ENE 005

Institute of
Engineering Thermodynamics

INSIDE –
In-situ Diagnostics in Water Electrolysers

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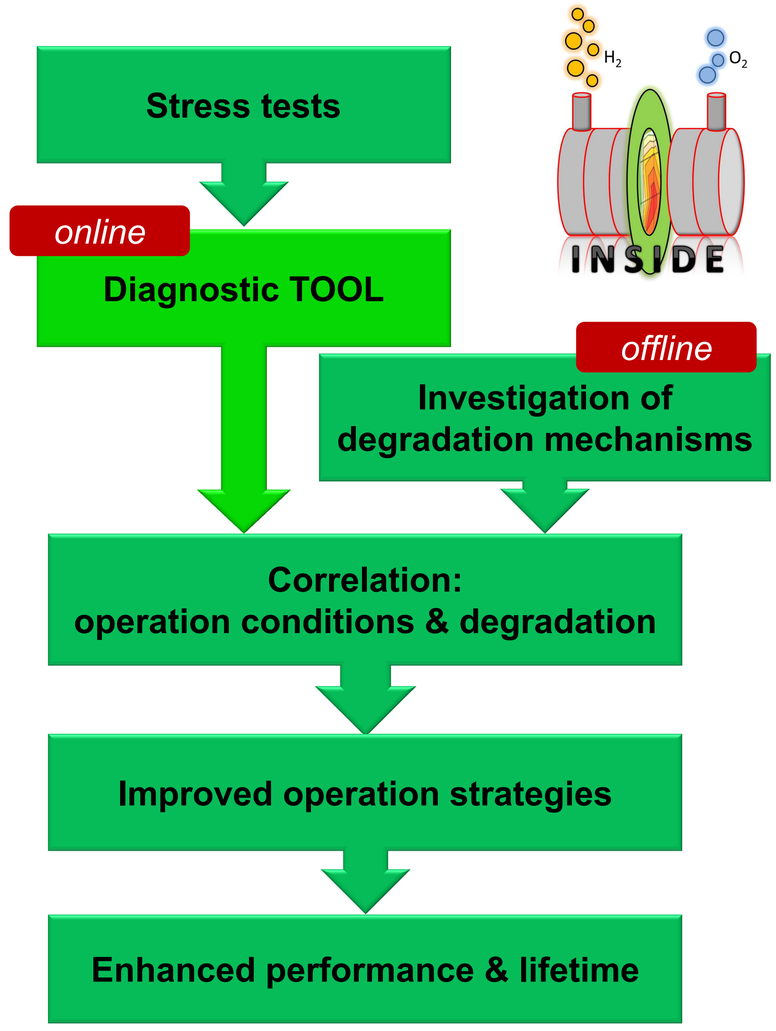
Main objectives

An electrochemical in-situ diagnostics tool for the monitoring of locally resolved current densities, which had been originally developed for the application in polymer electrolyte membrane fuel cells, is adapted to water electrolysers.
Three different technologies are represented in the undertaking:

- alkaline water electrolysis
- proton exchange membrane water electrolysis
- anion exchange membrane water electrolysis.

The developed tools allow to correlate performance issues and ageing processes with local anomalies. Corresponding mechanisms are investigated with ex-situ analytics.

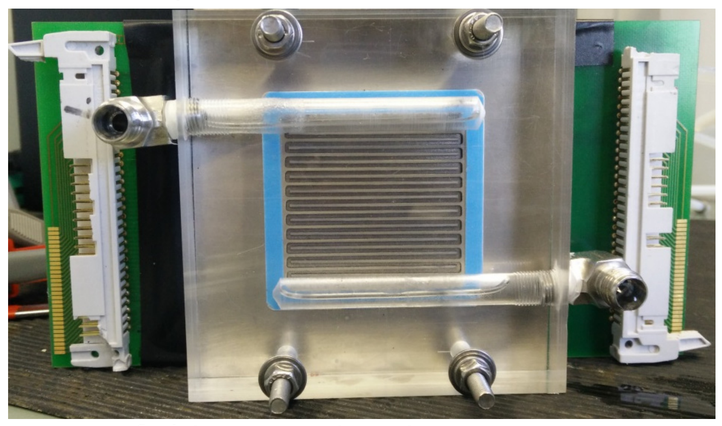


Technology

The patented segmented printed circuit board (PCB) for the monitoring of current density distributions in PEM based fuel cells is used and steadily improved at DLR. Applications are e.g. specific degradation mechanisms and optimisation of operation parameters. The technology has already been adapted for the use in Redox-Flow Battery systems and is ready for the next development step.

Challenges

The adaptation of the segmented board technology to chemical and physical environment: pH, pressure, bubble formation, and other current densities.



Successful integration in PEMWE test cell with optical access

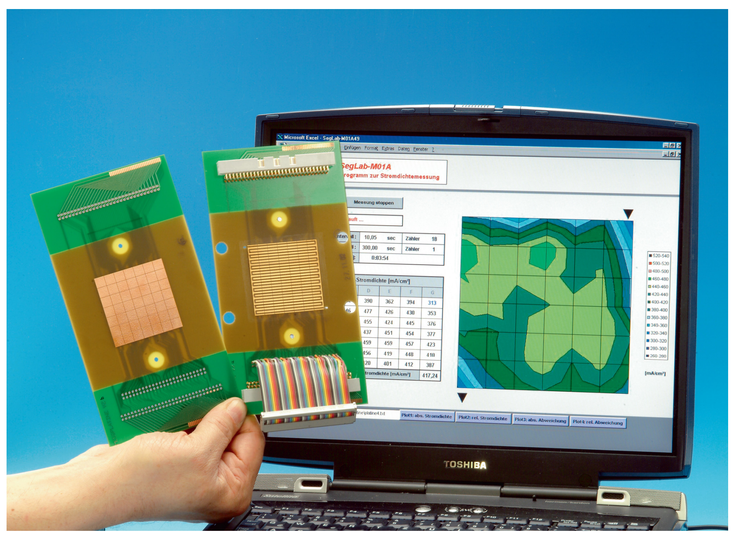
Partners

- Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Stuttgart, Germany (Coordinator)
- NEL Hydrogen AS, Notodden, Norway
- Heliocentris Italy S.r.l., Crespina, Italy
- Centre National de la Recherche Scientifique, France
- Université de Strasbourg, Strasbourg, France
- Hochschule Esslingen, Esslingen, Germany

Perspectives

Embedding of an in-situ tool enables:

- monitoring of performance and local anomalies during operation
- revealing systematical deficiencies not detectable offline
- correlating degradation mechanisms and system parameters
- identifying and preventing critical operation
- systematically improving the efficiency of water electrolysis
- recommendations for the use of present and for the design of future water electrolysers



Segmented printed circuit boards for in-situ online-diagnostics in PEM fuel cells

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Coordination:
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