Surface Observation of Mg-HA Coated Ti-6Al-4V Alloy by Plasma Electrolytic Oxidation

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초 록 : An ideal orthopedic implant should provide an excellent bone-implant connection, less implant loosening and minimum adverse reactions. Commercial pure titanium (CP-Ti) and Ti alloys have been widely utilized for biomedical applications such as orthopedic and dental implants. However, being bioinert, the integration of such implant in bone was not in good condition to achieve improved osseointegraiton, there have been many efforts to modify the composition and topography of implant surface. These processes are generally classified as physical, chemical, and electrochemical methods. Plasma electrolytic oxidation (PEO) as an electrochemical route has been recently utilized to produce this kind of composite coatings. Mg ion plays a key role in bone metabolism, since it influences osteoblast and osteoclast activity. From previous studies, it has been found that Mg ions improve the bone formation on Ti alloys. PEO is a promising technology to produce porous and firmly adherent inorganic Mg containing TiO_2 (Mg-TiO_2) coatings on Ti surface, and the amount of Mg introduced into the coatings can be optimized by altering the electrolyte composition. In this study, a series of Mg-TiO_2 coatings are produced on Ti-6Al-4V ELI dental implant using PEO, with the substitution degree, respectively, at 0, 5, 10 and 20%. Based on the preliminary analysis of the coating structure, composition and morphology, a bone like apatite formation model is used to evaluate the in vitro biological responses at the bone-implant interface. The enhancement of the bone like apatite forming ability arises from Mg-TiO_2 surface, which has formed the reduction of the Mg ions. The promising results successfully demonstrate the immense potential of Mg-TiO_2 coatings in dental and biomaterials applications. (This work was supported by NRF: 2015H1C1A1035241, hcchoe@chosun.ac.kr).