

Special Issue

Overcoming Zinc Battery Challenges: Novel Strategies and Solutions

Message from the Guest Editors

Zinc-ion batteries (ZIBs) have emerged as a pivotal alternative to lithium-ion systems, driven by inherent advantages in safety, cost-effectiveness (using abundant Zn metal), and the environmental compatibility of aqueous electrolytes. However, challenges such as dendrite growth, hydrogen evolution reaction (HER), and cathode degradation have historically hindered their commercialization. Recent breakthroughs address these limitations through innovative material design and ion-regulation strategies; therefore, this Special Issue addresses the recent progress in this field. Potential topics include but are not limited to the following: cathode engineering (layered/defect-rich materials, pre-intercalation chemistry); anode optimization (surface modification, 3D frameworks, SEI design); and electrolyte and interface design (hydrate-melt electrolytes, artificial interphases). These advances position ZIBs as key players in grid-scale energy storage, renewable integration, and applications in extreme environments.

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