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Modeling Encapsulated Microbubble Dynamics at High Pressure Amplitudes[1] JAN F HEYSE, SANJEEB BOSE, GIANLUCA IACCARINO, Stanford University — Encapsulated microbubbles are commonly used in ultrasound contrast imaging and are of growing interest in therapeutic applications where local cavitation creates temporary perforations in cell membranes allowing for enhanced drug delivery. Clinically used microbubbles are encapsulated by a shell commonly consisting of protein, polymer, or phospholipid; the response of these bubbles to externally imposed ultrasound waves is sensitive to the compressibility of the encapsulating shell. Existing models approximate the shell compressibility via an effective surface tension (Marmottant et al. 2005). We present simulations of microbubbles subjected to high amplitude ultrasound waves (on the order of 10^6 Pa) and compare the results with the experimental measurements of Helfield et al. (2016). Analysis of critical points (corresponding to maximum and minimum expansion) in the governing Rayleigh-Plesset equation is used to make estimates of the parameters used to characterize the effective surface tension of the encapsulating shell.

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