

Gas-Phase Electrochemical Systems for Future-Ready Energy Storage



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• Place: 104-E206 Classroom

Speaker

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Abstract

Classical electrochemical energy storage systems have primarily relied on solid-state electrodes and liquid electrolytes. However, emerging innovations focus on leveraging the three states of matter—solid, liquid, and gas—to achieve groundbreaking advancements in energy storage technologies. Gas-phase electrochemical systems, in particular, hold transformative potential for next-generation energy storage. By utilizing lightweight and abundant gaseous reactants like oxygen and carbon dioxide as cathodes, these systems can significantly enhance gravimetric energy density by eliminating the need for heavy transition metals typical in conventional lithium-ion batteries. To realize the full potential of gas-phase electrochemical systems, a deeper understanding of their reaction mechanisms and the development of innovative materials and designs are imperative.

This presentation delves into state-of-the-art innovations leveraging gaseous reactants, electrolytes, and byproducts to tackle pressing sustainability challenges. Highlights include recent breakthroughs in air-breathing batteries and the development of atmospheric open-cell structures enabled by aereoelectrolyte systems. These interdisciplinary advancements underscore the pivotal role of gas-phase electrochemical applications in shaping the future of green and sustainable energy storage systems.

