**Dynamics of cavitation bubbles near tissue-mimicking materials**

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**Abstract**

There is a growing interest in studying the behavior of cavitation bubbles near materials that mimic human tissue, as they hold great potential for various medical treatments. The interaction between these elastic surfaces and the cavitation bubble involves complex dynamics, including bubble splitting and the formation of fast micro jets that can cause damage to nearby boundaries. In this study, we investigate how the elasticity of the material and the distance between the bubble and the surface affect the bubble's behavior and the velocity of its micro jet. We conducted experiments by generating single laser-induced cavitation bubbles near agarose hydrogels with varying degrees of elasticity. Using high-speed imaging techniques, we closely observed the bubble dynamics, paying special attention to the formation and evolution of the micro jets. Our findings provide time-resolved evidence of the liquid micro jet atomization process within the bubble, which occurs before a fully liquid micro jet is established. The atomized portion of the micro jet can reach speeds of up to 2000 m/s, while the fully developed liquid micro jet travels at average speeds of up to 1000 m/s. To gain deeper insights into the dynamics leading to the formation of these high-speed micro jets, we also proposed a numerical model based on the boundary integral method and observe a remarkable agreement between the numerical simulations and the experimental observations