# THERMAL CONDUCTIVITY INVESTIGATION OF R-125/R-134a (39/61) MIXTURE IN THE VAPOR PHASE

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Ozone-friendly mixture of 39.2 mass % pentafluoroethane (R-125) and 60.8 mass % 1,1,1,2-tetrafluoroethane (R-134a) was investigated in the work. The relevance of developing new mixtures and studying their thermal conductivity is grounded by the continuous search for compositions with the optimal combination of high efficiency, availability, environmental safety and ease of use. This mixture was prepared in the laboratory by the weight method, the maximum weighing error being 0.1 g.

Thermal conductivity measurements were performed by the stationary method of coaxial cylinders in the temperature ranges from 320 to 415 K and pressures ranges from 0.1 MPa to 1.8 MPa. The measurement technique and the experiment procedure are described in detail in [1]. The measuring cell consisted of two vertical coaxial nickel cylinders: the external, 140 mm long, and the internal, 101.3 mm. The width of the annular gap between the cylinders was equal to 0.366 mm. We used copper-constantan thermocouples to measure the temperature of the cylinders and the temperature drop difference between them. The influence of the free ends on the thermal conductivity values was accounted by entering the respective corrections [1]. We filled the measurement cell with the investigated mixture from the liquid phase, thus avoiding the variations in the mixture composition. The error of the experimental data on the thermal conductivity was equal to 1.5–2.5%, while that on the temperature was 0.05 K and that on the pressure was within 4 kPa.

The measurement results were processed by an empirical dependence

$$\lambda(T,p) = a_0 + a_{10}\cdot\frac{T}{100} + a_{20}\cdot\frac{100}{T} + p\cdot(a_{11}\cdot\frac{T}{100} + a_{21}\cdot\frac{100}{T}) + \\ + p^2\cdot(a_{12}\cdot\frac{T}{100} + a_{22}\cdot\frac{100}{T}), \quad (1)$$

where $T$ in K, $p$ in MPa, $\lambda$ in $mW/(mK)$. It is shown that the dependence (1) can be applied in a wide range of parameters from atmospheric pressure to pressure on the condensation line. Reference tables for the temperature and pressure dependences of the mixture thermal conductivity are calculated using equation (1), and their errors are determined.

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1. Verba, O.I. and Gruzdev, V.A. Thermophys. Aeromech. 2002. Vol. 9. no. 3. P. 445.