

Supplementary Materials

Binary Nitrogen Precursor-Derived Porous Fe-N-S/C Catalyst for Efficient Oxygen Reduction Reaction in a Zn-Air Battery

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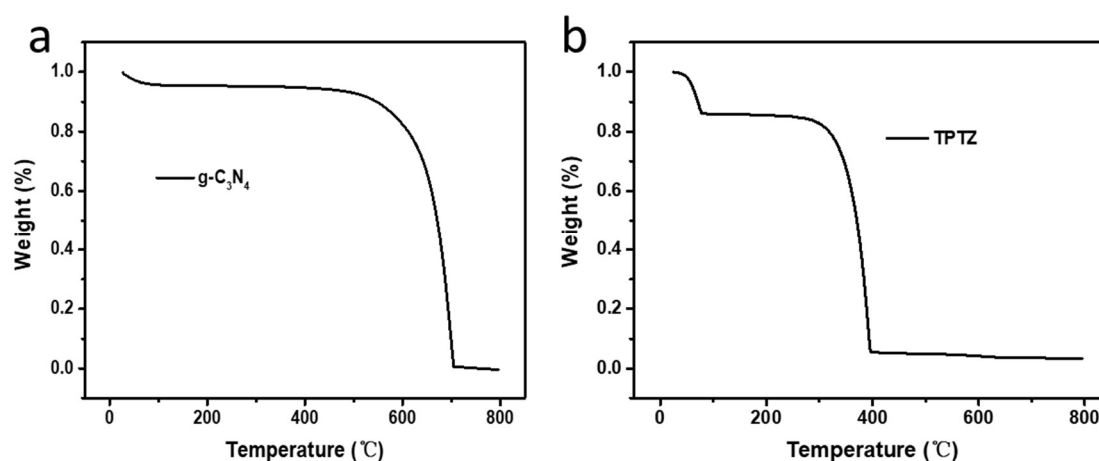


Figure S1. Thermogravimetric analysis (TGA) of (a) g-C₃N₄ and (b) TPTZ under N₂ atmosphere.

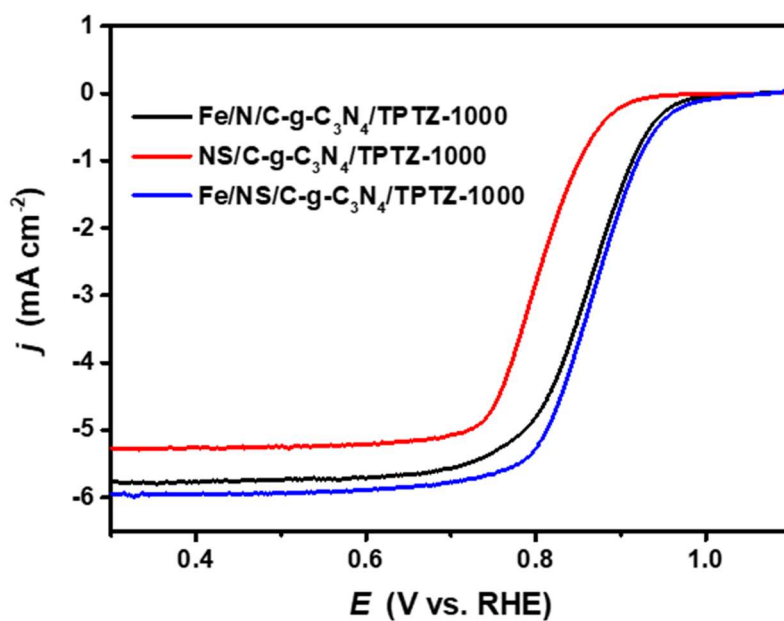


Figure S2. ORR polarization curves of Fe/N/C-g-C₃N₄/TPTZ-1000, NS/C-g-C₃N₄/TPTZ-1000 and Fe/NS/C-g-C₃N₄/TPTZ-1000 in O₂-saturated 0.1 M KOH solution with a rotational speed of 1600 rpm and a scan rate of 10 mV/s.

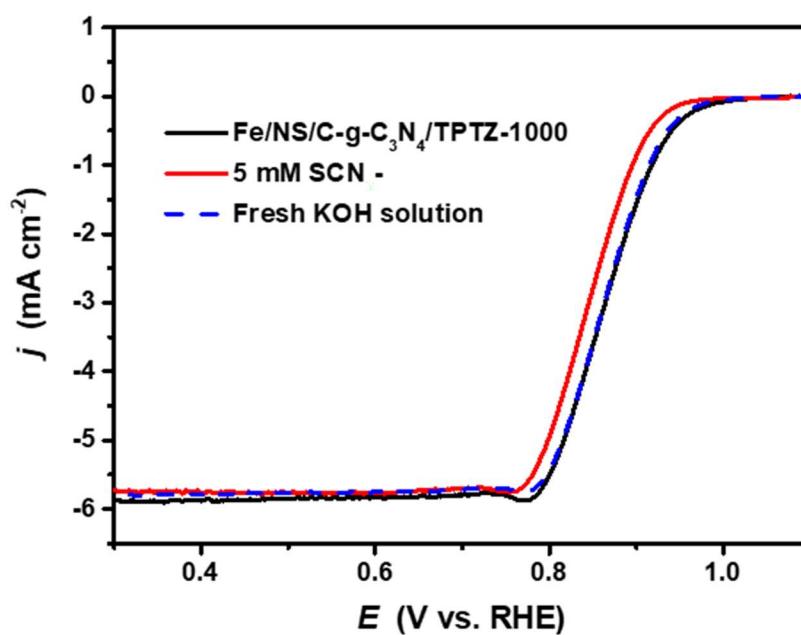


Figure S3. The polarization curves of Fe/NS/C-g-C₃N₄/TPTZ-1000 catalyst before and after adding SCN⁻ and after rinsing and replacing fresh O₂-saturated 0.1 M KOH solution.

Table S1. The element contents of Fe/NS/C-g-C₃N₄, Fe/NS/C-TPTZ and Fe/NS/C-g-C₃N₄/TPTZ obtained by XPS.

Catalyst	Fe(at. %)	N(at.%)	C(at.%)	O(at.%)	S(at.%)	N1	N2	N3	N4	N1+N3 (at.%)
Fe/NS/C-g-C ₃ N ₄	0.14	3.53	89.4	5.36	1.57	32.1	28.2	21.1	18.6	1.88
Fe/NS/C-TPTZ	0.22	4.94	87.12	6.06	1.66	31.5	15.3	38.5	14.7	3.46
Fe/NS/C-g-C ₃ N ₄ /TPTZ	0.29	6.67	85.71	6.45	0.79	40.5	27.9	19.9	11.7	4.03

Table S2. The element contents of Fe/NS/C-g-C₃N₄/TPTZ-T (T=800, 900, 1000) obtained by XPS.

Catalyst	Fe(at. %)	N(at.%)	C(at.%)	O(at.%)	S(at.%)	N1	N2	N3	N4
Fe/NS/C-g-C ₃ N ₄ /TPTZ-800	0.32	4.48	90.90	4.02	0.28	41.1	13.4	33.3	12.1
Fe/NS/C-g-C ₃ N ₄ /TPTZ-900	0.26	2.57	88.03	8.80	0.33	30.2	10.9	39.2	19.7
Fe/NS/C-g-C ₃ N ₄ /TPTZ-1000	0.20	1.40	92.26	5.13	1.01	28.1	8.7	46.8	16.4

Table S3. Comparison of ORR activity of Fe/NS/C-g-C₃N₄/TPTZ, Fe/NS/C-g-C₃N₄/TPTZ-T (T=800, 900, 1000) and Pt/C catalysts.

Catalyst	Loading / mg cm ⁻²	E _{1/2} / V (RHE)	j _{m@0.9V} / A g ⁻¹
Fe/NS/C-g-C ₃ N ₄ /TPTZ	0.4	0.853	2.38
Fe/NS/C-g-C ₃ N ₄ /TPTZ-800	0.4	0.863	4.85
Fe/NS/C-g-C ₃ N ₄ /TPTZ-900	0.4	0.864	4.60
Fe/NS/C-g-C ₃ N ₄ /TPTZ-1000	0.4	0.868	5.73
Pt/C	0.1	0.841	11.73