Construction of a biosensor based on a combination of cytochrome c, electrochemical reduced graphene oxides and gold nanoparticles

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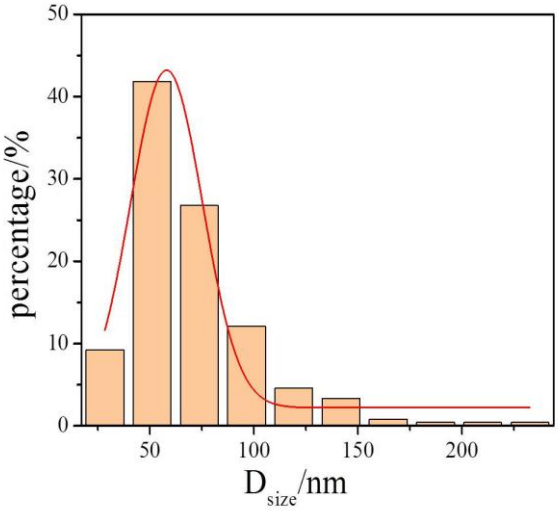

Figure S1. Size distribution of the separate gold nanoparticles

The true surface area of the electrode was calculated through a current of CV plot at different scan rates (10-100 mV/s) in 100 mM KCl solution containing 10 mM of $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$ (1:1). The CV curves of modified electrode versus scan rates were shown in Figure S2A. Plot of oxidation peak current of modified electrode against root of scan rates is shown in Figure S2B. The correlation coefficient (R^2) was 0.99.07. The surface area of the target sensor is calculated according to the Randles-Savcik formula, $i_p = 2.69 \times 10^5 A n^{5/2} {D_0}^{1/2} v^{1/2} C_0$, where n is the number of electron transfer involved in the redox reaction (n=1 for $[Fe(CN)_6]^{3-/4-}$ solution); A represents the true surface area of the electrode surface; D_0 represents the diffusion coefficient (for $[Fe(CN)_6]^{3-/4-}$ solution: $D_0 = 0.673 \times 10^{-5}$ cm^2/s); ν represents the scanning rate of cyclic voltammetry; C_0 represents the volume concentration of the probe; i_p represents the current value of the redox peak. After calculation, the true surface area of the target electrode is 0.04604 cm^2.

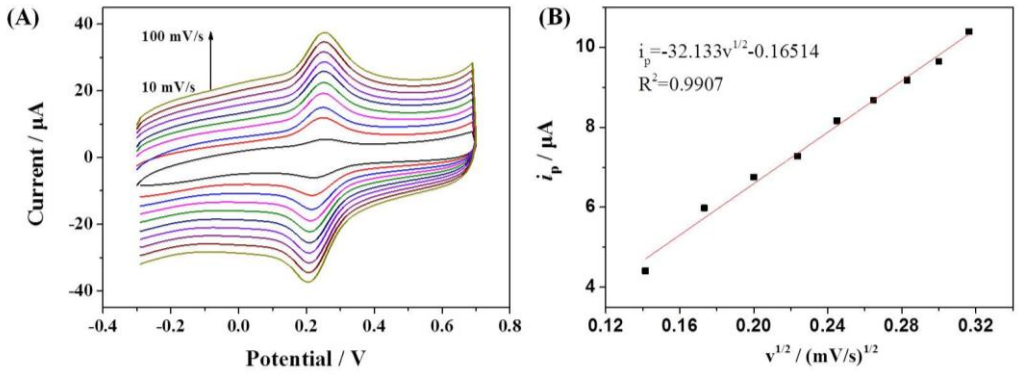

Figure S2 The CV curves of GCE/ERGO-Nafion/AuNPs/Cyt c/Nafion electrode in 100 mM KCl solution containing 10 mM of $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$ (1:1) (A), Plots of oxidation peak current of modified electrode vs scan rates (B).

Table S1. Comparison of the analytical performance of some Cyt c-based H_2O_2 biosensors.

No.	Various modified electrodes	Detection limit (μM)	Linear range (mM)	Reference
1	Cyt c/nanoporous Au film	6.3	0.01-12	[1]
2	Cyt c/RTIL-PDDA-AuNPs/MUA-MCH/Au	5.0	0.04–3.45	
3	Cyt c/RTIL-PDDA-graphene/MUA-MCH/Au	2.5	0.02–3.45	[2]
4	Cyt c/RTIL-AuNPs-graphene -PDDA/MUA-MCH/Au	2.5	0.01–4.45	
5	Cyt c/Nanorod-like gold/ITO	3.70	0.050-1.5	[3]
6	Cyt c/Nanopyramidal gold/ITO	1.56	0.010-1	[3]
7	Cyt c/PTCA-graphene/GCE	3.5	0.005-0.09	[4]
8	Cyt c/AuNPs/RTIL/MWNTs/GCE	3.0	0.05–1.15	[5]

No.	Various modified electrodes	Detection limit (μM)	Linear range (mM)	Reference
9	**Nafion/Cyt c/AuNPs/ERGO-Nafion/GCE**	**1.1**	**0.01-3.5**	**This work**
10	Cyt c/MWCNTs/CF/GCE	1.0	0.002-0.078	[6]
11	Cyt c/AuNPs/Chit/MWNTs/GCE	0.91	0.0015-0.51	[7]
12	Cyt c/11-MUA/AuNPs/3-MPTMS/ITO	0.5	---	[8]
13	Cyt c/NaY/GCE	0.32	0.008-0.128	[9]
14	Cyt c/MWCNT-PANI/ITO	0.3	0.0005-1.5	[10]
15	Cyt c/Graphene-PEDOT/GCE	0.249	0.0005-0.4	[11]
16	Cyt c/L-Cys/P3MT/MWCNT/GCE	0.23	0.0007-0.4	[12]
17	Nafion/Cyt c/GO-CNT/AuNPs/GCE	0.000027	$1x10^{-8}$ -$1.4x10^{-7}$	[13]

Cytochrome c (Cyt c)

room temperature ionic liquid (RTIL)

poly(diallyldimethylammonium chloride) (PDDA)

gold nanoparticles (AuNPs)

11-mercaptoundecanoic acid-6-mercapto-1-hexanol (MUA-MCH)

gold electrode (Au)

indium tin oxide (ITO)

3,4,9,10-perylenetetracarboxylicacid(PTCA)

glassy carbon electrode(GCE)

multi-walled carbon nanotubes (MWNTs)

electrochemical reduced graphene oxides (ERGO)

ciprofloxacin (CF)

chitosan (Chit)

11-mercapundecanoic acid (11-MUA)

3-mercaptopropyl trimethoxysilane (3-MPTMS).

Zeolite (NaY)

Polyaniline (PANI)

poly(3,4-ethylenedioxythiophene) (PEDOT)

L-Cystine (L-Cys)

poly(3-methylthiophene) (P3MT)

graphene oxides (GO)

carbon nanotubes (CNT)

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