
Sputtered Hydroxyapatite Coatings on PEO-treated Ti-40Ta-xNb Alloy in Solution Containing Mg and Zn Ions

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Ti-6Al-4V alloys have been extensively used as dental implants, but titanium and aluminum alloys without vanadium and aluminum are under development because they exhibit cytotoxicity and negative tissue reactions of aluminum and vanadium. To solve this problem, Ti alloys containing non-toxic elements such as Ta, Zr, Nb and Hf are being developed. In particular, Ta and Nb are among the most effective β -stabilizers of titanium. It has also been found to stabilize the modulus of elasticity.

In this study, sputtered hydroxyapatite coatings on PEO-treated Ti-40Ta-xNb alloy in solution containing Mg and Zn ions were researched. The Ti-40Ta-xNb ($x = 0, 3, 7, 15$) alloy were coated by HA-sputtering after PEO-treatment in a solution containing bioactive substance. The Ti-40Ta-xNb alloy was prepared in a vacuum chamber of an arc melting furnace and annealed at 1100 °C for 1 hour in an argon-atmosphere vacuum tube, followed by quenching. Then, at 280 V in a solution containing Ca/P and H_3PO_4 ions PEO-treatment was performed for 3 minutes, and HA sputtering was applied to the surface of the PEO-treated sample. Surface properties were characterized by optical microscopy (OM), field emission scanning electron microscopy (FE-SEM), energy dispersive X-ray spectroscopy (EDS) and X-ray diffraction (XRD).

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