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An electrochemical enzymatic nanoreactor based on dendritic mesoporous silica nanoparticles for living cell H₂O₂ detection

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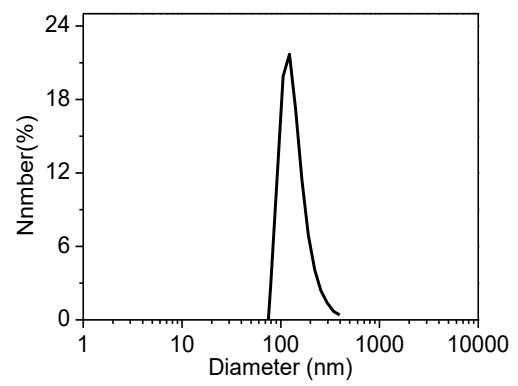


Fig. S1. Particle size distribution curve of DMSNs in D.I. water.

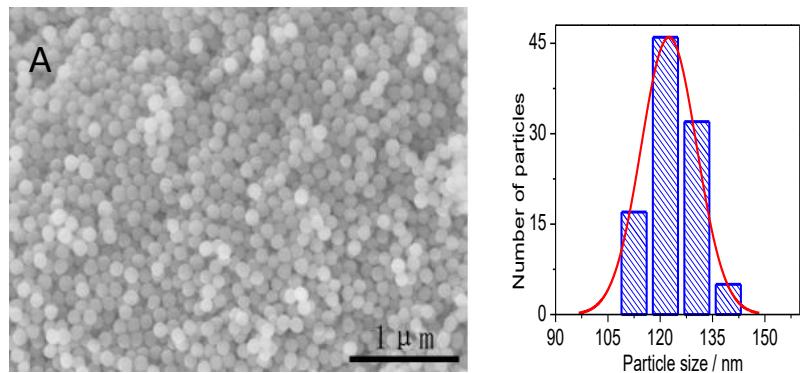


Fig. S2. The SEM images of nonporous silica nanospheres (NSNs). The size distribution of NSNs fitted by Gaussian function.

Table S1 Electrochemical parameters of different modified electrodes.

Biosensors	Load / mg g ⁻¹	E ^o / V (vs. SCE)	I _p / μA	Q / nc	K _m ^{app} / μM	k _s / s ⁻¹
HRP/DMSNs/GCE	23.6	-0.410	0.5247	211.7	11.48	13.53
HRP/NSNs/GCE	8.12	-0.397	0.2782	98.28	39.35	8.73
HRP/GCE	—	-0.384	0.2771	91.17	—	7.51

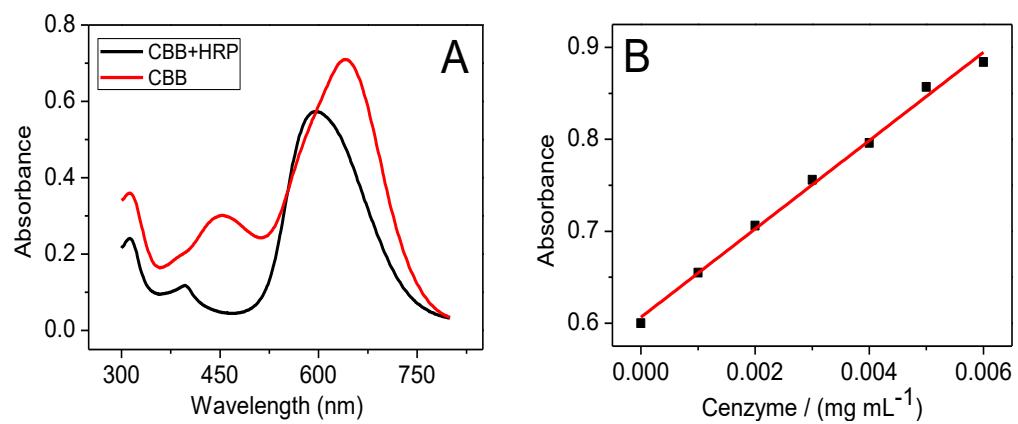


Fig. S3. (A) UV-vis spectra of Coomassie Brilliant Blue G-250 (CBB) and CBB-enzyme complex. (B) Plot of absorbance of CBB-enzyme and the concentration of enzyme in solution.

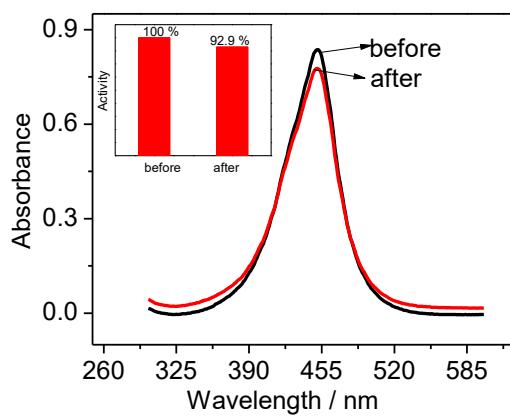


Fig. S4. UV-vis spectra of catalytic oxidation of TMB by hydrogen peroxide in the presence of HRP/DMSNs before and after treatment of high salt solution.

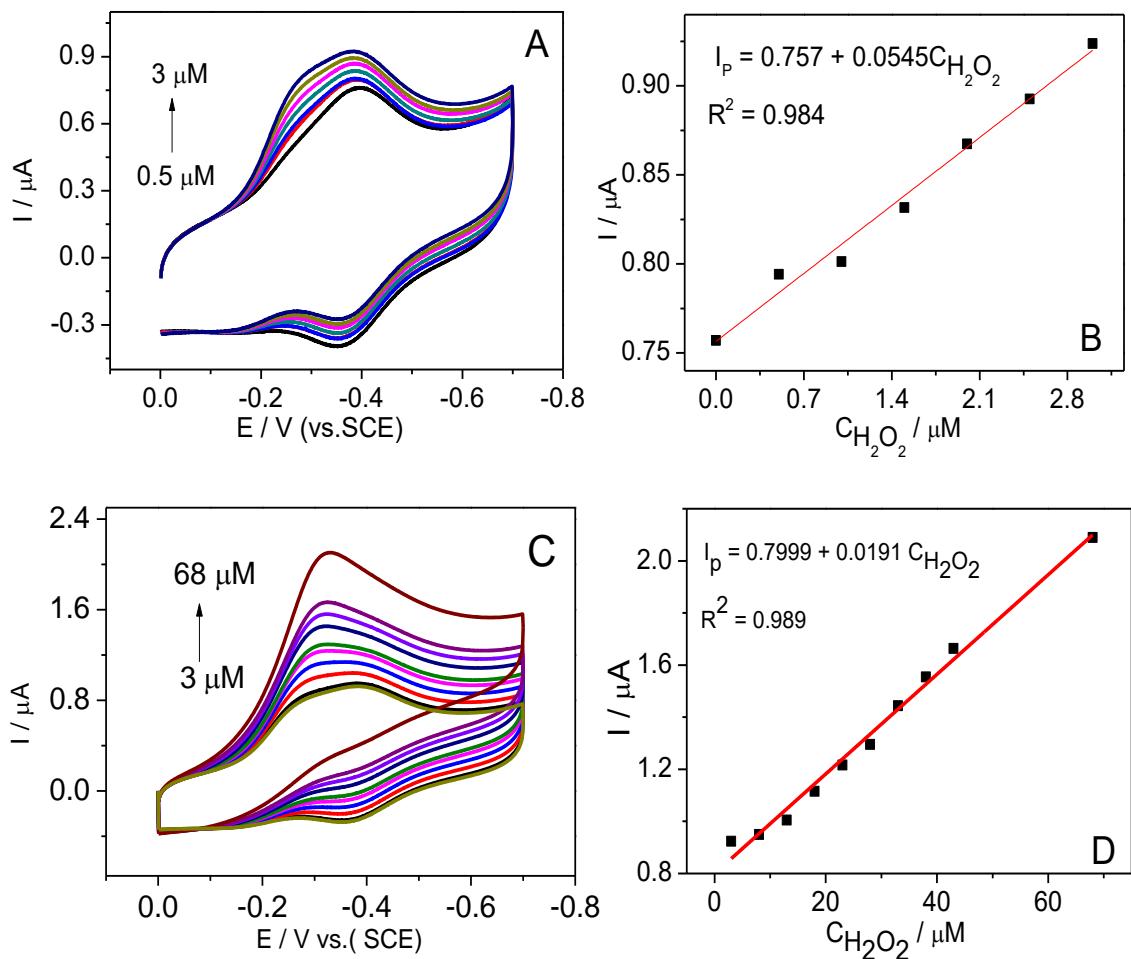


Fig. S5. (A) CV curves of HRP/NSNs/GCE in anaerobic 0.1 M pH 7.0 PBS containing different concentrations of H_2O_2 (from 0.5 to 3 μM). (B) Plot of the cathodic peak currents vs. the concentrations of H_2O_2 . (C) CV curves of HRP/NSNs/GCE in anaerobic 0.1 M pH 7.0 PBS containing different concentrations of H_2O_2 (from 3 to 68 μM). (D) Plot of the cathodic peak currents vs. the concentrations of H_2O_2 .

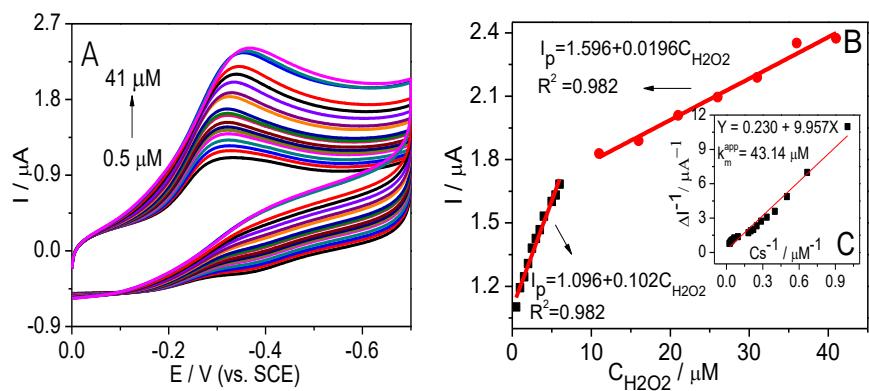


Fig. S6. (A) CV curves of HRP/GCE in anaerobic 0.1 M pH 7.0 PBS containing different concentrations of H₂O₂. (B) Plot of the cathodic peak currents vs. the concentrations of H₂O₂. Insert: double-reciprocal plot of the cathodic peak currents and the concentrations of H₂O₂ on HRP/GCE.

Table S2. Comparison of various H₂O₂ sensors.

Electrochemical biosensors	Linear range (μM)	Detection limit (μM)	Refs
Cu ₂ O/GNs	300–3300	20.8	1
GNP-TNT/HIL/HRP	15–750	2.2	2
graphene/Pt-nanocomposite	2–710	0.5	3
HRP-CTAB-AuNPs	0.5–105	0.23	4
HRP/silica matrix	20–200	3	5
HRP/NSNs	0.5–68	0.28	This work
HRP/MSNs	0.5–103	0.11	This work

References

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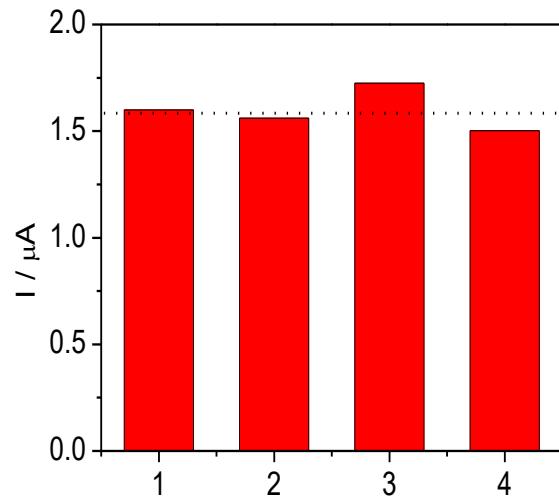


Fig. S7. Reproducibility of four HRP/DMSNs/GCE electrodes for the catalytic currents at -0.4 V in anaerobic PBS containing 20 μ M H_2O_2 .