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TÉMA

Electrical potentials of nanodiamonds with different surface terminations evaluated by Kelvin probe force microscopy

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Evaluation of nanodiamond electrical potential under relevant environment (air) is substantial for their application in electronics as well as sensors and biology. We report on a novel method for characterization of nanodiamonds based on recording of their electrical potential as a function of their size by Kelvin Probe Force Microscopy (KPFM). We studied thermally oxidized, hydrogenated and graphitized [Phys. Rev. B 84 (2011) 233407] detonation nanodiamonds of 5-10 nm size. The nanodiamonds were deposited from diluted water-based or methanolic solutions on a Si substrate half coated with Au. The KPFM evaluation method resolves characteristic surface potential differences of nanodiamonds with different surface terminations. Furthermore, the nanodiamonds were found to assume similar surface potentials relative to the substrate (5-60 mV), which are different from their zeta potentials and from the electrical potential of bulk diamond. This is observed also by Scanning Electron Microscopy (SEM). These results have fundamental implications for diverse nanodiamonds applications.

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