

# UNIVERSITY OF CALIFORNIA, IRVINE

## DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

### SPECIAL SEMINAR

***“DECARBONIZING INDUSTRIES FOR A CLIMATE-RESILIENT FUTURE: FROM RENEWABLE ENERGY TO SUSTAINABLE MATERIAL RECOVERY”***



**DUHAN ZHANG**

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**Thursday, April 25, 2024**

**4:00 - 5:30 PM**

**Engineering Tower, Conference Room 652**



**Abstract:** Long-term decarbonization within the power sector and the materials manufacturing sector stands as the most urgent challenge of our era. Without decisive action, carbon emissions associated with these sectors are set to more than double by 2050. The rapid expansion of affordable renewable electricity presents unprecedented opportunities to revolutionize conventional engineering processes through electrochemistry, thus providing solutions to our society's grand challenges. Hence, innovations in these sectors capable of reducing or eliminating CO<sub>2</sub> generation will be pivotal in changing our current climate trajectory. In this talk, I will discuss two of my previous experiences exploring and applying foundational principles in electrochemistry, mechanical engineering, and materials science to advance applications in energy storage and materials sustainability. First, I will present different approaches to electrolyte design for stabilizing metal electrodeposition processes at the interfaces in electrochemical cells, with practical applications in metal anode batteries. Then, I will introduce my work on a closed-loop materials recovery platform utilizing electrochemically-mediated techniques, which can separate waste into valuable product streams without additional waste generation, relying solely on low-cost electricity, water, and table salt. In the future, my research will delve deeper into fundamental mechanisms and pioneer technologies aimed at accelerating the transition to a low-carbon and climate-resilient future.

**Bio:** Dr. Duhan Zhang is dedicated to addressing pressing challenges at the intersection of energy, climate, and sustainability. Currently, Duhan is a Postdoctoral Associate, working with Prof. Yet-Ming Chiang, at the Massachusetts Institute of Technology in the Department of Materials Science and Engineering, distinguished by an MIT Energy Initiative (MITEI) Fellowship. She earned a Ph.D. in Mechanical Engineering from Cornell University, working with Prof. Lynden Archer, supported by the Telluride Association Fellowship. Her doctoral research focused on optimizing the stability of metal electrodeposition in energy storage systems by manipulating electrolyte properties. Her present work delves into energy materials, electrochemical energy storage and conversion systems, and electrification of materials recovery and manufacturing processes. Throughout her academic journey, Duhan has received multiple recognitions for her research and contributions, including the Mars Fellowship from the Lindau Nobel Laureate Meetings and the Best Paper Award from the Joint Center for Energy Storage Research (JCESR), among others. With a commitment to innovation and sustainability, she continues to push the boundaries of scientific inquiry for a brighter, greener future.