

Vapor Pressure for Three Fluorinated Propanes and the Effects of Impurities on Experimental Results

XiaoJuan Feng^S and XinHao Xu

Key Laboratory for Thermal Science and Power Engineering of Ministry of Education, Tsinghua University, Beijing, China

Hong Lin

Heat Division, National Institute of Metrology (NIM), Beijing, China

YuanYuan Duan^C

Key Laboratory for Thermal Science and Power Engineering of Ministry of Education, Tsinghua University, Beijing, China

Hydrofluorocarbons (HFCs) are promising alternatives for chlorofluorocarbon (CFCs) and hydrochlorofluorocarbons (HCFCs) as refrigerants, blowing agents, fire extinguishing agents, etc. The vapor pressure for three important fluorinated propanes, 1,1,1,2,3,3,3-heptafluoropropane (HFC-227ea), 1,1,1,3,3,3-hexafluoropropane (HFC-236fa) and 1,1,1,3,3-pentafluoropropane (HFC-245fa) were measured precisely with an improved PVT property measurement system from (234 to 303) K, (239 to 398) K and (235 to 427) K, respectively. The repeatability of vapor pressures was better than ± 50 Pa and the uncertainty of the vapor pressures was estimated to be ± 100 Pa. Unexpectedly, obvious discrepancies between the experimental results and other literature data were found at temperatures below 260 K and near the critical region. The experimental samples from different companies were analyzed with a gas chromatography, and less than 0.02 % impurities were found. The effects of the impurities on vapor pressure were considered to develop the Wagner-type vapor pressure equation from the experimental results. Critical pressure, normal boiling point and acentric factor of the three substances were also obtained according to the vapor pressure equation.