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(54) **CROSSLINKABLE DEUTERATED CHARGE TRANSPORTING COMPOUND, AN ORGANIC ELECTROLUMINESCENT DEVICE COMPRISING THE COMPOUND, AND A SOLUTION FORMULATION**

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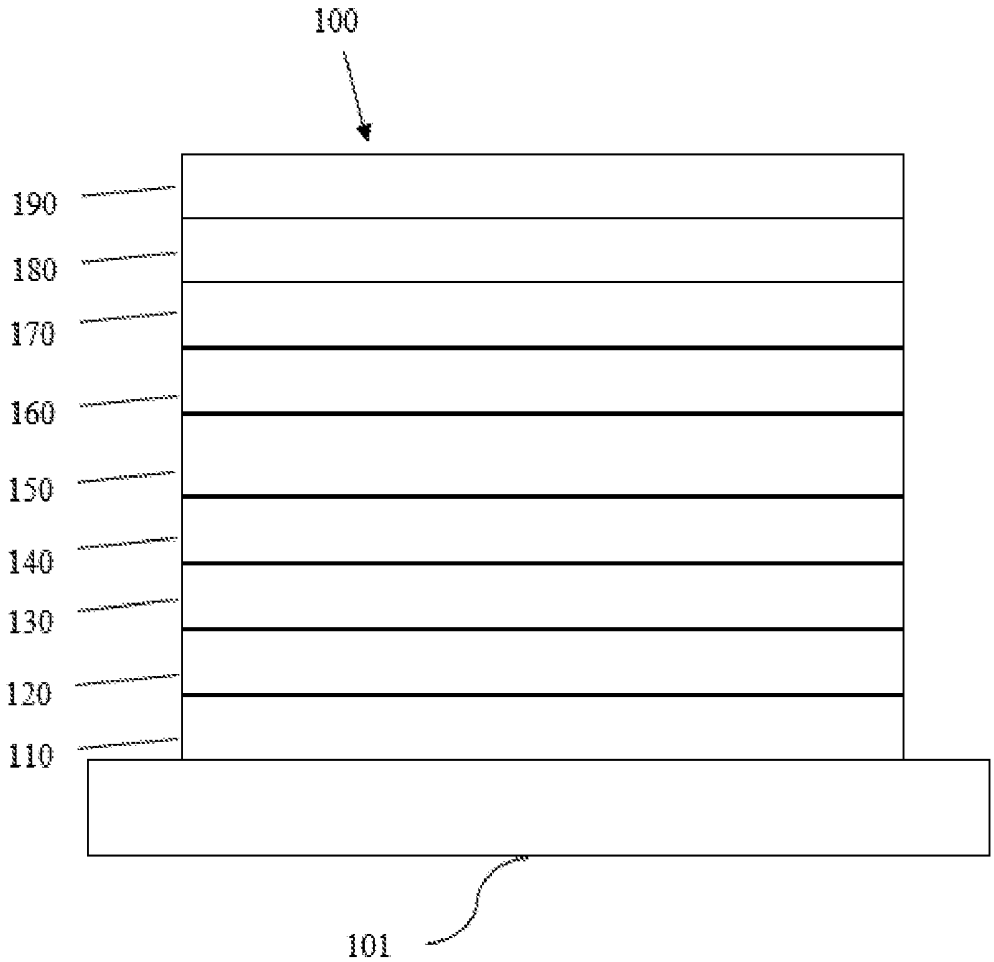
(57) **ABSTRACT**

A crosslinkable deuterated charge transporting compound comprising a charge transporting unit and a partially or fully deuterated polymerizable group is disclosed. By introducing partially or fully deuterated polymerizable group, the performance of the resulting charge transporting material can be greatly improved, thereby effectively improving the lifetime of the OLED device. Also disclosed are an organic electroluminescent device and a formulation comprising of a charge transporting solution.



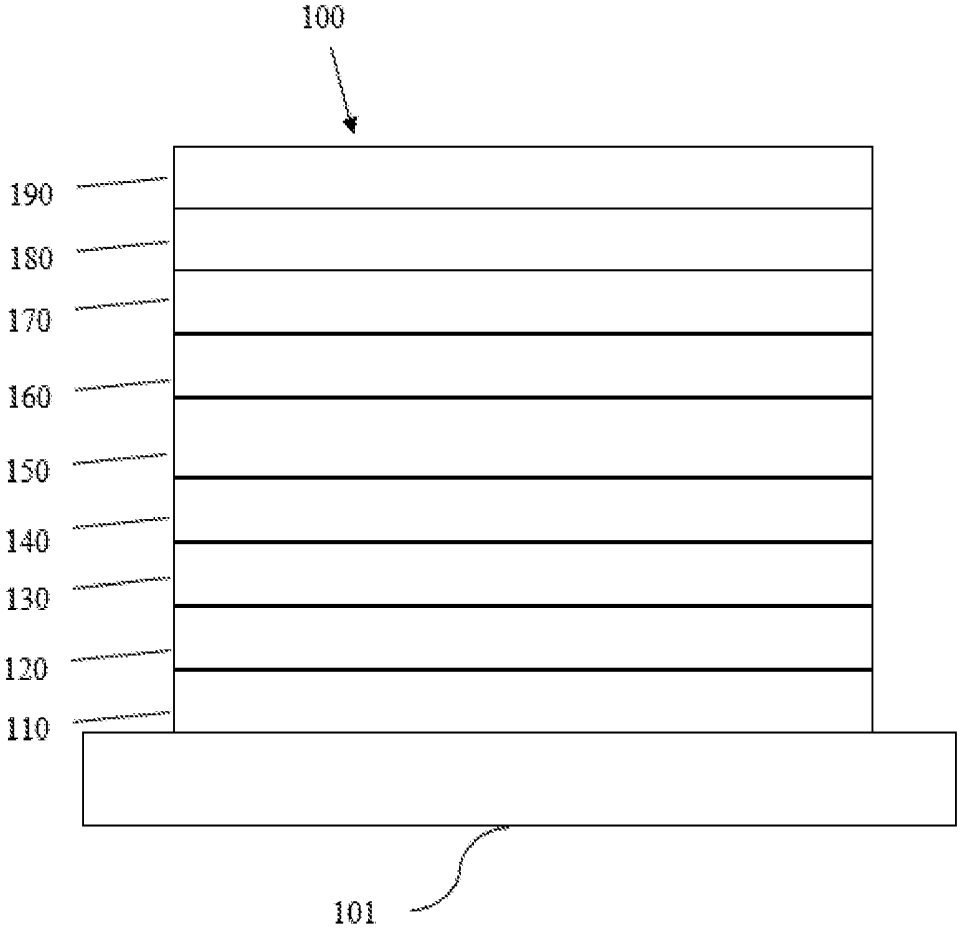


Figure 1

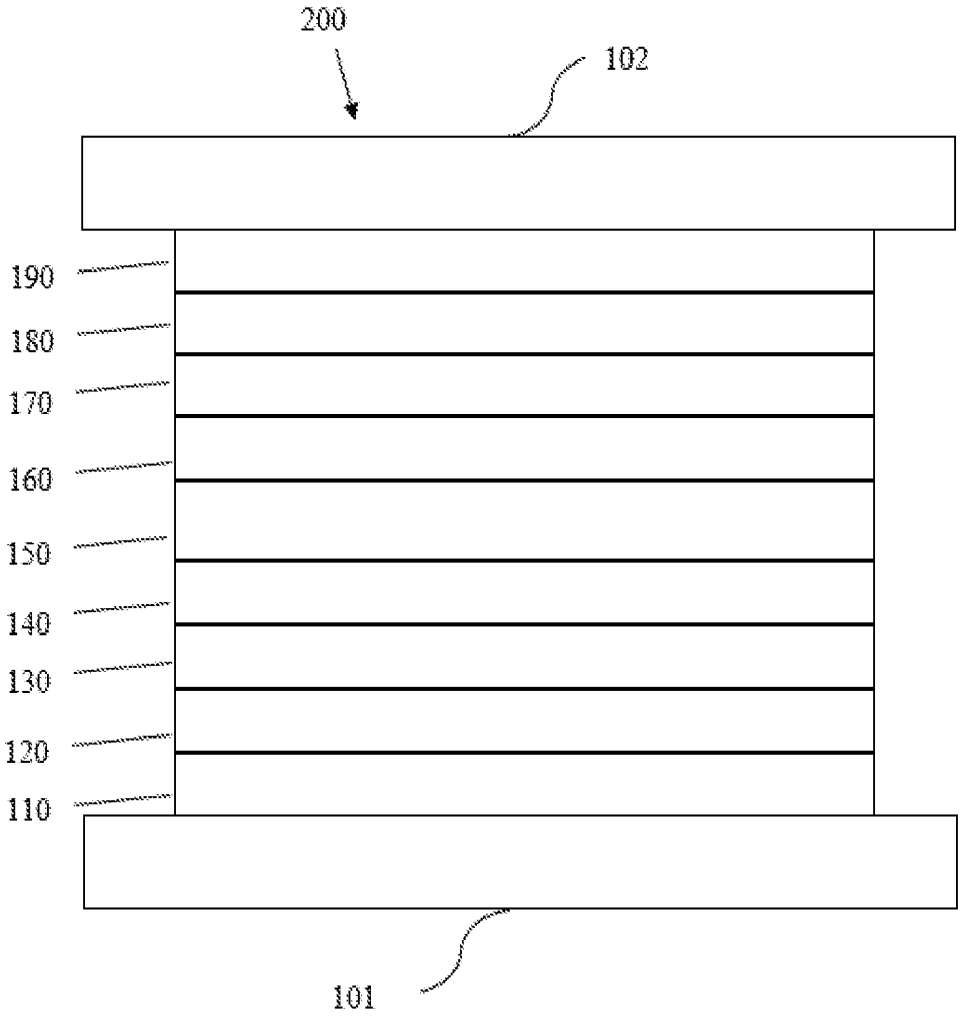


Figure 2

CROSSLINKABLE DEUTERATED CHARGE TRANSPORTING COMPOUND, AN ORGANIC ELECTROLUMINESCENT DEVICE COMPRISING THE COMPOUND, AND A SOLUTION FORMULATION

[0001] This application claims the benefit of U.S. Provisional Application No. 62/570,090, filed Oct. 9, 2017, the entire content of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a compound for organic electronic devices, such as organic light emitting devices. More specifically, the present invention relates to a charge transporting compound, an organic electroluminescent device comprising the compound, and a solution formulation.

BACKGROUND ART

[0003] An organic electronic device is preferably selected from the group consisting of organic light-emitting diodes (OLEDs), organic field-effect transistors (O-FETs), organic light-emitting transistors (OLETs), organic photovoltaic devices (OPVs), dye-sensitized solar cells (DSSCs), organic optical detectors, organic photoreceptors, organic field-quench devices (OFQDs), light-emitting electrochemical cells (LECs), organic laser diodes and organic plasmon emitting devices.

[0004] In 1987, Tang and Van Slyke of Eastman Kodak reported a bilayer organic electroluminescent device, which comprises an arylamine hole transporting layer and a tris-8-hydroxyquinolato-aluminum layer as the electron and emitting layer (Applied Physics Letters, 1987, 51 (12): 913-915). Once a bias is applied to the device, green light was emitted from the device. This invention laid the foundation for the development of modern organic light-emitting diodes (OLEDs). State-of-the-art OLEDs may comprise multiple layers such as charge injection and transporting layers, charge and exciton blocking layers, and one or multiple emissive layers between the cathode and anode. Since OLED is a self-emitting solid state device, it offers tremendous potential for display and lighting applications. In addition, the inherent properties of organic materials, such as their flexibility, may make them well suited for particular applications such as fabrication on flexible substrates.

[0005] OLED can be categorized as three different types according to its emitting mechanism. The OLED invented by Tang and van Slyke is a fluorescent OLED. It only utilizes singlet emission. The triplets generated in the device are wasted through nonradiative decay channels. Therefore, the internal quantum efficiency (IQE) of a fluorescent OLED is only 25%. This limitation hindered the commercialization of OLED. In 1997, Forrest and Thompson reported phosphorescent OLED, which uses triplet emission from heave metal containing complexes as the emitter. As a result, both singlet and triplets can be harvested, achieving 100% IQE. The discovery and development of phosphorescent OLED contributed directly to the commercialization of active-matrix OLED (AMOLED) due to its high efficiency. Recently, Adachi achieved high efficiency through thermally activated delayed fluorescence (TADF) of organic compounds. These emitters have small singlet-triplet gap that makes the transition from triplet back to singlet possible. In the TADF device, the triplet excitons can go through reverse intersystem crossing to generate singlet excitons, resulting in high IQE.

[0006] OLEDs can also be classified as small molecule and polymer OLEDs according to the forms of the materials used. Small molecule refers to any organic or organometallic material that is not a polymer. The molecular weight of a small molecule can be large as long as it has well defined structure. Dendrimers with well-defined structures are considered as small molecules. Polymer OLEDs include conjugated polymers and non-conjugated polymers with pendant emitting groups. Small molecule OLED can become a polymer OLED if post polymerization occurred during the fabrication process.

[0007] The emitting color of an OLED can be achieved by emitter structural design. An OLED may comprise one emitting layer or a plurality of emitting layers to achieve desired spectrum. In the case of green, yellow, and red OLEDs, phosphorescent emitters have successfully reached commercialization. Blue phosphorescent emitters still suffer from non-saturated blue color, short device lifetime, and high operating voltage. Commercial full-color OLED displays normally adopt a hybrid strategy, using fluorescent blue and phosphorescent yellow, or red and green. At present, efficiency roll-off of phosphorescent OLEDs at high brightness remains a problem. In addition, it is desirable to have more saturated emitting color, higher efficiency, and longer device lifetime.

[0008] There are various methods for OLED fabrication. Small molecule OLEDs are generally fabricated by vacuum thermal evaporation. Polymer OLEDs are fabricated by solution process. If the material can be dissolved or dispersed in a solvent, the small molecule OLED can also be produced by solution process. Thus it can be seen that the OLEDs can be manufactured by vacuum thermal evaporation (VTE) and solution process. The solution process includes spin-coating, inkjet printing, slit printing, and other printing methods. Solution process has long been considered as the alternative to VTE due to its potential advantage on large area fabrication and cost reduction. However, the lifetime, efficiency and driving voltage of the device prepared by the solution process are not as good as those prepared by the VTE method. Since the charge transporting layer of the solution process generally involves the use of crosslinked materials, the resulting crosslinked group may affect the stability of the device.

[0009] An organic electroluminescent device generally comprises charge transporting layers, typically a hole transporting layer and an electron transporting layer. For the charge transporting material, the appropriate carrier mobility, good thermal stability and current stability of the charge transporting material is important for improving the overall performance of the organic electroluminescent device. The performance of the existing charge transporting materials still need to be improved, especially for the solution processed devices. We have discovered that the introduction of deuterated polymerizable group in the charge transporting compounds can greatly improve the performance of the resulting charge transporting material, thereby effectively improving the overall performance of the OLED, especially the lifetime of the device. This has not been reported in the literature. In addition, the charge transporting compounds with the introduction of a deuterated polymerizable group is

more suitable for use in solution process and therefore has advantages in terms of large area fabrication and cost reduction.

SUMMARY OF THE INVENTION

[0010] The present invention aims to provide a solution to solve at least part of the above technical problems. By introducing deuterated polymerizable group, the performance of the resulting charge transporting material can be greatly improved, thereby effectively improving the stability of the OLED.

[0011] According to an embodiment of the present invention, a charge transporting compound is disclosed, which comprises a charge transporting unit and a polymerizable group, wherein the polymerizable group is partially or fully deuterated.

[0012] According to another embodiment, an organic electroluminescent device is disclosed, which comprises:

[0013] an anode,

[0014] a cathode,

[0015] a charge transporting layer disposed between the anode and cathode, wherein the charge transporting layer comprises a charge transporting compound comprising a charge transporting unit and a polymerizable group, wherein the polymerizable group is partially or fully deuterated.

[0016] According to yet another embodiment, a formulation comprising of a charge transporting solution comprises the charge transporting compound is also disclosed. And the charge transporting compound comprises a charge transporting unit and a polymerizable group, wherein the polymerizable group is partially or fully deuterated.

[0017] The charge transporting compound and the formulation of the charge transporting solution disclosed in the present invention can be used in the electronic devices. By introducing partially or fully deuterated polymerizable group, the performance of the resulting charge transporting material can be greatly improved, thereby effectively improving the stability of the OLED. In addition, the charge transporting compounds with the introduction of a deuterated polymerizable group is more suitable for use in solution process and therefore has advantages in terms of large area fabrication and cost reduction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. **1** schematically shows an organic light emitting device that can incorporate the charge transporting compound and formulation of the charge transporting solution disclosed herein.

[0019] FIG. **2** schematically shows another organic light emitting device that can incorporate the charge transporting compound and formulation of the charge transporting solution disclosed herein.

DETAILED DESCRIPTION

[0020] OLEDs can be fabricated on various types of substrates such as glass, plastic, and metal foil. FIG. **1** schematically shows the organic light emitting device **100** without limitation. The figures are not necessarily drawn to scale. Some of the layer in the figure can also be omitted as needed. Device **100** may include a substrate **101**, an anode **110**, a hole injection layer **120**, a hole transport layer **130**, an electron blocking layer **140**, an emissive layer **150**, a hole blocking layer **160**, an electron transport layer **170**, an electron injection layer **180** and a cathode **190**. Device **100** may be fabricated by depositing the layers described in order. The properties and functions of these various layers, as well as example materials, are described in more detail in U.S. Pat. No. 7,279,704 at cols. 6-10, which are incorporated by reference in its entirety.

[0021] More examples for each of these layers are available. For example, a flexible and transparent substrate-anode combination is disclosed in U.S. Pat. No. 5,844,363, which is incorporated by reference in its entirety. An example of a p-doped hole transport layer is m-MTDATA doped with F4-TCNQ at a molar ratio of 50:1, as disclosed in U.S. Patent Application Publication No. 2003/0230980, which is incorporated by reference in its entirety. Examples of host materials are disclosed in U.S. Pat. No. 6,303,238 to Thompson et al., which is incorporated by reference in its entirety. An example of an n-doped electron transport layer is BPhen doped with Li at a molar ratio of 1:1, as disclosed in U.S. Patent Application Publication No. 2003/0230980, which is incorporated by reference in its entirety. U.S. Pat. Nos. 5,703,436 and 5,707,745, which are incorporated by reference in their entireties, disclose examples of cathodes including compound cathodes having a thin layer of metal such as Mg:Ag with an overlying transparent, electrically-conductive, sputter-deposited ITO layer. The theory and use of blocking layers is described in more detail in U.S. Pat. No. 6,097,147 and U.S. Patent Application Publication No. 2003/0230980, which are incorporated by reference in their entireties. Examples of injection layers are provided in U.S. Patent Application Publication No. 2004/0174116, which is incorporated by reference in its entirety. A description of protective layers may be found in U.S. Patent Application Publication No. 2004/0174116, which is incorporated by reference in its entirety.

[0022] The layered structure described above is provided by way of non-limiting example. Functional OLEDs may be achieved by combining the various layers described in different ways, or layers may be omitted entirely. It may also include other layers not specifically described. Within each layer, a single material or a mixture of multiple materials can be used to achieve optimum performance. Any functional layer may include several sublayers. For example, the emissive layer may have a two layers of different emitting materials to achieve desired emission spectrum.

[0023] In one embodiment, an OLED may be described as having an "organic layer" disposed between a cathode and an anode. This organic layer may comprise a single layer or multiple layers.

[0024] An OLED can be encapsulated by a barrier layer to protect it from harmful species from the environment such as moisture and oxygen. FIG. **2** schematically shows the organic light emitting device **200** without limitation. FIG. **2** differs from FIG. **1** in that the organic light emitting device **200** include a barrier layer **102**, which is above the cathode **190**. Any material that can provide the barrier function can be used as the barrier layer such as glass and organic-inorganic hybrid layers. The barrier layer should be placed directly or indirectly outside of the OLED device. Multilayer thin film encapsulation was described in U.S. Pat. No. 7,968,146, which is herein incorporated by reference in its entirety.

[0025] Devices fabricated in accordance with embodiments of the invention can be incorporated into a wide variety of consumer products that have one or more of the

electronic component modules (or units) incorporated therein. Some examples of such consumer products include flat panel displays, monitors, medical monitors, televisions, billboards, lights for interior or exterior illumination and/or signaling, heads-up displays, fully or partially transparent displays, flexible displays, smart phones, tablets, phablets, wearable devices, smart watches, laptop computers, digital cameras, camcorders, viewfinders, micro-displays, 3-D displays, vehicles displays, and vehicle tail lights.

[0026] The materials and structures described herein may be used in other organic electronic devices listed above.

[0027] As used herein, "top" means furthest away from the substrate, while "bottom" means closest to the substrate. Where a first layer is described as "disposed over" a second layer, the first layer is disposed further away from substrate. There may be other layers between the first and second layer, unless it is specified that the first layer is "in contact with" the second layer. For example, a cathode may be described as "disposed over" an anode, even though there are various organic layers in between.

[0028] As used herein, "solution processible" means capable of being dissolved, dispersed, or transported in and/or deposited from a liquid medium, either in solution or suspension form.

[0029] A ligand may be referred to as "photoactive" when it is believed that the ligand directly contributes to the photoactive properties of an emissive material. A ligand may be referred to as "ancillary" when it is believed that the ligand does not contribute to the photoactive properties of an emissive material, although an ancillary ligand may alter the properties of a photoactive ligand.

[0030] It is believed that the internal quantum efficiency (IQE) of fluorescent OLEDs can exceed the 25% spin statistics limit through delayed fluorescence. As used herein, there are two types of delayed fluorescence, i.e. P-type delayed fluorescence and E-type delayed fluorescence. P-type delayed fluorescence is generated from triplet-triplet annihilation (TTA).

[0031] On the other hand, E-type delayed fluorescence does not rely on the collision of two triplets, but rather on the transition between the triplet states and the singlet excited states. Compounds that are capable of generating E-type delayed fluorescence are required to have very small singlet-triplet gaps to convert between energy states. Thermal energy can activate the transition from the triplet state back to the singlet state. This type of delayed fluorescence is also known as thermally activated delayed fluorescence (TADF). A distinctive feature of TADF is that the delayed component increases as temperature rises. If the reverse intersystem crossing rate is fast enough to minimize the non-radiative decay from the triplet state, the fraction of back populated singlet excited states can potentially reach 75%. The total singlet fraction can be 100%, far exceeding 25% of the spin statistics limit for electrically generated excitons.

[0032] E-type delayed fluorescence characteristics can be found in an exciplex system or in a single compound. Without being bound by theory, it is believed that E-type delayed fluorescence requires the luminescent material to have a small singlet-triplet energy gap (ΔE_{S-T}). Organic, non-metal containing, donor-acceptor luminescent materials may be able to achieve this. The emission in these materials is often characterized as a donor-acceptor charge-transfer (CT) type emission. The spatial separation of the HOMO and LUMO in these donor-acceptor type compounds often results in small ΔE_{S-T}. These states may involve CT states. Often, donor-acceptor luminescent materials are constructed by connecting an electron donor moiety such as amino- or carbazole-derivatives and an electron acceptor moiety such as N-containing six-membered aromatic rings.

Definition of Terms of Substituents

[0033] halogen or halide—as used herein includes fluorine, chlorine, bromine, and iodine.

[0034] Alkyl—contemplates both straight and branched chain alkyl groups. Examples of the alkyl group include methyl group, ethyl group, propyl group, isopropyl group, n-butyl group, s-butyl group, isobutyl group, t-butyl group, n-pentyl group, n-hexyl group, n-heptyl group, n-octyl group, n-nonyl group, n-decyl group, n-undecyl group, n-dodecyl group, n-tridecyl group, n-tetradecyl group, n-pentadecyl group, n-hexadecyl group, n-heptadecyl group, n-octadecyl group, neopentyl group, 1-methylpentyl group, 2-methylpentyl group, 1-pentylhexyl group, 1-butylpentyl group, 1-heptyloctyl group, 3-methylpentyl group. Additionally, the alkyl group may be optionally substituted. The carbons in the alkyl chain can be replaced by other hetero atoms. Of the above, preferred are methyl group, ethyl group, propyl group, isopropyl group, n-butyl group, s-butyl group, isobutyl group, t-butyl group, n-pentyl group, and neopentyl group.

[0035] Cycloalkyl—as used herein contemplates cyclic alkyl groups. Preferred cycloalkyl groups are those containing 4 to 10 ring carbon atoms and includes cyclobutyl, cyclopentyl, cyclohexyl, 4-methylcyclohexyl, 4,4-dimethylcyclohexyl, 1-adamantyl, 2-adamantyl, 1-norbornyl, 2-norbornyl and the like. Additionally, the cycloalkyl group may be optionally substituted. The carbons in the ring can be replaced by other hetero atoms.

[0036] Alkenyl—as used herein contemplates both straight and branched chain alkene groups. Preferred alkenyl groups are those containing two to fifteen carbon atoms. Examples of the alkenyl group include vinyl group, allyl group, 1-butenyl group, 2-butenyl group, 3-butenyl group, 1,3-butandienyl group, 1-methylvinyl group, styryl group, 2,2-diphenylvinyl group, 1,2-diphenylvinyl group, 1-methylallyl group, 1,1-dimethylallyl group, 2-methylallyl group, 1-phenylallyl group, 2-phenylallyl group, 3-phenylallyl group, 3,3-diphenylallyl group, 1,2-dimethylallyl group, 1-phenyl1-butenyl group, and 3-phenyl-1-butenyl group. Additionally, the alkenyl group may be optionally substituted.

[0037] Alkynyl—as used herein contemplates both straight and branched chain alkyne groups. Preferred alkynyl groups are those containing two to fifteen carbon atoms. Additionally, the alkynyl group may be optionally substituted.

[0038] Aryl or aromatic group—as used herein contemplates noncondensed and condensed systems. Preferred aryl groups are those containing six to sixty carbon atoms, preferably six to twenty carbon atoms, more preferably six to twelve carbon atoms. Examples of the aryl group include phenyl, biphenyl, terphenyl, triphenylene, tetraphenylene, naphthalene, anthracene, phenalene, phenanthrene, fluorene, pyrene, chrysene, perylene, and azulene, preferably phenyl, biphenyl, terphenyl, triphenylene, fluorene, and naphthalene. Additionally, the aryl group may be optionally substituted. Examples of the non-condensed aryl group include phenyl group, biphenyl-2-yl group, biphenyl-3-yl group,

biphenyl-4-yl group, p-terphenyl-4-yl group, p-terphenyl-3-yl group, p-terphenyl-2-yl group, m-terphenyl-4-yl group, m-terphenyl-3-yl group, m-terphenyl-2-yl group, o-tolyl group, m-tolyl group, p-tolyl group, p-t-butylphenyl group, p-(2-phenylpropyl)phenyl group, 4'-methylbiphenylyl group, 4"-t-butyl p-terphenyl-4-yl group, o-cumenyl group, m-cumenyl group, p-cumenyl group, 2,3-xylyl group, 3,4-xylyl group, 2,5-xylyl group, mesityl group, and m-quarterphenyl group.

[0039] Heterocyclic group or heterocycle—as used herein contemplates aromatic and non-aromatic cyclic groups. Hetero-aromatic also means heteroaryl. Preferred non-aromatic heterocyclic groups are those containing 3 to 7 ring atoms which includes at least one hetero atom such as nitrogen, oxygen, and sulfur. The heterocyclic group can also be an aromatic heterocyclic group having at least one heteroatom selected from nitrogen atom, oxygen atom, sulfur atom, and selenium atom.

[0040] Heteroaryl—as used herein contemplates noncondensed and condensed hetero-aromatic groups that may include from one to five heteroatoms. Preferred heteroaryl groups are those containing three to thirty carbon atoms, preferably three to twenty carbon atoms, more preferably three to twelve carbon atoms. Suitable heteroaryl groups include dibenzothiophene, dibenzofuran, dibenzoselenophene, furan, thiophene, benzofuran, benzothiophene, benzoselenophene, carbazole, indolocarbazole, pyridylindole, pyrrolodipyridine, pyrazole, imidazole, triazole, oxazole, thiazole, oxadiazole, oxatriazole, dioxazole, thiadiazole, pyridine, pyridazine, pyrimidine, pyrazine, triazine, oxazine, oxathiazine, oxadiazine, indole, benzimidazole, indazole, indoxazine, benzoxazole, benzisoxazole, benzothiazole, quinoline, isoquinoline, cinnoline, quinazoline, quinoxaline, naphthyridine, phthalazine, pteridine, xanthene, acridine, phenazine, phenothiazine, phenoxazine, benzofuropyridine, furodipyridine, benzothienopyridine, thienodipyridine, benzoselenophenopyridine, and selenophenodipyridine, preferably dibenzothiophene, dibenzofuran, dibenzoselenophene, carbazole, indolocarbazole, imidazole, pyridine, triazine, benzimidazole, 1,2-azaborine, 1,3-azaborine, 1,4-azaborine, borazine, and aza-analogs thereof. Additionally, the heteroaryl group may be optionally substituted.

[0041] Alkoxy—it is represented by —O-Alkyl. Examples and preferred examples thereof are the same as those described above. Examples of the alkoxy group having 1 to 20 carbon atoms, preferably 1 to 6 carbon atoms include methoxy group, ethoxy group, propoxy group, butoxy group, pentyloxy group, and hexyloxy group. The alkoxy group having 3 or more carbon atoms may be linear, cyclic or branched.

[0042] Aryloxy—it is represented by —O-Aryl or —O-heteroaryl. Examples and preferred examples thereof are the same as those described above. Examples of the aryloxy group having 6 to 40 carbon atoms include phenoxy group and biphenyloxy group.

[0043] Arylalkyl—as used herein contemplates an alkyl group that has an aryl substituent. Additionally, the arylalkyl group may be optionally substituted. Examples of the arylalkyl group include benzyl group, 1-phenylethyl group, 2-phenylethyl group, 1-phenylisopropyl group, 2-phenylisopropyl group, phenyl-t-butyl group, alpha.-naphthylmethyl group, 1-alpha.-naphthylethyl group, 2-alpha-naphthylethyl group, 1-alpha-naphthylisopropyl group, 2-alpha-naphthylisopropyl group, beta-naphthylmethyl group, 1-beta-naphthylethyl group, 2-beta-naphthylethyl group, 1-beta-naphthylisopropyl group, 2-beta-naphthylisopropyl group, p-methylbenzyl group, m-methylbenzyl group, o-methylbenzyl group, p-chlorobenzyl group, m-chlorobenzyl group, o-chlorobenzyl group, p-bromobenzyl group, m-bromobenzyl group, o-bromobenzyl group, p-iodobenzyl group, m-iodobenzyl group, o-iodobenzyl group, p-hydroxybenzyl group, m-hydroxybenzyl group, o-hydroxybenzyl group, p-aminobenzyl group, m-aminobenzyl group, o-aminobenzyl group, p-nitrobenzyl group, m-nitrobenzyl group, o-nitrobenzyl group, p-cyanobenzyl group, m-cyanobenzyl group, o-cyanobenzyl group, 1-hydroxy-2-phenylisopropyl group, and 1-chloro2-phenylisopropyl group. Of the above, preferred are benzyl group, p-cyanobenzyl group, m-cyanobenzyl group, o-cyanobenzyl group, 1-phenylethyl group, 2-phenylethyl group, 1-phenylisopropyl group, and 2-phenylisopropyl group.

[0044] The term "aza" in azadibenzofuran, aza-dibenzothiophene, etc. means that one or more of the C—H groups in the respective aromatic fragment are replaced by a nitrogen atom. For example, azatriphenylene encompasses dibenzo[f,h]quinoxaline,dibenzo[f,h]quinoline and other analogues with two or more nitrogens in the ring system. One of ordinary skill in the art can readily envision other nitrogen analogs of the aza-derivatives described above, and all such analogs are intended to be encompassed by the terms as set forth herein.

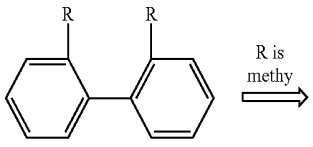
[0045] The alkyl, cycloalkyl, alkenyl, alkynyl, aralkyl, heterocyclic group, aryl, and heteroaryl may be unsubstituted or may be substituted with one or more substituents selected from the group consisting of deuterium, halogen, alkyl, cycloalkyl, arylalkyl, alkoxy, aryloxy, amino, cyclic amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acid, ether, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof.

[0046] It is to be understood that when a molecular fragment is described as being a substituent or otherwise attached to another moiety, its name may be written as if it were a fragment (e.g. phenyl, phenylene, naphthyl, dibenzofuryl) or as if it were the whole molecule (e.g. benzene, naphthalene, dibenzofuran). As used herein, these different ways of designating a substituent or attached fragment are considered to be equivalent.

[0047] In the compounds mentioned in this disclosure, the hydrogen atoms can be partially or fully replaced by deuterium. Other atoms such as carbon and nitrogen, can also be replaced by their other stable isotopes. The replacement by other stable isotopes in the compounds may be preferred due to its enhancements of device efficiency and stability.

[0048] In the compounds mentioned in this disclosure, multiple substitutions refer to a range that includes a double substitution, up to the maximum available substitutions.

[0049] In the compounds mentioned in this disclosure, the expression that adjacent substituents are optionally joined to form a ring is intended to be taken to mean that two radicals are linked to each other by a chemical bond. This is illustrated by the following scheme:



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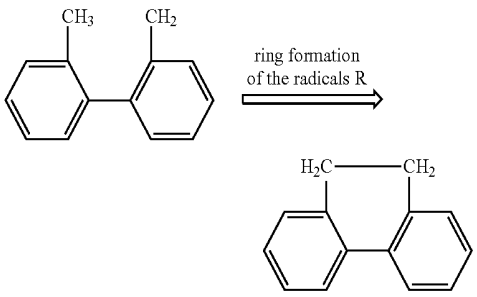
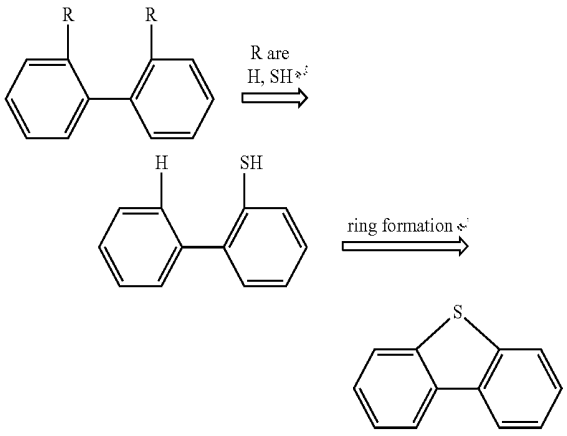


[0050] Furthermore, the expression that adjacent substituents are optionally joined to form a ring is also intended to be taken to mean that in the case where one of the two radicals represents hydrogen, the second radical is bonded at a position to which the hydrogen atom was bonded, with formation of a ring. This is illustrated by the following scheme:



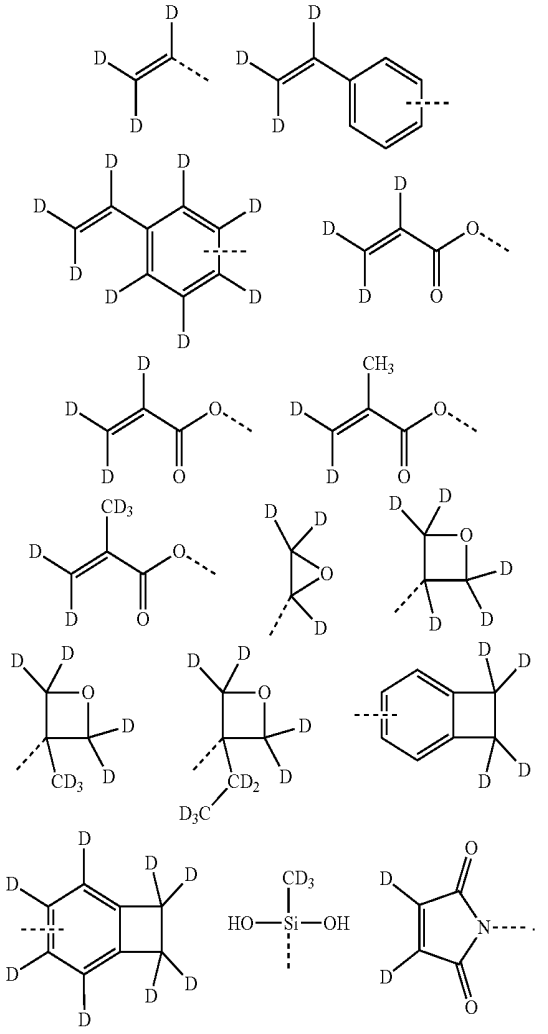
[0051] According to an embodiment of the present invention, a charge transporting compound comprising a charge transporting unit and a polymerizable group is disclosed, wherein the polymerizable group is partially or fully deuterated.

[0052] In one embodiment, wherein the charge transporting compound is a hole transporting compound.

[0053] In one embodiment, wherein the charge transporting compound is an electron transporting compound.

[0054] In one embodiment, wherein the polymerizable group of the charge transporting compound is selected from the group consisting of partially or fully deuterated vinyl, partially or fully deuterated styryl, partially or fully deuterated acrylate, partially or fully deuterated methacrylate, partially or fully deuterated epoxide, partially or fully deuterated oxetane, partially or fully deuterated benzocyclobutene, partially or fully deuterated siloxane, and partially or fully deuterated maleimide.

[0055] In one embodiment, wherein the polymerizable group of the charge transporting compound is selected from the group consisting of:



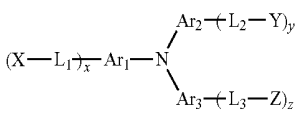
[0056] In one embodiment, wherein the charge transporting unit of the charge transporting compound is selected from the group consisting of triarylamine, carbazole, azacarbazole, triphenylene, dibenzofuran, dibenzothiophene, dibenzoselenophene, azadibenzofuran, azadibenzothiophene, azadibenzoselenophene, azatriphenylene, triazine, pyrimidine, benzimidazole, quinazoline, quinoxaline, naphthalene, phenanthrene, phenanthroline, anthracene, fluorene, azafluorene, fluoranthene, and pyrene.

[0057] In one embodiment, wherein the charge transporting compound is a small molecule.

[0058] In one embodiment, wherein the charge transporting compound is a polymer.

[0059] In one embodiment, wherein the charge transporting compound have a structure of formula 1:

Formula 1



[0060] Wherein

[0061] X, Y, and Z are independently selected from polymerizable groups;

[0062] x, y, and z are independently selected from 0, 1, 2, and 3;

[0063] the sum of x, y, and z equals to or is more than 1;

[0064] Each of L_1, L_2, and L_3 are independently selected from the group consisting of a single bond, a substituted or unsubstituted alkyl group having 1 to 20 carbon atoms, a substituted or unsubstituted cycloalkyl group having 3 to 20 ring carbon atoms, a substituted or unsubstituted heteroalkyl group having 1 to 20 carbon atoms, a substituted or unsubstituted arylalkyl group having 7 to 30 carbon atoms, a substituted or unsubstituted alkoxy group having 1 to 20 carbon atoms, a substituted or unsubstituted aryloxy group having 6 to 30 carbon atoms, a substituted or unsubstituted alkenyl group having 2 to 20 carbon atoms, a substituted or unsubstituted arylene group having 6 to 30 carbon atoms, a substituted or unsubstituted heteroarylene group having 3 to 30 carbon atoms, a substituted or unsubstituted alkylsilyl group having 3 to 20 carbon atoms, a substituted or unsubstituted arylsilyl group having 6 to 20 carbon atoms, a substituted or unsubstituted amino group having 1 to 30 carbon atoms, a carbonyl group, an ester group, a sulfanyl group, a sulfinyl group, a sulfonyl group, a phosphino group, and combinations thereof;

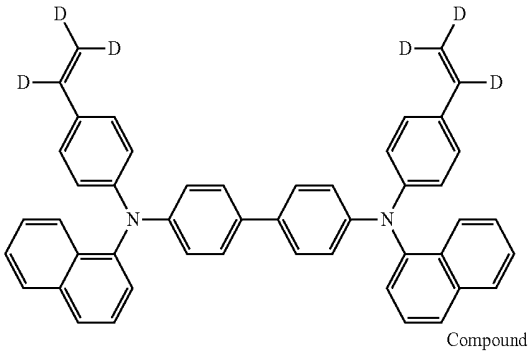
[0065] When x, y, or z is more than 1, each of L_1, L_2, L_3 and each of X, Y, Z can be the same or different;

[0066] Ar_1, Ar_2, and Ar_3 are each independently selected from the group consisting of a substituted or unsubstituted aryl group having 6 to 40 ring carbon atoms, a substituted or unsubstituted heteroaryl group having 5 to 40 ring atoms, and combinations thereof;

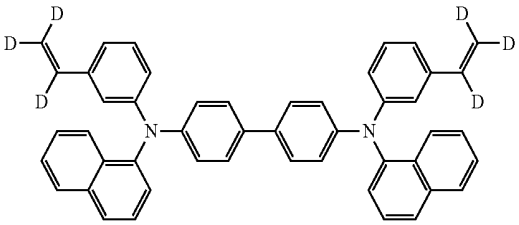
[0067] Any adjacent substitution groups are optionally joined to form a ring or a fused structure.

[0068] In one embodiment, wherein the charge transporting compound is selected from the group consisting of:

Compound 1



Compound 2



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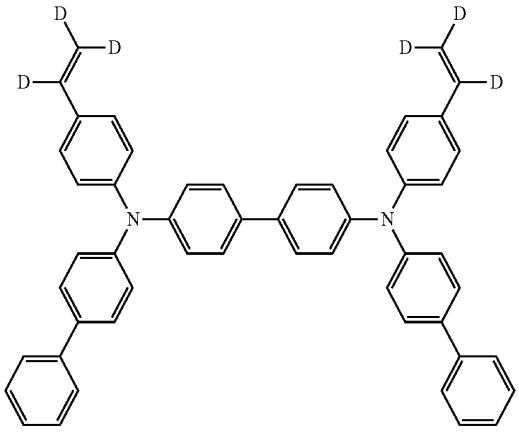
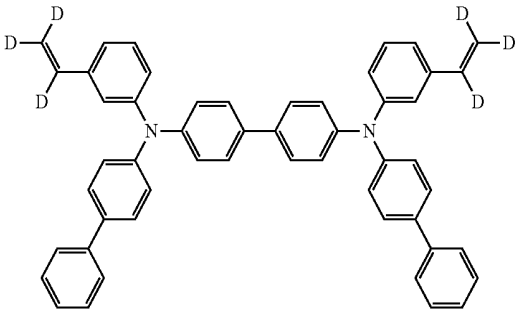
Compound 3



Compound 4



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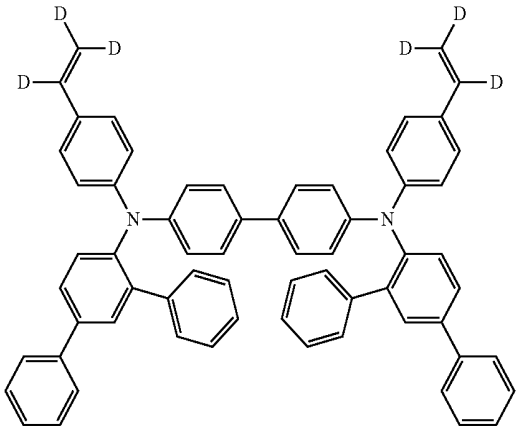
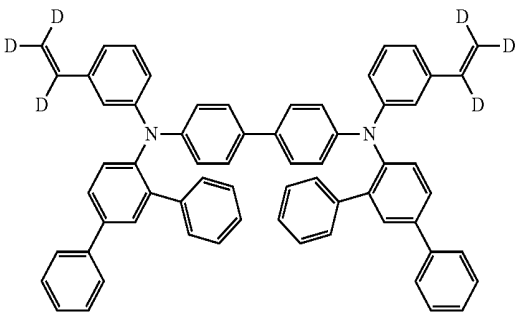


Compound 6



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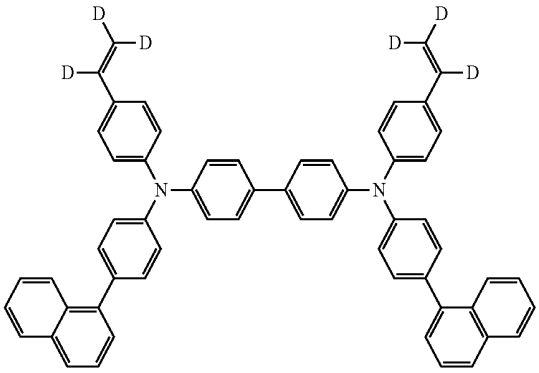
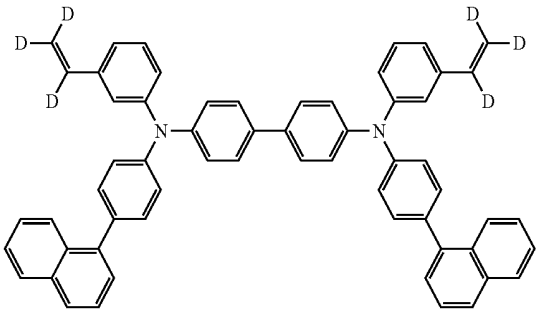
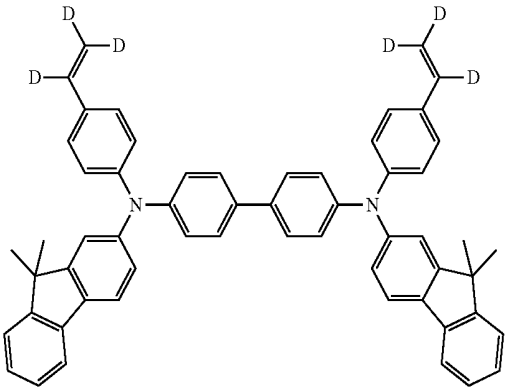


Compound 8



Compound 9



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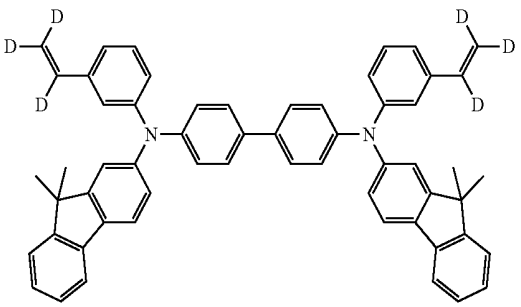

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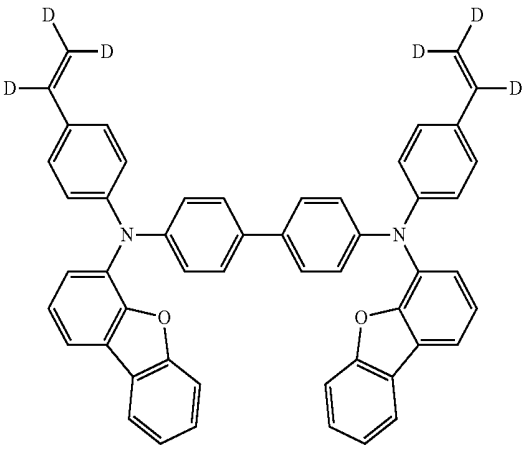
Compound 11



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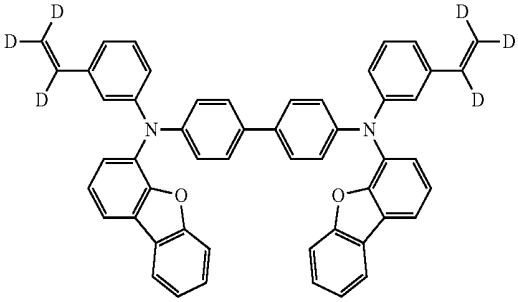
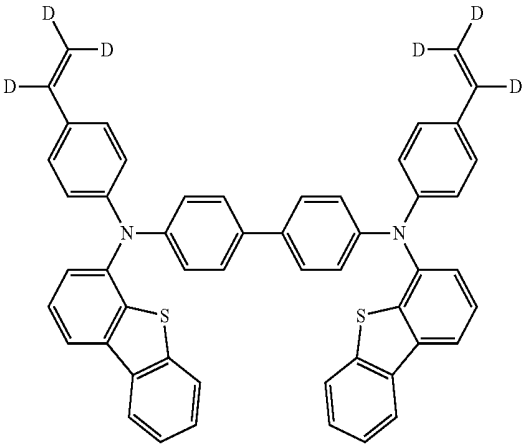


Compound 13



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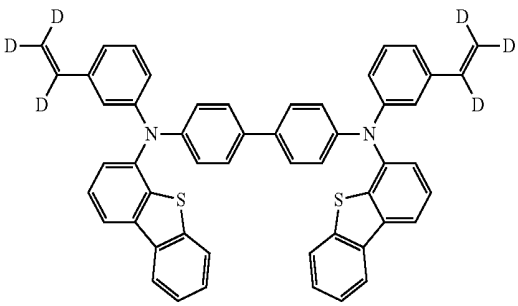

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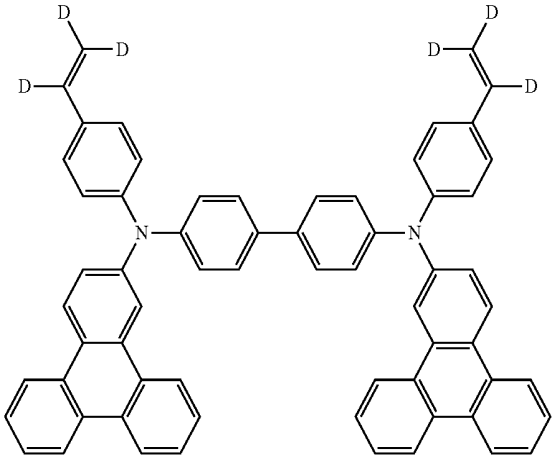

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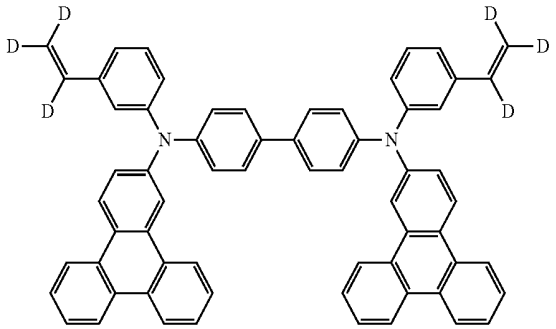

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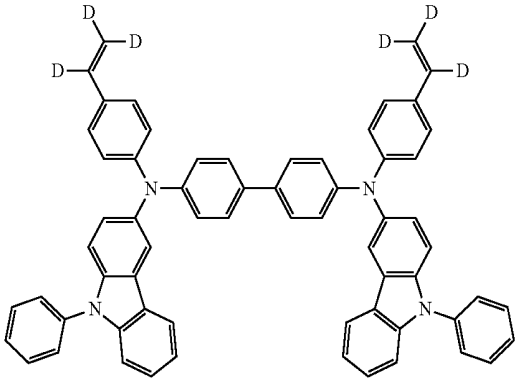

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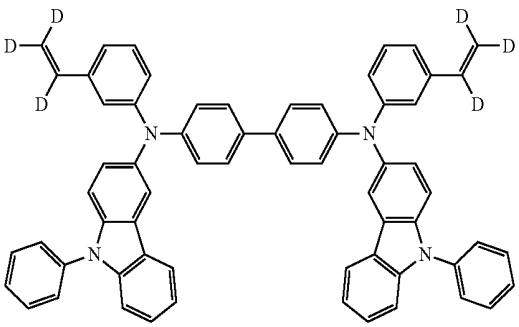

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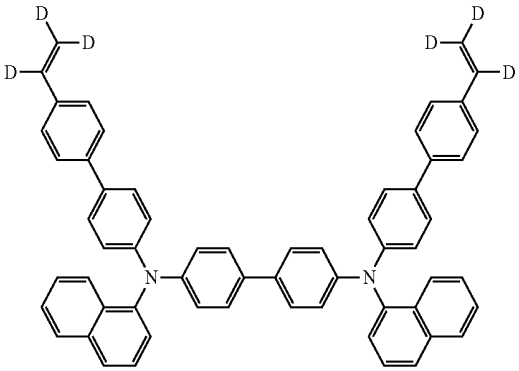

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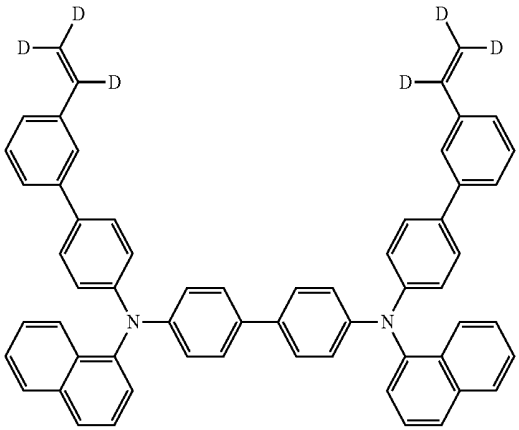

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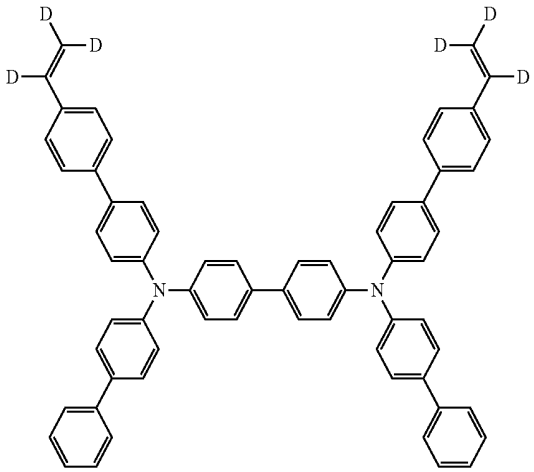

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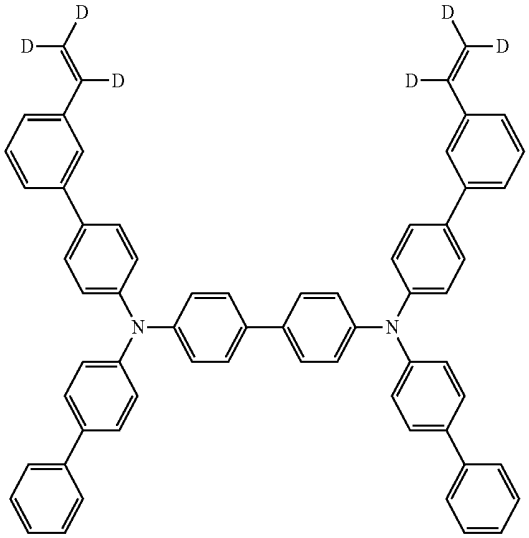

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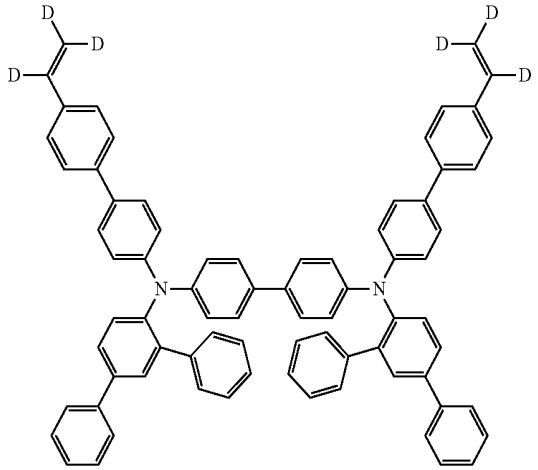

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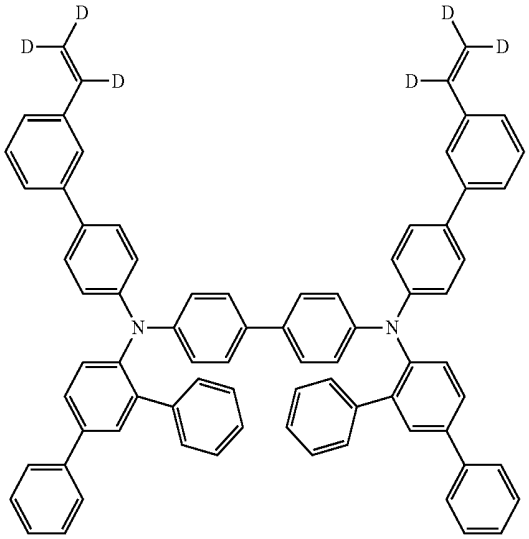

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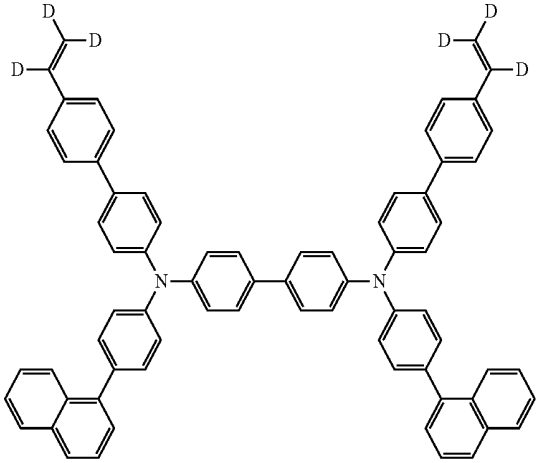

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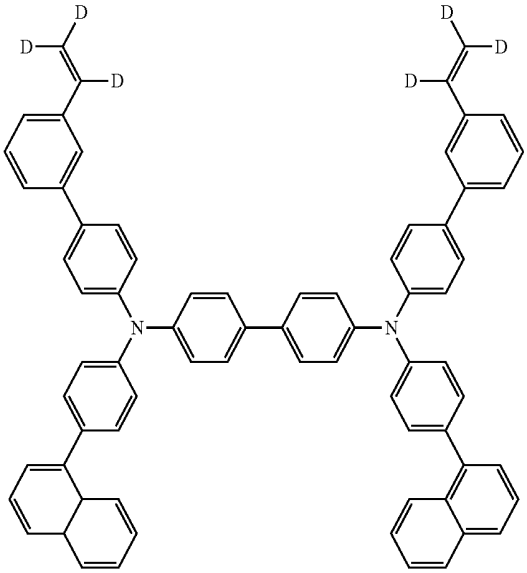

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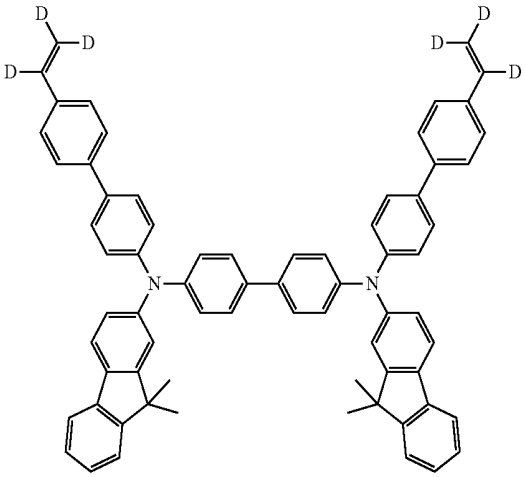

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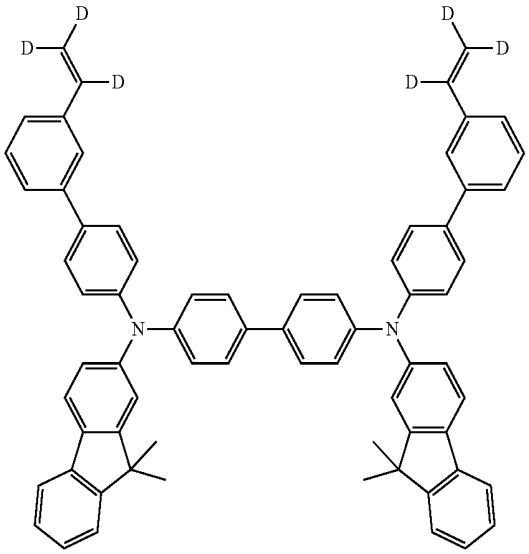

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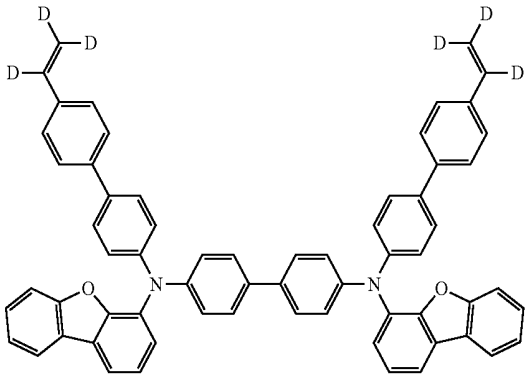

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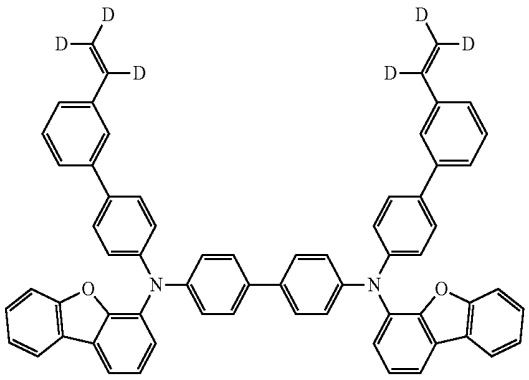

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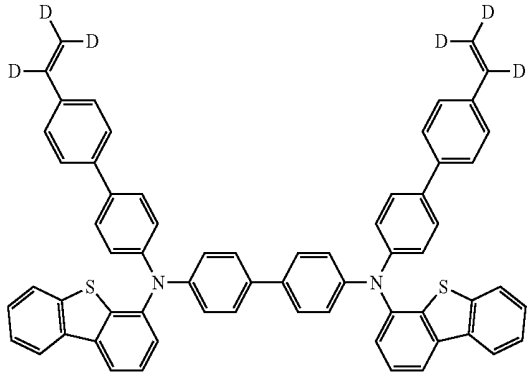

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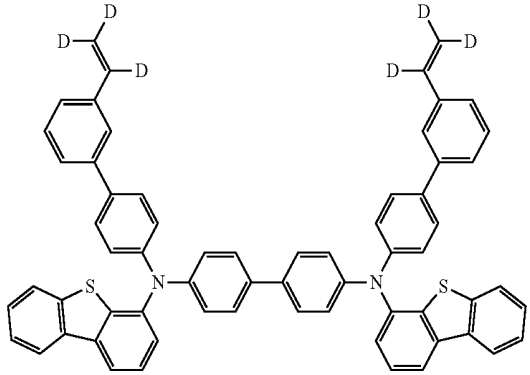

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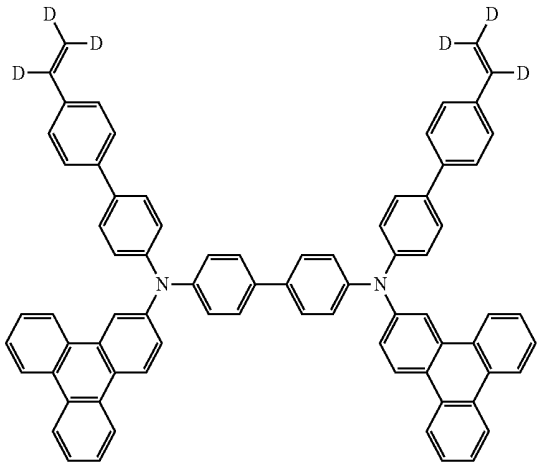

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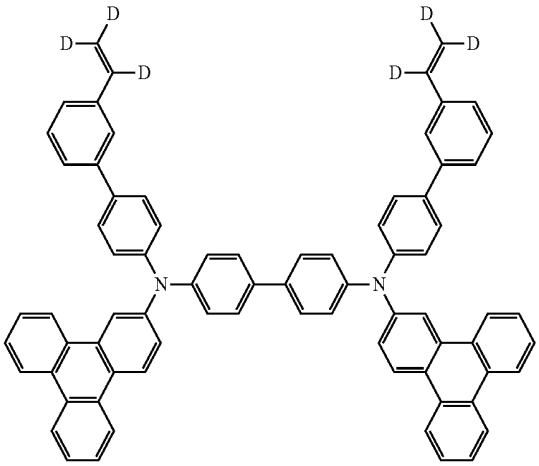

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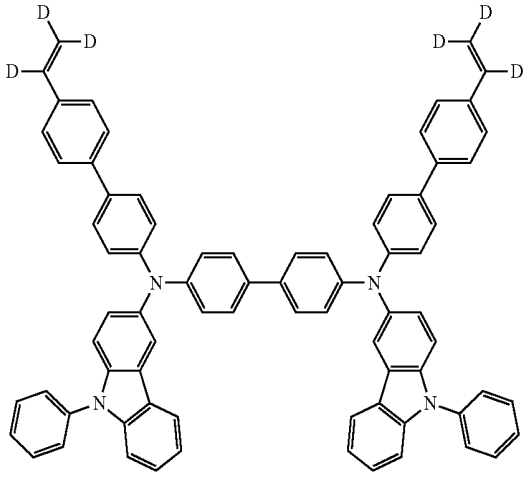

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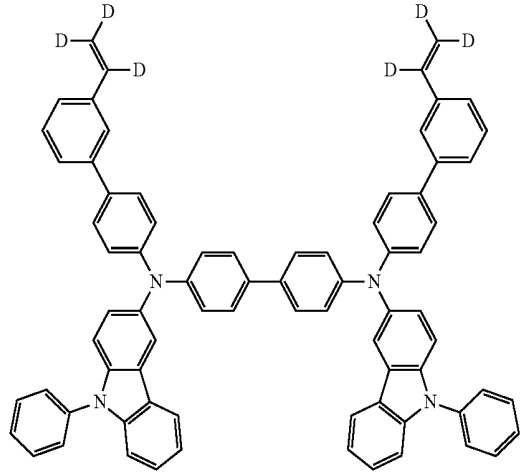

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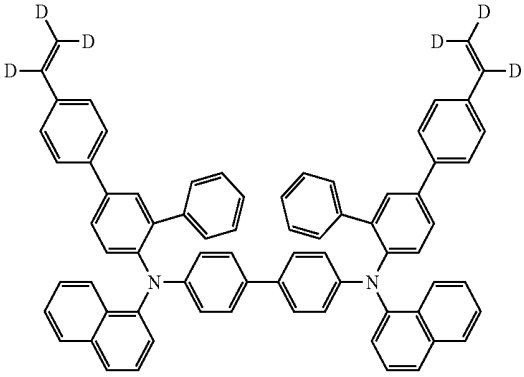
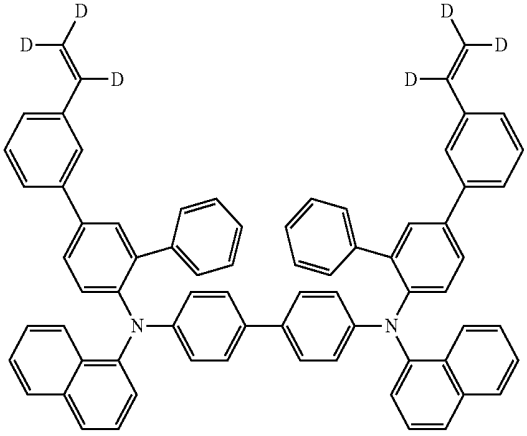
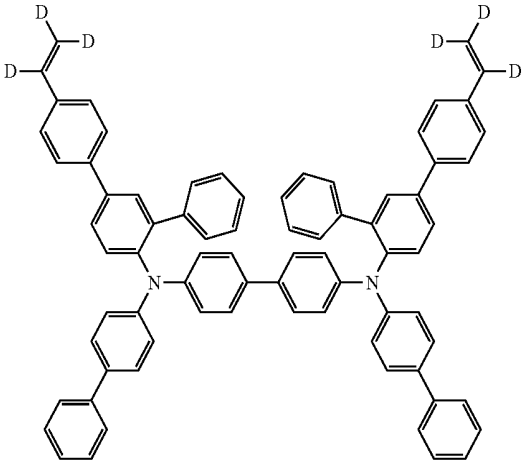
Compound 37



Compound 38



Compound 39



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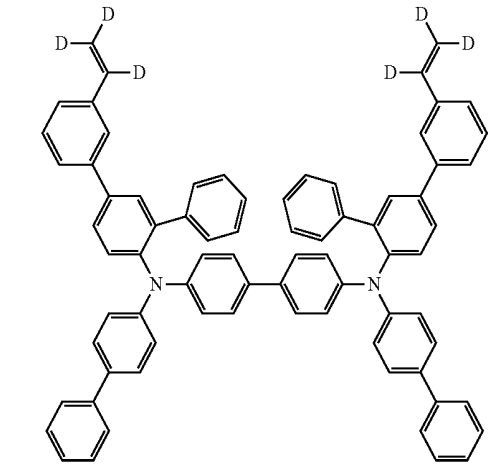
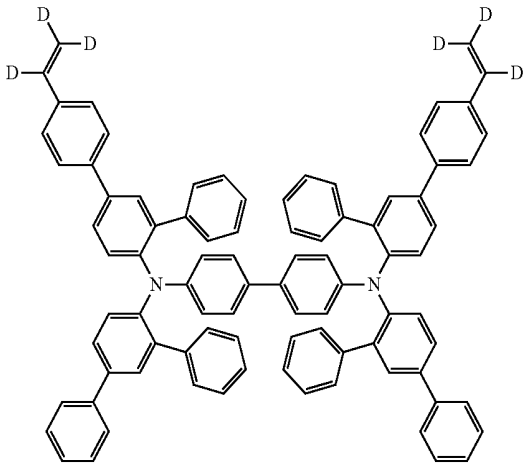
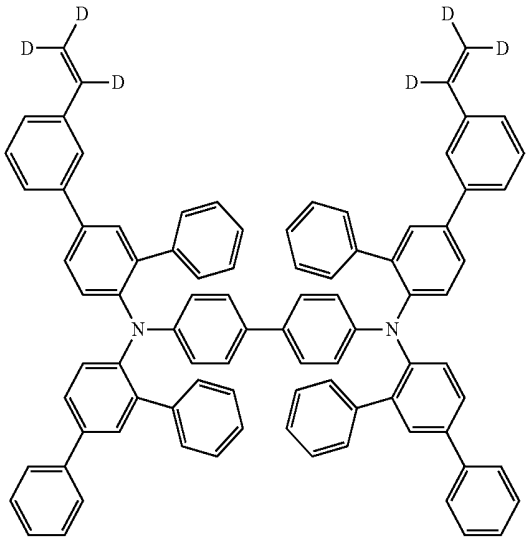
Compound 40



Compound 41



Compound 42



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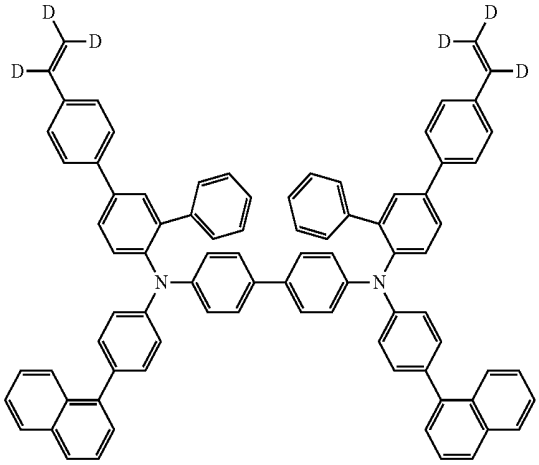
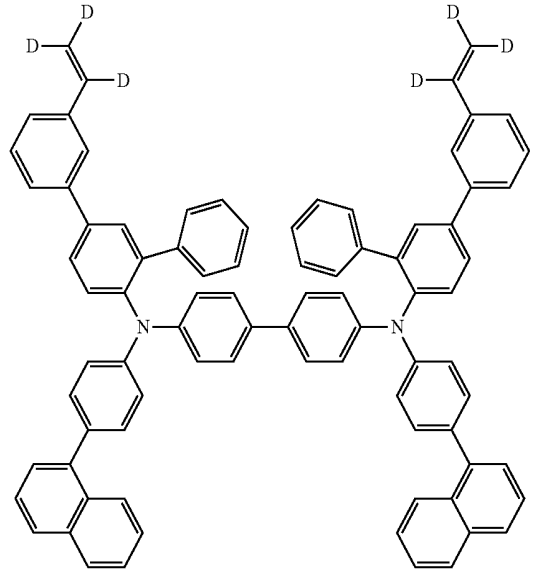
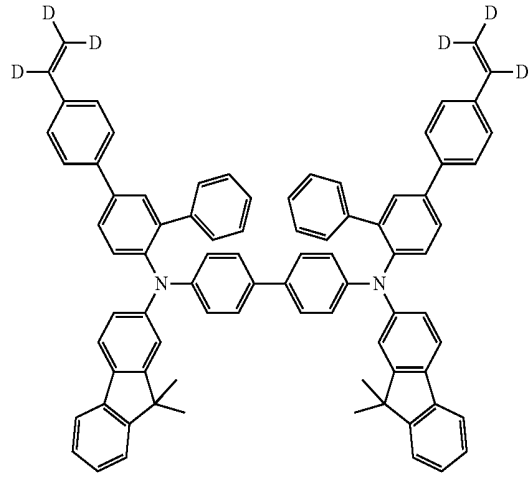
Compound 43



Compound 44



Compound 45



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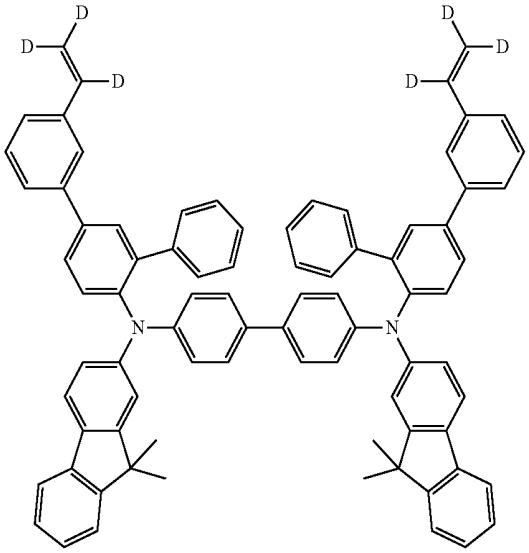
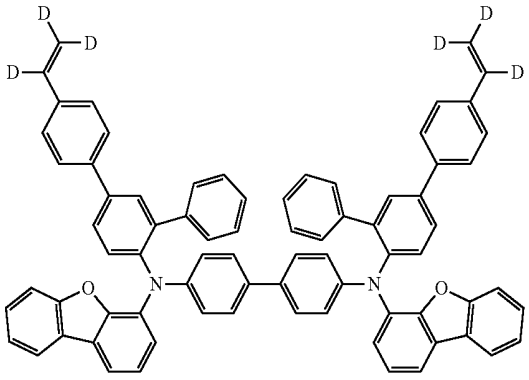
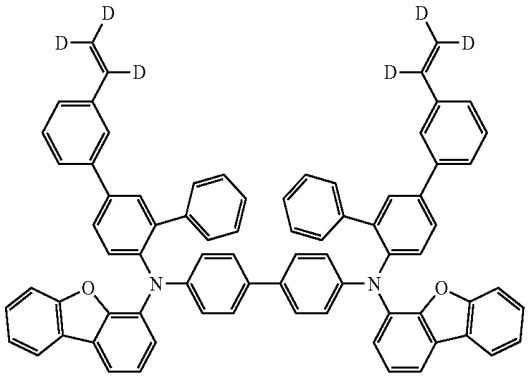
Compound 46



Compound 47



Compound 48



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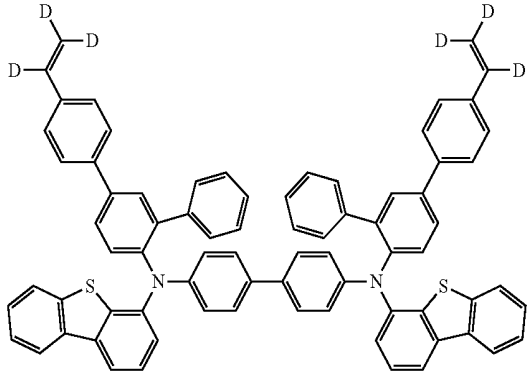
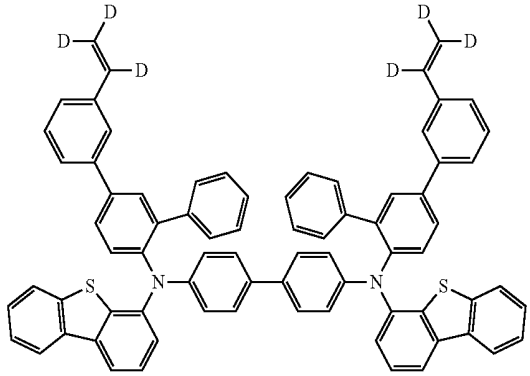
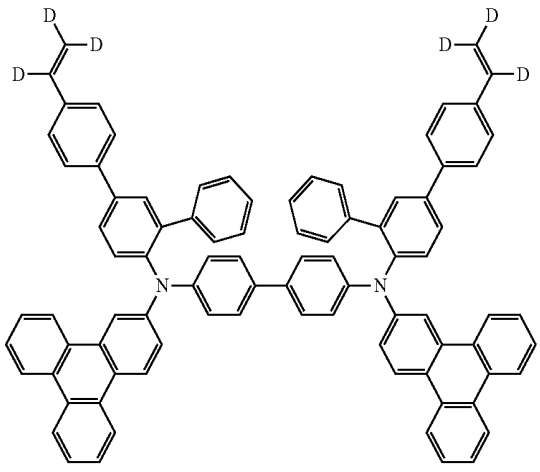
Compound 49



Compound 50



Compound 51



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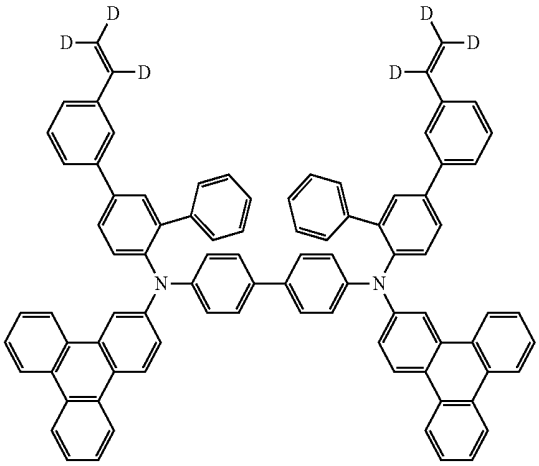
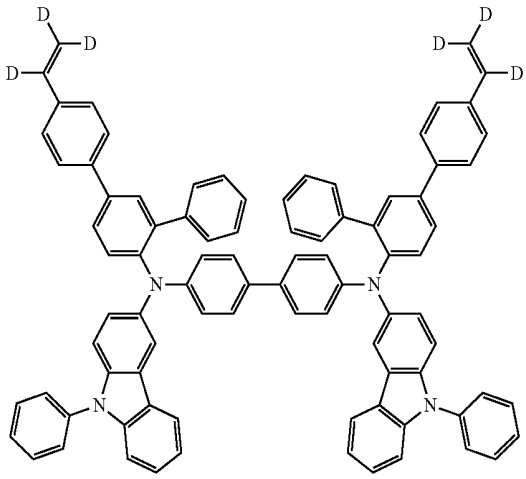
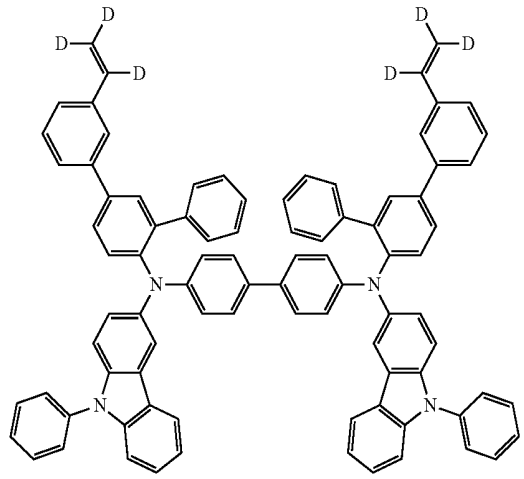
Compound 52



Compound 53



Compound 54



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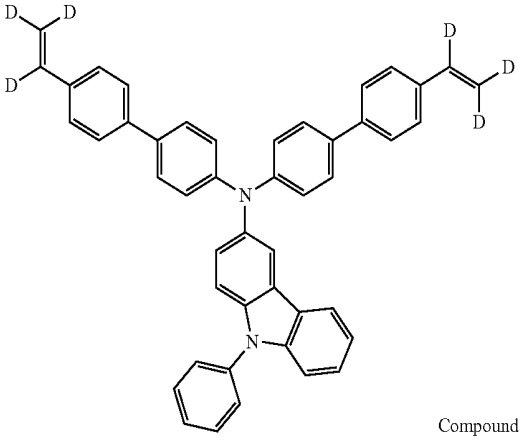
Compound 55



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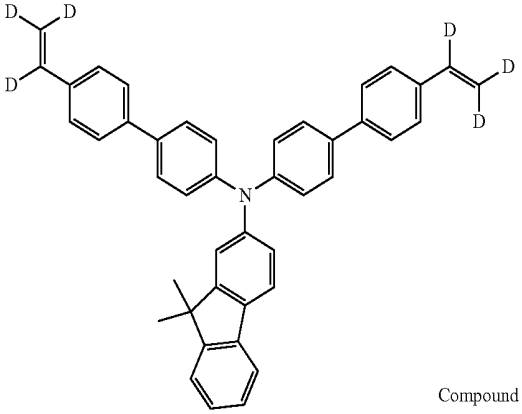

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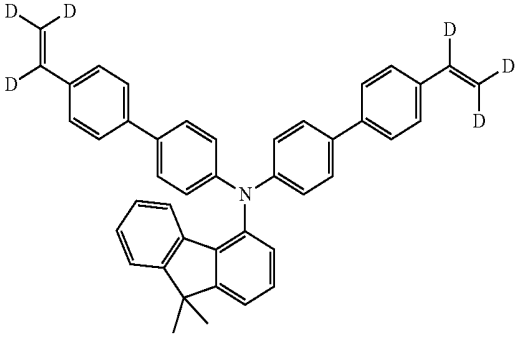

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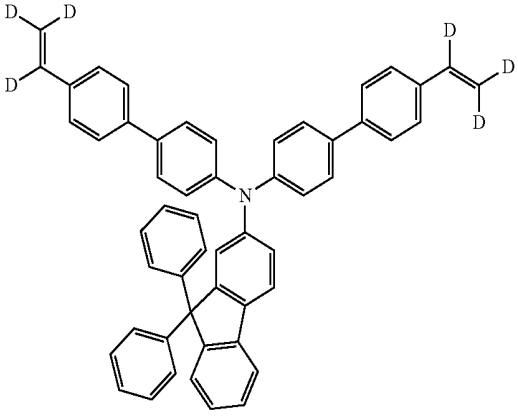

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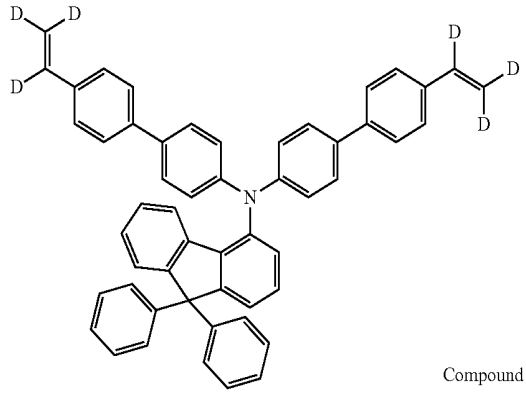

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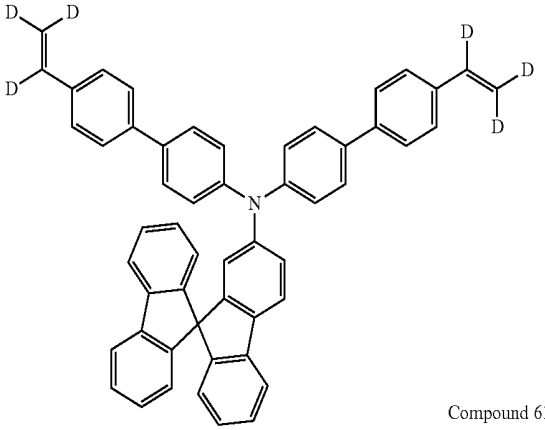

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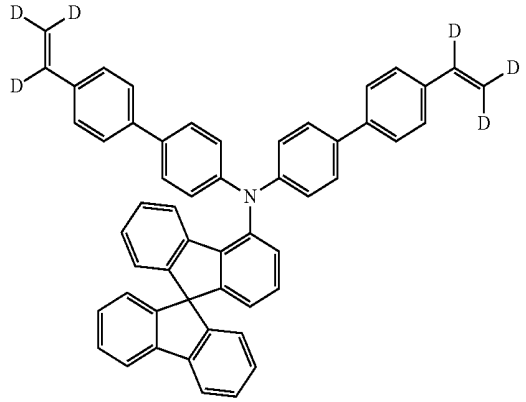

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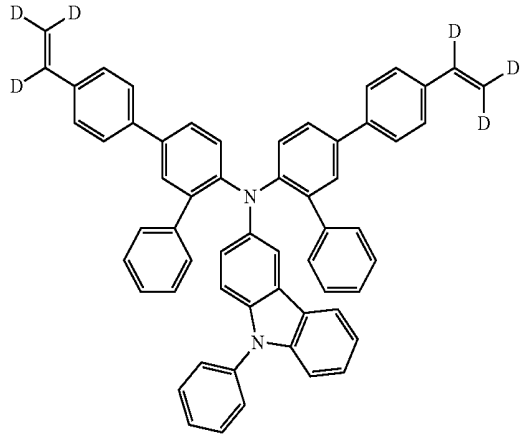

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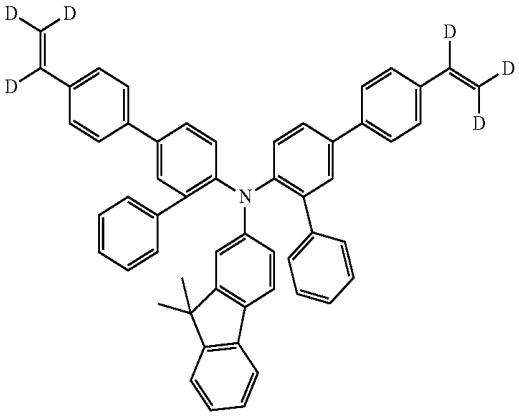

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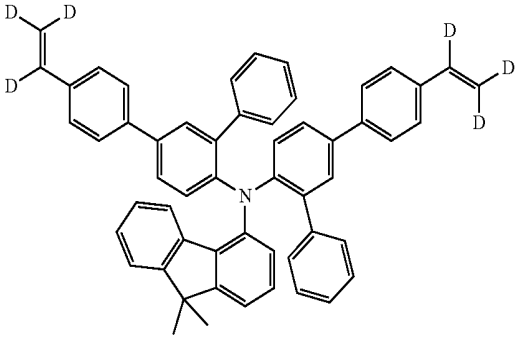

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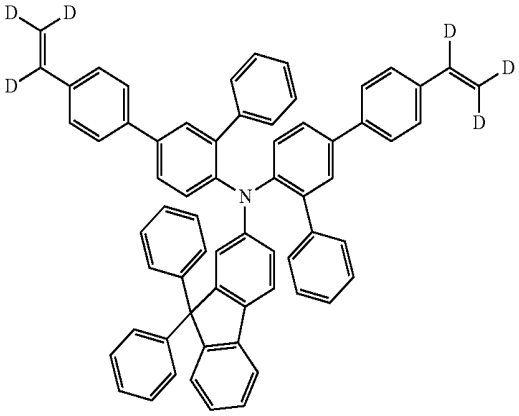

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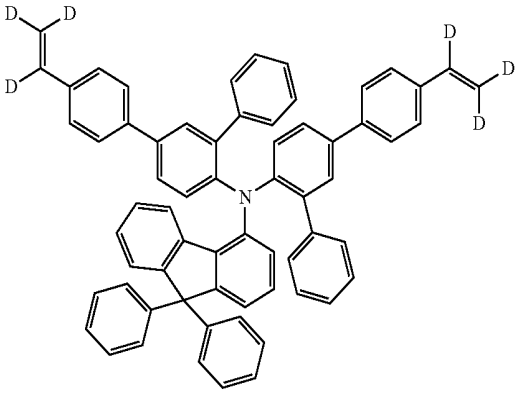

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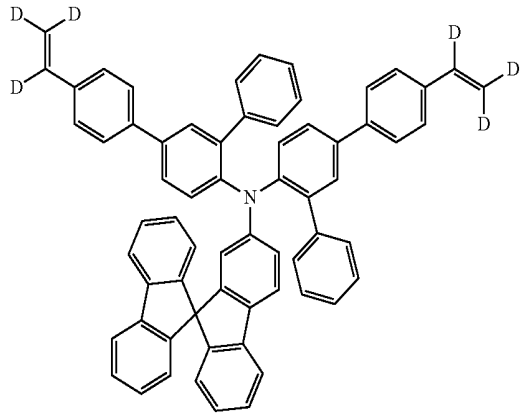

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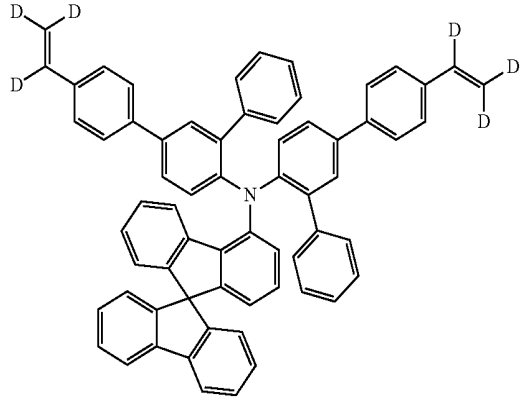

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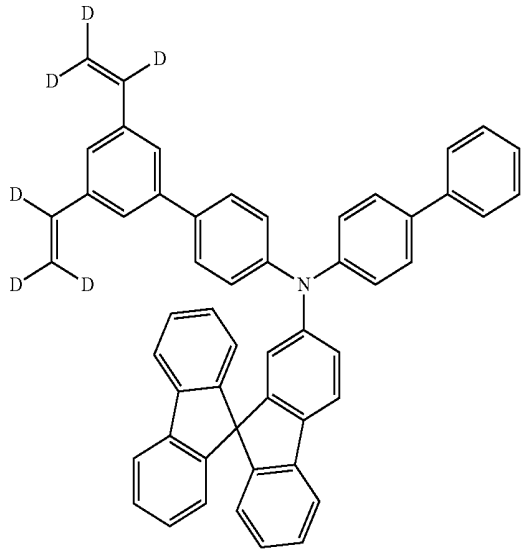

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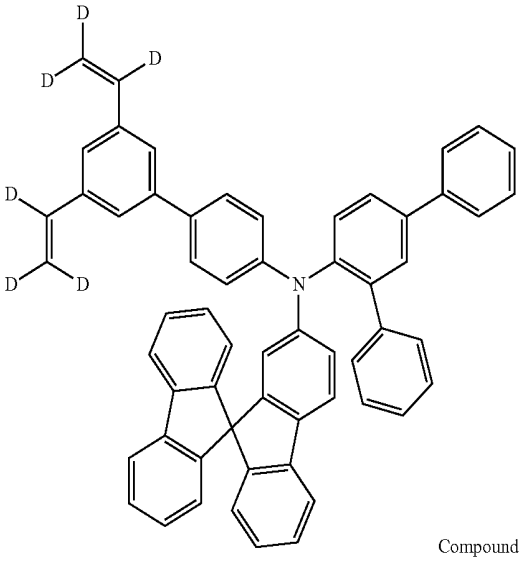

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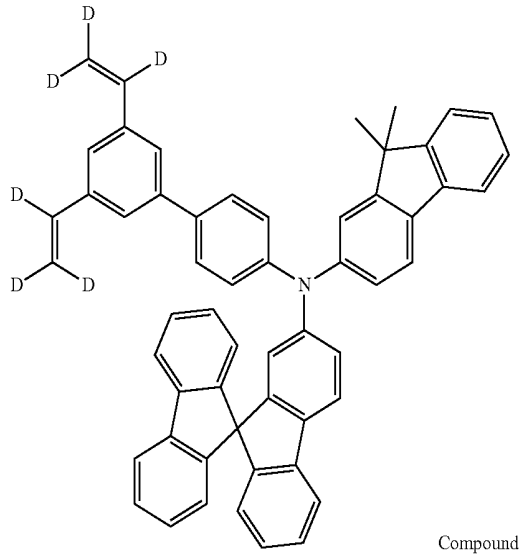

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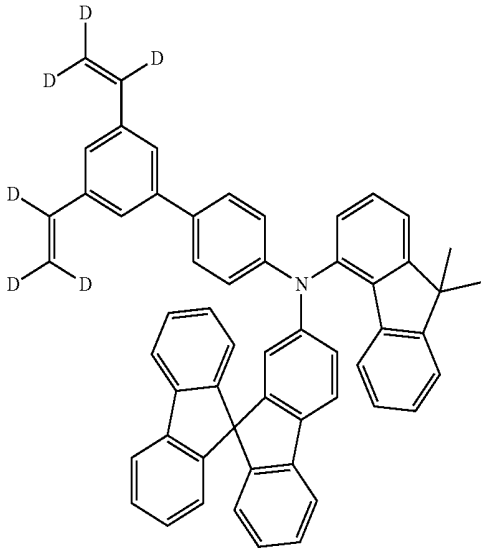

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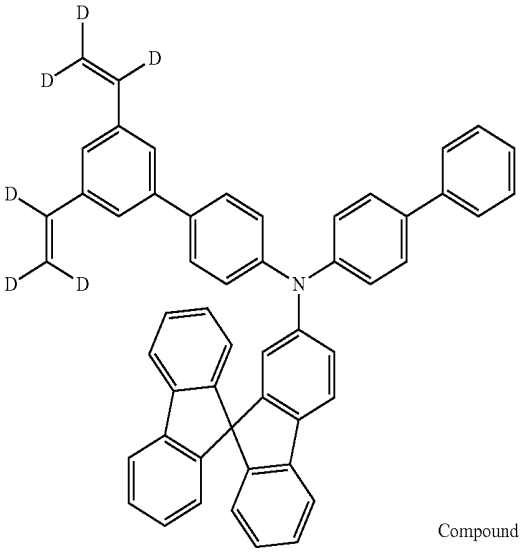

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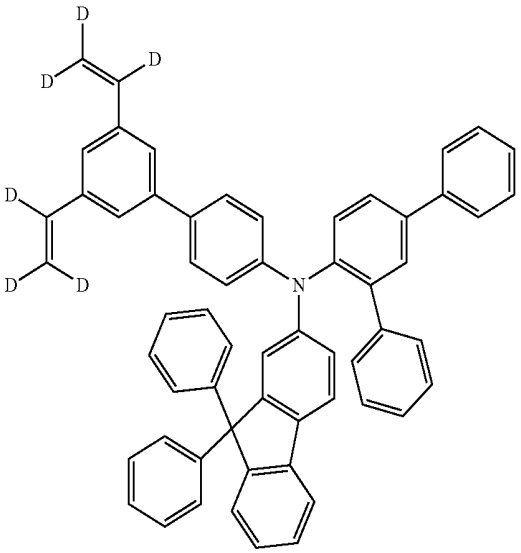

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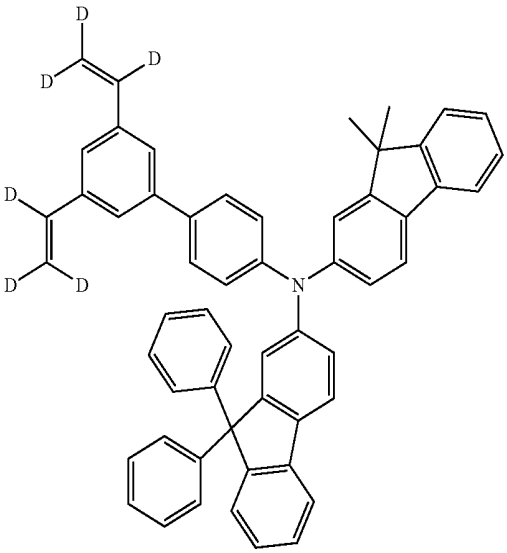

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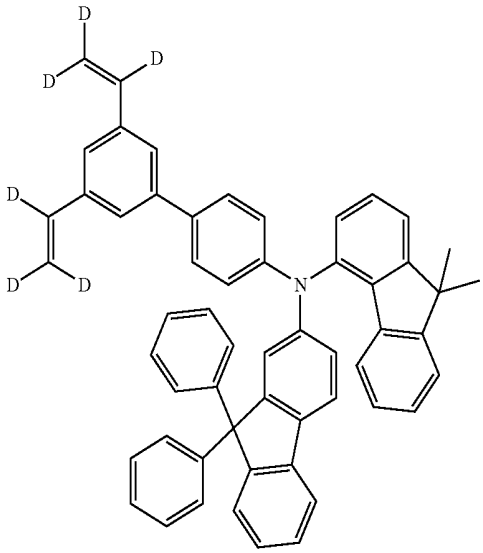

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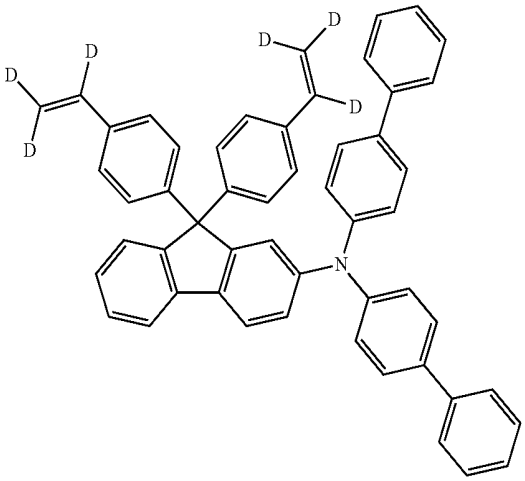

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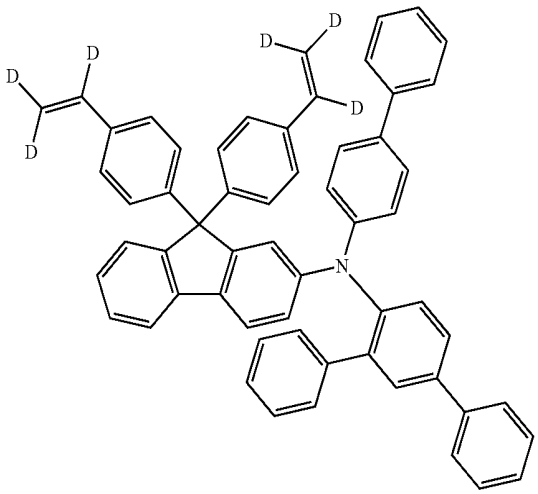

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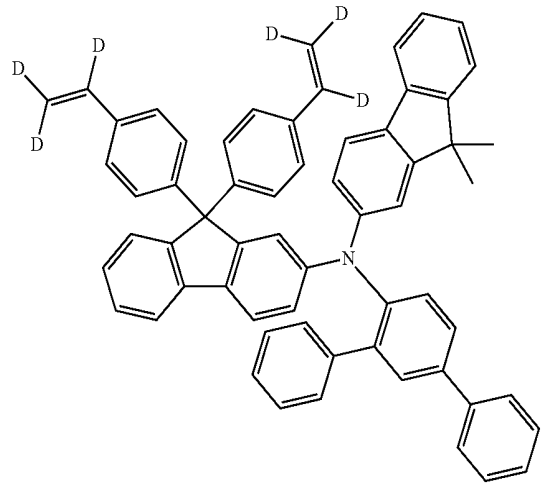

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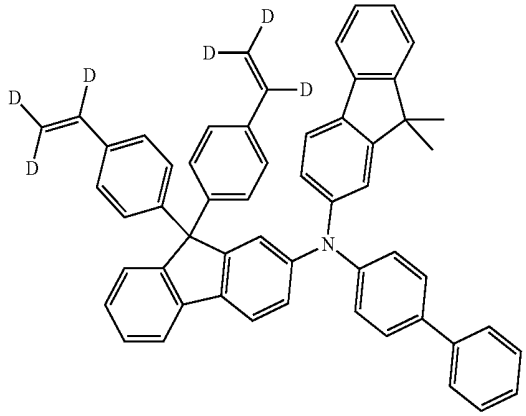

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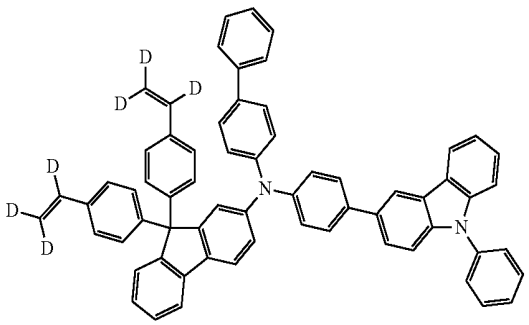

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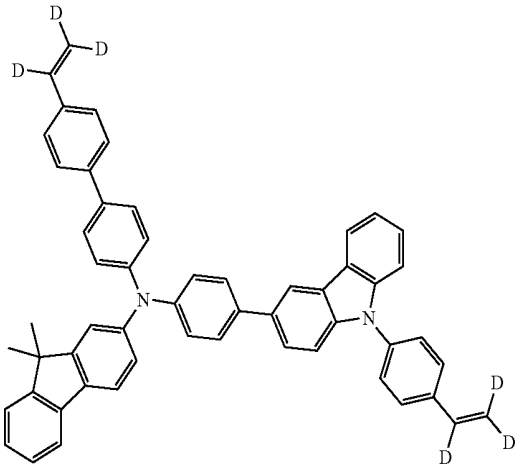

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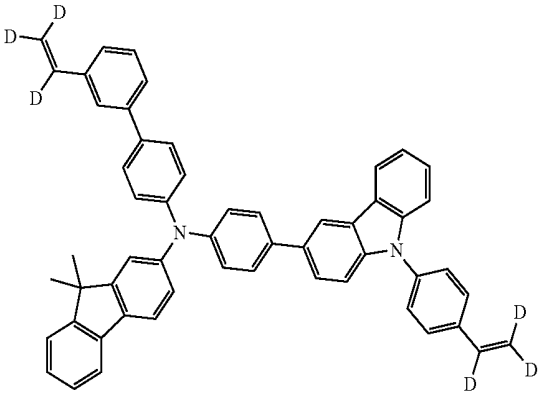

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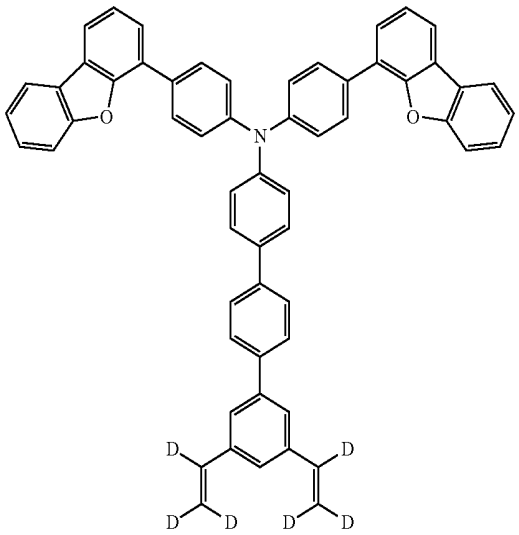

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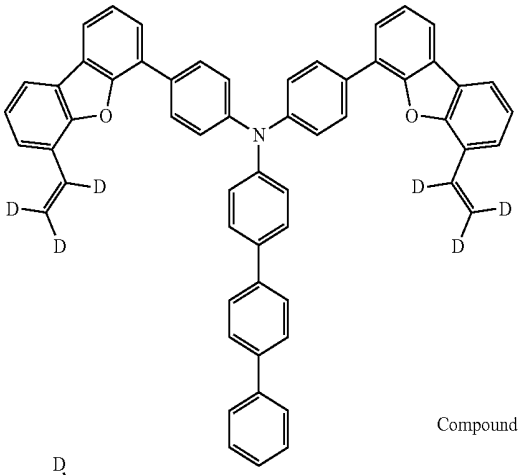

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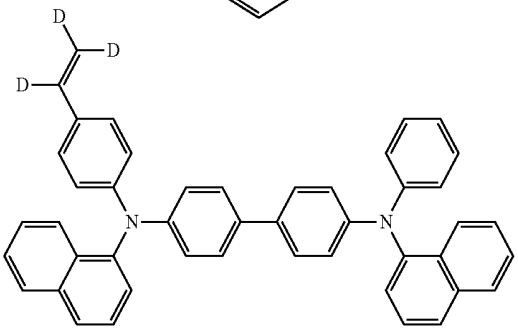

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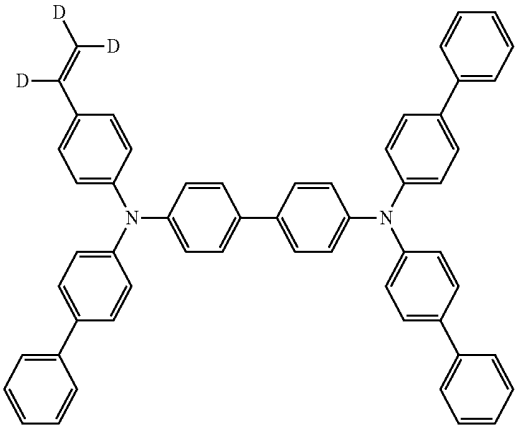

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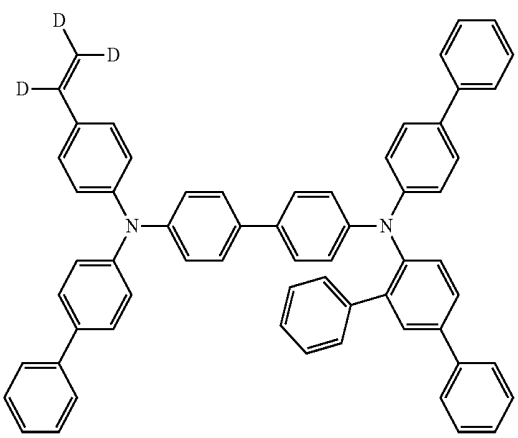

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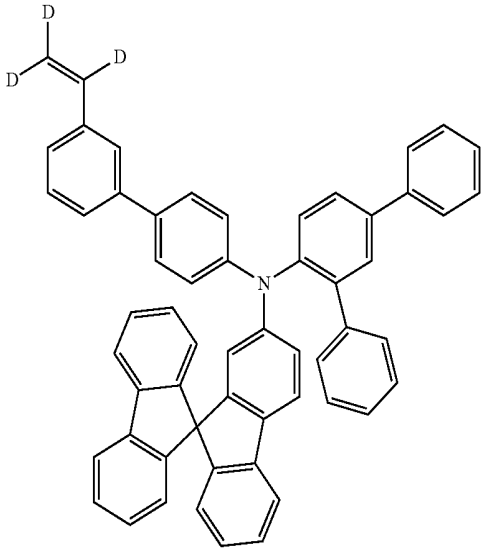

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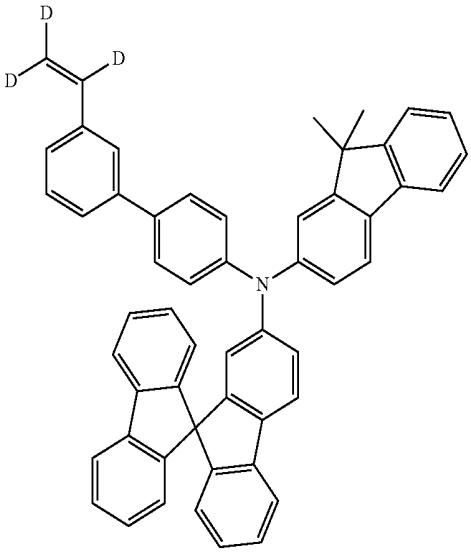

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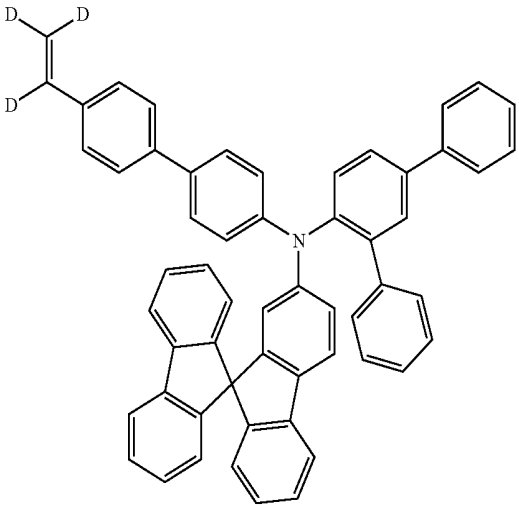

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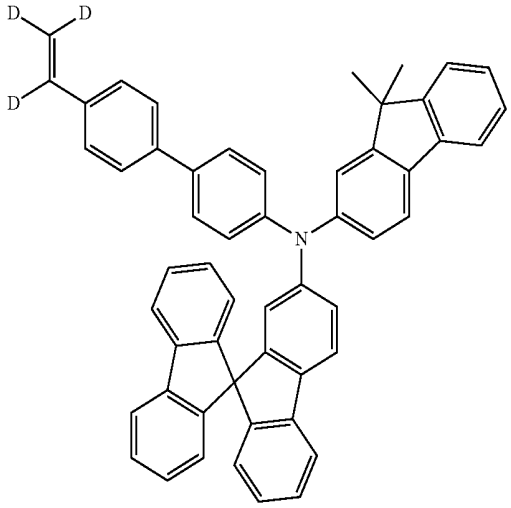

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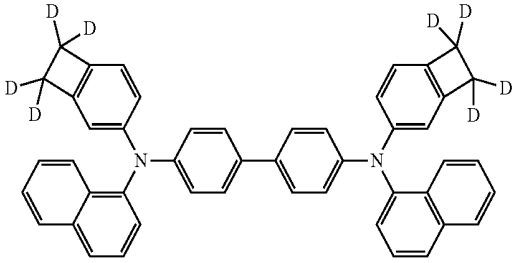

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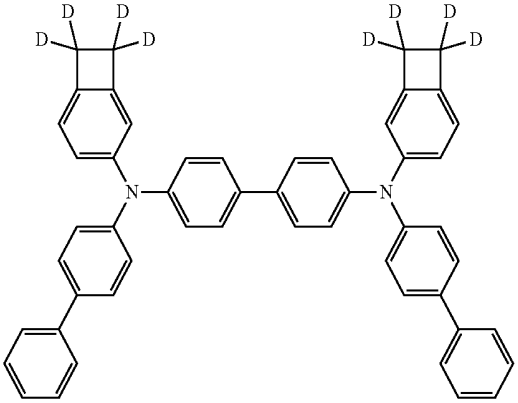

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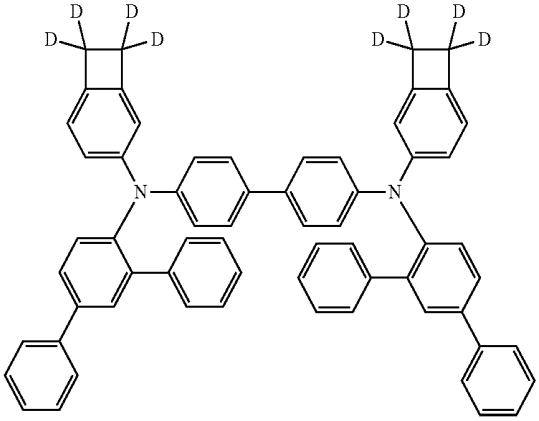

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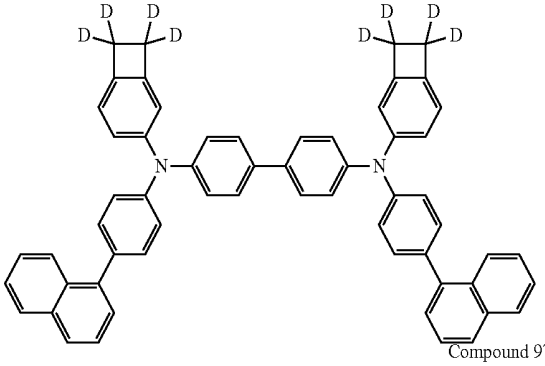

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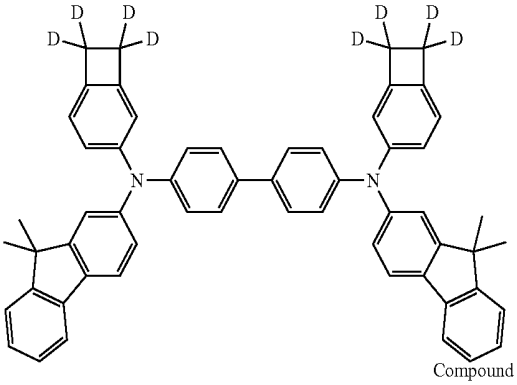

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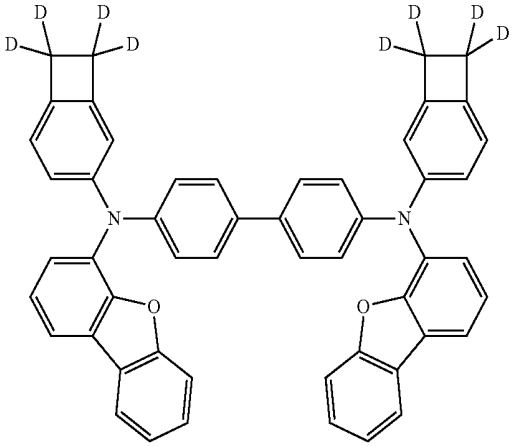

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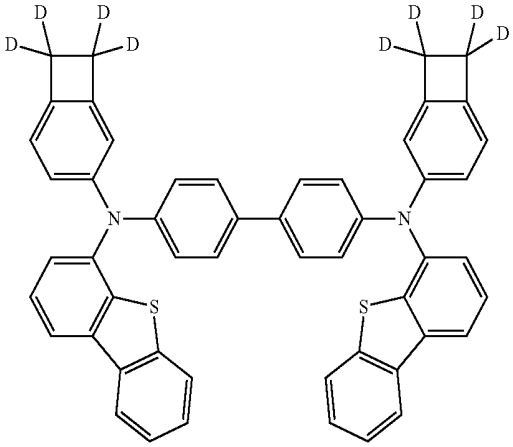

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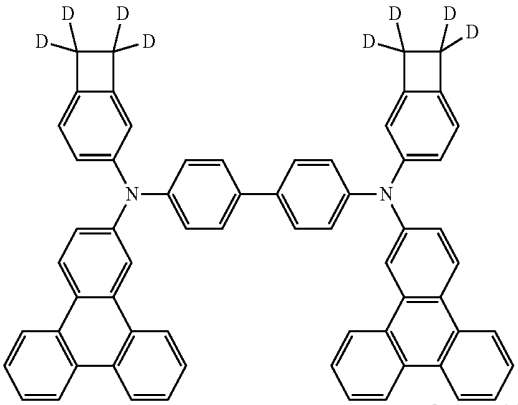
Compound 100



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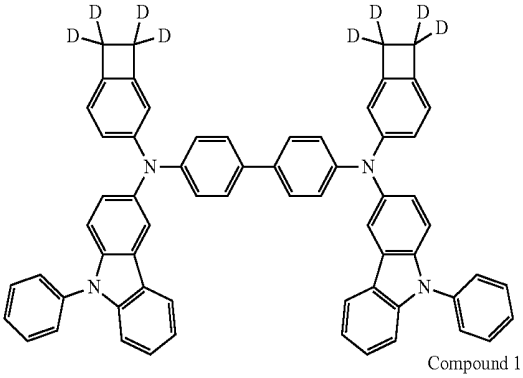

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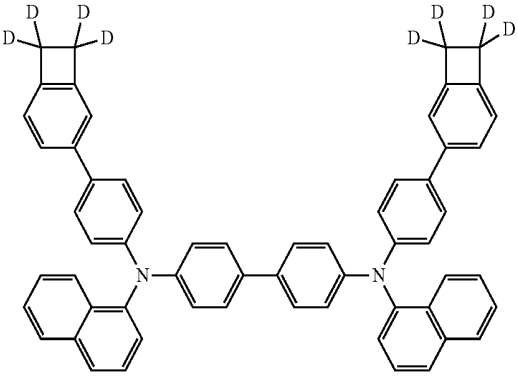

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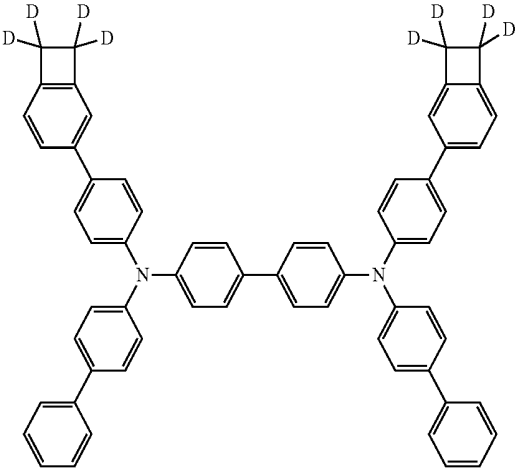

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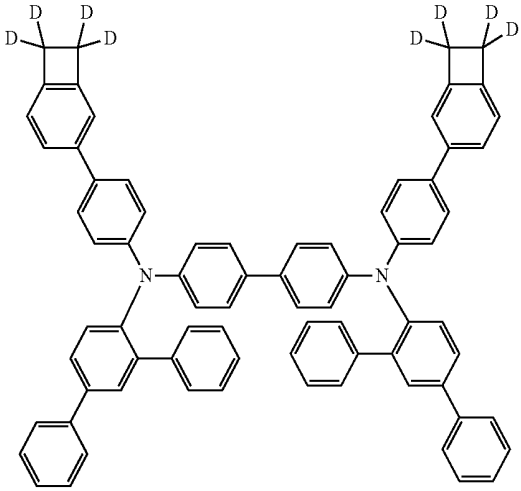
Compound 104



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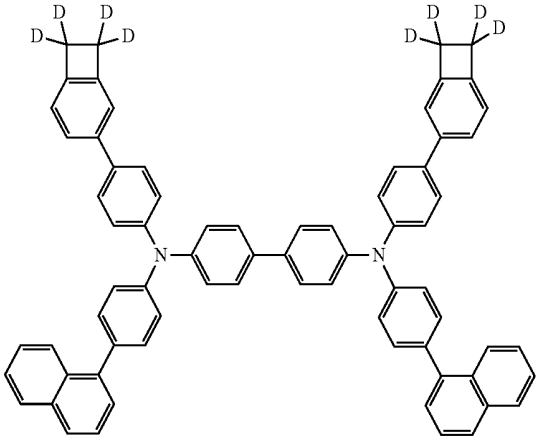

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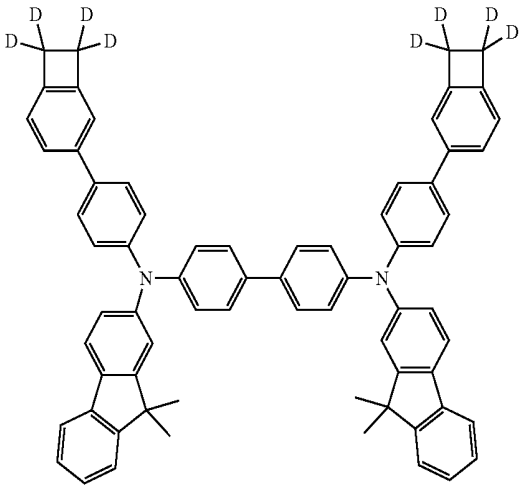

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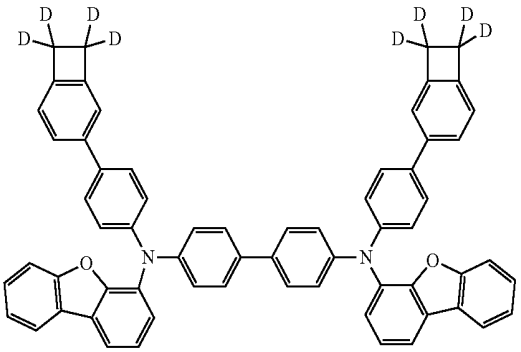
Compound 107



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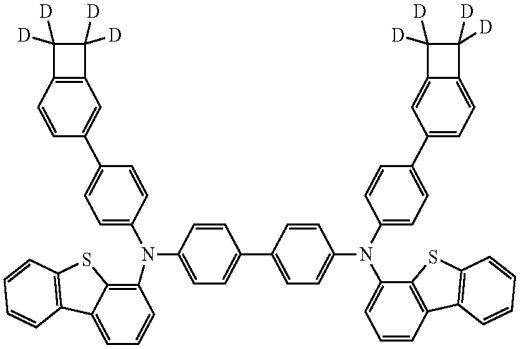

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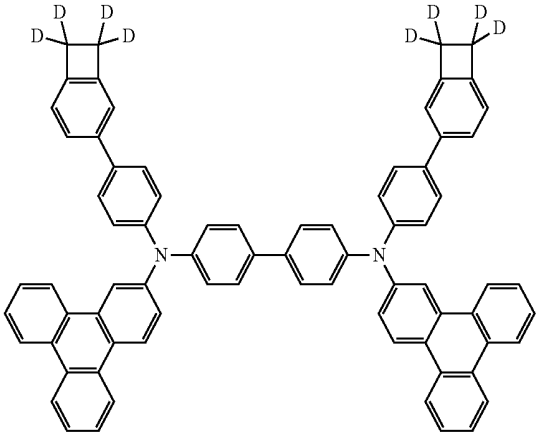
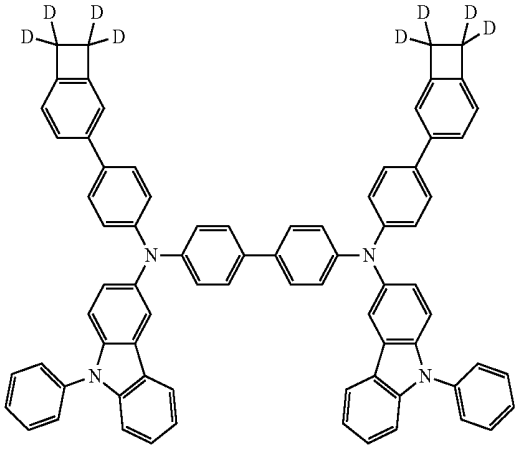


Compound 110



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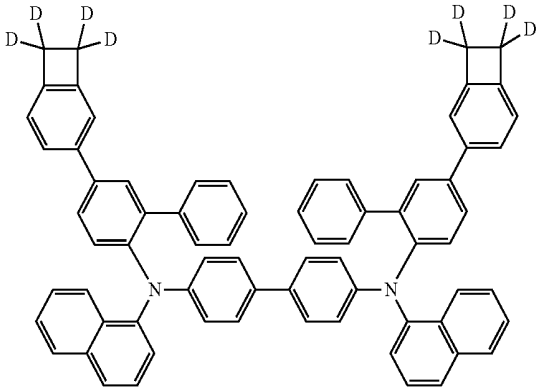
Compound 111



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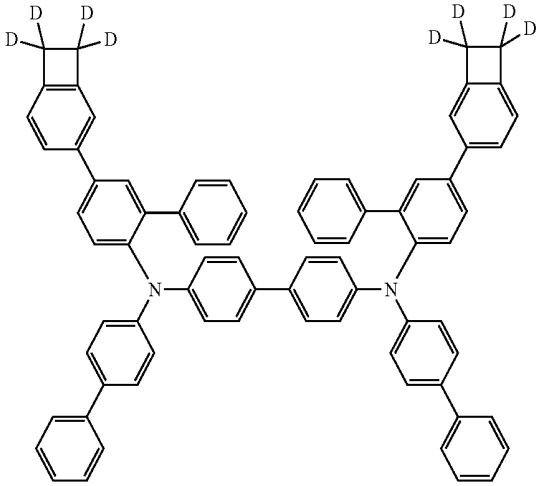

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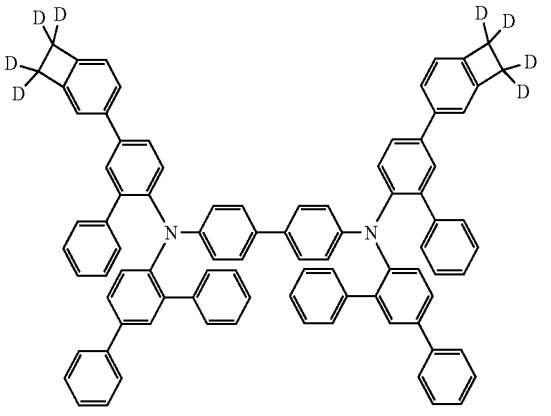

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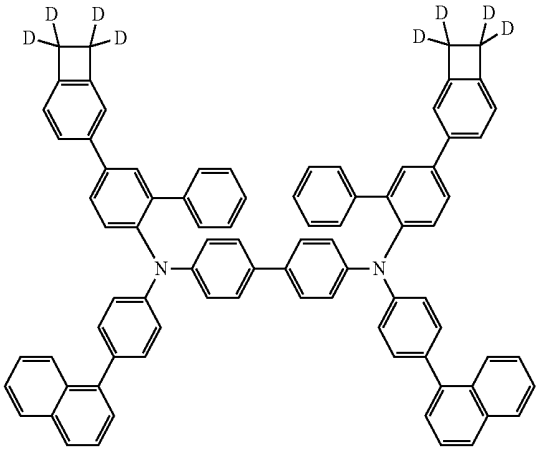
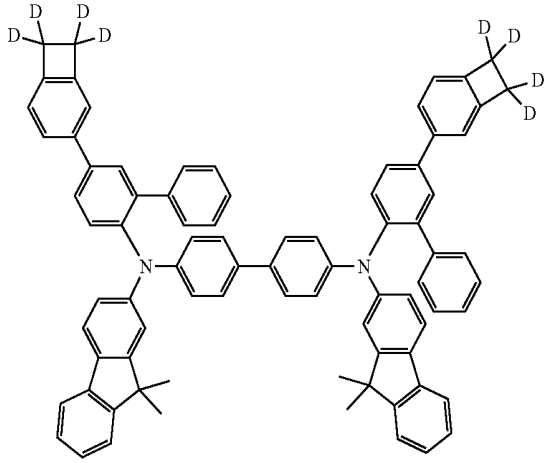
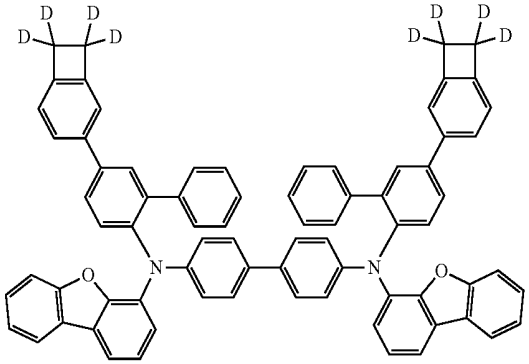
Compound 114



Compound 115



Compound 116



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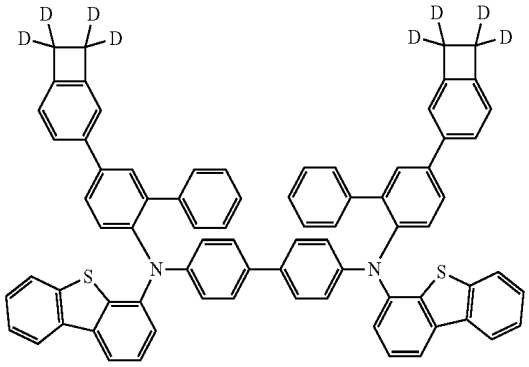
Compound 117



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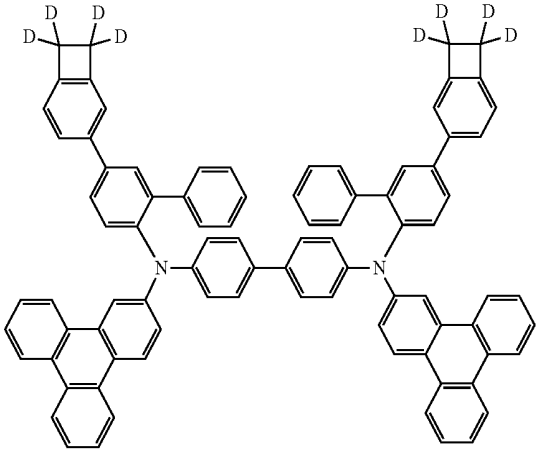
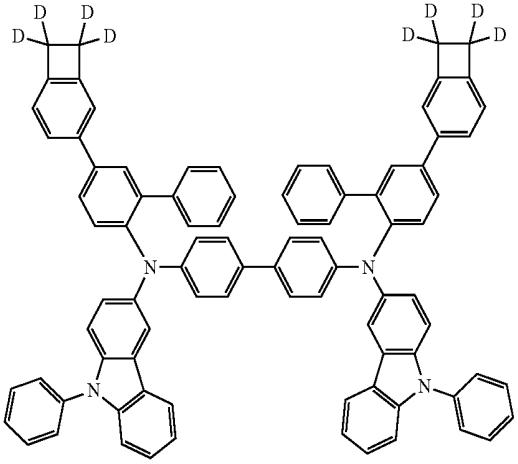


Compound 119



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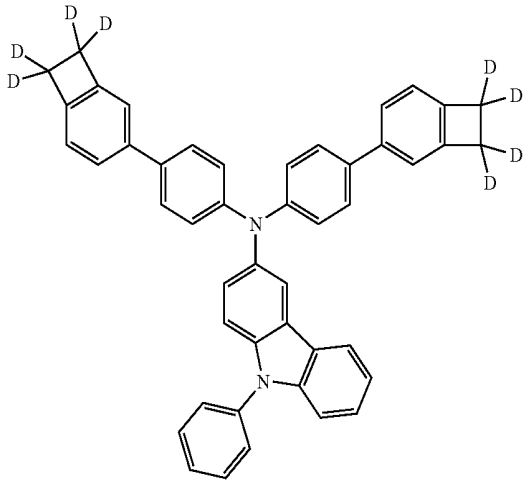
Compound 120



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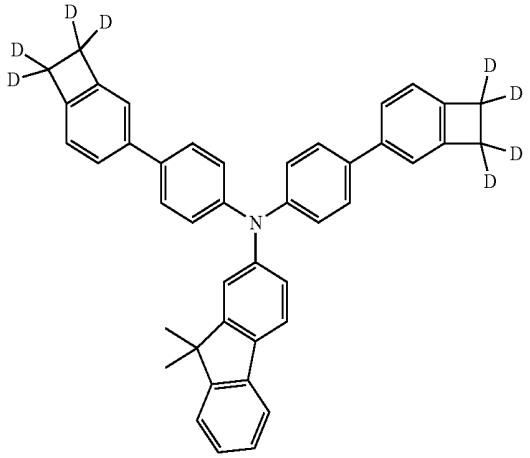

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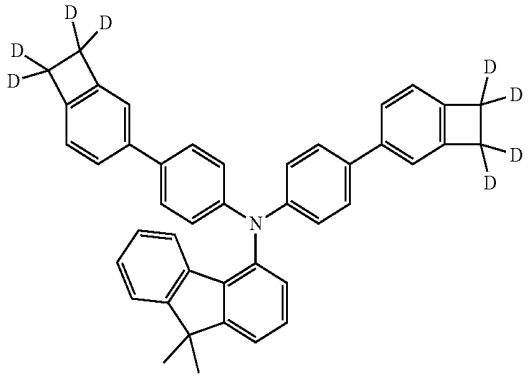

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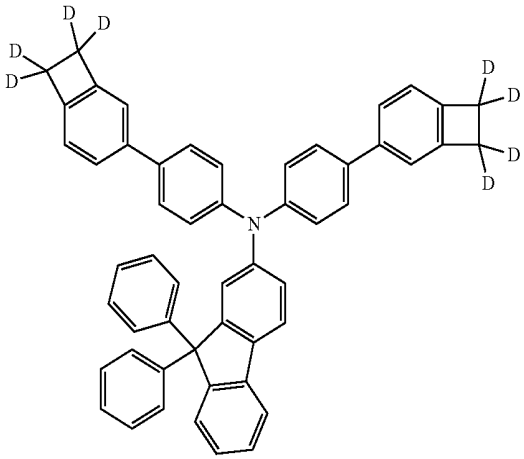

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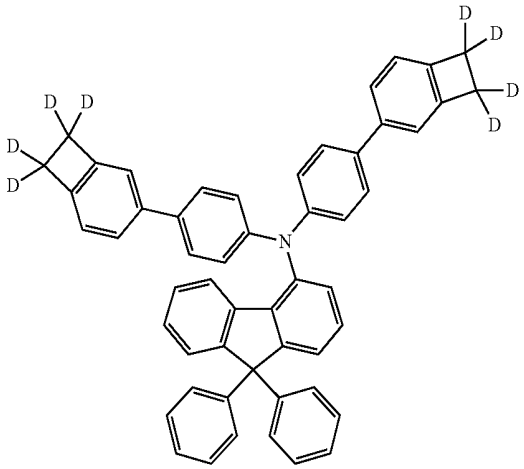

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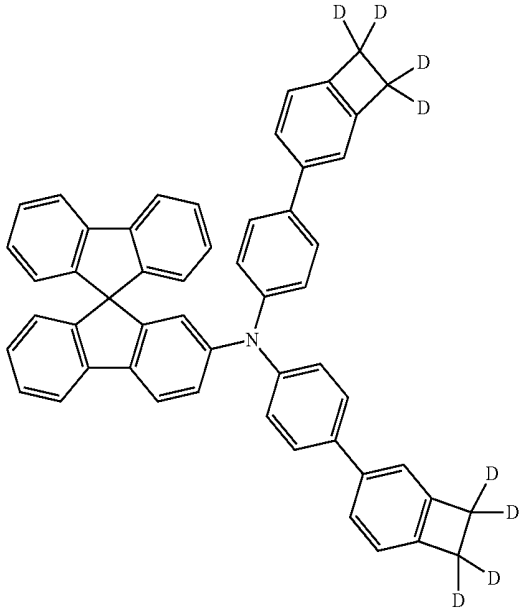

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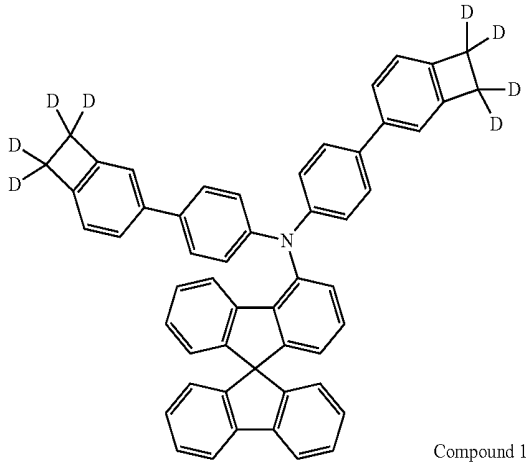

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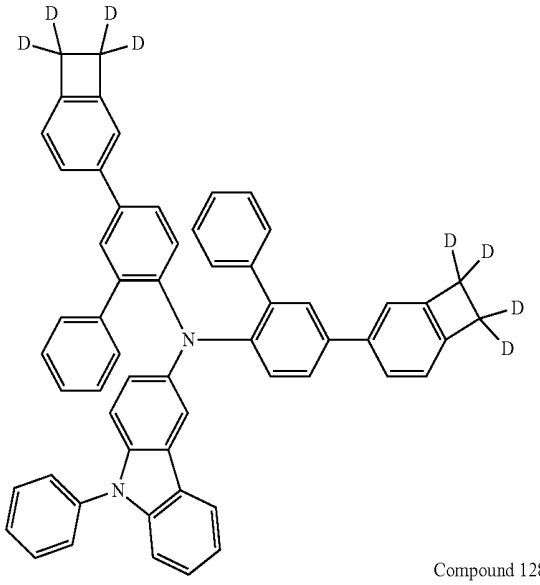

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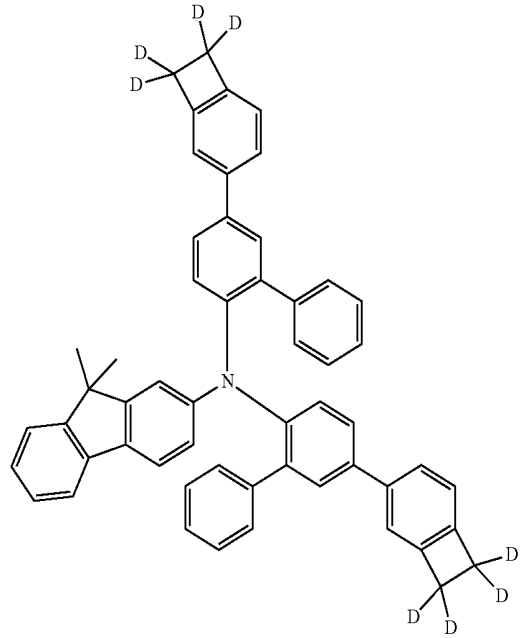

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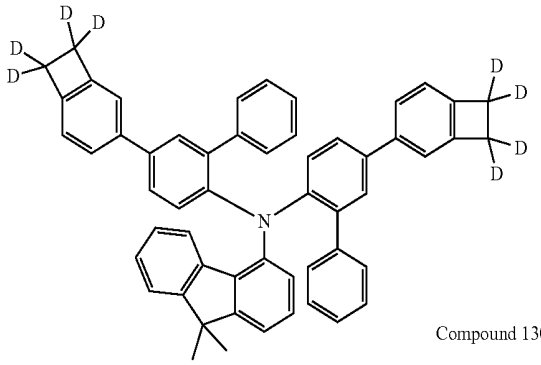
Compound 129



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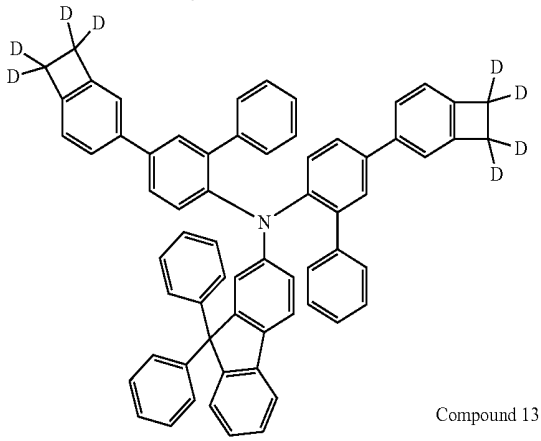

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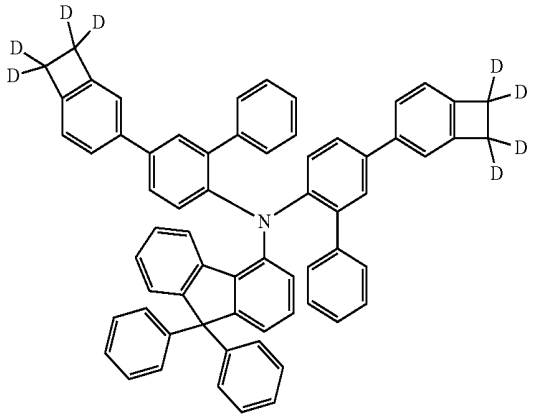

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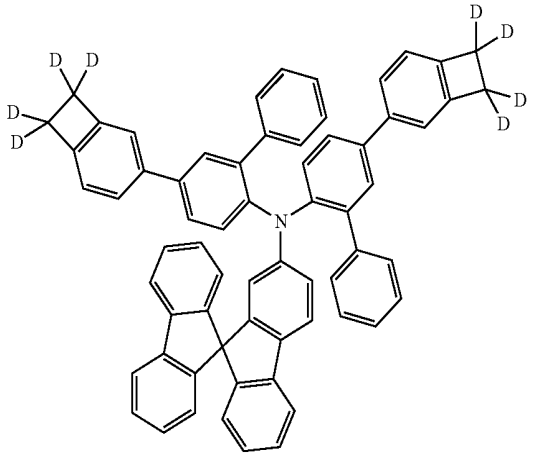

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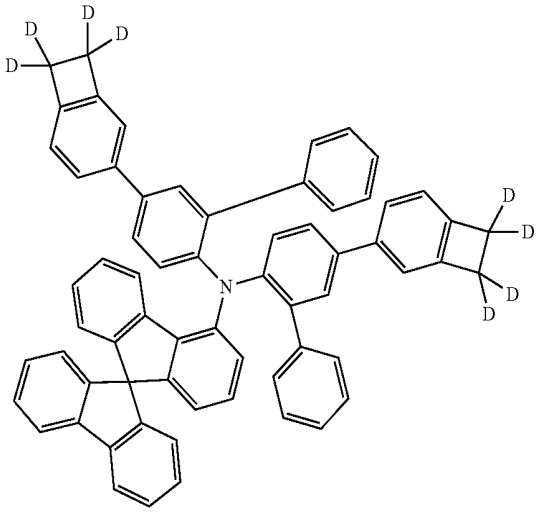
Compound 133



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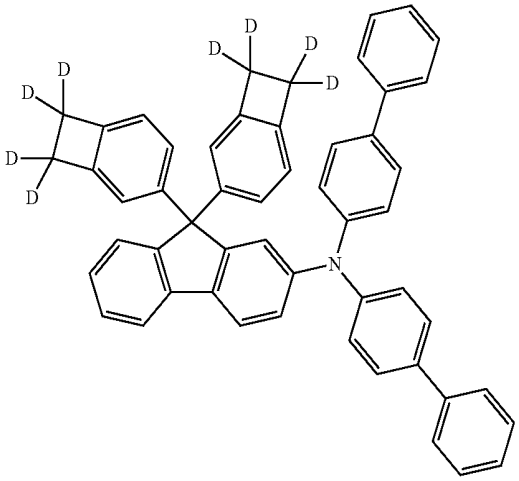
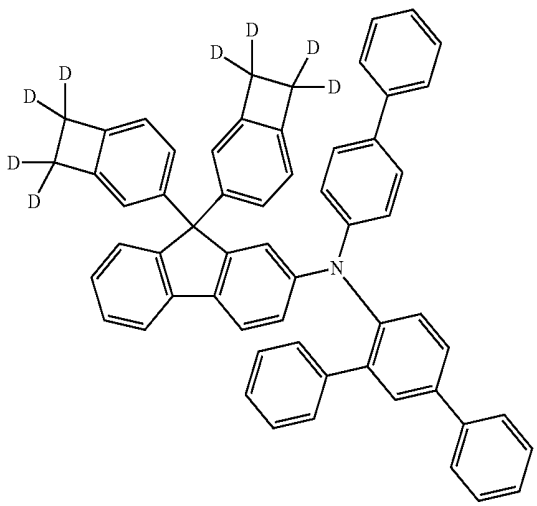


Compound 135



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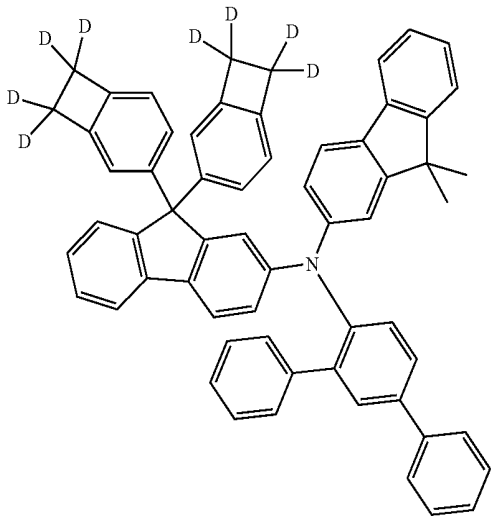
Compound 136



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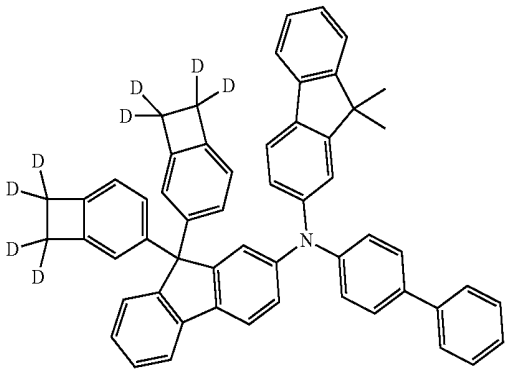

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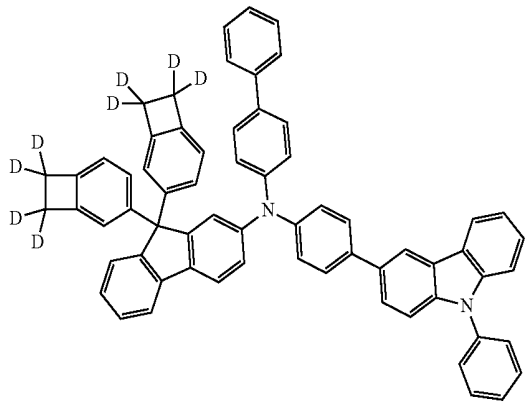

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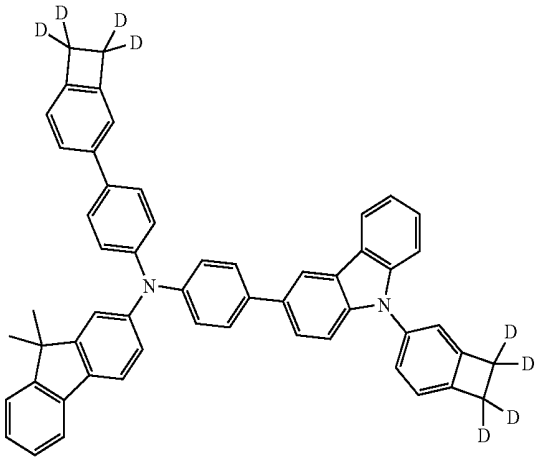

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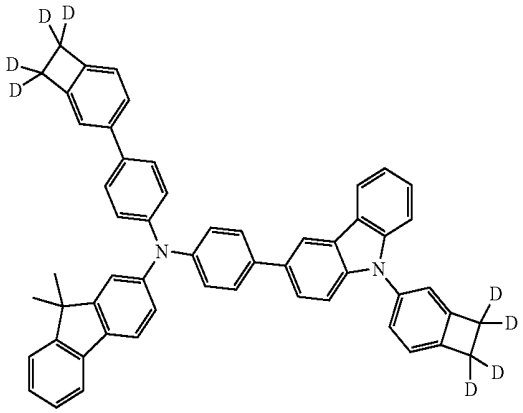

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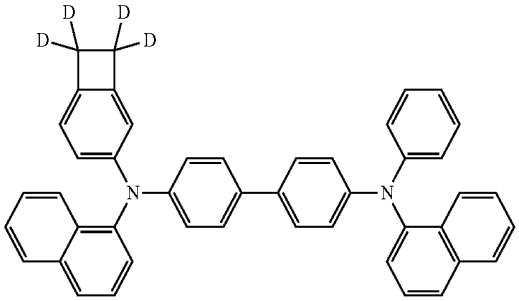

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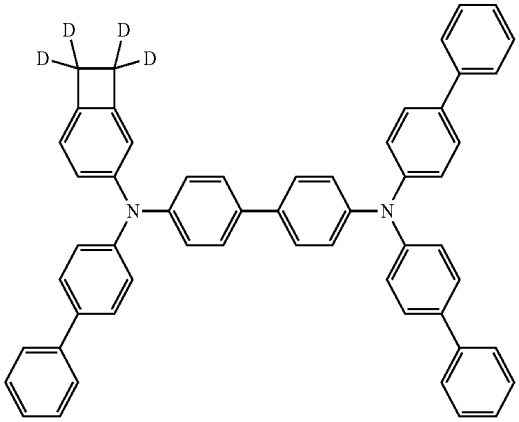

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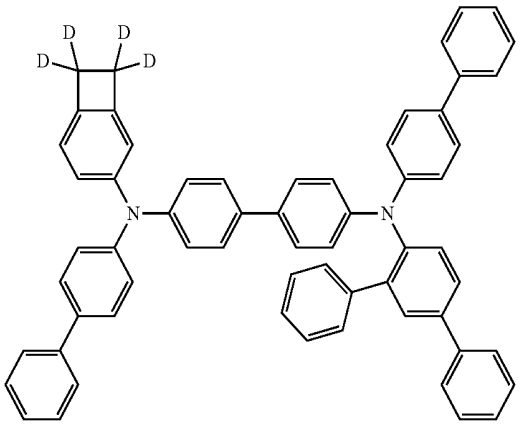

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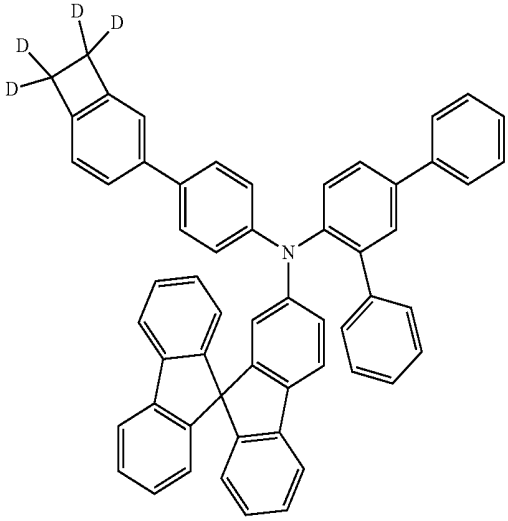

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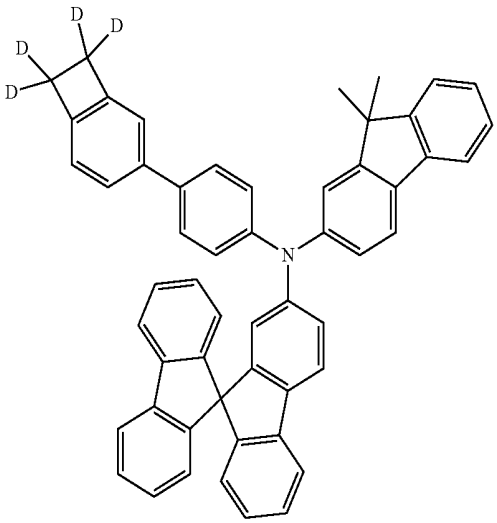

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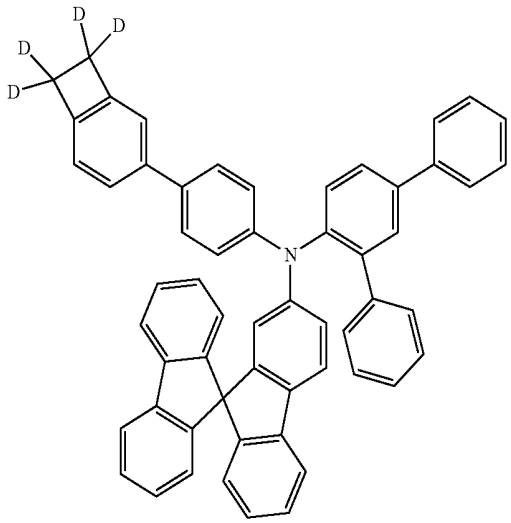
Compound 146



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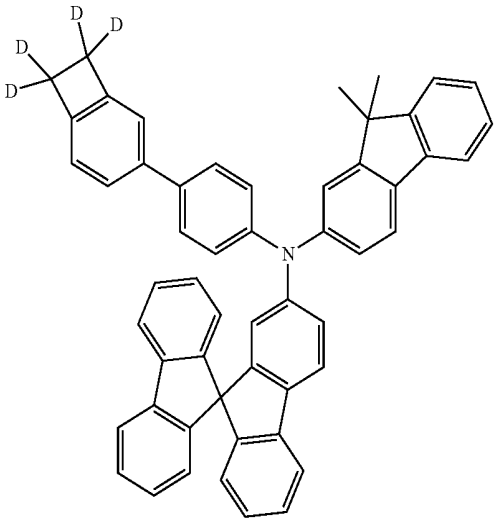

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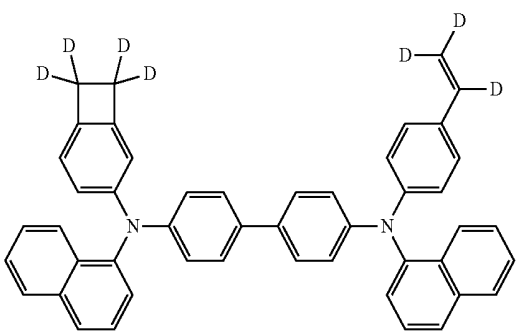

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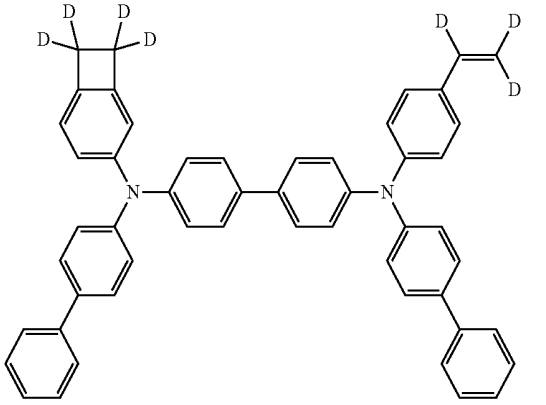
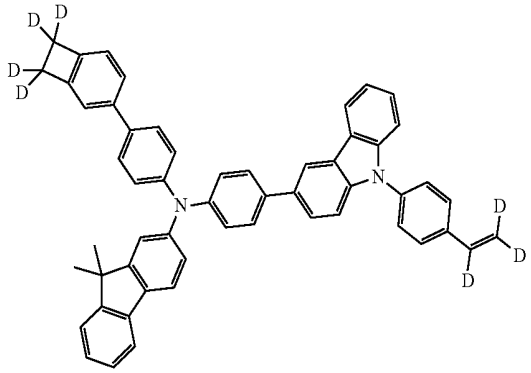
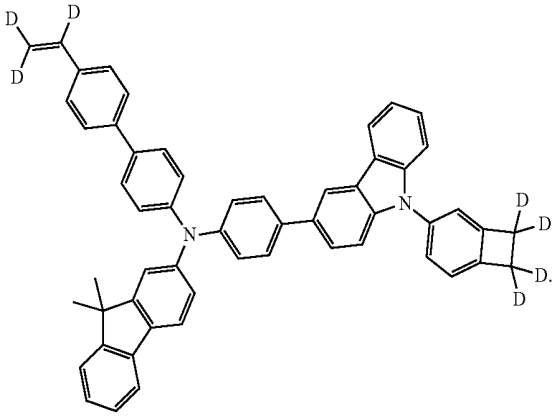
Compound 149



Compound 150



Compound 151



[0069] According to another embodiment, an organic electroluminescent device is disclosed. The organic electroluminescent device comprises:

[0070] an anode,

[0071] a cathode,

[0072] a charge transporting layer disposed between the anode and cathode, wherein the charge transporting layer comprises a charge transporting compound comprising a charge transporting unit and a polymerizable group, wherein the polymerizable group is partially or fully deuterated.

[0073] In one embodiment, wherein the charge transporting layer is fabricated by solution process.

[0074] In one embodiment, wherein the charge transporting layer is fabricated by ink-jet printing.

[0075] According to another embodiment, a formulation of a charge transporting solution is disclosed. The formulation of a charge transporting solution comprises a charge transporting compound comprising a charge transporting unit and a polymerizable group, wherein the polymerizable group is partially or fully deuterated.

[0076] Combination with Other Materials

[0077] The materials described herein as useful for a particular layer in an organic light emitting device may be used in combination with a wide variety of other materials present in the device. The combinations of these materials are described in more detail in U.S. Pat. App. No. 20160359122 at paragraphs 0133-0160, which are incorporated by reference in its entirety. The materials described or referred to the disclosure are non-limiting examples of materials that may be useful in combination with the compounds disclosed herein, and one of skill in the art can readily consult the literature to identify other materials that may be useful in combination.

[0078] The materials described herein as useful for a particular layer in an organic light emitting device may be used in combination with a variety of other materials present in the device. For example, emissive dopants disclosed herein may be used in combination with a wide variety of hosts, transport layers, blocking layers, injection layers, electrodes and other layers that may be present. The combination of these materials is described in detail in paragraphs 0080-0101 of U.S. Pat. App. No. 20150349273, which are incorporated by reference in its entirety. The materials described or referred to the disclosure are non-limiting examples of materials that may be useful in combination with the compounds disclosed herein, and one of skill in the art can readily consult the literature to identify other materials that may be useful in combination.

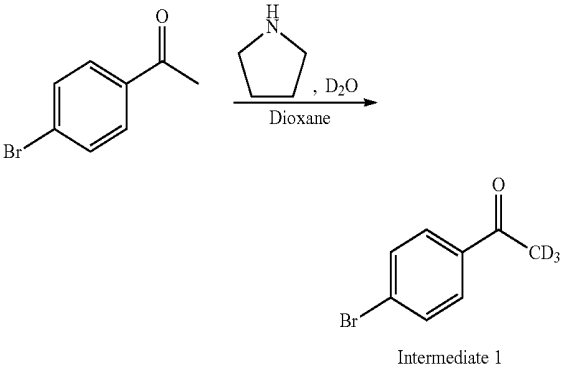
[0079] In the embodiments of material synthesis, all reactions were performed under nitrogen protection unless otherwise stated. All reaction solvents were anhydrous and used as received from commercial sources. Synthetic products were structurally confirmed and tested for properties using one or more conventional equipment in the art (including, but not limited to, nuclear magnetic resonance instrument produced by BRUKER, liquid chromatograph produced by SHIMADZU, liquid chromatography-mass spectrometer produced by SHIMADZU, gas chromatography-mass spectrometer produced by SHIMADZU, differential Scanning calorimeters produced by SHIMADZU, fluorescence spectrophotometer produced by SHANGHAI LENGGUANG TECH., electrochemical workstation produced by WUHAN CORRTEST, and sublimation apparatus produced by ANHUI BEQ, etc.) by methods well known to the persons skilled in the art. As the persons skilled in the art are aware of the above-mentioned equipment use, test methods and other related contents, the inherent data of the sample can be obtained with certainty and without influence, so the above related contents are not further described in this patent.

Synthesis Example

[0080] The method for preparing the compounds of the present invention is not limited. The compound 1 is exemplified as a typical but non-limiting example, and its synthesis route and preparation method are as follows:

[0081] Synthesis of Compound 1

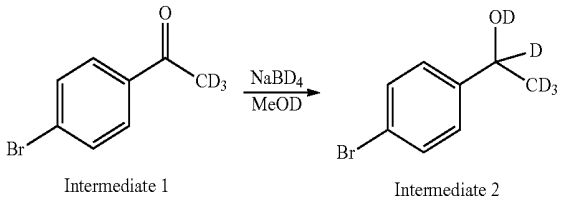
[0082] Step 1: Synthesis of Intermediate 1



Intermediate 1

[0083] A mixture of deuterium oxide (40 mL), anhydrous dioxane (40 mL), p-bromoacetophenone (4.8 g, 24 mmol) and tetrahydropyrrole (0.17 g, 2.4 mmol) was vigorously stirred overnight at room temperature under nitrogen. The solvent was removed in vacuo. Dilute hydrochloric acid (1 M) was added until pH=4, and dichloromethane (40 mL×3) was added. The combined organic extract was dried with anhydrous sodium sulfate, filtered and concentrated to give Intermediate 1 as a colorless liquid (4.5 g, 93%). The structure was confirmed by ^{1}H-NMR.

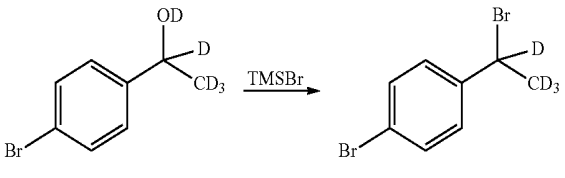
[0084] Step 2: Synthesis of Intermediate 2



Intermediate 1 Intermediate 2

[0085] $NaBD_4$ (0.94 g, 22.5 mmol) was added to Intermediate 1 (4.5 g, 22.3 mmol) in 30 mL of MeOD. After the mixture was stirred for 5 hours, saturated sodium bicarbonate (50 mL) was added and the mixture was extracted with ethyl acetate (40 mL×3). The combined organic extract was dried with anhydrous sodium sulfate, filtered and concentrated to give Intermediate 2 as a colorless oil (3.6 g, 78%). The structure was confirmed by GCMS.

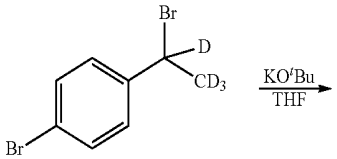
[0086] Step 3: Synthesis of Intermediate 3



Intermediate 2 Intermediate 3

[0087] Trimethylsilyl bromide (5.8 g, 38 mmol) was added to neat Intermediate 2 (4.0 g, 19.4 mmol) at 0° C. under nitrogen atmosphere. The mixture was stirred for 4 h at room temperature. Then the volatile materials were removed in vacuo. The residue was purified by silica column chromatography using CH_2Cl_2 as the eluent to give Intermediate 3 as colorless oil (3.5 g, 67%.). The structure was confirmed by GCMS.

[0088] Step 4: Synthesis of Intermediate 4



Intermediate 3

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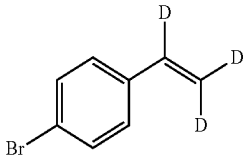
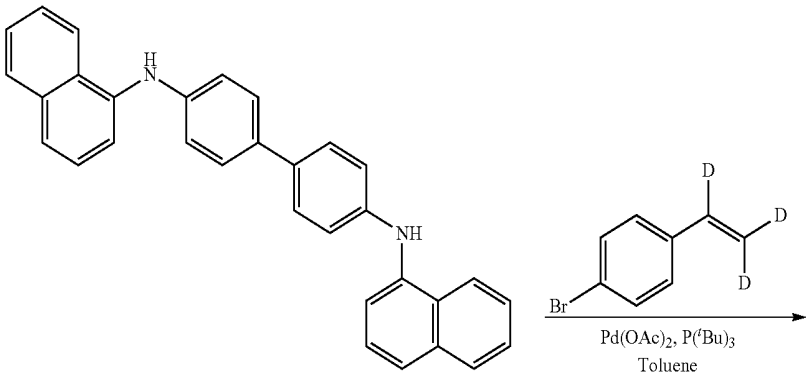
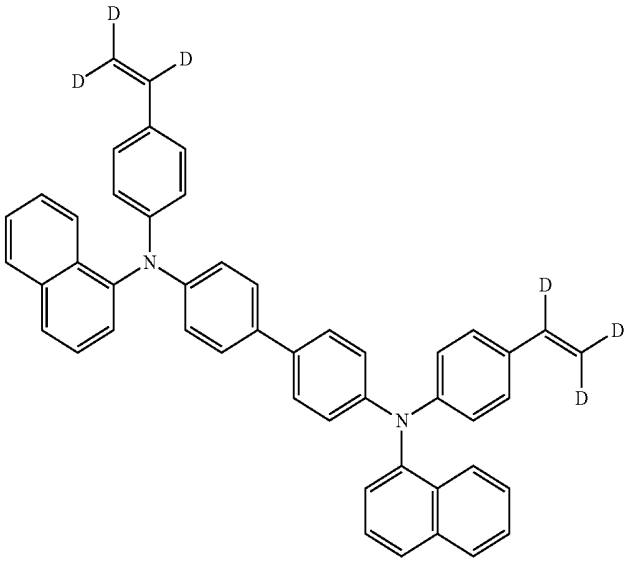


Intermediate 4

[0089] KO^{t}Bu in anhydrous THF (1 M, 17.3 mL, 17.3 mmol) was slowly added to Intermediate 3 (3.8 g, 14.2 mmol) in 10 mL of anhydrous THF at 0° C. under nitrogen and stirred overnight at room temperature. Then the solvent was evaporated and the mixture was treated with hexanes and filtered. The filtrate was dried by evaporation to give Intermediate 4 as a yellow liquid (1.2 g, 45%). The structure was confirmed by ^{1}H-NMR.

[0090] Step 5: Synthesis of Compound 1





Compound 1

[0091] A mixture of N,N'-bis(1-naphthyl)-4,4'-biphenyldiamine (2.0 g, 4.6 mmol), redistilled toluene (40 mL) and Intermediate 4 (1.2 g, 6.4 mmol) was bubbled with nitrogen for 15 min. Then tri-tert-butylphosphine (10% toluene solution, 1.1 mL, 0.5 mmol) and palladium acetate (52 mg, 0.23 mmol) were added and the mixture was heated overnight at 110° C. The solvent was removed in vacuo and the residue was purified by silica column chromatographed (hexane:toluene:triethylamine=50:1:0.1) to give Compound 1 (2.4 g, 80%). The product had a molecular weight of 647 and was identified as the target product. The structure was confirmed by ^{1}H-NMR (400 MHz, $CDCl_3$): Compound 1 δ (ppm) 7.87-7.93 (dd, 2H), 7.77 (d, J=8.4 Hz, 1H), 7.43-7.48 (dd, 2H), 7.33-7.39 (m, 4H), 7.22-7.25 (d, 2H), 7.03-7.06 (d, 2H), 6.96-6.99 (d, 2H). Non-deuterated compound δ (ppm) 7.87-7.92 (dd, 2H), 7.77 (d, J=8.4 Hz, 1H), 7.43-7.48 (dd, 2H), 7.33-7.39 (m, 4H), 7.22-7.25 (d, 2H), 7.03-7.06 (d, 2H), 6.96-6.99 (d, 2H), 6.59-6.66 (dd, 1H), 5.56-5.61 (d, J=17.6 Hz, 1H), 5.09-5.12 (d, J=10.8 Hz, 1H).

[0092] The persons skilled in the art should know that the above preparation method is only an illustrative example, and the persons skilled in the art can obtain the structure of other compounds of the present invention by modifying the above preparation method.

[0093] It is understood that the various embodiments described herein are by way of example only and are not intended to limit the scope of the invention. The present invention as claimed may therefore include variations from the particular examples and preferred embodiments described herein, as will be apparent to one of skill in the art. Many of the materials and structures described herein may be substituted with other materials and structures without deviating from the spirit of the invention. It is understood that various theories as to why the invention works are not intended to be limiting.

What is claimed is:

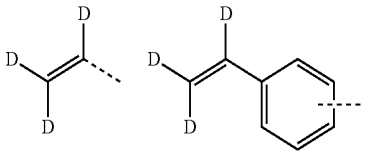
1. A charge transporting compound comprising a charge transporting unit and a polymerizable group, wherein the polymerizable group is partially or fully deuterated.

2. The charge transporting compound of claim **1**, wherein the charge transporting compound is a hole transporting compound.

3. The charge transporting compound of claim **1**, wherein the charge transporting compound is an electron transporting compound.

4. The charge transporting compound of claim **1**, wherein the polymerizable group is selected from the group consisting of partially or fully deuterated vinyl, partially or fully deuterated styryl, partially or fully deuterated acrylate, partially or fully deuterated methacrylate, partially or fully deuterated epoxide, partially or fully deuterated oxetane, partially or fully deuterated benzocyclobutene, partially or fully deuterated siloxane, and partially or fully deuterated maleimide.

5. The charge transporting compound of claim **4**, wherein the polymerizable group is selected from the group consisting of:



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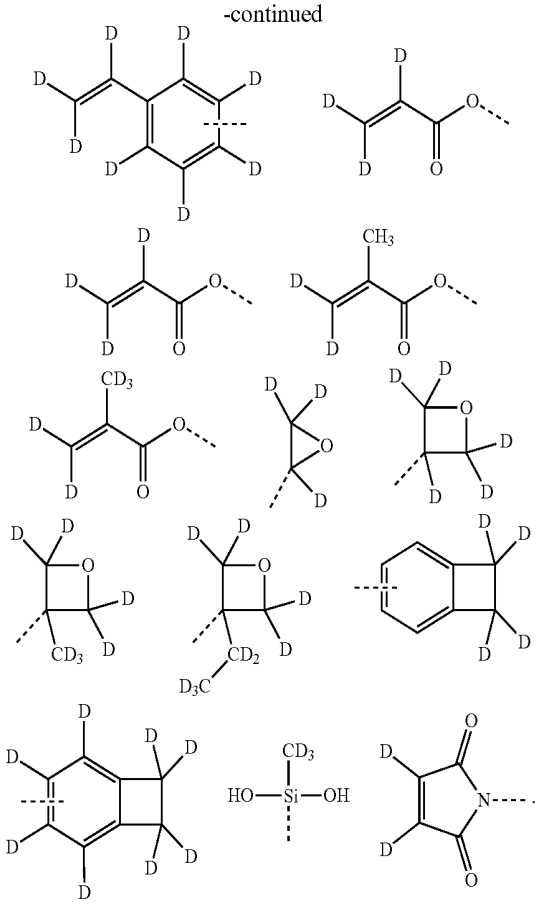


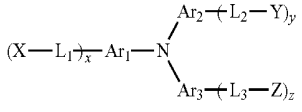
6. The charge transporting compound of claim **1**, wherein the charge transporting unit of the compound is selected from the group consisting of triarylamine, carbazole, azacarbazole, triphenylene, dibenzofuran, dibenzothiophene, dibenzoselenophene, azadibenzofuran, azadibenzothiophene, azadibenzoselenophene, azatriphenylene, triazine, pyrimidine, benzimidazole, quinazoline, quinoxaline, naphthalene, phenanthrene, phenanthroline, anthracene, fluorene, azafluorene, fluoranthene, and pyrene.

7. The charge transporting compound of claim **1**, wherein the charge transporting compound is a small molecule.

8. The charge transporting compound of claim **1**, wherein the charge transporting compound is a polymer.

9. The charge transporting compound of claim **1**, wherein the charge transporting compound having a structure of formula 1:

Formula 1



Wherein

X, Y, and Z are independently selected from polymerizable groups;

x, y, and z are independently selected from 0, 1, 2, and 3;

the sum of x, y, and z equals to or is more than 1;

Each of L_1, L_2, and L_3 are independently selected from the group consisting of a single bond, a substituted or unsubstituted alkyl group having 1 to 20 carbon atoms, a substituted or unsubstituted cycloalkyl group having 3 to 20 ring carbon atoms, a substituted or unsubstituted heteroalkyl group having 1 to 20 carbon atoms, a substituted or unsubstituted arylalkyl group having 7 to 30 carbon atoms, a substituted or unsubstituted alkoxy group having 1 to 20 carbon atoms, a substituted or unsubstituted aryloxy group having 6 to 30 carbon atoms, a substituted or unsubstituted alkenyl group having 2 to 20 carbon atoms, a substituted or unsubstituted arylene group having 6 to 30 carbon atoms, a substituted or unsubstituted heteroarylene group having 3 to 30 carbon atoms, a substituted or unsubstituted alkylsilyl group having 3 to 20 carbon atoms, a substituted or unsubstituted arylsilyl group having 6 to 20 carbon atoms, a substituted or unsubstituted amino group having 1 to 30 carbon atoms, a carbonyl group, an ester group, a sulfanyl group, a sulfinyl group, a sulfonyl group, a phosphino group and combinations thereof;

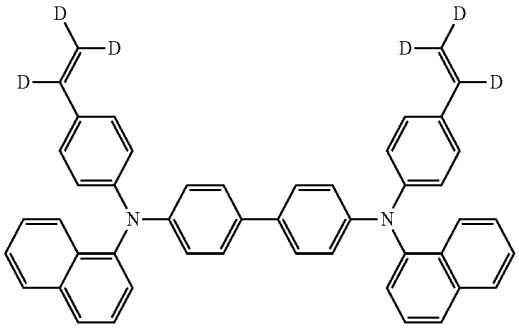
When x, y, or z is more than 1, each of L_1, L_2, L_3 and each of X, Y, Z can be the same or different;

Ar_1, Ar_2, and Ar_3 are each independently selected from the group consisting of a substituted or unsubstituted aryl group having 6 to 40 ring carbon atoms or a substituted or unsubstituted heteroaryl group having 5 to 40 ring atoms and combinations thereof;

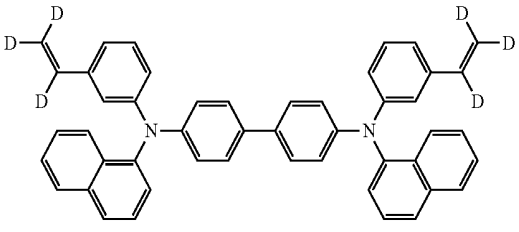
Any adjacent substitution groups are optionally joined to form a ring or a fused structure.

10. The charge transporting compound of claim **9**, wherein charge transporting compound is selected from the group consisting of:

Compound 1



Compound 2



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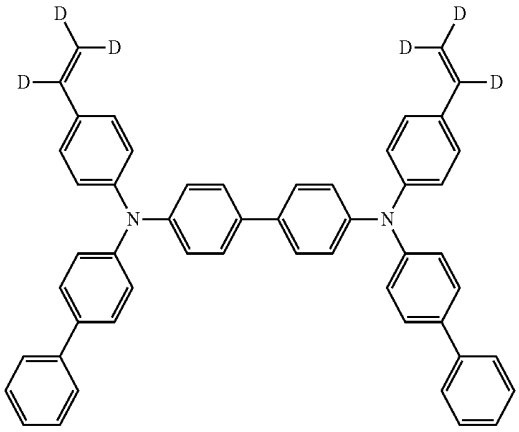
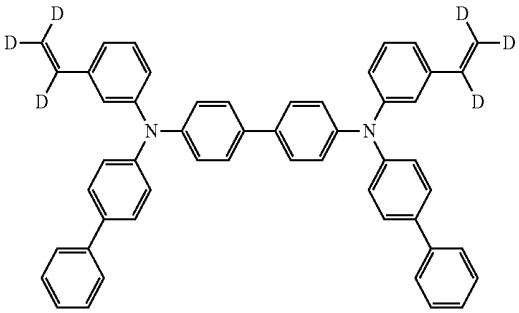
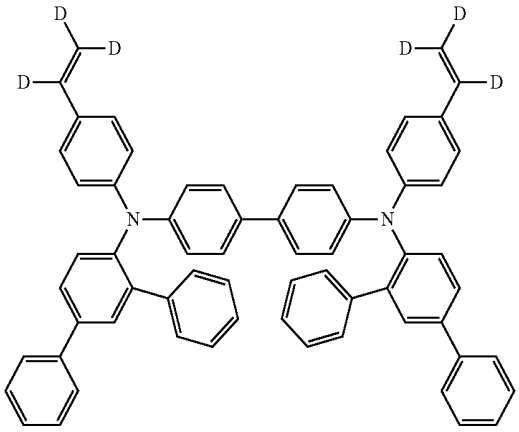
Compound 3



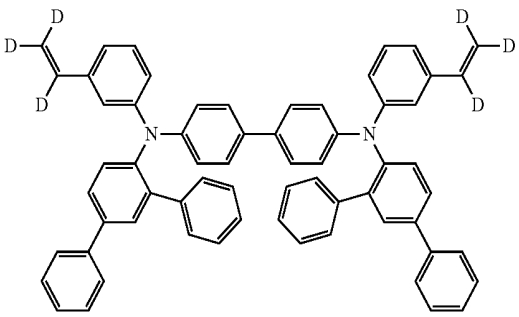
Compound 4



Compound 5



Compound 6



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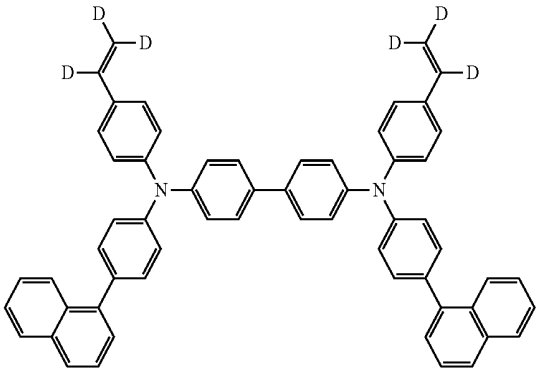
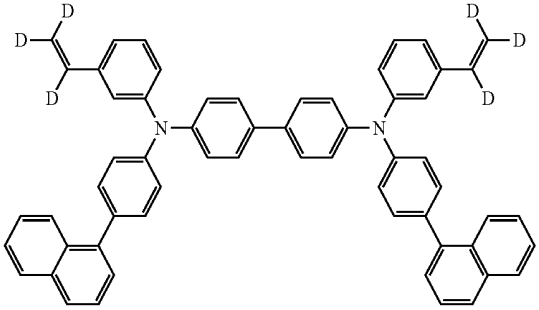
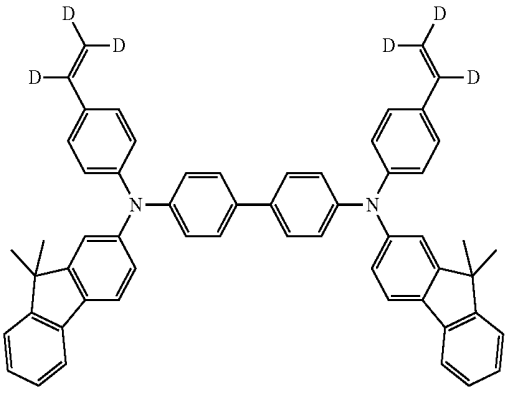


Compound 8



Compound 9



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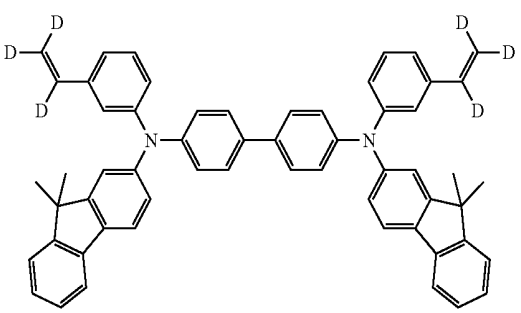

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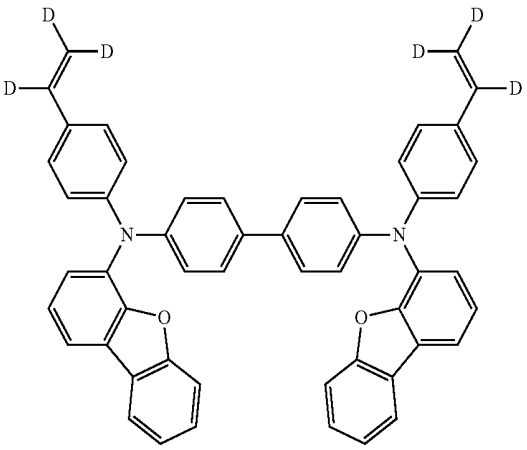

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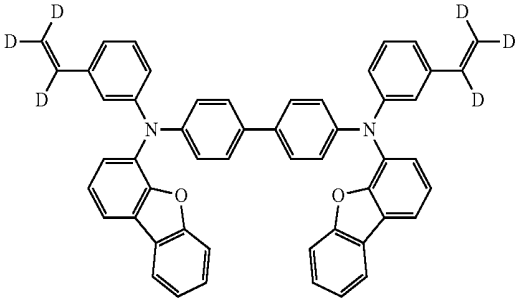

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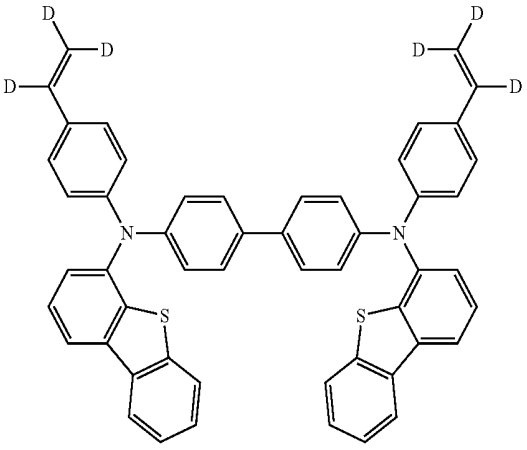

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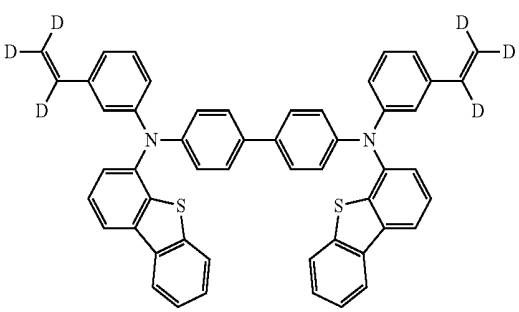

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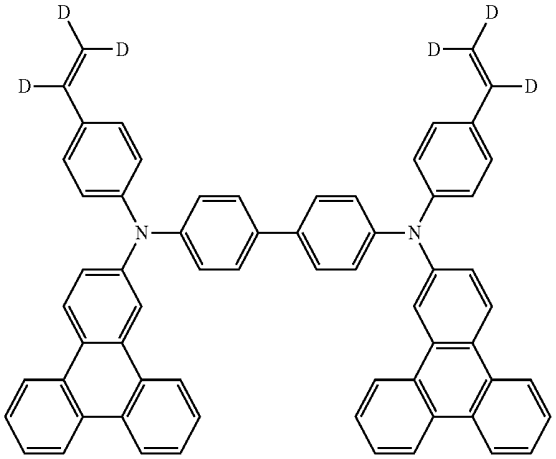

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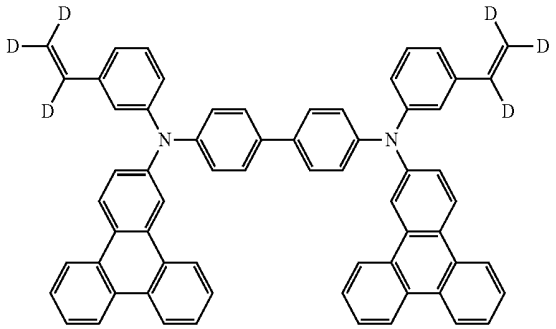

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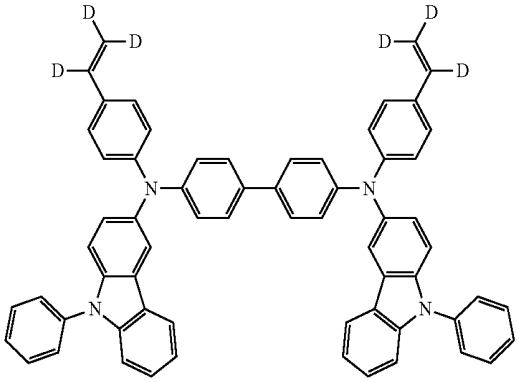

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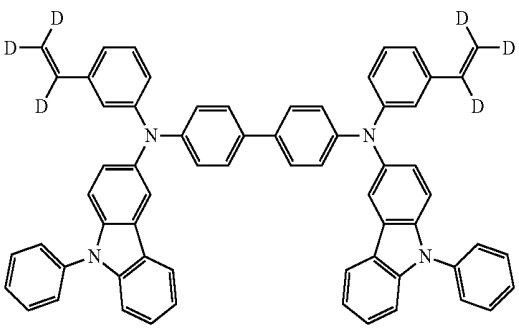

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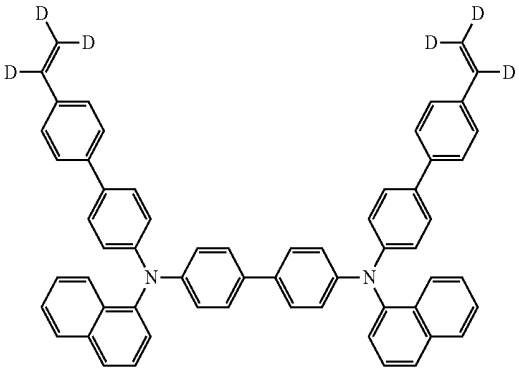

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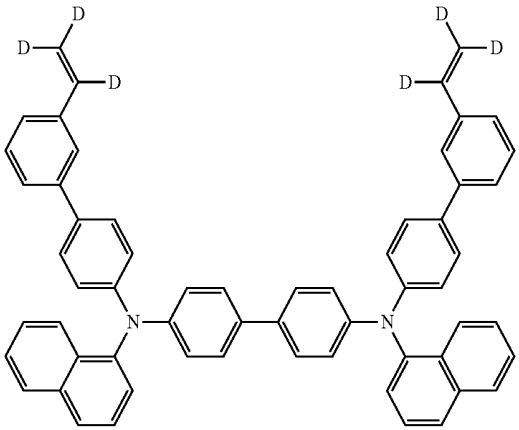

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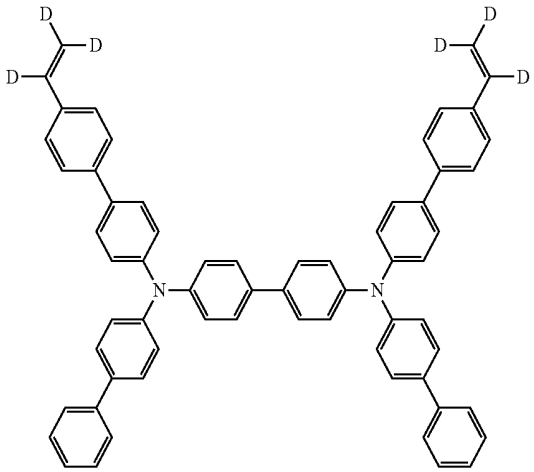

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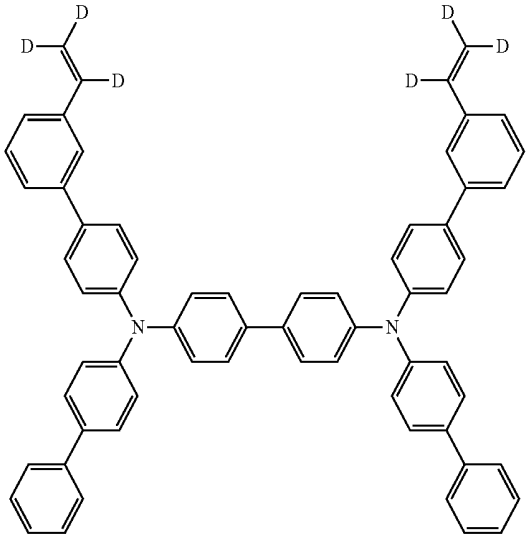
Compound 22



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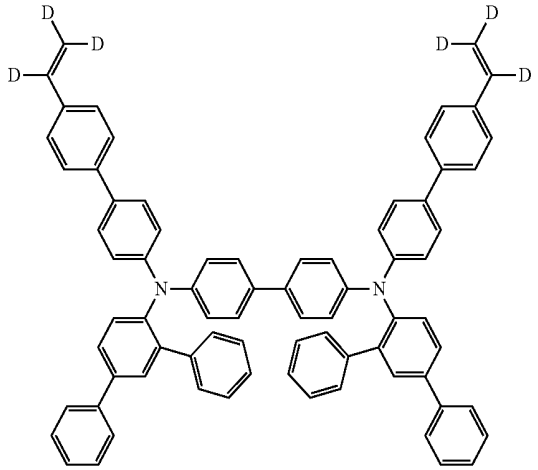

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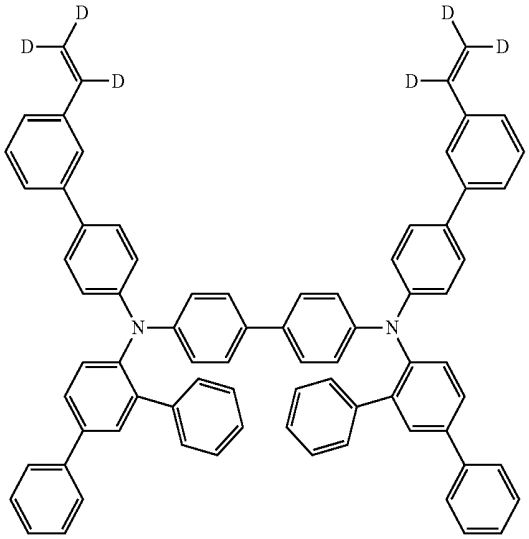

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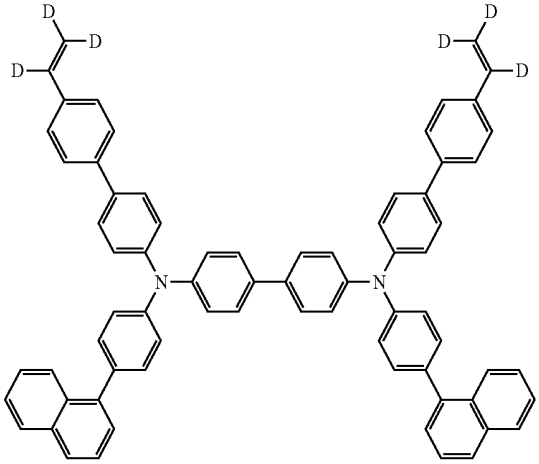

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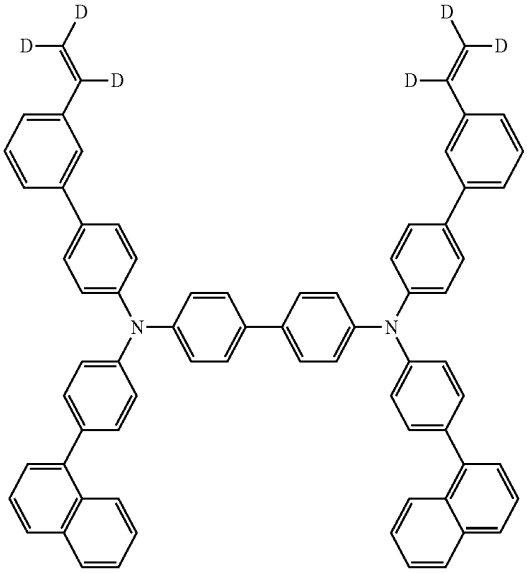

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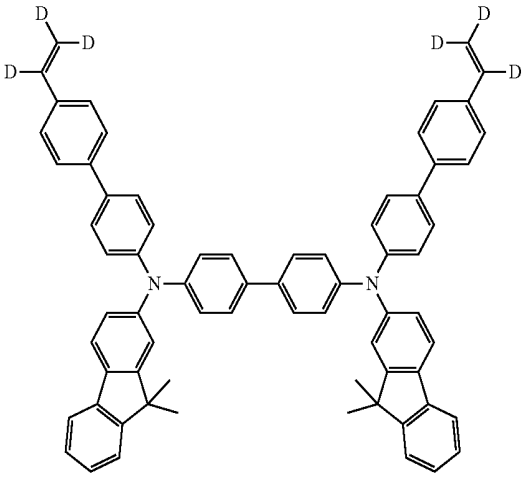

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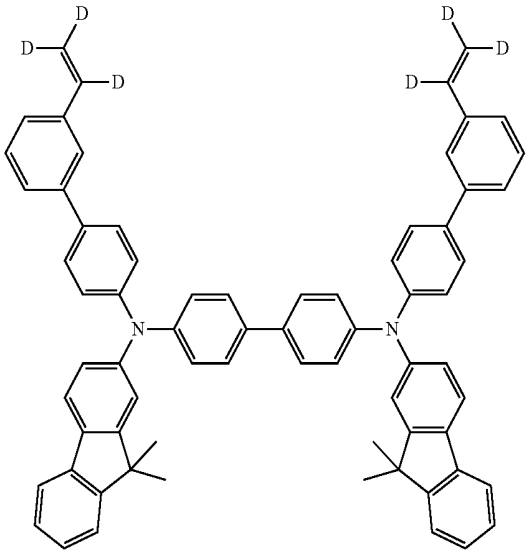
Compound 28



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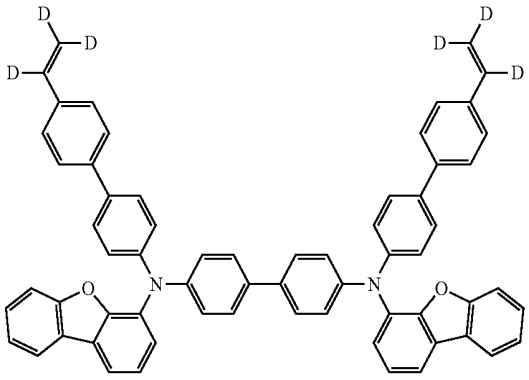

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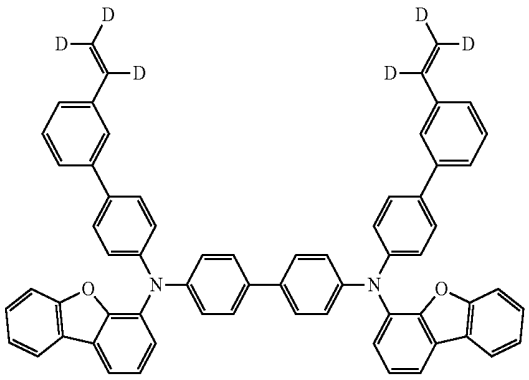

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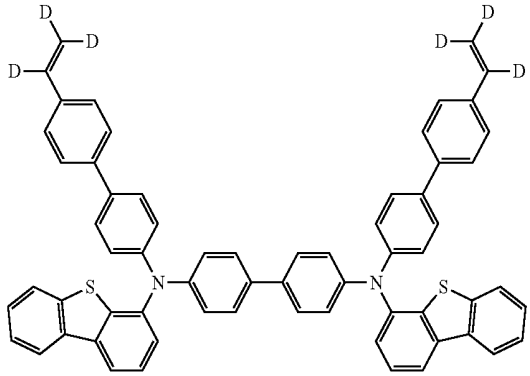

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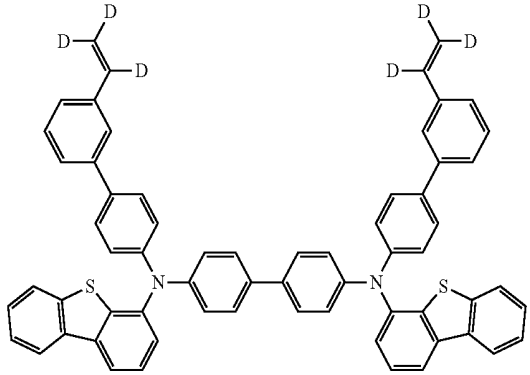

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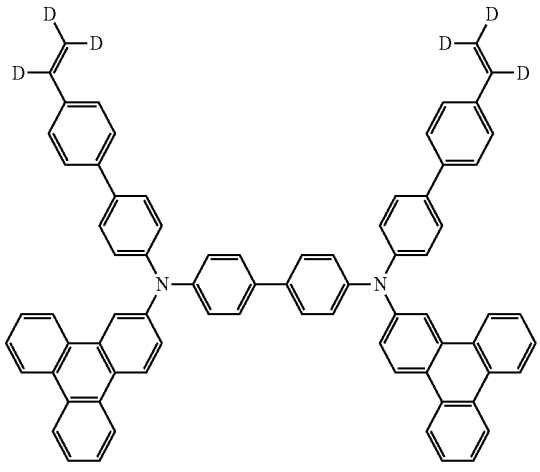

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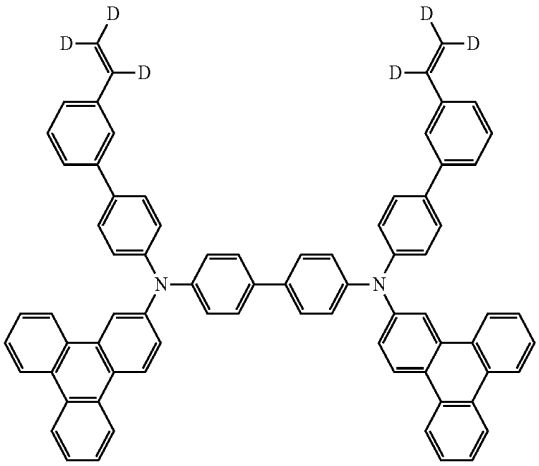
Compound 34



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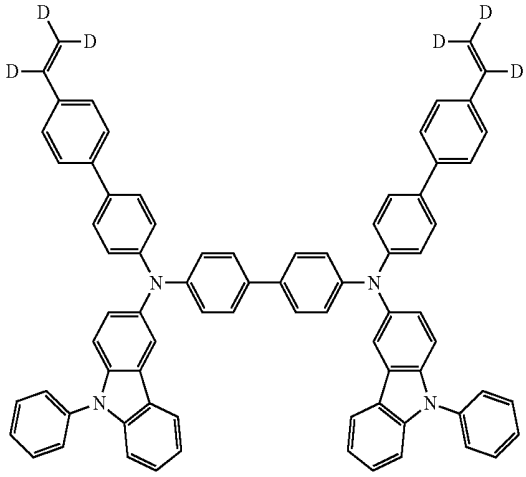
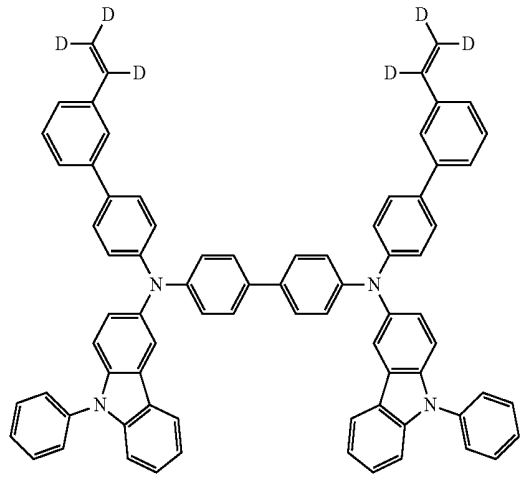


Compound 36



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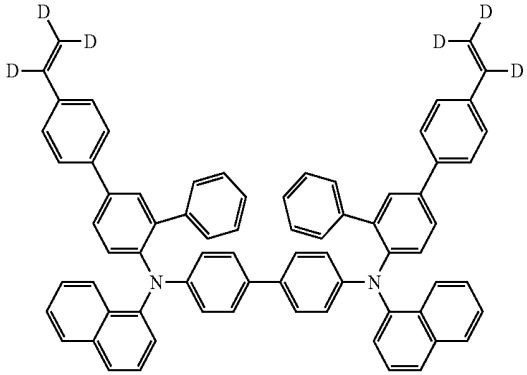
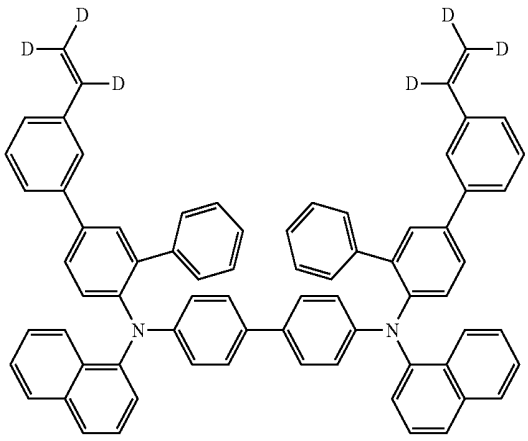
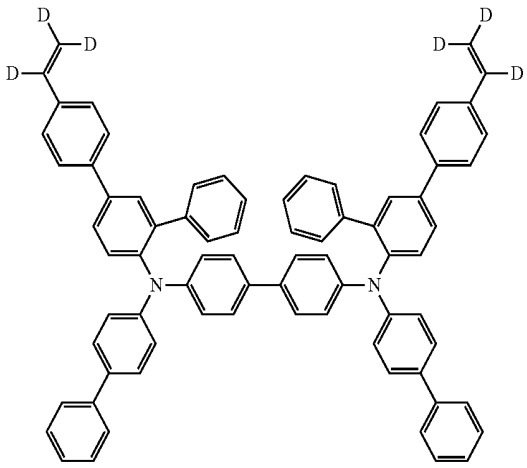
Compound 37



Compound 38



Compound 39



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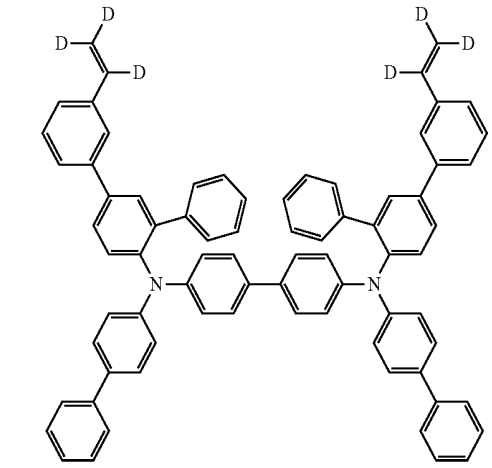
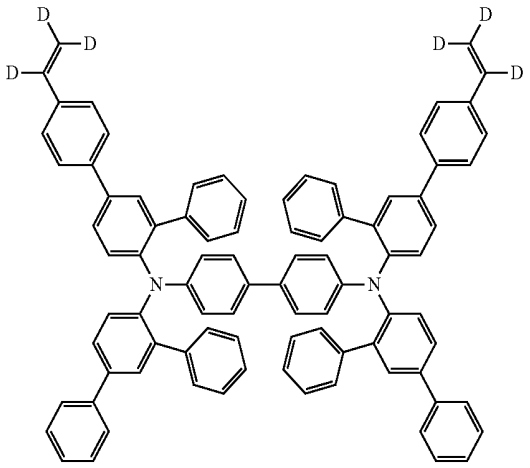
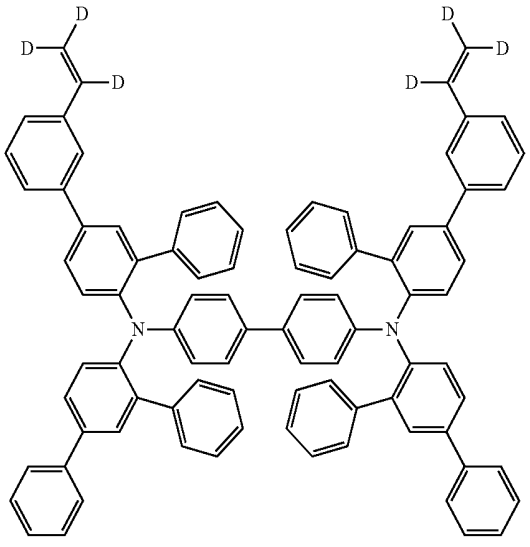
Compound 40



Compound 41



Compound 42



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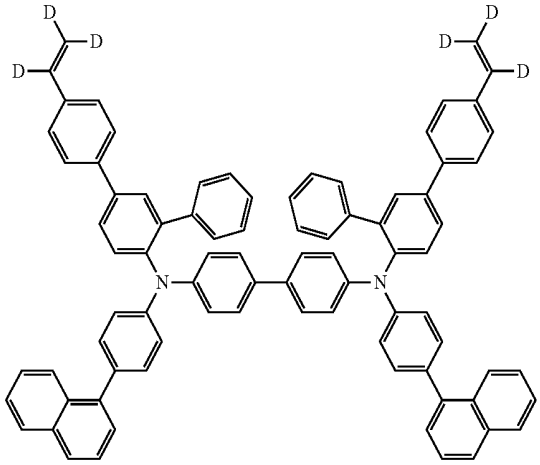
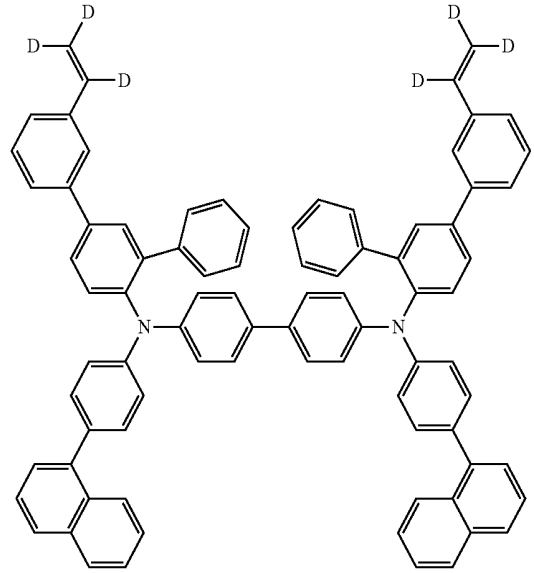
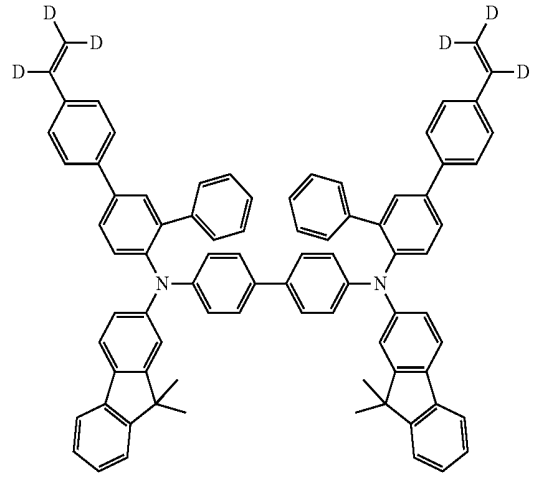
Compound 43



Compound 44



Compound 45



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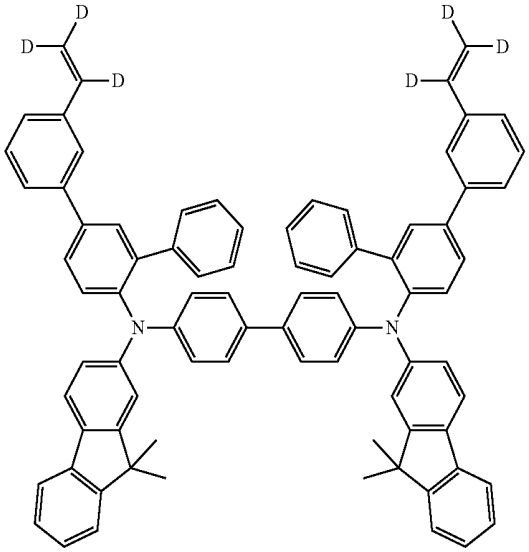
Compound 46



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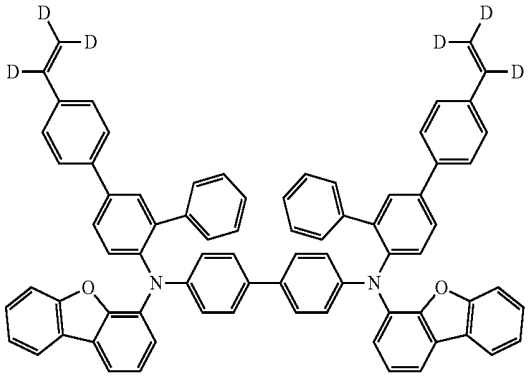

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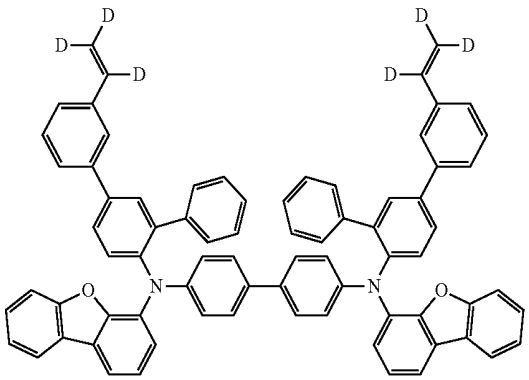

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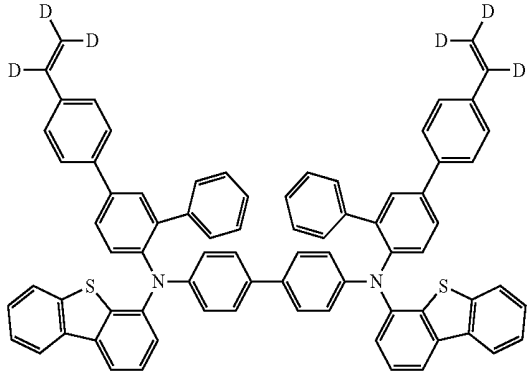

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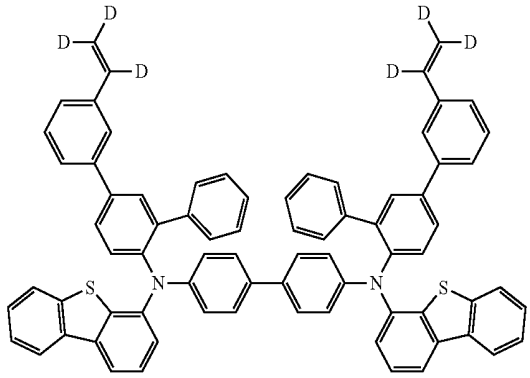

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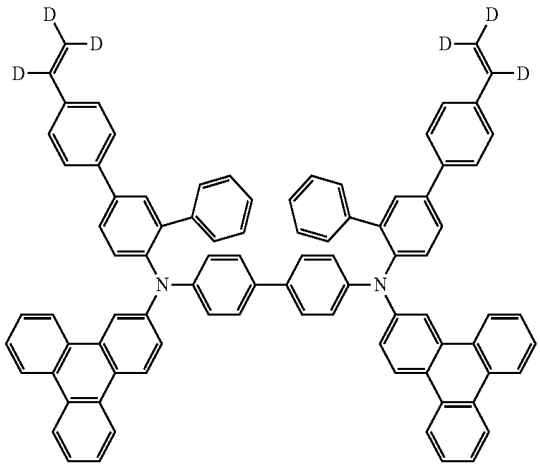

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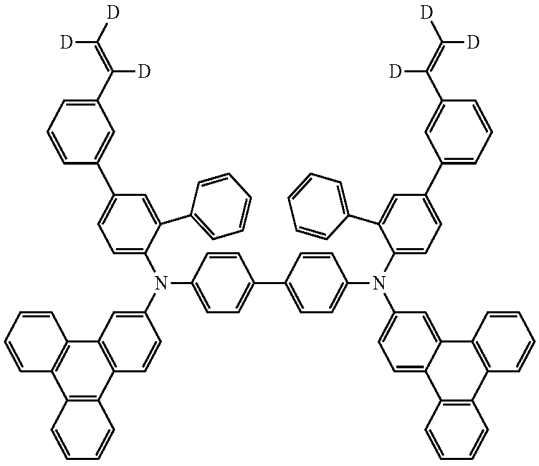

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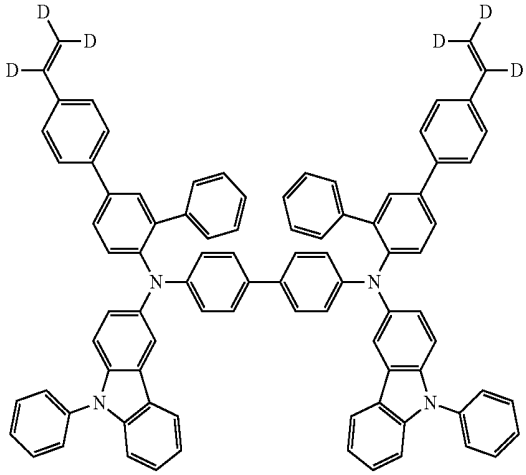

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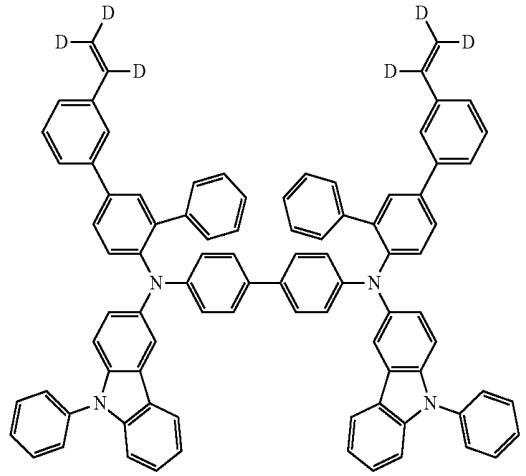

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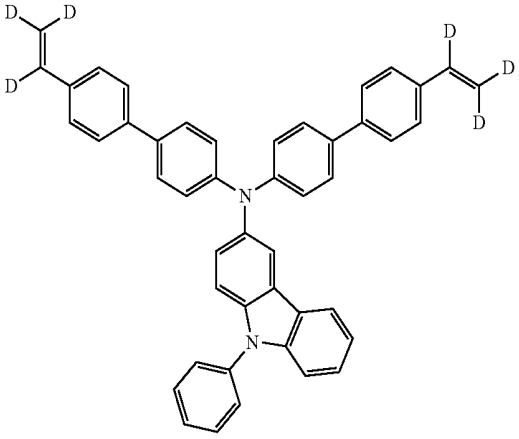

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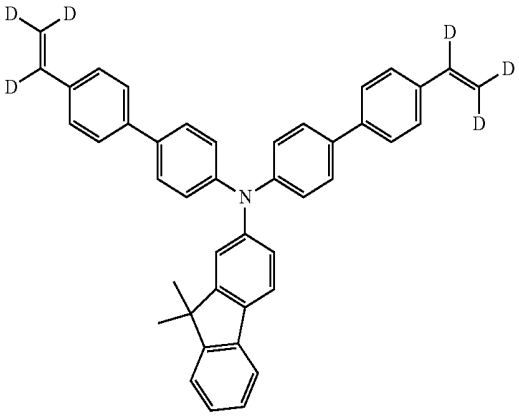

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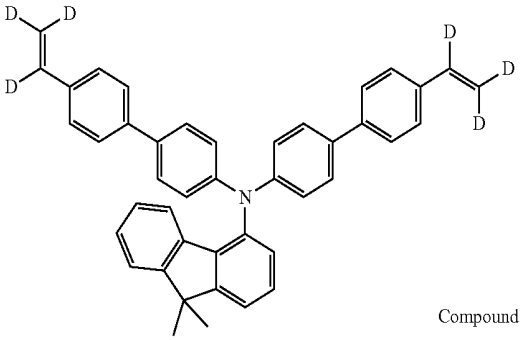

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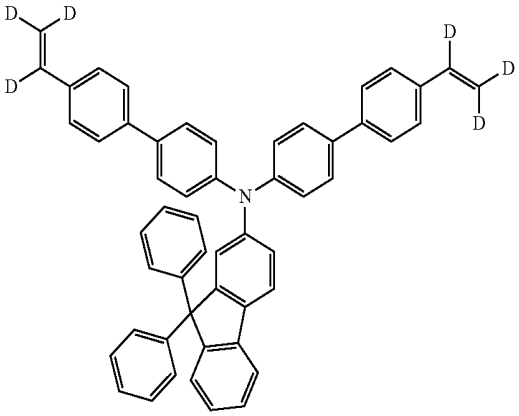

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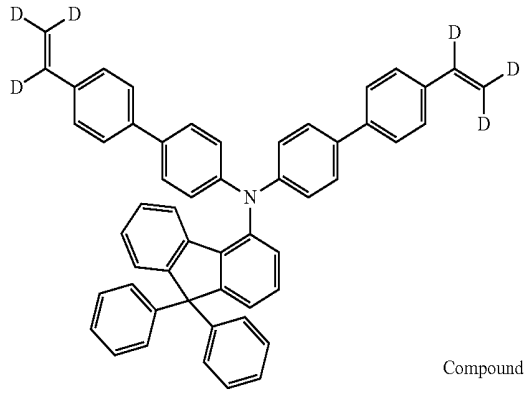

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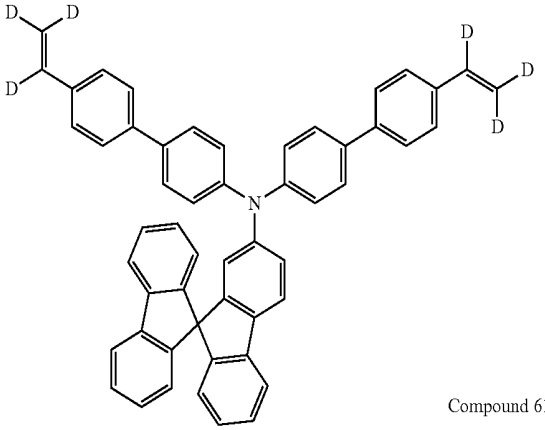

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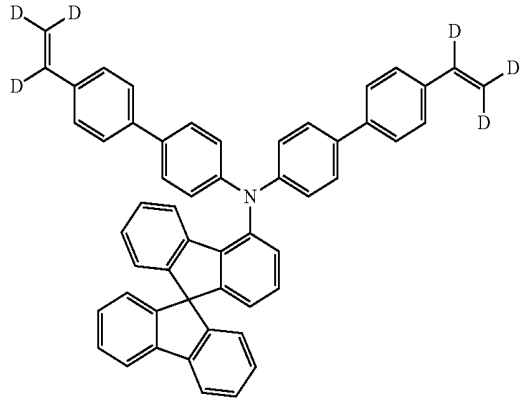

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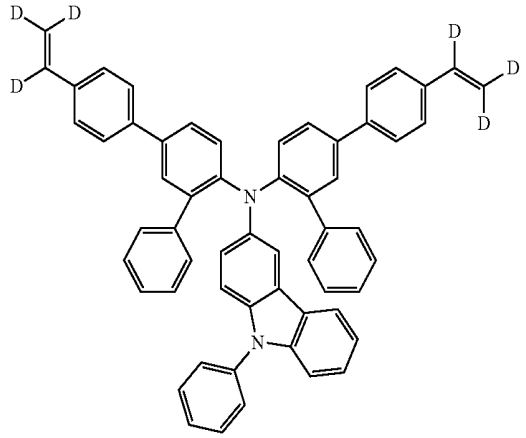

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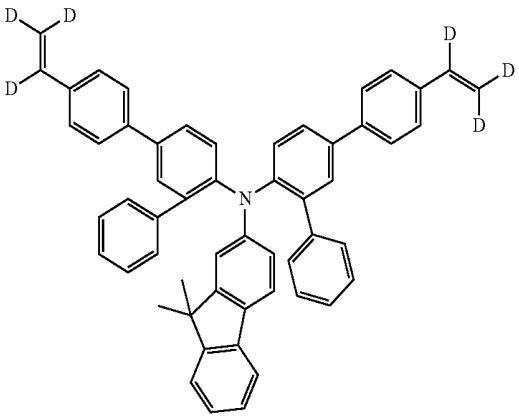

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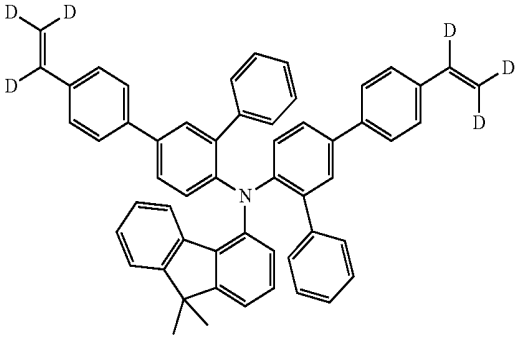

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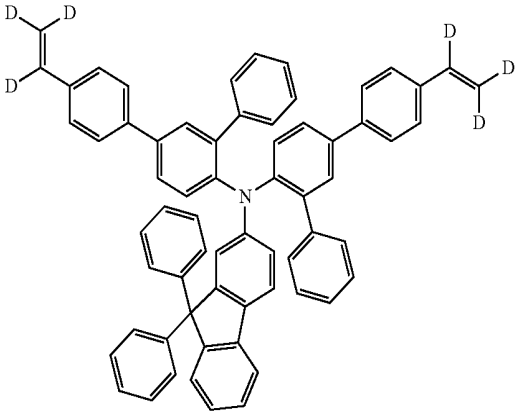

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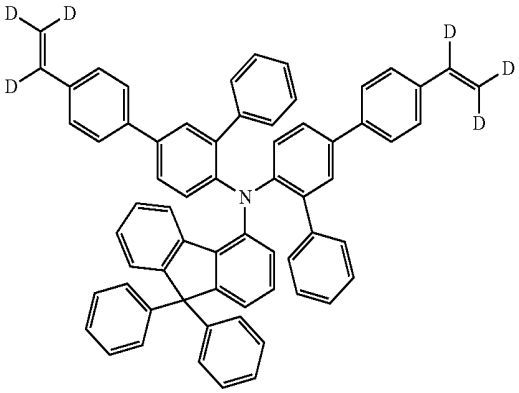

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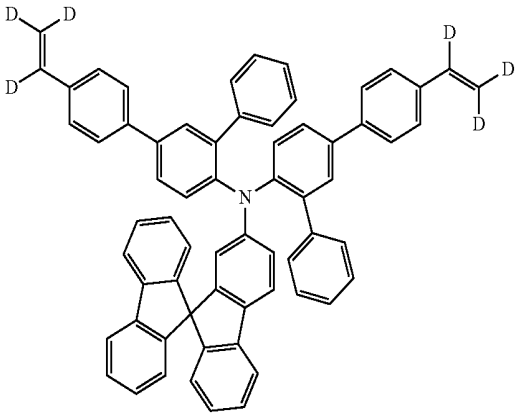

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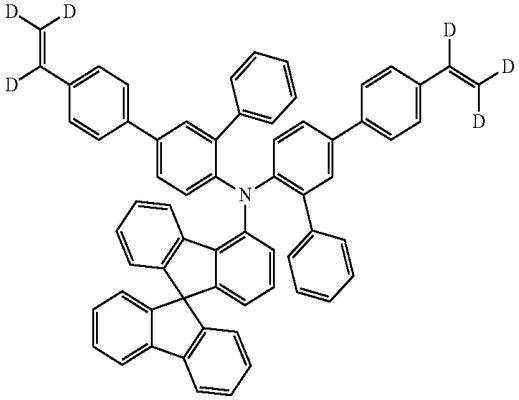

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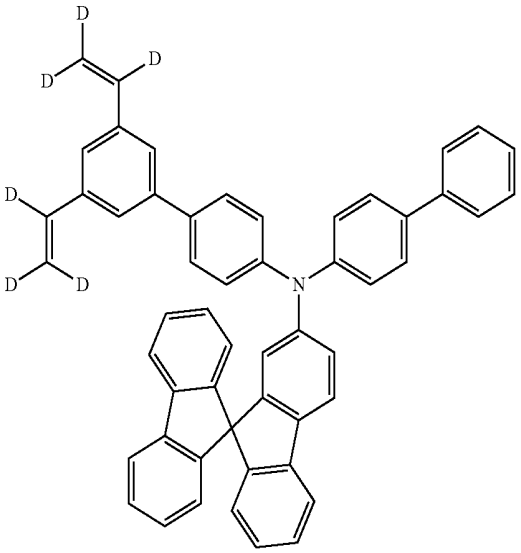

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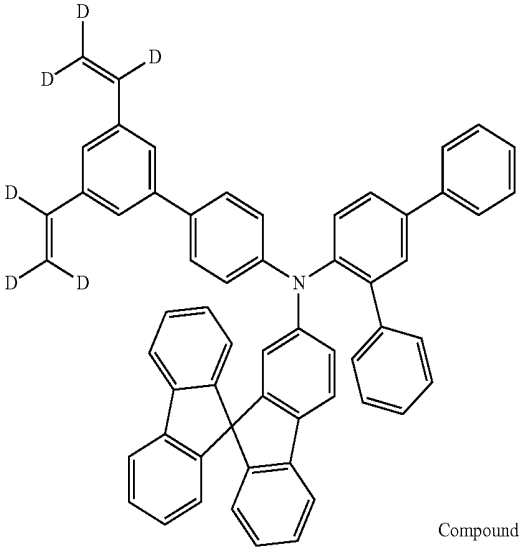

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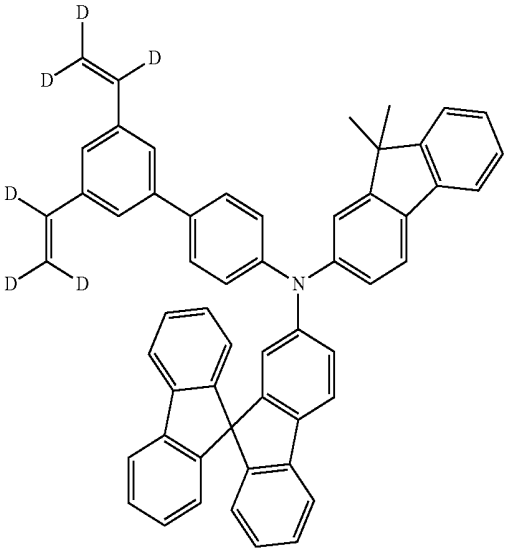

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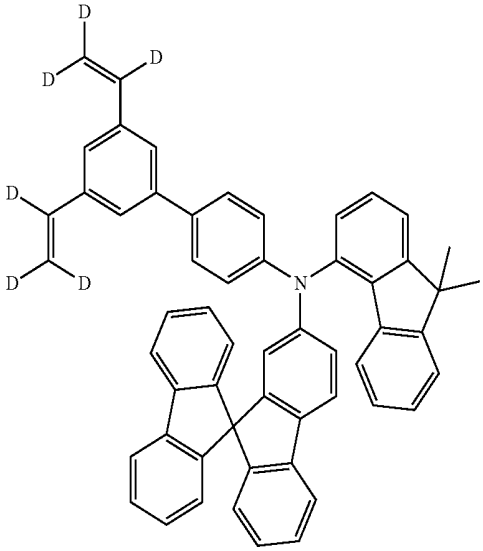

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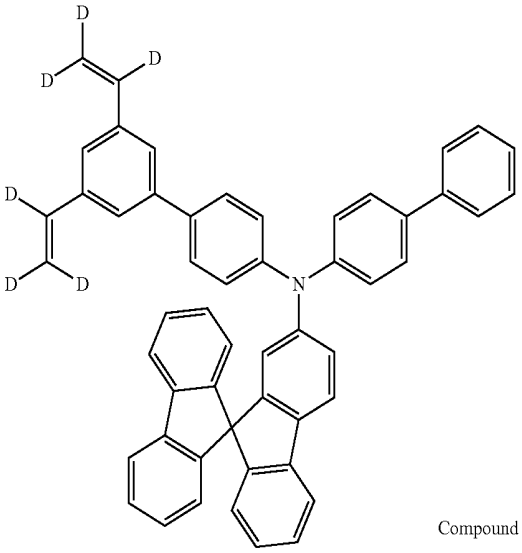

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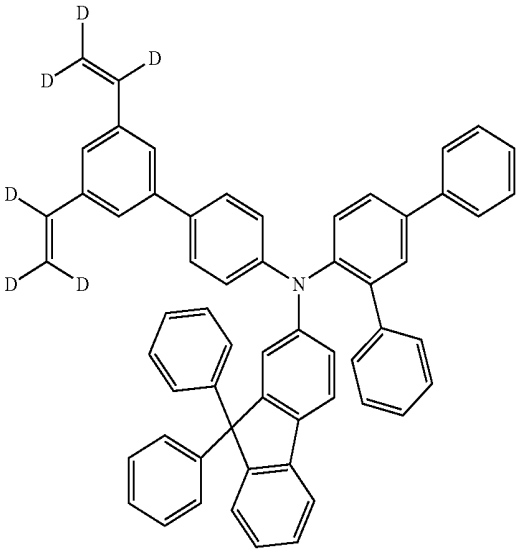

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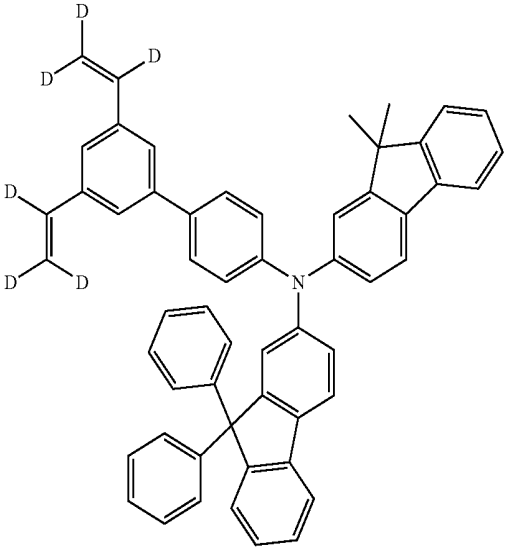

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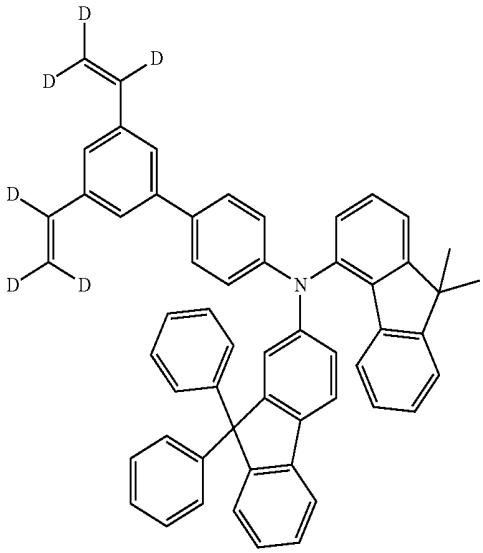

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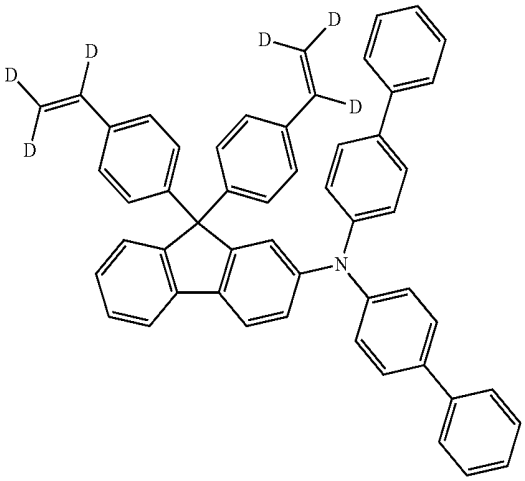

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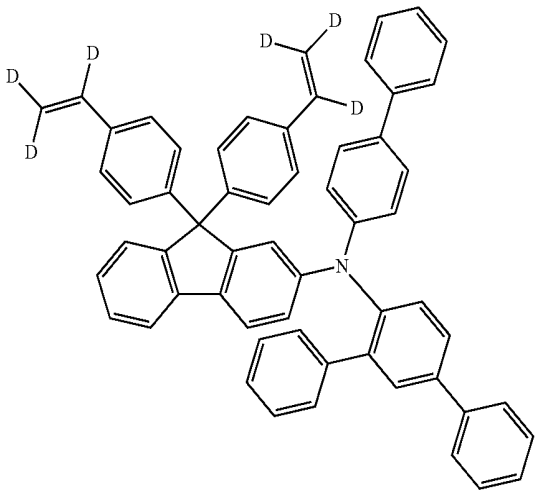

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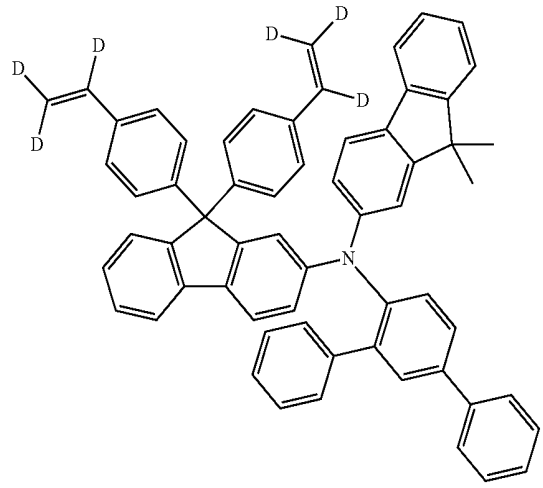

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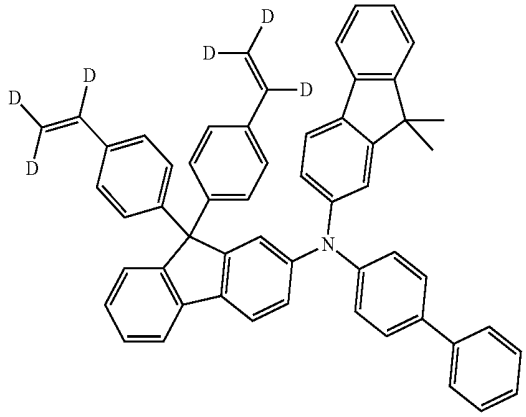

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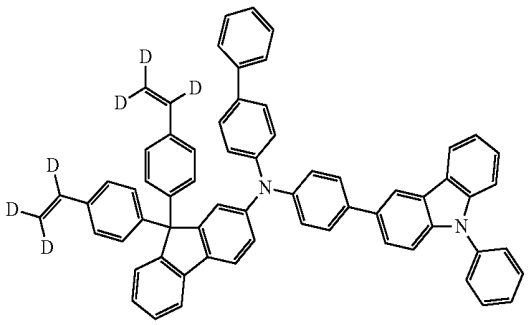

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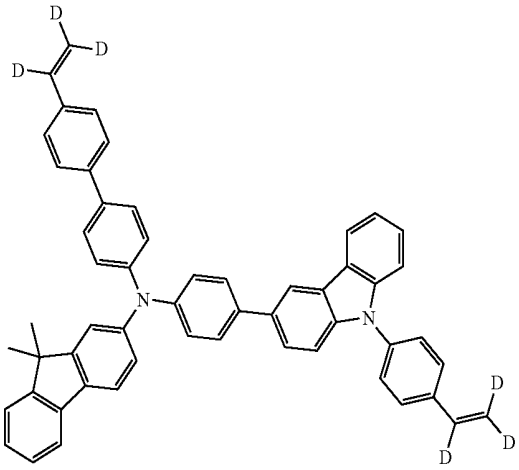

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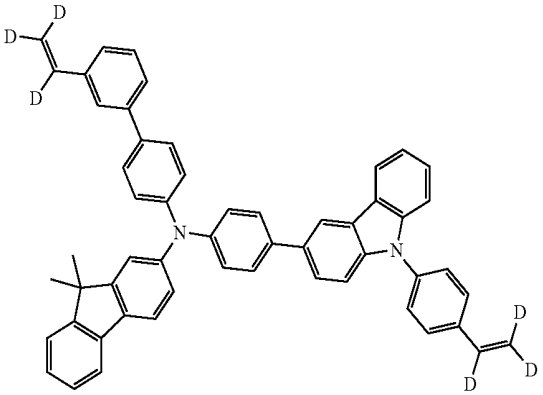

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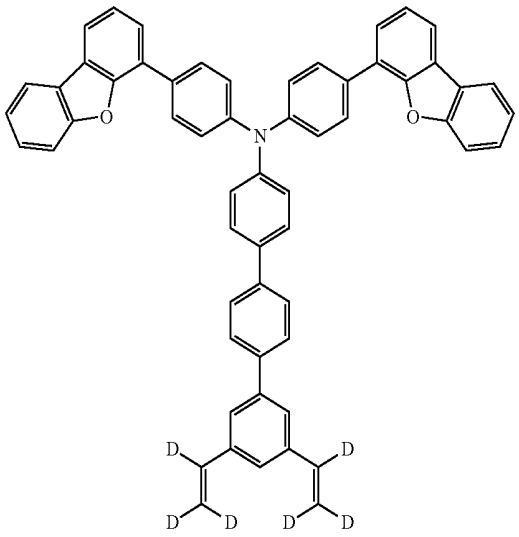

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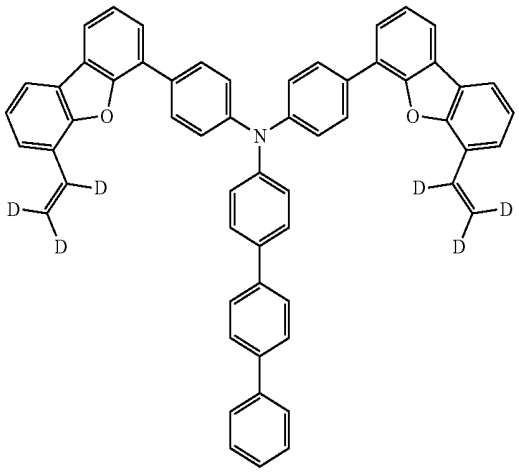

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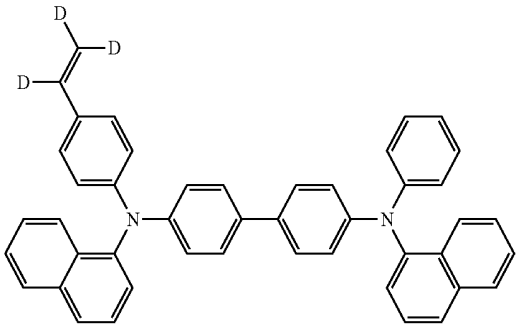

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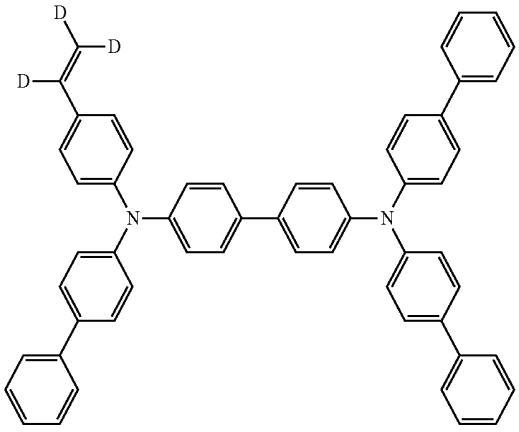

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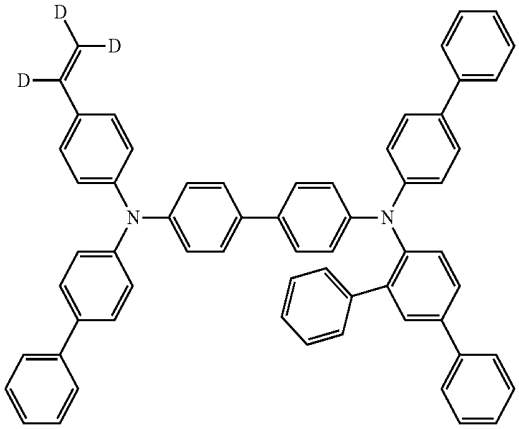

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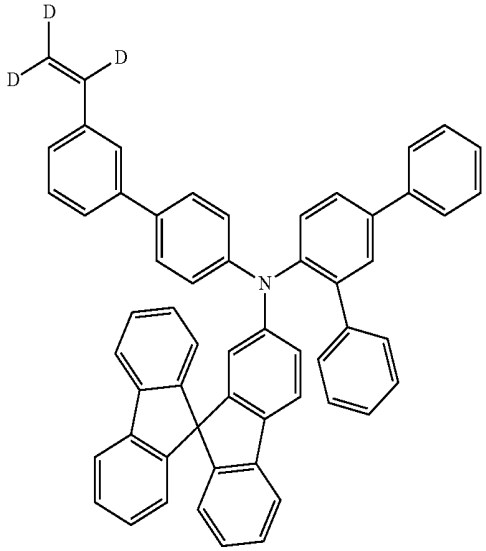

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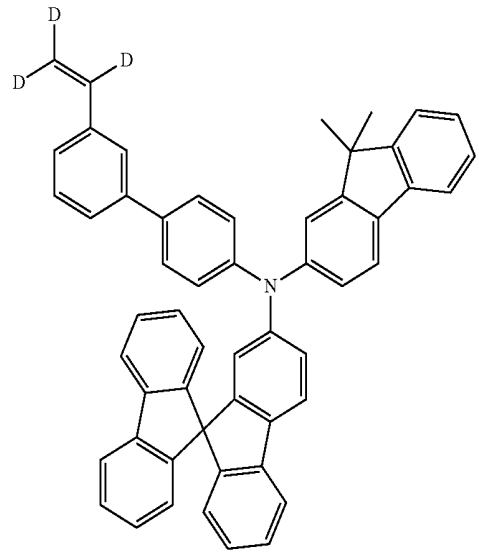

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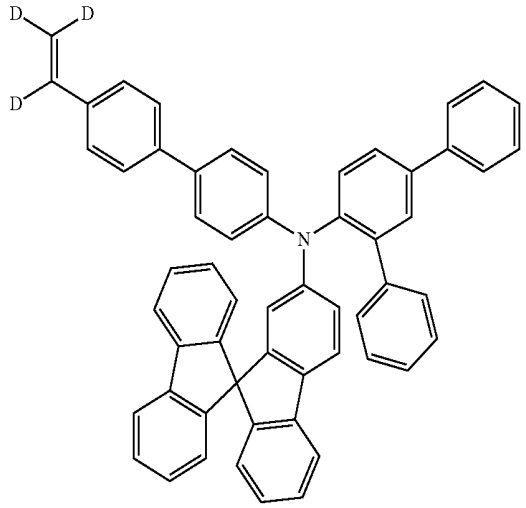

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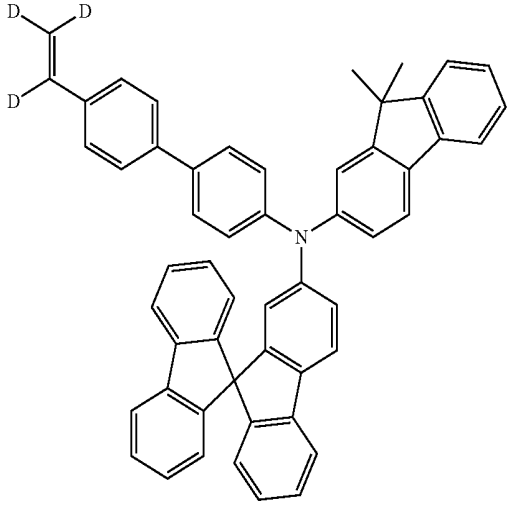

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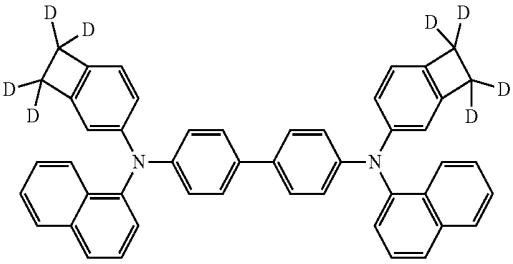

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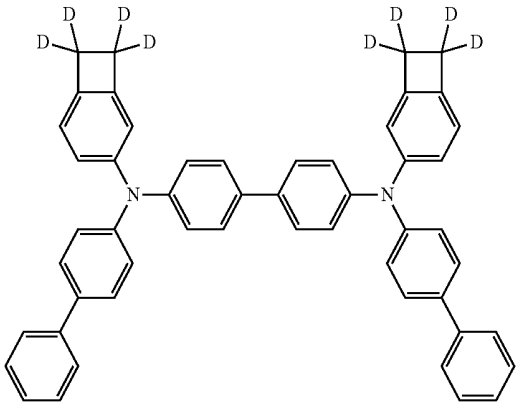

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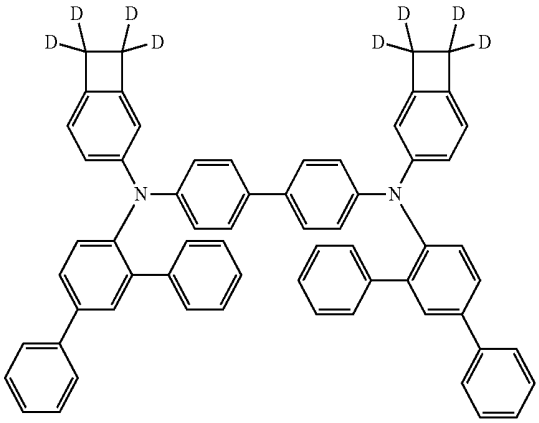

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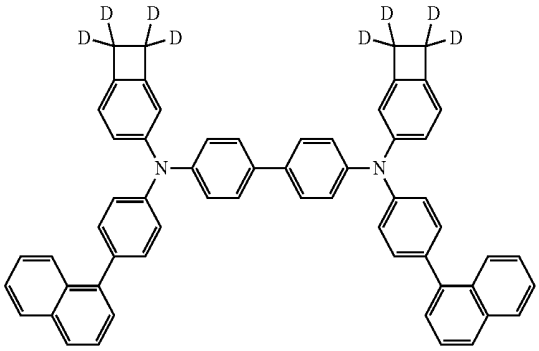

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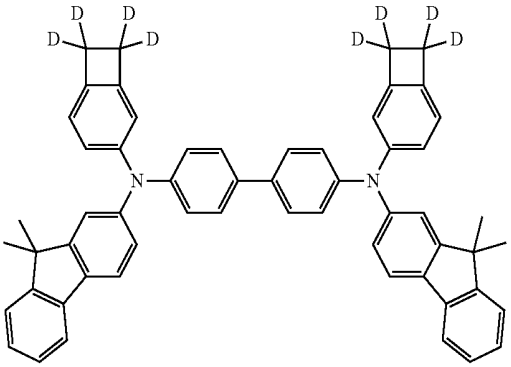

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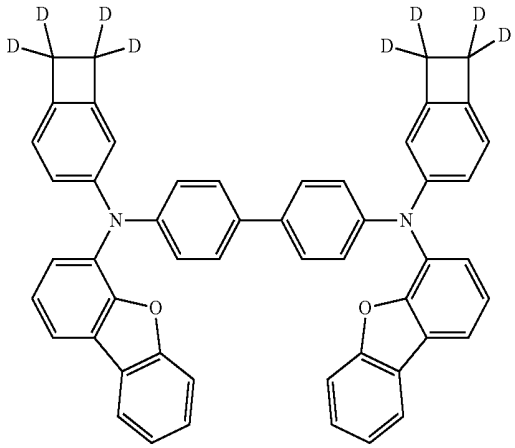
Compound 98



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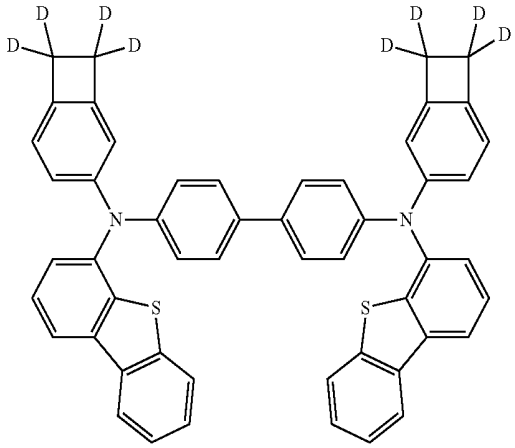

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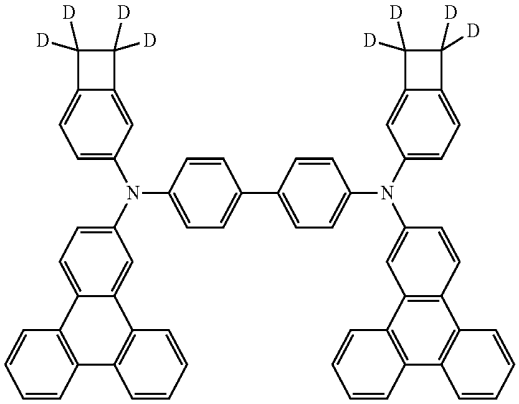

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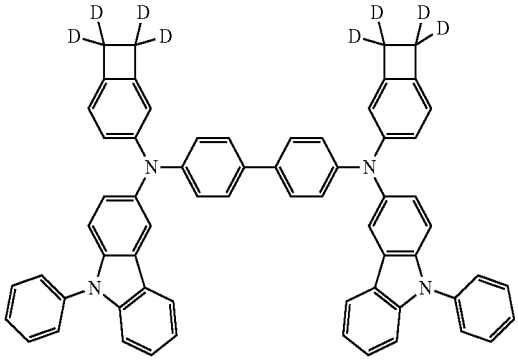

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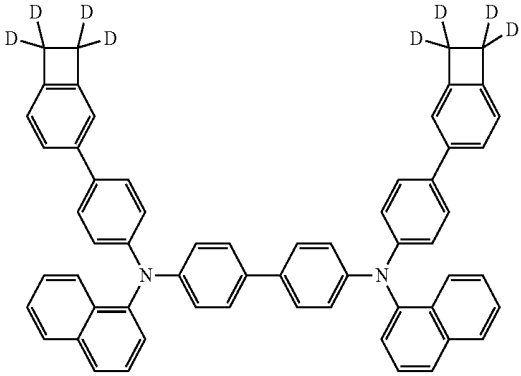

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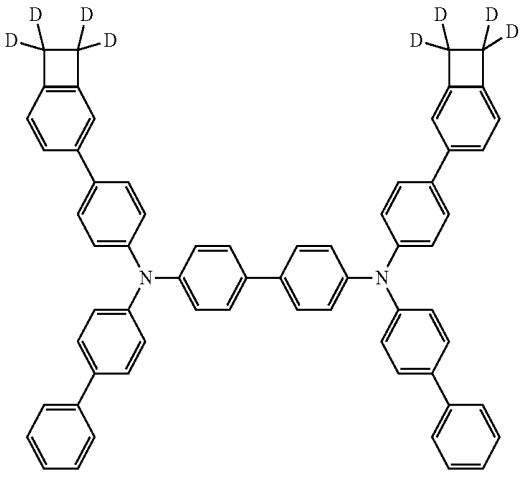

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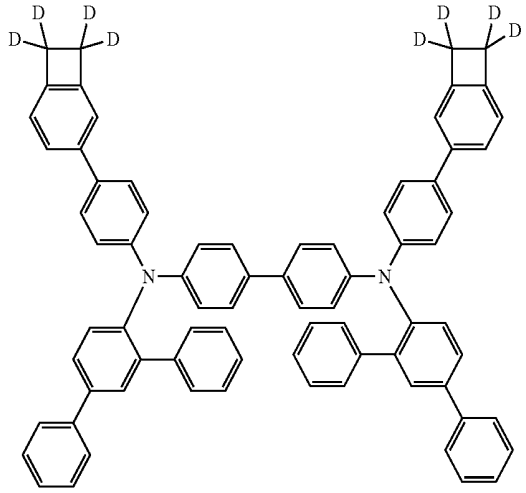
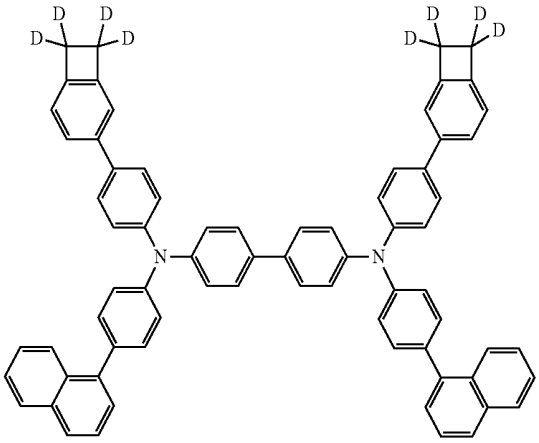
Compound 104



Compound 105



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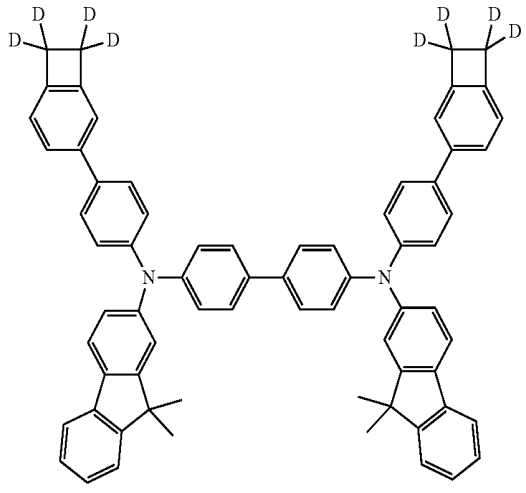

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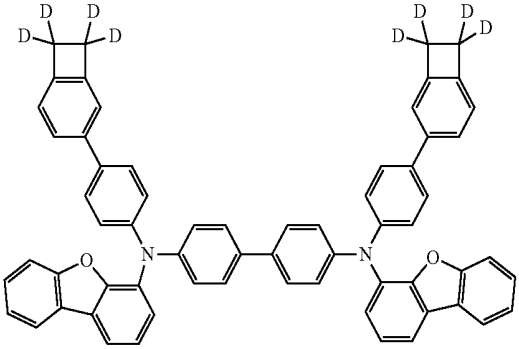

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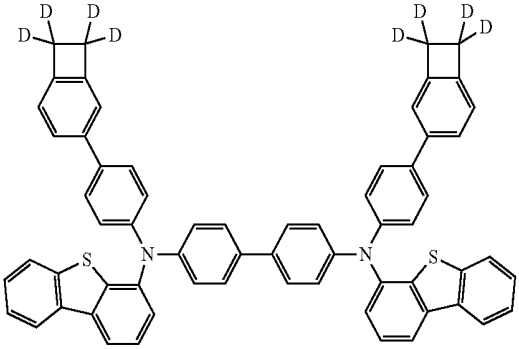

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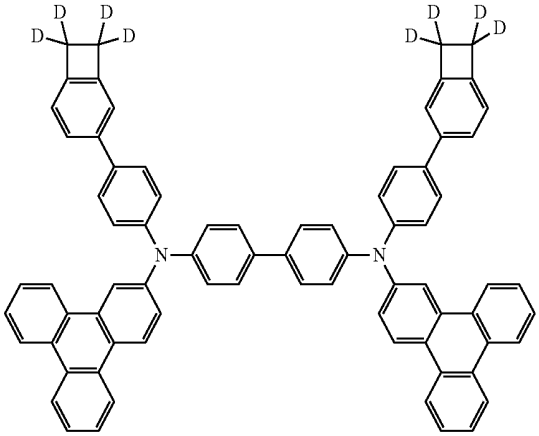

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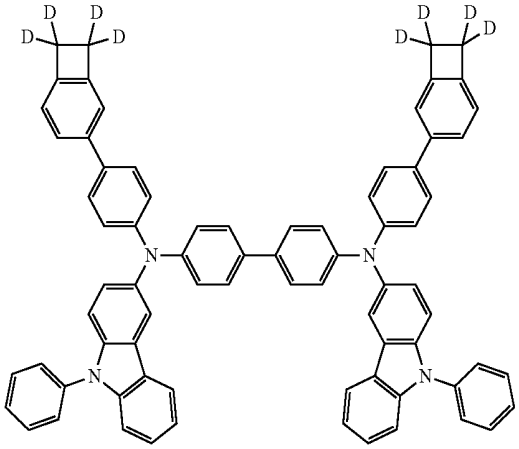

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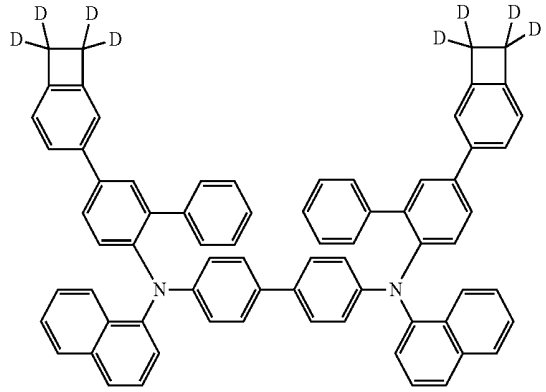

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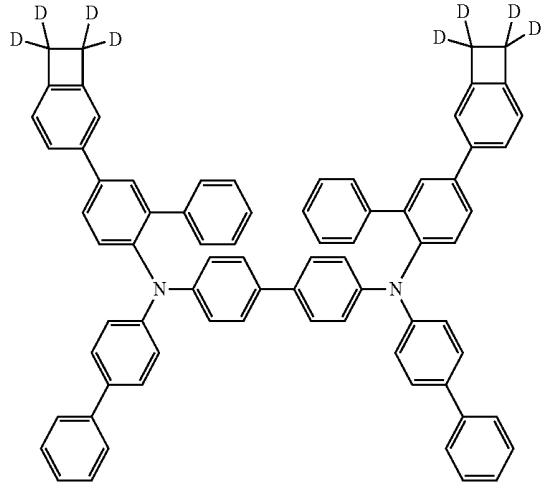

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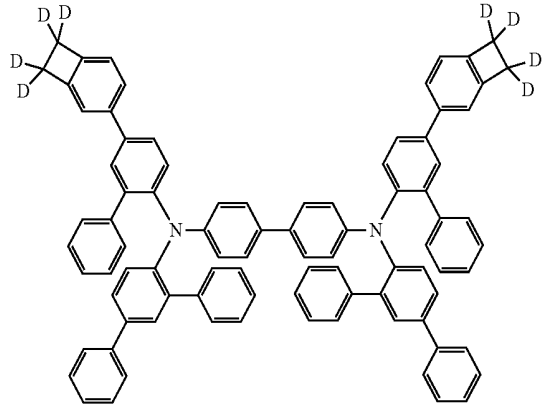

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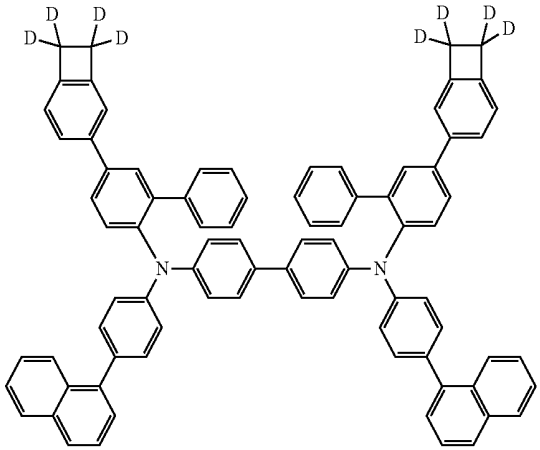

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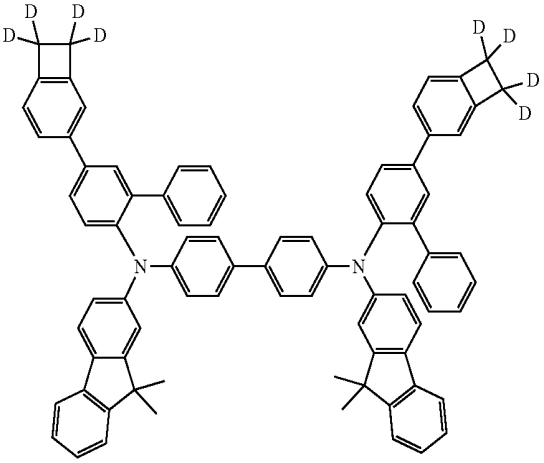

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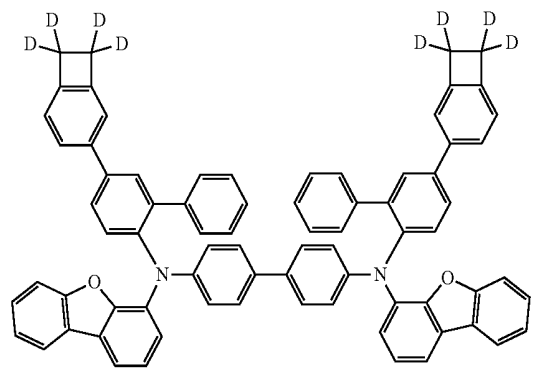

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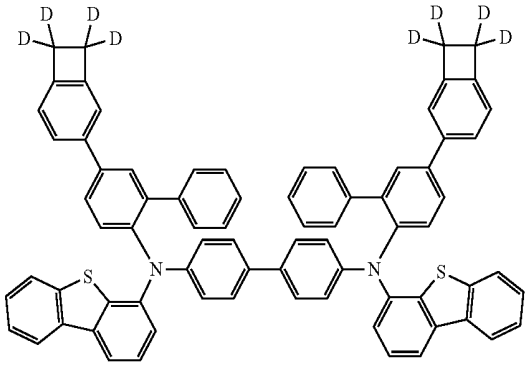

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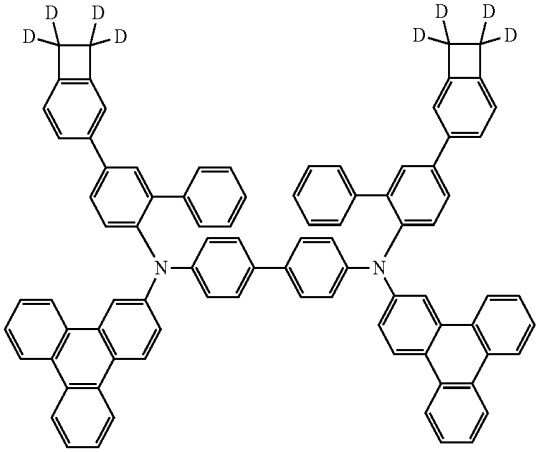

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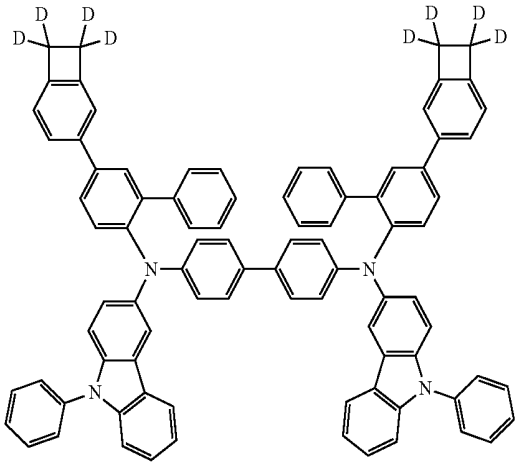

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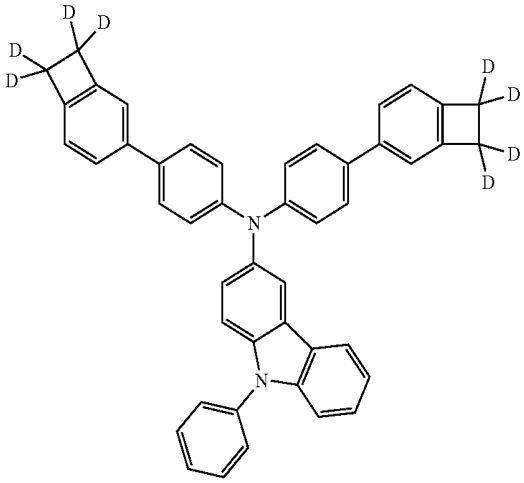

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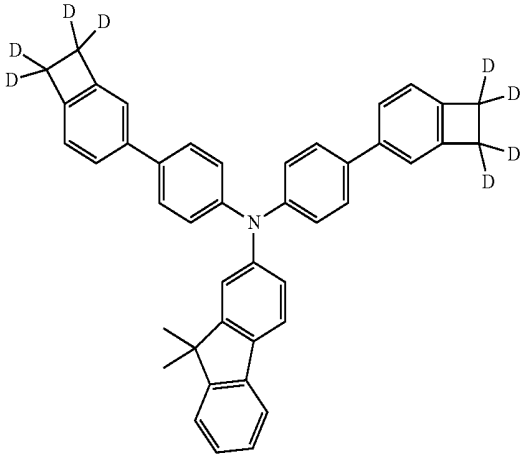

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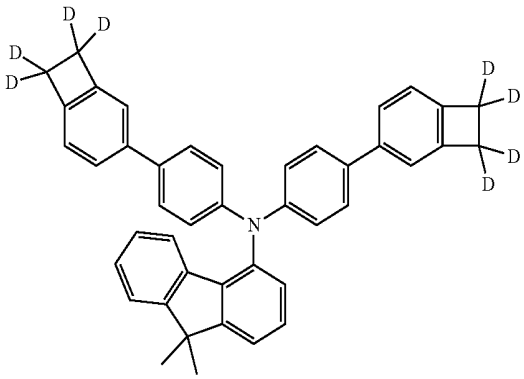

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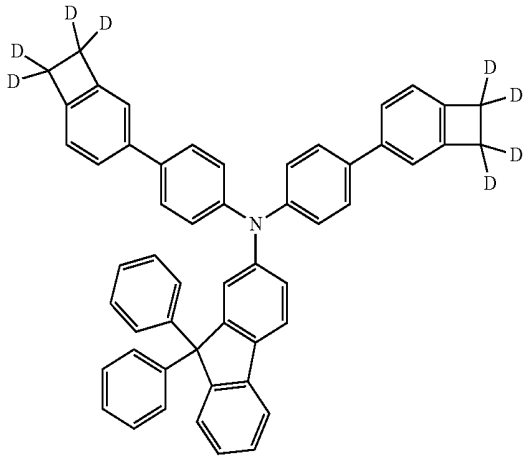

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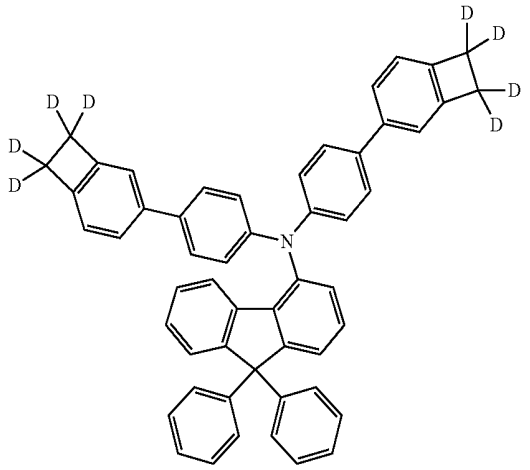

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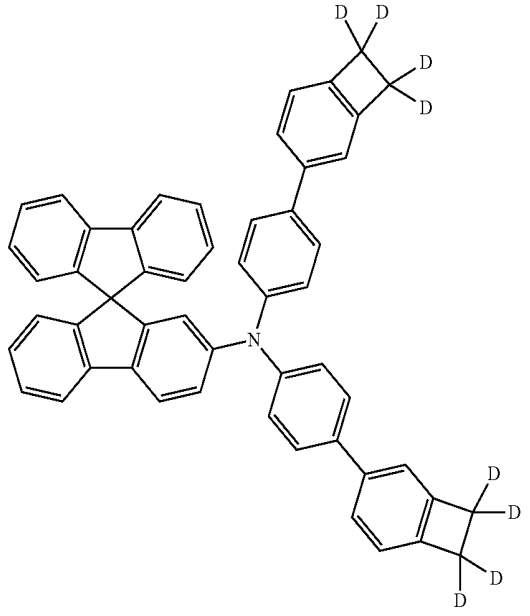

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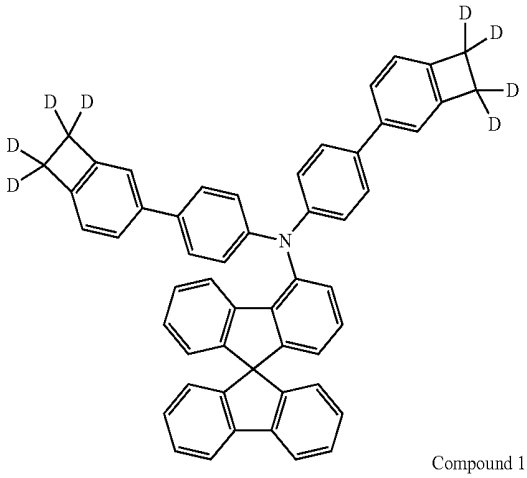

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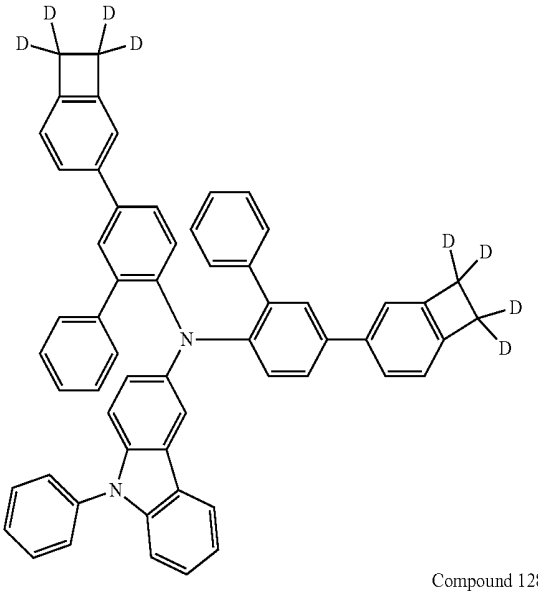

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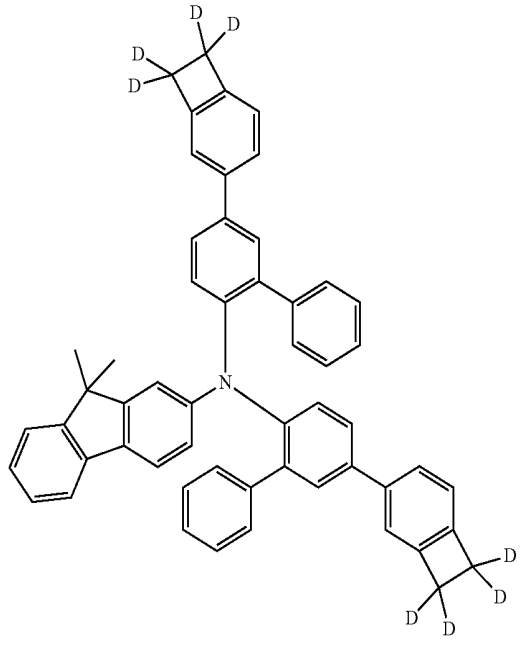

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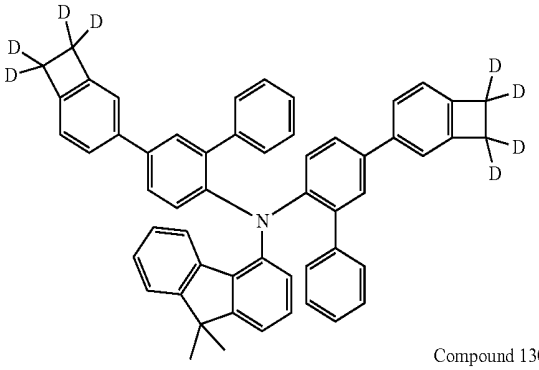

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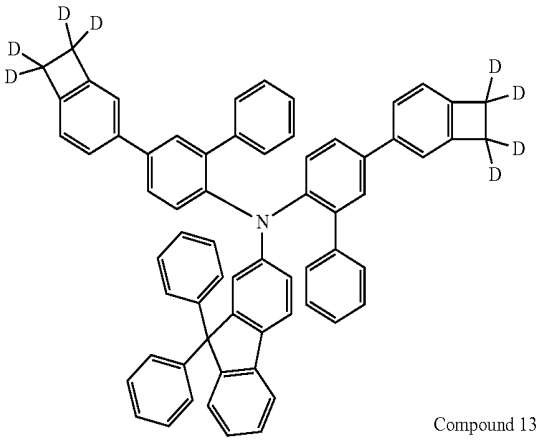

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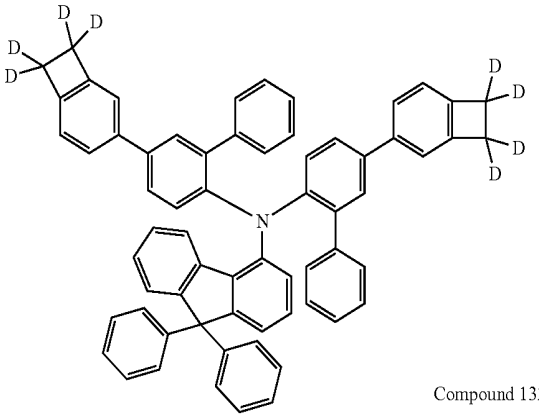

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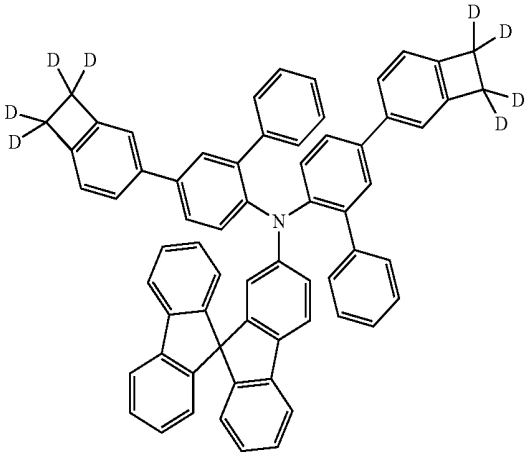

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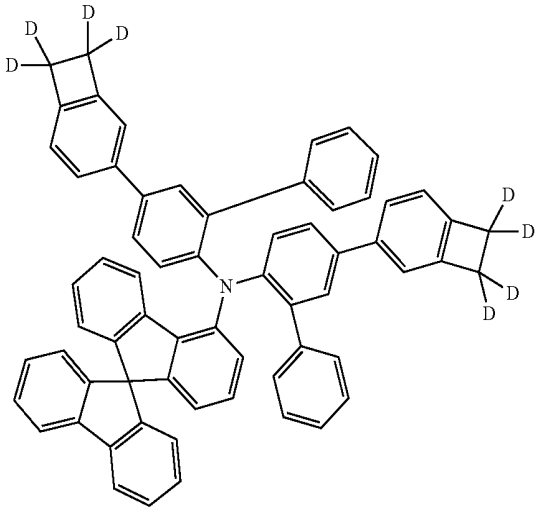

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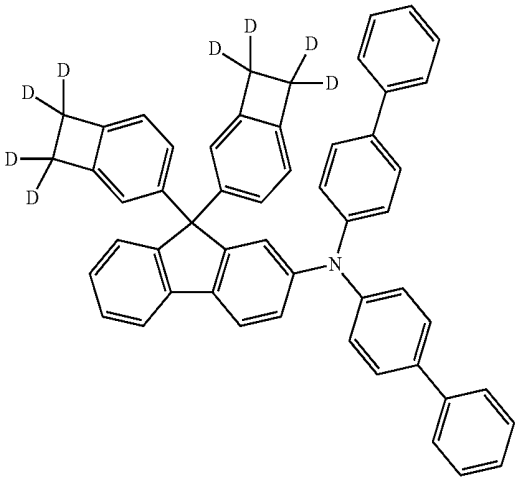

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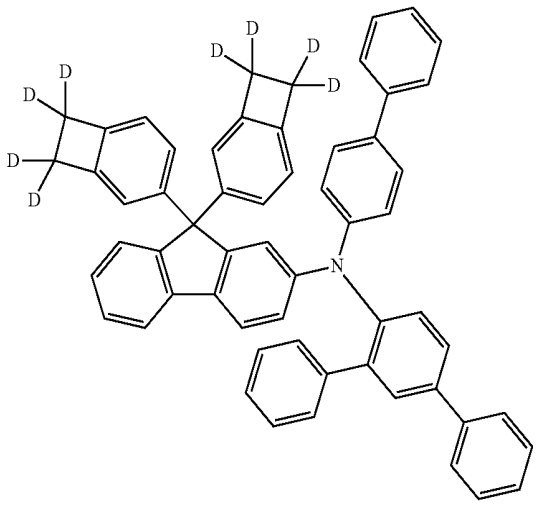

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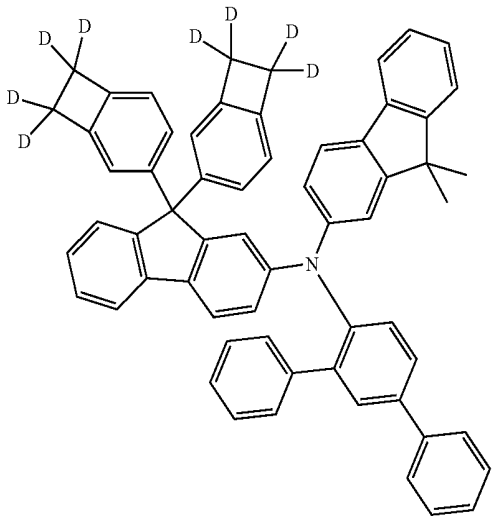

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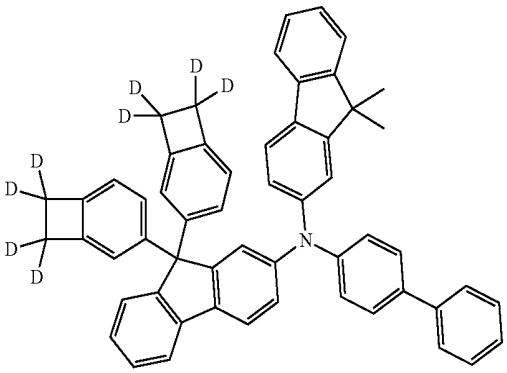

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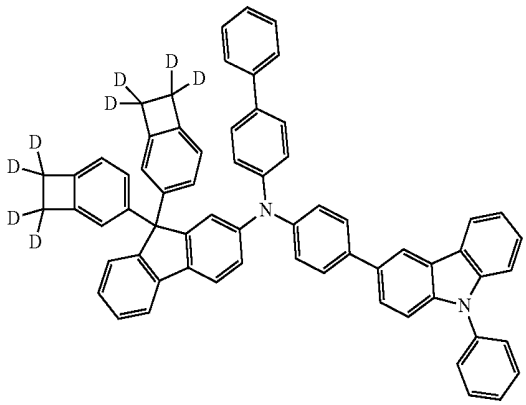

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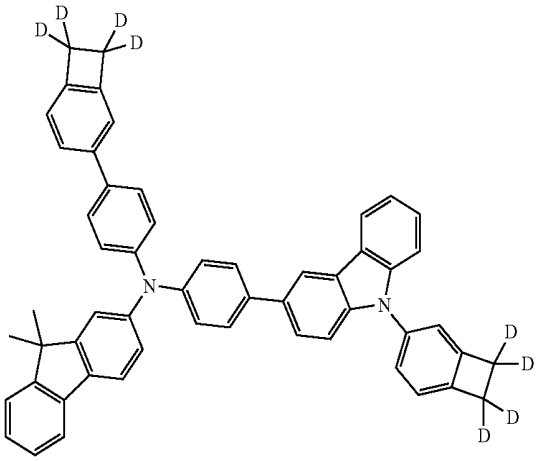

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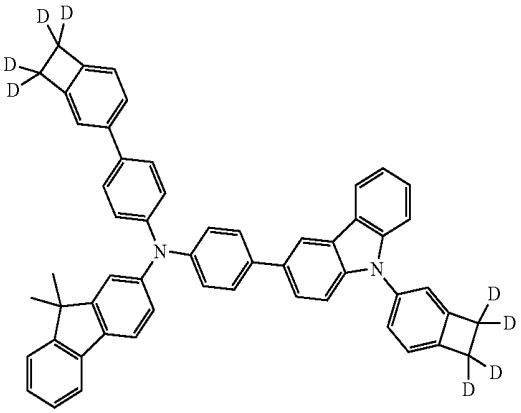

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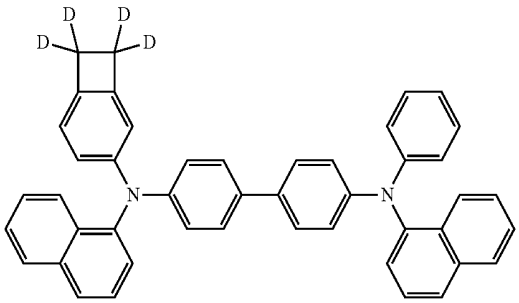

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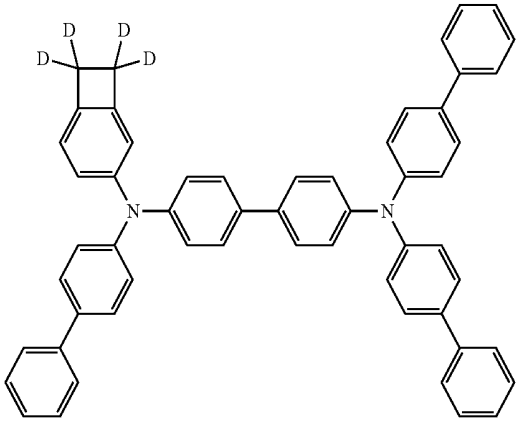

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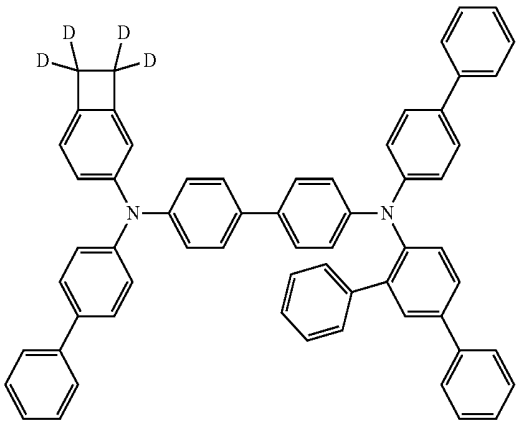

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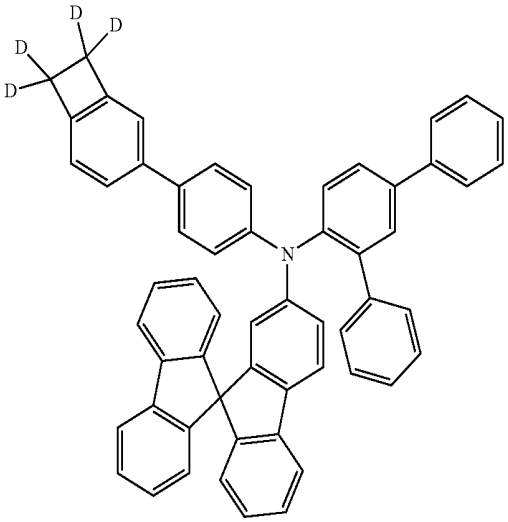

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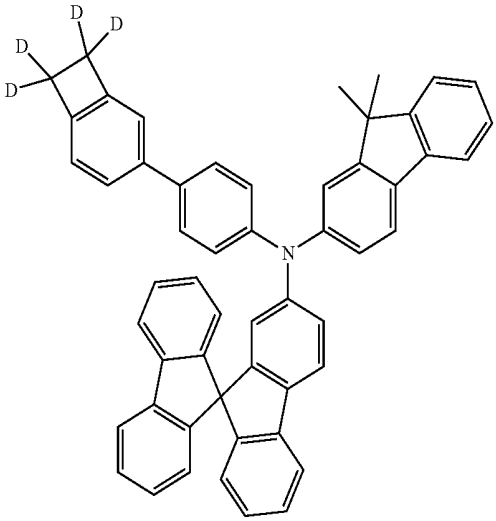

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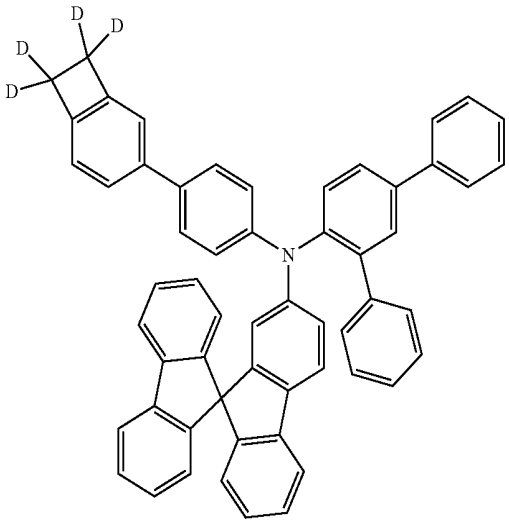

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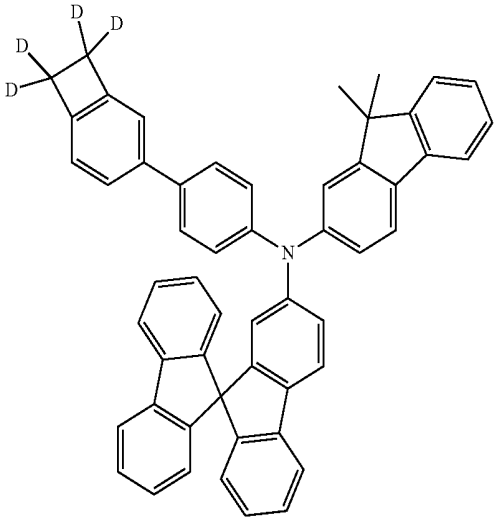

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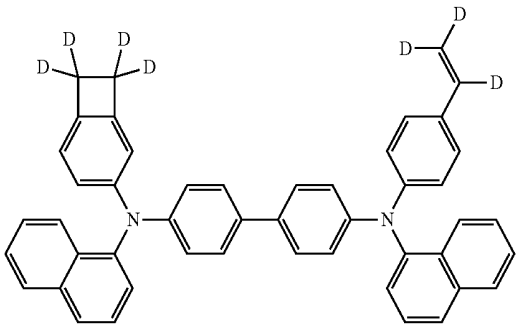

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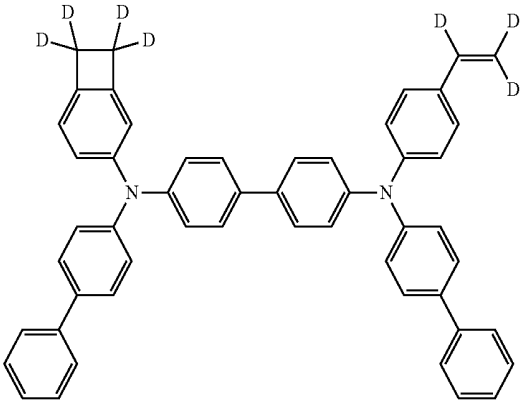

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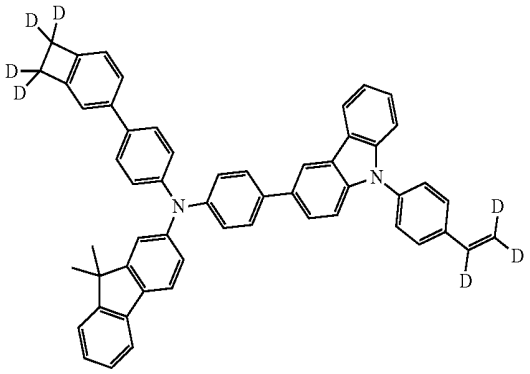

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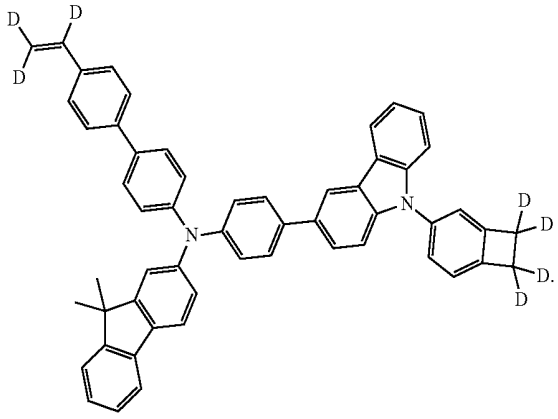
Compound 151



11. An organic electroluminescent device comprises:

an anode;

a cathode; and

a charge transporting layer disposed between the anode and cathode, wherein the charge transporting layer comprises a charge transporting compound comprising a charge transporting unit and a polymerizable group, wherein the polymerizable group is partially or fully deuterated.

12. The device of claim **11**, wherein the charge transporting layer is fabricated by solution process.

13. The device of claim **12**, wherein the charge transporting layer is fabricated by ink-jet printing.

14. A formulation of a charge transporting solution comprises the charge transporting compound of claim **1**.

* * * * *

专利名称(译)	可交联的氘代电荷输送化合物，包含该化合物的有机电致发光器件和溶液配方		
公开(公告)号	US20190109284A1	公开(公告)日	2019-04-11
申请号	US16/153852	申请日	2018-10-08
[标]申请(专利权)人(译)	夏传军		
申请(专利权)人(译)	夏，川军		
当前申请(专利权)人(译)	夏，川军		
[标]发明人	XIA CHUANJUN		
发明人	XIA, CHUANJUN		
IPC分类号	H01L51/00		
CPC分类号	H01L51/006 H01L51/0061 H01L51/0072 H01L51/0073 H01L51/0074 H01L51/0054 H01L51/0058 H01L51/5056 H01L51/5072 H01L51/0005		
优先权	62/570090 2017-10-09 US		
外部链接	Espacenet USPTO		

摘要(译)

公开了包含电荷输送单元和部分或完全氘代的可聚合基团的可交联的氘代电荷输送化合物。通过引入部分或完全氘代的可聚合基团，可以大大改善所得电荷输送材料的性能，从而有效地改善OLED器件的寿命。还公开了有机电致发光器件和包含电荷传输溶液的制剂。