Si and Mg Coatings on the Hydroxyapatite Film Formed Ti-29Nb-xHf Alloys by Plasma Electrolyte Oxidation

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초 록: Titanium and its alloys have been widely used for biomedical applications. However, the use of the Ti-6Al-4V alloy in biomaterial is then a subject of controversy because aluminum ions and vanadium oxide have potential detrimental influence on the human body due to vanadium and aluminum. Hence, recent works showed that the synthesis of new Ti-based alloys for implant application involves more biocompatible metallic alloying element,such as, Nb, Hf, Zr and Mo. In particular, Nb and Hf are one of the most effective Ti β-stabilizer and reducing the elastic modulus. Plasma electrolyte oxidation (PEO) is known as excellent method in the biocompatibility of biomaterial due to quickly coating time and controlled coating condition. The anodized oxide layer and diameter modulation of Ti alloys can be obtained function of improvement of cell adhesion. Silicon (Si) and magnesium (Mg) has a beneficial effect on bone. Si in particular has been found to be essential for normal bone and cartilage growth and development. In vitro studies have shown that Mg plays very important roles in essential for normal growth and metabolism of skeletal tissue in vertebrates and can be detected as minor constituents in teeth and bone.

Therefore, in this study, Si and Mg coatings on the hydroxyapatite film formed Ti-29Nb-xHf alloys by plasma electrolyte oxidation has been investigated using several experimental techniques. Ti-29Nb-xHf (x= 0, 3, 7 and 15wt%, mass fraction) alloys were prepared Ti-29Nb-xHf alloys of containing Hf up from 0 wt% to 15 wt% were melted by using a vacuum furnace. Ti-29Nb-xHf alloys were homogenized for 2 hr at 1050℃. The electrolyte was Si and Mg ions containing calcium acetate monohydrate + calcium glycerophosphate at room temperature. The microstructure, phase and composition of Si and Mg coated oxide surface of Ti-29Nb-xHf alloys were examined by FE-SEM, EDS, and XRD (Supported by NRF: 2015H1C1A1035241 & NRF: No.2008-0062283 ; hcchoe@chosun.ac.kr).