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Formation of strontium-substituted hydroxyapatite coatings on bulk Ti and TiN-coated substrates by plasma electrolytic oxidation

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Abstract

Crystalline strontium-substituted hydroxyapatite (Sr-HAp) coatings with porous structures were directly produced on bulk Ti and TiN-coated substrates by plasma electrolytic oxidation (PEO). PEO was conducted in the electrolytes consisting of 0.4 M $Ca(CH_3OOH)_2{\cdot}H_2O$ and 0.2 M $NaH_2PO_4{\cdot}2H_2O$ mixed with various concentrations of $Sr(OH)_2{\cdot}8H_2O$ ranging from 0–0.1M at 350 V for 15 min on bulk Ti. The relative integrated peak intensity, hydrophilicity, and cell viability of obtained Sr-HAp coatings firstly increased and then decreased with increasing the Sr^{2+} content. This indicates that optimum Sr addition could enhance both the growth and cell viability of the PEO-produced Sr-HAp coatings. Subsequently, the optimum Sr addition [0.05 M $Sr(OH)_2{\cdot}8H_2O$] was employed to make Sr-HAp coatings on TiN-coated substrates. The Sr-HAp coatings with fine porous morphology were obtained. Moreover, average growth rate of the coatings over TiN/Si was much higher than that on bulk Ti. The

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