Speed of sound measurements and correlation of {(1-*x*)3,3,3-trifluoropropene (HFO-1243zf) + *x*2,3,3,3-tetrafluoropropene (H FO-1234yf)} with *x*= (0.1582, 0.4625, 0.7623) at temperatures from 243.15 to 343.15 K and pressures up to 90 MPa

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In the search for a fourth generation of environmentally friendly refrigerants capable of meeting the numerous requirements of the EU F-Gas Regulation (REGULATION (EU) No. 517/2014) and the Kigali Amendment to the Montreal Protocol, hydrofluoroolefins (HFOs) have attracted increasing interest in the HVAC&R industry as promising alternatives to the established hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs), currently being phased out. Despite their potential in terms of thermodynamic and regulatory requirements, a paucity of data has been found in the literature on the thermodynamic properties of HFOs and their mixtures, which are required for the development of dedicated equations of state (EoS) [1]. In the present study, the speed of sound of the binary mixture {(1-*x*)R1243zf + *x*R1234yf} was measured with a double-path pulse-echo device, previously calibrated with toluene, using literature data from Dhakal et al. [2]. Measurements were made for three mixtures with *x*= (0.1582, 0.4625, 0.7623) along 8 isotherms ranging from 243.15 to 343.15 K and at pressures from near saturation to 90 MPa. The presented data, which to date represent the only available data set for the speed of sound of the selected mixture, were correlated by a dedicated empirical equation as a function of temperature and pressure. Furthermore, the experimental data were used to re-parameterise a Helmholtz free energy EoS which was previously optimised solely on the basis of experimental VLE data [3]. Using the EoS thus improved, good agreement was observed between experimental and correlated data for the binary system, both for speed of sound and VLE measurements.

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Significant references

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