

Variation in the morphology and electrochemical properties of PEO-PEG copolymer electrolytes containing titania

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Abstract

Nowadays, high-performance Li-ion polymer battery is highly demanded for the applications in mobile electronics and much effort has been concentrated on the improvement of polymer electrolytes. In this study using sol-gel processing additional inorganic components of TiO₂ or Al₂O₃-doped TiO₂ were introduced into complex polymer electrolytes consisting of poly(ethylene oxide)(PEO) and poly(ethylene glycol)(PEG) hybridized with lithium perchlorate(LiClO₄). The variation in the crystallinity and morphology of the hybrid electrolytes was investigated with the ratio of PEO/PEG and TiO₂/PEO-PEG using x-ray diffraction (XRD) and scanning electron microscopy (SEM), respectively. Also, differential scanning calorimetry (DSC) and fourier transform infrared spectrometry (FTIR) were performed to investigate the variation in the glass transition of the co-polymer and the presence of acetonitrile in the electrolyte, respectively. PEO-PEG/LiClO₄ hybrid electrolytes containing TiO₂ and Al₂O₃doped TiO₂, respectively showed enhanced ionic conductivity compared to PEO-PEG/LiClO₄. The structure-property relationship was established based upon the effect of TiO₂ and Al₂O₃doped TiO₂ addition on the morphology and electrochemical properties of PEO-PEG/LiClO₄ hybrids.