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# Influence of the conditions of gas dynamic unloading on laser initiation of PETN

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## Abstract

In this paper, we studied the influence of the conditions of gas-dynamic unloading on the laser initiation of the PETN. Samples made of PETN without inclusions and with aluminum inclusions of 0.1% by mass with a size at the maximum distribution of 100-120 nm were used. The first (1064 nm) and second (532 nm) harmonics of a neodymium laser operating in the mode of initiation were used as the initiation source pulse duration 14 ns. The dependences of the probability of an explosion on the energy density of the laser beam (frequency curves) were measured. Experimental results indicate that the critical energy density of the initiation of an explosion substantially depends on the conditions of gas-dynamic unloading. If gas emission is not blocked (for example, with a glass plate), a release of a substance (cavern) is observed and an explosion is not observed. This fact suggests that the laser initiation explosion of PETN is significantly affected by a thin layer adjacent to the substrate. It is shown that when blocking the gas-dynamic unloading of the sample during laser initiation, explosive decomposition occurs at lower laser pulse energy densities. Changing the conditions of gas-dynamic unloading affects the magnitude of the threshold for initiating an explosion in the same way when exposed to the first and second harmonics of a neodymium laser. In the case of PETN-based composites with inclusions of Al nanoparticles, the radiation is absorbed mainly by nanoparticles, they are heated and hot spots are formed with the initiation of a chemical reaction leading to explosive decomposition of the sample. At the used concentrations of inclusions, the absorption coefficient is 200 cm – 1, i.e. 0.63 absorbed energy is distributed in a layer of 50 microns.

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