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Evaporation induced spontaneous cyclic dimpling in binary mixtures and its role in bubble stability VINEETH CHANDRAN SUJA, JAVIER TAJUELO, GERALD FULLER, Stanford University — Liquid mixtures having components with heterogeneous volatilities, such as lubricants, are known to support stable foams in the absence of surfactants. Recent studies have shown this is a consequence of stabilizing Marangoni flows induced by the differential evaporation of liquid components from the surface of the bubble. Interestingly, unlike surfactant induced Marangoni flows, evaporation induced Marangoni flows periodically regenerate the thickness of bubble walls resulting in a fascinating phenomenon known as 'spontaneous cyclic dimpling'. This phenomenon has been studied in the context of emulsion stability resulting from surfactant diffusion, however very little is known about evaporation induced spontaneous cyclic dimpling. Here we study this phenomenon in detail by visualizing the spatio-temporal evolution of the wall thickness of single bubbles in binary mixtures using white light interferometry. Various binary mixtures of silicone oils are tested to understand the mechanics of spontaneous cyclic dimpling and its influence on bubble stability as function of species mole fraction, volatilities and viscosities.

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