

One-step Preparation of Epoxy Resin-based Ionic Gel Electrolyte for Solid-state Lithium Metal Batteries

Zhennan Wang¹, Haobo Shi², Weizhong Zheng², Weizhen Sun³, Ling ZHAO³, and Wei-Kang Yuan²

¹ECUST

²East China University of Science and Technology

³Affiliation not available

April 05, 2024

Abstract

Solid state lithium metal batteries have attracted wide attention in recent years due to their high energy density, flexibility, and high safety. In this work, a novel epoxy resin-based ionic gel electrolyte (IGE) was synthesized via one-step curing polymerization of epoxy monomer and amine hardener with soft segments in the presence of ionic liquid electrolytes. The morphology and molecular structure of IGE were characterized by SEM, AFM and ATR-FTIR. The obtained IGEs showed high room temperature ionic conductivity from 0.05 mS cm⁻¹ to 1.69 mS cm⁻¹. In addition, the evolution of solid electrolyte interface (SEI) between IGE and lithium metal was investigated by electrochemical impedance spectroscopy, galvanostatic charge-discharge test and X-ray photoelectron spectroscopy. Finally, The Li/IGE/LiFePO₄ cells can maintain a discharge capacity of 157 mAh g⁻¹ at 0.1 C after 50 cycles at 60 and 132 mAh g⁻¹ at 0.2 C after 150 cycles at room temperature.

Hosted file

Manuscript.docx available at <https://authorea.com/users/735180/articles/711696-one-step-preparation-of-epoxy-resin-based-ionic-gel-electrolyte-for-solid-state-lithium-metal-batteries>