

Efficient Light-emitting Materials for OLEDs

Patent Title:	Luminescent Gold(III) Compounds Containing Bidentate Ligand for Organic Light-emitting Devices and Their Preparation
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This invention provides a novel class of luminescent gold(III) compounds as efficient light-emitting materials for phosphorescent organic light-emitting devices (PHOLEDs).

Market Opportunity

There is a huge market potential for organic light-emitting devices (OLEDs) in the display and solid-state lighting industries, but most of the iridium-based patents are held by a few market players. Both local and international companies therefore would benefit from the introduction of gold-based phosphors. According to a market research report "OLED Materials Markets 2012" released by NanoMarkets, the global OLED material market is estimated to grow from US\$524 million in 2012 to over US\$7.4 billion in 2019 with a CAGR of over 45% [1]. In addition, NanoMarkets estimated that OLED lighting materials market will generate revenues of more than US\$1.3 billion by 2018 [2]. Particularly, Japan will dominate the OLED lighting business with sales reaching up to US\$1.1 billion while those in China and Korea can reach US\$420 and US\$230 million, respectively, by 2016 [3].

The HKU Invention

The use of heavy metal complexes in PHOLEDs is generally advantageous relative to the use of purely organic materials. Currently, most efforts have been invested in the use of iridium(III), platinum(II) and ruthenium(II). Other metal centers have been paid very little attention. This situation may cause iridium(III), platinum(II) and ruthenium(II) to occupy dominant market positions. Inventions with similar efficiency are needed to develop more potential opportunities for competition.

Apart from the iridium(III) and platinum(II) systems that have already been extensively studied over decades, our invention aims to explore new classes of phosphors containing alternative metal centers that show strong room-temperature phosphorescence in both ambient and low temperatures. We have developed a novel class of luminescent gold(III) compounds that are photo-stable and capable of displaying rich luminescence properties at both ambient and low temperatures. Specifically, this invention is related to the design and synthesis of a novel class of luminescent gold(III) compounds containing a bidentate and two donor ligands. These luminescent gold(III) compounds exhibit strong photoluminescence at both room and low temperatures in various media. In addition, strong electroluminescence can be observed when such luminescent gold(III) compounds are intentionally doped into a polymeric host matrix.



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This invention verifies that the luminescent gold(III) compounds are promising candidates as phosphorescent emitters or dopants for the fabrication of PHOLEDs. Therefore the luminescent gold(III) compounds are expected to be applied in the fabrication of organic light-emitting devices such as phosphorescent emitters or dopants to generate electroluminescence.

About the Lead Inventor

The lead inventor of this invention is Prof Vivian Wing-Wah Yam, who was honoured as Laureate in the 13th L'Oréal-UNESCO Women in Science Awards 2011 in recognition of her contributions on light-emitting materials and innovative ways of capturing solar energy. Prof Yam's major research focus is in the molecular design and synthesis of novel inorganic and organometallic metal complexes that may find potential applications as functional metal-based molecular materials. Her seminal works on luminescent polynuclear metal complexes and clusters and light-emitting carbon-rich organometallics have gained her international recognition. Prof Yam is an Academician of the Chinese Academy of Sciences and a Fellow of the Academy of Sciences for the Developing World and is elected as Foreign Associate of the National Academy of Sciences in U.S.A. for her distinguished continuing achievements in original research. She has also been awarded a Royal Society of Chemistry (UK) Centenary lectureship and medal.

References

- [1] "OLED Materials Markets 2012", published on July 5, 2012, NanoMarkets.
- [2] "OLED Lighting Materials Market Forecast 2013", published on October 12, 2012, NanoMarkets.
- [3] "OLED Lighting Markets Asia – 2011", published on April 5, 2011, NanoMarkets.

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