

Supplementary Information File

Exsolution of Nanoparticles on A-site-deficient ferrite perovskites: Its effect on co-electrolysis of CO₂ and H₂O

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Table S1. Indexing parameters for the crystal phase of LaFeO₃ orthorhombic perovskite.

Reference code: 00-152-6450				
Formula: LaFeO ₃				
Crystallographic parameters				
Crystal system: Orthorhombic				
Space group: P b n m				
a = 0.5552 nm, b = 0.5563 nm, c = 0.7843 nm				
Figure	2 θ (°)	Lattice Plane (h k l)	d- spacing (nm) experimental / theoretical	Degrees to spot 1 (°) experimental / theoretical
Figure 1(c1)	32.2195	(2 0 0)	0.2762 / 0.27760	0
Figure 1(c1)	32.1541	(0 2 0)	0.2772 / 0.27815	90.4 / 90
Figure 1(c2)	32.2195	(2 0 0)	0.2759 / 0.27760	0
Figure 1(c2)	46.1605	(2 2 0)	0.1988 / 0.19649	45.4 / 45

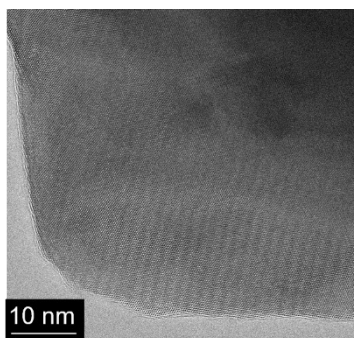


Fig. S1. TEM image of LSNF at 400°C under 1 mbar H₂.

Table S2. Indexing parameters for the crystal phase of Fe_{0.507}Ni_{0.493} monoclinic alloy.

Reference code: 00-901-1506 Formula: Fe _{0.507} Ni _{0.493} Crystallographic parameters Crystal system: Monoclinic Space group: P 1 m 1 a = 0.35810 nm, b = 0.35820 nm, c = 0.35870 nm		
Lattice Plane (h k l)	d- spacing (nm)	Degrees to spot 1
	experimental/ theoretical	experimental/ theoretical
(0 0 2)	0.17 / 0.17935	0.00
(1 1 1)	0.21 / 0.20684	54.07 / 54.74
(1 1 -1)	0.20 / 0.20693	126.85 / 125.26

Table S3. Indexing parameters for the crystal phase of La₂NiO₄ RP phase.

Database code ICSD 44121 Formula: La ₂ NiO ₄ Crystallographic parameters Crystal system: orthorhombic Space group: F m m m a = 0.546520 nm, b = 0.546869 nm, c = 0.1267804 nm		
Lattice Plane (h k l)	d- spacing (nm)	Degrees to spot 1
	experimental/ theoretical	experimental/ theoretical
(2 2 0)	0.2033 / 0.1933	0.00
(2 -2 0)	0.2065 / 0.1933	90.47 / 90.00

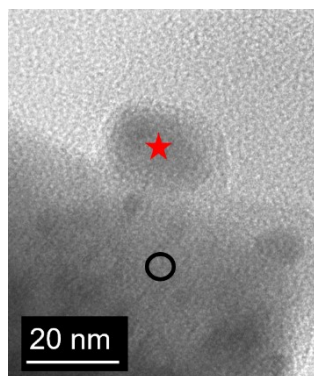


Fig. S2. STEM image of Red-LSNF after 2 h of reduction under 5% H₂/N₂ at 800°C.

The atomic composition on the point marked with a star: La 7.6%, Sr 0.6%, Ni 45.8%, Fe 46.0%. The atomic composition on the point marked with a circle: La 33.0%, Sr 2.8%, Ni 11.2%, Fe 53.0%.

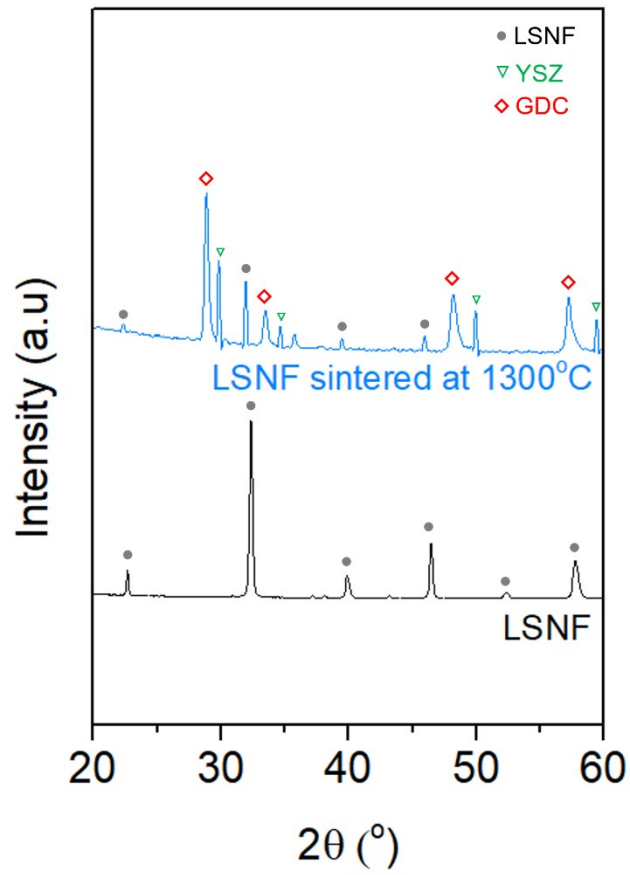


Fig. S3. (a) XRD pattern of LSNF cathode on GDC buffer layer on YSZ electrolyte after 2 h of sintering under air at 1300°C.