Vapor-Liquid Equilibrium Measurements of Binary Refrigerant Blends R1234yf + R1123, R1132(E), R32, and R1243zf

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R1234yf (2,3,3,3-tetrafluoroprop-1-ene, $CF_3CF=CH_2$) is expected to be a promising low-GWP HFO (hydrofluoroolefin) refrigerant as a R134a alternative, and refrigerant blends containing R1234yf are attractive in terms of flammability suppression. In this study, the binary refrigerant blends R1234yf + R1123, R1132(E) R32 [1-3] and R1243zf were measured from 263 to 323 K on the basis of a recirculation method with some additional data. A sample of the refrigerant blends was filled into an equilibrium cell (≈ 163 cm^3) equipped with optical windows in the vapor-liquid equilibrium condition, and the saturated vapor and liquid samples were extracted from the top and bottom of the equilibrium cell in small quantities into collection containers. The compositions of each sample were measured by a gas chromatograph (GC) with a thermal conductivity detector (TCD) and Porapak-Q column. The expanded uncertainties in the temperature, pressure, and mole fraction are estimated to be 10 mK, 3.0 kPa, and 0.007 $mol \cdot mol^{-1}$ (k = 2), respectively. Based on the systematic measurements of the binary blends containing R1234yf, a simple cubic equation of state (EOS) and the latest multi-parameter Helmholtz-energy EOSs for the blends were compared with the experimental data.

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References

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