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Enhanced dissolution of particle-stabilized bubbles by cooling VINCENT POULICHET, VALERIA GARBIN, Imperial College London — Foams and emulsions that are durable and stable under varying environmental conditions (e.g. temperature, humidity) are central in the food and personal care industry. Small bubbles (< 100 μm) need to be stabilized against dissolution even in a gas-saturated liquid, because the Laplace pressure drives diffusion across the curved gas-liquid interface. Solid particles adsorbed at the interface of microbubbles have been shown to prevent coalescence and also arrest bubble dissolution. We studied the effect of changes in temperature on the lifetime of particle-stabilized microbubbles. We report a mechanism of destabilization beyond dissolution arrest, driven by the cooling of the external liquid. We show that the dominant mechanism of destabilization is the increase in solubility of the gas in the liquid, leading to a condition of undersaturation, which drives gas diffusion. Control experiments show that indeed, at constant temperature and pressure, undersaturation alone is sufficient to cause particle-stabilized bubbles to dissolve.

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