Direct electrocatalysis and amperometric detection of H_2O_2

To improve the performance of the H_2O_2 sensor, some important influence factors were optimized, including the applied potential, the concentrations of NaOH and the concentrations of modifier. Fig. S1A shows the current response at different applied potentials after addition of 50 μM H_2O_2 into 0.1 M NaOH solution. From 0.40 to 0.60 V, the current response increases obviously with the increase of the applied potential. Considering the interference of many coexisted foreign species at too positive potential, 0.60 V is used as the working potential for detection of H_2O_2.

The influence of the concentrations of modifier covered on the surface of electrode is illustrated in Fig. S1B in ESI. With increasing the concentration of the modifier from 0.5 to 3.0 $mgmL^{-1}$, the electrocatalytic activity reaches a maximum value at around 1.0 $mgmL^{-1}$. So here we use the 1.0 mg/mL electrospun $LaNiO_3$ nanofibers to prepare the modified CPE.

Fig. S1C in ESI illustrates the effect of pH on the amperometric response of 50.0 μM H_2O_2. Different concentrations of NaOH were studied from 0.001 M to 0.50 M. The current response is the biggest and the most stable when the concentration of NaOH is 0.10 M. When the concentration is above 0.10 M NaOH, the background noise is high and the baseline is unstable. Therefore, 0.10 M NaOH is the most suitable supporting electrolyte in this experiment.

Direct electrocatalysis and amperometric detection of glucose

The applied potential, the concentrations of NaOH and the concentrations of modifier were also optimized so as to improve the performance of the glucose sensor. The effect of applied potential on the amperometric response of the sensor to glucose was examined. Corresponding results are shown in Fig. S2A in ESI. Upon increasing applied potential from 0.40 to 0.70 V, the current response reaches a maximum at 0.65 V. However, 0.6 V is chosen as the working potential so that some interference can be avoided from the too positive potential.

The most proper concentration of modifier is optimized by comparing different concentrations of electrospun $LaNiO_3$ nanofibers in the modified agent. According to Fig. S2B, the concentration ranges from 0.5 to 3.0 $mgmL^{-1}$ and the current response increases a maximum value at around 1.5 $mgmL^{-1}$, which is chosen in the sequent experiments.

The influence of pH on the amperometric response of 50 μM glucose was illustrated in Fig. S2C in ESI. With increasing the concentration of NaOH from 0.001 to 0.5 M, the electrocatalytic activity increases and reaches a maximum value at around 0.1 M NaOH. A high pH value is disadvantageous because the background noise is high and the baseline is unstable. For those reasons, 0.1 M NaOH is used as the supporting electrolyte for glucose detection.

Figcaption:

Fig. S1 (A) Effects of the applied potential in the presence of 50 μM H_2O_2 in 0.1M NaOH. (B) Effects of the concentration of the modifier in the presence of 10 μM H_2O_2 in 0.1 M NaOH. (C) Amperometric responses of the modified CPE at 0.6 V applied potential upon successive additions of 50 μM H_2O_2 into 10 mL NaOH solution with different concentrations of 0.001 M, 0.01 M, 0.05 M, 0.1 M, 0.25 M and 0.5 M. The detection solution was continuously stirred.

Fig. S2 Effects of the applied potential (A) and concentration of the modifier (B) in the presence of 50 μM glucose in 0.1 M NaOH. (C) Amperometric responses of the modified CPE at 0.6 V applied potential upon successive additions of 50 μM glucose into 10mL NaOH solution with different concentrations of 0.001 M, 0.01 M, 0.05 M, 0.1 M, 0.25 M and 0.5 M. The detection solution was continuously stirred.

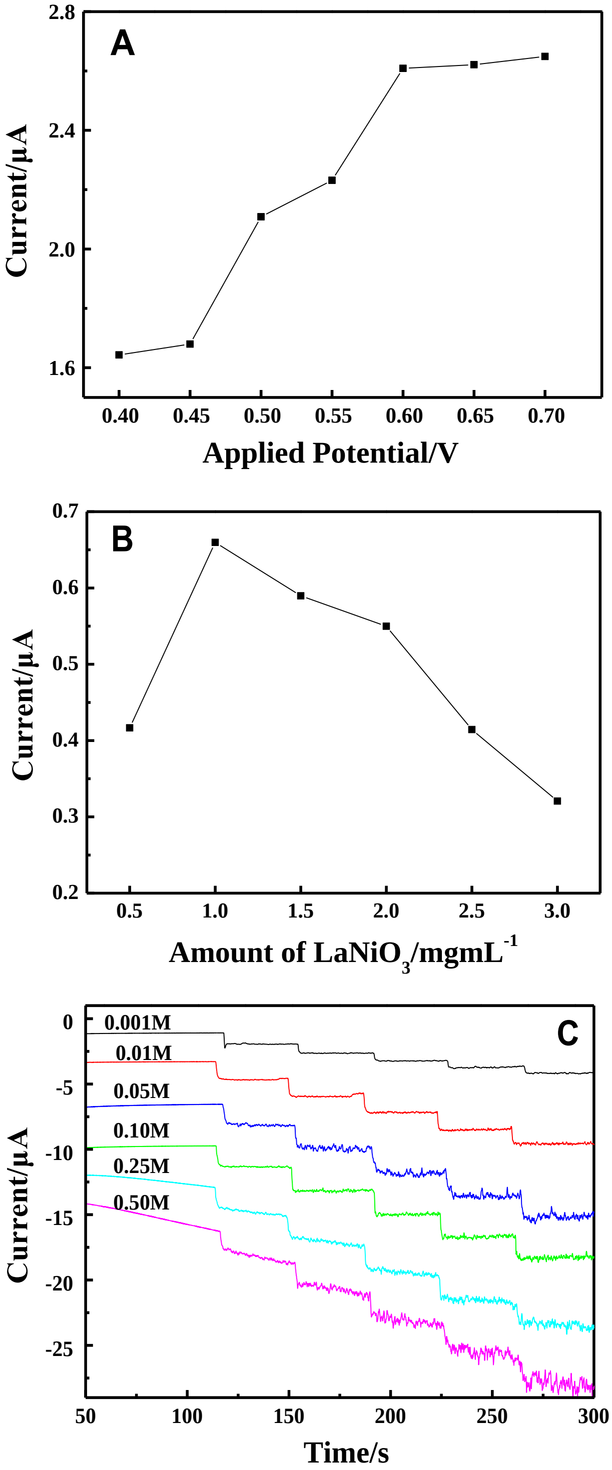
A
Current/μA
2.8
2.4
2.0
1.6
0.40
0.45
0.50
0.55
0.60
0.65
0.70
Applied Potential/V
B
Current/μA
0.7
0.6
0.5
0.4
0.3
0.2
0.5
1.0
1.5
2.0
2.5
3.0
Amount of LaNiO3/mgmL-1
C
0.001M
0.01M
0.05M
0.10M
0.25M
0.50M
Current/μA
0
-5
-10
-15
-20
-25
50
100
150
200
250
300
Time/s

Fig. S1

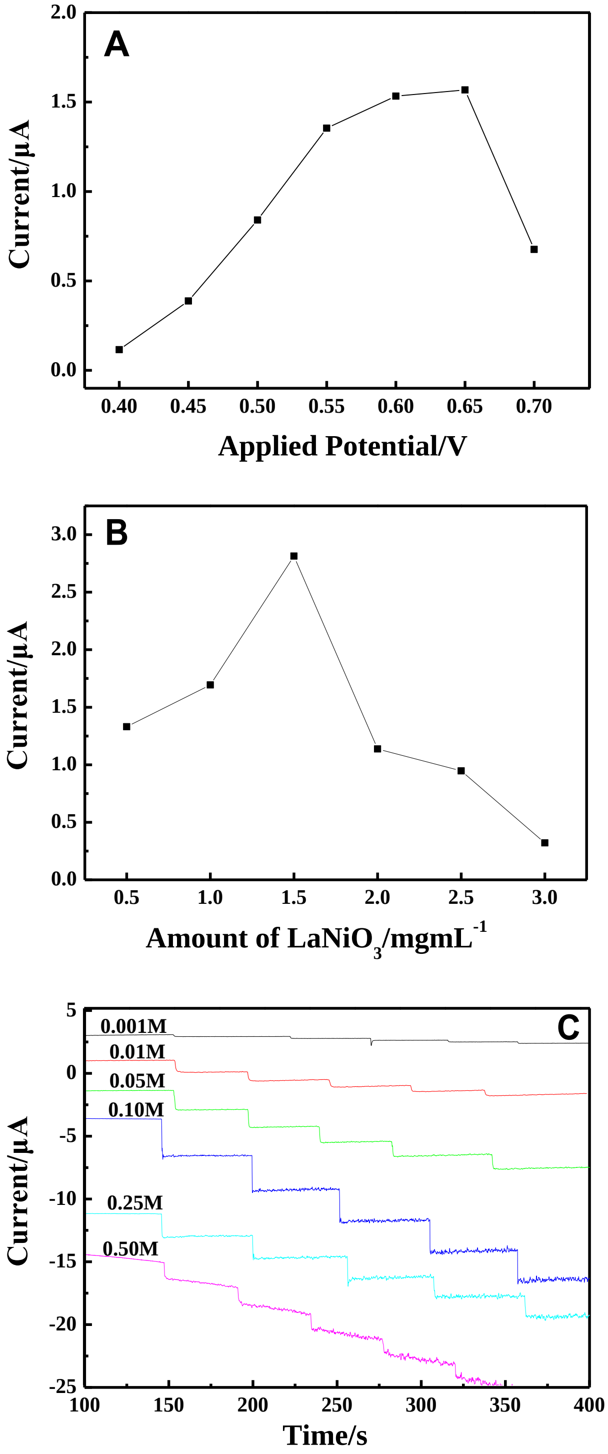
A
Current/µA
Applied Potential/V
B
Current/µA
Amount of LaNiO3/mgmL-1
C
0.001M
0.01M
0.05M
0.10M
0.25M
0.50M
Current/µA
Time/s

Fig. S2