Project Report 2043

Investigation of phenomena affecting the liquid water balance in a 50 cm2 PEFC

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Objectives: short, medium and long term

-Short Term: post-processing of experimental data obtained. Integration of the results obtained into the knowledge of the research groups involved (both at AICIA and PSI). Preparation of publications for conferences and journals. -Medium Term: continue with the collaboration with PSI (publications, measurements, research projects, etc.). Intended to carry out additional testing campaings if possible. -Long Term: continue with the collaboration with PSI (publications, measurements, research projects, etc.).

Brief summary of work carried out

Neutron imaging experiments for an operating 50 cm2 fuel cell: -Effect of different shut-down cell purging strategies tested (purging efficiency and cell recovery efficiency in subsequent start-up). -Effect of different cell humidification tested (3x3 matrix RHa/RHc tested). -Measurement of the effect of the cell/flow field channels orientation (influence on channel liquid water content/distribution). -Effect of different cathode stoichiometry on channel liquid water content/distribution. -Effect of the cell operating pressure on cell liquid water content/distribution (full matrix of Pan/Pcat tested).

Main achievements intended for publication

-Effect of different shut-down cell purging strategies tested (purging efficiency and cell recovery efficiency in subsequent start-up). -Effect of different cell humidification tested (3x3 matrix RHa/RHc tested). -Measurement of the effect of the cell/flow field channels orientation (influence on channel liquid water content/distribution). -Effect of different cathode stoichiometry on channel liquid water content/distribution. -Effect of the cell operating pressure on cell liquid water content/distribution (full matrix of Pan/Pcat tested).

Difficulties encountered

-Too brittle material of the new bipolar plates (composite) intended for testing. This resulted in small cracks in the plates and subsequent gas leakages. The testing protocols and one of the objectives of the experiment (flow field performance comparison) had to be modified during the set-up of the experiment, with successful outcome of results for

experiments not initially expected. -The mounting of the cell took longer than expected due to cell leakages (previous item) and errors in cell gaskets (user errors). The time for experiments could be recovered thanks to the scripting facilities of the test bench for full automatic testing 24 h.

Further comments

Excellent testing facility for fuel cell research. Excellent expertise and skills of PSI personnel for successful cell testing.