

FABRICATION OF $\text{Sm}_{0.5}\text{Sr}_{0.5}\text{COO}_3$ CATHODE THIN FILMS FOR IT-SOFCs BY ELECTROSTATIC SPRAY DEPOSITION

*Inyu Park, Jongmo Im, Sungeun 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*

Abstract

Strontium-doped samarium cobaltite ($\text{Sm}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$, SSC) has good electrochemical properties for intermediate-temperature solid oxide fuel Cells (IT-SOFCs) because it has mixed-conduction characteristics which are electronic and ionic conductivities. It has higher ionic conductivities than other cathode materials for SOFCs such as LSM and LSC. Electrostatic Spray Deposition (ESD) method has some advantages such as simple apparatus, convenience of controlling microstructure of thin films and variety of choice of precursor solution.

In this study, the ESD method was applied to fabricate porous SSC thin films for a SOFC cathode. Samarium chloride hexahydrate ($\text{SmCl}_3 \cdot 6\text{H}_2\text{O}$), strontium chloride hexahydrate ($\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$), cobalt nitrate hexahydrate ($\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$) as starting materials and methyl alcohol as solvent were used to make precursor solution. The porous SSC films were deposited on Si substrate and the microstructure was dependent on processing parameters such as substrate temperature, distance from nozzle to substrate, applied voltage and flow rate of a syringe. Scanning Electron Microscope (SEM) and X-ray Diffractometer (XRD) measurement were used to investigate the microstructure and crystallinity of the SSC films. The ESD technique is shown to be an efficient method in which SOFCs' cathode film can be fabricated with tailoring of the desired phases and microstructure.

References:

- [1] Changrong Xia, William Rauch, Fanglin Chen, Meilin Liu, Solid State Ionics, 149 (2002) 11-19
- [2] Chun-Liang Chang, Ching-Shiung Hsu, Bing-Hwai Hwang, Journal of Power Sources, 179 (2008) 734-738
- [3] Zhaolin Tang, Yongsong Xie, Howard Hawthorne, Dave Ghosh, Journal of Power Sources 157 (2006) 385-388

Figures:

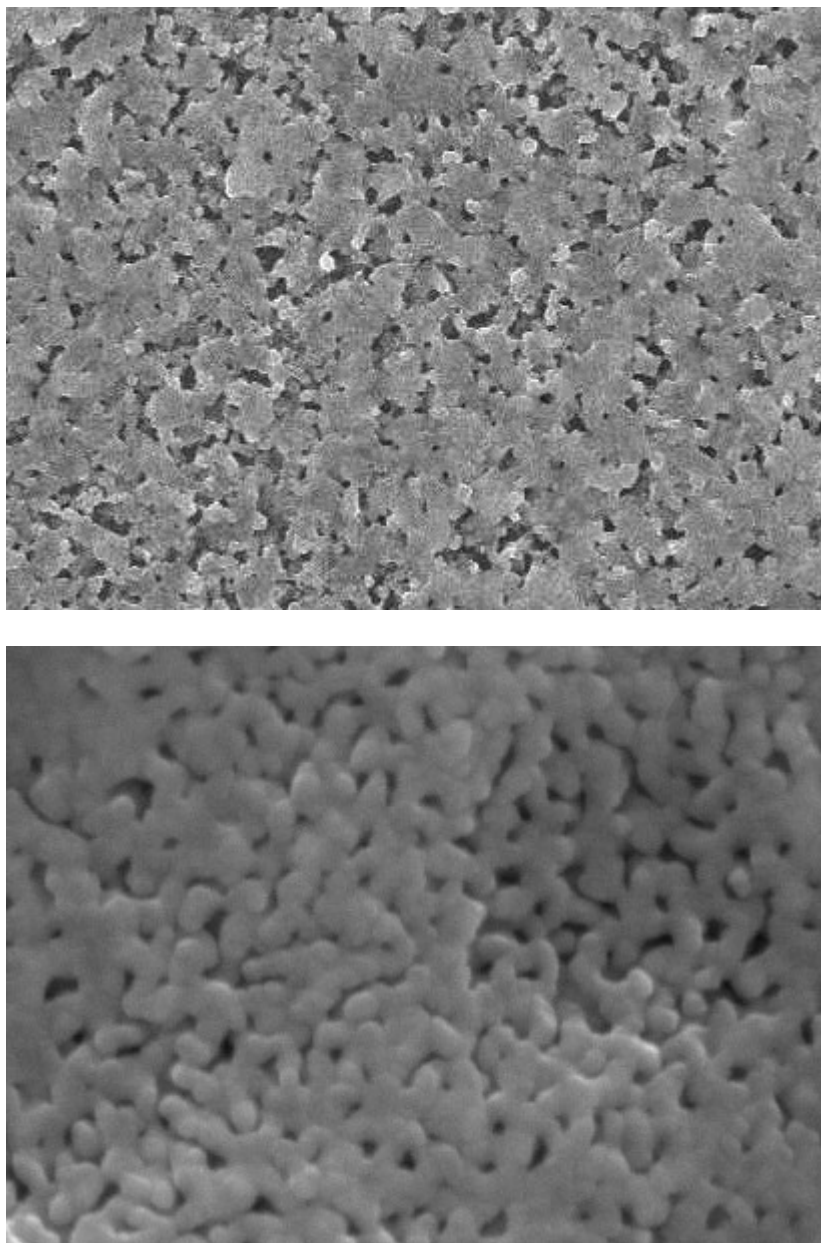


Fig.1. Surface morphologies of SSC films prepared by ESD deposited onto a silicon substrate at 350 °C and a distance of nozzle to substrate is 40 for 5min. (a) as-deposit, (b) sintered at 800 °C for 2 hrs.