Bretherton's buoyant bubble

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Résumé

When a buoyant bubble is inserted into a closed capillary that is slightly smaller than the liquid capillary length, it appears to become stuck. Recent calculations suggest that the bubble's motion is critically dependent on the dynamics of the surrounding liquid film; however, the absence of quantitative measurements leaves the nature of these dynamics unresolved. Here, we measure the dynamics of the liquid film surrounding a subcritical bubble using interference microscopy. Our measurements show that the film slowly relaxes to a constant thickness, consistent with stabilization by the disjoining pressure. The film thickness established by slow drainage of the film is recovered upon thermal perturbation, confirming that Bretherton's buoyant bubble is not trapped by contact line pinning

Mots-Clés: Disjoining pressure, marangoni flows, thin film flows, singularities, capillarity, lubrication theory

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