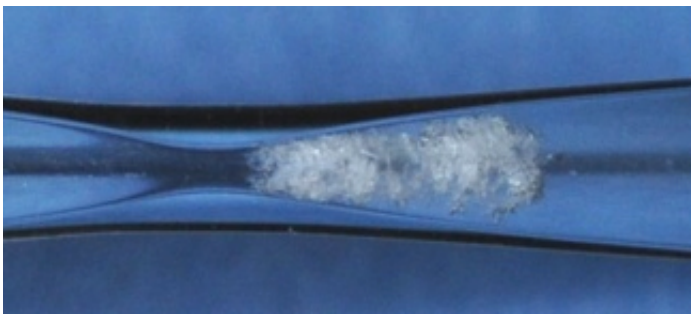
Cavitation aggressive intensity greatly enhanced using pressure at bubble collapse region

May 2 2016



This image shows hydrodynamic cavitation through a venturi tube. Credit: Hitoshi Soyama

Researchers at Tohoku University are developing a method to improve the aggressive intensity of cavitation without the need to increase the input power.

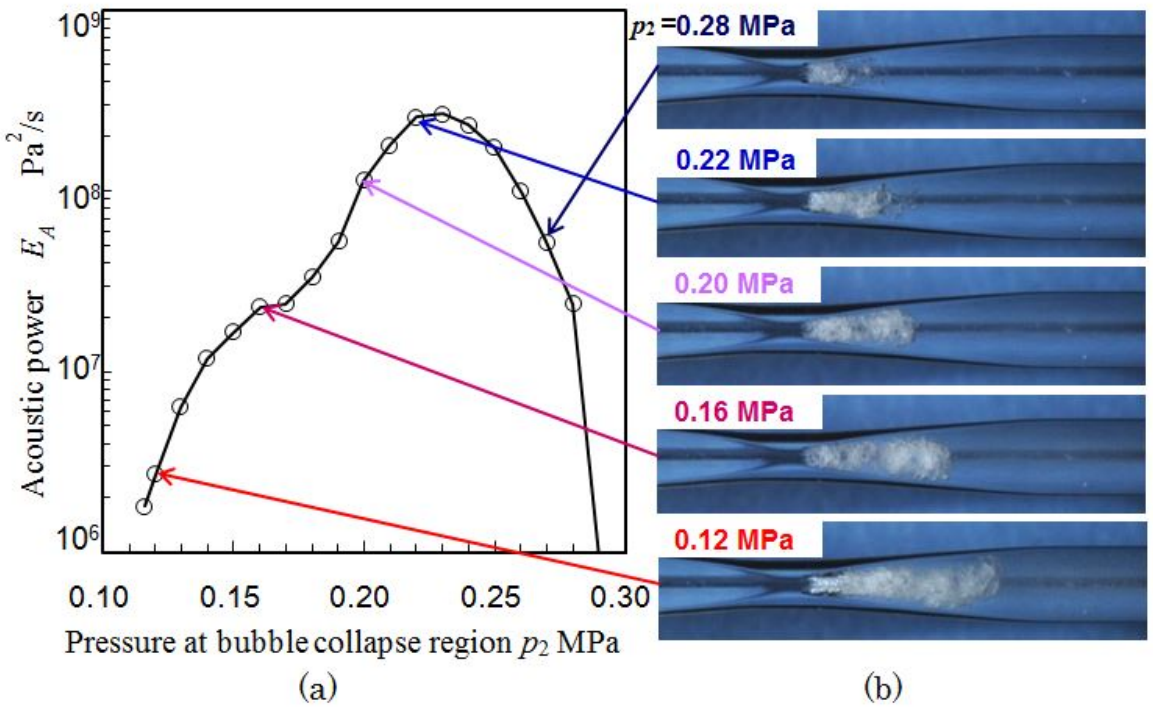
Cavitation - the formation, growth and subsequent collapse of microbubbles - produces high, localized energy which can be used in chemical processes for treating water and the pretreatment of biomass.

The research team found that the conventional cavitation method of applying ultrasonic energy was not strong enough, so they proposed using hydrodynamic cavitation instead.

In the proposed method, test water is passed through a constriction tube. Hydrodynamic cavitation is then produced by the decrease of pressure due to the increase of flow velocity.

The team found that the aggressive intensity of hydrodynamic cavitation was optimized with an increase of pressure at the bubble collapse region.

Although most researchers believe that an enlarged cavitation area produces aggressive intensity, by contrast, it seems a rise in aggressive intensity can occur with a reduced cavitation area. In the research experiments, the size of the cavitating region was reduced by varying the upstream and downstream pressures.



Although the developing region of hydrodynamic cavitation is decreased with an increase of pressure at bubble collapse region p2, the acoustic power is increased with the pressure and it has a peak at certain pressure. Credit: Hitoshi Soyama

The team has demonstrated the enhancement of cavitation aggressive intensity by a factor of about 100 by optimizing pressure at the region, measuring acoustic power at cavitation bubble collapse, and luminescence as a function of the pressure.

This method can be useful for practical applications, as it does not need additional power, but the aggressive intensity can be increased simply by controlling a valve downstream to the cavitating region.

More information: H. Soyama et al, Enhancing the aggressive intensity of hydrodynamic cavitation through a Venturi tube by increasing the pressure in the region where the bubbles collapse, *AIP Advances* (2016). DOI: 10.1063/1.4947572

Provided by Tohoku University

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