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Thematic course: Investigation of the influence of temperature on electrical conductivity of aqueous solutions of electrolytes. Part 4.

Acetates and phosphates

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Abstract

It is known that the electrical conductivity of solutions of electrolytes increases with increasing temperature due to the increase in the degree of dissociation of substances and the mobilities of the electrolyte ions formed in the corresponding solvents. The electrical conductivity of solutions of electrolytes is judged by the specific electrical conductivity and equivalent electrical conductivity. Therefore, in the literature, the effect of temperature on the specific electric conductivity and the equivalent electric conductivity is investigated. When studying the effect of temperature on the specific electrical conductivity of a solution of a certain electrolyte, its concentration should be taken into account. This approach in a literature was used solutions for chloride and potassium iodide, potassium hydroxide, sulfuric acid and magnesium sulfate. In this case, the error in determining the activation energy reaches 20%, which significantly affects the accuracy of determining the values of the specific electric conductivity at different concentrations of the electrolyte solution at certain temperatures. In another approach based on the investigation of the effect of temperature on the equivalent electrical conductivity at infinite dilution λ_∞, is proposed. In this case λ_∞ is composed of the limiting mobilities of the electrolyte constituent ions, it does not depend on the concentration of the electrolyte solution, but depends on the temperature. The experimental data $\lambda_\infty(T)$ obtained are described by the exponential Arrhenius equation $\lambda_\infty = A \cdot \exp(-E/(RT))$. This approach has been successfully used for aqueous solutions of strong, weak electrolytes and nitrates with the determination of the parameter A and the activation energy E for the corresponding solutions. It is established that the error in determining the values λ_∞ by the Arrhenius equation with the found values of the constants A and E for each of the electrolyte solutions studied at different temperatures does not exceed 3%. In this paper we present the results of an investigation of the effect of temperature on the electrical conductivity of aqueous solutions of certain salts of acetic and phosphoric acids. It is shown that for these solutions the Arrhenius equation more accurately describes the dependence of the limiting equivalent conductivity on temperature than the well-known linear Kol'rausch equation.

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