Hydroxyapatite Deposited Surface of Ti-25Nb-xZr Alloys after Nanotube Formation by Anodization

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Titanium (Ti) and its alloys are fast emerging as the most attractive choice for the majority of medical applications. Especially the Ti-6Al-4V alloy has been an important biomaterial in this field for a long period, due to its high specific strength, excellent corrosion resistance and superior biocompatibility. In addition, titanium and its alloys are used widely as orthopedic and dental implant materials. However releases toxic (Al and V) ions into the body, besides when titanium or titanium alloy is implanted in bone, the bonding of the implant with living bone often does not develop or a long time of several months is required to achieve the integration of the implants with bone tissue. For improving this problem, lower elastic modulus and biocompatible Ti alloys have included β stabilizing elements such as Ta, Nb and Zr contents. Titanium oxide nanotube formation on the titanium or titanium alloy surface is expected to be important to improve cell adhesion and proliferation under clinical conditions [1].

Hydroxyapatite [$Ca_{10}(PO_4)_6(OH)_2$] has been widely used as coating materials for dental orthopedic implants for many years, due to its close similarity of chemical composition and high biocompatibility with natural bone tissue [2].

In this study, the hydroxyapatite deposited surface of Ti-25Nb-xZr alloys after nanotube formation by anodization has been investigated using various methods. The Ti–25Nb–xZr alloys were prepared by an arc melting furnace, homogenized for 12 h at 1000 ° C in an argon atmosphere, and then water-quenched. Nanotubular structures were formed by an electrochemical method in 1 M H_3PO_4 electrolytes containing 0.8 wt. % NaF. Electrochemical deposition was carried out using a cyclic voltammetry method over a potential range of −1.5 V to 0 V at 80 ° C in a hydroxyapatite solution. This study was evaluated the phase and microstructure of Ti-25Nb-xZr alloys using an X-ray diffraction (XRD) and optical microscopy (OM). To understand the mechanism of precipitated hydroxyapatite, the morphology of Ti-25Nb-xZr alloys by anodic oxidation was investigated by field-emission scanning electron microscope (FE-SEM) (Supported by NRF: 2013 R1A1A 2006203; hcchoe@chosun.ac.kr).

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