

Objective and Scope

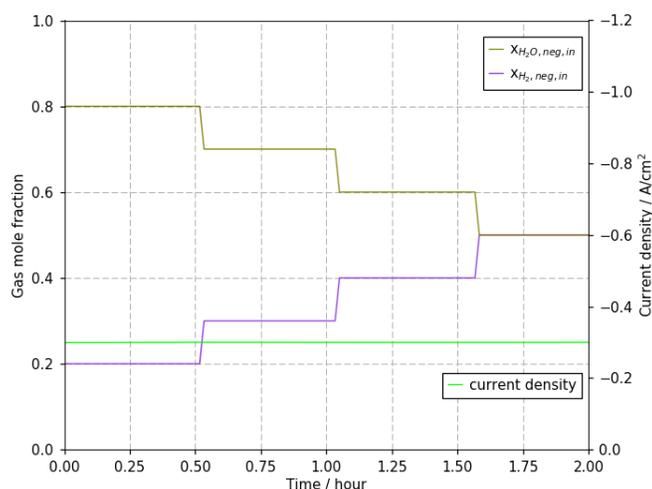
This test module deals with solid oxide cell (SOC) operation at different reactant composition either as a fuel cell (SOFC) or as an electrolyser (SOEC) to determine the influence of the reactant composition on the performance of an SOC cell/stack. It is a general characterization method that can be used in SOC R&D and for quality assurance.

Main Test Input Parameters (TIPs)

Static TIP	Variable TIP
Flow rates of inlet gases (f_{in})	Composition of inlet gases ($x_{i, in}$)
Temperature of the oven (T_{oven})	
Current (I)	

Test Procedure

- Set the stack temperature to the defined temperature. Change the reactant flows/compositions to the start point of the defined reactant gas flows/compositions.
- Change the stack/cell current to the defined current.
- Keep one of the electrode gas composition fixed while varying the reactant composition of the other electrode.



Example of evolution of inlet gas mole fraction during test (SOEC mode)

Critical Parameters and Parameter Controls

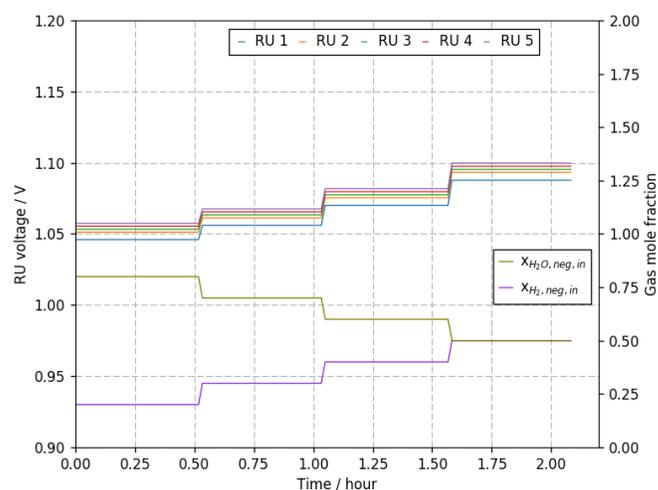
- Stability of stack/cell temperatures under each changing of gas composition.
- In SOEC mode, special care towards a stable supply of steam should be taken, so that the fluctuation at OCV for a single cell/RU is less than e.g., ± 10 mV per cell.

Main Test Output Parameters (TOPs) and Derived Quantities

TOP	Derived Quantities
Voltage of cell/RU/stack (V)	Reactant gas utilization (U_{gas})
Temperature of gas streams at cell/stack inlet/outlet, temperature of cell/stack (T)	Electrical power density ($P_{d,el}$)

Data Post Processing and Representation

Representation examples of influence of changing of reactant composition:



Example of RU voltage evolution with changing of inlet gas composition at -0.3 A/cm² in SOEC mode

