

## Supporting Information

### **Magnetic graphene oxides as highly effective adsorbents for rapid removal of a cationic dye rhodamine B from aqueous solutions**

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## Experimental

### *Synthesis of Fe<sub>3</sub>O<sub>4</sub> magnetic nanoparticles-graphene oxide (MNPs-GO):*

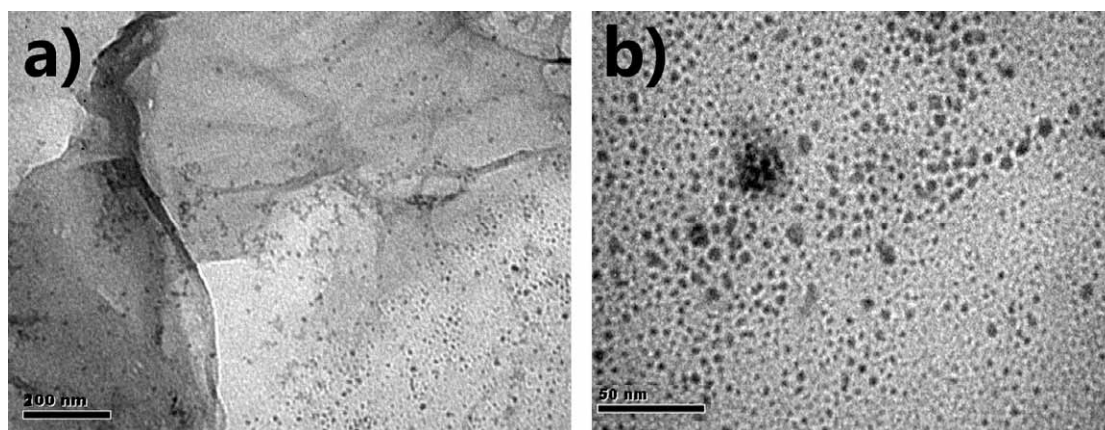
Graphite oxide was prepared from nature graphite powder using a Hummers method with a slight modification.<sup>1</sup> Firstly, H<sub>2</sub>SO<sub>4</sub> (95%) (46 mL) was added into a 500 mL flask, and then cooled by immersion in an ice-water bath. Subsequently, graphite powder (1.0 g) and NaNO<sub>3</sub> (0.5 g) were added under vigorous agitation to avoid agglomeration. KMnO<sub>4</sub> (6.0 g) was added into the suspension very slowly under stirring and the temperature of the mixture was kept lower than 10 °C. The ice-water bath was then removed, and the mixture was stirred at room temperature for 2 h. H<sub>2</sub>O (92 mL) was slowly added into the mixture with vigorous stirring. The temperature of the mixture increased to near 100 °C due to the addition of water and the color of the mixture changed from black to brown. Then, the mixture was diluted by adding 280 mL of H<sub>2</sub>O. Further, 5 mL of H<sub>2</sub>O<sub>2</sub> (30 wt. %) was added to the mixture. Finally, the mixture was filtered, washing with 10 % HCl and then de-ionized water. After filtration and drying at room temperature under vacuum, graphite oxide (GO) was obtained as a grey powder.

To synthesize the MNPs-GO hybrid, 0.5 g of prepared GO was added into a 250 mL flask, 30 mL of H<sub>2</sub>O was added under vigorous agitation. FeCl<sub>3</sub>·6H<sub>2</sub>O (0.8 g) and FeCl<sub>2</sub>·4H<sub>2</sub>O (0.3 g) pre-dissolved in 10 ml de-ionized water were added into the flask in a moment. After this, 15 mL of NH<sub>4</sub>OH aqueous solution (29 %) was added rapidly. The hybrid MNPs-GO was obtained after the mixture was kept stirring at room

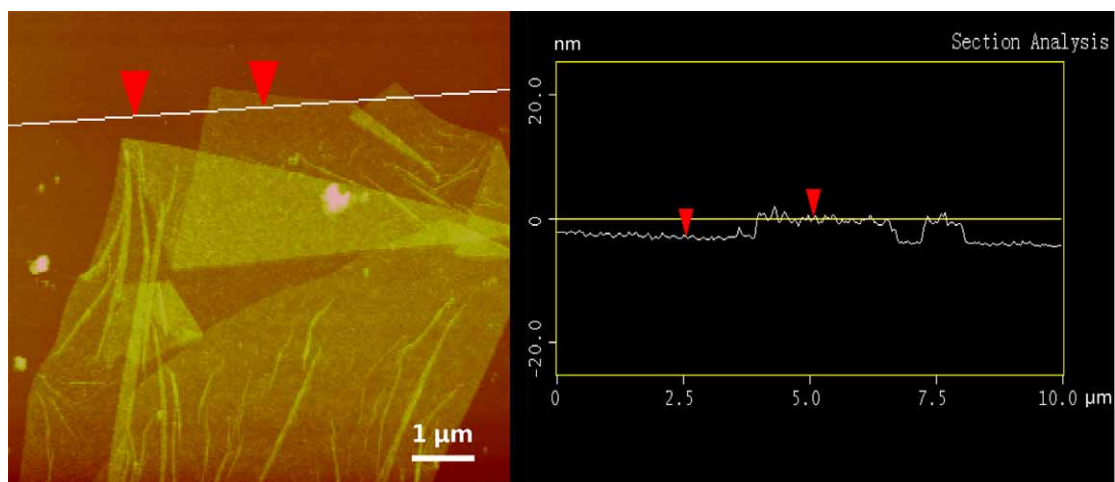
temperature for 2h. The product was separated from the solvent by using a magnetic force and washed with de-ionized water for several times, and then dried at room temperature under vacuum. Fe<sub>3</sub>O<sub>4</sub> nanoparticles (MNPs) was prepared by the same procedure without the addition of GO.

**Characterization:**

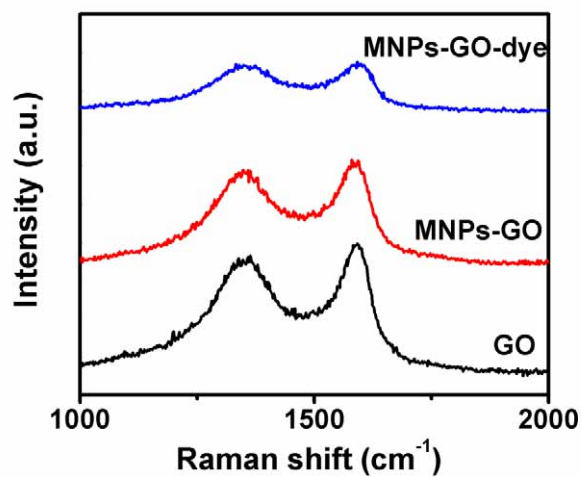
Transmission electron microscope (TEM) images of GO and MNPs-GO were obtained on an H-7500 Hitachi transmission electron microscope. The Fourier transform infrared (FTIR) spectra of the two samples were observed by Thermo Nicolet 360-FTIR spectrometer. The crystal structures of GO and MNPs-GO were measured by MSAL-XD2 X-ray diffractometer. The magnetic properties were investigated at room temperature using a vibrating sample magnetometer (VSM, LDJ 9600, LDJ Electronics Company of USA). The AFM image was obtained with a NTEGRA. The UV adsorption spectra were performed on a UV-2500. The Raman spectra were recorded on a Lab RAM HR800. The X-ray photoelectron spectroscopy (XPS) analysis was measured on a Thermo Scientific ESCALAB 250Xi using Al K Alpha radiation.



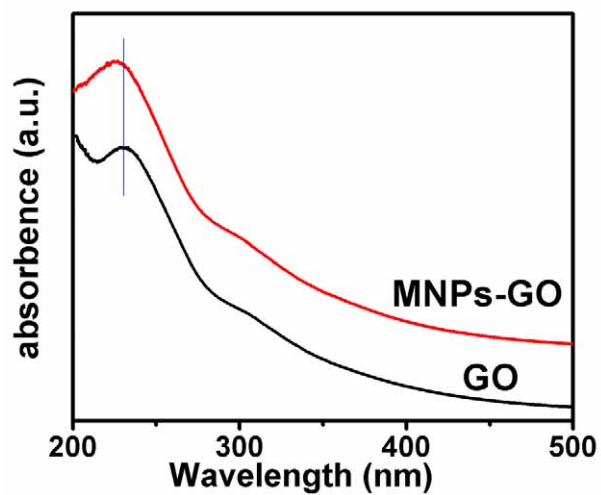
**Fig. S1** TEM images of MNPs-GO: The resolution (a)  $\times 200\text{nm}$ , (b)  $\times 50\text{nm}$ .



**Fig. S2** AFM image of GO (left) with a cross-sectional analyses (right) indicating the thickness and width at about 3.3nm and 10μm, respectively.



**Fig. S3** Raman spectra of GO, MNPs-GO and MNPs-GO-dye.



**Fig. S4** UV adsorption spectra of GO and MNPs-GO.

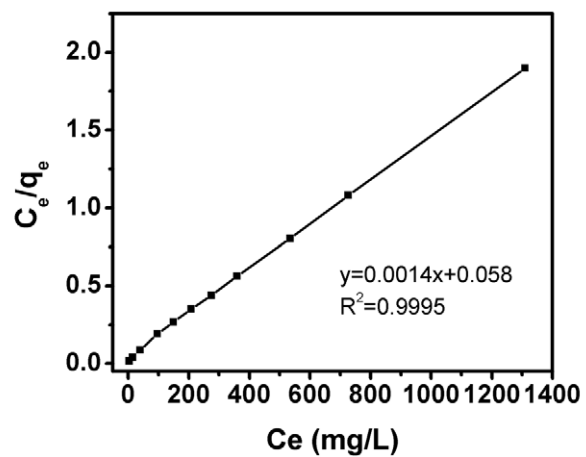


Fig. S5 Langmuir adsorption model

#### Reference

- 1 W.S. Hummer, and R.E Offeman, *J. Am. Chem. Soc.*, **1958**, 80, 1339.