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43.35.Ei, 43.35.Ty, 43.25.Nm

The acoustic nucleation of pockets of gas entrapped in cavitation nuclei has been well studied and described for a single pressure pulse. In this work we extend on this and explore the rich behavior displayed when pre-defined cavitation nuclei are driven continuously in the medium kHz regime (100 - 500 kHz) at pressures between 50-500 kPa. Here, the nuclei consist of stabilized gaspockets in cylindrical micropits etched in silicon substrates. It is found that above an acoustic pressure threshold the behavior of the liquid-gas meniscus switches from the well known stable drum-like vibration to bubble expansion outside the pit as occurs for a single pressure pulse. However in the continuous acoustic field a rich variety of events start to occur. The bubble displays strong shape oscillations and deformations, frequently resulting in microbubble pinch-off. Just above the threshold a large number of small bubbles are continuously ejected and immediately recaptured by the source bubble. At elevated acoustic pressures the pinch-off mechanism becomes more pronounced resulting in the generation of larger bubbles, which due to pressure gradients are frequently pushed away from the pit. Surprisingly, the resulting loss of gas generally does not lead to the deactivation of the pit. Due to the proces of gas diffusion the gas volume regains its initial value thus enabling another nucleation and microbubble pinch-off event.

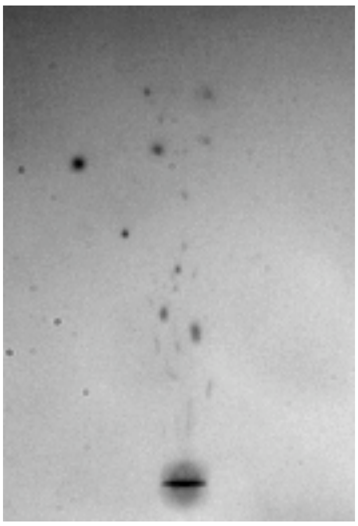

Figure 1: Micropit (diameter 30 μm) in an 80 kHz ultrasound field pinching off microbubbles