Catalysis Club of Philadelphia

Webinar: 7 pm, Thursday, October 21st, 2021
Zoom link shared after registration

Speaker: Prof. Yong Wang

Washington State University

Earth-abundant Fe Catalysts for the Conversion of Biomass

Student Speaker: Renjing Huang

Meeting Schedule:

6:30 PM: Welcome
7:00 PM: Talk by Renjing Huang
7:20 PM: Talk by Prof. Wang

Meeting Fees:

Free to all who register

Meeting Etiquette:

Please remember to mute your microphone and arrive early to solve any technical issues. Camera sharing prior to the talks is encouraged.

Online Registration – Please register online by Wednesday, September 22nd at http://catalysisclubphilly.org/webinar-registration/ or Arrangements Chair, hrenjing@seas.upenn.edu.

A Zoom meeting invite will be provided through the confirmation email. If you do not receive a confirmation email immediately after registration, please contact Renjing Huang, hrenjing@seas.upenn.edu.

Membership – Dues for the 2021-22 season will be $25 ($5 for the local chapter and $20 for the national club). Dues for students, post-docs and retirees will be $10 ($5 for the local club and $5 for the national club).

Earth-abundant Fe Catalysts for the Conversion of Biomass

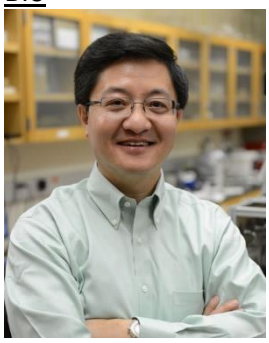
Yong Wang

The Gene & Linda Voiland School of Chemical Engineering and Bioengineering, Washington State University, Pullman, WA 99164, USA

Institute for Integrated Catalysis, Pacific Northwest National Laboratory, Richland, WA 99354, USA

It remains challenging to efficiently remove oxygen from bio-oil (O% = 10-30 wt%) to produce fuels with much lower oxygen content (< 2 wt%). Catalytic hydrodeoxygenation (HDO) is an effective and widely adopted strategy for O removal from bio-oil. In this presentation, our recent work on the development and fundamental understanding of earth-abundant Fe-based catalysts for improved selectivity and catalyst stability in HDO of lignin-derived phenolics will be discussed, including: 1) stabilization and promotion of Fe by trace amount of PGMs (e.g., Pd); 2) stabilization of Fe and tailoring of reaction pathways involved in HDO by functionalized C and alkali metals; and 3) mechanistic insight on hydrogen activation and spillover as well as their influence on HDO involved in catalytic pyrolysis.

Bio



Yong Wang is Voiland Distinguished Professor in Chemical Engineering at Washington State University (WSU) and a Laboratory Fellow and associate director of Institute for Integrated Catalysis at Pacific Northwest National Laboratory (PNNL). Dr. Wang received PhD degree in Chemical Engineering from WSU in 1993 and then joined PNNL in 1994 as a postdoc. He was promoted to laboratory Fellow in 2005. In 2009, Dr. Wang took a joint appointment at PNNL and WSU. Dr. Wang is best known for his leadership in the development of novel catalytic materials and reaction engineering to address the issues related to energy and atom efficiency related to the conversion of fossil and biomass feedstocks to fuels and chemicals. Dr. Wang has authored >370 peer reviewed publications with >31,000 citations and H index of 82. He is the inventor on 287 issued patents including 110 issued U.S. patents. He is a fellow of AIChE (American Institute of Chemical Engineers), ACS (American Society of Chemistry), RSC (Royal Society of Chemistry), AAAS (American Association of the Advancement of Science), and NAI (National Academy of Inventors). He is also a member of Washington State Academy of Science. He has won numerous awards including the 2021 ACS E.V.Murphree Award in Industrial Chemistry & Engineering, 2019 AIChE Catalysis and Reaction Engineering Practice Award, 2017 ACS I&EC Division Fellow Award, 2006 Asian American Engineer of the Year Award, Presidential Green Chemistry Award, 3 R&D 100 Awards, Distinguished Alumni Achievement Award from Chemical Engineering at WSU, 2 PNNL Inventor of the Year Awards, Battelle Distinguished Inventor Award, and the first recipient of PNNL Laboratory Director's Award for Exceptional Scientific Achievement Award. He is the past chair of the ACS Energy & Fuel Division and Director to

the AIChE Catalysis & Reaction Engineering Division, and currently serves editorial board of 8 catalysis and energy related journals including *ACS Catalysis, JACS Au,* and *Catalysis Today*.

The effects of SMSI on m-Cresol hydrodeoxygenation over Pt/Nb_2O_5 and Pt/TiO_2

Renjing Huang, Ohhun Kwon, Chao Lin, Raymond J.Gorte

The hydrodeoxygenation (HDO) of m-cresol was studied on $Pt/Nb_2O_5/MgAl_2O_4$ and $Pt/TiO_2/MgAl_2O_4$ catalysts to understand the effects of Strong Metal Support Interactions (SMSI). The Nb_2O_5 and TiO_2 supports were prepared as 0.7-nm films on $MgAl_2O_4$ by Atomic Layer Deposition (ALD) to ensure that the structures of the catalyst were the same. When reduced at 773 K to place Pt in the encapsulated state, $Pt/Nb_2O_5/MgAl_2O_4$ was much less active than $Pt/MgAl_2O_4$ at 573 K but much more active at 623 K. While $Pt/MgAl_2O_4$ deactivated rapidly due to coking, $Pt/Nb_2O_5/MgAl_2O_4$ showed significantly better coke tolerance and was almost 100% selective towards toluene production. $Pt/Nb_2O_5/MgAl_2O_4$ reduced at lower temperatures exhibited intermediate catalytic properties. The effect of reduction temperature on $Pt/TiO_2/MgAl_2O_4$ was much less and this catalyst was more similar to $Pt/MgAl_2O_4$ than its Nb_2O_5 counterpart. The implications of these results for understanding the nature of oxide promoters on HDO of m-cresol are discussed.

Bio

Renjing Huang earned his bachelor's degree in chemical engineering from Hong Kong University of Science and Technology. Currently, he is a 6th year PhD graduate student in the Department of Chemical and Biomolecular Engineering, University of Pennsylvania. His research interest includes single atom catalysis and biomass conversion on metal-metal oxide catalysts.