Full Paper ____________________________________ *Thematic Section:* Research into New Technologies.
Reference Object Identifier – ROI: jbc-01/18-54-5-120 *Subsection:* Electrochemistry.
The Digital Object Identifier – DOI: 10.37952/ROI-jbc-01/18-54-5-120
Submitted on April 07, 2018.

Thematic course: The study of temperature effect on electrical conductivity of aqueous solutions of electrolytes. Part 5.

Carboxylic and amino acids

© **Vera A. Petrukhina**, **Ekaterina V. Andreeva**, **Pavel I. Fedorov** and **Nikolay I. Kol'tsov***+
Department of Physical Chemistry and Macromolecular Compounds. Chuvash State University of I.N. Ulyanov. Moskovsky Ave., 15. Cheboksary, 428015. Chuvash Republic. Russia.
Phone: +7 (8352) 45-24-68. E-mail: koltsovni@mail.ru

*Supervising author; +Corresponding author

Keywords: aqueous solutions of carboxylic and amino acids, specific and equivalent electrical conductivity, temperature, Arrhenius and Kohlrausch equations.

Abstract

Electrical conductivity is an important property of solutions of various substances. It is associated with the mobility of ions that are formed when the substances dissociate in the appropriate solvents. The electrical conductivity of solutions is judged by the specific χ and equivalent λ electrical conductivities that increase with increasing temperature due to the increase in ion mobility. Among the electrolytes, it is necessary to isolate carboxylic and amino acids that are widely distributed in the plant and animal world. Therefore, it is of interest to study electrical conductivity of their aqueous solutions and the dependence of electrical conductivity on temperature. Most publications related to the study of electrical conductivity of aqueous solutions of carboxylic acids are devoted to the temperature effect on the specific electrical conductivity of acids at various concentrations. It is shown that activation energy of specific electrical conductivity of acids depends on the nature and concentration of the electrolyte as well as the temperature of the solution. However, the activation energy should depend on the nature of the electrolyte and should not depend on the concentration and temperature of the electrolyte solution. Therefore, we have proposed another approach to study temperature effect on electrical conductivity of aqueous solutions of electrolytes. This approach is based on the study of temperature effect on the equivalent electrical conductivity of electrolytes' solutions at infinite dilution $\lambda\infty$ and the description of the experimental data $\lambda\infty$ (T) by the exponential Arrhenius equation. In given paper the possibility of describing the experimental data $\lambda\infty$ (T) for aqueous solutions of some carboxylic and amino acids is also studied by this equation. It is shown that the Arrhenius equation with found values of activation energy adequately describes the dependence of limiting equivalent conductivity on temperature for aqueous solutions of aminoacetic, 2-aminopropane, maleic, malic, lactic, tartaric, aspartic and citric acids.

References

[1] A. Apelblat, M. Bester-Rogak, J. Barthel, R. Neueder. The analysis of electrical conductances of aqueous solutions of polybasic organic acids. Benzenehexacarboxylic (mellitic) acid and its neutral and acidi salts. *J. Phys. Chem. B*. **2006**. Vol.110. No.17. P.8893-8906.
[2] M.V. Demidova, T.N. Ponomareva, N.N. Barbotina. Electrical conductivity of concentrated water solutions of chloroacetic acid. *Success in Chemistry and Chemical Technology. Collection of scientific papers*. Moscow: D. Mendeleyev University of Chemical Technology of Russia. **2007**. Vol.21. No.3 (71). P.54-57. (russian)
[3] E.N. Shubnyakova, T.N. Ponomareva, N.N. Barbotina. Electrical conductivity of concentrated water solutions of mixtures of glycine and acetic acid. *Success in Chemistry and Chemical Technology. Collection of scientific papers*. Moscow: D. Mendeleyev University of Chemical Technology of Russia. **2007**. Vol.21. No.4(72). P.45-49. (russian)
[4] T.N. Ponomareva, N.N. Barbotina. Conductivity of concentrated aqueous solutions of some associated electrolytes. *Success in Chemistry and Chemical Technology. Collection of scientific papers*. Moscow: D. Mendeleyev University of Chemical Technology of Russia. **2008**. Vol.22. No.3(83). P.107-110. (russian)

[5] V.A. Petruhina, T.A. Kurnaleva, D.A. Egorova, and N.I. Koltsov. Investigation of the influence of temperature on electrical conductivity of aqueous solutions of electrolytes. Part 1. Strong electrolytes. *Butlerov Communications.* **2016**. Vol.45. No.1. P.107-109. DOI: 10.37952/ROI-jbc-01/16-45-1-107
[6] V.A. Petruhina, T.A. Kurnaleva, D.A. Egorova, A.S. Vasileva, and N.I. Koltsov. Investigation of the influence of temperature on electrical conductivity of aqueous solutions of electrolytes. Part 2. Weak electrolytes. *Butlerov Communications.* **2016**. Vol.45. No.1. P.110-112. DOI: 10.37952/ROI-jbc-01/16-45-1-110
[7] V.A. Petrukhina, E.V. Andreeva, and N.I. Koltsov. Investigation of the influence of temperature on electrical conductivity of aqueous solutions of electrolytes. Part 3. Nitrates. *Butlerov Communications.* **2017**. Vol.49. No.1. P.104-107. DOI: 10.37952/ROI-jbc-01/17-49-1-104
[8] V.A. Petrukhina, E.V. Andreeva, and N.I. Koltsov. Investigation of the influence of temperature on electrical conductivity of aqueous solutions of electrolytes. Part 4. Acetates and phosphates. *Butlerov Communications.* **2018**. Vol.53. No.2. P.140-144. DOI: 10.37952/ROI-jbc-01/18-53-2-140