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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MECHANICAL ENGINEERING FACULTY
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FACULTY OF MECHANICAL ENGINEERING IASI
CONFERENCE PROGRAM

THE 9th INTERNATIONAL CONFERENCE ON ADVANCED CONCEPTS IN MECHANICAL ENGINEERING

ACME2020

JUNE 4 – 5, 2020
IAŞI, ROMANIA

Organized by:

FACULTY of MECHANICAL ENGINEERING
THE “GHEORGHE ASACHI” TECHNICAL UNIVERSITY OF IASI

Under the aegis of:

ROMANIAN MINISTRY OF NATIONAL EDUCATION AND SCIENTIFIC RESEARCH
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
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| 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**  
| 16 | 2-16 | **Electrochemical Behavior of New Titanium Alloys**  
V Lucero Baldevenites, N Florido Suarez, P Socorro Perdomo, J | 16.50 - 17.00 |
<table>
<thead>
<tr>
<th>No.</th>
<th>ACME code</th>
<th>Title of the papers and authors</th>
<th>Hours</th>
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<tbody>
<tr>
<td>1</td>
<td>03-01</td>
<td>Experimental analysis of vertical vibration of railway bogie</td>
<td>12.00 - 12.15</td>
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<td>M Dumitriu, I C Cruceanu</td>
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<tr>
<td>2</td>
<td>03-03</td>
<td>Designing and testing a stand used to simulate the dummy head impact with different surfaces using CAD software</td>
<td>12.15 - 12.30</td>
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<td>A I Radu, D D Truşcă, G R Toganel, B C Benea</td>
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<td>3</td>
<td>03-04</td>
<td>Bearing fault diagnosis using the Kolmogorov-Smirnov test on frequency features extracted using the Goertzel algorithm</td>
<td>12.30 - 12.45</td>
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<tr>
<td>4</td>
<td>03-32</td>
<td>Arduino based mobile robot controlled by voluntary eye-blinks using LabVIEW GUI &amp; NeuroSky Mindwave Mobile Headset</td>
<td>12.45 - 13.00</td>
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<td>O A Ruşanu, L Cristea, M C Luculescu</td>
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<tr>
<td>5</td>
<td>03-06</td>
<td>Modelling and optimization of dynamic absorber with viscous friction</td>
<td>13.00 - 13.15</td>
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<td>R Ibănescu, M Ibănescu</td>
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<td>6</td>
<td>03-08</td>
<td>Determinations regarding the influence of the different elastic systems from the suspension structure of a N2 type vehicle, on the movement and comfort</td>
<td>13.15 - 13.30</td>
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<td>M F Mitroi, A Chiru</td>
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<td>7</td>
<td>03-12</td>
<td>Student demonstrator for teaching Brain-Computer Interfaces</td>
<td>13.30 - 13.45</td>
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<td>A Ianoşti-Andreeva-Dimitrova, D S Mândru, I D Bologa</td>
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<td>8</td>
<td>03-25</td>
<td>Design, tuning and evaluation of a stand-alone nitinol based thermomechanical actuator driver with a closed-loop position control system</td>
<td>13.45 - 14.00</td>
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**Session ACME-03-01: Mechatronics. CAD. Mechanical Vibrations**

Thursday, June 4th, 2020

Chairmen: Prof. Jose MACHADO and Lecturer Vlad CARLESCU
“In vivo” Analysis of Osteoinduction Treatment on Ti6Al7Nb

V. Lucero Baldevenites¹, N. Florido Suárez², P. Socorro Perdomo¹, J. Mirza Rosca¹

¹Mechanical Engineering Department, University of Las Palmas de Gran Canaria, Spain
²Processes Engineering Department, University of Las Palmas de Gran Canaria, Spain

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Abstract. The importance of the mechanical stability of one implant is evaluated by analyzing the quality of the osseointegration at the bone-implant interface through the analysis of the amount of neoformed bone in direct contact with the implant, able to mechanically fix the implant and the type of bone tissue that is formed. The study of the in vivo behavior of a Ti6Al7Nb implant, subjected to 2 different surface treatments, is of great interest in order to determine and evaluate the possible TOXICITY caused by the implant through the content of metals present in biological fluids of experimental animals, OSTEOINTEGRATION of the implant and OSTEOINDUCTION at the implant-bone interface. To study the release of ions from the implant (Ti6Al7Nb) to the body (determination of Aluminum toxicity), the Atomic Absorption Spectrometry (EAA) technique has been used. This technique has been chosen, since they have very good characteristics: high specificity, selectivity, excellent sensitivity at low concentrations (1000 ppm), speed of determination and a wide field of application (70 elements, which makes it the technique) best suited for measuring Aluminum in biological fluids.

For the bone-implant interface study (osseointegration), the Scanning Electron Microscopy technique with EDX analyzer was used.

This new treatment, called SBF (synthetic or simulated body fluids), has the advantage of inducing the formation of apatite (hydroxyapatite coating) in metals and other materials, immersed in solutions that simulate biological fluids (Ringer, Earl, Hanks). The innovation of this treatment is found in the use of biovitroceramic particles as substitutes.
1. Introduction:

The importance of the mechanical stability of one implant is evaluated by analyzing the quality of the osseointegration at the bone-implant interface through the analysis of the amount of neoformed bone in direct contact with the implant, able to mechanically fix the implant and the type of bone tissue that is formed.

The study of the in vivo behavior of a Ti6Al7Nb implant, subjected to 2 different surface treatments, is of great interest in order to determine and evaluate the possible TOXICITY caused by the implant through the content of metals present in biological fluids of experimental animals. OSTEOSTEINTEGRATION of the implant and OSTEOSTEINDUCTION at the implant-bone interface.

2. Experimental Part:

To study the release of ions from the implant (Ti6Al7Nb) to the body (determination of Aluminum toxicity), the Atomic Absorption Spectrometry (EAA) technique has been used. This technique has been chosen, since they have very good characteristics: high specificity, selectivity, excellent sensitivity at low concentrations (1000 ppm), speed of determination and a wide field of application (70 elements, which makes it the technique), best suited for measuring Aluminum in biological fluids.

For the bone-implant interface study (osseointegration), the Scanning Electron Microscopy technique with EDX analyzer was used.

3. Results and Discussions:

The area known as the tip-plate was analyzed by means of a 1.5 mm scan, collecting points, as in the other cases, from the bone part, the bone-metal interface and the metal.

Likewise, the interface was carefully examined in order to find out if there is metal contamination in the bone-organic structure.

Figure 1. Análisis interfaz hueso-implante en la zona de la punta-placa mediante barrido de 1.5 mm

This new treatment, called SBF (synthetic or simulated body fluids) has the advantage of inducing the formation of apatite (hydroxyapatite coating) in different surface treatments, is of great interest in order to determine and evaluate the possible TOXICITY caused by the implant through the content of metals present in biological fluids of experimental animals. OSTEOSTEINTEGRATION of the implant and OSTEOSTEINDUCTION at the implant-bone interface.

4. Conclusions:

In vitro tests, treatment superficial SBF with biovitroceramic particles to the implants indicate that there is good osteoinduction and biocompatibility in the samples, highlighting immersion time as an important parameter in deposition quality (biocompatibility and cytotoxicity): expression of alkaline phosphatase confirms that osteoblastic cells belong to the osteoblastic phenotype, existing positive histochemical reaction; Cytomorphological analyzes show differences related to the start of the culture: after 24 hours, results are better for samples immersed for 15 days; after 48 hours, results are better for samples immersed for 15 days.

Studies using the EAA technique indicate that the concentration of Al that can affect humans due to the diffusion of Al by wearing an implant is insignificant, and cannot be considered harmful compared to daily consumption due to food intake or other factors.

This last conclusion collides with the arguments found in the existing literature that bet on a change in the implantable material, that is, a change in the widely used Ti6Al4V alloy with satisfactory results for the Ti6Al7Nb alloy object of this study, much more expensive and difficult to obtain.

5. Acknowledgments:

We appreciate the support and generosity of ITC (Instituto Tecnológico de Canarias) Las Palmas, Spain, without which the present study could not have been completed.

References:


