Water Dispersions and Gels of Nano-diamond and Shungite as Studied by DLS, DSC and Adsorption

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Water dispersions and gels of nanodiamond (ND) and shungite carbon (Sh) have been studied by means of Dynamic Lihgt Scattering (DLS), Differential Scanning Calorimetry (DSC), Isopiestic method (IM) and adsorption/desorption measurements. Gels were prepared by removing of water from stable water dispersions or by adding of water to dry powders of nanoparticles directly or through the gas phase (IM). Stable in time water dispersion of Sh (r~50 nm) was prepared from shungite powder by sonication and centrifuging.

The characteristic size of carbon nanoparticles in the dispersion was compared with the size of nanophase water (NPhW) discovered in gels by means of DSC. For ND's (r ~ 2.5 nm) the DLS radius in the dispersion varied from 2.5 to 30 nm, depending on the intensity of the ultrasonic treatment. Contrary to that the radius of NPhW in ND gel was surprisingly stable (r~4-5 nm) and independent on the method of gel's preparation, pH (2-11) of water, preliminary heating of the dry powder. The radius of NPhW, calculated from the DSC traces was compared with the similar data obtained from the adsorption/desorption measurements.

Dried gels of ShC and ND were characterized by close parameters of specific surface and volume adsorption of water molecules.

The results obtained were used to describe the structure of carbon nano-particles in dispersion and gel.

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