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Catalysis Club of Philadelphia

Thursday March 19, 2009

Holiday Inn Select Hotel
Naamans Road and I-95, Claymont, DE

Toward the Design of Water Gas Shift Catalysts

Prof. W. Nicholas Delgass

School of Chemical Engineering, Purdue University

&

Student Poster Competition

Note: The Competition Starts at 5:00 PM

Student Posters and

Social Hour: 5:00 PM

Dinner: 6:30 PM

Meeting: 7:30 PM

Members: \$30.00

Walk Ins & Non-members: \$35.00

Student & Retired Members:
\$15.00

Menu - Dinner Buffet

Chicken Dijonaise - Served with a
Delicate Dijon Cream

Sliced Sirloin of Beef - Served with
a Mushroom Bordelaise Sauce

Vegan - Portabella Pasta

Meeting registration - Please notify your company representative or Alan Lee Stottlemeyer (alan@udel.edu, phone: 302.262.8281, fax: 302.831.1048) by

Thursday, March 12.

No meal reservation is required for this meeting, since the dinner is buffet-style.

Company Representatives – We would like to encourage you to make meal/meeting reservations to your company representative.

Membership - Dues for the 2008-09 season will be \$10.00 (\$5.00 for the local chapter and \$5.00 for the national club). Dues for students and post-docs will be \$6.00 (\$5.00 for local club and \$1.00 for national club). Please send your payment to Steve Harris, Lyondell Chemical Co., 3801 West Chester Pike, Newtown Square, PA 19073-2387.

Catalysis Club of Philadelphia

Thursday March 19, 2009

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Toward the Design of Water Gas Shift Catalysts

Prof. W. Nicholas Delgass

School of Chemical Engineering, Purdue University

Abstract

The water-gas shift (WGS) reaction ($\text{CO} + \text{H}_2\text{O} \rightarrow \text{CO}_2 + \text{H}_2$) plays an important role in the areas of hydrogen generation and purification and in the production of fuel. The goal of our research team has been to synthesize a WGS catalyst with a turnover rate (TOR) as high as that of the commercial Cu catalyst, but with the robustness of noble metals. With a library of over 220 catalysts, we have demonstrated a variety of behaviors including a strong influence of the support and additives such as Zn and Fe. At 240°C the addition of 19% Zn by weight to 2% Pd/Al₂O₃ increases the rate per mole of Pd by a factor of 12, while the rate is 130 times faster after the addition of 14% Fe. At this temperature the rate per mole of Pd in Pd-Fe is 3 times higher than the rate per mole of Cu on the commercial catalyst. Similar promotion effects of Fe are also seen in the PtFe/Al₂O₃ system. Interestingly, while Zn appears to alloy with Pd, Fe in the highly active catalysts seems to be zero valent, but not alloyed with Pd or Pt. These findings, together with the high activity of supported nano-gold particles, suggest unexpected metallic states as a source of high activity sites. These issues will be discussed in light of detailed kinetic and characterization data and in the context of a model-based catalyst design approach that we call Discovery Informatics.

Speaker's Bio

Nick Delgass is Maxine Spencer Nichols Professor of Chemical Engineering and Director of the Center for Catalyst Design at Purdue University. Over his 40 years of catalysis research and teaching, he has worked with a variety of spectroscopic tools for catalyst characterization and focused on using surface chemical information from those methods to understand catalytic activity in water gas shift, methanation, HDS, hydrogenation, epoxidation, NO_x reduction, olefin polymerization, and aromatization reactions. This work has resulted in over 125 papers, co-authorship of a book on Spectroscopy in Heterogeneous Catalysis, awards from the Michigan and New York Catalysis Societies, and numerous teaching awards. He is a past editor of the Journal of Catalysis and has served as consultant to major petroleum and chemical companies. His current work, in collaboration with several Purdue faculty members, emphasizes a systems and model-building approach to catalyst design in a framework called Discovery Informatics.

Catalysis Club of Philadelphia

Call for Posters

The Catalysis Club of Philadelphia will be holding their annual poster competition on Thursday, March 19, 2009. The best five posters will be presented awards with the top poster invited to present his or her work at the Spring Symposium (May 21, 2009). The competition is open to current graduate students only, but the club welcomes participation from senior undergraduates and post-docs looking to showcase their research in front of an industrial audience. All presenters will be sponsored by the club for the evening, so dinner's on us.

To enter, please submit a short abstract of your entry by March 2, 2009 to:

Joseph Fedeyko
fedeyjm@jmusa.com

Nominations are open for the 2009 Catalysis Club of Philadelphia Award

Each year the Catalysis Club of Philadelphia recognizes a person, preferably from the Philadelphia area, who has made an outstanding contribution to the advancement of catalysis. Such advancement can be scientific, technological, or in organization leadership. The award goes to an individual; no split Award to two or more persons will be given. The Award consists of a plaque and a \$1000 cash prize.

The entire nomination package, including a resume and recommendation letters, should not exceed 10 pages. The deadline for the receipt of nominations is April 10, 2009. Receipt of nominations will be acknowledged by email. Prior nomination packages sent in 2006 or later will automatically be considered for the 2009 Award.

Nomination letters along with supporting materials should be emailed in a single PDF document to:

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Phone: 610-359-2500