The comparison of two anodic oxidation methods on Ti-6Al-4V ELI

Jan Krčil[1], Anton Martikáň[2], Vladimír Mára[1], and Václav Nehasil[3]

[1]*CTU in Prague, Faculty of mechanical engineering, Department of materials engineering, Karlovo náměstí 13, Praha 2, 121 35, Česká republika*
[2]*MARTIKAN s.r.o., Dolná Mariková 789, 018 02, Slovenská republika.*
[3]*Charles university, Faculty of Mathematics and Physics, Department of Surface and Plasma Science, V Holešovičkách 747/2, Praha 8, 180 00, Česká republika.*

The oxide layers on the surfaces of titanium alloys are important for corrosion resistance and bio-compatibility. The compatibility between the tissue, bone and the implant is realized through the properties of the implants stable oxide layer. This oxide layer is mostly consisting, in the case of titanium alloys, of titanium dioxide. This kind of layers can be prepared by various methods; the oxidizing process and its parameters strongly influencing the properties of a layer. Then the differences in the chemical composition, mechanical properties, structure etc are influencing, among others, the stability, adhesion and bio-comopatibility of a bio-implant.

The anodic oxidation of titanium alloys, in proper electrolyte and oxidizing conditions, can lead to creation of oxide layer with certain structure on its surface. This surface structure is characterized of pores which size is in range from tens to hundreds of nanometers. The structured surface can change the interaction of cells (and subsequently the tissue) with the implants surface.

In the case of this work the oxide layer was realized on the Ti-6Al-4V ELI specimens by the means of anodic oxidation. The oxidizing process was realized in two electrolytes: acidic (1M H_2SO_4) and basic (0,5 % NaOH) with voltages between 25 V and 100V, the current density was preset at about 50 mA/cm^2. The prepared anodic oxide layer was then characterized by the surface coloration, the change in surface roughness, the thickness and surface morphology of each oxide layer. The basic behaviour of oxide layer was observed by the submersion in the Hanks balanced salt solution (HBSS).