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High Power Electrical Explosion of Single and Multi Wire Arrays in Water ALON GRINENKO, SERGEY EFIMOV, ARKADY SAYAPIN, ALEXANDER FEDOTOV, VICTOR GUROVICH, YAKOV KRASIK, Physics Department, Technion — Electrical explosions of wires in water medium is a promising method for generation of strong shock waves and non-ideal plasma. Here we report on underwater electrical wire explosions (UEWE) that were investigated experimentally and using computer modeling. Micro- and nano-second time scale generators for UEWE of Al, Cu and W wires were employed. A μs (6 kJ stored energy, current of 80 kA, rise time of 2.5 μs) and ns (400 J stored energy, current of 100 kA, rise time of 50 ns) generators were used in μs and ns time scale experiments, respectively. Obtained scaling laws for explosion parameters suggest that the increase in the discharge power rate leads to an increase in the generated pressure amplitudes. Furthermore, increasing the power rate allows for an extremely high energy deposition, namely up to 200 eV/atom was registered in ns Cu UEWE. The high value of the energy deposition is due to the absence of shunting plasma shell which presents in vacuum electrical wire explosions. In order to amplify the pressures generated by the exploding wires, a cumulation effect in imploding cylindrical wire arrays was implied. High pressures of converging shock waves up to 0.2 Mbar were registered near the axis of the array.

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