Accepted Manuscript

Characterization of hydroxyapatite coatings deposited by hydrothermal electrochemical method on NaOH immersed Ti6Al4V

Daihua He, Ping Liu, Xinkuan Liu, Fengcang Ma, Xiaohong Chen, Wei Li, Jiandi Du, Pu Wang, Jun Zhao

PII: S0925-8388(16)30443-1

DOI: 10.1016/j.jallcom.2016.02.173

Reference: JALCOM 36791

To appear in: *Journal of Alloys and Compounds*

Received Date: 31 December 2015

Revised Date: 18 February 2016

Accepted Date: 19 February 2016

Please cite this article as: D. He, P. Liu, X. Liu, F. Ma, X. Chen, W. Li, J. Du, P. Wang, J. Zhao, Characterization of hydroxyapatite coatings deposited by hydrothermal electrochemical method on NaOH immersed Ti6Al4V, *Journal of Alloys and Compounds* (2016), doi: 10.1016/j.jallcom.2016.02.173.

Characterization of hydroxyapatite coatings deposited by hydrothermal electrochemical method on NaOH immersed Ti6Al4V

Daihua He [a*], Ping Liu[a], Xinkuan Liu[a], Fengcang Ma[a], Xiaohong Chen[a], Wei Li[a], Jiandi Du[b], Pu Wang[b], Jun Zhao[c]

[a] School of Materials Science and Engineering, University of Shanghai for Science and Technology, Shanghai, PR China, 200093

[b] School of Mechanical Engineering, University of Shanghai for Science and Technology, Shanghai, PR China, 200093

[c] Key Laboratory of Inorganic Coating Materials, Chinese Academy of Sciences, Shanghai, PR China, 200050

Abstract: The hydrothermal electrochemical method was used to deposit hydroxyapatite coating on Ti6Al4V. In order to improve the bonding strength between the coating and substrate, the substrates were modified by 8 M NaOH solution before the deposition. The effects of immersing time on the substrate, on the hydroxyapatite coating, and on the bonding strength were studied. X-Ray Diffraction, Scanning Electron Microscope, Fourier Transform Infrared Spectroscopy and Drop Shape Analysis Method were applied. And the crystallinity of hydroxyapatite coating was calculated. The results show that immersing treatment effects the phase compositions, the microstructure and the wettability of the substrate surface. A porous, three-dimensional network structure is formed on the Ti6Al4V surface through the NaOH immersion. The pore size and depth increase with the increase of immersing time from 12 to 48 h. The surface microstructure of Ti6Al4V with 60 h' immersion time was different from the others. The modification treatment can improve the bonding strength between hydroxyapatite coating and the substrate obviously. The value of the bonding strength with the substrate immersed for 48 h is larger than those of the others. A bone-like apatite layer forms on the coating after 3 days of soaking in SBF, implying with good bioactivity of the hydroxyapatite coatings deposited by the method. The surface characteristics of the sample immersed with 48 h are more conductive to the deposition of hydroxyapatite and to the improvement of the bonding strength. The formation mechanism of hydroxyapatite coating deposited by hydrothermal electrochemical method was discussed.

Keywords: hydrothermal electrochemical method; hydroxyapatite coating; NaOH solution; immersing time; Ti6Al4V

* Corresponding author. Tel.: +86 021 55271682, Fax: +86 021 55271682
E-mail address: hedh21@163.com