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CarboNa - Stable Sodium Powders

A new pre-sodiation technique using sodium powder significantly enhances the efficiency, capacity, and energy density of sodium-ion batteries with minimal changes to existing manufacturing processes.

Battery researchers around the world have been developing sodium-ion batteries (SIBs) as an alternative technology to rechargeable lithium-ion batteries (LIBs). SIBs could potentially cost less than LIBs and be produced in larger scale for grid energy storage, owing to the natural abundance of sodium resources. Similar to LIBs, excessive solid electrolyte interphase (SEI) growth on the anode surface remains a major challenge to SIBs. Excessive SEI buildup throughout cycling consumes electrolyte, depletes available alkaline ions, and increases cell polarization. The reduction in the amount of available alkaline ions upon cycling often causes low capacity and poor capacity retention in full cells.

Researchers at Purdue University have developed a new pre-sodiation technique using sodium powder that can be applied to both anode and cathode materials with minimal modifications to conventional battery making processes. Sodium powder was prepared via ultrasonic heating, melting, and subsequent fragmentation of solid sodium chunks. Experimental results show that with the addition of sodium powder, hard carbon electrodes show reduction in first cycle capacity loss. In hard carbon vs. $NaCrO_2$ full cells, the addition of the powder on anode improves the first cycle Coulombic efficiency, reversible capacity, cell energy density, and energy efficiency. The use of sodium powder as electrode additives has shown promising enhancement of cycling performance.

Advantages:

-Easily implemented

-Improved first cycle Coulombic efficiency

-Improved reversible capacity

Technology ID

2017-POL-67739

Category

Energy & Power Systems/Energy Storage

Materials Science & Nanotechnology/Advanced Functional Materials

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-Improved cell energy density

-Improved energy efficiency

Potential Applications:

-Sodium-Ion Batteries

TRL: 2

Intellectual Property:

Provisional-Patent, 2018-02-20, United States | Utility Patent, 2019-02-19, United States | DIV-Patent, 2023-05-19, United States

Keywords: Sodium-ion batteries, SIBs, lithium-ion battery alternative, rechargeable batteries, grid energy storage, pre-sodiation technique, sodium powder, hard carbon electrodes, Coulombic efficiency, capacity retention, SEI growth, electrode additives