

研究论文

用于锂离子电池的新型超支化聚醚-聚氨酯聚合物电解质

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摘要 采用溶剂聚合法, 将一种自制新型超支化聚醚(PHEMO)与异氰酸酯在电解液中进行缩合反应, 生成了一种包含有电解液的新型超支化聚醚聚氨酯(PHEU)聚合物电解质. 利用傅里叶红外光谱(FTIR)、示差扫描量热分析(DSC)、热重分析(TGA)和交流阻抗谱等测试方法对PHEU的结构、热稳定性和离子电导率进行了研究. 研究表明, 当电解液中锂盐的浓度为3 mol/L, 电解液的质量为骨架材料质量加和的3倍时, 电解质体系的室温电导率可达到 6.12×10^{-4} S/cm; 电化学稳定窗口为2.2—4.0 V, 具有良好的热稳定性和优良的机械性能. 另外, 在这种新型的电解质中, 聚氨酯大分子将电解液小分子牢固地包裹在里面, 有效地防止了凝胶聚合物电解质的漏液问题, 从而可以提高电池的安全性能.

关键词 [阳离子开环聚合](#) [聚合物电解质](#) [聚氨酯](#) [超支化聚醚](#) [离子电导率](#)

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Novel Hyperbranched PEU Polymer Electrolytes for Lithium-ion Batteries

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Abstract A novel type of hyperbranched PEU(PHEU) was prepared from the reaction of the hyperbranched polyether(PHEMO) with hexaethylene diisocyanate(HDI) in electrolytes containing lithium salts. The thermal stabilities and ionic conductivities of the as-prepared electrolytes were investigated by Fourier transform infrared spectroscopy(FTIR), differential scanning calorimetry(DSC), thermogravimetric analysis(TGA) and alternating current(AC) impedance. When the concentration of the electrolyte is 3 mol/L, and the mass of the electrolyte is three folds as high as that of the polymer matrix, the polymer electrolyte can achieve an ionic conductivity of 6.12×10^{-4} S/cm at room temperature. Cyclic voltammogram indicates that the electrochemical stability window is from 2.2 to 4.0 V. In addition, the small molecules of electrolyte were perfectly enclosed by the polymer chains, which can avoid liquid leaking. Therefore, it is benefit for the safety of lithium-ion batteries.

Key words [Cationic ring-opening polymerization](#) [Polymer electrolytes](#) [Polyurethane](#) [Hyperbranched polyether](#) [Ionic conductivity](#)

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