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Thermal Lattice Boltzmann Simulations for Vapor-Liquid Two-Phase Flows in Two Dimensions[1] YIKUN WEI, YUEHONG QIAN, Institute of Applied Mathematics and Mechanics, Shanghai University, Shanghai, China, 200072
— A lattice Boltzmann model with double distribution functions is developed to simulate thermal vapor-liquid two-phase flows. In this model, the so-called mesoscopic inter-particle pseudo-potential for the single component multi-phase lattice Boltzmann model is used to simulate the fluid dynamics and the internal energy field is simulated by using a energy distribution function. Theoretical results for large-scale dynamics including the internal energy equation can be derived and numerical results for the coexistence curve of vapor-liquid systems are in good agreement with the theoretical predictions. It is shown from numerical simulations that the model has the ability to mimic phase transitions, bubbly flows and slugging flows.

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