Si and Mg doped Hydroxyapatite Film Formation by Plasma Electrolytic Oxidation

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초 록 : Titanium and its alloys are widely used as implants in orthopedics, dentistry and cardiology due to their outstanding properties, such as high strength, high level of hemocompatibility and enhanced biocompatibility. 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.

The aim of this study is to research Si and Mg doped hydroxyapatite film formation by plasma electrolytic oxidation. 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℃. Each alloy was anodized in solution containing typically 0.15 M calcium acetate monohydrate + 0.02 M calcium glycerophosphate at room temperature. A direct current power source was used for the process of anodization. Anodized alloys was prepared using 270V~300V anodization voltage at room. A Si and Mg coating was produced by RF-magnetron sputtering system. RF power of 100W was applied to the target for 1h 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; hcchoe@chosun.ac.kr).