The Chemical and Biomolecular Engineering Department

UNIVERSITY OF HOUSTON

A Short Course

APPLICATIONS OF HETEROGENEOUS CATALYSIS
May 1-5, 2017

We are pleased to announce the next presentation of our short course "Applications of Heterogeneous Catalysis" for May 1 – 5, 2017. The course is organized to match the needs of chemists and chemical engineers entering the practice of heterogeneous catalysis. However, it is equally suited to individuals experienced in certain areas but who wish to acquire an overview of the field. We do not emphasize research methodology but concentrate on applications to real problems.

The course has been given sixty-four times in Houston since 1971, fifteen times at various locations in Europe, and adapted many times for in-house courses at major companies. Many companies routinely send their personnel to us for training.

Course Description

Successful applications of the principles of catalysis to process design require a combination of physics, chemistry and engineering, together with considerable state-of-the-art "know-how" and guidance from theory. Contemporary catalysis has made significant progress in recent years toward the scientific design of optimum catalyst systems for specific process requirements. The purpose of this course is to cover current knowledge for both the researcher in catalysis and the engineer interested in process optimization. It will serve as a review for those knowledgeable in the subject and as an introduction to newcomers to the field.

The short course covers how to:

- Select an appropriate catalyst
- Prepare catalysts
- Characterize catalyst properties
- Test catalytic performance
- Model a catalyst
- Use a catalyst

The nature of catalytic components, such as supports, active materials and promoters, is discussed in detail from the perspective of process applications. Prediction of catalytic properties and design of specific systems are treated with reference to modern theories of catalysis and the correlations of kinetic properties. Guidelines for selecting potential catalytic "candidates" for

target processes are given. Laboratory and commercial methods of catalyst preparation are reviewed, with emphasis on proven process catalysts.

Modern instrumental methods for the characterization of catalyst physical and chemical properties are covered, especially techniques for measurement of surface areas, pore properties, crystallite sizes, acidities, etc. Catalytic kinetics, both chemical and diffusional, are considered, and the relationship of surface mechanisms to catalyst properties fully outlined.

The course also treats the design and construction of experimental reactors used to test catalytic properties, together with techniques for modeling process reactors. Also included are catalyst deactivation and regeneration.

Finally, several case histories demonstrate how laboratory catalysts are scaled-up to industrial processes. Critical aspects are emphasized, such as modeling, parametric sensitivity, stability and regeneration. Covered material emphasizes not only important applications to the refining and petrochemical industries but also to the rapidly growing fields of environmental catalysis, methane conversion,, zeolites, structured catalysts, among others.

Fee

The registration fee is $2,000, which includes a complete set of notes, coffee breaks, and an introductory lunch. Payment may be made with a personal or company check, credit card or we can send an invoice.

Registration

Please contact Ms. Nicolette Solano, Department of Chemical and Biomolecular Engineering, University of Houston (e-mail: nsolano2@central.uh.edu; phone: 713-743-4304; fax: 713-743-4323; or the co-directors for registration information). The deadline is April 20, 2017 with the registration fee paid in full. No cancellations will be accepted after April 20, 2017, but registrants may send substitutes or defer attendance to the next scheduled course.

Location

The course will be given on campus at the University of Houston, tentatively in the University Center. Sessions are from 9-12 pm and 2-5 pm Monday through Friday. Exact instructions for transportation to the University of Houston will be sent to registrants.

Hotel accommodations

Hotel accommodation is available at the recently renovated University Hilton Hotel on campus for a rate of $140/night plus tax. Details will be sent to registrants. Recommendations for other local hotels with arranged discounts will be mailed on request.

Schedule

Monday, May 1

9 a.m.	Introduction to catalysis, general concepts, overview	Jeff Rimer
12 pm.	Introductory lunch	
2 p.m.	Adsorption, catalytic kinetics, and reaction mechanisms	Jeff Rimer

Tuesday, May 2

9 a.m.	Kinetics measurements and analysis, kinetic modeling	Mike Harold
2 p.m.	Reaction and diffusion, transport disguise of catalyst performance	Dan Luss

Wednesday, May 3

9 a.m.	Computational Catalyst Design – Trends in Heterogeneous Catalysis	Lars Grabow
2 p.m.	Mechanistic-based Computational Catalyst Design – The Sabatier Principle and the Volcano Curve	Lars Grabow

Thursday, May 4

9 a.m.	Reactor modelling and design	Dan Luss
2 p.m.	Structured catalytic reactors, recent developments in emission catalysis	Mike Harold

Friday, May 5

9 a.m.	Catalytic materials – solid acids and zeolites	Jeff Rimer
2 p.m.	Catalyst and reactor deactivation	Dan Luss

Lecturers

Dan Luss, Ph.D. (University of Minnesota)
Cullen Professor of Chemical and Biomolecular Engineering, University of Houston

Dr. Luss joined the University of Houston in 1967 and specializes in chemical reaction engineering. He is a member of the National Academy of Engineering and the recipient of the AIChE Allan P. Colburn, Professional Progress, Wilhelm and Founders Awards and the ASEE Curtis McGraw Award. He is an experienced consultant to industry in reaction-engineering problems.

Jeffrey D. Rimer, Ph.D. (University of Delaware)
Ernest J. and Barbara M. Henley Associate Professor of Chemical and Biomolecular Engineering, University of Houston

Dr. Rimer joined the University of Houston in 2009 and specializes in the synthesis, characterization, and testing of microporous materials. He is chair of the Southwest Catalysis Society, vice-chair of the International Zeolite Association Synthesis Commission, and is the recipient of several honors that include the American Chemical Society PRF DNI award, the NSF CAREER award, and the Owens Corning Early Career Award from AIChE.

Michael P. Harold, Ph.D. (University of Houston)
M. D. Anderson Professor of Chemical and Biomolecular Engineering, University of Houston

Dr. Harold has had a mixed academia-industrial career (eight years at the University of Massachusetts, seven years at DuPont) before joining the University of Houston in 2000. He specializes in catalytic reaction engineering, spanning applications involving catalytic membranes, environmental catalysis, structured reactors, and biofuels. He organized the on-campus Texas Diesel Testing Facility and currently serves as Editor-in-Chief of the *AIChE Journal*.

Lars C. Grabow, Ph.D. (University of Wisconsin, Madison)
Assistant Professor of Chemical and Biomolecular Engineering, University of Houston

Dr. Grabow joined the University of Houston in 2011 and specializes in computational catalysis using density functional theory (DFT), microkinetic modeling, kinetic Monte Carlo simulations and descriptor-based catalyst design. He has been awarded early career awards from the U.S. Department of Energy, the National Science Foundation, and the American Chemical Society. He currently serves as the 2nd Vice Chair of the Catalysis and Reaction Engineering Division of AIChE and has authored a tutorial-style book chapter on "Computational Catalyst Screening" in the book "Computational Catalysis" in the RSC Catalysis Series.