Acoustic Cavitation. Experimental Results

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Biographical Sketch

Sergi Peshkovsky received an MS. and Ph.D. from Moscow Institute of Chemical Engineering. He most recently served as the Director of research and development for J, Inc. With over 30 years in the industry, he has published over 39 papers, including patents and articles.

Abstract

The talk consists of three interconnected parts as follows.

1. Ultrasound Sources for Producing Cavitation
We have designed powerful acoustic horns with large output surfaces and high gain simultaneously. These devices, which we call "barbell and barrel horns", can accurately match transducer to the liquid at cavitation, thereby, permitting the transmission of all available acoustic energy. The devices can provide up to 12 m/sec oscillatory velocities of the output surface, while the output surface itself is maximized for the operating frequency. We have also developed a software packing to aid in construction of a number of types of circular multi-echelon horns with low stresses at the steps and, therefore, with long lifetimes (durability).

2.Experimental Examination of Water at Cavitation
Measurements of the intensity of acoustic energy**,** dissipated in water at cavitation, were carried out with the help of a calorimeter and a set of barbell horns. A previously unknown second discontinuity in output has been revealed at the oscillatory velocity in the narrow range from 3 m/sec to 5 m/sec. Various secondary effects accompanying acoustic cavitation were also investigated.

3. Experimental Examination of Molten Polymers at Cavitation
A special set-up was used to identify and evaluate the threshold of acoustic cavitation in high polymers. We have observed that in high polymers the threshold of acoustic cavitation is a function of the acoustic treatment time. The observations were confirmed by repeating the experiments using transparent walls and a slotted capillary. The possibility of obtaining free radicals in molten polymers using acoustic cavitation opens the way for mechanical and chemical transformation of thermoplastics directly at the processing stage.