Measurements of Thermal Conductivity and Viscosity of Two New Refrigerants

Alexandre Grebenkov [C, S]
UNDP Minsk Country Office, Kyoto Capacity Building Project, Minsk, Belarus

Rajiv Singh
Honeywell Fluorine Products, Honeywell International Inc., Morristown, NJ, U.S.A.

Vladimir Saplitsa
Joint Institute for Power & Nuclear Research, Laboratory of Thermophysical Properties, Minsk, Belarus

Nikolay Lapardin
Odessa National Academy of Food Technologies, Odessa, Ukraine

Olga Beliayeva
Joint Institute for Power & Nuclear Research, Laboratory of Thermophysical Properties, Minsk, Belarus

Unfortunately, not all of new working fluids are ready for immediate introduction because of lack of their properties over a wide range of parameters. This is especially relevant to the thermal conductivity coefficient and viscosity, which are the most important but also the most difficult thermophysical properties for modeling and measurements. The main objective of this study is to directly measure the thermal conductivity and viscosity of two working fluids HFO-1234ze (trans-1,1,1,3-Tetrafluoropropene) and Fluid H (a blend of 2,3,3,3-Tetrafluoropropene and Trifluoromethyliodide) developed by Specialty Materials Division, Honeywell International Inc. To achieve this goal, direct measurements of the following properties were carried out for each of these fluids: (i) thermal conductivity in the liquid and gas phases over the temperature range from 255 K to 425 K and at pressures up to 20 MPa; (ii) viscosity in the liquid and gas phases over the temperature range from 225 K to 375 K and at pressures up to 6 MPa; (iii) vapor-liquid phase equilibrium parameters over the temperature range from 245 K up to the critical temperature; (iv) density in the liquid phase over the temperature range from 245 K to 375 K and at pressures from saturated curve up to 6 MPa. In order to generalize the data obtained, the well known models were applied. By the end of the study, reference data tables and equation parameters were compiled in a form suitable for a potential user.