SEMTE seminar

The Sub-Nanometer Length Scale: Exploring Fundamental Challenges in Aerosols & Catalysis

School for Engineering of Matter, Transport and Energy

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abstract

The length scale over which features are important and can be measured has steadily been moving toward the atomic length scale. Subtle changes on this length scale in many systems can have a significant impact on the desired material properties, but these differences are increasingly difficult to measure and control. In the first part of this talk, I will discuss my work on acid-base cooperative interactions and show how synthetic methods can be used to control acid-base cooperative interactions on the Ångstrom length scale. In the second part of this talk, I will discuss my work on synthesizing silicon quantum dots and measuring the subtle changes in surface chemistry using the nano-RDMA (Radial Differential Mobility Analyzer).

biosketch

Nicholas Brunelli received his PhD in Chemical Engineering from the California Institute of Technology in 2010. His doctoral research involved combining atmospheric-pressure microplasmas and *in-situ* aerosol size measurements to synthesize silicon quantum dots and other nanoparticle compositions. The small particle sizes produced from the microplasma spurred the invention of the nano-RDMA (Radial Differential Mobility Analyzer) to accurately capture particle size distributions. The materials characterization background provided the basis for him to transition into catalysis-based research during his postdoctoral appointment at the Georgia Institute of Technology. His postdoctoral research has focused on understanding acid-base cooperativity for important C-C bond forming reactions like the aldol and nitroaldol condensation while also collaborating on projects related to adsorbent materials for CO_2 capture.

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February 12, 2013 at 10:00am in GWC 487