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Lattice Boltzmann Modeling of Droplet on Superhydrophobic Wall with Surface Protrusion

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ABSTRACT

The lattice Boltzmann method (LBM) has been extensively utilized in various fields, including the droplet dynamics [1–4]. At present, significant challenges persist in accurately resolving interfacial dynamics during droplet collisions—including deformation [5], breakup process [6] and capturing microscale details [7] of contact line motion during droplet-wall interactions. In this work, the non-orthogonal multiple relaxation time lattice Boltzmann method is used to study droplets impacting superhydrophobic walls with different characteristic of surface protrusion. The horizontal displacement, maximum spreading length, and the contact time are probed in the process of droplet collisions under various conditions of Weber numbers and droplet velocities. These findings offer a deep insight into the dynamic characteristics of droplet impact on superhydrophobic walls with different characteristic of surface protrusion.

KEYWORDS

Droplet; lattice Boltzmann; superhydrophobic; droplet-wall

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