Thermal Conductivity of {$xCH_4 + (1-x)C_3H_8$} with x = 0.949 for Temperatures from (200 to 423) K and Pressures between (10 and 31) MPa

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The thermal conductivity of {$xCH_4 + (1-x)C_3H_8$} with x = 0.949 was measured at temperatures from (200 to 423) K and pressures between (10 to 31) MPa, using an transient hot-wire method. The measurements were conducted with a recently constructed transient hot-wire instrument. Two 12.5 µm diameter platinum wires of length 23 mm and 57 mm were arranged in opposite arms of a Wheatstone bridge in order to eliminate the end effects arising from axial conduction. These new data on transport properties of natural gas mixtures will assist to achieve more efficient designs of industrial processes and equipment. The data acquisition system (capable of multi-channel sampling at 1 MHz) interrogated several voltages in the circuit simultaneously. The pressure transducer and platinum resistance thermometer were calibrated before the measurement, and the resistances of the two platinum wires were determined as a function of temperature. Performance of the instrument was verified by measuring the thermal conductivity of nitrogen and helium over a range of temperatures and pressures. The results for the thermal conductivity of {$xCH_4 + (1-x)C_3H_8$} with x = 0.949 are compared with the limited literature data [1, 2] and values predicted from the extended corresponding states model implemented in REFPROP 9.1 by plots of deviations from that model.

References

[1] Smith, W. J. S.; Durbin, L. D.; Kobayashi, R. Thermal Conductivity of Light Hydrocarbons and Methane-Propane Mixtures at Low Pressures J. Chem. Eng. Data 1960, 5, 316-21
[2] Cheung, H.; Bromley, L. A.; Wilke, C. R. Thermal Conductivity of Gas Mixtures AIChE J. 1962, 8, 221-228