

ACOUSTICS2008/1731
**Determination of cavitation bubble lifetimes using bubble-bubble
coalescence data**

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The effect that surface-active solutes, such as aliphatic alcohols and sodium dodecylsulfate, have on the extent of bubble coalescence in liquids under different sonication conditions has been investigated by measuring the volume change of the solution following a period of sonication. The data obtained led to the conclusion that SDS does not reach equilibrium adsorption level at the bubble/solution interface. On this basis, a method is proposed for estimating nonequilibrium surface excess values for solutes that do not fully equilibrate with the bubble/solution interface during sonication. For the case of SDS in the presence of excess NaCl, the method was further employed to estimate the maximum lifetime of bubbles in a multibubble field. Data obtained from this study suggests that an acoustic bubble in a multibubble field has a finite lifetime, and that this lifetime decreases with increasing applied frequency, ranging from up to 0.35 ± 0.05 ms for 213 kHz to 0.10 ± 0.05 ms for 1062 kHz. These estimated lifetimes equate to a bubble in a multibubble field undergoing an upper limit of 50-200 oscillations over its lifetime for applied acoustic frequencies between 200 kHz and 1 MHz.