GENERATION OF 100GPA PRESSURE BY UNDERWATER CYLINDRICAL WIRE ARRAY EXPLOSION

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Generation of ultra-high pressure, temperature and density at the axis of converging cylindrical shock wave produced by underwater electrical wire array explosion will be reported. A pulsed sub-microsecond high-current generator with stored energy of ~4.2kJ and current amplitude of ~340kA with a rise time of ~1μs was used for underwater explosion of 40 Cu-wire cylindrical array. The velocity of the generated shock wave was obtained by analyzing the sequence of shadow images acquired by a multi frame fast framing camera. The time and space-resolved spectral characteristics of the shock wave self-emission were studied using an imaging spectrometer and photomultiplier tubes. Assuming black body radiation, a temperature up to 5000K was found at the shock wave front at radius of implosion $r \leq 10\mu m$. A comparison of the experimental and 1D HD simulation results showed that at $r \leq 10$ μm the pressure reaches 100GPa and density of water of $3.5 g/cm^3$. The duration of this high-density and high-pressure state of water was found to be ~5ns. Results of investigation of water in extreme conditions produced in experiments using a generator with a current amplitude and rise time of ~800kA and 350ns, respectively, will be reported as well.