

# Performance optimisation low-loaded PEMEL cells

## Description:

Current developments in proton exchange membrane (PEM) electrolysis for hydrogen production show a move towards thinner membrane materials with lower catalyst loading. Reasons are a significant performance increase due to reduced ohmic losses of thinner membranes and cost reduction of electrolyser stacks. However, thinner membranes increase the diffusive gas transfer and lower catalyst loading is associated with a reduced electrical conductivity. The reduction in electrical conductivity in the catalyst layer must be compensated by suitable support material, which is a challenge due to the demanding conditions on the anode side. Long-term effects of the cell lifetime still need to be investigated.

In this master thesis, the reduction of catalyst loading on the anode site of a PEM electrolyser is investigated first with a benchmark membrane. This includes different loadings of Iridium with and without support material. In the next step, membranes of different thickness are examined with selected catalyst loadings investigated in the first step. The result will be an optimized catalyst coated membrane (CCM) with reduced costs but still high electrical conductivity and thus high hydrogen production rates. This topic is tackled in the COMET centre subproject "ProGen".



Single cell test station

## Content:

- Literature research regarding thin membrane technology and low-loaded catalysts (1-2 months)
- Performance characterisation and data analysis of single cells (3-4 months)
- Thesis writing (1 month)

**Start:** Any time

**Duration:** approx. 6 months

**Compensation:** € 2 600

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