**Pt-WOx/C: An Intriguing Catalyst for Selective Conversions of Furfurals and Cresols**

Cong Wang

Advisor: Prof. Raymond J. Gorte

*Department of Chemical & Biomolecular Engineering, University of Pennsylvania, PA, 19104*

**Abstract**

In this talk, I will present results showing that WOx overlayers on Pt/C can promote the activity and selectivity towards desirable ring-opening of tetrahydrofurfural alcohol (THFA) to 1,5-pentanediol (1,5-PeD) and the selective hydrodeoxygenation (HDO) of *m*-cresol to toluene. In the reaction of THFA to 1,5-PeD, Pt paired with WOx was highly active and selective, even though the individual components were not active or selective. The active form of the catalyst is shown to exist as a sub-monolayer of WOx species on the Pt surface. This thin film could be formed by Atomic Layer Deposition (ALD) of W(CO)6 onto the Pt nanocrystals and STEM-EDS mapping demonstrated that ALD deposition occurred selectively on the Pt. When the catalyst was prepared by impregnation of Pt and W salts, the WOx is shown to be mobile and to anchor on the Pt surface to form the active interface. In the HDO of *m*-cresol to toluene, Pt/C was found to exhibit only modest selectivity and low stability, while Pt-WOx/C was found to be unusually active and selective to toluene. The Pt-WOx/C catalyst was more than 94% selective to toluene and exhibited little to no deactivation under a wide range of reaction conditions. Reactivity studies in combination with density functional theory (DFT) calculations indicate that the HDO reaction on Pt-WOx/C proceeds via a direct hydrogenolysis of the C-O bond in *m*-cresol adsorbed on oxygen vacancy (or redox) sites on WOx species. The DFT results also indicate that Pt helps stabilize the WOx film while facilitating oxygen vacancy formation.

**Speaker Bio:**

Cong Wang is a 4th-year Ph.D. student in the Gorte Group at the University of Pennsylvania. He received his M.S. in Chemical and Biomolecular Engineering at the University of Pennsylvania and his B.S. at Tsinghua University, China. His primary research interests are in heterogeneous catalysis, specifically metal/metal-oxide interactions for the selective biomass upgrades. His research projects thus far have mainly focused on the applications of hydrodeoxygenation, hydrogenation/dehydrogenation and acidic catalysts involving WOx overlayers.