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Lattice Boltzmann Simulations of Drop Impact on Heterogeneous Surfaces KEVIN CONNINGTON, The Levich Institute, The City College of New York, TAEHUN LEE, Mechanical Engineering, The City College of New York, JEFF MORRIS, JOEL KOPLIK, The Levich Institute, The City College of New York —
The dynamics of drop impact on heterogeneous substrates is important to understand from a materials research-application perspective. The phenomenon occurs in many situations, from ink-jet printing to fuel injection processes. Since drop impact is a physically complicated process, difficult to understand through experiments and theory alone, it is important to develop methods to study such a process numerically. The impact process poses many computational difficulties as well. Some of these difficulties include the tracking of a liquid-gas interface that undergoes extreme deformation in a short time period, accurately including the effects of surface tension, and realistically resolving the dynamic liquid-gas-solid contact line. Due to its kinetic nature, the Lattice Boltzmann Method(LBM) can incorporate mesoscopic physics into its formulation to resolve these difficulties, which otherwise pose significant problems for traditional continuum solvers. In our simulations, the interface is captured, instead of tracked, by keeping account of an order parameter in the fluid as in the phase field method. Here we discuss our numerical method and report results describing impact on a superhydrophobic surface for drops of large density ratio.

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