

## Non-aggregated Nanoparticles of Detonational Diamonds

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One of the most important problem limiting an effective industrial application of nanodiamonds is a multileveled aggregation of primary particles. It is known that the “fused” particles are formed on early steps of the detonation synthesis and such aggregates are characterized by strength and high resistance to chemical etching, as well as to traditional mechanical and acoustical methods of disintegration (1). It was shown that such tight aggregates, where single nano-clusters are bound to each other by diamond-like material, can be disintegrated by means of treatment in beads mills (2). However, such treatment is low productive and energy consuming and accompanied by a considerable contamination of nanodiamonds by a milling bodies material (up to 2.5 mass %).

In the present work a possibility to obtain nanodiamonds with a low degree of aggregation without additional mechanical treatment on the products of synthesis and purification is investigated.

By a proper choice of the conditions of detonation synthesis a diamond-containing soot was obtained, which is characterized by a high surface area 500-600 m<sup>2</sup>/g, and an optimal ratio between diamond and non-diamond carbon phases. The chemical purification of the nanodiamond was carried out by a liquid acidic oxidizing agent. The deep chemical disintegration of the “fused” nanodiamond particles proceeded simultaneously with the gasification of non-diamond carbon.

An average size of coherent scattering crystalline area of diamonds was determined as 3.5 nm by means of X-ray diffraction. According to the dynamic light scattering measurements, a mean size of chemically disintegrated nanodiamond particles in aqueous medium was in range 5-15 nm that practically corresponds to a free-dispersion state of the primary particles. FTIR spectroscopy shows reduction of the functional group variety and the shift of carbonyl peak to the lower wave numbers. The potentiometry suggests the higher carboxyl group density.

- [1] F. Krueger, M. Kataoka, T. Ozawa, Y. Fujino, A.E. Suzuki, A. Aleksenskii, A. Ya. Vul', E. Osawa. *Carbon* **43**, 1722 (2005).
- [2] Ultra-Dispersed nanocarbon and method for preparing the same. Kataoka et al. US Patent Application No US 2005/0008560 A1, Jan 13, 2005.