

Microfluidic PEM electrolyzer for hydrogen production

Mikrofluidischer PEM-Elektrolyseur für die Wasserstoffherzeugung

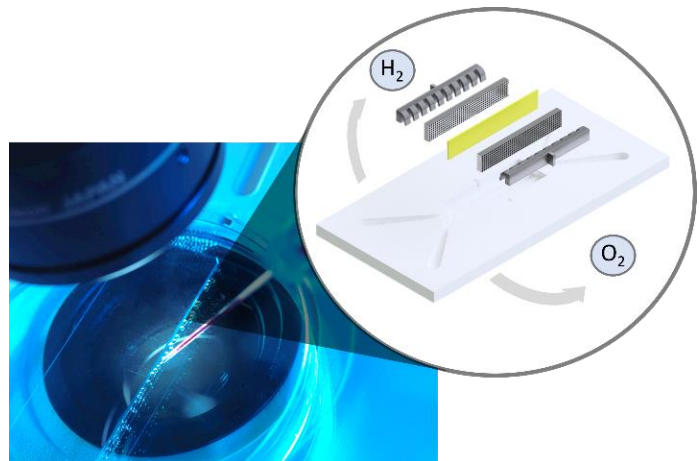
Bachelor Thesis / Master Thesis / ADP

Beginning: Immediately or by appointment

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The topic

Hydrogen has been recognized as one of the most promising pathways for decarbonizing the energy sector, while providing the required energy demands in an environmentally friendly manner. Proton exchange membrane (PEM) electrolyzers are a key technology for hydrogen production. However, for a large-scale adoption, enhancements in long-term operations are important. The durability of a PEM cell is negatively influenced by leaching of catalyst ions. To tackle this problem, it is of critical importance to understand the movement of metal ions near the catalyst layer and through the membrane. Novel experimental methods, such as fluorescence microscopy can be used to investigate the transport of ions in a microfluidic PEM electrolyzer.

Your Task

Microfluidic chips offer great potential for the in-situ visualization of ion transport during electrochemical reactions. You will design and fabricate a microfluidic chip that incorporates a miniature PEM electrolyzer. Based on the developed electrolyzer, further experiments for characterization will be conducted.

Work packages

- Design and fabrication of microfluidic chips using 3D printing and casting techniques
- Incorporation of PEM electrolyzer components into the microfluidic device to assemble a functioning electrolyzer
- Optional: Electrochemical characterization of the PEM electrolyzer
- Optional: Optical investigation of ion transfer through the membrane with Fluorescence microscopy

What you should bring

- Experience in CAD is helpful but not mandatory
- Independent and reliable working style
- Enjoy/Interest in practical work and a cake.

What we offer

- Develop in-depth understanding of electrochemical processes, especially water electrolysis
- Experience in reactor design and fabrication methods (CAD, 3D printing, etc.)
- Close supervision

If you have any questions, please do not hesitate to contact me personally, by phone or via email.