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Synthesis, Characterization and Electrical Studies of Solid Polymer Electrolyte (1-x) PANI-KAg_4I_5.xAl_2O_3

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Abstract : Solid polymer electrolytes have emerged as an area of interest in the field of solid state chemistry owing to their facile and cost-effective synthesis and number of applications in different areas of chemistry, extending over a wide range of temperatures. In the present work, polymer composite solid electrolyte comprising of Polyaniline (PANI) as polymer and potassium silver iodide (KAg4I5) using alumina (Al2O3) of different compositions having the formula (1-x) PANI- KAg4I5. x Al2O3 with x ranging from 0.0 to 0.5 was prepared by solid state reaction method. The structural elucidation and characterization was done by X- Ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetric-Differential Thermal Analysis (TG-DTA) and Impedance Spectroscopy. The thermal analysis shows a phase transition at 147°C attributed to β-α phase transition of AgI due to the disproportionation of KAg4I5 to AgI and KAg2I3 at temperatures higher than 36°C. The X Ray diffraction analysis also confirms the presence of both AgI and KAg2I3 in the samples. The conductivities recorded over a temperature range of 40-250° C lie in the range of 10-1 to 10-3 S cm-1. Maximum conductivity was seen in the compositon x = 0.4 i.e. 1.84 × 10-2 Scm-1 at 313 K and 1.38 × 10-1 Scm-1 at 513 K, with a minimum activation energy of 0.14 eV.

Keywords : polymer solid electrolytes, XRD, DTA, electrical conductivity, impedance spectroscopy
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