

Investigation of nanostructured particles obtained from sintered nanodiamonds

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Research of the phase transformations occurring in nanodiamond cluster under the influence of high-temperature annealing in various atmospheres have shown, that the sequence of structural transformations takes place: nanodiamond - onion-like form of carbon - nanographite. It is essential, that if at annealing in inert atmosphere the relation sp^2/sp^3 - hybridized carbon grows, that is the share of a graphite phase increases, on the contrary, at annealing in hydrogen atmosphere there is an interval of temperatures in which the share of sp^3 - hybridized carbon grows [1]. In hydrogen atmosphere in some interval of temperatures transition from the onion-like form of carbon in diamond can be observed.

Therefore for increase in the output of a diamond phase and improvement of sintering quality it is expedient to carry out preliminary modifying of initial nanodiamond's powders before compaction.

Object of research in this work were both nanodiamonds and diamond-containing mixture of detonation synthesis manufactured by Joint-Stock company "Sinta" (Minsk) after annealing in various conditions (hydrocarbonateous, reducing atmospheres, vacuum) and sintering at pressures of 1-3 GPa in the temperature range of 1200-2000°C. The purpose of the work is to research the influence of annealing, temperature and pressure on structure and phase composition of the particles obtained both from nanodiamond and detonation diamond-containing mixture.

The carried out research of phase structure of milled compacts, obtained after various modes of annealing and sintering of nanodiamonds and diamond-containing mixture, has shown, that the basic phase for samples, sintered under pressure after annealing in reducing atmosphere is graphite with various degree of perfection. Research of phase structure of the powders subjected to the vacuum thermal treatment, has shown, that the basic crystal phase is diamond, instead of graphite, as by other modes of sintering. The content of a diamond phase over 50 % is revealed in the samples obtained after annealing in vacuum, hydrocarbonateous atmosphere and sintering under pressure.

- [1] Vul A.Ya. Detonation nanodiamonds. Structure, phase transition and applications // VIII Int. Conf. "Hydrogen Materials Science and Chemistry of carbon Nanomaterials". Sudak, Ukraine.-P. 506. (2003).