Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Interfacial Electrochemistry of Hydrogen Evolution and Carbon Dioxide Reduction Reactions: From Understanding to Engineering

Nandita Mohandas

TIFR, Hyderabad

Electrochemical energy systems are central for the development of sustainable technologies, steering the transition towards a carbon-neutral future. Important heterogeneous electron transfer processes, such as the hydrogen evolution reaction (HER) and the carbon dioxide reduction reaction (CO_2RR), which are integral to this transition, are governed by a rich interplay of processes occurring at the electrochemical interface. In this talk, I will discuss how highly surface-sensitive vibrational spectroscopic techniques (IR and Raman) and molecular dynamics simulations can be used to understand the interface at a molecular level. I will also present how I used targeted electrode–electrolyte interface engineering strategies to tune the interfacial water structure and water activity, thereby enhancing the product selectivity and reaction kinetics of electrochemical processes such as HER and CO_2RR. These studies highlight the importance of understanding and engineering the electrochemical interface and open avenues for wide-ranging interface-engineering opportunities, laying a foundation for many future research directions.

Tuesday, Nov 18th 2025

11:30 Hrs (Tea / Coffee 11:15 Hrs)

Auditorium, TIFRH