Supplemental Information

Detection of polynucleotide kinase activity by using a gold electrode modified with magnetic microspheres coated with titanium dioxide nanoparticle and a DNA Dendrimer

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1. Table S1. DNA sequence

Name	Sequence
substrate probe (S1)	5'- HS-SH-(CH2)6 AAA GTCGA CGTCA TCGTC-3'
capture probe(S2)	5'-OH-AAA GACGA TGACG TCGAC-3'
link probe(S3)	5'-CTGCT ACTGC AGCTG GTCGA CGTCA TCGTC -3'

Table S2. Determination of T4 PNK added in the real sample

Number	Added (U/mL)	Founded(n=3; U/mL)	Recovery
1	0.1	0.104±0.003	1.041
2	1	0.983±0.08	0.983
3	5	4.81±0.4	0.962
4	10	10.31±0.2	1.031

2. The electrochemical catalysis toward various H_2O_2 concentrations

The bioelectrocatalytic currents are enlarged with the concentration of H_2O_2 increasing. Fig. S1 shows the calibration curve of the CV responses on the modified electrode at different H_2O_2 concentrations. The current response was linear with the H_2O_2 concentration in the range of 10-210 μM. The detection limit was 3 μM (3 n/s, where n was the standard deviation of the intercept and s was the slope of the calibration curve).

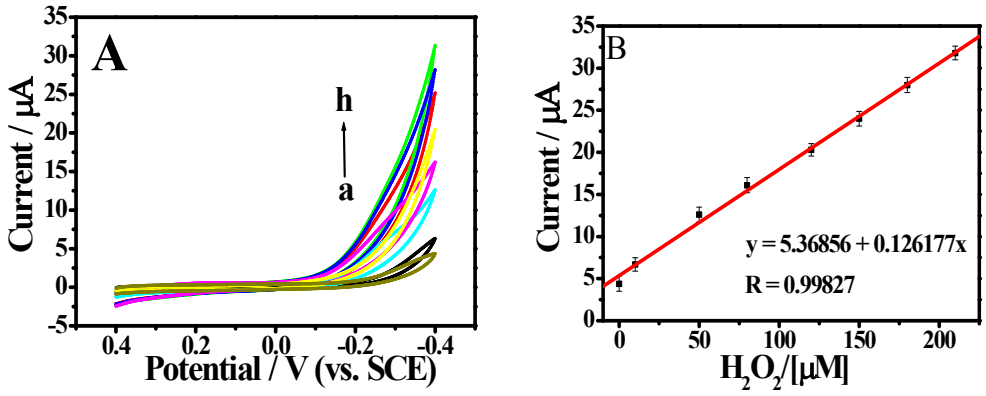

Fig. S1 (A) Cyclic voltammograms of S3-P-S2-TMNPs-S1/GE in Tis-HCl (pH 7.4) towards bioelectrocatalytic reduction of various concentrations of H_2O_2 (a-h): 0, 10, 50, 80, 120,150, 180, 210 μM, (B) The corresponding calibration curve of current vs. the concentration of H_2O_2.

3. Optimization of the Variables of the System

In this paper, a number of experimental conditions were optimized to achieve high sensitivity. Fig. S2 shows the optimization of the variables of the system, such as pH value, phosphorylation time, reaction temperature and the concentration of TMNPs. As shown in Fig. S2A, the largest current is obtained under pH 7.4. As shown in Fig. S3B, the electrochemical signals are intensified with the time of phosphorylation, and the best incubation time is 120 min. Fig. S2C depicts the effect of reaction temperature ranging from 25 to 40 ^oC on the system. It is obvious that the optimized reaction temperature is 35 ^oC. In this paper, the system can catalyze reduction hydrogen peroxide when the TMNPs were fabricated on the S1-P-S3-S2/GE. Hence the concentration of TMNPs is an important parameter. The effect of the concentration of TMNPs on the system is depicted as Fig. S2D. The currents response increases with the increase of the concentration of TMNPs and tends to the maximum current signal at 55 ng/mL. Thus, 55 ng/mL is used as the optimal TMNPs concentration to obtain a high sensitivity.

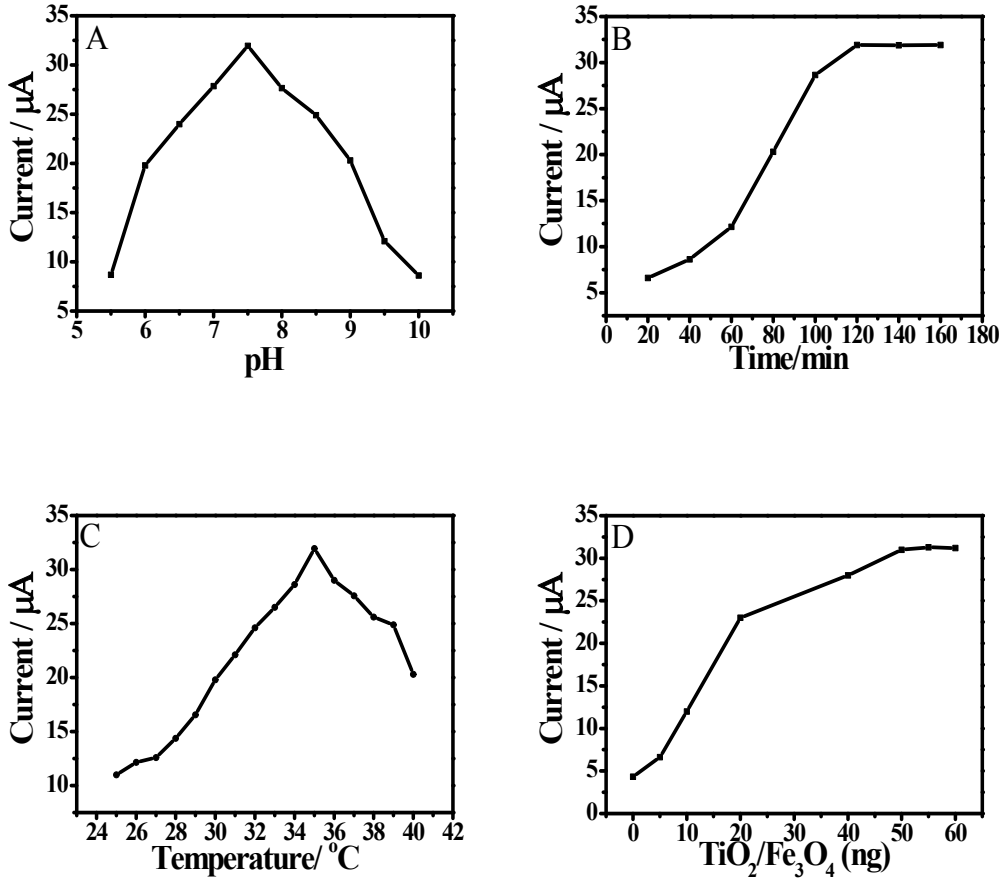

Fig. S2 Optimization of experimental conditions: (A) pH value, (B) incubation time for phosphorylation at room temperature, (C) incubation temperature, (D) different concentration of TMNPs.

4. The effect of TMNPs-DNA dendrimer structure

To further attest the procedure of the electrochemical amplification of our system, control experiments were discussed. As Fig. S3 shows, the signal based on TMNPs-DNA dendrimer structure (curve b) is obviously larger than that of conventional structure in which the S1/GE only hybridized with P-S2-TMNPs (curve a). This indicates that the TMNPs fabricated on the S3-P-S2-TMNPs-S1/GE are more due to the dendrimer structure than those on the S2-S1/GE which can only constitute conventional structure.

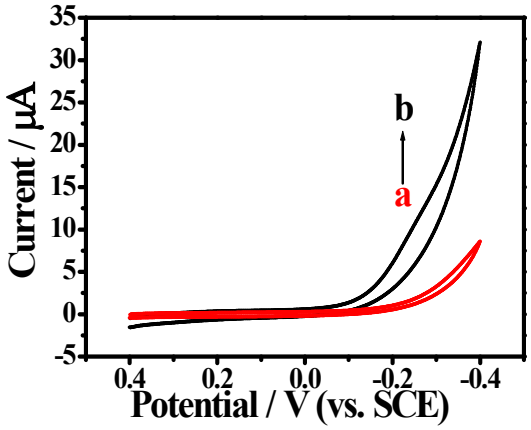

Figure S3 Cyclic voltammetrys of different electrodes in Tris-HCl (pH7.4): P-S2-TMNPs-S1/GE (a) S3-P-S2-TMNPs-S1/GE (b).