Sustainable Electrochemical Energy Storage: Opportunities and Challenges

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Electrochemical Energy Storage (EES) is one of the key drivers for sustainable mobility and smart grid. In this context, development of low-cost, high-energy density and safe battery technology is critical. Energy storage is also critical for rapid penetration of renewables such as solar and wind for the electric grid as part of decarbonization effort to meet global climate crisis. The talk will focus on the various scientific and technological advances in next generation battery materials and interfaces including development of solid-electrolytes for all lithium based solid-state batteries[1], sustainable high-capacity cathodes for advanced lithium-ion[2] and electrochemical flow systems for long-duration energy storage (LDES)[3]. Mechanistic insights based on *state-of-the-art* advanced operando-characterization of emerging battery materials and interfacial processes linking to battery performance and degradation will be presented. The talk will conclude recent advances in all-solid state batteries

References

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2. Next-Generation Cobalt-Free Cathodes – A Prospective Solution to the Battery Industry's Cobalt Problem, **Adv**. **Energy Mater**. 2103050, 2022
3. Membrane Design for non-aqueous Redox Flow Batteries: Current Status and Path Forward – **Chem,** 8, 1611 (2022); High-Capacity Organic Radical Mediated Phosphorus Anode for Sodium-Based Redox Flow Batteries, **ACS Energy Letters**, 4, 2593-2600, 2019