Department of Chemical Engineering Presents:

HAJIM SCHOOL OF ENGINEERING & APPLIED SCIENCES
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Catalytic Synthesis Gas Conversion to Produce Chemical Products from Non-Petroleum Resources

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The production of many fuel and chemical products today begins with petroleum. As concerns increase over the price and supply of petroleum, interest in natural gas, coal, and biomass resources as alternative carbon and hydrogen feed stocks intensifies. All three can be reformed or gasified to produce syngas, a reactive mixture of CO and H-2. Biomass-derived syngas is of particular interest as a renewable resource that is also potentially carbon-neutral with respect to atmospheric CO2. While the production of syngas has been commercialized, the development of simple and cost effective processes to utilize syngas to make a wide range of products is still a subject for research and future development.

I will present three catalytic strategies that utilize syngas to synthesize fuel and chemical products. First, theoretical investigation of the reactions of H2 and O2 on near-surface alloys of Au and Ni has suggested that a simple and efficient direct method for the synthesis of H2O2 is possible. This powerful yet environmentally benign bleaching and oxidizing agent may replace toxic chlorine-based agents in a wide variety of industrial processes. Second, ethylene glycol, which contains a carbon-carbon bond, can now be synthesized from syngas and its C-C bond-less derivatives using a new process catalyzed by acidic zeolites. Commercial production of ethylene glycol still relies exclusively on the C-C bonds already present in petroleum. Third, butanol is a viable gasoline replacement or blending agent, especially when produced from syngas and light olefins. Starting with rhodium particles supported on silica, a liquid phase catalyst confined to the silica pores formed, combining the best features of supported and homogeneous catalysts.