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CORROSION BEHAVIOUR OF NEW TITANIUM ALLOYS FOR MEDICAL APPLICATIONS

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Abstract: In the present study, the ability of four titanium alloys to resist the effects of corrosion has been analyzed. This was accomplished by analyzing how the corrosion potential evolves with time as well as observing the Bode diagrams obtained with electrochemical impedance spectroscopy (EIS).

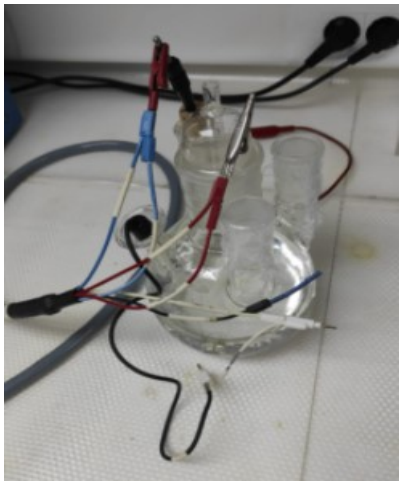

Fig. 1. Electrochemical cell

The proportions of each alloy were A1 (93.2 Ti, 4 Fe, 2 Al, 0.8 V %), A2 (94,4 Ti, 4 Mn, 0.6 Al, 1 Fe %), A3 (96,5 Ti, 3 Mn, 0.6 Al, 0.2 V %) and A4 (89.5 Ti, 10 Al, 0.5 V %). The four samples were covered in epoxy resin and cut in pieces. Afterwards the samples were polished using silicon carbide sheets of abrasive paper, the polishing was done progressively, using gradings from 280 to 1200 grit, ultimately using a 0.1 alpha alumina suspension for a last polish [1]. Electrochemical tests were performed by immersing the polished samples in a Ringer Lactate solution, standard guide of our laboratory [2]. While the samples were immersed, they were connected to a saturated calomel electrode (SCE) as reference electrode and to a platinum electrode acting as counter electrode.

EC-LAB software was used to interpret the electrical signals from the tests. A study of the evolution of the corrosion potential was carried out for each of the samples for a time of 1 hour. The electrochemical impedance spectroscopy technique was also used to obtain results, studying for potential values close to those obtained in the corrosion potential study for each sample, taking five minutes for each measurement. It was observed that the four samples reacted positively to being submerged in Ringer's lactate solution, tending to passivate, and therefore protecting themselves from corrosion.

Selective references:

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2. Ibriş, N.; Mirza Rosca, J.C. EIS study of Ti and its alloys in biological media. *J. Electroanal. Chem.* 2002, 526, 53–62, doi:10.1016/S0022-0728(02)00814-8.

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