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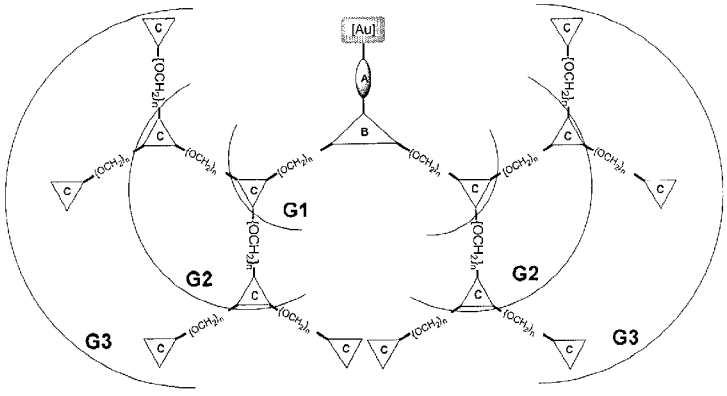
(54) **Title:** DENDRIMERS CONTAINING LUMINESCENT GOLD(III) COMPOUNDS FOR ORGANIC LIGHT-EMITTING DEVICES AND THEIR PREPARATION



(I)

(57) **Abstract:** A novel class of saturated or conjugated dendrimers containing at least one strong σ-donating group coordinated to cyclometalated tridentate gold(III) compounds having the chemical structure depicted by generic formula (I), wherein: (a) [Au] is a cyclometalated tridentate gold(III) group; (b) Unit A is a σ-donating chemical group; (c) Unit B is a central part of the dendrons comprising a branch point of dendrimers; (d) Unit C is optional surface groups or dendrons of the dendrimers; (e) n = 0 or 1.

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DENDRIMERS CONTAINING LUMINESCENT GOLD(III) COMPOUNDS FOR ORGANIC LIGHT-EMITTING DEVICES AND THEIR PREPARATION

FIELD OF THE INVENTION

Embodiments of the invention are directed to a novel class of dendrimers containing cyclometalated tridentate gold(III) compounds and the syntheses of these compounds. These solution-processable compounds can be used as light-emitting material in phosphorescent organic light-emitting devices (OLEDs).

BACKGROUND OF THE INVENTION

With the advantages of low cost, light weight, low operating voltage, high brightness, robustness, color tunability, wide viewing angle, ease of fabrication onto flexible substrates as well as low energy consumption, OLEDs are considered to be remarkably attractive candidates for flat panel display technologies and for solid-state lighting. Phosphorescent heavy metal complexes are an important class of materials in making OLEDs because of their relatively long triplet excited-state luminescence lifetimes and high luminescence quantum yields. The presence of a heavy metal center can effectively lead to a strong spin-orbit coupling and thus promotes an efficient intersystem crossing from its singlet excited state, eventually to the lowest-energy triplet excited state followed by relaxation to the ground state via phosphorescence at room temperature. This results in a four-fold enhancement on the internal quantum efficiency of the OLEDs up to 100 %.

Typically an OLED consists of several layers of semiconductor sandwiched between two electrodes. The cathode is composed of a low work function metal or metal alloy deposited by vacuum evaporation, whereas the anode is a transparent conductor such as indium-tin oxide (ITO). Upon the application of a DC voltage, holes injected by the ITO anode and electrons injected by the metal cathode will recombine to form excitons. Subsequent relaxation of excitons will then result in the generation of electroluminescence.

The breakthroughs that led to the exponential growth of this field and to its first commercialized products can be traced to two pioneering demonstrations. In 1987, Tang and VanSlyke [Tang, C. W.; VanSlyke, S. A. *Appl. Phys. Lett.* 51, 913 (1987)] proposed the use of a double-layer structure of vacuum deposited, small-molecular films, in which tris(8-hydroxyquinoline)aluminum(Alq3) was utilized both as light emitting layer and electron transporting layer. Later, the first polymeric light emitting device was pioneered by Burroughs *et al.* in 1990 [Burroughs, J. H.; Bradley, D. D. C ; Brown, A. R.; Marks, N.; Friend, R. H.; Burn, P. L.; Holmes, A. B. *Nature* 347, 539 (1990)], in which a yellow-green electroluminescence from poly(p-phenylenenvinylene) (PPV) was achieved. Since then, a number of new electroluminescent small molecular based and polymeric light emitting materials have been investigated with improved light emitting properties. The key advantage of

using polymers as light emitting materials is that they are highly soluble in most organic solvents, and the devices can be easily fabricated by using low-cost and efficient wet processing techniques, such as spin-coating, screen-printing, or ink-jet printing [Burrows, P. E.; Forrest, S. R.; Thompson, M. E. *Curr. Opin. Solid State Mat. Sci.* 2, 236 (1997)].

Apart from the development of small molecular and polymeric materials, recent demonstrations of the design and synthesis of dendrimers as light emitting materials provide new and interesting observations. Dendrimers are branched macromolecules consisting of repetitive units (dendrons) having a well-defined size and number of peripheral groups. These materials are typically comprised of three parts: a core unit, surrounding dendrons, and peripheral groups. The branching levels of the surrounding dendrons determine the dendrimer generation, in which the peripheral groups attached onto the surface of the surrounding dendrons can control the intermolecular interactions, solubility, viscosity and processability of the dendrimers. The emissive chromophores of the dendrimers can be located at the core of the dendrimer, within the surrounding dendrons or at the peripheral groups of the dendrimers. Typically, emissive chromophores are attached at the core units. In general, dendrimers can be divided into two classes, conjugated dendrons and saturated dendrons. The branching point of the conjugated dendrons or dendrimers must be fully conjugated but not essentially delocalized [Burn, P. L.; Lo, S. C ; Samuel, I. D. W. *Adv. Mater.* 19, 1675 (2007)].

The distinct properties of dendrimers allow them to be good candidates in making OLEDs. Unlike polymers, dendrimers show a well-defined structure and precise molecular weight, in which the purity of the products can be well controlled and are reproducible; both of which are crucial factors for commercialization. In addition, their high solubility in most organic solvents opens up a possibility to fabricate the devices by solution-processed techniques such as spin-coating and ink-jet printing. Such techniques not only are essential for the patterning of large-area displays and solid-state lighting panels, but also avoid the use of the expensive high-temperature vacuum evaporation techniques that are needed for preparing small molecular based OLEDs. More importantly, the dendrimer generation can control the intermolecular interactions. Intermolecular interactions are well-known to have an influence on the efficiency of OLEDs. Indeed, many emitters show strong luminescent properties in solution. However, the strong intermolecular interactions present in the solid state lead to the formation of dimers, excimers or aggregates that lower the efficiency of the OLEDs. At high current density, triplet-triplet annihilation tends to further lower performance. In view of these properties, the introduction of bulky peripheral groups can keep the molecules apart and thereby avoid these problems. Furthermore, the color of light emission can be fine-tuned by simply choosing different combinations of the cores, dendrimers, and type of peripheral groups. For instance, compounds with the same branching level of surrounding dendrons and surface groups attached to different cores can lead to different color emission. The glass transition temperature of these macromolecules is usually high, giving a good operation stability to the devices [Liu, D.; Li, J. Y. *J. Mater. Chem.* 19, 7584 (2009)].

The first OLED with dendrimers as light emitting materials was demonstrated by Wang *et al* [Wang, P. W.; Liu, Y. J.; Devadoss, C ; Bharathi, P.; Moore, J. S. *Adv. Mater.* 8, 237 (1996)]. These dendrimers contained a highly fluorescent core, 9,10-bis(phenylethynyl)-anthracene, phenylacetylene as surrounding dendrons for electron capture, and tertiary butyl groups as the peripheral groups that maintained its solubility. Such devices exhibited two major photoluminescence bands at 480 and 510 nm, and a broad, structureless emission band at 600 nm; however, the device performance was rather low and indeed no efficiency data was reported. Later , Halim *et al.* reported a family of conjugated light emitting dendrimers based on PPV structure [Halim, M.; Pillow, N. G ; Samuel, I. D. W ; Burn, P. L. *Adv. Mater.* 11, 371 (1999)]. These dendrimers consisted of a distyrylbenzene core for blue color emission, stilbene dendrons, and t-butyl peripheral groups for solution processing properties. All three generations of dendrimers could be spin-coated from a chloroform solution to form amorphous thin films that produced a blue emission in the photoluminescence spectrum. A red shift was observed in the electroluminescence spectrum for the first generation dendrimer. With increasingly bulky groups to form different generations of dendrimers, concentration quenching effects were substantially suppressed. This demonstrated that dendrimers can effectively prevent the intermolecular interactions and the formation of dimers, excimers or aggregates.

While solution-processable fluorescent OLEDs have been realized, their efficiencies are usually quite low, and can be as low as 0.1 %. In order to improve the device performance, it is desirable to make use of spin-orbit coupling in order to mix both singlet and triplet excited states. Hence, the use of heavy metal complexes in OLEDs is preferred over purely organic materials. Recently, a series of green-emitting carbazole conjugated dendrimers containing iridium(III) complexes have been reported by Ding *et al.* [Ding, J. Q.; Gao, J.; Cheng, Y.; Xie, Z; Wang, L. X.; Ma, D.; Jing, X. B.; Wang, F. S. *Adv. Funct. Mater.* 16, 571 (2006)]. By taking advantage of the dendritic structure(s), high solubility, non-doped, low cost solution-processable OLEDs had been achieved. By increasing the size of the dendrons, the intermolecular interactions can be significantly reduced, and good hole-transporting properties of carbazoles can be obtained. Superior device performance including peak external quantum efficiency (EQE) of 10.3 % and current efficiency (CE) of 34.7 cd A^{-1} were achieved for a non-doped green OLED. Red-emitting triphenylamine dendrimers containing iridium(III) complexes were also reported in 2007 [Zhou, G. J.; Wang, W. Y ; Yao, B.; Xie, Z. Y ; Wang, L. X. *Angew. Chem. Int. Ed.* 46, 1149 (2007).] The extended π-conjugated system of triphenylamine dendrons raises the highest occupied molecular orbital (HOMO) level, and the electron-rich triphenylamine moieties facilitate an efficient hole injection from the anode. High EQE and CE of the devices of 7.4 % and 3.7 cd A^{-1}, respectively, were reached, even higher or comparable to the vacuum deposited devices with similar Commission Internationale de L'Eclariage (CIE) color. This indicates that dendrimers are one of the promising light emitting materials for solution-processable OLEDs.

Even though there has been an increased interest in electrophosphorescent materials, particularly metal complexes with heavy metal centers, most of the development work has been focused on the use of iridium(III), platinum(II) and ruthenium(II), whereas the use of other metal centers has been much less explored. In contrast to the isoelectronic platinum(II) compounds which are known to exhibit rich luminescence properties, very few examples of luminescent gold(III) complexes have been reported, probably due to the presence of low-energy d-d ligand field (LF) states and the electrophilicity of the gold(III) metal center. One way to enhance the luminescence of gold(III) complexes is through the introduction of strong σ-donating ligands, which was first demonstrated by Yam *et al.* in which stable gold(III) aryl compounds were synthesized and found to display interesting photo luminescence properties even at room temperature [Yam, V. W. W.; Choi, S. W. K.; Lai, T. F.; Lee, W. K. *J. Chem. Soc, Dalton Trans.* 1001 (1993)]. Afterward, Yam *et al.* synthesized a series of bis-cyclometalated alkynylgold(III) compounds using various strong σ-donating alkynyl ligands, and all these compounds were found to exhibit rich luminescence behaviors at both room and low temperatures in various media [Yam, V. W.-W.; Wong, K. M.-C; Hung, L.-L.; Zhu, N. *Angew. Chem. Int. Ed.* 44, 3107 (2005); Wong, K. M.-C; Hung, L.-L.; Lam, W. H.; Zhu, N.; Yam, V. W.-W. *J. Am. Chem. Soc.* 129, 4350 (2007); Wong, K. M.-C; Zhu, X.; Hung, L.-L.; Zhu, N.; Yam, V. W.-W.; Kwok, H. S. *Chem. Commun.* 2906 (2005)]. Very recently, a new class of phosphorescent material of cyclometalated alkynylgold(III) complexes has been reported and fabricated by vapor deposition [Au, V. K.-M,; Wong, K. M.-C; Tsang, D. P.-K.; Chan, M. Y ; Yam, V. W.-W. *J. Am. Chem. Soc.* 132, 14273 (2010)]. The optimized OLED reached a EQE of 11.5 % and CE of 37.4 cd A^{-1}. This suggested that the alkynylgold(III) complexes are promising phosphorescent materials in terms of efficiency and thermal stability.

The present invention discloses herein the design, synthesis and photoluminescence behaviour of luminescent gold(III) dendrimers, and their device fabrication using solution-processing techniques to produce high efficiency dendrimer OLEDs. These devices combine saturated and conjugated dendrimers, containing at least one strong σ-donating group and a cyclometalated tridentate gold (III) compound. These novel devices can be fabricated using low cost, high efficiency, solution-processing techniques to obtain phosphorescence-based OLEDs that do not exhibit the limitations of known OLEDs.

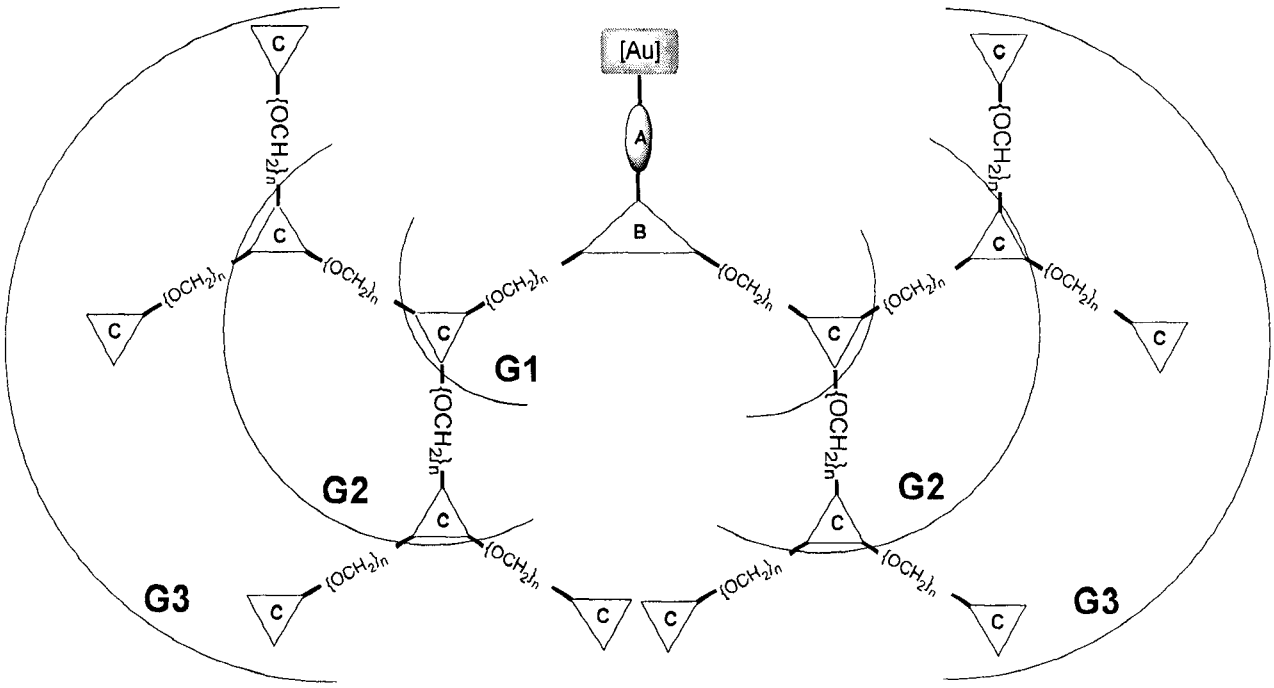
BRIEF SUMMARY OF THE INVENTION

Embodiments of the invention are directed to novel luminescent cyclometalated gold(III) dendrimers and their preparation. Other embodiments of the invention are directed to OLEDs from the novel luminescent gold(III) dendrimers.

The novel luminescent gold(III) dendrimers are either saturated or conjugated dendrimers containing one strong σ-donating group coordinated to a gold(III) metal center.

The novel luminescent gold(III) dendrimers have the chemical structure shown in the generic

formula,



wherein:

(a) [Au] is a cyclometalated tridentate gold(III) group;

(b) Unit A is a σ-donating chemical group;

(c) Unit B is a central part of the dendrons comprising a branch point of dendrimers;

(d) Unit C is optional surface groups or dendrons of the dendrimers;

(e) n = 0 or 1.

In accordance with the present invention, these novel luminescent gold(III) dendrimers, show either strong photoluminescence via a triplet excited state upon photo-excitation, or electroluminescence via a triplet exciton upon applying a DC voltage. These compounds according to embodiments of the invention are highly soluble in common organic solvents such as dichloromethane and chloroform. Alternatively, the compounds can be doped into a host matrix for thin film deposition by spin-coating or ink-jet printing or other known fabrication methods. In some embodiments of the compounds can be used for the fabrication of OLEDs as phosphorescent emitters or dopants to generate electroluminescence.

As shown in **FIG. 1,** according to one embodiment of the present invention, the cyclometalated gold(III) dendrimers are included in light-emitting layer 106 of OLED 100. OLED 100 further comprises a layered structure having cathode layer 102, electron transporting layer 104, luminescent gold(III) compound as light-emitting layer 106, hole-transporting layer 108, and anode 110 deposited on glass substrate 112.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of the basic structure of an organic EL device, in accordance with an embodiment of the present invention.

FIG. 2 shows the UV-Visible absorption spectra of compounds **1-3** in dichloromethane at 298 degrees K, in accordance with an embodiment of the present invention.

FIG. 3 shows the UV-Visible absorption spectra of compounds **4, 5, 9, 10** and **11** in dichloromethane at 298 degrees K, in accordance with an embodiment of the present invention.

FIG. 4 shows the UV-Visible absorption spectra of compounds **6-8** in dichloromethane at 298 degrees K, in accordance with an embodiment of the present invention.

FIG. 5 shows the UV-Visible absorption spectra of compounds **12** and **13** in dichloromethane at 298 degrees K, in accordance with an embodiment of the present invention.

FIG. 6 shows the normalized photoluminescence spectra of compounds **1-3** in dichloromethane at 298 degrees K in accordance with an embodiment of the present invention. No instrumental correction was applied for the emission wavelength.

FIG. 7 shows the normalized photoluminescence spectra of thin films of compound **2** doped into PMMA at different concentrations (wt%) at 298 degrees K, in accordance with an embodiment of the present invention. No instrumental correction was applied for the emission wavelength.

FIG. 8 shows the normalized photoluminescence spectra of thin films of compound **3** doped into PMMA at different concentrations (wt%) at 298 degrees K, in accordance with an embodiment of the present invention. No instrumental correction was applied for the emission wavelength.

FIG. 9 shows the photoluminescence spectra of compounds **4, 5** and **11** in dichloromethane at 298 degrees K, in accordance with an embodiment of the present invention. No instrumental correction was applied for the emission wavelength.

FIG. 10 shows the normalized photoluminescence spectra of compounds **6-8** in dichloromethane at 298 degrees K, in accordance with an embodiment of the present invention. No instrumental correction was applied for the emission wavelength.

FIG. 11 shows the normalized photoluminescence spectra of compounds **12** and **13** in dichloromethane at 298 degrees K, in accordance with an embodiment of the present invention. No instrumental correction was applied for the emission wavelength.

FIG. 12 shows the normalized photoluminescence spectra of thin films of compound **4** doped into PMMA at different concentrations (wt%) at 298 degrees K, in accordance with an embodiment of the present invention. No instrumental correction was applied for the emission wavelength.

FIG. 13 shows the electroluminescence spectra of a device with compound **2** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 14 shows the electroluminescence spectra of a device with compound **3** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 15 shows the electroluminescence spectra of device with compound **4** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 16 shows the electroluminescence spectra of a device with compound **5** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 17 shows the electroluminescence spectra of a device with compound **6** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 18 shows the electroluminescence spectra of a device with compound **7** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 19 shows the electroluminescence spectra of a device with compound **8** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 20 shows the electroluminescence spectra of a device with compound **9** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 21 shows the electroluminescence spectra of device with compound **10** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 22 shows the electroluminescence spectra of device with compound **11** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 23 shows the electroluminescence spectra of device with compound **12** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

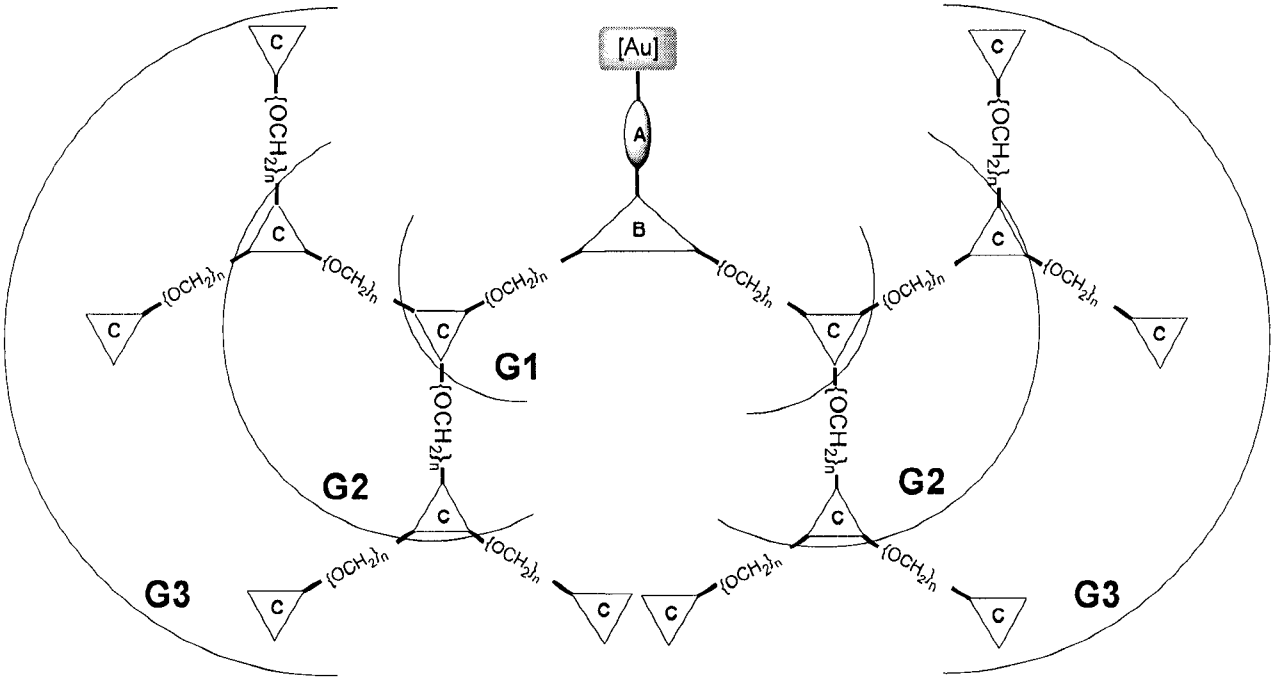
FIG. 24 shows the electroluminescence spectra of device with compound **13** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 25 shows a) current efficiency, b) power efficiency and c) external quantum efficiency of the device with compound **4** doped into MCP as the light-emitting layer, in accordance with an embodiment of the present invention.

FIG. 26a and 26b show the chemical structures of compounds **1-13.**

DETAILED DESCRIPTION OF THE INVENTION

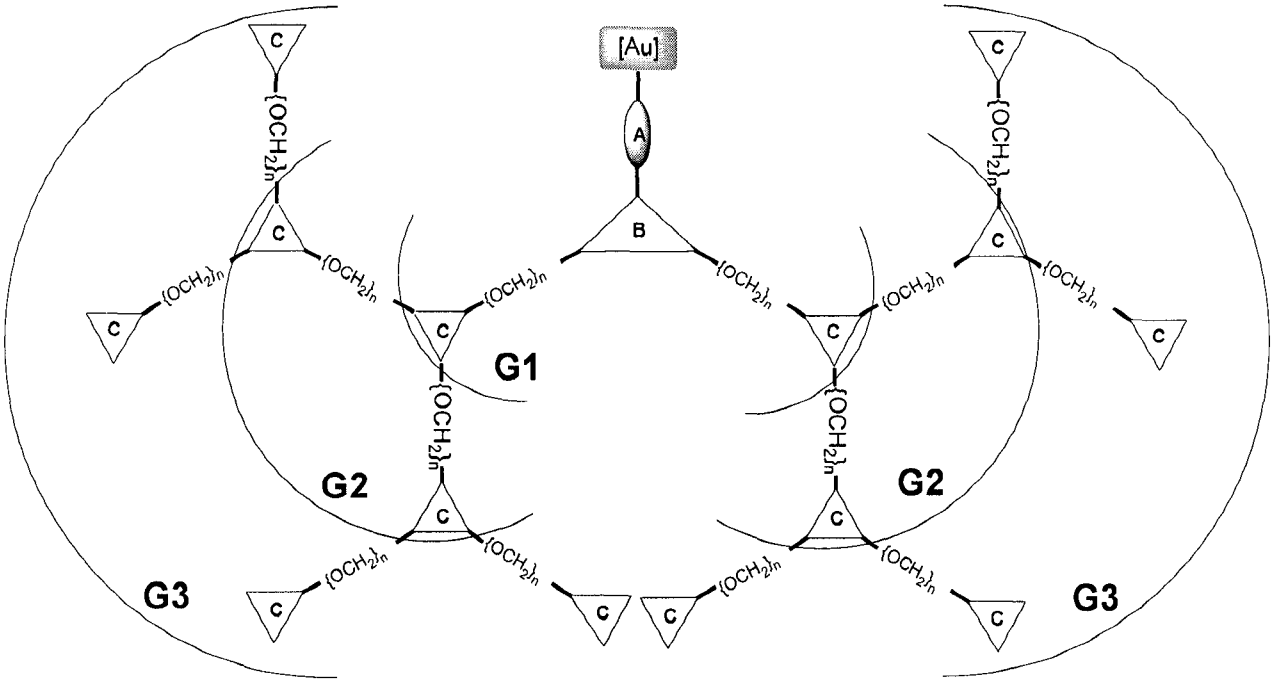
The present invention is directed to the synthesis and luminescence studies of novel classes of saturated and conjugated dendrimers containing one strong σ-donating group coordinated to the cyclometalated tridentate gold(III) metal centre. The compounds have the chemical structure shown in generic formula,



wherein:

(a) [Au] represents the cyclometalated tridentate gold(III) compounds;
(b) Unit A is the σ-donating group that can be an ancillary ligand;
(c) Unit B is the central part of the dendrons and the branching point of the dendrimers;
(d) Unit C is the optional surface groups or dendrons of the dendrimers; and
(e) n = 0 or 1.

The present invention relates to a luminescent gold(III) compound comprising the chemical structure represented by the following general formula,



wherein:

(a) [Au] is a cyclometalated tridentate gold(III) group;

(b) Unit A is a σ-donating chemical group;

(c) Unit B is a central part of the dendrons comprising a branch point of dendrimers;

(d) Unit C is optional surface groups or dendrons of the dendrimers;

(e) n = 0 or 1.

In any embodiment according to the present invention, unit A comprises at least one of alkylalkynyl, substituted alkylalkynyl, arylalkynyl, substituted arylalkynyl, heteroarylalkynyl and substituted heteroarylalkynyl.

In any embodiment according to the present invention, unit B and optional unit C comprise aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, optionally substituted with one or more alkyl, alkenyl, alkynyl, alkylaryl, cycloalkyl, OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, halo, aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, preferably B and C comprise benzene, phenyl derivatives, pyridine or pyridyl derivatives, wherein R is independently alkyl, alkenyl, alkynyl, alkyaryl, aryl, or cycloalkyl.

In any embodiment according to the present invention, the gold(III) compound is deposited as a thin layer on a substrate layer, preferably any one of the preceding claims, the thin layer is deposited by spin-coating, or inkjet printing.

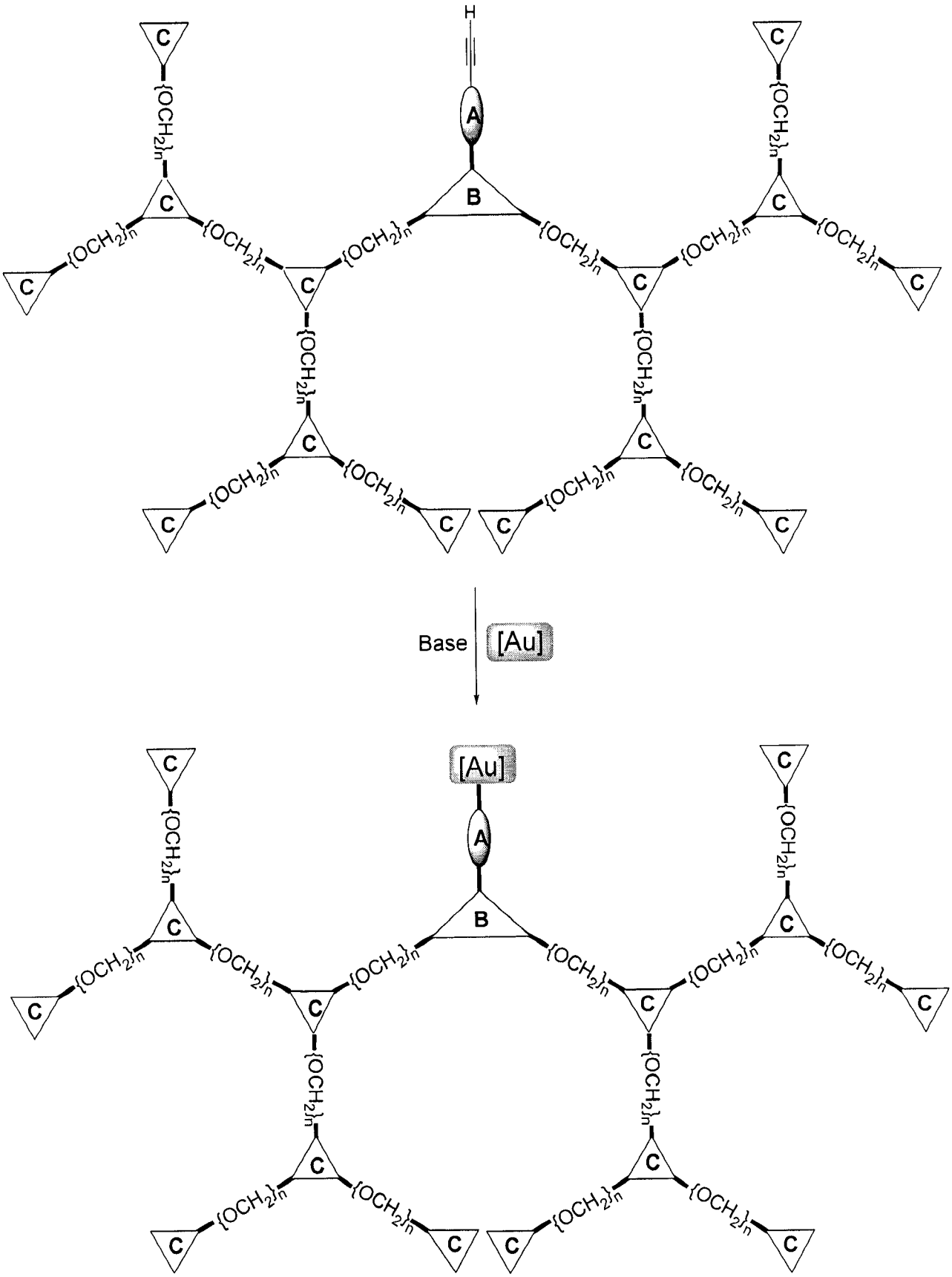
In any embodiment according to the present invention, the gold(III) compound has photoluminescence properties within a range of about 380 to 1050 nm.

In any embodiment according to the present invention, the gold(III) compound emits light in

response to the passage of an electric current or to a strong electric field.

In any embodiment according to the present invention, the gold(III) compound is used to fabricate an OLED, preferably the gold (III) compound serves as the light-emitting layer of the OLED, more preferably the gold (III) compound serves as a dopant in the light-emitting layer of the OLED, most preferably the emission energy of the compound varies with the concentration of the gold(III) compound dopant, or the gold(III) metal compound is a dopant included in the light emitting layer of the light-emitting device .

The present invention relates to a method for preparing a luminescent compound with a cyclometalated tridentate ligand and at least one strong σ-donating group coordinated to a gold(III) metal group, comprising the following reaction:



wherein:

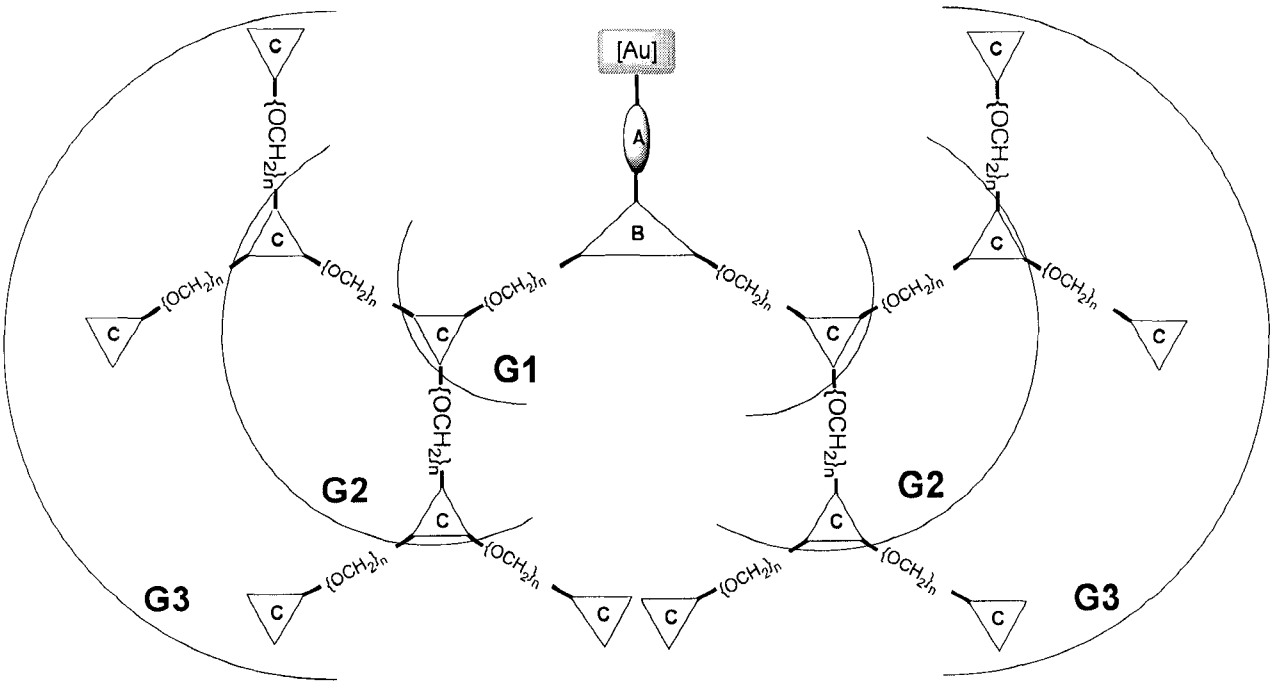
(a) Unit A comprises at least one of alkylalkynyl, substituted alkylalkynyl, arylalkynyl, substituted arylalkynyl, heteroarylalkynyl, and substituted heteroarylalkynyl;

(b) Unit B and optional unit C comprise aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, optionally substituted with one or more alkyl, alkenyl, alkynyl, alkylaryl, cycloalkyl, OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, halo, aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, preferably B and C comprise benzene, phenyl derivatives, pyridine or pyridyl derivatives, wherein R is independently alkyl, alkenyl, alkynyl, alkyaryl, aryl, or cycloalkyl.

In any embodiment according to the present invention, a luminescent compound is prepared.

In any embodiment according to the present invention, the gold(III) metal group comprises a light-emitting layer of a light emitting device, and/or the gold(III) metal group comprises a layer of a light emitting device, and/or the gold(III) metal compound is a dopant included in a light emitting device .

The present invention relates to a light-emitting device with an ordered structure comprising an anode, a hole-transporting layer, a light-emitting layer, an electron-transporting layer and a cathode wherein the light-emitting layer comprises a gold(III) compound having a chemical structure represented by the following general formula,



wherein:

(a) Unit A comprises at least one of alkylalkynyl, substituted alkylalkynyl, arylalkynyl, substituted arylalkynyl, heteroarylalkynyl, and substituted heteroarylalkynyl;

(b) Unit B and optional unit C comprise aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, optionally substituted with one or more alkyl, alkenyl, alkynyl, alkylaryl,

cycloalkyl, OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, NO_2, SO_2, SOR, SO_3R, halo, aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, preferably B and C comprise benzene, phenyl derivatives, pyridine or pyridyl derivatives, wherein R is independently alkyl, alkenyl, alkynyl, alkyaryl, aryl, or cycloalkyl, or the light-emitting layer comprises a gold(III) compound prepared according to the method of any one of the preceding claims.

In any embodiment according to the present invention, the light-emitting layer is prepared using at least one solution processing technique.

In any embodiment according to the present invention, the cyclometalated tridentate gold(III) group has a cyclometalated ligand based on pyridine, phenylpyridine or diphenylpyridine, most preferably 2,6-diphenyl-4-(2,5-difluorophenyl)pyridine.

In any embodiment according to the present invention, unit A is selected from, but is not limited to, alkylalkynyl, substituted alkylalkynyl, arylalkynyl, substituted arylalkynyl, heteroarylalkynyl and substituted heteroarylalkynyl. Preferably the unit A is arylalkynyl, most preferably phenylethynyl.

Units B and optional unit C comprise aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, optionally substituted with one or more alkyl, alkenyl, alkynyl, alkylaryl, cycloalkyl, OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, NO_2, SO_2, SOR, SO_3R, halo, aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, preferably B and C comprise benzene, phenyl derivatives, pyridine or pyridyl derivatives, wherein R is independently alkyl, alkenyl, alkynyl, alkyaryl, aryl, or cycloalkyl. Preferably unit B is heterocyclic group or diaryl amine, most preferably triazole substituted by benzyl or NR_2, wherein R is phenyl. Preferably unit C is aryl or heterocyclic group most preferably phenyl or carbazolyl.

In the present disclosure the following terms are used.

The term "optional" or "optionally" means that the subsequently described event or circumstance may or may not occur, and that the description includes instances where said event or circumstance occurs and instances in which it does not. For example, "optionally substituted alkyl" includes "alkyl" and "substituted alkyl," as defined below.

The term "halo" or "halogen" as used herein includes fluorine, chlorine, bromine and iodine preferably F, CI, Br, particularly preferably F or CI.

The term "alkyl" as used herein includes straight and branched chain alkyl groups, as well as cycloalkyl groups with alkyl groups having a cyclic structure. Preferred alkyl groups are those containing between one to eighteen carbon atoms, preferably from 1 to 10 carbon atoms,

particularly preferably from 1 to 6 carbon atoms and includes methyl, ethyl, propyl, isopropyl, butyl, isobutyl, *tert*-butyl, and other similar compounds. In addition, the alkyl group may be optionally substituted with one or more substituents selected from OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, halo and cyclic-amino.

The term "alkenyl" as used herein includes both straight and branched chain alkene radicals. Preferred alkenyl groups are those containing between two and eighteen carbon atoms, preferably from 2 to 10 carbon atoms, particularly preferably from 2 to 6 carbon atoms. In addition, the alkenyl group may be optionally substituted with one or more substituents selected from OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, halo and cyclic-amino.

The term "alkynyl" as used herein includes both straight and branched chain alkyne radicals. Preferred alkynyl groups are those containing between two and eighteen carbon atoms, preferably from 2 to 10 carbon atoms, particularly preferably from 2 to 6 carbon atoms. In addition, the alkynyl group may be optionally substituted with one or more substituents selected from OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, halo and cyclic-amino.

The term "arylalkynyl" as used herein includes an alkynyl group which has an aromatic group as a substituent. In addition, the arylalkynyl group may be optionally substituted with one or more substituents selected from OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, halo and cyclic-amino.

The term "alkylaryl" as used herein includes an alkyl group which has an aromatic group as a substituent. In addition, the alkylaryl group may be optionally substituted with one or more substituents selected from OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, halo and cyclic-amino.

R is independently alkyl, alkenyl, alkynyl, alkylaryl, aryl or cycloalkyl.

Aryl alone or in combination includes carbocyclic aromatic systems. The systems may contain one, two or three rings wherein each ring may be attached together in a pendant manner or may be fused. Preferably the rings have from 5 to 30 carbon atoms, preferably from 5 to 18 carbon atoms or are 5- or 6- membered rings. Suitable aryls are, for example, phenyl, naphthyl, acenaphthenyl, acenaphthylenyl, anthracenyl, fluorenyl, phenalenyl, phenanthrenyl. This aryl can be unsubstituted (i.e. all carbon atoms which are capable of substitution bear hydrogen atoms) or be substituted on one, more than one or all substitutable positions of the aryl. Suitable substituents are, for example, halogen, preferably F, Br or CI, alkyl radicals, preferably alkyl radicals having from 1 to 8 carbon atoms, particularly preferably methyl, ethyl, i-propyl or t-butyl, aryl radicals, preferably C_6-aryl radicals or fluorenyl, which may once again be substituted or unsubstituted, heteroaryl radicals, preferably heteroaryl radicals containing at least one nitrogen atom, particularly preferably pyridyl

radicals, alkenyl radicals, preferably alkenyl radicals which have one double bond, particularly preferably alkenyl radicals having a double bond and from 1 to 8 carbon atoms, or groups having a donor or acceptor function. Suitable groups having a donor or acceptor function are halogen radicals, preferably F, CI, Br, particularly preferably F, alkoxy radicals, carbonyl radicals, ester radicals, amine radicals, amide radicals, CH_2F groups, CHF_2 groups, CF_3 groups, CN groups, $N0_2$ groups, thio groups or SCN groups. The aryl radicals very particularly preferably bear substituents selected from the group consisting of methyl, F, C¦ and alkoxy, or the aryl radicals are unsubstituted. Preference is given to the aryl radical or the aryl group being a C_6-aryl radical which may optionally be substituted by at least one of the abovementioned substituents. The C_6-aryl radical particularly preferably bears none, one or two of the abovementioned substituents, with the one substituent preferably being located in the para position relative to the further linkage point of the aryl radical and, in the case of two substituents, these are each located in the meta position relative to the further linkage point of the aryl radical. The C_6-aryl radical is very particularly preferably an unsubstituted phenyl radical. The aryl or aryl moiety as used herein is preferably fluorenyl or phenyl, which may be unsubstituted or substituted by the abovementioned substituents, preferably halogen, alkyl or unsubstituted or substituted fluorenyl as used herein.

Heteroaryl alone or in combination includes heterocyclic aromatic systems or the above carbocyclic aromatic system containing at least one heteroatom. The systems may contain one, two or three rings wherein each ring may be attached together in a pendant manner or may be fused. Preferably the rings are 5- or 6- membered rings.

Heterocyclic and heterocycle refer to a 3 to 7-membered ring containing at least one heteroatom. This includes but not limited to pyridine, thiophene, furan, pyrazole, imidazole, oxazole, isoxazole, thiazole, isothiazole, pyrrole, pyrazine, pyridazine, pyrimidine, benzimidazole, benzofuran, benzothiazole, indole, naphthalene, triazole, tetrazole, pyran, thiapyran, oxadiazole, triazine, tetrazine, carbazole, dibenzothiophene, dibenzofuran, fluorine, and non-aromatic rings including but not limited to piperazine, piperidine, and pyrrolidine. The groups of the present invention can be substituted or unsubstituted. Preferred substituents include but are not limited to alkyl, alkoxy, aryl.

Heteroatom refers to S, O, N, P.

Substituted refers to any level of substitution although mono-, di- and tri-substitutions are preferred. Preferred substituents include substituents selected from OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, cyclic-amino, halogen, aryl, alkyl and heteroaryl.

Cyclometalated ligand in the cyclometalated tridentate gold(III) compounds is a term well known in the art. The preferred ligand is that based on pyridine, phenylpyridine, diphenylpyridine, isoquinoline, phenylisoquinoline or diphenylisoquinoline. The ligand includes but is not limited to 2,6-diphenylpyridine (C^N^C), 2,6-6w(4-/er/-butylphenyl)pyridine ('BuC^N^C'Bu),

2,6-diphenyl-4-(2,5-difluorophenyl)pyridine (2,5-F_2- C_6H_3- C^N^C), 2,6-diphenyl-4-/?-tolylpyridine (C^NTol^C), 2,6-diphenyl-4-phenylpyridine (C^NPh^C), 2,6-^w(4-fluorophenyl)pyridine (FC^N^CF), 2,6-diphenyl-4-(4-isopropylphenyl)pyridine (4-'Pr-Ph-C ^N^C), 2,6-diphenyl-4-(4-nitrophenyl)pyridine (4-N0 $_2$-Ph-C ^N^C), 2,6-diphenyl-4-(4-methoxyphenyl)pyridine (4-OMe-Ph-C ^N^C), 2,6-diphenyl-4-(4-methylyphenyl)pyridine (4-Me-Ph-C ^N^C), 2,6-diphenyl-4-(4-ethylyphenyl)-pyridine (4-Et-Ph-C ^N^C), 2,6-diphenyl-4-(2,3,4-trimethoxyphenyl)pyridine (2,3,4-OMe_3- Ph–C^N^C), 2,6-0w(4-methoxyphenyl)-4-(4-nitrophenyl)pyridine (4-N0 $_2$-Ph-MeOC ^N^COMe), 2,6-*bis*(2,4-dichlorophenyl)-4-(4-isopropylphenyl)-pyridine (4-'Pr-Ph-Cl $_2$C^N^CCl_2), 2,6-diphenyl-4-(4-tosylphenyl)pyridine (4-OTs-Ph-C ^N^C), 2,6-diphenyl-4-(4-dimethylaminophenyl)pyridine (4-NMe_2-Ph-C ^N^C), 2,6-diphenyl-4-(4-diphenylaminophenyl)pyridine (4-NPh_2-Ph-C ^N^C), 2,6-diphenyl-4-(4-bromophenyl)pyridine (4-Br-Ph-C ^N^C), 2,6-diphenyl-4-(4-chlorophenyl)pyridine (4-Cl-Ph-C ^N^C), 2,6-diphenyl-4-(4-flurophenyl)pyridine (4-F-Ph-C ^N^C), 2,6-diphenyl-4-(4-iodophenyl)pyridine (4-I-Ph-C ^N^C), 2,6-diphenyl-4-(2,5-dimethylphenyl)pyridine (2,5-Me_2-Ph-C ^N^C), 2,6-diphenyl-4-(2,3,4,5,6-pentafluorophenyl)pyridine (2,3,4,5,6-F_5-Ph-C ^N^C), and 1,3-diphenylisoquinoline (dpiq).

Benzene includes substituted or unsubstituted benzene.
Pyridine includes substituted or unsubstituted pyridine.
Thiophene includes substituted or unsubstituted thiophene.
Furan includes substituted or unsubstituted furan.
Pyrazole includes substituted or unsubstituted pyrazole.
Imidazole includes substituted or unsubstituted imidazole.
Oxazole includes substituted or unsubstituted oxazole.
Isoxazole includes substituted or unsubstituted isoxazole.
Thiazole includes substituted or unsubstituted thiazole.
Isothiazole includes substituted or unsubstituted isothiazole.
Pyrrole includes substituted or unsubstituted pyrrole.
Pyrazine includes substituted or unsubstituted pyrazine.
Pyridazine includes substituted or unsubstituted pyridazine.
Pyrimidine includes substituted or unsubstituted pyrimidine.
Benzimidazole includes substituted or unsubstituted benzimidazole.
Benzofuran includes substituted or unsubstituted benzofuran.
Benzothiazole includes substituted or unsubstituted benzothiazole.
Indole includes substituted or unsubstituted indole.
Naphthalene includes substituted or unsubstituted naphthalene.
Triazole includes substituted or unsubstituted triazole.

Tetrazole includes substituted or unsubstituted tetrazole.
Pyran includes substituted or unsubstituted pyran.
Thiapyran includes substituted or unsubstituted thiapyran.
Oxadiazole includes substituted or unsubstituted oxadiazole.
Triazine includes substituted or unsubstituted triazine.
Tetrazine includes substituted or unsubstituted tetrazine.
Carbazole includes substituted or unsubstituted carbazole.
Dibenzothiophene includes substituted or unsubstituted dibenzothiophene.
Dibenzofuran includes substituted or unsubstituted dibenzofuran.
Piperazine includes substituted or unsubstituted piperazine.
Piperidine includes substituted or unsubstituted piperidine.
Pyrrolidine includes substituted or unsubstituted pyrrolidine.

In some embodiments of the invention, the luminescent gold(III) dendrimers of structure (I) are prepared in high purity. The compounds described have been represented throughout by their monomeric structure. As is well known to those in the art, the compounds may also be present as dimers, trimers or dendrimers.

The luminescent gold(III) dendrimers can be used to form thin films by spin-coating, ink-jet printing or other known fabrication methods and be applied in OLEDs. Referring to FIG. 1, an organic EL device has, in order, substrate 112, hole-injecting anode 110, hole transporting layer 108, light-emitting layer 106, electron transporting layer 104, and electron-injecting cathode 102.

Substrate 112 is electrically insulated and can be either optically transparent, and comprise glass, plastic foil, or other appropriate material, or alternatively, may be opaque and comprise one or more semiconducting materials or ceramics. In one embodiment of the invention, the EL emission is viewed through substrate 112, or through both sides of the device, and substrate 112 comprises a transparent glass substrate or a plastic foil. In other embodiments, the EL emission is viewed only through the top electrode, and substrate 112 comprises an opaque semiconductor or ceramic wafers. Hole-injecting anode 110 injects holes into the organic EL layer when anode 110 is positively biased. Anode 110 is composed of a conductive and optionally transmissive layer. In one embodiment of the invention, viewing the EL emission through the substrate is desirable, and hole-injecting anode 110 is transparent. In other embodiments, the EL emission is viewed through the top electrode and the transmissive characteristics of anode 110 are immaterial, and therefore any appropriate materials including metals or metal compounds having a work function of greater than 4.1 eV are used. Appropriate metals include gold, iridium, molybdenum, palladium, and platinum. In some embodiments anode 110 is transmissive, and suitable materials are metal oxides, including indium-tin oxide, aluminum- or indium-doped zinc oxide, tin oxide, magnesium-indium oxide, nickel-tungsten oxide, and cadmium-tin oxide. The preferred metals and metal oxides can be deposited by evaporation, sputtering, laser ablation, and chemical vapor deposition. Suitable

materials for hole-transporting layer 108 include polycyclic aromatic compounds, for example, 4,4'-bis [N -(l -naphthyl)-iV-phenylamino]biphenyl (NPB), 4,4'-bis[A f-(3-methylphenyl)-N -phenylamino]biphenyl (TPD), 4,4',4''-tris[(3-methylphenyl)phenylamino] triphenylamine (MTDATA), and di-[4-(N,N -ditolyl-amino)phenyl]cyclohexane (TAPC). In addition, polymeric hole-transporting materials can be used including poly(N-vinylcarbazole) (PVK), polythiophene, polypyrrole, polyaniline, and copolymers including poly(3,4-ethylenedioxythiophene):poly(4-styrene-surlfonate) (PEDOT:PSS).

Light-emitting layer 106 in Figure 1 is formed by doping the phosphorescent Au(III) metal complex as a dopant into a host compound. Suitable host materials should be selected so that the triplet exciton can be transferred efficiently from the host material to the phosphorescent dopant material. Suitable host materials include certain aryl amines, triazoles and carbazole compounds. Examples of desirable hosts are 4,4'-bis(carbazol-9-yl)biphenyl (CBP), m-(N ,N -dicarbazole)benzene (mCP), 4,4',4''-tris(carbazol-9-yl)triphenylamine (TCTA), 3-(4-biphenylyl)-4-phenyl-5-te^butylphenyl-l, 2,butylphenyl-l,2,4-triazole (TAZ),/>bis(triphenylsilyi)benzene (UGH2), and PVK.

Electron-transporting layer 104 consists of materials or mixtures of materials having a high ionization potential and wide optical band gap. Suitable electron-transporting materials include l,3,5-tris(phenyl-2-benzimidazolyl)-benzene (TPBI), bathocuproine (BCP), bathophenanthroline (BPhen) and bis(2-methyl-8-quinolinolate)-4-(phenylphenolate)aluminum (BAlq), tris-[2,4,6-trimethyl-3-(pyridin-3-yl)phenyl]borane (3TPYMB), l,3,5-tri[(3-pyridyl)-phen-3-yl]benzene (TmPyPB), and l,3-bis[3,5-di(pyridin-3-yl)phenyl]benzene (BmPyPhB). In one embodiment of the invention, electron transporting layer 104 is prepared as an organic film by thermal evaporation, spin-coating, ink-jet printing from a solution, or other known fabrication methods. Electron-injecting cathode 102 acts as a transmissive electron injector that injects electrons into the organic EL layer of anode 110 when cathode 102 is negatively biased. Cathode 102 comprises a thin fluoride layer (which may be omitted) and a metal or metal alloy, preferably having a work function of less than 4 eV. Suitable materials include Mg:Ag, Ca, Li:Al, Al.

In some embodiments of the invention, novel luminescent gold(III) dendrimers are either the primary luminescent material or a secondary luminescent material in device 100. In some embodiments the novel gold(III) dendrimers are employed as electrophosphorescent dopants in multilayer OLED with an EQE of up to 7.6 %. Advantageously, the novel gold(III) compounds can be deposited in the OLEDs by spin-coating, screen printing or ink-jet printing. In addition, the modular molecular design of dendrimers as shown in Formula (I) allows independent optimization of electronic and processing properties combined with different metal centres producing OLEDs having various emission colours. The high solubility of the luminescent gold(III) dendrimers in a

variety of organic solvents permits simple and economic manufacturing and patterning of large-area displays.

In general, emissive layer 106 is sandwiched between hole-transporting layer 108 and electron-transporting layer 104. To ensure an efficient exothermic energy transfer between the host material and the dopant material, the triplet energy of the host material must be larger than that of the dopant material. In addition, both the ionization potential and the electron affinity of the host material should be larger than those of the dopant material in order to achieve efficient Foster energy transfer from the host to the dopant. In order to confine triplet excitons within emissive layer 106, the triplet energy of hole-transporting material 102 and electron-transporting material 104 should be larger than that of the dopant material.

The present invention will be illustrated more specifically by the following non-limiting examples, it being understood that changes and variations can be made therein without deviating from the scope and the spirit of the invention as hereinafter claimed. It is also understood that various theories as to why the invention works are not intended to be limiting.

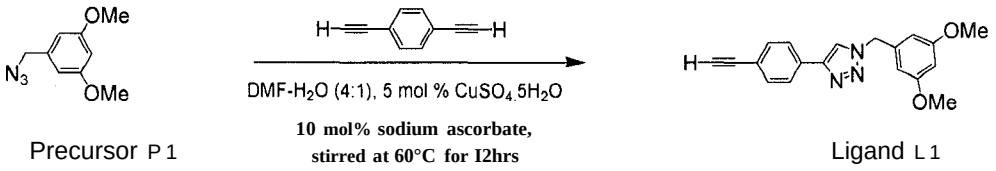
EXAMPLE 1

Synthesis and Characterization of Ligands 1-10

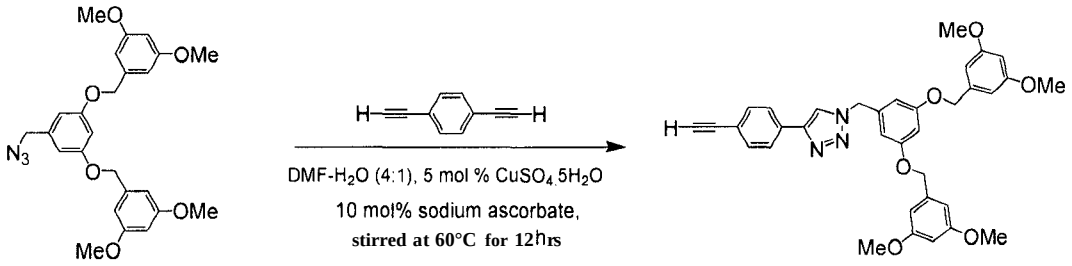
l-(3,5-dimethoxybenzyl)-4-(4-ethynylphenyl)-lH-l,2,3-triazole (ligand LI), l-(3,5-bis-(3,5-dimeoxybenyloxy)benzyl)-4-(4-ethynylphenyl)-lH-l,2,3-triazole (ligand L2), and l-(3,5-bis(3,5-bis(3,5-dimethoxybenzyloxy)benzyloxy)benzyl)-4-(4-ethylphenyl)-lH-l,2,3-triazole (ligand L3) were synthesized according to the following methodology. 3,5-dimethoxybenzylazide (precursor PI), 3,5-bis(3,5-dimethoxybenzyloxy)benzylazide (precursor P2), and [3,5-bis(3,5-bis(3,5-dimethoxybeenzyloxy)benzyloxy)]benzylazide (precursor P3) were synthesized according to the published procedure [Lee, J. W.; Kim, B. K.; Kim, J. H.; Shin, W. S.; Jin, S. H. *Bull. Korean Chem. Soc*, 26, 1790 (2005)]. For example, 3,5-dimethoxybenzyl bromide (1.50 g, 6.50 mmol) and sodium azide (1.27 g, 20.50 mmol) were disolved in DMF (30 mL) and heated in a sealed glass vessel under reflux for 12 h. The crude product was obtained by removal of solvent from the reaction mixture. The crude product was dissolved in dichloromethane (15 mL) and recrystallized by diffusion of pentane vapor into the solution to give ligand precursor PI as a pale white solid (1.20 g). Ligand precursors P2 and P3 were similarly synthesized.

Next, target ligands were synthesized from their respective precursors by the reaction of different polyarylether azide ligands with 1,4-diethynylbenzene in the presence of a catalytic amount of sodium ascorbate and $CuS0_4.5H_20$. For example, a mixture of 1,4-diethynylbenzene (0.15 g, 0.75 mmol) and precursor PI (0.13 g, 0.90 mmol) in the presence of 5 mol % $CuS0_4$-$5H_20$ (7.50 mg, 0.03 mmol) with 5 mol % sodium ascorbate (11.88 mg, 0.06 mmol) were dissolved in degassed (8 mL) DMF and H_20 (2 mL) and stirred for twelve hours under a nitrogen atmosphere at 50-60 °C. The crude product was cooled to room temperature and then extracted with diethyl ether (20 mL).

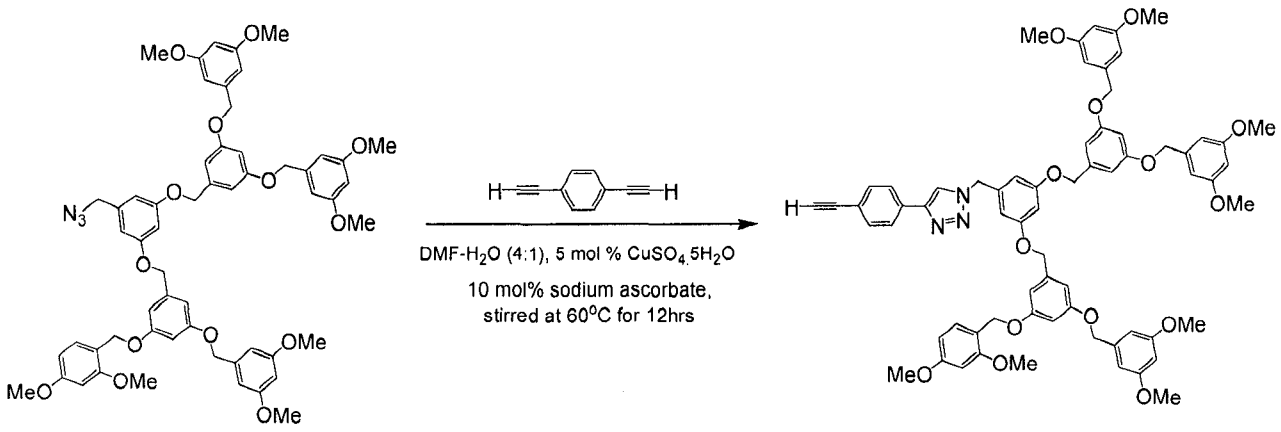
The desired product was isolated by column chromatography using ethyl acetate as the eluent. Column fractions were combined, the solvent removed, and subsequent recrystallization by diffusion of pentane vapor into a solution of the product in dichloromethane (10 mL) gave ligand L1 as a pale white solid. The yield of the ligand was approximately 70 %.



Precursor P1 Ligand L1



Precursor P2 Ligand L2

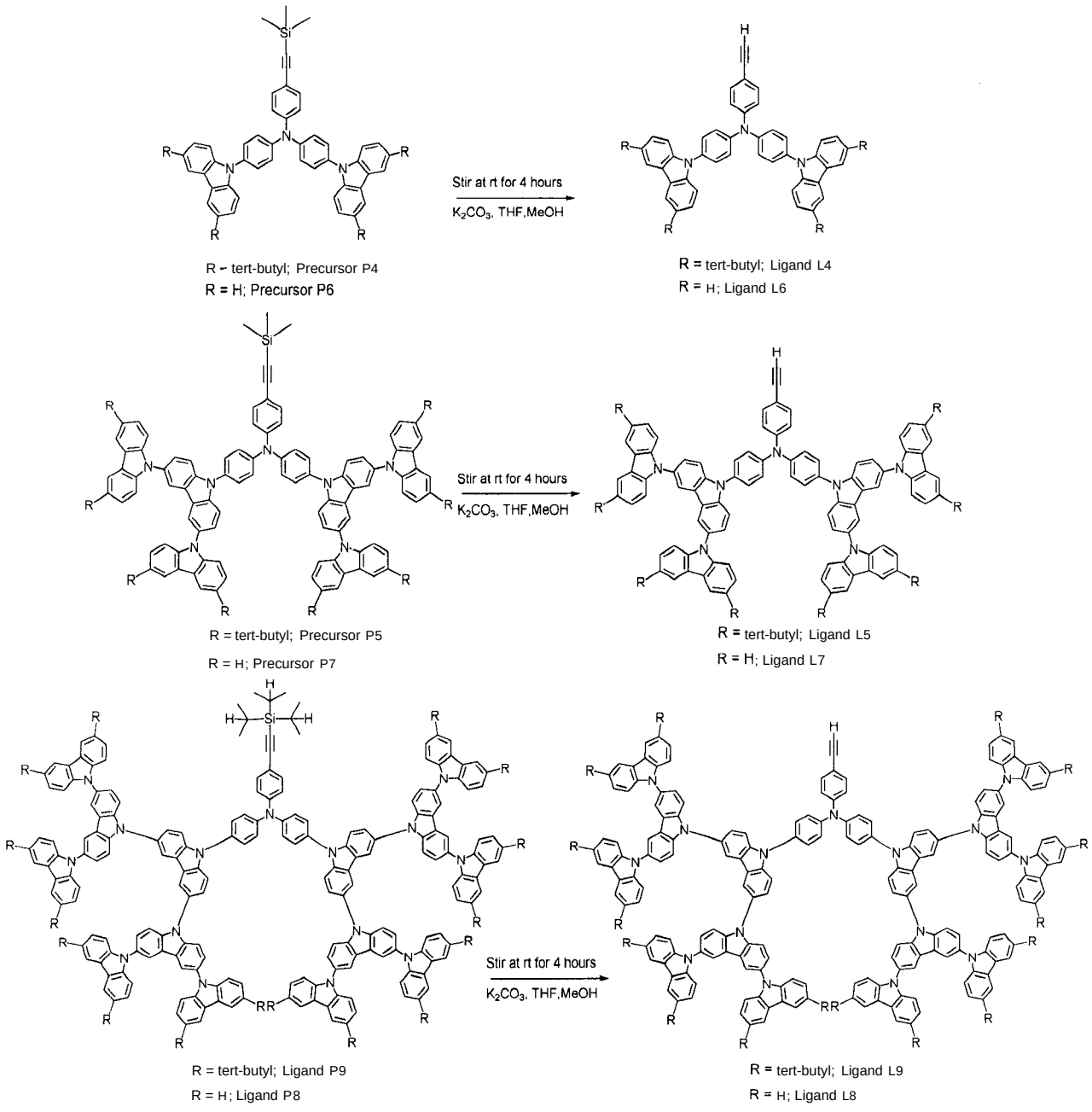


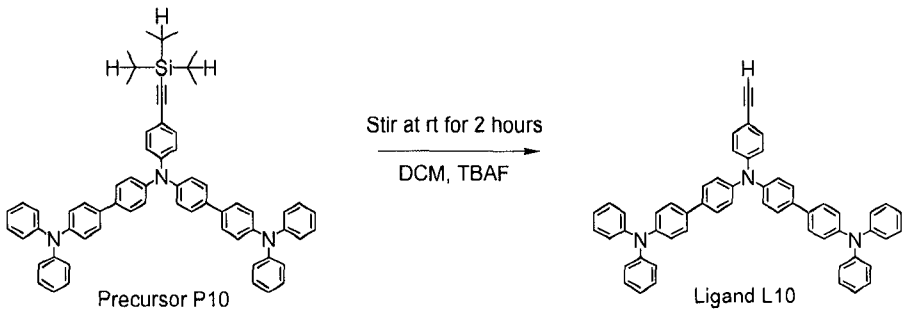
Precursor P3 Ligand L3

Carbazole or triphenylamine based dendritic alkynye ligands L4-L10 were synthesized according to the following methodology. The protected forms, precursors P4-P10, were prepared according to a modification of a procedure reported in the literature [Liu, Q. D.; Lu, J. P.; Day, M.; Tao, Ye.; Barrios, P.; Stupak, J.; Chan, K.; Li, J. J.; Chi, Y. *Adv. Funct. Mater.* 17, 1028, (2007); Kikuchi, A.; Nose, T. *Macromolecules* 30, 892 (1997); Zhu, M. R.; Zou, J. H.; Hu, S. J.; Li, C ; Yang, C. L.; Wu, H. B.; Qin, J. Q.; Cao, Y. *J. Mater. Chem. 22,* 361 (2012)]. Each target ligand was obtained by de-protection of the corresponding precursor ligand in a mixture of K_2C0_3 or tetrabutylammonium fluoride (TBAF) and an organic solvent. For example, a mixture of precursor P4 and K_2C0_3 in THF and MeOH was stirred for four hours under a nitrogen atmosphere at room temperature. The solvents were removed under reduced pressure. The crude product was diluted with dichloromethane. The organic phase was washed with NaCl in water three times (20 mL x 3), and

then extracted three times with dichloromethane (20 mL x 3). The organic extract was dried over anhydrous Na2S0$_4$ and filtered to remove Na_2S0_4. The solvent (dichloromethane) was evaporated under reduced pressure. Further purification was accomplished by column chromatography on silica gel with hexane-dichloromethane (6:1, v/v) as the eluent. The elution process was monitored by thin layer chromatography (TLC). Column fractions containing the product (R_f = 0.42) were pooled and the solvent removed by evaporation under reduced pressure. Subsequent recrystallization by diffusion of diethyl ether vapor into the solution of the product in dichloromethane gave ligand L4 as a pale brown solid.

Ligands L5-L10 were synthesized from precursors P5-P10 using the same procedure.





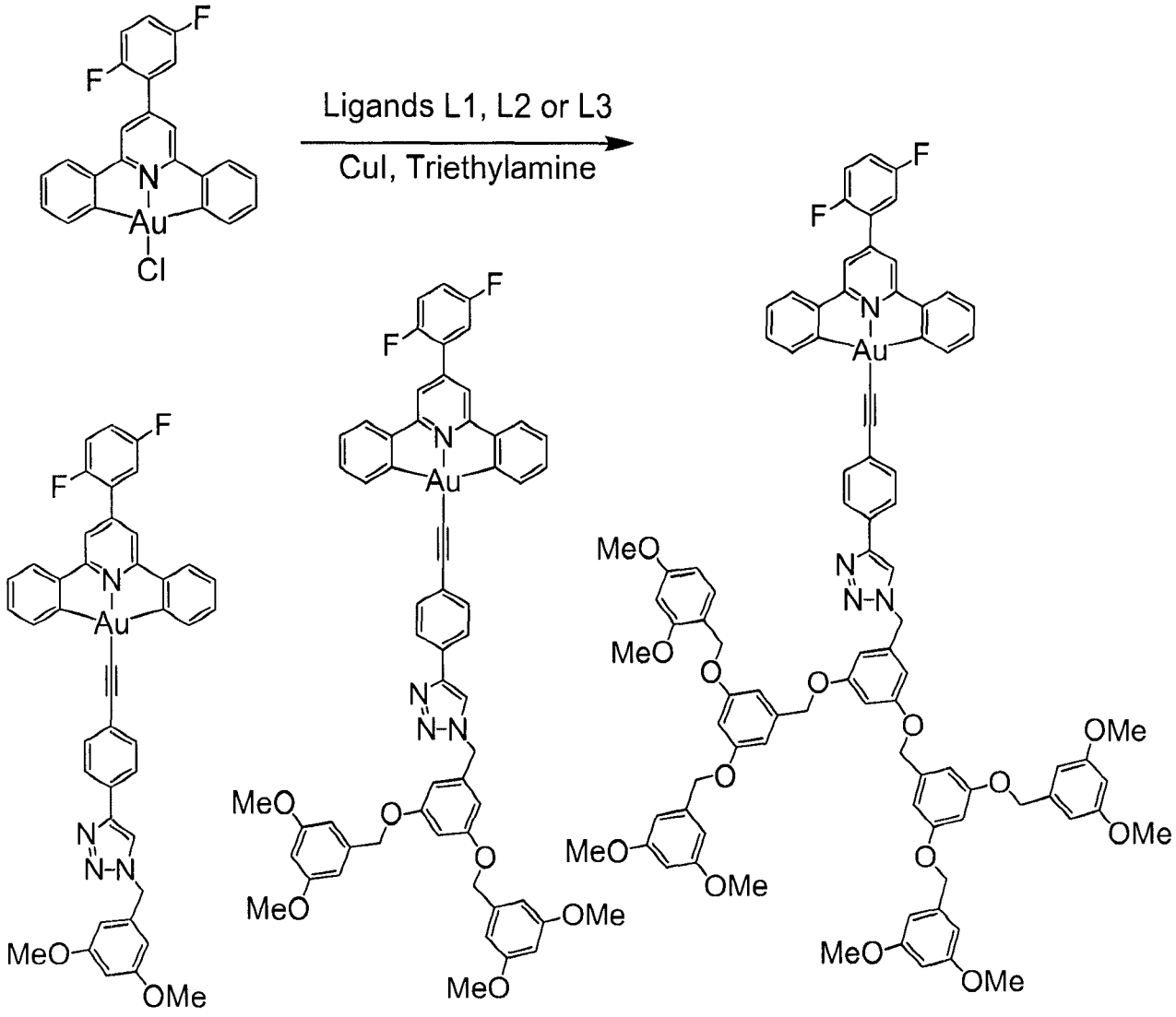
EXAMPLE 2

Synthesis and Characterization of Gold(III) Dendrimers

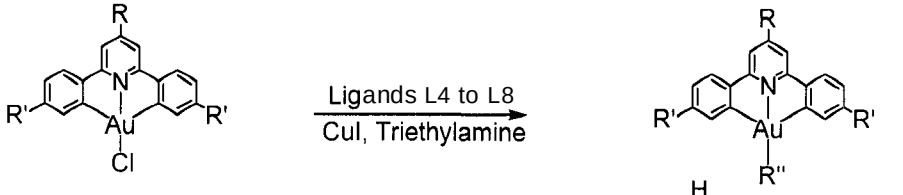
Compounds 1-13 were synthesized according to the following methodology.

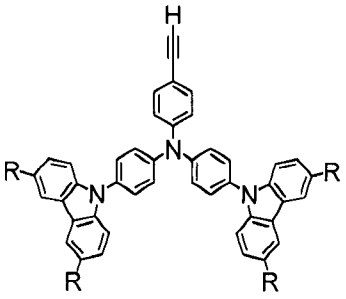
The tridentate ligands, 2,5-F2-C6H3-C ^N^C, ¾uC ^N^C'Bu, dpiq, and the precursor compounds, [Au(C^N^C)Cl], [Au(2,5-F_2- C_6H_3- C^N^C)C1)], [Au('BuC ^N^C'Bu)Cl] and [Au(dpiq)Cl], respectively, were prepared according to a modification of a procedure reported in the literature [Krohnke, F. *Synthesis* 1 (1976); Wong, K. H.; Cheung, K. K.; Chan, M. C. W.; Che, C. M. *Organometallics,* 17, 5305 (1998)].

The target compounds were synthesized by the reaction of the respective [Au(C^N^C)Cl], [Au(2,5-F_2- C_6H_3- C^N^C)C1), [AU('BUC^N^C¾U)C1] and [Au(dpiq)Cl] with different alkynes in the presence of a catalytic amount of copper(I) iodide in base and organic solvent. For example, compound 1 was synthesized from a mixture of [Au(2,5-F_2-C6H $_3$- C^N^C)C1] (1.04 g, 0.18 mmol), copper(I) iodide (3.80 mg, 0.02 mmol), triethylamine (2 mL) and ligand LI (0.60 g, 0.18 mmol) in degassed dichloromethane solution (30 mL) for twelve hours under a nitrogen atmosphere at room temperature. After removing the solvent, the crude product was purified by column chromatography on silica gel using ethyl acetate as the eluent. Column fractions containing the product were combined and evaporated to dryness under reduced pressure. The residue was dissolved in dichloromethane. Subsequent recrystallization by diffusion of diethyl ether vapor into the dichloromethane solution of the product (35 mL) gave compound 1 (40 mg) as pale yellow crystals. Compounds 2 through 13 were synthesized from their respective precursors using similar procedures.

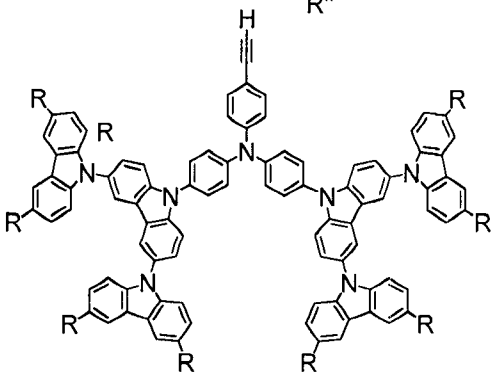


Compound 1 Compound 2 Compound 3



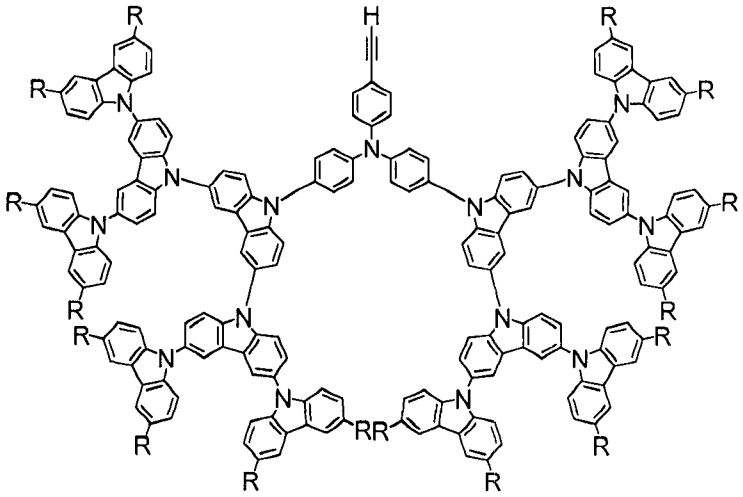


R = tert-butyl group; Ligand L4
R = H; Ligand L6



R = tert-butyl group; Ligand L5
R = H; Ligand L7

R = 2,5-$F_2C_6H_3$; R_2 = H; R" = Ligand L4 (Compound 4)
R = 2,5-$F_2C_6H_3$; R_2 = H; R" = Ligand L5 (Compound **5)**
R = H; R' = tert-butyl group; R" = Ligand L6 (Compound **6)**
R = H; R' = tert-butyl group; R" = Ligand L7 (Compound **7)**
R = H; R' = tert-butyl group; R" = Ligand L8 (Compound **8)**
R = H; R' = tert-butyl group; R" = Ligand L4 (Compound **9)**
R = H; R' = H; R" = Ligand L4 (Compound **10)**
R = 2,5-$F_2C_6H_3$; R_2 = H; R" = Ligand L9 (Compound **11)**



R = tert-butyl group; Ligand L9
R = H; Ligand L8

^{1}H NMR spectra were recorded on a Bruker AVANCE 400 (400 MHz) Fourier-transform NMR spectrometer with chemical shifts reported relative to tetramethylsilane. Positive FAB mass spectra were recorded on a Thermo Scientific DFS High Resolution Magnetic Sector Mass Spectrometer. IR spectra were recorded using a KBr disk on a Bio-Rad FTS-7 FTIR spectrometer (4000-400 cm^{-1}). Elemental analyses for the metal complexes were performed on the Carlo Erba 1106 elemental analyzer at the Institute of Chemistry, Chinese Academy of Sciences in Beijing. The results of the analyses confirm the high purity of all compounds 1-13.

The characteristic spectral properties of ligands L1-L10 and compounds 1-13 are as follows:

Ligand L1: Yield: 170 mg, 70 %. ^{1}H NMR (400 MHz, DMSO-d_6, 298 K, relative to Me_4Si): δ 3.11 (s, 1H), 3.71 (s, 6H), 5.55 (s, 2H), 6.47 (t, *J* = 2.0 Hz, 1H), 6.51 (d, *J* = 2.0 Hz, 2H), 7.54 (d, *J* = 8.4 Hz, 2H), 7.87 (d, *J* = 8.4 Hz, 2H), 8.67 (s, 1H). Positive FAB-MS: m/z 319 $[M]^+$. Elemental analyses: Found (%): C, 71.34; H, 5.55; N, 13.11. Calcd for $C_{19}H_{17}N_3O_2$: C, 71.45; H, 5.36; N, 13.15.

Ligand L2: Yield: 230 mg, 78 %. ^{1}H NMR (400 MHz, DMSO-d_6, 298 K, relative to Me_4Si): δ 3.11 (s, 1H), 3.71 (s, 12H), 5.00 (s, 4H), 5.55 (s, 2H), 6.47 (t, *J* = 2.0 Hz, 2H), 6.56-6.62 (m, 7H),

7.54 (d, *J* = 11.1 Hz, 2H), 7.85 (d, *J* = 11.1 Hz, 2H), 8.65 (s, 1H). Positive FAB-MS: m/z 592 $[M]^+$. Elemental analyses: Found (%): C, 68.91; H, 5.97; N, 6.67. Calcd for $C_{35}H_{33}N_3O_6 \cdot H_2O$: C, 68.95; H, 5.78; N, 6.89.

Ligand L3: Yield: 175 mg, 78 %. ^1H NMR (400 MHz, DMSO-d_6, 298 K, relative to Me_4Si): δ 3.11 (s, 1H), 3.71 (s, 24H), 4.96 (s, 12H), 5.53 (s, 2H), 6.41 (t, *J* = 2.0 Hz, 2H), 6.56-6.68 (m, 19H), 7.50 (d, *J* = 8.4 Hz, 2H), 7.83 (d, *J* = 8.4 Hz, 2H), 8.61 (s, 1H). Positive FAB-MS: m/z 1137 $[M]^+$. Elemental analyses: Found (%): C, 70.51; H, 5.81; N, 3.44. Calcd for $C_{67}H_{64}N_3O_{14} \cdot {}^1/_2H_2O$: C, 70.32; H, 5.72; N, 3.67.

Ligand L4: Yield: 480 mg, 83 %. ^1H NMR (400 MHz, $CDCl_3$, 298 K, relative to Me_4Si): δ 1.47 (s, 36H), 3.08 (s, 1H), 7.36-7.42 (m, 10H), 7.46-7.52 (m, 10H), 8.14 (d, *J* = 2.0 Hz, 4H). Positive FAB-MS: m/z 823 $[M]^+$. Elemental analyses: Found (%): C, 86.76; H, 4.97; N, 7.21. Calcd for $C_{60}H_6iN_3 \cdot {}^1/_2H_20$: C, 86.49; H, 7.50; N, 5.04.

Ligand L5: Yield: 200 mg, 83 %. ^1H NMR (400 MHz, $CDCl_3$, 298 K, relative to Me_4Si): δ 1.57 (s, 72H), 3.11 (s, 1H), 7.30-7.67 (m, 24H), 7.72-7.75 (m, 12H), 8.18 (d, *J* = 1.5 Hz, 8H), 8.28 (d, *J* =1.8 Hz, 4H). Positive FAB-MS: m/z 1707 $[M]^+$. Elemental analyses: Found (%): C, 85.19; H, 7.36; N, 5.54. Calcd for $C_{124}Hi_2iN_7 \cdot 2H_20$: C, 85.33; H, 7.21; N, 5.61.

Ligand L6: Yield: 230 mg, 77 %. ^1H NMR (400 MHz, CD_2Cl_2, 298 K, relative to Me_4Si): δ 3.15 (s, 1H), 7.26 (d, *J* = 8.4 Hz, 2H), 7.29-7.33 (m, 4H), 7.44-7.57 (m, 18H), 8.17 (d, *J* = 8.0 Hz, 4H). Positive FAB-MS: m/z 599 $[M]^+$. Elemental analyses: Found (%): C, 87.07; H, 4.98; N, 6.99. Calcd for $C_{60}H_6iN3 \cdot {}^1/_2H_20$: C, 86.81; H, 4.96; N, 6.90.

Ligand L7: Yield: 210 mg, 80 %. ^1H NMR (400 MHz, CDCI3, 298 K, relative to Me_4Si): δ 3.12 (s, 1H), 7.17 (d, *J* = 11.6 Hz, 2H), 7.27-7.33 (m, 8H), 7.40 (d, *J* = 6.0 Hz, 16H), 7.54 (d, *J* = 11.6 Hz, 4H), 7.65 (dd, *J* = 11.6 and 2.4 Hz, 4H), 7.69-7.77 (m, 10H), 8.17 (d, *J* = 11.6 Hz, 8H), 8.30 (d, *J* = 2.2 Hz, 4H). Positive FAB-MS: m/z 1260 $[M]^+$. Elemental analyses: Found (%): C, 87.38; H, 4.50; N, 7.54. Calcd for $C_{92}H_{57}N_7$: C, 87.66; H, 7.56; N, 7.77.

Ligand L8: Yield: 60 mg, 77 %. ^1H NMR (400 MHz, $CDCl_3$, 298 K, relative to Me_4Si): δ 3.15 (s, 1H), 7.21-7.31 (m, 16H), 7.34-7.40 (m, 34H), 7.56-7.77 (m, 22H), 7.81 (dd, *J* = 7.3 and 1.0 Hz, 4H), 7.90 (d, *J* = 8.4 Hz, 8H), 8.15 (d, *J* = 7.8 Hz, 16H), 8.29 (d, *J* = 8.4 Hz, 8H), 8.56 (d, *J* = 2.0 Hz, 4H). Positive FAB-MS: m/z 2579 $[M]^+$. Elemental analyses: Found (%): C, 85.86; H, 5.03; N, 7.81. Calcd for $C_{60}H_{61}N_3 \cdot 2{}^1/_2 CH_3CH_2OCH_2CH_3$: C, 85.93; H, 5.02; N, 7.59.

Ligand L9: Yield: 150 mg, 90 %. ^1H NMR (400 MHz, $CDCl_3$, 298 K, relative to Me_4Si): δ 1.40 (s, 144H), 3.15 (s, 1H,), 7.42 (d, *J* = 8.8 Hz, 16H), 7.43-7.45 (m, 18H), 7.59-7.63 (m, 22H), 7.64 (d, *J* = 8.8 Hz, 4H), 7.87-7.89 (m, 8H), 8.14 (d, *J* = 1.8 Hz, 16H), 8.26 (d, *J* = 1.8 Hz, 8H), 8.56 (s, 4H). Positive FAB-MS: m/z 3479 $[M]^+$. Elemental analyses: Found (%): C, 85.45; H, 7.51; N, 5.60. Calcd for $C_{252}H_{24}iNi5 \cdot 3CH_3CH_2OCH_2CH_3$: C, 85.65; H, 7.37; N, 5.67.

Ligand L10: Yield: 110 mg, 65 %. ^1H NMR (300 MHz, DMSO-d_6, 298 K, relative to Me_4Si): δ 3.04 (s, 1H), 7.04-7.11 (m, 18H), 7.18 (d, *J* = 9.0 Hz, 4H), 7.29-7.34 (m, 8H), 7.41 (d, *J* = 9.0 Hz, 2H), 7.59-7.66 (m, 8H). Positive FAB-MS: m/z 756 $[M]^+$.

Compound 1: [Au(2,5-F_2-C_6H_3-C^N^C-ligand LI)]. Yield: 40 mg, 27 %. ^1H NMR (400 MHz,

DMSO-d_6, 298 K, relative to Me_4Si): δ 3.71 (s, 6H), 5.55 (s, 2H), 6.47 (d, *J* = 2.0 Hz, 1H), 6.51 (t, *J* = 2.0 Hz, 2H), 7.34 (dt, *J* = 7.4 and 1.0 Hz 2H), 7.44 (dt, *J* = 7.4 and 1.0 Hz, 2H), 7.48-7.56 (m, 2H), 7.58 (d, *J* = 8.2 Hz, 2H), 7.74-7.82 (m, 1H), 7.86 (d, *J* = 7.4 Hz, 2H), 7.95 (dd, *J* = 7.4 and 1.0 Hz, 2H) 8.02 (d, *J* = 8.2 Hz, 2H), 8.18 (s, 2H), 8.67 (s, 1H). Positive FAB-MS: m/z 856 $[M]^+$. IR (KBr disk): 2337 cm^{-1} ν(C≡C). Elemental analyses: Found (%): C, 58.33; H, 3.54; N, 6.43. Calcd for $C_{42}H_{29}F_2N_4O_2Au \cdot {}^1/_2H_2O$: C, 58.27; H, 3.49; N, 6.47.

Compound 2: [Au(2,5-F_2-C_6H_3-C^N^C-ligand L2)]. Yield: 40 mg, 35 %. ^1H NMR (400 MHz, DMSO-d_6, 298 K, relative to Me_4Si): δ 3.70 (s, 12H), 5.00 (s, 4H), 5.55 (s, 2H), 6.41 (t, *J* = 4.4 Hz, 2H), 6.56-6.64 (m, 7H), 7.34 (dt, *J* = 7.6 and 1.0 Hz, 2H), 7.44 (dt, *J* = 7.6 and 1.0 Hz, 2H), 7.48-7.55 (m, 2H), 7.58 (d, *J* = 8.0 Hz, 2H), 7.77-7.81 (m, 1H), 7.82 (d, *J* = 7.6 Hz, 2H), 7.94 (dd, *J* = 7.6 and 1.0 Hz, 2H), 8.02 (d, *J* = 8.0 Hz, 2H), 8.18 (s, 2H), 8.65 (s, 1H). Positive FAB-MS: m/z 1128 $[M]^+$. IR (KBr disk): 2351 cm^{-1} ν(C≡C). Elemental analyses: Found (%): C, 61.26; H, 4.08; N, 4.88. Calcd for $C_{55}H_{45}F_2N_4O_6Au \cdot {}^1/_2H_2O$: C, 61.21; H, 4.07; N, 4.92.

Compound 3: [Au(2,5-F_2-C_6H_3-C^N^C-ligand L3)]. Yield: 57 mg, 26 %. ^1H NMR (400 MHz, DMSO-d_6, 298 K, relative to Me_4Si): δ 3.70 (s, 24H), 5.00 (s, 12H), 5.54 (s, 2H), 6.41 (t, *J* = 2.0 Hz, 2H), 6.56-6.66 (m, 19H), 7.33 (dt, *J* = 8.0 and 1.0 Hz, 2H), 7.43 (dt, *J* = 8.0 and 1.0 Hz, 2H), 7.48-7.55 (m, 2H), 7.56 (d, *J* = 8.4 Hz, 2H), 7.77-7.82 (m, 1H), 7.84 (d, *J* = 8.0 Hz, 2H), 7.93 (dd, *J* = 8.0 and 1.0 Hz, 2H) 8.03 (d, *J* = 8.4 Hz, 2H), 8.18 (s, 2H), 8.61 (s, 1H). Positive FAB-MS: m/z 1672 $[M]^+$. IR (KBr disk): 2351 cm^{-1} **ν(OC).** Elemental analyses: Found (%); **C,** 64.76; H, 4.75; N, 3.51. Calcd for $C_{90}H_{77}F_2N_4O_{14}Au$: C, 64.59; H, 4.63; N, 3.34.

Compound 4; [Au(2,5-F_2-C_6H_3-C^N^C-ligand L4)]. Yield: 80 mg, 68 %. ^1H NMR (500 MHz, CD_2Cl_2, 298 K, relative to Me_4Si): δ 1.47 (s, 18H), 7.25-7.37 (m, 7H), 7.43-7.47 (m, 10H), 7.50-7.53 (m, 8H), 7.61 (d, *J* = 4.8 Hz, 2H), 7.62-7.70 (m, 4H), 8.11 (dd, *J* = 7.3 and 1.0 Hz, 2H) 8.16 (d, *J* = 1.6 Hz, 4H). Positive FAB-MS: m/z 1360 $[M]^+$. IR (KBr disk): 2361 cm^{-1} **ν(OC).** Elemental analyses: Found (%): C, 73.12; H, 5.54; N, 4.02. Calcd for **$C_{83}H_{73}F_2N_4Au$:** C, 73.48; H, 5.76; N, 4.11.

Compound 5: [Au(2,5-F_2-C_6H_3-C^N^C-ligand L5)]. Yield: 48 mg, 28 %. ^1H NMR (400 MHz, CD_3Cl, 298 K, relative to Me_4Si): δ 1.46 (s, 72H), 7.20-7.25 (m, 3H), 7.27-7.39 (m, 12H), 7.44-7.47 (m, 10H), 7.58 (d, *J* = 8.0 Hz, 4H), 7.67-7.75 (m, 18H), 8.16-8.18 (m, 10H), 8.25 (d, *J* = 4.0 Hz, 4H). Positive FAB-MS: m/z 2242 $[M]^+$. IR (KBr disk): 2364 cm^{-1} ν(C≡C). Elemental analyses: Found (%): C, 78.59; H, 5.97; N, 4.99. Calcd for $C_{147}H_{133}F_2N_8Au \cdot 2H_2O$: C, 77.10; H, 6.07; N, 5.18.

Compound 6: [Au('BuC^N^C'Bu—ligand L6)]. Yield: 48 mg, 45 %. ^1H NMR (500 MHz, CD_2Cl_2, 298 K, relative to Me_4Si): δ 1.26 (s, 18H), 7.28-7.34 (m, 8H), 7.43-7.58 (m, 18H), 7.62 (d, *J* = 2.0 Hz, 2H), 7.63 (d, *J* = 2.0 Hz, 2H), 7.87 (t, *J* = 8.0 Hz, 1H), 8.16 (d, *J* = 7.4 Hz, 4H), 8.21 (d, *J* = 2.4 Hz, 2H). Positive FAB-MS: m/z 1136 $[M]^+$. IR (KBr disk): 2337 cm^{-1} ν(C≡C). Elemental analyses: Found (%): C, 72.04; H, 4.96; N, 4.94. Calcd for $C_{69}H_{55}N_4Au \cdot H_2O$: C, 71.74; H, 4.97; N, 4.85.

Compound 7: [Au('BuC^N^C'Bu—ligand L7)]. Yield: 50 mg, 32 %. ^1H NMR (500 MHz, CD_2Cl_2, 298 K, relative to Me_4Si): δ 1.26 (s, 18H), 7.26-7.32 (m, 8H), 7.33 (dd, *J* = 8.0 and 2.0 Hz, 2H), 7.39-7.43 (m, 18H), 7.48 (d, *J* = 7.4 Hz, 2H), 7.58 (d, *J* = 8.0 Hz, 2H), 7.63 (d, *J* = 8.2 Hz, 4H),

7.66-7.69 (m, 6H), 7.75 (d, *J* = 7.4 Hz, 4H), 7.80 (d, *J* = 8.5 Hz, 4H), 7.85 (t, *J* = 8.2 Hz, 1H), 8.16 (d, *J* = 8.0 Hz 8H), 8.22 (d, *J* = 2.0 Hz, 2H), 8.32 (d, *J* = 2.0 Hz, 4H). Positive FAB-MS: m/z 1796 $[M]^+$. IR (KBr disk): 2340 cm^{-1} v(C≡C). Elemental analyses: Found (%): C, 78.11; H, 4.71 ; N, 6.29. Calcd for $Cii_7H_{83}N_8Au$: C, 78.15; H, 4.65; N, 6.23.

Compound 8: [AU(*t*BUC^N^C'BU–ligand L8)]. Yield: 30 mg, 22 %. ¹H NMR (500 MHz, CD_2C1_2, 298 K, relative to Me_4Si): δ 1.26 (s, 18H), 7.24-7.28 (m, 16H), 7.34 (dd, *J* = 8.0 and 2.0 Hz, 2H), 7.37-7.48 (m, 32H), 7.48 (dd, *J* = 8.5 and 2.4 Hz, 4H), 7.58 (d, *J* = 8.0 Hz, 2H), 7.62 (dd, *J* = 8.5 and 2.0 Hz, 8H), 7.71-7.75 (m, 14H), 7.84 (d, *J* = 8.5 Hz, 4H), 7.87 (t, *J* = 8.4 Hz, 1H), 7.91 (dd, *J* = 8.6 and 2.0 Hz, 4H), 7.96 (d, *J* = 8.6 Hz, 4H), 8.16 (d, *J* = 8.0 Hz, 16H), 8.23 (d, *J* = 2.4 Hz, 2H), 8.34 (d, *J* = 2.0 Hz, 8H), 8.60 (d, *J* = 2.0 Hz, 4H). Positive FAB-MS: m/z 3119 $[M]^+$. IR (KBr disk): 2347 cm^{-1} v(C≡C). Elemental analyses: Found (%): C, 81.57; H, 4.77; N, 7.02. Calcd for $C_{213}H_{139}N_{16}Au'^1/_2H_2O$: C, 81.77; H, 4.51; N, 7.16.

Compound 9: [Au('BuC^N^C'Bu—ligand L4)]. Yield: 106 mg, 70 %. ¹H NMR (500 MHz, CD_2C1_2, 298 K, relative to Me_4Si): δ 1.40 (s, 18H), 1.46 (s, 36H), 7.30 (d, *J* = 8.6 Hz, 2H), 7.33 (dd, *J* = 8.2 and 1.8 Hz, 2H), 7.43-7.48 (m, 10H), 7.50-7.54 (m, 8H), 7.58 (d, *J* = 8.2 Hz, 2H), 7.62 (d, *J* = 8.6 Hz, 2H), 7.87 (t, *J* = 8.0 Hz, 1H), 8.16 (d, *J* = 1.8 Hz, 4H), 8.21 (d, *J* = 2.0 Hz, 2H). Positive FAB-MS: m/z 1360 $[M]^+$. IR (KBr disk): 2350 cm^{-1} **v(C=C).** Elemental analyses: Found (%): C, 74.46; H, 6.69; N, 3.87. Calcd for $C_{87}H_{84}N_4Au•^1/_2H_2O$: C, 74.48; H, 6.67; N, 4.08.

Compound 10: [Au(C^N^C-ligand L4)]. Yield: 120 mg, 83 %. ^1H NMR (500 MHz, DMSO-d_6, 298 K, relative to Me_4Si): δ 1.47 (s, 18H), 7.28-7.32 (m, 4H), 7.41-7.45 m, 10H), 7.50-7.53 (m, 8H), 7.56 (d, *J* = 8.0 Hz, 2H), 7.61 (d, *J* = 8.4 Hz, 2H), 7.65 (dd, *J* = 8.0 and 1.0 Hz, 2H), 7.93 (t, *J* = 8.0 Hz, 1H), 8.08 (dd, *J* = 7.2 and 1.0 Hz, 2H), 8.16 (d, *J* = 1.6 Hz, 4H). Positive FAB-MS: m/z 1248 $[M]^+$. IR (KBr disk): 2361 cm^{-1} v(C^C). Elemental analyses: Found (%): C, 73.48; H, 5.53; N, 4.43. Calcd for $C77H_7N_4Au''/_2H_20$: C, 73.49; H, 5.76; N, 4.45.

Compound 11: [Au(2,5-F_2-C_6H_3-ligand L9)]. Yield: 100 mg, 58 %. ^1H NMR (400 MHz, CD_3C1, 298 K, relative to Me_4Si): δ 1.46 (s, 144H), 7.23-7.36 (m, 21H), 7.45-7.47 (m, 20H), 7.61-7.70 (m, 24H), 7.77-7.80 (m, 6H,), 7.82-7.94 (m, 8H), 8.16-8.19 (m, 18H), 8.28 (d, *J* = 1.4 Hz, 8H), 8.58 (s, 4H). Positive FAB-MS: m/z 4017 $[M]^+$. IR (KBr disk): 2364 cm^{-1} v(C≡C). Elemental analyses: Found (%): C, 80.26; H, 6.52; N, 5.37. Calcd for $C_{275}H_{253}F_2N_{16}Au'\ l'/_2CH_3CH_2OCH_2CH_3$: C, 80.12; H, 6.22; N, 5.40.

Compound 12: [Au(C^N^C-ligand L10)]. Yield: 60 mg, 38 %. ^1H NMR (400 MHz, DMSO-d_6, 298 K, relative to Me_4Si): 6.96-7.08 (m, 18H), 7.14 (d, *J* = 8.0 Hz, 4H), 7.26-7.34 (m, 10H), 7.37 (t, *J* = 8.0 Hz, 2H), 7.43 (d, *J* = 8.0 Hz, 2H), 7.48-7.63 (m, 8H), 7.87-7.91 (m, 4H), 7.96 (d, *J* = 8.0 Hz, 2H), 8.17 (t, *J* = 8.0 Hz, 1H). Positive FAB-MS: m/z 1181 $[M]^+$.

Compound 13: [Au(dpiq-ligand L10)]. Yield: 30 mg, 45 %. ¹H NMR (500 MHz, DMSO-d_6, 298 K, relative to Me_4Si): 7.01-7.08 (m, 18H), 7.13 (d, *J* = 8.0 Hz, 4H), 7.29-7.60 (m, 22H), 7.61 (t, *J* = 5.0 Hz, 1H), 7.84-7.94 (m, 3H), 7.95 (d, *J* = 5.0 Hz, 1H), 8.07 (d, *J* = 5.0 Hz, 1H), 8.41 (d, *J* = 10.0 Hz, 1H), 8.50 (s, 1H), 8.94 (d, *J* = 10.0 Hz, 1H). Positive FAB-MS: m/z 1218 $[M]^+$.

EXAMPLE 3

UV-Vis Absorption Properties

The UV-vis absorption spectrum of compounds **1-13** in dichloromethane at 298 degrees K feature an intense absorption band at 240-375 nm and a moderately intense vibronic-structured absorption band at *ca.* 380—450 nm with extinction coefficients (ε) on the order of 10^4 $dm^3mol^{-1}cm^{-1}$. The UV-visible absorption data of compounds **1-13** in dichloromethane at 298 K have been summarized in Table 1.

As shown in FIG. **2,** compounds **1-3** show an intense absorption band at 250-290 nm and a moderately intense vibronic-structured band at *ca.* 370-410 nm in dichloromethane at 298 degrees K. The high energy band is assigned to the spin-allowed intraligand (IL) π→π* transition of the benzyloxy units. The molar extinction coefficients at approximately 285 nm increased from compound **1** to compound **3,** which is ascribed to the increased number of benzyloxy units. For instance, the extinction coefficients (ε) at 285 nm for compounds **1, 2** and **3** are 5.77 x 10^4, 6.48 x 10^4 and 7.93 x 10^4 $dm^3mol^{-1}cm^{-1}$ respectively. The low-energy vibronic-structured band shows vibrational progressional spacings of *ca.* 1300 cm^{-1}, corresponding to the skeletal vibrational frequency of the 2,5-F2-C_6H_3- C^N^C ligand. The low-energy absorptions are assigned as IL π→n* transition of the 2,5-F_2- C_6H_3- C^N^C ligand.

FIG. **3** shows the electronic absorption spectra of compounds **4, 5, 9, 10,** and **11.** Compounds **4, 5, 9-11** exhibit intense absorptions at 230-375 nm and a moderately intense vibronic-structured band at *ca.* 380-420 nm; it is noted that an additional absorption tail at 430-500 nm is observed in FIG. **3.** The absorption bands at 230-375 nm are mainly attributed to spin-allowed IL π-→π* transition of the carbazole units. Similar to other gold (III) compounds, the weaker vibronic-structured absorption band was tentatively assigned to a metal-perturbed IL π-→π* transition of the RC^N(R')^CR ligand with charge transfer character from the phenyl ring to the pyridyl unit. On the other hand, when 3,6-di-tert-butylcarbazole substituents are introduced at the 4,4' positions of the triphenylamine alkynyl moieties, electronic perturbation becomes so significant that ligand L4, L5 and L9 become more electron-rich, and the possibility of an admixture of IL π→π* [RC^N(R')^CR] and alkynyltriarylamine] or a ligand-to-ligand charge transfer (LLCT) u[alkynyltriarylamine]—» π* [RC^N(R')^CR] transition is likely.

FIGS. **4** and **5** show the electronic absorption spectra of compounds **6-8,** and the electronic absorption spectra of compounds **12-13,** respectively. Compounds **6-8** show intense absorption bands at 300-350 nm and a moderately intense vibronic-structured shoulder at *ca.* 390-410 nm; while compounds **12-13** exhibit strong absorption bands at *ca.* 300-380 nm. Moreover, a lower energy band can be observed at *ca.* 430-450 nm in compound **13.** The UV-vis absorption and emissive spectra of compounds **1-13** in Examples 3 and 4, respectively, gave the fundamental photophysical data, that provide useful guidelines for the design of the chemical structures to tune the emission color of the emitters in both solution and solid state.

EXAMPLE 4

Photoluminescence Properties

Unlike most other Au(III) compounds which are non-emissive or only show luminescence at low temperatures, compounds **1-13** display intense luminescence at 482-695 ntn in solution at room temperature (Table 1). FIG. **6** shows the normalized emission spectra of compounds **1-3.** Upon excitation at λ = 380 nm in dichloromethane solution at 298 degrees K, a vibronic-structured emission band with a band maximum at around 480 nm is observed for compounds **1-3.** Interestingly, the introduction of an increasing content of polyarylether dendrons onto the alkynyl moiety, results in a minor perturbation in the emission maxima . The progressional spacings of *ca.* 1300 cm^{-1}, that are characteristic of the C=C and C=N stretching frequencies of the 2,5-F2-C6H_3- C^N^C tridentate ligand, indicate the involvement of the tridentate ligand in the excited state origin. According the published literature concerning the luminescence of related compounds , the luminescences of compounds **1-3** are assigned assuming that they originate from a metal-perturbed IL ^{3}[π→it*] state of the 2,5-F2-C_6H_3- C^N^C tridentate ligand, probably mixed with a charge transfer character from the phenyl ring to the pyridyl unit.

FIGS. **7** and **8** display the normalized emission spectra of thin films of compounds **2** and **3** doped into a PMMA substrate at different concentrations. Both compounds show similar vibronic-structured emission bands with an emission energy similar to that observed for compound **2** in dichloromethane solution. The emissive origin is tentatively assigned assuming that it originates from a metal-perturbed IL ^{3}[π- »π*] state of the 2,5-F2-C_6H_3- C^N^C ligand. In contrast to the insignificant change of emission properties in dichloromethane solution, the saturated polyarylether dendrons dramatically influence the solid-state emission of the dendritic Au(III) compounds. A red emission tail is observed for compound **2** with increasing dopant concentrations from 8 wt% to 50 wt %, and it is more pronounced in the neat film. This observation could be due to the excimeric emission resulting from the π-stacking of the 2,5-F2-C_6H_3–C^N^C moieties with higher order and better packing of molecules at higher concentrations. The bathochromic problem is greatly alleviated by the introduction of the second generation of polyarylether dendrons onto the alkynyl moiety in compound **3.** It can be seen in FIG. **8** that with increasing dopant concentrations of compound **3** from 8 wt% to 50 wt% and even up to 100 wt% (i.e. neat film), the red emission tail has disappeared. The emission band of compound **3** in the 50 wt% dopant concentration is almost the same as that in the solution, suggesting that the π-stacking of the 2,5-F_2C6H_3- C^N^C moieties between the emissive cores has been reduced. The use of saturated polyarylether dendrons to prevent the π-stacking of the 2,5-$F_2C_6H_3$- C^N^C moieties and hence the formation of eximeric emission in order to maintain the colour purity and stability of the Au(III) chromophoric compounds is first demonstrated. In some embodiments of the present invention, π-stacking of the 2,5-$F_2C_6H_3$- C^N^C moieties is prevented by polyarylether dendrons, and effectively minimizes the intermolecular interactions between the molecules that lead to emission quenching or triplet-triplet annihilation. This emission quenching would otherwise inevitably degrade the performance of the

OLED.

FIGS. **9** and **10** show the normalized emission spectra of compounds **4, 5, 11** and normalized emission spectra of compounds **6-8** in dichloromethane at room temperature, respectively. Upon excitation at $\lambda > 380$ nm, a broad structureless emission band is observed at *ca.* 560-695 nm. Due to the presence of the electron-donating triphenylamine substituent on the ligand L4-L9 moieties, the origin of the emission band in compounds **4-8** and **11** is tentatively assigned as derived from an excited state of ^{3}LLCT π[alkynyltriarylamine $\rightarrow\pi^*$[RC^N(R')^CR] orgin. Interestingly, incorporation of the triphenylamine moiety into the higher generation of dendrimers for compounds **6-8** has resulted in higher-energy emission bands **[6** (591 nm) < 7 (570 nm) < **8** (560 nm)]. Similarly compounds **4, 5** and **11** exhibit progressively higher emission bands **[4** (695 nm) < **5** (646 nm) < **11** (620 nm)].

FIG. **11** shows the normalized photoluminescence spectra of compounds **12** and **13** in dichloromethane at 298 degrees K. A vibronic-structured band with a band maximum at around 600 nm is observed for compound **12** and a broad lower energy structureless emission band centered at 660 nm is noted for compound **13.**

FIG. **12** depicts the emission spectra of thin films of compound **4** doped into PMMA at different concentrations. A red shift in the emission band between 540 and 590 nm is observed with increasing dopant concentrations from 2 wt% to 50 wt%. The emission maximum in the neat film is almost identical to that in the 50 wt% thin film at around 591 nm, suggesting that the extent of π-stacking of the 2,5-F_2-C_6H_3-C^N^C moieties of compound **4** with increasing dopant concentration from 50 wt% to 100% (i.e. neat film) is similar. Such concentration-dependent emission has also been observed for other structurally related Au(III) compounds, probably due to dimeric/oligomeric or excimeric emission in the thin film arising from the π-π stacking of the 2,5-F_2-C_6H_3-C^N^C ligand. This concentration-dependent colour tuning can be accomplished by making use of the relationship between the emission colour of the OLED and the dopant concentration, and thus providing an optimal emission colour spectrum for an application for which the OLED will be used.

TABLE 1

Photophysical data for compounds **1-13**

Compound	Medium (77 K)	Absorption λ_{abs} / nm (λ_{max} / dm^3 mol^{-1} cm^{-1})	Emission λ_{em} / nm(t $_0$ / μs)	Φ_{sol}[a]	Φ_{film}[b]
1	CH_2Cl_2 (298)	285 (56850), 330 (15820), 365 (6825), 390 (5340), 410 (3660)	482, 512 (<0.1)	4×10^{-1}	[d]
2	CH_2Cl_2 (298)	285 (64800), 330 (17570), 365 (7170), 390 (5705), 410 (3706)	482, 512 (<0.1)	7×10^{-3}	0.16
3	CH_2Cl_2 (298)	285 (79250), 330 (18870), 365 (8490), 390 (6515), 410 (4465)	482, 512 (<0.1)	$9*10^{-1}$	0.20
4	CH_2Cl_2 (298)	242 (114410), 300 (54050), 330 (64500), 350 (41940), 390 (4740), 410 (5850)	695 (<0.1)	3×10^{-1}	0.57
5	CH_2Cl_2 (298)	244 (2333 10), 290 (108980), 302 (95340), 330 (69580), 350 (51510), 386 (7830), 408 (7585)	646(<0.1)	0.10	0.39
6	CH_2Cl_2 (298)	243 (121 150), 262 (85205), 295 (58750), 327 (60250), 344 (45430), 391 (15830),411 (12320)	591 (0.13)	0.13	0.17
7	CH_2Cl_2 (298)	243 (267750), 262 (168070), 295 (122600), 327 (83 120), 344 (67300), 391 (15490),411 (10355)	570 (0.14)	9×10^{-2}	0.15
8	CH_2Cl_2 (298)	243 (435480), 262 (240790), 295 (203 110), 327 (89210), 344 (73810), 391 (15290),411 (11360)	560 (0.13)	3×10^{-2}	0.13
9	CH_2Cl_2 (298)	240 (142790), 267 (82950), 299 (65346), 328 (60178), 394 (14570), 414 (11860)	610 (0.2)	$6*10^{-2}$	0.20
10	CH_2Cl_2 (298)	250 (83740), 267 (53065), 299 (41255), 328 (40790), 383 (7210), 402 (7380)	632 (<0.1)	2×10^{-2}	[c]
11	CH_2Cl_2 (298)	244 (523880), 300 (257760), 330 (112970), 350 (71705), 386 (122100), 408 (95 10)	620 (<0.1)	1×10^{-2}	0.28
12	CH_2Cl_2 (298)	312 (67670), 328 (68820), 362 (102045), 428 (10580)	660 (<0.1)	2×10^{-1}	0.20
13	CH_2Cl_2 (298)	300 (74215), 328 (77945), 346 (107635), 362 (104550), 430 (11890), 450 (10620)	600, 650 (<0.1)	2×10^{-3}	0.05

[a] The luminescence quantum yield, measured at room temperature using $[Ru(bpy)_3]Cl_2$ in aqueous state as the reference (excitation wavelength = 436 nm, $\Phi_{lum} = 0.042$)

[b] Φ_{film} of Au(III) compounds doped into MCP excited at wavelength of 320 nm

[c] Not determined

EXAMPLE 5

An organic EL device according to an embodiment of the invention was constructed in the following manner:

a) A transparent anode ITO-coated borosilicate glass substrate (38 mm x 38 mm) with sheet resistance of 30 Ω/square was ultrasonicated in the commercial detergent Decon 90, rinsed in deionized water having a resistivity of 18.2 mega-ohm for 15 minutes, and then dried in an oven at 120 degree C for an hour. The substrate was next subjected to an UV-ozone treatment in a Jelight 42-220 UVO-Cleaner equipped with a mercury grid lamp for 15 minutes in order to increase the work function of the ITO-coated glass substrate for better hole injection into the organic layer.

b) A 40-nm thick PEDOT:PSS hole-transporting layer was spin-coated by using a Laurell WS-400Ez-6NPP-Lit2 single wafer spin processor at 7000 rpm for 30 seconds onto the ITO-coated glass substrate of step a and baked at 110 degree C for 10 minutes in air.

c) A 30-nm thick light-emitting layer was spin-coated by using a Laurell WS-400Ez-6NPP-Lit2 single wafer spin processor at 6000 rpm for 25 seconds onto PEDOT-.PSS layer of step b, and

baked at 80 degree C for 10 minutes in air, in which compound **2** was doped into light-emitting MCP layer at different concentrations in the range from 5 to 50 %;

d) The substrate was put into a vacuum chamber, and the chamber was pumped down from 1 bar to 5×10^{-6} mbar;

e) A 30-nm thick BAlq electron-transporting layer was deposited by thermal evaporation on doped CBP light-emitting layer.

f) A 0.8-nm thick LiF layer and a 80 nm thick Al layer were deposited by thermal evaporation on the BAlq layer to form an electron-injecting cathode.

BAlq, LiF and Al were prepared by thermal evaporation from tantalum boats by applying current through the tantalum boats. Deposition rates were monitored with a quartz oscillation crystal and a Sigma SQM-242 quartz crystal card and controlled at 0.1-0.2 nm/s for both organic and metal layers. Current density-voltage-luminance characteristics of organic EL devices were measured with a programmable Keithley model 2420 power source and a Spectrascan PR 655 colorimeter under ambient air conditions. The devices exhibit vibronic-structured blue emission with a peak maximum at 472 nm and a maximum luminance of 670 cd/m^2.

EXAMPLE 6

The same materials and processing procedures were employed as described in Example 5, except that compounds **3, 6-10** were doped into MCP as the light-emitting layer.

EXAMPLE 7

The same materials and processing procedures were employed as described in Example 5, except compounds **4, 5, 11-13** were doped into MCP as the light-emitting layer. For compounds **4, 5** and **11,** a 5 nm thick TmPyPB and a 30 nm thick 3TPYMB were used as the electron-transporting layers; while for compounds **12** and **13,** a 30 nm thick BmPyPhB was used as the electron-transporting layer. FIGS. **13-24** depict the electroluminescence spectra of the resulting OLEDs with compounds **2-13** doped into MCP as light-emitting layer.

Table 2 summarizes the performance of OLEDs with selected Au(III) compounds doped into MCP as the light-emitting layer. FIG. **25** shows a) current efficiency, b) power efficiency and c) external quantum efficiency of the device with compound **4** doped into MCP as the light-emitting layer. For an optimized device with 20 % compound **4** doped into the MCP layer, high current, power, and external quantum efficiencies of 22.7 cd/A, 17.7 lm/W, and 7.60 %, respectively, were obtained. These high device efficiencies are comparable to those of solution-processable OLEDs based on an iridium(III) system and are much higher than those of solution-processable OLEDs based on other transition metal centres, such as platinum(II), ruthenium(II) and rhenium(II) systems. In addition, such devices exhibit a broad and structureless yellow emission spectrum with excellent CIE coordinates of (0.49, 0.49). In some embodiments of the invention, these Au(III) dendrimers possess desirable electrophosphorescent properties, and are candidates as electrophosphorescent dopants for OLEDs.

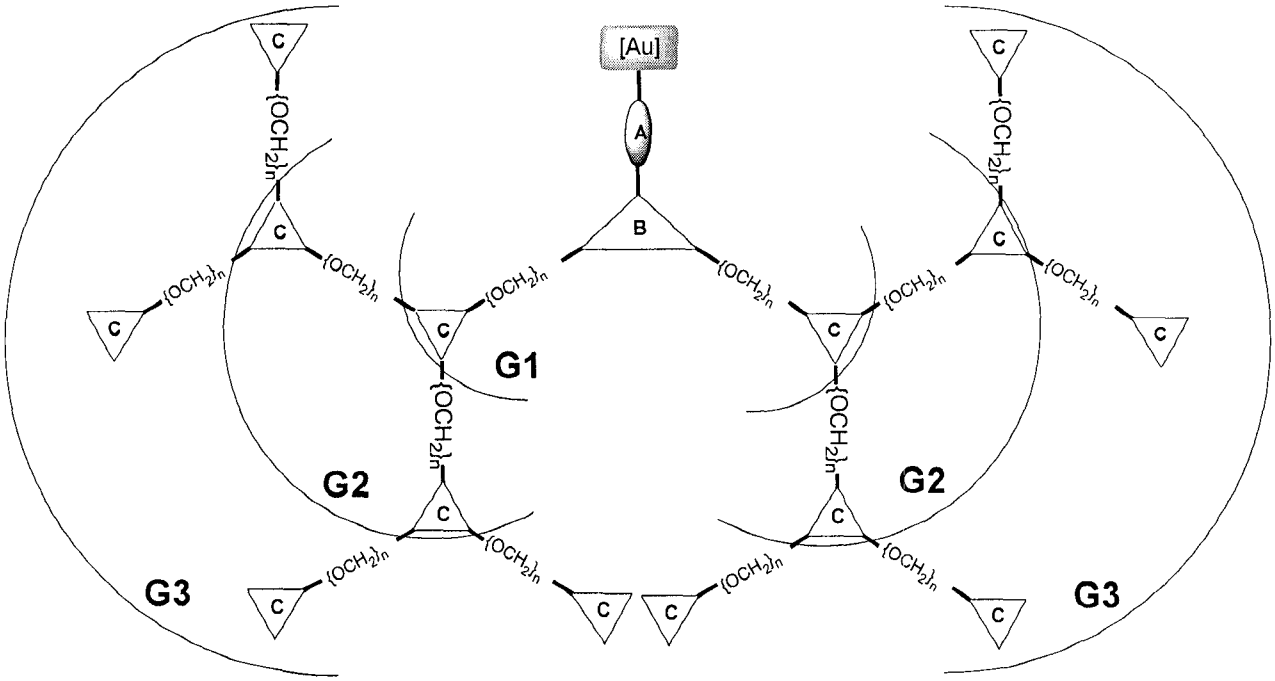
TABLE 2
Characteristics of OLEDs using Au(III) compounds as phosphorescent dopants

Compound	Max. Luminance (cd/m^2)	Current Efficiency (cd/A)	Power Efficiency (lm/W)	EQE (%)
2	670	3.3	1.3	1.2
3	800	6.7	3.5	2.5
4	10,300	22.7	17.7	7.6
5	2,200	21.9	16.4	7.0
6	2,800	10.6	6.1	3.7
7	1,700	4.7	3.3	1.6
8	1,100	1.0	0.6	0.4
9	4,300	13.7	10.8	4.3
10	3,100	16.1	12.6	5.1
11	900	11.4	9.6	3.8
12	3,800	20.0	16.4	6.3
13	650	1.2	0.8	0.9

These examples should not be construed as limiting the scope of the invention, but as providing illustrations of some of the embodiments of the invention.

What is claimed:

1. A luminescent gold(III) compound comprising the chemical structure represented by the following general formula,



wherein:

(a) [Au] is a cyclometalated tridentate gold(III) group;

(b) Unit A is a σ-donating chemical group;

(c) Unit B is a central part of the dendrons comprising a branch point of dendrimers;

(d) Unit C is optional surface groups or dendrons of the dendrimers;

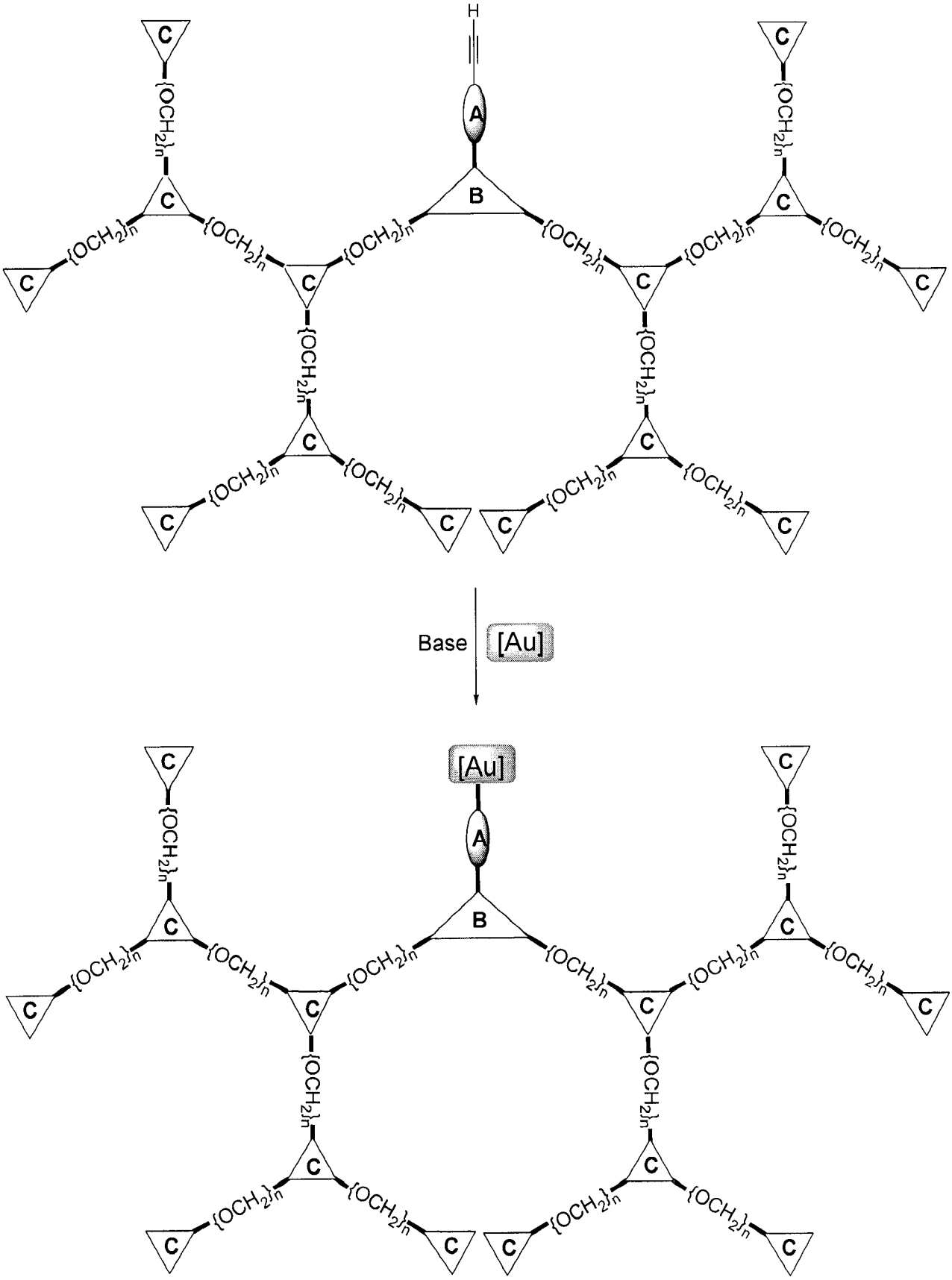
(e) n = 0 or 1.

2. The gold(III) compound according to claim 1, wherein unit A comprises at least one of alkylalkynyl, substituted alkylalkynyl, arylalkynyl, substituted arylalkynyl, heteroarylalkynyl and substituted heteroarylalkynyl, and/or
unit B and and optional unit C comprise aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, optionally substituted with one or more alkyl, alkenyl, alkynyl, alkylaryl, cycloalkyl, OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, NO2, SO2, SOR, SO3R, halo, aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, preferably B and C comprise benzene, phenyl derivatives, pyridine or pyridyl derivatives, wherein R is independently alkyl, alkenyl, alkynyl, alkyaryl, aryl, or cycloalkyl.

3. The gold(III) compound according to any one of the preceding claims wherein the compound is deposited as a thin layer on a substrate layer, preferablyany one of the preceding claims, the thin layer is deposited by spin-coating, or inkjet printing, and/or
the compound has photoluminescence properties within a range of about 380 to 1050 nm, and/or the compound emits light in response to the passage of an electric current or to a strong electric field, and/or the compound is used to fabricate an OLED, preferably the gold (III) compound serves as the light-emitting layer of the OLED, more preferably the gold (III) compound serves as a dopant in the light-emitting layer

of the OLED, most preferably the emission energy of the compound varies with the concentration of the gold(III) compound dopant, or the gold(III) metal compound is a dopant included in the light emitting layer of the light-emitting device .

4. A method for preparing a luminescent compound with a cyclometalated tridentate ligand and at least one strong σ-donating group coordinated to a gold(III) metal group, comprising the following reaction:



wherein:

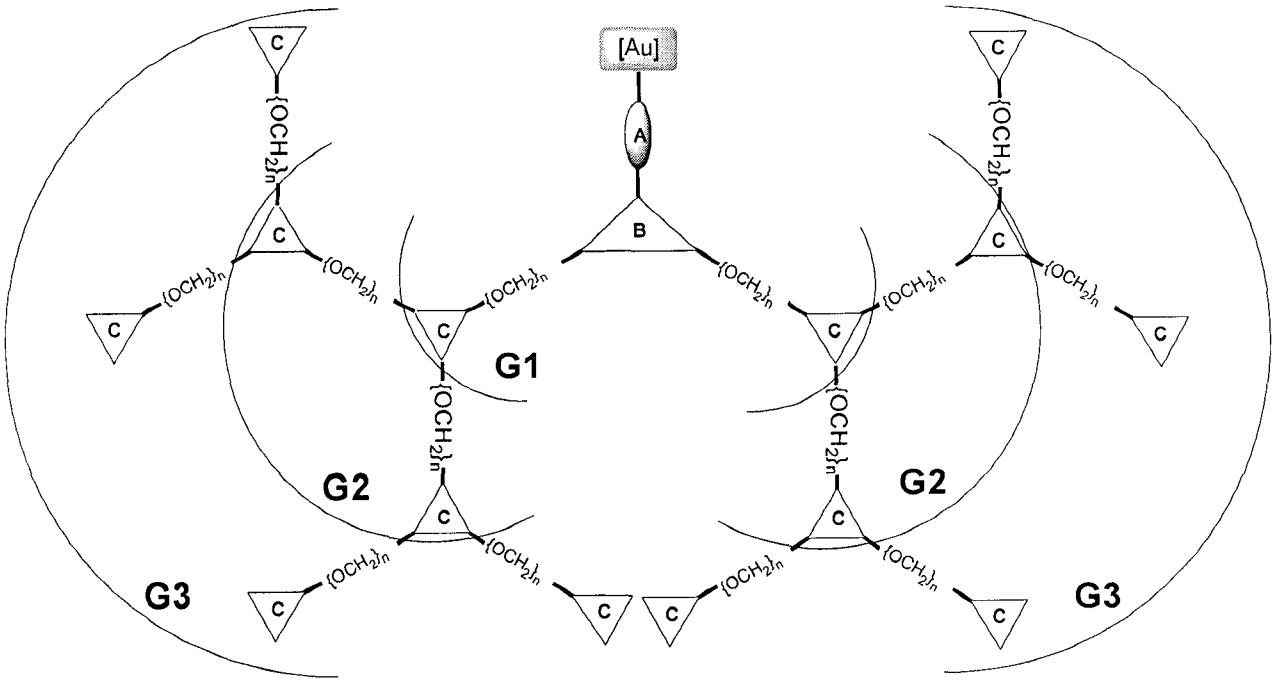
(a) Unit A comprises at least one of alkylalkynyl, substituted alkylalkynyl, arylalkynyl, substituted arylalkynyl, heteroarylalkynyl, and substituted heteroarylalkynyl;

(b) unit B and optional unit C comprise aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, optionally substituted with one or more alkyl, alkenyl, alkynyl, alkylaryl, cycloalkyl, OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, halo, aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, preferably B and C comprise benzene, phenyl derivatives, pyridine or pyridyl derivatives, wherein R is independently alkyl, alkenyl, alkynyl, alkyaryl, aryl, or cycloalkyl.

5. The method according to claim 4 wherein a luminescent compound is prepared.

6. The method according to any one of the preceding claims wherein the gold(III) metal group comprises a light-emitting layer of a light emitting device, and/or the gold(III) metal group comprises a layer of a light emitting device, and/or the gold(III) metal compound is a dopant included in a light emitting device .

7. A light-emitting device with an ordered structure comprising an anode, a hole-transporting layer, a light-emitting layer, an electron-transporting layer and a cathode wherein the light-emitting layer comprises a gold(III) compound having a chemical structure represented by the following general formula,



wherein:

(a) Unit A comprises at least one of alkylalkynyl, substituted alkylalkynyl, arylalkynyl, substituted arylalkynyl, heteroarylalkynyl, and substituted heteroarylalkynyl;

(b) Unit B and optional unit C comprise aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, optionally substituted with one or more alkyl, alkenyl, alkynyl, alkylaryl, cycloalkyl, OR, NR_2, SR, C(0)R, C(0)OR, $C(0)NR_2$, CN, CF_3, $N0_2$, $S0_2$, SOR, $S0_3R$, halo, aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclic group, preferably B and C comprise benzene,

phenyl derivatives, pyridine or pyridyl derivatives, wherein R is independently alkyl, alkenyl, alkynyl, alkyaryl, aryl, or cycloalkyl, or the light-emitting layer comprises a gold(III) compound prepared according to the method of any one of the preceding claims.

8. The light-emitting device of claim 7 wherein the light-emitting layer is prepared using at least one solution processing technique.

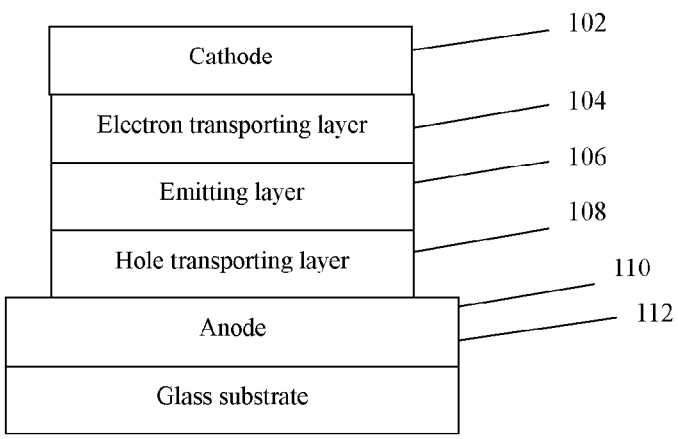


Figure 1

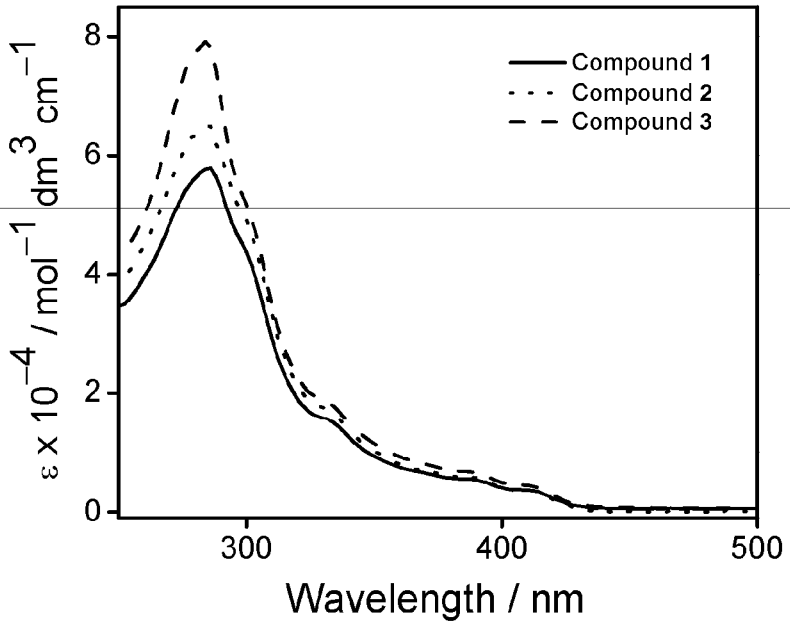


Figure 2

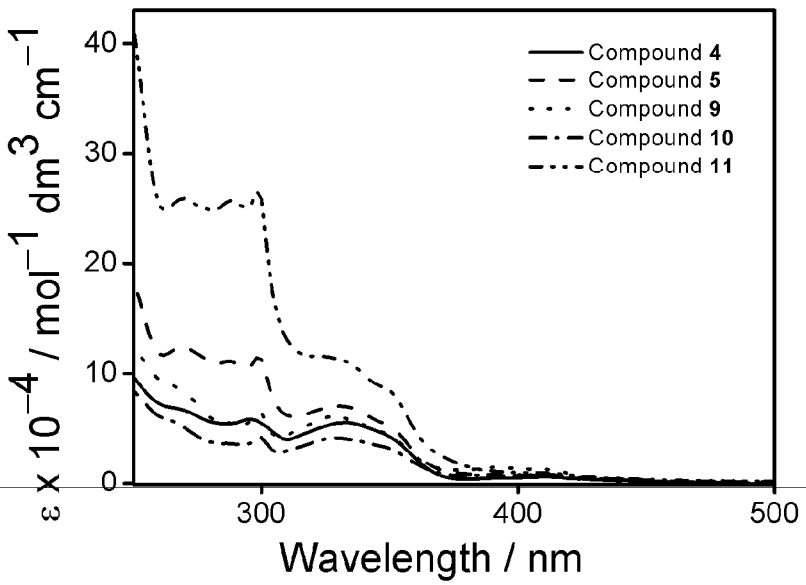


Figure 3

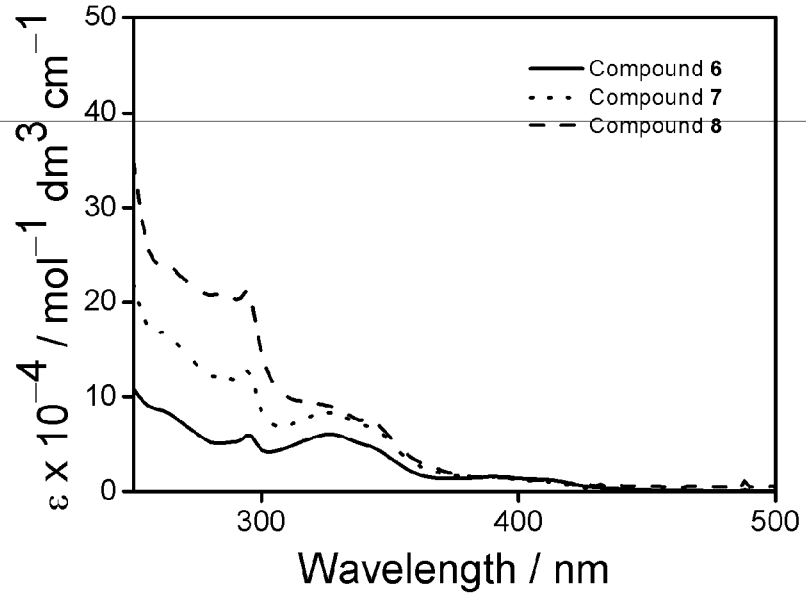


Figure 4

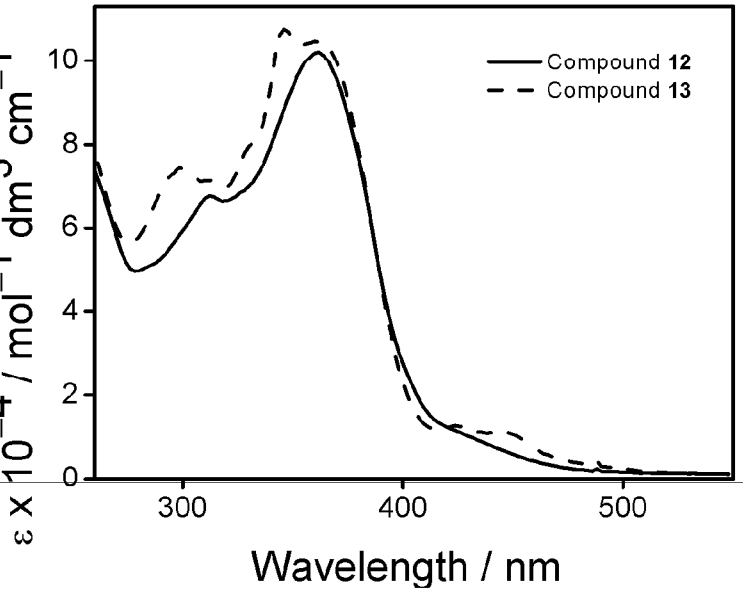


Figure 5

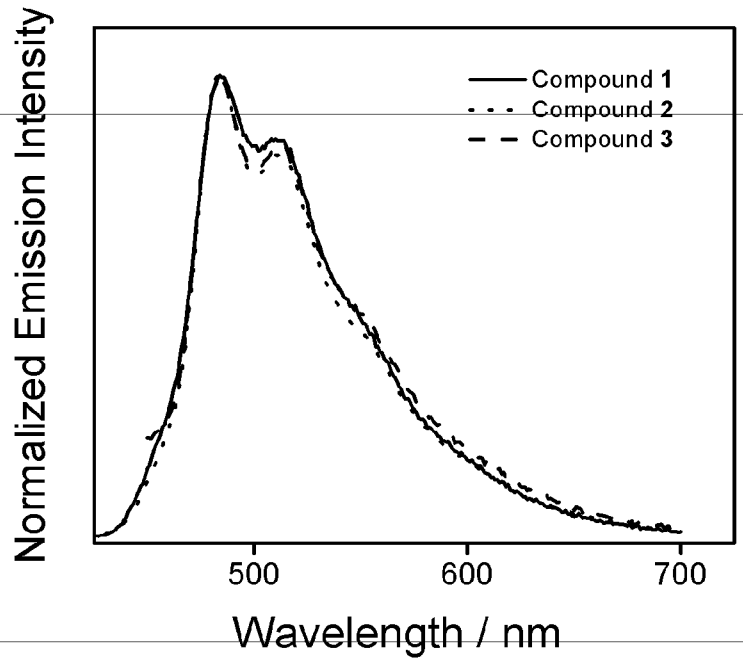


Figure 6

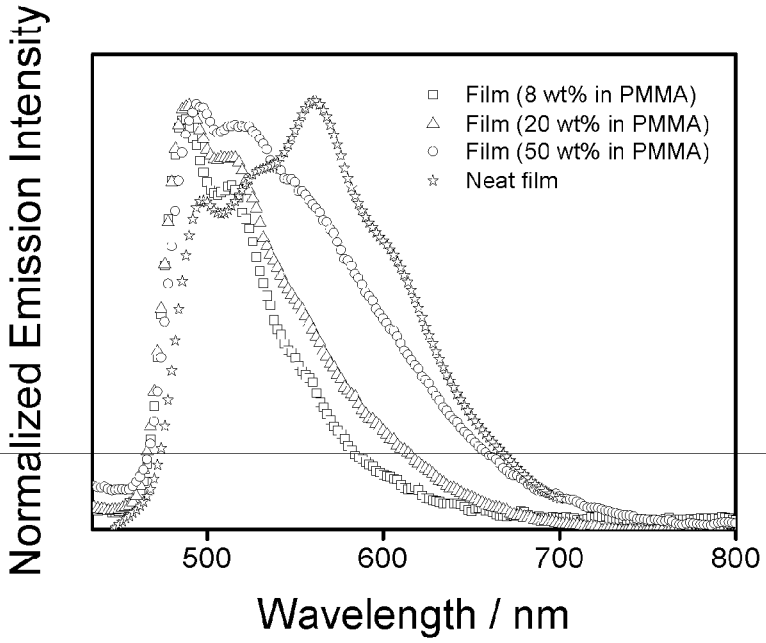


Figure 7

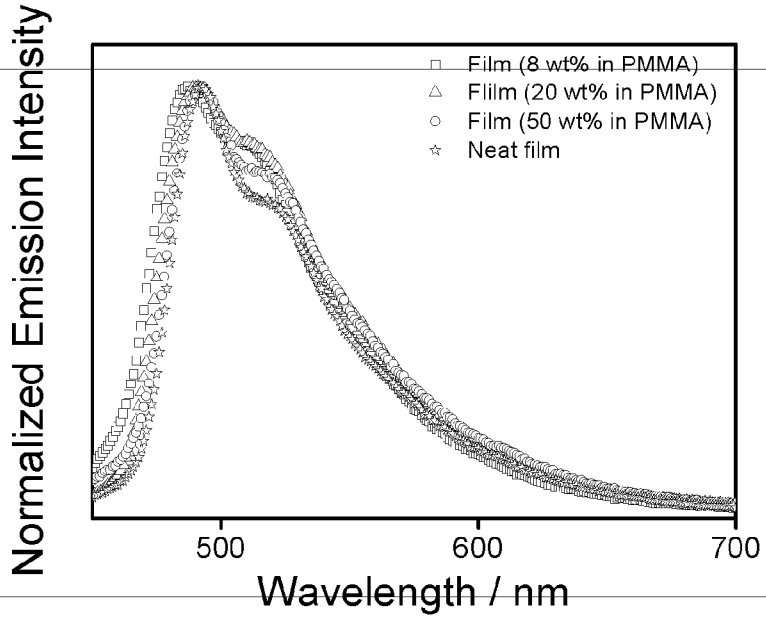


Figure 8

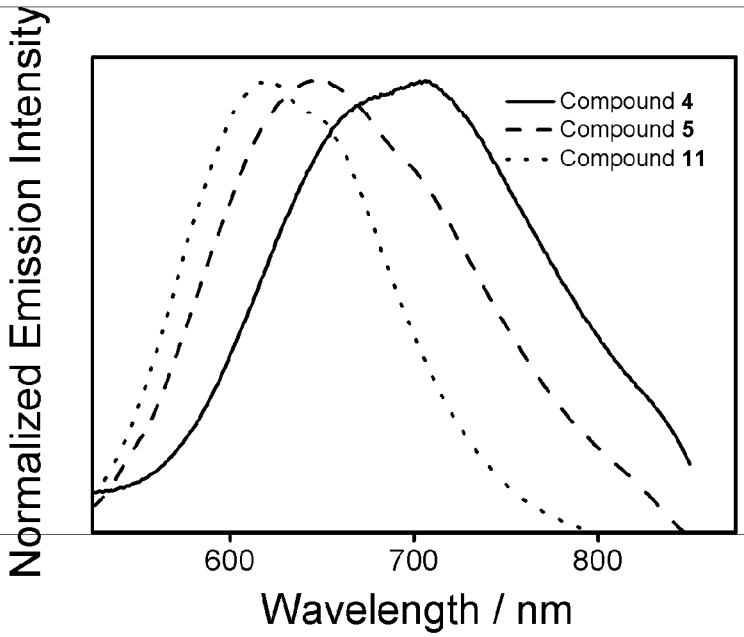


Figure 9

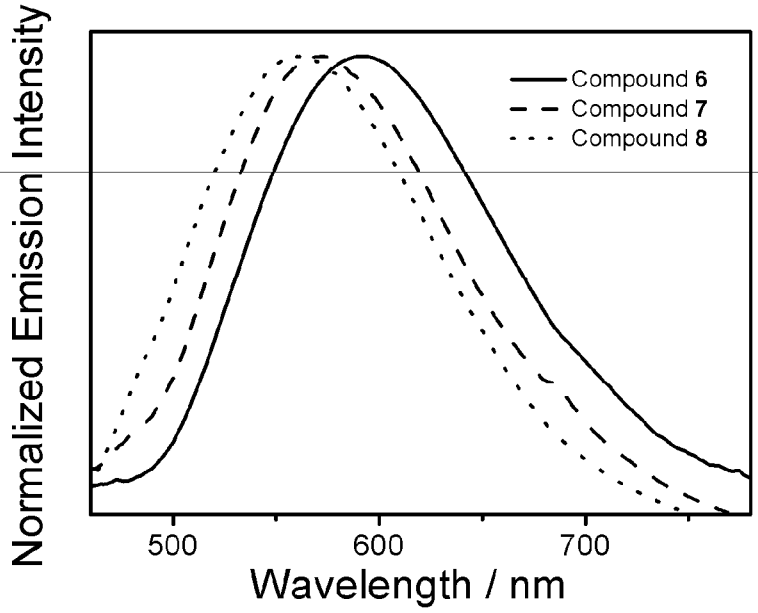


Figure 10

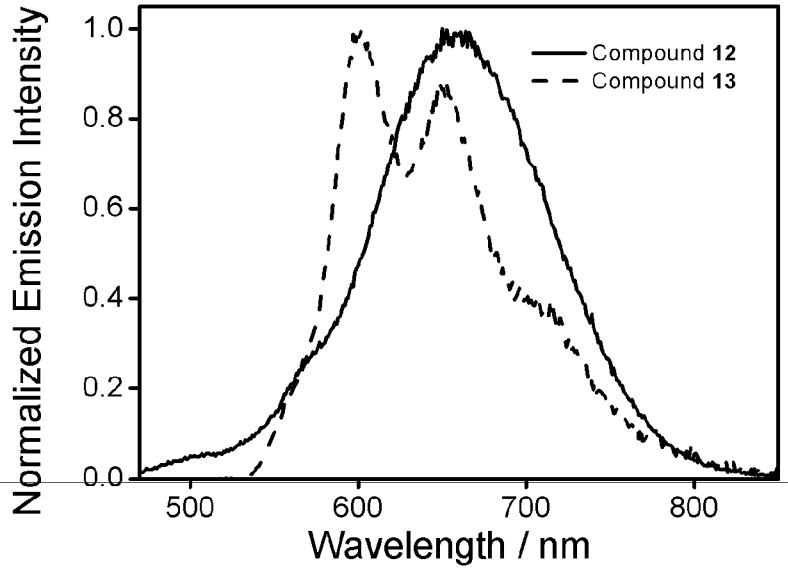


Figure 11

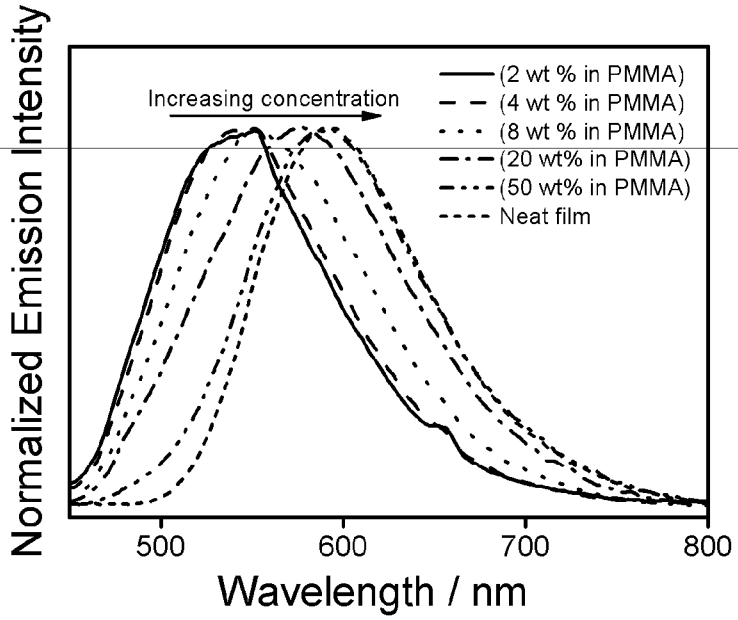


Figure 12

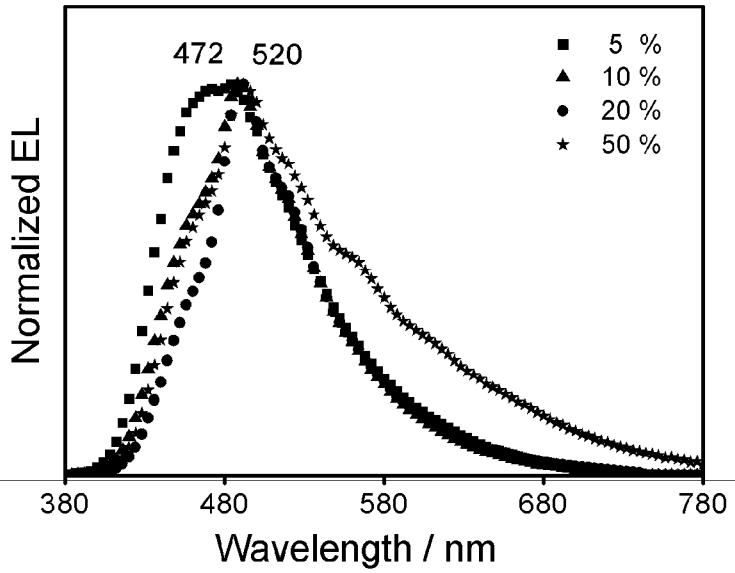


Figure 13

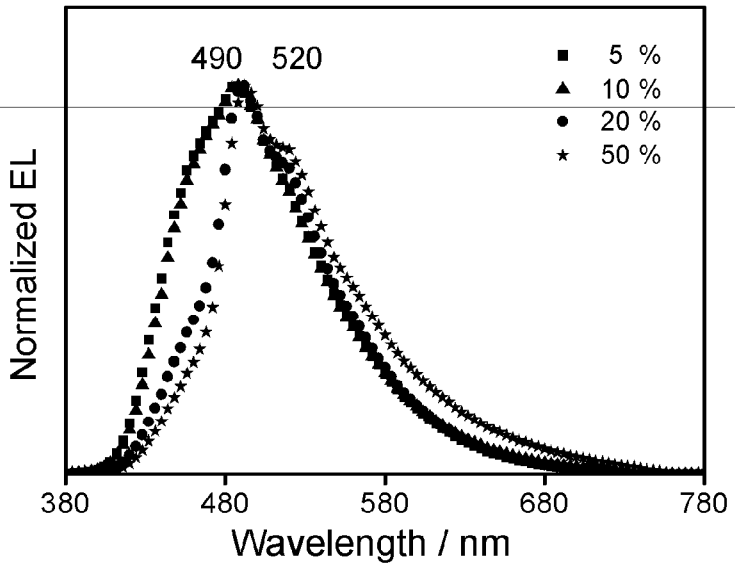


Figure 14

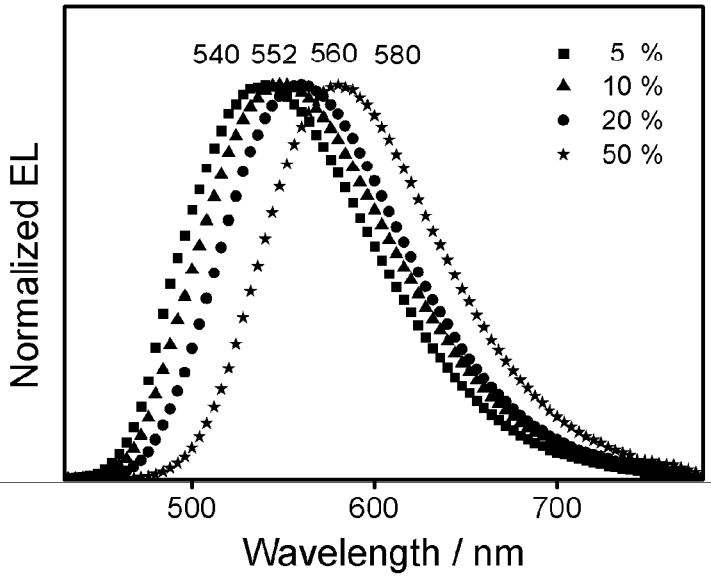


Figure 15

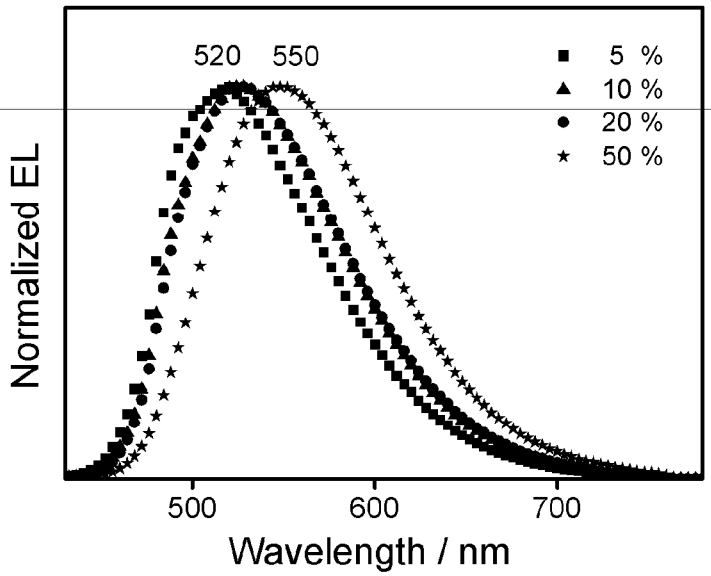


Figure 16

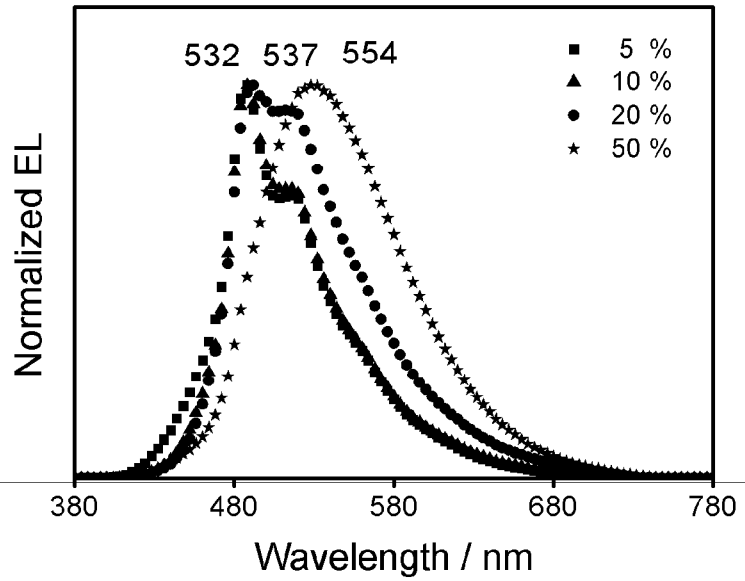


Figure 17

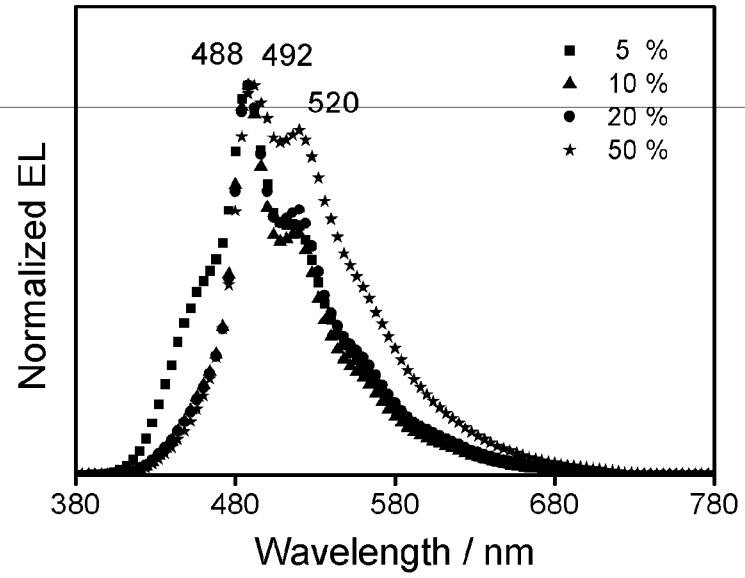


Figure 18

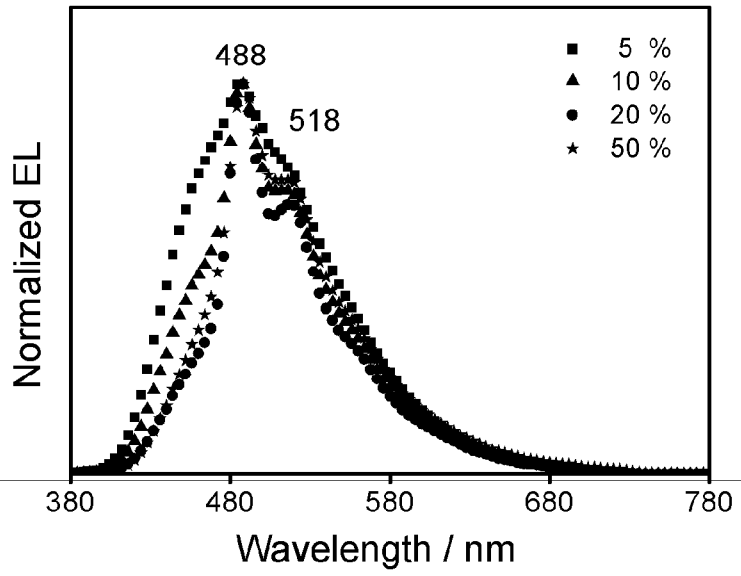


Figure 19

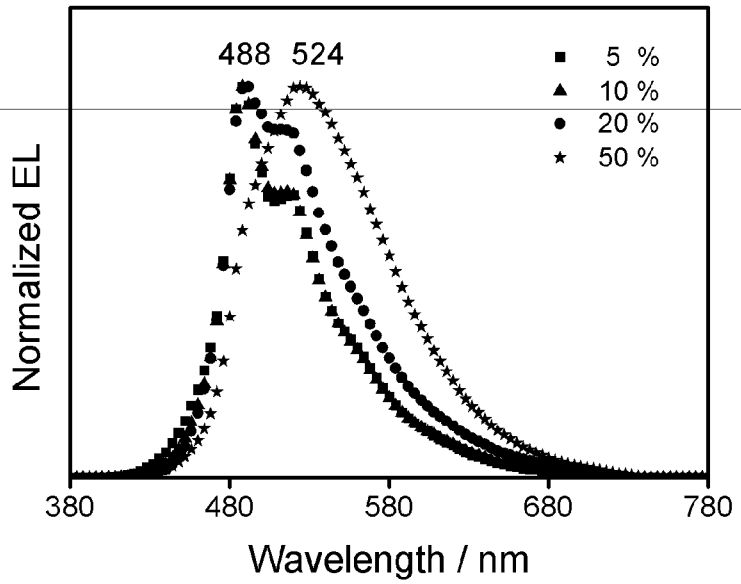


Figure 20

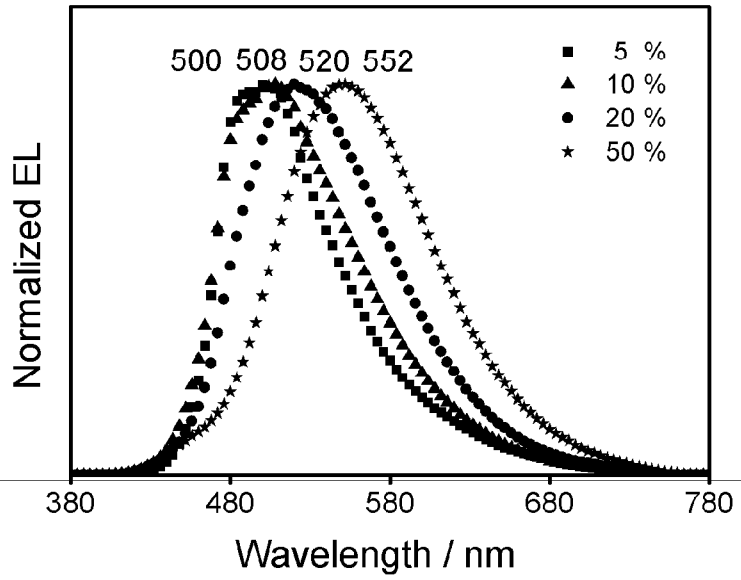


Figure 21

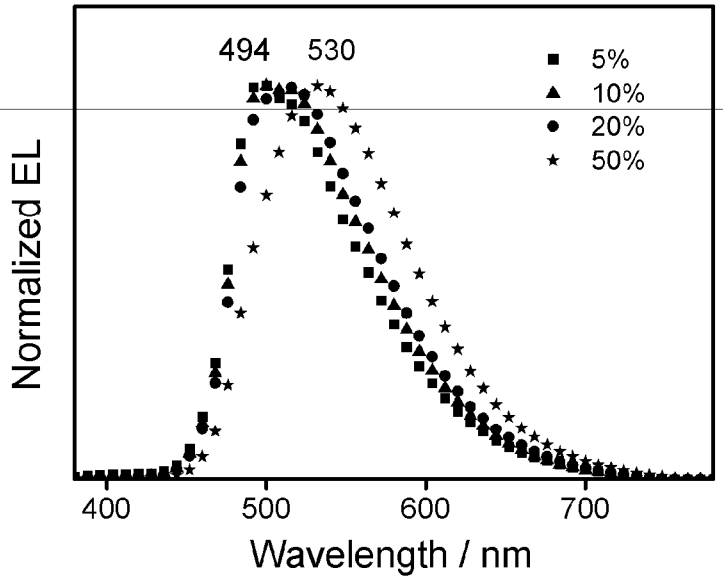


Figure 22

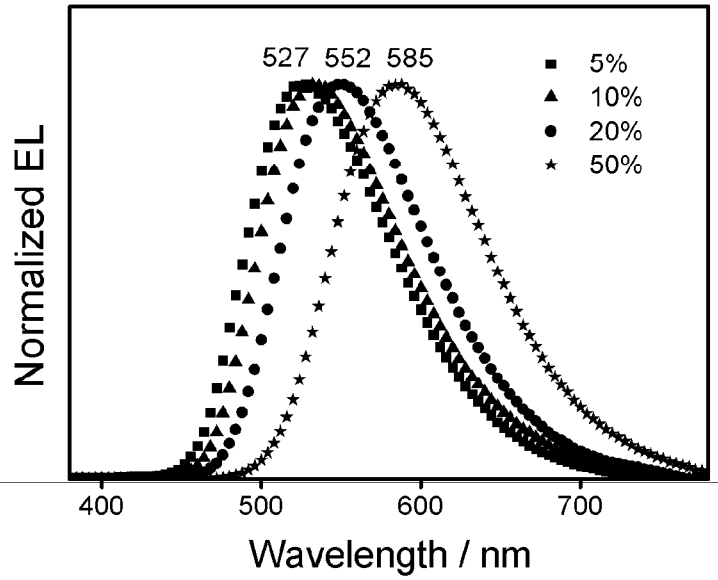


Figure 23

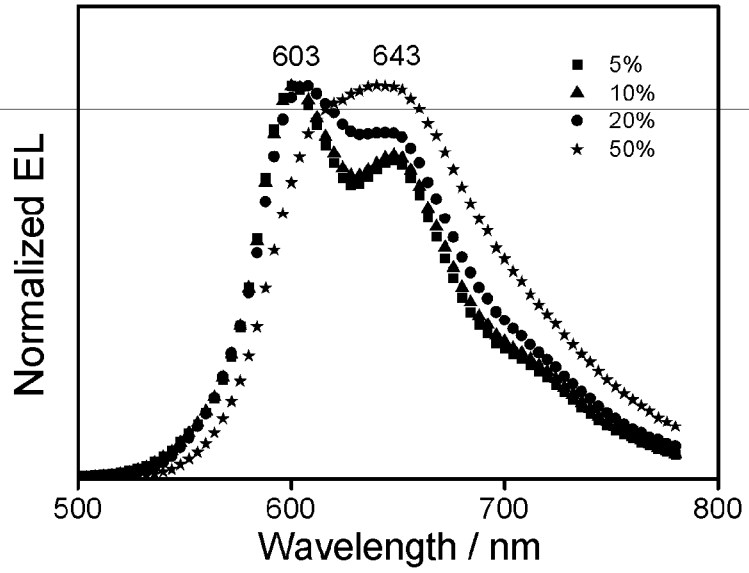
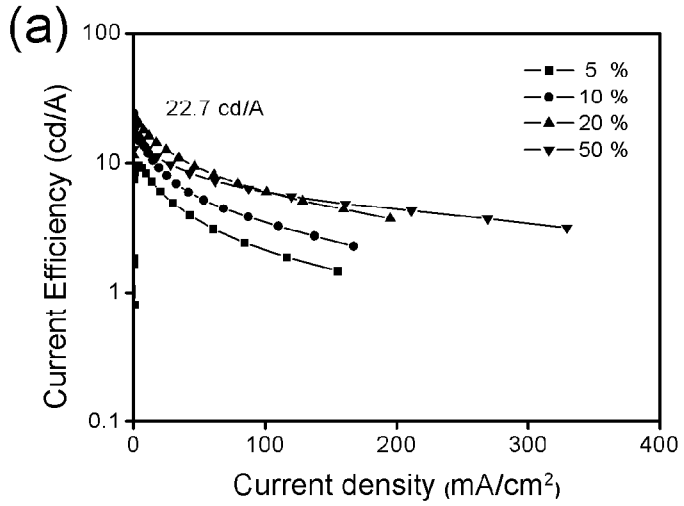
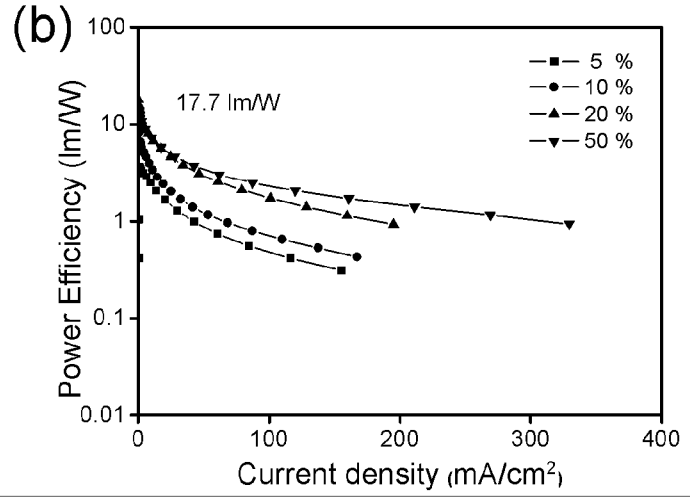


Figure 24


(a)
22.7 cd/A
5 %
10 %
20 %
50 %
Current Efficiency (cd/A)
Current density (mA/cm²)


(b)
17.7 lm/W
5 %
10 %
20 %
50 %
Power Efficiency (lm/W)
Current density (mA/cm²)

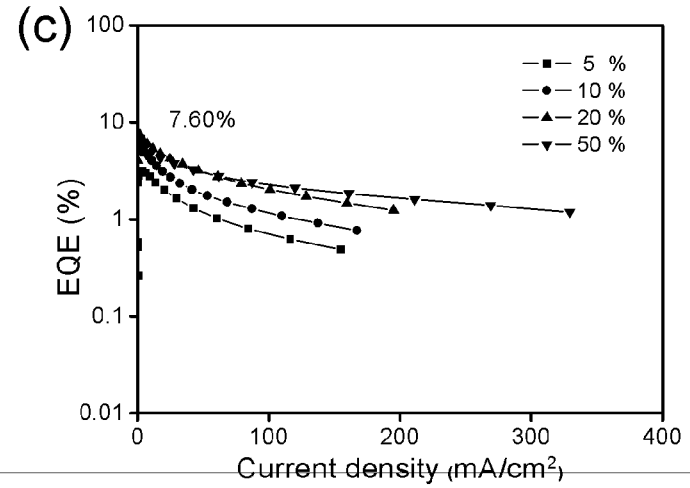
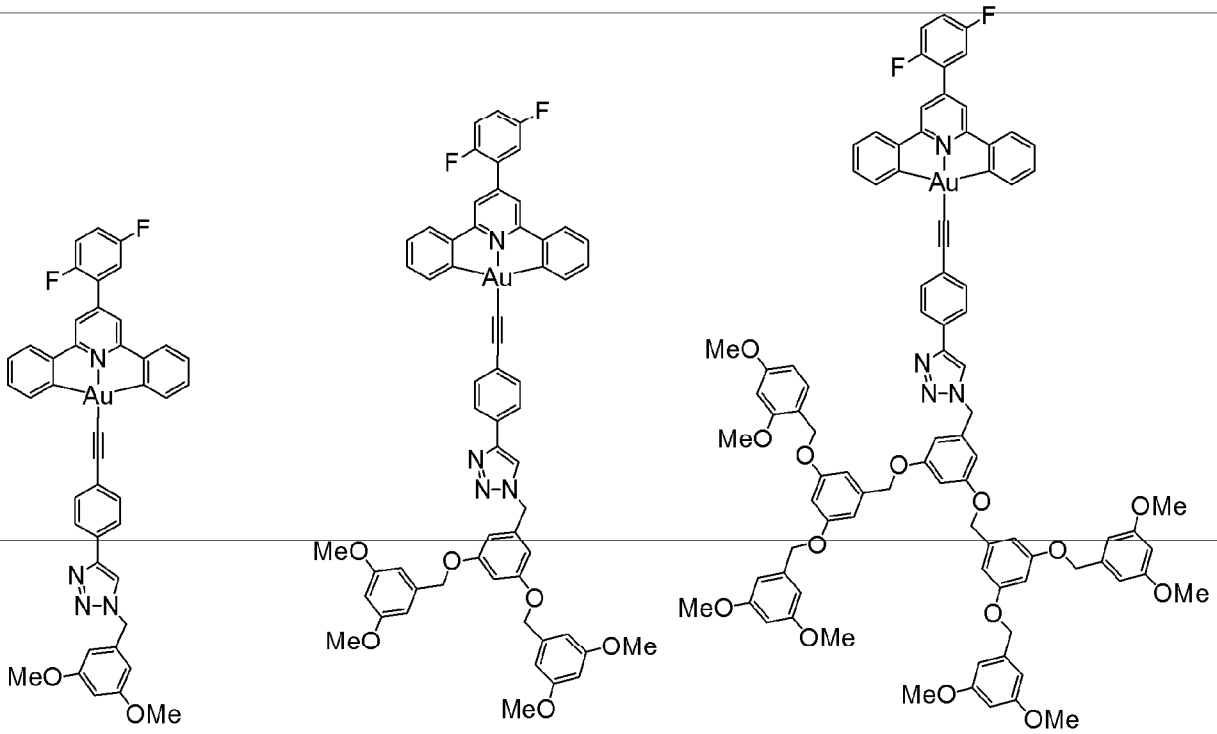

(c)
7.60%
5 %
10 %
20 %
50 %
EQE (%)
Current density (mA/cm²)

Figure 25


F
F
N
Au
N
N-N
MeO
OMe
Compound 1
Compound 2
Compound 3

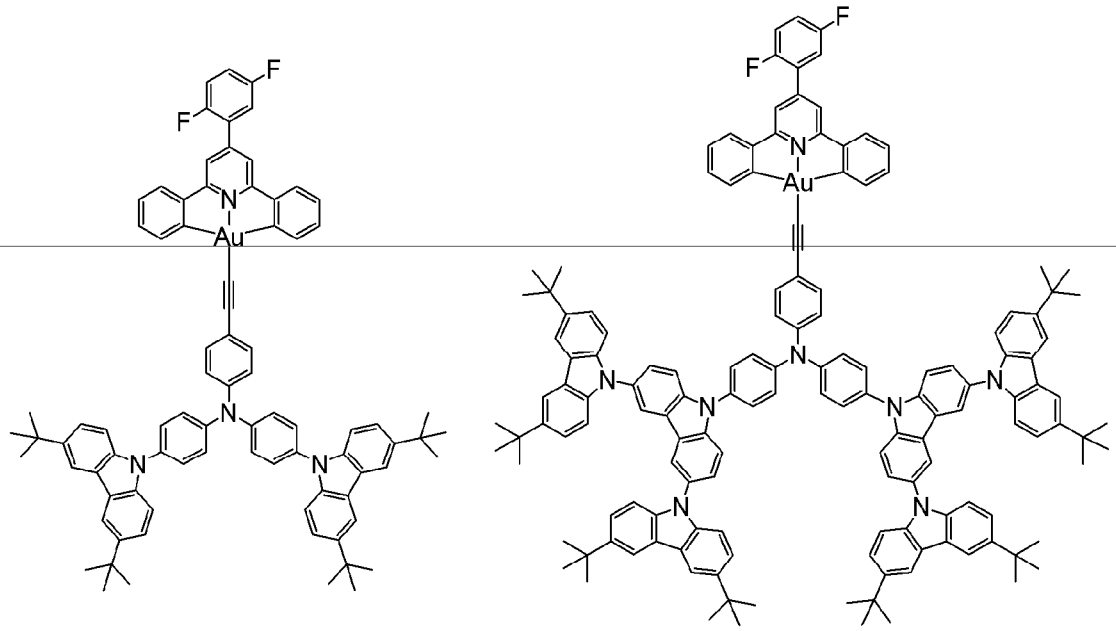
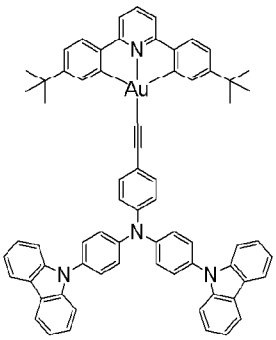
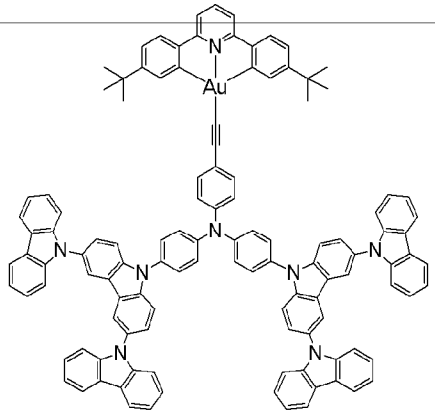

F
F
N
Au
N
Compound 4
Compound 5

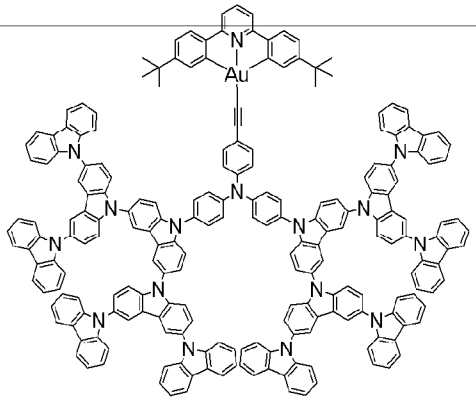
Figure 26a



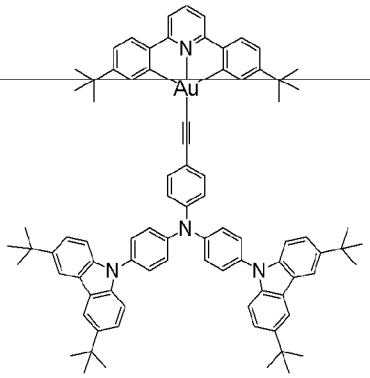
Compound 6



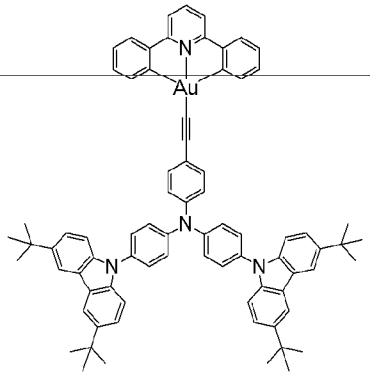
Compound 7



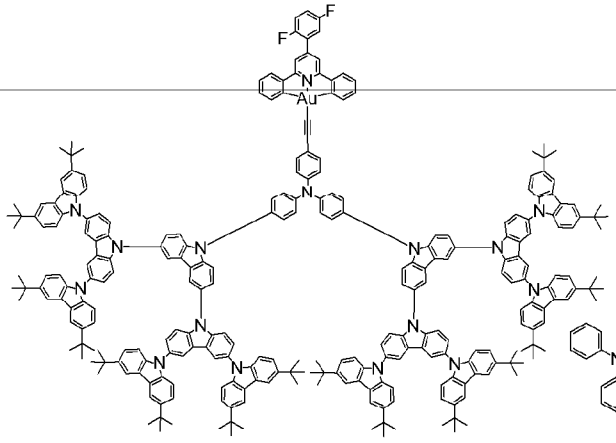
Compound 8



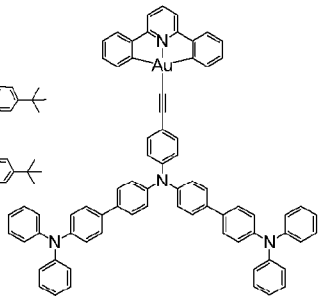
Compound 9



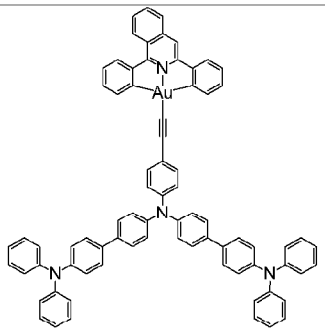
Compound 10



Compound 11



Compound 12



Compound 13

Figure 26b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/072044

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: C09K 11/-; H05B 33/-

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

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

WPI, EPODOC, CNKI, CPRS, SIN (Registry, CAplus): carbazolocarbazol, semiconductor, dicarboximide, electroluminescent, diode

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	VONIKA K. A. et al. Luminescent Cyclomentalated Dialkynylgold(III) Complexes of 2-Phenylpyridine-Type Derivatives with Readily Tunable Emission, Chemisty A European Jouranl, 22 October 2010, Vol. 17, No. 1, pages 130-142, especially Results and Discussion part.	1-8
A	WO 2011006353 A1 (THE UNIVERSITY OF HONG KONG), 20 January 2011 (20.01.2011), see examples	1-8

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 May 2013 (08.05.2013)	**23 May 2013 (23.05.2013)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer DI, Yanxin Telephone No. (86-10)62086319

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/072044

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SILVERIO C. et al. Luminescent Gold(III) Metallo-Acids and Their Hydrogen Bonded Supramolecular Liquid Crystalline Derivatives with Decyloxystilbazole as Hydrogen Acceptor, Dalton Transactions, 14 November 2008, No. 48, pages 6894-6900, especially Scheme 1.	1-8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/CN2013/072044

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
WO2011006353A1	20.01.2011	US2011012093A1	20.01.2011
		KR20120032525A	05.04.2012
		DE112010002628T5	14.06.2012
		CN102574870A	11.07.2012

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/072044

CLASSIFICATION OF SUBJECT MATTER

C09K 11/06 (2006.01) i

H05B 33/14 (2006.01) n

专利名称(译)	含有用于有机发光器件的发光金（III）化合物的树枝状大分子及其制备		
公开(公告)号	EP2820107A1	公开(公告)日	2015-01-07
申请号	EP2013754558	申请日	2013-03-01
[标]申请(专利权)人(译)	香港大学		
申请(专利权)人(译)	香港大学		
当前申请(专利权)人(译)	香港大学		
[标]发明人	YAM WING WAH VIVIAN TANG MAN CHUNG KOBE CHAN MEI YEE MAGGIE WONG MAN CHUNG KEITH		
发明人	YAM, WING WAH, VIVIAN TANG, MAN CHUNG, KOBE CHAN, MEI YEE, MAGGIE WONG, MAN CHUNG, KEITH		
IPC分类号	C09K11/06 H05B33/14		
CPC分类号	H01L51/0084 C07F1/12 C07F7/0805 C07F7/0812 C09K11/06 C09K2211/188 G05D21/00 G06Q10/10 G06Q50/02 H01L51/0072 H01L51/0091 H01L51/0095 H01L51/5012		
优先权	61/605533 2012-03-01 US		
其他公开文献	EP2820107B1 EP2820107A4		
外部链接	Espacenet		

摘要(译)

（I）所示化学结构的环金属化三齿金（III）化合物配位的新型饱和或共轭树状大分子，其中：（a）[Au]为环金属化三齿金（III）组;（b）A单位是西格玛捐献化学品集团;（c）B单元是包括树枝状分子分支点的树枝的中心部分;（d）单元C是树枝状聚合物的可选表面基团或树枝状分子;（e）n = 0或1。