An investigation on the abnormal trend of the conductivity properties of CMC/PVA-doped NH4Cl-based solid biopolymer electrolyte system

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Abstract

The present work was carried out to investigate the abnormal trend of electrochemical properties of solid biopolymer electrolytes (SBEs) system-based carboxymethyl cellulose (CMC) blended with polyvinyl alcohol (PVA)-doped NH4Cl. The SBEs system was prepared via solution casting technique and analyzed through Fourier transform infrared (FTIR) spectroscopy, thermogravimetric analysis (TGA), X-ray diffraction (XRD) analysis, and electrical impedance spectroscopy (EIS). Complexation was observed with the changes of peaks at 1065cm(-1), 1598cm(-1), 2912cm(-1), and 3396cm(-1) that corresponds to C-O-C, C=O of COO- stretching, C-H stretching, and O-H stretching, respectively, of CMC/PVA blend system upon the addition of NH4Cl. The decrease of the amorphousness and the increase of weight loss demonstrated the abnormal observation of the ionic conductivity when (1-5wt%) NH4Cl was added in the SBEs system which was lower than the un-doped SBEs system. It was also observed that the highest ionic conductivity at 8.86x10(-5)Scm(-1) was achieved by the sample containing 6wt% of NH4Cl. The temperature dependence of the SBEs system is found to be governed by the Arrhenius rule. Through the IR deconvolution technique, the conductivity of CMC/PVA-NH4Cl SBEs system was shown to be primarily influenced by the ionic mobility and diffusion coefficient of the ions.

Keywords

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