香港浸會大學 HONG KONG BAPTIST UNIVERSITY

Department of Chemistry

香港浸會大學理學院 HKBU Faculty of Science

Metallopolymers and Metallophosphors: New Multifunctional Molecular Materials with Emerging Applications in Organic Optoelectronics and Nanotechnology

PI: Prof. Wai-Yeung Wong

Organometallic molecules have become a field of intense activities in the optoelectronic research. They hold great promise as versatile functional materials for use in energy interconversions. These include systems where light is transformed into electricity and vice versa. Our work mainly focuses on the molecular design, synthesis and structure-property-function relationships of functional metallopolyynes and metallophosphors for applications in organic optoelectronics and nanotechnology in various domains.

I. Research Activities on Metallopolyynes

Metallopolyynes combine the processing advantages of polymers with the functionality provided by the presence of metal centres. Organometallic poly(aryleneethynylene)s have ample applications as sensor protectors, as converters for light/electricity signals and as patternable precursors to magnetic metal alloy nanoparticles (Fig. 1). Fueled by these advances in synthesis and materials properties, new applications (e.g. in chemosensing, magnetic data storage, bioimaging and anti-cancer research) of metallopolymers and other related molecules would continue to emerge.

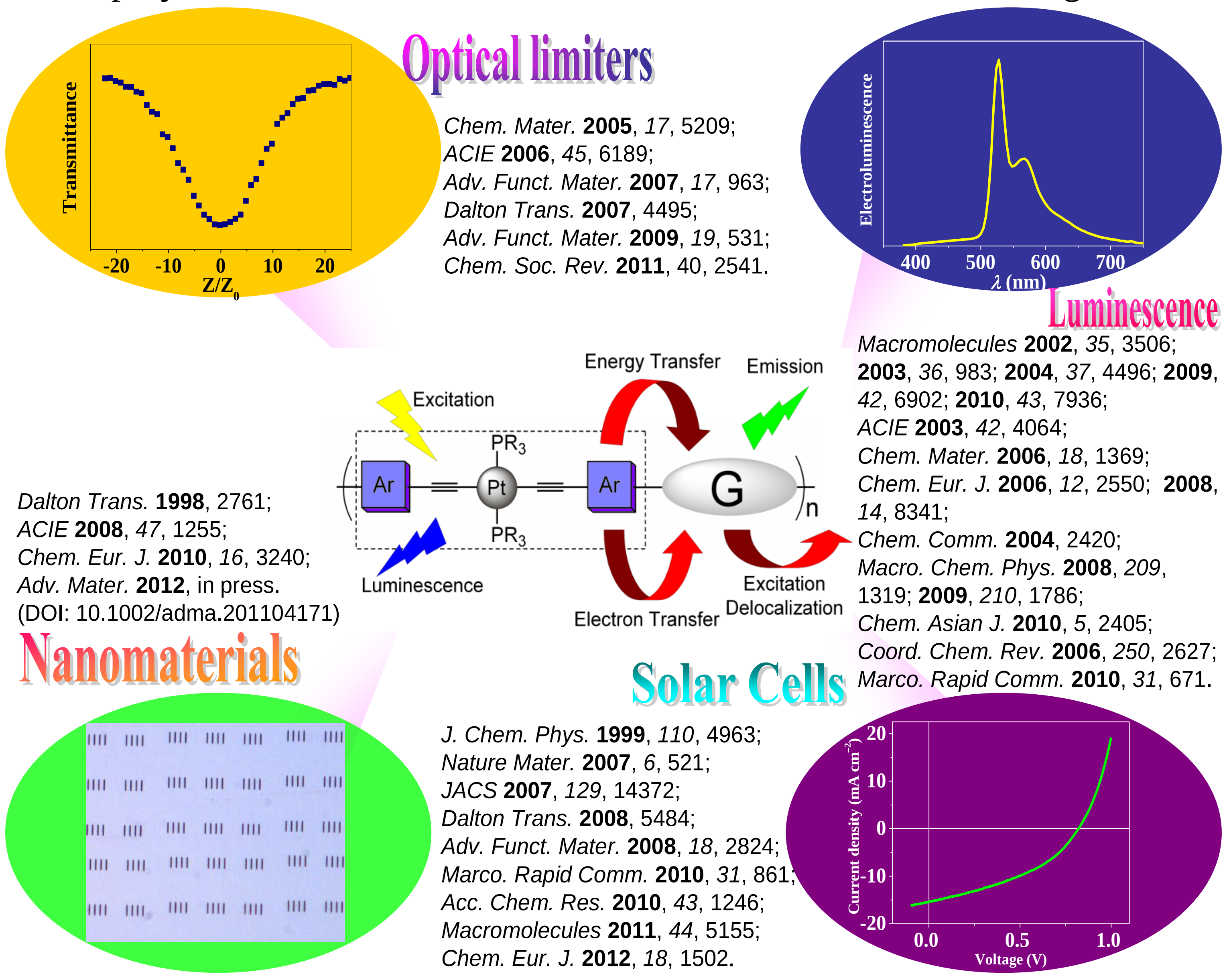


Fig. 1. Applications of metallopolyynes in various domains of materials science.

II. Research Activities on Metallophosphors

Because of their outstanding attributes, organic light-emitting diodes (OLEDs) and white organic light-emitting diodes (WOLEDs)/white polymer light-emitting diodes (WPLEDs) have been recognized in recent years as the most promising candidates for future flat-panel display technologies and next generation solid-state energy-saving lighting sources. We have elegantly coupled the conjugated functional organic chromophores (e.g. fluorene, triarylamine, carbazole and oxadiazole derivatives) with the phosphorescent properties of heavy metals to produce high-efficiency light emitters. In this context, the different functional units (such as hole transport, electron transport and triplet emission) are integrated into one molecular unit essential for more efficient charge transport in the electroluminescence process, producing metallophosphors with high performance.

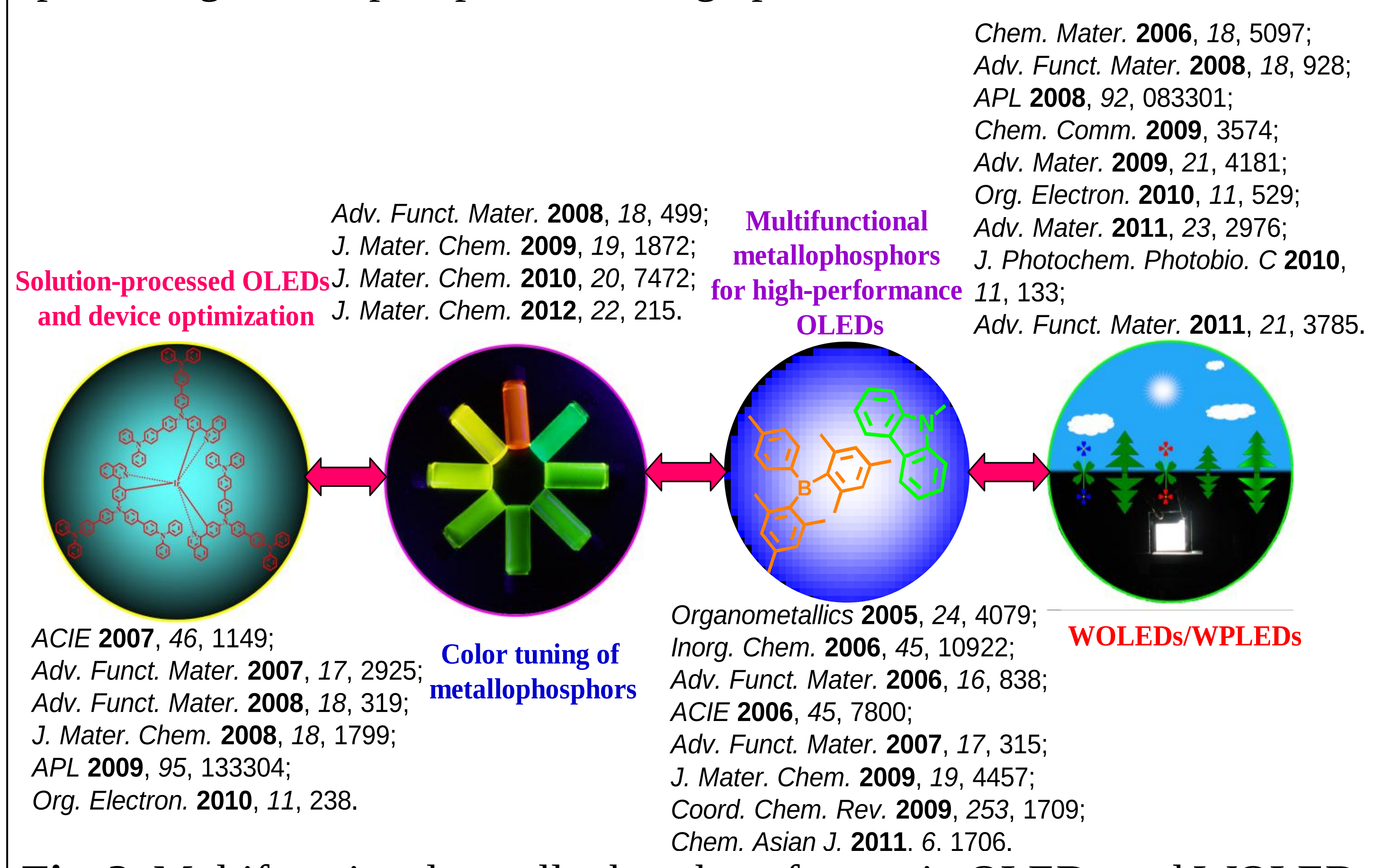
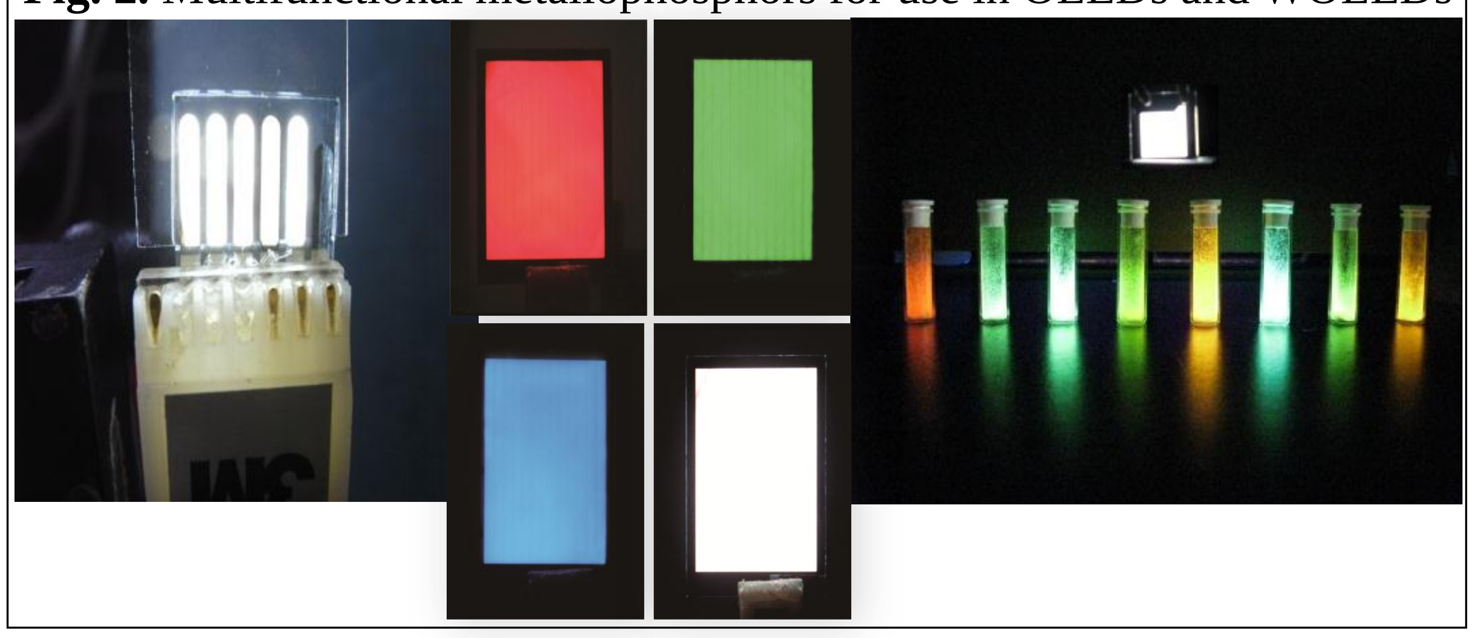


Fig. 2. Multifunctional metallophosphors for use in OLEDs and WOLEDs



Major Awards and Collaborations

FACS Distinguished Young Chemist Award (2011)
RSC Chemistry of the Transition Metals Award (2010)
First Class Prize in Natural Science Award (Ministry of Education) (2010)
Croucher Senior Research Fellowship (2009)

Profs. Ian Manners (University of Bristol) and Todd B. Marder (Durham University)
Prof. Pierre D. Harvey (Sherbrooke University)
Profs. Lixiang Wang, Dongge Ma and Zhiyuan Xie (CIAC)
Profs. Yong Cao and Hongbin Wu (SCUT) and Prof. He Tian (ECUST)
Dr. Aleksandra B. Djurišić (HKU)

Journal Cover Highlights

Metallopolyynes **Metallophosphors**

References

[1] W.-Y. Wong, X.-Z. Wang, Z. He, A. B. Djurišić, C.-T. Yip, K.-Y. Cheung, H. Wang, C. S. K. Mak, W.-K. Chan, *Nature Mater.* **2007**, *6*, 521.
[2] W.-Y. Wong, X.-Z. Wang, Z. He, K.-K. Chan, A. B. Djurišić, K.-Y. Cheung, C.-T. Yip, A. M.-C. Ng, Y. Y. Xi, C. S. K. Mak, W.-K. Chan, *J. Am. Chem. Soc.* **2007**, *129*, 14372.
[3] W.-Y. Wong, C.-L. Ho, *J. Mater. Chem.* (Feature article) **2009**, *19*, 4457.
[4] W.-Y. Wong, C.-L. Ho, *Coord. Chem. Rev.* **2009**, *253*, 1709.
[5] W.-Y. Wong, C.-L. Ho, *Acc. Chem. Res.* **2010**, *43*, 1246.
[6] G.-J. Zhou, W.-Y. Wong, *Chem. Soc. Rev.* (Critical review) **2011**, *40*, 2541.

This work was supported by grants from the Research Grants Council of HKSAR and Hong Kong Baptist University.