

Synthesis and characterization of biomaterials generated by plasma techniques

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Abstract

The PhD thesis is structured in two parts. The first part presents the doctoral theme, methods, and concepts, offering an in-depth study of the scientific literature on the following subjects: calcium phosphates, atmospheric pressure plasma treatments in stomatology, and thin film deposition techniques.

The second part presents the original contributions of the research. The aim of the thesis was the use of plasma techniques for biomedical applications, namely for dentistry and bone tissue engineering. Therefore, two research directions were developed, having two goals: i) improvement of fluoride treatments efficiency used in dentistry by atmospheric pressure plasma treatments and ii) tailoring the physicochemical and biological properties of calcium phosphate/chitosan composite coatings for bone tissue engineering applications using radio-frequency magnetron sputtering and matrix-assisted pulsed laser evaporation techniques. In the first case, the effects of an atmospheric pressure plasma activation step of an enamel-like model on the improvement of fluoride retention and on the biofilm inhibition were evaluated. In the second case, the physicochemical and the biological properties of the layers were evaluated based on the plasma and laser deposition methods, deposition parameters, and as a function of Sr dopant and chitosan content. Moreover, a laser-based method was developed for the identification of polymers.