CHEMICAL AND BIOLOGICAL ENGINEERING

SEMINAR ANNOUNCEMENT

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“Electrification and Decarbonization of Chemical Synthesis”

SEPTEMBER 9, 2019
12:00 NOON
SciTech Room 136
Chemical synthesis is responsible for significant emissions of carbon dioxide worldwide. These emissions arise not only due to the energy requirements of chemical synthesis, but since hydrocarbon feedstocks can be overoxidized or used as hydrogen sources. Using renewable electricity to drive chemical synthesis may provide a route to overcoming these challenges, enabling synthetic routes which operate at benign conditions and utilize sustainable inputs. We are developing an electrosynthetic toolkit in which distributed feedstocks, including air, water, and renewable electricity, can be converted into diverse fuels, chemicals, and materials.

In this presentation, we will first share recent advances made in our laboratory on nitrogen fixation to synthesize ammonia at ambient conditions. Specifically, our lab has developed a continuous lithium-mediated approach to ammonia synthesis and understood the reaction network that controls selectivity. Then, we will discuss how water can be used as a sustainable oxygen-atom source for epoxidation of olefins, providing a route to utilize oxidative equivalents in a water electrolyzer. These example reactions will illustrate how the modularity of chemical manufacturing could be enhanced through electrochemical routes which open up local and on-demand production of critical chemicals and materials.