Bone-like Apatite Formation on Ti-6Al-4V in Solution Containing Mn, Mg, and Si Ions after Plasma Electrolytic Oxidation in the SBF Solution

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초 록: Titanium and its alloys that have a good biocompatibility, corrosion resistance, and mechanical properties such as hardness and wear resistance are widely used in dental and orthopedic implant applications. They can directly connect to bone. However, they do not form a chemical bond with bone tissue.

Plasma electrolytic oxidation (PEO) that combines the high voltage spark and electrochemical oxidation is a novel method to form ceramic coatings on light metals such as titanium and its alloys. This is an excellent reproducibility and economical, because the size and shape control of the nano-structure is relatively easy.

Silicon (Si), manganese (Mn), and magnesium (Mg) has a useful to bone. Particularly, Si has been found to be essential for normal bone, cartilage growth and development. Manganese influences regulation of bone remodeling because its low content in body is connected with the rise of the concentration of calcium, phosphates and phosphatase out of cells. Insufficience of Mn in human body is probably contributing cause of osteoporosis. Pre-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 objective of this work was to study nucleation and growth of bone-like apatite formation on Ti-6Al-4V in solution containing Mn, Mg, and Si ions after plasma electrolytic oxidation. Anodized alloys was prepared at 270V~300V voltages. And bone-like apatite formation was carried out in SBF solution for 1, 3, 5, and 7 days. The morphologies of PEO-treated Ti-6Al-4V alloy in containing Mn, Mg, and Si ions were examined by FE-SEM, EDS, and XRD (Supported by NRF: 2015H1C1A1035241 ; hcchoe@chosun.ac.kr).