Cory Alexander Nelson

Graduate Institution: University of Texas at Austin

Graduate Discipline: Chemistry

Hometown: Eagan, MN

Relevant SC Research: Basic Energy Sciences

Research Interest:

My main focus is to establish new photophysical mechanisms that can be used to enhance photovoltaic efficiencies. I am currently working with lead sulfide colloidal quantum dot thin films investigating charge trapping and ultra-fast charge separation as a function of the capping molecule. Trap state formation is interrogated using near-infrared fluorescence where we can measure the energy of photons emitted from the recombination of trapped carriers. Ultra-fast charge separation is probed using time resolved second harmonic generation which is sensitive to the interfacial electric field that is generated upon the separation of carriers across a donor acceptor interface.

About Me:

I am currently involved in collaborations in vastly different areas of chemistry from metal organic frameworks to quantum dots. The common thread that unites them is their photophysical behavior. This behavior is studied using a vast array of techniques from steady state fluorescence to time resolved second harmonic generation which allows us to observe ultrafast charge transfer events. Using these techniques we can study everything from trap state formation to hot carrier injection. The long term goal of studying these phenomena is to understand more thoroughly the dynamics in novel organic and inorganic materials to rationally design devices for use in electronics and photovoltaics.

In addition to the actual scientific problem that we are addressing I am also very interested in designing experiments to better observe ultrafast processes. Right now we have two very powerful techniques but with some design changes they could give far more information about our systems of interest. Upon graduation I wish to continue to develop techniques to study interfacial electron transfer from confined systems. Ideally I would want to study coherent electron transfer with two dimensional spectroscopy.

Aside from strictly research I have been active in mentoring exchange students and high school students in the research lab as well as tutoring students in calculus. While teaching is time consuming I find it very rewarding. My involvement has solidified the importance of education of the next generation of scientists. Through working with these students I have acquired a passion for teaching students and hope that I can pursue a teaching and research career.

My latest achievement was to be selected to attend the Lindau conference for students and Nobel laureates in Lindau, Germany. It is an informal meeting to converse with students and Nobel laureates from around the world about scientific research, science in society and education. The open format of the lectures allows the laureates to give lectures on any topic of their choice which will make a very interesting meeting. In addition while in Germany I was invited to give a presentation at the Fritz Haber institute on our research involving quantum dot materials for photovoltaic applications.