Accepted Manuscript

Influence of surface pattern on the biological properties of Ti grade 2

Donata Kuczyńska, Piotr Kwaśniak, Marcin Pisarek, Paweł Borowicz, Halina Garbacz

PII: S1044-5803(17)31584-X
DOI: doi:10.1016/j.matchar.2017.09.024
Reference: MTL 8840

To appear in: *Materials Characterization*

Received date: 14 June 2017
Revised date: 22 August 2017
Accepted date: 21 September 2017

Please cite this article as: Donata Kuczyńska, Piotr Kwaśniak, Marcin Pisarek, Paweł Borowicz, Halina Garbacz , Influence of surface pattern on the biological properties of Ti grade 2. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Mtl(2017), doi:10.1016/j.matchar.2017.09.024

Influence of surface pattern on the biological properties of Ti Grade 2

Donata Kuczyńska[1], Piotr Kwaśniak[1], Marcin Pisarek[2], Paweł Borowicz[2], Halina Garbacz[1]*

[1] Faculty of Materials Science and Engineering, Warsaw University of Technology, Warsaw, Poland

[2]Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland

*Corresponding author

e-mail address: donatakuczynska@gmail.com

Abstract

This paper presents a detailed characterisation of Ti surface geometries as produced by non-contact laser functionalization and its impact on the process of protein adsorption. The proposed surface modification is designed for the local treatment of implantable devices with original roughness. In this work, titanium plates were initially modified by the two most common mechano-chemical treatments, shot peening and acid etching. The material under study was next functionalized DLIL (Direct Laser Interference Lithography) in order to obtained two different surface patterns: grooves and islands. The modified surfaces were characterized in terms of their shape, roughness, wettability, surface energy and chemical composition. For this purpose, the following methods were used: scanning electron microscopy, optical profilometry, atomic force microscopy, contact angle measurements, and X-ray photoelectron spectroscopy. Protein adsorption tests were conducted to consider the potential of the proposed methodology in biomedical applications and to compare the influence of the two different surface patterns on the initial state of ossointegration. To this end, XPS and FTIR studies were conducted. The systematic analysis presented will be useful when selecting an appropriate surface geometry for the local surface functionalization of implantable devices.

Keywords

Titanium, Surface Characterization, Multimodal topography, Protein adsorption