Surface Characteristics of Anodized Ti-30Nb-xTa Alloys with Ta Content

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Abstract: The purposed of this work was to determine surface charateristics of anodized Ti-30Nb-xTa alloys with Ta content. Samples were prepared by arc melting, followed by followed by homogenization for 12 hr at 1000 °C in argon atmosphere. The electrolyte for anodization treatment was prepared by mixing 465ml H_2O with 35M H_3PO_4 and anodized at 180V to 220V. The microstructures of the alloys were examined by X-ray diffractometer (XRD) and optical microscopy (OM). Surface characteristics of anodized Ti-30Nb-xTa alloys was investigated by potentiodynamic test and potentiostatic in 0.9% Nacl solution at 36.5±1℃. It was observed that the changed α phase to β phase with Ta content.

1. Introduction

The biomaterials for hard tissues should possess an excellent biocompatibility, superior corrosion capacity, high strength and suitable elastic modulus. Ti base alloys are extensively used in biomedical application. Although the Ti-6Al-4V alloy is an acceptable prosthetic biomaterials, recent studies indicated that the release and accumulation of Al and V ions could have harmful effects on the human body. Therefore, in order to overcome these disadvantages of Ti-6Al-4V alloy, many Ti alloys consisting of non-toxic elements such as Nb, Ta, Zr, Hf and Mo, have been developed for use in biomedical applications. Especially, tantalum and niobium are considered to be the strongest beta stabilizers, effectively decreasing Young's modulus of titanium alloys. Surface modification is generally essential to improve the chemical bonding between Ti implant and bone tissues. Anodic oxidation is cost-effective, straight forward and simple method for preparing self-organized porous structures.

The aim of this study was surface characteristics of anodized Ti-30Nb-xTa alloys with Ta content by using various experimental instruments.

2. Experimental

In this paper, Ti-30Nb-xTa alloys with Ta contents of 0, 3, 7 and 15 wt.% were melted by using a vacuum arc-melting furnace. Ti-30Nb-xTa alloys were homogenized for 12hr at 1000℃. The electrolyte for anodization treatment was prepared by mixing 465ml H_2O with 35M H_3PO_4 and anodized at 180V to 220V. This study was evaluated the phase and microstructure of Ti-30Nb-xTa alloys using an X-ray diffractometer (XRD) and optical microscopy (OM). Surface characteristics of anodized Ti-30Nb-xTa alloys was investigated by potentiodynamic test and potentiostatic in 0.9% Nacl solution at 36.5±1℃.

3. Conclusions

The surface characteristics of anodized alloy depended on the voltage, electrolyte and alloying elements.

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