Synthesis of a CuNPs/ Chitosan /Black phosphorus

Nanocomposite for Non-enzymatic Hydrogen Peroxide

Sensing

Supporting information

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1. Experimental Section

Fabrication of BP-modified electrode

Prior to deposition, a glassy carbon electrode (GCE) with a diameter of 3 mm was first mechanically polished with 0.3 μ m and 0.5 μ m alumina slurry sequentially and then sonicated in ethanol and deionized water for about 5 min. Then, the GCE was further cleaned in 0.25 M sulfuric acid solution by cyclic voltammetry (CV) in the potential range from -0.5 to + 1.2 V at a scan rate of 50 mV/s until a stable profile was obtained. The prepared electrodes were dried under a nitrogen stream and used for modification immediately. BP-GCE was prepared by dropping 6 μ L 5 mg/mL BP suspension onto the surface of GCE and was dried in nitrogen environment.

2. Supporting Figures and Tables

Fig. S-1. (A) Photograph of newly prepared BP and Chit-BP dispersions; (B) Photograph of BP and Chit-BP dispersions after one month.

Fig. S-2. Cyclic voltammograms of CuNPs-Chit-BP CGE in 100 mM PBS at different pH values (pH 2.5-10.0).

Fig. S-3. Amperometric response of the CuNPs-Chit-BP GCE at different potentials in 100 mM pH 7 PBS with consecutive dropwise addition of 200 μ M H₂O₂.

Fig. S-4. Comparison of catalytic activity of CuNPs-Chit-BP GCE toward H_2O_2 at a measurement interval of 2 weeks.

Fig. S-5. Amperometric response of CuNPs-Chit-BP GCE upon successive addition of 0.2 mM H_2O_2 , 0.5 mM UA, 0.5 mM AA and 0.5 mM NaNO₂ at -0.55 V under stirring in 100 mM pH 7 PBS saturated with N_2 .

Table S-1. Comparison of synthesis route, linear concentration range and LOD of different Cuincluded and BP-included non-enzymatic H₂O₂ sensors.



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Fig. S-2. Cyclic voltammograms of CuNPs-Chit-BP CGE in 100 mM PBS at different pH values (pH=2.5, 4, 7, 8.5, 10.0).



Figure S-3. Amperometric response of the CuNPs-Chit-BP GCE at different potentials in 100 mM pH 7 PBS with consecutive dropwise addition of 200 μ M H₂O₂



Fig. S-4. Comparison of catalytic activity of CuNPs-Chit-BP GCE toward H_2O_2 at a measurement interval of 2 weeks.



Figure S-5. Amperometric response of CuNPs-Chit-BP GCE upon successive addition of 0.2 mM H₂O₂, 0.5 mM UA, 0.5 mM AA and 0.5 mM NaNO₂ at -0.55 V under stirring in 100 mM pH 7 PBS saturated with N₂.

Modified Electrode	Synthesis Protocol	Performance		Reference
		Linear range (mM)	LOD (µM)	_
precipitation and				
hydrothermal approach				
CuS/rGO	180 °C heating for 24h	$0.005 \sim 1.5$	0.27	3
CuNP/rGO	electrodeposition	0.1 ~ 18	0.601	5
NiO and α -Fe ₂ O ₃	hydrothermal route	0.5 ~ 3	50	13
Cu@M-Chit–CNT	NaBH ₄ reduced CuNPs	0.0001 ~ 1	0.025	15
	Hybrid chitosan			
	derivative was needed			
Cu-CHIT-CNTs		0.05 ~ 12	20	16
Cu@f-MWCNT +		0.5 ~ 3		23
CHIT/GCE				
CuO@Cu2O-NWs/PVA		0.001 ~ 3	0.35	27
BP	supercritical carbon	$0.0001 \sim 0.05$	0.01	45
	dioxide assisted			
CuNPs/poly-o-	electrodeposition	0.001 ~ 1	0.1	50
phenylenediamine				
CuNP/Chit/BP	electrodeposition	$0.01 \sim 10.3$	0.39	the present
				work

Table S-1. Comparison of synthesis route, linear concentration range and LOD of different Cu-included and BP-included non-enzymatic H₂O₂ sensors.