Precise Measurements of p rho Tx Properties for CO_2-Propane Systems in the Temperature Range from (280 to 440) K at Pressures from (1 to 200) MPa

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To solve the problem of global warming, reasonable and safe natural working fluids such as CO_2, hydrocarbons, ammonia, and their mixtures should be proposed. In this study, we aim to elucidate reliable and new measurement data for CO_2/propane binary mixtures in higher range of temperatures and pressures, including the liquid and super-critical ranges, using the metal-bellows valuable volumometer. The purity of the CO_2 and propane sample was 99.99 vol% and 99.99 mol%, respectively. The expanded uncertainties (k=2) in temperature, pressure, and density measurements have been estimated to be less than 3 mK, 1.5 kPa ($p \leqq 7$ MPa), 0.06 % (7 MPa $< p \leqq 50$ MPa), 0.1 % (50 MPa $< p \leqq 150$ MPa), and 0.2 % ($p > 150$ MPa), and 0.09 %, respectively. In region more than 100 MPa at 280 K and 440 K, the uncertainty in density measurements rise up to 0.13 % and 0.22 %, respectively, due to the uncertainty in density of IAPWS-95 formulation of water[1] used for the calibration of the inner volume of the bellows container. In this presentation, we will report new measurement results of (p, r, T, x) property for CO_2/propane binary mixtures. Moreover, the excess molar volumes will be calculated based upon only the experimental data, and the results will be discussed by comparing with the available equations of state.

[1]W. Wagner, A. Pruss, *J. Phys. Chem. Ref. Data*, 31(2002) 387-535