Thermodynamic Properties of Acetone Calculated from Accurate Experimental Speed of Sound Measurements at Low Temperatures and High Pressures

S. Lago[C,S] and P.A.G. Albo
Istituto Elettrotecnico Nazionale "Galileo Ferraris", Torino, Italy
lago@ien.it

Speed of sound measurements in liquid-phase acetone are reported along seven isotherms in a temperature range between 243.15 and 303.15 K and at pressures up to 100 MPa.

Since direct measurements of density and isobaric heat capacity are relatively easy at atmospheric pressure but difficult at elevated pressures, a combination of acoustic measurements and numerical integration offers a well balanced approach to the determination of the thermodynamic properties of liquids. In this combination, the density and heat capacity of the liquid at high pressures are obtained by numerical integration of $(u(T,p))^{-2}$, with initial values obtained at atmospheric pressure as a function of temperature.

The values of the speeds of sound are subject to an overall estimated uncertainty of less than 0.2 %. These results were compared with literature values [1], and both the speed of sound data and the calculated density and heat capacity data were compared with the predictions of a dedicated equation of state [2].

[1] D.I.R. Low and E.A. Moelwyn-Hughes, *Proc. Roy. Soc. Lond., Ser. A* **267**, 384 (1962).
[2] E.W. Lemmon and R. Span, "Short Fundamental Equations of State for 20 Industrial Fluids", submitted to *J. Chem. Eng. Data*, (2005).