

Electrochemical Impedance study of Proton Conducting Polymer Electrolytes based on PVC Doped with Thiocyanate and Plasticized with Glycerol

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Solid polymer electrolyte (SPE) system based on poly (vinyl chloride) PVC doped with ammonium thiocyanate (NH₄SCN) salt has been prepared by solution cast techniques using glycerol as a plasticizer and THF tetra-hydro furan as a solvent. To examine the electrical properties of the electrolyte films the electrochemical impedance spectroscopy (EIS) has been used. The effect of glycerol on electrical properties and structure of the plasticized PVC-based polymer electrolyte was examined, and the various weight ratio of glycerol plasticizer (%5, %10, %15, and % 20) of PVC-NH₄SCN weight is well correlated. Electrolytes are the heart of electrochemical devices and their conductivity investigation is crucial from the viewpoint of electrochemical device application. EIS electrode impedance spectroscopy was used to determine the bulk resistance R_b of the films at room temperature. The increase of the ionic conductivity with an increase in the amount of glycerol was observed through an impedance study, and the maximum ionic conductivity was 1.02512 x 10⁻⁶ S cm⁻¹ obtained from (PVC-%20 NH₄SCN-%20 glycerol) system. Dielectric relaxation studies of the polymer electrolyte film have been studied. The rise of the dielectric polarization of the films is proved by increases in a dielectric constant and dielectric loss. The peaks appeared in the imaginary part of the electric modulus reveals that ion conduction occurs through the viscoelastic relaxation dynamic. In the AC conductivity pattern plateau region ascribed to DC conductivity is appeared.

Keywords: PVC electrolyte; NH₄SCN; plasticizer; impedance study; dielectric properties

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