

Supplementary information for

High-performance nanofibrous LaCoO₃ perovskite cathode for solid oxide fuel cells fabricated via chemically assisted electrodeposition

Saeed ur Rehman^{a,b}, Rak-Hyun Song^{a,b}, Tak-Hyoung Lim^{a,b}, Seok-Joo Park^{a,b}, Jong-Eun Hong^a,
Jong-Won Lee^{c,*}, Seung-Bok Lee^{a,b*}

^a *Fuel Cell Laboratory, New and Renewable Energy Research Division, Korea Institute of Energy Research, 152 Gajeong-ro, Yuseong-gu, Daejeon 34129, Republic of Korea*

^b *Department of Advanced Energy and Technology, Korea University of Science and Technology, 217 Gajeong-ro, Yuseong-gu, Daejeon 34113, Republic of Korea*

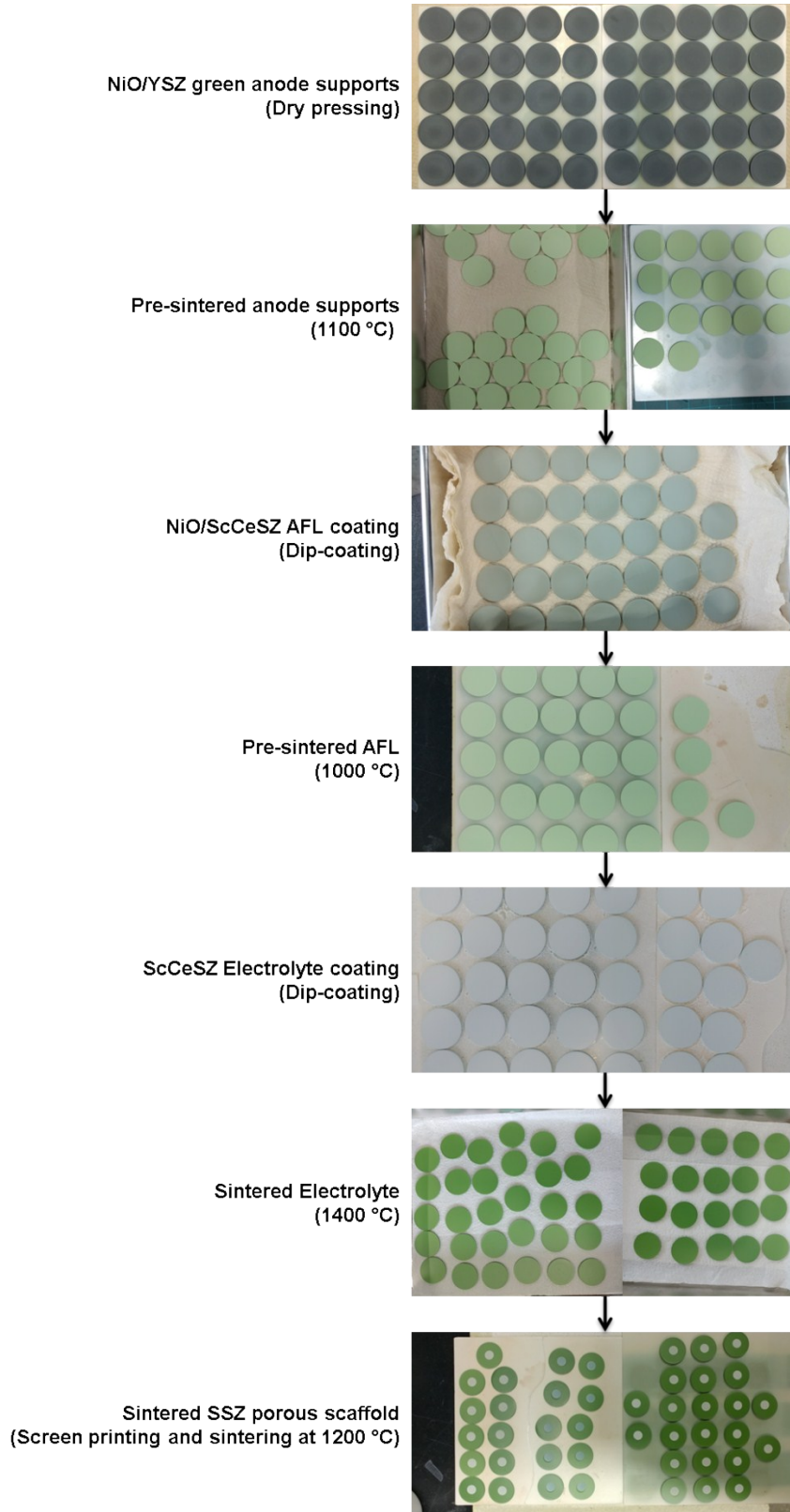
^c *Department of Materials Science and Engineering, Chosun University, 309 Pilmun-daero, Dong-gu, Gwangju 61452, Republic of Korea*

* Corresponding authors:

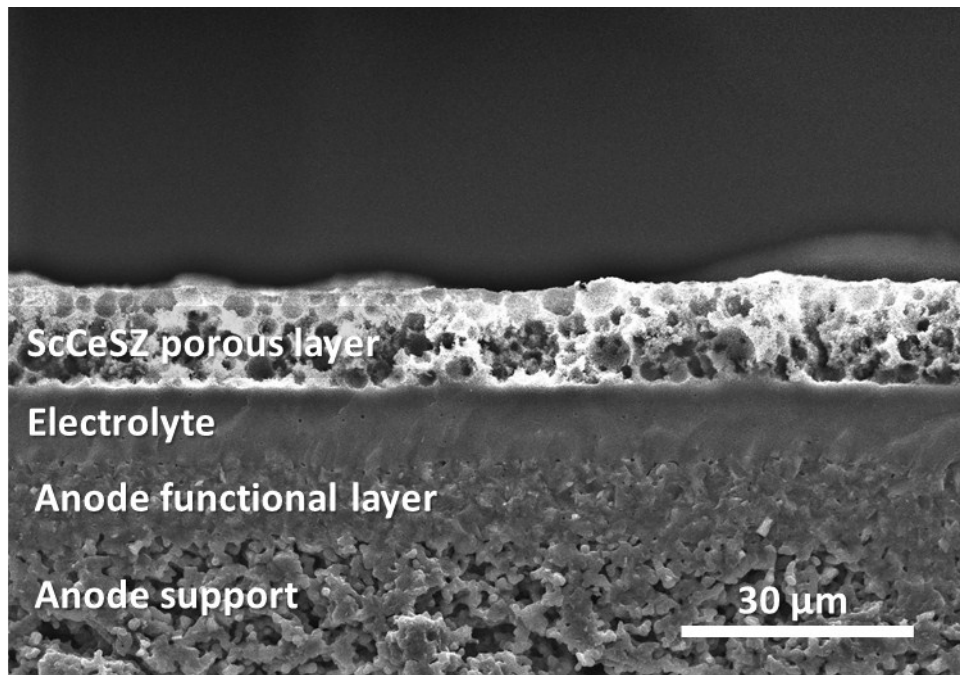
E-mail address: sblee@kier.re.kr (S.-B. Lee)

E-mail address: jongwon@chosun.ac.kr (J.-W. Lee)

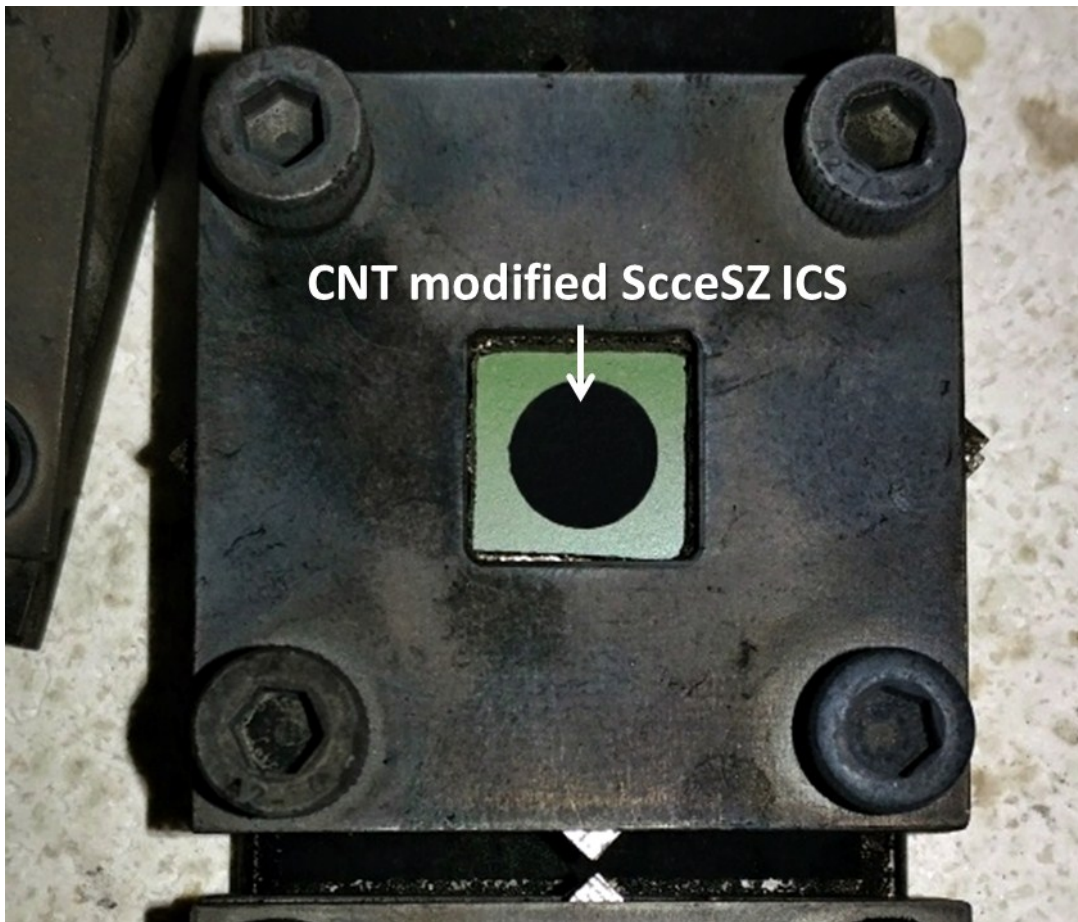
Fabrication of solid oxide fuel cell



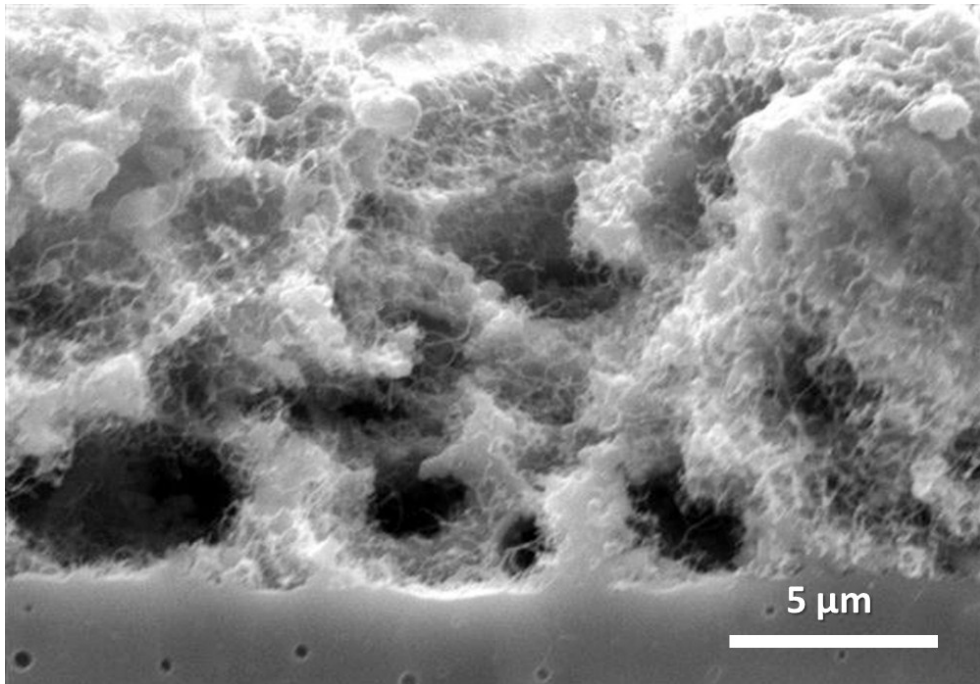
Cross sectional SEM image of the SOFC



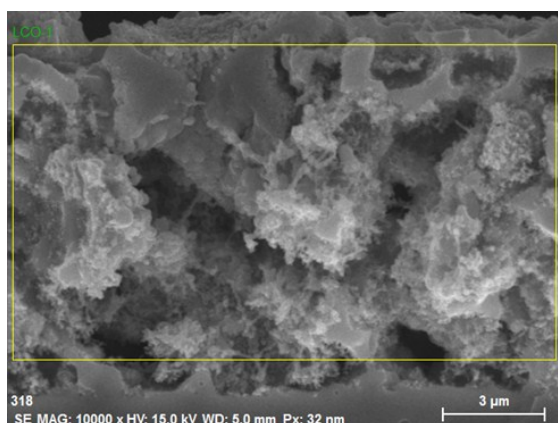
Fabrication of CNT template



Cross sectional SEM of CNT deposited ScCeSZ framework

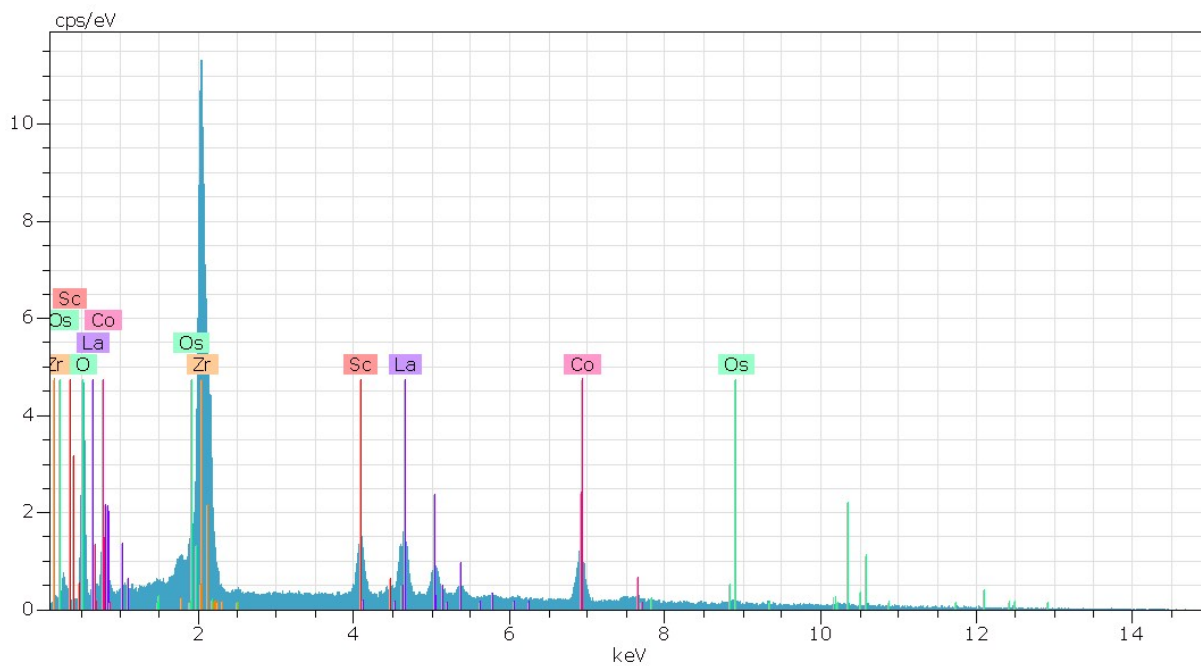


EDS analysis results of LCO1 cathode

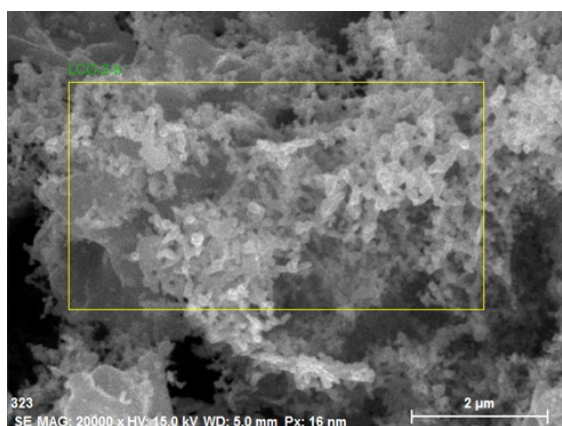


Spectrum: LCO-1

| El | AN | Series | unn. [wt.%] | C [at.%] | Atom. C Error (1 Sigma) [wt.%] |
|--------|----|----------|-------------|----------|--------------------------------|
| Zr | 40 | L-series | 42.98 | 19.21 | 1.53 |
| O | 8 | K-series | 24.94 | 63.54 | 3.13 |
| La | 57 | L-series | 14.70 | 4.31 | 0.44 |
| Co | 27 | K-series | 13.09 | 9.06 | 0.43 |
| Sc | 21 | K-series | 4.28 | 3.88 | 0.16 |
| Os | 76 | M-series | 0.00 | 0.00 | 0.00 |
| Total: | | | 100.00 | 100.00 | |

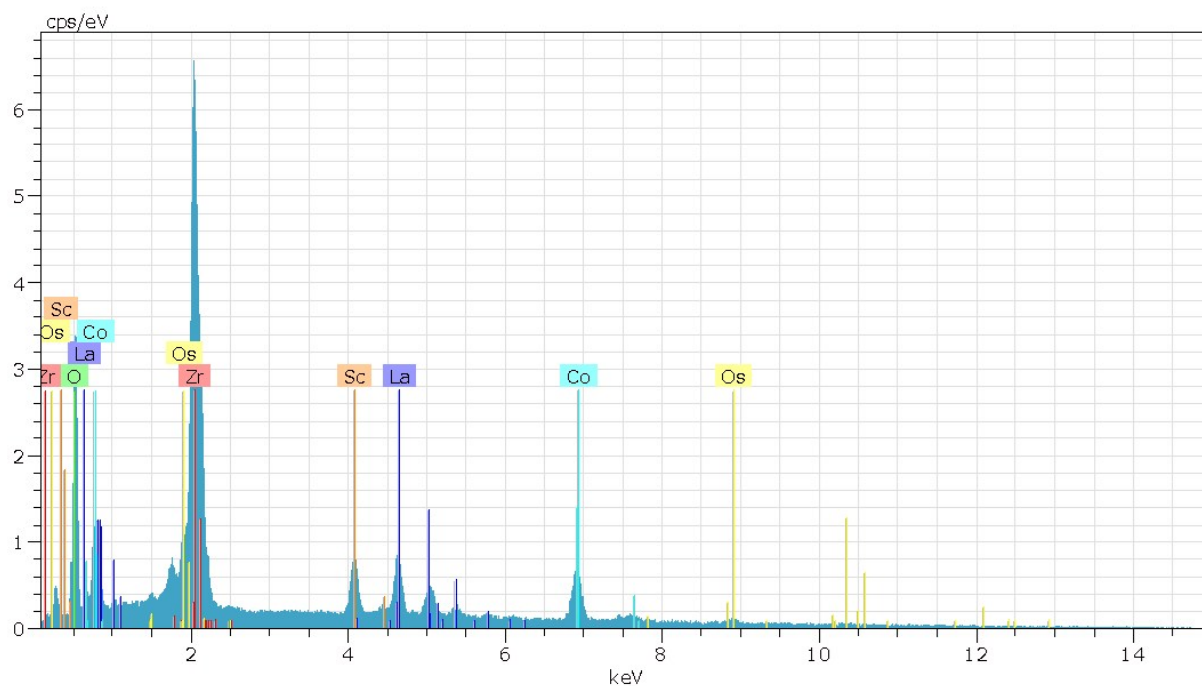


EDS analysis results of LCO2 cathode

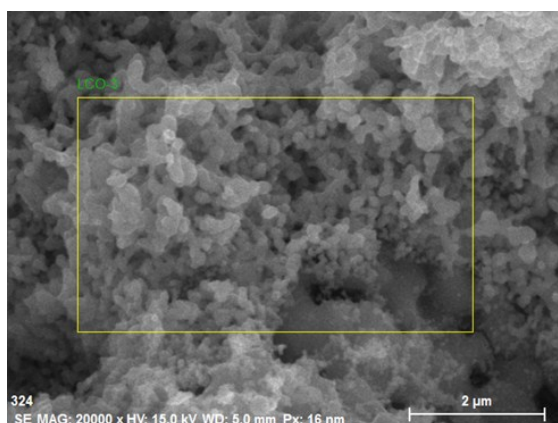


Spectrum: LCO-2-b

| El | AN | Series | unn. C [wt.%] | Atom. C [at.%] | Error (1 Sigma) [wt.%] |
|--------|----|----------|---------------|----------------|------------------------|
| Zr | 40 | L-series | 46.73 | 22.55 | 1.67 |
| O | 8 | K-series | 21.58 | 59.37 | 2.79 |
| La | 57 | L-series | 15.48 | 4.91 | 0.46 |
| Co | 27 | K-series | 11.66 | 8.71 | 0.39 |
| Sc | 21 | K-series | 4.55 | 4.45 | 0.16 |
| Os | 76 | M-series | 0.00 | 0.00 | 0.00 |
| Total: | | | 100.00 | 100.00 | |

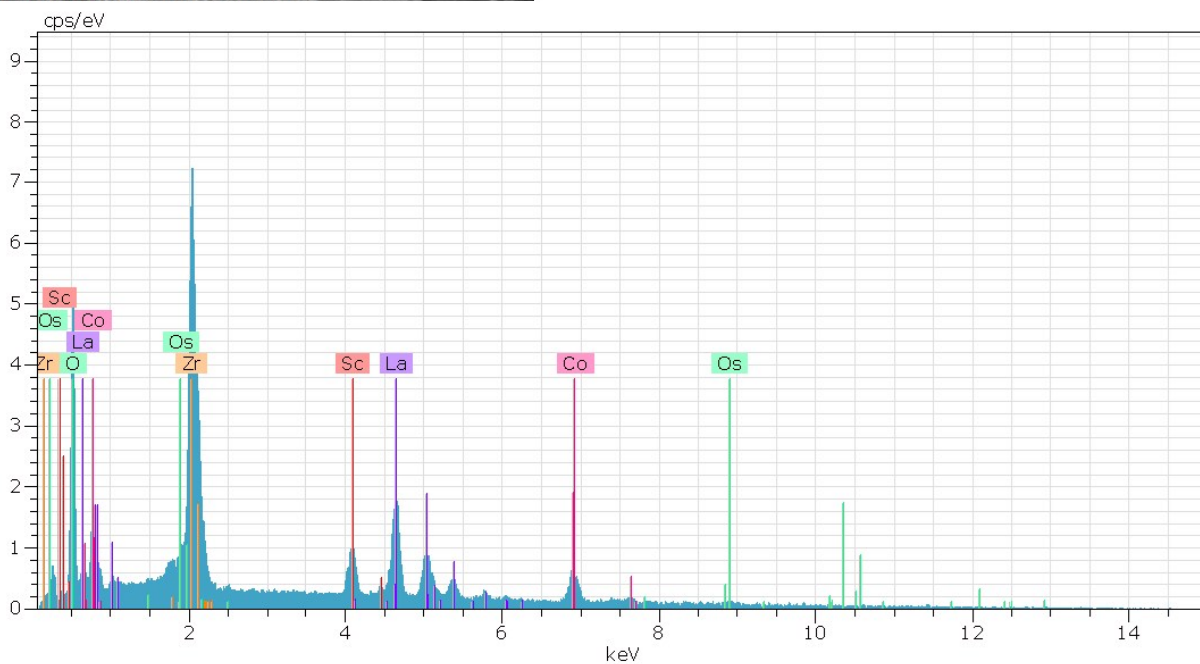


EDS analysis results of LCO3 cathode

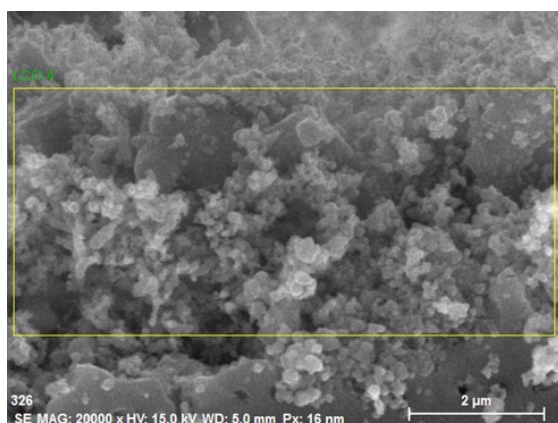


Spectrum: LCO-3

| El | AN | Series | unn. [wt.%] | C Atom. [at.%] | Error (1 Sigma) [wt.%] |
|---------------|----|----------|---------------|----------------|------------------------|
| Zr | 40 | L-series | 33.34 | 14.55 | 1.15 |
| O | 8 | K-series | 27.28 | 67.85 | 3.22 |
| La | 57 | L-series | 25.12 | 7.20 | 0.70 |
| Co | 27 | K-series | 10.61 | 7.16 | 0.35 |
| Sc | 21 | K-series | 3.66 | 3.24 | 0.13 |
| Os | 76 | M-series | 0.00 | 0.00 | 0.00 |
| Total: | | | 100.00 | 100.00 | |

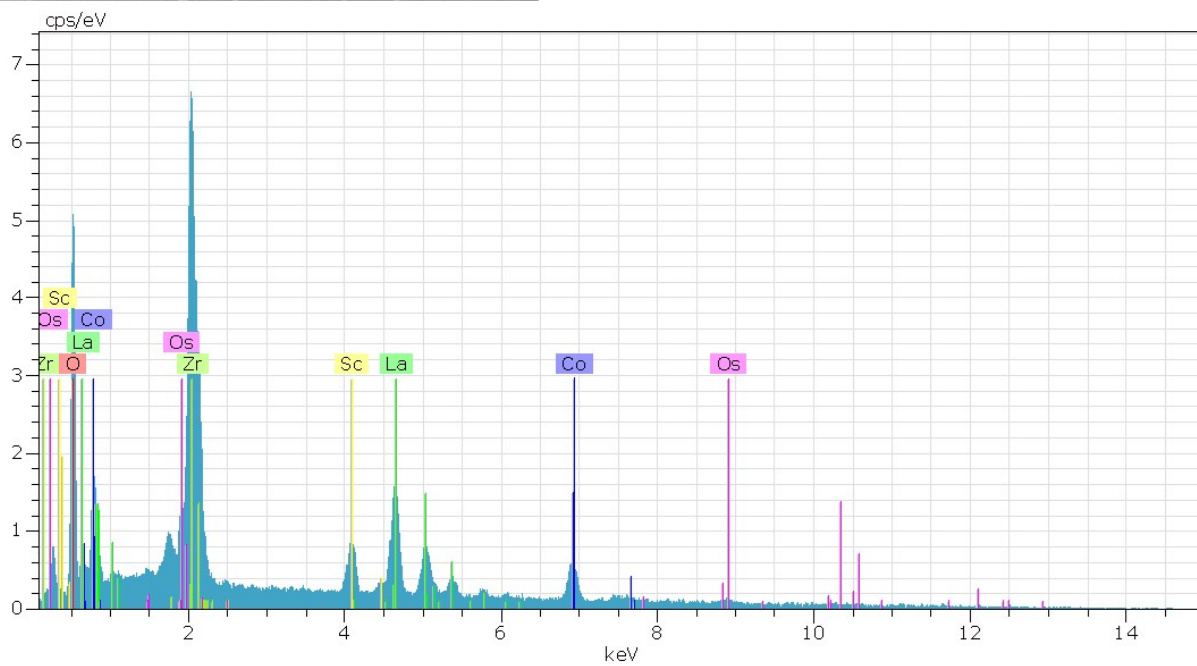


EDS analysis results of LCO4 cathode

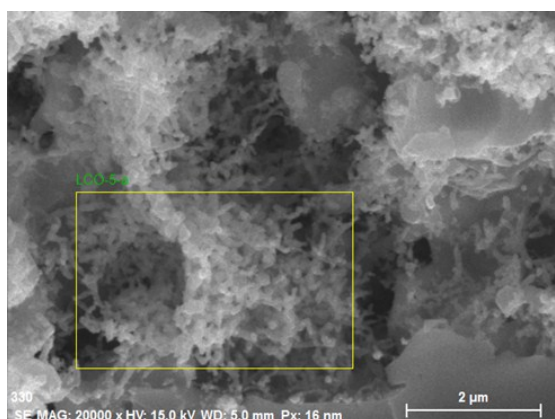


Spectrum: LCO-4

| El | AN | Series | unn. [wt.%] | C Atom. [at.%] | C Error (1 Sigma) [wt.%] |
|--------|----|----------|-------------|----------------|--------------------------|
| Zr | 40 | L-series | 34.63 | 15.54 | 1.22 |
| La | 57 | L-series | 26.23 | 7.73 | 0.74 |
| O | 8 | K-series | 26.14 | 66.88 | 3.17 |
| Co | 27 | K-series | 9.21 | 6.40 | 0.32 |
| Sc | 21 | K-series | 3.78 | 3.44 | 0.14 |
| Os | 76 | M-series | 0.00 | 0.00 | 0.00 |
| Total: | | | 100.00 | 100.00 | |

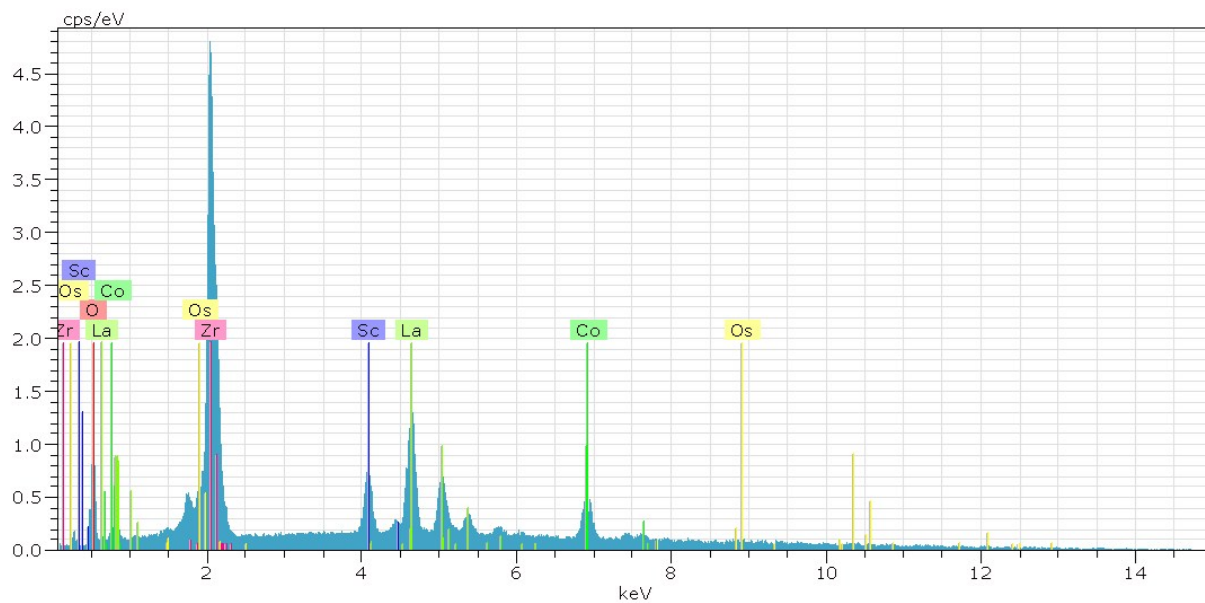


EDS analysis results of LCO5 cathode



Spectrum: LCO-5-a

| El | AN | Series | unn. [wt.%] | C Atom. [at.%] | C Error (1 Sigma) [wt.%] |
|--------|----|----------|-------------|----------------|--------------------------|
| Zr | 40 | L-series | 54.79 | 36.81 | 2.21 |
| La | 57 | L-series | 22.89 | 10.10 | 0.74 |
| O | 8 | K-series | 10.23 | 39.20 | 1.70 |
| Co | 27 | K-series | 8.02 | 8.34 | 0.31 |
| Sc | 21 | K-series | 4.07 | 5.55 | 0.16 |
| Os | 76 | M-series | 0.00 | 0.00 | 0.00 |
| Total: | | | 100.00 | 100.00 | |



Cross sectional SEM of SOFC with LCO2 cathode after 200 h of polarization test

