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Innovation Infosheet

Ultrasound-assisted Synthesis of Sodium Powder as Electrode Additive to Improve Cycling Performance of Sodium-Ion Batteries

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- Chemical Engineering

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- Batteries
- Chemical Engineering
- Hard Carbon
- Pre-Sodiation
- Sodium Powder
- Sodium-Ion Batteries
- Solid Electrolyte Interphase
- Sonication

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
-Improved cell energy density
-Improved energy efficiency

Potential Applications:
-Sodium-Ion Batteries

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