THE 9TH INTERNATIONAL CONFERENCE ON ADVANCED CONCEPTS IN MECHANICAL ENGINEERING

ACME

ADVANCED CONCEPTS in MECHANICAL ENGINEEERING

"GHEORGHE ASACHI" TECHNICAL UNIVERSITY OF IAŞI - FACULTY OF MECHANICAL ENGINEERING

JUNE 04 - 05, 2020, IASI, Romania

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Topics

- Machine Design. Tribology. (Section 1);
- Materials and Surface Engineering (Section 2);
- Mechatronics. CAD. Mechanical Vibrations. (Section 3);
- Theory of Mechanisms and Machinery. Robotics (Section 4);
- Mechanics of Deformable Bodies (Section 5);
- Automotives. Engine and Transmission. Road Safety (Section 6);
- Applied Thermodynamics, Heat Transfer, and Renewable Energy. Thermal Systems (Section 7);
- Technologies in Agriculture and Food Processing (Section 8);

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FACULTY OF MECHANICAL ENGINEERING IASI

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CONFERENCE PROGRAM

THE 9th INTERNATIONAL CONFERENCE ON ADVANCED CONCEPTS IN MECHANICAL ENGINEERING

ACME2020

JUNE 4 – 5, 2020
IAŞI, ROMANIA

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FACULTY of MECHANICAL ENGINEERING

THE "GHEORGHE ASACHI" TECHNICAL UNIVERSITY OF IASI

Under the aegis of:

ROMANIAN MINISTRY OF NATIONAL EDUCATION AND SCIENTIFIC RESEACH
ROMANIAN ACADEMY OF TECHNICAL SCIENCES
ACADEMY OF ROMANIAN SCIENTISTS

In partnership with:

AMERICAN UNIVERSITY OF MADABA, JORDAN
SIAR - SOCIETY OF AUTOMOTIVE ENGINEERS OF ROMANIA
ARoTMM - ROMANIAN ASSOCIATION FOR MECHANISMS AND MACHINE SCIENCE
SROMECA – ROMANIAN ASSOCIATION OF MECHATRONICS
ART – ROMANIAN TRIBOLOGY ASSOCIATION
SRT - ROMANIAN SOCIETY OF THERMODYNAMICS
AFCR - ROMANIAN ASSOCIATION FOR REFRIGERATION AND CRYOGENICS ENGINEERS

5	2-10	**Morphological and tribological studies of thermal plasma jet deposited coatings used in cardan joints** A Dascălu, B Istrate, C Munteanu, C Paleu Cîrlan, V Paleu	13.00 - 13.15
		Own World Lunch Break	14.00 - 15.00
		POSTER SESSION	
6	2-01	**Analysis of the collapse mode classification in case of circular tubes** C P Predoiu, R F Negrea, S Tabacu, D Popa	15.00 - 15.10
7	2-02	**Ecological process for depositing thin layers with high tribology resistance for reconditioning the hydraulic turbines** C A Tugui, P Vizureanu, N A Danila, M C Perju, D P Burduhos-Nergis	15.10 - 15.20
8	2-04	**Experimental analysis of three tetra-anti-chiral auxetic honeycomb structures** R Negrea, P Predoiu, S Tabacu, D Negrea	15.20 - 15.30
9	2-06	**Fatigue cracks in aluminum alloys structures detection using electromagnetic sensors array** R Steigmann, N Iftimie, G S Dobrescu, A Danila, P D Barsanescu, M D Stanciu, A Savin	15.30 - 15.40
10	2-09	**Contact stress simulation problem in case of the Mg alloys** S Lupescu, C Munteanu, A Tufescu, B Istrate, N Basescu	15.50 - 16.00
11	2-11	**The study of the mechanism interaction between sparks electric discharges and a AISI 316L biocompatible metallic samples** A Piron, F V Anghelina, C Popa, V Despa	16.00 - 16.10
12	2-12	**Theoretical investigation of optical phenomenon from nanometric antireflex layers** A T Pascu, M A Pascu, D Besnea	16.10 - 16.20
13	2-13	**Experimental research and simulation of vibration isolation elements mounted within transport boxes** D Voicu, R M Stoica, R Vilau, L Barothi	16.20 - 16.30
14	2-14	**“In vivo” Analysis of Osteoinduction Treatment on Ti6Al7Nb** V Lucero Baldevenites, N Florido Suarez, P Socorro Perdomo, J Mirza Rosca	16.30 - 16.40
15	2-15	**Microscopic Passivation of Bio High Entropy Alloys: Initial studies** N Florido Suarez, V Lucero Baldevenites, P Socorro Perdomo, I Voiculescu, V Geanta, J Mirza Rosca	16.40 - 16.50
16	2-16	**Electrochemical Behavior of New Titanium Alloys** V Lucero Baldevenites, N Florido Suarez, P Socorro Perdomo, J	16.50 - 17.00

		Mirza Rosca	
17	2-17	**Nanostructurated Ti-20Zr in Artificial Extra-cellular Fluids** V Lucero Baldevenites, N Florido Suarez, P Socorro Perdomo, J Mirza Rosca	17.00 - 17.10

Session ACME-03-01: Mechatronics. CAD. Mechanical Vibrations

Thursday, June 4th, 2020

Chairmen: *Prof. Jose MACHADO* and *Lecturer Vlad CARLESCU*

No.	ACME code	Title of the papers and authors	Hours
1	03-01	**Experimental analysis of vertical vibration of railway bogie** M Dumitriu, I C Cruceanu	12.00 - 12.15
2	03-03	**Designing and testing a stand used to simulate the dummy head impact with different surfaces using CAD software** A I Radu, D D Truşcă, G R Toganel, B C Benea	12.15 - 12.30
3	03-04	**Bearing fault diagnosis using the Kolmogorov-Smirnov test on frequency features extracted using the Goertzel algorithm** D Cordoneanu	12.30 - 12.45
4	03-32	**Arduino based mobile robot controlled by voluntary eye-blinks using LabVIEW GUI & NeuroSky Mindwave Mobile Headset** O A Ruşanu, L Cristea, M C Luculescu	12.45 - 13.00
5	03-06	**Modelling and optimization of dynamic absorber with viscous friction** R Ibănescu, M Ibănescu	13.00 - 13.15
6	03-08	**Determinations regarding the influence of the different elastic systems from the suspension structure of a N2 type vehicle, on the movement and comfort** M F Mitroi, A Chiru	13.15 - 13.30
7	03-12	**Student demonstrator for teaching Brain-Computer Interfaces** A Ianoşi-Andreeva-Dimitrova, D S Mândru, I D Bologa	13.30 - 13.45
8	03-25	**Design, tuning and evaluation of a stand-alone nitinol based thermomechanical actuator driver with a closed-loop position control system** N Popescu	13.45 - 14.00
		Own World Lunch Break	14.00 - 15.00

Microscopic Passivation of Bio High Entropy Alloys: Initial studies

Néstor R. Florido Suárez[1], Viviana E. Lucero Baldevenites, Pedro P. Socorro Perdomo, Ionelia Voiculescu, Víctor Geanta, Julia C. Mirza Rosca,
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In recent years, due to the great advance of scientific and technological research, new alloys are being explored with a different metallurgical concept: at least three basic components and these alloys are called High Entropy Alloys (HEA). In this way it was created the groundwork for a new concept in alloy design by looking after combinations of metals to work “in team” for an advanced material with unique properties.

At the end of the last century, the progress of science led to the rapid development of biomedical materials and the recent development of high entropy alloys (HEA) provides a new perspective for a new generation of biomaterials.

Two new experimental alloys were obtained by Vacuum Arc Remelting from high purity chemical elements (99.5%) that exhibit extremely low bio-toxicity for the human body (for this reason we named them BioHEA).

The alloys were microstructurally characterized and microhardness measurements were performed. Both the compositional analysis performed using the dispersive energy probe and the structural characterization by X-ray diffraction revealed the dendritic separation of compounds in the fine dendritic matrix.

In order to analyze the passivation process, the electrochemical impedance spectroscopy technique at different potentials was used and the experimental results were compared with those obtained by potentiostatic and potentiodynamic techniques.

The low corrosion rates, low corrosion currents and high polarization resistance attest the good stability of these BioHEA in simulated biological environments.

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Keywords:

Bio HEA, Corrosion, Biomaterials, corrosion, electrochemical

1. Introduction:

In recent years, due to the great advance of scientific and technological research, new alloys are being explored with a different metallurgical concept: at least three basic components and these alloys are called High Entropy Alloys (HEA) [1]. In this way it was created the groundwork for a new concept in alloy design by looking after combinations of metals to work "in team" for an advanced material with unique properties.
At the end of the last century, the progress of science led to the rapid development of biomedical materials and the recent development of high entropy alloys (HEA) provides a new perspective for a new generation of biomaterials [2].

2. Experimental Part:

Two new experimental alloys (with the composition presented in Table 1) were obtained by Vacuum Arc Remelting from high purity chemical elements (99.5%) that exhibit extremely low bio-toxicity for the human body (for this reason we named them BioHEA).
Both the compositional analysis performed using the dispersive energy probe and the structural characterization by X-ray diffraction revealed the dendritic separation of compounds in the fine dendritic matrix.
In order to analyze the passivation process, the electrochemical impedance spectroscopy technique at different potentials was used and the experimental results were compared with those obtained by potentiostatic and potentiodynamic techniques.

3. Results and Discussions:

Two new experimental alloys (with the composition presented in Table 1) were obtained by Vacuum Arc Remelting from high purity chemical elements (99.5%) that exhibit extremely low bio-toxicity for the human body (for this reason we named them BioHEA).

Table 1. The chemical composition of the alloys used

	Wt.%					
	Mo	Ta	Ti	Zr	Nb	Fe
BioHEA 1	20.45	32.45	12.67	18.97		15.46
BioHEA 2	17.32	38.95	13.21	17.45	13.07	

The EIS results of the analyzed BIo-HEA are shown in figure 1

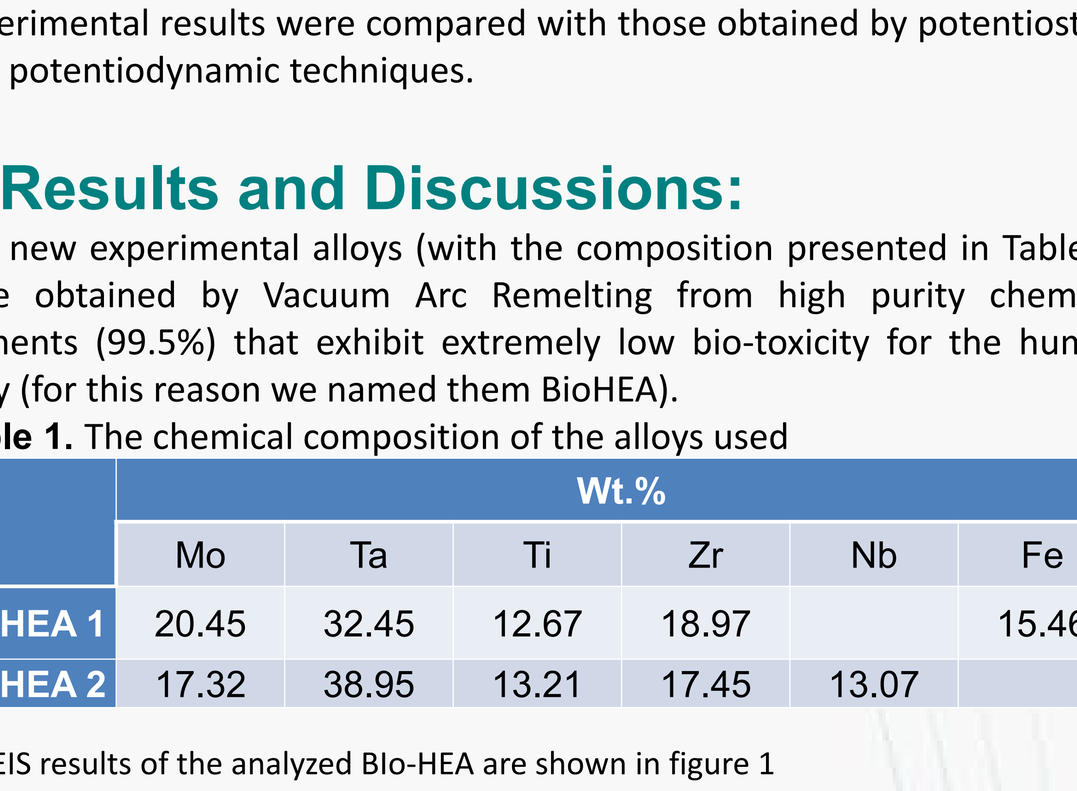

Figure 1. Chemical attack and metallographic analysis Bio-HEA 1 and 2

The alloys were microstructurally characterized (dendritic morphology) and microhardness measurements were performed (Fig.2)

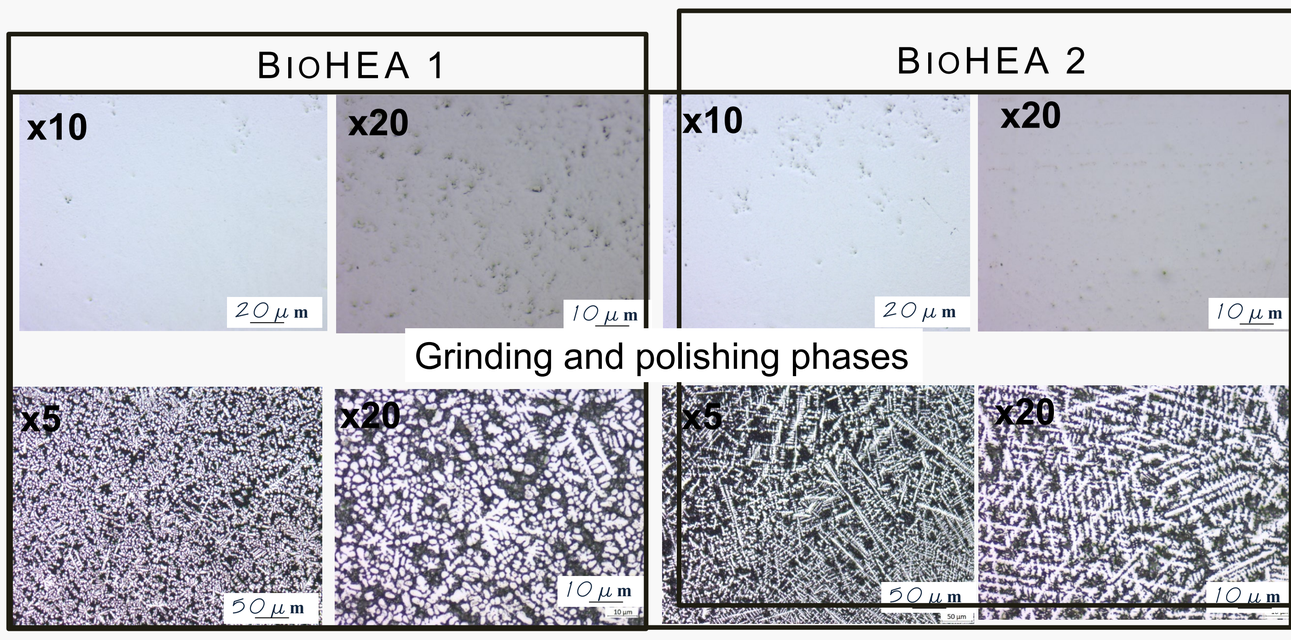

Figure 2. Chemical attack and metallographic analysis

The 24-hour corrosion potential is shown in Figure 3

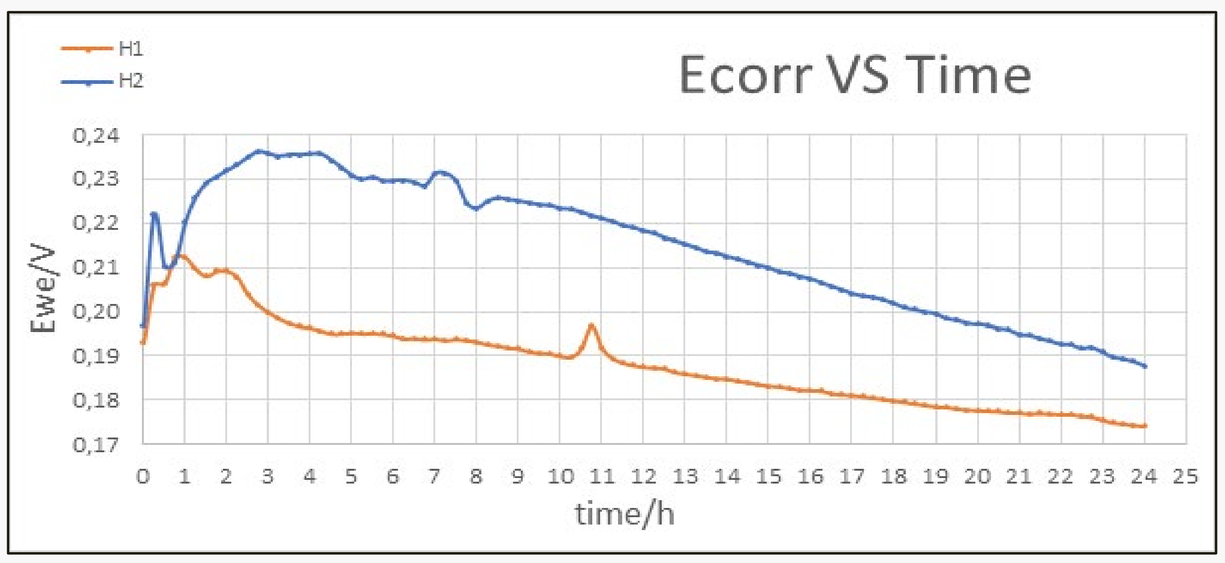

Figure 3. Corrosion potential in 24 hours

4. Conclusions:

The low corrosion rates, low corrosion currents and high polarization resistance attest the good stability of these BioHEA in simulated biological environments.

The effect of the presence of different elements on the HEAs properties in simulated body fluid (SBF). The microstructure, the hardness and the corrosion properties of high entropy alloys and their passive films were analyzed; the alloys were obtained by vacuum arc remelting from raw materials with high purity.
It resulted that the tested oxide films presented passivation tendency and a very good stability at local corrosion was detected. The mechanical data confirm the presence of an outer porous passive layer and an inner compact and protective passive layer. EIS confirms the mechanical results. The thicknesses of these layers were measured. SEM photographs of the surface and EDX profiles for the samples illustrate the appearance of a microporous layer.

5. Acknowledgments:

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References:

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