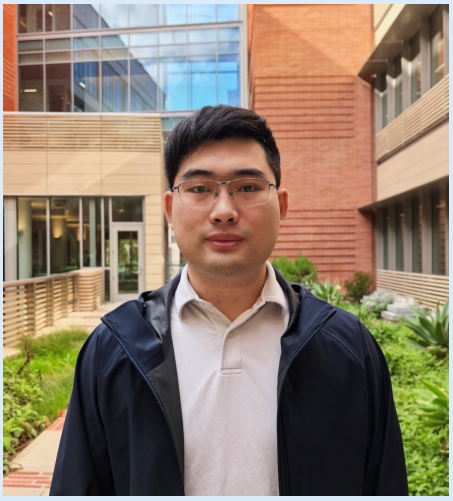
INORGANIC CHEMISTRY STUDENT EXIT TALK



Ran Wang

The Duan Lab

“Engineering Carbon Interfaces in Hydrogen and Microbial Fuel Cells”

Abstract: Fuel cells convert chemical energy into electricity using catalysts that range from metal nanoparticles to living microorganisms. Across these systems, the power a cell can deliver depends on how readily reactants and electrons move between the catalyst and its surroundings. In this talk, I will explore how carbon support structures can improve these pathways, beginning with mass transport in hydrogen fuel cells. In this system, both the membrane and the ionomer in the catalyst layer require sufficient hydration to conduct protons efficiently. For practical applications, however, the ability to operate at low relative humidity is desired to reduce the need for external humidifiers. The challenge is to retain enough water near the catalyst for proton conduction while keeping pores open for oxygen transport. I will discuss how graphene nano pockets around platinum particles help achieve this balance, allowing the cell to retain more of its power as humidity falls. I will then turn from mass transport at the hydrogen fuel cell cathode to electron transfer at the microbial fuel cell anode. Incorporating carbon nanotubes into a porous anode brings conductive surfaces into closer contact with a biofilm of Shewanella oneidensis, favoring direct electron transfer and increasing peak power. Together, these studies show how the carbon surrounding a catalyst can be designed to address the transport process that limits its performance.

Tuesday, December 1st 2026
4:00 p.m. | YH4222C - Collaboratory
Dongwon Yoo Seminar & Conference Hall

UCLA College | Physical Sciences Chemistry & Biochemistry

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