

Polymer Electrolytes for Lithium-Based Batteries: Advances and Prospects

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Summary

Polymer electrolytes have attracted great interest for next-generation lithium (Li)-based batteries in terms of high energy density and safety. In this review, we summarize the ion-transport mechanisms, fundamental properties, and preparation techniques of various classes of polymer electrolytes, such as solvent-free polymer electrolytes (SPEs), gel polymer electrolytes (GPEs), and composite polymer electrolytes (CPEs). We also introduce the recent advances of non-aqueous Li-based battery systems, in which their performances can be intrinsically enhanced by polymer electrolytes. Those include high-voltage Li-ion batteries, flexible Li-ion batteries, Li-metal batteries, lithium-sulfur (Li-S) batteries, lithium-oxygen (Li-O₂) batteries, and smart Li-ion batteries. Especially, the advantages of polymer electrolytes beyond safety improvement are highlighted. Finally, the remaining challenges and future perspectives are outlined to provide strategies to develop novel polymer electrolytes for high-performance Li-based batteries.

Graphical Abstract

