Physical Properties of a New Type of Molten Electrolytes, ZnCl$_2$-DMSO$_2$

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In the present work some physical properties of binary zinc chloride-dimethylsulfone (ZnCl$_2$-DMSO$_2$) melts were investigated; the phase diagram was determined by Differential Scanning Calorimeter (DSC) and Thermogravimetric Analyzer (TGA) analyses; the electric conductivity was measured using a direct-current computerized method. The conductivities of the melts increased with increasing temperature and DMSO$_2$ content. There was a maximum of the conductivity at 40 mol% ZnCl$_2$; the conductivity was 0.00423 S/cm at 110 $^\circ$C. The density of all the melts decreased with increasing temperature and DMSO$_2$ contents. The equivalent conductivities were given by $\Lambda = \kappa M_{\text{mix}}/\rho$, where $M_{\text{mix}}$ is the mean equivalent weight. These equivalent conductivities were fitted by the Arrhenius equation, where the activation energies were 25.2, 34.6, 44.5, 53.7 kJ/mol for 40, 50, 60, 70 mol% ZnCl$_2$, respectively.

Key words: Direct-current Computerized Method; Archimedean Technique; Equivalent Conductivity; Activation Energy.