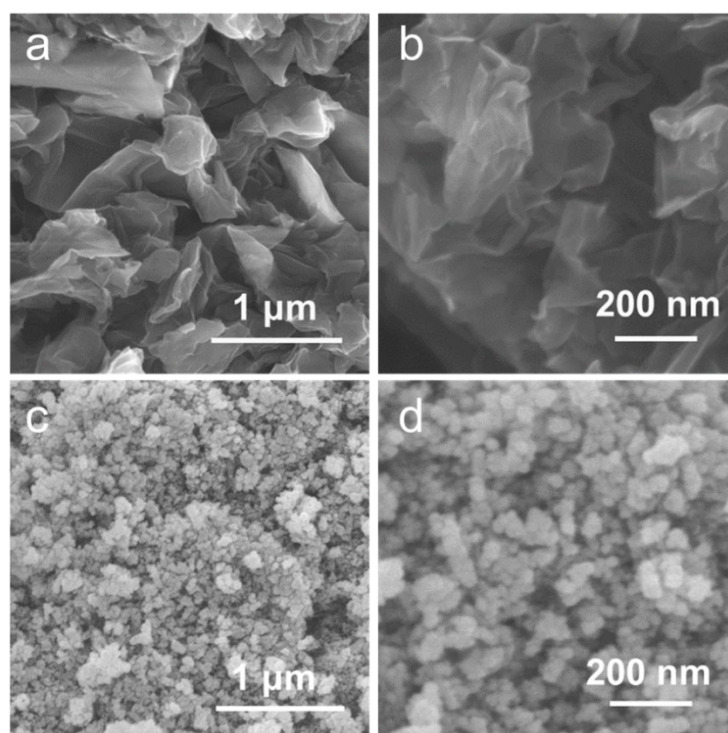# Reduced Graphene Oxide Supported CuO Nanoparticles with Synergistically

Enhanced Electrocatalytic Activity for Nitric Oxide Sensing

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Fig. S1 SEM images of (a) rGO, and (b) CuO.

**Condition Optimization**

Prior to further analysis, preparation conditions were optimized because these factors could affect the electrochemical properties of rGO/CuO remarkably. Both the type of copper source and the amount of rGO doping are relevant to the catalytic performance. Therefore, we optimized these two factors respectively and explored the influence of these two factors.

We first studied the electrocatalytic performance of rGO/CuO prepared by four different copper source materials. From Fig. S2a, rGO/CuO prepared with copper acetate shows the best activity towards NO, with a significant oxidation peak at +1.10 V starting from +0.70 V (red curve). We presume that this could be attributed to the varying morphology of CuO from different copper sources, which further leads to the fluctuating loadings on rGO and affects its catalytic performance for NO oxidation. Therefore, we chose copper acetate as the optimal copper source for subsequent experiments. At the same time, we also studied the electrochemical performance change caused by rGO doping. To determine the optimal rGO doping amount, the CV response of rGO/CuO prepared with four different rGO doping amounts of 0.05 g, 0.10 g, 0.15 g and 0.20 g were studied. The result shows that the best catalytic performance was obtained when the doping amount of GO was 0.15g (Fig. S2b).
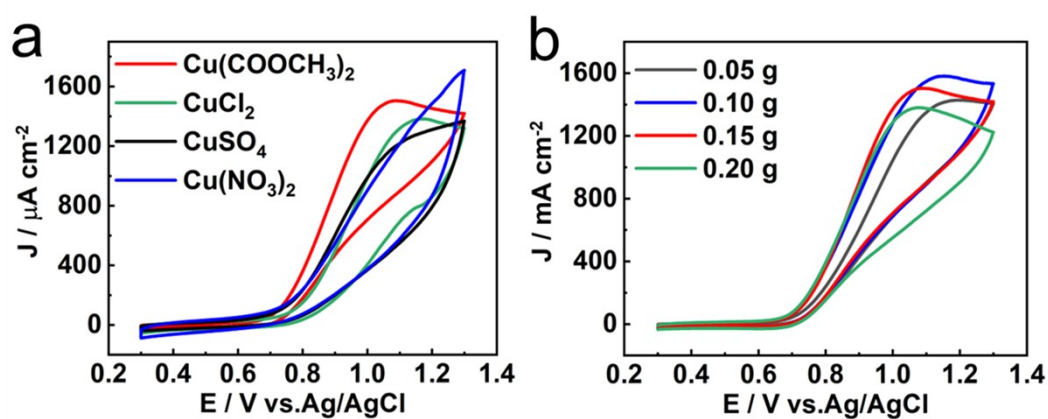

Fig. S2 (a) CV curves of rGO/CuO composite synthesized by four copper salts; (b) CV curves of rGO/CuO composite doped with different masses of rGO.
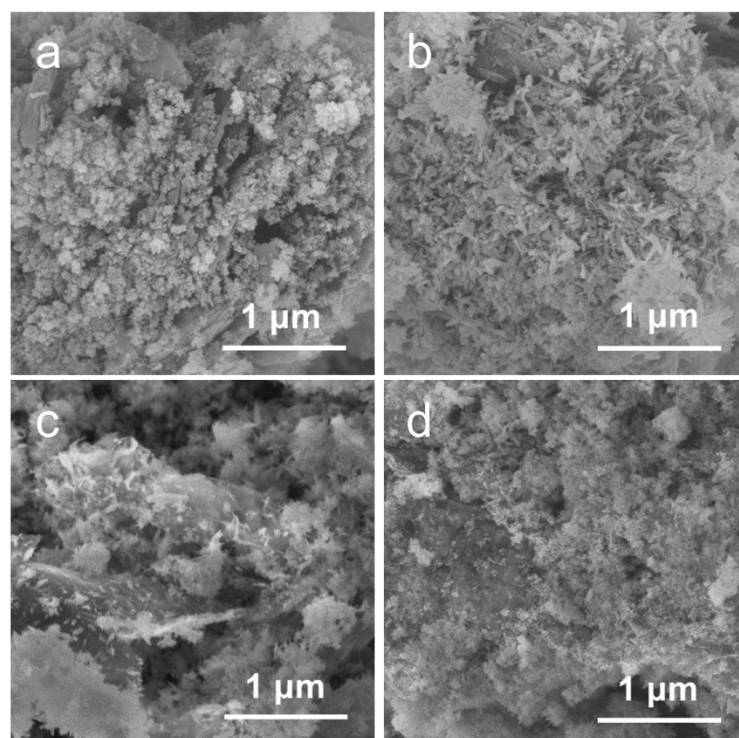
Fig. S3 SEM images of rGO/CuO prepared by four different copper source materials (a) $Cu(CH_3COO)_2$; (b) $CuCl_2$.; (c) $CuSO_4$ and (d) $Cu(NO_3)_2$.
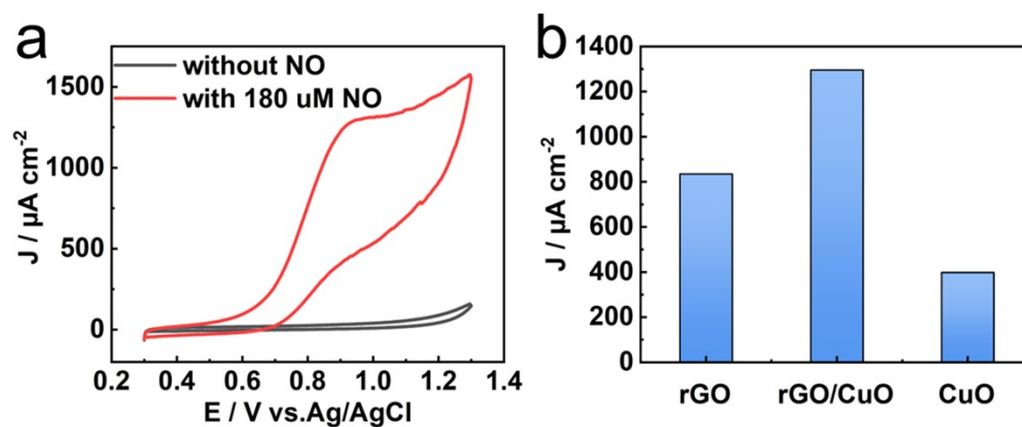
Fig. S4 (a) CV curves of rGO/CuO composite without/with 180 μM NO in 0.01 M PBS; (b) Current response of different materials at 0.95V with 180 μM NO in 0.01 M PBS.
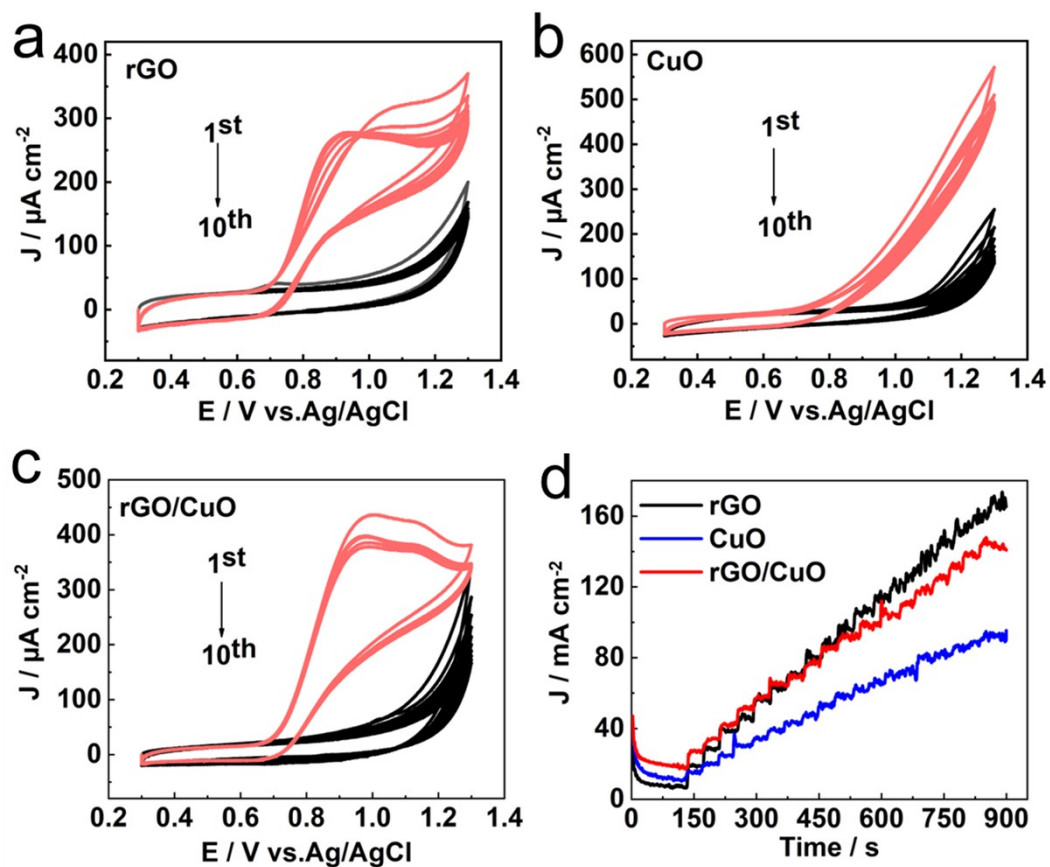
Fig. S5 CV curves (10 cycles) of (a) rGO, (b) CuO, and (c) rGO/CuO composite in the absence (black) and presence (red) of NO; (d) Chronoamperometric response of rGO, CuO, and rGO/CuO composite to successive injection of various concentrations of NO at an applied potential of 1.0 V.
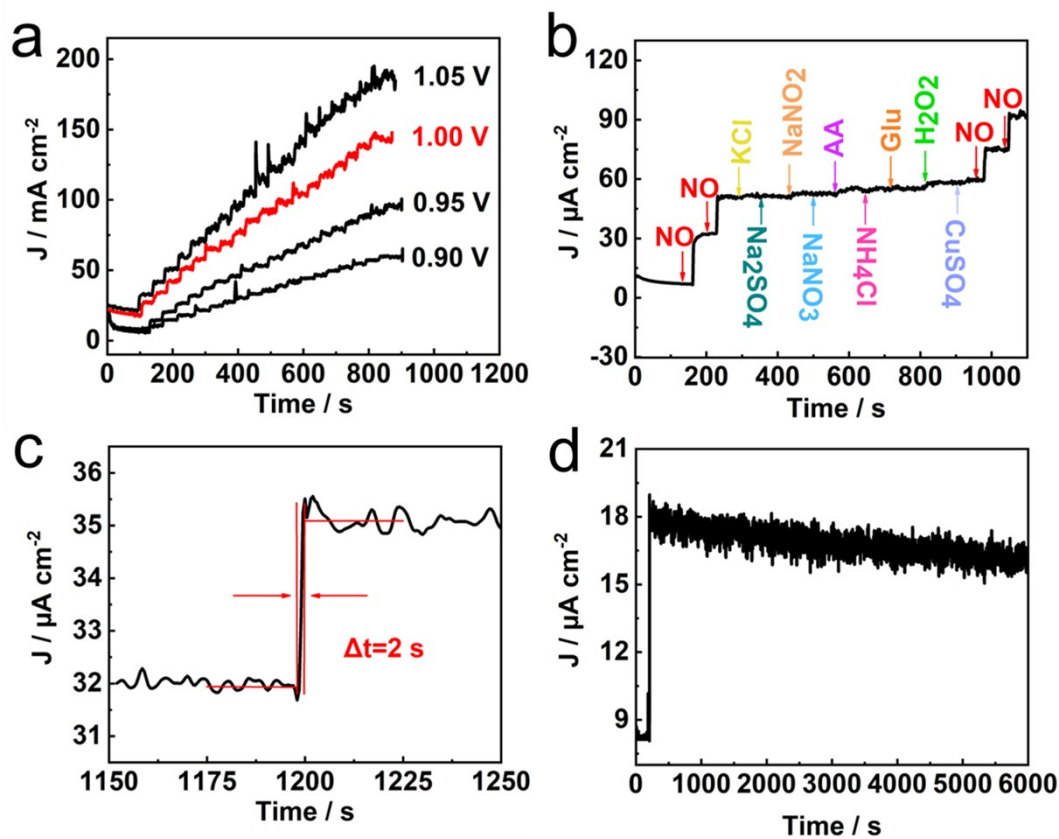
Fig. S6 (a) Chronoamperometric response of rGO/CuO at various potentials; (b) The selectivity performance of rGO/CuO; (c) The response time; (d) the long-term durability of the rGO/CuO.

Table S1 Comparison of the electrochemical performance of various NO sensors.

Modified electrodes	Linear range (nM – μM)	LOD (nM)	Response time (s)	Sensitivity (μA μM^{-1} cm^{-2})	Electrolyte	Stability (days)	Ref.
CuTAPc/MCOF/AgNPs	180-17.1	12.6	< 8	29.1	0.1 M PBS pH 7.4	15 (90.1%)	S1
Sb2O4/rGO/GCE	3.98-0.772	3.98	1.8	74.59	0.01 M PBS pH 7.4	25 (90.81%)	S2
Pt/erGO/GCE	250-40	52	0.7	/	0.1 M PBS pH 2.5	15（83%）	S3
AuNPs/3DGH/GCE	200-120	9	2.92	/	0.01 M PBS pH 7.4	/	S4
N-G/FePc/PLL ITO	180-400	180	< 4	0.21	0.01 M PBS pH 7.4	20（90%）	S5
Ni SACs/N-C/PDMS	1.8-1.35	1.8	/	0.43	PBS	/	S6
rGO/CoO4/Pt/GCE	10000-650	1730	/	0.368	0.1 M PBS pH 2.5	/	S7
rGO/CuO/GCE	90-138	9.57	2	5.48	0.01 M PBS pH 7.4	21（80.9%）	This work

Notes and references

S1. M. H. Wang, L. Zhu, S. Zhang, Y. F. Lou, S. R. Zhao, Q. Tan, L. H. He and M. Du, Sensor. Actuat. B-Chem. 2021, **338**, 129826.

S2. X. R. Deng, Z. Zou, Y. H. Zhang, J. C. Gao, T. T. Liang, Z. S. Lu and C. M. Li, J. *Colloid Interf. Sci.* 2021, **581**, 465-474.

S3. G. Mathew, N. Narayanan, D. A. Abraham, M. De and B. Neppolian, *Acs Omega.* 2021, **6**, 8068-8080.

S4. J. L. Li, J. L. Xie, L. X. Gao and C. M. Li, *ACS Appl. Mater. Inter.* 2015, **7**, 2726-2734.

S5. H. Y. Xu, C. Liao, Y. J. Liu, B. C. Ye and B. H. Liu, *Anal. Chem.* 2018, **90**, 4438-4444.

S6. M. Zhou, Y. Jiang, G. Wang, W. J. Wu, W. X. Chen, P. Yu, Y. Q. Lin, J. J. Mao and L. Q. Mao, *Nat. Commun.* 2020, **11**, 1-9.

S7. M. M. Shahid, P. Rameshkumar, A. Pandikumar, H. N. Lim, Y. H. Ng and N. M. Huang. *J. Mater. Chem. A.* 2015, **3**, 14458-14468.