DIRECT OBSERVATION OF THE STAGES OF LASER BREAKDOWN IN THE SAMPLES OF TRANSPARENT TARGETS IN THE TEMPORAL RANGE FROM FEMTO- TO NANOSECONDS

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S u m m a r y

The main stages of a laser breakdown and accompanying phenomena have been investigated by the example of typical isotropic transparent media (K-8 optical glass and KU-1 fused silica) exposed to powerful femtosecond pulses. For this purpose, we created new techniques of Femtosecond Time-Resolved Optical Polarigraphy (FTOP) combined with Induced Absorption (IA) microscopy with temporal and spatial resolutions equal to 450 fs and 2 μm, respectively. During the propagation of a pump pulse, its interaction with the target material is characterized by the breakup of the entire laser beam into separate filaments and the formation of non-stationary absorbing centers in their cores (probably laser-induced plasma that relaxes, by producing absorbing centers of different nature). Starting from delays of $\sim$ 300 ps, we observed the propagation of blast waves both in glass and in fused silica. Their propagation velocities have been directly measured.