TITANIUM SURFACE MODIFICATION BY NITROGEN PIII INSIDE CONDUCTIVE TUBES

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Surface modification of titanium by Nitrogen Plasma Immersion Ion Implantation (NPIII) inside conductive tubes was studied. Stainless steel metallic tubes with different diameters, 40 mm (MT40) and 110 mm (MT110), with 150 mm of length were placed in a large vacuum chamber of 600 liters to carry out the NPIII treatment. Nitrogen gas at 3 Pawas used to create the plasma while the pulse parameters were kept at 3kV/3A/30μs/1kHz for the MT110 and 2.7kV/1A/30μs/3kHz for the MT40. In order to study the effects of the treatment, several samples of titanium were placed inside the tube to be treated for 120 min. Another aim of this work is to show the possibility of the routine application of Raman Scattering Spectroscopy (RSS) in analyzing modified titanium surfaces. The samples were also investigated, before and after the NPIII treatment, using X-Ray Diffraction (XRD) and Field Emission Gun Scanning Electron Microscope coupled with Energy Dispersive X-Ray Spectroscopy (FEG-SEM/EDS). NPIII on the titanium changed the surface morphologies and characteristics of the RSS peaks of titanium nitrides and oxides were found to coexist in the samples treated by NPIII inside tubes. EDS results revealed the presence of nitrogen adsorbed in samples and new elements such as Fe, Cr and Ni that were sputtered from metallic tubes. This is a consequence of high concentration of nitrogen implanted into samples and of the increase in temperature due to the high ion flux bombardment on the surface, which was favorable to sputtering. The results have also demonstrated a substantial dependence of NPIII performance to the tube diameter. Work supported by CNPq Proc. 30008/2015-7/PCI-DA, FAPESP and Capes.