The properties of hydroxyapatite ceramic coatings produced by plasma electrolytic oxidation

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Abstract
Calcium phosphate coatings produced on the surface of Ti6Al4V by plasma electrolytic oxidation (PEO) using different concentrations of hydroxyapatite (HA) in a 0.12 M Na\textsubscript{3}PO\textsubscript{4} (NAP) electrolyte solution was investigated. It was found that the amount of calcium phosphate particles infiltrated into the coating layer as well as the thickness and the surface roughness of the coating increased with increasing HA concentration. The porosity of the ceramic coatings indicated an inverse relationship with the concentration of HA particles dispersed in the NAP solution. The result also demonstrates that higher scratch adhesive strength was achieved using 1.5 g/L HA solution, producing a critical load of 2099 mN, while 0 g/L HA only produced a critical load of 1247 mN. The adhesion becomes independent of thickness when the concentration of HA exceeds 1.5 g/L. The failure of the coating was characterized by large periodic hemispherical chipping, while intermittent delamination was noticed with the coating embedded with HA particles. This study demonstrate the viability of using PEO to produce a thin layer of HA ceramic coating on Ti6Al4V suitable for biomedical applications. © 2017 Elsevier Ltd and Techna Group S.r.l.

Author keywords
Coating characteristics Hydroxyapatite coating Plasma electrolytic oxidation

Indexed keywords
Engineering controlled terms: Aluminum alloys Calcium Calcium phosphate Ceramic materials Electrolysis Electrolytes Hydroxyapatite Medical applications Oxidation Phosphate coatings Sodium compounds Surface roughness Ternary alloys Titanium alloys Vanadium alloys

Compendex keywords: Adhesive strength Biomedical applications Coating characteristics Electrolyte solutions Hydroxyapatite ceramics Hydroxyapatite coating Inverse relationship Plasma electrolytic oxidation

Engineering main heading: Ceramic coatings

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Funding details
The authors would like to acknowledge the University of Malaya for providing the necessary resources and facilities for this study. This project was supported under the FRGS grant no. FP056-2015A and PPP grant No. PG186-2016A.

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