

Graphite diamond composites formed by a controlled oxidation of detonation blend

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The most of publications describing research of detonation nanodiamonds (DND) are devoted either to pristine detonation blend (DB) or to the high purity DND. The latter is notable for the lack of graphite-like structural systems included.

However the intermediate products contained both the diamond-like fragments and the graphite-like ones may be the subject-matter, too. But, to meet such a challenge it is necessary to create convenient obtaining methods of the products with replicable features.

Special research of oxidation DB in water solutions of dilute nitric acid (5-50% weight) has been undertaken to that end. The amount of nitric acid used was not sufficient for the complete destructive oxidation of the «graphitic» component. The oxidizing process has been carried out in an autoclave at the temperature 150-250°C to achieve the maximal efficacy. Oxidation could be stopped at any desirable stage.

In this way specimens with various ratios of diamond and graphitic structures were produced and tested. The results obtained let us to analyze the behavior of nanodiamond products as a function of the oxidation extent (OE). It is remarkable to see substantial extremuma of a number of character properties depended on the OE. The properties are the ones to be of practical interest and their extreme values have a significant difference from that of the same properties of initial DB and high purity DND.

The authors explain these facts by particular principles of a functional group formation on «graphitic» areas of the nanoparticles. There are all reasons for selection of partial oxidized intermediate products as a particular class of graphite-diamond nanocomposite materials (GDNM). The pilot plant for the production of DND and GDNM has already been created in SCTB «Technolog», St. Petersburg.