Supporting Information for

MOFs derived ZnCo-Fe core-shell nanocages for remarkable OER performance

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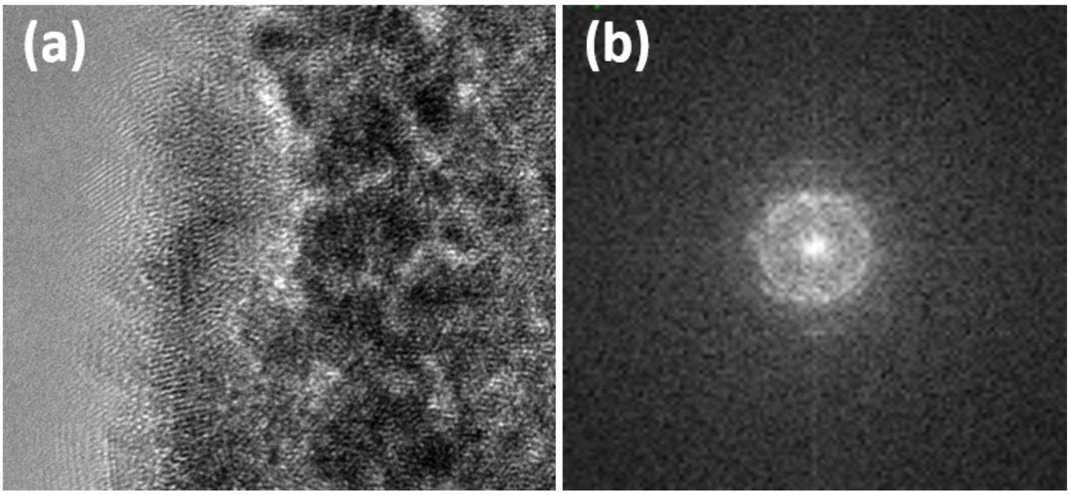

Figure S1. (a) HRTEM observation of the nanosheets outside of the ZnCo-Fe-20 nanocages and its corresponding Fast Fourier Transform Algorithm (FFT) pattern **(b)**; the dispersed and weak halo feature suggests a poor crystallization of the nanocage sample.

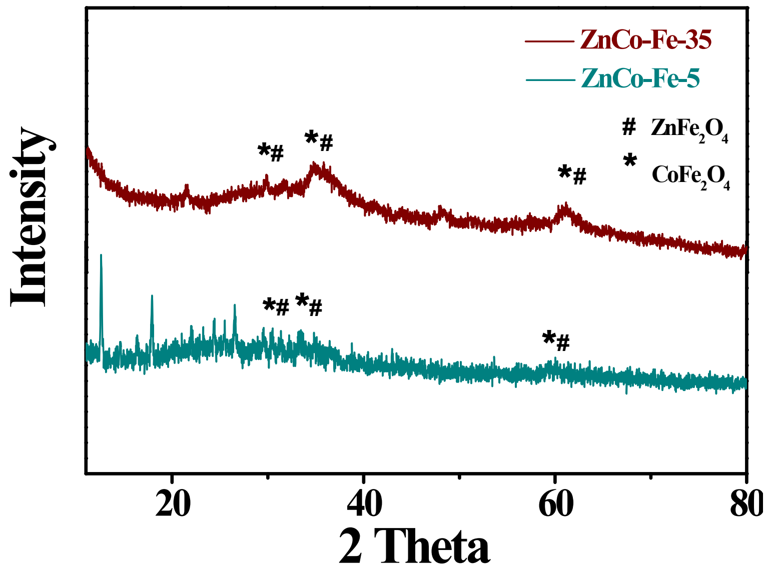

Figure S2. XRD patterns of ZnCo-Fe-5 and ZnCo-Fe-35.

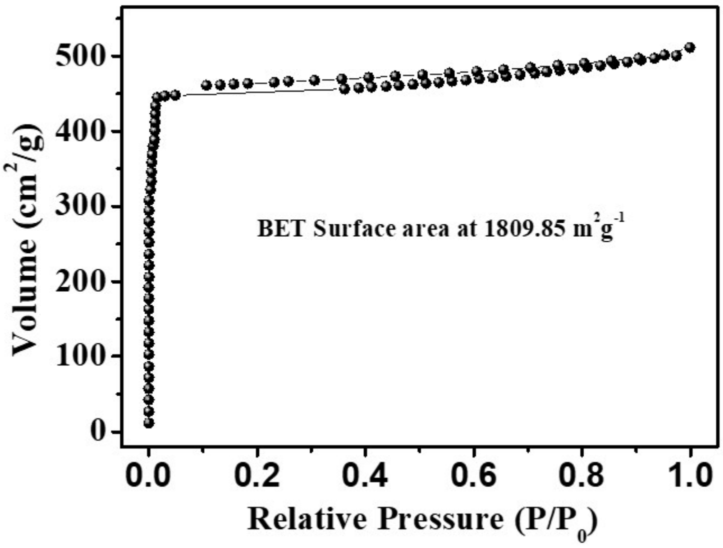

Figure S3. N_2 adsorption–desorption isotherms of ZnCo-Fe-20 and the corresponding BET surface of 1809.85 m^2g^{-1}. The curve indicates that the mesoporous structure is favorable for mass transfer in catalytic process.

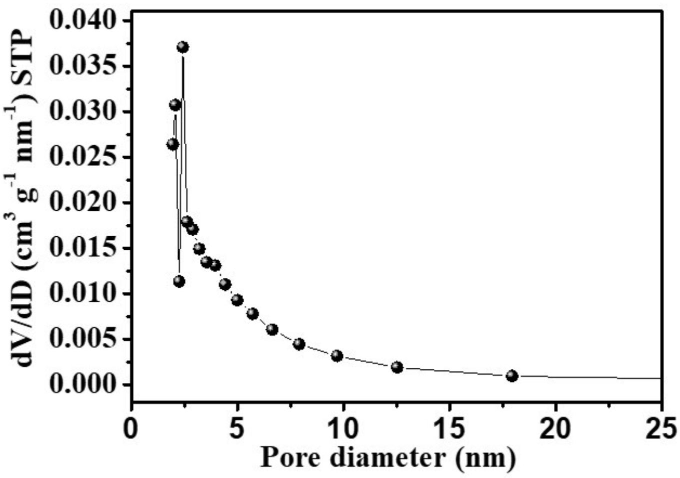

Figure S4. Pore size distributions plots of ZnCo-Fe-20 shows the uniform size distribution and the corresponding size is around 2.5 nm. It reveals the rapid penetration of the electrode during the catalytic process.

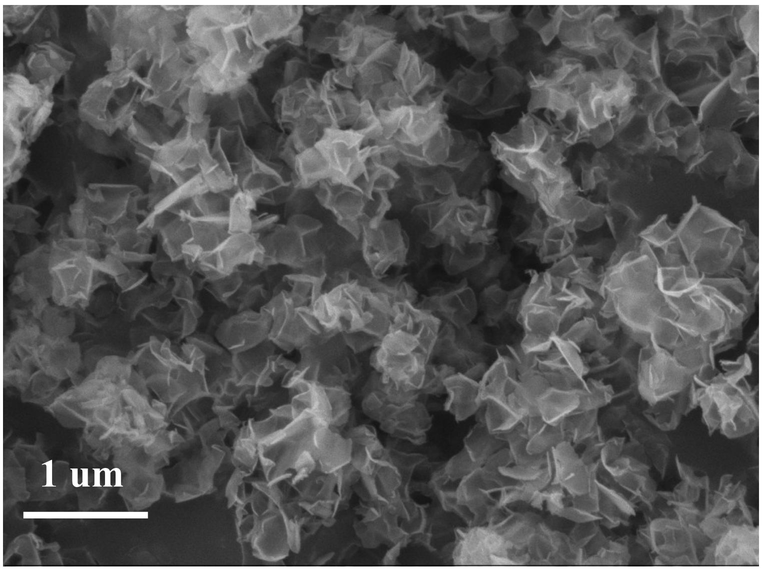

Figure S5. SEM images of ZnCo-Fe-20 after OER testing.

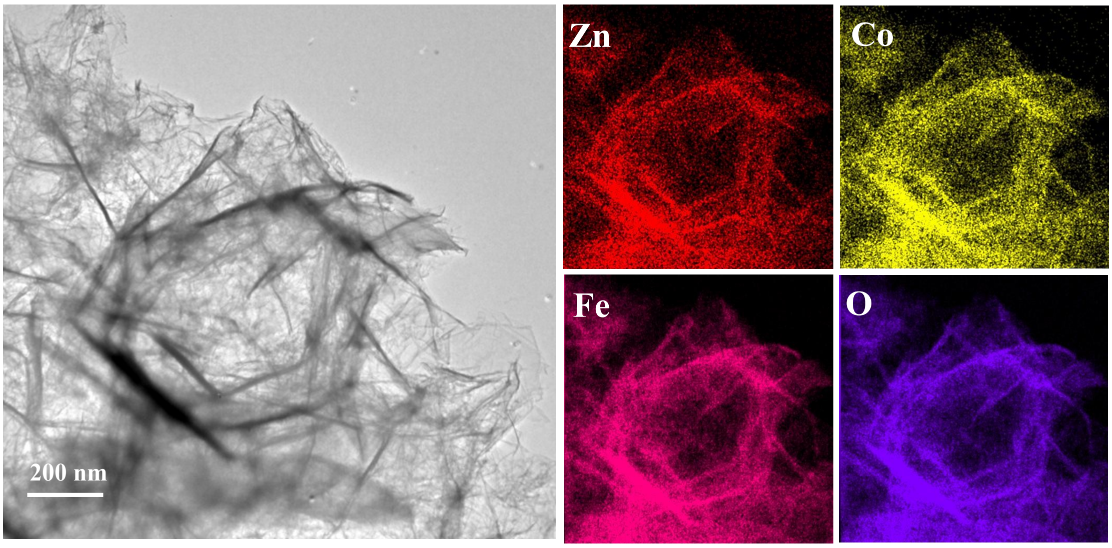

Figure S6.TEM images and the corresponding TEM element mapping of ZnCo-Fe-20 after OER testing.

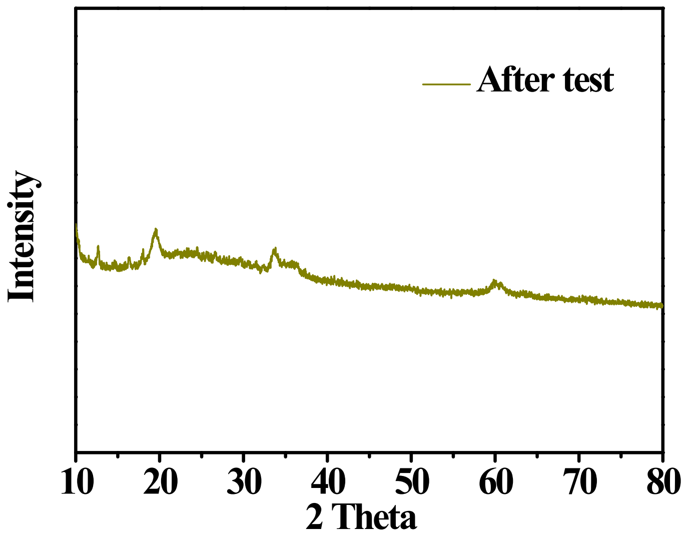

Figure S7. XRD patterns of the ZnCo-Fe-20 after OER testing.

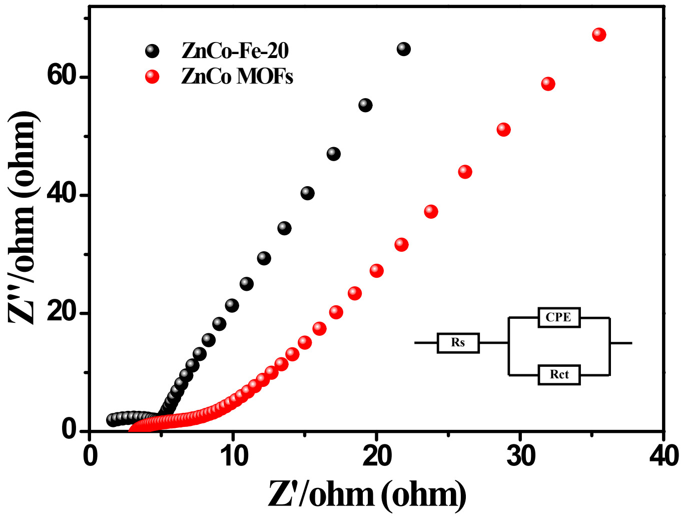

Figure S8. Nyquist plots of the ZnCo MOFs and ZnCo-Fe-20 hollow nanocages and the corresponding fitting results in the inset. It is found that ZnCo-Fe-20 possesses better electrical conductivity than the ZnCo MOFs.

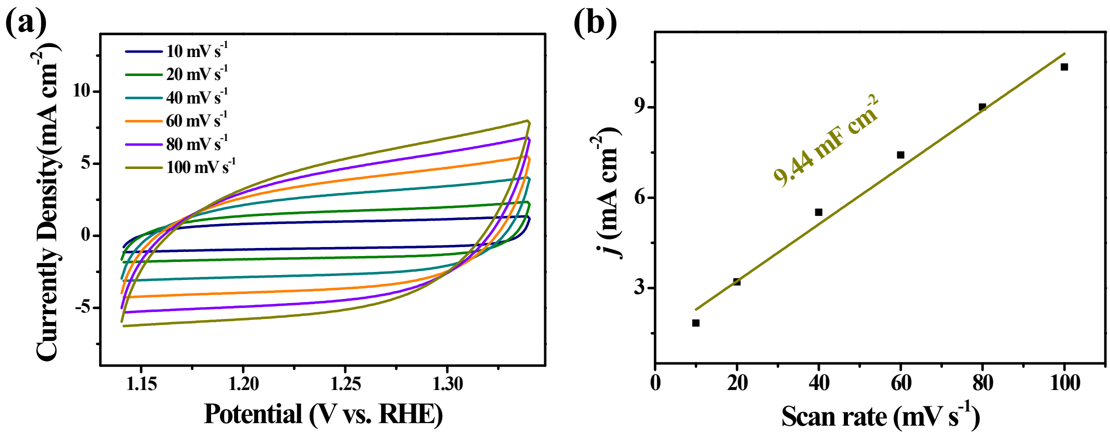

Figure S9. (a) Cyclic voltammograms (CV) curves for ZnCo-Fe-5 in the region of 1.14 ~1.34 V vs. RHE at various scan rates. (b) Charging current density differences ($J = J$a - Jc) plotted against scan rates fitted to estimate the electrochemical double-layer capacitances. The linear slope is equivalent to twice of the double-layer capacitance C_{dl}.

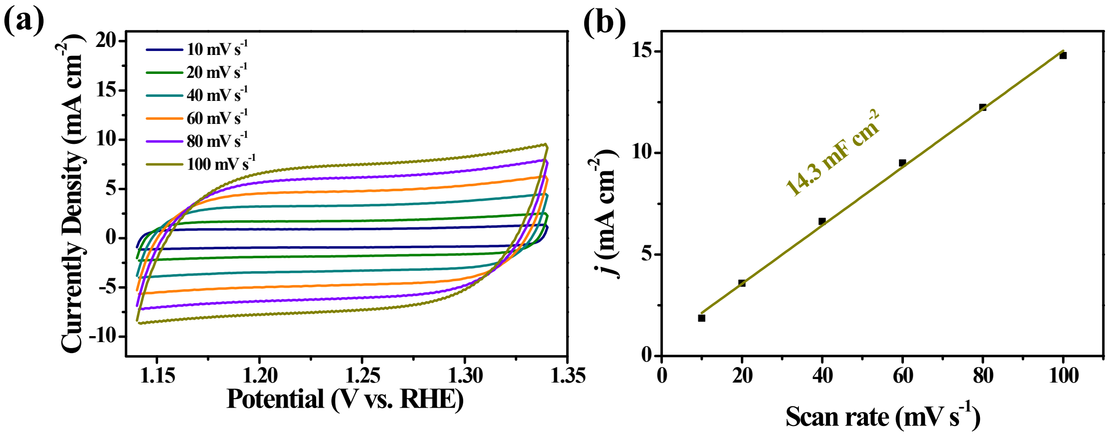

Figure S10. (a) Cyclic voltammograms (CV) curves for ZnCo-Fe-20 in the region of 1.14 ~1.34 V vs. RHE at various scan rates. (b) Charging current density differences plotted against scan rates.

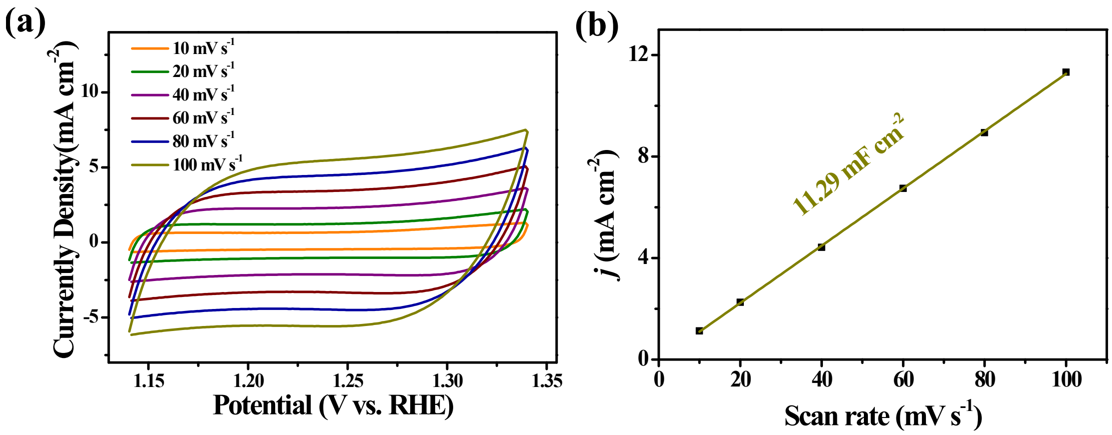

Figure S11. (a) Cyclic voltammograms (CV) curves for ZnCo-Fe-35 in the region of 1.14 ~1.34 V vs. RHE at various scan rates. (b) Charging current density differences plotted against scan rates.

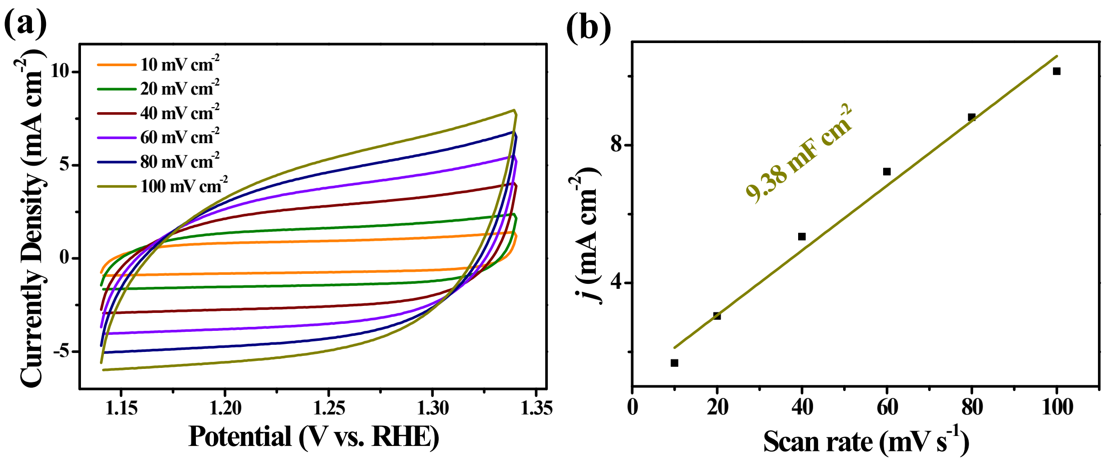

Figure S12. (a) Cyclic voltammograms (CV) curves for ZnCo MOFs in the region of 1.14 ~1.34 V vs. RHE at various scan rates. (b) Charging current density differences plotted against scan rates.

Table S1.

Catalyst	Overpotential at 10 mA cm^{-2}	Tafel Slope (mV dec^{-1})	Measurement Conditions	Reference
CoFe-LDH	286 mV	45 mV dec^{-1}	1.0 M KOH	Nanoscale, 2017,9,16467
$Fe_xCo_{3-x}O_4$	390 mV	72.9 mV dec^{-1}	1.0 M KOH	Nanoscale, 2015,8,1033
Cu@CoFe LDH	240 mV	44.4 mV dec^{-1}	1.0 M KOH	Nano Energy, 2017,41,327
Fe-CoOH	330 mV	37 mV dec^{-1}	1.0 M KOH	Adv. Energy Mater., 2017,1602148
ZnCo-Fe-20	176 mV	68.4 mV dec^{-1}	1.0 M KOH	**This work**
Ni-MOF/Fe-MOF	265 mV	82 mV dec^{-1}	1.0 M KOH	Adv. Funct. Mater., 2018,28,175048
Co_3O_4/HNCP-40	333 mV	69 mV dec^{-1}	1.0 M KOH	ACS Catal., 2018,8,7879
FeCo-P/C	360 mV	58.4 mV dec^{-1}	1.0 M KOH	Small Methods, 2018, 2, 1800214
Fe_1Co_3/VO-800	260 mV	53 mV dec^{-1}	1.0 M KOH	J. Mater. Chem. A, 2019, 7, 3090
$CoNi/CoFe_2O_4$/NF	230 mV	45 mV dec^{-1}	1.0 M KOH	J. Mater. Chem. A, 2018, 6, 19221

Table S1. Comparison of the OER activities of ZnCo-Fe-20 samples prepared in this work with some recently-reported. The materials above including the overpotential at 10 mA cm^{-2} and the corresponding Tafel slope are tested in 1.0 M KOH. Among the materials above, it shows the very competitive OER performance in our work.