PVT – Properties and Phase Equilibria for the Binary N-Pentane + Water System

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An investigation of the PVT properties of the binary n-pentane + water system was made in the ranges of concentration (x) 0 to 0.2143 mole fraction water, temperatures (T) 300 to 680 K, and pressures (P) up to 60 MPa, with a constant-volume piezometer. The experiment is carried out along isochores in a wide region of densities for six compositions. For each composition, the measurements are made along 8-9 isochores. The intervals of parameters studied cover the area of the inferior loci of critical points, including the upper critical end point (UCEP) with parameters: T = 463.85 K, P = 4.57 MPa.

The dependence of pressure along isochores of the points of inflection and breaks relevant to phase transitions (liquid-liquid and liquid – vapor) are observed. Values of the temperatures of the points of inflection and breaks in the curves of phase equilibria (liquid-liquid and liquid – vapor) in coordinates T(r) are constructed.

In accordance with the equality of concentration, the critical parameters (temperature, pressure) associated with liquid-liquid and liquid - vapor transitions are close to each other and at a concentration 0.2087 mole fraction of water, they merge in the UCEP. For compositions with concentration 0.2143 mole fraction of water, a line of liquid - vapor phase equilibria crosses with an increase of temperature in the area of high pressures without a hint of a critical point, pointing to the beginning of the area of breaking of a line of critical points.

The lines of phase equilibrium were described with the help of scaling equations. Cubic equations of state have been used to represent the experimental PVT data.

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