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Enhancement of Ionic Conduction in Alginate-PVA Polymer Electrolytes Do...



Enhancement of Ionic Conduction in Alginate-PVA Polymer Electrolytes Doped with Ammonium Thiocyanate

By

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Abstract

This study explores the eco-friendly enhancement of ionic conduction properties and transport properties in solid polymer electrolytes (SPEs) based on a sustainable alginate (Al) and polyvinyl alcohol (PVA) blend, modified by varying weight percentages (wt%) of ammonium thiocyanate (NH₄SCN) using a solution casting technique. The SPE system was characterized using Fourier-transform infrared (FTIR) spectroscopy, Thermal gravimetric analysis (TGA), X-ray diffraction (XRD), scanning electron microscopy (SEM), and electrical impedance spectroscopy

(EIS). SEM images revealed significant modifications in surface morphology correlating with different NH_4SCN contents. FTIR analysis confirmed interactions between the alginate-PVA matrix and NH_4SCN , evidenced by shifts and changes in peak intensities resulting from the protonation of $\text{H}^+ - \text{OOC}$. Impedance studies indicated a reduction in bulk resistance (R_b) with increasing NH_4SCN content up to 35 wt%, achieving the highest ionic conductivity of $3.4 \times 10^{-4} \text{ S cm}^{-1}$ at room temperature. Temperature dependence studies revealed that the SPE systems adhere to Arrhenius behavior, with regression values nearing unity. Additionally, dielectric response analysis showed a consistent trend with ionic conductivity, indicating enhanced transport properties. These findings highlight the potential of alginate-PVA- NH_4SCN SPEs for use in environmentally friendly applications such as proton batteries and supercapacitors, offering a sustainable alternative in energy storage solutions.

Keywords

Author Keywords: Ionic conductivity; Transport properties; Intermolecular interaction; Grotthuss mechanism

Keywords Plus: TRANSPORT-PROPERTIES; BLEND; MEMBRANE

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