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Bubbles and droplets with mobile surfaces bounce stronger but coalesce faster[1] FAN YANG, IVANURIEV VAKARELSKI, YUANSI TIAN, King Abdullah University of Science and Technology, ERQIANG LI, University of Science and Technology of China, DEREK CHAN, University of Melbourne, Swinburne University of Technology, SIGURDUR THORODDSEN, King Abdullah University of Science and Technology — Increased hydrodynamic interfacial mobility of bubbles or droplets in multiphase systems are expected to reduce the characteristic coalescence time and thereby change the stability of gas or liquid emulsions, which are of great importance across many industrial and biological fields. High-speed imaging of a bubble bouncing from a pool surface shows that it bounces more strongly from a mobile than an immobile one. We demonstrate this with a controlled collision within a pure fluorocarbon liquid, which produces a series of rebounds prior to a rapid coalescence event. The bubble shows a weaker bounce if the interface is immobile, whereas the final coalescence takes longer. Experiments with a buoyant droplet show similar results. The stronger rebound is due to lower viscous dissipation in the intervening thin film, during the collision when the surfaces are mobile. We also perform Volume-of-Fluid simulations with the Gerris software using extreme local grid refinement, which can reproduce the experiments. This allows us to simulate the head-on collision of two drops, where for certain parameter regime, we counter-intuitively see a full rebound for mobile surfaces, while immobile surfaces can lead to coalescence owing to a second collision driven by the added mass.

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