

Chem 793 – Interface Science

Some of the largest scientific challenges we face are directly related to the characterization and manipulation of chemical processes that occur at interfaces. These processes are foundational in many areas of renewable energy, atmospheric chemistry, condensed matter physics and engineering. Despite its importance, often the interface is overlooked due to the complexity of the characterization. In this class, we will deliver the following learning outcomes:

- Review of material characteristics of interfaces (crystal structure, band gap, surfaces, etc.)
- Surface Science: its definition and how its foundation of interfaces
- Common characterization techniques
 - Microscopy (scanning tunneling microscopy, atomic force microscopy, scanning electron microscopy, transmission electron microscopy)
 - Diffraction (X-ray and electron diffraction)
 - Spectroscopy (Photoelectron spectroscopy {ultraviolet, X-ray, and inverse photoemission}, Infrared and Raman spectroscopy, UV-vis spectroscopy)
 - Desorption and Scattering (Ion scattering, temperature programmed desorption)
- Advanced Characterization Techniques
 - *Operando* and *in situ* spectroscopy and microscopy
 - Synchrotron techniques (X-ray absorption, X-ray emission, resonance inelastic X-ray scattering)
- Modeling and Calculating Interfaces
- Survey of Major Topics in Interface Science
 - Photochemistry
 - Heterogeneous Catalysis
 - Electrocatalysis
 - Atmospheric Chemistry
 - Nanomaterials