Abstract Submitted
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Dissolution of spherical cap CO_2 bubbles attached to flat surfaces in air-saturated water[1] PABLO PEÑAS, Universidad Carlos III de Madrid (UC3M), MIGUEL A. PARRALES, JAVIER RODRIGUEZ-RODRIGUEZ, UC3M — Bubbles attached to flat surfaces immersed in quiescent liquid environments often display a spherical cap (SC) shape. Their dissolution is a phenomenon commonly observed experimentally. Modelling these bubbles as fully spherical may lead to an inaccurate estimate of the bubble dissolution rate. We develop a theoretical model for the diffusion-driven dissolution or growth of such multi-component SC gas bubbles under constant pressure and temperature conditions. Provided the contact angle of the bubble with the surface is large, the concentration gradients in the liquid may be approximated as spherically symmetric. The area available for mass transfer depends on the instantaneous bubble contact angle, whose dynamics is computed from the adhesion hysteresis model [Hong et al., Langmuir, vol. 27, 6890-6896 (2011)]. Numerical simulations and experimental measurements on the dissolution of SC CO_2 bubbles immersed in air-saturated water support the validity of our model. We verify that contact line pinning slows down the dissolution rate, and the fact that any bubble immersed in a saturated gas-liquid solution eventually attains a final equilibrium size.

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