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Controllable oxidization of boron doped nanodiamond covered with different solution via UV/ozone treatment

Abstract

UV/ozone irradiation was designed for controllable oxidation of nanodiamond films with distinctive chemical species. XPS investigation revealed that various kinds of oxygen-related chemical components would be functionalized onto nanodiamond surface covered by selective liquids for UV/ozone treatment. And the results of contact angle tests were in good accordance with the oxygen contents revealed from the deconvoluted C 1 s peaks. The covered solution on the nanodiamond film was found to be one significant factor besides UV/ozone illumination. Surface chemical components and the wettability were proved to be closely dependent on the covered liquids on the UV/ozone treated nanodiamond surface. Without any cover solution, heavy defects would be induced on nanodiamond via direct UV/ozone irradiation. However, basic solution rich with OH anions would be taken as an effective way forcontrollable oxidation, achieving high percentage of COOH but less defects on the nanocrystalline diamond surface. This controllable oxidation strategy would be widely applied for controllable surface modification of nanodiamond films in the device field.

Keywords

Contact angle; Nanodiamond film; Oxidation; SEM; UV/ozone; XPS