Speed of Sound Measurements in Isopentane at Temperatures from (230 to 350) K and Pressures up to 20 MPa

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In the context of climate change, liquefied natural gas (LNG) is an important bridging technology on the path to climate neutrality. For an optimal design of liquefaction and transport processes, as well as for accurate billing at transfer stations, it is highly relevant to know the thermodynamic properties of LNG as accurately as possible. The most recent calculation model for LNG of Thol *et al.* [1] shows that isopentane, even in small amounts, significantly influences the thermodynamic properties of liquid natural gas mixtures. To improve the calculation model, new measurements of binary systems containing isopentane are needed. However, since mixture models are always based on the pure-fluid equations of state of the components involved, the availability of highly accurate pure-fluid equations of state is essential as well. In addition to its occurrence as a trace substance in natural gas mixtures, isopentane is a potential working medium for heat pumps and ORC processes, which creates an additional interest in an improved equation of state.

For the construction of a highly accurate equation of state, the thermodynamic properties density and speed of sound are of particular importance. For isopentane, the existing literature has mainly investigated the speed of sound in the gas phase, while the data situation at liquid states is rather limited. Only El Hawary *et al.* [2] provide a comprehensive data set for the liquid phase.

In this work, the speed of sound in isopentane was measured for a temperature range of (230 to 350) K and pressures up to 20 MPa, confirming the data of El Hawary et al. [2] and complementing the speed of sound data set in liquid isopentane. The measurements were conducted with the pulse echo principle [3] in a single burst method with absolute uncertainties between (0.149 and 0.194) $m \cdot s^{-1}$ and relative uncertainties between (0.014 and 0.023) %.

References

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