Initiation of Low-density Mixtures of Petn and Nanodispersed Aluminum by Nanosecond Laser Pulses

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The main issue arising on direct laser initiation of individual HEs detonation is their high transparency in the range of the most commonly used laser sources. Thus, a nontrivial problem is sensibilization of the HEs to laser radiation when keeping their sensitivity (ideally, flegmatization) to other detonation-inducing impacts.
Introduction of light-absorbing additives into an HE bulk is a way to increase the HE sensitivity to laser pulse. Therefore, a problem of immediate interest is to optimize the parameters of a light-sensitive HE mixture to minimize its laser initiation threshold.
The present work investigates sensitivity of low-density ($\rho \leqslant 1.1$ g/cm^3) mixtures of PETN and nanodispersed aluminum to nanosecond pulsed laser radiation (λ=1064 nm). It compares the mixtures homogenized under ultrasound impact in highly volatile liquid medium (hexane) and manufactured through dry mixing in a closed electrostatic system. The equivalence of these technologies in terms of mixture sensitivity to pulsed laser radiation is shown. The mixture parameters (density, quantity and size of aluminum particles) are determined at which the laser pulsed initiation threshold in near IR-range is minimal.