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Catalysis Club of Philadelphia

Thursday February 19, 2009

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

Hydrodesulfurization with classic Ni-MoS₂/Al₂O₃ and new Pt-Pd on mesoporous zeolite catalysts

Prof. Roel Prins

ETH Zurich, Switzerland

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Nomination of new CCP officers for 2009-2010

Social Hour: 5:30 PM

Dinner: 6:30 PM

Meeting: 7:30 PM

Members: \$30.00

Walk Ins & Non-members: \$35.00

Student & Retired Members:
\$15.00

Menu

**Chicken Chesapeake - Lump
Crabmeat and Kennett Square
Mushrooms**

**Roast Loin of Pork - Served with
Port Wine Demi Glace**

**Vegan - Rigatoni with Vodka
Marinara**

Meal reservations - Please notify your company representative or Alan Lee Stottlemeyer (alan@udel.edu, phone: 302.262.8281, fax: 302.831.1048) by **Thursday, February 12.**

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.

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Hydrodesulfurization with classic Ni-MoS₂/Al₂O₃ and new Pt-Pd on mesoporous zeolite catalysts

Prof. Roel Prins

ETH Zurich, Switzerland

Abstract

Extensive research is being carried in academia and in the industry to find better catalysts than the classic sulfided Mo catalysts, promoted by Co or Ni, for the hydrodesulfurization (HDS) reaction, in which sulfur atoms are removed from sulfur-containing molecules present in fuels. Also the HDS mechanism is studied extensively to find leads for preparing more active classic catalysts. Examples of the development of new catalysts and of the investigation of the HDS mechanism will be presented. On the one hand we have studied the mechanism and kinetics of the HDS network of 4,6-dimethyldibenzothiophene (DM-DBT) over sulfided Mo and Ni-Mo on alumina catalysts. The network of the HDS of this molecule is complex and to get reliable rate constants of all reaction steps one needs to also study the reaction starting from intermediates. Therefore we first synthesized the tetrahydro and hexahydro DM-DBT intermediates and then studied their HDS. In this way we have been able to find all the rate constants in the kinetic network for sulfided Mo, CoMo and NiMo catalysts and explain the promoting effect of Ni, the inhibiting effect H₂S and the inhibiting effect of the methyl groups in DM-DBT compared to DBT. We have synthesized mesoporous ZSM-5 and Beta and have loaded them with Pt, Pd and Pt-Pd and studied their HDS properties. Metals supported on an acid support have a higher activity and a lower sulfur sensitivity. Zeolites have a high acidity, but have too narrow pores and therefore first mesopores must be created. While the HDS mechanism over the zeolite-supported metals is the same as over the sulfided metals on alumina, the kinetics is totally different.

Speaker's Bio

Roel Prins obtained his PhD in physical chemistry at the University of Amsterdam and worked in the Shell laboratory in Amsterdam and the Shell laboratory in Emeryville, USA from 1966-1977. From 1977-1987 he was professor of Inorganic Chemistry at the Technical University in Eindhoven, The Netherlands, and spent a sabbatical year (1986/87) in Berkeley, USA, in the group of Professor G.A. Somorjai. From 1987-2006 he was professor of Catalysis at the Eidgenössische Technische Hochschule (ETH) in Zurich, Switzerland, where his research concentrated on hydrodesulfurization and hydrodenitrogenation, the use of zeolites in catalysis, and EXAFS. He is corresponding member of the Royal Dutch Academy of Sciences and president of the Federation of European Catalysis Societies. At the ETH he served as chairman of the Institute for Chemical and Bioengineering, as chairman of the Department of Chemistry, and as a member of the ETH Research Committee. He chaired the Dutch synchrotron radiation committee, which built EXAFS and small angle scattering beamlines in Daresbury, England, was a member of the Swiss-Norwegian synchrotron radiation committee, which constructed EXAFS and XRD beamlines in Grenoble, France, and of the Scientific Advisory Committee for the Swiss Light Source at the Paul Scherrer Institute in Switzerland. He was editor-in-chief of the Journal of Catalysis and is now editor responsible for Asia. He was Schuit lecturer at the University of Delaware, USA (1994), Ipatieff lecturer at Northwestern University, USA (1999), guest professor at the Technical University in Delft (1994) and the Pierre et Marie Curie University in Paris (2001), and is honorary professor of the universities of Dalian, Chengdu and Taiyuan in China. Since 2006 he is guest professor at the Dalian University of Technology in China.