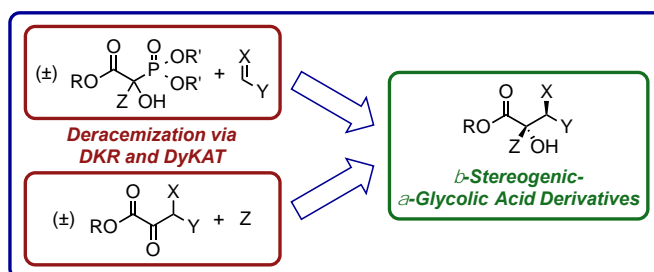




The Chinese University of Hong Kong
Department of Chemistry
Research Seminar Series

- Speaker:** Dr. Michael T. Corbett
 Department of Applied Chemistry
 Nagoya University, Japan
- Title:** Complexity-Building Deracemization Methodologies for the Construction of Optically Active Glycolates
- Date:** May 4, 2015 (Monday)
- Time:** 2:30 p.m.
- Venue:** L3, Science Centre

< Abstract >



Deracemization is an invaluable method for the generation of chiral molecules from simple racemic starting materials. While myriad dynamic kinetic processes have been reported in the literature, most are arguably complexity-neutral transformations (hydrogenation, acylation, etc.) due to the generation of a single stereocenter. Dynamic kinetic resolutions (DKRs) and dynamic kinetic asymmetric transformations (DyKATs) that utilize a single bond-forming step in the construction of multiple stereocenters are highly valuable synthetic strategies. Given their ubiquity in natural products and other fine chemicals, methodologies for the asymmetric construction of glycolic acid derivatives have garnered significant attention in the synthetic community. Deracemization provides an opportunity to telescope approaches for the synthesis of simple glycolic acid derivatives towards the construction of glycolates bearing higher-order molecular complexity. Our efforts towards the development of organocatalytic and transition metal-mediated strategies for the synthesis of β -stereogenic- α -glycolic acid derivatives from simple racemic starting materials under DKR and DyKAT reaction paradigms will be presented.

Biography:

Michael T. Corbett (1985) was born in Houston, USA. In 2008, he completed his B.S. in Chemistry at Xavier University (USA). Then, he received his Ph.D in Chemistry from the University of North Carolina at Chapel Hill (USA) under the tutelage of Prof. Jeffrey S. Johnson in 2013, where he worked on the development of complexity-building deracemization and desymmetrization methodologies. In 2011, he was awarded a JSPS Summer Program Fellowship to join the laboratory of Prof. Takashi Ooi at Nagoya University (Japan) where he studied organic ion-pair catalysis. Then, in 2014 he rejoined the laboratory of Prof. Takashi Ooi at Nagoya University (Japan) where he is currently a JSPS Postdoctoral Fellow studying the development of novel catalysts for the precise control of radical reactions.



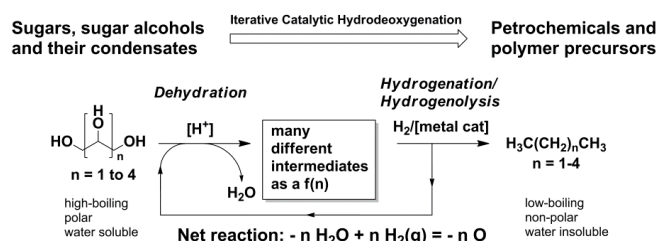
The Chinese University of Hong Kong
Department of Chemistry
Research Seminar Series

Speaker: Prof. Marcel Schlaf
Department of Chemistry
University of Guelph, Canada

Title: How to design, make and test acid-, water- and high temperature-stable homogeneous catalysts for the hydrodeoxygenation of biomass derived sugars and sugar condensates to value-added alcohols, alkenes and alkanes

<< Abstract >>

A shift from fossil to renewable carbon resources as the basis of the (petro-) chemical industry will require the development of new catalytic processes that convert highly oxygenated carbohydrates $[C_n(H_2O)_n]$ from sugars or ligno-cellulose to deoxygenated products that are identical or at least functionally equivalent to petro-chemicals derived from oil, coal and natural gas. This can in principle be achieved through an iterative process in which water is rejected through an acid catalyzed dehydration followed by a metal-catalyzed hydrogenation saturating any C=C and C=O bonds formed in the process, resulting in the net loss of oxygen and overall hydrodeoxygenation of the biomass derived substrates:



The hydrodeoxygenation of sugars and sugar-alcohols and/or their condensates, e.g., the C5/C6 species furfural, 5-hydroxymethylfurfural (HMF) or levulinic acid, to simpler diols, monols or alkenes/alkanes as petrochemicals and fuels typically requires $T \gg 150 \text{ }^\circ\text{C}$ and the use of a strong acid co-catalyst. The high polarity of these substrates can lead to rapid caramelization and therefore fouling and coking of traditionally employed heterogeneous catalyst surfaces, e.g., Ni, Pd or Pt supported on SiO_2 or Al_2O_3 and also cause leaching of the active metal into the product. These are two of the factors that to date have prevented the large-scale adaption of carbohydrate biomass as an industrial carbon source. With the necessarily aqueous acidic reaction media, the use of homogeneous catalysts may therefore offer distinct advantages for this task. However, the rational design, synthesis, testing and recycling of such catalysts poses a unique challenge as the catalysts must be both Brønsted acid- and water-stable and survive and be active at temperatures that are unprecedented for homogeneously catalyzed reactions.

Attempting to address this challenge, a series of ruthenium and iridium complexes based on a poly-pyridine-amine chelating ligand motif with temperature stabilities of up to $250 \text{ }^\circ\text{C}$ in aqueous acidic medium has been developed as ionic hydrogenation catalysts and evaluated against sugar derived substrates such as 2,5-hexanedione and 2,5-dimethylfuran (obtained from HMF). These substrates form part of the value chain from cellulose to value-added products that would be directly usable in existing petrochemical feed streams. E.g., the complex $[(4'\text{-Ph-terpy})\text{Ru}(\text{H}_2\text{O})_3](\text{OTf})_2$ is capable of converting 2,5-dimethylfuran to 2,5-hexanediol. The influence of temperature, acid co-catalysts and solvent systems employed will be discussed and possible hydrogenation reaction mechanisms, hydrodeoxygenation reaction cascades and catalyst decomposition pathways given.

Leading references:

- Schlaf, M. J. Chem. Soc., Dalton Trans. 2006, 4645-4653.
- Sullivan, R. J.; Latifi, E.; Chung, B. K. M.; Soldatov, D. V.; Schlaf, M. ACS Catalysis 2014, 4, 4116-4128.

Date: May 7, 2015 (Thursday)

Time: 4:30 p.m.

Venue: L3, Science Centre



ALL ARE WELCOME

Contact Person: Prof. Zuowei Xie



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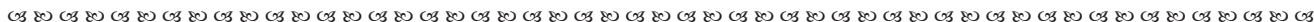
Speaker: Prof. Shengming Ma
Fudan University and
Shanghai Institute of Organic Chemistry (CAS)

Title: Allene Synthesis : Second Generation
Technology and Applications

Date: May 8, 2015 (Friday)

Time: 3:30 p.m.

Venue: L1
Science Centre



ALL ARE WELCOME

Contact Person:
Prof. Zuowei Xie



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

Speaker: Prof. Dr. Thomas J.J. Müller
Institut für Organische Chemie und
Makromolekulare Chemie
Heinrich-Heine-Universität Düsseldorf
Germany

Title: Transition Metal Catalysis as an Entry to
Diversity-Oriented Synthesis of Heterocycles

Date: May 15, 2015 (Friday)

Time: 10:30 a.m.

Venue: L3
Science Centre

