

## Supplementary Information

### **Construction of Fe<sub>3</sub>O<sub>4</sub>@Au catalysts via the surface functional group effect of ferric oxide for efficient electrocatalytic nitrite reduction**

Wei Zhang<sup>a</sup>, Jin Li<sup>a</sup>, Cuilian Sun<sup>a</sup>, Xiujing Xing<sup>b</sup>, Yaokang Lv<sup>c</sup>, Wei Xiong<sup>a,\*</sup>, and Hao Li<sup>d,\*</sup>

<sup>a</sup> Key Laboratory of Novel Biomass-Based Environmental and Energy Materials in Petroleum and Chemical Industry, Key Laboratory of Green Chemical Engineering Process of Ministry of Education, Hubei Key Laboratory of Novel Reactor & Green Chemical Technology, School of Chemistry and Environmental Engineering, Wuhan Institute of Technology, Wuhan 430205, China

<sup>b</sup> Chemistry Department, University of California, Davis, California 95616, United States

<sup>c</sup> College of Chemical Engineering, Zhejiang University of Technology, Hangzhou, 310014 P. R. China

<sup>d</sup> Advanced Institute for Materials Research (WPI-AIMR), Tohoku University, Sendai 980-8577, Japan

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\*Corresponding author

E-mail address: xiongwei@wit.edu.cn (W. X.); li.hao.b8@tohoku.ac.jp (H. L.)

Tel/Fax: +86-27-87195001; +81-080-9363-8256

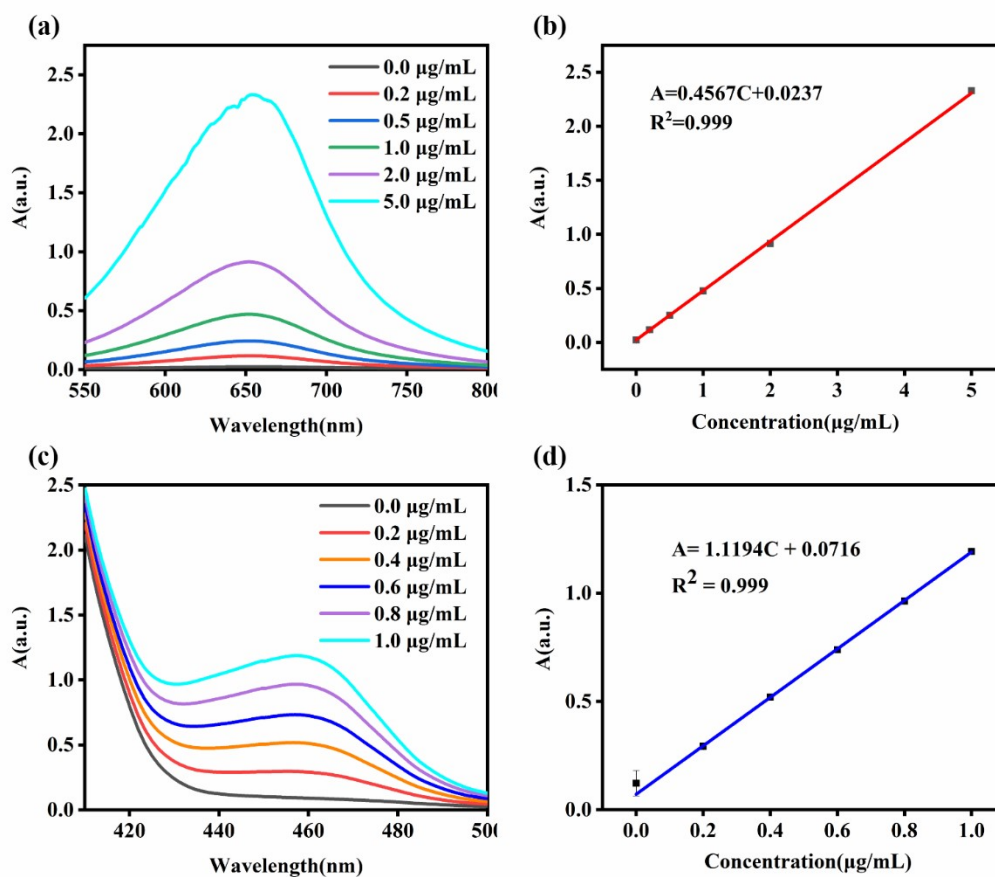


Figure S1 (a) UV absorption spectra at different  $\text{NH}_3$  concentrations and (b) Ammonia nitrogen standard curve; (c) UV-Vis absorption spectra of different concentrations of  $\text{N}_2\text{H}_4$  and (d) Standard curve of  $\text{N}_2\text{H}_4$ .

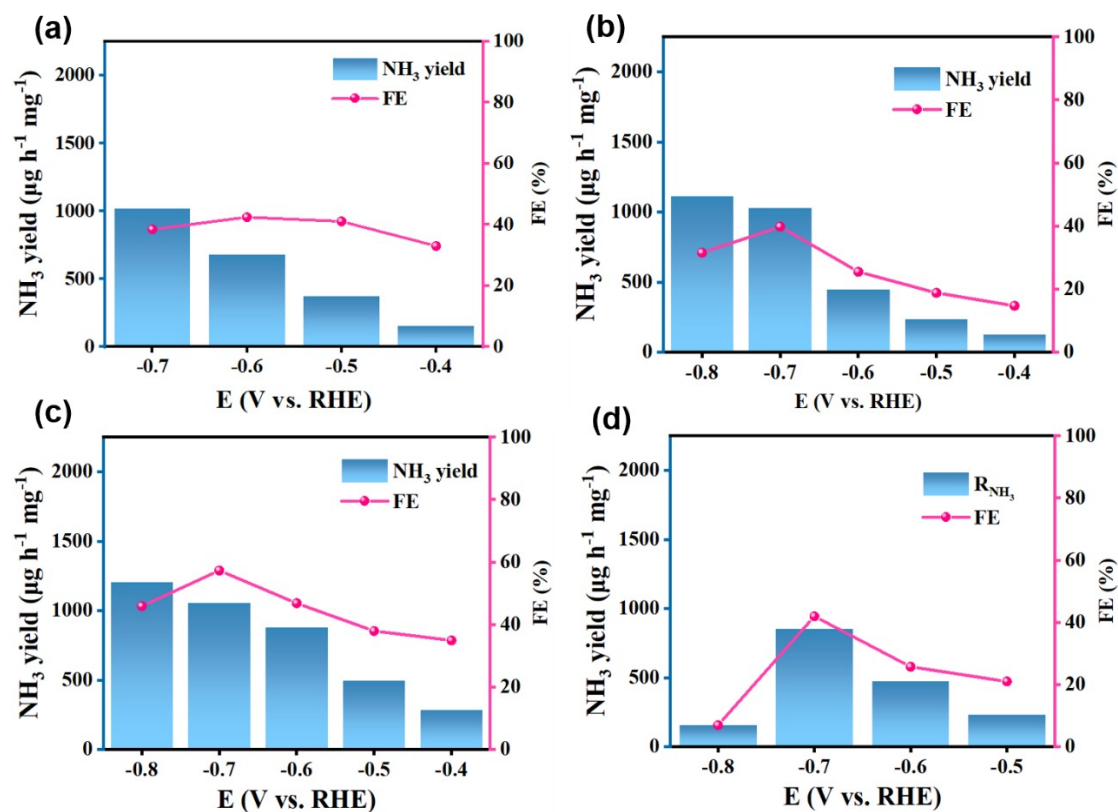


Figure S2  $\text{NH}_3$  yield and FE of (a)  $\text{Fe}_3\text{O}_4$ , (b)  $\text{Fe}_3\text{O}_4\text{-NH}_2$ , (c)  $\text{Fe}_3\text{O}_4\text{-COOH}$  and (d)  $\text{Fe}_3\text{O}_4\text{-SH}$  at various voltages.

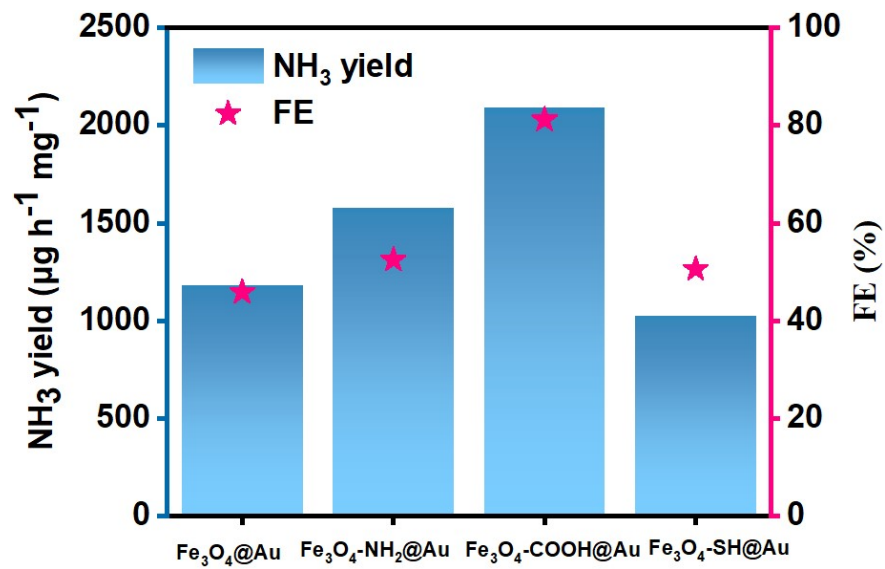


Figure S3 Performance comparison of different samples.

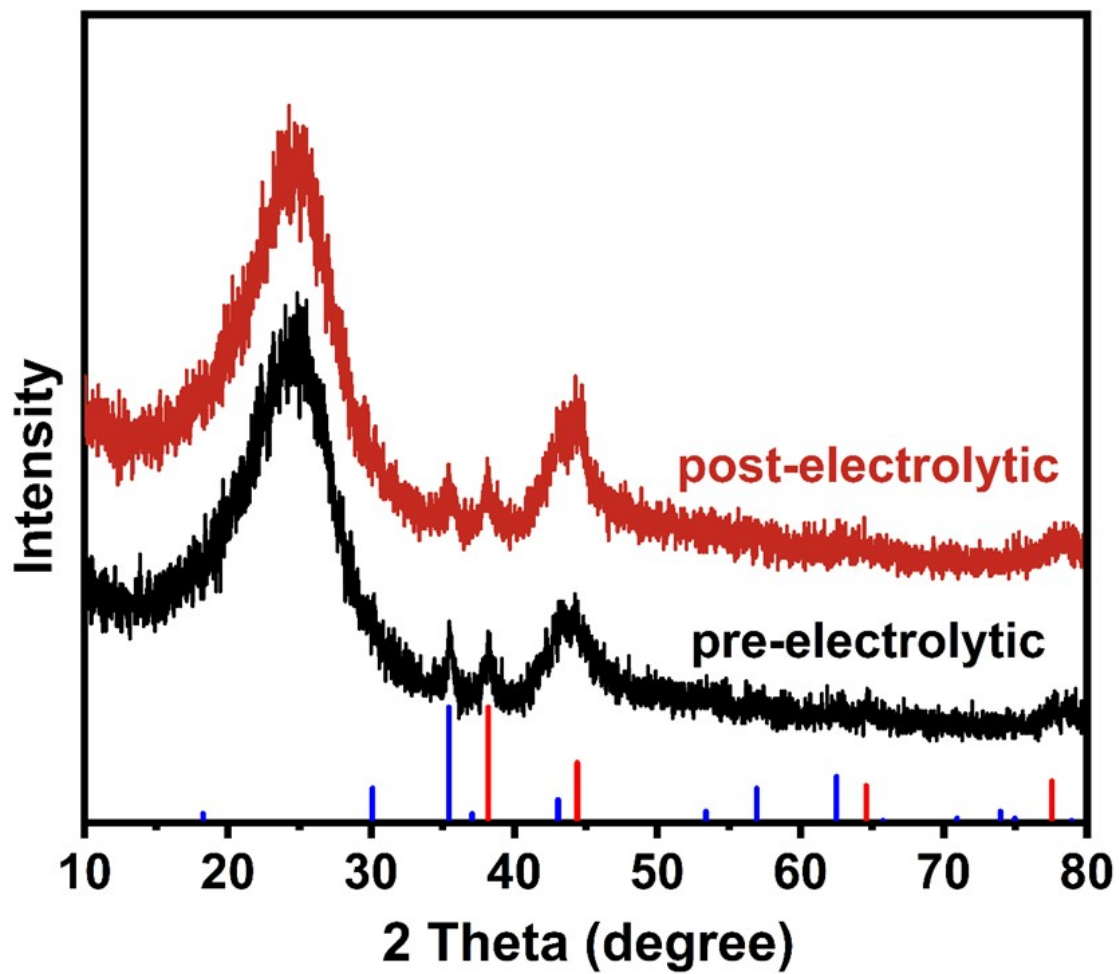


Figure S4 XRD of  $\text{Fe}_3\text{O}_4\text{-COOH@Au}_{1.5}/\text{CC}$ , both unelectrolysed (black) and subjected to electrolysis for 24 h (red).

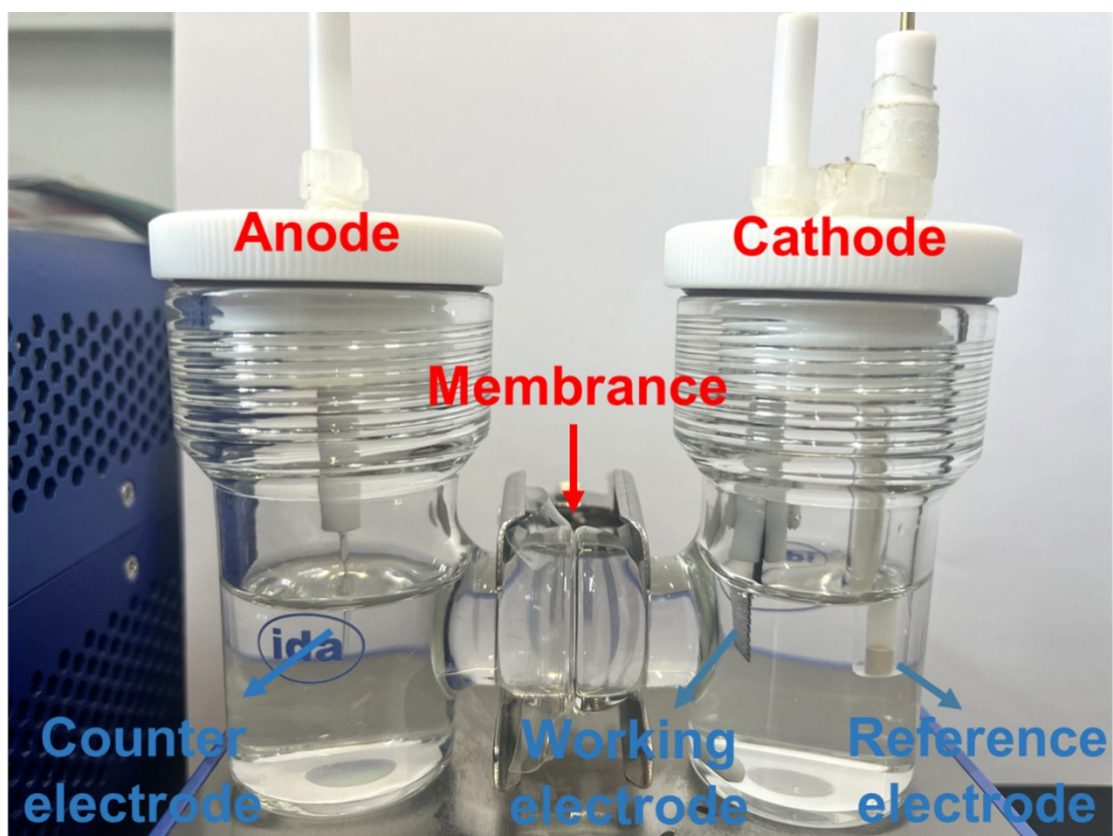


Figure S5 H-Type Electrolysis Cell.

Table S1 ICP test results for  $\text{Fe}_3\text{O}_4\text{-COOH@Au}_{0.5}$ ,  $\text{Fe}_3\text{O}_4\text{-COOH@Au}_{1.0}$  和  $\text{Fe}_3\text{O}_4\text{-COOH@Au}_{1.5}$ .

Sample	Test Elements	Relative element content (%)
$\text{Fe}_3\text{O}_4\text{-COOH@Au}_{0.5}$	Au	1.38%
$\text{Fe}_3\text{O}_4\text{-COOH@Au}_{1.0}$	Au	16.27%
$\text{Fe}_3\text{O}_4\text{-COOH@Au}_{1.5}$	Au	45.53%

Table S2 Performance comparison of samples Fe<sub>3</sub>O<sub>4</sub>, Fe<sub>3</sub>O<sub>4</sub>-NH<sub>2</sub>, Fe<sub>3</sub>O<sub>4</sub>-COOH and Fe<sub>3</sub>O<sub>4</sub>-SH.

sample	NH <sub>3</sub> yield (μg h <sup>-1</sup> mg <sub>cat</sub> <sup>-1</sup> )	FE (%)
Fe <sub>3</sub> O <sub>4</sub>	682.7	42.0
Fe <sub>3</sub> O <sub>4</sub> -NH <sub>2</sub>	1026.5	39.8
Fe <sub>3</sub> O <sub>4</sub> -COOH	1053.9	57.0
Fe <sub>3</sub> O <sub>4</sub> -SH	851.3	41.2