Roughness and wettability of the Ti Grade 2 surfaces modified by nanosecond laser

Richard Antala, Peter Šugár, Jana Šugárová, and Michal Moško

Slovak University of Technology in Bratislava, Faculty of Materials Science and Technology in Trnava, Ulica Jána Bottu č. 2781/25, 917 24 Trnava, Slovakia

Surface characteristics of the materials dedicated to application in a biological environment play an important role. Chemical and phase composition, surface morphology and roughness determine the processes on the interface implant-surrounding bone, therefore many researchers are looking for optimal implant's surface integrity with an emphasis on micro and nano roughness alternation, in combination with the improved thickness of passivation layer and enhanced surface energy [1 - 4]. One of many ways how to improve the surface properties of materials for biomedical applications is laser structuring [5].

In this study, the impact of laser structuring parameters on the surface roughness and wettability of flat Ti Grade 2 surfaces was examined. Five experimental surfaces were prepared applying different levels of laser pulse energy maintaining the constant value of the scanning speed and five surfaces were prepared using various values of scanning speed while keeping the pulse energy constant. The surface morphology was documented employing high-resolution digital microscopy followed by the surface roughness parameters measurement using the contact profilometer. Finally, the surface wettability was measured using the sessile drop technique [6].

Experimental results confirmed a tendency of the surface contact angle to increase with the increase of the scanning speed, which corresponds with the trend of surface roughness parameters Rsk and Rku to be higher when the scanning speed is increased. An opposite tendency of the contact angle decrease was observed with the rise of the laser pulse energy. It is consistent with the trend of a slight decrease in the surface profile kurtosis Rku when the pulse energy grows.

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