



Hydrogen Europe: European Hydrogen & Fuel cell Project Database

Project ROBANODE

Understanding and minimizing anode degradation in hydrogen and natural gas fuelled SOFCs

Solid oxide fuel cells (SOFCs) are among the most promising fuel cell systems as they produce electric energy with high efficiency. Moreover, they are quite flexible concerning the use of hydrogen as well as of carbon based fuels, due to their high operation temperatures that allow for direct oxidation or reforming in the anode compartment, due to the catalytic action of the anode at these temperatures. In spite of their significant comparative advantages, especially for stationary applications, SOFCs have not been commercialized yet, due to their production cost as well as to their gradual degradation especially that of the anode electrodes, which results in limited lifetime. The key factors affecting anode degradation in hydrogen fuelled SOFCs are thermal sintering, electrochemical sintering and local oxidation (redox cycling) of the nickel particles. Additional anode degradation factors in SOFCs fed with natural or biogas are carbon deposition and sulfur poisoning. Although research on these issues is intensive, no major technological breakthroughs have been so far with respect to robust operation, sufficient lifetime and competitive cost. As a result, penetration of this quite promising technology to broad markets is not possible yet. The proposed project offers an effective methodology for a holistic approach of the SOFC anode degradation problem, through detailed investigation of the degradation mechanisms under various operating conditions and the prediction of the anode performance, degradation and lifetime on the basis of a robust mathematical model, which takes into account all underlying phenomena. In this respect, the ROBANODE project proposes a novel strategy for understanding degradation phenomena and addresses scientific and technological issues, which shall offer significant impact concerning successful implementation of both hydrogen and gaseous hydrocarbon, fuelled Solid Oxide Fuel Cells.

Project Information

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Project partners

Coordinator :

FORTH/ICEHT - Foundation for Research and Technology - Hellas/ Institute of Chemical Engineering Sciences

Partners :

EPFL - Ecole Polytechnique Fédérale de Lausanne

CNRS - Centre National de la Recherche Scientifique

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Sub project(s)

Sub project 1

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Sub project categories

Research

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