Enhancing proton conductivity of sodium alginate doped with glycolic acid in bio-based polymer electrolytes system

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ABSTRACT

The investigation on bio-based polymer electrolytes (BBPEs) system based on alginate doped with a various composition of glycolic acid (GA) were carried out and prepared using solution casting technique. The BBPEs complexes were characterized by using fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD), thermal gravimetric analysis (TGA), differential scanning calorimetry (DSC) and electrical impedance spectroscopy (EIS). The complexation was observed to have taken place between alginate and GA with apparent changes of the peak wavenumber, specifically at the $–COO^-$ of alginate functional group. Moreover, from the impedance analysis, it is evident that the sample which contains 20 wt. % of GA possessed the optimum ionic conductivity of 5.32×10^{-5} S cm^{-1} at room temperature with the lowest activation energy. The ionic conductivity increased by incorporating GA was demonstrated via the enhancement of their thermal stability as well as amorphousness. The findings of the present investigation suggest that alginate polymer has the potential to be applied as an electrolyte system for electrochemical devices applications.

KEYWORDS

Amorphous materials; Ionic conductivity; Proton-conducting; Thermal stability

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