SCHOOL OF CHEMICAL, BIOLOGICAL & MATERIALS ENGINEERING

And

UNIVERSITY OF OKLAHOMA BIOENGINEERING CENTER

100 E. Boyd, Sarkeys Energy Center, T-335 405-325-5811 The University of Oklahoma Norman, Oklahoma 2010 – 2011 Seminar Series

DR. STEVEN L. SUIB

BOARD OF TRUSTEES DISTINGUISHED PROFESSOR OF CHEMISTRY
DEPARTMENT HEAD
DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

Will present a seminar on

"CATALYTIC ACTIVATION OF CO₂ AND HYDROCARBONS USING POROUS METAL OXIDES"

This presentation will focus on the preparation of nano-size porous transition metal oxide materials, their characterization, and catalytic applications. Various morphologies of such catalytic materials, average oxidations states, structures, and chemical compositions can influence the catalytic activity of selective oxidations of hydrocarbons. Mechanistic studies of these reactions suggest that oxygen ion mobility is critical for reactivity. These semiconducting materials can be used as secondary rechargeable battery materials, sensors, adsorbents, and for catalytic remediation of toxic hydrocarbons. The most significant results found in this work are related to the novel structural and physical properties of porous manganese oxide materials. Variable pore size materials have been synthesized using structure directors and with a variety of synthetic methodologies. Transformations of tunnel materials with temperature and in specific atmosphere have recently been studied with in situ Synchrotron methods. Conductivities of these materials appear to be related to the structural properties of these systems with more open structures being less conductive. Catalytic properties of these OMS and OL materials have been shown to be related to the redox cycling of various oxidations states of manganese such as Mn²⁺, Mn³⁺, and Mn⁴⁺. Selectivity to produce desired products in catalytic reactions is the focus of our research. The role of redox chemistry in preparation and use of such catalysts will be discussed. Catalysts for selective oxidations, production of acrolein, and activation of CO2 are of current interest. Novel methods of catalyst preparation such as in situ mixing nozzle microwave methods will be mentioned. Catalysts that are porous oxides and mixed metal oxides are used in these reactions. Effects of morphology and particle size on rates of reaction have been observed. In situ soft XPS studies of oxygenates at metal oxide surfaces have led to understanding of surface species present in oxidation reactions. Electrocatalysis experiments can be used to selectively activate molecules and enhance yields of catalytic processes by the polarization of catalytic interfaces under certain conditions. Relationships among catalysts, preparation methods, surface species, and catalytic activity and selectivity will be discussed.

THURSDAY, JANUARY 27, 2011
COOKIES AND COFFEE -- 2:45 P.M.
SEMINAR -- 3:00 P.M.
SARKEYS ENERGY CENTER, ROOM M-204

THIS IS A REQUIRED SEMINAR FOR CHE 5971