IR-spectroscopy of the Surface State of Detonation Nanodiamonds

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The variety of dimensional and structural-morphological properties combined with the variety of chemical functional groups on the particle surface allows speaking about detonation nanodiamonds like about the whole class of nanomaterials with wide range of properties and possibilities. At that the actual task is the development of uniform methods of identification and analysis of the significant properties of nanodiamonds produced in different technological conditions.

In the present work the properties of nanodiamonds with different dimensional characteristics, aggregate morphologies, and chemical composition of the surface groups were investigated with the method of IR-Fourier-spectroscopy.

Investigations were conducted on the device «Termo Nicolete Nexus 470» (USA) modified to the 670-model level, with the using the method of diffuse reflection (add-in device Smart Diffuse Reflectance (for Nexus)).

The powders of nanodiamonds synthesized in four different variants of detonation synthesis were investigated. The base purifying of nanodiamonds was made with oxidative liquid mixtures. Carboxylated, aminated, alkylated and H-terminated diamond surfaces were received with the methods of chemical modification. For identification of characteristic absorption bands additional chemical reactions on surface functional groups were made.

The analysis of the received collection of IR-spectra accounting the conditions of powders producing and treatment allowed one reconcilably identify main types of functional groups and bands that are peculiar to different nanodiamond modifications. The influence of surface carbonic structures was established on spectral characteristics of diamond powders. The influence of dimensional factors on the position and intensity of absorption bands in IR-range was shown.