

Conference Report

Dynamic Materials, Crystals, and Phenomena Conference (DynaMiC)

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The Dynamic Materials, Crystals, and Phenomena Conference (DynaMiC23) took place at the Adolphe Merkle Institute in Fribourg, Switzerland, from March 22nd to 24th, 2023. It was organised by **Jovana V. Milić** (Adolphe Merkle Institute, University of Fribourg, Switzerland) and **Simon Krause** (Max Planck Institute for Solid-State Research, Stuttgart, Germany) in collaboration with the nanoGe conferences, with the aim of bringing together a diverse community of researchers working on the topic of functional solid-state dynamics in framework materials.

Functional solid-state dynamic (i.e., amphidynamic) materials represent a distinctive class of condensed matter that merges crystalline materials with components that exhibit dynamic behaviour in their solid state. This category encompasses a variety of framework materials, such as porous framework materials, metal-organic frameworks (MOFs), covalent organic frameworks (COFs), and other hybrid and bio-inspired materials. These dynamic materials often draw inspiration from nature, and while their unique properties increase the complexity of understanding their functions, they also pave the way for innovative applications. The conference aimed to gather experts from multiple disciplines and create an unparalleled platform for open discussions to deepen the understanding of dynamic materials across various material classes and length scales (Fig. 1). Topics covered in the symposium included responsive molecular switches and machines, porous dynamic materials, and emerging dynamic materials like hybrid perovskites (Fig. 2). Additionally, the program

addressed essential experimental and theoretical techniques for assessing the structural and dynamic properties of this unique class of materials at a spatial-temporal level. The hybrid conference format involved sessions both on-site and online, providing attendees with insights into the dynamic materials, crystals, and phenomena. The program consisted of a series of keynote and invited talks, contributing presentations, and a poster session that covered a wide range of related topics (Fig. 3).

The first day of the conference began with a keynote address by **Stephen Loeb** (University of Windsor, Canada) on designing mechanically interlocked molecules to function in the solid state, which provided a historical perspective on solid-state dynamics. The focus was on macrocyclic ring rotation, large amplitude translation, molecular switching, and the precise placement and interaction between components with different dynamics. This was followed by an invited talk by **Angiolina Comotti** (University of Milano-Bicocca, Italy) on rotor dynamics and light-driven motors in 3D porous architectures. In the afternoon, invited lectures covered topics such as pressure-driven phase transitions for solid-state refrigeration by **Claire Hobday** (University of Edinburgh, UK), non-crystallinity and disorder in dynamic metal-organic frameworks by **Sebastian Henke** (Technische Universität Dortmund, Germany), and static and dynamic conformational freedom by **Stefano Canossa** (Max Planck Institute for Solid-State Research, Germany). The day concluded with a welcome reception, dinner, and networking.

The second day began with a keynote by **Monique van der Veen** (Delft University of Technology, The Netherlands) on coupled linker and electric field-induced dynamics in metal-organic frameworks and **Nicolas Giuseppone** (University of Strasbourg, France) on artificial molecular machines that work on different scales. The conference proceeded with four excellent contributing talks by early-career researchers: **Ken-ichi Otake** (Kyoto

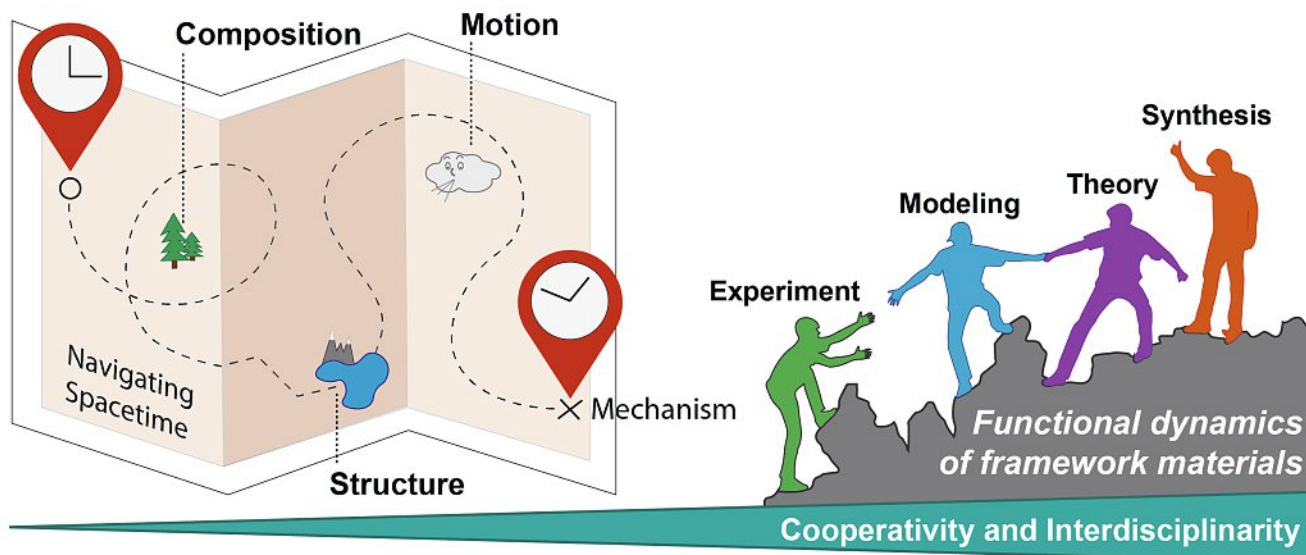


Fig. 1. Schematic of the cross-disciplinary in the field of functional dynamic materials.

University, Japan), **Irena Senkovska** (Technische Universität Dresden, Germany), **Qi Zhang** (University of Groningen, The Netherlands), and **Lukas Pfeifer** (EPFL, Switzerland). The afternoon session focused on theoretical insights for dynamic materials, featuring presentations by **Jack Evans** (University of Adelaide, Australia) on approaches to describe the dynamics of molecular motors embedded in framework materials, **Veronique Van Speybroeck** (Ghent University, Belgium) on challenges in modelling spatiotemporal phenomena in metal-organic frameworks, and **François-Xavier Coudert** (Université PSL / CNRS, France) on the systematic exploration of framework materials using multi-scale modelling and machine learning. The day concluded with a poster session and dinner with the speakers.

The final day of the conference started with a keynote by **Andrew Goodwin** (University of Oxford, UK) on dynamics and correlated disorders in some framework materials and **Susumu Kitagawa** (Kyoto University, Japan) on chemistry and application of soft porous crystals from porous coordination polymers (PCPs/MOFs). Moreover, three invited talks were presented by **Omer Yaffe** (Weizmann Institute of Science, Israel) on shedding light on phase transformations in amphidynamic crystals, **Dominik Kubicki** (University of Warwick, UK) on recent advances in understanding structural dynamics in metal halide perovskites using solid-state NMR, and **Tessel Bouwens** (University of Cambridge, UK) on using supramolecular machinery to enhance the efficiency of photoelectrochemical cells. The conference concluded with a **panel discussion** addressing challenges and opportunities for functional solid-state dynamics and a closing ceremony awarding several early-career researchers for their presentations, including Dazaet Galicia (sponsored by Journal of Materials Chemistry C), Esengül Ciftci (sponsored by Materials Horizon), and Alexandr Marunchenko (sponsored by Thieme Organic Materials).

In summary, the DynaMiC23 conference fostered collaboration and knowledge exchange among a diverse group of researchers across related disciplines worldwide. The event will play an important role in building a community of researchers and collaborators dedicated to advancing the understanding and application of functional dynamic materials and phenomena.

More information about the conference and the related program can be accessed *via* the conference website: <https://www.nanoge.org/DynaMIC23/home> (accessed April 3, 2023).

Acknowledgement

The authors are grateful to the sponsors enabling the organisation of DynaMiC, namely Max Planck Institute for Solid-State Research (MPI-FKF), Adolphe Merkle Institute (AMI), NCCR Bio-Inspired Materials,

Swiss Chemical Society Division for Fundamental Research, Villars, Journal of Materials Chemistry C, Materials Horizons, and Thieme Organic Materials. They acknowledge the support of the Swiss National Science Foundation Scientific Exchanges grant no. 216824 and colleagues and collaborators supporting the conference organisation, namely Jessica Clough and José Berrocal (Adolphe Merkle Institute), Myriam Marano and Lucas Montero (NCCR Bio-Inspired Materials), John Kelley and Armin Feyer (Adolphe Merkle Institute), and Maria Pintado, Laura Casamayor, and Beatriz Esteve (nanoGe). We appreciate the support of young researchers from AMI and MPI-FKF throughout the conference, namely Ghewa AlSabeih, Weifan Luo, Murad Najafov, Kevin Ballestas, and Gianluca Bravetti (AMI), as well as Esengül Ciftci, Timo Manitz, Ardeshir Dadgar Yeganeh, and Kristina Gjorgjevikj (MPI-FKF). We also appreciate the invitation to contribute to CHIMIA.

Notes

This report was prepared with the support of GPT4 using the online conference program.

Received: April 4, 2023

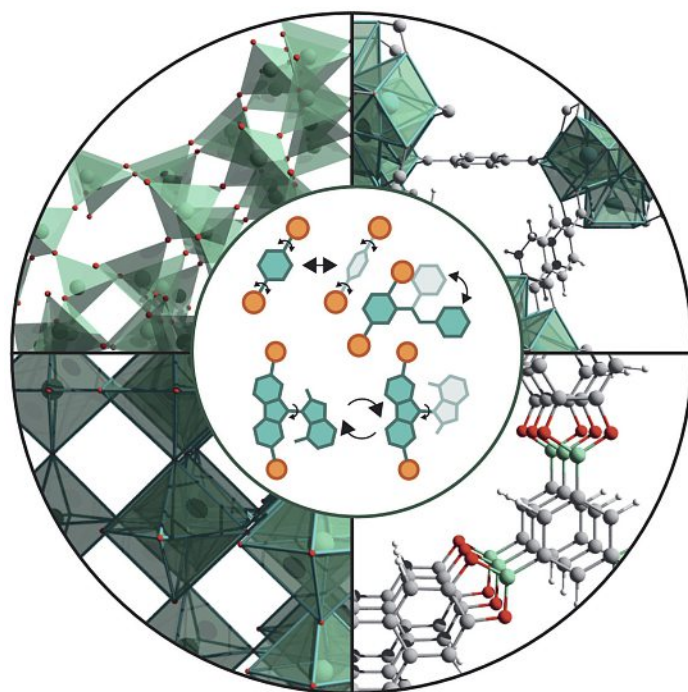


Fig. 2. Schematic representation of functional dynamic materials based on molecular frameworks across materials classes.



Fig. 3. Photograph of the participants of the DynaMiC conference in Fribourg on March 22–24, 2023 (Credit: Scott Capper, Adolphe Merkle Institute, Switzerland).