UCLA College | Physical Sciences Chemistry & Biochemistry

Inorganic Chemistry Student Exit Seminar

Duan Research Group

Sibo Wang

"Study of Pt-based Nanomaterials for Catalysis in Hydrogen Economy"

Abstract: Hydrogen has been recognized as an attractive energy carrier to achieve fossil fuels phase-out and limit climate change. The realization of hydrogen economy consists of the production of hydrogen, hydrogen storage and transportation, and the utilization of hydrogen. To increase the efficiency of these processes, Pt-based nanomaterials which have high surface areas and unique chemical characteristics serve as promising catalysts. In particular, our group has studied Pt-based nanocatalysts for the electric hydrogen evolution reaction and hydrogen oxidation reaction (HER/HOR), which are critical reactions in electrolyzers and fuel cells for the conversion between the hydrogen energy and electricity to produce and use hydrogen. In this talk, I will discuss the fundamental mechanisms of HER/HOR on Pt-electrolyte interface and the reactions kinetics enhancement by surface modification on Pt-based nanomaterials. Overall, this work aims to provide a molecular understanding of reaction mechanisms on the catalyst surface and shed new insights into the design and engineering of the nanomaterials for efficient catalysis.

Shuaijing Du

"Introducing Chirality into Hybrid Superlattices"

Abstract: I will present recent results on two different projects, with the common theme of introducing chirality into hybrid superlattices. 1: Modular assembly of a library of hybrid superlattices. Hybrid superlattices, composed of two-dimensional atomic crystals (2DACs) and self-assembled molecular layers, provide a platform for synergizing the rich physical properties of solid-state 2DACs with customizable molecular functionalities. In this project, we develop a modular electrostatic co-assembly approach for synthesizing over 50 hybrid superlattices from a diverse set of 2DACs and molecular building blocks. We demonstrate that in addition to amines, chiral amino acids and coordination complexes can also assemble with exfoliated MoS_2 into hybrid superlattices, incorporating optical chirality into the hybrid superlattices. 2: Construction of chiral hybrid superlattices with monoatomic platinum layers. Compared with layered materials such as graphite and transitional metal dichalcogenides with highly anisotropic in-plane covalent bonds, freestanding metallic two-dimensional (2D) films with atomic thickness are intrinsically more difficult to achieve. This study introduces stabilized monoatomic Pt layers by forming a chiral hybrid superlattice structure with self-assembled chiral carboxylic acid ligand layers. Circular dichroism (CD) spectra of the chiral hybrid superlattices show clear CD signals distinct from the chiral carboxylic acids themselves.

Tuesday, September 10th, 2024
10:00 a.m. | Young Hall 4222C
Dongwon Yoo Seminar & Conference Hall

For more information, please email kvalerio@chem.ucla.edu