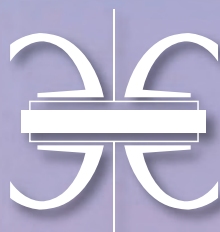


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EFCF 2023

Low-Temperature

Fuel Cells, Electrolysers & H₂ Processing

From fundamental science to accelerated integration

International Conference Series est. 1994
with Exhibition & FCH/EIS Tutorials

4 – 7 July 2023

Lucerne, Switzerland

Chaired by

Prof. Michael H. Eikerling

Prof. Anna K. Mechler

Forschungszentrum Jülich, Germany
RWTH Aachen University

Featuring

Hydrogen and Direct Liquid Fuel Cells

Water Electrolysis and CO₂ Reduction

Electrochemical Engineering

and **System Integration**



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27th Conference in Series

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- **Hydrogen and Direct Liquid Fuel Cells**
- **Water Electrolysis and CO₂ Reduction**
- **Electrochemical Engineering and System Integration**

Scope of the Forum

www.EFCF.com/Scope

The EFCF 2023 will be concerned with low-temperature **hydrogen** and **direct liquid fuel cells** including PEM, HT-PEM, AFC, PAFC and AEM-based systems; **water electrolysis** based on PEM, AEL and AEM; **materials and technologies for CO₂ reduction**. The conference **motto** is: "From fundamental science to accelerated integration". The **topics** that will be covered encompass the fundamental understanding of relevant materials and interfacial phenomena; the complex interplay of reaction kinetics with the transport of mass, heat and water; advanced modelling and diagnostics; accelerated materials development; all the way to the implementation and demonstration in real-world devices, requiring optimized engineering design, system integration and testing; topics related to H₂ purification, (de-) humidification and compression will be featured as well.

The 27th edition of this highly successful series of conferences that started in 1994 continues the tradition as the primary international event promoting frontier-type scientific and industrial developments in these fields. The forum has evolved meanwhile into one of the **largest international meetings** and a **leading venue in Europe** dedicated to the scientific and technical exchange on hydrogen fuel cells and electrolysers. It offers scientists, engineers and manufactures alike an excellent platform to present and discuss recent progress, industrial achievements and inventions and to expand their network of contacts. Your presence and contributions in the unique setting of the EFCF 2023 meeting will create new opportunities for you and the community.

Also the following companies have reported in previous EFCF editions about their technical status and achievements:

Automotive OEMs: Audi, BMW, Daimler, Fiat, Hyundai, Honda, Nissan, Renault, Toyota

Electrolyser & H₂ Industry: AirLiquide, AREVA/Helion, Giner, Hydrogenics, IHT, ITM, Linde, NEL/Proton OnSite, Shell, Siemens.

Topics

www.EFCF.com/Conference

The three day technical conference will feature parallel lectures of invited and contributed papers and posters. A Scientific Advisory Committee, see www.EFCF.com/SAC, has been formed to evaluate and structure the technical program. This panel exercises full independence in all scientific and technical matters and ensures that presentations are of consistently high quality, yet understandable for participants with various backgrounds and expertise.

Topics will encompass, but not be limited to:

Fundamentals of low-temperature fuel cells

- 01 Electrocatalysis (ORR, HOR)
- 02 New ionic polymers for PEM, AEM, catalyst layers
- 03 Local reaction environment at interfaces
- 04 MEA development, materials integration and testing
- 05 Electrode design and water management
- 06 Understanding and mitigation of degradation

Advances in Modeling and Diagnostics

- 13 Processes in porous transport layers
- 14 Multiscale structural and physico-chemical characterization
- 15 Advanced electrochemical testing and diagnostics
- 16 *In situ* and operando diagnostics
- 17 Monitoring and prediction of performance and lifetime

Accelerated Material Development

- 23 Modern lab concepts (autonomous, decentral, AI-driven)
- 24 Accelerated simulations and inverse materials design
- 25 Workflow management for integration and scale-up
- 26 Multimodal characterization and AI-based image analysis
- 27 Digital twins and intelligent data analytics for monitoring and lifetime prediction

Electrolysis and Electrolysers

- 07 Electrocatalysis (OER, HER)
- 08 Water electrolysis (AEL, AEM, PEM and beyond)
- 09 CO₂ reduction to fuels and chemicals
- 10 Salt and waste water electrolysis
- 11 Electrolysis under extreme conditions
- 12 Advanced materials and components

Electrochemical Engineering and System Integration

- 18 Tailored MEA design and optimized flow-fields
- 19 Stack design, operation, durability and lifetime
- 20 System characterization and stack integration
- 21 H₂ purification, de(humidification) and compression for electrochemical systems
- 22 Balance of plant design

Application, Market and Deployment

- 28 Life Cycle Analysis (LCA), Business and economy models
- 29 H₂ technologies as enabler for renewables, assessment and applicability
- 30 Rollout and operation: Portable, stationary, mobile incl. infrastructure (road, water, air, space)
- 31 Regional and industrial development and demonstration

Publication Policy

www.EFCF.com/PP, [.../Library](http://www.EFCF.com/Library)

All contributions, which provide an **extended abstract**, will be offered **publication with a DOI** in the **EFCF community** of the general-purpose **open-access repository** www.Zenodo.org. Since 2012 a limited number of contributions will be invited to be included in a **Special Issue** of the peer-reviewed Journal "Fuel Cells – From Fundamentals to Systems" published by Wiley-VCH, e.g.: **EFCF 2013** – Volume 14, Issue 5, pg 671–774; **EFCF 2019** – Volume 20, Issue 4, pg 383-514 (see www.EFCF.com/SI). Authors who wish to **publish "elsewhere"** may opt out and thus retain also all their copyrights.

Furthermore, the programme and event details are distributed in the **Final Announcement** by letter post, email, and on www.EFCF.com/FA. All one-page abstracts of the oral and poster presentations are published in the **Book of Abstracts**. Together with all extended abstracts, they are made available in the electronic **Proceedings of the Conference**. They are distributed to the EFCF participants only, as a temporary reference during the conference and as ongoing internal reference in the EFCF MemberZone. The **final EFCF Proceedings** will be a synthesis of the Book of Abstracts and the access info to the available, event related publications. It is freely accessible on www.EFCF.com/Proceedings together with all other event info.

Abstract Submission

www.EFCF.com/AuthorCentre

Members of academic institutions, R&D organizations, engineering firms and industry are invited to submit contributions for oral or poster presentation at the EFCF 2023 featuring Low-Temperature Fuel Cells, Electrolysers and H₂ Processing. **The submission procedure is:**

1. Download Abstract Template, Instructions and Samples from www.EFCF.com/Download
2. Upload your one-page abstracts at www.EFCF.com/Upload by **30 November 2022** (late abstracts cannot be considered for oral presentation).
3. Receive notification about acceptance in February 2023. This requires you to submit an extended abstract/paper by **30 April 2023**. This is a condition to be listed in the final program and to be eligible for publication with a DOI or consideration for the Special Issue.

Presenting authors are required to register for the forum and to pay the appropriate registration fee. Please consult the list of fees below for details of privileges offered for early registration, respectively rebates and support options. EFCF cannot provide direct financial support to authors of papers.

For Frequently Asked Questions please visit www.EFCF.com/FAQ or email FZJ@efcf.com.

Venue and Access

www.EFCF.com/Lucerne, [.../Join](http://www.EFCF.com/Join)

EFCF events are traditionally held at the Culture and Convention Centre Lucerne (KKL) in conjunction with the Fuel Cell, Electrolyser & H₂ Technology and Supplier Exhibition and the popular FC, EL & H₂ Tutorial (FCH). An Electrochemical Impedance Spectroscopy (EIS) Tutorial and special symposium MEEP 2023 for Microbial Electrochemistry are additionally organised. The KKL conference centre is a well-known location on the picturesque waterfront of the Lake Lucerne, easy to reach by plane and train, and within a short walk from charming hotels and the historical town centre.

EFCF 2023 will take place again as a physical and virtual event (hybrid), offering participants from all continents regardless of restrictions and origin the opportunity to contribute and participate. However, being present in Lucerne in person is an unbeatable win-win situation for all. Therefore, it makes sense that only physically present participants will have the coveted opportunity to present orally.

Time Schedule and Events

www.EFCF.com/Schedule, [.../Events](http://www.EFCF.com/Events)

30 November 2022	Deadline for submission of abstracts via website – www.EFCF.com/Upload
February 2023	Notification about acceptance in the EFCF programme
March 2023	Final Announcement with definitive oral program poster and exhibitor list
30 April 2023	Deadline for submission of extended abstract/paper – www.EFCF.com/Upload
4 July 2023	10:00 –17:00 Tutorials: EIS: Electrochemical Impedance Spectroscopy; FC&H₂: Fuel Cells. Electrolyser & H ₂ , Project meetings 11:00 –16:00 Exhibition and poster Set-up , 16:00 Opening of Exhibition and Registration, 18:00 "Welcome Reception"
5 July 2023	09:00 –18:00 International and Industrial Overviews – Keynotes – Oral and Poster Sessions, Exhibition 18:30 "Swiss Surprise Night": An enjoyable exchange event with Swiss cuisine, folklore, culture and drinks
6 July 2023	09:00 –18:00 Keynotes – Oral and Poster Sessions, Exhibition, Special Events: MEEP symposium (www.i-MEEP.com) 19:30 "Dinner on the Lake": Unique pleasure boat tour with music and picturesque scenery, an unforgettable networking event
7 July 2023	09:00 –17:00 Oral and Poster Sessions – Plenary Keynotes, Exhibition, Schoenbein Medal Award, Closing Ceremony, Good-by coffee

Services and Fees

www.EFCF.com/Fee

Conference	Physical			Virtual	
	Early - 31 March	Regular from 1 April	Late from 15 May	Regular - 14 May	Late from 15 May
• Students, trainees and unemployed persons etc. with valid identification	600	+150	+100 CHF	375	+50 CHF
• Government, universities, consultants etc.	1'350	+150	+100 CHF	750	+50 CHF
• Industry and commerce	1'950*	+150	+100 CHF		
Tutorials	Single and two-day tickets are also available.				
• FC, EL & H ₂ Tutorial - Fuel Cells, Electrolysers & Hydrogen (kick-start, www.EFCF.com/FCH):	580 CHF			400	+50 CHF
• EIS Tutorial - Electrochemical Impedance Spectroscopy (advanced, www.EFCF.com/EIS)	580 CHF			400	+50 CHF

Starting from 3 people attractive rebates are offered for group registration.

Exhibitors are entitled to up to a 55% discount on conference fees.

To benefit mail your request to forum@EFCF.com.

*Incl. 600 CHF donation for student support, All fees include the 7.7% VAT,

where applicable One Swiss Franc ("CHF") is valued at about 1.04 EURO,

1.04 US Dollar, 142 YEN, 7.1 CNY (Aug 2022, www.finanze.net/devisen).

Physical fees include access to conference and exhibition, plus all advantages of the virtual access as well as business lunches, all refreshments, welcome reception on Tuesday and the Dinner on the Lake on Thursday. Optional: Swiss Surprise on Wednesday (120 CHF pp). **Virtual fees include** virtual live and on-demand access as well as access to the virtual community rooms during and to the member zone after the conference, proceedings of the EFCF 2023 conference, EFCF membership with all additional services and rebates until the next conference (worth 750 CHF, 375 CHF for students) and post conference access to available presentations, book of abstracts and ISBN proceedings back to 1994.

Excellent Student Support Fund

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Chairs of the Conference



Prof. Michael H. Eikerling

received his Ph.D. in Physics from Technische Universität München in 1999. From 2003 to 2019, he was Professor of Theoretical Chemical Physics and Electrochemical Materials Science at Simon Fraser University in Burnaby, British Columbia, Canada. Between 2003 and 2013, he held a cross-appointment to the fuel cell institute of Canada's National Research Council in Vancouver, BC, where he shaped a program in physical modeling of fuel cells.

In May 2019, he was appointed as Professor at RWTH Aachen University and Director at the Institute of Energy and Climate Research (IEK) in Forschungszentrum Jülich, Germany, heading the Institute Section for Theory and Computation of Energy Materials (IEK-13). His research employs a wide spectrum of methods in physical theory and computation, to approach a diverse range of scientific challenges, from fundamental to applied topics. He contributes to: modeling transport phenomena at interfaces and in nanopores, theory and computation of electrocatalytic phenomena, studying self-organization in electrochemical materials, statistical physics of heterogeneous media, porous electrode theory, and modeling and diagnostics of electrochemical devices.

Prof. Eikerling has supervised > 70 highly qualified personnel, including 30 PhD students as well as 30 postdoctoral fellows and research associates. He has published over 170 journal articles (h-index 49 on google scholar), 8 book chapters and 1 textbook. In 2017, he was awarded the Alexander Kuznetsov Prize for Theoretical Electrochemistry of the International Society of Electrochemistry for his work in modeling polymer electrolyte fuel cells. He has directed or (co-)organized > 20 conferences, workshops and symposia and has served the electrochemical community in various roles (a.o., as topical editor of *Electrocatalysis*, SNG; editorial board member of *Scientific Reports*, SNG; chair of the Physical Electrochemistry division of ISE).



Prof. Anna K. Mechler

Since May 2020, Prof. Anna K. Mechler is Professor for Electrochemical Reaction Engineering at RWTH Aachen University, as a member of the Aachener Verfahrenstechnik (AVT). She is also leading a research group at the Institute of Energy and Climate Research (IEK-9) in Forschungszentrum Jülich.

Anna K. Mechler obtained her PhD in Electrochemistry in 2014 from Ruhr-University Bochum, for research conducted at the Max-Planck-Institute for Iron Research in the group of Karl J.J. Mayrhofer. Her PhD research focused on the combinatorial screening of fuel cell catalysts using the scanning flow cell. Following the completion of her PhD, she joined the group of Frédéric Jaouen at University Montpellier as a Postdoc to develop hybrid catalysts for the oxygen reduction reaction. In 2016, she became a research scientist and subsequently group leader for "Electrocatalysis" at the Max-Planck-Institute for Chemical Energy Conversion in Mülheim a.d. Ruhr.

Her current research focuses on the development of PEM fuel cell catalysts as well as the improvement of low-temperature electrolysis technologies. She is especially interested in bridging the gap from fundamental studies in electrocatalysis to the incorporation of new materials and electrodes into fully functional electrolyzers and fuel cells.

Anna K. Mechler coordinates the BMBF-funded project "Prometh₂eus" with 26 partners, as part of the flagship project "H₂Giga", an initiative that drives the large-scale deployment of electrolyzers in Germany. As a member of the steering committee of the "Hydrogencluster" at RWTH Aachen, she recently co-organized the 1st Aachen Hydrogen Colloquium.

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www.EFCF.com/SAC

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Publication of Proceedings, Presentations, Special issues

Low-Temperature

Electrolysers, Fuel Cells & H₂ Processing

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- This 27th high-level international event held in beautiful Switzerland offers an unobstructed look at the state-of-the-art technology
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