TEMPERATURE DEPENDENCE OF pH RELAXATION TIME IN AQUEOUS SALT SOLUTIONS WITH DISSOLVED CARBON DIOXIDE

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To investigate the physical nature of optimal temperature, lower and upper temperatures for the life interval of warm-blooded organisms we have considered the relaxation time of the pH parameter in dilute aqueous NaCl solutions in contact with atmospheric carbon dioxide. For this purpose, the establishment of equilibrium distribution of carbon dioxide in aqueous salt solutions in contact with atmospheric air starting from some time is investigated. More precisely, the relaxation time of carbon dioxide, as a function of temperature and pH, is investigated. It is found that the pH relaxation time is a very nontrivial function of temperature, pH values and sodium chloride concentration. We have shown that all characteristic temperatures correspond to the minimum value of the relaxation time considered as a function of temperature and pH. Using selection principle and our experimental data, we have shown that the lower and upper temperature limits for their possible activity are close to 30°C and 42°C, respectively [1].

Main attention is paid to the definition of the reducible and irreducible components of pH in aqueous salt solutions and to the determination of their temperature and concentration dependences. It is shown that the temperature dependence of the reducible pH component in dilute aqueous solutions of sodium chloride has a linear character and differs from that in pure water only by the value of its slope, which increases, as the salt concentration grows. At the same time, the temperature dependence of the irreducible pH component is non-monotonic and has a minimum in vicinity of 37°C that is optimal for the human and mammalian life activities [2]. The existence of a characteristic salt concentration dividing the family of the temperature dependences of pH into two subfamilies with different behaviors of their temperature dependences has been established.

[1] L.A. Bulavin, N.P. Malomuzh, O.V. Khorolskyi. Temperature and concentration dependences of pH in aqueous NaCl solutions with dissolved atmospheric CO_2. *Ukrainian Journal of Physics*, **2022**, 67(12), 833–840. https://doi.org/10.15407/ujpe67.12.833

[2] L.A. Bulavin, N.P. Malomuzh, O.V. Khorolskyi. Reducible and irreducible components of the pH value in dilute aqueous solutions of sodium chloride. *Ukrainian Journal of Physics*, **2023**, 68(3), 177–183. https://doi.org/10.15407/ujpe68.3.177