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Coalescence-induced self-propulsion of viscous droplets on superomniphobic surfaces. HAMED VAHABI, WEI WANG, SETH DAVIES, Colorado State University, JOSEPH M.MABRY, Air Force Research Laboratory, Edwards AFB, ARUN KOTA, Colorado State University — Coalescence-induced self-propulsion has a key role in releasing the liquid droplets thereby preventing flooding on super-repellent surfaces during the condensation. Prior work has identified different regimes (i.e., inertial-capillary regime and visco-capillary regime) of coalescence-induced self-propulsion via altering the size of the droplets of water on superhydrophobic surfaces. However, there are no reports that have employed liquids with a wide range of surface tensions or wide range of viscosities. This is primarily due to the inability of superhydrophobic surfaces to repel low surface tension liquids. In this work, we fabricated superomniphobic surfaces (i.e., surfaces extremely repellent to both high surface tension liquids like water and low surface tension liquids like oils and alcohols) to overcome this limitation. Our results indicate that our superomniphobic surface can repel liquids with surface tension >27 mN/m (e.g., n-hexadecane) and viscosity <220 mPa.s. Utilizing our superomniphobic surfaces, we systematically investigated the coalescence-induced jumping velocity of droplets with various surface tensions and viscosities in the visco-capillary regime and explained the different observations compared to prior work.

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