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Micro- and nano- second time scale, high power electrical wire explosions in water. ALON GRINENKO, SERGEY EFIMOV, ARKADII SAYAPIN, ALEXANDER FEDOTOV, VIKTOR GUROVICH, YAKOV KRASIK, PLASMA AND PULSED POWER LABORATORY TEAM — Experimental and magneto-hydro-dynamic simulation results of micro- and nanosecond time scale underwater electrical Al, Cu and W wires explosions are presented. A capacitor bank with stored energy up to 6 kJ (discharge current up to 80 kA with 2.5 μs quarter period) was used in microsecond time scale experiments and water forming line generator with current amplitude up to 100 kA and pulse duration of 100 ns were used in nanosecond time scale experiments. Extremely high energy deposition of up to 60 times the atomization enthalpy was registered in nanosecond time scale explosions. A discharge channel evolution and surface temperature were analyzed by streak shadow imaging and using fast photo-diode with a set of interference filters, respectively. Microsecond time scale electrical explosion of cylindrical wire array showed extremely high pressure of converging shock waves at the axis, up to 0.2 MBar. A 1D and 2D magneto-hydro-dynamic simulation demonstrated good agreement with such experimental parameters as discharge channel current, voltage, radius, and temperature.

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