PROPAGATION OF HIGH-FREQUENCY SEQUENCE OF SHOCK WAVES IN WATER WITH GAS BUBBLES

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Abstract: Interaction of the wave package in the form of the high-frequency ($\sim$ 7 kHz) sequence of three shock waves (SW) with bubbly liquid (BL) — water with air bubbles — and the momentum transfer from SW to BL have been studied experimentally. The wave package was generated by detonating the gaseous stoichiometric propane–oxygen mixture in a detonation tube with three tube branches of different lengths submerged in BL. In the experiments, the initial volumetric gas content in water was varied from 2% to 16% at the average diameter of air bubbles 3–4 mm and SW velocity in BL in the range of 40 to 180 m/s. Experiments showed that the use of high-frequency shock-wave pulses in a hydrojet pulsed detonation engines is pointless because of the arising interference of pulses which worsens the momentum transfer from SW to BL: on the one hand, the waves penetrating into water quickly merge, thus feeding each other and increasing the BL velocity, but on the other hand, the initial gas content for each successive SW decreases and, accordingly, the efficiency of the momentum transfer decreases.

Keywords: hydraulic shock tube; sequence of shock waves; water with air bubbles; momentum transfer; hydrojet pulsed detonation engine

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