
EFCF 2021
FINAL ANNOUNCEMENT
29 June – 2 July
25th EFCF Conference in Series with Tutorials & Exhibition
Low-Temperature
Electrolysers, Fuel Cells
H2 Processing virtual Forum
29 June 2021
TUTORIALS:
FCH: Fuel Cell, Electrolyser & H2
EIS: El.chem. Impedance Spectroscopy
Chaired by
Prof. Thomas J. Schmidt
Dr. Emiliana Fabbri
PSI Paul Scherrer Institute Villigen, Switzerland
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www.EFCF.com

Schedule of virtual Events

Motto 2021: Fundamentals & Engineering Design

www.EFCF.com/...

Tuesday, 29 June 2021

All times are given in: UTC/GMT +2 hours

09:30 – 10:00	Get-Together in the virtual rooms, on-line registration for Tutorials …/TutReg	16:00 – 19:00	Warm-up - Visit the **…/EXHIBITIONv** & fix dates with exhibitors. View pre-recorded **…/POSTERv** presentations & join colleges in **…**/joinCommunity: Network, exchange & clarify also any requests with the **…/REGISTRATION** desk. On-line registration is open all day
10:00 – 17:00	…/FCHv: Fuel Cells & Hydrogen Tutorial Dr. G. G. Scherer, Dr. J. Van herle …/EISv: Electrochemical Impedance Spectroscopy Tutorial Dr. André Weber & Dr. Dino Klotz		

Wednesday, 30 June 2021

08:30 – 09:00	Access via the virtual EFCF Conference Centre on www.EFCF.com, get used to the system or get a valid …/REGISTRATION, desk open all day	09:00 – 18:00	Conference Sessions 1 – 5, Poster Session (13.15-14.30); Keynotes by FCH JU - EU Program, USA H2-Consoritium, CH Trucks & HRS, invited talks on electrocatalysts, membranes, operation, electrolysers
Ever/Breaks	Enjoy the **…/EXHIBITIONv**, have a look, contact, follow power pitches		
12:30	Press Conference in the specific break out session …/joinCommunity	18:00 – 19:00	**…/joinC**ommunity for networking, individual discussions and relaxing.

Thursday, 1 July 2021

08:30 – 09:00	Access via the virtual EFCF Conference Centre on www.EFCF.com		invited talks on components, MEA, degradation.,CO_2 reduction, catalysts
09:00 – 18:00	Conference Sessions 6 – 11, Poster Session (1315-14.30); Keynotes on Turnkey Solutions by Linde, Platinum Degradation by Uni Leiden,	Ever/Breaks	Enjoy the **…/EXHIBITIONv**, have a look, contact, follow power pitches
		18:00 – 19:00	**…**/joinCommunity network & relive memories of Dinner on the Lake

Friday, 2 July 2021

08:30 – 09:00	Access via the virtual EFCF Conference Centre on www.EFCF.com	15:00 – 16:15	Closing & Award Ceremony: Best poster, best scientific contribution & outstanding lifetime work; Keynote by the EFCF Gold Medal of Honour Winner Prof. Peter Strasser, TU Berlin/Germany
…….. – 13:30	**…**/EXHIBITIONv complete your visits and exchange contact information		
09:00 – 15:00	Conference Sessions 12 – 15; Keynotes on H2 Key Enabler by Hydrogen Europe and 2nd Generation Mirai by Toyota, invited talks on systems, OER& HER catalysts, modeling, design, operation, lifetime, materialising the H2	16:15 – 17:00	**…/joinC**ommunity to say Goodbye until the next EFCF …. in LUCERNE

The promotion of **Electrolyser, Fuel Cell & Hydrogen** technologies through conference, literature & media, is the sole purpose of the European Electrolyser & Fuel Cell Forum (EFCF). The Forum is a **high level exchange platform**, & provides technical sessions, keynotes from internationally renowned speakers, an industry exhibition & tutorials. Also the organization of international project meetings is supported & as a key added value for networking, the very popular EFCF recreational events take place in the charming & inspirational area of Lake Lucerne.

The EFCF has a **heritage of more than 25 years**! Already in 1994, the 1st Electrolyser & Fuel Cell Forum attracted leading international speakers as well as a global audience, the base for establishing a high quality conference series. The EFCF 2021, the 25th edition, focuses on Low Temperature Electrolysers, Fuel Cells, Electrolysers & H_2 Processing – Research, Development & Application. The Forum covers "Hydrogen & Direct Fuel Cells, H_2 Processing, Water Electrolysis & CO_2 Reduction. The EFCF 2022, will focus again on Solid Oxide Technologies, covering High Temperature Fuel Cells, Electrolysers & Membrane reactors.

The Electrolyser & Fuel Cell Forum invites more than 10,000 stakeholders to participate in this internationally recognised event. Held **virtually this year** due to the still sanitary situation, the organisational team strives to transmit the spirit of Lucerne to the Community through virtual channels, as already successfully done in October 2020. The well put together program with dynamic exchanges in smaller groups in between did arouse the interest of all over several days. This year some **180 contributions** and **posters** will be presented in **28 partially parallel sessions** over the course of 3 intensive & stimulating days. The conference takes place in two parallel streams/webinars, with the high level technical program & opportunities for Q&A.

An important added value of the EFCF Event series are the many strong relationships & contacts that have been established at the Forum. EFCF wants to facilitate this equally under the virtual conditions. A third virtual room is open & animated to connect exhibitors, presenters & other particpants, allowing both one to one & group conversations. Accroding to the feedbacks for EFCF 2020 we succeeded in keeping a lively "Spirit of Lucerne" amongst the participants – the **Spirit beats the Virus**! As organisers, we strive to further improve the **direct connections of participants** through animation in this room, accessible also for interested parties not taking part in the main program. The two extended poster sessions are held to recognise the excellent poster contributions, which are accessible throughout the entire event. In the closing & awards ceremony, the audience will be privileged to hear a keynote given by the winner of the 2021 **Gold Medal of Honour: Prof. Peter Strasser from TU Berlin**, Germany will summarise major findings from Electrocatalytic Fundamentals to Electrolyser Cell Designs.

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 H_2 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.

Very special thanks in this year goes to the chairs **Prof. Thomas J. Schmidt & Dr. Emiliana Fabbri** from Paul Scherrer Institute, PSI in Switzerland. Together with them we offer a sound scientific program building the bridge from science to technology – from technology to applications! Finally, we like to **thank all** authors, exhibitors & suppliers for their excellent contributions & the Scientific Advisory Committee www.EFCF.com/SAC for their evaluations. Together with the numerous participants & exhibitors, the stage has been set for an exuberant EFCF 2021 on Low Temperature Electrolysers, Fuel Cells, & H_2 Processing.

Thank you & we look forward to seeing you soon
virtually, but with the brilliant Spirit of Lucerne
Olivier Bucheli & Michael Spirig
Electrolyser & Fuel Cell Forum www.EFCF.com

Low-Temperature

Electrolysers, Fuel Cells & H_2 Processing Forum

Conference Chairs: **Prof. Thomas J. Schmidt** & **Dr. Emiliana Fabbri** PSI Paul Scherrer Institute Villigen, Switzerland

EFCF 2021

Dear Conference Participants,

It is our great pleasure to welcome you to the 25th edition of the Electrolyser & Fuel Cell Forum, which this year focuses on low temperature Electrolyzers, Fuel Cells & H_2 processing.

Despite the uncertainties related to the current pandemic situation, it is our great honor to continue this year with the EFCF series, a prestigious and internationally recognized event for the research community and industry. The EFCF 2021 will offer a broad overview of the recent progress and existing challenges related to low-temperature fuel cells and electrolyzers, including CO_2 reduction. This year's program includes contributions covering fundamental understanding of electrocatalyst materials and reaction kinetics, as well as progresses and current issues for fuel cells and electrolyzer systems. Furthermore, contributions related to advanced characterizations and diagnostic methods, as well as system modeling will be featured during the conference. A full session will be dedicated to hydrogen processing including H_2 purification, compression, storage and distribution.

Participating at EFCF 2021 with its very rich and comprehensive program will provide an unparalleled opportunity to establish new contacts and to exchange scientific, technical, industrial and business information.

We would like to thank the Scientific Advisory Committee for their invaluable contribution, evaluating and selecting oral and poster contributions, leading to a high-quality conference program which we feel confident will offer something of interest and enjoyment for everyone.

We really are looking forward to welcoming you to EFCF 2021!

Prof. Thomas J. Schmidt

In February 2011, Professor Thomas J. Schmidt (*1970) became Chair of Electrochemistry at Swiss Federal Institute of Technology, Zurich, combined with the appointment as Head of the Electrochemistry Laboratory at Paul Scherrer Institute in Villigen, Switzerland. Since 2014 Prof. Schmidt is Director of the Swiss Competence Center for Energy Research (SCCER) Heat & Electricity Storage.

Dr. Emiliana Fabbri

Emiliana Fabbri received her PhD in Materials Science from the University of Rome Tor Vergata, Italy on December 2008. A significant part of her PhD studies were carried out in the group of Prof. E. Wachsman at the University of Florida, Gainesville USA. In 2009 she was appointed as tenured scientist at the International Center for Material Nanoarchitectonics (MANA) at the National Institute for Materials Science (NIMS), Japan.

Prof. Thomas J. Schmidt received his University Diploma in Chemistry from the University of Ulm/Germany in 1996 and his PhD in Chemistry from the same University in 2000. That same year he joined the group of P.N. Ross and N.M. Markovic at Lawrence Berkeley National Laboratory as a Chemist Postdoctoral Fellow. During this period, he intensively studied the fundamentals of electrocatalysis of fuel cell reactions. He continued to work with G. G. Scherer at Paul Scherrer Institut in Villigen/Switzerland on the development of membrane electrode assemblies (MEAs) using radiation-grafted membranes and on oxygen electrocatalys with oxide containing catalysts. Since late 2002, he was working in the industrial development of high temperature membrane electrode assemblies and their components (membranes, catalysts, electrodes) using polybenzimidazole based membranes at BASF Fuel Cell GmbH (formerly Pemeas GmbH). During these eight years in industries, Dr. Schmidt led the high-temperature MEA R&D activities as Director R&D and helped to successfully commercialize the BASF Fuel Cell Celtec® MEAs.

In parallel since 2009, he has been working as lecturer for Physical Chemistry at Provadis School of International Management and Technology, University of Applied Sciences in Frankfurt/Germany.

He recently served as co-editor of the book entitled Polymer Electrolyte Fuel Cell Durability published by Springer. Since fall 2009, he has been also serving as instructor of the Short Course PEM Fuel Cells held at the fall meetings of the Electrochemical Society. Dr. Schmidt was chairman and co-organizer of several conferences, e.g., the Gordon Research Conference on Fuel Cells (2005) and the ECS Polymer Electrolyte Fuel Cells Symposia (2010 to 2013). Prof. Schmidt currently serves as Associate Editor of the Journal of the Electrochemcial Society and the ECS Electrochemistry Letters.

In autumn 2010, he received the Charles W. Tobias Young Investigator Award from the Electrochemical Society. He was awarded the Otto-Monsted Visiting Professorship at the Technical University of Denmark (Lyngby) in 2013.

Dr. Emiliana Fabbri deeply investigated conduction mechanisms in solid state ionic conductors as well as electrochemical reactions related to fuel cells. Since January 2012, Emiliana Fabbri joined the Paul Scherrer Institute in Switzerland as senior scientist working on materials for electrochemical energy storage and conversion, with emphasis on metal oxides. To gain a fundamental understanding of electrochemical reaction mechanisms and catalytic activity descriptors, she is particularly interested in the catalyst surface chemistry and electronic structure investigated by operando X-ray photoelectron spectroscopy and X-ray absorption spectroscopy, respectively.

Dr. Fabbri is the author of more than 100-refereed articles and she has received the Kepler Prize from the European Academy of Sciences and the American Ceramic Society Ross Coffin Purdy Award in 2012 and 2012, respectively. She was co-organizer of the Material Research Society (MRS) Fall meeting in 2014 and of the 223 Electrochemical Society (ECS) meeting.

Scientific Organizing Committee

www.EFCF.com/SOC

The SOC will make the scientific quality check of the extended abstracts.It has been formed from the team of the Electrochemistry Laboratory at Paul Scherrer Institute PSI in Villigen, Switzerland

Dr. Salvatore De Angelis, PSI, CH
Dr. Luca Artiglia, PSI, CH
Dr. Pierre Boillat, PSI, CH
Dr. Felix Büchi, PSI, CH
Dr. Jens Eller, PSI, CH
Dr. Lorenz Gubler, PSI, CH
Dr. Mayank Sabharwal, PSI, CH
Dr. Juan Herranz Salaner, PSI, CH

FCH Tutorial: An excellent kick-start to EFCF 2021

Dr. Günther G. Scherer

Dr. Jan Van herle

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.

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 in the virtual rooms
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 www.EFCF.com/EXHIBITIONv

The Tutorial language is English. **Register online at - www.EFCF.com/TutReg**
The registration fee for the virtual tutorial is CHF 220 for all participants. Participation in the tutorial (including successful completion of the final questionnaire) will give **0.5 ECTS credits**, confirmed on the participation certificate.

EIS Tutorial: An advanced booster to EFCF 2021

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 in the virtual rooms
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 www.EFCF.com/EXHIBITIONv

The Tutorial language is English. Register online at - www.EFCF.com/TutReg
The registration fee for the virtual tutorial is CHF 220 for regular participants and CHF 150 for EFCF 2021 participants. 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.kkl-luzern.ch/en/

The Low-Temperature Fuel Cells, Electrolysers & H_2 Processing Forum 2021 will be held from 29 June – 3 July, 2021. All presentations (live and pre-recorded) will be live streamed online from our virtual presenters from around the world, in this fully interactive virtual event. This will allow everyone to participate, and present their work from their office or home. Additionally, the entire event will be recorded and made available to all registered participants in the www.EFCF.com/Memberzone, allowing you to watch everything on-demand at any time and place convenient for you.

Technical Program

www.EFCF.com

This conference will deal exclusively with development and application of hydrogen- and direct alcohol- FUEL CELLS, as well as alkaline + PEM ELECTROLYSIS and the materialising of HYDROGEN economy. The EFCF 2021 conference covers the most important scientific and technical aspects in these fields. The inputted contributions are completed with **13 invited talks** and **8 keynotes** from leading personalities of the community. They range from pioneering science, innovative developments and methods **(CNRS Paris, CNR-ITAE Italy, FZJ, Imperial College London, TU München, PSI, Unis of Berlin, Bern, Copenhagen, Leiden, Padova, Yamanshi, Zurich)** to the opportunities and challenges of today's and future applications and infrastructure implementation **(Linde, NEL, Toyota, Hydrogen EU, NREL/U.S.A)**. Automotive and electrolyser OEMs present their hydrogen vision and industrial perspectives.

These high-level presentations will provide the framework for the topics, with science, technology, industry and markets including the following landmark representations: **Uni Leiden** presents findings about "platinum degradation", **FCH JU** overviews the "R&D in the European Program", NREL reports about the "new H_2 consortium in USA", **Hydrogen Europe**, the leading European industry association, paves the way to „H_2 as the key enabler for cyclic economy", **Linde** will share its „Green gas turnkey solutions", **H_2 Energy Holding AG** details its industry driven "Fuel cell truck project", **Toyota** introduces its „second generation Mirai" and Prof. Peter Strasser from **Uni Berlin**, completes the program with the EFCF 2021 Gold Medal of Honour Winner keynote.

The EFCF 2021 sessions are roughly classified as:

a) Science & Know-how for Membrane related Electrochemical Processes:
   Material/catalysis research, diagnostics, characterisation, transport phenomena, durability, degradation, modelling, testing;

b) Bridge to Products: (commercial) FC-EL-H_2 Component Performance and Operation;

c) Industrial Achievements & R&D Inventions:
   Approaches & Design of Systems, Applications, Combinations & Implementations.

EFCF 2021 presents a comprehensive State-of-the-Art overview and outlook. In an attractive, well balanced three-day program, about **180 contributions** will be presented i.e. over **125 oral** presentations in **28 sessions**, and around **50 posters** in 2 specific poster sessions. The EFCF starts with two tutorials, offers technical lectures, poster presentations, exhibits and product presentations and integrates valuable, virtual networking activities. Let yourself be surprised.

EFCF registration covers unrestricted admission to the virtual conference, exhibition and networking activities. 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 details are also available from the virtually present exhibitors. The EFCF 2021 will be the major virtual European FUEL CELL, ELECTROLYSIS and HYDROGEN event of the year.

Special Event

www.EFCF.com/SE

In past years the MEEP and GSM events completed the EFCF core conference program. Due to the unclear travel situation caused by the pandemic, the EFCF has decided to postpone these additional events. Instead 2-3h online events wil take place in fall of 2021 in order to rephrasein summer of 2022 with integral events at the next real-life EFCF.

MEEP - www.i-MEEP.com
Microbial, enzymatic & Bio-Photovoltaic electrochemical Reactors symposium, 4th & 5th edition
organised by EFCF in collaboration with KIT Applied Biology Institute & Bristol Bio Energy Centre.

The aim of the MEEP symposium is to further establish the biannual Microbial/Enzymatic Electrochemistry Platform (MEEP) covering science & engineering, materials & manufacturing, components & systems, design, testing & integration.

GSM - www.GridServiceMarket.com
Grid Service Market symposium, 5th & 6th edition
organised by EFCF and HSLU, in collaboration with SwissGrid and further TSOs & DSOs

The GSM Symposium focuses on Grid Flexibility & Business with New Technologies e.g.: Power to X, Water Electrolysers, Fuel Cells, Virtual Power Plants, Batteries, Demand Side Response (DSR), Load Management, Control Reserves, Direct Marketing etc. GSM bridges these interdependent topics. International experts, GOs and NGOs and industry present and discuss the market logic, business model experience, regulations, grid balancing, future trends and long term business plans.

Exhibition

www.EFCF.com/ExReg

This year EFCF offers an innovative **3D-virtual exhibition**. Like in a physical event all participants are welcome in the exhibition hall before they enter in the conference sessions. They will recognize and discover the **booths**, interest for 3D-visualised **objects** and access information including **pitches, videos**, meeting and **contact information** from each exhibitor. In the breaks after the sessions, the audience is redirected again to the exhibition and can stay there or move to the **community events** to listen to **exhibitor live talks** and pitches, or join the **poster presentations** or join **breakout session** for group discussions with exhibitors,colleagues and the peers both established and new.

Exhibitors from all parts of the world are invited to participate in this international fuel cell show of high reputation. 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. During the forum the Exhibitors will have the opportunity to present their products and services in live talks.

With the **EFCF virtual exhibition package** the exhibitors benefit from being **present around the globe** for the entire community – and this is new: Even before, during and after the event – **you will have year round until the next EFCF event**. It is also planned to transport the digital 3D-exhibition to other events, which further pushes the world presence without any additional effort from the exhibitors. Potential clients can learn about the products at any time.

For further information please contact the Electrolyser & Fuel Cell Forum or visit www.EFCF.com/Exhibition. Find more details about the exhibition in the rear of this booklet.

International Project Meetings

wwwEFCF.com/FPM

As many international experts participate in the Electrolyser & Fuel Cell Forum, the conference week offers an ideal opportunity for international project meetings.

Please feel free to use this time to schedule your meetings for your ongoing projects, setting up of new projects, or for other topic related events.

To simplify project initiators' and organizers' life, the organisation of such events for registered participants and exhibitors are supported by our organization. These meeting can be made fully virtual using the EFCF platform and private meeting rooms.

at www.EFCF.com/FPM or send an e-mail to forum@efcf.com

EFCF Online Library

www.EFCF.com/Library

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 generalpurpose 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 also the Conference Agendas with the Programs & the Book of Abstracts as well as the impressions of all EFCF events 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.

EFCF Community: Lobby (Public Zone) – Lounge (Member Zone)

www.EFCF.com/Memberzone

Since 2020 the new virtual EFCF Community is established and growing. It offers a strong platform, where a wide range of FCH information is made readily available to the public in an open access format. Additionally it allows members the opportunity to exchange deeper results, find direct contacts, view on-demand presentations as well as live streams and community activities during scheduled EFCF Events.

Therefore the EFCF Community consists of the EFCF Lobby (Public Zone) and of the EFCF Lounge (Member Zone).

International Board of Advisors

www.EFCF.com/IBoA

Of the **Electrolyser & Fuel Cell Forum**
An International Board of Advisors has been formed to guide the EUROPEAN FUEL CELL FORUM AG in technical and policy matters (21 countries; 6 continents; 16% women). The following 33 distinguished experts have accepted to serve on the International Board of Advisors:

Prof. Joongmyeon Bae, KAIST, Daejeon, Korea
Prof. Frano Barbir, University of Split, Croatia
Dr. Ulf Bossel, ALMUS AG, Switzerland
Dr. Isotta Cerri, Toyota Motor Europe, Belgium-Japan
Dr. Niels Christiansen, NCCI innovation, Denmark
Prof. Paulo Emílio V. de Miranda, Coppe - Federal University of Rio de Janeiro, Brazil
Prof. Michael Eikerling, Forschungszentrum Jülich, Germany
Dr. Karl Föger, formerly Ceramic Fuel Cells, Australia
Prof. K. Andreas Friedrich, DLR Stuttgart, Germany (IBoA Chair)
Dr. Nancy L. Garland, Department of Energy, USA
Prof. Hubert A. Gasteiger, Technische Universität München, Germany
John Bøgild Hansen, Haldor Topsøe A/S, Denmark
Prof. Angelika Heinzel, Universität Duisburg-Essen, Germany
Prof. John Irvine, University of St. Andrews, United Kingdom
Prof. Ellen Ivers-Tiffée, Karlsruhe Institute of Technology, Germany
Prof. Deborah Jones, Université Montpellier II, France
Prof. John A. Kilner, Imperial College London, United Kingdom
Dr. Jari Kiviaho, VTT Technical Research Center, Finland
Dr. Ruey-yi Lee, Institute of Nuclear Energy Research, Taiwan ROC
Dr. Florence Lefebrve-Joud, CEA, France

In the Lobby (Public Zone), in addition to the information from the Public Library (see above), on-demand poster presentations & live discussions and pitches will be available. Pre-recorded and live talks from exhibitors as well as access to public community building sessions will also be offered there.

In the Lounge (Member Zone), members have specific access to the proceedings of the conference, the EFCF participant and member lists, structured on-demand oral and poster presentations & discussions, live streams of running EFCF events as well as special live EFCF community actions. Community members also receive special offers e.g. for tutorials and other EFCF events. EFCF participants automatically receive a membership valid until the next EFCF event, and additionally membership can also be booked after an event.

Publication Offers: Proceedings (DOI), Journals www.EFCF.com/PP

The complete proceedings will be available in electronic format to all conference participants for an optimal scientific exchange. In addition, EFCF offers three possibilities for publication of the works:

1.a. Authors may benefit from the assignment of an individual DOI and publication of their contribution in the EFCF Community on the open access repository hosted by Zenodo (www.Zenodo.org).

1.b. Authors can apply for inclusion of their contribution in a Special Issue of „FUEL CELLS – From Fundamentals to Systems" (Impact Factor 2019: 1.876, www.fuelcells.wiley-vch.de). Selected papers will need to comply with the journal's guidelines, and go through a peer-review process.

2. Authors are also free to publish their work ELSEWHERE. In the case of 1.b. and 2. only the title, contact, and one-page abstract will appear in the proceedings to prevent a clash of copyrights.

Niels Luchters, HySa Cathalysis, University of Cape Town, South Africa
Prof. Norbert H. Menzler, Forschungszentrum Jülich, Germany
Prof. Mogens B. Mogensen, Technical University of Denmark, Denmark
Prof. Vladislav A. Sadykov, Boreskov Institute of Catalysis, Russia
Prof. Massimo Santarelli, Politecnico di Torino, Italy
Prof. Kazunari Sasaki, Kyushu University, Japan
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

Who should attend?

The fully virtual nature of both the conference and 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 also provides opportunities for informal exchanges between industry, market and academia, a platform for technology transfer and recruitment of qualified students and trainees, in the form of break out rooms, round table discussions, and light hearted social gatherings. The Electrolyser & Fuel Cell Forum 2021 allows decision makers to meet politicians, inventors to meet investors, engineers to meet scientists, power & transport industry to meet OEMs and users to meet providers. Participants from all continents are invited and welcome to attend this prestigious event.

EFCF 2021

ORAL & POSTER PROGRAM

29 June – 2 July

Available as On-Demand Streams

25th EFCF Conference in Series with Tutorials & Exhibition

Low-Temperature

Electrolysers, Fuel Cells H_2 Processing virtual Forum

Available as On-Demand Streams

TUTORIALS:

FCH: Fuel Cell, Electrolyser & H_2

EIS: El.chem. Impedance Spectroscopy

Chaired by

Prof. Thomas J. Schmidt

Dr. Emiliana Fabbri

PSI Paul Scherrer Institute Villigen, Switzerland

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Session Program as performed

Low-Temperature Electrolysers, Fuel Cells & H_2 Processing

EFCF 2021

On-Demand via www.EFCF.com/Community, 29 June - 2 July

We - Fr	A www.EFCF.com/**JoinA**	Page	B www.EFCF.com/**JoinB**	Page
We 9:00*	A01: P1: Opening Session K1-3 by FCH JU - EU Program, USA H_2-Consoritium, CH Truck & HRS Project	13		
11:00	A02: PEM Fuel Cell & Electrolyzer Systems	15	B02: PEM Electrocatalysts I; I1	15
13:15	www.EFCF.com/JoinP A03: Poster Session I covering All Session Topics	16		
14:30	A04: Electrolyzers Components and MEA I; I2	16	B04: Pt & Pt-free Electrocatalysts I; I3	16
16:30	A05: Operando Analysis; I4	17	B05: Membrane Electrolytes; I5	17
Th 9:00	A06: K4 - Turnkey Solutions by Linde	18	B06: K5 - Platinum Degradation by Uni Leiden	18
9:30	A07: MEA Development & Characterization	18	B07: PEM Electrocatalysts II; I6	18
11:00	A08: Electrolyzers Components and MEA II; I7	19	B08: Pt & Pt-free Electrocatalysts II	19
13:15	www.EFCF.com/JoinP A09: Poster Session II covering All Session Topics	20		
14:30	A10: CO_2 Reduction	20	B10: Stability & Degradation Mechanisms; I8	20
16:30	A11: MEA Degradation Mechanisms I; I9	21	B11: OER & HER Catalysts I; I10	21
Fr 9:00	A12: K6 - H_2 Key Enabler by Hydrogen Europe	22	B12: K7 - 2nd Generation Mirai by Toyota	22
9:30	A13: Stack Design & Operation	22	B13: MEA Degradation Mechanisms II	22
11:00	A14: MEA & Systems; I11	23	B14: OER & HER Catalysts II; I12	23
13:30	A15: Materialising the Hydrogen Economy	24	B15: Modeling of Kinetics & Transport; I13	24
15:05	A16: P2: Closing Ceremony K8 by the EFCF Gold Medal of Honour Winner 2021	25		

UTC/GMT +2 hours

Legend: Px: = Plenary, Kx = Keynote; Ix: = Invited Talk

*All times are given in

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09:00 A01: P1: Opening Session, Keynotes by FCH JU - EU Program, USA H_2-Consoritium, CH Truck & HRS Project

UTC/GMT +2 hours

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)**
Thomas Schmidt, Emiliana Fabbri; PSI Paul Scherer Institut, Villigen/Switzerland

09:15 **Welcome to Switzerland (A0103)**
Stefan Oberholzer, Rolf Schmitz; Swiss Federal Office of Energy, Bern/Switzerland

09:30 **K1: The Status of Low Temperature fuel cell and electrolyser R&D in the European Fuel Cell and Hydrogen Joint Undertaking Programme (A0104)**
Nikolaos Lymperopoulos, Lionel Boillot, Antonio Aguilo-Rullan, Dimitra Dirmiki, Mirela Atanasiu, Bart Biebuyck; Fuel Cells and Hydrogen Joint Undertaking, Brussels/Belgium

09:50 **K2: An Overview of Research Activities of a new H_2 consortium in USA (A0105)**
Brian Pivovar; NREL - National Renewable Energy Lab Boulder/U.S.A.

10:10 **K3: Fuel cell trucks – from vision to biz model (A0106)**
Patrick Huber, Rolf Huber; H_2 Energy Holding AG, Zuerich/Switzerland

10:30 Break - For Refreshment & Networking in www.EFCF.com/Lobby

Futher Keynotes

1 July 09:00

K4: Green gas turnkey solutions at industrial scale with modular PEM electrolyser technology (A0601);
Volker Göke; ITM Linde Electrolysis GmbH; Dresden/Germany

K5: Atomic-level mechanisms of platinum degradation (B0601)
Marc Koper; Leiden University, Leiden/Netherlands

2 July 09:00

K6: Hydrogen, key enabler for a cyclic economy (A1201)
Jorgo Chatzimarkakis; Hydrogen Europe, Brussels/Belgium

K7: Toyota moving forward with second generation Mirai (B1201); Isotta Cerri;Toyota Motor Europe, Brussels/Belgium, Kohei Yoshida; Toyota Motor Corp. Toyota City/Japan

2 July 15:00

K8: Electrocatalysis - the dark side of solar fuel production and use (A1604)
Peter Strasser, EFCF Gold Medal of Honour Winner 2021
Department of Chemistry, Chemical Engineering Division, Technical Uni Berlin, Berlin/Germany

Scientific Advisory Committee

The SAC has been formed to evaluate & structure the technical program.
This panel exercises full scientific independence in all technical matters.

Dr. Antonino Arico, CNR-ITAE, IT
Dr. Isotta Cerri, Toyota Motor Europe, BE
Prof. Ib Chorkendorff, DTU, DE
Prof. Michael Eikerling, FZJ, CA
Dr. Sylvie Escribano, CEA, FR
Dr. Emiliana Fabbri, PSI, CH (Chair)
Prof. Andreas Friedrich, DLR, DE
Prof. Hubert Gasteiger, TU München, DE
Prof. Frederic Jaouen, Inst. Charles Gerhardt Montpellier, FR
Prof. Deborah Jones, CNRS, FR
Prof. Ulrike Krewer, TU Braunschweig, DE
Prof. Karl J. Mayrhofer, MPI für Eisenforschung GmbH, DE
Dr. Jürgen Rechberger, AVL List GMBH, AT
Dr. Günther G. Scherer, formerly PSI, CH
Prof. Thomas J. Schmidt, PSI, CH (Chair)
Prof. Peter Strasser, TU Berlin, DE
Dr. André Weber, Karlsruhe Institute of Technology (KIT), DE
Prof. Jianbo Zhang, Tsinghua University, CN

All Invited Talks

30 June

11:00 **I1: Hierarchical Oxygen Reduction Electrocatalysts with a Low Pt loading comprising a Graphene "Core" and a Carbon Nitride "Shell" (B0201)**
Vito Di Noto (1,2), Enrico Negro (1,3), Angelocladio Nale (1), Keti Vezzù (1,2), Gioele Pagot (1,3)
(1) Dept. of Industrial Engineering, University of Padova; Padova/Italy;
(2) Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali, Florence/Italy;
(3) Centro Studi "Giorgio Levi Cases", Padova/Italy

14:30 **I2: Green hydrogen production by innovative membrane electrolysis technologies (A0401)**
Antonino Salvatore Arico
Institute of Advanced Energy Technologies (CNR-ITAE), Messina/Italy

I3: Novel spectroscopic insight on the in situ electronic and geometric properties of Fe/N/C catalysts (B0401)
Juan Herranz; PSI, Villigen/Switzerland

16.30 **I4: Direct Evidence of Cobalt Oxyhydroxide Formation on a LSCO Perovskite Water Splitting Catalyst (A0501)**
Luca Artiglia (1), Emiliana Fabbri (1), Anthony Boucly (1), Dennis Palagin (1), Zbynek Novotny (1,2), Thomas Justus Schmidt (1,3)
(1) Paul Scherrer Institute, Villigen/Switzerland
(2) Institute of Physics, University of Zurich/Switzerland
(3) Laboratory of Physical Chemistry, ETH Zürich/Switzerland

I5: Partially fluorinated anion exchange membranes for alkaline fuel cells and electrolyzers (B0501)
Kenji Miyatake; Yamanshi University, Yamanashi/ Japan

1 July

09:30 **I6: Model studies of oxygen evolution catalysts (B0701)**
Ifan E. L. Stephens;
Department of Materials, Molecular Sciences Research Hub, Imperial College, London/UK

11:00 **I7: Challenges and Opportunities for Low Temperature Water Electrolysis at industrial level (A0801)**
Katherine Ayers
NEL Hydrogen/Proton OnSite, Wallingford CT/USA

14:30 **I8: Evaluation of electrocatalyst activity, stability and selectivity – online coupling of analytical techniques to electrochemical flow cells (B1001)**
Karl JJ Mayrhofer, Serhiy Cherevko, Ioannis Katsounaros, Balazs Berkes
Helmholtz-Institute Erlangen-Nürnberg, Forchungszentrum Jülich; Erlangen/Germany

15:30 **I9: Tailored design of catalysts for the electrochemical CO_2 conversion: From model systems towards applications (A1005)**
Peter Broekmann
Uni Bern, Bern/Switzerland

15:30 **I10: Tackling the activity/stability relationship for oxygen evolution reaction catalysts by triggering novel reaction mechanisms (B1101)**
Alexis Grimaud
College de france, CNRS, Paris/France

2 July

11:15 **I11: A path towards designing the components of next generation water electrolyzers (A1401)**
Marcelo Carmo
Forschungszentrum Juelich GmbH, Jülich/Germany

11:00 **I12: Developing catalysts for (water) electrolysis: from catalyst synthesis to performance testing (B1401)**
Matthias Arenz (1), Johanna Schröder (1), Aline Bornet (1), Etienne Berner (1), Francesco Bizzotto (1), Vlad Mints (1), Gustav Wiberg (1), Jonathan Quinson (2), Mohammad Tovini (3), Hany El-Sayed (3)
(1) Uni of Bern, Bern/Switzerland
(2) Uni of Copenhagen, Copenhagen/Denmark
(3) Technical University of Munich, Munich/Germany

13:30 **I13: Electrocatalysis on High Entropy Alloys (B1501)**
Jan Rossmeisl
Department of Chemistry, University of Copenhagen, Copenhagen/Denmark

11:00 A02: PEM Fuel Cell & Electrolyzer Systems

11:00 **A System Level Analysis of Evaporative Cooling for Polymer Electrolyte Fuel Cells (A0201);**
Michael Striednig (1), Magali Cochet (1), Pierre Boillat (1,2), Thomas J. Schmidt (1,3), Felix N. Büchi (1); (1) Electrochemistry Lab, PSI; (2) Lab for Neutron Scattering & Imaging, PSI, Villigen PSI; (3) Lab of Physical Chemistry, ETH Zürich/Switzerland

11:15 **High-Pressure PEMWE Stack and System Characterization (A0202);**
Ragnhild Hancke, Piotr Bujlo, Øystein Ulleberg;
Institute for Energy Technology, Department for Hydrogen Technology; Kjeller/Norway

11:30 **Fuel cell powered cargo pedelecs for inner-city logistics (A0203)**
Torsten Knöri, Mathias Schulze, Inga Bürger, Tilo Maag
German Aerospace Center; Stuttgart/Germany

11:45 **Photovoltaic driven electrolysis in the PECSYS project (A0204);**
S. Calnan (1), R. Bagacki (1), F. Bao (1), I. Dorbandt (1), E. Kemppainen (1), C. Schary (1), R. Schlatmann (1), M. Leonardi(2), S.A. Lombardo (2), R.G. Milazzo (2), S.M.S. Privitera (2), C. Connelli (3), D. Consoli (3), C. Gerardi (3), P. Zani(3), M. Carmo (4), S. Haas (4), M. Lee (4), M. Mueller (4), W. Zwaygardt (4), J. Oscarsson (5), L. Stolt (5,6), M. Edoff (6), T. Edvinsson (6), I. B. Pehlivan (6)
(1) PVcomB, Helmholtz-Zentrum Berlin für Materialien & Energie GmbH, Berlin/Germany ;
(2) Consiglio Nazionale Delle Ricerche CNR-IMM, Catania/Italy;
(3) Enel Green Power SpA, Rome/Italy; (4) FZJ, Jülich/Germany; (5) Solibro Research AB, Uppsala/Sweden; (6) Dept of Materials Science & Engineering, The Ångström Lab, Uppsala/Sweden

12:00 **Effects of Impurities in the Cathode Airflow on PEM Fuel Cell Stacks (A0205)**
Michael Schmid, Tim Wagner, Dr. Joachim Scholta
Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW), Ulm/Germany

12:15 **Ex-situ Tests on Long Term Stability of Bipolar Plates for High Temperature PEM Fuel Cells (A0206);**
Nadine Pilinski (1), Henrike Schmies (1), Thorsten Hickmann (2), Peter Wagner (1);
(1) German Aerospace Center DLR; Oldenburg; (2) Eisenhuth GmbH & Co. KG; Osterode-am-Harz/Germany

B02: PEM Electrocatalysts I

I1: Hierarchical Oxygen Reduction Electrocatalysts with a Low Pt loading comprising a Graphene "Core" and a Carbon Nitride "Shell" (B0201)
Vito Di Noto (1,2), Enrico Negro (1,3), Angeloclaudio Nale (1), Keti Vezzù (1,2), Gioele Pagot (1,3);
(1) Dept. of Industrial Engineering, University of Padova; Padova/Italy; (2) Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali, Florence/Italy; (3) Centro Studi "Giorgio Levi Cases", Padova/Italy

Development of High Durable catalyst for PEFC (B0203)
Tomohiro Akiyama, Minoru Ishida, Masaru Kagawa, Koichi Matsutani
Tanaka Kikinzoku Kogyo K.K.; Kanagawa/Japan

Oxygen reduction reaction activity and stability of Pt-based catalysts prepared by wet impregnation of mesoporous N-doped carbon supports (B0204)
Julia Melke (1,2,3), Sven Küspert (1,2), Anna Fischer (1,2,3)
(1) Institute of Inorganic and Analytical Chemistry, University Freiburg
(2) FMF – Freiburg Materials Research Center, University Freiburg
(3) FIT - Freiburg Center for Interactive Materials and Bioinspired Technologies, University Freiburg; Freiburg/Germany

Functionalisation of Carbon Blacks by Nitrogen Plasma Treatment for PEMFC Applications (B0205);
Alice Parnière (1), Pierre-Yves Blanchard (1), Sara Cavaliere (1,2), Jacques Rozière (1), Deborah J. Jones (1); (1) Agrégats Interfaces et Matériaux pour l'Energie, ICGM Université de Montpellier, CNRS, ENSCM, Montpellier cedex 5, (2) Inst. Uni de France (IUF), Paris/France

Optimized Membrane Electrode Assemblies for PEM Fuel Cells Based on Gas Diffusion Electrodes (B0206);
Ulrich Rost (1), Pit Podleschny (1), Mats Podleschny (1), Ivan Radev (2), Volker Peinecke (2), Michael Brodmann (1); (1) Westfälische Hochschule UAS; Gelsenkirchen; (2) Zentrum für BrennstoffzellenTechnik GmbH; Duisburg/Germany

12:30 Lunch Break - Recreate & Join again the www.EFCF.com/**VirtualExhibiton** or direct for **Networking** & **Poster Session** www.EFCF.com/**joinP**

13:15 A03: Poster Session I (covering All Session Topics) www.EFCF.com/JoinP

14:30 A04: Electrolyzers Components and MEA I

14:30 **I2: Green hydrogen production by innovative membrane electrolysis technologies (A0401)**
Antonino Salvatore Arico;
Institute of Advanced Energy Technologies (CNR-ITAE), Messina/Italy

15:00 **Fluorine-free membrane electrode assemblies for water electrolysis based on sulfonated polyphenylensulfone (A0403)**
Carolin Klose (1,2), Torben Saatkamp (3), Andreas Münchinger (3), Luca Bohn (2), Giorgi Titvinidze (4), Matthias Breitwieser (1,2), Klaus-Dieter Kreuer (3), Severin Vierrath (1,2)
(1) Hahn-Schickard, Freiburg/Germany; (2) Electrochemical Energy Systems, IMTEK, University of Freiburg/Germany; (3) Max-Planck-Institut für Festkörperforschung, Stuttgart/Germany; (4) Agricultural University of Georgia, Tbilisi/Georgia

15:15 **Improving anion-exchange-membrane water electrolyzers by adjusting the ionomer content in the catalyst layers (A0404)**
Susanne Koch (1,2), Sophia Kilian (1), Philipp Heizmann (1,3), Matthias Breitwieser (1,2), Severin Vierrath (1,2,3); (1) Electrochemical Energy Systems, IMTEK - Dept of Microsystems Engineering, Uni of Freiburg; (2) Hahn-Schickard; (3) Uni of Freiburg, Institute and FIT – Freiburg Center for Interactive Materials and Bioinspired Technologies; Freiburg/Germany

15:30 **Low-Ir Loaded Catalysts – Enabler for PEM Water Electrolysis on a Large Scale (A0405)**
Christian Gebauer, Florian Eweiner, Robert Maric
Heraeus Deutschland GmbH & Co. KG.; Hanau/Germany

15:45 **Through-Thickness Potential Distribution in the Porous Transport Layer of a PEM Water Electrolyser (A0406)**
Hans Becker (1), Edmund J. F. Dickinson (1), Xuekun Lu (1,2), Graham Smith (1), Gareth Hinds (1);
(1) National Physical Laboratory; Teddington/United Kingdom; (2) Electrochemical Innovation Lab, Department of Chemical Engineering, University College London; London/United Kingdom

B04: Pt & Pt-free Electrocatalysts I

I3: Novel spectroscopic insight on the in situ electronic and geometric properties of Fe/N/C catalysts (B0401);
Juan Herranz; PSI, Villigen/Switzerland

Effect of Carbon Matrix and Fe-species on the Activity and Stability of Fe-N-C Catalysts for PEMFC (B0403)
Julia Hülstede (1,2), Dana Schonvogel (1), Henrike Schmies (1), Peter Wagner (1), Alexander Dyck (3), Michael Wark (2); (1) Institute of Engineering Thermodynamics, German Aerospace Center (DLR), Oldenburg/Germany ; (2) Institute of Chemistry, Carl von Ossietzky University of Oldenburg, Oldenburg/Germany ; (3) Institute of Networked Energy Systems, German Aerospace Center (DLR), Oldenburg/Germany

Impact of Ink Formulation and Processing on the PEFC Performance of Self-Supported Pt-Ni Aerogels (B0404)
Meriem Fikry (1), Maximilian Georgi (2), Nelli Weiss (2), Juan Herranz (1), 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

Hydrothermal carbon supports for the design of Pt/C ORR electrocatalysts with higher stability (B0405)
Julian Martin (1), Julia Melke (1,2), Anna Fischer (1,2,3)
(1) University of Freiburg, Institute of Inorganic and Analytical Chemistry
(2) University of Freiburg, Freiburg Materials Research Center; (3) University of Freiburg, Freiburg Center for Interactive Materials and Bioinspired Technologies; Freiburg/Germany

Flow Synthesis of PGM-Based Catalysts for Fuel Cells (B0410) = (B0406)
Steffen Woderich, Christoph Gimmler, Horst Weller
Fraunhofer CAN, Hamburg/Germany

16:00 Break - For **Refreshment** & **Networking** in www.EFCF.com/**Lobby**

16:30 A05: Operando Analysis

16:30 **I4: Direct Evidence of Cobalt Oxyhydroxide Formation on a LSCO Perovskite Water Splitting Catalyst (A0501)**
Luca Artiglia (1), Emiliana Fabbri (1), Anthony Boucly (1), Dennis Palagin (1), Zbynek Novotny (1,2), Thomas Justus Schmidt (1,3
(1) Paul Scherrer Institute, Villigen/Switzerland
(2) Institute of Physics, University of Zurich, Zuerich/Switzerland
(3) Laboratory of Physical Chemistry, ETH Zürich, Zürich/Switzerland

17:00 **Operando Fuel Cell Liquid Water Distribution in the Microporous Layer (A0503)**
Yen-Chun Chen (1), Christoph Csoklich (1), Anne Berger (2), Thomas J. Schmidt (1), Felix N. Büchi (1)
(1) Paul Scherrer Institut; Villigen/Switzerland
(2) Technical University of Munich, Department of Chemistry and Catalysis Research Center; Garching/Germany

17:15 **Operando Determination of the Capillary Pressure in the GDL of Polymer Electrolyte Fuel Cells (A0504)**
Adrian Mularczyk (1), Qingyang Lin (2), Daniel Niblett (3), Jens Eller (1)
(1) Paul Scherrer Institut; Villigen/Switzerland;
(2) Dep of Earth Science and Engineering, Imperial College London; London/UK;
(3) Dep of Chemical Engineering and Analytical Science, Uni of Manchester; Manchester/UK

17:30 **Noninvasive measurement of humidity distribution in Polymer Electrolyte Fuel Cells (PEFCs) (A0505)**
Arnaud Schuller (1), Thomas J. Schmidt (1,2), Jens Eller (1)
(1) Electrochemistry Laboratory, Paul Scherrer Institut; Villigen, PSI/Switzerland
(2) Laboratory of Physical Chemistry, ETH Zürich; Zürich/Switzerland

17:45 **Probing ionomer swelling and water content in catalyst layer during operation using Small Angle Neutron and X-Ray Scattering (A0506)**
Arnaud Morin, Jongmin Lee, Florian Chabot, Fabrice Micoud, Sébastien Rosini, Gérard Gebel, Sylvie Escribano, Sandrine Lyonnard
Univ. Grenoble Alpes, CEA, Grenoble/France

B05: Membrane Electrolytes

I5: Partially fluorinated anion exchange membranes for alkaline fuel cells and electrolyzers (B0501)
Kenji Miyatake
Yamanshi University, Yamanashi/ Japan

Impact of the SG phase morphology on the performances and durability of hybrid polymer membranes for fuel cell applications (B0503)
C. Tougne (1), E. Ferri (2), L. Gonon (1), V. H. Mareau (1), H. Mendil-Jakani (1), V. Dufaud (2), C. Santini (2), E. Espuche (3), M. Daoudi (4), O. Lottin (4), J.-C. Perrin (4), A. El Kaddouri (4)
(1) Univ. Grenoble Alpes, CEA, CNRS, Grenoble/France
(2) Université Claude Bernard Lyon1, Villeurbanne/France; (3) Université Claude Bernard Lyon1, Villeurbanne/France;(4) Université de Lorraine, Nancy/France

A New Process for Polybenzimidazole (PBI) Membranes for Hydrogen Devicces (B0504)
Laura A. Murdock, Brian C. Benicewicz
Department of Chemistry & Biochemistry; University of South Carolina, Columbia/USA

Next Generation Polybenzimidazole (PBI) Membranes (B0505)
Laura A. Murdock, Brian C. Benicewicz
University of South Carolina, Department of Chemistry and Biochemistry; Columbia, S.C./USA

Polybenzimidazole membrane for vanadium redox flow batteries with high capacity retention (B0506)
Elena Zanzola, Jamie Duburg, Lorenz Gubler
Electrochemistry Laboratory, Paul Scherrer Institut, Villigen PSI/Switzerland

18:00 End of Sessions - www.EFCF.com/**Lobby** or www.EFCF.com/**JoinC** for **Networking** & in Memory of the legendary **"Swiss Surprise Nights"**

09:00 A06: Keynote - Turnkey Solutions by Linde

09:00 **K4: Green gas turnkey solutions at industrial scale with modular PEM electrolyser technology (A0601)**
Volker Göke; ITM Linde Electrolysis GmbH; Dresden/Germany

09:25 5 Min to change to Session A07 or B07

09:30 A07: MEA Development & Characterization

09:30 **Electrodes based on PtAgAu alloy nanorod arrays for Polymer Electrolyte Fuel Cells (A0701)**
Shangfeng Du (1), Elok Fidiani (1), Yang Li (1), Gnanavel Thirunavukkarasu (2), Yu-Lung Chiu (2)
(1) School of Chemical Engineering, Univ ersity of Birmingham, Birmingham/UK;
(2) School of Metallurgy and Materials, University of Birmingham, Birmingham/UK

09:45 **A fluorine-free hydrocarbon-based proton exchange membrane fuel cell with state-of-the-art performance (A0702)**
Hien Nguyen (1,2), Florian Lombeck (2), Claudia Schwarz (2), Philipp Heizmann (1), Michael Adamski (3), Hsu-Feng Lee (3), Benjamin Britton (3), Severin Vierrath (1,2), Matthias Breitwieser (1,2);
(1) Electrochemical Energy Systems, IMTEK Department of Microsystems Engineering, Uni of Freiburg, (2) Hahn-Schickard; Freiburg/Germany, (3) Ionomr Innovations Inc.; Vancouver/Canada

10:00 **From Modeling Water Phenomena to PEFC Catalyst Layers with Reduced Pt Loading (A0703)**
Yufan Zhang (1,2), Thomas Kadyk (1,3), Michael Eikerling (1,2,3)
(1) Theory and Computation of Energy Materials (IEK-13), Institute of Energy and Climate Research, Forschungszentrum Jülich GmbH, (2) Chair of Theory and Computation of Energy Materials, Faculty of Georesources and Materials Engineering, RWTH Aachen University, AachenGermany; (3) Jülich Aachen Research Alliance, JARA Energy, Jülich/Germany

10:15 **Hydrogen Transport Impedance for the Study of Anodes in PEMFCs (A0704)**
M.A. Folgado, A. Molinero, J.C. Oller, J.M. Barcala, A.M. Chaparro; Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT); Avda. Madrid/Spain

B06: Keynote - Platinum Degradation by Uni Leiden

K5: Atomic-level mechanisms of platinum degradation (B0601)
Marc Koper
Leiden University, Leiden/Netherlands

B07: PEM Electrocatalysts II

I6: Model studies of oxygen evolution catalysts (B0701)
Ifan E. L. Stephens
Department of Materials, Molecular Sciences Research Hub, Imperial College, London/UK

The Effect of the Precursor Agglomerate Size on the Morphology and Performance of a Non-Noble Metal Oxygen Reduction Catalyst (B0703)
Seçil Ünsal (1), Thomas J. Schmidt (1,2), Juan Herranz (1)
(1) Electrochemistry Laboratory, Paul Scherrer Institut; Villigen/Switzerland
(2) Laboratory of Physical Chemistry, ETH Zürich; Zürich/Switzerland

Open Circuit Voltage Mystery Solved for Polymer Electrolyte Fuel Cells (B0707) = (B0704)
Ulf Bossel
Almus AG, Oberrohrdorf/Switzerland

10:30 Break - For **Refreshment** & **Networking** in www.EFCF.com/**Lobby**

11:00 A08: Electrolyzers Components and MEA II

11:00 **I7: Challenges and Opportunities for Low Temperature Water Electrolysis at industrial level (A0801)**
Katherine Ayers
NEL Hydrogen/Proton OnSite, Wallingford CT/USA

11:15

11:30 **Comparison of Oxygen Evolution on Iridium Oxide Electrodes in Laboratory Set-ups and in Nafion Based Technical Cells (A0803)**
Mogens B. Mogensen (1), Katrine A. Elsøe (1*), Torben Jacobsen (2)
(1) Department of Energy Conversion and Storage, Technical University of Denmark; Lyngby/Denmark
(2) Department of Chemistry, Technical University of Denmark; Lyngby/Denmark

11:45 **Highly efficient low-loaded Ir-anodes proton exchange membrane water electrolysis: concepts to reduce in-plane resistance (A0804);** Edgar Cruz Ortiz (1), Florian Lombeck (2),
11:51 Matthias Kroschel (3), Jessica Hübner (3), Luca Bohn (1), Miriam von Holst (2), Matthias Breitwieser (1,2), Peter Strasser (3), Severin Vierrath (1,2); (1) Electrochemical Energy Systems, IMTEK, University of Freiburg, (2) Hahn-Schickard, Freiburg, (3) The Electrochemical Energy, Catalysis and Materials Science Laboratory, Technische Universität Berlin; Berlin/Germany

12:00 **NEWELY Project: Next Generation Alkaline Membrane Water Electrolysers with Improved Components and Materials (A0805)**
12:04 Aldo .S Gago (1), Regine Reissner (1), Fatemeh Razmjooei (1). S. Asif Ansar (2), Lukas Mues (2), Corinna Harms (2), K. Andreas Friedrich (1); (1) German Aerospace Center (DLR), Institute of Engineering Thermodynamics; Stuttgart & (2) Oldenburg/Germany

12:15 **Membrane-less Porous Wall Electrolyzer (A0806)**
Pooria Hadikhani (1), S. Mohammad H. Hashemi (1,2), Steven A. Schenk (1), Demetri Psaltis (1)
(1) Optics laboratory, École Polytechnique Fédérale de Lausanne (EPFL); Lausanne/Switzerland;
(2) Computational Science & Engineering Laboratory; ETH, Zurich/Switzerland

B08: Pt & Pt-free Electrocatalysts II

Towards active and stable bifunctional $NiCo_2O_4$ catalysts for O_2 evolution and reduction (B0801); Ricardo P. M. Duarte (1,2), Ifan, E. L. Stephens (1), Mary Ryan (1), Alejandro Martinez (2), Jonathan Sharman (2); (1) Department of Materials, Imperial College London, London/UK; (2) Johnson Matthey Technology Centre, Reading/UK

Fe-N-Carbon aerogel catalyst for oxygen reduction reaction (B0802); Hongxin GE (1), Frédéric Jaouen (2), Nicolas Bibent (2), Kavita Kumar (3), Frédéric Maillard (3), Sandrine Berthon-Fabry (1); (1) MINES ParisTech, PSL University PERSEE - Centre procédés, énergies renouvelables et systèmes énergétiques; Cedex; (2) ICGM - UMR 5253; Montpellier/France; (3) LEPMI, Univ. Grenoble Alpes, Univ. Savoie Mont Blanc, CNRS, Grenoble Grenoble/France

Synthesis of Pt/C from (NH4)2PtCl6 through Microwave-Assisted Synthesis: A particle size-controlled growth (B0803); Raghunandan Sharma (1), Yue Wang (2), Fan Li (2), Jessica Chamier (3), Shuang Ma Andersen (1); (1) Dep of Green Technology, Uni of Southern Denmark; Odense-M/Denmark; (2) Department of Chemistry & Chemical Engineering, College of Environmental & Energy Engineering Beijing University of Technology; Beijing/P.R.China; (3) Department of Chemical Engineering, University of Cape Town; Rondebosch/South Africa

Ordered electrodes with Pt nanorod arrays grown on Au-sputtered gas diffusion layers for PEMFCs (B0805)
Yichang Yan, Yang Li, Shangfeng Du
University of Birmingham; Birmingham/United Kingdom

Template- and Surfactant-free Synthesis of PtCu Nanowires for Direct Formic Acid Fuel Cell Applications (B0806)
Yang Li, Shangfeng Du; Centre for Hydrogen and Fuel Cell Research; School of Chemical Engineering, University of Birmingham, Birmingham/UK

12:30 Lunch Break - Recreate & Join again the www.EFCF.com/**VirtualExhibiton** or direct for **Networking & Poster Session** www.EFCF.com/**joinP**

13:15 A09: Poster Session II (covering All Session Topics) www.EFCF.com/JoinP

14:30 A10: CO_2 Reduction

14:30 **Highly efficient formic acid and carbon dioxide electro-reduction to alcohols on indium oxide electrodes (A1001);** Kayode Adesina Adegoke (1), Shankara Gayathri Radhakrishnan (1), Clarissa L. Gray (1), Barbara Sowa (1), Claudia Morais (2), Paul Rayess (2), Egmont, R. Rohwer (1), Clément Comminges (2), K. Boniface Kokoh (2), Emil Roduner (1,3); (1) Dep of Chemistry, University of Pretoria; Pretoria/South Africa; (2) Université de Poitiers, Cedex-9/France; (3) Institute of Physical Chemistry, University of Stuttgart; Stuttgart/Germany

14:45 **Unsupported PdPt Aerogels as CO_2-electroreduction Catalysts (A1002)**
Justus S. Diercks (1), Maximilian Georgi (2), Juan Herranz (1), Nataša Diklic (1), Piyush Chauhan (1), Alexander Eychmüller (2), Thomas J. Schmidt (1,3); (1) PSI, Electrochemistry Laboratory; Villigen-PSI/Switzerland; (2) Technical University Dresden, Chair of Physical Chemistry; Dresden/Germany; (3) ETH Zürich, Laboratory for Physical Chemistry; Zürich/Switzerland

15:00 **Dynamics of Direct Hydrocarbon Polymer Electrolyte Membrane Fuel Cells (A1003)**
Eugene H. Kong (1), G.K. Surya Prakash (2), Paul D. Ronney (1); (1) Aerospace and Mechanical Engineering Department, University of Southern California; Los-Angeles/USA; (2) Loker Hydrocarbon Institute, University of Southern California; Los-Angeles/USA

15:15 **Methanol Oxidation Reaction on Platinum Catalysts Deposited onto Ceria-Carbon Substrate (A1004);** Huy Qui Vinh Nguyen (1), Jaak Nerut (1), Heili Kasuk (1), Peeter Valk (1), Meelis Härmas (1), Jaan Aruväli (2), Enn Lust (1); (1) Institute of Chemistry, University of Tartu; Tartu/Estonia; (2) Institute of Ecology and Earth Sciences, University of Tartu; Tartu/Estonia

15:30 **I9: Tailored design of catalysts for the electrochemical CO_2 conversion: From model systems towards applications (A1005)**
Peter Broekmann
Uni Bern, Bern/Switzerland

15:45

B10: Stability & Degradation Mechanisms

I8: Evaluation of electrocatalyst activity, stability and selectivity – online coupling of analytical techniques to electrochemical flow cells (B1001)
Karl JJ Mayrhofer, Serhiy Cherevko, Ioannis Katsounaros, Balazs Berkes
Helmholtz-Institute Erlangen-Nürnberg, Forchungszentrum Jülich; Erlangen/Germany

Local Ageing Effects of Polymer Electrolyte Fuel Cell MEAs exposed to stressful operating conditions (B1003); Miriam Koprek (1), Robert Schlumberger (2), Florian Wilhelm (1), Matthias Messerschmidt (1), Joachim Scholta (1); (1) Zentrum für Sonnenenergie- und Wasserstoffforschung Baden-Württemberg (ZSW); Ulm; (2) AUDI AG; Ingolstadt/Germany

Catalyst degradation under different testing conditions – a review (B1004)
Eleonora Gadducci, Loredana Magistri, Aristide Fausto Massardo
Università degli Studi di Genova - DIME; Genova/Italy

Accessing electrode nanostructure with Small Angle Neutron Scattering: a tool to probe the aging effect over the ionomer (B1005); Florian Chabot, Arnaud Morin, Jongmin Lee; Univ. Grenoble Alpes, CEA, LITEN; Grenoble/France

Ionic Liquids for the recovery of Platinum and Polymer Electrolyte Membrane from PEMFC (B1006); Marion Chevallier (1), Mathias Coudray (1), Isabelle Rougeaux (1), Corentin Bourdiol (1), Véronique Dufaud (2), Hakima Mendil-Jakani (1), Paul-Henri Haumesser (1), Catherine Santini (2), Marlène Chapuis (1), Pierre Feydi (1), Emmanuel Billy (1); (1) LVME, CEA Liten, Commissariat à l'énergie atomique et aux énergies alternatives; Grenoble/France; (2) Université Claude Bernard, Villeurbanne/France

16:00 Break - For **Refreshment** & **Networking** in www.EFCF.com/**Community**

16:30 A11: MEA Degradation Mechanisms I

16:30 **Mechanistic Insight of PEFC Catalyst Layer Saturation via Small Angle X-ray Scattering (A1101)**
Kinanti Aliyah, Lorenz Gubler, Jens Eller;
Electrochemistry Laboratory, PSI; Villigen/Switzerland

16:45 **Impact of a chemical-mechanical ex-situ aging on PFSA membranes for fuel cells (A1102)**
Mylène Robert (1), Assma El Kaddouri (1), Jean-Christophe Perrin (1), Laetitia Dubau (2), Kévin Mozet (1), Meriem Daoudi (1), Jérôme Dillet (1), Jean-Yves Morel (1), Stéphane André (1), Olivier Lottin (1); (1) Université de Lorraine, CNRS, LEMTA, Nancy/France; (2) Univ. Grenoble Alpes, Univ. Savoie Mont Blanc, Grenoble/France

17:00 **Investigation on the local ageing of membrane electrode assemblies under realistic driving cycle conditions (A1103)**
Elena Colombo, Andrea Bisello, Andrea Baricci, Andrea Casalegno
Department of Energy, Politecnico di Milano; Milan/Italy

17:15 **1D LT-PEM Fuel Cell Contamination Model (A1104)**
Tim Wagner, Michael Schmid, Joachim Scholta
Center for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW); Ulm/Germany

17:30 **Dynamic Characterization of incremental PEM Single Cells at high Relative Humidities (A1105)**
Sebastian Raab, André Weber
Institute for Applied Materials (IAM-ET), Karlsruhe Institute of Technology (KIT); Karlsruhe/Germany

17:45 **Single cell testing of newly developed materials in HT-PEM fuel cells (A1106)**
Julian Büsselmann (1), Dana Schonvogel (1), Hendrik Eims (1), Jörg Belack (2), Jurica Vidakovic (3), Peter Wagner (1)
(1) DLR-Institute of Engineering Thermodynamics; Oldenburg/Germany; (2) BASF New Business GmbH; Ludwigshafen-am-Rhein/Germany; (3) Trigona GmbH; Wiesbaden/Germany

B11: OER & HER Catalysts I

I10: Tackling the activity/stability relationship for oxygen evolution reaction catalysts by triggering novel reaction mechanisms (B1101)
Alexis Grimaud
College de france, CNRS, Paris/France

Evaluation of commercial catalysts' OER performance by means of RDE (B1103)
Nataša Diklić (1), Alexandra Beard Pătru (1), Adrian Heinritz (1), Tianyu Cen (1), Juan Herranz (1), Thomas J. Schmidt (1,2);
(1) Paul Scherrer Institute; Villigen-PSI/Switzerland; (2) ETH Zürich; Zürich/Switzerland

Electrochemical Hydrogen Sulfide Decomposition using Proton Conducting Ceramic for Pure Hydrogen Production (B1104)
Taehong Kim (1), Sanghun Lee (1), Minseok Bae (1), Joongmyeon Bae (1)*, Sai P. Katikaneni (2), Kunho Lee (2); (1) Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology, Daejeon/Republic of Korea; (2) Research and Development Center, Saudi Aramco, Dhahran/Saudi Arabia

Investigation of the key-parameters for high OER activity of Ir-based mixed oxides (B1105)
Mateusz Odziomek (1,2), Marine Elmaalouf (1), Marco Faustini (2), Cédric Boissière (2), Silvia Duran (3), Cédric Tard (3), Andrea Zitolo (4), Marion Giraud (1), Jennifer Peron (1)
(1) Université de Paris, Paris/France; (2) Sorbonne Université, CNRS, Paris/France;
(3) LCM, CNRS, Ecole Polytechnique, Université Paris-Saclay; Cedex/France
(4) Synchrotron SOLEIL, L'orme des Merisiers, Gif-sur-Yvette/France

Interfacial insights into electrolyte-dependent oxygen evolution reactions in alkaline media (B1109) = (B1106)
Guangfu Li, Julie Anne D. del Rosario, Po-Ya Abel Chuang, Mu Pan
Foshan Xianhu Lab of Advanced Energy Science and Technology
Guangdong Laboratory, Xianhu Hydrogen Val

18:00 End of Sessions - www.EFCF.com/**Lobby** or www.EFCF.com/**JoinC** for **Networking** & in Memory of the unrivaled **"Dinners on the Lake"**

09:00 A12: Keynote - H_2 Key Enabler by Hydrogen Europe

09:00 **K6: Hydrogen, key enabler for a cyclic economy (A1201)**
Jorgo Chatzimarkakis
Hydrogen Europe, Brussels/Belgium

B12: Keynote - 2nd Generation Mirai by Toyota

K7: Toyota moving forward with second generation Mirai (B1201)
Isotta Cerri (1), Kohei Yoshida (2)
(1) Toyota Motor Europe, Brussels/Belgium,
(2) Toyota Motor Corporation Toyota City/Japan

09:25 5 Min to change to Session A13 or B13

09:30 A13: Stack Design & Operation

09:30 **AutoStack Industrie – Advanced Stack Technology for Automotive Volume Production – Mid Term Results (A1301)**
André Martin (1), Ludwig Jörissen (2)
(1) André Martin Consulting; Idstein/Germany;
(2) Centre for Solar and Hydrogen Research (ZSW); Ulm/Germany

09:45 **Carbon-Coated Stainless Steel as a Bipolar Plate Material in PEM Water Electrolyzers (A1302)**
Sebastian Proch (1), Ulf Bexell (1), Claire Moffatt (1), Mikael Stenström (1), Carlos Bernuy-Lopez (1), Jörgen Westlinder (1), Hans Becker (2), Graham Smith (2), Edmund Dickinson (2), Gareth Hinds (2)
(1) Surface Research, Strategic Research, AB Sandvik Materials Technology; Sandviken/Sweden; (2) National Physical Laboratory; Teddington/United Kingdom

10:00 **Study of a novel high-pressure PEM water electrolyser based on hydraulic cell compression (A1303)**
Ulrich W. Rost (1,2), Florian J. Wirkert (2), Jeffrey Y. Roth (1,2), Michael Brodmann (2)
(1) ProPuls GmbH; Gelsenkirchen/Germany
(2) Westfälische Hochschule University of Applied Sciences; Gelsenkirchen/Germany

10:15 **A study of Aluminium substrate as a bipolar plate material with an investigation of ex-situ test conditions (A1304)**
Liam Cooper*, Ahmad El-Kharouf
Centre for Fuel Cell and Hydrogen Research, Chemical Engineering, University of Birmingham; Birmingham/UK

B13: MEA Degradation Mechanisms II

The Importance of Water Management for Gross Hydrogen Starvation (B1301)
Adrian Heinritz (1), Juan Herranz (1), Thomas J. Schmidt (1,2)
(1) Paul Scherrer Institute; Villigen-PSI/Switzerland; (2) ETH Zürich; Zürich/Switzerland

Simulative Investigation on Local Hydrogen Starvation in Polymer Electrolyte Membrane Fuel Cells (B1302)
Fengmin Du (1,2), Qinhao Chen (1), Tuan Anh Dao (1), Thomas J. Schmidt (2,3), Alin Orfanidi (1)
(1) BMW Group, Munich/Germany
(2) Laboratory for Physical Chemistry, ETH Zurich, Zurich/Switzerland
(3) Electrochemistry Laboratory, Paul Scherrer Institute, Villigen-PSI/Switzerland

Short-Term Reversal Events: Promising Characterization Methods and Novel Failure Modes for OER Based PEFC-Anodes (B1303)
Dominik Bentele (1,2), Kerem Aylar (2), Katja Olsen (2), Elias Klemm (1), Sebastian H. Eberhardt (2)
(1) University of Stuttgart, Institute of Chemical Technology, Stuttgart/Germany
(2) cellcentric GmbH & Co. KG, Kirchheim/Teck-Nabern/Germany

Investigating Porous Transport Layers in PEWE: Interfacial Properties vs Bulk Transport (A1107) = (B1304))
C. Cesar Weber, Tobias Schuler, Lorenz Gubler, Felix N. Büchi, Salvatore de Angelis
Electrochemistry Laboratory, Paul Scherrer Institut; Villigen/Switzerland

10:30 Break - For **Refreshment** & **Networking** in www.EFCF.com/**Lobby**

11:00 A14: MEA & Systems

11:00 **Proposing Design Guides for High Performance GDLs (A1403)**
Christoph Csoklich (1), Thomas J. Schmidt (1,2), Felix N. Büchi (1)
(1) Electrochemistry Laboratory, PSI; Villigen PSI/Switzerland
(2) Laboratory of Physical Chemistry, ETH Zürich; Zürich/Switzerland

11:15 **I11: A path towards designing the components of next generation water electrolyzers (A1401)**
Marcelo Carmo
11:30 Forschungszentrum Juelich GmbH, Jülich/Germany

11:45 **Combined effect of flow traps and field gradient on the improved mass transport characteristics and performance of PEM fuel cell: A Numerical Study (A1404)**
Pranav Padavu (1), Poornesh Kumar Koorata (1), Santoshkumar D Bhat (2)
(1) Electrochemical Energy System Design Lab, National Institute of Technology Karnataka, Mangalore/India
(2) Fuel Cell Research Lab, CSIR-Central Electrochemical Research Institute, Chennai/India

12:00 **Methodology using design of experiments to maximise PEMFC performance (A1405)**
Philipp Oppek (1,2), André Weber (1)
(1) Institute for Applied Materials (IAM-ET), Karlsruhe Institute of Technology (KIT); Karlsruhe/Germany
(2) Schaeffler Technologies AG & Co KG; Karlsruhe/Germany

12:15 **PEM-Electrolysis: On the Tradeoff between Pressure and Performance (A1406)**
Fabian Scheepers (1), Markus Stähler (1), Andrea Stähler (1), Martin Müller (1), Marcelo Carmo (1,2), Werner Lehnert (1,3)
(1) Forschungszentrum Jülich GmbH, Jülich/Germany
(2) Queen's University, Kingston, Ontario/Canada; (3) RWTH-Aachen, Aachen/Germany

B14: OER & HER Catalysts II

I12: Developing catalysts for (water) electrolysis: from catalyst synthesis to performance testing (B1401)
Matthias Arenz (1), Johanna Schröder (1), Aline Bornet (1), Etienne Berner (1), Francesco Bizzotto (1), Vlad Mints (1), Gustav Wiberg (1), Jonathan Quinson (2), Mohammad Tovini (3), Hany El-Sayed (3)
(1) University of Bern, Bern/Switzerland, (2) University of Copenhagen, Copenhagen/Denmark, (3) Technical University of Munich, Munich/Germany

Elucidation of the Role of Glycine for Ultrahigh Surface-Area Iridium Oxide Catalysts for Water Oxidation (B1403)
Chaekyung Baik, Seung Woo Lee, Chanho Pak
Graduate School of Energy Convergence, Institute of Integrated Technology, Gwangju Institute of Science and Technology; Gwangju/Republic of Korea

Boosting H_2-Evolution and O_2-Evolution Reactions by Self-Supported Electrocatalysts Derived from Nickel-Cobalt Modified Polyaniline Polymer (B1404)
Razik Djara (1,2), Nathalie Masquelez (2), Marie-Agnès Lacour (3), Abdelhafid Merzouki (1), Julien Cambedouzou (2), David Cornu (2), Sophie Tingry (2), Yaovi Holade (2)
(1) Lab de Physico-Chimie des Hauts Polymères (LPCHP), Uni Ferhat Abbas; Sétif/Algeria
(2) Institut Européen des Membranes, Uni Montpellier; (3) ChemLab, Montpellier/France

Flame Spray Synthesized Co-based Electrocatalysts for Oxygen Evolution Reaction in Alkaline Media (B1405)
Dino Aegerter (1), Emiliana Fabbri (1), Sena Yüzbasi (2), Thomas Graule (2), Thomas J. Schmidt (1,3)
(1) Electrochemistry Laboratory, PSI; Villigen-PSI/Switzerland
(2) Laboratory for High Performance Ceramics, Empa; Dübendorf/Switzerland
(3) Laboratory of Physical Chemistry, ETH Zürich; Zürich/Switzerland

Q&A of B1405

12:30 Lunch Break - Recreate & **Join** again the www.EFCF.com/**VirtualExhibiton** or direct for **Networking** www.EFCF.com/**joinC**

13:30 A15: Materialising the Hydrogen Economy

13:30 **Lower-cost, On-or-Off-Grid, H_2 and NH_3 Production from Curtailed Wind and Solar by "Wild DC" Close-coupling to Electrolysis Stacks Arrays (A1501)**
William C Leighty; Alaska Applied Sciences, Inc.; Juneau/USA

13:45 **Hydrogen Economics from Water Electrolysis at High Temperature and Pressure (A1502)**
Thomas Holm (1,2), Tory Borsboom-Hanson (1), Omar E. Herrera (1), Walter Mérida (1)
(1) The Uni of British Columbia; Vancouver/Canada; (2) Inst for Energy Technology; Kjeller/Norway

14:00 **Hy-Lab – Two independent laboratories for hydrogen quality measurement (A1503)**
Dr. Christian Spitta (1), Ralf Witzany (1), Thomas Optenhostert (1), Alexander Kvasnicka (1), Markus Jenne (2), Günther Schlumberger (2), Dr. Vladimir Valter (2)
(1) ZBT GmbH; Duisburg/Germany
(2) ZSW; Ulm/Germany

14:15 **AVL PEM Development for Road and Marine Applications (A1504)**
Juergen Rechberger
AVL List GmbH; Graz/Austria

14:30 **MSc Course in FCH Technologies (A1505)**
Robert Steinberger-Wilckens (1), Aravind Purushothaman Vellayani (2), Massimo Santarelli (3), Yegor Brodnikovskyi (4), Lars N. Cleeman (5), Karel Bouzek (6), Jan Van herle (7), Jean-Luc Delplancke (8), Ioan Iordache (9), Florence Druart (10), Vladimir Molkov (11), Olaf Jedicke (12)
(1) University of Birmingham, Birmingham/UK, (2) TU Delft/Hanze Universiteit Groningen, Groningen/Netherlands.(3) Politecnico di Torino, Torino/Italy; (4) KPI Kyiv, Kyiv/Ukraine; (5) DTU, Lyngby/Denmark; (6) VSCHT Prague, Praugue/Czech Republic; (7) EPFL, Lausanne/Switzerland (8) Universite Libre de Bruxelles, Brussels/Belgium; (9) UPB Bucharest, Bucharest/Romania (10) INP Grenoble, Grenoble/France; (11) Ulster University, Ulster/UK; (12) KIT, Karlsruhe/Germany

14:45 **The Hydrogen Mission: time to roll out (A1506)**
Ana Dominguez, Thomas Freund
Swagelok Switzerland, Arbor Fluidtec AG; Wohlen/Switzerland

09:25 5 Min to change to Session A16

B15: Modeling of Kinetics & Transport

I13: Electrocatalysis on High Entropy Alloys (B1501)
Jan Rossmeisl
Department of Chemistry, University of Copenhagen, Copenhagen/Denmark

Model-Based Analysis of Anode Mass Transport Losses in Proton Exchange Membrane Water Electrolyser (B1503)
Tamara Miličić (1), Haashir Altaf (2), Luka Živković (1), Nicole Vorhauer-Huget (2), Evangelos Tsotsas (2), Tanja Vidaković-Koch (1)
(1) Max Planck Institute for Dynamics of Complex Technical Systems; Magdeburg/Germany
(2) Otto von Guericke University Magdeburg; Magdeburg/Germany

3-D simulation of heat and water transport processes in PEFCs during evaporative cooling and humidification (B1504)
Robert Herrendörfer (1), Magali Cochet (2), Pierre Boillat (2), Jürgen O. Schumacher (1)
(1) ZHAW, Institute of Computational Physics; Winterthur/Switzerland
(2) Electrochemistry Laboratory, Paul Scherrer Institute; Villigen-PSI/Switzerland

Distribution of Polytetrafluorethylene in the Gas Diffusion Layers of Polymer Electrolyte Fuel Cells (B1505)
Dieter Froning (1), Uwe Reimer (1), Werner Lehnert (1,2)
(1) Forschungszentrum Jülich GmbH, Institute for Energy and Climate Research; Jülich/Germany
(2) Modeling in Electrochemical Process Engineering; RWTH Aachen University, Aachen/Germany

Application of Loewner framework for data-driven modeling and interpretation of impedance spectra of polymer electrolyte membrane fuel cells (B1507) = (B1506)
Bansidhar Patel (1), Antonio Sorrentino (1), Ion Victor Gosea (1) Athanasios Antoulas (1,2), Tanja Vidaković-Koch (1); (1) Max Planck Inst. for Dynamics of Complex Technical Systems; Magdeburg/Germany; (2) Rice Uni, Dep. of Electrical and Computer Engineering; Houston/USA

15:05 A16: P3: Closing Ceremony
Keynote by the EFCF Gold Medal of Honour Winner 2021

15:05 **Summary by the Chairs (A1601)**
Thomas Schmidt, Emiliana Fabbri
PSI Paul Scherer Institut, Villigen/Switzerland, Villigen/Switzerland

15:20 **Information on Next EFCFs :**
EFCF 2023 9th FC, Electrolyser & H_2 Processing Forum
EFCF 2022 15th European SOFC & SOE Forum (A1602)
Michael Spirig (1), Michael Eikerling (2), Olivier Bucheli (1)
(1) European Electrolyser & Fuel Cell Forum, Lucerne/Switzerland,
(2) FZJ Forschungszentrum Jülich, Jülich/Germany

15:30 **Christian Friedrich Schönbein Award**
for the Best Poster, Best Science Contribution, Medal of Honour (A1603)
Emiliana Fabbri, Thomas Schmidt
PSI Paul Scherer Institut, Villigen/Switzerland

15:40 **K8: Electrocatalysis - the dark side of solar fuel production and use (A1604)**
Peter Strasser, EFCF Gold Medal of Honour Winner 2021
Department of Chemistry, Chemical Engineering Division, Technical University Berlin, Berlin/Germany

16:05 **Thank you and Closing by the Organizers (A1605)**
Michael Spirig,Olivier Bucheli
European Electrolyser & Fuel Cell Forum, Luzern/Switzerland

16:15 End of Sessions - End of Conference
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Fuel Cells
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CO_2 Emission Reduction & Reuse
EFCF 2022
Lucerne Switzerland 5 – 8 July

Low-Temperature
Fuel Cells
Electrolysers & H_2 Processing
EFCF 2023
Lucerne Switzerland 4 – 7 July

Poster List

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A03 Poster Session I covering All Session Topics — **Wednesday, 30 June 2021** — Afternoon **13.15 - 14:30**

A09 Poster Session II covering All Session Topics — **Thursday, 1 July 2021** — Afternoon **13.15 - 14:30**

A02: PEM Fuel Cell & Electrolyzer Systems

High temperature proton exchange membrane fuel cells: progress in advanced materials and key technologies (A0207)
Rizwan Haider (1), Yichan Wen (1), Zi-Feng Ma (1), a David P. Wilkinson (2), Lei Zhang (3), Xianxia Yuan (1)*, Shuqin Song (4)*, Jiujun Zhang (2,5)
(1) Department of Chemical Engineering, Shanghai Jiao Tong University; Shanghai/China
(2) Department of Chemical and Biological Engineering, University of British Columbia; Vancouver/Canada
(3) Energy, Mining & Environment, National Research Council of Canada; Vancouver/Canada
(4) The Key Lab of Low-carbon Chemistry & Energy Conservation of Guangdong Province, School of Materials Science and Engineering, Sun Yat-sen University; Guangzhou/China
(5) Institute for Sustainable Energy/College of Sciences, Shanghai University; Shanghai/China

Optimisation and Integration of PEFC System with Multiple Energy Storage Devices On-board Tri-Hybrid Electric Vehicle (A0208)
Naseruddin Khan, Yousif Al-Sagheer, Robert Steinberger-Wilckens
Centre for Hydrogen and Fuel Cell Research, School of Chemical Engineering, University of Birmingham; Edgbaston/UK

Biomimetic flow fields for proton exchange membrane fuel cells (A0209)
Alfredo Iranzo (1,2), C.H. Arredondo (3), A.M. Kannan (4), Christian Suarez (1,2), Francisco Javier Pino (1), Felipe Rosa (1), José Guerra (1)
(1) Thermal Engineering Group, Energy Engineering Department, School of Engineering, Universidad de Sevilla/Spain; (2) AICIA, Andalusian Association for Research & Industrial Cooperation, Escuela Superior de Ingenieros de Seville/Spain; (3) Área Académica de Ingeniería en Energía, Universidad Politécnica de Francisco I Madero, Hidalgo/Mexico; (4) The Polytechnic School, Ira A. Fulton Schools of Engineering, Arizona State University, M esa/USA

B02 + B07: PEM Electrocatalysts I + II

Experimental Set-Up for Tranport Studies of Anodes in PEMFCs (B0704) = (B0207)
A. Molinero, J.C. Oller, J.M. Barcala, M.A. Folgado, A.M. Chaparro
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT); Avda. Madrid/Spain

Fabrication and characterization of $La_{0.6}Sr_{0.4}Co_{0.8}Fe_{0.2}O_{3-\delta}$ perovskite-based anodes by water-based tape casting (B0208)
Kimia Y. Javan, Vincenzo M. Sglavo
University of Trento, Department of Industrial Engineering; Trento/Italy

Open Circuit Voltage Mystery Solved for Polymer Electrolyte Fuel Cells (B0704) = (B0707)
Ulf Bossel, Almus AG, Oberrohrdorf/Switzerland

B04 + B08: Pt & Pt-free Electrocatalysts I + II

Lead and Nitrogen Co-doped Multi-walled CNT Electrocatalyst for Oxygen Reduction Reaction (B0408)
Ehsan Zarmehri (1,2), Ivar Kruusenberg (1), Andris Šutka (3)
National Institute of Chemical Physics and Biophysics, Tallinn/Estonia

Linking morphological properties of Pt/C catalysts to electrochemical performances for improved catalysis in fuel cells (B0409)
Philipp Heizmann (1,2), Miriam von Holst (1,3), Hien Nguyen (1,3), Florian Lombeck (3), Claudia Schwarz (3), Carolin Klose (1,3), Matthias Breitwieser (1,3), 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

Defect propagation at the anode in Polymer Electrolyte Membrane Fuel Cells (A0210)
Salah Touhami (1), Helen Barboza-Da-Silva (2), Marie Crouillere (3), Christine Nayoze-Coynel (4), Lionel Flandin (3), Olivier Chadebec (2), Corine Bas (3), Assma El Kaddouri (1), Sébastien Rosini (4), Florence Dubelley (3), Florence Druart (3), Gilles Cauffet (2), Marian Chatenet (3), Yann Bultel (3), Fabrice Micoud (4), Laetitia Dubau (3), Julia Mainka (1), Jérôme Dillet (1), Olivier Lottin (1)
(1) Univ. Lorraine, CNRS, LEMTA; Vandœuvre-lès-Nancy/France
(2) Univ. Grenoble Alpes, CNRS, Grenoble/France
(3) Univ. Grenoble Alpes, Univ. Savoie-Mont Blanc, CNRS, Grenoble/France
(4) Univ. Grenoble Alpes, CEA, LITEN; Grenoble/France

Measurement of Conductivity and Microstructural Assessment for Optimisation of Ni-BCZY Reduction Conditions (A0211)
Zac Dehaney-Steven, Hwan Kim
Low Emissions Resources Global, Ltd; Dundee/Scotland

Investigating water transport in low EW PFSA membranes for air humidification (A0212)
Amedeo Grimaldi (1), Lorenzo Villa (1), Andrea Baricci (1), Stefano De Antonellis (1), Claudio Oldani (2), Andrea Casalegno (1)
(1) Department of Energy, Politecnico di Milano; Milan/Italy
(2) Solvay Specialty Polymers SpA, R&D Centre; Bollate/Italy;

Novel Control Approach for Integrating Water Electrolysers to Renewable Energy Sources (A0213)
Yousif Al-Sagheer, Robert Steinberger-Wilckens
Centre for Fuel Cell and Hydrogen Research; University of Birmingham, Birmingham/UK

Elucidating the impact of Pt-ink ageing on fuel cell performance in laboratory scale CCM production (A0214)
Claudia Schwarz (1), Philipp Heizmann (2), Severin Vierrath (1,2), Matthias Breitwieser (1,2)
(1) Hahn-Schickard; Freiburg/Germany
(2) Electrochemical Energy Systems, IMTEK Department of Microsystems Engineering, University of Freiburg; Freiburg/Germany

Flow Synthesis of PGM-Based Catalysts for Fuel Cells (B0406) = (B0410)
Laura A. Murdock, Brian C. Benicewicz
Fraunhofer CAN, Hamburg/Germany

B05: Membrane Electrolytes

Next Generation Polybenzimidazole (PBI) Membranes (B0505) = (B0507)
Laura A. Murdock, Brian C. Benicewicz
University of South Carolina, Department of Chemistry and Biochemistry; Columbia, S.C./USA

B07 see B02: PEM Electrocatalysts I + II

B08 see B04: Pt & Pt-free Electrocatalysts I + II

B10: Stability & Degradation Mechanisms

Preliminary investigation of water uptake and retention of self-healing membranes (B1007)
George Ludlam, Harald Schlegl, Xiaoran Li, Riccardo Degl'Innocenti, Gaurav Gupta, Richard Dawson, Hungyen Lin
Department of Engineering, Lancaster University, Lancaster/United Kingdom

B11 + B14: OER & HER Catalysts I + II

Oxygen evolution reaction catalyzed by magnetic oxides under an external magnetic field (B1107)
Zhichuan J. Xu, Xiao Ren, Tianze Wu, Chao Wei, Riccardo Ruixi Chen
School of Materials Science and Engineering, Nanyang Technological University, Singapore/Singapore

The Effect of Cobalt Oxide Catalyst on the Performance of Lanthanum Strontium Cobalt Ferrite (LSCF) Electrode (B1108)
Alberto Olivo, Berceste Beyribey, Hwan Kim, Joshua Persky
Low Emissions Resources Global Ltd.; Dundee/UK

Interfacial insights into electrolyte-dependent oxygen evolution reactions in alkaline media (B1106) = (B1109)
Guangfu Li, Julie Anne D. del Rosario, Po-Ya Abel Chuang, Mu Pan
Foshan Xianhu Lab of Advanced Energy Science and Technology Guangdong Laboratory, Xianhu Hydrogen Val

A04 + A08: Electrolyzers Components and MEA I + II

Moderate Oxophilic CoFe in Carbon Nanofiber for the Oxygen Evolution Reaction in Anion Exchange Membrane Water Electrolysis (A0407)
Sinwoo Kang (1), Kahyun Ham (1), Sungyool Bong (1), Jaeyoung Lee (1,2)
(1) School of Earth Sciences and Environmental Engineering, Gwangju Institute of Science and Technology (GIST); Gwangju/South Korea
(2) Ertl Center for Electrochemistry and Catalysis, GIST; Gwangju/South Korea

A05: Operando Analysis

Dynamic modelling and simulations of a PEM electrolysis system for flexible operation (A0507)
Elena Crespi*, Giulio Guandalini, Stefano Campanari
Politecnico di Milano, Department of Energy, Milano/Italy

Simultaneous terahertz imaging and optical gauging of water build-up in a PEMFC (A0508)
Decio F. Alves-Lima (1), Harald Schlegl (1), Bryan M. Williams (2), Rosa Letizia (1), Richard Dawson (1), Hungyen Lin (1)
(1) Department of Engineering, Lancaster University; Lancaster/United Kingdom
(2) Department of Computing and Communications, Lancaster University; Lancaster/United Kingdom

A novel advanced test system for PEM water electrolysis based on hydraulic cell compression (A0509)
Ulrich W. Rost (1,2), Florian J. Wirkert (2), Jeffrey Y. Roth (1,2), Svenja Stiber (3), Aldo S. Gago (3), K. Andreas Friedrich (3), Michael Brodmann (2)
(1) ProPuls GmbH; Gelsenkirchen/Germany
(2) Westfälische Hochschule University of Applied Sciences; Gelsenkirchen/Germany
(3) German Aerospace Center (DLR), Institute of Engineering Thermodynamics; Stuttgart/Germany

A07: MEA Development & Characterization

Evaluation of polarization resistance of line-and-space patterned polymer electrolyte fuel cells using distribution of relaxation times (A0707)
Akihisa Tanaka, Keisuke Nagato, Morio Tomizawa, Kohei Nagai, Masayuki Nakao
Department of Mechanical Engineering, Graduate School of Engineering, The University of Tokyo; Tokyo/Japan

Development of Self-Water Management Catalyst Layer to reduce the cost of PEFC (A0708)
Kimihiko Sugiura, Saki Teramae
Osaka prefecture university College of Technology; Osaka/Japan

B13 see A11: MEA Degradation Mechanisms I + II

B14 see B11: OER & HER Catalysts I + II

B15: Modeling of Kinetics & Transport

Application of Loewner framework for data-driven modeling and interpretation of impedance spectra of polymer electrolyte membrane fuel cells (B1506) = (B1507)
Bansidhar Patel (1), Antonio Sorrentino (1), Ion Victor Gosea (1) Athanasios Antoulas (1,2), Tanja Vidaković-Koch (1)
(1) Max Planck Institute for Dynamics of Complex Technical Systems; Magdeburg/Germany
(2) Rice University, Department of Electrical and Computer Engineering; Houston/USA

Real-time Monitoring of the Water Balance in a PEMFC (B1508)
Rémi Bligny (1), Jérôme Dillet (1), Sophie Didierjean (1), Tobias Schmitt (1,2), Ulrich Sauter (2), Gaël Maranzana (1)
(1) Université de Lorraine, CNRS, LEMTA, Nancy/France
(2) Robert Bosch GmbH, Stuttgart/Germany

Modelling of PEMFC Cold Start (B1509)
Tom Gießgen, Thomas Jahnke
German Aerospace Center (DLR), Institute of Engineering Thermodynamics; Stuttgart/Germany

Suitability of Nafion modified membranes as electrolyte for thermocells with hydrogen electrodes (B1510)
Pablo Radici (1), Maike Willke (1), Corina Harms (2), Stephan Kabelac (1)
(1) Institute of Thermodynamics, Leibniz University; Hannover/Germany
(2) NEXT ENERGY – EWE Research Centre for Energy Technology at the University of Oldenburg; Oldenburg/Germany

The effects of ordered microstructure in the gas diffusion layer (GDL) (A0709)
Hossein Pourrahmani, Jan Van herle
Group of Energy Materials (GEM), Ecole Polytechnique Federale de Lausanne (EPFL); Sion/Switzerland

Catalyst layer with graded Pt concentration for polymer electrolyte membrane fuel cells (A0710)
Pit Podleschny (1,3), Ulrich Rost (1), Ivan Radev (2), Roxana Muntean (4), Volker Peinecke (2), Martin Muhler (3), Michael Brodmann (1)
(1) Westfälische Hochschule Gelsenkirchen; Gelsenkirchen/Germany
(2) The Hydrogen and Fuel Cell Center (ZBT); Duisburg/Germany
(3) Laboratory of Industrial Chemistry, Ruhr-University Bochum, Bochum/Germany
(4) Department of Materials and Manufacturing Engineering, University Politehnica of Timişoara, Timişoara/Romania

Improved Anode Morphology for Industrial Scale Production of PEM Fuel Cells (A0711)
Farmal Khan (1), Florian Lombeck (1), Matthias Breitwieser (1,2), Hien Nguyen (1)
(1) Hahn-Schickard; Freiburg/Germany
(2) Electrochemical Energy Systems, IMTEK, University of Freiburg; Freiburg/Germany

A08 see A04: Electrolyzers Components and MEA I + II

A10: CO_2 Reduction

Metal Electrodeposition on Gas Diffusion Electrodes for the catalysed CO_2 Electroreduction Reaction (A1007)
Mila Manolova (1), Şeniz Sörgel (1), Joachim Hildebrand (2), Elias Klemm (2), Fabian Bienen (3), Denis Kopljar (3), Norbert Wagner (3)
(1) Research Institute for Precious Metals & Metal Chemistry (fem); Gmünd/Germany
(2) ITC - Institute of Chemical Technology, University of Stuttgart; Stuttgart/Germany
(3) DLR – German Aerospace Center, Institute of Engineering Thermodynamics; Stuttgart/Germany

Formation of 1-Butanol from CO_2 on Phosphorus-Rich Copper Cathode (A1008)
Minjun Choi (1), Sungyool Bong (1), Jaeyoung Lee (1,2)
(1) School of Earth Sciences and Environmental Engineering, Gwangju Institute of Science and Technology; Gwangju/Republic of Korea
(2) Ertl Center for Electrochemistry and Catalysis, Gwangju Institute of Science and Technology; Gwangju/Republic of Korea

A13: Stack Design & Operation

Impedance-based, spatially resolved DC-Performance- Model for PEMFC (A1307)
Tobias Goosmann, Marcel Heinzmann, André Weber
Karlsruhe Institute of Technology (KIT), Institute for Applied Materials (IAM-ET); Karlsruhe/Germany

Electrochemical performance of PEMFC using porous media inside the gas flow channel (A1308)
Hossein Pourrahmani, Jan Van herle
Group of Energy Materials (GEM), Ecole Polytechnique Federale de Lausanne (EPFL); Sion/Switzerland

Sustainable Alkaline Membrane Fuel Cell (SAMFC) Stack Modeling and Simulation (A1309)
Rodrigo C. Raimundo (1), José V. C. Vargas (1,2), Juan C. Ordonez (3), Wellington Balmant (2), André B. Mariano (4)
(1) Graduate Program in Materials Science Engineering (PIPE), and Sustainable Energy Research and Development Center (NPDEAS), Federal University of Paraná; Curitiba/Brazil
(2) Graduate Program in Mechanical Engineering (PGMEC), Department of Mechanical Engineering, and Sustainable Energy Research and Development Center (NPDEAS), Federal University of Paraná; Curitiba/Brazil
(3) Department of Mechanical Engineering, Energy and Sustainability Center and Center for Advanced Power Systems, Florida State University; Tallahassee/U.S.A.
(4) Department of Electrical Engineering, and Sustainable Energy Research and Development Center (NPDEAS), Federal University of Paraná; Curitiba/Brazil

A14: MEA & Systems

Numerical analysis of cathode micro-patterned PEMFC based on heterogeneous pore scale model under low-humidified condition (A1407)
Morio Tomizawa (1), Gen Inoue (2), Keisuke Nagato (1), 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

Test setup design for a fast electrochemical characterization of flow cells for CO_2-Electrolysis to gaseous products (A1009)
Joey Disch (1,2), Severin Vierrath (1,2)
(1) Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT); Freiburg/Germany;
(2) Electrochemical Energy Systems, IMTEK - Department of Microsystems Engineering, University of Freiburg; Freiburg/Germany

A11 + B13: MEA Degradation Mechanisms I + II

Investigating Porous Transport Layers in PEWE: Interfacial Properties vs Bulk Transport (B1304) = (A1107)
C. Cesar Weber, Tobias Schuler, Lorenz Gubler, Felix N. Büchi, Salvatore de Angelis
Electrochemistry Laboratory, Paul Scherrer Institut; Villigen/Switzerland

Possible repair mechanism for aromatic hydrocarbon-based polymer electrolyte membranes used in fuel cells (A1108)
T. de Wild (1,2), T. Nemeth (1,2), T. Nauser (2), T. J. Schmidt (1,3), L. Gubler (1)
(1) Paul Scherrer Institute, Electrochemistry Laboratory; Villigen-PSI/Switzerland
(2) ETH Zürich, Laboratory of Inorganic Chemistry; Zürich/Switzerland
(3) ETH Zürich, Laboratory of Physical Chemistry; Zürich/Switzerland

Model based design of experiments: Determination of optimal measurement protocol for unique identification of catalyst degradation model parameters (A1109)
Andraz Kravos (1), Ambroz Kregar (1,2), Tomaz Katrasnik (1)
(1) Faculty of Mechanical Engineering, University of Ljubljana; Ljubljana/Slovenia
(2) Faculty of Education, University of Ljubljana; Ljubljana/Slovenia

Investigating Graphene as a Proton Selective Barrier for Enhancing Nafion Durability (A1111)
Jordan Frow* (1), James Devine-Stoneman (2), Joel Fruhman (2), Gaurav Gupta (1), Richard Dawson (1), Hungyen Lin (1)
(1) Engineering Building, Lancaster University; Lancaster/United Kingdom
(2) LowDee Limited, Manchester/United Kingdom

A15: Materialising the Hydrogen Economy

Exporting Alaska's Stranded Natural Gas as CO_2-emission-free Ammonia, a Carbon-free Hydrogen Transmission and Storage Medium and Fuel (A1507)
William C Leighty
The Leighty Foundation; Juneau/USA

Polyvinylpyrrolidone-Stabilized Palladium Nanocrystals as Chemiresistive Sensors for Low-Concentration Hydrogen Gas Detection (A1508)
Deepshikha Jaiswal-Nagar, Gaana K.
School of Physics, Indian Institute of Science Education and Research Thiruvanthapuram; Thiruvananthapuram/India

Hydrogen Fuel Cells: Mapping from Patent Analysis (A1509)
Lawrence Cezar Moura, Mario González, Jéssica Silva, Lara Silva, Izaac Braga, Paula Ferreira
Federal University of Rio Grande do Norte/ Creation Research Group; Natal/Brazil

A dynamic model for simulating the energy performance of a renewable hydrogen-based grid (A1510)
Mario Iamarino, Donato Abbate, Antonio Ferraro, Antonio D'Angola
Scuola di Ingegneria, Università della Basilicata; Potenza/Italy

Hydride phase investigation of Ti-V-Cr alloy by using In-Situ Neutron Diffraction (A1511)
Viney Dixita (2), Lambert van Eijckb, Jacques Huot (1)
(1) IRH, UQTR, Trois-Rivières, Québec, Canada
(2) Energy Science and Engineering Department, IITB, Mumbai, Maharashtra/India

Optimization of Room Temperature Hydrogen Sensing Capability of Pd Nanocluster Film (A1512)
Viney Dixit, Deepshikha Jaiswal-Nagar, Adithya Jayakumar, Sarath Jose, Gaana K.
School of Physics, Indian Institute of Science Education and Research Thiruvanthapuram; Thiruvananthapuram/India

The Multiple Roles of Carbon Materials in PEM Fuel Cell Components (A1513)
Marlene Rodlert, Flavio Mornaghini, Pascual García-Pérez, Raffaele Gilardi
Imerys Graphite & Carbon; Bironico/Switzerland

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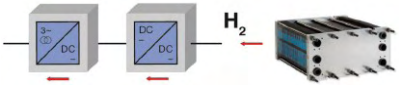

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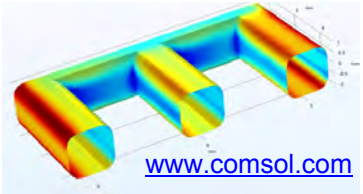

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FC & H_2 – Fuel Cells and Hydrogen Tutorial	CHF 220 / € 200 / $ 240
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Admission of academic staff etc.	CHF 600 / € 550 / $ 650

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Lucerne (view video clip) www.EFCF.com/Lucerne

Although we may not be able to gather in person in Lucerne this year, let's allow ourselves to look forward to a time when this will again be possible and remind ourselves of this wonderful location that makes EFCF so special.

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 „Kapellbrucke" 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.

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Tutors:

Dr. Günther G. Scherer, formerly PSI, Switzerland

MER Dr. Jan Van Herle, EPFL, Switzerland

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10:00 **Lecture 1 Welcome & 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 - Summary**

17:00 End of FCH Tutorial, Visit the virtual exhibition of EFCF 2021 www.EFCF.com/EXHIBITIONv

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Tutors:
Dr. André Weber, KIT, Germany
Dr. Dino Klotz, I2CNER, Kyushu Uni, Japan

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09:30 Registration, welcome refreshments
10:00 **Lecture 1 Welcome & 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 2021 www.EFCF.com/EXHIBITIONv

Registration, Services & Fees

Virtual registration is **available** and **includes**:
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.**

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

Virtual CHF 150 for EFCF 2021 participants
CHF 220 for regular registration
Exhibitors & Groups are entitled to rebates.
The FCH tutorial is also on-demand available.
Request a quote at forum@efcf.com.

PRE-ANNOUNCEMENT

EFCF 2022

26th International Conference in Series

Lucerne, Switzerland, 5 – 8 July

15th European SOFC & SOE Forum

Chaired by:

Dr. Julie Mougin
Dr. Jerome Laurencin

CEA-Liten, Grenoble, France

Featuring

- **Solid Oxide Technologies**
  Fuel Cells (SOFC), Electrolysers (SOE) &
  Membrane Reactors (SOMR), CO_2 Emission Reduction & Reuse
- **Exhibition:** Suppliers, Materials, Testing, Components, SO-Technologies
- **Tutorials:** FCH – Fuel Cell, Electrolyser & Hydrogen
  EIS – Electrochemical Impedance Spectroscopy
- **GSM 2021:** Grid Service Market Symposium
  Grid Flexibility & Utilities & ESCO oriented Business

www.EFCF.com/2022

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Scope of the Forum

EFCF 2022

The 15th EUROPEAN SOFC & SOE FORUM 2022 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, Ceramatec, Ceres Power, Convion, EBZ, Elcogen, Fuel Cell Energy/Versa Power, Halder Topsoe, Hexis/Viessmann, Microsoft, Plansee, SOLIDpower, Sunfire, Sylfen.

Chairs of the Conference

CEA-Liten, Grenoble, France

Dr-Ing. Julie Mougin is Head of Hydrogen Technologies Laboratory at CEA, French Atomic and Alternative Energies Commission, in Grenoble, France. Graduated from Grenoble Institute of Technology (INPG) in Electrochemistry, she obtained a PhD in Materials Science and gained industrial experience in the field of materials for energy and automotive markets before joining CEA/Liten in 2005 as the head of the SOFC/SOE testing and characterization research group. From January 2010 to now, she is leading the Hydrogen Technologies Laboratory, focused on hydrogen production, storage and fuel cells. She also supervised during 4 years a team in charge of techno-economical and life cycle assessment for new energies technologies.

In her current position, she supervises a team of 35 people in charge of the development and characterization of SOE and SOFC technologies, from cells to systems. She has a large coordination experience as coordinator of various past and on-going EU projects related to hydrogen and fuel cells (RAMSES, INSIGHT, REFLEX, MULTIPLHY). She is appointed as an international expert in the field of hydrogen, involved in several missions like contributing to EU roadmaps, review of national hydrogen programs for several countries, and standards.

Julie Mougin is author/co-author of 50 publications in reviewed scientific journals (100 in total), five book chapters and four patents.

Dr. Hab. Jerome Laurencin is a senior scientist at the French Atomic and Alternative Energies Commission (CEA), where he leads a research group on the modeling and characterizations of Solid Oxide Cells (SOC). After a Master degree in material science and engineering, he obtained his Ph.D. from Grenoble Institute of Technology (INPG) with a dissertation on the performance and durability of solid oxide fuel cells. He received his habilitation in 2013 on the modeling of high temperature electrochemical devices.

Jérôme Laurencin has been working on the field of SOC for more than 15 years at CEA. His research activities are related to the modelling coupled with advanced material and mechanical characterizations. With his research group, he has adapted methods based on synchrotron X-ray radiation for the microstructural and physico-chemical characterizations. He developed a multi-scale and multi-physic modeling framework that accounts for the electrochemical and mechanical cell behavior. His current research interests aim at understanding the complex relationships between the electrode microstructure and the fundamental properties of materials to optimize the cell durability and robustness in electrolysis and fuel cell modes.

Jérôme Laurencin has participated to several National and European projects as work-package leader. He is author/co-author of 80 articles in peer-reviewed scientific journals (more than 120 in total), two book chapters and holds 5 patents in the field of SOC.

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

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

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Pre-Announcements

GSM 2021 + GSM 2022

Virtual 15 September

Lucerne 4 - 5 July

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Microbial/Enzymatic Electrochemistry Platform

MEEP 2021 + MEEP 2022

Virtual 21 October

Lucerne 7 - 8 July

Switzerland

Featuring

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