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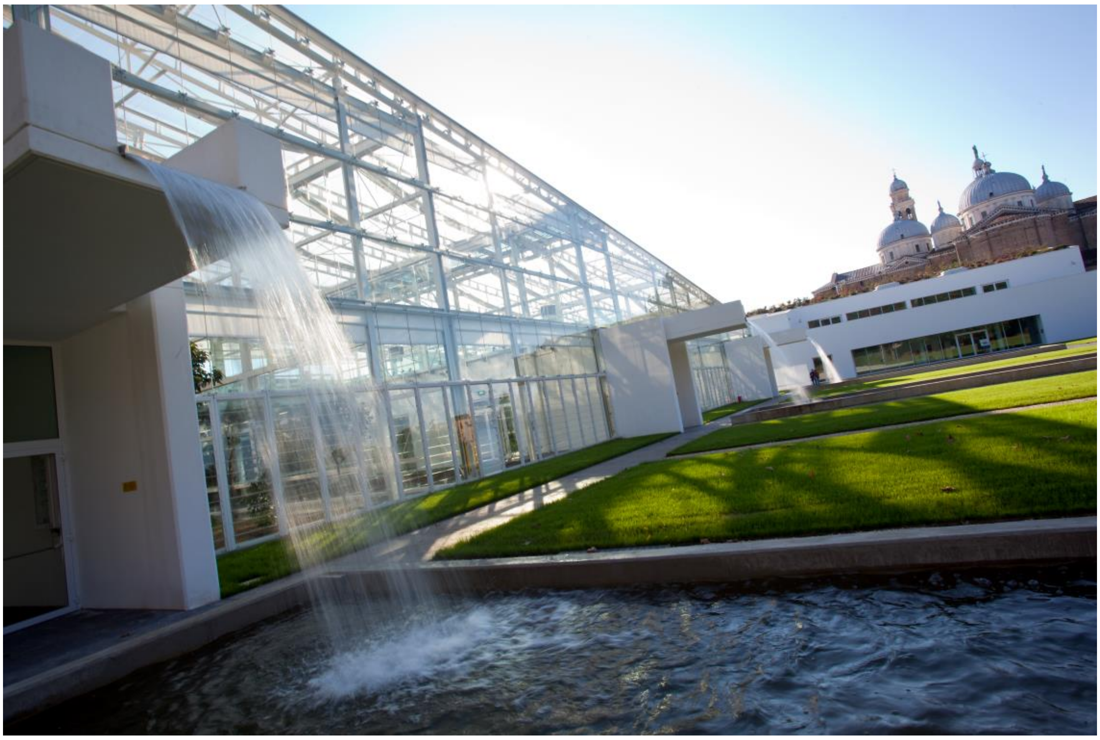

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Influence of process parameters of simultaneous anodization/anaphoretic electrodeposition synthesis of hydroxyapatite/titanium oxide composite coatings on adhesion

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In-situ synthesis of hydroxyapatite/titanium oxide (HAp/TiO_2) coating on titanium was performed via anaphoretic deposition of hydroxyapatite (HAp) and simultaneous anodization of Ti to produce highly adherent and strengthened composite coating. The influence of electric potential, time, electrolyte concentration and pH value of the anodization process on titanium surface roughness and anodization of titanium was examined, as well as influence of same process parameters on adhesion strength and compactness of composite HAp/TiO_2 coatings was investigated. Prior to novel *in situ* method of synthesis of hydroxyapatite/titanium oxide composite coatings by simultaneous anodization/anaphoretic electrodeposition described in this manuscript, optimization of anodization process of titanium was performed. Anodization was executed under different electric potentials and different distances of counter electrodes from working electrodes, but all anodization processes had constant quantity of electric charge. Characterization of titanium samples, prepared from grade 6 Ti, and having rectangular contact surfaces of 10×10×0.89 mm included SEM/EDS analyses, X-ray diffraction analyses, AFM surface topography, morphology and roughness analyses and linear measurements of roughness.

A chemical precipitation method was used to prepare hydroxyapatite powder by the reaction of calcium oxide (obtained by calcination of $CaCO_3$ for 5 h at 1000 °C in air) and phosphoric acid. A stoichiometric amount of the calcium oxide was stirred in distilled water and phosphoric acid was added drop wise to the suspension in order to obtain hydroxyapatite powder, $Ca_{10}(PO_4)_6(OH)_2$.

Two types of HAp coatings were prepared, in order to compare the adhesion, morphology and consistency of the HAp and composite HAp/TiO_2 on Ti, namely cathaphoretic and anaphoretic coatings, respectively [1,2]. The prepared coatings were characterized by field emission scanning electron microscopy, X-ray diffraction and electron dispersive spectroscopy. Adhesion was investigated by *ASTM D 3359 – 97 Test method B*. Uniform and adherent HAp/TiO_2 composite coating on Ti was obtained. Since smaller size of HAp crystals within highly porous coating structures is of improved binding ability to various biomolecules, our coating is expected to be of excellent coverage and compactness. The obtained coating can be good candidate for bone implants due to improved adhesion.

[1] S. Eraković, A. Janković, I.Z. Matić, Z.D. Juranić, M. Vukašinović-Sekulić, T. Stevanović and V. Mišković-Stanković, *Mater. Chem. Phys.*, 2013, **142**, 521–530.
[2] M.R. Pantović Pavlović, S.G. Eraković, M.M. Pavlović, J.S. Stevanović, V. V Panić and N.L. Ignjatović, *Surf. Coatings Technol.*, 2019, **358**, 688–694.