

Equation of State and Phase Behavior of a Difluoromethane - Pentafluoroethane Mixture

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Binary mixture of difluoromethane (R32) and pentafluoroethane (R125) corresponds to the requirements for new ozone-safe refrigerants. Therefore we derived the equation of state on the basis of experimental data for this mixture by method of Lemmon and Jacobsen (1999). The experimental data for mixture R32/R125 include 2973 p, ρ, T, x points from 18 sources at 200-400 K and 0,02-39 MPa for 19 values of composition, 302 points in saturation from 10 sources at 205-340 K for 29 compositions and 388 values of isochoric heat capacity at 207-397 K and 4-33 MPa. For satisfaction of phase equilibrium condition data on 43 isotherms at 223-340 K were used. At calculations the reliable equations of state for the components were used. The coefficients of interaction function for mixture were defined on the basis of step-wise regression analysis proposed by Reuck and Armstrong (1979). The root mean square deviation of density values calculated by compiled equations of state from experimental data is equal 0.25% and of c_v values — 1,10 %. Thermodynamic properties of mixture were calculated by equation of state for four values of composition for the temperatures 200-400 K and pressures 0.1-39 MPa. The p, T, x diagram was plotted in order to analyze the thermodynamic behavior of the R32/R125 mixture at the phase equilibrium state. The temperature differences of saturated vapor and liquid on isobars were analyzed in order to estimate quantitatively the behavior of this mixture in the saturation state at various compositions. This enables to maintain optimum values of the temperature difference between water or air and refrigerant upon its condensation and between a cooled object and vaporizing refrigerant. The analysis shows, that this mixture is applicable as refrigerant over a wide range of compositions.