Supporting Information

Well-Defined ZIF-Derived Fe-N Codoped Carbon Nanoframes as Efficient Oxygen Reduction Catalysts

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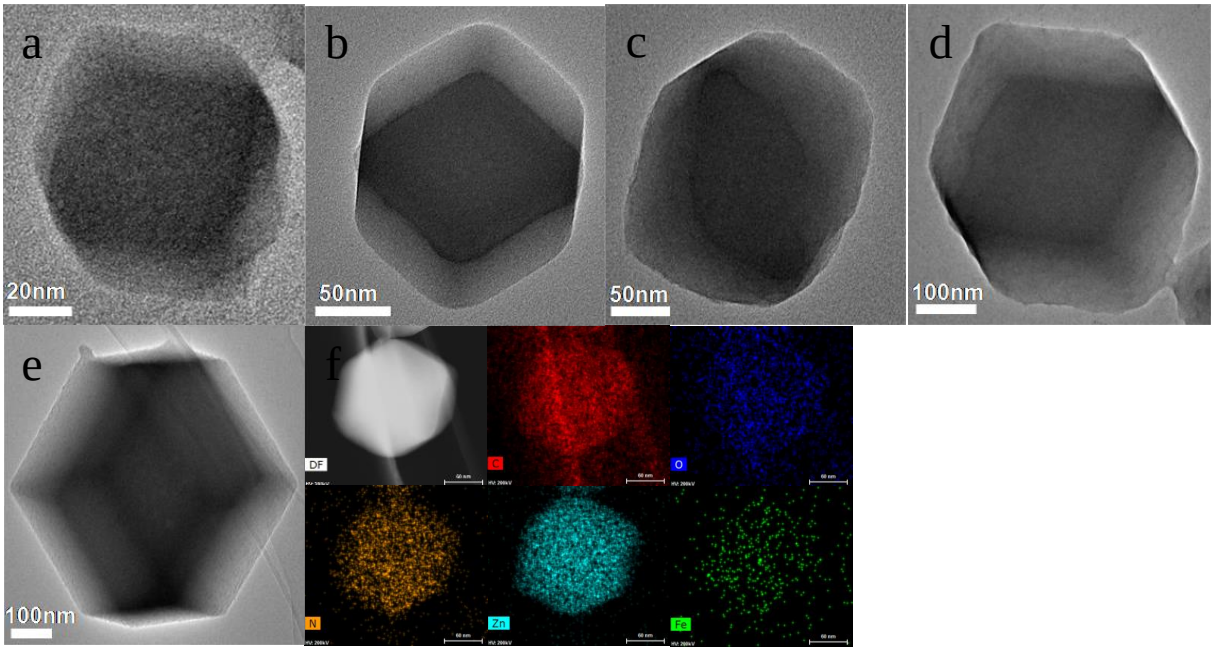

Figure. S1 TEM images of the corresponding precursors(a) ZIF-8, (b) FeZIF-0.42, (c) FeZIF-0.84, (d) FeZIF-2.53,(e) FeZIF-3.54; (f)HAADF-STEM images and elemental mappings of FeZIF-0.84 precursors

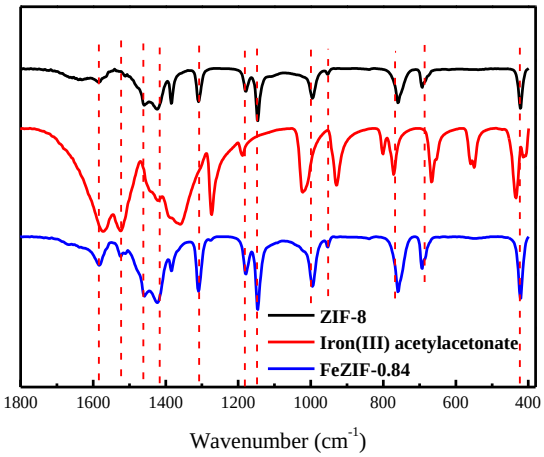

Figure. S2 FTIR spectra of the ZIF-8, Iron(III) acetylacetonate, FeZIF-0.84

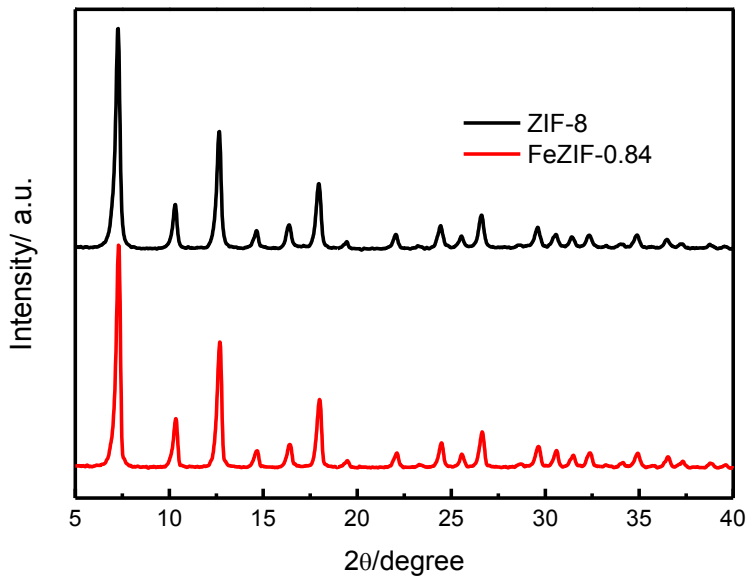

Figure. S3 PXRD of the ZIF-8 and FeZIF-0.84

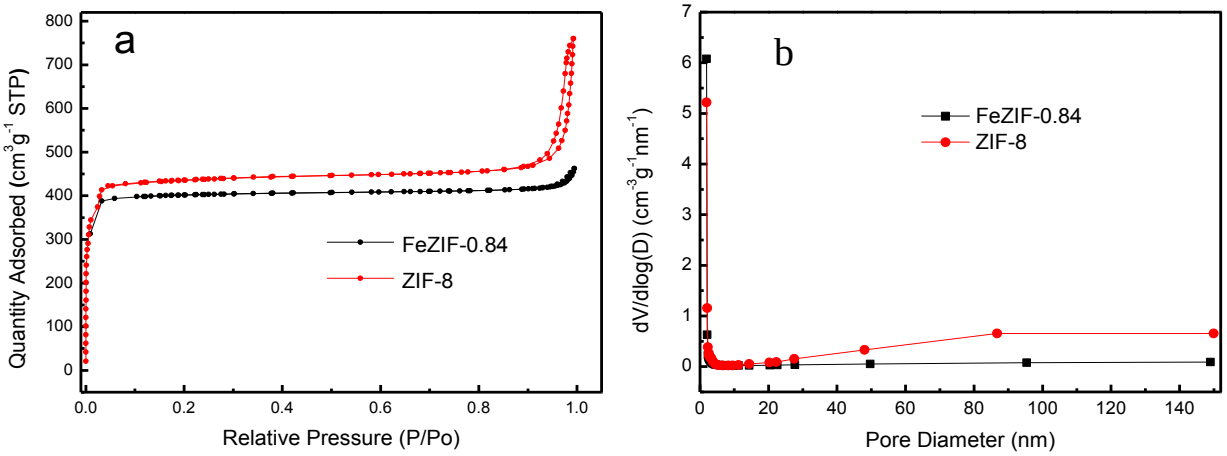

Figure. S4 N_2 adsorption and desorption isotherms(a) and pore size distributions(b) of ZIF-8 and FeZIF-0.84

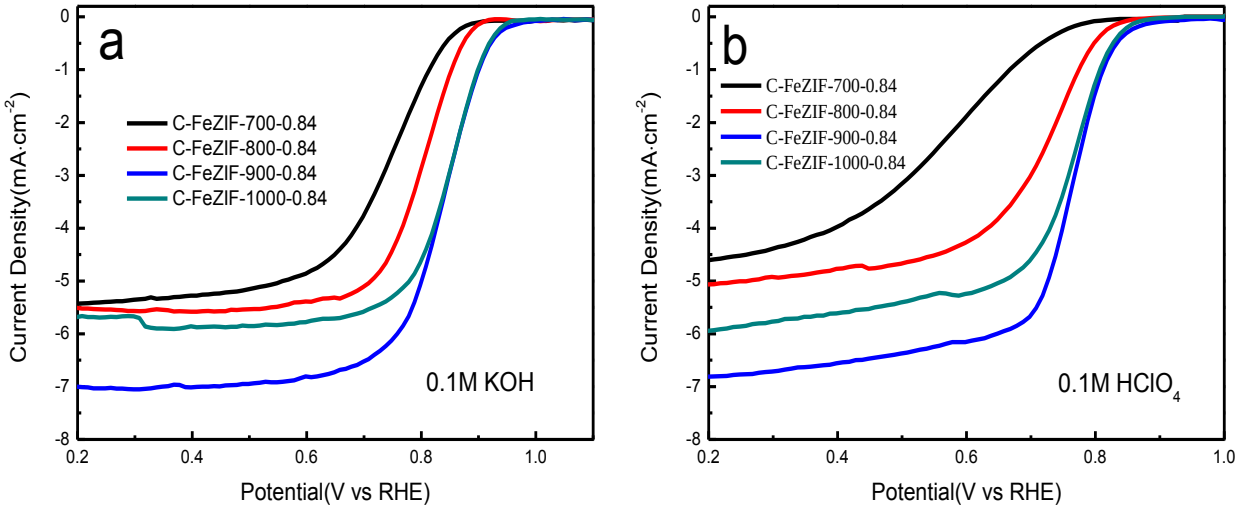

Figure. S5 ORR curves of C-FeZIF-0.84 in 0.1M KOH(a) and 0.1M $HClO_4$(b) at different pyrolysis temperatures

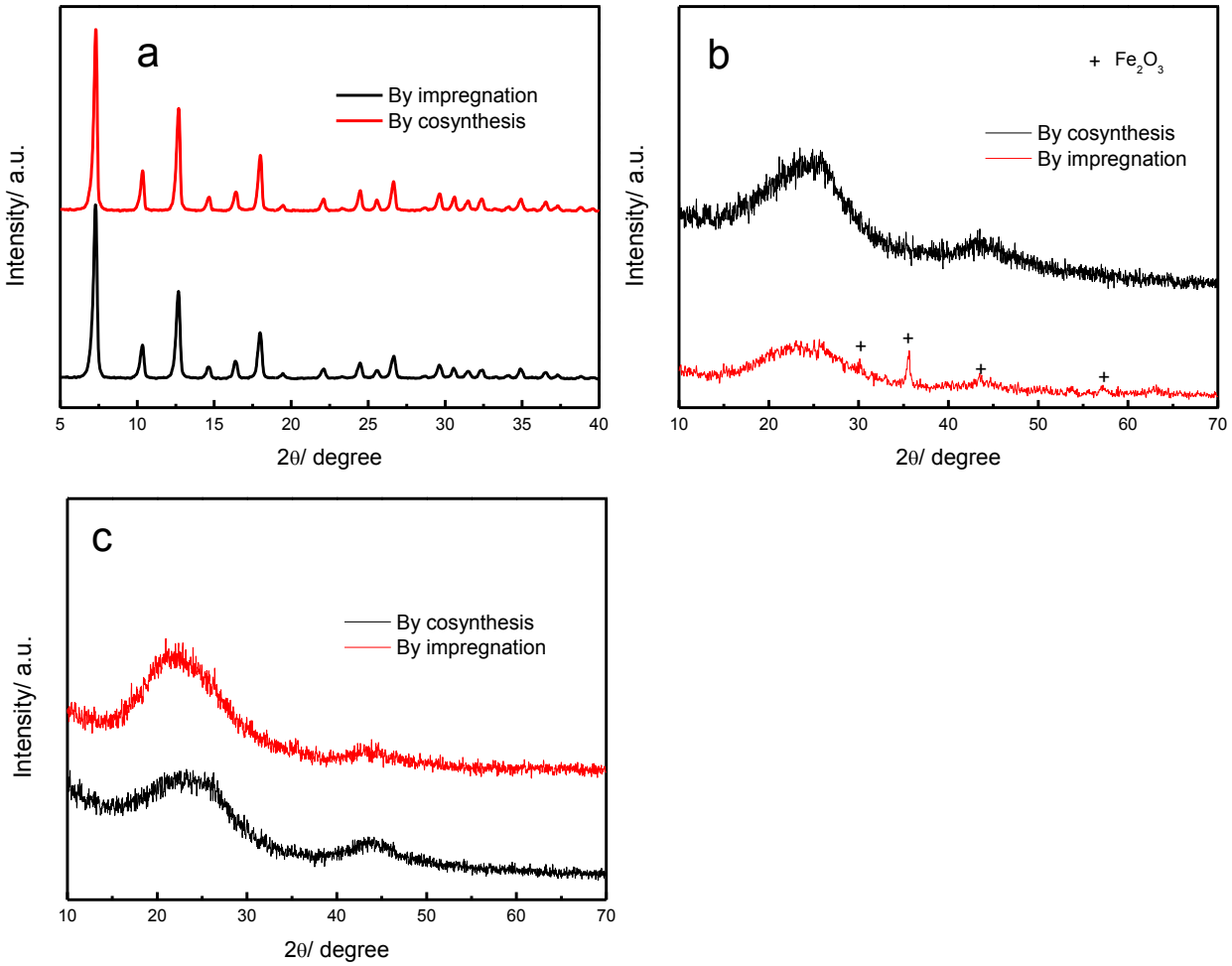

Figure. S6 XRD patterns of FeZIF-0.84 precursor prepared by co-synthesis and impregnation method(a); C-FeZIF-900-0.84 before acid leaching(b) and after acid leaching(c)

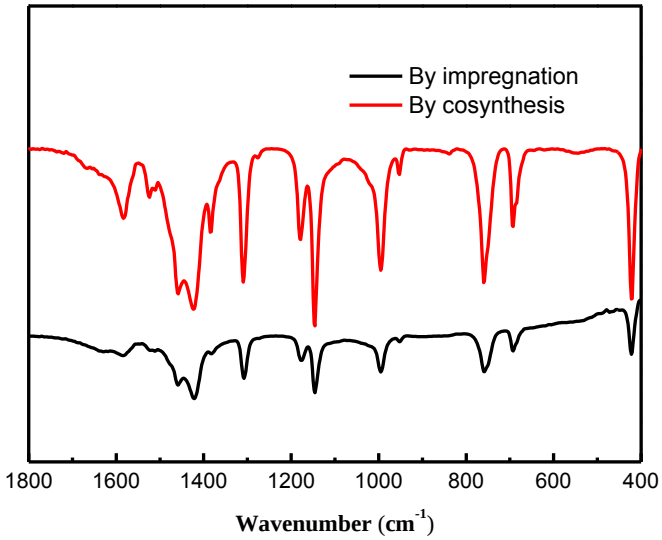

Figure. S7 FTIR spectra of FeZIF-0.84 precursor prepared by co-synthesis and impregnation method

Table. S1 Comparison of the E_{onset} and $E_{1/2}$ toward ORR for non-noble metal catalysts reported and this work in alkaline medium.

Catalyst	E_{onset}vsRHE	$E_{1/2}$vsRHE	Electrolyte	References
Fe N/C-800	0.923	0.809	0.1MKOH	J. Am. Chem. Soc. 2014, 136, 11027
Fe_3C/C-800	1.05	0.83	0.1MKOH	Angew. Chem. Int. Ed. 2014, 53,3675
Co/N/C	0.94	0.83	0.1MKOH	Adv. Mater. 2016, 28, 2337–2344
Fe_3C-GNRs	0.95	0.78	0.1MKOH	ACS Nano 2015, 9, 7407-7418.
Co@Co_3O_4@C-CM	0.93	0.81	0.1MKOH	Energy Environ. Sci. 2015, 8, 568-76
Fe-N/C-800	0.98	/	0.1MKOH	J. Am. Chem. Soc. 2015, 137, 5555
Fe/N/C	0.94	0.83	0.1MKOH	ACS Nano, 2016, 10 (6), pp 5922–5932
GNS/MC	/	0.85	0.1MKOH	Adv. Energy Mater. 2016, 1501794
C-FeZIF-900-0.84	0.95	0.84	0.1MKOH	This work

Table. S2 Comparison of the E_{onset} and $E_{1/2}$ toward ORR for non-noble metal catalysts reported and this work in acid medium.

Catalyst	E_{onset}vsRHE	$E_{1/2}$vsRHE	Electrolytes	References
PFeTTPP-1000	0.93	0.76	0.1M $HClO_4$	Angew. Chem. Int. Ed. 2013, 52, 8349-8353.
ZIF-67-900	0.85	0.71	0.5 M H_2SO_4	J. Mater. Chem. A. 2014, 2, 14064-14070.
PpPD-Fe-C	0.826	0.718	0.5 M H_2SO_4	Angew. Chem. Int. Ed. 2014, 53, 10673-10677.
CPANIFe-NaCl	0.91	0.74	0.1M $HClO_4$	J. Am.Chem. Soc. 2015, 137, 5414
PCN-FeCo/C	0.90	0.76	0.1M $HClO_4$	Adv. Mater. 2015, 27, 3431
N–Fe/G (60)-900-S	0.834	0.716	0.1M $HClO_4$	Nanoscale 2015, 7, 14707
FeNC-20-1000	0.90	0.77	0.1M $HClO_4$	J. Mater. Chem. A, 2016,4, 11357-11364
Fe_3C/NG-800	0.92	0.77	0.1M $HClO_4$	Adv. Mater. 2015, 27, 2521-2527
C-FeZIF-900-0.84	0.90	0.77	0.1M $HClO_4$	This work

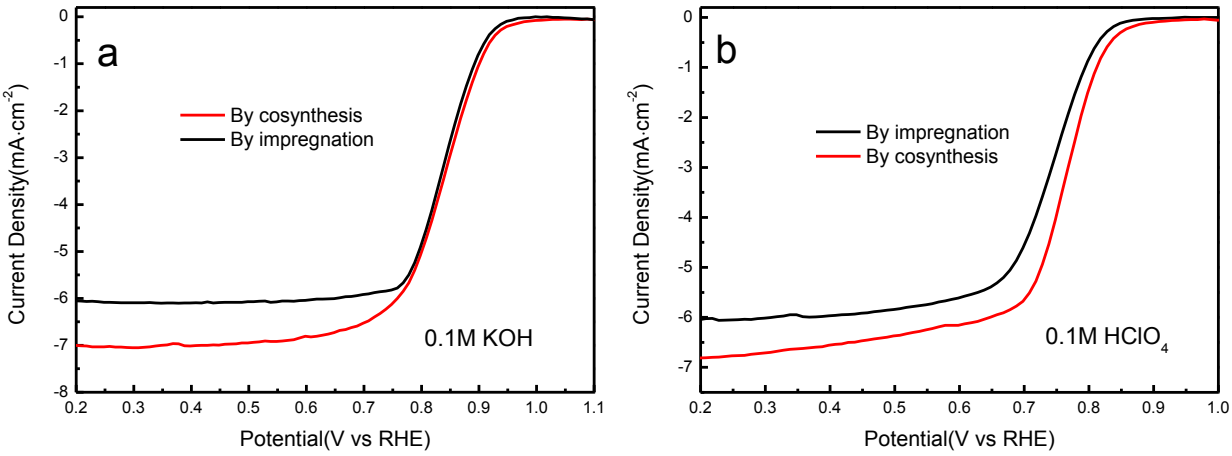

Figure. S8 ORR curves of C-FeZIF-900-0.84 in 0.1M KOH(a) and 0.1M $HClO_4$(b) prepared by cosynthesis and impregnation method