Electronic Supplementary Information(ESI)

$Sn(OH)_x$-assisted synthesis of mesoporous Mn-porphyrinic frameworks and their carbon derivatives for electrocatalysis

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FigureS1.Calibration to reversible hydrogen electrode (RHE) for ORR in 0.1 M KOH (A) and 0.1M $KClO_4$ (B).

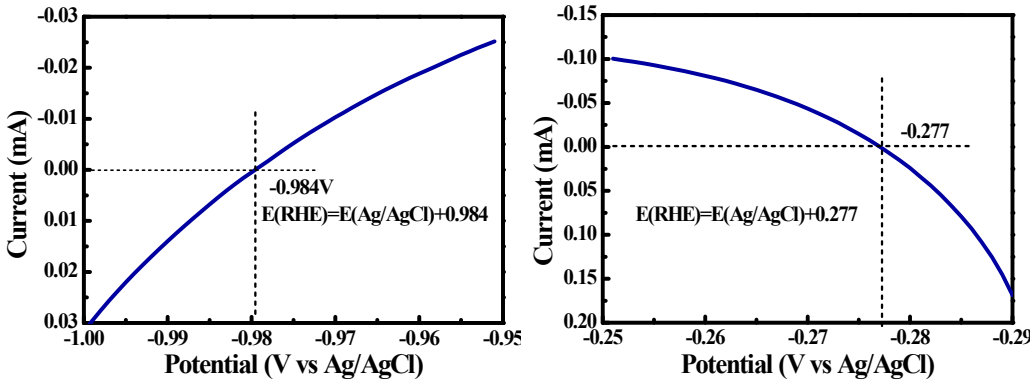

Figure S2. TEM images of Mn-COFs (A and B) and Mn-COFs*(C).

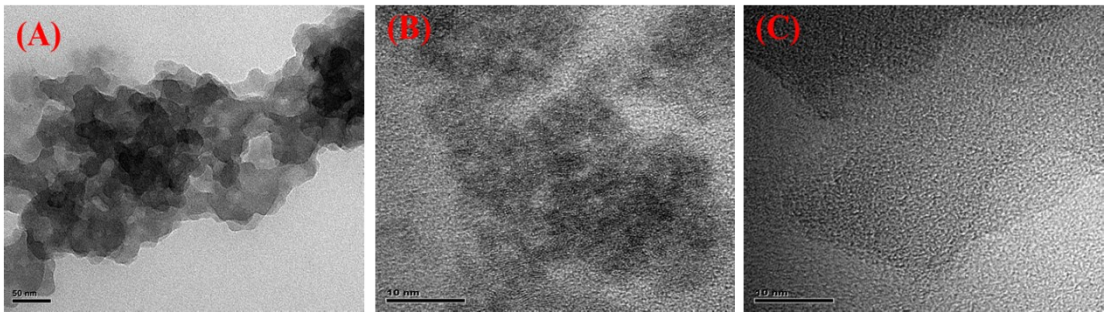

Figure S3. (A) N_2-sorption isotherm curves of Mn-COFs and Mn-COFs*. (B) Raman spectra of S-N-C-800 and Mn-S-N-C-800. (C) N_2-sorption isotherm curves of Mn-S-N-C-800 and Mn-S-N-C-800*. (D) XPS survey spectrum of Mn-S-N-C-800.

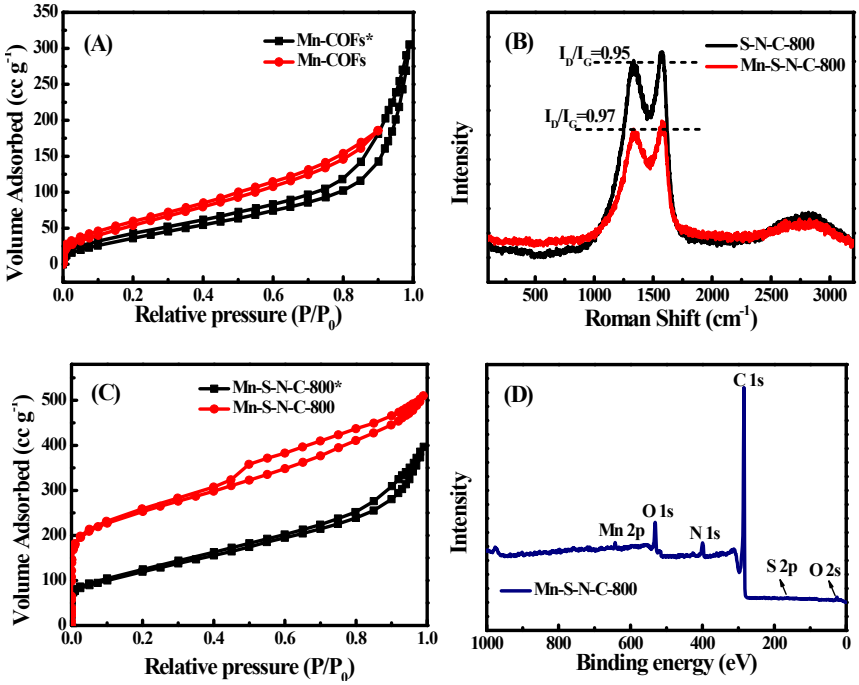

Figure S4. (A) LSV curves of Mn-S-N-C-800 with Pt wire and graphite rod as counter electrode in 0.1 M O_2-saturated KOH, respectively. (B) CV curves before and after 5,000 cycles with graphite rod as counter electrode. (C) LSV curves of Mn-S-N-C-800 with different loading. (D) LSV curves of Mn-S-N-C-800 and commercial Pt/C with different loading.

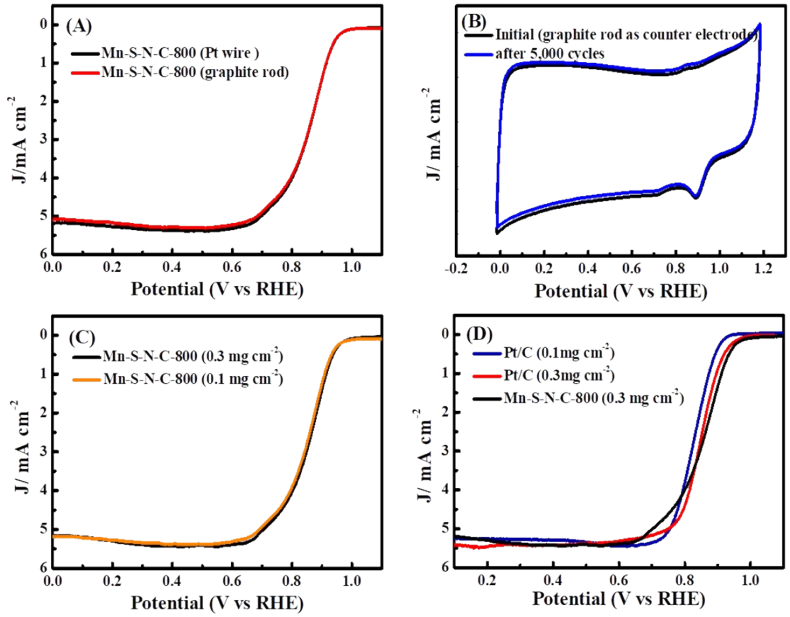

Figure S5. LSV curves of Mn-S-N-C-800 and Mn-S-N-C-800 after poisoning with 0.1 M and 0.2M NaF in 0.1 M $HClO_4$.

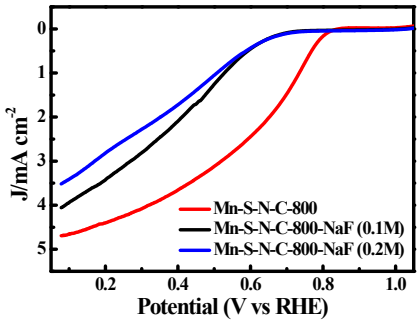

Figure S6. TEM images of Mn-S-N-C-700 (A) and Mn-S-N-C-900 (B).

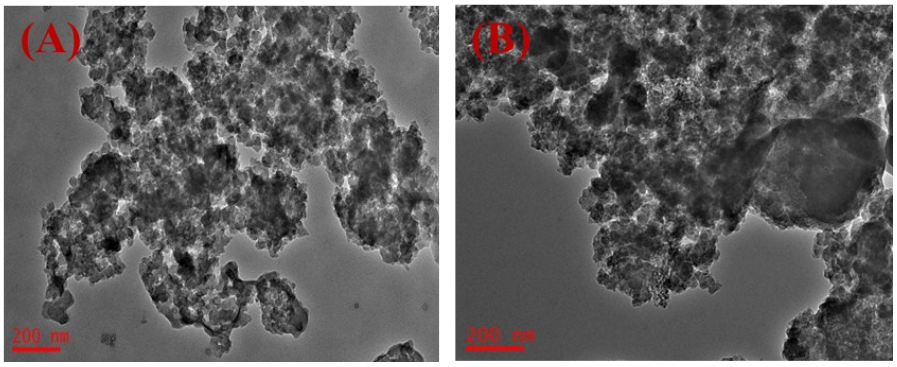

Figure S7.The deconvoluted N 1s (A), Mn 2p (B), C1s (C) and S2p (D) XPS spectra of Mn-S-N-C-700, -800 and -900.

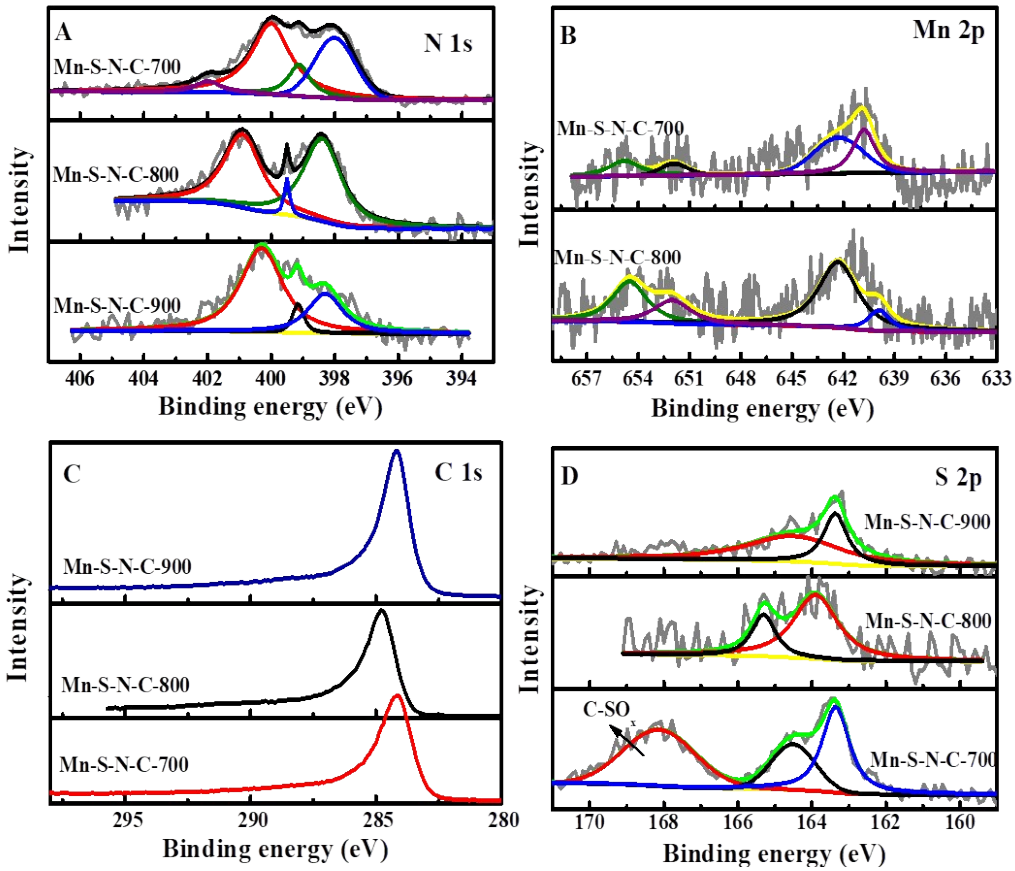

Table S1. The ORR performance of Mn-S-N-C-800 in 0.1 M KOH solution, in contrast to the previously reported Mn-based ORR catalysts.

Catalysts	**loading**	**E_{onset} (V vs. RHE)**	**$E_{1/2}$ (V vs.RHE)**	**Ref.**
Mn-S-N-C-800	**0.3 mg cm^{-2}**	**0.98**	**0.86**	**This work**
MnNPC-900	0.4 mg cm^{-2}	0.97	0.84	S1
Mn_3O_4QDs/N-p-MCNT	0.3 mg cm^{-2}	0.85	0.75	S2
Mn-N-C	0.8 mg cm^{-2}	0.92	0.78	S3
Mn/C-NO	0.3 mg cm^{-2}	1.0	0.86	S4
Mn_xO_y-NC	0.3 mg cm^{-2}	Not given	0.81	S5
D-AC@2Mn-4Co	0.3 mg cm^{-2}	0.88	0.80	S6
Mn_3O_4-CoO	0.3 mg cm^{-2}	0.86	0.75	S7
$MnFe_2O_4$	0.6 mg cm^{-2}	Not given	0.81	S8

Table S2. The surface species analyses of Mn-S-N-C-700,-800 and -900 by XPS (at. %).

Samples	**S**	**N**	**O**	**Mn**	**C**
Mn-S-N-C-700	0.82	5.96	10.81	0.54	81.87
Mn-S-N-C-800	0.14	5.20	7.34	1.19	86.13
Mn-S-N-C-900	0.10	2.24	7.03	0.20	90.43

Reference

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