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Effects of encapsulation elasticity on the stability of an encapsulated contrast microbubble for medical imaging and drug delivery AMIT KATIYAR, KAUSIK SARKAR, University of Delaware — Encapsulated microbubbles for ultrasound imaging show a shelf life of months while free bubbles, in aqueous medium, last for milliseconds. For microbubbles, with inelastic encapsulation, lifetime of hours is possible only at extremely low surface tension (<1 mN/m) or at extreme oversaturation. However, microbubbles with elastic encapsulation can resist dissolution. Analytical expressions involving saturation level, surface tension and interfacial dilatational elasticity are determined for attaining non-zero equilibrium radius for these microbubbles. All encapsulated bubbles dissolve in undersaturated medium. In a saturated medium, an encapsulated bubble is found to achieve a long-time stable radius when interfacial dilatational elasticity is larger than the equilibrium surface tension. For bubbles with interfacial dilatational elasticity smaller than the equilibrium surface tension, stable bubble of non-zero radius can be achieved only when the saturation level is greater than a critical value. Even if they initially contain a gas other than air, bubbles that reach a stable radius finally become air bubbles. The model is applied to an octafluoropropane filled lipid-coated 2.5 lm bubble. Effects of elasticity, shell permeability, initial mole fraction, initial radius and saturation level are discussed.

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