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4P45 - Combustion of electrical underwater exploded aluminum wire

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Experimental observation of aluminum (Al) combustion realized in microsecond timescale under-damped underwater electrical explosion of Al wire is presented. Experiments were carried out using pulse power generator with peak current ~220 kA and rise time of ~1.6 μ s. Using time-resolved spectroscopy, absorption bands of AlO oxide was obtained in the case of Al wire explosion with diameter <0.6 mm when underdamped discharge was realized. The temporal evolution of the temperature, calculated using time-dependent vibrational lines intensity, shows a minor increase from ~6000 K at 35 μ s (with respect to the beginning of the discharge current) towards the maximum of ~7000 K at 65 μ s and cooling thereafter. This range of temperature of AlO oxides satisfactory coincides with the temperature obtained from the Plank's radiation of the plasma channel, ~5700 K. Also, it was shown that in the case of overdamped discharge realized during "30\maximus with respect to the beginning of 0.8 mm in diameter Al wire, only a weak continuous light spectrum was registered during "30\maximus with respect to the beginning of the discharge current.

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