Accepted Manuscript

In-vitro electrochemical study of TiB/TiB_2 composite coating on titanium in Ringer's solution

Adib Ebrahimi, Hamid Esfahani, Arash Fattah-alhosseini, Omid Imantalab

PII: S0925-8388(18)32433-2

DOI: 10.1016/j.jallcom.2018.06.312

Reference: JALCOM 46648

To appear in: *Journal of Alloys and Compounds*

Received Date: 15 April 2018

Revised Date: 22 June 2018

Accepted Date: 25 June 2018

Please cite this article as: A. Ebrahimi, H. Esfahani, A. Fattah-alhosseini, O. Imantalab, In-vitro electrochemical study of TiB/TiB_2 composite coating on titanium in Ringer's solution, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.06.312.

In-vitro Electrochemical Study of TiB/TiB_2 Composite Coating on Titanium in Ringer's Solution

Adib Ebrahimi, Hamid Esfahani*, Arash Fattah-alhosseini, Omid Imantalab

Department of Materials Engineering, Bu-Ali Sina University, Hamedan 65178-38695, Iran

(*Corresponding Author, E-mail:h.esfahani@basu.ac.ir)

Abstract

In this work, different electrochemical analyses in Ringer's solution at 37 ˚C were implemented to understand the electrochemical response of diversity of titanium boride coatings developed on the commercially pure titanium (CP–Ti) via pack cementation method. X-ray diffraction (XRD) patterns and scanning electron microscopy (SEM) images indicated that the boriding creates the TiB whiskers and TiB whiskers/TiB_2 dense layer on the top of the surface of CP–Ti in respect to the heat-treatment at 900 and 1000 ˚C for 3 h. Potentiodynamic polarization curves cleared the passive behavior of the borided samples. Electrochemical impedance spectroscopy (EIS) assays revealed the satisfactory corrosion resistance of the borided samples in Ringer's solution. Mott–Schottky (M–S) assessments represented that the passive films formed on CP–Ti and the borided samples behaved as doped n-type semiconductor properties. Furthermore, M–S assessments indicated that the donor concentration of the passive films decreased with increasing the time. Finally, the borided sample at 900 °C in comparison with the borided sample at 1000 °C illustrated to be the more suitable selection for bioimplant applications, mainly due to better surface conditions to form a less defective and more protective passive film.

Keywords: Diffusion; Mott-Schottky; Passive film; Ringer Buffer Solution; Titanium boride