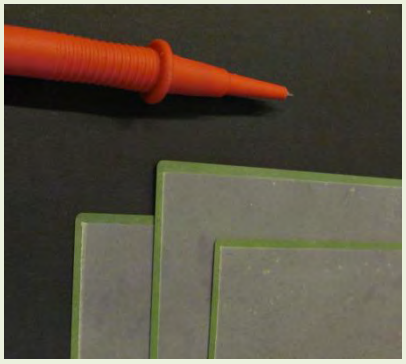
Fiaxell
SOFC Technologies™

Components for
Solid Oxide Fuel Cell development

2R-Cell™ a redox resistant ASC



Fiaxell has developed a novel anode supported thin electrolyte, the **2R-Cell™**, that provides **robustness and reliability upon multi thermo and redox-cycles**.

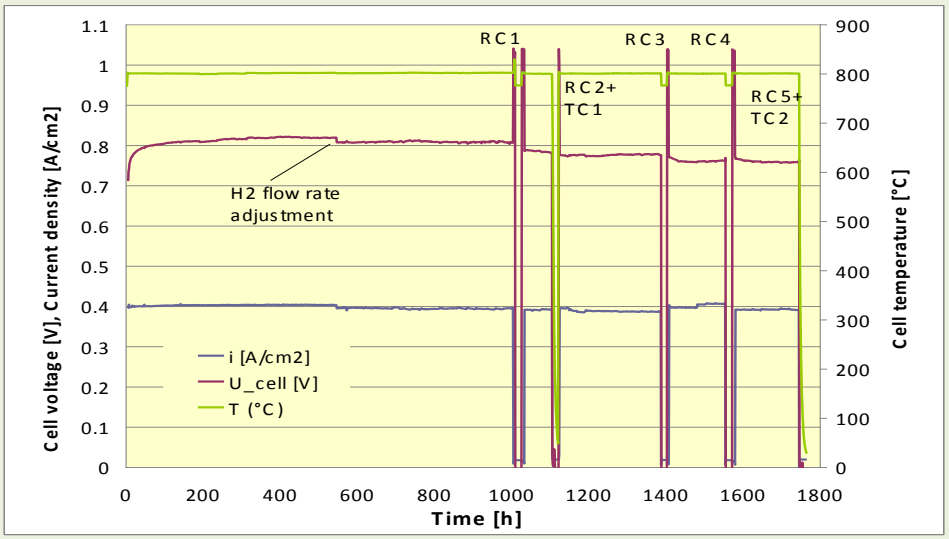
Mechanical properties before and after 10 redox-cycles have been measured at the University of Trento.

The maximal bending strength (180±10 Mpa) did not decrease after the RC and the Weibull modulus was about 9 which indicates a reliable ceramic.

Left: 100x100 mm 2R-Cell with a post sintered 2.5 µm GDC buffer layer

- 4% potential drop at first redox cycle
- Less than 1 % loss per RC for the 3 following redox cycles
- Cumulative loss of 5% after 1800h, 4 RC and 1 TC

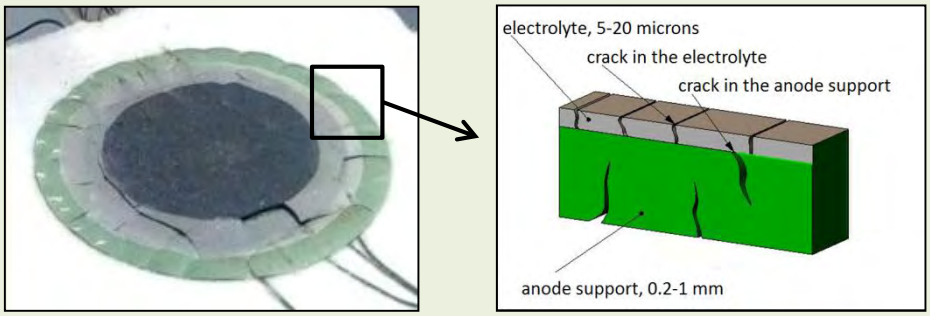
2R-Cell™ after a test and redox cycles in the Open Flanges Set-Up. Gold grid is used to collect current on cathode side



Cell potential of 2R-Cell at an operating temperature of 800 (°C) recorded during 1800 (h) at LENI-EPFL. The cell endures multiples redox and thermo cycles. It is equipped with an LSM/8YSZ cathode.

Why using a redox cell?

Contrary to 2R-Cell™, standard anode supported cell (ASC) are destroyed when re-oxidation occurs. The reason is the expansion of the anode support when the metallic nickel re-oxidizes, which causes micro-cracks in the electrolyte and anode support



Standard ASC after a complete redox cycle. Failures are everywhere in the cell

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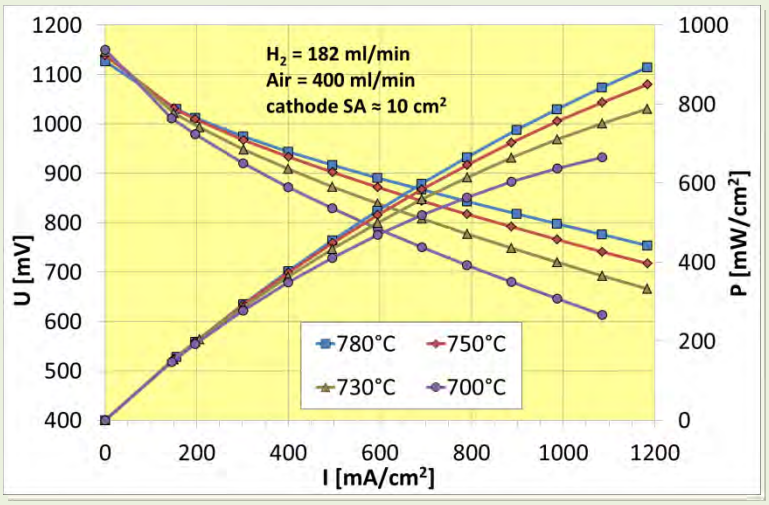
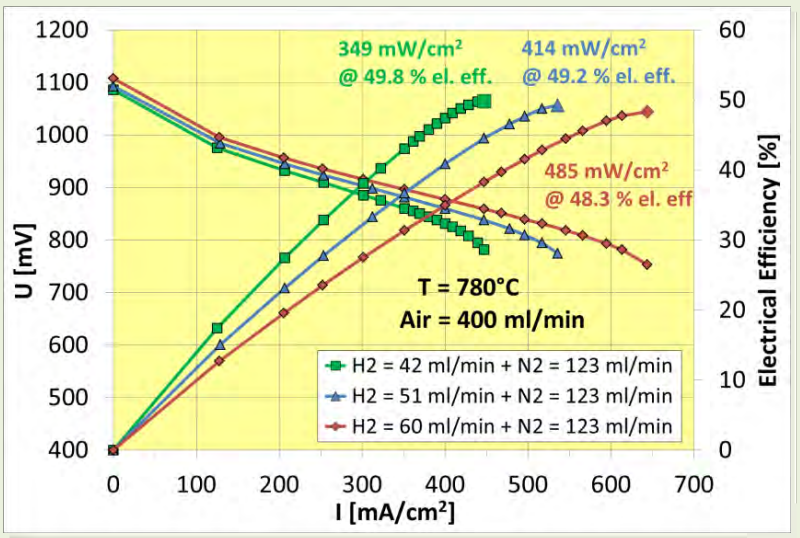
Power density

- LSC-GDC cathode and a GDC buffer layer
- Electrical performances are measured at 700, 730, 750 and 780 (°C)
- Current density of **1 A/cm²** achieved at **0.8 V and 780 °C**



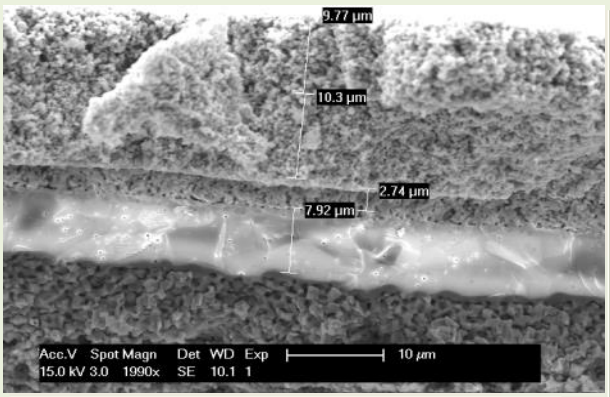


Efficiency

- Electrical efficiency at 42, 51 and 60 ml/min of dry H_2
- **Close to 50 % efficiency** obtained in the Open Flanges Set-Up™ (without any sealing)
- Maximum of **485 mW/cm²** with an efficiency greater than **48%**

Benefits

- **Redox 2R-Cell™** are made with very standard raw materials: NiO, 8YSZ, 3PSZ
- **Customizable**: compatible with other electrolyte materials such as ceria, BIT or BCY (protonic conductor)
- **Robust for electrolysis** test mode
- Removal of carbon and sulfur deposition simply by stack re-oxidation



SEM cross section of 2R-Cell™. From bottom to top: AFL, electrolyte, GDC, LSC-GDC, LSC composite cathode

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