

Supplementary information for

Facile surface modification of LSCF/GDC cathodes by epitaxial deposition of $\text{Sm}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$ via
ultrasonic spray infiltration

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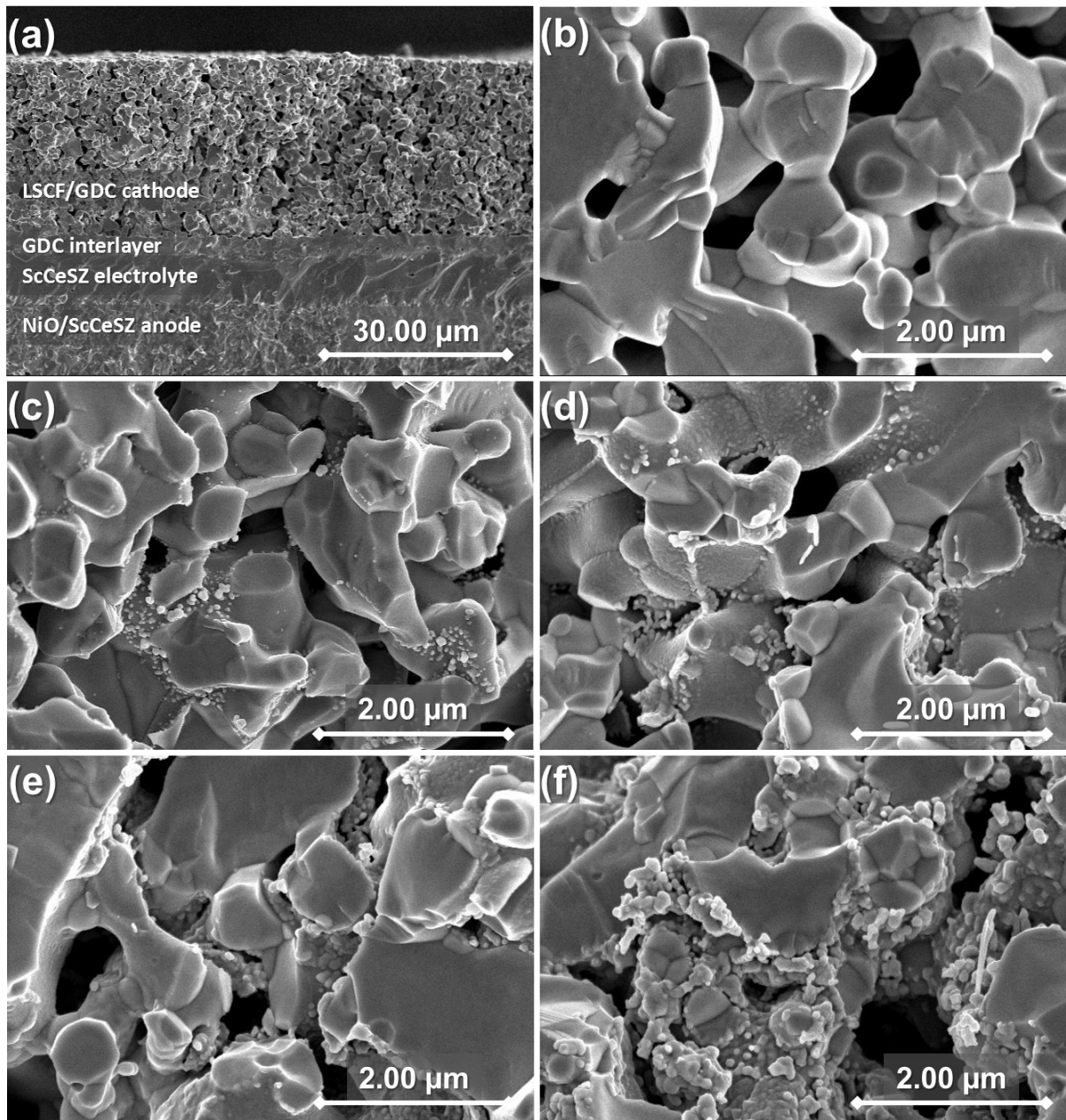


Figure S1: Cross-sectional SEM images of (a) a flat tubular anode-supported SOFC and LSCF/GDC cathodes of (b) Cell-1, (c) Cell-2, (d) Cell-3, (e) Cell-4, and (f) Cell-5.

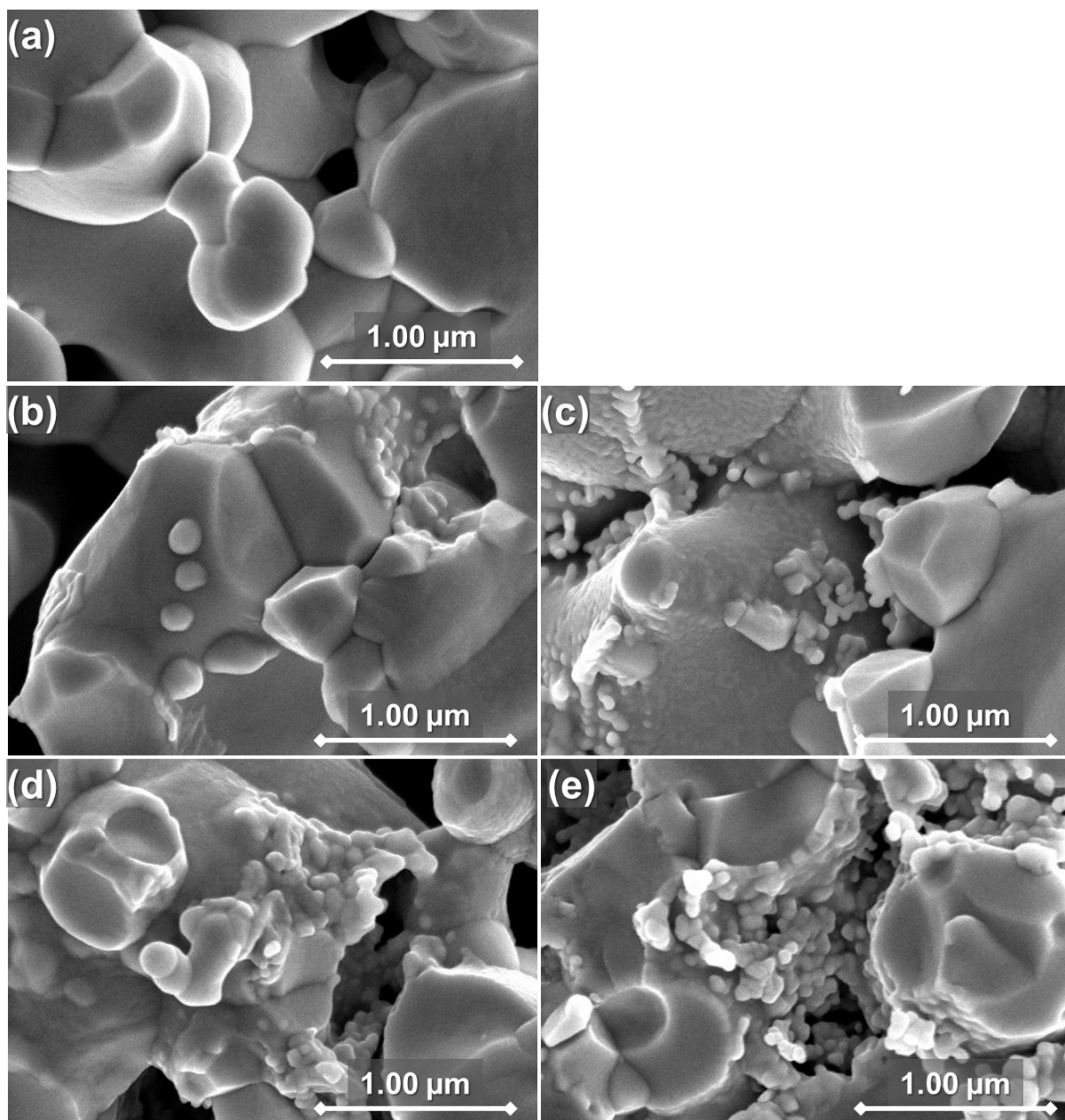


Figure S2: High resolution cross-sectional SEM images of LSCF/GDC cathodes of (a) Cell-1, (b) Cell-2, (c) Cell-3, (d) Cell-4, and (e) Cell-5

Table S1: SSC catalyst loading in LSCF/GDC cathode of various cells after calcination at 850 °C

Sample	Cell-2	Cell-3	Cell-4	Cell-5
Infiltrated SSC (mg)	1.1	0.5	1.1	1.51

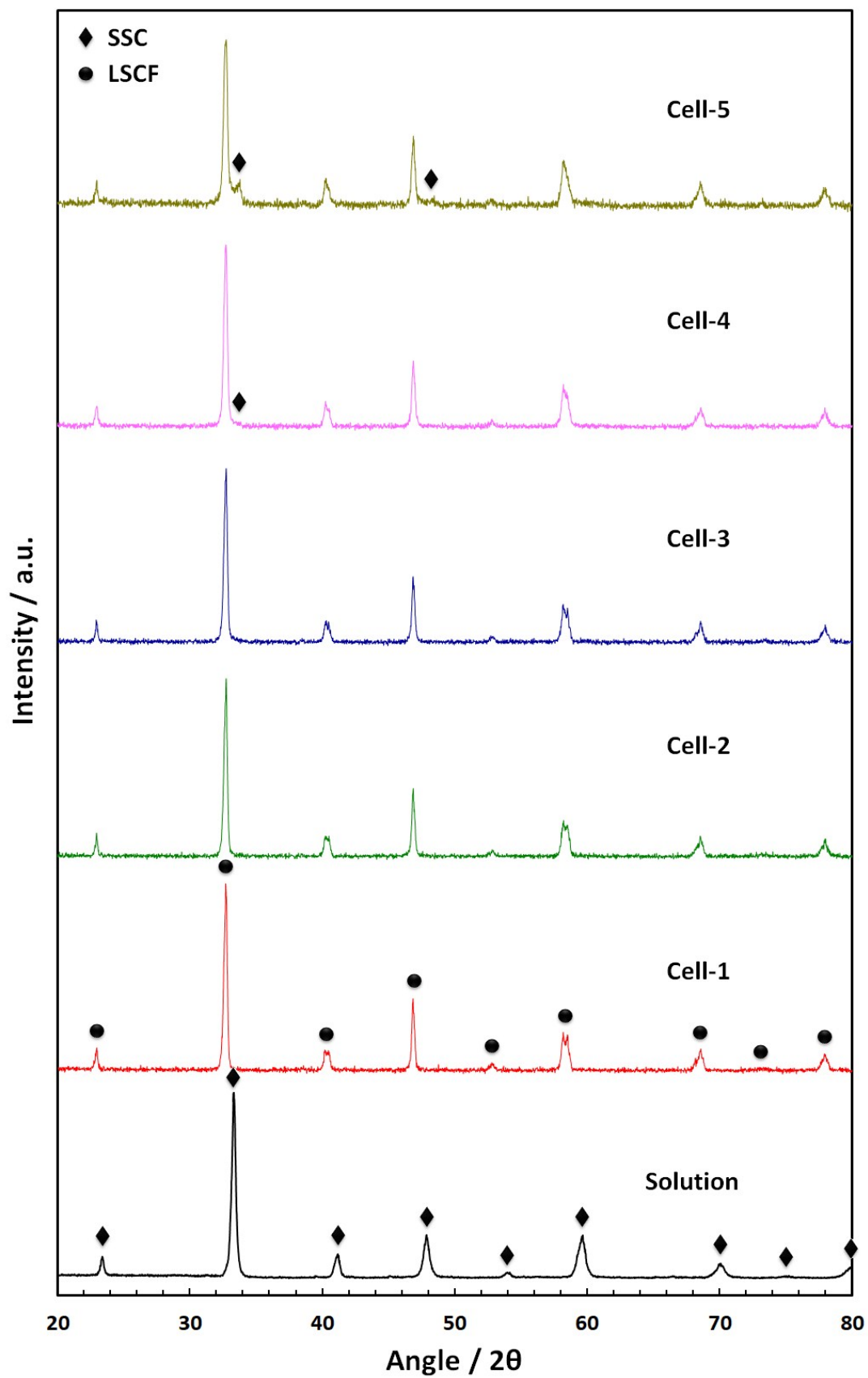


Figure S3: XRD analysis of SSC solution and LSCF-GDC composite cathodes having SSC infiltrated by micropipette/ultrasonic-spray after calcination at 850 °C.

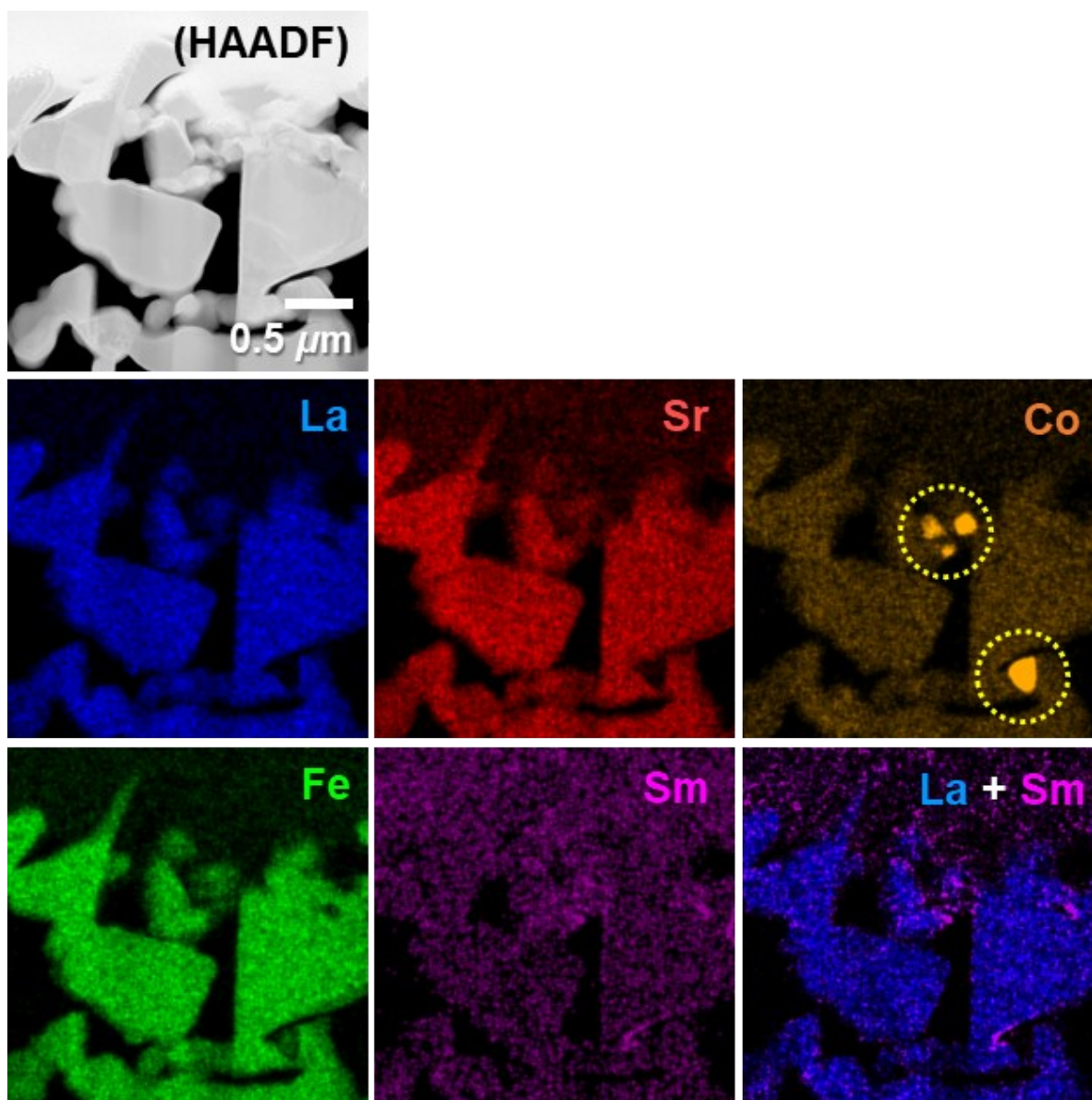


Figure S4: Additional sets of HAADF-STEM EDS chemical maps for SSC-infiltrated LSCF/GDC cathode consistently verify the presence of Co-rich particles (yellow dotted circle).

Table S2: Quantitative composition analysis for top (SSC) and bottom (LSCF) area.

		Position No.					Avg.
		1	2	3	4	5	
Top (SSC)	$\frac{[\text{Sm}]}{[\text{Sr}]}$	1.06	1.13	1.14	0.98	1.02	1.06
Bottom (LSCF)	$\frac{[\text{Co}] + [\text{Fe}]}{[\text{La}] + [\text{Sr}]}$	1.11	0.95	0.89	1.32	0.98	1.05

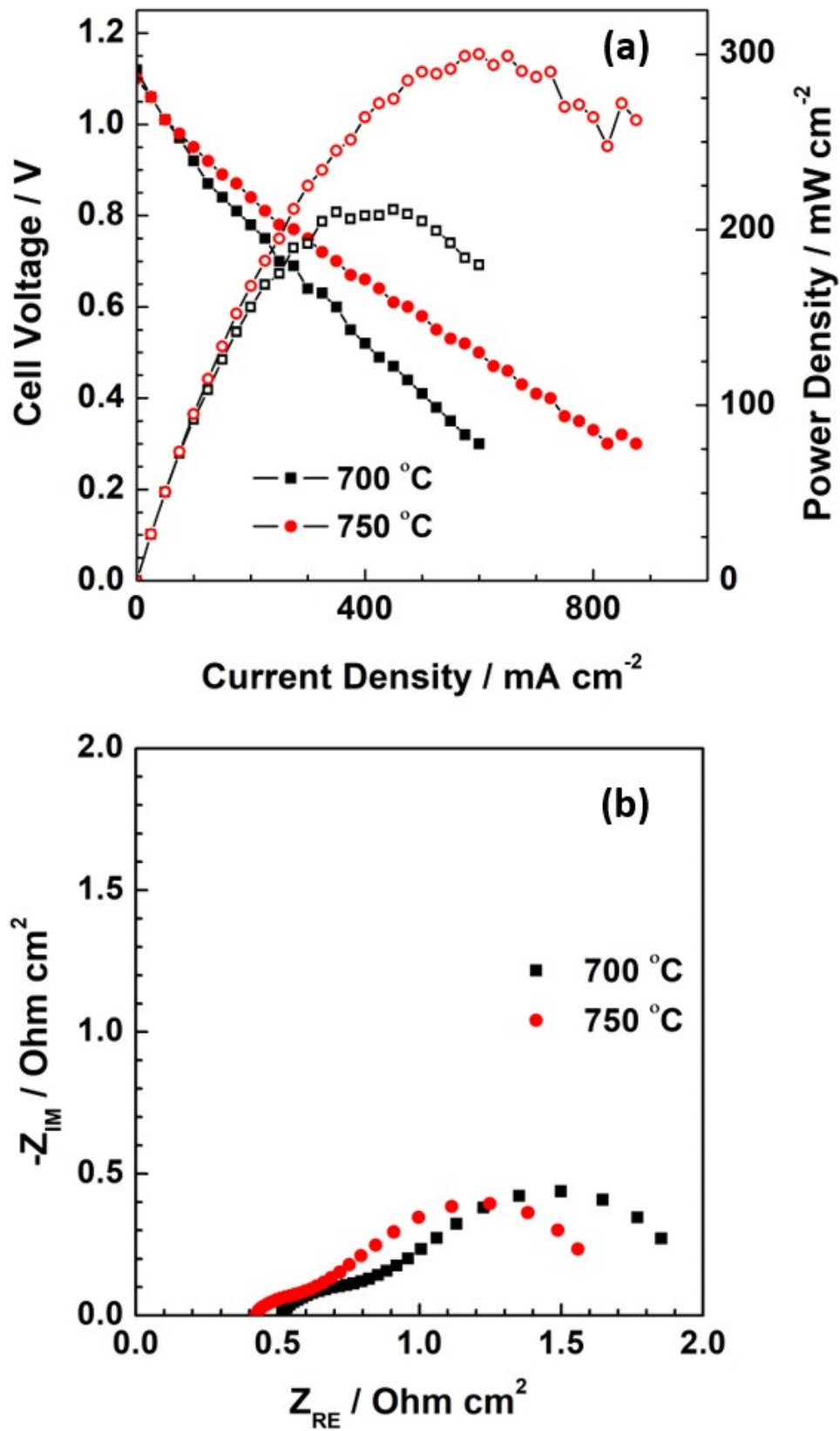


Figure S5: Electrochemical performance of Cell-1 at 700 and 750 °C; (a) polarization curves and (b) impedance plots.

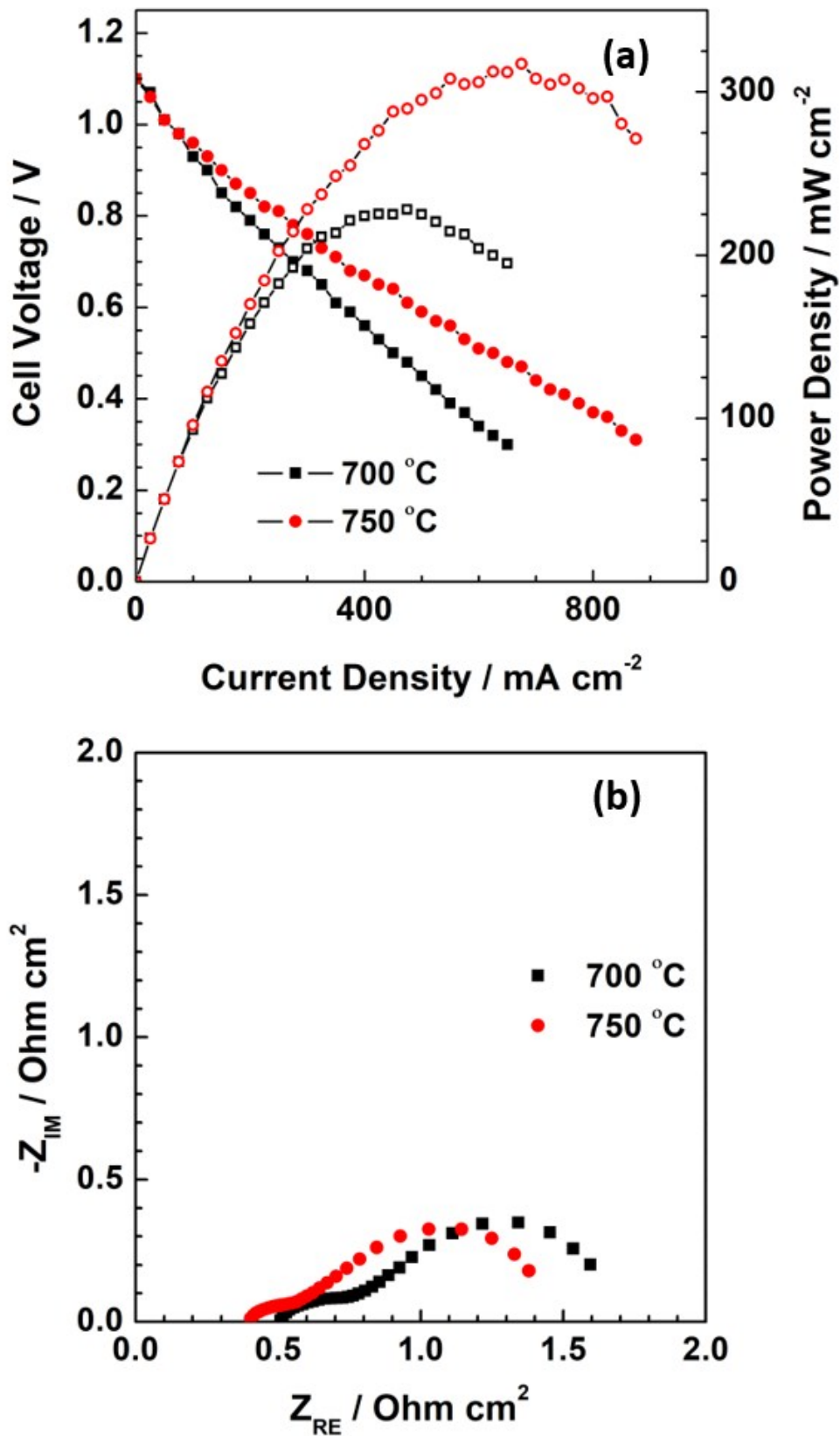


Figure S6: Electrochemical performance of Cell-2 at 700 and 750 °C; (a) polarization curves and (b) impedance plots.

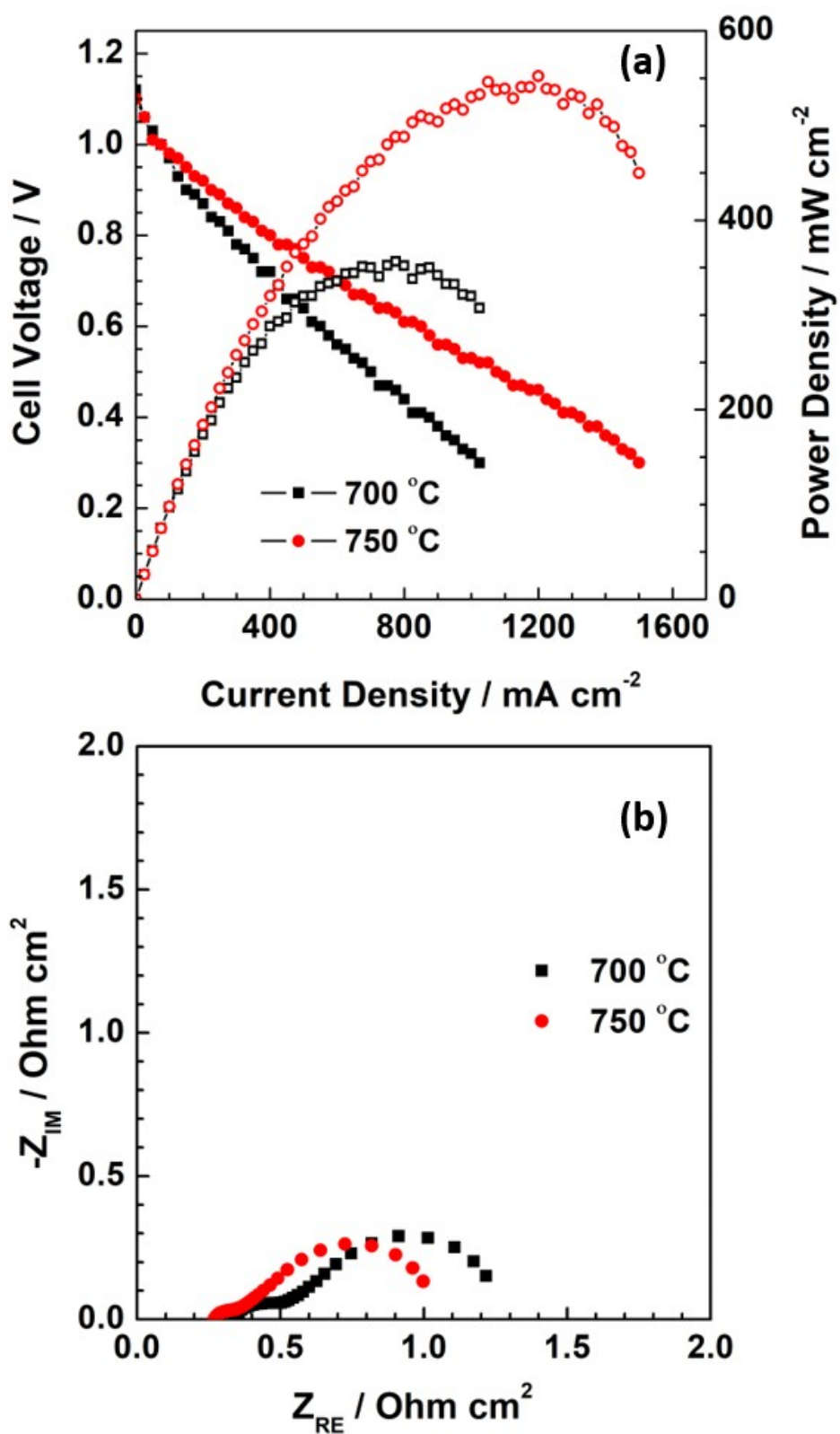


Figure S7: Electrochemical performance of Cell-3 at 700 and 750 °C; (a) polarization curves and (b) impedance plots.

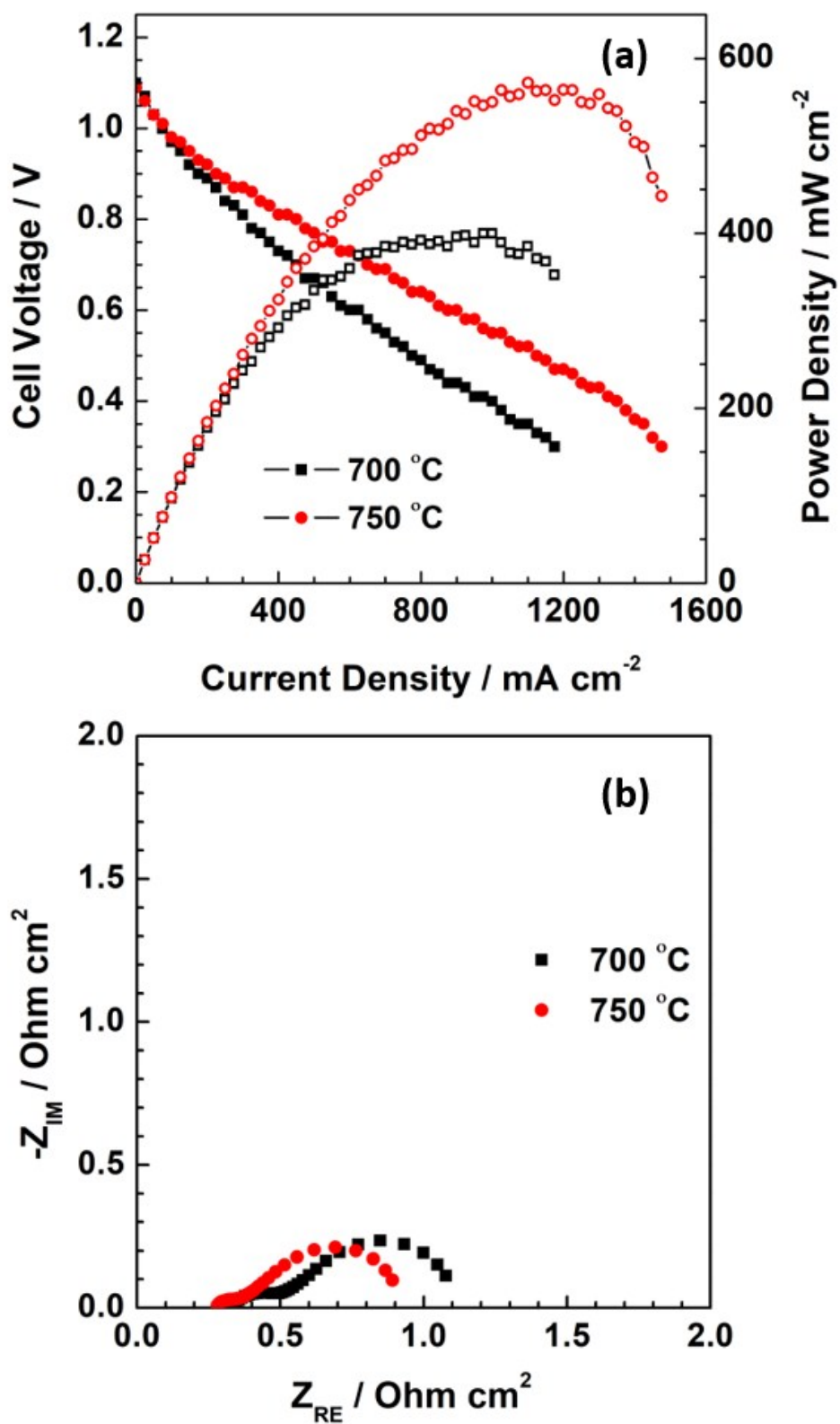


Figure S8: Electrochemical performance of Cell-4 at 700 and 750 °C; (a) polarization curves and (b) impedance plots.

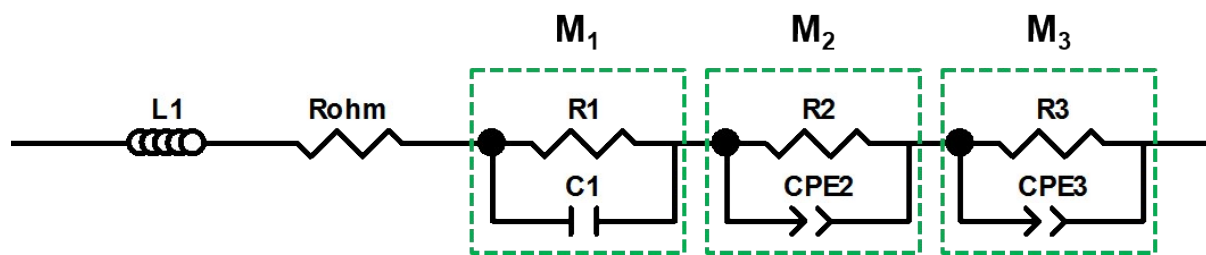


Figure S9: Equivalent circuit model used for the simulation of impedance data of various SOFCs operated at 700, 750 and 800 °C

Table S3: Equivalent circuit model analysis results of various SOFCs operated at 700, 750 and 800 °C

Sample	Temp. (°C)	Area-specific resistance ($\Omega \text{ cm}^2$)					
		R_{ohm}	R_1	R_2	R_3	R_p	R_{total}
Cell-1	800	0.361	0.119	0.095	0.757	0.971	1.332
	750	0.427	0.166	0.119	0.989	1.273	1.700
	700	0.519	0.235	0.148	1.130	1.513	2.032
Cell-2	800	0.348	0.108	0.088	0.638	0.834	1.182
	750	0.404	0.154	0.101	0.844	1.099	1.503
	700	0.511	0.219	0.109	0.882	1.209	1.720
Cell-3	800	0.241	0.060	0.055	0.450	0.561	0.802
	750	0.285	0.097	0.074	0.623	0.793	1.078
	700	0.340	0.162	0.083	0.714	0.959	1.299
Cell-4	800	0.237	0.057	0.047	0.368	0.467	0.704
	750	0.275	0.096	0.061	0.510	0.666	0.941
	700	0.338	0.160	0.081	0.573	0.794	1.134
Cell-5	800	0.234	0.058	0.046	0.346	0.450	0.684
	750	0.270	0.091	0.058	0.444	0.592	0.862
	700	0.334	0.151	0.071	0.516	0.757	1.097