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Ultrasound-induced nanofragmentation of bubbles DEBRA COX, University of New Mexico, JAMES THOMAS — Micron-sized bubbles are of considerable interest for use in biomedical imaging and drug delivery. Lipid-coated bubbles have been reported to rapidly shrink in the presence of short (3 μs) ultrasound pulses, purportedly by shedding of the coat during compression. Loss of coat would increase the internal pressure, enhancing diffusive gas loss long after the pulse. Note that during such a short pulse, diffusive gas loss is insignificant. If lipid-shedding is the mechanism for bubble shrinkage, a coated bubble in ultrasound may shrink no faster than a quiescent uncoated bubble; the shrinkage rate is entirely dominated by diffusive loss between pulses. Remarkably, we find that most insonated lipid-coated bubbles do shrink faster than quiescent uncoated bubbles. If bubbles cannot shrink by diffusive gas loss, they must fragment, though no fragmentation was observed. The results are consistent with "nanofragmentation," where sub-micron fragments (which entrap gas) are lost from the bubble. Entrapment of gas in fragments may have important consequences for their efficacy in ultrasound-mediated drug delivery, and could affect their ability to transfer drugs to cells.

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