



Hydrogen Europe: European Hydrogen & Fuel cell Project Database

Project AD ASTRA

HARnessing Degradation mechanisms to prescribe Accelerated Stress Tests
for the Realization of SOC lifetime prediction Algorithms

AD ASTRA aims to define Accelerated Stress Testing (AST) protocols deduced from a systematic understanding of degradation mechanisms of aged components in solid oxide cell (SOC) stacks, operating in both fuel cell and electrolysis modes. In particular, fuel and oxygen electrode issues and interconnect contact loss will be tackled. The project will build upon relevant information harvested in FCH JU projects, as well as make use of many samples taken from stacks operated in the field for thousands of hours, supplied by leading European SOC manufacturers across the two application areas CHP and P2X (combined heat&power generators and power-to-commodity energy storage). The approach to harnessing the intricate phenomena causing critical performance degradation will be based upon a methodical analysis of in-service performance data correlated with post-operation states, augmented by a dual-focus campaign targeting macroscopic stack testing procedures as well as specific component ageing tests. The probabilistic nature of degradation will be captured by slimming down deterministic simulation models through conception and integration of stochastic correlations between (nominal/accelerated) operating conditions and degradation effects, based on statistically significant data obtained from field-tests and purposely generated experiments. Stochastic interpretation will thus serve the physical description of dominant SOFC degradation mechanisms in CHP and P2X operation, but allowing rapid estimation of remaining useful stack life. The combined results will be translated to validated test protocols that allow quantifying and predicting degradation in SOCs as a function of test aggravation, defining appropriate transfer functions between stress-accelerating and real-world conditions. The overall project approach will be formalized for adoption by the relevant standards-developing organisations.

Funding

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Project partners

Coordinator :

[CEA - Commissariat à l'énergie atomique et aux énergies alternatives](#)

Partners :

[DVGW - German Technical and Scientific Association for Gas and Water](#)

[EPFL - Ecole Polytechnique Fédérale de Lausanne](#)

[EIFER - Europäisches Institut für Energieforschung](#)

[INSTITUTE OF ELECTROCHEMISTRY AND ENERGY SYSTEMS](#)

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Sub project(s)

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