An effective fabrication of solid-state lithium metal batteries based on multi-functional poly(arylene ether sulfone)-g-poly(ethylene glycol) material

하이안, 김덕준†
성균관대학교
(djkim@skku.edu†)

Lithium ion conductive poly(arylene ether sulfone)-g-poly(ethylene glycol) (PAES-g-PEG) is synthesized for the application of solid state electrolyte membrane and electrode binder. The solid polymer electrolyte system prepared from PAES-g-PEG and 1-butyl-1-methylpyrrollidum bis(fluoromethane sulfonyl) (PYR-1,4-TFSI) ionic liquid illustrates high ion conductivity and low interfacial resistance at room temperature, along with excellent thermal and mechanical stability. As the PAES-g-PEG containing lithium bis (fluoromethane sulfonyl) (LiTFSI) salt exhibits not only such high conductivity of 2.11×10^{-4} S cm^{-1} but also excellent adhesive strength (> 23 MPa), it plays an important role as a binder for the electrode. As the active electrode materials such as LCO and NMC622 are quite well compatible with PAES-g-PEG, the battery cells fabricated by binding the synthesized SPE and cathode layer show excellent cell performance of 139.01 mAh g^{-1} (LCO) and 158.15 mAh g^{-1} (NMC 622) at 0.1C. When this multi-functional PAES-g-PEG material is applied to the lithium sulfur battery system, the resulting cell discharge capacity is even higher than 925 mAh g^{-1} at 0.1C with long term cyclic stability.