EQUATIONS FOR CALCULATIONS LIQUID-VAPOR EQUILIBRIUM IN BINARY MIXTURES CONTAINING METHANE

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Some authors investigated experimentally the liquid-vapor phase equilibrium in binary mixtures containing methane, but did not describe analytically obtained data. Therefore we fulfilled the analytical description of experimental data on phase equilibrium in binary mixtures helium-methane, argon-methane and carbon dioxide-methane. The compiled equations represent the pressure of liquid or vapor as a function of temperature and composition and contain from 4 to 6 coefficients.

At compiling equations the program was used that provides optimization of coefficients of equations number without significant reducing the accuracy of experimental data approximation. The program provides the selection of the most significant coefficients from the bank, which contains 30 coefficients.

For the mixture helium-methane 305 experimental values of pressure for liquid and vapor from 4 sources were used in the intervals of temperature 93...191 K and pressure 0,48...26,22 MPa. For the mixture argon-methane 168 values of pressure for liquid and vapor from 4 sources were used in the intervals of temperature 90...126 K and pressure 0.016...3.87 MPa. For the mixture carbon dioxide-methane 184 values of pressure from 4 sources were used in the intervals of temperature 219...293 K and pressure 0,58...8,52 MPa. For liquid and vapor, almost equal quantity of data is obtained.

The standard deviations of the experimental values of pressure from the calculated values are from 1.8 to 5.3%. The greatest deviation is observed for the mixture helium-methane due to a sharp increase of pressure on the isotherms depending on the composition. Constructed histograms of deviations indicate that the distribution of deviations is close to normal.

Equations allow to determine the composition or temperature of phases at given values of the remaining parameters of phase equilibrium. Calculations of the composition and temperature of the coexisting phases showed quite satisfactory agreement of the calculated values with the experimental data.