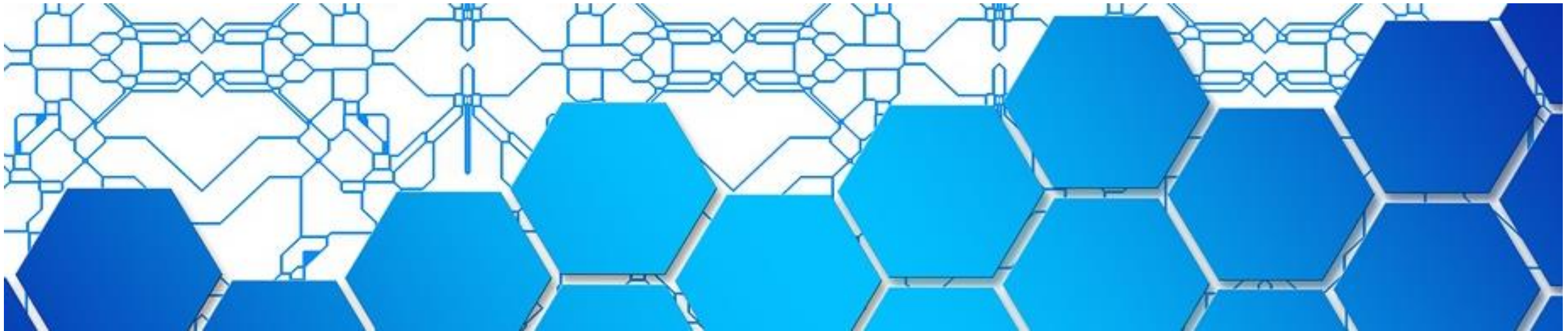


Potential for cost reduction and performance improvement for PEMFC at component and system level

AFC TCP Topical Meeting 2021

Key Messages



THE MEETING

On 10/11 November 2021, the Topical Meeting on Potential for cost reduction and performance improvement for PEMFC at component and system level took place at Graz University of Technology.

Distinguished experts, both from the realms of research and development and industry, delivered captivating presentations that delved into a wide range of facets and advancements related to this subject matter. Key focal points encompassed research in fuel cell technology, the application of fuel cells in mobile contexts, production and manufacturing processes, and the sustainable recycling of essential fuel cell components such as catalysts and MEAs (membrane electrode assemblies).

TOPICS INCLUDED, AMONG OTHERS

- Recent advances of PEMFC technologies and challenges for applications beyond personal owned vehicles
- Engineering Solutions for Economical and Durable Fuel Cell Vehicles
- Cost-efficient and environmentally friendly recycling of materials in PEM fuel cells and electrolysis cells

THE REPORT

Following the meeting, a report was published in the Journal of power sources.

The Report provides an overview of the latest trends in material advancements and the emergence of manufacturing techniques for MEAs. It systematically assesses these materials and methods, focusing on their impact on cell performance and scalability. Moreover, it identifies and analyzes the ongoing and anticipated scientific challenges based on findings published in the past five years. Lastly, the report conducts a quantitative comparison of the results from cited papers, both among themselves and against the internal benchmarks cited in each work. This comprehensive analysis offers a thorough depiction of the current state of the art in PEFC MEA manufacturing.

CONCLUSION

In-depth scrutiny was undertaken to examine the latest advances in the field of materials development and manufacturing methods for PEFCs. These developments were extensively reviewed, and significant trends were systematically analyzed on a component-by-component basis. It was fortuitous that references containing data from industrial R&D departments were at our disposal and could also be included in the analysis. By combining the knowledge extracted from the literature, several promising pathways for increasing performance, platinum utilization, and lifetime in the future were identified.

KEY MESSAGES

- Increasing the ECSA of catalysts by unusually high specific activity, developing methods to mitigate poisoning by the sulfonic acid groups in the PFSA or increasing the oxygen accessibility, e.g., by using highly mesoporous carbon supports.
- Improvement of local oxygen transport to the active sites by PFSA modification (e.g. HOPI-approach) or chemical masking (e.g. ODT-approach).
- Increase proton conductivity by using ionomers with short side chain to thereby maintain proton conductivity at lower ionomer content and indirectly increase oxygen permeability
- Improve and optimize ink-mixing techniques and determine their impact on the newly developed materials.
- Investigate the lifetime and degradation mechanisms of non-precious metal components over extended operating periods.
- Upscaling and industrialization of coating methods such as ultra-sonic spray coating or electrospinning to production rates achieved in slot die coating.