Charge-transfer reactions of colloidal metal oxide nanocrystals

Physical interfaces are centrally important to the functioning of nearly all photochemical, electrochemical and electronic devices. Indeed, performance is often a direct consequence of the composition, structure and physicochemical properties of the often poorly defined regions between components that work in concert to impart functionality. The nature of the interface is especially important, and of considerable current interest, in chemical systems designed for renewable energy production and storage. These interfaces are usually between solid-state inorganic materials and liquid-phase electrolyte solutions. In emerging energy technologies in particular, oxidation/reduction (redox) reactions of metal oxide materials (MO\textsubscript{x}) play a key role.

Understanding the structure-reactivity relationships governing redox reactions at these solid-state/liquid interfaces remains a challenging frontier area in the fundamental sciences.

In my MSc research I wish to elucidate fundamental relationships controlling the energies, rates and mechanisms of electron-transfer reactions of reduced colloidal metal-oxide nanocrystals (NCs) serving as models for the interfaces between solid-state materials and reactive species in solution.
Bibliography