Nanotube Formation on Ti-Ta and Ti-Nb Alloy Surface .

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CP-Ti and Ti-Al-4V alloys arewidely used in dental and orthopedic implants due to their many advantages,including biocompatibility, excellent corrosion resistance and low modulus ofelasticity. However, the Ti-6Al-4V alloy causes the cytotoxic effect and sideeffects of the vanadium ion, aluminum ions can cause neurological disorders. Inorder to improve this, there is a growing interest in the development of beta-type Ti alloys preparedby adding beta-type stabilizing elements such as Mo, V, Ta, and Nb. Inparticular, Ta and Nb can reduce the modulus of elasticity when alloyed with Tidue to stabilization of the β phase. Also, proper surface deformation is very important to improve thebiocompatibility of implants. Particularly, formation of titanium oxidenanotubes on titanium alloy surface greatly improves cell attachment andadhesion, and this nanoscale surface topography greatly affects bone celldifferentiation including osteoclast activation and osteogenesis activity.

In this study, nanotube formation on Ti-Ta andTi-Nb alloy surface was researched. For thisstudy, Ti-xTa and Ti-xNb alloy were used as nanotubesformation specimens. The Ti–xNb and Ti-xTa alloys were remelted at least tentimes in order to avoid inhomogeneity, and then cylindrical specimens (diameter10 mm, thickness 4 mm) were cut by using laser from cast ingots of the Tialloys. Heat treatment was carried out at 1100 °C for 1 h for homogenization inargon atmosphere. Nanotube formation on the Ti-xTa and Ti-xNb alloy wasperformed using anodization with a DC power supply at 30 V for 1 h in 1 M H_3PO_4+ 0.8 wt.%NaF at 25 °C. The morphology changes of the coatings on the Ti-xTaand Ti-xNb alloy surface were observed using FE-SEM, FT-IR, XRD, contact-anglegoniometer, and scratch tester.

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