Understanding Charge Transfer Dynamics from Photo-excited Quantum Dots

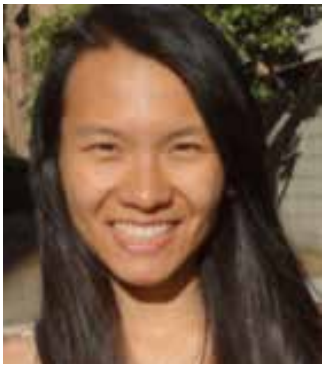
Semiconductor nanocrystals, or quantum dots, exhibit great potential as light absorbers in solar energy conversion applications. Many of these applications rely on controlling charge transfer at the interface of the photo-excited quantum dots. However, mechanistic understanding of this interfacial charge transfer process is lacking within the field of semiconductor nanocrystals. We have developed a model system for studying this charge transfer process, using cadmium selenide quantum dots tethered to molecular charge accepting species. This summer, we will modify the energy levels of these charge acceptors through synthetic organic chemistry, thus gaining insight into the mechanism for charge transfer.

Jacob Olshansky
Ph.D. Candidate, Chemistry

Jacob Olshansky recently finished his third year as a Chemistry Ph.D. student in the research group of A. Paul Alivisatos. Before coming to UC Berkeley, he completed his undergraduate studies in chemistry and physics at Haverford College, graduating in 2012.

His Ph.D. research has been motivated by a desire to develop improved technologies for solar energy conversion. Thus far his research has focused on quantum dots owing to their potential as light absorbers in solar energy conversion schemes. Specifically, he has been working to understand the dynamics of charge carriers in photo-excited quantum dots.

This summer, the SMART program will support his efforts to map out charge extraction rates from quantum dots. Further, he is interested in using research as an instructional tool for undergraduate students. He hopes that the SMART program will help him improve his ability to provide this instruction to undergraduates through research mentorship.



Xiao Fu
Junior, Chemistry and Philosophy

Xiao Fu is a rising Junior at UC Berkeley studying Chemistry and Philosophy. She is impressed by the mechanisms of chemical reactions, especially reactions with color changes or interesting names or ambitious applications.

She is excited about this summer with the SMART program, because the research she is working on has all the above features. She is looking forward to learning more about organic synthesis, working with air sensitive species, and making quantum dots.

UC Berkeley's Student Mentoring And Research Team (SMART) is a paid professional development program that engages doctoral students in creating mentored research opportunities conducted with selected undergraduate student mentees during a ten-week period over the summer. Both participants receive compensation and training throughout their participation. SMART broadens the professional development of doctoral students and fosters research skills and paths to advanced studies for undergraduates.

Expenses associated with each team total $10,000 000 ($5K graduate stipend/ $3.5K undergrad stipend/$1.5K research and conference costs). As a donor-supported program of the Graduate Division, the majority of teams are underwritten through a combination of donor funds paired with matching support courtesy of the Graduate Division.

Learn more at smart.berkeley.edu

Berkeley
UNIVERSITY OF CALIFORNIA