Towards to Surface and Bulk Modification of Detonation Nanodiamond

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Well known polyfunctional nature of the detonation nanodiamond (DND) powder surface and its complex chemical content are reasons to evaluate the DND as industrial semi-product. But from the other side, the DND peculiarities act as great challenge to the efforts of scientists and engineers in direction to the DND structure and properties changing. At this point we have to use the strategy, different from classical up- and down–srategies [1].

We have continued our previous study [1] with aim to achieve more predictable DND's properties helpful for its usefulness in fundamental research and practical application. We use high temperature gas phase treatment of the DND powders : H_2 at 1 and 50 atm in 850-1100ºC range; CCl4/Ar mixture, 450-850ºC range. There were find out that rigid hydrogenation seriously reduce total oxygen content from 6 to 2 mass.%, according to nuclear reaction technique. In the same time, by XPS-spectroscopy a change of chemical nature of bonded in the bulk of the DND particles nitrogen has been observed. Preferably occurring in original DND particles the N-O-C groups converted to preferably N-C groups. Differential thermogravimetry learn us on changing highly polyfunctional surface to less polyfunctional state. Instead 5 peaks observed in original UDA-SP's thermogram after its hydrogenation and chlorination only two peaks in the differential thermogram are visible, but not at identical temperature positions. In the same time some raise in oxidation resistance, about 12ºC, was feasible. Therefore the first necessary steps have been done towards to more standard and less polyfunctional DND, what is stage for it use in creation of nanostructuring systems in course of self-organisation and by synthesis of diamond-contained composites on base of inorganic and polymer matrixes. Authors acknowledge participation in the experiments to V.B.Vykhodets, M.R.Kiselev, S.A.Denisov and A.G.Chopurova.

[1] B.V. Spitsyn et al. *Diam. Relat. Mater.* **15**, 296 (2006).