

Measurements of the Surface Tension for 2,3,3,3-Tetrafluoropropene(HFO-1234yf)

Kouhei Takahashi^{C, S}

Graduate School of Science and Engineering, Iwaki, Fukushima, Japan

Katsuyuki Tanaka and Yukihiro Higashi

Department of Mechanical Systems and Design Engineering, Iwaki Meisei University, Iwaki, Fukushima, Japan

The surface tension for 2,3,3,3-tetrafluoropropene(HFO-1234yf) was measured by the differential capillary-rise method. Two capillaries with inner radii of 0.4222 ± 0.0009 mm and 0.7526 ± 0.0009 mm were placed vertically in the pressure vessel. After the sample is filled into the pressure vessel, the sample rises inside these capillaries due to the surface tension and the capillary-rise difference of the sample was obtained from the measurement of the height difference of the meniscus bottom of two capillaries by the traveling microscope. The surface tension can be obtained from the capillary-rise difference, inner radii of capillaries, gravity acceleration, and saturated densities. As for the calculation of the saturated densities, Peng-Robinson equation of state for saturated vapor density and Hankinson-Thomson equation for saturated liquid density were used. Twenty-nine data of surface tension for HFO-1234yf were obtained in the temperature range from 273 K to 338 K. The experimental uncertainties of temperature and surface tension are estimated to be within ± 20 mK and ± 0.1 mN/m, respectively. On the basis of the present data, the surface tension was correlated as a function of temperature by a van der Waals-type correlation. The standard and maximum deviation of the surface tension from the present correlation were 0.06 mN/m and 0.13 mN/m, respectively.