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## E-MRS Spring 2012 - Symposium G

### Functional Biomaterials

The symposium "Functional Biomaterials" focuses on processing, characterization and modelling of materials for biomedical and biotechnological applications as well as on their interactions with biological systems.

#### Scope

The field of biomaterials is becoming one of the largest and fastest growing research areas. Important advances have been made in the fabrication of materials that can be inserted or put in contact with biological systems. Some of these are specially relevant since they emerge in parallel from the field of nanotechnology. A key aspect to further developments in this field is the ability to design functional materials that are able to control the biological surrounding and to induce specific responses on biomolecules, cells and tissues. By responding to changes in the biological environment, or transformation from one state to another in the presence of biological systems, functional biomaterials are capable of improving device integration and control tissue regeneration. The symposium will focus on experimental and theoretical aspects of materials design and fabrication as well as characterization of the interactions at the material/biological systems interface.


The following topics are part of the scope of the symposium:

- Design and synthesis of biofunctional materials
- Novel processing technologies towards micro and nanostructured materials
- Novel characterization technologies for the investigation of material/biological system interactions
- Phenomena at the material/biological systems interactions
- Applications of functional materials for imaging, diagnostic and biosensing
  
- Computational modelling

This symposium aims at bringing researchers from different disciplines (materials science, physics, chemistry, biology and medicine) together to discuss the latest advancement in the biomaterials field and lead to the design and development of novel materials and devices with controlled properties and functionalities.

#### Hot topics to be covered by the symposium

- Surface modification
- Nano- and micropatterning of material surfaces
- Hydrogels
- Functional polymers and biopolymers
- Porous and composite biomaterials
- Biohybrid materials
- Stimuli responsive materials
- Biomedical devices
- Drug delivery systems
- Micro and nanosystems for biological recognition
- Antibacterial surfaces
- Biomolecules at the surface or interface
- Cells behaviour at the interface (mammalian and bacteria)
- Blood- and tissue-material interactions

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#### Important deadlines

##### E-MRS 2012 SPRING MEETING

Discounted Preregistration  
Deadline: April 5, 2012



#### Other Events

##### E2C European Energy Conference

17-20 April 2012  
Exhibition & Congress  
Centre  
Maastricht  
NL

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##### Junior EUROMAT

23-27 July 2012  
Lausanne,  
Switzerland

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##### E-MRS 2012 Fall Meeting

17-21 September 2012  
University of Technology  
Warsaw  
Poland

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##### TCM 2012 Symposium on Transparent Conductive Materials

21-25 October 2012  
Hersonissos, Crete  
Greece

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- Modelling of behaviour of material surfaces in biological environments
- Modelling of dynamic processes at the surface/ biological system interfaces

#### Tentative list of invited speakers

1. Serena Best, University of Cambridge (UK), Department of Materials Science and Metallurgy
2. Christopher J. Bettinger, Carnegie Mellon University Pittsburgh PA (USA), Biomedical Engineering Materials Science and Engineering Biomaterials-based Microsystems and Electronics
3. Rena Bizios, University of Texas at San Antonio (USA), Cellular and Tissue Engineering Laboratory, Department of Biomedical Engineering
4. Kenneth Dawson, University College Dublin (Ireland), Centre for BioNano Interactions (CBNI), School of Chemistry and Chemical Biology
5. Michael Gelinsky, Technische Universität Dresden (Germany), Centre for Translational Bone, Joint and Soft Tissue Research
6. Christine Knabe, Charité-University Medical Center Berlin (Germany), Oral Structural Biology
7. Robert A. Latour, Clemson University (USA), Bioengineering, Biomolecular Modeling Lab
8. Paolo Netti, University of Naples Federico II (Italy), Interdisciplinary Research Centre on Biomaterials
9. Roland Netz, Technical University Munich (Germany), Physics Department, Bio-soft Matter Theory
10. Willem Norde, University of Groningen (The Netherlands), Faculty of Medical Science
11. **Hannes C. Schniepp**, The College of William & Mary, Department of Applied Science (USA)
12. Jörg Tiller, TU Dortmund (Germany), Laboratory of Biomaterials and Polymer Sciences
13. Ichiro Yamashita, Nara Institute of Science and Technology and Advanced Tech. Res. Lab., Panasonic Co. Ltd (Japan)

#### List of scientific committee members:

1. Marc Bohner, RMS Foundation (Switzerland), Skeletal Substitute Group
2. Henk J. Busscher, University Medical Center of Groningen (The Netherlands), Department of Biomedical Engineering
3. Lucio Colombi Ciacchi, University of Bremen (Germany), Hybrid Materials Interfaces
4. Si-Shen Feng, National University of Singapore (Singapore), Department of Chemical and Biomolecular Engineering
5. Klaus D. Jandt, Friedrich-Schiller-University Jena (Germany), Institute of Materials Science and Technology (IMT)
6. Matthias Lutolf, École Polytechnique Fédérale de Lausanne (Switzerland), Laboratory of Stem Cell Bioengineering
7. Ramalingam Murugan, University of Strasbourg (France), Biomaterials and Tissue Engineering
8. Roger Narayan, University of North Carolina (USA), UNC/NCSU Joint Department of Biomedical Engineering

#### ✚ Symposium organizers

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distilled water or ethanol was added. The pastes were coated on the substrates by bar-coating. The samples were heated to 300-500°C and held at each temperature for 1-10 h. After cooling, the substrates were immersed in distilled water to dissolve the remaining flux. Well-developed, one-dimensional and highly crystalline HAp crystals were successfully and directly grown on titanium substrate at 300°C using KNO<sub>3</sub>-LiNO<sub>3</sub> flux coating method. The most important feature of this study is that high-quality whiskers layer were successfully grown at a relatively low temperature of 300°C, because the nitrate system flux has very low eutectic temperatures.

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16:00

### **Sol-Gel Synthesis and Characterization of Samarium and Manganese Substituted Calcium Hydroxyapatite**

**Authors :** I. Bogdanoviciene, M. Misevicius, A. Beganskiene, A. Kareiva

**Affiliations :** Department of General and Inorganic Chemistry, Vilnius University, LT-03225 Vilnius, Lithuania

**Resume :** Synthetic calcium hydroxyapatite (CHAp) is known to be one of most important implantable material and is used as substitute material for human hard tissues (bones and teeth). The general importance of CHAp has led to extensive research in numerous areas. In this study, nanostructured Sm- and Mn-substituted CHAp samples have been synthesized using a simple, environmentally friendly aqueous sol-gel chemistry route. For the characterization of obtained CHAp samples, the X-ray diffraction analysis, scanning electron microscopy, UV-visible reflection and infrared spectroscopy and luminescence measurements were recorded. It was shown that phase purity of the end products highly depends on the amount of lanthanide or transition metal. The reflectance of Mn-substituted calcium hydroxyapatite samples is wavelength independent in the wavelength range of 450-800 nm and equal almost 100%. The samarium-substituted samples show a significant decrease of transmission at ~430 nm. The luminescent properties of these samples were also investigated. The positions of the broad emission bands are almost independent of the Sm concentration. The intensity of these quite symmetric photoluminescence peaks at around 600 and 650 nm slightly depends on the samarium concentration, and the highest emission intensity possess the CHAp samples containing 0.5 mol % and 1.0 mol % of Sm. In conclusion, Sm-substituted CHAp shows interesting luminescent properties and could be a good candidate for biocompatible drug carriers. The catalytic properties of manganese-substituted CHAp are under investigations. This research was funded by a grant (No. TAP-04/2011) from the Research Council of Lithuania.

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16:00

### **Improved Corrosion Resistance on Biodegradable Magnesium by Zinc and Aluminum Ion Implantation**

**Authors :** Ruizhen Xu<sup>1</sup>, Xiongbo Yang<sup>1</sup>, Kai Wong Suen<sup>1</sup>, Guosong Wu<sup>1</sup>, Penghui Li<sup>1</sup>, Paul K. Chu<sup>1†</sup>

**Affiliations :** <sup>1</sup>Department of Physics and Materials Science, City University of Hong Kong, Hong Kong, Hong Kong SAR

**Resume :** Magnesium and its alloys have promising applications as biodegradable materials but their corrosion behavior must be improved. It has been shown that plasma immersion ion implantation (PIII) can enhance the corrosion resistance by modifying the surface composition. In this study, pure magnesium is implanted with zinc and aluminum by PIII and X-ray photoelectron spectroscopy (XPS) is carried out to characterize the composition and elemental chemical states. Polarization, electrochemical impedance spectroscopy (EIS), and immersion tests are further used to evaluate the corrosion resistance of the implanted magnesium in simulated body fluids (SBF). Scanning electron microscopy (SEM) is used to examine the surface morphology of the samples after immersion in SBF. Our results demonstrate that the magnesium samples implanted with Zn and Al have better anti-corrosion properties than pure magnesium and that dual metal ion implantation is an effective way to improve the corrosion characteristics.

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16:00

### **Improving HAP bioactive coatings by SiC and Mg addition**

**Authors :** A.Vladescu<sup>1</sup>, V.Braic<sup>1</sup>, A.Kiss<sup>1</sup>, M.Balaceanu<sup>1</sup>, I.Pana<sup>1,2</sup>, I.Titorencu<sup>3,4</sup>, A.Parau<sup>1,5</sup>

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