

Communication

Understanding the Role of Nano-Aluminum Oxide in All-Solid-State Li-S cells

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Abstract

Aluminum oxide (Al₂O₃) is a well-known electrolyte filler for stabilizing Li-metal (Li⁰) anode in all-solid-state Li⁰-based batteries. However, its strong interaction with lithium polysulfides (PS) hinders the direct application of Al₂O₃-added electrolytes in all-solid-state lithium-sulfur batteries (ASSLSBs). Herein, the role of Al₂O₃ in ASSLSBs both as electrolyte filler and cathode additive is studied. The combination of Al₂O₃-added electrolyte and Al₂O₃-added S₈ cathode with optimum cell configuration could deliver an unprecedented discharge capacity of 0.85 mAh cm⁻² (C/10, 30 cycles) for polymer-based ASSLSBs. These results suggest that the rational incorporation of Al₂O₃ can lead simultaneously to PS anchoring and Li⁰ anode stabilizing benefits from the ceramic filler, thus improving the electrochemical performance of ASSLSBs.