# Formation of metal nanoparticles by sputter deposition on UNCD films by NPIII inside conductive tubes

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Surface modification of ultrananocrystalline diamond (UNCD) films by Nitrogen Plasma Immersion Ion Implantation (NPIII) inside conductive tubes was studied. UNCD films were deposited on titanium substrates by CVD process using a hot filament reactor. They were treated by NPIII inside stainless steel metallic tubes, with 150 mm in length and different diameters, which were placed in the interior of vacuum chamber of 600 liters. UNCD films were investigated, before and after the NPIII treatment, using Field Emission Gun Scanning Electron Microscopy (FEG-SEM) with auxiliary Energy Dispersive Spectroscopy (EDS), X-Ray Diffraction (XRD), Raman Scattering Spectroscopy (RSS) and X-ray Photoelectron Spectroscopy (XPS). NPIII on the UNCD film inside conductive tubes changes the surface morphologies, increases the degree of disorder and the structural defects and results in metal nanoparticles by sputter deposition of the materials from the conductive tubes. Surface analysis have also demonstrated substantial dependence of NPIII with the tube diameter. For the UNCD films treatment by NPIII inside tube with diameter of 110 mm (T110), there was formation of metal oxide and nitride layers on the surface. For the tube with diameter of 40 mm (T40), DRX patterns showed the loss of crystallinity of the UNCD films and more pronounced formation of metal nanoparticles by sputter deposition on the surface. These facts can be attributed to the rise of temperature and increase of plasma density, as the diameter of the tube is reduced (from T110 to T40).

Keywords: Plasma Immersion Ion Implantation, Surface Modification, Ultrananocrystalline Diamond Films, conductive tubes.

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