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SMART MATERIALS AND SURFACES

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NanoMedicine
2019

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Joint International Conferences and Exhibition

23 - 25 Oct. 2019

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Portugal NanoMed 2019 Conference Abstract Confirmation

Julia Claudia Mirza Rosca <julia.mirza@ulpgc.es>

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Dra. Julia Claudia Mirza Rosca
Catedrática de Universidad
Departamento de Ingeniería Mecánica

t +34 928 45 1891 ; 616 876 482
www.ulpgc.es

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De: Setcor Conferences and Events <info@setcor.org>
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October 23, 2019

SMS 2019 / EGF 2019 / NanoMed 2019 - Joint Posters Session I
Synthesis / Characterization / Properties

Posters Room Cascais

N.	Title	Author, Affiliation, Country
1.	Numerical and experimental validation of SMArt thermography for the control of GFRP composite laminate M. De Giorgi, R. Nobile, and **A. Saponaro**	**Prof. Riccardo Nobile**, University of Salento, **Italy**
2.	Magnetic and Electrical Properties of postannealed Co2MnSi Heusler alloy films **G. Grigaliūnaitė-Vonsevičienė**, B. Vengalis, A. Maneikis and R. Juškėnas	**Dr. Grazina Grigaliunaite-Vonseviciene**, Vilnius Gediminas Technical University, **Lithuania**
3.	Microstructure and mechanical properties of Fe-based amorphous alloy produced using the direct metal deposition method **W. Pilarczyk**	**Prof. Wirginia Pilarczyk**, Silesian University of Technology, **Poland**
4.	Modification and characterization of VACNTs for application as water harvesting surfaces from dew and fog R.A. Pinheiro, V.J. Trava-Airoldi and **E.J. Corat**	**Dr. Evaldo Corat**, National Institute for Space Research- São José dos Campos, **Brazil**
5.	In-pack Ohmic Heating of Packaged Food Using Carbon Black Loaded Polyethylene Films **M. Gratz** and H. Jaeger	**Mr. Maximilian Gratz**, University of Natural Resources and Life Sciences (BOKU), **Austria**
6.	Structural, magnetic and electrochemical properties of AlCoCrFeNiSi high entropy alloys **R. Babilas**, A. Radoń and W. Łoński	**Dr. Rafal Babilas**, Silesian University of Technology, **Poland**
7.	Tunable and functionalizable polydopamine thin films by means of electropolymerization. **T. Marchesi D'Alvise**, S. Harvey, K. Wunderlich and T. Weil	**Mr. Tommaso Marchesi**, Max Planck Institute for Polymer Research, **Germany**
8.	The Effect of Plasma Electrolytic Polishing on the Surface Properties of Steel after Nitrocarburising **S. Kusmanov**, S. Silkin and I. Tambovskiy	**Prof. Sergei Kusmanov**, Kostroma State University, **Russia**
9.	Microstructure and Corrosion Resistance of Zn-Al-Mg Alloy Coated Steel Product and Its Applications K. Kim, S. So, I. Park, J. Yoon, **M. Oh**, Y. Jang and M. Lee	**Prof. Min-suk Oh**, Chonbuk National University, **Rep. of Korea**
10.	Modified Epoxy Coating with high Efficiency Isocyanate Micro-capsules for Corrosion Protection of Steel **M. Attaei**, L. M. Calado, M. Taryba A. C. Marques and M.F. Montemor	**Ms. Mahboobeh Attaei**, Lisbon University, **Portugal**
11.	Terbium doped calcium germinate (Ca2GeO4) as a potential candidate for LED application I. Koseva, P. Tzvetkov, P. Ivanov, **R. Tomova**, A. Yordanova and V. Nikolov	**Prof. Reni Tomova**, The Institute of Optical Materials and Technologie, **Bulgaria**
12.	Structure and luminescent properties of Eu3+ doped glass in the system WO3-La2O3-B2O3-Nb2O5 L. Aleksandrov, R. Iordanova, M. Milanova, P. Ivanov, P. Petrova and **R. Tomova**	**Prof. Reni Tomova**, The Institute of Optical Materials and Technologie, **Bulgaria**
13.	Dry Transfer of Chemical Vapor Deposition Graphene onto Silicon Wafers Treated by Silane Coupling Agents **M. Ishihara** and M. Hasegawa	**Dr. Masatou Ishihara**, National Institute of Advanced Science and Technology (AIST), **Japan**
14.	SnOx thin films using RF sputtering as transparent conductive materials **Y. Zakaria**, A. Slaoui, S. Ahzi, A. Samara, V. Bermudez Benito and S. Mansour	**Mr. Yahya Zakaria**, Hamad Bin Khalifa University, **Qatar**
15.	The Barrier and Electrochemical Properties of CVD Graphene on Metallic Substrates **P. Ozga**, A. Hara, Z. Świątek and J. Pstruś	**Dr. Piotr Ozga**, Polish Academy of Sciences, **Poland**
16.	Graphene surface analysis and layer counting using scanning low energy electron microscopy **L. Průcha**, J. Piňos, M. Kizovský and E. Mikmeková	**Mr. Lukas Prucha**, Institute of Scientific Instruments of the CAS, **Czech Republic**

17.	Adjustable Hydrogenation of Monolayer Graphene Depending on Back-Gate Voltage **H.Choi** and J.Hong	**Ms. Harim Choi**, Yonsei University, **Rep.of Korea**
18.	Low contact resistance for graphene on Pt bottom electrode and its effects on device performance **J.Cha**, J. Son and J. Hong	**Mr. Jongin Cha**, Yonsei University, **Rep. of Korea**
19.	Plasmon-enhanced Substrates for the Super-resolution Fluorescence Imaging C-Y.Lin, G. Abrigo and **F-C. Chien**	**Mr. Fan-Ching Chien**, National Central University, **Taiwan**
20.	Synthesis of silver nanoparticles and nanocomposites with unique structure and optical properties by UV-irradiation method **A. Radoń**	**Mr. Adrian Radoń**, Silesian University of Technology, **Poland**
21.	SbSI nanowires composites for energy harvesting and sensors **B. Toroń**. P. Szperlich, M. Jesionek, M. Kozioł and M. Nowak	**Dr. Bartłomiej Toroń**, Silesian University of Technology, **Poland**
22.	Density Functional Study of Two Dimensional Monolayer PtX2[X= S, Se and Te]. **H. Alaqi** and W.A.Diery	**Ms. Hadeel Alaqi**, King Abdulaziz University, **Saudi Arabia**
23.	EIS Characterization of Passive Films Formed on AlxCoCrFeNi Alloys **M.López Ríos**, N.Florido Suárez, I.Voiculescu, V.Geanta and J.C.Mirza Rosca	**Dr. Miguel Lopez**, Las Palmas de Gran Canaria University, **Spain**
24.	Effects of Nickel Content on the Microstructure, Microhardness and Corrosion Behavior of High-entropy AlCoCrFeNix Alloys **M.López Ríos**, P.P.Socorro Perdomo, V.Lucero Baldevenites, I.Voiculescu, V.Geanta and **J.C.Mirza Rosca**	**Dr. Miguel Lopez**, Las Palmas de Gran Canaria University, **Spain**
25.	Thin ice under pressure on graphene: a theoretical NMR study A. Jaadouni, E. Rauls, W.G. Schmidt and **U. Gerstmann**	**Dr. Uwe Gerstmann,** University of Paderborn, **Germany**

Joint Posters Session I Synthesis / Characterization / Propertie

EIS Characterization of Passive Films Formed on Al$_x$CoCrFeNi Alloys

M.López Ríos,[1] N.Florido Suárez[1], I.Voiculescu[2], V.Geanta[2], J.C.Mirza Rosca[1*]

[1] Las Palmas de Gran Canaria University, Mech. Eng.Dept.,Spain
[2] Politehnica University of Bucharest, LAMET, Bucharest, Romania

Abstract:

Electrochemical Impedance Spectroscopy (EIS) measurements have been performed on High Entropy Alloys (HEAs) type Al$_x$CoCrFeNi with different aluminium content (x = 0.6; 0.8 and 1.0) in order to characterize their passive film and corrosion resistance at 37ºC under simulated physiological conditions (Ringer´s solution) acidulated with HCl at pH=3. The impedance spectra were obtained at different potential values between E_{corr} and + 0.7 V vs. SCE.

Analysis of the impedance spectra was done by fitting the experimental data to different equivalent circuits. Two equivalent circuits, with one time constant and two time constants respectively, can be satisfactory used for fitting the spectra: one time constant represents the characteristics of the passive film and the second one is for the charge transfer reactions.

The polarization resistance and the double layer capacity were compared at different polarization potentials for the detection of the passive film structure and the roughness of the electrode surface.

It can be seen for both materials that the resistence of the passive film is very high and decreases slightly with the potential: the very high resistance of the passive film implies a high corrosion resistance which can be attributed to the formation of the protective oxide layer.

There is a decrease in the values of the parameter n of the CPE (constant phase element used in the mathematically modelling in order to consider also the electrochemical behavior of systems which do not correspond exactly to a pure capacitance) related to the rugosity of the electrode surface.

Keywords: high entropy alloys, aluminium, EIS, equivalent circuit, corrosion resistance, passivation, Ringer solution.

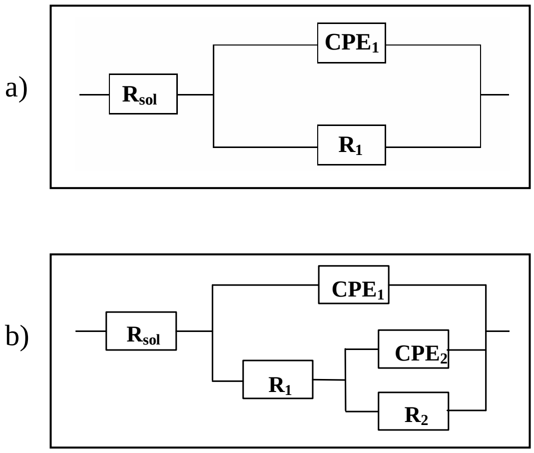


Figure 1: Figure illustrating the equivalent ciruits used for the fitting of the experimental data where R_{sol} is the ohmic resistance of the electrolyte. a) The first circuit has one time constant.

b) The second equivalent circuit fitted for HEAs in Ringer's solution of pH = 3 presents the second time constant which illustrates the slight porosity of the passive layer on the alloy surface (R_1 and CPE_1). So, the equivalent circuit contains in addition a parallel circuit for charge transfer reactions through the passive layer consisting of the double layer capacitance CPE_2 and charge transfer resistance R_2.

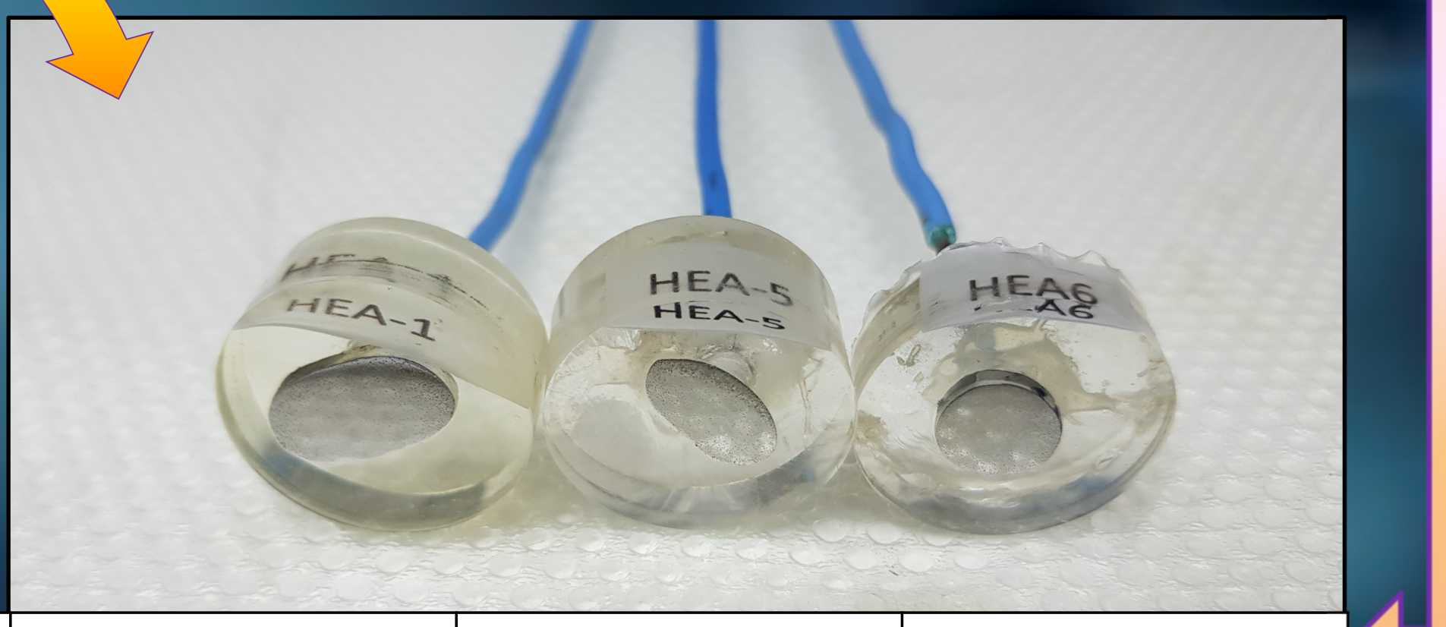
References:

1. B. Gwalani, S. Gorsse, D. Choudhuri, Y. Zheng, R.S.Mishra, R. Banerjee (2019) Tensile yield strength of a single bulk Al0.3CoCrFeNi high entropy alloy can be tuned from 160 MPa to 1800 MPa, *Scripta Materialia*, 162, 18-23
2. Z.Li, S.Zhao, R.O.Ritchie, M.A.Meyers (2019) Mechanical properties of high-entropy alloys with emphasis on face-centered cubic alloys, *Progress in Materials Science*, 102, 296-345.
3. D.B.Miracle, O.N.Senkov, A critical review of high entropy alloys and related concepts (2017), *Acta Materialia*, 122, 448-511.

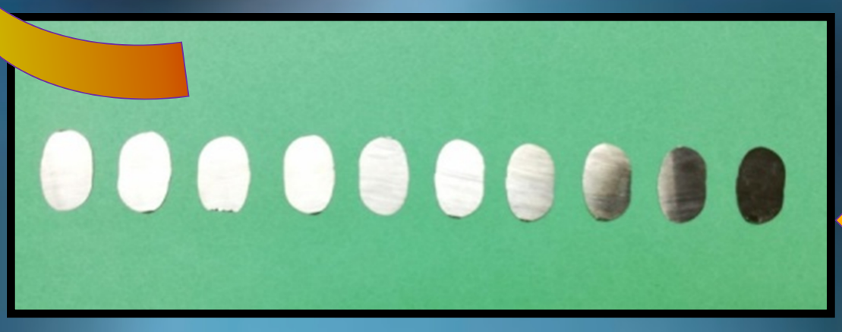
EIS Characterization of Passive Films Formed on AlxCoCrFeNi Alloys

M.López Ríos,1 N.Florido Suárez1, I.Voiculescu2, V.Geanta2, J.C.Mirza Rosca1*
[1] Las Palmas de Gran Canaria University, Mech. Eng. Dept.,Spain
[2] Politehnica University of Bucharest, LAMET, Bucharest, Romania

SPECIMENS

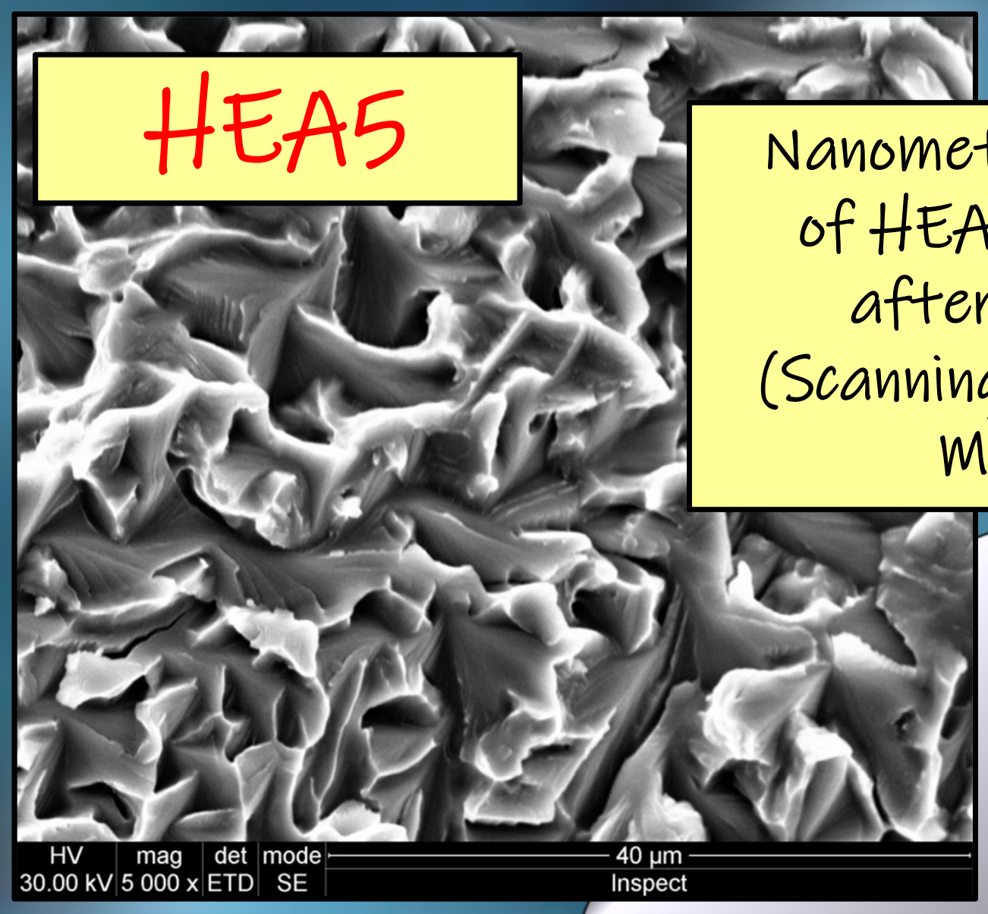


COMPONENTS	HEA 1	HEA 5	HEA 6
	AlCrFeCoNi	$Al_{0.8}$CrFeCoNi	$Al_{0.6}$CrFeCoNi
Al, wt%	10,67	8,72	6,68
Cr, wt%	20,55	21,00	21,47
Fe, wt%	22,13	22,61	23,12
Co, wt%	23,32	23,82	24,36
Ni, wt%	23,33	23,85	24,36

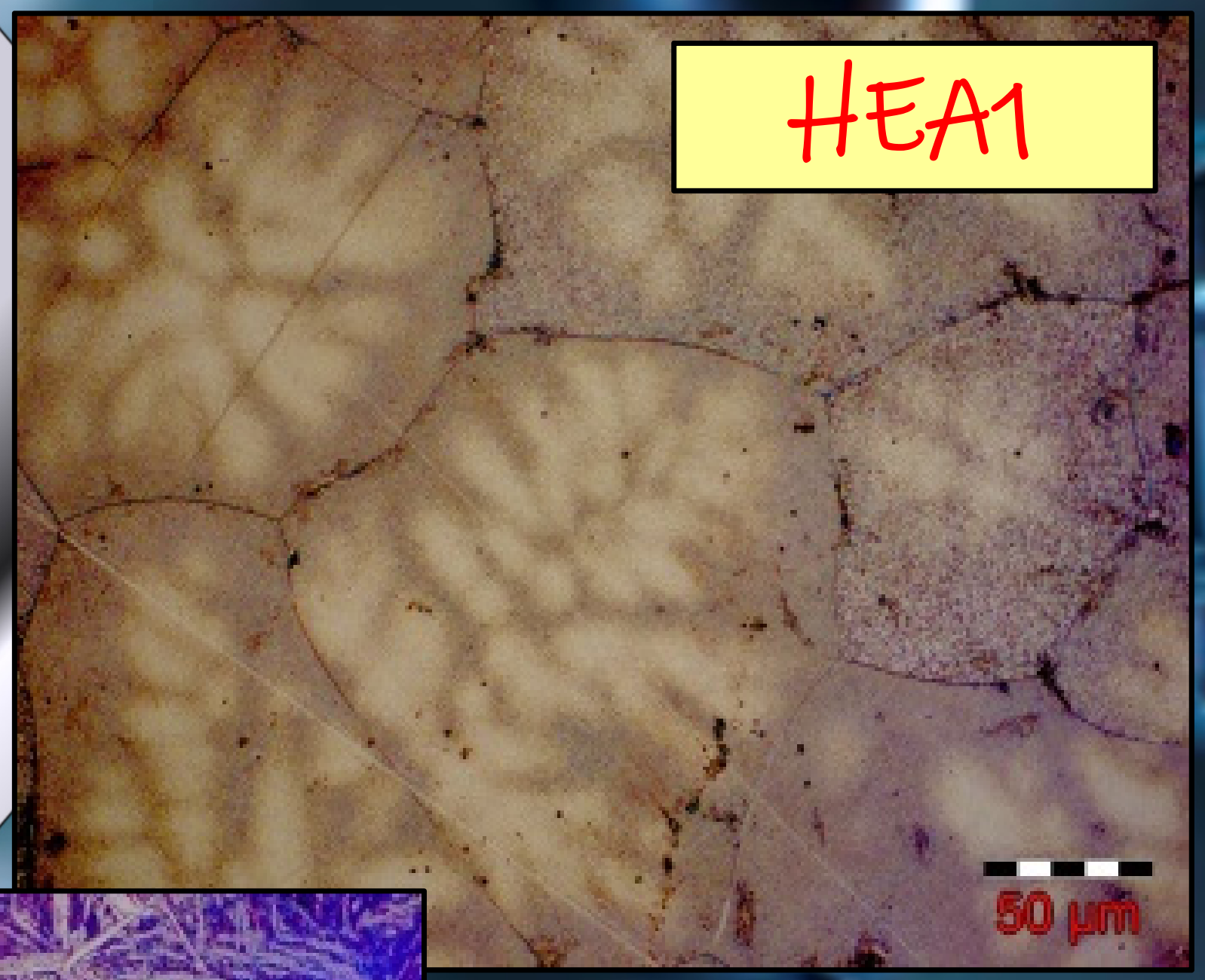


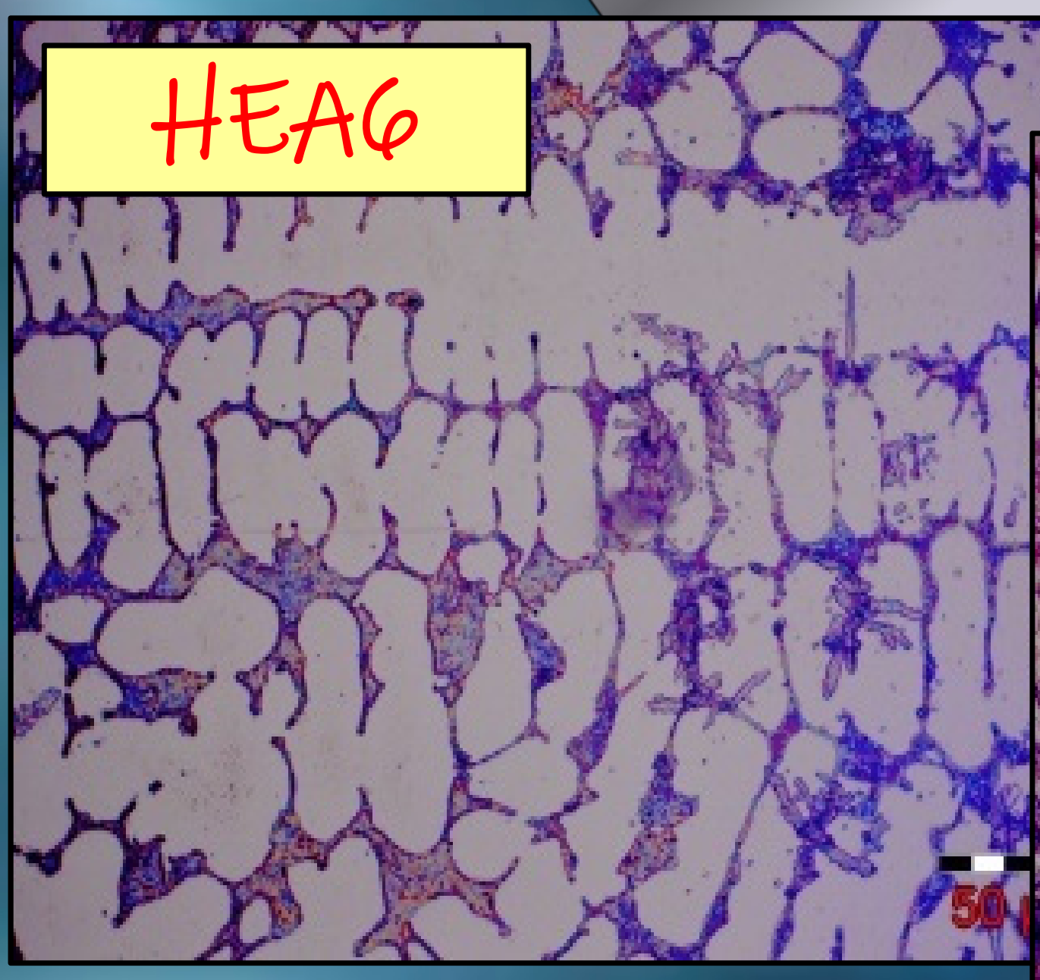
Electrochemical Impedance Spectroscopy (EIS) measurements have been performed on High Entropy Alloys (HEAs) type AlxCoCrFeNi with different aluminium content (x = 0.6; 0.8 and 1.0) in order to characterize their passive film and corrosion resistance at 37ºC under simulated physiological conditions (Ringer´s solution) acidulated with HCl at pH=3

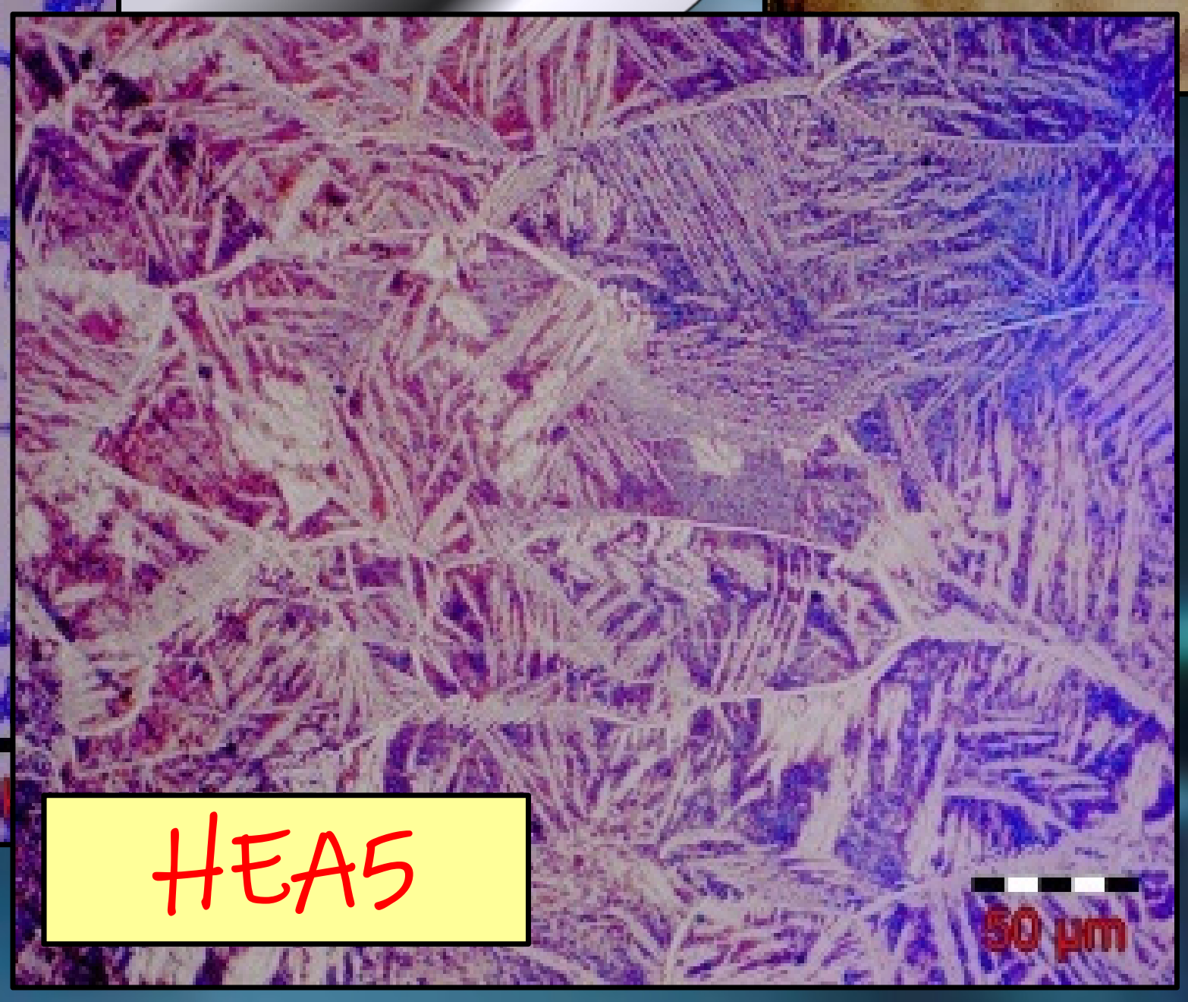
METALLOGRAPHY



Nanometric image of HEA5 surface after fracture (Scanning Electron Microscope)

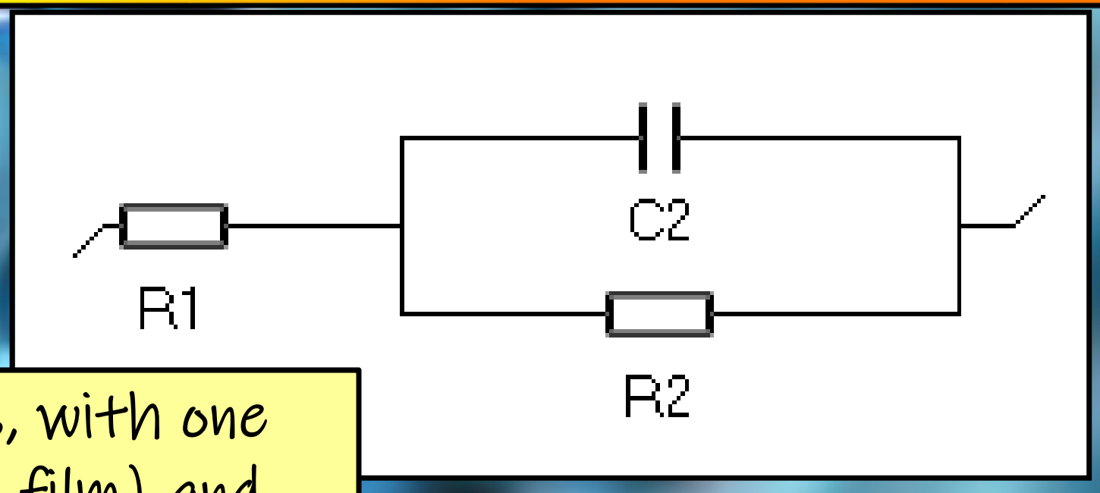




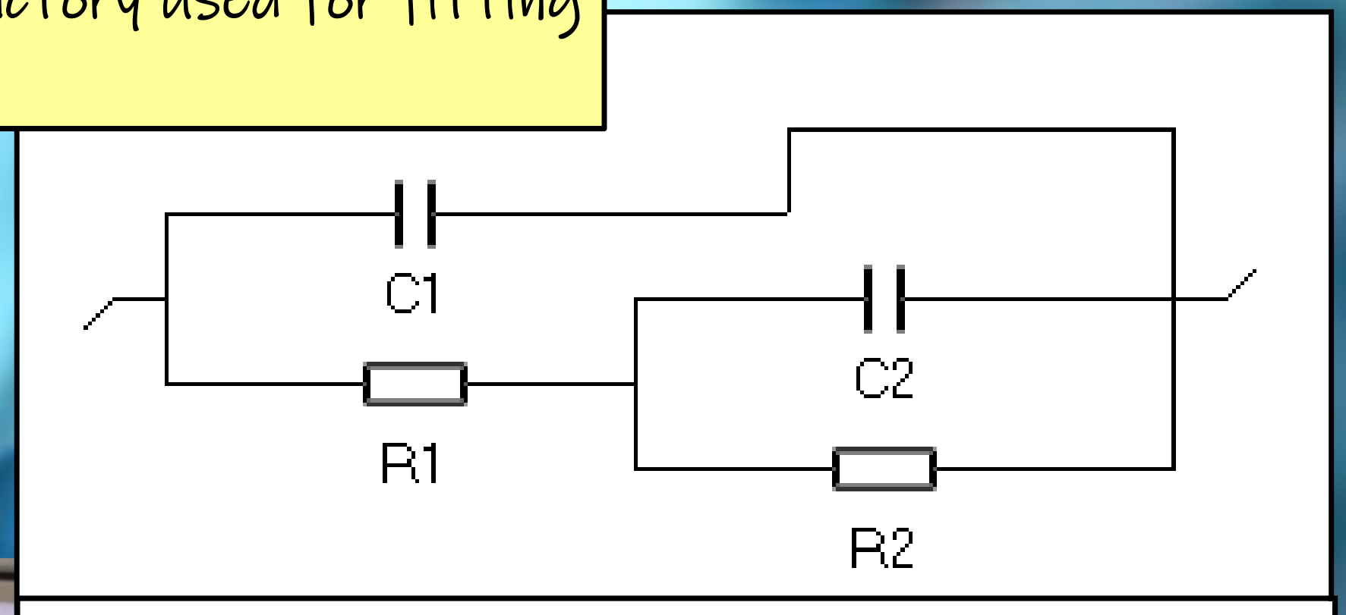


CORROSION BEHAVIOUR

ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY



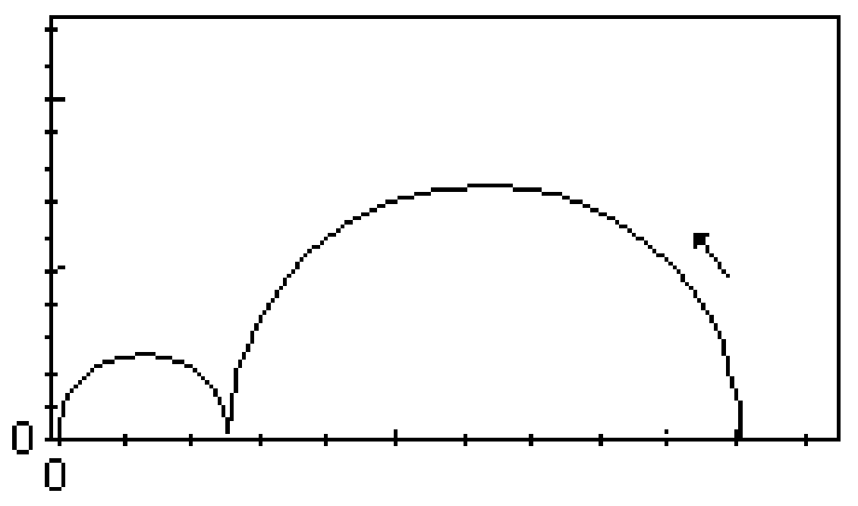
Two equivalent circuits, with one time constant (passive film) and two time constants (charge transfer reactions) respectively, can be satisfactory used for fitting the spectra.

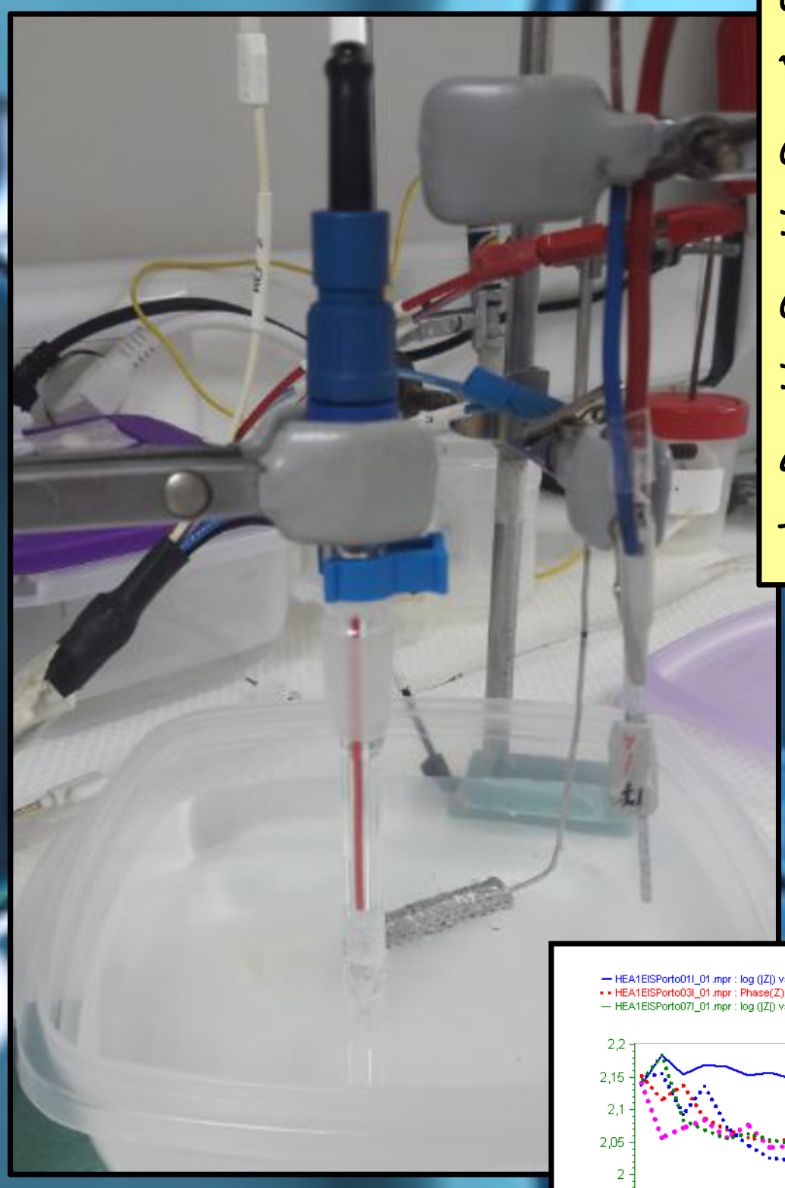


Impedance

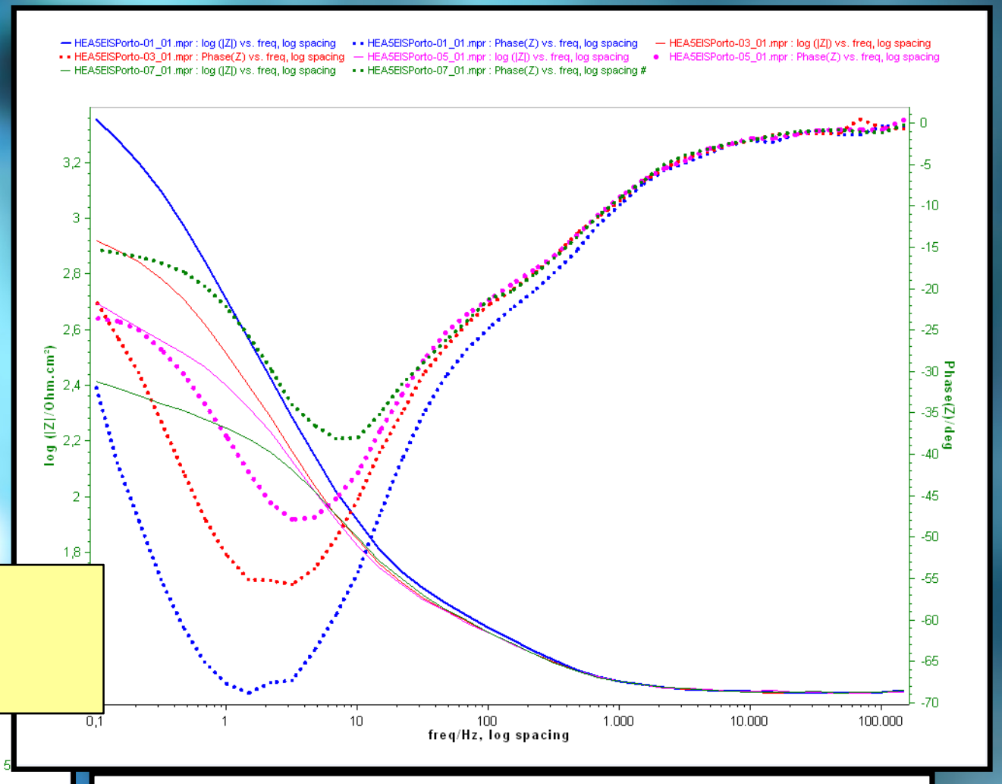
$$Z(f) = \frac{R_2 + R_1(1 + j2\pi f C_2 R_2)}{1 + j2\pi f C_2 R_2 + j2\pi f C_1(R_2 + R_1(1 + j2\pi f C_2 R_2))}$$

Nyquist Diagram (-Im(Z) vs. Re(Z))

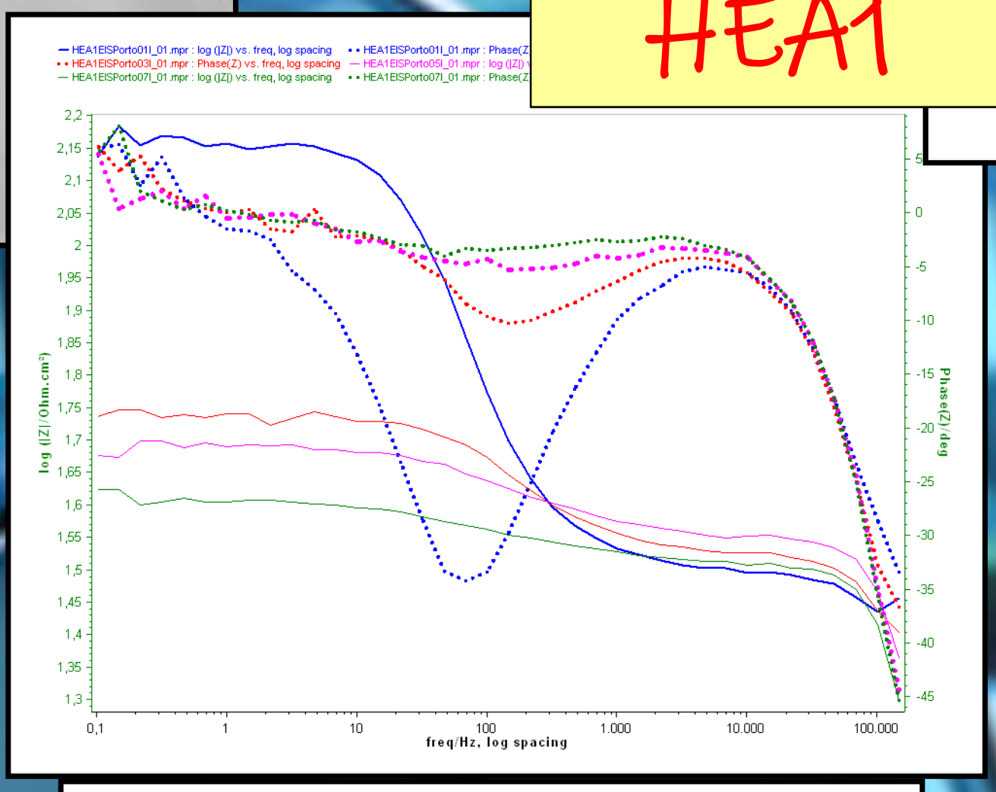




The polarization resistance and the double layer capacity were compared at different polarization potentials for the detection of the passive film structure and the roughness of the electrode surface .

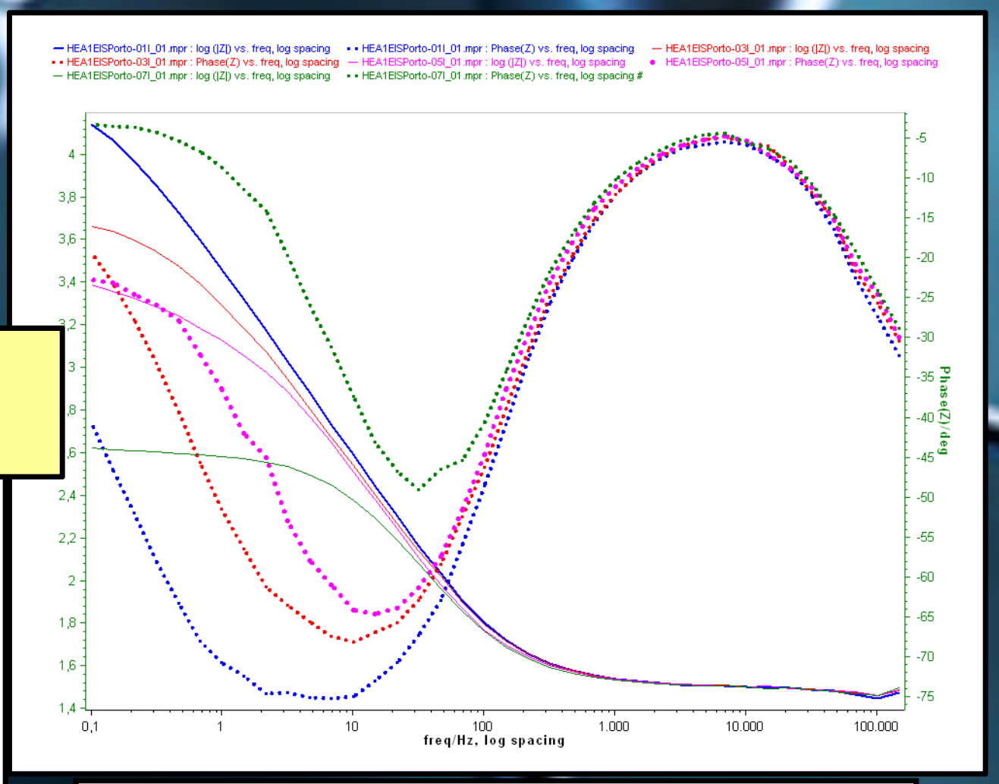


BODE plot
log(Z) vs frequency vs phase (Z)
[-0.7V - E_{corr}]



BODE plot
log(Z) vs frequency vs phase (Z)
[E_{corr} - 0.7V]

It can be seen for all materials that the resistance of the passive film is very high and decreases slightly with the potential : the very high resistance of the passive film implies a high corrosion resistance which can be attributed to the formation of the protective oxide layer.



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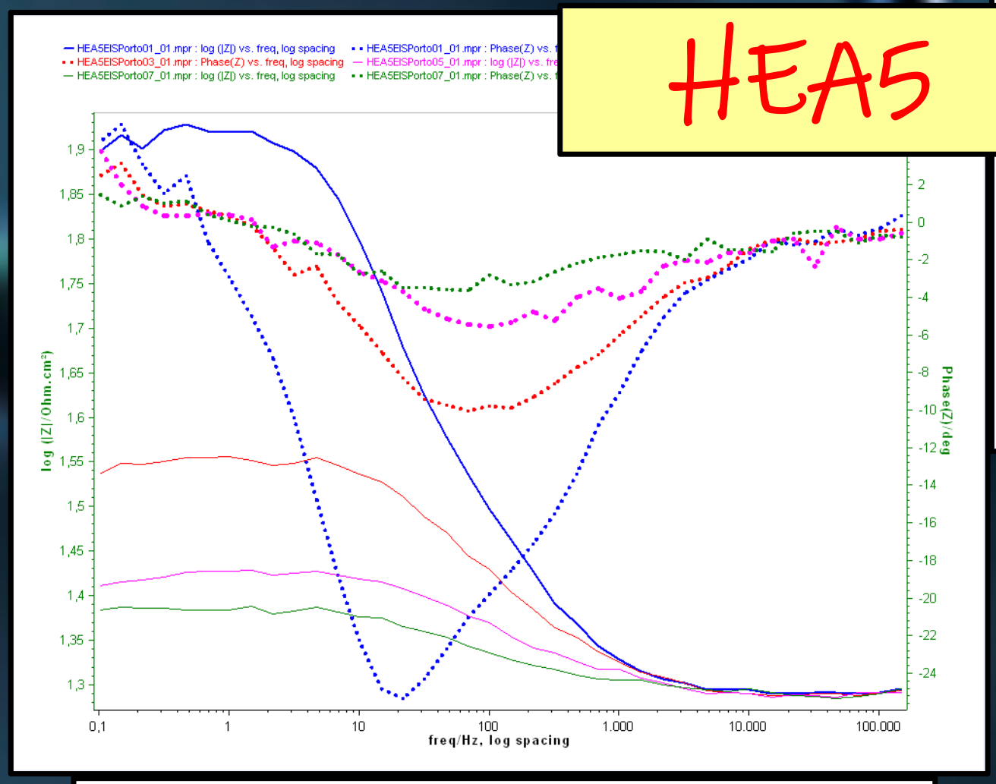
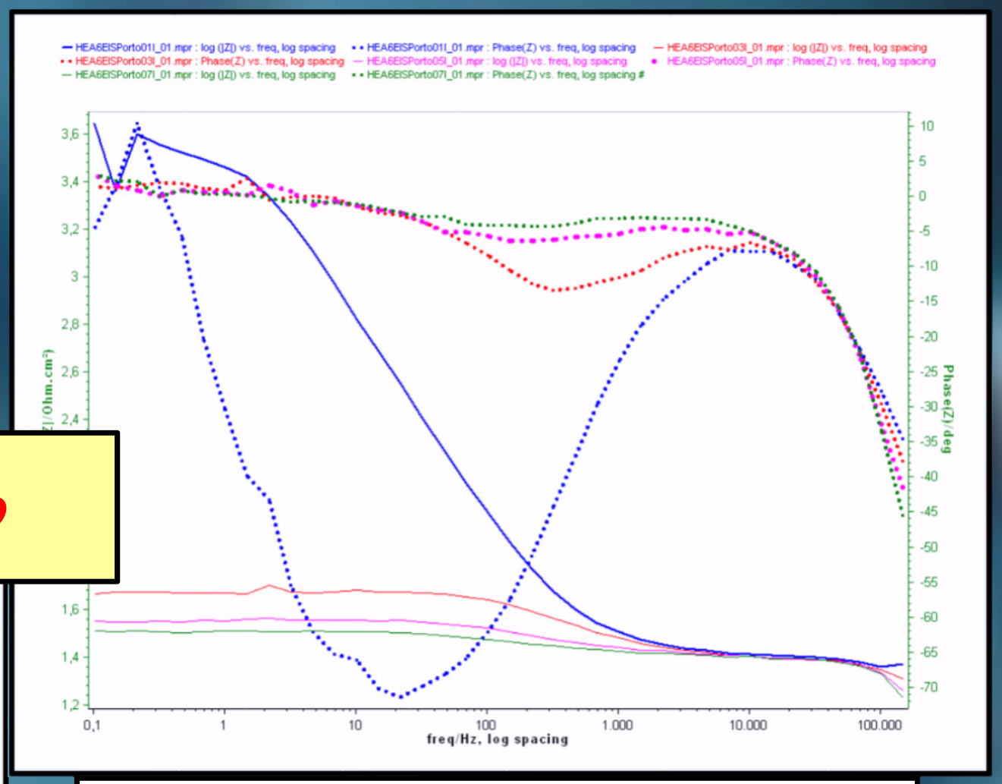


BODE plot
log(Z) vs frequency vs phase (Z)
[E_{corr} - 0.7V]



BODE plot
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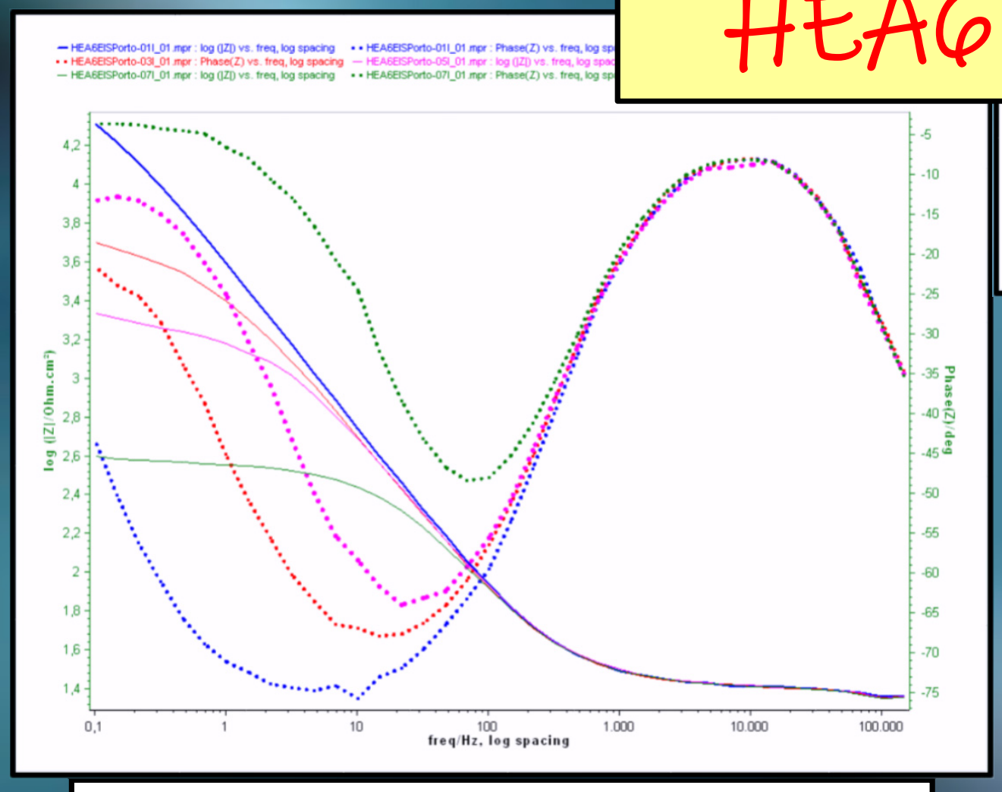
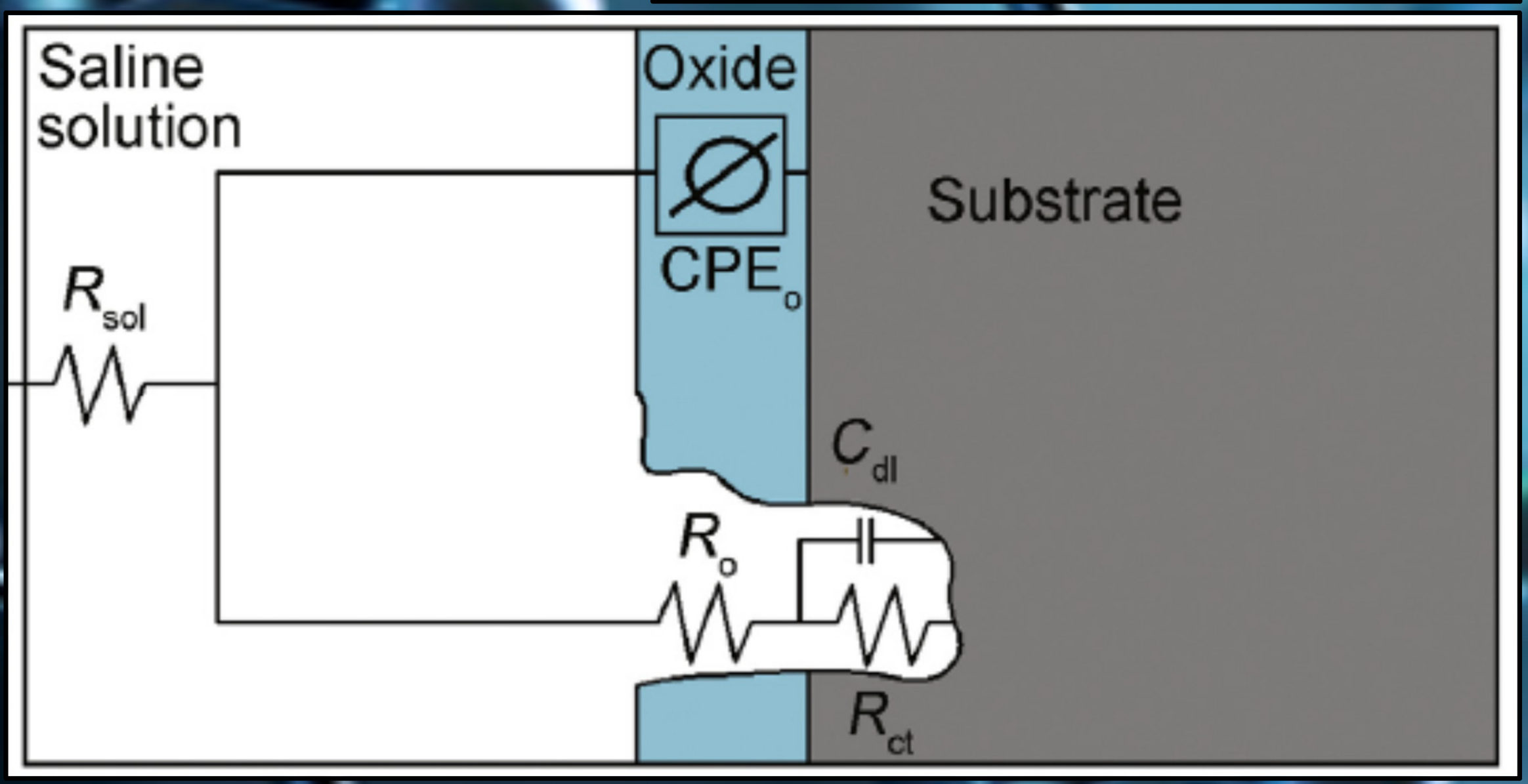


BODE plot
log(Z) vs frequency vs phase (Z)
[E_{corr} - 0.7V]

There is a decrease in the values of the impedance of CPE (slope of the lg[Z] vs lg(f) in Bode plots), related to the rugosity of the electrode surface.

R. Kotoka et al. / Journal of Materials Science & Technology 31 (2015) 873–880



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