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HY-Core: Upscaling AEM Electrolysis

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Introduction/Background

- The German Government is pursuing the goal of establishing hydrogen as a key technology in energy transition (1).
- To maintain sufficiently large generation capacities in the future and obtain the needs of the energy sector and industry, technologies producing hydrogen flexibly and cost-effective are required.
- In addition to the established processes of proton exchange membrane (PEM) and alkaline electrolysis, anion exchange membrane (AEM) electrolysis plays a special role in that it combines the advantages of the other two processes.
- It is suitable for direct use with volatile power generators (wind turbines and photovoltaic systems) and does not require the use of precious metals or strongly alkaline electrolytes.
- However, it currently has a technology readiness level of 4 to 5, which makes research activities necessary for market ramp-up.

Aim of the Project

In HY-Core, the project consortium consisting of Münster University of Applied Sciences (UAS) and Enapter is building the first megawatt prototype of an AEM-based power-to-gas (PtG) plant.

The pursued outcomes of the project are:

- Reduction of hydrogen costs through establishment of AEM electrolysis,
- Determination of technical optimisation potentials.

Procedure

- To build the first AEM-based megawatt PtG plant, the project consortium use a procedure called up-numbering, stacking up 440 of Enapter's own manufactured electrolysis modules—each being rated at 2.4 kW.
- The use of a high number of existing small-scale modules shall make the system both cost-effective in production and resilient to external influences.
- If individual stacks malfunction, they can be replaced during operation.
- The electrolyte, an aqueous solution of 1 wt% of KOH, is circulating through the stacks. In order to be able to use the electrolyte for as long as possible and thus decrease operating costs, the treatment of the degraded electrolyte shall be investigated as well.

Up-numbering electrolyser modules

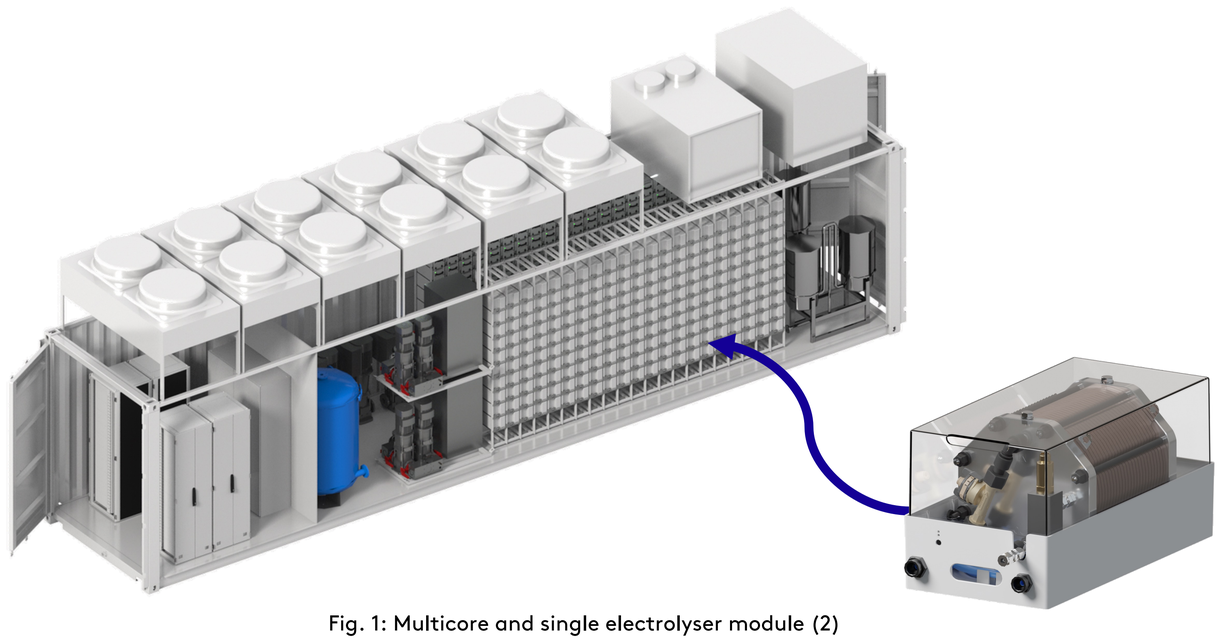

Fig. 1: Multicore and single electrolyser module (2)

Project Partner, Project Manager, Funding

FH MÜNSTER
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Enapter

Projektträger Jülich
Forschungszentrum Jülich

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AEM Electrolysis

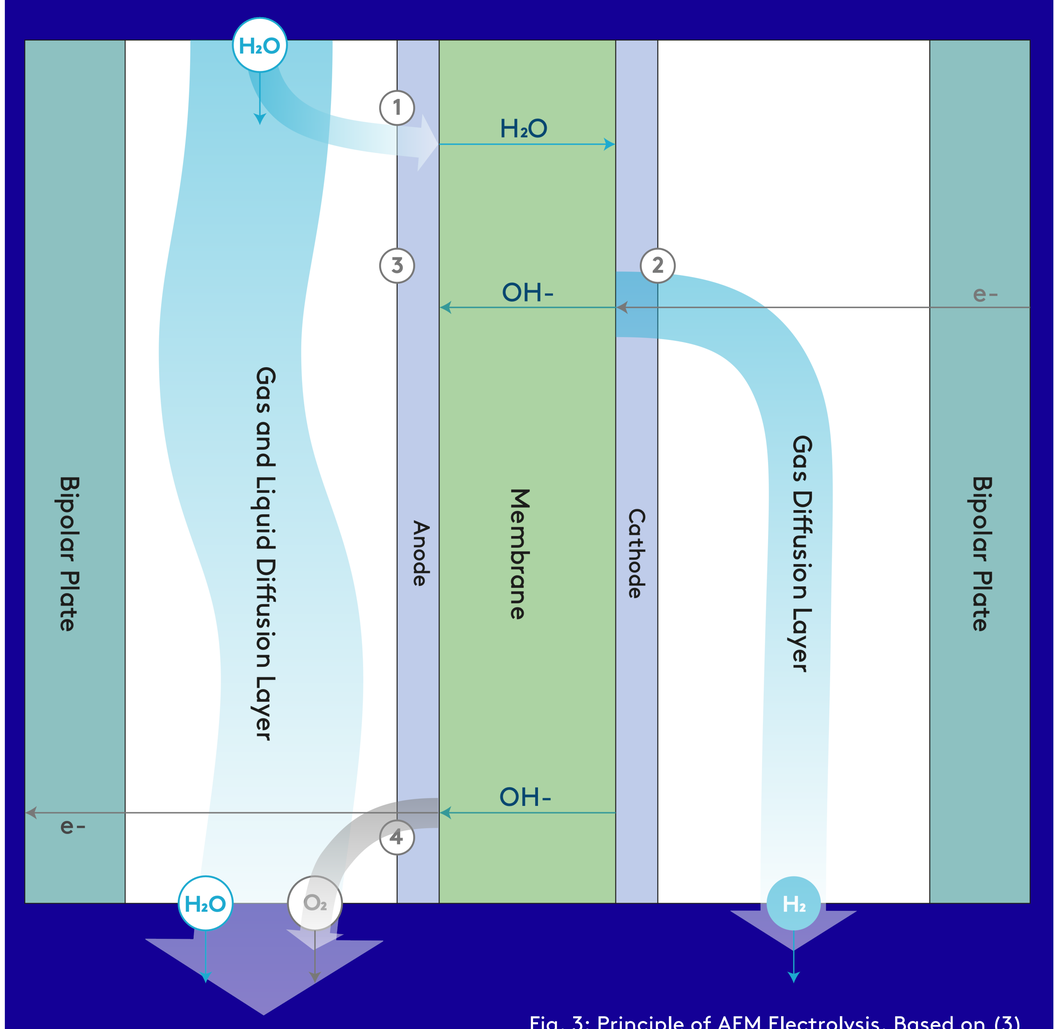

Fig. 3: Principle of AEM Electrolysis. Based on (3)

1. Water travels from the anode half-cell through the membrane.
2. Hydrogen is produced at the dry cathode and released via the gas diffusion layer.
3. OH^- moves back to the anode via the membrane.
4. Oxygen is produced from OH^- at the anode and released via the gas and liquid diffusion layer.

References

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Contact