UC San Diego
JACOBS SCHOOL OF ENGINEERING
Aiiso Yufeng Li Family Department of Chemical and Nano Engineering

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Department Seminar

Wednesday, January 14, 2026
11:00am – 12:pm PT
SME 248

Dr.Shu Hu, PhD

"When Light Meets Heat: Synergistic Photo-Thermal Catalysis for Enhanced Selectivity"

Assistant Professor
Department of Chemical & Environmental Engineering
Yale University

Abstract: Despite significant advances in electrification and energy efficiency, liquid fuels and fine chemicals remain essential for meeting the growing demands of data centers, aviation, marine shipping, and pharmaceutical manufacturing. Traditional thermal catalysis —breaking C-O and C-H bonds, forming C-C and C-N bonds—offers scalability but often suffers from poor selectivity. Conversely, photocatalysts can deliver exceptional selectivity but typically exhibit limited stability and reaction rates. I will discuss new opportunities in highly efficient solar energy conversion and selective catalysis, enabled by a novel class of coating-stabilized photocatalysts. I will describe a decade of systematic functional coating discovery that has extended photocatalyst operational lifetimes from minutes to over one year under outdoor operation. Then, we achieved record-breaking solar water-splitting efficiency of 10.5%. Through probing and quantifying dynamic semiconductor-liquid interfaces, we co-designed catalysts and reactors to demonstrate: (i) selective CO_2 conversion integrated with direct air capture and ocean capture, and (ii) selective plastic waste pyrolysis. These achievements have opened new frontiers in light- driven catalysis—operating at high temperatures in vapor phases—enabling selective synthesis while eliminating costly separation steps.

Bio: Shu Hu has been a faculty member in the Department of Chemical and Environmental Engineering at Yale since 2016. He received his Ph.D. from Stanford University in 2012. Then, he conducted postdoctoral research in the Division of Chemistry and Chemical Engineering at Caltech until 2015. His past contributions have been recognized with the ACS Energy & Fuel Emerging Researcher Award (2024), the Global Chinese Chemical Engineer Award (2022), the DOE Early Career Award (2021), and several award lectureships, including the Schottky Seminar.

Seminar Host: Ping Liu