CURRENT COLLECTION AND STACKING OF ANODE SUPPORT CELLS WITH METAL INTERCONNECTS TO COMPACT REPEATING UNITS

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Repeat element and short SOFC stack development is presented using ASE based cells for <800°C operation with FeCr interconnects. Emphasis is put not on high power density but on the comparison of power output between small single cells (4 cm^2) carrying ideal current collectors and larger cells of identical fabrication (50 cm^2) but equipped with realistic current collectors adequate for low cost stacking and comprising thin metal interconnect (MIC) sheets (≤ 1 mm) and gas distribution layers (GDL) for current pick-up from the electrodes.

We demonstrate that this difference in performance is less than a factor of 2, with roughly half of the extra loss attributable to additional contact resistances and the other half to gas feed limitation effects that lead to inhomogeneous current distribution and fuel-empoverished zones. Using an unoptimised cathode, power density of 0.2 Wcm^{-2} or 10 W_{el} per 50 cm^2 cell at 800°C was obtained. This result was reproducible for short stacks of 1, 3 and 4 elements, for a compactness of >0.5 kW/L.
Thermal cycling for a complete repeat element assembly was demonstrated with insignificant deterioration.

Implementation of an improved cathode will allow to increase this output. Ongoing modelling efforts on fluid flow and thermal behaviour will allow to further optimise the present design, especially on the manifold aspect, in order to improve gas distribution.

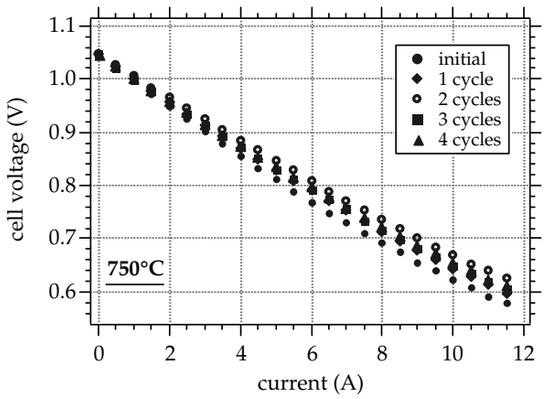

Fig. 1. i-V output after thermal cycling (x4) on a complete repeat element (50 cm^2 active cell area) including GDLs and MICs.

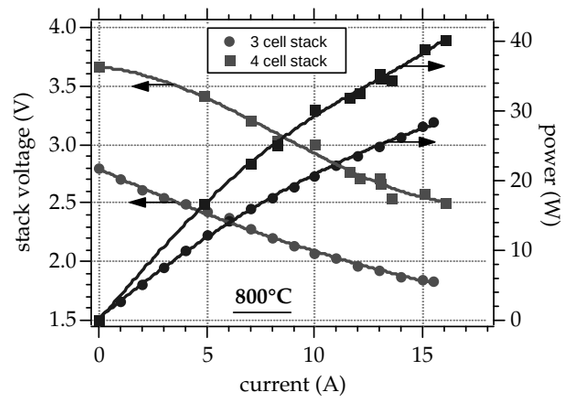

Fig. 2. Power output of 3-cell and 4-cell short stacks (50 cm^2 active cell area, < 3 mm repeat unit height)