

Supplementary Information

Active and robust $\text{La}_{0.75}\text{Sr}_{0.25}\text{Cr}_{0.5}\text{Mn}_{0.5}\text{O}_3$ -based fuel electrode coated with in-situ grown nanoparticle via electron conduction and oxygen exchange enhancements for solid oxide electrolysis cells

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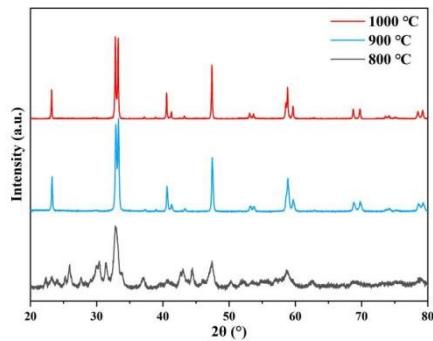


Fig. S1 XRD patterns of LCN calcined at different temperatures in air for 2 h.

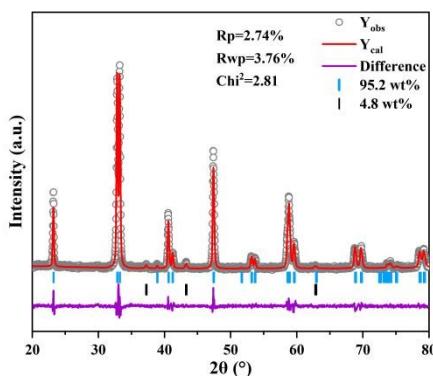


Fig. S2 Rietveld refinement of the as-prepared LCN sintered at 900 °C for 2 h.

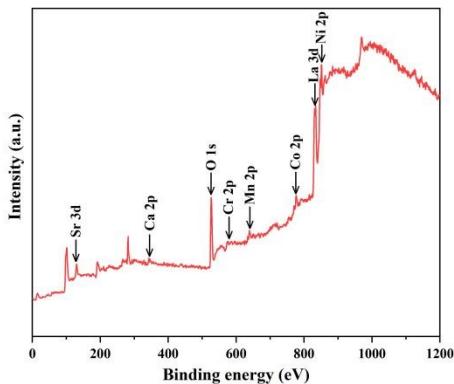


Fig. S3 XPS spectra for 15wt% LCN/LSCCM sample.

Table S1 XPS analysis of O 1s.

Sample	Binding energy (eV)				Relative concentration (%)			
	O _{lat}	O ⁻ /O ₂ ²⁻	OH ⁻	O _H	O _{lat}	O ⁻ /O ₂ ²⁻	OH ⁻	O _H
LSCCM	528.6	529.9	531.1	532.3	48.3	17	24.5	10.2
15wt% LCN/LSCCM	528.8	530.3	531.4	532.7	47.7	20.5	23.4	8.4

Table S2 Comparison of current densities for various SOECs during CO₂ electrolysis.

FUEL	ELECTROLYTE/AIR	FEEDING	TEMPERAT	APPLIED	CURRENT	REFEREN
ELECTRODE	ELECTRODE	GAS	URE(°C)	VOLTAGE (V)	DENSITY (A CM ⁻²)	CE
LCN/LSCCM-GDC	SSZ/LSM-GDC	CO ₂	800	1.6	0.69	This work
Pd-GDC/LSCM	YSZ/LSCF-YSZ	CO ₂ -CO(1:1)	850	1.5	0.35	1
LSCM-GDC/YSZ	YSZ/LSM-SSZ	CO ₂	800	1.6	0.28	2
CMO/ LSCM-GDC	YSZ/LSM-SSZ	CO ₂	800	1.8	0.52	3
CeO ₂ /LSCM-GDC	YSZ/LSM-YSZ	CO ₂	800	1.5	0.30	4
CeCo/LSCF-GDC	YSZ/LSM-YSZ	CO ₂ -CO(9:1)	800	1.5	0.65	5
LSFN-GDC	YSZ/LSFN-GDC	CO ₂	800	1.5	0.54	6
LSFV-GDC	YSZ/LSM-YSZ	CO ₂	800	1.6	0.62	7
HE-PBM-SDC	LSGM/HE-PBM-SDC	CO ₂	800	2.0	1.21	8
SF _{1.58} M-SDC	LSGM/LSM-SDC	CO ₂	800	1.8	1.16	9
PBSFG	LSGM/PBSFG	CO ₂	850	1.5	0.82	10
PBFN-GDC	YSZ/PBFN-GDC	CO ₂	800	2.0	0.84	11

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