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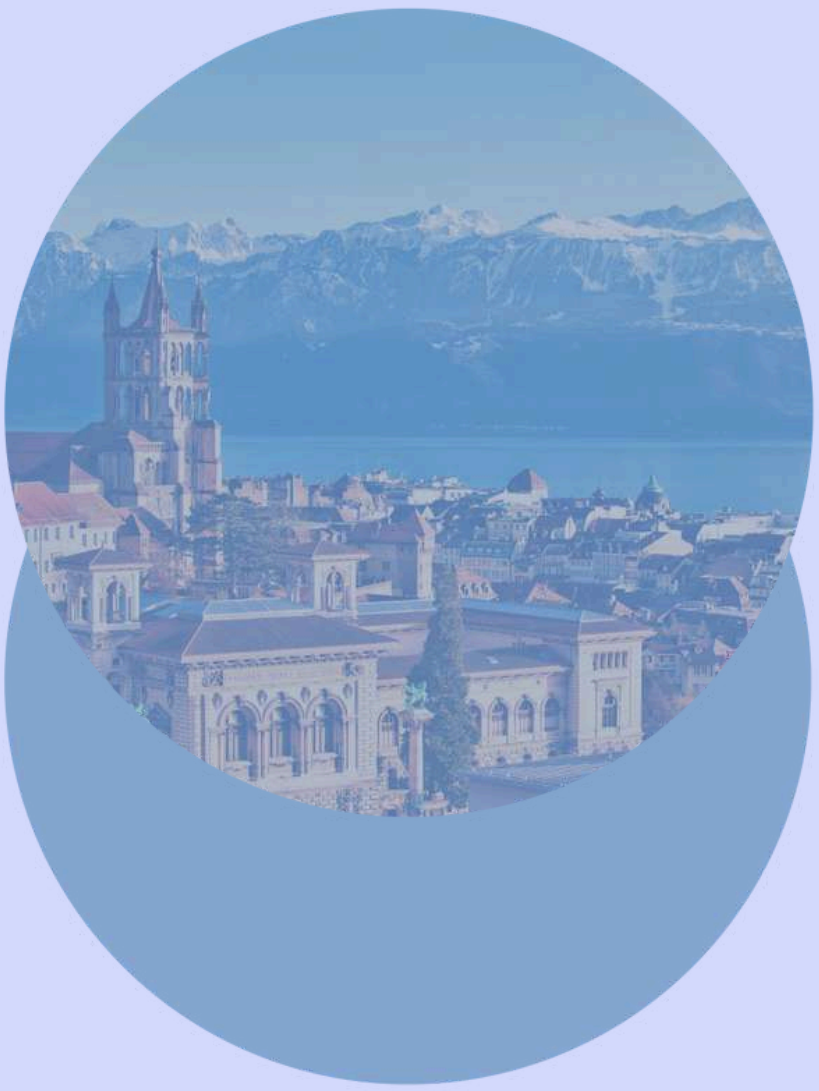
Materials for Sustainable Development Conference

**MATSUS Fall 2024** - Lausanne, Switzerland

12th - 15th November, 2024 **#MATSUS24**

# DIGITAL AGENDA



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**MATSUS Fall 2024** - Lausanne, Switzerland
12th - 15th November, 2024 **#MATSUS24**

# SCIENTIFIC ORGANIZERS

**Raffaella Buonsanti**

École Polytechnique Fédérale de Lausanne

**Joey Luther**

National Renewable Energy Laboratory
Golden Colorado

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# MATSUS | Materials for Sustainable Development Conference

MATSUS Fall 2024 Lausanne, Switzerland · 12th - 15th November, 2024 #MATSUS24

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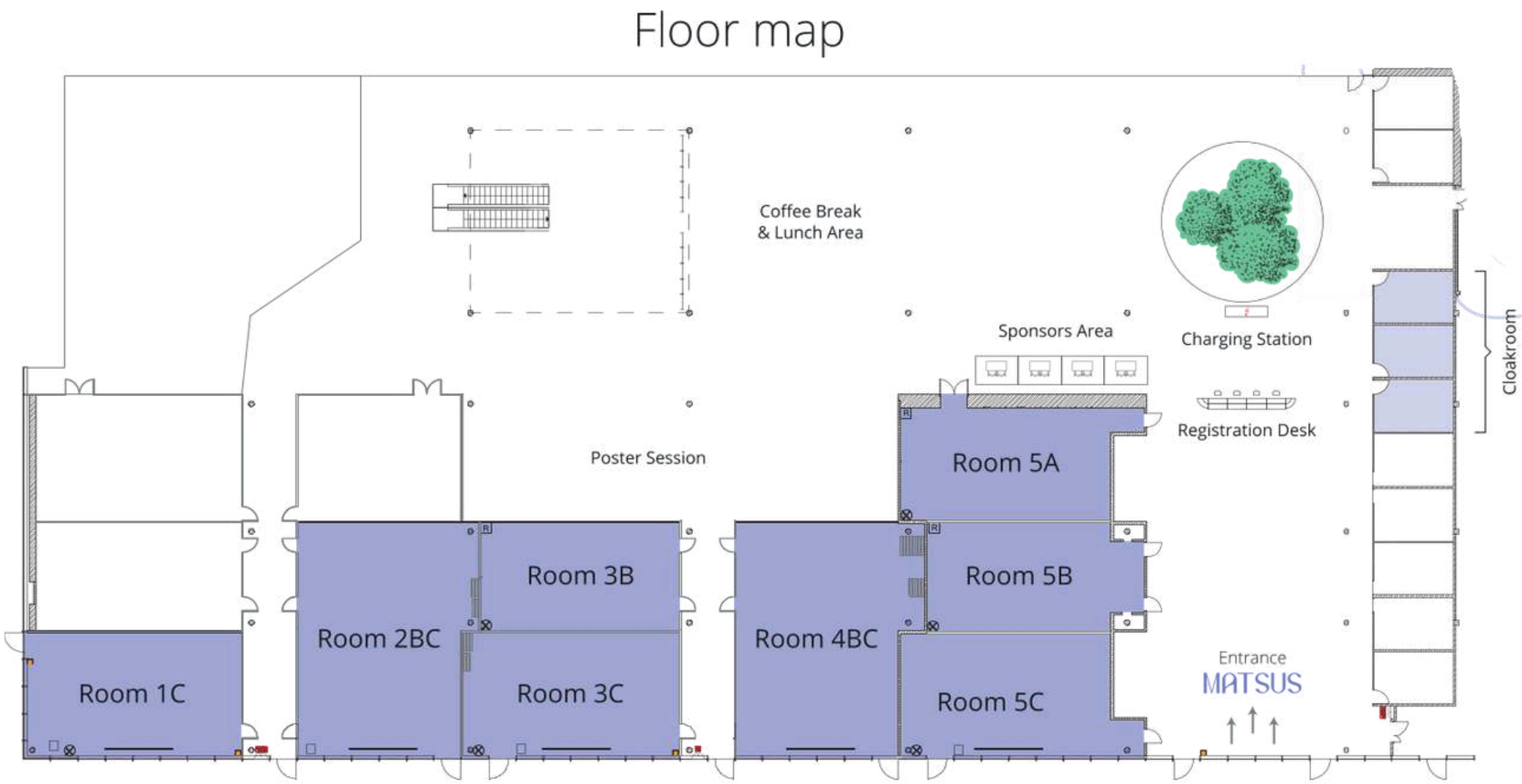
## Schedule at a glance

nanoge.org/MATSUSFall24

| | | Tuesday 12th | Wednesday 13th | Thursday 14th | Friday 15th |
|---|---|---|---|---|---|
| Room 1C | Morning | **#PhotoQD** Photophysics of Colloidal Quantum Dots | **#NANOFUN** Functional Nanomaterials Based on QDs: from Synthesis to Devices | **#NANOFUN** Functional Nanomaterials Based on QDs: from Synthesis to Devices | |
| | Afternoon | **#PhotoQD** Photophysics of Colloidal Quantum Dots | **#NANOFUN** Functional Nanomaterials Based on QDs: from Synthesis to Devices | | |
| Room 2BC | Morning | **#PhotoDeg** Materials and Devices for Stable and Efficient Solar Fuels | **#PhotoDeg** Materials and Devices for Stable and Efficient Solar Fuels | **#PECCO2** Advances in (Photo)Electrochemical CO2 Conversion to Chemicals and Fuels | **#PECCO2** Advances in (Photo)Electrochemical CO2 Conversion to Chemicals and Fuels |
| | Afternoon | **#PhotoDeg** Materials and Devices for Stable and Efficient Solar Fuels | **#PhotoDeg** Materials and Devices for Stable and Efficient Solar Fuels | **#PECCO2** Advances in (Photo)Electrochemical CO2 Conversion to Chemicals and Fuels | **#PECCO2** Advances in (Photo)Electrochemical CO2 Conversion to Chemicals and Fuels |
| Room 3B | Morning | **#OMIEC** Understanding Mixed Ionic-Electronic Conductors | **#OMIEC** Understanding Mixed Ionic-Electronic Conductors | **#(P)ECBio2X** (Photo)Electrochemical biomass and wast valorisation for sustainable energy and chemical production | **#ChiNano** Exploring Chiral Nanostructured Materials and Plasmonics for Energy applicationsa |
| | Afternoon | **#OMIEC** Understanding Mixed Ionic-Electronic Conductors | **#(P)ECBio2X** (Photo)Electrochemical biomass and wast valorisation for sustainable energy and chemical production | **#ChiNano** Exploring Chiral Nanostructured Materials and Plasmonics for Energy applicationsa | **#ChiNano** Exploring Chiral Nanostructured Materials and Plasmonics for Energy applicationsa |
| Room 3C | Morning | **#C&T-electrocat** Computational and Theoretical Electrocatalysis | **#C&T-electrocat** Computational and Theoretical Electrocatalysis | **#EEInt** Electrode-Electrolyte Interfaces in Electrocatalysis | |
| | Afternoon | **#C&T-electrocat** Computational and Theoretical Electrocatalysis | **#EEInt** Electrode-Electrolyte Interfaces in Electrocatalysis | **#EEInt** Electrode-Electrolyte Interfaces in Electrocatalysis | |
| Room 4BC | Morning | **#PeroMAT** Halide Perovskite and Perovskite-inspired Materials: Synthesis and Applications | **#PeroMAT** Halide Perovskite and Perovskite-inspired Materials: Synthesis and Applications | **#PeroMAT** Halide Perovskite and Perovskite-inspired Materials: Synthesis and Applications | **#Adinos** Advances in inorganic thin film semiconductors for solar energy conversion |
| | Afternoon | **#PeroMAT** Halide Perovskite and Perovskite-inspired Materials: Synthesis and Applications | **#PeroMAT** Halide Perovskite and Perovskite-inspired Materials: Synthesis and Applications | **#Adinos** Advances in inorganic thin film semiconductors for solar energy conversion | **#Adinos** Advances in inorganic thin film semiconductors for solar energy conversion |
| Room 5A | Morning | **#SOLTEC** Solar Technologies for Renewable Fuels and Chemicals: On the Way to Industrial Implementation | **#NeuroMorph** Engineering of Semiconductors for Neuromorphic Devices | **#ModElOp** Modeling Electrochemistry in Operando | |
| | Afternoon | **#SOLTEC** Solar Technologies for Renewable Fuels and Chemicals: On the Way to Industrial Implementation | | **#ModElOp** Modeling Electrochemistry in Operando | |
| Room 5B | Morning | **#AdCharMHP** Advanced Characterisation of Metal Halide Perovskites towards Improved Optoelectronics | **#AdCharMHP** Advanced Characterisation of Metal Halide Perovskites towards Improved Optoelectronics | **#PeroLight** Perovskites for Light Emission: From Materials to Devices | |
| | Afternoon | **#AdCharMHP** Advanced Characterisation of Metal Halide Perovskites towards Improved Optoelectronics | **#PeroLight** Perovskites for Light Emission: From Materials to Devices | **#PeroLight** Perovskites for Light Emission: From Materials to Devices | |
| Room 5C | Morning | **#BattMatt** From Atoms to Devices – Battery Materials Design Across the Scales | **#BattMatt** From Atoms to Devices – Battery Materials Design Across the Scales | **#AMADISTA** Accelerated Materials Discovery Through Automation and Machine Learning | |
| | Afternoon | **#BattMatt** From Atoms to Devices – Battery Materials Design Across the Scales | | | |
| | | | **Poster Session** | **Social Dinner** | |

# Venue. Where can I find my session?



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# #PeroMAT - Halide perovskite and perovskite-inspired materials: synthesis and applications

Days: Tuesday Nov 12th, Wednesday Nov 13th & Thursday Nov 14th

[Click here to view the program]

**Symposium Organizers:** Raquel Galian, Lakshminarayana Polavarapu, Paola Vivo

**Invited Speakers:** Robert Hoye, Mónica Lira Cantú, Lorenzo Malavasi, Liberato Manna, Iván Mora Seró, Francisco Palazon, Hakan Rensmo, Riika Suhonen, Anja Wecker, Gustavo de Miguel

**Description:** Halide perovskites and perovskite-inspired materials have garnered significant attention in recent years for their potential use in a wide range of applications including solar cells, photodetectors, lasers, and photocatalysis. They have revolutionized the field of thin film solar cells due to their intriguing optical and electronic properties such as tunable band gap, high absorption coefficient, long charge carrier diffusion, solution processability, and low-cost fabrication. The high photoluminescence quantum yield and tunable emission color of low- dimensional perovskites (thin film, 2D perovskites, and colloidal nanocrystals) make them very attractive as efficient fluorophores. The design and engineering of novel compositions and hetero-architectures based on related perovskite materials is a very promising approach for enhancing the performance and stability of perovskite-based devices across various applications. Moreover, their use as heterogeneous photocatalysts offers a sustainable and promising strategy, employing renewable solar energy, to produce high-value chemicals and fuels. This symposium provides a platform for researchers and experts in the field to share their latest findings, exchange ideas, and collaborate on addressing challenges and advancing understanding and light-harvesting applications.

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# #PeroLight - Perovskites for Light Emission: From Materials to Devices

Days: Wednesday Nov 13th & Thursday Nov 14th

[Click here to view the program]

**Symposium Organizers:** Krishanu Dey, Saascha Feldmann, Xinyu Shen

**Invited Speakers:** Omar F. Mohammed, Dibyajyoti Gosh, Neil Greenham, Maksym Kovalenko, Rebecca Milot, Iván Mora Seró, Paulina Plochocka, Cesare Soci, Yana Vaynzof, Zhengguo Xiao, Baodan Zhao

**Description**: Riding in the coat tails of developments of single junction and multijunction perovskite solar cells, research on perovskite light emitting diodes (LEDs) have also skyrocketed in recent years. This surge is primarily driven by the facile tunability of optical bandgaps in halide perovskite materials, that can exhibit a wide colour gamut in the ultraviolet to near-infrared range with high luminescence yield and colour purity. This symposium will bring together the community to discuss the fundamental physics of light emission in a range of halide perovskite materials, report on the recent progress of device efficiencies and also brainstorm on the remaining challenges of stability and scalability. In addition, exciting prospects of optically pumped lasing and single photon emission, shown recently by lowering the structural and/or electronic dimensionality of perovskites, will also be presented. Furthermore, latest updates on perovskite-based light emitting transistors, where the electroluminescence of the channel can be controlled by the gate voltage, will also be provided. On the other hand, by exploiting the favourable attributes of high X-ray absorption and efficient down-conversion into visible photons, emerging halide perovskite-based scintillators have shown quite unprecedented performance for medical imaging, which will also constitute an important focus area for this symposium.

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# #ADINOS - Advances in inorganic thin film semiconductors for solar energy conversion

Days: Thursday Nov 14th & Friday Nov 15th

Click here to view the program

**Symposium Organizers:** Mirjana Dimitrievska, Xiaojhing Hao, Shudhansu Shukla

**Invited Speakers:** Guy Brammertz, Andrea Crovetto, Anna Fontcuberta i Morral, Geoffroy Hautier, Robert Hoye, Alejandro Perez Rodríguez, Albert Polman, Edgardo Saucedo, Thomas Unold, Peter Vesborg, Rachel Woods Robinson

**Description**: Fueled by the rapid advancements in the field of chalcogenide and perovskite materials, many promising semiconductors have emerged with high optical absorption and excellent optoelectronic properties. These include novel and earth abundant chalcogenides, oxides, pnictides and defect-tolerant perovskite inspired materials. Development of these material systems is desirable for their applicability in thin film solar cells and tandem solar cells. The experimental progress is closely tied to their fundamental properties and charge carrier transport. Moreover, computation and machine learning augmented material studies play a pivotal role in designing new photovoltaic materials and characterization. The symposium invites contributions involving novel PV concepts and materials development. Example material systems include but not limited to:
kesterite ($Cu_2ZnSn(S,Se)_4$ and derived compounds), sulfides and selenides ($CuInGaS_2$, $Sb_2Se_3$, $Sb_2S_3$, Se), oxides ($BiFeO_3$, $BiTiO_3$, $Cu_2O$, $BiVO_4$ etc.), nitrides ($ZnSnN_2$, $Cu_3N$), and emerging chalcogenides ($BaZrS_3$, $Cu_3BiS_3$, $AgBiS_2$, $NaBiS_2$, $CuSbS_2$, GeS, etc.)

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# #NANOFUN - Functional Nanomaterials: from materials to applications

Days: Wednesday Nov 13th & Thursday Nov 14th

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**Symposium Organizers:** Emmanuelle Lhuillier, Shalini Singh

**Invited Speakers:** Uri Banin, Alexander Bessonov, Benjamin Diroll, Maria Ibáñez, Prashant Jain, Jannika Lauth, Peter Reiss, Kevin Ryan, James Utterback, Javier Vela

**Description**: Thanks to almost 40 years of development, colloidally grown semiconductor nanomaterials have now reached an impressive level of control with atomically precise growth and advanced control of interaction with light through growth of heterostructure and coupling to photonics structures. Thus, this symposium aims to cover all aspects from the development of new synthetic process and discovery of new functional materials to the most advanced applications of the materials including optoelectronics (solar cell, detector, LED....), photonics, quantum and bio applications.

# #PhotoQD - Photophysics of colloidal quantum dots

Days: Tuesday Nov 12th

[Click here to view the program]

**Symposium Organizers:** Philippe Green, Jannika Lauth

**Invited Speakers:** Dmitry Baranov, Pieter Geiregat, Jaco Geuchies, Miri Kazes, Freddy Rabouw, Katherine Shulenberger, Mark Wilson

**Description:** Colloidal quantum dots (QD) are promising materials for a range of applications ranging from light emission and display to photocatalysis. Underlying the performance output of these applications lies in their fundamental size, surface and compositions dependent photophysical properties. The aim of this symposium will be to reunite a community of researchers studying the optical properties of nanocrystal on both the single QD and ensemble level. We will bring together leading researchers on single QD spectroscopy and ultrafast spectroscopy with scientist invested in the assembly of optoelectronic devices and energy transfer processes. We aim at a symposium with several renowned keynote speakers, excellent invited speakers followed by a session of contributed talks, with ample time for questions and discussions. We will strongly encourage abstract submission for contributed talks and Posters, which will allow for a wide variety of researchers to share their exciting work. We will ensure the diversity of our speakers.

# #AdCharMHP - Advanced Characterisation of Metal Halide Perovskites towards Improved Optoelectronics

Days: Tuesday Nov 12th & Wednesday Nov 13th

[Click here to view the program]

**Symposium Organizers:** Juliane Borchert, Robert Oliver, Alexandra Ramadan

**Invited Speakers:** Petra Cameron, Matteo Degani, Jacky Even, Eva M. Herzig, Saiful Islam, Silvia Motti, Sandheep Ravishankar, Philip Schulz, Mathias Uller Rothmann

**Description:** Metal halide perovskites have emerged as outstanding materials for optoelectronics, for example leading to unprecedented gains in the power conversion efficiency of solar cells. This rise has been enabled by the unconventional physics and chemistry of these materials which is still being unravelled. Deep insights into their unusual behaviour are crucial to keep advancing metal halide perovskites towards their potential and ultimately commercial reality. Understanding these materials requires advanced chararacterisation techniques which span optical & photoemission spectroscopies to in-situ structural measurements and computational insights.

This symposium invites contributions related to the advanced characterisation of metal halide perovskites for optoelectronic applications, including solar cell, light emission technologies and beyond. It serves as a valuable gathering of experts and researchers in the field, providing a platform for sharing the latest insights and methods that can advance perovskite-based technologies. The diversity of speakers, including physicists, chemists, engineers, and materials scientists, underscores the interdisciplinary nature of this research. This symposium aims to facilitate discussions on recent progress and challenges that have been highlighted by the latest characterisation techniques. We hope that this gathering of researchers can accelerate the practical use of these materials in sustainable energy and lighting technologies.

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# #PhotoDeg - Materials and devices for stable and efficient solar fuels

Days: Tuesday Nov 12th & Wednesday Nov 13th

[Click here to view the program]

**Symposium Organizers:** Sophia Haussener, Sandra Luber, Simone Pokrant

**Invited Speakers:** Joel Ager, Ulrich Aschauer, Serhiy Cherevko, Todd Deutsch, Salvador Eslava, Georg Kastlunger, Núria López, Raffaello Mazzaro, Zetian Mi, Patrik Schmuki, Verena Streibel, Francesca Toma

**Description:** Photoelectrochemical water splitting or CO2 reduction present two approaches of using renewable resources and abundant feedstocks (water and CO2) for the processing of fuels and valuable chemicals. This symposium will provide a platform for discussion of research on photoelectrochemical water splitting and CO2 reduction with a focus on degradation, longevity, robustness, stability and reliability of such devices and the materials used. The underlying process presents many challenges, including photoabsorber and co-catalyst design, branching mechanisms leading to degradation, challenges in managing multi-physical transport, and development of reactors for conversion with high stability while maintaining high efficiency. This symposium will feature recent progress in addressing these challenges by approaches spanning catalyst design, operando methods for characterization, and device engineering, covering computational as well as experimental methods.

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# #C&T - electrocat - Computational and theoretical electrocatalysis

Days: Tuesday Nov 12th & Wednesday Nov 13th

[Click here to view the program]

**Symposium Organizers:** Federico Calle-Vallejo, Max Garcia-Melchor

**Invited Speakers:** Alexander Bagger, Maytal Caspary Toroker, Giancarlo Cicero, Livia Giordano, Karoliina Honkala, Rachel Kerber, Ana Belén Muñoz-García, Kai Exner, Jan Rossmeisl, Samira Siahrostami, Egill Skúlason, Matthias Vandichel

**Description:** Electrocatalysis is a blooming field, and electrochemical devices such as fuel cells and electrolyzers promise to help tackle major energetic and environmental challenges. Computational and theoretical tools are already available (or being developed) to understand and deconvolute complex phenomena at electrochemical interfaces and guide the design of enhanced electrode materials. This symposium aims to gather consolidated and up-and-coming scientists to present and discuss the latest developments in computational modelling of CO electroreduction, O reduction and evolution, hydrogen evolution, and nitrogen cycle electrocatalysis. Contributions with a focus on electrocatalytic materials design, machine learning, adsorbate solvation, applied potential, electrolyte and pH effects, electrochemical reaction kinetics, double-layer effects, and related concepts, are welcome in this symposium.

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# #ModElOp - Modeling Electrochemistry in Operando

Days: Thursday Nov 14th

[Click here to view the program]

**Symposium Organizers:** Federico Dattila, Kevin Rossi

**Invited Speakers:** Paige Brimley, Katharina Doblhoff-Dier, Rodrigo García-Muelas, Núria López, Simone Pezzotti, Philipp Röse

**Description:** Electrochemistry is crucial for the transition to a sustainable society, opening pathways for green fuels production, eco-friendly energy storage and CO2-neutral synthesis of commodity-chemicals. The accurate modelling of electrocatalytic processes under realistic conditions sheds light on the mechanisms that rule the activity, selectivity, and stability of a catalyst, toward the design of novel materials with improved performances.
Ab initio calculations offer unique insights on reaction mechanisms and material properties, enabling the definition of simple yet complete models for electrochemical cells. Electrolyte effects such as concentration of species and their mass transport can be assessed through dedicated numerical multiphysics methods. Finally, machine-learning algorithms promise to facilitate the exploration of catalysts' properties over larger time-, length-, and chemical spaces.
This symposium will foster a multi-disciplinary and collaborative environment, bridging the atomistic scale till the industrially relevant ones and encouraging the circulation of novel ideas and recent milestones in the theory and modelling of electrochemical processes.
To this end, established and emerging leaders in the development of methods for the accurate modelling of electrochemical reactions, solid-liquid electrified interfaces and solute-solvent interactions will present their latest research achievements. Young researchers' active participation will be also fostered through dedicated oral and poster contributions spots.

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# #PECCO2 - Advances in (Photo)Electrochemical CO2 Conversion to Chemicals and Fuels

Days: Thursday Nov 14th & Friday Nov 15th

[Click here to view the program]

**Symposium Organizers:** Deepak Pant, Adriano Sacco, Juqin Zeng

**Invited Speakers:** Tudy Bernier, Angelica Chiodoni, Guillermo Díaz-Sainz, Sophia Haussener, Simelys Hernandez, Elvar Jónsson, Matthew Mayer, Silvia Nappini, Esther Santos, Damien Voiry

**Description:** The symposium will be an exciting gathering of leading scientists, researchers, and experts in the field of electrochemistry, sustainability, and carbon management. This event will explore groundbreaking developments and innovations in the (photo)electrochemical conversion of carbon dioxide into valuable and sustainable products.

Our symposium aims to provide a comprehensive platform for discussing the latest breakthroughs in CO (photo)electroreduction, a critical technology in the fight against climate change. The program will feature a diverse range of topics, including catalyst design, reaction mechanisms, energy efficiency, reactor design and simulation, advanced characterizations, and scaling up electrochemical processes. Prominent speakers from academia, industry, and government agencies will present their research findings and discuss the potential applications of CO reduction technologies.

Participants will have the opportunity to engage in stimulating discussions, network with peers, and forge collaborations to drive progress towards a greener, more sustainable future. Join us at this symposium as we collectively explore and shape the future of electrochemical CO reduction, contributing to a world where CO becomes a valuable resource rather than a greenhouse gas.

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# #(P)EC-Bio2X - (Photo)electrochemical biomass and waste valorization for sustainable energy and chemical production

Days: Wednesday Nov 13th & Thursday Nov 14th

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**Symposium Organizers:** Georg Kastlunger, Hui Luo, Camilo A. Mesa

**Invited Speakers:** Corina Andronescu, Silvia Favero, Sixto Gimenez Julia, Anders Hellman, Karoliina Honkala, Erwin Reisner, Pablo Sebastián Fernández, Kevin Sivula

**Description:** In the transition towards Net-Zero greenhouse gas emissions, there is significant interest in phasing out fossil fuels in the energy and chemical sectors. With a circular economy mindset, one attractive solution is producing fossil fuel alternatives from the accumulated waste stream, such as biomass from food and agriculture waste, plastic waste and polluted wastewater from industry. (Photo)electrochemical conversion has recently emerged as a promising avenue in this direction due to its sustainable process, eliminating the use of hazardous reagents, and low carbon emission when coupled with renewable energy sources. Currently, the design of efficient and stable catalyst materials, and the scaling up feasibility pose a bottleneck for commercialization. Therefore, this symposium invites contributions in scientific developments with atomistic level theory, fundamental electrochemistry, spectroscopy, materials synthesis, life-cycle and technoeconomic analysis that ultimately bring us a step closer towards establishing a Net-Zero circular economy.

# #ChiNano - Exploring Chiral Nanostructured Materials and Plasmonics for Energy applications

Days: Thursday Nov 14th & Friday Nov 15th

Click here to view the program

**Symposium Organizers:** Sascha Feldmann, Magalí Lingenfelder, Giulia Tagliabue

**Invited Speakers:** Martina Basini, Emiliano Cortes, Matthew Fuchter, Jose Ramon Galan-Mascaros, Prashant Jain, Vladimiro Mujica, Ron Naaman, Reiko Oda, Adriana Pietropaolo, Erwin Reisner, Xia Wang, Angela Wittmann

**Description:** Organic and inorganic nanostructured materials that enhance light-matter coupling can open new pathways for controlling charge, spin, light, and photochemical processes.
Generally, functional nanostructured materials are at the heart of technologies needed for a sustainable energy future. Their use covers green energy production in photovoltaics, renewable fuels, and more efficient energy consumption: for example in light-emitting applications and future information processing technologies.
Far less explored, yet extremely promising, are chiral nanomaterials and plasmonic nanostructures.
This symposium aims to facilitate cross-talk between the various research fields concerned with chiral functional nanomaterials. It will focus on the fundamental mechanisms relating the structures to the properties of chiral organic and inorganic materials, plasmonic cavities and metasurfaces for photochemistry, and topological materials.
Together as a community we aim to gain a deeper understanding of how these materials can unleash their full potential for device applications, and to uncover synergies by studying these fascinating materials from different backgrounds and characterization techniques, including optical, electrical, and electrochemical probes, from locally resolved materials studies to device-level measurements.
We will bring together leading nano-scientists interested in chiral optoelectronics, plasmonics, synthesis and advanced characterization, computational modelling, to enhance our understanding of these fascinating and promising materials.

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# #EEInt - Electrode-Electrolyte Interfaces in Electrocatalysis

Days: Wednesday Nov 13th & Thursday Nov 14th

[Click here to view the program]

**Symposium Organizers:** Yu Katayama, Mariana Monteiro

**Invited Speakers:** Andrea Auer, Aliaksandr Bandarenka, Chang Hyuck Choi, Marta Costa Figueiredo, Alexis Grimaud, Yu Huang, Hod Idan, Sheena Louisia, Soren Scott, Jin Suntivich, Matthias Waegele, Ward van der Stam

**Description:** Electrocatalysis research is key for pushing emerging electrochemical conversion technologies from lab to industrial scale. For many years the focus was to develop better electrocatalyst materials towards improved activities and selectivities. However, more and more the key role of the electrolyte composition has been highlighted, inclusing the effect of solvent, pH, ion identitiy and concentration, among others. With that, several efforts have also emerged towards probing the electrochemical interface to selectively identify the role of each of these individual parameters on the overall electrocatalytic response. Going one step further, several strategies for tailoring the electrocatalytic interface have gained space, as for example surface modifications via anchoring of organic molecules, or immobilization of ionic liquids at the interface. In this symposium, progress and challenges of how electrolyte properties affect electrocatalytic reactions will be discussed, including the use of in-situ and operando methods to probe the interface. We aim to bring together leading researchers on the field, covering insights both from theory and experiments, providing a platform for the exchange of ideas and the exploration of new approaches and collaborations. We will leave ample time for questions and discussions in the program. Diversity will be ensured for keynote, invited and contributed talks, and posters.

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# #OMIEC - Understanding Mixed Ionic-Electronic Conductors

Days: Tuesday Nov 12th & Wednesday Nov 13th

[Click here to view the program]

**Symposium Organizers:** Natalie Banerji, Olivier Bardagot

**Invited Speakers:** Gitti Frey, Loren G. Kaake, Nicolas Leclerc, Vincent Lemaur, Christine Luscombe, Wouter Maes, Bryan Paulsen, Erin Ratcliff, Tom van der Pol

**Description:** Organic mixed ionic-electronic conductors (OMIEs) can transport both ionic and electronic charges and are therefore ideal candidates for electrochemical devices. Those include electrochromic displays, energy-storage systems (batteries, supercapacitors) and organic electrochemical transistors (OECTs), enabling exciting new opportunities for energy harvesting/storage, biomedical applications, and neuromorphic computing. This symposium provides a forum for discussing interdisciplinary research in organic ionic, electronic, and mixed ionic-electronic conductors. The emphasis will be on the following:

1. Provide a theoretical framework for the wide range of ionic, electronic, and mixed ionic-electronic transport processes in organic materials.
2. Understand the fundamental mechanisms of electrochemical doping processes in organic electronic devices.
3. Explore the impact of chemical functionality, (macro)molecular structure, and film morphology on ionic, electronic, and mixed ionic-electronic transport.
4. Discuss the challenges and opportunities for in-operando characterization of organic mixed ionic-electronic conductors, including spectroscopy, scattering, microbalance, microprobe, and electron microscopy.

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# #BattMat - From atoms to devices - Battery materials design across the scales

Days: Tuesday Nov 12th & Wednesday Nov 13th

[Click here to view the program]

**Symposium Organizers:** Heather Au, Emilia Olsson

**Invited Speakers:** Maria Crespo, Sunita Dey, Alexander Forse, Jana Beatrice Fritzke, Saiful Islam, Laura Lander, Svetlana Menkin, Wei Yu, Carla de Tomas

**Description:** To deliver the next generation of battery technologies a concerted materials design effort across length scales combining computation, experiment and engineering is required. In this symposium, we invite contributions on topics ranging across atomic scale modelling and experimental synthesis of battery materials; from the isolated bulk materials and interfaces, to device fabrication and modelling. Applications of advanced in situ characterisation, cutting edge synthesis methods, and novel device configurations are welcomed. Finally, contributions containing a firm focus on circularity and sustainability in battery design and how this should be incorporated into the design process are invited.

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# #AMADISTA - Accelerated Materials Discovery Through Automation and Machine Learning

Days: Thursday Nov 14th

[Click here to view the program]

**Symposium Organizers:** Philippe Schwaller, Tobias Stubhan, Christian Wolff

**Invited Speakers:** Tonio Buonassisi, Ivano Eligio Castelli, Loïc Roch, Beom-Soo ki

**Description:** Automation, robotics and methods from machine learning and artificial intelligence open new avenues in accelerating the way we discover materials for many sustainable applications, including energy materials (photovoltaics, solar thermal, catalysis, energy storage, carbon capture), light emission, but also medicinal drugs or fertilizers. This symposium focuses on providing a broad overview of recent developments in non-centralized self-driving laboratories and high-throughput experimentation for different applications, the creation of large material databases, and their use in redefining and accelerating the path of discovery.

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# #NeuroMorph - Engineering of Semiconductors for Neuromorphic Devices

Days: Wednesday Nov 13th

[Click here to view the program]

**Symposium Organizers:** Shahzada Ahmad, Samrana Kazim

**Invited Speakers:** Juan Bisquert, Bruno Ehrler, Wolfgang Tress

**Description:** To overcome the computational bottlenecks for artificial intelligence-based applications, the development of brain-inspired neuromorphic computing is vouched as a potential solution. There is growing demand for technology beyond silicon as electronic materials for neuromorphic artificial intelligence devices, to address adherent issues associated with conventional CMOS technology, including volatility and energy inefficiency. In society's mission to reduce energy consumption, there is a rising demand for emerging technology such as electronic materials to reduce silicon reliance for neuromorphic devices. Armed with energy efficiency and exceptional flexibility, halide perovskites can emulate the features of synaptic functions in the human brain. Recent advancements in memristive and memory technologies have spurred interest in the construction of effective and high-performing neuromorphic computing systems. In addition to being energy-efficient and versatile, metal oxides organic semiconductors, halide perovskites, 2D materials, chalcogenides, piezoelectric materials, and magnetics materials, can mimic the properties of synaptic processes in the human brain. The materials and device aspects for low-power switching neuromorphic devices, as well as characterization procedures, will be the main topics of this conference along with the emerging fields of bioinspired ionic-electronic-photonic materials.

# #SOLTEC - Solar Technologies for Renewable Fuels and Chemicals: On the Way to Industrial Implementation

Days: Tuesday Nov 12th

[Click here to view the program]

**Symposium Organizers:** Miguel García-Tecedor, Víctor A. de la Peña O'Shea

**Invited Speakers:** Joel Ager, Jose Ramon Galan-Mascaros, Sixto Gimenez Julia, Sophia Haussener, Camilo A. Mesa, Manuel Romero, Philippe Schwaller, Alessandro Senocrate

**Description:** During the last few years, enormous efforts have been made in the understanding and development of solar chemical technologies, leading to important achievements in this field. The next step to implement these technologies as sustainable renewable alternatives is their scale-up and industrialization, representing a great challenge. This symposium is open to contributions on different routes towardssolar fuels generation using scaled-up technologies at an industrial level. It will cover topics from photoelectrocatalytic, photovoltaic, photocatalysis and concentrated solar power technologies. Additionally, contributions on the employment of Artificial Intelligence (A.I), Machine Learning and other digital technologies to ease and accelerate the lab-to-industry transition are also welcome.

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