THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT
SPRING COLLOQUIUM SERIES PRESENTS:

Jill Millstone

Professor and Leo B. and Theresa Y. Wegemer Endowed Chair of Chemistry

University of Pittsburgh

Rethinking nucleation and growth in small multimetallic nanoparticles

The formation of nanoparticles remains a rich and intriguing phenomena that challenges our understanding of what it means to make and form solid materials. Traditional theories describe colloidal nanoparticle formation as a nucleation process, with many recent works adding nuance to both classic nucleation and La Mer-derived models. However, our conception of nanoparticle formation influences the synthetic techniques we apply and therefore the synthetic outcomes we obtain. In this work, we study the role of particle formation rate in both the stoichiometry and chemical ordering of the resulting bimetallic architectures. We consider multiple aspects of the synthesis including steric and electronic properties of both metallic precursor and reductant, and we use both photochemical and chemical reduction pathways to modulate specific rates in the overall reactions. Our results clarify conventional wisdom regarding the role of heterometallic bond dissociations energies and relative metal standard reduction potentials. Combined with previous work from our group and others, our results point towards new directions in understanding the competing roles of thermodynamic and kinetic driving forces in bimetallic nanoparticle formation.

Jill E. Millstone is a Professor and the Leo B. and Theresa Y. Wegemer Endowed Chair of Chemistry at the University of Pittsburgh with affiliated appointments in the Departments of Chemical Engineering and Mechanical Engineering and Materials Science. Since joining the faculty at Pitt in 2011, she has received honors including the NSF CAREER Award, the ACS Unilever Award for Outstanding Young Investigator in Colloid and Surfactant Science, the Cottrell Research Scholar Award, the Chancellor's Distinguished Research Award, and the Kavli Emerging Leader in Chemistry Lectureship. She currently serves as an associate editor at ACS Nano, and on the editorial advisory board of several journals including Journal of Physical Chemistry Letters and Chem. She has served as the Chair of the Nanoscience Division within the Inorganic Chemistry Division of the American Chemical Society, and is currently a Councilor from the Division of Colloid and Surface Chemistry. Her group studies the chemical mechanisms underpinning metal and metal-like nanoparticle synthesis, surface chemistry, and optoelectronic behaviors.

Co-hosted by Professor Chad Mirkin and IIN

Northwestern | INTERNATIONAL INSTITUTE FOR NANOTECHNOLOGY

Tuesday, April 25 • 4 pm CT • Tech L211

In person only; no Zoom

Questions? Contact allison.macknick@northwestern.edu and megan.ray@northwestern.edu

Northwestern | McCORMICK SCHOOL OF ENGINEERING