INTERNATIONAL SYMPOSIUM OF SCIENTIFIC RESEARCH AND INNOVATIVE SUDIES

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A STUDY OF METALLIC GLASS $Al_{93}Ti_3Cr_2Fe_3$ BIOMEDICAL APPLICATIONS

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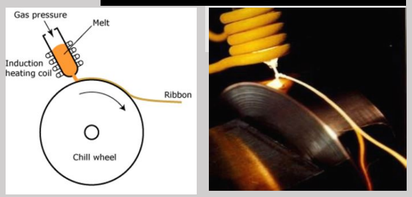
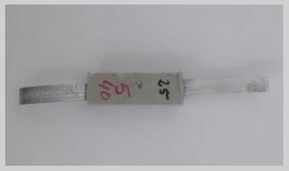
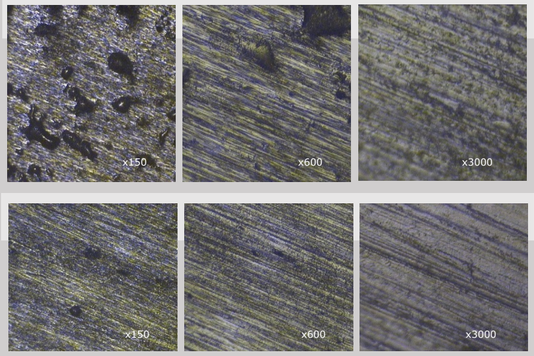
Metal Spinning Method

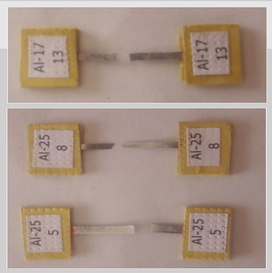


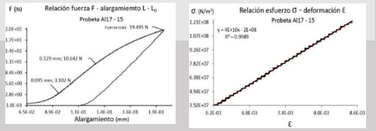
Metallic glass tapes

SAMPLES

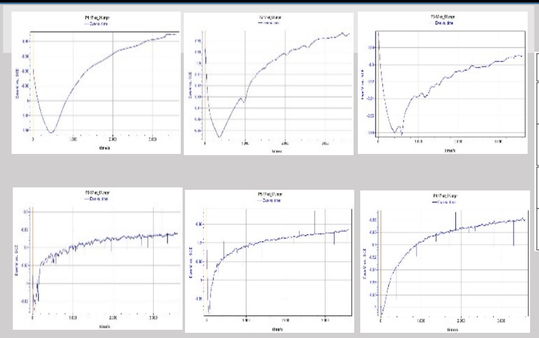




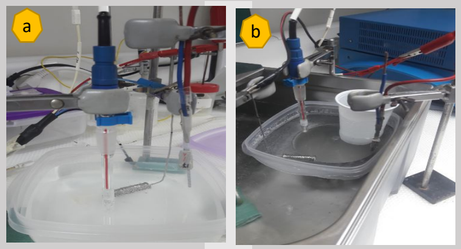


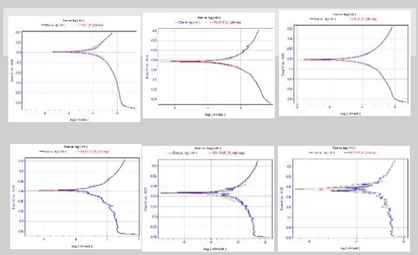


Cinta	σ_{rot} (N/m²)	E (GPa)
Al - 17	$(148 \pm 7) \cdot 10^6$	30,0 ± 2,0
Al - 25	$(316 \pm 70) \cdot 10^6$	31,8 ± 2,6



Nº Probeta	OCP, Ewe vs ESC (V) t = 0 seg	t = 3600 seg	ΔE (V)
P-1 17	-0.956	-0.910	0.046
P-2 17	-0.893	-0.873	0.020
P-3 17	-0.863	-0.890	-0.027
P-4 17	-0.998	-0.862	0.136
P-5 17	-0.908	-0.863	0.045
P-6 17	-0.977	-0.862	0.115
P-1 25	-0.572	-0.792	-0.220
P-2 25	-0.812	-0.893	-0.081
P-3 25	-1.093	-0.867	0.226
P-4 25	-0.674	-0.849	-0.175
P-5 25	-0.748	-0.840	-0.092
P-6 25	-0.730	-0.853	-0.123





Cinta	Velocidad de corrosión (mmpy)
17 T. Ambiente	$(2{,}70 \pm 1{,}00) \cdot 10^{-3}$
17 T. Corporal	$(1{,}82 \pm 1{,}57) \cdot 10^{-2}$
25 T. Ambiente	$(6{,}00 \pm 1{,}00) \cdot 10^{-4}$
25 T. Corporal	$(7{,}60 \pm 2{,}90) \cdot 10^{-3}$

Conclusions

The values of the tensile strength σ_{ten} can be considered low in comparison with other alloys used as titanium-based biomaterials or stainless steels, although in none of the two metallic glass samples studied is this value lower than that of cortical bone (50 - 150 MPa). To highlight the average value obtained for the σ_{ten} for the Al-25 sample, which is of the order of 2.2 times that of Al-17. In all the microphotographs taken of the metallic glass samples, without attack and with the attacks carried out with hydrofluoric acid, a non-crystalline structure is observed, as is to be expected in a material with a glassy structure. The samples studied show good corrosion behavior, although they show a notable increase in corrosion rate when tested at body temperature (40ºC). Comparing the corrosion rate between the samples Al-17 and Al-25 at each temperature analyzed, it is observed that Al-17 at room temperature has a corrosion rate increase of about 4.5 times with respect to the corrosion rate of Al-25. It is concluded that the Al-25 sample presents a better behavior as biomaterial due to the higher mechanical resistance, a low Young's modulus and a lower corrosion rate. The metallographic study confirms the amorphous structure of the samples, in none of the micrographs crystalline structures are observed.