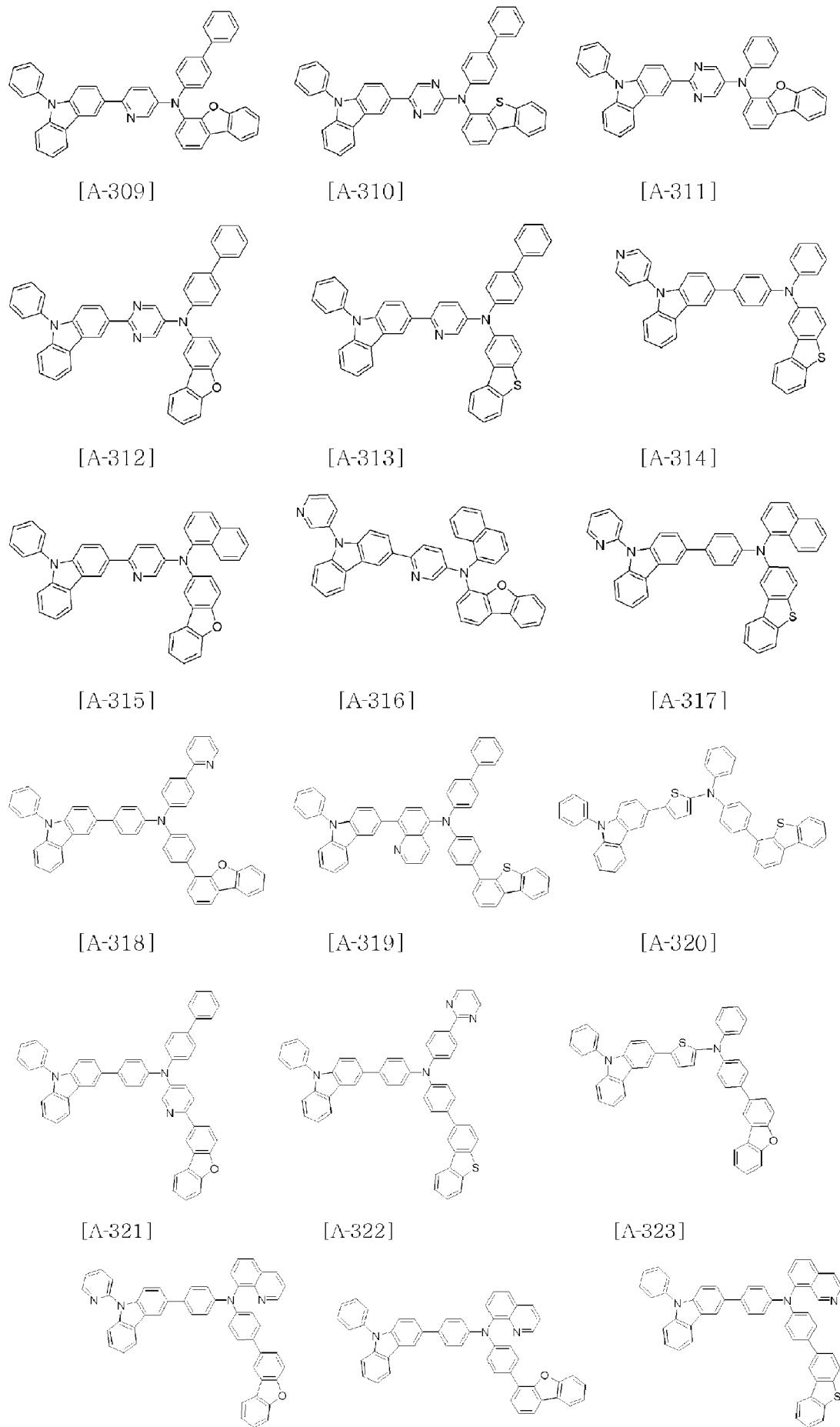
[269]



[270] The compound for an optoelectronic device according to one embodiment may include at least one of the compounds represented by the following Chemical Formulae A-306 to A-323. In the following structure, dibenzofuran having a hole transporting property or dibenzothiophene is asymmetrically bound to a carbazole structure to form a tertiary arylamine and includes a hetero aromatic ring group as an electron acceptor, and therefore the structure shows asymmetric bipolar characteristics in its molecular structure. High efficiency may be realized when it is used as a phosphorescent host material and a hole blocking layer material.

[271] [A-306] [A-307] [A-308]

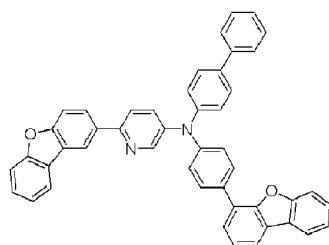
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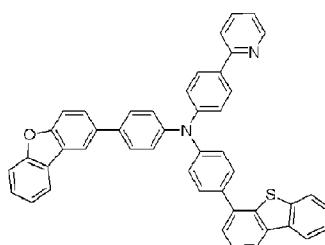
[273] The compound for an optoelectronic device according to one embodiment may include at least one of the compounds represented by the following Chemical Formulae A-396 to A-413. In the following structure, dibenzofuran having a hole transporting property or dibenzothiophene is asymmetrically bound to a carbazole structure to form a tertiary arylamine and includes a hetero aromatic ring group as an electron acceptor, and therefore the structure shows asymmetric bipolar characteristics in its molecular structure. High efficiency may be realized when it is used to be a phosphorescent host material and a hole blocking layer material.

[274]

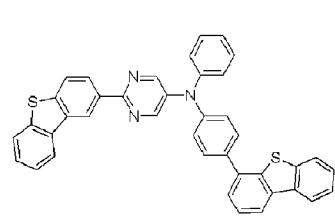
[A-396]



[A-397]



[A-398]

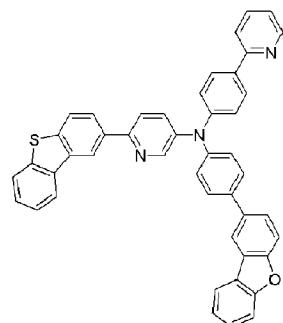


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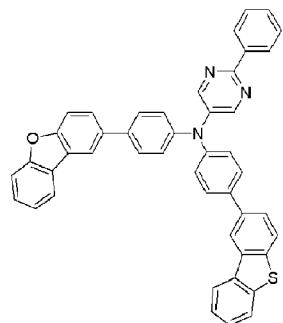
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[A-401]

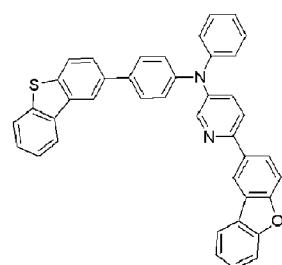
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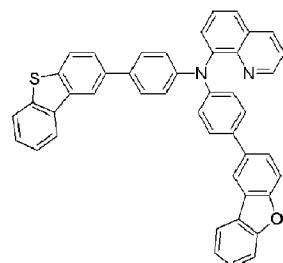
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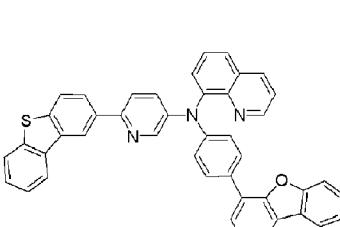
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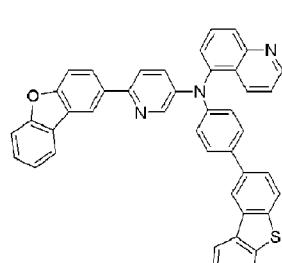
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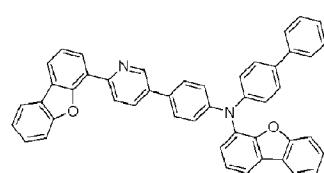
[A-405]



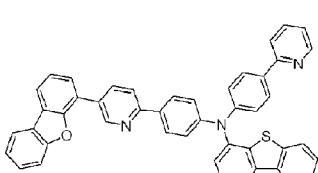
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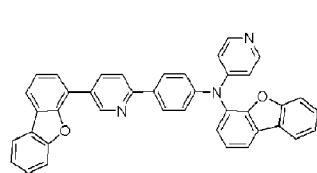
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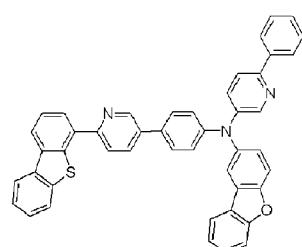
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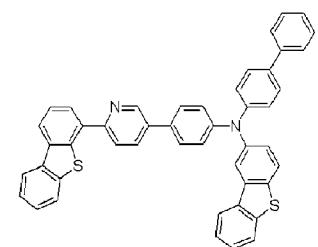
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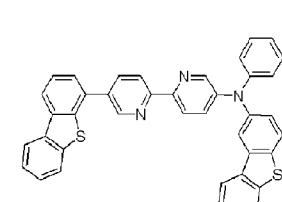
[A-410]



[A-411]

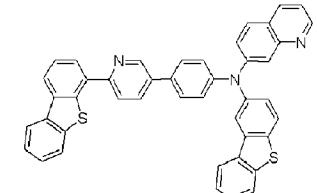
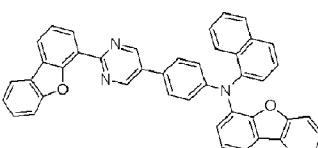
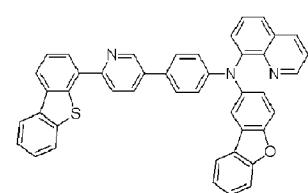


[A-412]



[A-413]

[276]



[277] When the compound for an optoelectronic device is applied to an electron blocking layer and a hole transport layer (HTL), its electron blocking properties may be reduced due to a functional group having an electron characteristic in a molecule. Therefore, in order to use the compound as an electron blocking layer, it is preferable that the

compound doesn't include a functional group having an electron characteristic. Examples of the functional group having an electron characteristic are benzoimidazole, pyridine, pyrazine, pyrimidine, triazine, quinoline, isoquinoline, or the like. However, the explanations as above are limited to when the compound is used as an electron blocking layer or a hole transport layer (HTL) (or a hole injection layer (HIL)).

- [278] When the compound is required to have electron-transporting and hole-transporting properties, a light emitting diode may have improved life-span and reduced driving voltage by introducing the electron transport backbone.
- [279] According to the embodiment of the present invention, a compound for an optoelectronic device has a maximum light emitting wavelength ranging from 320 to 500nm and triplet excitation energy of 2.0eV or more (T1), and in particular, ranging from 2.0 to 4.0eV. When it has this high excitation energy, it can transport a charge to a dopant well and improve luminous efficiency of the dopant, and can also decrease the driving voltage by freely regulating HOMO and LUMO energy levels. Accordingly, it can be usefully applied as a host material or a charge-transporting material.
- [280] The compound for an optoelectronic device may also be used as a nonlinear optical material, an electrode material, a chromic material, and as a material applicable to an optical switch, a sensor, a module, a waveguide, an organic transistor, a laser, an optical absorber, a dielectric material, and a membrane due to its optical and electrical properties.
- [281] The compound for an optoelectronic device including the above compound has a glass transition temperature of 90°C or higher and a thermal decomposition temperature of 400°C or higher, so as to improve thermal stability. Thereby, it is possible to produce an organic photoelectric device having high efficiency.
- [282] The compound for an optoelectronic device including the above compound may play a role of emitting light or injecting and/or transporting electrons. In other words, the compound for an optoelectronic device may be used as a phosphorescent or fluorescent host material, a blue light emitting dopant material, or an electron transporting material.
- [283] Since the compound for an optoelectronic device according to one embodiment is used for an organic thin layer, it may improve the life-span characteristic, efficiency characteristic, electrochemical stability, and thermal stability of an organic photoelectric device, and decrease the driving voltage.
- [284] The optoelectronic device may include an organic photoelectronic device, an organic light emitting diode, an organic solar cell, an organic transistor, an organic photosensitive drum, an organic memory device, or the like. For example, the compound for an optoelectronic device according to one embodiment may be included in an electrode

or an electrode buffer layer in the organic solar cell to improve the quantum efficiency, and it may be used as an electrode material for a gate, a source-drain electrode, or the like in the organic transistor.

[285] Hereinafter, an organic light emitting diode will be described in detail.

[286] According to another embodiment of the present invention, an organic light emitting diode including an anode, a cathode, and at least one or more organic thin layer between the anode and the cathode is provided, and at least one of the organic thin layers may include the compound for an optoelectronic device of the present invention.

[287] The organic thin layer that may include the compound for an optoelectronic device may include a layer selected from the group consisting of an emission layer, a hole transport layer (HTL), a hole injection layer (HIL), an electron transport layer (ETL), an electron injection layer (EIL), a hole blocking film, and a combination thereof. The at least one layer includes the compound for an optoelectronic device according to one embodiment. Particularly, the compound for an optoelectronic device according to one embodiment may be included in a hole transport layer (HTL) or a hole injection layer (HIL). In addition, when the compound for an optoelectronic device is included in the emission layer, the compound for an optoelectronic device may be included as a phosphorescent or fluorescent host, and particularly, as a fluorescent blue dopant material.

[288] FIGS. 1 to 5 are cross-sectional views showing an organic photoelectric device including the compound for an optoelectronic device according to one embodiment of the present invention.

[289] Referring to FIGS. 1 to 5, organic photoelectric devices 100, 200, 300, 400, and 500 according to one embodiment include at least one organic thin layer 105 interposed between an anode 120 and a cathode 110.

[290] The anode 120 includes an anode material having a large work function to help hole injection into an organic thin layer. The anode material includes: a metal such as nickel, platinum, vanadium, chromium, copper, zinc, and gold, or alloys thereof; a metal oxide such as zinc oxide, indium oxide, indium tin oxide (ITO), and indium zinc oxide (IZO); a combined metal and oxide such as ZnO:Al or SnO₂:Sb; or a conductive polymer such as poly(3-methylthiophene), poly[3,4-(ethylene-1,2-dioxy)thiophene] (PEDT), polypyrrole, and polyaniline, but is not limited thereto. It is preferable to include a transparent electrode including indium tin oxide (ITO) as an anode.

[291] The cathode 110 includes a cathode material having a small work function to help electron injection into an organic thin layer. The cathode material includes: a metal such as magnesium, calcium, sodium, potassium, titanium, indium, yttrium, lithium, gadolinium, aluminum, silver, tin, and lead, or alloys thereof; or a multi-layered material such as LiF/Al, Liq/Al, LiO₂/Al, LiF/Ca, LiF/Al, and BaF₂/Ca, but is not limited thereto. It is preferable to include a metal electrode including aluminum as a

cathode.

- [292] Referring to FIG. 1, the organic photoelectric device 100 includes an organic thin layer 105 including only an emission layer 130.
- [293] Referring to FIG. 2, a double-layered organic photoelectric device 200 includes an organic thin layer 105 including an emission layer 230 including an electron transport layer (ETL), and a hole transport layer (HTL) 140. The emission layer 130 also functions as an electron transport layer (ETL), and the hole transport layer (HTL) 140 layer has an excellent binding property with a transparent electrode such as ITO or an excellent hole transporting property.
- [294] Referring to FIG. 3, a three-layered organic photoelectric device 300 includes an organic thin layer 105 including an electron transport layer (ETL) 150, an emission layer 130, and a hole transport layer (HTL) 140. The emission layer 130 is independently installed, and layers having an excellent electron transporting property or an excellent hole transporting property are separately stacked.
- [295] As shown in FIG. 4, a four-layered organic photoelectric device 400 includes an organic thin layer 105 including an electron injection layer (EIL) 160, an emission layer 130, a hole transport layer (HTL) 140, and a hole injection layer (HIL) 170 for binding with the cathode of ITO.
- [296] As shown in FIG. 5, a five layered organic photoelectric device 500 includes an organic thin layer 105 including an electron transport layer (ETL) 150, an emission layer 130, a hole transport layer (HTL) 140, and a hole injection layer (HIL) 170, and further includes an electron injection layer (EIL) 160 to achieve a low voltage.
- [297] In FIG. 1 to FIG. 5, the organic thin layer 105 including at least one selected from the group consisting of an electron transport layer (ETL) 150, an electron injection layer (EIL) 160, an emission layer 130 or 230, a hole transport layer (HTL) 140, a hole injection layer (HIL) 170, and combinations thereof includes a compound for an optoelectronic device. The material for the organic photoelectric device may be used for an electron transport layer (ETL) 150 including the electron transport layer (ETL) 150 or electron injection layer (EIL) 160. When it is used for the electron transport layer (ETL), it is possible to provide an organic photoelectric device having a simpler structure because it does not require an additional hole blocking layer (not shown).
- [298] Furthermore, when the compound for an optoelectronic device is included in the emission layer 130 and 230, the material for the organic photoelectric device may be included as a phosphorescent or fluorescent host or a fluorescent blue dopant.
- [299] The organic photoelectric device may be fabricated by: forming an anode on a substrate; forming an organic thin layer in accordance with a dry coating method such as evaporation, sputtering, plasma plating, and ion plating or a wet coating method such as spin coating, dipping, and flow coating; and providing a cathode thereon.

[300] Another embodiment of the present invention provides a display device including the organic photoelectric device according to the above embodiment.

[301] Hereinafter, the embodiments are illustrated in more detail with reference to examples. However, the following are exemplary embodiments and are not limiting.

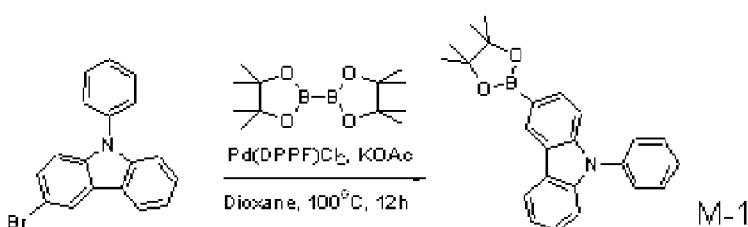
[302] **Preparation of compound for optoelectronic device**

[303] **Synthesizing intermediate product**

[304] **Synthesis of intermediate product, M-1**

[305] [Reaction Scheme 1]

[306]



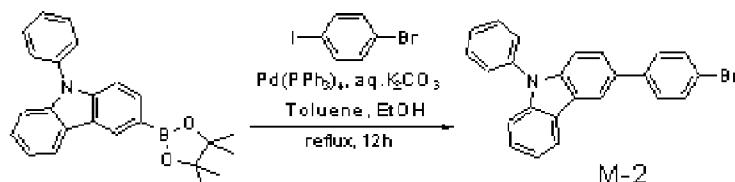
[307] 50g (155.18mmol) of 3-bromo-9-phenyl-9H-carbazole, 3.41g (4.65mmol) of Pd(dppf)Cl₂, 51.32g (201.8mmol) of bis(pinacolato)diboron, and 45.8g (465.5mmol) of potassium acetate were dissolved in 520ml of 1,4-dioxane. The reactants were refluxed and agitated under a nitrogen atmosphere for 12 hours and extracted 3 times with dichloromethane and distilled water. The extract was dried with magnesium sulfite and filtered, and the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed at a volume ratio of 7:3 through silica gel column chromatography, and then 43g of a white solid intermediate M-1 was acquired as a desired compound (yield: 75%).

[308] LC-Mass (theoretical mass: 369.19g/mol, measured mass: M+1 = 370g/mol)

[309] **Synthesis of intermediate product, M-2**

[310] [Reaction Scheme 2]

[311]



[312] 40g (108.3mmol) of the intermediate M-1, 30.6g (108.3mmol) of 1-bromo-4-iodobenzene, and 1.25g (1.08mmol) of tetrakis(triphenylphosphine)palladium were added to a flask and dissolved in 270ml of toluene and 135mL of ethanol under a nitrogen atmosphere.

[313] Then, 135ml of an aqueous solution including 31.9g (58.9mmol) of potassium carbonate was added to the reactants and then refluxed and agitated for 12 hours. After the reaction, the reactants were extracted with ethylacetate. The extract was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced

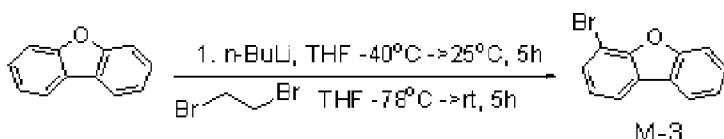
pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 35g of a white solid intermediate M-2 was acquired as a desired compound (yield: 75%).

[314] LC-Mass (theoretical mass: 398.29g/mol, measured mass: M+1 = 399g/mol, M+3 = 401g/mol)

[315] Synthesis of intermediate product, M-3

[316] [Reaction Scheme 3]

[317]



[318] 10g (59.5mmol) of a dibenzofuranyl group was added to a two neck round-bottomed flask that was dried under vacuum, and 119mL of anhydrous tetrahydrofuran was added under a nitrogen atmosphere followed by dissolving. Then, the reactants were cooled down to -40°C and agitated.

[319] Then, 26mL of 2.5M n-butyl lithium (in hexane, 65.5mmol) was slowly added to the reactants and the resultant was agitated for 5 hours at room temperature under a nitrogen atmosphere. The reactants were cooled down to -78°C, and 22.4g (119mmol) of 1,2-dibromoethane that was dissolved in 10mL anhydrous tetrahydrofuran was slowly added and then agitated for 5 hours at room temperature.

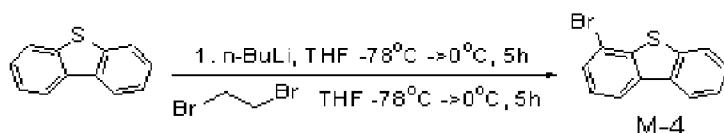
[320] After the reaction, the solution was concentrated under reduced pressure to remove the solvent. Then the reactants were extracted with distilled water and dichloromethane, and the extract was dried with magnesium sulfite and filtered. The filtrate was concentrated under reduced pressure. The reactants were recrystallized in n-hexane and then 11g of a white solid intermediate M-3 was acquired as a desired compound (yield: 75%).

[321] GC-Mass (theoretical mass: 245.97g/mol, measured mass: M = 246g/mol, M+2 = 248g/mol)

[322] Synthesis of intermediate product, M-4

[323] [Reaction Scheme 4]

[324]



[325] 10g (54.3mmol) of dibencothiophene that was dried under a vacuum condition was added to a two neck round-bottomed flask and dissolved with 120mL of anhydrous tetrahydrofuran under a nitrogen atmosphere. Then, the reactant was cooled down to -40°C and agitated.

[326] Then, 24mL of 2.5M n-butyllithium (in hexane, 59.7mmol) was slowly added to the

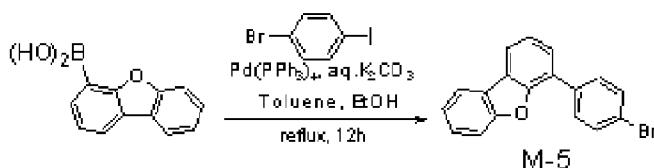
reactants and agitated for 5 hours at room temperature under a nitrogen atmosphere. The reactants were cooled down to -78°C, and 20.4g (108.6mmol) of 1,2-dibromoethane that was dissolved in 10mL anhydrous tetrahydrofuran was slowly added and then agitated for 5 hours at room temperature. After the reaction, the solution was concentrated under reduced pressure to remove the solvent. Then the reactant was extracted with distilled water and dichloromethane, and the extract was dried with magnesium sulfite and filtered. The filtrate was concentrated under reduced pressure. The reactant was recrystallized in n-hexane, and then 11g of a white solid intermediate M-4 was acquired as a desired compound (yield: 77%).

[327] GC-Mass (theoretical mass: 261.95g/mol, measured mass: M = 262g/mol, M+2 = 264g/mol)

[328] Synthesis of intermediate product, M-5

[329] [Reaction Scheme 5]

[330]



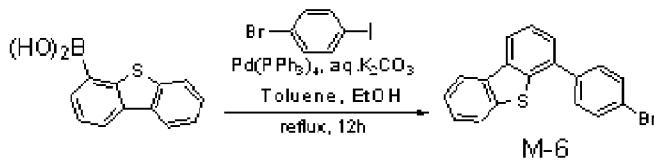
[331] 20g (94.4mmol) of 4-dibenzofuranboronic acid, 28g (99.2mmol) of 1-bromo-4-iodobenzene, and 1.08g (0.94mmol) of tetrakis(triphenylphosphine)palladium were added to a flask and dissolved in 240ml of toluene and 120mL of ethanol under a nitrogen atmosphere. Then, 120ml of an aqueous solution including 28g (188.8mmol) of potassium carbonate was added to the reactant and then refluxed and agitated for 12 hours. After the reaction, the reactant was extracted with ethylacetate. The extract was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 9:1 through silica gel column chromatography, and then 27g of a white solid intermediate M-5 was acquired as a desired compound (yield: 89%).

[332] LC-Mass (theoretical mass: 322.00g/mol, measured mass: M+1 = 323g/mol, M+3 = 325g/mol)

[333] Synthesis of intermediate product, M-6

[334] [Reaction Scheme 6]

[335]



[336] 20g (87.69mmol) of 4-dibenzothiopheneboronic acid, 27.3g (96.46mmol) of 1-bromo-4-iodobenzene, and 1.01g (0.88mmol) of tetrakis(triphenylphosphine)palladium were added to a flask and dissolved in 240ml of toluene and 120mL of ethanol under a nitrogen atmosphere. Then, 120ml of an aqueous solution including 28g (188.8mmol) of potassium carbonate was added to the reactant and then refluxed and agitated for 12 hours. After the reaction, the reactant was extracted with ethylacetate. The extract was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 9:1 through silica gel column chromatography, and then 27g of a white solid intermediate M-6 was acquired as a desired compound (yield: 89%).

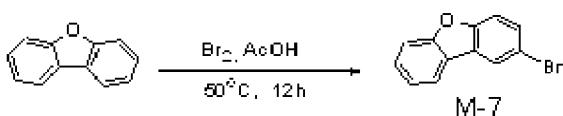
phinepalladium were added to a flask and dissolved in 220ml of toluene and 110mL of ethanol under a nitrogen atmosphere. Then, 110ml of an aqueous solution including 25.8g (175.4mmol) of potassium carbonate was added to the reactant and then refluxed and agitated for 12 hours. After the reaction, the reactant was extracted with ethylacetate. The extract was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 9:1 through silica gel column chromatography, and then 25g of a white solid intermediate M-6 was acquired as a desired compound (yield: 83%).

[337] LC-Mass (theoretical mass: 337.98g/mol, measured mass: M+1 = 338g/mol, M+3 = 340g/mol)

[338] Synthesis of intermediate product, M-7

[339] [Reaction Scheme 7]

[340]



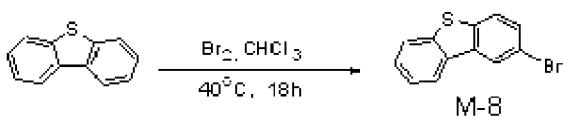
[341] 30g (178.4mmol) of a dibenzofuranyl group was added to a round-bottomed flask and dissolved in 270g of acetic acid. Then, 29g (181.5mmol) of bromine that was dissolved in 6g of acetic acid was slowly added to the reactant at 50°C for 4 hours. The reactant was further agitated at 50°C for 8 hours and cooled down, and then the solution was added to distilled water. The orange solid was dissolved in dichloromethane and washed with a sodium thiosulfite aqueous solution, and then the organic layer was dried with magnesium sulfite and filtered. The filtrate was concentrated under reduced pressure. The product was recrystallized in dichloromethane/n-hexane, and then 10.1g of a white solid intermediate M-7 was acquired as a desired compound (yield: 23%).

[342] GC-Mass (theoretical mass: 245.97g/mol, measured mass: M = 246g/mol, M+2 = 248g/mol)

[343] Synthesis of intermediate product, M-8

[344] [Reaction Scheme 8]

[345]



[346] 30g (162.8mmol) of a dibenzothiophenyl group was added to a round-bottomed flask and dissolved in 270g of acetic acid. Then, 29g (181.5mmol) of bromine that was dissolved in 6g of acetic acid was slowly added to the reactant for 4 hours. The reactant was further agitated at 40°C for 12 hours and cooled down, and then the solution was added to a sodium thiosulfite aqueous solution. The organic layer was

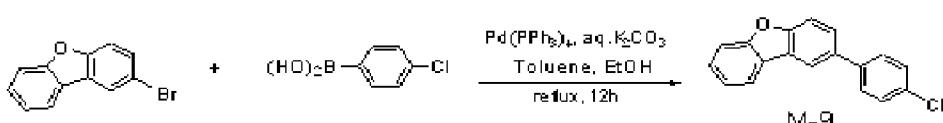
dried with magnesium sulfite and filtered. Then the filtrate was concentrated under reduced pressure. The product was recrystallized with ethylacetate/n-hexane and then 15.4g of a white solid intermediate M-8 was acquired as a desired compound (yield: 36%).

[347] GC-Mass (theoretical mass: 261.95g/mol, measured mass: M = 262g/mol, M+2 = 264g/mol)

[348] Synthesis of intermediate product, M-9

[349] [Reaction Scheme 9]

[350]



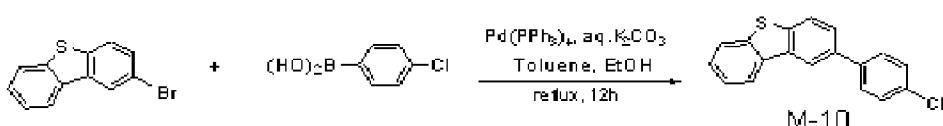
[351] 20g (127.9mmol) of 4-chlorophenylboronic acid, 30.0g (121.5mmol) of intermediate M-7, and 1.48g (1.28mmol) of tetrakistriphenylphosphinepalladium were added to a flask and dissolved in 320ml of toluene and 160mL of ethanol under a nitrogen atmosphere. Then, 160ml of an aqueous solution including 37.7g (255.8mmol) of potassium carbonate was added to the reactant and then refluxed and agitated for 12 hours. After the reaction, the reactant was extracted with ethylacetate. The extract was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 9:1 through silica gel column chromatography, and then 28.1g of a white solid intermediate M-9 was acquired as a desired compound (yield: 83%).

[352] LC-Mass (theoretical mass: 278.05g/mol, measured mass: M+1 = 279g/mol)

[353] Synthesis of intermediate product, M-10

[354] [Reaction Scheme 10]

[355]



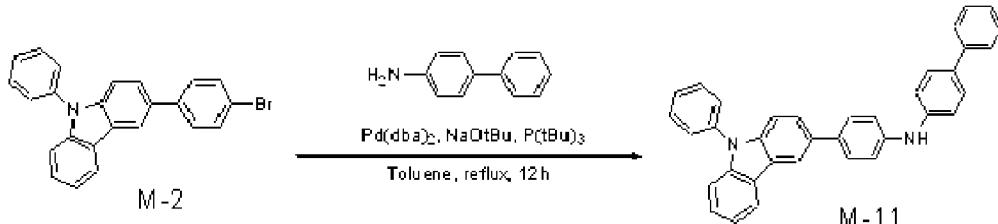
[356] 20g (127.9mmol) of 4-chlorophenylboronic acid, 32.0g (121.5mmol) of intermediate M-8, and 1.48g (1.28mmol) of tetrakistriphenylphosphinepalladium were added to a flask and dissolved in 320ml of toluene and 160mL of ethanol under a nitrogen atmosphere. Then, 160ml of an aqueous solution including 37.7g (255.8mmol) of potassium carbonate was added to the reactant and then refluxed and agitated for 12 hours. After the reaction, the reactant was extracted with ethylacetate. The extract was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 9:1 through silica gel column chromatography, and then 30.4g of a white solid intermediate M-10 was acquired as a desired compound (yield: 85%).

[357] LC-Mass (theoretical mass: 294.03 g/mol, measured mass: M+1 = 295 g/mol)

[358] Synthesis of intermediate product, M-11

[359] [Reaction Scheme 11]

[360]



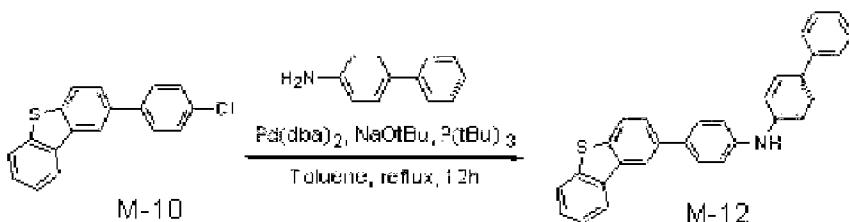
[361] 30g (75.3mmol) of intermediate M-2, 14.0g (82.83mmol) of 4-aminobiphenyl, 10.9g (113.0mmol) of sodium t-butoxide, and 0.46g (2.26mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 750ml of toluene, and 0.43g (0.753mmol) of $\text{Pd}(\text{dba})_2$ was added, and was then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The extract was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 27.5g of a white solid intermediate M-11 was acquired as a desired compound (yield: 75%).

[362] LC-Mass (theoretical mass: 486.21g/mol, measured mass: $\text{M}+1 = 487\text{g/mol}$)

[363] Synthesis of intermediate product, M-12

[364] [Reaction Scheme 12]

[365]



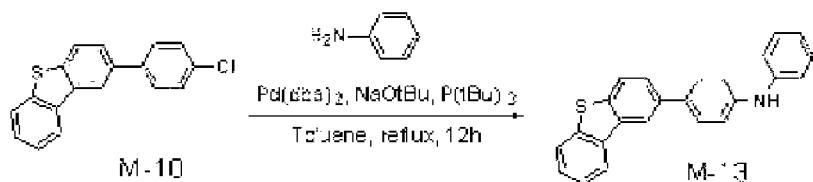
[366] 5g (17.0mmol) of intermediate M-10, 3.02g (17.85mmol) of 4-aminobiphenyl, 2.45g (25.5mmol) of sodium t-butoxide, and 0.10g (0.51mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 170ml of toluene, and 0.098g (0.17mmol) of $\text{Pd}(\text{dba})_2$ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 5.23g of a white solid intermediate M-12 was acquired as a desired compound (yield: 72%).

[367] LC-Mass (theoretical mass: 427.14g/mol, measured mass: $\text{M}+1 = 428\text{g/mol}$)

[368] Synthesis of intermediate product, M-13

[369] [Reaction Scheme 13]

[370]



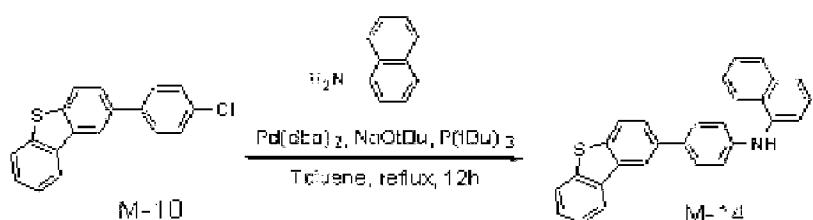
[371] 5g (17.0mmol) of intermediate M-10, 1.66g (17.85mmol) of aniline, 2.45g (25.5mmol) of sodium t-butoxide, and 0.10g (0.51mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 170ml of toluene, and 0.098g (0.17mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 4.66g of a white solid intermediate M-13 was acquired as a desired compound (yield: 78%).

[372] LC-Mass (theoretical mass: 351.11g/mol, measured mass: M+1 = 352g/mol)

[373] Synthesis of intermediate product, M-14

[374] [Reaction Scheme 14]

[375]



[376] 5g (17.0mmol) of intermediate M-10, 2.56g (17.85mmol) of 1-aminonaphthalene, 2.45g (25.5mmol) of sodium t-butoxide, and 0.10g (0.51mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 170ml of toluene, and 0.098g (0.17mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 4.98g of a white solid intermediate M-14 was

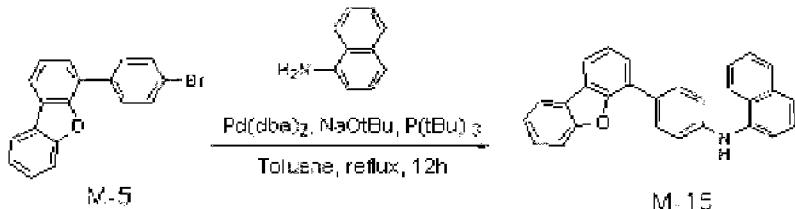
acquired as a desired compound (yield: 73%).

[377] LC-Mass (theoretical mass: 401.12g/mol, measured mass: M+1 = 402g/mol)

[378] Synthesis of intermediate product, M-15

[379] [Reaction Scheme 15]

[380]



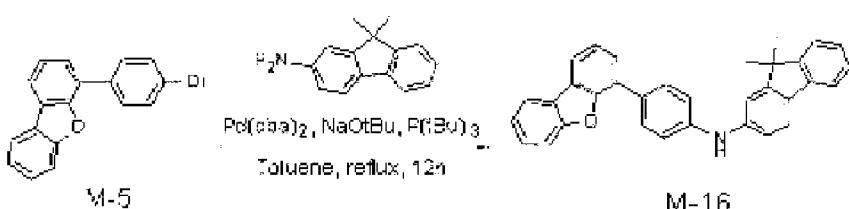
[381] 5.49g (17.0mmol) of intermediate M-5, 2.56g (17.85mmol) of 1-aminonaphthalene, 2.45g (25.5mmol) of sodium t-butoxide, and 0.10g (0.51mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 170ml of toluene, and 0.098g (0.17mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 5.05g of a white solid intermediate M-15 was acquired as a desired compound (yield: 77%).

[382] LC-Mass (theoretical mass: 385.15g/mol, measured mass: M+1 = 386g/mol)

[383] Synthesis of intermediate product, M-16

[384] [Reaction Scheme 16]

[385]



[386] 5.49g (17.0mmol) of intermediate M-5, 3.74g (17.85mmol) of (9,9-dimethyl-9H-fluorene-2-yl)amine, 2.45g (25.5mmol) of sodium t-butoxide, and 0.10g (0.51mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 170ml of toluene, and 0.098g (0.17mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 6.0g of a white solid

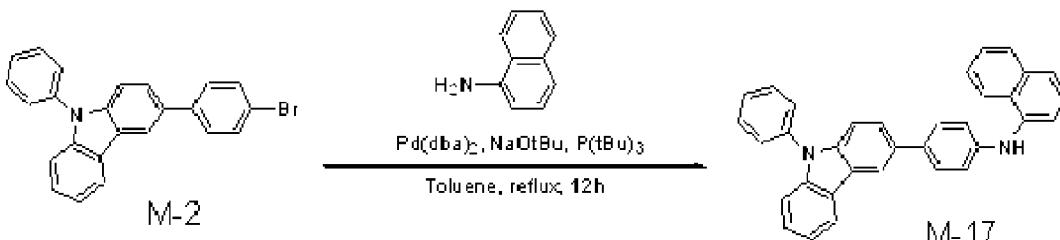
intermediate M-16 was acquired as a desired compound (yield: 78%).

[387] LC-Mass (theoretical mass: 451.19g/mol, measured mass: M+1 = 452g/mol)

Synthesis of intermediate product, M-17

[389] [Reaction Scheme 17]

[390]



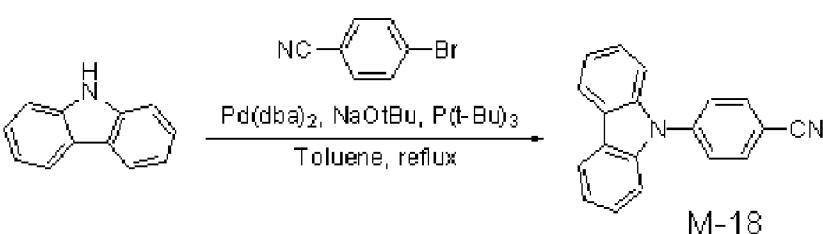
[391] 30g (75.3mmol) of intermediate M-2, 11.9g (82.83mmol) of 1-aminonaphthalene, 10.9g (113.0mmol) of sodium t-butoxide, and 0.46g (2.26mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 750ml of toluene, and 0.43g (0.753mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 25.7g of a white solid intermediate M-17 was acquired as a desired compound (yield: 74%).

[392] LC-Mass (theoretical mass: 460.19g/mol, measured mass: M+1 = 461g/mol)

Synthesis of intermediate product, M-18

[394] [Reaction Scheme 18]

[395]



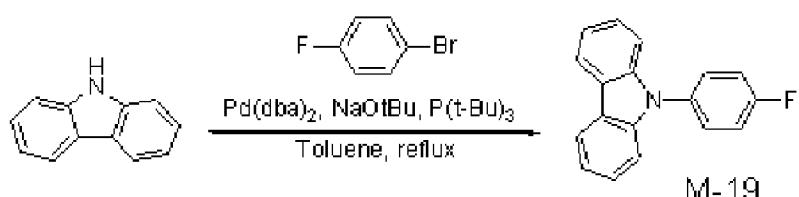
[396] 20g (119.6mmol) of carbazole, 23.9g (131.6mmol) of 4-bromobenzonitrile, 23g (239.2mmol) of sodium t-butoxide, and 1.45g (7.18mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 600ml of toluene, and 1.38g (2.39mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 22.8g of a white solid intermediate M-18 was acquired as a desired compound (yield: 71%).

[397] LC-Mass (theoretical mass: 268.10g/mol, measured mass: M+1 = 269g/mol)

[398] Synthesis of intermediate product, M-19

[399] [Reaction Scheme 19]

[400]



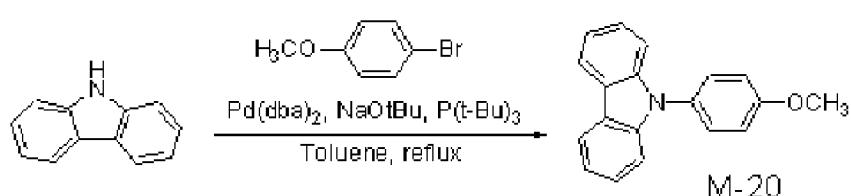
[401] 22.8g of a white solid intermediate M-19 was acquired as a desired compound (yield: 73%) in accordance with the same procedure as in the acquiring process of intermediate M-18, except that 1-bromo-4-fluorobenzene was used instead of 4-bromobenzonitrile.

[402] LC-Mass (theoretical mass: 261.10g/mol, measured mass: M+1 = 262g/mol).

[403] Synthesis of intermediate product, M-20

[404] [Reaction Scheme 20]

[405]



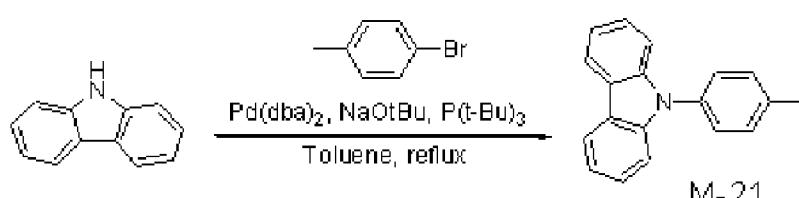
[406] 25.5g of a white solid intermediate M-20 was acquired as a desired compound (yield: 78%) in accordance with the same procedure as in the acquiring process of intermediate M-18, except that 4-bromoanisole was used instead of 4-bromobenzonitrile.

[407] LC-Mass (theoretical mass: 273.12g/mol, measured mass: M+1 = 274g/mol).

[408] Synthesis of intermediate product, M-21

[409] [Reaction Scheme 21]

[410]



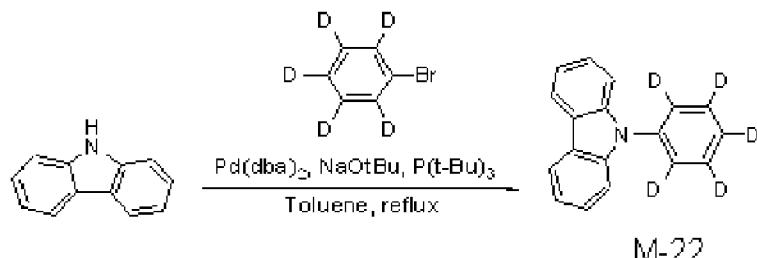
[411] 24.3g of a white solid intermediate M-21 was acquired as a desired compound (yield: 79%) in accordance with the same procedure as in the acquiring process of intermediate M-18, except that 4-bromotoluene was used instead of 4-bromobenzonitrile.

[412] LC-Mass (theoretical mass: 257.12g/mol, measured mass: M+1 = 258g/mol).

[413] Synthesis of intermediate product, M-22

[414] [Reaction Scheme 22]

[415]



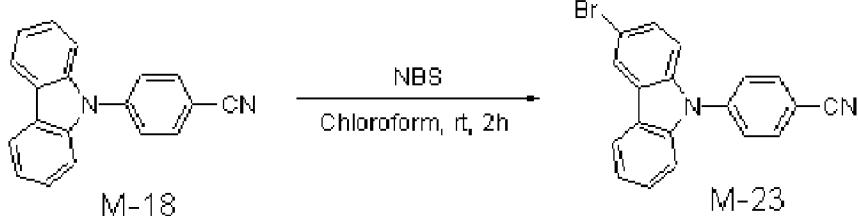
[416] 24.1g of a white solid intermediate M-22 was acquired as a desired compound (yield: 81%) in accordance with the same procedure as in the acquiring process of intermediate M-18, except that bromobenzene-d₅ was used instead of 4-bromobenzonitrile.

[417] LC-Mass (theoretical mass: 248.14g/mol, measured mass: M+1 = 249g/mol).

[418] Synthesis of intermediate product, M-23

[419] [Reaction Scheme 23]

[420]



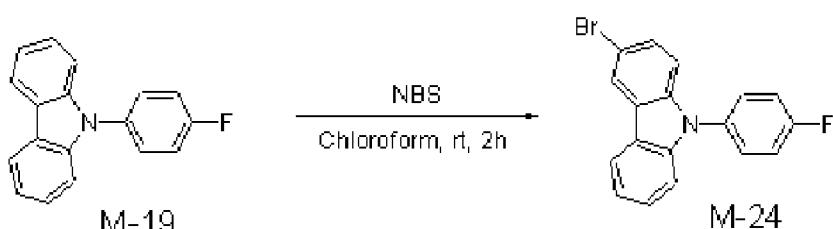
[421] 20g (74.5mmol) of intermediate M-18 was dissolved in 370mL of chloroform, and then 13.3g (74.5mmol) of N-bromosuccinimide was added and agitated at room temperature for 2 hours. After the reaction, the reactant was extracted with distilled water and dichloromethane. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was recrystallized in n-hexane, and then 21.2g of a white solid intermediate M-23 was acquired as a desired compound (yield: 82%).

[422] LC-Mass (theoretical mass: 346.01g/mol, measured mass: M+1 = 347g/mol, M+3 = 349g/mol)

[423] Synthesis of intermediate product, M-24

[424] [Reaction Scheme 24]

[425]



[426] 21.0g of a white solid intermediate M-24 was acquired as a desired compound (yield: 83%) in accordance with the same procedure as in the acquiring process of intermediate M-23, except that intermediate M-19 was used instead of intermediate M-

18.

[427] LC-Mass (theoretical mass: 339.01g/mol, measured mass: M+1 = 340g/mol, M+3 = 342g/mol).

[428] Synthesis of intermediate product, M-25

[429] [Reaction Scheme 25]

[430]



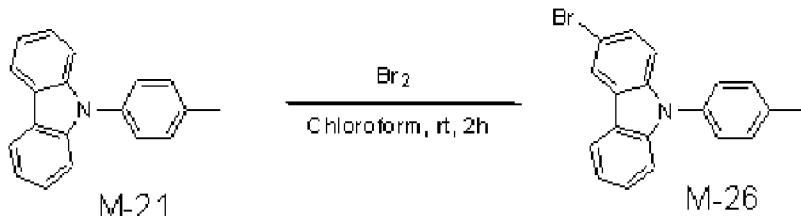
[431] 21.8g of a white solid intermediate M-25 was acquired as a desired compound (yield: 83%) in accordance with the same procedure as in the acquiring process of intermediate M-23, except that intermediate M-20 was used instead of intermediate M-18.

[432] LC-Mass (theoretical mass: 351.03g/mol, measured mass: M+1 = 352g/mol, M+3 = 354g/mol).

[433] Synthesis of intermediate product, M-26

[434] [Reaction Scheme 26]

[435]



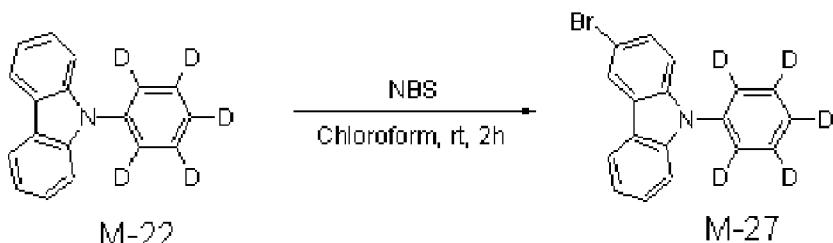
[436] 20g (74.5mmol) of intermediate M-21 was dissolved in 370mL of chloroform, and then 11.9g (74.5mmol) of bromine was added and agitated at room temperature for 2 hours. After the reaction, the reactant was extracted with distilled water and dichloromethane. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was recrystallized in n-hexane, and then 18.8g of a white solid intermediate M-26 was acquired as a desired compound (yield: 75%).

[437] LC-Mass (theoretical mass: 335.03g/mol, measured mass: M+1 = 336g/mol, M+3 = 338g/mol)

[438] Synthesis of intermediate product, M-27

[439] [Reaction Scheme 27]

[440]



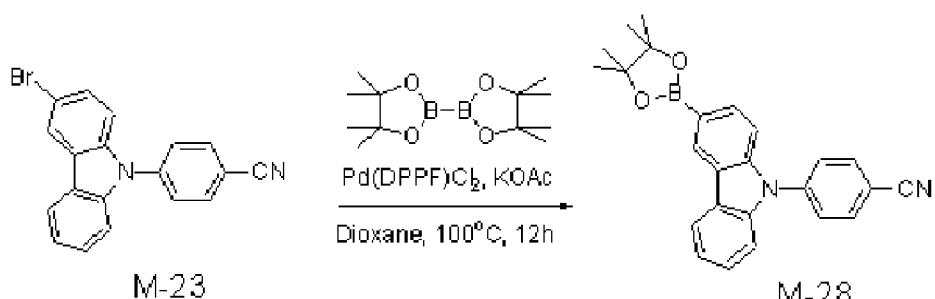
[441] 20.7g of a white solid intermediate M-27 was acquired as a desired compound (yield: 85%) in accordance with the same procedure as in the acquiring process of intermediate M-23, except that intermediate M-22 was used instead of intermediate M-18.

[442] LC-Mass (theoretical mass: 326.05g/mol, measured mass: M+1 = 327g/mol, M+3 = 329g/mol).

[443] **Synthesis of intermediate product, M-28**

[444] [Reaction Scheme 28]

[445]



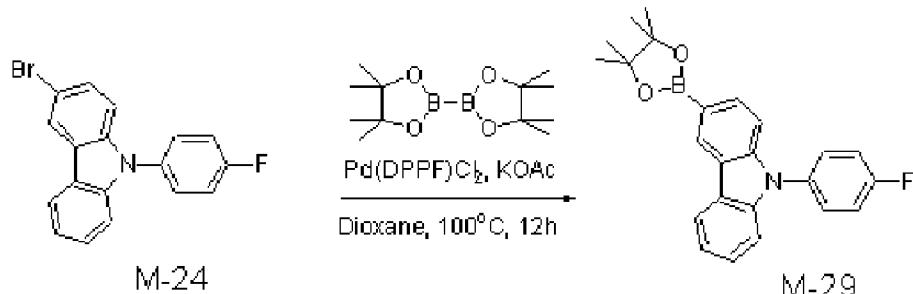
[446] 18g (51.8mmol) of intermediate M-23, 0.85g (1.04mmol) of Pd(dppf)Cl₂, 14.5g (57.0mmol) of bis(pinacolato)diboron, and 10.2g (103.6mmol) of potassium acetate were dissolved in 260ml of 1,4-dioxane. The reactant was refluxed and agitated for 12 hours under a nitrogen atmosphere, and then extracted 3 times with dichloromethane and distilled water. The extract was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 14.5g of a white solid intermediate M-28 was acquired as a desired compound (yield: 71%).

[447] LC-Mass (theoretical mass: 394.19g/mol, measured mass: M+1 = 395g/mol)

[448] **Synthesis of intermediate product, M-29**

[449] [Reaction Scheme 29]

[450]



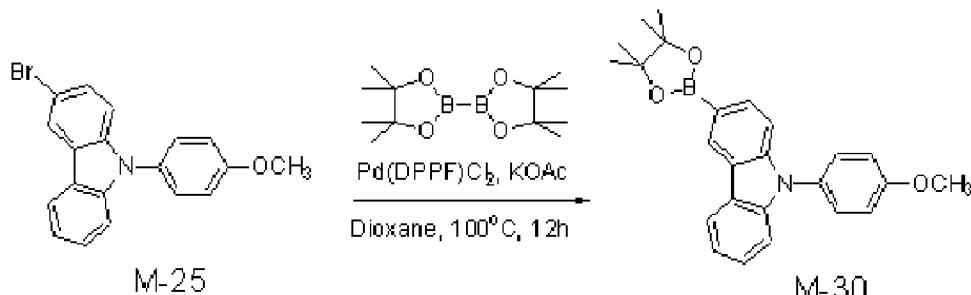
[451] 14.2g of a white solid intermediate M-29 was acquired as a desired compound (yield: 75%) in accordance with the same procedure as in the acquiring process of intermediate M-28, except that intermediate M-24 was used instead of intermediate M-23.

[452] LC-Mass (theoretical mass: 387.18g/mol, measured mass: M+1 = 388g/mol).

[453] Synthesis of intermediate product, M-30

[454] [Reaction Scheme 30]

[455]



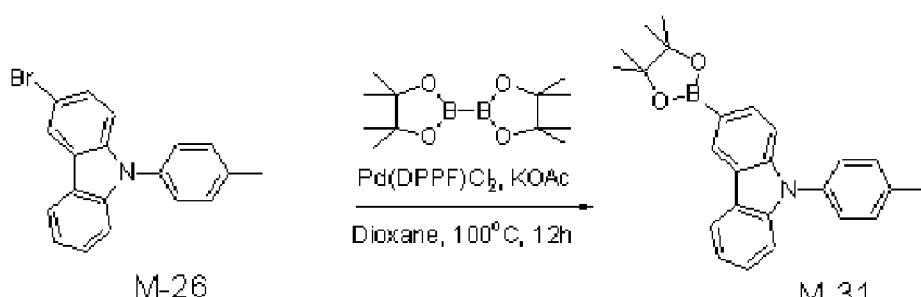
[456] 15.9g of a white solid intermediate M-30 was acquired as a desired compound (yield: 77%) in accordance with the same procedure as in the acquiring process of intermediate M-28, except that intermediate M-25 was used instead of intermediate M-24.

[457] LC-Mass (theoretical mass: 399.20g/mol, measured mass: M+1 = 400g/mol).

[458] Synthesis of intermediate product, M-31

[459] [Reaction Scheme 31]

[460]



[461] 16.1g of a white solid intermediate M-31 was acquired as a desired compound (yield: 81%) in accordance with the same procedure as in the acquiring process of intermediate M-28, except that intermediate M-26 was used instead of intermediate M-

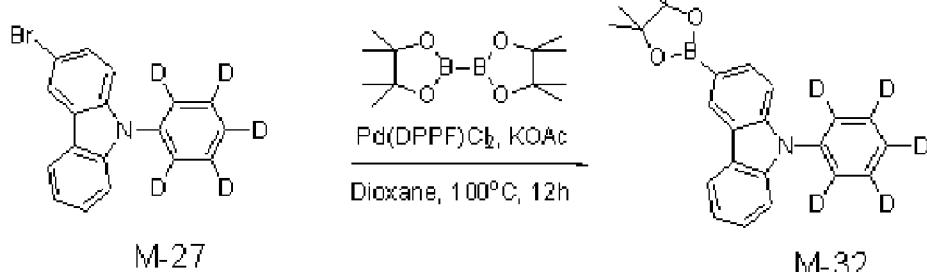
23.

[462] LC-Mass (theoretical mass: 383.21g/mol, measured mass: M+1 = 384g/mol).

[463] Synthesis of intermediate product, M-32

[464] [Reaction Scheme 32]

[465]



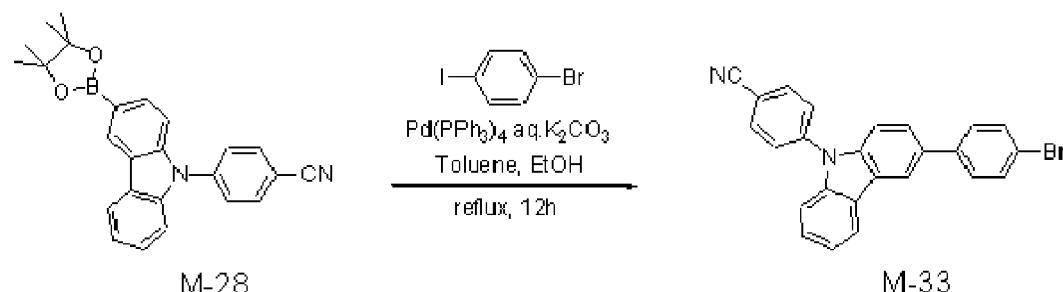
[466] 15.1g of a white solid intermediate M-32 was acquired as a desired compound (yield: 81%) in accordance with the same procedure as in the acquiring process of intermediate M-28, except that intermediate M-27 was used instead of intermediate M-23

[467] LC-Mass (theoretical mass: 359.20g/mol, measured mass: M+1 = 360g/mol).

[468] Synthesis of intermediate product, M-33

[469] [Reaction Scheme 33]

[470]



[471] 12g (30.4mmol) of intermediate M-28, 8.6g (30.4mmol) of 1-bromo-4-iodobenzene, and 0.35g (0.304mmol) of tetrakis(triphenylphosphine)palladium were added to a flask and dissolved in 152ml of toluene and 76mL of ethanol under a nitrogen atmosphere.

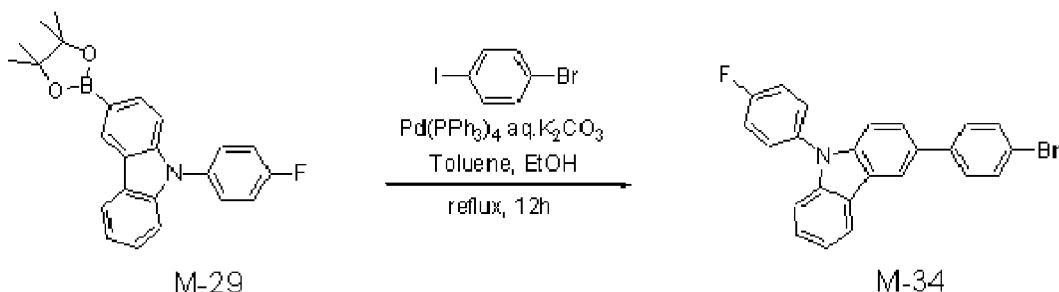
[472] 76ml of an aqueous solution including 8.95g (60.8mmol) of potassium carbonate was added, and then refluxed and agitated for 12 hours. After the reaction, the reactant was extracted with ethylacetate. The extract was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 10.6g of a white solid intermediate M-33 was acquired as a desired compound (yield: 82%).

[473] LC-Mass (theoretical mass: 422.04g/mol, measured mass: M+1 = 423g/mol, M+3 = 425g/mol)

[474] Synthesis of intermediate product, M-34

[475] [Reaction Scheme 34]

[476]



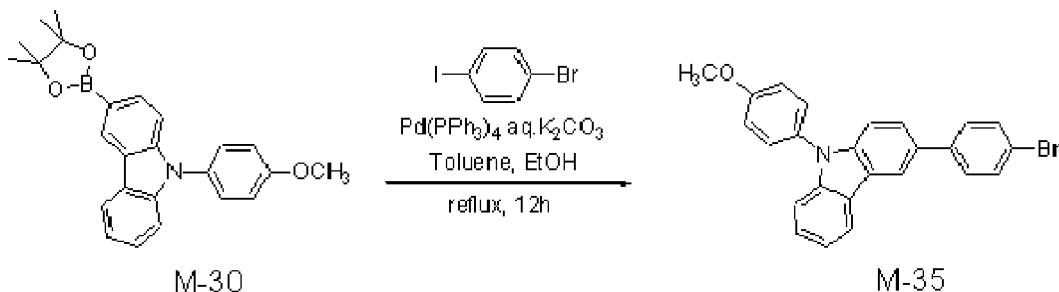
[477] 10.8g of white solid intermediate M-34 was acquired as a desired compound (yield: 85%) in accordance with the same procedure as in the acquiring process of intermediate M-33, except that M-9 was used instead of M-28.

[478] LC-Mass (theoretical mass: 415.04g/mol, measured mass: M+1 = 416g/mol, M+3 = 418g/mol).

[479] Synthesis of intermediate product, M-35

[480] [Reaction Scheme 35]

[481]



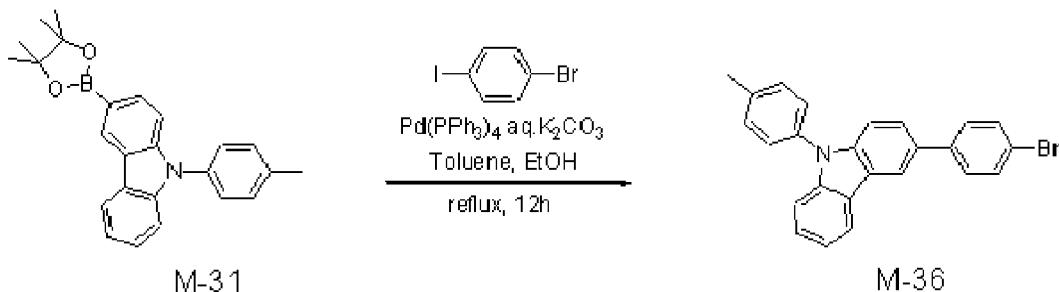
[482] 10.9g of a white solid intermediate M-35 was acquired as a desired compound (yield: 84%) in accordance with the same procedure as in the acquiring process of intermediate M-33, except that intermediate M-30 was used instead of intermediate M-28.

[483] LC-Mass (theoretical mass: 428.32g/mol, measured mass: M+1 = 429g/mol, M+3 = 431g/mol).

[484] Synthesis of intermediate product, M-36

[485] [Reaction Scheme 36]

[486]



[487] 10.9g of white solid intermediate M-36 was acquired as a desired compound (yield: 87%) in accordance with the same procedure as in the acquiring process of in-

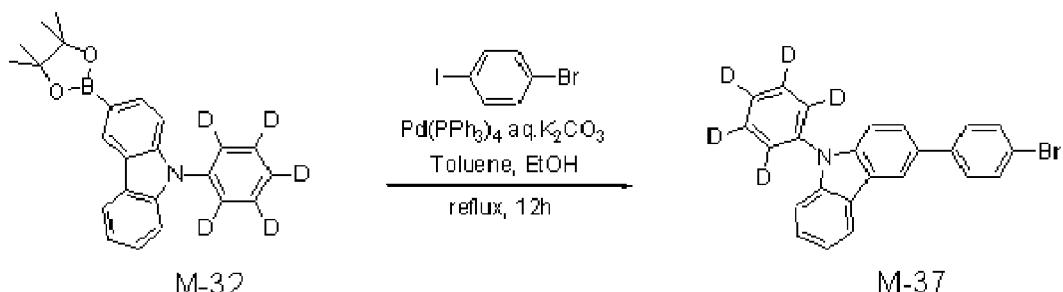
termediate M-33, except that M-31 was used instead of M-28.

[488] LC-Mass (theoretical mass: 411.06g/mol, measured mass: M+1 = 412g/mol, M+3 = 414g/mol).

[489] Synthesis of intermediate product, M-37

[490] [Reaction Scheme 37]

[491]



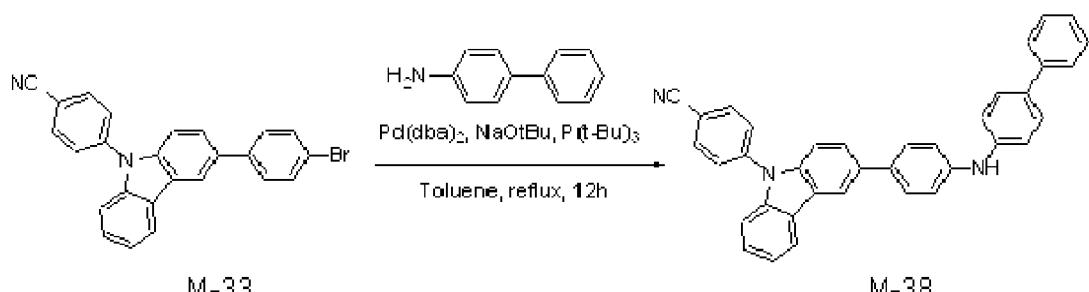
[492] 10.9g of white solid intermediate M-36 was acquired as a desired compound (yield: 89%) in accordance with the same procedure as in the acquiring process of intermediate M-33, except that M-31 was used instead of M-28.

[493] LC-Mass (theoretical mass: 402.08g/mol, measured mass: M+1 = 403g/mol, M+3 = 405g/mol).

[494] Synthesis of intermediate product, M-38

[495] [Reaction Scheme 38]

[496]



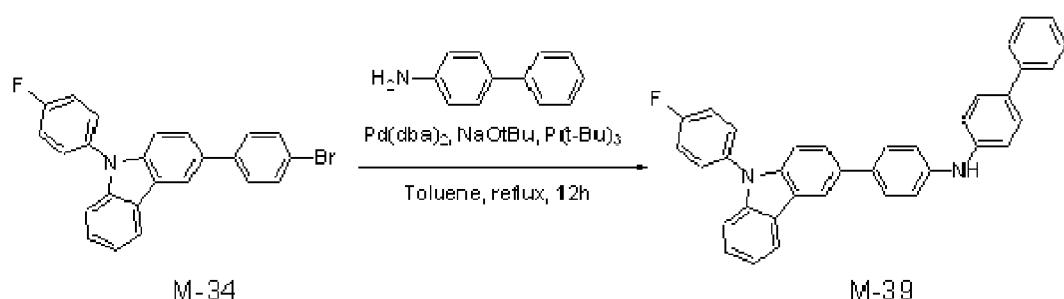
[497] 10g (19.5mmol) of intermediate M-33, 3.3g (19.5mmol) of 4-aminobiphenyl, 3.7g (39.0mmol) of sodium t-butoxide, and 0.12g (0.58mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 195ml of toluene, and 0.11g (0.753mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 7.2g of a white solid intermediate M-38 was acquired as a desired compound (yield: 72%).

[498] LC-Mass (theoretical mass: 511.20g/mol, measured mass: M+1 = 512g/mol)

[499] Synthesis of intermediate product, M-39

[500] [Reaction Scheme 39]

[501]



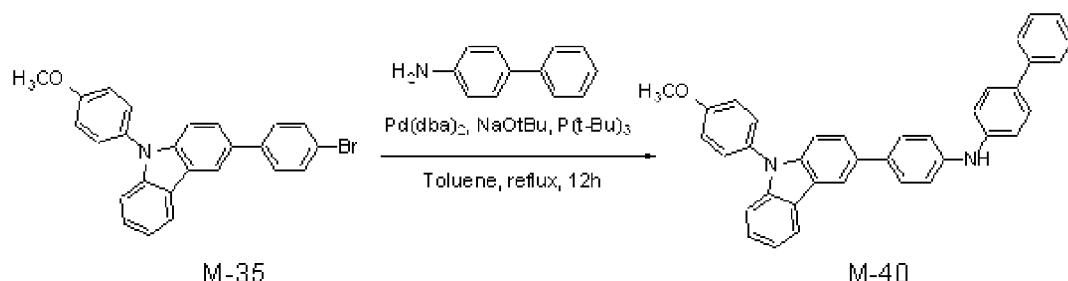
[502] 7.4g of a white solid intermediate M-39 was acquired as a desired compound (yield: 75%) in accordance with the same procedure as in the acquiring process of intermediate M-38, except that intermediate M-34 was used instead of intermediate M-33.

[503] LC-Mass (theoretical mass: 504.20g/mol, measured mass: $\text{M}+1 = 504.60\text{g/mol}$).

[504] Synthesis of intermediate product, M-40

[505] [Reaction Scheme 40]

[506]



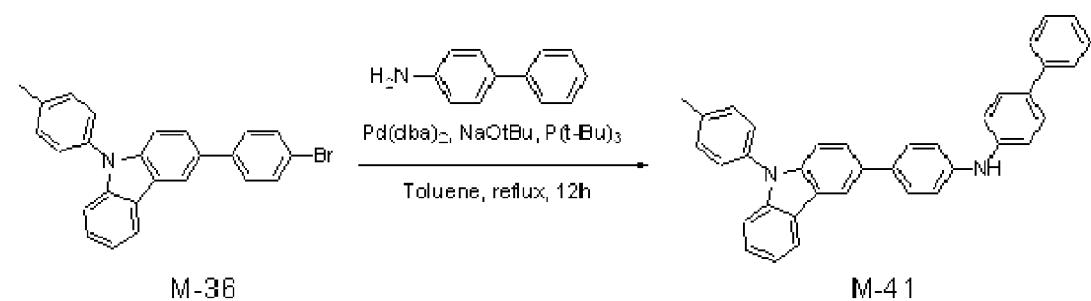
[507] 7.7g of a white solid intermediate M-40 was acquired as a desired compound (yield: 76%) in accordance with the same procedure as in the acquiring process of intermediate M-38, except that intermediate M-35 was used instead of intermediate M-33.

[508] LC-Mass (theoretical mass: 516.22/mol, measured mass: $\text{M}+1 = 517\text{g/mol}$).

[509] Synthesis of intermediate product, M-41

[510] [Reaction Scheme 41]

[511]



[512] 7.7g of a white solid intermediate M-41 was acquired as a desired compound (yield: 79%) in accordance with the same procedure as in the acquiring process of intermediate M-38, except that intermediate M-36 was used instead of intermediate M-

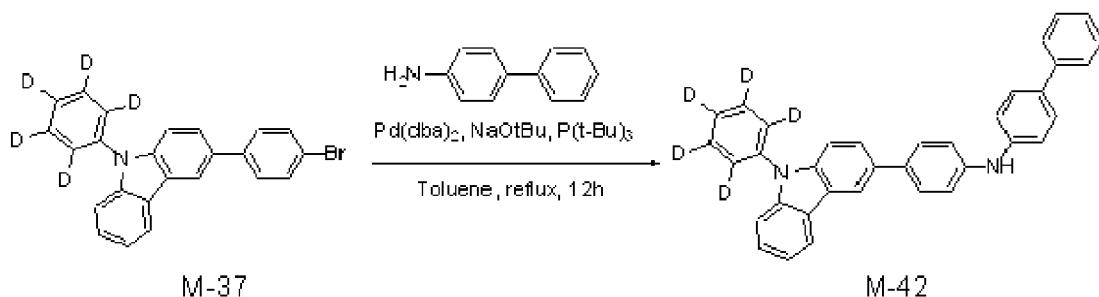
33.

[513] LC-Mass (theoretical mass: 500.23/mol, measured mass: M+1 = 501g/mol).

[514] Synthesis of intermediate product, M-42

[515] [Reaction Scheme 42]

[516]



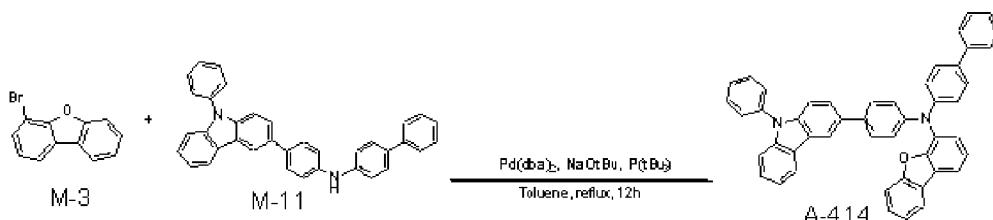
[517] 8.0g of a white solid intermediate M-42 was acquired as a desired compound (yield: 83%) in accordance with the same procedure as in the acquiring process of intermediate M-38, except that intermediate M-37 was used instead of intermediate M-33.

[518] LC-Mass (theoretical mass: 491.24/mol, measured mass: M+1 = 492g/mol).

[519] Example 1: Preparation of Compound represented by Chemical Formula A-414

[520] [Reaction Scheme 43]

[521]



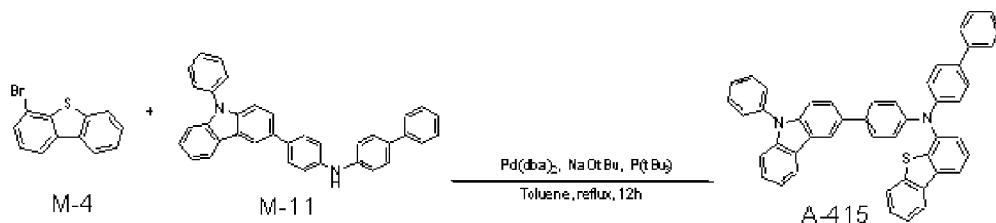
[522] 5g (20.2mmol) of intermediate M-3, 9.85g (20.2mmol) of sodium t-butoxide, and 0.12g (2.26mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 200ml of toluene, and 0.12g (0.202mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 12g of a white solid compound A-414 was acquired as a desired compound (yield: 91%).

[523] LC-Mass (theoretical mass: 652.25g/mol, measured mass: M+1 = 653g/mol)

[524] Example 2: Preparation of Compound represented by Chemical Formula A-415

[525] [Reaction Scheme 44]

[526]



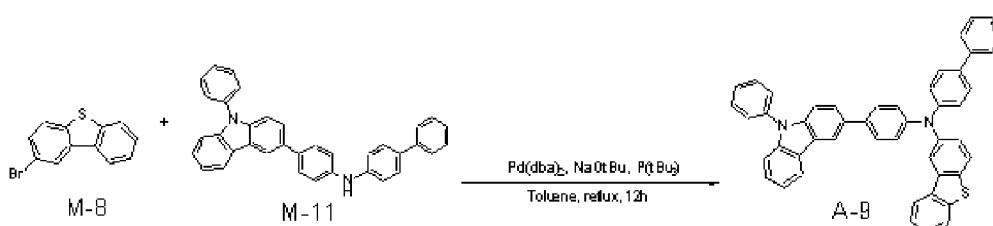
[527] 5.3g (20.2mmol) of intermediate M-4, 9.85g (20.2mmol) of M-11, 2.91g (30.3mmol) of sodium t-butoxide, and 0.12g (2.26mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 200ml of toluene, and 0.12g (0.202mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 11.8g of a white solid compound A-415 was acquired as a desired compound (yield: 87%).

[528] LC-Mass (theoretical mass: 668.23g/mol, measured mass: M+1 = 669g/mol)

Example 3: Preparation of Compound represented by Chemical Formula A-9

[530] [Reaction Scheme 45]

[531]



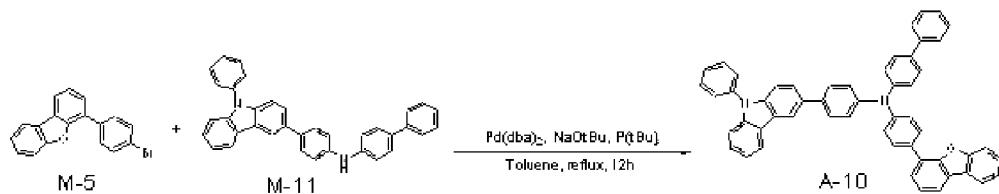
[532] 5.3g (20.2mmol) of intermediate M-8, 9.85g (20.2mmol) of M-11, 2.91g (30.3mmol) of sodium t-butoxide, and 0.12g (2.26mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 200ml of toluene, and 0.12g (0.202mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 11.8g of a white solid compound A-9 was acquired as a desired compound (yield: 87%).

[533] LC-Mass (theoretical mass: 668.23g/mol, measured mass: M+1 = 669g/mol)

Example 4: Preparation of Compound represented by Chemical Formula A-10

[535] [Reaction Scheme 46]

[536]



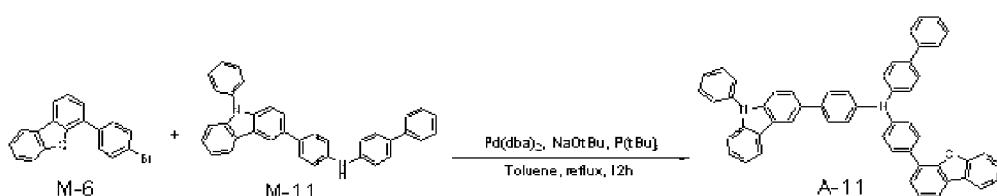
[537] 6.5g (20.2mmol) of intermediate M-5, 9.85g (20.2mmol) of intermediate M-11, 2.91g (30.3mmol) of sodium t-butoxide, and 0.12g (2.26mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 200ml of toluene, and 0.12g (0.202mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 12.4g of a white solid compound A-10 was acquired as a desired compound (yield: 84%).

[538] LC-Mass (theoretical mass: 728.28g/mol, measured mass: M+1 = 729g/mol)

[539] Example 5: Preparation of Compound represented by Chemical Formula A-11

[540] [Reaction Scheme 47]

[541]



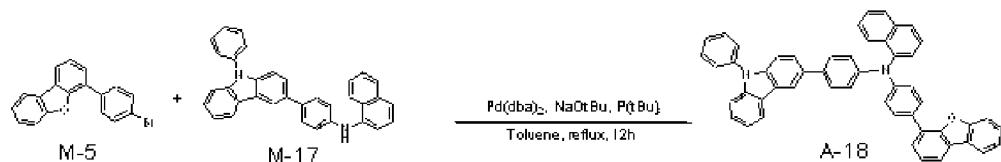
[542] 6.85g (20.2mmol) of intermediate M-6, 9.85g (20.2mmol) of M-11, 2.91g (30.3mmol) of sodium t-butoxide, and 0.12g (2.26mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 200ml of toluene, and 0.12g (0.202mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 13.2g of a white solid compound A-11 was acquired as a desired compound (yield: 88%).

[543] LC-Mass (theoretical mass: 744.26g/mol, measured mass: M+1 = 745g/mol)

[544] Example 6: Preparation of Compound represented by Chemical Formula A-18

[545] [Reaction Scheme 48]

[546]



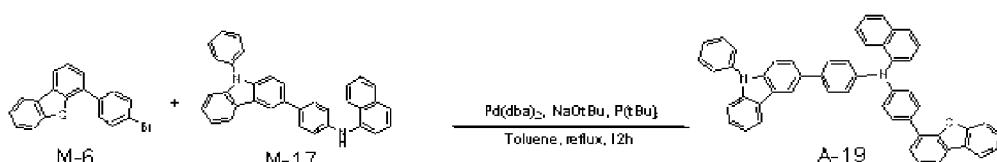
[547] 6.53g (20.2mmol) of intermediate M-5, 9.30g (20.2mmol) of M-17, 2.91g (30.3mmol) of sodium t-butoxide, and 0.12g (2.26mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 200ml of toluene, and 0.12g (0.202mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 12.5g of a white solid compound A-18 was acquired as a desired compound (yield: 88%).

[548] LC-Mass (theoretical mass: 702.27g/mol, measured mass: M+1 = 703g/mol)

Example 7: Preparation of Compound represented by Chemical Formula A-19

[550] [Reaction Scheme 49]

[551]



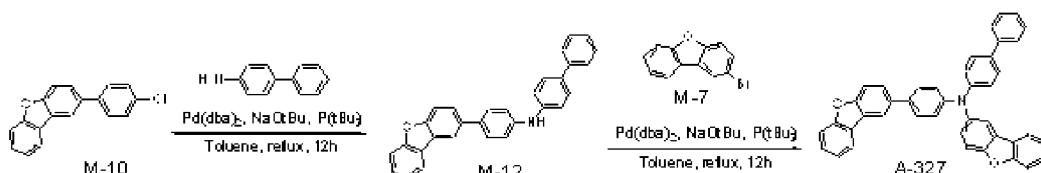
[552] 6.85g (20.2mmol) of intermediate M-6, 9.30g (20.2mmol) of M-17, 2.91g (30.3mmol) of sodium t-butoxide, and 0.12g (2.26mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 200ml of toluene, and 0.12g (0.202mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 12.3g of a white solid compound A-18 was acquired as a desired compound (yield: 85%).

[553] LC-Mass (theoretical mass: 718.24g/mol, measured mass: M+1 = 719g/mol)

Example 8: Preparation of Compound represented by Chemical Formula A-327

[555] [Reaction Scheme 50]

[556]



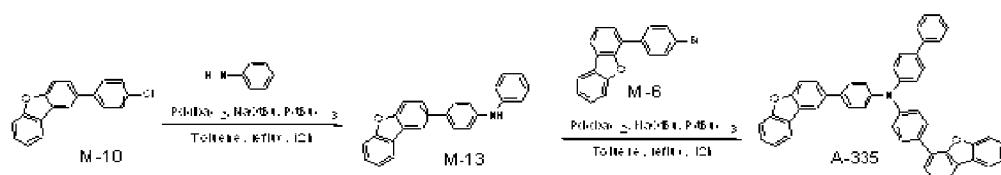
[557] 5.2g (12.2mmol) of intermediate M-12, 3.0g (12.2mmol) of intermediate M-7, 1.76g (18.3mmol) of sodium t-butoxide, and 0.074g (0.37mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 120ml of toluene, and 0.070g (0.122mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 6.2g of a white solid compound A-327 was acquired as a desired compound (yield: 86%).

[558] LC-Mass (theoretical mass: 593.18g/mol, measured mass: M+1 = 594g/mol)

Example 9: Preparation of Compound represented by Chemical Formula A-335

[560] [Reaction Scheme51]

[561]



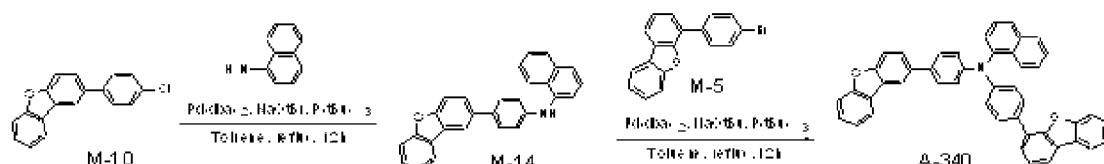
[562] 4.3g (12.2mmol) of intermediate M-13, 4.14g (12.2mmol) of intermediate M-6, 1.76g (18.3mmol) of sodium t-butoxide, and 0.074g (0.37mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 120ml of toluene, and 0.070g (0.122mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 6.8g of a white solid compound A-335 was acquired as a desired compound (yield: 91%).

[563] LC-Mass (theoretical mass: 609.16g/mol, measured mass: M+1 = 610g/mol)

Example 10: Preparation of Compound represented by Chemical Formula A-340

[565] [Reaction Scheme52]

[566]



[567] 4.9g (12.2mmol) of intermediate M-14, 3.94g (12.2mmol) of intermediate M-5, 1.76g (18.3mmol) of sodium t-butoxide, and 0.074g (0.37mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 120ml of toluene, and

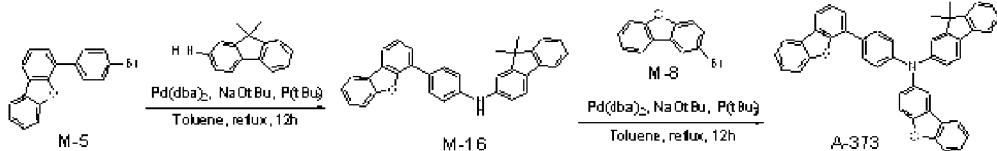
0.070g (0.122mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 7.2g of a white solid compound A-340 was acquired as a desired compound (yield: 92%).

[568] LC-Mass (theoretical mass: 643.20g/mol, measured mass: M+1 = 644g/mol)

Example 11: Preparation of Compound represented by Chemical Formula A-373

[570] [Reaction Scheme 53]

[571]



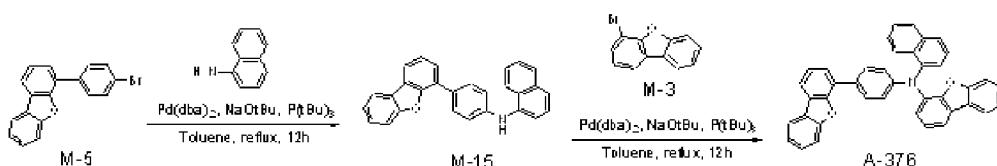
[572] 5.51g (12.2mmol) of intermediate M-16, 3.21g (12.2mmol) of intermediate M-8, 1.76g (18.3mmol) of sodium t-butoxide, and 0.074g (0.37mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 120ml of toluene, and 0.070g (0.122mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 7.0g of a white solid compound A-373 was acquired as a desired compound (yield: 91%).

[573] LC-Mass (theoretical mass: 633.21g/mol, measured mass: M+1 = 634g/mol)

Example 12: Preparation of Compound represented by Chemical Formula A-376

[575] [Reaction Scheme 54]

[576]



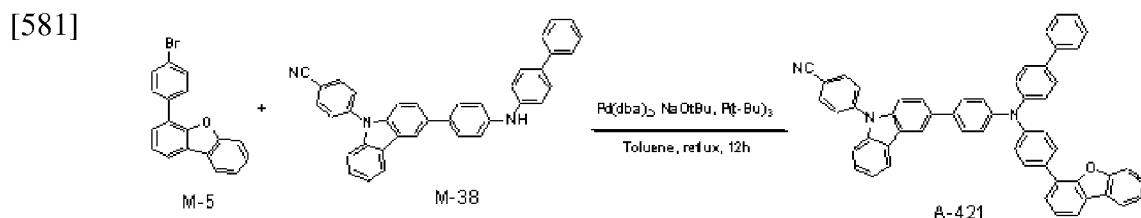
[577] 4.7g (12.2mmol) of intermediate M-15, 3.01g (12.2mmol) of intermediate M-3, 1.76g (18.3mmol) of sodium t-butoxide, and 0.074g (0.37mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 120ml of toluene, and 0.070g (0.122mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 7.0g of a white solid compound A-376 was acquired as a desired compound (yield: 91%).

lacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 6.2g of a white solid compound A-376 was acquired as a desired compound (yield: 92%).

[578] LC-Mass (theoretical mass: 551.19g/mol, measured mass: M+1 = 552g/mol)

[579] **Example 13: Preparation of Compound represented by Chemical Formula A-**
421

[580] [Reaction Scheme 55]

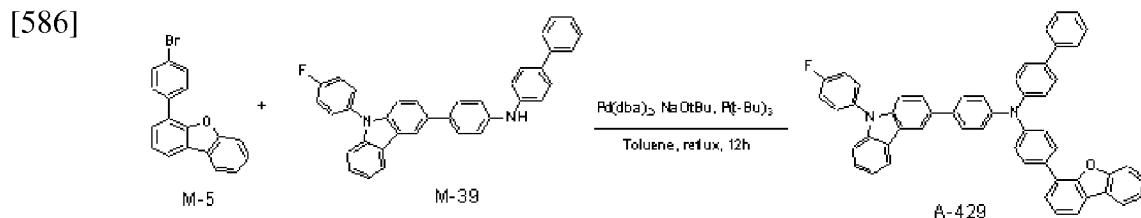


[582] 4.4g (13.7mmol) of intermediate M-5, 7.0g (13.7mmol) of intermediate M-38, 2.63g (27.4mmol) of sodium t-butoxide, and 0.08g (0.41mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 137ml of toluene, and 0.08g (0.137mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 8.7g of a white solid compound A-421 was acquired as a desired compound (yield: 84%).

[583] LC-Mass (theoretical mass: 753.28g/mol, measured mass: M+1 = 754g/mol)

[584] **Example 14: Preparation of Compound represented by Chemical Formula A-**
429

[585] [Reaction Scheme 56]



[587] 8.3g of a white solid compound A-429 was acquired as a desired compound (yield: 81%) in accordance with the same procedure as in the acquiring process of compound A-421, except that intermediate M-39 was used instead of intermediate M-38.

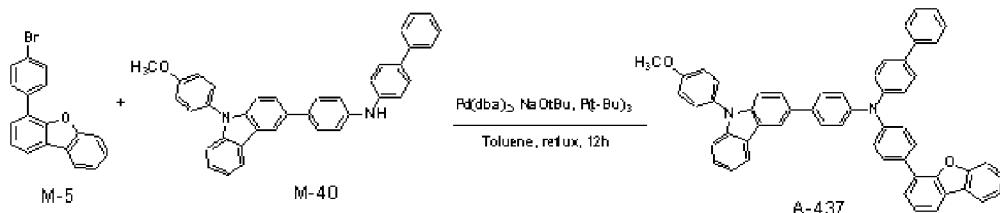
[588] LC-Mass (theoretical mass: 746.27g/mol, measured mass: M+1 = 747g/mol).

[589] Example 15: Preparation of Compound represented by Chemical Formula A-

437

[590] [Reaction Scheme 57]

[591]



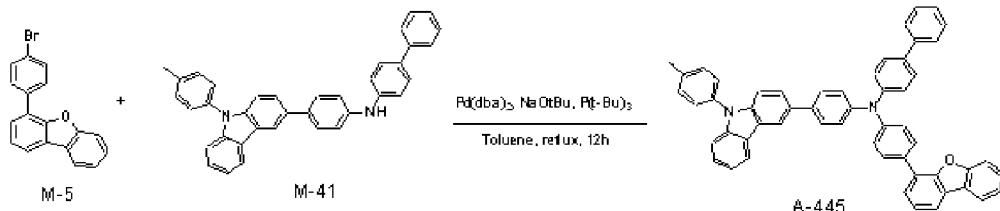
[592] 8.8g of a white solid compound A-437 was acquired as a desired compound (yield: 85%) in accordance with the same procedure as in the acquiring process of compound A-421, except that intermediate M-40 was used instead of intermediate M-38.

[593] LC-Mass (theoretical mass: 758.29g/mol, measured mass: M+1 = 759g/mol).

[594] **Example 16: Preparation of Compound represented by Chemical Formula A-445**

[595] [Reaction Scheme 58]

[596]



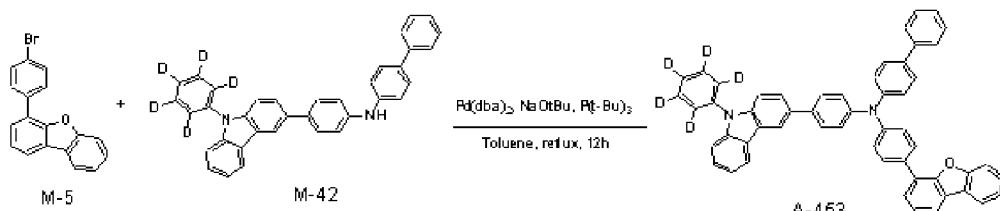
[597] 8.9g of a white solid compound A-445 was acquired as a desired compound (yield: 87%) in accordance with the same procedure as in the acquiring process of compound A-421, except that intermediate M-41 was used instead of intermediate M-38.

[598] LC-Mass (theoretical mass: 742.30g/mol, measured mass: M+1 = 743g/mol).

[599] **Example 17: Preparation of Compound represented by Chemical Formula A-453**

[600] [Reaction Scheme 59]

[601]



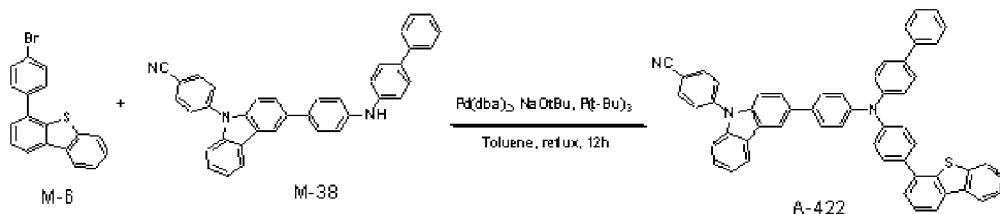
[602] 8.3g of a white solid compound A-453 was acquired as a desired compound (yield: 83%) in accordance with the same procedure as in the acquiring process of compound A-421, except that intermediate M-42 was used instead of intermediate M-38.

[603] LC-Mass (theoretical mass: 733.31g/mol, measured mass: M+1 = 734g/mol).

[604] **Example 18: Preparation of Compound represented by Chemical Formula A-422**

[605] [Reaction Scheme 60]

[606]



[607]

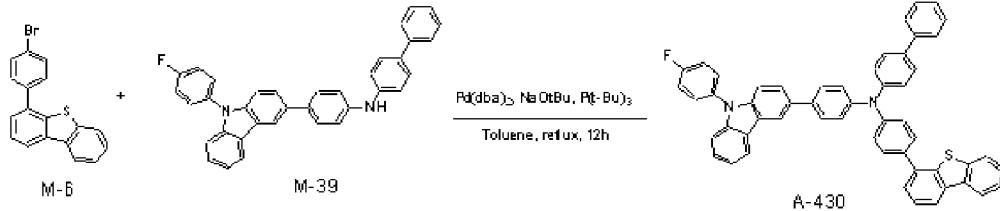
4.6g (13.7mmol) of intermediate M-6, 7.0g (13.7mmol) of intermediate M-38, 2.63g (27.4mmol) of sodium t-butoxide, and 0.08g (0.41mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 137ml of toluene, and 0.08g (0.137mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 7:3 through silica gel column chromatography, and then 8.6g of a white solid compound A-422 was acquired as a desired compound (yield: 82%).

[608] LC-Mass (theoretical mass: 769.26g/mol, measured mass: M+1 = 770g/mol)

[609] **Example 19: Preparation of Compound represented by Chemical Formula A-**
430

[610] [Reaction Scheme 61]

[611]



[612]

8.8g of a white solid compound A-430 was acquired as a desired compound (yield: 84%) in accordance with the same procedure as in the acquiring process of compound A-422, except that intermediate M-39 was used instead of intermediate M-38.

[613]

LC-Mass (theoretical mass: 762.25g/mol, measured mass: M+1 = 763g/mol).

[614]

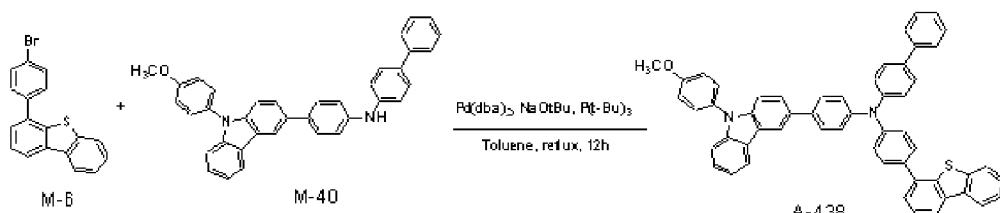
Example 20: Preparation of Compound represented by Chemical Formula A-438

[615]

[Reaction Scheme 62]

[616]

The diagram shows the chemical structure of 2-methyl-2-butene-1-ol. It consists of a four-carbon chain with a double bond between the second and third carbons. A methyl group is attached to the second carbon, and a hydroxyl group (-OH) is attached to the first carbon.



[617]

9.1g of a white solid compound A-438 was acquired as a desired compound (yield: 86%) in accordance with the same procedure as in the acquiring process of compound

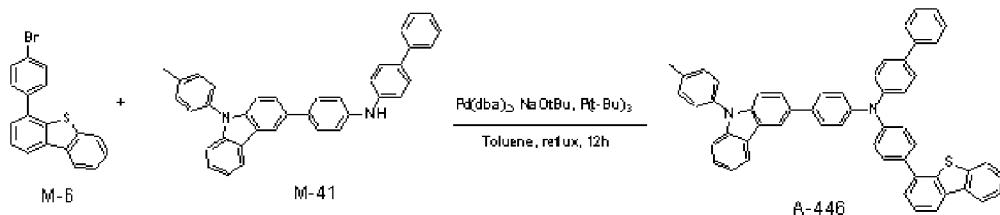
A-422, except that intermediate M-40 was used instead of intermediate M-38.

[618] LC-Mass (theoretical mass: 774.27g/mol, measured mass: M+1 = 775g/mol).

Example 21: Preparation of Compound represented by Chemical Formula A-446

[620] [Reaction Scheme 63]

[621]



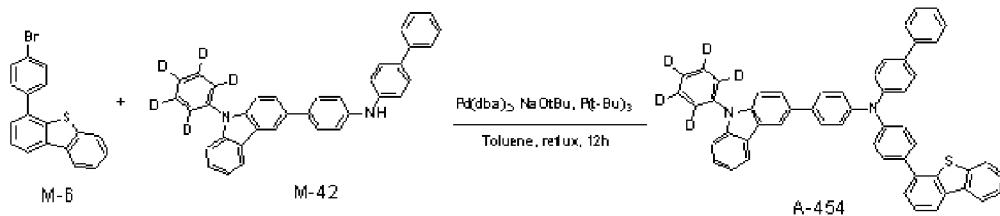
[622] 9.2g of a white solid compound A-446 was acquired as a desired compound (yield: 88%) in accordance with the same procedure as in the acquiring process of compound A-422, except that intermediate M-41 was used instead of intermediate M-38.

[623] LC-Mass (theoretical mass: 758.28g/mol, measured mass: M+1 = 759g/mol).

Example 22: Preparation of Compound represented by Chemical Formula A-454

[625] [Reaction Scheme 64]

[626]



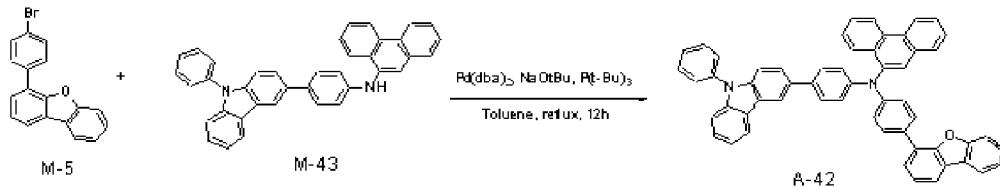
[627] 8.8g of a white solid compound A-454 was acquired as a desired compound (yield: 86%) in accordance with the same procedure as in the acquiring process of compound A-422, except that intermediate M-42 was used instead of intermediate M-38.

[628] LC-Mass (theoretical mass: 749.29g/mol, measured mass: M+1 = 750g/mol).

Example 23: Preparation of Compound represented by Chemical Formula A-42

[630] [Reaction Scheme 65]

[631]

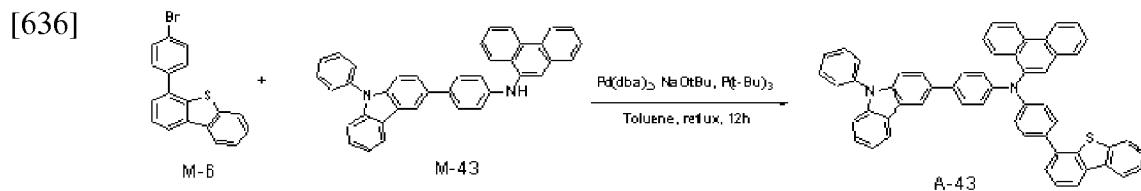


[632] 8.4g of a white solid compound A-42 was acquired as a desired compound (yield: 81%) in accordance with the same procedure as in the acquiring process of compound A-421, except that intermediate M-43 was used instead of intermediate M-38.

[633] LC-Mass (theoretical mass: 752.28g/mol, measured mass: M+1 = 753g/mol).

Example 24: Preparation of Compound represented by Chemical Formula A-43

[635] [Reaction Scheme 66]

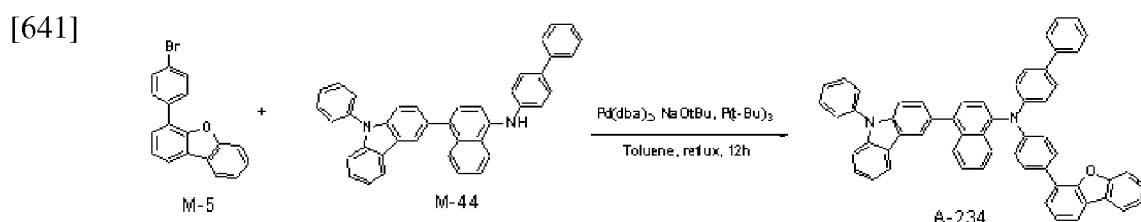


[637] 8.7g of a white solid compound A-43 was acquired as a desired compound (yield: 83%) in accordance with the same procedure as in the acquiring process of compound A-422, except that intermediate M-43 was used instead of intermediate M-38.

[638] LC-Mass (theoretical mass: 768.26g/mol, measured mass: M+1 = 769g/mol).

Example 25: Preparation of Compound represented by Chemical Formula A-234

[640] [Reaction Scheme 67]

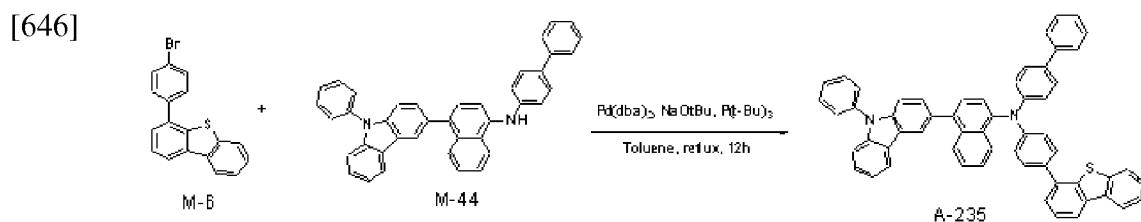


[642] 9.0g 21.8 of a white solid compound A-234 was acquired as a desired compound (yield: 84%) in accordance with the same procedure as in the acquiring process of compound A-421, except that intermediate M-44 was used instead of intermediate M-38.

[643] LC-Mass (theoretical mass: 778.30g/mol, measured mass: M+1 = 779g/mol).

Example 26: Preparation of Compound represented by Chemical Formula A-235

[645] [Reaction Scheme 68]



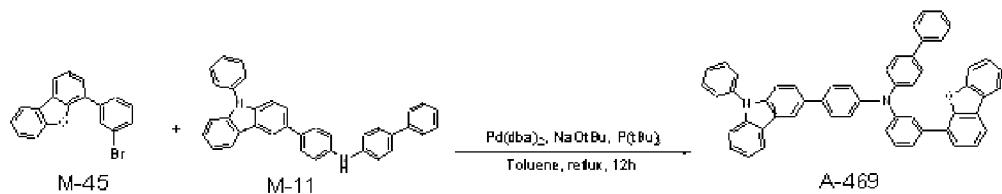
[647] 9.0g of a white solid compound A-235 was acquired as a desired compound (yield: 83%) in accordance with the same procedure as in the acquiring process of compound A-422, except that intermediate M-44 was used instead of intermediate M-38.

[648] LC-Mass (theoretical mass: 794.28g/mol, measured mass: M+1 = 795g/mol).

Example 27: Preparation of Compound represented by Chemical Formula A-469

[650] [Reaction Scheme 69]

[651]



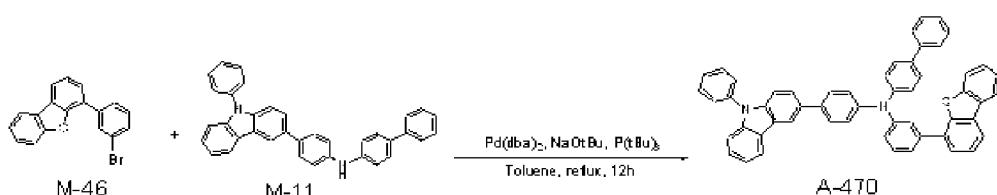
[652] 12.8g of a white solid compound A-469 was acquired as a desired compound (yield: 87%) in accordance with the same procedure as in the acquiring process of intermediate compound A-10, except that intermediate M-45 was used instead of intermediate M-5.

[653] LC-Mass (theoretical mass: 728.28g/mol, measured mass: M+1 = 729g/mol).

Example 28: Preparation of Compound represented by Chemical Formula A-470

[655] [Reaction Scheme 70]

[656]



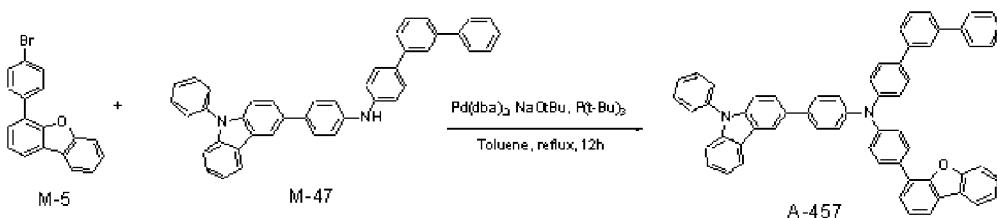
[657] 13.4g of a white solid compound A-470 was acquired as a desired compound (yield: 89%) in accordance with the same procedure as in the acquiring process of intermediate compound A-11, except that intermediate M-46 was used instead of intermediate M-6.

[658] LC-Mass (theoretical mass: 744.26g/mol, measured mass: M+1 = 745g/mol).

Example 29: Preparation of Compound represented by Chemical Formula A-457

[660] [Reaction Scheme 71]

[661]



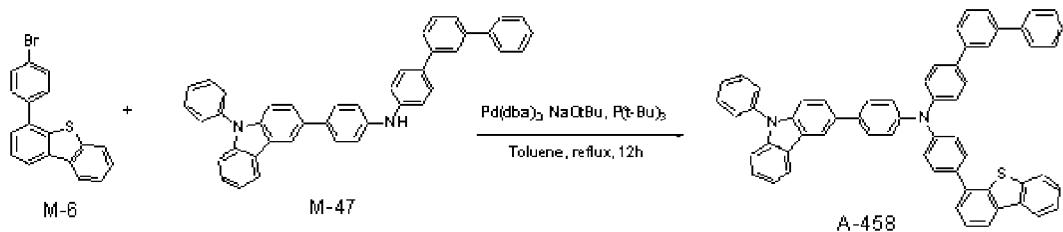
[662] 9.4g of a white solid compound A-457 was acquired as a desired compound (yield: 85%) in accordance with the same procedure as in the acquiring process of intermediate compound A-421, except that intermediate M-47 was used instead of intermediate M-38.

[663] LC-Mass (theoretical mass: 804.31g/mol, measured mass: M+1 = 805g/mol).

Example 30: Preparation of Compound represented by Chemical Formula A-458

[665] [Reaction Scheme 72]

[666]



[667]

10.01g of a white solid compound A-458 was acquired as a desired compound (yield: 89%) in accordance with the same procedure as in the acquiring process of intermediate compound A-422, except that intermediate M-47 was used instead of intermediate M-38.

[668]

LC-Mass (theoretical mass: 820.29g/mol, measured mass: M+1 = 821g/mol).

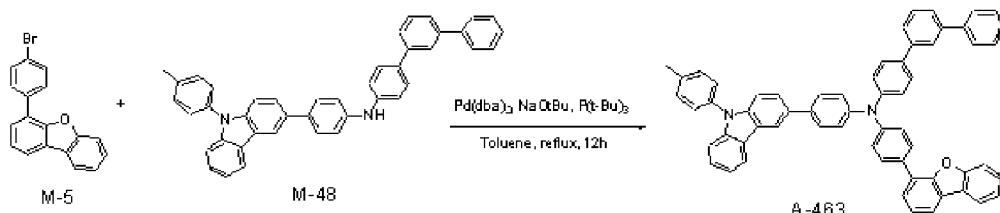
[669]

Example 31: Preparation of Compound represented by Chemical Formula A-463

[670]

[Reaction Scheme 73]

[671]



[672]

9.5g of a white solid compound A-463 was acquired as a desired compound (yield: 85%) in accordance with the same procedure as in the acquiring process of intermediate compound A-421, except that intermediate M-48 was used instead of intermediate M-38.

[673]

LC-Mass (theoretical mass: 818.33g/mol, measured mass: M+1 = 819g/mol).

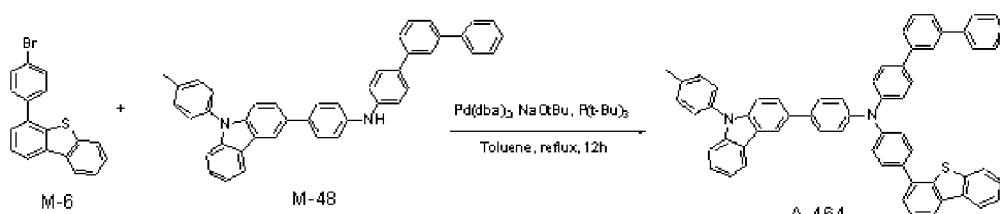
[674]

Example 32: Preparation of Compound represented by Chemical Formula A-464

[675]

[Reaction Scheme 74]

[676]



[677]

9.8g of a white solid compound A-464 was acquired as a desired compound (yield: 86%) in accordance with the same procedure as in the acquiring process of intermediate compound A-422, except that intermediate M-48 was used instead of intermediate M-38.

[678]

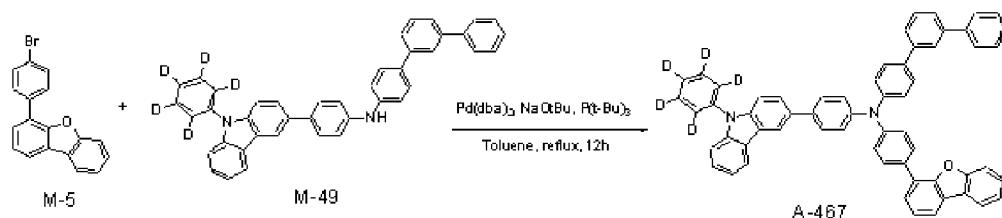
LC-Mass (theoretical mass: 834.31g/mol, measured mass: M+1 = 835g/mol).

[679]

Example 33: Preparation of Compound represented by Chemical Formula A-467

[680] [Reaction Scheme 75]

[681]



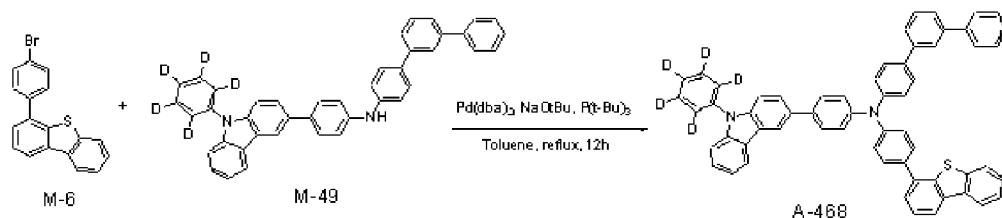
[682] 9.8g of a white solid compound A-467 was acquired as a desired compound (yield: 88%) in accordance with the same procedure as in the acquiring process of intermediate compound A-421, except that intermediate M-49 was used instead of intermediate M-38.

[683] LC-Mass (theoretical mass: 809.34g/mol, measured mass: M+1 = 810g/mol).

[684] **Example 34: Preparation of Compound represented by Chemical Formula A-468**

[685] [Reaction Scheme 76]

[686]



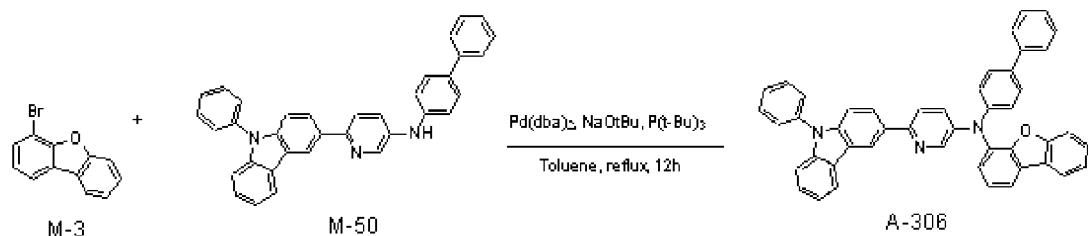
[687] 9.3g of a white solid compound A-468 was acquired as a desired compound (yield: 82%) in accordance with the same procedure as in the acquiring process of intermediate compound A-422, except that intermediate M-49 was used instead of intermediate M-38.

[688] LC-Mass (theoretical mass: 825.32g/mol, measured mass: M+1 = 826g/mol).

[689] **Example 35: Preparation of Compound represented by Chemical Formula A-306**

[690] [Reaction Scheme 77]

[691]



[692] 3.4g (13.7mmol) of intermediate M-3, 6.7g (13.7mmol) of intermediate M-50-aminonaphthalene, 2.63g (27.4mmol) of sodium t-butoxide, and 0.08g (0.41mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 750ml of toluene, and 0.43g (0.753mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with

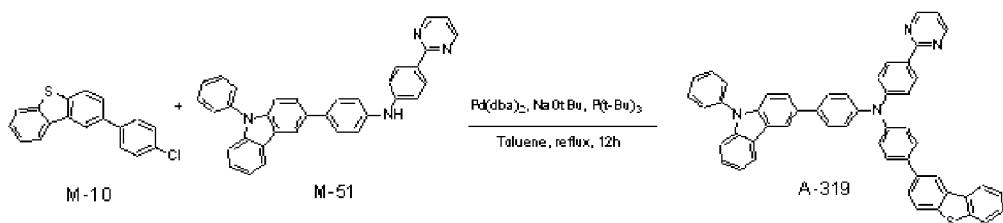
ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 6:4 through silica gel column chromatography, and then 7.0g of a white solid compound A-306 was acquired as a desired compound (yield: 78%).

[693] LC-Mass (theoretical mass: 653.25g/mol, measured mass: M+1 = 654g/mol)

Example 36: Preparation of Compound represented by Chemical Formula A-319

[695] [Reaction Scheme 78]

[696]



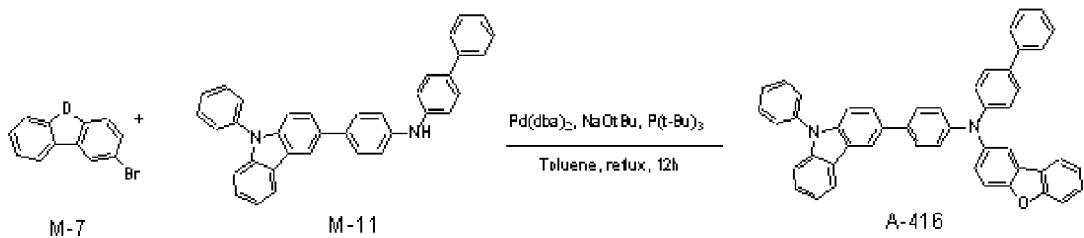
[697] 4.0g (13.7mmol) of intermediate M-10, 6.7g (13.7mmol) of intermediate M-51, 2.63g (27.4mmol) of sodium t-butoxide, and 0.08g (0.41mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 137ml of toluene, and 0.08g (0.137mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen atmosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 6:4 through silica gel column chromatography, and then 8.4g of a white solid compound A-306 was acquired as a desired compound (yield: 82%).

[698] LC-Mass (theoretical mass: 746.25g/mol, measured mass: M+1 = 747g/mol)

Example 37: Preparation of Compound represented by Chemical Formula A-416

[700] [Reaction Scheme 79]

[701]



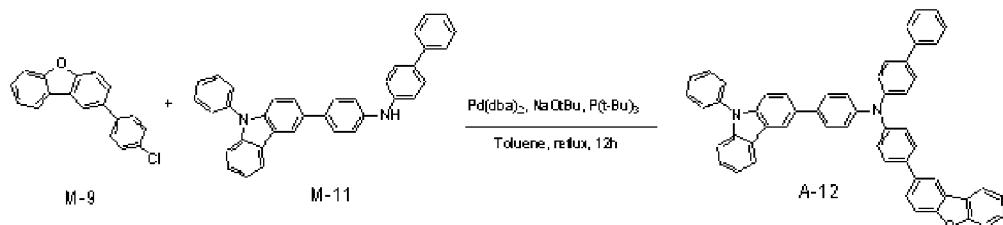
[702] 11.2g of a white solid compound A-416 was acquired as a desired compound (yield: 85%) in accordance with the same procedure as in the acquiring process of intermediate compound A-414, except that intermediate M-7 was used instead of intermediate M-3.

[703] LC-Mass (theoretical mass: 652.25g/mol, measured mass: M+1 = 653g/mol).

Example 38: Preparation of Compound represented by Chemical Formula A-12

[705] [Reaction Scheme 80]

[706]



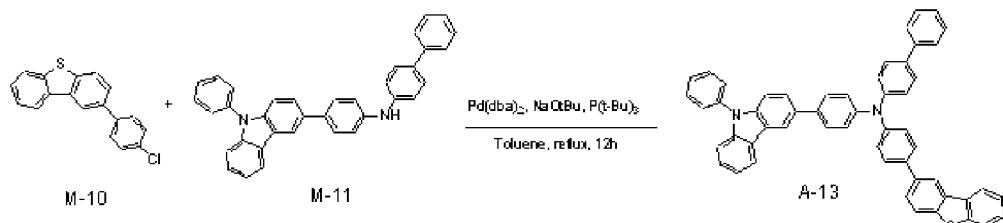
[707] 12.2g of a white solid compound A-12 was acquired as a desired compound (yield: 83%) in accordance with the same procedure as in the acquiring process of intermediate compound A-414, except that intermediate M-9 was used instead of intermediate M-3.

[708] LC-Mass (theoretical mass: 728.28g/mol, measured mass: M+1 = 729g/mol).

Example 39: Preparation of Compound represented by Chemical Formula A-13

[710] [Reaction Scheme 81]

[711]



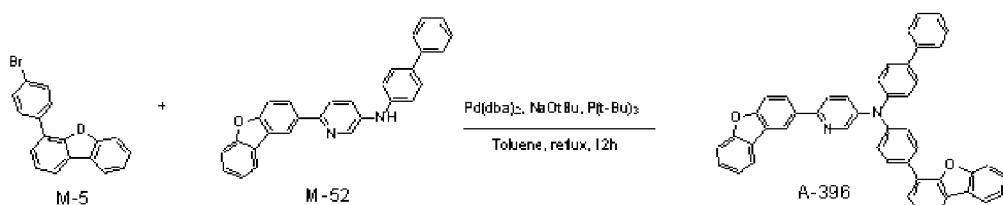
[712] 12.8g of a white solid compound A-13 was acquired as a desired compound (yield: 85%) in accordance with the same procedure as in the acquiring process of intermediate compound A-414, except that intermediate M-10 was used instead of intermediate M-3.

[713] LC-Mass (theoretical mass: 744.26g/mol, measured mass: M+1 = 745g/mol).

Example 40: Preparation of Compound represented by Chemical Formula A-396

[715] [Reaction Scheme 82]

[716]



[717] 4.4g (13.7mmol) of intermediate M-5, 5.7g (13.7mmol) of intermediate M-52, 2.63g (27.4mmol) of sodium t-butoxide, and 0.08g (0.41mmol) of tri-tetra-butylphosphine were added to a flask and dissolved in 137ml of toluene, and 0.08g (0.137mmol) of Pd(dba)₂ was added and then refluxed and agitated for 12 hours under a nitrogen at-

mosphere. After the reaction, the reactant was extracted with ethylacetate and distilled water. The organic layer was dried with magnesium sulfite and filtered. Then, the filtrate was concentrated under reduced pressure. The product was purified with n-hexane/dichloromethane mixed in a volume ratio of 6:4 through silica gel column chromatography, and then 7.2g of a white solid compound A-396 was acquired as a desired compound (yield: 80%).

[718] LC-Mass (theoretical mass: 654.23g/mol, measured mass: M+1 = 655g/mol)

Fabrication of Organic Light Emitting Diode

Example 41

[721] A glass substrate thin film coated with 1500Å of indium tin oxide (ITO) was ultrasonic-wave cleaned with distilled water. Subsequently, the glass substrate cleaned with distilled water was ultrasonic-wave cleaned with a solvent such as isopropyl alcohol, acetone, methanol, or the like and dried. Then the glass substrate was moved to a plasma cleaner and cleaned for 5 minutes with oxygen plasma, and then the substrate was moved to a vacuum evaporator.

4,4'-bis[N-[4-{N,N-bis(3-methylphenyl)amino}-phenyl]-N-phenylamino]biphenyl (DNTPD) was vacuum deposited on the ITO substrate using an ITO transparent electrode prepared according to the above procedure to provide a 600Å thick hole injection layer (HIL). Then the compound prepared according to Example 4 was vacuum deposited to provide a 300Å-thick hole transport layer (HTL). A 250Å-thick emission layer was vacuum deposited on the hole transport layer (HTL) using 9,10-di-(2-naphthyl)anthracene (ADN) as a host and 3wt% of 2,5,8,11-tetra(tert-butyl)perylene (TBPe) as a dopant.

[722] Next, Alq₃ was vacuum-deposited to be 250Å thick on the emission layer, forming an electron transport layer (ETL). On the electron transport layer (ETL), LiF at 10Å and Al at 1000Å were sequentially vacuum-deposited to fabricate a cathode, completing an organic light emitting diode.

[723] The organic light emitting diode had five organic thin layers.

[724] In particular, it had Al (1000Å/LiF (10Å)/Alq₃ (250Å)/EML[ADN:TBPe=97:3] (250Å)/HTL (300Å/DNTPD (600Å/ITO (1500Å).

Example 42

[726] An organic light emitting diode was prepared with the same method as Example 41, except for using Example 5 instead of Example 4.

Example 43

[728] An organic light emitting diode was prepared with the same method as Example 41, except for using Example 6 instead of Example 4.

Example 44

[730] An organic light emitting diode was prepared with the same method as Example 41,

except for using Example 7 instead of Example 4.

[731] **Example 45**

[732] An organic light emitting diode was prepared with the same method as Example 41, except for using Example 9 instead of Example 4.

[733] **Example 46**

[734] An organic light emitting diode was prepared with the same method as Example 41, except for using Example 10 instead of Example 4.

[735] **Example 47**

[736] An organic light emitting diode was prepared with the same method as Example 41, except for using Example 38 instead of Example 4.

[737] **Example 48**

[738] An organic light emitting diode was prepared with the same method as Example 41, except for using Example 39 instead of Example 4.

[739] **Comparative Example 1**

[740] An organic light emitting diode was prepared with the same method as Example 41, except for using NPB instead of Example 4. The structure of NPB is shown in the following.

[741] **Comparative Example 2**

[742] An organic light emitting diode was prepared with the same method as Example 41, except for using HT1 instead of Example 4. The structure of HT1 is shown in the following.

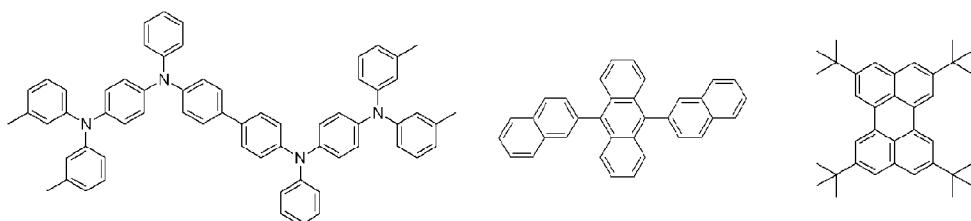
[743] **Comparative Example 3**

[744] An organic light emitting diode was fabricated in accordance with the same procedure as in Example 41, except that HT2 was used instead of the Example 41. The structure of HT2 is described in the following.

[745] The structure of DNTPD, ADN, TBPe, NPB, HT1, and HT2 that are used for preparing the organic light emitting diode is shown as follows.

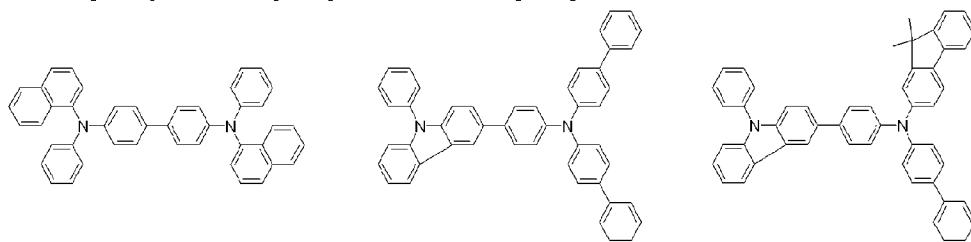
[746] [DNTPD] [ADN] [TBPe]

[747]



[748] [NPB] [HT1] [HT2]

[749]



[750] **Analysis and Characteristic Measurement of the Compounds**

[751] **Analysis of $^1\text{H-NMR}$ result**

[752] In order to structural analyze the intermediate M-1 to M-42 compounds of Examples 1 to 40, the molecular weight was measured using GC-MS or LC-MS, and $^1\text{H-NMR}$ was measured by dissolving the intermediate M-1 to M-42 compounds in a CD_2Cl_2 solvent or a CDCl_3 solvent and using 300 MHz NMR equipment.

[753] As an example of the analysis, FIG. 6 shows the $^1\text{H-NMR}$ result of A-414 according to Example 1, FIG. 7 shows the result of A-415 according to Example 2, FIG. 8 shows the result of A-9 according to Example 3, FIG. 9 shows the result of A-10 according to Example 4, FIG. 10 shows the result of A-11 according to Example 5, FIG. 11 shows the result of A-18 according to Example 6, FIG. 12 shows the result of A-19 according to Example 7, FIG. 13 shows the result of A-469 according to Example 27, FIG. 14 shows the result of A-470 according to Example 28, FIG. 15 shows the result of A-457 according to Example 29, FIG. 16 shows the result of A-416 according to Example 37, FIG. 17 shows the result of A-12 according to Example 38, and FIG. 18 shows the result of A-13 according to Example 39.

[754] **Fluorescent Characteristic Analysis**

[755] The compounds of the examples were dissolved in THF, and PL (photoluminescence) wavelength was measured using HITACHI F-4500 equipment to measure fluorescent characteristics. FIG. 19 shows the PL wavelength measurement results of Examples 3, 4, and 5.

[756] **Electrochemical Characteristic**

[757] The compounds of Examples 1, 2, 3, 4, and 5 were measured regarding electrochemical characteristics by using cyclic voltammetry equipment. The results are provided in Table 1.

[758] Table 1

[Table 1]

[Table]

Synthesis Example	Example 1A-414	Example 2A-415	Example 3A-9	Example 4A-10	Example 5A-11
HOMO (eV)	5.24	5.23	5.23	5.22	5.27
LUMO (eV)	2.16	2.17	2.16	2.15	2.17
Band gap (eV)	3.08	3.06	3.07	3.07	3.10

[759]

[760] Referring to Table 1, the compounds according to Examples 1 to 10 turned out to be able to be used as a hole transporting layer and an electron blocking layer.

[761] Thermal Characteristic

[762] Thermal decomposition temperature of the compounds synthesized according to Examples 1, 2, 3, 4, 5, 6, 7, 27, 28, 29, 37, 38, and 39 were measured by thermogravimetry (TGA) to show the thermal characteristics. The synthesized compounds were measured to determine glass transition temperature (Tg) by differential scanning calorimetry (DSC). The results are shown in the following Table 2.

[763] Table 2

[Table 2]

[Table]

Example	Material	Thermal decomposition temperature (°C)	Tg (°C)
Example 1	A-414	485	124
Example 2	A-415	460	133
Example 3	A-9	475	132
Example 4	A-10	522	128
Example 5	A-11	532	133
Example 6	A-18	506	137
Example 7	A-19	520	141
Example 27	A-469	503	122
Example 28	A-470	511	124
Example 29	A-457	546	125
Example 37	A-416	449	135
Example 38	A-12	516	125
Example 39	A-13	531	133

[764]

[765] Referring to Table 2, all of the compounds according to Example 1, 2, 3, 4, 5, 6, 7, 27, 28, 29, 37, 38, and 39 had excellent thermal stability, excellent thermal decomposition temperature of 400Å or higher, and Tg higher than 90Å. When it is used as a material for an organoelectric field light emitting diode (OLED), it may have good life-span characteristics. Also when it is used for preparing an organic light emitting diode with process heat, it may have excellent process stability.

[766]

Performance Measurement of Organic Light Emitting Diode

[767]

The organic light emitting elements of Examples 41 to 48 and Comparative Examples 1 to 3 were measured regarding current density and luminance changes depending on voltage change. In particular, the measurements were performed as follows. The results are shown in the following Table 2.

[768]

(1) Current density change measurement depending on voltage

[769]

The organic light emitting diodes were respectively measured regarding a current in a unit device by using a current-voltage meter (Keithley 2400) while their voltages were increased from 0V. Each current value was divided by area, measuring current density.

[770]

(2) Luminance change measurement depending on voltage change

[771]

The prepared organic light emitting diode was measured regarding luminance while

its voltage was increased from 0V to 10V by using a luminance meter (Minolta Cs-1000A).

[772] (3) Luminous efficiency measurement

[773] The organic light emitting diode were measured by using luminance, current density, and voltage measured from (1) and (2) regarding current efficiency (cd/A) at the same current density (10mA/cm²).

[774] Table 3

[Table 3]

[Table]

Device	Compound used in hole transport layer (HTL)	Voltage(V)	Color (EL color)	Efficiency (cd/A)	Half-life (h) at 1000cd/m ²
Example 41	A-10	6.3	Blue	6.1	2170
Example 42	A-11	6.3	Blue	6.2	2290
Example 43	A-18	6.2	Blue	5.9	1870
Example 44	A-19	6.2	Blue	6.0	1910
Example 45	A-335	6.9	Blue	5.2	1570
Example 46	A-340	6.8	Blue	5.7	1490
Example 47	A-12	6.1	Blue	6.2	2150
Example 48	A-13	6.1	Blue	6.1	2230
Comparative Example 1	NPB	7.1	Blue	4.9	1250
Comparative Example 2	HT1	6.6	Blue	5.7	1340
Comparative Example 3	HT2	6.4	Blue	5.9	1350

[775] Current density: 10mA/cm²

[776] Referring to the results of [Table 3], the materials that were used for preparing the hole transport layer (HTL) of Examples 41 to 48 turned out to decrease driving voltage of the organic light emitting diode but improved luminance and efficiency.

[777] Further, the half-life of Examples 41 to 48 were remarkably improved compared to the half-life of Comparative Examples 1 to 3, particularly, the organic light emitting diode of Example 42 had a half-life of 2290 hours, which was 1.8 times improved compared to that of Comparative Example 1 of 1250 hours. In terms of commercial

selling, the life-span of a device is one of the biggest issues for commercializing a device. Therefore, the devices according to the exemplary embodiments are shown as sufficient to be commercialized.

[778] While this invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims. Therefore, the aforementioned embodiments should be understood to be exemplary but not limiting the present invention in any way.

[779] **<Description of Symbols>**

[780] 100: organic photoelectric device 110: cathode

[781] 120: anode 105: organic thin film

[782] 130: emission layer 140: hole transport layer (HTL)

[783] 150: electron transport layer (ETL) 160: electron injection layer (EIL)

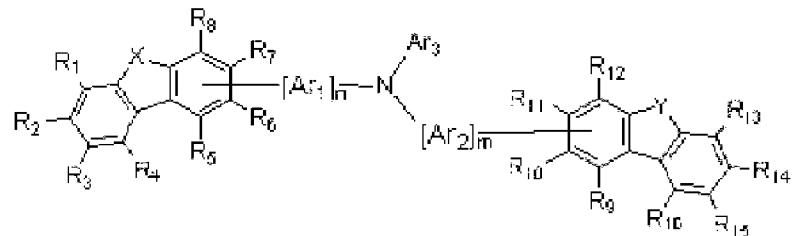
[784] 170: hole injection layer (HIL) 230: emission layer + electron transport layer (ETL)

Claims

[Claim 1]

A compound for an optoelectronic device represented by the following Chemical Formula 1:

[Chemical Formula 1]



wherein in Chemical Formula 1,

R₁ to R₁₆ are the same or different, and are independently selected from hydrogen, deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a carboxyl group, a ferrocenyl group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C2 to C30 heteroaryl group, a substituted or unsubstituted C1 to C20 alkoxy group, a substituted or unsubstituted C6 to C20 aryloxy group, a substituted or unsubstituted C3 to C40 silyloxy group, a substituted or unsubstituted C1 to C20 acyl group, a substituted or unsubstituted C2 to C20 alkoxy-carbonyl group, a substituted or unsubstituted C2 to C20 acyloxy group, a substituted or unsubstituted C2 to C20 acylamino group, a substituted or unsubstituted C2 to C20 alkoxycarbonyl amino group, a substituted or unsubstituted C7 to C20 aryloxycarbonyl amino group, a substituted or unsubstituted C1 to C20 sulfamoyl amino group, a substituted or unsubstituted C1 to C20 sulfonyl group, a substituted or unsubstituted C1 to C20 alkylthiol group, a substituted or unsubstituted C6 to C20 arylthiol group, a substituted or unsubstituted C1 to C20 heterocyclothiol group, a substituted or unsubstituted C1 to C20 ureide group, and a substituted or unsubstituted C3 to C40 silyl group,

at least one of R₁ to R₈ represents a bond with Ar₁,

at least one of R₉ to R₁₆ represents a bond with Ar₂,

at least one of R₁ to R₈ is optionally bound to Ar₁ through a sigma bond,

at least one of R₉ to R₁₆ is optionally bound to Ar₂ through a sigma bond,

X is selected from NR₁₇, O, S, and SO₂(O=S=O), wherein R₁₇ is a sub-

stituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group,

Y is selected from O, S, and SO₂(O=S=O),

Ar₁ and Ar₂ are the same or different, and are independently a substituted or unsubstituted C6 to C30 aryl group or a substituted or unsubstituted C2 to C30 heteroaryl group,

n is an integer ranging from 1 to 4,

m is an integer ranging from 0 to 4, and

Ar₃ is a substituted or unsubstituted C6 to C30 aryl group or a substituted or unsubstituted C2 to C30 heteroaryl group, provided that Ar₃ is not a substituted or unsubstituted carbazolyl group, a substituted or unsubstituted dibenzofuranyl group, or a substituted or unsubstituted dibenzothiophenyl group, and when X is NR₁₇, Ar₃ is not a fluorenyl group.

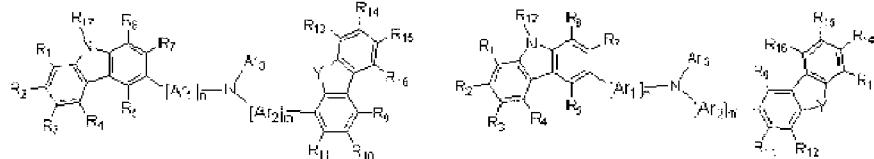
[Claim 2]

The compound of claim 1, wherein X is selected from NR₁₇, O, S, and SO₂(O=S=O), wherein R₁₇ is a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group, and the “substituted” aryl group or heteroaryl group refers to one substituted with at least one substituent selected from deuterium, a halogen, a cyano group, hydroxy group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C1 to C20 alkoxy group, a substituted or unsubstituted C3 to C40 silyl group, and a combination thereof.

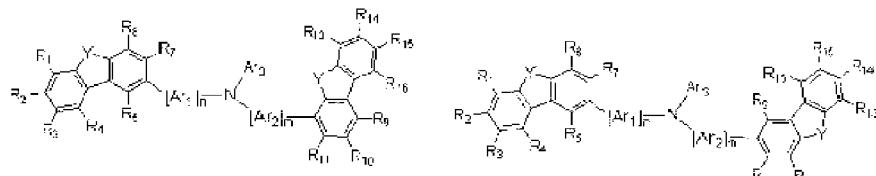
[Claim 3]

The compound of claim 1, wherein the compound for an optoelectronic device comprises one of the compounds represented by the following Chemical Formulae 2 to 7:

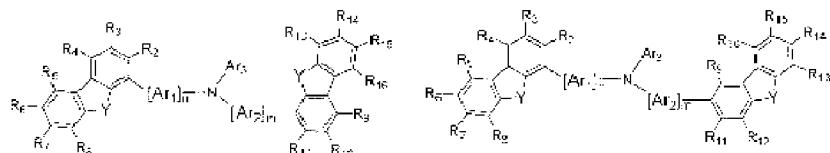
[Chemical Formula 2] [Chemical Formula 3]



[Chemical Formula 4] [Chemical Formula 5]



[Chemical Formula 6] [Chemical Formula 7]



wherein in Chemical Formulae 2 to 7,

R₁ to R₁₆ are the same or different, and are independently selected from hydrogen, deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a carboxyl group, a ferrocenyl group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, a substituted or unsubstituted C2 to C30 heteroaryl group, a substituted or unsubstituted C1 to C20 alkoxy group, a substituted or unsubstituted C6 to C20 aryloxy group, a substituted or unsubstituted C3 to C40 silyloxy group, a substituted or unsubstituted C1 to C20 acyl group, a substituted or unsubstituted C2 to C20 alkoxy-carbonyl group, a substituted or unsubstituted C2 to C20 acyloxy group, a substituted or unsubstituted C2 to C20 acylamino group, a substituted or unsubstituted C2 to C20 alkoxy carbonyl amino group, a substituted or unsubstituted C7 to C20 aryloxycarbonyl amino group, a substituted or unsubstituted C1 to C20 sulfamoyl amino group, a substituted or unsubstituted C1 to C20 sulfonyl group, a substituted or unsubstituted C1 to C20 alkylthiol group, a substituted or unsubstituted C6 to C20 arylthiol group, a substituted or unsubstituted C1 to C20 heterocyclothiol group, a substituted or unsubstituted C1 to C20 ureide group, and a substituted or unsubstituted C3 to C40 silyl group,

R₁₇ is a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C6 to C30 aryl group, or a substituted or unsubstituted C2 to C30 heteroaryl group,

Y is selected from O, S, and SO₂(O=S=O),

Ar₁ and Ar₂ are the same or different, and are independently a substituted or unsubstituted C6 to C30 aryl group or a substituted or unsubstituted C2 to C30 heteroaryl group,

n is an integer ranging from 1 to 4,

m is an integer ranging from 0 to 4, and

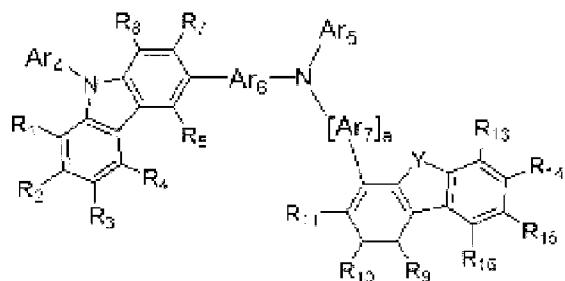
Ar₃ is a substituted or unsubstituted C6 to C30 aryl group or a substituted or unsubstituted C2 to C30 heteroaryl group,

provided that Ar₃ is not a substituted or unsubstituted carbazolyl group, a substituted or unsubstituted dibenzofuranyl group, or a substituted or unsubstituted dibenzothiophenyl group.

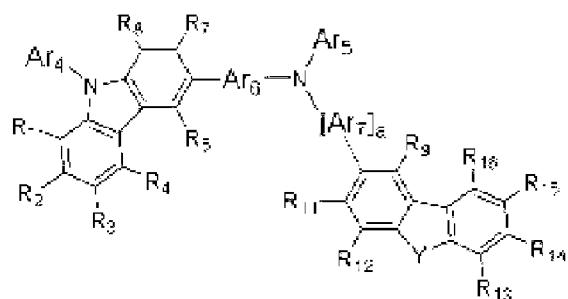
[Claim 4]

The compound of claim 1, wherein the compound for an optoelectronic device comprises one of the compounds represented by the following Chemical Formulae 8 or 9:

[Chemical Formula 8]



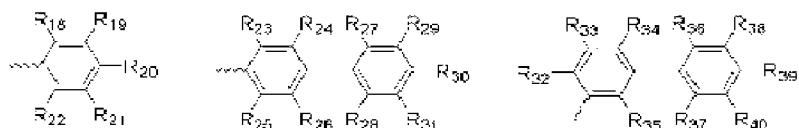
[Chemical Formula 9]



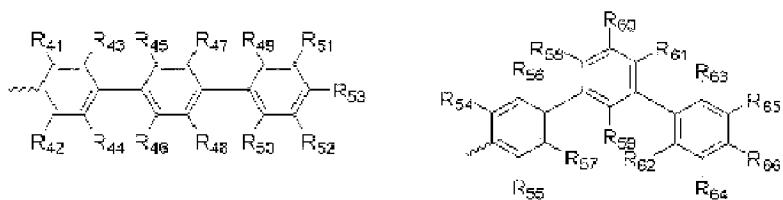
wherein in Chemical Formulae 8 and 9,

Ar₄ and Ar₅ are the same or different, and are independently selected from the substituent represented by the following Chemical Formulae 10 to 18,

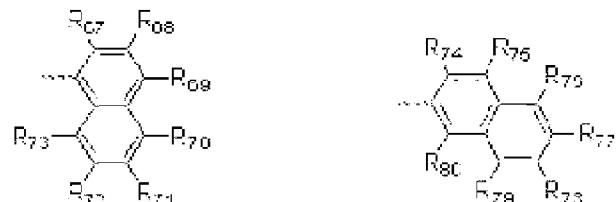
[Chemical Formula 10] [Chemical Formula 11] [Chemical Formula 12]



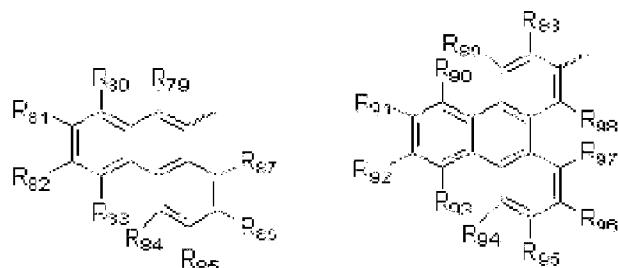
[Chemical Formula 13] [Chemical Formula 14]



[Chemical Formula 15] [Chemical Formula 16]



[Chemical Formula 17] [Chemical Formula 18]



R₁ to R₅, R₇ to R₁₆, and R₁₈ to R₉₈ are the same or different, and are independently selected from hydrogen, deuterium, a halogen, a cyano group, a hydroxyl group, an amino group, a substituted or unsubstituted C1 to C20 amine group, a nitro group, a substituted or unsubstituted C1 to C20 alkyl group, a substituted or unsubstituted C1 to C20 alkoxy group, or a substituted or unsubstituted C3 to C40 silyl group, Ar₆ and Ar₇ are the same or different, and are independently a substituent selected from the above Chemical Formulae 10 to 18, and at least one of R₁₈ to R₉₈ is bound to an adjacent atom, and a is 0 or 1.

[Claim 5]

The compound of claim 1, wherein Ar₃ is selected from a substituted or unsubstituted phenyl group, a substituted or unsubstituted naphthyl group, a substituted or unsubstituted anthracenyl group, a substituted or unsubstituted phenanthryl group, a substituted or unsubstituted naphthacenyl group, a substituted or unsubstituted pyrenyl group, a substituted or unsubstituted biphenylyl group, a substituted or unsubstituted p-terphenyl group, a substituted or unsubstituted m-terphenyl group, a substituted or unsubstituted chrysenyl group, a substituted or unsubstituted triperylene group, a substituted or unsubstituted

perylenyl group, a substituted or unsubstituted indenyl group, a substituted or unsubstituted furanyl group, a substituted or unsubstituted thiophenyl group, a substituted or unsubstituted pyrrolyl group, a substituted or unsubstituted pyrazolyl group, a substituted or unsubstituted imidazolyl group, a substituted or unsubstituted triazolyl group, a substituted or unsubstituted oxazolyl group, a substituted or unsubstituted thiazolyl group, a substituted or unsubstituted oxadiazolyl group, a substituted or unsubstituted thiadiazolyl group, a substituted or unsubstituted pyridyl group, a substituted or unsubstituted pyrimidinyl group, a substituted or unsubstituted pyrazinyl group, a substituted or unsubstituted triazinyl group, a substituted or unsubstituted benzofuranyl group, a substituted or unsubstituted benzothiophenyl group, a substituted or unsubstituted benzimidazolyl group, a substituted or unsubstituted indolyl group, a substituted or unsubstituted quinolinyl group, a substituted or unsubstituted isoquinolinyl group, a substituted or unsubstituted quinazolinyl group, a substituted or unsubstituted quinoxalinyl group, a substituted or unsubstituted naphthydinyl group, a substituted or unsubstituted benzoxazinyl group, a substituted or unsubstituted acridinyl group, a substituted or unsubstituted phenazinyl group, a substituted or unsubstituted phenothiazinyl group, or a substituted or unsubstituted phenoxazinyl group.

[Claim 6]

The compound of claim 4, wherein Ar₄ is selected from a substituent represented by the above Formulae 10 to 18, and at least one of the substituents of R₁₈ to R₉₈ that is selected to Ar₄ is not hydrogen.

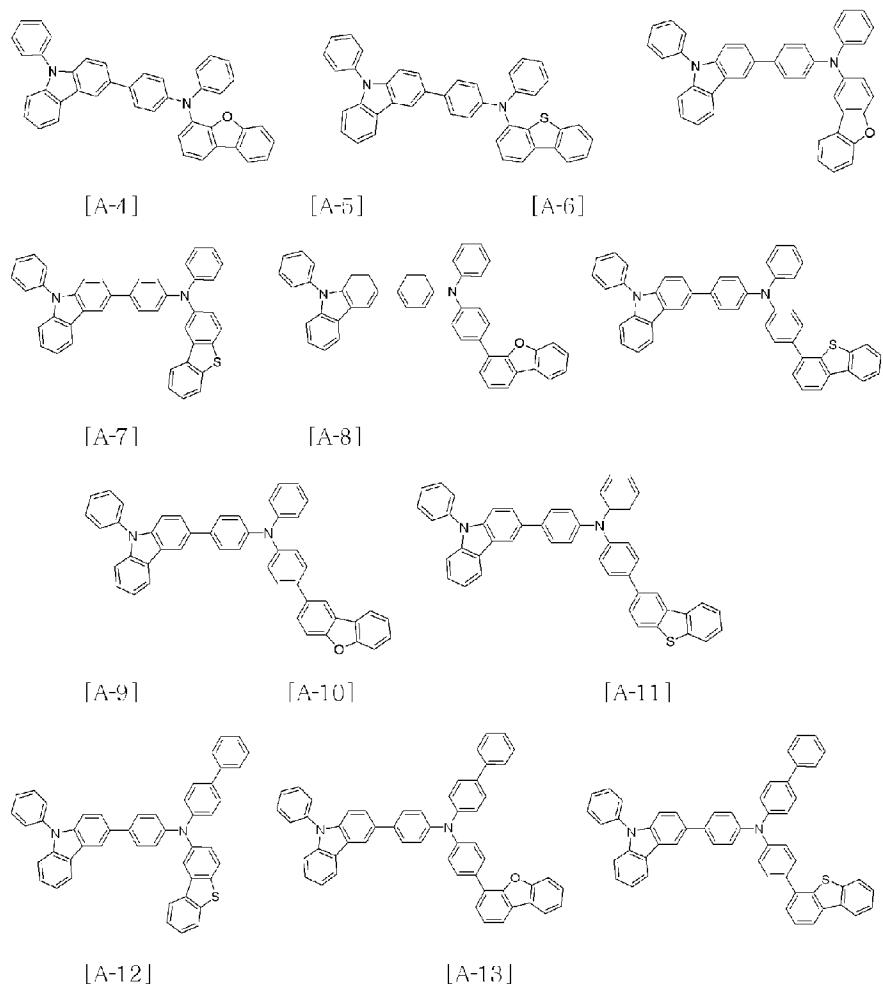
[Claim 7]

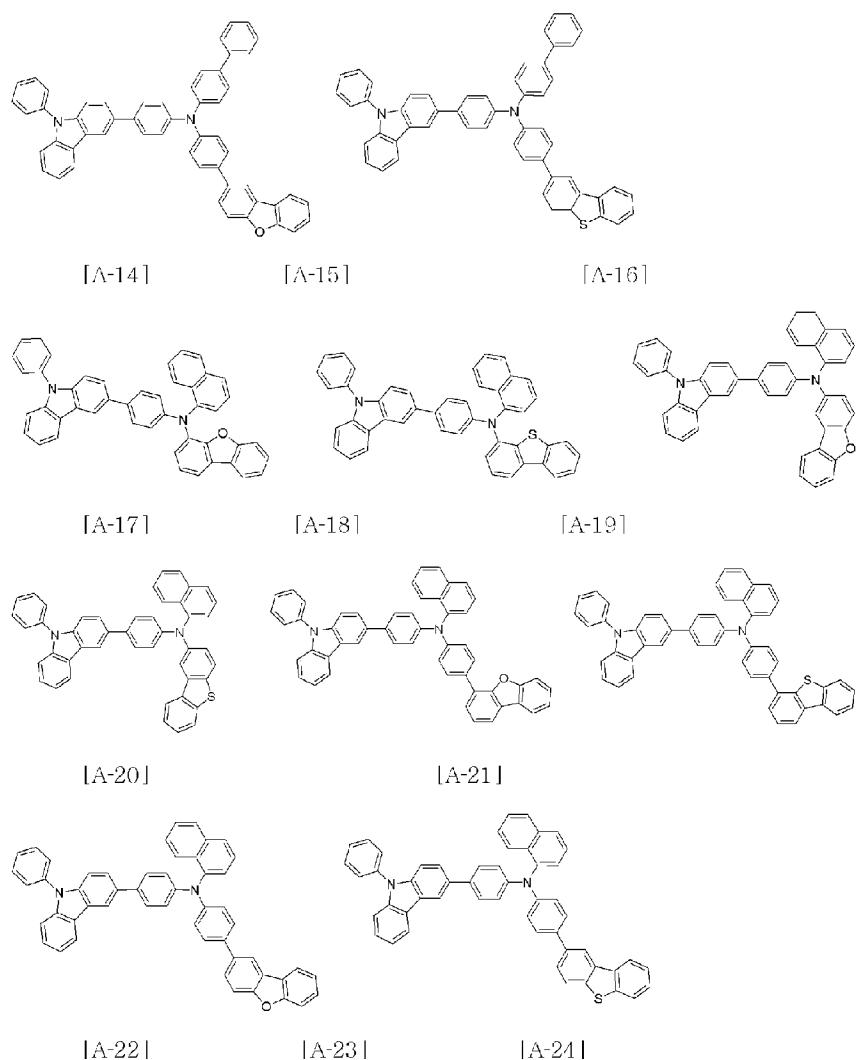
A compound for an optoelectronic device represented by the following Chemical Formulae A-1 to A-305, A-414 to A-416, A-457, A-458, or A-469 to A-473.

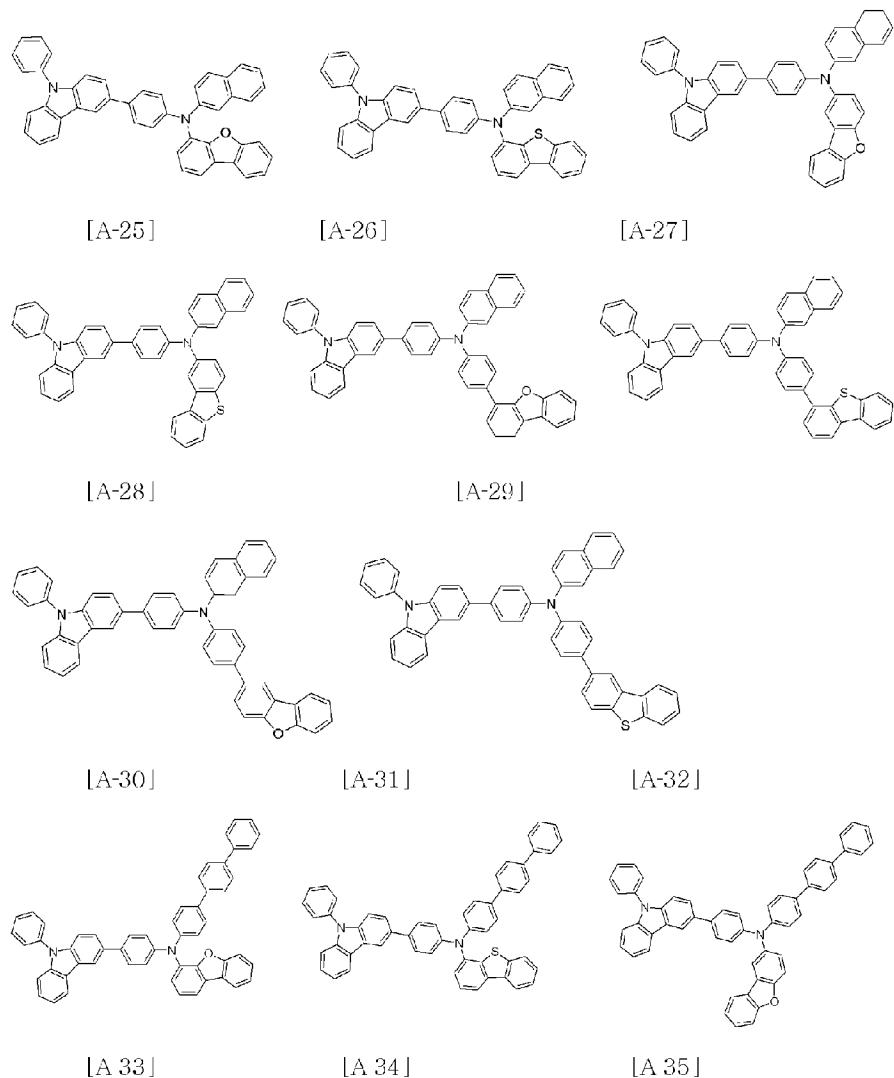
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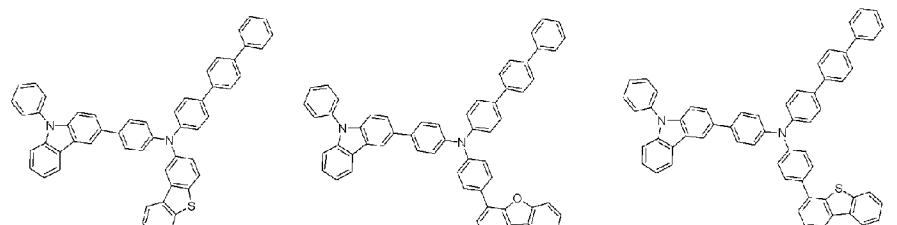
[A-2]

[A-3]



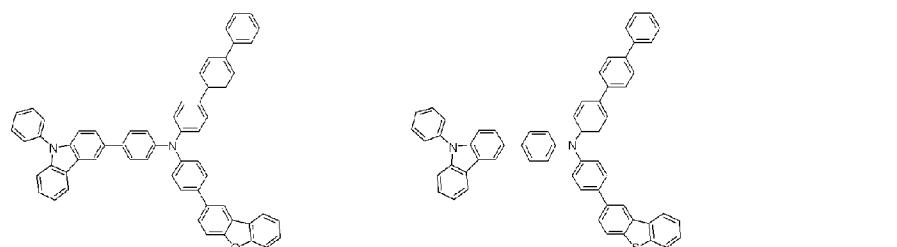






[A-36]

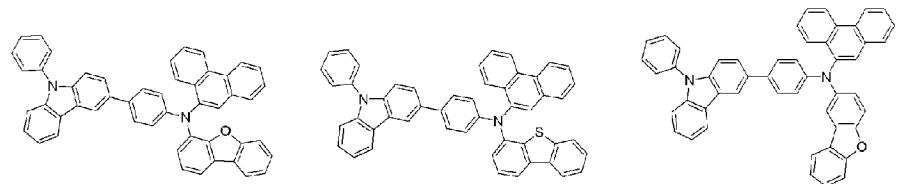
[A-37]



[A-38]

[A-39]

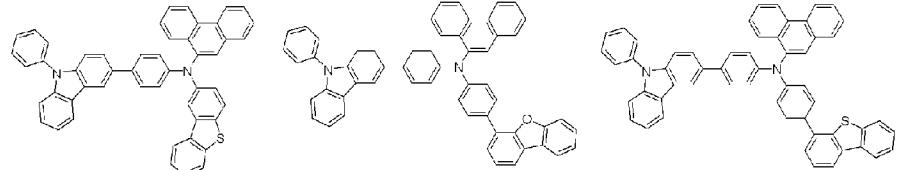
[A-40]



[A-41]

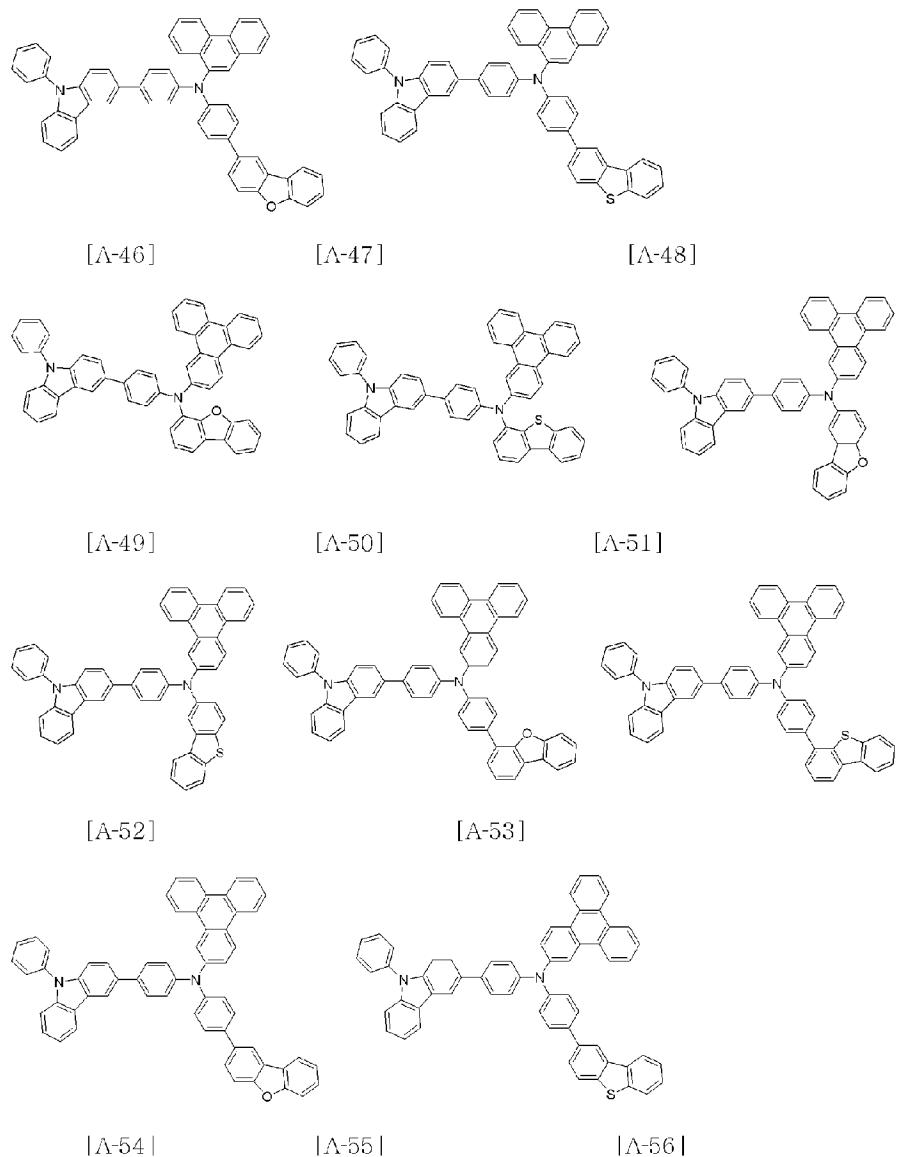
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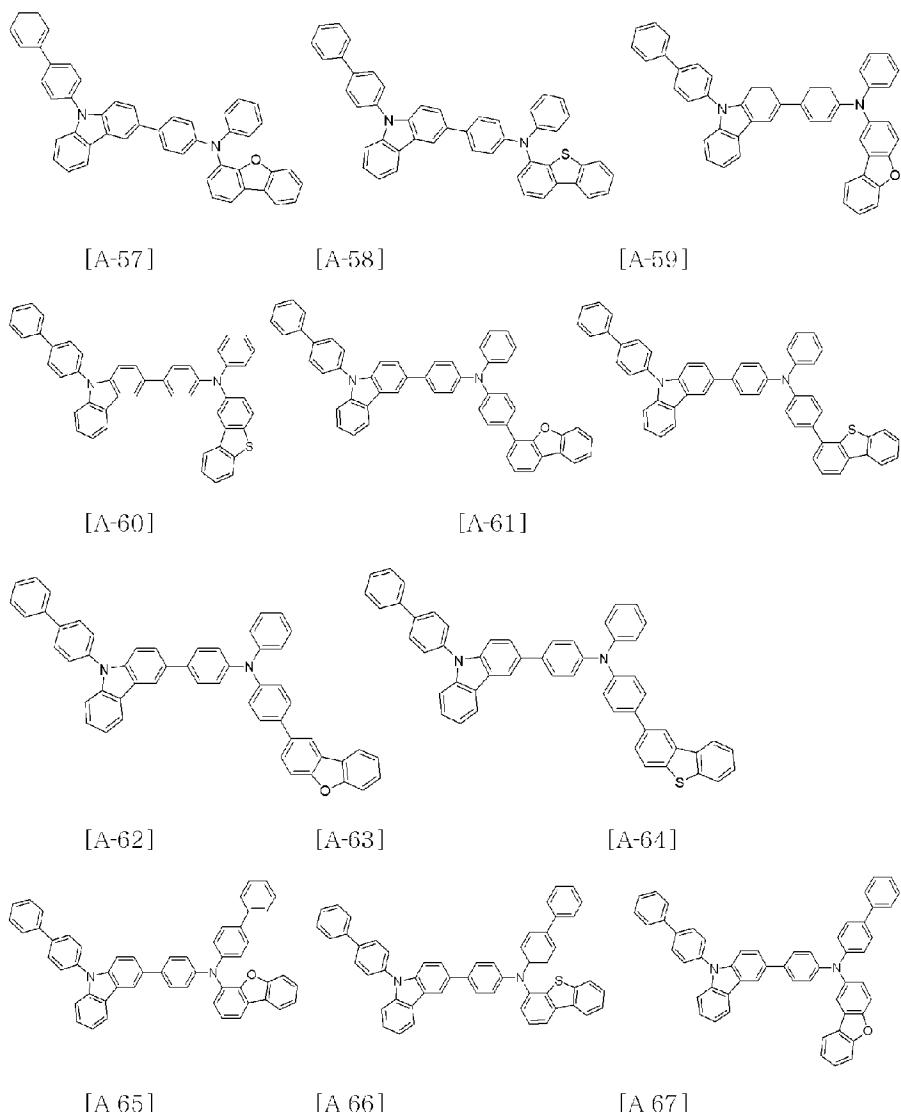
[A-43]

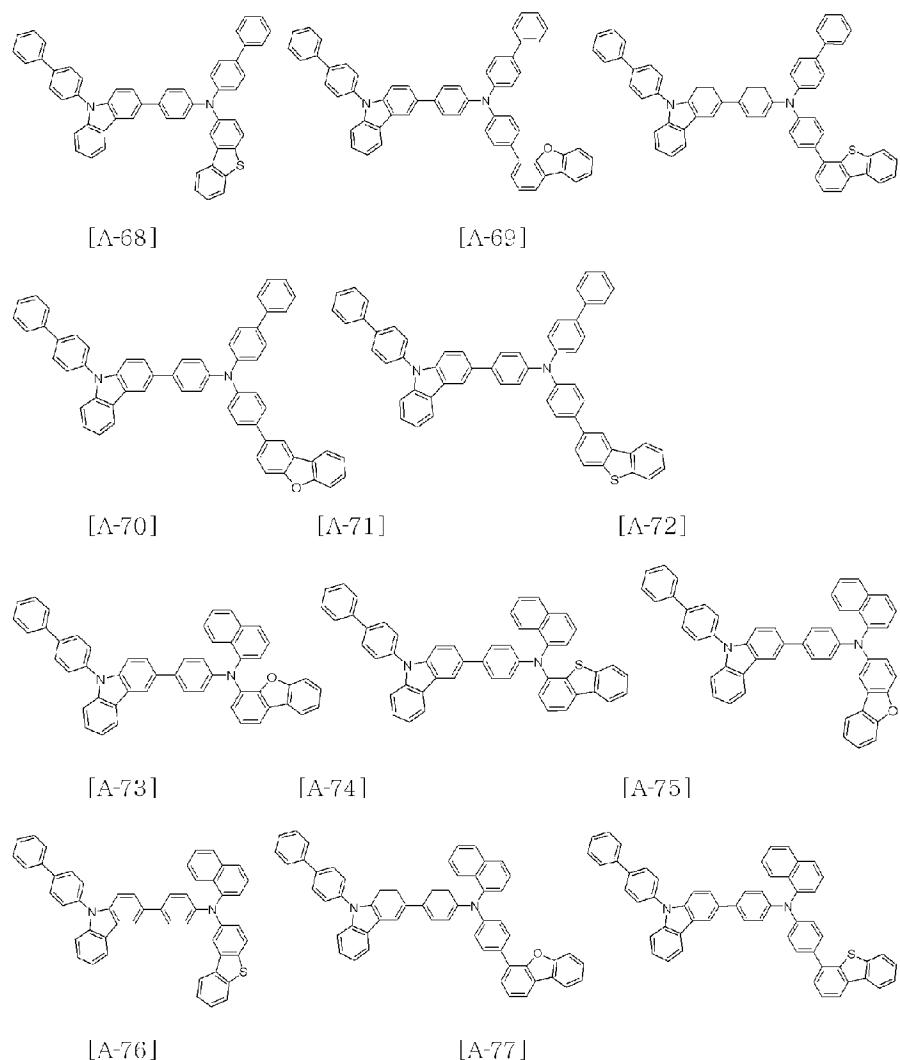


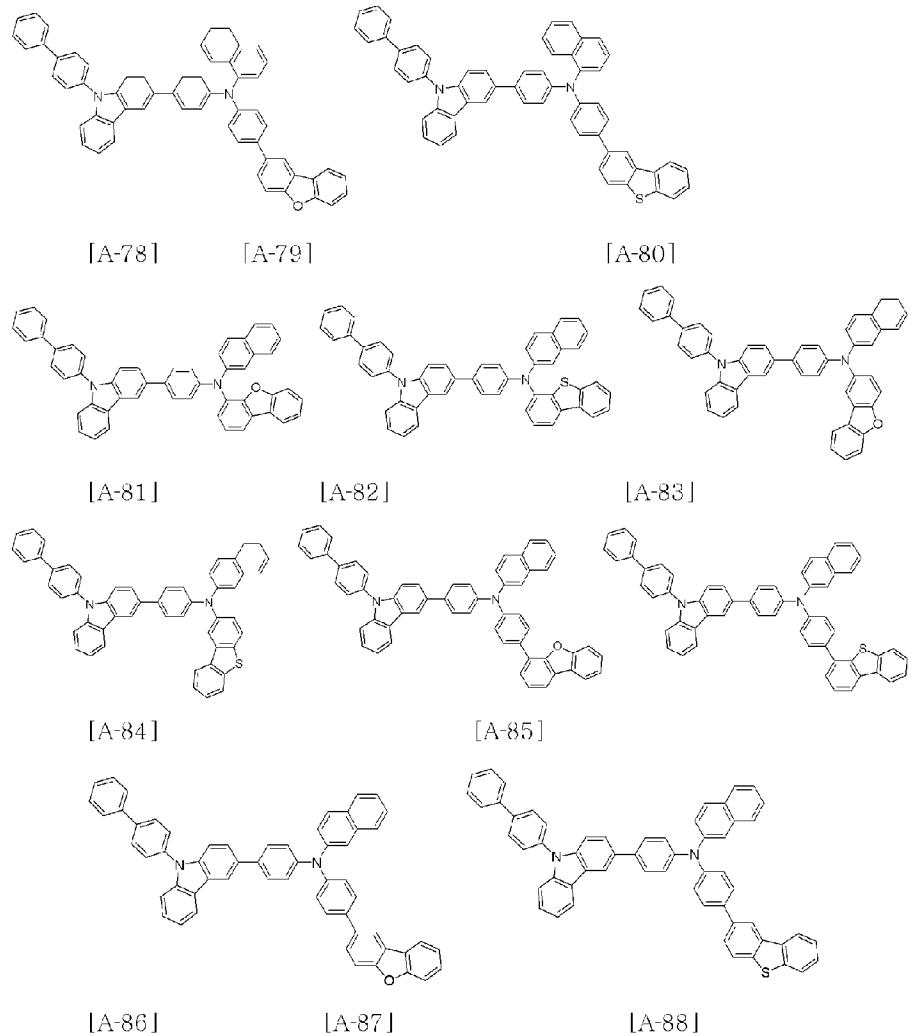
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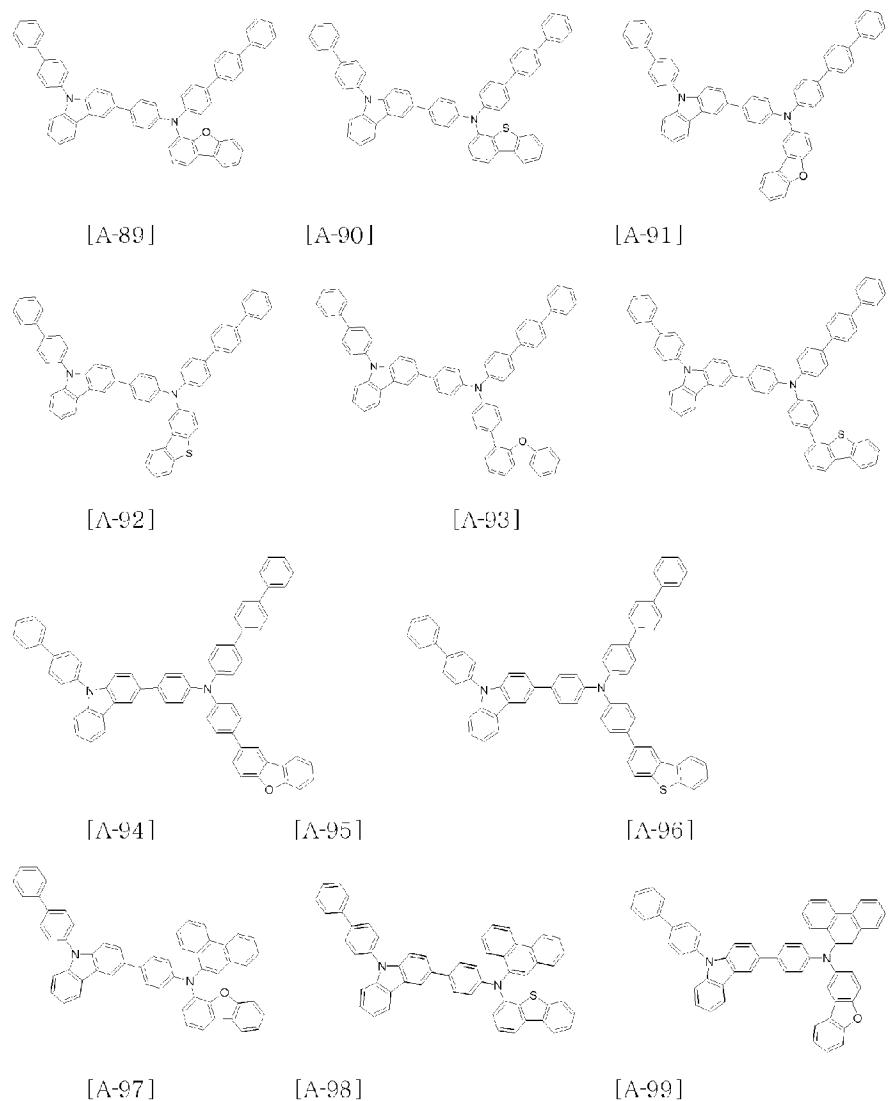
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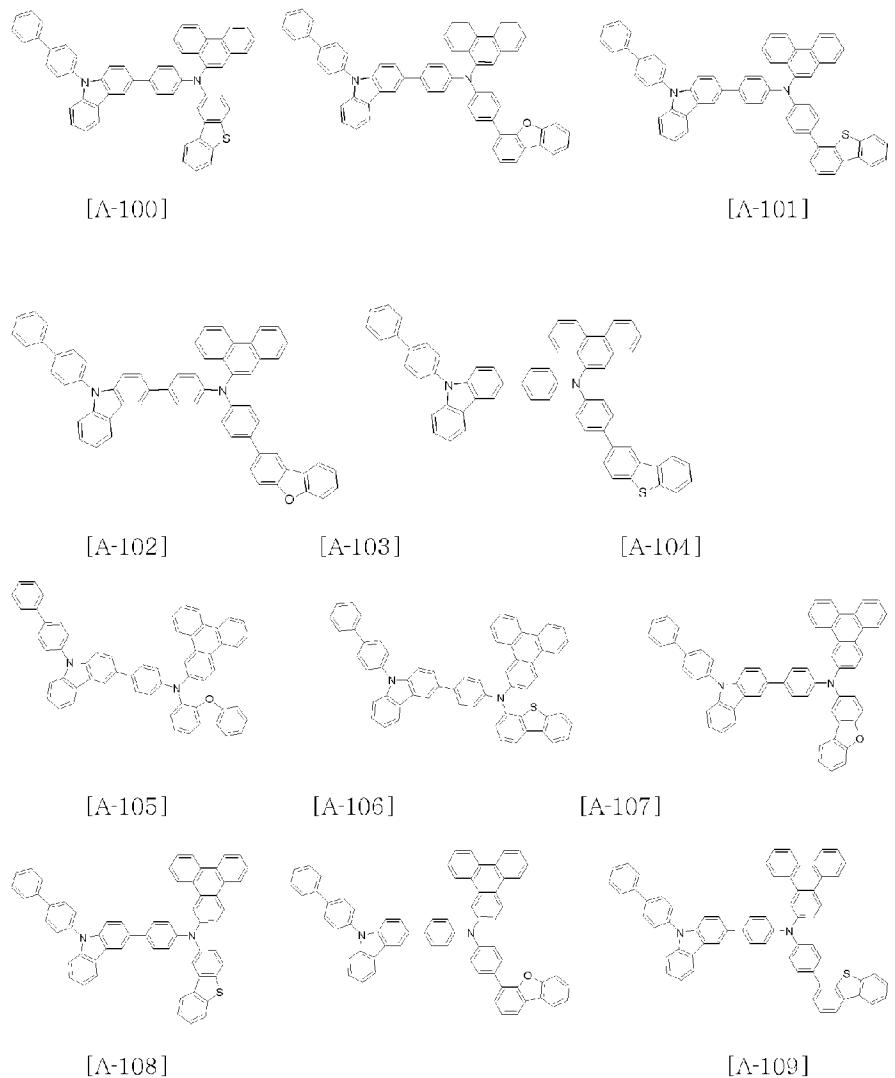


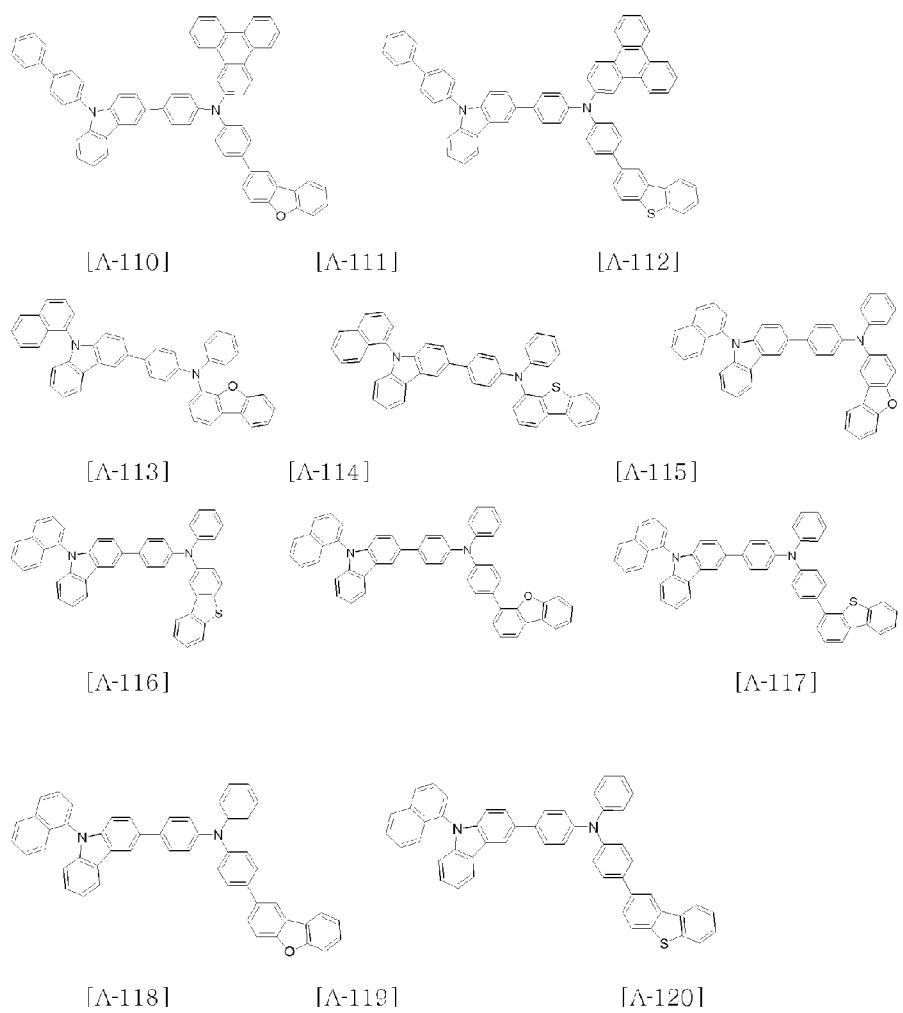


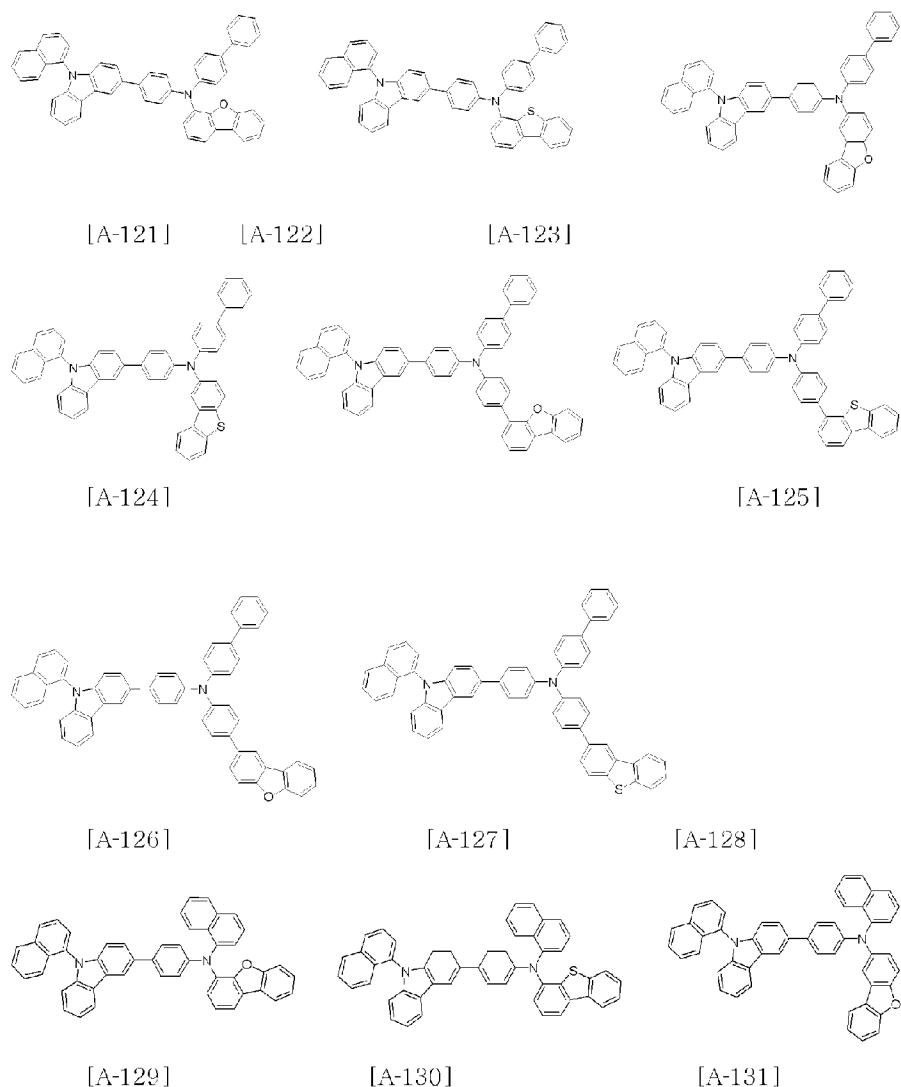


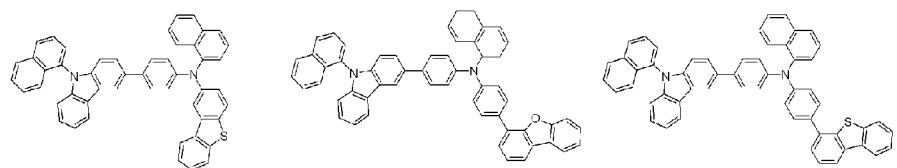






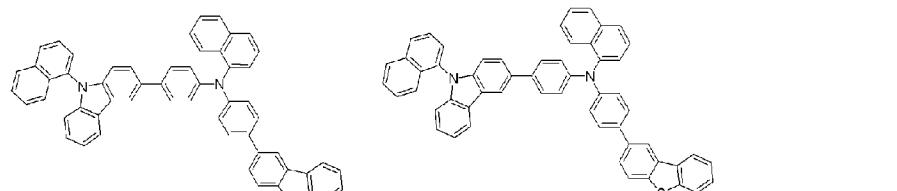






[A-132]

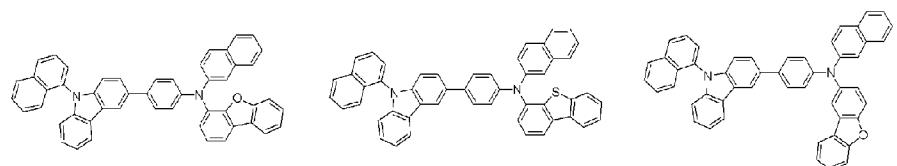
[A-133]



[A-134]

[A-135]

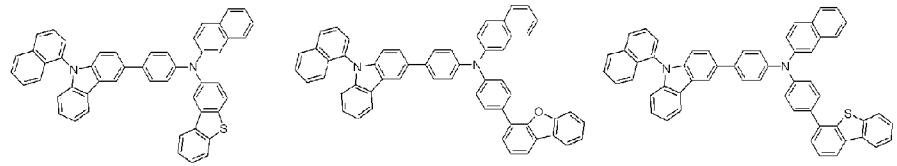
[A-136]



[A-137]

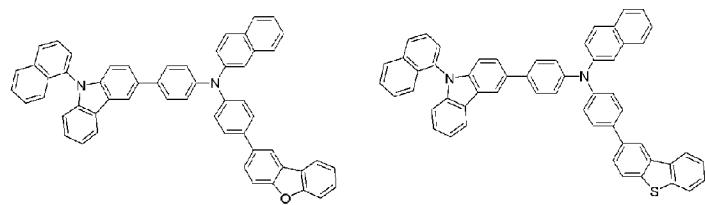
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[A-139]

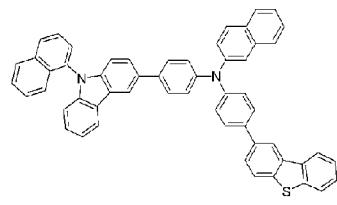


[A-140]

[A-141]

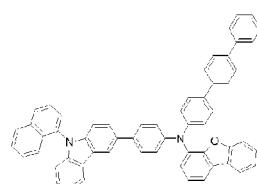


[A-142]

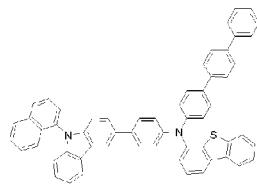


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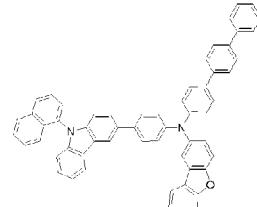
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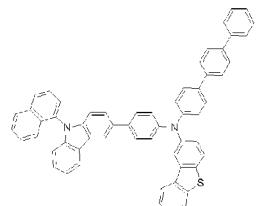
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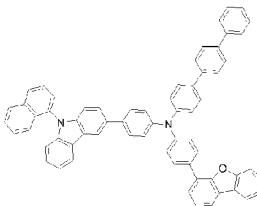
[A-146]



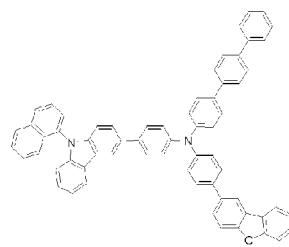
[A-147]



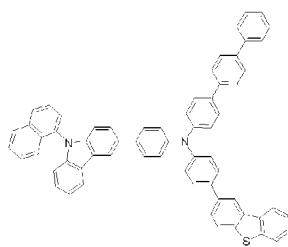
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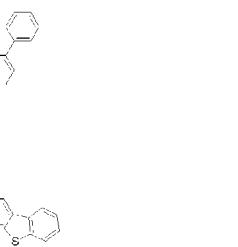
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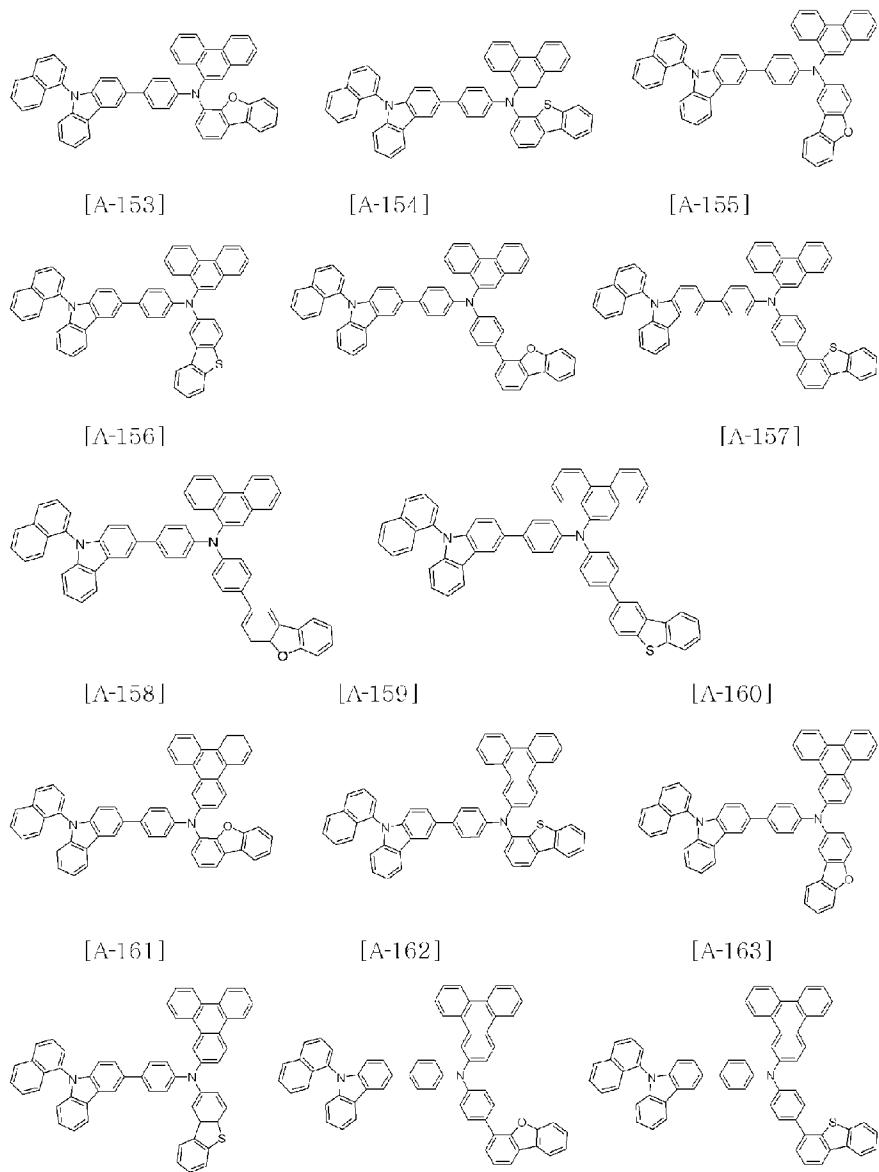
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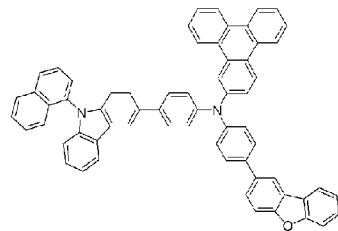
[A-151]



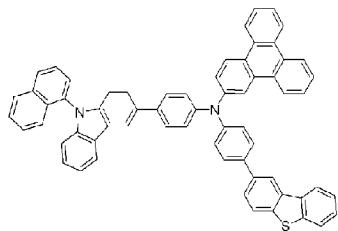
[A-152]



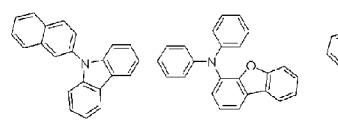
[A-164]



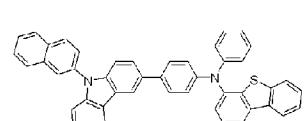
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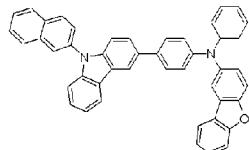
[A 166]



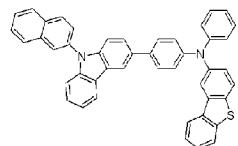
[A 167]



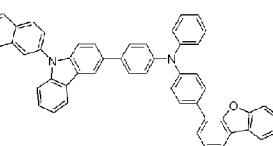
[A 168]



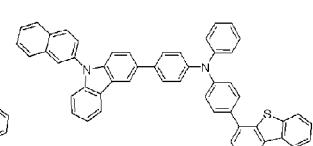
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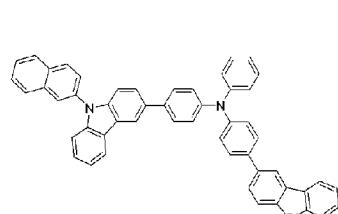
[A-170]



[A-171]

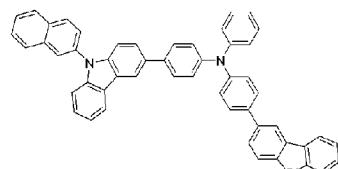


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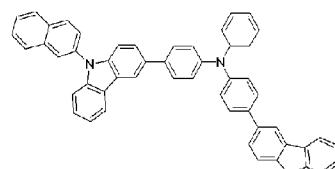


[A-173]

[A-174]

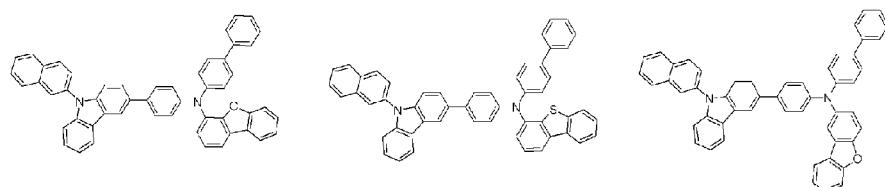


[A-175]



[A-176]

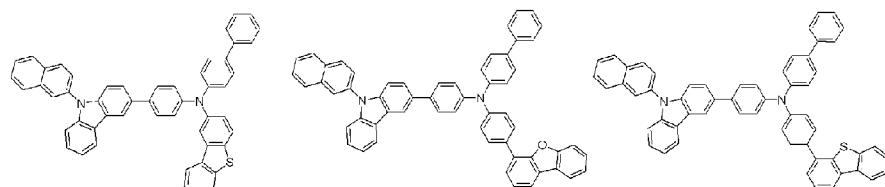
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[A-177]

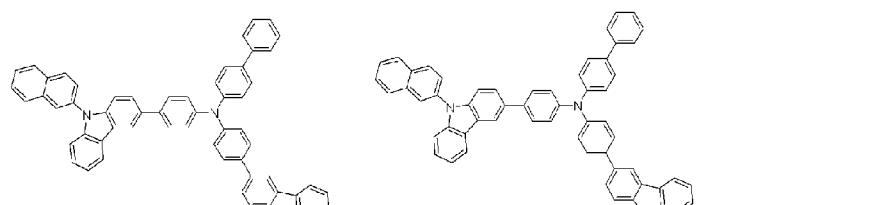
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[A-179]



[A-180]

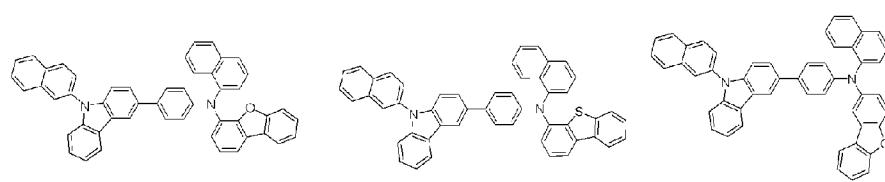
[A-181]



[A-182]

[A-183]

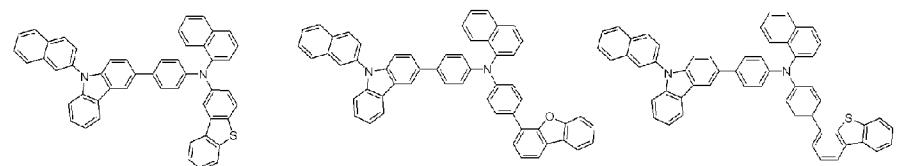
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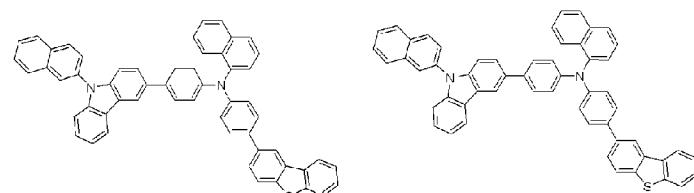
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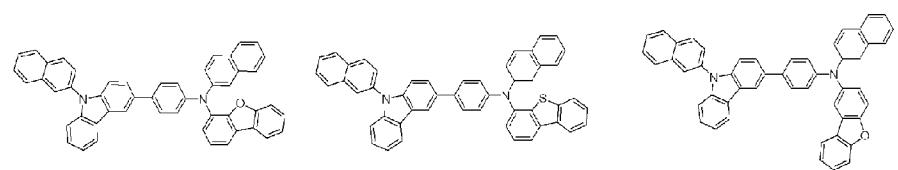
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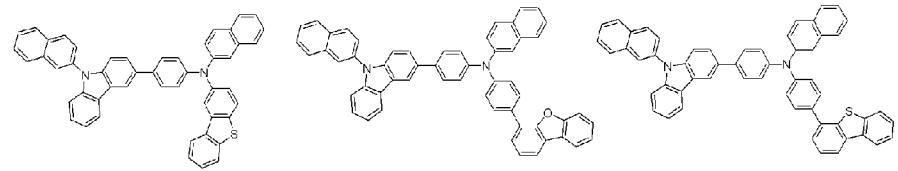
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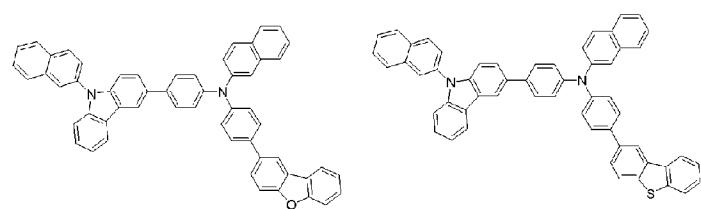
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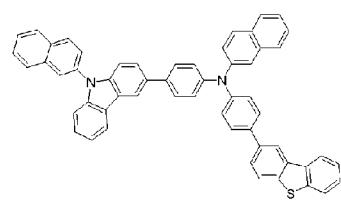


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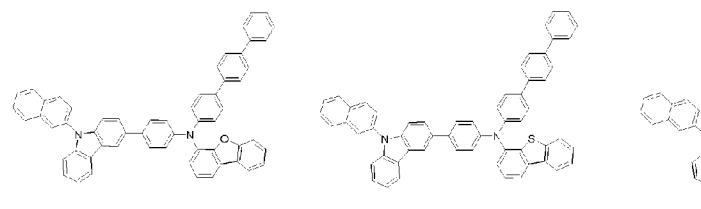


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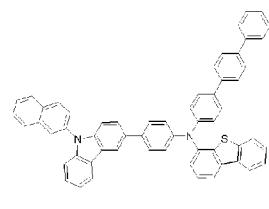


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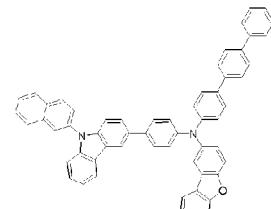
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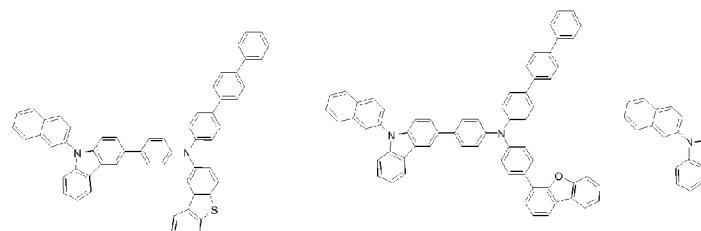
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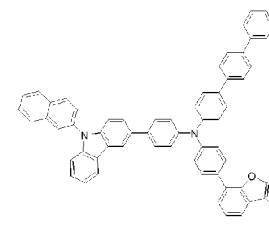
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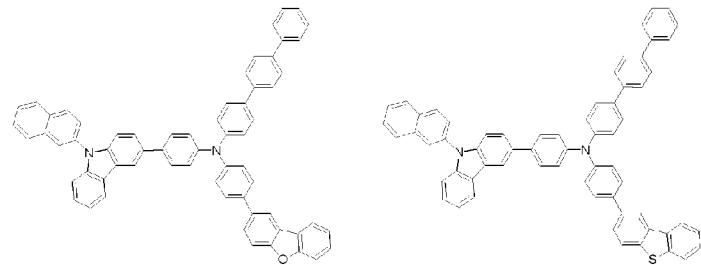
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[A-204]



[A-205]



[A 206]

[A 207]

[A 208]

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[A-213]

[A-214]

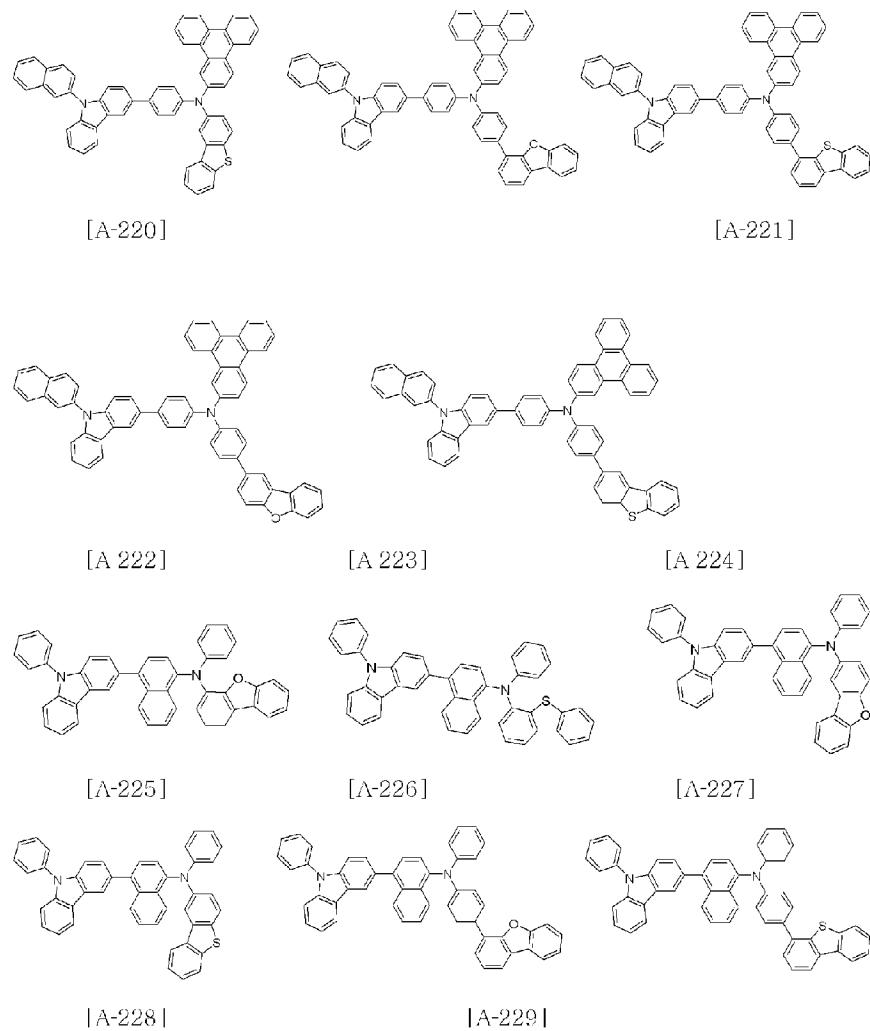
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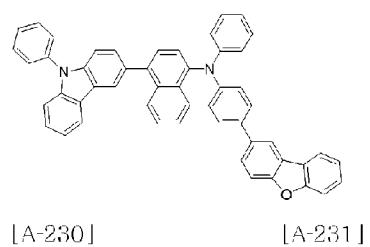
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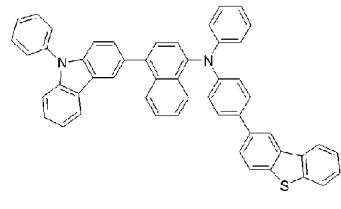
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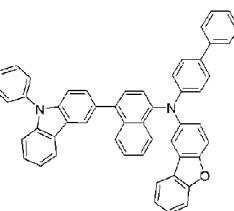




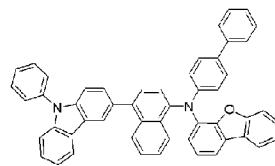
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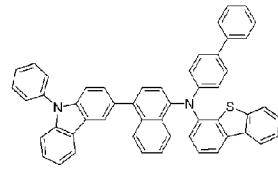
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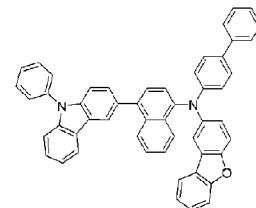
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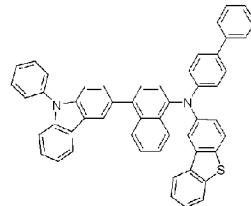
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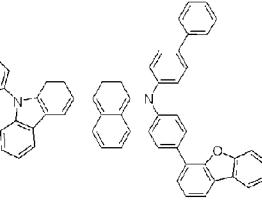
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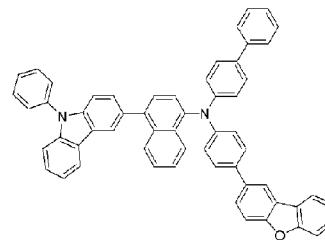
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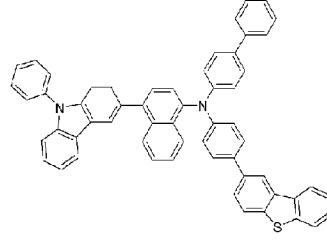
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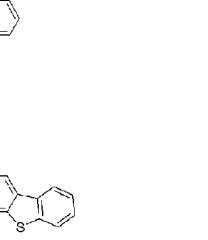
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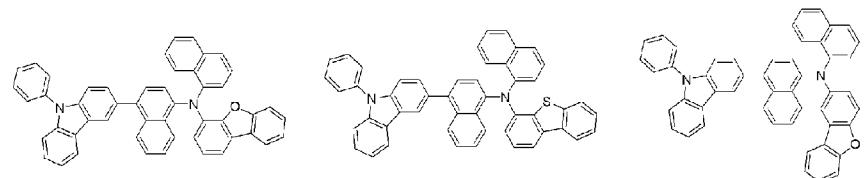
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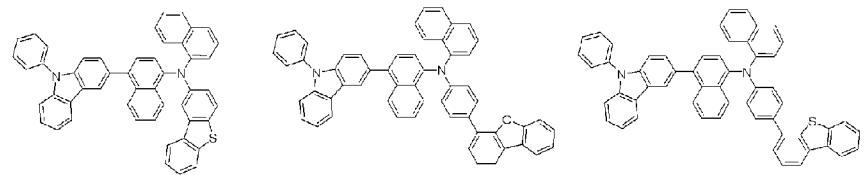
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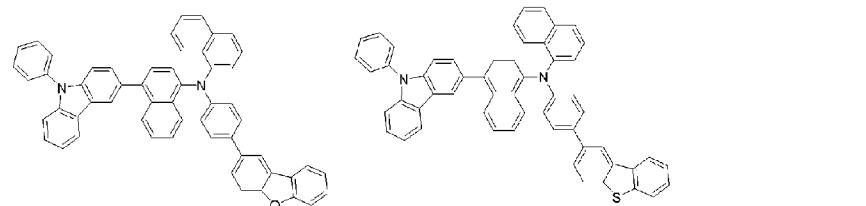
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[A-243]



[A-244]

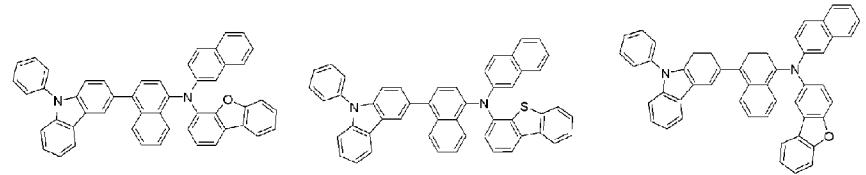
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[A-247]

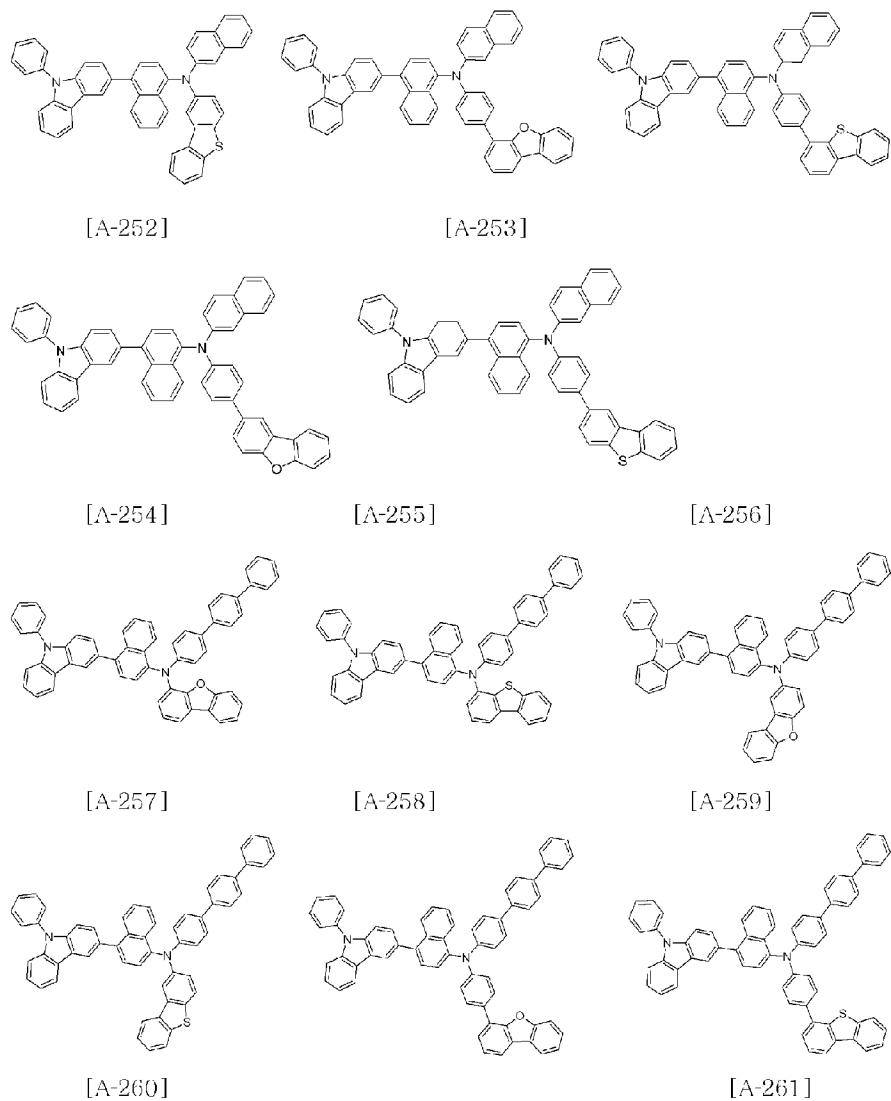
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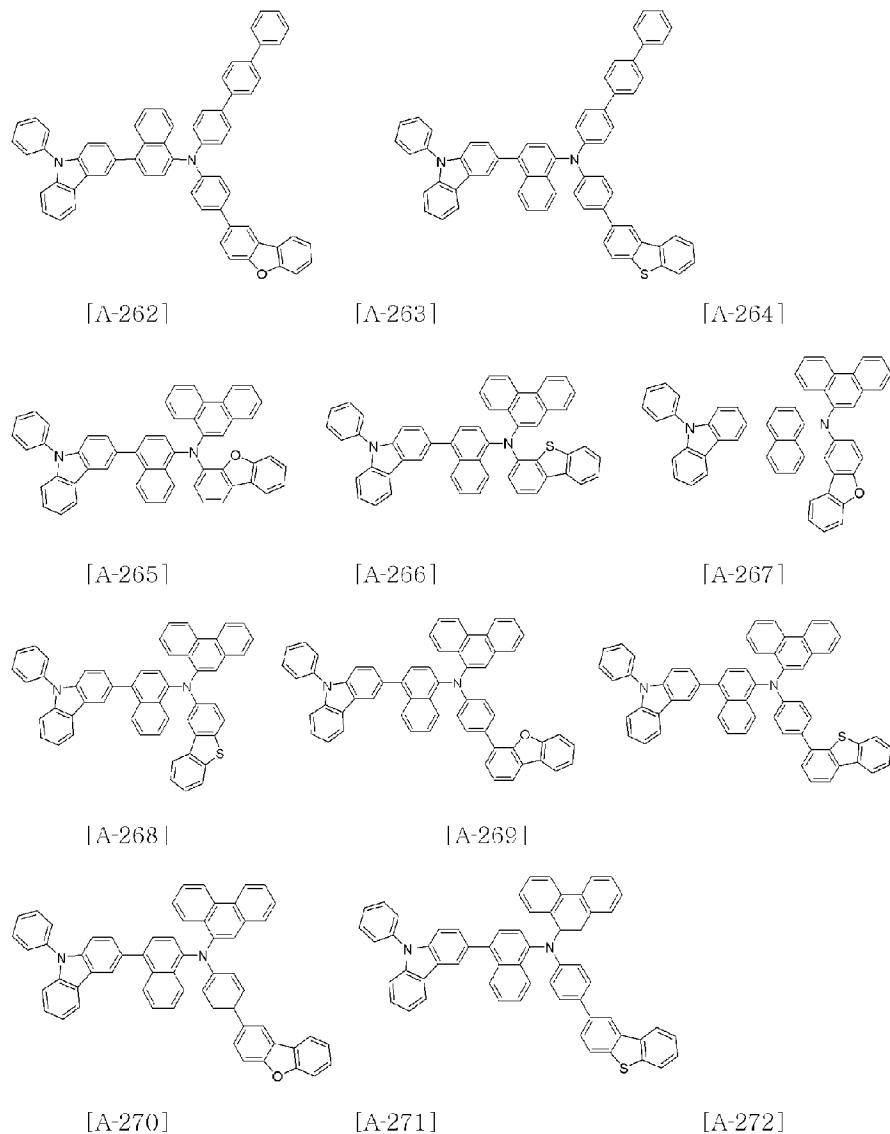


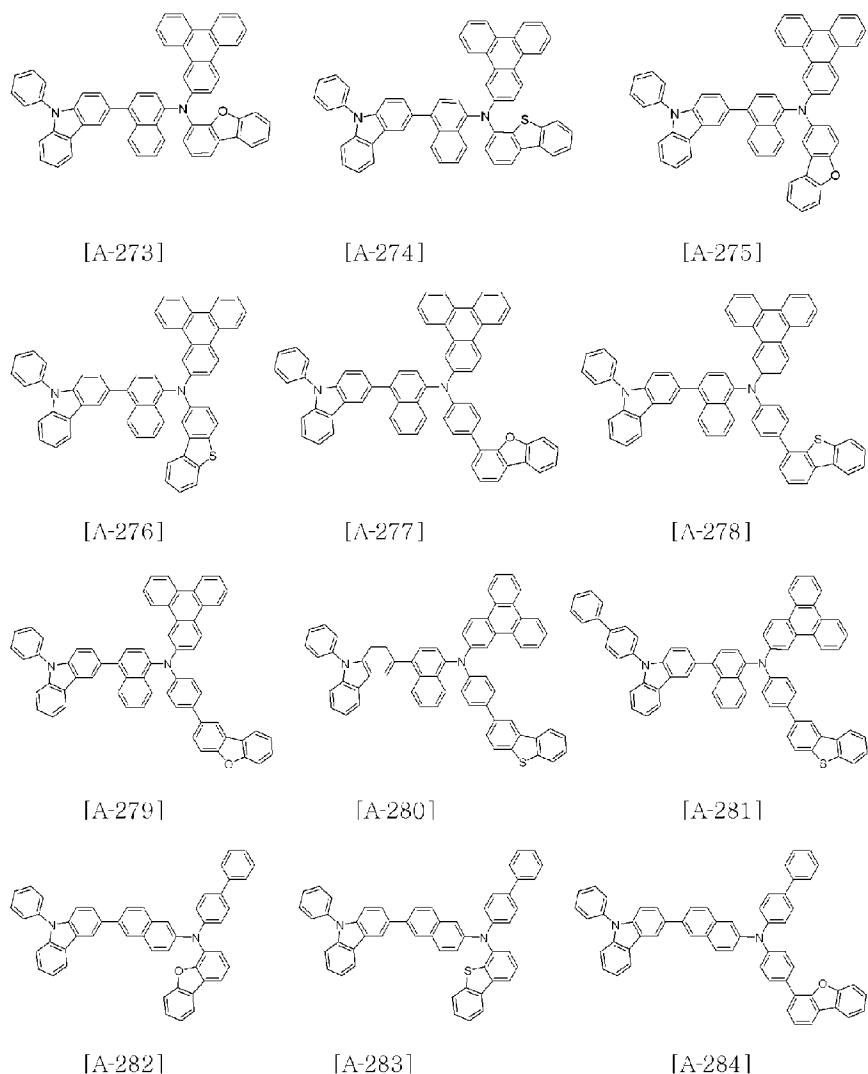
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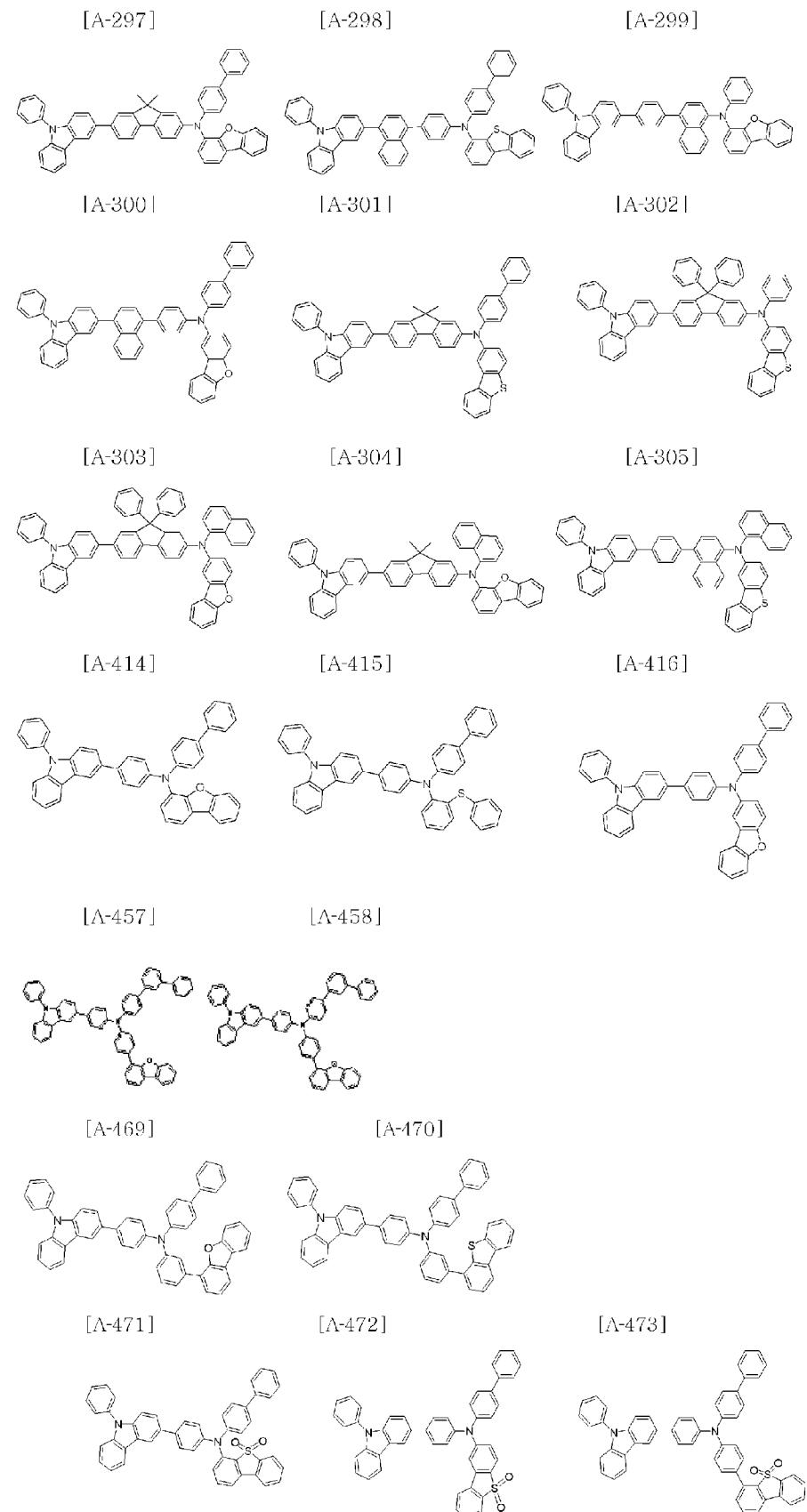
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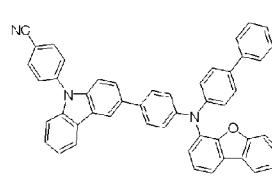


[Claim 8]

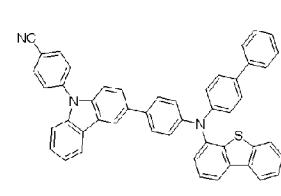
A compound for an optoelectronic device represented by the following

Chemical Formulae A-417 to A-456, or A-459 to A-468.

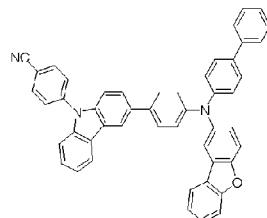
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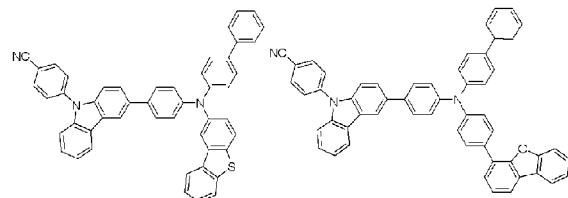
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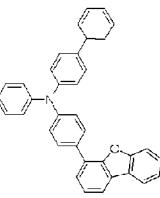
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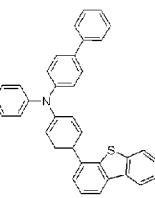
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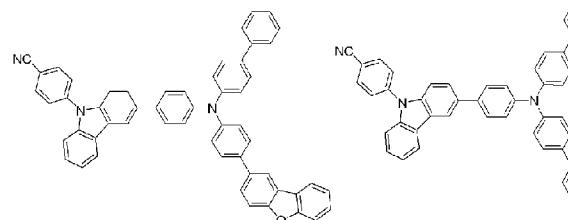
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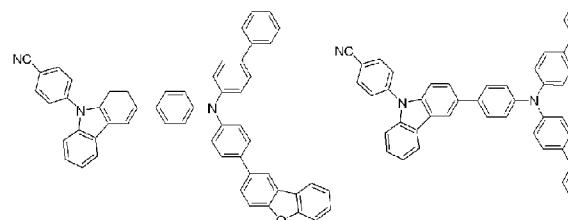
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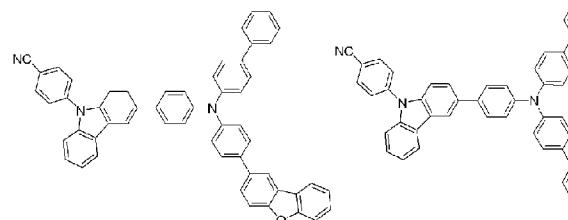
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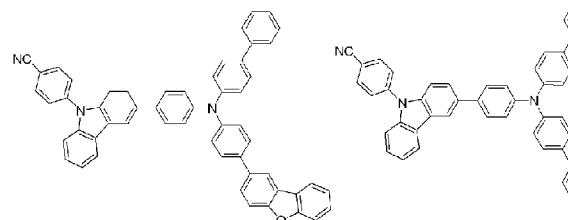
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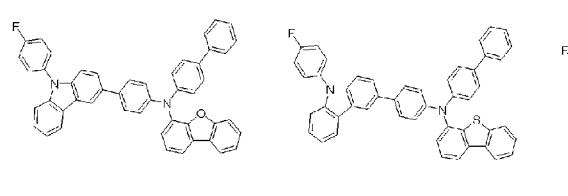
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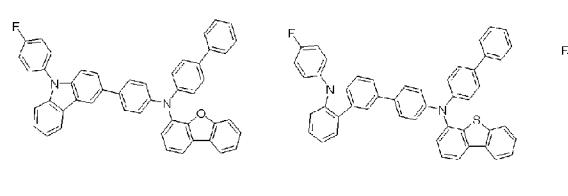
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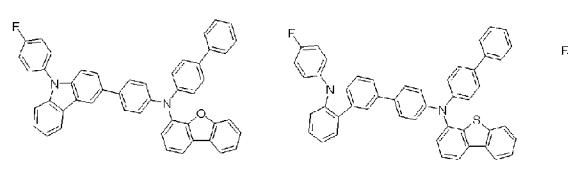
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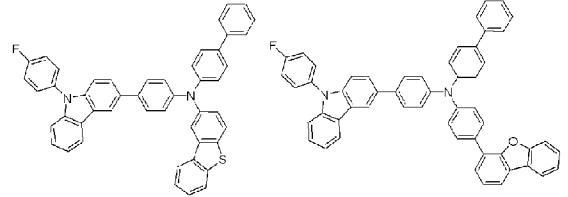
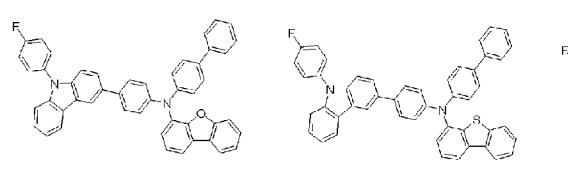
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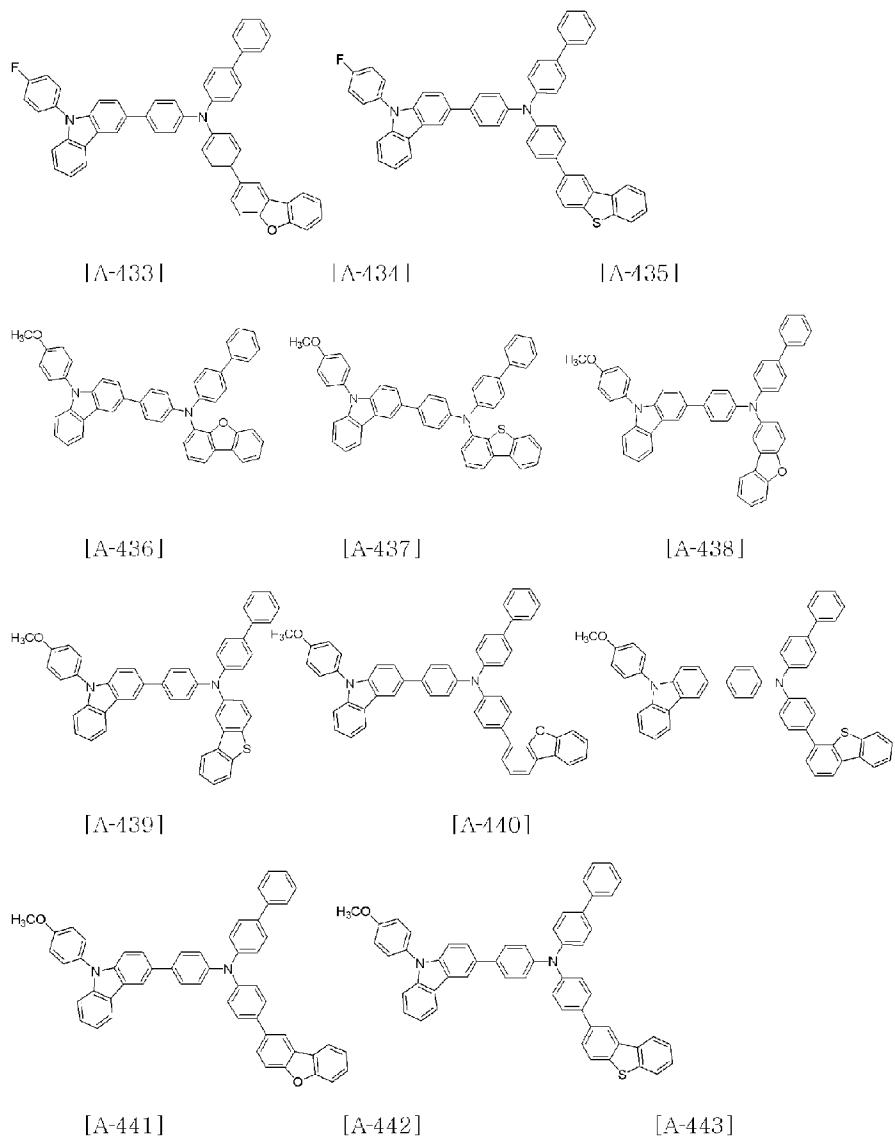


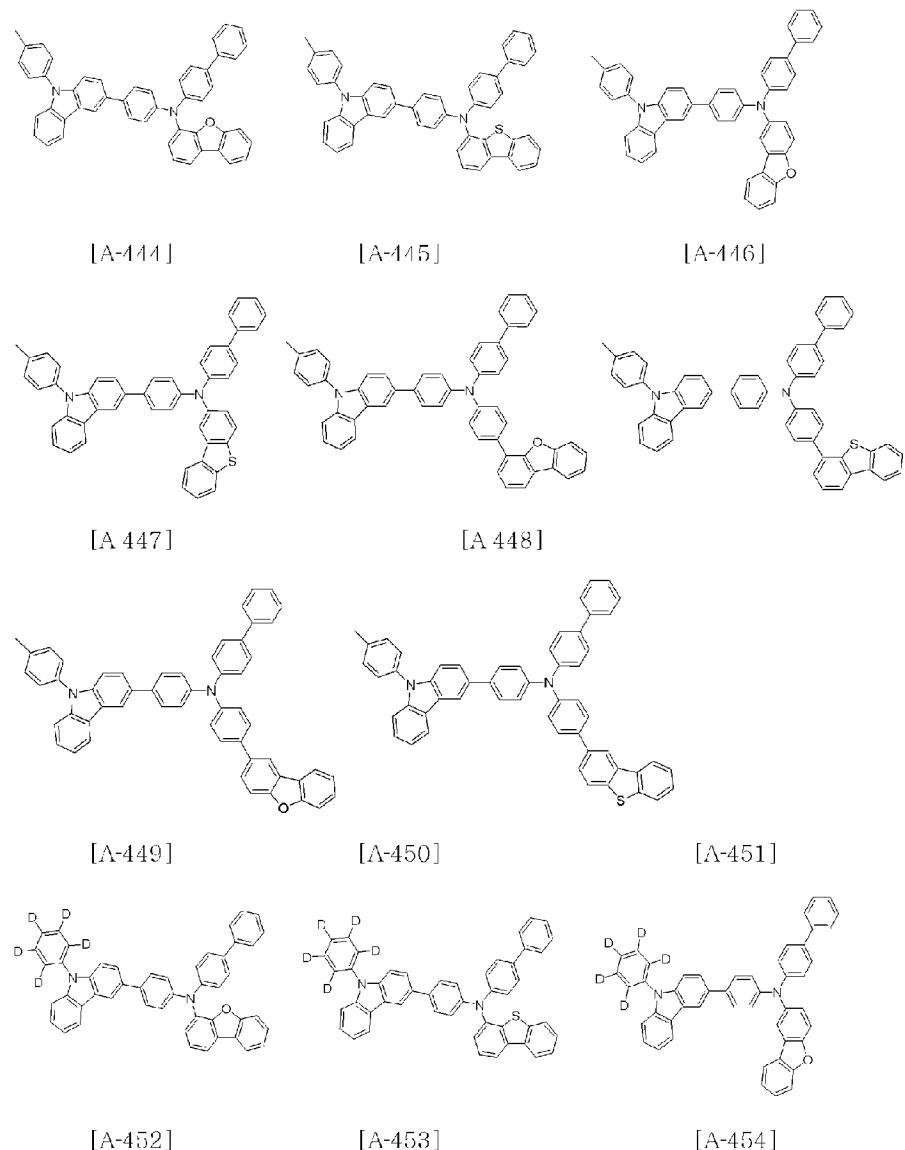
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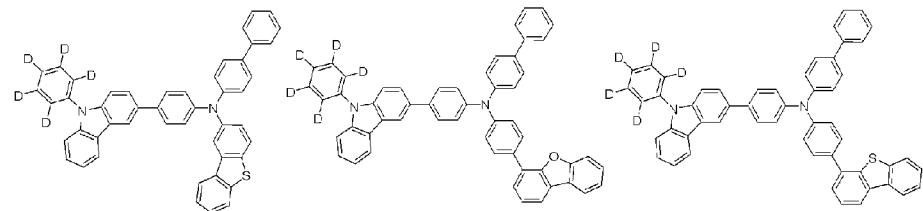


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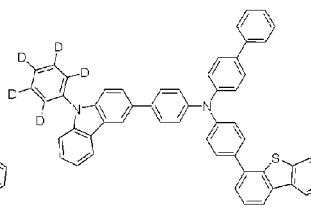




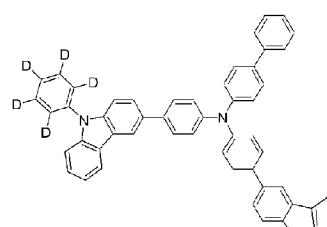




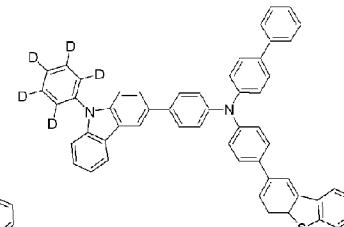
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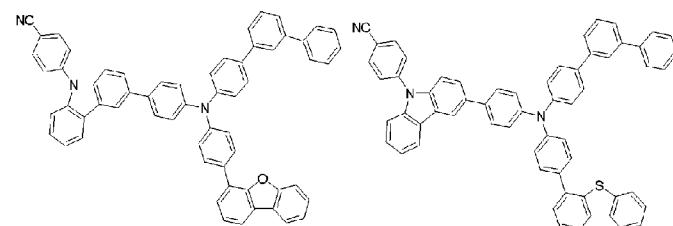
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[A-459]



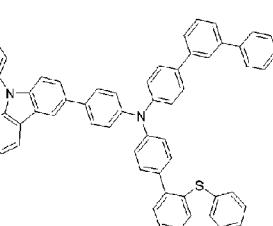
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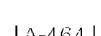
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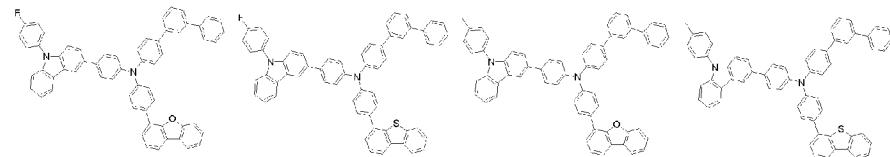
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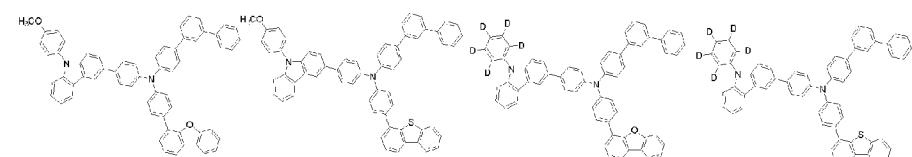
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[A-464]



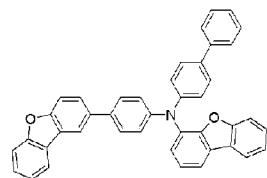
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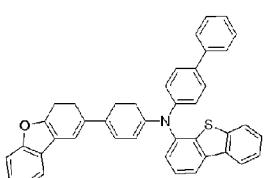
[Claim 9]

A compound for an optoelectronic device represented by the following Chemical Formulae A-324 to A-395.

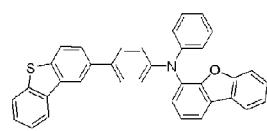
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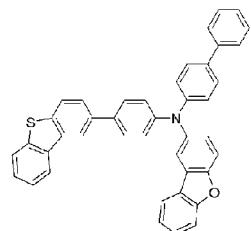
[A-325]



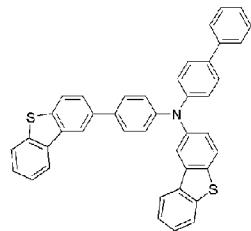
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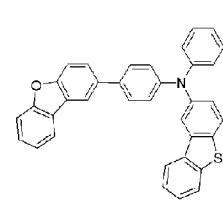
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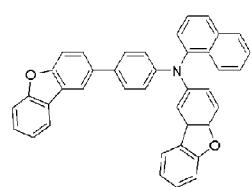
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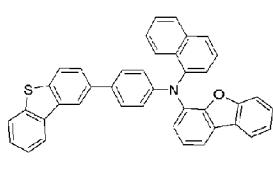
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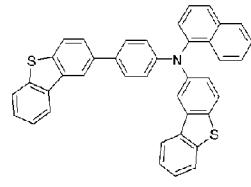
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[A-331]



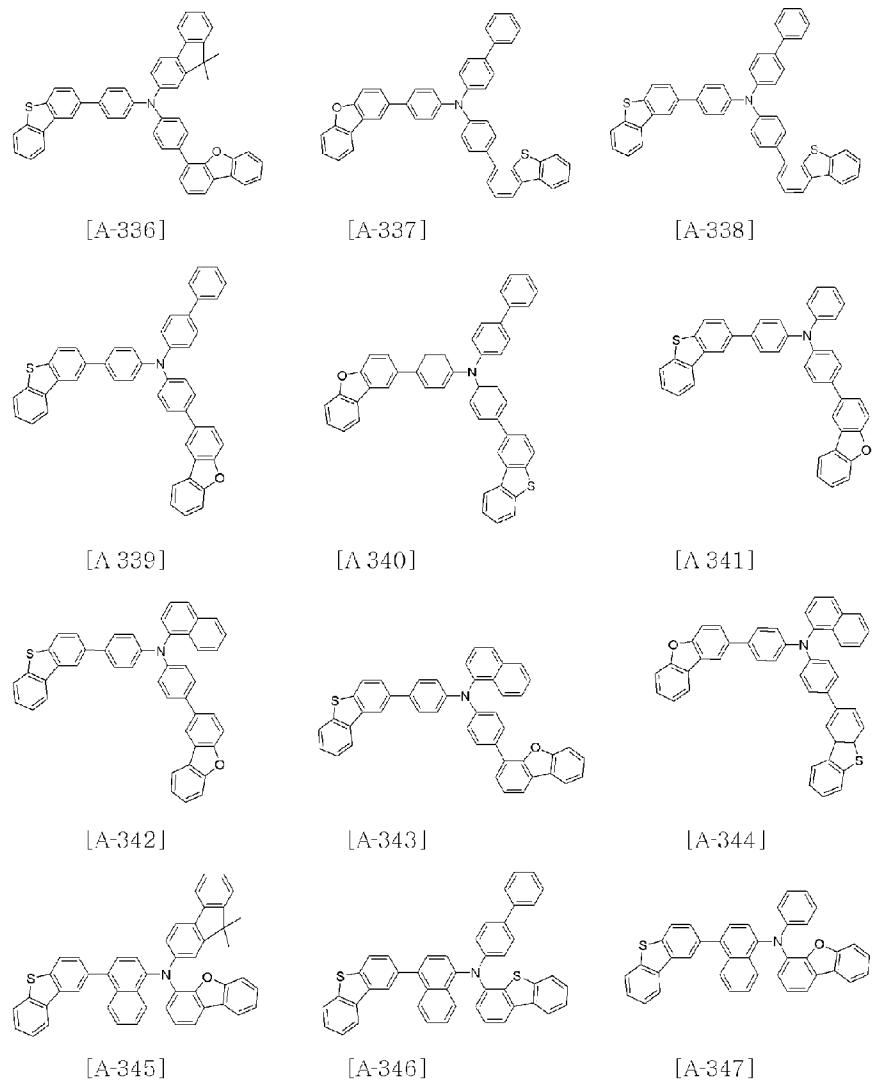
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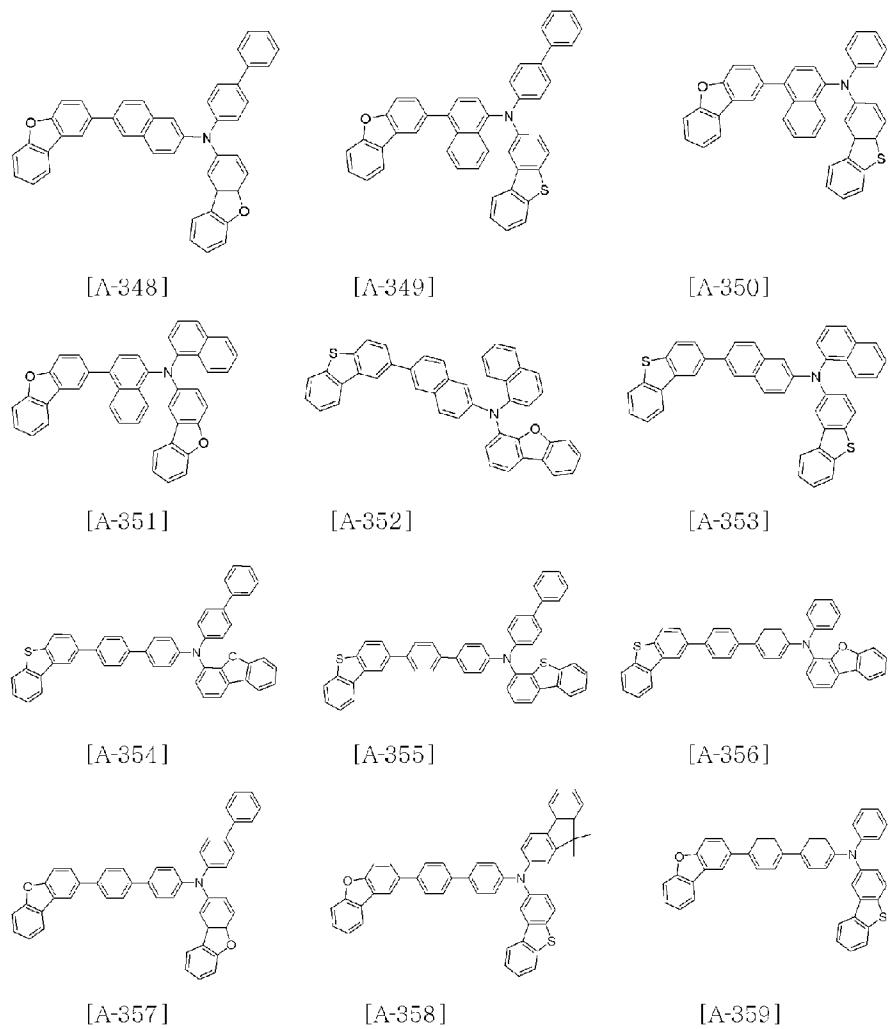


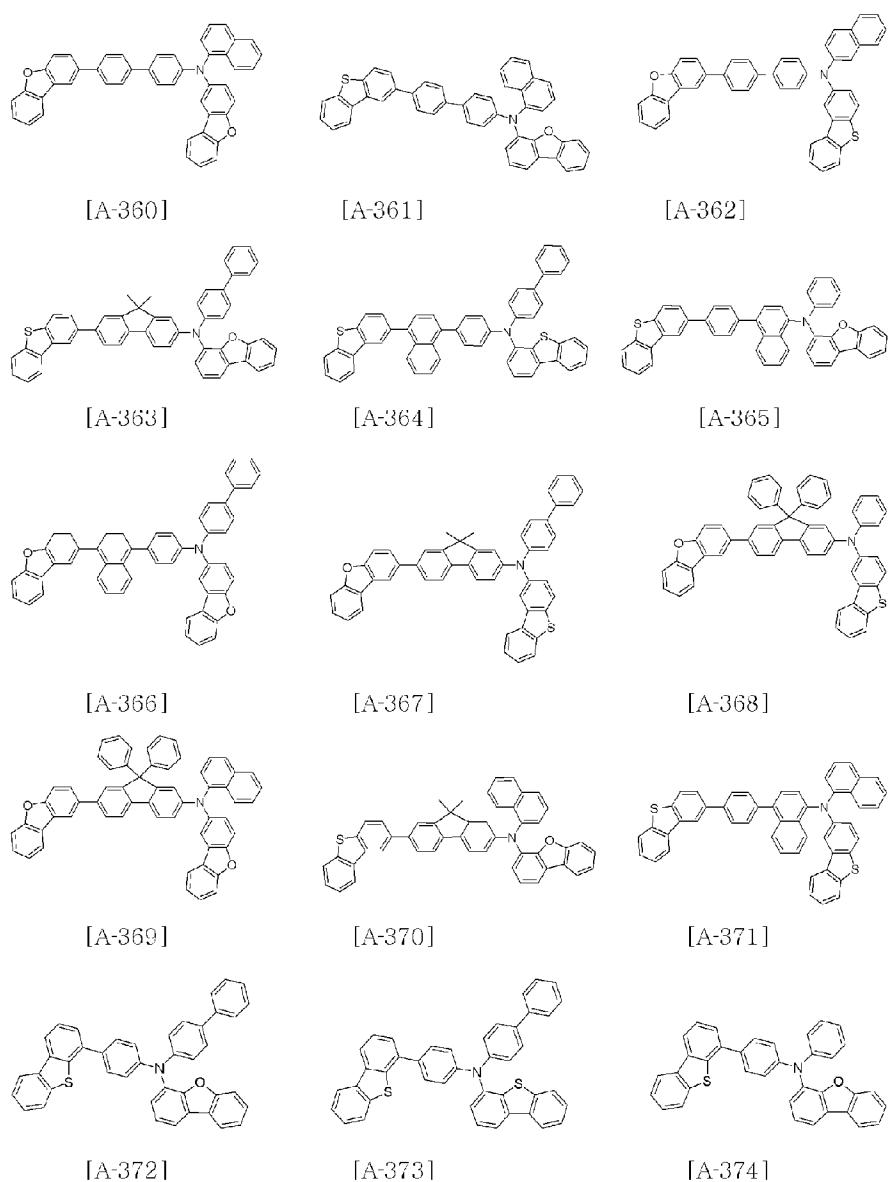
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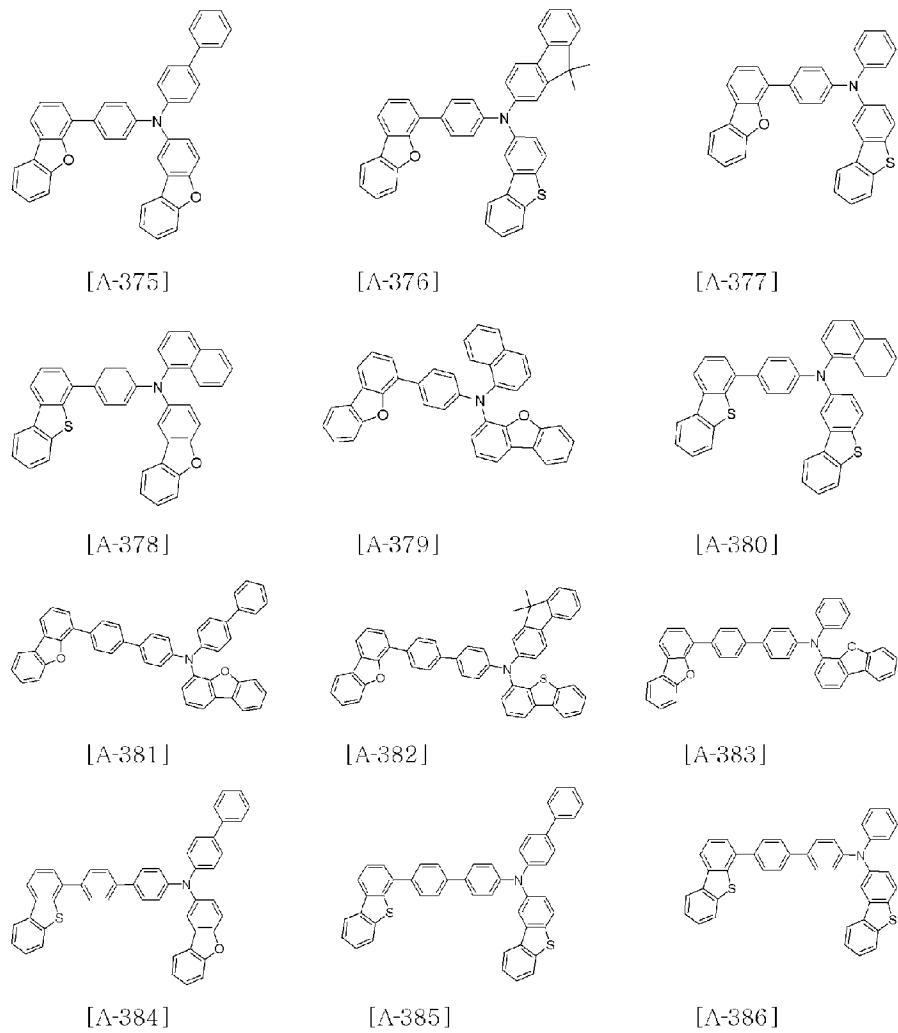
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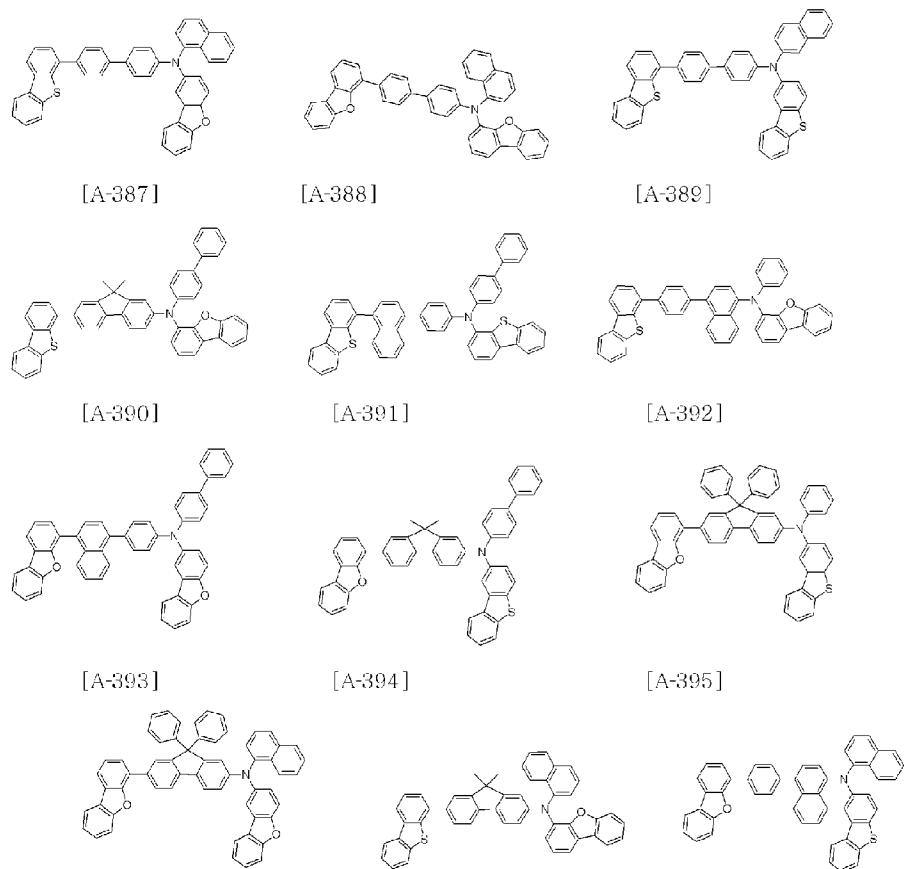
[A-335]











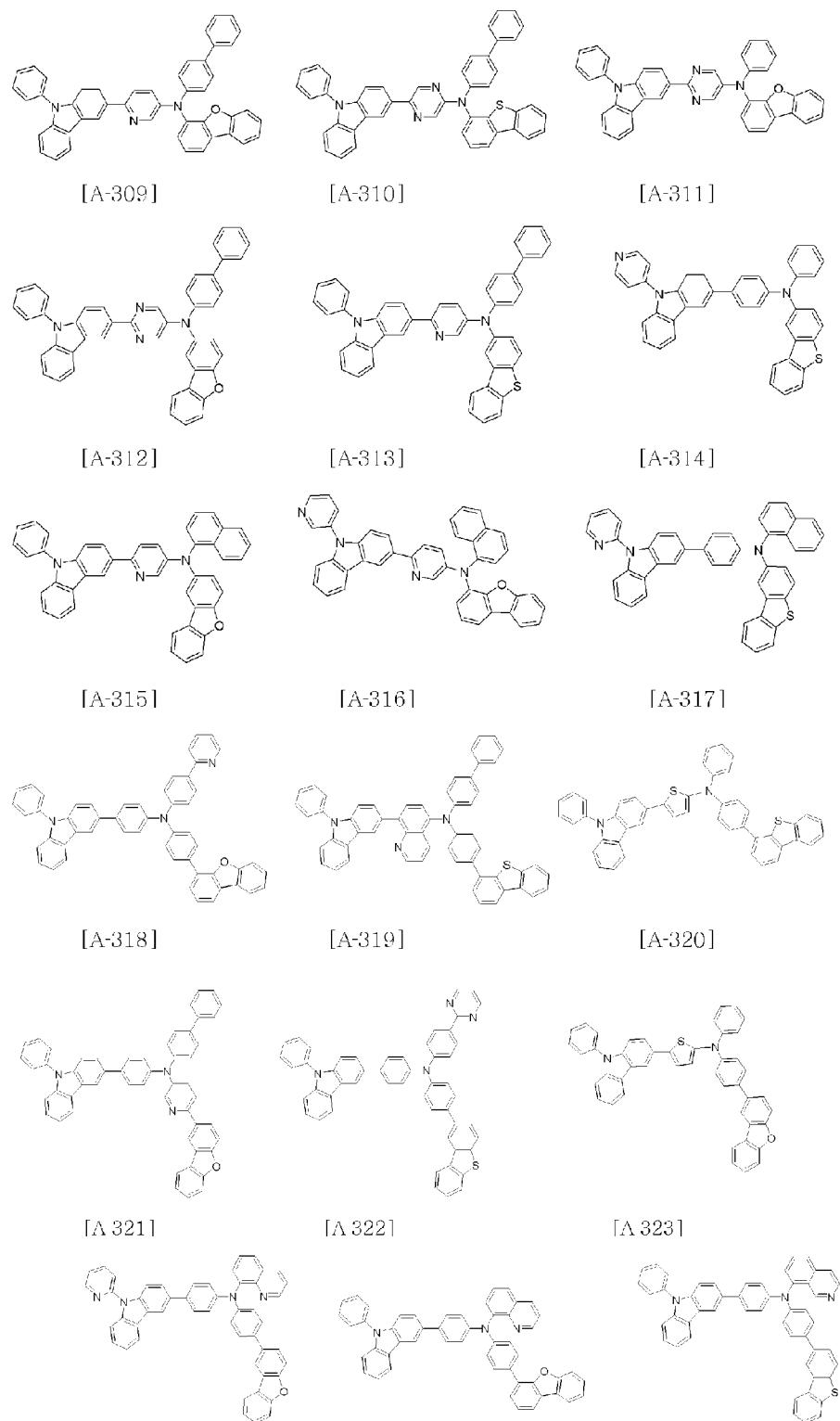
[Claim 10]

A compound for an optoelectronic device represented by the following Chemical Formulae A-306 to A-323.

[A-306]

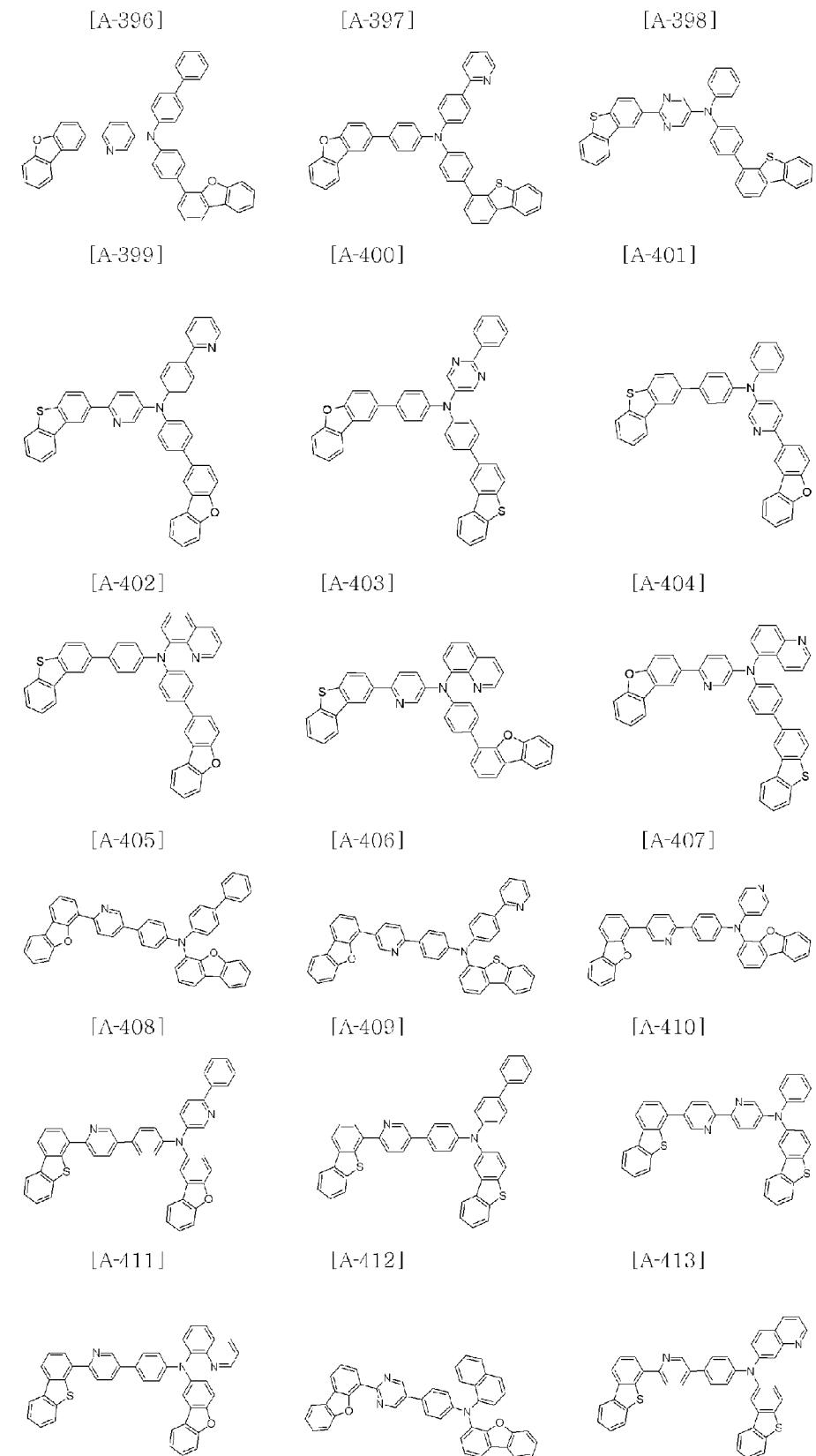
[A-307]

[A-308]



[Claim 11]

A compound for an optoelectronic device represented by the following Chemical Formulae A-396 to A-413.



[Claim 12]

The compound of claim 1, wherein the compound for an optoelectronic device comprises a hole transport material or a hole injection material for an organic light emitting diode.

[Claim 13] The compound of claim 1, wherein the compound for an optoelectronic device comprises triplet exciton energy (T1) of about 2.0eV or higher.

[Claim 14] The compound of claim 1, wherein the optoelectronic device comprises an organic photoelectronic device, an organic light emitting diode, an organic solar cell, an organic transistor, an organic photo-conductor drum, an organic memory device, or the like.

[Claim 15] An organic light emitting diode including an anode, a cathode, and at least one or more organic thin film between the anode and the cathode is provided, and at least one of the organic thin films comprises the compound of claim 1.

[Claim 16] The organic light emitting diode of claim 15, wherein the organic thin film comprises an emission layer, a hole transport layer (HTL), a hole injection layer (HIL), an electron transport layer (ETL), an electron injection layer (EIL), a holeblocking film, or a combination thereof.

[Claim 17] The organic light emitting diode of claim 15, the compound for an optoelectronic device is included in a hole transport layer (HTL), a hole injection layer (HIL), an electron transport layer (ETL), or an electron injection layer (EIL).

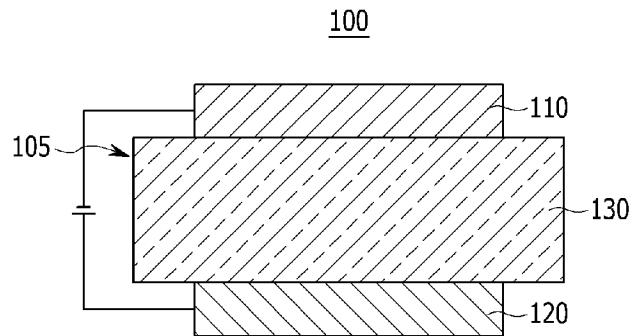
[Claim 18] The organic light emitting diode of claim 15, wherein the compound for an optoelectronic device is included in an emission layer.

[Claim 19] The organic light emitting diode of claim 15, wherein the compound for an optoelectronic device is used as a phosphorescent or fluorescent host material in an emission layer.

[Claim 20] A display device comprising the organic light emitting diode of claim 15.

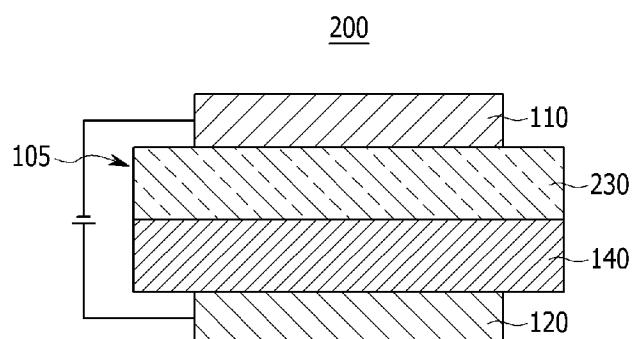
[Fig. 1]

FIG. 1



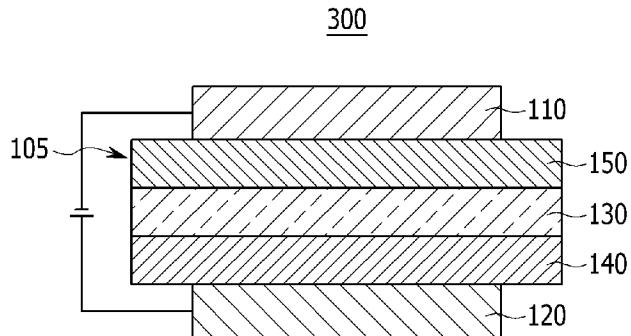
[Fig. 2]

FIG.2



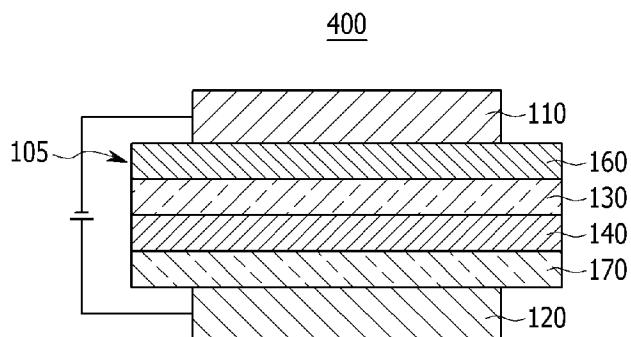
[Fig. 3]

FIG. 3



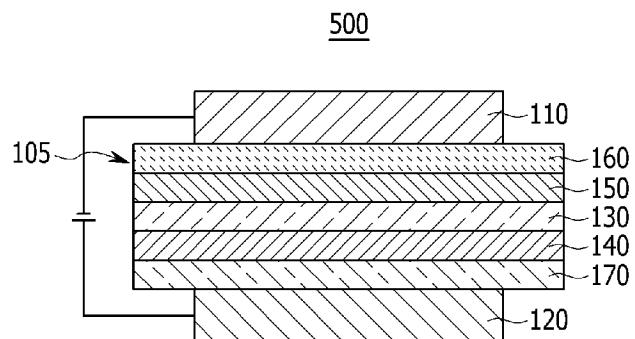
[Fig. 4]

FIG.4



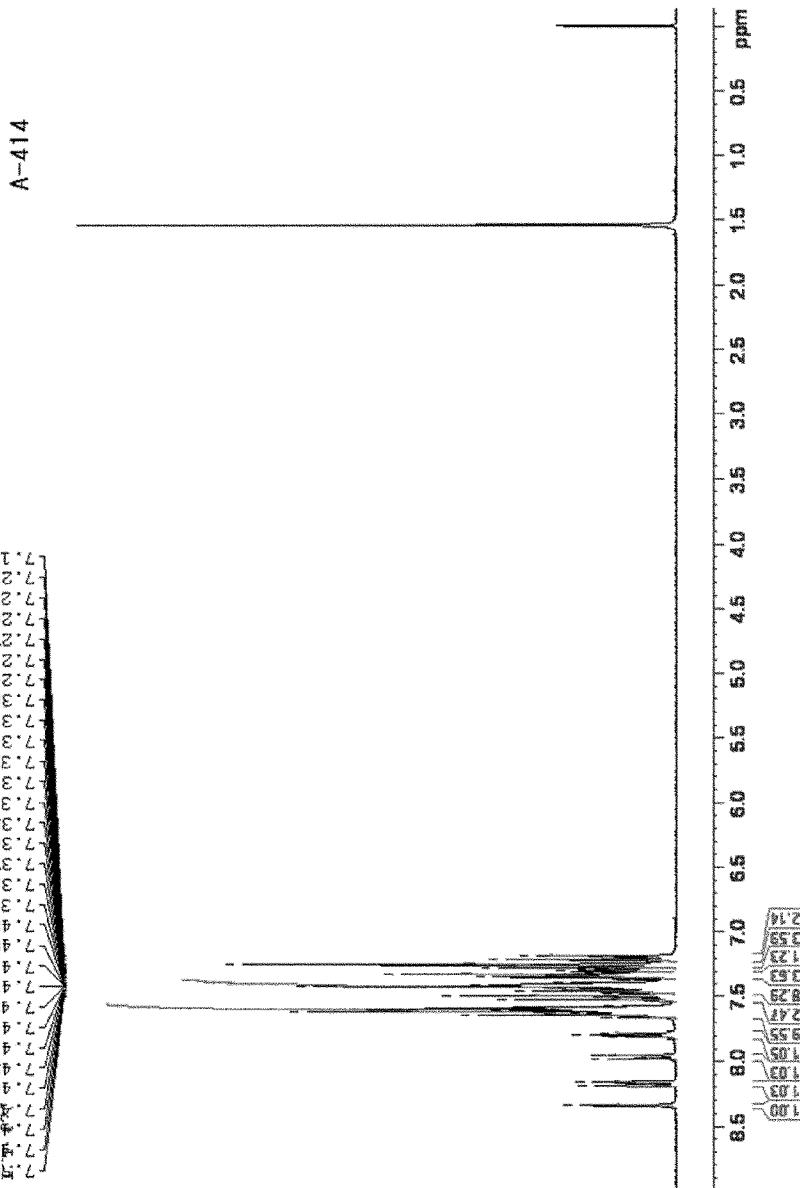
[Fig. 5]

FIG. 5



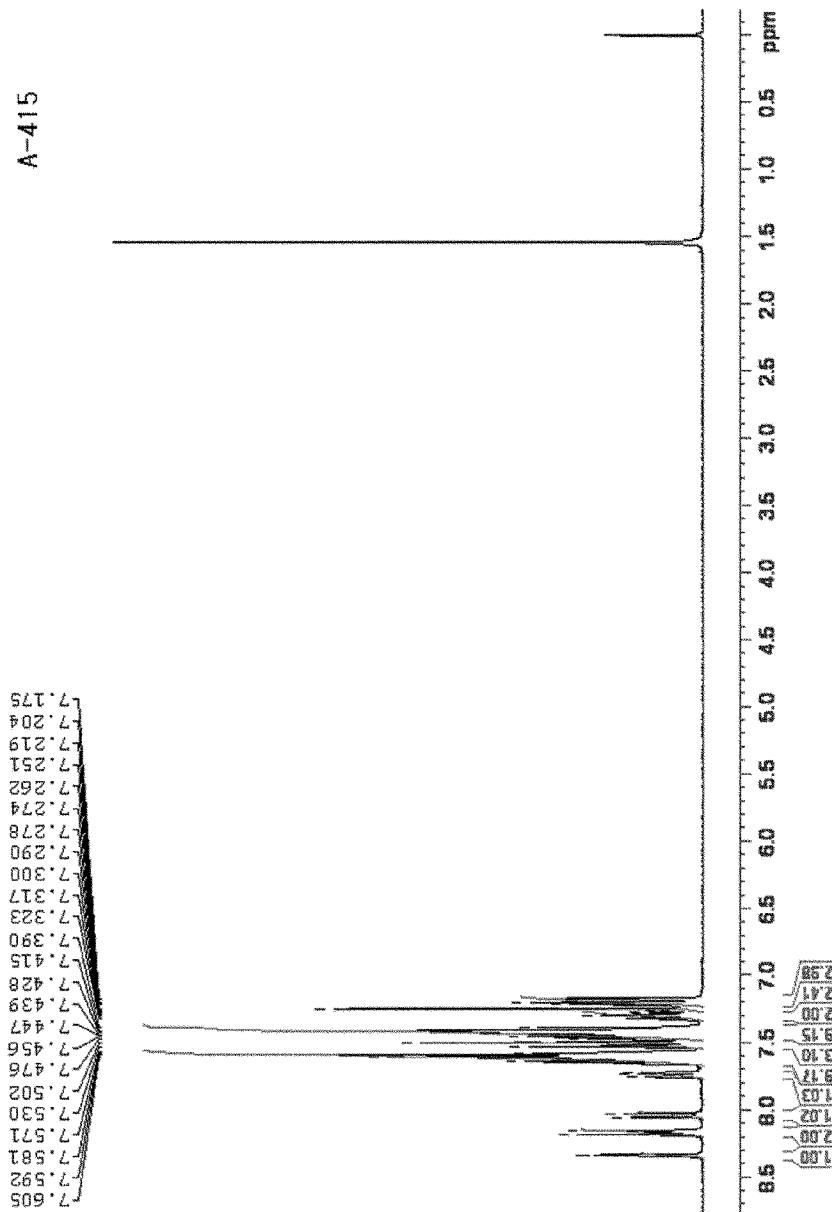
[Fig. 6]

FIG. 6



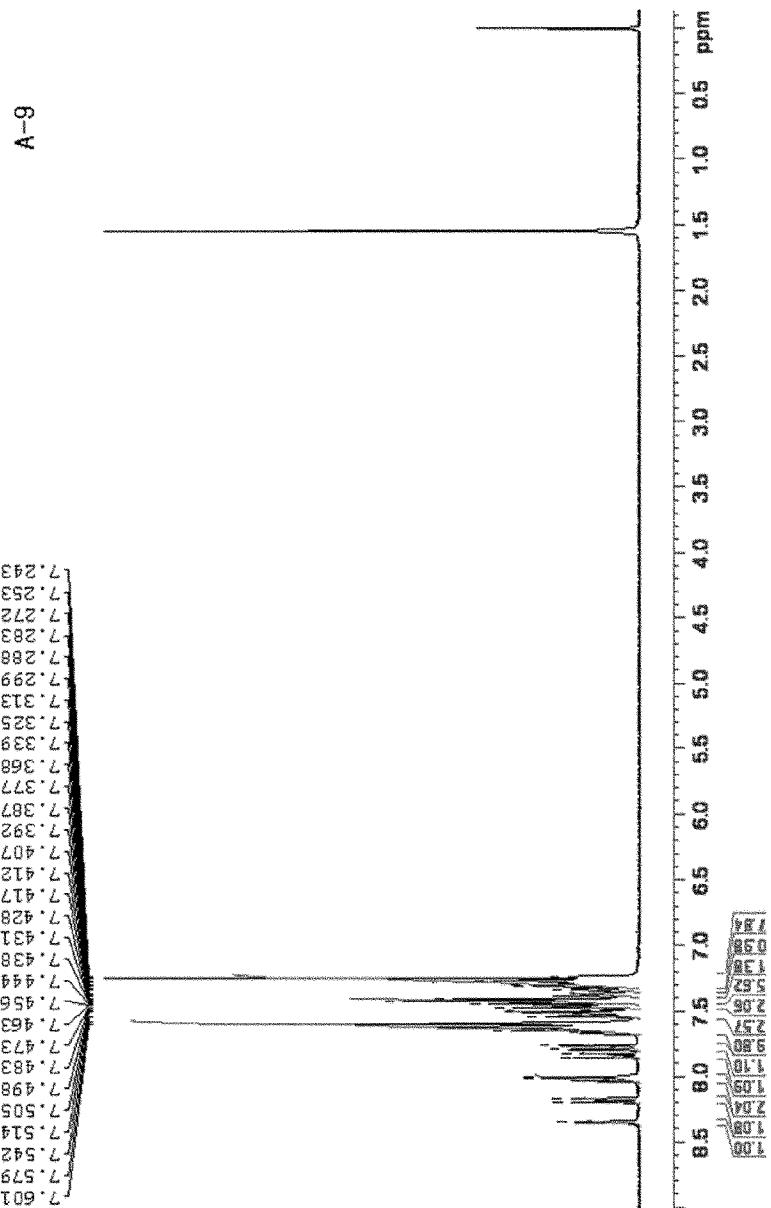
[Fig. 7]

FIG.7



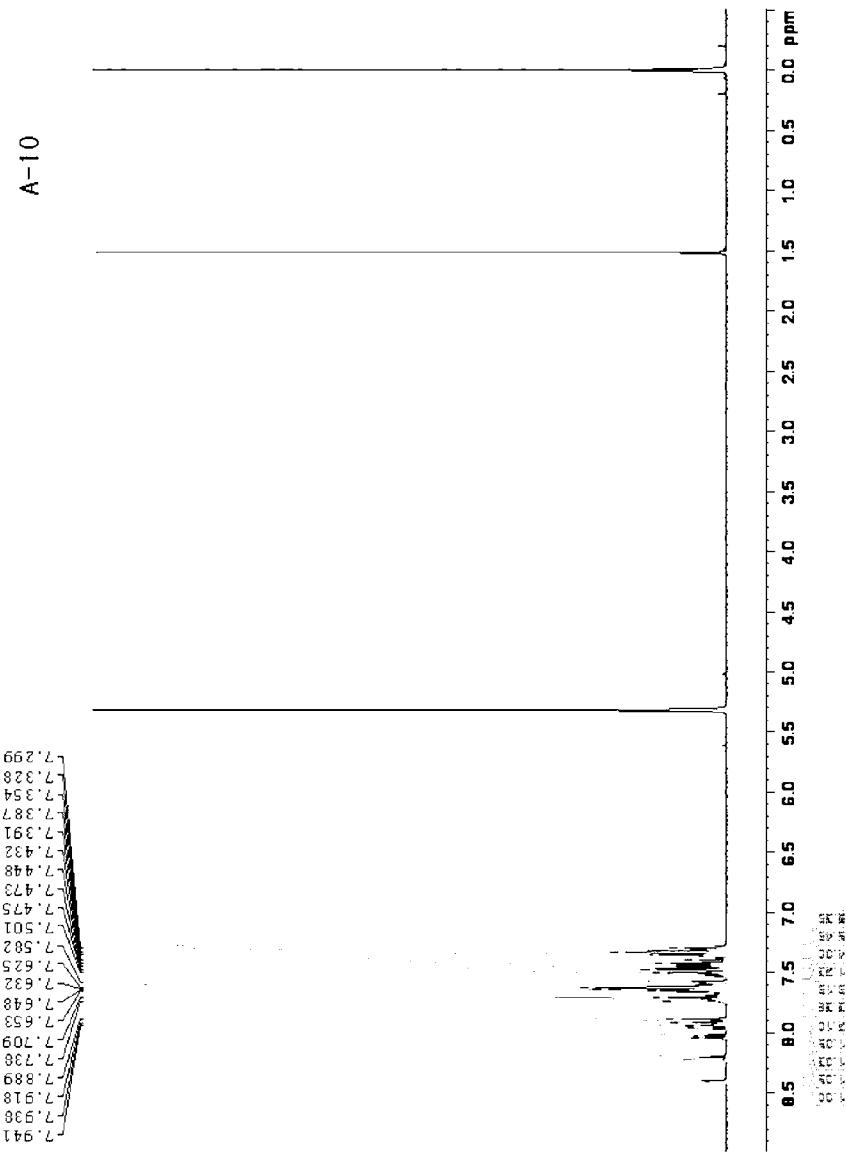
[Fig. 8]

FIG.8



[Fig. 9]

FIG.9



[Fig. 10]

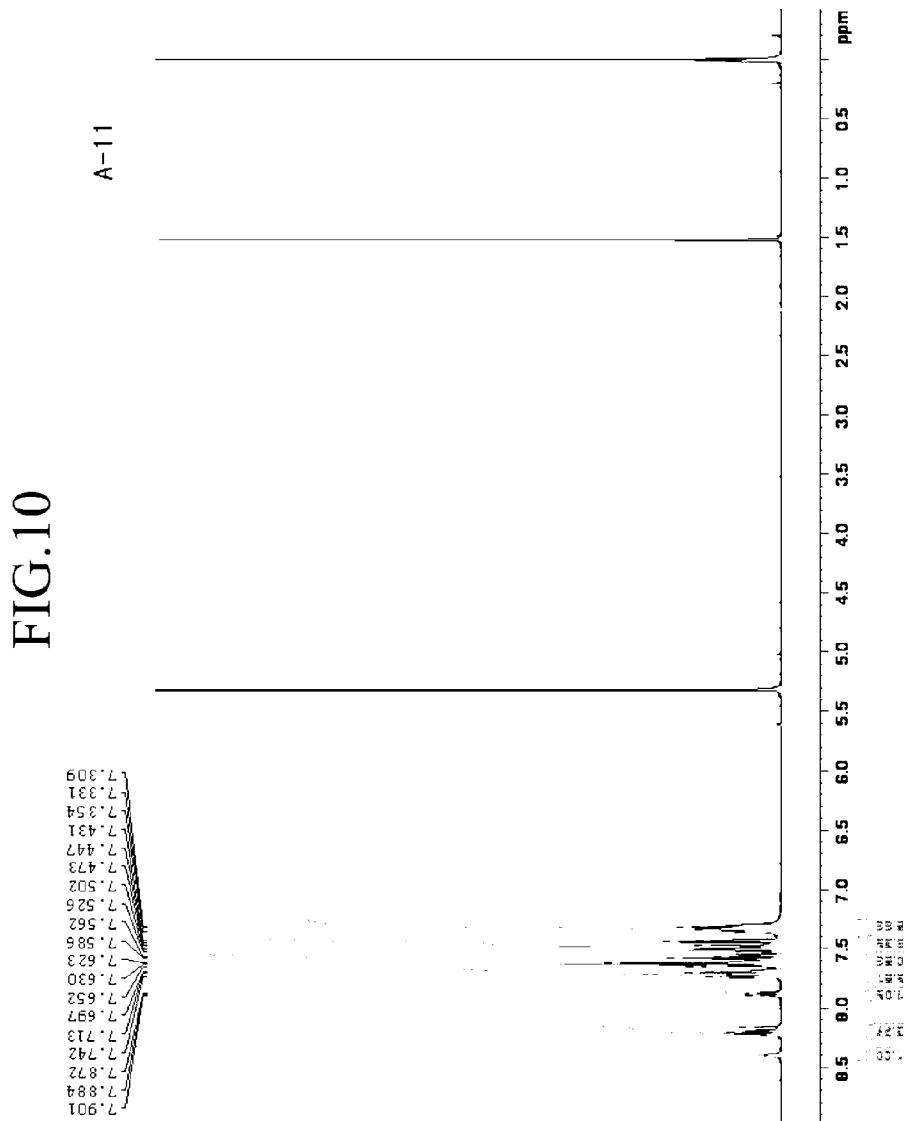
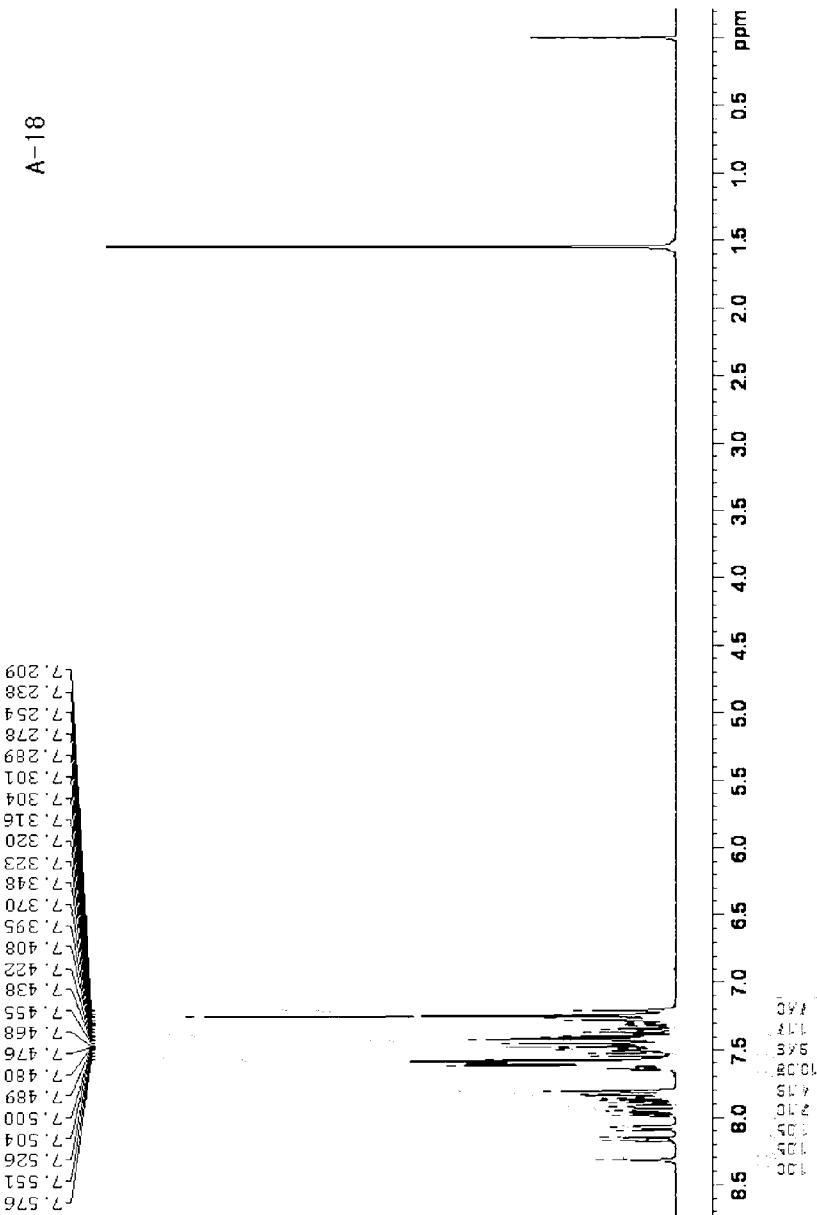


FIG. 10

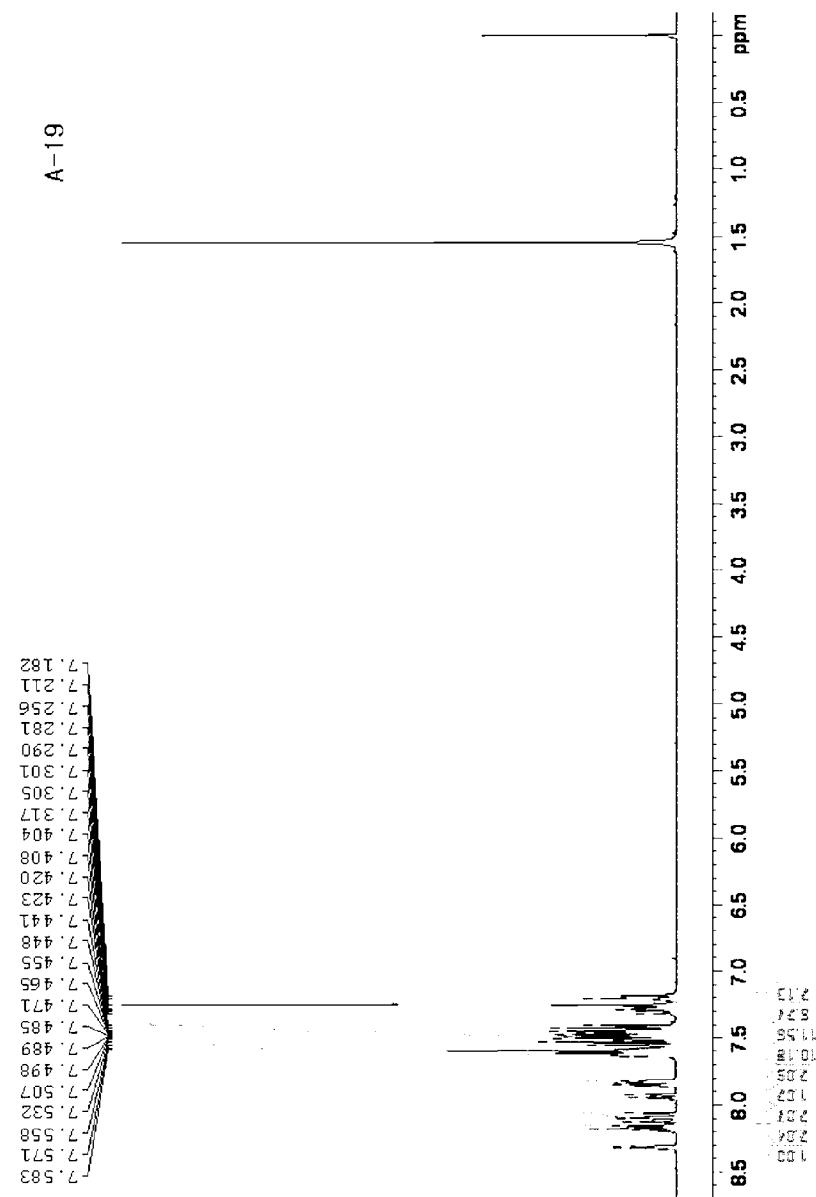
[Fig. 11]

FIG.11



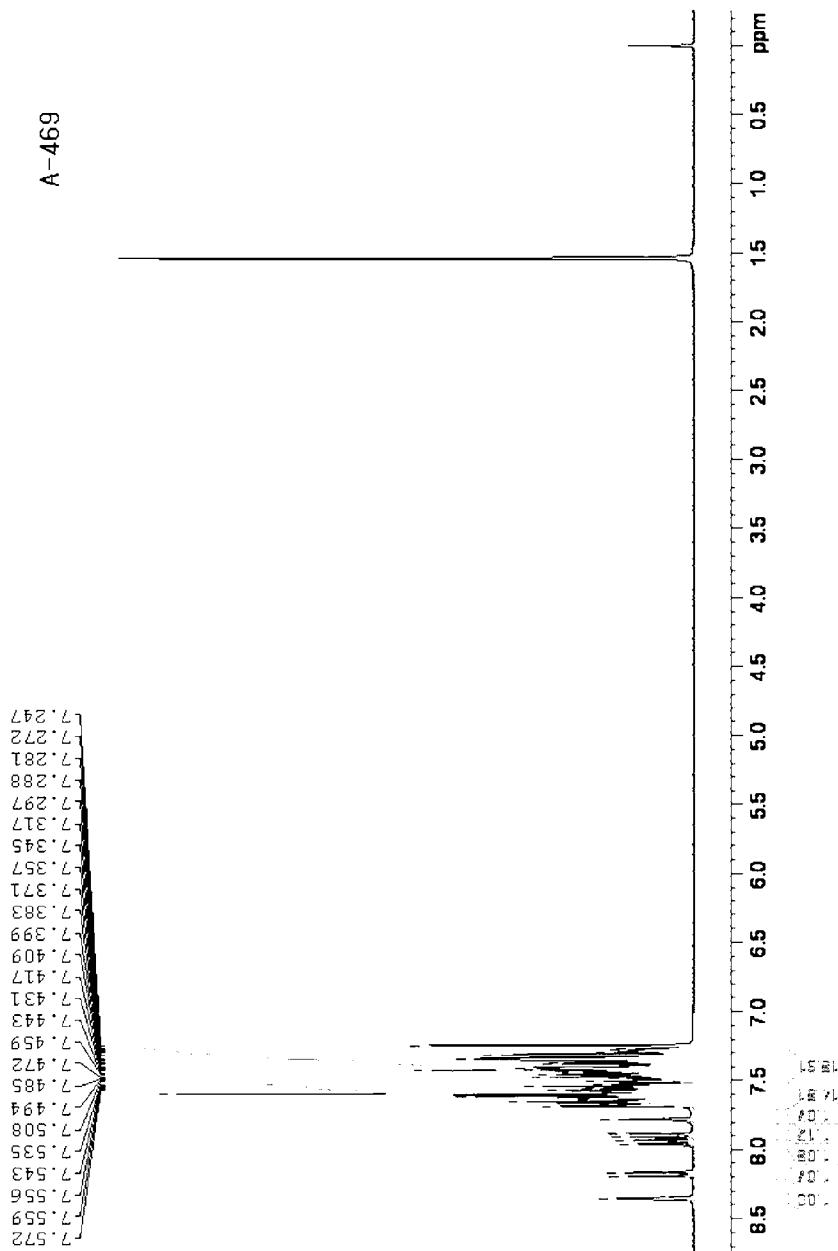
[Fig. 12]

FIG.12



[Fig. 13]

FIG.13



[Fig. 14]

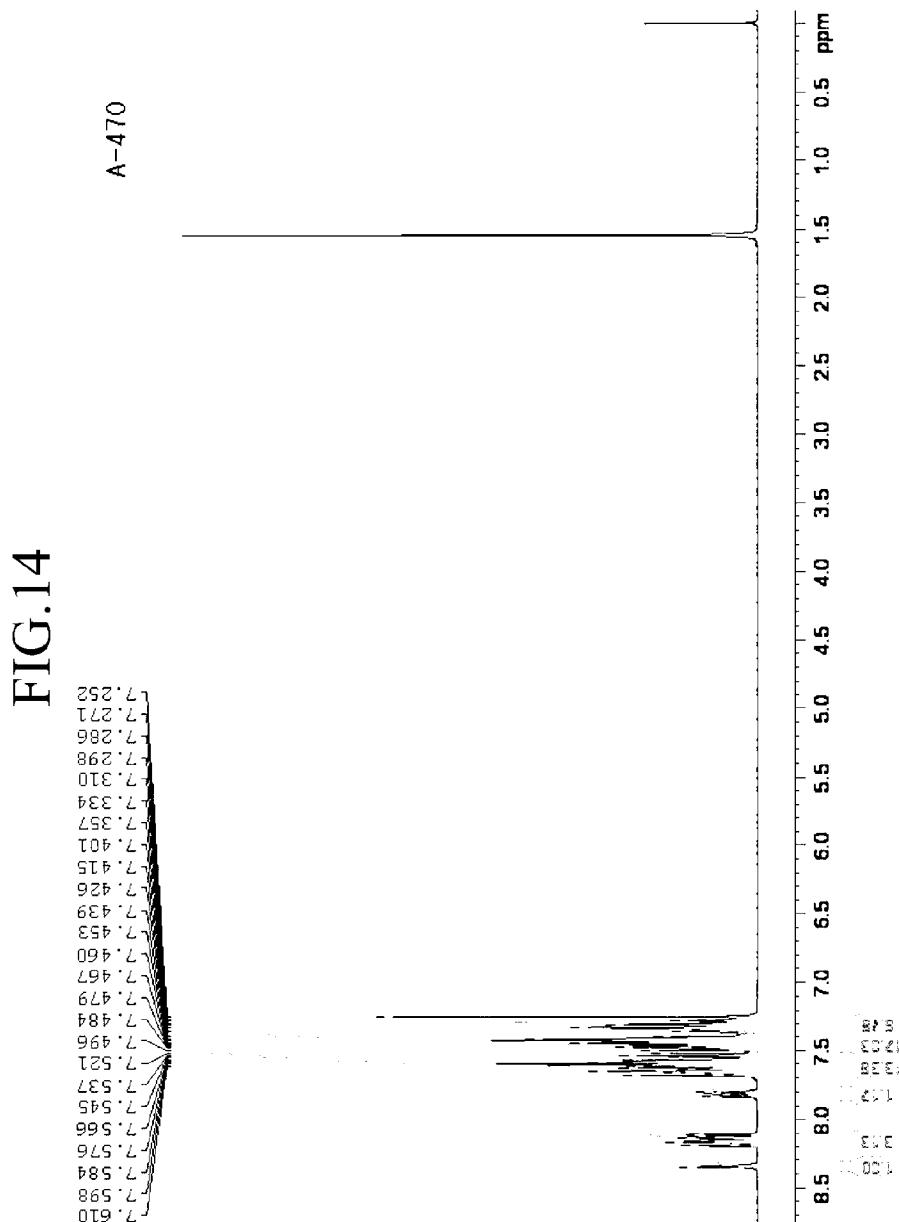
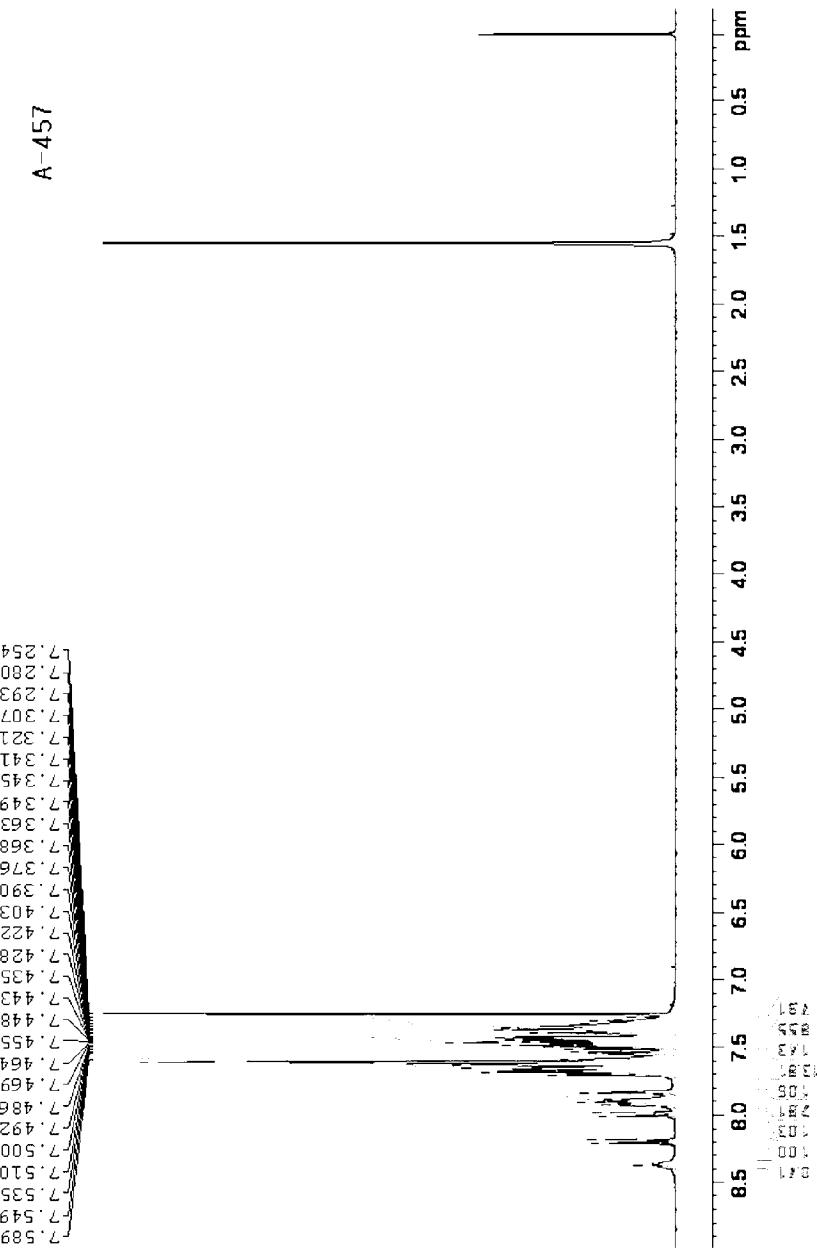


FIG. 14

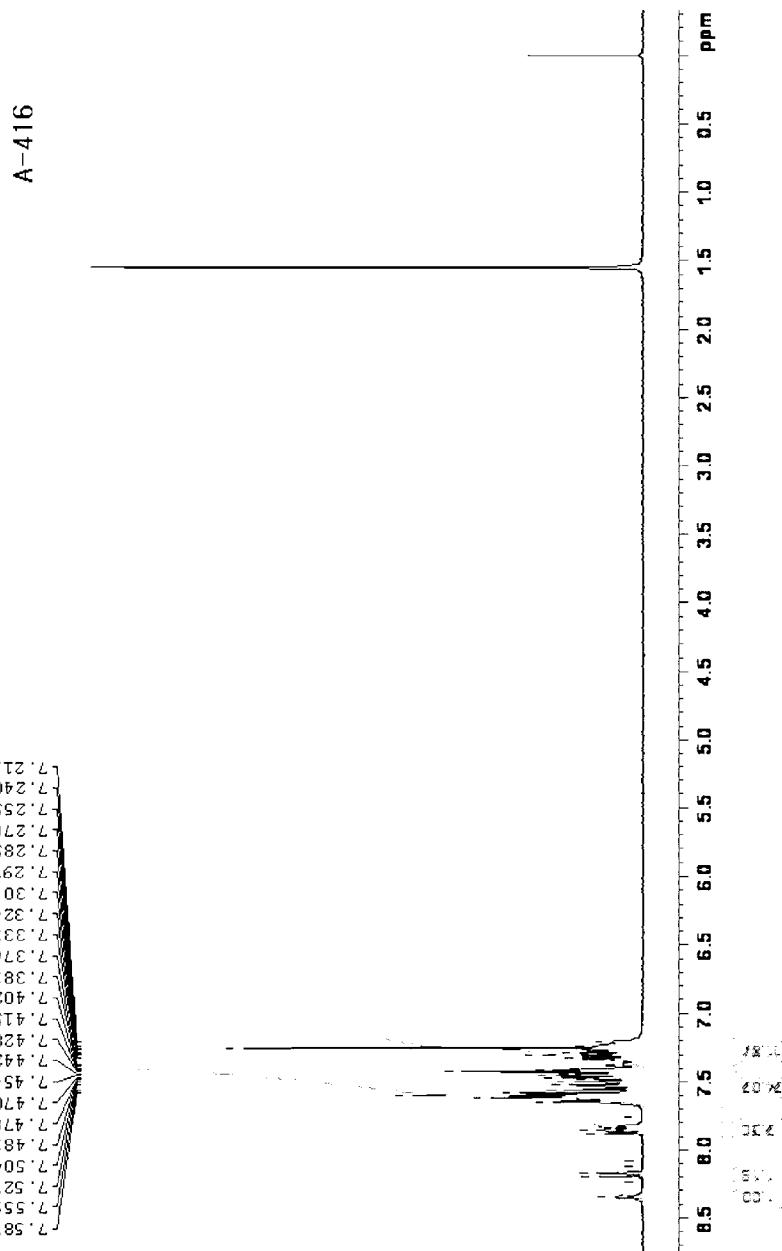
[Fig. 15]

FIG.15



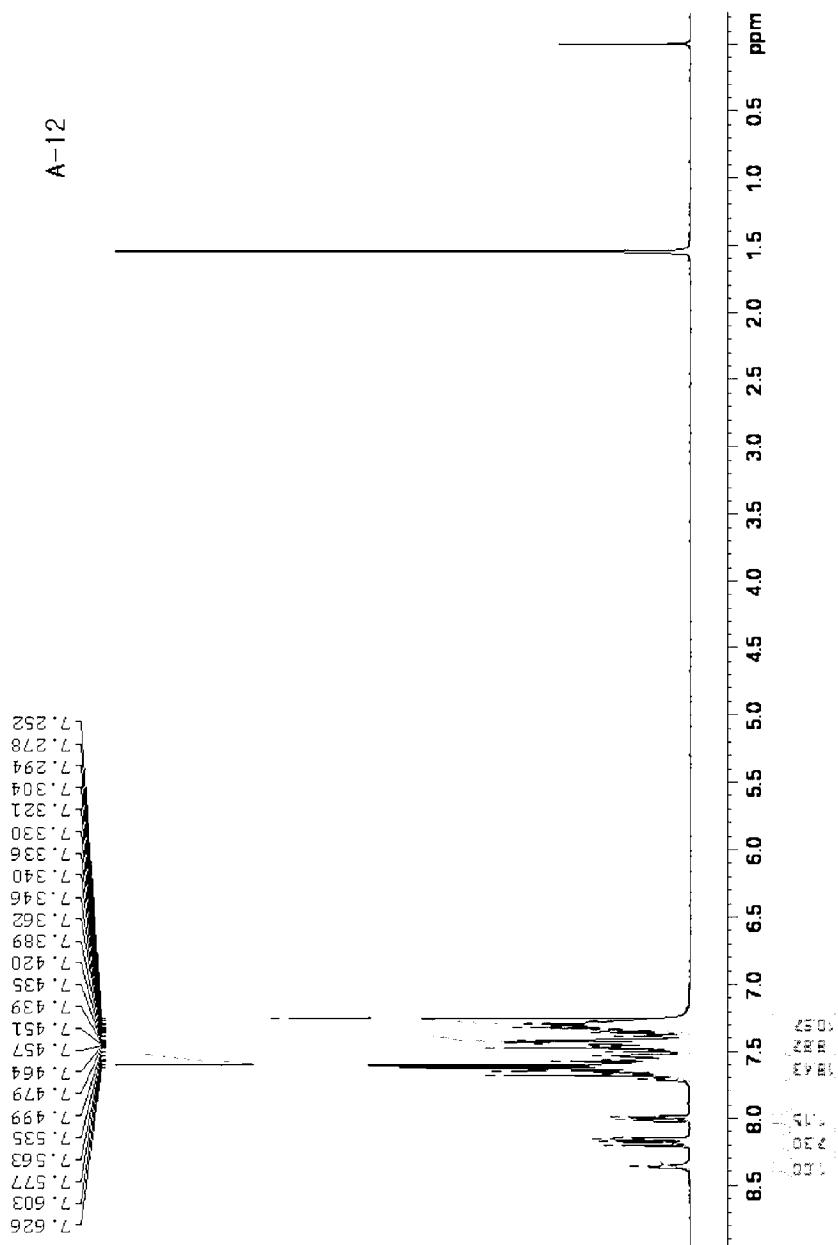
[Fig. 16]

FIG. 16



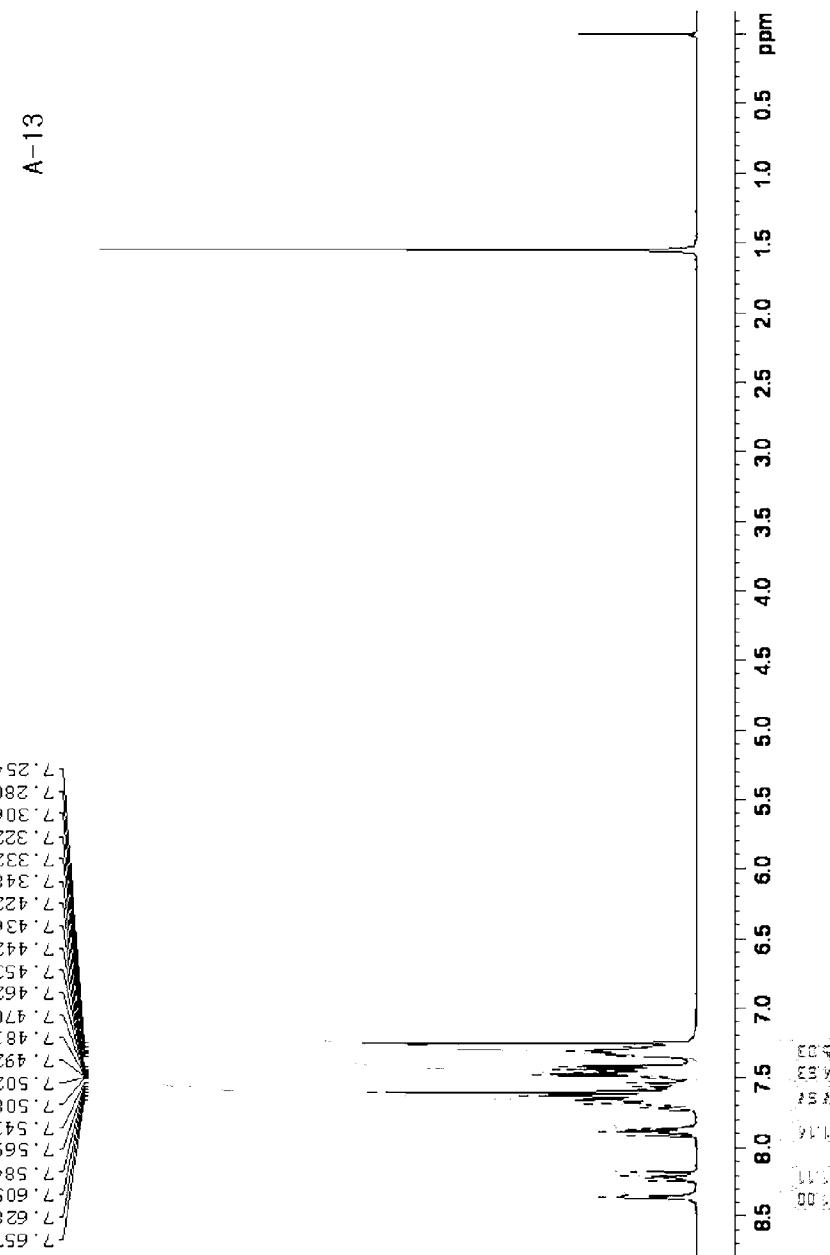
[Fig. 17]

FIG.17



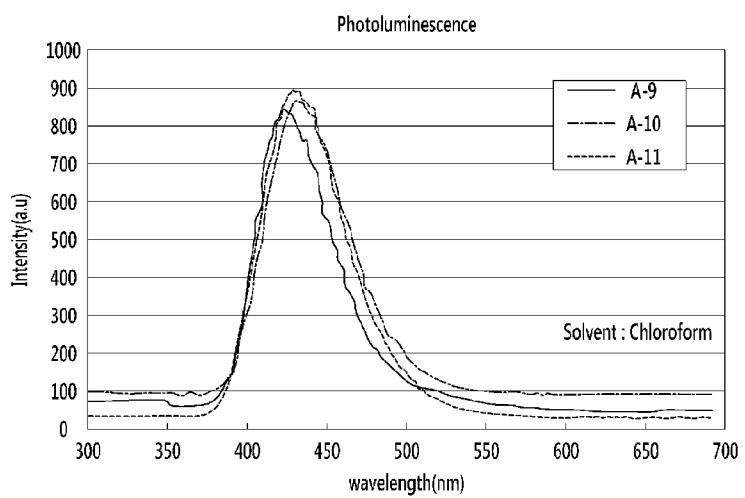
[Fig. 18]

FIG.18



[Fig. 19]

FIG.19



专利名称(译)	用于光电器件的化合物，包括有机发光二极管在内的有机发光二极管，包括有机发光二极管		
公开(公告)号	EP2561037A2	公开(公告)日	2013-02-27
申请号	EP2011772295	申请日	2011-04-25
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申请(专利权)人(译)	第一毛织INC.		
当前申请(专利权)人(译)	第一毛织INC.		
[标]发明人	RYU DONG WAN JUNG SUNG HYUN HUH DAL HO LEE KYOUNG MI LEE NAM HEON CHAE MI YOUNG		
发明人	RYU, DONG-WAN JUNG, SUNG-HYUN HUH, DAL-HO LEE, KYOUNG-MI LEE, NAM-HEON CHAE, MI-YOUNG		
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CPC分类号	H01L51/0074 C09B57/00 C09B57/008 C09K11/06 C09K2211/1022 C09K2211/1029 C09K2211/1088 C09K2211/1092 H01L51/0061 H01L51/0067 H01L51/0072 H01L51/0073 H01L51/50 H01L51/5012 H01L51/5048 H01L51/5088 H01L51/5092 H01L51/5096 H05B33/14 Y02E10/549		
代理机构(译)	MICHALSKI HÜTTERMANN & PARTNER PATENTANWÄLTE		
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其他公开文献	EP2561037A4 EP2561037B1		
外部链接	Espacenet		

摘要(译)

提供一种用于光电器件的化合物和包括该化合物的有机光电器件。用于光电子器件的化合物由化学式1表示。提供了一种有机光电器件，其具有优异的电化学和热稳定性，从而在低驱动电压下具有优异的寿命特性和高发光效率。