

A solid poly(ethylene oxide)(PEO)-LiN(SO₂CF₃)(LiTFSI)/MOF-5 composite electrolyte for lithium-ion batteries

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ABSTRACT

MOF-5, one of the most studied members of metal organic frameworks (MOFs), is first employed as an inorganic-organic hybrid filler in a poly(ethylene oxide) (PEO)-LiN(SO₂CF₃)₂ (LiTFSI) electrolyte. Electrochemical properties of this composite solid electrolyte correlating to lithium ion battery use have been investigated for different compositions. When 10% MOF-5 is incorporated, the ionic conductivity (σ) can be most increased that a highest conductivity of 3.01×10^{-5} S/cm is reached at a composition of PEO-LiTFSI (EO:Li=10:1)/10% MOF-5. Moreover, the interfacial stability with lithium electrode is greatly increased compared with pristine polymer electrolyte, though the transference number (t_+) and the electrochemical oxidation potential are lowered after incorporation of MOF-5. The performance of solid-state LiFePO₄/Li batteries using composite and pristine electrolyte are compared at 60 °C. It shows a higher capacity and coulombic efficiency during cycling when 10% MOF-5 is incorporated to PEO-LiTFSI.