Investigation of the effect of operating strategies on the degradation of PEM electrolysers using experiments and simulation

Description:

In the funded COMET research project "HyTechonomy", all aspects of the hydrogen economy are being considered and further developed. In the sub-project "HyGen", the production of hydrogen from green electricity by means of water electrolysis is focussed on. In order for the "green" hydrogen produced in this way to be more cost-effective than currently available climate-damaging alternatives, further improvements are needed in the production costs, efficiency and service life of the electrolysers used.

The influence of operating conditions and modes of operation on the degradation and consequently the lifetime of proton exchange membrane (PEM) electrolysers will be investigated using experiments and simulation within this master thesis. The results should lead to a model, that can be used to optimize operating strategies of real life applications.

The basis of the investigation is literature research on degradation mechanisms and the creation of a testplan for the required single-cell tests. After conducting the necessary experiments on the HyCentA single-cell testbench, the relationship between various influencing parameters and voltage degradation should be implemented in a simulation model in MATLAB Simulink. After validating the simulation model, various operation strategies should be evaluated based on their expected voltage degradation.

Content:

- Literature research on degradation mechanisms and existing models (1 month)
- Testing of various stressors on the HyCentA PEM single-cell testbench (2 months)
- Development of a load profile dependent aging model based on experimental results (1 months)
- Implementation of the Python or MATLAB degradation model in the existing MATLAB Simulink electrolyser model and validation (1 month)
- writing of thesis in English or German (1 month)

- **Start:** Any time
- **Duration:** approx. 6 Months
- **Payment**: € 2.600,00
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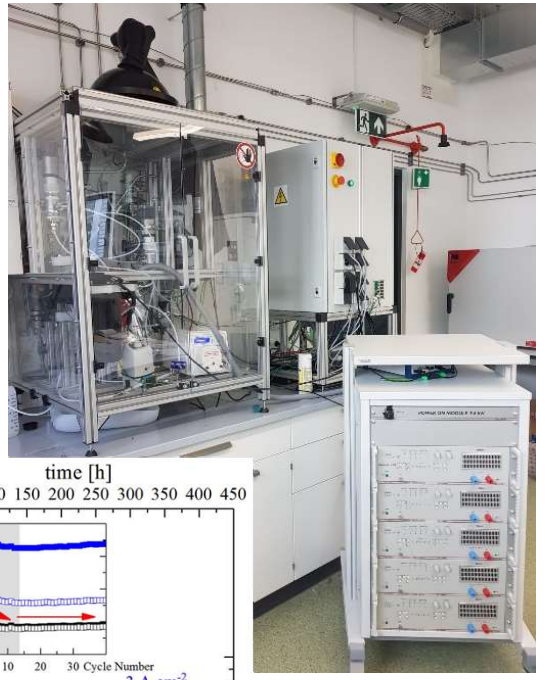
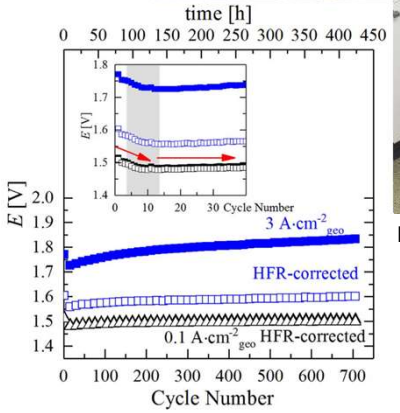


HyCentA single-cell testbench



Change of cell voltage over load cycles
DOI: 10.1149/2.0421908jes