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Flayer target acceleration and energy transfer at its collision with massive targets

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Investigations of efficiency of macroparticle acceleration and crater creation processes for the two wavelengths of the PALS (Prague Asterix Laser System) facility laser beam: λ_1=1.315 μm and λ_3=0.438 μm, and two types of targets made of Al: single massive target and double target consisting of a foil (thickness of 6 and 11 μm) placed before the massive target at the distance of 200-500 μm are presented. Targets were irradiated by the iodine laser beam: E_L=120-240J, the focal spot diameter of 250 μm, and the pulse duration of 0.4 ns. Velocities of the accelerated macroparticles as well as electron density distributions of plasma stream were determined by means of a 3-frame interferometry. Shape and volume of craters were obtained employing crater replica technology and microscopy measurement.

Experimental results were analyzed and interpreted by means of two-dimensional theoretical and numerical simulations. Energy transfer as well as two- dimensional shock wave generation and crater formation at the collision of laser-driven macroparticle with massive target have been described. The values of laser energy absorption coefficient, ablation loading efficiency and efficiency of energy transfer at the laser-driven macroparticle impact have been obtained at the different wavelength of laser radiation by crater volume measurement data.

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