

## Promises and Challenges of Na-Ion Batteries

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Na-ion batteries have been considered a promising candidate to replace Li-ion batteries for large-scale energy storage systems because of their low cost compared to Li-ion batteries. However, current Na-ion batteries have slightly lower energy densities than Li-ion batteries. The energy density limitations offset the cost savings due to the use of Na<sup>+</sup> as a charge carrier. As a result, the cost per energy (\$/Wh) of current Na-ion batteries is not attractive yet. Therefore, it is necessary to improve the energy density of Na-ion batteries by developing high-capacity electrode materials with appropriately redox potentials.

In this presentation, we introduce promising high-capacity electrode materials that our group has recently developed. In particular, we demonstrate the reaction and failure mechanisms of phosphate- and oxide-based cathode materials and phosphorus-based anode materials. Our findings will provide fundamental insights into strategies to improve the electrochemical performance of Na-ion batteries.