

Vapor Pressure Measurements and Correlation for Trans-1-Chloro-3,3, 3-trifluoroprop-1-ene (R1233zd(E))

Shuhao Li^S, Fufang Yang, Kai Zhang, Yuanyuan Duan^C and Zhen Yang

Key Laboratory for Thermal Science and Power Engineering of Ministry of Education, Beijing Key Laboratory for CO₂ Utilization and Reduction Technology, Tsinghua University, Beijing, China
yyduan@tsinghua.edu.cn

Global warming is prompting the development of working fluids with low global warming potential (GWP). R1233zd(E) possesses many environmental protection features, such as GWP of 7, low ozone depletion potential (ODP) of 0.0005. It also has a short atmospheric lifetime of 30 to 40 days, for the existence of carbon-carbon double bond in the molecular structure. Being nonflammable and nontoxic, R1233zd(E) is classified to ASHRAE class A1. Thus, as an alternative to 1,1,1,3,3-Pentafluoropropane (R245fa), R1233zd(E) can be used as the working fluid for the organic Rankine cycle system (ORCs) and also as a new refrigerant in refrigeration systems. For the proper design of ORCs and refrigeration systems, especially in evaporation and condensation processes, reliable vapor pressure data are necessary. In this work, 52 vapor pressure data points of R1233zd(E) were measured over the temperature range from (253 to 423) K and over the pressures from (18 to 2736) kPa using a static method.^[1] The volume of apparatus is 500 mL. The expanded uncertainty with a 95 % level of confidence (k=2) in temperature measurement was estimated to be 6.6 mK, and in pressure measurement was estimated to be 0.9 kPa. Experimental data of this work and from the literature are evaluated and fitted to a Wagner-type vapor equation with five coefficients, and compared to other available experimental data and correlations.

References:

[1] An Baolin, Yang Fufang, Duan Yuanyuan, Yang Zhen. Measurements and New Vapor Pressure Correlation for HFO-1234ze(E). *Journal of Chemical and Engineering Data*, 2017, 62(1): 328-332.