The Effect of Plasticization on Conductivity and Other Properties of Starch/Chitosan Blend Biopolymer Electrolyte Incorporated with Ammonium Iodide

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This work focuses on polymer electrolytes composed of a starch-chitosan blend host, ammonium iodide (NH₄I) and glycerol. Fourier transform infrared (FTIR) analysis confirms the interaction of starch-chitosan-NH₄I-glycerol. The highest room temperature conductivity is \((1.28 \pm 0.07) \times 10^{-3} \text{ S cm}^{-1}\), obtained by a sample containing 30 wt% glycerol. Dielectric studies showed that the electrolytes obeyed non-Debye behavior. The total ionic transference number for the 30 wt% glycerol sample was 0.991, and the conduction mechanism for this sample followed the quantum mechanical tunneling (QMT) model. Linear sweep voltammetry (LSV) showed that this sample was electrochemically stable up to 1.90 V. The highest conducting sample was used in the fabrication of an electrical double layer capacitor (EDLC) cell.

Keywords Polymer electrolyte; conductivity; starch-chitosan blend; ammonium iodide; EDLC

Introduction
Solid polymer electrolyte (SPE) based ionic conductors have been investigated widely because they offer advantages such as ease of fabrication, good shelf life and good mechanical properties [1]. Various polymers have been investigated including chitosan [2], methyl cellulose (MC) [3], starch [4], polyethylene oxide (PEO) [5] and polyvinyl alcohol (PVA) [6]. Polymers obtained from natural polymers such as starch, cellulose and chitosan have attracted attention due to their biodegradable, renewable and sustainable properties [7–10].

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