ATO 처리후, 플라즈마 전해 산화 처리된 Ti-6Al-4V 합금의 표면 형태

Surface Morphology of PEO-treated Ti-6Al-4V Alloy after Anodic Titanium Oxide Treatment

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Abstract : Commercially pure titanium (CP-Ti) and Ti-6Al-4V alloys have been widely used in implant materials such as dental and orthopedic implants due to their corrosion resistance, biocompatibility, and good mechanical properties. However, surface modification of titanium and titanium alloys is necessary to improve osseointegration between implant surface and bone. Especially, when titanium oxide nanotubes are formed on the surface of titanium alloy, cell adhesion is greatly improved. In addition, plasma electrolytic oxide (PEO) coatings have a good safety for osseointegration and can easily and quickly form coatings of uniform thickness with various pore sizes. Recently, the effects of bone element such as magnesium, zinc, strontium, silicon, and manganese for bone regeneration are researching in dental implant field. The purpose of this study was researched on the surface morphology of PEO-treated Ti-6Al-4V alloy after anodic titanium oxide treatmentusing various instruments.

Ti-6Al-4V ELI disks were used as specimens for nanotube formation and PEO-treatment. The solution for the nanotube formation experiment was 1 M H_3PO_4 + 0.8 wt. % NaF electrolyte was used. The applied potential was 30V for 1 hours. The PEO treatment was performed after removing the nanotubes by ultrasonics for 10 minutes. The PEO treatment after removal of the nanotubes was carried out in the Ca $(CH_3)_2 \cdot H_2O$ + $(CH_3COO)_2Mg \cdot 4H_2O$ + Mn $(CH_3COO)_2 \cdot 4H_2O$ + Zn $(CH_3CO_2)_2Zn \cdot 2H_2O$ + Sr $(CH_2COO)_2 \cdot 0.5H_2O$ + $C_3H_7CaO_6P$ and $Na_2SiO_3 \cdot 9H_2O$ electrolytes. And the PEO-treatment time and potential were 3 minutes at 280V. The morphology changes of the coatings on Ti-6Al-4V alloy surface were observed using FE-SEM, EDS, XRD, AFM, and scratch tester. The morphology of PEO-treated surface in 5 ion coating solution after nanotube removal showed formation or nano-sized mesh and micro-sized pores. (This research was supported by Supported by Ministry of Science, ICT and Future Planning: 17GJ1006;hcchoe@chosun.ac.kr)