Title	Bioactivity and Corrosion Resistance of NiTi After Calcium Plasma Immersion Ion Implantation
Author(s)	Liu, XM; Wu, SL; Chu, PK; Chan, YL; Chung, CY; Chu, CL; Yeung, KWK; Lu, WW; Cheung, KMC; Luk, KDK
Citation	The 34th IEEE International Conference on Plasma Science (ICOPS 2007) and The 16th IEEE International Pulsed Power Conference (PPPS-2007), Albuquerque, NM., 17-22 June 2007. In Conference Proceedings, 2007, p. 375, no. 3P31
Issued Date	2007
URL	http://hdl.handle.net/10722/104227
Rights	IEEE Conference Record - Abstracts. Copyright © Institute of Electrical and Electronics Engineers.; This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.

07CH37865

IEEE Conference Record - Abstracts

PPPS-2007

Pulsed Power Plasma Science 2007

The 34th IEEE International Conference on Plasma Science and
The 16th IEEE International Pulsed Power Conference

June 17-22, 2007
Albuquerque, New Mexico USA

Sponsored by:
Plasma Science and Applications Committee and
Pulsed Power Science and Technology Committee of
The IEEE Nuclear and Plasma Sciences Society

BIOACTIVITY AND CORROSION RESISTANCE OF NiTi AFTER CALCIUM PLASMA IMMERSION ION IMPLANTATION

X. M. Liu [a], S. L. Wu [a], Paul K. Chu [a,*], Y. L. Chan [b], C. Y. Chung [a], C. L. Chu [a,c], K. W. K. Yeung [b], W. W. Lu [b], K. M. C. Cheung [b], K. D. K. Luk [b]

[a] *Department of Physics and Materials Science City University of Hong Kong, Hong Kong, China*

[b] *Division of Spine Surgery, Department of Orthopaedics and Traumatology, The University of Hong Kong, Pokfulam, Hong Kong*

[c] *School of Materials Science and Engineering, Southeast University, Nanjing 210018, China*

Plasma immersion ion implantation (PIII) is an effective approach to enhance the surface properties of various types of biomaterials. In order to enhance the surface bioactivity and corrosion resistance of NiTi shape memory alloy, calcium ions were implanted into NiTi alloys that have been pre-plasma-implanted with oxygen and nitrogen. The results are compared to samples without pre-treatment. The bioactivity of calcium-implanted NiTi was evaluated by immersion tests in simulated body fluid (SBF). The surface of NiTi before and after immersion tests was characterized by X-ray photoelectron spectroscopy (XPS). The XPS results reveal that the structure of the calcium-implanted layer in all the samples is composed of calcium oxide and gradually becomes a Ca-P layer after a period incubation in SBF. This Ca-P film also can be detected by scanning electron microscopy (SEM). To evaluate the anti-corrosion performance of NiTi, electrochemical potentiodynamic polarization tests were conducted on the NiTi samples in SBF. NiTi samples with pre-oxygen and nitrogen plasma implantation exhibit better corrosion resistance than single calcium-implanted samples. Our results indicate that calcium implantation can enhance the bioactivity of NiTi alloy due to the formation of calcium phosphate on the surface of the alloy. Plasma ion implantation can also improve the corrosion resistance of NiTi.