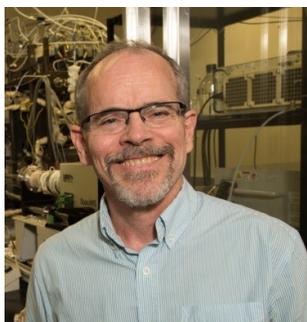


September 12 | 11:00AM | 206 Furnas



Mike Harold, Ph.D.

Anderson Professor and Chair

Department of Chemical and Biomolecular Engineering

University of Houston

**Amol Ajinkya Memorial Fund Lecture*

Multi-Functional Structured Catalysts **For Clean Exhaust from Lean Burn Vehicles**

The U.S. faces the difficult dual challenge of reducing the consumption of transportation fuels and improving air quality. Lean burn gasoline, diesel, and natural gas engines are of interest because they are more fuel efficient than conventional stoichiometric gasoline engines. Unfortunately, the unconverted oxygen in the exhaust prevents the use of the conventional three-way catalytic converter to reduce nitrogen oxides (“NO_x”) to N₂. In this talk we describe progress towards the combination of two NO_x reduction technologies, *NO_x Storage and Reduction (NSR)* and *Selective Catalytic Reduction (SCR)*.

Research in our group uses a combination of experimentation and modeling, both to provide deeper insight and to devise “optimal” structures and operating strategies for emission control technologies. NSR is shown to be a promising but complex catalytic process that involves the sequential periodic reactive trapping of NO_x and its rapid reduction on multi-functional catalysts containing precious metal and storage components. SCR is adopted from the stationary source process which utilizes NH₃ as the NO_x reductant, and utilizes both Cu- and Fe-exchanged zeolite catalysts. As stand-alone reactors, NSR has the noted disadvantage of cost (precious metal) and byproducts (NH₃, N₂O), while SCR requires an aqueous urea system to provide the NH₃, which may “slip” from the reactor under the inherent transient vehicle operation. Moreover, both NSR and SCR have constrained temperature operating windows (low and high). Multi-functional catalyst architectures that combine two or more active layers or zones can be effective strategies to address cost and/or performance limitations. The “NSR + SCR” catalyst combines periodic NO_x storage and reduction with in situ NH₃ generation and selective catalytic reduction of NO_x. To be described are results from targeted experiments as well as kinetic and reactor modeling that advance our understanding of these interesting catalytic reaction systems.

Refreshments at 10:45AM

Wednesday Seminar Series