COMPLEX HIGH-SPEED INVESTIGATION OF LASER PLASMA

A. Yu. Ivanov, V. I. Nedolugov, S. V. Vasilyev

Grodno State University

Our aim was to investigate the temporal evolution of the distributions of the electron density and of the concentration of heavy particles in laser plasma in a single experiment. We studied the interaction of radiation from various lasers (ruby laser GOR-100M, module based on a GOS-1001 (X = 1.06 ц m), a rhodamine laser, pumped by a coaxial flashlamp), with samples of aluminum, copper, zinc, indium, lead, tin both at atmospheric and lower («10^{л}- Torr) pressures of air at average radiation power densities *q* « 1-100 MW/cm^{л}. A fast two-wevelengh holographic cinematography (temporal resolution «0.8 ц s, spatial resolution «25 ц m), integral and time - resolved («1 ц s) spectroskopy and split unfolding method were used in an investigation of a laser plasma. The time evolution of the electron densities and heavy-particle concentrations was determined and a study was made of the nature of motion of a shock wave front. A weak dependence of the evolution of the shock wave velocity on the target materials was observed in the average power density range 1 -100 MW/cm^2. A faster increase in the dimensions of a refracting plasma region, compared with a luminous region, and strong expulsion of cold air by an erosion plasma were recorded. The tranformation of erosion plasma into air flame was investigated.

It is important to note that all the measurements were carried out in the course of the same experiments. This enabled us to use this method in studies of laser plasmas initiated by unstable emitters, and also under conditions avoiding the second interaction of a light pulse.