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Particle-laden microbubbles: forced oscillations, surface modes, jetting and particle ejection VINCENT POULICHET, VALERIA GARBIN, Imperial College London — Self-assembly of microparticles at fluid-fluid interfaces is exploited for emulsion stabilization, tunable nanomaterials, and nanocomposites with complex morphologies. Disassembly of interfacial particle monolayers is equally important, for instance for green catalytic processes, but has been far less explored. We demonstrate controlled disassembly of monolayers of microparticles trapped at the interface of microbubbles. The bubbles are driven into oscillations by an applied ultrasound wave, triggering particle ejection. We visualize forced ejection events at the single particle level using high-speed video microscopy. Measurements of the local area density of particles and of the acceleration of the bubble interface reveal that the interplay of several mechanisms is responsible for particle expulsion: tangential stresses due to the fast compression of the bubble interface, interparticle interactions at the interface, and the body force acting on the particles due to the acceleration of the interface. Non-linear bubble dynamics can also be exploited to design complex particle expulsion scenarios, such as surface modes and jetting, with relevance to directed particle delivery in microreactors.

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