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**The Short Time Scale Events of Acoustic Droplet Vaporization**[1]
DAVID S. LI[2], OLIVER D. KRIPFGANS[3], J. BRIAN FOWLKES[4], JOSEPH L. BULL[5], University of Michigan — The conversion of a liquid microdroplets to gas bubbles initiated by an acoustic pulse, known as acoustic droplet vaporization (ADV), has been proposed as a method to selectively generate gas emboli for therapeutic purposes (gas embolotherapy), specifically for vascularized tumors. In this study we focused on the first 10 microseconds of the ADV process, namely the gas nucleation site formation and bubble evolution. BSA encapsulated dodecafluoropentane (CAS: 678–26–2) microdroplets were isolated at the bottom of a degassed water bath held at 37 $^\circ$ C. Microdroplets, diameters ranging from 5-65 microns, were vaporized using a single pulse (4-16 cycles) from a 7.5 MHz focused single element transducer ranging from 2-5 MPa peak negative pressure and images of the vaporization process were recorded using an ultra-high speed camera (SIM802, Specialised Imaging Ltd). It was observed that typically two gas nuclei were formed in series with one another on axis with ultrasound pulse. However, relative positioning of the nucleation sites within the droplet depended on droplet diameter. Additionally, depending on acoustic parameters the bubble could deform into a toroidal shape. Such dynamics could suggest acoustic parameters that may result in tissue damage.

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