

Abstract Submitted  
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**Jumping Mechanism of Self-Propelled Droplet** YONGSHENG

LIAN, YAN CHEN, University of Louisville — The self-propelled behavior of coalesced droplets can be utilized to enhance heat transfer performance of dropwise condensation. It has been recognized that the droplet self-propelling is the combined result of the conversion of surface energy to kinetic energy and the unsymmetrical boundary conditions imposed on the droplets. However, the roles of boundary conditions, which largely determine the conversion ratio of surface energy to the effective jumping kinetic energy, are not well understood. In this paper we use a numerical approach to investigate the boundary condition effect on the self-propelling behavior. A Navier-Stokes equation solver for multiphase flows is used to describe the flow field. The moment of fluid interface reconstruction technique is applied to resolute the interfaces. A direction splitting method is applied to advect the interface. And an approximate projection method is used to decouple the calculation of velocity and pressure. Comparisons are made with experimental results and show the simulation can accurately capture self-propelling behavior. Our simulation show the vertical flow velocity inside the coalesced droplet can increase the normalized jumping velocity but the contact area between droplets and substrate can decrease jumping velocity. High viscous dissipation is observed at the beginning of the coalescence which reduces jumping velocity.

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