The Electrical Conductivity of the Molten Binary Systems $CO(NH_2)_2$-MNO_3 (M = Li, Na, NH_4)

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The electrical conductivity of molten $CO(NH_2)_2$-MNO_3 (M = Li, Na, NH_4) with various nitrate contents has been measured at 358 – 393 K. For Li and Na the conductivity increased with increasing concentration of urea [$CO(NH_2)_2$], whereas for NH_4 the conductivity decreased with increasing concentration of urea. The relationship between the conductivity and the temperature can be expressed by $\kappa = \kappa_0 \exp(-E_\kappa/RT)$. For the mole fractions 0.7, 0.8, and 0.9 of urea, the activation energies E_κ are 31.28, 25.91, and 22.96 kJ/mol for the $CO(NH_2)_2$-$LiNO_3$ system, and 32.64, 30.51, and 25.40 kJ/mol for the $CO(NH_2)_2$-$NaNO_3$ system, whereas for the mole fractions 0.5, 0.7, and 0.8 of urea the activation energies are 20.39, 19.73, and 18.95 kJ/mol for the $CO(NH_2)_2$-NH_4NO_3 system. The more stable the forming complex is, the lower is the conductivity. The conductivities are in the order $CO(NH_2)_2$-NH_4NO_3 > $CO(NH_2)_2$-$NaNO_3$ > $CO(NH_2)_2$-$LiNO_3$.

Key words: Electrical Conductivity; Activation Energies; Amide Molten Salts.