Derivative Properties from High Precision Equations of State

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In this study, the behaviour of derivative properties estimated by equations of state, including isochoric heat capacity, isobaric heat capacity, speed of sound and the Joule-Thomson coefficient for pure compounds and a mixture, have been investigated. The Schmidt-Wagner and Jacobsen-Stewart equations of state were used for predictions of derivative properties of ten different pure compounds from various nonpolar hydrocarbons, nonpolar cyclic hydrocarbons, polar compounds, and refrigerants. The estimations were compared to experimental data. In order to evaluate the behaviour of mixtures, the extended corresponding states principle (ECS) was studied. Analytical relationships were derived for isochoric heat capacity, isobaric heat capacity, the Joule-Thomson coefficient, and the speed of sound. The ECS calculations were compared to the reference surface data of methane + ethane. The ECS principle was found to generate data of high quality.