Thermodynamic Properties of New Environmentally Acceptable Working Fluids for Thermally-Driven Refrigerators

A.N. Shahverdiyev and A.T. Bulgan
Department: "Thermotechnics and Thermoinstallations"
Huseyin Javid Avenue
Azerbaijan Technical University
25. Baku, Azerbaijan

Importance of the thermal energy facilities is increasing more and more with the use of the alternative power sources. Dehydrated solutions are considered as ecologically pure working substances in facilities using such alternative power sources as solar energy, geothermal waters, etc.

Recently, much attention is paid to the development of new working substances, taking into account ozone hole problems and cycles for the refrigerators. In this connection the study of the new working substances has considerable practical and theoretical importance. These new working substances should respond to both traditional and definite thermodynamical requirements. An experimental investigation of the thermophysical properties allows reliable information on temperature, pressure and concentration dependences of these properties for the binary and multicomponent solutions to be obtained.

The experiments were carried out in a facility using the constant-volume piezometer method. In the facilities for the measurement of the thermodynamic properties, the reliability of the applied technique is controlled by the periodic measurements of the saturation pressure P_σ of water and the obtained data of P_σ are compared with the MST data. According to this comparison, errors are within acceptable norms. Errors of measurements of pressure, temperature and specific volume are $\Delta P = 0.05\%$, $\Delta T = 0.0I$ -0.02 K, and $\Delta v = 0.08$-0.1%, respectively.

Solutions under investigation were prepared by weighting. Experiments were conducted with methanol with the mark "chemically pure" and salts LiBr and LiCI with the mark “MERCK." Graphoanalytical analysis of changing properties of the substances under investigation is performed.

Based on the reliable experimental data, some new equations, aimed at the description of the investigated properties are proposed. These state equations allow calculation of the main thermodynamic properties of the system under consideration.