

The effect of electrochemical deposited chitosan–nanostructured calcium phosphate coatings on titanium

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INTRODUCTION

Biomedical coating research focuses on understanding the interaction between implant surface and biological system and the exploitation of this knowledge to design improved interfaces with biological systems [1,2]. The incorporation of inorganic nanofillers of calcium phosphate (CaP), such as hydroxyapatite (HA) and β -tricalcium phosphate (β -TCP), in resorbable organic polymers has been shown accelerate *in situ* the specific interaction with bone cell surface receptors and thus can properly direct cell proliferation and differentiation [2–5]. In this study, we investigated the functionalization of titanium with chitosan and nanostructured CaP via an electrolytic chemical deposition.

MATERIALS AND METHODS

Chitosan solutions ([CH] = 1 g/L in acetic acid) containing nanostructured CaP were used as electrolytic bath (i. [HA] = 0.05–0.4 g/L, ii. [β -TCP] = 0.3 g/L, and iii. HA/ β -TCP = 70/30 wt%). Coatings were obtained by electrochemical deposition onto titanium specimens (c.p. grade 2) in galvanostatic mode ($J = 30 \text{ mA cm}^{-2}$, Source-Meter 2425, Keithley Instruments). Coatings were characterized via X-ray diffraction and scanning electron microscopy, immersed in simulated body fluid (SBF) and tested *in vitro* with osteosarcoma cell line (Saos-2).

RESULTS AND DISCUSSIONS

Obtained chitosan hybrid coatings show a regular surface morphology and a homogeneous distribution of inorganic phase within the polymer matrix (Figure 1a). After immersion in SBF, nanostructured CaP promoted the bioactivity and all coatings showed a mineralization: at 7 days time-point of immersion, the deposition of apatite structure was detected (Figure 1b). Cells were well spread all over the different coatings, their viability increased up to 10 days of culture and no significant differences have been detected compared to control.

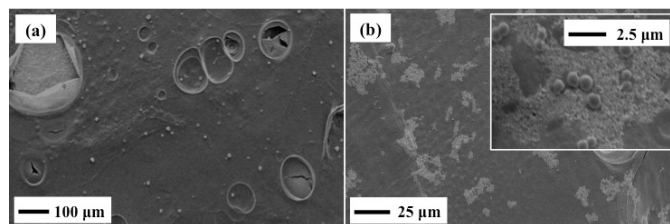


Figure 1. Surface morphology of (a) deposited coating and (b) 7 days after immersion in SBF.

CONCLUSIONS

Hybrid nanostructured CaP-chitosan coatings were successfully obtained via electrochemical deposition on titanium substrates. The tuning of HA and/or β -TCP resulted in an increase of the coating bioactivity and its ability to improve osteoblast-like cell attachment and spreading.

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