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Exploring the frontiers of polymer electrolyte: Pioneering advances in lithium-ion batteries recycling
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Abstract
The soaring popularity of lithium-ion batteries (LIBs) as an advanced energy storage technology has resulted in a concerning surge of battery waste, intensifying environmental issues. Improper disposal in landfills or through incineration poses severe risks of toxic leaching into soil and water, jeopardizing public safety and our planet. Conventional recycling methods relying on hydrometallurgy or pyrometallurgy techniques inadvertently contribute to these environmental hazards. To overcome these challenges and embrace an eco-friendly approach, extensive research efforts have been dedicated to the development of electrochemical and direct LIBs technologies. Notably, the integration of these cutting-edge technologies with polymer electrolyte components holds immense potential. However, addressing the inherent limitations of these electrolytes is crucial. This impactful overview delves into the diverse characteristics of polymer hosts and salts, with primary objective of facilitating the design of optimal polymer electrolytes. Furthermore, the paper explores global initiatives aimed at enhancing the mechanical strength and electrochemical properties of various polymer electrolyte systems. Strategies such as polymer crosslinking or mixing, incorporation of inorganic fillers and the use of plasticizing agents are thoroughly examined. By harnessing these advancements, we can unlock the full potential of polymer electrolytes, revolutionize LIBs recycling, and pave the way for a sustainable future. © 2024 Elsevier B.V.

Author Keywords
Batteries waste; Electrochemical technologies; Environmental hazards; LIBs; Polymer electrolytes; Sustainable LIBs recycling

Index Keywords
Crosslinking, Electronic Waste, Environmental protection, Environmental technology, Hazards, Polyelectrolytes, Recycling, Sustainable development, Waste incineration; Battery recycling, Battery waste, Disposal in landfills, Electrochemical technology, Energy storage technologies, Environmental hazards, Environmental issues, Polymer electrolyte, Soil and water, Sustainable lithium-ion battery recycling; Lithium-ion batteries

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