Physical Chemistry Seminar

Tuesday, November 10, 2015 | **11:00 am** | **Room 1315 Chemistry Building**

Some Hidden Facts about Chemistry in the Solid-State

Professor Prashant K. Jain

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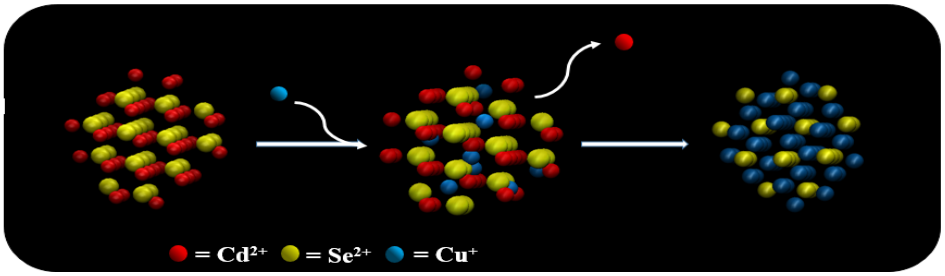
Host: Randy Goldsmith



In this talk, I will provide an atomistic view of how chemical and catalytic transformations occur in solid-state materials, which play a central role in our everyday world as heterogeneous catalysts, adsorbents, and batteries. As chemists, we know precisely how structure dictates reactivity on the molecular scale, but the same is not true for solid-state materials, where chemical complexity, nanoscale granularity, and emergent behavior prevail. Unlike bulk-level studies, which smear out this rich behavior, my laboratory studies chemistry in individual nanodomains of a complex material, often revealing previously hidden atomistic dynamics and structure-activity relationships. Using real-time movies of single nanocrystals undergoing transformations, I will show how new chemical principles are discovered. For instance, in the ion exchange of cadmium selenide, an individual nanocrystal is found to switch abruptly from the reactant to the product state, leading us to the discovery that such solid-state transformations involve atomic co-operativity, like those exhibited by biomolecules like haemoglobin. I will provide insights into popular transformations like CO_2 adsorption on metals, self-assembled monolayer formation, galvanic reactions in bimetallic catalysts, and ion transport in chalcogenides. I will end with a roadmap of how these atomistic insights can allow the rational design of “super-catalysts” and “super-sorbents”.

Refreshments will be available prior to the seminar at 10:45 a.m. outside room 1315

Graduate Students can meet with the speaker in Room 8305F at 1:00 pm