Influence of the Concentration of OH Radicals on the Growth of Hydroxyapatite on Titanium Samples Treated by PBII&D

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Abstract

Titanium has been widely used as a biomaterial due to its biocompatibility and good mechanical properties. However, the bone-implant integration is still a problem. Frequently, the metallic implant is encapsulated by a fibrous tissue, which hinders the chemical bonding between the material and the bone. Owing to that superficial treatments are generally performed to improve the interaction of the metal surface with body fluids aiming at the improvement of bone ongrowth. The incorporation of calcium on the surface of titanium by ion implantation has provided good results on the increment of Ti bioactivity. However, that is an expensive technique and the treatment of implants with complex geometries is complicated. In this context, the plasma immersion ion implantation and deposion techinique, PIII&D, has stood out as a very advantageous alternative to conventional ion implantation. In this work the deposition of calcium-containing films onto titanium samples has been performed by PIII&D. Granulated metallic calcium was sublimated by an electron beam at the same time as negative pulses were applied to titanium samples immersed in argon DC plasmas. It was evaluated the influence of the concentration of OH radicals, as estimated from infrared absorption spectra, on the growth of hydroxyapatite (the main mineral component of the bone) in samples treated under different conditions. X-ray diffraction spectroscopy was used to analyze the film crystalline structure, while the surface morphology was evaluated by Scanning Electron Microscopy.

Keywords: PBII&D, calcium, hydroxyapatite, titanium, bioactivity

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