PHYSICAL SEMINAR

"A Hybrid Molecular-Nanocrystal Platform for Photon Upconversion"

Guest Speaker:

Professor Ming Lee Tang

University of California, Riverside

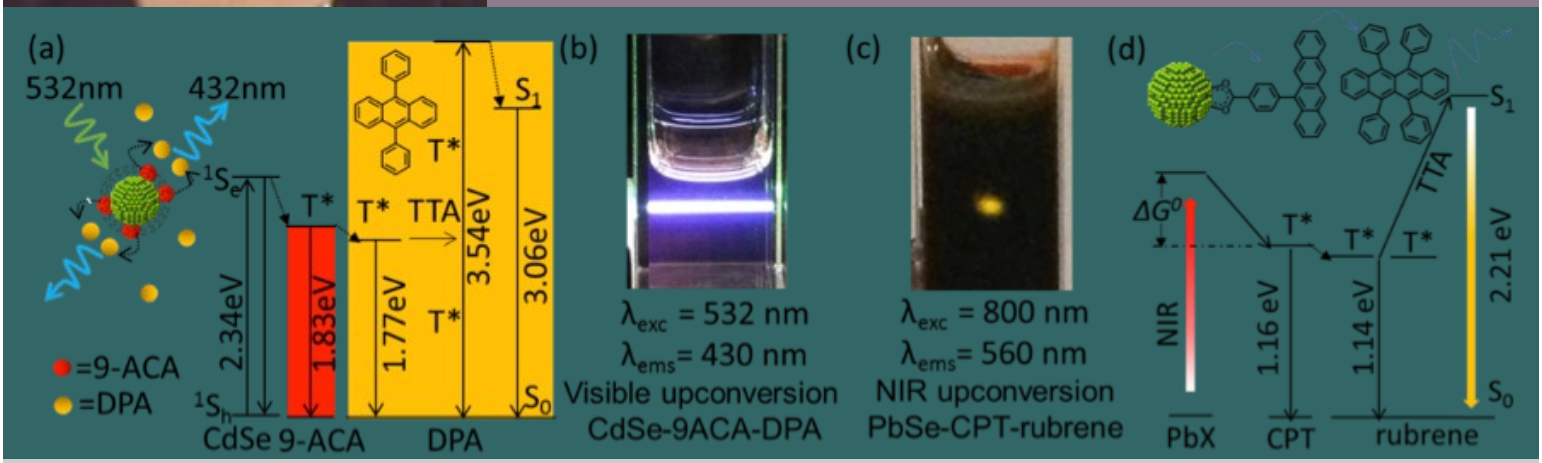
Department of Chemistry

Monday, May 8th, 4:00pm

Hutchison Hall Room 473

University of Rochester

Department of Chemistry



Abstract::

Third generation photovoltaics are inexpensive modules that promise power conversion efficiencies (PCEs) exceeding the thermodynamic Shockley-Queisser limit, perhaps by using up- or down-converters, intermediate band solar cells, tandem cells, hot carrier devices, or multi-exciton generation (MEG). Here, I introduce a hybrid platform comprised of semiconductor nanocrystals and organic semiconductor molecules that can efficiently upconvert light of visible and infrared wavelengths, at excitation densities below the solar flux. For example, colloidally synthesized core-shell lead sulfide -cadmium sulfide nanocrystals (NCs), in combination with tetracene derivatives, absorb near infrared (NIR) light and emit visible light at 560 nm with an upconversion quantum yield (QY) of 8.4 ± 1.0 %. This is achieved with 808 nm cw excitation at 3.2 mW/cm2, approximately three times lower than the available solar flux. The molecular and nanocrystal engineering here paves the way towards utilizing this hybrid upconversion platform in photovoltaics, photodetectors and photocatalysis.

Host: Professor Kathryn Knowles ● Email: knowles@chem.rochester.edu