Electronic Supplementary Information (ESI)

Tuning Dimensions and Structures of Nitrogen-doped Carbon Nanomaterials Derived from Sacrificial g-C_3N_4/Metal-Organic Frameworks for Enhanced Electrocatalytic Oxygen Reduction

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Figures and Tables

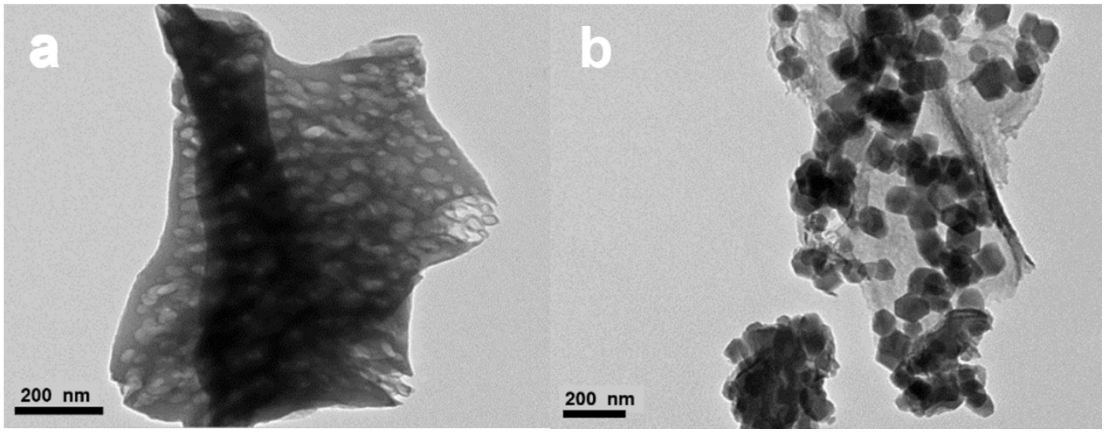

Figure S1. TEM images of (a) g-C_3N_4 and (b) Zn/Co-ZIF@g-C_3N_4.

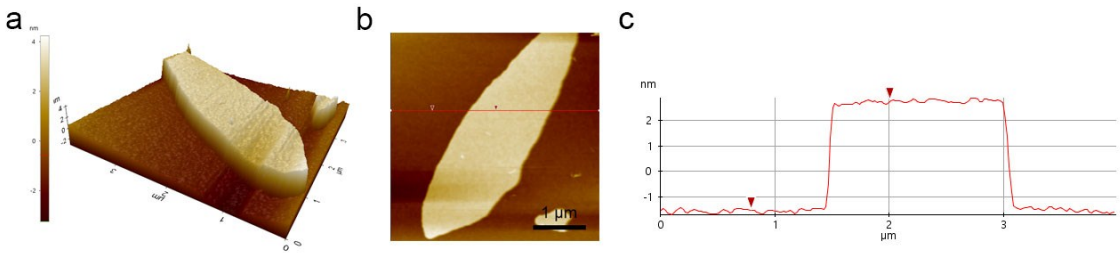

Figure S2. AFM images of N-CNS.

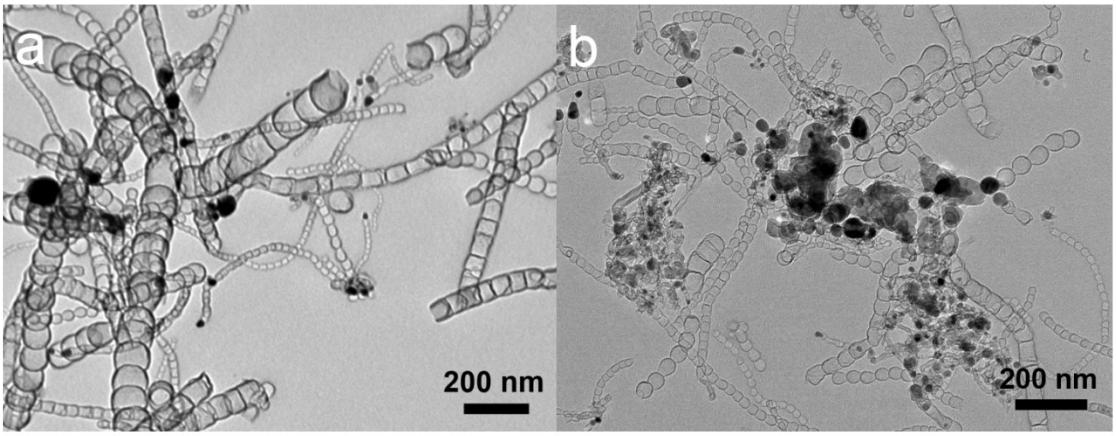

Figure S3. TEM images of (a) Co/N-BCNTs-800 and (b) Co/N-BCNTs-1000.

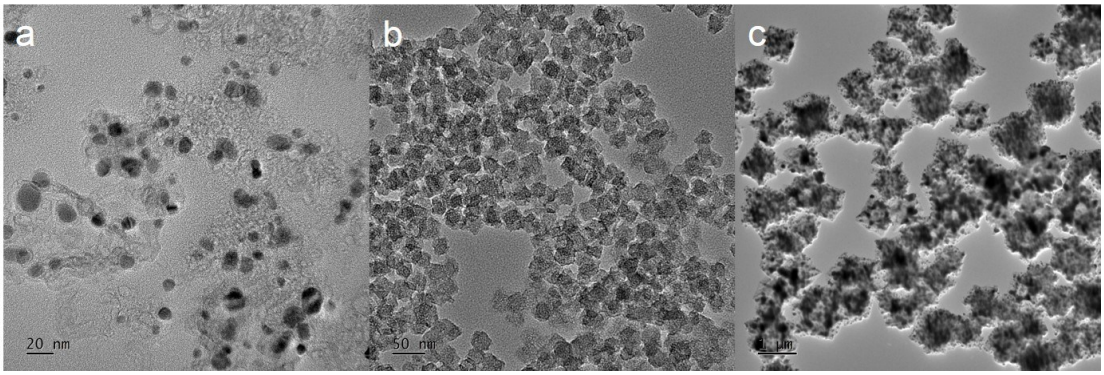

Figure S4. TEM images of (a) Zn-Co-ZIF-900，(b) ZIF-8-900 and (c) ZIF-67-900.

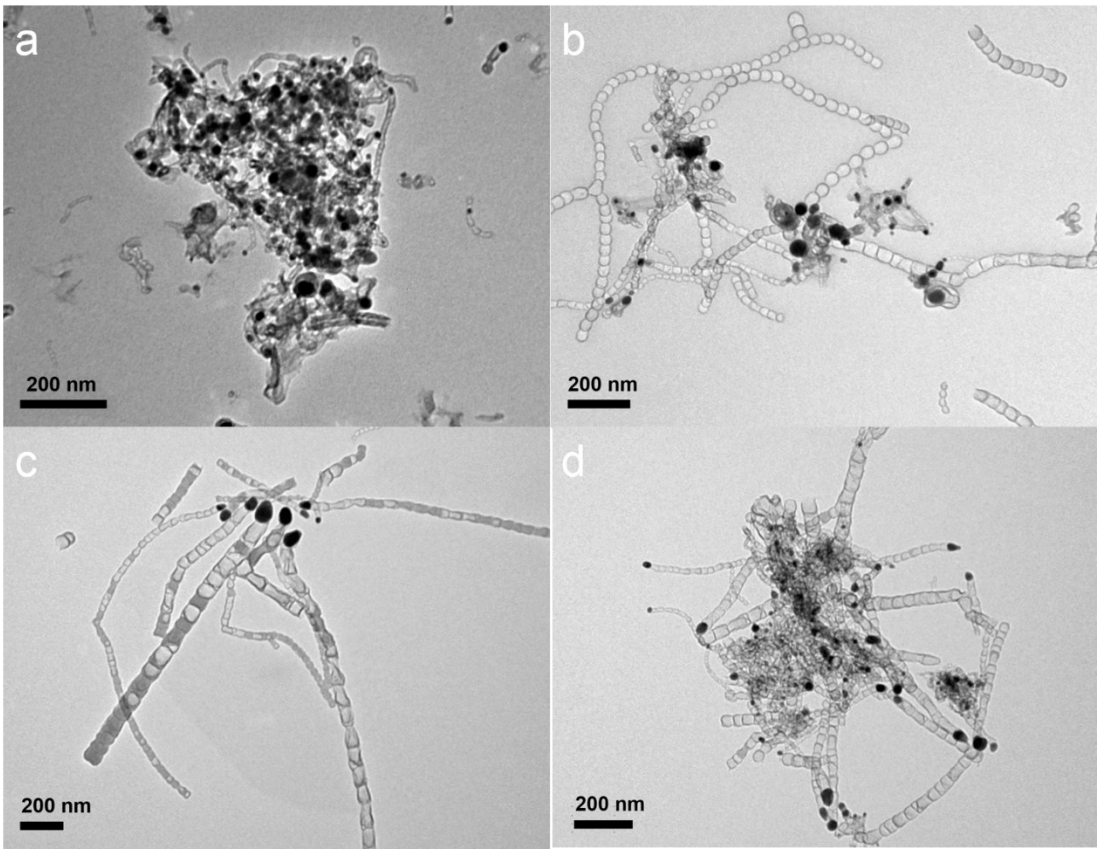

Figure S5. TEM images of Zn/Co=X/Y derived Co/N-BCNTs. (a) Zn/Co=3 (b) Zn/Co=2 (c) Zn/Co=1/2 (d) Zn/Co=1/3.

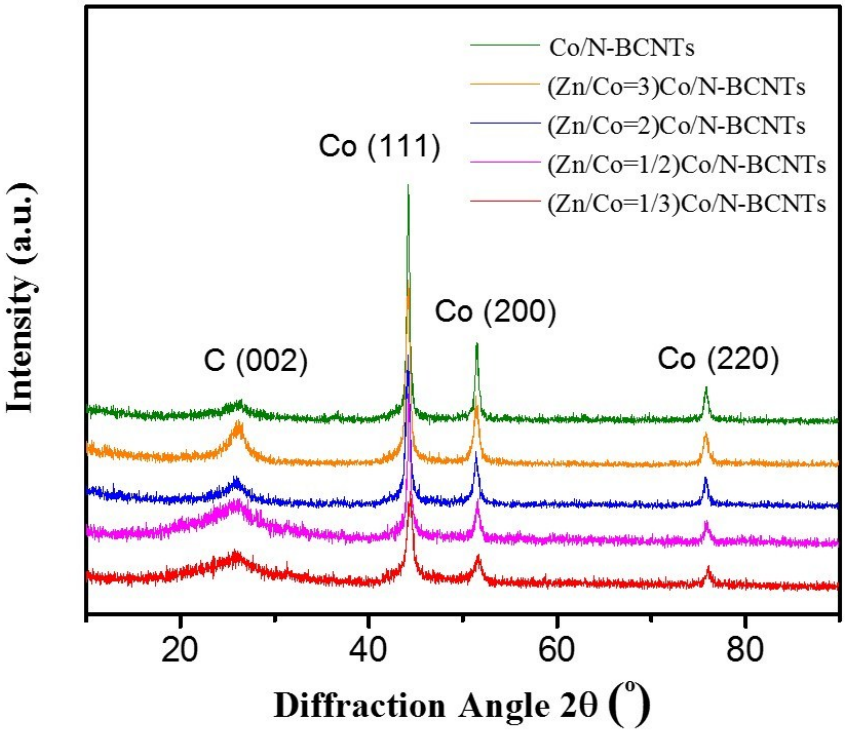

Figure S6. XRD patterns of Zn/Co=X/Y derived Co/N-BCNTs.

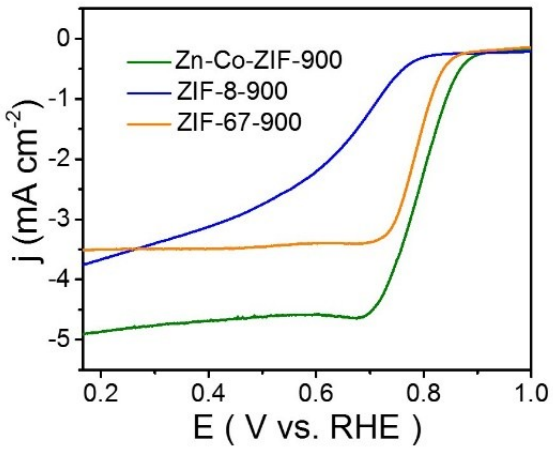

Figure S7. LSV curves in an O_2 -saturated 0.1 M KOH solution at a sweep rate of 10 mV s^{-1} and electrode rotation speed of 1600 rpm.

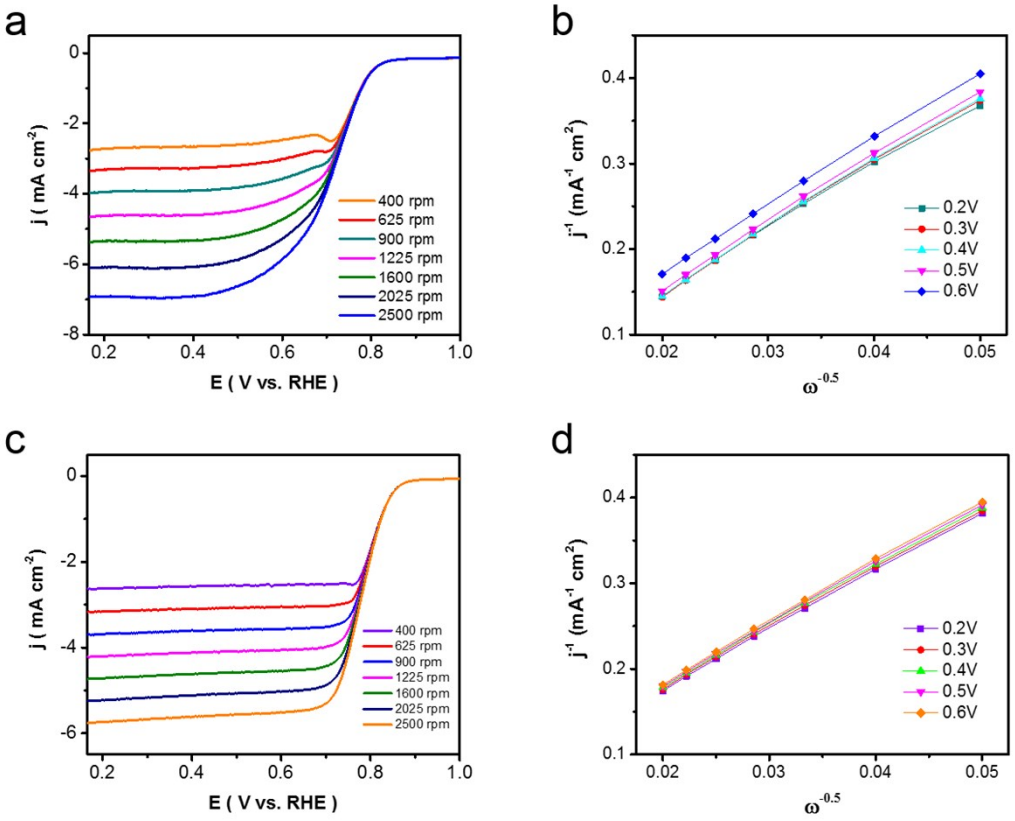

Figure S8. (a) LSV curves for N-CNS at various rotation rates. (b) Corresponding Kouteck–Levich plots derived from the RDE data. (c) LSV curves for Co/N-CNTFs at various rotation rates. d) Corresponding Kouteck–Levich plots derived from the RDE data.

Table S1. Elemental contents of the synthesized catalysts determined by XPS spectra

Sample	**C**	**O**	**N**	**Co**	**Zn**
Co/N-BCNTs	83.51	7.03	8.04	1.38	0.05
N-GNS	77.25	13.77	7.59	0	1.39
Co-CNTFs	87.50	8.49	3.47	0.54	0
Co-BCNT-800	83.3	8.58	7.22	0.79	0.11
Co-BCNT-1000	86.5	5.91	6.26	1.31	0.02

Table S2. Percentage of various nitrogen species determined by XPS spectra

Sample	Pyridinic N (%)	Pyrrolic N (%)	Graphitic N (%)
Co/N-BCNTs	2.49	1.93	3.62
N-CNS	0	4.10	3.49
Co/N-CNTFs	1.21	1.11	1.45
Co/N-BCNTs-800	2.82	2.45	1.88
Co/N-BCNTs-1000	2.07	1.75	2.44

Table S3. Comparison of ORR performance of Co/N-BCNTs materials with the state-of-the-art Co-N-C catalysts in 0.1M KOH electrolyte solution

Catalysts	Loading (mg cm^{-2})	Half-wave Potential (V vs. RHE)	Activity vs. Pt/C	Ref.
Co/N-BCNTs	0.20	~0.83	better	This work
Zn/Co@C-NCNFS	0.18	0.77	worse	S1
$Co_{0.85}Se$@NC	0.41	~0.82	worse	S2
Co@NPC-acid		0.75	worse	S3
Co-N-C-0.4	0.40	0.84	comparable	S4
SUCo-0.03-800	0.10	0.82	worse	S5
Co@N-PGCS	0.51	0.81	better	S6
Co-N/C 800	0.24	0.78	worse	S7
ZIF/rGO-700-AL	0.41	~0.83	comparable	S8
Co-N/C (Co-A NSs)	0.40	0.84	worse	S9
Co/N-C-800	0.25	~0.77	worse	S10
Co_{10}-NMCV	0.15	~0.76	worse	S11
Co_{15}-N-C800	0.49	~0.82	comparable	S12

References

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