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Movement of a droplet on a structured substrate: a dissipative particle dynamics simulation GUOHUI HU, YI YAO, Shanghai Institute of Applied Math and Mech, Shanghai University — The last decade has witnessed the explosive development of microfluidic systems. They allow the integration of various steps of chemical or biological analyses on a single chip, which significantly minimize reagent volume and material cost. Droplet manipulation is one of the crucial technologies in microfluidic devices design and optimization. The wettability gradient employs an imbalance of surface tension on the circumference of a droplet base, thus it can be applied to actuate a droplet on a substrate in the direction of wetting gradient. In the present study, dissipative particle dynamics is applied to investigate movement of a liquid droplet actuated on a structured substrate. The wetting property ranging from hydrophilic to hydrophobic is implemented by adjusting the coefficient of solid-liquid attraction, which results in variation of solid-liquid surface tension. The structure of internal flow is analyzed based on numerical results, as well as the movement of the contact line. The influences of wettability gradient, thermal fluctuation are intensively discussed, as well as the wall structures.

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