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"Materials Chemistry via Electrochemistry: Electrochemical Synthesis of Semiconductor Electrodes and Catalysts for Use in Solar Energy Conversion"

Thursday

April 14, '16

12:15 pm

Room 1315

Chemistry Bldg.

Harvesting energy directly from sunlight as nature accomplishes through photosynthesis is a very attractive and desirable way to solve the energy challenge. Many efforts have been made to find appropriate materials and systems that can utilize solar energy to produce chemical fuels. One of the most viable options is the construction of a photoelectrochemical cell that can directly utilize solar energy to drive chemical reactions (e.g. reduction of water to H_2, reduction of CO_2 to carbon-based molecules). For successful construction of photoelectrochemical cells, simultaneous developments of photoelectrodes, which will efficiently capture photons to generate and separate electron-hole pairs, and catalysts, which will facilitate the use of photogenerated electrons and holes for desired interfacial charge transfer reactions, are necessary. Furthermore, optimally interfacing photoelectrodes and catalysts is critical because the photoelectrode/catalyst interface can govern the overall efficiency of the integrated photoelectrode system. Our research group has been developing new electrochemical synthesis conditions to produce semiconductor electrodes and catalysts with precisely controlled compositions and architectures. In this seminar, we will discuss synthesis and properties of a few promising photoelectrode and catalyst systems for use in solar energy conversion. New synthesis strategies to improve photon absorption, charge transport properties, and catalytic properties will be presented. We will also discuss various strategies to increase the overall utility and efficiency of the photoelectrochemical cells, which include our new results on electrochemical and photoelectrochemical biomass conversion.