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Coalescence induced self-propulsion of droplets on superomniphobic surfaces. HAMED VAHABI, WEI WANG, SETH DAVIES, Colorado State University, JOSEPH M.MABRY, Air Force Research Laboratory, ARUN K.KOTA, Colorado State University — We utilized superomniphobic surfaces to systematically investigate the different regimes of coalescence-induced self-propulsion of liquid droplets with a wide range of droplet radii, viscosities and surface tensions. Our results indicate that for all the liquids studied, the transition from the inertial-capillary regime to the visco-capillary regime occurs over a narrow range of Ohnesorge number $Oh \approx 0.02$ to 0.05. The non-dimensional jumping velocity V_j^* is nearly constant ($V_j^* \approx 0.2$) in the inertial-capillary regime and decreases in the visco-capillary regime as the Ohnesorge number Oh increases, in agreement with prior work. Within the visco-capillary regime, decreasing the droplet radius R_0 results in a more rapid decrease in the non-dimensional jumping velocity V_j^* compared to increasing the viscosity μ. This is because decreasing the droplet radius R_0 increases the inertial-capillary velocity V_{ic} in addition to increasing the Ohnesorge number Oh.

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