

Thermodynamic Properties of 1-Alkenes in the Liquid State

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The speed of sound was measured in the series of 1-alkenes (C_nH_{2n}): 1-hexene, 1-octene, 1-decene, 1-dodecene, 1-tetradecene and 1-hexadecene in the range of temperatures 303–433 K and pressures up to 100 MPa with inaccuracy less than 0.1%. Using the results of our measurements the correlation between speed of sound and molecular structure of 1-alkenes was investigated from $n=6$ to $n=16$ over the temperature range between 303 and 433 K at pressures of 0.1–100 MPa. The method of calculation and prediction of the speed of sound in 1-alkenes is presented. A simple asymptotic formula for the speed of sound as a function of the temperature, the pressure and the number of carbon atoms was derived. This formula can be used to calculate and to predict the speed of sound in the series of 1-alkenes from 1-hexene to higher homologues in the liquid state. Using a grid algorithm [1,2] the tables of thermodynamic properties of alkenes C_6 – C_{16} in the range of temperatures 303–433 K and pressures 0.1–100 MPa from the speed of sound data were calculated. The obtained properties include the speed of sound, the density, the coefficient of thermal expansion, the isobaric and isochoric heat capacities, the coefficient of isothermal compressibility, the enthalpy and the entropy. It is also shown that the Tait equation can be used to represent density of alkenes from 1-hexene to 1-hexadecene. The coefficients of the Tait equation are calculated. This equation describes the most reliable literature data with average deviation less than 0.2%.

- [1] T.S. Khasanshin, A.P. Shchamialiou, and O.G. Poddubskij, *Int. J. Thermophysics* **24**, 1277 (2003).
- [2] T.S. Khasanshin, A.P. Shchamialiou, and O.G. Poddubskij, *High Temp. – High Press.* **35/36**, 227 (2003/2004).