Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting information

Direct electrochemistry and bioelectrocatalysis of horseradish peroxidase entrapped in a self-supporting nanoporous gold electrode: a new strategy to improve the orientation of immobilized enzyme

Lu Lu,*[ab] Yanjie Dong,[a] Junwei Wang,[a] Qianqian Li[a] and Xia Wu*[a]

[a]*School of Chemistry and Chemical Engineering, Anqing Normal University, Anqing 246011, P. R. China*

[b]*Collaborative Innovation Center for Petrochemical New Materials, Anqing 246011, P. R. China*

*Corresponding author: Lu Lu and Xia Wu

Address: No. 128 Linghu Nanlu

Anqing Normal University

School of Chemistry and Chemical Engineering

Anqing 246011, China

Tel.: +86-556-550-0090; Fax: +86-556-550-0090

E-mail address: lulu19861117@126.com; xiawu@aqtc.edu.cn

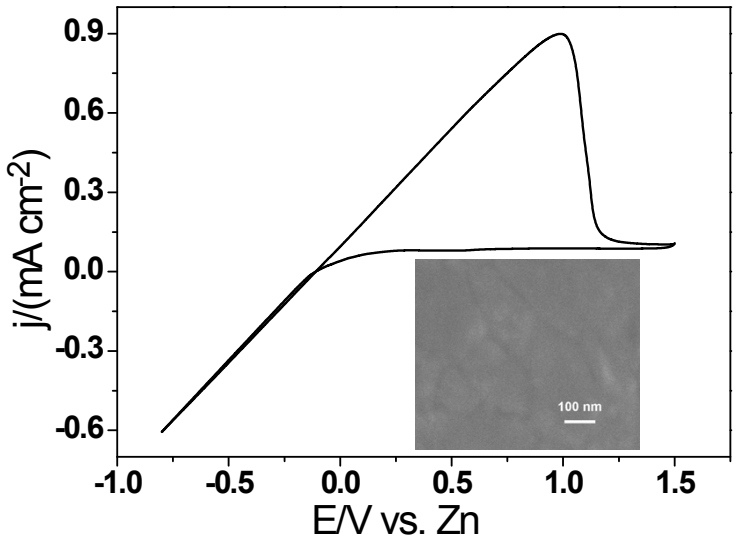

Fig. S1. The CV gram of a polished gold wire in [Choline]Cl·2$ZnCl_2$ at 40 ℃. Scan rate: 0.01 V s^{-1}. Inset: the SEM image of the gold wire surface after the electrochemical treatment.

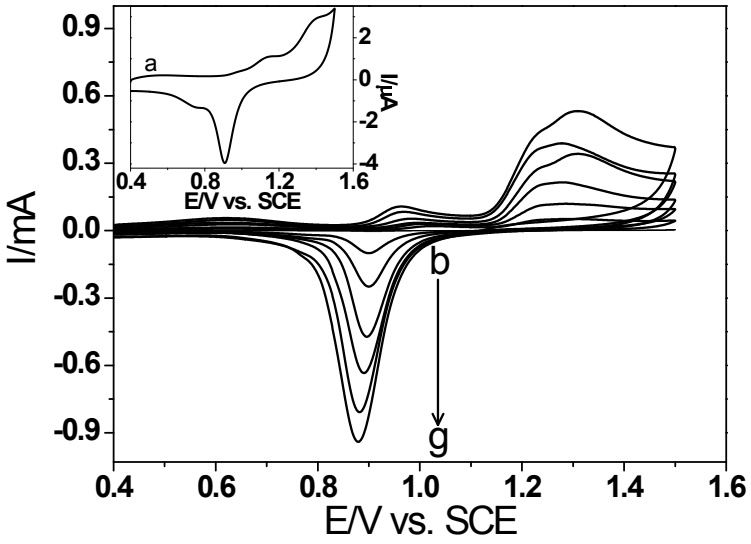

Fig. S2. CV grams of a polished gold electrode (a) and NPGEs (b-g) in 0.5 M H_2SO_4 solution at a scan rate of 0.1 V s^{-1}. Inset: the magnified curve of curve a. The NPGEs were obtained from the gold electrode after alloying/dealloying at 50 ℃ (b), 70 ℃ (c), 90 ℃ (d), 100 ℃ (e), 110 ℃ (f) and 120 ℃ (g) at a scan rate of 0.01 V s^{-1} after 15 cycles.

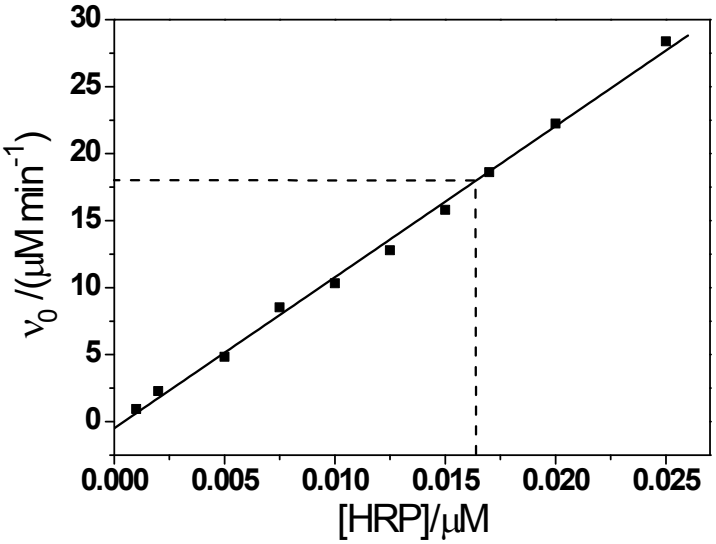

Fig. S3. Calibration curve of the initial rate of catalytic oxidation of OPD by HRP versus the concentration of HRP in 0.1 M phosphate buffer (pH 7.0). Each datum was an average of three replicate determinations.

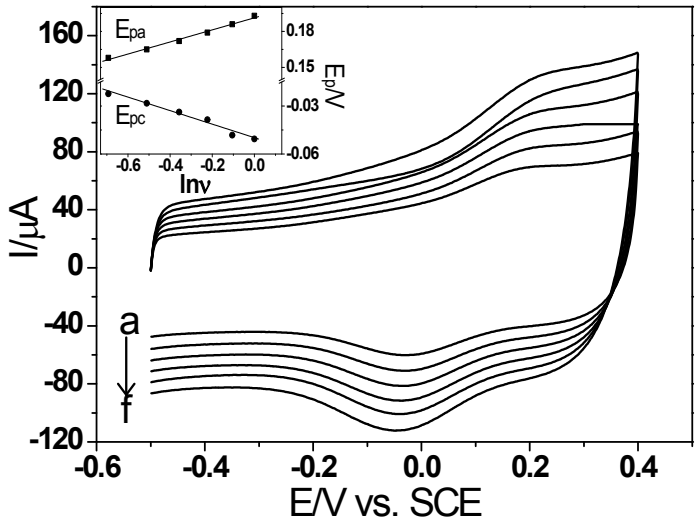

Fig. S4. CV grams of Nafion/HRP/NPGE in 0.1 M phosphate buffer (pH 7.0) at different scan rates (a-f: 0.5, 0.6, 0.7, 0.8, 0.9 and 1.0 V s^{-1}). Inset: plot of redox peak potential versus lnν.

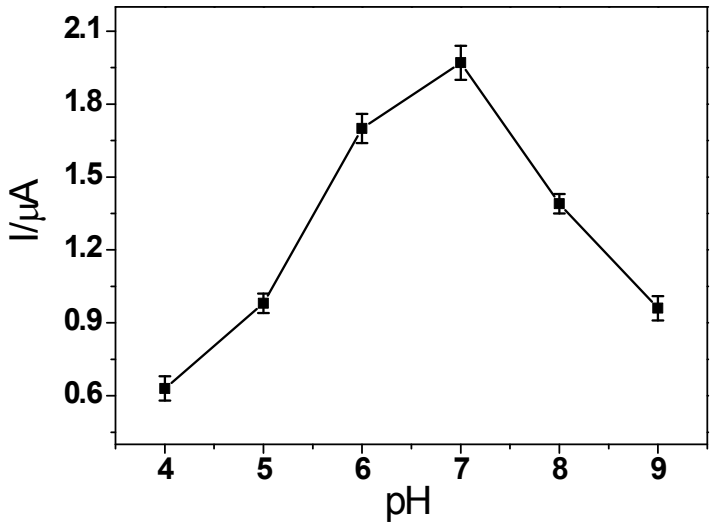

Fig. S5. The effect of the buffer pH on the electrochemical response current of 0.1 mM H_2O_2 on Nafion/HRP/NPGE.

Table S1. The real area (A_{real}) and R_f of the NPGEs fabricated under different temperatures.[a, b]

Temperature/℃	A_{real}/mm^2	R_f
50	11	6.2
70	27	15.3
90	58	32.8
100	76	42.9
110	104	58.8
120	156	88.1

[a] NPGEs fabricated after 15 scan cycles at a scan rate of 0.01 V s^{-1}.

[b] Each datum was an average of three replicate determinations.

Table S2. Comparison of analytical performance of several HRP biosensors for H_2O_2.

HRP biosensors	Linear range/μM	Sensitivity/μA mM^{-1}	Detection limit/μM	References
Nafion/HRP-GNS[a]-TiO_2/GCE[b]	41-630	0.23	5.9	1
Ti/TiO_2/Au/HRP	5-400	Not reported	2	2
MWNTs[c]/chitosan/ GCE	16.7-740	4.9	10.3	3
HRP/HNT[d]/chitosan/ GCE	2.6-75	12	0.7	4
SPCE[e]/GS[f]-Nafion/ Fe_3O_4-Au-HRP	20-2500	Not reported	12	5
Nafion/HRP/NPGE	10-380	21	2.6	This work

[a] Gold nano-seeds.

[b] Glassy carbon electrode.

[c] Multi-wall carbon nanotubes.

[d] Halloysitenanotubes.

[e] Screen-printed carbon electrode.

[f] Graphene sheets.

References

1. Y. Wang, X. Ma, Y. Wen, Y. Xing, Z. Zhang and H. Yang, *Biosens. Bioelectron.*, 2010, **25**, 2442-2446.

2. A. K. M. Kafi, G. Wu and A. Chen, *Biosens. Bioelectron.*, 2008, **24**, 566-571.

3. L. Qian and X. Yang, *Talanta*, 2006, **68**, 721-727.

4. X. Sun, Y. Zhang, H. Shen and N. Jia, *Electrochim. Acta*, 2010, **56**, 700-705.

5. X. Yang, F. Xiao, H. Lin, F. Wu, D. Chen and Z. Wu, *Electrochim. Acta*, 2013, **109**, 750-755.

Table S3. Determination of H_2O_2 in real samples (diluted disinfector).*

Real sample	Value found in diluted sample/mM	Added/mM	Total found/mM	Recovery/%
1	0.168	0.050	0.214	98.2
2	0.168	0.100	0.273	101.9
3	0.168	0.150	0.328	103.1

* Each datum was an average of three replicate determinations.