UC MERCED | CHEMISTRY & BIOCHEMISTRY

DATE 04/25/2025 | TIME 01:30pm | LOCATION COB1 110

CHEMISTRY & BIOCHEMISTRY SEMINAR:
Probing the Hot Carrier Activity and Redox Surface Properties of Gold Nanoparticles

Daniel Valenzuela

Graduate Student
Department of Chemistry & Biochemistry
UC Merced

Abstract:

Gold nanoparticles have been widely used as a model system for studying how redox behavior at the nanoscale governs both photocatalytic reactivity and particle formation. In this talk, I will present three distinct projects that explore different aspects of gold nanoparticle behavior, ranging from photocatalysis to redox chemistry and morphology. Although these projects address different scientific questions, collectively they illustrate the versatility of gold nanoparticles as a platform for probing surface reactivity at the nanoscale.

In the first part, I will highlight how interband and intraband excitations of gold nanoparticles provide mechanistic insight into photocatalytic processes. Our current results examining the role of hot holes in the dehalogenation of 2-iodobenzonitrile using colloidal gold nanoparticles show enhanced reaction rates under short-wavelength excitation, suggesting that interband-generated hot holes play a key role in catalyzing the rate-limiting hydride transfer step. Further experiments are underway to develop a more complete mechanistic picture.

In the second part, I will briefly introduce two prospective projects from our lab that build on our latest publication related to the redox behavior of gold nanoparticles. The first project investigates whether surface gold atoms maintain their noble character as nanoparticle size decreases, in contrast to other noble metals such as platinum or palladium. The second project explores how redox potentials at gold nanoparticle surfaces influence the morphology of their growth.

For more info, contact: Son Nguyen son@ucmerced.edu