

Impact induced cavitation

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ABSTRACT: You may have seen a popular party trick: by holding a liquid-filled glass bottle with one hand and striking the open top with the other, it causes the bottom of the bottle to break. This fracturing phenomenon is caused by cavitation. Cavitation is a local evaporation phenomenon that occurs in a liquid as the pressure suddenly drops below the liquid's vapor pressure. After reaching the maximum size, a cavitation bubble collapses violently, causing many extreme physical processes at the end of the collapse, including shock waves, a high temperature at the center of the bubble (conceivably $\sim 10^3$ K or higher), and high-speed jets ($\sim 10^2$ m/s). These physical processes can cause severe, localized damage to hard surfaces such as glass and alloys. The typical causes of cavitation include external driving energy (e.g., focused laser or ultrasound, underwater detonation), although the most common cause is the fast-flowing fluid itself (for instance, as it moves through a ship's propeller or the elbow of a pipe). In this talk, we discuss a different cause: impact-induced cavitation, which is the reason behind the cracking beer bottle party trick and Sayano-Shushenskaya hydropower station accident in 2009.

ALL ARE WELCOME!