ESRF	**Experiment title:** Investigation of structure of meteoritic nanodiaonds and associated carbonaceous phases using lens-assisted high energy diffraction	**Experiment number**: HS 3971
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Report:

Direct information about defects and structure of nanodiamonds in general and in particular of meteoritic nanodiamonds is very limited. In the current project we have performed detailed High-Energy diffraction study of structure of nanodiamonds from several petrological classes of meteorites as well of synthetic nanodiamonds produced by various modifications of the CVD and detonation processes. The samples were thoroughly characterized using spectroscopic and scattering techniques (SAXS, Raman spectroscopy, photoluminescence) prior to the beamtime.

During the beamtime we had a unique opportunity of making simultaneous measurements using two different types of detectors, combining wide-angle (MAR-345) and small-angle (FREELON) domains. This combination is very beneficial for the data analyses using pair distribution function (PDF) approach: the SAXS pattern provides information about external shape of the particles, which is important for detail modelling by the PDF formalism. The combined consideration of these data sets is currently underway.

Preliminary examination of the obtained data using the concept of apparent lattice parameter (alp), developed and successfully applied to nanoparticles by the project participants show that the internal structure of the nanodiamonds of different sizes (average diameter between 5 and 25 nm) somewhat differs, which reflects different degrees of lattice strain.

Investigation of Ultra-Nanocrystalline Diamond (UNCD) films grown with different concentrations of N_2 in the growth chamber (between 0 and 25 at%) showed that increased nitrogen content led to development of obvious texture, which is pronounced by transition from uniform Debye rings at the N-free sample to distinct textured spots for the sample grown at high nitrogen content. This observation supports earlier electron microscopy results showing appearance of elongated diamond crystals (diamond “wires”) at nitrogen addition to the growth chamber. However, up to present the textural information about the orientation of the “wires” was not available.

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