

Co,N-doped carbon sheets prepared by a facile method as high-efficiency oxygen reduction catalysts

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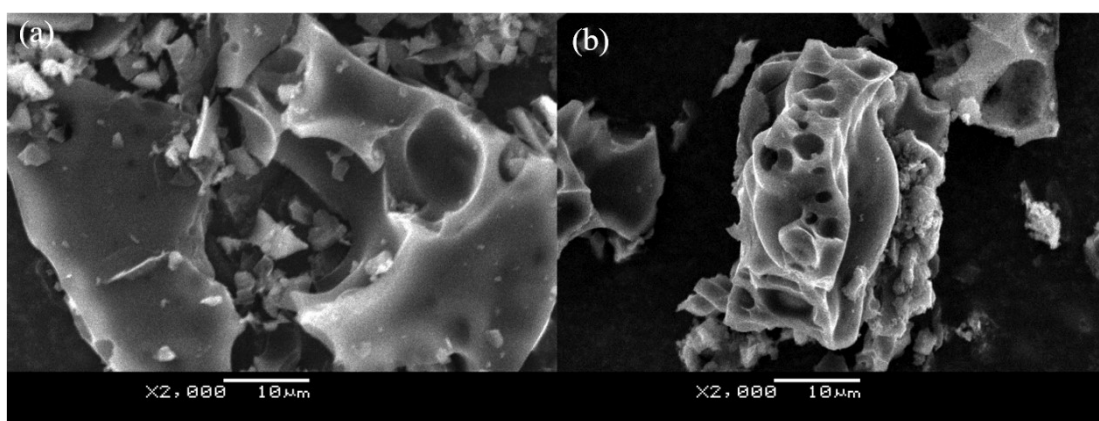


Fig. S1. Cross-sectional SEM images of N-C(a) and Co-N-C-43.8(b)

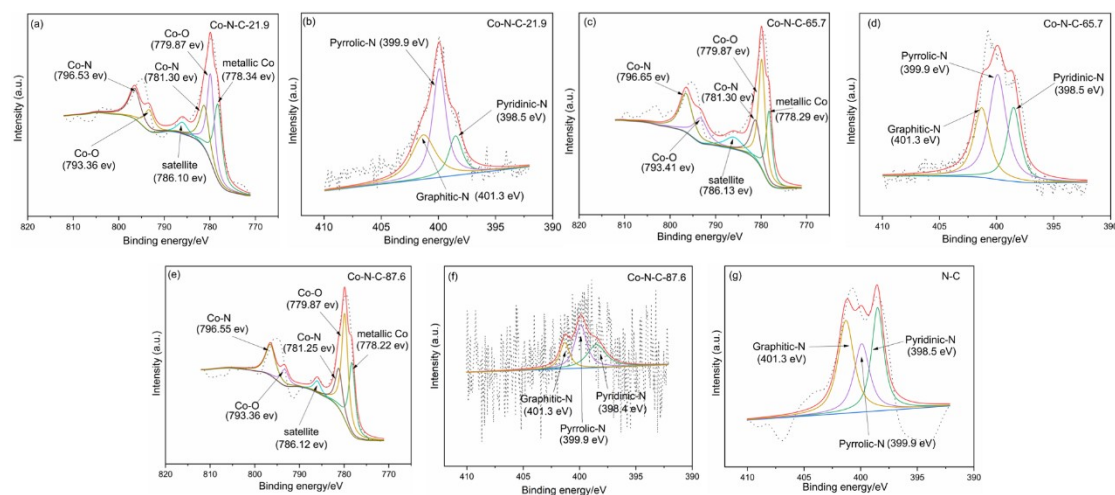


Fig. S2. XPS results of N1s and Co2p of Co-N-C-21.9(a, b), Co-N-C-65.7(c, d), Co-N-C-87.6(e, f), N-C(g)

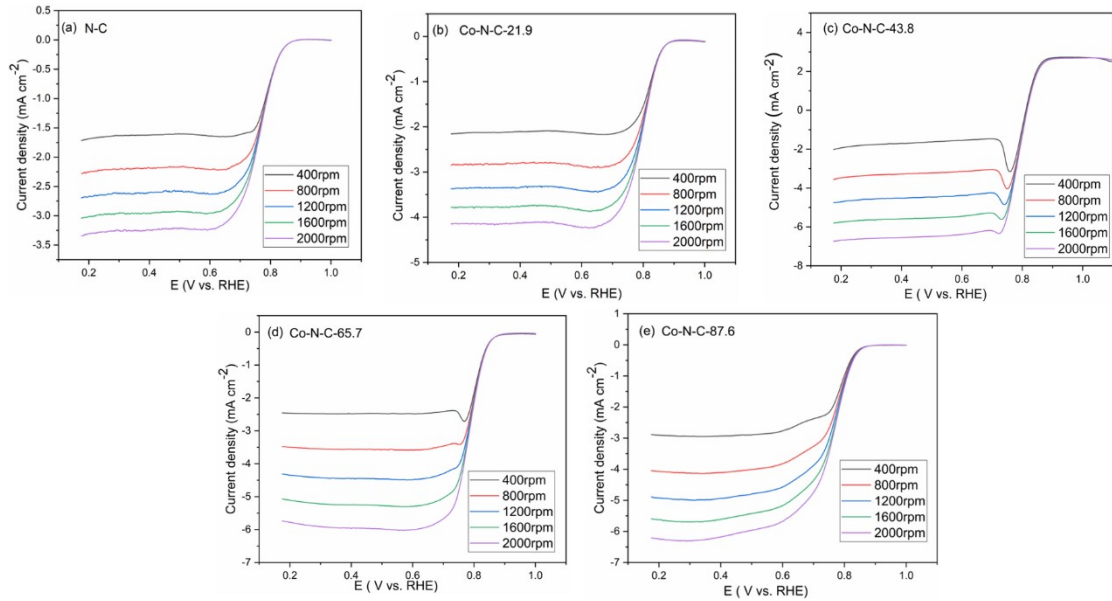


Fig. S3. LSV results of N-C(a)、Co-N-C-21.9(b)、Co-N-C-43.8(c)、Co-N-C-65.7(d)、Co-N-C-87.6(e)

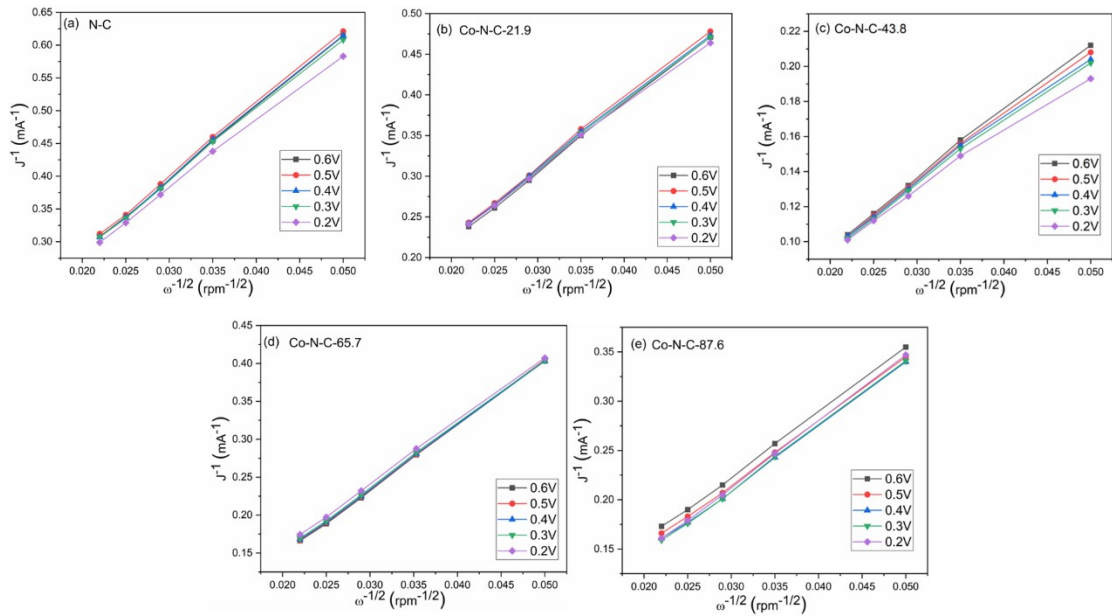


Fig. S4. K-L plots of N-C(a)、Co-N-C-21.9(b)、Co-N-C-43.8(c)、Co-N-C-65.7(d)、Co-N-C-87.6(e)

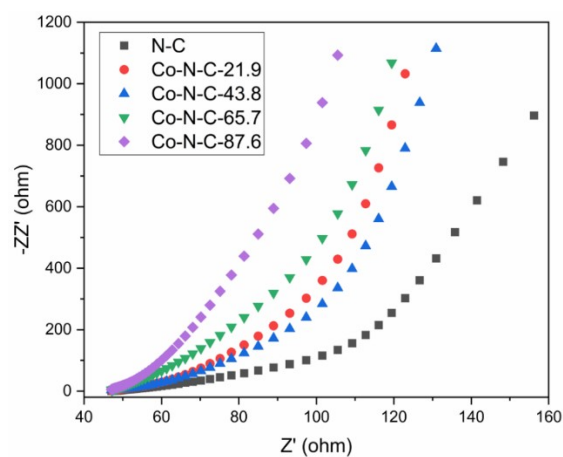


Fig. S5. Electrochemical impedance spectra of N-C, Co-N-C-21.9, Co-N-C-43.8, Co-N-C-65.7 and Co-N-C-87.6.

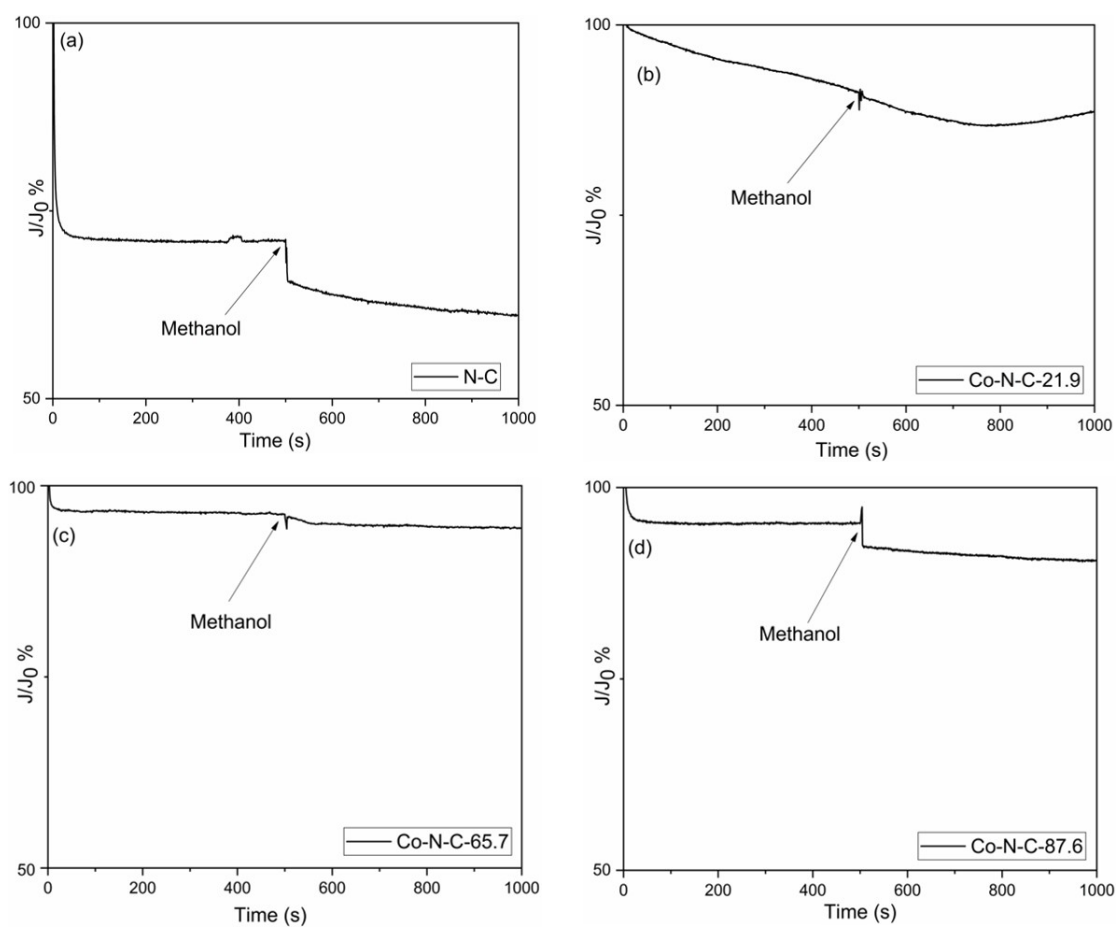


Fig. S6. Chronoamperometric responses of N-C(a)、Co-N-C-21.9(b)、Co-N-C-65.7(c)、Co-N-C-87.6(d) with 3M methanol

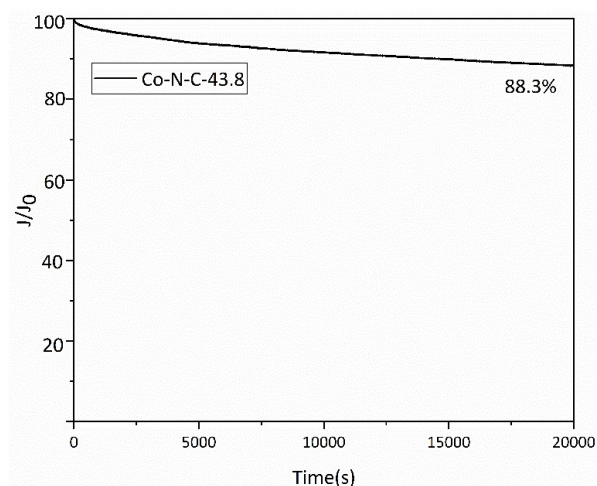


Fig. S7. Chronoamperometric responses of the Co-N-C-43.8 catalyst sample in O₂-saturated 0.1 M KOH

Table S1 Element content of five catalyst samples

Samples	C (at%)	N (at%)	O (at%)	Co (at%)
N-C	94.51	2.38	3.11	/
Co-N-C-21.9	93.76	1.57	4.16	0.51
Co-N-C-43.8	87.44	3.17	8.4	0.99
Co-N-C-65.7	87.56	2.71	8.62	1.11
Co-N-C-87.6	89.81	2.91	5.75	1.53

Table S2 Percentage contents of different forms of nitrogen and cobalt in five catalyst samples (%)

Catalyst sample	Pyridine nitrogen	Pyrrole nitrogen	Graphite nitrogen	Metallic cobalt	Co-O	Co-N
N-C	33.19	27.86	38.95	/	/	/
Co-N-C-21.9	17.57	47.71	34.72	35.57	32.50	31.88
Co-N-C-43.8	28.95	39.74	31.31	21.67	41.59	36.74
Co-N-C-65.7	25.36	46.55	28.09	29.89	33.72	36.39
Co-N-C-87.6	35.78	43.04	21.18	29.86	30.69	39.45

Table S3 Electrocatalytic comparison of five catalyst samples and Pt/C

Samples	Onset potential (V vs. RHE)	Half-wave potential (V vs. RHE)	Current density (mA cm ⁻²)	Electron transfer n
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N-C	0.988	0.767	3.0	2.6
Co-N-C-21.9	0.925	0.800	3.8	3.5
Co-N-C-43.8	0.998	0.800	5.8	4.3
Co-N-C-65.7	0.965	0.792	5.1	3.3
Co-N-C-87.6	0.951	0.763	5.6	3.7
Pt/C	0.967	0.797	5.9	4.0

Table S4. Summary of electrochemical internal resistance values of different samples

	N-C	Co-N-C- 21.9	Co-N-C- 43.8	Co-N-C- 65.7	Co-N-C- 87.6
Resistance(ohm)	46.57	44.32	24.50	42.60	34.93