A Crossover Multi−Fluid Nonrandom Lattice Equation of State using the sine model

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The classical multi−fluid nonrandom lattice fluid equations of state fail to reproduce the non−analytical, singular behavior of fluids in the critical region by long−scale fluctuations in density. Supercritical fluids are characterized by large inhomogeneity of molecular distribution. The density fluctuation is a suitable parameter for quantitative and direct description of the inhomogeneity from the view of mesoscopic or microscopic scale.

In this research we develop a new crossover multi−fluid nonrandom lattice model using the sine model near to and far from the critical region which incorporates the scaling laws asymptotically close to the critical point and its transformed into the classical lattice fluid equations of state far away from the critical point. We show that, over a wide range of states, the crossover multi−fluid nonrandom crossover lattice fluid equation of state yields a much better representation of the thermodynamic properties of supercritical fluids than the classical lattice fluid equations of state.