Acoustic and Thermodynamic Properties of Binary Liquid Mixture N-Dodecane + N-Hexadecane

Talgat Khasanshin, Vladimir Samuilov, Aliaksandr Shchamialiou [C, S] and Fares Mosbakh
Mogilev State University of Food Technologies, Mogilev, Belarus

This paper deals with experimental results for the speed of sound in liquid binary dodecane + hexadecane mixtures and the calculation of thermodynamic properties at temperatures from 298 to 433 K and at pressures up to 100 MPa. The speed of sound has been obtained using a method of direct time measurement of an impulse traveling through the investigated medium in the temperature range 298–433 K and at pressures 0.1–100 MPa and concentrations 0–100 %. The pressure was measured by dead weight gauge manometers. The temperature was measured by platinum-resistance thermometer. Mixture composition was prepared by a weight method and was kept under control by chromatography analysis before and after measurements. The n-Alkanes used in this study were supplied by Aldrich with a mass purity of the main product greater than 99 %. The error of the experimental data does not exceed 0.1 %. To calculate thermodynamic properties as input data for sound speed we used the results of our measurements performed at atmospheric and elevated pressures together with literature data on density and isobaric heat capacity at atmospheric pressure. Missing values of density and isobaric heat capacity have been obtained on the basis of its correlation dependencies on molecular weight. For convenience of calculation these properties have been represented in analytical form. The algorithm and the program for property calculation of dodecane + hexadecane mixture at high pressures have been developed. The calculation procedure is based on the known relations linking thermodynamic values and acoustic ones. Detailed tables of the recommended values of sound speed, density, isobaric and isochoric heat capacities, isothermal compressibility have been developed for the first time. Calculated values of thermodynamic properties have been estimated. It has been shown that in the range of possible comparison calculated values of density agree perfectly with the experimental values.