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Lattice Boltzmann Method for Liquid-Gas-Particle Systems with Compact Discretization TAEHUN LEE, SAMANEH FAROKHIRAD, City College of CUNY — We have developed a liquid-gas-particle (LGP) lattice Boltzmann method (LBM) that utilizes only the nearest neighbor lattice sites for the computation of intermolecular forcing terms. Previous LGP-LBM requires larger number of lattice sites to model the interaction of fluid interfaces with immersed solid particles. This makes the treatment of contact line on a particle cumbersome when the partially wetting particle interacts with liquid-gas interface. The new model is capable of suppressing spurious currents at equilibrium. Many existing multi-component solvers suffer from spurious currents and the inability to employ components with sufficiently large density differences due to stability issues. Due to their finite size and wetting properties, particles deform an interface locally, which can lead to capillary interactions that dramatically alter the behavior of the system, relative to the particle-free case. We will present the liquid-gas-particle algorithm and its validations, which include two-particles on a flat liquid-gas interface approaching each other due to capillary effects, and a particle-laden drop impact with various impaction velocities.

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