

COMPARISON OF ELECTRO AND AIR-BLAST SPRAY DEPOSITION FOR PREPARING LANTHANUM STRONTIUM MANGANITE FILMS

Jongmo Im, Inyu Park, Seungun Jang, and Dongwook Shin*

*Division of Material Science & Engineering, Hanyang University
17 Haengdang-dong, Seongdong-gu, Seoul, 133-791, Korea*

*Corresponding author: dwshin@hanyang.ac.kr

Electro spray deposition (ESD) and air-blast spray deposition (ASD), using liquid droplets atomized by electric field and gas pressure respectively, are based on the aerosol technique. These techniques have shown many advantages over several conventional deposition techniques, such as a simple set-up, inexpensive and nontoxic precursors, high deposition rate and, in particular, easy control of the surface morphology of the deposited layers. These methods also enable the thin film deposition in ambient atmosphere even if an additional heat treatment is required to obtain film with high degree of crystallinity [1,2].

In this work, air-blast spray deposition and electro-spray deposition were applied to prepare porous lanthanum strontium manganite (LSM) films on silicon substrate in the submicron range for the cathode application in solid oxide fuel cell (SOFC). The precursor solution was prepared by dissolving lanthanum nitrate hydrate, manganese nitrate hexahydrate and strontium chloride hexahydrate into methanol. The morphology of LSM film was dependant on the process parameters such as substrate temperature, liquid flow rate, air flow rate, nozzle-substrate distance, deposition time, and DC voltage. The effects of heating temperature on the crystal structure of films were investigated with X-ray diffraction (XRD) in the heating temperature range of 600 to 1000 °C. The microstructure of the LSM film was also studied by scanning electron microscopy (SEM). The porous LSM film was successfully prepared in the solution flow rate range of 1 l/min to 6 l/min, the substrate temperature of 200 °C to 600 °C, the nozzle-substrate distance range of 1 cm to 6 cm, the air flow rate range of 0.1 Mpa to 0.5 Mpa, and the DC voltage range of 1 kV to 20 kV.

References:

- [1] I. Taniguchi, R.C. van Landschoot and J. Schoonman, *Solid State Ionics*. **160** (2003) 271.
- [2] D. Beckel, A Dubach, A. R. Studart, and L. J. Gauckler, *J. Electroceram.* **16** (2006) 221.

Acknowledgements

This work was supported by the Seoul Research and Business Development Program (Grant No.10583).

Figures:

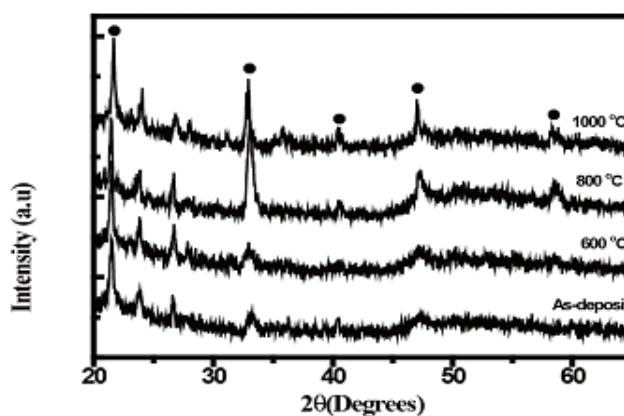


Fig. 1. X-ray diffraction patterns of LSM layers heated in the sintering temperature range of 600 °C to 1000 °C

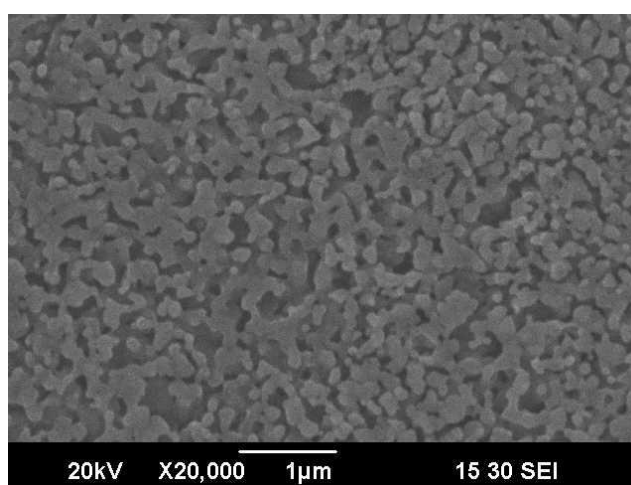


Fig. 2. Surface SEM image of sintered LSM films on Si deposited by electro spray deposition at argon pressure 0.45 Mpa, substrate temperature 325 °C, deposition time 10 min, solution flow rate 4.5 ml/h, and precursor solution concentration 0.05M at nozzle-substrate distance 4 cm