

Department of Physics & Astronomy

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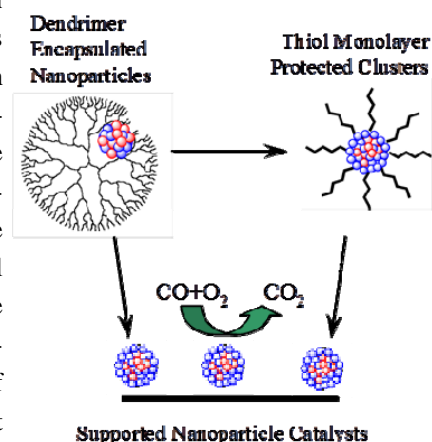
3:15 p.m. - 4:15 p.m.

BB 3.04.18

Michaelis-Menten Kinetics & Physical Organic Chemistry for Characterizing Supported Au Nanoparticle Catalysts

Our current work is focused on applying traditional physical organic chemistry and classical kinetics models to the characterization of heterogeneous catalyts. These techniques can be used to determine catalyst metrics that allow for simple, facile, and chemically meaningful comparisons between catalyts. Metrics we employ include Michaelis-Menten approaches to reaction kinetics, CO heat of adsorption measurements via infrared spectroscopy, Hammett studies, and kinetic isotope effects. The kinetic metrics in particular provide opportunities for understanding how supports, poisons, and heterometals (for bimetallic catalyts) affect catalysis by gold.

We are also working to prepare supported catalyts using solution nanoparticle synthesis techniques. PAMAM dendrimers offer a means of templating finely dispersed mono- and bimetallic nanoparticles in solution. Particle compositions unavailable through traditional syntheses can be prepared, and in some cases it is possible to control particle morphologies (e.g. core-shell vs. well-mixed nanoparticles). It is desirable to maintain mild dendrimer removal conditions to preserve metastable nanoparticle structures. Detailed investigations of thermal treatments applied to dendrimer templated Au nanoparticles indicate relatively mild temperatures (150 – 250 °C). Recent work with supported Au, Ni-Au, and Pd- catalyts will be highlighted as examples of the available synthetic techniques and the utility of various catalyst metrics.



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