ABSTRACT SUBMISSION

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Fabrication of innovative calcium phosphate bioceramics using the electrostatic spray deposition technique.

V. Müller[1,2*], E. Djurado[1*], S. Tadier[2], T Pagnier[1], L. Gremillard[2]

[1]*Univ. Grenoble Alpes, Univ. Savoie Mont Blanc, CNRS, Grenoble INP, LEPMI, Grenoble, France*
[2]*Université de Lyon, INSA-Lyon, MATEIS, UMR 5510 CNRS, Lyon, France*
*veronica.muller@grenoble-inp.fr, *elisabeth.djurado@grenoble-inp.fr

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ABSTRACT

Replacement of missing or diseased hard tissues has become a common procedure in medicine and dentistry. In this field, coatings are frequently applied onto the surface of metallic implants, such as titanium and titanium alloys in order to improve their biological performance -i.e., to enhance bone contact or bone anchorage, defined as osseointegration-. Because of their similarity to the inorganic component of bones and teeth, calcium phosphate (CaP) bioceramics are considered as suitable material for use as a surface coating.

Currently, the most frequently applied method to coat titanium implants with CaP films is the plasma spraying technique, which has considerable drawbacks, for instance, unpredictable phase changes, the large thickness needed to completely cover the implant, and possible particle release and delamination.[1] Among alternative methods of depositing CaP coatings, Electrostatic Spray Deposition technique (ESD) is investigated as a promising low-temperature deposition technique.

ESD is a low-cost method, innovative, based on electrohydrodynamics' laws, that allows the deposition of films with a large variety of original morphologies and phases including crystalline and amorphous states of CaP. In this study, the microstructural and structural properties of the CaP coatings deposited on Ti alloy are investigated for different precursor solutions containing calcium and triethyl phosphate and for several ESD deposition parameters. The microstructure and composition of the obtained coatings were characterized by scanning electron microscopy (SEM) associated with energy dispersive X-ray spectroscopy (EDX). Their structural properties were determined using X-ray diffraction (XRD), Raman spectroscopy and Fourier-transformed infrared spectroscopy (FTIR).

This work[2] has shown that ESD proved to be a viable and potentially interesting technique to coat pure calcium phosphates such as carbonated hydroxyapatite on metals (Ti alloy) with unique dense, reticular or coral-type microstructures. Moreover, CaP films appear to be adherent and osteoconductive. The biological coating performances *in vivo* and *in vitro* studies are in progress.

References :

[1] P. Layrolle *et al.*, Bioceramics Conference (1998) 11: 465– 468.
[2] V. Müller *et al.*, Bioceramics, to be submitted