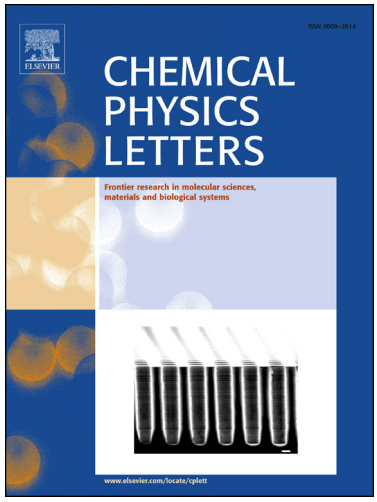

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Ionic Conductivity and Transport Properties of Poly(vinylidene fluoride-*co*-hexafluoropropylene)-Based Solid Polymer Electrolytes

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Abstract

Polymer electrolytes containing poly(vinylidene fluoride-*co*-hexafluoropropylene) (PVdF-HFP) and various concentrations of lithium triflate were prepared to determine the optimal polymer-salt composition for maximum ionic conductivity. Complex formation was ascertained from X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM) and differential scanning calorimetry (DSC) studies. The conductivity measurements reveal that the ionic conductivity of the polymer electrolytes containing various salt concentrations increases with temperature and obeys the Arrhenius rule. It is found that the electrolyte containing 25 wt. % of lithium triflate exhibits the highest room temperature conductivity. Moreover, Ionic transference measurements show predominance of ionic motion.

Keywords: Solid Polymer electrolyte, PVdF-HFP, Lithium triflate, Ionic conductivity

1 Introduction

Because of the ease in the preparation of polymer electrolyte films and their potential application in a variety of electrochemical devices, such as lithium ion batteries, fuel cells, supercapacitors, electrochromic displays and sensors, solid polymer electrolytes have been widely studied since the 1970's [1–12]. Owing to the ever-growing need for safe, reliable and more efficient electrical energy storage systems in portable devices and automotive industries, much of the research has focused on polymer electrolyte based lithium ion battery technologies. The major advantages of polymer electrolytes over the conventional liquid electrolytes are their intrinsic properties such as good mechanical properties, high energy density, no risk of leakage and their ability to form good electrode-electrolyte interfacial contact. Therefore, with the view of developing a polymer electrolyte with adequate ionic conductivity and good structural, thermal and electrochemical properties for practical device applications, research has been carried out on various polymer-salt complex systems.

Recently, PVdF-HFP polymer electrolytes based on lithium salts have been extensively investigated owing to the advantageous inherent properties of PVdF-HFP copolymer such as good electrochemical stability, non-combustibility, high dielectric constant

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