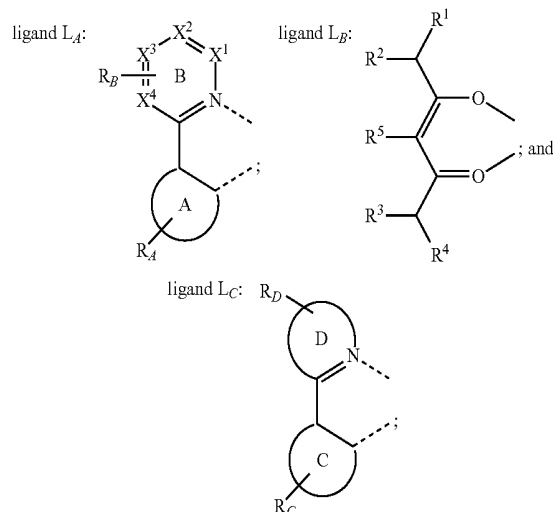




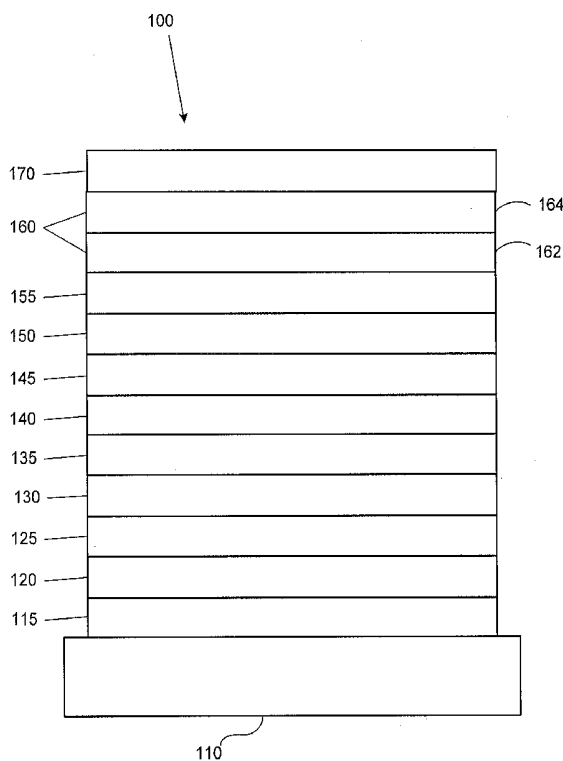
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(19) **United States**(12) **Patent Application Publication**
BOUDREAU et al.(10) **Pub. No.: US 2015/0236277 A1**(43) **Pub. Date: Aug. 20, 2015**(54) **ORGANIC ELECTROLUMINESCENT
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CPC **H01L 51/0085** (2013.01); **H01L 51/5056**
(2013.01)(57) **ABSTRACT**

Compounds having the formula $M(L_A)_x(L_B)_y(L_C)_z$, devices containing the same, and formulations containing the same are described. The compounds include:



where M is a metal having an atomic number greater than 40; x is 1, or 2; y is 1, or 2; and z is 0, 1, or 2; where $x+y+z$ is the oxidation state of the metal M, where X^1 , X^2 , X^3 , and X^4 are C or N; where at least one of R^1 , R^2 , R^3 , and R^4 has at least two C atoms; where R_B represents di, tri, or tetra-substitution, and where two adjacent R_B for a six-member carbocyclic or heterocyclic ring E fused to ring B; where, when ring E is heterocyclic, the only heteroatom is nitrogen; where ring E can be further substituted; and where (a) at least one of X^1 , X^2 , X^3 , and X^4 is N, (b) ring E is heterocyclic, or (c) both.



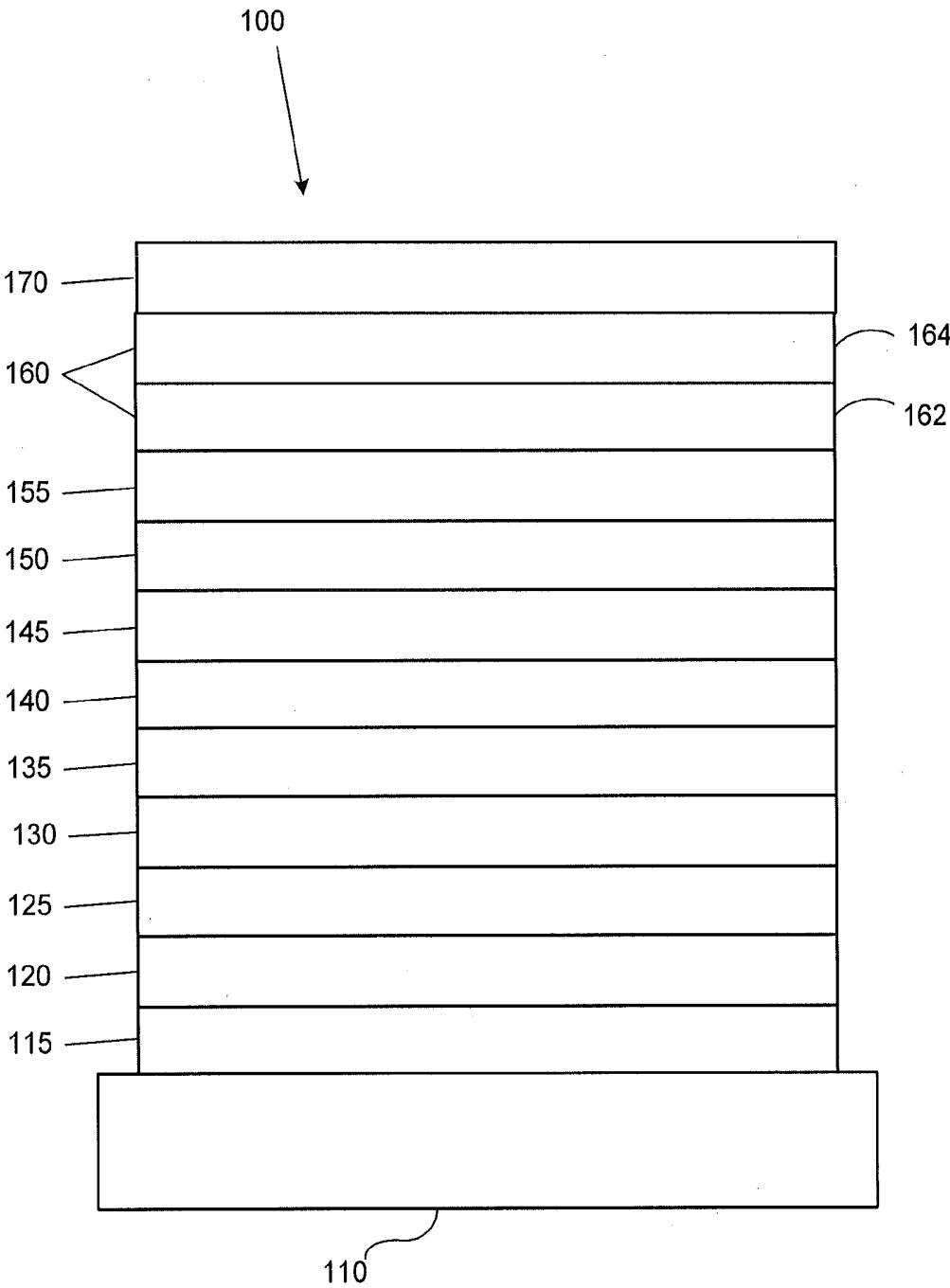


FIGURE 1

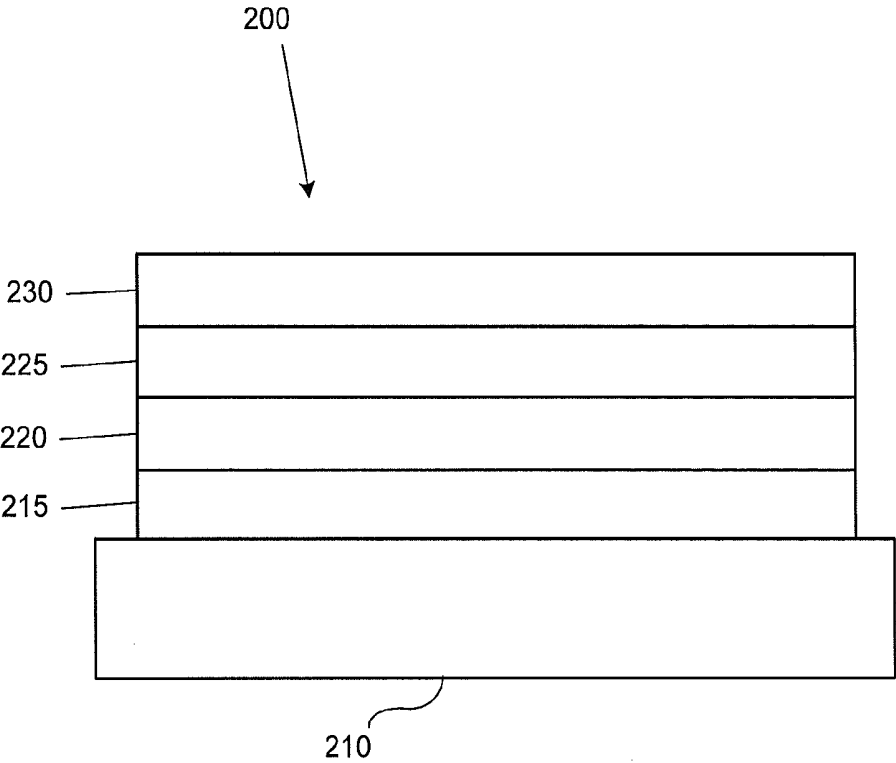
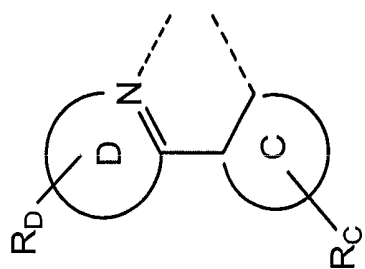
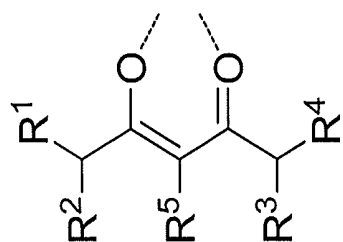


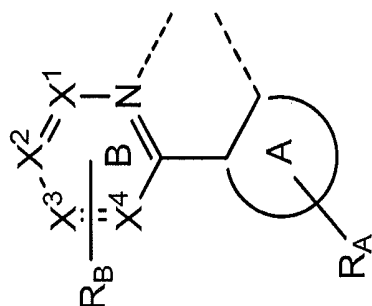
FIGURE 2



Ligand L_C



Ligand L_B



Ligand L_A

FIGURE 3

ORGANIC ELECTROLUMINESCENT MATERIALS AND DEVICES

PARTIES TO A JOINT RESEARCH AGREEMENT

[0001] The claimed invention was made by, on behalf of, and/or in connection with one or more of the following parties to a joint university corporation research agreement: Regents of the University of Michigan, Princeton University, University of Southern California, and the Universal Display Corporation. The agreement was in effect on and before the date the claimed invention was made, and the claimed invention was made as a result of activities undertaken within the scope of the agreement.

FIELD OF THE INVENTION

[0002] The present invention relates to compounds for use as emitters and devices, such as organic light emitting diodes, including the same.

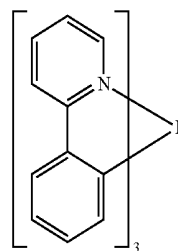
BACKGROUND

[0003] Opto-electronic devices that make use of organic materials are becoming increasingly desirable for a number of reasons. Many of the materials used to make such devices are relatively inexpensive, so organic opto-electronic devices have the potential for cost advantages over inorganic devices. In addition, the inherent properties of organic materials, such as their flexibility, may make them well suited for particular applications such as fabrication on a flexible substrate. Examples of organic opto-electronic devices include organic light emitting devices (OLEDs), organic phototransistors, organic photovoltaic cells, and organic photodetectors. For OLEDs, the organic materials may have performance advantages over conventional materials. For example, the wavelength at which an organic emissive layer emits light may generally be readily tuned with appropriate dopants.

[0004] OLEDs make use of thin organic films that emit light when voltage is applied across the device. OLEDs are becoming an increasingly interesting technology for use in applications such as flat panel displays, illumination, and backlighting. Several OLED materials and configurations are described in U.S. Pat. Nos. 5,844,363, 6,303,238, and 5,707,745, which are incorporated herein by reference in their entirety.

[0005] One application for phosphorescent emissive molecules is a full color display. Industry standards for such a display call for pixels adapted to emit particular colors, referred to as "saturated" colors. In particular, these standards call for saturated red, green, and blue pixels. Color may be measured using CIE coordinates, which are well known to the art.

[0006] One example of a green emissive molecule is tris(2-phenylpyridine)iridium, denoted Ir(ppy)₃, which has the following structure:



[0007] In this, and later figures herein, we depict the dative bond from nitrogen to metal (here, Ir) as a straight line.

[0008] As used herein, the term "organic" includes polymeric materials as well as small molecule organic materials that may be used to fabricate organic opto-electronic devices. "Small molecule" refers to any organic material that is not a polymer, and "small molecules" may actually be quite large. Small molecules may include repeat units in some circumstances. For example, using a long chain alkyl group as a substituent does not remove a molecule from the "small molecule" class. Small molecules may also be incorporated into polymers, for example as a pendent group on a polymer backbone or as a part of the backbone. Small molecules may also serve as the core moiety of a dendrimer, which consists of a series of chemical shells built on the core moiety. The core moiety of a dendrimer may be a fluorescent or phosphorescent small molecule emitter. A dendrimer may be a "small molecule," and it is believed that all dendrimers currently used in the field of OLEDs are small molecules.

[0009] 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.

[0010] 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.

[0011] 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.

[0012] As used herein, and as would be generally understood by one skilled in the art, a first "Highest Occupied Molecular Orbital" (HOMO) or "Lowest Unoccupied Molecular Orbital" (LUMO) energy level is "greater than" or "higher than" a second HOMO or LUMO energy level if the first energy level is closer to the vacuum energy level. Since ionization potentials (IP) are measured as a negative energy relative to a vacuum level, a higher HOMO energy level corresponds to an IP having a smaller absolute value (an IP that is less negative). Similarly, a higher LUMO energy level corresponds to an electron affinity (EA) having a smaller absolute value (an EA that is less negative). On a conventional energy level diagram, with the vacuum level at the top, the LUMO energy level of a material is higher than the HOMO

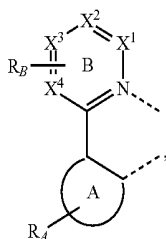
energy level of the same material. A “higher” HOMO or LUMO energy level appears closer to the top of such a diagram than a “lower” HOMO or LUMO energy level.

[0013] As used herein, and as would be generally understood by one skilled in the art, a first work function is “greater than” or “higher than” a second work function if the first work function has a higher absolute value. Because work functions are generally measured as negative numbers relative to vacuum level, this means that a “higher” work function is more negative. On a conventional energy level diagram, with the vacuum level at the top, a “higher” work function is illustrated as further away from the vacuum level in the downward direction. Thus, the definitions of HOMO and LUMO energy levels follow a different convention than work functions.

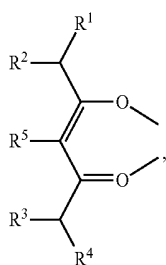
[0014] More details on OLEDs, and the definitions described above, can be found in U.S. Pat. No. 7,279,704, which is incorporated herein by reference in its entirety.

SUMMARY OF THE INVENTION

[0015] According to one embodiment, a compound having a formula $M(L_A)_x(L_B)_y(L_C)_z$ is disclosed. In the formula, the ligand L_A is

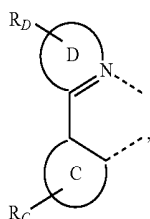


the ligand L_B is



and

the ligand L_C is



where:

- [0016] M is a metal having an atomic number greater than 40;
- [0017] x is 1, or 2;
- [0018] y is 1, or 2;
- [0019] z is 0, 1, or 2;
- [0020] x+y+z is the oxidation state of the metal M;
- [0021] X^1 , X^2 , X^3 , and X^4 are C or N;
- [0022] R^1 , R^2 , R^3 , and R^4 are independently selected from group consisting of alkyl, cycloalkyl, aryl, and heteroaryl;
- [0023] at least one of R^1 , R^2 , R^3 , and R^4 has at least two C atoms;
- [0024] R^5 is selected from group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof;
- [0025] rings A, C, and D are each independently a 5 or 6-membered carbocyclic or heterocyclic ring;
- [0026] R_A , R_C , and R_D each independently represent mono, di, tri, or tetra-substitution, or no substitution;
- [0027] R_B represents di, tri, or tetra-substitution;
- [0028] two adjacent R_B form a six-member carbocyclic or heterocyclic ring E fused to ring B; wherein, when ring E is heterocyclic, the only heteroatom is nitrogen; and wherein ring E can be further substituted;
- [0029] each of R_A , R_B , R_C , and R_D are independently selected from the group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof;
- [0030] any adjacent substituents of R_A , R_B , R_C , and R_D are optionally joined to form a fused ring; and where (a) at least one of X^1 , X^2 , X^3 , and X^4 is N, (b) ring E is heterocyclic, or (c) both.

[0031] According to another aspect of the disclosure, a first device is also provided. The first device includes a first organic light emitting device, that includes an anode, a cathode, and an organic layer disposed between the anode and the cathode. The organic layer can include a compound according to the formula $M(L_A)_x(L_B)_y(L_C)_z$, and the variations thereof as described herein.

[0032] In yet another aspect of the present disclosure, a formulation that comprises a compound according to the formula $M(L_A)_x(L_B)_y(L_C)_z$, and the variations thereof as described herein. The formulation can include one or more components selected from the group consisting of a solvent, a host, a hole injection material, hole transport material, and an electron transport layer material, disclosed herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] FIG. 1 shows an organic light emitting device.

[0034] FIG. 2 shows an inverted organic light emitting device that does not have a separate electron transport layer.

[0035] FIG. 3 shows Ligands L_A , L_B and L_C of the compounds described herein.

DETAILED DESCRIPTION

[0036] Generally, an OLED comprises at least one organic layer disposed between and electrically connected to an

anode and a cathode. When a current is applied, the anode injects holes and the cathode injects electrons into the organic layer(s). The injected holes and electrons each migrate toward the oppositely charged electrode. When an electron and hole localize on the same molecule, an "exciton," which is a localized electron-hole pair having an excited energy state, is formed. Light is emitted when the exciton relaxes via a photoemissive mechanism. In some cases, the exciton may be localized on an excimer or an exciplex. Non-radiative mechanisms, such as thermal relaxation, may also occur, but are generally considered undesirable.

[0037] The initial OLEDs used emissive molecules that emitted light from their singlet states ("fluorescence") as disclosed, for example, in U.S. Pat. No. 4,769,292, which is incorporated by reference in its entirety. Fluorescent emission generally occurs in a time frame of less than 10 nanoseconds.

[0038] More recently, OLEDs having emissive materials that emit light from triplet states ("phosphorescence") have been demonstrated. Baldo et al., "Highly Efficient Phosphorescent Emission from Organic Electroluminescent Devices," *Nature*, vol. 395, 151-154, 1998; ("Baldo-I") and Baldo et al., "Very high-efficiency green organic light-emitting devices based on electrophosphorescence," *Appl. Phys. Lett.*, vol. 75, No. 3, 4-6 (1999) ("Baldo-II"), which are incorporated by reference in their entireties. Phosphorescence is described in more detail in U.S. Pat. No. 7,279,704 at cols. 5-6, which are incorporated by reference.

[0039] FIG. 1 shows an organic light emitting device 100. The figures are not necessarily drawn to scale. Device 100 may include a substrate 110, an anode 115, a hole injection layer 120, a hole transport layer 125, an electron blocking layer 130, an emissive layer 135, a hole blocking layer 140, an electron transport layer 145, an electron injection layer 150, a protective layer 155, a cathode 160, and a barrier layer 170. Cathode 160 is a compound cathode having a first conductive layer 162 and a second conductive layer 164. 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.

[0040] 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 emissive and 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.

[0041] FIG. 2 shows an inverted OLED 200. The device includes a substrate 210, a cathode 215, an emissive layer 220, a hole transport layer 225, and an anode 230. Device 200 may be fabricated by depositing the layers described, in order. Because the most common OLED configuration has a cathode disposed over the anode, and device 200 has cathode 215 disposed under anode 230, device 200 may be referred to as an "inverted" OLED. Materials similar to those described with respect to device 100 may be used in the corresponding layers of device 200. FIG. 2 provides one example of how some layers may be omitted from the structure of device 100.

[0042] The simple layered structure illustrated in FIGS. 1 and 2 is provided by way of non-limiting example, and it is understood that embodiments of the invention may be used in connection with a wide variety of other structures. The specific materials and structures described are exemplary in nature, and other materials and structures may be used. Functional OLEDs may be achieved by combining the various layers described in different ways, or layers may be omitted entirely, based on design, performance, and cost factors. Other layers not specifically described may also be included. Materials other than those specifically described may be used. Although many of the examples provided herein describe various layers as comprising a single material, it is understood that combinations of materials, such as a mixture of host and dopant, or more generally a mixture, may be used. Also, the layers may have various sublayers. The names given to the various layers herein are not intended to be strictly limiting.

[0043] For example, in device 200, hole transport layer 225 transports holes and injects holes into emissive layer 220, and may be described as a hole transport layer or a hole injection layer. 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 may further comprise multiple layers of different organic materials as described, for example, with respect to FIGS. 1 and 2.

[0044] Structures and materials not specifically described may also be used, such as OLEDs comprised of polymeric materials (PLEDs) such as disclosed in U.S. Pat. No. 5,247,190 to Friend et al., which is incorporated by reference in its entirety. By way of further example, OLEDs having a single organic layer may be used. OLEDs may be stacked, for example as described in U.S. Pat. No. 5,707,745 to Forrest et al., which is incorporated by reference in its entirety. The OLED structure may deviate from the simple layered structure illustrated in FIGS. 1 and 2. For example, the substrate may include an angled reflective surface to improve out-coupling, such as a mesa structure as described in U.S. Pat. No. 6,091,195 to Forrest et al., and/or a pit structure as described in U.S. Pat. No. 5,834,893 to Bulovic et al., which are incorporated by reference in their entireties.

[0045] Unless otherwise specified, any of the layers of the various embodiments may be deposited by any suitable method. For the organic layers, preferred methods include thermal evaporation, ink-jet, such as described in U.S. Pat. Nos. 6,013,982 and 6,087,196, which are incorporated by reference in their entireties, organic vapor phase deposition (OVPD), such as described in U.S. Pat. No. 6,337,102 to

Forrest et al., which is incorporated by reference in its entirety, and deposition by organic vapor jet printing (OVJP), such as described in U.S. Pat. No. 7,431,968, which is incorporated by reference in its entirety. Other suitable deposition methods include spin coating and other solution based processes. Solution based processes are preferably carried out in nitrogen or an inert atmosphere. For the other layers, preferred methods include thermal evaporation. Preferred patterning methods include deposition through a mask, cold welding such as described in U.S. Pat. Nos. 6,294,398 and 6,468,819, which are incorporated by reference in their entireties, and patterning associated with some of the deposition methods such as ink-jet and OVJD. Other methods may also be used. The materials to be deposited may be modified to make them compatible with a particular deposition method. For example, substituents such as alkyl and aryl groups, branched or unbranched, and preferably containing at least 3 carbons, may be used in small molecules to enhance their ability to undergo solution processing. Substituents having 20 carbons or more may be used, and 3-20 carbons is a preferred range. Materials with asymmetric structures may have better solution processability than those having symmetric structures, because asymmetric materials may have a lower tendency to recrystallize. Dendrimer substituents may be used to enhance the ability of small molecules to undergo solution processing.

[0046] Devices fabricated in accordance with embodiments of the present invention may further optionally comprise a barrier layer. One purpose of the barrier layer is to protect the electrodes and organic layers from damaging exposure to harmful species in the environment including moisture, vapor and/or gases, etc. The barrier layer may be deposited over, under or next to a substrate, an electrode, or over any other parts of a device including an edge. The barrier layer may comprise a single layer, or multiple layers. The barrier layer may be formed by various known chemical vapor deposition techniques and may include compositions having a single phase as well as compositions having multiple phases. Any suitable material or combination of materials may be used for the barrier layer. The barrier layer may incorporate an inorganic or an organic compound or both. The preferred barrier layer comprises a mixture of a polymeric material and a non-polymeric material as described in U.S. Pat. No. 7,968,146, PCT Pat. Application Nos. PCT/US2007/023098 and PCT/US2009/042829, which are herein incorporated by reference in their entireties. To be considered a "mixture", the aforesaid polymeric and non-polymeric materials comprising the barrier layer should be deposited under the same reaction conditions and/or at the same time. The weight ratio of polymeric to non-polymeric material may be in the range of 95:5 to 5:95. The polymeric material and the non-polymeric material may be created from the same precursor material. In one example, the mixture of a polymeric material and a non-polymeric material consists essentially of polymeric silicon and inorganic silicon.

[0047] Devices fabricated in accordance with embodiments of the invention may be incorporated into a wide variety of consumer products, including flat panel displays, computer monitors, medical monitors, televisions, billboards, lights for interior or exterior illumination and/or signaling, heads up displays, fully transparent displays, flexible displays, laser printers, telephones, cell phones, personal digital assistants (PDAs), laptop computers, digital cameras, camcorders, viewfinders, micro-displays, 3-D displays, vehicles,

a large area wall, theater or stadium screen, or a sign. Various control mechanisms may be used to control devices fabricated in accordance with the present invention, including passive matrix and active matrix. Many of the devices are intended for use in a temperature range comfortable to humans, such as 18 degrees C. to 30 degrees C., and more preferably at room temperature (20-25 degrees C.), but could be used outside this temperature range, for example, from -40 degree C. to +80 degree C.

[0048] The materials and structures described herein may have applications in devices other than OLEDs. For example, other optoelectronic devices such as organic solar cells and organic photodetectors may employ the materials and structures. More generally, organic devices, such as organic transistors, may employ the materials and structures.

[0049] The term "halo" or "halogen" as used herein includes fluorine, chlorine, bromine, and iodine.

[0050] The term "alkyl" as used herein contemplates both straight and branched chain alkyl radicals. Preferred alkyl groups are those containing from one to fifteen carbon atoms and includes methyl, ethyl, propyl, isopropyl, butyl, isobutyl, tert-butyl, and the like. Additionally, the alkyl group may be optionally substituted.

[0051] The term "cycloalkyl" as used herein contemplates cyclic alkyl radicals. Preferred cycloalkyl groups are those containing 3 to 7 carbon atoms and includes cyclopropyl, cyclopentyl, cyclohexyl, and the like. Additionally, the cycloalkyl group may be optionally substituted.

[0052] The term "alkenyl" as used herein contemplates both straight and branched chain alkene radicals. Preferred alkenyl groups are those containing two to fifteen carbon atoms. Additionally, the alkenyl group may be optionally substituted.

[0053] The term "alkynyl" as used herein contemplates both straight and branched chain alkyne radicals. Preferred alkyl groups are those containing two to fifteen carbon atoms. Additionally, the alkynyl group may be optionally substituted.

[0054] The terms "aralkyl" or "arylalkyl" as used herein are used interchangeably and contemplate an alkyl group that has as a substituent an aromatic group. Additionally, the aralkyl group may be optionally substituted.

[0055] The term "heterocyclic group" as used herein contemplates non-aromatic cyclic radicals. Preferred heterocyclic groups are those containing 3 or 7 ring atoms which includes at least one hetero atom, and includes cyclic amines such as morpholino, piperidino, pyrrolidino, and the like, and cyclic ethers, such as tetrahydrofuran, tetrahydropyran, and the like. Additionally, the heterocyclic group may be optionally substituted.

[0056] The term "aryl" or "aromatic group" as used herein contemplates single-ring groups and polycyclic ring systems. The polycyclic rings may have two or more rings in which two carbons are common to two adjoining rings (the rings are "fused") wherein at least one of the rings is aromatic, e.g., the other rings can be cycloalkyls, cycloalkenyls, aryl, heterocycles, and/or heteroaryls. Additionally, the aryl group may be optionally substituted.

[0057] The term "heteroaryl" as used herein contemplates single-ring hetero-aromatic groups that may include from one to three heteroatoms, for example, pyrrole, furan, thiophene, imidazole, oxazole, thiazole, triazole, pyrazole, pyridine, pyrazine and pyrimidine, and the like. The term heteroaryl also includes polycyclic hetero-aromatic systems having two

or more rings in which two atoms are common to two adjoining rings (the rings are “fused”) wherein at least one of the rings is a heteroaryl, e.g., the other rings can be cycloalkyls, cycloalkenyls, aryl, heterocycles, and/or heteroaryls. Additionally, the heteroaryl group may be optionally substituted.

[0058] The alkyl, cycloalkyl, alkenyl, alkynyl, aralkyl, heterocyclic group, aryl, and heteroaryl may be optionally substituted with one or more substituents selected from the group consisting of hydrogen, deuterium, halogen, alkyl, cycloalkyl, heteroalkyl, 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.

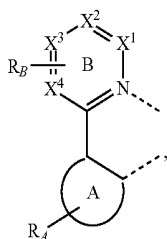
[0059] As used herein, “substituted” indicates that a substituent other than H is bonded to the relevant position, such as carbon. Thus, for example, where R^1 is mono-substituted, then one R^1 must be other than H. Similarly, where R^1 is di-substituted, then two of R^1 must be other than H. Similarly, where R^1 is unsubstituted, R^1 is hydrogen for all available positions.

[0060] The “aza” designation in the fragments described herein, i.e. aza-dibenzofuran, aza-dibenzonethiophene, etc. means that one or more of the C—H groups in the respective fragment can be replaced by a nitrogen atom, for example, and without any limitation, azatriphenylene encompasses both dibenzo[f,h]quinoxaline and dibenzo[f,h]quinoline. 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.

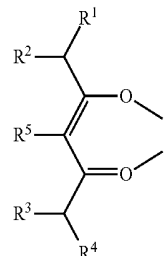
[0061] It is to be understood that when a molecular fragment is described as being a substituent or otherwise attached to another moiety, its name may be written as if it were a fragment (e.g. naphthyl, dibenzofuryl) or as if it were the whole molecule (e.g. naphthalene, dibenzofuran). As used herein, these different ways of designating a substituent or attached fragment are considered to be equivalent.

[0062] The claimed compounds are organometallic complexes that include both quinazoline-based ligands and ligands formed from branched acetylacetone (acac) derivatives. The combination of these ligands allows red phosphorescent materials with good external quantum efficiency (EQE), color, and lifetime.

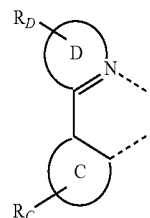
[0063] According to one embodiment, a compound having the formula $M(L_A)_x(L_B)_y(L_C)_z$ is disclosed. In the formula $M(L_A)_x(L_B)_y(L_C)_z$, ligand L_A is



ligand L_B is



and ligand L_C is



where:

- [0064]** M is a metal having an atomic number greater than 40;
- [0065]** x is 1, or 2;
- [0066]** y is 1, or 2;
- [0067]** z is 0, 1, or 2;
- [0068]** $x+y+z$ is the oxidation state of the metal M;
- [0069]** X^1 , X^2 , X^3 , and X^4 are C or N;
- [0070]** R^1 , R^2 , R^3 , and R^4 are independently selected from group consisting of alkyl, cycloalkyl, aryl, and heteroaryl;
- [0071]** at least one of R^1 , R^2 , R^3 , and R^4 has at least two C atoms;
- [0072]** R^5 is selected from group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof;
- [0073]** rings A, C, and D are each independently a 5 or 6-membered carbocyclic or heterocyclic ring;
- [0074]** R_A , R_C , and R_D each independently represent mono, di, tri, or tetra-substitution, or no substitution;
- [0075]** R_B represents di, tri, or tetra-substitution;
- [0076]** two adjacent R_B form a six-member carbocyclic or heterocyclic ring E fused to ring B; wherein, when ring E is heterocyclic, the only heteroatom is nitrogen; and wherein ring E can be further substituted;
- [0077]** each of R_A , R_B , R_C , and R_D are independently selected from the group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof;
- [0078]** any adjacent substituents of R_A , R_B , R_C , and R_D are optionally joined to form a fused ring; and where (a) at least one of X^1 , X^2 , X^3 , and X^4 is N, (b) ring E is heterocyclic, or (c) both.

[0079] In some embodiments, at least one of R^1 , R^2 , R^3 , and R^4 has at least three C atoms, while in other embodiments at least one of R^1 , R^2 , R^3 , and R^4 has at least four C atoms. In some embodiments, at least one of R^1 , R^2 , R^3 , and R^4 is a branched alkyl.

[0080] In some embodiments, the M can be selected from the group consisting of Ir, Rh, Re, Ru, Os, Pt, Au, and Cu.

[0081] In some embodiments, ring A is benzene. In some embodiments, ring C is benzene, and ring D is pyridine.

[0082] In some embodiments, R^5 is selected from group consisting of hydrogen, deuterium, alkyl, cycloalkyl, and combinations thereof. In some embodiments, R^5 is hydrogen.

[0083] In some embodiments, R^1 , R^2 , R^3 , and R^4 are alkyl or cycloalkyl. In some more specific embodiments, R^1 , R^2 , R^3 , and R^4 are independently selected from the group consisting of methyl, ethyl, propyl, 1-methylethyl, butyl, 1-methylpropyl, 2-methylpropyl, pentyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl, 1,1-dimethylpropyl, 1,2-dimethylpropyl, 2,2-dimethylpropyl, cyclobutyl, cyclopentyl, cyclohexyl, partially or fully deuterated variants thereof, and combinations thereof.

[0084] In some embodiments, the compound is selected from the group consisting of:

[0085] wherein X^5 , X^6 , X^7 , and X^8 are C or N;

[0086] wherein R^7 , and R^8 each independently represent mono, di, tri, or tetra-substitution, or no substitution;

[0087] wherein R^6 , R^7 , and R^8 are independently selected from group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof; and

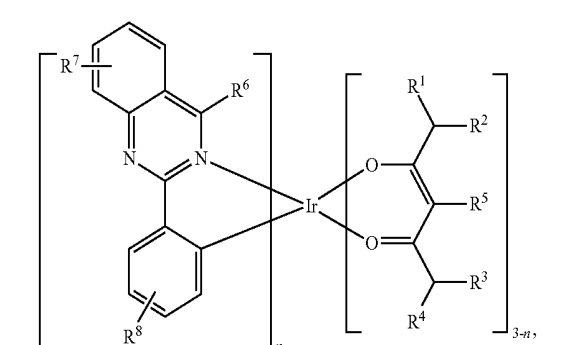
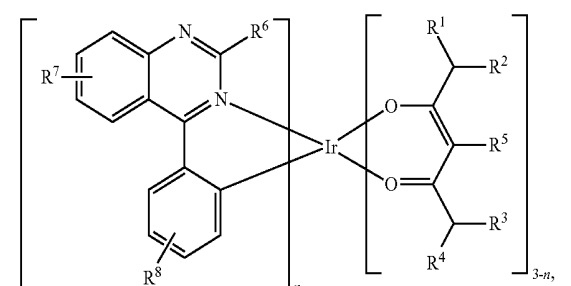
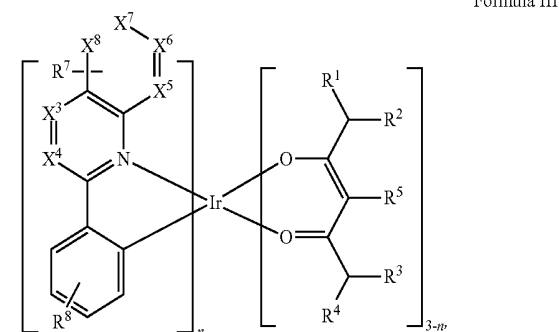
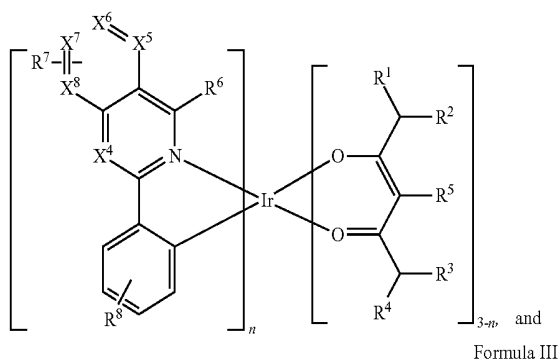
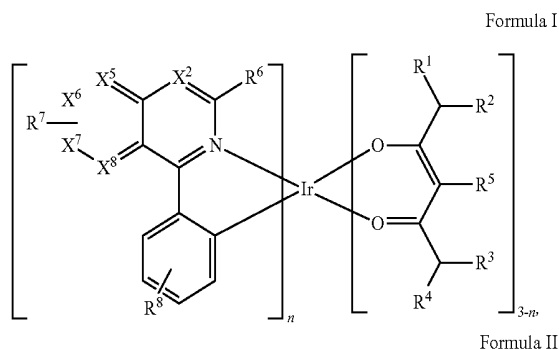
[0088] wherein n is 1 or 2.

[0089] In some embodiments, n is 2. In some embodiments, at least one of X^5 , X^6 , X^7 , and X^8 is N. In other embodiments, at least two of X^5 , X^6 , X^7 , and X^8 are N.

[0090] In some embodiments, R^6 and R^7 are independently selected from group consisting of hydrogen, deuterium, alkyl, cycloalkyl, and combinations thereof. In some embodiments, R^6 is branched alkyl or cycloalkyl. In some embodiments, R^7 is at least monosubstituted and is branched alkyl or cycloalkyl.

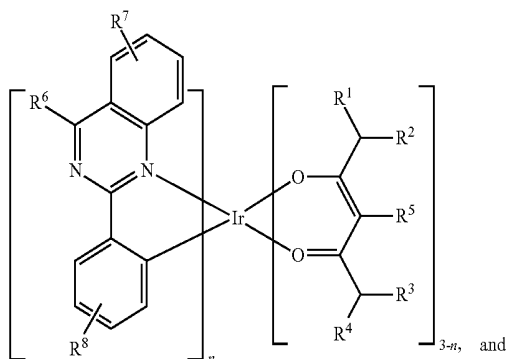
[0091] In some embodiments, R^8 is selected from group consisting of hydrogen, deuterium, alkyl, cycloalkyl, halide, and combinations thereof. In some embodiments, R^8 comprises at least one halide, at least one alkyl, or both. In some embodiments, R^8 comprises at least one halide and at least two alkyls.

[0092] In some embodiments, the compound is selected from the group consisting of:

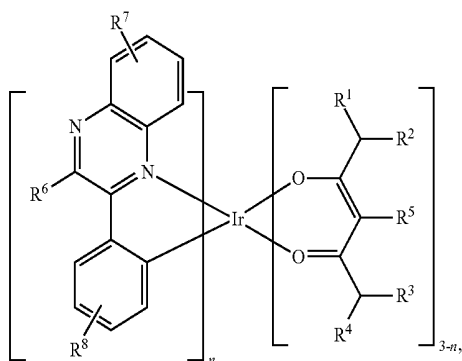


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Formula VI



Formula VII

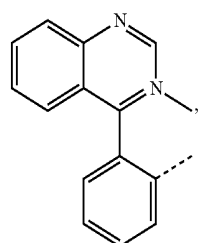


[0093] wherein R^7 , and R^8 each independently represent mono, di, tri, or tetra-substitution, or no substitution;

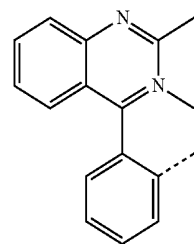
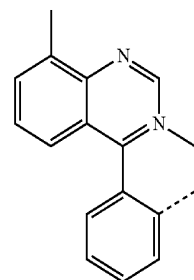
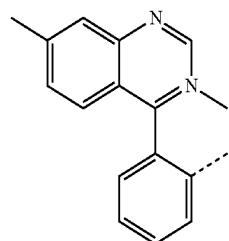
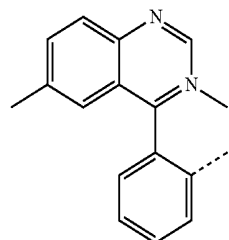
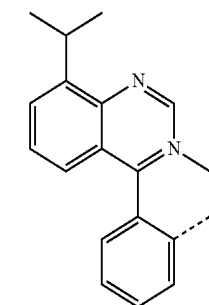
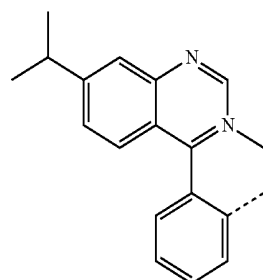
[0094] wherein R^6 , R^7 , and R^8 are independently selected from group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof; and

[0095] wherein n is 1 or 2.

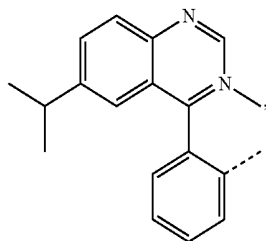
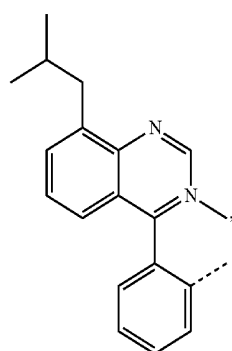
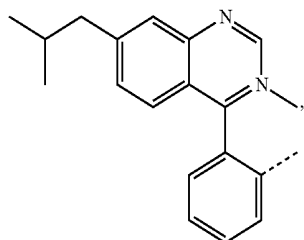
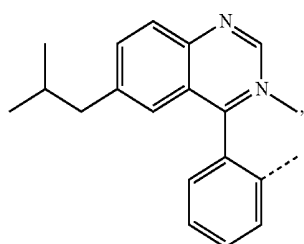
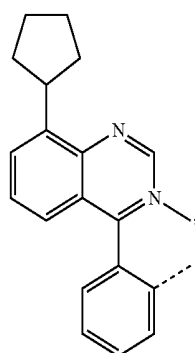
[0096] In some embodiments, L_A is selected from the group consisting of L_{A1} to L_{A270} listed below:

 L_{A1}

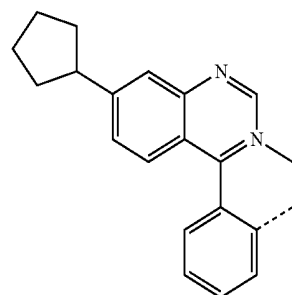
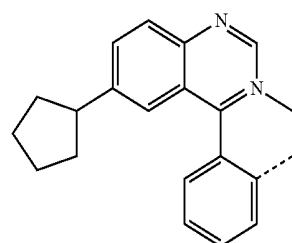
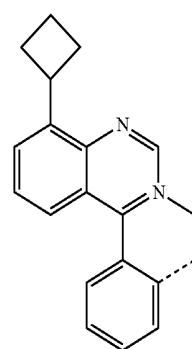
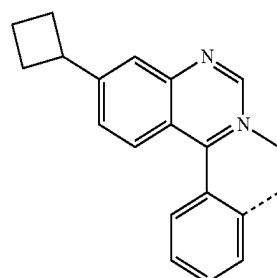
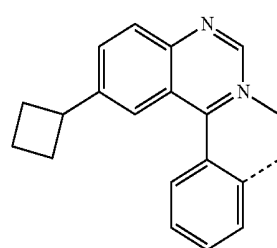
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 L_{A2}  L_{A3}  L_{A4}  L_{A5}  L_{A6}  L_{A7} 

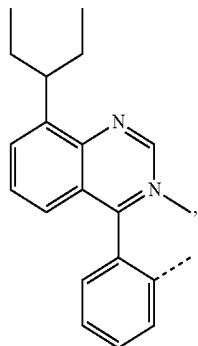
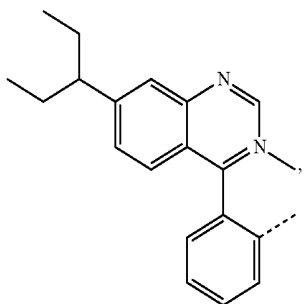
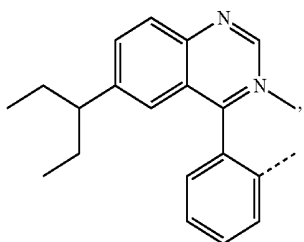
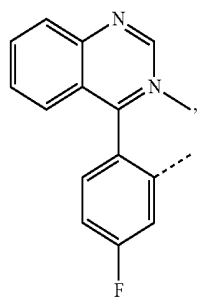
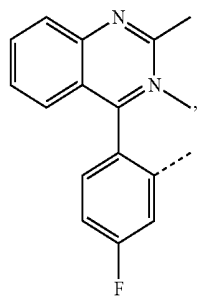
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L₄₈L₄₉L₄₁₀L₄₁₁L₄₁₂

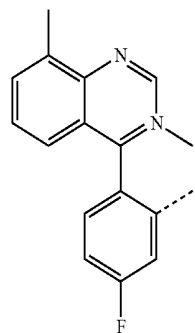
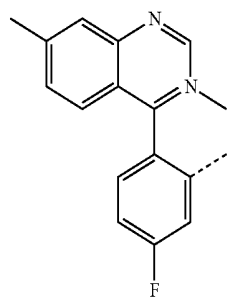
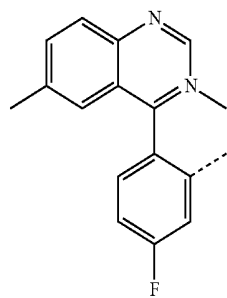
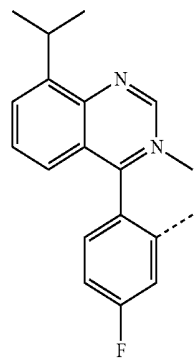
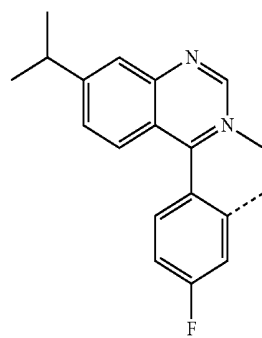
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L₄₁₃L₄₁₄L₄₁₅L₄₁₆L₄₁₇

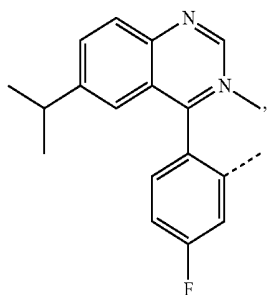
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L₄₁₈L₄₁₉L₄₂₀L₄₂₁L₄₂₂

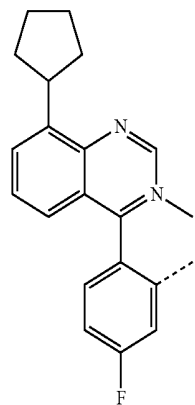
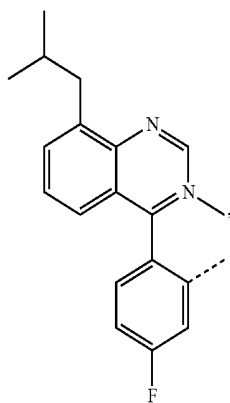
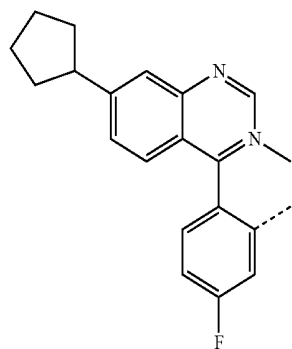
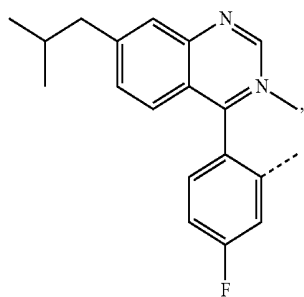
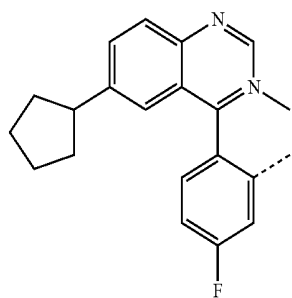
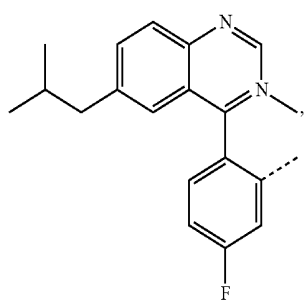
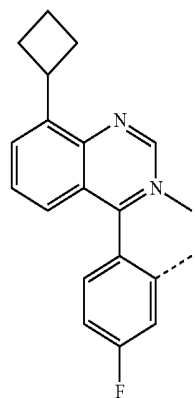
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L₄₂₃L₄₂₄L₄₂₅L₄₂₆L₄₂₇

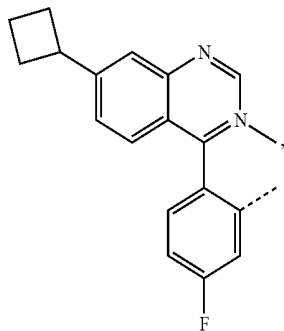
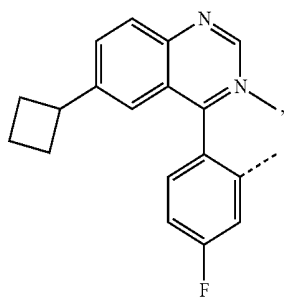
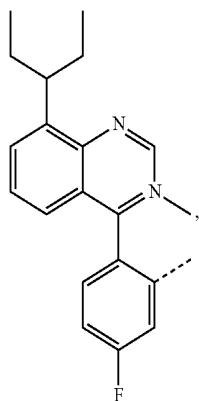
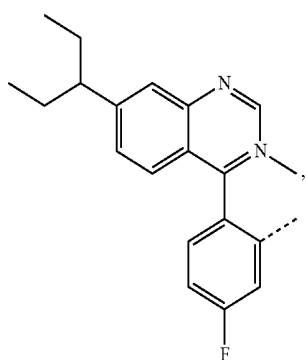
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L₄₂₈

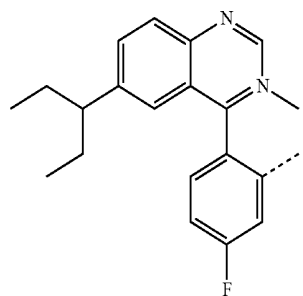
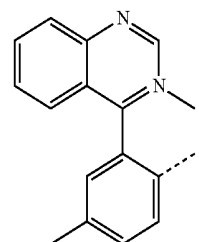
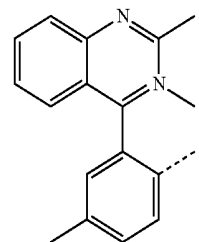
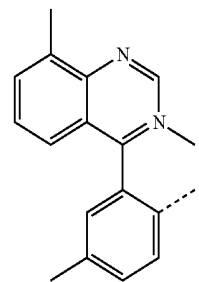
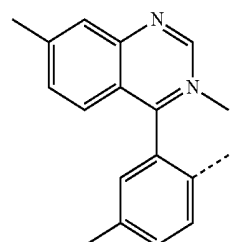
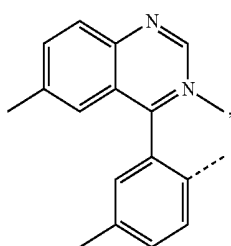
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L₄₃₂L₄₂₉L₄₃₃L₄₃₀L₄₃₄L₄₃₁L₄₃₅

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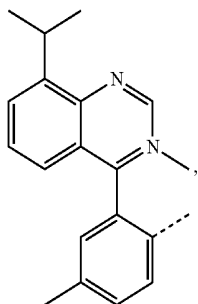
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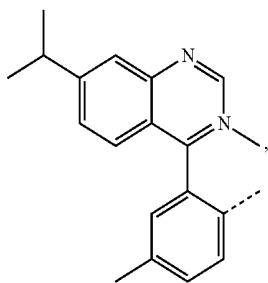
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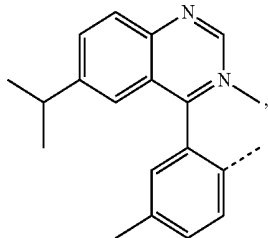
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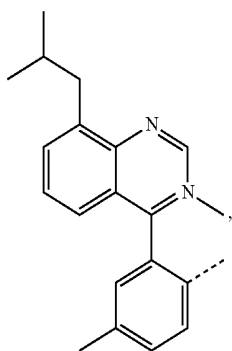
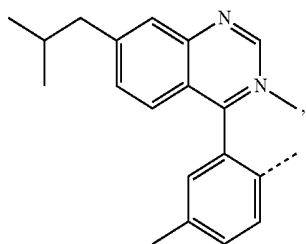
LA47



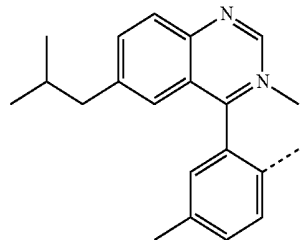
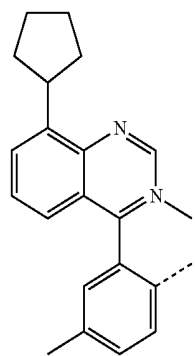
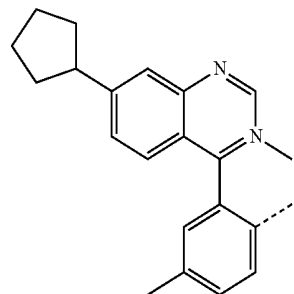
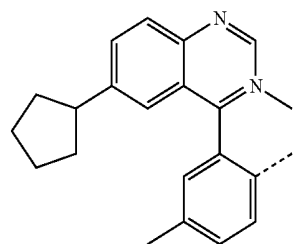
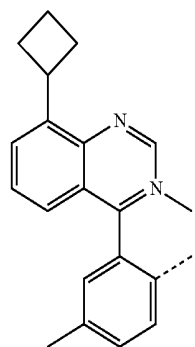
LA48



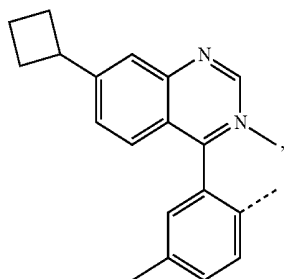
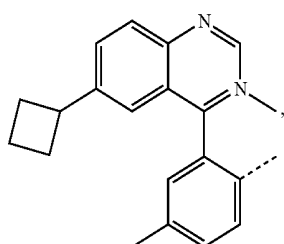
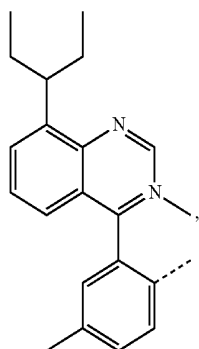
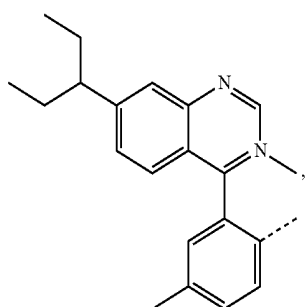
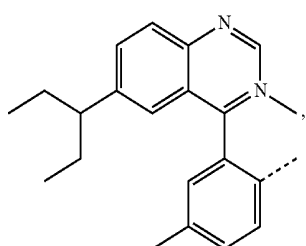
LA49

L₄₅₀

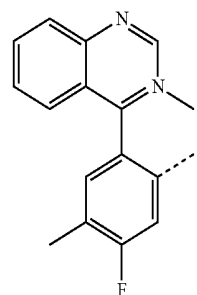
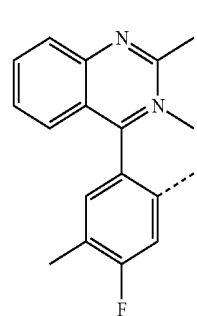
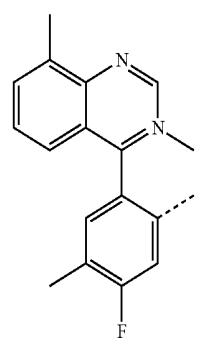
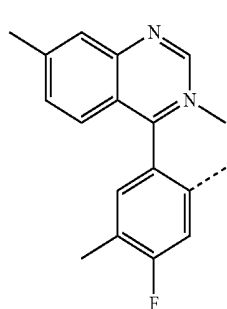
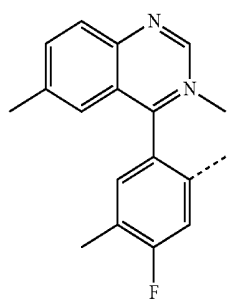
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L₄₅₁L₄₅₂L₄₅₃L₄₅₄L₄₅₅

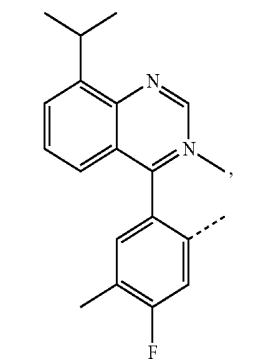
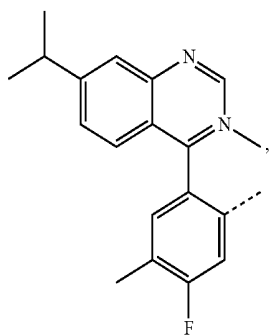
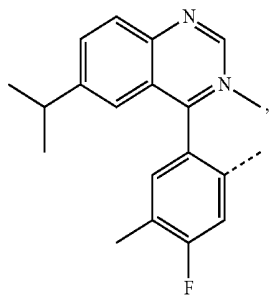
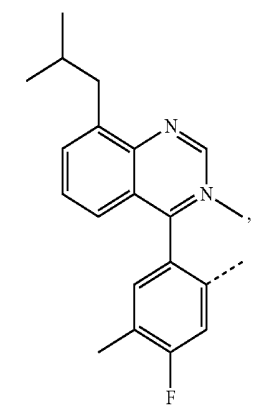
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L₄₅₆L₄₅₇L₄₅₈L₄₅₉L₄₆₀

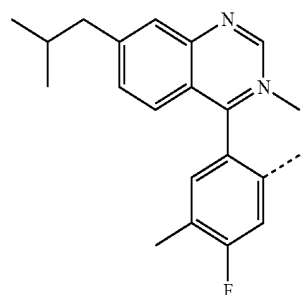
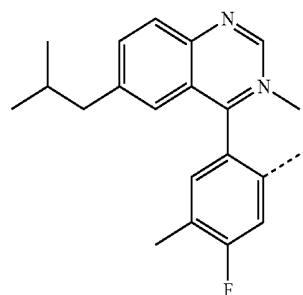
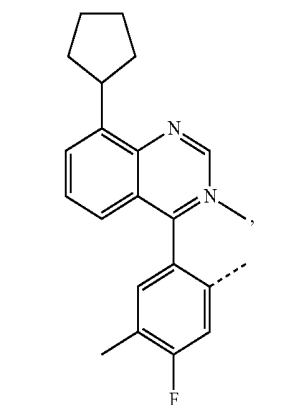
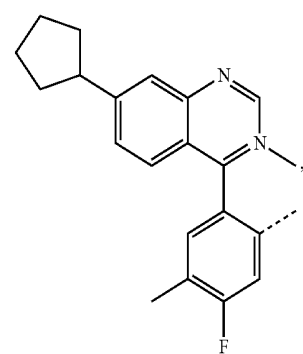
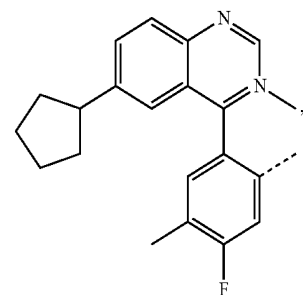
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L₄₆₁L₄₆₂L₄₆₃L₄₆₄L₄₆₅

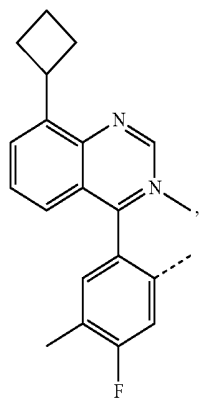
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L₄₆₆L₄₆₇L₄₆₈L₄₆₉

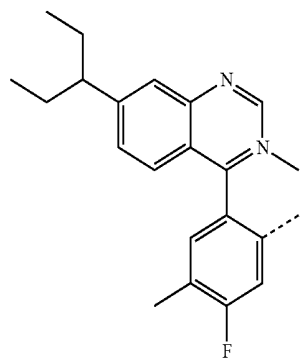
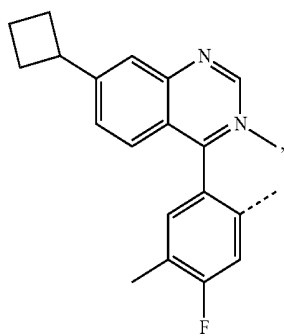
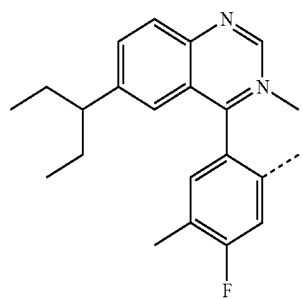
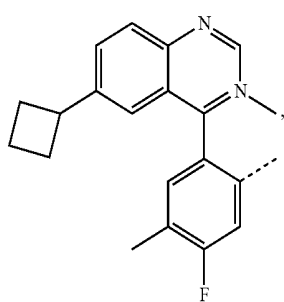
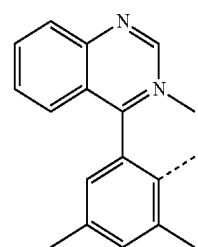
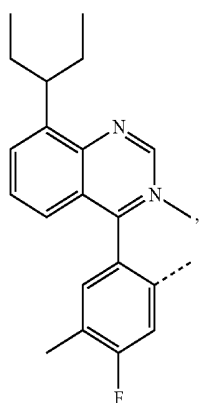
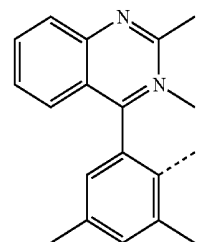
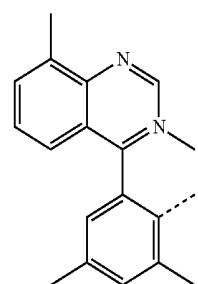
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L₄₇₀L₄₇₁L₄₇₂L₄₇₃L₄₇₄

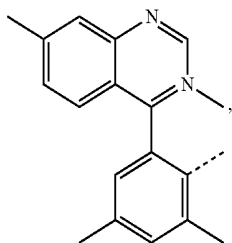
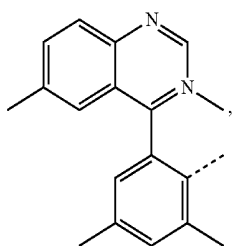
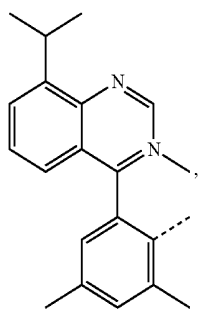
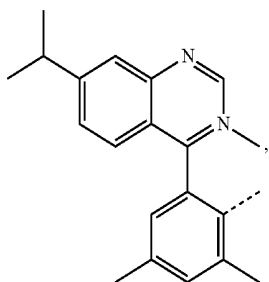
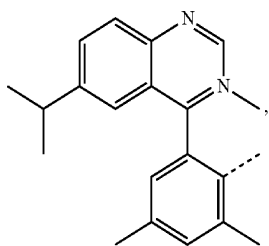
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L₄₇₅

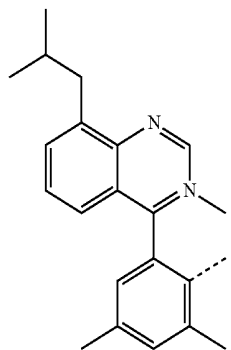
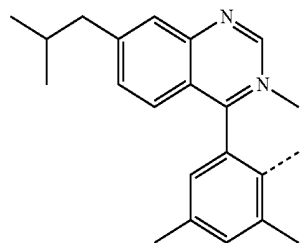
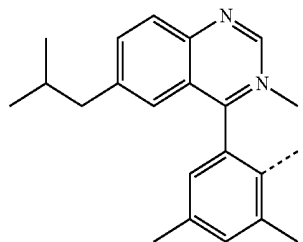
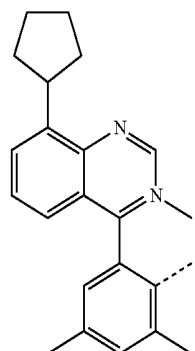
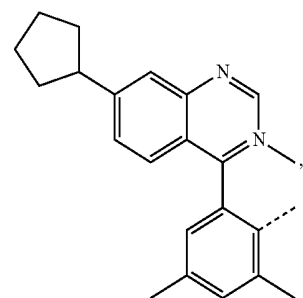
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L₄₇₉L₄₇₆L₄₈₀L₄₇₇L₄₈₁L₄₇₈L₄₈₂L₄₈₃

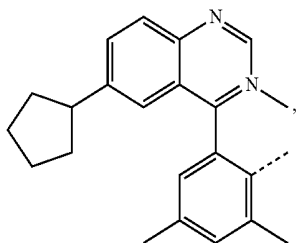
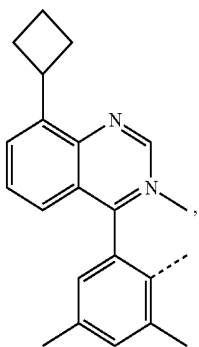
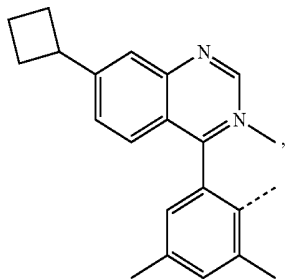
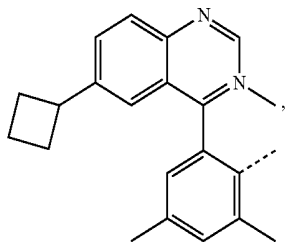
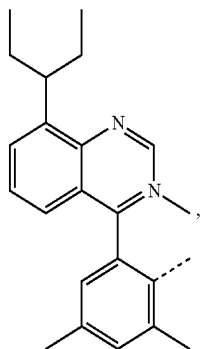
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L₄₈₄L₄₈₅L₄₈₆L₄₈₇L₄₈₈

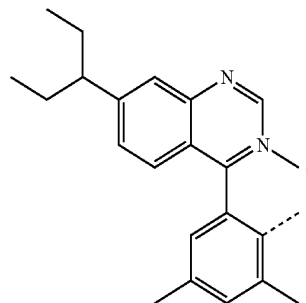
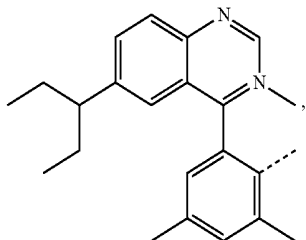
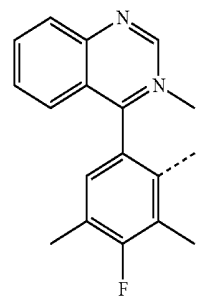
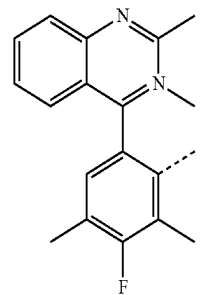
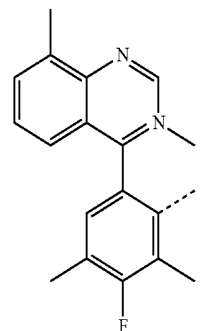
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L₄₈₉L₄₉₀L₄₉₁L₄₉₂L₄₉₃

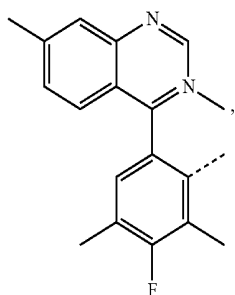
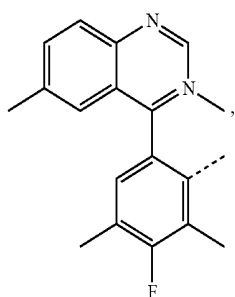
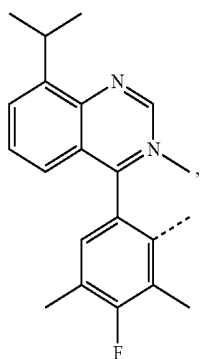
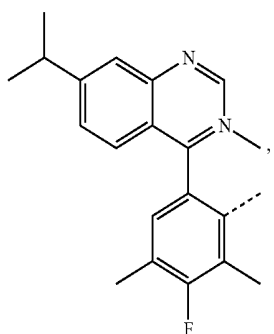
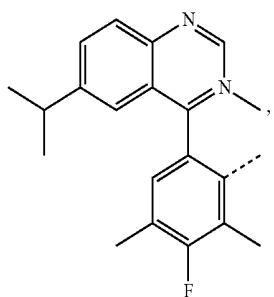
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L₄₉₄L₄₉₅L₄₉₆L₄₉₇L₄₉₈

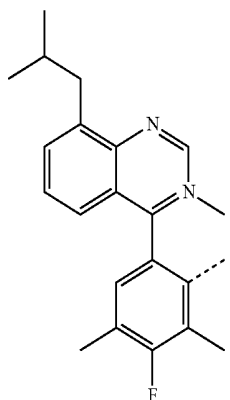
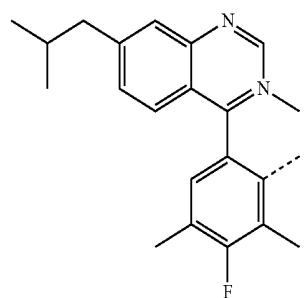
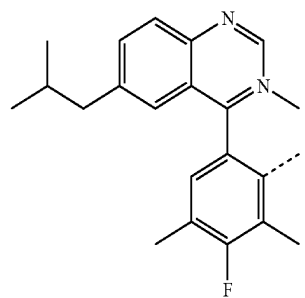
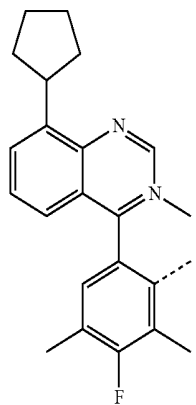
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L₄₉₉L₄₁₀₀L₄₁₀₁L₄₁₀₂L₄₁₀₃

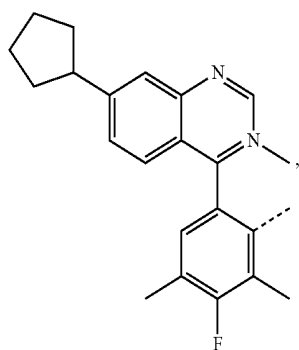
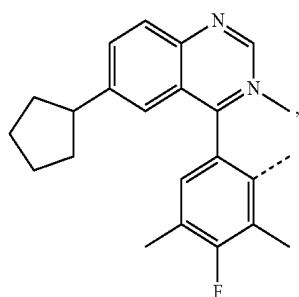
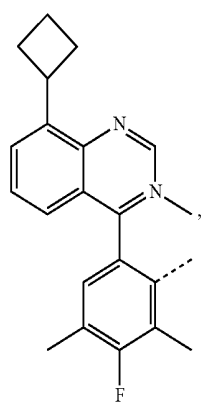
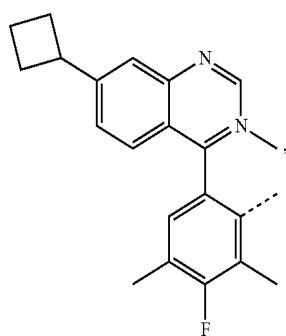
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L_{A104}L_{A105}L_{A106}L_{A107}L_{A108}

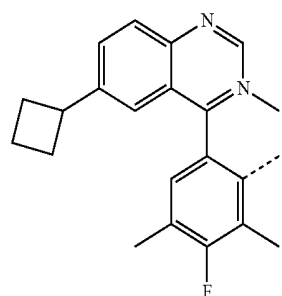
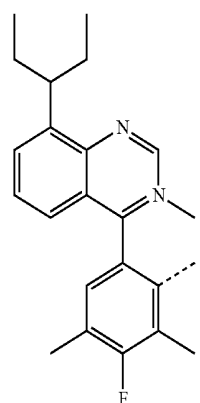
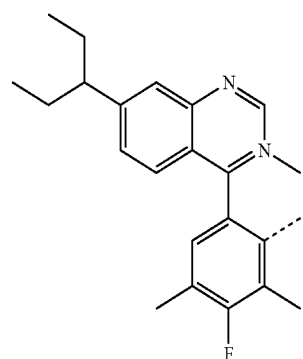
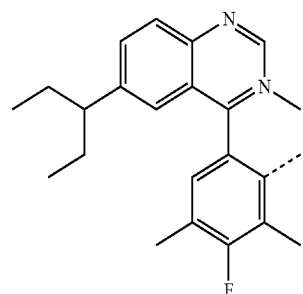
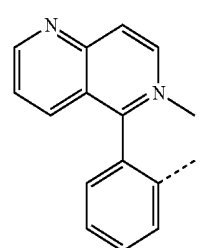
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L_{A109}L_{A110}L_{A111}L_{A112}

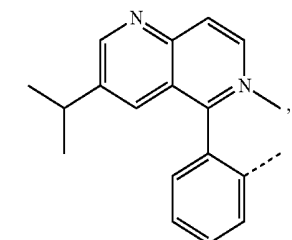
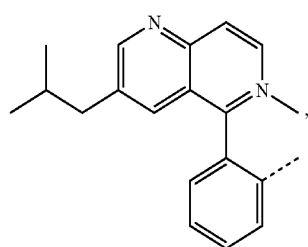
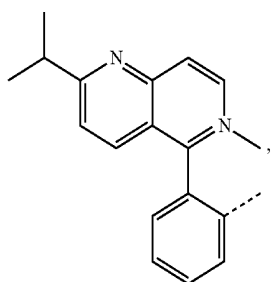
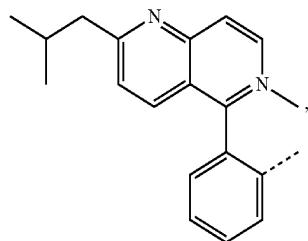
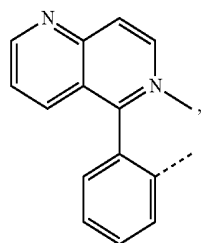
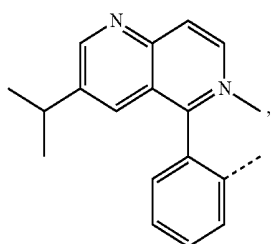
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L_{A113}L_{A114}L_{A115}L_{A116}

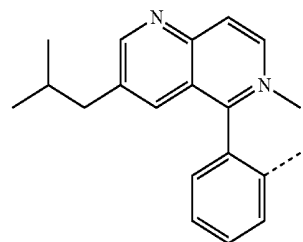
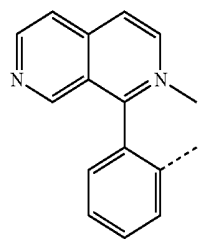
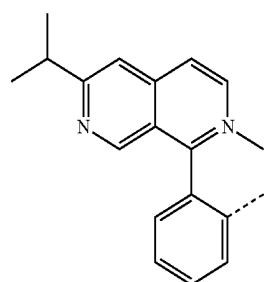
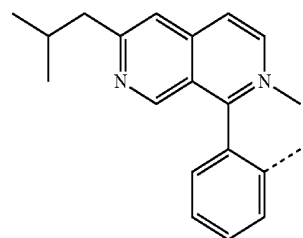
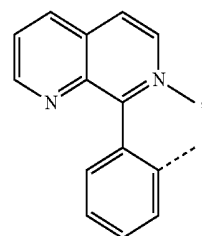
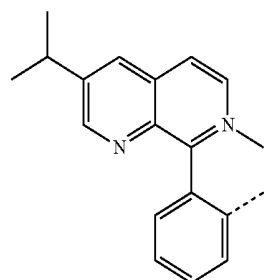
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L_{A117}L_{A118}L_{A119}L_{A120}L_{A121}

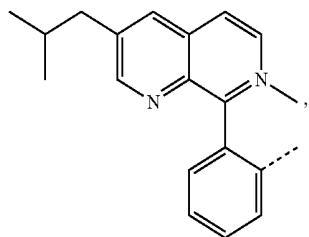
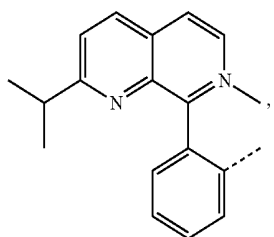
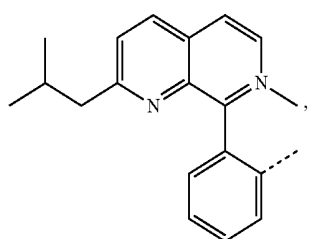
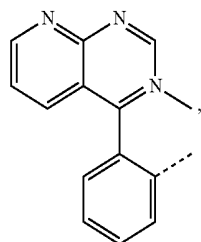
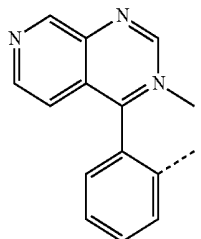
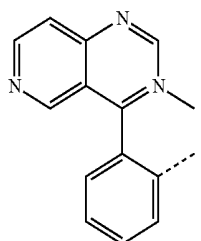
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L_{A122}L_{A123}L_{A124}L_{A125}L_{A126}L_{A127}

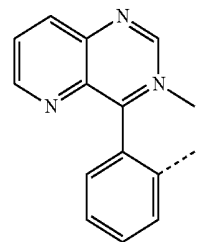
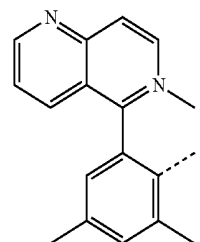
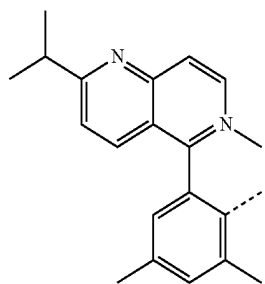
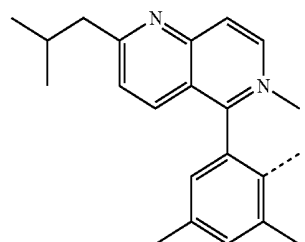
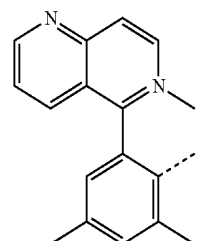
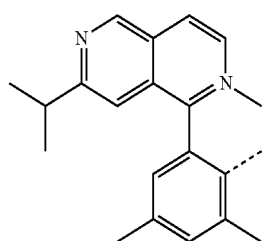
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L_{A128}L_{A129}L_{A130}L_{A131}L_{A132}L_{A133}

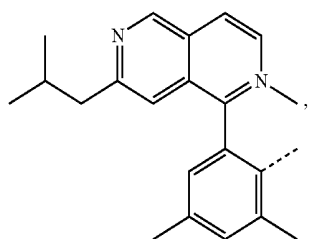
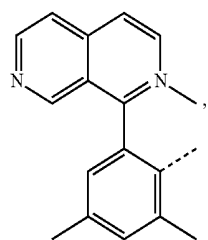
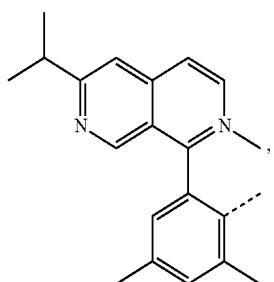
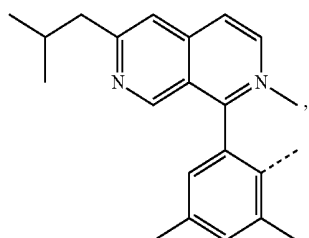
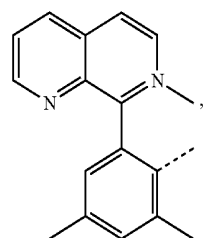
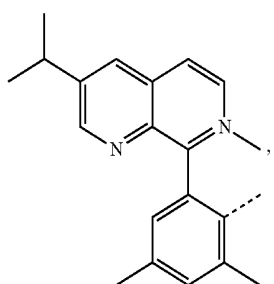
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L_{A133}L_{A134}L_{A135}L_{A136}L_{A137}L_{A138}

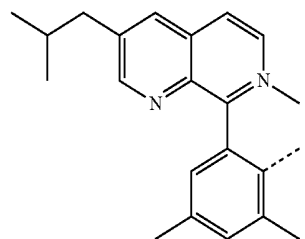
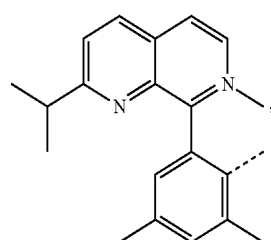
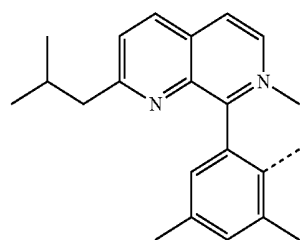
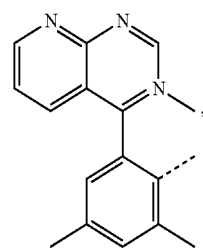
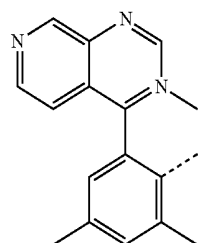
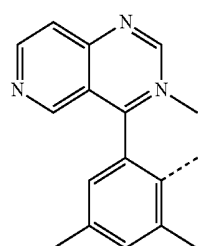
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L_{A139}L_{A140}L_{A141}L_{A142}L_{A143}L_{A144}

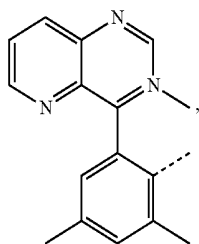
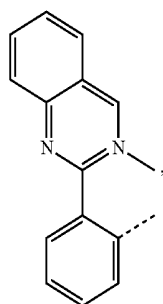
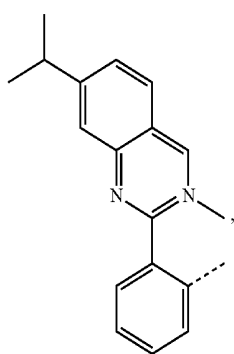
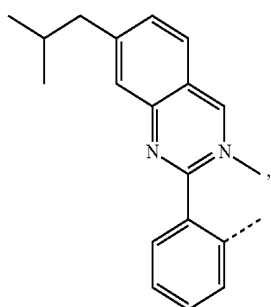
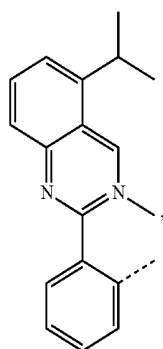
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L_{A145}L_{A146}L_{A147}L_{A148}L_{A149}L_{A150}

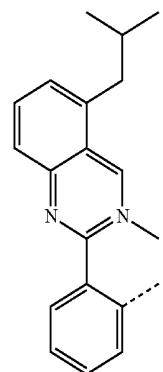
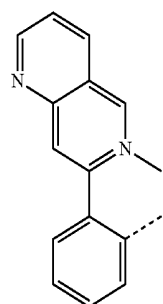
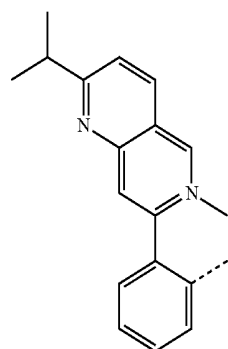
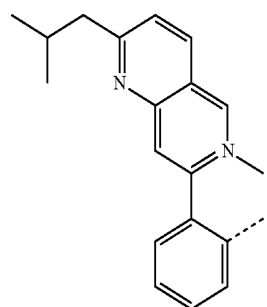
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L_{A151}L_{A152}L_{A153}L_{A154}L_{A155}L_{A156}

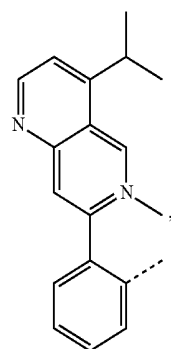
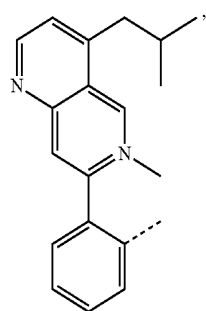
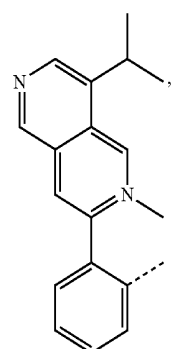
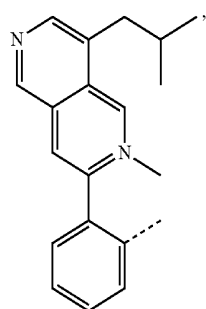
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L_{A157}L_{A158}L_{A159}L_{A160}L_{A161}

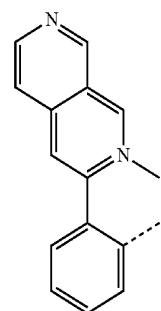
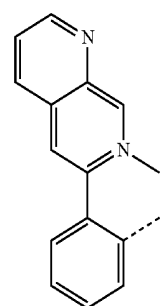
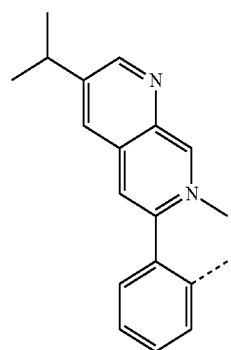
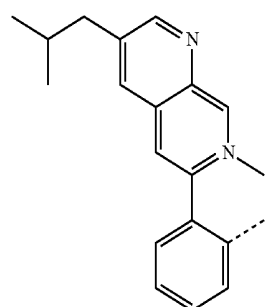
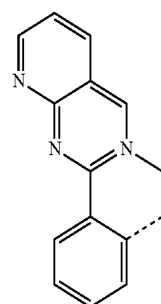
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L_{A162}L_{A163}L_{A164}L_{A165}

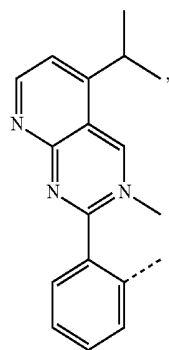
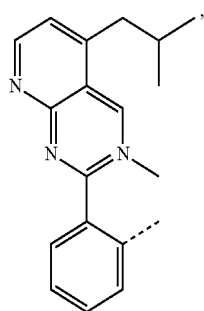
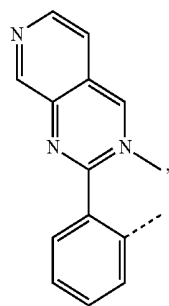
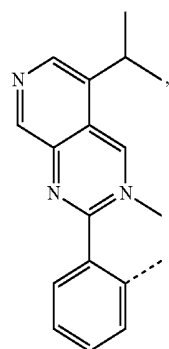
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L_{A166}L_{A167}L_{A168}L_{A169}

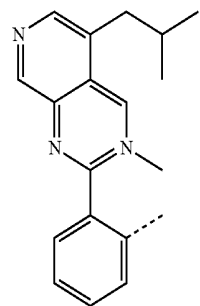
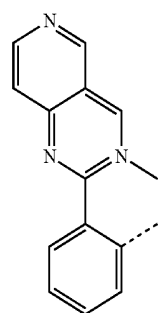
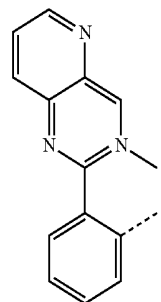
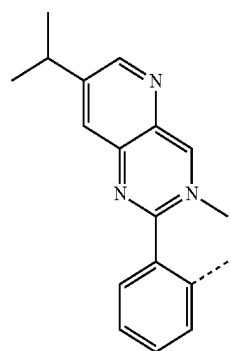
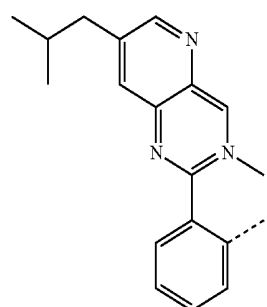
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L_{A170}L_{A171}L_{A172}L_{A173}L_{A174}

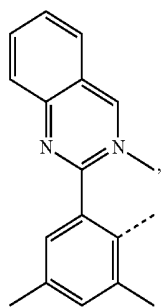
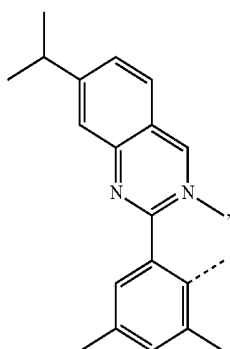
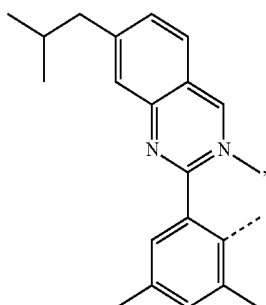
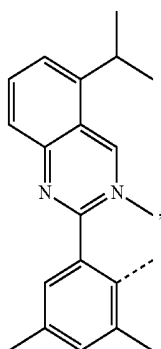
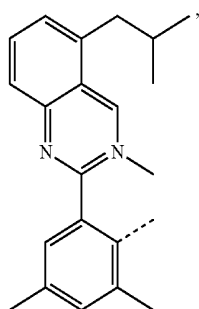
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L_{A175}L_{A176}L_{A177}L_{A178}

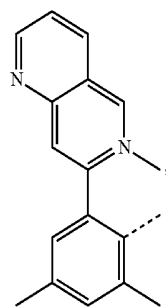
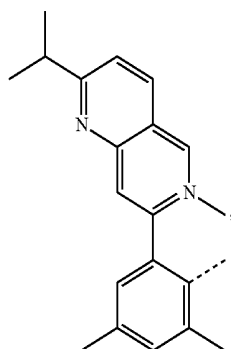
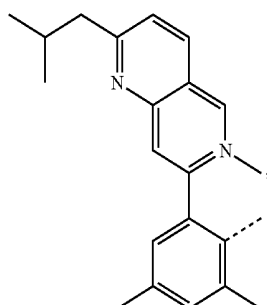
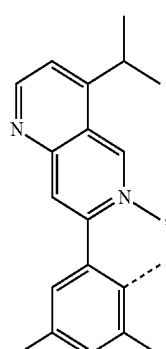
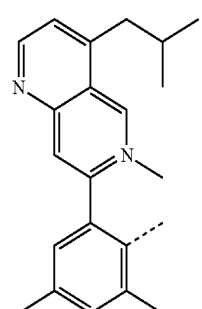
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L_{A179}L_{A180}L_{A181}L_{A182}L_{A183}

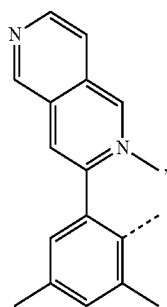
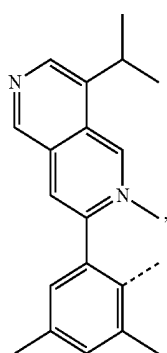
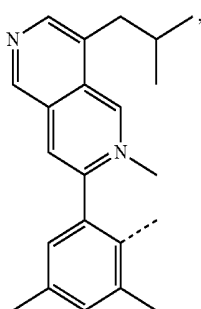
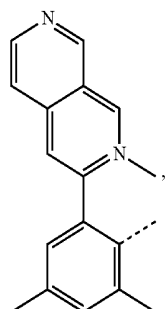
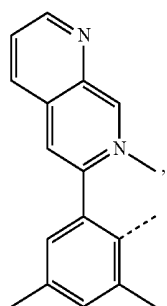
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L_{A184}L_{A185}L_{A186}L_{A187}L_{A188}

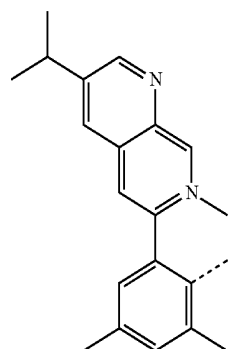
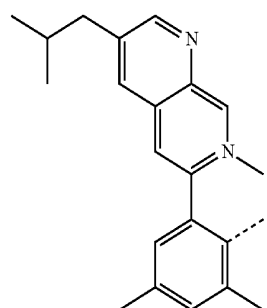
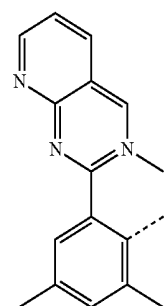
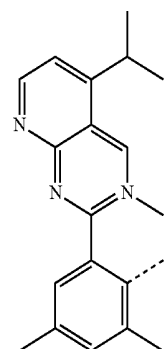
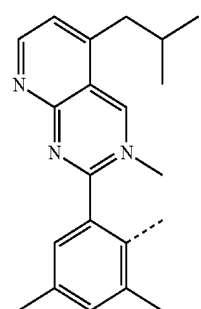
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L_{A189}L_{A190}L_{A191}L_{A192}L_{A193}

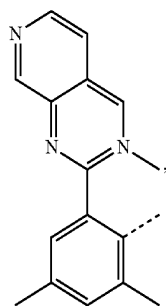
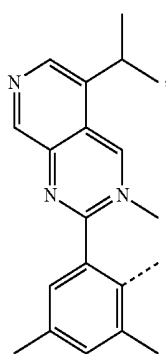
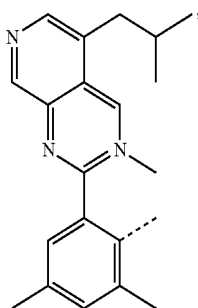
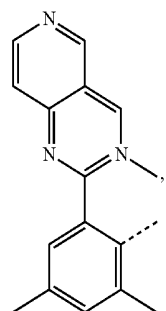
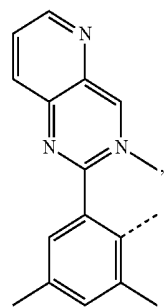
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L₄₁₉₄L₄₁₉₅L₄₁₉₆L₄₁₉₇L₄₁₉₈

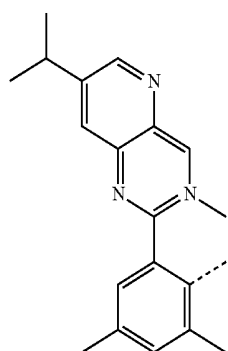
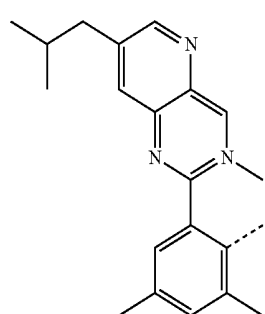
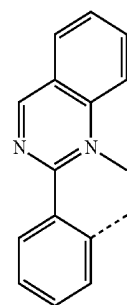
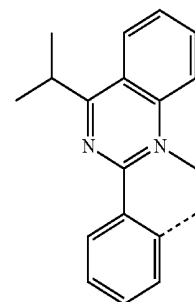
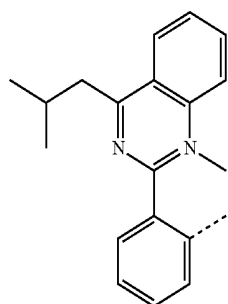
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L₄₁₉₉L₄₂₀₀L₄₂₀₁L₄₂₀₂L₄₂₀₃

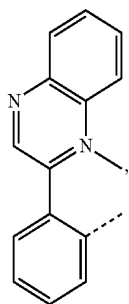
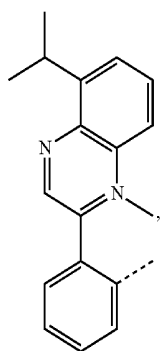
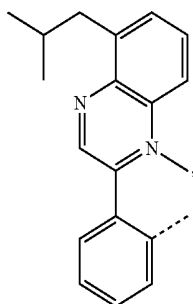
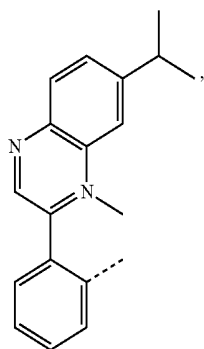
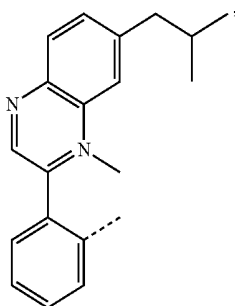
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L₄₂₀₄L₄₂₀₅L₄₂₀₆L₄₂₀₇L₄₂₀₈

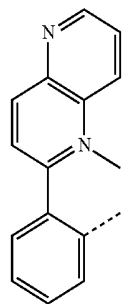
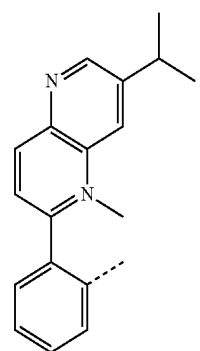
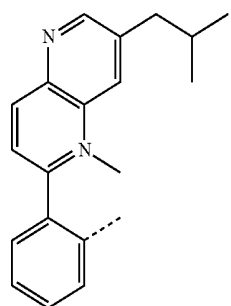
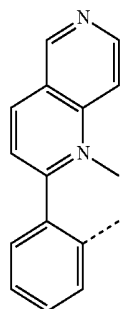
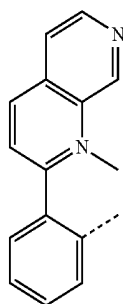
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L₄₂₀₉L₄₂₁₀L₄₂₁₁L₄₂₁₂L₄₂₁₃

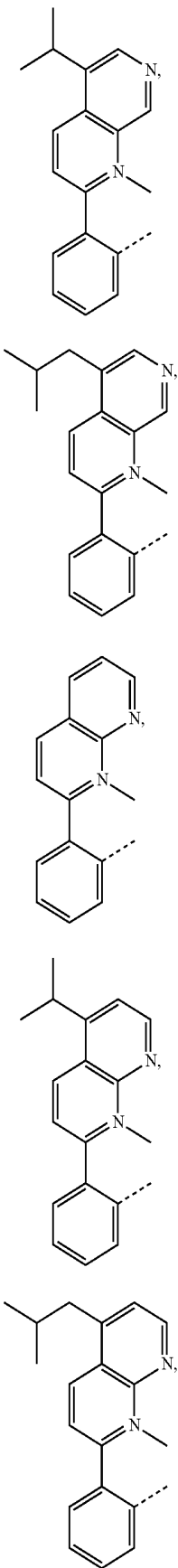
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L₄₂₁₄L₄₂₁₅L₄₂₁₆L₄₂₁₇L₄₂₁₈

-continued

L₄₂₁₉L₄₂₂₀L₄₂₂₁L₄₂₂₂L₄₂₂₃

-continued



L₄₂₂₄

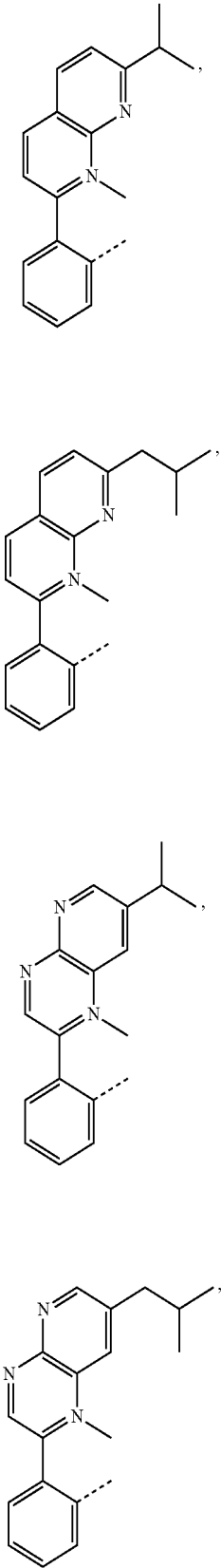
L₄₂₂₅

L₄₂₂₆

L₄₂₂₇

L₄₂₂₈

-continued



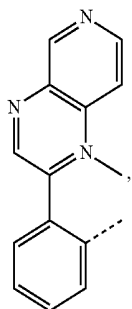
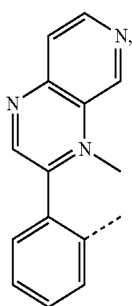
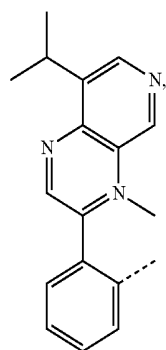
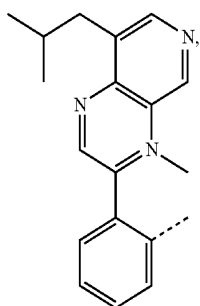
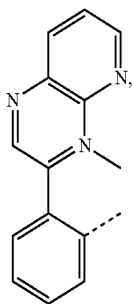
L₄₂₂₉

L₄₂₃₀

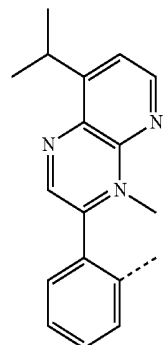
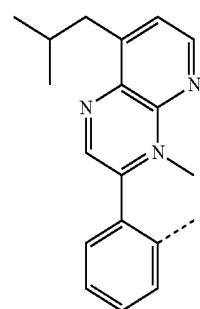
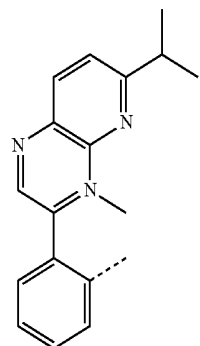
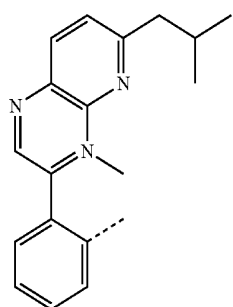
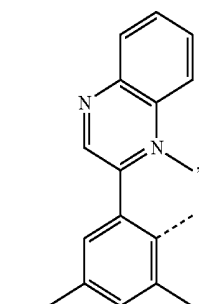
L₄₂₃₁

L₄₂₃₂

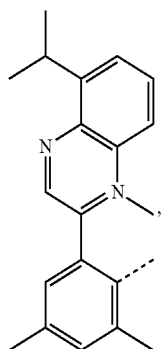
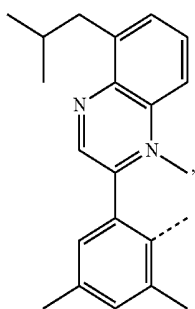
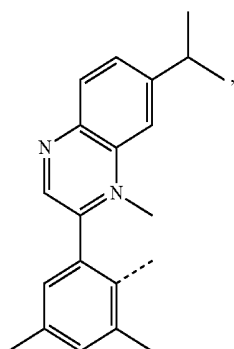
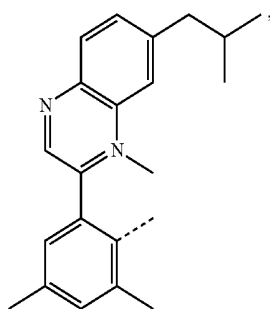
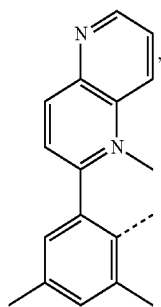
-continued

L₄₂₃₃L₄₂₃₄L₄₂₃₅L₄₂₃₆L₄₂₃₇

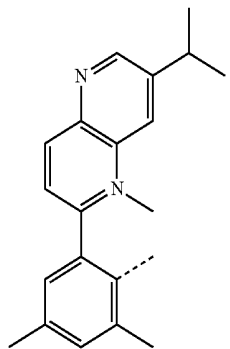
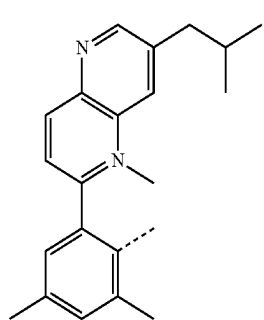
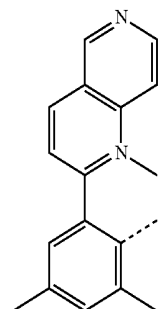
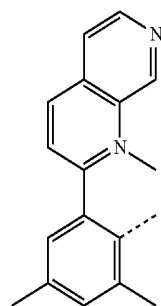
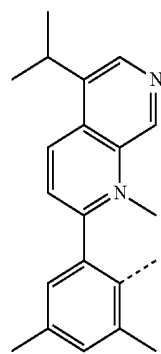
-continued

L₄₂₃₈L₄₂₃₉L₄₂₄₀L₄₂₄₁L₄₂₄₂

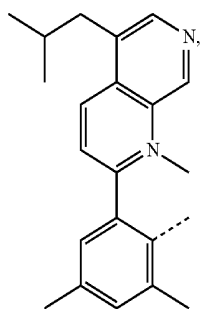
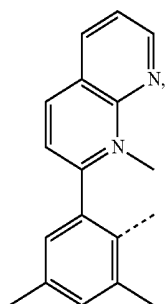
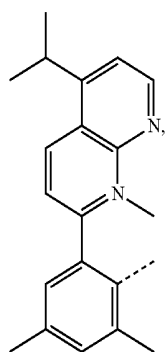
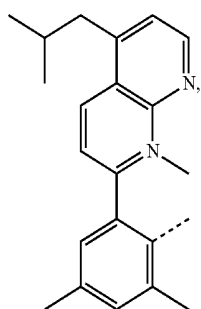
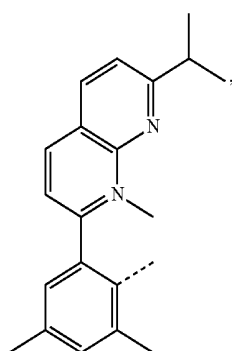
-continued

L₄₂₄₃L₄₂₄₄L₄₂₄₅L₄₂₄₆L₄₂₄₇

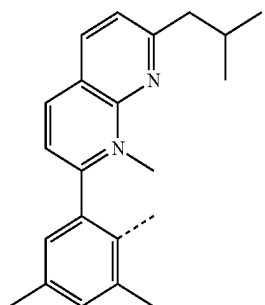
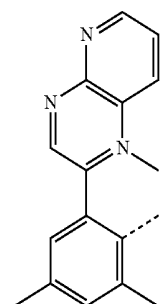
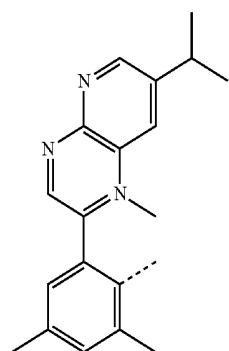
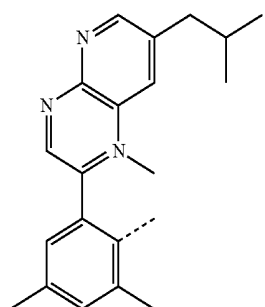
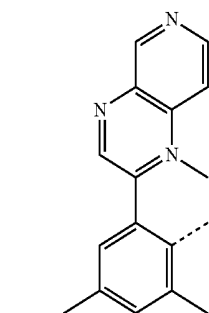
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L₄₂₄₈L₄₂₄₉L₄₂₅₀L₄₂₅₁L₄₂₅₂

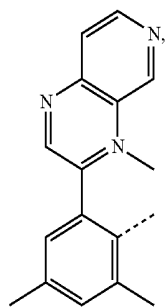
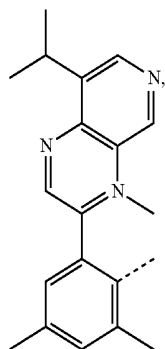
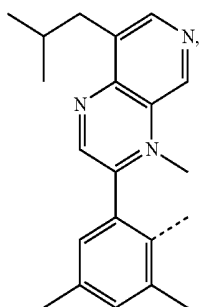
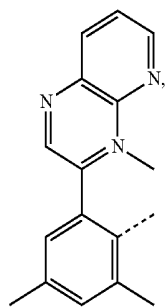
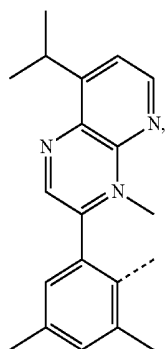
-continued

L₄₂₅₃L₄₂₅₄L₄₂₅₅L₄₂₅₆L₄₂₅₇

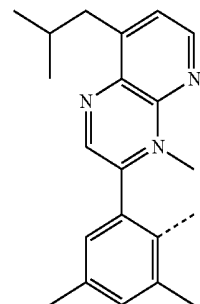
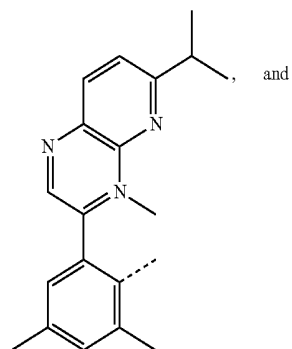
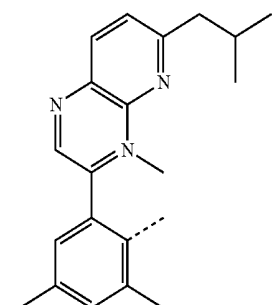
-continued

L₄₂₅₈L₄₂₅₉L₄₂₆₀L₄₂₆₁L₄₂₆₂

-continued

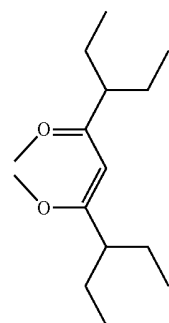
L_{A263}L_{A264}L_{A265}L_{A266}L_{A267}

-continued

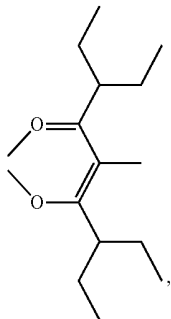
L_{A268}L_{A269}L_{A270}

[0097] Some embodiments are drawn to compounds of formula $M(L_A)_x(L_B)_y(L_C)_z$, where $x=1$ or 2 , $y=1$ or 2 , and $z=0$.

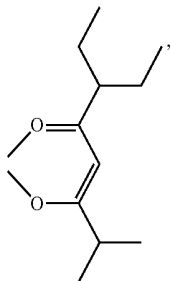
[0098] In some embodiments, L_B is selected from the group consisting of L_{B1} - L_{B13} listed below:

L_{B1}

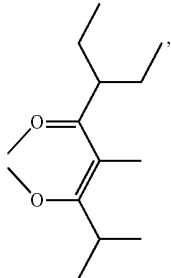
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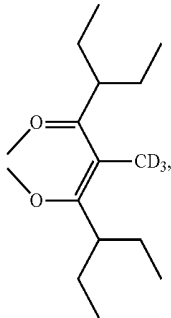
L_{B2}



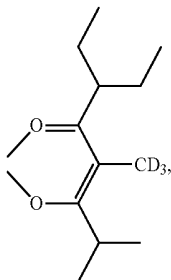
L_{B3}



L_{B4}

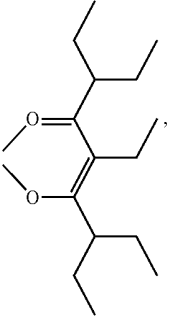


L_{B5}

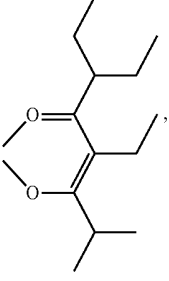


L_{B6}

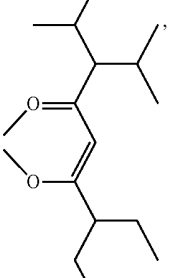
-continued



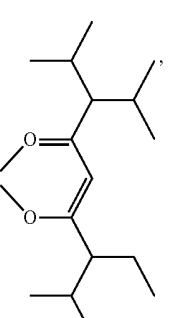
L_{B7}



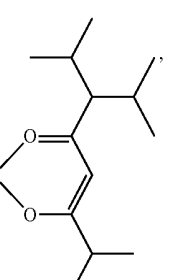
L_{B8}



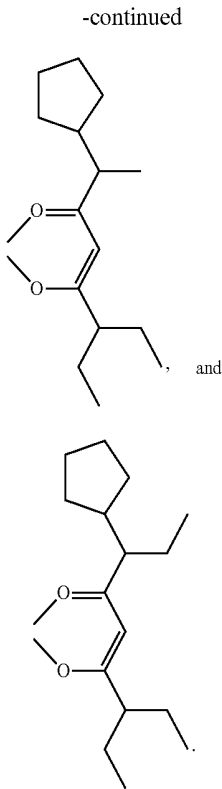
L_{B9}



L_{B10}



L_{B11}



-continued		
Compound Number	L_A	L_B
32	L_{A32}	L_{B1}
33	L_{A33}	L_{B1}
34	L_{A34}	L_{B1}
35	L_{A35}	L_{B1}
36	L_{A36}	L_{B1}
37	L_{A37}	L_{B1}
38	L_{A38}	L_{B1}
39	L_{A39}	L_{B1}
40	L_{A40}	L_{B1}
41	L_{A41}	L_{B1}
42	L_{A42}	L_{B1}
43	L_{A43}	L_{B1}
44	L_{A44}	L_{B1}
45	L_{A45}	L_{B1}
46	L_{A46}	L_{B1}
47	L_{A47}	L_{B1}
48	L_{A48}	L_{B1}
49	L_{A49}	L_{B1}
50	L_{A50}	L_{B1}
51	L_{A51}	L_{B1}
52	L_{A52}	L_{B1}
53	L_{A53}	L_{B1}
54	L_{A54}	L_{B1}
55	L_{A55}	L_{B1}
56	L_{A56}	L_{B1}
57	L_{A57}	L_{B1}
58	L_{A58}	L_{B1}
59	L_{A59}	L_{B1}
60	L_{A60}	L_{B1}
61	L_{A61}	L_{B1}
62	L_{A62}	L_{B1}
63	L_{A63}	L_{B1}
64	L_{A64}	L_{B1}
65	L_{A65}	L_{B1}
66	L_{A66}	L_{B1}
67	L_{A67}	L_{B1}
68	L_{A68}	L_{B1}
69	L_{A69}	L_{B1}
70	L_{A70}	L_{B1}
71	L_{A71}	L_{B1}
72	L_{A72}	L_{B1}
73	L_{A73}	L_{B1}
74	L_{A74}	L_{B1}
75	L_{A75}	L_{B1}
76	L_{A76}	L_{B1}
77	L_{A77}	L_{B1}
78	L_{A78}	L_{B1}
79	L_{A79}	L_{B1}
80	L_{A80}	L_{B1}
81	L_{A81}	L_{B1}
82	L_{A82}	L_{B1}
83	L_{A83}	L_{B1}
84	L_{A84}	L_{B1}
85	L_{A85}	L_{B1}
86	L_{A86}	L_{B1}
87	L_{A87}	L_{B1}
88	L_{A88}	L_{B1}
89	L_{A89}	L_{B1}
90	L_{A90}	L_{B1}
91	L_{A91}	L_{B1}
92	L_{A92}	L_{B1}
93	L_{A93}	L_{B1}
94	L_{A94}	L_{B1}
95	L_{A95}	L_{B1}
96	L_{A96}	L_{B1}
97	L_{A97}	L_{B1}
98	L_{A98}	L_{B1}
99	L_{A99}	L_{B1}
100	L_{A100}	L_{B1}
101	L_{A101}	L_{B1}
102	L_{A102}	L_{B1}
103	L_{A103}	L_{B1}
104	L_{A104}	L_{B1}

[0099] In some embodiments, $z=0$, $x=1$ or 2 , $y=1$ or 2 , and the compound having the formula of $\text{Ir}(L_A)_x(L_B)_y$ is selected from the group consisting of Compound 1 to Compound 3510 listed in the table below:

Compound Number	L_A	L_B
1	L_{A1}	L_{B1}
2	L_{A2}	L_{B1}
3	L_{A3}	L_{B1}
4	L_{A4}	L_{B1}
5	L_{A5}	L_{B1}
6	L_{A6}	L_{B1}
7	L_{A7}	L_{B1}
8	L_{A8}	L_{B1}
9	L_{A9}	L_{B1}
10	L_{A10}	L_{B1}
11	L_{A11}	L_{B1}
12	L_{A12}	L_{B1}
13	L_{A13}	L_{B1}
14	L_{A14}	L_{B1}
15	L_{A15}	L_{B1}
16	L_{A16}	L_{B1}
17	L_{A17}	L_{B1}
18	L_{A18}	L_{B1}
19	L_{A19}	L_{B1}
20	L_{A20}	L_{B1}
21	L_{A21}	L_{B1}
22	L_{A22}	L_{B1}
23	L_{A23}	L_{B1}
24	L_{A24}	L_{B1}
25	L_{A25}	L_{B1}
26	L_{A26}	L_{B1}
27	L_{A27}	L_{B1}
28	L_{A28}	L_{B1}
29	L_{A29}	L_{B1}
30	L_{A30}	L_{B1}
31	L_{A31}	L_{B1}

-continued

Compound Number	L _A	L _B
105	L _{A105}	L _{B1}
106	L _{A106}	L _{B1}
107	L _{A107}	L _{B1}
108	L _{A108}	L _{B1}
109	L _{A109}	L _{B1}
110	L _{A110}	L _{B1}
111	L _{A111}	L _{B1}
112	L _{A112}	L _{B1}
113	L _{A113}	L _{B1}
114	L _{A114}	L _{B1}
115	L _{A115}	L _{B1}
116	L _{A116}	L _{B1}
117	L _{A117}	L _{B1}
118	L _{A118}	L _{B1}
119	L _{A119}	L _{B1}
120	L _{A120}	L _{B1}
121	L _{A121}	L _{B1}
122	L _{A122}	L _{B1}
123	L _{A123}	L _{B1}
124	L _{A124}	L _{B1}
125	L _{A125}	L _{B1}
126	L _{A126}	L _{B1}
127	L _{A127}	L _{B1}
128	L _{A128}	L _{B1}
129	L _{A129}	L _{B1}
130	L _{A130}	L _{B1}
131	L _{A131}	L _{B1}
132	L _{A132}	L _{B1}
133	L _{A133}	L _{B1}
134	L _{A134}	L _{B1}
135	L _{A135}	L _{B1}
136	L _{A136}	L _{B1}
137	L _{A137}	L _{B1}
138	L _{A138}	L _{B1}
139	L _{A139}	L _{B1}
140	L _{A140}	L _{B1}
141	L _{A141}	L _{B1}
142	L _{A142}	L _{B1}
143	L _{A143}	L _{B1}
144	L _{A144}	L _{B1}
145	L _{A145}	L _{B1}
146	L _{A146}	L _{B1}
147	L _{A147}	L _{B1}
148	L _{A148}	L _{B1}
149	L _{A149}	L _{B1}
150	L _{A150}	L _{B1}
151	L _{A151}	L _{B1}
152	L _{A152}	L _{B1}
153	L _{A153}	L _{B1}
154	L _{A154}	L _{B1}
155	L _{A155}	L _{B1}
156	L _{A156}	L _{B1}
157	L _{A157}	L _{B1}
158	L _{A158}	L _{B1}
159	L _{A159}	L _{B1}
160	L _{A160}	L _{B1}
161	L _{A161}	L _{B1}
162	L _{A162}	L _{B1}
163	L _{A163}	L _{B1}
164	L _{A164}	L _{B1}
165	L _{A165}	L _{B1}
166	L _{A166}	L _{B1}
167	L _{A167}	L _{B1}
168	L _{A168}	L _{B1}
169	L _{A169}	L _{B1}
170	L _{A170}	L _{B1}
171	L _{A171}	L _{B1}
172	L _{A172}	L _{B1}
173	L _{A173}	L _{B1}
174	L _{A174}	L _{B1}
175	L _{A175}	L _{B1}
176	L _{A176}	L _{B1}
177	L _{A177}	L _{B1}

-continued

Compound Number	L _A	L _B
178	L _{A178}	L _{B1}
179	L _{A179}	L _{B1}
180	L _{A180}	L _{B1}
181	L _{A181}	L _{B1}
182	L _{A182}	L _{B1}
183	L _{A183}	L _{B1}
184	L _{A184}	L _{B1}
185	L _{A185}	L _{B1}
186	L _{A186}	L _{B1}
187	L _{A187}	L _{B1}
188	L _{A188}	L _{B1}
189	L _{A189}	L _{B1}
190	L _{A190}	L _{B1}
191	L _{A191}	L _{B1}
192	L _{A192}	L _{B1}
193	L _{A193}	L _{B1}
194	L _{A194}	L _{B1}
195	L _{A195}	L _{B1}
196	L _{A196}	L _{B1}
197	L _{A197}	L _{B1}
198	L _{A198}	L _{B1}
199	L _{A199}	L _{B1}
200	L _{A200}	L _{B1}
201	L _{A201}	L _{B1}
202	L _{A202}	L _{B1}
203	L _{A203}	L _{B1}
204	L _{A204}	L _{B1}
205	L _{A205}	L _{B1}
206	L _{A206}	L _{B1}
207	L _{A207}	L _{B1}
208	L _{A208}	L _{B1}
209	L _{A209}	L _{B1}
210	L _{A210}	L _{B1}
211	L _{A211}	L _{B1}
212	L _{A212}	L _{B1}
213	L _{A213}	L _{B1}
214	L _{A214}	L _{B1}
215	L _{A215}	L _{B1}
216	L _{A216}	L _{B1}
217	L _{A217}	L _{B1}
218	L _{A218}	L _{B1}
219	L _{A219}	L _{B1}
220	L _{A220}	L _{B1}
221	L _{A221}	L _{B1}
222	L _{A222}	L _{B1}
223	L _{A223}	L _{B1}
224	L _{A224}	L _{B1}
225	L _{A225}	L _{B1}
226	L _{A226}	L _{B1}
227	L _{A227}	L _{B1}
228	L _{A228}	L _{B1}
229	L _{A229}	L _{B1}
230	L _{A230}	L _{B1}
231	L _{A231}	L _{B1}
232	L _{A232}	L _{B1}
233	L _{A233}	L _{B1}
234	L _{A234}	L _{B1}
235	L _{A235}	L _{B1}
236	L _{A236}	L _{B1}
237	L _{A237}	L _{B1}
238	L _{A238}	L _{B1}
239	L _{A239}	L _{B1}
240	L _{A240}	L _{B1}
241	L _{A241}	L _{B1}
242	L _{A242}	L _{B1}
243	L _{A243}	L _{B1}
244	L _{A244}	L _{B1}
245	L _{A245}	L _{B1}
246	L _{A246}	L _{B1}
247	L _{A247}	L _{B1}
248	L _{A248}	L _{B1}
249	L _{A249}	L _{B1}
250	L _{A250}	L _{B1}

-continued

Compound Number	L _A	L _B
251	L _{A251}	L _{B1}
252	L _{A252}	L _{B1}
253	L _{A253}	L _{B1}
254	L _{A254}	L _{B1}
255	L _{A255}	L _{B1}
256	L _{A256}	L _{B1}
257	L _{A257}	L _{B1}
258	L _{A258}	L _{B1}
259	L _{A259}	L _{B1}
260	L _{A260}	L _{B1}
261	L _{A261}	L _{B1}
262	L _{A262}	L _{B1}
263	L _{A263}	L _{B1}
264	L _{A264}	L _{B1}
265	L _{A265}	L _{B1}
266	L _{A266}	L _{B1}
267	L _{A267}	L _{B1}
268	L _{A268}	L _{B1}
269	L _{A269}	L _{B1}
270	L _{A270}	L _{B1}
271	L _{A1}	L _{B2}
272	L _{A2}	L _{B2}
273	L _{A3}	L _{B2}
274	L _{A4}	L _{B2}
275	L _{A5}	L _{B2}
276	L _{A6}	L _{B2}
277	L _{A7}	L _{B2}
278	L _{A8}	L _{B2}
279	L _{A9}	L _{B2}
280	L _{A10}	L _{B2}
281	L _{A11}	L _{B2}
282	L _{A12}	L _{B2}
283	L _{A13}	L _{B2}
284	L _{A14}	L _{B2}
285	L _{A15}	L _{B2}
286	L _{A16}	L _{B2}
287	L _{A17}	L _{B2}
288	L _{A18}	L _{B2}
289	L _{A19}	L _{B2}
290	L _{A20}	L _{B2}
291	L _{A21}	L _{B2}
292	L _{A22}	L _{B2}
293	L _{A23}	L _{B2}
294	L _{A24}	L _{B2}
295	L _{A25}	L _{B2}
296	L _{A26}	L _{B2}
297	L _{A27}	L _{B2}
298	L _{A28}	L _{B2}
299	L _{A29}	L _{B2}
300	L _{A30}	L _{B2}
301	L _{A31}	L _{B2}
302	L _{A32}	L _{B2}
303	L _{A33}	L _{B2}
304	L _{A34}	L _{B2}
305	L _{A35}	L _{B2}
306	L _{A36}	L _{B2}
307	L _{A37}	L _{B2}
308	L _{A38}	L _{B2}
309	L _{A39}	L _{B2}
310	L _{A40}	L _{B2}
311	L _{A41}	L _{B2}
312	L _{A42}	L _{B2}
313	L _{A43}	L _{B2}
314	L _{A44}	L _{B2}
315	L _{A45}	L _{B2}
316	L _{A46}	L _{B2}
317	L _{A47}	L _{B2}
318	L _{A48}	L _{B2}
319	L _{A49}	L _{B2}
320	L _{A50}	L _{B2}
321	L _{A51}	L _{B2}
322	L _{A52}	L _{B2}
323	L _{A53}	L _{B2}

-continued

Compound Number	L _A	L _B
324	L _{A54}	L _{B2}
325	L _{A55}	L _{B2}
326	L _{A56}	L _{B2}
327	L _{A57}	L _{B2}
328	L _{A58}	L _{B2}
329	L _{A59}	L _{B2}
330	L _{A60}	L _{B2}
331	L _{A61}	L _{B2}
332	L _{A62}	L _{B2}
333	L _{A63}	L _{B2}
334	L _{A64}	L _{B2}
335	L _{A65}	L _{B2}
336	L _{A66}	L _{B2}
337	L _{A67}	L _{B2}
338	L _{A68}	L _{B2}
339	L _{A69}	L _{B2}
340	L _{A70}	L _{B2}
341	L _{A71}	L _{B2}
342	L _{A72}	L _{B2}
343	L _{A73}	L _{B2}
344	L _{A74}	L _{B2}
345	L _{A75}	L _{B2}
346	L _{A76}	L _{B2}
347	L _{A77}	L _{B2}
348	L _{A78}	L _{B2}
349	L _{A79}	L _{B2}
350	L _{A80}	L _{B2}
351	L _{A81}	L _{B2}
352	L _{A82}	L _{B2}
353	L _{A83}	L _{B2}
354	L _{A84}	L _{B2}
355	L _{A85}	L _{B2}
356	L _{A86}	L _{B2}
357	L _{A87}	L _{B2}
358	L _{A88}	L _{B2}
359	L _{A89}	L _{B2}
360	L _{A90}	L _{B2}
361	L _{A91}	L _{B2}
362	L _{A92}	L _{B2}
363	L _{A93}	L _{B2}
364	L _{A94}	L _{B2}
365	L _{A95}	L _{B2}
366	L _{A96}	L _{B2}
367	L _{A97}	L _{B2}
368	L _{A98}	L _{B2}
369	L _{A99}	L _{B2}
370	L _{A100}	L _{B2}
371	L _{A101}	L _{B2}
372	L _{A102}	L _{B2}
373	L _{A103}	L _{B2}
374	L _{A104}	L _{B2}
375	L _{A105}	L _{B2}
376	L _{A106}	L _{B2}
377	L _{A107}	L _{B2}
378	L _{A108}	L _{B2}
379	L _{A109}	L _{B2}
380	L _{A110}	L _{B2}
381	L _{A111}	L _{B2}
382	L _{A112}	L _{B2}
383	L _{A113}	L _{B2}
384	L _{A114}	L _{B2}
385	L _{A115}	L _{B2}
386	L _{A116}	L _{B2}
387	L _{A117}	L _{B2}
388	L _{A118}	L _{B2}
389	L _{A119}	L _{B2}
390	L _{A120}	L _{B2}
391	L _{A121}	L _{B2}
392	L _{A122}	L _{B2}
393	L _{A123}	L _{B2}
394	L _{A124}	L _{B2}
395	L _{A125}	L _{B2}
396	L _{A126}	L _{B2}

-continued

Compound Number	L _A	L _B
397	L _{A127}	L _{B2}
398	L _{A128}	L _{B2}
399	L _{A129}	L _{B2}
400	L _{A130}	L _{B2}
401	L _{A131}	L _{B2}
402	L _{A132}	L _{B2}
403	L _{A133}	L _{B2}
404	L _{A134}	L _{B2}
405	L _{A135}	L _{B2}
406	L _{A136}	L _{B2}
407	L _{A137}	L _{B2}
408	L _{A138}	L _{B2}
409	L _{A139}	L _{B2}
410	L _{A140}	L _{B2}
411	L _{A141}	L _{B2}
412	L _{A142}	L _{B2}
413	L _{A143}	L _{B2}
414	L _{A144}	L _{B2}
415	L _{A145}	L _{B2}
416	L _{A146}	L _{B2}
417	L _{A147}	L _{B2}
418	L _{A148}	L _{B2}
419	L _{A149}	L _{B2}
420	L _{A150}	L _{B2}
421	L _{A151}	L _{B2}
422	L _{A152}	L _{B2}
423	L _{A153}	L _{B2}
424	L _{A154}	L _{B2}
425	L _{A155}	L _{B2}
426	L _{A156}	L _{B2}
427	L _{A157}	L _{B2}
428	L _{A158}	L _{B2}
429	L _{A159}	L _{B2}
430	L _{A160}	L _{B2}
431	L _{A161}	L _{B2}
432	L _{A162}	L _{B2}
433	L _{A163}	L _{B2}
434	L _{A164}	L _{B2}
435	L _{A165}	L _{B2}
436	L _{A166}	L _{B2}
437	L _{A167}	L _{B2}
438	L _{A168}	L _{B2}
439	L _{A169}	L _{B2}
440	L _{A170}	L _{B2}
441	L _{A171}	L _{B2}
442	L _{A172}	L _{B2}
443	L _{A173}	L _{B2}
444	L _{A174}	L _{B2}
445	L _{A175}	L _{B2}
446	L _{A176}	L _{B2}
447	L _{A177}	L _{B2}
448	L _{A178}	L _{B2}
449	L _{A179}	L _{B2}
450	L _{A180}	L _{B2}
451	L _{A181}	L _{B2}
452	L _{A182}	L _{B2}
453	L _{A183}	L _{B2}
454	L _{A184}	L _{B2}
455	L _{A185}	L _{B2}
456	L _{A186}	L _{B2}
457	L _{A187}	L _{B2}
458	L _{A188}	L _{B2}
459	L _{A189}	L _{B2}
460	L _{A190}	L _{B2}
461	L _{A191}	L _{B2}
462	L _{A192}	L _{B2}
463	L _{A193}	L _{B2}
464	L _{A194}	L _{B2}
465	L _{A195}	L _{B2}
466	L _{A196}	L _{B2}
467	L _{A197}	L _{B2}
468	L _{A198}	L _{B2}
469	L _{A199}	L _{B2}

-continued

Compound Number	L _A	L _B
470	L _{A200}	L _{B2}
471	L _{A201}	L _{B2}
472	L _{A202}	L _{B2}
473	L _{A203}	L _{B2}
474	L _{A204}	L _{B2}
475	L _{A205}	L _{B2}
476	L _{A206}	L _{B2}
477	L _{A207}	L _{B2}
478	L _{A208}	L _{B2}
479	L _{A209}	L _{B2}
480	L _{A210}	L _{B2}
481	L _{A211}	L _{B2}
482	L _{A212}	L _{B2}
483	L _{A213}	L _{B2}
484	L _{A214}	L _{B2}
485	L _{A215}	L _{B2}
486	L _{A216}	L _{B2}
487	L _{A217}	L _{B2}
488	L _{A218}	L _{B2}
489	L _{A219}	L _{B2}
490	L _{A220}	L _{B2}
491	L _{A221}	L _{B2}
492	L _{A222}	L _{B2}
493	L _{A223}	L _{B2}
494	L _{A224}	L _{B2}
495	L _{A225}	L _{B2}
496	L _{A226}	L _{B2}
497	L _{A227}	L _{B2}
498	L _{A228}	L _{B2}
499	L _{A229}	L _{B2}
500	L _{A230}	L _{B2}
501	L _{A231}	L _{B2}
502	L _{A232}	L _{B2}
503	L _{A233}	L _{B2}
504	L _{A234}	L _{B2}
505	L _{A235}	L _{B2}
506	L _{A236}	L _{B2}
507	L _{A237}	L _{B2}
508	L _{A238}	L _{B2}
509	L _{A239}	L _{B2}
510	L _{A240}	L _{B2}
511	L _{A241}	L _{B2}
512	L _{A242}	L _{B2}
513	L _{A243}	L _{B2}
514	L _{A244}	L _{B2}
515	L _{A245}	L _{B2}
516	L _{A246}	L _{B2}
517	L _{A247}	L _{B2}
518	L _{A248}	L _{B2}
519	L _{A249}	L _{B2}
520	L _{A250}	L _{B2}
521	L _{A251}	L _{B2}
522	L _{A252}	L _{B2}
523	L _{A253}	L _{B2}
524	L _{A254}	L _{B2}
525	L _{A255}	L _{B2}
526	L _{A256}	L _{B2}
527	L _{A257}	L _{B2}
528	L _{A258}	L _{B2}
529	L _{A259}	L _{B2}
530	L _{A260}	L _{B2}
531	L _{A261}	L _{B2}
532	L _{A262}	L _{B2}
533	L _{A263}	L _{B2}
534	L _{A264}	L _{B2}
535	L _{A265}	L _{B2}
536	L _{A266}	L _{B2}
537	L _{A267}	L _{B2}
538	L _{A268}	L _{B2}
539	L _{A269}	L _{B2}
540	L _{A270}	L _{B2}
541	L _{A1}	L _{B3}
542	L _{A2}	L _{B3}

-continued

Compound Number	L _A	L _B
543	L _{A3}	L _{B3}
544	L _{A4}	L _{B3}
545	L _{A5}	L _{B3}
546	L _{A6}	L _{B3}
547	L _{A7}	L _{B3}
548	L _{A8}	L _{B3}
549	L _{A9}	L _{B3}
550	L _{A10}	L _{B3}
551	L _{A11}	L _{B3}
552	L _{A12}	L _{B3}
553	L _{A13}	L _{B3}
554	L _{A14}	L _{B3}
555	L _{A15}	L _{B3}
556	L _{A16}	L _{B3}
557	L _{A17}	L _{B3}
558	L _{A18}	L _{B3}
559	L _{A19}	L _{B3}
560	L _{A20}	L _{B3}
561	L _{A21}	L _{B3}
562	L _{A22}	L _{B3}
563	L _{A23}	L _{B3}
564	L _{A24}	L _{B3}
565	L _{A25}	L _{B3}
566	L _{A26}	L _{B3}
567	L _{A27}	L _{B3}
568	L _{A28}	L _{B3}
569	L _{A29}	L _{B3}
570	L _{A30}	L _{B3}
571	L _{A31}	L _{B3}
572	L _{A32}	L _{B3}
573	L _{A33}	L _{B3}
574	L _{A34}	L _{B3}
575	L _{A35}	L _{B3}
576	L _{A36}	L _{B3}
577	L _{A37}	L _{B3}
578	L _{A38}	L _{B3}
579	L _{A39}	L _{B3}
580	L _{A40}	L _{B3}
581	L _{A41}	L _{B3}
582	L _{A42}	L _{B3}
583	L _{A43}	L _{B3}
584	L _{A44}	L _{B3}
585	L _{A45}	L _{B3}
586	L _{A46}	L _{B3}
587	L _{A47}	L _{B3}
588	L _{A48}	L _{B3}
589	L _{A49}	L _{B3}
590	L _{A50}	L _{B3}
591	L _{A51}	L _{B3}
592	L _{A52}	L _{B3}
593	L _{A53}	L _{B3}
594	L _{A54}	L _{B3}
595	L _{A55}	L _{B3}
596	L _{A56}	L _{B3}
597	L _{A57}	L _{B3}
598	L _{A58}	L _{B3}
599	L _{A59}	L _{B3}
600	L _{A60}	L _{B3}
601	L _{A61}	L _{B3}
602	L _{A62}	L _{B3}
603	L _{A63}	L _{B3}
604	L _{A64}	L _{B3}
605	L _{A65}	L _{B3}
606	L _{A66}	L _{B3}
607	L _{A67}	L _{B3}
608	L _{A68}	L _{B3}
609	L _{A69}	L _{B3}
610	L _{A70}	L _{B3}
611	L _{A71}	L _{B3}
612	L _{A72}	L _{B3}
613	L _{A73}	L _{B3}
614	L _{A74}	L _{B3}
615	L _{A75}	L _{B3}

-continued

Compound Number	L _A	L _B
616	L _{A76}	L _{B3}
617	L _{A77}	L _{B3}
618	L _{A78}	L _{B3}
619	L _{A79}	L _{B3}
620	L _{A80}	L _{B3}
621	L _{A81}	L _{B3}
622	L _{A82}	L _{B3}
623	L _{A83}	L _{B3}
624	L _{A84}	L _{B3}
625	L _{A85}	L _{B3}
626	L _{A86}	L _{B3}
627	L _{A87}	L _{B3}
628	L _{A88}	L _{B3}
629	L _{A89}	L _{B3}
630	L _{A90}	L _{B3}
631	L _{A91}	L _{B3}
632	L _{A92}	L _{B3}
633	L _{A93}	L _{B3}
634	L _{A94}	L _{B3}
635	L _{A95}	L _{B3}
636	L _{A96}	L _{B3}
637	L _{A97}	L _{B3}
638	L _{A98}	L _{B3}
639	L _{A99}	L _{B3}
640	L _{A100}	L _{B3}
641	L _{A101}	L _{B3}
642	L _{A102}	L _{B3}
643	L _{A103}	L _{B3}
644	L _{A104}	L _{B3}
645	L _{A105}	L _{B3}
646	L _{A106}	L _{B3}
647	L _{A107}	L _{B3}
648	L _{A108}	L _{B3}
649	L _{A109}	L _{B3}
650	L _{A110}	L _{B3}
651	L _{A111}	L _{B3}
652	L _{A112}	L _{B3}
653	L _{A113}	L _{B3}
654	L _{A114}	L _{B3}
655	L _{A115}	L _{B3}
656	L _{A116}	L _{B3}
657	L _{A117}	L _{B3}
658	L _{A118}	L _{B3}
659	L _{A119}	L _{B3}
660	L _{A120}	L _{B3}
661	L _{A121}	L _{B3}
662	L _{A122}	L _{B3}
663	L _{A123}	L _{B3}
664	L _{A124}	L _{B3}
665	L _{A125}	L _{B3}
666	L _{A126}	L _{B3}
667	L _{A127}	L _{B3}
668	L _{A128}	L _{B3}
669	L _{A129}	L _{B3}
670	L _{A130}	L _{B3}
671	L _{A131}	L _{B3}
672	L _{A132}	L _{B3}
673	L _{A133}	L _{B3}
674	L _{A134}	L _{B3}
675	L _{A135}	L _{B3}
676	L _{A136}	L _{B3}
677	L _{A137}	L _{B3}
678	L _{A138}	L _{B3}
679	L _{A139}	L _{B3}
680	L _{A140}	L _{B3}
681	L _{A141}	L _{B3}
682	L _{A142}	L _{B3}
683	L _{A143}	L _{B3}
684	L _{A144}	L _{B3}
685	L _{A145}	L _{B3}
686	L _{A146}	L _{B3}
687	L _{A147}	L _{B3}
688	L _{A148}	L _{B3}

-continued

Compound Number	L _A	L _B
689	L _{A149}	L _{B3}
690	L _{A150}	L _{B3}
691	L _{A151}	L _{B3}
692	L _{A152}	L _{B3}
693	L _{A153}	L _{B3}
694	L _{A154}	L _{B3}
695	L _{A155}	L _{B3}
696	L _{A156}	L _{B3}
697	L _{A157}	L _{B3}
698	L _{A158}	L _{B3}
699	L _{A159}	L _{B3}
700	L _{A160}	L _{B3}
701	L _{A161}	L _{B3}
702	L _{A162}	L _{B3}
703	L _{A163}	L _{B3}
704	L _{A164}	L _{B3}
705	L _{A165}	L _{B3}
706	L _{A166}	L _{B3}
707	L _{A167}	L _{B3}
708	L _{A168}	L _{B3}
709	L _{A169}	L _{B3}
710	L _{A170}	L _{B3}
711	L _{A171}	L _{B3}
712	L _{A172}	L _{B3}
713	L _{A173}	L _{B3}
714	L _{A174}	L _{B3}
715	L _{A175}	L _{B3}
716	L _{A176}	L _{B3}
717	L _{A177}	L _{B3}
718	L _{A178}	L _{B3}
719	L _{A179}	L _{B3}
720	L _{A180}	L _{B3}
721	L _{A181}	L _{B3}
722	L _{A182}	L _{B3}
723	L _{A183}	L _{B3}
724	L _{A184}	L _{B3}
725	L _{A185}	L _{B3}
726	L _{A186}	L _{B3}
727	L _{A187}	L _{B3}
728	L _{A188}	L _{B3}
729	L _{A189}	L _{B3}
730	L _{A190}	L _{B3}
731	L _{A191}	L _{B3}
732	L _{A192}	L _{B3}
733	L _{A193}	L _{B3}
734	L _{A194}	L _{B3}
735	L _{A195}	L _{B3}
736	L _{A196}	L _{B3}
737	L _{A197}	L _{B3}
738	L _{A198}	L _{B3}
739	L _{A199}	L _{B3}
740	L _{A200}	L _{B3}
741	L _{A201}	L _{B3}
742	L _{A202}	L _{B3}
743	L _{A203}	L _{B3}
744	L _{A204}	L _{B3}
745	L _{A205}	L _{B3}
746	L _{A206}	L _{B3}
747	L _{A207}	L _{B3}
748	L _{A208}	L _{B3}
749	L _{A209}	L _{B3}
750	L _{A210}	L _{B3}
751	L _{A211}	L _{B3}
752	L _{A212}	L _{B3}
753	L _{A213}	L _{B3}
754	L _{A214}	L _{B3}
755	L _{A215}	L _{B3}
756	L _{A216}	L _{B3}
757	L _{A217}	L _{B3}
758	L _{A218}	L _{B3}
759	L _{A219}	L _{B3}
760	L _{A220}	L _{B3}
761	L _{A221}	L _{B3}

-continued

Compound Number	L _A	L _B
762	L _{A222}	L _{B3}
763	L _{A223}	L _{B3}
764	L _{A224}	L _{B3}
765	L _{A225}	L _{B3}
766	L _{A226}	L _{B3}
767	L _{A227}	L _{B3}
768	L _{A228}	L _{B3}
769	L _{A229}	L _{B3}
770	L _{A230}	L _{B3}
771	L _{A231}	L _{B3}
772	L _{A232}	L _{B3}
773	L _{A233}	L _{B3}
774	L _{A234}	L _{B3}
775	L _{A235}	L _{B3}
776	L _{A236}	L _{B3}
777	L _{A237}	L _{B3}
778	L _{A238}	L _{B3}
779	L _{A239}	L _{B3}
780	L _{A240}	L _{B3}
781	L _{A241}	L _{B3}
782	L _{A242}	L _{B3}
783	L _{A243}	L _{B3}
784	L _{A244}	L _{B3}
785	L _{A245}	L _{B3}
786	L _{A246}	L _{B3}
787	L _{A247}	L _{B3}
788	L _{A248}	L _{B3}
789	L _{A249}	L _{B3}
790	L _{A250}	L _{B3}
791	L _{A251}	L _{B3}
792	L _{A252}	L _{B3}
793	L _{A253}	L _{B3}
794	L _{A254}	L _{B3}
795	L _{A255}	L _{B3}
796	L _{A256}	L _{B3}
797	L _{A257}	L _{B3}
798	L _{A258}	L _{B3}
799	L _{A259}	L _{B3}
800	L _{A260}	L _{B3}
801	L _{A261}	L _{B3}
802	L _{A262}	L _{B3}
803	L _{A263}	L _{B3}
804	L _{A264}	L _{B3}
805	L _{A265}	L _{B3}
806	L _{A266}	L _{B3}
807	L _{A267}	L _{B3}
808	L _{A268}	L _{B3}
809	L _{A269}	L _{B3}
810	L _{A270}	L _{B3}
811	L _{A1}	L _{B4}
812	L _{A2}	L _{B4}
813	L _{A3}	L _{B4}
814	L _{A4}	L _{B4}
815	L _{A5}	L _{B4}
816	L _{A6}	L _{B4}
817	L _{A7}	L _{B4}
818	L _{A8}	L _{B4}
819	L _{A9}	L _{B4}
820	L _{A10}	L _{B4}
821	L _{A11}	L _{B4}
822	L _{A12}	L _{B4}
823	L _{A13}	L _{B4}
824	L _{A14}	L _{B4}
825	L _{A15}	L _{B4}
826	L _{A16}	L _{B4}
827	L _{A17}	L _{B4}
828	L _{A18}	L _{B4}
829	L _{A19}	L _{B4}
830	L _{A20}	L _{B4}
831	L _{A21}	L _{B4}
832	L _{A22}	L _{B4}
833	L _{A23}	L _{B4}
834	L _{A24}	L _{B4}

-continued

Compound Number	L _A	L _B
835	L _{A25}	L _{B4}
836	L _{A26}	L _{B4}
837	L _{A27}	L _{B4}
838	L _{A28}	L _{B4}
839	L _{A29}	L _{B4}
840	L _{A30}	L _{B4}
841	L _{A31}	L _{B4}
842	L _{A32}	L _{B4}
843	L _{A33}	L _{B4}
844	L _{A34}	L _{B4}
845	L _{A35}	L _{B4}
846	L _{A36}	L _{B4}
847	L _{A37}	L _{B4}
848	L _{A38}	L _{B4}
849	L _{A39}	L _{B4}
850	L _{A40}	L _{B4}
851	L _{A41}	L _{B4}
852	L _{A42}	L _{B4}
853	L _{A43}	L _{B4}
854	L _{A44}	L _{B4}
855	L _{A45}	L _{B4}
856	L _{A46}	L _{B4}
857	L _{A47}	L _{B4}
858	L _{A48}	L _{B4}
859	L _{A49}	L _{B4}
860	L _{A50}	L _{B4}
861	L _{A51}	L _{B4}
862	L _{A52}	L _{B4}
863	L _{A53}	L _{B4}
864	L _{A54}	L _{B4}
865	L _{A55}	L _{B4}
866	L _{A56}	L _{B4}
867	L _{A57}	L _{B4}
868	L _{A58}	L _{B4}
869	L _{A59}	L _{B4}
870	L _{A60}	L _{B4}
871	L _{A61}	L _{B4}
872	L _{A62}	L _{B4}
873	L _{A63}	L _{B4}
874	L _{A64}	L _{B4}
875	L _{A65}	L _{B4}
876	L _{A66}	L _{B4}
877	L _{A67}	L _{B4}
878	L _{A68}	L _{B4}
879	L _{A69}	L _{B4}
880	L _{A70}	L _{B4}
881	L _{A71}	L _{B4}
882	L _{A72}	L _{B4}
883	L _{A73}	L _{B4}
884	L _{A74}	L _{B4}
885	L _{A75}	L _{B4}
886	L _{A76}	L _{B4}
887	L _{A77}	L _{B4}
888	L _{A78}	L _{B4}
889	L _{A79}	L _{B4}
890	L _{A80}	L _{B4}
891	L _{A81}	L _{B4}
892	L _{A82}	L _{B4}
893	L _{A83}	L _{B4}
894	L _{A84}	L _{B4}
895	L _{A85}	L _{B4}
896	L _{A86}	L _{B4}
897	L _{A87}	L _{B4}
898	L _{A88}	L _{B4}
899	L _{A89}	L _{B4}
900	L _{A90}	L _{B4}
901	L _{A91}	L _{B4}
902	L _{A92}	L _{B4}
903	L _{A93}	L _{B4}
904	L _{A94}	L _{B4}
905	L _{A95}	L _{B4}
906	L _{A96}	L _{B4}
907	L _{A97}	L _{B4}

-continued

Compound Number	L _A	L _B
908	L _{A98}	L _{B4}
909	L _{A99}	L _{B4}
910	L _{A100}	L _{B4}
911	L _{A101}	L _{B4}
912	L _{A102}	L _{B4}
913	L _{A103}	L _{B4}
914	L _{A104}	L _{B4}
915	L _{A105}	L _{B4}
916	L _{A106}	L _{B4}
917	L _{A107}	L _{B4}
918	L _{A108}	L _{B4}
919	L _{A109}	L _{B4}
920	L _{A110}	L _{B4}
921	L _{A111}	L _{B4}
922	L _{A112}	L _{B4}
923	L _{A113}	L _{B4}
924	L _{A114}	L _{B4}
925	L _{A115}	L _{B4}
926	L _{A116}	L _{B4}
927	L _{A117}	L _{B4}
928	L _{A118}	L _{B4}
929	L _{A119}	L _{B4}
930	L _{A120}	L _{B4}
931	L _{A121}	L _{B4}
932	L _{A122}	L _{B4}
933	L _{A123}	L _{B4}
934	L _{A124}	L _{B4}
935	L _{A125}	L _{B4}
936	L _{A126}	L _{B4}
937	L _{A127}	L _{B4}
938	L _{A128}	L _{B4}
939	L _{A129}	L _{B4}
940	L _{A130}	L _{B4}
941	L _{A131}	L _{B4}
942	L _{A132}	L _{B4}
943	L _{A133}	L _{B4}
944	L _{A134}	L _{B4}
945	L _{A135}	L _{B4}
946	L _{A136}	L _{B4}
947	L _{A137}	L _{B4}
948	L _{A138}	L _{B4}
949	L _{A139}	L _{B4}
950	L _{A140}	L _{B4}
951	L _{A141}	L _{B4}
952	L _{A142}	L _{B4}
953	L _{A143}	L _{B4}
954	L _{A144}	L _{B4}
955	L _{A145}	L _{B4}
956	L _{A146}	L _{B4}
957	L _{A147}	L _{B4}
958	L _{A148}	L _{B4}
959	L _{A149}	L _{B4}
960	L _{A150}	L _{B4}
961	L _{A151}	L _{B4}
962	L _{A152}	L _{B4}
963	L _{A153}	L _{B4}
964	L _{A154}	L _{B4}
965	L _{A155}	L _{B4}
966	L _{A156}	L _{B4}
967	L _{A157}	L _{B4}
968	L _{A158}	L _{B4}
969	L _{A159}	L _{B4}
970	L _{A160}	L _{B4}
971	L _{A161}	L _{B4}
972	L _{A162}	L _{B4}
973	L _{A163}	L _{B4}
974	L _{A164}	L _{B4}
975	L _{A165}	L _{B4}
976	L _{A166}	L _{B4}
977	L _{A167}	L _{B4}
978	L _{A168}	L _{B4}
979	L _{A169}	L _{B4}
980	L _{A170}	L _{B4}

-continued

Compound Number	L _A	L _B
981	L _{A171}	L _{B4}
982	L _{A172}	L _{B4}
983	L _{A173}	L _{B4}
984	L _{A174}	L _{B4}
985	L _{A175}	L _{B4}
986	L _{A176}	L _{B4}
987	L _{A177}	L _{B4}
988	L _{A178}	L _{B4}
989	L _{A179}	L _{B4}
990	L _{A180}	L _{B4}
991	L _{A181}	L _{B4}
992	L _{A182}	L _{B4}
993	L _{A183}	L _{B4}
994	L _{A184}	L _{B4}
995	L _{A185}	L _{B4}
996	L _{A186}	L _{B4}
997	L _{A187}	L _{B4}
998	L _{A188}	L _{B4}
999	L _{A189}	L _{B4}
1000	L _{A190}	L _{B4}
1001	L _{A191}	L _{B4}
1002	L _{A192}	L _{B4}
1003	L _{A193}	L _{B4}
1004	L _{A194}	L _{B4}
1005	L _{A195}	L _{B4}
1006	L _{A196}	L _{B4}
1007	L _{A197}	L _{B4}
1008	L _{A198}	L _{B4}
1009	L _{A199}	L _{B4}
1010	L _{A200}	L _{B4}
1011	L _{A201}	L _{B4}
1012	L _{A202}	L _{B4}
1013	L _{A203}	L _{B4}
1014	L _{A204}	L _{B4}
1015	L _{A205}	L _{B4}
1016	L _{A206}	L _{B4}
1017	L _{A207}	L _{B4}
1018	L _{A208}	L _{B4}
1019	L _{A209}	L _{B4}
1020	L _{A210}	L _{B4}
1021	L _{A211}	L _{B4}
1022	L _{A212}	L _{B4}
1023	L _{A213}	L _{B4}
1024	L _{A214}	L _{B4}
1025	L _{A215}	L _{B4}
1026	L _{A216}	L _{B4}
1027	L _{A217}	L _{B4}
1028	L _{A218}	L _{B4}
1029	L _{A219}	L _{B4}
1030	L _{A220}	L _{B4}
1031	L _{A221}	L _{B4}
1032	L _{A222}	L _{B4}
1033	L _{A223}	L _{B4}
1034	L _{A224}	L _{B4}
1035	L _{A225}	L _{B4}
1036	L _{A226}	L _{B4}
1037	L _{A227}	L _{B4}
1038	L _{A228}	L _{B4}
1039	L _{A229}	L _{B4}
1040	L _{A230}	L _{B4}
1041	L _{A231}	L _{B4}
1042	L _{A232}	L _{B4}
1043	L _{A233}	L _{B4}
1044	L _{A234}	L _{B4}
1045	L _{A235}	L _{B4}
1046	L _{A236}	L _{B4}
1047	L _{A237}	L _{B4}
1048	L _{A238}	L _{B4}
1049	L _{A239}	L _{B4}
1050	L _{A240}	L _{B4}
1051	L _{A241}	L _{B4}
1052	L _{A242}	L _{B4}
1053	L _{A243}	L _{B4}

-continued

Compound Number	L _A	L _B
1054	L _{A244}	L _{B4}
1055	L _{A245}	L _{B4}
1056	L _{A246}	L _{B4}
1057	L _{A247}	L _{B4}
1058	L _{A248}	L _{B4}
1059	L _{A249}	L _{B4}
1060	L _{A250}	L _{B4}
1061	L _{A251}	L _{B4}
1062	L _{A252}	L _{B4}
1063	L _{A253}	L _{B4}
1064	L _{A254}	L _{B4}
1065	L _{A255}	L _{B4}
1066	L _{A256}	L _{B4}
1067	L _{A257}	L _{B4}
1068	L _{A258}	L _{B4}
1069	L _{A259}	L _{B4}
1070	L _{A260}	L _{B4}
1071	L _{A261}	L _{B4}
1072	L _{A262}	L _{B4}
1073	L _{A263}	L _{B4}
1074	L _{A264}	L _{B4}
1075	L _{A265}	L _{B4}
1076	L _{A266}	L _{B4}
1077	L _{A267}	L _{B4}
1078	L _{A268}	L _{B4}
1079	L _{A269}	L _{B4}
1080	L _{A270}	L _{B4}
1081	L _{A1}	L _{B5}
1082	L _{A2}	L _{B5}
1083	L _{A3}	L _{B5}
1084	L _{A4}	L _{B5}
1085	L _{A5}	L _{B5}
1086	L _{A6}	L _{B5}
1087	L _{A7}	L _{B5}
1088	L _{A8}	L _{B5}
1089	L _{A9}	L _{B5}
1090	L _{A10}	L _{B5}
1091	L _{A11}	L _{B5}
1092	L _{A12}	L _{B5}
1093	L _{A13}	L _{B5}
1094	L _{A14}	L _{B5}
1095	L _{A15}	L _{B5}
1096	L _{A16}	L _{B5}
1097	L _{A17}	L _{B5}
1098	L _{A18}	L _{B5}
1099	L _{A19}	L _{B5}
1100	L _{A20}	L _{B5}
1101	L _{A21}	L _{B5}
1102	L _{A22}	L _{B5}
1103	L _{A23}	L _{B5}
1104	L _{A24}	L _{B5}
1105	L _{A25}	L _{B5}
1106	L _{A26}	L _{B5}
1107	L _{A27}	L _{B5}
1108	L _{A28}	L _{B5}
1109	L _{A29}	L _{B5}
1110	L _{A30}	L _{B5}
1111	L _{A31}	L _{B5}
1112	L _{A32}	L _{B5}
1113	L _{A33}	L _{B5}
1114	L _{A34}	L _{B5}
1115	L _{A35}	L _{B5}
1116	L _{A36}	L _{B5}
1117	L _{A37}	L _{B5}
1118	L _{A38}	L _{B5}
1119	L _{A39}	L _{B5}
1120	L _{A40}	L _{B5}
1121	L _{A41}	L _{B5}
1122	L _{A42}	L _{B5}
1123	L _{A43}	L _{B5}
1124	L _{A44}	L _{B5}
1125	L _{A45}	L _{B5}
1126	L _{A46}	L _{B5}

-continued

Compound Number	L _A	L _B
1127	L _{A47}	L _{B5}
1128	L _{A48}	L _{B5}
1129	L _{A49}	L _{B5}
1130	L _{A50}	L _{B5}
1131	L _{A51}	L _{B5}
1132	L _{A52}	L _{B5}
1133	L _{A53}	L _{B5}
1134	L _{A54}	L _{B5}
1135	L _{A55}	L _{B5}
1136	L _{A56}	L _{B5}
1137	L _{A57}	L _{B5}
1138	L _{A58}	L _{B5}
1139	L _{A59}	L _{B5}
1140	L _{A60}	L _{B5}
1141	L _{A61}	L _{B5}
1142	L _{A62}	L _{B5}
1143	L _{A63}	L _{B5}
1144	L _{A64}	L _{B5}
1145	L _{A65}	L _{B5}
1146	L _{A66}	L _{B5}
1147	L _{A67}	L _{B5}
1148	L _{A68}	L _{B5}
1149	L _{A69}	L _{B5}
1150	L _{A70}	L _{B5}
1151	L _{A71}	L _{B5}
1152	L _{A72}	L _{B5}
1153	L _{A73}	L _{B5}
1154	L _{A74}	L _{B5}
1155	L _{A75}	L _{B5}
1156	L _{A76}	L _{B5}
1157	L _{A77}	L _{B5}
1158	L _{A78}	L _{B5}
1159	L _{A79}	L _{B5}
1160	L _{A80}	L _{B5}
1161	L _{A81}	L _{B5}
1162	L _{A82}	L _{B5}
1163	L _{A83}	L _{B5}
1164	L _{A84}	L _{B5}
1165	L _{A85}	L _{B5}
1166	L _{A86}	L _{B5}
1167	L _{A87}	L _{B5}
1168	L _{A88}	L _{B5}
1169	L _{A89}	L _{B5}
1170	L _{A90}	L _{B5}
1171	L _{A91}	L _{B5}
1172	L _{A92}	L _{B5}
1173	L _{A93}	L _{B5}
1174	L _{A94}	L _{B5}
1175	L _{A95}	L _{B5}
1176	L _{A96}	L _{B5}
1177	L _{A97}	L _{B5}
1178	L _{A98}	L _{B5}
1179	L _{A99}	L _{B5}
1180	L _{A100}	L _{B5}
1181	L _{A101}	L _{B5}
1182	L _{A102}	L _{B5}
1183	L _{A103}	L _{B5}
1184	L _{A104}	L _{B5}
1185	L _{A105}	L _{B5}
1186	L _{A106}	L _{B5}
1187	L _{A107}	L _{B5}
1188	L _{A108}	L _{B5}
1189	L _{A109}	L _{B5}
1190	L _{A110}	L _{B5}
1191	L _{A111}	L _{B5}
1192	L _{A112}	L _{B5}
1193	L _{A113}	L _{B5}
1194	L _{A114}	L _{B5}
1195	L _{A115}	L _{B5}
1196	L _{A116}	L _{B5}
1197	L _{A117}	L _{B5}
1198	L _{A118}	L _{B5}
1199	L _{A119}	L _{B5}

-continued

Compound Number	L _A	L _B
1200	L _{A120}	L _{B5}
1201	L _{A121}	L _{B5}
1202	L _{A122}	L _{B5}
1203	L _{A123}	L _{B5}
1204	L _{A124}	L _{B5}
1205	L _{A125}	L _{B5}
1206	L _{A126}	L _{B5}
1207	L _{A127}	L _{B5}
1208	L _{A128}	L _{B5}
1209	L _{A129}	L _{B5}
1210	L _{A130}	L _{B5}
1211	L _{A131}	L _{B5}
1212	L _{A132}	L _{B5}
1213	L _{A133}	L _{B5}
1214	L _{A134}	L _{B5}
1215	L _{A135}	L _{B5}
1216	L _{A136}	L _{B5}
1217	L _{A137}	L _{B5}
1218	L _{A138}	L _{B5}
1219	L _{A139}	L _{B5}
1220	L _{A140}	L _{B5}
1221	L _{A141}	L _{B5}
1222	L _{A142}	L _{B5}
1223	L _{A143}	L _{B5}
1224	L _{A144}	L _{B5}
1225	L _{A145}	L _{B5}
1226	L _{A146}	L _{B5}
1227	L _{A147}	L _{B5}
1228	L _{A148}	L _{B5}
1229	L _{A149}	L _{B5}
1230	L _{A150}	L _{B5}
1231	L _{A151}	L _{B5}
1232	L _{A152}	L _{B5}
1233	L _{A153}	L _{B5}
1234	L _{A154}	L _{B5}
1235	L _{A155}	L _{B5}
1236	L _{A156}	L _{B5}
1237	L _{A157}	L _{B5}
1238	L _{A158}	L _{B5}
1239	L _{A159}	L _{B5}
1240	L _{A160}	L _{B5}
1241	L _{A161}	L _{B5}
1242	L _{A162}	L _{B5}
1243	L _{A163}	L _{B5}
1244	L _{A164}	L _{B5}
1245	L _{A165}	L _{B5}
1246	L _{A166}	L _{B5}
1247	L _{A167}	L _{B5}
1248	L _{A168}	L _{B5}
1249	L _{A169}	L _{B5}
1250	L _{A170}	L _{B5}
1251	L _{A171}	L _{B5}
1252	L _{A172}	L _{B5}
1253	L _{A173}	L _{B5}
1254	L _{A174}	L _{B5}
1255	L _{A175}	L _{B5}
1256	L _{A176}	L _{B5}
1257	L _{A177}	L _{B5}
1258	L _{A178}	L _{B5}
1259	L _{A179}	L _{B5}
1260	L _{A180}	L _{B5}
1261	L _{A181}	L _{B5}
1262	L _{A182}	L _{B5}
1263	L _{A183}	L _{B5}
1264	L _{A184}	L _{B5}
1265	L _{A185}	L _{B5}
1266	L _{A186}	L _{B5}
1267	L _{A187}	L _{B5}
1268	L _{A188}	L _{B5}
1269	L _{A189}	L _{B5}
1270	L _{A190}	L _{B5}
1271	L _{A191}	L _{B5}
1272	L _{A192}	L _{B5}

-continued

Compound Number	L _A	L _B
1273	L _{A193}	L _{B5}
1274	L _{A194}	L _{B5}
1275	L _{A195}	L _{B5}
1276	L _{A196}	L _{B5}
1277	L _{A197}	L _{B5}
1278	L _{A198}	L _{B5}
1279	L _{A199}	L _{B5}
1280	L _{A200}	L _{B5}
1281	L _{A201}	L _{B5}
1282	L _{A202}	L _{B5}
1283	L _{A203}	L _{B5}
1284	L _{A204}	L _{B5}
1285	L _{A205}	L _{B5}
1286	L _{A206}	L _{B5}
1287	L _{A207}	L _{B5}
1288	L _{A208}	L _{B5}
1289	L _{A209}	L _{B5}
1290	L _{A210}	L _{B5}
1291	L _{A211}	L _{B5}
1292	L _{A212}	L _{B5}
1293	L _{A213}	L _{B5}
1294	L _{A214}	L _{B5}
1295	L _{A215}	L _{B5}
1296	L _{A216}	L _{B5}
1297	L _{A217}	L _{B5}
1298	L _{A218}	L _{B5}
1299	L _{A219}	L _{B5}
1300	L _{A220}	L _{B5}
1301	L _{A221}	L _{B5}
1302	L _{A222}	L _{B5}
1303	L _{A223}	L _{B5}
1304	L _{A224}	L _{B5}
1305	L _{A225}	L _{B5}
1306	L _{A226}	L _{B5}
1307	L _{A227}	L _{B5}
1308	L _{A228}	L _{B5}
1309	L _{A229}	L _{B5}
1310	L _{A230}	L _{B5}
1311	L _{A231}	L _{B5}
1312	L _{A232}	L _{B5}
1313	L _{A233}	L _{B5}
1314	L _{A234}	L _{B5}
1315	L _{A235}	L _{B5}
1316	L _{A236}	L _{B5}
1317	L _{A237}	L _{B5}
1318	L _{A238}	L _{B5}
1319	L _{A239}	L _{B5}
1320	L _{A240}	L _{B5}
1321	L _{A241}	L _{B5}
1322	L _{A242}	L _{B5}
1323	L _{A243}	L _{B5}
1324	L _{A244}	L _{B5}
1325	L _{A245}	L _{B5}
1326	L _{A246}	L _{B5}
1327	L _{A247}	L _{B5}
1328	L _{A248}	L _{B5}
1329	L _{A249}	L _{B5}
1330	L _{A250}	L _{B5}
1331	L _{A251}	L _{B5}
1332	L _{A252}	L _{B5}
1333	L _{A253}	L _{B5}
1334	L _{A254}	L _{B5}
1335	L _{A255}	L _{B5}
1336	L _{A256}	L _{B5}
1337	L _{A257}	L _{B5}
1338	L _{A258}	L _{B5}
1339	L _{A259}	L _{B5}
1340	L _{A260}	L _{B5}
1341	L _{A261}	L _{B5}
1342	L _{A262}	L _{B5}
1343	L _{A263}	L _{B5}
1344	L _{A264}	L _{B5}
1345	L _{A265}	L _{B5}

-continued

Compound Number	L _A	L _B
1346	L _{A266}	L _{B5}
1347	L _{A267}	L _{B5}
1348	L _{A268}	L _{B5}
1349	L _{A269}	L _{B5}
1350	L _{A270}	L _{B5}
1351	L _{A1}	L _{B6}
1352	L _{A2}	L _{B6}
1353	L _{A3}	L _{B6}
1354	L _{A4}	L _{B6}
1355	L _{A5}	L _{B6}
1356	L _{A6}	L _{B6}
1357	L _{A7}	L _{B6}
1358	L _{A8}	L _{B6}
1359	L _{A9}	L _{B6}
1360	L _{A10}	L _{B6}
1361	L _{A11}	L _{B6}
1362	L _{A12}	L _{B6}
1363	L _{A13}	L _{B6}
1364	L _{A14}	L _{B6}
1365	L _{A15}	L _{B6}
1366	L _{A16}	L _{B6}
1367	L _{A17}	L _{B6}
1368	L _{A18}	L _{B6}
1369	L _{A19}	L _{B6}
1370	L _{A20}	L _{B6}
1371	L _{A21}	L _{B6}
1372	L _{A22}	L _{B6}
1373	L _{A23}	L _{B6}
1374	L _{A24}	L _{B6}
1375	L _{A25}	L _{B6}
1376	L _{A26}	L _{B6}
1377	L _{A27}	L _{B6}
1378	L _{A28}	L _{B6}
1379	L _{A29}	L _{B6}
1380	L _{A30}	L _{B6}
1381	L _{A31}	L _{B6}
1382	L _{A32}	L _{B6}
1383	L _{A33}	L _{B6}
1384	L _{A34}	L _{B6}
1385	L _{A35}	L _{B6}
1386	L _{A36}	L _{B6}
1387	L _{A37}	L _{B6}
1388	L _{A38}	L _{B6}
1389	L _{A39}	L _{B6}
1390	L _{A40}	L _{B6}
1391	L _{A41}	L _{B6}
1392	L _{A42}	L _{B6}
1393	L _{A43}	L _{B6}
1394	L _{A44}	L _{B6}
1395	L _{A45}	L _{B6}
1396	L _{A46}	L _{B6}
1397	L _{A47}	L _{B6}
1398	L _{A48}	L _{B6}
1399	L _{A49}	L _{B6}
1400	L _{A50}	L _{B6}
1401	L _{A51}	L _{B6}
1402	L _{A52}	L _{B6}
1403	L _{A53}	L _{B6}
1404	L _{A54}	L _{B6}
1405	L _{A55}	L _{B6}
1406	L _{A56}	L _{B6}
1407	L _{A57}	L _{B6}
1408	L _{A58}	L _{B6}
1409	L _{A59}	L _{B6}
1410	L _{A60}	L _{B6}
1411	L _{A61}	L _{B6}
1412	L _{A62}	L _{B6}
1413	L _{A63}	L _{B6}
1414	L _{A64}	L _{B6}
1415	L _{A65}	L _{B6}
1416	L _{A66}	L _{B6}
1417	L _{A67}	L _{B6}
1418	L _{A68}	L _{B6}

-continued

Compound Number	L _A	L _B
1419	L _{A69}	L _{B6}
1420	L _{A70}	L _{B6}
1421	L _{A71}	L _{B6}
1422	L _{A72}	L _{B6}
1423	L _{A73}	L _{B6}
1424	L _{A74}	L _{B6}
1425	L _{A75}	L _{B6}
1426	L _{A76}	L _{B6}
1427	L _{A77}	L _{B6}
1428	L _{A78}	L _{B6}
1429	L _{A79}	L _{B6}
1430	L _{A80}	L _{B6}
1431	L _{A81}	L _{B6}
1432	L _{A82}	L _{B6}
1433	L _{A83}	L _{B6}
1434	L _{A84}	L _{B6}
1435	L _{A85}	L _{B6}
1436	L _{A86}	L _{B6}
1437	L _{A87}	L _{B6}
1438	L _{A88}	L _{B6}
1439	L _{A89}	L _{B6}
1440	L _{A90}	L _{B6}
1441	L _{A91}	L _{B6}
1442	L _{A92}	L _{B6}
1443	L _{A93}	L _{B6}
1444	L _{A94}	L _{B6}
1445	L _{A95}	L _{B6}
1446	L _{A96}	L _{B6}
1447	L _{A97}	L _{B6}
1448	L _{A98}	L _{B6}
1449	L _{A99}	L _{B6}
1450	L _{A100}	L _{B6}
1451	L _{A101}	L _{B6}
1452	L _{A102}	L _{B6}
1453	L _{A103}	L _{B6}
1454	L _{A104}	L _{B6}
1455	L _{A105}	L _{B6}
1456	L _{A106}	L _{B6}
1457	L _{A107}	L _{B6}
1458	L _{A108}	L _{B6}
1459	L _{A109}	L _{B6}
1460	L _{A110}	L _{B6}
1461	L _{A111}	L _{B6}
1462	L _{A112}	L _{B6}
1463	L _{A113}	L _{B6}
1464	L _{A114}	L _{B6}
1465	L _{A115}	L _{B6}
1466	L _{A116}	L _{B6}
1467	L _{A117}	L _{B6}
1468	L _{A118}	L _{B6}
1469	L _{A119}	L _{B6}
1470	L _{A120}	L _{B6}
1471	L _{A121}	L _{B6}
1472	L _{A122}	L _{B6}
1473	L _{A123}	L _{B6}
1474	L _{A124}	L _{B6}
1475	L _{A125}	L _{B6}
1476	L _{A126}	L _{B6}
1477	L _{A127}	L _{B6}
1478	L _{A128}	L _{B6}
1479	L _{A129}	L _{B6}
1480	L _{A130}	L _{B6}
1481	L _{A131}	L _{B6}
1482	L _{A132}	L _{B6}
1483	L _{A133}	L _{B6}
1484	L _{A134}	L _{B6}
1485	L _{A135}	L _{B6}
1486	L _{A136}	L _{B6}
1487	L _{A137}	L _{B6}
1488	L _{A138}	L _{B6}
1489	L _{A139}	L _{B6}
1490	L _{A140}	L _{B6}
1491	L _{A141}	L _{B6}

-continued

Compound Number	L _A	L _B
1492	L _{A142}	L _{B6}
1493	L _{A143}	L _{B6}
1494	L _{A144}	L _{B6}
1495	L _{A145}	L _{B6}
1496	L _{A146}	L _{B6}
1497	L _{A147}	L _{B6}
1498	L _{A148}	L _{B6}
1499	L _{A149}	L _{B6}
1500	L _{A150}	L _{B6}
1501	L _{A151}	L _{B6}
1502	L _{A152}	L _{B6}
1503	L _{A153}	L _{B6}
1504	L _{A154}	L _{B6}
1505	L _{A155}	L _{B6}
1506	L _{A156}	L _{B6}
1507	L _{A157}	L _{B6}
1508	L _{A158}	L _{B6}
1509	L _{A159}	L _{B6}
1510	L _{A160}	L _{B6}
1511	L _{A161}	L _{B6}
1512	L _{A162}	L _{B6}
1513	L _{A163}	L _{B6}
1514	L _{A164}	L _{B6}
1515	L _{A165}	L _{B6}
1516	L _{A166}	L _{B6}
1517	L _{A167}	L _{B6}
1518	L _{A168}	L _{B6}
1519	L _{A169}	L _{B6}
1520	L _{A170}	L _{B6}
1521	L _{A171}	L _{B6}
1522	L _{A172}	L _{B6}
1523	L _{A173}	L _{B6}
1524	L _{A174}	L _{B6}
1525	L _{A175}	L _{B6}
1526	L _{A176}	L _{B6}
1527	L _{A177}	L _{B6}
1528	L _{A178}	L _{B6}
1529	L _{A179}	L _{B6}
1530	L _{A180}	L _{B6}
1531	L _{A181}	L _{B6}
1532	L _{A182}	L _{B6}
1533	L _{A183}	L _{B6}
1534	L _{A184}	L _{B6}
1535	L _{A185}	L _{B6}
1536	L _{A186}	L _{B6}
1537	L _{A187}	L _{B6}
1538	L _{A188}	L _{B6}
1539	L _{A189}	L _{B6}
1540	L _{A190}	L _{B6}
1541	L _{A191}	L _{B6}
1542	L _{A192}	L _{B6}
1543	L _{A193}	L _{B6}
1544	L _{A194}	L _{B6}
1545	L _{A195}	L _{B6}
1546	L _{A196}	L _{B6}
1547	L _{A197}	L _{B6}
1548	L _{A198}	L _{B6}
1549	L _{A199}	L _{B6}
1550	L _{A200}	L _{B6}
1551	L _{A201}	L _{B6}
1552	L _{A202}	L _{B6}
1553	L _{A203}	L _{B6}
1554	L _{A204}	L _{B6}
1555	L _{A205}	L _{B6}
1556	L _{A206}	L _{B6}
1557	L _{A207}	L _{B6}
1558	L _{A208}	L _{B6}
1559	L _{A209}	L _{B6}
1560	L _{A210}	L _{B6}
1561	L _{A211}	L _{B6}
1562	L _{A212}	L _{B6}
1563	L _{A213}	L _{B6}
1564	L _{A214}	L _{B6}

-continued

Compound Number	L _A	L _B
1565	L _{A215}	L _{B6}
1566	L _{A216}	L _{B6}
1567	L _{A217}	L _{B6}
1568	L _{A218}	L _{B6}
1569	L _{A219}	L _{B6}
1570	L _{A220}	L _{B6}
1571	L _{A221}	L _{B6}
1572	L _{A222}	L _{B6}
1573	L _{A223}	L _{B6}
1574	L _{A224}	L _{B6}
1575	L _{A225}	L _{B6}
1576	L _{A226}	L _{B6}
1577	L _{A227}	L _{B6}
1578	L _{A228}	L _{B6}
1579	L _{A229}	L _{B6}
1580	L _{A230}	L _{B6}
1581	L _{A231}	L _{B6}
1582	L _{A232}	L _{B6}
1583	L _{A233}	L _{B6}
1584	L _{A234}	L _{B6}
1585	L _{A235}	L _{B6}
1586	L _{A236}	L _{B6}
1587	L _{A237}	L _{B6}
1588	L _{A238}	L _{B6}
1589	L _{A239}	L _{B6}
1590	L _{A240}	L _{B6}
1591	L _{A241}	L _{B6}
1592	L _{A242}	L _{B6}
1593	L _{A243}	L _{B6}
1594	L _{A244}	L _{B6}
1595	L _{A245}	L _{B6}
1596	L _{A246}	L _{B6}
1597	L _{A247}	L _{B6}
1598	L _{A248}	L _{B6}
1599	L _{A249}	L _{B6}
1600	L _{A250}	L _{B6}
1601	L _{A251}	L _{B6}
1602	L _{A252}	L _{B6}
1603	L _{A253}	L _{B6}
1604	L _{A254}	L _{B6}
1605	L _{A255}	L _{B6}
1606	L _{A256}	L _{B6}
1607	L _{A257}	L _{B6}
1608	L _{A258}	L _{B6}
1609	L _{A259}	L _{B6}
1610	L _{A260}	L _{B6}
1611	L _{A261}	L _{B6}
1612	L _{A262}	L _{B6}
1613	L _{A263}	L _{B6}
1614	L _{A264}	L _{B6}
1615	L _{A265}	L _{B6}
1616	L _{A266}	L _{B6}
1617	L _{A267}	L _{B6}
1618	L _{A268}	L _{B6}
1619	L _{A269}	L _{B6}
1620	L _{A270}	L _{B6}
1621	L _{A1}	L _{B7}
1622	L _{A2}	L _{B7}
1623	L _{A3}	L _{B7}
1624	L _{A4}	L _{B7}
1625	L _{A5}	L _{B7}
1626	L _{A6}	L _{B7}
1627	L _{A7}	L _{B7}
1628	L _{A8}	L _{B7}
1629	L _{A9}	L _{B7}
1630	L _{A10}	L _{B7}
1631	L _{A11}	L _{B7}
1632	L _{A12}	L _{B7}
1633	L _{A13}	L _{B7}
1634	L _{A14}	L _{B7}
1635	L _{A15}	L _{B7}
1636	L _{A16}	L _{B7}
1637	L _{A17}	L _{B7}

-continued

Compound Number	L _A	L _B
1638	L _{A18}	L _{B7}
1639	L _{A19}	L _{B7}
1640	L _{A20}	L _{B7}
1641	L _{A21}	L _{B7}
1642	L _{A22}	L _{B7}
1643	L _{A23}	L _{B7}
1644	L _{A24}	L _{B7}
1645	L _{A25}	L _{B7}
1646	L _{A26}	L _{B7}
1647	L _{A27}	L _{B7}
1648	L _{A28}	L _{B7}
1649	L _{A29}	L _{B7}
1650	L _{A30}	L _{B7}
1651	L _{A31}	L _{B7}
1652	L _{A32}	L _{B7}
1653	L _{A33}	L _{B7}
1654	L _{A34}	L _{B7}
1655	L _{A35}	L _{B7}
1656	L _{A36}	L _{B7}
1657	L _{A37}	L _{B7}
1658	L _{A38}	L _{B7}
1659	L _{A39}	L _{B7}
1660	L _{A40}	L _{B7}
1661	L _{A41}	L _{B7}
1662	L _{A42}	L _{B7}
1663	L _{A43}	L _{B7}
1664	L _{A44}	L _{B7}
1665	L _{A45}	L _{B7}
1666	L _{A46}	L _{B7}
1667	L _{A47}	L _{B7}
1668	L _{A48}	L _{B7}
1669	L _{A49}	L _{B7}
1670	L _{A50}	L _{B7}
1671	L _{A51}	L _{B7}
1672	L _{A52}	L _{B7}
1673	L _{A53}	L _{B7}
1674	L _{A54}	L _{B7}
1675	L _{A55}	L _{B7}
1676	L _{A56}	L _{B7}
1677	L _{A57}	L _{B7}
1678	L _{A58}	L _{B7}
1679	L _{A59}	L _{B7}
1680	L _{A60}	L _{B7}
1681	L _{A61}	L _{B7}
1682	L _{A62}	L _{B7}
1683	L _{A63}	L _{B7}
1684	L _{A64}	L _{B7}
1685	L _{A65}	L _{B7}
1686	L _{A66}	L _{B7}
1687	L _{A67}	L _{B7}
1688	L _{A68}	L _{B7}
1689	L _{A69}	L _{B7}
1690	L _{A70}	L _{B7}
1691	L _{A71}	L _{B7}
1692	L _{A72}	L _{B7}
1693	L _{A73}	L _{B7}
1694	L _{A74}	L _{B7}
1695	L _{A75}	L _{B7}
1696	L _{A76}	L _{B7}
1697	L _{A77}	L _{B7}
1698	L _{A78}	L _{B7}
1699	L _{A79}	L _{B7}
1700	L _{A80}	L _{B7}
1701	L _{A81}	L _{B7}
1702	L _{A82}	L _{B7}
1703	L _{A83}	L _{B7}
1704	L _{A84}	L _{B7}
1705	L _{A85}	L _{B7}
1706	L _{A86}	L _{B7}
1707	L _{A87}	L _{B7}
1708	L _{A88}	L _{B7}
1709	L _{A89}	L _{B7}
1710	L _{A90}	L _{B7}

-continued

Compound Number	L _A	L _B
1711	L _{A91}	L _{B7}
1712	L _{A92}	L _{B7}
1713	L _{A93}	L _{B7}
1714	L _{A94}	L _{B7}
1715	L _{A95}	L _{B7}
1716	L _{A96}	L _{B7}
1717	L _{A97}	L _{B7}
1718	L _{A98}	L _{B7}
1719	L _{A99}	L _{B7}
1720	L _{A100}	L _{B7}
1721	L _{A101}	L _{B7}
1722	L _{A102}	L _{B7}
1723	L _{A103}	L _{B7}
1724	L _{A104}	L _{B7}
1725	L _{A105}	L _{B7}
1726	L _{A106}	L _{B7}
1727	L _{A107}	L _{B7}
1728	L _{A108}	L _{B7}
1729	L _{A109}	L _{B7}
1730	L _{A110}	L _{B7}
1731	L _{A111}	L _{B7}
1732	L _{A112}	L _{B7}
1733	L _{A113}	L _{B7}
1734	L _{A114}	L _{B7}
1735	L _{A115}	L _{B7}
1736	L _{A116}	L _{B7}
1737	L _{A117}	L _{B7}
1738	L _{A118}	L _{B7}
1739	L _{A119}	L _{B7}
1740	L _{A120}	L _{B7}
1741	L _{A121}	L _{B7}
1742	L _{A122}	L _{B7}
1743	L _{A123}	L _{B7}
1744	L _{A124}	L _{B7}
1745	L _{A125}	L _{B7}
1746	L _{A126}	L _{B7}
1747	L _{A127}	L _{B7}
1748	L _{A128}	L _{B7}
1749	L _{A129}	L _{B7}
1750	L _{A130}	L _{B7}
1751	L _{A131}	L _{B7}
1752	L _{A132}	L _{B7}
1753	L _{A133}	L _{B7}
1754	L _{A134}	L _{B7}
1755	L _{A135}	L _{B7}
1756	L _{A136}	L _{B7}
1757	L _{A137}	L _{B7}
1758	L _{A138}	L _{B7}
1759	L _{A139}	L _{B7}
1760	L _{A140}	L _{B7}
1761	L _{A141}	L _{B7}
1762	L _{A142}	L _{B7}
1763	L _{A143}	L _{B7}
1764	L _{A144}	L _{B7}
1765	L _{A145}	L _{B7}
1766	L _{A146}	L _{B7}
1767	L _{A147}	L _{B7}
1768	L _{A148}	L _{B7}
1769	L _{A149}	L _{B7}
1770	L _{A150}	L _{B7}
1771	L _{A151}	L _{B7}
1772	L _{A152}	L _{B7}
1773	L _{A153}	L _{B7}
1774	L _{A154}	L _{B7}
1775	L _{A155}	L _{B7}
1776	L _{A156}	L _{B7}
1777	L _{A157}	L _{B7}
1778	L _{A158}	L _{B7}
1779	L _{A159}	L _{B7}
1780	L _{A160}	L _{B7}
1781	L _{A161}	L _{B7}
1782	L _{A162}	L _{B7}
1783	L _{A163}	L _{B7}

-continued

Compound Number	L _A	L _B
1784	L _{A164}	L _{B7}
1785	L _{A165}	L _{B7}
1786	L _{A166}	L _{B7}
1787	L _{A167}	L _{B7}
1788	L _{A168}	L _{B7}
1789	L _{A169}	L _{B7}
1790	L _{A170}	L _{B7}
1791	L _{A171}	L _{B7}
1792	L _{A172}	L _{B7}
1793	L _{A173}	L _{B7}
1794	L _{A174}	L _{B7}
1795	L _{A175}	L _{B7}
1796	L _{A176}	L _{B7}
1797	L _{A177}	L _{B7}
1798	L _{A178}	L _{B7}
1799	L _{A179}	L _{B7}
1800	L _{A180}	L _{B7}
1801	L _{A181}	L _{B7}
1802	L _{A182}	L _{B7}
1803	L _{A183}	L _{B7}
1804	L _{A184}	L _{B7}
1805	L _{A185}	L _{B7}
1806	L _{A186}	L _{B7}
1807	L _{A187}	L _{B7}
1808	L _{A188}	L _{B7}
1809	L _{A189}	L _{B7}
1810	L _{A190}	L _{B7}
1811	L _{A191}	L _{B7}
1812	L _{A192}	L _{B7}
1813	L _{A193}	L _{B7}
1814	L _{A194}	L _{B7}
1815	L _{A195}	L _{B7}
1816	L _{A196}	L _{B7}
1817	L _{A197}	L _{B7}
1818	L _{A198}	L _{B7}
1819	L _{A199}	L _{B7}
1820	L _{A200}	L _{B7}
1821	L _{A201}	L _{B7}
1822	L _{A202}	L _{B7}
1823	L _{A203}	L _{B7}
1824	L _{A204}	L _{B7}
1825	L _{A205}	L _{B7}
1826	L _{A206}	L _{B7}
1827	L _{A207}	L _{B7}
1828	L _{A208}	L _{B7}
1829	L _{A209}	L _{B7}
1830	L _{A210}	L _{B7}
1831	L _{A211}	L _{B7}
1832	L _{A212}	L _{B7}
1833	L _{A213}	L _{B7}
1834	L _{A214}	L _{B7}
1835	L _{A215}	L _{B7}
1836	L _{A216}	L _{B7}
1837	L _{A217}	L _{B7}
1838	L _{A218}	L _{B7}
1839	L _{A219}	L _{B7}
1840	L _{A220}	L _{B7}
1841	L _{A221}	L _{B7}
1842	L _{A222}	L _{B7}
1843	L _{A223}	L _{B7}
1844	L _{A224}	L _{B7}
1845	L _{A225}	L _{B7}
1846	L _{A226}	L _{B7}
1847	L _{A227}	L _{B7}
1848	L _{A228}	L _{B7}
1849	L _{A229}	L _{B7}
1850	L _{A230}	L _{B7}
1851	L _{A231}	L _{B7}
1852	L _{A232}	L _{B7}
1853	L _{A233}	L _{B7}
1854	L _{A234}	L _{B7}
1855	L _{A235}	L _{B7}
1856	L _{A236}	L _{B7}

-continued

Compound Number	L _A	L _B
1857	L _{A237}	L _{B7}
1858	L _{A238}	L _{B7}
1859	L _{A239}	L _{B7}
1860	L _{A240}	L _{B7}
1861	L _{A241}	L _{B7}
1862	L _{A242}	L _{B7}
1863	L _{A243}	L _{B7}
1864	L _{A244}	L _{B7}
1865	L _{A245}	L _{B7}
1866	L _{A246}	L _{B7}
1867	L _{A247}	L _{B7}
1868	L _{A248}	L _{B7}
1869	L _{A249}	L _{B7}
1870	L _{A250}	L _{B7}
1871	L _{A251}	L _{B7}
1872	L _{A252}	L _{B7}
1873	L _{A253}	L _{B7}
1874	L _{A254}	L _{B7}
1875	L _{A255}	L _{B7}
1876	L _{A256}	L _{B7}
1877	L _{A257}	L _{B7}
1878	L _{A258}	L _{B7}
1879	L _{A259}	L _{B7}
1880	L _{A260}	L _{B7}
1881	L _{A261}	L _{B7}
1882	L _{A262}	L _{B7}
1883	L _{A263}	L _{B7}
1884	L _{A264}	L _{B7}
1885	L _{A265}	L _{B7}
1886	L _{A266}	L _{B7}
1887	L _{A267}	L _{B7}
1888	L _{A268}	L _{B7}
1889	L _{A269}	L _{B7}
1890	L _{A270}	L _{B7}
1891	L _{A1}	L _{B8}
1892	L _{A2}	L _{B8}
1893	L _{A3}	L _{B8}
1894	L _{A4}	L _{B8}
1895	L _{A5}	L _{B8}
1896	L _{A6}	L _{B8}
1897	L _{A7}	L _{B8}
1898	L _{A8}	L _{B8}
1899	L _{A9}	L _{B8}
1900	L _{A10}	L _{B8}
1901	L _{A11}	L _{B8}
1902	L _{A12}	L _{B8}
1903	L _{A13}	L _{B8}
1904	L _{A14}	L _{B8}
1905	L _{A15}	L _{B8}
1906	L _{A16}	L _{B8}
1907	L _{A17}	L _{B8}
1908	L _{A18}	L _{B8}
1909	L _{A19}	L _{B8}
1910	L _{A20}	L _{B8}
1911	L _{A21}	L _{B8}
1912	L _{A22}	L _{B8}
1913	L _{A23}	L _{B8}
1914	L _{A24}	L _{B8}
1915	L _{A25}	L _{B8}
1916	L _{A26}	L _{B8}
1917	L _{A27}	L _{B8}
1918	L _{A28}	L _{B8}
1919	L _{A29}	L _{B8}
1920	L _{A30}	L _{B8}
1921	L _{A31}	L _{B8}
1922	L _{A32}	L _{B8}
1923	L _{A33}	L _{B8}
1924	L _{A34}	L _{B8}
1925	L _{A35}	L _{B8}
1926	L _{A36}	L _{B8}
1927	L _{A37}	L _{B8}
1928	L _{A38}	L _{B8}
1929	L _{A39}	L _{B8}

-continued

Compound Number	L _A	L _B
1930	L _{A40}	L _{B8}
1931	L _{A41}	L _{B8}
1932	L _{A42}	L _{B8}
1933	L _{A43}	L _{B8}
1934	L _{A44}	L _{B8}
1935	L _{A45}	L _{B8}
1936	L _{A46}	L _{B8}
1937	L _{A47}	L _{B8}
1938	L _{A48}	L _{B8}
1939	L _{A49}	L _{B8}
1940	L _{A50}	L _{B8}
1941	L _{A51}	L _{B8}
1942	L _{A52}	L _{B8}
1943	L _{A53}	L _{B8}
1944	L _{A54}	L _{B8}
1945	L _{A55}	L _{B8}
1946	L _{A56}	L _{B8}
1947	L _{A57}	L _{B8}
1948	L _{A58}	L _{B8}
1949	L _{A59}	L _{B8}
1950	L _{A60}	L _{B8}
1951	L _{A61}	L _{B8}
1952	L _{A62}	L _{B8}
1953	L _{A63}	L _{B8}
1954	L _{A64}	L _{B8}
1955	L _{A65}	L _{B8}
1956	L _{A66}	L _{B8}
1957	L _{A67}	L _{B8}
1958	L _{A68}	L _{B8}
1959	L _{A69}	L _{B8}
1960	L _{A70}	L _{B8}
1961	L _{A71}	L _{B8}
1962	L _{A72}	L _{B8}
1963	L _{A73}	L _{B8}
1964	L _{A74}	L _{B8}
1965	L _{A75}	L _{B8}
1966	L _{A76}	L _{B8}
1967	L _{A77}	L _{B8}
1968	L _{A78}	L _{B8}
1969	L _{A79}	L _{B8}
1970	L _{A80}	L _{B8}
1971	L _{A81}	L _{B8}
1972	L _{A82}	L _{B8}
1973	L _{A83}	L _{B8}
1974	L _{A84}	L _{B8}
1975	L _{A85}	L _{B8}
1976	L _{A86}	L _{B8}
1977	L _{A87}	L _{B8}
1978	L _{A88}	L _{B8}
1979	L _{A89}	L _{B8}
1980	L _{A90}	L _{B8}
1981	L _{A91}	L _{B8}
1982	L _{A92}	L _{B8}
1983	L _{A93}	L _{B8}
1984	L _{A94}	L _{B8}
1985	L _{A95}	L _{B8}
1986	L _{A96}	L _{B8}
1987	L _{A97}	L _{B8}
1988	L _{A98}	L _{B8}
1989	L _{A99}	L _{B8}
1990	L _{A100}	L _{B8}
1991	L _{A101}	L _{B8}
1992	L _{A102}	L _{B8}
1993	L _{A103}	L _{B8}
1994	L _{A104}	L _{B8}
1995	L _{A105}	L _{B8}
1996	L _{A106}	L _{B8}
1997	L _{A107}	L _{B8}
1998	L _{A108}	L _{B8}
1999	L _{A109}	L _{B8}
2000	L _{A110}	L _{B8}
2001	L _{A111}	L _{B8}
2002	L _{A112}	L _{B8}

-continued

Compound Number	L _A	L _B
2003	L _{A113}	L _{B8}
2004	L _{A114}	L _{B8}
2005	L _{A115}	L _{B8}
2006	L _{A116}	L _{B8}
2007	L _{A117}	L _{B8}
2008	L _{A118}	L _{B8}
2009	L _{A119}	L _{B8}
2010	L _{A120}	L _{B8}
2011	L _{A121}	L _{B8}
2012	L _{A122}	L _{B8}
2013	L _{A123}	L _{B8}
2014	L _{A124}	L _{B8}
2015	L _{A125}	L _{B8}
2016	L _{A126}	L _{B8}
2017	L _{A127}	L _{B8}
2018	L _{A128}	L _{B8}
2019	L _{A129}	L _{B8}
2020	L _{A130}	L _{B8}
2021	L _{A131}	L _{B8}
2022	L _{A132}	L _{B8}
2023	L _{A133}	L _{B8}
2024	L _{A134}	L _{B8}
2025	L _{A135}	L _{B8}
2026	L _{A136}	L _{B8}
2027	L _{A137}	L _{B8}
2028	L _{A138}	L _{B8}
2029	L _{A139}	L _{B8}
2030	L _{A140}	L _{B8}
2031	L _{A141}	L _{B8}
2032	L _{A142}	L _{B8}
2033	L _{A143}	L _{B8}
2034	L _{A144}	L _{B8}
2035	L _{A145}	L _{B8}
2036	L _{A146}	L _{B8}
2037	L _{A147}	L _{B8}
2038	L _{A148}	L _{B8}
2039	L _{A149}	L _{B8}
2040	L _{A150}	L _{B8}
2041	L _{A151}	L _{B8}
2042	L _{A152}	L _{B8}
2043	L _{A153}	L _{B8}
2044	L _{A154}	L _{B8}
2045	L _{A155}	L _{B8}
2046	L _{A156}	L _{B8}
2047	L _{A157}	L _{B8}
2048	L _{A158}	L _{B8}
2049	L _{A159}	L _{B8}
2050	L _{A160}	L _{B8}
2051	L _{A161}	L _{B8}
2052	L _{A162}	L _{B8}
2053	L _{A163}	L _{B8}
2054	L _{A164}	L _{B8}
2055	L _{A165}	L _{B8}
2056	L _{A166}	L _{B8}
2057	L _{A167}	L _{B8}
2058	L _{A168}	L _{B8}
2059	L _{A169}	L _{B8}
2060	L _{A170}	L _{B8}
2061	L _{A171}	L _{B8}
2062	L _{A172}	L _{B8}
2063	L _{A173}	L _{B8}
2064	L _{A174}	L _{B8}
2065	L _{A175}	L _{B8}
2066	L _{A176}	L _{B8}
2067	L _{A177}	L _{B8}
2068	L _{A178}	L _{B8}
2069	L _{A179}	L _{B8}
2070	L _{A180}	L _{B8}
2071	L _{A181}	L _{B8}
2072	L _{A182}	L _{B8}
2073	L _{A183}	L _{B8}
2074	L _{A184}	L _{B8}
2075	L _{A185}	L _{B8}

-continued

Compound Number	L _A	L _B
2076	L _{A186}	L _{B8}
2077	L _{A187}	L _{B8}
2078	L _{A188}	L _{B8}
2079	L _{A189}	L _{B8}
2080	L _{A190}	L _{B8}
2081	L _{A191}	L _{B8}
2082	L _{A192}	L _{B8}
2083	L _{A193}	L _{B8}
2084	L _{A194}	L _{B8}
2085	L _{A195}	L _{B8}
2086	L _{A196}	L _{B8}
2087	L _{A197}	L _{B8}
2088	L _{A198}	L _{B8}
2089	L _{A199}	L _{B8}
2090	L _{A200}	L _{B8}
2091	L _{A201}	L _{B8}
2092	L _{A202}	L _{B8}
2093	L _{A203}	L _{B8}
2094	L _{A204}	L _{B8}
2095	L _{A205}	L _{B8}
2096	L _{A206}	L _{B8}
2097	L _{A207}	L _{B8}
2098	L _{A208}	L _{B8}
2099	L _{A209}	L _{B8}
2100	L _{A210}	L _{B8}
2101	L _{A211}	L _{B8}
2102	L _{A212}	L _{B8}
2103	L _{A213}	L _{B8}
2104	L _{A214}	L _{B8}
2105	L _{A215}	L _{B8}
2106	L _{A216}	L _{B8}
2107	L _{A217}	L _{B8}
2108	L _{A218}	L _{B8}
2109	L _{A219}	L _{B8}
2110	L _{A220}	L _{B8}
2111	L _{A221}	L _{B8}
2112	L _{A222}	L _{B8}
2113	L _{A223}	L _{B8}
2114	L _{A224}	L _{B8}
2115	L _{A225}	L _{B8}
2116	L _{A226}	L _{B8}
2117	L _{A227}	L _{B8}
2118	L _{A228}	L _{B8}
2119	L _{A229}	L _{B8}
2120	L _{A230}	L _{B8}
2121	L _{A231}	L _{B8}
2122	L _{A232}	L _{B8}
2123	L _{A233}	L _{B8}
2124	L _{A234}	L _{B8}
2125	L _{A235}	L _{B8}
2126	L _{A236}	L _{B8}
2127	L _{A237}	L _{B8}
2128	L _{A238}	L _{B8}
2129	L _{A239}	L _{B8}
2130	L _{A240}	L _{B8}
2131	L _{A241}	L _{B8}
2132	L _{A242}	L _{B8}
2133	L _{A243}	L _{B8}
2134	L _{A244}	L _{B8}
2135	L _{A245}	L _{B8}
2136	L _{A246}	L _{B8}
2137	L _{A247}	L _{B8}
2138	L _{A248}	L _{B8}
2139	L _{A249}	L _{B8}
2140	L _{A250}	L _{B8}
2141	L _{A251}	L _{B8}
2142	L _{A252}	L _{B8}
2143	L _{A253}	L _{B8}
2144	L _{A254}	L _{B8}
2145	L _{A255}	L _{B8}
2146	L _{A256}	L _{B8}
2147	L _{A257}	L _{B8}
2148	L _{A258}	L _{B8}

-continued

Compound Number	L _A	L _B
2149	L _{A259}	L _{B8}
2150	L _{A260}	L _{B8}
2151	L _{A261}	L _{B8}
2152	L _{A262}	L _{B8}
2153	L _{A263}	L _{B8}
2154	L _{A264}	L _{B8}
2155	L _{A265}	L _{B8}
2156	L _{A266}	L _{B8}
2157	L _{A267}	L _{B8}
2158	L _{A268}	L _{B8}
2159	L _{A269}	L _{B8}
2160	L _{A270}	L _{B8}
2161	L _{A1}	L _{B9}
2162	L _{A2}	L _{B9}
2163	L _{A3}	L _{B9}
2164	L _{A4}	L _{B9}
2165	L _{A5}	L _{B9}
2166	L _{A6}	L _{B9}
2167	L _{A7}	L _{B9}
2168	L _{A8}	L _{B9}
2169	L _{A9}	L _{B9}
2170	L _{A10}	L _{B9}
2171	L _{A11}	L _{B9}
2172	L _{A12}	L _{B9}
2173	L _{A13}	L _{B9}
2174	L _{A14}	L _{B9}
2175	L _{A15}	L _{B9}
2176	L _{A16}	L _{B9}
2177	L _{A17}	L _{B9}
2178	L _{A18}	L _{B9}
2179	L _{A19}	L _{B9}
2180	L _{A20}	L _{B9}
2181	L _{A21}	L _{B9}
2182	L _{A22}	L _{B9}
2183	L _{A23}	L _{B9}
2184	L _{A24}	L _{B9}
2185	L _{A25}	L _{B9}
2186	L _{A26}	L _{B9}
2187	L _{A27}	L _{B9}
2188	L _{A28}	L _{B9}
2189	L _{A29}	L _{B9}
2190	L _{A30}	L _{B9}
2191	L _{A31}	L _{B9}
2192	L _{A32}	L _{B9}
2193	L _{A33}	L _{B9}
2194	L _{A34}	L _{B9}
2195	L _{A35}	L _{B9}
2196	L _{A36}	L _{B9}
2197	L _{A37}	L _{B9}
2198	L _{A38}	L _{B9}
2199	L _{A39}	L _{B9}
2200	L _{A40}	L _{B9}
2201	L _{A41}	L _{B9}
2202	L _{A42}	L _{B9}
2203	L _{A43}	L _{B9}
2204	L _{A44}	L _{B9}
2205	L _{A45}	L _{B9}
2206	L _{A46}	L _{B9}
2207	L _{A47}	L _{B9}
2208	L _{A48}	L _{B9}
2209	L _{A49}	L _{B9}
2210	L _{A50}	L _{B9}
2211	L _{A51}	L _{B9}
2212	L _{A52}	L _{B9}
2213	L _{A53}	L _{B9}
2214	L _{A54}	L _{B9}
2215	L _{A55}	L _{B9}
2216	L _{A56}	L _{B9}
2217	L _{A57}	L _{B9}
2218	L _{A58}	L _{B9}
2219	L _{A59}	L _{B9}
2220	L _{A60}	L _{B9}
2221	L _{A61}	L _{B9}

-continued

Compound Number	L _A	L _B
2222	L _{A62}	L _{B9}
2223	L _{A63}	L _{B9}
2224	L _{A64}	L _{B9}
2225	L _{A65}	L _{B9}
2226	L _{A66}	L _{B9}
2227	L _{A67}	L _{B9}
2228	L _{A68}	L _{B9}
2229	L _{A69}	L _{B9}
2230	L _{A70}	L _{B9}
2231	L _{A71}	L _{B9}
2232	L _{A72}	L _{B9}
2233	L _{A73}	L _{B9}
2234	L _{A74}	L _{B9}
2235	L _{A75}	L _{B9}
2236	L _{A76}	L _{B9}
2237	L _{A77}	L _{B9}
2238	L _{A78}	L _{B9}
2239	L _{A79}	L _{B9}
2240	L _{A80}	L _{B9}
2241	L _{A81}	L _{B9}
2242	L _{A82}	L _{B9}
2243	L _{A83}	L _{B9}
2244	L _{A84}	L _{B9}
2245	L _{A85}	L _{B9}
2246	L _{A86}	L _{B9}
2247	L _{A87}	L _{B9}
2248	L _{A88}	L _{B9}
2249	L _{A89}	L _{B9}
2250	L _{A90}	L _{B9}
2251	L _{A91}	L _{B9}
2252	L _{A92}	L _{B9}
2253	L _{A93}	L _{B9}
2254	L _{A94}	L _{B9}
2255	L _{A95}	L _{B9}
2256	L _{A96}	L _{B9}
2257	L _{A97}	L _{B9}
2258	L _{A98}	L _{B9}
2259	L _{A99}	L _{B9}
2260	L _{A100}	L _{B9}
2261	L _{A101}	L _{B9}
2262	L _{A102}	L _{B9}
2263	L _{A103}	L _{B9}
2264	L _{A104}	L _{B9}
2265	L _{A105}	L _{B9}
2266	L _{A106}	L _{B9}
2267	L _{A107}	L _{B9}
2268	L _{A108}	L _{B9}
2269	L _{A109}	L _{B9}
2270	L _{A110}	L _{B9}
2271	L _{A111}	L _{B9}
2272	L _{A112}	L _{B9}
2273	L _{A113}	L _{B9}
2274	L _{A114}	L _{B9}
2275	L _{A115}	L _{B9}
2276	L _{A116}	L _{B9}
2277	L _{A117}	L _{B9}
2278	L _{A118}	L _{B9}
2279	L _{A119}	L _{B9}
2280	L _{A120}	L _{B9}
2281	L _{A121}	L _{B9}
2282	L _{A122}	L _{B9}
2283	L _{A123}	L _{B9}
2284	L _{A124}	L _{B9}
2285	L _{A125}	L _{B9}
2286	L _{A126}	L _{B9}
2287	L _{A127}	L _{B9}
2288	L _{A128}	L _{B9}
2289	L _{A129}	L _{B9}
2290	L _{A130}	L _{B9}
2291	L _{A131}	L _{B9}
2292	L _{A132}	L _{B9}
2293	L _{A133}	L _{B9}
2294	L _{A134}	L _{B9}

-continued

Compound Number	L _A	L _B
2295	L _{A135}	L _{B9}
2296	L _{A136}	L _{B9}
2297	L _{A137}	L _{B9}
2298	L _{A138}	L _{B9}
2299	L _{A139}	L _{B9}
2300	L _{A140}	L _{B9}
2301	L _{A141}	L _{B9}
2302	L _{A142}	L _{B9}
2303	L _{A143}	L _{B9}
2304	L _{A144}	L _{B9}
2305	L _{A145}	L _{B9}
2306	L _{A146}	L _{B9}
2307	L _{A147}	L _{B9}
2308	L _{A148}	L _{B9}
2309	L _{A149}	L _{B9}
2310	L _{A150}	L _{B9}
2311	L _{A151}	L _{B9}
2312	L _{A152}	L _{B9}
2313	L _{A153}	L _{B9}
2314	L _{A154}	L _{B9}
2315	L _{A155}	L _{B9}
2316	L _{A156}	L _{B9}
2317	L _{A157}	L _{B9}
2318	L _{A158}	L _{B9}
2319	L _{A159}	L _{B9}
2320	L _{A160}	L _{B9}
2321	L _{A161}	L _{B9}
2322	L _{A162}	L _{B9}
2323	L _{A163}	L _{B9}
2324	L _{A164}	L _{B9}
2325	L _{A165}	L _{B9}
2326	L _{A166}	L _{B9}
2327	L _{A167}	L _{B9}
2328	L _{A168}	L _{B9}
2329	L _{A169}	L _{B9}
2330	L _{A170}	L _{B9}
2331	L _{A171}	L _{B9}
2332	L _{A172}	L _{B9}
2333	L _{A173}	L _{B9}
2334	L _{A174}	L _{B9}
2335	L _{A175}	L _{B9}
2336	L _{A176}	L _{B9}
2337	L _{A177}	L _{B9}
2338	L _{A178}	L _{B9}
2339	L _{A179}	L _{B9}
2340	L _{A180}	L _{B9}
2341	L _{A181}	L _{B9}
2342	L _{A182}	L _{B9}
2343	L _{A183}	L _{B9}
2344	L _{A184}	L _{B9}
2345	L _{A185}	L _{B9}
2346	L _{A186}	L _{B9}
2347	L _{A187}	L _{B9}
2348	L _{A188}	L _{B9}
2349	L _{A189}	L _{B9}
2350	L _{A190}	L _{B9}
2351	L _{A191}	L _{B9}
2352	L _{A192}	L _{B9}
2353	L _{A193}	L _{B9}
2354	L _{A194}	L _{B9}
2355	L _{A195}	L _{B9}
2356	L _{A196}	L _{B9}
2357	L _{A197}	L _{B9}
2358	L _{A198}	L _{B9}
2359	L _{A199}	L _{B9}
2360	L _{A200}	L _{B9}
2361	L _{A201}	L _{B9}
2362	L _{A202}	L _{B9}
2363	L _{A203}	L _{B9}
2364	L _{A204}	L _{B9}
2365	L _{A205}	L _{B9}
2366	L _{A206}	L _{B9}
2367	L _{A207}	L _{B9}

-continued

Compound Number	L _A	L _B
2368	L _{A208}	L _{B9}
2369	L _{A209}	L _{B9}
2370	L _{A210}	L _{B9}
2371	L _{A211}	L _{B9}
2372	L _{A212}	L _{B9}
2373	L _{A213}	L _{B9}
2374	L _{A214}	L _{B9}
2375	L _{A215}	L _{B9}
2376	L _{A216}	L _{B9}
2377	L _{A217}	L _{B9}
2378	L _{A218}	L _{B9}
2379	L _{A219}	L _{B9}
2380	L _{A220}	L _{B9}
2381	L _{A221}	L _{B9}
2382	L _{A222}	L _{B9}
2383	L _{A223}	L _{B9}
2384	L _{A224}	L _{B9}
2385	L _{A225}	L _{B9}
2386	L _{A226}	L _{B9}
2387	L _{A227}	L _{B9}
2388	L _{A228}	L _{B9}
2389	L _{A229}	L _{B9}
2390	L _{A230}	L _{B9}
2391	L _{A231}	L _{B9}
2392	L _{A232}	L _{B9}
2393	L _{A233}	L _{B9}
2394	L _{A234}	L _{B9}
2395	L _{A235}	L _{B9}
2396	L _{A236}	L _{B9}
2397	L _{A237}	L _{B9}
2398	L _{A238}	L _{B9}
2399	L _{A239}	L _{B9}
2400	L _{A240}	L _{B9}
2401	L _{A241}	L _{B9}
2402	L _{A242}	L _{B9}
2403	L _{A243}	L _{B9}
2404	L _{A244}	L _{B9}
2405	L _{A245}	L _{B9}
2406	L _{A246}	L _{B9}
2407	L _{A247}	L _{B9}
2408	L _{A248}	L _{B9}
2409	L _{A249}	L _{B9}
2410	L _{A250}	L _{B9}
2411	L _{A251}	L _{B9}
2412	L _{A252}	L _{B9}
2413	L _{A253}	L _{B9}
2414	L _{A254}	L _{B9}
2415	L _{A255}	L _{B9}
2416	L _{A256}	L _{B9}
2417	L _{A257}	L _{B9}
2418	L _{A258}	L _{B9}
2419	L _{A259}	L _{B9}
2420	L _{A260}	L _{B9}
2421	L _{A261}	L _{B9}
2422	L _{A262}	L _{B9}
2423	L _{A263}	L _{B9}
2424	L _{A264}	L _{B9}
2425	L _{A265}	L _{B9}
2426	L _{A266}	L _{B9}
2427	L _{A267}	L _{B9}
2428	L _{A268}	L _{B9}
2429	L _{A269}	L _{B9}
2430	L _{A270}	L _{B9}
2431	L _{A1}	L _{B10}
2432	L _{A2}	L _{B10}
2433	L _{A3}	L _{B10}
2434	L _{A4}	L _{B10}
2435	L _{A5}	L _{B10}
2436	L _{A6}	L _{B10}
2437	L _{A7}	L _{B10}
2438	L _{A8}	L _{B10}
2439	L _{A9}	L _{B10}
2440	L _{A10}	L _{B10}

-continued

Compound Number	L _A	L _B
2441	L _{A11}	L _{B10}
2442	L _{A12}	L _{B10}
2443	L _{A13}	L _{B10}
2444	L _{A14}	L _{B10}
2445	L _{A15}	L _{B10}
2446	L _{A16}	L _{B10}
2447	L _{A17}	L _{B10}
2448	L _{A18}	L _{B10}
2449	L _{A19}	L _{B10}
2450	L _{A20}	L _{B10}
2451	L _{A21}	L _{B10}
2452	L _{A22}	L _{B10}
2453	L _{A23}	L _{B10}
2454	L _{A24}	L _{B10}
2455	L _{A25}	L _{B10}
2456	L _{A26}	L _{B10}
2457	L _{A27}	L _{B10}
2458	L _{A28}	L _{B10}
2459	L _{A29}	L _{B10}
2460	L _{A30}	L _{B10}
2461	L _{A31}	L _{B10}
2462	L _{A32}	L _{B10}
2463	L _{A33}	L _{B10}
2464	L _{A34}	L _{B10}
2465	L _{A35}	L _{B10}
2466	L _{A36}	L _{B10}
2467	L _{A37}	L _{B10}
2468	L _{A38}	L _{B10}
2469	L _{A39}	L _{B10}
2470	L _{A40}	L _{B10}
2471	L _{A41}	L _{B10}
2472	L _{A42}	L _{B10}
2473	L _{A43}	L _{B10}
2474	L _{A44}	L _{B10}
2475	L _{A45}	L _{B10}
2476	L _{A46}	L _{B10}
2477	L _{A47}	L _{B10}
2478	L _{A48}	L _{B10}
2479	L _{A49}	L _{B10}
2480	L _{A50}	L _{B10}
2481	L _{A51}	L _{B10}
2482	L _{A52}	L _{B10}
2483	L _{A53}	L _{B10}
2484	L _{A54}	L _{B10}
2485	L _{A55}	L _{B10}
2486	L _{A56}	L _{B10}
2487	L _{A57}	L _{B10}
2488	L _{A58}	L _{B10}
2489	L _{A59}	L _{B10}
2490	L _{A60}	L _{B10}
2491	L _{A61}	L _{B10}
2492	L _{A62}	L _{B10}
2493	L _{A63}	L _{B10}
2494	L _{A64}	L _{B10}
2495	L _{A65}	L _{B10}
2496	L _{A66}	L _{B10}
2497	L _{A67}	L _{B10}
2498	L _{A68}	L _{B10}
2499	L _{A69}	L _{B10}
2500	L _{A70}	L _{B10}
2501	L _{A71}	L _{B10}
2502	L _{A72}	L _{B10}
2503	L _{A73}	L _{B10}
2504	L _{A74}	L _{B10}
2505	L _{A75}	L _{B10}
2506	L _{A76}	L _{B10}
2507	L _{A77}	L _{B10}
2508	L _{A78}	L _{B10}
2509	L _{A79}	L _{B10}
2510	L _{A80}	L _{B10}
2511	L _{A81}	L _{B10}
2512	L _{A82}	L _{B10}
2513	L _{A83}	L _{B10}

-continued

Compound Number	L _A	L _B
2514	L _{A84}	L _{B10}
2515	L _{A85}	L _{B10}
2516	L _{A86}	L _{B10}
2517	L _{A87}	L _{B10}
2518	L _{A88}	L _{B10}
2519	L _{A89}	L _{B10}
2520	L _{A90}	L _{B10}
2521	L _{A91}	L _{B10}
2522	L _{A92}	L _{B10}
2523	L _{A93}	L _{B10}
2524	L _{A94}	L _{B10}
2525	L _{A95}	L _{B10}
2526	L _{A96}	L _{B10}
2527	L _{A97}	L _{B10}
2528	L _{A98}	L _{B10}
2529	L _{A99}	L _{B10}
2530	L _{A100}	L _{B10}
2531	L _{A101}	L _{B10}
2532	L _{A102}	L _{B10}
2533	L _{A103}	L _{B10}
2534	L _{A104}	L _{B10}
2535	L _{A105}	L _{B10}
2536	L _{A106}	L _{B10}
2537	L _{A107}	L _{B10}
2538	L _{A108}	L _{B10}
2539	L _{A109}	L _{B10}
2540	L _{A110}	L _{B10}
2541	L _{A111}	L _{B10}
2542	L _{A112}	L _{B10}
2543	L _{A113}	L _{B10}
2544	L _{A114}	L _{B10}
2545	L _{A115}	L _{B10}
2546	L _{A116}	L _{B10}
2547	L _{A117}	L _{B10}
2548	L _{A118}	L _{B10}
2549	L _{A119}	L _{B10}
2550	L _{A120}	L _{B10}
2551	L _{A121}	L _{B10}
2552	L _{A122}	L _{B10}
2553	L _{A123}	L _{B10}
2554	L _{A124}	L _{B10}
2555	L _{A125}	L _{B10}
2556	L _{A126}	L _{B10}
2557	L _{A127}	L _{B10}
2558	L _{A128}	L _{B10}
2559	L _{A129}	L _{B10}
2560	L _{A130}	L _{B10}
2561	L _{A131}	L _{B10}
2562	L _{A132}	L _{B10}
2563	L _{A133}	L _{B10}
2564	L _{A134}	L _{B10}
2565	L _{A135}	L _{B10}
2566	L _{A136}	L _{B10}
2567	L _{A137}	L _{B10}
2568	L _{A138}	L _{B10}
2569	L _{A139}	L _{B10}
2570	L _{A140}	L _{B10}
2571	L _{A141}	L _{B10}
2572	L _{A142}	L _{B10}
2573	L _{A143}	L _{B10}
2574	L _{A144}	L _{B10}
2575	L _{A145}	L _{B10}
2576	L _{A146}	L _{B10}
2577	L _{A147}	L _{B10}
2578	L _{A148}	L _{B10}
2579	L _{A149}	L _{B10}
2580	L _{A150}	L _{B10}
2581	L _{A151}	L _{B10}
2582	L _{A152}	L _{B10}
2583	L _{A153}	L _{B10}
2584	L _{A154}	L _{B10}
2585	L _{A155}	L _{B10}
2586	L _{A156}	L _{B10}

-continued

Compound Number	L _A	L _B
2587	L _{A157}	L _{B10}
2588	L _{A158}	L _{B10}
2589	L _{A159}	L _{B10}
2590	L _{A160}	L _{B10}
2591	L _{A161}	L _{B10}
2592	L _{A162}	L _{B10}
2593	L _{A163}	L _{B10}
2594	L _{A164}	L _{B10}
2595	L _{A165}	L _{B10}
2596	L _{A166}	L _{B10}
2597	L _{A167}	L _{B10}
2598	L _{A168}	L _{B10}
2599	L _{A169}	L _{B10}
2600	L _{A170}	L _{B10}
2601	L _{A171}	L _{B10}
2602	L _{A172}	L _{B10}
2603	L _{A173}	L _{B10}
2604	L _{A174}	L _{B10}
2605	L _{A175}	L _{B10}
2606	L _{A176}	L _{B10}
2607	L _{A177}	L _{B10}
2608	L _{A178}	L _{B10}
2609	L _{A179}	L _{B10}
2610	L _{A180}	L _{B10}
2611	L _{A181}	L _{B10}
2612	L _{A182}	L _{B10}
2613	L _{A183}	L _{B10}
2614	L _{A184}	L _{B10}
2615	L _{A185}	L _{B10}
2616	L _{A186}	L _{B10}
2617	L _{A187}	L _{B10}
2618	L _{A188}	L _{B10}
2619	L _{A189}	L _{B10}
2620	L _{A190}	L _{B10}
2621	L _{A191}	L _{B10}
2622	L _{A192}	L _{B10}
2623	L _{A193}	L _{B10}
2624	L _{A194}	L _{B10}
2625	L _{A195}	L _{B10}
2626	L _{A196}	L _{B10}
2627	L _{A197}	L _{B10}
2628	L _{A198}	L _{B10}
2629	L _{A199}	L _{B10}
2630	L _{A200}	L _{B10}
2631	L _{A201}	L _{B10}
2632	L _{A202}	L _{B10}
2633	L _{A203}	L _{B10}
2634	L _{A204}	L _{B10}
2635	L _{A205}	L _{B10}
2636	L _{A206}	L _{B10}
2637	L _{A207}	L _{B10}
2638	L _{A208}	L _{B10}
2639	L _{A209}	L _{B10}
2640	L _{A210}	L _{B10}
2641	L _{A211}	L _{B10}
2642	L _{A212}	L _{B10}
2643	L _{A213}	L _{B10}
2644	L _{A214}	L _{B10}
2645	L _{A215}	L _{B10}
2646	L _{A216}	L _{B10}
2647	L _{A217}	L _{B10}
2648	L _{A218}	L _{B10}
2649	L _{A219}	L _{B10}
2650	L _{A220}	L _{B10}
2651	L _{A221}	L _{B10}
2652	L _{A222}	L _{B10}
2653	L _{A223}	L _{B10}
2654	L _{A224}	L _{B10}
2655	L _{A225}	L _{B10}
2656	L _{A226}	L _{B10}
2657	L _{A227}	L _{B10}
2658	L _{A228}	L _{B10}
2659	L _{A229}	L _{B10}

-continued

Compound Number	L _A	L _B
2660	L _{A230}	L _{B10}
2661	L _{A231}	L _{B10}
2662	L _{A232}	L _{B10}
2663	L _{A233}	L _{B10}
2664	L _{A234}	L _{B10}
2665	L _{A235}	L _{B10}
2666	L _{A236}	L _{B10}
2667	L _{A237}	L _{B10}
2668	L _{A238}	L _{B10}
2669	L _{A239}	L _{B10}
2670	L _{A240}	L _{B10}
2671	L _{A241}	L _{B10}
2672	L _{A242}	L _{B10}
2673	L _{A243}	L _{B10}
2674	L _{A244}	L _{B10}
2675	L _{A245}	L _{B10}
2676	L _{A246}	L _{B10}
2677	L _{A247}	L _{B10}
2678	L _{A248}	L _{B10}
2679	L _{A249}	L _{B10}
2680	L _{A250}	L _{B10}
2681	L _{A251}	L _{B10}
2682	L _{A252}	L _{B10}
2683	L _{A253}	L _{B10}
2684	L _{A254}	L _{B10}
2685	L _{A255}	L _{B10}
2686	L _{A256}	L _{B10}
2687	L _{A257}	L _{B10}
2688	L _{A258}	L _{B10}
2689	L _{A259}	L _{B10}
2690	L _{A260}	L _{B10}
2691	L _{A261}	L _{B10}
2692	L _{A262}	L _{B10}
2693	L _{A263}	L _{B10}
2694	L _{A264}	L _{B10}
2695	L _{A265}	L _{B10}
2696	L _{A266}	L _{B10}
2697	L _{A267}	L _{B10}
2698	L _{A268}	L _{B10}
2699	L _{A269}	L _{B10}
2700	L _{A270}	L _{B10}
2701	L _{A1}	L _{B11}
2702	L _{A2}	L _{B11}
2703	L _{A3}	L _{B11}
2704	L _{A4}	L _{B11}
2705	L _{A5}	L _{B11}
2706	L _{A6}	L _{B11}
2707	L _{A7}	L _{B11}
2708	L _{A8}	L _{B11}
2709	L _{A9}	L _{B11}
2710	L _{A10}	L _{B11}
2711	L _{A11}	L _{B11}
2712	L _{A12}	L _{B11}
2713	L _{A13}	L _{B11}
2714	L _{A14}	L _{B11}
2715	L _{A15}	L _{B11}
2716	L _{A16}	L _{B11}
2717	L _{A17}	L _{B11}
2718	L _{A18}	L _{B11}
2719	L _{A19}	L _{B11}
2720	L _{A20}	L _{B11}
2721	L _{A21}	L _{B11}
2722	L _{A22}	L _{B11}
2723	L _{A23}	L _{B11}
2724	L _{A24}	L _{B11}
2725	L _{A25}	L _{B11}
2726	L _{A26}	L _{B11}
2727	L _{A27}	L _{B11}
2728	L _{A28}	L _{B11}
2729	L _{A29}	L _{B11}
2730	L _{A30}	L _{B11}
2731	L _{A31}	L _{B11}
2732	L _{A32}	L _{B11}

-continued

Compound Number	L _A	L _B
2733	L _{A33}	L _{B11}
2734	L _{A34}	L _{B11}
2735	L _{A35}	L _{B11}
2736	L _{A36}	L _{B11}
2737	L _{A37}	L _{B11}
2738	L _{A38}	L _{B11}
2739	L _{A39}	L _{B11}
2740	L _{A40}	L _{B11}
2741	L _{A41}	L _{B11}
2742	L _{A42}	L _{B11}
2743	L _{A43}	L _{B11}
2744	L _{A44}	L _{B11}
2745	L _{A45}	L _{B11}
2746	L _{A46}	L _{B11}
2747	L _{A47}	L _{B11}
2748	L _{A48}	L _{B11}
2749	L _{A49}	L _{B11}
2750	L _{A50}	L _{B11}
2751	L _{A51}	L _{B11}
2752	L _{A52}	L _{B11}
2753	L _{A53}	L _{B11}
2754	L _{A54}	L _{B11}
2755	L _{A55}	L _{B11}
2756	L _{A56}	L _{B11}
2757	L _{A57}	L _{B11}
2758	L _{A58}	L _{B11}
2759	L _{A59}	L _{B11}
2760	L _{A60}	L _{B11}
2761	L _{A61}	L _{B11}
2762	L _{A62}	L _{B11}
2763	L _{A63}	L _{B11}
2764	L _{A64}	L _{B11}
2765	L _{A65}	L _{B11}
2766	L _{A66}	L _{B11}
2767	L _{A67}	L _{B11}
2768	L _{A68}	L _{B11}
2769	L _{A69}	L _{B11}
2770	L _{A70}	L _{B11}
2771	L _{A71}	L _{B11}
2772	L _{A72}	L _{B11}
2773	L _{A73}	L _{B11}
2774	L _{A74}	L _{B11}
2775	L _{A75}	L _{B11}
2776	L _{A76}	L _{B11}
2777	L _{A77}	L _{B11}
2778	L _{A78}	L _{B11}
2779	L _{A79}	L _{B11}
2780	L _{A80}	L _{B11}
2781	L _{A81}	L _{B11}
2782	L _{A82}	L _{B11}
2783	L _{A83}	L _{B11}
2784	L _{A84}	L _{B11}
2785	L _{A85}	L _{B11}
2786	L _{A86}	L _{B11}
2787	L _{A87}	L _{B11}
2788	L _{A88}	L _{B11}
2789	L _{A89}	L _{B11}
2790	L _{A90}	L _{B11}
2791	L _{A91}	L _{B11}
2792	L _{A92}	L _{B11}
2793	L _{A93}	L _{B11}
2794	L _{A94}	L _{B11}
2795	L _{A95}	L _{B11}
2796	L _{A96}	L _{B11}
2797	L _{A97}	L _{B11}
2798	L _{A98}	L _{B11}
2799	L _{A99}	L _{B11}
2800	L _{A100}	L _{B11}
2801	L _{A101}	L _{B11}
2802	L _{A102}	L _{B11}
2803	L _{A103}	L _{B11}
2804	L _{A104}	L _{B11}
2805	L _{A105}	L _{B11}

-continued

Compound Number	L _A	L _B
2806	L _{A106}	L _{B11}
2807	L _{A107}	L _{B11}
2808	L _{A108}	L _{B11}
2809	L _{A109}	L _{B11}
2810	L _{A110}	L _{B11}
2811	L _{A111}	L _{B11}
2812	L _{A112}	L _{B11}
2813	L _{A113}	L _{B11}
2814	L _{A114}	L _{B11}
2815	L _{A115}	L _{B11}
2816	L _{A116}	L _{B11}
2817	L _{A117}	L _{B11}
2818	L _{A118}	L _{B11}
2819	L _{A119}	L _{B11}
2820	L _{A120}	L _{B11}
2821	L _{A121}	L _{B11}
2822	L _{A122}	L _{B11}
2823	L _{A123}	L _{B11}
2824	L _{A124}	L _{B11}
2825	L _{A125}	L _{B11}
2826	L _{A126}	L _{B11}
2827	L _{A127}	L _{B11}
2828	L _{A128}	L _{B11}
2829	L _{A129}	L _{B11}
2830	L _{A130}	L _{B11}
2831	L _{A131}	L _{B11}
2832	L _{A132}	L _{B11}
2833	L _{A133}	L _{B11}
2834	L _{A134}	L _{B11}
2835	L _{A135}	L _{B11}
2836	L _{A136}	L _{B11}
2837	L _{A137}	L _{B11}
2838	L _{A138}	L _{B11}
2839	L _{A139}	L _{B11}
2840	L _{A140}	L _{B11}
2841	L _{A141}	L _{B11}
2842	L _{A142}	L _{B11}
2843	L _{A143}	L _{B11}
2844	L _{A144}	L _{B11}
2845	L _{A145}	L _{B11}
2846	L _{A146}	L _{B11}
2847	L _{A147}	L _{B11}
2848	L _{A148}	L _{B11}
2849	L _{A149}	L _{B11}
2850	L _{A150}	L _{B11}
2851	L _{A151}	L _{B11}
2852	L _{A152}	L _{B11}
2853	L _{A153}	L _{B11}
2854	L _{A154}	L _{B11}
2855	L _{A155}	L _{B11}
2856	L _{A156}	L _{B11}
2857	L _{A157}	L _{B11}
2858	L _{A158}	L _{B11}
2859	L _{A159}	L _{B11}
2860	L _{A160}	L _{B11}
2861	L _{A161}	L _{B11}
2862	L _{A162}	L _{B11}
2863	L _{A163}	L _{B11}
2864	L _{A164}	L _{B11}
2865	L _{A165}	L _{B11}
2866	L _{A166}	L _{B11}
2867	L _{A167}	L _{B11}
2868	L _{A168}	L _{B11}
2869	L _{A169}	L _{B11}
2870	L _{A170}	L _{B11}
2871	L _{A171}	L _{B11}
2872	L _{A172}	L _{B11}
2873	L _{A173}	L _{B11}
2874	L _{A174}	L _{B11}
2875	L _{A175}	L _{B11}
2876	L _{A176}	L _{B11}
2877	L _{A177}	L _{B11}
2878	L _{A178}	L _{B11}

-continued

Compound Number	L _A	L _B
2879	L _{A179}	L _{B11}
2880	L _{A180}	L _{B11}
2881	L _{A181}	L _{B11}
2882	L _{A182}	L _{B11}
2883	L _{A183}	L _{B11}
2884	L _{A184}	L _{B11}
2885	L _{A185}	L _{B11}
2886	L _{A186}	L _{B11}
2887	L _{A187}	L _{B11}
2888	L _{A188}	L _{B11}
2889	L _{A189}	L _{B11}
2890	L _{A190}	L _{B11}
2891	L _{A191}	L _{B11}
2892	L _{A192}	L _{B11}
2893	L _{A193}	L _{B11}
2894	L _{A194}	L _{B11}
2895	L _{A195}	L _{B11}
2896	L _{A196}	L _{B11}
2897	L _{A197}	L _{B11}
2898	L _{A198}	L _{B11}
2899	L _{A199}	L _{B11}
2900	L _{A200}	L _{B11}
2901	L _{A201}	L _{B11}
2902	L _{A202}	L _{B11}
2903	L _{A203}	L _{B11}
2904	L _{A204}	L _{B11}
2905	L _{A205}	L _{B11}
2906	L _{A206}	L _{B11}
2907	L _{A207}	L _{B11}
2908	L _{A208}	L _{B11}
2909	L _{A209}	L _{B11}
2910	L _{A210}	L _{B11}
2911	L _{A211}	L _{B11}
2912	L _{A212}	L _{B11}
2913	L _{A213}	L _{B11}
2914	L _{A214}	L _{B11}
2915	L _{A215}	L _{B11}
2916	L _{A216}	L _{B11}
2917	L _{A217}	L _{B11}
2918	L _{A218}	L _{B11}
2919	L _{A219}	L _{B11}
2920	L _{A220}	L _{B11}
2921	L _{A221}	L _{B11}
2922	L _{A222}	L _{B11}
2923	L _{A223}	L _{B11}
2924	L _{A224}	L _{B11}
2925	L _{A225}	L _{B11}
2926	L _{A226}	L _{B11}
2927	L _{A227}	L _{B11}
2928	L _{A228}	L _{B11}
2929	L _{A229}	L _{B11}
2930	L _{A230}	L _{B11}
2931	L _{A231}	L _{B11}
2932	L _{A232}	L _{B11}
2933	L _{A233}	L _{B11}
2934	L _{A234}	L _{B11}
2935	L _{A235}	L _{B11}
2936	L _{A236}	L _{B11}
2937	L _{A237}	L _{B11}
2938	L _{A238}	L _{B11}
2939	L _{A239}	L _{B11}
2940	L _{A240}	L _{B11}
2941	L _{A241}	L _{B11}
2942	L _{A242}	L _{B11}
2943	L _{A243}	L _{B11}
2944	L _{A244}	L _{B11}
2945	L _{A245}	L _{B11}
2946	L _{A246}	L _{B11}
2947	L _{A247}	L _{B11}
2948	L _{A248}	L _{B11}
2949	L _{A249}	L _{B11}
2950	L _{A250}	L _{B11}
2951	L _{A251}	L _{B11}

-continued

Compound Number	L _A	L _B
2952	L _{A252}	L _{B11}
2953	L _{A253}	L _{B11}
2954	L _{A254}	L _{B11}
2955	L _{A255}	L _{B11}
2956	L _{A256}	L _{B11}
2957	L _{A257}	L _{B11}
2958	L _{A258}	L _{B11}
2959	L _{A259}	L _{B11}
2960	L _{A260}	L _{B11}
2961	L _{A261}	L _{B11}
2962	L _{A262}	L _{B11}
2963	L _{A263}	L _{B11}
2964	L _{A264}	L _{B11}
2965	L _{A265}	L _{B11}
2966	L _{A266}	L _{B11}
2967	L _{A267}	L _{B11}
2968	L _{A268}	L _{B11}
2969	L _{A269}	L _{B11}
2970	L _{A270}	L _{B11}
2971	L _{A1}	L _{B12}
2972	L _{A2}	L _{B12}
2973	L _{A3}	L _{B12}
2974	L _{A4}	L _{B12}
2975	L _{A5}	L _{B12}
2976	L _{A6}	L _{B12}
2977	L _{A7}	L _{B12}
2978	L _{A8}	L _{B12}
2979	L _{A9}	L _{B12}
2980	L _{A10}	L _{B12}
2981	L _{A11}	L _{B12}
2982	L _{A12}	L _{B12}
2983	L _{A13}	L _{B12}
2984	L _{A14}	L _{B12}
2985	L _{A15}	L _{B12}
2986	L _{A16}	L _{B12}
2987	L _{A17}	L _{B12}
2988	L _{A18}	L _{B12}
2989	L _{A19}	L _{B12}
2990	L _{A20}	L _{B12}
2991	L _{A21}	L _{B12}
2992	L _{A22}	L _{B12}
2993	L _{A23}	L _{B12}
2994	L _{A24}	L _{B12}
2995	L _{A25}	L _{B12}
2996	L _{A26}	L _{B12}
2997	L _{A27}	L _{B12}
2998	L _{A28}	L _{B12}
2999	L _{A29}	L _{B12}
3000	L _{A30}	L _{B12}
3001	L _{A31}	L _{B12}
3002	L _{A32}	L _{B12}
3003	L _{A33}	L _{B12}
3004	L _{A34}	L _{B12}
3005	L _{A35}	L _{B12}
3006	L _{A36}	L _{B12}
3007	L _{A37}	L _{B12}
3008	L _{A38}	L _{B12}
3009	L _{A39}	L _{B12}
3010	L _{A40}	L _{B12}
3011	L _{A41}	L _{B12}
3012	L _{A42}	L _{B12}
3013	L _{A43}	L _{B12}
3014	L _{A44}	L _{B12}
3015	L _{A45}	L _{B12}
3016	L _{A46}	L _{B12}
3017	L _{A47}	L _{B12}
3018	L _{A48}	L _{B12}
3019	L _{A49}	L _{B12}
3020	L _{A50}	L _{B12}
3021	L _{A51}	L _{B12}
3022	L _{A52}	L _{B12}
3023	L _{A53}	L _{B12}
3024	L _{A54}	L _{B12}

-continued

Compound Number	L _A	L _B
3025	L _{A55}	L _{B12}
3026	L _{A56}	L _{B12}
3027	L _{A57}	L _{B12}
3028	L _{A58}	L _{B12}
3029	L _{A59}	L _{B12}
3030	L _{A60}	L _{B12}
3031	L _{A61}	L _{B12}
3032	L _{A62}	L _{B12}
3033	L _{A63}	L _{B12}
3034	L _{A64}	L _{B12}
3035	L _{A65}	L _{B12}
3036	L _{A66}	L _{B12}
3037	L _{A67}	L _{B12}
3038	L _{A68}	L _{B12}
3039	L _{A69}	L _{B12}
3040	L _{A70}	L _{B12}
3041	L _{A71}	L _{B12}
3042	L _{A72}	L _{B12}
3043	L _{A73}	L _{B12}
3044	L _{A74}	L _{B12}
3045	L _{A75}	L _{B12}
3046	L _{A76}	L _{B12}
3047	L _{A77}	L _{B12}
3048	L _{A78}	L _{B12}
3049	L _{A79}	L _{B12}
3050	L _{A80}	L _{B12}
3051	L _{A81}	L _{B12}
3052	L _{A82}	L _{B12}
3053	L _{A83}	L _{B12}
3054	L _{A84}	L _{B12}
3055	L _{A85}	L _{B12}
3056	L _{A86}	L _{B12}
3057	L _{A87}	L _{B12}
3058	L _{A88}	L _{B12}
3059	L _{A89}	L _{B12}
3060	L _{A90}	L _{B12}
3061	L _{A91}	L _{B12}
3062	L _{A92}	L _{B12}
3063	L _{A93}	L _{B12}
3064	L _{A94}	L _{B12}
3065	L _{A95}	L _{B12}
3066	L _{A96}	L _{B12}
3067	L _{A97}	L _{B12}
3068	L _{A98}	L _{B12}
3069	L _{A99}	L _{B12}
3070	L _{A100}	L _{B12}
3071	L _{A101}	L _{B12}
3072	L _{A102}	L _{B12}
3073	L _{A103}	L _{B12}
3074	L _{A104}	L _{B12}
3075	L _{A105}	L _{B12}
3076	L _{A106}	L _{B12}
3077	L _{A107}	L _{B12}
3078	L _{A108}	L _{B12}
3079	L _{A109}	L _{B12}
3080	L _{A110}	L _{B12}
3081	L _{A111}	L _{B12}
3082	L _{A112}	L _{B12}
3083	L _{A113}	L _{B12}
3084	L _{A114}	L _{B12}
3085	L _{A115}	L _{B12}
3086	L _{A116}	L _{B12}
3087	L _{A117}	L _{B12}
3088	L _{A118}	L _{B12}
3089	L _{A119}	L _{B12}
3090	L _{A120}	L _{B12}
3091	L _{A121}	L _{B12}
3092	L _{A122}	L _{B12}
3093	L _{A123}	L _{B12}
3094	L _{A124}	L _{B12}
3095	L _{A125}	L _{B12}
3096	L _{A126}	L _{B12}
3097	L _{A127}	L _{B12}

-continued

Compound Number	L _A	L _B
3098	L _{A128}	L _{B12}
3099	L _{A129}	L _{B12}
3100	L _{A130}	L _{B12}
3101	L _{A131}	L _{B12}
3102	L _{A132}	L _{B12}
3103	L _{A133}	L _{B12}
3104	L _{A134}	L _{B12}
3105	L _{A135}	L _{B12}
3106	L _{A136}	L _{B12}
3107	L _{A137}	L _{B12}
3108	L _{A138}	L _{B12}
3109	L _{A139}	L _{B12}
3110	L _{A140}	L _{B12}
3111	L _{A141}	L _{B12}
3112	L _{A142}	L _{B12}
3113	L _{A143}	L _{B12}
3114	L _{A144}	L _{B12}
3115	L _{A145}	L _{B12}
3116	L _{A146}	L _{B12}
3117	L _{A147}	L _{B12}
3118	L _{A148}	L _{B12}
3119	L _{A149}	L _{B12}
3120	L _{A150}	L _{B12}
3121	L _{A151}	L _{B12}
3122	L _{A152}	L _{B12}
3123	L _{A153}	L _{B12}
3124	L _{A154}	L _{B12}
3125	L _{A155}	L _{B12}
3126	L _{A156}	L _{B12}
3127	L _{A157}	L _{B12}
3128	L _{A158}	L _{B12}
3129	L _{A159}	L _{B12}
3130	L _{A160}	L _{B12}
3131	L _{A161}	L _{B12}
3132	L _{A162}	L _{B12}
3133	L _{A163}	L _{B12}
3134	L _{A164}	L _{B12}
3135	L _{A165}	L _{B12}
3136	L _{A166}	L _{B12}
3137	L _{A167}	L _{B12}
3138	L _{A168}	L _{B12}
3139	L _{A169}	L _{B12}
3140	L _{A170}	L _{B12}
3141	L _{A171}	L _{B12}
3142	L _{A172}	L _{B12}
3143	L _{A173}	L _{B12}
3144	L _{A174}	L _{B12}
3145	L _{A175}	L _{B12}
3146	L _{A176}	L _{B12}
3147	L _{A177}	L _{B12}
3148	L _{A178}	L _{B12}
3149	L _{A179}	L _{B12}
3150	L _{A180}	L _{B12}
3151	L _{A181}	L _{B12}
3152	L _{A182}	L _{B12}
3153	L _{A183}	L _{B12}
3154	L _{A184}	L _{B12}
3155	L _{A185}	L _{B12}
3156	L _{A186}	L _{B12}
3157	L _{A187}	L _{B12}
3158	L _{A188}	L _{B12}
3159	L _{A189}	L _{B12}
3160	L _{A190}	L _{B12}
3161	L _{A191}	L _{B12}
3162	L _{A192}	L _{B12}
3163	L _{A193}	L _{B12}
3164	L _{A194}	L _{B12}
3165	L _{A195}	L _{B12}
3166	L _{A196}	L _{B12}
3167	L _{A197}	L _{B12}
3168	L _{A198}	L _{B12}
3169	L _{A199}	L _{B12}
3170	L _{A200}	L _{B12}

-continued

Compound Number	L _A	L _B
3171	L _{A201}	L _{B12}
3172	L _{A202}	L _{B12}
3173	L _{A203}	L _{B12}
3174	L _{A204}	L _{B12}
3175	L _{A205}	L _{B12}
3176	L _{A206}	L _{B12}
3177	L _{A207}	L _{B12}
3178	L _{A208}	L _{B12}
3179	L _{A209}	L _{B12}
3180	L _{A210}	L _{B12}
3181	L _{A211}	L _{B12}
3182	L _{A212}	L _{B12}
3183	L _{A213}	L _{B12}
3184	L _{A214}	L _{B12}
3185	L _{A215}	L _{B12}
3186	L _{A216}	L _{B12}
3187	L _{A217}	L _{B12}
3188	L _{A218}	L _{B12}
3189	L _{A219}	L _{B12}
3190	L _{A220}	L _{B12}
3191	L _{A221}	L _{B12}
3192	L _{A222}	L _{B12}
3193	L _{A223}	L _{B12}
3194	L _{A224}	L _{B12}
3195	L _{A225}	L _{B12}
3196	L _{A226}	L _{B12}
3197	L _{A227}	L _{B12}
3198	L _{A228}	L _{B12}
3199	L _{A229}	L _{B12}
3200	L _{A230}	L _{B12}
3201	L _{A231}	L _{B12}
3202	L _{A232}	L _{B12}
3203	L _{A233}	L _{B12}
3204	L _{A234}	L _{B12}
3205	L _{A235}	L _{B12}
3206	L _{A236}	L _{B12}
3207	L _{A237}	L _{B12}
3208	L _{A238}	L _{B12}
3209	L _{A239}	L _{B12}
3210	L _{A240}	L _{B12}
3211	L _{A241}	L _{B12}
3212	L _{A242}	L _{B12}
3213	L _{A243}	L _{B12}
3214	L _{A244}	L _{B12}
3215	L _{A245}	L _{B12}
3216	L _{A246}	L _{B12}
3217	L _{A247}	L _{B12}
3218	L _{A248}	L _{B12}
3219	L _{A249}	L _{B12}
3220	L _{A250}	L _{B12}
3221	L _{A251}	L _{B12}
3222	L _{A252}	L _{B12}
3223	L _{A253}	L _{B12}
3224	L _{A254}	L _{B12}
3225	L _{A255}	L _{B12}
3226	L _{A256}	L _{B12}
3227	L _{A257}	L _{B12}
3228	L _{A258}	L _{B12}
3229	L _{A259}	L _{B12}
3230	L _{A260}	L _{B12}
3231	L _{A261}	L _{B12}
3232	L _{A262}	L _{B12}
3233	L _{A263}	L _{B12}
3234	L _{A264}	L _{B12}
3235	L _{A265}	L _{B12}
3236	L _{A266}	L _{B12}
3237	L _{A267}	L _{B12}
3238	L _{A268}	L _{B12}
3239	L _{A269}	L _{B12}
3240	L _{A270}	L _{B12}
3241	L _{A1}	L _{B13}
3242	L _{A2}	L _{B13}
3243	L _{A3}	L _{B13}

-continued

Compound Number	L _A	L _B
3244	L _{A4}	L _{B13}
3245	L _{A5}	L _{B13}
3246	L _{A6}	L _{B13}
3247	L _{A7}	L _{B13}
3248	L _{A8}	L _{B13}
3249	L _{A9}	L _{B13}
3250	L _{A10}	L _{B13}
3251	L _{A11}	L _{B13}
3252	L _{A12}	L _{B13}
3253	L _{A13}	L _{B13}
3254	L _{A14}	L _{B13}
3255	L _{A15}	L _{B13}
3256	L _{A16}	L _{B13}
3257	L _{A17}	L _{B13}
3258	L _{A18}	L _{B13}
3259	L _{A19}	L _{B13}
3260	L _{A20}	L _{B13}
3261	L _{A21}	L _{B13}
3262	L _{A22}	L _{B13}
3263	L _{A23}	L _{B13}
3264	L _{A24}	L _{B13}
3265	L _{A25}	L _{B13}
3266	L _{A26}	L _{B13}
3267	L _{A27}	L _{B13}
3268	L _{A28}	L _{B13}
3269	L _{A29}	L _{B13}
3270	L _{A30}	L _{B13}
3271	L _{A31}	L _{B13}
3272	L _{A32}	L _{B13}
3273	L _{A33}	L _{B13}
3274	L _{A34}	L _{B13}
3275	L _{A35}	L _{B13}
3276	L _{A36}	L _{B13}
3277	L _{A37}	L _{B13}
3278	L _{A38}	L _{B13}
3279	L _{A39}	L _{B13}
3280	L _{A40}	L _{B13}
3281	L _{A41}	L _{B13}
3282	L _{A42}	L _{B13}
3283	L _{A43}	L _{B13}
3284	L _{A44}	L _{B13}
3285	L _{A45}	L _{B13}
3286	L _{A46}	L _{B13}
3287	L _{A47}	L _{B13}
3288	L _{A48}	L _{B13}
3289	L _{A49}	L _{B13}
3290	L _{A50}	L _{B13}
3291	L _{A51}	L _{B13}
3292	L _{A52}	L _{B13}
3293	L _{A53}	L _{B13}
3294	L _{A54}	L _{B13}
3295	L _{A55}	L _{B13}
3296	L _{A56}	L _{B13}
3297	L _{A57}	L _{B13}
3298	L _{A58}	L _{B13}
3299	L _{A59}	L _{B13}
3300	L _{A60}	L _{B13}
3301	L _{A61}	L _{B13}
3302	L _{A62}	L _{B13}
3303	L _{A63}	L _{B13}
3304	L _{A64}	L _{B13}
3305	L _{A65}	L _{B13}
3306	L _{A66}	L _{B13}
3307	L _{A67}	L _{B13}
3308	L _{A68}	L _{B13}
3309	L _{A69}	L _{B13}
3310	L _{A70}	L _{B13}
3311	L _{A71}	L _{B13}
3312	L _{A72}	L _{B13}
3313	L _{A73}	L _{B13}
3314	L _{A74}	L _{B13}
3315	L _{A75}	L _{B13}
3316	L _{A76}	L _{B13}

-continued

Compound Number	L _A	L _B
3317	L _{A77}	L _{B13}
3318	L _{A78}	L _{B13}
3319	L _{A79}	L _{B13}
3320	L _{A80}	L _{B13}
3321	L _{A81}	L _{B13}
3322	L _{A82}	L _{B13}
3323	L _{A83}	L _{B13}
3324	L _{A84}	L _{B13}
3325	L _{A85}	L _{B13}
3326	L _{A86}	L _{B13}
3327	L _{A87}	L _{B13}
3328	L _{A88}	L _{B13}
3329	L _{A89}	L _{B13}
3330	L _{A90}	L _{B13}
3331	L _{A91}	L _{B13}
3332	L _{A92}	L _{B13}
3333	L _{A93}	L _{B13}
3334	L _{A94}	L _{B13}
3335	L _{A95}	L _{B13}
3336	L _{A96}	L _{B13}
3337	L _{A97}	L _{B13}
3338	L _{A98}	L _{B13}
3339	L _{A99}	L _{B13}
3340	L _{A100}	L _{B13}
3341	L _{A101}	L _{B13}
3342	L _{A102}	L _{B13}
3343	L _{A103}	L _{B13}
3344	L _{A104}	L _{B13}
3345	L _{A105}	L _{B13}
3346	L _{A106}	L _{B13}
3347	L _{A107}	L _{B13}
3348	L _{A108}	L _{B13}
3349	L _{A109}	L _{B13}
3350	L _{A110}	L _{B13}
3351	L _{A111}	L _{B13}
3352	L _{A112}	L _{B13}
3353	L _{A113}	L _{B13}
3354	L _{A114}	L _{B13}
3355	L _{A115}	L _{B13}
3356	L _{A116}	L _{B13}
3357	L _{A117}	L _{B13}
3358	L _{A118}	L _{B13}
3359	L _{A119}	L _{B13}
3360	L _{A120}	L _{B13}
3361	L _{A121}	L _{B13}
3362	L _{A122}	L _{B13}
3363	L _{A123}	L _{B13}
3364	L _{A124}	L _{B13}
3365	L _{A125}	L _{B13}
3366	L _{A126}	L _{B13}
3367	L _{A127}	L _{B13}
3368	L _{A128}	L _{B13}
3369	L _{A129}	L _{B13}
3370	L _{A130}	L _{B13}
3371	L _{A131}	L _{B13}
3372	L _{A132}	L _{B13}
3373	L _{A133}	L _{B13}
3374	L _{A134}	L _{B13}
3375	L _{A135}	L _{B13}
3376	L _{A136}	L _{B13}
3377	L _{A137}	L _{B13}
3378	L _{A138}	L _{B13}
3379	L _{A139}	L _{B13}
3380	L _{A140}	L _{B13}
3381	L _{A141}	L _{B13}
3382	L _{A142}	L _{B13}
3383	L _{A143}	L _{B13}
3384	L _{A144}	L _{B13}
3385	L _{A145}	L _{B13}
3386	L _{A146}	L _{B13}
3387	L _{A147}	L _{B13}
3388	L _{A148}	L _{B13}
3389	L _{A149}	L _{B13}

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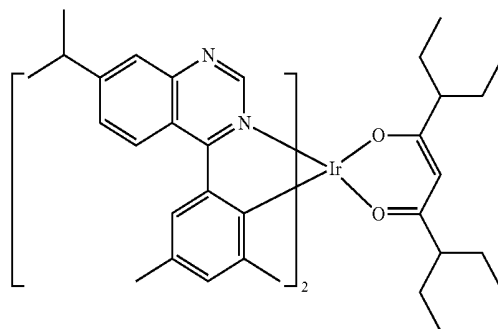
Compound Number	L _A	L _B
3390	L _{A150}	L _{B13}
3391	L _{A151}	L _{B13}
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3393	L _{A153}	L _{B13}
3394	L _{A154}	L _{B13}
3395	L _{A155}	L _{B13}
3396	L _{A156}	L _{B13}
3397	L _{A157}	L _{B13}
3398	L _{A158}	L _{B13}
3399	L _{A159}	L _{B13}
3400	L _{A160}	L _{B13}
3401	L _{A161}	L _{B13}
3402	L _{A162}	L _{B13}
3403	L _{A163}	L _{B13}
3404	L _{A164}	L _{B13}
3405	L _{A165}	L _{B13}
3406	L _{A166}	L _{B13}
3407	L _{A167}	L _{B13}
3408	L _{A168}	L _{B13}
3409	L _{A169}	L _{B13}
3410	L _{A170}	L _{B13}
3411	L _{A171}	L _{B13}
3412	L _{A172}	L _{B13}
3413	L _{A173}	L _{B13}
3414	L _{A174}	L _{B13}
3415	L _{A175}	L _{B13}
3416	L _{A176}	L _{B13}
3417	L _{A177}	L _{B13}
3418	L _{A178}	L _{B13}
3419	L _{A179}	L _{B13}
3420	L _{A180}	L _{B13}
3421	L _{A181}	L _{B13}
3422	L _{A182}	L _{B13}
3423	L _{A183}	L _{B13}
3424	L _{A184}	L _{B13}
3425	L _{A185}	L _{B13}
3426	L _{A186}	L _{B13}
3427	L _{A187}	L _{B13}
3428	L _{A188}	L _{B13}
3429	L _{A189}	L _{B13}
3430	L _{A190}	L _{B13}
3431	L _{A191}	L _{B13}
3432	L _{A192}	L _{B13}
3433	L _{A193}	L _{B13}
3434	L _{A194}	L _{B13}
3435	L _{A195}	L _{B13}
3436	L _{A196}	L _{B13}
3437	L _{A197}	L _{B13}
3438	L _{A198}	L _{B13}
3439	L _{A199}	L _{B13}
3440	L _{A200}	L _{B13}
3441	L _{A201}	L _{B13}
3442	L _{A202}	L _{B13}
3443	L _{A203}	L _{B13}
3444	L _{A204}	L _{B13}
3445	L _{A205}	L _{B13}
3446	L _{A206}	L _{B13}
3447	L _{A207}	L _{B13}
3448	L _{A208}	L _{B13}
3449	L _{A209}	L _{B13}
3450	L _{A210}	L _{B13}
3451	L _{A211}	L _{B13}
3452	L _{A212}	L _{B13}
3453	L _{A213}	L _{B13}
3454	L _{A214}	L _{B13}
3455	L _{A215}	L _{B13}
3456	L _{A216}	L _{B13}
3457	L _{A217}	L _{B13}
3458	L _{A218}	L _{B13}
3459	L _{A219}	L _{B13}
3460	L _{A220}	L _{B13}
3461	L _{A221}	L _{B13}
3462	L _{A222}	L _{B13}

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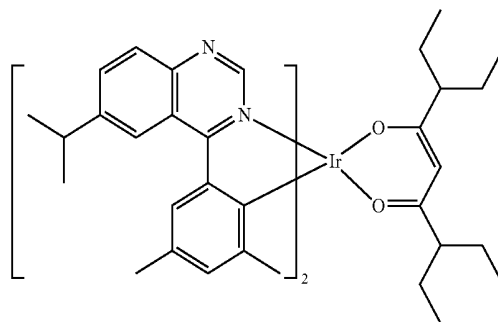
Compound Number	L _A	L _B
3463	L _{A223}	L _{B13}
3464	L _{A224}	L _{B13}
3465	L _{A225}	L _{B13}
3466	L _{A226}	L _{B13}
3467	L _{A227}	L _{B13}
3468	L _{A228}	L _{B13}
3469	L _{A229}	L _{B13}
3470	L _{A230}	L _{B13}
3471	L _{A231}	L _{B13}
3472	L _{A232}	L _{B13}
3473	L _{A233}	L _{B13}
3474	L _{A234}	L _{B13}
3475	L _{A235}	L _{B13}
3476	L _{A236}	L _{B13}
3477	L _{A237}	L _{B13}
3478	L _{A238}	L _{B13}
3479	L _{A239}	L _{B13}
3480	L _{A240}	L _{B13}
3481	L _{A241}	L _{B13}
3482	L _{A242}	L _{B13}
3483	L _{A243}	L _{B13}
3484	L _{A244}	L _{B13}
3485	L _{A245}	L _{B13}
3486	L _{A246}	L _{B13}
3487	L _{A247}	L _{B13}
3488	L _{A248}	L _{B13}
3489	L _{A249}	L _{B13}
3490	L _{A250}	L _{B13}
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3494	L _{A254}	L _{B13}
3495	L _{A255}	L _{B13}
3496	L _{A256}	L _{B13}
3497	L _{A257}	L _{B13}
3498	L _{A258}	L _{B13}
3499	L _{A259}	L _{B13}
3500	L _{A260}	L _{B13}
3501	L _{A261}	L _{B13}
3502	L _{A262}	L _{B13}
3503	L _{A263}	L _{B13}
3504	L _{A264}	L _{B13}
3505	L _{A265}	L _{B13}
3506	L _{A266}	L _{B13}
3507	L _{A267}	L _{B13}
3508	L _{A268}	L _{B13}
3509	L _{A269}	L _{B13}
3510	L _{A270}	L _{B13}

-continued

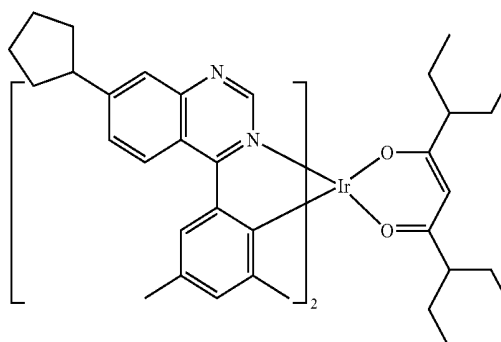
Compound 87



Compound 88

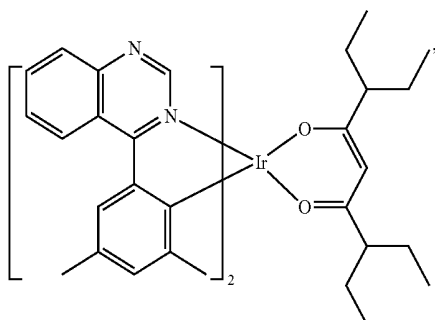


Compound 93

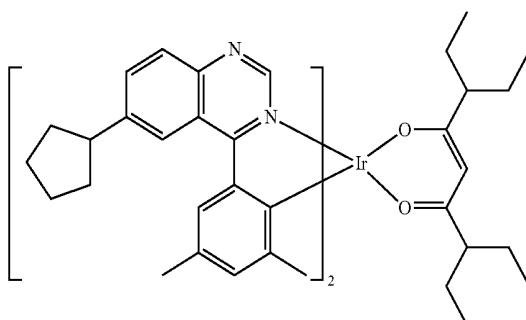


[0100] In some embodiments, the compound is selected from the group consisting of:

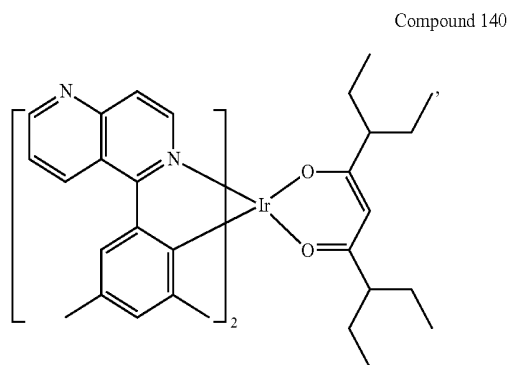
Compound 81



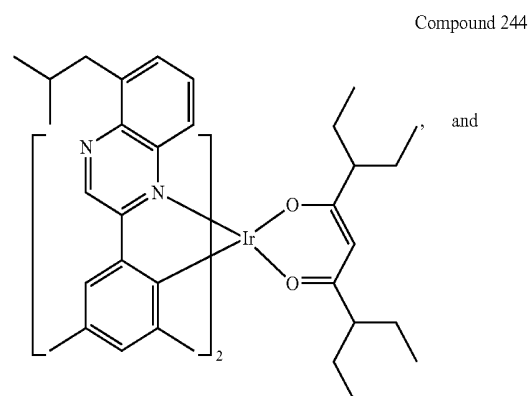
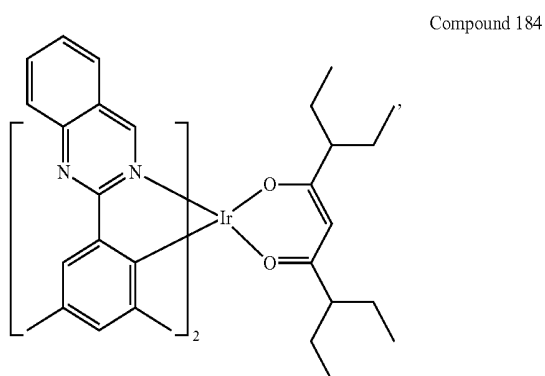
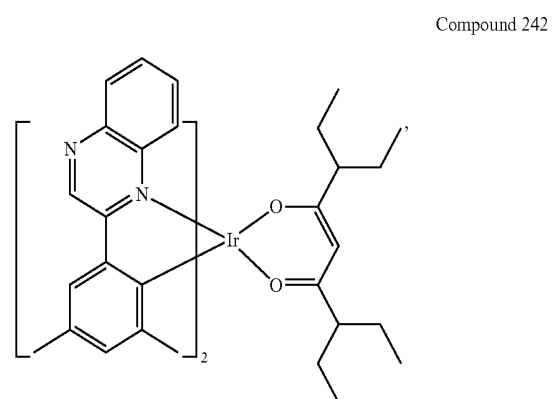
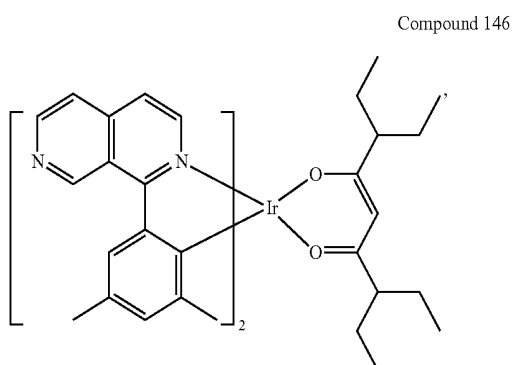
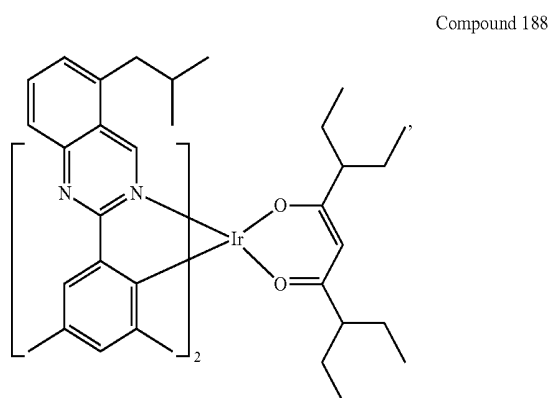
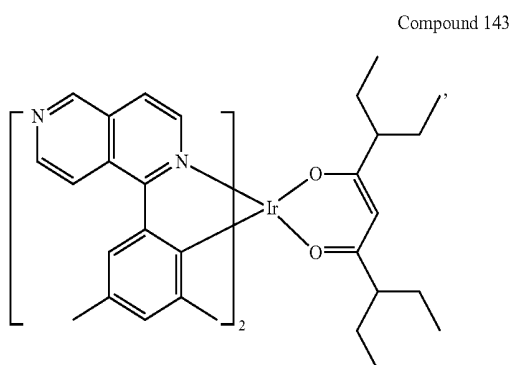
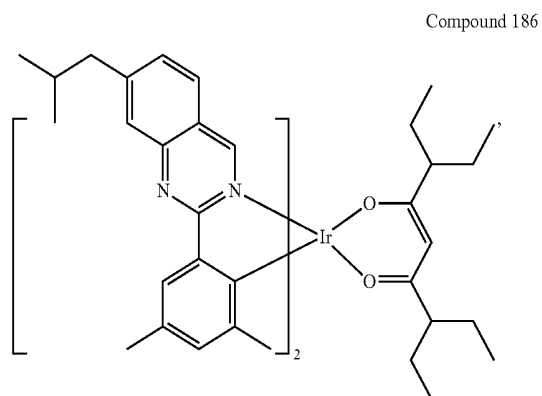
Compound 94



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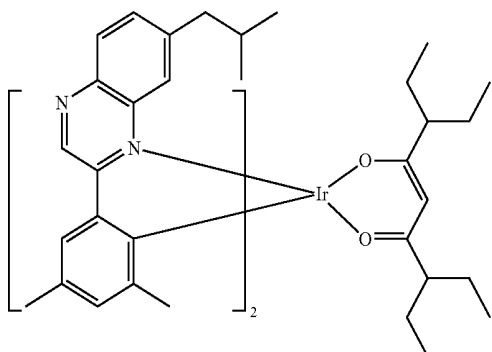
-continued



and

-continued

Compound 246

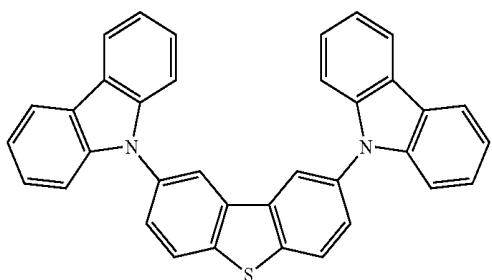


[0101] According to another aspect of the present disclosure, a first device is also provided. The first device includes a first organic light emitting device, that includes an anode, a cathode, and an organic layer disposed between the anode and the cathode. The organic layer can include a compound according to the formula $M(L_A)_x(L_B)_y(L_C)_z$, and its variations as described herein.

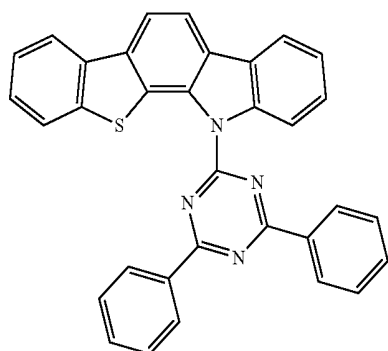
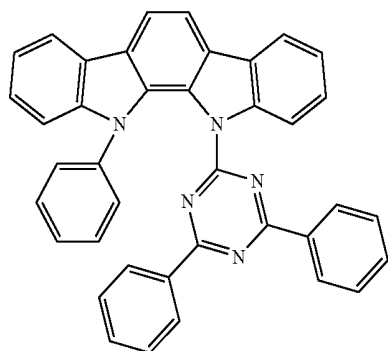
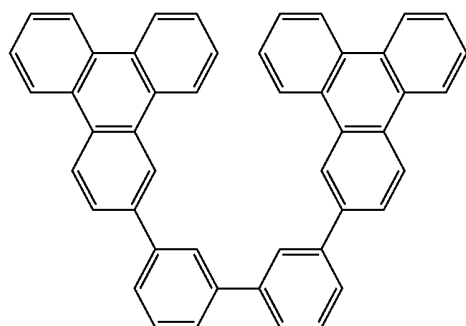
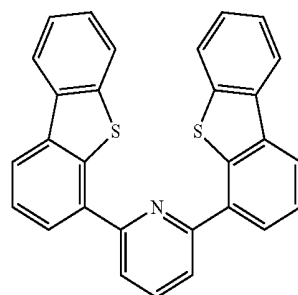
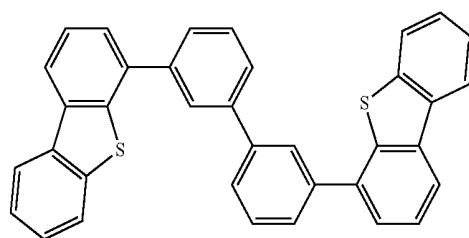
[0102] The first device can be one or more of a consumer product, an organic light-emitting device and a lighting panel. The organic layer can be an emissive layer and the compound can be an emissive dopant in some embodiments, while the compound can be a non-emissive dopant in other embodiments.

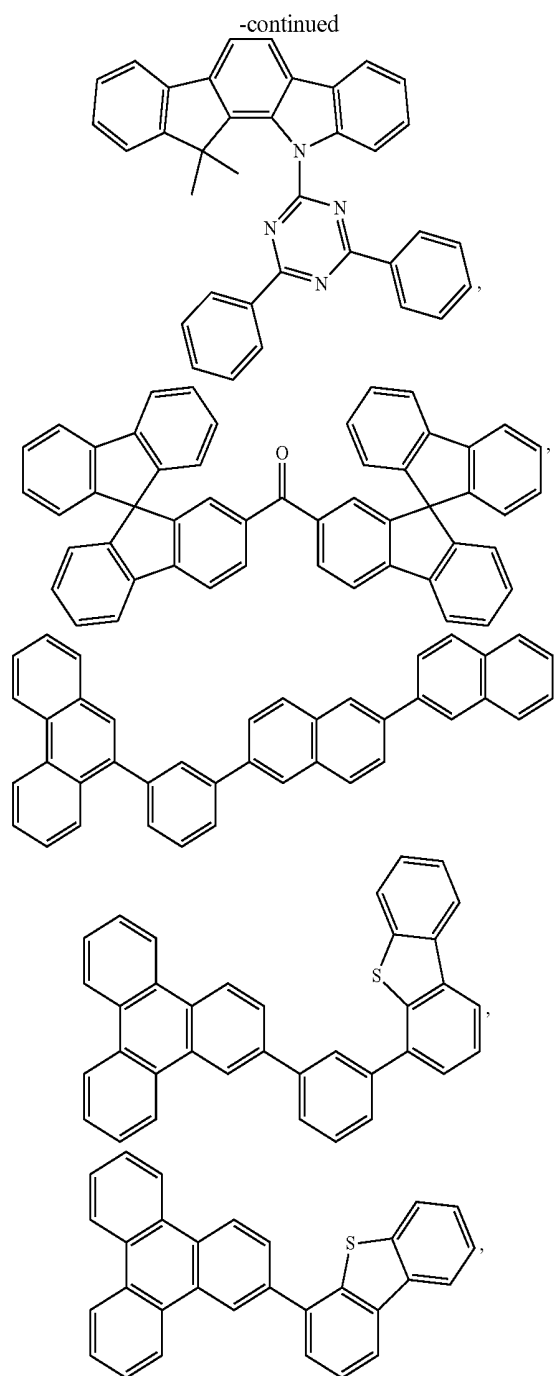
[0103] The organic layer can also include a host. In some embodiments, the host can include a metal complex. The host can be a triphenylene containing benzo-fused thiophene or benzo-fused furan. Any substituent in the host can be an unfused substituent independently selected from the group consisting of C_nH_{2n+1} , OC_nH_{2n+1} , OAr_1 , $N(C_nH_{2n+1})_2$, $N(Ar_1)(Ar_2)$, $CH=CH-C_nH_{2n+1}$, $C\equiv C-C_nH_{2n+1}$, Ar_1 , Ar_1-Ar_2 , $C_nH_{2n}-Ar_1$, or no substitution. In the preceding substituents n can range from 1 to 10; and Ar_1 and Ar_2 can be independently selected from the group consisting of benzene, biphenyl, naphthalene, triphenylene, carbazole, and heteroaromatic analogs thereof.

[0104] The host can be a compound selected from the group consisting of carbazole, dibenzothiophene, dibenzofuran, dibenzoselenophene, azacarbazole, aza-dibenzothiophene, aza-dibenzofuran, and aza-dibenzoselenophene. The host can include a metal complex. The host can be a specific compound selected from the group consisting of:



-continued





and combinations thereof.

[0105] In yet another aspect of the present disclosure, a formulation that comprises a compound according to the formula $M(L_A)_x(L_B)_y(L_C)_z$ is described. The formulation can include one or more components selected from the group consisting of a solvent, a host, a hole injection material, hole transport material, and an electron transport layer material, disclosed herein.

Combination with Other Materials

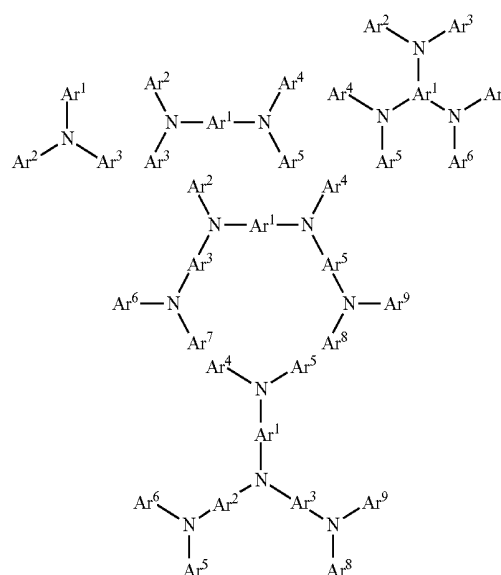
[0106] The materials described herein as useful for a particular layer in an organic light emitting device may be used in combination with a wide variety of other materials present in the device. For example, emissive dopants disclosed herein may be used in conjunction with a wide variety of hosts,

transport layers, blocking layers, injection layers, electrodes and other layers that may be present. The materials described or referred to below 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.

HIL/HTL:

[0107] A hole injecting/transporting material to be used in the present invention is not particularly limited, and any compound may be used as long as the compound is typically used as a hole injecting/transporting material. Examples of the material include, but not limit to: a phthalocyanine or porphyrin derivative; an aromatic amine derivative; an indolocarbazole derivative; a polymer containing fluorohydrocarbon; a polymer with conductivity dopants; a conducting polymer, such as PEDOT/PSS; a self-assembly monomer derived from compounds such as phosphonic acid and silane derivatives; a metal oxide derivative, such as MoO_x ; a p-type semiconducting organic compound, such as 1,4,5,8,9,12-Hexaazatriphenylenehexacarbonitrile; a metal complex, and a cross-linkable compounds.

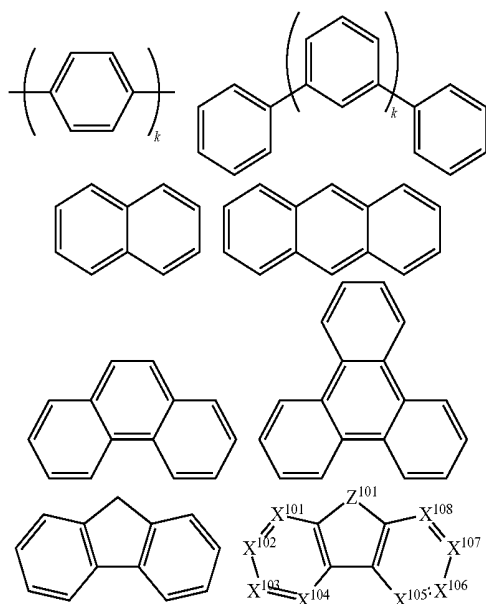
[0108] Examples of aromatic amine derivatives used in HIL or HTL include, but not limit to the following general structures:



[0109] Each of Ar^1 to Ar^9 is selected from the group consisting aromatic hydrocarbon cyclic compounds such as benzene, biphenyl, triphenyl, triphenylene, naphthalene, anthracene, phenalene, phenanthrene, fluorene, pyrene, chrysene, perylene, azulene; group consisting aromatic heterocyclic compounds such as 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, quinoxaline,

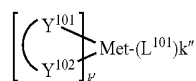
quinoxaline, naphthyridine, phthalazine, pteridine, xanthene, acridine, phenazine, phenothiazine, phenoxazine, benzofuro-pyridine, furodipyridine, benzothienopyridine, thienodipyri-dine, benzoselenophenopyridine, and selenophenodipyri-dine; and group consisting 2 to 10 cyclic structural units which are groups of the same type or different types selected from the aromatic hydrocarbon cyclic group and the aromatic heterocyclic group and are bonded to each other directly or via at least one of oxygen atom, nitrogen atom, sulfur atom, silicon atom, phosphorus atom, boron atom, chain structural unit and the aliphatic cyclic group. Wherein each Ar is further substituted by a substituent selected from the group consist-ing of hydrogen, deuterium, halide, alkyl, cycloalkyl, het-eroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof.

[0110] In one aspect, Ar¹ to Ar⁹ is independently selected from the group consisting of:



wherein k is an integer from 1 to 20; X¹⁰¹ to X¹⁰⁸ is C (including CH) or N; Z¹⁰¹ is NAr¹, O, or S; Ar¹ has the same group defined above.

[0111] Examples of metal complexes used in HIL or HTL include, but not limit to the following general formula:



wherein Met is a metal, which can have an atomic weight greater than 40; (Y¹⁰¹-Y¹⁰²) is a bidentate ligand, Y¹⁰¹ and Y¹⁰² are independently selected from C, N, O, P, and S; L¹⁰¹ is an ancillary ligand; k' is an integer value from 1 to the maximum number of ligands that may be attached to the metal; and k'+k'' is the maximum number of ligands that may be attached to the metal.

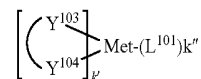
[0112] In one aspect, (Y¹⁰¹-Y¹⁰²) is a 2-phenylpyridine derivative. In another aspect, (Y¹⁰¹-Y¹⁰²) is a carbene ligand.

In another aspect, Met is selected from Ir, Pt, Os, and Zn. In a further aspect, the metal complex has a smallest oxidation potential in solution vs. Fe³⁺/Fe couple less than about 0.6 V.

Host:

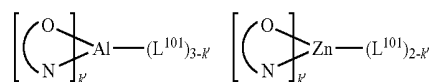
[0113] The light emitting layer of the organic EL device of the present invention preferably contains at least a metal complex as light emitting material, and may contain a host material using the metal complex as a dopant material. Examples of the host material are not particularly limited, and any metal complexes or organic compounds may be used as long as the triplet energy of the host is larger than that of the dopant. While the Table below categorizes host materials as preferred for devices that emit various colors, any host material may be used with any dopant so long as the triplet criteria is satisfied.

[0114] Examples of metal complexes used as host are preferred to have the following general formula:



wherein Met is a metal; (Y¹⁰³-Y¹⁰⁴) is a bidentate ligand, Y¹⁰³ and Y¹⁰⁴ are independently selected from C, N, O, P, and S; L¹⁰¹ is an another ligand; k' is an integer value from 1 to the maximum number of ligands that may be attached to the metal; and k'+k'' is the maximum number of ligands that may be attached to the metal.

[0115] In one aspect, the metal complexes are:



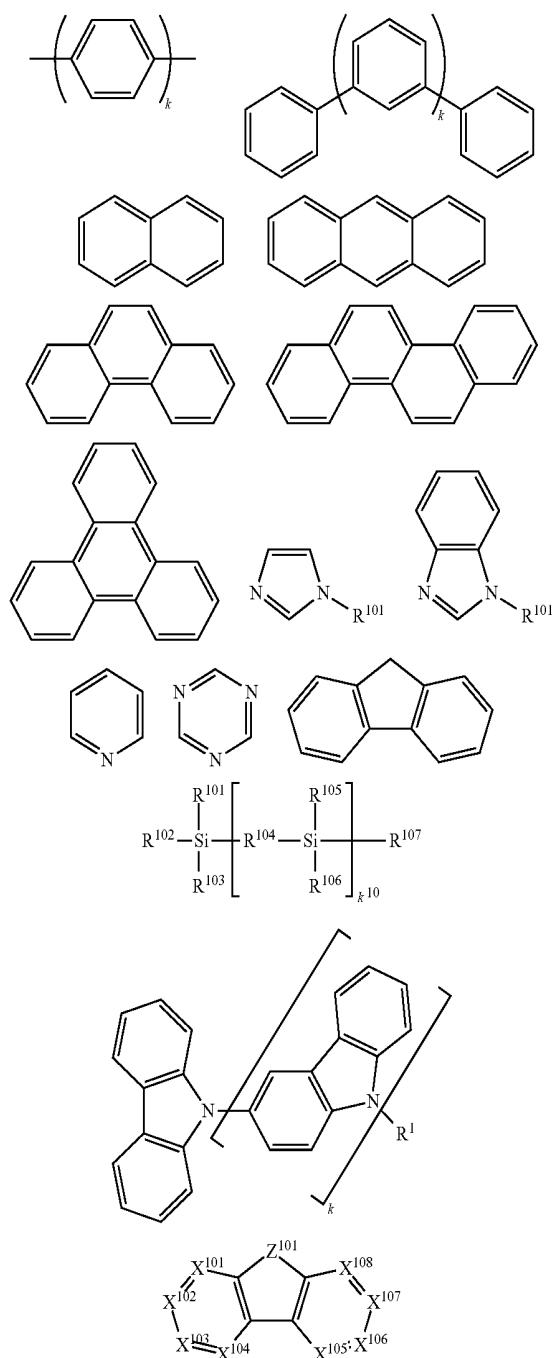
wherein (O—N) is a bidentate ligand, having metal coordinated to atoms O and N.

[0116] In another aspect, Met is selected from Ir and Pt. In a further aspect, (Y¹⁰³-Y¹⁰⁴) is a carbene ligand.

[0117] Examples of organic compounds used as host are selected from the group consisting aromatic hydrocarbon cyclic compounds such as benzene, biphenyl, triphenyl, triphenylene, naphthalene, anthracene, phenalene, phenanthrene, fluorene, pyrene, chrysene, perylene, azulene; group consisting aromatic heterocyclic compounds such as 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, quinoxaline, quinoxaline, naphthyridine, phthalazine, pteridine, xanthene, acridine, phenazine, phenothiazine, phenoxazine, benzofuro-pyridine, furodipyri-dine, benzothienopyridine, thienodipyridine, benzosele-nophenopyridine, and selenophenodipyridine; and group consisting 2 to 10 cyclic structural units which are groups of the same type or different types selected from the aromatic hydrocarbon cyclic group and the aromatic heterocyclic

group and are bonded to each other directly or via at least one of oxygen atom, nitrogen atom, sulfur atom, silicon atom, phosphorus atom, boron atom, chain structural unit and the aliphatic cyclic group. Wherein each group is further substituted by a substituent selected from the group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof.

[0118] In one aspect, host compound contains at least one of the following groups in the molecule:



wherein R¹⁰¹ to R¹⁰⁷ is independently selected from the group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof, when it is aryl or heteroaryl, it has the similar definition as Ar's mentioned above. k is an integer from 0 to 20 or 1 to 20; k''' is an integer from 0 to 20. X¹⁰¹ to X¹⁰⁸ is selected from C (including CH) or N. Z¹⁰¹ and Z¹⁰² is selected from NR¹⁰¹, O, or S.

HBL:

[0119] A hole blocking layer (HBL) may be used to reduce the number of holes and/or excitons that leave the emissive layer. The presence of such a blocking layer in a device may result in substantially higher efficiencies as compared to a similar device lacking a blocking layer. Also, a blocking layer may be used to confine emission to a desired region of an OLED.

[0120] In one aspect, compound used in HBL contains the same molecule or the same functional groups used as host described above.

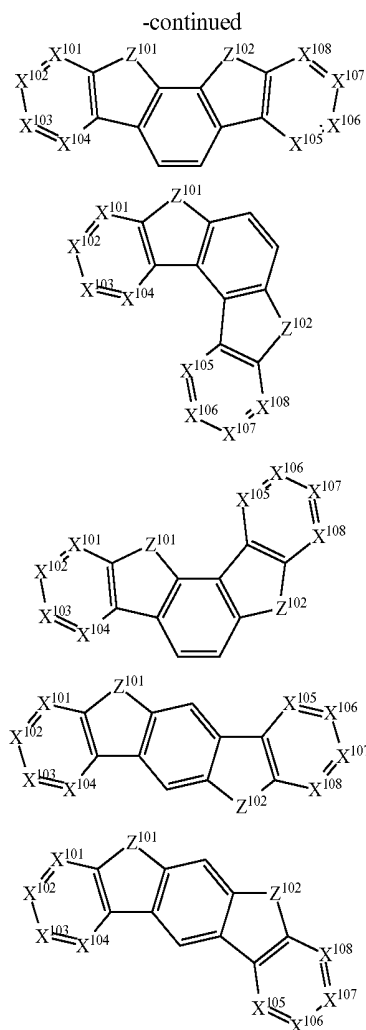


TABLE 1

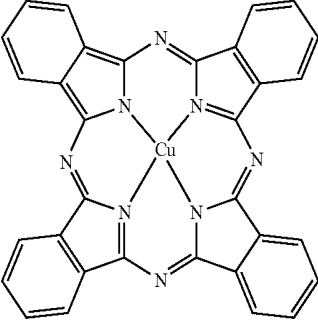
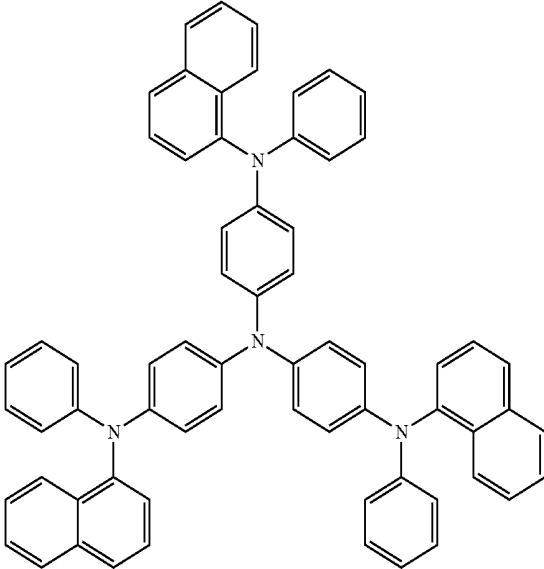
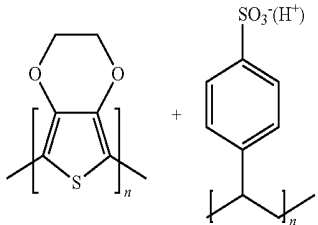
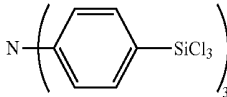
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Hole injection materials		
Phthalocyanine and porphyrin compounds		Appl. Phys. Lett. 69, 2160 (1996)
Starburst triarylamines		J. Lumin, 72-74, 985 (1997)
CF _x Fluorohydrocarbon polymer	$\text{—[CH}_x\text{F}_y\text{]}_n\text{—}$	Appl. Phys. Lett. 78, 673 (2001)
Conducting polymers (e.g., PEDOT:PSS, polyaniline, polythiophene)		Synth. Met. 87, 171 (1997) WO2007002683
Phosphonic acid and silane SAMs		US20030162053

TABLE 1-continued

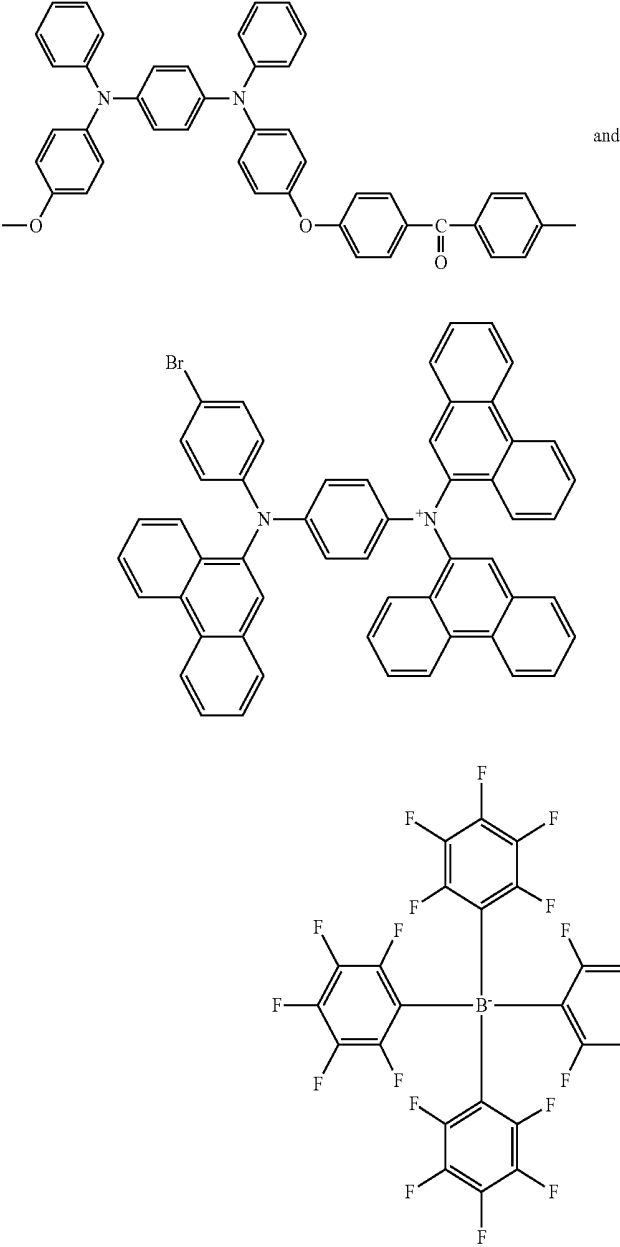
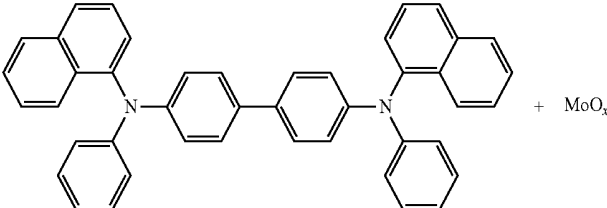
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Triarylamine or polythiophene polymers with conductivity dopants		EP1725079A1
Organic compounds with conductive inorganic compounds, such as molybdenum and tungsten oxides		US20050123751 SID Symposium Digest, 37, 923 (2006) WO2009018009

TABLE 1-continued

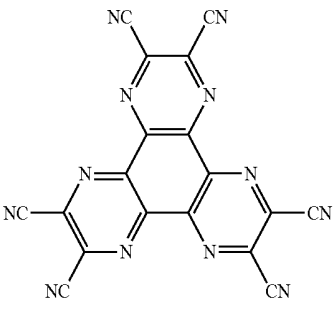
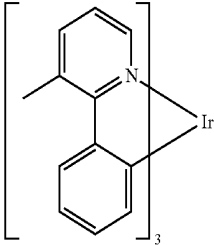
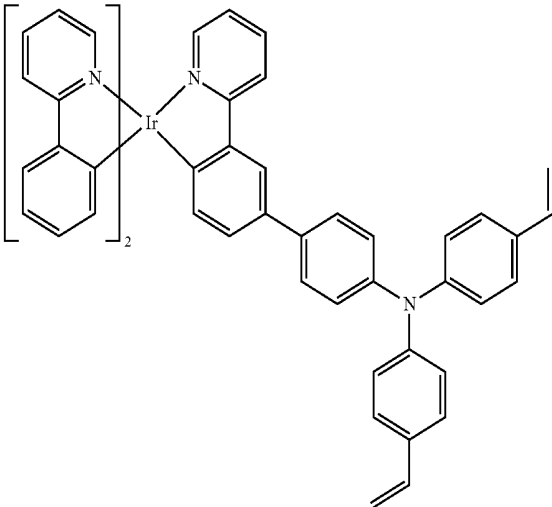
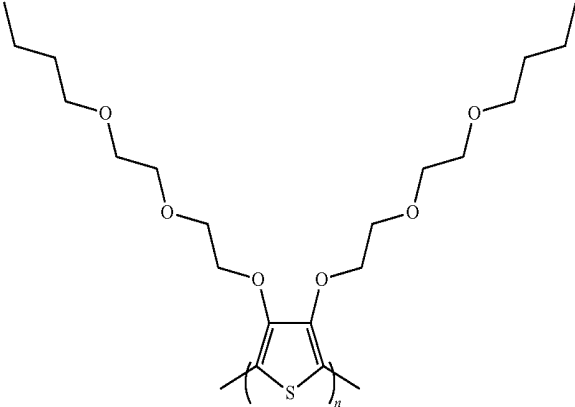
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
n-type semiconducting organic complexes		US20020158242
Metal organometallic complexes		US20060240279
Cross-linkable compounds		US20080220265
Polythiophene based polymers and copolymers		WO 2011075644 EP2350216

TABLE 1-continued

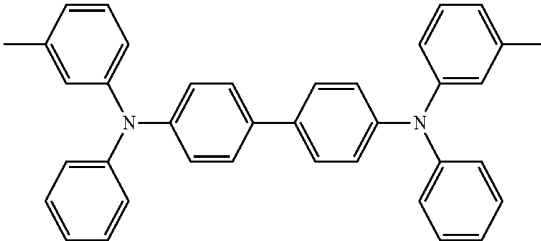
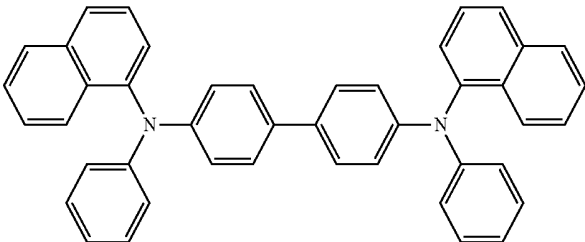
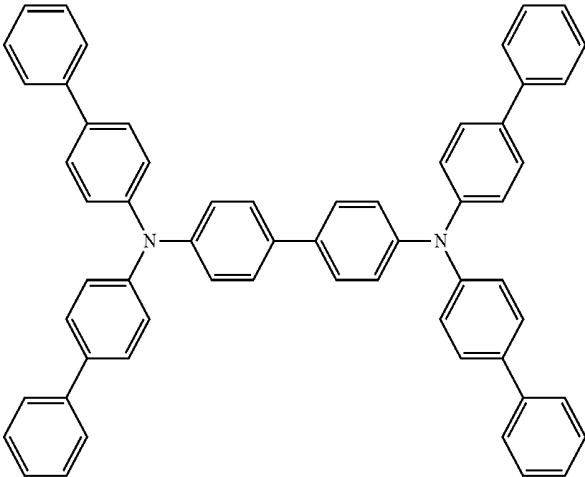
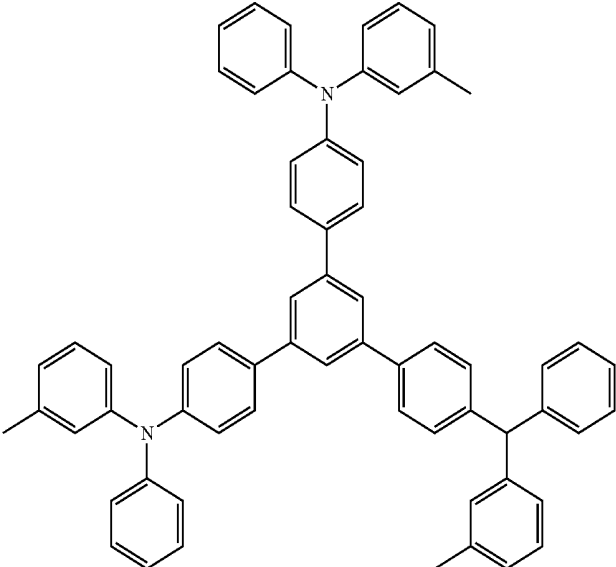
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
	Hole transporting materials	
Triarylamines (e.g., TPD, α -NPD)		Appl. Phys. Lett. 51, 913 (1987)
		U.S. Pat. No. 5,061,569
		EP650955
		J. Mater. Chem. 3, 319 (1993)

TABLE 1-continued

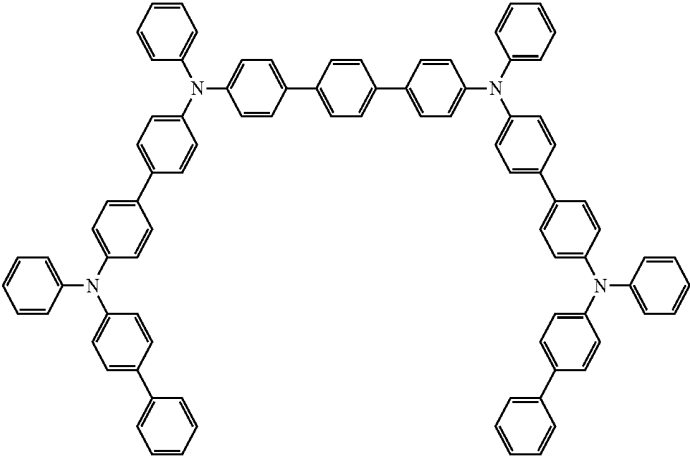
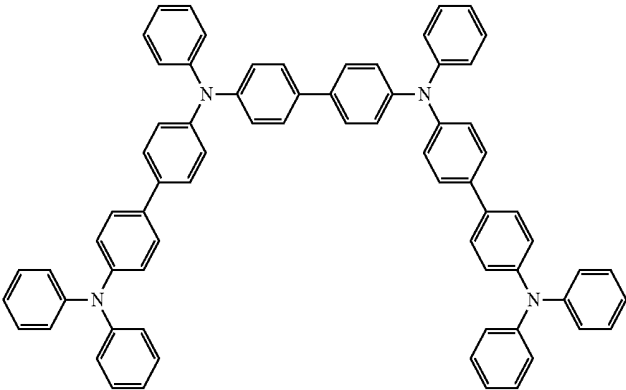
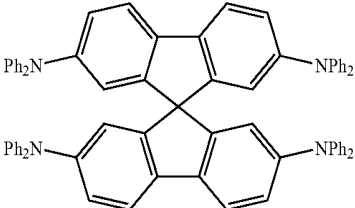
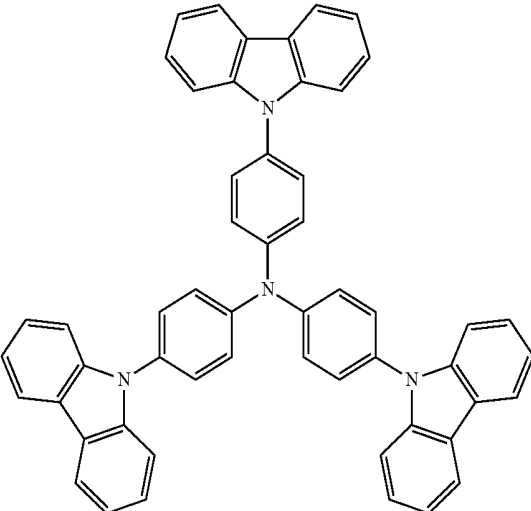
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		Appl. Phys. Lett. 90, 183503 (2007)
		Appl. Phys. Lett. 90, 183503 (2007)
Triaylamine on spirofluorene core		Synth. Met. 91, 209 (1997)
Arylamine carbazole compounds		Adv. Mater. 6, 677 (1994), US20080124572

TABLE 1-continued

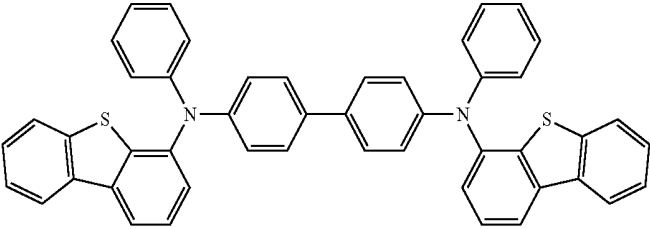
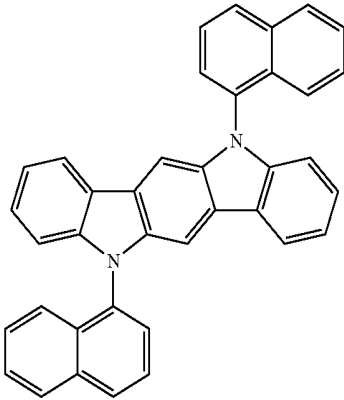
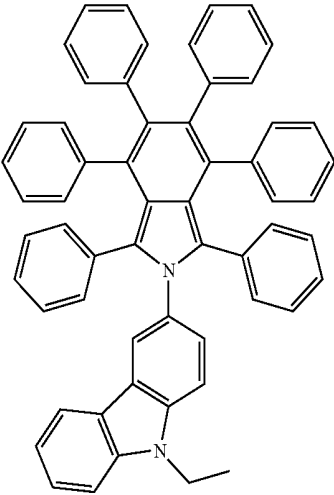
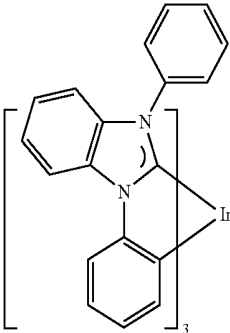
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Triarylamine with (di)benzothiophenei/(di) zofuran		US20070278938, US20080106190 US20110163302
Indolocarbazoles		Synth. Met. 111, 421 (2000)
Isoindole compounds		Chem. Mater. 15, 3148 (2003)
Metal carbene complexes		US2008008221

TABLE 1-continued

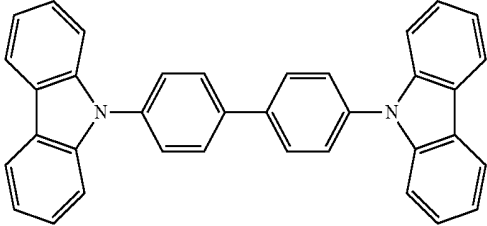
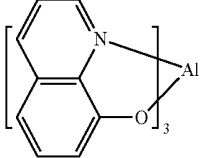
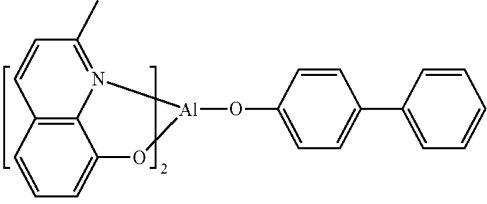
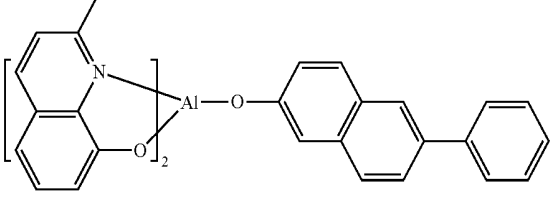
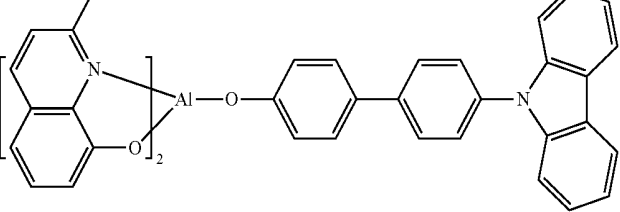
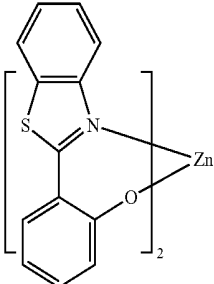
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Phosphorescent OLED host materials		
Red hosts		
Arylcarbazoles		Appl. Phys. Lett. 78, 1622 (2001)
Metal 8-hydroxyquinolates (e.g., Alq ₃ , BAlq)		Nature 395, 151 (1998)
		US20060202194
		WO2005014551
		WO2006072002
Metal phenoxybenzothiazole compounds		Appl. Phys. Lett. 90, 123509 (2007)

TABLE 1-continued

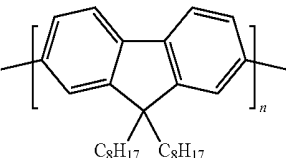
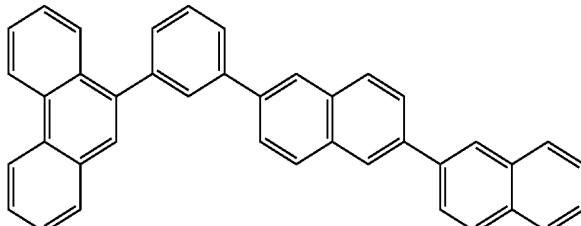
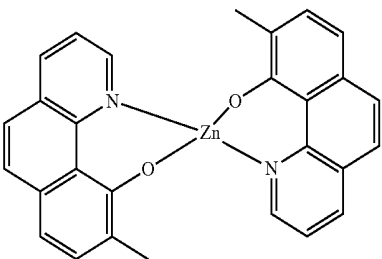
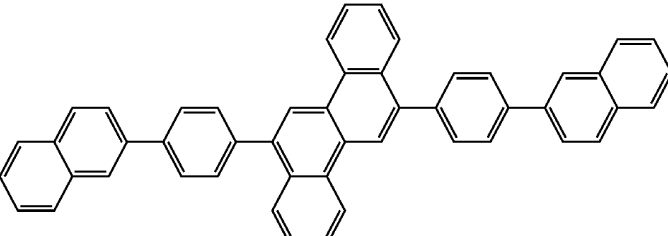
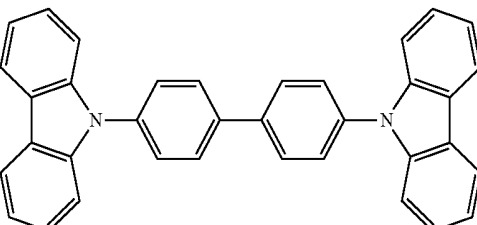
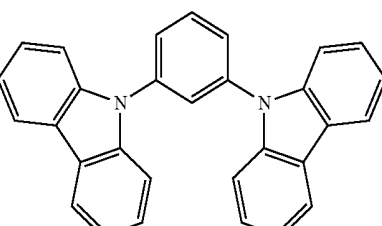
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Conjugated oligomers and polymers (e.g., polyfluorene)		Org. Electron. 1, 15 (2000)
Aromatic fused rings		WO2009066779, WO2009066778, WO2009063833, US20090045731, US20090045730, WO2009008311, US2009008605, US20090009065
Zinc complexes		WO2010056066
Chrysene based compounds		WO2011086863
Green hosts		
Arylcarbozoles		Appl. Phys. Lett. 78, 1622 (2001)
		US20030175553

TABLE 1-continued

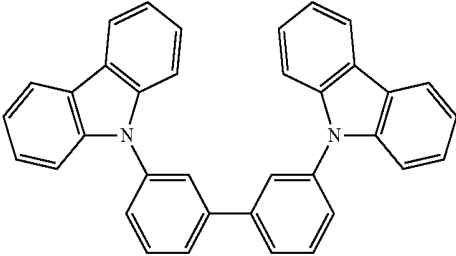
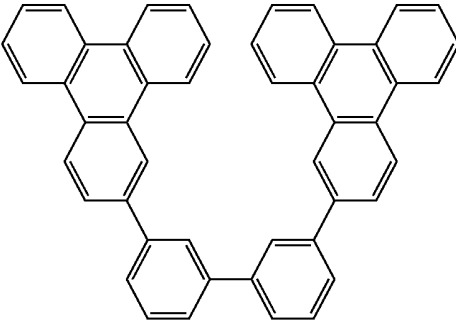
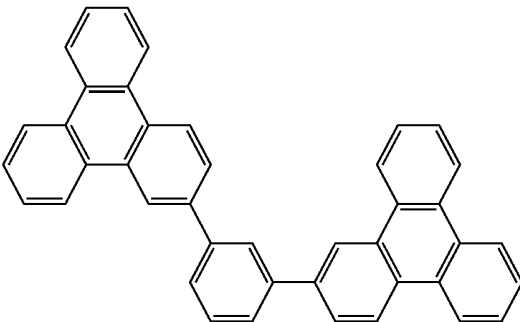
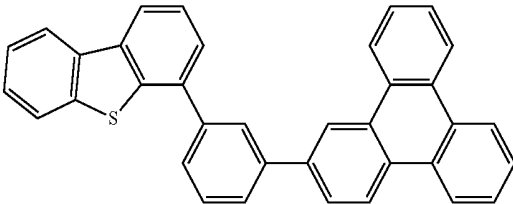
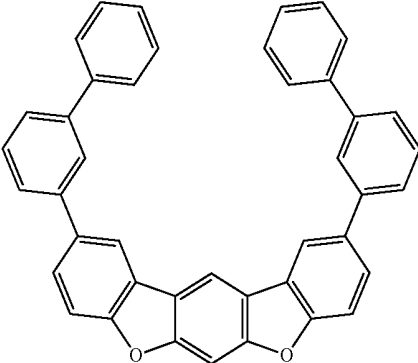
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		WO2001039234
Aryltriphenylene compounds		US20060280965
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		WO2009021126
Poly-fused heteroaryl compounds		US20090309488 US20090302743 US20100012931

TABLE 1-continued

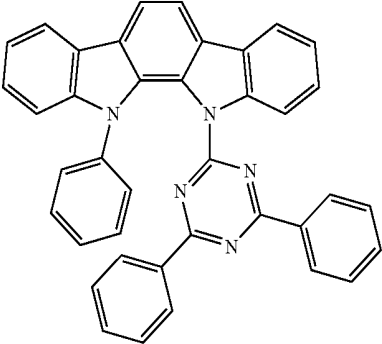
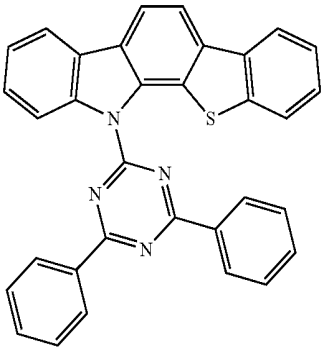
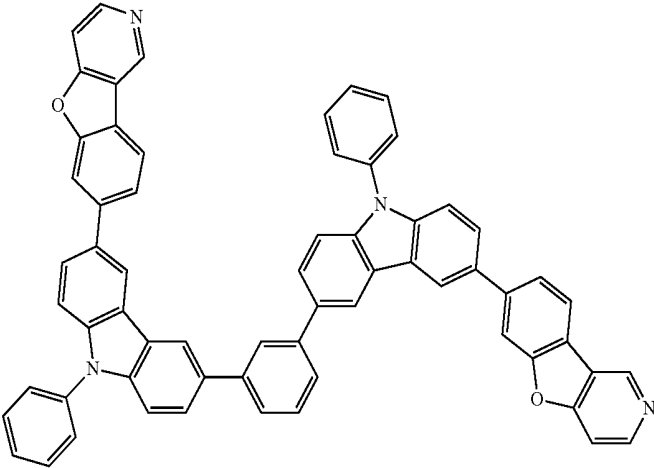
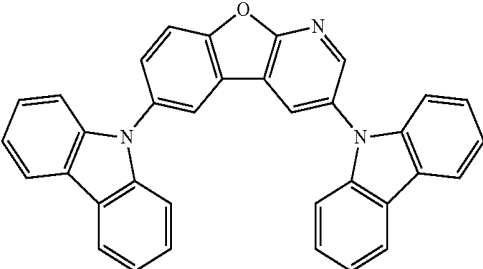
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Donor acceptor type molecules		WO2008056746
		WO2010107244
Aza-carbazole/DBT/DBF		JP2008074939
		US20100187984

TABLE 1-continued

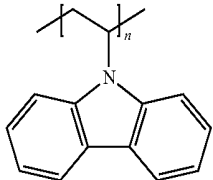
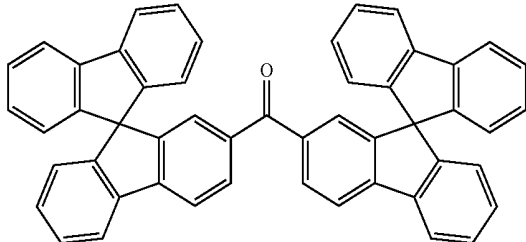
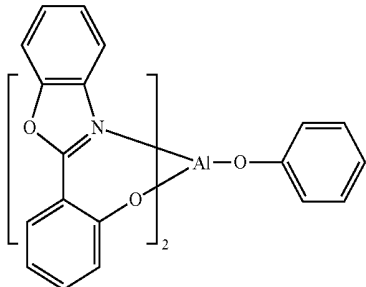
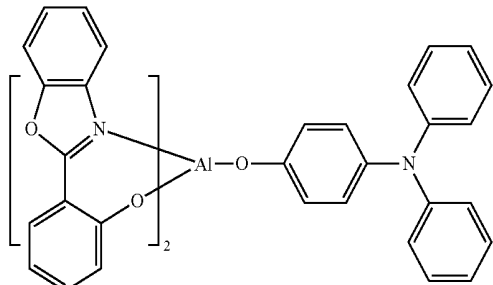
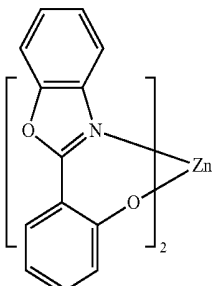
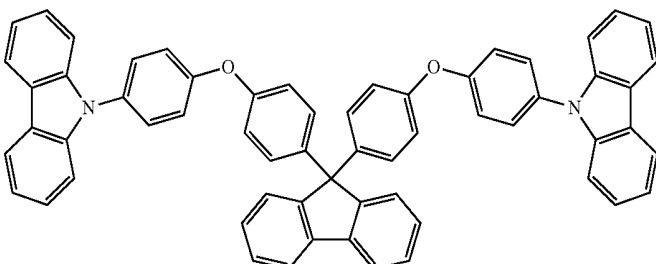
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Polymers (e.g., PVK)		Appl. Phys. Lett. 77, 2280 (2000)
Spirofluorene compounds		WO2004093207
Metal phenoxybenzoxazole compounds		WO2005089025
		WO2006132173
		JP200511610
Spirofluorene-carbazole compounds		JP2007254297

TABLE 1-continued

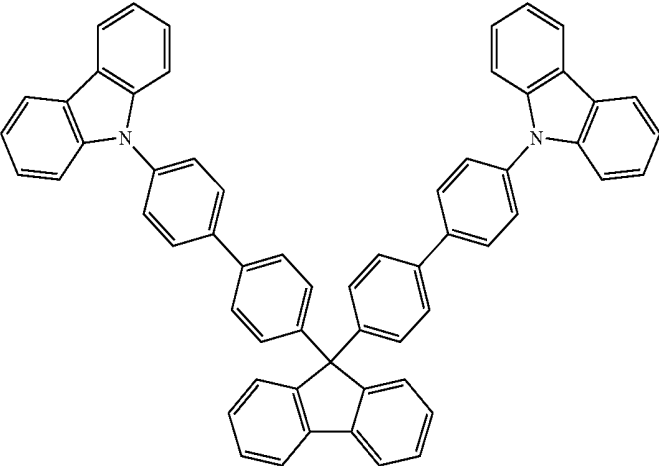
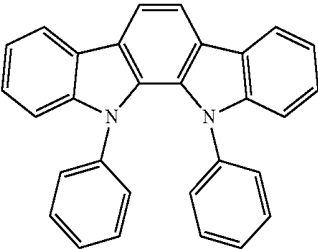
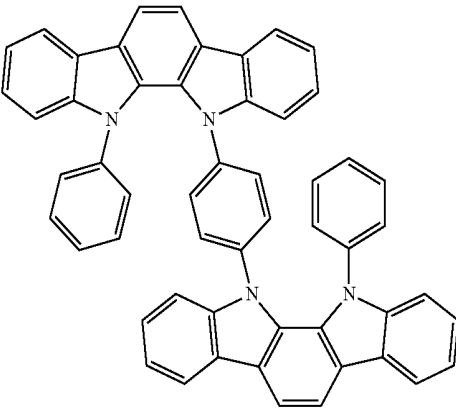
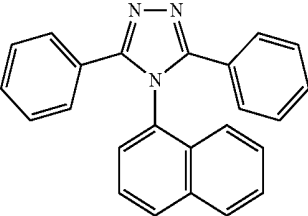
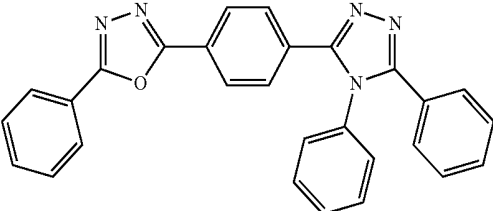
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		JP2007254297
Indolocarbazoles		WO2007063796
		WO2007063754
5-member ring electron deficient heterocycles (e.g., triazole, oxadiazole)		J. Appl. Phys. 90, 5048 (2001)
		WO2004107822

TABLE 1-continued

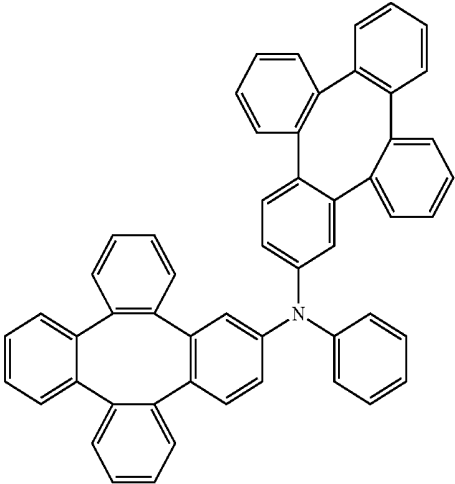
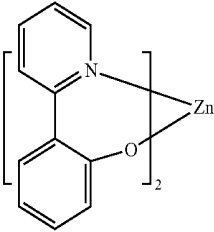
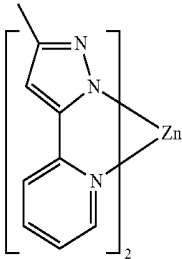
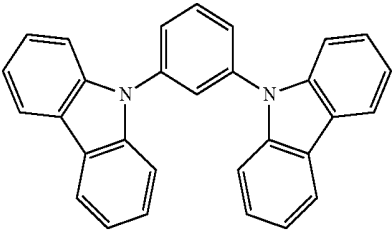
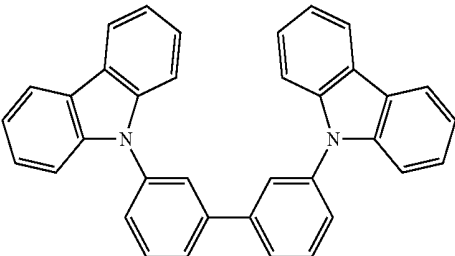
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Tetraphenylene complexes		US20050112407
Metal phenoxypyridine compounds		WO2005030900
Metal coordination complexes (e.g., Zn, Al with N-N ligands)		US20040137268, US20040137267
Blue hosts		Appl. Phys. Lett., 82, 2422 (2003)
Arylcarbazoles		US20070190359

TABLE 1-continued

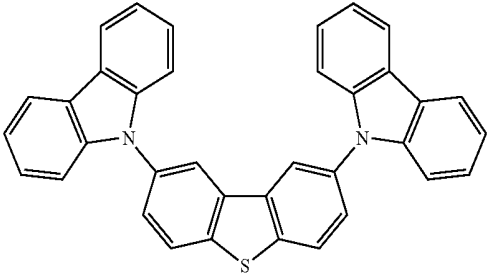
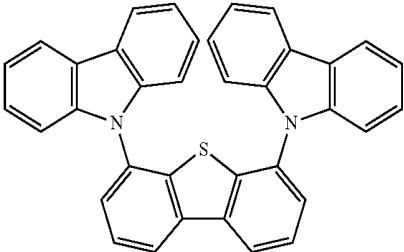
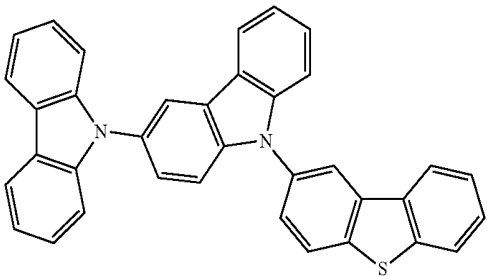
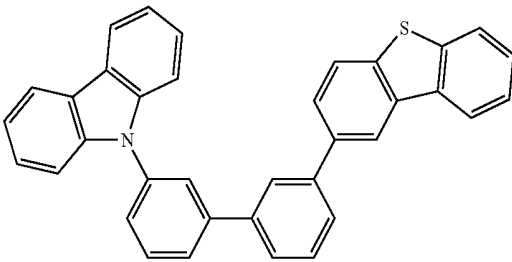
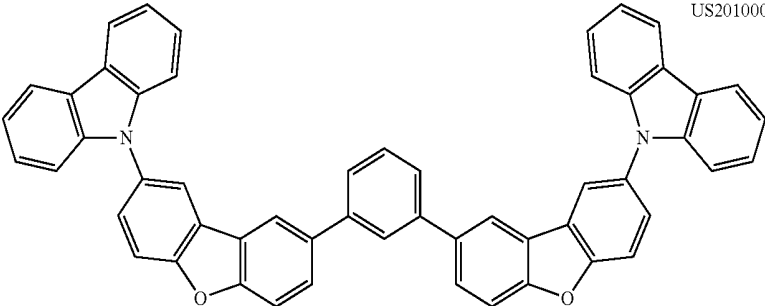
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Dibenzothiophene/ Dibenzofuran-carbazole compounds		WO2006114966, US20090167162
		US20090167162
		WO2009086028
		US20090030202, US20090017330
		US20100084966

TABLE 1-continued

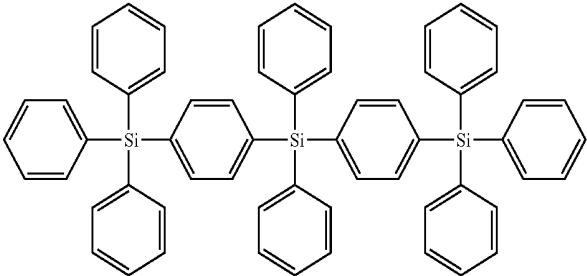
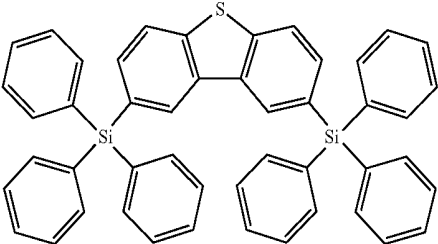
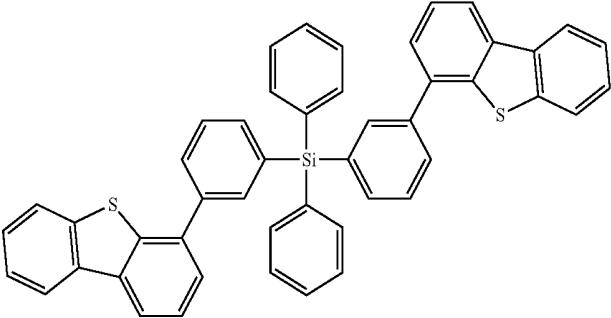
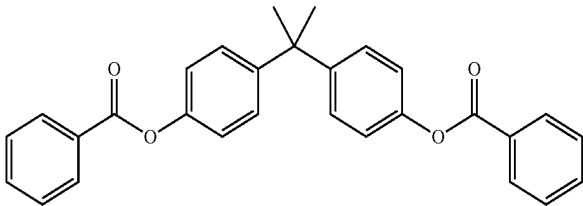
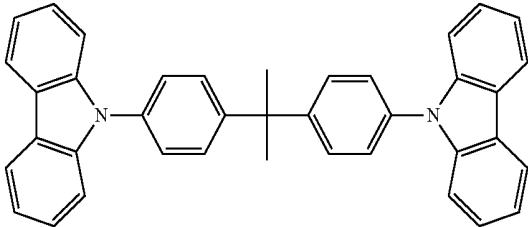
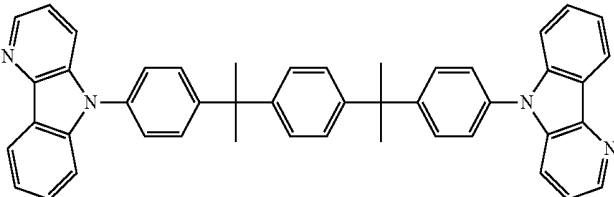
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Silicon aryl compounds		US20050238919
		WO2009003898
Silicon/Germanium aryl compounds		EP2034538A
Aryl benzoyl ester		WO2006100298
Carbazole linked by non-conjugated groups		US20040115476
Aza-carbazoles		US20060121308

TABLE 1-continued

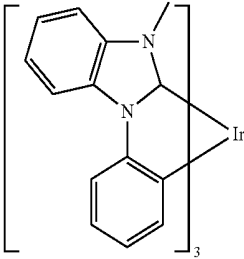
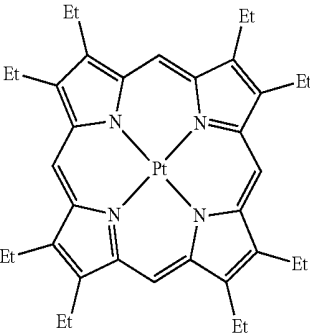
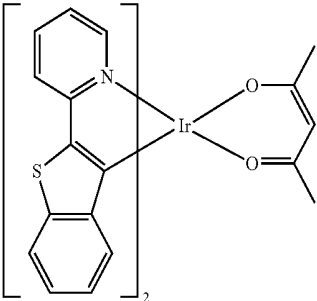
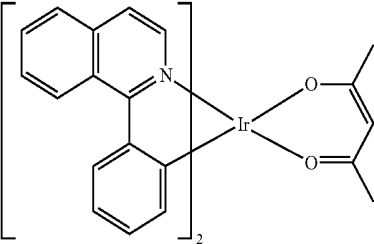
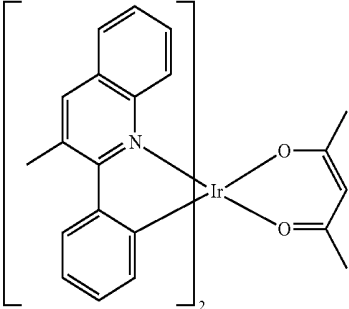
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
High triplet metal organometallic complex		U.S. Pat. No. 7,154,114
Phosphorescent dopants		
Red dopants		
Heavy metal porphyrins (e.g., PtOEP)		Nature 395, 151 (1998)
Iridium(III) organometallic complexes		Appl. Phys. Lett. 78, 1622 (2001)
		US2006835469
		US2006835469

TABLE 1-continued

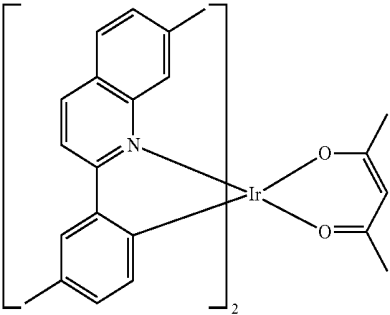
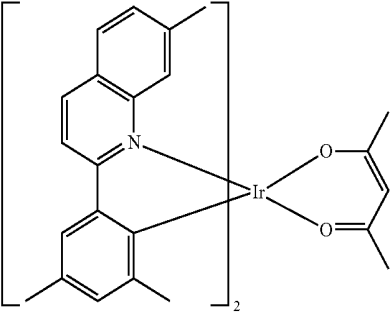
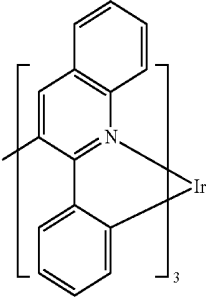
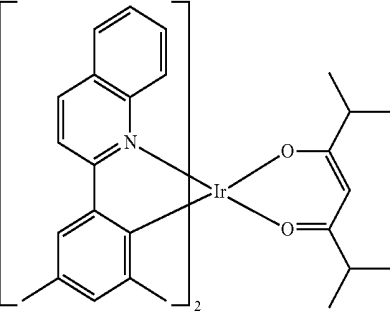
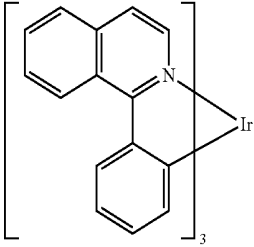
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TABLE 1-continued

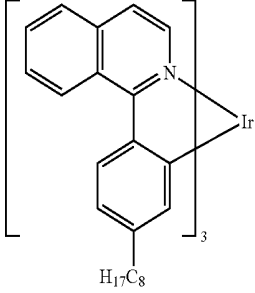
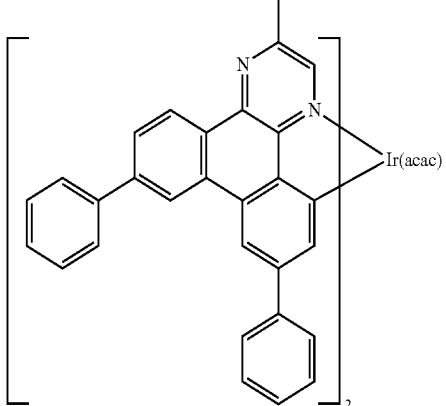
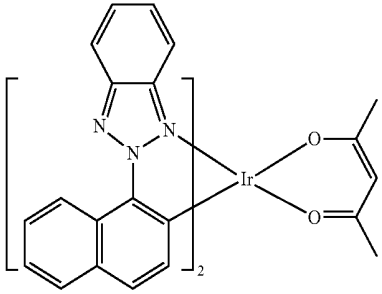
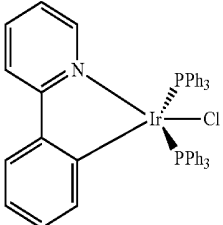
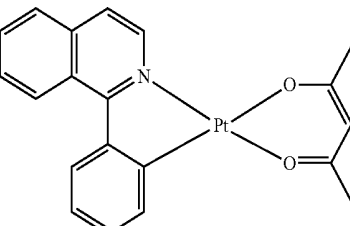
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		Adv. Mater. 19, 739 (2007)
		WO2009100991
		WO2008101842
		U.S. Pat. No. 7,232,618
Platinum(II) organometallic complexes		WO2003040257

TABLE 1-continued

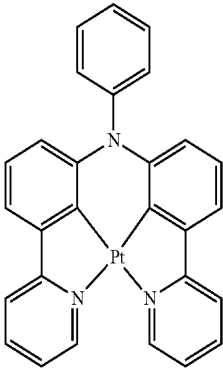
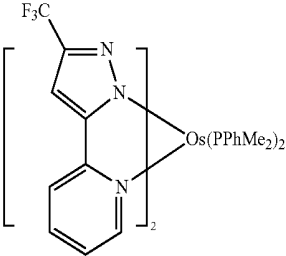
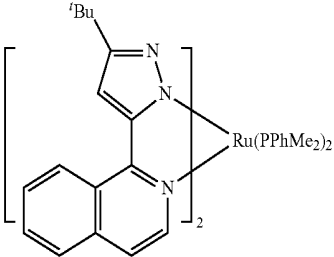
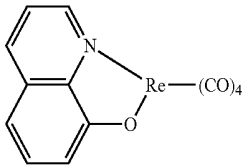
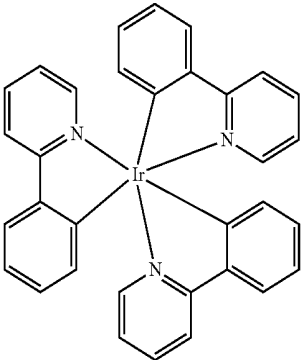
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20070103060
Osmium(III) complexes		Chem. Mater. 17, 3532 (2005)
Ruthenium(II) complexes		Adv. Mater. 17, 1059 (2005)
Rhenium (I), (II), and (III) complexes		US20050244673
Green dopants		
Iridium(III) organometallic complexes	 and its derivatives	Inorg. Chem. 40, 1704 (2001)

TABLE 1-continued

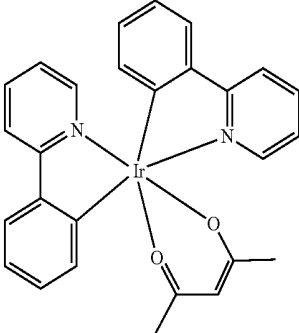
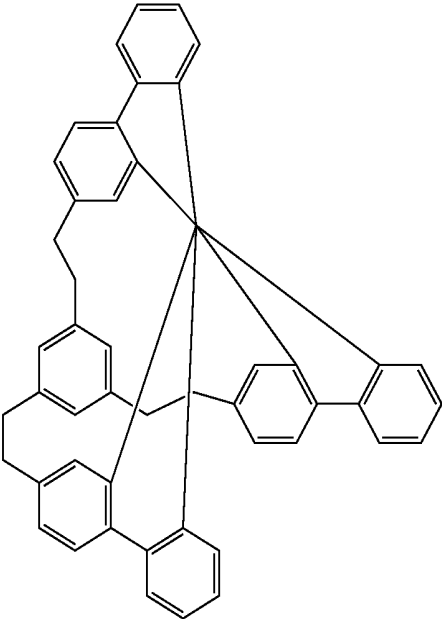
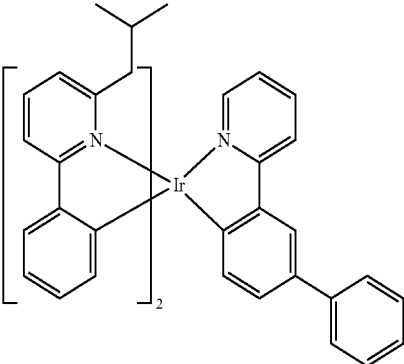
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		US20020034656
		U.S Pat. No. 7,332,232
		US20090108737

TABLE 1-continued

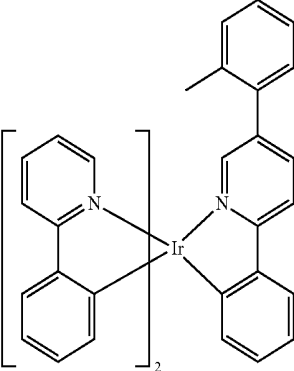
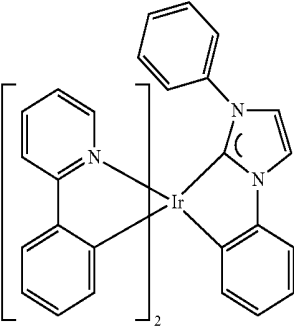
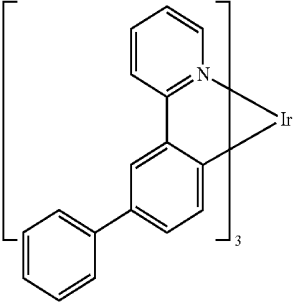
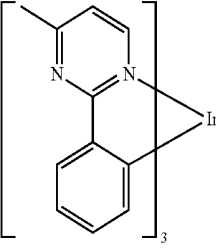
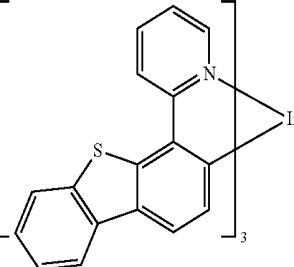
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
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		EP1841834B
		US20060127696
		US20090039776
		U.S. Pat. No. 6,921,915

TABLE 1-continued

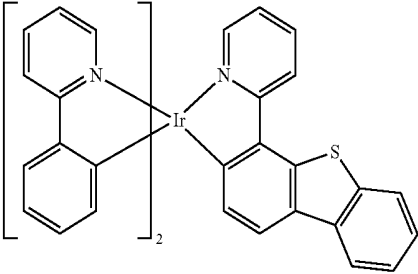
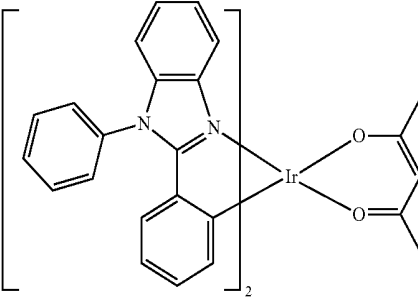
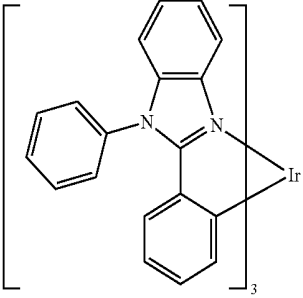
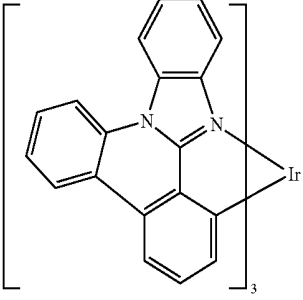
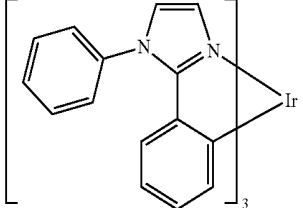
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20100244004
		U.S. Pat. No. 6,687,266
		Chem. Mater. 16 2480 (2004)
		US20070190359
		US 20060008670 JP2007123392

TABLE 1-continued

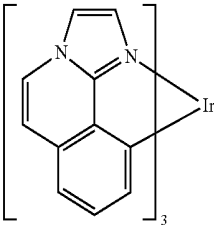
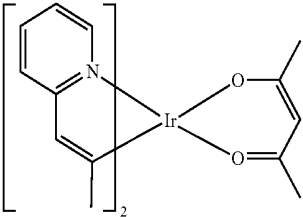
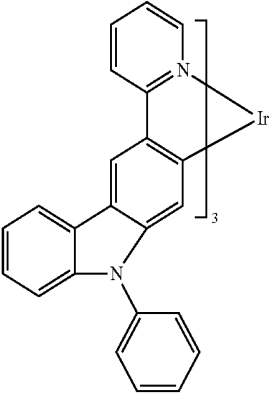
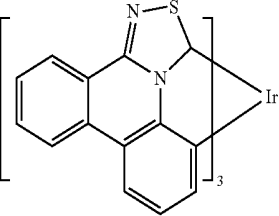
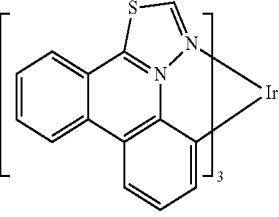
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		WO2010086089, WO2011044988
		Adv. Mater 16, 2003 (2004)
		Angew. Chem. Int Ed. 2006, 45, 7800
		WO2009050290
		US20090165846

TABLE 1-continued

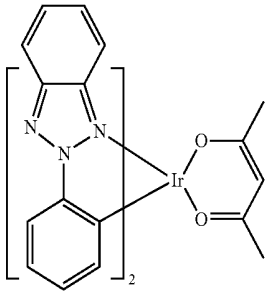
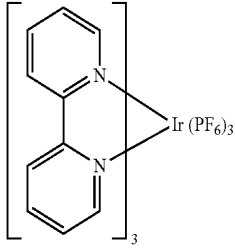
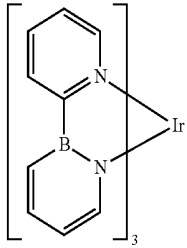
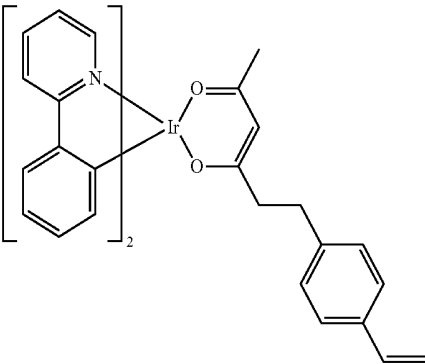
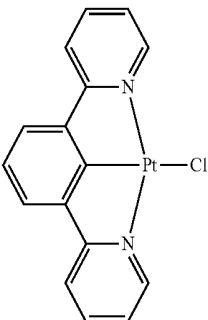
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20080015355
		US20010015432
		US20100295032
Monomer for polymeric metal organometallic compounds		U.S. Pat. No. 7,250,226, U.S. Pat. No. 7,396,598
Pt(II) organometallic complexes, including polydentate ligands		Appl. Phys. Lett. 86, 153505 (2005)

TABLE 1-continued

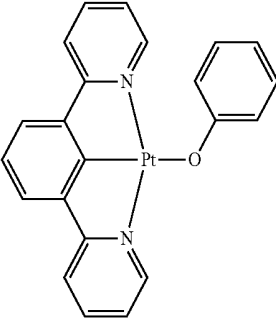
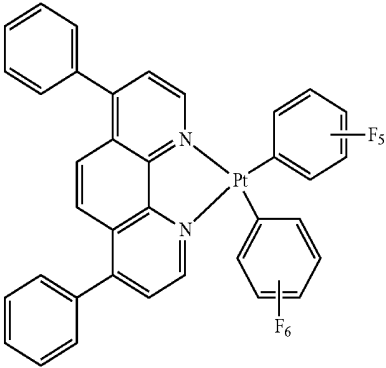
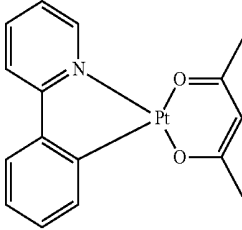
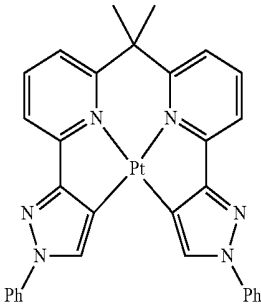
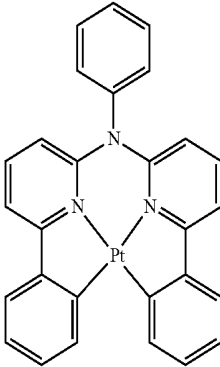
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		Chem. Lett. 34, 592 (2005)
		WO2002015645
		US20060263635
		US20060182992 US20070103060

TABLE 1-continued

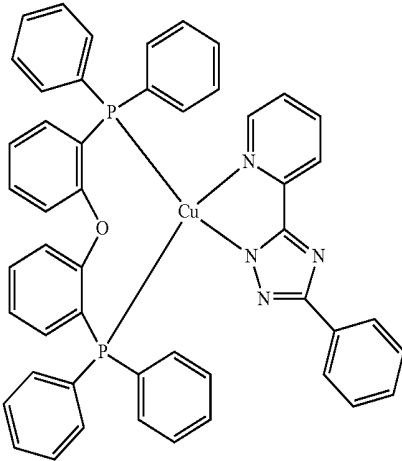
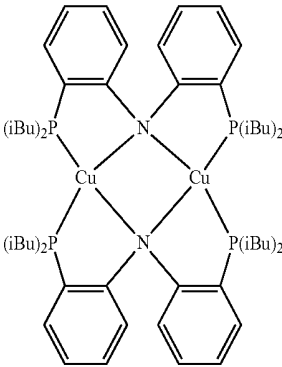
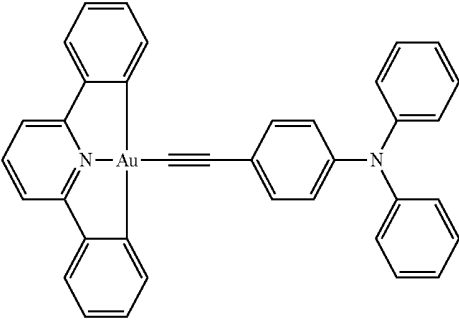
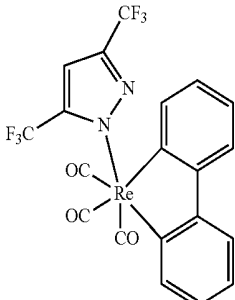
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Cu complexes		WO2009000673
		US20070111026
Gold complexes		Chem. Commun. 2906 (2005)
Rhenium(III) complexes		Inorg. Chem. 42, 1248 (2003)

TABLE 1-continued

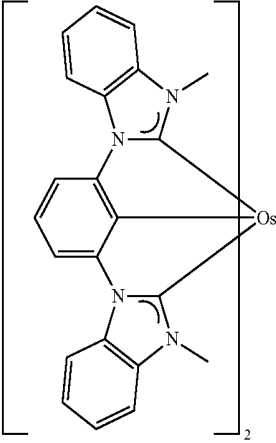
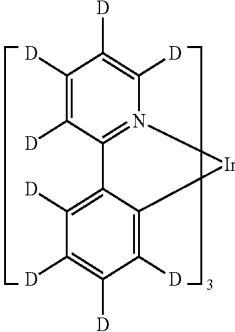
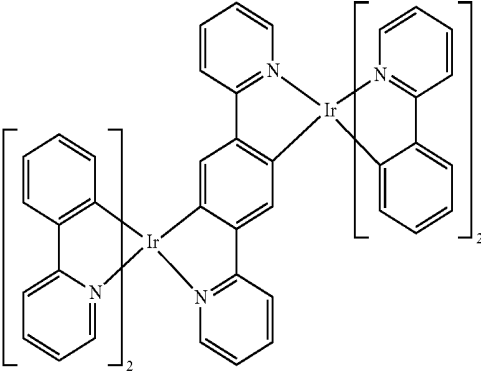
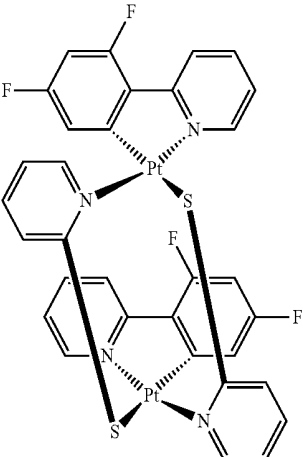
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Osmium(II) complexes		U.S. Pat. No. 7,279,704
Deuterated organometallic complexes		US20030138657
Organometallic complexes with two or more metal centers		US20030152802
		U.S. Pat. No. 7,090,928

TABLE 1-continued

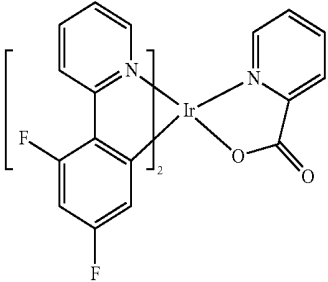
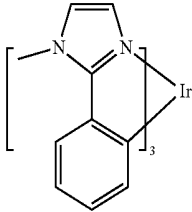
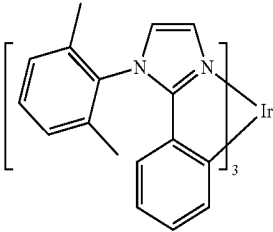
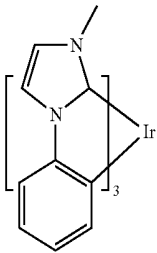
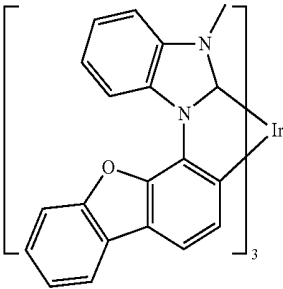
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Blue dopants		
Iridium(III) organometallic complexes		WO2002002714
		WO2006009024
		US20060251923 US20110057559 US20110204333
		U.S. Pat. No. 7,393,599, WO2006056418, US20050260441, WO2005019373
		U.S. Pat. No. 7,534,505

TABLE 1-continued

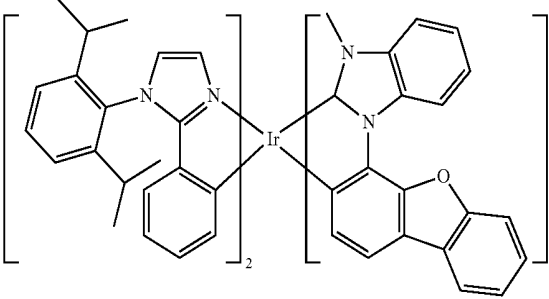
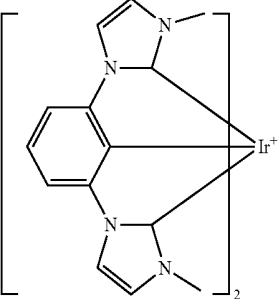
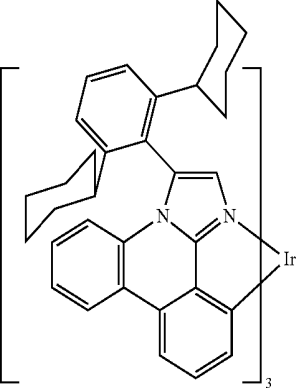
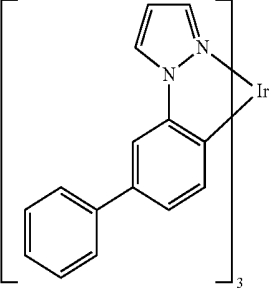
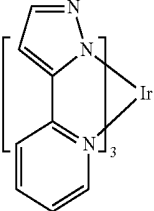
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		WO2011051404
		U.S. Pat. No. 7,445,855
		US20070190359, US20080297033 US20100148663
		U.S. Pat. No. 7,338,722
		US20020134984

TABLE 1-continued

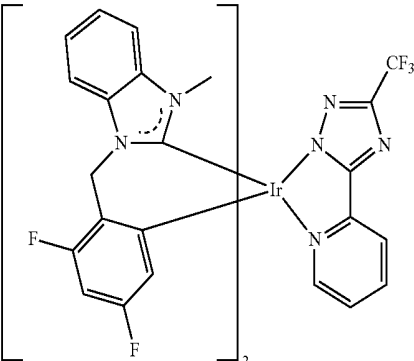
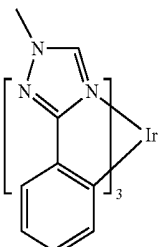
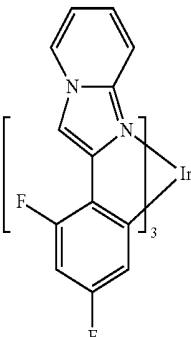
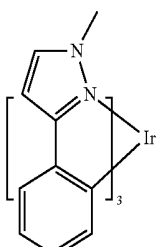
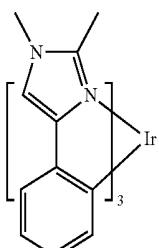
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		Angew. Chem. Int Ed. 47, 4542 (2008)
		Chem. Mater. 18, 5119 (2006)
		Inorg. Chem. 46, 4308 (2007)
		WO2005123873
		WO2005123873

TABLE 1-continued

MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		WO2007004380
		WO2006082742
Osminium(II) complexes		U.S. Pat. No. 7,279,704
		Organometallics 23, 3745 (2004)
Gold complexes		Appl. Phys. Lett. 74,1361 (1999)

TABLE 1-continued

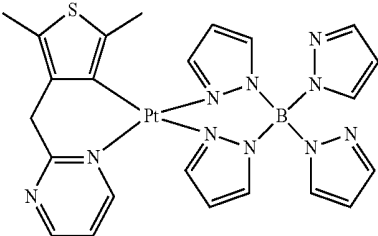
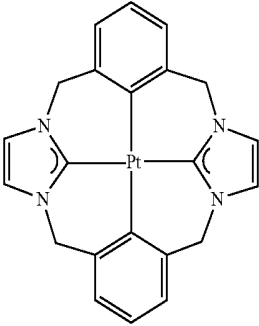
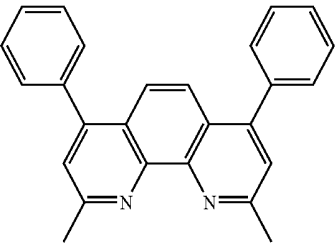
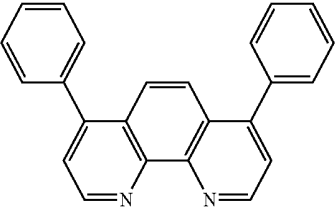
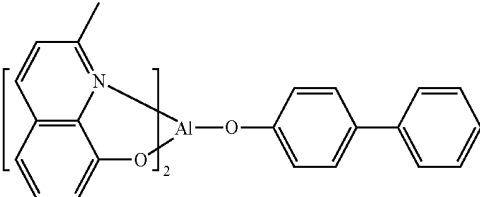
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Platinum (II) complexes		WO2006098120, WO2006103874
Pt tetradentate complexes with at least one metal- carbene bond		U.S. Pat. No. 7,655,323
Exciton/hole blocking layer materials		
Bathocuprine compounds (e.g., BCP, BPhen)		Appl. Phys. Lett. 75, 4 (1999)
		Appl. Phys. Lett. 79, 449 (2001)
Metal 8-hydroxyquinolates (e.g., BAlq)		Appl. Phys. Lett. 81, 162 (2002)

TABLE 1-continued

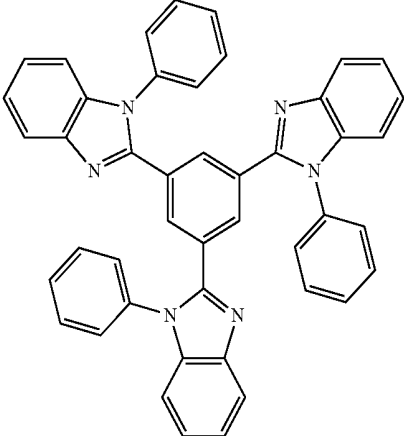
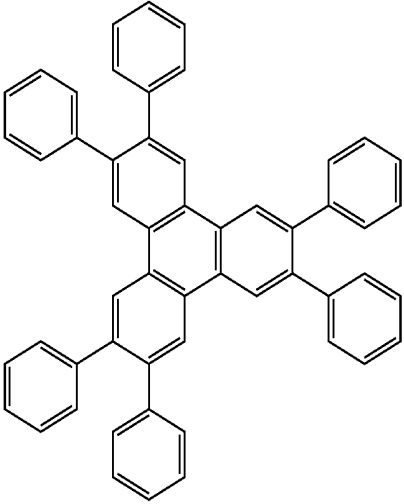
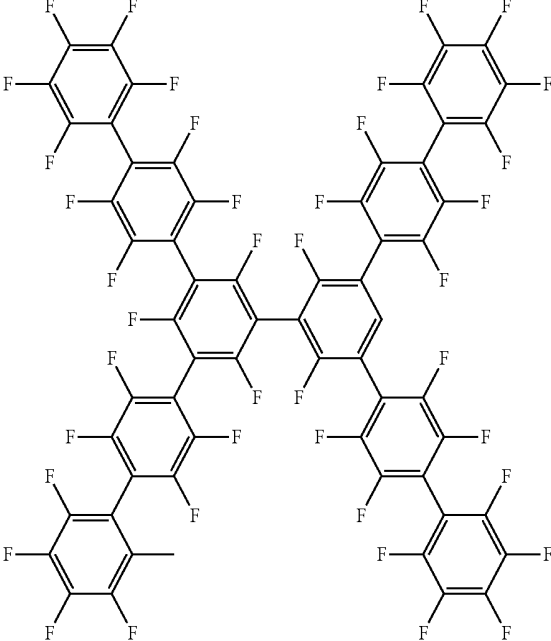
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
5-member ring electron deficient heterocycles such as triazole, oxadiazole, imidazole, benzoimidazole		Appl. Phys. Lett. 81, 162 (2002)
Triphenylene compounds		US20050025993
Fluorinated aromatic compounds		Appl. Phys. Lett. 79, 156 (2001)

TABLE 1-continued

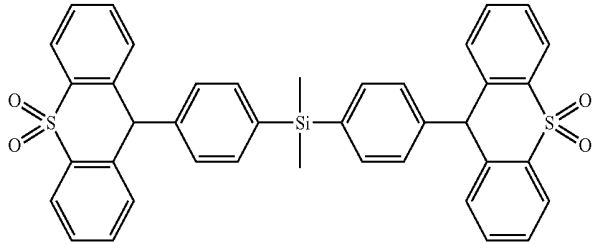
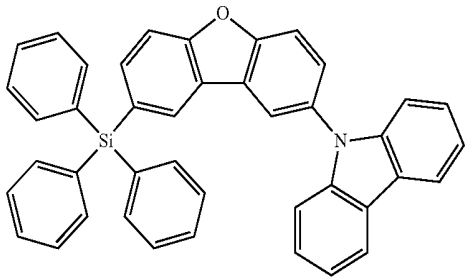
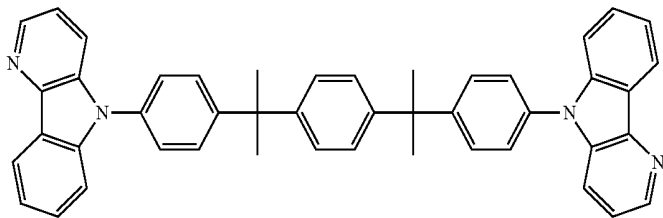
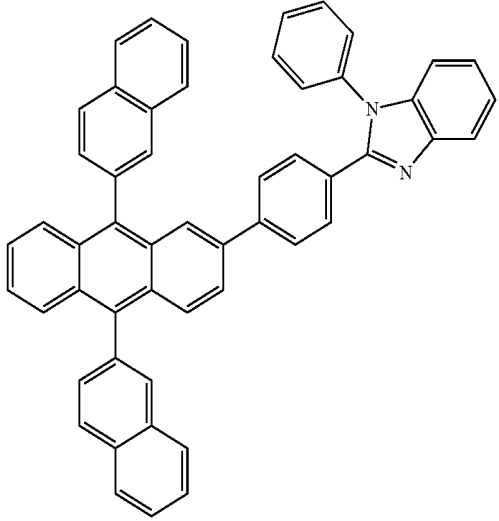
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Phenothiazine-S-oxide		WO2008132085
Silylated five-membered nitrogen, oxygen, sulfur or phosphorus dibenzoheterocycles		WO20110079051
Aza-carbazoles		US20060121308
Electron transporting materials		
Anthracene-benzimidazole compounds		WO2003060956

TABLE 1-continued

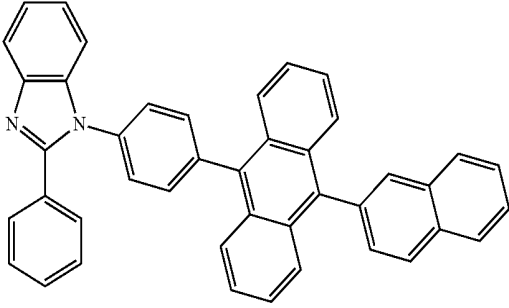
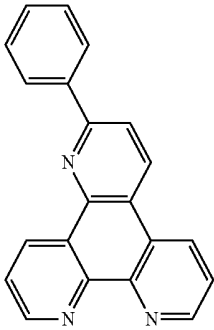
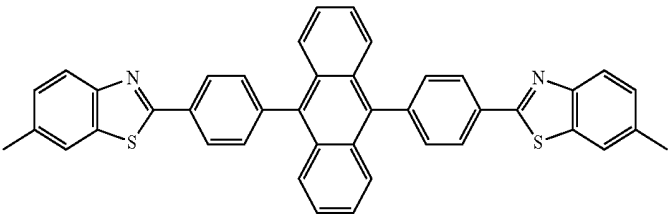
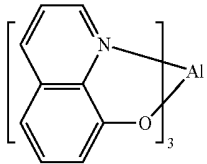
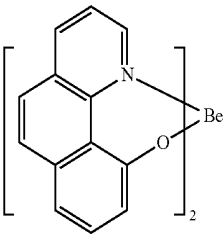
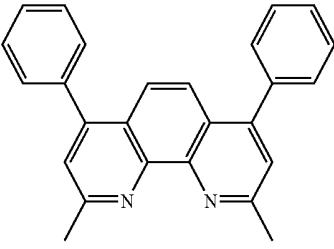
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20090179554
Aza triphenylene derivatives		US20090115316
Anthracene-benzothiazole compounds		Appl. Phys. Lett. 89, 063504 (2006)
Metal 8-hydroxyquinolates (e.g., Alq ₃ , ZrQ ₄)		Appl. Phys. Lett. 51, 913 (1987) U.S. Pat. No. 7,230,107
Metal hydroxybenoquinolates		Chem. Lett. 5, 905 (1993)
Bathocuprine compounds such as BCP, BPhen, etc		Appl. Phys. Lett. 91, 263503 (2007)

TABLE 1-continued

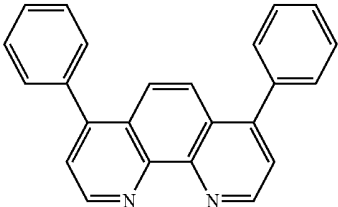
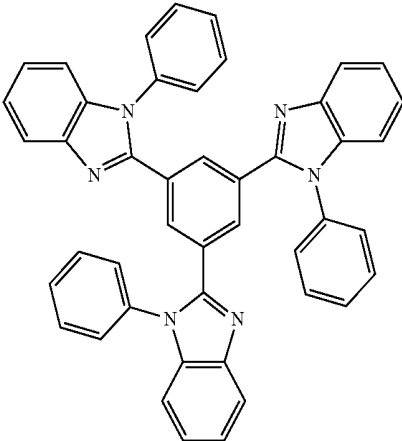
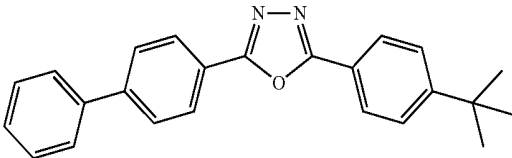
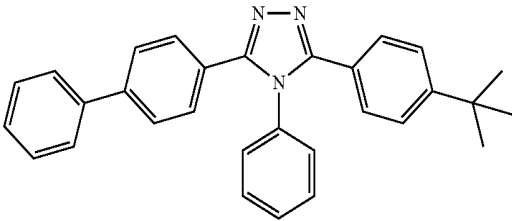
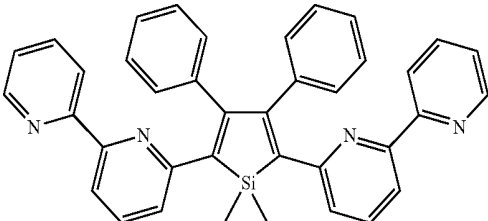
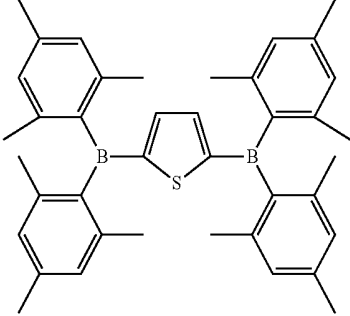
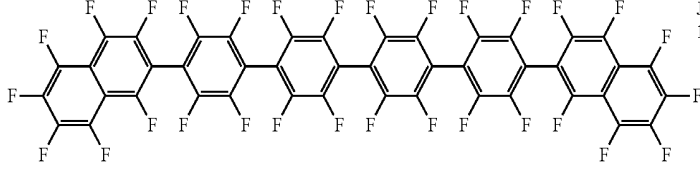
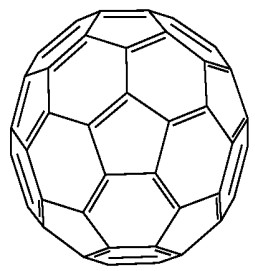
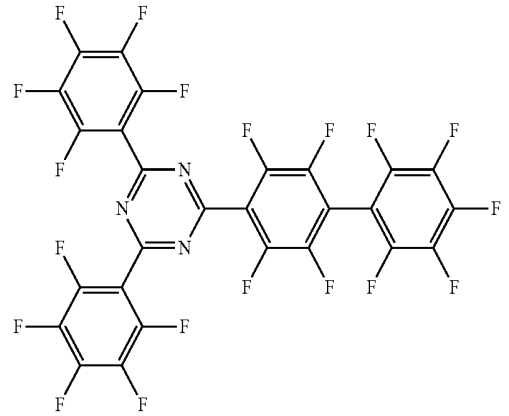
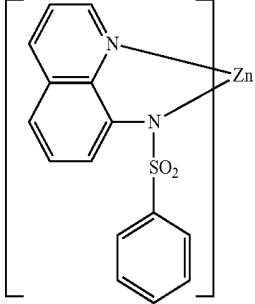
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		Appl. Phys. Lett. 79, 449 (2001)
5-member ring electron deficient heterocycles (e.g., triazole, oxadiazole, imidazole, benzoimidazole)		Appl. Phys. Lett. 74, 865 (1999)
		Appl. Phys. Lett. 55, 1489 (1989)
		Jpn. J. Apply. Phys .32, L917 (1993)
Silole compounds		Org. Electron. 4, 113 (2003)

TABLE 1-continued

MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Arylborane compounds		J. Am. Chem. Soc. 120, 9714 (1998)
Fluorinated aromatic compounds		J. Am. Chem. Soc. 122, 1832 (2000)
Fullerene (e.g., C60)		US20090101870
Triazine complexes		US20040036077
Zn (N^N) complexes		U.S. Pat. No. 6,528,187

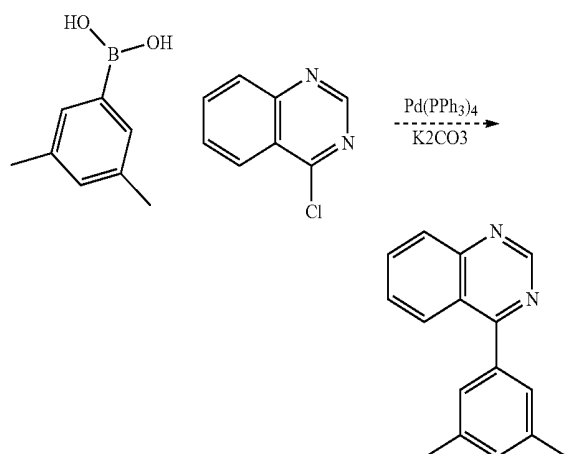
EXPERIMENTAL

[0127] All reactions were carried out under nitrogen protections unless specified otherwise. All solvents for reactions are anhydrous and used as received from commercial sources.

Synthesis of Compound 81

Synthesis of 4-(3,5-dimethylphenyl)quinazoline

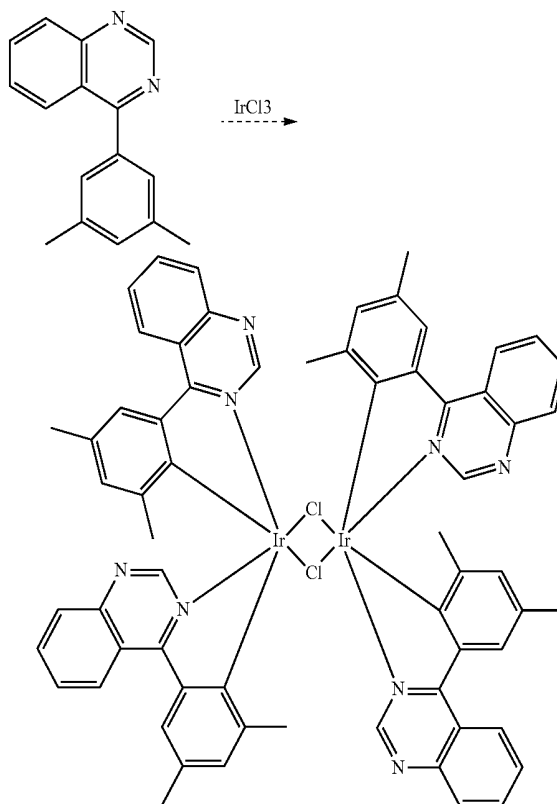
[0128]



[0129] (3,5-Dimethylphenyl)boronic acid (5.75 g, 38.4 mmol), 4-chloroquinazoline (5.05 g, 30.7 mmol), and K_2CO_3 (8.48 g, 61.4 mmol) were dissolved in toluene (150 mL) and water (30 mL). The mixture was degassed by bubbling it with nitrogen for 30 minutes and adding tetrakis(triphenylphosphine)palladium ($Pd(PPh_3)_4$) (1.78 g, 1.53 mmol). The mixture was then held at 100° C. overnight. Upon completion of the reaction, the mixture was cooled to room temperature, extracted with toluene, and washed with brine and water. The organic solution was filtered and evaporated. The crude product was purified by column chromatography using a gradient mixture of ethyl acetate (EA) (from 20 to 65%) in heptanes. The white powder product was recrystallized three times from heptanes to give colorless crystals (5.0 g, 70% yield).

Synthesis of Ir(III) Dimer

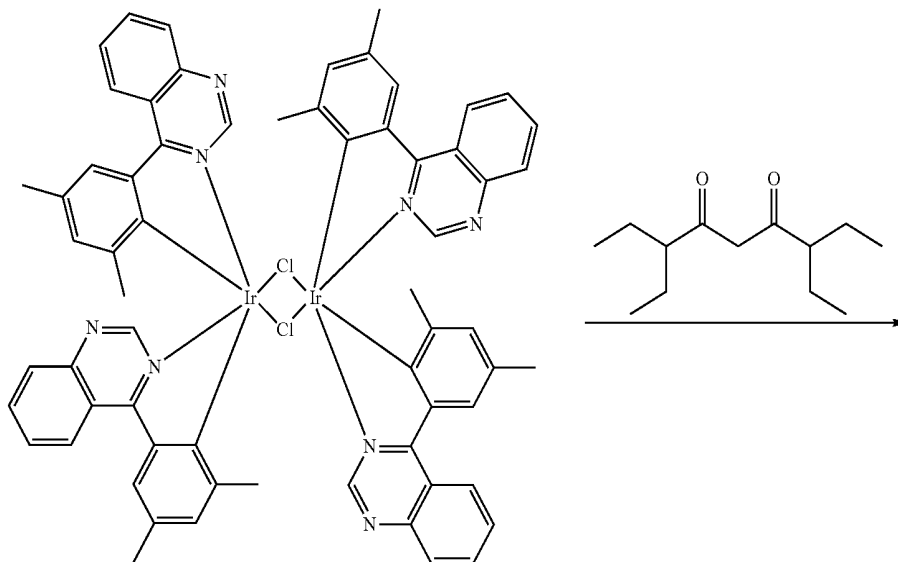
[0130]



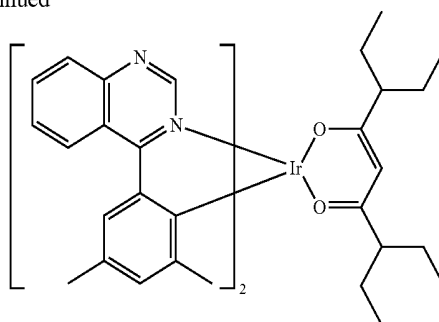
[0131] The 4-(3,5-Dimethylphenyl)quinazoline (2.50 g, 10.7 mmol) was solubilized in ethoxyethanol (30 mL) and water (10 mL) and degassed by bubbling with nitrogen for 30 minutes. Iridium chloride (1.32 g, 3.56 mmol) was then added to the mixture and the reaction was refluxed under nitrogen for 24 h. After cooling down to room temperature, the solid product was filtered, washed with methanol, and dried to give the Ir(III) dimer (2.40 g, 97% yield).

Synthesis of Compound 81

[0132]



-continued



[0133] Ir(III) Dimer (2.00 g, 1.15 mmol) and 3,7-diethylnonane-4,6-dione (1.84 g, 8.64 mmol) were suspended in 2-ethoxyethanol (35 mL) and degassed by bubbling nitrogen. Potassium carbonate (1.19 g, 8.64 mmol) was then added, and the mixture was stirred at room temperature for 48 h. The solvent was evaporated under vacuum, methanol was added and the solid was filtered. The crude red solid was purified by column chromatography starting with 100% heptanes and slowly adding 15% of dichloromethane in heptanes. The solid obtained were recrystallized from dichloromethane and methanol. The target compound is obtained as a red solid (0.45 g, 22% yield).

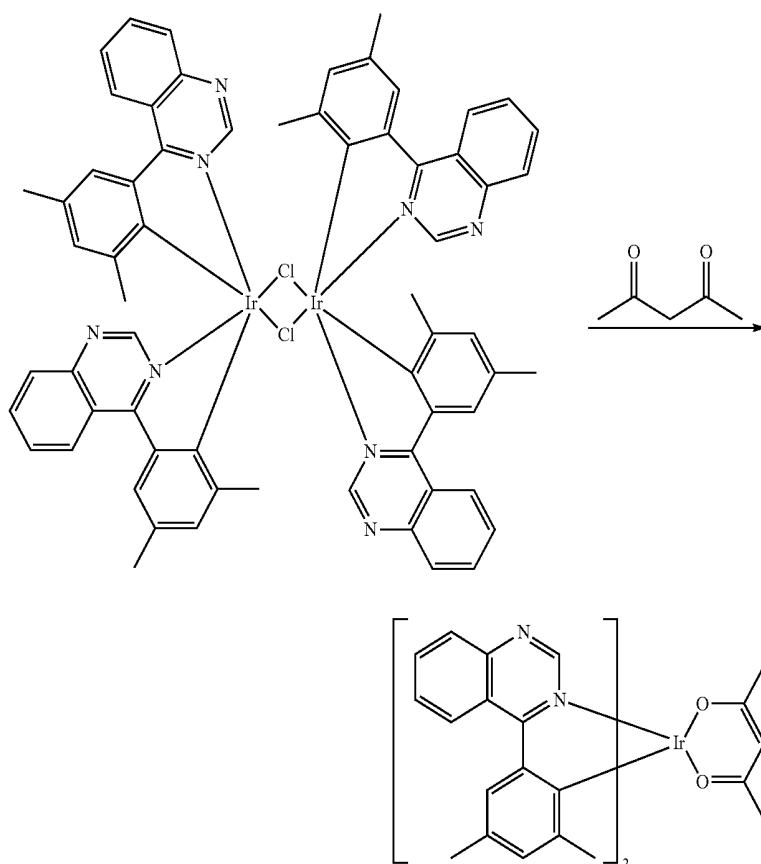
[0135] The Ir(III) Dimer (2.50 g, 1.44 mmol) (see above) and pentane-2,4-dione (1.48 g, 14.4 mmol) were diluted in 2-ethoxyethanol (48 mL) and degassed by bubbling nitrogen. Potassium carbonate (1.99 g, 14.4 mmol) was then added to the mixture, which was then stirred at room temperature for 24 h. The solvent was evaporated under vacuum. The crude oil was dissolved in DCM and filtered through a plug of triethylamine-treated silica. The solvent was then evaporated. Methanol (25 mL) was added to the solid and the product was recrystallized in a freezer. The target compound was obtained as a dark red solid (0.52 g, 22% yield).

Device Examples

[0136] All example devices were fabricated by high vacuum ($<10^{-7}$ Torr) thermal evaporation. The anode electrode was 1200 Å of indium tin oxide (ITO). The cathode

Synthesis of Comparative Compound 1

[0134]



consisted of 10 Å of LiF followed by 1,000 Å of Al. All devices are encapsulated with a glass lid sealed with an epoxy resin in a nitrogen glove box (<1 ppm of H₂O and O₂) immediately after fabrication, and a moisture getter was incorporated inside the package.

[0137] The organic stack of the device examples consisted of sequentially, from the ITO surface, 100 Å of LG101 (purchased from LG Chem) as a hole injection layer (HIL), 400 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (NPD) as a hole transporting layer (HTL), 400 Å of the inventive compound or comparative compound doped in BAQ as a host and compound H as a stability dopant (SD) with as an emissive layer (EML), 100 Å of BAQ as a blocking layer (BL), and 450 Å of Alq₃ (tris-8-hydroxyquinoline aluminum) as an electron transport layer (ETL).

-continued

Compound H

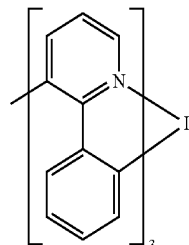


TABLE 2

Device structures of inventive compounds							
	HIL	HTL	EML (400 Å, doping %)		BL	ETL	
Device Example	LG101 100 Å	NPD 400 Å	BAQ	Compound H 9%	Compound 81 3%	BAQ 100 Å	Alq 450 Å
Comparative Example	LG101 100 Å	NPD 400 Å	BAQ	Compound H 9%	Comparative compound 1 3%	BAQ 100 Å	Alq 450 Å

[0138] The device results and data are summarized in Tables 2 and 3 from those devices. As used herein, NPD, Alq, BAQ, SD have the following structures:

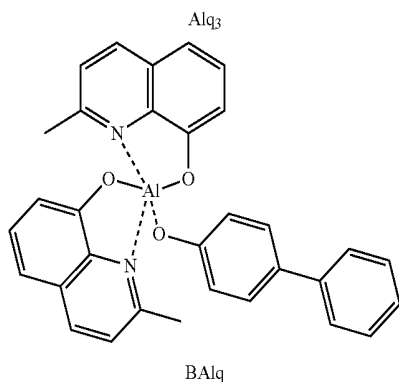
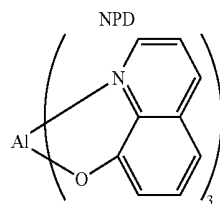
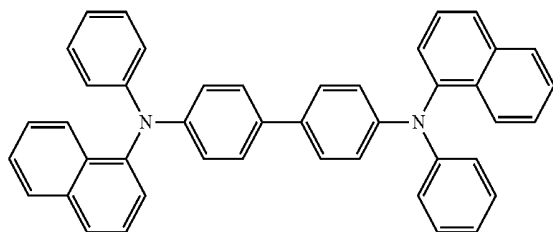


TABLE 3

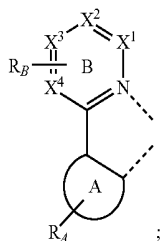
VTE device results							
	1931 CIE		λ max [nm]	FWHM [nm]	At 1,000 nits		
	CIE x	CIE y			Voltage [%]	LE [%]	EQE [%]
Device Example	0.71	0.29	668	62	99	129	119
Comparative Example	0.71	0.29	672	72	100	100	100

[0139] Table 3 summarizes the performance of the devices. The driving voltage (V), luminous efficiency (LE), and external quantum efficiency (EQE) were measured at 1000 nits. The EL spectra were measured at 10 mA/cm². Both device example and comparative example devices showed very deep red color with a CIE of (0.71, 0.29). Example device and comparative example one has 668 nm and 672 nm of peak wavelength, respectively and the example device has 10 nm narrower full width at half maximum (FWHM) than the comparative example. Example device has 29% higher LE and 19% higher EQE than comparative example.

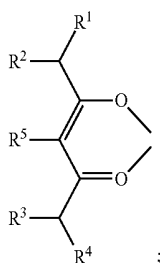
[0140] It is understood that the various embodiments described herein are by way of example only, and are not intended to limit the scope of the invention. For example, many of the materials and structures described herein may be substituted with other materials and structures without deviating from the spirit 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. It is understood that various theories as to why the invention works are not intended to be limiting.

We claim:

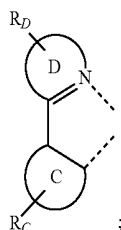
1. A compound having a formula $M(L_A)_x(L_B)_y(L_C)_z$; wherein the ligand L_A is



wherein the ligand L_B is



wherein the ligand L_C is



wherein M is a metal having an atomic number greater than 40;

wherein x is 1, or 2;

wherein y is 1, or 2;

wherein z is 0, 1, or 2;

wherein $x+y+z$ is the oxidation state of the metal M;

wherein X^1 , X^2 , X^3 , and X^4 are C or N;

wherein R^1 , R^2 , R^3 , and R^4 are independently selected from group consisting of alkyl, cycloalkyl, aryl, and heteroaryl;

wherein at least one of R^1 , R^2 , R^3 , and R^4 has at least two C atoms;

wherein R^5 is selected from group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof;

wherein rings A, C, and D are each independently a 5 or 6-membered carbocyclic or heterocyclic ring;

wherein R_A , R_C , and R_D each independently represent mono, di, tri, or tetra-substitution, or no substitution;

wherein R_B represents di, tri, or tetra-substitution;

wherein two adjacent R_B form a six-member carbocyclic or heterocyclic ring E fused to ring B; wherein, when ring E is heterocyclic, the only heteroatom is nitrogen; and wherein ring E can be further substituted;

wherein

(a) at least one of X^1 , X^2 , X^3 , and X^4 is N,

(b) ring E is heterocyclic, or

(c) both;

wherein each of R_A , R_B , R_C , and R_D are independently selected from the group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof; and wherein any adjacent substituents of R_A , R_B , R_C , and R_D are optionally joined to form a fused ring.

2. The compound of claim 1, wherein M is selected from the group consisting of Ir, Rh, Re, Ru, Os, Pt, Au, and Cu.

3. The compound of claim 1, wherein M is Ir.

4. The compound of claim 1, wherein ring A is benzene.

5. The compound of claim 1, wherein ring C is benzene, and ring D is pyridine.

6. The compound of claim 1, wherein R^5 is selected from group consisting of hydrogen, deuterium, alkyl, cycloalkyl, and combinations thereof.

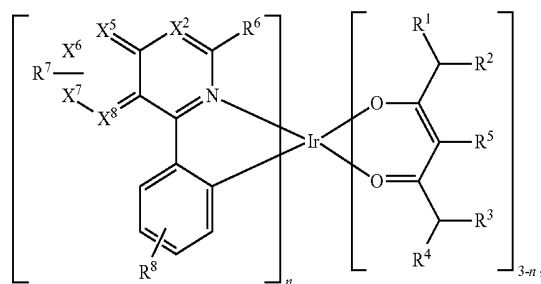
7. The compound of claim 1, wherein R^5 is hydrogen.

8. The compound of claim 1, wherein R^1 , R^2 , R^3 , and R^4 are alkyl or cycloalkyl.

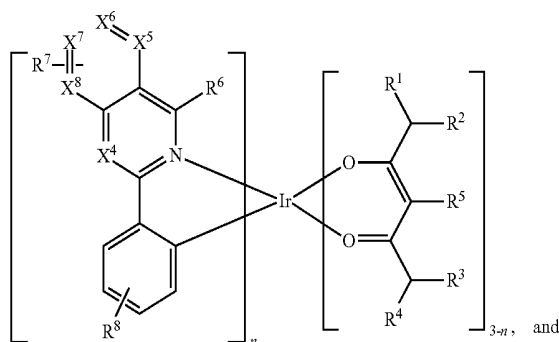
9. The compound of claim 1, wherein R^1 , R^2 , R^3 , and R^4 are independently selected from the group consisting of methyl, ethyl, propyl, 1-methylethyl, butyl, 1-methylpropyl, 2-methylpropyl, pentyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl, 1,1-dimethylpropyl, 1,2-dimethylpropyl, 2,2-dimethylpropyl, cyclobutyl, cyclopentyl, cyclohexyl, partially or fully deuterated variants thereof, and combinations thereof.

10. The compound of claim 1, wherein the compound is selected from the group consisting of:

Formula I

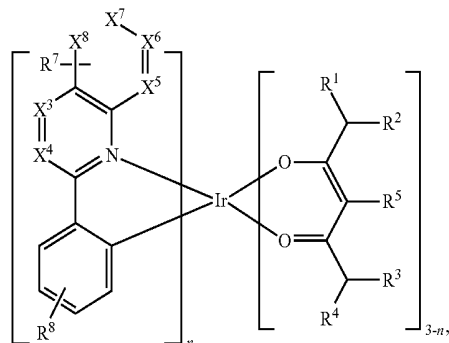


Formula II



-continued

Formula III



wherein X^5 , X^6 , X^7 , and X^8 are C or N;
 wherein R^7 and R^8 each independently represent mono, di, tri, or tetra-substitution, or no substitution;
 wherein R^6 , R^7 , and R^8 are independently selected from group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkenyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof; and
 wherein n is 1 or 2.

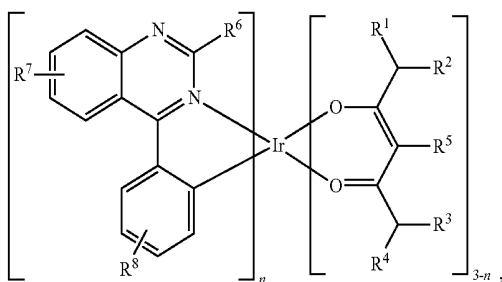
11. The compound of claim 10, wherein R^6 and R^7 are independently selected from group consisting of hydrogen, deuterium, alkyl, cycloalkyl, and combinations thereof.

12. The compound of claim 10, wherein R^8 is selected from group consisting of hydrogen, deuterium, alkyl, cycloalkyl, halide, and combinations thereof.

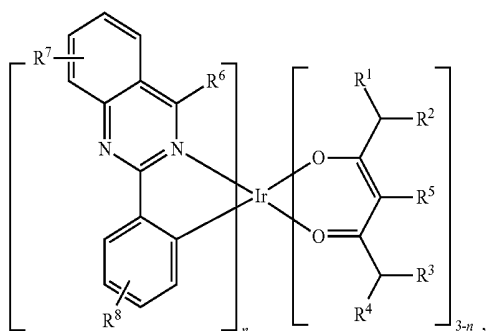
13. The compound of claim 10, wherein n is 2.

14. The compound of claim 1, wherein the compound is selected from the group consisting of:

Formula IV

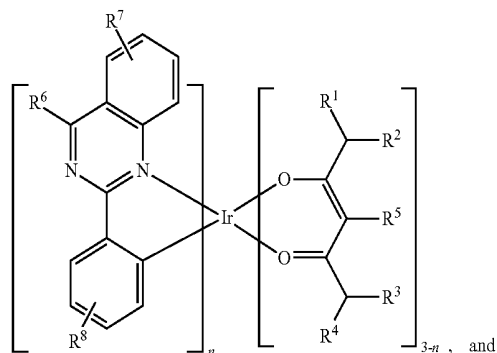


Formula V

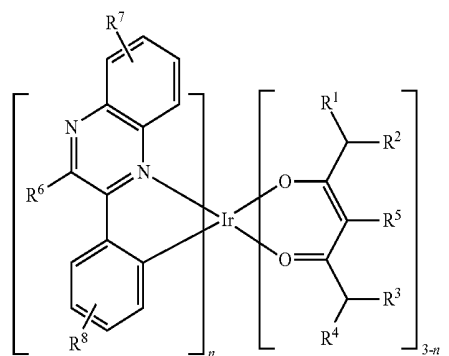


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Formula VI



Formula VII

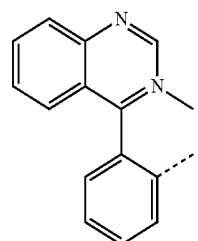


wherein R^7 and R^8 each independently represent mono, di, tri, or tetra-substitution, or no substitution;

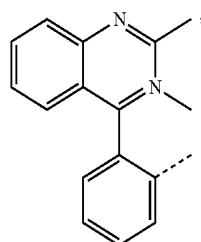
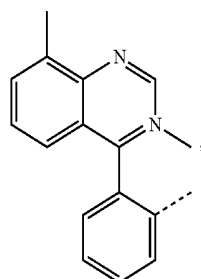
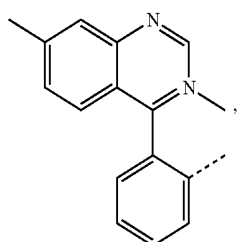
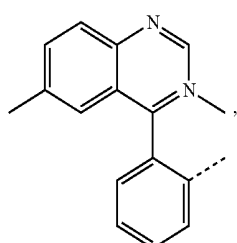
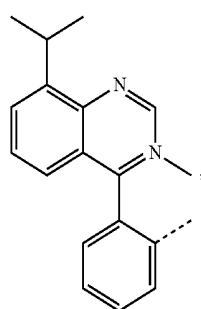
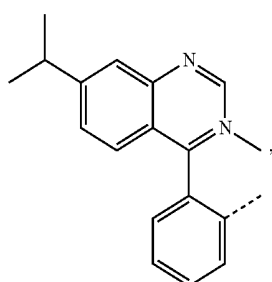
wherein R^6 , R^7 , and R^8 are independently selected from group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkenyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof, and

wherein n is 1 or 2.

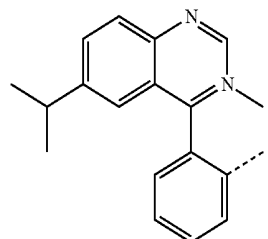
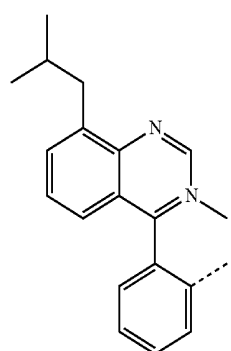
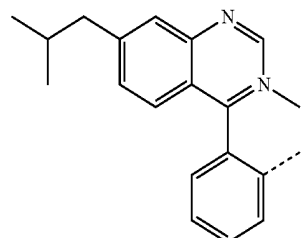
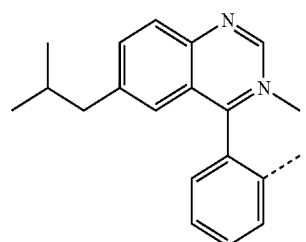
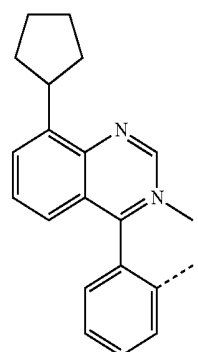
15. The compound of claim 1, wherein L_A is selected from the group consisting of L_{A1} to L_{A270} listed below:

 L_{A1} 

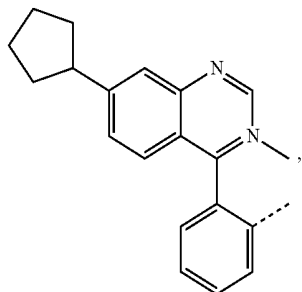
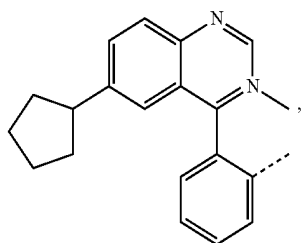
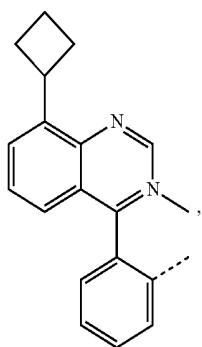
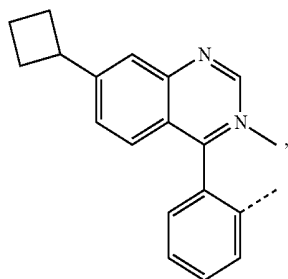
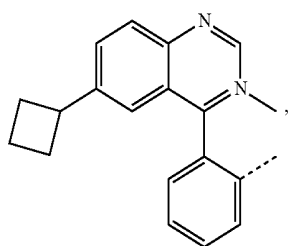
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L₄₂L₄₃L₄₄L₄₅L₄₆L₄₇

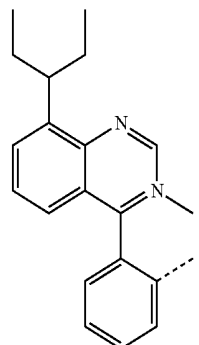
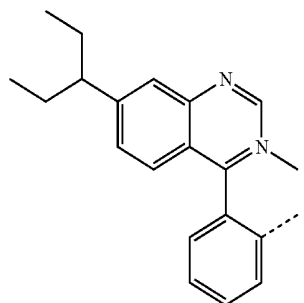
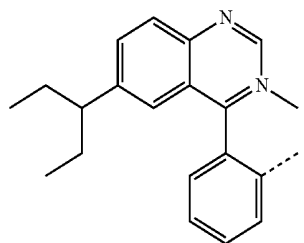
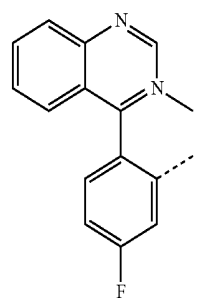
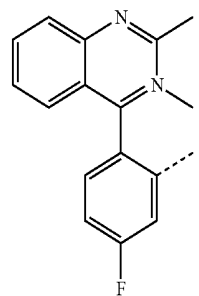
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L₄₈L₄₉L₄₁₀L₄₁₁L₄₁₂

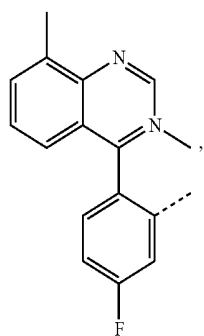
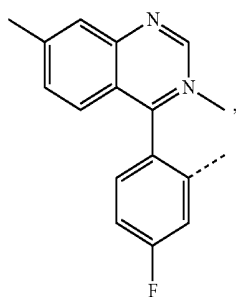
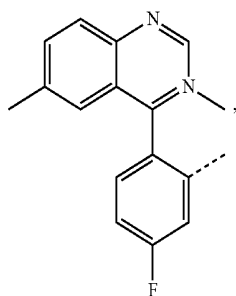
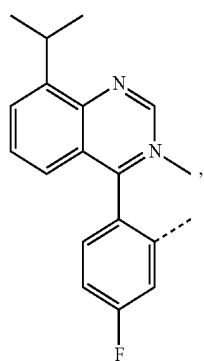
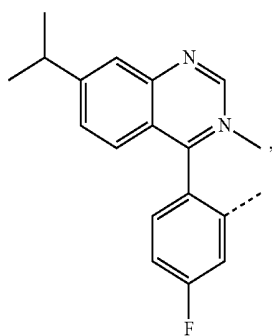
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L₄₁₃L₄₁₄L₄₁₅L₄₁₆L₄₁₇

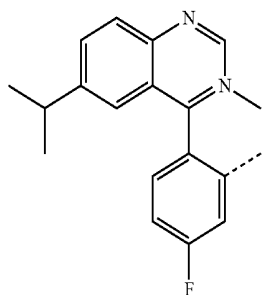
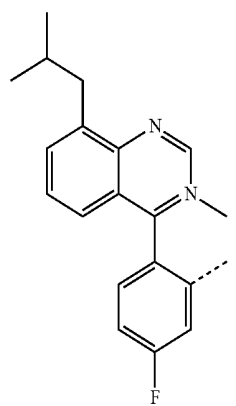
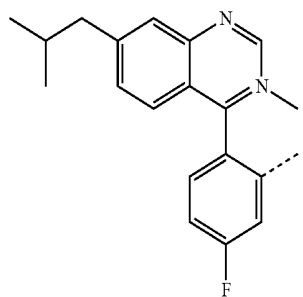
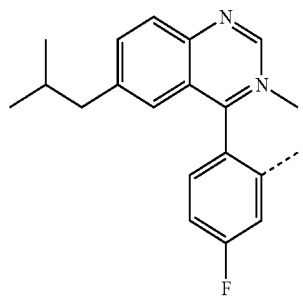
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L₄₁₈L₄₁₉L₄₂₀L₄₂₁L₄₂₂

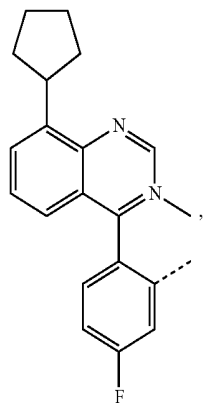
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L₄₂₃L₄₂₄L₄₂₅L₄₂₆L₄₂₇

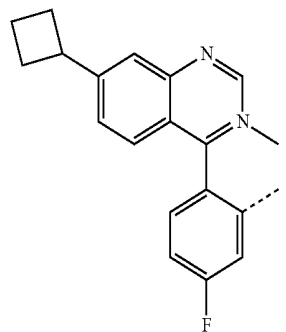
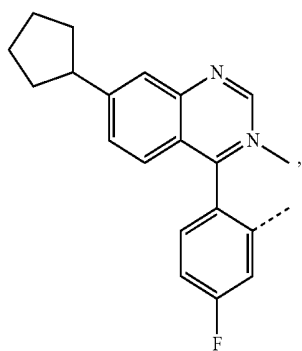
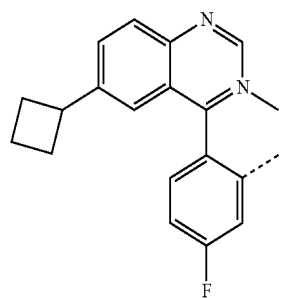
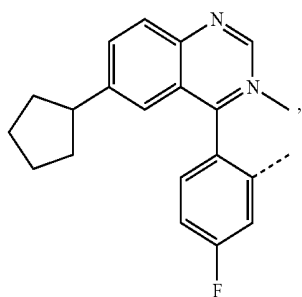
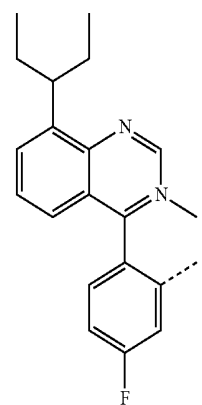
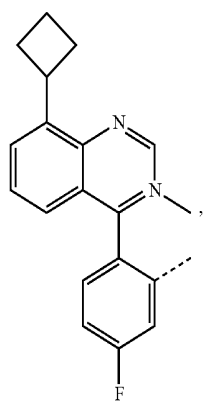
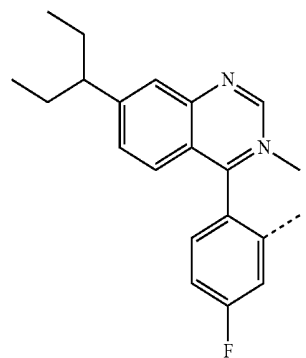
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L₄₂₈L₄₂₉L₄₃₀L₄₃₁

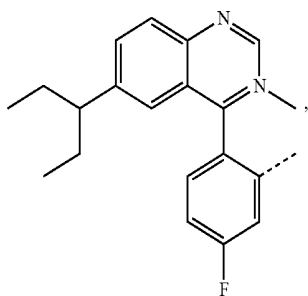
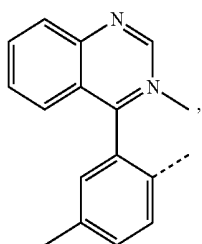
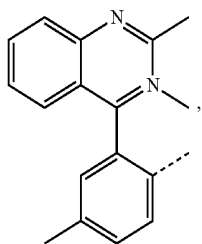
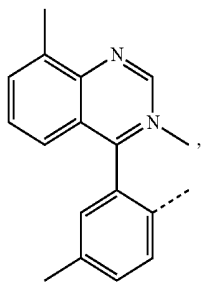
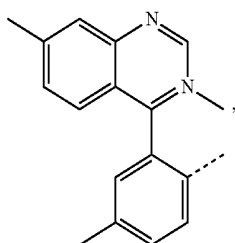
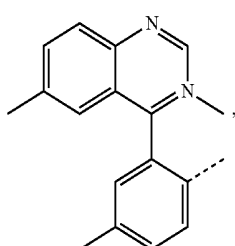
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L₄₃₂

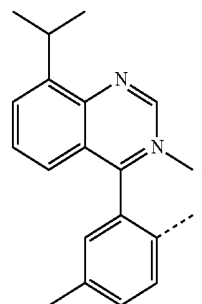
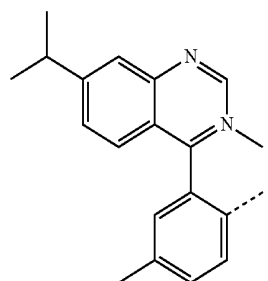
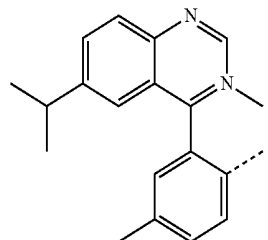
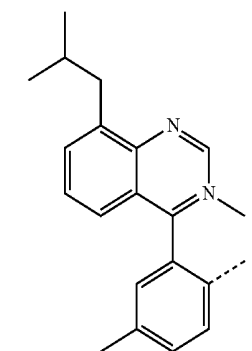
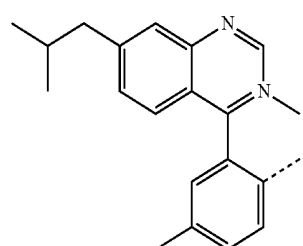
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L₄₃₆L₄₃₃L₄₃₇L₄₃₄L₄₃₈L₄₃₅L₄₃₉

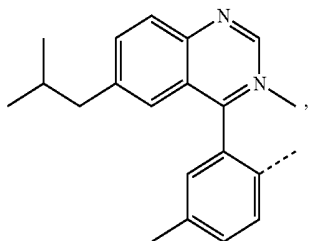
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L₄₄₀L₄₄₁L₄₄₂L₄₄₃L₄₄₄L₄₄₅

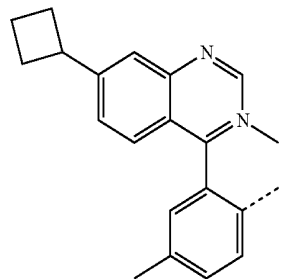
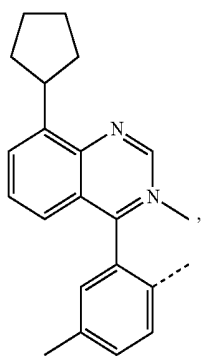
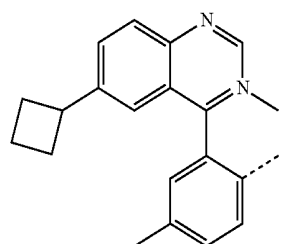
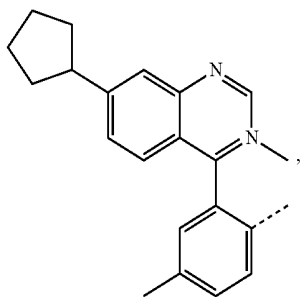
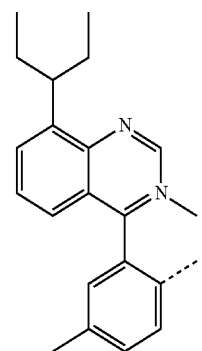
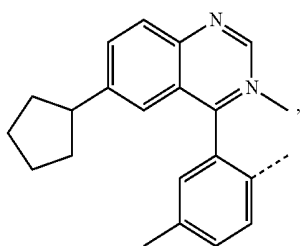
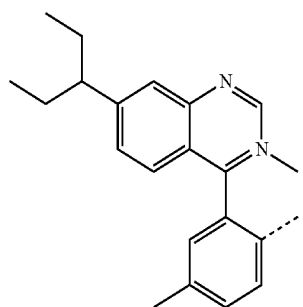
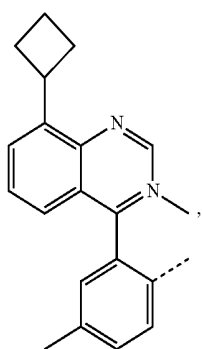
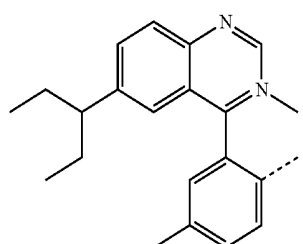
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L₄₄₆L₄₄₇L₄₄₈L₄₄₉L₄₅₀

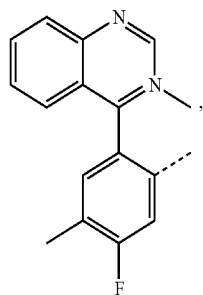
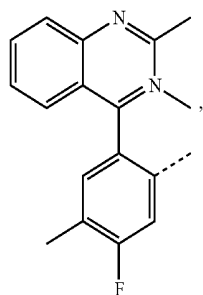
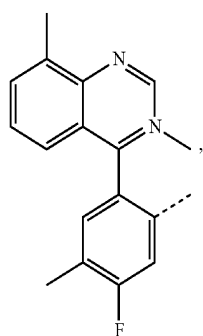
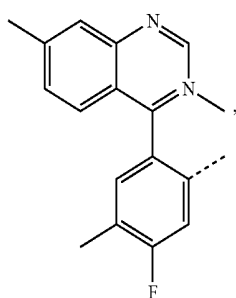
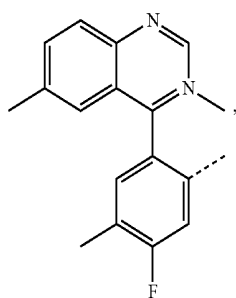
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L₄₅₁

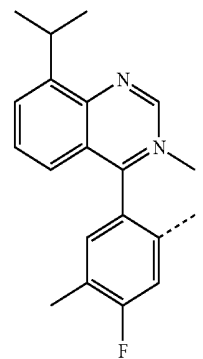
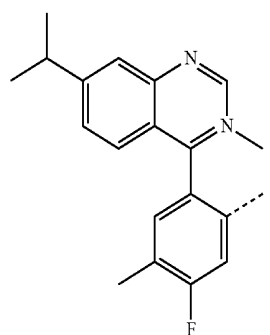
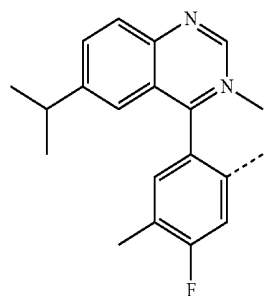
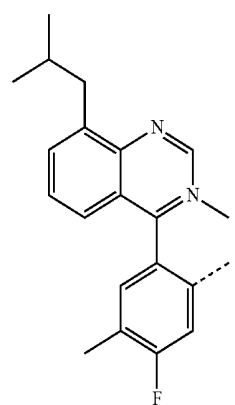
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L₄₅₆L₄₅₂L₄₅₇L₄₅₃L₄₅₈L₄₅₄L₄₅₉L₄₅₅L₄₆₀

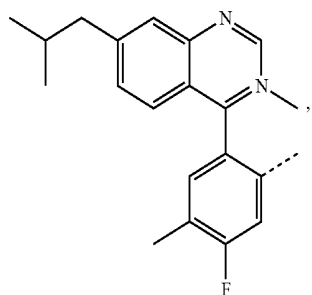
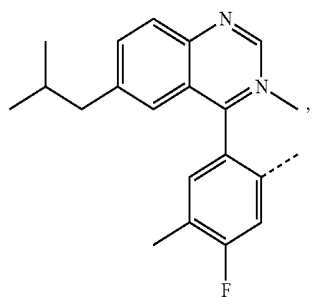
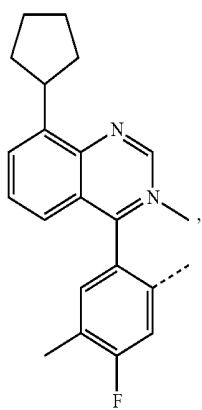
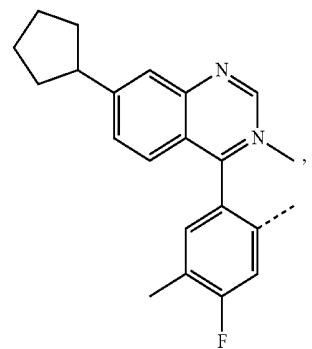
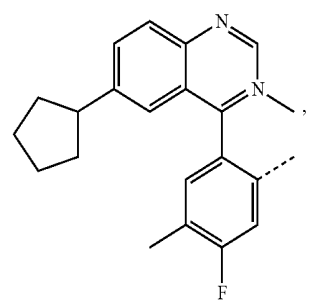
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L₄₆₁L₄₆₂L₄₆₃L₄₆₄L₄₆₅

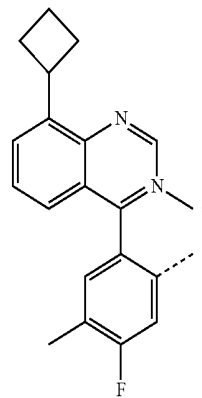
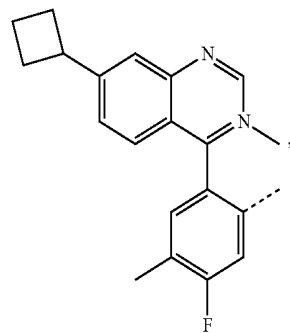
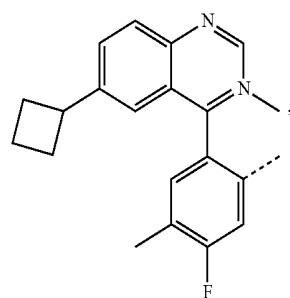
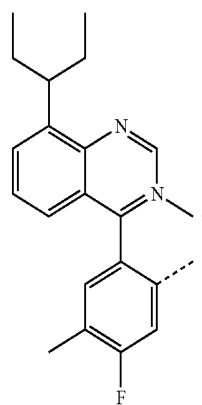
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L₄₆₆L₄₆₇L₄₆₈L₄₆₉

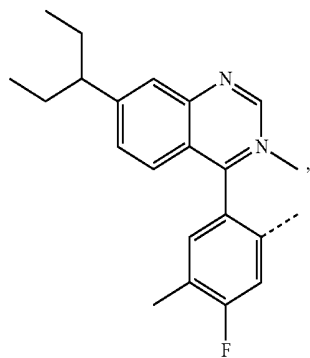
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L₄₇₀L₄₇₁L₄₇₂L₄₇₃L₄₇₄

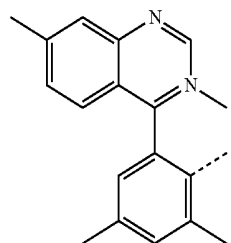
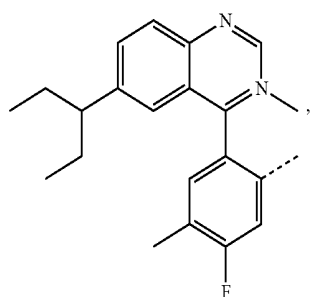
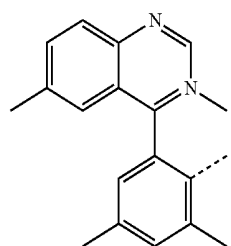
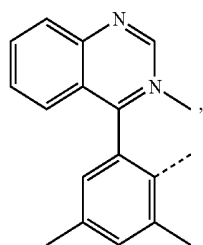
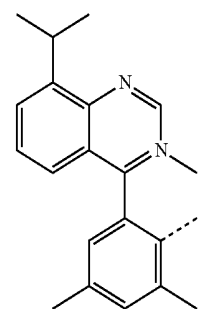
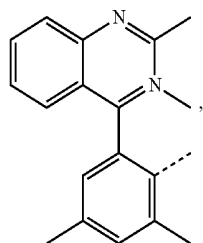
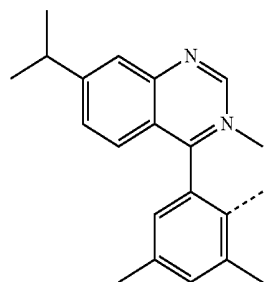
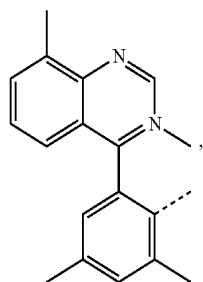
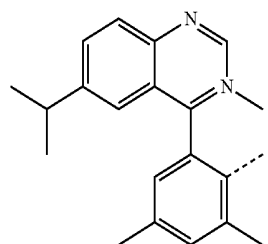
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L₄₇₅L₄₇₆L₄₇₇L₄₇₈

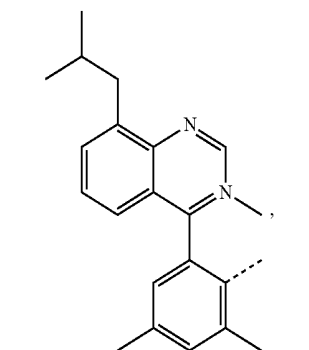
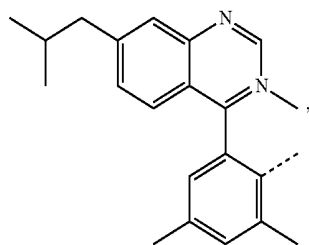
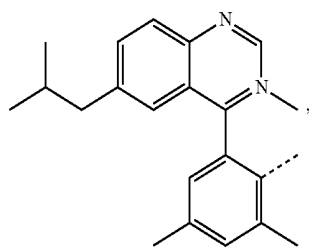
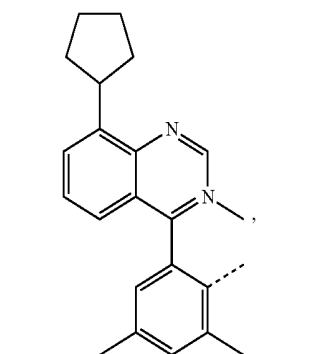
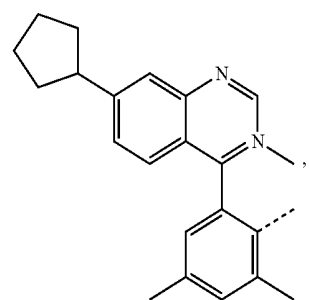
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L₄₇₉

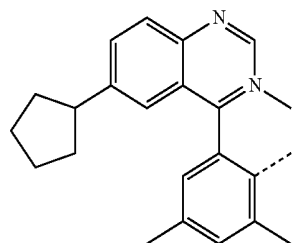
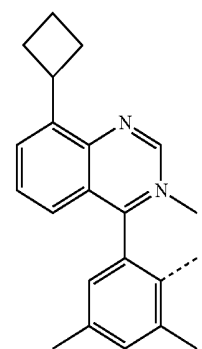
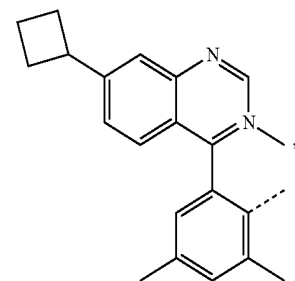
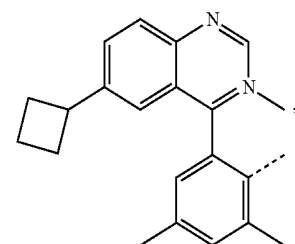
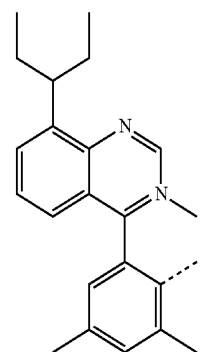
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L₄₈₄L₄₈₀L₄₈₅L₄₈₁L₄₈₆L₄₈₂L₄₈₇L₄₈₃L₄₈₈

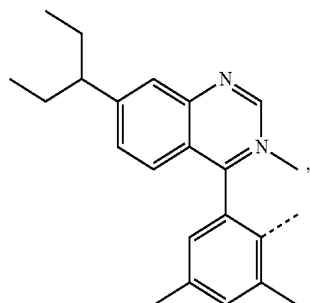
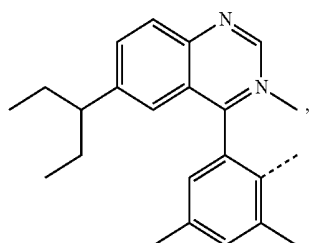
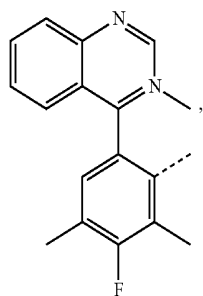
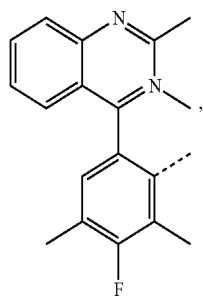
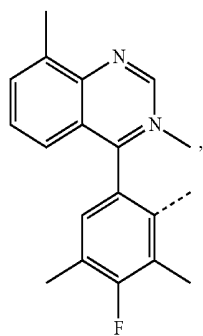
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L₄₈₉L₄₉₀L₄₉₁L₄₉₂L₄₉₃

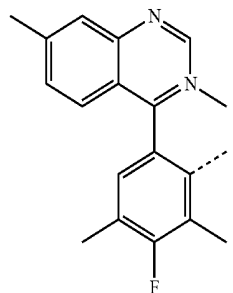
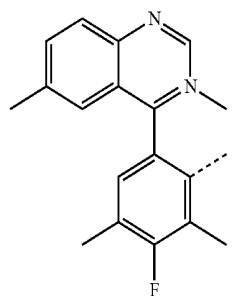
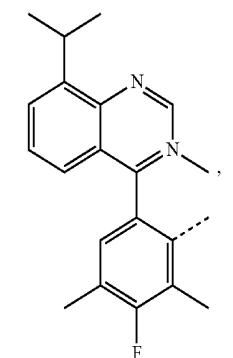
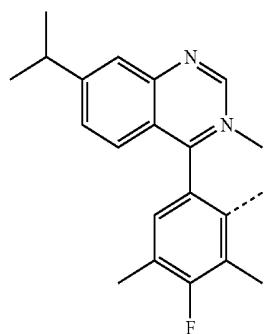
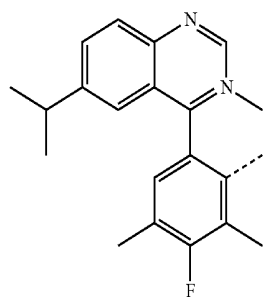
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L₄₉₄L₄₉₅L₄₉₆L₄₉₇L₄₉₈

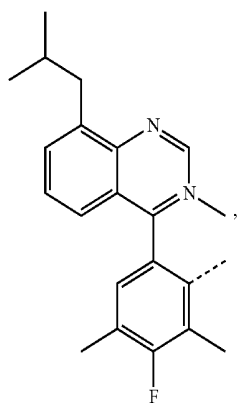
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L₄₉₉L₄₁₀₀L₄₁₀₁L₄₁₀₂L₄₁₀₃

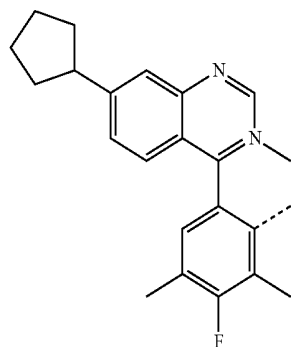
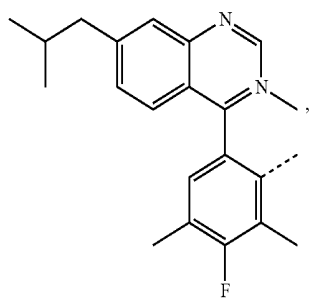
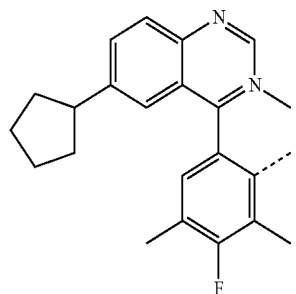
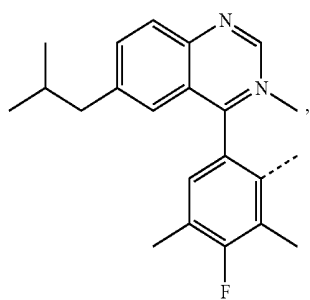
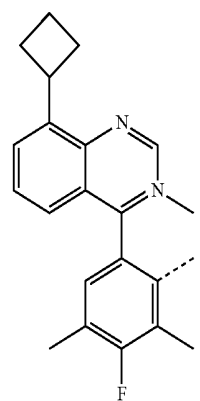
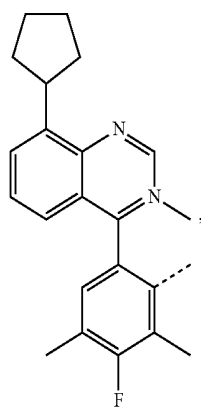
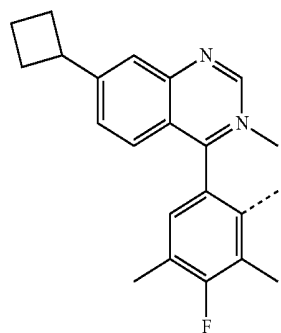
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L₄₁₀₄L₄₁₀₅L₄₁₀₆L₄₁₀₇L₄₁₀₈

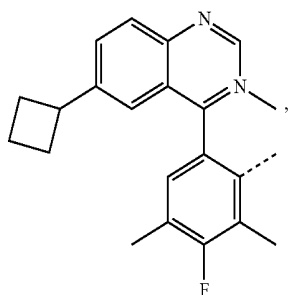
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L_{A109}

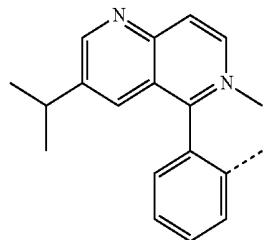
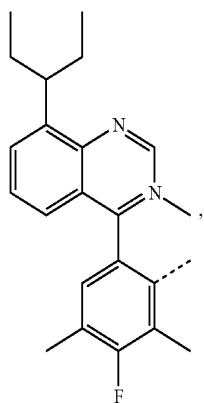
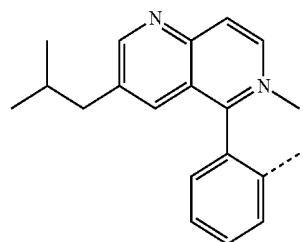
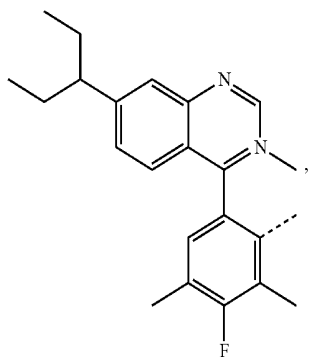
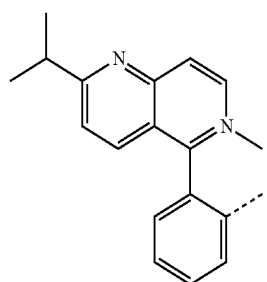
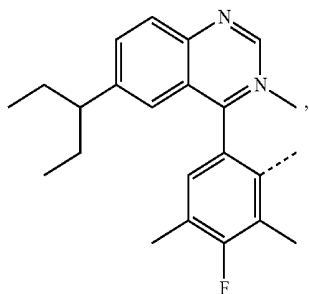
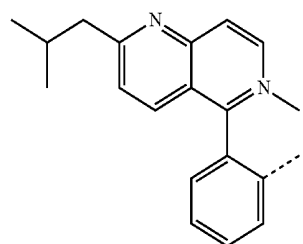
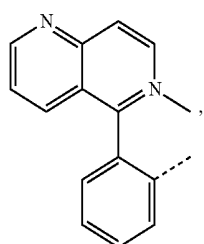
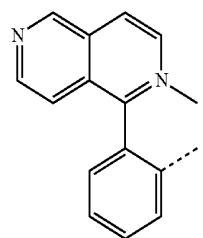
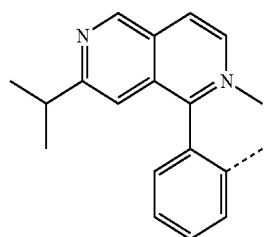
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L_{A113}L_{A110}L_{A114}L_{A111}L_{A115}L_{A112}L_{A116}

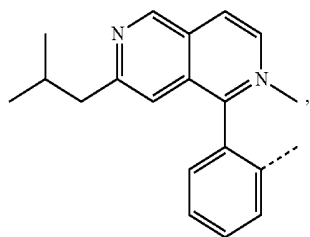
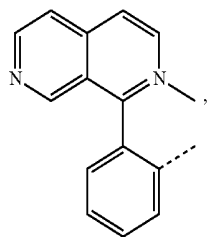
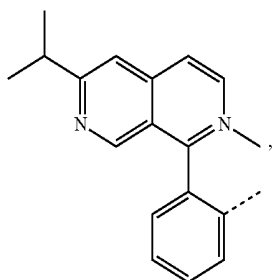
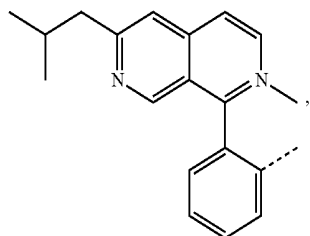
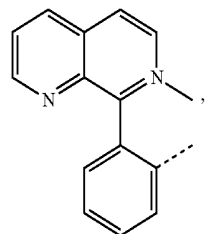
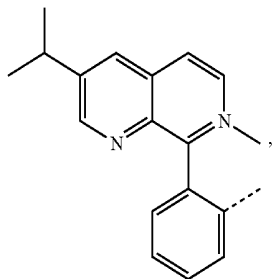
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L_{A117}

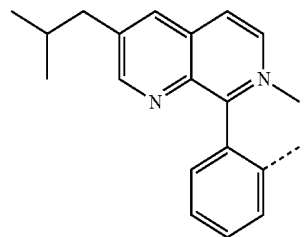
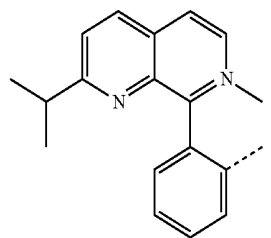
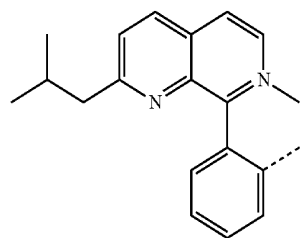
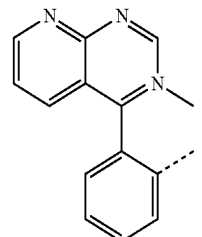
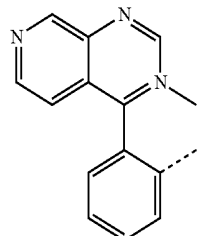
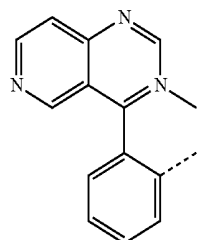
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L_{A122}L_{A118}L_{A123}L_{A119}L_{A123}L_{A120}L_{A124}L_{A121}L_{A125}L_{A126}

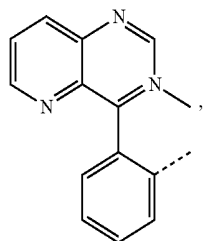
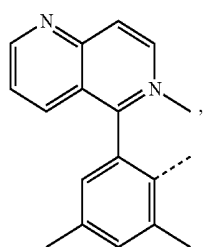
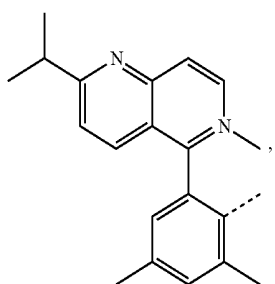
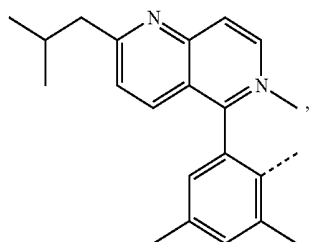
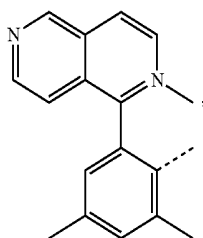
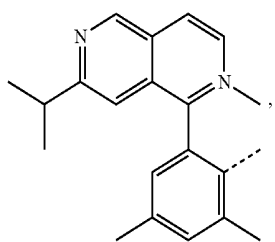
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L_{A127}L_{A128}L_{A129}L_{A130}L_{A131}L_{A132}

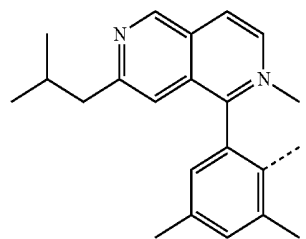
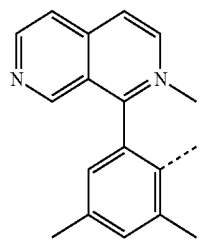
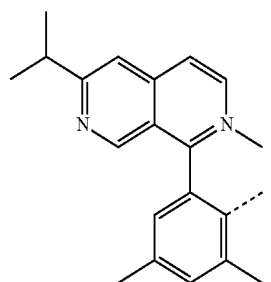
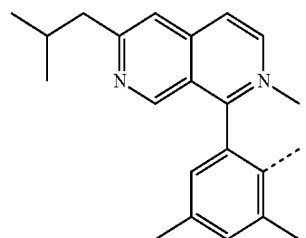
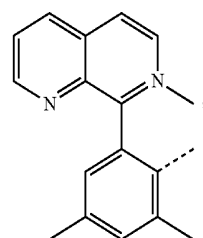
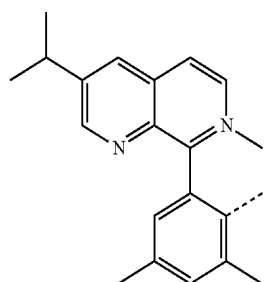
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L_{A133}L_{A134}L_{A135}L_{A136}L_{A137}L_{A138}

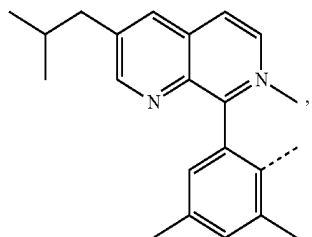
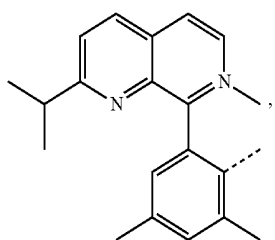
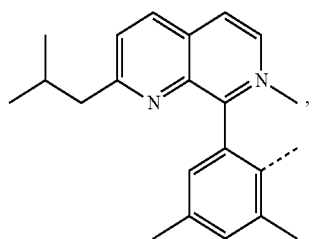
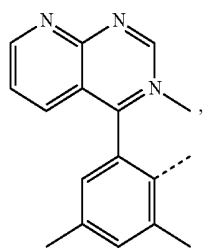
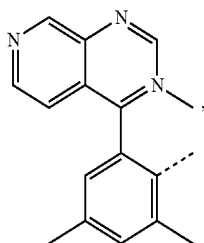
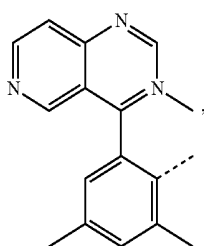
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L_{A139}L_{A140}L_{A141}L_{A142}L_{A143}L_{A144}

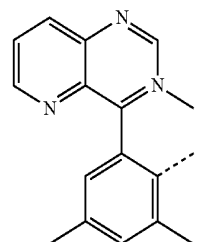
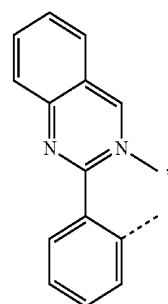
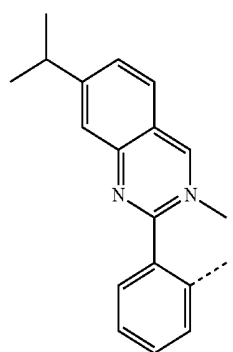
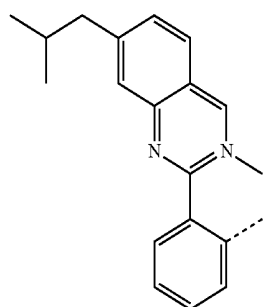
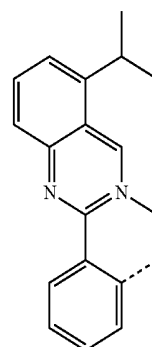
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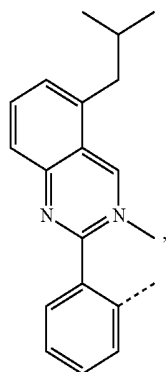
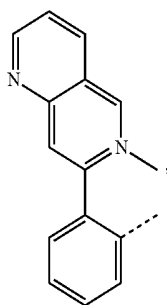
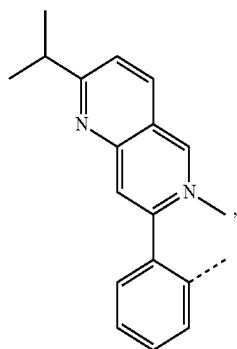
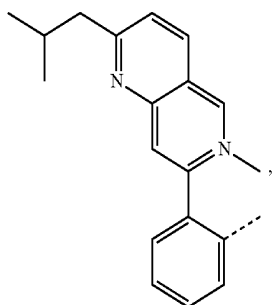
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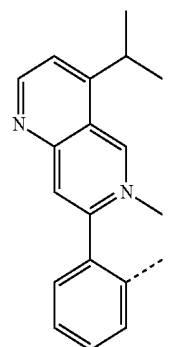
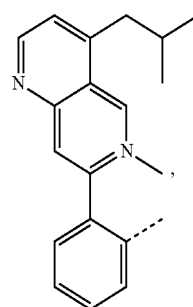
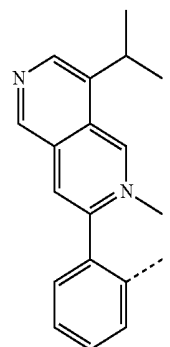
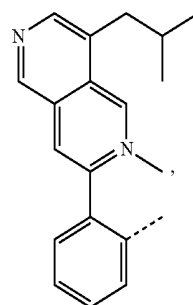
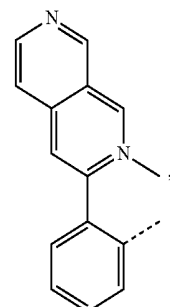
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L_{A157}L_{A158}L_{A159}L_{A160}L_{A161}

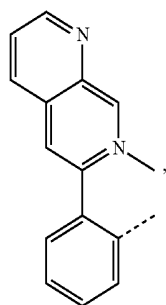
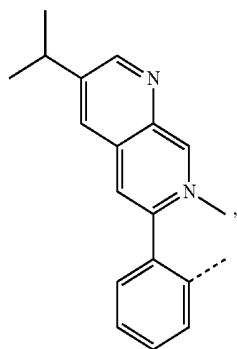
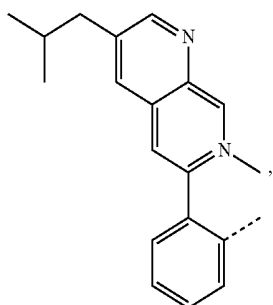
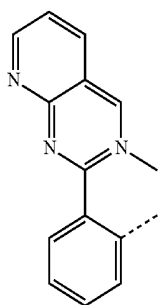
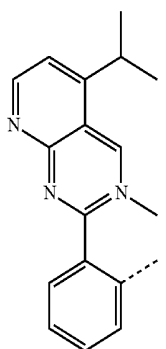
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L_{A162}L_{A163}L_{A164}L_{A165}

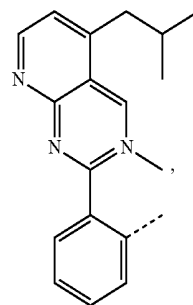
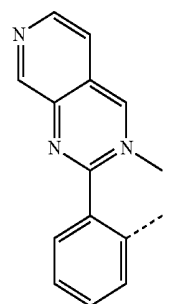
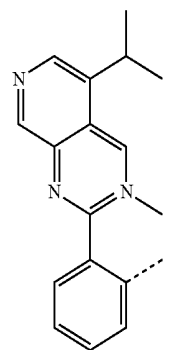
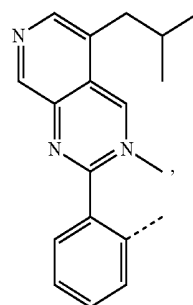
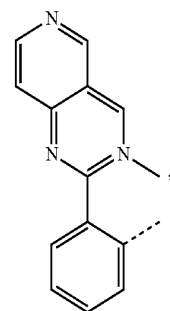
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L_{A166}L_{A167}L_{A168}L_{A169}L_{A170}

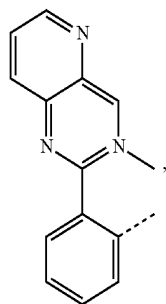
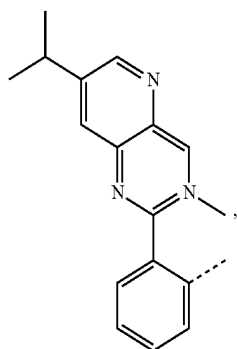
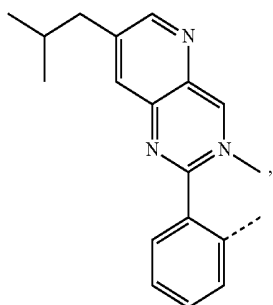
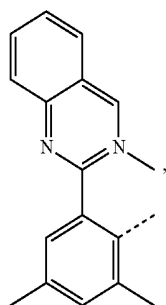
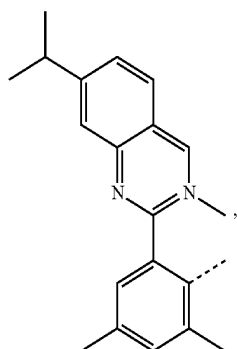
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L_{A171}L_{A172}L_{A173}L_{A174}L_{A175}

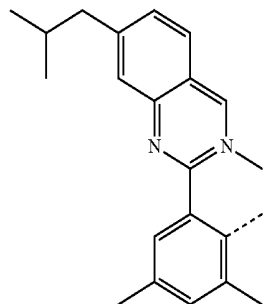
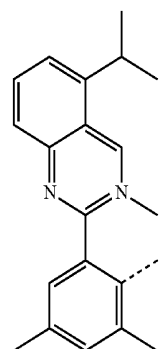
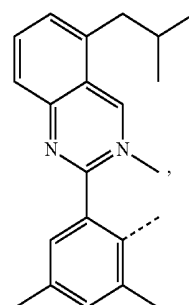
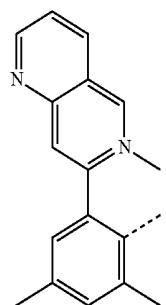
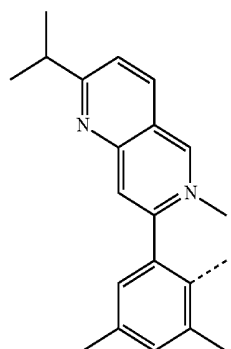
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L_{A176}L_{A177}L_{A178}L_{A179}L_{A180}

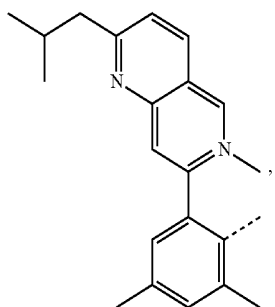
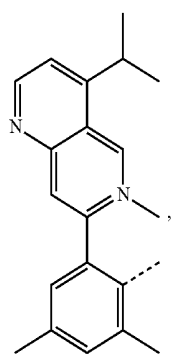
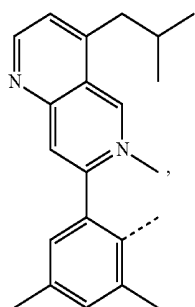
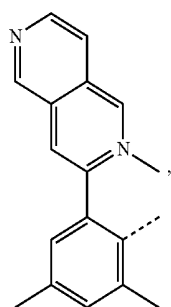
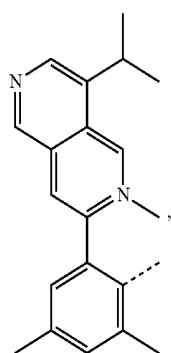
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L_{A181}L_{A182}L_{A183}L_{A184}L_{A185}

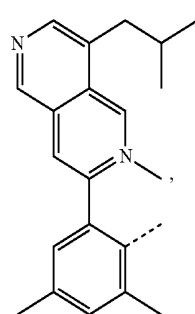
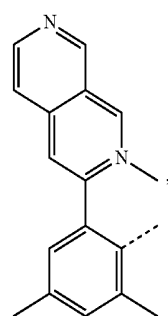
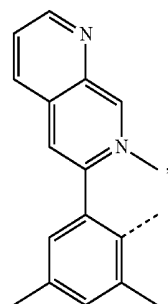
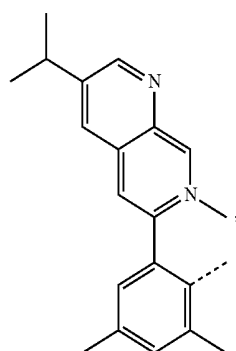
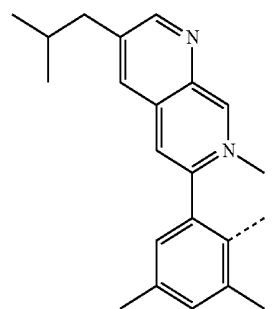
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L_{A186}L_{A187}L_{A188}L_{A189}L_{A190}

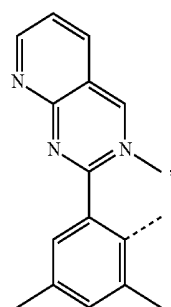
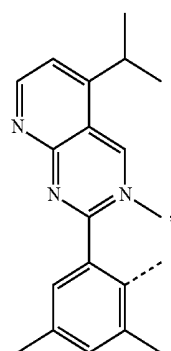
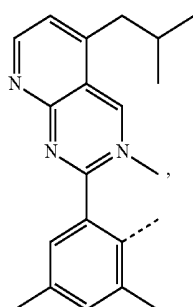
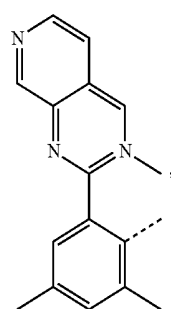
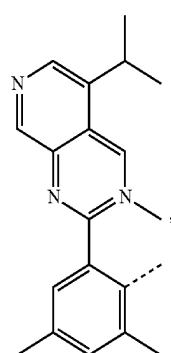
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L_{A191}L_{A192}L_{A193}L_{A194}L_{A195}

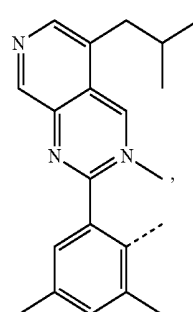
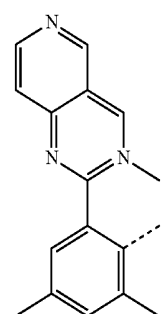
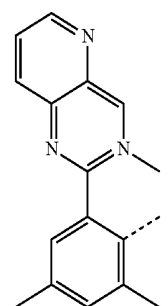
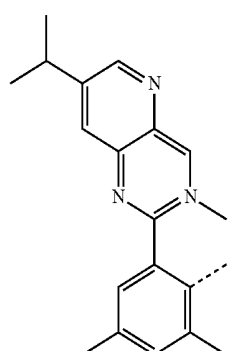
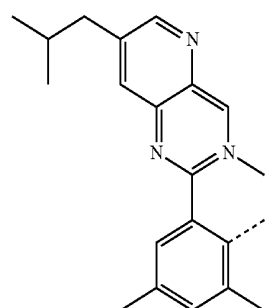
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L_{A196}L_{A197}L_{A198}L_{A199}L_{A200}

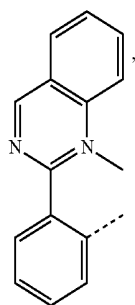
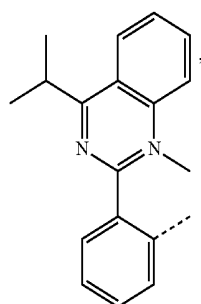
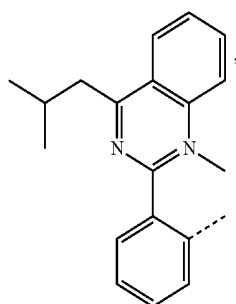
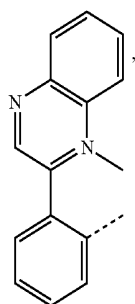
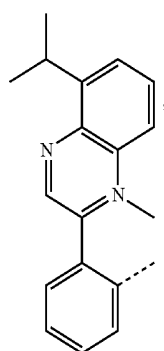
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L_{A201}L_{A202}L_{A203}L_{A204}L_{A205}

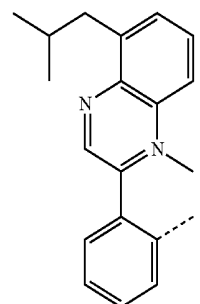
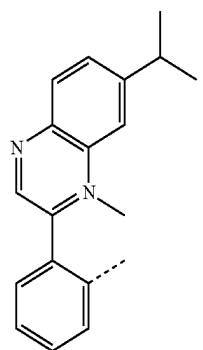
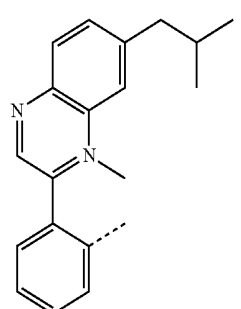
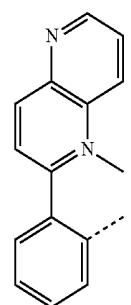
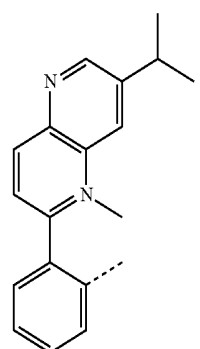
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L_{A206}L_{A207}L_{A208}L_{A209}L_{A210}

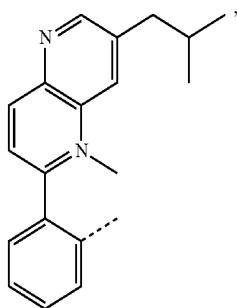
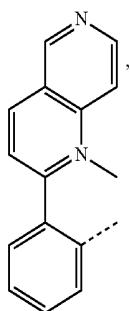
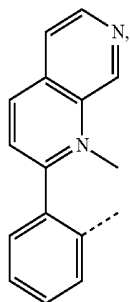
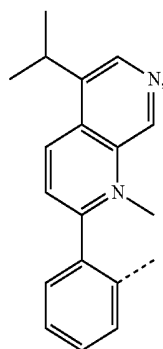
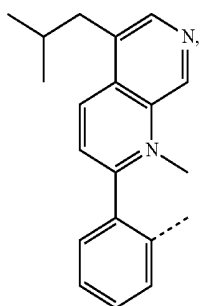
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L₄₂₁₁L₄₂₁₂L₄₂₁₃L₄₂₁₄L₄₂₁₅

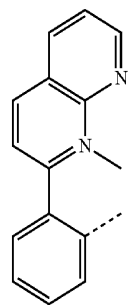
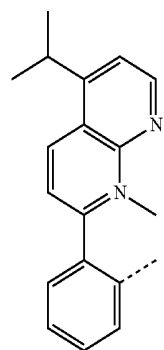
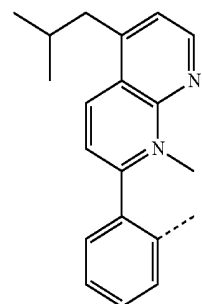
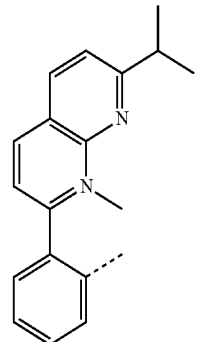
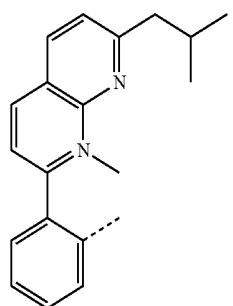
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L₄₂₁₆L₄₂₁₇L₄₂₁₈L₄₂₁₉L₄₂₂₀

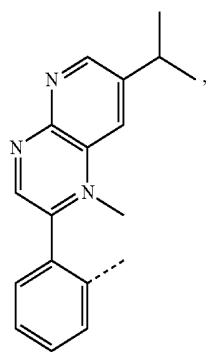
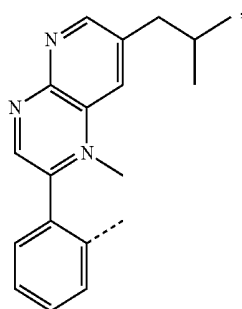
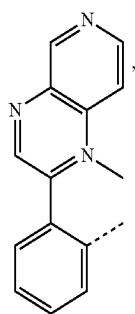
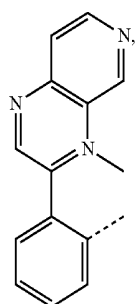
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L_{A221}L_{A222}L_{A223}L_{A224}L_{A225}

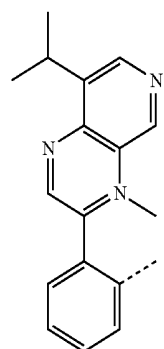
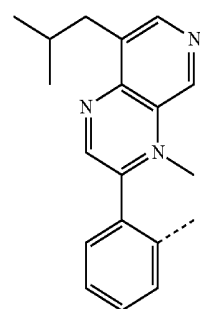
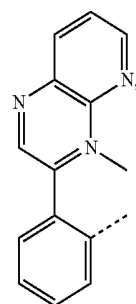
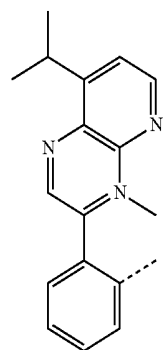
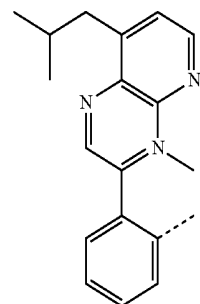
-continued

L_{A226}L_{A227}L_{A228}L_{A229}L_{A230}

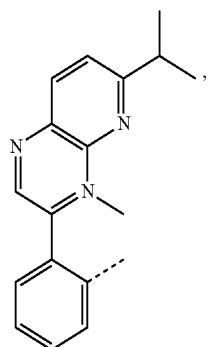
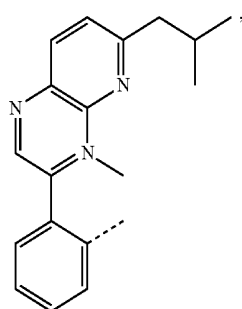
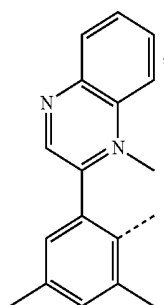
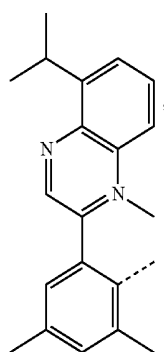
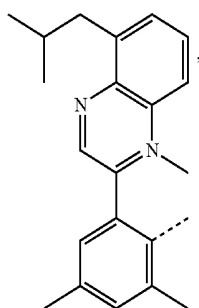
-continued

L₄₂₃₁L₄₂₃₂L₄₂₃₃L₄₂₃₄

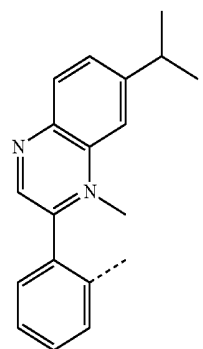
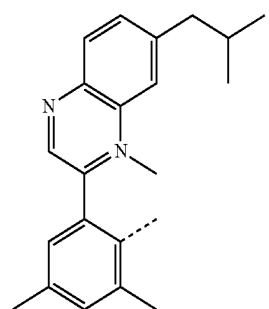
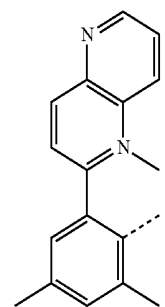
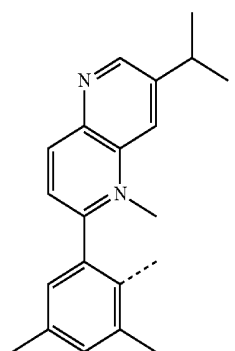
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L₄₂₃₅L₄₂₃₆L₄₂₃₇L₄₂₃₈L₄₂₃₉

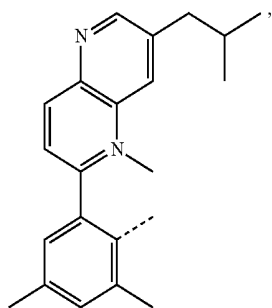
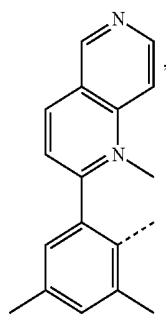
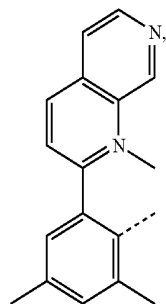
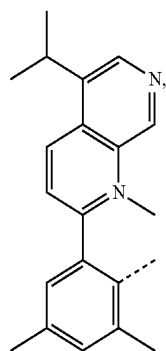
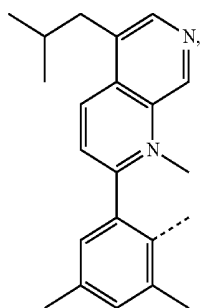
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L_{A240}L_{A241}L_{A242}L_{A243}L_{A244}

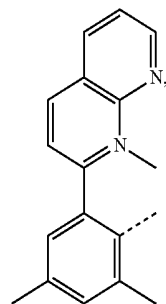
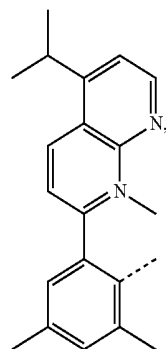
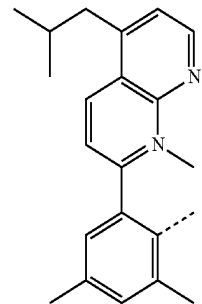
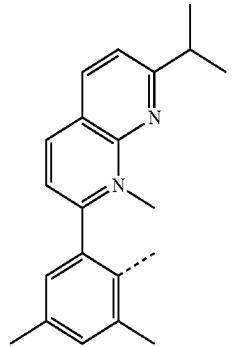
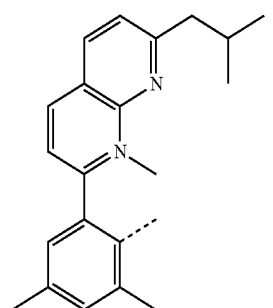
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L_{A245}L_{A246}L_{A247}L_{A248}

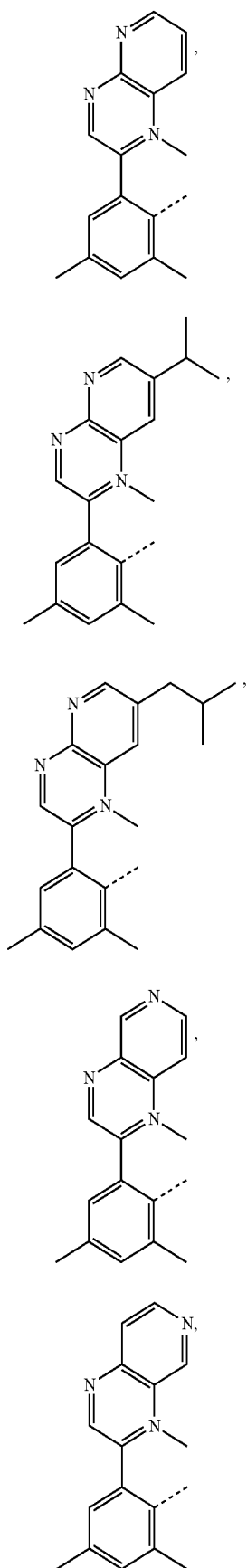
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L₄₂₄₉L₄₂₅₀L₄₂₅₁L₄₂₅₂L₄₂₅₃

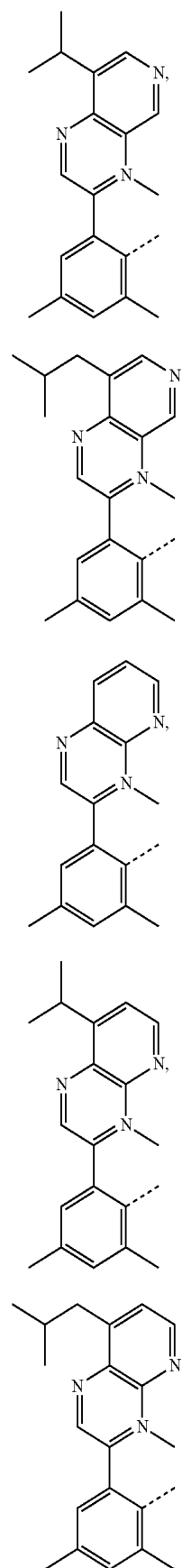
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L₄₂₅₄L₄₂₅₅L₄₂₅₆L₄₂₅₇L₄₂₅₈

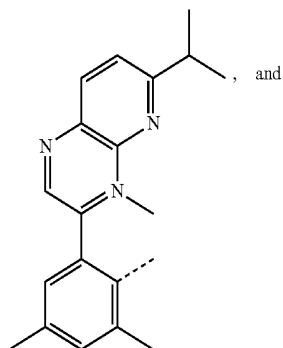
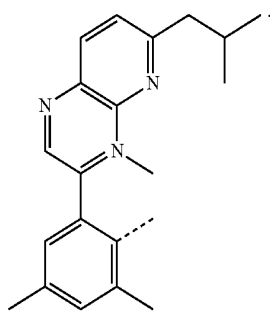
-continued

L₄₂₅₉L₄₂₆₀L₄₂₆₁L₄₂₆₂L₄₂₆₃

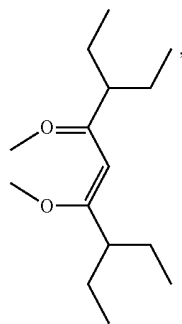
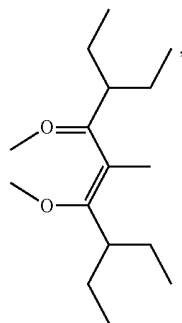
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L₄₂₆₄L₄₂₆₅L₄₂₆₆L₄₂₆₇L₄₂₆₈

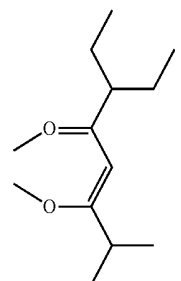
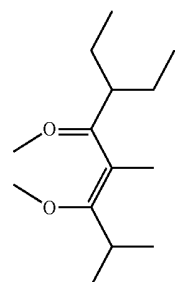
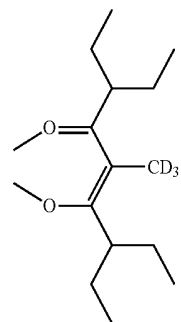
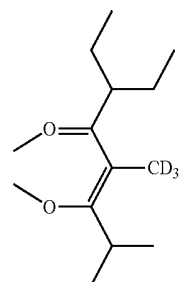
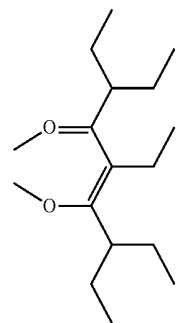
-continued

L_{A269}L_{A270}

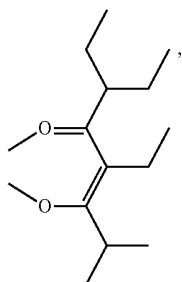
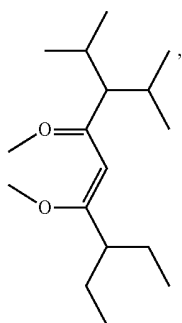
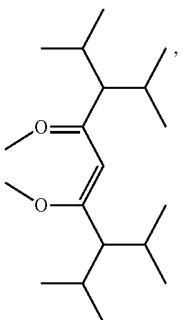
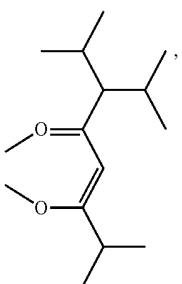
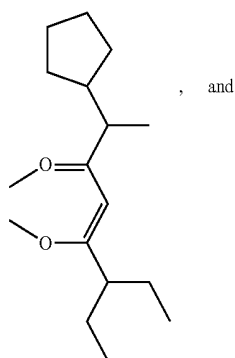
16. The compound of claim 15, wherein $x=1$ or 2, $y=1$ or 1, and $z=0$, and wherein L_B is selected from the group consisting of L_{B1} - L_{B13} listed below:

L_{B1}L_{B2}

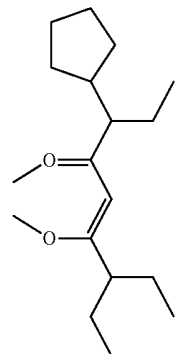
-continued

L_{B3}L_{B4}L_{B5}L_{B6}L_{B7}

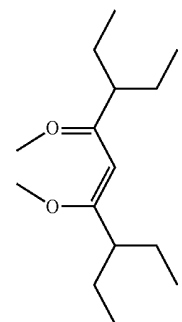
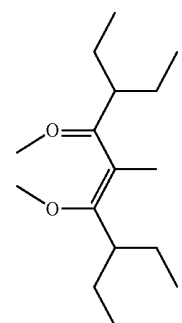
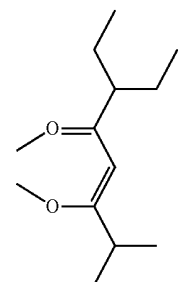
-continued

L_{B8}L_{B9}L_{B10}L_{B11}L_{B12}

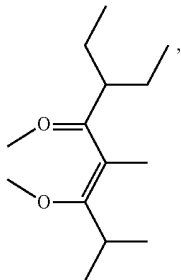
-continued

L_{B13}

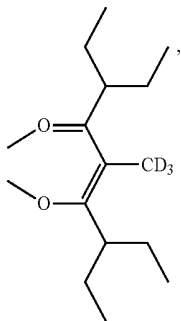
17. The compound of claim 1, wherein L_B is selected from the group consisting of L_{B1}-L_{B13} listed below:

L_{B1}L_{B2}L_{B3}

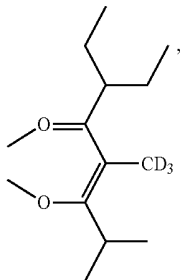
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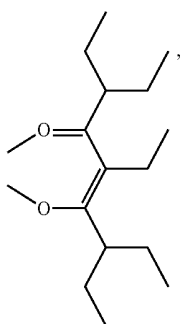
L_{B4}



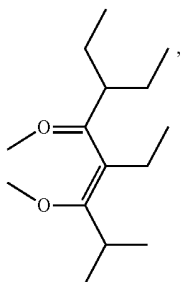
L_{B5}



L_{B6}

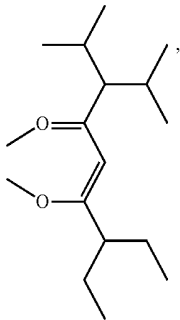


L_{B7}

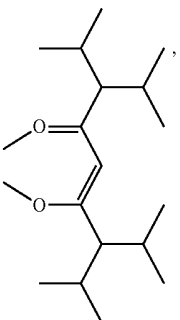


L_{B8}

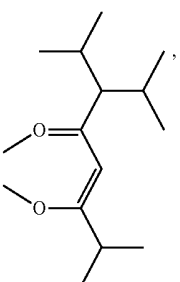
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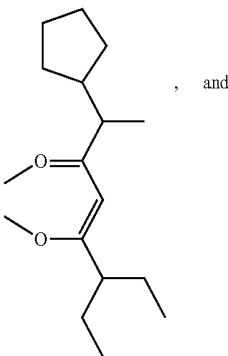
L_{B9}



L_{B10}



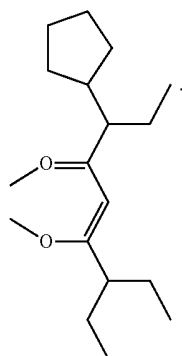
L_{B11}



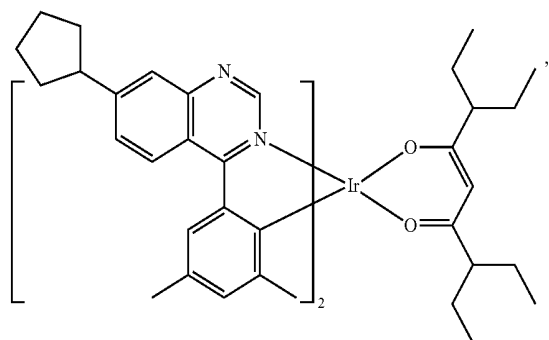
L_{B12}

, and

-continued

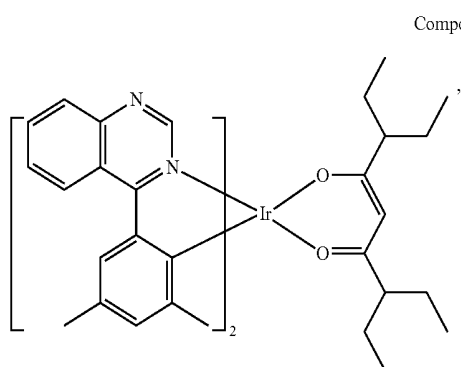
 L_{B13}

-continued

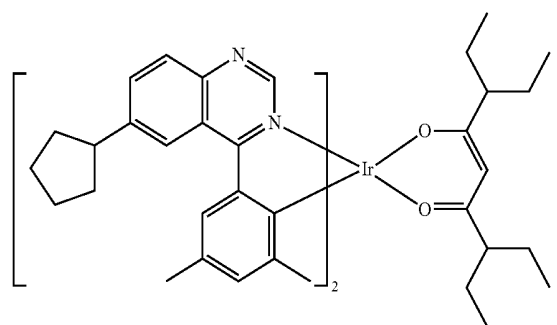


Compound 93

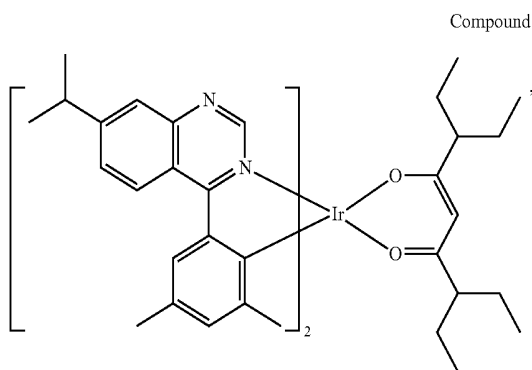
18. The compound of claim 1, wherein the compound is selected from the group consisting of:



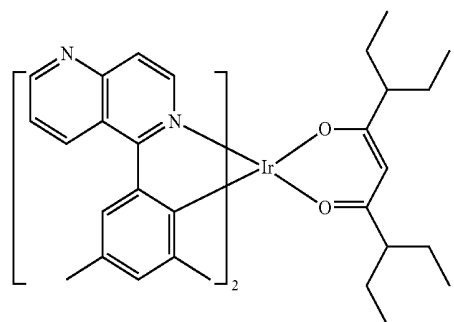
Compound 81



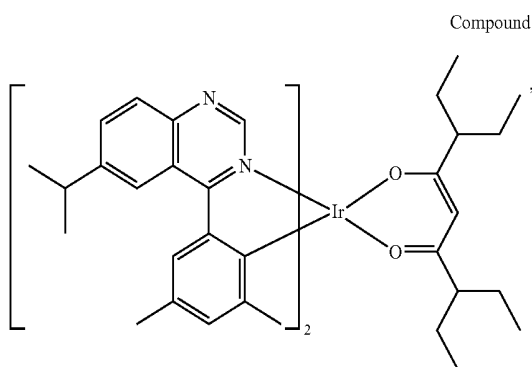
Compound 94



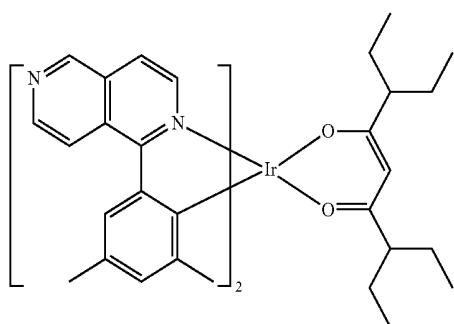
Compound 87



Compound 140

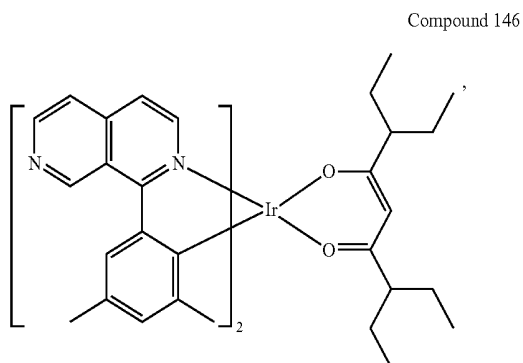


Compound 88



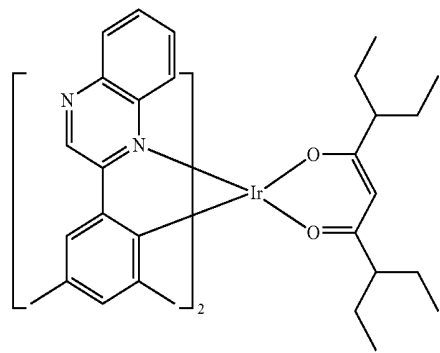
Compound 143

-continued

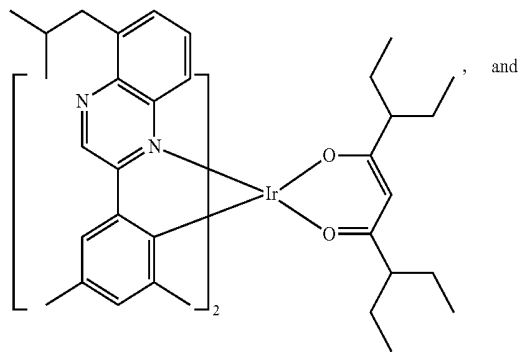
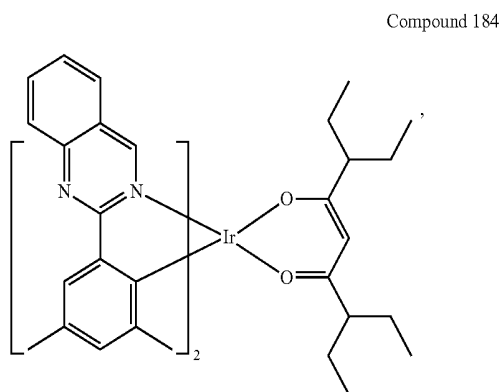


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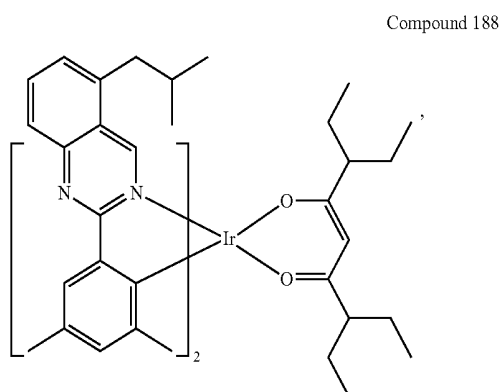
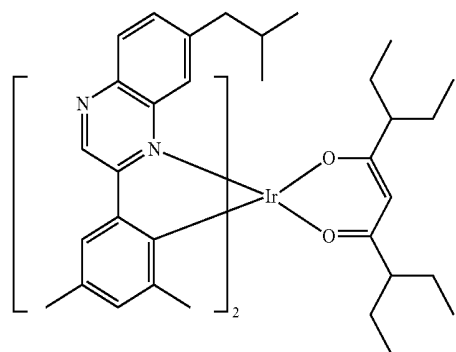
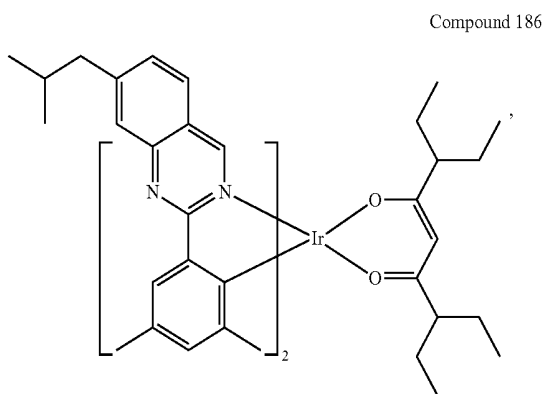
Compound 242



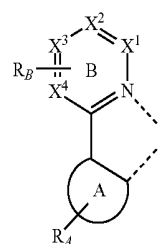
Compound 244



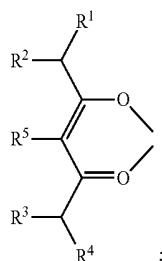
Compound 246



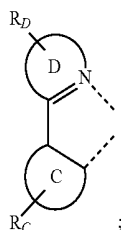
19. A first device comprising a first organic light emitting device, the first organic light emitting device comprising:
 an anode;
 a cathode; and
 an organic layer, disposed between the anode and the cathode, comprising a compound having a formula $M(L_A)_x(L_B)_y(L_C)_z$;
 wherein the ligand L_A is



wherein the ligand L_B is



wherein the ligand L_C is



wherein M is a metal having an atomic number greater than 40;

wherein x is 1, or 2;

wherein y is 1, or 2;

wherein z is 0, 1, or 2;

wherein $x+y+z$ is the oxidation state of the metal M;

wherein X^1 , X^2 , X^3 , and X^4 are C or N;

wherein R^1 , R^2 , R^3 , and R^4 are independently selected from group consisting of alkyl, cycloalkyl, aryl, and heteroaryl;

wherein at least one of R^1 , R^2 , R^3 , and R^4 has at least two C atoms;

wherein R^5 is selected from group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof;

wherein rings A, C, and D are each independently a 5 or 6-membered carbocyclic or heterocyclic ring;

wherein R_A , R_C , and R_D each independently represent mono, di, tri, or tetra-substitution, or no substitution;

wherein R_B represents di, tri, or tetra-substitution;

wherein two adjacent R_B form a six-member carbocyclic or heterocyclic ring E fused to ring B; wherein, when ring E is heterocyclic, the only heteroatom is nitrogen; and wherein ring E can be further substituted;

wherein

(a) at least one of X^1 , X^2 , X^3 , and X^4 is N,

(b) ring E is heterocyclic, or

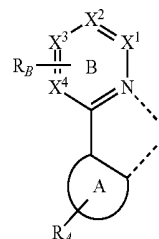
(c) both;

wherein each of R_A , R_B , R_C , and R_D are independently selected from the group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof; and

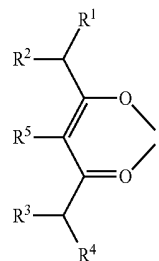
wherein any adjacent substituents of R_A , R_B , R_C , and R_D are optionally joined to form a fused ring.

20. A formulation comprising a compound having a formula $M(L_A)_x(L_B)_y(L_C)_z$:

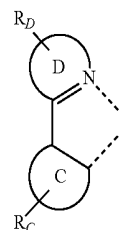
wherein the ligand L_A is



wherein the ligand L_B is



wherein the ligand L_C is



wherein M is a metal having an atomic number greater than 40;

wherein x is 1, or 2;

wherein y is 1, or 2;

wherein z is 0, 1, or 2;

wherein $x+y+z$ is the oxidation state of the metal M;

wherein X^1 , X^2 , X^3 , and X^4 are C or N;

wherein R^1 , R^2 , R^3 , and R^4 are independently selected from group consisting of alkyl, cycloalkyl, aryl, and heteroaryl;

wherein at least one of R^1 , R^2 , R^3 , and R^4 has at least two C atoms;

wherein R^5 is selected from group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof;

wherein rings A, C, and D are each independently a 5 or 6-membered carbocyclic or heterocyclic ring;

wherein R_A , R_C , and R_D each independently represent mono, di, tri, or tetra-substitution, or no substitution; wherein R_B represents di, tri, or tetra-substitution; wherein two adjacent R_B form a six-member carbocyclic or heterocyclic ring E fused to ring B; wherein, when ring E is heterocyclic, the only heteroatom is nitrogen; and wherein ring E can be further substituted;

wherein

- (a) at least one of X^1 , X^2 , X^3 , and X^4 is N,
- (b) ring E is heterocyclic, or
- (c) both;

wherein each of R_A , R_B , R_C , and R_D are independently selected from the group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof; and wherein any adjacent substituents of R_A , R_B , R_C , and R_D are optionally joined to form a fused ring.

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专利名称(译)	有机电致发光材料和器件		
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[标]发明人	BOUDREAUULT PIERRE LUC T DYATKIN ALEXEY BORISOVICH XIA CHUANJUN YAMAMOTO HITOSHI		
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摘要(译)

式 $M(LA)_x(LB)_y$ 的化合物 $(LC)_z$ ，描述含有它们的装置和含有它们的制剂。这些化合物包括：其中M是金属原子序数大于40；x是1或2；y是1或2；和z是0,1或2；其中 $x+y+z$ 是金属M的氧化态，其中 X_1 ， X_2 ， X_3 和 X_4 是C或N；其中 R_1 ， R_2 ， R_3 和 R_4 中的至少一个具有至少两个C原子；其中R_B表示二，三或四取代，并且其中两个相邻的R_B表示与环B稠合的六元碳环或杂环E；其中，当环E是杂环时，唯一的杂原子是氮；其中环E可以进一步被取代；其中(a) X_1 ， X_2 ， X_3 和 X_4 中的至少一个是N，(b)环E是杂环，或(c)两者。

