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Communication

Enhanced Li-ion conductivity of polymer electrolytes with selective introduction of hydrogen in the anion

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Abstract

The anion chemistry of lithium salts plays a pivotal role in dictating the physicochemical and electrochemical performance of solid polymer electrolytes (SPEs), thus affecting the cyclability of all solid-state lithium metal batteries (ASSLMBs). Bis(trifluoromethanesulfonyl)imide anion (TFSI−) has long been studied as the most promising candidate for SPEs; however, the Li-ion conductivities of the TFSI-based SPEs remain still low (Li-ion transference number, ~ 0.2). In this work, we report new H-containing anions, conceived on the basis of theoretical considerations, as an electrolyte salt for SPEs. SPEs comprising H-containing anions achieve higher Li-ion conductivities than the TFSI-based ones, and those anions are electrochemically stable for various kinds of ASSLMBs (Li-LiFePO4, Li-S and Li-O2 batteries). This opens a new avenue for designing safe and high-performance ASSLMBs in the future.