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Lithium (fluorosulfonyl)(pentafluoroethylsulfonyl)imide/poly (ethylene oxide) polymer electrolyte: Physical and electrochemical properties

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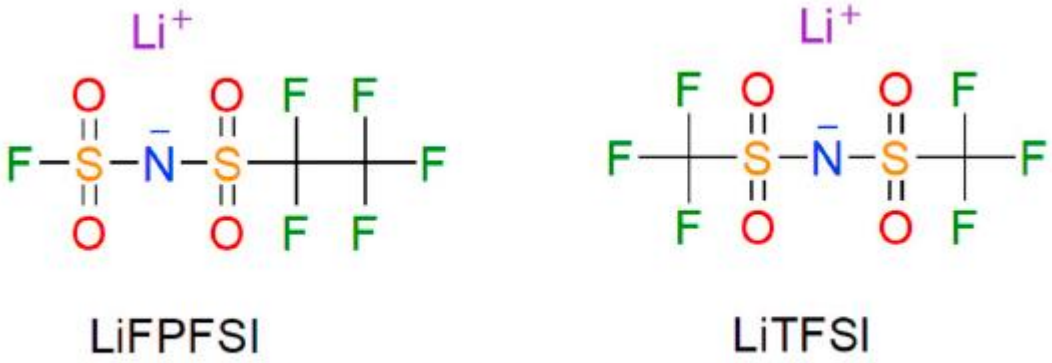
ABSTRACT

The chemical structure of lithium salts is believed to play a pivotal role on the intrinsic properties of solid polymer electrolytes (SPEs), which are considered as an important element for accessing safe and reliable lithium batteries. Herein, we propose the use of lithium (fluorosulfonyl)(pentafluoroethylsulfonyl)imide (LiFPFSI), an isomer of the widely used lithium bis(trifluoromethanesulfonyl)imide (LiTFSI) salt, as a conducting salt for building high-performance SPEs. The physicochemical and electrochemical properties of the LiFPFSI/poly(ethylene oxide) (PEO) electrolytes are comparatively studied with the reference LiTFSI/PEO electrolytes, in terms of phase transition, ionic conductivity, lithium-ion transference number (T_{Li^+}), electrochemical stability and the interfacial behavior between lithium metal (Li°) and SPEs. Compared to the LiTFSI/PEO electrolytes, the LiFPFSI/PEO electrolytes exhibit lower glass transition temperatures and higher ionic conductivities, and in particular, better stability against Li° electrode. These results suggest that LiFPFSI would be a promising salt for improving the performance of SPE-based solid-state Li° batteries.



Scheme 1. Chemical structures of LiFPFSI and LiTFSI.

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