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GUEST EDITORIAL

Research and Integration of Hydrogen Technologies to Access Economic Sustainability (EFCF2023)

Michael H. Eikerling[1] | Olivier Bucheli[2] | Yannis Ieropoulos[3] | Ludovic Jourdin[4] | Petra Bele[5]

[1]Forschungszentrum Jülich, Germany/RWTH Aachen University, Aachen, Germany | [2]European Fuel Cell Forum AG, Lucerne, Switzerland | [3]University of Southampton, Southampton, UK | [4]Delft University of Technology, Delft, the Netherlands | [5]Technical University Munich, Munich, Germany

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The 27th edition of the European Fuel Cell Forum with a focus on Low Temperature Electrolyzers, Fuel Cells, and H_2 Processing saw the return to the normal in-person conference modus. With the hitherto highest number of participants of the low-temperature conference branch, an excellent line-up of oral and poster presentations, and an overall positive vibe in conversations, the conference asserted the standing of the EFCF as the prime forum for scientific-technical exchanges on electrochemical hydrogen technologies in Europe.

The drive towards hydrogen as the currency of a sustainable global economy is as dynamic as ever. Yet, enabling the epochal energy transition through market-ready water electrolysis and fuel cell technologies remains an ambitious undertaking, especially when facing the immediacy of rapidly transforming climate and ecological systems. It needs unprecedented alignment of efforts from scientists, technology developers, and system integrators, driven by a high awareness of socioeconomic and environmental needs and relying on unwavering government support.

'Integration', the motto of the EFCF2023 conference, refers to the realization that any challenge related to the performance or stability of fuel cell or electrolyzer technologies, even if it originates deep at the materials level, will not be solved in isolation. It necessitates integration from an early stage, to be achieved scale-to-scale, component-to-component, and lab-to-lab, and combining modeling and characterization in meaningful ways. Challenged by the socioeconomic and political landscape and aligning with this motto, EFCF2023 kept its focus on fundamental understanding of electrocatalyst materials and reaction kinetics, as well as progresses and current issues for fuel cell and electrolyzer systems and their integration across the different physical levels. Furthermore, contributions related to advanced modelling and diagnostics, as well as engineering, system integration, and demonstration of real-world devices.

In total 172 papers were presented at EFCF2023, of which 108 have been presented orally. Several poster presentations also prepared as an MP4 record presentation accessible to conference participants through EFCF's website also after the conference, similar to the recorded oral presentations. Finally, a limited number of scientific papers have been selected to become part of this Special Issue.

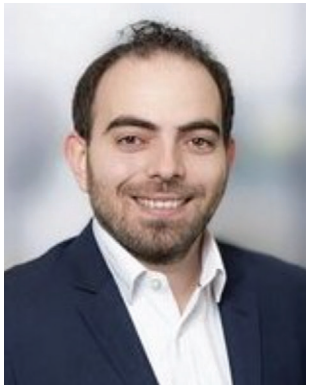
Alongside EFCF2023, the 5th International Microbial/Enzymatic Electrochemistry Platform Symposium (MEEP2023) was held. This event sparked lively discussions on the use of microbial cells and enzymes as 'catalysts' in various electrochemical systems, ranging from electricity generation in microbial fuel cells to the conversion of carbon dioxide into chemicals and fuels in microbial electrosynthesis systems. To bring these technologies to industrial scale, it is essential to explore both fundamental and applied engineering aspects—a focus reflected in the MEEP2023 program. The symposium covered topics such as microbial biofilm functions, electron transfer mechanisms, novel materials and biohybrids, multiscale mass transport, and scale-up challenges. MEEP2023 featured a total of 59 contributions, with 37 delivered as oral presentations.

Many thanks are due to the Editor-in-Chief Prof. Eileen Yu and Senior Editor Dr. Petra Bele of the journal *Fuel Cells–From Fundamentals to Applied Systems* for their great support on publishing this combined Special issue in this esteemed journal.

Michael H. Eikerling

Olivier Bucheli

Yannis Ieropoulos



Ludovic Jourdin

Petra Bele