

Titanium nanostructural surface processing for improved biocompatibility

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Abstract

X-ray photoelectron spectroscopy, grazing incident x-ray diffraction, transmission electron microscopy, and scanning electron microscopy were conducted to evaluate the effect of titanium hydride on the formation of nanoporous TiO₂ on Ti during anodization. Nano-titanium-hydride was formed cathodically before anodizing and served as a sacrificial nanoprecipitate during anodization. Surface oxidation occurred and a multinanoporous structure formed after cathodic pretreatments followed by anodization treatment. The sacrificial nanoprecipitate is directly dissolved and the Ti transformed to nanoporous TiO₂ by anodization. The formation of sacrificial nanoprecipitates by cathodic pretreatment and of the multinanostructure by anodization is believed to improve biocompatibility, thereby promoting osseointegration.