Printable Polymer Electrolyte: A New Route Toward All-Solid-State Li-Ion Batteries

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The forthcoming smart energy era has inspired the relentless pursuit of high-energy/safe rechargeable power sources. Recent fire/explosion accidents of lithium-ion batteries (LIBs) have spurred us to devote greater attention to safety failures. All-solid-state LIBs have garnered considerable attention as a promising approach to simultaneously resolving the aforementioned safety concerns as well as the challenges associated with the limited energy density of current LIBs. Here, we present a new class of printable polymer electrolytes as a new material strategy to address the longstanding issues of conventional inorganic electrolyte-based all-solid-state LIBs. The printable electrolytes are rationally designed to act as a self-standing, ion-conductive separator membrane and also as an electrolyte in the printable electrodes, after ultraviolet (UV) curing-induced solidification. Rheology tuning of the electrode and electrolyte pastes, in combination with the multistage printing, enables the monolithic integration of (in-series/in-plane) bipolar-stacked cells with reliable/sustainable electrochemical performance onto complex-shaped objects.