COLLOIDAL SUSPENSION OF HEAVILY BORON-DOPED NANODIAMONDS

Boron-doped nanodiamonds (B-ND) are synthesized in heterohydrocarbon system under HPHT conditions, providing a high doping level up to 10^{21} cm^{-3}. Estimation of boron concentration was performed with use of Raman tool [1]. The product is cleaned by boiling in mixture of sulfuric and nitric acids (3:1), then washed with water to produce solution with PH 2.5-5. Typical concentration of nanodiamonds in water is about 1 mg/ml (Fig. 1a). The basic proposed product has average crystal size of 4-5 nm, similar to that for detonation nanodiamonds. DLS spectra collected after ultrasonication procedure demonstrates a small fraction of agglomerates more than 100 nm (Fig 1f). Electrokinetic potential is about -40 mV, characteristic for stable suspension (Fig. 1e). The suspension remains stable for several months. Morphology of nanodiamonds is demonstrated in the Fig. 1b. The synthesis technology makes it possible to produce nanodiamonds with a mean crystal size ranging from about 2 to 30 nm by varying time and temperature of HPHT process. Synthesis in the hetero-hydrocarbon system provides production of nanodiamonds free of metallic and nitrogen impurities (Fig. 1c).

Boron-doped nanodiamonds can be used in electrochemistry, medicine, inkjet printing of sensors, and as seeds for growing CVD diamond films doped with boron.

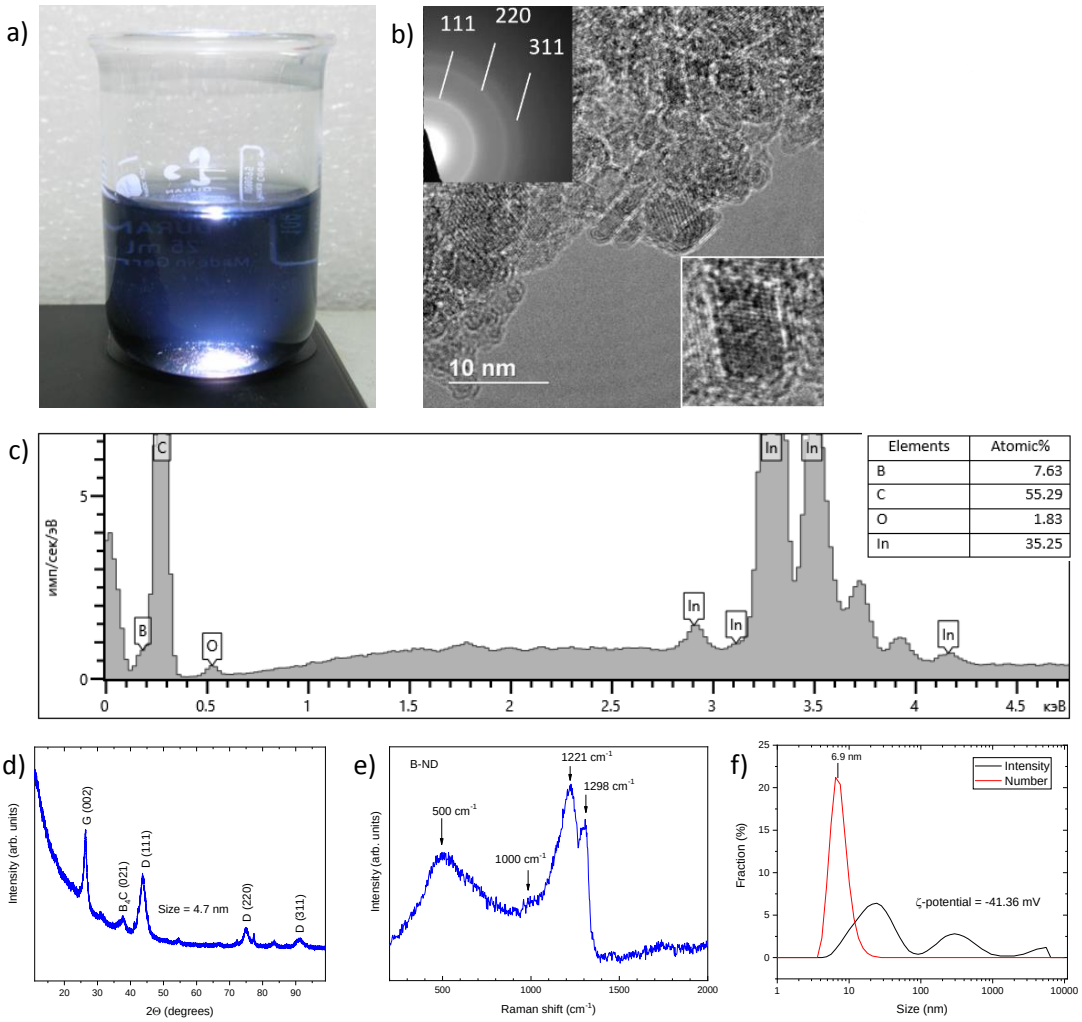

Fig. 1. a) Colloidal solution of B-ND in water, b) TEM image of B-ND with electron diffraction pattern, c) EDX analysis of synthesized product placed on the Indium plate, d) X-Ray diffraction pattern of synthesized product, e) Raman spectrum of cleaned and dried B-ND, f) DLS spectra of B-ND in water.

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