

Characteristics of ionically conducting jatropha oil-based polyurethane acrylate gel electrolyte doped with potassium iodide

ABSTRACT

Currently, there is a growing trend of using bio-based materials from renewable resources in the construction of polymer electrolytes. In this study, a gel polymer electrolyte from Jatropha oil-based polyurethane acrylate (PUA) was prepared by doping the PUA with various concentrations (0–30 weight%) of potassium iodide (KI) salt. The PUA gel electrolyte was characterized by Fourier-transform infrared spectrometry (FTIR), thermal analysis and electrochemical analysis was performed by using electrochemical impedance spectroscopy. Subsequently, the dielectric properties of the gel polymer electrolyte were studied. A conductivity of $1.59 \times 10^{-4} \text{ S cm}^{-1}$ was achieved for the PUA incorporated with 25 weight% KI at room temperature. The dielectric study indicated the non-Debye nature of the materials. It has been shown, via transference number measurement that the conducting species in this work were predominantly ions, with only 4% contribution from electrons. An electrochemical stability window of 2.0 V was obtained by using linear sweep voltammetry for the highest conducting gel electrolyte.

Keyword: Bio-based polymer; Gel electrolyte; Polyurethane acrylate; Jatropha oil