Supplementary Materials

Boosting the bifunctional catalytic activity of $La_{0.85}Y_{0.15}Ni_{0.7}Fe_{0.3}O_3$ perovskite air electrode with facile hybrid strategy of metallic oxide for rechargeable Zn–air batteries

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Experimental Section

Materials

Lanthanum nitrate hexahydrate ($La(NO_3)_3 \cdot 6(H_2O)$), Yttrium nitrate hexahydrate ($Y(NO_3)_3 \cdot 6(H_2O)$), Nickel nitrate hexahydrate ($Ni(NO_3)_2 \cdot 6(H_2O)$), Iron(III) nitrate nonahydrate ($Fe(NO_3)_3 \cdot 9(H_2O)$), Cobaltous nitrate hexahydrate ($Co(NO_3)_3 \cdot 6(H_2O)$), EDTA, CA, and Nafion perfluorinated resin solution (5%) were purchased from Sigma-Aldrich. Others were obtained from Shanghai Aladdin Biochemical Technology Co., Ltd. Deionized water (DI,>18 M cm) was used for all experiments. All chemicals were analytic reagents.

Figure

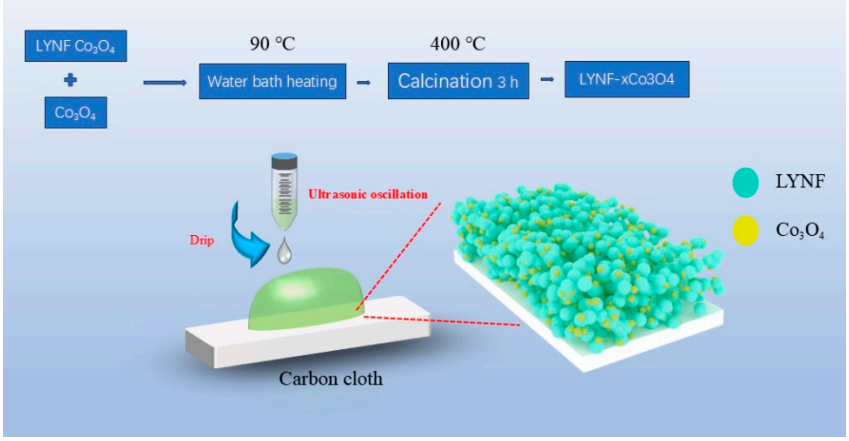

Figure S1. Flow chart of LYNF-Co_3O_4.

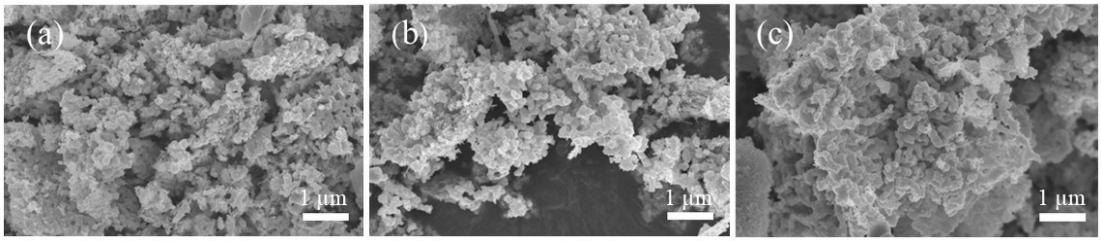

Figure S2. SEM image of LYNF-0.25Co_3O_4, LYNF-Co_3O_4, and LYNF-Co_3O_4.

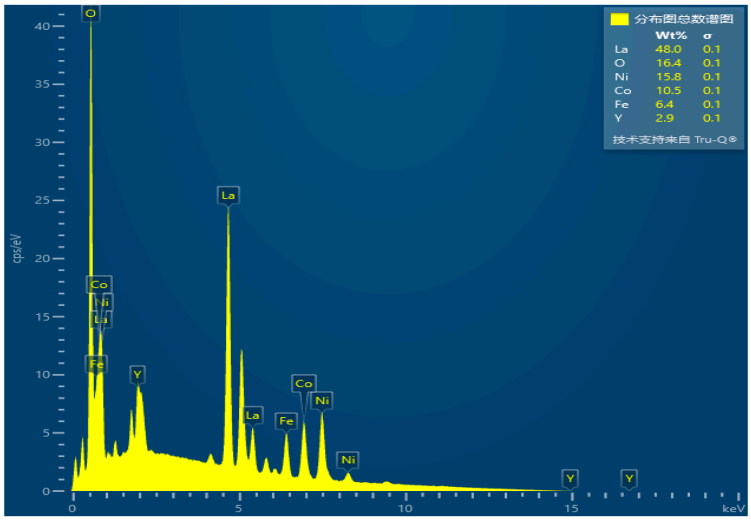

Figure S3. Spectra of total number of L, Y, N, F, and O distribution maps.

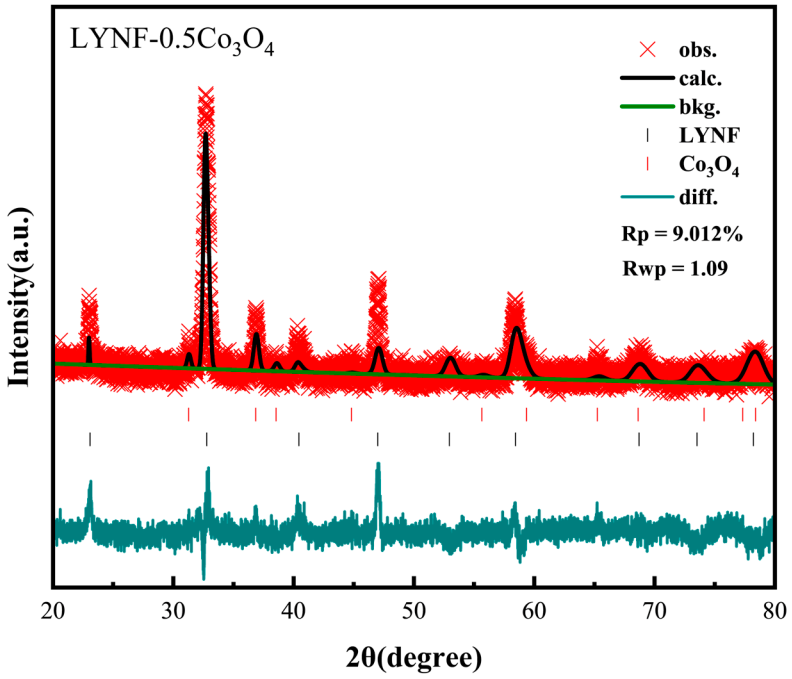

Figure S4. XRD Rietveld image of LYNF-Co_3O_4.

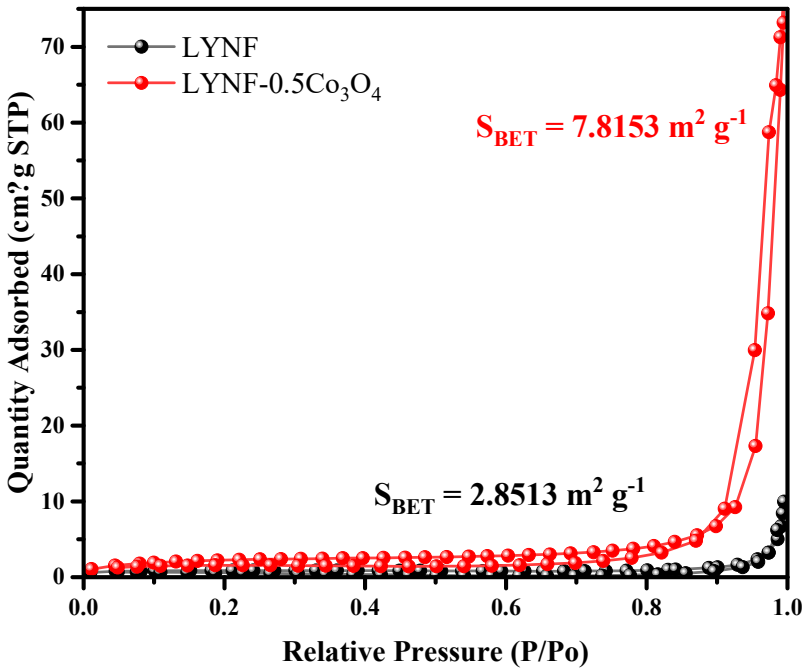

Figure S5. Nitrogen adsorption isotherm curves of LYNF and LYNF-0.5Co_3O_4.

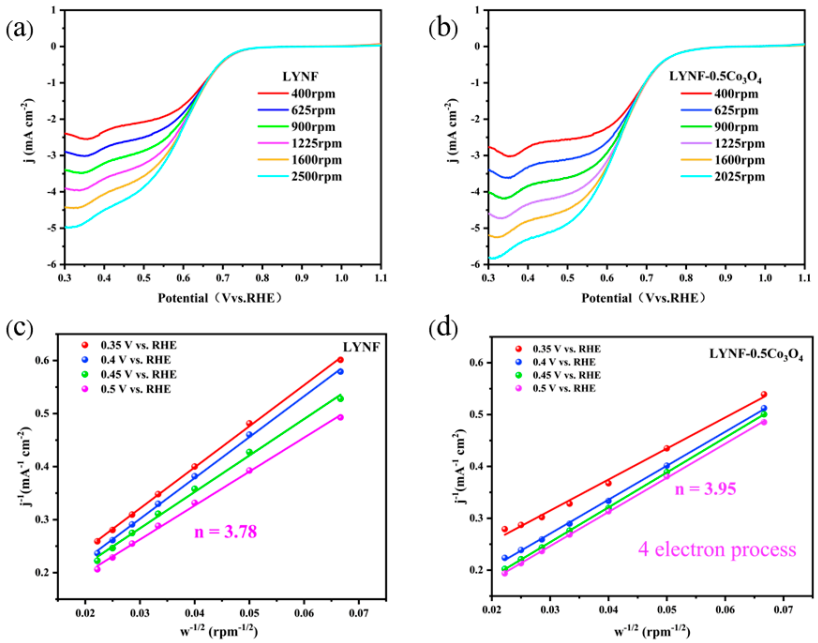

Figure S6. (a) (b) ORR polarization plots of LYNF and LYNF-Co_3O_4 in O_2-saturated 0.1M KOH electrolytes at different rotation rates. (b) (c) Koutecky–Levich plots of LYNF and LYNF-Co_3O_4.

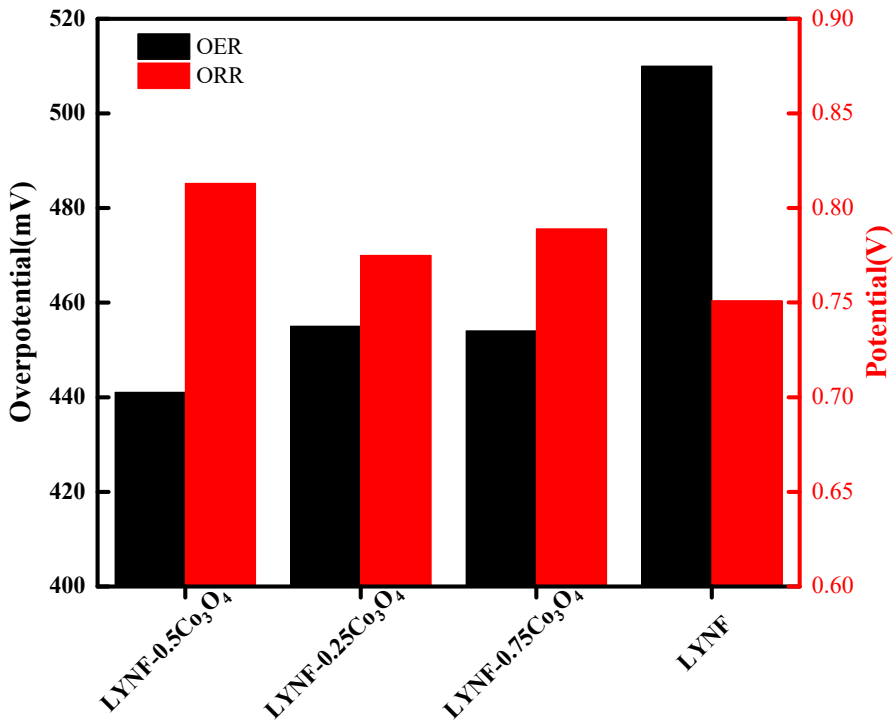

Figure S7. ORR and OER performance comparison chart.

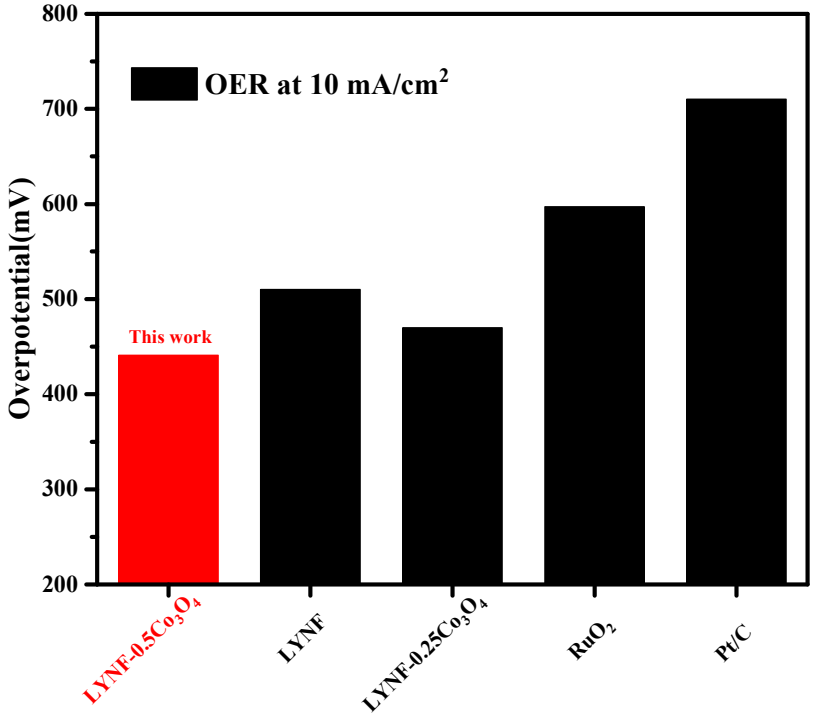

Figure S8. Overpotentials to afford 10 mA cm^{-2} for different electrocatalysts [35,36].

Table

Table S1. Optimization of state-of-the-art catalysts relative to our work.

Catalysts	Load ($mg\ cm^{-2}$)	Scan rate ($mV\ s^{-1}$)	E_{ORR}@1mA cm^{-2}	E_{OER}@10mA cm^{-2}	ΔE(V)	Reference
LYNF	0.189	5	0.63	1.78	1.15	This work
LYNF-Co_3O_4	0.189	5	0.68	1.71	1.03	This work
$LaNi_{0.8}Fe_{0.2}O_3$	0.2	5	0.67	1.71	1.04	[44]
LNO-Fe_6	0.2262	10	0.71	1.65	0.94	[45]
$LaCo_{0.8}Ru_{0.2}O_3$	0.204	5	0.72	1.69	0.97	[46]
$LaMnO_3$-CoO	0.232	5	0.59	1.78	1.19	[47]