DEMMEA

Understanding the Degradation Mechanisms of Membrane-Electrode-Assembly for High Temperature PEMFCs and Optimization of the Individual Components

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Abstract:
The state of the art high temperature PEM fuel cell technology is based on H3PO4 imbibed polymer electrolytes. The most challenging areas towards the optimization of this technology are: (i) the development of stable long lasting polymer structures with high ionic conductivity and (ii) the design and development of catalytic layers with novel structures and architectures aiming to more active and stable electrochemical interfaces with minimal Pt corrosion. In this respect the objective of the present proposal is to understand the functional operation and degradation mechanisms of high temperature H3PO4 imbibed PEM and its electrochemical interface. The degradation mechanisms will be thoroughly studied and be focused on low loading Pt or nanostructured alloyed Pt electrocatalysts and catalytic layers, which will be supported on finely dispersed or structurally organized modified carbon supports (nanotubes, pyrolytic carbon). A stable electrocatalytic layer with full metal electrocatalyst utilization at the electrode/electrolyte interface can thus be achieved. The high temperature PEM membrane electrode assembly (MEA) will be based on a) PBI and variants as control group and b) the advanced state of the art MEAs based on aromatic polyethers bearing pyridine units. These MEAs have been developed optimized and tested at temperatures up to 200oC, where they exhibit stable and efficient operation. In the present proposal they will be studied and tested in single fuel cells with regards to their operating conditions and long term stability aiming to the development of a series of diagnostic tests that will lead in the design and development of an accelerated test and prediction tool for the MEA's performance. If we can really understand the fundamentals of the failure mechanisms, then we can use that information to guide the development of new materials or we can develop system approaches to mitigate these failures.

Project details	
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Participant organisation	**Country**
FOUNDATION FOR RESEARCH AND TECHNOLOGY HELLAS	Greece
Paul Scherrer Institut	Switzerland
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (CNRS)	France
FuMA-Tech Gesellschaft für funktionelle Membranen und Anlagentechnologie mbH	Germany
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