Subtheme : Fuel cells & electrolysers I
Presentation type: Oral
Reference: 437
Monday, June 24 at 5:20 PM

Characterisation of Intermediate Temperature Solid Oxide Fuel Cells (IT-SOFC) fabricated only by tape casting

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Abstract

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, design and development 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]

A tape casting method is presented, aiming to fabricate cost effective and large size cells, this article presents large size planar anode supported cells with multi layer developed by tape casting and co-sintering at low temperature [4]. Nickel Oxide (NiO) - Gd0.1Ce0.9O1.95 (GDC) composite with carbon poreformer has been used as anode support layer, GDC as electrolyte layer and La0.6Sr0.4Co0.2Fe0.8O3 (LSCF)-GDC composite as cathode layer. By using this method crack free, flawless full cells,have been achieved. Cells having 10 cm2 active area have been characterized in fiaxell set up, which have yielded open circuit voltage (OCV) of 1.002 V, 0.920 V, 0.836 V at 500, 598 and 648°C respectively. The maximum power density obtained at 500, 598 and 648°C are 124 mW.cm-2, 364 mW.cm-2 and 466 mW.cm-2. So these large cells developed by above said process will be stacked ; long term performance and reactivity are to be studied in near future.

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