

Viscosity of Gaseous 1,1,1,3,3-Pentafluoropropane (HFC245fa)

Xiaopo Wang, Jiangtao Wu^C and Zhigang Liu^S

*Center of Thermal & Fluid Science, School of Energy and Powering Engineering, Xi'an Jiaotong University,
Xi'an, Shaanxi, China*

Due to the negative environmental impact of chlorofluorocarbons (CFCs), the Montreal Protocol has specified a schedule for the phase-out of CFCs. Thus, the thermophysical properties and environmental characteristics of HFC245fa make it suitable for a number of applications such as centrifugal chillers for comfort cooling, Rankine Cycle for energy recovery and power generation, and sensible heat transfer in low-temperature refrigeration. It also has zero ozone depletion potential and a low global warming potential. So, this refrigerant is currently considered to be a promising replacement for chlorine-containing compounds such as 1,1-dichloro-fluoroethane (R141b) and 1,2-dichloro-1,1,2,2-tetrafluoroethane (R114). For serious application, the availability of its physical properties is a necessity. Several publications have already dealt with the compressed and saturated liquid densities, static dielectric constant, vapor pressure, thermal conductivity and liquid viscosity. But to the author's knowledge, there are no experimental data reported in the literature on the gaseous viscosity of HFC245fa. In this work, the viscosity of gaseous HFC245fa was measured with an oscillating disk viscometer of the Maxwell type from 300.15 to 396.15 K at pressures up to 1.6 MPa. The data obtained are relative to the viscosity of nitrogen. The estimated accuracy of the measured results is $\pm 1.0\%$. Two empirical equations for the viscosities were obtained, one is for the atmospheric viscosities as a function of temperature, and the other is for the viscosities in the whole range of the present measurement as a function of temperature and density. And the same time, the intermolecular potential parameters, σ and ϵ , were determined from the viscosity data at 0.1 MPa.