

The dynamics of carbon nanoparticles size at the detonation of TNT–RDX charges

Rubtsov I A^{1,2,®}, **Ten K A**^{1,2}, **Titov V M**¹, **Pruuel E R**^{1,2},
Kashkarov A O^{1,2} and **Kremenko S I**^{1,2}

¹ Lavrentyev Institute of Hydrodynamics of the Siberian Branch of the Russian Academy of Sciences, Lavrentyev Avenue 15, Novosibirsk 630090, Russia

² Novosibirsk State University, Pirogova Street 2, Novosibirsk 630090, Russia

® rubtsov@hydro.nsc.ru

During the detonation of oxygen-deficient high-explosive nano-sized condensed carbon particles are formed. At that, the time of particles forming depends on the charge diameter.

In this work, we carry out the dynamic measurement of small-angle x-ray scattering (SAXS) during the detonation of molten charges of TNT–RDX of 20, 30, 40 mm in diameter. The dynamics of the average size of carbon particles are recovered from the SAXS data. Scattering centers with an average size of about 4–6 nm are formed at the time less than the resolution of the technique (0.5 μ s behind the detonation front). After that, we observe their growth during several microseconds. The time of nanoparticle growth behind the chemical reaction zone increased from 3 to 6–8 μ s when the charge diameter was enlarged from 20 to 40 mm.

The work is supported by the Russian Foundation for Basic Research (project No. 16-29-01050).