PHENOMENOLOGY OF SHOCK WAVE PROPAGATION IN WATER WITH BUBBLES OF REACTIVE GAS

K. A. Avdeev\textsuperscript{1,2}, V. S. Aksenov\textsuperscript{1,2,3}, A. A. Borisov\textsuperscript{1,2}, I. A. Sadykov\textsuperscript{1,3}, S. M. Frolov\textsuperscript{1,2,3}, F. S. Frolov\textsuperscript{1,2}, and I. O. Shamshin\textsuperscript{1,2,3}

\textsuperscript{1}Noncommercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation
\textsuperscript{2}N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation
\textsuperscript{3}National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation

Abstract: Interaction of a shock wave (SW) with a reactive bubbly medium (BM) — pure water (without thickening additives) saturated with bubbles of stoichiometric acetylene—oxygen mixture has been studied experimentally. In experiments, the initial volume fraction of gas in water was varied from 0.5% to 10% with gas bubbles 1.5–4 mm in diameter and the propagation velocity of shock waves in the bubbly medium ranged from 260 to 580 m/s. It is shown that in water with reactive gas bubbles, a detonation-like mode of reaction front propagation can be realized: a pressure wave followed by the luminosity front caused by bubble ignition is registered in the experiments. The specific features of the behavior of bubbles in such waves have been studied. The results obtained can be used to develop a pulse-detonation hydrojet engine with thrust created by the momentum transfer from SW to BM.

Keywords: chemically active bubbly medium; shock wave; hydroshock tube; explosion; detonation; acetylene—oxygen mixture; experiment

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Contributors

Avdeev Konstantin A. (b. 1971) — Candidate of Science in technology, specialist, Non-commercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation; senior research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; kaavdeev@mail.ru

Aksenov Victor S. (b. 1952) — Candidate of Science in physics and mathematics, senior research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; designer, Noncommercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation; associate professor, National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation; v.aksenov@mail.ru

Borisov Anatoliy A. (b. 1932) — Doctor of Science in physics and mathematics, chief research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; scientific consultant, Noncommercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation; professor, National Research Nuclear University
MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation; borisov@chph.ras.ru

Sadykov Ilyas A. (b. 1993) — technician, Noncommercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation; student, National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation; churus1314@rambler.ru

Frolov Sergey M. (b. 1959) — Doctor of Science in physics and mathematics, head of department, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; scientific head, Noncommercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation; professor, National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation; smfrol@chph.ras.ru

Frolov Fedor S. (b. 1981) — Candidate of Science in physics and mathematics, senior research scientist, N.N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; senior specialist, Noncommercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation; f.frolov@chph.ru

Shamshin Igor O. (b. 1975) — Candidate of Science in physics and mathematics, senior research scientist, N.N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; senior specialist, Noncommercial Partnership Center of Pulse Detonation Combustion, 4 Kosygin Str., Moscow 119991, Russian Federation; associate professor, National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation; igor_shamshin@mail.ru