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Fraunhofer Institute for Solar
Energy Systems ISE

Upscaling Fuel Cells and Electrolyzers

Production Research on Membrane Electrode Assemblies

www.ise.fraunhofer.de/hydrogen-technologies

Production Research on Membrane Electrode Assemblies

The membrane electrode assembly (MEA) is the electrochemical heart of electrolyzers and fuel cells. Our production research in "H2 MEA-TEC", ranges from catalyst ink to 7-layer MEAs. We investigate the influence of process design and parameters, materials and component architecture on MEA cost, quality and operation behavior.

Our Offer

Investigation of sheet-to-sheet as well as roll-to-roll processes from laboratory to industrial scale:

- Catalyst ink formulation
- Process variation and parameter evaluation for coating and drying
- Direct printing or decal transfer route
- Cutting and subgasket lamination
- Application of porous transport layer or gas diffusion layer
- Quality control along the process chain with in-line and off-line, industrial-scale or laboratory-scale ex-situ analytics
- Investigation of effects of defects with state-of-the-art in-situ characterization
- Techno-economic analysis of MEA production costs with respect to process technologies

Entire Production Process from Lab to Industrial Scale: Hydrogen Membrane Electrode Assemblies Technology Evaluation Center, H2 MEA-TEC



1 Catalyst ink mixing process and initial dispersion steps.



2 Roll-to-roll coating line to apply catalyst layers on decal films or membranes.



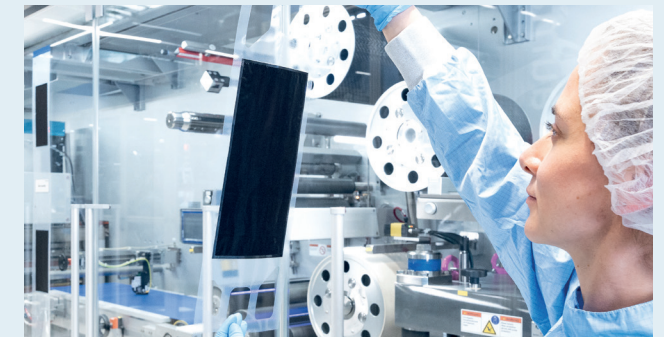
3 R2R transfer machine to transfer anode and cathode catalyst layers from decal films onto the membrane.



4 Converting machine pre-cuts CCM and subgaskets in several process steps and combines them to form 5-layer MEAs.



5 In-line quality control using optical line scan cameras.



6 The result: a full-scale 5-layer MEA.

Upscaling Fuel Cells and Electrolyzers

The ramp-up of the electrolysis and fuel cell market is driving investments in machinery for mass production. At the same time, many aspects of high-throughput production as well as industrial-scale processes, such as roll-to-roll for mass production, have not yet been thoroughly investigated.

Empowering MEA Production

Our portfolio combines the needs of material and component developers, machine suppliers and manufacturers. We assist you in optimizing machine process parameters in order to integrate new materials, components and process technologies. We also conduct research on innovative MEA designs. Our process validations include cost assessments to understand cost sensitivity in terms of machinery, material consumption, quality control, personnel, footprint and environmental impact, etc.

We know MEAs

Our core competence is our understanding of the membrane electrode assembly. We emphasize four perspectives in our research and development:

- A strong in-situ characterization with state-of-the-art electrochemical measurement techniques enables us to evaluate MEA behavior in operation.
- Using a broad range of ex-situ analytical equipment we can correlate MEA performance and degradation to its microstructure.
- With our industry-oriented MEA production processes we are able to design specific MEA architectures and use selected material compositions.
- Our modeling confirms our physical understanding of the MEA and allows us to assess various materials and operation strategies.

Further Information



Virtual Tour H2 MEA-TEC



Contact

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