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High Ionic Conductivity Solid State Electrolyte for Li Batteries

A new nonflammable, solution-based solid-state electrolyte system enables safer and more easily manufactured Li-ion batteries with lower synthesis temperatures and direct compatibility with pure Li metal anodes.

The flammability of current liquid and polymeric electrolytes in Li-ion batteries is a major impediment in the rapid adaption of Li batteries in electric vehicles, portable devices, battery systems for the grid, and battery systems for military applications. Current solid state electrolytes are hindered in their implementation in Li-ion batteries by their low ionic conductivity. The desired cubic structural phases for high ionic conductivity garnet LiLaZrO currently need fabrication at temperatures in excess of 1300 degrees Celsius, making synthesis very challenging. Traditional synthesis methods of garnet materials, such as ball-milling, are incompatible with high volume manufacturing.

Researchers at Purdue University have developed a new solid state electrolyte material system. This new class of solid state electrolytes is fabricated employing solution-based synthesis, which is advantageous over ball milling and other current methods, rendering it easily scalable for manufacturing purposes. The electrolytes are nonflammable, solving a critical requirement in battery safety while improving ionic conductivity and lowering the synthesis temperature. This material can be directly grown on Li metal, avoiding undesired parasitic resistances associated with interfaces needed to protect pure Li metal anodes that limit device performance and cyclability.

Advantages:

-Lower synthesis temperature without compromising ionic conductivity

-More facile fabrication

-Greater probability of improving ionic conductivity by stoichiometry changes, densification, and processing

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Category
Automotive & Mobility
Tech/Battery Management & Charging Technologies
Energy & Power Systems/Energy Storage

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-Chemical compatibility with pure Li anodes

Potential Applications:

-Battery manufacturers

-Hybrid vehicles

TRL: 2

Intellectual Property:

Provisional-Patent, 2014-11-11, United States | Utility Patent, 2015-11-10, United States | DIV-Patent, 2019-07-24, United States

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