UCMERCED | CHEMISTRY & BIOCHEMISTRY

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CHEMISTRY & BIOCHEMISTRY SEMINAR SERIES:

Revealing the Complexities of the Electrode-Electrolyte Interface Using Vibrational Spectroscopy

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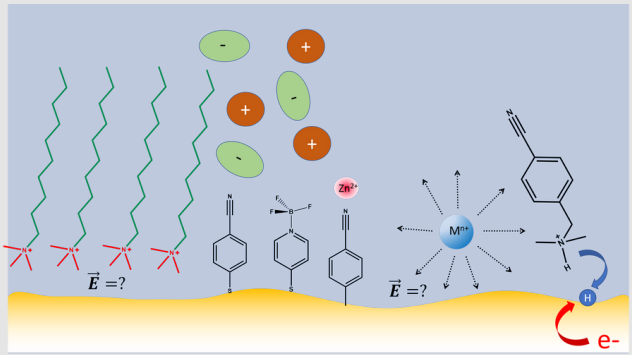
Abstract:

Controlling the chemical microenvironments at an interface is a central goal of surface chemistry and more specifically electrochemistry. The interface is known to behave quite differently from the bulk, both in its physical and chemical properties. A quantity of central importance in electrochemistry is the interfacial electric field, which is closely related to the electric double layer structure. The interfacial fields act as polarizing agents for catalyzing reactions and are important for selectivity, ion transport, and lowering charge transfer barriers. We use vibrational Stark shift spectroscopy to measure such fields in an array of complex environments including the interface between electrodes and solvents, surfactants, and ionic liquids. Using these vibrational probes, we answer questions such as: How is the dielectric solvation different at the interface? How is proton transfer affected by the solvent and the interfacial field? How can one tailor and engineer the interfacial fields for specific purposes? These are some of the fundamental questions that we will focus on answering and will highlight their relevance to modern challenges in electrochemistry.



About the Speaker:

Jahan Dawlaty is an experimental physical chemist at the University of Southern California. Dr. Dawlaty received his undergraduate degree in chemistry from Concordia College in Minnesota and his Ph.D. in physical chemistry from Cornell University, where he worked at the interface of materials and spectroscopy both in the chemistry and electrical engineering departments with John Marohn and Farhan Rana. He joined UC Berkeley for his postdoctoral work with Graham Fleming. He started his independent career at the University of Southern California in 2012. He applies spectroscopic methods to fundamental molecular problems of relevance to catalysis. He has worked on measuring and modeling interfacial electric fields at electrochemical interfaces, excited state proton dynamics in molecular and material systems, and lattice dynamics in hydrogen bonded solids. He has received the NSF CAREER award, the AFOSR Young Investigator Award, the Cottrell Scholar Award, and the Journal of Physical Chemistry Lectureship Award among others. He has served as a guest member in the Annual Reviews of Physical Chemistry editorial meeting, and a guest editor for the Journal of Chemical Physics. He is interested in chemical education, with special emphasis on modernizing the pedagogy of chemical thermodynamics and kinetics.

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