Enhancement of plasticizing effect on bio-based polyurethane acrylate solid polymer electrolyte and its properties

ABSTRACT

Polyurethane acrylate (PUA) from vegetable oil has been synthesized and prepared for solid polymer electrolyte. Polyol has been end-capped with Toluene 2,4-Diisocyanate (TDI) followed by hydroxylethylmethylacrylate (HEMA) in a urethanation process to produce PUA. The mixtures were cured to make thin polymeric films under UV radiation to produce excellent cured films which exhibit good thermal stability and obtain high ionic conductivity value. 3 to 15 wt. % of ethylene carbonate (EC) mixed with 25 wt. % $LiClO_4$ was added to PUA to obtain PUA electrolyte systems. PUA modified with plasticizer EC 9 wt. % achieved the highest conductivity of 7.86×10^{-4} S/cm, and relatively improved the linear sweep voltammetry, transference number and dielectric properties. Fourier Transform Infrared Spectroscopy (FTIR) and dielectric analysis were presented. Thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC), followed by X-ray Diffraction (XRD) and morphology have been studied. The addition of plasticizer to the polyurethane acrylate shows significant improvement in terms of the conductivity and performance of the polymer electrolyte.

Keyword: Biopolymer electrolyte; Plasticizer; Solid polymer; Polyurethane acrylate; Conductivity