

Coalescence-Induced Jumping of Multiple Condensate Droplets on Hierarchical Superhydrophobic Surfaces

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OBJECTIVE

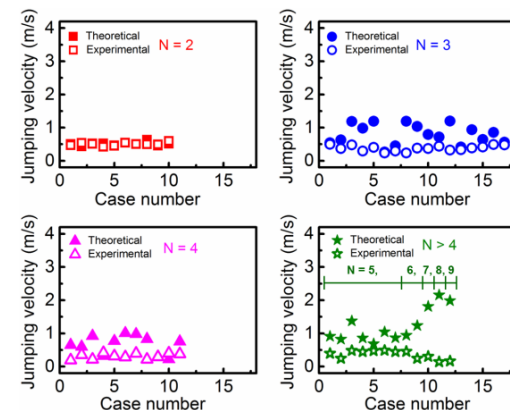
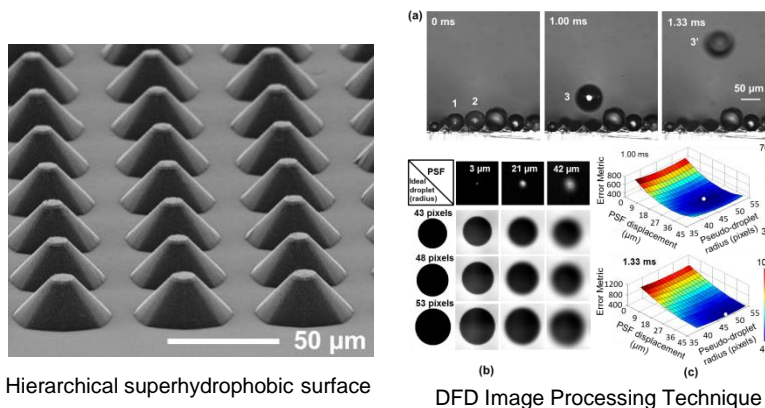
Investigate the dynamics of jumping events induced by coalescence of multiple droplets of different with suitable experimental techniques and develop a theoretical model to explain the underlying physical mechanism.

APPROACH

- Design and fabricate hierarchical superhydrophobic surfaces on silicon substrate.
- Develop a depth-from-defocus (DFD) image processing technique to track the droplet jumping trajectories in three dimensions in order to appropriately characterize the jumping behavior.
- Develop a theoretical model to quantitatively predict jumping velocities.

PUBLICATIONS

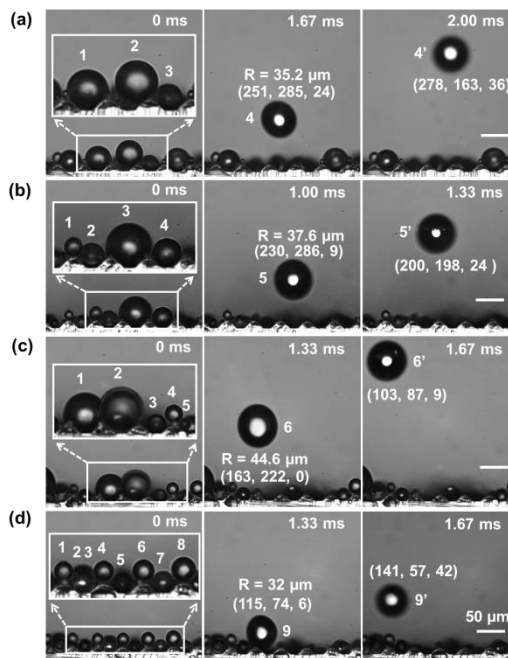
X. Chen, Ravi S. Patel, J. A. Weibel, and S. V. Garimella, *Sci. Rep.*, 6, 18649, 2016.



Comparisons between experimental droplet jumping velocities and theoretical predictions as a function of the number of coalescing droplets.

IMPACT

- The removal of condensate droplets from the hierarchical surface was dominated by the coalescence of multiple droplets.
- The jumping velocity decreases gradually with an increase in the number of coalescing droplets.
- A general model is developed to explain the trends of droplet jumping velocity observed in the experiments.



Selected cases showing droplet jumping induced by the coalescence of (a-d) three, four, five and eight droplets (marked with numbers in the inset images), respectively.