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Surface modification of titanium implants by adherent hydroxyapatite/titanium oxide composite coatings using novel *in-situ* synthesis

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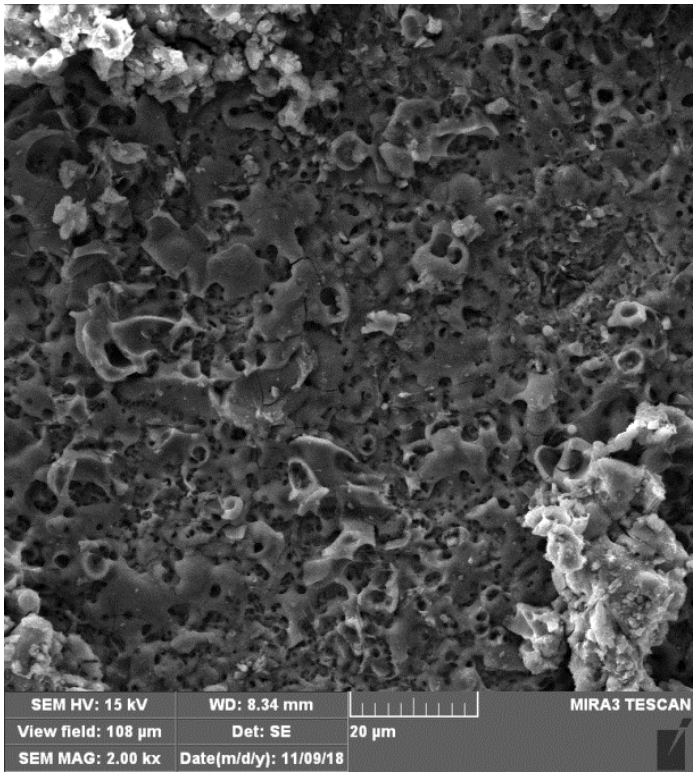

Figure 1. FE-SEM microphotographs of titanium surface after removing anHAP/TiO_2 coating.

The medical devices based on titanium and its alloys are widely used in the repair and replacement of a degraded or inhibited function of locomotor system [1]. Ti and its alloys exhibit high mechanical strength, good workability, resistant to corrosion and low cost. Although, they are widely used as orthopedic and dental implants their inability to interact with living tissue will inhibit their biological fixation and osseointegration [2]. Therefore, to improve the hard-tissue compatibility of Ti various surface treatments have been developed for the inorganic coating formation [3]. The hydroxyapatite (HAp, $Ca_{10}(PO_4)_6(OH)_2$) with superior osteogenic activity is a competitive approach to make novel coatings for titanium implants applications. HAp is a calcium phosphate very similar to the inorganic part of the human bone and hard tissues both in morphology and composition. Herein, *in-situ* synthesis of HAp/TiO_2 coating on titanium was performed via anaphoretic deposition of HAp and simultaneous anodization of Ti to produce highly adherent and strengthened composite coating.

It can be seen that morphology of Ti substrate of anHAP/TiO_2 coating is of tubular shape, and tube formation occurs mainly due to competing processes of anodization and electrophoretic deposition of HAp. anHAp/TiO_2 coating does not need sintering process, and simultaneous Ti anodization and HAp deposition occur, where HAp crystals incorporate in the anodized Ti surface. From the presented results it can be concluded that novel suggested process of *in situ* simultaneous anHAp/TiO_2 deposition with Ti surface anodization gives much better results that cathaphoretic deposition regarding adhesion.

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