

# IMPROVED MODEL OF AN OPTICAL DETONATOR CAPSULE

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**Abstract:** An improved model of the detonator optical capsule was created on the basis of a standard detonator capsule No. 8 with an improved optical-fiber radiation input system initiated by a continuous infrared laser with a wavelength  $\lambda = 975$  nm. Photosensitive compositions based on primary explosives — lead azide, diazodinitrophenol, fast burning complex compound — bis(ethylenediamine)-copper-(II)-perchlorate, and a secondary explosive CL-20 with an addition of 0.5% photoabsorbing nanodisized powders of aluminum, copper oxide, and graphite were studied. In the course of the work, the run-up distance and time of combustion-to-detonation transition were determined at a laser radiation power of 3.3 W.

**Keywords:** laser initiation; detonation; optical detonator capsule; lead azide; diazodinitrophenol; bis(ethylenediamine)-copper (II) perchlorate; CL-20

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## Figure Captions

**Figure 1** Sketch of the new optical detonator capsule (ODC): 1 — bimetallic sleeve; 2 — steel cap; 3 — teflon film; 4 — connector; 5 — guide nut; 6 — optical fiber; 7 — photosensitive composition; 8 — primary charge; and 9 — secondary charge

**Figure 2** Equipped ODC, on the witness plate

**Figure 3** Schematic of experimental installation: 1 — power supply; 2 — oscilloscope; 3 — signal modulator; 4 — laser module; 5 — ODC; 6 — pressure gauge bomb; 7 — pressure sensor; and 8 — personal computer

**Figure 4** Oscillogram of experiment: (a) front of the laser power increase; (b) ODC test; 1 — modulator signal; 2 — signal of the photo sensor; and 3 — piezo sensor signal

**Figure 5** Duralumin witness plates with a thickness of 4 mm: (a) test on combustion-to-detonation transition; and (b) penetration test

## Table Captions

**Table 1** The ODC test series on lead azide (LA) + 0.5% nAl

**Table 2** The ODC test results based on diazodinitrophenol (DDNP) without additives

**Table 3** The ODC test series based on DDNP

**Table 4** The ODC test results based on bis(ethylenediamine)-copper-(II)-perchlorate (BEDCP)

**Table 5** The ODC test result based on CL-20

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