

o-OCO AREA B: STRUCTURAL MATERIALS

B: STRUCTURAL MATERIALS

Research on structural materials is a fascinating field, full of discoveries and commercial opportunities. Nowadays, industry, academia, and funding agencies have a once-in-a-generation opportunity to achieve climate neutrality by 2050 - the European Green Deal, the Clean Planet for All strategy, and the Paris Agreement. It will thus contribute to fighting climate change and moving towards a zero-pollution ambition for a toxic-free environment and a circular economy using digital technologies as an enabler and new forms of collaboration. Many industries are committed to reducing their emissions and thereby contributing to the achievement of climate targets. The timing is perfect, Area "B - Structural Materials " in Euromat a wide-ranging coverage and consolidates research activities in all experimental and theoretical aspects of advanced steels and cast irons, light weight metals, high-temperature alloys and intermetallic compounds, advanced ceramics, and high entropy alloys. This area emphasizes those aspects of the science of structural materials that are concerned with their manufacturing, processing, and fabrication, the relationship between the macro/ micro/nanostructures and properties (mechanical, chemical, electrical, electrical, electrochemical, magnetic, and optical), industrial materials, and more importantly, resource and supply chain issues, and life cycle and sustainability practices.

AREA COORDINATORS

Prof.



Francisca Caballero Spanish National Research Council (ES)



Prof. **Pawel Zieba** Polish Academy of Sciences (PL)

SYMPOSIA

B01:	Advanced Steels
B02:	Light Weight Metals
B03:	High-Temperature Alloys and Intermetallic
B04:	Advanced Structural Ceramics
B05:	High Entropy Alloys
B06:	Fatigue, Wear and Corrosion of Materials and Structures
B07:	Materials Characterization, Testing and Modeling
B08:	Advanced Cast Irons
B09:	Theory-Guided Development of Structural Materials

DEADLINE FOR ABSTRACT SUBMISSION 31 January 2023

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DEAR MATERIALS SCIENCE AND ENGINEERING COMMUNITY, DEAR COLLEAGUES,

We cordially invite you to join the 17th European Congress and Exhibition on Advanced Materials and Processes - FEMS EUROMAT 2023, which will be held in Frankfurt am Main, Germany, 03 - 07 September 2023. The congress venue will be the Frankfurt Goethe-University's new Westend Campus with its park-like ambiance and beautiful travertine-faced buildings, one of Germany's most attractive ones.

Our ambition is to organize a memorable and successful congress in the tradition of previous FEMS EUROMAT congress to offer delegates many opportunities to engage in discussions, build new and strengthen existing partnerships and collaborations within and outside Europe.

Germany has a long tradition in Material Science and Engineering. The German Materials Society - DGM - was founded in 1919 and is one of the founding members of FEMS.

DGM's proprietary congress platform will serve as a proven interface allowing delegates to participate on-site or connect from another location via internet. As the first hybrid FEMS EUROMAT, we will offer the best of both worlds – physical and virtual.

We hope that you'll participate in the congress to share with us your experience and views in the field of Materials Science and Engineering.

On behalf of the Scientific Committee



Prof. Dr. Ehrenfried Zschech deepXscan GmbH, Dresden, Germany *Chair of FEMS EUROMAT 2023*

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Congress Office Deutsche Gesellschaft für Materialkunde e.V. Marie-Curie-Straße 11-17 53757 Sankt Augustin, Germany T +49 (0) 69 75306 750 euromat@dgm.de

ABOUT FRANKFURT AM MAIN

Frankfurt's skyline is truly unique. From the Main Tower's rooftop observation platform, situated some 200 meters above the city streets, one has a spectacular view of the surrounding region. Nearby, in the historical old town, Römer City Hall, the Frankfurt Cathedral and St Paul's Church are all must-sees.

Old town flair in the heart of the big city: A old part of Frankfurt has been brought back to life. Completed in 2018, the New Frankfurt Old Town consists of 15 faithfully reconstructed buildings and 20 brand-new dwellings connected by a series of winding laneways. Many of the buildings feature structural ornaments dating back to the Middle Ages – thankfully saved from the destruction of World War II and now returned to their places of origin. A series of museums, restaurants, bars and shops combine to breathe new life into the old quarter, nestled between Frankfurt Cathedral and the Römerberg, turning it into a lively new urban space.

CONGRESS VENUE

Goethe University was founded in 1914 as a unique "citizens' university," financed by wealthy citizens in Frankfurt, Germany. Named in 1932 after one of the city's most famous natives, Johann Wolfgang von Goethe, today the university has over 48,000 students. Goethe University is the third largest university in Germany.

Goethe University

Westend Campus Seminar Building Theodor-W.-Adorno-Platz 5 60323 Frankfurt, Germany



Campus Westend, Goethe University, Frankfurt, Germany

03 - 07 Sep 2023 (Frankfurt am Main) euromat2023.com

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Area B: Structural Materials **B01: Advanced Steels**

The development of any future advanced generation of steels involves a thorough understanding of the mechanisms governing phase transformations and the processing- microstructure-property relationships.

The scope of the symposium covers topics from new design methods and concepts to the evaluation of novel steels performance in service. To achieve this, a detailed microstructure characterization from the atomic to the microscopic level is required. This underpins the fundamental understanding of processingmicrostructure-properties-performance relationships.

This forum will enhance progress and support future advances in modern structural steels by promoting interaction and communication between scientists, designers, and end users.

Symposium Organizer



Dr. Carlos Garcia Mateo CENIM-CSIC



Dr. Goro Miyamoto Tohoku University



Dr. Matthias Kuntz Robert Bosch GmbH





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Area B: Structural Materials B02: Light Weight Metals

Light weight metals, including aluminum, magnesium, and titanium, are key materials for the development of many technologies to improve our lives and gain a sustainable future.

This symposium will be a meeting point for professionals and researchers on light weight metals to share their knowledge, show their advances, and discuss the exciting present and future of light weight materials, metal matrix composites, and high-entropy alloys.

Contributions related to novel materials or processing techniques, such as additive manufacturing or nanostructuration, and postprocessing methods, such as heat treatment, surface treatment, or coatings, are welcomed. Also, theoretical contributions, applied research, new technologies, and recycling are encouraged.

With the expected contributions, the symposium will be an excellent opportunity for knowledge exchange and networking for all the participants.

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

- Alloy design including aluminum, magnesium, titanium alloys, and high-entropy alloys.
- Light weight metal composites, cellular materials, and foams.
- Advanced processing and nanostructuration.
- Additive manufacturing of light weight metals.

- Performance evaluation of light weight metals in different applications, environments, and conditions: mechanical, thermal, electrical, biocompatibility, wear, corrosion, ...

- Novel testing and characterization of light alloys.
- Modeling and simulation.
- Improvements in sustainability, recycling, and live cycle of light weight metals.
- Light weight metals for the achievement of the UN Sustainable Development Goals.

Symposium Organizer

DGM



Prof. Dr. Joaquín Rams Rey Juan Carlos University



Dr. Belén Torres Barreiro Rey Juan Carlos University



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Area B: Structural Materials B03: High-Temperature Alloys and Intermetallic

The transition to low-carbon energy production poses a large number of technological challenges. One of them is to improve the efficiency of energy production systems to minimize the use of resources. It is well known that the best way to increase efficiency is to increase the process temperature. Thus, low carbon energy technologies as different from each other as fuel cells and hydrogen, concentrated solar power, bioenergy, geothermal, and sustainable nuclear, find commonalities in need to operate at temperatures above 400°C, up to 1000°C. These extreme operating conditions, that is high temperature operation under an aggressive environment, requires the use and development of alloys that maintain their integrity for a sufficiently long time within reasonable costs.

This symposium will focus on the understanding processing-microstructure-property of high temperature resistant alloys and Intermetallic for structural application in energy production systems. Topics of interest include:

- Development of new materials with superior creep and/or corrosion resistance at high temperature
- Improvement of material performance at high temperatures by tailoring chemical composition or thermomechanical process
- Advanced characterization techniques to assess high temperature mechanical properties and corrosion resistance
- Advanced tools to accelerate the materials development process, e.g., by the use of high throughput characterization techniques, artificial intelligence algorithms, automatization of process, ...

Experimental and modeling contributions are welcome

The symposium will gather researchers interested in material development to operate at high temperatures and aggressive environments as well as on advances techniques to assess creep and oxidation/corrosion resistance.

Symposium Organizer

DGM



Dr. Rebeca Hernández Pascual CIEMAT



Prof. Dr. Marta Serrano García CIEMAT



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Area B: Structural Materials B04: Advanced Structural Ceramics

Advanced structural ceramics demonstrate enhanced mechanical properties under demanding conditions. They serve as structural components and are often subjected to mechanical and thermal loading, not only in structural applications in place of metals, polymers, and composites but also in functional applications.

Under erosive, corrosive, or high-temperature environments, advanced ceramics display superior wear resistance, making them ideal for tribological applications, such as mineral processing equipment, while others are chemically inert and therefore suitable for bone replacements in the highly corrosive environment of the human body. Strong covalent bonds also make some of these ceramics thermo-chemically inert and resistant to ablation, with promising use in the areas of aerospace, automotive, and power generation.

Additionally, today's growing complexity of many classes of functional ceramics poses major challenges to structural science, to which the development and the increasing predictive power of computation make key contributions. Consequently, the complexity of structural problems and the structure-function relationships are intensively studied for miniaturized applications, as well as in the functional fields of sensors, energy, and catalysis, most of the time in terms of device viability and re-usability.

All the above applications have to go beyond a number of technological barriers in order to enable the use of structural and functional advanced ceramics in everyday reality. The most significant challenges include the inherent flaw sensitivity of ceramics and the variability of their mechanical properties during use. Toughening methods, such as the engineering of microstructures that may obstruct the propagation of cracks or absorb energy during the crack propagation, or phase transformation and microcracking, or even the introduction of fiber, are research lines under continued exploration. These challenges are also tackled throughout innovative ceramic processing technologies, such as colloidal procedures, additive manufacturing, and fast/cold sintering technologies.

Therefore, the topics of the Advanced Structural Ceramics Symposium are related to:

- Processing strategies and challenges for microstructure engineering
- Ceramics and composites in extreme environmental conditions
- Structural integrity of functional ceramics
- Thermo-mechanical behavior in different extreme environments
- Predictive computational models

Symposium Organizer

DGM



Dr. Begoña Ferrari Spanish National Research Council



Dr. Laura Silvestroni National Research Council



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Area B: Structural Materials B05: High Entropy Alloys

This symposium will provide a venue for presentations of research progress on the experimental discoveries and theoretical modeling of high-entropy alloys (HEAs) and related compositional complex alloys (CCAs), covering alloy design, processing, microstructures, and structural and functional properties. Presentations dedicated to other types of high-entropy materials, for example, high-entropy ceramics, are also welcomed.

In contrast to conventional alloys, which are mainly based upon one principal element, HEAs/CCAs have multi-principal elements, often four or more. The significantly high mixing entropy could stabilize the solid-solution phases in face-centered-cubic (FCC), body-centered-cubic (BCC), and hexagonal close-packed (HCP) structures against intermetallic compounds. Moreover, carefully designed HEAs/CCAs possess tailorable properties that compete and, in some cases, surpass conventional alloys. Depending on alloy systems, such properties include strength, ductility, corrosion and oxidation resistance, fatigue and wear resistance, and functionalities like superconductivity, thermoelectricity, and catalysis. These properties will undoubtedly make these new materials of interest for use in various structural and functional applications. Given the novel and exciting nature of HEAs/CCAs, the research area is seeing rapid growth.

Topics to be covered in this symposium include but are not limited to:

- Material fabrication and processing, such as casting, powder metallurgy, additive manufacturing, severe plastic deformation, and thermomechanical treatments
- Advanced characterization, such as synchrotron and neutron scattering, three-dimensional (3D) atom probe tomography, and high-resolution TEM
- Mechanical behavior, such as fracture, fatigue, creep, and micro/nano-mechanics
- Functionality, such as magnetic, electric, thermal, catalytic, and biomedical behavior
- Corrosion and oxidation behavior
- Wear and tribological behavior
- Hydrogen storage and hydrogen embrittlement
- Coatings and surface treatment
- Combinatorial alloy design and high throughput screening
- Theoretical modeling and simulation using density functional theory, molecular dynamics, Monte Carlo simulations, phase-field, and finite-elements method, and CALPHAD modeling
- Machine learning and artificial intelligence applied to the discovery of novel HEAs/CCAs

- 1D and 2D high-entropy materials, including for example, high-entropy nanoparticles and highentropy MXenes

- Industrial applications

Symposium Organizer

DGM



Prof. Dr. Sheng Guo Chalmers University of Technology



Dr. Jörg Kaspar Fraunhofer Institute IWS Dresden



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Area B: Structural Materials

B06: Fatigue, Wear and Corrosion of Materials and Structures

Light-weight design, harsh operation conditions, extending safe service life, CO_2 efficient and new manufacturing routes, and multiscale materials simulation concepts are challenging issues to be addressed in today's mechanical design and testing of materials. This is, in particular, the case, when interactions between fatigue, wear, and environment, e.g., fretting fatigue,

- fretting fatigue,
- corrosion fatigue,
- thermo-mechanical fatigue,
- very high cycle fatigue,
- stress-corrosion cracking,
- tribo corrosion, etc.

need to be taken into account. The symposium addresses these interactions as "missing links" in

- mechanical materials characterization,
- modeling, simulation, and data-driven approaches.

Of course, any other contributions dealing with one of the aspects, fatigue, wear and corrosion of any type of engineering materials (metallic alloys, composites, polymers, etc.), are welcome.

Symposium Organizer

DGM



Prof. Dr.-Ing. habil. Ulrich Krupp RWTH Aachen University



Prof. Dr. Thierry Palin-Luc ENSAM



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Area B: Structural Materials

B07: Materials Characterization, Testing and Modeling

The scope of this symposium is to bring together scientists and engineers from different communities to discuss the latest developments in material characterization, testing, and modeling. A strong focus is placed on the relationship between the mechanical properties of materials and their microstructure under various complex loadings.

To ensure safety, reliability and durability of materials and components, it is vital to improve knowledge and understanding about their internal structure, physical properties, and behavior in response to inservice variables such as mechanical, thermal, and environmental loadings as well as materials related variable (phases, precipitates, grain size, etc). In addition, the development of engineering components relies on adequate modeling and simulation of material deformation, damage, and failure under application-relevant loading conditions. Microstructure and mechanical characterization methods must therefore be targeted and intelligent such that situation-appropriate material models can be developed and the behavior of safety-critical components can be approximated with confidence.

Targeted topics include, but are not limited to:

- Fundamental physical deformation mechanisms in structural materials.
- Effect of in-service variables on microstructure and mechanical properties of materials.
- Characterization of structural materials using, for example, DIC, DIC 3D, SEM, EBSD, FIB-SEM, TEM, XRD, NDT.

- Mechanical test methods that characterize, for example, creep, fatigue, thermo-mechanical fatigue, bi-axial behavior and performance in different environments (e.g., vacuum, hydrogen).

- Failure of materials, including crack initiation and propagation under creep, fatigue, stress, corrosion, oxidation.
- Surface modifications/treatments and their effect on damage and mechanical properties,
- Modeling and numerical simulation approaches for material deformation and processing, and
- Fracture mechanics.

This symposium covers materials for propulsion, energy and power generation, metallic materials, structural materials, functional materials, composite materials, novel alloys, coatings, etc.

Symposium Organizer

DGM



Dr. Pearl Agyakwa The University of Nottingham

Dr. Svjetlana Stekovic Linköping University



Dr. James Rouse The University of Nottingham



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Area B: Structural Materials B08: Advanced Cast Irons

Advanced cast irons can be produced with excellent mechanical and service properties that can challenge several quenched and tempered steels for structural components, with the benefit of tremendous production cost savings because of near-shape casting and low alloying element contents. Advanced cast irons consist of several classes of new modern materials, e.g., high-Si irons where silicon promotes fully ferritic structures with significant solid solution strengthening effect; austempered ductile irons where opportune heat treatments trigger a microstructure made of tough bainite and metastable carbon-rich austenite which confers remarkable strength and ductility; ductile irons with perferritic structure that has the same strength as conventional fully pearlitic ductile irons but higher ductility; high Ni grey and ductile irons with austenitic metallic matrix with good corrosion resistance, and excellent for high and low temperature applications; compacted graphite irons which are fast developing at the expense of grey and ductile irons.

The combination in advanced cast irons of excellent mechanical properties, significantly lower cost, and relatively lower density than steels, makes the use of these materials very attractive for components in heavy transportation like trucks, mining machinery, and train systems, and in power generation as in wind turbines.

In this symposium on modern cast irons for structural applications, contributions from experimental investigations and numerical simulations are invited, covering topics like melt control, modification and inoculation, pouring process, solidification and heat treatments, mechanical properties. Control and prediction of process-microstructure-properties relationships are key issues.

Topics to be covered:

- Mould filling
- Solidification and solid-state transformations
- Modification and inoculation
- Characterization via advanced techniques
- Microstructure characterization
- Mechanical properties
- Residual stresses
- Tribology and machinability
- Mathematical modeling and applications

Symposium Organizer

DGM



Dr. Tito Andriollo Aarhus University



Dr. Giuliano Angella CNR-ICMATE



Prof. Dr.-Ing. Marcin Górny AGH University of Science and Technology

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Area B: Structural Materials

B09: Theory-Guided Development of Structural Materials

There is a pressing need to develop new structural materials for a range of industries. Automotive, aerospace, nuclear, and energy sectors are just some of the sectors demanding new materials. Such demand stems from environmental, criticality, and sustainability needs, as well as the emergence of new technologies such as electric cars and airplanes, fusion and small nuclear reactors, and additive manufacturing. This symposium aims to provide a forum to present theory-guided research by adopting one or several of the established techniques for materials design. Work including one or several tools such as computational thermodynamics, dislocation dynamics, crystal plasticity, density functional theory, molecular dynamics is welcome. We particularly encourage the presentation of work wherein structural properties are set out as objectives for material design; these may include strength, corrosion and hydrogen embrittlement resistance, fatigue, ductility, and toughness.

This is a joint symposium with symposium D12 in area D "Characterization and Modeling"



Prof. Dr. Raymundo Arroyave Texas A&M University





Prof. Dr. Pedro Rivera Diaz Del Castillo University of Southampton





ARFAS



A: Functional Materials **Bernhard Bayer-Skoff**

TU Wien, Austria Luis Pereira UNINOVA, Portugal



B: Structural Materials

Francisca Caballero

Spanish National Research Council, Spain **Pawel Zieba** Polish Academy of Sciences, Poland



C: Processing

Eduard Hryha Chalmers University of Technology, Sweden

Ioanna Zergioti National Technical University of Athens, Greece



D: Characterization and Modeling

Eva Olsson Chalmers University of Technology, Sweden

Christophe Pinna The University of Sheffield, UK



E: Energy and Transportation Vito Di Noto

University of Padova, Italy **Dirk Lehmhus**

Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany



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Strategy and Technology

Transfer

F: Materials for Healthcare

Aldo R. Boccaccini Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany Sandra Van Vlierberghe

Gent University, Belgium

G: Education, Strategy and Technology Transfer Marco Falzetti G: Education,

APRE - Agenzia per la Promozione della Ricerca Europea, Italy

Paloma Fernández Sánchez Universidad Complutense de Madrid, Spain



H: Materials for Circularity and Sustainability

Gesa Beck SRH Berlin University of Applied Sciences, Germany

Artur Braun

Swiss Federal Laboratories for Materials Science and Technology (EMPA), Switzerland

Deadline for abstract submission: 31 January 2023. Contribution submissions from Young Scientists are welcome.

KEYDATES & DEADLINES

31 JANUARY 2023 DEADLINE FOR ABSTRACT SUBMISSION

31 JANUARY 2023 DEADLINE EARLY BIRD TICKETS

MAY 2023 AUTHORS CONFIRMATION

JUNE 2023 PRELIMINARY PROGRAM

03 SEPTEMBER 2023 START OF EUROMAT 2023

EARLY BIRD TICKETS

ON-SITE TICKETS*

FEMS MEMBER - FULL CONGRESS	805€
FEMS MEMBER - HALF CONGRESS	515€
REGULAR - FULL CONGRESS	950€
REGULAR - HALF CONGRESS	610€
REGULAR - ONE DAY	380€

ON-SITE TICKETS - YOUNG SCIENTISTS*

Full Congress only. Bachelor, Master and PhD Students up to 30 years (proof required). These tickets cannot be booked separately without a catering

YOUNG SCIENTISTS - FEMS MEMBER	433€
YOUNG SCIENTISTS - REGULAR	510€

ONLINE TICKETS**

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MS MEMBER	325€
EGULAR	380€

*On-site tickets include:

the possibility to watch all contributions on-demand for 14 days after the

****Online tickets include:**

the online participation through a browserbased web congress plattform and the possibility to watch all contributions on-demand for 14 days after the

Congress Office

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