CATALYSIS CLUB OF PHILADELPHIA
Promoting Catalytic Science and Technologies

Officers
CHAIR
Jacob Dickinson
DuPont

CHAIR-ELECT
Parag Shah
PQ Corporation

PAST CHAIR
Eric Sacia
AbbVie

TREASURER
Joshua Pacheco
Zeolyst International

SECRETARY
Jennifer Lee
University of Pennsylvania

PROGRAM CHAIR
Srinivas Rangarajan
Lehigh University

ARRANGEMENTS CHAIR
Chao Lin
University of Pennsylvania

DIRECTOR, SPONSORSHIP
Bill Borghard
Rutgers University

DIRECTOR, STUDENT POSTER
Marat Orazov
University of Delaware

DIRECTOR, MEMBERSHIP
Lifeng Wang
Zeolyst International

WEBMASTER
Thomas Yeh
Johnson Matthey

NATIONAL REPRESENTATIVE
Dion Vlachos
University of Delaware

Catalysis Club of Philadelphia

Webinar: 7pm, Thursday, August 13th, 2020

Webinar link shared after registration

Speaker: Mr. Boris Sheludko

Rutgers University, Department of Chemistry & Chemical Biology

Supported Pincer-Iridium Species as Catalysts for C-H Activation Reactions: Design, Synthesis, Characterization and Kinetics

Gold Sponsor Talks: Altamira, TCG, PQ/Zeolyst

Meeting Schedule:
7:00 PM: Welcome
7:05 PM: Gold Sponsor Talks
7:20 PM: Talk by Mr. Sheludko

Meeting Fees:
Free to all who register

Meeting Etiquette:
Please remember to mute your microphone and arrive early to solve any technical issues

Online registration – Please register online by **Wednesday, *August 12th*** at http://catalysisclubphilly.org/webinar-registration/ or notify Chair-Elect Parag Shah.

A webinar meeting invite will be provided on August 13th to all those who register.

Membership - Dues for the 2019-20 season will be $25.00 ($5.00 for the local chapter and $20.00 for the national club). Dues for students, post-docs and retirees will be $10.00 ($5.00 for local club and $5.00 for national club).

Catalysis Club of Philadelphia

Webinar: 7pm, Thursday, August 13th, 2020

Webinar link shared after registration

Supported Pincer-Iridium Species as Catalysts for C-H Activation Reactions: Design, Synthesis, Characterization and Kinetics

Boris Sheludko, *Department of Chemistry & Chemical Biology, Rutgers University.*

Abstract

Pincer-ligated iridium complexes of the form [Ir(^{R4}PCP)L] (^{R4}PCP = κ^3-C_6H_3-2,6-$(XPR_2)_2$; X = CH_2, O; R = *t*Bu, *i*Pr) have seen application in various C-H, O-H and N-H activation reactions over the last several decades. Specifically, their competence toward *n*-alkane dehydrogenation at temperatures as low as 240 °C, coupled with their regioselectivity towards formation of terminal olefin (at early reaction times), has attracted considerable attention. However, homogeneous species based on pincer-iridium complexes often suffer from inhibition of product olefin species, and recyclability is often difficult to achieve. The goal of our research has been the design of a heterogeneous system that would allow access to the high activity and regioselectivity of a homogeneous catalyst, while conferring a robustness and recyclability that is often associated with heterogeneous materials.

Previously, our work has resulted in an example of such a continuous-flow system. Surprisingly, the pincer-iridium catalyst used displayed remarkable stability as a function of time on stream at 340 °C, with negligible loss of activity at equilibrium conversion over the course of 31 days. The stability conferred upon heterogenization allowed for access to reaction temperatures of 300 – 340 °C, making thermodynamically challenging reactions such as alkane dehydroaromatization and alkane oligomerization (with zeolite co-catalyst) more feasible. The heterogenized pincer-iridium species has been characterized in situ via Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS) and ex situ via several techniques including Magic Angle Spinning Nuclear Magnetic Resonance (MAS NMR) and X-ray Absorption Spectroscopy.

XAS also indicated the decomposition of such materials at high temperatures to a novel iridium phosphide nanophase that itself appears to be an interesting alkane dehydrogenation catalyst as well. Scanning Transmission Electron Microscopy (STEM) imaging allowed for the observation of both the fresh pincer-iridium species as well as the generated iridium phosphide phase in further detail.

Speaker Biography

Boris Sheludko attended Wesleyan University as part of a five-year B.A./M.A. program, during which time he performed research under the guidance of Professor Albert J. Fry. His thesis research focused on elucidating the mechanism and scope of an electrochemical route leading from diphenyl ketones to benzhydryl ethers. Upon graduating, he was recruited as a senior research technician at ExxonMobil Research & Engineering Corporate Strategic Research, addressing issues including refinery coking and, separately, exploring "bottom-of-the-barrel" feedstocks. In 2015, he returned to academia to obtain his Ph.D. in chemistry at Rutgers University – New Brunswick under the guidance of Professors Fuat E. Celik (Chemical & Biochemical Engineering) and Alan S. Goldman (Chemistry & Chemical Biology). His current research focuses on the development of metal oxide-supported pincer-iridium organometallic complexes and the use of such species as catalysts for alkane dehydrogenation. More broadly, he is interested in applying surface organometallic chemistry in the design of heterogeneous catalysts in thermodynamically challenging reactions.