



New Materials and Approaches for Li-Ion Batteries and Beyond

Guest Editor:

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Message from the Guest Editor

Dear colleagues,

Traditional lithium-ion battery (LIB) technology possesses the “rocking-chair” flow of lithium ions between electrodes, and LIB cathode materials rely on the redox of transition metal ions (e.g., $\text{Fe}^{3+}/\text{Fe}^{2+}$ in LiFePO_4). Despite being characteristic of superb reversibility and round-trip efficiencies, the further development of LIBs is limited by the inherent energy density and high cost. Therefore, it is urgent to develop disruptive energy systems with higher specific energies and lower costs. Researchers worldwide have been carrying out extensive work and developing a series of promising battery prototypes. One example is the use of lightweight oxygen as the cathode to establish the metal–oxygen battery system, which has two attractive advantages over LIBs: higher cathode capacities and an inexhaustible supply of oxygen from the air. Of course, researchers must overcome many significant challenges to fully utilize the potential of “proof-of-concept” LIB alternatives: battery safety is always a huge hurdle before practical applications, and the tradeoffs between the lifespan and achievable specific energy are often overwhelming.





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