Zinc-motivated $Fe/Fe_5C_2/Fe_{1-x}S$@ Fe-N-C active sites grown on N-doped porous carbon toward efficient oxygen reduction reaction in zinc-air batteries

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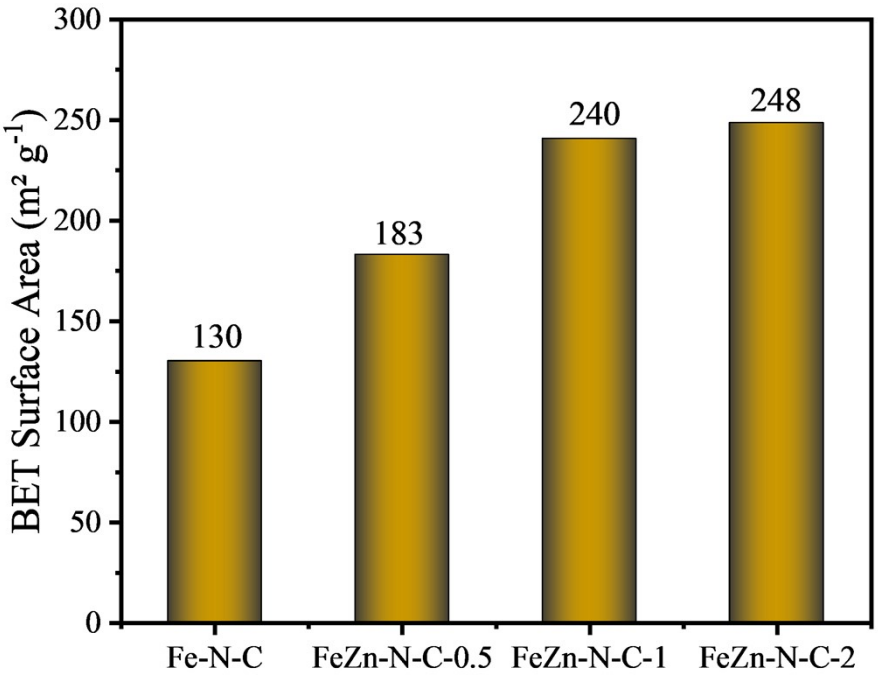

Fig. S1 Specific surface area of the prepared catalysts.

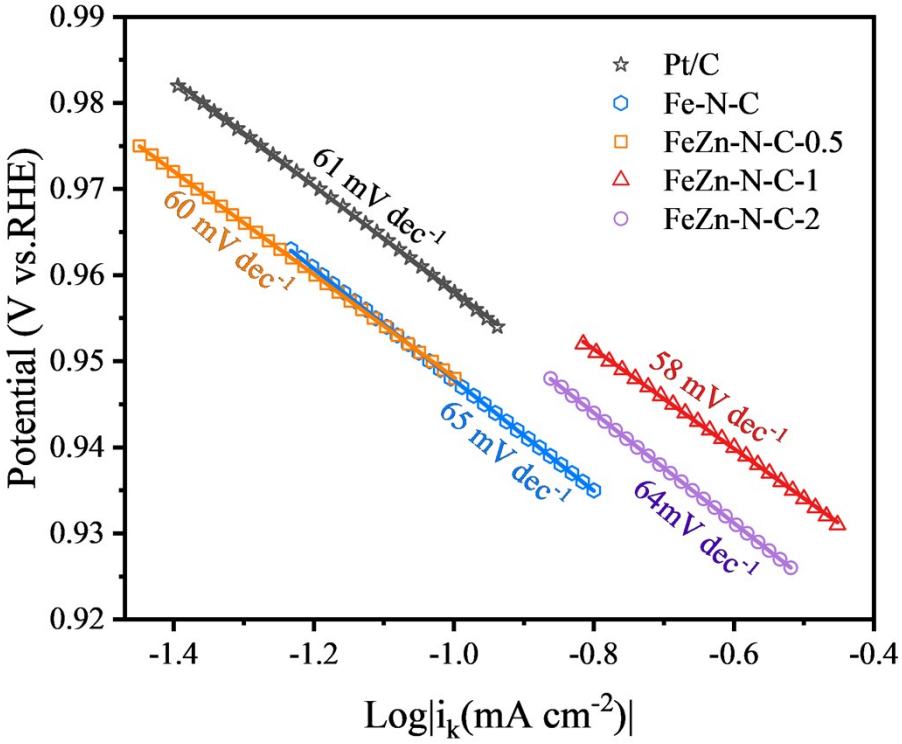

Fig. S2 Tafel slopes of Fe-N-C, FeZn-N-C-0.5, FeZn-N-C-1, FeZn-N-C-2 and Pt/C in O_2-saturated 0.1 M KOH.

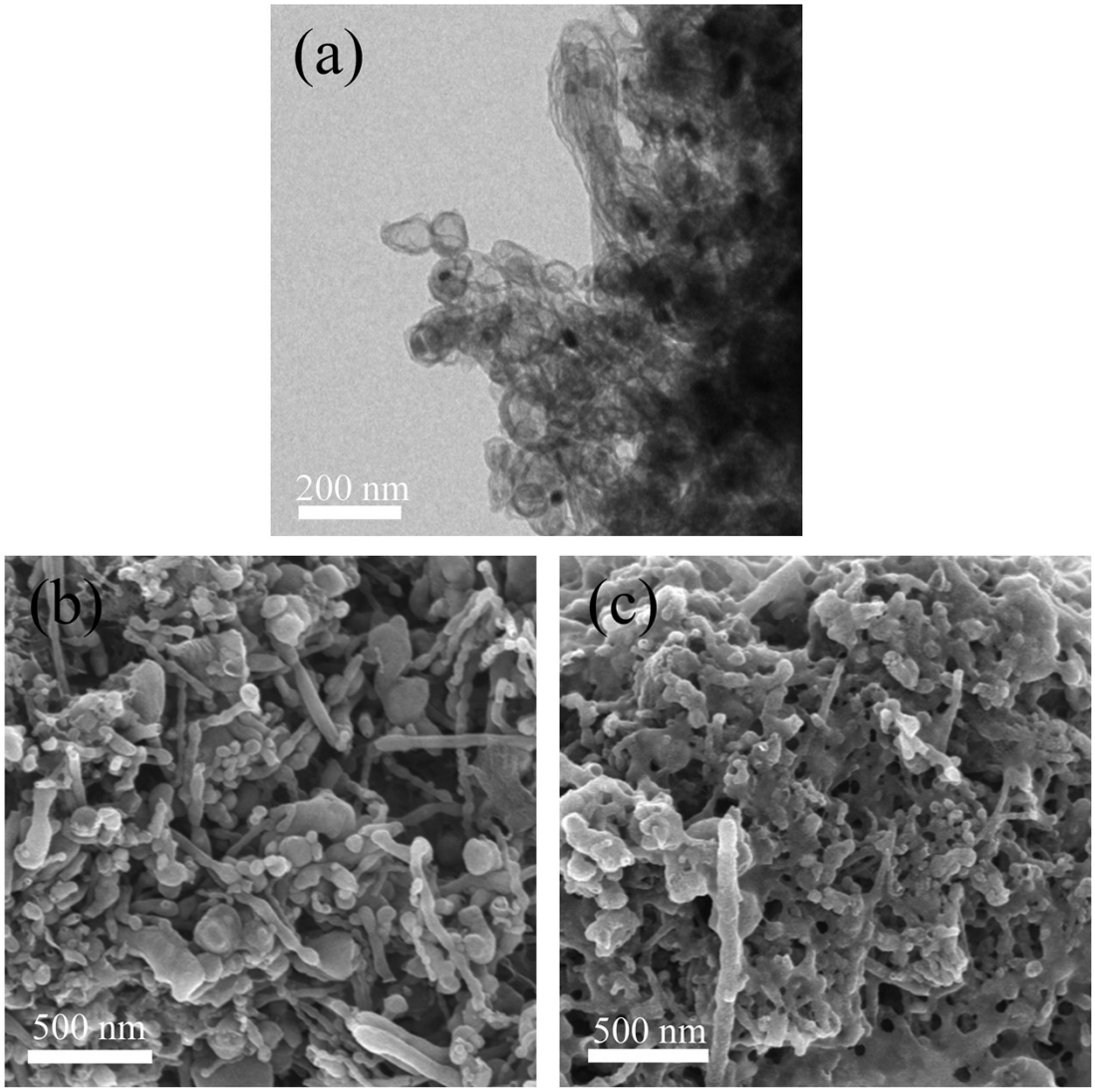

Fig. S3 (a) TEM image of FeZn-N-C-1 after more than 40000 s stability test. (b) SEM image of FeZn-N-C-1 (c) SEM image of FeZn-N-C-1 after more than 40000 s stability test.

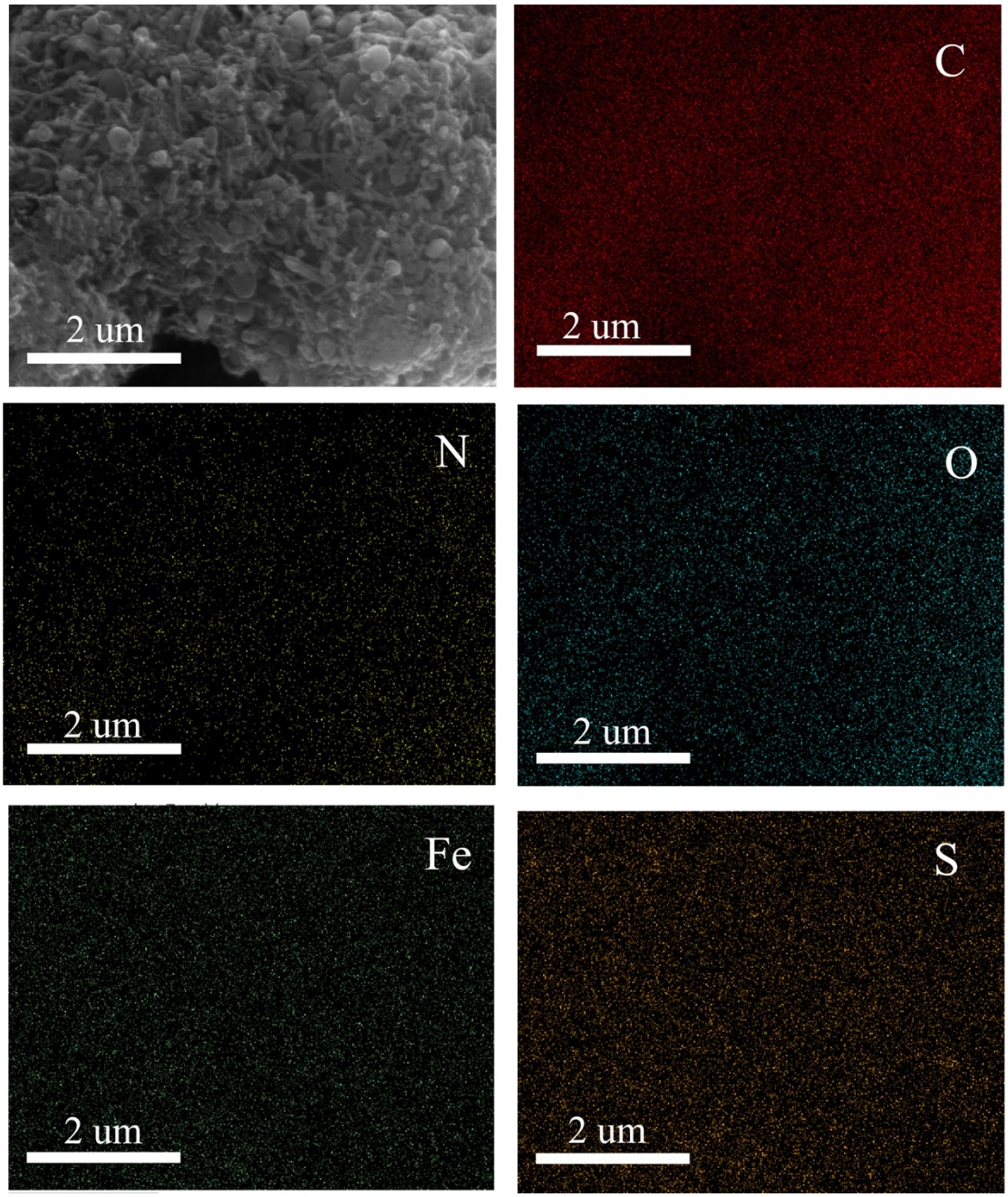

Fig. S4 SEM elemental mapping image of FeZn-N-C-1.

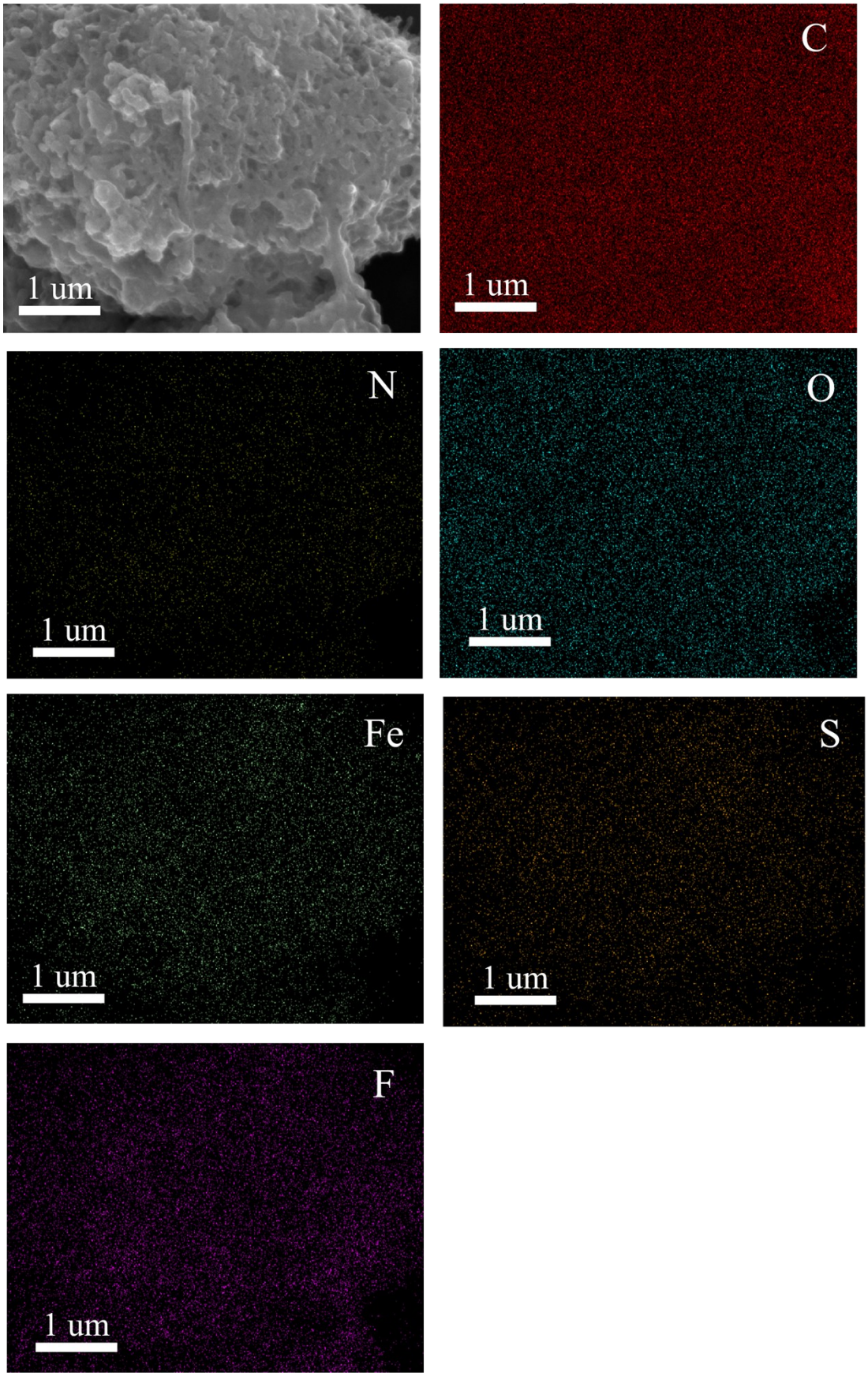

Fig. S5 SEM elemental mapping image of FeZn-N-C-1 after more than 40000 s stability test.

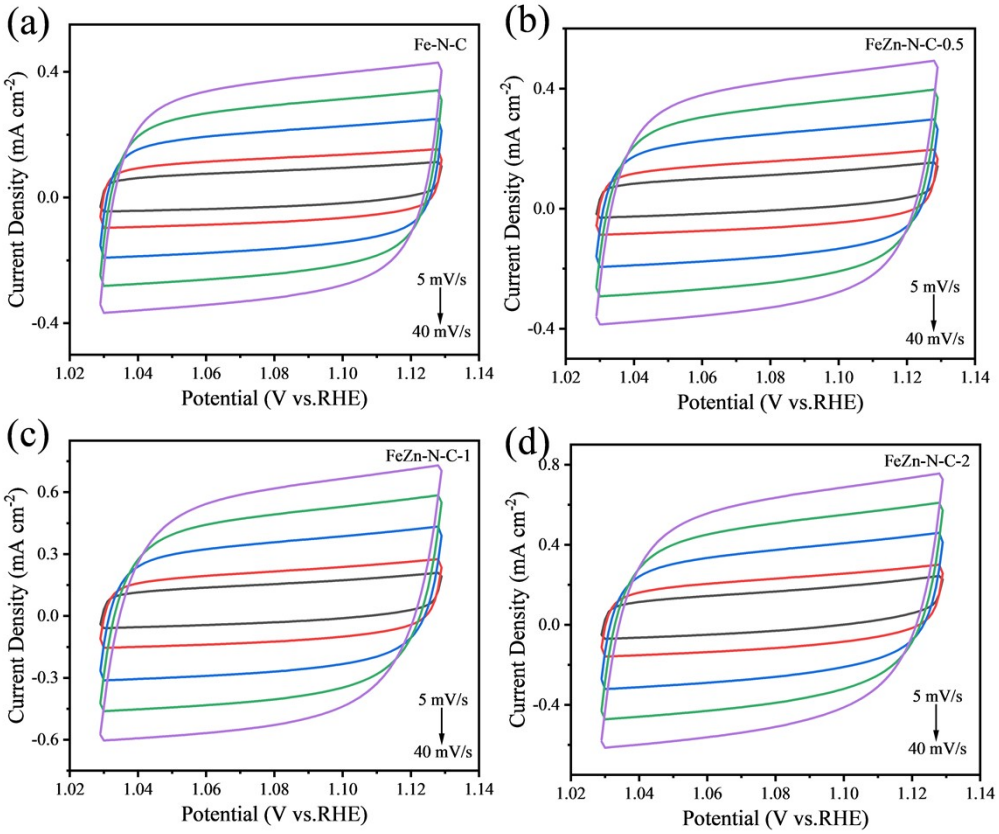

Fig. S6 CV curves for (a) Fe-N-C, (b) FeZn-N-C-0.5, (c) FeZn-N-C-1 and (d) FeZn-N-C-2 at different scan rates. (Scanning rate: 5 mV/s, 10 mV/s, 20 mV/s, 30 mV/s, 40 mV/s).

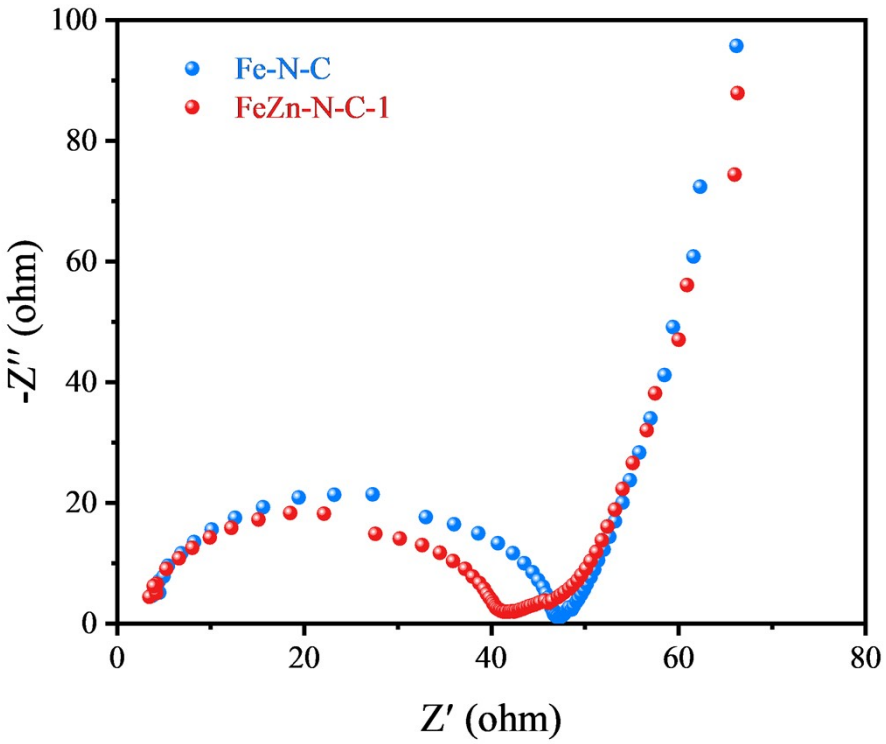

Fig. S7 The electrochemical impedance spectra results of Fe-N-C and FeZn-N-C-1 in O_2-saturated 0.1 M KOH.

Table. S1 A comparative table of the present work and the recently reported ORR performance of Fe-N-C catalysts in alkaline media.

Materials	$E_{1/2}$ (V) (vs. RHE) in 0.1 M KOH	References
FeZn-N-C-1	0.846	This work
Fe SA-NSC-900	0.860	[1]
Fe_2N@NCNTs	0.860	[2]
Fe−Co/Co_3O_4@NC-900	0.840	[3]
Se/Fe-Co_3O_4/N-CNs	0.800	[4]
Fe/Fe_3C/$FeN_{0.0324}$@N-GC-850	0.870	[5]
Fe/Fe_3C@N-doped CNTs	0.863	[6]
FeNC-950	0.840	[7]
FeSb/NC	0.830	[8]
Fe-N-C/MUS	0.860	[9]
FeNFC800	0.829	[10]
FeNC-24	0.852	[11]
FeCo/FeCoP@NMn-CNS-800	0.840	[12]
A-FeNC	0.850	[13]

Table. S2 Summary of liquid and all-solid nitrogen-air cell performance using Fe-N-C cathode catalysts.

Materials	Peak power density (mW cm^{-2})	Specific capacity (mAh g^{-1})	References
FeZn-N-C-1	143.6	804	This work
Fe_2N@NCNTs	135	762	[2]
Fe-Co/Co_3O_4@NC-900	107.6	—	[3]
Se/Fe-Co_3O_4/N-CNs	141.3	765.6	[4]
Fe/Fe_3C@N-doped CNTs	206	781	[6]
FeSb/NC	175	751	[8]
FeCo/FeCoP@NMn-CNS-800	135	—	[12]
A-FeNC	102.2	—	[13]
Fe-N-HPC	164.8	735	[14]
Fe/Fe_3C@Fe-N_x-C	147	—	[15]
Cu/Fe/NeCNS	76.4	—	[16]
CoFeNi@CNT	152.3	814	[17]
SA-Fe-NC	164	806	[18]

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