Surface Characteristics of Hydroxyapatite Coated Surface on Nano/Micro Pore Structured Ti-35Ta-xNb Alloys

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Abstract: In this study, we investigated surface characteristics of hydroxyapatite coated surface on nano/micro pore structured Ti-35Ta-xNb alloys. This paper was focus on morphology and corrosion resistance of Anodic oxidation. To prepare the samples, Ti-35Ta-xNb (x= 0, 10 wt. %) alloys were manufactured by arc melting and heat-treated for 12 h at 1050 ℃ in Ar atmosphere at 0 ℃ water quenching. Micro-pore structured surface was performed using anodization with a DC power supply at 280 V for 3 min, nanotube formed on Ti-35Ta-xNb alloys was performed using DC power supply at 30 V in 60 min at room temperature. Surface morphology and structure were examined by field-emission scanning electron microscopy, energy-dispersive X-ray spectroscopy and X-ray diffraction.

1. Introduction

The Ti alloys and Cp-Ti were widely used for biomedical implant due to its excellent strength and low density. Especially, Ti-6Al-4V alloy was widely used for an orthopedic and dental implant material because of excellent combination of biocompatibility, corrosion resistance, and mechanical properties. However Ti-6Al-4V alloy has some problem to biomaterials because it has potential cytotoxic and allergy. Recently, β-type Ti alloys were applicable to biomedical materials because of their superior properties such as low Young's modulus, super-elasticity and good biocompatibility. To enhanced biocompatibilities, electrochemical anodic oxidation is known to excellent method in the biocompatibility of biomaterials. The anodizing oxide layer and diameter modulation of Ti alloys can be obtained function of improvement of cell adhesion. Hydroxyapatite is used in the coating on Ti alloys due to it is similar to human bone.

2. Experimental

In this study, This alloys were prepared from Ti with 35 wt. % Ta and Nb which contents of 0 to 10 wt. % and were manufacture in arc-melting furnace. Micro-pore oxidation surface was performed to electrolyte in 0.15 M Calcium acetate monohydrate + 0.02 M Calcium glycerophosphate at DC power supply at 280 V for 3 min. Nanotube oxidation surface was preformed to electrolyte in 1 M H_3PO_4 + 1.2 wt. % NaF at 30 V for 60 min. Microstructures of the alloys were examined by optical microscopy (OM, Olympus BM60 M, Japan) and field emission scanning electron microscopy (FE-SEM, Hitachi 3000, Japan). X-ray diffraction (XRD) was employed to identify the phases in the Ti-35Ta-xNb alloys. The morphology of the anodized oxidation surface was characterized by a field-emission scanning electron microscopy (FE-SEM, Hitachi S-4800, Japan).

3. Conclusion

The microstructure of Ti-35Ta-xNb alloys showed martensite α'', needle-like and β phase, the peak of β phase increased with Nb contents. The morphology of HA coated Ti-35Ta-xNb alloys have influence on surface shape. (Supported by NRF: No.2008-0062283, hcchoe@chosun.ac.kr).

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