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An improved lattice Boltzmann method for incompressible two-phase flows with large density differences TAKAJI INAMURO, TAKAAKI YOKOYAMA, KENTARO TANAKA, MOTOKI TANIGUCHI, Dept. Aeronautics and Astronautics, Kyoto University — We propose a new LBM for two-phase fluid flows with high density ratios by improving the pressure computing of Inamuro et al.'s method (2004) [J. Comput. Phys. 198 (2004) 628] without solving the pressure Poisson equation. In the proposed method, the velocity and pressure fields are computed by using a single velocity distribution function even for high density ratios and by adjusting the speed of sound in a high density region to satisfy the continuity equation. In order to show the validity of the method, we apply the method to the simulations of a stationary drop, binary droplet collision, rising bubbles, and a milk crown. In a stationary drop, pressure and density profiles are computed, and the effect of a sound speed on time evolution of the pressure field in the drop. In the simulations of a binary droplet collision and rising bubbles, the computed results by the proposed method are compared with those by Inamuro et al.'s method (2004). A thin sheet and tiny drops can be computed in the simulation of a milk crown.

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