

EFCF 2023

FINAL ANNOUNCEMENT

4 – 7 July

KKL Lucerne/Switzerland 

Low-Temperature

Fuel Cells, Electrolysers & H₂ Processing Forum

From fundamental science to accelerated integration

4 July 2023
TUTORIALS:
FCH: Fuel Cell, Electrolyser & H₂
EIS: El.chem. Impedance Spectroscopy



Chaired by
Prof. Michael H. Eikerling
Prof. Anna K. Mechler
Forschungszentrum Jülich, Germany
RWTH Aachen University

MEEP
SYMPOSIUM
Microbial Enzymatic
Electrochem. Reactors

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Schedule of Events

Motto 2023: From fundamental science to accelerated integration

www.EFCF.com/Events

Tuesday, 4 July 2023

09:30 – 10:00	Registration for Tutorials – 2 nd floor club rooms above auditorium	11:00 – 16:00	Exhibition set-up
10:00 – 17:00	.../FCH: Fuel Cells & Hydrogen Tutorial Dr. G. G. Scherer, Dr. J. Van herle .../EIS: Electrochemical Impedance Spectroscopy Tutorial Dr. A. Weber, Dr. D. Klotz	16:00 – 18:00	Poster pin-up / Opening of the exhibition
			On-site Registration open (continued on the following days)
		18:00 – 19:00	Welcome gathering in the splendid KKL exhibition hall

Wednesday, 5 July 2023

08:00 – 16:00	On-site Registration , Speakers Warmup Coffee till 09:00, info at main desk	10:00 – 12:00	Registration for MEEP symposium 2023, 12:00 – 18.00 Sessions
09:00 – 18:00	Conference Sessions 1–6, Keynotes K1–4 & Invited Talks: Presentations on programs & activities in EU, USA & China, Enabling H2 Champions, plus Overview of Electrochemical H2 Adsorption and Absorption	12:00 – 18:00	Exhibition & Poster area open. 12:30 Press Conference
		09:00 – 18:00	Poster Session I: All Session Topics
		18:30 – 23:00	Swiss Surprise night, MEEP Network Evening and H2 Champions Dinner all with separate registration

Thursday, 6 July 2023

08:00 – 16:00	On-site Registration , Speakers Warmup Coffee till 09:00, info at main desk	09:00 – 18:00	MEEP Sessions
09:00 – 18:00	Conference Sessions 7–13, Keynotes K5–7 & Invited Talks: Specific Material Development, Electrolyser Industrialization & GW scale plants, Transport in MEAs, High-throughput Experimentation, Design through X-Ray Techniques, Catalysts for O2 Evolution,	13:15 – 15:00	Exhibition & Poster area open
		19:20 – 23:25	Poster Session II
			Great Dinner on the Lake – The unique networking event

Friday, 7 July 2023

08:00 – 09:00	On-site Registration , Speakers Warmup Coffee till 09:00, info at main desk	15:00 – 16:15	Closing & Award Ceremony:
09:00 – 12:00	Exhibition & Poster area open		Best poster, best scientific contribution & outstanding lifetime work;
09:00 – 16:15	Conference Sessions 14–18, Keynotes K7–8: Advances in FC Modeling/Diagnostics, Advanced Electrocatalysts, Dynamic Operation of Electrolyzers, Electrosynthesis of Oxygenates & Hydrocarbons	16:15 – 17:00	Keynote K8 by the EFCF Gold Medal of Honour Winner 2023 – Deborah Jones, Université Montpellier/France
			Goodbye coffee and travel refreshment in front of the Luzerner Saal

The sole purpose of the European Electrolyser and Fuel Cell Forum is the promotion of electrolyser, fuel cell and hydrogen technologies through the EFCF conference, literature and media. It is a high-level exchange platform, providing scientific sessions and tutorials, an exhibition, as well as international project meetings and recreational networking events in the charming and inspirational area of Lucerne, the heart of Switzerland. Every summer EFCF invites more than 10'000 stakeholders to participate in this internationally recognised event on the shores of the picturesque Lake Lucerne.

This year is a breakthrough – the quantity and quality of contributions has reached a new level. More than 300 contributions and posters will be presented in nearly 40 sessions over the course of 3.5 intensive and stimulating days. The high-level scientific content will be complemented by 10 excellent plenary and keynote presentations with country overviews and on market, deployment, investment, industrialization and diagnostics, as well as 7 invited technical presentations from recognized leading experts. Two extended poster sessions recognise the excellence of the poster contributions that are accessible throughout the entire conference. In addition, pre-recorded posters and oral presentations will be made available on-demand at www.EFCF.com/MemberZone. There will also be a 3rd presentation stream, the MEEP Symposium. About 50–80 experts will specifically exchange on the emerging topic of microbial, enzymatic & bio-photovoltaic electrochemical reactors. The EFCF closes with the award ceremony, where the audience will be privileged to hear a keynote from the winner of the 2023 Gold Medal of Honour. Awarded is Prof. Deborah Jones from Université Montpellier/France for her outstanding contribution to catalyst development for low and high temperature PEM fuel cells and electrolysers. Based on the convincing number and quality of submissions, up to 500 participants from 40 countries are expected.

The EFCF has a heritage of close to 30 years! As far back as 1994 the 1st European Fuel Cell Forum attracted leading international speakers as well as a global audience, the base for establishing a high-quality conference series. The EFCF 2023, the 27th edition, focuses on Low Temperature Electrolysers and H₂ Processing – From Fundamental Science to Accelerated Integ-

ration. The EFCF 2023 is expected to be Europe's largest dedicated low temperature electrolyser and fuel cell event: the place to be and to meet the experts!

Over the years, many strong relationships and contacts have been established at these events. Dedicated advisors & conference chairs keep a watchful eye on scientific quality. Unlike many commercial conferences, EFCF is organised by fuel cell technologists & scientists. As active members of the European electrolyser, FC and H₂ community, they have been observing the trends & following the recommendations from the EFCF International Board of Advisors www.EFCF.com/IBoA. The organisers ensure that the stakeholder's needs are always the focus of the Forum, to enable scientific breakthroughs & their subsequent transfer into products.

We are dedicated to continuously grow the European Electrolyser and Fuel Cell Forum as one of the most prominent meeting places for the comprehensive exchange of scientific and technical information and for high-level networking. This creates an environment that enables scientific breakthroughs and their subsequent transfer into industry. A very special thank you for this year's conference goes to Prof. Michael H. Eikerling and Prof. Anna K. Mechler from Forschungszentrum Jülich and RWTH Aachen University, Germany. Both present a very strong scientific experience and cooperate closely with industrial partners on fundamental aspects of understanding. They reflect very well the ambition of the EFCF: Building a bridge from science to technology – from technology to products! Together we are proud to offer a sound scientific programme, unforgettable side events and invite you to the pleasant surroundings of Lucerne. Finally, we would like to thank all the authors, exhibitors and suppliers for their excellent contributions, the Scientific Advisory and Organising Committees for their review work, and our staff members for fastidiously taking care of all the organizational details. Together with the numerous participants and exhibitors, the stage has been set for an exuberant EFCF 2023.

Thank you and we look forward to seeing you in Lucerne in July
Olivier Bucheli & Michael Spirig
European Electrolyser & Fuel Cell Forum – www.EFCF.com



Low-Temperature Fuel Cells, Electrolysers & H₂ Processing Forum

Conference Chairs:

Prof. Michael H. Eikerling
Prof. Anna K. Mechler

Forschungszentrum Jülich, Germany
RWTH Aachen University

EFCF 2023

Dear Conference Participants,

It is our great pleasure to welcome you to the 27th edition of the European Fuel Cell Forum that will focus on Low Temperature Electrolyzers, Fuel Cells & H₂ Processing.

The future looks bright for hydrogen as a currency of a sustainable economy. Yet, enabling the epochal energy transition through market-ready water electrolysis and fuel cell technologies remains an ambitious undertaking, especially given the envisaged timelines. It needs unprecedented alignment of efforts from scientists, technology developers and system integrators, driven by a high awareness of socio-economic and environmental needs and relying on unwavering government support.

Integration, as the motto of EFCF 2023, refers to the realization that any challenge related to performance or stability, even if it originates deep at the materials level, will not be solved in isolation. It necessitates integration from an early stage, to be achieved scale-to-scale, component-to-component and lab-to-lab, and combining modeling and characterization in

meaningful ways. Conference topics that are geared towards this motto encompass the basic knowledge of materials and interfacial phenomena; the interplay of reaction kinetics with the transport of mass, heat and water; advanced modelling and diagnostics; accelerated materials development; all the way to engineering of real-world devices, system integration and demonstration.

We wish to thank the Scientific Advisory Committee for their invaluable support in evaluating and selecting oral and poster contributions for the program. With this program, we hope that EFCF 2023 will offer all participants a forum for a vibrant exchange along the most relevant scientific, technical, industrial and business-related directions.

Michael H. EIKERLING and Anna K. MECHLER
Forschungszentrum Jülich, Germany
RWTH Aachen University

Conference language is English

Chaired by:



Since May 2020, **Prof. Anna 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 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 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.



Prof. Michael 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. From 2003 – 2013, he held a cross-appointment to the fuel cell institute of Canada's National Research Council in Vancouver, shaping a program in physical modeling of fuel cells.

In May 2019, he was appointed Professor at RWTH Aachen University and Director at the Institute of Energy and Climate Research (IEK) in Forschungszentrum Jülich, heading the Institute Section for Theory and Computation of Energy Materials. His research employs a wide spectrum of methods in physical theory and computation, to approach a range of scientific challenges. 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.

Dr. Eikerling has supervised > 70 personnel, including PhD students, postdoctoral fellows, and research associates. He has published over 170 journal articles, 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.

FCH Tutorial: Excellent Kick-Start to EFCF 2023

The Tutorial will provide the basic concepts required to address the general but also more specialised field of fuel cells. Fuel cell technology is interdisciplinary par excellence, and requires knowledge in electrochemistry, materials science, mechanical and electrical engineering, catalysis, corrosion, thermal management, systems engineering etc. The course will cover these different aspects as broadly as possible, illustrated by many examples. All fuel cell families will be addressed i.e Hydrogen Fuel Cells (H_2FC) and High Temperature Fuel Cells (HTFC) as well as Hydrogen Production, Storage and Infrastructure (H_2PSI). Applications and examples will be mostly surrounding the two most popular fuel cell types, PEFC (G. G. Scherer = GGS) and SOFC (J. Van herle = JVh), this is due to the expertise of both lecturers in their respective specialties.



Dr. Günther G. Scherer



Dr. Jan Van herle

The Tutorial will be targeted to newcomers as well as those who have been working in the area of fuel cells for some time. Participants will gain, or revise, current understanding of the operation and key challenges of fuel cell technology, where considerable progress in recent years has been achieved and new insights gathered. The requirements for fuel cell market introduction will be discussed.

The Tutorial lecture topics are fuel cell operating principles, thermodynamics, kinetics, efficiencies, central notions such as electrolyte ionic conductivity, electrode overpotential, triple phase boundary, Nernst equation, fuel reforming, cell and stack architectures and design, fuels (both fossil and renewable) for different fuel cells including their treatment, all fuel cell families (SOFC, MCFC, PAFC, PEFC/DMFC, AFC).

Tutorial Schedule:

- 09:30 Registration & Get-Together
- 10:00 Welcome & Introduction (EFCF)
- 10:15 Lecture 1: **Fundamentals of Electrochemical Energy Conversion (GGS)**
- 11:00 Lecture 2: **Characteristics of the important Fuel Cell Technologies (GGS)**
- 11:45 Coffee break
- 12:00 Lecture 3: **Fuels for Fuel Cells, Fuel Processing (JVh)**
- 12:45 Lunch break
- 14:00 Lecture 4: **Applications of Polymer Electrolyte Fuel Cells PEFC (GGS)**
- 14:45 Lecture 5: **System Aspects, Applications of High temp. Fuel Cells SOFC (JVh)**
- 15:30 Coffee break
- 15:45 Lecture 6: **State-of-the-Art, Challenges, Summary (JVh)**
- 17:00 End of Tutorial, Opportunity to visit the Exhibition

The Tutorial language is English. Register online at - www.EFCF.com/TutReg
Each participant will receive a copy of all of the Tutorial lectures. The tutorial registration fee for all participants is CHF 580.—.

The Tutorials can also be booked and viewed on-demand – see www.EFCF.com/MemberZone

EIS Tutorial: An advanced Booster to EFCF 2023



Dr. André Weber



Dr. Dino Klotz

Electrochemical Impedance Spectroscopy (EIS) has become an important tool for studying mass and charge transport in electrochemical systems. It is not only of importance for fundamental research, but also for characterizing batteries, fuel cells, sensors, etc. The EIS Tutorial is focused on medium to experienced level users, who are already familiar with the principles of Fuel Cells and Electrolysers.

The EIS Tutorial will support you with new findings and relevant experiences. During the EIS Tutorial you will receive answers to questions before you have to ask them, as well as the chance to ask questions you may not dare to voice in front of a general audience. You will come into contact with the specialists and other experienced users. You enlarge your exchange and discussion network within the EIS community. Opportunity for discussion and exchange are provided, especially during the 'EIS challenge'.

The EIS Tutorial is an excellent extension of your current know-how. It contains 5 lectures and an 'EIS challenge': The lectures will range from the basic principles, that makes EIS one of the most powerful analyzing instruments available today, to more advanced applications of EIS, to very sophisticated cases and many practical experiences. Many results will be presented, and

the right interpretation discussed. The lectures are followed by an 'EIS challenge', where all kinds of impedance questions, problems, and latest experiences can be discussed and exchanged with other participants.

Tutorial Schedule:

- 09:30 Registration & Get-Together
- 10:00 Welcome & Introduction (EFCF)
- 10:15 Lecture 1: **Fundamentals of electrochemical impedance spectroscopy**
- 11:00 Lecture 2: **Evaluation of impedance spectra
Kramers-Kronig test, DRt-Analysis & CNLs Fit**
- 11:45 Coffee break
- 12:00 Lecture 3: **Applications i – Analysis of Materials & interfaces**
- 12:45 Lunch Break
- 14:00 Lecture 4: **Applications ii – Analysis single Cells & stacks**
- 14:45 Lecture 5: **Impedance Modelling & Simulation**
- 15:30 Coffee break
- 15:45 Lecture 6: "EIS challenge" – Summary
- 17:00 End of EIS Tutorial, Opportunity to visit the Exhibition

The Tutorial language is English.

Register online at – www.EFCF.com/Reg

The registration fee for the tutorial is CHF 580 for on-site and CHF 400 for live, online participation. Participation in the tutorial (including successful completion of the EIS Challenge) will give **0.5 ECTS credits**, confirmed on the participation certificate.

Date and Place

www.EFCF.com/KKL

The Low-Temperature Fuel Cells, Electrolysers & H₂ Processing Forum will be held from 4 – 7 July, 2023 in the renowned Kultur und Kongresszentrum (KKL) in Lucerne, Switzerland. The parallel lectures will be presented in the 'Auditorium', 'Convention Foyer' and in the 'Club Rooms'. The KKL is located next to the main railway station, and directly on the shore of Lake Lucerne. Boat traffic, water front activities, as well as spectacular views of the old town and snow-capped mountains add to the charm of this unique venue.

To see a video of Lucerne go to www.EFCF.com/Lucerne

To see details of the KKL go to www.kkl-luzern.ch

Technical Program

www.EFCF.com/Program

The EFCF 2023 conference will deal exclusively 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 covers the most important scientific and technical aspects in this field. The inputted contributions are completed with 7 invited talks and 10 keynotes from leading personalities of the community. They range from R&D overviews in EU (by CH JU), UNITED STATES (by Los Alamos National Lab) & CHINA (by Guangdong Taiji Power) to technical high-level presentations about „Materials Development for Water Splitting & CO₂ Reduction (K5)“, „Industrialization of Hydrocarbon PEMs & AEMs (K6)“, „GW Scale Electrolysers (K7)“, „Electrosynthesis (K8)“, „Advances in Characterization of Catalysts & Electrodes (K9)“ and finally the Gold Medal of Honour Winner surprise keynote about „Materials Developments for Low Temperature FCs & ECs (K10)“. As a novel chance for the community, the investor FiveT presents its cooperation opportunities to attract new „...Champions to Build the H₂ Economy (K4)“.

The invited talks will then be about „H₂ Ad- & Absorption (I1)“, „Water Formation in MEAs (I2)“, „High-throughput Experimentation (I3)“, „Membrane Designs Through X-Ray Tech (I4)“, „Ir-Based Catalysts for O₂ Evolution (I5)“, „Advanced Electrochemical Techniques (I6)“, and „Dynamic Operation of AWE (I7)“

The EFCF 2023 sessions are roughly classified in:

- Science & Know-how for Membrane related Electrochemical Processes e.g. material/catalysis research, diagnostics, characterisation, transport phenomena, durability, degradation, modelling, testing;
- Bridge to Products, where (commercial) FC-EL-H₂ Component Performance and Operation are in the focus;
- Industrial Achievements & R&D Inventions, where the emphasis lies on Approaches & Design of Systems, Applications, Combinations & Implementations. Major groups and leading OEMs as well as stack provider present their Status and Outlook.

The parallel special SYMPOSIUM - MEEP (Microbial/Enzymatic Electrochemistry Platform), shortly outlined in the next section and in separate announcements, complete the EFCForum's comprehensive State-of-the-Art overview and outlook.

In attractive, well balanced two and four-day programmes, more than **310 contributions** will be presented i.e. over **150 oral** presentations in **35 sessions**, and more than **160 posters** in 4 specific poster sessions. The EFCF starts with two tutorials, offers technical lectures, poster presentations, exhibits, product presentations and demonstrations, and integrates valuable, well-liked networking activities. EFCF+MEEP events are offered in the same building. EFCF registration covers unrestricted admission to the conference, exhibition and networking events, as well as to the MEEP symposium, which can also be booked separately. The EFCForum is designed to inform representatives of industry, trade, finance, utilities and users, as well as engineers, technology brokers, service providers, consultants and members of the research community. Implementation and application detail information are also available from the exhibitors. The Low-Temperature Fuel Cells, Electrolysers & H₂ Processing Forum will be the major European ELECTROLYSIS, FUEL CELLS and HYDROGEN event in the year 2023.

Green Hydrogen Forum & Expo

GHF+E 2023



14 - 16 June, Messe Munich, Germany

www.EFCF.com/GHF

Free Day Ticket
with EFCF Promo Code
"EFCF_ees2023"

Special Events

www.EFCF.com/SE

The following Special Events complete the EFCF program. These events use EFCF as a perfect platform because many stakeholders are already present and EFCF supports the organization and promotion of the events (see www.EFCF.com/FPM). For more details, registration and the latest information see www.EFCF.com/SE, the specific links and/or the separate announcements.

4 July 8 – 17 KKL Club Rooms	FCH-Tutorial 0.5 ECTS; Level: kick-start; EIS-Tutorial 0.5 ECTS; Level: advanced;	www.EFCF.com/FCH www.EFCF.com/EIS
6 July 13.00 – 17.00 KKL Club Rooms	KICstartH2 Why hydrogen? Why higher education? Scope: Accelerate hydrogen uptake throughout Europe through education and innovation. A consortium of 9 HEIs develops niche educational methodologies that not only tackle content on hydrogen technologies but also innovation methods in business and management.	www.EFCF.com/KICstartH2
5 July 11.00 6 July 18.00 KKL Club Rooms	MEEP 2023 4th international symposium on Microbial, Enzymatic & Bio-Photo-voltaic Electrochemical Reactors; Organised with www.Cost-PHOENIX.eu	www.EFCF.com/MEEP

Participation & Registration:

To participate in any of the public events register in advance. Some of the event will be hybrid, with the possibility to join both on-site and remote. Follow the specific links. If you have any questions or if you want to organize also an event, contact forum@efcf.com.

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www.EFCF.com/SAC

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We thank the SAC for the evaluation and contribution to structure the technical program.



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As a pioneering investment platform dedicated to clean hydrogen, with Hy24 as asset manager, FiveT Hydrogen expects technologies to boost hydrogen potential.

Join FiveT's presentation at 14h30 and the exclusive network dinner at 18h30 on July 5th. Application for dinner: www.EFCF.com/FiveT



Exhibition

www.EFCF.com/ExReg

EFCF 2023 offers you a top chance to catch up on some exhibition opportunities, and share your products directly with potential new clients. The technical exhibition will be held in the splendid Foyer of the Lucerne Hall. This event offers industry, suppliers, test equipment providers and research laboratories the opportunity to showcase their latest products and services, as well as allowing important face-to-face contact with potential new clients.

Exhibitors from all over the world are invited to participate.

In addition to fuel cell, electrolyser and hydrogen technology developers showing systems, related hardware and applications, suppliers can present new materials, stack and system components, control devices, production technology, qualification and test benches and diagnostic tools alongside research and development services.

For further information please contact the European Fuel Cell Forum or visit www.EFCF.com/Exhibition. The details of confirmed exhibitors are listed in the rear of this booklet.

EFCF Online Library

www.EFCF.com/O-Lib

The EFCF online library offers fast and easy access to both free and purchased information. The library is constantly being updated, and currently contains Proceedings with ISBN dating back to 2011, with files from as far back as 1994 gradually or on request being converted and uploaded. With a free login, the current and future proceedings will be accessible. Additionally, since 2020, all eligible contributions will be assigned a DOI (Digital Object Identifier) and published online in the EFCF community of the general purpose open-access repository www.Zenodo.org. The EFCF library offers direct access to this EFCF community and the EFCF Special Issue Series of the Journal „FUEL CELLS“ from Wiley-VCH. In the library you can also access the Conference Agendas with the Programs & the Book of Abstracts, as well as the impressions of all EFCF events which are made publicly available.

The EFCF Online Library also provides download access to the available presentations from the year of attendance and the 5 previous years for all registered attendees of an EFCF event with an approved login, upon permission of the authors. To obtain download rights after the conference, post-registration is possible. Please send an email to forum@EFCF.com.

Publication Offers: Proceedings (DOI), Journals

www.EFCF.com/PP

All contributions, which deliver an extended abstract, have the opportunity to be published with their own DOI in the EFCF community of the general purpose, open-access repository www.Zenodo.org.

Since 2012 a limited number of contributions will additionally be invited to be included in a Special Issue in the peer reviewed „Fuel Cells – From Fundamentals to Systems“ with an impact factor of 2.948 and 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“, can opt out. All copyrights remain with the authors.

Presentation available with approved participant login

www.EFCF.com/Presentations

At the EFCF conferences, participants are not permitted to take pictures of the presentations (literary property). This allows presenters to show their latest results, which are, for example, intended for publication in a scientific paper at a later date. However, presenters usually indicate their willingness to share their presented and eventually copyedited slides to the conference registrants. Upon receiving the authors permission, presentations of the current and previous years will be made available in the online library www.EFCF.com/PRESENTATIONS for all registered participants of the European Fuel Cell Forum with an approved login. To obtain download rights after the conference, post-registration is possible by „filing Contact Data“ on the www.EFCF.com/Lib on-line form.

Who should attend?

The conference with exhibition offers an attractive programme for potential users of fuel cells, decision makers, researchers and engineers in industry, laboratories, academic institutions, governments, investors, consultants and electric power engineers. The event provides many opportunities for informal exchanges between industry, market and academia, a platform for technology transfer and recruitment of qualified students and trainees. The European Electrolyser and Fuel Cell Forum combines the personal atmosphere of a workshop with the format of a scientific conference. This is the time and the place where decision makers meet politicians, inventors meet investors, engineers meet scientists, power & transport industry meet OEMs and users meet providers. Participants from all continents are invited and welcome to attend this prestigious event.

Virtual participation is also possible as well as on-demand access after the event.

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www.EFCF.com/IBoA

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- Dr. Günther G. Scherer, formerly Paul Scherrer Institute, Switzerland
- Dr. Subhash Singhal, Pacific Northwest National Laboratory, USA
- Prof. Robert Steinberger-Wilckens, University of Birmingham, United Kingdom
- Prof. Constantinos Vayenas, University of Patras, Greece
- Prof. Wei Guo Wang NIMTE, PR China
- Prof. Jianbo Zhang, Tsinghua University, China
- Assoc. Prof. Zhichuan Jason Xu, NTU, Singapore

EFCF 2023 Session Program

Low-Temperature Fuel Cells, Electrolysers & H₂ Processing

KKL Lucerne, Switzerland, 4 - 7 July

incl. MEEP symposium, Exhibition, Tutorials

We - Fr		A Luzerner Saal	B Auditorium	M Club Rooms
We UTC/GMT +2 hours	9:00	A01: <u>P1</u> : Opening Session <u>K1-3</u> : EU, USA, China		5 - 6 July MEEP 2023 5 th international symposium on Microbial, Enzymatic & Bio-Photovoltaic Electrochemical Reactors, Cells & Systems
	11:00	A02: PEM-Electrolysis	B02: Fuel Cell Catalysts	
	13:15	Auditorium Foyer	A03: Poster Session I covering All Session Topics	
	14:30	A04: <u>K4</u> : Enabling Champions		
	15:00	A05: Fuel Cell System Analysis and Degradation	B05: Ionic Media	
	16:30	A06: Alkaline Electrolysis	B06: Electrode Fabrication	
Th UTC/GMT +2 hours	9:00	A07: <u>K5</u> : Improvements in Material Development	B07: <u>K6</u> : Prospects for the Electrolyser Industrialization	
	9:30	A08: Tailored MEA Design for Fuel Cells & Impact of Flow-Fields	B08: Alkaline (OER) Catalysts	
	11:00	A09: Advanced Systems & Components	B09: Advanced Testing and Diagnosis	
	13:15	Auditorium Foyer	A03: Poster Session I covering All Session Topics	
	14:40	A11: <u>K7</u> : GW scale electrolyser plants		
	15:00	A12: Alternative Fuel Cell Systems and Additives	B12: AI-driven R&D	
Fr UTC/GMT +2 hours	16:30	A13: Multiscale Characterization	B13: Catalysts for Acidic Electrolysis	
	9:00	A14: <u>K8</u> : Electrosynthesis	B14: <u>K9</u> : Modeling and Diagnostics	
	9:30	A15: Life Cycle Analysis and Economic Viability	B15: Structure-based and Dynamic Modeling	
	11:00	A16: Performance and Lifetime Assessment	B16: Local Reaction Environment and Interactions	
	13:30	A17: Dynamic Operation of Systems	B17: CO ₂ -Electrolysis	
	15:05	A18: <u>P2</u> : Closing Ceremony <u>K10</u> by the EFCF Gold Medal of Honour Winner 2023		Legend: <u>Px</u> : = Plenary, <u>Kx</u> : = Keynote All times are given in UTC/GMT +2 hours

All Keynote (K..) & Invited (I..) Talks

5. July
09:30 **K1: EUROPEAN UNION - The Status of Low Temperature Electrolyser and Fuel Cell R&D in the European Clean Hydrogen Joint Undertaking Programme (A0104)**

Nikolaos Lyemperopoulos, Lionel Boillot, Antonio Aguilo-Rullan, Dimitra Dirmiki, Mirela Atanasiu, Bart Biebuyck, Clean Hydrogen Joint Undertaking; Brussels/Belgium;

09:50 **K2: UNITED STATES: Hydrogen & Fuel Cells for a Clean Energy Infrastructure (A0105)**

Rod Borup, Los Alamos National Lab, Los Alamos, New Mexico/U.S.A.

10:10 **K3: CHINA - Current Policies and Incentives for Fuel Cell Deployment (A0106)**

Dustin Banham (1,2,3); (1) Guangdong Taiji Power; (2) School of Materials Science and Hydrogen Energy, Foshan University; (3) Guangdong Key Laboratory for Hydrogen Energy Technologies, Foshan/PR China;

11:00 **I1: An Overview of Electrochemical Hydrogen Adsorption and Absorption (B0201)**

Gregory Jerkiewicz, Department of Chemistry, Queen's University, Kingston/Canada;

14:30 **K4: Enabling Champions to Scale up the Hydrogen Economy (A0401)**

Nicolas Brahy, Pierre-Etienne Franc, David Crnjac
FiveT Hydrogen AG, Pfäffikon SZ/Switzerland

6. July
09:00 **K5: Integrating Coherent Workflows into Materials Development for Water Splitting and CO₂ Reduction (A0701)**

Doris Segets, Process Technology for Electrochemical Functional Materials, Uni of Duisburg-Essen/Germany;

K6: Hydrocarbon PEMs and AEMs: From Concept to Industrialization (B0701)

Steven Holdcroft, Simon Fraser University, Department of Chemistry, Greater Vancouver/Canada;

11:00 **I2: Liquid Water Formation and Transport in Membrane Electrode Assembly of PEMFC: Liquid Injection, Vapor Condensation and Mixte Scenarii (B0901)**

Joël Pauchet (1), Marc Prat (2)

(1) Université Grenoble Alpes, CEA, LITEN, Grenoble
(2) Institut de Mécanique des Fluides de Toulouse (IMFT), Université de Toulouse, CNRS – Toulouse/France

14:40 **K7: Scaling Electrolysers from Lab to Commercial Gigawatt Scale Plants (A1101)**

Srikanth Santhanam, Jeff Martin, Charudatta Patil,
Shell Global Solutions International B.V., Amsterdam/The Netherlands

15:00 **I3: Enhancing Electrochemical Research by Utilizing High-throughput Experimentation (B1201)**

Andreas Müller (1), Florian Huber (1), Michael Dejmeck (1), Fabian Schneider (1), Burkhard Hecker (2), Deniz Dogan (2,3), Herrmann Tempel (2), Rüdiger-A. Eichel (2,3)
(1) hte GmbH, Heidelberg/Germany; (2) Forschungszentrum Jülich, Institute of Energy and Climate Research - Fundamental Electrochemistry (IEK-9), Jülich/Germany;
(3) RWTH Aachen University, Institute of Physical Chemistry, Aachen/Germany;

16:30 **I4: Informing Polymer Electrolyte Membrane Fuel Cells and Electrolyzer Designs Through X-Ray Techniques (A1301)**

Aimy Bazylak; Department of Mechanical and Industrial Engineering, Faculty of Applied Science and Engineering, University of Toronto/Canada;

I5: Understanding the Nature and Activity of Supported Ir-Based Catalysts for Oxygen Evolution Reaction (B1301)

Darija Susac, Ziba S.H. Rajan, Julie-Anne Hoffman, Genna Moss, Rhiyaad Mohamed
HySA Catalysis, Cape Town/South Africa;

7. July
09:00 **K8: Electrosynthesis of Oxygenates and Hydrocarbons (A1401)**

Boon Siang Yeo, Department of Chemistry, National University of Singapore, Singapore;

K9: Advances in Characterization of Low-Temperature Fuel cell and Electrolyzer Catalysts and Electrodes (B1401)

Debbie Myers, Argonne National Laboratory, Lisle/Illinois USA

11:00 **I6: Why Advanced Electrochemical Techniques are Essential to Design Advanced Electrocatalysts (B1601)**

Kristina Tschulik, Analytical Chemistry II, Faculty of Chemistry and Biochemistry, Ruhr University Bochum, Bochum/Germany

13:30 **I7: Dynamic Operation of Alkaline Water Electrolyzers: Modeling, Simulation, and Control Strategies (A1701)**

Jörn Brauns (1,2), Felix Gäde (1,2), Fabian Kirstein (1,2), Maik Becker (1,2), Thomas Turek (1,2), (1) Institute of Chemical and Electrochemical Process Engineering, TU Clausthal/Germany; (2) Research Center Energy Storage Technologies, Goslar/Germany;

15:40 **K10: Gold Medal 2023 Winner Keynote on Materials Developments for Low Temperature Fuel Cells & Electrolysers: Performance, Durability & Sustainability (A1804)**

Deborah Jones, EFCF Gold Medal of Honour Winner 2023
Université Montpellier, Montpellier/France

EFCF 2023, 4 - 7 July

Session Program

Morning - Luzerner Saal

Wednesday, 5 July 2023

09:00 A01: P1: Opening Session K1-3: EU, USA, China

09:00 **Welcome by the Organizers (A0101)**

Michael Spirig, Olivier Bucheli;
European Electrolyser & Fuel Cell Forum, Luzern/Switzerland

09:05 **Welcome by the Chairs (A0102)**

Michael H. Eikerling, Anna K. Mechler
Forschungszentrum Jülich & RWTH Aachen University, Jülich & Aachen, Germany

09:15 **Welcome to Switzerland (A0103)**

Stefan Oberholzer, Rolf Schmitz, Benoît Revaz
Swiss Federal Office of Energy, Bern/Switzerland

09:30 **K1: EUROPEAN UNION - The Status of Low Temperature Electrolyser and Fuel Cell R&D in the European Clean Hydrogen Joint Undertaking Programme (A0104)**

Nikolaos Lymperopoulos, Lionel Boillot, Antonio Aguilo-Rullan, Dimitra Dirmiki, Mirela Atanasiu, Bart Biebuyck,
Clean Hydrogen Joint Undertaking; Brussels/Belgium;

09:50 **K2: UNITED STATES: Hydrogen & Fuel Cells for a Clean Energy Infrastructure (A0105)**

Rod Borup, Los Alamos National Lab, Los Alamos, New Mexico/U.S.A.

10:10 **K3: CHINA - Current Policies and Incentives for Fuel Cell Deployment (A0106)**

Dustin Banham (1,2,3)
(1) Guangdong TaiJi Power;
(2) School of Materials Science and Hydrogen Energy, Foshan University;
(3) Guangdong Key Laboratory for Hydrogen Energy Technologies, Foshan/PR China;

10:30 Break - Ground Floor in the Exhibition



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Scientific Organizing Committee (SOC)

www.EFCF.com/SOC

Dr. Tobias Binninger

Dr. Thomas Kadyk

Dr. Mehrtoos Eslamibidgoli

Dr. Piotr Kowalski

Dr. Jun Huang

Dr. Kourosh Malek

all from FZJ, Germany

We thank the SOC for the content and quality contribution of the technical contributions.

11:00 A02: PEM-Electrolysis

- 11:00 **Ultra-low Ir Loaded Anodes as Catalyst for PEM Water Electrolysis (A0201)**
Bas van Dijk (1), Ivan Garcia Torregrossa (1), Paige Shirvanian (1), Paul Poodt (2), Oscar Diaz Morales (1), Jie Shen (1), Frennie Bens (1), Mahmoud Ameen (1);
(1) TNO; (2) SparkNano, The Netherlands;
- 11:15 **Insights on Activation Protocols Shorter than 30 Hours for PEM WE Cells (A0202)**
Irene Franzetti, Ai-Lin Chan, Tom Smolinka, Fraunhofer ISE, Freiburg im Breisgau/Germany;
- 11:30 **Modelling and Validation of a 250 kW Proton Exchange Membrane Water Electrolysis System (A0203)**
Felipe H. Ravaglio-Pasquini (1,2), Andras Perl (1), Amogh Amladi (2), Chaitanya Joglekar (2), Theo Woudstra (2), Jan-Jaap Aué (1), P. V. Aravind (2)
(1) Hanzehogeschool Groningen/Netherlands; (2) University of Groningen/Netherlands;
- 11:45 **Pressurized Test Bench for Impedance Analysis of PEMEL-cells (A0204)**
Debora Brinker, Gözde Kardeş, Philipp Röse, André Weber
Institute for Applied Materials – Electrochemical Technologies (IAM-ET), Karlsruhe Institute of Technology, Karlsruhe/Germany;
- 12:00 **Corrosion Phenomena of Carbon-based Bipolar Plates in PEM Electrolysis (A0205)**
Leonard Messing (1), Kai Junge Puring (1), Lukas Kopietz (1), Michael Joemann (1), Anna Grevé (1,2), Ulf-Peter Apfel (1,3); (1) Fraunhofer Inst. for Environmental, Safety & Energy Technology, UMSICHT, Oberhausen; (2) Cross Energy Systems, Faculty of Mechanical Engineering; (3) Inorganic Chemistry I, Faculty of Chemistry & Biochemistry, Ruhr University, Bochum/Germany;
- 12:15 **Toward Low Loading and High Utilization Ratio of Iridium Catalyst for PEM Water Electrolyzers Using Smoltek Carbon Nanofibers (A0206)**
Xin Wen (1), Sankar Sasidharan (2), Bastien Penninckx (1), Jaime Sanchez (1), Zhenyuan Xia (2), Uta Klement (2), Ellinor Ehrnberg (1), Qi Li (1), Fabian Wenger (1)
(1) Smoltek Hydrogen AB, Gothenburg/Sweden;
(2) Chalmers University of Technology, Gothenburg/Sweden;

B02: Fuel Cell Catalysts**I1: An Overview of Electrochemical Hydrogen Adsorption and Absorption (B0201)**

Gregory Jerkiewicz
Department of Chemistry, Queen's University, Kingston/Canada;

Electrocatalysts for Alkaline Oxygen Reduction Reaction - Radicals & Selectivity (B0203)

Krzysztof Kruczala (1), Szymon Wierzbicki (1), John C. Douglin (2), Ramesh K. Singh (2,4), Dario R. Dekel (2,3); (1) Faculty of Chemistry, Jagiellonian Uni, Krakow/Poland; (2) The Wolfson Dep. of Chemical Engineering, (3) Grand Technion Energy Program GTEP, Technion-Israel Inst. of Technology, Haifa/Israel; (4) CO₂ Research & Green Technologies Centre, VIT, Vellore/India;

Toward Low Pt Loading of**Unsupported Pt-Ni Aerogels Cathode Catalyst Layer in PEMFCs (B0204)**

Meriem Fikry (1), Tim Welmers (1), Juan Herranz (1), Pavel Khavlyuk (2), Alexander Eychmüller (2) Thomas. J Schmidt (1,3); (1) Electrochemistry Laboratory, Paul Scherrer Institut, Villigen/Switzerland; (2) Physical Chemistry, Technische Universität Dresden, Dresden/Germany; (3) Laboratory of Physical Chemistry, ETH Zürich, Zürich/Switzerland;

Study and Optimization of Vertically Aligned**Carbon Nanotube Composites and Catalysts for Fuel Cell Applications (B0205)**

Matthieu Tempelaere, Marc Zimmermann, Marianne Chatenet, Nicolas Blasco
Univ. Grenoble Alpes, CNRS, Grenoble INP, LEPMI, Grenoble/France;

M-N-C Cathode Catalysts with Varied Porous Structure for Anion-Exchange Membrane Fuel Cells (B0206)

Jaana Lilloja (1), Marek Mooste (1), Elo Kibena-Pöldsepp (1), Ave Sarapuu (1), Arvo Kikas (2), Vambola Kisand (2), Maike Kääril (1), Jekaterina Kozlova (2), Alexey Treshchalov (2), Päärn Paiste (3), Jaan Aruväli (3), Jaan Leis (1), Aile Tamm (2), Steven Holdcroft (4), Kaido Tammeveski (1); Institute of (1) Chemistry; (2) Physics; (3) Ecology & Earth Sciences, University of Tartu, Tartu/Estonia; (4) Dep. of Chemistry, Simon Fraser University, Burnaby, BC/Canada;

12:30 Lunch - 2nd Floor on the Terrace / Coffee - Ground Floor in the Exhibition & 1st Floor in the Poster Area

13:15 A03: Poster Session I covering All Session Topics

Auditorium Foyer

S-Chairs: Anna K. Mechler, Michael H. Eikerling

14:30 A04: K4: Enabling Champions by FiveT Hydrogen

14:30 **K4: Enabling Champions to Scale up the Hydrogen Economy (A0401)**
Nicolas Brahy, Pierre-Etienne Franc, David Crnjac, FiveT Hydrogen AG, Pfäffikon SZ/Switzerland



15:00 A05: Fuel Cell System Analysis and Degradation

15:00 **High Powered Fuel Cell Stacks and Systems EH Group (A0501)**
Mardit Matian
EH GROUP Engineering AG, Nyon/Switzerland;

15:15 **Degradation Effects Observed in Automotive Fuel Cell Stacks by Applying a New Realistic Test Protocol (A0502)**
Michael A. Schmid (1), Jürgen Kaczerowski (1), Florian Wilhelm (1), Joachim Scholta (1), Bernd Müller (2), Markus Hölzle (1);
(1) ZSW, Ulm/Germany;
(2) BMW Group, Munich/Germany;

15:30 **Experimental Dynamics Analysis of a Full-Scale Automotive PEM Fuel Cell System (A0503)**
Jonas Breitingner (1), Mark Hellmann (1), Helerson Kemmer (1), Stephan Kabelac (2);
(1) Robert Bosch GmbH, Renningen;
(2) Leibniz University Hannover, Garbsen/Germany;

15:45 **AutoStack Industrie – High-Performance Stack Technology for Automotive Mass Production – Project Results (A1512) = (A0504)**
André Martin (1), Ludwig Joerissen (2)
(1) André Martin Consulting, Idstein/Germany;
(2) Centre for Solar and Hydrogen Research, Ulm/Germany;

B05: Ionic Media

Molecular Engineering of Anion Exchange Membranes for Hydrogen FC and WE (B0501)
Chulsung Bae (1, 2);
(1) Rensselaer Polytechnic Institute, Troy, NY /USA;
(2) Yonsei University, Seoul/S. Korea;

Teaching an Old Dog New Tricks: Recent Advances in PBI Membranes (B0502)
Laura Murdock, Ishwor Karki, Ben Howard, Brian C. Benicewicz
University of South Carolina, SC Columbia/USA;

Effects of Solution Composition and Pt Particles on Ionomer Morphology & Adsorption Behavior (B0503)
Yuting Guo (1), Takuya Mabuchi (1,2), Gaoyang Li (1), Takashi Tokumasu (1);
(1) Institute of Fluid Science, Tohoku Uni, Aoba-ku/Sendai;
(2) Frontier Research Institute for Interdisciplinary Sciences, Tohoku Uni, Aoba-ku/Sendai;

Influence of Ionomer Chemistry on Oxygen Permeability in Hydrocarbon-based Proton-exchange Membrane Fuel Cells (B0504)
Hannes Liepold (1), Hien Nguyen (1,2), Andreas Muenchinger (2), Severin Vierrath (1,2)
(1) Electrochemical Energy Systems, IMTEK Department of Microsystems Engineering, University of Freiburg; Freiburg/Germany; (2) Hahn-Schickard; Freiburg/Germany;

16:00 Break - Ground Floor in the Exhibition & 1st Floor in the Poster Area

16:30 A06: Alkaline Electrolysis

- 16:30 **A Composite Membrane for Alkaline Electrolysis at Increased Temperature (A0601)**
Felix Lohmann-Richters, Leon Bürgers,
Andrea Stähler, Markus Stähler, Martin Müller
Forschungszentrum Jülich, Jülich/Germany;
- 16:45 **In-situ AEM-WE MEA Characterization: Influence of Components and Conditions (A0602)**
Bastian Kaufmann, Miriam Hesse, Moritz Pilaski
The Hydrogen and Fuel Cell Center (ZBT GmbH), Duisburg/Germany;
- 17:00 **A Numerical Investigation of Mass Transport in a PTL layer of an Anion Exchange Membrane Water Electrolysis (A0603)**
Farhad Farajimoghadam, Edoardo Gino Macchi,
Matteo Testi, Mohsen Shiea, Luca Praticco, Luigi Crema
Fondazione Bruno Kessler, TN/Italy;
- 17:15 **Pilot-scale Preparation of Nickel-Cobalt Based Anode Materials for Alkaline Electrolysis (A0604)**
Vineetha Vinayakumar (1), Adarsha Kumara Adagalale Jinadath (1), Timo Wagner (2), Christian Marcks (3), Nicolas Wöhr (2,4), Anna K. Mechler (3), Doris Segets (1,4)
(1) Institute for Combustion and Gas Dynamics-Particle Science and Technology (IVG-PST), University of Duisburg-Essen (UDE), Duisburg/Germany;
(2) Faculty of Physics, University of Duisburg-Essen (UDE), Duisburg/Germany;
(3) Electrochemical Reaction Engineering, RWTH Aachen University, Aachen/Germany;
(4) Center for Nanointegration Duisburg-Essen (CENIDE), University of Duisburg-Essen (UDE), Duisburg/Germany;

B06: Electrode Fabrication

- MEA Cost Reduction Through Manufacturing Approaches & Materials Level Innovation (B0601)**
Dustin Banham (1,2,3), Ye Peng (1,2,3), Jin Bai, Jay Choi
(1) Guangdong Taiji Power, Foshan/China;
(2) School of Materials Science and Hydrogen Energy, Foshan University, Foshan/PR China;
(3) Guangdong Key Laboratory for Hydrogen Energy Technologies, Foshan/PR China;
- Unraveling the Core of FC Performance: Engineering the Ionomer/Catalyst Interface (B0602)**
Jian Xie (1,2)
(1) Department of Mechanical and Energy Engineering, Indiana University Purdue University Indianapolis, Indianapolis/USA;
(2) School of Mechanical Engineering, Purdue University, West Lafayette/USA;
- Impact of Ionomer Side-chain Length on the Performance of PEFC Electrode Fabricated via Electro spray Deposition (B0603)**
Seo-Won Choi (1,2), Hyunguk Choi (1), Won-Young Choi (1),
Young Je Park (1), Young Gi Yoon (1), Chi-Young Jung (1)
(1) Fuel Cell Research and Demonstration Center, Korea Institute of Energy Research, Jeollabuk-do/Republic of Korea; (2) Graduate School of Energy Convergence, Gwangju Institute of Science and Technology, Gwangju/Republic of Korea;
- Effects of Dispersion Component on the Jetting Behavior and Catalyst Layer Structure for Inkjet-printed Electrodes in Proton Exchange Membrane Fuel Cells (B0604)**
Qingying Zhao (1,2), Tobias Morawietz (1), Pawel Gazdzicki (1), K. Andreas Friedrich (1,2)
(1) Germany Aerospace Center (DLR), Stuttgart/Germany;
(2) University of Stuttgart, Stuttgart/Germany;



FiveT
Hydrogen

- 17:30 **Degradation Assessment for Dynamic Operation of Alkaline Electrolysis powered by Renewable (A0605)**
Sharon-Virginia Pape (1), Roger Keller (1), Martin Müller (1), Anna K. Mechler (1,2,3,4), Felix Lohmann-Richters (1)
(1) Institute of Energy and Climate Research, Electrochemical Process Engineering (IEK-14); Forschungszentrum Juelich GmbH, Juelich/Germany;
(2) Electrochemical Reaction Engineering (AVT.ERT), RWTH Aachen Uni, Aachen/Germany;
(3) Institute of Energy and Climate Research, Fundamental Electrochemistry (IEK-9); Forschungszentrum Juelich GmbH, Juelich/Germany; (4) JARA-ENERGY, Aachen/Germany
- 17:45 **Design of High-Performance and Scalable Non-Noble AEM-WE Anodes based on Corrosion Engineering (A0606)**
Miriam Hesse (1), Bastian Kaufmann (1), Harry Hoster (1), Ulf-Peter Apfel (2), Thomas Ernst Müller (3)
(1) ZBT GmbH Duisburg/Germany; (2) Fraunhofer UMSICHT, Oberhausen/Germany; (3) Ruhr-University Bochum, Carbon Sources and Conversion, Bochum/Germany;

- Analysis of Pt Utilization in Patterned Electrodes of PEMFCs via Heterogeneous Pore-scale Modeling (B0605)**
Morio Tomizawa (1), Gen Inoue (2), Keisuke Nagato (1), Akihisa Tanaka (1), Hideto Koshiba (1), Hirotaka Oya (1), Masayuki Nakao (1)
(1) Department of Mechanical Engineering, Graduate School of Engineering, The University of Tokyo, Tokyo/Japan;
(2) Department of Chemical Engineering, Faculty of Engineering, Kyushu University, Fukuoka/Japan;
- Ultra-small, Coating-free, Pyramidal Platinum Nanoparticles for High Stability Fuel Cell Oxygen Reduction (B0606)**
Emanuele Magliocca (1), Valentina Mastronardi (2), Mauro Moglianetti (2), Thomas S. Miller (1)
(1) Electrochemical Innovation Laboratory, Department of Chemical Engineering, University College London, London/UK;
(2) Istituto Italiano di Tecnologia, Nanobiointeractions&Nanodiagnosics, Genova/Italy;

18:00 End of Sessions

- 18:30 Social Event 1: **Swiss Surprise Night** - Registered participants meet between KKL and railway station
Social Event 2: **H₂ Champions Dinner** - By personal invitation from FiveT - Apply here www.EFCF.com/FiveT

Enjoy your Evening
in and around Lucerne



09:00 A07: K5: Improvements in Material Development by Uni Duisburg-Essen

09:00 **K5: Integrating Coherent Workflows into Materials Development for Water Splitting and CO₂ Reduction (A0701)**

Doris Segets
Process Technology for Electrochemical Functional Materials, Uni of Duisburg-Essen/Germany;

B07: K6: Prospects for the Electrolyser Industrialization by Simon Fraser Uni

K6: Hydrocarbon PEMs and AEMs: From Concept to Industrialization (B0701)

Steven Holdcroft
Simon Fraser University, Department of Chemistry, Greater Vancouver/Canada;

09:30 A08: Tailored MEA Design for Fuel Cells and Impact of Flow-Fields

09:30 **Percolation Pathways in Gas Diffusion Layers for Polymer Electrolyte Fuel Cells Designed by Additive Manufacturing (A0801)**

Tim Dörenkamp, Felix N. Büchi,
Thomas J. Schmidt, Jens Eller
Electrochemistry Laboratory, Paul Scherrer Institut, Villigen/Switzerland;

B08: Alkaline (OER) Catalysts

Perovskite Bifunctional Catalyst Design for Alkaline OER and ORR (B0801)

Casey E. Beall (1), Emiliana Fabbri (1), Vivian Meier (1), Adam H. Clark (1), NatašaDiklić (1), Sena Yüzbaşı (2), Sayaka Takahashi (3), Dino Aegerter (1), Kanji Otsuji (3), Katsuyoshi Kakinuma (3), Kenji Miyatake (3), Makoto Uchida (3), Thomas Graule (2), Maarten Nachtegaal (1), Thomas J. Schmidt (1)
(1) Paul Scherrer Institut (PSI), Villigen/Switzerland;
(2) EMPA, Duebendorf/Switzerland; (3) University of Yamanashi, Kofu/Japan;

09:45 **Systematic Optimization of Pt-free Gas Diffusion Electrodes for HT-PEMFC Application (A0802)**

Tanja Zierdt (1), Julia Müller-Hülstede (1), Dana Schonvogel (1), Peter Wagner (1), K. Andreas Friedrich (2,3)
(1) German Aerospace Center (DLR), Institute of Engineering Thermodynamics, Oldenburg;
(2) Institute of Engineering Thermodynamics, Stuttgart; (3) University of Stuttgart, Institute for Building Energetics, Thermotechnology & Energy Storage (IGTE), Stuttgart/Germany;

Advanced Metallic Frameworks for Development of Robust and Efficient Water Splitting Electrodes (B0802)

Tam D. Nguyen (1,2), Joe Varga (2), Douglas MacFarlane (1), Alexandr Simonov (1)
(1) School of Chemistry, Monash University, Victoria/Australia;
(2) Energys Australia Pty Ltd, Victoria/Australia;

10:00 **Spatial Distribution of Loss Processes Along the Gas Channels of PEMFC (A0803)**

Philipp Oppek (1), Tobias Goosmann (1), Tatyana Reshetenko (2), André Weber (1)
(1) Institute for Applied Materials (IAM-ET), Karlsruhe Institute of Technology (KIT), Karlsruhe/Germany;
(2) Hawaii Natural Energy Institute (HNEI), University of Hawaii, Honolulu/USA;

Electrochemical Modification

of Nickel-based Electrodes for the Oxygen Evolution Reaction (OER) (B0803)

Clara Gohlke, Johann Kautz, Anna K. Mechler
Electrochemical Reaction Engineering (AVT.ERT), RWTH Aachen University, Aachen/Germany;

10:15 **Effect of Purge Gases during Shutdown on PEMFC Degradation and Cold Start Performance (A0804)**

Gema Montaner Ríos, Florian Becker, Matthias Schröder, Christoph Gentner; German Aerospace Center (DLR), Institute of Engineering Thermodynamics, Hamburg/Germany;

Influence of Raney-nickel Phase Composition

on Activity and Stability of Oxygen Electrode in Alkaline Electrolysis (B0804)

Nicky Bogolowski, Ronja Korbus, Jean-Francois Drillet
Dechema-Forschungsinstitut, Frankfurt/Germany;

10:30 Break - Ground Floor in the Exhibition

11:00 A09: Advanced Systems & Components

11:00 **H₂ Production via Electrolysis of Biomass from Distillery Whisky Waste Streams (A0901)**
Robert Price (1,2), Norman Gillies (2), Alasdair Day (2), Edward Brightman (1), Jun Li (1)
(1) Department of Chemical and Process Engineering, University of Strathclyde, Glasgow; (2) Isle of Raasay Distillery, R&B Distillers Ltd., Borodale House, Isle of Raasay, Kyle/Scotland;

11:15 **Decoupled Water Splitting for Green Hydrogen Production: Reshaping WE (A0902)**
Avner Rothschild (1), Hen Dotan (3), Avigail Landman (3), Gideon Grader (2);
Department of (1) Materials Science and Engineering; (2) Chemical Engineering, Technion – Israel Institute of Technology, Haifa/Israel; (3) H2Pro, Caesarea Industrial Park, Israel;

11:30 **The Zn-H₂ Storage System (A0903)**
Robert Hahn (1), Oren Rosenfeld (2), Chaim Markheim (2), Andreas Schamel (2)
(1) Fraunhofer IZM, Berlin/Germany;
(2) Zn2H2 Zinc to Hydrogen, Erfstadt/Germany;

11:45 **Hybrid Design of Thin Titanium Microporous Layers for Polymer Electrolyte WE (A0904)**
Carl Cesar Weber (1)*, Tobias Schuler (2), Jacob Wrubel (2), Lorenz Gubler (1), Guido Bender (2), Felix N. Büchi (1); (1) Electrochemistry Laboratory, Paul Scherrer Institut, Villigen/Switzerland; (2) National Renewable Energy Laboratory, Golden CO/USA;

12:00 **Corrosion Protection of Metallic Bipolar Plates and Porous Transport Layers in PEM Water Electrolyzer Anodes (A0905)**
Michel Prestat (1), Flavien Vucko (1), Khaoula Chergui (2,3), Benoit Lescop (2), Stéphane Rioual (2), Ludvine Rault (3), Valérie Demange (3); (1) French Corrosion Institute; (2) Univ Brest, CNRS, Lab-STICC, Brest; (3) Univ Rennes, CNRS, ISCR, ScanMAT Rennes/France;

12:15 **Application of HiPIMS Coatings to Enhance the Durability and Performance of Bipolar Plates in PEM and AEM Electrolyzers (A0906)**
Jose Antonio Santiago (1), Ivan Fernandez (1), Pablo Diaz (1) Ambjorn Wennberg (1), M. Panizo (2,3), Javier Diez (4), Lucia Mendizabal (4); (1) Nano4Energy SL, Madrid/Spain;
(2) Departamento de Física Aplicada e Ingeniería de Materiales, ETSII Ingenieros Industriales (UPM), Madrid/Spain; (3) Centro Láser, Universidad Politécnica de Madrid, Madrid/Spain;
(4) Department of Surface Physics and Technology, IK4-TEKNIKER, Eibar/Spain;

B09: Advanced Testing and Diagnosis

I2: Liquid Water Formation and Transport in Membrane Electrode Assembly of PEMFC: Liquid Injection, Vapor Condensation and Mixte Scenarii (B0901)

Joël Pauchet (1), Marc Prat (2)
(1) Université Grenoble Alpes, CEA, LITEN, Grenoble
(2) Institut de Mécanique des Fluides de Toulouse (IMFT),
Université de Toulouse, CNRS – Toulouse/France

Mapping of Conductance and Electrical Losses in PEM Cells Using Lock-in Thermography with AC Excitation (B0903)

Volker Naumann (1), Erik Grunwald (1), Lennard Giesenberg (2), Wolfram Münchgesang (2), Kerstin Witte-Bodnar (2), Klemens Ilse (1)
(1) Fraunhofer IMWS, Halle/Germany; (2) Fraunhofer IWES, Halle/Germany;

Deconvolution of Gas Diffusion Processes in Incremental Polymer Electrolyte Membrane Fuel Cells (B0904)

Sebastian Raab, André Weber; Institute for Applied Materials – Electrochemical Technologies (IAM-ET), Karlsruhe Institute of Technology (KIT), Karlsruhe/Germany;

EPIS as a Diagnostic Tool for the PEFC Cathode (B0905)

Amir Niroumand (1,2), Qingxin Zhang (1), Hooman Homayouni (1),
(1) Greenlight Innovation, Burnaby, BC/Canada;
(2) Simon Fraser University, Burnaby, BC/Canada;
(3) Forschungszentrum Jülich, Jülich/Germany;

Three-dimensional Impedance Modeling of PEMFC (B0906)

Akihisa Tanaka (1), Keisuke Nagato (1), Gen Inoue (2), Morio Tomizawa (1), André Weber (3), Masayuki Nakao (1)
(1) Department of Mechanical Engineering, Graduate School of Engineering, The University of Tokyo, Tokyo/Japan;
(2) Department of Chemical Engineering, Kyushu University, Fukuoka/Japan;
(3) Inst. for Applied Materials (IAM-ET), Karlsruhe Institute of Technology, Karlsruhe/Germany;

12:30 Lunch - 2nd Floor on the Terrace / Coffee - Ground Floor in the Exhibition & 1st Floor in the Poster Area

13:15 A10: Poster Session II covering All Session Topics**Auditorium Foyer**

S-Chairs: Michael H. Eikerling, Anna K. Mechler

14:40 A11: K7: GW scale electrolyser plants by Shell

14:40 **K7: Scaling Electrolysers from Lab to Commercial Gigawatt Scale Plants (A1101)**
Srikanth Santhanam, Jeff Martin, Charudatta Patil, Shell Global Solutions International B.V., Amsterdam/The Netherlands

15:00 A12: Alternative Fuel Cell Systems and Additives**B12: AI-driven R&D**

15:00 **2-Propanol Fuel Cell System (A1201)**
Katharina Braun (1), Yazan Mahayni (2), Simon Thiele (2), Lukas Weiß (1), Michael Wensing (1) (1) Friedrich-Alexander-Universität Erlangen-Nürnberg, Professorship for Fluid System Technology, Erlangen/Germany; (2) Helmholtz-Institute Erlangen-Nürnberg for Renewable Energy (IEK-11), Forschungszentrum Jülich GmbH, Erlangen/Germany;

I3: Enhancing Electrochemical Research by Utilizing High-throughput Experimentation (B1201)
Andreas Müller (1), Florian Huber (1), Michael Dejmek (1), Fabian Schneider (1), Burkhard Hecker (2), Deniz Dogan (2,3), Herrmann Tempel (2), Rüdiger-A. Eichel (2,3) (1) hte GmbH, Heidelberg/Germany; (2) Forschungszentrum Jülich, Institute of Energy and Climate Research - Fundamental Electrochemistry (IEK-9), Jülich/Germany; (3) RWTH Aachen University, Institute of Physical Chemistry, Aachen/Germany;

15:15 **Advances in More Effective and Uniform Fuel Distribution in Direct Formic Acid FC (A1202)**
Monika Jałowiecka, Zuzanna Bojarska, Artur Malolepszy, Łukasz Makowski
Warsaw University of Technology, Faculty of Chemical and Process Engineering, Warsaw/Poland;

15:30 **Pt-Ru Nanowire Electrocatalysts for Direct Methanol Fuel Cells (A1203)**
Milon Miah, Shangfeng Du
School of Chemical Engineering, University of Birmingham, Birmingham/UK;

Enabling Data Sharing within the Emerging Hydrogen Technology Ecosystem (B1203)
Kourosh Malek (1,2)
(1) Theory and Computation of Energy Materials (IEK-13), Institute of Energy and Climate Research, Forschungszentrum Jülich GmbH, Jülich/Germany;
(2) Center for Advanced Simulation and Analytics (CASA), Simulation and Data Lab for Energy Materials, Forschungszentrum Jülich GmbH, Jülich/Germany;

15:45 **Experience with Autonomous Ammonia-AFC Power Plants: From Heat to Frost (A1204)**
Alexander Yuzefovsky, Ziya R. Karichev, Michael Lerner, Alon Ostricher, Alexander Shapiro and Gennadi Finkelshtain
GenCell Ltd. Petah-Tikva/Israel;

Deep Learning-Assisted Analysis of the Water Management in the Catalyst Layer of Fuel Cells (B1204)
Gaoyang Li (1), Takuya Mabuchi (1,2), Yuting Guo (1), Takashi Tokumasu (1)
(1) Institute of Fluid Science, Tohoku University, Aoba-ku/Sendai;
(2) Frontier Research Institute for Interdisciplinary Sciences, Tohoku University, Aoba-ku/Sendai;

16:00 Break - Ground Floor in the Exhibition & 1st Floor in the Poster Area

16:30 A13: Multiscale Characterization

- 16:30 **I4: Informing Polymer Electrolyte Membrane Fuel Cells and Electrolyzer Designs Through X-Ray Techniques (A1301)**
 Aimy Bazylak; Department of Mechanical and Industrial Engineering, Faculty of Applied Science and Engineering, University of Toronto/Canada;
- 17:00 **Multiscale tomography and digital material design of porous transport electrodes in proton exchange membrane water electrolyzers (A1303)**
 Markus Bierling (1,2), David McLaughlin (1,2), Thomas Böhm (1), Simon Thiele (1,2) (1) Helmholtz-Institute Erlangen-Nürnberg, Erlangen/Germany; (2) Department of Chemical and Biological Engineering, Friedrich-Alexander-University Erlangen-Nürnberg, Erlangen/Germany;
- 17:15 **The Effect of Catalyst Layer and Microporous Layer Saturation Level in PEFC Revealed by Small and Wide Angle X-ray Scattering (A1304)**
 Kinanti Aliyah (1), Anne Berger (2), Timon Lazaridis (2), Christian Appel (3), Andreas Menzel (3), Hubert Gasteiger (2), Felix N. Büchi (1), Lorenz Gubler (1), Jens Eller (1) (1) Electrochemistry Laboratory, Paul Scherrer Institut, Villigen PSI/Switzerland; (2) Chair of Technical Electrochemistry, Technical University of Munich, Munich/Germany; (3) Swiss Light Source, Paul Scherrer Institut, Villigen PSI/Switzerland;
- 17:30 **Carbon-Ionomer Distribution in the Cathode Catalyst Layer combining Focused Ion Beam Scanning Electron Microscopy and Modeling (A1305)**
 Mohamed Ahmed-Maloum (1), Laure Guetaz (2), Thomas David (2), Arnaud Morin (2), Joël Pauchet (2), Michel Quintard (1), Marc Prat (1); (1) Inst. de Mécanique des Fluides de Toulouse, Uni de Toulouse, CNRS Toulouse; (2) Univ. Grenoble Alpes, CEA, Liten, Grenoble/France;
- 17:45 **Categorizing Microstructural Degradation Effects and their Occurrence Depending on the Operation Mode of the PEM Electrolyzer (A1306)**
 Kerstin Witte-Bodnar (1), Lennard Giesenberg (2), Wolfram Münchgesang (2), Alexander Müller (1), Volker Naumann (1), Klemens Ilse (1); (1) Fraunhofer Institute for Microstructure of Materials and Systems, Halle; (2) Fraunhofer Institute for Wind Energy Systems, Leuna/Germany;

18:00 End of Sessions**19:15**

Dinner on the Lake Boarding 19.20 - Lake side of KKL pier 5/6 - Departure fix 19.30
 Back 23.00 (short stop in Brunnen 22.30 for return by train)

B13: Catalysts for Acidic Electrolysis

- I5: Understanding the Nature and Activity of Supported Ir-Based Catalysts for Oxygen Evolution Reaction (B1301)**
 Darija Susac, Ziba S.H. Rajan, Julie-Anne Hoffman, Genna Moss, Rhiyaad Mohamed HySA Catalysis, Cape Town/South Africa;
- Inkjet Printed Catalyst Layers for PEM Electrolyzers (B1303)**
 Christian Zeiner, Kathleen Heinrich, Dana Mitra, Andreas Willert, Ralf Zichner Fraunhofer Institute for Electronic Nano Systems, Chemnitz/Germany;
- Investigation of Iridium Supported on Transition Metal Carbides as Oxygen Evolution Reaction Catalyst in Proton Exchange Membrane Water Electrolysis (B1304)**
 Sambal S Ambu (1,2), Miriam Goll (2), Schwan Hosseiny (2), K. Andreas Friedrich (1,3) (1) Institute of Building Energetics, Thermal Engineering and Energy Storage, University of Stuttgart, Stuttgart/Germany; (2) Cutting edge nanomaterials, Waldenbuch/Germany; (3) Institute of Engineering Thermodynamics, German Aerospace Center (DLR), Stuttgart/Germany;
- Implementation of {Mo-S}-based electrocatalysts in PEM water electrolyzers (B1305)**
 Serge Al Bacha (1), Maria El Khoueiry (1), Clément Falaise (2), Nathalie Leclerc (2), Emmanuel Cadot (2), Loïc Assaud (1) (1) University Paris-Saclay, ICMMO-ERIEE, Orsay/France; (2) UVSQ, ILV, Versailles/France;
- Model-Based Analysis of the Performance Limitations of IrO₂ and RuO₂ Catalysts during Oxygen Evolution (B1306)**
 Philipp Röse, Gözde Kardes, Janis Geppert, Ulrike Krewer Karlsruhe Institute of Technology, Institute for Applied Materials & Electrochemical Technologies, Karlsruhe/Germany;



09:00 A14: K8: Electrosynthesis

09:00 **K8: Electrosynthesis of Oxygenates and Hydrocarbons (A1401)**
Boon Siang Yeo, Department of Chemistry, National University of Singapore, Singapore;

B14: K9: Characterization of Catalysts and Electrodes by Argonne National Lab.

K9: Advances in Characterization of Low-Temperature Fuel cell and Electrolyzer Catalysts and Electrodes (B1401)
Debbie Myers, Argonne National Laboratory, Lisle/Illinois USA

09:30 A15: Life Cycle Analysis and Economic Viability

09:30 **Life Cycle Assessment of Energy Storage and Supply of Electric Vehicles Focus: Batteries and Fuel Cell Systems (A1501)**
Pavlo Shyposha, Leonard Freisem, Anne Magdalene Syré, Dietmar Göhlich
Technische Universität Berlin, Fachgebiet Methoden der Produktentwicklung und Mechatronik, Berlin/Germany;

09:45 **Materials Requirements at MEA Level for PEMFC to Achieve Targets for Heavy Duty Applications (A1502)**
Julien Durst
SYMBIO, Vénissieux/France;

10:00 **Low-pressure Operation of PEM Fuel Cell Systems for Aircraft Applications (A1503)**
Dominik Murschenhofer, Jonas Settele, Cornelia Bänisch
German Aerospace Center (DLR), Institute of Engineering Thermodynamics, Stuttgart/Germany;

10:15 **Comparative Energy Economic Studies on Hydrogen Energy Storage Technologies (A1504)**
Sanghun Lee; Department of Climate and Energy Systems Engineering, Ewha Womans University, Republic of Korea;

B15: Structure-based and Dynamic Modeling

Comprehending Mechanistic Pathways for the Oxygen Reduction Reaction by Volcano Analyses (B1501)

Kai S. Exner (1,2,3)
(1) University Duisburg-Essen, Essen/Germany; (2) Cluster of Excellence RESOLV, Bochum/Germany; (3) Center for Nanointegration (CENIDE), Duisburg/Germany;

Structure-based Modeling of PEFC Catalyst Layers: Enabling Optimized Materials Design (B1502)

Wolfgang Olbrich (1,2,3), Thomas Kadyk (2,4), Ulrich Sauter (1), Jeff Gostick (5), Michael Eikerling (2,3,4)

(1) Robert Bosch GmbH, Corporate Research, Renningen/Germany; (2) Theory and Computation of Energy Materials (IEK-13), Institute of Energy and Climate Research, Forschungszentrum Jülich GmbH, Jülich/Germany; (3) Chair of Theory and Computation of Energy Materials, Faculty of Georesources and Materials Engineering, RWTH Aachen University; (4) Jülich Aachen Research Alliance, JARA Energy, Jülich/Germany; (5) Department of Chemical Engineering, University of Waterloo, Waterloo, ON/Canada;

Modeling Water Phenomena in the Cathode Side of Polymer Electrolyte Fuel Cells (B1503)

Yufan Zhang (1,2), Gerard Agravante (3), Thomas Kadyk (1,4), Michael H. Eikerling (1,2,4)
(1) Theory and Computation of Energy Materials (IEK-13), Institute of Energy & Climate Research, Forschungszentrum Jülich GmbH, Jülich/Germany; (2) Chair of Theory & Computation of Energy Materials, Faculty of Georesources & Materials Engineering, RWTH Aachen University, Aachen/Germany; (3) Dep. of Chemical & Petroleum Engineering, University of Calgary, Calgary/Canada; (4) Jülich Aachen Research Alliance, JARA Energy, Jülich/Germany;

Modeling of Catalyst Degradation in PEM Fuel Cells Applied to 3D Simulation (B1504)

Clemens Fink (1), Marijo Telenta (1), Joel Mata Edjokola (2), Merit Bodner (2)
(1) AVL List GmbH, Graz/Austria; (2) Graz University of Technology, Graz/Austria;

10:30 Break - Ground Floor in the Exhibition

11:00 A16: Performance and Lifetime Assessment

- 11:00 **A Journey Through PEFC Model Parameterization Where we are and what we Need (A1601)**
Matthias Hanauer, Christophe Gerling, Michael Eppler, Ulrich Berner, Ulrich Sauter
Robert Bosch GmbH, Robert-Bosch-Campus 1, Renningen/Germany;
- 11:15 **Monitoring the Operation of PEM Fuel Cells with Machine Learning (A1602)**
Lukas Klass, Alexander Kabza, Frank Sehnke, Katharina Strecker, Markus Hölzle
Centre for Solar Energy and Hydrogen Research Baden-Württemberg, Ulm/Germany;
- 11:30 **Defect Prediction and Categorization in Catalyst Layers of PEMFC by Machine Learning (A1603)**
Jakob Hog, Linda Ney, Rajveer Singh, Jonas Krause, Marius Singler, Simon Auerbach, Akshay Patil, Sebastian Tepner, Nada Zamel, Roman Keding, Florian Clement, Ulf Groos
Fraunhofer-Institut für Solare Energiesysteme ISE, Freiburg/Germany;
- 11:45 **Artificial Intelligence (AI) Based Lifetime Prediction for PEMW-Electrolysis (A1604)**
P. Pojhan, A. Alsaiaid,
A. Gusak, B. Oberschachtsiek
The hydrogen and fuel cell center (ZBT GmbH), Duisburg/Germany;
- 12:00 **High-Pressure PEM Water Electrolyser Performance (A1605)**
Thomas Holm, Ragnhild Hancke,
Piotr Bujlo, Øystein Ulleberg
Institute for Energy Technology, Kjeller/Norway;
- 12:15 **Dynamic X-ray Imaging of Flooding and Degradation in CO₂-electrolysis (A1606)**
Robert Fischer (1), Matthieu Dessiex (1, 2), Federica Marone (3), Felix N. Büchi (1)
(1) Electrochemistry Laboratory, Paul Scherrer Institut, Villigen/Switzerland;
(2) Laboratory of Renewable Energy Science and Engineering, EPFL, Lausanne/Switzerland;
(3) Swiss Light Source, Paul Scherrer Institut, PSI/Switzerland;

B16: Local Reaction Environment and Interactions

- I6: Why Advanced Electrochemical Techniques are Essential to Design Advanced Electrocatalysts (B1601)**
Kristina Tschulik
Analytical Chemistry II, Faculty of Chemistry and Biochemistry,
Ruhr University Bochum, Bochum/Germany
- pH Effects in a Model Electrocatalytic Reaction Disentangled (B1603)**
Xinwei Zhu, Jun Huang, Michael Eikerling
Theory and Computation of Energy Materials (IEK-13), Institute of Energy and Climate
Research, Forschungszentrum Jülich GmbH, Germany;
- Dynamics and Impedance of Nonlinear ion Transport Under Nanoconfinement (B1604)**
Zengming Zhang, Jun Huang
IEK-13, Institute of Energy and Climate Research, Forschungszentrum Jülich GmbH,
Jülich/Germany;
- The Impact of Catalyst-Ionomer Interactions in Alkaline Membrane Electrochemical Devices (B1605)**
Ami Yang-Neyerlin, Cheng He, Bryan Pivovar
National Renewable Energy Laboratory, Golden, CO/USA;
- Development of Catalytic Interfaces for Carbon Dioxide Electroreduction and Photoelectrochemical Water Oxidation (B1606)**
Pawel J. Kulesza, Iwona A. Rutkowska
Faculty of Chemistry, University of Warsaw, Warsaw/Poland;

12:30 Lunch & Coffee - 2nd Floor on the Terrace & still open 1st Floor in the Poster Area

13:30 A17: Dynamic Operation of Systems

- 13:30 **I7: Dynamic Operation of Alkaline Water Electrolyzers: Modeling, Simulation, and Control Strategies (A1701)**
 Jörn Brauns (1,2), Felix Gäde (1,2),
 Fabian Kirstein (1,2), Maik Becker (1,2), Thomas Turek (1,2)
 (1) Institute of Chemical and Electrochemical Process Engineering, TU Clausthal/Germany;
 (2) Research Center Energy Storage Technologies, Goslar/Germany;

13:45

- 14:00 **Low-temperature Electrolysis Under Intermittent Operation: Modeling of the Impacts and Experimental Validation (A1703)**
 Emma Nguyen (1,2), Pierre Olivier (1),
 Marie-Cécile Pera (2), Elodie Pahon (2), Robin Roche (2), Stéphane Fortin (1)
 (1) Engie Lab CRIGEN, Stains/France;
 (2) FEMTO-ST Institute, FCLab, Univ. Bourgogne Franche-Comté, CNRS, Belfort/France;

- 14:15 **Two-phase Model of Aqueous KOH Solution and Gases for Transient Modelling of Alkaline Electrolysers (A1704)**
 Hans Wiggerhauser, Faisal Sedeqi, Marius Tomberg, Marc Heddrich, Fatemeh Razmjooei,
 Syed Asif Ansar; Inst. of Engineering Thermodynamics, German Aerospace Center (DLR),
 Stuttgart/Germany;

- 14:30 **Alkaline Water Electrolysis – Secondary Battery Hybrid System Modeling and Simulation for Renewable Energy Connection (A1705)**
 Ham Jinyoung, Jang Dohyung, Shin Haeseong, Shin Heesun Kang Sanggyu
 Department of Naval Architecture and Ocean Engineering,
 Seoul National University, South Korea;

B17: CO₂-Electrolysis

- Insights Into the Role of Anions on the Electrochemical Reduction of CO₂ in Alkaline Solutions on Au (B1701)**
 Nishant Sinha (1), Sahithi Gorthy (2), Sharankumar Shetty (1), Matthew Neurock (2)
 (1) Shell Technology Center Bangalore, Bengaluru/India; (2) Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis/USA;

- Press it, Heat it, Twist it: A Series of Hidden Parameters for the Electrochemical CO₂ Reduction (B1702)**
 Lucas Hoof (1), Niklas Thissen (1), Kevinjeorjios Pellumbi (1), Kai junge Puring (1), Daniel Siegmund (1,2), Ulf-Peter Apfel (1,2)
 (1) Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT, Oberhausen/Germany; (2) Inorganic Chemistry I, Ruhr University Bochum, Bochum/Germany;

- Achieving Ultra-low Ag Loadings for CO₂ Electroreduction via Tailored Molecular Electrocatalysts (B1703)**
 Kevinjeorjios Pellumbi (1,2), Dominik Krisch (3), He Sun (3), Sebastian A. Sanden (2), Lucas Hoof (1,4), Leonard Messing (1,4), Kai junge Puring (1), Daniel Siegmund (1,2), Wolfgang Schöfberger (3), Ulf-Peter Apfel (1,2); (1) Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT, Oberhausen/Germany; (2) Inorganic Chemistry I, Ruhr University Bochum, Bochum/Germany; (3) Institute of Organic Chemistry, Laboratory for Sustainable Chemistry and Catalysis (LSusCat), Johannes Kepler University (JKU), Linz/Austria; (4) Cross Energy Systems, Ruhr University Bochum, Bochum/Germany;

- Stability Investigation of a CO₂ Electrolyzer with a Bipolar Membrane (B1704)**
 Matthieu Dessieux (1,2), Robert Fischer (1),
 Sophia Haussener (2), Felix N. Büchi (1)
 (1) Electrochemistry Laboratory, Paul Scherrer Institut, Villigen/Switzerland; (2) Laboratory of Renewable Energy Science and Engineering, EPFL, Lausanne/Switzerland;

- Inherently Stable PGM-free Bipolar MEA for CO₂ Electrolysis (B1705)**
 Mengran Li (1, 2), Siddhartha Subramanian (1), Kailun Yang (1), Thomas Burdyny (1)
 (1) Materials for Energy Conversion and Storage (MECS), Department of Chemical Engineering, Faculty of Applied Sciences, Delft University of Technology, Delft/The Netherlands; (2) Department of Chemical Engineering, The University of Melbourne, Melbourne/Australia;

14:45 **Dynamic Modeling and Optimal Operation Strategy of Polyelectrolyte Water Membrane Electrolysis System (A1706)**
Shin Hee-Sun (1), Shin Haeseong (1), Kim Kyong-Hwan (2), Lim Chang Hyuck (2), Kang Sanggyu (1); (1) Department of Naval Architecture and Ocean Engineering, Seoul National University; (2) Korea Research Institute of Ships & Ocean Eng. Korea;

Current-distribution on Highly selective and Flooding-resistant Electrodes for CO₂ Electrolysis (B1706)
Hugo-Pieter Iglesias van Montfort, Thomas Burdyny
Department of Chemical Engineering, Delft University of Technology, Delft/The Netherlands;

15:00 5 Min to change from Session B17 to Luzerner Saal for Plenary Session A18

Afternoon - Luzerner Saal

Friday, 7 July 2023

**15:05 A18: P2: Closing Ceremony
Keynote by the EFCF Gold Medal of Honour Winner 2023**

15:05 **Summary by the Chairs (A1801)**
Michael H. Eikerling, Anna K. Mechler
Forschungszentrum Jülich & RWTH Aachen University, Jülich & Aachen, Germany

15:20 **Information on Next EFCF:
EFCF 2025 10th It FC, Electrolyser & H₂ Processing Forum
EFCF 2024 16th European SOFC & SOE Forum (A1802)**
Olivier Bucheli (1), ??? (2), Michael Spirig (1)
(1) European Electrolyser & Fuel Cell Forum; (2)?., Lucerne/Switzerland

15:30 **Christian Friedrich Schönbein Award
for the Best Poster, Best Science Contribution, Medal of Honour (A1803)**
Anna K. Mechler, Michael H. Eikerling
Forschungszentrum Jülich & RWTH Aachen University, Jülich & Aachen, Germany

15:40 **K10: Gold Medal 2023 Winner Keynote on
Materials Developments for Low Temperature Fuel Cells & Electrolysers:
Performance, Durability & Sustainability (A1804)**
Deborah Jones, EFCF Gold Medal of Honour Winner 2023
Université Montpellier, Montpellier/France

16:05 **Thank you and Closing by the Organizers (A1805)**
Michael Spirig, Olivier Bucheli
European Electrolyser & Fuel Cell Forum, Luzern/Switzerland

16:15 End of Sessions - End of Conference
Good bye coffee and travel refreshment in front of the Luzerner Saal

Solid Oxide Technologies

EFCF 2024

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Poster List

A04: Poster Session I

covering All Session Topics

A10: Poster Session II

Wednesday, 5 July 2023

Thursday, 6 July 2023

Auditorium Foyer

Afternoon 13.15 - 15:00

Afternoon 13.15 - 15:00

A02: PEM-Electrolysis

Degradation of Low Loaded CCMs Using Advanced Electrocatalysts for PEM Electrolysis and Pathways to a Semi-Empirical Model (A0207)

Yannis Fischer (1,3), Aldo Gago (2) Peter Wagner (1), K. Andreas Friedrich (2,3)

(1) German Aerospace Center (DLR), Institute of Engineering Thermodynamics, Oldenburg/Germany;

(2) German Aerospace Center (DLR), Institute of Engineering Thermodynamics, Stuttgart/Germany;

(3) University of Stuttgart, Institute for Building Energetics, Thermotechnology and Energy Storage (IGTE), Stuttgart/Germany;

Modeling the Aging Effects Due to Bubble Coverage at the Electrode in Anion Exchange Membrane Water Electrolysis (A0208)

Ronit Kumar Panda (1), Guillaume Serre (1), Frederic Fouda-Onana (1), Yann Bultel (2), Pascal Schott (1), Johannes Ast (1)

(1) Univ. Grenoble Alpes, CEA, LITEN, DEHT, Grenoble/France;

(2) Univ. Grenoble Alpes, Univ. Savoie Mont Blanc, Grenoble/France;

Quantification of Degradation Mechanisms in Acidic Water Electrozer Catalysts: Roles of Bulk structure and Surface Chemistry (A0209)

Raghunandan Sharma (1), Per Morgan (1), Saso Gyergyek (2), Shuang Ma Andersen (1)

(1) Department of Green Technology (IGT), SDU Chemical Engineering, University of Southern Denmark, Odense/Denmark;

(2) Department for Materials Synthesis, Jozef Stefan Institute, Ljubljana/Slovenia;

On Cell Component Characteristics to Meet PEM Electrolysis Performance Targets (A0210)

Elena Crespi, Luca Praticcò, Matteo Testi

Fondazione Bruno Kessler (FBK), Center of Sustainable Energy (SE), Trento/Italy;

B02: Fuel Cell Catalysts

Engineering of High-surface Area Carbons with Optimized Properties for Pt/C PEMFC Catalysts Design - MP4 - (B0207)

Sven Kùspert (1,2), Julian Martin (1,2), Niklas Ortlieb (1,2), Robert Marić (3), Anna Fischer (1,2,4)

(1) Institut für Anorganische und Analytische Chemie, Albert-Ludwigs-Universität, Freiburg/Germany;

(2) Freiburger Materialforschungszentrum, Albert-Ludwigs-Universität, Freiburg/Germany;

(3) Heraeus Deutschland GmbH & Co. KG, Hanau/Germany;

(4) Freiburger Zentrum für interaktive Werkstoffe und bioinspirierte Technologien, Albert-Ludwigs-Universität, Freiburg/Germany;

Optimized Carbon Supports for Durable and High Performance PEMFC Electrodes (B0208)

Bryan Carré, Nathalie Job

Department of Chemical Engineering - NCE (Nanomaterials, Catalysis, Electrochemistry), University of Liège, Liège/Belgium;

Effect of Different Fe-N-C Catalysts on the Performance and Stability in HT-PEMFCs (B0209)

Julia Müller-Hülstede (1), Henrike Schmies (1),

Dana Schonvogel (1), Peter Wagner (1), Michael Wark (2)

(1) German Aerospace Center (DLR), Institute of Engineering Thermodynamics, Oldenburg/Germany;

(2) Institute of Chemistry, Carl von Ossietzky University of Oldenburg, Oldenburg/Germany;

Template-Directed Nitrogen- and Transition-Metal-Doped Mesoporous Nanocarbons for Anion-Exchange Membrane Fuel Cell Application (B0210)

Kaarel Kisand (1), Ave Sarapuu (1), John C. Douglin (4), Arvo Kikas (2), Alexey Treshchalov (2),

Maike Käärik (1), Helle-Mai Piirsoo (2), Päärn Paiste (3), Jaan Aruväli (3), Vambola Kisand (2), Jaan Leis (1), Aile Tamm (2), Dario R. Dekel (4,5), Kaido Tammeveski (1)

Institute of (1) Chemistry; (2) Physics; (3) Ecology and Earth Sciences, University of Tartu, Tartu/Estonia;

(4) The Wolfson Department of Chemical Engineering, Technion—Israel Institute of Technology,

Effect of Anode Degree of Crystallinity on Kinetics of Regeneration in E-TAC Water Electrolysis (A0211)

Elena Davydova, Yossi Halpern, Avner Rothschild
Department of Materials Science and Engineering, Technion – Israel Institute of Technology, Technion City, Haifa/Israel;

Cobalt-Iron Cyanometallate Overlayers as Active Components for Oxygen Evolution during Water Electrolysis in Acid Medium (A0212)

Iwona A. Rutkowska, Marzena Krech, Pawel J. Kulesza
Faculty of Chemistry, University of Warsaw, Warsaw/Poland;

Effect of Membrane Temperature on Hydrogen Permeation of PEM Water Electrolyzer (A0213)

Wenjie Ding(1,2), Liang Zhang(1,2), Jun Li(1,2), Jian Huang(1,2), Yang Yang(1,2), Xun Zhu(1,2), Qiang Liao(1,2)

- (1) Key Laboratory of Low-grade Energy Utilization Technologies and Systems, Chongqing University, Shapingba District/China;
- (2) Institute of Engineering Thermophysics, School of Energy and Power Engineering, Chongqing University, Shapingba District/China;

Carbon-coated Stainless Steel in PEM Water Electrolyzers and Fuel Cells (A0214)

Sebastian Proch, Ulf Bexell, Jörgen Westlinder
Surface Research, Strategic Research, Sandviken/Sweden; *Present address: SSAB EMEA AB, Product Development, Borlänge/Sweden;

Effect Mechanism of Spraying Temperature on MEA Performance in PEMWE (A0215)

Penglin Yang (1,2), Jian Huang (1,2), Jun Li (1,2), Kaijie Luo (1,2), Yuyang Wang (1,2), Xun Zhu (1,2), Qiang Liao (1,2)

- (1) Key Laboratory of Low-grade Energy Utilization Technologies and Systems, Chongqing University, Shapingba District/China;
- (2) Institute of Engineering Thermophysics, School of Energy and Power Engineering, Chongqing University, Shapingba District/China;

Mechanical Stability of Woven Mesh Reinforced Membranes in PEMWE (A0216)

Julian Kink (1,2), Martin Ise (1), Boris Bensmann (2), Richard Hanke-Rauschenbach (2)
(1) Siemens Energy Global GmbH & Co. KG, Erlangen/Germany;
(2) Leibniz University, Institute of Electric Power Systems, Hannover/Germany;

Haifa/Israel; (5) The Nancy & Stephen Grand Technion Energy Program (GTEP), Technion – Israel Institute of Technology, Haifa/Israel;

Study of The Role of Nitrogen-doped Graphene and Reduced Graphene Oxide with Zeolite Imidazole Framework Catalysts for PEM Fuel Cells (B0211)

Sudharsan Sridhar (1), Hassan Shirzadi Jahromi (1), Muralidhar Ghantasala (1), Ramakrishna Guda (2), Bade Shrestha (1), Madhavi V (3), G. Mohan Rao (3), Elena Rozhkova (4), Kamlesh Suthar (5)
(1) Department of Mechanical and Aerospace Engineering, Western Michigan University, Kalamazoo, Michigan/USA;
(2) Department of Chemistry, Western Michigan University, Kalamazoo, Michigan/USA;
(3) Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore/India;
(4) Center for Nanoscale Materials, Argonne National Laboratory, Lemont, Illinois/USA;
(5) Advanced Photon Source, Argonne National Laboratory, Lemont, Illinois/USA;

MOF-derived Fe-Zn-N-C Catalysts with Molecular Fe-N_x Sites as ORR Catalyst for High Performance Anion-Exchange Membrane Fuel Cells - MP4 - (B0212)

Patrick Elsaesser (1,2,3), Esmal Balaghi (1,2), Anna Fischer (1,2,3,4)
(1) Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT), Freiburg/Germany;
(2) Institute of Inorganic and Analytical Chemistry, Freiburg/Germany;
(3) Cluster of Excellence livMatS@FIT, Freiburg/Germany;
(4) Freiburg Materials Research Center, Freiburg/Germany;

Effect of the Carbon Support for Pt-Fe ORR Catalysts (B0213)

Marta Mazurkiewicz-Pawlicka (1), Joanna Kobek (1), Szymon Jaworowski (1), Monika Jałowicka (1), Piotr Bazarzik (2), Jan Krzysztoforski (1)
(1) Warsaw University of Technology, Faculty of Chemical and Process Engineering, Warsaw/Poland;
(2) Warsaw University of Technology, Faculty of Materials Science and Engineering, Warsaw/Poland;

Development of High Activity Catalyst for PEFC (B0214)

Minoru Ishida, Tomohiro Akiyama, Masaru Kagawa, Koichi Matsutani
Tanaka Kikinzo Kogyo K.K.;

PEM Fuel Cell Theory Revisited (B0215)

Ulf Bossel
Fuel Cell Consultant, Oberrohrdorf/Switzerland;

A05: Fuel Cell System Analysis and Degradation

Experimental Observation of OCV Decay and ECSA Loss as Independent Measures of Degradation in PEM Fuel Cells Under Combined Chemical and Mechanical Stress Tests (A0507)

Poornesh Kumar Koorata
Electrochemical Energy System Design Lab,
National Institute of Technology Karnataka Surathkal, Mangalore/India;

A Comprehensive PEMFC System Model for Evaluation of Air Supply System Dynamics (A0508)

Hoang Nghia Vu, Younghyeon Kim, Sangseok Yu
Chungnam National Univ., Daejeon/Republic of Korea;

Membrane Humidifier Model for PEM Fuel Cell Systems (A0509)

Sophie Mull (1), Lukas Weiß (1),
Stefan Buhl (2), Michael Wensing (1)
(1) Friedrich-Alexander-Universität Erlangen-Nürnberg,
Professorship for Fluidsystemtechnology, Erlangen/Germany;
(2) MAN Truck & Bus SE, Nürnberg/Germany;

Operando Recovery of Reversible Performance Losses in PEMFC (A0511)

Qian Zhang, Mathias Schulze, Pawel Gazdzicki, K.A. Friedrich
German Aerospace Center (DLR e.V.),
Institute of Engineering Thermodynamics, Stuttgart/Germany;

PEMFC Degradation in a Maritime Context: Causes, Mechanisms and Monitoring (A0512)

Annabel Broer, Lindert van Biert, Henk Polinder
Faculty of Maritime and Transport Technology, Delft/The Netherlands;

Investigation of Degradation Mechanism During Different Start-Up and Shut-Down Events in an Automotive PEM Fuel Cell (A0513)

Rafat Mahmood, Adrian Jurjevic, Natascha Weidler
cellcentric GmbH & Co. KG, Teck-Nabern/Germany;

Accelerated Stress Tests on PEMFC Single Cells with Electro sprayed Catalyst Layers (A0514)

Luis Duque, M Antonia Folgado, Antonio M. Chaparro
CIEMAT, Madrid/Spain;

Mixed Metal Oxide as the Cathodes for Anion Exchange Membrane Electrolyzers (B0216)

Facheng Su (1), Shang-Fu Wang (1), Hsiharng Yang (1, 2)
(1) Graduate Institute of Precision Engineering, National Chung Hsing Uni, Taichung City/ Taiwan;
(2) Innovation and Development Center of Sustainable Agriculture (IDCSA), National Chung Hsing University Taichung City/ Taiwan;

Novel Catalysts for Proton Exchange Membrane Fuel Cells via Fluidized Bed Atomic Layer Deposition (B0217)

Fiona Pescher, Severin Vierrath
Electrochemical Energy Systems, Laboratory for MEMS Applications, IMTEK - Department of Microsystems Engineering, University of Freiburg, Freiburg/Germany;

Study of Ruthenium Contamination Effect on Oxygen Reduction Activity of Platinum-based Fuel Cells Cathode Catalyst (B0218)

D. Kaplan (1,2), P. Tereshchuk (3), C. Olewsky (1), M. Shviro (4), A. Natan (3), E. Peled (1)
(1) School of Chemistry, Faculty of Exact Sciences, Tel Aviv University, Tel Aviv/Israel;
(2) Nuclear Research Center - Negev, Beer-Sheva/Israel;
(3) School of Electrical Engineering, Faculty of Engineering, Tel Aviv University, Tel Aviv/Israel;
(4) Institute of Energy and Climate Research, IEK-14, Forschungszentrum Jülich, Jülich/Germany;

B05: Ionic Media

The Influence of Acidity, Water Content and Temperature of Ionic Liquids on the Double Layer Properties of the Pt/PIL Interface (B0507)

Carsten Korte, Yanpeng Suo, Klaus Wippermann, Christian Rodenbücher
Forschungszentrum Jülich GmbH, Institute of Energy & Climate Research IEK-14, Jülich/Germany;

Process Progress Produces Performance Prowess: New Developments in Polybenzimidazole (PBI) Membranes (B0508)

Ben I. Howard, Laura A. Murdock, Brian C. Benicewicz
University of South Carolina, SC Columbia/USA;

Anion Exchange Membranes and Ionomers for Fuel Cell and Water Electrolysis (B0509)

Chuan Hu, Nanjun Chen, Jong Hyeong Park, Na Yoon Kang, Young Jun Lee, Seung Won Jeong, Young Moo Lee; Department of Energy Engineering, Hanyang University, Seoul/Korea;

Biobased Chitosan for PEM Electrolyzers (B0510)

Santino Melo, Enio de Deus
Department of Metallurgical and Materials Science, Federal University of Ceará, Fortaleza/Ceará;

Voltage Degradation Coefficients Validation on PEMFC Stacks Tested in Different Operating Conditions (A0515)

Silvia Crosa (1), Eleonora Gadducci (1),
Thomas Lamberti (2), Antonio Saturnio (3), Loredana Magistri (1)
(1) Thermochemical Power Group – DIME - Università degli Studi di Genova, Genova/Italy;
(2) BluEnergy Revolution (BER) Scarl, Genoa/Italy;
(3) European Commission, Joint Research Centre (JRC), Petten/Netherlands;

Detection and Degradation of Pinhole Defects in Polymer Electrolyte Fuel Cells (A0516)

Grace Amadi (1), Edward Brightman (1), Graham Smith (2)
(1) Department of Chemical and Process Engineering,
University of Strathclyde, Glasgow Scotland/UK;
(2) National Physical Laboratory, Teddington, England/UK;

A06: Alkaline Electrolysis

Comparing the Performance of Bi-based Gas Diffusion Electrodes (GDEs) in Acidic and Highly Alkaline Medium (A0607)

Qinhao Chen (1,2), Alexander Kube (1,2), Dennis Kopljar (1), Prof. Andreas Friedrich (1,2)
(1) German Aerospace Center, Stuttgart/Germany;
(2) University of Stuttgart, Stuttgart/Germany;

Hydrogen Crossover and Supersaturation in Advanced Alkaline Water Electrolysis (A0608)

Rodrigo Lira Garcia Barros (1), Joost Kraakman (1),
Matheus T. de Groot (1,2), John van der Schaaf (1,3)
(1) Eindhoven University of Technology, Eindhoven/The Netherlands;
(2) HyCC, Amersfoort/The Netherlands;
(3) Eindhoven Institute of Renewable Energy System (EIRES), Eindhoven/The Netherlands;

Hydrogen Reconversion from Ammonia through Anion Exchange Membrane Electrolysis (A0609)

Riham Kanaan, Pedro Affonso Nobrega, Christian Beauger
Mines Paris, PSL University, Centre for processes,
renewable energy and energy systems (PERSEE), Sophia Antipolis/France;

Alkaline Membrane Electrolysis: A Review of Experimental Techniques (A0610)

Jaroslaw Milewski, Rafał Bernat Olaf Dybiński, Aliaxandr Martsinych
Warsaw University of Technology, Faculty of Power and Aeronautical Engineering, Warsaw/Poland;

High-temperature Polymer Electrolyte Fuel Cells Based on Protic Ionic Liquids (B0511)

Christian Rodenbücher (1), Carsten Korte (1), Yingzhen Chen (1), Klaus Wippermann (1), Piotr Kowalski (2), Sangwon Kim (3), Jungtae Kim (3), Rolf Hempelmann (3), Beom-Jun Kim (4)
(1) Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research (IEK-14) - Electrochemical Process Engineering, Jülich/Germany;
(2) Forschungszentrum Jülich GmbH, Institute of Energy and Climate; Research (IEK-13) - Theory and Computation of Energy Materials, Jülich/Germany;
(3) KIST Europe and Transfercenter Sustainable Electrochemistry, Saarland University, Saarbrücken/Germany; (4) Korea Institute of Energy Research (KIER), Fuel Cell Research & Demonstration Center, Buan, Jeollabuk-do/Republic of Korea;

Effects of Chemically Modified Porous Supports on the Structure and Properties of PFSA Reinforced Composite Membranes for PEMFC - MP4 - (B0512)

Miguhn Yuk, Gunoh Lee, Jaehyun Kim, Hwan Yeop Jeong, Duk Man Yu, Kyung Jin Lee, Tae-Ho Kim; Energy materials research center, Korea research institute of chemical technology, Korea;

Understanding Key Driving Forces and Controlling A'-site Cation Segregation in NdBa_{1-x}Sr_xCo₂O_{5+δ} Solid Oxide Fuel Cell Cathode Materials (B0513)

Jyotsana Kala (1), Uzma Anjum (2), Brajesh Kumar Mani (1), M. Ali Haider (2)
(1) Department of Physics, Indian Institute of Technology, Delhi/India;
(2) Department of Chemical Engineering, Indian Institute of Technology, Delhi/India;

B06: Electrode Fabrication

Fabrication of Pillar-structured Electrode of Polymer Electrolyte Fuel Cell (B0607)

Hideto Koshiba, Keisuke Nagato, Morio Tomizawa, Akihisa Tanaka, Hirotaka Oya, Masayuki Nakao
Department of Mechanical Engineering, Graduate School of Engineering, The University of Tokyo, Tokyo/Japan;

Development of Cu-rich GdBa_{0.5}Sr_{0.5}Co_{2-x}Cu_xO_{5+δ} Oxygen Electrodes for Application at Lowered Temperatures (B0608)

Keyun Li (1), Konrad Świerczek (1), Piotr Winiarz (1), Agnieszka Brzoza-Kos (1), Yang Zhang (2)
(1) AGH University of Science and Technology, Faculty of Energy and Fuels, Krakow/Poland;
(2) Ningbo Institute of Material Technology and Engineering, Chinese Academy of Sciences, Ningbo/China;

Ti-powder Microporous Layers with Different Particle Sizes and Loading for Polymer Electrolyte Membrane-Unitized Reversible Fuel Cells - MP4 - (B0609)

Byeonghyun Kang, Minhyeok Ahn, Min Soo Kim; Seoul National University; Seoul/South Korea;

AEM-Water Electrolysis - The Best of two Worlds (A0611)

Matthias Ranz (1), Bianca Grabner (1),
Christine Bandl (2), Marie Macherhammer (1) Wolfgang Kern (2), Alexander Trattner (1)
(1) HyCentA Research GmbH, Graz/Austria;
(2) Montanuniversität Leoben, Leoben/Austria;

Systematic Optimization of the Anode and Cathode Electrodes for Anion Exchange Membrane Electrolyzers - MP4 - (A0612)

Noor Ul Hassan (1), Paul A. Kohl (2), William E. Mustain (1)
(1) Department of Chemical Engineering, University of South Carolina, SC/USA;
(2) School of Chemical and Biomolecular Engineering, Georgia Institute of Technology, Atlanta/USA;

A08: Tailored MEA Design for Fuel Cells and Impact of Flow-Fields**Cathodic Arc Evaporation of Graphitic Carbon-based Coating for Metallic Bipolar Plates (A0807)**

Maximilian Steinhorst (1,2), Maurizio Giorgio (2), Teja Roch (2), Christoph Leyens (1,2)
(1) Fraunhofer Institute for Material and Beam Technology IWS; Dresden/Germany;
(2) Technische Universität Dresden, Institute of Material Science; Dresden/Germany;

Large-area and High Efficiency Spatial Atomic Layer Deposition for low PGM Loading MEA's (A0808)

Corné Frijters, Jeroen Smeltink
Paul Poodt, Sparknano B.V., Eindhoven/the Netherlands;

Effect of Compression on the Membrane Electrode Assembly of Polymer Electrolyte Electrolysers (A0809)

Edgar Cruz Ortiz (1,2), Melanie Bühler (1,2), Severin Vierrath (1,2,3)
(1) Hahn-Schickard, Freiburg/Germany;
(2) Electrochemical Energy Systems, IMTEK – Department of Microsystems Engineering, University of Freiburg, Freiburg/Germany;
(3) University of Freiburg, Institute and FIT – Freiburg Center for Interactive Materials and Bioinspired Technologies, Freiburg/Germany;

Developing PEMFC MEA for Stationary Application (A0810)

Eunjoon Yang, Jinhwa Lee, Joseph Baejung Kim
Fuel Cells Business Unit, HYUNDAI MOBIS, Seoul/South Korea;

Ethylene Glycol / Water-Based Synthesis of Pt/Vulcan Cathode Catalysts Correlated to PEM Fuel Cell Performance (B0610)

Daniel Böhm (1), Iosif Mangoufis-Giasin (1), Farah Mirzayeva (1), Zeljana Vajic (2), Tilman Jurzinsky (1), Katharina Hengge (1), Thomas Burger (1), Hany El-Sayed (1)
(1) Freudenberg Fuel Cell e-Power Systems GmbH, Munich/Germany; (2) Faculty for applied science and mechatronics, University of Applied Sciences Munich, Munich/Germany;

Self-Assembly Electrodes to Boost Power Performance of Direct Formic Acid Fuel Cells - MP4 - (B0611)

Shangfeng Du, Yang Li, Yichang Yan; School of Chemical Engineering, Uni of Birmingham/UK;

Dependency of Polymer Electrolyte Membrane Fuel Cell (PEMFC) Performance at High Current Densities and Catalyst Layer Structure on the Cathode Catalyst Ink Solvent Composition (B0612)

Masuma Sultana Ripa, Ludwig Jörissen, Sylvain Brimaud
Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW), Ulm/Germany;

Systematic Analysis for the Effect of Ionomer Equivalent Weight, and Ionomer to Carbon Ratio for Development of the Graded Cathode Catalyst Layer in the PEMFC (B0613)

Sepehr Saadat, Emanuel Heider, Ludwig Jörissen
Zentrum für Sonnenenergie- und Wasserstoff- Forschung BW, Ulm/Germany;

Effects of Graded-Porosity Cathode GDL and MPL Used in PEFCs (B0614)

Isaac Okereke (1,2), Mohammed S. Ismail (1,3), Derek Ingham (1), Kevin Hughes (1), Lin Ma (1), Mohammed Pourkashanian (1,4)
(1) Energy 2050, Department of Mechanical Engineering, University of Sheffield, Sheffield/UK;
(2) Department of Mechanical Engineering, Faculty of Engineering, Akwa Ibom State Uni, Nigeria;
(3) School of Engineering, University of Hull, Hull/UK;
(4) Translational Energy Research Centre, University of Sheffield, Sheffield/UK;

Homogeneous Distribution of Pt and PFSA Ionomer in the Catalyst Layer and its Impact on PEMFC Performance and Operando Stability (B0615)

Hyunguk Choi (1,2), Won-Young Choi (1), Seo-Won Choi (1), Young-Je Park (1), Nam-Jin Lee (1), Yong-Min Jung (1), Kwang-Shik Myung (1), Young-Gi Yoon (1), Sung-Chul Yi (2), Chi-Young Jung (1)
(1) Fuel Cell Research and Demonstration Center, Korea Institute of Energy Research, Jeollabuk-do/Republic of Korea;
(2) Department of Chemical Engineering, Hanyang University, Seoul/Republic of Korea;

Numerical Simulation of Polymer Electrolyte Fuel Cells with Non-Homogenous Metal Foam as a Flow Distributor (A0811)

Hadi Heidary, Robert Steinberger-Wilckens

Centre for Hydrogen and Fuel Cell Research, University of Birmingham, Edgbaston, B15 2TT, Birmingham/UK;

Investigation of System Induced Causes of Defects on Metallic Bipolar Plates in Progressive die Forming (A0812)

Sangwook Lee (1), Dennis Meelkop (1), Henning Janssen (1), Christian Brecher (1,2)

(1) Fraunhofer Institute for Production Technology IPT, Aachen/Germany;

(2) Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Aachen/Germany;

Influence of anisotropic conductive expanded graphite bipolar plates on thermal management performance of proton exchange membrane fuel cell (A0813)

Yujie Ding (1,2), Quanquan Gan (3,4),

Yangbin Shao (3), Liangfei Xu (3), Jianqiu Li (3), Minggao Ouyang (3)

(1) Academy of Building Energy Efficiency, School of Civil Engineering, Guangzhou University, Guangzhou/China;

(2) Guangdong Provincial Key Laboratory of Building Energy Efficiency and Application Technologies, Guangzhou/China;

(3) State Key Laboratory of Automotive Safety and Energy, School of Vehicle and Mobility, Tsinghua University, Beijing/China;

(4) Shanghai SinoFuelcell CO., Ltd., Shanghai/China;

A09: Advanced Systems & Components

Investigation of Film-based PTL, Perforated and Surface-patterned by a Femtosecond Laser Processing in a Liquid Flow Chamber (A0907)

Andreas Gusak (1), B. Oberschachtsiek (1),

Philipp Maack (2), Christian Günther (2), Cemal Esen (2)

(1) The Hydrogen and Fuel Cell Center, GmbH, Duisburg/Germany;

(2) Applied Laser Technology, Ruhr-Universität Bochum, Bochum/Germany;

e-LEAF - Light Weight, Low-Cost, and Flexible Printed Fuel Cell:

A Game Changer in Energy Conversion (B0616)

Thi Hai Van Nguyen, Diogo Miguel Esperança Garcia, Guilherme Cadete Paixão da Costa, Paul Lacharminoise, Claudia Delgado Simão; EURECAT Technology center of Catalonia, Barcelona/Spain

Determination of the Cathode Catalyst Layer Structure Limitations of PEM fuel Cells (B0617)

Tom Servais, Nathalie Job; Chemical Engineering Department, University of Liège, Liège/Belgium;

Advances in a Portable PEMFC Design with Passive Mass Transport (B0618)

M. Antonia Folgado, Luis Duque, Antonio M. Chaparro

CIEMAT, Madrid/Spain;

Phase Change Multiphase Flow with Reactive Transport Processes in Proton Exchange Membrane Fuel Cells (B0619)

Yi Yuan, Li Chen, Yu Zhang, Wen-Quan Tao

Key Laboratory of Thermo-Fluid Science and Engineering of MOE, School of Energy and Power Engineering, Xi'an Jiaotong University, Shaanxi/China;

Design and Multi-objective Optimization

for High-performance Proton Exchange Membrane Fuel Cells (B0620)

Jing Yao (1), Zhen Wu (1), Fusheng Yang (1), Zaoxiao Zhang (1,2)

(1) Xi'an Jiaotong University, Xi'an/PR China;

(2) State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an/PR China;

Engineered Carbon Supports

for Pt/C ORR Catalysts in High-performance PEMFC - MP4 - (B0621)

Miriam von Holst (1), Sven Küspert (2,3),

Julian Martin (2,3), Jan Oechsler (2,3), Hassan Fadlullah (1), Arbëri Salihi (1), Robert Marić (6),

Anna Fischer (2,3,4), Severin Vierrath (1,5)

(1) Hahn-Schickard, Freiburg/Germany;

(2) Institut für Anorganische und Analytische Chemie, Albert-Ludwigs-Universität Freiburg, Freiburg/Germany;

(3) Freiburger Materialforschungszentrum, Albert-Ludwigs-Universität Freiburg, Freiburg/Germany;

(4) Freiburger Zentrum für interaktive Werkstoffe und bioinspirierte Technologien, Albert-Ludwigs-Universität Freiburg, Freiburg/Germany;

(5) Institut für Mikrosystemtechnik, Albert-Ludwigs-Universität Freiburg, Freiburg/Germany;

(6) Heraeus Deutschland GmbH & Co. KG, Hanau/Germany;

Evaluation of Different Materials for the Coating of Porous Transport Layers in Proton Exchange Membrane Water Electrolyzers (A0908)

T. Sievert (1), S. Zerresen (2), M. Bram (1),
A. Glüsen (2), S. Uhlenbruck (1), O. Guillon (1), R. Vaßen (1)
(1) Forschungszentrum Jülich, Institute of Energy and Climate Research, Materials Synthesis and Processing (IEK-1);
(2) Forschungszentrum Jülich, Institute of Energy and Climate Research, Electrochemical Process Engineering (IEK-14) Jülich/Germany;

Low Cost Coating Technology for PEM Water Electrolyzer Bipolar Plates and PTLs (A0909)

Matthew Philips, Conghua "CH" Wang
TreadStone Technologies, Inc. Princeton, NJ/USA;

Novel Coatings for SS Bipolar Plates for PEMWE by High Volume Magnetron Sputtering Technology (A0910)

Lucia Mendizabal (1), Jose Antonio Santiago (2)
(1) Tekniker, Eibar/Spain;
(2) Nano4energy, Madrid/Spain;

Main Effects Extraction of Pure Water Electrolysis with Overlapping Cathode/anode EDLs (A0911)

Haosen Xu, Jianbo Zhang
School of Vehicle and Mobility, Tsinghua University, Beijing/China;

Light Commercial Vehicle and Unmanned Vessel Demonstrators Using unique Printed Circuit Board Fuel Cell Technology (A0912)

Cedric Rouaud, Puneet Jethani, Anoop Selvaraj, William Nock
Bramble Energy, Crawley/UK

Hydrogen Production in the Cathodic Regime of Plasma-Driven Solution Electrolysis (A0913)

Sergii Bepalko (1), Jerzy Mizeraczyk (2)
(1) Research and Innovation Centre Pro-Akademia, Konstantinów Łódzki/Poland;
(2) Gdynia Maritime University, Department of Marine Electronics, Gdynia/Poland;

Understanding Diffusion of Na-Ion in Layered Materials for Energy Storage Devices (A0914)

Deepak Seth, Manish Kr. Singh,
Jayashree Pati, Manish Agarwal, M. Ali Haider, Rajendra S. Dhaka
Indian Institute of Technology Delhi, Hauz Khas, New Delhi, Delhi/India;

Characterization of multiple interfaces in electrospun catalyst layers for polymer electrolyte fuel cells (B0622)

Dechun Si (1), Han Liu (2), Kejian Wang (2), Jianbo Zhang (3,4)
(1) Beijing Huairou Laboratory, Beijing/PR China;
(2) College of Mechanical and Electrical Engineering, Beijing University of Chemical Technology, Beijing/PR China;
(3) School of Vehicle and Mobility, State Key Laboratory of Automotive Safety and Energy, Tsinghua University, Beijing/PR China;
(4) Beijing Co-innovation Center for Electric Vehicles, Beijing Inst. of Technology, Beijing/PR China;

B08: Alkaline (OER) Catalysts

Investigation of Phase Dependent Bifunctional Activity of Ni₃B/Ni₂B Catalysts for Water Splitting Using Scanning Electrochemical Cell Microscopy (B0807)

Lithin Madayan Banatheth (1), Simon Schumacher (1), Alejandro E. Pérez-Mendoza (1), Ulrich Burkhardt (2), Iryna Antonyshyn (2), Corina Andronesco (1)
(1) Chemical Technology III, Faculty of Chemistry and CENIDE; University of Duisburg-Essen
Duisburg/Germany; (2) Max-Planck-Institut für Chemische Physik fester Stoffe, Dresden/Germany;

Unravelling Structure-activity Relationships of Spray-coated Catalyst Layers used for Alkaline Water Electrolysis (B0808)

Adarsh Jain (1), Vineetha Vinayakumar (1), Christian Marcks (3), Anna K. Mechler (3), Doris Segets (1,2)
(1) Institute for Combustion and Gas Dynamics-Particle Science and Technology (IVG-PST), University of Duisburg-Essen (UDE), Duisburg/Germany;
(2) Center for Nanointegration Duisburg-Essen (CENIDE), University of Duisburg-Essen (UDE), Duisburg/Germany;
(3) Electrochemical Reaction Engineering, RWTH Aachen University, Aachen/Germany;

Ni-Fe Stoichiometry Variation Through Electrochemical Catalyst Deposition on Graded Ni-substrates for AEMWE (B0809)

Maximilian Cieluch (1), Norbert Kazamer (1), Leonard Böhm (1), Florian Wirkert (1), Ulf-Peter Apfel (2,3), Michael Brodmann (1)
(1) Westphalian University of Applied Sciences, Westphalian Energy Institute, Gelsenkirchen/Germany;
(2) Ruhr University Bochum, Inorganic Chemistry 1, Bochum/Germany;
(3) Fraunhofer UMSICHT, Oberhausen/Germany;

Development of a Hydrogen Metal Hydride Storage Manufactured by Additive Manufacturing (A0915)

Tim Röver (1), Tom Hoffmann (1), Lars Baetcke (2) Mr. Sebastian Roth (3) and Mr. Dirk Herzog (4)
(1) Hamburg University of Technology (TUHH), Institute of Laser and Systems Technologies (iLAS), Hamburg/Germany;

(2) Helmholtz-Zentrum Hereon, Institute of Hydrogen Technology, Geesthacht/Germany;

Modeling of Ejectors Applied in PEMFC Systems (A0916)

Nicklas Lindacher, Lukas Weiß, Sebastian Rieß, Michael Wensing
Friedrich-Alexander-Universität Erlangen-Nürnberg, Professorship for Fluid System Technology, Erlangen/Germany;

High Performance kW-class alkaline Water Electrolyzer System with Non-noble Based Electrodes (A0917)

Sven Marx (1), Franz Egert (1), Ullmer Dirk (1), Philipp Spieth (2),
Tonja Möllenstedt (2), Brinner Andreas (2), Fatemeh Razmjooei (1), Syed Asif Ansar (1)
(1) Institute of Engineering Thermodynamics, German Aerospace Center (DLR), Stuttgart/Germany;
(2) Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW), Stuttgart/Germany;

Modelling of Air-Cooled PEM Fuel Cell Systems for Small Passenger Aircraft - MP4 - (A0918)

Daniel Juschus (1), Christoph Gentner (2)
(1) German Aerospace Center (DLR), Institute of Engineering Thermodynamic, Innovation Center for Small Aircraft Technologies, Aachen/Germany;
(2) Energy System Integration, Hamburg/Germany;

Fuel Cell Stack and Power Electronics Interaction (A0919)

Linh Le Phuong, Christoph Gentner, Florian Becker
German Aerospace Center (DLR), Institute of Engineering Thermodynamics, Hamburg/Germany;

Efficient and Durable Lab-Scale Alkaline Water Electrolyzer for Demonstration of Improved Components and Operation at Stack Level (A0920)

Dirk Ullmer, Thi Anh Le, Franz Egert, Sven Marx, Fatemeh Razmjooei, Syed Asif Ansar
Institute of Engineering Thermodynamics, German Aerospace Center (DLR), Stuttgart/Germany;

Thermal Integration of Membrane Distillation and Water Electrolysis Stack (A0921)

Tim Arthur, Jonathan Love, Graeme Millar
Queensland University of Technology, Brisbane/Australia;

Understand the Stability of Supported (oxy)sulfides Phases for Hydrogen Evolution Reaction (B0810)

Q Cacciuttolo (1), C. Legens (1), A. Bonduelle-Skrzypczak (1), M. Obadia (1), E. Bracco (1), V. Briois (2), L. Dubau (3), E. Sibert (3)

(1) IFP Energies Nouvelles, Solaize/France;

(2) Univ Savoie Mt Blanc, Univ Grenoble Alpes, CNRS, Grenoble Grenoble/France;

(3) SOLEIL synchrotron – Saint-Aubin/France;

Iridium-Cobalt Oxide from Modified Adam's Fusion Synthesis Method as Electrocatalyst for Oxygen Evolution Reaction - MP4 - (B0811)

Marc Francis Labata, Guangfu Li, Po-Ya Abel Chuang
School of Engineering, University of California, California/United States;

Feasibility study on Porous Titanium Oxide Based Suspension Sprayed Coatings as Anodic Catalyst Support Structure for PEMWE (B0812)

Norbert Kazamer (1), Filofteia-Laura Toma (2), Anja Meyer (3), Maximilian Cieluch (1), Leonard Böhm (1), Ulrich Wilhelm Rost (1), Michael Brodmann (1)

(1) Westphalian University of Applied Sciences, Gelsenkirchen/Germany;

(2) Fraunhofer Institute for Material and Beam Technology (IWS), Dresden/Germany;

(3) Fraunhofer Institute for Ceramic Technologies and Systems (IKTS), Dresden/Germany;

Laser Nanostructured TiOx as Support Structure Approach for Catalyst Loading Reduction of PEMWE Anodes (B0813)

Lisa Sagewka (1), Pit Podleschny (1), Norbert Kazamer (1), Tim Hülser (2), Johannes Näther (3), Florian Wirkert (1), Stefan Bergfeld (4), Michael Brodmann (1)

(1) Westphalian University of Applied Sciences, Gelsenkirchen/Germany;

(2) Institute for Energy and Environmental Technology e. V. (IUTA), Duisburg/Germany;

(3) Hochschule Mittweida University of Applied Sciences, Mittweida/Germany;

(4) Bergfeld Lasertech, Aachen/Germany;

Finding NiMo: Electrodeposition of NiMo Catalysts on Carbon Nano Fibers for use in AEM Electrolysis (B0814)

Leonard Böhm (1), Norbert Kazamer (1), Maximilian Cieluch (1), Florian Wirkert (1), Pit Podleschny (1), Gabriela Marginean (2), Ulf-Peter Apfel (3,4), Michael Brodmann (1)

(1) Westphalian University of Applied Sciences Gelsenkirchen Bocholt Recklinghausen, Westphalian Energy Institute, Gelsenkirchen/Germany;

(2) Westphalian University of Applied Sciences Gelsenkirchen Bocholt Recklinghausen, Department of Materials Science and Testing, Gelsenkirchen/Germany; (3) Ruhr University Bochum, Inorganic Chemistry 1, Bochum/Germany; (4) Fraunhofer UMSICHT, Oberhausen/Germany;

A12: Alternative Fuel Cell Systems and Additives

Efficiency and Durability Enhancement of PEM-FC-Systems by Anode-System Control (A1207)

Florian Becker, Christoph Gentner

German Aerospace Center (DLR), Institute of Engineering Thermodynamics; Hamburg/Germany;

Analysis of Cerium Ion Transport Properties

in PEM of Polymer Electrolyte Fuel Cells Using Molecular Dynamics Simulations (A1208)

Hiroto Suzuki (1,2), Takuya Mabuchi (2,3), Takashi Tokumasu (2)

(1) Graduate School of Engineering, Tohoku University, Sendai City/Japan;

(2) Institute of Fluid Science, Tohoku University, Sendai City/Japan;

(3) Frontier Research Institute for Interdisciplinary Sciences, Tohoku University, Sendai City/Japan;

A13: Multiscale Characterization

Combined chemical and elemental material analysis of PEM (A1307)

Jana Kalbacova

HORIBA Jobin Yvon GmbH, Oberursel/Germany;

A15: Life Cycle Analysis and Economic Viability

Total cost of Ownership Analysis of Fuel Cell Forklift Considering the Economic Effect of Carbon Emissions Reduction: A Korean Empirical Case (A1507)

Ji-Su Sim, Junhyung Kim, Donghyun An, Seokhwan Hong, Deok-Joo Lee

Department of Industrial Engineering, Seoul National University; Seoul/Republic of Korea;

System Architecture of Multi-stack Fuel Cell Systems (A1508)

Florian Pillath

German Aerospace Center (DLR), Institute of Engineering Thermodynamics, Hamburg/Germany;

The Gulf of Mexico: Transition to the Green Hydrogen Offshore Energy Field - MP4 - (A1509)

Elias Greenbaum (1), Kent Satterlee (2), Jason McKenna (3)

(1) GTA, Inc., Atlanta, Georgia/USA;

(2) Gulf Offshore Research Institute, Mandeville, Louisiana/USA;

(3) Jason McKenna, USM Marine Research Center, Gulfport, Mississippi/USA;

Highly Dispersed Pt Species Consisting of Pt Single-atoms, Clusters and Nanoparticles on Mesoporous N-doped Carbon Nanospheres for Improved Hydrogen Evolution Reaction (B0815)

Sven Küspert (1,2), Zhiqiang Zeng (1,2), Niklas Ortlieb (1,2), Haytham Hussein (4), Markus Knäbbeler-Buß (5), Niclas Hug (1), Julia Melke (1,2,3), Anna Fischer (1,2,3)

(1) University of Freiburg, Institute of Inorganic and Analytical Chemistry, Freiburg/Germany;

(2) University of Freiburg, Freiburg Materials Research Center (FMF), Freiburg/Germany;

(3) University of Freiburg, Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT), Freiburg/Germany;

(4) University of Warwick, Department of Chemistry, Coventry/United Kingdom;

(5) The Fraunhofer Institute for Solar Energy Systems (ISE), Freiburg/Germany;

Low Pt Loading Electrode for Hydrogen Production in PEMECs by Magnetron Sputtering (B0816)

Antía Villamayor, Eva G-Berasategui, Lucía Mendizabal

TEKNIKER, Basque Research and Technology Alliance (BRTA), Gipuzkoa/Spain;

Development of TiO₂/MoS₂/CNT Photocatalysts for Hydrogen Evolution Reaction (B0817)

Jakub Zabrzycycki, Zuzanna Bojarska, Marta Mazurkiewicz-Pawlicka

Faculty of Chemical and Process Engineering, Warsaw University of Technology, Warsaw/Poland;

Lanthanum-Nickel-based Perovskite-coated Nickel Electrodes for the OER Electrocatalysis (B0818)

Nikolas Mao Kubo, Rim Mhamdi, Regina Palkovits

Institute of Technical and Macromolecular Chemistry, RWTH Aachen University, Aachen/Germany;

Study of the Highly Active and Durable Misfit Layered Structure Catalyst for Oxygen Evolution Reaction (B0819)

Sung Ryul Choi, Jun-Young Park

HMC, Department of Nanotechnology and Advanced Materials Engineering, Sejong University/Korea;

Ultrafast Synthesized Ni/Fe Hydroxide Foam for Efficient Alkaline Water-to-Hydrogen Conversion via Urea Electrolysis (B0820)

Siyuan Zhao, Meng Ni

Department of Building and Real Estate, The Hong Kong Polytechnic University, Hong Kong;

Influences on Iridium Catalyst Dissolution in Single-Cell PEM Water Electrolysis (B0821)

An Phuc Dam (1), Georgios Papakonstantinou (1), Kai Sundacher (1,2)

(1) Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg/Germany;

(2) Otto- von-Guericke University Magdeburg, Process Systems Engineering, Magdeburg/Germany;

FLAGSHIPS – Zero Emission Hydrogen Fuel Cells Vessels Entering European Rivers (A1510)

Jyrki Mikkola (1), Mathieu Longueville (2), Dirk de Jong (3), Christina Mikkelsen (4) Alexandre Bellot (5), Pavel Berg (6), Arber Haxhiu (7), Pål Gunnar Eide (8), Colin Bettini (9), Marius Knutsen (10)
(1) VTT Technical Research Centre of Finland, Espoo/Finland;
(2) Compagnie Fluviale de Transport, Le Havre/France;
(3) Future Proof Shipping, Rotterdam/Netherlands;
(4) Ballard Power Systems Europe, Hobro/Denmark;
(5) LMG Marin, Toulouse/France;
(6) LMG Marin AS, Bergen/Norway;
(7) ABB, Helsinki/Finland;
(8) SEAM, Norway;
(9) PersEE, Lyon/France;
(10) NCE Maritime CleanTech, Stord/Norway;

Analysis of Heavy-Duty Requirements and Mission Profiles to Develop ASTs for PEMFC (A1511)

Juan Sanchez-Monreal, Jens Mitzel, Pawel Gazdzicki
German Aerospace Center (DLR), Insititue of Engineering Thermodynamics, Stuttgart/Germany;

AutoStack Industrie – High-Performance Stack Technology for Automotive Mass Production – Project Results (A0504) = (A1512)

André Martin (1), Ludwig Joerissen (2)
(1) André Martin Consulting, Idstein/Germany;
(2) Centre for Solar and Hydrogen Research, Ulm/Germany;

Considerations on Operation of Multi-Megawatt Scale Water Electrolysis Plant on Fluctuating Power (A1513)

Børre Tore Børresen, Per Kristian Andvik, Sima Jonoud
Equinor ASA; Trondheim/Norway;

Hydrogen Charging Characteristics to Vehicle Tanks (A1514)

Sang Woo Karng, Bo Hyun Kim
Korean Institute Science and Technology, Seoul/Republic of Korea;

Data-driven Reliability Growth Model for Fuel cell forklift: a Korean Empirical Case (A1515)

Seokhwan Hong, Donghyun An,
Ji-Su Sim, Junhyung kim, Deok-Joo Lee
Department of Industrial Engineering, Seoul National University, Seoul/Republic of Korea;

Hydrangea-type Co/Mo₂C embedded carbon composites for high efficiency oxygen evolution reaction (B0822)

Cheol Hyoun Ahn, Hyung Koun Cho; School of Advanced Materials Science and Engineering, Sungkyunkwan University, Gyeonggi-do/Republic of Korea;

B09: Advanced Testing and Diagnosis

Impedance-based Observation and Quantification of Water in PEMFCs (B0907)

Tobias Goosmann, Philipp Oppek, Sebastian Raab, André Weber
Karlsruhe Institute of Technology (KIT), Institute for Applied Materials (IAM-ET), Karlsruhe/Germany;

Metrology For Hydrogen Technologies (B0908)

Graham Smith, Gareth Hinds; National Physical Laboratory, Teddington/UK;

A Novel Alkaline Electrolyte Membrane Water Electrolysis Test Bench for Material Screenings and Component Analyses (B0909)

Ulrich Rost (1), Philipp Neuhaus (1), Jeffrey Roth (1,2), Francesca Panaccione (3), Matteo Testi (3), Frederic Fouda-Onana (4)
(1) ProPuls GmbH, Gelsenkirchen/Germany;
(2) Westfälische Hochschule, Gelsenkirchen/Germany;
(3) Fondazione Bruno Kessler, Povo/Italy;
(4) CEA, LITEN, Grenoble/France;

Experimental Simulation of a Large Electrolysis Stack with a Differential Laboratory Scale Test Cell (B0910)

Lukas Ritz (1), Martin Müller (1), Anna Mechler (1,2), Felix Lohmann-Richters (1)
(1) Forschungszentrum Jülich GmbH, Juelich/Germany;
(2) RWTH Aachen University, Electrochemical Reaction Engineering, Aachen/Germany;

Experimental Investigation of Multiphysics and Voltage Losses Distribution in Proton Exchange Membrane Fuel Cells with a Large Active Area During the Cold Start (B0911)

Zihan Zhou, Diankai Qiu, Linfa Peng, Xinmin Lai
State Key Laboratory of Mechanical System and Vibration, Shanghai Jiao Tong University, P.R. Shanghai/China;

Setup for and Initial Experiments on PEMFC Monitoring (B0912)

Piotr Bujto, Thomas Holm, Ragnhild Hancke, Øystein Ulleberg
Institute for Energy Technology, Kjeller/Norway;

Modeling and Simulation of a Green Hydrogen Chain Deployment

in the Case of a Power-to-Gas-to-Power Scenario Using SISTER Library (A1516)

Thomas Bertheau (1,2), Pierrick Haurant (2), Fabien Claudel (1), Sara Hany (1), Abdelmalek Malouche (1), Seloua Mouhoubi*

(1) Capgemini, Issy-les-Moulineaux/France;

(2) Pierrick HAURANT IMT Atlantique, GEPEA, Nantes/France;

Production Chains and Energy Balances for Green hydrogen-Based E-Fuels (A1517)

Abigail Okine, Bheki Shabangu, Samuel Sogbesan, Yousif Al-Sagheer, Grant Wilson, Robert Steinberger-Wilckens

(1) Centre for Hydrogen and Fuel Cell Research;

(2) Birmingham Centre for Energy Storage, University of Birmingham, Birmingham/UK

Up-Skilling the European Fuel Cell and Hydrogen Work Force (A1518)

Robert Steinberger-Wilckens, Yousif Al-Sagheer

Centre for Hydrogen and Fuel Cell Research, University of Birmingham, Birmingham/UK

Manufacturing and Supply Chain Challenges in the Context of PEM Electrolysis (A1519)

Carlo Locci, Philipp Lettenmeier

Siemens Energy, Erlangen/Germany;

A16: Performance and Lifetime Assessment

Revealing the Mechanism of Performance Discrepancy between H-cell and Gas Diffusion Electrode (A1607)

Tiange Yuan (1,2), Charley Thomas Bakker (1), Hugo-Pieter Iglesias van Montfort (1),

Oleksandr Voznyy (2), Mengran Li (3), Thomas Burdyny (1)

(1) Department of Chemical Engineering, Faculty of Applied Sciences, Delft University of Technology, Delft/The Netherlands;

(2) Department of Physical & Environmental Sciences, University of Toronto, Ontario/Canada;

(3) Department of Chemical Engineering, The University of Melbourne, Victoria/Australia;

Dynamic Simulation of PEM Water Electrolysis System with Detailed 2D Stack Model (A1608)

Shin Haeseong (1), Kang Sanggyu (1),

Gilwon Kim (2), Kyong-Hwan Kim (2)

(1) Department of Naval Architecture and Ocean Engineering,

Seoul National University, South Korea;

(2) Korea Research Institute of Ships & Ocean Eng. South Korea;

Nonlinear Frequency Response Analysis

of the Proton Exchange Membrane Water Electrolyzer (B0913)

Tamara Miličić (1), Thanh Vu Hoang (2), Luka A. Živković (1), Tanja Vidaković-Koch (1)

(1) Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg/Germany;

(2) Otto von Guericke University Magdeburg, Magdeburg/Germany;

Electrochemical Characterization of Membranes for AEM Cell (B0914)

Margherita Montini, Vincenza Marzocchi, Massimiliano Boccia

H2 Energy S.r.l, Pizzighettone, CR/Italy;

Analysis of Semi-empirical Electrical Equivalent Circuits

Applied in PEMWE Degradation Research (B0915)

Annabel Broer (1), Ivan Garcia Torregrosa (2)

(1) Faculty of Maritime and Transport Technology, Delft/The Netherlands;

(2) Sungrow Benelux B.V., Amsterdam/The Netherlands;

B12: AI-driven R&D

Parameter Exploration System in the Electrode Drying Process

for Structure Optimization of Polymer Electrolyte Fuel Cell Catalyst Layers (B1207)

Hirotsuka Oya, Keisuke Nagato, Morio Tomizawa, Akihisa Tanaka, Hideto Koshiba, Masayuki Nakao

Department of Mechanical Engineering, Graduate School of Engineering, The University of Tokyo, Tokyo/Japan;

Ontology-based Graph Data Structures for Scalable Data Management

in PEFC and PEWE Fabrication (B1208)

Max Dreger (1), Kourosh Malek (1),

Michael Eikerling (1,2), Mohammed J. Eslambidgoli (1)

(1) Theory and Computation of Energy Materials (IEK-13),

Institute of Energy and Climate Research, Forschungszentrum Jülich GmbH, Jülich/Germany;

(2) Jülich Aachen Research Alliance, JARA Energy, Jülich/Germany;

B13: Catalysts for Acidic Electrolysis

Development and Validation of 25kW PEM-FC Stack for Stationary Applications (A1609)

Joseph Baejung Kim, Jinhwa Lee, Eunjoon Yang
Fuel Cells Business Unit, HYUNDAI MOBIS, Seoul/South Korea;

Effects of Magnetic Field on the Performance of Polymer Electrolyte Membrane Fuel Cell (A1610)

Jun Yeob Chung, Wonseok Yang, Yongchan Kim
Department of Mechanical Engineering, Korea University, Seoul/Republic of Korea;

Investigating the Transient Response of a Low Pt-loaded PEMFC Under Various Operating Conditions (A1611)

Asal Saeidfar, Serhat Yesilyurt
Sabanci University, Istanbul/Turkey;

Designing Durable, Inexpensive and Energy-Efficient PEM Electrolyzer Stacks through the use of Simulation (A1612)

Julius Rauh, Benedikt Karan, Johannes Wilhelm, Alexander Trattner
HyCentA Research GmbH, Graz/ Austria;

Case Study of Heavy-Duty FC Truck: Computationally Efficient Reduced Order Mathematical Node Model of PEM Fuel Cell for Real-Time Implementation (A1613)

Sachin Hegde (1), Joy Njeru (1), Dr. Till Kaz (1), Prof. Dr. Ralf Wörner (1), Silvano Pozzi (2)
(1) Esslingen University of Applied Sciences, Germany;
(2) Ballard Power Systems Inc., Canada;

Performance Analysis of Electrochemical Hydrogen Compressor - MP4 - (A1614)

Dongkeun Lee (1), Young Sang Kim (1,2),
Kook Young Ahn (1,2), Yonggyun Bae (1), Jin Young Park (1)
(1) Korea Institute of Machinery & Materials (KIMM); Gajeongbuk-ro, Yuseong-gu, Daejeon/South Korea;
(2) University of Science and Technology (UST), Daejeon/South Korea;

Mechanism Investigation on Sudden Failure of Polymer Electrolyte Membrane Fuel Cell under Severe Membrane Dehydration (A1615)

Yangbin Shao, Liangfei Xu, Zunyan Hu, Ling Xu,
Xiyuan Zhang, Guanlei Zhao, Jianqiu Li, Minggao Ouyang
State Key Lab of Automotive Safety and Energy,
School of Vehicle and Mobility, Tsinghua University, Beijing/China;

B15: Structure-based and Dynamic Modeling

Challenges & Intricacies of Modelling PEM Fuel Cells. Part 1: CFD Workflow - MP4 - (B1507)

Aleksey Gerasimov (1), Henning Eickenbusch
(2), Wolfgang Bauer (2), Bernd Brasas (3), Pritish Bodke (2)
(1) Ansys Sweden AB, Gothenburg/Sweden;
(2) Ansys Germany GmbH, Otterfing/Germany;
(3) Ansys Germany GmbH, Hannover/Germany;

Lattice Boltzmann Simulation of Gas Diffusion and Oxygen Reduction Reaction inside the Cathode Catalyst Layer of a PEM Fuel Cell (B1508)

Konrad Gülicher (1), Arnulf Latz (1,2), Thomas Jahnke (1)
(1) German Aerospace Center (DLR), Institute of Engineering Thermodynamics, Stuttgart/Germany;
(2) Helmholtz Institute Ulm for Electrochemical Energy Storage (HIU), Ulm/Germany;

Takagi Sugeno Fuzzy Approach for PEM Fuel Cell System Modeling (B1509)

Ahmed Zoukit (1), Issam Salhi (2), David Sedarsky (1)
(1) Chalmers university of technology, Gothenburg/Sweden;
(2) University of Technology Belfort-Montbeliard, Belfort/France;

Challenges & Intricacies of Modelling PEM Fuel Cells. Part 2: FEA Workflow - MP4 - (B1510)

Aleksey Gerasimov (1), Davor Cokljat (2)
(1) Ansys Sweden AB, Gothenburg/Sweden;
(2) Ansys UK Ltd, Sheffield/United Kingdom;

Atomistic Simulation of Protic Ionic Liquids as Promising Electrolytes for Mid-Temperature Fuel Cells (B1511)

Federico Parisi (1,2) Christian Rodenbücher (2), Carsten Korte (2), Piotr M. Kowalski (1)
(1) Theory and Computation of energy Materials (IEK-13), Jülich/Germany;
(2) Electrochemical Process Engineering (IEK-14), Jülich/Germany;

A Framework for Research on Reliability Assessment of BOP Devices in Green Hydrogen Production Systems (B1512)

KyungHa Ryu (1), BoSik Kang (1),
Seung-Wook Baek (2), JongWon Park (1), Chung Sung Lee (1)
(1) Korea Institute of Machinery & Materials, Daejeon/Korea;
(2) Korea Research Institute of Standards and Science, Daejeon/Korea;

An Innovative Model-based Investigation of PEMFC Ageing Under Real-world Operation (A1616)

Francesco Verducci, Amedeo Grimaldi, Elena Colombo, Andrea Baricci, Andrea Casalegno
Politecnico di Milano, Department of Energy, Milan/Italy;

Elucidating PEMFC Heavy-duty Systems Lifetime by H₂/air Front Exposure Time (A1617)

A.L Rangel-Cardenas, D. Damiano, J. Lenssen
Nedstack Fuel Cell Technology, B.V, Arnhem/The Netherlands;

Behavior of unsupported Pt-Ni aerogel cathode catalyst layers upon PEMFC cold-start (A1618)

Alvaro Garcia-Padilla (1), Meriem Fikry (1), Juan Herranz (1), Pavel Khavlyuk (2), Alexander Eychmüller (2), Thomas. J Schmidt (1,3)
(1) Electrochemistry Laboratory, Paul Scherrer Institut, Villigen/Switzerland;
(2) Physical Chemistry, Technische Universität Dresden, Dresden/Germany;
(3) Laboratory of Physical Chemistry, ETH Zürich, Zürich/Switzerland;

A17: Dynamic Operation of Systems

Influence of Gas Pressure on Intermediate Temperature PEMFC Performance and Crossover (A1707)

Martina Butori, Björn Eriksson, Nikola Nikolić,
Carina Lagergren, Göran Lindbergh, Raket Wreland Lindström
KTH Royal Institute of Technology, Stockholm/Sweden;

Improved Operating Strategies for the Optimization of PEMFC System Performance (A1708)

Guillaume Soubeyran, Fabrice Micoud,
Benoit Morin, Magali Reyrier, Jean-Philippe Poirot - Crouvezier
Commissariat à l'Energie Atomique (CEA), Grenoble/France;

Development of Accelerated Durability Test Protocols for Polymer Electrolyte Membrane Fuel Cell Stacks (A1709)

Miriam Koprek (1), Robert Schlumberger (2),
Christian Wachtel (2), Florian Wilhelm (1),
Joachim Scholta (1), Markus Hölzle (1)
(1) Zentrum für Sonnenenergie- und Wasserstofforschung Baden-Württemberg (ZSW),
Ulm/Germany;
(2) AUDI AG, Ingolstadt/Germany;

Detailed 2D modeling of PEM Water Electrolysis Stack with 2-phase Flow Analysis (B1513)

Shin Haeseong (1), Kang Sanggyu (1), Gilwon Kim (2), Kyong-Hwan Kim (2)
(1) Department of Naval Architecture and Ocean Engineering, Seoul National University,
Seoul/Korea;
(2) Korea Research Institute of Ships & Ocean Eng. Korea;

Dynamic Modeling and Simulation of Alkaline Water Electrolysis (B1514)

Dohyung Jang, Haeseong Shin, Sanggyu Kang
Department of Naval Architecture and ocean Engineering, Seoul National University; Seoul/Republic
of Korea;

B16: Local Reaction Environment and Interactions

Impact of Coupled Transport Mechanisms on the Performance of a PEM Based Thermoelectric Energy Converter (B1607)

Maïke Willke, Stephan Kabelac
Insitute of Thermodynamics, Leibniz University Hannover/Germany;

B17: CO₂-Electrolysis

Geometric Catalyst Utilization in Zero-Gap CO₂ Electrolyzers (B1707)

Siddhartha Subramanian, Thomas Burdyny
Materials for Energy Conversion and Storage (MECS), Department of Chemical Engineering,
Faculty of Applied Sciences, Delft University of Technology, Delft/The Netherlands;

Synthesis and Characterization of Metal-Organic Frameworks as Efficient Electrocatalysts for CO₂ Reduction Reactions (B1708)

Khatereh Roohi (1), Mohammad Soleimani (1), Prasad Gonugunta (1,2), Arjan Mol (1), Peyman Taheri (1)
(1) Materials Science and Engineering, Faculty of Mechanical, Maritime and Material Engineering,
Delft University of Technology, Delft/the Netherlands;
(2) Process & Energy, Faculty of Mechanical, Maritime and Material Engineering, Delft University of
Technology, Delft/the Netherlands;

The Intermittent Electrochemical Reduction of Carbon Dioxide on a Copper catalyst (B1710)

Jesse Kok, Thomas Burdyny
Delft University of Technology, Materials for energy conversion and storage, Delft/The Netherlands;

Towards Optimal Dynamic Operation of an AEM Electrolyzer Stack by Means of Mathematical Modelling (A1710)

Yingying Yang, Nga Thi Quynh Do, Nicolas Schlüter, Daniel Schröder
Institute of Energy and Process Systems Engineering (InES), Technische Universität Braunschweig, Braunschweig/Germany;

Design of Ultra-light 5-kW Air-cooled PEMFC Stack (A1711)

Ming Han, Lei Wang, Mei Lin Chng, Gucheng Wang, Zuchang Gao, Jonathan Chua
Clean Energy Research Center, School of Engineering, Temasek Polytechnic, Singapore;

Effect of Ambient Temperature on Fuel Cell Stack Compression Force (A1712)

Achim Kampker (1), Heiner Heimes (1), Mario Kehrer (1), Florian Henkel (2), Johannes Huber (1,2)
(1) Production Engineering of E-Mobility Components, RWTH Aachen University, Aachen/Germany;
(2) cellcentric GmbH & Co. KG, Kirchheim unter Teck/Germany;

Relation of Local Cell Voltage and Current Density Distribution during Fuel Starvation in PEMFC Stacks (A1713)

Jens Nissen (1,2), Jan Schwämmlein (1), Markus Hölzle (2)
(1) cellcentric GmbH & Co. KG, Kirchheim unter Teck/Germany;
(2) Zentrum für Sonnenenergie- und Wasserstoff-Forschung (ZSW), Ulm/Germany;

Investigation of Thermal Management System for PEM Fuel Cell Stack via Deep Learning and Multi-objective Genetic Algorithms (A1714)

Zengjia Guo, Yang Wang, Siyuan Zhao, Meng Ni
Department of Building and Real Estate, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong/China;

Dynamic Modeling and Simulation of Alkaline Water Electrolysis System (A1715)

Dohyung Jang, Haeseong Shin, Sanggyu Kang
Department of Naval Architecture and ocean Engineering, Seoul National University;
Seoul/Republic of Korea;

Impact of Contact Resistance Formation and Intermittent Operation on Proton Exchange Membrane Water Electrolyzer Performance (A1716)

Carina Schramm, Matthias Kornherr, Matthias F. Ernst, Hubert A. Gasteiger
Technical Electrochemistry & Catalysis Research Centre, Technical University of Munich, Garching/Germany;

Combining Microreactor Technology with Electrochemical CO₂ Capture & Utilization (B1711)

Seyedehfatemah Hosseini, Siyu Zhong, Peter Holtappels, Roland Dittmeyer
Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen/Germany;

Separating Loss Mechanisms in Zero-gap CO₂ Electrolyzers via Reference Electrodes (B1713)

Luca Bohn (1,2), Joey Disch (1,2), Severin Vierrath (1,2)
(1) Electrochemical Energy Systems, IMTEK – Department of Microsystems Engineering, University of Freiburg, Freiburg/Germany;
(2) Freiburg Center for Interactive Materials and bioinspired Technologies (FIT), University of Freiburg, Freiburg/Germany;

Low Loaded Carbon Supported Ag Nanoparticles in Zero-gap CO₂ Electrolysis to CO Enabling High Mass Activity (B1714)

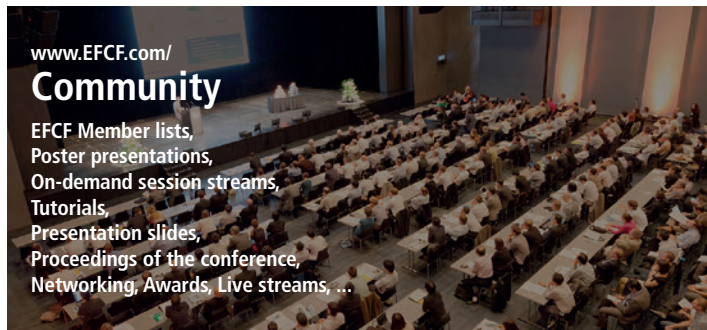
Khaled Seteiz (1,2), Josephine Häberlein (1,2), Philipp Heizmann (1,2), Joey Disch (1,2), Severin Vierrath (1,2)
(1) Electrochemical Energy Systems, IMTEK – Department of Microsystems Engineering, University of Freiburg, Freiburg/Germany;
(2) Freiburg Center for Interactive Materials and bioinspired Technologies (FIT), University of Freiburg, Freiburg/Germany;

Fantastic Nanoparticles and Where to Find Them: Three-dimensional Electron Tomography of Ag/C Electrocatalysts for CO₂ Reduction (B1715)

Philipp Heizmann (1,2), Khaled Seteiz (1,2), Josephine Häberlein (1,2), Joey Disch (1,2), Severin Vierrath (1,2,3)
(1) Electrochemical Energy Systems, IMTEK – Department of Microsystems Engineering, University of Freiburg, Freiburg/Germany;
(2) Freiburg Center for Interactive Materials and bioinspired Technologies (FIT), University of Freiburg, Freiburg/Germany;
(3) Hahn-Schickard-Gesellschaft für angewandte Forschung e.V., Freiburg/Germany;

A Study on the Dry Reforming Characteristics of Sr_{1-x}A_xTi_{1-y}RuyO_{3-d} Catalyst (B1716)

Sung Pil Yoon, Kab In Kim, Emilio Audasso
Hydrogen & Fuel Cell Research Center, Korea Institute of Science and Technology, Seoul/Republic of Korea;



MEEP 2023

Microbial/Enzymatic Electrochemistry Platform

5th International

MEEP Symposium

5 - 7 July 2023, Lucerne Switzerland



Symposium Chairs

Prof. Ioannis Ieropoulos
University of Southampton, UK

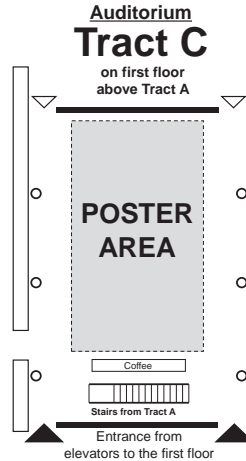
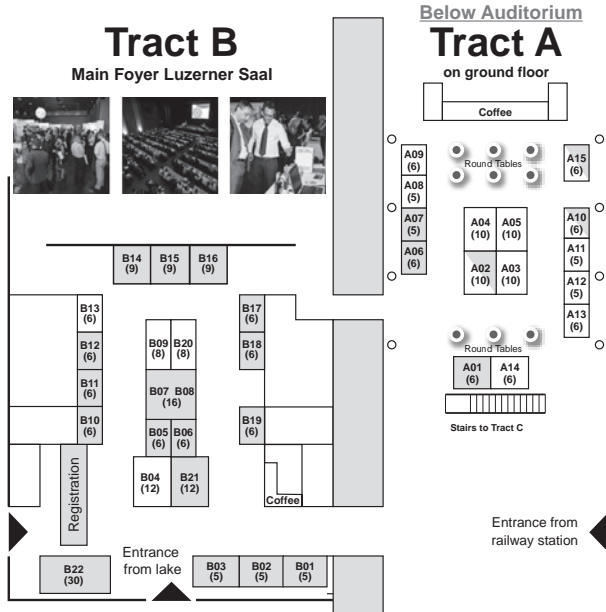
Asst. Prof. Ludovic Jourdin
Delft University of Technology, NL

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- Biofilm Optimization & Modelling
- MES Microbial Electrosynthesis
- MFC Applications
- New Materials, Biohybrids & Surfaces
- Electromethanogenesis
- Diffusion Control & Education

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Legend:
 A01-15, B01-20, C01-06 Booth identification
 (6), (9), (12), (16), etc. Booth area in square meters

Exhibition

EFCF 2023

Lucerne Switzerland 4 – 7 July

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List of Exhibitors

www.EFCF.com/ExhibList

Booth NO	Company	Exhibits	Web
B12	Adele Hydrogen Lyon / France	Alkaline Water Electrolyser Electrodes	www.adelehydrogen.com
B02	AGC Chemicals Europe Amsterdam / Netherlands	FORBLUE™ i-SERIES, S-SERIES, SELEMION and Fluon® FILM	www.agcce.com
B03	balticFuelCells GmbH Schwerin / Germany	quickCONNECTfixture qCF FC12/100 High Amp	www.balticfuelcells.de
B22	BAYERN INTERNATIONAL Munich Munich / Germany	Bavarian Pavilion	www.bayern-international.de
B17	BioLogic Science Instruments GmbH Göttingen / Germany	Potentiostat, Pull-Ups, Small Accessories	www.biologic.net
B10	Bronkhorst (Schweiz) AG Aesch / Switzerland	Mass Flow Meters and -Controllers, Pressure Sensors and -Controllers, Evaporator	www.bronkhorst.com
B21	Bürkert Contromatic AG (Schweiz) Hünenberg / Switzerland	Valves & pumps, flow controllers, pneumatics & process interfaces, sensors, transmitters, customised solutions, process automation	www.buerkert.ch
B01	DiLiCo engineering GmbH Magdeburg / Germany	Measurement technology for Fuel Cells and Electrolysers	www.dilico.de
B16	Feintool International Holding AG Lyss / Switzerland	Bipolar plates	www.feintool.com
A01	Fomenta AG Buttikon / Switzerland	Strategic and operational Technology-Management-Services	www.fomenta.ch
B07/B08	Forschungszentrum Juelich GmbH Juelich / Germany	R&D for Energy and Climate, Energy Materials, Modeling, Simulation, Electrochemical Reaction Engineering, Fuel Cells & Electrolysers	www.fz-juelich.de

A07	Gamry Instruments Warminster PA / United States	1010E, 5000E, 3000/AE, LPI1010-Power Supply	www.gamry.com
B22	Gustav Klein GmbH & Co KG Schongau / Germany	Regenerative electrical loads for fuel cell testing	www.gustav-klein.com
B22	HEIDEN Power GmbH Pürgen / Germany	Manufacturer and distributor of electronic devices of power electronics	www.heidenpower.com
B19	HORIBA FuelCon AG Barleben / Germany	Test and production solutions for Fuel Cells and Electrolyzers	www.horiba-fuelcon.com
A06	Innoreal LLC Baar / Switzerland	Creating, consulting & coaching for successful innovation processes	www.innoreal.ch
B05	Inrag AG MuttENZ / Switzerland	Mikro Gaschromatographen / H2 measurement devices	www.inrag.ch
B22	NürnbergMesse GmbH Nürnberg / Germany	Management international trade fairs	www.nuernbergmesse.de
B15	ONEJOON GmbH Bovenden / Germany	Continuous furnaces for debinding and sintering of SOFC and SOEC	www.onejoon.de
B11	S++ Simulation Services Murnau / Germany	Current density distribution, measurement devices, single cell voltage measurement devices	www.splusplus.com
B06	Scribner Associates, Inc. Southern Pines / United States	Fuel Cell, Redox Flow, Electrolyzer, MTS, SOFC Test Stations	www.scribner.com
B14	Solar Promotion GmbH Pforzheim / Germany	Green Hydrogen Forum & Expoi, The SmarterE Europe - Trade Fairs	www.solarpromotion.com
B18	Tanaka KikinZoku International (Europe) GmbH Frankfurt a.M. / Germany	Pt/C catalyst IrOx catalyst, Precious Metal recycling	www.tanaka-preciousmetals.com
B22	ZAHNER-elektrik GmbH & Co. KG Kronach / Germany	Potentiostats for Electrochemistry and Photoelectrochemistry, Electronic load	www.zahner.de



HYDROGEN EUROPE RESEARCH

**PARTICIPATION IN THE
CLEAN HYDROGEN
PARTNERSHIP**

**WE REPRESENT THE EUROPEAN SCIENTIFIC COMMUNITY INVOLVED IN THE DEVELOPMENT
OF A NEW INDUSTRIAL ECOSYSTEM BASED ON HYDROGEN**



108 Universities and Research & Technology Organisations (RTO)
in 25 countries in Europe and beyond

**CONTRIBUTION TO
THE POLICY WORKING
GROUP**

WE ARE A MEMBER OF THE CLEAN HYDROGEN PARTNERSHIP

We are one of the three members (alongside the European Commission and Hydrogen Europe) of the Clean Hydrogen Partnership, an Institutionalised European Partnership that aims to accelerate the development and deployment of a European value chain for clean hydrogen technologies.

**INVOLVEMENT IN THE
WORKING GROUP ON
SKILLS**

WE DISCUSS EUROPEAN POLICIES WITH OUR MEMBERS

Through our Policy Working Group, we promote the voice of the fuel cells and hydrogen scientific community on the European political stage. We draft papers and monitor relevant European funding opportunities for our members.

WE WORK TO CREATE A HYDROGEN SKILLS AGENDA

Together with companies, regions and national associations, we reflect on the topic of skills, trainings and education in the field of hydrogen and fuel cells. We work to provide up-to-date information on these aspects through the Fuel Cells and Hydrogen Observatory.

**ACCESS TO THE
MAPPING OF RESEARCH
AND INNOVATION
ACTIVITIES IN EUROPE**

**DO YOU WANT TO BECOME AN ACTOR OF OUR EUROPEAN NETWORK, AND WORK TO ENSURE THE
EXCELLENCE OF EUROPEAN SCIENTIFIC RESEARCH?**

CONTACT US AT SECRETARIAT@HYDROGENEUROPERESEARCH.EU TO DISCOVER HOW TO BECOME A MEMBER!

*HYDROGEN EUROPE RESEARCH - AVENUE DE LA TOISON D'OR 56-60 BOX 5, B-1060 BRUSSELS, BELGIUM
WEBSITE: [HTTPS://HYDROGENEUOPERESEARCH.EU/](https://hydrogeneuoperesearch.eu/)*

Special Networking Events

www.EFCF.com/Events

Welcome Gathering

Tuesday, 4 July: 18:00, in the exhibition, ground floor: Meet old friends, find new contacts, and exchange already with the exhibitors – a perfect start to the conference.

Swiss Surprise (optional, limited to 80 participants)

Wednesday, 5 July: 18:30, place to be announced. A special surprise is offered in an unusual place close to Lucerne: An enjoyable evening with Swissness, music, drinks, and dinner. Tickets are sold on a first-come-first-serve-basis for CHF 120 per person. During your on-line registration (www.EFCF.com/Registration) please select the option to purchase tickets in advance for you and your guests.

Dinner on the Lake

Thursday, 6 July: 19:30 Pier 6 („Brücke 6“) next to Congress Center: A very special pleasure-boat (flagship of the fleet) will take us on a tour of the lake past a magnificent landscape to the „Rutli“ glade, birthplace of Switzerland (1291). Enjoy the unique blend of music, drinks, and a candle-light dinner while gliding past beautiful scenery. Live music contributes to this unforgettable evening. Included in the EFCF registration fee. Please choose this option during your on-line registration on www.EFCF.com/Registration to purchase additional tickets for your guests (CHF 120 per person).

Entertainment for Accompanying Persons

During the European Full Cell Forum your guests and yourself have the possibility to explore the beautiful region of Lucerne together with an experienced local guide. Bucher Travel Inc. and the Lucerne Tourist Office are able to organize for you and your guests entertaining trips around local attractions. It is possible to take a tour of Lucerne visiting the medieval part of the city, followed by a tour of the picturesque surrounding area e.g. Mount Pilatus, the Glass Factory & Mount Stanserhorn, etc. The excursions are arranged locally on a daily basis de-

pending on weather conditions and requests. To get more information about the programmes and to book an activity, please visit www.EFCF.com – Registration – Spouse Programmes or contact in advance Bucher Travel Inc., booking@buchertravel.ch, +41 41 418 55 46 and/or visit www.luzern.com. The EFCF team can support you on-site at the registration desk in finding further offers and opportunities, except during the main registration time (Tuesday afternoon, Wednesday morning). Accompanying persons may participate in the „Swiss Surprise“ and „Dinner on the Lake“ for CHF 120.– per person as well as in the lunches on the terrace of the KKL. Please purchase guest tickets as long as they are available during your on-line registration. Additional lunch tickets are only sold on site until fully booked. The exhibitions can always be visited for free.

Tutorial Registration

www.EFCF.com/TutReg

The registration fee for either Tutorial (FC & H₂ or EIS) includes the lectures with documentation, business lunch, snacks, coffee, refreshments, and access to the exhibition and poster area. You can also register for a Tutorial without participating at the Scientific Conference. Please indicate your choice during the easy on-line registration at www.EFCF.com/TutReg.

In addition, both tutorials are also available virtually and can be booked and accessed at any time. The on-demand tutorials include recorded lectures, full documentation & contact details of the tutors for any questions. Live virtual attendance will only be arranged if a sufficient number of people request it: To do so, please email reg@efcf.com.

	live, on-site in Lucerne	virtual, on-demand
FC & H ₂ – Fuel Cells and Hydrogen Tutorial	CHF 580.–	CHF 400.–
EIS – Electrochemical Impedance Spectroscopy Tutorial	CHF 580.–	CHF 400.–

Conference Services

www.EFCF.com/Services

All participants enjoy full conference privileges. Accompanying persons and guests are kindly asked to buy tickets for meals and social events at the registration desk. The following conference privileges are included in the conference package:

- Participation in the EFCF conference, access to the poster and exhibition areas as well as to the MEEP symposium (www.EFCF.com/MEEP)
- Access to on-line electronic proceedings, agenda and bag inserts
- Download rights after the conference at www.EFCF.com/Lib of
 - presentations accessible with author permission
 - proceedings from this year and former years
- Participation in all networking events:
 - Tuesday: Welcome Gathering with drinks and snacks
 - Thursday: Dinner on the Lake on the motor pleasure ship Diamond
- Refreshments during intermissions, breaks and goodbye close
- Three business lunches (Wednesday to Friday)

Not included:

Tutorials (can be booked separately),
Swiss Surprise Night on Wednesday
(tickets to be ordered when registering
for the conference www.EFCF.com/Registration).



Conference On-line Registration

www.EFCF.com/Registration

Please register on-line at www.EFCF.com/Registration for all Forum events – conference, tutorial, side events – and pay by credit card. Bank transfer is also possible if arranged far enough in advance.

If you are unable to register online please e-mail reg@efcf.com and we will assist you with your registration. EFCF reserves the right to charge an extra service fee for this.



Exhibition On-line Registration

www.EFCF.com/ExReg

LAST BOOTHS left: Companies wishing to participate in the exhibition can still register on-line at www.EFCF.com/ExReg or download the Exhibition Package including the Exhibition Registration Form from www.EFCF.com/ExPack. Please complete and return the form to the address shown on the bottom of the form. Request for a LAST MINUTE offer.

Please contact exhibition@efcf.com, Leandra Spirig +41 79 622 02 27

Exhibit at next EFCF

- ▶ **Combine** Exhibition & Conference Participation enjoy up to **70% rebate** on booth fee.
 - ▶ **Book your Booth** until 31 October: get up to **9% discount** on booth fees.
 - ▶ **Safeguard your Booth** for 2024 & 2025 nonbinding with **3% return** on booth fees.
 - ▶ **Advertise your Product & Services** profit from **single & package offers**
- contact Leandra exhibition@efcf.com +41 79 622 02 27

The following admission fees* apply:

www.EFCF.com/Fee

Students, Trainees, Unemployed

Full-time students (age 26 or younger with valid identification) CHF 750.–

Academic Staff, Government, Consultants

CHF 1500.–

Industry, Trade and Commerce

Fuel cell developers, manufacturers and distributors pay an extra CHF 600.– to support the participation of students and trainees. This event provides an excellent platform for recruitment. Participants from industry and commerce benefit from the student support. CHF 2100.–

Rebates

Interesting rebates are possible for group reservation (one bill), for exhibitors (up to 55%), agreed long-term promotion activities. Applications to be sent to forum@efcf.com.

Surcharge on current fee* for Late Registration

Extra fee for late registration after 14 May 2023 CHF 100.–

Extra fee for on-site registration after 1 July 2023 CHF 200.–

One-Day Tickets

Registration includes full access to on-line conference proceedings and one Forum Agenda, as well as all conference privileges of the day, plus download of presentations accessible with author permission. Please register on-line at www.EFCF.com/Registration in advance, or at the registration desk (extra fees apply). CHF 750.–

Tutorials

FC & H₂ – Fuel Cells and Hydrogen Tutorial live, on-site in Lucerne CHF 580.–

EIS – Electrochemical Impedance Spectroscopy Tutorial CHF 580.–

Extra Ticket for Dinner on the Lake

Additional guests tickets for the „Dinner on the Lake“ evening event on Thursday are sold on a first-come-first-serve basis. Please order your guests tickets on-line at www.EFCF.com/Registration during your registration or ask on-site. CHF 120.–

Swiss Surprise Night (optional)

Tickets for the entertaining evening event „Swiss Surprise“ on Wednesday night are sold on a first-come-first-serve basis. Participation is limited to 80 persons and is not included in the conference fee. Please order your and your guests' tickets on-line at www.EFCF.com/Registration during your registration or ask on-site. CHF 120.–

* Fees are incl. 7.7% VAT where applicable and valid from 16. April 2023. Early bird fees from before are then no longer valid.

Virtual Options

EFCF 2023 will again be accessible as a physical and virtual** event (hybrid) around the world. However, being present in person in Lucerne is an unbeatable win-win networking opportunity. Therefore, it makes sense that only those who participate in person will have the chance to present orally. About 400–500 stakeholders are expected on-site.

Please contact us immediately if you can only participate virtually. Additionally, we offer the opportunity for oral and poster presentations to be uploaded as a pre-recorded mp4, visible worldwide at www.EFCF.com/MEMBERZONE. Here you can also view sessions from previous years, with your EFCF 2023 participant access.

**Remark: The virtual live transmission will only be activated if there is sufficient demand.

Students, Trainees, Unemployed CHF 375.–

Academic Staff, Government, Consultants CHF 750.–

Industry, Trade & Commerce CHF 750.–

Virtual FCH-Tutorial live CHF 400.–

Virtual EIS-Tutorial live CHF 400.–

Extra fee for late registration after 16 May 2023 CHF 50.–

Payment of the Registration Fee

www.EFCF.com/TaC

Bucher Travel Inc. handles all On-line conference registrations. The registration fee can be paid by credit card or via bank transfer if sufficiently ahead of time. Payments are confirmed in writing, institutions and companies may request invoices for registration of employees on company stationery. Please accept all bank charges related to the transfer expenses to your payment. All payments must be made in Swiss Francs (CHF). Foreign currency exchange rates for April 2023: 1 CHF \approx 1.02 EUR \approx 1.11 USD \approx 148.5 JPY \approx 0.89 GBP (www.EFCF.com/Currency). Registrations are accepted as long as space is available.

Cancellation Policy

www.EFCF.com/TaC

Cancellations of confirmed registrations have to be sent by email to booking@buchertravel.ch before 31 May of the event year. Fees already paid will be refunded, except for a charge of 300 CHF to cover administrative expenses and the cost of the proceedings. All withdrawing registrants will receive the access to the proceedings of the coming EFCF conference. No refunds are made for cancellations received after 31 May of the event year. No-Shows do not qualify for refunds.

Project Meeting Support Enquiry

www.EFCF.com/FPM

Stakeholders interested in the Organisational Support Service for their project, set-up, or other issue-meetings can get more information at www.EFCF.com/FPM or via email to forum@efcf.com.

Hotel Reservation

www.EFCF.com/Hotel

Please book your hotel independently through the usual online booking sites or directly with a specific hotel. At www.EFCF.com/Hotel you will find a list of some low cost accommodation in and around the city of Lucerne.

Lucerne (view video clip)

www.EFCF.com/Lucerne

Lucerne is located in the heart of Switzerland on the Lake of Lucerne admired for its beauty and tranquillity. Nostalgic paddle wheel steamers connect the romantic town to charming sites. From there you may ascend picturesque „Mount Rigi“ and steep „Mount Pilatus“, or reach the high regions in the Alps of Switzerland. Cogwheel mountain trains, cable cars or aerial tramways take you past alpine scenery to breath-taking panoramic views of the Top of Switzerland. Most of the places can be reached between 1 – 3 hours travel.

Lucerne itself is built along the „Lake of Lucerne“ and the „Reuss River“, outflow of the lake. The medieval part is closest to the waterfront. Bridges connect both banks. The famous wooden „Kapellbrücke“ has been perfectly rebuilt by local artisan after total destruction by a catastrophic fire in 1993. Lucerne is located in the heart of Western Europe and is an ideal start location for further travels around the continent before or after the conference.



How to get to Lucerne

www.EFCF.com/Lucerne

By car, train or bus:

The Gotthard trans-alpine **autobahn and railway pass through Lucerne**, and provide easy access by car, train or bus from north or south. Lucerne is ca. 1 hour from Zurich.

EFCF also offers info and support, if you would like to get picked up by a taxi or bus, preferable when you travel in groups, and/or intend to add a business or private trip possibly with accompanying persons, please send your requests to forum@efcf.com.

By airplane:

Zurich is the gateway for the European Fuel Cell Forum. Choose **Zurich as your destination**. From Zurich airport you can take a direct **train to Lucerne**. The train station is below the airport terminal complex, and direct trains leave at 15 and 38 minutes past the hour. There are three more trains per hour that require easy changing in Zurich. The pleasant train journey takes a little over 1 hour. Most hotels are within walking distance from the Lucerne train station and the conference location at the KKL.

We hope you have a pleasant journey and we look forward to welcoming you in Lucerne!



European Fuel Cell Forum AG
Olivier Bucheli & Michael Spirig
Obgardihalde 2
CH-6043 Luzern-Adligenswil / Switzerland
Tel. +41 44-586-5644
forum@EFCF.com, www.EFCF.com



EFCF 2024

2 – 5 July

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EFCF 2025

1 – 4 July

Int. Project Meetings

in the EFCF week are popular
EFCF helps to organise www.EFCF.com/FPM



EFCF 2023 international ELECTROLYSER, FUEL CELL & HYDROGEN event

Keynote & Invited Talks on EU, USA & China Country Overviews and on Market, Deployment, Investment, Industrialization and Diagnostics, H₂ Adsorption/Absorption, Transport in MEAs, High-throughput Experimentation, Design through X-Ray Techniques, Catalysts for O₂ Evolution, Advanced Electrocatalysts, Dynamic Operation of Electrolyzers, Electrosynthesis of Oxygenates & Hydrocarbons

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Tel. +41 44-586-5644 forum@EFCF.com

www.EFCF.com

Switzerland 

Final
ANNOUNCEMENT
Program, Keynotes, Registration


MEEP 2023
Microbial/Enzymatic Electrochemistry Platform

Microbial, Enzymatic & Bio-Photovoltaic Electrochemical Reactors

Fuel Cells & Electrolyser Systems

5th International

MEEP Symposium

5-7 July 2023, Lucerne Switzerland 

Symposium Chairs **Prof. Ioannis Ieropoulos**
University of Southampton, UK
Asst. Prof. Ludovic Jourdin
Delft University of Technology, NL

Keynotes

K1: From Microbes to Power – Gemma Reguera

K2: Biophotovoltaics – Chris Howe

Featuring

- Biofilm Optimization & Modelling
- MES Microbial Electrosynthesis
- MFC Applications
- New Materials, Biohybrids & Surfaces
- Electromethanogenesis
- Diffusion Control & Education

Organised in conjunction with:
PHOENIX – Cost Action – www.COST-Phoenix.eu
EFCF – European Electrolyser & Fuel Cell Forum

www.I-MEEP.com



Final ANNOUNCEMENT

Program, Keynotes, Registration

5th Symposium

MEEP 2023

Lucerne, Switzerland 5 - 7 July

Microbial, Enzymatic & Bio-Photovoltaic Electrochemical Reactors

Bio-Electrochemical Systems
Fuel Cells, Electrolysers

Chaired by

Prof. Ioannis Ieropoulos University of Southampton, UK

Asst. Prof. Ludovic Jourdin Delft University of Technology, The Netherlands

Keynotes:

K1 **From Microbes to Power**

Gemma Reguera, Michigan State University, East Lansing, Michigan/USA

K2 **Biophotovoltaics: Extracellular electricity production
from photosynthetic microorganisms**

Chris Howe, Department of Biochemistry, Cambridge University, UK

Invited Speakers:

- I1: **Eileen Yu** Develop electrochemical enzymatic biosensors for Superoxide ($O_2^{\cdot-}$) in blood
- I2: **Makarand Ghangrekar** Bio-electrochemical wastewater treatment technologies to facilitate reuse of treated water and resource recovery
- I3: **Paniz Izadi** CO_2 and electrons as only substrates for electrobiorefineries
- I4: **Catarina Paquete** Exploring the extracellular electron uptake pathway of Sideroxydans lithotrophicus ES-1
- I5: **Andrea Pietrelli** Protection, resilience and rehabilitation of damaged environments - EU COST ACTION CA19123



Scope of the Symposium

www.i-MEEP.com/Scope

The **5th International MEEP 2023 Symposium** features all Microbial & Enzymatic Electrochemical Reactors, focusing on Microbial and Enzymatic Electrosynthesis, Microbial Fuel Cells, Microbial Electrolysis Cells, Bioelectrochemical sensors and Applications. It is organised in conjunction with **PHOENIX**, a **COST- EU Cooperation** in Science and Technology - action www.COST-Phoenix.eu. It covers science and engineering, materials and manufacturing, components and systems, design, testing, integration, and applications, and aims to further establish this biannual Microbial/Enzymatic Electrochemistry Platform (MEEP).

It offers students, researchers, suppliers and industry, the opportunity to come together and share information and insights into these continually evolving and important technologies. In 9 sessions 37 oral presentations - including 2 high level keynotes, 5 invited speakers and 2 extended poster sessions, **more than 50 presentations over a 2 day period** will be given.

This event will be held alongside the already well established and highly respected European Fuel Cell Forum (www.EFCF.com, since 1994, 400-500 attendees). This offers further opportunities to exchange with researchers and industry members in the fields of low temperature Fuel Cell, Electrolysers & H_2 research from around the world as well as to visit the accompanying exhibition with 20-30 exhibitors.

MEEP 2023 will also offer **virtual access** for those who are unable to attend in person. **70-100 MEEP stakeholders** are expected in Lucerne and will benefit from face-to-face networking, while virtual attendees will be able to follow the scientific presentations live or watch them later at a convenient time.

5th MEEP Symposium 2023

Fuel Cells & Electrolyser Systems

Microbial, Enzymatic & Bio-Photovoltaic Electrochemical Reactors

Chaired by: Prof. Ioannis Ieropoulos, University of Southampton, UK
Asst. Prof. Ludovic Jourdin, Delft University of Technology, The Netherlands

5 – 7 July, KKL,
Lucerne, Switzerland

www.i-MEEP.com/Registration



Session Program

Club Rooms

Wednesday, July 5

10:00	On-site MEEP Registration Warm-up: Possibility to view & discuss mounted posters	Poster Presenters are asked to arrive early to put up their posters so that they can be presenting to those stakeholders already at the venue	
11:30	M01 Welcome Keynote on Microbes to Power Biofilm optimization and modelling		
M0101	Welcome by the Organizers	Michael Spirig, Fiona Moore, Olivier Bucheli	EFCF, Lucerne/Switzerland
M0102	Welcome by the Symposium Chairs	Ioannis Ieropoulos (1), Ludovic Jourdin (2)	(1) University of Southampton, Southampton/UK (2) Delft University of Technology, Delft/The Netherlands
Keynote M0103	K1: From Microbes to Power	Gemma Reguera	Michigan State University, East Lansing, Michigan/USA
M0104	Analysis and optimization of biofilm formation by the knallgas bacterium <i>C. necator</i> in microbial electrosynthesis cells	Miriam Edel, Johannes Gescher	Hamburg University of Technology, Technical Microbiology, Hamburg/Germany
M0105	Pore Network modelling of flow through in-silico biofilms	Emad Aamer (1), Lars Beyer (1), Felix Faber (1), Katja Bettenbrock (2), Robert Dürr (3), Achim Kienle (1,2), Nicole Vorhauer-Huget (1)	(1) Otto-von-Guericke University (2) Max-Planck-Institute for Dynamics of Complex Technical Systems (3) Magdeburg-Stendal University of Applied Sciences, Magdeburg/Germany;
M0106	Artificial conductive biofilms in <i>Shewanella oneidensis</i>	Lukas Kneuer, Leah Kobza, Edina Klein, Johannes Gescher	Institute of Technical Microbiology, Hamburg University of Technology, Hamburg/Germany
13:10	Coffee break & poster discussion		
M02	Poster Session		
14:20	M03 Microbial electrosynthesis I		
Invited M0301	I1: Develop electrochemical enzymatic biosensors for Superoxide (O₂⁻) in blood	Eileen Yu	Loughborough University, Loughborough, Leicestershire/UK
M0302	Small, Smaller, Smallest Using a scaled-down bio-electrochemical reactor to profile hydrogen and pH throughout biofilms producing carboxylates from CO ₂	Marijn Winkelhorst, Nick Bowring, Arlette Nieuwsteeg, Marcel Langeveld, Adrie Straathof, Ludovic Jourdin	Delft University of Technology, Faculty of Applied Science, Department of Biotechnology, Delft/The Netherlands
M0303	Hydrogenophaga pseudoflava DSM 1084, a promising sustainable producer of long-chain fatty acids, is able to grow electroautotrophically	Beshr Al Khateeb, Johannes Gescher	Institute of Technical Microbiology, Hamburg Technical University, Hamburg/Germany
M0304	CO ₂ capture by <i>Ralstonia eutropha</i> in Bioelectrochemical Systems (BESs) under different operational conditions	Rosa Anna Nastro (1), Vincenzo Pasquale (1), Claudio Avignone Rossa (2)	(1) Department of Science and Technology, University of Naples "Parthenope", Naples/Italy; (2) Department of Microbial Sciences, University of Surrey, Guildford/UK
M0305	The role of selenocysteine in CO ₂ reduction by an electrocatalytic formate dehydrogenase	Feilong Li (1,2), Silvan Scheller (1), Michael Lienemann (2)	(1) Department of Bioproducts and Biosystems, Aalto University, Espoo/Finland; (2) VTT Technical Research Centre of Finland, Espoo/Finland
M0306	Bioinorganic electrosynthesis system for microbial protein production from biogas and sustainable electricity	Mingyi Xu, Yifeng Zhang	Department of Environmental Engineering, Technical University of Denmark, Kongens Lyngby/Denmark
P M0307	Electrocatalytic CO ₂ biotransformation into acetic acid with <i>Sporomusa ovata</i>	Jérémie Noël (1), Sunny Maye (1), Loredana Di Maggio (1), Fabian Fischer (1,2)	(1) HES-SO Valais-Wallis, Institut Technologie du Vivant, (2) HES-SO Valais Wallis, Institute of Sustainable Energy, Sion/Switzerland
P M0308	A growth-based screening strategy for directed evolution of an electroactive formate dehydrogenase	Feilong Li, Michael Lienemann	VTT Technical Research Centre of Finland, Espoo/Finland
16:05	Short break		
16:30	M04 MFC applications I		
Invited M0401	I2: Bio-electrochemical wastewater treatment technologies to facilitate reuse of treated water and resource recovery	Makarand Ghangrekar	Indian Institute of Technology Kharagpur, Kharagpur/India
M0402	Electrowetland pilot of 50 m ² : operation and characterization under real conditions for 1 year	Pau Bosch-Jimenez, Clara Corbella, Ainhoa Gaudes, Pau Lopez, Daniele Molognoni, Eduard Borràs	LEITAT Technological Center, Terrassa/Spain
M0403	Plant-Microbial Fuel Cells as a natural power source for remote wireless sensor applications	Daniel Groen (1), Hadi Rajaei (1), Pim de Jager (1,2)	(1) R&D department, Plant-e Ltd, Renkum/The Netherlands, (2) Faculty of Environmental Technology, Wageningen Uni & Research, Wageningen/The Netherlands;

M0404	Tailored Preparation of Ternary Biochar-Copper-Hydroxyapatite Multicomposites for Electromethanogenesis Cathode Materials	Sebastiano Campisi (1), Giorgia Ghiara (2), Michele Bigica (1), Antonella Gervasini (1), Pierangela Cristiani (3)	(1) Università degli Studi di Milano, Dipartimento di Chimica, Milan/Italy; (2) Università degli Studi di Milano, Dipartimento di Scienze e Politiche Ambientali, Milan/Italy; (3) Ricerca sul Sistema Energetico - RSE S.p.A., Milan/Italy
M0405	Assessing efficiency and biofilm kinetics in bioelectrochemical systems fed with industrial wastewater	Ahmed Elreedy, Johannes Gescher	Institute of Technical Microbiology, Hamburg University of Technology, Hamburg/Germany
P M0407	Zinc recovery from bioleachate using a microbial electrolysis cell	Sabine Spiess (1), Jiri Kucera (2), Sarah Haneschläger (1), Clemens Habermaier (1), Rebeka Frühholz (1), Marianne Haberbauer (1)	(1) K1-MET GmbH, Linz/Austria; (2) Department of Biochemistry, Faculty of Science, Masaryk University, Brno/Czechia
P M0408	Scrap stainless steel anode and earthenware separator based single chamber microbial fuel cell for the treatment of real textile wastewater	Rahul Kandpal (1), Syed Wazed Ali (2), Shaikh Ziauddin Ahammad (3)	(1) School of Interdisciplinary Research, Indian Inst. of Technology, (2) Dept. of Textile & Fibre Engineering, Indian Inst. of Technology, (3) Department of Biochemical Engineering and Biotechnology, Indian Institute of Technology, New Delhi/India
P M0409	Scale-up of microbial fuel cells using large area gas diffusion electrodes	Laura Landwehr (1), Dennis Haupt (2), Ulrich Kunz (1), Michael Sievers (2)	(1) Clausthal University of Technology, Institute of Chemical and Electrochemical Process Engineering; (2) Clausthal University of Technology, Environmental Technology Research Centre, Clausthal-Zellerfeld/Germany
P M0410	Application of Weak MFCs in Power Management	Carlos Augusto Berlitz (1, 2), Andrea Pietrelli (2), Gaël Pillonnet (1), Bruno Allard (2)	(1) CEA-Leti, Univ. Grenoble Alpes, Grenoble/France; (2) Université de Lyon, INSA Lyon, ECL, Villeurbanne/France
P M0411	Life cycle assessment and circular economy: As a case study the development of PV-photovoltaic systems in urban areas of Greece.	Agisilaos Economou	National Technical University of Athens, Athens/Greece
P M0412	Lifetime and capabilities monitoring of bio-electrochemical systems through tiny machine learning	Andrea Pietrelli (1), Fabien Mieyeville (1), Bruno Allard (1) Vincenzo Ferrara (2)	(1) Univ Lyon, Université Claude Bernard Lyon 1, Villeurbanne/France; (2) Sapienza University, Department of Information engineering, electronics and telecommunication, Rome/Italy

18:00 End of Sessions

19:30 **MEEP Network Evening** (tickets for 120.- pP available)

Thursday, July 6

09:00 M05 Keynote on Biophotovoltaics New materials, Biohybrids & Surfaces

Keynote M0501	K2: Biophotovoltaics Extracellular electricity production from photosynthetic microorganisms	Chris Howe	Department of Biochemistry, Cambridge University, Cambridge/UK
M0502	Exploring the Microenvironment of Electroactive Microbes Embedded in Polymer Matrices	Ramya Veerubhotla (1,2), Ugo Marzocchi (1,2)	(1) Section for Microbiology, Department of Biology (2) Center for Electromicrobiology, Department of Biology, Aarhus University, Aarhus/Denmark
M0503	Understanding the influence of the cathode on the performance of MFC biosensors	Anna Salvian, Claudio Avignone-Rossa, John Varcoe, Siddharth Gadkar	University of Surrey, Guildford/UK
M0504	When microbial electrochemistry meets additive manufacturing technique: Designing free-standing 3D pyrolytic carbon electrode for effective H₂O₂ production	Rusen Zou, Yifeng Zhang	Department of Environmental Engineering, Technical University of Denmark, Lyngby/Denmark
M0505	Biophotovoltaics possible areas of application	Paolo Bombelli, Christopher Howe	Department of Biochemistry, University of Cambridge, Cambridge/UK
P M0507	Evaluation of validated Microbial Fuel Cell reactors for Biophotovoltaic operation	Abdul Quadir MG, Michele Morgante, Loredana Di Maggio (1), Melania Reggente, Charlotte Roullier (2), Rossella Labarile (3), Ardemis Boghossian (2), Massimo Trotta (3), Fabian Fischer (1)	(1) School of Engineering, Institute of Life Technologies, HES-SO Valais, Sion/Switzerland; (2) Institute of Chemical Sciences and Engineering, EPFL, Lausanne/Switzerland; (3) CNR - Institute for Physical-Chemical Processes-CNR Bari/Italy
P M0508	Sustainable sea mining: extracting mineral resources from sea water desalination brine. An application of Microbial Desalination Cells (MDCs)	Enrica Leccisi (1), Salvatore Mellino (1), Fabio Flagiello (2), Rosa Anna Nastro (1), Sergio Ulgiati (1)	(1) Department of Science and Technology, University Parthenope of Naples, Naples/Italy; (2) En.TECH Italia srl, Gragnano/Italy
P M0509	Environmental Education on Perspective of Sustainable Development in Albania	Etleva Hamzaraj, Anila Papparisto, Sara Bomi	Department of Biology, Faculty of Natural Sciences, University of Tirana, Tirana/Albania
P M0510	Aspen Plus Simulation of Hydrogen Production Process via Biomass Gasification Using Korean Rice Husks	Jihyeon Son, Sanghun Lee	Department of Climate and Energy Systems Engineering, Ewha Womans University, Seoul/South Korea
P M0511	Performance Improvement of Glucose Oxidase Biofuel Cell by Methyl Red and Chitosan Composite Electrodes	Facheng Su (1), Yujiyun Wu (1), Hsiharn Yang (1,2)	(1) Graduate Institute of Precision Engineering, (2) Innovation and Development Center of Sustainable Agriculture (IDCSA), National Chung Hsing University Taichung City/Taiwan
P M0512	Intermolecular interactions of soil and polymer backbone dictates the proton transfer through membrane separator in microbial fuel cell	Parini Surti (1), Suresh Kumar Kailasa (1), Arvind Kumar Mungray (2)	(1) Department of Chemistry, (2) Department of Chemical Engineering, Sardar Vallabhbhai National Institute of Technology, Surat, Gujarat/India

10:40 Coffee break & poster discussion

11:10 M06 MES - microbial electrosynthesis II

S-Chair:

Invited M0601	I3: CO₂ and electrons as only substrates for electrobiorefineries	Paniz Izadi	Department of Environmental Microbiology, Helmholtz Centre for Environmental Research, Leipzig/Germany
M0602	Microbial Activity in Microbial Electrosynthesis from CO₂ in Par with Syngas and Chain Elongation Fermentations	Oriol Cabau-Peinado, Marijn Winkelhorst, Adrie J.J. Straathof, Ludovic Jourdin	Delft University of Technology, Faculty of Applied Sciences, Department of Biotechnology, Delft/Netherlands
M0603	Bench-top validation of the electro-acetogenesis process for biogas upgradation through CO₂ utilization	Moumita Roy, Mansi, Sunil A. Patil	Department of Earth and Environmental Sciences, Indian Institute of Science Education and Research, Mohali (IISER Mohali), Punjab/India

M0604	Transcriptome and proteome analysis of Clostridium ljungdahlii reveals key stress response pathways in microbial electrosynthesis	Sara Al Sbei (1,2), Maliheh Abdollahi Mirbadi (3), Falk Harnisch (3), Miriam A. Rosenbaum (1,2)	(1) Leibniz Inst. for Natural Product Research & Infection Biology, Hans-Knöll-Institute, Jena; (2) Faculty of Biological Science, Friedrich-Schiller-Uni Jena, Thuringa; (3) Dept. of Env. Microbiology, Helmholtz-Centre, Leipzig/Germany
M0605	Electron4Protein Electricity-driven single-cell protein production	Narcís Pous (1), Lluís Bañeras (2), Maria Dolors Balaguer (1), Sebastià Puig (1)	(1) LEQUIA, Institute of the Environment, University of Girona, Girona/Spain; (2) gEMM, Institute of Aquatic Ecology, University of Girona, Girona/Spain

12:40 Lunch

Thursday, July 6

13:25 M07 Poster Session

13:45 M08 Electromethanogenesis & MFC applications II

M0801	Overcoming the competition of methanogenesis for acetate production through a continuous bioelectrochemical system with a mixed culture enriched with Acetobacterium Woodii	Jacopo Ferretti, Lorenzo Cristiani, Marianna Villano, Marco Zeppilli	Department of Chemistry, University of Rome Sapienza, Rome/Italy
M0802	Pre-enrichment of electrodes with acetoclastic electroactive bacteria and hydrogenotrophic methanogens and external voltage application promotes the performance of anaerobic digestion	Hari Ananda Rao (1), Krishna P. Katuri (1), Pascal E. Saikaly (1,2)	(1) Water Desalination and Reuse Center (WDRC), (2) Environmental Science and Engineering Program, King Abdullah University of Science and Technology, Thuwal/Saudi Arabia
M0803	Insights into the impact of polyethylene microplastics on methane recovery from wastewater via bioelectrochemical anaerobic digestion	Song Wang (1), Yanyan Su (2), Yifeng Zhang (1)	(1) Department of Environmental and Resource Engineering, Technical University of Denmark, Lyngby/Denmark; (2) Carlsberg Research Laboratory, Valby/Denmark
M0804	Integrated Hydroponics-Microbial Electrochemical Technology for efficient sewage management at households	Ravi K. Yadav, Sunil A. Patil	Department of Earth and Environmental Sciences, Indian Institute of Science Education and Research Mohali (IISER Mohali), Punjab/India
M0805	Pseudomonas citronellolis Electroactivity in a Dual Chamber Microbial Fuel Cell	Constantina K. Varnava (1), Panagiotis Persianis (1), Ioannis Ieropoulos (2), Argyro Tsipa (1,3)	(1) Dept. of Civil & Env. Engineering, Uni. of Cyprus, Nicosia/Cyprus; (2) Water and Environmental Engineering Group, University of Southampton, Southampton/UK; (3) Nireas Int. Water Research Centre, Uni. of Cyprus, Nicosia/Cyprus
M0806	Evaluation of ceramic microbial fuel cells as wastewater treatment and energy recovery process	Francisco J Rodríguez Valadez	Electrochemical Research Center, Querétaro/México
M0807	Waste-derived MIL-53(Fe)Fe3O4@CNT supported on carbon felt enabling effective cathodic degradation of acridine orange via bio-electro-Fenton process	Monali Priyadarshini (1), Azhan Ahmad (2), Shradha Yadava (1), Makarand M. Ghangrekar (1,2)	(1) School of Environmental Science and Engineering, (2) Department of Civil Engineering, Indian Institute of Technology Kharagpur, Kharagpur/India

15:30 Coffee break & poster discussion

16:00 M09 Diffusion control, education & MFC applications III Closing

Invited M0901	14: Exploring the extracellular electron uptake pathway of Sideroxydans lithotrophicus ES-1	Catarina Paquete	Nova University, Lisbon, Portugal
M0902	Study of a microfluidic septum to control diffusion inside a microbial fuel cell for biosensing applications	Giacomo Spisni (1,2), Giulia Massaglia (1,2), Candido Fabrizio Pirri (1,2), Stefano Bianco (1), Marzia Quaglio (1,2)	(1) Politecnico di Torino, Department of Applied Science and Technology, Turin/Italy; (2) Istituto Italiano di Tecnologia, CSFT@PoliTo, Turin/Italy
M0903	BREW: An easy-to-replicate and fully open-source workstation for educators and students to teach, learn and research various aspects of bioelectrochemical systems	Chyntol Kanhimbe(1), James M Courtney(2), Neil V Rees(1), Robert Steinberger Wilckens(1)	(1) University of Birmingham, Birmingham/UK; (2) Swansea University, Swansea/UK
M0904	Anaerobic microbial electrochemical fluidized membrane bioreactor for domestic wastewater treatment and reuse with energy recovery	Krishna P. Katuri (1), Hari Ananda Rao (1), Yogesh Singh (1), Pascal E. Saikaly (1,2)	(1) Water Desalination and Reuse Center; (2) Environmental Science and Engineering Program, Biological and Environmental Science and Engineering Division, King Abdullah Uni of Science & Technology, Thuwal/Saudi Arabia
Invited M0905	15: PHOENIX: Protection, resilience and rehabilitation of damaged environments (EU COST ACTION CA19123)	Andrea Pietrelli	University of Lyon, Villeurbanne/France
M0906	Summary of the Chairs CLOSING	Ludovic Jourdin (1), Ioannis Ieropoulos (2) Michael Spirig, Fiona Moore, Olivier Bucheli (3)	(1) Delft University of Technology, Delft/The Netherlands (2) University of Southampton, Southampton/UK (3) European Fuel Cell Forum, Lucerne/Switzerland

18:00 End of sessions & end of official MEEP Symposium

Networking recommendation: Stay and join the unforgettable "Dinner on the Lake" to cruise towards the sunset with your colleagues in an incredible setting

19:20 **Dinner on the Lake** - Unique pleasure boat trip, with dinner, drinks and music, ... and lots of networking in an inspiring atmosphere and picturesque landscape.

Boarding at 19:20, lake side of KKL pier 5/6, Departure 19:30, Back 23:00 (sponsored extra tickets for 120.- CHF pP available, short stop in Brunnen 22.30 for direct return by train)

Offer for Wednesday morning, 5 July

08:00	EFCF on-site registration, also open to register for MEEP and to book special tickets	EFCF Sessions
09:00	EFCF 2023: First morning session block* >>>>>>	A01: Opening, Keynotes 1-3: Overview from EU, USA and China A02: PEM Electrolysis, B02: Fuel Cell Catalysts

Possibility for Friday, 7 July

08:00	EFCF on-site registration open to book special tickets for MEEP participants	EFCF Sessions
09:00	EFCF 2023: Conference, Poster area & Exhibition >>>>>> incl. Breaks, Documentation and Lunch*	A14: Keynote: Electrosynthesis of Oxygenates and Hydrocarbons A15: Life cycle analysis and economic viability A16: Performance and lifetime assessment A17: Dynamic operation A18: Closing & Keynote by the EFCF Gold Medal Winner
16:15	www.EFCF.com/FA	B14: Keynote: Advances in modeling and diagnostics by Debbie Myers B15: Structure based and dynamic modeling B16: Local Reaction Environment and Interactions B17: CO2 Electrolysis

*special tickets available at the registration desk or contact info@i-meep.com

Attendance

Venue & Access

www.i-MEEP.com/Lucerne

MEEP events are traditionally held at the Culture and Convention Centre Lucerne (KKL) in conjunction with the European Electrolyser and Fuel Cell Forum www.EFCF.com. EFCF offers also a technology & supplier exhibition as well as the popular tutorials: FC&H₂ & EIS (each 0.5 ECTS credits). The KKL conference centre (www.i-MEEP.com/KKL) is a well-known location, on the stunning waterfront of the Lake Lucerne. It is easy to arrive by plane and train, and is located just a short walk from charming hotels and the historical town centre.

Time Schedule & Events

www.i-MEEP.com/Schedule

31 May 2023

Deadline for submission of **paper** – www.i-MEEP.com/Upload

4 July 2023 10.00 – 17.00

Project meetings & Tutorials:

1. FCH: Fuel Cell, Electrolyser & Hydrogen (0.5 ECTS credits, Level: kick-starter, 15-20 participants)

2. EIS: Electrochemical Impedance Spectroscopy (0.5 ECTS credits, Level: advanced, 20-30 participants)

Early arrivals are invited to visit the **EFCF exhibition** starting at 16:00 and attend the **EFCF Welcome Reception** at 18:00.

MEEP symposium 2023

5 July 2023 10:00

On-site MEEP Registration, Warm-up: View & discuss mounted posters or join 1st EFCF sessions (ask info@i-MEEP.com)

11:30 – 18:00 Welcome, Keynotes, Invited & Contributed Presentations in Oral and Poster Sessions, opportunity to visit EFCF exhibition and poster session

19:00 Possibility to join Swiss Surprise Night (reservation in advance recommended as capacity is limited, first come, first served).

6 July 2023 09:00 – 18:00

Oral & Poster Sessions – Plenary Keynotes, Exhibition, Award and Closing Ceremony

19:30 "Dinner on the Lake": Unique pleasure boat tour with music & picturesque scenery, an unforgettable networking event, together and sponsored by EFCF (reservation in advance during online registration recommended as capacity is limited, fcf)

7 July 2023 09:00 – 16:00

Reserve day to establish partnerships, board & project meetings. Possibility to join EFCF sessions (ask info@i-MEEP.com)

Services & Fees → REGISTRATION

www.i-MEEP.com/REGISTRATION

Symposium Fees*	Physical			Virtual	
	Early - 17 April	Regular from 18 April	Late from 15 May	Regular - 14 May	Late from 15 May
• Students, trainees and unemployed persons etc. with valid identification	420	+150	+100 CHF	270	+50 CHF
• Government, universities, consultants etc., industry and commerce	720	+150	+100 CHF	470	+50 CHF
• Phoenix member: Students, trainees and unemployed persons etc. with valid identification	320	+150	+100 CHF	170	+50 CHF
• Phoenix member: Government, universities, consultants etc., industry and commerce	620	+150	+100 CHF	370	+50 CHF

Tutorials

Day tickets on request.

• 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

*All fees include the 7.7% VAT where applicable. Discounts are offered for group registrations of 3 or more. For further information please contact us at info@i-MEEP.com. Foreign currency exchange rates for April 2023: 1 CHF ≈ 1.02 EUR ≈ 1.11 USD ≈ 148.5 JPY ≈ 0.89 GBP (www.i-MEEP.com/Currency). Registrations are accepted as long as space is available..

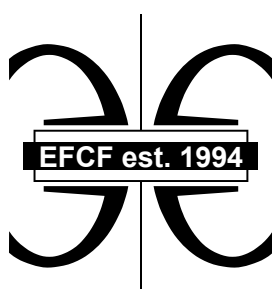
Physical fees include access to the MEEP symposium and EFCF exhibition & poster area, plus all advantages of the virtual access as well as all business lunches, all refreshments, welcome reception. But the exclusive evening networking events on Wednesday the "Swiss Surprise Night" and on Thursday the unique, very well-known and popular "Dinner on the Lake" are not included in the fee. They can easily be booked during the online registration (each CHF 120 p.p.) as long as space is available. Additionally the fees include also all the **virtual access rights**, including the MEEP membership benefits (alone worth 470 CHF, 270 CHF for students).

Virtual access includes virtual, live and on-demand access as well as access to the virtual community rooms during and to the member zone after the

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We are excited to offer a variety of partner- & sponsorship opportunities for those interested in supporting MEEP 2023. Sponsors will profit from direct contact with leading experts in these important emerging technologies. Sponsorship includes networking opportunities, a chance to showcase any products or services, and a great way to establish new partnerships within this diverse, international scientific community. Contact sponsor@i-mEEP.com to find out more.



Symposium Chairs



Prof. Ioannis Ieropoulos

University of Southampton, UK

is Professor and Chair of Environmental Engineering, in the Water & Environmental Engineering Group, Department of Civil, Maritime & Environmental Engineering at the University of Southampton, UK. He has an interest in waste utilisation and energy autonomy and produced the EcoBot family of robots, powered by microbial fuel cells (MFCs) fed on organic waste; the latest example is Row-bot. He leads a Gates Foundation funded program, developing MFCs for sanitation, looking also into biodegradable materials. He has published >90 peer reviewed journal papers, generated >£7M of research income in the last 8 years and is frequently invited at international conferences, such as ECS. He is a member of the EPSRC Peer Review College, a reviewer for the EU and numerous scientific Journals and the Editor in Chief for Sustainable Energy Technologies & Assessments (SETA).



Assistant Prof. Ludovic Jourdin

Delft University of Technology,
The Netherlands

leads the Microbial Electrochemistry and Technology group at the Delft University of Technology, where he also co-initiated the e-Refinery institute. His research predominantly focuses on investigating and developing microbial electrosynthesis processes for the production of chemicals, fuels, and materials from C-waste such as CO₂. His group uses multiscale and multidisciplinary approaches that combines experiments, theory, and computer simulations, and integrates expertise in the fields of microbiology, physics, chemistry, (bio)process engineering, and multi-scale modelling.

Ludovic is an early-career independent PI, who has published more than 20 peer reviewed journal papers, presented at over 25 international conferences, generated in excess of €3M of research funding in the last 4 years, and is a reviewer for various research agencies and international journals.

Scientific Advisory Board

www.I-MEEP.com/SAB

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FCH Tutorial

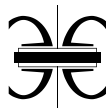
- ✓ Basic understanding of chemical, physical & technical principles
- ✓ Application requirements & practical examples of current developments
- ✓ Strong base to exchange with your partners & clients

Tutors:



Dr. Günther G. Scherer
formerly PSI, Switzerland

MER Dr. Jan Van Herle
EPFL, Switzerland (right)



www.EFCH.com/FCH

Related with **EFCH 2023**, 4 - 7 July
**Low temperature FUEL CELLS,
ELECTROLYSERS & H₂ Processing**
27th Int. Conference Series, Tutorials & Exhibition est. 1994

PROGRAM



FCH Tutorial: Live 4 July 2023

www.EFCF.com/FCH

09:30 Registration, welcome refreshments

10:00 Welcome and Introduction

10:00 **Lecture 1 Fundamentals of Electrochemical Energy Conversion**

11:00 **Lecture 2 Characteristics of the important Fuel Cell & Electrolyser Technologies**

11:45 Coffee break

12:00 **Lecture 3 Fuels for fuel cells, fuel processing**

12:45 Lunch break

14:00 **Lecture 4 Applications of Polymer Electrolyte Technologies** such as PEFC, DMFC, H₂FC, ...

14:45 **Lecture 5 System aspects, applications of Solid Oxide Technologies** such as SOFC, SOE, SOMR

15:30 Coffee break

15:45 **Lecture 6 State-of-the-art, challenges, summary**

17:00 End of FCH Tutorial, Visit the exhibition and poster area of EFCF

The Tutorial language is English.

Registration, Services & Fees

Both **on-site** & **virtual** participation are available & include:
Complete documentation of the tutorial lectures, exchange with FCH experts & users, admission to the EFCF exhibition, VAT & the **certificate of attendance** with confirmation of **0.5 ECTS credits**.
Additionally for onsite participants: Welcome refreshments, business lunch, snacks, drinks & access to the poster session.

On-line Registration : www.EFCF.com/TutReg

CHF 580 for live, on-site participation
CHF 400 for live, virtual participation (+CHF 50 late fee from 15 May)
CHF 350 for on-demand access to recorded lectures
- ca. 2-3 weeks after live performance published
- email exchange with the tutors possible
Exhibitors & groups are entitled to rebates. Ask forum@efcf.com.



Electrochemical Impedance Spectroscopy

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EIS Tutorial

- ✓ Basic principles of EIS for analysing Electrochemical Reactor Technologies
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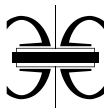
Tutors:



Dr. André Weber
KIT, Germany



Dr. Dino Klotz
Zurich Instruments AG, Zurich



www.EFCE.com/EIS

Related with **EFCE 2023**, 4 - 7 July
**Low temperature FUEL CELLS,
ELECTROLYSERS & H₂ Processing**
27th Int. Conference Series, Tutorials & Exhibition est. 1994

PROGRAM



EIS Tutorial: Live 4 July 2023

www.EFCF.com/EIS

09:30 Registration, welcome refreshments

10:00 Welcome and Introduction

10:10 **Lecture 1 Fundamentals of Electrochemical Impedance Spectroscopy**

11:00 **Lecture 2 Impedance Spectra Eval., Kramers-Kronig Test, DRT-Analysis, CNLS Fit**

11:45 Coffee break

12:00 **Lecture 3 Applications I - Analysis - Materials and (Model-) Electrodes**

12:45 Lunch break

14:00 **Lecture 4 Applications II - Analysis - Single Cells and Stacks**

14:45 **Lecture 5 Impedance Modelling and Simulation**

15:30 Coffee break

15:45 **Lecture 6 "EIS challenge" - Summary**

17:00 End of EIS Tutorial, Visit the virtual exhibition of EFCF

The EIS Tutorial language is English.

Registration, Services & Fees

Both **on-site** & **virtual** participation are available & include:
Complete documentation of the tutorial lectures, exchange with EIS experts & users, admission to the EFCF exhibition, VAT & the **certificate of attendance** with confirmation of **0.5 ECTS credits**.
Additionally for onsite participants: Welcome refreshments, business lunch, snacks, drinks & access to the poster session.

On-line registration: www.EFCF.com/TutReg

CHF 580 for live, on-site participation

CHF 400 for live, virtual participation (+CHF 50 late fee from 15 May)

CHF 350 for on-demand access to recorded lectures

- ca. 2-3 weeks after live performance published

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PRE-ANNOUNCEMENT

EFCF 2024

28th International Conference in Series

Lucerne, Switzerland, 2 – 5 July

16th European SOFC & SOE Forum

Chaired by:

Prof. Albert Tarancón

ICREA and head of the Nanoionics
and Fuel Cells group at IREC

Featuring

■ Solid Oxide Technologies

Fuel Cells (SOFC), Electrolysers (SOE) &
Membrane Reactors (SOMR), CO₂ Emission Reduction & Reuse

■ Exhibition: Suppliers, Materials, Testing, Components, SO-Technologies

■ Tutorials: FCH – Fuel Cell, Electrolyser & Hydrogen

EIS – Electrochemical Impedance Spectroscopy

■ GSM 2024: Grid Service Market Symposium

Grid Flexibility & Utilities & ESCO oriented Business



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European Electrolyser & Fuel Cell Forum
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Scope of the Forum

The 16th EUROPEAN SOFC & SOE FORUM 2024 will address issues of science, engineering, materials, systems, applications and markets for all types of Solid Oxide Fuel Cell and Electrolysis technologies, as well as for any electrochemical Reactors based on Solid Oxide Membranes. The Forum continues the strong tradition as one of the leading international meetings on Solid Oxide science, technology and implementation.

Technical Status and Achievements: The following companies have presented in the previous EFCF editions:

AVL, Boeing, Bosal, Bosch, Ceramtec, Ceres Power, Convion, EBZ, Elcogen, Fuel Cell Energy/Versa Power, Halder Topsoe, Hexis/Viessmann, Microsoft, Plansee, SOLIDpower, Sunfire, Sylfen.

Chair of the Conference



ICREA Prof. Albert Tarancón is Head of the Fuel Cells Group at the Catalonia Institute for Energy Research (IREC). Albert holds M.Sc. and PhD in Physics from the University of Barcelona (2001, 2007) and an M. Eng. in Materials Science from the Polytechnic University of Catalonia (2007). He has worked as a research associate at CSIC (ES) and as a visiting researcher at the University of Oslo (NO), Imperial College London (UK) and Caltech (USA). In 2010, Albert joined the Catalonia Institute for Energy Research (IREC) as Head of Group. Since 2018, he is ICREA Research Professor at IREC and leads a group of 25+ people dedicated to hydrogen technologies and alternative energy sources.

Albert has devoted more than 20 years to the field of Solid Oxide Cells developing innovative materials, cells and stacks close together with the major industrial players in Europe. In recent times, Albert's team is pioneering the introduction of revolutionary 3D printing technologies in the SOC community exploring unprecedented shapes and interfaces to improve performance and efficiency. In his active career, Albert has been Principal Investigator of 10 European projects, including two ERC grants, coordinating four of them on hydrogen technologies. Moreover, he has been actively involved in the definition of national and international research programmes in the field of power generation and energy storage.

Albert has authored more than 150 scientific articles in peer-reviewed journals collecting more than 5000 citations and 200+ oral presentations in international congresses (60+ invited and keynotes). Albert has been recently included in the 1% top-cited scientists in the field of "Energy". Moreover, he is currently editor of the emerging Journal of Physics Energy (IoP publishing) and the well-reputed Journal of the European Ceramic Society (Elsevier).

ICREA and head of the Nanoionics and Fuel Cells group at IREC

Exhibition

Why exhibit at EFCF?

Efficient & Effective

Contact with the right people, who understand and benefit from your added values and participate in the purchasing decision.

Valuable Contacts

Complete & Convenient

Booth fees include supplies, services and VAT. Profit from striking offers such as a fully equipped booth from 800 CHF when 2 participants are booked.

All Inclusive

100% visibility

in the core of the Fuel Cell, Electrolyser & Hydrogen community boosts

Product Selling

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