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Effect of surfactants on bubble collisions with an air-water interface SHIYAN WANG, TIANQI GUO, SADEGH DABIRI, PAVLOS P. VLACHOS, AREZOO M. ARDEKANI, School of Mechanical Engineering, Purdue University, West Lafayette, IN 47907, USA — Collisions of bubbles on an air-water interface are frequently observed in natural environments and industrial applications. We study the coefficient of restitution of a bubble colliding on an air-water interface in the presence of surfactants through a combination of experimental and numerical approaches. In a high concentration surfactant solution, bubbles experience perfectly inelastic collisions, and bubbles are arrested by the interface after the collision. As the surfactant concentration decreases, collisions are altered to partially inelastic, and eventually, elastic collisions occur in the pure water. In a high concentration surfactant solution, the reduced bouncing is attributed to the Marangoni stress. We identify the Langmuir number, the ratio between absorption and desorption rates, as the fundamental parameter to quantify the Marangoni effect on collision processes in surfactant solutions. The effect of Marangoni stress on the bubble's coefficient of restitution is non-monotonic, where the coefficient of restitution first decreases with Langmuir number, and then increases.

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