University of Minnesota
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Department of Chemistry

Seminar

9:45 a.m. Thursday, January 20 • 331 Smith Hall

Postdoctoral Scholar

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Hot Electron Transfer from Semiconductor Nanocrystals: Implications for Quantum-Dot Photovoltaics

Abstract

In conventional semiconductor solar cells, absorption of photons with energies greater than the semiconductor band gap generate “hot” charge carriers that quickly “cool” before all of their energy can be captured – a process that limits device efficiency. Semiconductor nanocrystals (or quantum dots) have been touted as promising materials for photovoltaics because discretization of their electronic energy levels can slow down this cooling process, which might enable the extraction of photogenerated charge carriers before their excess energy is converted to heat.

In this talk, I will demonstrate hot electron transfer from PbSe nanocrystals to delocalized conduction band sates of TiO2 and the concomitant excitation of coherent surface vibrational modes associated with this ultrafast process. In order to make these measurements, we developed the use of optical second harmonic generation (SHG) for femtosecond time-resolved studies of interfacial charge separation. I will discuss the information we obtain from this technique as well as the effect of temperature, nanocrystal size, and surface chemistry, and how these observations inform our understanding of electronic coupling at interfaces between confined states and bulk materials.

Host: Professor Christopher Cramer
Refreshments will be served prior to the seminar.