

# **Principles of Current Industrial Production Technology of Detonation Nanodiamonds (ND) with a New Elemental Composition and Application thereof**

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The imperfection of an elemental composition of ND, especially: a low content of a basic element – carbon (75-90 wt.%), a over high content of oxygen (to 23,4 wt.%), and also a high quantity of incombustible impurities (to 4-5 wt.%) results in the considerable limitation in availability of ND for finishing polishing, polymer chemistry, galvanics, medicine and biology etc.

We have developed a new method of detonation synthesis of ND; the explosion of an explosive charge is realized in a water or ice jacket when preliminarily addition of easy-oxidizable, as a rule, oxygen-free compounds in it [PCT/RU-application 2005/000686 of 27.01.2006, Nanodiamond and production method thereof; PCT/RU-application 2005/000685 of 27.01.2006, Diamond-carbon material and production method thereof]. When the explosion at a stage of turbulization of detonation products aggressive (at high temperature) gaseous explosion products (CO<sub>2</sub>, H<sub>2</sub>O, NO<sub>2</sub>, N<sub>2</sub>O<sub>3</sub>, O<sub>2</sub>) attack ND producing its oxidation. High residual temperature also results in graphitization of ND. The addition of easy-oxidizable compounds allows two problems to be solved: - to fix the oxidizing type gases and hinder in their influence on ND; - to decrease temperature in the blasting chamber due to a partial oxidation of easy-oxidizable compounds and, as a result, to reduce graphitization of ND.

The changes in composition and quantity of easy-oxidizable compounds in the charge jacket allow to vary an elemental composition of ND within the following limits (wt.%): Ñ - 90,2-98,0; H – 0,1-5,0; N – 1,5-3,0; O-0,1-4,5; that of diamond-containing blend (DB): Ñ - 89,1-95,2; H – 1,2-5,0; N – 2,1-4,8; O-0,1-4,7. Besides, composition and quantity of easy-oxidizable compounds increase the content of ND in DB and decrease the quantity of incombustible impurities in ND upto 0,1 wt.%. We have also developed a new more accurate elemental composition analysis for ND and DB.

On the basis of new ND and DB we have developed 2 technologies of electrochemical chrome-plating, iron-plating, tin-plating, silver-plating and zinc-plating with some-fold improvement of parameters significant in practice.

Addition of ND into sols based on tetraetoxysilane allows to obtain film coatings having strong biocycle and deodorant properties.

On the basis of ND the reliable and easy-to-work diagnostic test systems for diagnosis of serious human diseases at early stages have been developed.

Addition of ND into the laser-sensitive initiating explosive compositions allows to substantially decrease the initiation threshold (~ 1,5 time).