

## Scanning Electron Microscopy of the Electrochemical Corrosion Products of a Titanium Based Metallic Foam

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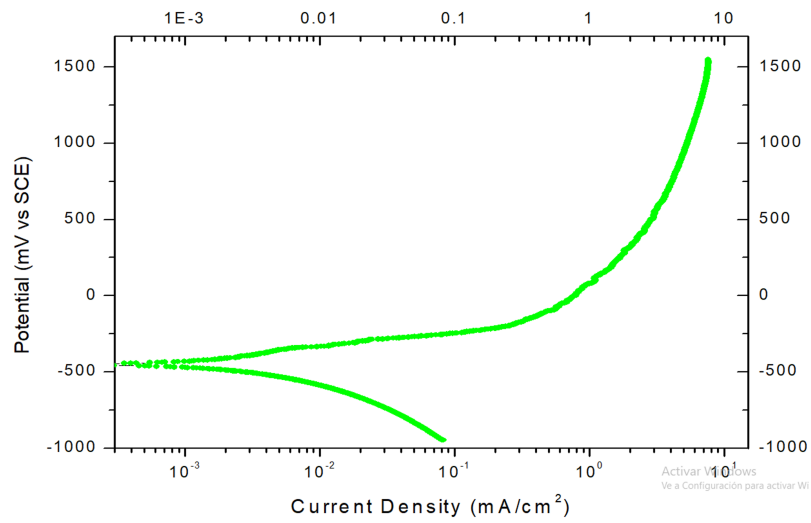
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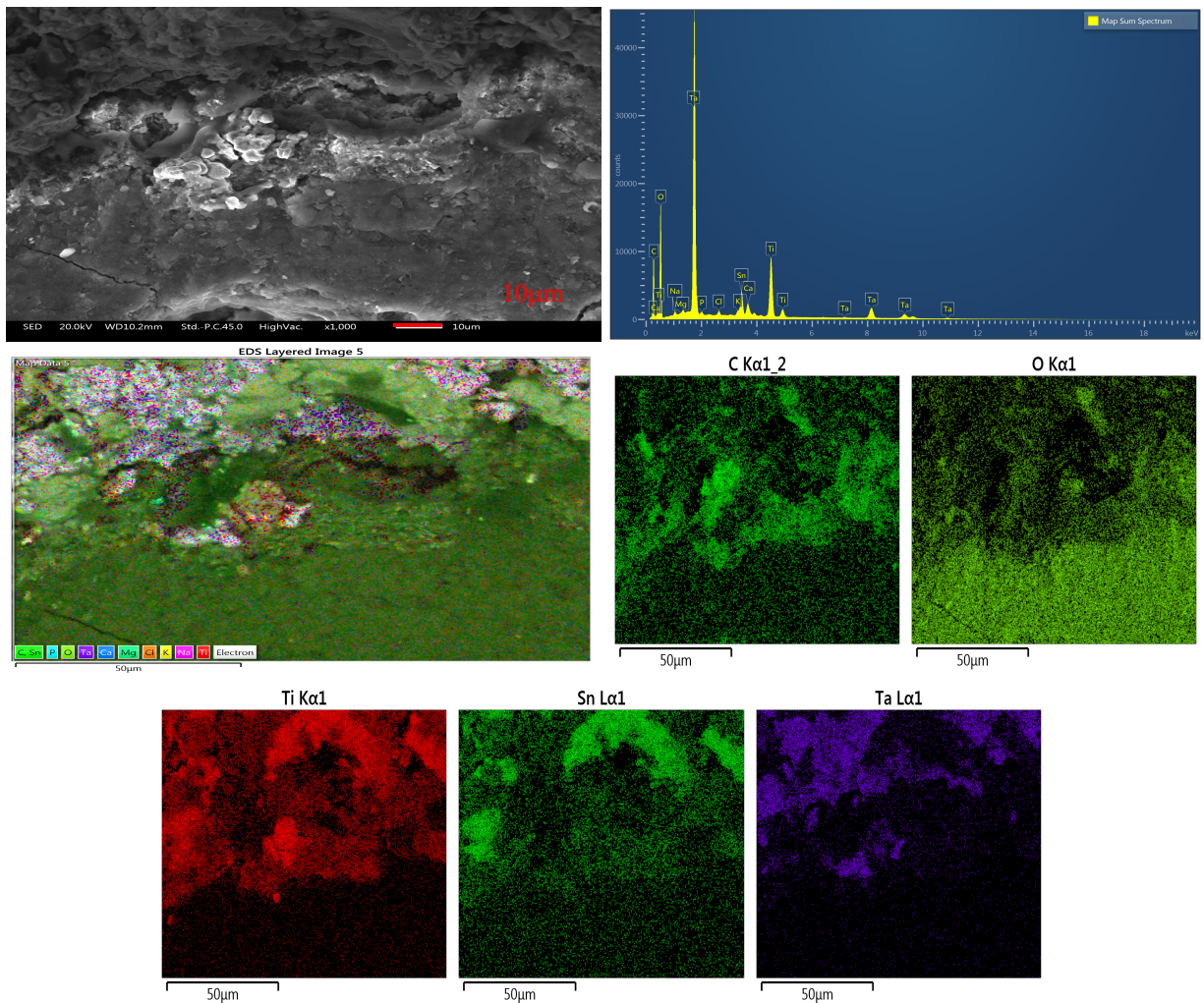
The Electrochemical analysis is one of the methods used in metal alloys with biomedical applications using synthetic saliva, mouth rinse, Hank's solution, sodium silicate as a means, to mention a few [1]. The main objective of this work is to observe the results obtained from the metallic foam of 75% Ti-13% Ta12% Sn with 30% spacer by the electrochemical method of potentiodynamic polarization curves using synthetic saliva at 37 °C and a pH of 6.8. The electrochemical test was carried out in a three-electrode cell arrangement, Saturated Calomel reference electrode (SCE), graphite auxiliary electrode (AE) and the working electrode (WE), the potential was varied in a range of -1500 mV to + 1500 mV with respect to the open circuit potential (OCP) [2]. The working electrode was the foam with 30% of the spacer, which was obtained from a mechanical mixture of 75% Ti-13% Ta-12% Sn powders in % by weight. Pouring them into a matrix of 8mm in diameter, they were compacted at 430 MPa. To obtain the green with a length of 8mm, later they were sintered in a conventional oven at 1200 °C in an argon atmosphere. Scanning electron microscopy (SEM) + EDS was performed. In figure 1, the potentiodynamic curve is observed, in which an active dissolution behavior can be observed throughout the test. The electrochemical results have a corrosion potential ( $E_{\text{corr}}$ ) of -451 mV. The obtained Tafel slopes were, anodic beta ( $\beta_a$ ) 120 mV/decade and as cathodic beta ( $\beta_c$ ) 158 mV/decade. While the value of the corrosion current density ( $i_{\text{corr}}$ ) was 0.00149 mA/cm<sup>2</sup>. On the other hand, Figure 2 shows the images of SEM, where it is possible to appreciate corrosion products on the surface, in the same way, small cracks are perceived. The semiquantitative EDS analysis of the electrochemical test in the synthetic saliva at 37 °C showed high concentrations of Tantalum and Carbon. by literature indicates that Ta and O with high concentration may be a sublayer of TaO<sub>2</sub> formed as a corrosion product [3]. In the case of carbon it is observed that the residues could be considered by the element used as a spacer (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>. The other elements of the alloy such as Tin and Titanium were not considerable. The presence of oxygen could be attributed to the formation of an oxide.

### References:

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**Figure 1.** Potentiodynamic polarization plot of Metallic Foam Titanium Base



**Figure 2.** Photomicrographs SEM and X-ray mappings EDS of Titanium based Metallic Foam, corroded in synthetic saliva at 37 °C.