Silicon-doped Hydroxyapatite Morphology of Ti-Nb-Zr alloy

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The titanium (Ti) implant is one of the most popular for the replacement of dental and orthopedic hard tissue. The issues of osseointegration are highly closed with their surface properties, many kind of surface modification have been tried to be a biocompatible. One of the trial approaches for the bioactive implant surface is to deposit thin hydroxyapatite [$Ca_{10}(PO_4)_6(OH)_2$, HA] on implant surfaces. HA is known as one of bioactive material that may form a chemical bond to the surrounding bone, moreover, silicon-doped HA (Si-HA) can role as an essential element for higher biological organism at the initial healing period. As a coating substrate, β phased Ti-35Nb-10Zr alloy system has significant low elastic modulus and has non-toxic elements than that of pure Ti and conventional alloys. The objective of this study was to investigate the silicon-doped hydroxyapatite morphology of Ti-Nb-Zr alloy using cyclic electrochemical deposition method. The Ti-Nb (35 wt.%)-Zr (10 wt.%) alloy was manufactured by arc melting furnace. Si-HA coating was performed by pulsing the potential with a method of cyclic voltammetry with variable cyclic time (10-150) and electrolyte [$Ca(NO_3)_2$, $NH_4H_2PO_4$, and $Na_2SiO_3 9H_2O$; 1.67 Ca/P ratio; 1-2.5 wt.% Si content]. The surface characteristics were observed by scanning electron microscopy, X-ray diffractometer, and, electrochemical test [potentiodynamic and AC impedance test; Analysis of variance (ANOVA) with $p < 0.05$]. As results, more cyclic time of coatings layer could be have increased corrosion potential and decreased current density, also has more plate like structure than that of less cyclic time (Supported by NRF: 2013 R1A1A 2006203; hcchoe@chosun.ac.kr).

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