

Measurements of the Critical Parameters for Propane

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PVT properties and vapor pressures for propane are measured by a metal-bellows variable volumometer with optical cell in the vicinity of the critical point, keeping the temperature constant. The experimental uncertainties in temperature, pressure and density measurements are estimated to be ± 4.8 mK, ± 0.70 kPa and ± 0.42 kg/m³, respectively, at a 95 % confidence level. In this study, the meniscus disappearance and the critical opalescence for propane have been observed, and the digital images transformed from the pictures have been analyzed in order to determine the critical parameters of propane. Variation of the luminance along the vertical axis shows a convex form in a single phase region, whereas it shows a minimum at the position where the meniscus exists.

We had fully attention for the purification of the sample. The purity of the sample used was reported to be better than 99.99 vol%. Sample is purified further by degassing five times by freeze-thaw cycling before loading. The influence of impurities often appears in the vicinity of the critical point. When impurities are contained in the pure sample, vapor pressure does not show fixed value due to the change in the density. So we measured vapor pressures at 320 K, 343.1315 K, 369 K and 369.6252 K. The data confirm the effect of impurities in the sample for the vapor pressure is negligible.

We have been observing carefully the critical phenomena in the temperature range from 369.950 K to 370.050 K at an interval of 10 mK at densities from 218 kg/m³ to 228 kg/m³ at an interval of 1 kg/m³. We will propose the critical parameters for propane by the image analysis on the basis of these observations.