Research of the Nanodiamonds Formation Possibility in the Cavitation Process

Stebleva O.V., Vereshchagin A.L., Leonov G.V.

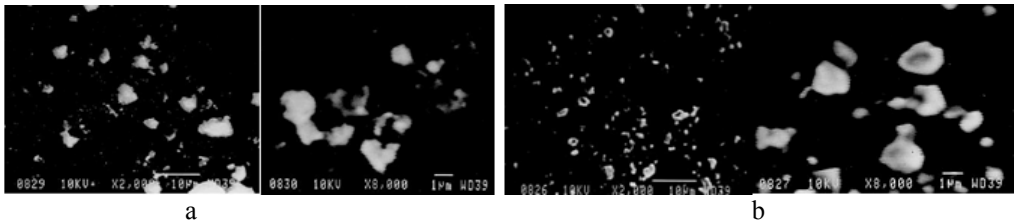
Biysk Technological Institute,Trofimova 27, 659305 Biysk, Russia

The nanodiamond (ND) can be synthesized with the detonation of the carbon-containing explosives [1] and the process of hydrodynamic cavitation [2]. In the work is examined the possibility of obtaining the nano-dispersed carbonic phase, including ND, in the acoustic cavitation fields.

The subject of studies were hexane and ethanol. The detonation ND, obtained in FR&PC "Altay" (Biysk) from the alloy TG 60/40, was selected as the standart model. The duration of ultrasonic action was 60 minutes with the power of ultrasonic apparatus 68 W and vibrations frequency of 22 kHz and wave intensity 2 W/cm^2. After working the models of liquid were dried, and the obtained dry residue of dark color was analyzed by the methods of electron microscopy (figure 1) and thermal analysis. In the central section of the particles, shown on the photographs, the brown inclusions to be considered as the amorphous carbonic mass are visible, whose output comprises less than 1% of the mass of initial organic liquid.

The results of thermal analysis showed that oxidation temperatures of the hexane models and detonation ND are located in one range, and the ethanol model oxidation begins to 50°C earlier. The loss of the mass of the nanocarbon models at the oxidation stage is close to detonation ND, whiches indicate the identical content of inorganic admixtures in all models.

In the process of collapsing the cavitation bubbles is separated the quantity of energy, sufficient for the break of the chemical bonds between C and H in the liquid, which leads to the formation of the carbonic phase of substance. Pressure developed in this case is sufficient for the transformation of nondiamond carbon into another, denser modification.



a b

Fig. 1 - a) DND; b) cavitation nanoparticles from ethanol (the electron microscopy 2000-and 8000 fold resolution).

[1] A.M. Staver et al. *FGV* **20**(5), 100 (1984).

[2] E.M. Galimov. *Nature* **243**, 389 (1973).