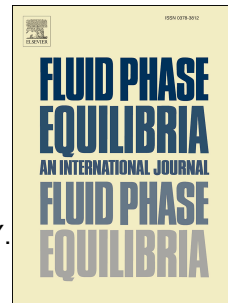


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Thermal Conductivity of Gaseous and Liquid n-Pentane

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ABSTRACT

Measurements of the thermal conductivity of n-pentane performed for the first time, in a coaxial cylinder cell operating in steady state conditions are reported. The measurements of the thermal conductivity of n-pentane were carried out along nine isotherms in the liquid state and fourteen isotherms in the gaseous state. The present data cover the temperature range from 300 K to 620 K and the pressure range from 0.1 to 50 MPa. An analysis of the various sources of error leads to an estimated uncertainty of approximately $\pm 1.5\%$. A comparison is provided with the previous experimental works.

Keywords: n-pentane, gas, liquid, thermal conductivity, transports properties.

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1 INTRODUCTION

The goal of this work is to report new set of data and to provide wide-ranging correlations for the thermal conductivity of n-pentane that are valid over gas and liquid states. Normal pentane is a major component of natural gas and fuels. In the industry n-pentane is mainly used as primary blowing agent in the manufacture of polystyrene foam. In the heat exchanger of geothermal power plants, n-pentane due to its much lower boiling point, is vaporized by the hot geothermal water to control the rotation of the turbines. In some refrigerant circuits, n-pentane can be added as an additive to the refrigerant. Normal pentane is also used as a solvent, and in various industrial applications such as pharmaceutical, petrochemical, paints and coatings. Normal pentane is a solvent commonly used in organic chemistry. In order to design efficient chemical processes and equipment, the chemical industry required truthful thermophysical property data. Moreover, accurate experimental data are needed to develop correlations which can represent the transport properties as functions of temperature and pressure (or density). While hydrocarbons are widely used in the chemical industry, the measurements of the thermal conductivity of n-pentane are very limited compared to other industrial fluids. Moreover, as shown in Table 1, were previous experimental work are listed, most data were reported in the liquid state [1-12].

In Table 1, are reviewed the most important experimental measurements of the thermal conductivity of n-pentane reported in the literature. A more extensive set of publications on

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