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Computational Analysis of Inkjet Drop Impact on Dry Surfaces with Different Wetting Characteristics TAEHUN LEE, JEFFREY MORRIS, City College of City University of New York — Numerical simulations of micron-scale water drop impact on dry surfaces are carried out over a wide range of impact velocities ($1 \leq We \leq 100$, $100 \leq Re \leq 1,000$, and $Oh \sim 0.015$) and equilibrium contact angles ($6^\circ - 107^\circ$). A two-distribution function lattice Boltzmann equation (LBE) method is employed, which recovers the advective Cahn-Hilliard and the incompressible Navier-Stokes equations for binary fluids. Minimization of the total free energy subject to the polynomial wall free energy implicitly predicts the contact angle and the density profile at solid surfaces. The evolution of the drop on substrate after initial spreading is most sensitive to the wall free energy. Dimensionless diameter and height of the drop obtained from the simulations are compared with experimental results with reasonable accuracy. In inkjet printing, the maximum spreading ratio is an important parameter for its significant effect on the dot size. For higher contact angle surfaces, the maximum spreading ratio based on the wetted surface area is noticeably smaller than the maximum dimensionless diameter that is experimentally measured.

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