Structural investigations of carbon nanostructures produced by hydrodynamical cavitation technique

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Originally an idea of diamonds production by hydrodynamical cavitation was presented by academician E M Galimov [1]. He supposed the possibility of nature diamonds formation at fast magma flowing in kimberlitic pipes during bubbles collapse. Experimental setup to reproduce the high pressure and temperature reaction centers by means of the cavitation following the above idea was created. A few crystalline nanocarbon forms were successfully recovered after treatment of benzene (C_6H_6) [2].

From the general point of view, the physics by cavitational bubbles collapsing and by shock-compression is very similar [3]. But, the environment conditions, especially theirs that appropriate for the rapid cooling, are important as well. For example, the higher the cooling capacity, the larger the detonation nanodiamonds yield, which can reach 90%. Various measurements, including X-ray diffraction and high-resolution TEM revealed that the size of the diamond grains in the soot is distributed around 5 nm. The purpose of this study is to investigate a new rapid cooling technique under shock compression during hydrodynamical cavitation and to clarify carbon behavior under special range of P-T conditions. A special nanodiamond particles were found in the samples recovered from the benzene after treatment at the proper experimental setup. The results of characterization for the produced nanocarbon forms by means of the transmission electron microscope (TEM) and Raman spectroscopy are reported.

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[2] Galimov E., Kudin A., Skorobogatskiy V., Aronin A., *Dok. Acad. of Sciences* **395,** 187 (2004).
[3] Dnestrovskiy A., Voropaev S., Ponomareva E., *Doklady Physics* **56,** 78 (2011).