

CBC SEMINAR ANNOUNCEMENT



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The Combination of Metal and Organocatalysis for Asymmetric Synthesis

Traditionally, either metal based or organocatalysts are generally used alone to promote fundamentally different reactions in asymmetric catalytic processes.¹ The combination of metal complexes and organic molecules in cooperative and relay catalysis may enable new transformations through the simultaneous or sequential activation and reorganization of multiple chemical bonds by the metal- and organocatalysts. This concept holds great potential in creating a broad scope of organic synthetic reactions, as previously demonstrated by transformations accelerated by metal/organic binary catalyst systems.² My group has long been involved in this rising field,³ in particular, recently centered on the development of unprecedented asymmetric relay catalytic protocols (ARC reactions). As a result, we have demonstrated that the combined use of organocatalysts and transition metals in asymmetric catalysis.⁴ Herein, we will report some enantioselective transformations catalyzed by combined binary systems consisting of transition metal complexes and Brønsted acids, leading to the generation of chiral products with high optical purity.⁵⁻⁷

References:

- [1] (a) *Comprehensive Asymmetric Catalysis*; Jacobsen, E. N.; Pfaltz, A.; Yamamoto, H. Eds.; Springer-Verlag: Heidelberg, 1999. (b) Berkessel, A.; Groger, H. *Asymmetric Organocatalysis*; Wiley-VCH: Weinheim, 2005.
- [2] (a) Shao, Z.; Zhang, H. *Chem. Soc. Rev.* **2009**, *38*, 2745. (b) Zhong, C.; Shi, X. *Eur. J. Org. Chem.* **2010**, 2999. (c) Han, Z.-Y.; Wang, C.; Gong, L.-Z. In *Science of Synthesis, Asymmetric Organocatalysis*; List, B., Maruoka, K., Eds.; Georg Thieme Verlag: Stuttgart, 2011, section 2.3.6
- [3] (a) Chen, G.; Deng, Y.; Gong, L.; Mi, A.; Cui, X.; Jiang, Y.; Choi, M. C. K.; Chan, A. S. C. *Tetrahedron: Asymmetry* **2001**, *12*, 1567. (2) Hu, W.-H.; Xu, X.-F.; Zhou, J.; Liu, W.-J.; Huang, H.-X.; Hu, J.; Yang, L.-P.; Gong, L.-Z. *J. Am. Chem. Soc.* **2008**, *130*, 7782.
- [4] (a) Han, Z.-Y.; Xiao, H.; Chen, X.-H.; Gong, L.-Z. *J. Am. Chem. Soc.* **2009**, *131*, 9182. (b) Wang, C.; Han, Z.-Y.; Luo, H.-W.; Gong, L.-Z. *Org. Lett.* **2010**, *12*, 2266.
- [5] Han, Z.-Y.; Chen, D.-F.; Wang, Y.-Y.; Guo, R.; Wang, P.-S.; Wang, C.; Gong, L.-Z. *J. Am. Chem. Soc.* **2012**, *134*, 6532-6535.
- [6] Ren, L.; Lei, T.; Ye, J.-X.; Gong, L.-Z. *Angew. Chem. Int. Ed.* **2012**, *51*, 771-774.
- [7] Unpublished Results.

Date: 15th November 2012 (Thursday)
Time: 11:00am – 12:30pm
Venue: NTU SPMS CBC Building Level 2,
Conference Room
Host: Professor Loh Teck Peng