ABSTRACT

Silver Iodide (AgI) based superionic conductors continue to be investigated for their intriguing structure phase transformation and complex but useful ion dynamics. However, unlike the others alkali iodides, AgI does not easily admit impurities in its tetrabonded zincblende structure. Introduction of copper (I) iodide (CuI) into AgI lattice was expected to initiate and stabilize changes in structure of the cation sublattice which controls the phase stability and phase transition behavior. In the present work, silver rich xCuI-(1-x)AgI ($0.1 \leq x \leq 0.4$) have been prepared by sintering method. The mixtures were ground and pelletized before subjected to sintering temperature at 250°C. In determining the conductivity of xCuI-(1-x)AgI, impedance were measured by using EIS (Electrochemical Impedance Spectroscopy) over frequency range from 50 Hz to 1 MHz and in the temperature range from 25°C to 150°C. The highest conducting sample was 0.4CuI-0.6AgI with room temperature conductivity of $(1.75 \pm 0.10) \times 10^{-5}$ Scm^{-1}. Conductivity-temperature graphs show competition in the transportation between the β- and γ- phases of AgI. It is inferred that the incorporation of CuI with the mixture reduces the transition temperature of β- to α-AgI. Dielectric studies, in particular the graphs of imaginary modulus, M_i versus frequency, seem to indicate that the samples are still ionic conductors although CuI is a mixed electron-hole conductor. From the total ac conductivity $\sigma(\omega) = A\,\omega^s$, s was found to be quite constant with temperature. From the results, the transport of the mixed conductor sample can be explained by the quantum mechanical tunneling (QMT) model. X-ray diffraction (XRD) showed that CuI used in the present work increased the stability of metastable γ-AgI.