

1 **Supporting information**

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3 **Magnetic graphene oxide decorated with chitosan and Au nanoparticles:**  
4 **synthesis, characterization and application for detection of trace**

5 **Rhodamine B**

6 Lili Xu<sup>1</sup>, Hongbo Suo<sup>1</sup>, Jianling Wang<sup>1</sup>, Feixiang Cheng<sup>1</sup>, Houmei Liu<sup>2,\*</sup>, Hongdeng Qiu<sup>3,\*</sup>

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8 <sup>1</sup>College of Chemistry and Environmental Science, Qijing Normal University, Qijing 655011,  
9 China

10 <sup>2</sup>School of Pharmacy, Shandong University, Jinan, Shandong, 250012, China

11 <sup>3</sup>CAS Key Laboratory of Chemistry of Northwestern Plant Resources and Key Laboratory for  
12 Natural Medicine of Gansu Province, Lanzhou Institute of Chemical Physics, Chinese Academy of  
13 Sciences, Lanzhou 730000, China

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## 22 **Preparation of the magnetic adsorbent of Fe<sub>3</sub>O<sub>4</sub>@CS/GO/Au**

### 23 **Preparation of Fe<sub>3</sub>O<sub>4</sub>@CS**

24 The CS functionalized magnetic nanoparticles (Fe<sub>3</sub>O<sub>4</sub>@CS) were synthesized via a reported  
25 method, as described to our previous work [1]. CS (0.3 g) was dissolved in 50 mL acetic acid  
26 solution (1%, v/v). Then Fe<sub>3</sub>O<sub>4</sub> nanoparticles (2.0 g) were added into the solution prepared above  
27 and vigorously stirred for 30 min. Afterwards, 50 mL of 1M NaOH solution was added to the  
28 suspension to precipitate the chitosan coated magnetic nanoparticles. The obtained Fe<sub>3</sub>O<sub>4</sub>@CS  
29 nanoparticles were washed with deionized water until the pH reached 7.0 and stored at 4 °C.

### 30 **Preparation of Fe<sub>3</sub>O<sub>4</sub>@CS/GO**

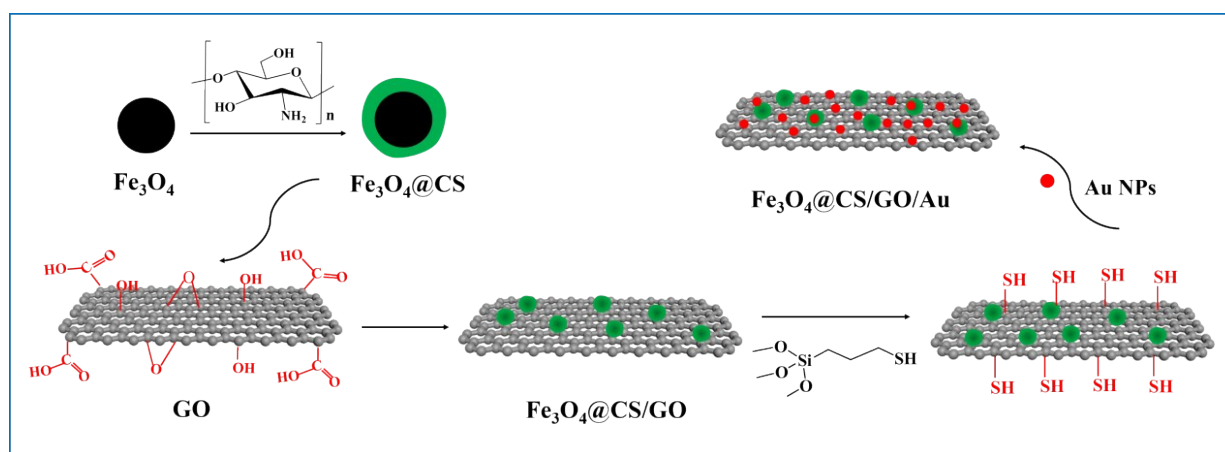
31 Due to the presence of -NH<sub>2</sub> in the CS molecule, the Fe<sub>3</sub>O<sub>4</sub>@CS/GO was prepared according to  
32 our previous work [2,3]. Briefly, GO (0.10 g) was added to 100 mL deionized water under the lengthily  
33 ultrasonic treatment for 2 h. After the GO was well dispersed, the Fe<sub>3</sub>O<sub>4</sub>@CS nanoparticles (2.0 g)  
34 were added and then stirred at 80 °C for 12 h for the bonding of GO. After the reaction,  
35 Fe<sub>3</sub>O<sub>4</sub>@CS/GO was washed with deionized water and methanol in turn then dried under vacuum for 24  
36 h at 60 °C.

### 37 **Preparation of Au NPs gel**

38 The Au NPs gel was prepared through the reduction of HAuCl<sub>4</sub> by trisodium citrate [4]. 100 mL  
39 of HAuCl<sub>4</sub> aqueous solution (0.01%, w/w) was added into a round-bottom flask and then heated at  
40 115 °C under vigorous stirring. While boiling, 2 mL of trisodium citrate aqueous solution (1%, w/w)  
41 was added quickly. The solution turned to wine red in 2 min. Finally, the solution was heated for 15  
42 min continuously. Stirring did not stop until the solution cooled to room temperature. The prepared  
43 Au NPs gel was stored at 4 °C in the refrigerator.

### 44 **Preparation of Fe<sub>3</sub>O<sub>4</sub>@CS/GO/Au**

45 The dried  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}$  was suspended in 80 mL of dry toluene and then an excess of  
46 trimethoxysilylpropanethiol (1 mL) was added. The suspension was stirred and refluxed for 48 h.  
47 After refluxing, the sulfydryl-modified  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}$  was washed with toluene, ethanol, and  
48 deionized water in turn, and then dried under vacuum for 12 h at 60 °C. The dried sulfydryl-  
49 modified  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}$  were added to the Au NPs gel under ultrasonic treatment for 20 min and  
50 subsequently stirred for 3 h. After the above process, due to the interaction between Au NPs and -  
51 SH, the Au NPs were modified on the surface of sulfydryl-modified  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}$ . The prepared  
52  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}/\text{Au}$  was dried under vacuum at 60 °C overnight and the preparation process was  
53 shown in Fig. S1.



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55 **Fig. S1.** The preparation process of  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}/\text{Au}$ .

## 57 **Samples collection and preparation**

### 58 **Preparation of the RB stock solution**

59 Firstly, stock solution of the RB at a concentration of  $1.0 \text{ mg mL}^{-1}$  were prepared in ultrapure  
60 water and stored at 4 °C. Afterwards, during the optimization of extraction and desorption  
61 parameters section, working solutions at different concentrations were all obtained by diluting the  
62 stock solutions with ultrapure water. The pH of working solution was adjusted by HCl / NaOH.

### 63 **Real samples preparation**

64 The soft drink and eye shadow samples were obtained from the local markets (Qujing, China).

65 The waste water sample was obtained from local industry. Spiked samples at two concentration  
66 levels (0.2 and 2.0  $\mu\text{g L}^{-1}$ ) were all prepared by adding the stock solution to the four blank samples.

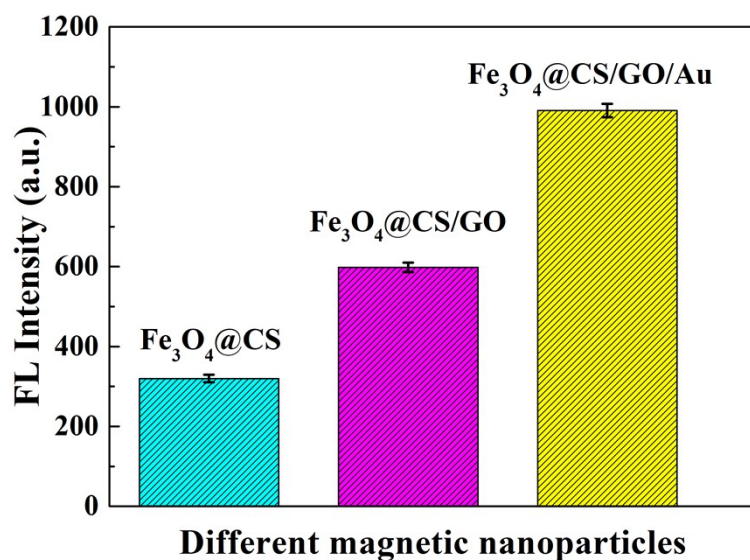
67 All the prepared samples were stored at 4 °C in the dark. All the prepared samples were adjusted to  
68 6.0 using HCl / NaOH and were homogenized before being extracted and analyzed. The blank  
69 samples were prepared as follows.

70 **Tap water, soft drink and waste water:** The tap water, soft drink and waste water samples were  
71 filtered through 0.45  $\mu\text{m}$  cellulose membrane filter (Millipore) respectively. And then the prepared  
72 samples were stored at 4 °C in the dark.

73 **Eye shadow:** Eye shadow sample (5 mg) was dissolved in ethanol, filtered and diluted with  
74 distilled water to 50 mL in a volumetric flask. Then 5 mL of the solution was further diluted to 50  
75 mL with distilled water. The prepared sample was stored at 4 °C in the dark and used for MSPE and  
76 subsequent determination of RB.

### 77 **Adsorbents comparison**

78 Compared among  $\text{Fe}_3\text{O}_4@\text{CS}$ ,  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}$  and  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}/\text{Au}$ , the results indicated that  
79 the extraction efficiency of  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}/\text{Au}$  was the best as shown in Fig. S2.



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81 **Fig. S2.** Comparison of the extraction efficiency among  $\text{Fe}_3\text{O}_4@\text{CS}$ ,  $\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}$ , and

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$\text{Fe}_3\text{O}_4@\text{CS}/\text{GO}/\text{Au}$ .

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