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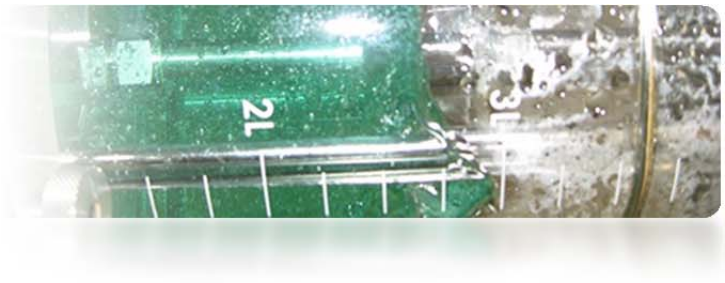

SEMINARS IN CHEMICAL AND BIOMOLECULAR ENGINEERING

Friday, January 29, 2016 10:00AM

PENTHOUSE → BH8500

Presented by

Dr. Coleman Kronawitter

Postdoctoral Research Associate, Chemical and Biological Engineering

Princeton University

"Materials Design and the Investigation of Interfacial Chemistry and Electronic Structure for Solar Fuel Synthesis Technologies"

The discovery of new materials and their organization into functional nanoscale architectures can have transformative effects on modern energy conversion technologies. This is especially true for solar-driven electrocatalytic devices for fuel production, which at present lack the required energy efficiency and product selectivity for commercialization. When a new promising material is applied, open questions inevitably present themselves regarding the atomic or nanoscale nature of the associated new interfaces. I will argue that generating a fundamental understanding of the electronic structure and chemical nature of interfaces in these devices is essential to push this technology forward. Interfacial processes lie at the origins of efficiency because: (1) interfaces are the source of electrochemical potential gradients (which are responsible for charge separation), and (2) interfaces comprise the active sites for reactions (the characteristics of which determine the selectivity of chemical transformations).

In this talk, I will discuss my recent investigations of new materials and interfacial chemistry and electronic structure relevant for the design of solar fuel devices. First I will describe the discovery and characterization of new metal oxides and nanoscale architectures that enable the water oxidation reaction, a key and often limiting half reaction for solar fuel production. Next I will present work that emphasizes the use of simplified model systems to assess the physical origins of efficiency. Here, surface-sensitive spectroscopic and scanning probe techniques are used to study the electronic structures of active interfaces, and to characterize the surface chemistry of reactant molecules and molecular co-catalysts relevant for selective CO_2 reduction.

***Coleman Kronawitter** is a Postdoctoral Research Associate at Princeton University in the Department of Chemical and Biological Engineering. His research emphasizes chemical and materials aspects of new energy technologies, and he is particularly focused on*

understanding origins of efficiency in new processes for solar energy conversion. Dr. Kronawitter received a B.S. from Rutgers University in 2006 and a M.S. from the University of California, Berkeley in 2010. In 2012 he received a Ph.D. from the University of California, Berkeley, majoring in Mechanical Engineering with a concentration in Energy Science and Technology, and minoring in Chemical Engineering and Materials Science and Engineering. His research activities are highly cross-disciplinary and span diverse aspects of energy conversion, including physical chemistry, nanotechnology, applied and solid-state physics, environment/ecology, and materials science.