

# EUROMAT 2017

**FEMS** **30**  
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EUROPEAN CONGRESS AND EXHIBITION ON ADVANCED MATERIALS AND PROCESSES

**17-22 SEPTEMBER 2017**  
**THESSALONIKI, GREECE**

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CONFERENCE CULTURAL CENTER  
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**Symposia Booklet**

**EURO  
MAT  
2017**



HELLENIC  
METALLURGICAL  
SOCIETY (HMS)



HELLENIC SOCIETY FOR THE  
SCIENCE & TECHNOLOGY OF  
CONDENSED MATTER (HSSTM)

## Preface

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Dear Colleagues,

Preparations for EUROMAT2017 are well underway. The next crucial step is the submission of high quality abstracts for each of the eight themes of the conference by the deadline of 31st of January 2017.

It gives me great pleasure to introduce to you this booklet where you can find the abstracts of all the proposed symposia. The symposia, invited plenary talks and planned tutorials should attract researchers, industrialists and decision makers from all over the world.

An objective for this conference was to build on and even surpass the achievements of previous EUROMAT conferences. When selecting the eight themes of the conference and the sub-thematic areas of each one, the scientific committee paid particular attention to provide a balanced coverage of basic science and applications in as many major fields of Materials Science and Engineering as it is possible within the conference constraints.

In this booklet you will find the abstracts for 60 symposia. This impressive number of proposed symposia has been possible because of the effort and commitment of a remarkably large number of colleagues throughout Europe and the rest of the world who agreed to dedicate part of their precious time to organise a particular symposium or coordinate a group of symposia in a particular theme. I am grateful to all these colleagues for their hard work and support.

The ambition of the scientific committee, FEMS and local organisers is to produce a very comprehensive final programme that will give all participants many opportunities to make new friends and renew old acquaintances, to have discussions and exchange experiences and knowledge and advance current understanding in many fields of materials science and engineering.

I sincerely hope that you will be able to present part(s) of your research in EUROMAT2017. I would be grateful if you could also promote your chosen symposium(a) and theme area(s) and the whole conference.

See you in Thessaloniki in September 2017.

*Panos Tsakiroopoulos*

**Prof. Panos Tsakiroopoulos**

Chair of the Scientific Committee, Euromat 2017



Dear Colleagues,

As the President of FEMS (the Federation of European Materials Societies) it gives me great pleasure to introduce FEMS and the Euromat conference series to you. Euromat is one of the flagship events in the FEMS calendar and in 2017 will have even greater significance as this year marks the 30th Anniversary since the inception of the Federation. FEMS represents 28 materials, minerals and mining societies across Europe which when combined have in excess of 25,000 members.

We are extremely pleased that the Euromat event will take place in Thessaloniki in 2017. For Euromat 2017 we have established strong links with our counterparts in the USA, namely TMS and have arranged a number of symposia where TMS will be directly involved in the organisation of these symposia to give a flavour of activity from across the Atlantic. I am really looking forward to Euromat2017 and you will see from this booklet that we have more Areas being covered than at previous conferences, including Area H which focuses on Raw Materials. This event promises to be a highlight in the Euromat series, held at an impressive venue in an equally lovely setting on the coast at Thessaloniki. Looking ahead we have just recently awarded the next two in the Euromat series to Stockholm, Sweden in 2019 and Graz, Austria in 2021.

On behalf of FEMS I would like to thank all of those individuals who have been involved in bringing this conference to life whether organisationally or scientifically. I look forward to welcoming you to Thessaloniki next September.

With Warmest Regards,

A handwritten signature in blue ink, reading 'Brett Suddell'.

**Dr Brett C Suddell FIMMM CEnv**  
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The 2017 FEMS Award winners, will also be included in the plenary speakers list.



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**Area A: Functional Materials**  
**Area Coordinator:**

Emmanuel Giannelis  
*Cornell University, USA*



## A.1

Title: Carbon-based nanomaterials		
Organizer	Institution	Contact email
Eric Anglaret	Université de Montpellier, France	eric.anglaret@umontpellier.fr
Vladimir Falko	National Graphene Institute, University of Manchester, United Kingdom	Vladimir.falko@manchester.ac.uk
Costas Galiotis	University of Patras and FORTH/ ICE-HT, Greece	c.galiotis@iceht.forth.gr
Maurizio Prato	University of Trieste, Italy	prato@units.it
Summary		
<p>This symposium will cover all aspects related to production/processing, characterization, devices, applications and industrial perspectives of materials based on the most popular carbon nanomaterials, including Graphene, Carbon Nanotubes, Carbon Nanoparticles:</p> <ol style="list-style-type: none"><li>1. Functionalization, dispersion, processing of carbon nanotubes, carbon nanoparticles and graphene; nanocarbon-based composites</li><li>2. Electronic, plasmonic, optical and mechanical properties of carbon nanotubes, carbon nanoparticles, graphene and related devices</li><li>3. Graphene heterostructures with boron nitride and other 2D materials</li><li>4. Safety and biomedical applications of carbon nanotubes, carbon nanoparticles and graphene</li><li>5. Synthesis; selection methods and characterisation metrology for standardization and quality control</li></ol>		



## A.2

Title: Innovations in Functional Nanomagnets		
Organizer	Institution	Contact email
Makis Angelakeris	Aristotle University of Thessaloniki, Greece	agelaker@auth.gr
Michael Farle	University of Duisburg-Essen, Germany	Michael.farle@uni-due.de
Panagiotis Pouloupoulos	University of Patras, Greece	poulop@upatras.gr
Radek Zboril	Regional Centre of Advanced Technologies and Materials, Czech Republic	Radek.zboril@upol.cz
Summary		
<p>This Symposium aims to assemble scientists not only from Europe, but also world-wide, who work on the field of magnetic nanomaterials. Magnetic nanomaterials have been in the center of scientific interest the last few decades due to their importance for fundamental as well as for applied research. Magnetic sensors are everywhere: in cars, homes, factories and new applications in biomedical and nanoengineered devices are reported nearly on a monthly basis. Spintronics and recently Spin-Logic dominates the discussions and research efforts for near future electronic devices and quantum computers. Magnetic hybrid nanoparticles, for example, after long-term efforts to be employed in magnetic recording, nowadays they are of main importance in nanomedicine for drug delivery. Magnetic multilayers and thin films are already used in the magneto-optical hard discs. In combination with miniature read heads they have bring the personal computers and laptops in the terabyte storage area, nowadays. P. Grunberg and A. Fert have been awarded with a Noble of Physics for progress in magnetic nanomaterials. Furthermore, innovative complex materials for ferroic cooling or a new class of naturally formed nanolaminated magnets (MAX-phases) have come to the center of interest for energy relevant applications.</p> <ul style="list-style-type: none"> <li>✓ Authors are welcome to present their works on modern magnetic nanomaterials with emphasis on functionalization for applications.</li> <li>Potential topics include, but not limited to:</li> <li>✓ Recent developments in synthetic procedures of magnetic heterostructures</li> <li>✓ Advances in interface nanomagnetism (ferro/antiferro, hard/soft interfaced nanomagnets)</li> <li>✓ Latest technologies for biomagnetic evaluation and nanotoxicity issues of magnetic nanostructures</li> <li>✓ Multifunctional role of magnetic interfaces</li> <li>✓ Interface mechanisms using model systems (multilayers, core/shell particles)</li> <li>✓ Role of magnetic anisotropy and coupling at the nanoscale and macroscopic magnetic behavior</li> <li>✓ Recent advances in nanomagnetically driven interface magnetic applications (i.e spintronics, magnetic recording)</li> <li>✓ Low dimensional (quantum dots, nanowires, nanowhiskers) magnetic materials: Formation and Properties</li> </ul>		



## A.3

Title: Functional Polymers and Related (Nano)Composites		
Organizer	Institution	Contact email
Jean-François Gerard	INSA Lyon, France	jean-francois.gerard@insa-lyon.fr
Philippe Dubois	LIST Belvaux, Luxembourg	Philippe.dubois@list.lu
Ton Peijs	QUEEN MARY University, London, United Kingdom	t.peijs@qmul.ac.uk
Summary		
<p>The objective of the Symposium is to gather scientists and engineers from both academia and industry for discussing and exchanging their current RD&amp;I activities in the field of functional polymers and (nano)composite materials and their applications. The conference program will feature lectures by expert invited speakers to be announced soon. We encourage participants to present their current research work as oral communications or posters in one of the topics of the program.</p>		
Targeted topics:		
<ul style="list-style-type: none"> <li>✓ New trends in controlled polymer synthesis and chemical functionalization</li> <li>✓ Applications as smart polymer materials incl. shape-memory polymers/(nano)composites, self-healing polymeric materials, smart hydrogels, self-responsive (nano)coatings</li> <li>✓ Polymer materials from renewable resources: bio-based polymers and composites, biodegradable polymers</li> <li>✓ Functionalized (filled) rubbers and elastomers</li> <li>✓ Functional polymers in additive manufacturing (3D printing)</li> <li>✓ Functional nanocomposites and nanohybrids,</li> <li>✓ Compatibilization of functional polymer blends</li> <li>✓ Advanced processing and characterization techniques for functional polymeric materials</li> </ul>		



## A.4

Title: Self Healing Materials & Shape Memory materials		
Organizer	Institution	Contact email
S. van der Zwaag	Delft University of Technology, The Netherlands	S.vanderZwaag@tudelft.nl
Summary		
<p>In this symposium we like to present the latest developments in the field of self healing materials as well as in the field of shape memory materials. While there are clear distinctions between self healing materials (which are able to restore their functionality after the occurrence of damage) and shape memory materials (which are able to restore their external shape and dimensions after additional deformation), increasingly research is being presented in which the shape recovery is used to promote the healing process.</p> <p>In this symposium we welcome contributions focused exclusively on self healing or shape memory effects, but also contributions in which both phenomena are combined.</p> <p>Both fields are not restricted to any particular material class, hence we welcome contributions from the fields of polymers, metals, ceramics, composites and functional materials. The research may be fundamental, conceptual or more applied. It can be experimental or theoretical.</p> <p>In the selection of oral presentations, priority will be given to those contributions presenting 'new' work.</p>		





## A.5

Title: Colloidal Nanoparticles: Synthesis, functionalization and applications		
Organizer	Institution	Contact email
Antonios G. Kanaras	University of Southampton, United Kingdom	a.kanaras@soton.ac.uk
Wolfgang Parak	University of Marburg, Germany	wolfgang.parak@physik.uni-marburg.de
Liberato Manna	Italian Institute of technology, Genova, Italy	Liberato.Manna@iit.it
Catherine Dendrinos Samara	Aristotle University of Thessaloniki, Greece	samkat@chem.auth.gr
<b>Summary</b>		
<p>Inorganic Colloidal nanocrystals are employed in several fields of science ranging from biology and medicine and the development of new diagnostic methods, drug delivery, and imaging, to physics and engineering and the fabrication of novel devices for energy conversion and storage. The major reason for the vast range of applications for colloidal nanocrystals is the ability to easily tune the density of their electronic states, which allows the control of their magnetic, optical, electrical, catalytic and mechanical properties, characteristic for different materials. The control over the properties of these nanocrystals can be achieved by chemically adjusting their size, shape, and composition as well as by carefully selecting the ligands to coat their surface in order to retain the stability and target ability. At this symposium we aim to cover the current state of art in colloidal nanoparticle synthesis and functionalization as well as their applications in Biomedical and Physical Sciences.</p> <p>The topics include but they are not limited to:</p> <ul style="list-style-type: none"> <li>✓ Synthesis of Colloidal Nanoparticles of various chemical compositions and various shapes including nanorods, nanowires, spheres and other complex structures.</li> <li>✓ Doping of nanoparticles.</li> <li>✓ Purification methods for narrowing colloidal nanoparticles' dispersity.</li> <li>✓ Surface chemistry of colloidal nanoparticles of various morphologies.</li> <li>✓ Self-assembly of Nanoparticles: From nanoparticle oligomers to higher hierarchy structures.</li> <li>✓ Colloidal Nanoparticles in Biomedical applications.</li> <li>✓ Colloidal Nanoparticles in Biosensing.</li> <li>✓ Colloidal Nanoparticles in Devices including LEDs and photovoltaics.</li> <li>✓ Colloidal Nanoparticles in Catalysis.</li> </ul>		



## A.6

Title of symposium: Advanced Materials for Space Exploration		
Organizer	Institution	Contact email
George Vekinis	Institute of Nanoscience and Nanotechnology, NCSR Demokritos, Greece	g.vekinis@inn.demokritos.gr
Barrie Dunn	School of Engineering, University of Portsmouth, United Kingdom	barrie.dunn@port.ac.uk
Jean-Marc Bouilly	Airbus D&S	jean-marc.bouilly@astrium.eads.net
Summary		
<p>The exploration of space and other worlds is one of humankind's most challenging and rewarding ventures. It represents a critical step in humankind's preparation for the colonisation of our Solar System that will surely happen in the future.</p> <p>In the most recent NASA Global Exploration Strategy document it is stated: <i>"Space exploration enriches and strengthens humanity's future. Searching for answers to fundamental questions such as: 'Where did we come from?' 'What is our place in the universe?' and 'What is our destiny?' can bring nations together in a common cause, reveal new knowledge, inspire young people and stimulate technical and commercial innovation on Earth."</i></p> <p>There is little doubt that the development of new and enhanced materials is perhaps the most critical endeavour <i>enabling</i> space exploration. While many new and advanced materials are continuously being developed worldwide for a plethora of new applications, space exploration presents many special challenges that usually demand extreme and often unusual combination of properties from all types of materials.</p> <p>Scope of the Symposium:</p> <p>The symposium aims to bring together materials scientists and engineers and their students from around Europe and beyond and to present the most up-to-date research results in all materials fields crucial to space exploration.</p> <p>The targeted topics of the symposium are:</p> <ul style="list-style-type: none"> <li>✓ Materials for thermomechanical protection of space probes and spacecraft</li> <li>✓ Electronic materials for space exploration</li> <li>✓ Advanced structural materials for the space environment</li> <li>✓ Ultra-light materials for space exploration</li> <li>✓ Advanced materials for human protection</li> <li>✓ Materials modelling for space exploration</li> <li>✓ Specialist coatings for space exploration</li> </ul>		





## A.7

Title: Functional Nanomaterials for Novel Applications		
Organizer	Institution	Contact email
Paloma Fernández	University Complutense, Madrid, Spain	arana@ucm.es
Ana Cremades	University Complutense, Madrid, Spain	cremades@fis.ucm.es
Oliver Rader	Helmholtz-Zentrum Berlin, Germany	rader@helmholtz-berlin.de
Peter Schaaf	Technische Universität Ilmenau, Ilmenau, Germany	peter.schaaf@tu-ilmenau.de
Summary		
<p>Functional materials have to be constantly developed and improved for many applications, e.g. energy related. Nanostructured materials are extensively studied for energy-related applications such as solar cells, catalysts, thermoelectrics, lithium ion batteries, supercapacitors, and hydrogen storage systems, environmental, electronic, optic, sensing and medical applications, to mention a few. Resulting from their nanoscale dimensions, they exhibit a high surface to volume ratio, excellent transport properties, and confinement effects. The symposium intends to cover all these in a multidisciplinary way. The different approaches in the actual research to improve or design new nano and micromaterials of interest for a wide range of applications will be presented. The targeted topics include fundamental as well as applied aspects of material design, synthesis, theory and modelling, properties of interest and application of nanomaterials. The topics include, but are not limited to:</p> <ul style="list-style-type: none"> <li>✓ Nanoparticles, nanowires or nanotubes, two-dimensional or layered materials</li> <li>✓ Nano and microstructures, heterostructures, novel geometries, and integration for improved electronic, optical, sensing and/or energy generation/storage performance.</li> <li>✓ After-growth treatments to improve the physical properties</li> <li>✓ Growth of self-arranged structures, self-assembly</li> <li>✓ Materials grown by novel routes</li> <li>✓ Obtaining novel morphologies with different functionalities</li> <li>✓ High-yield growth procedures at nano- and microscale</li> <li>✓ Influence of the growth method on the defect structure</li> <li>✓ Doping processes at the nano- and microscale</li> <li>✓ Electrical and Optical Properties (lasing, resonant cavities...)</li> <li>✓ Sensing behaviour and other functional properties as piezoelectricity or magnetism</li> <li>✓ Ferroelectric heterostructures</li> <li>✓ Nanostructured thermoelectrics</li> <li>✓ Advanced and in situ-characterization techniques of nano and micromaterials</li> </ul>		





## A.8

Title: Materials by Design		
Organizer	Institution	Contact email
Julien Varignon	Unité Mixte De Physique CNRS Thales, France	Julien.varignon@gmail.com
Nicholas C. Bristowe	Imperial College London, United Kingdom	n.bristowe@imperial.ac.uk
Summary		
<p>ABO<sub>3</sub> oxide perovskites, and related materials, have attracted widespread interest over the last several decades with much thanks owed to the original discoveries of colossal magnetoresistance and high-temperature superconductivity in these systems. However, the physical behavior of perovskites is not limited to these phenomena, which also display ferroelectricity, (anti)-ferromagnetism, structural distortions, orbital and charge orderings, metal-insulator transitions or thermoelectricity to name a few. This diverse range of properties is usually ascribed to the subtle interplay between the structural, electronic and magnetic degrees of freedom, yielding promising multifunctional behavior. Therefore, oxide perovskites appear as building blocks to engineer novel exotic phenomena through the combination of appropriate strategies, most notably using strain and/or interface engineering. The search of novel materials with multifunctional character is not restricted to fundamental academic interest, but these systems show huge potential for device applications, and indeed some have already entered into industry.</p> <p>Researchers are welcome to present their recent discoveries and developments, both at the experimental and theoretical level, on both bulk perovskites and related materials, as well as thin films and heterostructures. The symposium aims to cover these potential topics:</p> <ul style="list-style-type: none"><li>✓ Interfacial properties and 2-dimensional electron gas;</li><li>✓ Ferroics, multiferroics and magnetoelectric materials;</li><li>✓ Metal-insulator phase transition phenomena;</li><li>✓ Flexoelectricity;</li><li>✓ Electro/Magneto/Elasto-caloric effects;</li><li>✓ Advances in ab initio calculations and experimental methods;</li><li>✓ Domain boundary phenomena;</li><li>✓ Light-induced phenomena.</li></ul>		



## A.9

Title: Functional Membranes		
Organizer	Institution	Contact email
Volker Abetz	Helmholtz-Zentrum Geesthacht, Germany	volker.abetz@hzg.de
Katja Loos	University of Groningen, The Netherlands	k.u.loos@rug.nl
Summary		
<p>Membrane technology is a key technology for a sustainable society, as it enables separation and purification of many substances which are relevant for human beings, such as water, air and many chemicals. Scope of the Symposium is to bring together material scientists, chemists, physicists and engineers working on the development of new tailored polymer, inorganic and hybrid membranes for all sorts of areas such as filtration, distillation, desalination and biological separations, including energy applications. Also new developments in catalytically active membranes and membranes with adsorbing functionalities are within the scope of this symposium. Besides membrane production and characteristics material development and novel characterization techniques will be topics of this symposium as well. During the last decade material development for membrane applications has significantly increased. Examples of new developments are so-called thermally rearranged polymers, polymers of intrinsic microporosity, porous organic frameworks and metal organic frame works, or asymmetric perovskite membranes showing promising properties in gas separations, or isoporous block copolymer membranes for ultrafiltration. These examples show the strong potential of synthesis of new materials and their processing for improved separations.</p>		



**Area B: Structural Materials**  
**Area Coordinators:**

Hans-Jürgen Christ  
*University of Siegen, Germany*

&

Gregory Haidemenopoulos  
*University of Thessaly, Greece*





## B.1

Symposium title: Advanced High Strength Steels		
Organizers	Institution	Contact email
Wolfgang Bleck	RWTH Aachen University, Germany	bleck@iehk.rwth-aachen.de
Francisca Caballero	CENIM, Spain	fgc@cenim.csic.es
Ronald Schnitzer	Montanuniversitaet, Leoben, Austria	ronald.schnitzer@unileoben.ac.at
Summary		
<p>Modern steel concepts aim at improved properties by tailoring the microstructure. Three trends are of major interest in nowadays materials' development activities: the decrease of the structural length of microstructural constituents towards nanosized quantities, the increase of alloying level and by this the interaction of different elements in enriched zones, and finally more complex and adjusted robust processes activating several metallurgical mechanisms for controlled microstructure development.</p> <p>This symposium invites contributions of newly developed steels for structural applications, studies of the control of process kinetics for multiphase microstructures and the microstructure-property relationships of advanced high strength steels. New design methods including both experimental approaches and simulation aspects as well as new design concepts like damage tolerance of self-healing behavior will be covered as well.</p> <p>The use of advanced steels for light-weight design like in car bodies, for power generation like in offshore windmills or high-efficient turbines, for infrastructure like in pipelines, for chemical plants or other challenging applications will be highlighted. The metallurgical processing of these materials, their manufacturing, their testing, usage and recycling require new concepts and a sophisticated understanding of the physical phenomena involved. The symposium will provide a survey of recent steel developments, the usage of new tools and methods for materials characterization and the progress in understanding complex materials.</p>		
<u>Topics to be covered:</u> <ul style="list-style-type: none"><li>✓ Advanced high strength steel development</li><li>✓ Light-weight steels</li><li>✓ Steels for press hardening</li><li>✓ Characterization of microstructures</li><li>✓ Partitioning of alloying elements</li><li>✓ Micro- and macro segregation</li><li>✓ Process development for advanced high strength steels</li><li>✓ Through process modelling for advanced high strength steels</li><li>✓ Application of advanced high strength steels</li></ul>		

## B.2

### Title: Light Weight Metals

Organizer	Institution	Contact email
Michele V. Manuel	University of Florida, USA	mmanuel@mse.ufl.edu
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Eric Nyberg	Brunel University, United Kingdom	eric.nyberg@brunel.ac.uk
Mathieu Brochu	McGill University, Canada	mathieu.brochu@mcgill.ca
Frank Monheillet	Ecole des Mines de Saint-Etienne, France	montheil@emse.fr

### Summary

This symposium aims to bring together both fundamental and applied research in the area of light metals (including aluminum, magnesium and titanium alloys) and low-density metallic materials (including but not limited to metal matrix composites, bulk metallic glasses and high-entropy alloys). The goal of the symposium is to stimulate dialog and discussion among leading professionals and emerging leaders on the present and future of light weight alloys. Submissions in the areas of basic research to industrially and technological relevant applied research are welcome. Contributions from both theoretical and experimental research efforts are encouraged.

This symposium will cover, but is not limited to, the following range of topics:

- ✓ Alloy design and material development
- ✓ Advanced processing and manufacturing
- ✓ Novel testing and characterization methods
- ✓ Modeling and simulation
- ✓ Next generation and emerging applications
- ✓ Challenges in sustainability and wide-spread Integration
- ✓ Behavior under extreme conditions





## B.3

### Title: High-temperature alloys

Organizer	Institution	Contact email
Milenkovic Srdjan	IMDEA Materials Institute, Spain	srdjan.milenkovic@imdea.org
Naka Shigehisa	ONERA French Aerospace Lab, France	shigehisa.naka@onera.fr

### Summary

High temperature materials are critical to many processes and applications, such as aircraft turbine engines for aircraft and land applications, high temperature fuel cells, nuclear power generation, chemical plant processes, as well as semiconductor processing. Some of the most challenging technological problems of the future, such as developing clean, efficient energy conversion are expected to be solved by high temperature materials science. The socio-economic demand for increased performance, reliability and efficiency of the latest components necessitates novel designs that will subject key components to even harsher environments and conditions.

The High Temperature Alloys Symposium will focus on the latest progress and developments related to microstructure, processing, properties and applications of high temperature alloys (e.g. Heat resisting steels, Superalloys, Intermetallics). Topics of interest range from fundamentals of phase constitution, stability and transformations, over alloy development, microstructure, mechanical and environmental response, to developments in processing methods and in technological aspects for successful commercial applications. Contributions are welcome of both experimental and modelling nature.

The Symposium is intended to foster discussions and debate regarding the most recent understanding of high temperature alloys and the state of the art in experimental studies of high temperature materials and processes for scientific and technological applications. Research groups from all over the world will be brought together to showcase the latest developments in the field.

The Symposium will be focused on metallic and intermetallic materials, with presentations covering a wide variety of topics including:

- ✓ Modeling and simulation
- ✓ Thermodynamics, phase constitution, equilibria and transformations
- ✓ Defect structures and formation
- ✓ Alloy development and microstructure/properties relationships
- ✓ Mechanical properties, deformation and failure mechanisms
- ✓ Oxidation behavior
- ✓ Novel experimental setups and approaches (alloy prototyping, in-situ testing and characterization)
- ✓ Processing and joining
- ✓ Novel structural and functional applications

The meeting will include keynote lectures and oral selected contribution, as well as a poster session.





## B.4

Title: Advanced properties of SPD-processed metallic materials		
Organizer	Institution	Contact email
Heinz Werner Höppel	Universität Erlangen-Nürnberg (FAU), Germany	hwe.hoeppel@fau.de
Andrea Bachmaier	Austrian Academy of Sciences, Austria	andrea.bachmaier@oeaw.ac.at
Anton Hohenwarter	Montanuniversität Leoben, Austria	anton.hohenwarter@unileoben.ac.at
Summary		
<p>Severe plastic deformation (SPD) methods allow achieving ultrafine-grained (UFG) or nanocrystalline (NC) microstructures in metallic materials with extraordinary mechanical properties. Thus, these materials are very promising for new light-weight construction concepts as they can be produced in larger quantities with either homogenous or locally tailored/graded mechanical properties by microstructural design. This symposium focuses on the <b>mechanical properties of metallic materials</b> with UFG or NC microstructures processed by SPD methods. In this context, not only the properties of single component (monolithic) UFG/NC materials are in focus but also tailored /graded metallic materials and composites are of interest. Furthermore, emphasis is laid on advances in the understanding of the mechanical properties of UFG/ NC materials under static or cyclic loading conditions, the underlying deformation and damage mechanisms and the related microstructural stability under mechanical load including superplastic behavior. Principal investigations on the deformation mechanisms in UFG/NC materials related to SPD-processing parameters are also welcome. This symposium is <b>closely allied with Symposium C10 where thermomechanical processing, SPD methods and the obtained nanostructures</b> are in focus.</p>		



## B.5

Title: Advanced Ceramics		
Organizer	Institution	Contact email
Thomas Graule	EMPA, Switzerland	thomas.graule@empa.ch
Tadeusz Lis Jerzy	Akademia Gorniczo-Hutnicza im. Stanislaw Staszica w Krakowie, Poland	lis@agh.edu.pl
Athena Tsetsekou	National Technical University of Athens, Greece	athtse@metal.ntua.gr
Dariusz Kata	Akademia Gorniczo-Hutnicza im. Stanislaw Staszica w Krakowie, Poland	kata@agh.edu.pl
Summary		
<p>Advanced ceramics concern an innovative area of materials science and engineering covering a plethora of applications in almost every industrial field, as these materials can combine unique properties (mechanical, thermal, biological, chemical, optical, electrical). Their major drawback is their brittle fracture. Thus, the research trends in this area concern the improvement of mechanical behavior and the further enhancement of ceramics' properties to broaden the spectrum of applications. This can be done by tailoring the microstructure, by developing nanosized structures and by the proper design.</p> <p>This symposium invites contributions on advanced ceramics for structural, biological, chemical, catalytic, electronic and optical applications. The contributions can include studies on the development of novel nanopowders, on powder synthesis and processing (dispersion and stabilization strategies, shaping methods), on novel sintering techniques, on process control for micro- or nano-structured composites fabrication, on the microstructure-property relationships as well as on new design and simulation aspects.</p> <p><u>Topics to be covered:</u></p> <ul style="list-style-type: none"> <li>✓ Powder synthesis methods</li> <li>✓ Strategies for the stabilization of nanoparticle dispersions</li> <li>✓ New colloidal shaping technologies</li> <li>✓ Process development for nanostructured ceramics</li> <li>✓ Advanced sintering methods</li> <li>✓ Development of composite structures</li> <li>✓ Characterization of microstructures</li> <li>✓ Process modeling for advanced ceramics development</li> <li>✓ Microstructure-property relationships</li> <li>✓ Novel applications of advanced ceramics (catalytic, electronic, optical, anticorrosive, e.t.c.</li> </ul>		



## B.6

### Title: Advanced Composites

Organizer	Institution	Contact email
Dasari Aravind	Nanyang Technological University (NTU), Singapore	aravind@ntu.edu.sg
Bodo Fiedler	Hamburg University of Technology (TUHH), Germany	fiedler@tuhh.de

### Summary

Advanced structural polymer-based composites are increasingly used in defense, aerospace, transport and marine applications where 'mass optimization' and 'multi-functionality' are keywords. This symposium on Advanced Composites aims to offer a great platform for scientists/researchers, engineers, and industry practitioners as well as managers in the structural composites field to share, discuss and present their latest research to the relevant community. As this a dynamic field, the scope of this symposium will cover a broad range of mechanical, physical and functional properties of composites. Both theoretical/analytical and experimental works on prediction of the performance of composite components are encouraged as well as challenging industrial applications or recent developments in hierarchical structured materials.

Topics include (but not limited to):

- ✓ Thermal and electrical conductivity
- ✓ FST Properties
- ✓ Nano-Materials
- ✓ Multifunctional Materials
- ✓ Thermal and flame properties
- ✓ Micro-Mechanics
- ✓ Multi-Scale Modelling
- ✓ Fracture Mechanics
- ✓ Progressive Failure Analysis
- ✓ Fatigue
- ✓ Impact
- ✓ Structural Health Monitoring



## B.7

### Title: Hybrid and Metal-Organic Framework (MOF) Materials

Organizer	Institution	Contact email
Bartolomeo Civalieri	University of Turin, Italy	bartolomeo.civalieri@unito.it
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Joachim Hausmann	Technical University of Kaiserslautern, Germany	joachim.hausmann@ivw.uni-kl.de

### Summary

The Symposium covers Metal-Organic Framework (MOF) Materials as microscopic material systems and Hybrid Materials and Structures as material combinations more on the meso- and macroscopic level.

Hybrid framework materials are constructed from a combination of organic and inorganic units at the molecular/nanoscale level. The incredibly rich structural diversity and chemical versatility of such materials can lead to the emergence of many unique and novel properties that opens access to a wide spectrum of multifunctionalities not present in traditional materials.

The exploration of structure-function relationships has attracted considerable interests in broadening the combination of chemically bound organic and inorganic building blocks to yield an increasingly large number of 1D, 2D and 3D framework materials and hybrid composite systems. In this respect, metal-organic frameworks (MOFs) are amongst the most extensively studied hybrid framework materials and they have garnered major developments in the last decade mainly because of their nanoporous architectures and tunable physical and chemical properties.

Material combinations of polymeric composite materials and metals at a larger length scale are considered as Hybrid Materials and Structures. Hybridization on mesoscopic scale could be layered materials of fiber reinforced polymers and metallic foils (fiber-metal-laminates) as well as reinforcements with different types of fibers. On macroscopic scale inherent joining of different materials to a multi-material structure is understood as hybrid structure. Independent of the length scale, materials are combined in such a way, that synergies of specific properties are obtained.

In light of the rapid advances witnessed in the field, this Symposium aims at covering both fundamental aspects in the design, synthesis and characterization of hybrid and metal-organic framework materials and their technologically relevant multifunctional properties and innovative new applications. Furthermore, it also aims at gathering and connecting people that work at the cutting-edge research of the field by sharing their knowledge from materials science, chemistry, solid-state physics, crystalline engineering and biology.

New trends and exciting topics will be discussed, ranging from self-assembly and emergence of complexity in organic/inorganic hybrids to multifunctional supramolecular hierarchical nanoparticles, from host-guest confinement strategy to gas storage, sensing and drug delivery, from tunable opto-electronic features and enhanced photo-stability/activity to film deposition and nanofabrication of MOFs for integration in microelectronic devices. Common research topics of hybrid material systems on meso- and macroscale are interfacial behavior, residual stresses, mechanical behavior, processing and many more. Contributions covering experimental and theoretical aspects are invited.



## B.8

Title: High Entropy Alloys and Compositionally Complex Alloys		
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Easo George	Ruhr-University Bochum, Germany	easo.george@ruhr-uni-bochum.de
Summary		
<p>Recent developments in high-entropy alloys (HEA) with single-phase microstructures and compositionally complex alloys (CCA) with multi-phase microstructures will be considered. In both cases the alloys should consist of several elements (in general &gt; 4) with none of the elements dominating the composition with respect to atomic fraction. Special care should be taken in describing the preparation and heat treatment of samples examined. All kinds of materials properties are of interest, with emphasis on mechanical behavior, diffusional effects, dislocation morphology and behavior. Microstructure characterizations on all length scales are welcome. Papers dealing with the identification or repudiation of salient features and properties, ascribable mainly to high entropy, are especially welcome.</p>		



## B.9

Title: Bulk Metallic Glasses		
Organizer	Institution	Contact email
Eckert Jürgen	Erich Schmid Institute of Materials Science, Leoben, Austria	juergen.eckert@unileoben.ac.at
Jörg F. Löffler	ETH Zürich, Switzerland	joerg.loeffler@mat.ethz.ch
Summary		
<p>Stimulated by the high demand for new materials with enhanced mechanical, chemical and physical properties, metallic glasses and composites containing glassy or metastable phases are currently at the cutting edge of metal research. These materials exhibit unique properties which often surpass those of conventional structural materials and are therefore attractive for “high-end” applications.</p> <p>The close links between the thermodynamic, kinetic, elastic, and plastic properties of metallic glasses are remarkable, and appear to provide predictability for these apparently disordered systems at a level that far exceeds that for their ordered crystalline counterparts. A key challenge is to understand these correlations, which may have common structural origins, and exploit such understanding to develop new glass compositions that combine a good glass forming ability with desirable mechanical properties. This would permit a more widespread application of these paradigm-shifting materials.</p> <p>The symposium aims to promote international scientific and technological exchange on the recent progress in synthesis, processing, properties and applications of these exceptional materials. It covers topics (but is not limited to) such as rapid solidification, powder metallurgy, bulk metallic glasses, thin films and coatings, thermoplastic forming, glass-forming ability, thermal stability, structure, and physical, chemical, thermal, magnetic, mechanical and biological properties. Contributions from both theoretical and experimental points of view are welcome. Interaction between academia and industry is highly encouraged.</p>		





## B.10

### Title: Fatigue, Wear and Corrosion of Materials and Structures

Organizer	Institution	Contact email
Georgios Savaidis	Aristotle University of Thessaloniki, Greece	gsavaidis@auth.gr
Michael Vormwald	Technische Universität Darmstadt, Germany	vormwald@wm.tu-darmstadt.de
Wolfram Fürbeth	DECHEMA-Forschungsinstitut Frankfurt, Germany	fuerbeth@dechema.de

### Summary

The scope of the symposium includes characterization, testing, and modeling of degradation processes such as Wear, Corrosion and Fatigue. This includes compromise of functionality and lifetime with damage phenomena due to wear, corrosion and/or cycling loading. Phenomena of interest range from all classes of engineering materials (metals, polymers, elastomers, ceramics, and composites) to engineering components and structures. We encourage submission of papers that combine understanding and characterization of corrosion and/or fatigue mechanisms, application of corresponding material parameters to problems in engineering components, structures, and design, as well as physically-based models to address the mechanics and the needs for calculative and/or testing methods for accurate wear, corrosion and/or fatigue design. Emphasis is given on engineering material behavior when influenced by structure, process and environment, especially in reference to the design process to prevent and avoid premature failure in operation.

Subjects treated in the symposium address:

- ✓ Wear and Fatigue properties of engineering materials
- ✓ Novel testing and characterization methods
- ✓ Multiaxial fatigue and complex loading effects on material behavior, components and structures
- ✓ Effects of manufacturing processes on wear and/or fatigue properties
- ✓ Effects of surface treatment on Wear and/or Fatigue
- ✓ Wear and Fatigue modeling and calculation
- ✓ Fracture Mechanics and crack growth
- ✓ Damage Mechanics
- ✓ Life prediction and durability
- ✓ Thermo-chemical-mechanical degradation
- ✓ Characterization and Modelling of Corrosion
- ✓ Corrosion Engineering
- ✓ Design Engineering



## B.11

### Title: Mechanical Properties and Microstructure

Organizer	Institution	Contact email
Tilmann Beck	TU Kaiserslautern, Germany	beck@mv.uni-kl.de
Walther Frank	TU Dortmund, Germany	frank.walther@tu-dortmund.de

### Summary

Understanding the correlations between microstructure of structural materials and their mechanical properties is a prerequisite for both, alloy development and reliable component design. Hence, the symposium “Mechanical Properties and Microstructure” aims to promote high-level scientific exchange in this important field of materials science and engineering. It covers the whole range of structural materials ranging from metals over polymers and ceramics to fiber and particle reinforced compounds. Quasistatic loadings, creep, low- and high-temperature fatigue, thermomechanical fatigue as well as creep-fatigue interaction will be considered.

The symposium features the following topics:

- ✓ Microstructure-property relationships of metals in quasistatic loading at ambient and elevated temperatures
- ✓ Cyclic deformation and crack initiation in low- and high-temperature fatigue of metals
- ✓ Thermomechanical fatigue and creep-fatigue interaction of metals
- ✓ Fatigue crack growth and microstructure
- ✓ Very high cycle fatigue of metals and compound materials
- ✓ Deformation and fatigue of polymers

Scientists working in one or more of the above mentioned research topics are encouraged to submit their abstracts until the deadline specified in the EUROMAT call-for papers.



**Area C: Processing**  
**Area Coordinators:**

Nikolaos Michailidis  
*Aristotle University of Thessaloniki, Greece*  
&  
Ke Lu  
*Chinese Academy of Sciences, China*



# C.1

## Title: Coatings and Surface Modification Techniques

Organizer	Institution	Contact email
Elias Aperathitis	FORTH, Greece	eaper@physics.uoc.gr
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Rainer Cremer	KCS Europe, Germany	cremer@kcs-europe.de
Ru Lin Peng	Linköping Univ, SE	ru.peng@liu.se

### Summary

Recent innovations and research in materials, coatings and processes are designed to make surfaces or substrates more useful, more durable in harsh environments (high-T (temperature), high-P (stress), corrosive, etc.) and/or more cost effective.

This symposium addresses current scientific and technological progress in traditional and cutting edge coating and thin film processes as well as surface modification treatments or techniques such as vacuum-based processes, electroless deposition, plasma processing, ion-beam methods, thermal and chemical diffusion, hardfacing and anodization.

Important topics to be covered include, but are not limited:

#### C1.1: Coatings and thin films

- ✓ Relations between synthesis conditions, microstructure and properties of thin films
- ✓ Mechanical, electrical, optical and sensing properties of thin films
- ✓ Wear & low-friction mechanism identification using advanced surface analytical techniques
- ✓ Coatings with advanced properties (self-cleaning, wettability, smart coatings, thermal barrier coatings, bioactivity, anti-fouling, anti-bactericide, etc)
- ✓ Metallic coatings for oxidation and corrosion protection (deposition, properties, performance, and modelling)
- ✓ Applications of films and coatings

#### C1.2: Coatings deposition routes and novel characterization techniques

- ✓ Plasma deposition and related technologies
- ✓ Diagnostics and modeling of plasma during deposition
- ✓ Development of new PVD sources and low damage deposition techniques
- ✓ New coating technologies, pulsed plasmas, HiPIMS and industrial coating units
- ✓ Fabrication of nanoparticles and nanostructures by plasma based methods.
- ✓ Non-plasma deposition of coatings and thin films (CVD, laser assisted, plating, electrodeposition, etc)
- ✓ Novel fabrication and synthesis routes
- ✓ Investigation of initial phases of thin films growth
- ✓ In situ characterization of coatings during deposition
- ✓ High resolution characterization techniques of thin films

#### C1.3: Surface engineering and modification for coatings and substrates with tailored and enhanced properties

- ✓ Chemical methods for surface modification (electroless, anodization, electrochemical)
- ✓ Non chemical methods for surface modification (thermal, photons, laser, ions, spraying, machining, mechanical treatments, etc)
- ✓ Hybrid coatings deposition routes with in situ surface engineering
- ✓ Surface engineering for performance and durability in gas turbine and aero engine applications.



## C.2

Title: Laser-based processing and manufacturing		
Organizer	Institution	Contact email
Robert Eason	University of Southampton, United Kingdom	rwe@orc.soton.ac.uk
Andrés F.Lasagni	Technische Universität Dresden, Germany	andres_fabian.lasagni@tu- dresden.de
Gert-willem Römer	University of Twente, The Netherlands	g.r.b.e.romer@utwente.nl
Ioanna Zergioti	National Technical University of Athens, Greece	zergioti@mail.ntua.gr
Summary		
<p>Laser-based manufacturing is a key technology, able to open significant markets for manufacturers applying laser-material processing, as well as for equipment manufacturers. Industrial sectors with high economic and social relevance, such as automotive, microelectronics, aviation and (bio)medical sectors rely on the quality of laser-material processing for the functionality of their products. The aim of this Symposium is to bring together scientists and engineers working on laser-based manufacturing processes on macro-, micro- and/or nanometer scale for advanced applications, addressing the current scientific and technological advances related to laser-based technology. The papers will be oriented to technical or industrial developments as well as basic research studies describing applications in different technological fields. Furthermore, the basic interactions of laser beams with materials and the influence of such interactions in the mechanisms governing the manufacturing processes will be discussed. Topics of this symposium will cover the following subjects (but not limited to):</p> <ul style="list-style-type: none"> <li>✓ Laser beam cutting and drilling, forming</li> <li>✓ Laser beam welding, soldering and brazing</li> <li>✓ Laser surface treatment, including, but not limited to transformation hardening, annealing, alloying, cladding, cleaning, marking,</li> <li>✓ Laser micro/nano processing, including, but not limited to micro-joining, micro-cutting &amp; drilling, surface patterning/texturing, (ultra) short pulsed laser processing,</li> <li>✓ Laser-based Additive Manufacturing processing, both on the macro- and micro/nano scale, including laser-transfer techniques,</li> <li>✓ Fundamental aspects of laser-material processing, including dynamics, modeling and simulation,</li> <li>✓ Laser sources, optics, components and systems for laser-based manufacturing,</li> <li>✓ Laser direct writing (waveguide, crystallization, photopolymerization, etc).</li> <li>✓ Optical Tweezing and trapping for biomedical applications.</li> </ul>		





## C.3

Title: Powder routes: from synthesis to processing		
Organizer	Institution	Contact email
Claude Estournès	CIRIMAT, Toulouse France	estournes@chimie.ups-tlse.fr
Christophe L. Martin	CNRS, Grenoble-INP, Laboratoire SIMAP, France	christophe.martin@simap.grenoble-inp.fr
Summary		
<p>Synthesis and processing are two of the most important steps in the area of powder technology. These two highly coupled topics will be treated in this symposium on powders. The final aim of obtaining a material with controlled microstructure for specific applications will guide the symposium. As well as finely tailoring powder characteristics for controlled microstructure, the production and processing of powders at the industrial level will also be an important theme for the symposium. Industrial participation is thus highly encouraged. Progress in mature technologies and advances in new technologies will depend on a fine understanding of the chemical, physical and mechanical mechanisms driving the powder route. Modelling, both analytical and numerical, of these mechanisms and of their coupling is an essential step that will be emphasized in the symposium. Research on powder developments for new processing technologies such as additive manufacturing are welcomed.</p> <p>Abstracts on the following topics are sought for:</p> <p><b>Powder synthesis</b></p> <ul style="list-style-type: none"><li>✓ tailored powders with innovative methods via chemical engineering (solution precipitation, fluid phase) to mechanical methods (high energy milling, mechanical alloying).</li><li>✓ reactor engineering for innovative powers</li><li>✓ surface functionalization and core-shell particle</li><li>✓ modelling of powder synthesis</li></ul> <p><b>Powder processing</b></p> <ul style="list-style-type: none"><li>✓ self-assembly and tailored nanostructures</li><li>✓ field assisted sintering (SPS, microwave, flash sintering, dynamic compaction, ... )</li><li>✓ powders in additive manufacturing</li><li>✓ near-net complex shape processes (hot-pressing, Powder Injection Molding, sinter-forging, ...)</li><li>✓ controlled microstructure and microstructure development (ultra-fine grains, , Functionally Graded Materials, porous materials)</li><li>✓ powder processing modelling</li></ul>		





## C.4

Title: Additive Manufacturing		
Organizer	Institution	Contact email
Ugo Lafont	European Space Agency, The Netherlands	Ugo.Lafont@esa.int
Alberto Molinari	Trento University, Italy	alberto.molinari@unitn.it
Sebastian Piegert	Siemens AG, Germany	sebastian.piegert@siemens.com
Eduard Hryha	Chalmers University of Technology, Sweden	hryha@chalmers.se
Summary		
<p>Additive Manufacturing (AM) is an emerging manufacturing technology driven by both consumer market and industry. The public perception is dominated by the consumer market. However, the more demanding requirements and applications can be found in industry regardless of the material utilized. In order to generate a viable product many aspects along the process chain need to be considered and are thus areas for research and development. This symposium aims to cover all aspects related to the latest developments in AM from specific material development (polymers, resin, metals, ceramic, bio-compatible) to the latest advances in processing:</p> <ul style="list-style-type: none"> <li>✓ Base material characterization and impact to consolidated material properties</li> <li>✓ Process development and material properties of AM materials</li> <li>✓ Development of advanced machine concepts (4D printing, productivity, materials)</li> <li>✓ Design for AM</li> <li>✓ NDE of AM materials and products</li> <li>✓ Thin structures and their properties (thin walled parts, lattice structures, porous materials, ...)</li> <li>✓ In-line monitoring</li> <li>✓ Process modelling</li> <li>✓ Management of stress and distortion</li> <li>✓ Post processing (heat treatment, surface refinement, etc. ...)</li> <li>✓ Relationships between process parameters, microstructure and properties</li> <li>✓ The structural metastability of materials processed by EBM and SLM</li> <li>✓ The anisotropy of microstructure of AM components</li> <li>✓ Residual stresses and heat treatments</li> <li>✓ Surface microgeometry and finishing</li> <li>✓ Structural materials by AM</li> <li>✓ Functional materials by AM</li> <li>✓ Sintering shrinkage and dimensional stability of binder-jet printed components</li> </ul> <p>The session organisers will invite a selected number of authors to submit their full paper for consideration in a special issue of Powder Metallurgy</p>		



## C.5

### Title: Interface Design and Modelling, Wetting and High-Temperature Capillarity

Organizer	Institution	Contact email
Simeon Agathopoulos	University of Ioannina, Greece	sagat@cc.uoi.gr
Fabrizio Valenza	National Research Council (CNR) - ICMATE, Italy	valenza@ge.ieni.cnr.it

#### Summary

This symposium is organized in order to host the summit of the scientific outcome worldwide in the areas of interface design and modelling, capillarity, and wetting phenomena at (predominantly but not exclusively) high temperatures. More specifically, it aims to be an international hub for exchanging ideas and presenting the most recent results in the field of surfaces and interfaces, of wetting and of capillarity in materials, materials processing, and capillarity in crystal growth. These fields will be tackled by both experimental and theoretical studies, which will enrich our knowledge in capillarity and wetting as well as they will emerge novel perceptions, new equipments, and different approaches for studying and analyzing these phenomena.

The topics of this symposium will cover the following subjects (but not limited to):

- ✓ Liquid surfaces of metals, glasses and salts; surface energy and adsorption.
- ✓ Metal-metal, metal-ceramic, metal-glass and ceramic-ceramic interfaces: Wettability, adhesion, interfacial reactions, segregation, grain boundary wetting and intergranular films.
- ✓ Capillarity in microgravity.
- ✓ Marangoni phenomena.
- ✓ Corrosion and embrittlement by liquid metals.
- ✓ Advances in measurement techniques of capillary properties.
- ✓ Modelling and simulation.
- ✓ Materials processing: Crystal growth, foundry processes, composite materials etc.
- ✓ Joining of metals and ceramics.
- ✓ Processing of metal matrix composites.

#### Special Issue publication

- ✓ The Symposium Organisers will invite a selected number of authors to submit their full paper for consideration in a special issue of **Journal of Materials Engineering & Performance (JMEP)**.



## C.6

Title: Joining		
Organizer	Institution	Contact email
Ivan Kaban	IFW Dresden, Germany	i.kaban@ifw-dresden.de
Christof Sommitsch	TU Graz, Austria	christof.sommitsch@tugraz.at
Summary		
<p>This symposium considers all kind of research in the field of similar and dissimilar welding and joining techniques. Advanced and new processes as well as hybrid processes are of interest. Process development, process simulation, the structure analysis and the properties of both the weld/joint and the thermo-mechanically affected zone shall be covered.</p>		
<p>Considered processes and topics:</p> <ul style="list-style-type: none"><li>✓ WELDING<ul style="list-style-type: none"><li>▪ Arc welding</li><li>▪ Energy beam welding</li><li>▪ Resistance welding</li><li>▪ Solid-state welding</li><li>▪ Friction stir welding</li></ul></li><li>✓ BRAZING AND SOLDERING</li><li>✓ PLASTIC JOINING<ul style="list-style-type: none"><li>▪ Adhesive bonding</li><li>▪ Welding</li></ul></li><li>✓ CERAMIC JOINING</li><li>✓ MECHANICAL JOINING<ul style="list-style-type: none"><li>▪ Riveting</li><li>▪ Clinching</li><li>▪ Flow drilling</li></ul></li><li>✓ ARC PHENOMENA AND WELD POOL</li><li>✓ MICROSTRUCTURE AND MECHANICAL PROPERTIES</li><li>✓ POST WELD HEAT TREATMENT</li><li>✓ HOT AND COLD CRACKING</li><li>✓ RESIDUAL STRESSES AND DISTORTION</li><li>✓ HYDROGEN IN WELDING</li><li>✓ NANOMATERIALS IN JOINING</li><li>✓ PHYSICAL PROPERTIES CONTROLLING JOINING PROCESS (WETTING, DIFFUSION, DISSOLUTION)</li><li>✓ ECOLOGICAL AND ECONOMICAL ASPECTS OF JOINING</li></ul>		
<p><b>Special Issue publication</b></p> <ul style="list-style-type: none"><li>✓ The Symposium Organisers will invite a selected number of authors to submit their full paper for consideration in a special issue of <b><u>Journal of Materials Engineering &amp; Performance (JMEP)</u></b>.</li></ul>		





## C.7

Title: Steel making		
Organizer	Institution	Contact email
Schenk Johannes	Montanuniversität Leoben, Austria	johannes.schenk@unileoben.ac.at
Papaefthymiou Spyros	National Technical University of Athens, Greece	spapaef@metal.ntua.gr
Summary		
<p>Today's Advanced High Strength Steels (AHSS) contain high amounts of Manganese and other carbonitride forming elements that need special care during secondary steelmaking. Refining techniques such as calcium treatment (or CaSi) for the modification of inclusions, soft bubbling, vacuum degassing metallurgy, hydrogen removal and other numerous practical aspects of the steel making process are to be addressed in the frames of this Symposium on steel making. Current trends, the urge for productivity increase, the need to monitor the off-gases (emissions etc.) are to be addressed here. Of course the scientific approach on EAF, ladle and/or blast furnace metallurgy is always of paramount importance. Data analysis, development and statistical evaluation of historical data can be also presented within this Symposium.</p> <p>Within the scope of the workshop are furthermore the following:</p> <ul style="list-style-type: none"><li>✓ Optimization of existing processes</li><li>✓ Discussion on the implementation of new technologies</li><li>✓ Processing of iron ore to primary metal, sponge iron and/or the further treatment to crude steel</li><li>✓ Production of steel with renewable energies</li><li>✓ Production of high-quality steel in the circular economy (i.e. high scrap rates)</li><li>✓ Casting related issues (e.g. hot shortness, defects etc.)</li><li>✓ Dynamic soft reduction for the avoidance of macro- and micro- segregation</li><li>✓ Endless casting and rolling</li><li>✓ Energy- and emission- control and optimization in the steel industry</li></ul>		



## C.8

Title: Solidification, Casting, Foundry and Liquid Metal processing		
Organizer	Institution	Contact email
Alexander E. Karantzalis	University of Ioannina, Greece	akarantz@cc.uoi.gr
Andrew Kennedy	The University of Nottingham, United Kingdom	andrew.kennedy@nottingham.ac.uk
Summary		
<p>The aim of the symposium is to present the latest scientific and technological advances related to the field of solidification and casting phenomena along with their technological implementation in the foundry industry. Cast metals property and microstructural characterization, liquid metal state physicochemical characteristics and process parameter evaluation and simulation, consist the core the symposium upon which (but not limited) the following topics can be addressed:</p> <ul style="list-style-type: none"><li>✓ Physicochemical properties of liquid metals</li><li>✓ Production of porous metals and alloys (metallic foams) by liquid metallurgy</li><li>✓ Casting and solidification of metals and alloys: microstructure and property assessment</li><li>✓ Modelling of solidification, casting and foundry processing</li><li>✓ Liquid metal/slag/refractory reactivity</li></ul>		



## C.9

Title: Manufacturing Processes		
Organizer	Institution	Contact email
Konstantinos-Dionysios Bouzakis	Aristotle University of Thessaloniki, Greece	bouzakis@eng.auth.gr
Luca Settineri	Politecnico di Torino, Italy	luca.settineri@polito.it
Summary		
<p>Challenges in manufacturing are continuously growing due to the trend of parts miniaturization and increased geometry complexity, the emergence of new materials and the demand for specific surface texture and properties in the final products. Especially, new materials are very demanding in terms of manufacturing, given their high strength and low machinability.</p> <p>The symposium aims to exchange current and future trends of manufacturing processes, with a view to advancing state-of-the-art and encouraging innovation for developing new and efficient processes. It focuses on both the scientific and industrial application, trying to bridge the gap between academia and industry.</p> <p>The topics covered by the symposium may include, but are not limited to:</p> <ul style="list-style-type: none"><li>✓ Machinability of materials</li><li>✓ Tool materials and design</li><li>✓ Material removal processes</li><li>✓ Material forming processes</li><li>✓ EDM/ECM processes</li><li>✓ Meso/micro/nano manufacturing</li><li>✓ Material models in manufacturing processes</li><li>✓ Tribology and wear</li></ul>		





## C.10

Title: Thermomechanical Processing, Severe Plastic Deformation and Nano-structuring		
Organizer	Institution	Contact email
Angella Giuliano	CNR-ICMATE, Italy	giuliano.angella@cnr.it
Thierry Grosdidier	Metz, Uni. Lorraine, France	thierry.grosdidier@univ-lorraine.fr
Julia Ivanisenko	KIT, Germany	julia.ivanisenko@kit.edu
Michal Krzyzanowski	AGH Uni. of Science and Technology, Poland	krzyzano@metal.agh.edu.pl
<b>Summary</b>		
<p>Severe plastic deformation (SPD) is a very attractive research field for metallic materials because it provides new possibilities for manufacturing nanostructured materials in large quantities and allows microstructural design on different hierarchical levels. Besides also through Thermo-Mechanical Processing (TMP) or combinations of TMP and SPD, significant ultra-fine structure in bulk materials can be achieved by the refinement of phases by using hot, warm, cold and even cryogenic deformations, or combination of them. In addition to grain size refinement, several metallurgical processes, highly desirable for alloy design take place during SPD. Among them are mechanically driven phase transformations, formation of metastable phases, grain boundary engineering and the formation of desirable textures. This Symposium provides a unique opportunity to bring together experts working in the field of SPD in order to discuss the actual scientific problems in the field, such as:</p> <ul style="list-style-type: none"> <li>✓ microstructure evolution and grain refinement in single- and multi-phase alloys as well as composites</li> <li>✓ correlation between the SPD-induced microstructures and the resulting mechanical properties</li> <li>✓ strategies to enhance the microstructure stability at elevated temperatures and cyclic loading</li> <li>✓ new developments in tailoring/grading mechanical properties of ultrafine grained (UFG) materials by SPD-processing</li> <li>✓ deformation mechanisms, mechanically driven phase transformations and superplasticity in UFG materials related to SPD-processing</li> <li>✓ novel SPD processes as well as recent advancements of established processing methods.</li> <li>✓ Surface nanocrystallization by SPD and multilayered materials</li> <li>✓ SPD for specific applications (biomaterials, H-storage materials, ...)</li> </ul>		



## C.11

### Title: Processes and Materials for Nanoelectronics

Organizer	Institution	Contact email
Tsoukalas Dimitris	National Technical University of Athens, Greece	dtsouk@central.ntua.gr
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Alain Claverie	CEMES-CNRS Toulouse, France	claverie@cemes.fr

### Summary

Understanding, engineering and integrating novel functional materials are needed in order to allow further progress in low power scaled electronic devices and in the realization of circuits beyond the Von-Neumann architecture. These efforts are required to process the vast data produced from an increasing number of connected devices. This Symposium addresses the main challenges the materials science community is facing to fulfill these requirements. The main topics will be related to materials characterization and properties as well as their processing and integration into devices. It will include, but is not limited to, the following topics:

- ✓ Channel semiconductor materials: strained-Silicon, (strained-)Ge, SiGe alloys, GaN, III-V, 2-D materials
- ✓ Materials for non-volatile memory devices: PCM, Oxides;
- ✓ Ferroelectrics and insulating materials
- ✓ Magnetic materials for MTJ and related devices
- ✓ Emerging novel processes: growth, fabrication, doping, stress
- ✓ Advanced characterization techniques: composition, defects, dopants, stress
- ✓ Materials and processing related to architecture: planar (Silicon-On-Insulator) vs 3D (multi-gate, nanowires)
- ✓ Gate-stack materials for future switching devices
- ✓ Resistive RAM materials and devices
- ✓ Materials, processing, and characterization for TFET, SET, SAT
- ✓ Physical modelling of processes and devices



## **Area D: Characterization and Modelling**

### **Area Coordinators:**

Eric Le Bourhis

*Poitiers University, FR*

&

Sotirios Ves

*Aristotle University of Thessaloniki, GR*





## D.1

Title: Materials Science with Synchrotron Radiation X-rays		
Organizer	Institution	Contact email
Federico Boscherini	University of Bologna, Italy	federico.boscherini@unibo.it
Maria Katsikini	Aristotle University of Thessaloniki, Greece	katsiki@auth.gr
Peter D. Lee	University of Manchester, United Kingdom	peter.lee@manchester.ac.uk
Summary		
<p>This symposium intends to bridge the gap between the available modern X-ray synchrotron radiation techniques and innovative materials research. It aims at fostering the dialog between materials scientists and experts in X-ray methods.</p> <p>Thanks to orders of magnitude improvements in source brilliance and increased availability, great progress in the application of X-ray methods to materials science has been made. An improved control of the space-time structure of the probing X-ray photons and the concurrent development of sophisticated experimental set-ups and data analysis schemes is resulting in highly refined characterization of materials and devices.</p> <p>We welcome abstracts on:</p> <ul style="list-style-type: none"><li>✓ Novel applications of X-ray synchrotron methods to the study and characterization of advanced materials and devices.</li><li>✓ New instruments, methods and/or analysis tools and protocols.</li><li>✓ Complementary studies with laboratory x-rays sources.</li></ul> <p>The program will be defined with particular attention to the following focus topics:</p> <ul style="list-style-type: none"><li>✓ Development of <i>in situ</i> environmental stages for real and reciprocal space imaging and their applications</li><li>✓ Coherent imaging and developments in image reconstruction</li><li>✓ 3D diffraction imaging</li><li>✓ X-ray microscopy</li><li>✓ Joint XAS/XES investigations of advanced materials</li><li>✓ Spatially resolved spectroscopy (including XAS, XRF, XPS, XPEEM) of advanced materials and devices.</li><li>✓ Spectroscopic studies of transient states</li><li>✓ Local structure of dopants/defects by spectroscopy and <i>ab-initio</i> simulations</li><li>✓ Oxide ultra thin films: defectivity and reactivity</li><li>✓ Ordering at the meso- and nano-scale</li><li>✓ Surface, interface and adsorption studies</li></ul>		



## D.2

Title: Nanoscale Materials Characterization and Modeling by Advanced Microscopy Methods		
Organizer	Institution	Contact email
Thomas Walther	University of Sheffield, United Kingdom	t.walther@sheffield.ac.uk
Georgios Dimitrakopoulos	Aristotle University of Thessaloniki, Greece	gdim@auth.gr
Sławomir Kret	Polish Academy of Sciences, Poland	kret@ifpan.edu.pl
Georgios Fournalis	National Technical University of Athens, Greece	mmgf@mail.ntua.gr
Summary		
<p>This symposium covers the nanoscale characterization of the structure and chemical composition of materials, as well as structure-property relationships attained through advanced electron and scanning probe microscopies and associated spectroscopies. Furthermore, it includes the atomistic and energetical modelling of nanostructures performed in synergy with such experimental methods. We invite contributions spanning the development of microscopy or modelling in materials science, and applications comprising investigations of both established and innovative materials, nanomaterials, heterostructures, nanostructures, interfaces, and defects.</p>		
<p><b>Keynote speakers:</b>  Prof. <b>Gustaaf Van Tendeloo</b> (EMAT, Antwerp Univ., Belgium) – Topic: <i>“Imaging soft matter (beam sensitive materials) in 2D and 3D”</i>  Prof. <b>Sokrates Pantelides</b> (Vanderbilt Univ., USA) – Topic: <i>“Probing the nanoscale one atom at a time using a combination of theory and microscopy”</i></p>		
<p><b>Invited speakers:</b>  Prof. <b>Eva Olsson</b> (Chalmers Univ., Sweden) – Topic: <i>“In Situ Electron Microscopy Studies of Functional Nanostructured Materials – Linking Atomic Structure to Properties”</i>  Dr. <b>Martin Albrecht</b> (Leibniz Inst. for Cryst. Growth, Germany) – Topic: Pending  Prof. <b>Wayne Kaplan</b> (Technion Inst. of Technology, Israel) – Tentative, Topic: <i>“Adsorption and the Mechanism of Grain Boundary Motion”</i></p>		
<p><b>Scope:</b>  Advances in electron and scanning probe microscopies are facilitating the determination of materials structures and structure-property relationships down to the sub-nanometer scale in synergy with image and spectra simulations based on minimum energy models of the investigated systems. Electron microscopy is a prominent tool for the direct structural and compositional characterization of materials at the nano and atomic scales. State-of-the-art TEM covers a range of techniques including HRTEM, STEM, CBED, 3D electron tomography and electron holography, as well as spectroscopies such as EELS, EFTEM and EDXS. At the forefront is the effort for accurate quantitative chemical and strain analysis of nanostructures employing image simulations and exact measurement methods such as peak finding and geometric phase analysis. At the same time, atom probe tomography is a distinct approach that is rapidly developing to provide nanoscale compositional analysis. In a synergistic approach, these experimental methods are combined nowadays with</p>		





atomistic simulations and energetical calculations using approaches such as ab initio, molecular dynamics, Monte Carlo or finite elements, spanning length and time scales, in order to advance models and to

better understand materials behavior. This symposium invites contributions focusing on the aforementioned methods and on their application to the investigation of nanomaterials, low dimensional materials (e.g. quantum dots, nanoparticles, nanowires, 2D materials), semiconductors, energy-related materials, functional and smart materials, thin films, metals, alloys, biomaterials, amorphous and soft materials.

**Topics to be covered by the symposium:**

- ✓ Imaging and diffraction including aberration correction, CBED and precession diffraction
- ✓ Electron holography
- ✓ Spectroscopies including EDXS, EELS, EFTEM
- ✓ Electron and atom probe tomographies
- ✓ In situ characterization by TEM and scanning probe methods and spectroscopies
- ✓ Novel quantification methods and image simulations for the determination of composition and strain
- ✓ Special methods for sample preparation of nano objects for quantitative analysis including FIB and ultramicrotomy
- ✓ Atomistic simulations and energetical calculations of materials structures and structure-property relations
- ✓ Applications to low dimensional materials systems
- ✓ Applications to heterostructures, nanostructures, interfaces and defects
- ✓ Applications to metallic and ceramic materials

*Papers will be published in:*

(a) Philosophical Magazine, (b) Materials Science & Technology (Taylor & Francis)

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## D.3

**Title: Materials at extreme conditions: static or dynamic compression combined or not with low or high temperatures**

Organizer	Institution	Contact email
Jean Paul Itié	Synchrotron SOLEIL, France	jean-paul.itie@synchrotron-soleil.fr
John Arvanitidis	Aristotle University of Thessaloniki, Greece	jarvan@physics.auth.gr
Ilias Zouboulis	National Technical University of Athens, Greece	zoubisig@central.ntua.gr

### Summary

This symposium intent to host papers addressing the experimental or theoretical study of the electronic, mechanical and structural properties of all states of matter (solid, liquid or gaseous) under static or dynamic compression combined or not with low or high temperatures. It allows for the understanding of the behavior of materials, probing their property modifications, possible phase transitions or chemical reactions and aims to act as a lighthouse, illuminating an era of new paradigms in materials science and technology.

### Scope:

Pressure and temperature are state variables intimately connected with our description and understanding of Nature. Although achievement of extreme pressure and/or temperature conditions is still not a trivial experimental task, the continuing advances in Instrumentation and Techniques allow their access by a broader body of scientists. Moreover, the increasing accessibility of Large Facilities for fast and/or specialized types of measurements allow also further advancement in the field. Today, extreme conditions extend far beyond the fields of Physics and Chemistry, both experimentally and theoretically, in the more applied fields of Material Science, Material Technology and Industry, Life Sciences, Food Science and Technology, GeoSciences and AstroSciences. Revisiting Matter and its applications in the nanoscale regime -Nanoscience and Nanotechnology- is also an element of study under extreme conditions. Hence, the study of materials under extreme conditions cover today all the fields of contemporary Science as evidenced in the following Topics covered by this Symposium and find more and more commercial/industrial applications.

### Topics to be covered by the symposium:

- ✓ Bio- and Life Sciences
- ✓ Chemistry, Synthesis and Novel Materials
- ✓ Dynamic Pressure in Synchrotron Radiation Sources
- ✓ Electronic, Magnetic and Transport Properties
- ✓ Food Science and Technology
- ✓ Functional Materials at High Pressure
- ✓ Earth and Planetary Sciences
- ✓ Instrumentation, Metrology and Techniques
- ✓ Nanoscience and Nanotechnology
- ✓ New States of Matter at High Pressure and Low Temperature
- ✓ Phase Transitions: Thermodynamics and Kinetics
- ✓ Simple Systems and Experiments at Extreme Conditions
- ✓ Spectroscopy
- ✓ Structural and Mechanical Properties
- ✓ Theory: Modeling and Molecular Dynamics



## D.4

### Title: Small scale mechanics, fracture, interface, experiments and modeling

Organizer	Institution	Contact email
Christophe Pinna	University of Sheffield, United Kingdom	c.pinna@sheffield.ac.uk
Eric Le Bourhis	University of Poitiers, France	eric.le.bourhis@univ-poitiers.fr

#### Summary

The past decade has seen exciting progress in small scale mechanical testing which is becoming extremely important for the development of nanomaterials, for the understanding of physical phenomena at micro/nano-scales, especially at interfaces, and for the development and validation of multi-scale models. There has been a rapid expansion of available techniques in recent years to examine mechanical properties of materials from the macroscale down to the nanoscale with expansion of in-situ experimental facilities as well as modeling approaches. This symposium aims to bring together the rapidly growing small-scale mechanical research community, particularly in the areas of: 1) mechanical testing of interface & fracture 2) In-situ methods 3) modeling.

Topics to be covered by the symposium:

- Mechanical testing at micro/nano scales
- Measurement techniques of strain/stress fields in micro/nano-structures
- Characterization techniques of material properties across the length scales
- Validation techniques for multi-scale models
- Micro/nano-mechanics of interfaces
- Micro/nano-mechanics of damage and fracture
- Small scale mechanics of nanomaterials

#### KEYNOTE SPEAKER

Dr. Mohsen Asle Zaeem

Roberta and G. Robert Couch Assistant Professor , Department of Materials Science and Engineering, Missouri University of Science and Technology (Rolla)

**2016 TMS Young Leaders International Scholar Award recipient**

**"Competing Mechanisms between Dislocation and Phase Transformation in Plastic Deformation of Yttria-Stabilized Tetragonal Zirconia Nanopillars"**

#### PUBLICATION

A selection of papers will be published in a special issue of the journal "**Materials Science and Technology**" after the journal's standard peer review process and acceptance.





## D.5

Title: Application of ICME principles in the design of structural materials		
Organizer	Institution	Contact email
Ulrich Prael	RWTH Aachen University, Germany	ulrich.prael@iehk.rwth-aachen.de
Ernst Kozeschnik	TU Wien, Austria	ernst.kozeschnik@tuwien.ac.at
Javier Llorca	IMDEA Materials Institute & Technical University of Madrid, Spain	javier.llorca@imdea.org
Yu Zhong	Department of Mechanical and Materials Engineering at Florida International University, USA	yzhong@fiu.edu
Summary		
<p>Integrated Computational Materials Engineering – ICME – is an emerging field in materials science and engineering. The main objective of ICME is the integration of various modeling and simulation approaches, sometimes operating on different length and time scales, into a holistic simulation framework to achieve a comprehensive description of the evolution of materials and engineering components during processing and manufacturing. Application of ICME can substantially shorten product and process development time, while lowering cost and improving outcome. However, linking a variety of models and simulation approaches into one holistic scenario opens important scientific questions, such as, the influence of process parameters or model coefficients on microstructure and properties, the stability of process or simulation chains or the influence of error propagation on the simulation results.</p> <p><b>Scope:</b></p> <p>The scope of this symposium is to discuss and present novel strategies, especially related to linking different models (material models, process models etc) by either bridging multiple scales and/or multiple process steps along the value chain. The focus is, among others, on developing theoretical, experimentally driven, and computational approaches to material characterization, property prediction, microstructure evolution, etc. They should provide a deeper and better understanding of the processing-microstructure-properties relationship in all kind of materials for structural applications (metallic alloys, composites, hybrids, polymers, ceramics).</p> <p><b>Topics to be covered by the symposium:</b></p> <ul style="list-style-type: none"> <li>✓ Computer aided design of materials and processes</li> <li>✓ Ab initio driven simulation and prediction of properties and processes</li> <li>✓ Multiscale modeling of mechanical properties and failure behavior of materials</li> <li>✓ Multiscale modeling of microstructure evolution during material processing</li> <li>✓ Local properties prediction towards tailored properties</li> <li>✓ Integrating material models in process models and component design</li> <li>✓ Virtual design, virtual processing and virtual testing of structural materials</li> <li>✓ Uncertainty and error propagation in multiscale modeling and generation of design allowable</li> </ul>		





## D.6

### Title: Multi-Length-Scale Innovations in Damage Evolution in Materials: Characterization, Modeling, and Validation - Joint Symposium

Organizer	Institution	Contact email
Bernard Normand	University of Lyon, INSA Lyon, France	bernard.normand@insa-lyon.fr
Ellen Cerreta	Los Alamos National Laboratory, USA	ecerreta@lanl.gov
George T Gray III	Los Alamos National Laboratory, USA	rusty@lanl.gov
Damien Féron	CEA, France	damien.feron@cea.fr

#### Summary

Materials are enabling to all of mankind's endeavors. Accordingly, all aspects of their usage bring great societal and environmental impacts, whether in manufacturing, energy, transportation, building, agriculture, etc. Materials in routine applications are subjected to stresses increasingly complex and are often simultaneously subject to physical, mechanical, thermal, chemical and radiation constraints. Such complex service environments lead to a greater potential for damage than if a material were subjected to a simple stress state / service environment. Accordingly, to design or optimize materials performances with the composition and architecture tuned for a complex loading environment, the materials science community is working to discover, quantify, and develop understanding of the synergies between these various phenomena to support the development of predictive, physically-based models of material damage.

This symposium provides a venue to bring together the global research community working to link advanced diagnostics, 3D material characterization, experiments quantifying damage evolution, model development and validation to highlight the advances in understanding damage mechanisms, experimental characterization, model developments, and validation efforts working to develop physically-based, multi-length-scale models of material damage in complex loading environments.

#### Targeted topics:

- ✓ Numerical tools (e.g. density functional theory, molecular dynamics, cellular automata) to model multi-length-scale damage evolution.
- ✓ New developments / applications of 3D characterization of material microstructure and damage evolution
- ✓ New developments in experimental techniques quantifying damage evolution in materials
- ✓ Multifunctional materials (e.g. stress corrosion cracking, tribo-corrosion)
- ✓ Advanced functionalities, (e.g. self-diagnosis, self-healing, energy harvesting)



## D.7

Title: Structural Health Monitoring and Control		
Organizer	Institution	Contact email
Evangelos Hristoforou	National TU of Athens, Greece	eh@metal.ntua.gr
Roland Shemama	GMI-Aero, Paris, France	roland.chemama@gmi-aero.com
Luc Dupre	University of Gent	luc.dupre@ugent.be
Konstantinos Kalkanis	NOMASICO Ltd, United Kingdom	konstantinos_kalkanis@yahoo.co.uk
Summary		
<p>Scope: “Structural Health Monitoring” Symposium refers to the condition monitoring and corrective actions (maintenance) on material structures</p> <p>Description &amp; targeted topics: The symposium will refer to:</p> <ul style="list-style-type: none"><li>✓ Stress monitoring in steels</li><li>✓ Stress monitoring in non-ferrous metals</li><li>✓ Stress monitoring in composite structures</li><li>✓ Modeling of stress monitoring</li><li>✓ Rehabilitation of stresses in steels</li><li>✓ Rehabilitation of stresses in non-ferrous metals</li><li>✓ Rehabilitation of stresses in composites</li><li>✓ Towards standardization process of the above mentioned topics</li><li>✓ Other</li></ul> <p>Audience: contributors and audience from the following industrial and academic areas are welcome:</p> <ul style="list-style-type: none"><li>✓ Steel producers and manufacturers</li><li>✓ Energy stakeholders, including nuclear energy</li><li>✓ Transportation, including shipping, railways and automotive</li><li>✓ Constructions, including buildings, bridges etc.</li><li>✓ Non-ferrous metal producers and manufacturers</li><li>✓ Non-ferrous metal users</li><li>✓ Composite manufacturers and users</li><li>✓ Airplane industries</li><li>✓ Academia</li><li>✓ Classification societies</li><li>✓ Standardization organizations</li><li>✓ Local manufacturers and end users</li></ul>		



## D.8

### Title: Ab initio models for thermodynamic and elastic properties of advanced materials

Organizer	Institution	Contact email
Sergei Dudarev	University of Oxford, United Kingdom	sergei.dudarev@ukaea.uk; sergei.dudarev@materials.ox.ac.uk
Martin Friak	Academy of Sciences of the Czech Republic, Czech Republic	friak@ipm.cz

### Summary

Quantum-mechanical density functional *ab initio* computational methods have now achieved an unprecedented level of accuracy and reliability in predicting properties of a broad variety of materials. *Ab initio* calculations provide deep insight in the fundamentals of electronic structure of a material and its excited electronic states, as well as atomistic and magnetic dynamics, controlling the phase stability and properties at elevated temperatures, up to the melting point. Owing to their universality and reliability, quantum-mechanical approaches have become the method of choice not only for studying existing materials but also for designing new materials. In particular, whenever experimental data are missing, density functional and other quantum-mechanical calculations deliver information required for constructing higher-level mathematical models and algorithms, including semi-empirical thermodynamic calculations of phase diagrams (CALPHAD), atomistic and continuum methods, and multi-scale models for simulating complex microstructural features like defects and dislocations. The scope of the symposium includes *ab initio* and other quantum-mechanical models, and applications of these models to the treatment of thermodynamic and mechanical, for example elastic, properties of materials. Contributions are invited that cover both the methodological developments as well as a variety of applications to a range of materials including:

- (i) Nickel and cobalt based superalloys
- (ii) High entropy alloys (HEAs)
- (iii) Advanced steels
- (iv) Light-weight structural materials
- (v) Advanced functional materials
- (vi) Dislocations and defects in metals and alloys, including HEAs
- (vii) Magnetic metals and alloys
- (viii) Atomistic and magnetic dynamics and thermodynamics of advanced materials
- (ix) Ab initio based predictive multiscale models

Invited speakers at the symposium are:

- ✓ Prof. **Igor A. Abrikosov** (Linköping University, Sweden)
- ✓ Prof. **Ralf Drautz** (Ruhr-Universität Bochum, Germany)
- ✓ Dr. **Mihai-Cosmin Marinica** (CEA Saclay, France)
- ✓ Prof. **Jörg Neugebauer** (Max-Planck Institute for Iron Research, Germany)





## D.9

**Title: Qualification and modelling of structural and fuel materials for sustainable nuclear reactors.**

Organizer	Institution	Contact email
Lorenzo Malerba	SCK•CEN, Belgium	lmalerba@sckcen.be
Marjorie Bertolus	CEA, France	marjorie.bertolus@cea.fr
Jana Kalivodová	CVR, Czech Republic	Jana.Kalivodova@cvrez.cz

### Summary

This symposium intends to host papers addressing recent advances concerning the understanding of the physical processes leading to structural and fuel material ageing and degradation in the conditions envisaged for Generation IV reactors, using advanced models and/or microstructural characterization, to help in the qualification of these materials and in the elaboration of design rules. Nuclear materials topics or relevance for GenII/III reactors or fusion will be considered, as well, especially if they are of interest also for Gen IV reactors.

### Scope:

Sustainable nuclear energy systems, also denoted as Generation IV reactors, along with the necessary fuel recycling facilities, allow the nuclear fuel cycle to be closed and the energy output from available resources to be substantially increased, while improving the management of high level radioactive waste through transmutation processes. These systems are therefore potentially able to provide energy for many centuries to come. However, the operating conditions envisaged for these systems are demanding and will impact on the performance of structural and fuel materials: the safety and the feasibility of most of these nuclear system concepts and their optimization will depend crucially on the capability of the chosen materials to withstand the operating conditions expected. Materials capable of withstanding extreme conditions like high temperature, prolonged irradiation, and chemically aggressive environments, must therefore be selected or developed, properly qualified, and their behaviour in operation fully understood. Some of these conditions are common to both current nuclear systems and fusion, as well as non-nuclear high energy efficiency systems. The ambition of this symposium is to link physical understanding and subsequent model development, based on in-depth experimental characterisation and advanced modelling, with the elaboration of rules for the design of GenIV reactor systems, in order respond to the expectations in terms of safety and efficiency of future nuclear reactors, with focus on fast reactors but ranging from advanced light water reactors to fusion.

### Targeted topics:

- ✓ Degradation mechanisms under irradiation, due to high temperature or in connection with exposure to aggressive coolants in steels (austenitic, ferritic/martensitic, ...) and other metallic alloys, structural ceramics ( $\text{SiC}_f/\text{SiC}$ , ...) and fuels (MOX, minor-actinide containing materials, ...): models and experiments
- ✓ Use of models and data to elaborate design rules for structural materials or to improve the reliability of fuel performance codes
- ✓ Advances in the qualification of materials for the conditions expected in future nuclear reactors



## D.10

### Title: Multiscale Modeling of Materials

Organizer	Institution	Contact email
Theodoros Karakasidis	University of Thessaly, Greece	thkarak@uth.gr
Serafim Kaliadasis	Imperial College, London, United Kingdom	s.kaliadasis@imperial.ac.uk
Petros Koumoutsakos	ETH Zurich, Switzerland	petros@ethz.ch
Konstantinos Tserpes	University of Patras, Greece	kitserpes@upatras.gr
Siegfried Schmauder	Universität Stuttgart, Germany	siegfried.schmauder@imwf.uni-stuttgart.de

### Summary

This symposium is dedicated to multiscale materials modelling aiming to describe complex phenomena in which several mechanisms with disparately different characteristic time- and space-scales come to the fore. Such systems include crack propagation, epitaxial growth, and multiphase fluid including flows with moving contact lines. We invite contributions implementing different multiscale modeling methods such as atomistic modeling with molecular dynamics (classical and ab-initio) or Monte Carlo, coarse grained methods such as dissipative particle dynamics, iterative Boltzmann inversion, hybrid multiscale methods, hierarchical multiscale modeling, continuum methods (based e.g. on finite elements) and atomistic-based continuum methods.

### Scope

Multiscale (fluid-solid) materials modelling combines synergistically existing and emerging methods from different scientific disciplines in order to bridge the wide range of time- and length-scales that are present in various phenomena and processes in materials science such as epitaxial growth, multiphase fluid flows in complex environments (such as fractured and porous media) and associated wetting effects, fluid-solid interaction including interaction between solids and complex fluids and failure of multifunctional materials and nanocomposites. The appropriate modeling of the complex behavior of fluid-solid materials represents a significant technological and financial interest. The appropriate description of various phenomena necessitates the atomistic modeling using ab-initio or classical molecular dynamics, however such methods are computationally prohibitive despite drastic improvement in computational power and necessarily restrict the analysis to small scales. Thus, mesoscopic methods based on coarse graining techniques such as dissipative particle dynamics and other particle methods have been developed in recent years. The combination of such methods with classical continuum methods based e.g. on finite-element discretization, is particularly attractive as it leads to models with high computational efficiency and allows bridging the nano- with the macro-scale.

In particular, there are two main multiscale modelling strategies that are been pursued. The hierarchical/parameter passing framework where parameters extracted at smaller scales are used as input at modelling at larger scales and the concurrent approach tries to solve all scales concurrently.

Today multiscale modelling is a truly cross disciplinary area which involves physicists and applied mathematicians, as well as engineers, chemists and biologists on the academic front, and industrial scientists and engineers on the applied front. The proposed symposium aims to address recent advances in this rapidly growing field by bringing together leading experts from different communities.





### Topics

- ✓ Multiscale modeling
- ✓ Coarse grained methods
- ✓ Molecular dynamics (classical and ab-initio)
- ✓ Dissipative particle dynamics
- ✓ Dynamic force mapping
- ✓ Iterative Boltzmann inversion
- ✓ Concurrent multiscale schemes
- ✓ Hybrid multiscale schemes
- ✓ Hierarchical multiscale schemes
- ✓ Smoothed particle hydrodynamics
- ✓ Fluid-particle models
- ✓ Continuum methods (e.g. finite elements)
- ✓ Atomistic-based continuum methods
- ✓ Fluid-solid interactions
- ✓ Solid-fluid systems
- ✓ Complex flow modeling

### Tentative list of invited speakers *(to be updated)*

- **Prof. Ingo Steinbach**, Interdisciplinary Centre for Advanced Materials Simulation (ICAMS), Ruhr-University Bochum, Germany
- **Prof. Markus Schmuck**, School of Mathematical & Computer Sciences, Heriot-Watt University, Edinburgh, United Kingdom

### Special Issues publications

The symposium organizers are planning to arrange special issues for selected papers of the conference in international journals such as:

***Molecular Simulation,***

***Materials Science and Technology,***

***Plastics, Rubber & Composites: Macromolecular Engineering***

and a few others as well as some special volumes on given areas.





## **Area E: Energy and Environment**

Area Coordinators:

Maria Luisa Di Vona

*University of Rome Tor Vergata, Italy*

&

Emmanuel Giannelis

*Cornell University, USA*



## E.1

Title: Hydrogen production, conversion, and storage		
Organizer	Institution	Contact email
Maria Luisa Di Vona	University of Roma Tor Vergata, Rome, Italy	divona@uniroma2.it
Bogdan Kuchta	University of Aix-Marseille, Marseille, France	bogdan.kuchta@univ-amu.fr
Ioannis Kallitsis	University of Patras, Patras, Greece	j.kallitsis@upatras.gr
Toshiyuki Mori	NIMS, Japan	MORI.Toshiyuki@nims.go.jp
Summary		
<p>This symposium is intended to make the point on current improvements in the field of the “hydrogen economy”, which include hydrogen production (electrolyzers), hydrogen conversion (fuel cells), and hydrogen storage. The development of advanced materials is paramount if these technologies are to be installed at a large scale. Improved nano-architectures are also required, as well as, better durability and longer lifetime of devices. High performance water electrolyzers are an important topic for the production of hydrogen containing little impurities, such as CO, that damage the expensive electrocatalysts. Solid oxide ceramic and polymeric electrolyzer technologies are currently marketed with different temperature domains and performance targets.</p> <p>In the fuel cell sector, two major types are currently developed: Solid Oxide Fuel Cells (SOFC) rely on ceramic solid electrolytes and other high temperature components, whereas Polymer Electrolyte Fuel Cells (PEFC) use polymeric conductors and work at low temperature. The development of less expensive high performance catalytic electrodes, containing less or no noble metals is another requirement. Alternative fuel cell technologies, including Direct Alcohol Fuel Cells or Enzymatic Fuel Cells, are other hot subjects.</p> <p>For the implementation of a “hydrogen economy” hydrogen storage materials include high surface area and high porosity solids (chemically modified carbons, metal organic frameworks –MOF), but also chemical storage in form of compounds (formic acid, cycloalkanes, etc.) or metal hydrides with large storage capacity. Numerical simulations methodology bring valuable input for testing and screening the performance of new materials.</p>		
<b>Topics:</b> <ul style="list-style-type: none"> <li>✓ Proton exchange membrane fuel cells (PEMFC)</li> <li>✓ Anion exchange membrane fuel cells (AEMFC)</li> <li>✓ Solid Oxide Fuel Cells (SOFC)</li> <li>✓ Proton-Conducting Fuel Cells (PCFC)</li> <li>✓ Direct Alcohol Fuel Cells (DAFC)</li> <li>✓ Polymer electrolyte water electrolysis</li> <li>✓ Solid Oxide water electrolysis</li> <li>✓ Alkaline electrolysis</li> <li>✓ Photoelectrochemical water splitting</li> <li>✓ Physical and chemical hydrogen adsorption</li> <li>✓ Numerical modeling</li> </ul>		

## E.2

### Title: Batteries and Supercapacitors

Organizer	Institution	Contact email
Philippe Knauth	Aix Marseille University, CNRS, France	philippe.knauth@univ-amu.fr
Isabella Nicotera	University of Calabria, Italy	isabella.nicotera@unical.it
Alan V. Chadwick	University of Kent, United Kingdom	a.v.chadwick@kent.ac.uk
Jean Scoyer	Scaron Consulting	Jean.Scoyer@gmail.com

### Summary

#### Scope

Rechargeable batteries and supercapacitors are in the center of interest all over the world for the development of electrochemical energy storage systems from the macroscale to the microscale. At the macroscale, redox flow batteries are credible power storage systems for the intelligent grid and various chemistries are currently developed, including and beyond all-vanadium redox flow batteries. Electrical transportation, including electric or hybrid electric vehicles, is another major topic of interest, which relies on sufficiently powerful and durable power sources. On the microscale, the development of autonomous systems for microelectronics and the internet of things relies on independent rechargeable micropower sources, such as 3D microbatteries.

This symposium invites contributions covering the various chemistries developed in the domain of rechargeable batteries and supercapacitors.

The topics include advances in redox flow batteries, Li-ion and Li-metal batteries, including Li-air and Li-S, Na-ion batteries and new chemistries studied in recent years, such as Mg and Ca batteries.

Improved high voltage cathode and high insertion capacity anode materials are continuously increasing the battery performances. Another highly investigated field, fundamental for a further size reduction and safety improvement of power systems, is that of solid electrolytes, including inorganic ceramics and glasses as well as organic polymers.

High performance microbatteries are fundamental for the development of autonomous microsystems, including micro-sensors, micro-actuators and micro-electromechanical systems (MEMS).

In the field of supercapacitors, carbon-based double-layer capacitors are studied as well as oxide-based pseudocapacitors and hybrid systems.

Leading experts in the field will present ground-breaking advances reached in the last years in the battery and supercapacitor field. Oral and poster communications are invited to present the very last innovations and advances on the following topics.

#### Targeted topics

Rechargeable Li-ion and Li metal batteries

Li-sulfur and Li-air batteries

Na-ion batteries

New chemistries (including Mg and Ca batteries)

Redox flow batteries, including all-vanadium and other chemistries

High voltage cathode materials

High insertion anode materials

Inorganic solid electrolytes

Solid polymer electrolytes

Microbatteries (2D and 3D)

Supercapacitors

Carbon-based double-layer capacitors

Oxide pseudocapacitors



**List of confirmed invited speakers**

Peter Bruce (Univ. Oxford, UK)

Thierry Djenizian (Ecole des Mines St Etienne, France)

Stefano Passerini (Helmholtz Institute Ulm, Germany)

Tom Zawodzinski (Univ. Tennessee, USA)

## E.3

Title: Materials for Energy harvesting Joint Symposium		
Organizer	Institution	Contact email
Spyros Diplas	SINTEF, Norway	spyros.diplas@sintef.no
Theodora Kyratsi	University of Cyprus, Cyprus	kyratsi@ucy.ac.cy
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Paul R. Ohodnicki	National Energy Technology Laboratory, USA	Paul.Ohodnicki@netl.doe.gov
Amit Pandey	LG Fuel Cell Systems Inc., USA	dramitpandey@gmail.com
Monica Della Pirriera	Leitat, Spain	mdella@leitat.org
Susan Schorr	HZB and FU Berlin, Germany	susan.schorr@helmholtz-berlin.de
João Manuel De Almeida Serra	University of Lisbon, Portugal	jmserra@fc.ul.pt
Jianwu Sun	Linköping University, Sweden	jiasu@ifm.liu.se
Summary		
<p>Major energy saving solutions need to be developed and implemented as soon as possible due to the increasing global demands as well as the environmental impact of using fossil fuels. The need for renewable energy, energy efficiency, and energy harvesting is motivating the discovery of new materials and design of new devices and structures. At energy harvesting, the energy is derived from sources such as solar, thermal, and vibrational energy. In the view of this demand, this symposium emphasizes on energy harvesting and aims to cover a wide spectrum of recent developments on materials used for energy harvesting based on solar energy (PV, photocatalysts), the utilization of thermal gradients (thermoelectrics) and the vibrational energy (piezoelectrics).</p> <p>This symposium will focus on the following, but not limited, areas; manufacturing/processing issues, characterization of structures/nanostructures, structural defects, surface, bulk and interfacial phenomena, optoelectronic and thermoelectric properties, transport properties, multiscale modeling, new concepts for next-generation materials. The symposium aims at linking the fundamental knowledge and information obtained from characterization, modeling and testing to the development of devices with improved performance and if possible reduced costs.</p>		
Topics to be covered by the symposium:		
<ul style="list-style-type: none"> <li>✓ Silicon-based solar cells</li> <li>✓ Thermal PV materials</li> <li>✓ Innovative materials for solar applications</li> <li>✓ Perovskite solar cells</li> <li>✓ Compound semiconductor based solar cells</li> <li>✓ Tandem and heterojunction solar cell structures</li> <li>✓ Current and new practices in processing</li> <li>✓ Materials challenges of thermoelectric devices</li> <li>✓ Bulk materials and Low-dimensional thermoelectric materials</li> <li>✓ Piezoelectric Materials: composition, fabrication and characterization</li> <li>✓ Pb-free Piezoelectric materials</li> <li>✓ Characterization and modelling of materials, properties and devices</li> <li>✓ Advances in materials processing</li> <li>✓ Solar energy conversion materials properties</li> <li>✓ Photocatalysts</li> <li>✓ Photoelectrochemical (PEC) cells</li> <li>✓ Solar-driven charge carrier function and energy conversion</li> </ul>		

**KEYNOTE SPEAKER**

Prof. Young Soo Kang, Sogang University, Korea

"Artificial Photosynthesis via Solar Light Driven CO<sub>2</sub> Reduction into Methanol"

Papers presented in the Symposium will be published in a special issue on "Materials for Energy Harvesting" in *Physica Status Solidi A*





## E.4

### Title: Materials for Fusion and Fission

Organizer	Institution	Contact email
Thierry Angot	Aix-Marseille Université - CNRS - PIIM, France	thierry.angot@univ-amu.fr
Christian Grisolia	CEA-IRFM, France	christian.grisolia@cea.fr
Dirk Engelberg	University of Manchester, United Kingdom	d.engelberg@manchester.ac.uk

### Summary

High performance structural materials are crucial for successful operation of nuclear fusion and fission reactors. A long list of open questions must be addressed to ensure reliable reactor performance and the implementation of new materials, from neutron irradiation resistance, thermo-mechanical behavior, to local heat transfer rates and particle loads. Thus, this symposium aims at bringing together researchers to discuss these challenges, opening the route to reliable nuclear energy generation. It will cover material issues from both the experimental and fundamental point of view, giving priority to multi-scale approaches. This symposium covers various topics relevant to either fusion or fission research (list is not exhaustive):

- ✓ Novel material innovations (2D/3D) for fission/fusion application
- ✓ Performance and development of structural plant materials (Steels, Ni-alloys, etc.)
- ✓ Structural materials to support the nuclear fuel cycle, including materials for storage and disposal, and associated material issues
- ✓ Advances in nuclear fuel cladding, advanced processing, and fuel coatings
- ✓ Reliable plasma facing components (PFCs) for nuclear fusion based on tungsten, tungsten alloys, low Z materials, or liquid metals, including hydrogen isotope retention and release, damage and defects, operation in a deleterious environment, erosion, re-deposition, migration and dust formation.



## E.5

### Title: Energy materials for organic photovoltaics and OLEDs

Organizer	Institution	Contact email
Stergios Logothetidis	Aristotle University of Thessaloniki, Greece	logot@auth.gr
Jean-Jacques Simon	Aix Marseille University, France	jean-jacques.simon@im2np.fr
Argiris Laskarakis	Aristotle University of Thessaloniki, Greece	alask@auth.gr
Norbert Koch	Helmholtz-Zentrum Berlin für Materialien und Energie & HU Berlin, Germany	norbert.koch@physik.hu-berlin.de

### Summary

#### Description

During the last years there has been an enormous research activity globally for the development of energy materials (organic, inorganic, hybrid) that can be used for applications such as Organic Photovoltaics (OPVs) and Organic Light Emitting Diodes (OLEDs). A rich variety of synthesis and thin film fabrication and processing methods in combination with different materials compositions have been explored with the aim to fabricate OPV and OLED devices with potential for commercialization to consumer markets. Nevertheless, despite the exciting advances in the field, there are still several key issues to be investigated in order to enable the widespread use of energy materials for these applications.

#### Symposium Scope

This symposium aims at bringing together world-class researchers in the field of novel energy materials to discuss the main challenges for their synthesis and thin fabrication. This symposium will focus on the key issues and phenomena that include materials chemistry and synthesis, thin film processing by wet, additive, as well as vacuum methods, interface phenomena, doping, nanostructuring, novel analytical/characterization techniques, methodologies and materials modelling by computational methods.

This symposium is a forum for researchers coming from diverse disciplines to share their research findings and to enable a deeper understanding of the above key issues and will unleash the true potential of organic-based and hybrid energy materials for these applications.

#### Symposium Topics

- ✓ novel synthesis and bulk processing approaches
- ✓ nanostructures for enhancement of light absorption and light emission & band structure engineering
- ✓ fundamental physics and photo-physics of energy materials
- ✓ structure-processing-property relationships of energy materials
- ✓ charge separation & transport
- ✓ optimization of nanostructures at interfaces and surfaces
- ✓ novel concepts for optimization of morphology
- ✓ large-area processing of energy materials
- ✓ theoretical modeling of materials and devices
- ✓ lifetime and functional/environmental stability of devices
- ✓ emergent manufacturing technologies and industrial perspectives





## E.6

Title: Advanced Materials for Transport Applications		
Organizer	Institution	Contact email
Dirk Lehmhus	Univ. of Bremen, Bremen, Germany	dirk.lehmhus@uni-bremen.de
Axel von Hehl	Stiftung Institut für Werkstofftechnik (IWT), Bremen, Germany	vonhehl@iwt-bremen.de
Rene Alderliesten	TU Delft, Delft, The Netherlands	R.C.Alderliesten@tudelft.nl
Kambiz Kayvantash	CADLM, Massy, France	kambiz.kayvantash@cadlm.com
Hohe Jörg	Fraunhofer Institut für Werkstoffmechanik (IWM), Freiburg, Germany	joerg.hohe@iwm.fraunhofer.de
<b>Summary</b>		
<p>Transport applications are a major driving force specifically for structural material development, where weight reduction must be achieved in parallel to the fulfillment of several other requirements such as crashworthiness etc. The planned symposium will highlight lightweight design as common denominator of the symposium as a whole, but also define specific session topics to provide focal points for contributions. This is deemed mandatory from past experience to first win submissions against competing, technology-oriented symposia, then an audience. Session topics will be</p> <ul style="list-style-type: none"> <li>✓ Additive Manufacturing for Transport Applications</li> <li>✓ Hybrid Engineering Materials &amp; Structures for Multi-Material Designs</li> <li>✓ Intelligent Materials, Structures and Systems</li> <li>✓ Simulation, Modeling, Optimization and Big Data applications for Process Discovery</li> </ul> <p>For all of these, specific session flyers detailing the content will be prepared and distributed. Further topics may emerge from submissions received.</p> <p>All symposium organizers have significant experience with Euromat, and all can rely on a broad network of contacts in areas covered by the symposium, thus ensuring a significant number of contributions. To motivate further contributors, the organizers plan to directly address EU funded projects from the symposium's thematic area and suggest Euromat to them as ideal platform for publication of their results, discussion, and cross-project exchange. For this, we reserve the possibility of creating a special session, potentially with direct EU support.</p> <p>Contributors will be offered the possibility of submitting their work to a dedicated special issue (SI) of a high-ranking scientific journal. In the past, such SIs have been realized with Adv. Eng. Materials (Euromat 2009), Steel Res. Int. and J. of Intelligent Mat. Systems and Structures (Euromat 2011) and Materials &amp; Design (Euromat 2013). For Euromat 2017, an agreement with Advanced Engineering Materials has been reached – and since many European projects are required to publish according to an OpenAccess model, a second such special issue arrangement has been made with Materials by MDPI (Dirk Lehmhus is member of the Editorial Board).</p>		





## **Area F: Biomaterials and Healthcare**

### **Area Coordinators:**

Jérôme Chevalier  
*University of Lyon, France*

&

María Vallet-Regí  
*Universidad Complutense de Madrid, Spain*



## F.1

Title: Biomaterials for Tissue Engineering		
Organizer	Institution	Contact email
Antonio Salinas	Universidad Complutense de Madrid, Spain	salinas@ucm.es
Aldo Boccaccini	University of Erlangen-Nuremberg, Germany	aldo.boccaccini@ww.uni-erlangen.de
Chiara Vitale-Brovarone	Politecnico di Torino, Italy	chiara.vitale@polito.it
Katharina Schmidt-Bleek	Charité - Universitätsmedizin Berlin, Germany	katharina.schmidt-bleek@charite.de
Didier Letourneur	Bâtiment Inserm, France	didier.letourneur@inserm.fr
Summary		
<p>This symposium will cover biomaterials used in tissue engineering and regenerative medicine fields. The focus will be the scientific and technological aspects related to the design, fabrication and characterization of innovative biomaterials for new emerging applications. The challenges and future research in this growing area will be addressed, including the search of the most effective cell types, scaffolds and signals to achieve the living tissue regeneration. The actual efforts looking for more cost-effective systems will also be addressed. The symposium will offer an excellent platform for presentation and discussion of the most recent and relevant results in this highly interdisciplinary field.</p> <p>Hot topics to be covered by the symposium:</p> <ul style="list-style-type: none"> <li>✓ Bone Healing</li> <li>✓ Biomimetic Scaffolds</li> <li>✓ Bone regeneration and reconstruction</li> <li>✓ Bioactive and biodegradable materials</li> <li>✓ Material testing</li> <li>✓ Cell behaviour in regeneration</li> <li>✓ Animal models</li> <li>✓ Nanomedicine</li> </ul>		



## F.2

Title: Biomaterials for therapeutic delivery		
Organizer	Institution	Contact email
Miguel Manzano	Universidad Complutense de Madrid, Spain	mmanzano@ucm.es
Joao Mao	University of Aveiro, Aveiro, Portugal	jmano@ua.pt
María Vallet-Regí	Universidad Complutense de Madrid, Spain	vallet@ucm.es
Summary		
<p>This symposium aims to cover a variety of biomaterials currently employed for the delivery of therapeutic agents, and to present the latest results from <i>in vitro</i> and <i>in vivo</i> studies. Synthetic or natural biomaterials play a key role in modern drug delivery technologies. The latest advances on synthesis and characterization of those biomaterials would be here presented.</p> <p>The ability to control the <i>in vitro</i> and <i>in vivo</i> delivery of therapeutic agents from implanted biomaterials would be discussed throughout the Symposium. Recent advances both in Academia and Industry on this release topic would be here presented and discussed.</p> <p>The targeted topics in this Symposium include the functional biomaterials development from the perspective of materials design, including polymers, ceramics, metals and hybrid materials; and from the perspective of the functionality, including the delivery of a variety of therapeutic agents, such as drugs, ions, or any type of biomolecule.</p> <p>This symposium will highlight the role of biomaterials in the drug delivery area, bringing together researchers from many different areas, such as materials engineers, chemists, physicists, biologists, biomedical researchers and medical doctors.</p> <p><b>Invited speakers in this Symposium will include:</b>  Prof. Nicholas Peppas (Texas University, USA)  Prof. Wim Hennink (Utrecht University, Netherlands)  Prof. J Zink (UCLA, USA)  Prof. Samuel Stupp (Northwestern University, USA)</p>		





## F.3

Title: Nanobiomaterials and nanotechnology for implants, devices and theragnostic		
Organizer	Institution	Contact email
Alejandro Baeza	Universidad Complutense de Madrid, Spain	abaezaga@ucm.es
Daniel Ruiz-Molina	ICN2: Catalan Institute of Nanoscience and Nanotechnology, Spain	dani.ruiz@icn2.cat
María Vallet-Regí	Universidad Complutense de Madrid, Spain	vallet@ucm.es
Summary		
<p>In the recent years, the application of nanotechnology to the medical practice has provided a broad amount of novel tools suitable for the treatment of unmet clinical situations and also for the early detection of complex pathologies. The aim of this symposium is to present the recent advances carried out in the latest years related with the application of nanomaterials, nanodevices and self-assembled nanostructures as implants, drug delivery carriers, imaging agents and theranostics. The development of nanomaterials for nanomedicine needs an interdisciplinary approach. This forum will provide a platform on which to discuss the current state of the art in the field and their future prospects, offering the possibility to act as a meeting point for worldwide experts with different backgrounds such as clinicians, chemists, physicists, biologists, etc. Fundamental research leads to translation of these findings into clinically applicable interventions, and this process will also be a focus of the meeting.</p> <p>Hot topics to be covered by the symposium:</p> <ul style="list-style-type: none"> <li>✓ Nanomedicine</li> <li>✓ Nanoparticle (Bio)functionalization</li> <li>✓ Nanocomposites</li> <li>✓ Biocompatibility</li> <li>✓ Targeting strategies</li> <li>✓ Smart drug delivery systems</li> <li>✓ Nanomaterials for imaging and guided therapy</li> <li>✓ Nanotherapeutics and nanotheranostics</li> </ul> <p><b>Invited speakers in this Symposium will include:</b></p> <p>Prof. C. J. Brinker, University of New Mexico, USA, jbrinker@unm.edu</p> <p>Prof. Thomas Bein Ludwig Maximilians, Universität München, Germany, tbein@cup.uni-muenchen.de</p>		



## F.4

### Title: The Next Generation of Implants with Multi-functional Properties: Advanced Synthesis, Processing and Surface Modification Methods for Biomaterials

Organizer	Institution	Contact email
Aldo Boccaccini	University of Erlangen-Nuremberg, Germany	aldo.boccaccini@ww.uni-erlangen.de
Pieter Cools	Ghent University, Belgium	Pieter.Cools@UGent.be
Laurent Gremillard	University of Lyon, INSA Lyon, France	laurent.gremillard@insa-lyon.fr
Paola Palmero	Politecnico di Torino, Italy	d011712@polito.it

#### Summary

The next generation of implants will exhibit added functions. In addition to the standard mechanical properties required for orthopaedic and dental devices, implants should for example be integrated in the host tissue (e.g. bone). For this purpose, the implant surface must be modified, and current effort is for example dedicated to surface modification of biomaterials to insure a suitable biological response. In some cases, the implanted material must favour specific biological interactions, and then degrade at a specific rate without compromising clinical success. It is the aim of this symposium of reviewing the latest achievement in terms of surface modification of biomaterials, new biodegradable materials, and drug release, for example.

This is also the objective of the session to review the evolution of biomaterials in terms of mechanical properties or other properties of interest as far as new implants are concerned. These properties are linked to the structure of the materials at different scales. Therefore, contributions providing new generic materials science in the field of structure-properties are welcome.

In vitro characterization methods able to provide, in advance and without heavy in-vivo trial, insights into the biological and functional properties of new biomaterials will also be addressed in this symposium.

## F.5

**Title: Translation of biomaterials research towards innovation and product development: from concepts to clinic**

Organizer	Institution	Contact email
Jérôme Chevalier	University of Lyon, INSA Lyon, France	Jerome.chevalier@insa-lyon.fr
Hakan Engqvist	Uppsala University, Sweden	hakan.engqvist@angstrom.uu.se
Tobias Fueederer	MOESCHTER GROUP Holding GmbH & Co., Germany	t.fuerderer@moeschter-group.com
Christophe Marquette	University of Lyon, France	christophe.marquette@univ-lyon1.fr
Corrado Piconi	University of Roma, Italy	corpico@libero.it

### **Summary**

Medical devices are of crucial interest in orthopaedics, dental, cardiovascular, and soft-tissue reconstruction. They represent a huge market for the industry and exciting scientific challenges for researchers, as hopes for a better life for millions of patients. Many of them are exploiting the behaviour of today's innovative biomaterials that are showing increased complexity and multi-functionality. Used for tissue substitution or regeneration, as well as for diagnostics and drug release, they are also more often associated to biologic substances.

The path leading from the concept of a device to an effective and safe product is full of pitfalls. To release a product to the market demand a long selective exercise, which requires different concurrent skills; patents, financing, process development, clinical, regulatory, business development, etc... all finalized to the final objective.

This symposium aims to collect testimonies of academics, medical-device producers, and entrepreneurs as well as other core competences to illustrate the commercial development of new biomaterials concepts and technologies.

Experiences of academic spin-offs and of innovative start-ups are especially welcome.





## F.6

**Title: Bio-Inspired Materials: From structural materials towards multi-functional biomaterials.**

Organizer	Institution	Contact email
Peter Fratzl	Max Planck Institute of Colloids and Interfaces, Germany	peter.fratzl@mpikg.mpg.de
Julian Jones	Imperial College London, United Kingdom	julian.r.jones@imperial.ac.uk
Sylvain Meille	INSA Lyon, University of Lyon, France	sylvain.meille@insa-lyon.fr
Eduardo Saiz	Imperial College London, United Kingdom	e.saiz@imperial.ac.uk

### Summary

Natural materials, tissues and structures, although built at ambient temperature with a quite limited selection of components, have evolved with time to a complexity and hierarchical structures, which overpasses most of the artificial materials and structures.

Natural materials have adapted to various biological, physical and structural needs and have the ability to self-healing via various biological processes and to answer often-conflicting needs. They have been therefore a source of inspiration for engineers and researchers over the centuries. However, bio-inspiration is gaining more and more interest in the engineering fields and for biomedical applications.

This symposium will explore design principles underlying biological materials and present and prospective examples of how these design elements can be translated into artificial materials and biomaterials. Both biological materials as a source of inspiration and current developments of bio-inspired architectures and multi-functional (bio)-materials and surfaces will be discussed.



## **Area G: Education and Technology Transfer**

### **Area Coordinator:**

Heinrich Hofmann

*Ecole Polytechnique Fédéral Lausanne, Switzerland*



## G.1

Title: Competences and Basic Knowledge in the ICT ER		
Organizer	Institution	Contact email
Paloma Fernández	University Complutense, Spain	arana@ucm.es
Summary		
<p>As far as the new technologies are becoming ever more important in Education, critical voices arise claiming that the use of these (Information and Communication Technologies) ICT tools may be detrimental for the basic knowledge acquisition. On the other hand, employers demand a more practical and updated knowledge, giving increasing importance to managing competences and skills.</p> <p>Although Long Life Learning is gaining importance, one main step previous to the entrance to the work market, is the University, and in this context we should be able to make both visions compatible.</p> <p>To determine to which extent the use of ICT can help teachers and students, at University level, to find a compromise between the practical and the basic learning is a challenge for both, Education Institutions and Professionals.</p> <p>Between the topics to be addressed:</p> <ul style="list-style-type: none"><li>✓ e- and b-learning</li><li>✓ MOOC: use and design, how to include them in the University courses</li><li>✓ Gamification tools</li><li>✓ Tools for collaborative working</li><li>✓ Flipped classroom at the University</li></ul>		





## G.2

Title: Key material fields for modern curricula		
Organizer	Institution	Contact email
H.M. Polatoglou	Aristotle University of Thessaloniki, Greece	hariton@phycics.auth.gr
Mébarek Alouani	Université de Strasbourg IPCMS, France	Mebarek.Alouani@ipcms.unistra.fr
Michael Finnis	Imperial College London, United Kingdom	m.finnis@imperial.ac.uk
Summary		
<p>Materials science and technology through great breakthroughs are helping humanity to face great challenges such the climate change, sustainable development, energy efficiency, health, transportation, recreation and education. The implications of such progress have become so integrated to our daily life that are most of the time are taken for granted. It is urgent to close the gap between current science and technology education and everyday life experience by integrating materials education into curricula. This can also be extended to lifelong learning programs. The symposium will aim to bring together experts on material education to share best practices and new ideas with fellow materials educators and discuss key material fields for modern curricula. These could include e-learning, massive open on-line courses, materials portfolios, materials and sustainable development, laboratory work, introduction of nanotechnology to all levels of education, inspiration from nature, material selection, utilization of ab-initio simulations to explore key material properties, molecular dynamics simulations, common programs between industry, academia and schools, teacher's education on materials, etc.</p>		



## G.3

Title: Critical Materials in Design, Manufacturing and Recycling		
Organizer	Institution	Contact email
Margarethe Hofmann	Matsearch Consulting and Entwicklungsfond für Seltene Metalle	mhofmann@matsearch.ch
Summary		
<p>Materials in innovative products are classified as “critical” due to their confined availability caused by resource limitations, expensive extraction methods, geopolitical factors, and a variety of further influences. Other factors of criticality link to high price volatilities, and impact on the political, social and ecological environment of the mining region as well as world-wide. Although during the last two years, supply shortages and price variations of critical materials were less dramatic, the topic is continuing to be of high relevance.</p> <p>The European Commission classifies elements such as cobalt, gallium, indium and the Rare Earths to be critical, but also e.g, chromium or magnesium. Many of these elements are required in some ways for innovative products such as technologies for green energy and transporting with less pollution, and communication electronics for enabling private connectivity, global business activities and information exchange at all levels (private to business) and for broad areas of our planet. Most people are not aware that we are successively running short of such materials, as they are used – although in small quantities – in millions of products and in compounds that are mostly difficult to recycle and to re-use and that are in many cases not engineered in an economical and sustainable way. Life Cycle Analysis (LCA) is a way to assess the various processing steps of a product and by this to improve its sustainability in the whole value chain. Changes in design, and new solutions in substitution and recycling must be introduced so that crucial functions of critical elements in innovative materials and components can be sustained for the future. This workshop in Session G will highlight some of the tools used to assess and to evaluate the situation and will provide recommendations and an outlook for the future.</p>		



## G.4

Title: Transferable skills for Masters and PhD's in Material science		
Organizer	Institution	Contact email
Heinrich Hofmann	Ecole Polytechnique Federale de Lausanne, Switzerland	Heinrich.hofmann@epfl.ch
Emmanuel P. Giannelis	Cornell University, USA	epg2@cornell.edu
Summary		
<p>It is well acknowledged that material science engineers must have a solid formation in basic science and in engineering to be able to carry out successfully their often multidisciplinary work in academia and industry. But it is also well known that successful engineers must also have transferable skills like project management, communication, understand sustainable development and processes, entrepreneurial behavior and social competences. It is still under discussion if universities are capable to teach young students in this field, or they have to learn it by doing during the studies or later on job in academia (PhD work, Post-Doc) or in industry.</p> <p>In this session this topic will be discussed und 4 different aspects:</p> <p>The industrial needs (80 % or more of the students and PhD will work finally in the industry)</p> <p>The academic needs (how can we prepare our students for an academic career?)</p> <p>The possibilities and competences of universities to full fill this needs</p> <p>How can students profit from this skills to find a job.</p> <p>This session will bring together from in participants from industry and academia to discuss the different aspects and to show the different approaches in EU and US. The session will also be very interesting for young researchers to learn more about the expectations of industry and academia regarding the skills of a young potential collaborators.</p>		





## **Area H: Raw Materials**

### **Area Coordinators:**

**Bart Blanpain**

*KU Leuven, Belgium*

**&**

**Patrice Turchi**

*Lawrence Livermore National Laboratory, USA*



## H.1



### Title: Critical Materials: Impact on Near-term Advanced Energy Technologies

Organizer	Institution	Contact email
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Roderick Eggert	Colorado School of Mines, USA	reggert@mines.edu

#### Summary

Societies' rapidly expanding utilization of energy has an indisputable impact on quality of life and the environment on a global scale. Energy technologies require raw materials, some of which are subject to supply risks, price volatility or concerns about long-term availability. These supply challenges, both actual and potential, can threaten the development and deployment of emerging energy technologies. Overcoming these challenges depends on one or a combination of three approaches: expanding and diversifying primary material supplies, reducing wastes and developing substitute materials. Persistent attention, rather than temporary panic, is the key to avoiding the negative consequences of supply challenges. This symposium covers the use, optimization and/or substitution of critical materials in energy applications. A commonality between alternative energy technologies and high efficiency fossil fuel technologies is the conversion of energy into mechanical work. This symposium will include discussions of economically driven causality critical materials have on adaptation of higher efficiency energy technologies and applications. Both hard and soft magnetic materials used in energy conversion devices including magnetic refrigeration will be discussed. Innovative technologies and material solutions which mitigate cost and supply problems including process engineering approaches that would enhance availability of critical materials will be a primary focus area of the symposium. Presentations on topics relevant to the efficient use of rare-earth materials, near critical energy storage materials, substitute magnetic materials, nanocomposite magnets, and materials relevant to non-permanent magnet applications (soft and semi-hard magnet materials) are encouraged. Finally, magnetic materials relevant to the specific demands of energy conversion for applications such as wind, land-based and marine transportation, and power conversion, and the use and development of high performance carbon-based materials, especially those manufactured from renewable resources for energy applications including Li-ion batteries and fuel cells, will also be topics for presentations.



## H.2

Title: Sustainable Production of (Critical) Materials		
Organizer	Institution	Contact email
Dimitrios Panias	National Technical University of Athens, Greece	panias@metal.ntua.gr
Mishra Brajendra	Worcester Polytechnic Institute (WPI), USA	bmishra@WPI.EDU
Guo Muxing	University of Leuven – KU Leuven (KUL), Germany	muxing.guo@kuleuven.be
Summary		
<p>Metals and materials are key enablers for any technology used in the modern society. Regardless of the category to which these metals belong (Base, Ferrous, Non-Ferrous, Noble, Precious, Critical, technology etc.), they have been incorporated in an increasing number of applications that improve our daily lives, thanks to their unique properties. Metals and metallic products are found in numerous high-technology and high-demand applications such as transport, building, packaging, engineering, renewable energy technologies, electronics, etc. Their consumption in our society is increasing almost exponentially pushing their production higher and higher. Taking into account the greater societal awareness on environmental issues and the stricter environmental legislation almost all over the world, there is an increased pressure on the technology developers and stakeholders to boost technological innovations towards sustainable metals production from primary as well as secondary resources.</p> <p>Therefore, this symposium is dedicated on, both relatively mature sustainable materials processing technologies that can be transferred to the existing industry as well as on radical innovative sustainable technologies that could shape the future of the materials processing industrial sector. The following main topics are addressed:</p> <ul style="list-style-type: none"><li>✓ Extraction of metals (critical and non-critical) from primary and secondary resources via Hydro-, Pyro-, Electro-, Bio- and Iono-metallurgical processing,</li><li>✓ Valorization of residues towards zero waste processing in mining and metallurgical industry,</li><li>✓ Opportunities for reuse, remanufacturing and recycling of metals and materials</li></ul> <p>Selected papers from this symposium will be published after review in the Journal of Sustainable Metallurgy (<a href="http://www.springer.com/materials/special+types/journal/40831">http://www.springer.com/materials/special+types/journal/40831</a>) which is published by Springer and is dedicated to presenting metallurgical processes and related research aimed at improving the sustainability of metal-producing industries, with a particular emphasis on materials recovery, reuse, and recycling.</p>		



## H.3

### Title: Materials Life Cycle Approach and Flow Analysis

Organizer	Institution	Contact email
Margarethe Hofmann-Amttenbrink	ESM Foundation, Switzerland	mhofmann@matsearch.ch
Alessandra Hool	ESM Foundation, Switzerland	alessandra.hool@matsearch.ch
Roland Gauß	EIT Raw Materials	roland.gauss@eitrawmaterials.eu
Guido Sonnemann	University of Bordeaux, France	guido.sonnemann@u-bordeaux.fr

### Summary

With the growth of the world population, the development of societies and the increase of world-wide economic activity, human needs for materials e.g. for construction, food, transport, health care and communication increase. The mining, extraction, processing, production, use, and disposal of these materials have a severe impact on the local and global ecology and influence also the economic environment. To assess the environmental impact of specific products, it is necessary to take a broad view and consider all stages of the value chain, that is, from cradle to grave. Techniques such as Life Cycle Assessment (LCA) allow for a broad environmental evaluation of a material or product by compiling an inventory of relevant energy and material inputs and environmental releases, and assessing the impact caused by those. These inventory flows include inputs of water, energy, and raw materials, and releases to air, land, and the hydrological cycle. To develop such an inventory, models using data on inputs and outputs are constructed, considering all activities within the system boundary and the product's or material's supply chain. In a Life Cycle Analysis, the endpoint categories usually relate to specific areas which should be protected, namely human health, natural environment, and natural resources. However, discussions are ongoing whether other impact, such as socio-economic implications of materials criticality, should also be taken into account. This is of high relevance for European companies in view of legislation, possible price volatilities and supply chain risks.

As raw materials have a natural limitation in their availability, and since extraction and transport often have a large ecological impact, the potential of exploiting the "urban mine" has received greater attention lately. Scientists, industries, and governmental bodies worldwide begin to rethink how to extract valuable materials by recycling and finding solutions for a circular economy. To know about occurrence and content of these urban mines, the stakeholders need a systematic method to keep track of and display stocks and flows of the materials entering, staying within and leaving the different processes of the anthroposphere. The quantification of flows and stocks of materials, e.g. for a certain sector, in a certain ecosystem or by a specific population, can be done by materials flow analysis (MFA). Since products used in Europe are often manufactured off-shore, their composition and origin is not always specified in detail. A global view and increased transparency is thus indispensable for a proper assessment of materials' and products' ecological impact, and for enabling informed and sustainable decisions.

The ESM session aims at showing different approaches to gather a holistic view on products, their raw materials and the related environmental and social impact, and to acquire and aggregate the necessary knowledge. Thus, contributions on different angles and methodologies are welcome – besides life cycle assessment and materials flow analyses also related and modified approaches such as criticality analyses, life cycle sustainability assessment, value-chain mapping, economic input-output LCA, or socio-economic assessment.

## THE DESTINATION



Ever since the 4<sup>th</sup> century BC, when it was founded, Thessaloniki has kept its urban character and has remained a civic center and the hub of the region. The city's centuries-long multicultural history has been associated with great empires, as it has known the Roman, Byzantine, and Ottoman Rule. Thessaloniki was greatly influenced by many ethnic and religious groups (Jews, Romans, Armenians, and others), as well as Greeks from Constantinople, Pontus (northeastern Turkey), and Asia Minor. Numerous monuments, dating to various historical periods, coexist in a unique and charming way and manifest Thessaloniki's multicultural and cosmopolitan history. Nowadays, the historic capital -by right- of Macedonia, the land of Alexander the Great, has evolved into a modern and alluring metropolis.

A multitude of monuments and cultural assets and the city's tradition exist in harmony with a modern lifestyle and high-tech infrastructure, a casual mood, the spirit of hospitality, a vibrant local population, diverse artistic events, a long list of choices for entertainment, an exceptional culinary tradition, and a fresh feel in the atmosphere, coming from the seafront and the northwest winds. Thessaloniki is located at the center of a greater area with incomparable historical monuments and natural sites and offers the opportunity for visits to archaeological sites known over the world (Ancient Pella, Vergina, Dion, Petralona Cave), to areas of exquisite natural beauty (river deltas, lakes, Mt. Olympus), to the monastic state of Agion Oros [the Holy Mountain], as well as to Halkidiki, a famous tourist destination. Additionally, there is always the opportunity to practice sports (swimming, ski, golf, etc.) or to indulge in wellness tourism (hot springs, spas). In short, Thessaloniki is a city that can cater for even the most demanding needs, any time of the year.