Abstract Submitted
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Buckling of a colloid-armored bubble[1] NICOLAS TACCOEN, LadHyX and Department of Mechanics, Ecole Polytechnique, CNRS, Palaiseau 91128, France, DENIZ Z. GUNES, Nestle Research Center, Food Science and Technology Department, Vers-Chez-Les- Blanc, CH-1000 Lausanne 26, Switzerland, CHARLES N. BAROUD, LadHyX and Department of Mechanics, Ecole Polytechnique, CNRS, Palaiseau 91128, France — We investigate the dissolution of a single air-in-water bubble whose surface is coated with solid particles, as an elementary model of an aging particle-stabilized foam. A microfluidic setup is used to produce a single bubble on demand, force the adsorption of particles to its interface, and hold it stationnary for long-term observation. When the gas dissolves in the surrounding liquid, the particles on the interface eventually jam, thus forming a rigid shell that encloses the bubble. As the temperature and pressure conditons are varied, this armor can either arrest the dissolution of the gas or it can buckle, which leads to the complete disapearance of the bubble. We experimentally demonstrate the existence of a threshold pressure above which the shell is not resistant enough to stabilize the bubble. This is modeled by comparing the mechanical resistance of the hollow shell with the compressive stress due to the dissolution in the liquid, which is controlled through the thermodynamic parameters. These experiments yield the first quantitative measurements of the mechanical resistance of a colloidal shell against ripening. It opens the possibility to study the behavior of more complex armors, by varying the size distribution, the shape and the chemistry of the particles.

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