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A Patel-Teja equation of state for R-1224yd(Z) refrigerant

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Despite the limited accuracy, cubic equations are widely adopted in chemical engineering thanks to their simplicity and acceptable accuracy when used for designing thermodynamic machines. In this work, a Patel-Teja equation of state is proposed for modeling thermodynamic properties of cis-1-chloro-2,3,3,3-tetrafluoro-1-propene, also known as R-1224yd(Z). Experimental measurements of vapor pressure and compressed liquid densities have been used to fit the equation parameters and specific heat capacities have been calculated using the equation and the ideal gas specific heat capacities. Differently, speed of sound is obtained using the expression derived from the equation of state, but fitting independent parameters obtained from compressed liquid speed of sound experimental measurements. Predictions of the model have been compared with available experimental measurements, showing deviations better than 0.5 % for vapor pressure, 2 % for compressed liquid densities up to 370 K, better than 1 % for compressed gas densities up to 420 K, better than 2 % for speed of sound in liquid and in vapor phase and better than 5 % for isobaric specific heat capacity.