

High-Performance and Durable Alcohol-Fueled Symmetrical Solid Oxide Fuel Cell Based on Ferrite Perovskite Electrode

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Table S1. Unit cell parameters of the samples.

Sample	a (Å)	b (Å)	c (Å)	Volume (Å ³)	Volume/4 (Å ³)
SFN	3.8579(1)	3.8541(8)	3.8495(3)	288.96(1)	57.24
Ce10SFN	3.8757(3)	3.8746(7)	3.8830(8)	233.24(1)	58.31
Ce15SFN	3.8651(1)	3.8700(2)	3.8802(8)	232.16(1)	58.04
Ce20SFN	3.8751(3)	3.8776(3)	3.8754(4)	235.51(1)	58.23
Ce15SFN-R	5.6129(4)	7.8019 (6)	5.5558(9)	243.29(6)	60.80
Ce20SFN-R	5.6396(9)	7.7989(9)	5.5179(2)	242.77(1)	60.69

Table S2. Elemental analysis of the perovskite-type oxide $\text{Ce}_{0.2}\text{Sr}_{0.8}\text{Fe}_{0.95}\text{Ni}_{0.05}\text{O}_3$ performed by XPS.

Elements	Nominal	XPS	
		Oxygenated	Reduced
Ce	0.20	0.168	0.132
Sr	0.80	0.938	1.088
Fe	0.95	0.822	0.722
Ni	0.05	0.072	0.058

Table S3. Electrochemical performance of reported SOFC with ethanol.

Anode	Electrolyte	PPD W cm ⁻²	Stability h	Temp. °C	Ref
Cu–CeO ₂ –ScSZ	ScSZ	0.22	50	800	[1]
2xNi-SDCN ₄₀	ScSZ	1.4	100	700	[2]
CeO ₂ -Co-Cu	ScSZ	0.4	-	850	[3]
CeO ₂ -Co	ScSZ	0.2	-	850	[3]
50 wt % NiO+30 wt % 3YSZ+20 wt % 8YSZ	ScSZ	0.44	80	800	[4]
NiO	YSZ	0.15	18	740	[5]
1% Sn/Ni	YSZ	0.19	20	740	[5]
Ni-modified La _{0.6} Sr _{0.4} Fe _{0.8} Co _{0.2} O ₃	YSZ	0.65	100	850	[6]
La _{0.6} Sr _{0.4} Co _{0.2} Fe _{0.7} Mo _{0.1} O _{3-δ}	LSGM	0.48	40	850	[7]
(La _{0.6} Sr _{0.4}) _{0.9} Co _{0.2} Fe _{0.6} Nb _{0.2} O ₃	LSGM/SDC	0.062	20	850	[8]
La _{0.75} Sr _{0.25} Cr _{0.5} Mn _{0.5} O _{3-δ}	LSGM	0.1	60	850	[9]
La _{0.65} Bi _{0.1} Sr _{0.25} Cr _{0.5} Fe _{0.5} O _{3-δ}	LSGM	0.4	250	800	[10]
La _{0.75} Sr _{0.25} Cr _{0.5} Fe _{0.5} O _{3-δ}	LSGM	0.2	-	800	[10]
SrV _{0.5} Mo _{0.5} Ni _{0.1} O _{4-δ}	LSGM	0.2	80	800	[11]
Ce _{0.2} Sr _{0.8} FeO ₃	LSGM	0.15	-	800	This work
Ce _{0.2} Sr _{0.8} Fe _{0.95} Ni _{0.05} O ₃	LSGM	0.58	300	800	This work

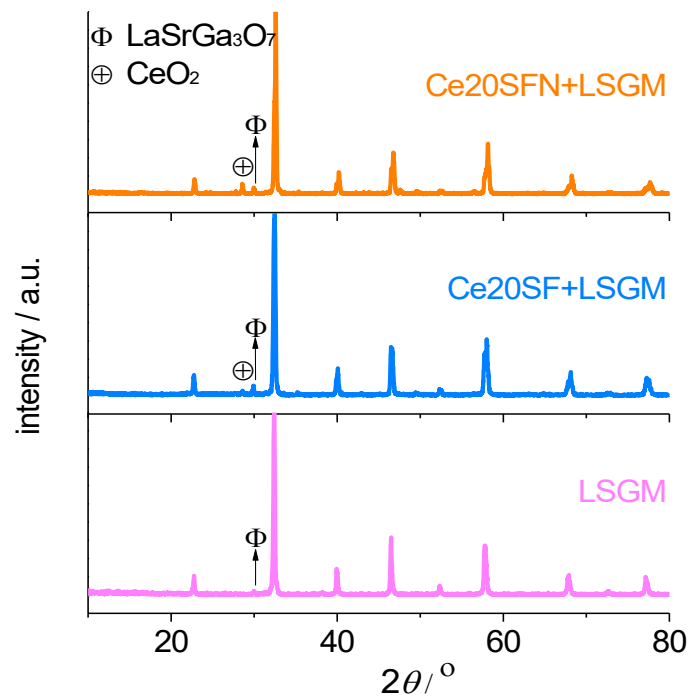


Figure S1. XRD patterns of Ce20SFN, and Ce20SF mixed with LSGM and calcined at 1100 °C for 2 h in the air.

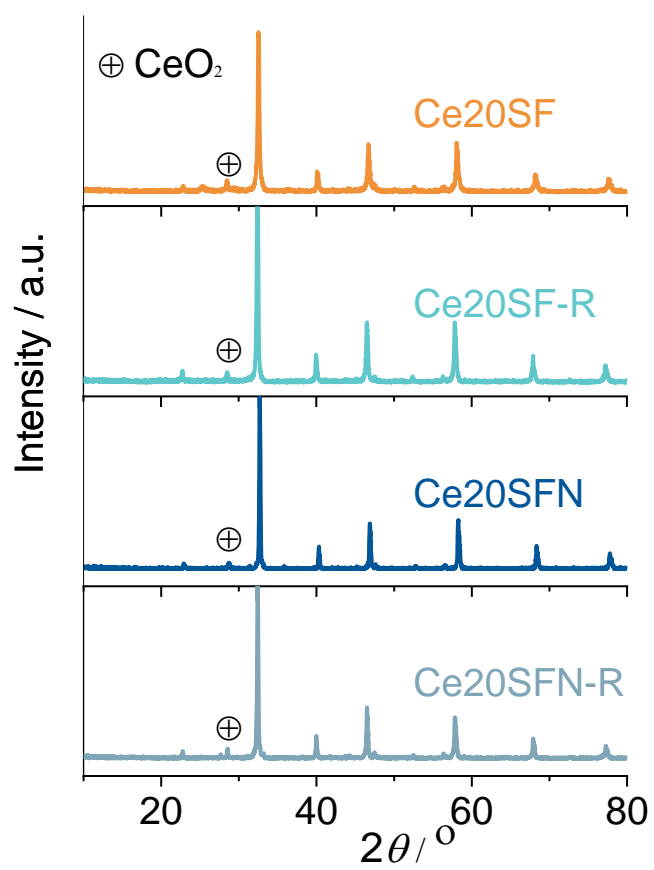


Figure S2. XRD patterns of Ce20SFN and Ce20SF in air and 5% H₂.

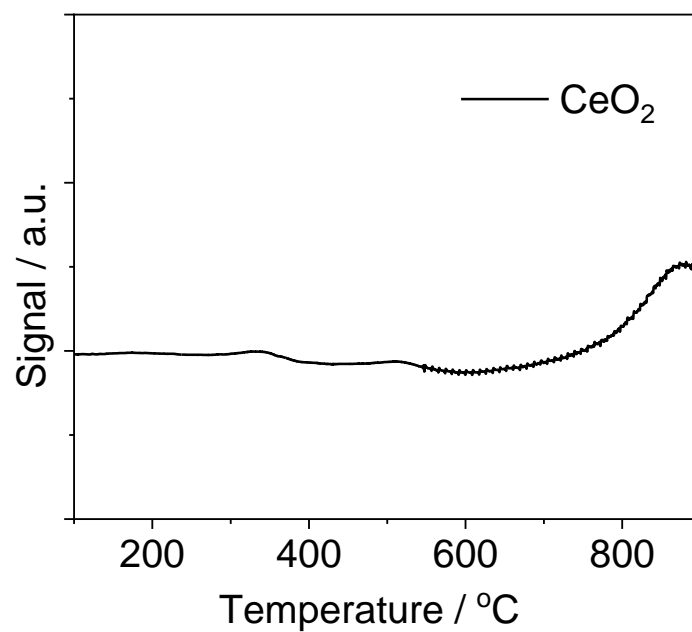


Figure S3. TPR of CeO₂ samples from 100 to 900 °C under 5% Ar/H₂. The hydrogen consumption for CeO₂ from 400 to 900 °C is 0.1372 mmol/g.

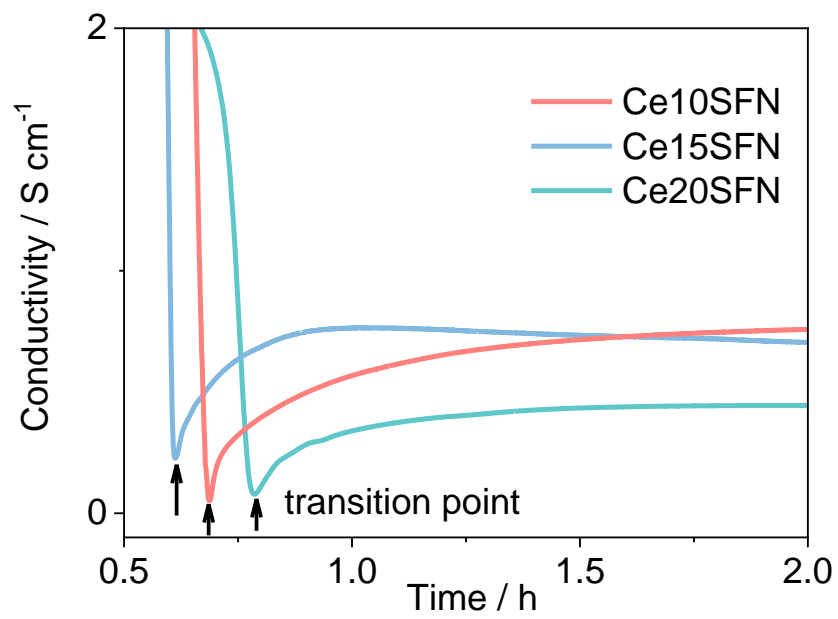


Figure S4. Conductivity for Ce10SFN, Ce15SFN and Ce20SFN at 800 °C

Fe-C-O, 1073 K

'+' = 1.0 atm P(total) isobar

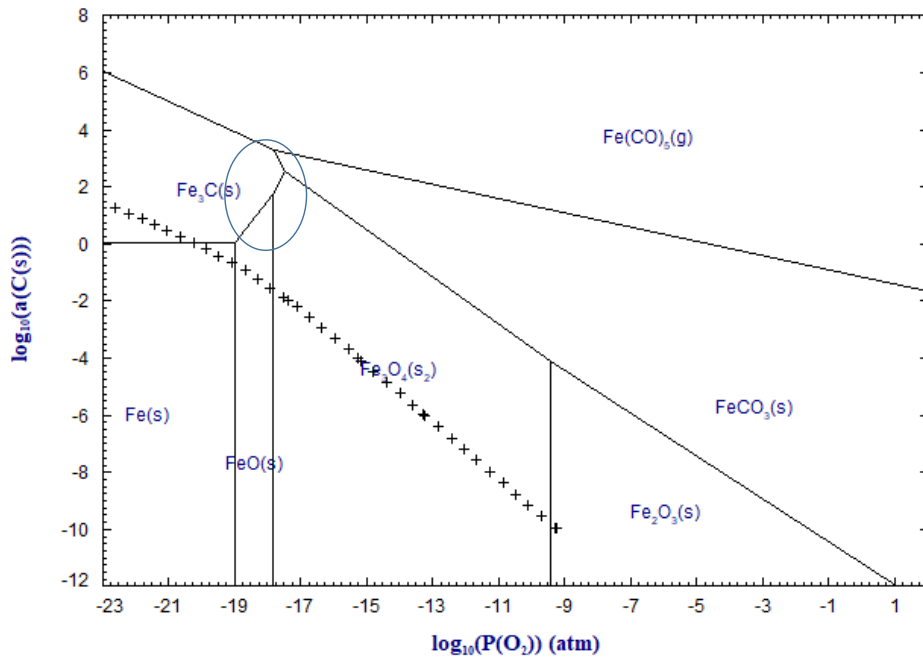


Figure S5. Phase diagram of Fe-C-O at 800 °C.

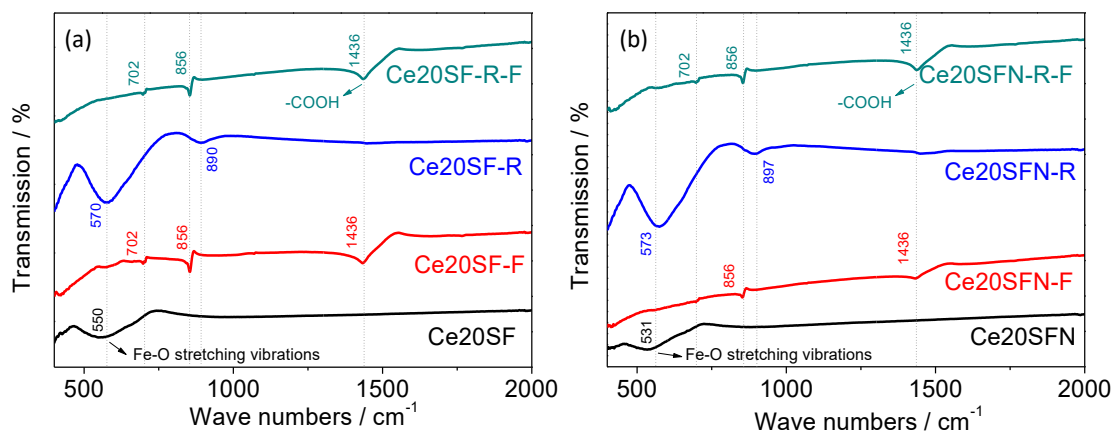


Figure S6. FTIR spectra of the samples (a) Ce20SF, Ce20SF-R and Ce20SF-R-F and (b) Ce20SFN, Ce20SFN-R and Ce20SFN-R-F.

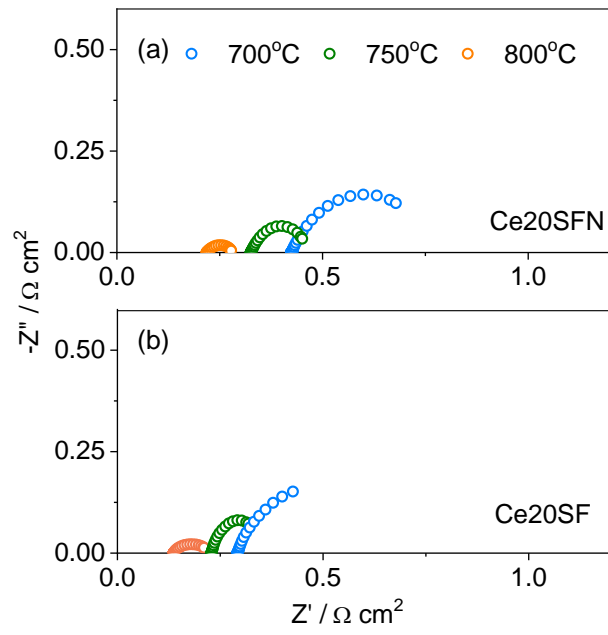


Figure S7. EIS of the symmetrical cell with Ce20SF and Ce20SFN electrode under ambient air.

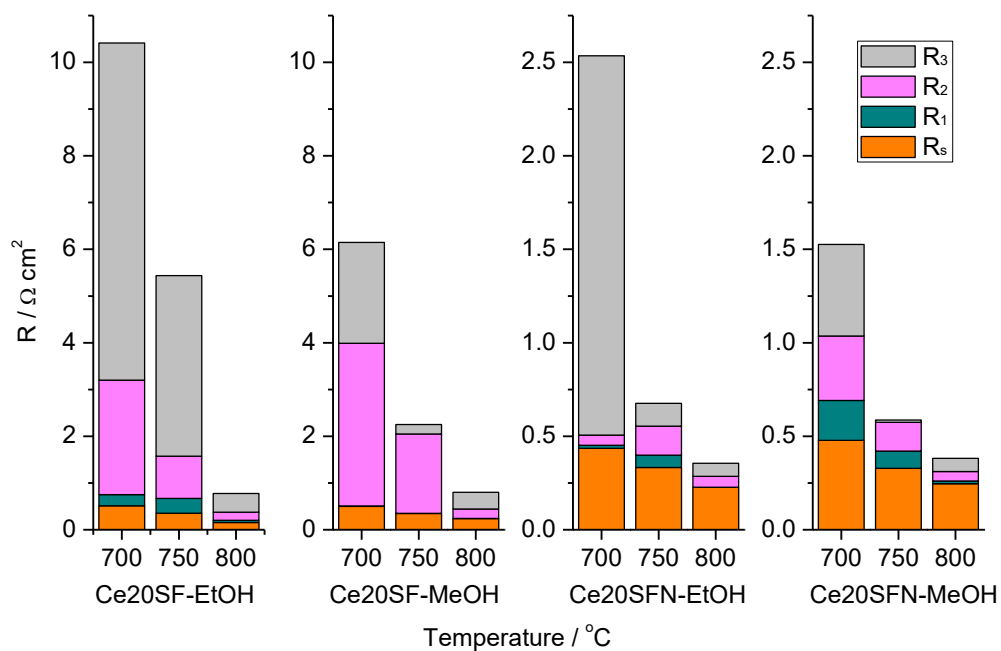


Figure S8. Fitted impedance parameters of the cells with the Ce20SF and Ce20SFN electrode in EtOH and MeOH at 700, 750, and 800 °C. R₁, R₂ and R₃ are the resistance components for the high, middle and low frequency, respectively.

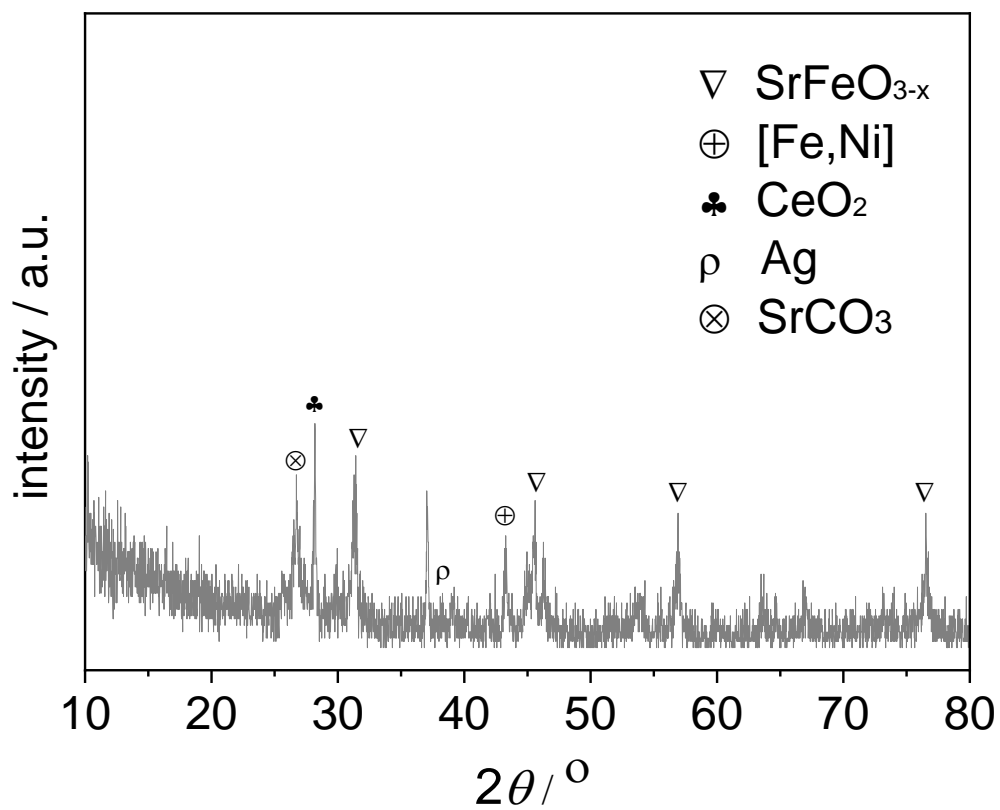


Figure S9. XRD patterns of Ce20SFN anode after stability test for 300 h.

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