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Plasma formation inside deformed gas bubbles submerged in water[1] BRADLEY SOMMERS, JOHN FOSTER, University of Michigan — Plasma formation in liquids produces highly reactive products that may be desirable for a variety of applications, including water purification and waste processing. The direct ignition of plasma in these environments, however, is limited by the large breakdown strength of liquids, which imposes severe voltage and energy requirements on the design of practical devices. One way to address this issue is by first igniting plasma in gas bubbles injected into the water. These bubbles provide an environment with higher reduced electric field (E/N) that is more suitable for plasma formation. If the same bubbles can be excited into strong distortions of their shape and volume, then it is possible to further alter E/N, both by field enhancement at the bubble's highly distorted dielectric interface (via E) and by fluctuations in its internal gas pressure (via N). This principle is investigated by trapping a single bubble at the node of a 26.4 kHz underwater acoustic field and driving it into violent oscillations using an A.C electric field. A third high voltage needle is placed nearby and used to ignite plasma in the bubble at various points during its oscillation. The bubble response is captured using a high speed camera capable of up to 30,000 frames per second.

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