

Study on ionic conduction of alginate bio-based polymer electrolytes by incorporating ionic liquid

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ABSTRACT

Biopolymer electrolytes is attracting a great deal of interest as a substitute for synthetic polymer electrolytes in electrochemical devices. They are carbon-neutral, sustainable, and reduce dependency on non-renewable fossil fuels, and easily biodegradable. The present work aims to develop the alginate bio-based polymer electrolytes (BBPEs) with the addition of various composition (2 to 10 wt%) of ionic liquid (1-butyl-3-methylimidazolium chloride) via solution casting technique. The ionic conduction study was characterized using electrical impedance spectroscopy (EIS) at different frequencies ranging from 50 Hz to 1 MHz. With the addition of 6 wt% 1-butyl-3-methylimidazolium chloride ([Bmim]Cl), the ionic conductivity of the BBPEs system was improved significantly from $5.32 \times 10^{-5} \text{ S cm}^{-1}$ to $2.03 \times 10^{-3} \text{ S cm}^{-1}$ at ambient temperature. The electrical properties analysis revealed that the ionic conductivity sample-based BBPEs has a good relationship with electrical properties formulism and shows non-Debye behavior where no single relaxation occurred in the present system.

KEYWORDS

1-Butyl-3-methylimidazolium chloride; Alginate; Bio-based polymer electrolytes; Electrical properties; Ionic conduction properties

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