Formulation of extrudable composite electrolytes based on polymer and lithium argyrodite

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Resume:

With the ever-increasing demand for batteries, it is essential to develop technologies capable of meeting this growing need. One promising road is the development of all-solid-state batteries, which are considered to represent the fourth generation of battery technology. [1] The fifth generation is expected to involve solid-state lithium-sulfur batteries. [2] These advanced batteries offer significant advantages, particularly in terms of high energy density, which translates to a reduction in overall mass. Nevertheless, extensive research is still required to address the remaining challenges and to establish viable pathways for industrial-scale implementation.

The research targets the formulation of electrolytes, usable in the lithium-sulfur technology, that could be processed and shaped by extrusion. These formulations combine polymers, sulfurs and even lithiated oxides in the case of the positive electrode. The development aims at obtaining ionic conductivity (and electronic conduction in cathodes) by controlling the blend morphology and the electrolyte or electrode geometry during processing by extrusion.

The initial results demonstrate the feasibility of extruding lithium argyrodite with polymer matrices. Various formulations were successfully processed by extrusion, enabling the investigation of key functional properties, including mechanical performance, thermal stability across a broad temperature range and conductivity. Furthermore, the dispersion of lithium argyrodite within the polymer matrix was analyzed for different compositions, providing insight into the influence of formulation on material homogeneity and performance.

References:

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