ABSTRACT SUBMISSION

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Effect of silver and strontium incorporation route on hydroxyapatite coatings obtained by rf-SPS

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ABSTRACT

Hydroxyapatite coatings have been currently used since the 90' on hip prostheses for their ability to promote faster osseointegration and bone growth. Nevertheless, post-operative infections are a recurring problem in about 5% of newly implanted prostheses. To overcome this problem, doping with antibacterial elements has become a new trend. In this work, hydroxyapatite coatings elaborated by radio-frequency suspension plasma spraying (rf-SPS) to cope with the demand of nanostructured-coatings were doped with silver and strontium. Silver is known for its antibacterial properties and strontium for its stimulation of bone reconstruction [1,2]. Several doping strategies were explored thanks to the greater possibilities offered by SPS compared with conventional spraying (APS). First way: calcium phosphate powders were doped while synthesized by wet chemical and dispersed in water before thermal spraying. Second way: undoped powder was dispersed into aqueous medium where nitrates or nanoparticles of the dopant(s) were respectively dissolved/dispersed. This last way can only be implemented in the case of a liquid precursor. XRD revealed a high level of crystallinity and hydroxyapatite proportion for most of the coatings, with the presence of Ag_2O in the case of silver dispersion in the aqueous medium. EDS has demonstrated the homogeneous incorporation of strontium. FTIR and Raman spectroscopies confirmed the apatitic structure of all the coatings except for the ones obtained with the doped powder, which favored the formation of TCP phase over hydroxyapatite. However, the doping of the powders gives a homogeneous coating, whereas the doping of the solution containing the powder is more likely to concentrate the dopants at the grain boundaries of the splats. But the nanostructured character of those coatings caused by the SPS technique minimizes this difference. A new type of bi-functionalized coating (Fig. 1) with the upper layer doped and the inner one undoped has been developed to combine the biological activity due to the dopants with the stability associated with hydroxyapatite. Bacteriological tests, adsorption of BSA and cellular proliferation are currently performed as well as mechanical tests (traction and flexion) in order to certify their compliance with standards.

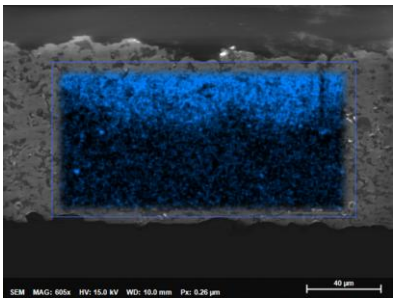

Figure 1 SEM-EDS image of strontium doped-bilayered hydroxyapatite coating. Strontium appears in blue

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