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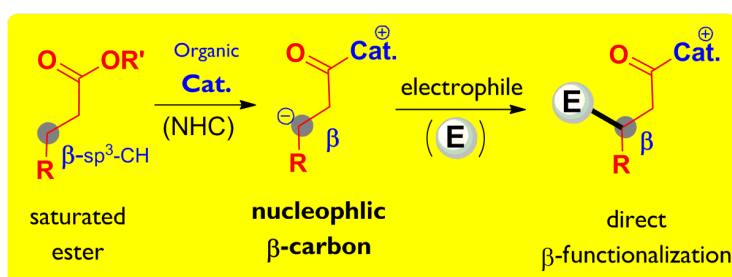
The Chinese University of Hong Kong
Department of Chemistry
Research Seminar Series

Speaker: Prof. Yonggui Robin Chi
Division of Chemistry and Biological Chemistry
Nanyang Technological University, Singapore

Title: Carbene Organocatalyst-Enabled New Activation Modes and Rapid Access to Functional Molecules

<< Abstract >>

The Chi group works on the discovery and development of sustainable organic catalysis and new synthetic strategies for organic synthesis, pharmaceutical manufacturing, and materials assemblies or modifications. One focus is to develop basic new action modes for the functionalization of relatively inert C-H, C-C, N-S, and other non-reactive chemical bonds by using N-heterocyclic carbene (NHC) organic catalysts or through the combination of multiple catalysts. Recent advancements for new activation mode development include NHC-catalyzed activation of stable saturated esters (for both α , and β sp^3 -CH), and cooperative organic (NHC) and transition metal catalysis. Applications of these new activation modes for rapid (essentially one step) assembly of functional molecules for biomedical and agriculture uses have also been carried out either in our laboratories or through collaborations. Recently, we have realized single electron transfer (SET) chemistry (radical chemistry) for unusual activation of organic molecules using carbene catalysis. We also actively apply our catalytic methods in rapid synthesis of functional molecules for medicinal and agriculture use.

**References**

- [1] *Nature Commun.* **2015**, 6, DOI: 10.1038/ncomms7207.
- [2] *J. Am. Chem. Soc.* **2015**, 137, 2416-2419.
- [3] *J. Am. Chem. Soc.* **2015**, 137, DOI: 10.1021/jacs.5b02219.
- [4] *Nature Commun.* **2014**, 5, DOI: 10.1038/ncomms4982.
- [5] *Nature Commun.* **2014**, 5, DOI: 10.1038/ncomms6027.
- [6] *J. Am. Chem. Soc.* **2014**, 136, 1214-1217.
- [7] *Nature Chem.* **2013**, 5, 835-839.
- [8] *J. Am. Chem. Soc.* **2013**, 135, 8113-8116.
- [9] *Angew. Chem. Int. Ed.* **2013**, 52, 8588-8591.
- [10] *Angew. Chem. Int. Ed.* **2013**, 52, 11134-11137.

Date: December 10, 2015 (Thursday)

Time: 10:30 a.m.

Venue: LT2, Lady Shaw Building



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Contact Person:
Prof. Ying-Yeung Yeung



The Chinese University of Hong Kong
Department of Chemistry
Research Seminar Series

Speaker: Mr. John W. F. To
 Department of Chemical Engineering
 Stanford University

Title: Design and synthesis of hierarchical porous carbon for CO₂ capture and oxygen reduction and evolution catalysis

<< Abstract >>

Porous carbon is an interesting class of materials with desirable properties including thermal conductivity, high surface area, tunability over pore geometries, as well as flexibility for heteroatom doping. An ideal sorbent should possess a hierarchical structure, in which the ultramicropores will provide high selectivity and capacity while the mesopores are important for allowing fast gas diffusion. However, such hierarchical structures remain to be challenging to rationally design and synthesize in carbon-based sorbents.

In this talk, I will describe a “designer carbon” with controlled synthesis of a novel Ndoped hierarchical carbon that exhibits outstanding performance in both CO₂ capture and electrochemical catalysis. Our porous carbon was prepared using low temperature carbonization (≤ 500 °C) of a rigid conjugated polymer organic framework synthesized through co-assembly and polymerization of a rationally designed pyrrole monomer and a soft-template. The molecular design of the modified monomer and a low temperature process allows controllability over the ultramicropore volume and nitrogen functional groups, which are essential for CO₂ adsorption under post-combustion conditions. This led to a record-high Henry’s law CO₂/N₂ selectivity (~200:1 at 323 K) among physisorptive carbon materials while possessing high adsorption capacity.

To further tune the material for applications in fuel cell, we performed a NH₃ activation treatment of the as-synthesized porous carbon. The resulting material exhibits excellent performance for both the oxygen reduction reaction (ORR) and the oxygen evolution reaction (OER) as demonstrated by means of fundamental electrochemical studies as well as when integrated into the oxygen electrode of a regenerative fuel cell. The activities observed for both the ORR and the OER are comparable to that achieved by state-of-the-art Pt and Ir in an alkaline environment, but at much lower costs. *These results are paramount for the deployment of energy storage systems that utilize O₂-H₂O chemistries such as regenerative fuel cells and metal-air batteries.*

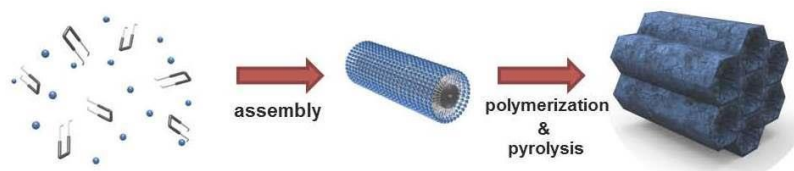


Figure shows the co-assembly process of the molecular engineered monomer using a soft template approach.

Date: December 22, 2015 (Tuesday)

Time: 11:00 a.m.

Venue: L3, Science Centre



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Contact Person:
 Prof. Jiang Xia