THE BEHAVIOR OF ANODIZED Zr AT HIGHER TEMPERATURE IN ORAL CAVITY

Maria VARDAKI[1], Sabina-Magda POPA[2], Stefania-Alina BUZINCU[3], Ioana DEMETRESCU[4,5]

Abstract. *The aim of the present paper is investigation of behavior at different temperature in oral cavity of anodized Zr in two different conditions. The anodizing procedure was performed in two different mixtures of NH_4F and distilled water in glycerol leading to two electrolytes (E1, E2) of the same substances, but with different concentrations. Regarding the other anodizing conditions, the anodizing voltage and time were the same for both electrolytes being 3 different voltages (20 V, 40 V and 60 V) and 1 hour. Anodized samples characterization included surface analysis and electrochemical stability in Afnor saliva at different temperature, taking into account that in oral cavity the temperatures could be different. Surface analysis as scanning electronic microscopy (SEM) was completed with contact angle determinations and electrochemical procedures have been represented by potentiodynamic polarization curves (Tafel curves) and electrochemical impedance spectroscopy. As conclusion surface analysis demonstrated the different lengths and diameters of nanotubes ZrO_2 obtained after anodizing at different voltage and higher hydrophilic character with the voltage elaboration increase. Regarding the electrochemical stability, for samples fabricated in both electrolytes were observed higher corrosion rates at higher temperatures and smaller activation energy.*

Keywords: ZrO_2 nanotubes, SEM, electrochemical tests, Afnor saliva, activation energy

1.Introduction

Generally speaking biomaterials materials are chosen as a function of their biocompatibility, mechanical properties, electrochemical stability and price [1-3]. The development of material for dental use has the same motivations in selection, but is more dynamic in promoting materials materials taking into account the esthetic factor as well. Zirconium, nowadays an alternative for Ti the golden reference in dental applications, is a valve metal and as Ti [4] has a natural passivation ceramic oxide formed spontaneously on the surface. Zr has a higher density than Ti (6.52g/cm^3) but a convenient Young's modulus as 88 GPa and a lateral shear strength of 33 GPa. Zr native passive film on the surface named "zirconia" with the formula ZrO_2, has osseointegration better when compared to titanium [5] and in the oral cavity, is not affected by plaque accumulation. This

[1]PhD, Depart. of General Chemistry, University Politehnica of Bucharest, Romania, (e-mail: vardaki_m@hotmail.com).
[2]Master, Depart. of General Chemistry, University Politehnica of Bucharest, Romania (sabinapopa54@gmail.com).
[3]Master, Depart. of General Chemistry, University Politehnica of Bucharest, Romania, (e-mail buzincu.stef@gmail.com).
[4]Prof, Depart. of General Chemistry, University Politehnica of Bucharest, Romania (ioana_demetrescu@yahoo.com).
[5] Academy of Romanian Scientists, 54 Spaiul Independentei, 050094, Bucharest, Romania