DREXEL UNIVERSITY
Materials Science and Engineering
College of Engineering

Department of Materials Science and Engineering

Candidacy Exam

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Hill Conference Room (LeBow 240)

Microenvironment and Chemical Confinement in Electrochemical Energy Storage Systems

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Abstract

This presentation explores the significant impact of microenvironment and chemical confinement on charge storage mechanisms in electrochemical energy storage (EES) systems. The investigation focuses on diverse energy storage materials, including porous carbons, transition metal oxides, and MXenes, which possess distinct geometries and confined chemistries. The presentation will discuss how the material's geometry influences charge storage mechanisms, shedding light on the interplay between nano-ranged structure and electrochemical properties. Furthermore, it extensively examines the effects of confined water, inorganic ions, and organic species on electrochemical mass transport, emphasizing their ability to significantly alter the charge storage mechanisms and diversify the energy storage technologies. This comprehensive examination of microenvironment and chemical confinement aims to deepen our understanding of charge storage mechanisms and lay the foundation for the development of more efficient and advanced EES systems.