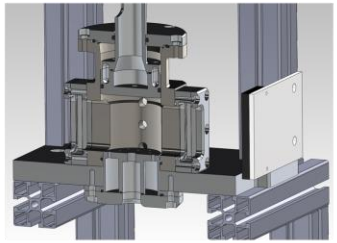
CHEMISTRY/ MATERIALS

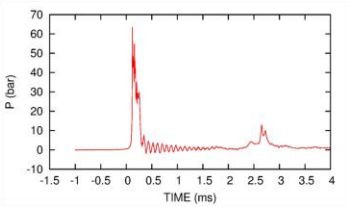
Ref : MA00254

Multifrequency cavitation inducer device

Multifrequency cavitation device



Sectional view of the chamber interior



Pressure curve generated by the impact

MARKET CHALLENGES

Cavitation is a phenomenon by which vapor bubbles appear in a liquid when its pressure falls below the vapor pressure. Techniques based on cavitation are especially suitable in order to induce processes with high activation energy. The concentration of energy produced during the bubble implosions can be used to promote certain processes requiring high pressure and temperature.

Cavitation process is used in biotechnology to separate cellular organelles or molecules from tissues or cells, either for further research & development studies or for biological manufacturing (food or pharma ingredients). The extraction requires critical conditions to break down the cells materials in order to release the desired biological material.

In chemical reactions, one of the main issues of pre-existing techniques is the lack of reproducibility and control of the process of cavitation. In addition for both biological and chemical applications industrials face difficulties to upscale the technique so as to treat large volumes of liquid. This is the main drawback that prevents a wide application of techniques based on cavitation to industrial processes

SUGGESTED APPLICATIONS

- **Chemical industry**

This technique should be suitable for all applications where ultrasonic and hydrodynamic cavitation has been successfully applied (e.g water treatment) as well as for molecular reactions requiring high pressure conditions.

- **Biological industry**

This technique may applied to homogenization reaction, cell disruption, molecular extraction,

DEVELOPMENT STATUS

An operational laboratory equipment has been designed with following dimensions

Pressure of the 1st piston: 25 mbar ; **Weight of the 1st piston:** 490 g

Pressure of the 2nd piston: 25 mbar; **Weight of the 2nd piston:** 250g

Height of the chamber: 25cm

Diameter of the chamber: 15 cm

INNOVATIVE SOLUTION

This device is designed to overcome these difficulties by taking advantage of a high amplitude multifrequency generator designed to efficiently transmit pressure pulses through the liquid exciting frequencies. It offers a range of low resonance frequencies related to the response of bubble clusters to the high frequencies related to the oscillation of individual bubbles.

The device is inspired by the classical French Press and it is distinguished by the presence of a second movable piston. The combination of these pistons provides a good control of the bubble radius distribution and of the amplitude and frequency of the pressure excitation induced in the liquid.

COMPETITIVE ADVANTAGES

- Capability to excite a wide range of frequencies with large amplitudes. The waves contain a significant amount of energy in both, the high and low frequency range, which are effectively transmitted over long distances.
- The method used to transmit high amplitude pressure pulses is significantly more efficient than the one used in high amplitude ultrasonic horns
- The various parameters that can be varied in the equipment design allowing a good control of the range of frequencies and amplitudes excited, which can vary depending on the specific application.
- Reproducibility
- Reliable control of the cavitation process.

IP RIGHTS

Priority patent application filed in 2015

HOMOGENIZATION | HIGH PRESSURE CONDITIONS | CAVITATION PROCESS | CELL DISRUPTION

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