Studies on the effect of H^+ carrier toward ionic conduction properties in alginate-ammonium sulfate complexes–based polymer electrolytes system

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ABSTRACT

The present work highlights the contribution of ammonium sulfate $(NH_4)_2SO_4$ as H^+ carriers in alginate-based solid polymer electrolytes (SPEs) that were successfully prepared via a solution casting technique. The Fourier transform infrared analysis revealed that molecular interactions between the host polymer and the ionic dopant complexes occurred at the wavenumbers 3700–2500 cm^{-1}, 1800–1500 cm^{-1}, and 1200–900 cm^{-1}. These regions corresponded to the O-H stretching, COO^- and C-O-C, moieties of alginate, respectively, which coordinated with the H^+ carrier from $(NH_4)_2SO_4$. At ambient temperature, the optimum ionic conductivity was obtained at 3.01×10^{-5} S cm^{-1} for the sample containing 10 wt.% of $(NH_4)_2SO_4$. The IR-deconvolution approach shows that the ionic conduction enhancement is governed by the ionic mobility and the diffusion coefficient of H^+ carriers, and the findings show that the present biopolymer, which is an alginate-based SPEs system, has an excellent possibility to be used as electrolytes for application in electrochemical devices.

KEYWORDS:

Polymer electrolytes; polysaccharide polymer; ionic conductivity; molecular interaction

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