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Coalescence-induced jumping of nanoscale droplets on superhydrophobic surfaces ZHI LIANG, PAWEL KEBLINSKI, Rensselaer Polytechnic Institute, NANOSCALE SCIENCE AND ENGINEERING CENTER TEAM — The coalescence-induced jumping of tens of microns size droplets on superhydrophobic surfaces has been observed in both experiments and simulations. However, whether the coalescence-induced jumping would occur for smaller, particularly nanoscale droplets, is an open question. Using molecular dynamics simulations, we demonstrate that in spite of the large internal viscous dissipation, coalescence of two nanoscale droplets on a super-hydrophobic surface can result in a jumping of the coalesced droplet from the surface with a speed of a few m/s. Similar to the coalescence-induced jumping of microscale droplets, we observe that the bridge between the coalescing nano-droplets expands and impacts the solid surface, which leads to an acceleration of the coalesced droplet by the pressure force from the solid surface. We observe that the jumping velocity decreases with the droplet size and its ratio to the inertial-capillary velocity is a constant of about 0.126, which is close to the minimum value of 0.111 predicted by continuum-level modeling of Enright et al. [R. Enright, N. Miljkovic, J. Sprittles, K. Nolan, R. Mitchell, and E. N. Wang, ACS Nano 8, 10352 (2014)].

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