Shih-Fu Ou, J Biotechnol Biomater 2022, Volume 12

Improvement of antibacterial ability of NiTi alloys by depositing Ag/collagen coatings

Shih-Fu Ou

National Kaohsiung University of Science and Technology, Taiwan

NiTi alloys are one of the most important shape memory alloys because of their superior shape memory effect and peseudoelasticity compared to other shape memory alloys. NiTi alloys have been used in orthopaedic device applications, such as osteotomy fixation staples and intramedullary implants owing to their unique shape memory effect, superelasticity, low elastic modulus, and good resistance to fatigue. However, they suffer some drawbacks. The NiTi alloys lack antibacterial properties, and some patients are allergic to components with Ni. This study fabricated a Ag/collagen coating on a porous oxide film on NiTi alloy to improve the antibacterial ability of NiTi implants. Plasma electrolytic oxidation was first applied on NiTi to form a porous surface, which was then coated with silver through electrochemical deposition (ECP). Collagen was then used to modulate the amounts and shapes of the Ag during ECP. It was found that Ag aggregations with coarse dendritic structures were non-uniformly distributed on the surface. The distrubution of Ag aggregations was improved by deposition of collagen and Ag in the same time. The addition of collagen enables the silver aggregation to change to a sphere-like shape. Furthermore, the assistance of collagen also reduces the size of Ag aggregation. Cross-sectional TEM indicated that many Ag clusters are aggregated with each other and fill part of the pores on the oxide surface and inside the oxide film. The deposition of Ag on the oxide film causes the contact angle to increase, which suggests that the Ag-covered surface is hydrophobic. The Ag/collagen coating improves the hydrophilicity of the porous oxide film on NiTi alloy. The Ag/collagen coating can effectively prevent adhesion adn proliferation of Escherichia coli. The oxide film can protect the substrate from bacteria adhesion but cannot kill the bacterial in the suspension

Biography

Shih-Fu, Ou started his master study since 2003 in the department of mechanical engineering at National Taiwan University of Science and Technology for research of bone cement. Afterwards, he obtained his Ph.D. degree in 2011 from the department of mechanical engineering at National Taiwan University for research the anodic oxidation of titanium alloys applied in biomedical implants. Since 2020, he is associate professor of department of mold and die in National Kaohsiung University of Sciences and Technology. His current research is divided into three parts. The first is focused on using powder metallurgy to form bioceramic and ceramic-metal composites. The second is to develop NiTi biomaterial by arc-melting. The third is to modify the surface physical and chemical properties of Ti and NiTi alloys applied as implants.

Received: July 15, 2022; **Accepted**: July 16, 2022; **Published**: November 30, 2022