

Ionic conduction study of enhanced amorphous solid bio-polymer electrolytes based carboxymethyl cellulose doped NH₄ Br

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ABSTRACT

The present work deal with the development of enhanced amorphous solid bio-polymer electrolytes (SPEs) based on carboxymethyl cellulose (CMC) doped ammonium bromide (NH₄Br) and plasticized with various composition of ethylene carbonate (EC). The SPEs sample was successfully prepared via solution casting and has been characterized by using Fourier Transform Infra-Red spectroscopy (FTIR), X-ray Diffraction (XRD), Thermo Gravimetric Analysis (TGA) and Electrical Impedance Spectroscopy (EIS) technique. The IR-spectra changes were observed at COO⁻ and C–O–C moiety of the CMC indicate that the interaction had occurred in the SPEs system when EC was added. The highest conducting of the SPEs system at ambient temperature (303K) was achieved at 1.12×10^{-4} S/cm for unplasticized sample and enhanced to 3.31×10^{-3} S/cm when plasticized with 8 wt% EC. The increasing of ionic conductivity of the present system is due to the increment of amorphous nature in CMC SPEs system as revealed from XRD analysis. The ionic conductivity of SPEs system was found to be influenced by number of ions (η), ions mobility (μ) and diffusion coefficient (D) of transport properties based on Rice and Roth approach.

KEYWORDS:

Amorphous bio-polymer material; Plasticizer; Proton conduction (H⁺); Ionic conductivity