奈米氫化鈦對植體表面生成奈米多孔性二氧化鈦之影響研究

Effect of nano-titanium hydride on the formation of nanoporous titanium oxide (NTO) layer on implant

中文摘要

諸多研究顯示，鈦基金屬及其合金於人體的生物相容性(biocompatibility)有極高的評價，其非常適合做爲人體的植入物，然而鈦金屬及其合金之所以具極佳的生物相容性主要是與鈦金屬表面的氧化層有關，研究指出植體表面氧化層厚度與孔徑大小對於細胞初始的攀附行爲、增殖及分化有密切的關係。若能有效增加氧化層厚度與降低植體表面孔徑尺寸將對骨整合會有所助益。於文獻指出氫化鈦是形成網狀奈米多孔性氧化層結構主要因子，並且能有效增加氧化層厚度。因此，本研究以電化學陰極處理方式使鈦基金屬表層形成一層氫化鈦(TiH2)薄膜，再以電化學陽極處理，使表面形成一層網狀奈米多孔性的二氧化鈦(TiO2)結構，並以一些物理及化學性的分析儀器測試表面之成分、元素、膜厚、孔洞大小及結構，進一步進行細胞實驗並探討網狀奈米多孔性的二氧化鈦的形成機制。

英文摘要

Titanium-based alloys with excellent biocompatibility have been investigated by many researches. It is due to its passive oxide film. The surface characteristics of titanium implant, such as pore sizes/roughness, oxide thickness are related to initial cell behaviors and osseointegration. It seems to be helpful to osseointegration if can effectively keep the oxidation in nanoporous and increase oxide thickness. Based on this study, in order to get the thick oxidation and the minimum pore size, the titanium hydride is the main factor in forming thick nanoporous titanium oxide structure. The present electrochemiscal process was performed as surface treatment of titanium-based implant. Titanium hydride (TiH2) was formed on titanium implant surface after cathodic treatment. Nanoporous titanium oxide structure was formed by anodic surface treatment. As the mention above, physical properties, chemical properties as well as biocompatibility of titanium implant with and without electrochemical treatments were analyzed clearly. Furthermore, mechanism of bone healing on nanoporous implant surface and interaction were also discussed clearly