NUMERICAL SIMULATION OF THE MOMENTUM TRANSFER FROM THE SHOCK WAVES TO THE BUBBLE MEDIA

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Abstract: Based on the system of equations for a two-phase compressible viscous flow, a two-dimensional numerical simulation of momentum transfer from the shock wave propagating in a gas to a pure water and water with air bubbles has been performed. Under the effect of a shock wave on the pure water, the incompressible liquid is set in motion due to gas overpressure induced by shock reflection from the gas–liquid interface, whereas when the shock wave interacts with the water containing air bubbles, the compressible bubbly liquid is set in motion due to shock penetration into it. Parametric calculations have shown that the transfer of momentum from the shock wave to the bubbly liquid was accompanied by short-duration dynamic effects with the momentum transferred to the bubbly water considerably exceeding the momentum transferred to the pure water, other conditions being equal. These dynamic effects can be used to create energy-efficient pulse jet propulsion devices.

Keywords: bubbly liquid; shock wave; momentum transfer; numerical simulation

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