Development of stable high-performance aqueous dual-ion battery using concentrated electrolytes

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Abstract

Currently commercial lithium-ion batteries (LIBs) have a foothold in the marketplace for powering both electronics and electric vehicles due to their high energy density and high efficiency. However, safety issues remain, stemming from the use of volatile, flammable, and toxic organic solvents in the electrolytes. In addition, the geochemical constraints and increasing cost of lithium (and cobalt) resources raises concerns on the long-term material availability. As a result, the pursuit of alternative technologies that are low cost and provide safety to meet the demand for large scale energy storage and delivery has risen.

Although the rapid development of high-energy aqueous LIBs has been achieved, the implementation of anion-storing graphite as cathode is still in the preliminary stage. The anion intercalation reaction in graphite exhibits a high operating voltage and is an ideal cathode candidate for high energy batteries, however, the aqueous electrolyte systems with adequate oxidative stability has been the greatest challenge. In this study, basic on novel aqueous dual-ion battery, we further search new electrolytes and electrode materials to develop high-stability and -reversibility aqueous dual-ion battery.