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Our seminar

“BIOMASS AND NATURAL GAS VALORIZATION
BY ZEOLITE CATALYSIS”

My research group is interested in developing catalysis technology that enables abundant, inexpensive, and when possible, the transformation of renewable carbon sources into feedstocks for the chemical industry. We combine expertise in materials synthesis, catalysis and kinetics and reaction engineering to develop novel catalysts and catalytic processes that produce valuable products out of raw materials.

In the first part of this talk I will discuss on-going research towards the development of catalysts for the selective oxidation of methane into methanol. This is desirable because currently this is accomplished indirectly via syngas from methane using steam reforming. We will show that zeolites can serve as hosts of transition metals oxide clusters (copper or iron) that are analogous to metal oxide clusters observed in a number of important enzymes, such as methane mono-oxygenase. These clusters are capable of oxidizing methane to methanol, carbon monoxide and CO₂. By selectively choosing materials that compartmentalize Cu-O clusters, we have identified zeolite structures that are able to selectively oxidize methane to methanol with very high selectivity (99%+).

In the second part of the talk I will discuss a number of alternative pathways to transform furans (typically produced from glucose dehydration) into valuable commodity chemicals. To this end we have developed and optimized zeolite catalyst compositions to form aromatic species out of the furans via Diels-Alder chemistry. We will describe in detail our efforts to producing benzoic acid and γ-methylstyrene from furans in high selectivity and high yield, along with the elucidation of the reaction mechanism.

Despite the maturity of the field of zeolite catalysis this talk will show that tantalizing new opportunities emerge from the discovery of new zeolite structures and from improvements in our control of the composition of the framework and extra-framework species.

Thursday, March 24, 2016
Cookies and Coffee -- 1:30 P.M.
Seminar -- 1:45 P.M.
Sarkeys Energy Center, M-204

This is a required seminar for CHE 5971

Accommodations on the basis of disability are available by contacting the office.