Electrochemical Performance of Single Step Fabricated Intermediate Temperature Solid Oxide Fuel Cells (IT-SOFC)

V.Sivasankaran[a] [b], L.Combemale[a], G.Caboche[a], M.C. Pera[b]

[a] ICB, CNRS UMR 6303, Department I.R.M,University of Burgundy, Dijon, France,

[b]FCLAB, CNRS UMR 3539, FEMTO -ST, UMR 6174, University of Franche-Comte, Belfort, France.

Solid oxide fuel cells which directly convert chemical energy into electrical energy have gained attention in last few decades due to high efficiency and variety of fuels used [1]. Material selection and design plays a crucial role in the performance of the cell. The main criteria for selection of materials are its working temperature range. Conventional materials used have high working temperature range of above 800°C. Here comes the problem of the reactivity of the interconnect materials, their cost and durability. To overcome this, working temperature has been reduced and Intermediate Temperature Solid Oxide Fuel Cells (IT-SOFC's) have been in the picture for a while from now. Its working range is 500-700°C. To enhance performances, anode supported planar SOFCs are chosen and preferred over other types [2]. The fabrication of large size planar cells are always time consuming, costly and involves many steps of sintering [3].

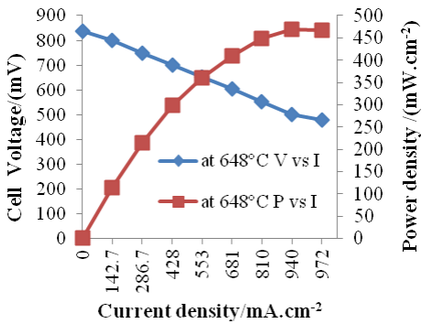

Figure 1. I-V and Power density curves at 648°C

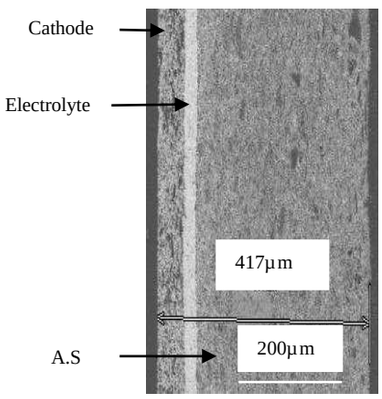

Figure 2. SEM Picture of Full cell

A tape casting method is presented, aiming to produce cost effective and large size cells, this article presents large size planar anode supported cells with multi layer obtained by tape casting and co-sintering at low temperature [4]. By using this method crack free, flawless full cell have been achieved. NiO- $Gd_{0.1}Ce_{0.9}O_{1.95}$ (GDC) composite with carbon (pore former) has been used as anode support (A.S), GDC as electrolyte and $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ - GDC as cathode. After one step sintering process the cells of size 10 cm^2 have been characterized in (Fiaxell set up) and a power density of 466 $mW.cm^{-2}$ at 648°C has been achieved which was shown in Figure 1.Figure 2. shows the cross section of full cell after polishing obtained by above said process.

References

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4. V.Sivasankaran, L.Combemale, G.Caboche, French patent number FR12/59643.