

SYNCHROTRON RADIATION INSTRUMENTATION FOR "IN SITU" INVESTIGATION OF EXPLOSION WITH NANOSECOND TIME RESOLUTION

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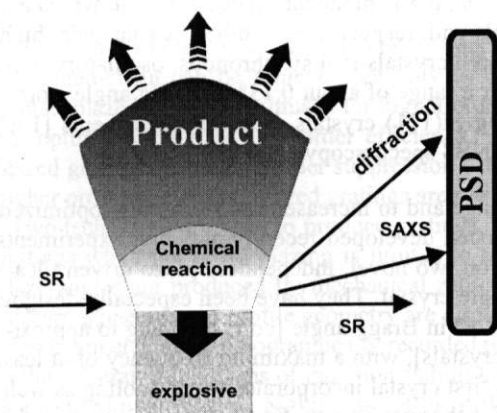


Figure 1. The scheme of "in situ" investigation of explosion detonation front with SAXS and WAXS.

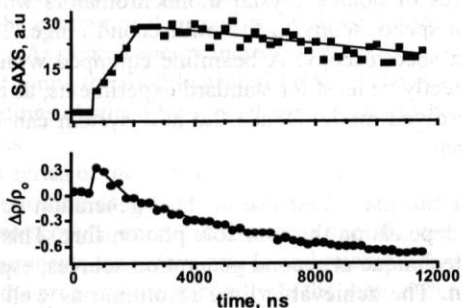


Figure 2. The time dependence of the density change (ρ_0 is the initial density) and integral SAXS intensity in detonation front in the explosive 50/50 hexogen-trotyl.

is very important for understanding the detonation mechanism and mechanism of the diamond particles growth. In the following series of experiments at VEPP-4 we plan to install a ten times stronger explosion chamber, the faster PSD and to receive the time resolution close to 10 ns [1].

Reference

[1] S.G.Nikitenko, et al. J. DE PHYSIQUE IV, (S. au J. de Physique III, 4), 1997, 7, C2, 549.

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The special instrumentation was developed for investigation of explosion. This is an explosion chamber, detonation front sensors and position sensitive detectors (PSD), which were synchronized with movement of electrons in the VEPP-3.

The explosion chamber can operate with an amount of an explosive close to 20 g (the trotyl equivalent). It has an entrance window for the primary SR beam and an exit windows for SAXS and WAXS.

The system of wire sensors were installed in the explosive. It gives information on detonation front movement (the velocity is 7 km/s; temperature is close to 4000 C).

The different type of PSD: an AsGa photodiode array, CCD array and "Image Plate". The time resolution of SAXS and WAXS in 125 ns was received.

The time dependence of the absorption coefficient of the explosive (it gives information on variation of density ρ) was measured during the explosion. In the same experiments, the SAXS and diffraction data were received.

In the first experiments hexogen - trotyl was used, because the product of explosion is diamond powder. In this experiment the SAXS signal increased sharply for 1500 ns. It is an unusual result, because the theory say that all chemical transformations must finish in ~ 250 ns. The received information