

Measurements of Thermophysical Properties for HCFO-1233zd(E)

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Power generation systems using organic compounds with low boiling temperatures as working fluid (organic Rankine cycle) is one possible solution to utilize low-grade waste heat. Although HFC-245fa has been popular working fluid for organic Rankine cycles, it has a large value of GWP (Global Warming Potential). Recently produced refrigerant HCFO-1233zd(E) is expected as an alternative for HFC-245fa. At this time, however, available experimental data of this new refrigerant is very limited. In this work, measurements of thermophysical properties for HCFO-1233zd(E) are conducted using three different apparatuses to cover wide range of temperature and pressure. The first apparatus has two constant volume cells with a pressure sensor on the basis of the extracted method to measure vapor pressures and saturated densities in the temperatures from 300 K to 400 K. The second apparatus has a constant volume cell designed for operating at high temperatures and high pressures on the basis of the isochoric method to measure PVT properties in the temperatures from 323 K to 523 K and pressures up to 10 MPa, including the critical region. The final apparatus is based on a metal bellows method to measure densities of the compressed liquid. Vapor pressures, saturated liquid and vapor densities, and PVT properties covering the critical region are obtained from the apparatuses. Based on the present data, correlations for the properties are formulated. In addition, the critical parameters, normal boiling temperature, acentric factor, and heat of vaporization are derived from the present data, and the validity of these properties are also discussed.