

Electrochemical Innovations for a Sustainable Future: Advancements in Lithium-Ion Battery Recycling and Hydrogen Pump Technology

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Abstract: The escalating demand for lithium-ion batteries (LIBs) in electric vehicles and electronic devices has resulted in a significant increase in LIB e-waste, causing environmental problems and resource scarcity. Currently, hydro and pyrometallurgy stand as the predominant industrial methods for battery recycling. However, challenges include high energy consumption, tedious and multiple steps to recover pure metals, and a lack of selective recovery of metals. One section of the talk explores eco-friendly methods for selectively recovering metals from LIB waste through solvometallurgy, followed by electrodeposition.

Hydrogen (H_2), with its high gravimetric energy density and abundant resources, emerges as a suitable candidate to meet the growing requirements for clean energy. Electrochemical hydrogen pumps (EHP) are an innovative technology for the simultaneous purification and compression of H_2 . Currently, major H_2 production occurs from steam methane reforming and biomass gasification, leading to the presence of impurities along with H_2 . The presence of carbon monoxide (CO) in the H_2 stream poses a significant challenge, leading to catalyst poisoning and decreased EHP efficiency. The second part of the talk covers efforts to mitigate CO poisoning in EHP through electrochemical methods.

Bio: Suchithra Ashoka Sahadevan is a postdoctoral research associate at Washington University in St Louis, USA (2022-present) (Prof. Vijay Ramani). She completed her Integrated BS-MS from IISER Kolkata (2015) (Prof. Swadhin Mandal). She holds a Ph.D. from the University of Angers, France (2019), with joint affiliation with the University of Cagliari, Italy. Her doctoral research focused on the study of multi/functional materials in 2D Metal-Organic Frameworks (MOFs), nanosheets, hybrid pi-d materials, and molecular conductors (Dr. Narcis Avarvari/Prof. Maria Laura Mercuri). Following that, she worked as a postdoctoral fellow at KTH Royal Institute of Technology, Sweden (2021-2022), investigating the selective recovery of metals using sulfur polymer (Dr. James Gardner).

With a strong background in materials, inorganic, and electrochemistry, Dr. Ashoka Sahadevan specializes in sustainable practices, energy storage, and lithium-ion battery recycling. She was awarded Excellent cum laude for her Ph.D. thesis, has over 300 citations, and holds an H-Index of 10.