

DEVELOPMENT OF SOFCROLL⁽¹⁾

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SOFCRoll (1) is a new solid oxide fuel cell design being developed at the University of St Andrews. Figure 1 is a schematic of the SOFCRoll design. The gases are introduced at the centre of the fuel cell, and then flow around the spiral. In this way the outer layers of the SOFCRoll not only provide structural support, but are also an active element of the fuel cell. The new geometry of the SOFCRoll therefore removes the need for support components associated with the two leading designs of planar and tubular geometry. This should provide much higher power densities together with reduced space requirements.

Another feature of this design is that, similar to the tubular cells, the fuel and oxidant gases are kept separate without the requirement of high temperature seals associated with the planar cells (1).

Production of the SOFCRoll utilises tape casting, which is a cheap and easily scalable manufacturing technique. The geometry requires all components to be co-fired as a single unit (1, 2), which further reduces the cost and time of the cell production. The shrinkage of the cell components however needs to be matched to prevent cracking of the cells on firing, whilst at the same time still producing sufficiently porous electrodes and a gas tight electrolyte. With careful control of tape casting parameters both of these conditions can be achieved as shown in Figure 2. This shows a typical microstructure achieved when co-firing the tape-cast components as a single unit in the SOFCRoll geometry.

Preliminary tests have demonstrated good sealing, whilst on-going modifications are yielding promising improvements in current densities.

This paper gives an overview of current SOFCRoll development, together with power output expectations.

REFERENCES

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2. F. G. E. Jones and J. T. S. Irvine, in *Fifth European Solid Oxide Fuel Cell Forum*, J. Huijsmans, Editor, vol. 1, p. 123, European Fuel Cell Forum, Oberrohrdorf, CH (2002)

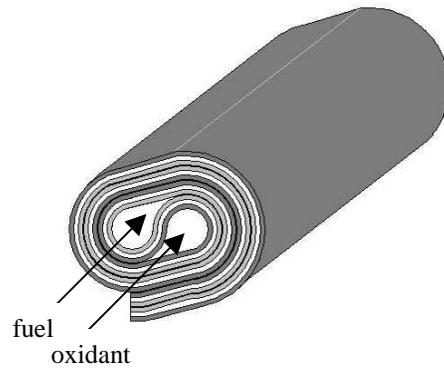


Figure 1: Schematic of the SOFCRoll geometry

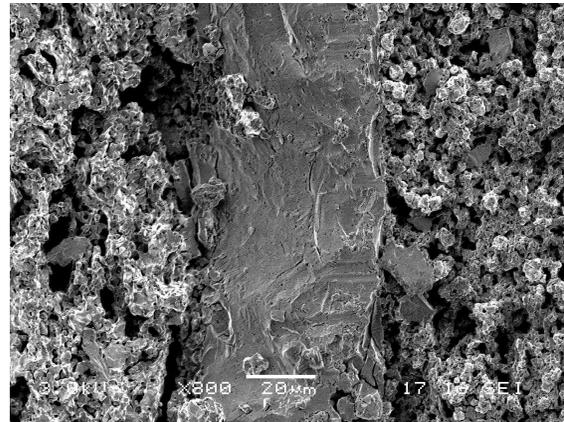


Figure 2: SEM image showing the microstructure of the co-fired SOFCRoll fuel cell (left to right, cathode, electrolyte, anode) produced by tape casting