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Dependence of pressure in compressed condensed matter on parameters of high-power laser pulses.

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Under irradiation of a condensed matter by high-power pulses, a high-temperature plasma propagating toward the laser beam is produced and intense shock waves propagate deep in a nonevaporated matter. A pressure jump at the front of these waves can achieve tens (in some cases, even hundreds of megabars (!)). The behavior of matter under such extremal conditions is of interest for researchers, studying the problems of nuclear fusion and astrophysics, and involved in some applied investigations.

Therefore, the question of what pressures are produced in a condensed matter at different radiation parameters and different materials of a target is current interest. The direct measurement of such pressures in compressed materials is challenging experimental problem. In this connection it is useful to perform numerical calculations and, by comparing them with experimental data, to obtain similarity relations (scaling) for determining these pressures from the known data on parameters of radiation and targets.

We present the results of 2D numerical simulations of experiments performed earlier on the PALS setup (Prague Asterix Laser System, Czech republic), derive the similarity relation based on these simulations, and discuss the results obtained (see also, [1], [2]).

1. A.I. Lebo, I.G. Lebo, D. Batani. Quantum Electron., v.38, 747, (2008)

2. I.G. Lebo, A.I. Lebo, D. Batani et al. Laser and Particle Beams, v.26, 179, (2008)