SYNTHESIS AND CHARACTERIZATION OF PVP/Cu^{2+} BASED SOLID POLYMER ELECTROLYTE FOR RECHARGEABLE BATTERIES

Paranagama D. G. S. P.*, Zainudeen U. L. and Najitha A. R.
Department of Physical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka, Sammanthurai, Sri Lanka
**sachini12paranagama@gmail.com*

The growing need for sustainable and efficient energy technology has propelled notable progress in the field of rechargeable batteries. Electrolytes are the essential part of rechargeable battery systems which are responsible for stability and reversibility of the battery. Rechargeable batteries that use traditional organic liquid electrolytes have been linked to a number of safety problems in recent years. Because of this, solid polymer electrolytes which have the advantages of shape adaptability, flexibility, stability, low weight, and cheap manufacturing costs are being researched as viable alternatives to the organic liquid electrolytes that are currently used in rechargeable batteries. In this study, pure and different concentrations of Cu^{2+} ion-doped polyvinylpyrrolidone (PVP) solid polymer electrolytes (SPEs) have been prepared by solution casting method. The formation of complexes between the polymer and Cu^{2+} ions has been confirmed by Fourier transform infrared spectroscopy (FTIR) and UV-Visible spectroscopy. The highest ionic conductivity of 10.70×10^{-4} S cm^{-1} has been observed in the 15% Cu^{2+} ions-doped PVP electrolyte at room temperature. The ionic conductivity of the best electrolyte has been further enhanced by nanofiller effect. 0.2% TiO_2 nanofiller incorporated 15% PVP/Cu^{2+} electrolyte sample has become the most suitable SPE for rechargeable batteries and it shows a maximum ionic conductivity of 1.65×10^{-3} S cm^{-1}. According to thermal stability test, 60 ºC could be considered an optimal operating temperature for the rechargeable battery using this fabricated SPE.

Keywords: *Fourier Transform Infrared Spectroscopy (FTIR), Nanofiller, Polyvinylpyrrolidone (PVP), Solid Polymer Electrolyte (SPE), UV-Visible spectroscopy.*