



Seminar

DATE: 06 July 2023
TIME: 3:00 PM
LOC: HEM/219



GUEST SPEAKER:

Prof. Dr. Hongjie Dai
Stanford University, USA

TITLE:

“Renewable energy research: from electrochemical CO₂ reduction to alkali metal/Cl₂ batteries”

ABSTRACT:

In the first part of this talk I will first present our recent work on electro-reduction of CO₂ (CO₂RR) to high-value chemicals, a topic important to the environmental and energy landscapes. I will show approaches to enable Cu/CuO_x based electrocatalyst achieving up to > 87-98 % Faradaic efficiency (FE) of CO₂RR to formate or acetate in electrolytes under 58 atm high pressure CO₂(g). In situ dynamic electrolytic speciation measurement techniques were developed to measure dissolved CO₂(aq). In-situ Raman spectroscopy suggested the O-bound bidentate intermediate *OC*O* formed on active Cu(I) sites under high pressures as a precursor to formate or acetate. A novel approach of introducing a liquid CO₂(l) layer at the interface of 58 atm CO₂(g) and aqueous electrolyte by melting CO₂(s) further increased CO₂(aq) concentration and boosted CO₂ reduction current density to the ~ 100 mA/cm² level with a high FE. In the second part of the talk I will present our latest progress on developing high performance rechargeable Na/Cl₂ and Li/Cl₂ batteries, achieving specific capacities up to 5000 mAh/g operating down to -80 degree Celsius.

PROFILE OF Prof. Dr. Hongjie Dai

Prof. Dr. Hongjie Dai is the Jackson-Wood Professor of Chemistry at Stanford University. He has made fundamental contributions to nanosciences especially to novel carbon-based nanomaterials including carbon nanotubes and graphene nanoribbons. He pioneered nano-carbon biological and nanomedicine applications including imaging in the NIR-II/SWIR window. In the renewable energy area, he advanced new electrocatalysts for splitting fresh water and seawater, and developed rechargeable aluminum-ion battery and Na/Cl₂ and Li/Cl₂ batteries.

Dai is a member of the US National Academy of Sciences, National Academy of Medicine, a fellow of the American Academy of Arts and Sciences and a foreign member of the Chinese Academy of Sciences. Dai received the APS James McGroddy Prize for New Materials, the ACS Pure Chemistry Award, the MRS Mid-Career Researcher Award, the NIH Director's Pioneer Award, the Humboldt Research Award, and others.