

**박막 고체산화물 연료전지용 LSM-YSZ 전극  
(LSM-YSZ Cathodes for Thin-film Solid Oxide Fuel Cells)**

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1. Introduction

In recent years several groups worldwide have been involved in the development of solid oxide fuel cells (SOFCs) capable of delivering high power at reduced temperatures. The approaches generally fall into two categories: the use of materials with substantially higher conductivity and/or fabrication of SOFCs using thin film electrolyte membranes. Clearly, after the resistance of the electrolyte has been lowered to acceptable (or negligible) levels, the performance of anode and cathode becomes the limiting factor to performance at reduced temperatures. In this study the electrochemical evaluation of a series of cathodes will be presented.

2. Experimental

For the electrolytes, sintered 8mol% yttria-stabilized zirconia (YSZ) pellets were used. Various  $\text{La}_{1-x}\text{Sr}_x\text{MnO}_3$  (LSM;  $0 \leq x \leq 0.5$ ) powders were prepared by glycine-nitrate combustion process, and then calcined in air at 1200°C for 4 h. The LSM powders and YSZ powders were milled in a ratio 50/50 vol%. The LSM-YSZ cathode powders applied on the electrolyte plates as a working electrode by the colloidal deposition technique. The electrodes were examined by scanning electron microscopy and studied by impedance spectroscopy.

3. Results and discussion

Reproducible impedance spectra were confirmed by using the improved cell. The typical spectra measured for an air//air cell at 900°C were composed of two depressed arcs. Impedance characteristics of the LSM-YSZ cathodes found to be affected by experimental conditions such as operation temperature, composition, electrolyte geometry and surface polishing, catalytic interlayer, and changing Pt paste. The results obtained indicate that some of conditioning can be of great importance for the properties of the cathode and thus the performance of the SOFC.

4. Conclusions

Further improvements of the electrochemical performance for LSM-YSZ cathode materials at reduced temperatures may come from engineering of electrolyte/electrode interface. The impedance response was very sensitive to fabrication origin of the LSM-YSZ/YSZ cells, and reproducible spectra could be obtained by establish very consistent process and test procedures of the cell components.

5. References

1. S. Souza, S.J. Visco, and L.C. De Jonge, *Solid State Ionics*, **98**, 57 (1997)
2. L.A. Chick, L.R. Pederson, G.D. Maupin, J.L. Bates, L.E. Thomas, and G.J. Exarhos, *Mater. Lett.*, **10**[1,2], 6 (1990)