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Investigation of temperature effect on the electrical conductivity of solutions inorganic salts in ethanol

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Abstract

The electrical conductivity of the solutions depends on the nature of the solute and solvent. For a solvent, the main parameter is the dielectric constant. Since the dielectric constant of alcohols is much less than the dielectric constant of water, the electrical conductivity of alcoholic solutions of salts is less than the electrical conductivity of their aqueous solutions. Therefore, alcoholic solutions of inorganic salts are weak electrolytes. We previously studied the electrical conductivity of inorganic salts in a number of alcohols (ethanol, propanol-2 and butanol-1) at room temperature. It is of interest to study the effect of temperature on the electrical conductivity of salts in alcohols. Obviously, an increase of temperature salt solutions leads to an increase in their electrical conductivity. To study the temperature dependence of the electrical conductivity of aqueous solutions electrolytes, we proposed an approach based on the study of the effect of temperature on the equivalent electrical conductivity of solutions at infinite dilution λ_∞. Using this approach, we studied the electrical conductivity of aqueous solutions of a number of inorganic salts, carboxylic acids, and amino acids as a function of temperature. It has been established that for these solutions the dependence $\lambda_\infty(T)$ is described by the exponential Arrhenius equation $\lambda_\infty = A \cdot \exp(-E/(RT))$. However, such studies have not been conducted for alcoholic salt solutions. In this regard, this article explores the possibility of describing the experimental data $\lambda_\infty(T)$ for solutions of certain inorganic salts in ethanol by this equation. It is shown that the Arrhenius equation with the found activation energies adequately describes the temperature dependence of the ultimate equivalent conductivity for solutions of a number of inorganic salts (chloride and calcium nitrate, cadmium iodide, lithium and potassium chloride, chloride, iodide and ammonium nitrate, silver nitrate and sodium bromide) in ethyl alcohol.

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