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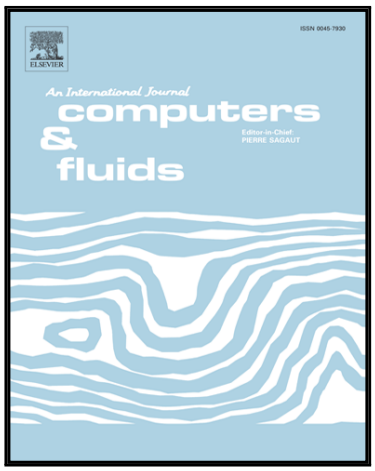

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PII: S0045-7930(17)30147-0
DOI: 10.1016/j.compfluid.2017.04.022
Reference: CAF 3463

To appear in: *Computers and Fluids*

Received date: 9 February 2015
Revised date: 9 April 2016
Accepted date: 21 April 2017

Please cite this article as: Soon Ho Lee , Sung Wan Son , Ho Yeon Choi , Sang-Hu Park , ManYeong Ha , A numerical study on the separation of droplet on the heterogeneous surface, *Computers and Fluids* (2017), doi: 10.1016/j.compfluid.2017.04.022

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A numerical study on the separation of droplet on the heterogeneous surface

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Abstract

The behavior of the hemispherical droplet existing on a heterogeneous surface was investigated using a 3-D Lattice Boltzmann method. Considering the shape where a rectangular hydrophobic surface with width is l and vertical length L exists at the center of a square bottom surface, which is relatively hydrophilic, and of which the length of one side is L. The hydrophilic surfaces on the left and right sides separated by the hydrophobic surface have different contact angles of θ_1 and θ_2 respectively, while the hydrophobic surface located between two hydrophilic surfaces has a contact angle of θ_3. The contact angles θ_1 and θ_2 of two different hydrophilic surfaces considered are in the range from 20° to 70°, while the contact angle θ_3 of hydrophobic surface considered is in the range from 120° to 170°. Whether the droplet is separated or not and the separation time depend on the sizes of the contact angles θ_1 and θ_2 of the two hydrophilic surfaces separated by a rectangular hydrophobic surface and the contact angle θ_3 of the hydrophobic surface. The times spent for separation and movement also depend on the size of the contact angle of each bottom surface, which also has an effect on the amount of the droplet being separated and divided.

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