

Synthesis, Characterization and Electrical Studies of Solid Polymer Electrolyte (1-x) PANI-KAg₄I₅.xAl₂O₃

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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 composition 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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