

MATERIALS SCIENCE AND TECHNOLOGY IN EUROPE

FEMS EUROMAT23

03 - 07 September 2023

Frankfurt am Main (Germany) & Online

AREA H:

**MATERIALS FOR
CIRCULARITY AND
SUSTAINABILITY**



H: MATERIALS FOR CIRCULARITY AND SUSTAINABILITY

The scope of the topic "Materials for Circularity and Sustainability" are materials science challenges and solutions for sustainable development to stop the dramatic increase of the demand for material resources. For instance, in the last 40 years, global material extraction increased about three times to more than 90 billion tonnes. According to a historical trend, this extraction would rise in the next 40 years up to more than 180 billion tonnes. If a scenario towards sustainability development is assumed - with circulating of materials (e.g., by re-use, re-manufacturing, and re-cycling) - 25 % less increase can be expected. [UN Environment, International Resource Panel, Global Resource Outlook 2019].

There are numerous opportunities to improve material circulation, like research activities for standard materials in mono-material fluxes (e.g., steel, aluminum, glass, and paper) or for complex products like buildings or electronic products. Carbon-based materials (bio-based and plastics) need other technologies to circulate than inorganic materials.

AREA COORDINATORS



Prof. Dr.

Gesa Beck

SRH Berlin University of Applied Sciences (DE)



Dr.

Artur Braun

Swiss Federal Laboratories for Materials Science and Technology (EMPA) (CH)

SYMPOSIA

H02: Financing and Business Models for Circular Economy

H03: Recycling of Technology Materials and Composites from WEEE

H05: Carbon-Capture Technologies, Polymeric and Bio-Based and Biodegradable Materials in Circular Economy

H06: Processing and Properties of Recovered Metals and Alloys from Contaminated Recycling Fractions

H07: Digitalization for Circularity

H08: Nanomaterials in Products and Processes under Circular Considerations

H09: Materials Circularity for Sustainability

H10: Fundamental Science of Sustainable Metallurgy

DEADLINE FOR ABSTRACT SUBMISSION

31 January 2023

[EUROMAT2023.com](https://www.euromat2023.com)



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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

[EUROMAT2023.com](https://euromat2023.com)



Congress Office

Deutsche Gesellschaft für Materialkunde e.V.

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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

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Area H: Materials for Circularity and Sustainability

H02: Financing and Business Models for Circular Economy

This symposium discusses recent innovations in the field of circular business models and their dissemination in an interdisciplinary manner. It welcomes both practitioners and members of the academic community. To represent the diversity of approaches, a broad definition of circular business models is applied, comprising all business solutions aimed at improving the circularity of resource use along the life cycle stages of a product. This can involve, amongst others, solutions for the following stages:

- Product design: Solutions aimed to improve the longevity, durability, or recyclability of products
- Manufacturing: Solutions to substitute non-renewable with renewable inputs to foster the re-manufacturing of used product components
- Retail: Solutions to organize/stimulate the re-use of products
- Use: Product sharing models, products-as-a-service models, repair services
- Waste disposal: Solutions to enhance waste collection or sorting
- End-of-life treatment: Solutions to increase resource recovery (recycling, composting, energy recovery, etc.)

Presenters are allowed to address this subject area from different angles. First, they could present specific business solutions (ideas, start-ups) by highlighting their economic viability, their market environment, and their contributions to the societal goals of circularity and sustainability. Second, they could discuss financing instruments designed to promote the dissemination of business solutions in this field. Or third, they could provide a general overview of opportunities and barriers concerning the market penetration of circular business solutions in certain life cycle stages, covering aspects related to technology (readiness, cost structure), consumer preferences (attitudes, sentiments), or regulation (EU, national legislation).

Symposium Organizer



Maja Jelic
ABCircular GmbH



Dr. Andre Wolf
Centrum für Europäische Politik



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Area H: Materials for Circularity and Sustainability

H03: Recycling of Technology Materials and Composites from WEEE

The world is facing enormous challenges like broken supply chains, a short supply of raw materials, and an increasing amount of complex and, thus, hard to recycle WEEE. The symposium will deal with all aspects of WEEE recycling and value preserving technologies to recover even small amounts of rare, valuable, and critical materials. The detoxification of waste streams, as well as the improvement of yields and qualities of the recycling processes, shall be addressed. Furthermore, the symposium will cover modern recycling processes and analytical methods that can be applied to detect hazardous as well as valuable materials and sorting techniques. The potential of modern, fully automated multisensor systems in combination with artificial intelligence, material, and product databases will be presented as well as alternative approaches such as thermal and chemical recycling that also can be solutions to separate complex composite materials. It includes mitigation of energy use and reduction of emissions (CO₂) and all measures to optimize the material circularity index and environmental impact as a whole.

Symposium Organizer



Dr.-Ing. Mertol Göknelma
Izmir Institute of Technology



Dr. Barbara Güttler
Leibniz-Institut für Verbundwerkstoffe



Dr. Karsten Wambach
Bifa Umweltinstitut GmbH



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Area H: Materials for Circularity and Sustainability

H05: Carbon-Capture Technologies, Polymeric and Bio-Based and Biodegradable Materials in Circular Economy

Growing social environmental awareness about the hazards of the plastic pollution in nature and high emissions requires a systematic introduction of the circular economy into the plastics industry. Similarly, as in nature, this approach aims for a technically regenerative system, where the waste generated during the production (post-industrial or pre-consumer) as well as after the service life of products (post-consumer) can be recycled and reused as effectively as possible. The economic and ecological basis for post-consumer recycling is products and materials designed both to fulfill consumer needs during the service life and for subsequent recycling (design for recycling).

However, the above-mentioned approaches are still not sufficient to reduce the overall environmental impact and meet net-zero emission targets. Carbon-capture is a crucial technology to mitigate climate change and reduce carbon emissions produced by various industries, transportation, etc. The captured CO₂ can be used as a resource or stored, providing the basis for carbon removal from the atmosphere.

At the same time, the practical realization of these approaches needs close international collaboration between scientists, industry, and relevant authorities and agencies. In this context, the symposium offers a platform for a better understanding of the challenges and innovative solutions in the field, as well as scientific and personal exchange with colleagues.

Contributions for oral presentations and posters should include but are not limited to the following:

- Advanced bio-based, biodegradable, and synthetic polymers and composites
- Design for recycling of plastics and plastic-based products
- Recycling of synthetic and biobased composites
- Advanced characterization techniques for recycled materials and recyclability
- Innovative recycling technologies and processes
- Green production
- Carbon capture, storage, and its utilization approaches
- Circular carbon approaches (combination with industrial processes)
- Circular bio-economy
- Regulatory framework required for a sustainable circular economy

Symposium Organizer



PD Dr. rer. nat. habil. Satyanarayana Narra
University of Rostock



Dr. Giovanni Perotto
Istituto Italiano di Tecnologia (IIT)



Dr. Madina Shamsuyeva
Leibniz Universität Hannover



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Area H: Materials for Circularity and Sustainability

H06: Processing and Properties of Recovered Metals and Alloys from Contaminated Recycling Fractions

In the future, increasingly important sources of recyclable materials can be expected in the field of electromobility. E-car bodies and battery boxes are primarily made of structural materials such as iron and aluminum-based alloys in order to significantly reduce vehicle weight and, thus, increase the vehicle's range. In addition, metals are also used as functional materials in the battery cell as electrode material and are available for recycling as well.

However, when recycling an E-car at the end of its product life, as in many other areas, it is virtually impossible to separate the various alloys used by type, which is why the resulting recyclate contains various alloying elements and impurities which, if not regenerated with primary alloys, would increase contamination in the secondary material cycle after each cycle steadily.

This is precisely the thematic focus of the symposium, which calls for submissions that address research into new approaches to the metallurgy and processing of contaminated recycled fractions, taking into account the properties of products made from them.

Symposium Organizer



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



Prof. Dr. Stefan Pogatscher
Montanuniversität Leoben



Prof. Dr.-Ing. Axel von Hehl
University of Siegen



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Area H: Materials for Circularity and Sustainability

H07: Digitalization for Circularity

Increasing material circularity is a very complex task involving many stakeholders from different scientific communities. Due to the diverse time and length scales involved (compare steel used in infrastructure with steel components in a smartphone), digitalization plays an important role in increasing sustainability.

This symposium will bring together experts from different modeling fields as it covers all aspects related to Digitalization and Circular Materials:

- Modeling of material flow
- Modeling-based assessment of sustainability (ecological, economic, and social), incl. criticality
- Simulation of recycling processes
- Simulation-based efficiency enhancement
- Computational design of Circular Materials
- Digital twins as part of the design for recycling
- Databases and software surrounding Circular Materials

Symposium Organizer



Dr. Emanuel Ionescu
Fraunhofer Research Institution IWKS



Dr. Moritz to Baben
GTT-Technologies



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Area H: Materials for Circularity and Sustainability

H08: Nanomaterials in Products and Processes under Circular Considerations

The symposium focuses on nanomaterials in products and processes under circular considerations on the intersection of science, technology, environment, and health issues for taking action for a sustainable world for all.

The shift from a linear economy, 'take-make-dispose' to a circular economy, including reduce, reuse, recycle, and recover, has gained much attention recently. Besides, nanotechnology, which is one of the most exciting crucial enabling technologies of the twenty-first century, has become more popular technology compared to conventional technology. The benefits of nanotechnology depend on the fact that it is possible to tailor the structures of materials at extremely small scales to achieve specific properties, thus greatly extending the materials science toolkit.

The repercussions of biodiversity loss, deforestation, careless waste disposal, air pollution, water insecurity, toxic loads, plastic pollution, global warming from fossil fuels, and climate change are presently being felt both individually and collectively around the world.

The symposium includes an overview of scientific, technical, environmental, and health issues related to nanomaterials, their synthesis and characterization techniques, physical, chemical, and biological properties. Nanotechnology, in which nanomaterials are used in order to make use of size- and structure-dependent properties and phenomena of products thanks to nanoscience, has a wide range of application fields from energy to health, from food security to the electronic industry.

The symposium covers all aspects of nanomaterials, nanoscience, and nanotechnology, such as:

- Nanomaterials, synthesis, and characterization techniques
- Nanomaterials, physical, chemical, and biological properties
- Nanomaterials, (e.g., synchrotron-based) spectroscopic techniques
- Modeling of nanomaterials, theoretical studies of nanomaterials
- Nanomaterials for renewable energy and hydrogen energy
- Nanomaterials for a clean environment
- Nanomaterials for electronics
- Nanomaterials for water and food security
- Nanomaterials for medicine (imaging, prevention, detection, and treatment of diseases/viruses)
- Nanomaterials for nanobiotechnology
- Nanomaterials in products in landfills, in organic processes, in recycling processes

with particular attention to contributions focusing on process and product design in the framework of circular economy.

Symposium Organizer



Prof. Dr. Selma Erat
Mersin University



Prof. Dr. Maurizio Fermeglia
University of Trieste



Dr. Carsten Gellermann
Fraunhofer Institute ISC and FNT



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Area H: Materials for Circularity and Sustainability

H09: Materials Circularity for Sustainability

With the transition to a circular economy and to contribute to the global agenda on zero carbon footprint for sustainable infrastructure, EuroMat encourages the introduction of fresh solutions and collaborations in Materials Circularity. Redesigning of circular materials to create, preserve and recover value, regeneration of raw materials free of toxic precursors and by-products, and hence, resolving key supply chain challenges. Value Retention Processes or VRPs are commonly applied to keep technical nutrients within a circular economy. Strategically adopting VRPs must identify policies in terms of Impact metrics; use of material and energy, emissions, waste production, cost advantage, and employment opportunity ensuring greater utility, service-life, and value of the products and their components. The session aims to address all aspects of circularity engineering related to VRPs, for diverse materials and processes of engineering applications. Pressing challenges will be viewed under the lens, such as innovation for making sustainable products, the potential for creating a more harmonised and aligned approach to policy, and legislation, Life Cycle Assessments in making a new material choice, and scalability of advanced materials. The current challenges, as well the latest technologies and solutions related to materials science and engineering, should be discussed; and introduced during the EuroMat conference in Frankfurt. Themes can be around:

1. Future of Sustainable Materials in Diverse applications.
2. Challenges and Strategies for mass adopting circular Materials.
3. Closed loop scaling of Repair, Reuse, Remanufacture, Refurnish, Redesign
4. Identifying advanced technologies in Accelerating Sustainable Innovation
5. Green Skills: Upskilling the Future Workforce
6. Role of Materials and Process Innovation
7. Key Challenges in Reuse and Breakdown of existing products
8. Sustainability Assessment of Materials Selection and related Processes
9. Policy Framework in Materials Circularity

Symposium Organizer



Prof. Dr.-Ing. Frank Balle
University of Freiburg



Dr. Kiran Gulia
University of Wolverhampton



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Area H: Materials for Circularity and Sustainability

H10: Fundamental Science of Sustainable Metallurgy

Metallic materials are of enduring importance in our society, and they have enabled civilization over millennia through structural and functional applications, even under the harshest environmental conditions. However, their production often requires a huge energy input (~8% of the global energy) and generates ~30% of industrial CO₂-equivalent emissions, becoming an unfavorable cause of global warming. To tackle the urgent decarbonization challenges in the metal industry, innovative and sustainable paradigm shifts must be quickly developed in metallurgical processes.

This symposium focuses on fundamental research in the field of sustainable metallurgy to support the disruptive technology shifts in the metal industry (incl. steel, aluminum, nickel, manganese, titanium, etc.). Topics of particular interest include, but are not limited to:

- Sustainable metallurgy approaches of ferrous and nonferrous metals using renewable energy resources, e.g., renewable hydrogen and electricity, biomass, etc.
- Strategies for efficient utilization of low-grade input materials
- Sustainable metallurgical approaches using recycled scraps, impurity element detections, and impurity-tolerant material/process design
- Use of metallurgical by-products such as slag, dust, and sludges as secondary raw materials
- Fundamental understanding of physical, chemical, and mechanical phenomena in sustainable metallurgical processes
- Development and application of advanced instrumentations for in-situ and in-operando experimentation during sustainable metallurgical processes
- Multiscale experimental and computational approaches
- Data-driven prediction and optimization of metallurgical processes

Symposium Organizer



Alexander Roald Michael Gramlich
RWTH Aachen University



Dr.-Ing. Yan Ma
MPI für Eisenforschung GmbH



Prof. Dr. Johannes Schenk
Montanuniversität Leoben



Dr.-Ing. Wenwen Song
RWTH Aachen University



AREAS



A: Functional Materials

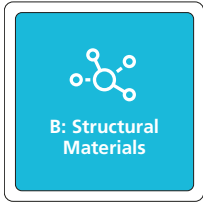
A: Functional Materials

Bernhard Bayer-Skoff

TU Wien, Austria

Luis Pereira

UNINOVA, Portugal



B: Structural Materials

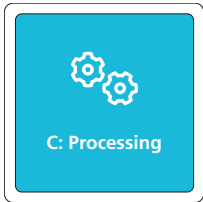
B: Structural Materials

Francisca Caballero

Spanish National Research Council, Spain

Pawel Zieba

Polish Academy of Sciences, Poland



C: Processing

C: Processing

Eduard Hryha

Chalmers University of Technology, Sweden

Ioanna Zergioti

National Technical University of Athens, Greece



D: Characterization and Modeling

D: Characterization and Modeling

Eva Olsson

Chalmers University of Technology, Sweden

Christophe Pinna

The University of Sheffield, UK



E: Energy and Transportation

E: Energy and Transportation

Vito Di Noto

University of Padova, Italy

Dirk Lehmus

Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany



F: Materials for Healthcare

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

G: Education, Strategy and Technology Transfer

Marco Falzetti

APRE - Agenzia per la Promozione della Ricerca Europea, Italy

Paloma Fernández Sánchez

Universidad Complutense de Madrid, Spain



H: Materials for Circularity and Sustainability

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Gesa Beck

SRH Berlin University of Applied Sciences, Germany

Artur Braun

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

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*

These tickets cannot be booked separately without a catering package!

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 package!

YOUNG SCIENTISTS - FEMS MEMBER 433€

YOUNG SCIENTISTS - REGULAR 510€

ONLINE TICKETS**

Full Congress only

FEMS MEMBER 325€

REGULAR 380€

**On-site tickets include:*

the possibility to watch all contributions on-demand for 14 days after the congress | catering package:

- Coffee breaks (Monday, Tuesday, Wednesday, Thursday)
- Lunchtime snacks
- Welcome reception

***Online tickets include:*

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

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DGM

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