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Measurements and Modeling of Vapor-Liquid Equilibrium Properties for Low GWP refrigerants R1123/R1234yf/R32 Ternary Mixtures

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Key Word (3 words)

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Abstract (less than 300 words)

There is an immediate need to replace existing refrigerants that have significant greenhouse effects with next-generation, low-GWP type refrigerants. While preserving refrigerant performance, to reduce flammability and / or toxicity and to improve compatibility with lubricating oils, various multi-component refrigerant mixtures are potential candidates. In this study, regarding the HFO1123/HFO1234yf/HFC32 ternary mixtures, we performed precise measurements of vapor-liquid equilibrium properties and tried to verify the reliability of two kind of thermodynamic property models. Measurements were conducted at temperatures from 303.15 to 328.15 K and at saturation pressures up to 3.7 MPa. The expanded uncertainties (k = 2) in temperature, pressure, and component measurements were estimated to be less than 0.03 K, 1.4 kPa, and 0.43 mol%, respectively. One of the models used is the Helmholtz-type equation of state with the latest parameters. We used this equation of state to predict the VLE data for the ternary mixtures. Another model is the Peng-Robinson equation of state modified by Mathias and Copeman. We used the optimized parameters of pures and binary mixtures published by the present authors, for the present calculations of each ternary mixtures without any additional parameters specified to the ternary mixtures. Systematic comparisons between the predicted values and the present measurement results for the ternary mixtures will be discussed.

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