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Dynamics of Acoustically Vaporized Microdroplets ADNAN QAMAR, ZHENG ZHENG WONG, J. BRIAN FOWLKES, JOSEPH BULL, University of Michigan — A combined theoretical and computational approach is utilized to understand the bubble evolution dynamics resulting by vaporizing the superheated dodecafluoropentane (DDFP, C_5F_{12}) microdroplets via an acoustic perturbation. This work is inspired by a developmental gas embolotherapy technique for cancer treatment by infarcting tumors using selectively formed gas bubbles. The evolution process comprises of three regimes; an initial linear rapid spherical growth followed by a linear compressed oval shaped growth and finally a slow asymptotic non-linear spherical growth. The bubble evolution process compares quite well with the ultra high-speed experiments. The final bubble radius scales linearly with the initial droplet radius and is approximately five times the initial droplet radius. A pressure pulse with amplitude approximately twice as that of ambient conditions is observed. The pressure pulse wavelength increases with an increasing droplet size whereas the pulse amplitude is weakly dependent on droplet size. This work is supported by NIH grant R01EB006476.

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