Effect of polar aprotic solvents on hydroxyethyl cellulose-based gel polymer electrolyte

Ionics

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Abstract

Quasi-solid bioelectrolytes based on hydroxyethyl cellulose (HEC) and sodium iodide (NaI) in three different polar aprotic solvent systems, dimethylformamide (DMF), dimethyl sulfoxide (DMSO), and dimethylacetamide (DMA), were fabricated and characterized. FTIR studies revealed active solvent-ion interactions in DMF-based electrolytes in comparison to DMA and DMSO. The effect of the solvent system on the crystallinity of HEC gel electrolytes was more significant at low NaI concentration. In each solvent system, the highest ionic conductivity was achieved at 70 wt% NaI and generally DMF-based electrolytes showed higher conductivity than the other solvents. The availability of multiple complexation sites present in DMF is ascribed to improvement in ion mobility and hence conductivity. Rheological analysis was carried out to elucidate the mechanical properties of the gels. Generally, the mechanical strength of the polymer gels was unaffected by the type of solvent.

Keywords

Hydroxyethyl cellulose  Solvents  Dimethylformamide  Dimethylacetamide  Dimethyl sulfoxide

Notes

Compliance with ethical standards