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Ultrasound-enhanced mass transfer during single bubble diffusive growth[1] ALVARO MORENO SOTO, Department of Mechanical Engineering, Massachusetts Institute of Technology, PABLO PEAS LPEZ, GUILLAUME LAJOINIE, DETLEF LOHSE, DEVARAJ VAN DER MEER, Physics of Fluids Group, University of Twente — In mildly supersaturated solutions, bubbles generally grow by diffusion. However, gas bubbles exposed to ultrasound fields will experience a sudden massive mass transfer enhancement. This event takes place when the working frequency of the ultrasound matches the natural frequency of the bubbles. We show that when a bubble approaches resonance, it undergoes non-linear oscillations which generate a strong microstreaming flow. This results in a bubble growth rate which exceeds the diffusive growth by two orders of magnitude. We program different chirps of decreasing frequency which allow us to continuously enhance the mass transfer rate into the bubble and consequently achieve detachment within a shorter time. This configuration is potentially relevant to novel medical treatments involving targeted drug delivery and industrial applications where bubble accumulation becomes detrimental.

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