

Supporting information

$\text{Cu}_2\text{O}@$ Co/N-doped carbon as antibacterial catalysts for oxygen reduction in microbial fuel cells

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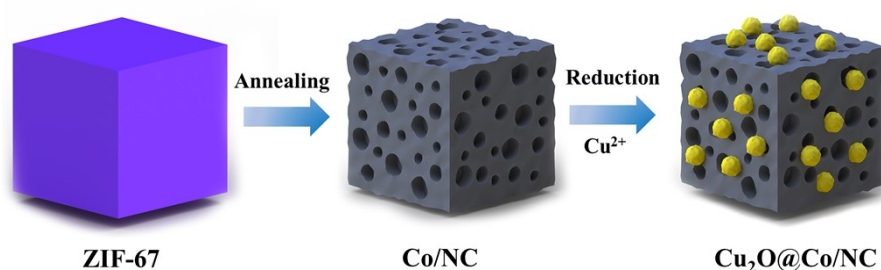


Figure S1. Schematic illustration for synthesis of $\text{Cu}_2\text{O}@$ Co/NC.

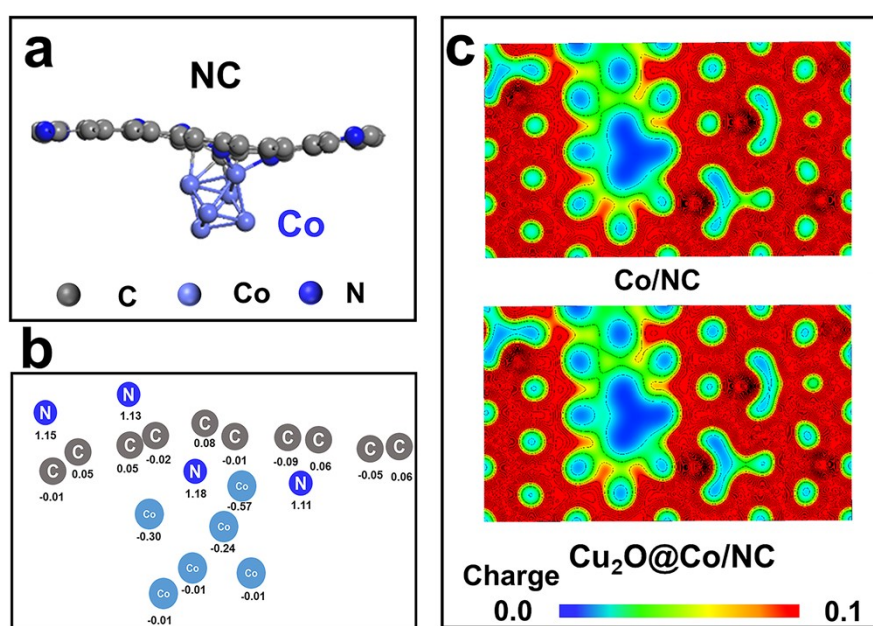


Fig S2. (a) Model of Co/NC. (b) Calculated charge of atoms of Co/NC. (c) Charge density

distribution.

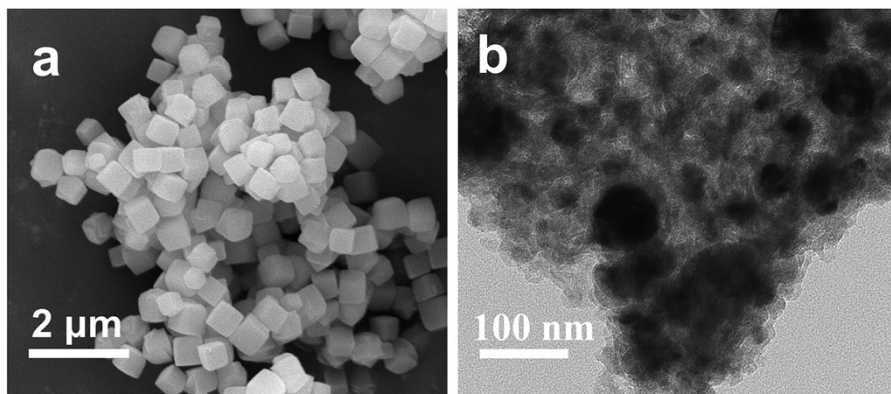


Figure S3. (a) SEM image of ZIF-67 and (b) TEM image of Co/NC.

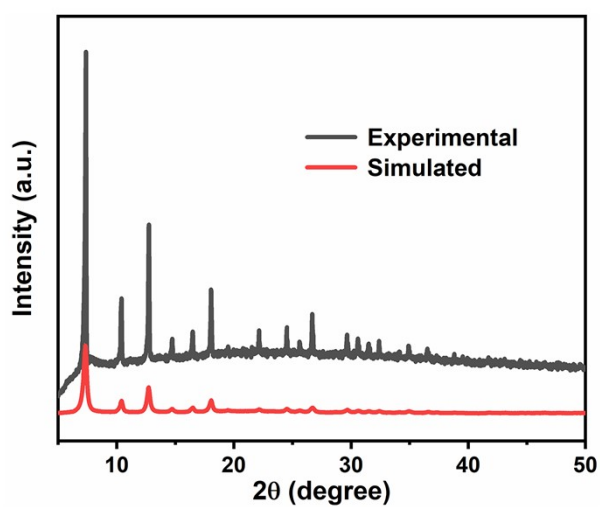


Figure S4. XRD patterns of ZIF-67 precursor.

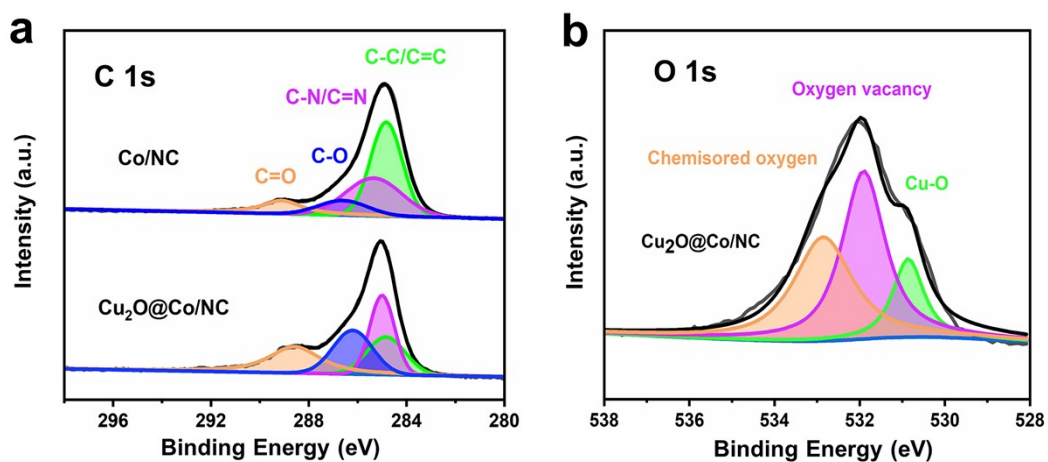


Figure S5. XPS spectra of Cu₂O@Co/NC in the C 1s (a) and O 1s (b) region.

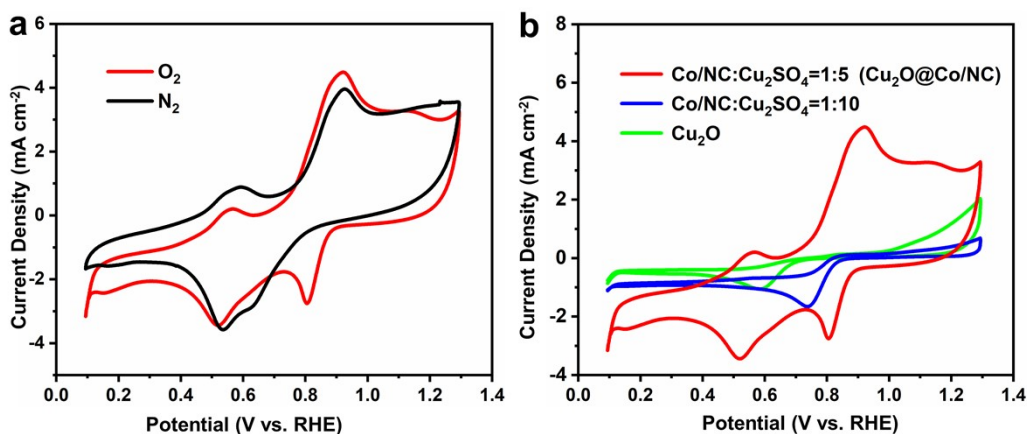


Figure S6. (a) CV curves in O₂-saturated and N₂-saturated 0.1 M KOH of Cu₂O@Co/NC (b) CV curves of different ratios.

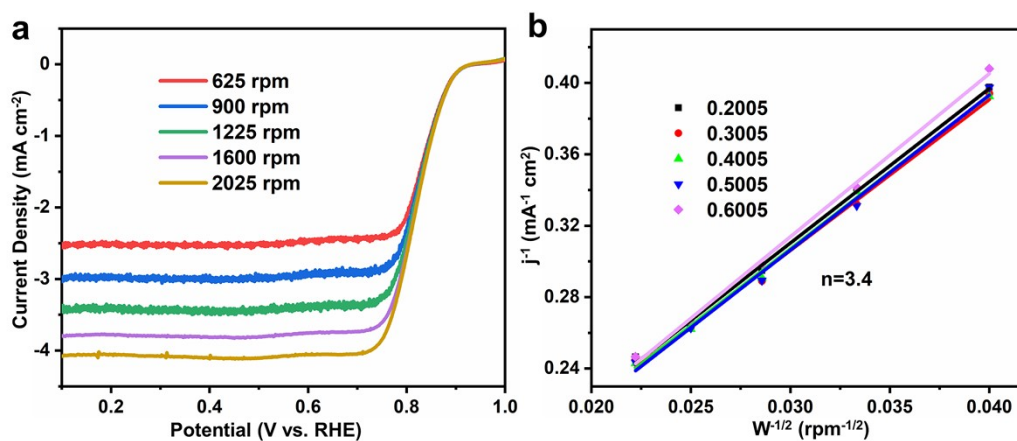


Figure S7. (a) LSV of Cu₂O@Co/NC with different electrode rotation speeds (b) the corresponding K-L plots at different potentials.

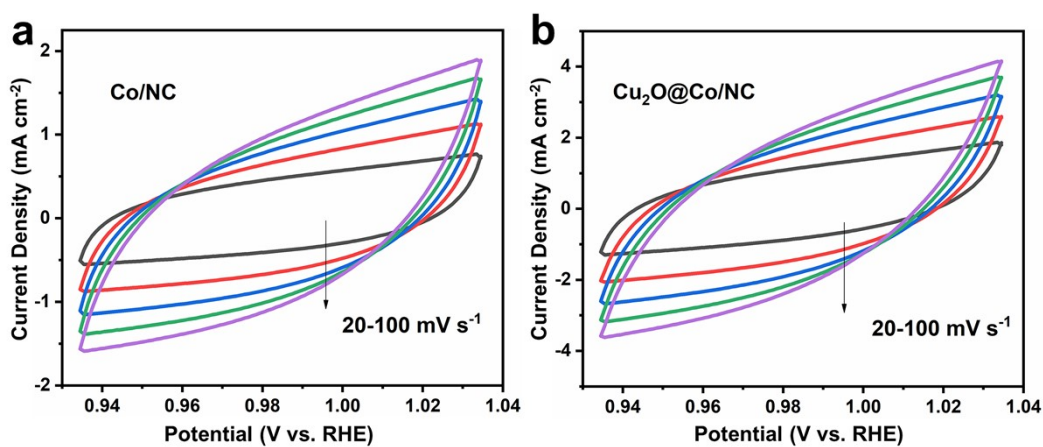


Figure S8. CV curves of (a) Co/NC and (b) Cu₂O@Co/NC in the non-faradic capacitance current range from 20 to 100 mV s⁻¹.

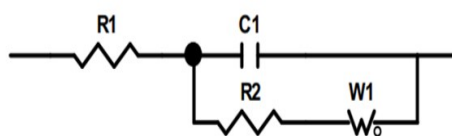


Figure S9. Equivalent circuit.



Figure S10. Half-wave potential of various ORR catalysts¹⁻⁶.

Table S1. Impedance fitting results.

	Pt/C (Ohm cm ⁻²)	Cu ₂ O@Co/NC (Ohm cm ⁻²)	Co/NC (Ohm cm ⁻²)
R ₁	0.245	0.283	0.193
R ₂	2.831	3.605	4.957

Table S2. Summary of ORR activities of various catalysts in 0.1M KOH.

Catalysts	Half-wave potential (V)	Onset potential (V)	Limiting current density (mA cm ⁻²)	Tafel slope (mV dec ⁻¹)	Ref.
Co-N _x /C-MnO	0.87	0.93	5.76	79.5	1
MnCo ₂ O ₄ /NCNTs	0.76	/	6.06	61.9	2
Fe _x Co _{9-x} -NHCS-V	0.80	/	/	55.75	3
Hollow Fe-N/ C-800	0.80	0.99	5.19	76.33	4
ZIF-67@CoTMPP (800)	0.78	0.85	/	56	5
Zn/CoN-C	0.86	1.00	6.1	67	6
Cu ₂ O@Co/NC	0.80	0.89	3.80	62.99	this work

Table S3. Comparison of MFCs performance with different cathode catalysts.

Anode	Cathode	External resistance	Output voltage	Power density	Reference
carbon cloth	GO-Zn/Co (1:1)-800	1000 Ω	145 mV	773 mW m ⁻²	7
carbon cloth	GCN-Co@CoO	1000 Ω	600 mV	611±9 mW m ⁻²	8
carbon paper	Ag/Co-N-C	/	502 ± 12 mV	548±12 mW m ⁻²	9
carbon felt	MPC-800	1000 Ω	470 mV	240 mW m ⁻²	10
carbon felt	GO/MgO	1000 Ω	354 mV	755.63 mW m ⁻²	11
carbon felt	Mn-Fe@g-C ₃ N ₄	1000 Ω	450 mV	413±7 mW m ⁻²	12
carbon cloth	Cu ₂ O@Co/NC	1000 Ω	430 mV	1100 mW m ⁻²	this work

References

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