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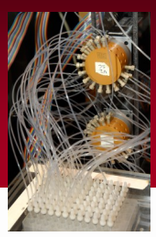
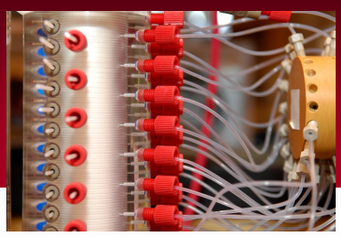


The Gene and Linda Voiland School of

Chemical Engineering and Bioengineering

2014 Seminar Series
Monday, November 10, 2014
12:00 p.m. CUE 319

Miroslaw Derewinski
Pacific Northwest National Laboratory
Institute for Integrated Catalysis
Richland, WA

Mirek Derewinski is a Senior Scientist in the Institute of Integrated Catalysis at the Pacific Northwest National Laboratory in Richland, WA. He received his Ph.D. in Chemistry from the Technical University in Warsaw, Poland in 1981 and his D.Sc. from the Institute of Catalysis and Surface Chemistry, PAS in Krakow, Poland. He has held several positions at the Institute of Catalysis and Surface Science, PAS (Head of Research Group and Deputy Director, Krakow, Poland), National High School of Chemistry, CNRS (Research Fellow, Montpellier, France), and University of Paris VI , CNRS (Research Fellow, Paris, France). He served as a Visiting Professor at the Laboratoire de Matériaux Catalytiques et Catalyse en Chimie Organique, CNRS (Montpellier, France), Laboratoire SIEN at the Universite Pierre et Marie Curie (Paris, France), and The International Center for Materials Nanoarchitectonics (Tsukuba, Ibaraki, Japan). His research is focused on the fundamental studies of the formation and stability of ordered microporous materials and related solids to use that knowledge to design complex catalysts. The formation of the microporous materials is followed using kinetic experiments with in situ MAS NMR spectroscopy and in situ TEM to monitor and analyze the elementary steps of nucleation and crystal growth.

Synthesis and application of hierarchical porous materials:

The high surface area, molecular dimensions of the pores, high sorption capacity, high homogeneity of the active sites leads to a widespread utilization of zeolites involving their acid, base, bifunctional (acid-base, metal-acid) and redox properties. For several catalytic applications, however, the relatively small size of the microporous channels leads to a serious drawback as they impose steric constraints to the diffusion and/or access of reactants to the active sites, as well as to the formation and/or diffusion of target products. Synthesis of novel zeolite-based materials with hierarchical pore structure reduce the diffusion limitations and improve the catalytic performance. The lecture compares two different approaches to synthesize such materials, together with their catalytic properties, i.e., (i) m*esostructured materials* via *assembling of protozeolitic particles* and (ii) *bifunctional, hierarchical porous catalysts prepared via carbon-template zeolites*

With respect to first material, the design, preparation and full characterization of novel solid-state systems composed of zeolitic nanoparticles (below 10 nm in size) assembled into a highly porous, layered material will be presented. The main advantage of the new material is a considerably higher accessibility of active sites making it suitable for application as an effective catalyst even for reactions carried out in a liquid phase. The catalytic performance (terpene hydrocarbon isomerization) is considerably better than that of standard zeolites and amorphous aluminosilicates.

Using carbon exo-templating is an alternative approach inducing mesoporosity in zeolites. It will be shown that nearly uniform intracrystalline meso-voids can be generated by growing zeolite crystallites around such carbon nanoparticles. During the lecture, the improved catalytic performance of metal or metal sulfide loaded zeolites comprising intracrystalline mesopores in methane dehydroaromatization (MDA) and hydroconversion of n-octane will be described.