

# Where and when are Nanodiamonds Formed under Explosion?

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In this work synchrotron radiation (SR) was used from wiggler with field 20 of electron accelerator VEPP-3 (Institute of Nucleus Physics SB RAS). Spectrum of SR was near 25 keV, frequency 4 MHz, exposure 1 ns, spatial resolution 0,1 mm. Electronic scheme of the detector allows to remember 32 frames of small angle X-ray scattering (SAXS), made through 125, 250 or 500 ns. The answer to a questions, asked in the title, was received after two series of model experiment by means of implantation of nano diamonds as "probe" into the explosives.

**The first series of experiments - "nanoprobe".** In this serieses experiment nano diamond was used as a "probe", and was implanted in TNT and RDX before experiment. The amount of nano diamond was near 8% (weight) – the same as much was formed of nano diamond in system TNT/RDX 50/50. The mixture of diamond powder and explosive was pressed in cylindrical samples with diameter 15 mm. These samples gives a strong SAXS. During experiment this signal was compared with SAXS in the systems TNT/RDX 50/50. When the detonation front in TNT have reach the irradiated by SR zone, at that moment the SAXS signal from implanted diamonds start to monotonously grows because the condensation of carbon in solid state phase is begin. At explosive TNT/RDX 30/50 integral SAXS signals begins from zero level and gives the dependence of time  $I(t)$ , similar to the curve of TNT, but with smaller intensity. The difference was equal to the SAXS signal from the "probe". Explosion of RDX brings to reduction of the SAXS signal from implanted diamonds. This effect can be explained as a destruction of "probe" nano diamond in this experiment. Conclusions from these model experiments: 1) on the detonation front of TNT/RDX 30/50 and near it the nanodiamonds are absent; 2) RDX explosion products are very chemicaly active and destroy the nuclears of diamonds in the system TNT/RDX 30/50.

**The second series of experiments – "diamond sphere".** In the explosive PETN, not giving carbon during detonation and accordingly SAXS, were implanted fine (2 mm) disks pressed from TNT/RDX 50/50. These disks served as a generator of diamond. During explosion the diamonds were injected in surrounding space and all time being on surface of the fine expanding sphere. SR penetrated into this sphere, interacted with diamonds and gave SAXS. In serieses experiment SR scanned this sphere on different distance from center. This scan has allowed to restore where and when was formed nanodiamonds.