

Research on a nanoporous oxide film on a titanium surface by electrochemical treatment

李勝揚,林哲堂

Cheng H-C;Chan C-C;Lee S-Y;Lin C-T;Ou K-L

Abstract

Titanium-based alloys have been investigated by many researchers. Their excellent biocompatibility is due to a passive oxide film. The surface characteristics of titanium, such as pore size and roughness, are related to initial cell behaviors and osseointegration. Osseointegration can apparently be improved and maintained if the titanium is oxidized and porous. However, the surface design of dental implants which enhances the rate of osseointegration remains unknown. In this study, an electrochemical process was performed as a surface treatment for titanium. Titanium hydride (TiH_2) was formed on the titanium surface after cathodic treatment. A nano-porous titanium oxide structure was formed by anodic surface treatment. The physical and chemical properties of titanium with and without electrochemical treatments were analyzed. Furthermore, the mechanisms by which oxidation and porosity of titanium surfaces are formed are also discussed. In traditional anodic treatments, the pore size increases with the oxidation thickness. In order to obtain thick oxidation and a minimum pore size, titanium hydride plays an important role in forming a thick nano-porous titanium oxide structure. Titanium hydride comprises the nanostructure. When it was dissolved in an alkaline solution, a thick titanium oxide nano-porous layer was formed.