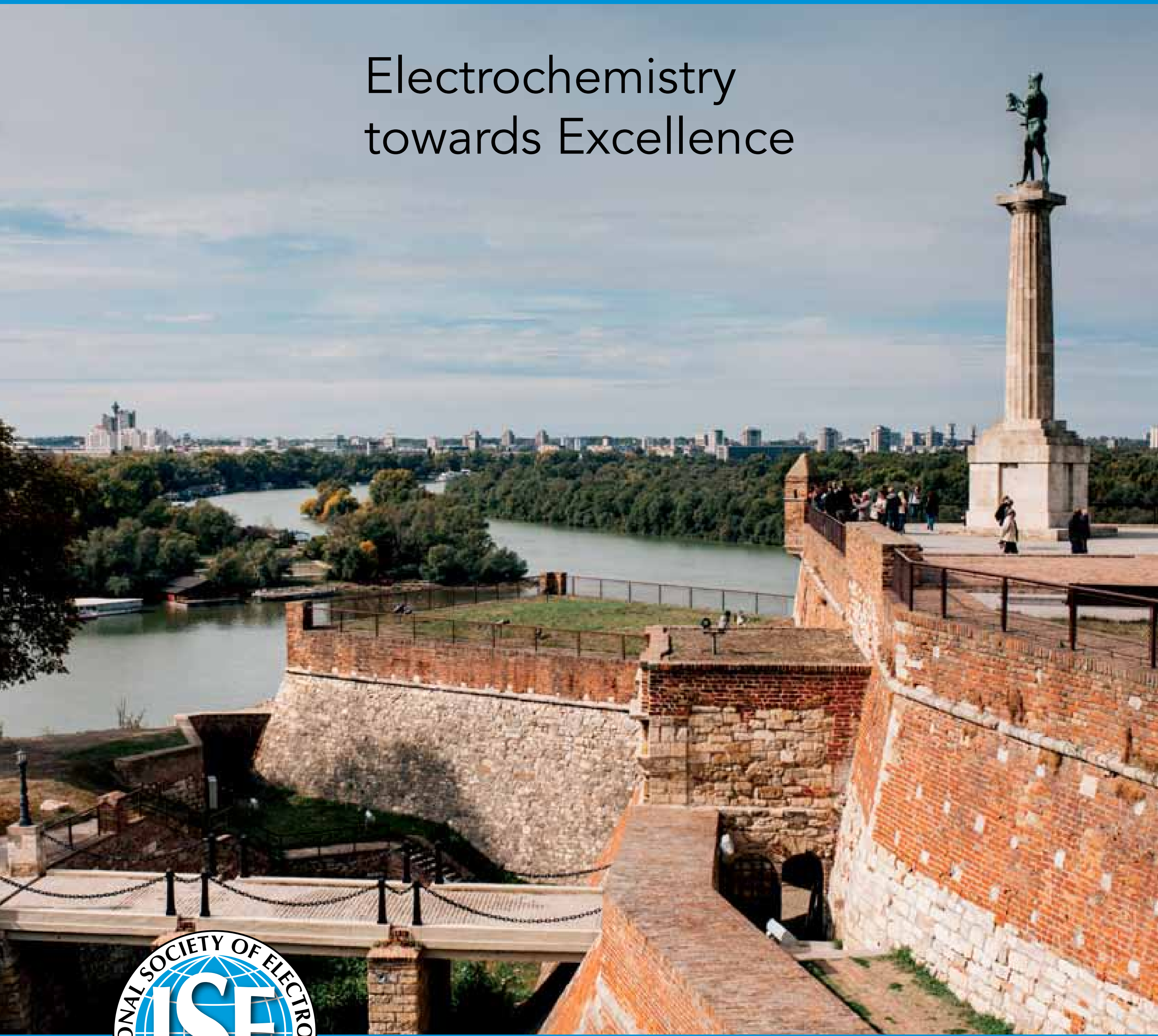
71st Annual Meeting

of the International Society of Electrochemistry

30 August - 4 September 2020
Belgrade, Serbia

Electrochemistry
towards Excellence



https://annual71.ise-online.org
e-mail: events@ise-online.org

Re: Information ID: [ise202804]

ISE Conferences <events@ise-online.org>

Mar 07/07/2020 13:12

Para: Nestor Ruben Florido Suarez <nestor.florido@ulpgc.es>; vincent.vivier@sorbonne-universite.fr <vincent.vivier@sorbonne-universite.fr>

Dear Nestor Florido Suárez,

It is our pleasure to inform you that your submission "Nanostructurated bioactive surface of Ti-Ta alloys for medical devices" (ise202804) has been accepted and selected for a Poster presentation in symposium "s11" of the ISE Belgrade Online Meeting.

Please be aware that for your presentation to be maintained as a Poster presentation, we must receive your registration before 31 July 2020. To help us manage this first ISE Online Meeting, please register as soon as possible, don't wait until the last moment.

Link to registration: https://annual71.ise-online.org/registration.php

For all Oral presentations, you will soon receive more information from your Symposium Organizers.

Only registered participant will be able to submit a Poster (pdf), and will receive information about how to submit.

IMPORTANT DATES
Registration deadline for presentation(s): 31 July 2020
(Presentations without a registered speaker or Poster presenter will be cancelled and removed from the program on 01 August 2020).

With best wishes,

Jelana Bajat and Aleksandar Dekanski Organizing Committee co-chairs

****
International Society of Electrochemistry
email: events@ise-online.org
****

On 07/07/20 14:04, Nestor Ruben Florido Suarez wrote:

> Dear Sir,
> I sent 2 abstracts and I don´t have answer only from 1. Please let me know something about that with ID 202804.
> Thank you very much, your faithfully,

Nanostructurated bioactive surface of Ti-Ta alloys for medical devices

Néstor R. Florido Suárez, Pedro P. Socorro Perdomo, Tomás Gil López, Julia C. Mirza Rosca
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Campus Universitario de Tafira, EIIC, 35017
nestor.florido@ulpgc.es

The most commonly used titanium alloy is Ti6Al4V but further studies have shown that the release of both V and Al ions might cause long-term health problems [1,2]. In response to these health problems, new Ti alloys have been developed and among them, titanium-tantalum alloys are expected to become promising candidates for medical applications due firstly to tantalum which is a non-toxic element and secondly due to their better compatibility with bone tissue compared with Ti and Ti6Al4V [3].

The aim of this study is to investigate the influence of tantalum concentration on the behaviour of different bioactive Ti-Ta alloys as biomaterials for medical applications. Three kinds of binary Ti-Ta alloys with 5%,15% and 25% mass tantalum with a surface modification treatment consisting of immersing the samples in hot concentrated NaOH followed by washing with distilled water and dried at 40ºC during 24 hours.

The microstructure of the Ti-Ta alloys were observed by metallographic technique and by scanning tunnelling microscopy (STM).

Were analysed using various roughness parameters such as: arithmetic mean roughness (Ra), maximum height (Ry) and 10-point mean roughness (Rz).

Ti25Ta alloy with lower surface roughness experienced less corrosion when compared to the specimens with higher surface roughness values.

The differences in the hardness and depth of passive layer concerned mostly with bioactive treatment and the concentration of tantalum in the alloy.

Analysis of the impedance spectra was done by fitting these data to the equivalent circuit proposed in Fig.1. The components of the circuit take into account the electrolytic resistance, the resistance and the capacitance of the passive layer, the double layer capacitance and the charge transfer resistance (the model of the surface is presented in Fig.2).

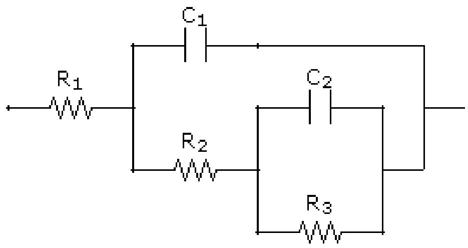

Fig. 1. Equivalent circuit used for fitting the experimental data of EIS

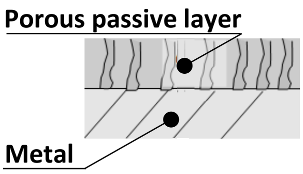

Fig. 2. The model proposed for passive layer formed on the surface of bioactive alloys.

Among studied Ti-Ta alloys, the Ti-25Ta exhibits after chemical treatment, superior properties of the passive film and corrosion behaviour, therefore it appears to be a promising candidate for novel biomaterials. Further experiments are needed to quantify the influence of tantalum content on biocompatibility and cell growth on nanostructurated bioactive Ti-Ta alloys.

UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA

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UNIVERSIDAD POLITÉCNICA DE MADRID

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1 Composition of the Elements

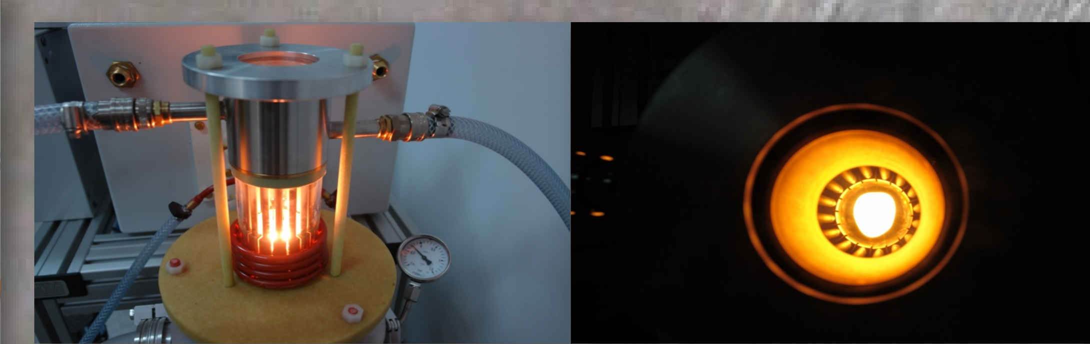
- Composición del titanio

Fe	N_2	O_2	H_2	C	Ti
0.02	0.03	0.018	0.0015	0.008	0.9225

- Composición del tantalio

Fe	Si	Mo	W	Ti	Ni	O_2	C	H_2	N_2	Nb	Ti
0.001	0.005	0.002	0.005	0.001	0.001	0.003	0.001	1.5e-4	0.001	0.002	0.996

2 Cold Crucible Furnace Treatment

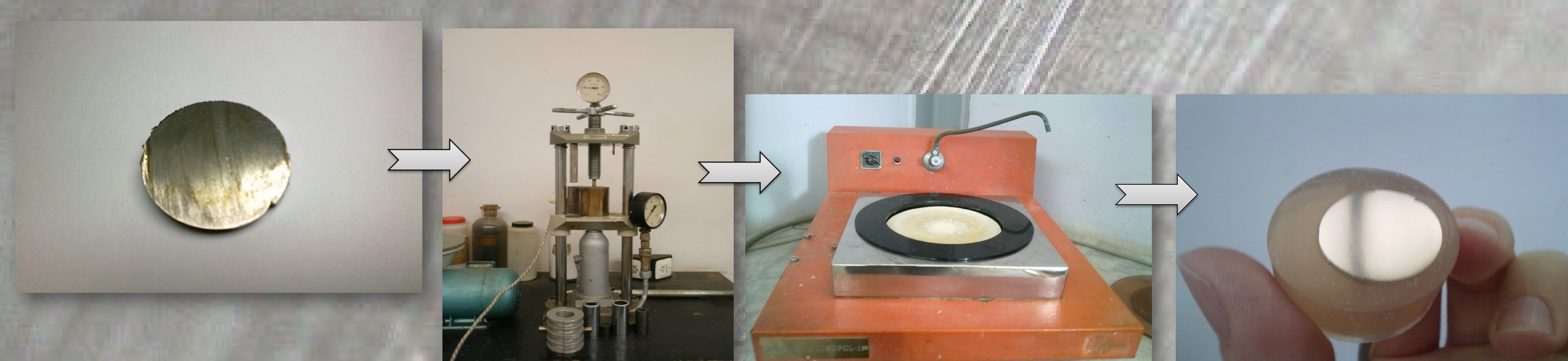


4 Precision Cutting Machine

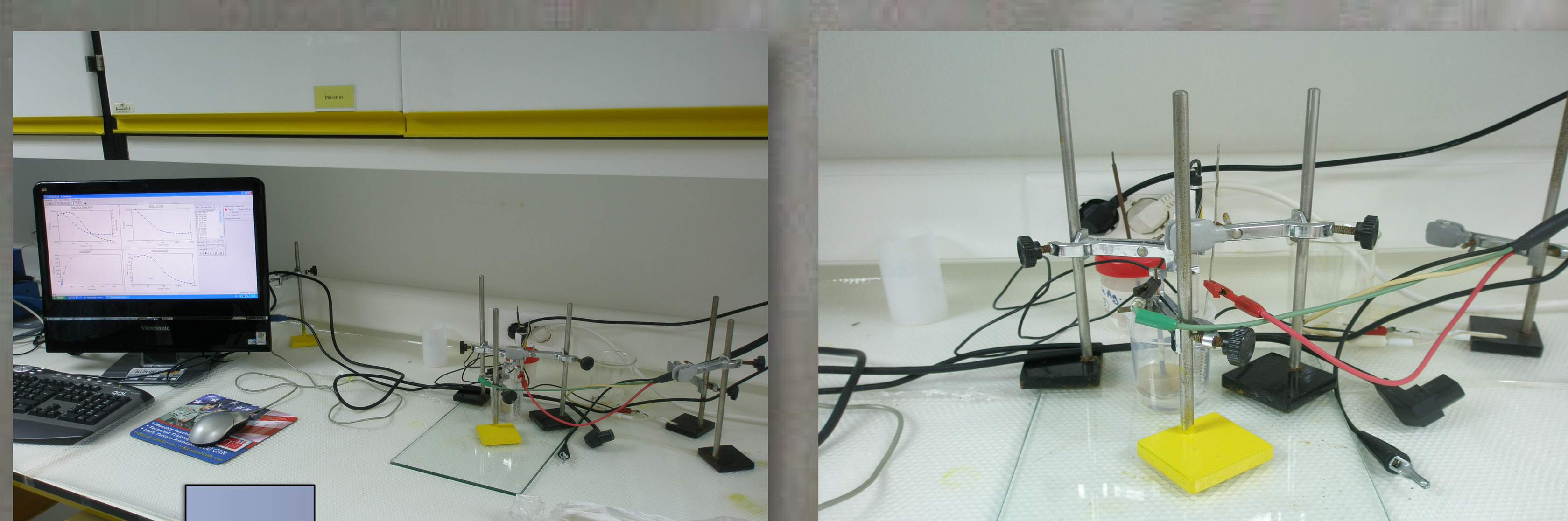
3 Alloy Composition

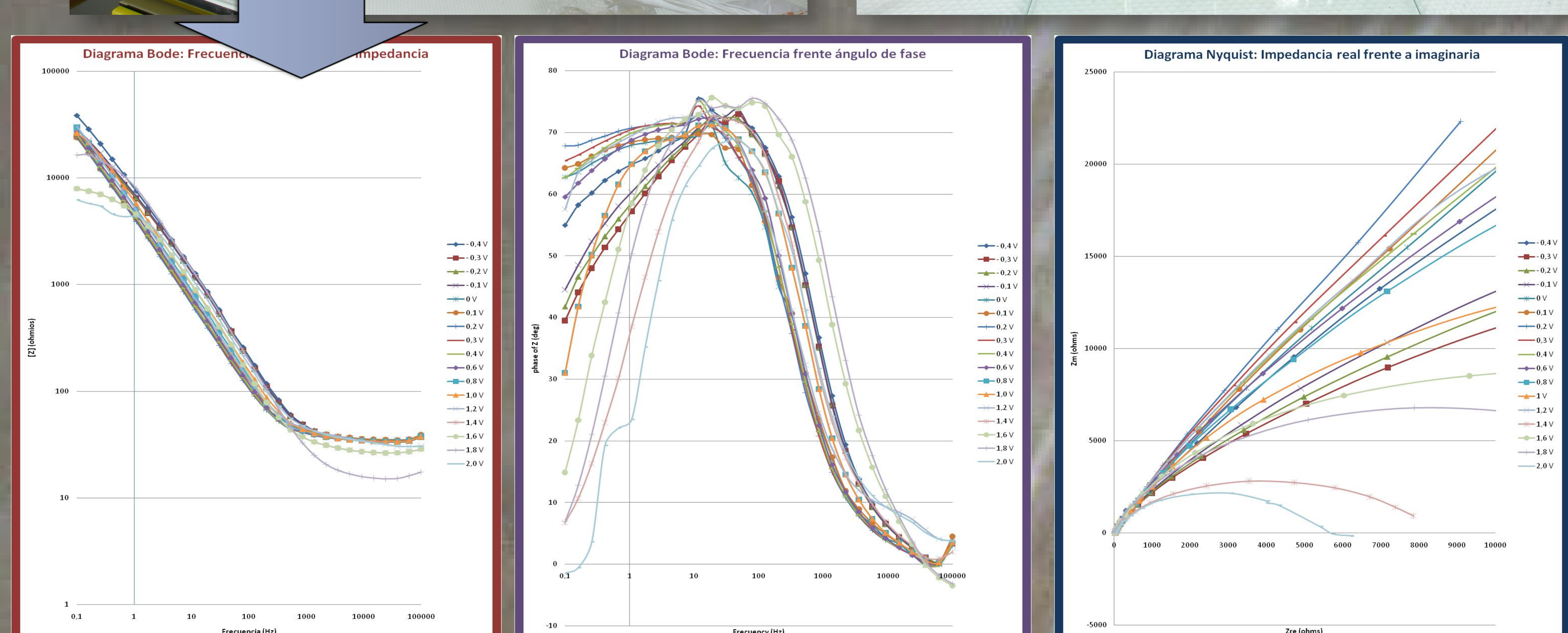
	Alloy 1		Alloy 2		Alloy 3		Alloy 4	
Composition	Tantalum	Titanium	Tantalum	Titanium	Tantalum	Titanium	Tantalum	Titanium
	0.5	0.95	0.15	0.85	0.25	0.75	0.3	0.7
Density	5,11 g/ml		6.33 g/ml		7.54 g/ml		8.15 g/ml	

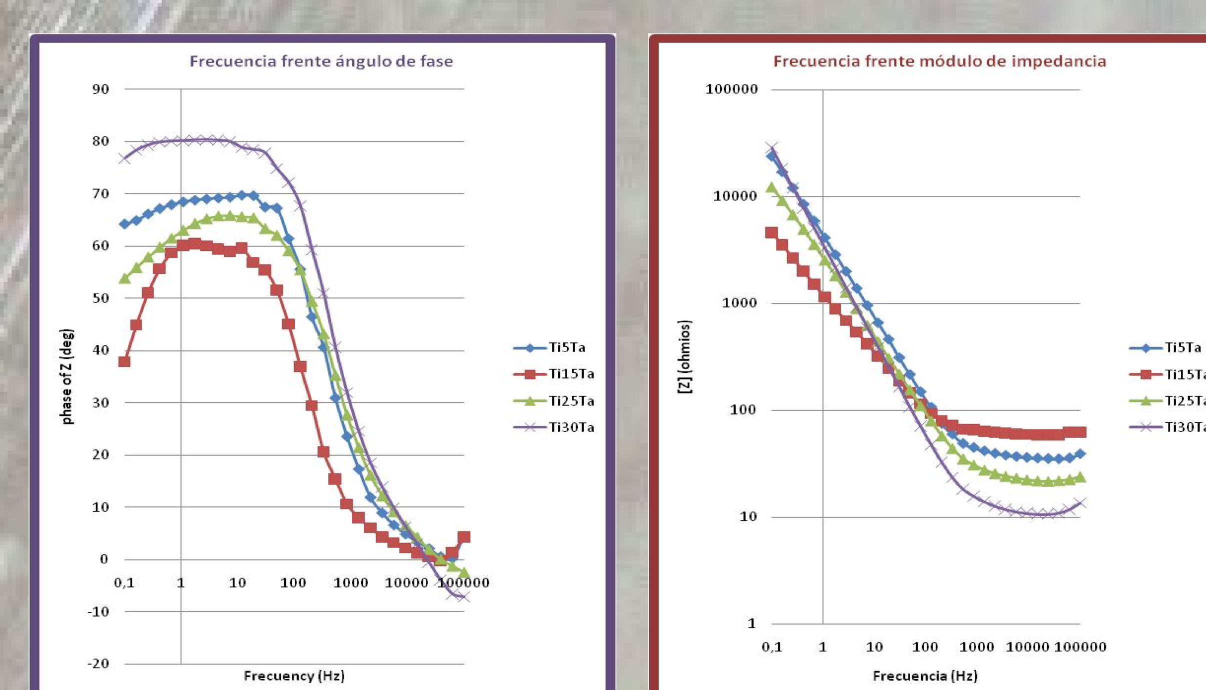
5 Press and Metallographic Polisher



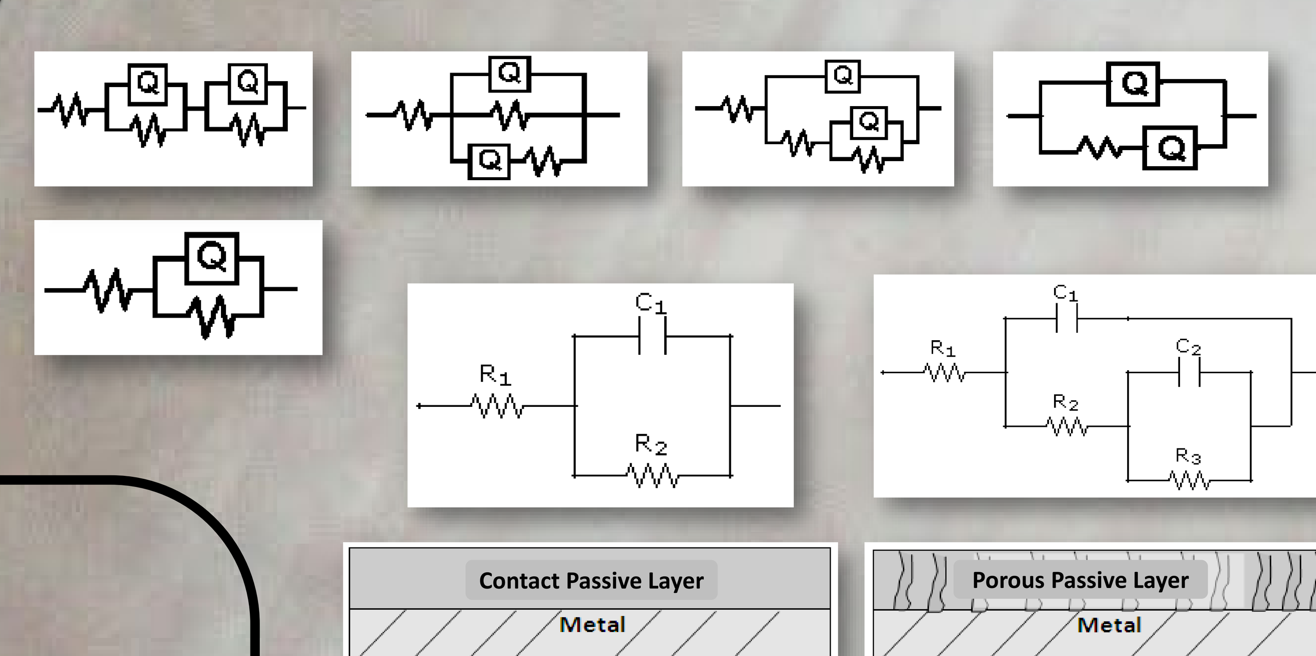
6 Electrochemical Impedance Spectroscopy Test

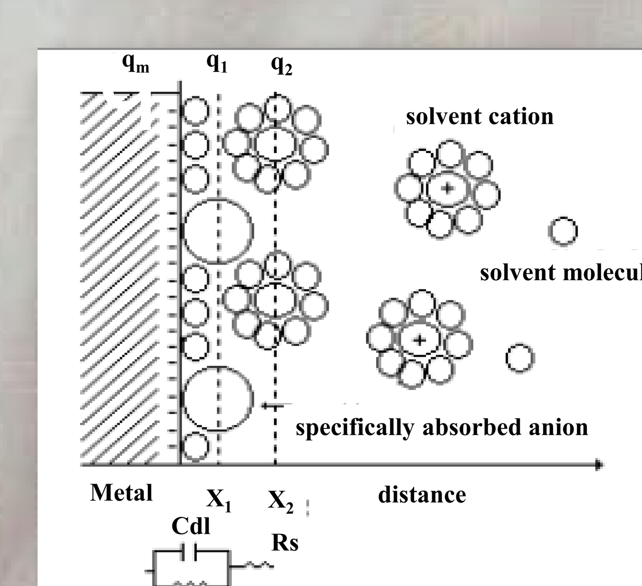






- Equivalent Circuit Adjustment





Conclusions:

Titanium alloys with 30% tantalum showed better results. Their electrolytic resistance remains constant in the potential sweep, around 27 Ωcm^{-2}. The capacity of the passive layer decreases slowly as the potential increases. The resistance of the passive layer also decreases slowly with increasing potential up to 1.2 V, at which point there is a drop of one tenth.