THE OHIO STATE UNIVERSITY

The William G. Lowrie Department of Chemical and Biomolecular Engineering Graduate Program Cordially invites you to attend a seminar on

Catalytic Conversion of 2,3-Butanediol to Fuels and Chemicals

Keith L. Hohn

Chair and Professor
Department of Chemical, Paper, and Biomedical Engineering
Miami University

Thursday, February 29th, 11:30 AM
130 Koffolt Lab, CBEC 151 W Woodruff Ave
Reception at 11:00 AM - CBEC Lobby

Bio

Keith L. Hohn joined the Department of Chemical, Paper, and Biomedical Engineering at Miami in 2019 to serve as Professor and Chair.

He came to Miami after serving as the William H. Honstead Professor of Chemical Engineering at Kansas State University, where he worked for 20 years. He earned his B.S. in chemical engineering from the University of Kansas and his Ph.D. in chemical engineering from the University of Minnesota.

Dr. Hohn's research area is in heterogeneous catalysts with emphasis on energy applications. This includes research on natural gas conversion, hydrogen generation, and the conversion of biomass-derived compounds to fuels and chemicals. One recent project was on the catalytic conversion of 2,3-butanediol, a key chemical intermediate that can be produced from biomass. Over a series of papers, Dr. Hohn's demonstrated that 2,3-butanediol could be converted to polymer precursors, solvents, flavoring compounds, and fuel-range hydrocarbons.

Dr. Hohn has served his scientific community through a number of leadership positions. He has served as the founding Editor-in-Chief for Catalysts, an open-source journal dedicated towards all areas of catalysis. Under his leadership, the journal has developed into a trusted publication venue with a impact factor of 3.444 and more than 1000 papers published each year.

Dr. Hohn also was co-founder and inaugural President of the Great Plains Catalysis Society. In recognition of Dr. Hohn's research contributions, he was awarded the Frankenhoff Outstanding Research Award from the College of Engineering at Kansas State University in 2018.

Abstract

Because of the limited nature of petrochemical resources, renewable biobased feedstocks are increasingly being considered for production of fuels and chemicals. One approach for doing this is to identify platform chemicals that can easily be produced from biomass, and that can be converted to products with strong economic potential. We have identified 2,3-butanediol (2,3-BDO) as an excellent candidate as a platform chemical for conversion to a wide variety of chemicals.

This seminar will discuss different catalytic routes to convert 2,3-BDO to fuels and chemicals. The first route converts 2,3-BDO to butene over acid-base bifunctional catalysts. Butene could further be converted to hydrocarbon fuels via oligomerization and hydrogenation. A second route dehydrates 2,3-BDO to methyl ethyl ketone over acid catalysts, followed by aldol condensation on Cu/ZrO_2 to C8 ketones that can then be hydrogenated to fuel-range hydrocarbons on Cu/Al_2O_3 or Pt/Al_2O_3. Towards chemical production, result will be shared on direct conversion of 2,3-BDO to butadiene over alumina and acetione using copper catalysts.

Through these studies of 2,3-BDO chemistry, we have discovered that product selectivity can be manipulated by controlling catalyst structure and the relative number of metal and acid sites. For example, the pore size of the support significantly impacted the products formed when trying to convert 2,3-BDO to butene. The selectivity to large molecules produced via oligomerization increased as the pore size increased, while the selectivity to smaller molecules produced via catalytic cracking reactions decreased. The impact of catalyst properties on different reactions of 2,3-BDO will be reviewed and mechanistic studies will be discussed to provide a picture of the fundamental reaction schemes occurring for 2,3-BDO over various catalysts.