Low Cost Materials for High Energy Sodium-ion Battery

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Abstract

Sodium-ion battery is a low cost energy storage device, which are similar in some ways to lithium-ion batteries. In both systems, Na/Li ions are shuttled between the battery's positive and negative electrodes during charging and discharging. Taking into account recent concerns about a possible lithium shortage with the spread of electric vehicles, it is urgent to search for alternative energy storage systems that could complement the existing Li-ion technology. For this purpose, Na-ion technology can be a suitable choice in terms of battery cost, safety, and raw material abundance. Due to the increased size and heavier weight of the Na atom compared to the Li atom, the volumetric energy density and specific energy density obtainable for the sodium-ion battery would be less than those obtainable with the lithium-ion battery. However, Na-ion batteries would be interesting for very low cost systems for grid storage, which could make renewable energy a primary source of energy rather than just a supplemental one. Here, we will present our work on both anode and cathode materials for sodium ion battery. The anode materials include carbon based materials, Sn-based materials and red phosphorous based composites with high specific capacity and excellent capacity retention. Cathode materials will be focus on the low-cost Prussian blue materials.

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