1 Optimization of experimental conditions

For the detection of IL-8, with the Fe_3O_4@GO@MIP based sensor, chronoamperometry measurements were performed in a solution containing $K_3[Fe(CN)_6]$. According to the above investigation, it is clear that in the presence of IL-8, it will selectivity bind to the MIP-based sensor and cause a decrease of the measured current (the higher concentration of IL-8, the larger decrease of the current). In order to achieve a sensitive MIP sensor, it is necessary to optimize the experimental conditions (to ensure the MIP-based sensor can bind more IL-8 and generate more significant response).

1.1 Optimization of Fe_3O_4@GO@MIP nanoparticles mass

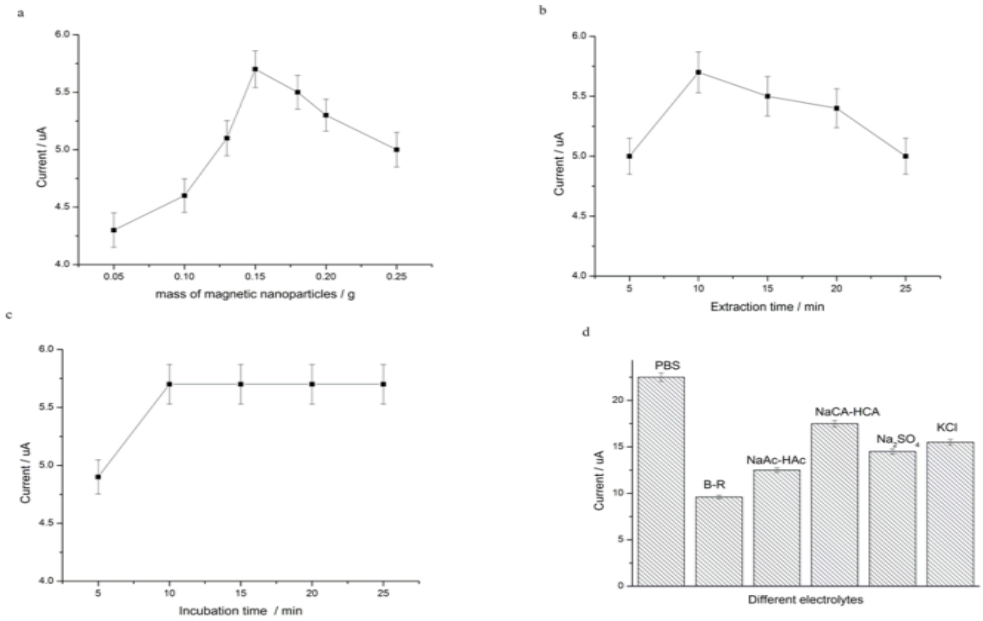

Fig.1/(a) Effect of different Fe_3O_4@GO@MIP nanoparticles mass on the current response; (b) Effect of different extraction time on the current response; (c) Effect of different incubation time on the current response; (d) Peak DPV currents from PBS, B-R, NaAc-HAc, NaCA-HCA, Na_2SO_4 and KCl (concentration 0.1 mol L^{-1}). The IL-8 concentration is 5 pM. Error bars are standard deviations across three repetitive experiments.

The thickness of the Fe_3O_4@GO@MIP nanoparticles is an important parameter that affects the sensitivity and stability of the constructed sensor. In this work, the thickness was controlled by adjusting the mass of magnetic nanoparticles. As shown in Fig. 1 (a), the current response increased with the increasing of the mass of magnetic nanoparticles and reached maximum at 0.15 g. When the nanoparticles mass was more than 0.15 g, the current response decreased, suggesting that the membrane was too thick to remove the template molecules completely. Therefore, 0.15 g nanoparticles were used to produce an imprinted membrane with a suitable thickness.

1.2 Influence of extraction time

To examine the influence of extraction time on the current response and improve the recognition ability of the prepared sensor, the Fe_3O_4@GO@MIP modified electrode was washed by 0.5 mol/L sodium phosphate buffer containing 0.5 mol/L sorbitol for 5 min, 10 min, 15 min, 20 min, and 25 min to remove template molecules, respectively. It was found that the maximum current response was obtained when the extraction time was 10 min (Fig. 1(b)). That is, 10 min's extraction is enough to remove the template molecules, and further extraction in the strong acid may slightly damage the formed MIP film and lead to signal decrease. Therefore, 10 min was chosen as the optimal extraction time.

1.3 Effect of incubation time

It is important to optimize the incubation time to achieve the maximum current response of the sensor. The MIP-based sensor was incubated in IL-8 solution for 5 min, 10 min, 15 min, 20 min, and 25 min at room temperature, respectively. As shown in Fig. 1(c), the current signal increased with the increase of the incubation time and reached equilibrium when the incubation time was 10 min. Thus, to achieve high sensitivity and save assaying time, the incubation of 10 min was chosen.

1.4 Effect of supporting electrolytes

To increase the peak DPV current, the supporting electrolytes were optimized. Fig. 1(d) illustrates the peak DPV current from various supporting electrolytes each with concentration of 0.1 mol L^{-1}, including PBS, Na_2SO_4, KCl, and Britton-Robinson (B-R), NaAc-HAc, and NaCA-HCA buffer solutions. PBS was chosen as the supporting electrolyte for its highest peak current.

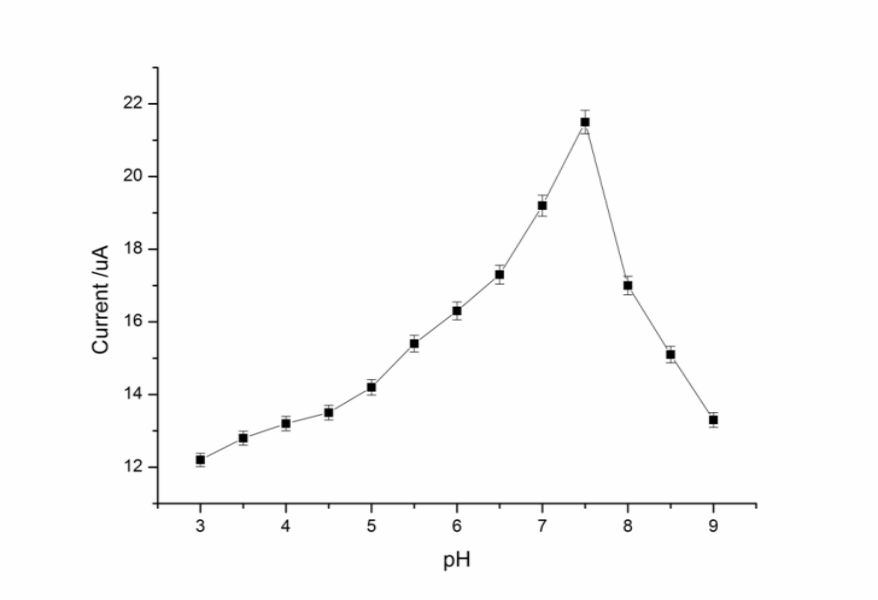

Fig.2/ Peak DPV currents for different pHs. The error bars indicate the standard deviation from three measurements.

Solution acidity remarkably affects the electrochemical behavior of the sensors [25].The DPV of Fe_3O_4@GO@MIP modified electrode was used to analyze the effects of solution acidity. Fig. 7 shows the peak DPV current in 0.1mol L^{-1} PBS. For very high or low pH, the peak DPV current decreased because more H^+ or OH^- were absorbed on the cavity of the Fe_3O_4@GO@MIP; thus, the electron transfer was obstructed. The pH of 7.5 was set as the suitable acidity compared with the peak currents of other pH values.

2 The plot of ELISA and proposed method