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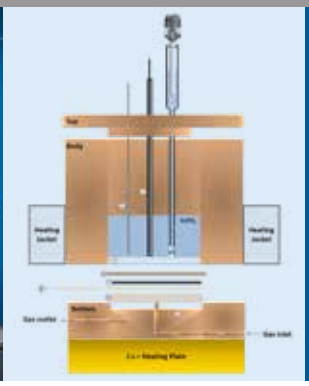


1 *Classic DEMS cell.*
2 *DEMS cell for GDE characterization.*
3 *Single-cell tests.*

INVESTIGATION OF THE INFLUENCE OF FUEL IMPURITIES

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Challenge

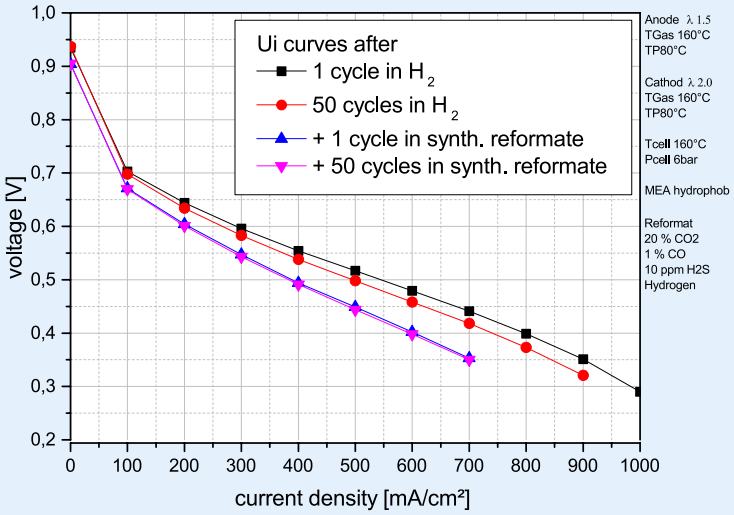
As fuel cell technology is introduced into new applications, it is important that the fuel cells can be operated with hydrogen from different sources, including the integration of an upstream reformer. This means that the hydrogen may contain impurities. In order to select fuel cell components such as MEAs, and also for the dimensioning of filters, it is important to know and understand the effects of these impurities. For this purpose, Fraunhofer ICT has developed a variety of testing methods.

Catalyst testing

A catalyst with a high tolerance to impurities is a precondition for the stability of the entire system. Fraunhofer ICT can test gas diffusion electrodes on a small scale. Online MS measurements allow the effects of impurities on the electrochemical behavior to be investigated under near-real conditions, as well as the reactions of the impurities. Examples include the investigation of the influence of methanol on DMFC cathodes, and the differentiation between the oxidation of CO from the fuel cell and the carbon support material of HT-PEMFC anodes.

Tests on MEA level

The results of tests on catalysts need to be validated, at least on a single cell level. Fraunhofer ICT is able to test LT-PEMFC, HT-PEMF and AEMFC cells with different gaseous and liquid impurities in the anode or cathode gas, including in the ppm range.



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Examples

- Separation of CO oxidation and the catalyst support corrosion of new PtRh/C catalysts for HT-PEMFCs
- Proof of thiofuran tolerance of standard Pt/C catalysts
- Investigation of the oxidation products of methanol on DMFC cathodes
- Proof of operational stability of an HT-PEMFC with a highly wetted reformate

Our offer

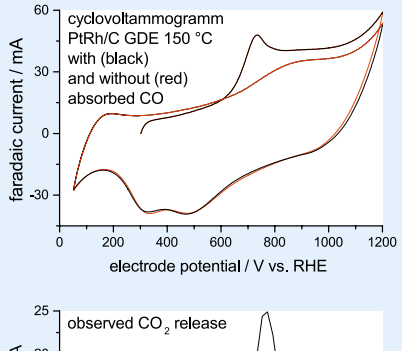
- Investigation of the effect of impurities on electrode catalysts
- Identification of catalysts with a high tolerance
- Purification from undesired reactions and secondary products, if any
- Validation in single-cell tests

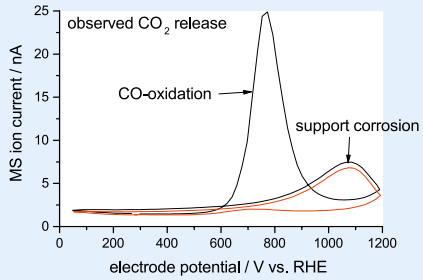
4 Single-cell measurement on the MEA of a project partner, concerning accelerated aging via start-stop cycles in H_2 and a synthetic reformate.

5 CO stripping in an HT-DEMS cell at 150 °C in the presence of a PtRh/C catalyst.

6 Hydrogen oxidation at the Pt/C catalyst at 145 °C, in the absence (black) and presence (blue) of toluene and thiophene.

7 Linear-sweep measurement of the oxygen reduction at the standard Pt/C catalyst, with and without methanol. Online MS measurement of the product release during methanol oxidation.





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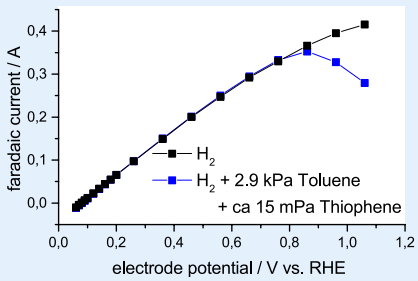

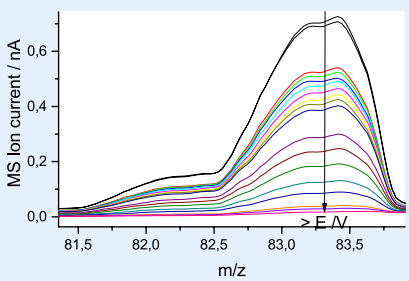

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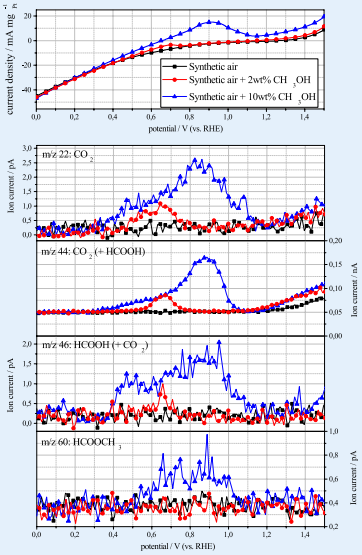

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