

## Comparative study of some commercial detonation nanodiamonds

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Comparative systematic study of physical/chemical properties of series of commercial detonation nanodiamonds (DND) has been performed. In addition to conventional set of methods (HTEM, DLS, IR, x-ray) differential scanning calorimetry (DSC) was used to reveal dispersibility of DND in water.

The study was mainly focused on the materials, made by PlasmaChem GmbH. Single Digit ND (SDND) material produced by acidic/temperature treatment of crude DND [1] demonstrated unique properties both in DLS and DSC. The material easily forms stable in time almost mono-sized water dispersion. The DLS averaged diameter of DND species in the dispersion (~5-8 nm) was close to the size of primary DND particles (d~5nm).

Peak of melting of nanosized water (PMNW) [2] occurred in DSC traces of SDND at 263-264 K. This is the lowest temperature of PMNW measured for DND materials so far. One may assume that SDND as aqueous gel and dry powder is a completely disaggregated material consists of non-bonded primary particles.

For all the materials studied (SDND, WND, GO1, Nano-Pure GO1, made by PlasmaChem GmbH) the correlation was found between DLS and DSC data. The lower is the temperature of PMNW in the DSC trace; the smaller is the DLS diameter of DND aggregate in the dispersion. One may predict possible size of aggregate in the dispersion from the DSC traces of the material prior to making of the dispersion. Reproducibility of DSC traces is better than those of the DLS data.

The results obtained were compared with the data for other commercial DND.

- [1] Fedutik Yu, Antipov A, Maltseva E, Kalachev A, Gubarevich T. Proceedings of 3rd International Symposium «Detonation Nanodiamonds: Technology, Properties and Applications» St.Petersburg; Russia; 2008 p.65 – 72
- [2] Korobov M.V., Batuk M.M., Avramenko N.V., Ivanova N.I., Rozhkova N.N., Ōsawa E., *Diamond & Related Materials* **19**, 665 (2010).