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(54) **ORGANIC ELECTROLUMINESCENT MATERIALS AND DEVICES**

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H01L 51/00	(2006.01)
C07F 15/00	(2006.01)
H01L 51/50	(2006.01)

(52) **U.S. Cl.**

CPC ***H01L 51/0085*** (2013.01); ***C07F 15/0033*** (2013.01); ***C09K 11/06*** (2013.01); *C09K 2211/1029* (2013.01); *C09K 2211/1044* (2013.01); *C09K 2211/185* (2013.01); *H01L 51/5016* (2013.01); *H01L 51/5056* (2013.01); *H01L 51/5072* (2013.01); *H01L 51/5088* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,769,292	A	9/1988	Tang et al.
5,061,569	A	10/1991	VanSlyke et al.
5,247,190	A	9/1993	Friend et al.
5,703,436	A	12/1997	Forrest et al.
5,707,745	A	1/1998	Forrest et al.
5,834,893	A	11/1998	Bulovic et al.
5,844,363	A	12/1998	Gu et al.
6,013,982	A	1/2000	Thompson et al.

(Continued)

FOREIGN PATENT DOCUMENTS

CN	101160370	4/2008
CN	101899296	12/2010

(Continued)

OTHER PUBLICATIONS

Adachi, Chihaya et al., "Organic Electroluminescent Device Having a Hole Conductor as an Emitting Layer," Appl. Phys. Lett., 55(15): 1489-1491 (1989).

Adachi, Chihaya et al., "Nearly 100% Internal Phosphorescence Efficiency in an Organic Light Emitting Device," J. Appl. Phys., 90(10): 5048-5051 (2001).

Adachi, Chihaya et al., "High-Efficiency Red Electrophosphorescence Devices," Appl. Phys. Lett., 78(11)1622-1624 (2001).

Aonuma, Masaki et al., "Material Design of Hole Transport Materials Capable of Thick-Film Formation in Organic Light Emitting Diodes," Appl. Phys. Lett., 90:183503-1-183503-3, (2007).

Baldo et al.,"Highly Efficient Phosphorescent Emission from Organic Electroluminescent Devices," Nature, vol. 395, 151-154, (1998).

(Continued)

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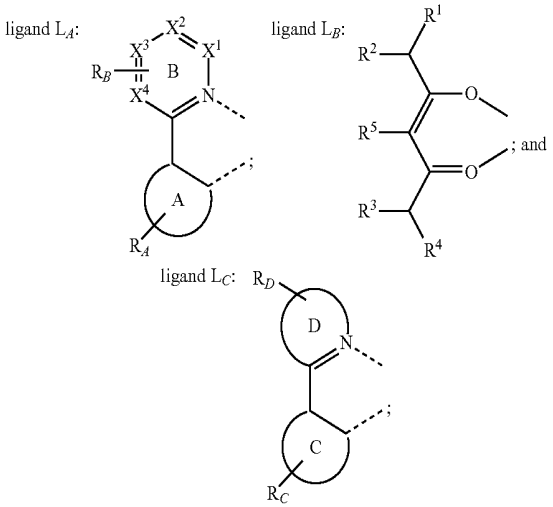
(57) **ABSTRACT**

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 form 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 heterocylic, or (c) both.

20 Claims, 3 Drawing Sheets

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,087,196	A	7/2000	Sturm et al.	
6,091,195	A	7/2000	Forrest et al.	
6,097,147	A	8/2000	Baldo et al.	
6,294,398	B1	9/2001	Kim et al.	
6,303,238	B1	10/2001	Thompson et al.	
6,337,102	B1	1/2002	Forrest et al.	
6,468,819	B1	10/2002	Kim et al.	
6,528,187	B1	3/2003	Okada	
6,687,266	B1	2/2004	Ma et al.	
6,835,469	B2	12/2004	Kwong et al.	
6,921,915	B2	7/2005	Takiguchi et al.	
7,087,321	B2	8/2006	Kwong et al.	
7,090,928	B2	8/2006	Thompson et al.	
7,154,114	B2	12/2006	Brooks et al.	
7,250,226	B2	7/2007	Tokito et al.	
7,279,704	B2	10/2007	Walters et al.	
7,332,232	B2	2/2008	Ma et al.	
7,338,722	B2	3/2008	Thompson et al.	
7,393,599	B2	7/2008	Thompson et al.	
7,396,598	B2	7/2008	Takeuchi et al.	
7,431,968	B1	10/2008	Shtein et al.	
7,445,855	B2	11/2008	Mackenzie et al.	
7,470,928	B2	12/2008	Jeong et al.	
7,534,505	B2	5/2009	Lin et al.	
9,034,483	B2	5/2015	Alleyne et al.	
9,397,302	B2 *	7/2016	Boudreault et al.	C07F 15/0033
9,484,541	B2 *	11/2016	Boudreauit et al.	H01L 51/0085
2002/0034656	A1	3/2002	Thompson et al.	
2002/0134984	A1	9/2002	Igarashi	
2002/0158242	A1	10/2002	Son et al.	
2003/0068526	A1	4/2003	Kamatani et al.	
2003/0138657	A1	7/2003	Li et al.	
2003/0152802	A1	8/2003	Tsuboyama et al.	
2003/0162053	A1	8/2003	Marks et al.	
2003/0175553	A1	9/2003	Thompson et al.	
2003/0230980	A1	12/2003	Forrest et al.	
2004/0036077	A1	2/2004	Ise	
2004/0137267	A1	7/2004	Igarashi et al.	
2004/0137268	A1	7/2004	Igarashi et al.	
2004/0174116	A1	9/2004	Lu et al.	
2005/0025993	A1	2/2005	Thompson et al.	
2005/0112407	A1	5/2005	Ogasawara et al.	
2005/0238919	A1	10/2005	Ogasawara	
2005/0244673	A1	11/2005	Satoh et al.	
2005/0260441	A1	11/2005	Thompson et al.	
2005/0260449	A1	11/2005	Walters et al.	
2006/0008670	A1	1/2006	Lin et al.	
2006/0134462	A1	6/2006	Yeh et al.	
2006/0202194	A1	9/2006	Jeong et al.	
2006/0240279	A1	10/2006	Adamovich et al.	
2006/0251923	A1	11/2006	Lin et al.	
2006/0263635	A1	11/2006	Ise	
2006/0280965	A1	12/2006	Kwong et al.	
2007/0122655	A1	5/2007	Deaton et al.	
2007/0190359	A1	8/2007	Knowles et al.	
2007/0278938	A1	12/2007	Yabunouchi et al.	
2008/0015355	A1	1/2008	Schafer et al.	
2008/0018221	A1	1/2008	Egen et al.	
2008/0106190	A1	5/2008	Yabunouchi et al.	
2008/0124572	A1	5/2008	Mizuki et al.	
2008/0220265	A1	9/2008	Xia et al.	
2008/0297033	A1	12/2008	Knowles et al.	
2009/0008605	A1	1/2009	Kawamura et al.	
2009/0009065	A1	1/2009	Nishimura et al.	
2009/0017330	A1	1/2009	Iwakuma et al.	
2009/0030202	A1	1/2009	Iwakuma et al.	
2009/0039776	A1	2/2009	Yamada et al.	
2009/0045730	A1	2/2009	Nishimura et al.	
2009/0045731	A1	2/2009	Nishimura et al.	
2009/0101870	A1	4/2009	Prakash et al.	
2009/0108737	A1	4/2009	Kwong et al.	
2009/0115316	A1	5/2009	Zheng et al.	
2009/0165846	A1	7/2009	Johannes et al.	
2009/0167162	A1	7/2009	Lin et al.	
2009/0179554	A1	7/2009	Kuma et al.	
2013/0281693	A1	10/2013	Inoue et al.	
2014/0246656	A1 *	9/2014	Inoue et al.	H01L 51/0085 257/40
2015/0001472	A1 *	1/2015	Boudreault et al.	C07F 15/0033 257/40

FOREIGN PATENT DOCUMENTS

CN	103539821	1/2014
EP	0650955	5/1995
EP	1725079	11/2006
EP	2034538	3/2009
JP	200511610	1/2005
JP	2007123392	5/2007
JP	2007254297	10/2007
JP	2008074939	4/2008
WO	2001039234	5/2001
WO	2002002714	1/2002
WO	200215645	2/2002
WO	2003040257	5/2003
WO	2003060956	7/2003
WO	2004093207	10/2004
WO	2004107822	12/2004
WO	2005014551	2/2005
WO	2005019373	3/2005
WO	2005030900	4/2005
WO	2005089025	9/2005
WO	2006103874	10/2005
WO	2005123873	12/2005
WO	2005124889	12/2005
WO	2006009024	1/2006
WO	2006056418	6/2006
WO	2006072002	7/2006
WO	2006082742	8/2006
WO	2006098120	9/2006
WO	2006100298	9/2006
WO	2006114966	11/2006
WO	2006132173	12/2006
WO	2007002683	1/2007
WO	2007004380	1/2007
WO	2007063754	6/2007
WO	2007063796	6/2007
WO	2008056746	5/2008
WO	2008101842	8/2008
WO	2008132085	11/2008
WO	2009000673	12/2008
WO	2009003898	1/2009
WO	2009008311	1/2009
WO	2009018009	2/2009
WO	2009021126	2/2009
WO	2009050290	4/2009
WO	2009062578	5/2009
WO	2009063833	5/2009
WO	2009066778	5/2009
WO	2009066779	5/2009
WO	2009086028	7/2009
WO	2009100991	8/2009
WO	2011059814	5/2011

OTHER PUBLICATIONS

Baldo et al., "Very hlgh-efficiency green organic light-emitting devices based on electrophosphorescence," Appl. Phys. Lett., vol. 75, No. 1, 4-6 (1999).

Gao, Zhiqiang et al., "Bright-Blue Electroluminescence From a Silyl-Substituted ter-(phenylene-vinylene) derivative," Appl. Phys. Lett., 74(6): 865-867 (1999).

Guo, Tzung-Fang et al., "Highly Efficient Electrophosphorescent Polymer Light-Emitting Devices," Organic Electronics, 115-20 (2000).

Hamada, Yuji et al., "High Luminance in Organic Electroluminescent Devices with Bis(10-hydroxybenzo[h]quinolinato) beryllium as an Emitter," Chem. Lett., 905-906 (1993).

(56) **References Cited**

OTHER PUBLICATIONS

Holmes, R.J. et al., "Blue Organic Electrophosphorescence Using Exothermic Host-Guest Energy Transfer," Appl. Phys. Lett., 82(15):2422-2424 (2003).

Hu, Nan-Xing et al., "Novel High Tg Hole-Transport Molecules Based on Indolo[3,2-b]carbazoles for Organic Light-Emitting Devices," Synthetic Metals, 111-112:421-424 (2000).

Huang, Jinsong et al., "Highly Efficient Red-Emission Polymer Phosphorescent Light-Emitting Diodes Based on Two Novel Tris(1-phenylisoquinolinato-C2,N)iridium(III) Derivatives," Adv. Mater., 19:739-743 (2007).

Huang, Wei-Sheng et al., "Highly Phosphorescent Bis-Cyclometalated Iridium Complexes Containing Benzoimidazole-Based Ligands," Chem. Mater., 16(12):2480-2488 (2004).

Hung. L.S. et al., "Anode Modification in Organic Light-Emitting Diodes by Low-Frequency Plasma Polymerization of CHF3," Appl. Phys. Lett., 78(5):673-675 (2001).

Ikai, Masamichi et al., "Highly Efficient Phosphorescence From Organic Light-Emitting Devices with an Exciton-Block Layer," Appl. Phys. Lett., 79(2):156-158 (2001).

Ikeda, Hisao et al., "P-185 Low-Drive-Voltage OLEDs with a Buffer Layer Having Molybdenum Oxide," SID Symposium Digest, 37:923-926 (2006).

Inada, Hiroshi and Shirota, Yasuhiko, "1,3,5-Tris[4-(diphenylamino)phenyl]benzene and its Methylsubstituted Derivatives as a Novel Class of Amorphous Molecular Materials," J. Mater, Chem., 3(3):319-320 (1993).

Kanno, Hiroshi et al., "Highly Efficient and Stable Red Phosphorescent Organic Light-Emitting Device Using bis[2-(2-benzothlazoyl)phenolato]zinc(II) as host material," Appl. Phys. Lett., 90:123509-1-123509-3 (2007).

Kido, Junji et al.,"1,2,4-Triazole Derivative as an Electron Transport Layer in Organic Electrominescent Devices," Jpn. J. Appl. Phys., 32:L917-L920 (1993).

Kuwabara, Yoshiyuki et al., "Thermally Stable Multilayered Organic Electroluminescent Devices Using Novel Starburst Molecules, 4,4',4"-Tri(N-carbazolyl)triphenylamine (TCTA) and 4,4'4"-Tris(3-methylphenylphenyl-amino) triphenylamine (m-MTDATA), as Hole-Transport Materials," Adv. Mater., 6(9):677-679 (1994).

Kwong, Raymond C. et al., "High Operational Stability of Electrophosphorescent Devices," Appl. Phys. Lett., 81(1) 162-164 (2002).

Lamansky, Sergey et al., "Synthesis and Characterization of Phosphorescent Cyclometalated Iridium Complexes," Inorg. Chem., 40(7):1704-1711 (2001).

Lee, Chang-Lyoul et al., "Polymer Phosphorescent Light-Emitting Devices Doped with Tris(2-phenylpyridine) Iridium as a Triplet Emitter", Appl. Phys., Lett., 77(15):2280-2282 (2000).

Lo, Shih-Chun et al., "Blue Phosphorescence from Iridium(III) Complexes at Room Temperature," Chem. Mater., 18 (21)5119-5129 (2006).

Ma, Yuguang et al., "Triplet Luminescent Dinuclear-Gold(I) Complex-Based Light-Emitting Diodes with Low Turn-On voltage," Appl. Phys. Lett., 74(10):1361-1363 (1999).

Mi, Bao-Xiu et al., "Thermally Stable Hole-Transporting Material for Organic Light-Emitting Diode an Isoindole Derivative," Chem. Mater., 15(16):3148-3151 (2003).

Nishida, Jun-ichi et al., "Preparation, Characterization, and Electroluminescence Characteristics of α-Diimine-type Platinum(II) Complexes with Perfluorinated Phenyl Groups as Ligands," Chem. Lett., 34(4): 592-593 (2005).

Niu, Yu-Hua et al., "Highly Efficient Electrophosphorescent Devices with Saturated Red Emission from a Neutral Osmium Complex," Chem. Mater., 17(13):3532-3536 (2005).

Noda, Tetsuya and Shirota,Yasuhiko, "°5,5'-Bis(dimesitylboryl)-2,2'-bithiophene and 5,5"-Bis(dimesitylboryl)-2,2'5',2"-terthiophene as a Novel Family of Electron-Transporting Amorphous Molecular Materials," J. Am. Chem. Soc., 120 (37):9714-9715 (1998).

Okumoto, Kenji et al., "Green Fluorescent Organic Light-Emitting Device with External Quantum Efficiency of Nearly 10%," Appl. Phys. Lett., 89:083504-1-063504-3 (2006).

Palilis, Leonidas C., "High Efficiency Molecular Organic Light-Emitting Diodes Based on Siloie Derivatives and Their Exciplexes," Organics Electronics, 4:113-121 (2003).

Paulose, Betty Marie Jennifer S. et al., "First Examples of Alkenyl Pyridines as Organic Ligands for Phosphorescent Iridium Complexes", Adv. Mater., 16(22):2003-2007 (2004).

Ranjan, Sudhir et al., "Realizing Green Phosphorescent Light-Emitting Materials from Rhenium(I) Pyrazolato Diimine Complexes," Inorg. Chem., 42(4):1248-1255 (2003).

Sakamoto; Youichi et al., "Synthesis, Characterization, and Electron-Transport Property of Perfluorinated Phenylene Dendrimers," J. Am. Chem. Soc., 122(8):1832-1833 (2000).

Salbeck, J. et al., "Low Molecular Organic Glasses for Blue Electroluminescence," Synthetic Metals, 91:209-215 (1997).

Shirota, Yasuhiko et al., "Starburst Molecules Based on pi-Electron Systems as Materials for Organic Electroluminescent Devices," Journal of Luminescence, 72-74:985-991 (1997).

Sotoyama, Wataru et al., "Efficient Organic Light-Emitting Diodes with Phosphorescent Platinum Complexes Containing NN^C^N CN^C^N N-Coordinating Tridentate Ligand," Appl. Phys. Lett., 86:153505-1-153505-3 (2005).

Sun, Yiru and Forrest, Stephen R., "High-Efficiency White Organic Light Emitting Devices with Three Separate Phosphorescent Emission Layers," Appl. Phys. Lett., 91:263503-1-263503-3 (2007).

T. Östergård et al., "Lanomuir-Blodgett Light-Emitting Diodes of Poly(3-Hexylthiophene) Electro-Optical Characteristics Related to Structure," Synthetic Metals, 88:171-177 (1997).

Takizawa. Shin-ya et al., "Phosphorescent Iridium Complexes Based on 2-Phenylimidazo[1,2-α]pyridine Ligands : Tuning of Emission Color toward the Blue Region and Application to Polymer Light-Emitting Devices," Inorg. Chem., 46(10):4308-4319 (2007).

Tang. C.W. and VanSlyke, S.A., "Organic Electroluminescent Diodes," Appl. Phys. Lett., 51(12):913-915 (1987).

Tung, Yung-Liang et al., "Organic Light-Emitting Diodes Based on Charge-Neutral Ru II PHosphorescent Emitters," Adv. Mater., 17(8)1059-1064 (2005).

Van Slyke, S. A. et al., "Organic Electrominescent Devices with Improved Stability," Appl. Phys. Lett., 69 (15):2160-2162 (1996).

Wang, Y. et al., "Highly Efficient Electroluminescent Materials Based on Fluorinated Organometallic Iridium Compounds," Appl. Phys. Lett., 79(4):449-451 (2001).

Wong, Keith Man-Chung et al.,"A Novel Class of Phosphorescent Gold(III) Alkynyl-Based Organic Light-Emitting Devices with Tunable Colour," Chem. Commun., 2906-2908 (2005).

Wong, Wai-Yeung, "Multifunctional Iridium Complexes Based on Carbazole Modules as Highly Efficient Electrophosphors," Angew. Chem. Int. Ed., 45:7800-7803 (2006).

European Search Report dated Jun. 23, 2015 for corresponding EP Application No. 15000451.3.

Yang, Cheng-Hsien et al., "Color tuning of iridium complexes for organic light-emitting diodes: The electronegative effect and π-conjugation effect" Journal of Organometallic Chemistry, 691, (2006), pp. 2767-2773.

Office Action dated Nov. 7, 2017 in corresponding Chinese Patent Application No. 201510072177.7.

* cited by examiner

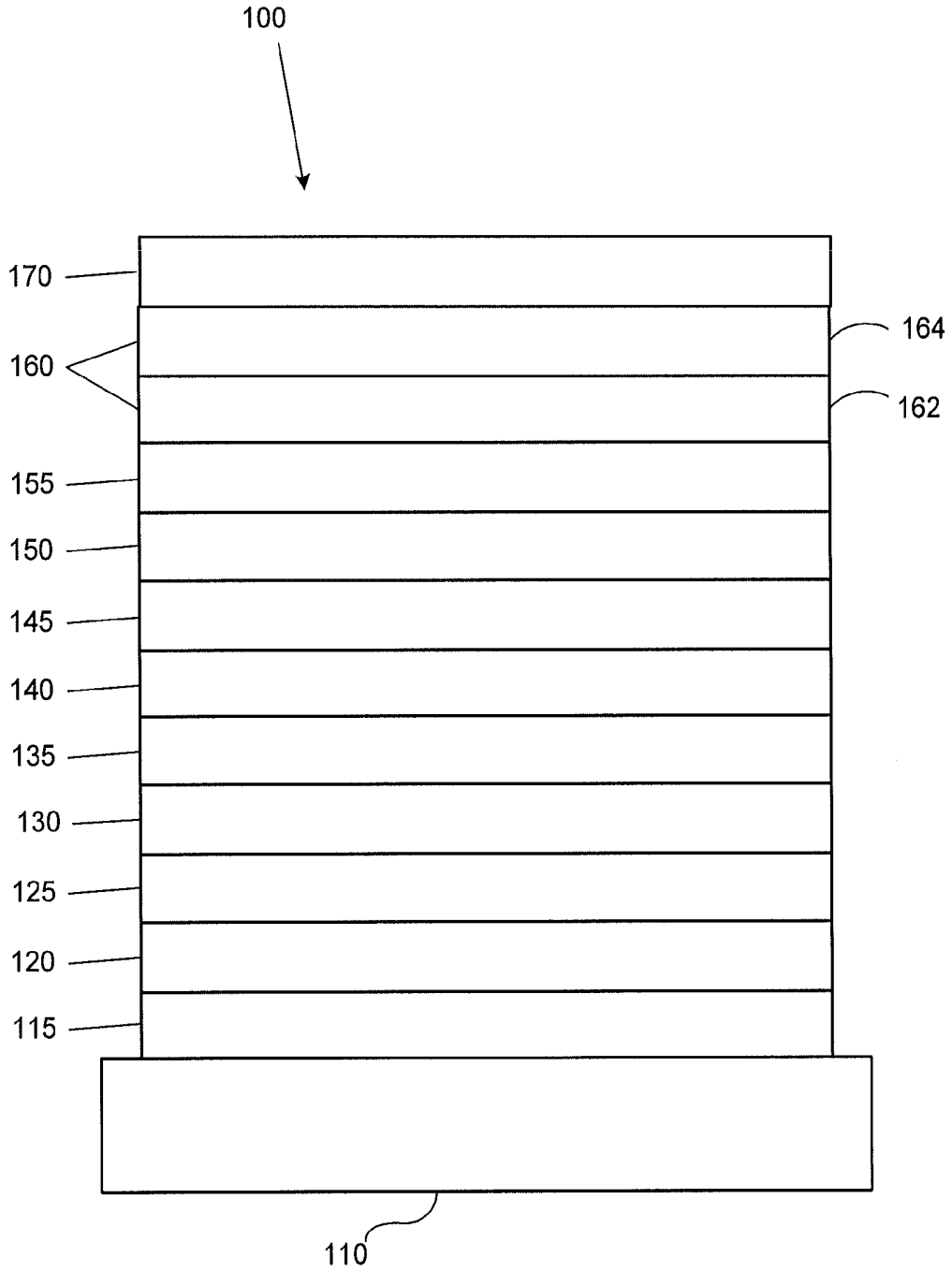


FIGURE 1

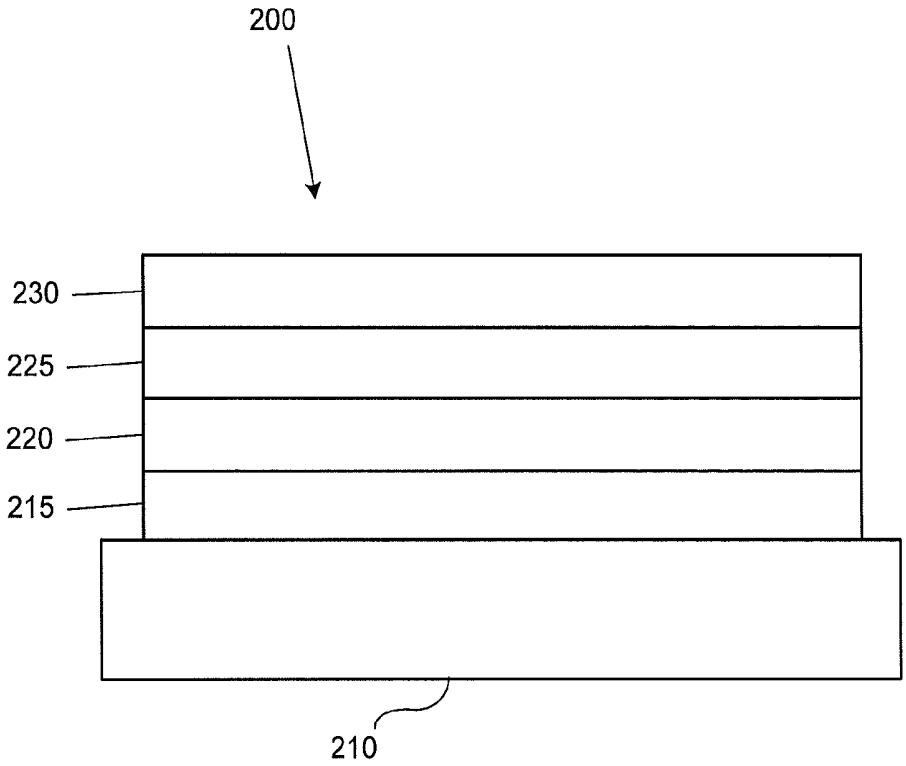
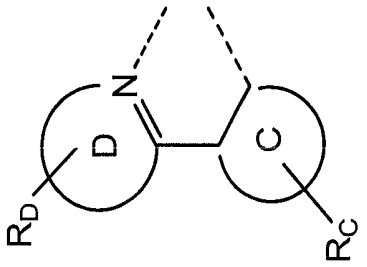
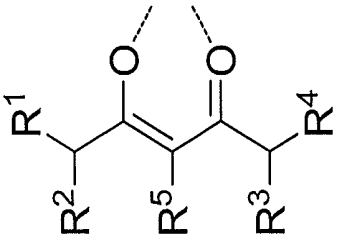


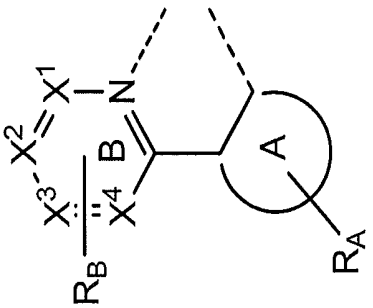
FIGURE 2



Ligand L_C



Ligand L_B



Ligand L_A

FIGURE 3

ORGANIC ELECTROLUMINESCENT MATERIALS AND DEVICES

PARTIES TO A JOINT RESEARCH AGREEMENT

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

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

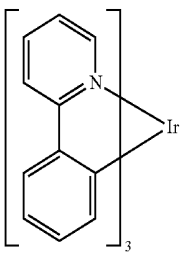
BACKGROUND

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.

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.

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.

One example of a green emissive molecule is tris(2-phenylpyridine) iridium, denoted $Ir(ppy)_3$, which has the following structure:



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

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.

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.

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.

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.

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.

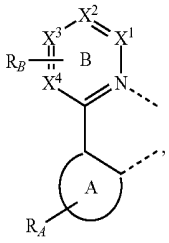
As used herein, and as would be generally understood by one skilled in the art, a first work function is "greater than" or "higher than" a second work function if the first work function has a higher absolute value. Because work functions are generally measured as negative numbers relative to vacuum 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.

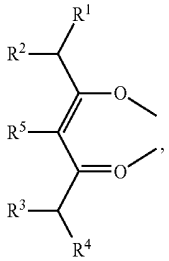
More details on OLEDs, and the definitions described above, can be found in U.S. Pat. No. 7,279,704, which is incorporated herein by reference in its entirety.

SUMMARY OF THE INVENTION

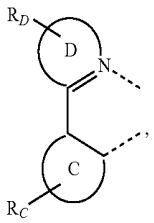
According to one embodiment, a compound having a formula $M(L_A)_x(L_B)_y(L_C)_z$ is disclosed. In the formula, the ligand L_A is



the ligand L_B is



and the ligand L_C is



where:

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

x is 1, or 2;

y is 1, or 2;

z is 0, 1, or 2;

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

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

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

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

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;

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

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

R_B represents di, tri, or tetra-substitution;

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;

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;

any adjacent substitutents 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 heterocylic, or (c) both.

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.

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, are provided. 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

FIG. **1** shows an organic light emitting device.

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

FIG. **3** shows Ligands L_A, L_B and L_C of the compounds described herein.

DETAILED DESCRIPTION

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.

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.

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.

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.

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 F_4-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.

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**.

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. 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**.

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.

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.

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.

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.

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.

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

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.

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.

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.

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

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.

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, piperdino, pyrrolidino, and the like, and cyclic ethers, such as tetrahydrofuran, tetrahydropyran, and the like. Additionally, the heterocyclic group may be optionally substituted.

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.

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.

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.

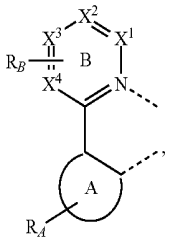
As used herein, "substituted" indicates that a substituent other than H is bonded to the relevant position, such as carbon. Thus, for example, where R^1 is mono-substituted, then one R^1 must be other than H. Similarly, where R^1 is di-substituted, then two of R^1 must be other than H. Similarly, where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

The "aza" designation in the fragments described herein, i.e. aza-dibenzofuran, aza-dibenzothiophene, 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.

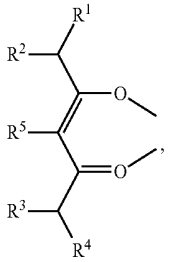
It is to be understood that when a molecular fragment is described as being a substituent or otherwise attached to another moiety, its name may be written as if it were a fragment (e.g. naphthyl, dibenzofuryl) or as if it were the whole molecule (e.g. naphthalene, dibenzofuran). As used herein, these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

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.

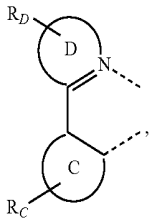
According to one embodiment, a compound having the formula $M(L_A)_x(L_B)_y(L_C)_z$ is disclosed. In the formula $M(L_A)_x(L_B)_y(L_C)_z$, ligand L_A is



ligand L_B is



and ligand L_C is



where:

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

x is 1, or 2;

y is 1, or 2;

z is 0, 1, or 2;

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

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

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

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

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;

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

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

R_B represents di, tri, or tetra-substitution;

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;

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;

any adjacent substitutents 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 heterocylic, or (c) both.

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.

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

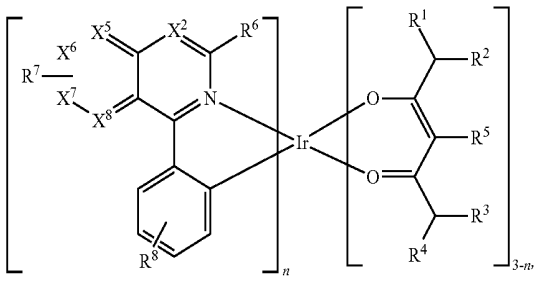
In some embodiments, ring A is benzene. In some embodiments, ring C is benzene, and ring D is pyridine.

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.

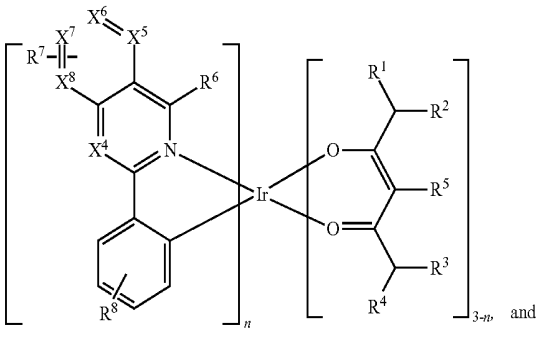
In some embodiments, R^1, R^2, R^3, and R^4 are alkyl or cycloalkyl. In some more specific embodiments, R^1, R^2, R^3, and R^4 are independently selected from the group consisting of methyl, ethyl, propyl, 1-methylethyl, butyl, 1-methylpropyl, 2-methylpropyl, pentyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl,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

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

Formula I



Formula II



and

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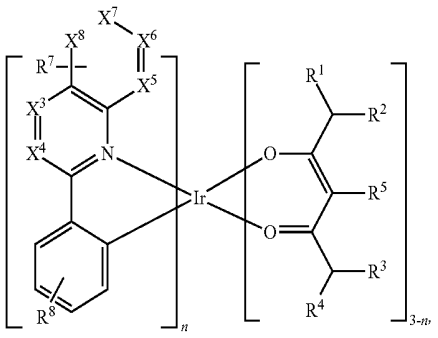
Formula III



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, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof; and

wherein n is 1 or 2.

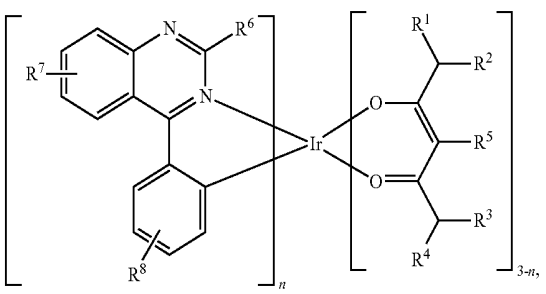
In some embodiments, n is 2. In some embodiments, at least one of X^5, X^6, X^7, and X^8 is N. In other embodiments, at least two of X^5, X^6, X^7, and X^8 are N.

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.

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.

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

Formula IV



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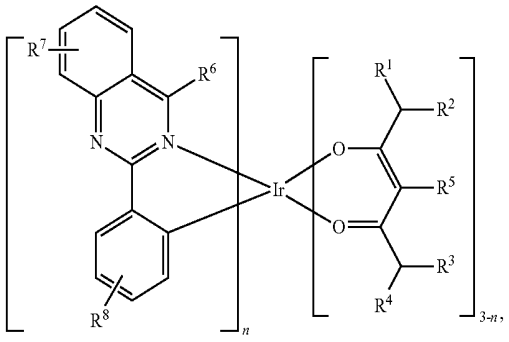
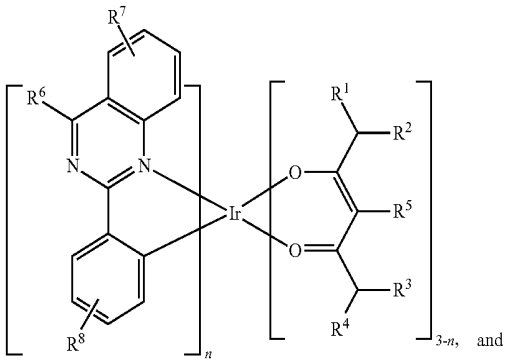
Formula V

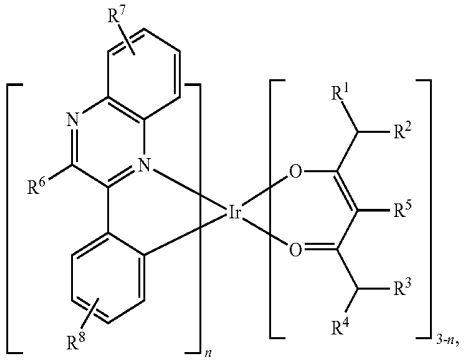


Formula VI



and

Formula VII



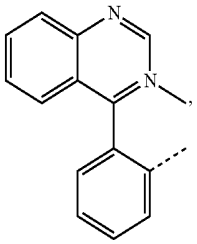
wherein R^7, and R^8 each independently represent mono, di, tri, or tetra-substitution, or no substitution;

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, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, sulfanyl, sulfinyl, sulfonyl, phosphino, and combinations thereof; and

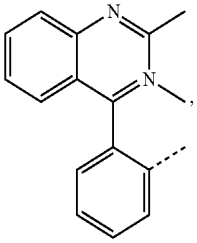
wherein n is 1 or 2.

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

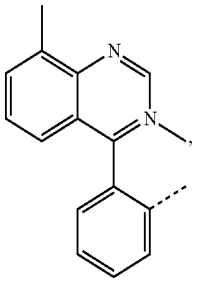
L_{A1}



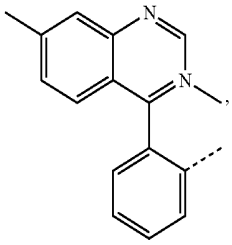
L_{A2}



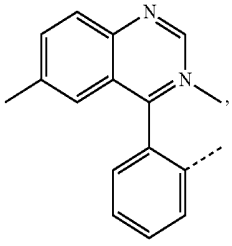
L_{A3}



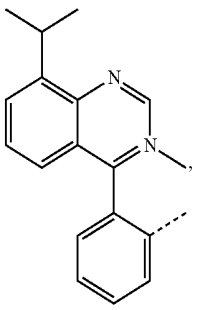
L_{A4}



L_{A5}



L_{A6}



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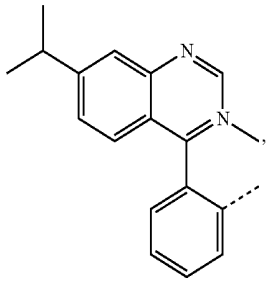
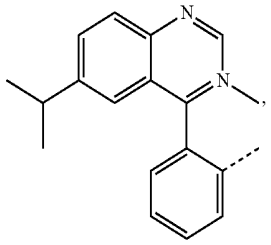
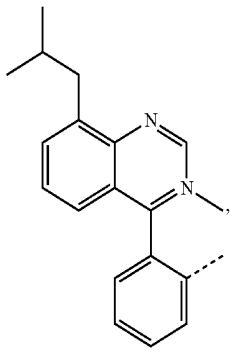
L_{A7}



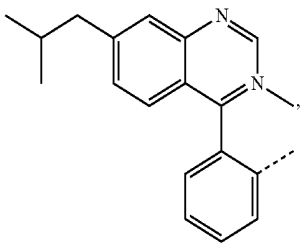
L_{A8}



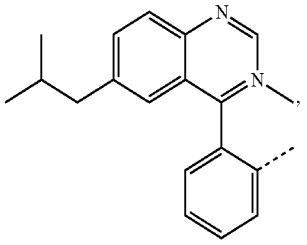
L_{A9}



L_{A10}



L_{A11}



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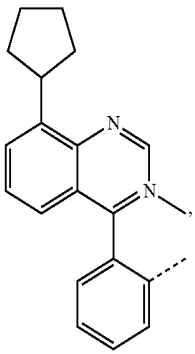
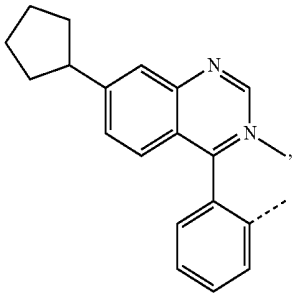
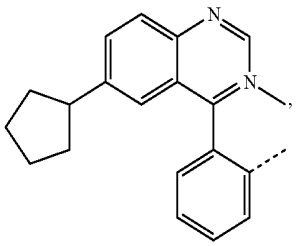
L_{A12}



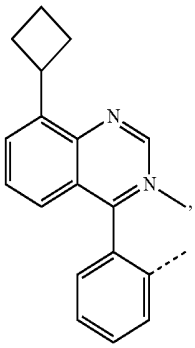
L_{A13}



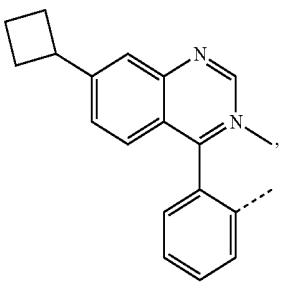
L_{A14}



L_{A15}



L_{A16}



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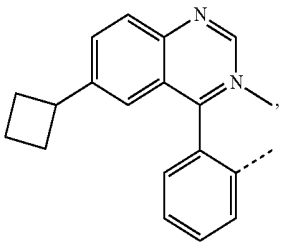
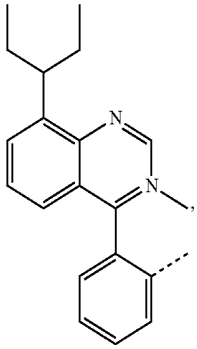
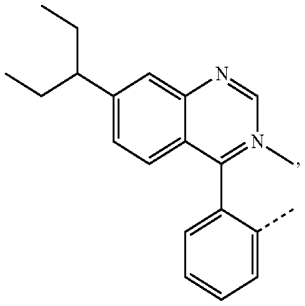
L_{A17}



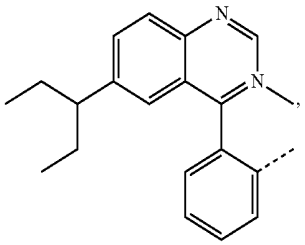
L_{A18}



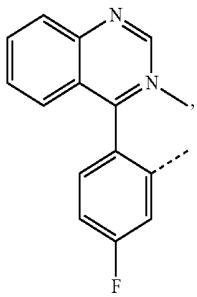
L_{A19}



L_{A20}



L_{A21}



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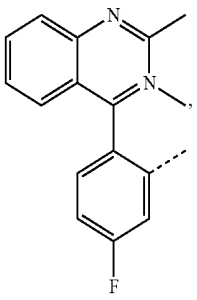
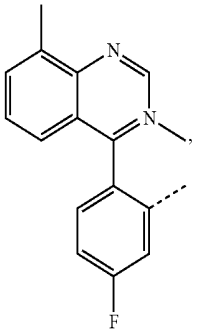
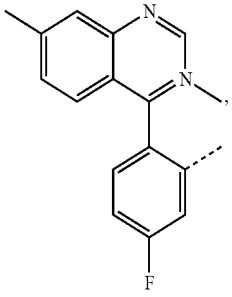
L_{A22}



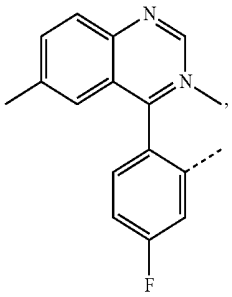
L_{A23}



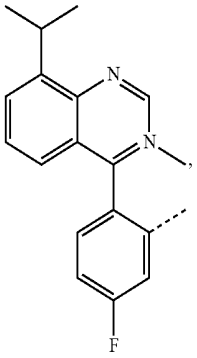
L_{A24}



L_{A25}



L_{A26}



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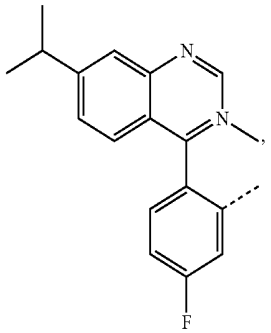
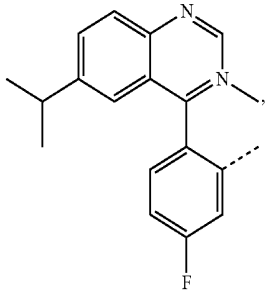
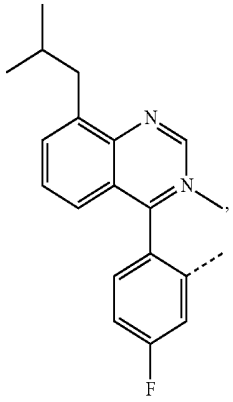
L_{A27}



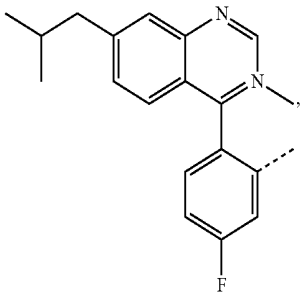
L_{A28}



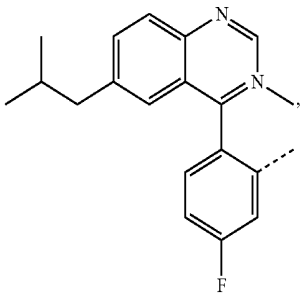
L_{A29}



L_{A30}



L_{A31}



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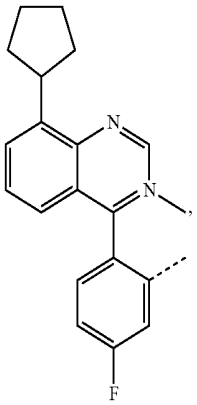
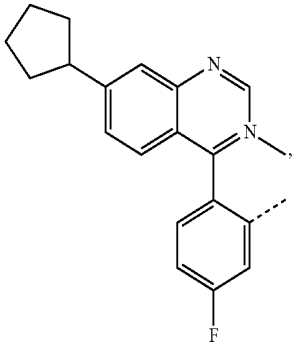
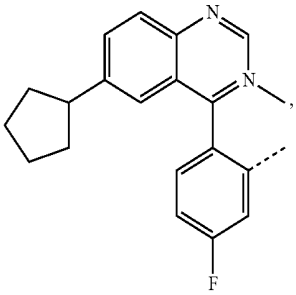
L_{A32}



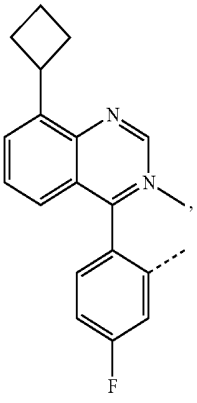
L_{A33}



L_{A34}



L_{A35}



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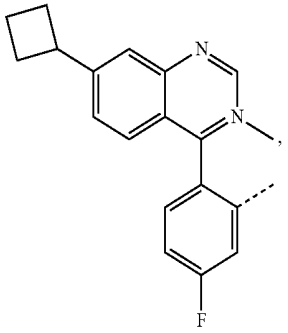
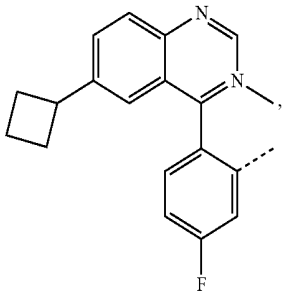
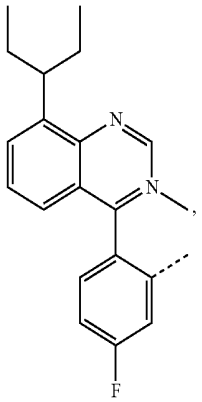
L_{A36}



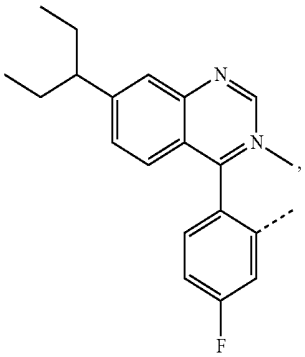
L_{A37}



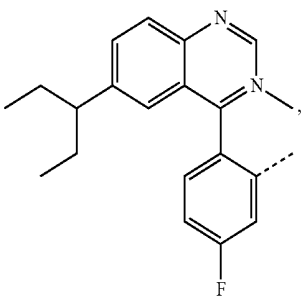
L_{A38}



L_{A39}



L_{A40}



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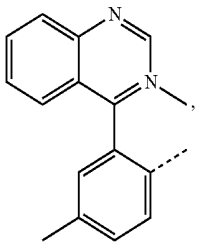
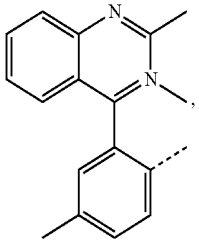
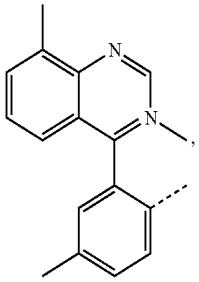
L_{A41}



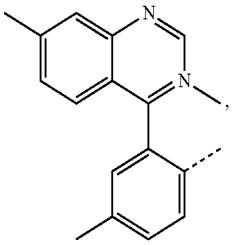
L_{A42}



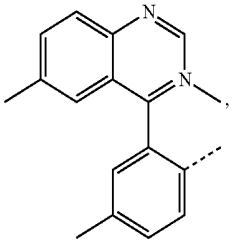
L_{A43}



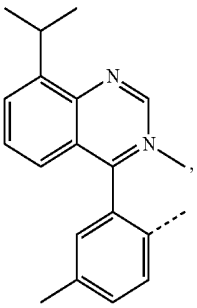
L_{A44}



LA45



LA46



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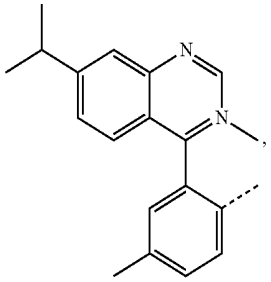
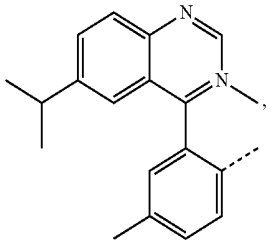
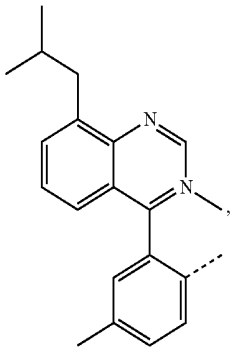
LA47



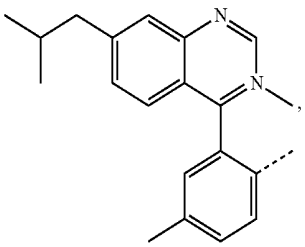
LA48



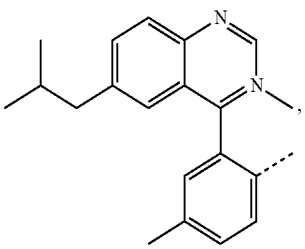
LA49



L_{A50}



L_{A51}



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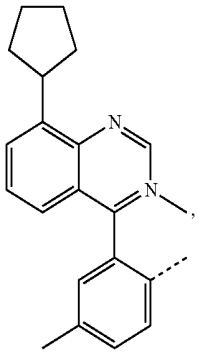
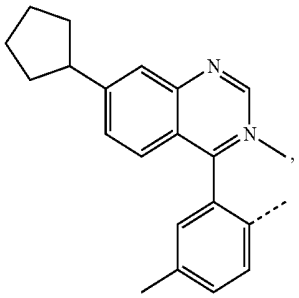
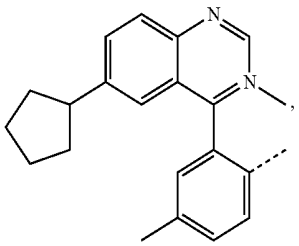
L_{A52}



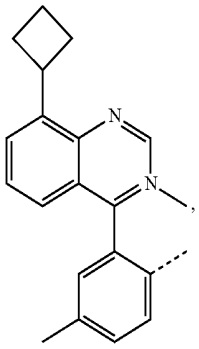
L_{A53}



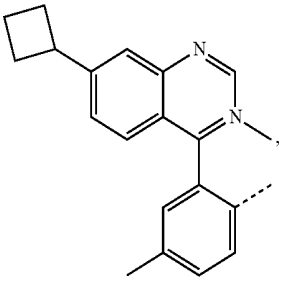
L_{A54}



L_{A55}



L_{A56}



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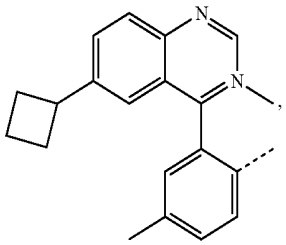

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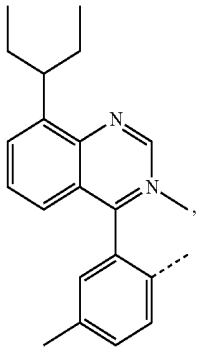

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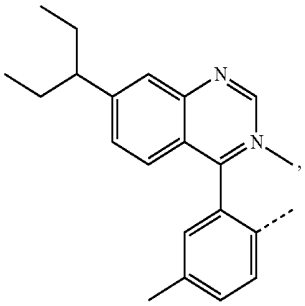

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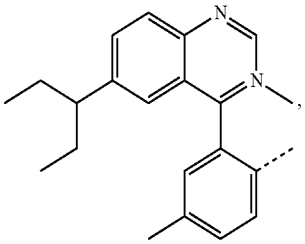

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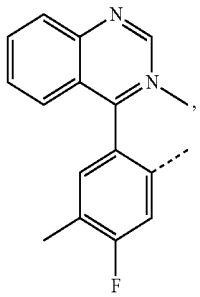

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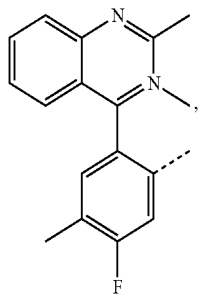

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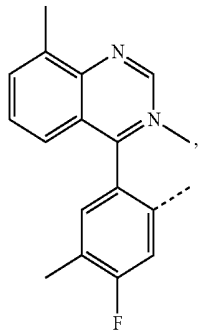

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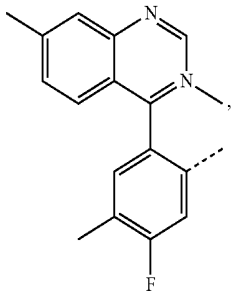

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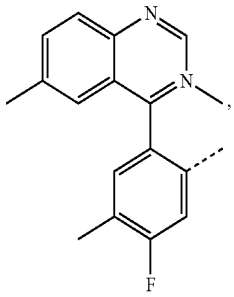

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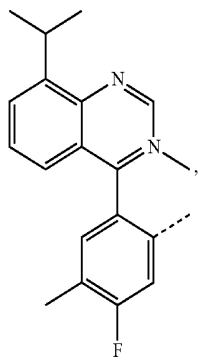

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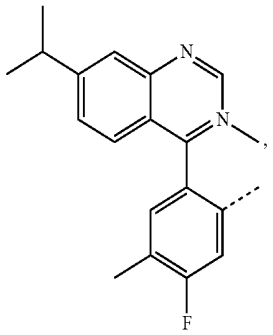

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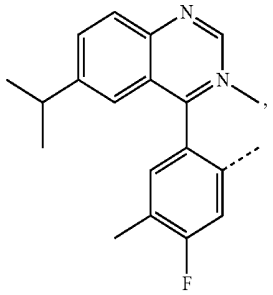

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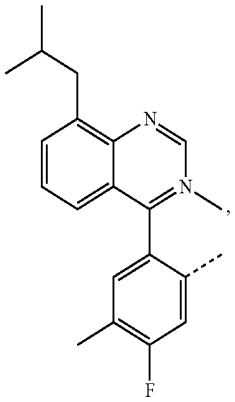

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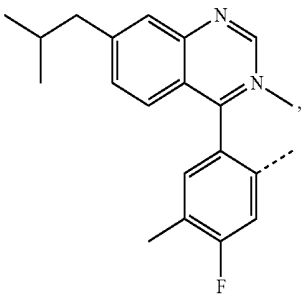

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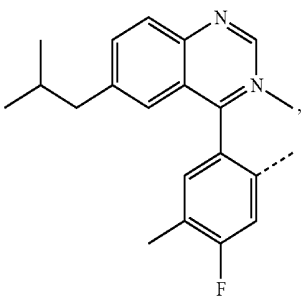

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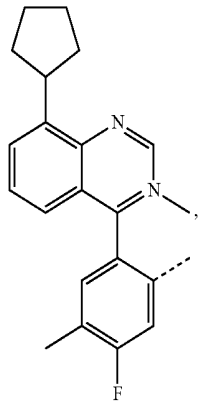

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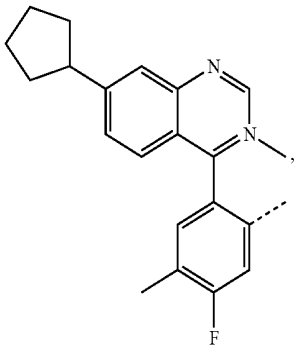

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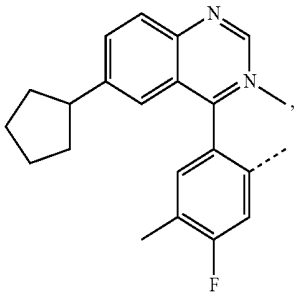

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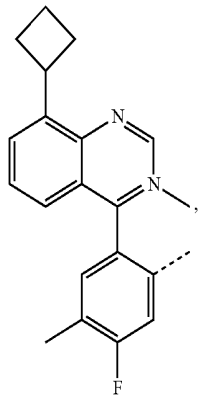

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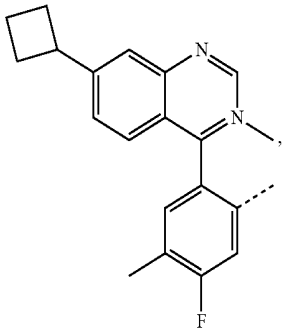

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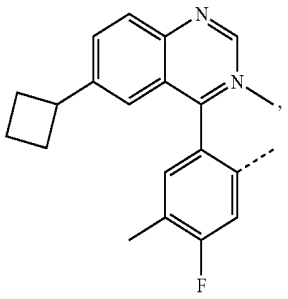

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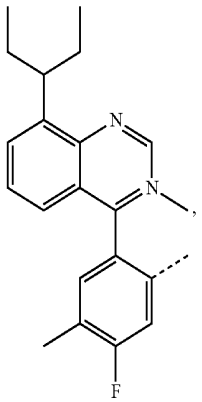

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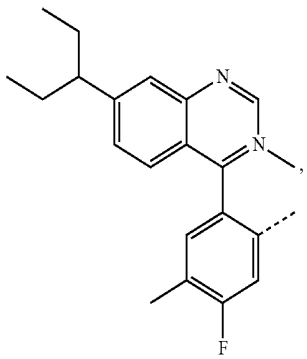

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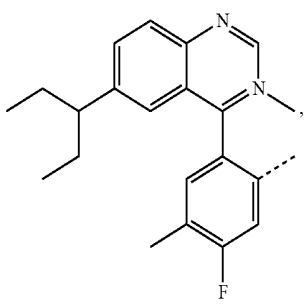

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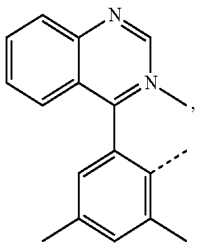

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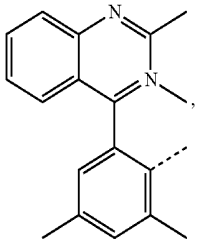

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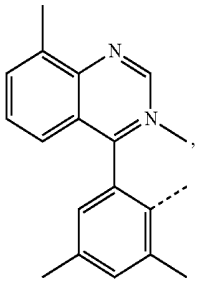

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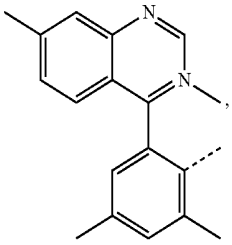

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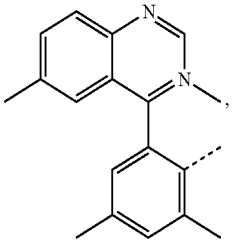

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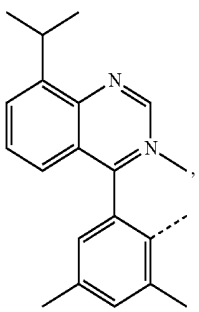

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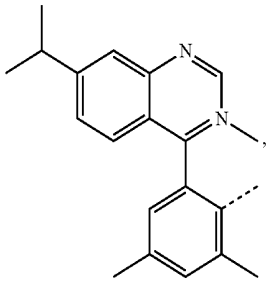

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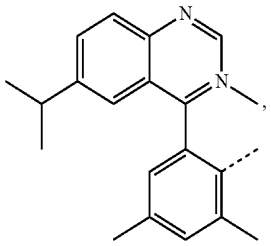

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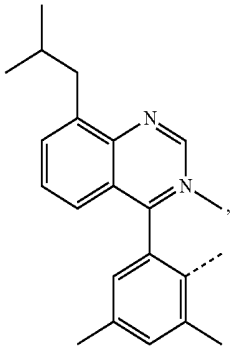

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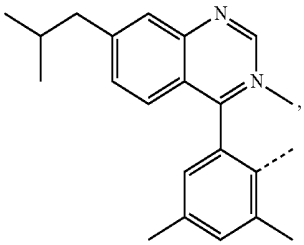

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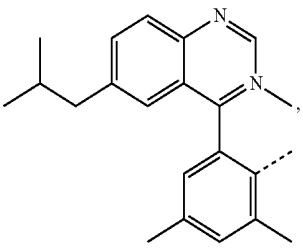

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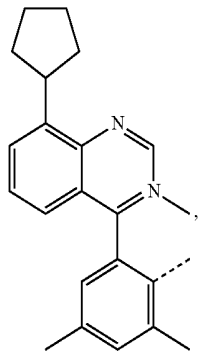

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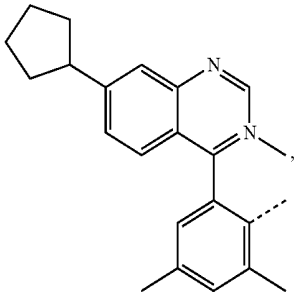

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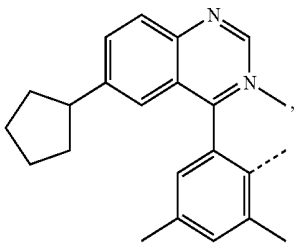

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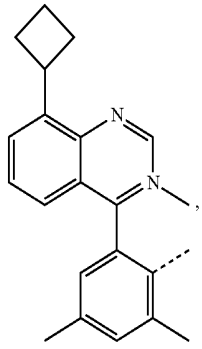

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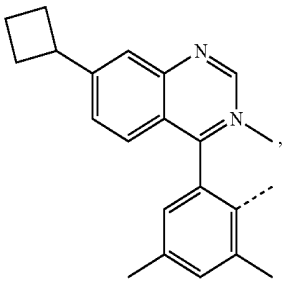

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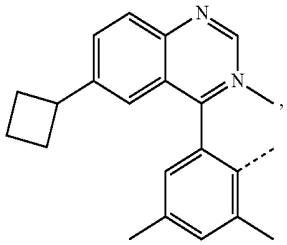

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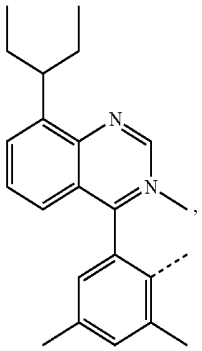

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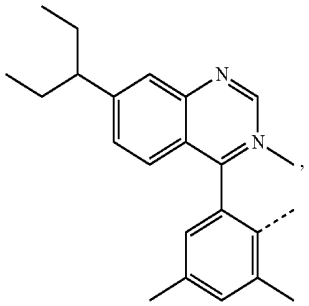

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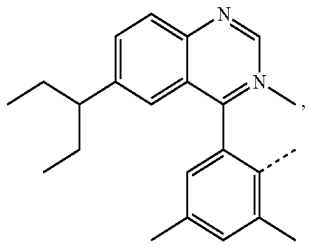

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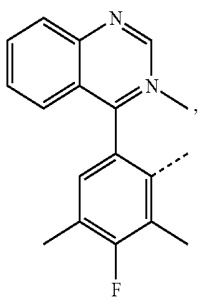

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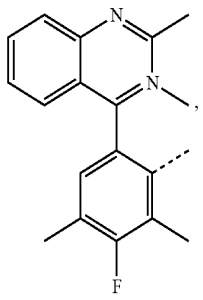

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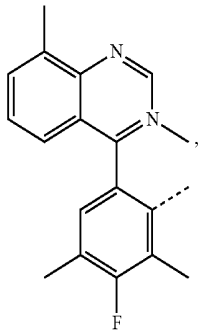

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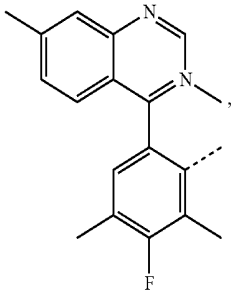

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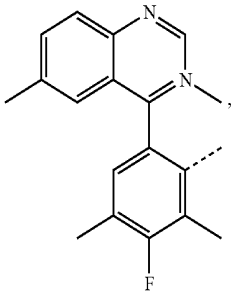

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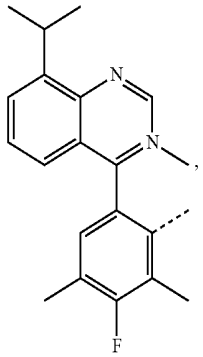

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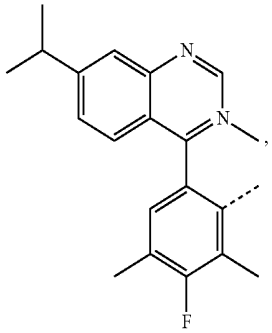

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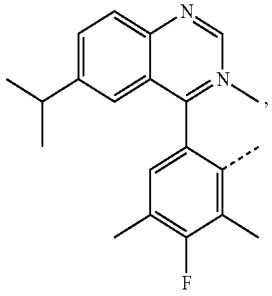

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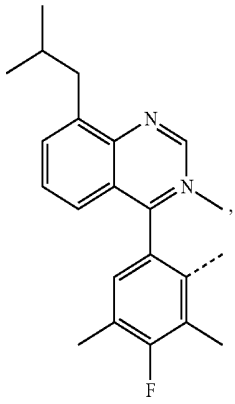

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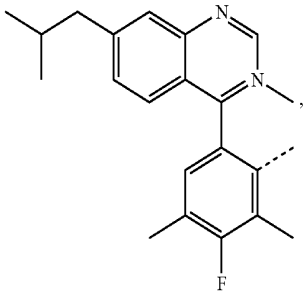

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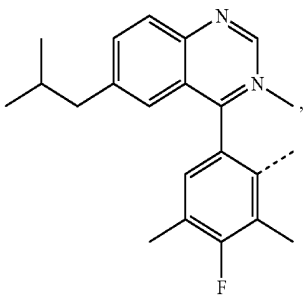

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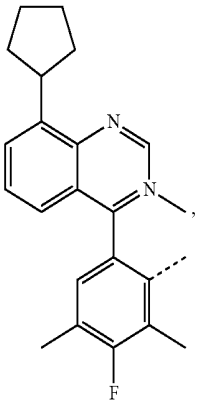

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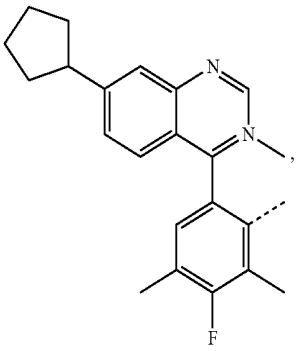

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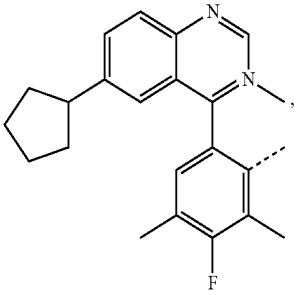

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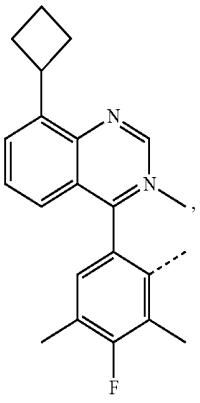

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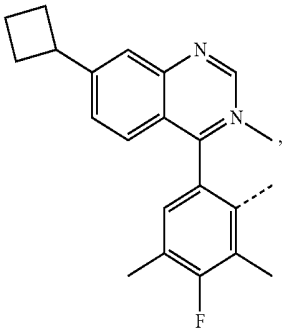

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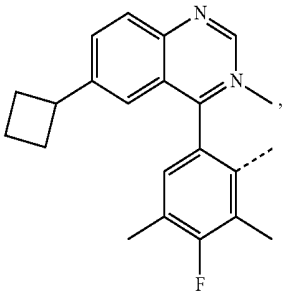

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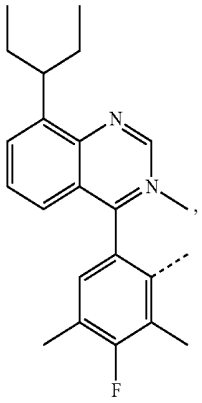

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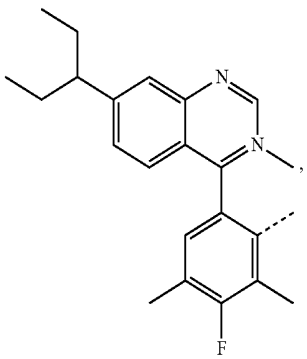

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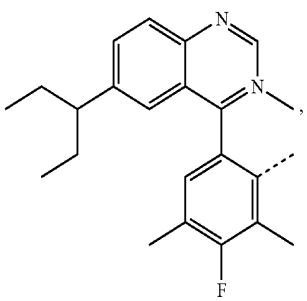

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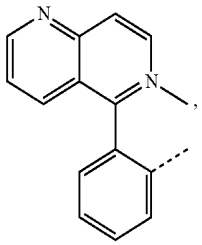

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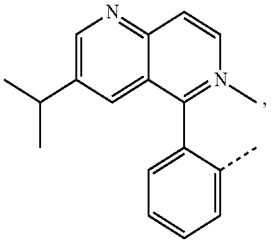

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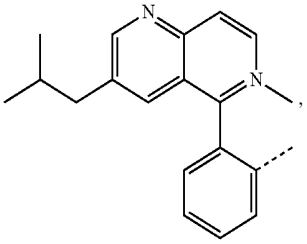

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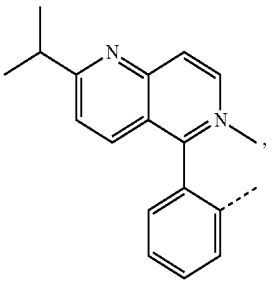

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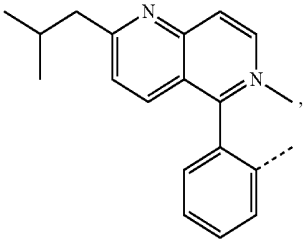

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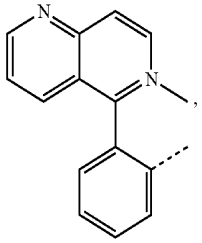

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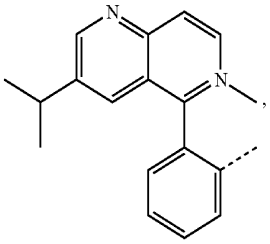

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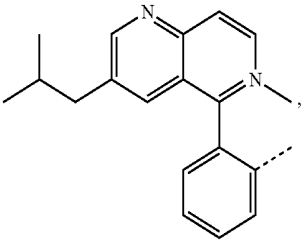

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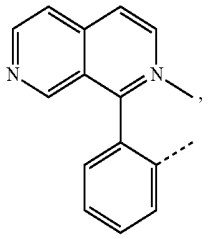

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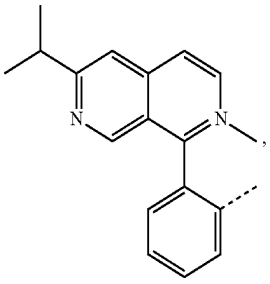

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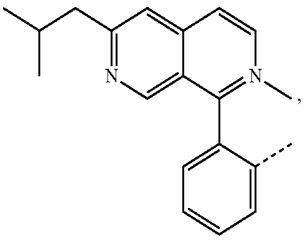

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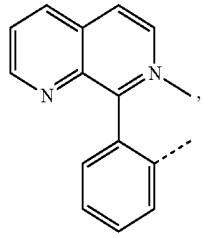

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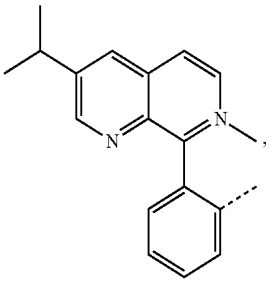

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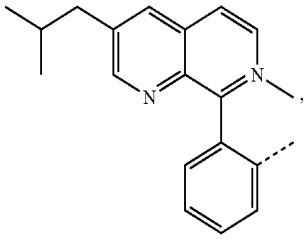

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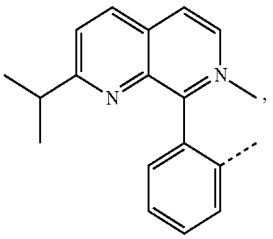

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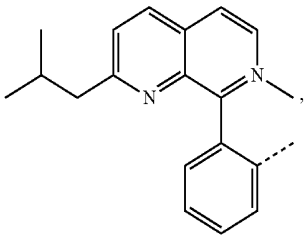

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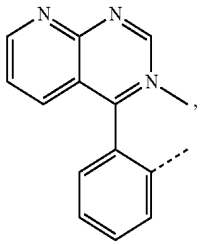

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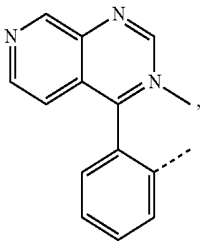

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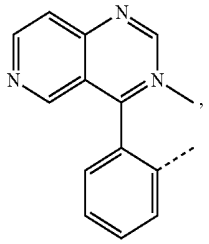

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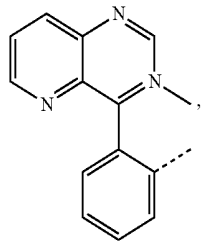

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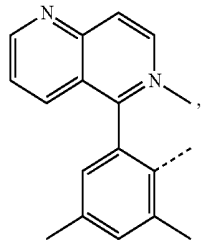

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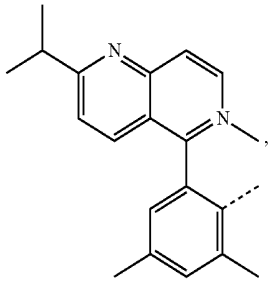

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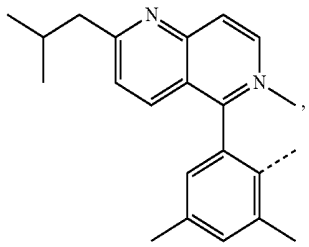

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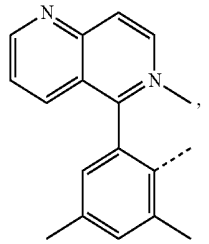

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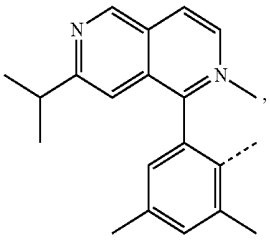

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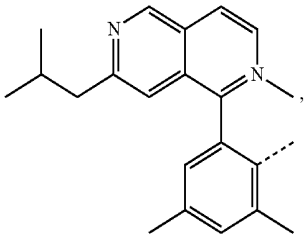

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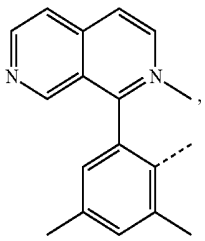

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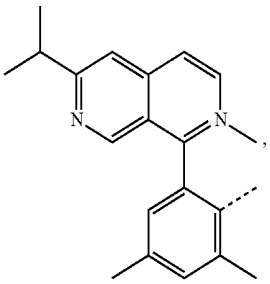

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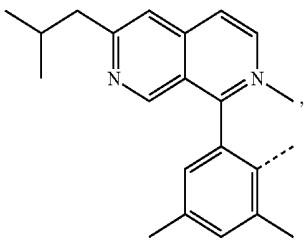

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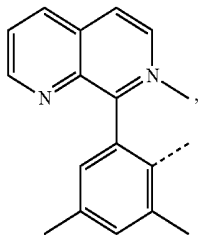

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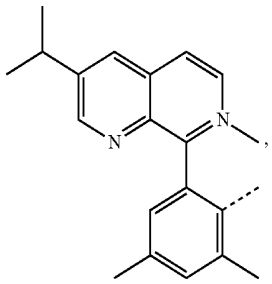

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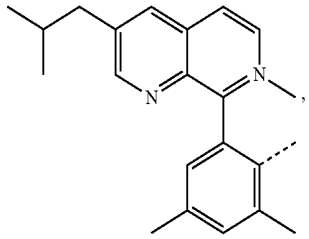

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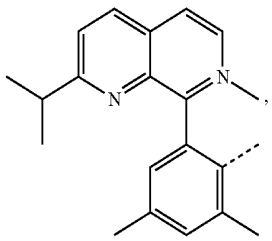

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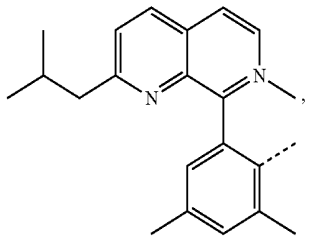

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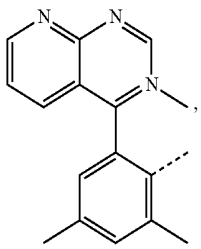

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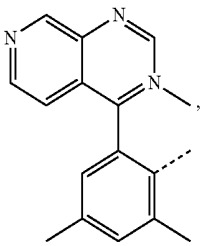

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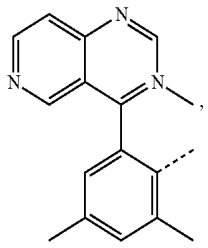

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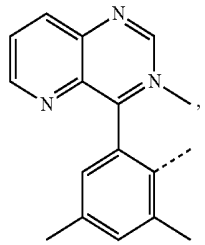

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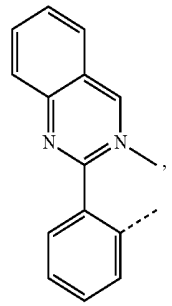

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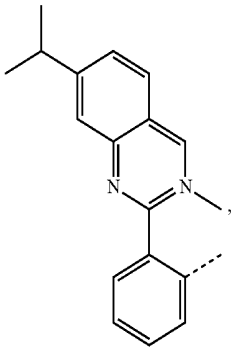

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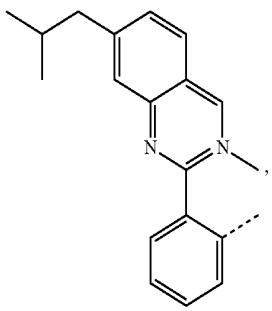

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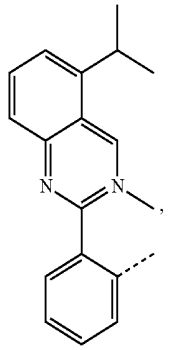

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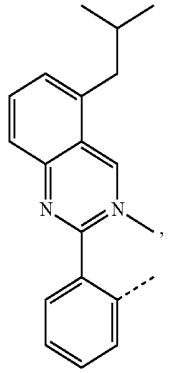

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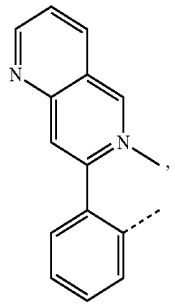

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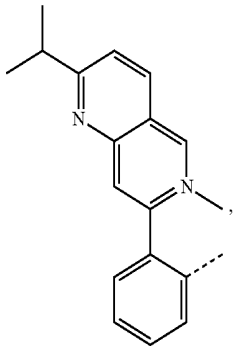

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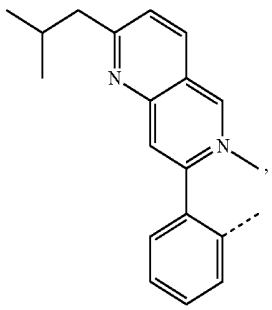

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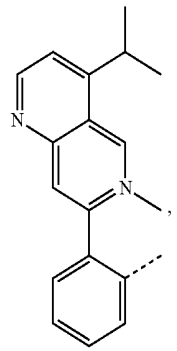

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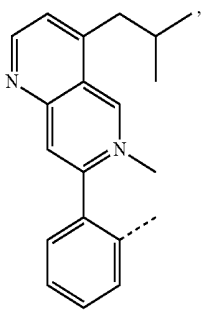

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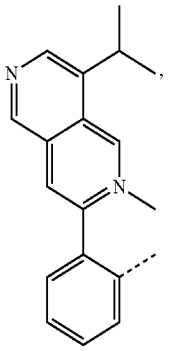

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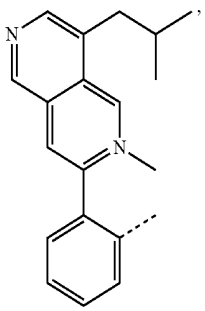

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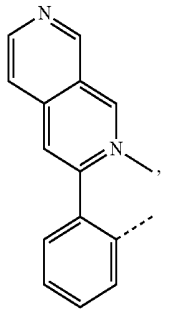

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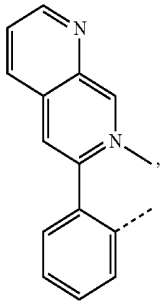

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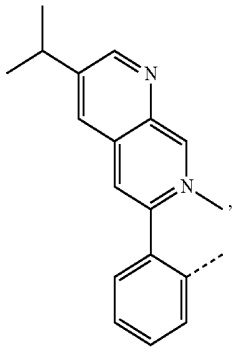

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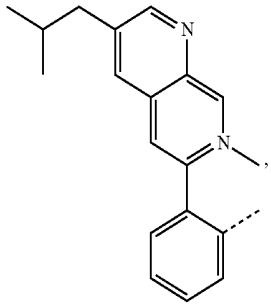

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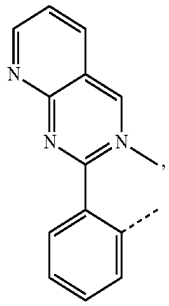

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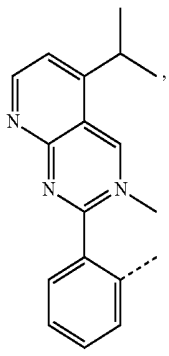

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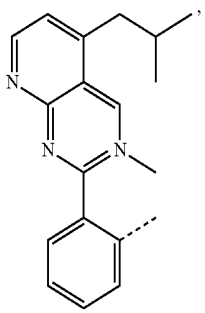

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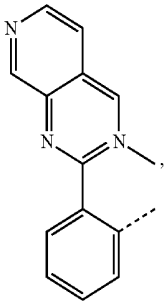

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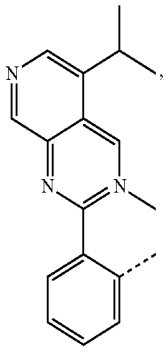

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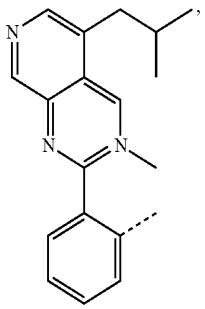

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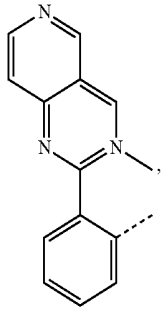

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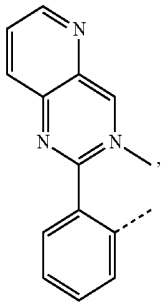

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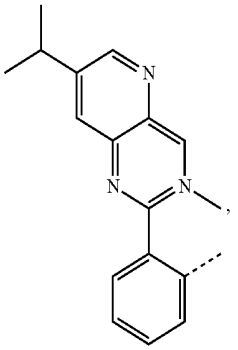

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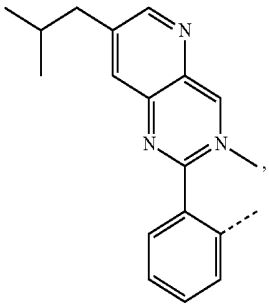

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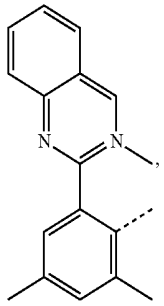

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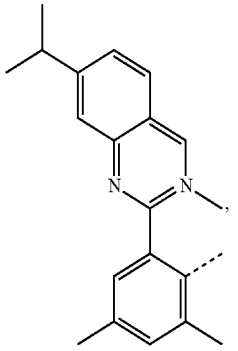

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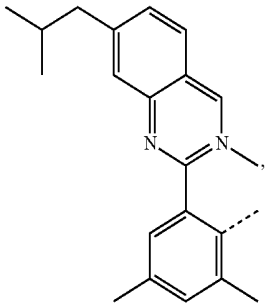

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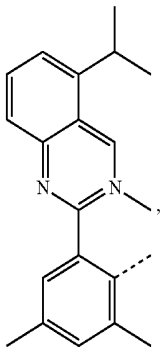

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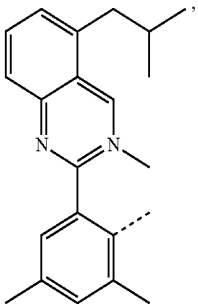

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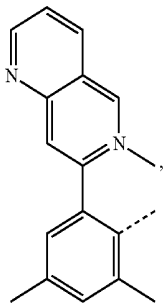

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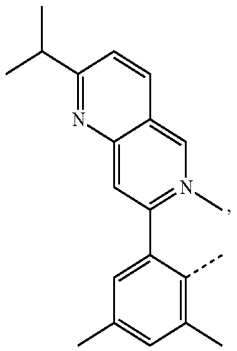

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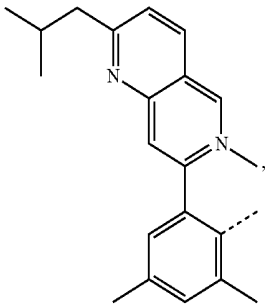

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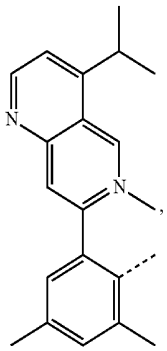

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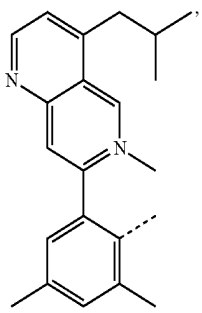

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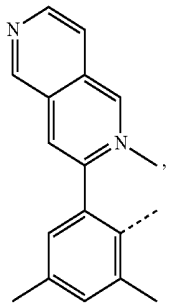

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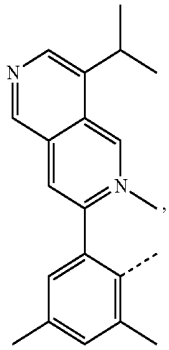

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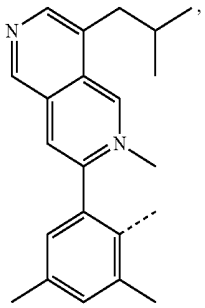

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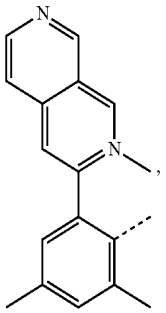

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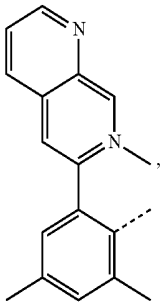

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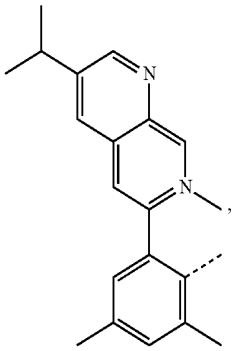

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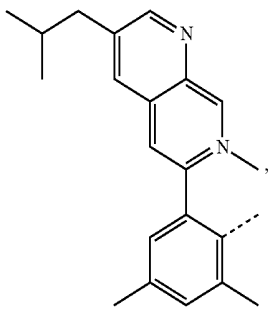

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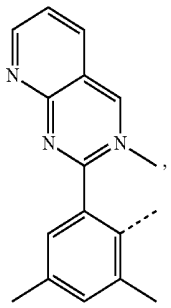

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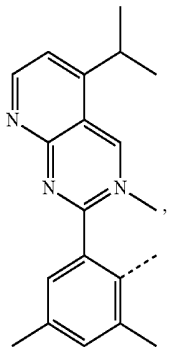

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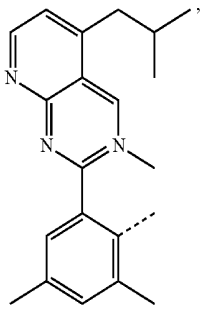

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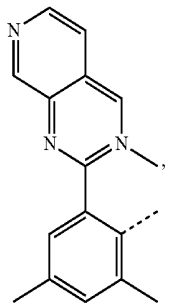

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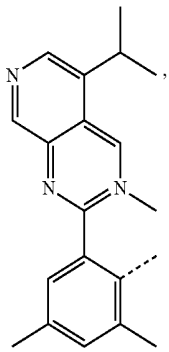

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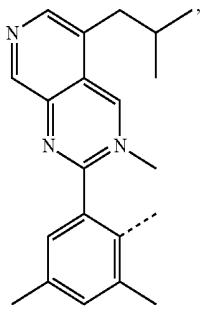

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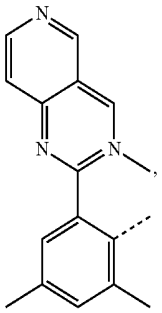

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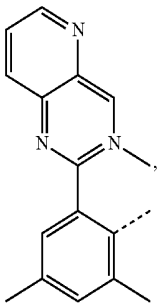

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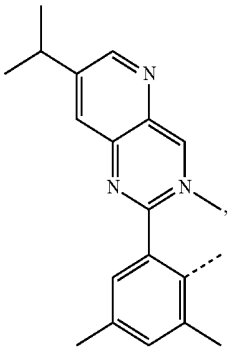

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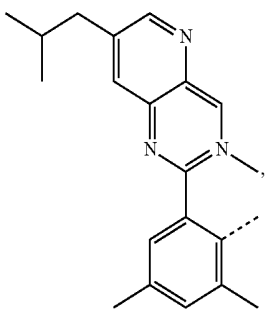

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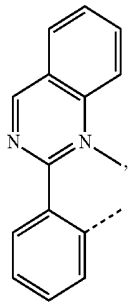

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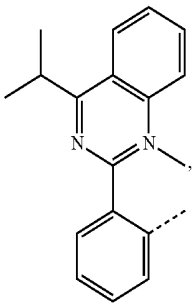

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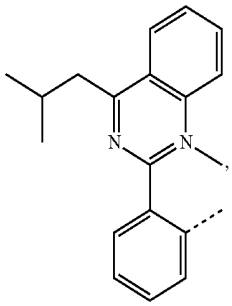

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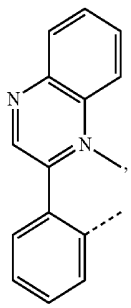

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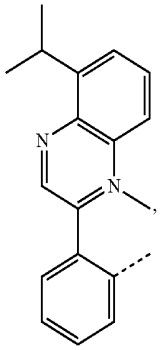

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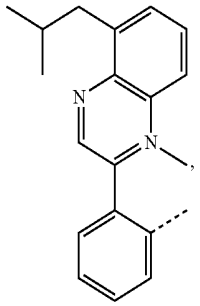

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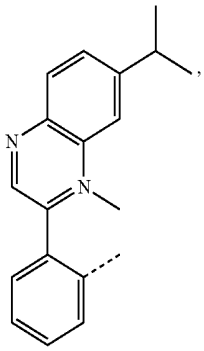

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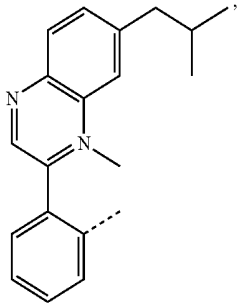

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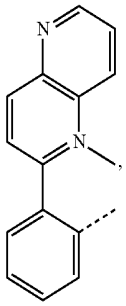

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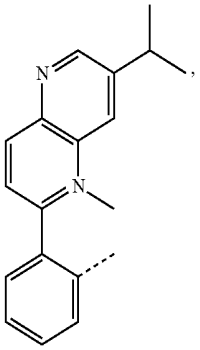

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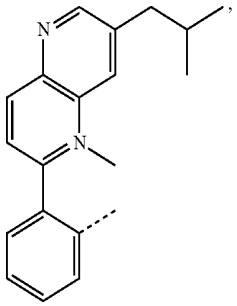

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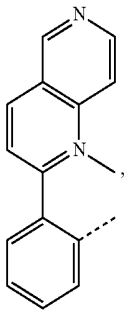

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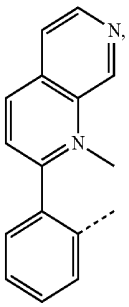

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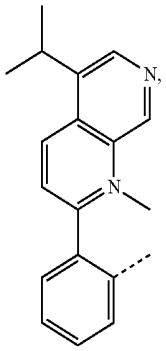

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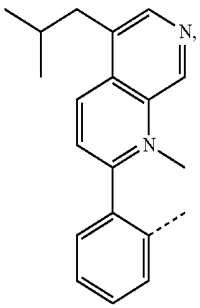

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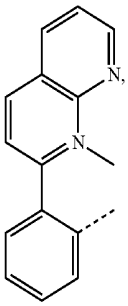

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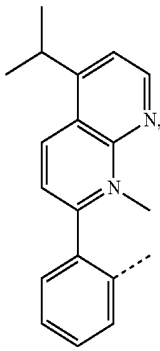

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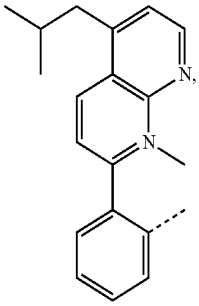

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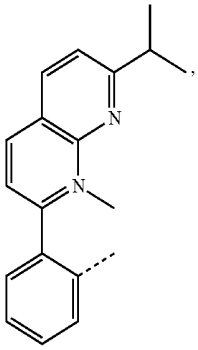
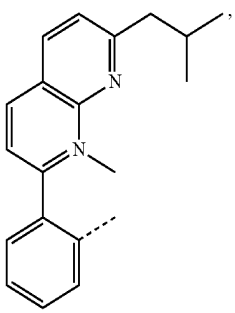


L_{A230}



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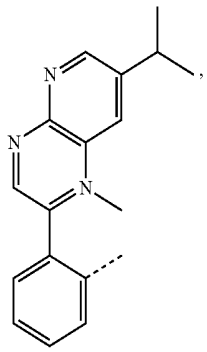
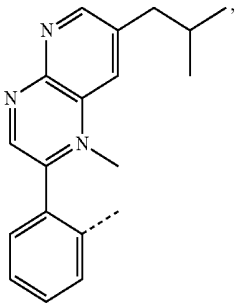
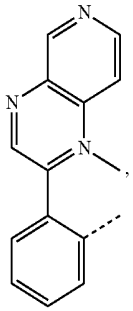
L_{A231}



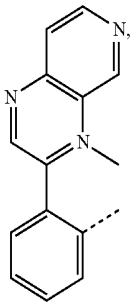
L_{A232}



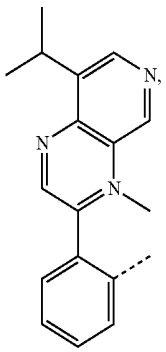
L_{A233}



L_{A234}



L_{A235}



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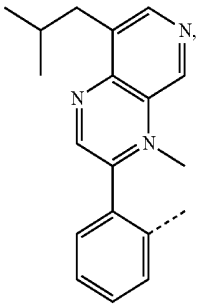
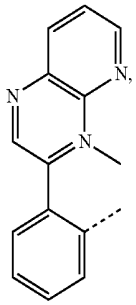
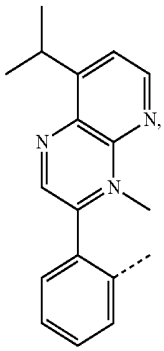
L_{A236}



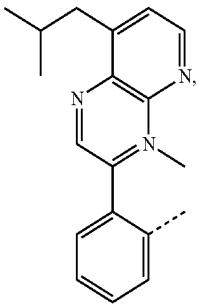
L_{A237}



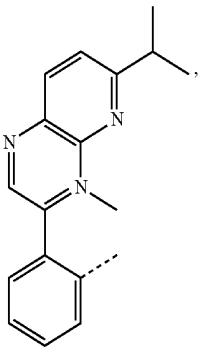
L_{A238}



L_{A239}



L_{A240}



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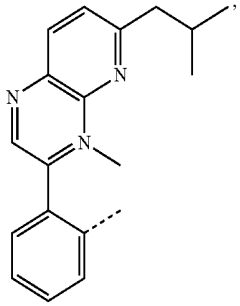
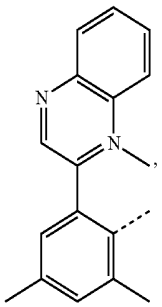
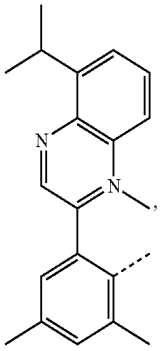
L_{A241}



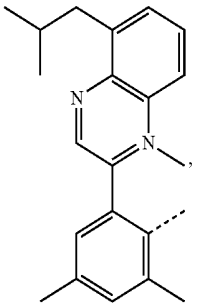
L_{A242}



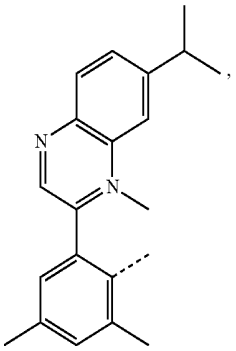
L_{A243}



L_{A244}



L_{A245}



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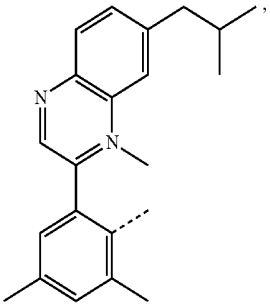
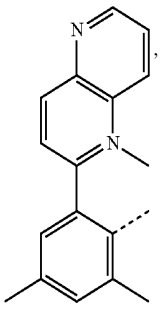
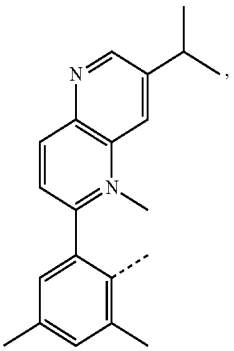
L_{A246}



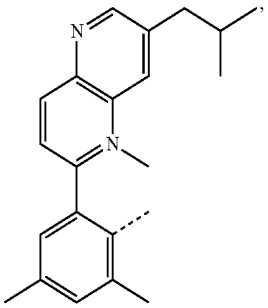
L_{A247}



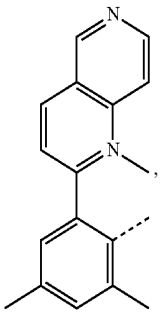
L_{A248}



L_{A249}



L_{A250}



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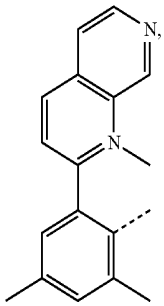
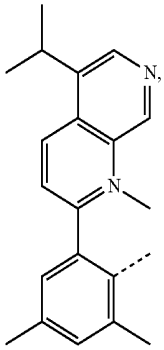
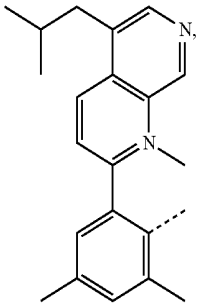
L_{A251}



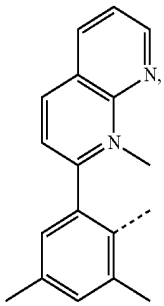
L_{A252}



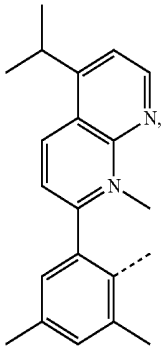
L_{A253}



L_{A254}



L_{A255}



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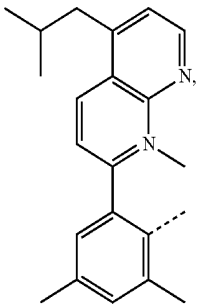
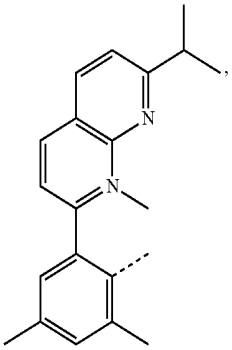
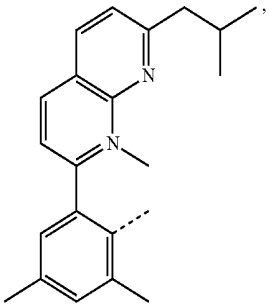
L_{A256}



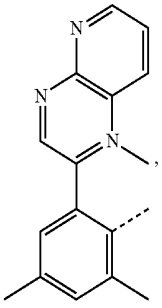
L_{A257}



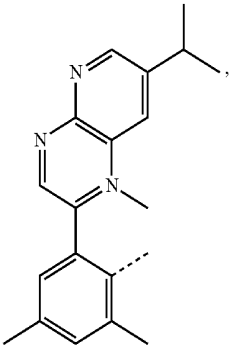
L_{A258}



L_{A259}



L_{A260}



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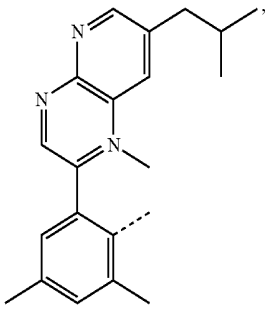
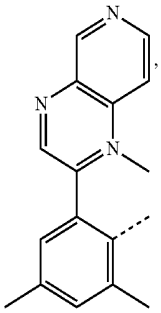
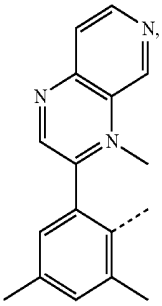
L_{A261}



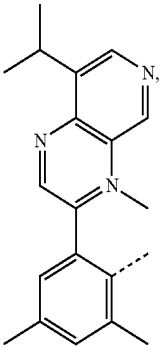
L_{A262}



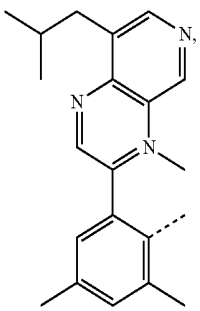
L_{A263}



L_{A264}



L_{A265}



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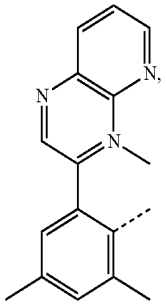
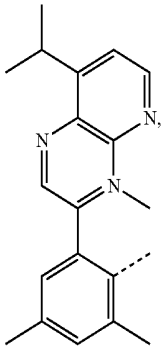
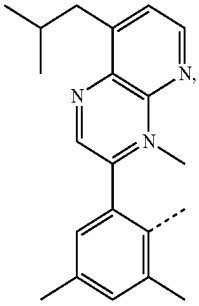
L_{A266}



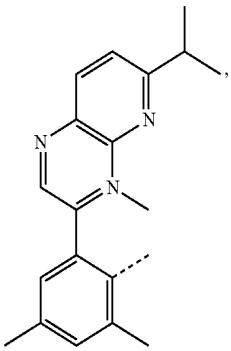
L_{A267}



L_{A268}

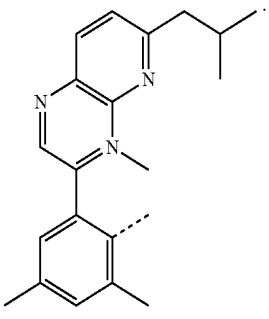


L_{A269}



and

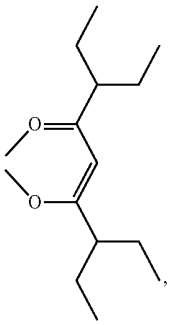
L_{A270}



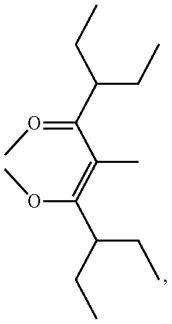
Some embodiments are drawn to compounds of formula $M(L_A)_x(L_B)_y(L_C)_z$, where x=1 or 2, y=1 or 2, and z=0.

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

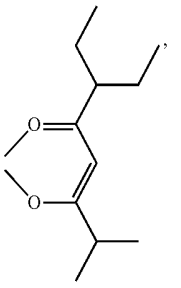
L_{B1}



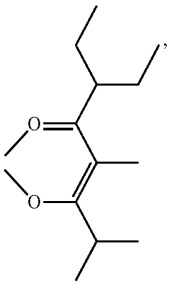
L_{B2}



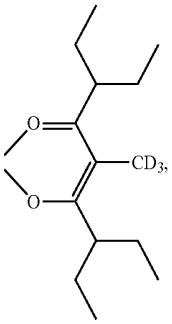
L_{B3}



L_{B4}



L_{B5}



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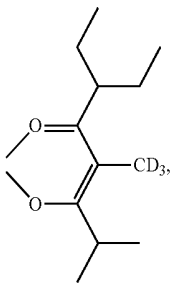
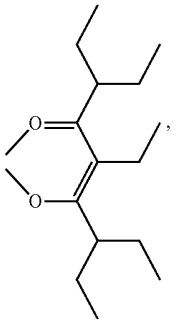
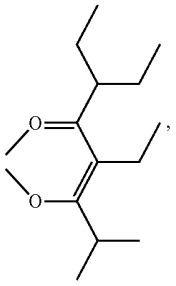
L_{B6}



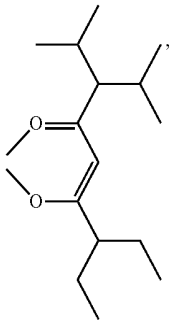
L_{B7}



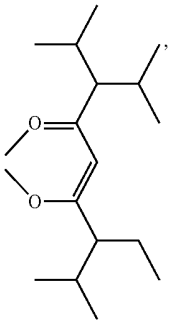
L_{B8}



L_{B9}



L_{B10}



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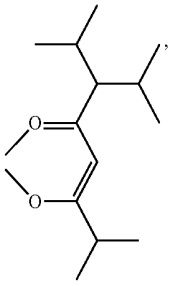
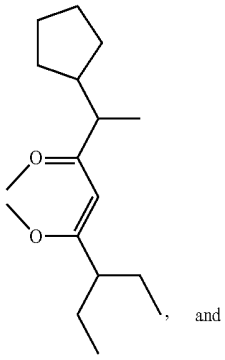
L_{B11}

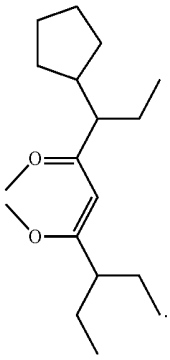


L_{B12}



and

L_{B13}



In some embodiments, z=0, x=1 or 2, y=1 or 2, and the compound having the formula of $Ir(L_A)_x(L_B)_y$ 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}

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Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
174	L_{A174}	L_{B1}
175	L_{A175}	L_{B1}
176	L_{A176}	L_{B1}
177	L_{A177}	L_{B1}
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}

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Compound Number	L_A	L_B
250	L_{A250}	L_{B1}
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}
324	L_{A54}	L_{B2}
325	L_{A55}	L_{B2}

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Compound Number	L_A	L_B
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}
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}

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Compound Number	L_A	L_B
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}
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}

Compound Number	L_A	L_B
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}
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}

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

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Compound Number	L_A	L_B
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}
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}

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Compound Number	L_A	L_B
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}
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}

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Compound Number	L_A	L_B
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}
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}

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Compound Number	L_A	L_B
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}
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}

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Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
2074	L_{A184}	L_{B8}
2075	L_{A185}	L_{B8}
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}
2149	L_{A259}	L_{B8}

-continued

Compound Number	L_A	L_B
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}
2222	L_{A62}	L_{B9}
2223	L_{A63}	L_{B9}
2224	L_{A64}	L_{B9}
2225	L_{A65}	L_{B9}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

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Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

Compound Number	L_A	L_B
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}
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}

-continued

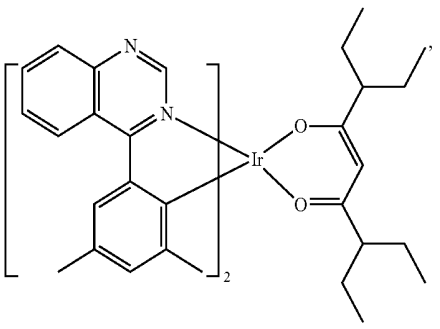
Compound Number	L_A	L_B
3366	L_{A126}	L_{B13}
3367	L_{A127}	L_{B13}
3368	L_{A128}	L_{B13}
3369	L_{A129}	L_{B13}
3370	L_{A130}	L_{B13}
3371	L_{A131}	L_{B13}
3372	L_{A132}	L_{B13}
3373	L_{A133}	L_{B13}
3374	L_{A134}	L_{B13}
3375	L_{A135}	L_{B13}
3376	L_{A136}	L_{B13}
3377	L_{A137}	L_{B13}
3378	L_{A138}	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}
3390	L_{A150}	L_{B13}
3391	L_{A151}	L_{B13}
3392	L_{A152}	L_{B13}
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}

-continued

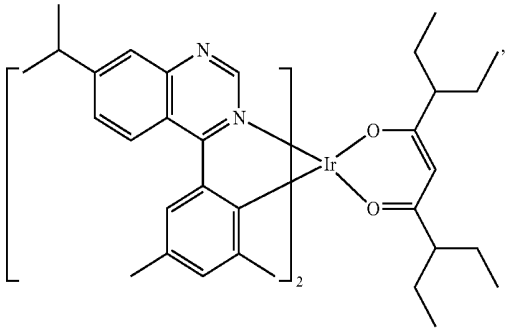
Compound Number	L_A	L_B
3442	L_{A202}	L_{B13}
3443	L_{A203}	L_{B13}
3444	L_{A204}	L_{B13}
3445	L_{A205}	L_{B13}
3446	L_{A206}	L_{B13}
3447	L_{A207}	L_{B13}
3448	L_{A208}	L_{B13}
3449	L_{A209}	L_{B13}
3450	L_{A210}	L_{B13}
3451	L_{A211}	L_{B13}
3452	L_{A212}	L_{B13}
3453	L_{A213}	L_{B13}
3454	L_{A214}	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}
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}
3491	L_{A251}	L_{B13}
3492	L_{A252}	L_{B13}
3493	L_{A253}	L_{B13}
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}

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

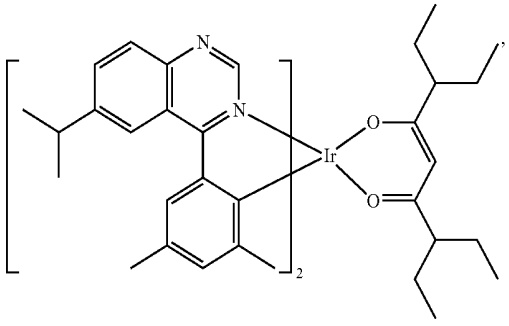
Compound 81



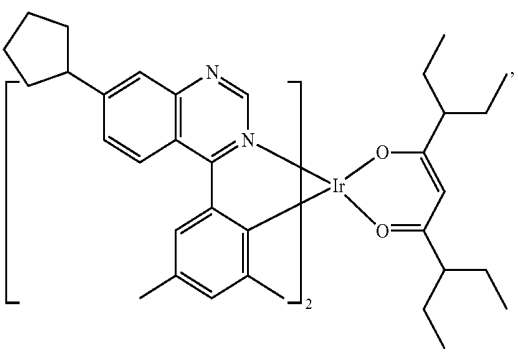
Compound 87



Compound 88



Compound 93



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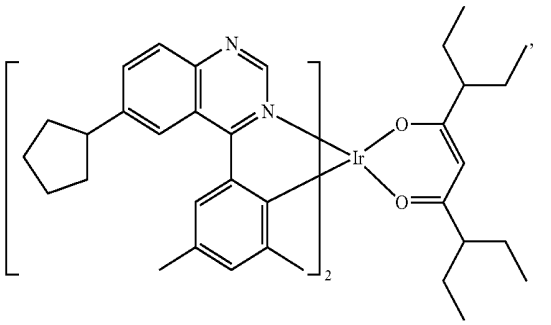
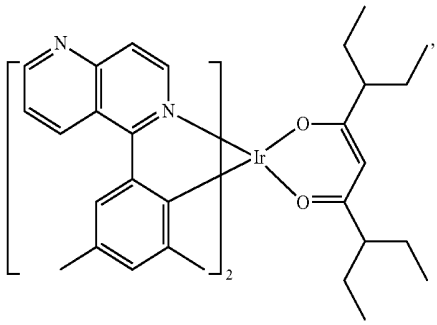
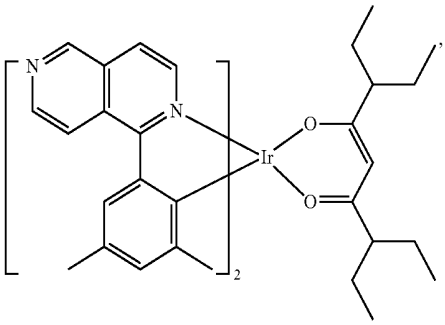
Compound 94



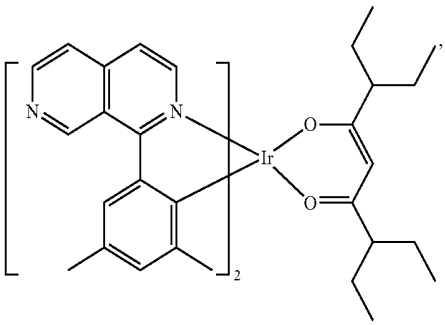
Compound 140



Compound 143



Compound 146



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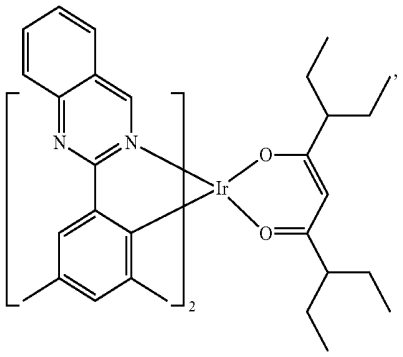
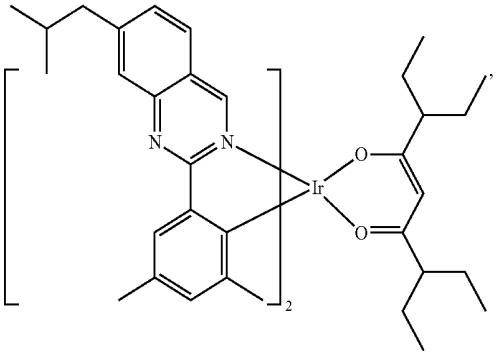
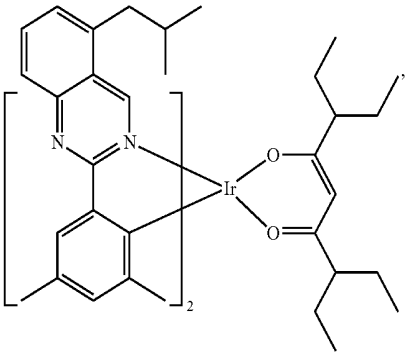
Compound 184



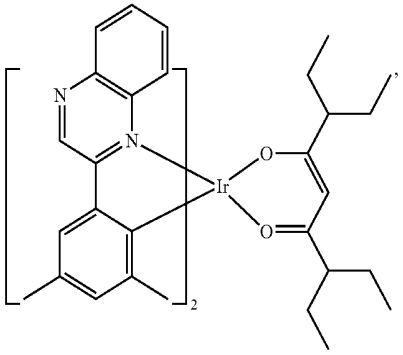
Compound 186



Compound 188



Compound 242



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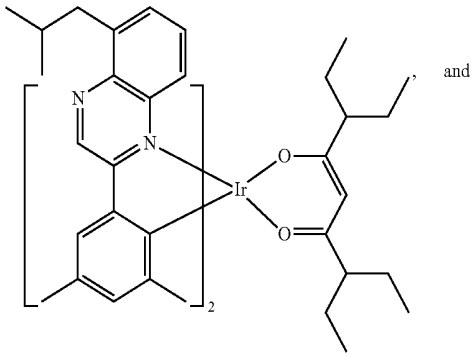
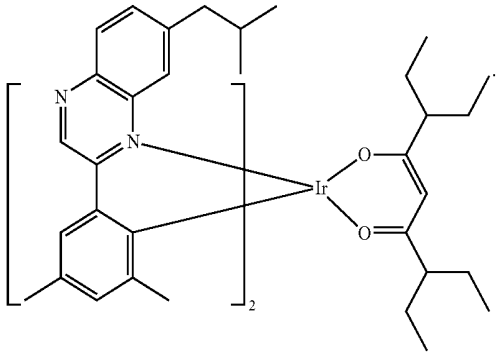
Compound 244



and

Compound 246

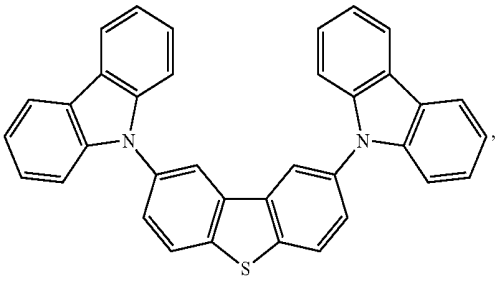


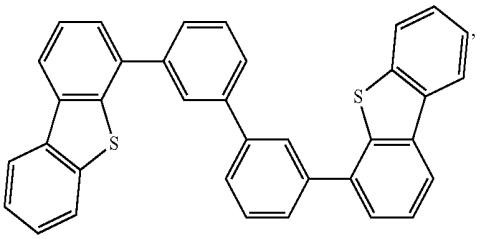
According to another aspect of the present disclosure, a first device is also provided. The first device includes a first organic light emitting device, that includes an anode, a cathode, and an organic layer disposed between the anode and the cathode. The organic layer can include a compound according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

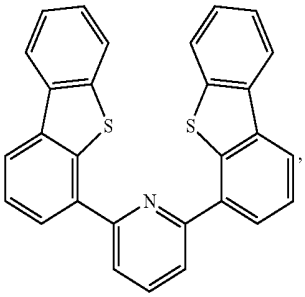
The first device can be one or more of a consumer product, an organic light-emitting device and a lighting panel. The organic layer can be an emissive layer and the compound can be an emissive dopant in some embodiments, while the compound can be a non-emissive dopant in other embodiments.

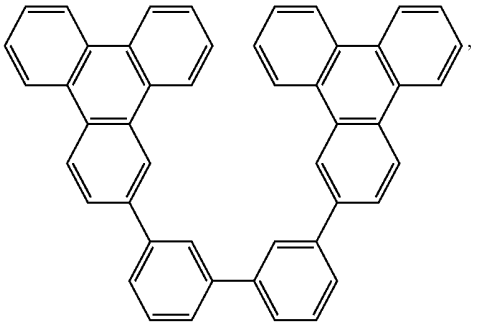
The organic layer can also include a host. In some embodiments, the host can include a metal complex. The host can be a triphenylene containing benzo-fused thiophene or benzo-fused furan. Any substituent in the host can be an unfused substituent independently selected from the group consisting of C_nH_{2n+1}, 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.

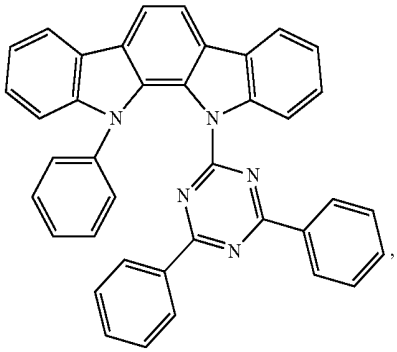
The host can be a compound selected from the group consisting of carbazole, dibenzothiphene, dibenzofuran, dibenzoselenophene, azacarbazole, aza-dibenzothiophene, aza-dibenzofuran, and aza-dibenzoselenophene. The host can include a metal complex. The host can be a specific compound selected from the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

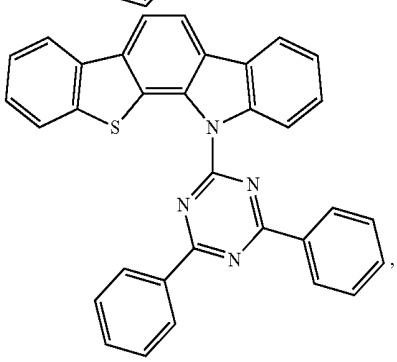












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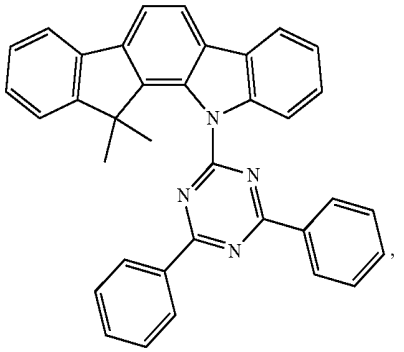
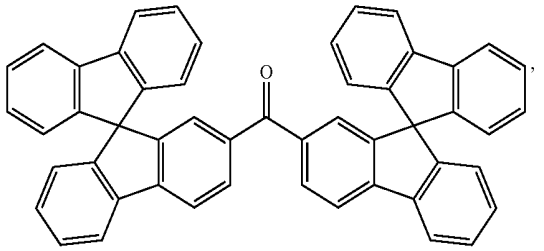
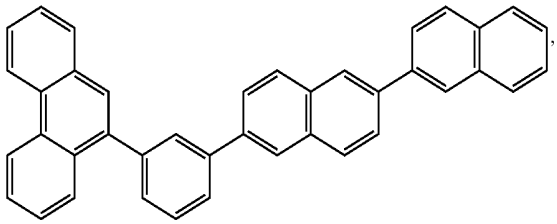
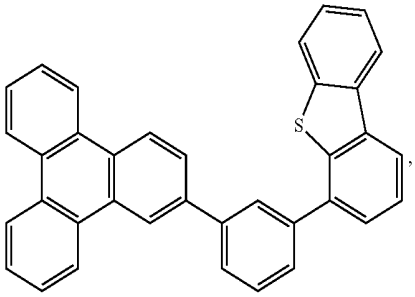
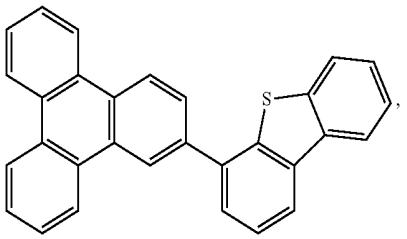










and combinations thereof.

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

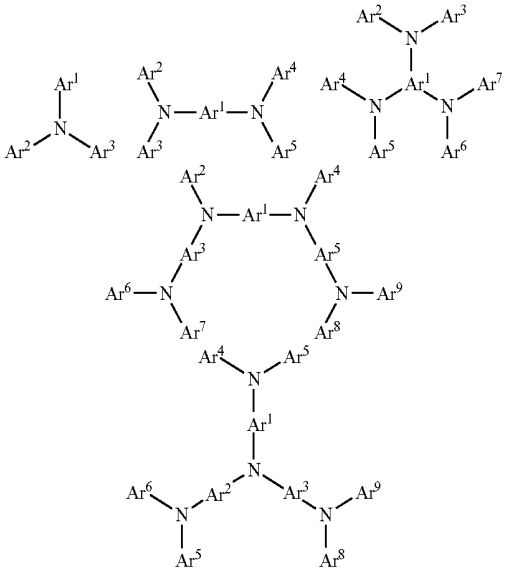
The materials described herein as useful for a particular layer in an organic light emitting device may be used in combination with a wide variety of other materials present in the device. For example, emissive dopants disclosed herein may be used in conjunction with a wide variety of hosts, transport layers, blocking layers, injection layers, electrodes and other layers that may be present. The mate-

rials 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:

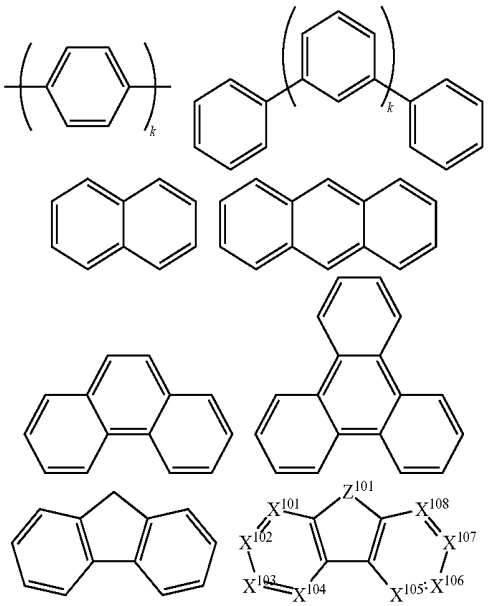
A hole injecting/transporting material to be used in the present invention is not particularly limited, and any compound may be used as long as the compound is typically used as a hole injecting/transporting material. Examples of the material include, but not limit to: a phthalocyanine or porphyrin derivative; 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.

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



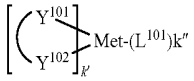
Each of Ar^1 to Ar^9 is selected from the group consisting aromatic hydrocarbon cyclic compounds such as benzene, biphenyl, triphenyl, triphenylene, naphthalene, anthracene, phenalene, phenanthrene, fluorene, pyrene, chrysene, perylene, azulene; group consisting aromatic heterocyclic compounds such as 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, quinazoline, quinoxaline, naphthyridine, phthalazine, pteridine, xanthene, acridine, phenazine, phenothiazine, phenoxazine, benzofuropyridine, furodipyridine, benzothienopyridine, thienodipyridine, benzoselenophenopyridine, 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 Ar 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.

In one aspect, Ar^1 to Ar^9 is independently selected from the group consisting of:



wherein k is an integer from 1 to 20; X^{101} to X^{108} is C (including CH) or N; Z^{101} is NAr^1, O, or S; Ar^1 has the same group defined above.

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; (Y^{101}-Y^{102}) is a bidentate ligand, Y^{101} and Y^{102} are independently selected from C, N, O, P, and S; L^{101} 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.

In one aspect, (Y^{101}-Y^{102}) is a 2-phenylpyridine derivative. In another aspect, (Y^{101}-Y^{102}) 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. Fc^+/Fc couple less than about 0.6 V.

Host:

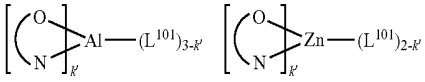
The light emitting layer of the organic EL device of the present invention preferably contains at least a metal complex as light emitting material, and may contain a host

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.

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

wherein Met is a metal; (Y^{103}-Y^{104}) is a bidentate ligand, Y^{103} and Y^{104} are independently selected from C, N, O, P, and S; L^{101} 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.

In one aspect, the metal complexes are:

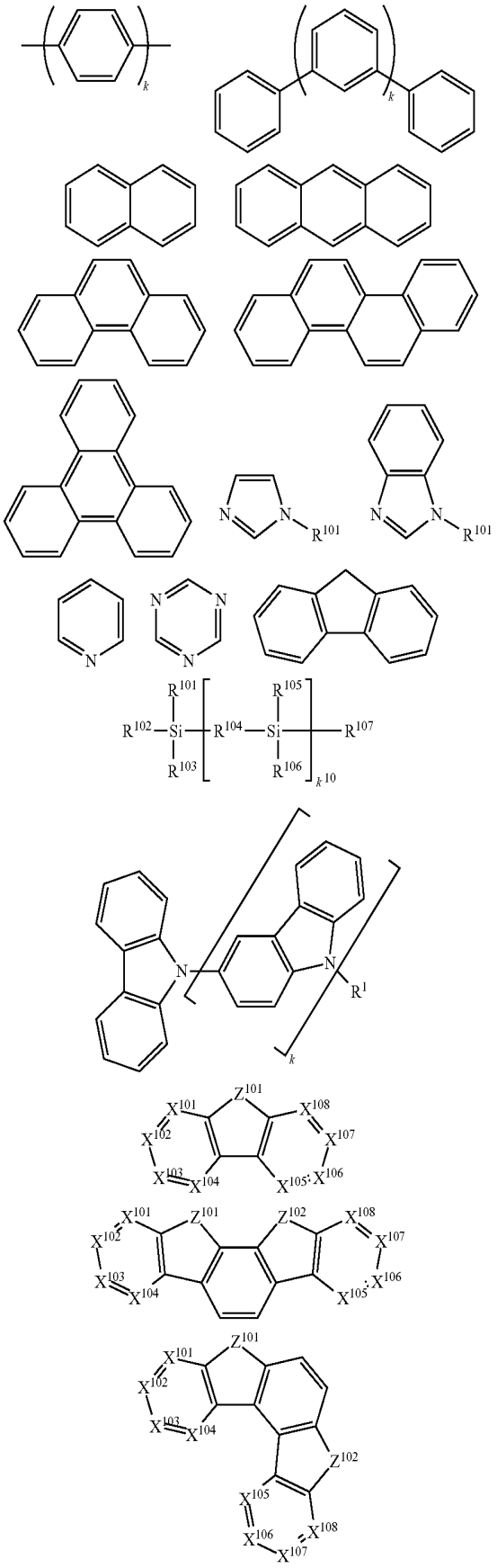


wherein (O—N) is a bidentate ligand, having metal coordinated to atoms O and N.

In another aspect, Met is selected from Ir and Pt. In a further aspect, (Y^{103}-Y^{104}) is a carbene ligand.

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, quinazoline, quinoxaline, naphthyridine, phthalazine, pteridine, xanthene, acridine, phenazine, phenothiazine, phenoxazine, benzofuropyridine, furodipyridine, benzothienopyridine, thienodipyridine, benzosclenophenopyridine, 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.

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



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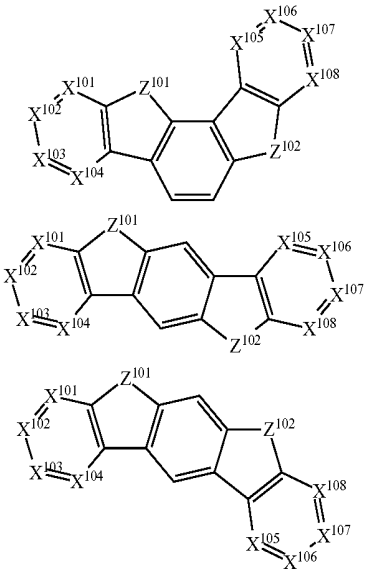


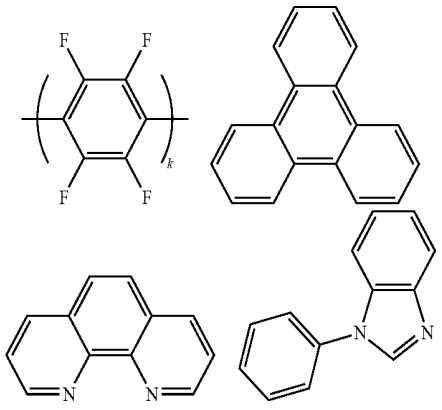
wherein R^{101} to R^{107} is independently selected from the group consisting of hydrogen, deuterium, halide, alkyl, cycloalkyl, heteroalkyl, arylalkyl, alkoxy, aryloxy, amino, silyl, alkenyl, cycloalkenyl, heteroalkenyl, alkynyl, aryl, heteroaryl, acyl, carbonyl, carboxylic acids, ester, nitrile, isonitrile, 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. X^{101} to X^{108} is selected from C (including CH) or N. Z^{101} and Z^{102} is selected from NR^{101}, O, or S.

HBL:

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.

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

In another aspect, compound used in HBL contains at least one of the following groups in the molecule:



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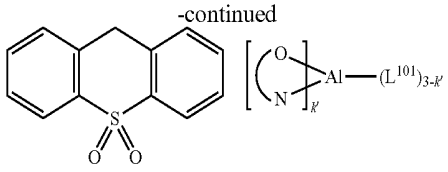
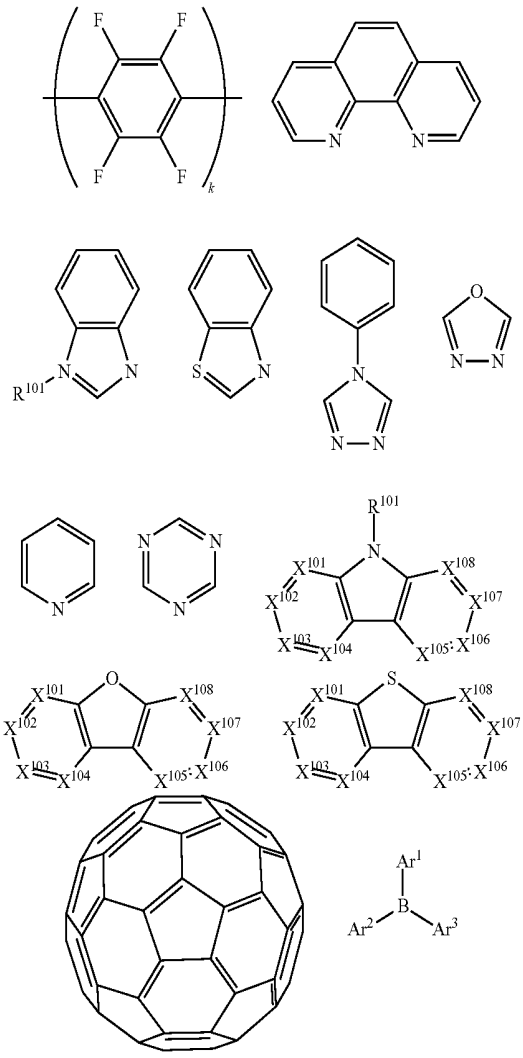


wherein k is an integer from 1 to 20; L^{101} is an another ligand, k' is an integer from 1 to 3.

ETL:

Electron transport layer (ETL) may include a material capable of transporting electrons. Electron transport layer may be intrinsic (undoped), or doped. Doping may be used to enhance conductivity. Examples of the ETL material are not particularly limited, and any metal complexes or organic compounds may be used as long as they are typically used to transport electrons.

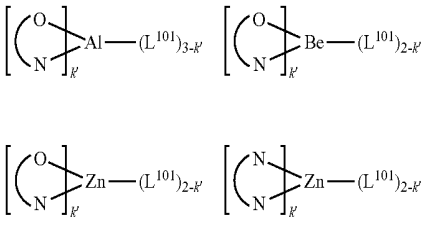
In one aspect, compound used in ETL contains at least one of the following groups in the molecule:



wherein R^{101} is 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. Ar^1 to Ar^3 has the similar definition as Ar's mentioned above. k is an integer from 1 to 20, X^{101} to X^{108} is selected from C (including CH) or N.

In another aspect, the metal complexes used in ETL contains, but not limit to the following general formula:



wherein (O—N) or (N—N) is a bidentate ligand, having metal coordinated to atoms O, N or N, N; L^{101} is another ligand; k' is an integer value from 1 to the maximum number of ligands that may be attached to the metal.

In any above-mentioned compounds used in each layer of the OLED device, the hydrogen atoms can be partially or fully deuterated. Thus, any specifically listed substituent, such as, without limitation, methyl, phenyl, pyridyl, etc. encompasses undeuterated, partially deuterated, and fully deuterated versions thereof. Similarly, classes of substituents such as, without limitation, alkyl, aryl, cycloalkyl, heteroaryl, etc. also encompass undeuterated, partially deuterated, and fully deuterated versions thereof.

In addition to and/or in combination with the materials disclosed herein, many hole injection materials, hole transporting materials, host materials, dopant materials, exiton/hole blocking layer materials, electron transporting and electron injecting materials may be used in an OLED. Non-limiting examples of the materials that may be used in an OLED in combination with materials disclosed herein are listed in Table 1 below. Table 1 lists non-limiting classes of materials, non-limiting examples of compounds for each class, and references that disclose the materials.

TABLE 1

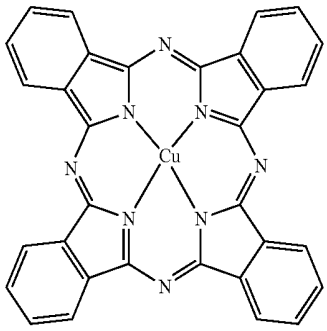
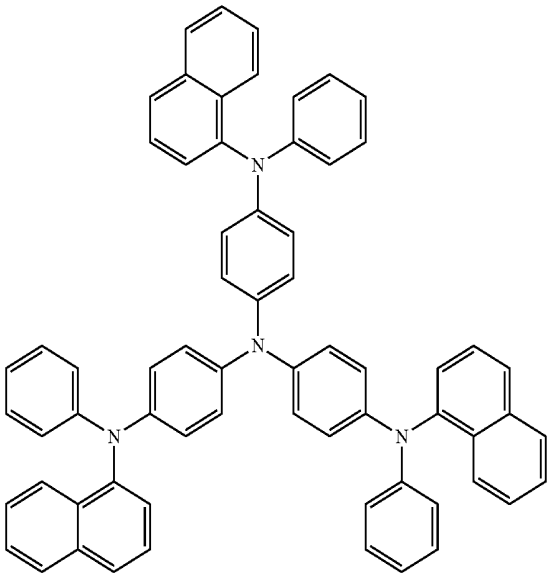
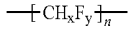
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Hole injection materials		
Phthalocyanine and porphyin compounds		Appl. Phys. Lett.69, 2160 (1996)
Starburst triarylamines		J. Lumin, 72-74, 985 (1997)
CF_x Fluorohydrocarbon polymer		Appl. Phys. Lett. 78, 673 (2001)

TABLE 1-continued

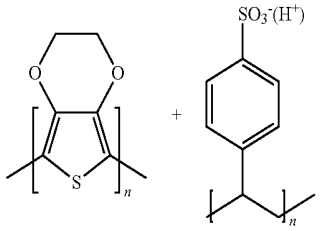
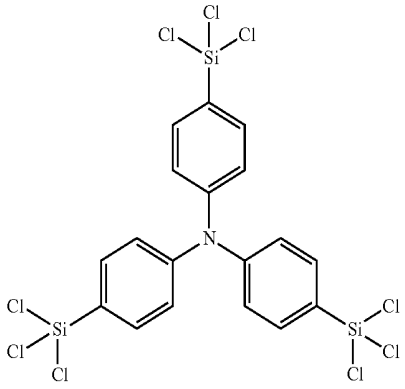
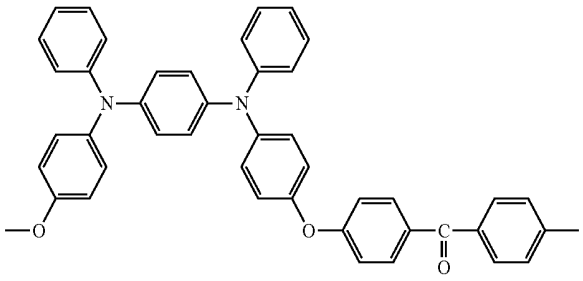
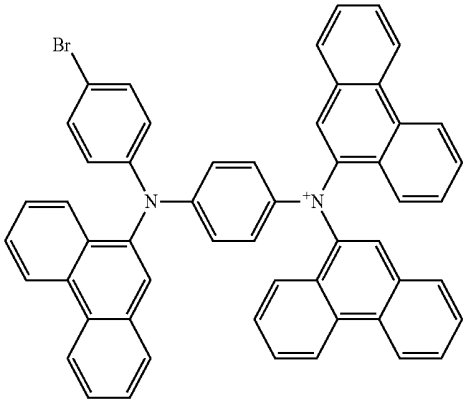
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Conducting polymers (e.g., PEDOT:PSS, polyaniline, polypthiophene)		Synth. Met. 87, 171 (1997) WO2007002683
Phosphonic acid and silane SAMs		US20030162053
Triarylamine or polythiophene polymers with conductivity dopants	 and 	EP1725079A1

TABLE 1-continued

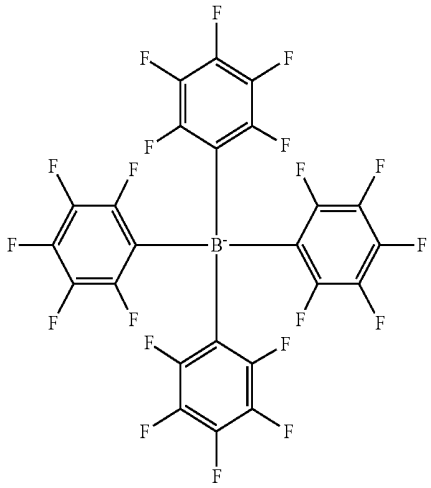
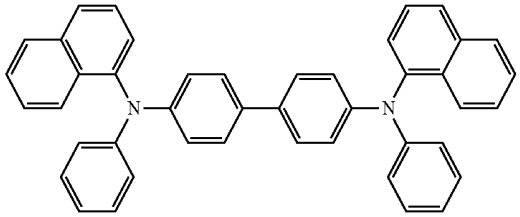
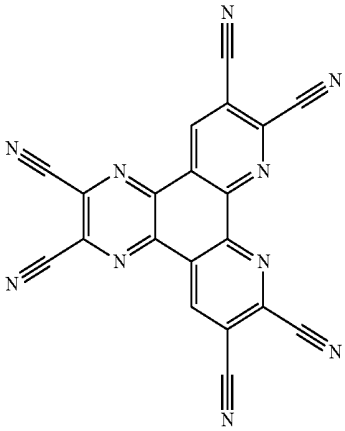
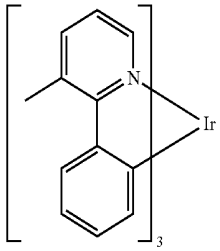
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		
Organic compounds with conductive inorganic compounds, such as molybdenum and tungsten oxides		US20050123751 SID Symposium Digest, 37, 923 (2006) WO2009018009
n-type semiconducting organic complexes		US20020158242
Metal organometallic complexes		US20060240279

TABLE 1-continued

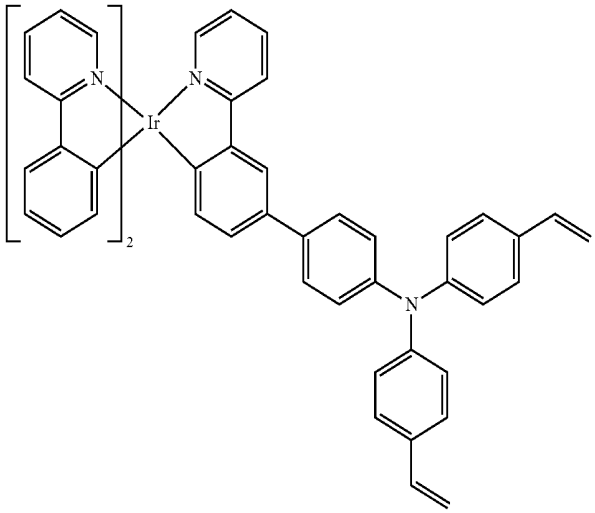
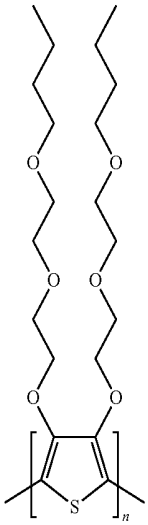
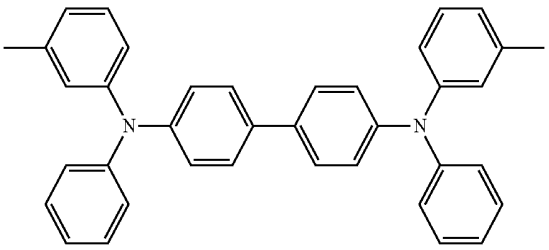
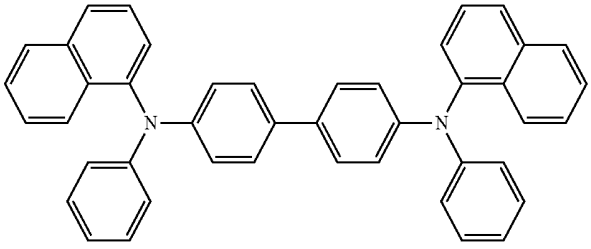
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Cross-linkable compounds		US20080220265
Polythiophene based polymers and copolymers		WO 2011075644 EP2350216
Hole transporting materials		
Triarylamines (e.g., TPD, α-NPD)		Appl. Phys. Lett. 51, 913 (1987)
		U.S. Pat. No. 5,061,569

TABLE 1-continued

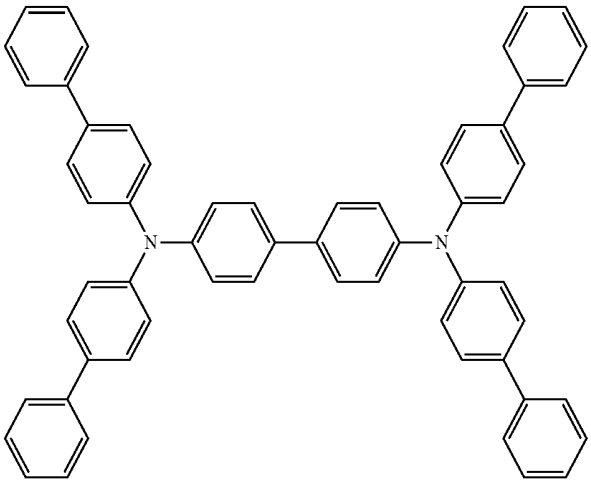
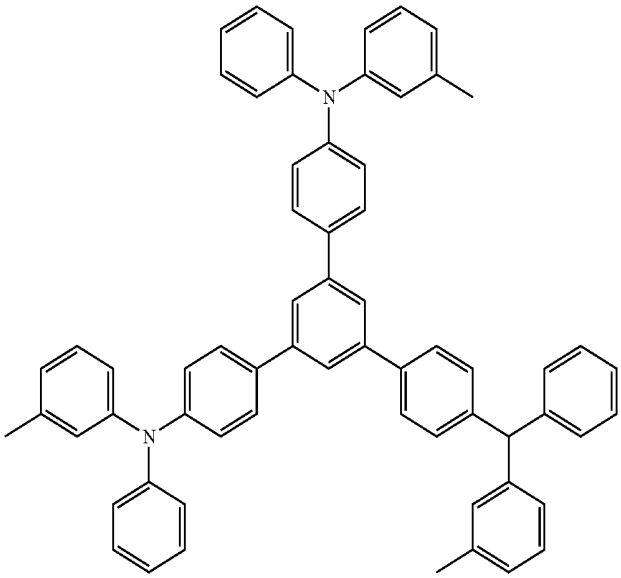
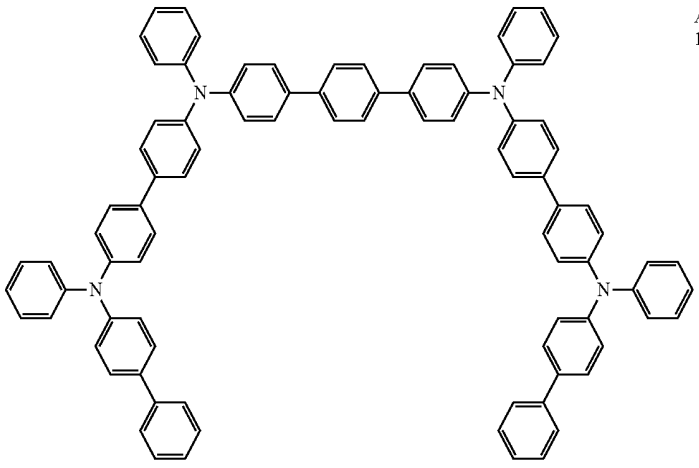
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		EP650955
		J. Mater. Chem. 3, 319 (1993)
		Appl. Phys. Lett. 90, 183503 (2007)

TABLE 1-continued

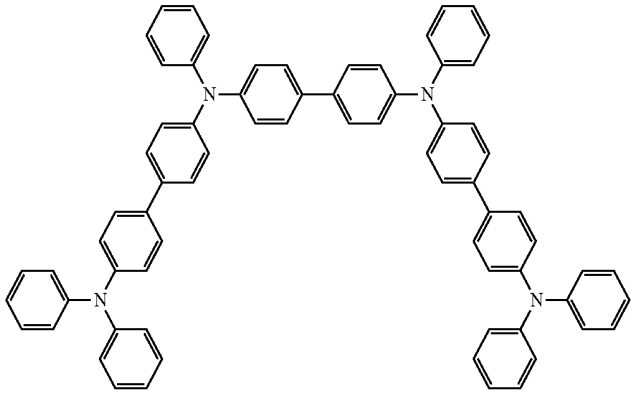
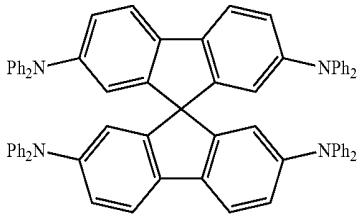
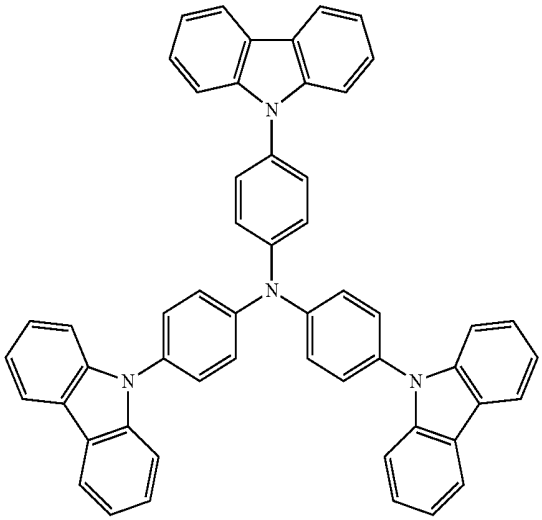
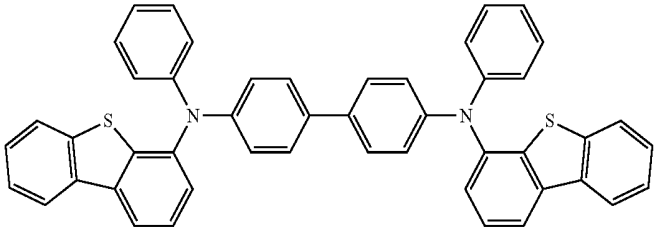
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		Appl. Phys. Lett. 90, 183503 (2007)
Triaylamine on spirofluorene core		Synth. Met. 91, 209 (1997)
Arylamine carbazole compounds		Adv. Mater. 6, 677 (1994), US20080124572
Triarylamine with (di)benzothiophenei/(di) zofuran		US20070278938, US20080106190 US20110163302

TABLE 1-continued

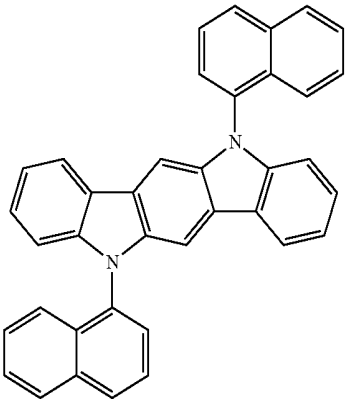
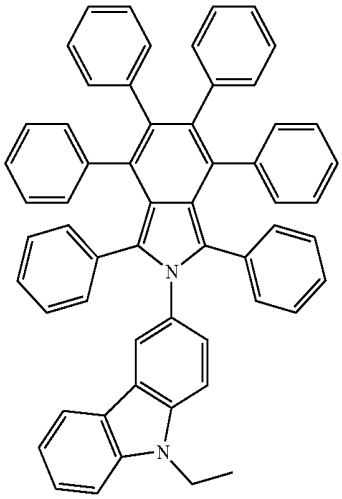
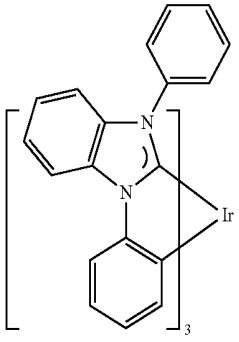
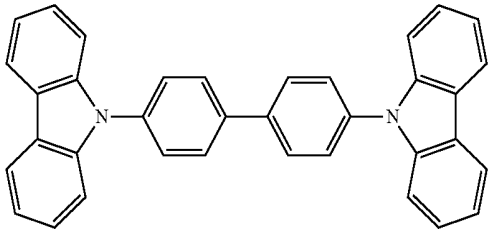
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Indolocarbazoles		Synth. Met. 111, 421 (2000)
Isoindole compounds		Chem. Mater. 15, 3148 (2003)
Metal carbene complexes		US2008008221
Phosphorescent OLED host materials		
Red hosts		
Arylcarbazoles		Appl. Phys. Lett. 78, 1622 (2001)

TABLE 1-continued

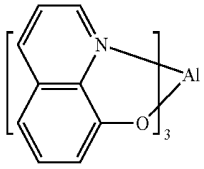
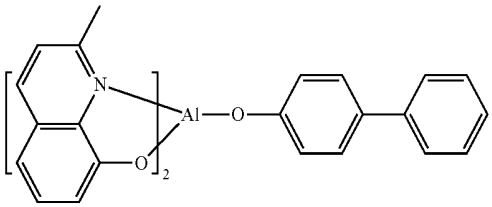
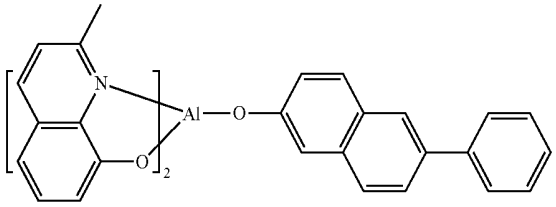
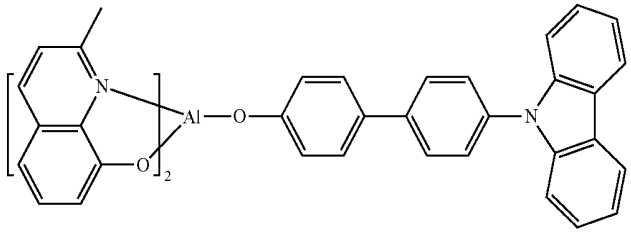
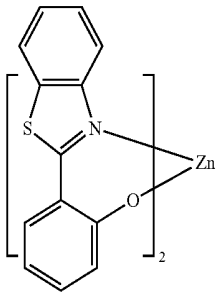
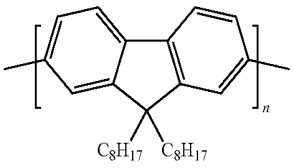
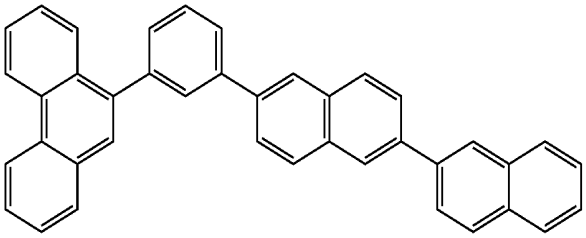
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Metal 8-hydroxyquinolates (e.g., Alq_3, BAlq)		Nature 395, 151 (1998)
		US20060202194
		WO2005014551
		WO2006072002
Metal phenoxybenzothiazole compounds		Appl. Phys. Lett. 90, 123509 (2007)
Conjugated oligomers and polymers (e.g., polyfluorene)		Org. Electron. 1, 15 (2000)
Aromatic fused rings		WO2009066779, WO2009066778, WO2009063833, US20090045731, US20090045730, WO2009008311, US20090008605, US20090009065

TABLE 1-continued

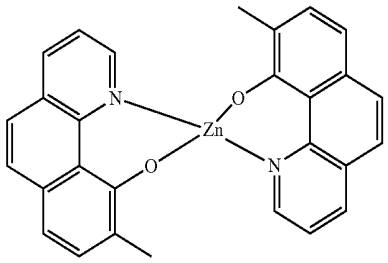
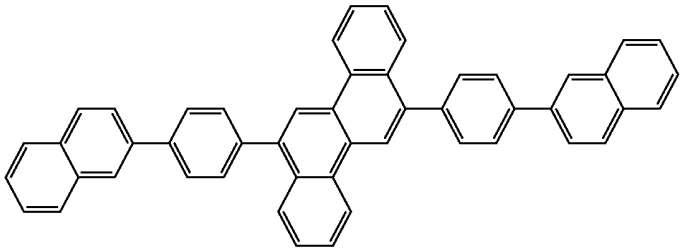
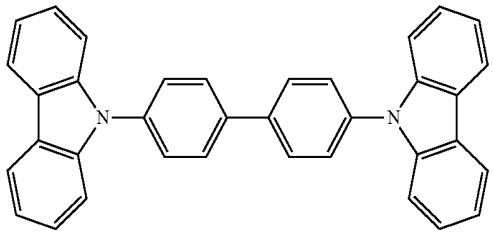
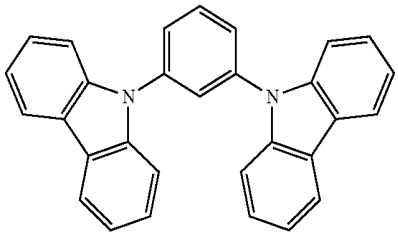
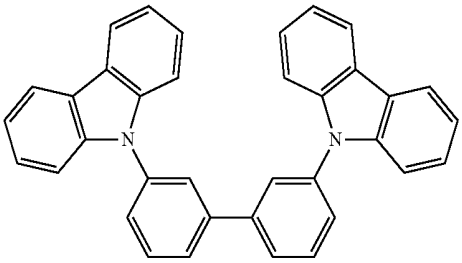
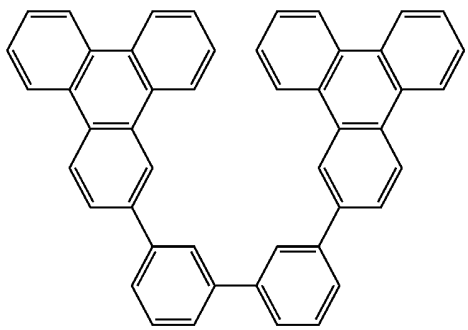
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Zinc complexes		WO2010056066
Chrysene based compounds		WO2011086863
Green hosts		
Arylcarbozoles		Appl. Phys. Lett. 78, 1622 (2001)
		US20030175553
		WO2001039234
Aryltriphenylene compounds		US20060280965

TABLE 1-continued

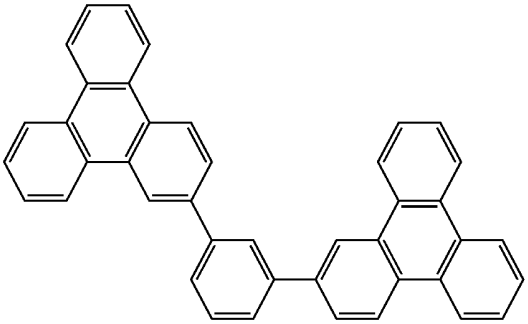
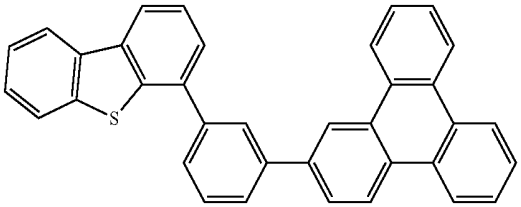
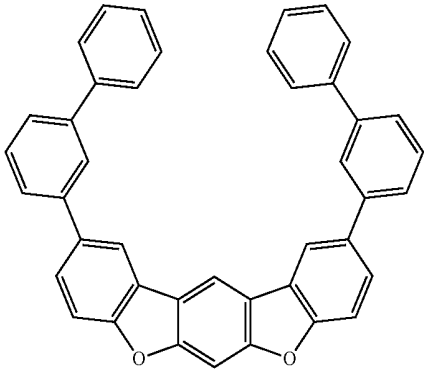
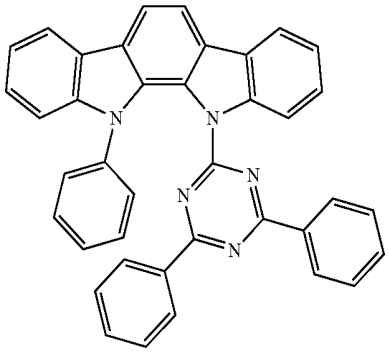
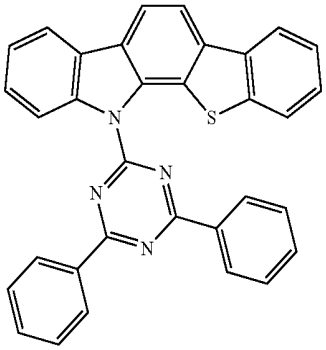
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20060280965
		WO2009021126
Poly-fused heteroaryl compounds		US20090309488 US20090302743 US20100012931
Donor acceptor type molecules		WO2008056746
		WO2010107244

TABLE 1-continued

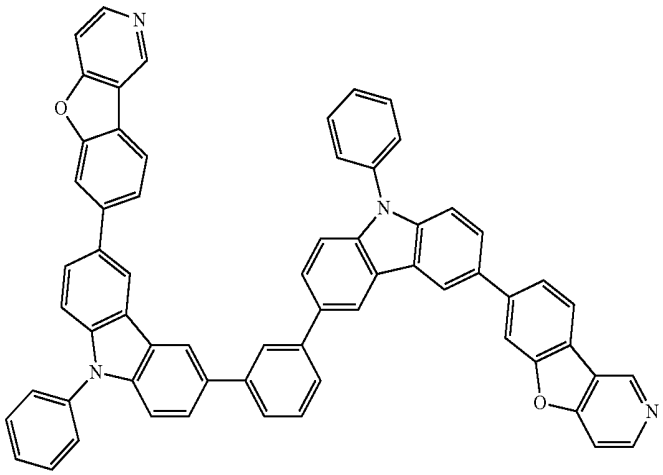
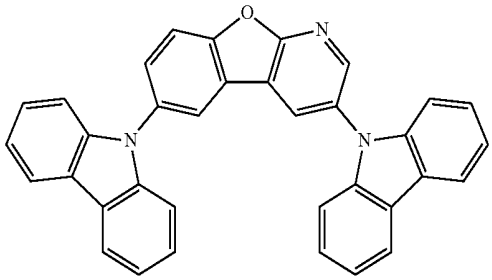
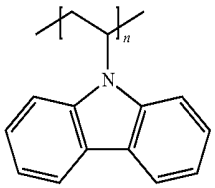
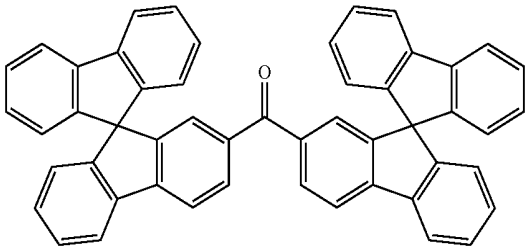
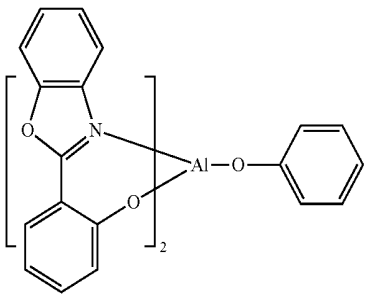
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Aza-carbazole/DBT/DBF		JP2008074939
		US20100187984
Polymers (e.g., PVK)		Appl. Phys. Lett. 77, 2280 (2000)
Spirofluorene compounds		WO2004093207
Metal phenoxybenzooxazole compounds		WO2005089025

TABLE 1-continued

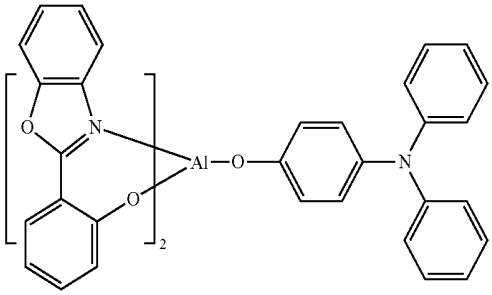
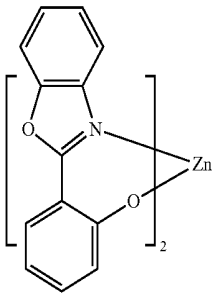
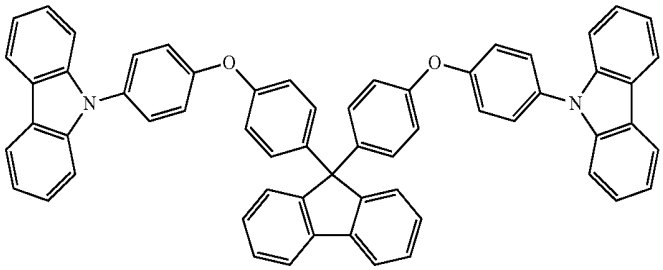
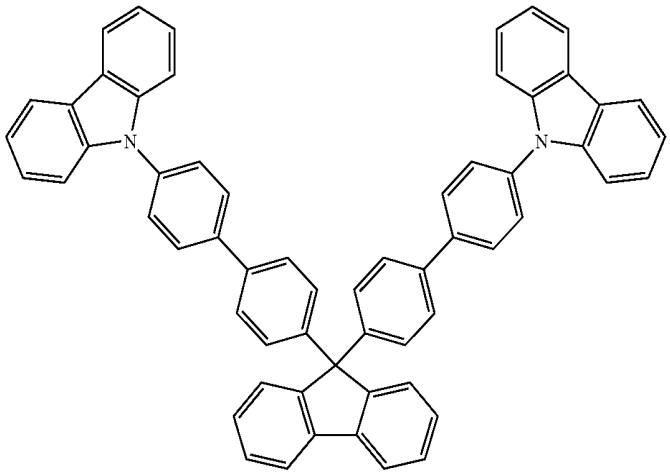
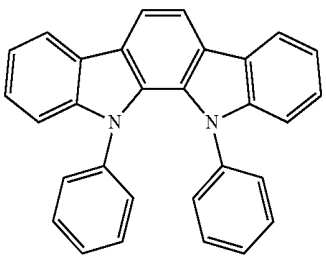
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		WO2006132173
		JP200511610
Spirofluorene-carbazole compounds		JP2007254297
		JP2007254297
Indolocarbazoles		WO2007063796

TABLE 1-continued

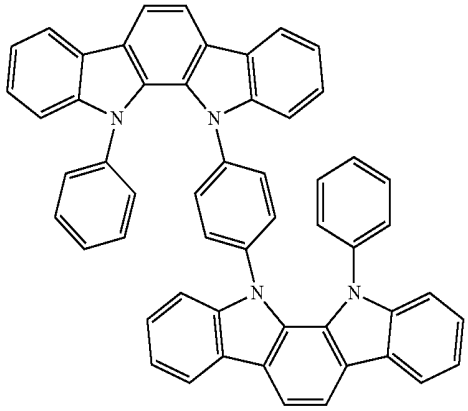
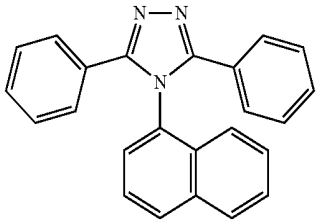
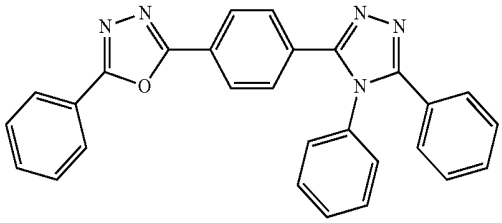
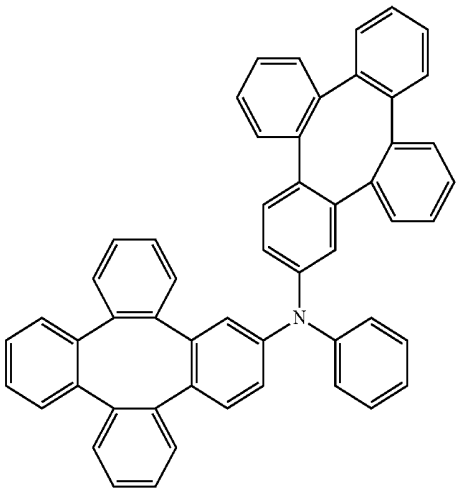
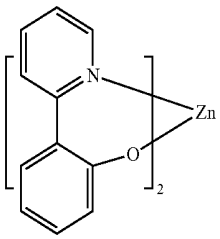
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		WO2007063754
5-member ring electron deficient heterocycles (e.g., triazole, oxadiazole)		J. Appl. Phys. 90, 5048 (2001)
		WO2004107822
Tetraphenylene complexes		US20050112407
Metal phenoxypyridine compounds		WO2005030900

TABLE 1-continued

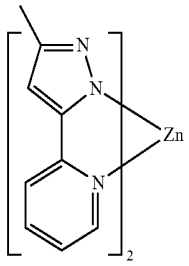
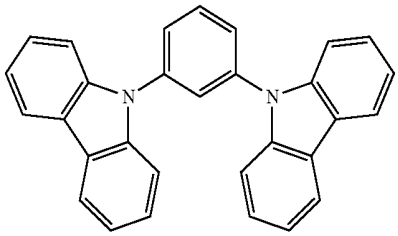
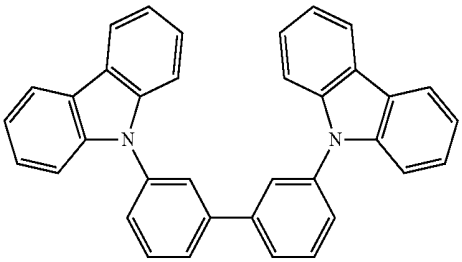
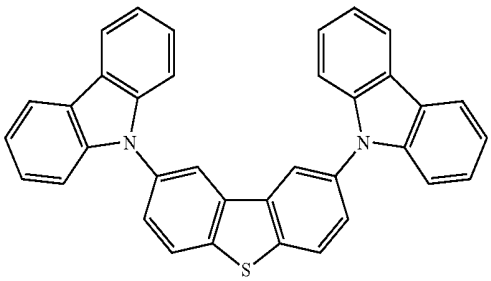
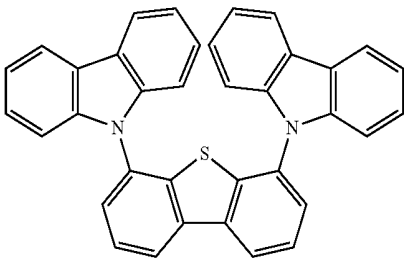
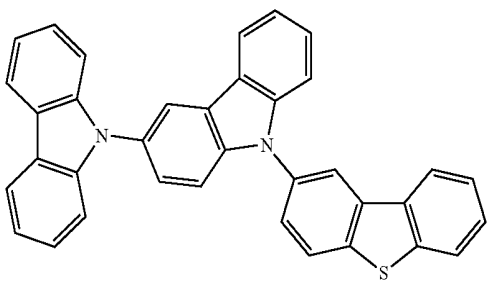
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Metal coordination complexes (e.g., Zn, Al with N^N ligands)		US20040137268, US20040137267
Blue hosts		
Arylcarbazoles		Appl. Phys. Lett, 82, 2422 (2003)
		US20070190359
Dibenzothiophene/ Dibenzofuran-carbazole compounds		WO2006114966, US20090167162
		US20090167162
		WO2009086028

TABLE 1-continued

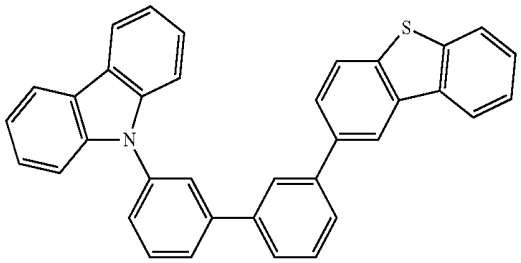
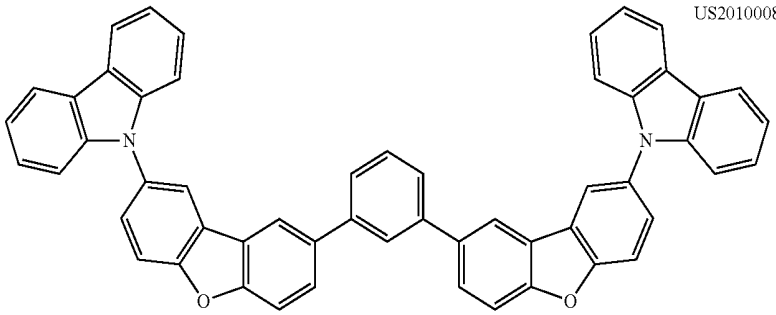
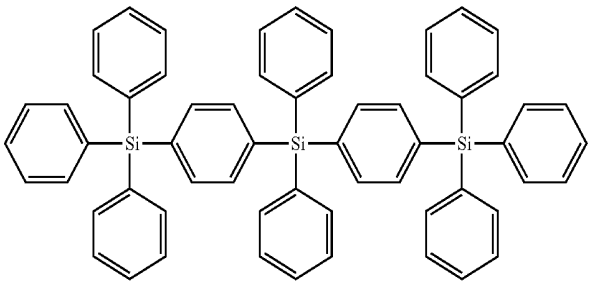
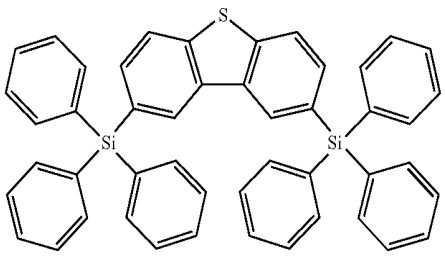
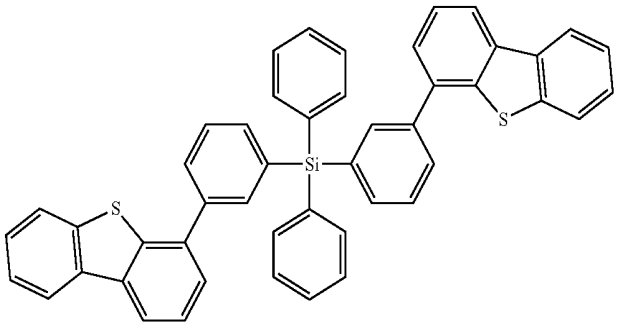
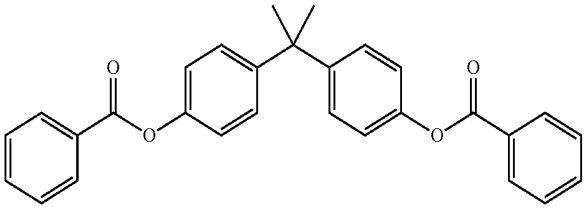
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20090030202, US20090017330
		US20100084966
Silicon aryl compounds		US20050238919
		WO2009003898
Silicon/Germanium aryl compounds		EP2034538A
Aryl benzoyl ester		WO2006100298

TABLE 1-continued

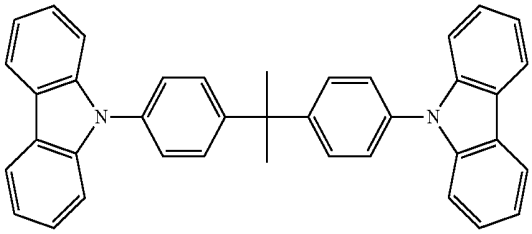
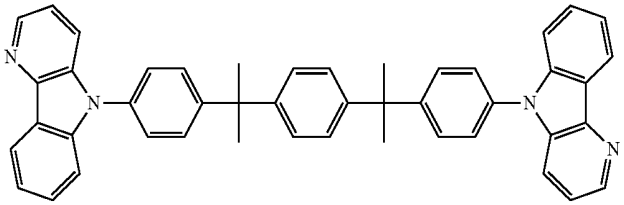
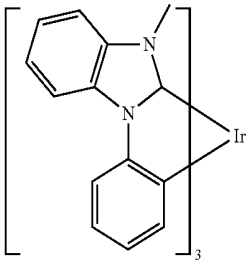
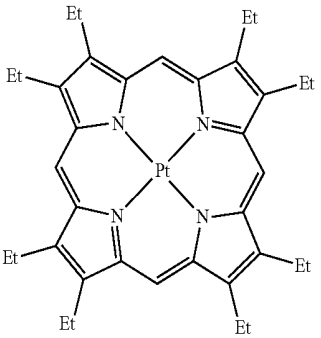
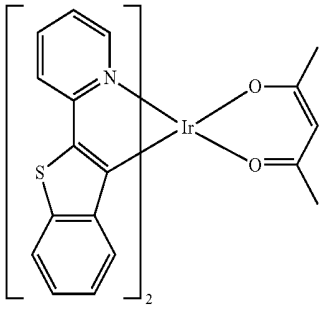
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Carbazole linked by non-conjugated groups		US20040115476
Aza-carbazoles		US20060121308
High triplet metal organometallic complex		U.S. Pat. No. 7,154,114
Phosphorescent dopants		
Red dopants		
Heavy metal porphyrins (e.g., PtOEP)		Nature 395, 151 (1998)
Iridium(III) organometallic complexes		Appl. Phys. Lett. 78, 1622 (2001)

TABLE 1-continued

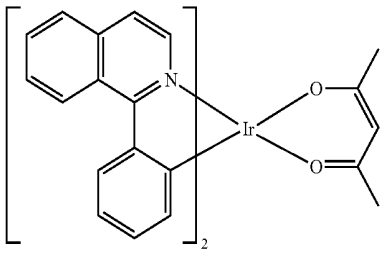
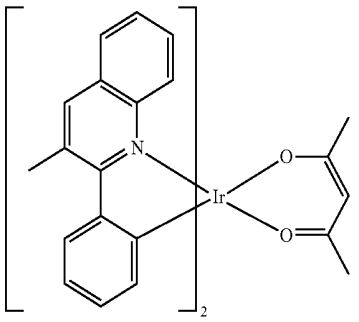
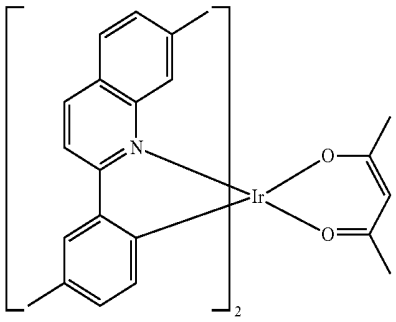
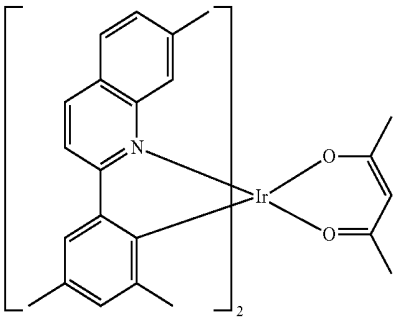
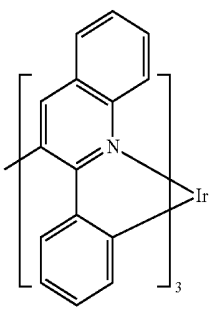
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US2006835469
		US2006835469
		US20060202194
		US20060202194
		US20070087321

TABLE 1-continued

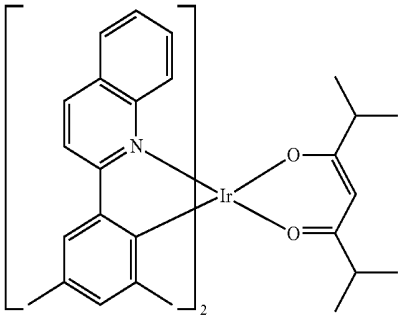
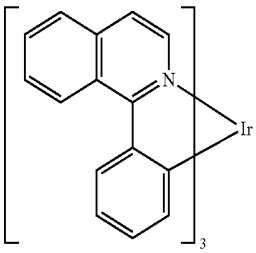
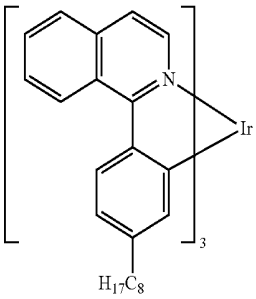
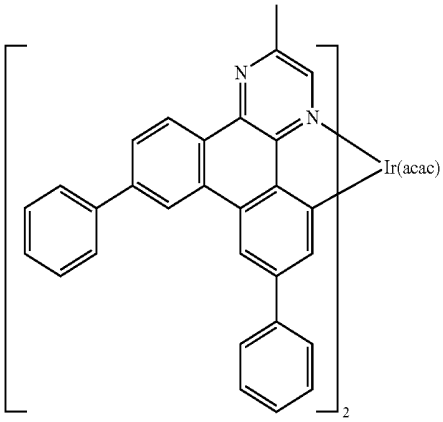
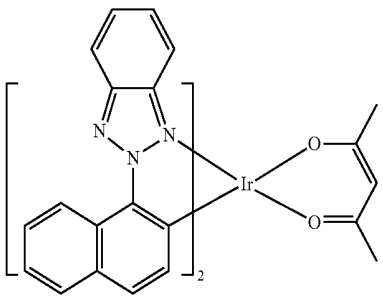
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20080261076 US20100090591
		US20070087321
		Adv. Mater. 19, 739 (2007)
		WO2009100991
		WO2008101842

TABLE 1-continued

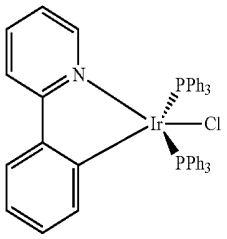
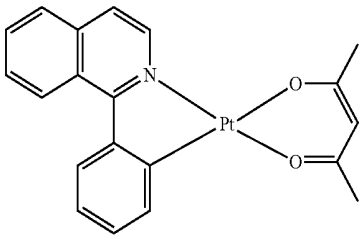
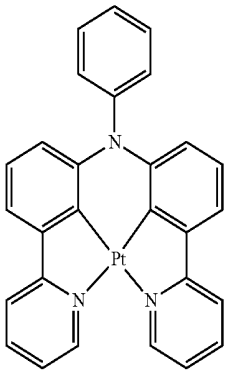
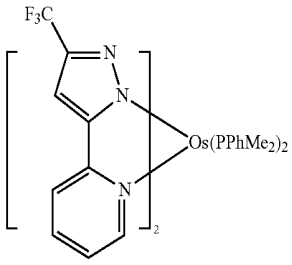
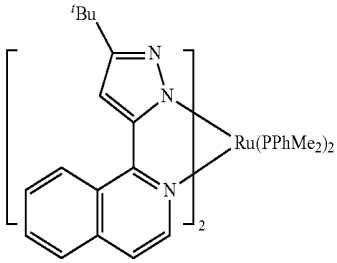
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		U.S. Pat. No. 7,232,618
Platinum(II) organornetallic complexes		WO2003040257
		US20070103060
Osminum(III) complexes		Chem. Mater. 17, 3532 (2005)
Ruthenium(II) complexes		Adv. Mater. 17, 1059 (2005)

TABLE 1-continued

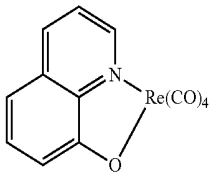
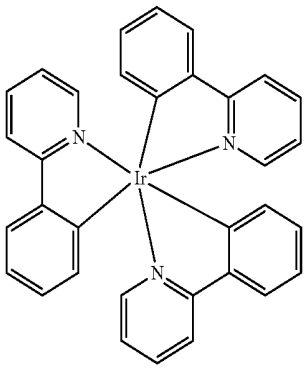
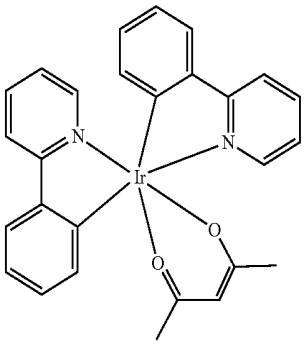
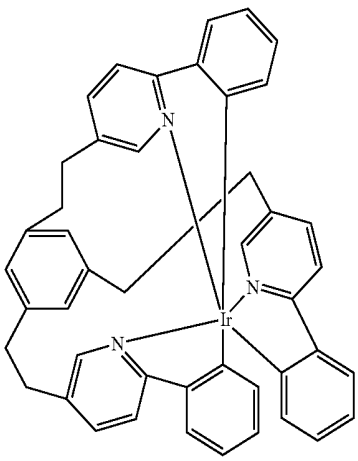
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Rhenium (I), (II), and (III) complexes		US20050244673
Green dopants		
Iridium(III) organometallic complexes	 and its derivatives	Inorg. Chem. 40, 1704 (2001)
		US20020034656
		U.S Pat. No. 7,332,232

TABLE 1-continued

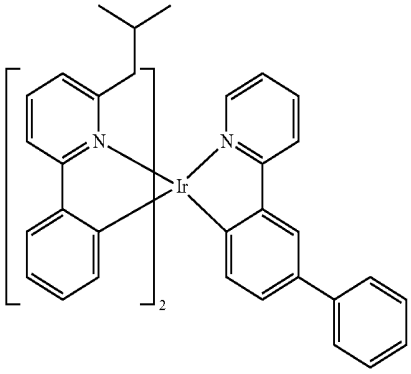
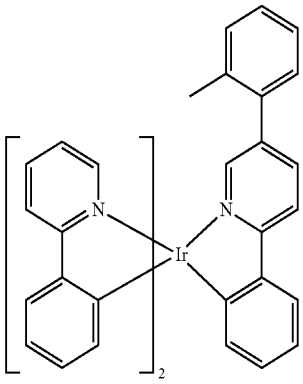
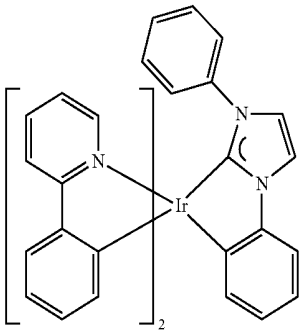
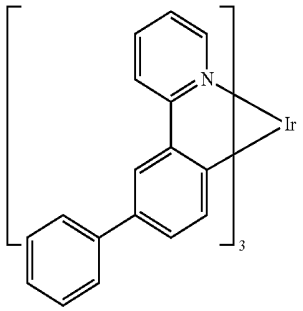
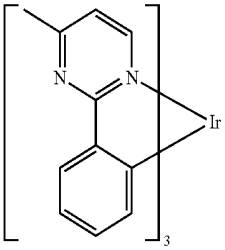
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20090108737
		WO2010028151
		EP1841834B
		US20060127696
		US20090039776

TABLE 1-continued

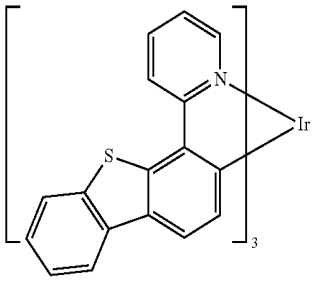
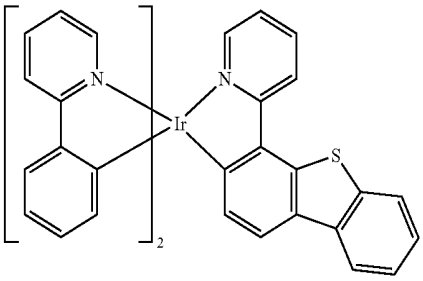
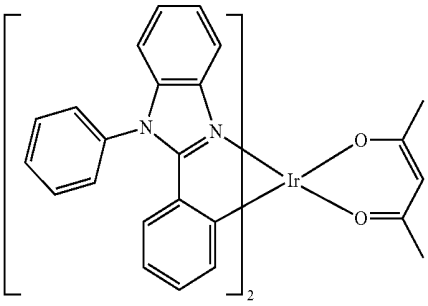
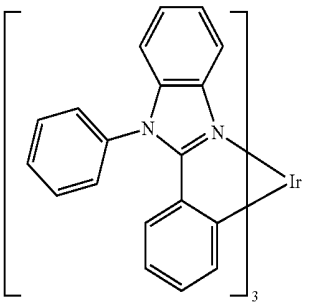
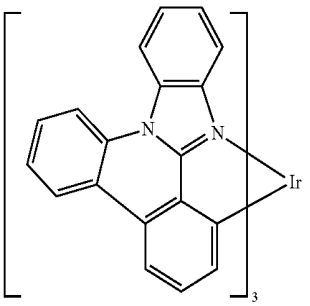
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		U.S. Pat. No. 6,921,915
		US20100244004
		U.S. Pat. No. 6,687,266
		Chem. Mater. 16 2480 (2004)
		US20070190359

TABLE 1-continued

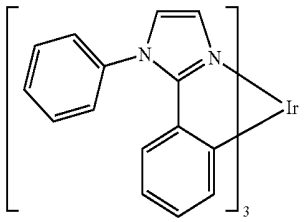
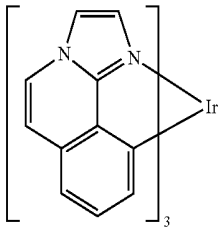
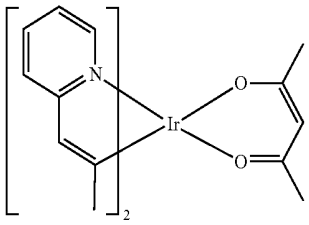
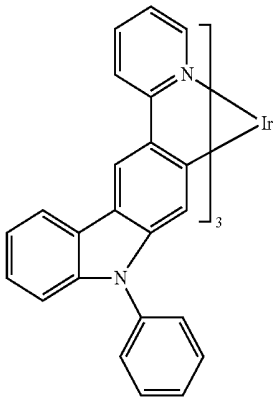
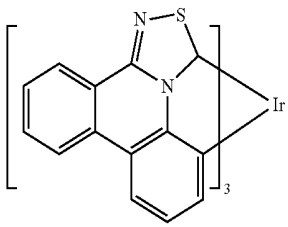
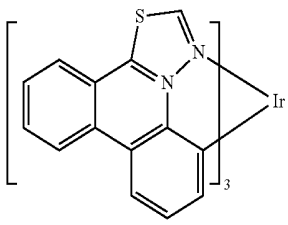
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US 20060008670 JP2007123392
		WO2010086089, WO2011044988
		Adv. Mater 16, 2003 (2004)
		Angew. Chem. Int Ed. 2006, 45, 7800
		WO2009050290
		US20090165846

TABLE 1-continued

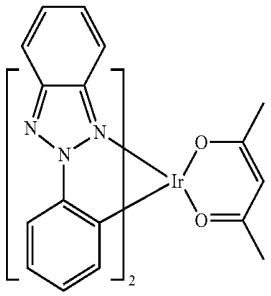
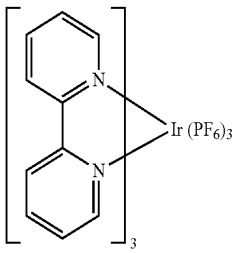
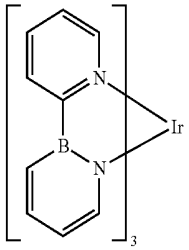
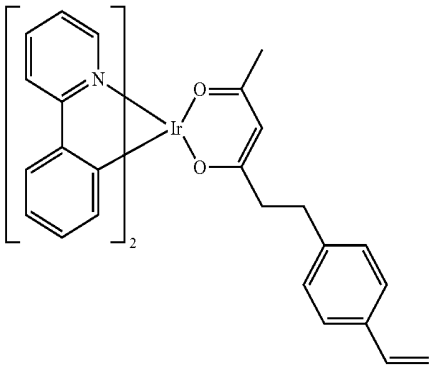
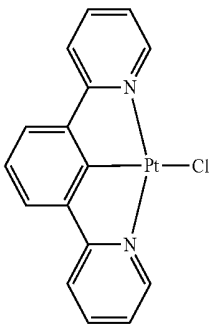
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20080015355
		US20010015432
		US20100295032
Monomer for polymeric metal organometallic compounds		U.S. Pat. No. 7,250,226, U.S. Pat. No. 7,396,598
Pt(11) organometallic complexes, including polydentated ligands		Appl. Phys. Lett. 86, 153505 (2005)

TABLE 1-continued

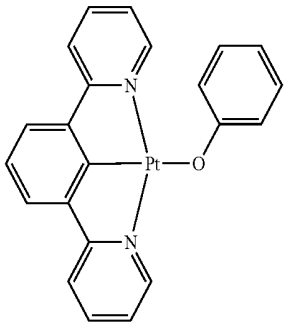
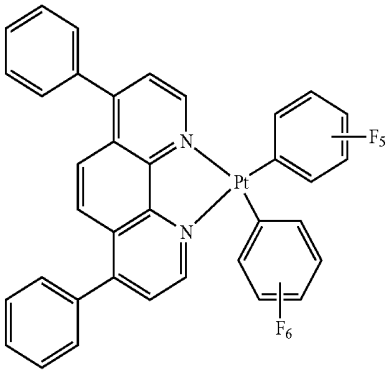
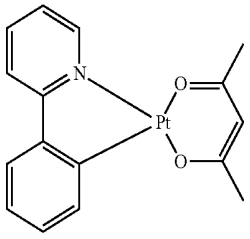
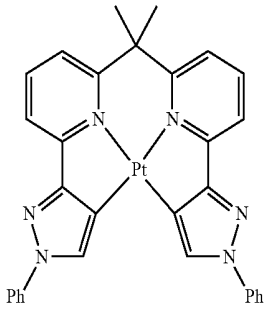
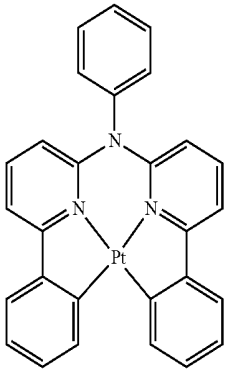
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		Appl. Phys. Lett. 86, 153505 (2005)
		Chem. Lett. 34, 592 (2005)
		WO2002015645
		US20060263635
		US20060182992 US20070103060

TABLE 1-continued

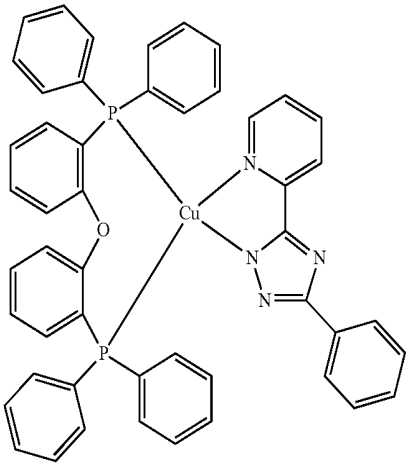
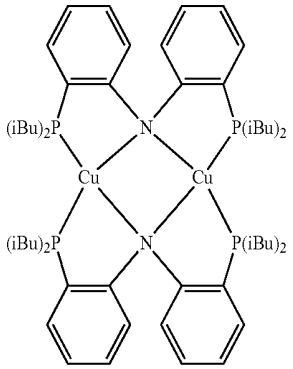
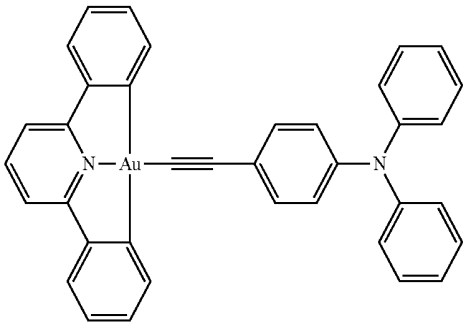
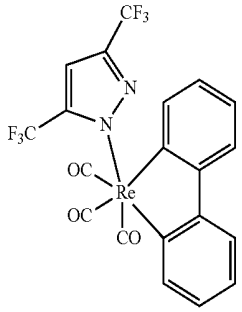
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Cu complexes		WO2009000673
		US20070111026
Gold complexes		Chem. Commun. 2906 (2005)
Rhenium(III) complexes		Inorg. Chem. 42, 1248 (2003)

TABLE 1-continued

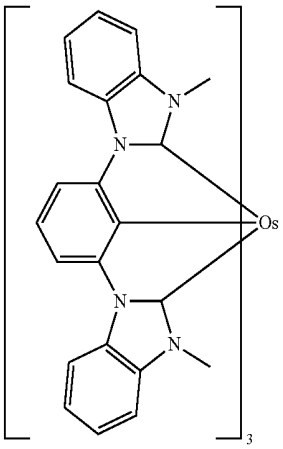
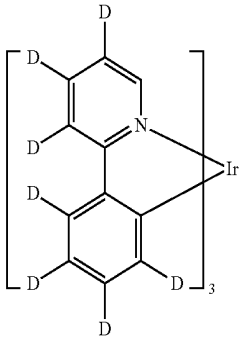
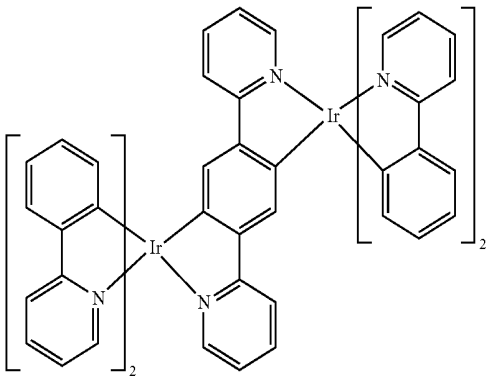
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Osmium(II) complexes		U.S. Pat. No. 7,279,704
Deuterated organometallic complexes		US20030138657
Organometallic complexes with two or more metal centers		US20030152802

TABLE 1-continued

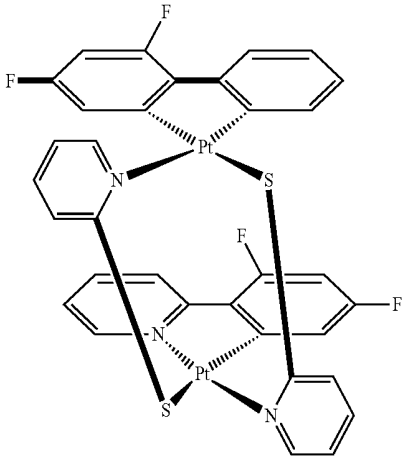
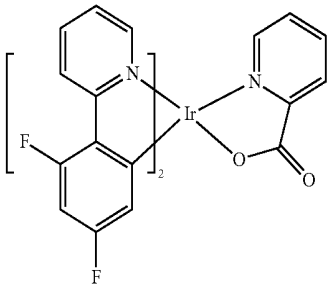
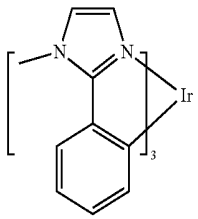
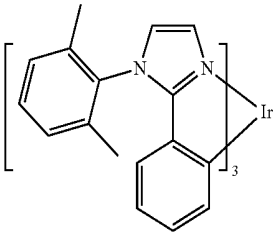
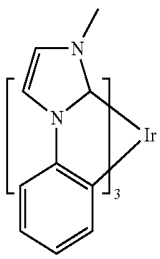
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		U.S. Pat. No. 7,090,928
Blue dopants		
Iridium(III) organometallic complexes		WO2002002714
		WO2006009024
		US20060251923 US20110057559 US20110204333
		U.S. Pat. No. 7,393,599, WO2006056418, US20050260441, WO2005019373

TABLE 1-continued

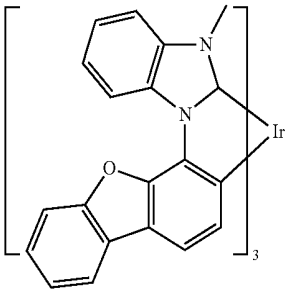
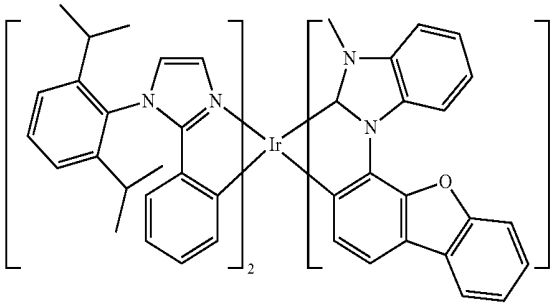
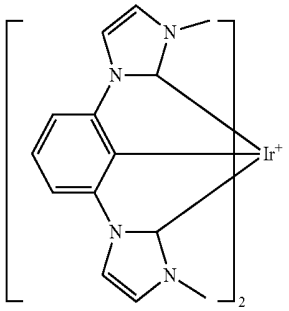
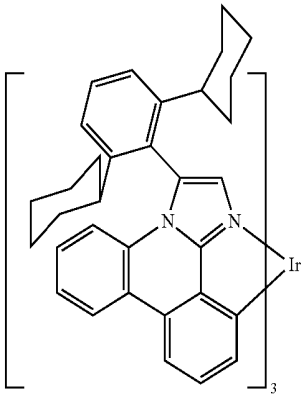
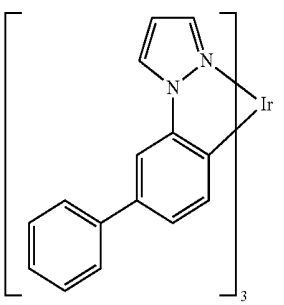
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		U.S. Pat. No. 7,534,505
		WO2011051404
		U.S. Pat. No. 7,445,855
		US20070190359, US20080297033 US20100148663
		U.S. Pat. No. 7,338,722

TABLE 1-continued

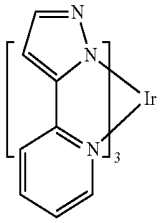
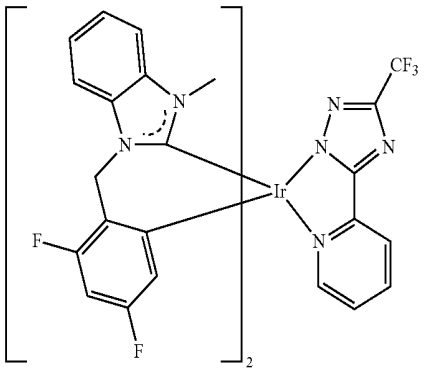
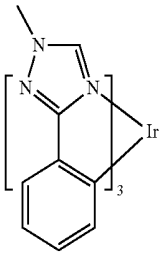
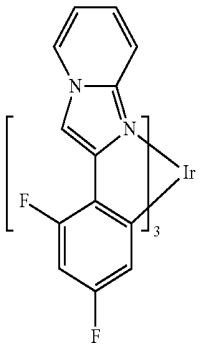
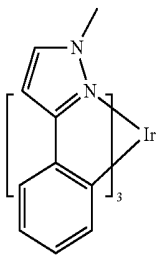
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20020134984
		Angew, Chem. Int Ed. 47, 4542 (2008)
		Chem. Mater. 18, 5119 (2006)
		Inorg. Chem. 46, 4308 (2007)
		WO2005123873

TABLE 1-continued

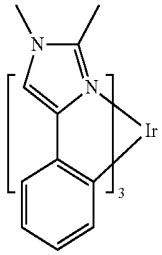
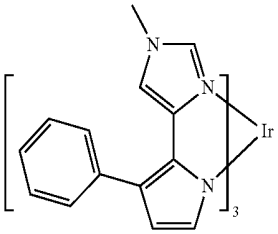
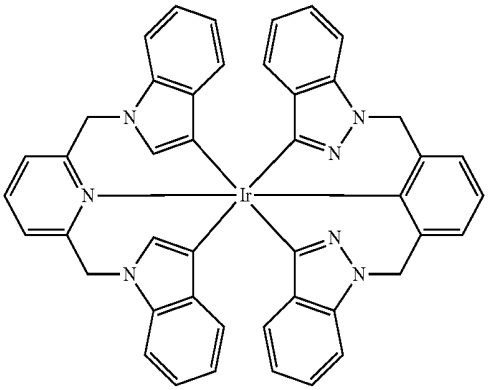
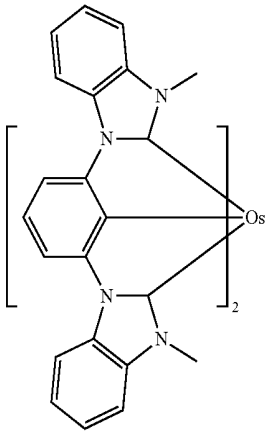
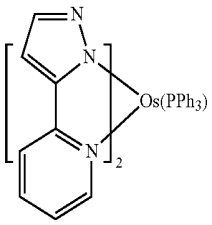
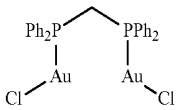
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		WO2005123873
		WO2007004380
		WO2006082742
Osminium(II) complexes		U.S. Pat. No. 7,279,704
		Organometallics 23, 3745 (2004)
Gold complexes		Appl. Phys. Lett. 74,1361 (1999)

TABLE 1-continued

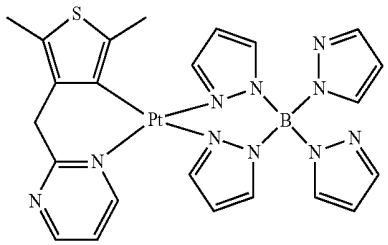
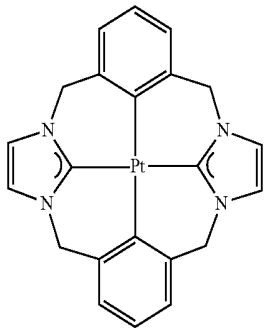
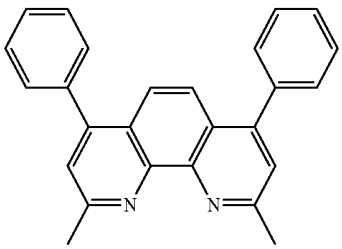
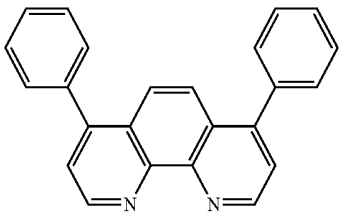
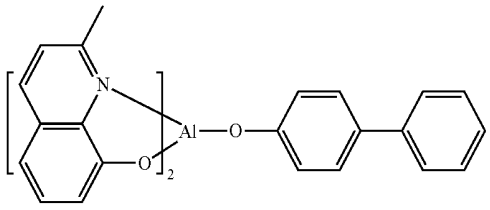
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Platinum (II) complexes		WO2006098120, WO2006103874
Pt tetradentate complexes with at least one metal-carbene bond		U.S. Pat. No. 7,655,323
Exciton/hole blocking layer materials		
Bathocuprine compounds (e.g., BCP, BPhen)		Appl. Phys. Lett. 75, 4 (1999)
		Appl.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

TABLE 1-continued

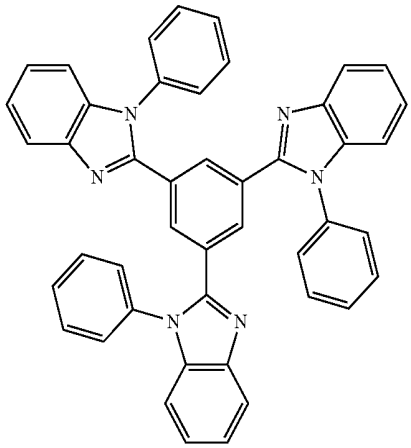
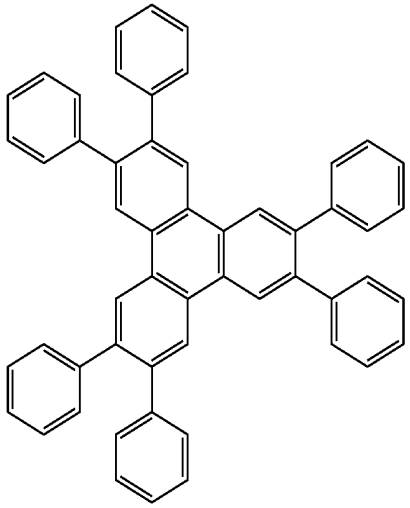
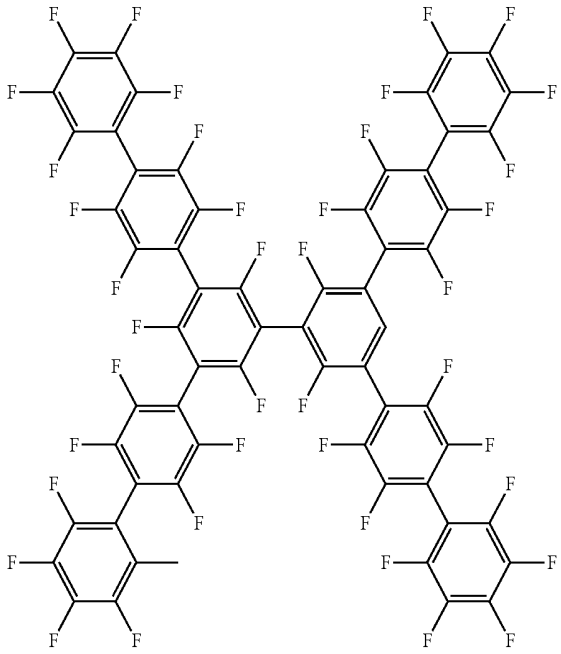
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
5-member ring electron deficient heterocycles such as triazole, oxadiazole, imidazole, benzoimidazole		Appl. Phys. Lett. 81, 162 (2002)
Triphenylene compounds		US20050025993
Fluorinated aromatic compounds		Appl. Phys. Lett. 79, 156 (2001)

TABLE 1-continued

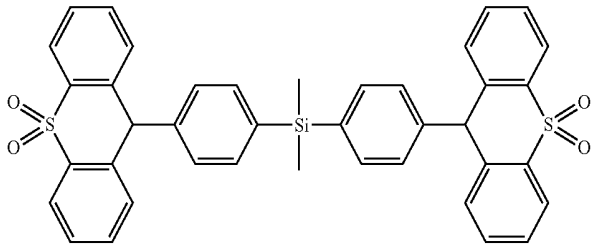
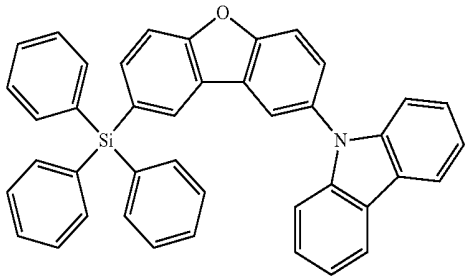
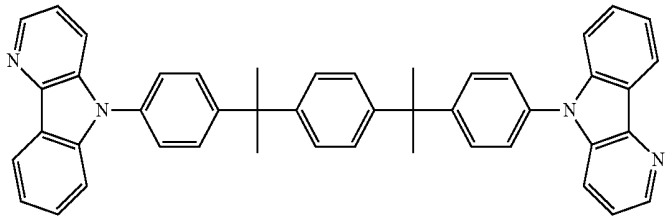
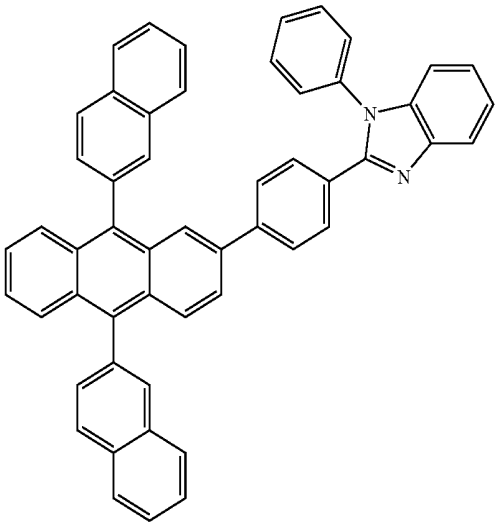
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Phenothiazine-S-oxide		WO2008132085
Silylated five-membered nitrogen, oxygen, sulfur or phosphorus dibenzoheterocycles		WO20110079051
Aza-carbazoles		US20060121308
Electron transporting materials		
Anthracene-benzoimidazole compounds		WO2003060956

TABLE 1-continued

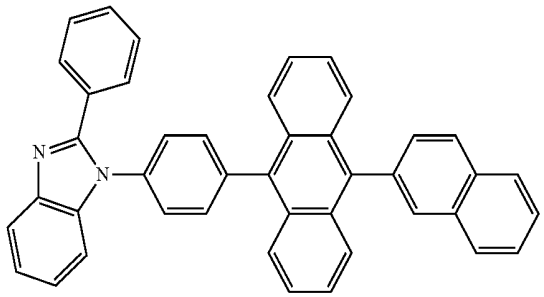
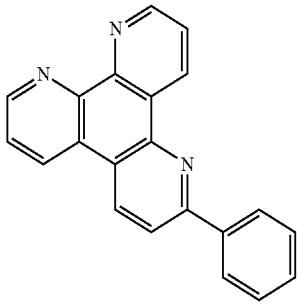
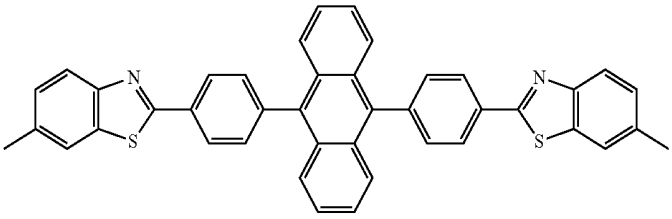
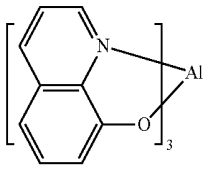
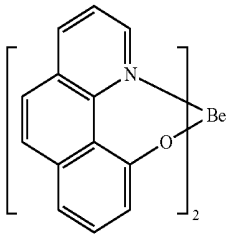
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
		US20090179554
Aza triphenylene derivatives		US20090115316
Anthracene-benzothiazole compounds		Appl. Phys. Lett. 89, 063504 (2006)
Metal 8-hydroxyquinolates (e.g., Alq_3, Zrq_4)		Appl. Phys. Lett. 51, 913 (1987) U.S. Pat. No. 7,230,107
Metal hydroxybenoquinolates		Chem. Lett. 5, 905 (1993)

TABLE 1-continued

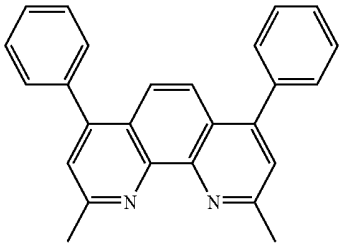
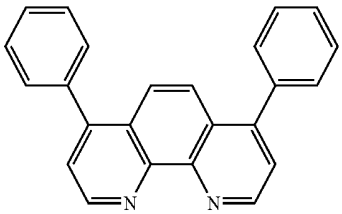
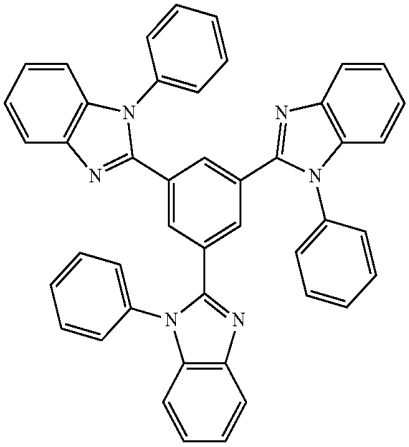
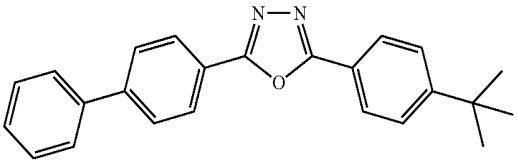
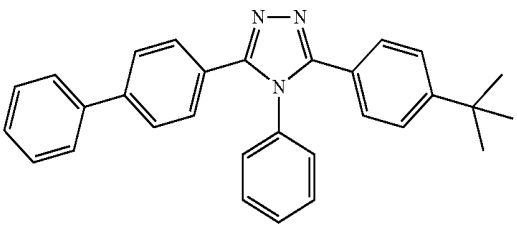
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Bathocuprine compounds such as BCP, BPhen, etc		Appl. Phys. Lett. 91, 263503 (2007)
		Appl. Phys. Lett. 79, 449 (2001)
5-member ring electron deficient heterocycles (e.g.,triazole, oxadiazole, imidazole, benzoimidazole)		Appl. Phys. Lett. 74, 865 (1999)
		Appl. Phys. Lett. 55, 1489 (1989)
		Jpn. J. Apply. Phys .32, L917 (1993)

TABLE 1-continued

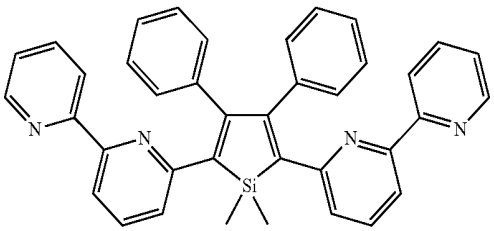
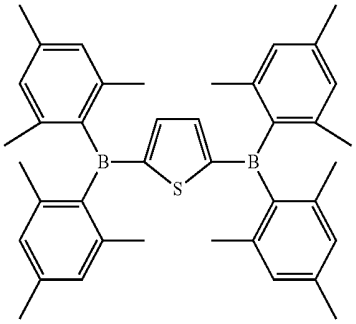
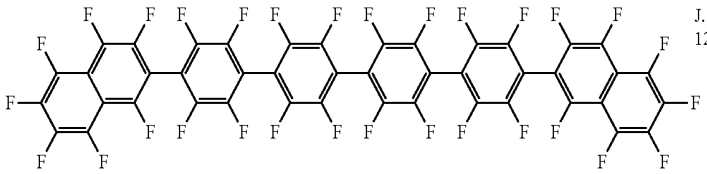
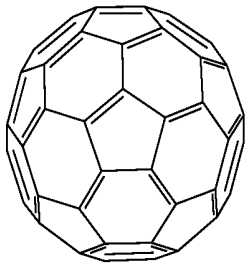
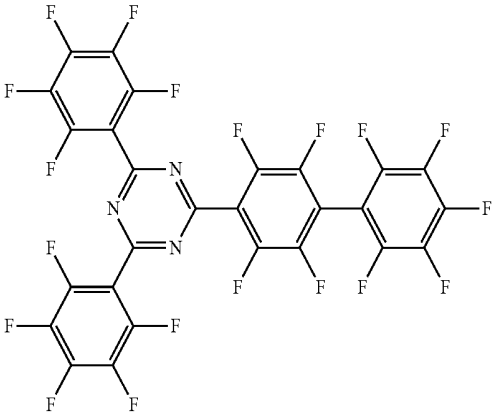
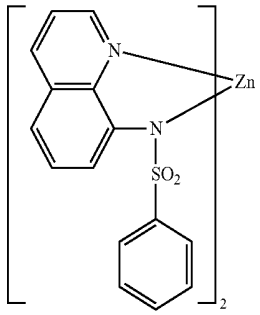
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Silole compounds		Org. Electron. 4, 113 (2003)
Arylborane compounds		J. Am. Chem. Soc. 120, 9714 (1998)
Fluorinated aromatic compounds		J. Am. Chem. Soc. 122, 1832 (2000)
Fullerene (e.g., C60)		US20090101870
Triazine complexes		US20040036077

TABLE 1-continued

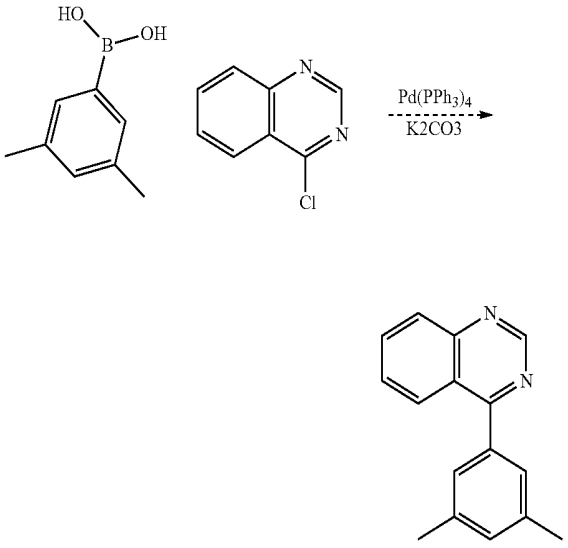
MATERIAL	EXAMPLES OF MATERIAL	PUBLICATIONS
Zn (N^N) complexes		U.S. Pat. No. 6,528,187

Experimental

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

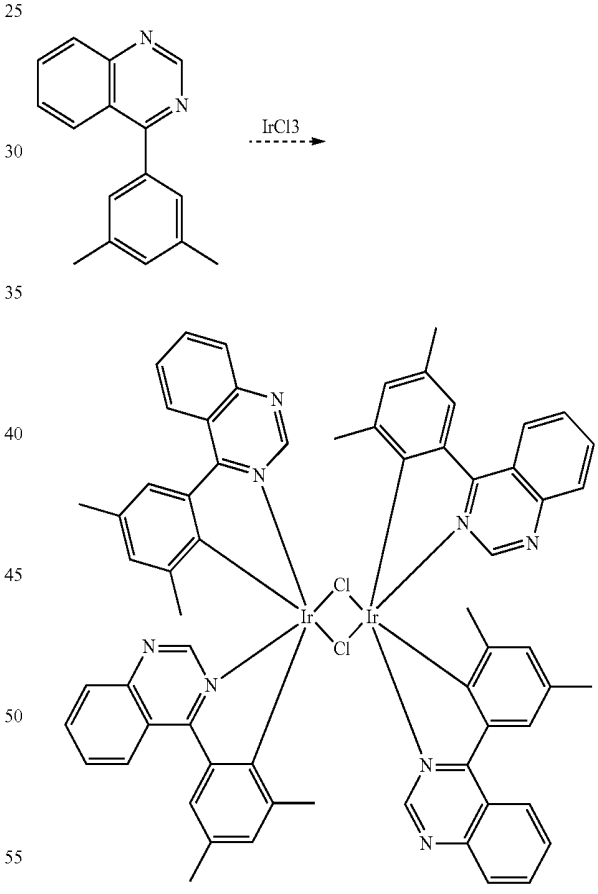
Synthesis of Compound 81

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



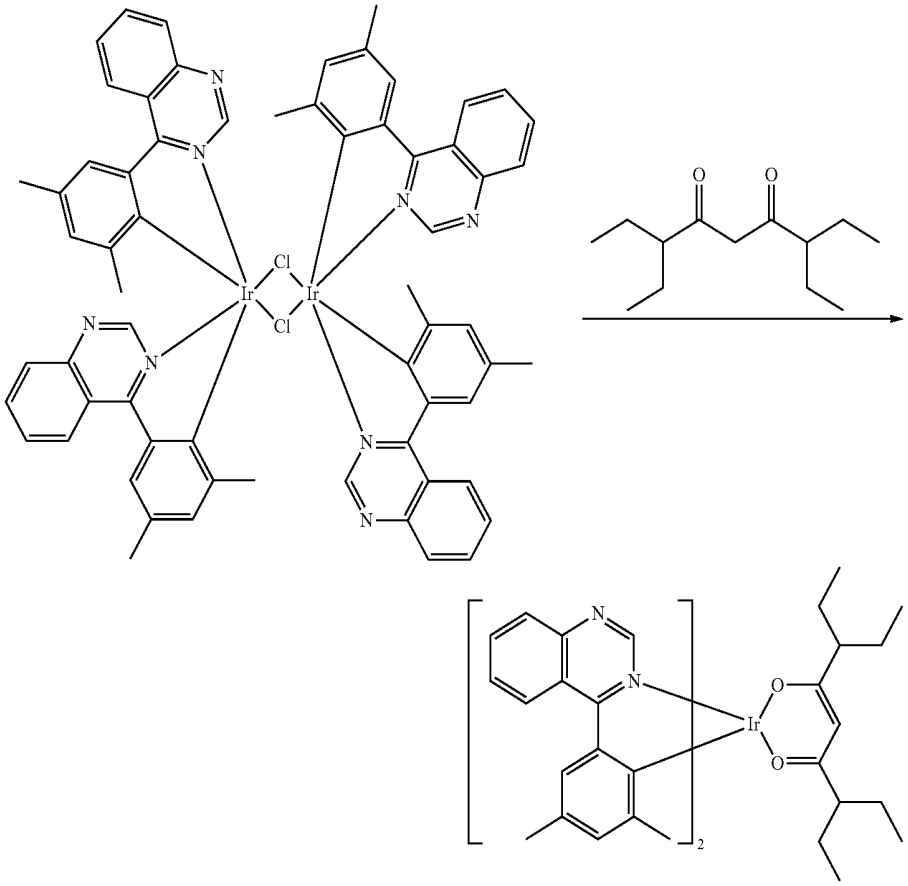
(3,5-Dimethylphenyl)boronic acid (5.75 g, 38.4 mmol), 4-chloroquinazoline (5.05 g, 30.7 mmol), and K_2CO_3 (8.48 g, 61.4 mmol) were dissolved in toluene (150 mL) and water (30 mL). The mixture was degassed by bubbling it with nitrogen for 30 minutes and adding tetrakis(triphenylphosphine)palladium ($Pd(PPh_3)_4$) (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



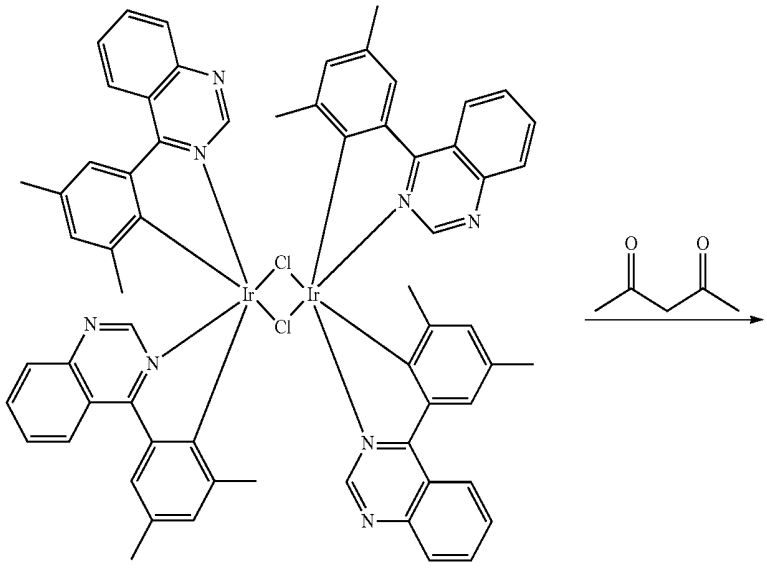
The 4-(3,5-Dimethylphenyl)quinazoline (2.50 g, 10.7 mmol) was solubilized in ethoxyethanol (30 mL) and water (10 mL) and degassed by bubbling with nitrogen for 30 minutes. Iridium chloride (1.32 g, 3.56 mmol) was then added to the mixture and the reaction was refluxed under nitrogen for 24 h. After cooling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

Synthesis of Compound 81



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).

Synthesis of Comparative Compound 1



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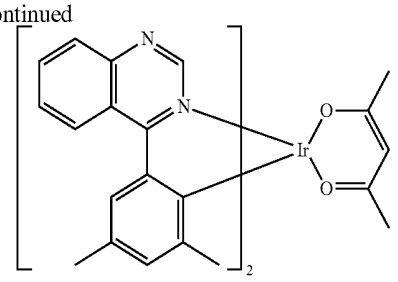


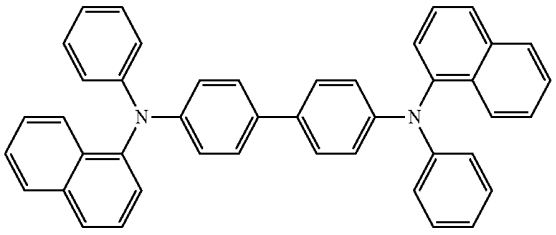
The Ir(III) Dimer (2.50 g, 1.44 mmol)(see above) and pentane-2,4-dione (1.48 g, 14.4 mmol) were diluted in 2-ethoxyethanol (48 mL) and degassed by bubbling nitrogen. Potassium carbonate (1.99 g, 14.4 mmol) was then added to the mixture, which was then stirred at room temperature for 24 h. The solvent 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

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 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 H_2O and O_2) immediately after fabrication, and a moisture getter was incorporated inside the package.

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 BAlq as a host and compound H as a stability dopant (SD) with as an emissive layer (EML), 100 Å of BAlq as a blocking layer (BL), and 450 Å of Alq_3 (tris-8-hydroxyquinoline aluminum) as an electron transport layer (ETL).

The device results and data are summarized in Tables 2 and 3 from those devices. As used herein, NPD, Alq_3, BAlq, SD have the following structures:disclosure



NPD

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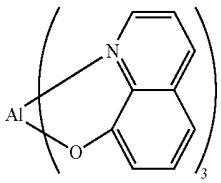
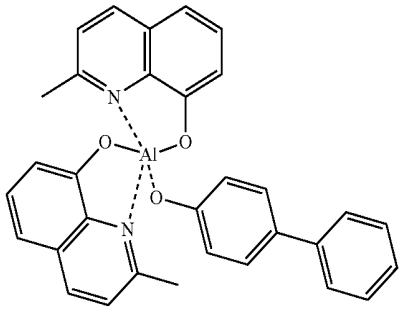


Alq_3



BAlq

Compound H

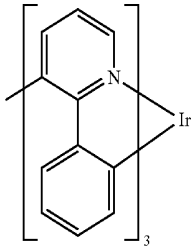


TABLE 2

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

TABLE 2-continued

Device structures of inventive compounds

	HIL	HTL		EML (400 Å, doping %)		BL	ETL
Comparative Example	LG101 100 Å	NPD 400 Å	BAlq	Compound H 9%	Comparative compound 1 3%	BAlq 100 Å	Alq 450 Å

TABLE 3

VTE device results

	1931 CIE				At 1,000 nits		
	CIE x	CIE y	λ max [nm]	FWHM [nm]	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

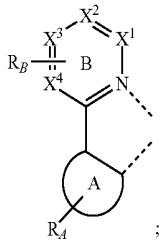
Table 3 summarizes the performance of the devices. The driving voltage (V), luminous efficiency (LE), and external quantum efficiency (EQE) were measured at 1000 nits. The EL spectra were measured at 10 mA/cm^2. Both device example and comparative example devices showed very deep red color with a CIE 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.

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:

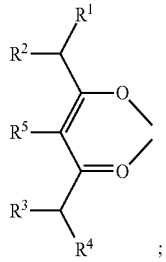
1. A compound having a formula $M(L_A)_x(L_B)_y(L_C)_z$:

wherein the ligand L_A is



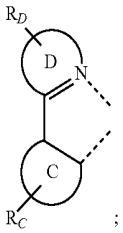
;

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 independently C or N, with the proviso that at least two of X^1, X^2, X^3, and X^4 that are adjacent to each other are carbon;

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

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

wherein R^5 is 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;

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, with the proviso that R_B is attached only to those of X^1, X^2, X^3, and X^4 that are carbon;

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 R_A, R_C, and R_D, and any R_B other than the two that form ring E, 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; and

wherein any adjacent substituents of R_A, 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 z is 1 or 2, ring C is benzene, and ring D is pyridine.

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

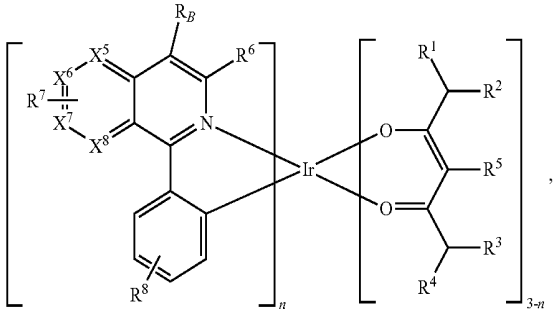
7. The compound of claim **1**, wherein R^5 is hydrogen.

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

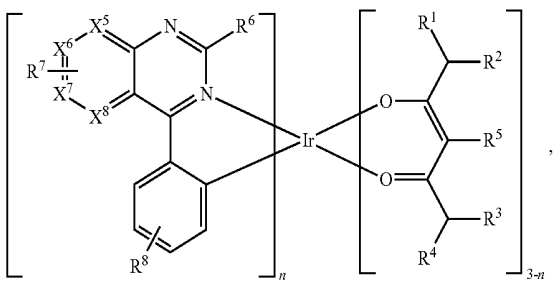
9. The compound of claim **1**, wherein R^1, R^2, R^3, and R^4 are independently selected from the group consisting of ethyl, propyl, 1-methylethyl, butyl, 1-methylpropyl, 2-methylpropyl, pentyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl, 1,1-dimethylpropyl, 1,2-dimethylpropyl, 2,2-dimethylpropyl, 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(C)



Formula I(N)



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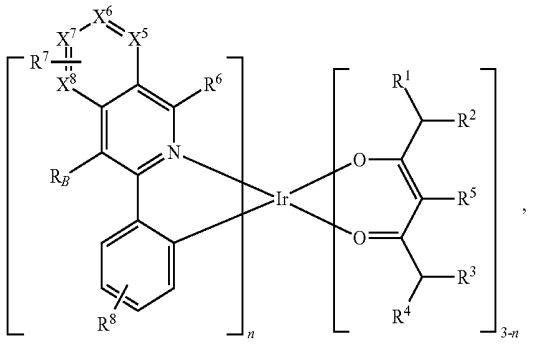
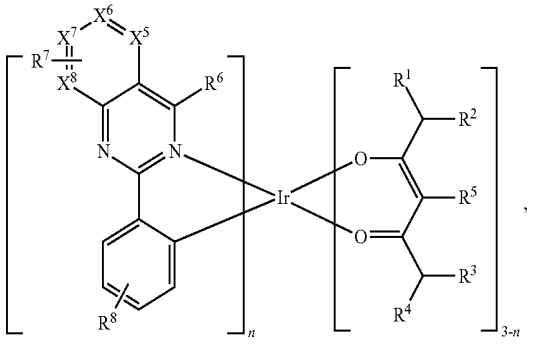
Formula II(C)

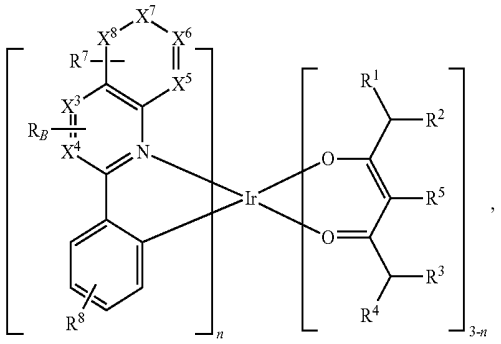


Formula II(N)



and

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 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;

wherein, in Formula III, X^3, X^4 or both are N, R_B is attached to X^3 only when X^3 is carbon, and R_B is attached to X^4 only when X^4 is carbon; and

wherein n is 1 or 2.

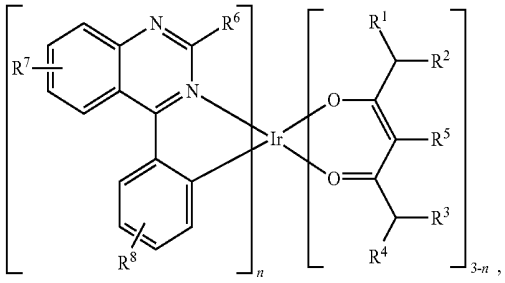
11. The compound of claim **10**, wherein R^6, and R^7 are independently selected from the group consisting of hydrogen, deuterium, alkyl, cycloalkyl, and combinations thereof.

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

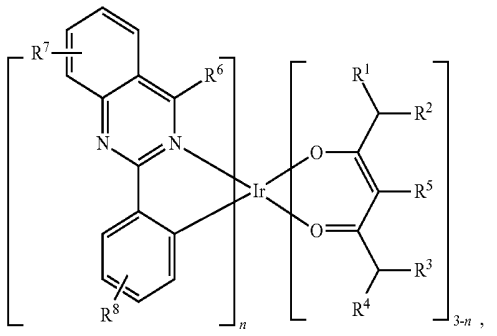
13. The compound of claim **10**, wherein n is 2.

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

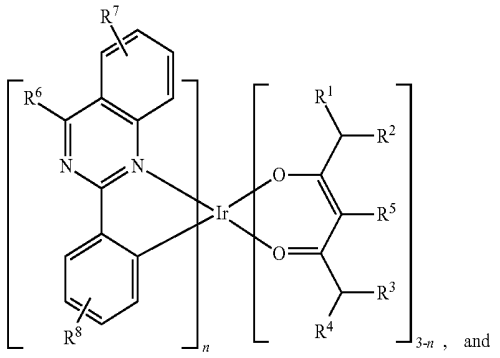
Formula IV



Formula V

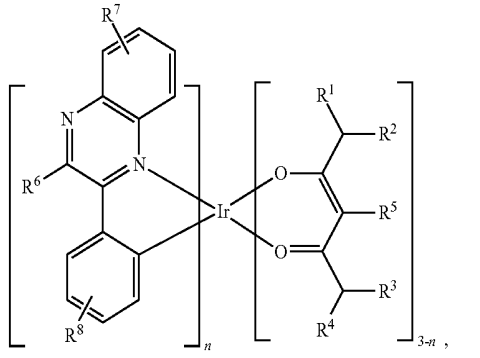


Formula VI



and

Formula VII



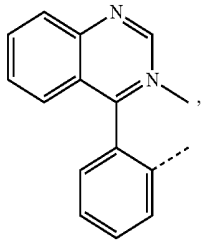
wherein R^7, and R^8 each independently represent mono, di, tri, or tetra-substitution, or no substitution;

wherein R^6, R^7, and R^8 are independently selected from 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

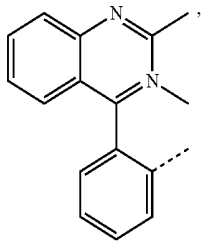
wherein n is 1 or 2.

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

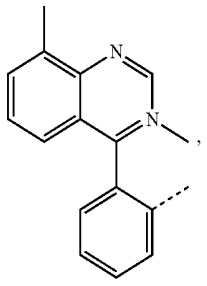
L_{A1}



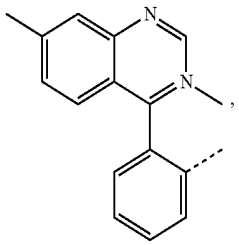
L_{A2}



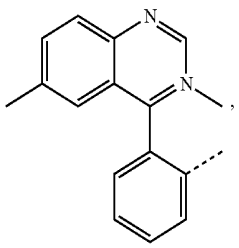
L_{A3}



L_{A4}



L_{A5}



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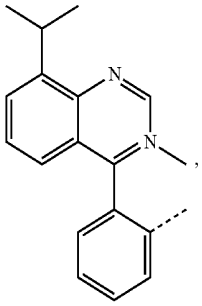
L_{A6}



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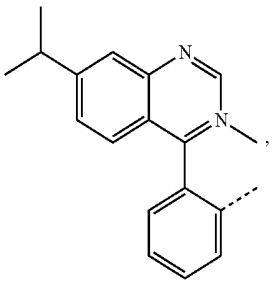

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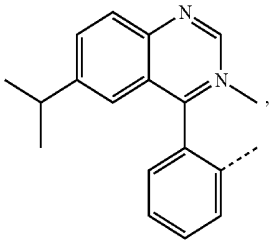

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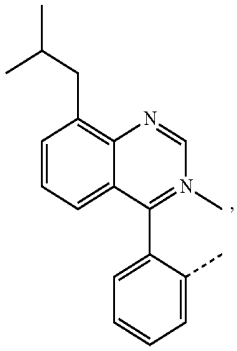

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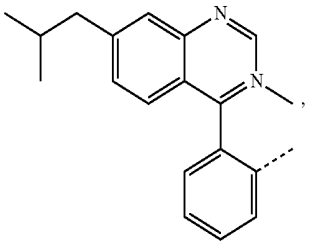

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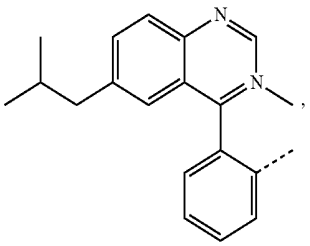

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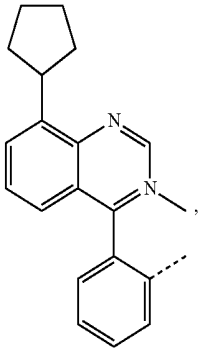

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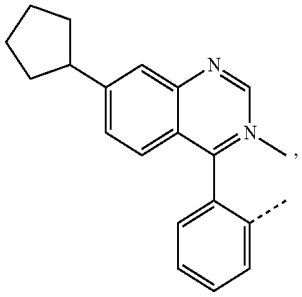

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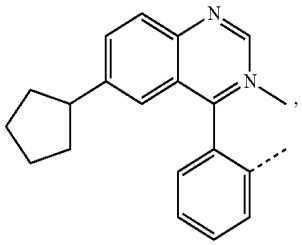

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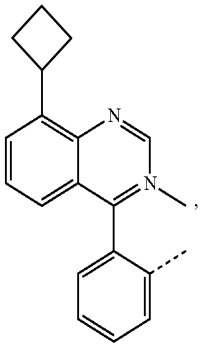

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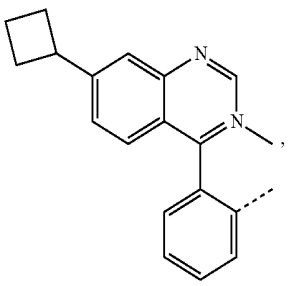

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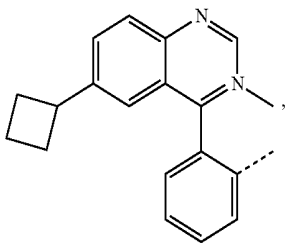

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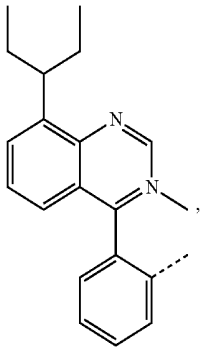

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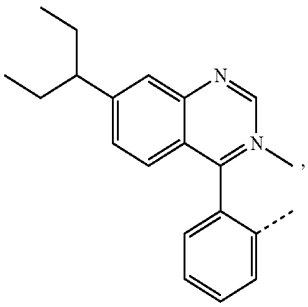

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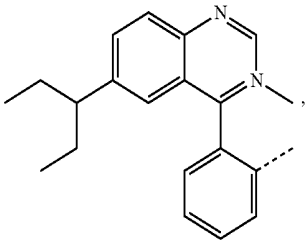

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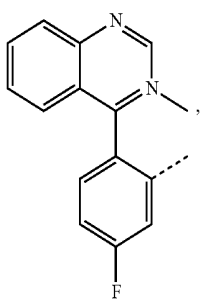

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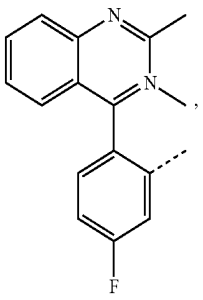

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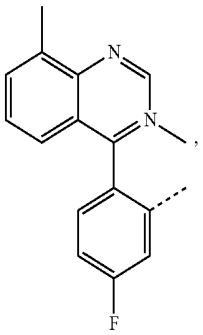

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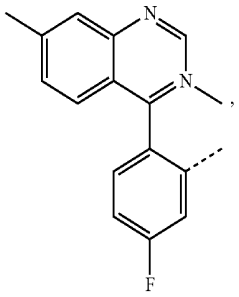

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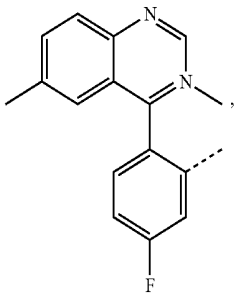

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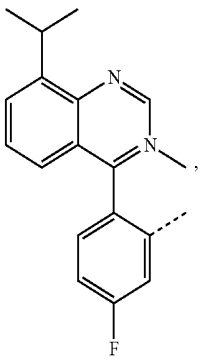

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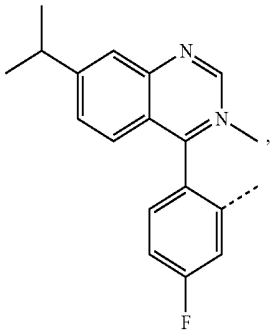

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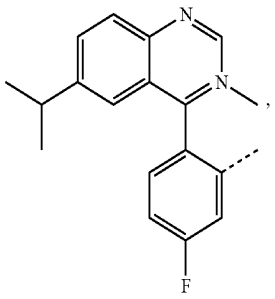

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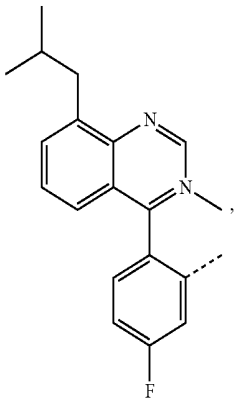

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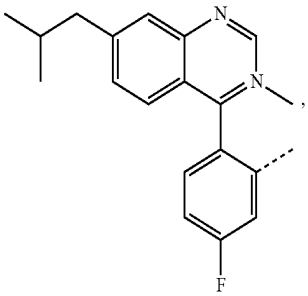

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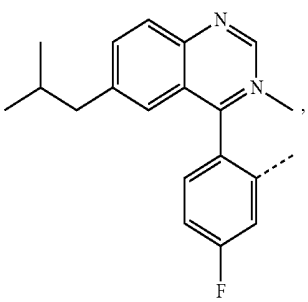

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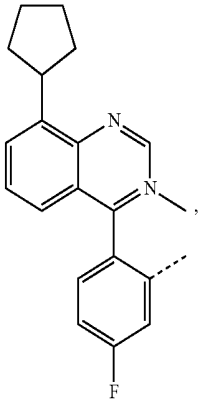

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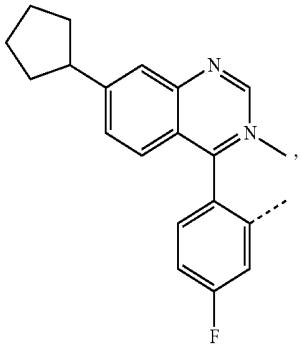

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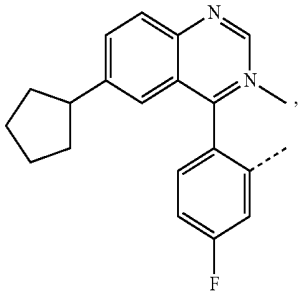

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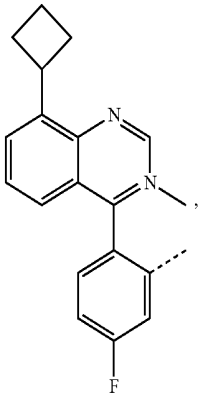

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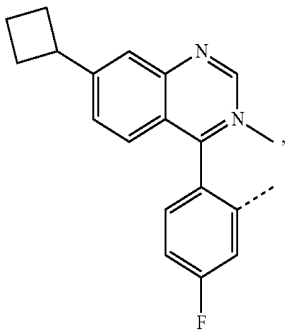

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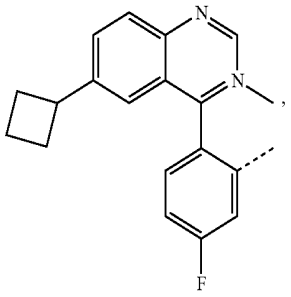

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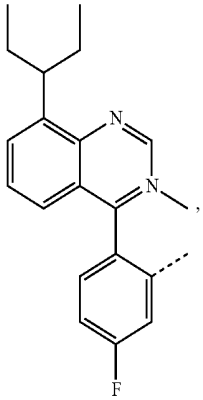

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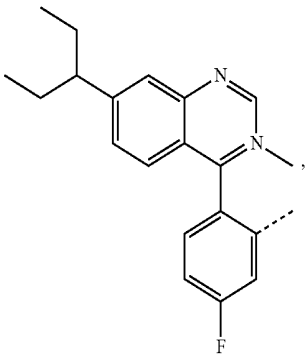

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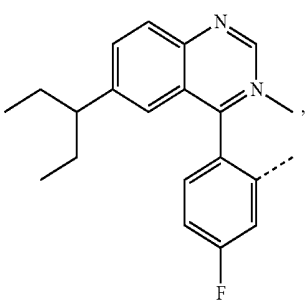

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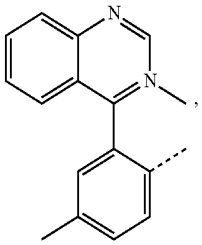

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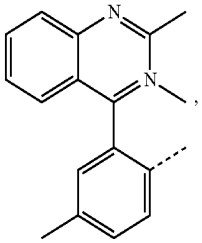

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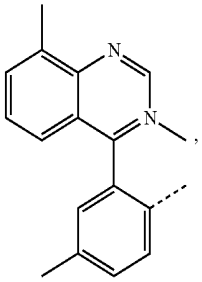

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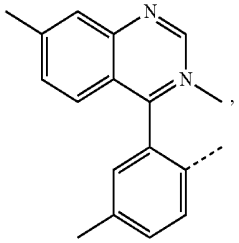

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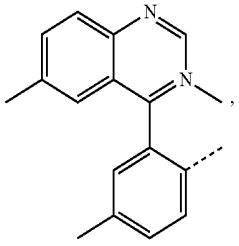

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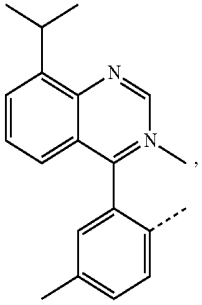

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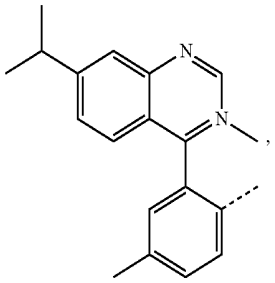

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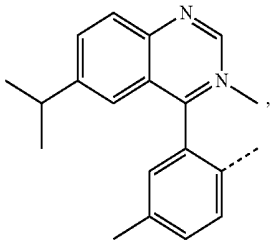

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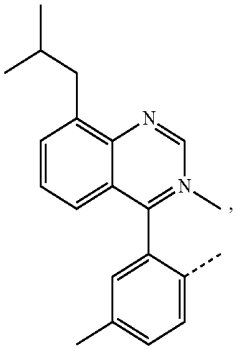

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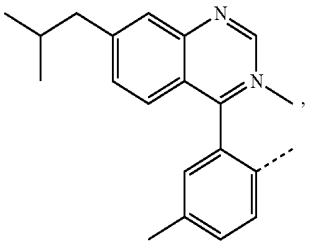

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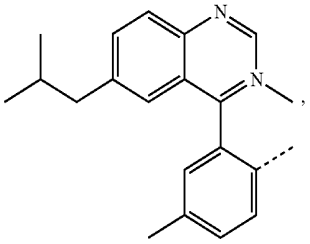

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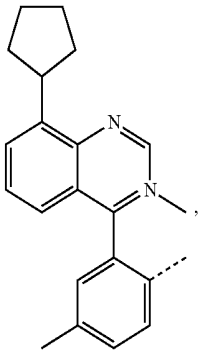

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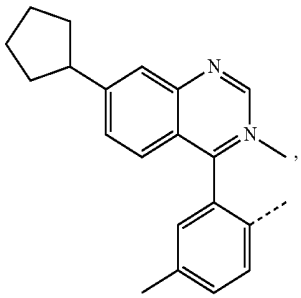

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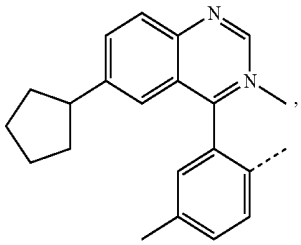

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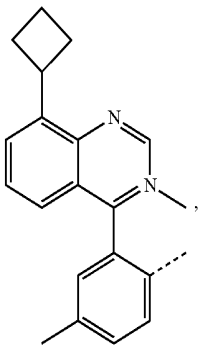

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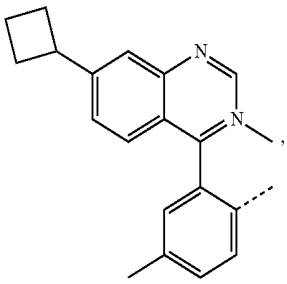

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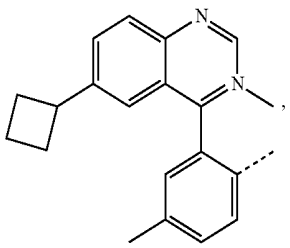

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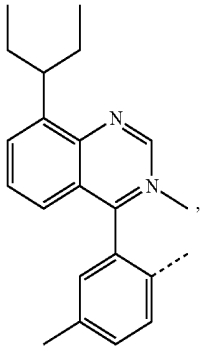

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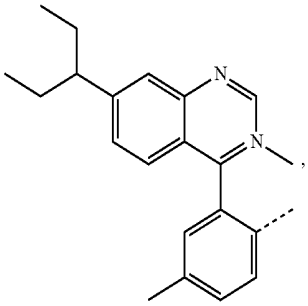

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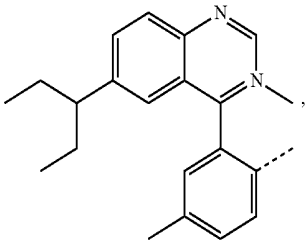

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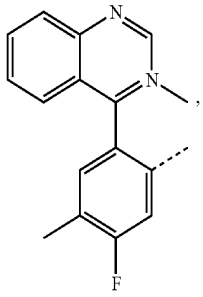

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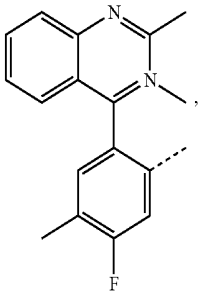

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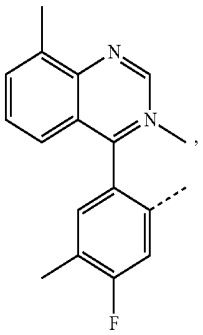

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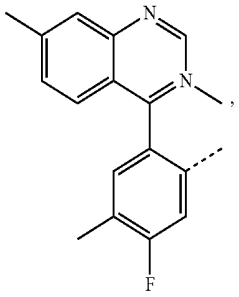

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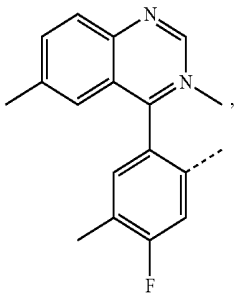

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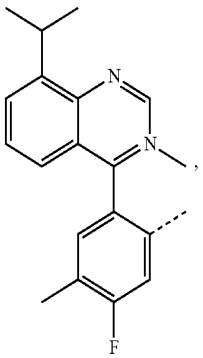

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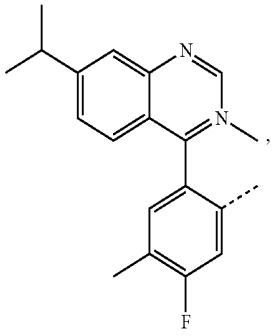

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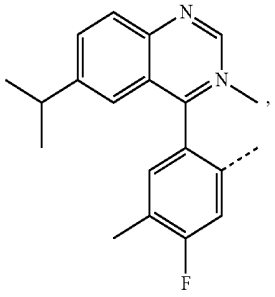

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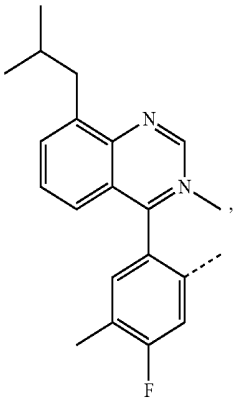

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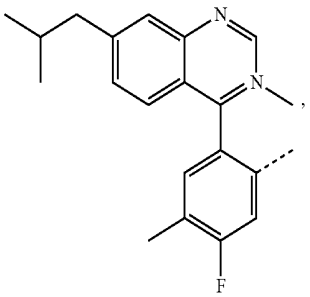

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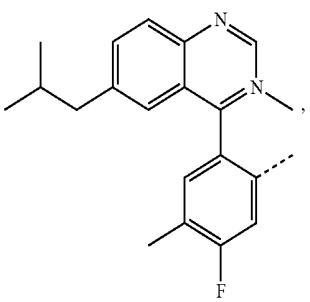

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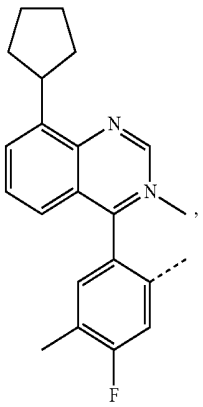

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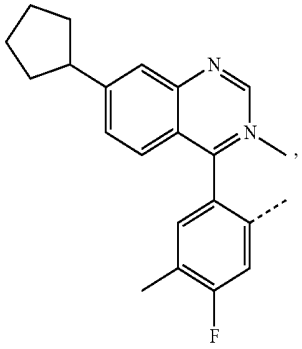

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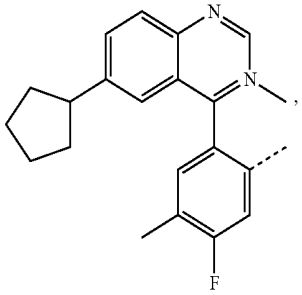

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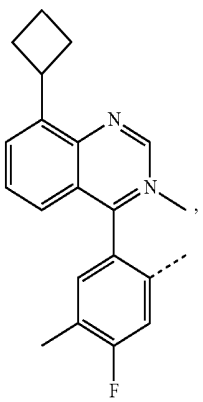

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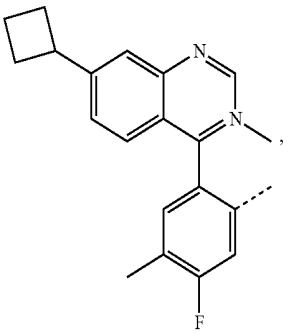

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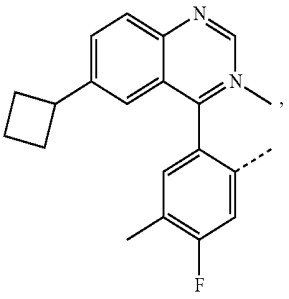

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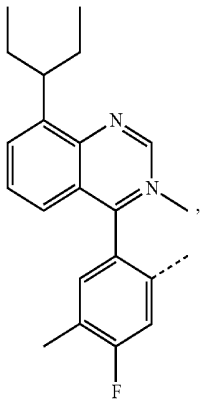

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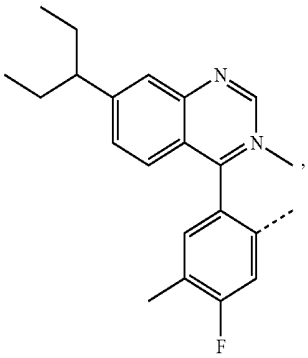

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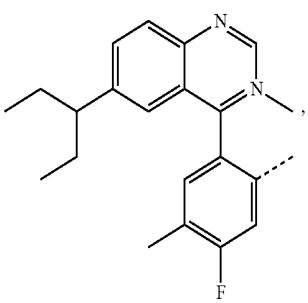

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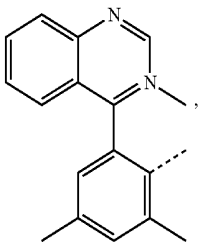

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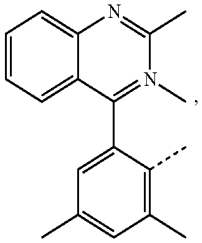

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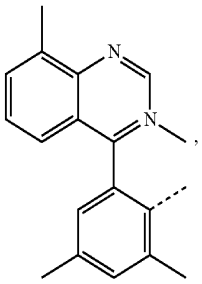

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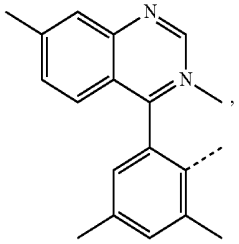

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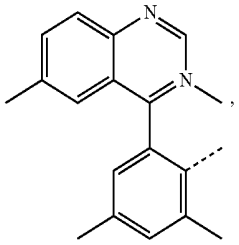

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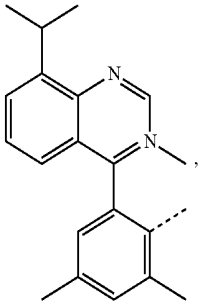

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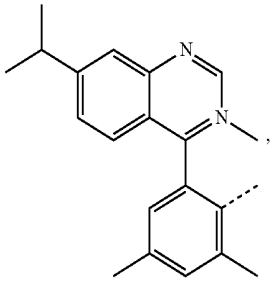

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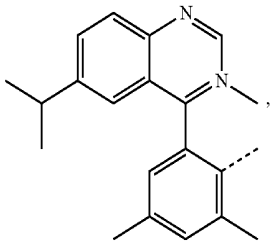

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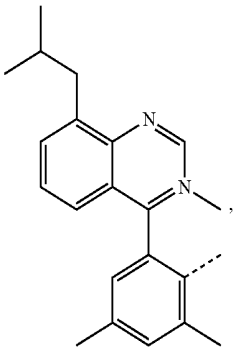

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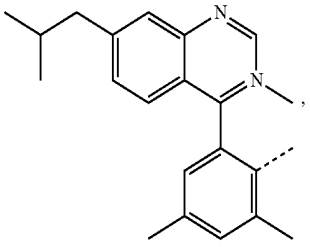

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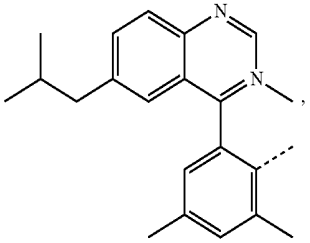

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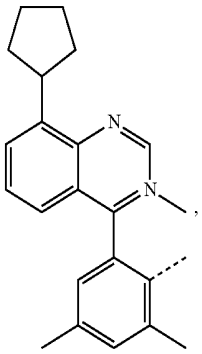

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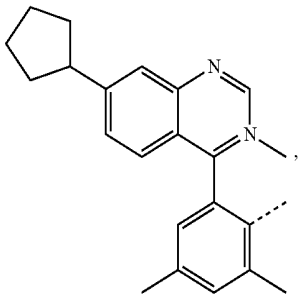

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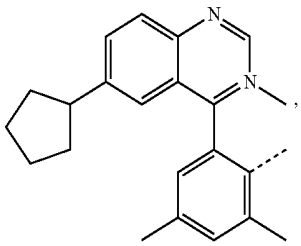

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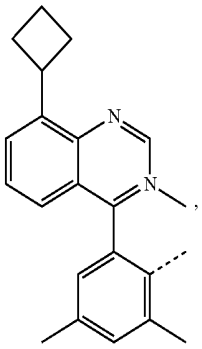

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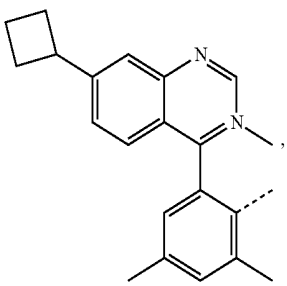

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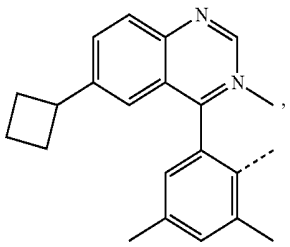

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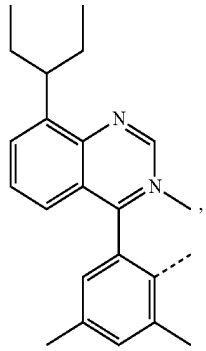

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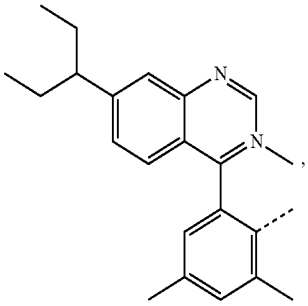

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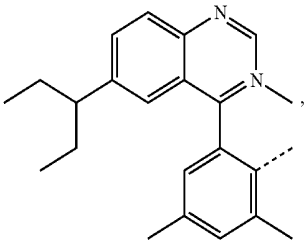

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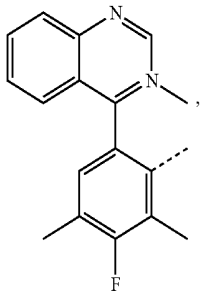

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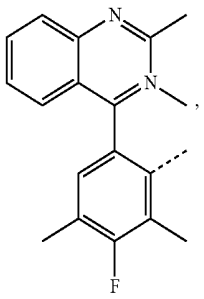

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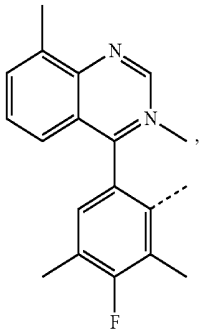

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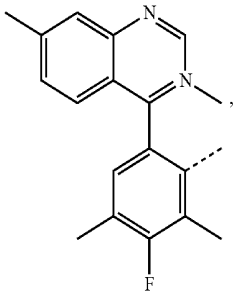

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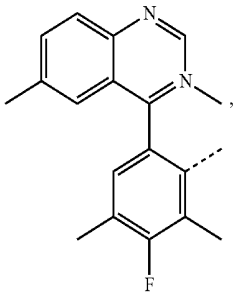

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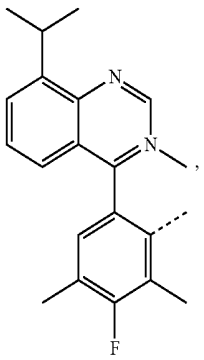

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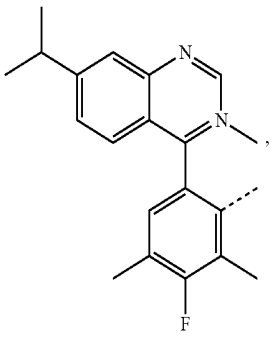

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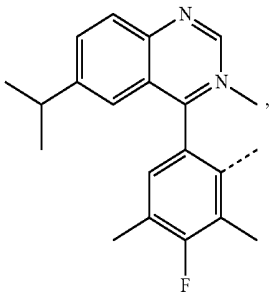

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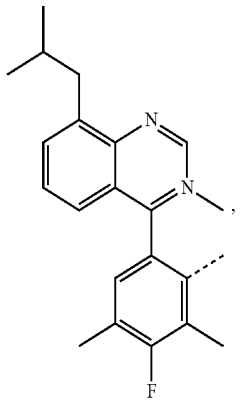

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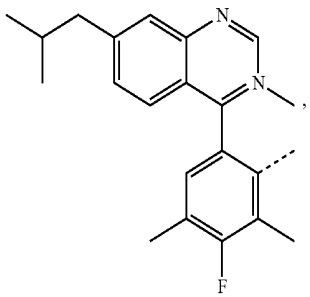

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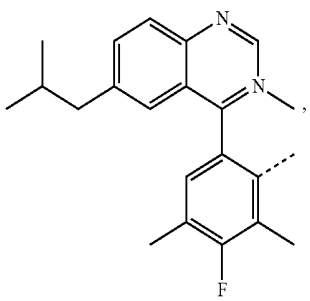

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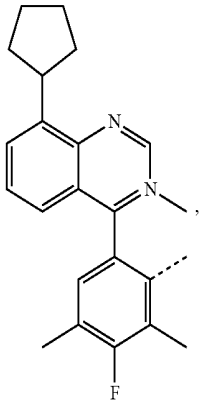

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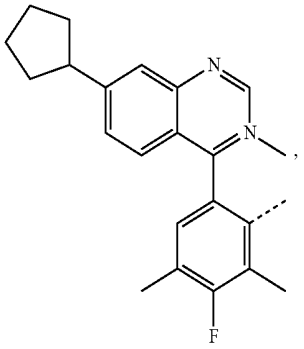

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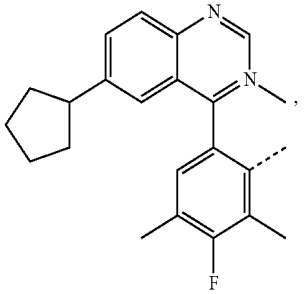

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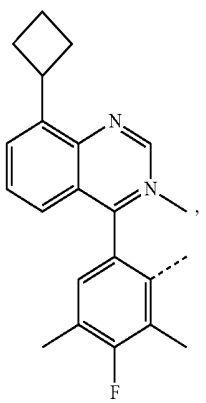

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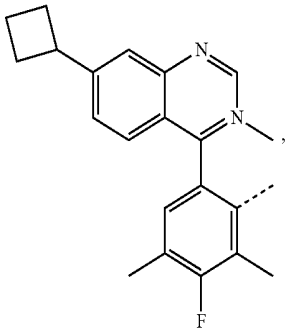

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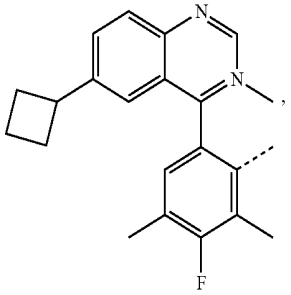

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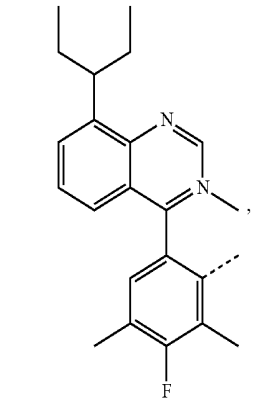

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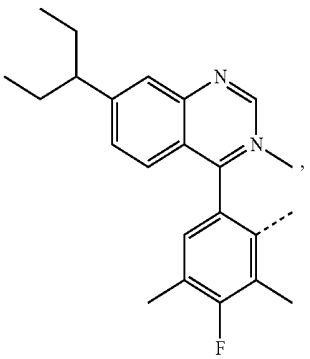

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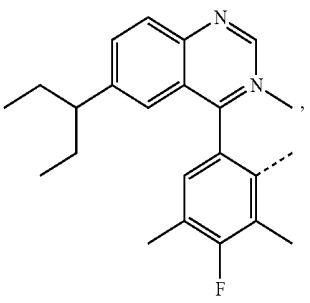

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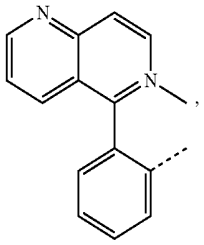

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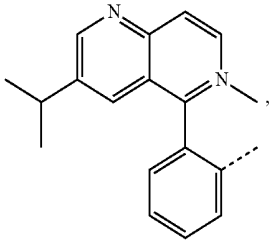

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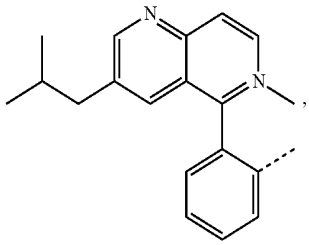

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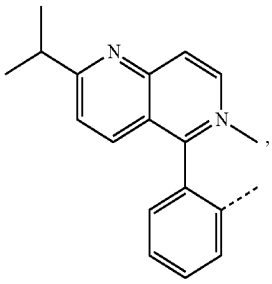

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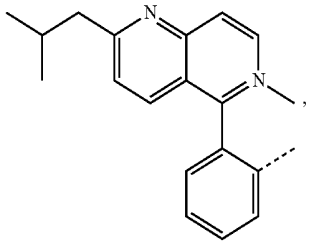

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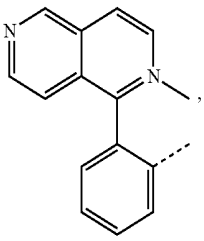

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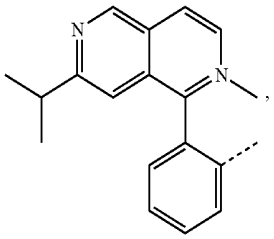

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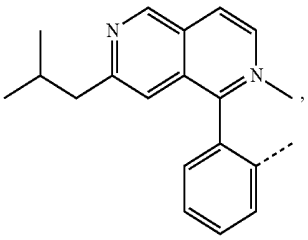

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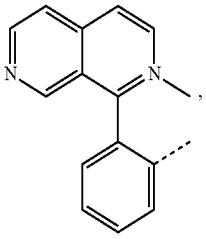

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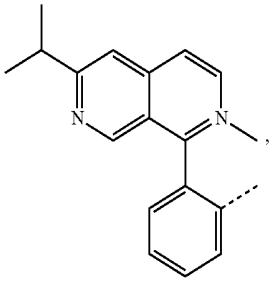

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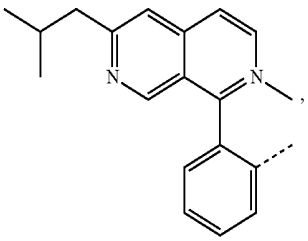

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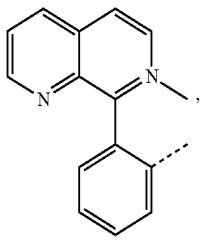

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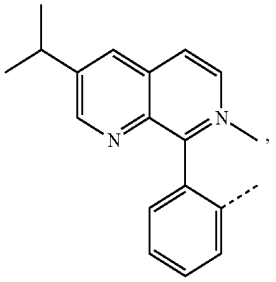

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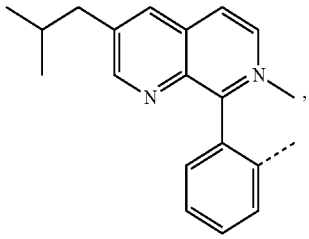

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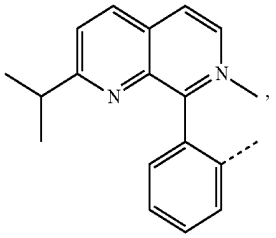

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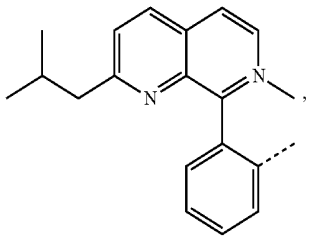

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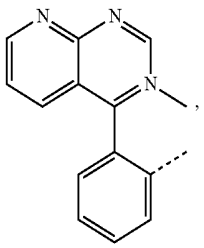

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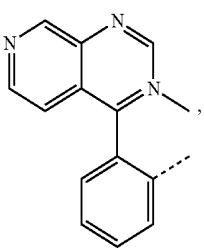

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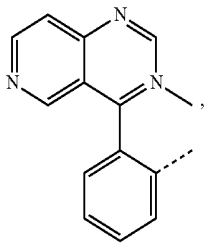

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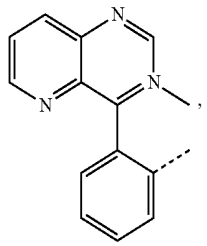

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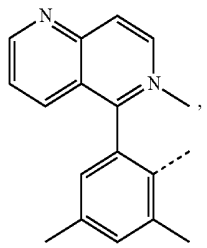

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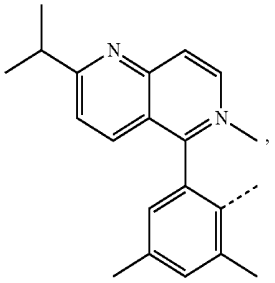

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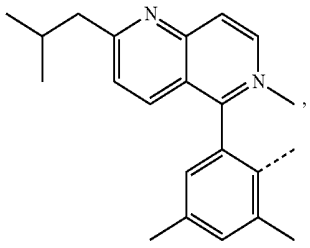

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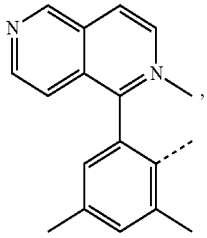

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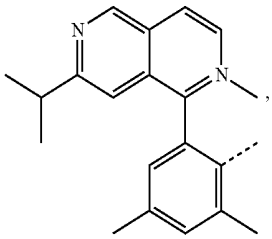

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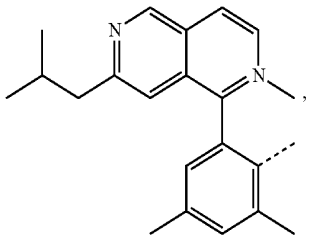

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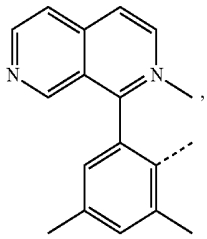

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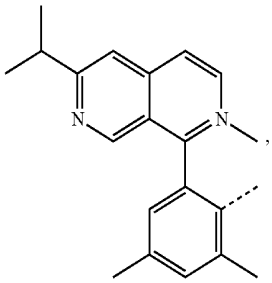

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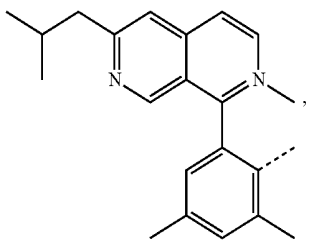

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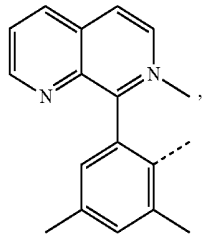

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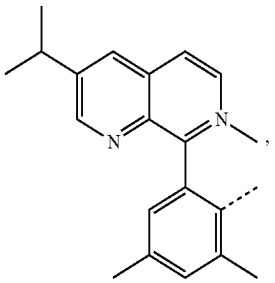

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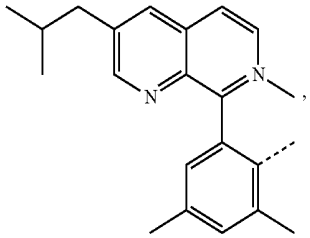

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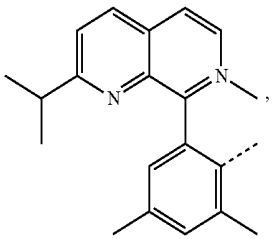

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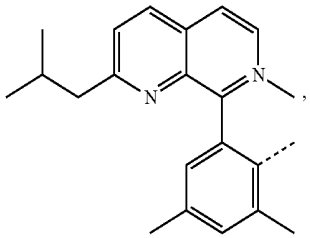

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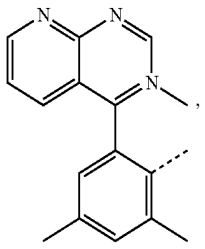

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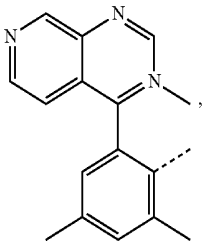

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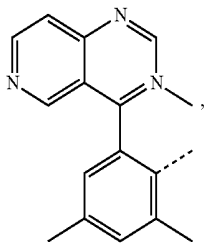

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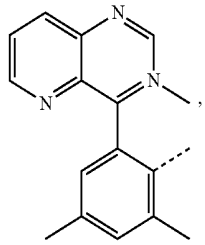

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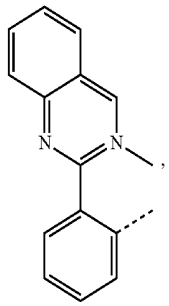

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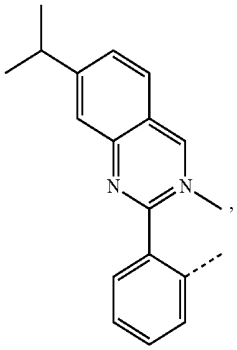

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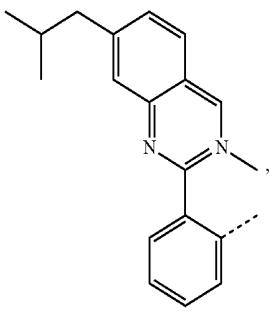

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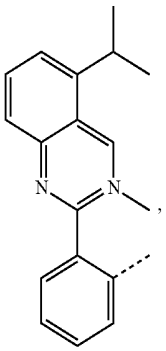

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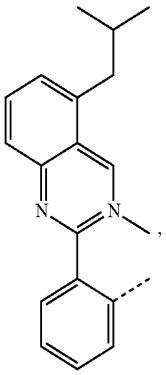

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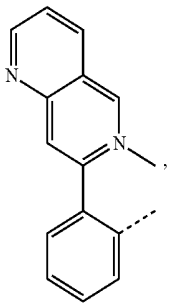

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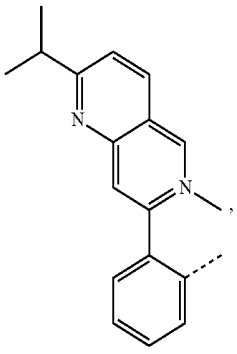

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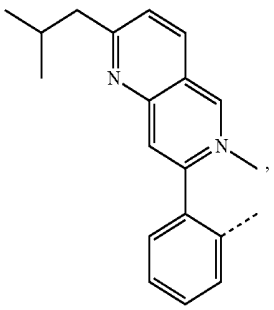

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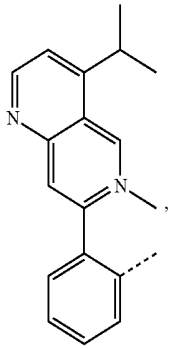

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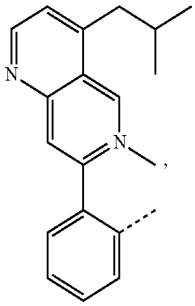

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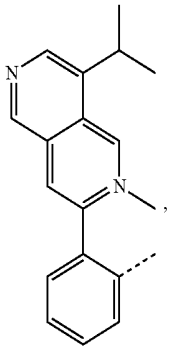

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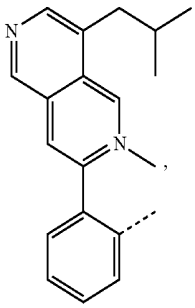

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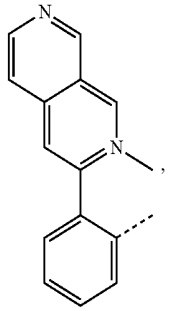

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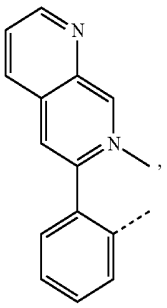

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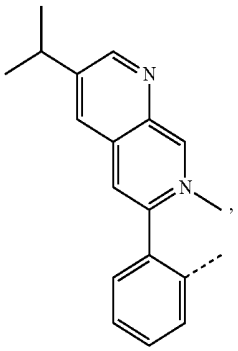

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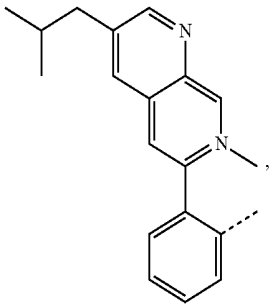

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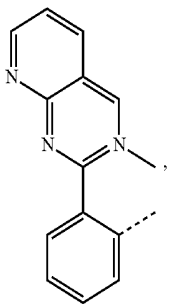

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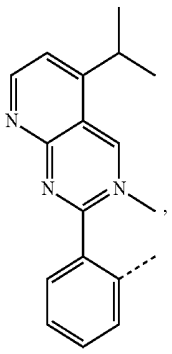

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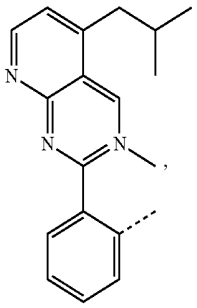

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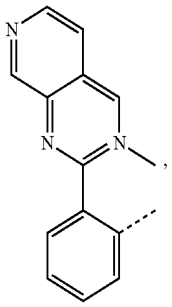

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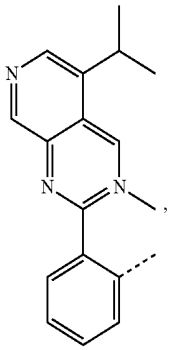

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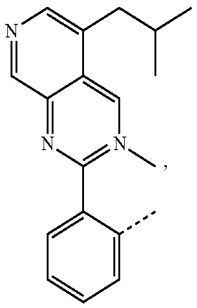

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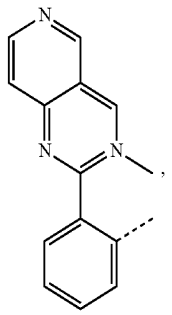

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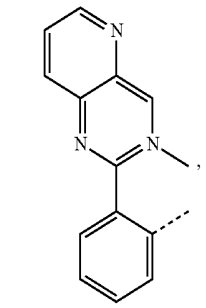

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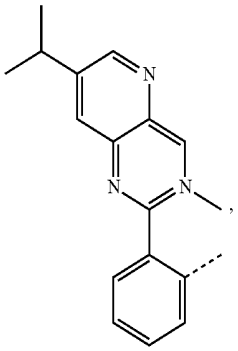

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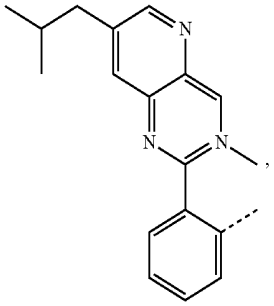

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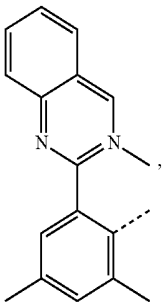

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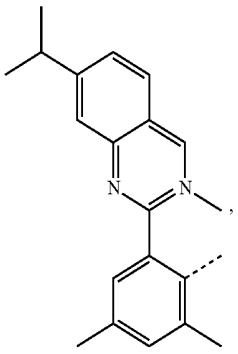

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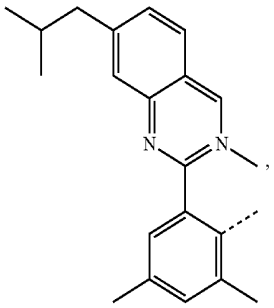

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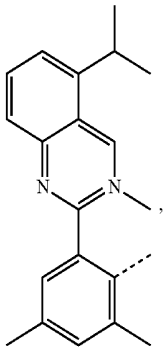

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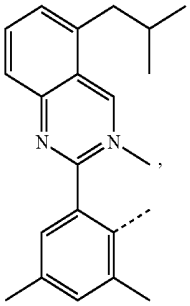

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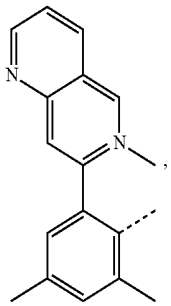

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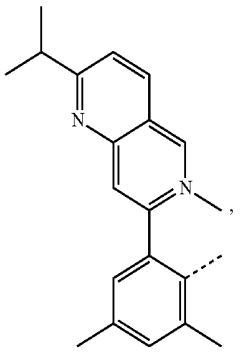

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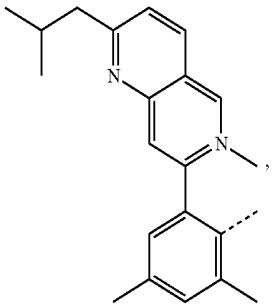

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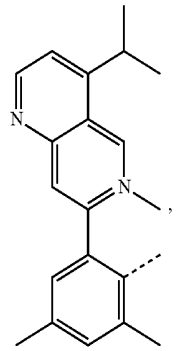

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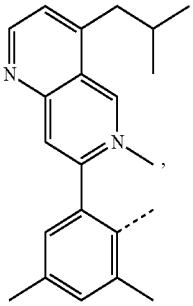

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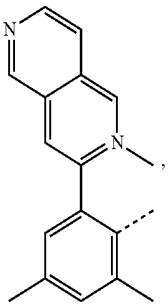

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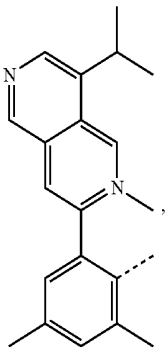

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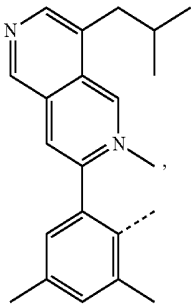

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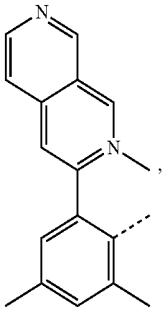

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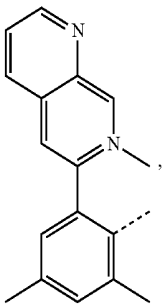

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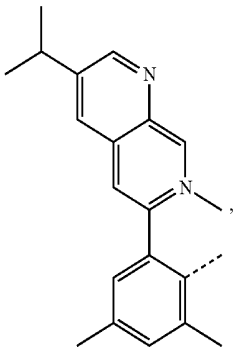

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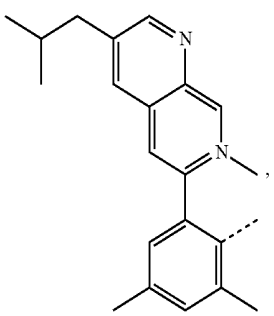

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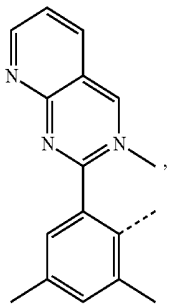

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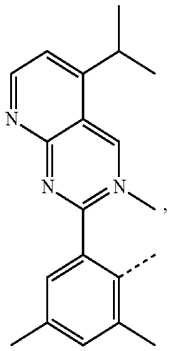

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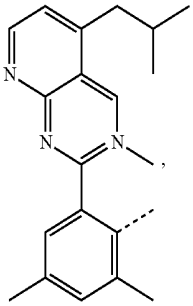

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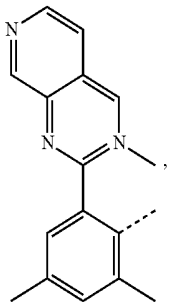

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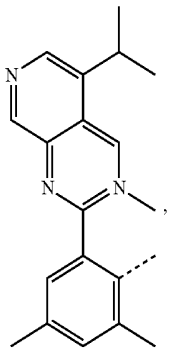

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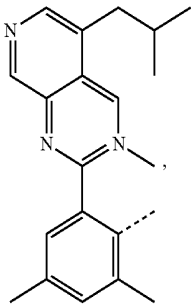

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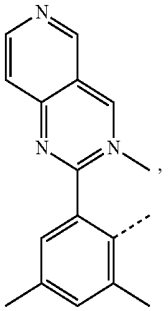

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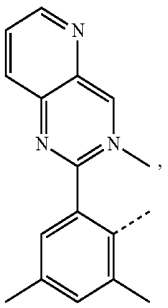

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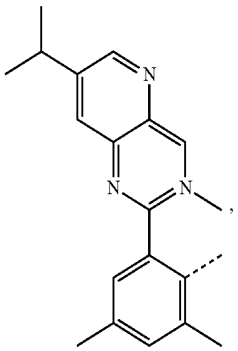

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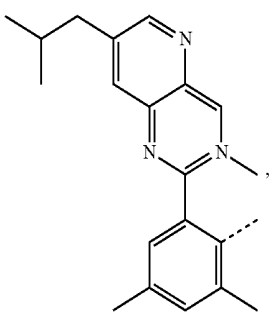

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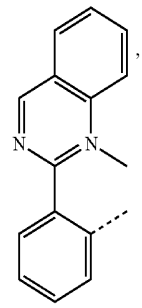

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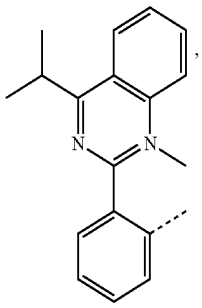

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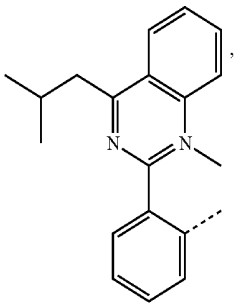

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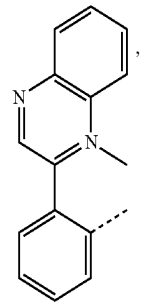

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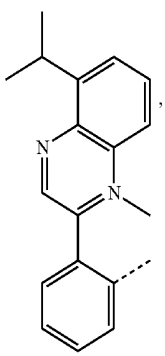

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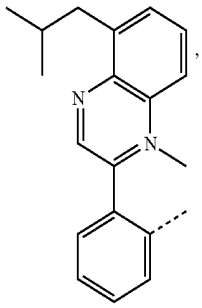

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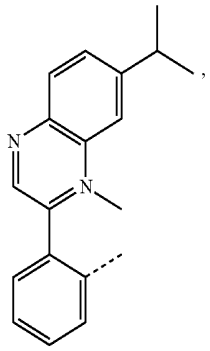

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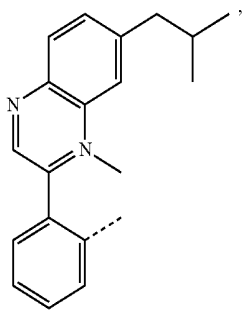

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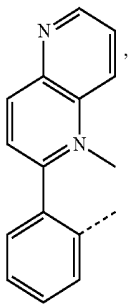

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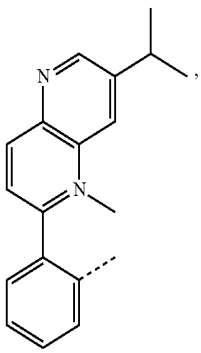

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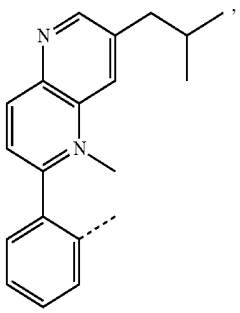

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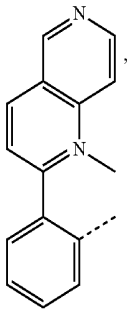

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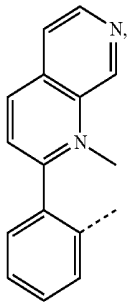

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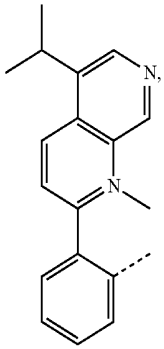

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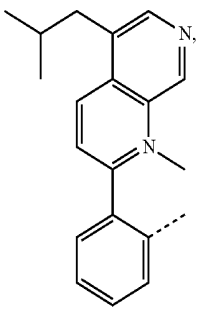

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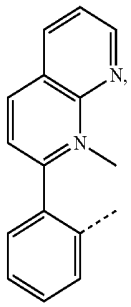

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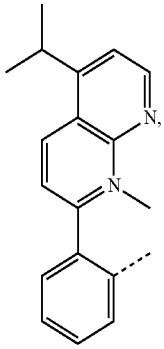

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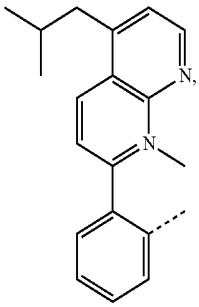

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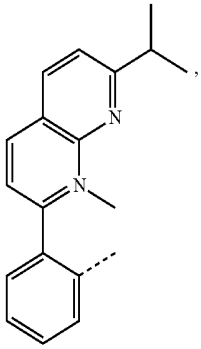

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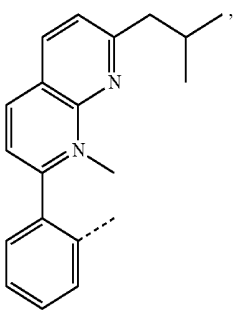

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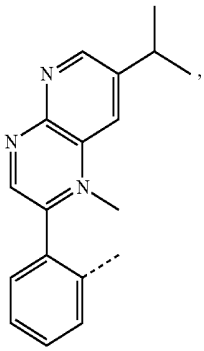

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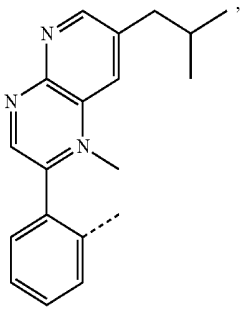

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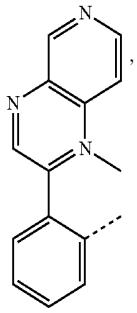

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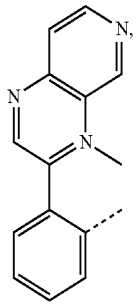

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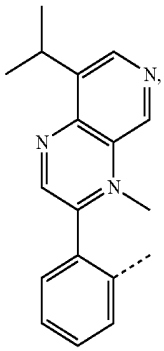

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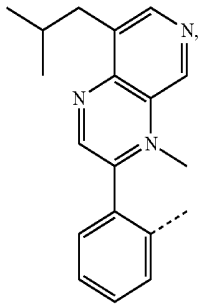

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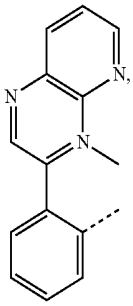
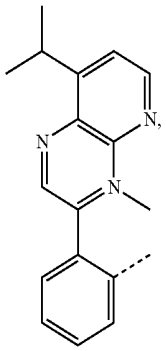
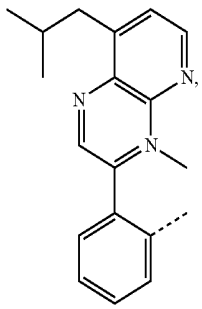


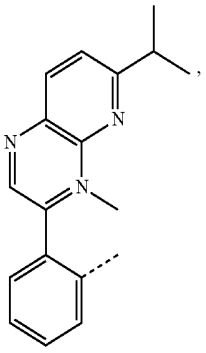
L_{A238}



L_{A239}



L_{A240}



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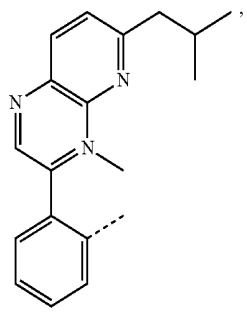
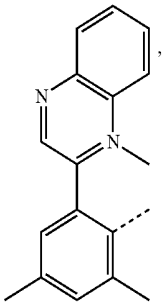
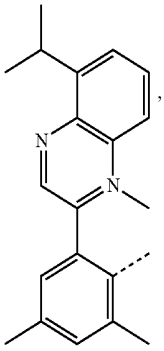
L_{A241}



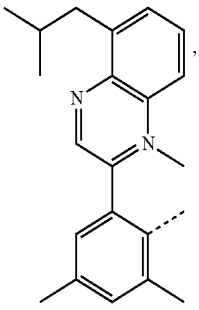
L_{A242}



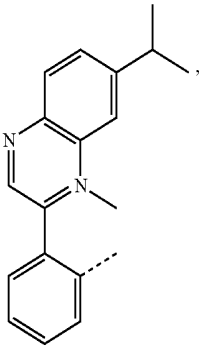
L_{A243}



L_{A244}



L_{A245}



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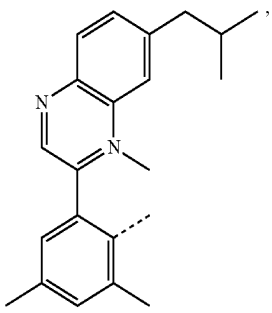
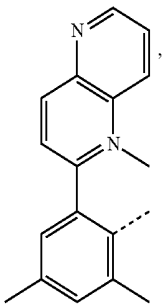
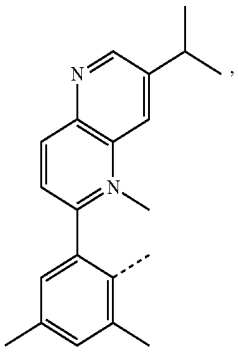
L_{A246}



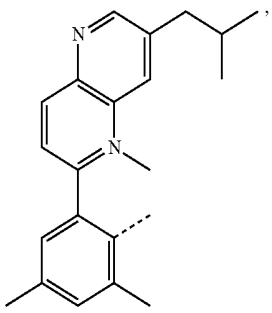
L_{A247}



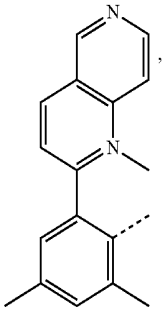
L_{A248}



L_{A249}



L_{A250}



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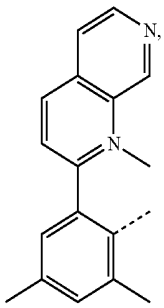
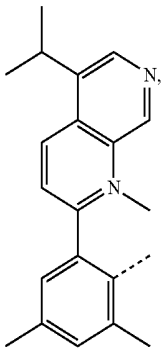
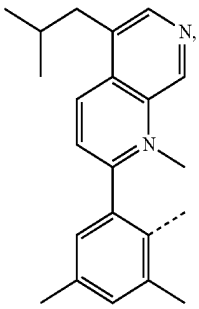
L_{A251}



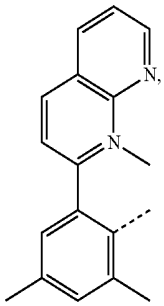
L_{A252}



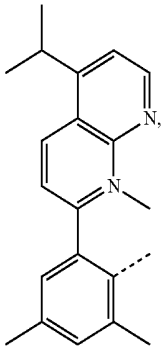
L_{A253}



L_{A254}



L_{A255}



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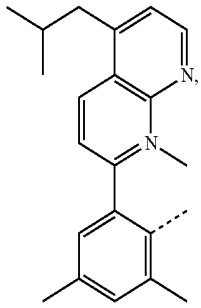
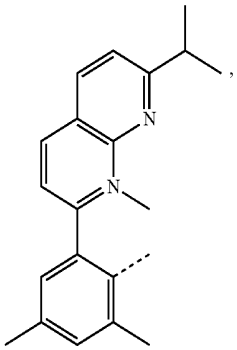
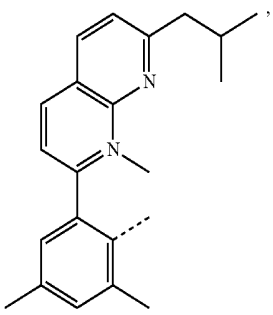
L_{A256}



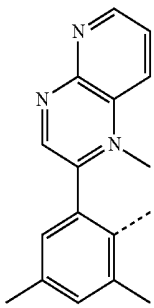
L_{A257}



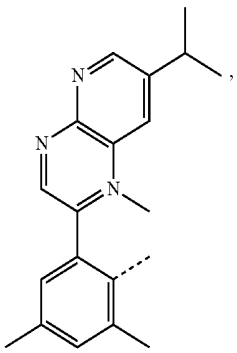
L_{A258}



L_{A259}



L_{A260}



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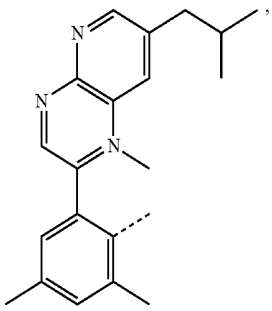
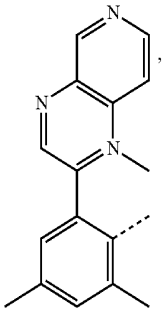
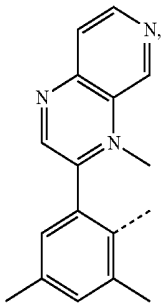
L_{A261}



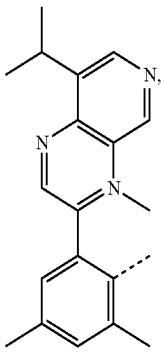
L_{A262}



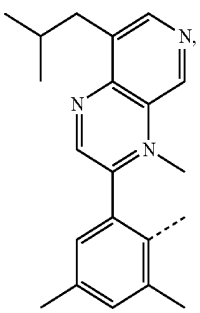
L_{A263}



L_{A264}



L_{A265}



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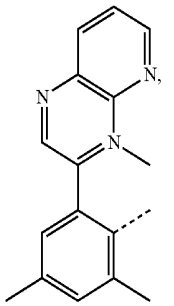
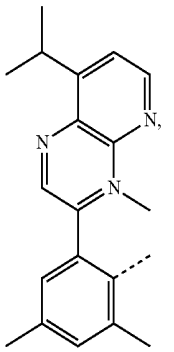
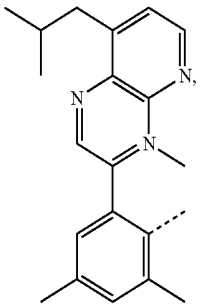
L_{A266}



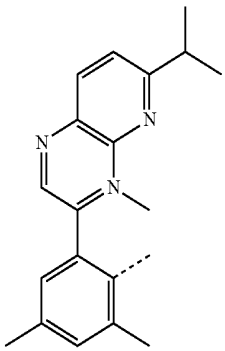
L_{A267}



L_{A268}

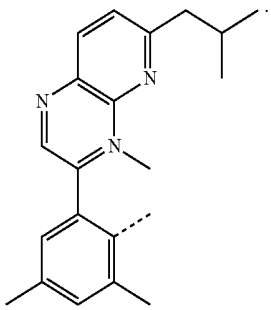


L_{A269}



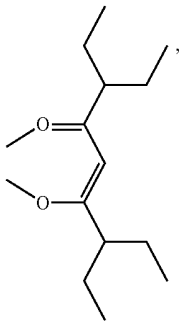
and

L_{A270}

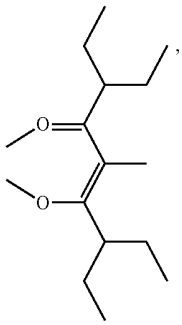


16. The compound of claim **15**, wherein x=1 or 2, y=1 or 2, and z=0, and wherein L_B is selected from the group consisting of L_{B1}, L_{B2}, L_{B5}, L_{B7}, L_{B9}, L_{B10}, and L_{B13} listed below:

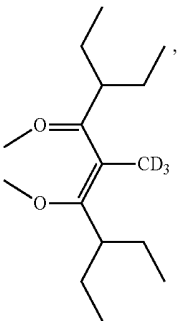
L_{B1}



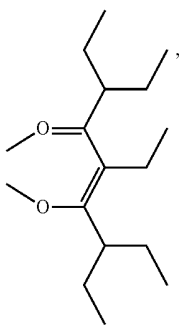
L_{B2}



L_{B5}

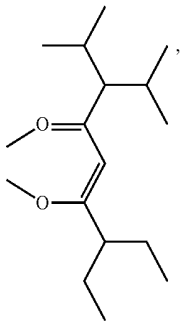


L_{B7}

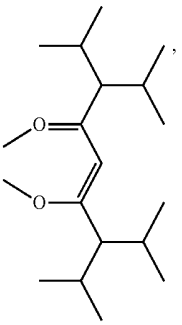


-continued

L_{B9}

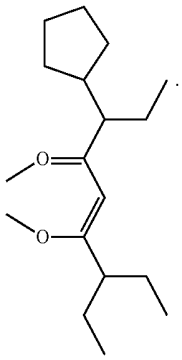


L_{B10}



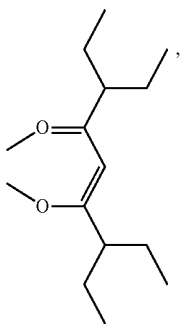
and

L_{B13}



17. The compound of claim **1**, wherein L_B is selected from the group consisting of L_{B1}, L_{B2}, L_{B5}, L_{B7}, L_{B9}, L_{B10}, and L_{B13} listed below:

L_{B1}



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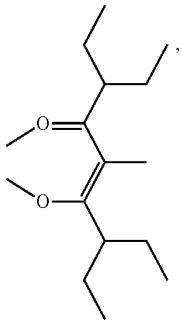
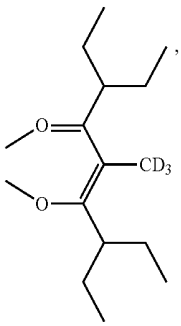
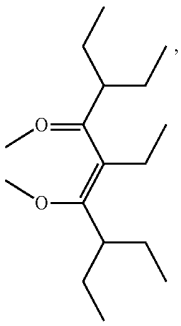
L_{B2}



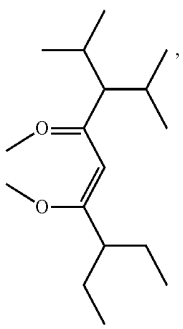
L_{B5}



L_{B7}



L_{B9}



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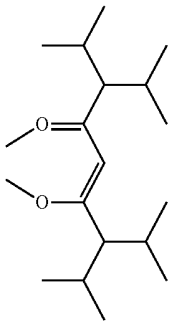
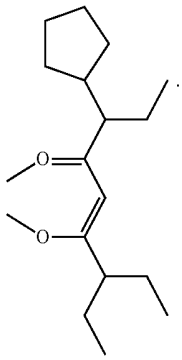
L_{B10}



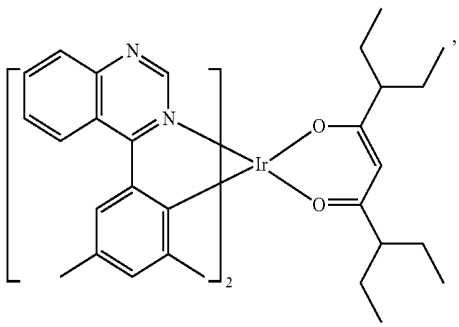
and

L_{B13}

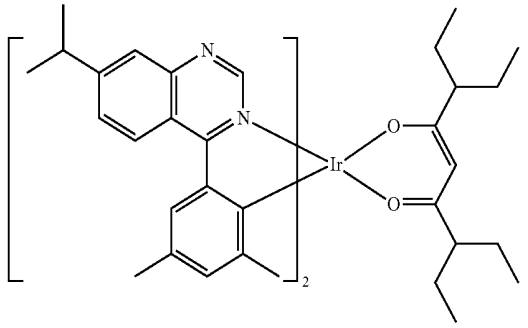


18. The compound of claim **1**, wherein the compound is selected from the group consisting of:

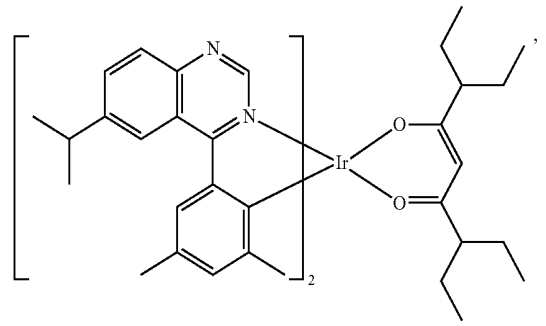
Compound 81



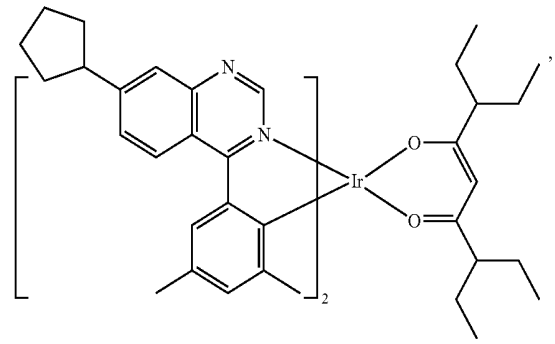
Compound 87



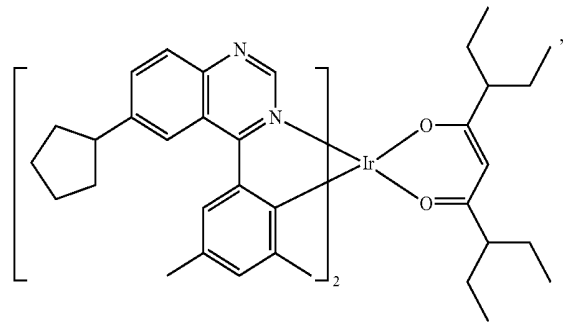
Compound 88



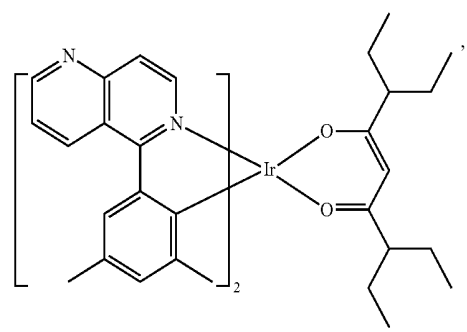
Compound 93



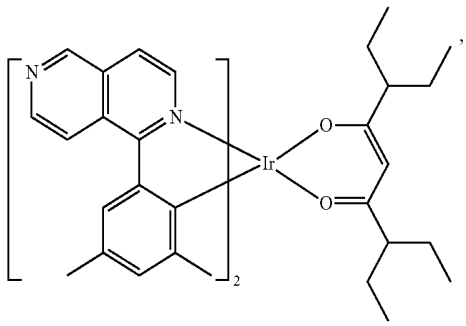
Compound 94



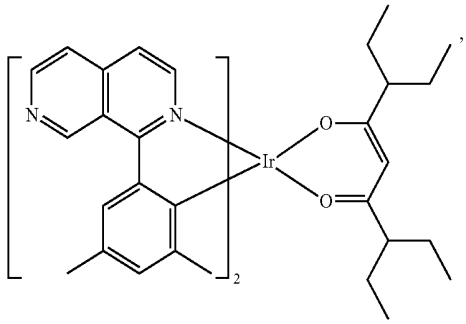
Compound 140



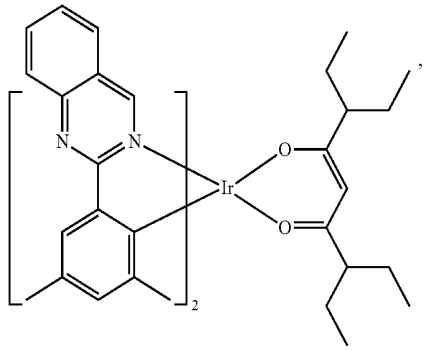
Compound 143



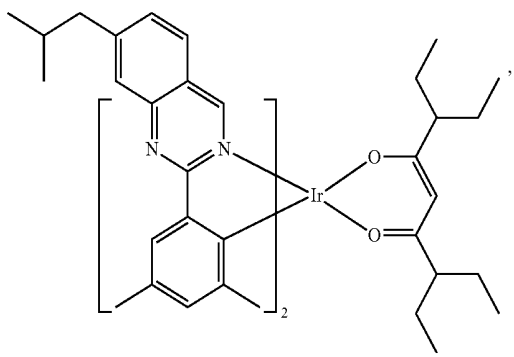
Compound 146



Compound 184



Compound 186



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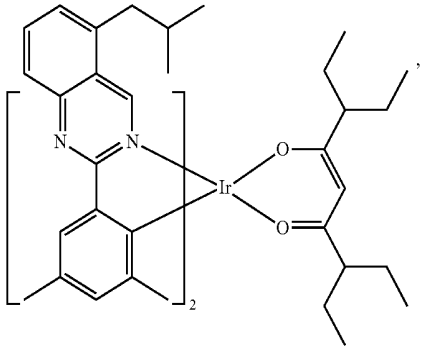
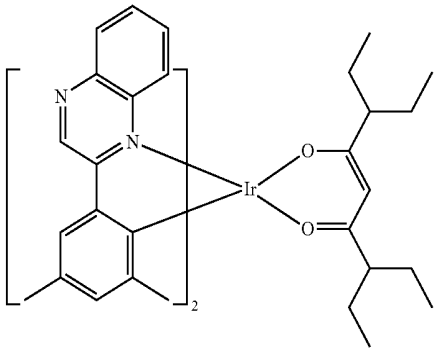
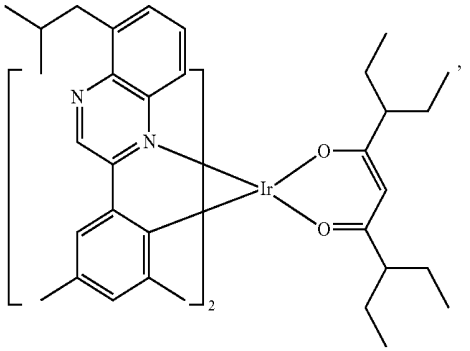
Compound 188



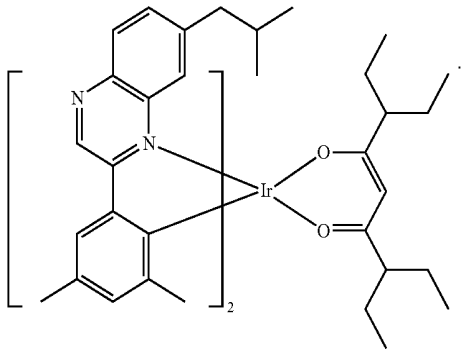
Compound 242



Compound 244



Compound 246



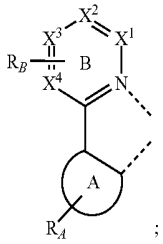
19. A first device comprising a first organic light emitting device, the first organic light emitting device comprising:

an anode;

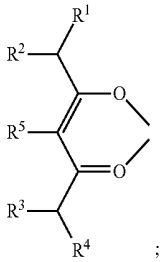
a cathode; and

an organic layer, disposed between the anode and the cathode, comprising a compound having a formula $M(L_A)_x(L_B)_y(L_C)_z$:

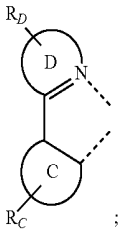
wherein the ligand L_A is



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 independently C or N, with the proviso that at least two of X^1, X^2, X^3, and X^4 that are adjacent to each other are carbon;

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

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

wherein R^5 is 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;

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, with the proviso that R_B is attached only to those of X^1, X^2, X^3, and X^4 that are carbon;

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

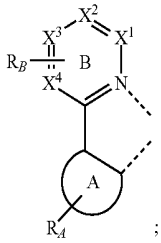
(c) both;

wherein each R_A, R_C, and R_D, and any R_B other than the two that form ring E, 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; and

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

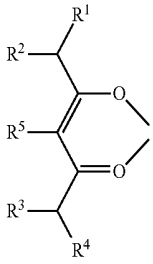
20. A formulation comprising a compound having a formula $M(L_A)_x(L_B)_y(L_C)_z$:

wherein the ligand L_A is



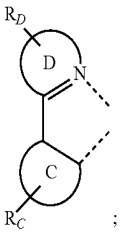
;

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 independently C or N, with the proviso that at least two of X^1, X^2, X^3, and X^4 that are adjacent to each other are carbon;

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

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

wherein R^5 is 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;

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, with the proviso that R_B is attached only to those of X^1, X^2, X^3, and X^4 that are carbon;

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 R_A, R_C, and R_D, and any R_B other than the two that form ring E, 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; and

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

* * * * *

专利名称(译)	有机电致发光材料和器件		
公开(公告)号	US10003033	公开(公告)日	2018-06-19
申请号	US14/183100	申请日	2014-02-18
[标]申请(专利权)人(译)	环球展览公司		
申请(专利权)人(译)	通用显示器公司		
当前申请(专利权)人(译)	通用显示器公司		
[标]发明人	BOUDREAULT PIERRE LUC T DYATKIN ALEXEY BORISOVICH XIA CHUANJUN YAMAMOTO HITOSHI		
发明人	BOUDREAULT, PIERRE-LUC T. DYATKIN, ALEXEY BORISOVICH XIA, CHUANJUN YAMAMOTO, HITOSHI		
IPC分类号	H01L51/54 C09K11/06 H01L51/00 C07F15/00 H01L51/50		
CPC分类号	H01L51/0085 C07F15/0033 C09K11/06 C09K2211/1029 C09K2211/1044 C09K2211/185 H01L51/5016 H01L51/5056 H01L51/5072 H01L51/5088		
代理机构(译)	DUANE MORRIS LLP		
其他公开文献	US20150236277A1		
外部链接	Espacenet		

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代表二，三或四取代，并且其中两个相邻的R B形成与环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。