10.1071/CH17503_AC



Australian Journal of Chemistry 2018, 71(2 & 3), 170-176

# Supplementary Material

# A label-free electrochemical aptasensor for the rapid detection of tetracycline based on ordered mesoporous carbon-$Fe_3O_4$

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**Optimization of experimental conditions using cyclic voltammetry (CV)**

The scan rate, the loading amount of OMC-$Fe_3O_4$, the concentration of TET aptamer, pH value of the solution and incubation time play significant roles for TET detection.

The effect of scan rate on the electrochemical response was investigated. Cyclic voltammograms of aptasensor at different scan rates: (a) 0.01, 0.02, 0.05, 0.10, 0.25, 0.50, 0.75 V/s in testing solution (from inner to outer), (b) the linear dependence of redox peak currents on scan rates were shown in Fig. S1. It was found that the anodic peak potential shifted to a more positive direction and the cathodic peak potential shifted to a more negative direction with an increasing scan rate (Fig. S1A); and the redox peak currents were linearly proportional to the square root of scan rate (Fig. S1B), indicating a typical electrochemically quasi-reversible process [1]. Hence, the peak currents responses of the thionine on the surface of the modified electrode were controlled by the mass diffusion, showing a diffusion-controlled process in the solution [2]. From these results, a scan rate of 0.1 V/s was chosen for further test.

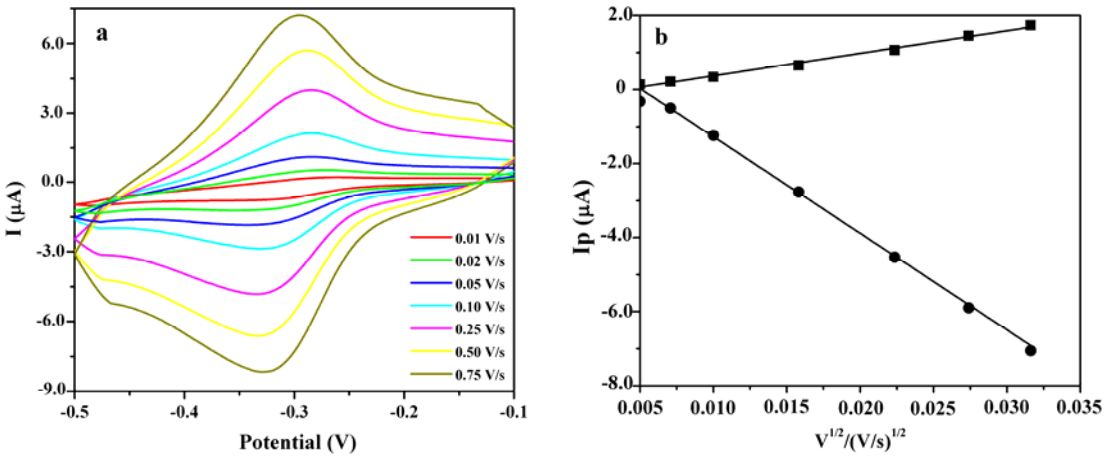


Fig. S1 Cyclic voltammograms of aptasensor at different scan rates: (a) 0.01, 0.02, 0.05, 0.10, 0.25, 0.50, 0.75 V/s in testing solution (from inner to outer), (b) the linear dependence of redox peak currents on scan rates

The loading amount of OMC-$Fe_3O_4$ influenced the performance of aptasensor. The thickness, compactness of the OMC-$Fe_3O_4$ layer, which was related to the loading amount, directly affected the current response of the aptasensor. Therefore, the OMC-$Fe_3O_4$ loading were optimized from 0.1 to 1.0 mg $mL^{-1}$ through CV studies. As shown in Fig. S2a, the peak current rose with increasing concentration of OMC-$Fe_3O_4$ immobilized on the electrode and reached the maximum at 0.5 mg $mL^{-1}$, then tend to decreased. This is attributed to the increase of film thickness, which led to an increase of interface electron transfer resistance, making the electron transfer more difficult. Therefore, 0.5 mg $mL^{-1}$ was selected as the optimum concentration of OMC-$Fe_3O_4$ in the subsequent work.

The density of the aptamer immobilized on the electrode surface is another important parameter. As shown in Fig. S2b, the response increased along with the increasing concentration of the aptamer and reached the maximum value at 2.0 μM, whereas the further increase of aptamer concentration led to the decrease of peak current. That is, a low density leads to a low response, while the dense immobilization of aptamer may mask the electrode surface and decrease the response [3]. Therefore, 2.0 μM was used as the optimized concentration of the aptamer.

It could be assumed that TET specific aptamer that is also ssDNA would be degenerated by strong acid or alkali environment. As shown in Fig. S2c, with the increase in pH from 5.0 to 7.5, the peak current increased and reached the maximum value at 6.0, suggesting that pH 6.0 was sufficient for the reaction. Thus, pH 6.0 was

chosen in the following experiments.

The effect of the incubation time on the peak current of the aptasensor was also investigated. As shown in Fig. S2d, the obtained peak current increased sharply with the increasing incubation time and tended to level off after 50 min. This indicated that an equilibration state was reached. Longer incubation time was not able to improve the signal response. Therefore, an incubation time of 50 min was chosen.

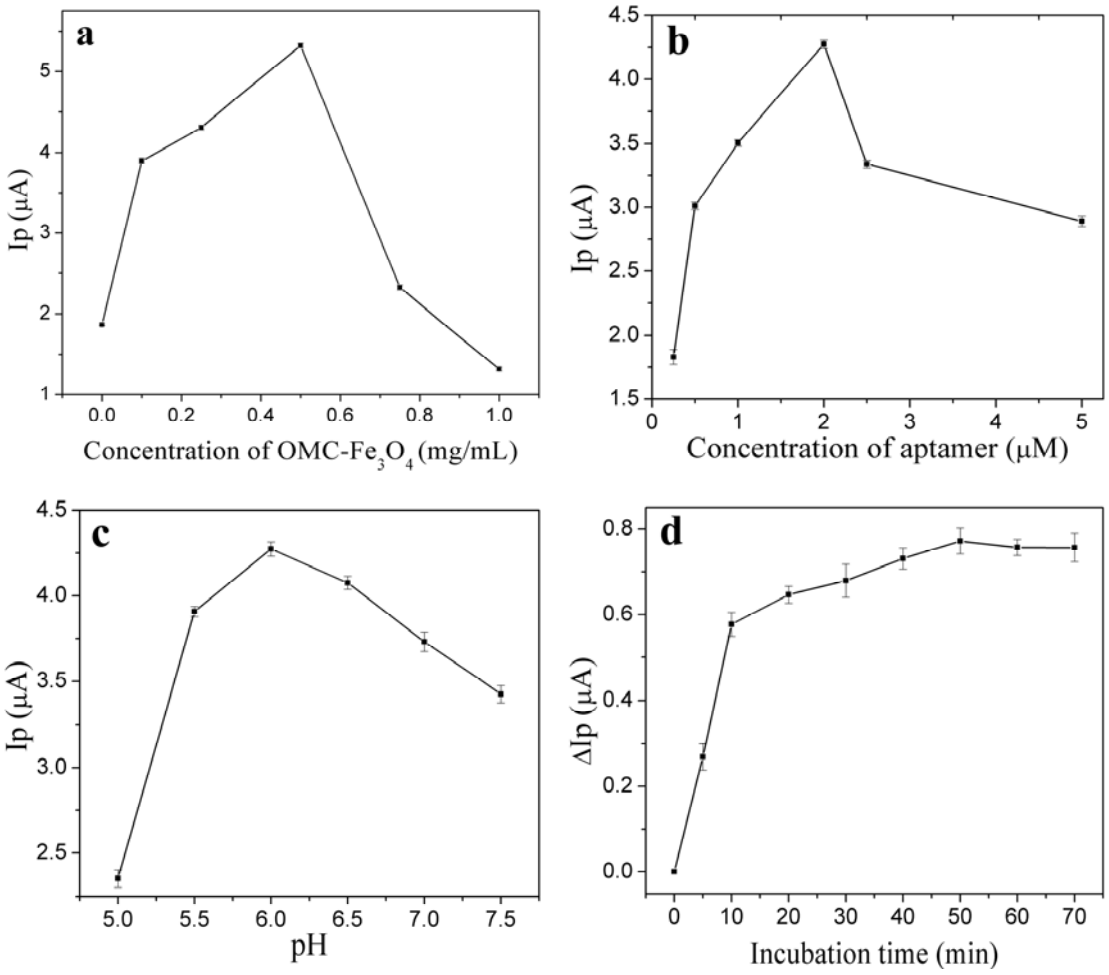


Fig. S2 Effect of (a) loading amount of OMC-$Fe_3O_4$; (b) the concentration of TET aptamer; (c) pH; (d) incubation time on the electrochemical response.

References

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