Physical Properties of a New Type of Molten Electrolytes, $FeCl_3$-$DMSO_2$

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Some physical properties of ferric chloride-dimethyl sulfone ($FeCl_3$-$DMSO_2$) melts were investigated. The phase diagram was determined by differential scanning calorimeter and thermogravimetric analyzer. The electric conductivity, measured with computerized direct-current method, increased with increasing temperature and $DMSO_2$ content. The conductivity was maximal (0.02149 S/cm) at 115 °C for 30 mol% $FeCl_3$. The densities of all melts decreased with increasing temperature and $DMSO_2$ content. The equivalent conductivities were given by $\Lambda = \kappa M_{\mathrm{mix}}/\rho$, where M_{mix} is the mean equivalent weight of the binary melts. These equivalent conductivities were fitted by the equation $\Lambda = \Lambda_0 \exp(-E_\Lambda/RT)$, where the activation energies E_Λ were 8.63, 22.94, 25.92 kJ/mol for 30, 40, 50 mol% $FeCl_3$, respectively.

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