E1-07: Ionic conductivity of the Li_2O-P_2O_5-TeO_2 glass system

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Most of the ion conducting glasses reported in the literature deal with systems with a single network former. It has been reported that the simultaneous use of 2 different network formers gives an enhanced conductivity in the Ag^+ conducting glass systems. Similar studies on a Li^+ conducting glass system formed with P_2O_5 and TeO_2 as simultaneous network formers and Li_2O as anetwork modifier are reported. The general formula of the system studied is: $0.4Li_2O + 0.6[xP_2O_5 + (1\text{-}x)Te_2O_4]$.

The glass was prepared by melting the appropriate quantities of Li_2CO_3, TeO_2 and $NH_4H_2PO_4$ and quenching the melt in a brass mould in air at room temperature, Samples were obtained in the form of a pellet of 6 mm diameter and 2 mm thickness. They were transparent and colourless and their glassy state was confirmed using a polarizing microscope. Gold electrodes were deposited by evaporating gold on both flat surfaces of the pellets. Conductivity measurements were performed in the temperature range 150 - 300°C using the impedance spectroscopy technique.

The conductivity of this glass system was found to be higher than that of its limiting binary compositions Li_2O-P_2O_5 and Li_2O-TeO_2. The isothermic variations of the conductivity versus molar ratio, In σ versus x, show 2 maxima. The activation energy calculated from the Arrhenius plots show 2 minima corresponding to the above 2 conductivity maxima and the Arrhenius pre-exponential factors remain constant. The observed conductivity enhancement could be explained in terms of the mixed former effect.

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