Magnesium Ion-Conducting Biopolymer Electrolytes Based on Carboxymethyl Cellulose Derived from Palm Oil Empty Fruit Bunch Fibre

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As demands for global lithium supplies have raised questions about the sustainability of the supply of lithium, a potential alternative to lithium batteries has been developed. New biodegradable-carboxymethyl cellulose (CMC) extracted from empty fruit bunches of palm oil is used to produce biopolymer electrolytes (BPE) using magnesium acetate salt. Solution casting has been used to prepare biopolymer electrolytes in various ratios of magnesium acetate. Via Fourier transform infrared characterisation, electrochemical impedance spectroscopy, transference number measurements and linear sweep voltammetry, studies on the structural, electrical and electrochemical behaviour of CMC were conducted. Upon the addition of 20 wt% of magnesium acetate, the highest ionic conductivity of $1.83 \times 10^{-3} \text{ S cm}^{-1}$ at ambient temperature was achieved. The interactions between CMC and magnesium acetate were verified by the Fourier transform infrared results. Electrochemical stability of more than 2 V was shown by the biosourced polymer electrolytes, whereas the measurement of transference number showed that electrolytic conduction was dominated by ions.

Keywords: carboxymethyl cellulose; biosourced polymer electrolytes; magnesium acetate; electrical studies

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