

Supporting Information

Mass Transfer in Co/N/C Catalyst Layer for Anion Exchange Membrane Fuel Cell

Weikang Zhu, Yabiao Pei, Yang Liu, Junfeng Zhang, Yanzhou Qin, Yan Yin* and Michael D. Guiver*

State Key Laboratory of Engines, School of Mechanical Engineering, Tianjin University, Tianjin, 300072, People's Republic of China.

*E-mail: geosign@tju.edu.cn (J. Zhang); yanyin@tju.edu.cn (Y. Yin)

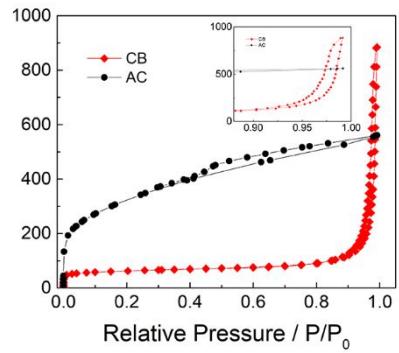


Figure S1. The nitrogen adsorption-desorption isotherms of carbon black and active carbon

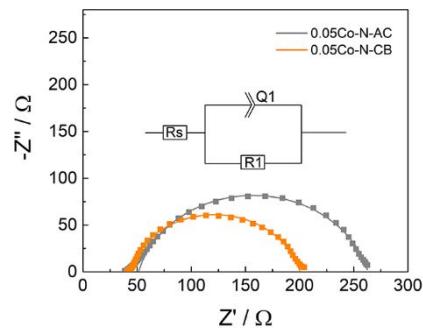


Figure S2. The electrochemical impedance spectroscopy (EIS) of different samples in oxygen saturated 0.1 M KOH at 0.85 V vs RHE from 100 kHz to 0.01 Hz. The inset is the corresponding equivalent circuit diagram.

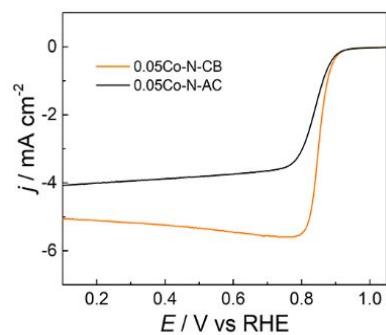


Figure S3. The linear sweep voltammetry curves with iR correction of 0.05Co-N-CB and 0.05Co-N-AC.

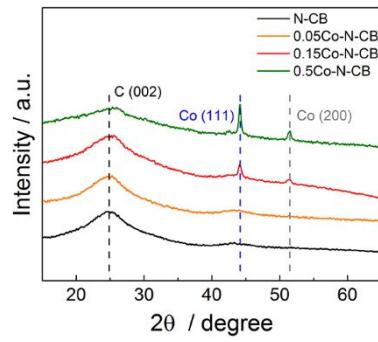


Figure S4. The XRD patterns of different catalysts with various Zn and Co ratio.

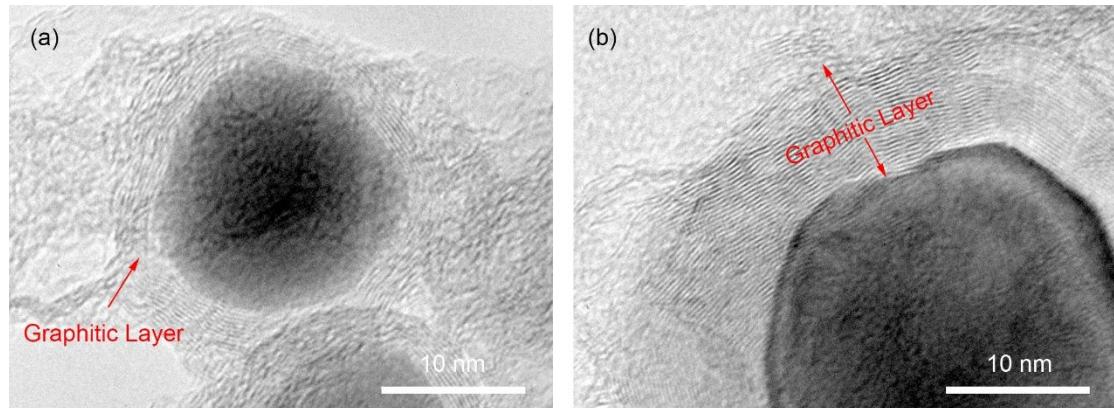


Figure S5. The high resolution TEM images of (a) 0.15Co-N-CB and (b) 0.5Co-N-CB.

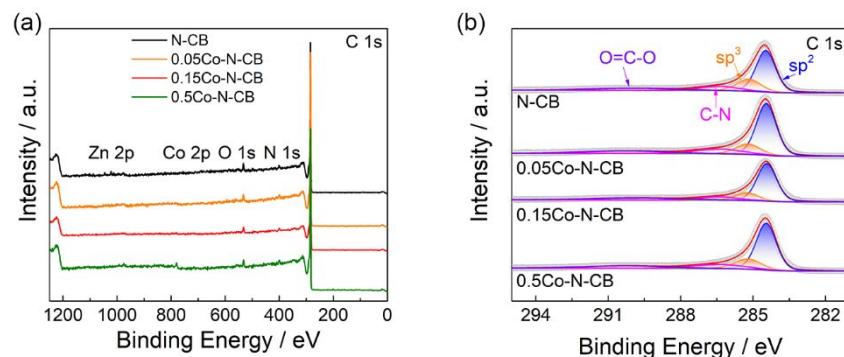


Figure S6. (a) The survey XPS spectra of all the catalysts with different percentages of Co. (b) The high-resolution XPS spectra and corresponding deconvoluted curves of C 1s,

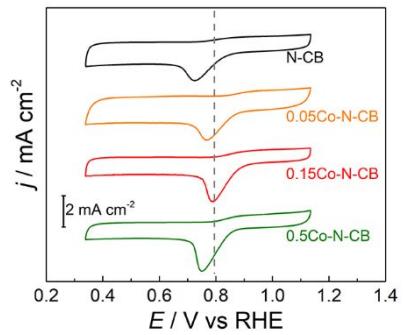


Figure S7. The CV curves of different catalysts with various Zn and Co ratio.

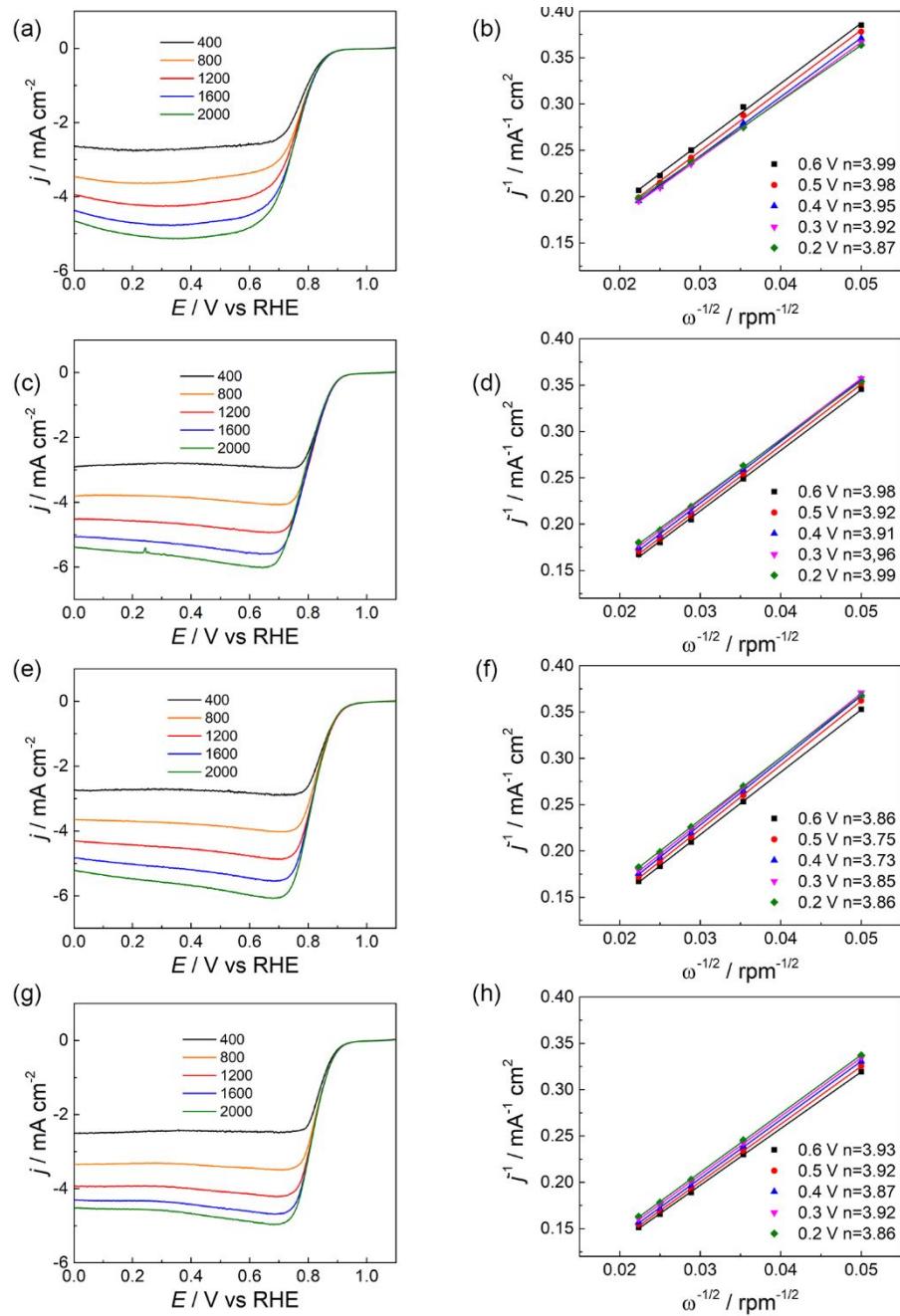


Figure S8. The linear sweep voltammetry curves (without iR correction) of (a) N-CB, (c) 0.05Co-N-CB, (e) 0.15Co-N-CB, (g) 0.5Co-N-CB in oxygen saturated 0.1 M KOH at different rotation rates. (b, d, f and h) are the corresponding Koutecky-Levich (K-L) plots.

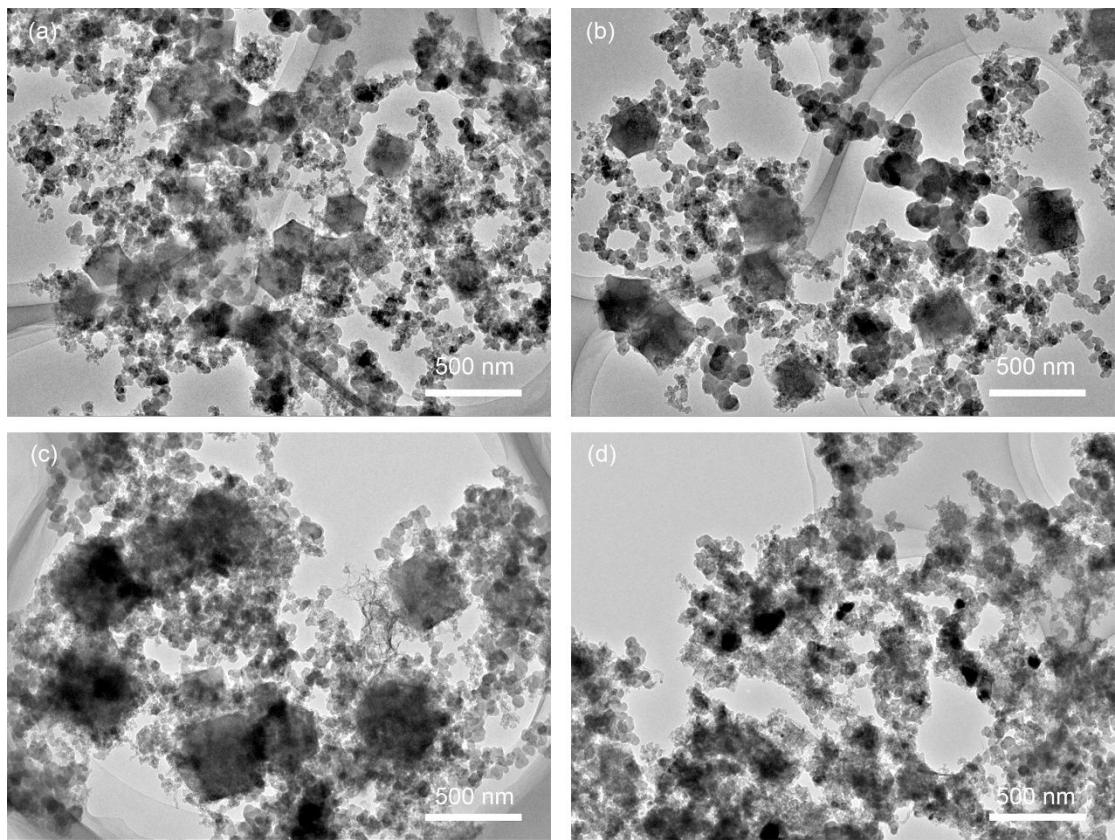


Figure S9. The low magnification TEM images of (a) N-CB, (b) 0.05Co-N-CB, (c) 0.15Co-N-CB and (d) 0.5 Co-N-CB.

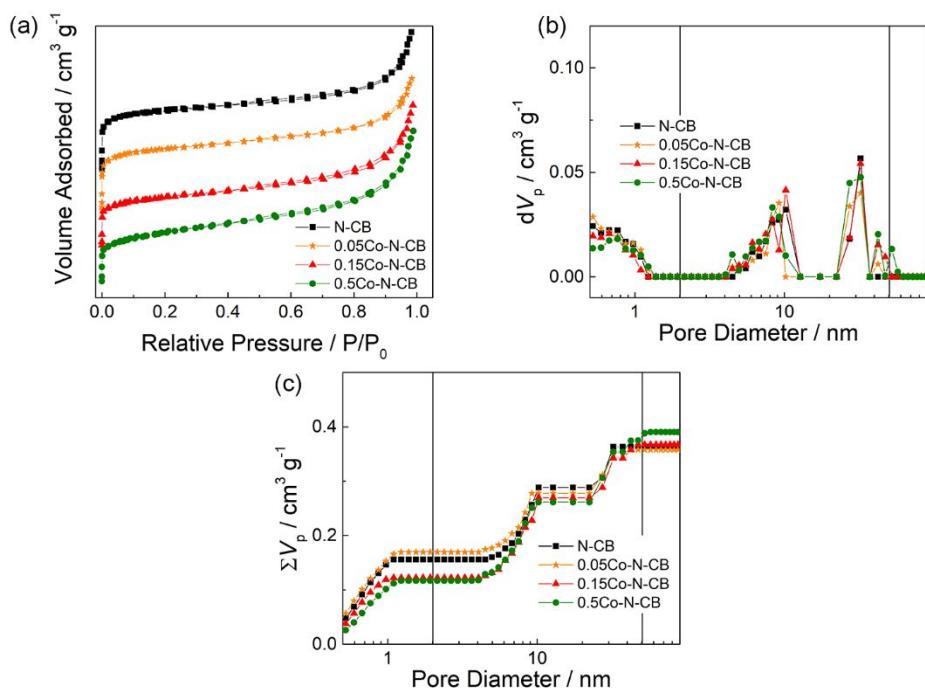


Figure S10. The (a) nitrogen adsorption-desorption isotherm curves, (b) pore size distribution and (c) pore volume curves of N-CB, 0.05Co-N-CB, 0.15Co-N-CB, and 0.5Co-N-CB.

Table S1. The relative amount of C, N, Co and Zn via XPS analysis.

Sample	C at.%	N at.%	Co at.%	Zn at.%
N-CB	97.60	2.01	0	0.39
0.05Co-N-CB	98.00	1.44	0.28	0.28
0.15Co-N-CB	97.07	2.36	0.43	0.14
0.5Co-N-CB	97.20	2.21	0.56	0.03

Table S2. The comparison of this catalyst with other ORR catalysts in literatures.

	ORR Catalyst	Onset potential (V vs RHE)	Half-wave potential (V vs RHE)	Diffusion current density with 1600 rpm (mA cm ⁻²)	Ref.
1	CAN-Pc(Fe/Co)	1.04	0.84	5.23	[1]
2	Polymer-modified CNT	0.87	0.7	3.52	[2]
3	NCN-1000-5	0.95	0.82	6.43	[3]
4	ZIF-CB-700	0.96	0.814	~4.7	[4]
5	α -MnO ₂ /C	0.825	-	5.2	[5]
6	SNBC12	-	0.85	4.14	[6]
7	FeCN-S-800	0.91	0.76	~5.0	[7]
8	C-MOF-C2-900	-	0.817	~5.0	[8]
9	Fe–N–C-800–acid	0.93	0.75	4.3	[9]
10	Fe-NMG	0.96	0.83	5.0	[10]
11	Mn ₃ O ₄ /MXene	0.89	0.8	3.15	[11]
12	Co/CoO@Co-N-C-800	-0.05	-0.17	~5.5	[12]
13	Fe/N/C HNSs	0.89	0.72	~5.0	[13]
14	Co ₃ O ₄ @C-MWCNTs	0.89	0.81	4.5	[14]
15	0.15Co-N-CB	0.98	0.87	5.18	This work

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