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Bubbles as leaky pistons: extracting small particles from polydisperse suspensions YINGXIAN YU, SEPIDEH KHODAPARAST, HOWARD A. STONE, Princeton University — Moving air bubbles in liquid-filled geometries act as leaky pistons. When confined in a cylinder, a bubble moves relative to the liquid as a small fraction of the liquid leaks through a very thin annular gap between the bubble and the internal wall of the cylinder. At low velocities the thickness of this lubricating film formed around the bubble is set only by the liquid properties and the translating speed of the bubble, thus can be tuned in a simple fashion. Here, we use these air bubble pistons for extracting small particles from bidisperse microspheres suspensions. Particle extraction occurs when the thickness of the lubricating liquid film falls between the diameters of the two different particles. Initially, when the bubble interface is free of particles, both large and small particles can move into the liquid film region. While large particles will be collected at the bubble interface, small particles can leak through the thin film. As a result, the small particles are extracted from the bidisperse suspension and transferred to the back of the bubble. Findings of this study can potentially be useful to better understand the interaction between particles and liquid-gas interfaces.

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