

European CMetAC

ECMetAC Newsletter No. 13

July 2024

Dear colleagues of the ECMetAC network,

Greetings from the board of directors!

Our meeting in Kranjska Gora, Slovenia, in November 2023 was very enjoyable and we look forward to two upcoming ECMetAC events.

Our Euroschool will be held in Jülich, Germany, in early November. ECMetAC members costs will be sponsored up to a certain number of PhD students per member, representing a perfect opportunity for PhD students to deepen the links between them. See details below.

The next annual ECMetAC Days will take place in Zagreb, Croatia. Preparations are already underway and the webpage is now live. We are looking forward to welcoming all of you at our yearly meeting in Croatia! Again, more details below.

A new feature in our newsletter is a presentation from one of our partners on their capabilities and interests with a view to stimulating new collaborations. This time Marc Armbrüster has provided details of his lab at the Technical University of Chemnitz.

We wish you all a good summer, with hopefully some nice weather!

Best wishes,

Julian Ledieu, Ronan McGrath,
Marc Armbrüster, Jean-Pierre Celis
and Émilie Gaudry

Call open for the Secretary General position

The mandate of the Secretary General (SG) position will terminate in April 2025. By then, Prof. Ronan McGrath will have been acting as SG for 12 years and will resign from his position due to retirement. Consequently, a call is now **officially open** for candidacy with a deadline set on 15th November 2024. Please address your letter to both Dr. Julian Ledieu (julian.ledieu@univ-lorraine.fr) and Prof. Marc Armbrüster (marc.armbruester@chemie.tu-chemnitz.de). The election will be held in the next GA-GB meeting on 28th November 2024 in Zagreb, Croatia.

Missing Content?

If you have any news items for circulation, either on our website <https://ecmetac.eu/> or in future newsletters, please send them to Julian Ledieu (julian.ledieu@univ-lorraine.fr).

Newsletter Subscription

If you are interested in receiving the ECMetAC newsletter on a regular basis, please go to <https://ecmetac.eu/> and subscribe for the newsletter at the bottom of the webpage.

Imprint

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Aperiodic 2024 in Caen, France

The latest edition of the Aperiodic conference series, was held in Caen, France, in June 2024 and brought together the aperiodic community once again for stimulating talks and discussions across a broad range of topics.



(Caen: View of the castle grounds, right, with the Church of Saint-Pierre in the background)

From a complex metallic alloy point of view, it was heartening to see how we continue to push the boundaries in the discovery and characterisation of incommensurately modulated and quasicrystalline phases. Early deep learning algorithms for phase identification keep us up to date with the machine-learning revolution in materials science, while novel methods to investigate order/disorder (atomic resolution holography, reverse Monte Carlo modelling, Truchet tile architectures) allow for deep structural characterisation.

Aperiodic magnetism remains a hot topic, with at least 10 of the ~55 talks discussing magnetic properties to some degree across both theoretical and experimental disciplines; of particular note was the observation of long-range anti-ferromagnetic order in a Tsai-type quasicrystal, which should prove to be an exciting discovering both within and outside our field.

The conference also saw the presentation of the inaugural Ted Janssen and An-Pang Tsai prize, implemented by the Commission on Aperiodic Crystals of the IUCr. The award, which recognizes 'outstanding contributions to the

field of Aperiodic Crystals', was presented to Dr. Stefan Förster and Prof. Tsunetomo Yamada while family members of both Ted and An-Pang watched on. Many congratulations to both recipients!

The organising committee did an excellent job, aided by fantastic weather, with the gala dinner a highlight: dining atop a ~1000-year-old castle was certainly a unique experience! Likewise, the conference excursion to both Bayeux and Omaha beach gave us all the chance to reflect and contemplate on the rich (ancient and modern) history of the area.

(Contributed by Dr. Sam Coates, University of Liverpool.)

Summer graduate!

Naïma Saadi graduated with her PhD from the University of Liverpool in July 2024. Her PhD thesis, entitled "Multiscale Quasiperiodic Materials," involves the fabrication of complex functional quasicrystalline metamaterials using prominent additive manufacturing methods, including direct ink writing (DIW) and stereolithography (SLA), and the characterisation of their mechanical and photonic properties. Her work, presented at several ECMetAC events over the past 4 years, demonstrated the potential of additive manufacturing for leading-edge material solutions in physics, engineering, and materials science. Naïma was co-supervised by Dr Esther Garcia-Tunon (School of Engineering), Prof. Ronan McGrath, and Dr Hem Raj Sharma (School of Physical Sciences). She now works in research and development at the National Composite Centre in Bristol, UK.



Partner Presentation: Materials for Innovative Energy Concepts at Chemnitz University of Technology

Scope of Work

The group of Prof. Armbrüster is dedicated to exploring the chemical properties of intermetallic compounds. A strong focus is hereby on their catalytic and electrocatalytic behaviour in numerous reactions – selective and CO₂ hydrogenation, methanol steam reforming, electrochemical methanol oxidation, CO₂ reduction or water splitting.

Materials

Preferred form of the intermetallic compounds is in an unsupported, polycrystalline state. The synthesis of these materials is rather straightforward and allows comprehensive subsequent characterisation. For the catalytic studies – on crushed powders for gas-phase reactions or bulk electrodes for electrocatalysis – reliable structure-property relationships can be derived as these are not obscured by support or particle-size effects.

As high-performance catalytic materials are frequently nanoparticulate, also supported intermetallic nanoparticles are synthesised. Characterisation of these much more complex materials is more complicated and often done in cooperation with other groups in the ECMetAC network. The resulting catalytic properties can be understood by the knowledge gained on the unsupported materials.

Co-operation within the ECMetAC network enables also materials from the other end of the complexity range, i.e. cm-sized and well-oriented single crystals. These are catalytically studied in gas-phase and electro catalysis, allowing to gain deep understanding of the orientation-dependent properties. Combining our expertise with the competences on surface science and density functional theory within the ECMetAC network results in understanding on the atomic level, enabling development of innovative catalytic materials.

Methods

The following methods are available in the group:

Bulk synthesis: Arc and high-frequency melting, thermal annealing under different atmospheres, vapour solid synthesis

Nanoparticulate synthesis (supported/unsupported): hot-injection method, reactive metal support interaction, classical wet impregnation and incipient wetness impregnation, electrochemical methods

Characterisation: XRD, DTA/TG, metallography by optical microscopy and SEM (incl. EDX), ICP/OES, electrochemical corrosion studies

In situ and operando characterisation: XRD/MS up to 1000 °C in various static/dynamic atmospheres (water-/methanol-vapour, hydrogen, oxygen, ethylene, acetylene, CO₂ ... and (safe) mixtures thereof), XRD under electrochemical conditions (pouch cell dry or in electrolyte) at ambient temperature. DTA/TG/MS up to 1250 °C in various atmospheres (static or dynamic) as above.



Catalytic testing: Electrochemical (aqueous, non-aqueous) half-cell reactions, fuel cell testing and stability studies. Gas phase catalysis comprises selective hydrogenations (acetylene, crotonaldehyde), methanol and ethanol steam reforming, CO₂ hydrogenation.

Contact

For further questions and inquiries please contact Prof. Marc Armbrüster (marc.armbruester@chemie.tu-chemnitz.de) or visit <https://www.tu-chemnitz.de/chemie/mc/> – we are happy to co-operate!

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Upcoming Events

[ECMetAC Euroschool 2024](#) in Jülich 4th till 8th November 2024



From <https://www.fz-juelich.de/en/er-c>

Reminder: The next [ECMetAC Euroschool](#) will take place from 4th till 8th November 2024 at the Ernst Ruska-Centre Forschungszentrum Jülich. The event will be dedicated to Advanced Synthesis and Characterisation. More precisely, the Euroschool will focus on intermetallic compounds and advanced synthesis techniques including bulk and single crystal growth as well as nanoparticle synthesis along with an introduction to cutting-edge techniques. The lectures will be complemented by step-by-step tutorials, lab exercise and lab tours.

Students will have the opportunity to discuss their results during a poster session, hence extending their scientific network.

[Registrations are now open](#) and we encourage you to join us or to send young scientists at the Euroschool.

The organisers, Dr. Marc Heggen, Prof. Marc Armbrüster and Marie Göcking are looking forward to welcoming you in Jülich.

Prof. Emilie Gaudry

[ECMetAC Days 2024](#)

This year, the annual event ECMetAC Days 2024 will take place in Zagreb, Croatia, from November 25 to 28. The event's website is available [here](#). Registration is now open. The deadline for registration and abstract submission is September 15th. We cordially invite you to join us at the ECMetAC Days 2024 in the beautiful capital of Croatia.

Mario Novak & Petar Popčević,
on behalf of the Organizing Committee.

ICQ 16 2025

[The 16th International Conference on Quasicrystals \(ICQ16\)](#) will be held on 22-27 June 2025 in Nancy, France.

This event will offer an excellent opportunity for researchers working on quasicrystals and related topics to discuss on emerging research, exchange ideas, establish a plural dialogue and encourage active collaborations with other research groups, hence promoting material science and engineering. This conference will bring together all the best scientists in the world to review the most recent developments in the field.



The conference will be held in Nancy, a magnificent ducal city located just 90 minutes from Paris and from Luxembourg. Nancy is the French capital of Art Nouveau, with an outstanding collection of 18th century monuments, including the beautiful royal square Stanislas inscribed on UNESCO's World Heritage List. It is also a lively student city, where you can enjoy a friendly atmosphere with many bars, café terraces, restaurants and museums.

The Organizing Committee looks forward to welcoming you at ICQ16 in 2025 in Nancy.

<https://ecmetac.eu/>