

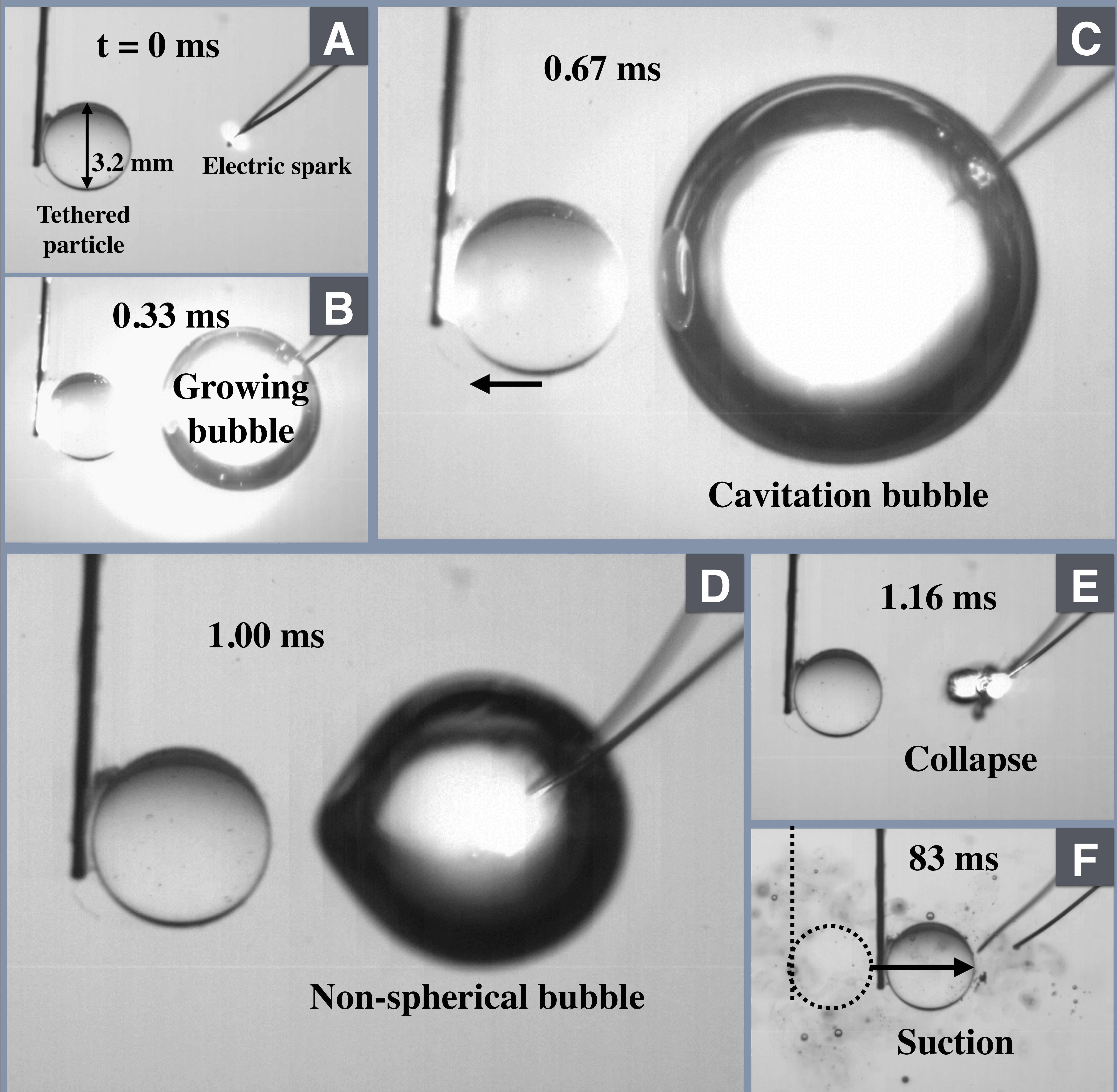
Kick a ball with a bubble

Gabriel Guenoun², Will Crowe¹, Stéphane Poulain³, and Sunghwan (Sunny) Jung¹

¹Biomedical Engineering and Mechanics, Virginia Tech, Blacksburg, VA

²Physics Department, ENS Cachan, France

³DAEP, Université de Toulouse, ISAE-Supaero, Toulouse, France



Description

We investigate the behavior of a particle when exposed to a spark-induced cavitation bubble.

The images show a cavitation bubble (on the right) as it induces the motion of a glass particle (on the left) tethered to a wire in water. The cavitation bubble is generated by a momentary 50-Volt current, nucleating a bubble in the water (Fig. A) and initiating fluid flows around the bubble. As the cavitation bubble expands (Fig. B), water flows radially outward from the cavitation, pushing the glass particle away. As shown in Fig. C, the bubble reaches its maximum size and begins to attenuate in volume. As the bubble shrinks, it is no longer able to maintain its spherical shape (Fig. D) and will collapse in on itself to its nucleation point (Fig. E). The collapse of the cavitation bubble “sucks” the surrounding fluid along with the particle inward (Fig. F) towards the epicenter of the cavitation bubble. This experiment demonstrates a bubble-particle system; the particle was moved away from the bubble upon induction of the cavitation bubble, and the particle was sucked towards the cavitation point upon collapse of the bubble. Further, we plan to investigate the effect of particle size, density, and distance from the cavitation bubble to understand the detailed dynamics of the particle-bubble interaction.