

Enhancement of Biocompatibility on Bioactive Ti-Nb-Based Alloy by High-Density Plasma Modification

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Abstract

The formations and characteristics of oxides on the surfaces of the plasma-treated Ti-Nb-Hf alloys were investigated by employing X-ray photoelectron spectroscopy, X-ray powder diffractometer and scanning electron microscopy. Further, the non-treated and plasma-treated specimens were incubated in phosphate-buffered saline (PBS) containing albumin to evaluate their biocompatibility. The results indicate that through O₂-plasma treatment, the thickness of the oxide layer increases, and the surface roughness improves, exhibiting little protuberances and numerous micropores and cavities on the treated surface. The compositions of the oxide layers in the specimen without O₂-plasma treatment consist of TiO, Ti₂O₃ and TiO₂, and the oxides transform to mainly TiO₂ as the specimen is treated with O₂-plasma. In addition, the formation of nitrides by allylamine plasma treatment can provide amino-group linkings for the attachment of albumin. Plasma oxidation and polymerization are believed to improve biocompatibility and therefore promote osseointegration.