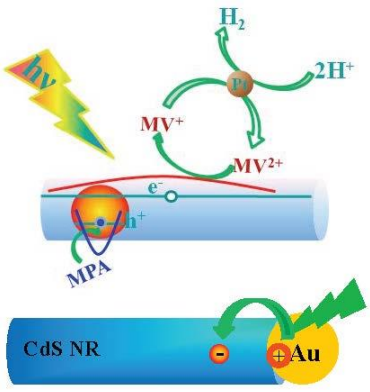
CORE-CM SEMINAR
Michigan State University — Department of Chemistry

Prof. Tinquian "Tim" Lian
Emory University

Solar Energy Conversion Using Atoms, Molecules, and Solids



Quantum confined semiconductor nanocrystals have emerged as a new class of light harvesting and charge separation materials in photovoltaic and photocatalytic devices. Compared with single component quantum dots (or "artificial atoms"), semiconductor nanoheterostructures (or "artificial molecules"), which consist of two or more component materials, offer additional opportunities to control their charge separation properties by tailoring their compositions and dimensions through wavefunction engineering. With (quasi)-type II band alignment, forward charge transfer (charge separation and hole filling) can be facilitated, while the backward recombination (charge recombination and exciton-exciton annihilation) is simultaneously retarded, enhancing the charge separation efficiency. Near-unity quantum yield of redox mediator (methylviologen radical) generation can be achieved in asymmetric CdSe/CdS dot/rod nano-heterostructures. When coupled with catalysts (Pt), these nanorods led to a much higher solar-driven hydrogen generation efficiency compared to molecular dyes and other nanocrystals. Quantum dots can also form "Artificial solid" electrodes with high carrier mobility and strong quantum confinement effect, enabling their integration into photoelectrochemical water splitting devices. If time permit, we will also discuss ongoing studies on the mechanism of surprisingly efficient Plasmon induced hot electron transfer and photochemistry in semiconductor-Au nanorod heterostructures. (Relevant recent publications: 2012: *JACS, Vol. 134*, 4250, 10337, 11701 & 11289, 2013: *Nano Lett. (Vol.13)*, 3678-3683 & 5563-5569, ACS Nano (Vol. 7), 7173-7185)

Thursday, March 13, 2014
12:00 PM
Room 1400 – BPS
Professor Jim McCusker – Host

Accommodations for persons with disabilities may be requested by calling the Chemistry Department at (517) 355-9715, X345 two days prior to the event to ensure sufficient time to make arrangements. Requests received after this date will be met when possible.