Liquid and Vapor Density Measurements of Refrigerant Blends Containing Hydrofluoroolefins from T = (230 to 400) K with Pressures to 20 MPa

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Our current work is focused on characterizing the performance of potential replacements for HFC-134a in air conditioning equipment; specifically, non-flammable binary refrigerant blends with zero ozone depletion potential (ODP) and global warming potential (GWP) less than that of HFC-134a. In this work, the pressure-density-temperature-composition (p-ρ-T-x) data of two compositions for each of three binary refrigerant blends (HFO-1234yf/HFC-134a, HFC-134a/1234ze(E), and HFO-1234yf/1234ze(E)) were measured in both the liquid and vapor phases using a two-sinker, magnetic-suspension densimeter. Single-phase liquid densities were measured over a temperature range of (230 to 400) K and pressures up to 20 MPa; for refrigerant blends containing HFO-1234yf the maximum pressure was limited to 8 MPa. Single-phase vapor densities were measured over a temperature range of (253 to 293) K and included determination of the dew-point. Experimental data, including an assessment of the associated expanded uncertainties, will be presented. Additionally, measurement results will be compared to available literature data and to existing equations of state and mixture models.