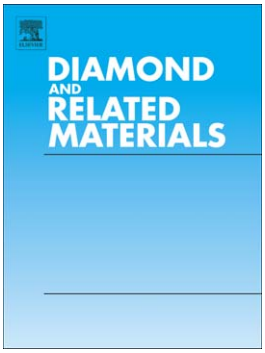

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Methods to grow porous diamond film doped with boron and nitrogen by deposition on carbon nanotubes

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Abstract: The nanocomposite of diamond deposited on carbon nanotubes (CNTs) emerged as an alternative to get Boron-Doped Diamond (BDD-CNTs) and Nitrogen-Doped Diamond (NDD-CNTs) porous films. This work got excellent wet individual seeding of each carbon nanotube of a CNT forest with minimum changes to its original morphology. The use of an oxygen plasma to graft polar groups on CNT surface enabled efficient electrostatic self-assembling (ESA) of nanodiamonds from a dispersion in a KCl diluted solution. The use of other routes with polymer functionalization and/or polymer based nanodiamond dispersion always left some residues and promoted nanodiamond bridging among carbon nanotubes. Even though any of the alternatives may produce porous diamond-CNT composites, the one grown to reproduce closely CNT morphology may allow much better results, as a larger surface area. Thermal Chemical Vapor Deposition (CVD) via floating catalyst produced the CNTs. Two different procedures promoted functionalization, either by immersion in the cationic polymer PDDA (poly Diallyldimethylammonium Chloride) or O_2 plasma functionalization. Seeding went on from 4 nm diamond particles dispersed either in DI water with the anionic polymer Poly Sodium Styrenesulfonate (PSS), or with a KCl solution in DI water. A Hot Filament Chemical Vapor reactor deposited diamond film on the CNTs. The composites were characterized through Raman spectroscopy, scanning electron microscopy with field emission gun (FEG-SEM) and Energy dispersive x-ray spectroscopy (EDS).

Keywords: Porous diamond, nanocomposite, carbon nanotubes.