Welcome to the second issue of the ENMat Newsletter. ENMat has been founded in September 2005, to create a powerful network of leading Materials Research Centres in Europe. We expect to stimulate beneficial interdisciplinary activities between members of the network as well as to increase the efficiency of the transfer of results from R&D to industry. We also expect to improve opportunities for participation in activities in the frame of EU-FP7 within joint projects.

Members

• AIDICO, Construction Technology Institute, Valencia, Spain
• AIT Austrian Institute of Technology GmbH, Seibersdorf, Austria
• Centre for Materials Science and Engineering (CMSE), Ghent University, Ghent, Belgium
• Centre for Research and Development of Materials and Technologies (CRDMT), Prague, Czech Republic
• Competence Centre for Materials Science and Technology (CCMX), Ecole Polytechnique Fédérale de Lausanne, Switzerland
• Department of Materials and Production Engineering, University “Federico II Napoli”, Naples, Italy
• Department of Metallurgy and Materials, University of Birmingham, Birmingham, UK
• EMPA Swiss Federal Laboratories for Materials Testing and Research, Dübendorf, Switzerland
• Fraunhofer Institute for Ceramic Technologies and Systems (IKTS), Dresden, Germany
• French Atomic Energy Commission (CEA), Grenoble, France
• Fundacion ITMA, Llanera, Spain
• Institute of Mechanical Engineering and Industrial Management – INEGI, Porto, Portugal
• Institute of Science and Technology for Ceramics (CNR-ISTEC), Faenza, Italy
• Laboratoire des Multimatériaux et Interfaces, Université Claude Bernard Lyon 1, Lyon, France
• Materials Design Division, Warsaw University of Technology, Warsaw, Poland
• “Petru Poni” Institute of Macromolecular Chemistry, Iasi, Romania
• School of Materials, University of Manchester, Manchester, UK
• SP Materials Research Centre, SP Technical Research Institute of Sweden, Borås, Sweden
• Universidad Complutense de Madrid, Madrid, Spain
• VTT Technical Research Centre of Finland, Espoo, Finland

Highlights in this Newsletter

- Description of ENMat members in Czech Republic (CSNMT) and Belgium (CMSE) - page 2
- How to get financial support for STSM from COST? - page 3
- ENMat expertise in the field of Biomaterials research - page 4
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Web page: http://www.enmat.eu
ENMat Members - CSNMT, Prague


The Czech Society for New Materials and Technologies (CSNMT) was founded in 1993 as a voluntary association. It now includes 337 individual members and 42 “team” members – Technical Universities, Research Companies, industrial enterprises, Academia and others – see diagram. Activities are focused on research cooperation, organisation of conferences and workshops, transfer of new technologies and research knowledge into industry, preparing consortia and solution of national and international projects, promotion of education in materials engineering, etc. One of the founder members is SVÚM a.s., Prague – Research and Testing Centre. This company was founded in 1949 as a non-profit organization (National research institute for materials - SVUM), from 1994 it is a fully private company with 58 employees – 30 of them are scientific and research workers. The company is one of the most respected materials research and testing institutions in the Czech Republic.

Main activities:
1. Basic and applied Research and Development
   - Metals, Plastics, Composites
   - Technology and Heat Treatment
   - Advisory services, expertise, supervision
   - Machine parts life prediction
   - Failure analyses of investment plants, constructional parts and tools
2. Testing of Materials
   - Accredited labs according to CSN EN ISO/IEC Standard 17025 (European/Worldwide validity)

ENMat Members - CMSE

Centre for Materials Science and Engineering (CMSE), Ghent University

The Centre for Materials Science and Engineering (CMSE), founded in 2000, combines the broad expertise in Materials Science available at Ghent University, Belgium. CMSE is a coordinating organisation of 12 departments in the Faculties of Engineering Science, Science, Bio engineering science and Medicine working together at an Interfaculty and multidisciplinary level. More than 300 persons, including around 50 professors and approximately 180 researchers, are working in the field of Materials Science and Engineering.

CMSE aims at a cooperation in the field of materials science and the further development of this domain at Ghent University via activities on different levels (education, research and development, service providing to the industry, technology transfer). CMSE functions as coordinator of joint multidisciplinary national and international research projects and builds a platform for consulting / discussion regarding the vision on education and research in the field of materials science.

Among the activities of the CMSE are research in the field of materials science and the industrial applications for a large variety of materials, such as metals, (bio) polymers, ceramic materials, composites, textiles, materials linked to concrete, biomaterials, semiconductors, electronics, coatings, chemicals, wood and wood-based materials. Research results are applied in order to obtain material developments leading to products with a high added value and materials innovation. Interdisciplinary and multidisciplinary research (properties, structure, applications, processing, modelling, ...) is stimulated in order to develop new materials, find new applications, optimise materials, ...

One of the objectives of CMSE is the development of a common research infrastructure that can be used by all members. In addition each of the participating departments has at its disposal a wide range of equipment and techniques necessary for the execution of the research mentioned above. An overview of the research infrastructure available at each department can be found through the CMSE website (http://cmse.ugent.be). CMSE is one of the founding members of ENMat and its chairman, Prof. Paul Kiekens, has been the First President of ENMat for 4 years. It is also actively involved in the COST Action MP0701 on polymer nanocomposite materials. On 24th September 2009 a COST Day on “Biotechnological Functionalisation of Advanced Fibre Reinforced Composites” (cooperation between COST actions 868 and MP0701) was organised in Ghent in the framework of the International Conference “Latest Advances in High Tech Textiles and Textile-Based Materials” from 23 - 25 September 2009 (http://www.textileconferences.be). Next to the plenary session of the COST Day, attended by around 200 people, there were also parallel sessions on “Advanced Fibre Reinforced Composites” and “Nanocomposites”. The papers of all presentations were published in the conference proceedings.

Web page: http://www.enmat.eu
The COST action MP0701 on Polymer Nanocomposites is now in its third year being in operation for now 30 months. The action is scheduled to last for a total of 48 months. Already 31 out of 35 COST countries have joined the COST action MP0701. This means that each laboratory out of these countries is in principle entitled to participate in the workshops, seminars, conferences, summer schools and scientific exchange programmes. Additionally, participants from 15 Non-COST countries have already participated in the various activities of COST MP0701. A number of conferences and thematic workshops have already been performed in order to facilitate information exchange and to intensify the cooperation between the laboratories. A total of 270 individual scientists and researchers have participated so far. The follow-up workshops and other activities of 2010 are listed in the table below.

### Table: List of activities of the COST action MP0701 in 2010 and beyond

<table>
<thead>
<tr>
<th>Date</th>
<th>Type</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td>June 1st 2010</td>
<td>Wiener Neustadt</td>
<td>Workshop: Nanoparticles Surface (Modified/Unmodified) as a basis for the interaction with polymer matrix</td>
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<tr>
<td>September 23rd and 24th 2010</td>
<td>Novi Sad</td>
<td>Workshop: Food packaging innovations</td>
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<tr>
<td>October 5th and 6th 2010</td>
<td>Graz</td>
<td>COST day and conference: Workshop: Food packaging innovations</td>
</tr>
<tr>
<td>November 30th 2010</td>
<td>Krakow</td>
<td>MC meeting: Workshop: Nanocomposites Surface (Modified/Unmodified) as a basis for the interaction with polymer matrix</td>
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<td>December 1st - 3rd, 2010</td>
<td>Krakow</td>
<td>Conference: Workshop: Nanocomposites Surface (Modified/Unmodified) as a basis for the interaction with polymer matrix</td>
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<td>April 2011</td>
<td>Napoli</td>
<td>Training school: Synthesis of hybrid organic-inorganic nanocomposites for innovative nanocomposites structures</td>
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<tr>
<td>10 June 2011</td>
<td>Paris</td>
<td>Workshop/ Training School: Multiphase Polymers and Polymer Composites Systems: Macro to Nano Scales</td>
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### WUT - EMPA STSM Exchange

Composites with novel functional and structural properties by nanoscale materials (Nano Composite Materials - NCM)

Report on the stay of a young researcher from Warsaw University of Technology at EMPA with a COST MP0701 STSM grant.

EMPA is an interdisciplinary research and services institution for material science and technology development. It is open to various levels of cooperation not only with industry units, but with research institutes and universities as well. Additionally, it contributes to young scientists’ development and mobility sharing experience it gained through the years. The Department of Inorganic Technology and Ceramics of Warsaw University of Technology (WUT) has a long tradition which history began in 1919. The students’ education curriculum includes acquiring knowledge of technological processes from both theoretical and practical point of view with particular emphasis laid on physicochemical aspects that govern the processes. EMPA has been cooperating with WUT since a few years already. However, I am the very first person from my department who took part in the exchange programme.

One of the projects within the COST action frame in which EMPA - Materials and Science Technology (Switzerland) collaborates with the Department of Inorganic Technology and Ceramics at the Faculty of Chemistry (WUT, Poland) concerns the development of a fabrication method for metal-ceramic nanocomposite coatings obtained by electrochemical means. The work is divided into two parts:

- **Stabilisation investigation of ceramic nanoparticles in a plating bath carried out in EMPA Dübendorf**
- **Electrodeposition experiments conducted in EMPA Thun**

I divided my work time between the two departments: Laboratory of High Performance Ceramics (EMPA Dübendorf) and Laboratory for Mechanics of Materials and Nanostructures (EMPA Thun). Depending on the research area, I got a feedback from both these groups of the Swiss institute. In both places I received a great support from experienced scientists. This interdisciplinary project combines topics from colloid science and electrochemistry giving opportunity for experience exchange for researchers from different scientific fields.
Expertise on following biomaterials and biopolymers:
- Novel biodegradable polymers
- Starch
- Cellulose derivatisation
- Nanocellulose
- Organically modified nanoparticles
- Self-assembled organic coatings
- Hydrophobic proteins
- Organic conductors
- Metallic and ceramic coatings (e.g. thermal spray coatings)
- Biocompatible sol-gel coatings

Actual research domains concerning (bio)polymers technology / Competences:
- Development of Fibre Reinforced Composites and their processing methods
- Development of Biopolymer foams
- Bioelectronics (biomicrosystems, cell culture platforms, arrays for drug testing, MEMS, lab-on-chip)
- Nanobiotechnology (self-assembled molecular biosensors, surface active proteins, nanocellulose, metallic nanoparticles, carbon nanostructures, combination of top-down and bottom-up techniques, and biological interfaces)
- Biochemistry
- 3D printing of biopolymer scaffolds for tissue engineering (Direct Write Technology)
- Bio-lubrication - tribology
- Biomimetic surfaces
- Sol-gel chemistry
- Thermally sprayed coatings

BIMATERIALS AND BIOMECHANICS AT INEGI

INEGI Biomaterials and Biomechanics group is working on the following research topics:

- Regenerative medical devices
  - 3D printing of polymeric materials for the development of ligament augmentations
  - Bioactive surfaces
  - Bioengineered scaffolds
  - Bioelectronic devices
  - Biofunctional materials
  - Biodegradable polymers

- Reconstructive medical devices
  - Artificial joints
  - Tissue engineering

- Novel devices
  - Nanobiotechnology
  - Nanomedicine

- Computational modeling
  - Finite element methods

BIOENGINEERING/INNOVATION GROUP

Biomaterials are being produced to meet the needs of a wide variety of applications. Research is being conducted to improve the mechanical properties of biomaterials and reduce the cost of manufacturing.

- Development of novel polymeric materials
- Development of novel ceramic materials
- Development of novel composite materials
- Development of novel metallic materials

- Development of novel polymeric coatings
- Development of novel ceramic coatings
- Development of novel composite coatings
- Development of novel metallic coatings

- Development of novel polymeric devices
- Development of novel ceramic devices
- Development of novel composite devices
- Development of novel metallic devices

- Development of novel polymeric biodegradable devices
- Development of novel ceramic biodegradable devices
- Development of novel composite biodegradable devices
- Development of novel metallic biodegradable devices

- Development of novel polymeric injectable devices
- Development of novel ceramic injectable devices
- Development of novel composite injectable devices
- Development of novel metallic injectable devices

- Development of novel polymeric bioactive devices
- Development of novel ceramic bioactive devices
- Development of novel composite bioactive devices
- Development of novel metallic bioactive devices

- Development of novel polymeric scaffolds
- Development of novel ceramic scaffolds
- Development of novel composite scaffolds
- Development of novel metallic scaffolds

- Development of novel polymeric biomembranes
- Development of novel ceramic biomembranes
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- Development of novel metallic biomembranes

- Development of novel polymeric biomaterials
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- Development of novel metallic biomaterials

- Development of novel polymeric biodegradable biomaterials
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- Development of novel polymeric injectable biomaterials
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- Development of novel polymeric bioactive biomaterials
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Web page: http://www.enmat.eu
Topchim, a Belgian SME, has developed a technology to make water dispersed nanoparticles derived from organic polymers. Starting materials are co-polymers of styrene and maleic anhydride, which upon imidisation form nanoparticles with a diameter of around 100 nm. Due to the organic nature of the nanoparticles the physical properties of the nanoparticles can easily be modified and the interactions between the particles, and between the particles and the substrate is much higher than with inorganic nanoparticles. By applying the organic nanoparticles to a substrate, properties such as printability, gloss and water repellence can be much improved. The nanoparticles provide a certain roughness to the substrate so that a lotus effect is observed. Contact angles with water of more than 140 degrees are obtained. Furthermore, Topchim succeeded in encapsulating active ingredients, such as biorenewable oils, UV absorbers, dyes, biocides and optical brighteners into the nanoparticles. By doing so a water dispersion with a high stability is obtained that turns into a hydrophobic material upon drying.

Further research is being performed within a joint project with the “Centre for Materials Science and Engineering” (CMSE) of Ghent University, funded by the “Institute for the promotion of Innovation by Science and Technology in Flanders” (IWT).

So far, Topchim has focused on the application of the nanoparticles on paper and card board. Now it is looking to the application on new substrates such as fibres, fabrics and nonwovens, glass, metals, wood, concrete, etc. Moreover, these nanoparticles can be combined with several chemicals in order to increase their functionality, opening possibilities for further application in surface treatment.

More info on: [http://www.topchim.be](http://www.topchim.be)

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**EVENTS**

- Summer School on Materials Characterisation: 25-27 August 2010  
  - A short-course on *Advanced Characterisation Techniques of Materials* at EPFL, Lausanne.  
- **International Aerosol Conference 2010**: August 29 - September 3, 2010, Helsinki, Finland.  
- 23rd and 24th September 2010 in Novi Sad, Serbia: COST MP0701 Workshop on “Nanoparticles Surface (Modified/Unmodified) as a base for the interaction with polymer matrix”.  
  URL: [http://www.nanocomposites-cost.eu/?News](http://www.nanocomposites-cost.eu/?News)
- **VTT Functional materials Industrial workshop 2010**: 24 September 2010, Espoo, Finland.  
- **2010 TAPPI International Conference on Nano for the Forest Product Industry**: 27-29 September 2010, Espoo, Finland.  
- **Nanoparticle products from new mineral resources in Europe**: Workshop, 30 September 2010, Espoo, Finland.  
  URL: [http://promine.gtk.fi/](http://promine.gtk.fi/)
- October 5th and 6th 2010: A “COST day on Food Packaging”. Co-operation between COST actions MP0701 on Polymer Nanocomposites, FA0904 on Eco-sustainable Food Packaging based on Polymer Nanomaterials and MPN 527 on Plasma Polymers and related materials. Location: Graz, Austria.  
  URL: [http://www.matchmaking.at/foodpackaging](http://www.matchmaking.at/foodpackaging)
- **2nd International Conference NANOCON 2010**: 12-14 October 2010, Olomouc, Czech Republic.  
  URL: [www.nanocon.cz](http://www.nanocon.cz)
  URL: [http://www.istec.cnr.it/eventi.htm](http://www.istec.cnr.it/eventi.htm)
- **COST action MP0701 Workshop and Training School on Multiphase Polymers and Polymer Composites Systems: Macro to Nano Scales**: 7-10 June 2011, Paris, France.  