THERMAL RESISTANCE OF SUPERHEATED AQUEOUS SOLUTIONS

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The report is dealt with an experimental verification of the hypothesis of L. P. Filippov on the relationship between the additional thermal resistance of solutions (with respect to the additive law) and their excess volume. Earlier, the fact of such relationship was confirmed for solutions with a positive value excess volume. In this study, solutions with a negative excess volume are considered.

The technique consists in recording the parameters of the response to pulse heat release for the given parameters of the heating function and their subsequent comparison with the additive values. The source of heat and a sensitive element is a wire probe — resistance thermometer. According to the primary data measured in the experiment, the values of the weight-average temperature of the probe $T(t)$, the power of its heating $P(t)$, the density of the heat flux through its surface $q(t)$, and the thermal resistance of the substance $R_\lambda = \Delta T(t)/q$ are calculated for a given timing t.

According to the presented technique, experiments were carried out with pure substances and water—glycol solutions (ethylene glycol, diethylene glycol, triethylene glycol) at atmospheric pressure and temperatures of 90°C, 120°C, 150°C. The last two temperatures are in the region of superheated states of solutions with a significant water content.

It is found that the heat transfer characteristics of solutions with negative excess volume have negative deviations from additive values. This circumstance indicates the existence of additional thermal resistance in solutions of this type. A qualitative correlation was also found between the value of the additional thermal resistance and the value of the excess volume of the solutions.