INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Nanopowder Coatings that Enhance Li Battery Component Performance

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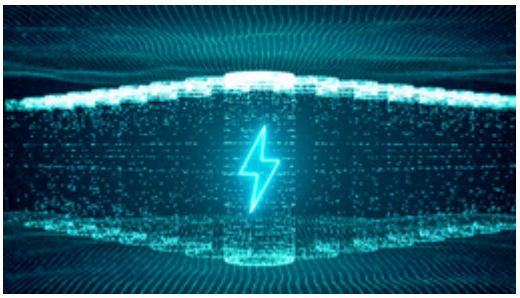

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Hardware
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OVERVIEW

A coating of active or anode material with nanopowders to improve battery performance

- Coatings can be applied by ball milling, ultrasonic mixing, or electrospray methods
- Yields enhanced energy capacities, greater stability, and improved degradation results

BACKGROUND

Nano powder coatings can enhance the performance of lithium battery components in several ways, including improved electrode performance, enhanced conductivity, increased durability, and augmented safety. Coating the electrode material with nanoscale coatings can increase the surface area of the material, which expands the contact area with the electrolyte and accelerates the rate of charge and discharge. Coating can offer mechanical properties that resist charge or discharge dimensional changes and prevent unwanted phase transitions, favoring the formation of desirable phases. Uniform and complete coating also protects battery components from degradation due to electrochemical reactions such as oxidation and reduction that can cause corrosion. Alternatively, nonuniform coating causes crack initiation that leads to coating failure as well as causing chemical pitting of substrates that progresses to corrosion. As such, a need exists for augmented processes which optimize the advantages of nanocoating for lithium batteries.

INNOVATION

Researchers have discovered that coating active or anode materials with nanopowders that are solid electrolytes or which can transform to solid electrolytes during battery operation can substantially improve the performance of the coated active material through enhanced energy

capacities, or greater long-term stability. These coatings can be applied very simply by mixing using ball milling, ultrasonic mixing or electrospray coatings and despite being porous offer a wide variety of much enhanced properties. Studies have confirmed that this approach eliminates or greatly reduces degradative processes in a number of unexpected ways. While porous coatings are prone to failure because the pores themselves can promote degradation of the active materials, use of these solid nanopowders yield enhanced energy capacities, greater long-term stability, and improved or eliminated degradation. This invention will prove useful for a wide range of applications, and further refinements of the processes hold promise for ongoing functional advances.

References

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