Fabrication of Anode-Supported SOFC by Sol-Gel Coating Method

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Recently, many attempts have been made to reduce the operation temperatures of solid oxide fuel cells (SOFCs) below 700^0C to enhance their thermal- and mechanical-shock resistance. However, since the lowering of temperature causes the increase of electrolyte ohmic loss and electrode overpotential, the fabrication of thin film electrolytes and the extension of the triple-phase boundary (TPB) to electrodes as well as cell designs will be key issues. Here we have applied the sol-gel hot-spin coating process as the cheapest and simplest method fabricating thin electrolytes onto porous substrates. To improve the performance of the LSM cathode, the complete cell was modified by sol-gel dip-coating process reported by Yoon et al.. The cell thus fabricated was set up in test cell station with 200 ml.min^{-1} humidified H_2 (30%) and N_2 as the fuel and 200 ml.min^{-1} humidified air as the oxidant at 600^0C.

The single cell consisting of 20μm thick electrolyte, Ni-Al porous anode substrate, and LSM cathode exhibited the open circuit voltage of 1.14V and maximum power density of 0.34 W.cm^{-2} at 600 mA.cm^{-2} at 600^0C with humidified hydrogen as the fuel and air as the oxidant.