ENHANCEMENT IN THE ELECTRICAL CONDUCTIVITY OF LITHIUM SULFIDE GLASSES DUE TO MIXED GLASS FORMER EFFECT

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The glasses exhibit higher conductivity than the polycrystalline ceramics of the same composition. Lithium conducting glasses seems to be quite promising as solid electrolytes in batteries and other electrochemical devices. The polarizability of the anions coordinated with mobile cation is an important factor which governs the conductivity. The stronger the polarizability of the anion associated with mobile ion, the higher is the conductivity. A systematic gain in conductivity has been observed when oxygen is replaced by sulfur (the latter being more polarizable than the former).

The glasses of Li_2S : SiS_2 : GeS_2 system were prepared by using twin roller quenching technique inside a glove box under Argon atmosphere and their electrical conductivity has been studied.

The results of $30Li_2S$: $(70-X)$ SiS_2: GeS_2 ($0 < x < 70$) glasses show a maximum in the conductivity and a minimum in the activation energy. The observed enhancement in the conductivity is of two order of magnitude. The results have been explained on the basis of mixed glass former effect. The Ge being slightly larger than Si, the substitution of Si by Ge increases the interionic bond distance and consequently increases the interstitial window radius r_D. As a result E_M, the activation energy for migration decreases. Simultaneously E_C, the coulombic energy increases due to increase in the jump distance. This is also supported by the results of density measurements. The mixed glass former effect (MGFE), offers the possibility of developing new solid electrolytes of vital interest.

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