

## Experimental Section

### Materials

Ferrocene ( $\text{Fe}(\text{C}_5\text{H}_5)_2$ ,  $\geq 98\%$ ), hydrogen peroxide ( $\text{H}_2\text{O}_2$ , 30%), and acetone ( $\text{C}_3\text{H}_6\text{O}$ ) ( $\geq 99\%$ ) were of analytic grade (AR) from the Shanghai Chemical Factory, China. All chemicals were used as received without further purification.

### Synthesis of superparamagnetic colloidal nanochainss

In a typical synthesis, ferrocene (0.70 g) were dissolved in an acetone (30 mL) solvent. After intense sonication for 30 min, 0.50 mL of hydrogen peroxide was slowly added into the above mixture solution, which then was vigorously stirred for 30 min with a magnetic stirring apparatus. After that, the precursor solution was transferred to the Teflon-lined stainless autoclave with the total volume of 40.0 mL with a 0.40 T external magnetic field applied (realized through placing two magnets in the autoclave), as shown in Figure S1. And then the autoclave was heated to and maintained at 200 °C. After 72 h, the autoclave was cooled naturally to room temperature. The precipitates were then washed with acetone three times to remove excess ferrocene. The resulting black products were dried at room temperature in a vacuum oven.

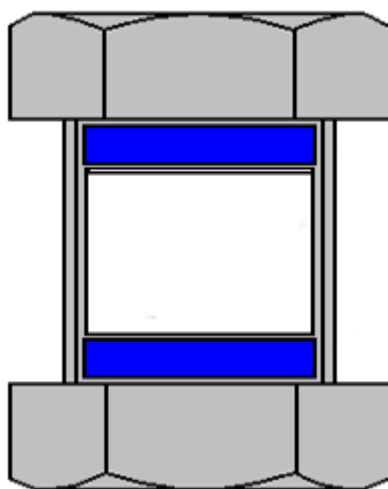


Figure S1. The schemes of magnetic autoclave. Blue parts represent the magnet.

### **Removal of Pb<sup>2+</sup> through using colloidal nanochains as adsorbent**

Typically, the nanochains suspension (1 g/L, 4 mL) dissolved in distilled water and aqueous solution (1 mL) of Pb<sup>2+</sup> were transferred to the centrifugal tube (10 mL). After uniform oscillated with uptake time of 120 min using a shaker ensure sufficient interaction between magnetic nanoparticles and Pb<sup>2+</sup>, the above mixture solution was magnetized for 5 min by a 0.20 T magnet, and the supernatant was transferred under an external magnetic field. The concentration of Pb<sup>2+</sup> solution performed is 0.1 mg/L, 1 mg/L, 10 mg/L, and 100 mg/L, respectively. Meanwhile, the pH performed is selected for 6. The inductive coupled plasma-atomic emission spectroscopy was used to examine the removal efficiency of Pb<sup>2+</sup>.

### **Investigation of the Relationship between pH Value and Removal Efficiency.**

All performances in this section are similar to the above one under uptake time of 120 min. The concentration of Pb<sup>2+</sup> solution is selected for 1 mg/L. The pH of Pb<sup>2+</sup> solution was adjusted with 1 M HNO<sub>3</sub> and controlled from 1 to 6.

### **Sample Characterization**

The Raman spectrum was taken on a LABRAM-HR Confocal Laser Micro-Raman spectrometer using an Ar<sup>+</sup> laser with 514.5 nm at room temperature. The powder X-ray diffraction (XRD) patterns were collected on a Japan Rigaku D/MAX-γA X-ray diffractometer equipped with Cu Kα radiation ( $\lambda = 1.54178 \text{ \AA}$ ) over the  $2\theta$  range of 10–70 °C. The FT-IR spectrum was obtained using a Magna-IR 750 spectrometer in the range of 400–4000 cm<sup>-1</sup> with a resolution of 4 cm<sup>-1</sup>. Surface charge was measured using Particles Analyzer (Delsa Nano C) from Beckman Coulter. Transmission electron microscopy (TEM) images were obtained on Hitachi H-800 transmission electron microscope, which used an accelerating voltage of 200kV. High-resolution transmission electron microscopy (HRTEM) images were taken on a JEOL-2010 transmission electron microscope, which was operated at 200 KV. Magnetic studies were carried out with a

vibrating sample magnetometer on a physical properties measurement system (PPMS) at room temperature.

The concentration of heavy metal ions was measured using inductive coupled plasma-atomic emission spectroscopy (Atomscan Advantage). The surface area and pore volume was collected by accelerated surface area and porosimetry (ASAP 2020 M+C).

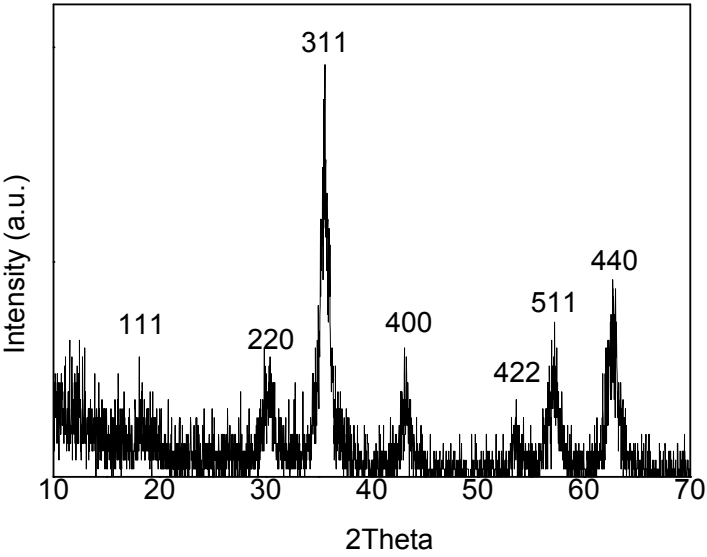


Figure S2. XRD spectrum of the as-obtained products.

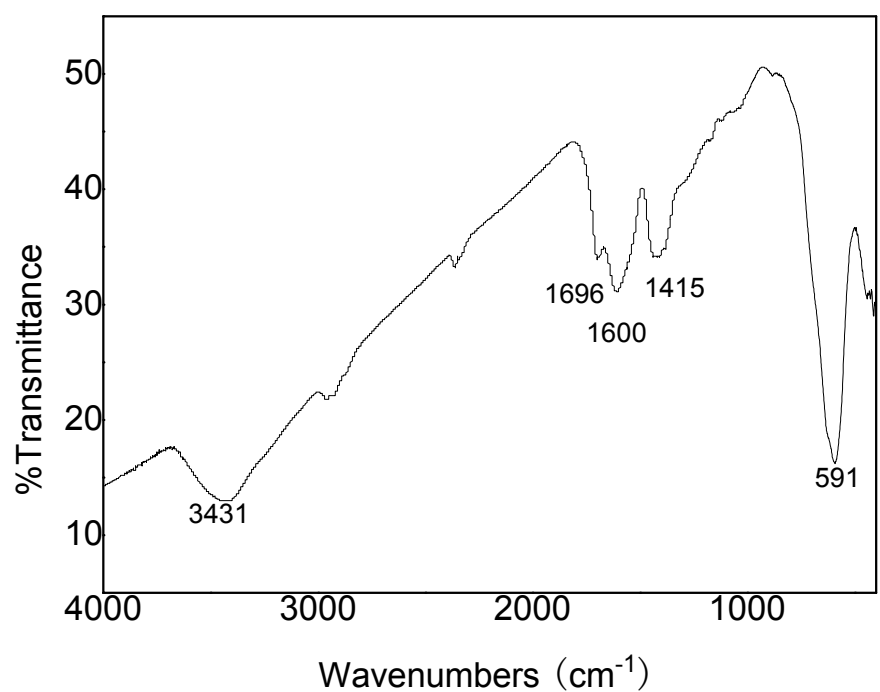


Figure S3. FT-IR spectrum of the as-obtained products.

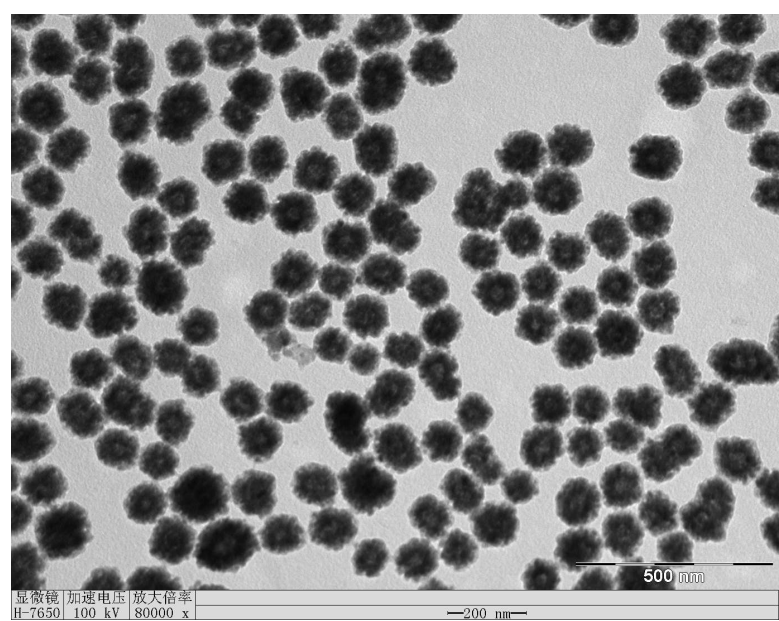
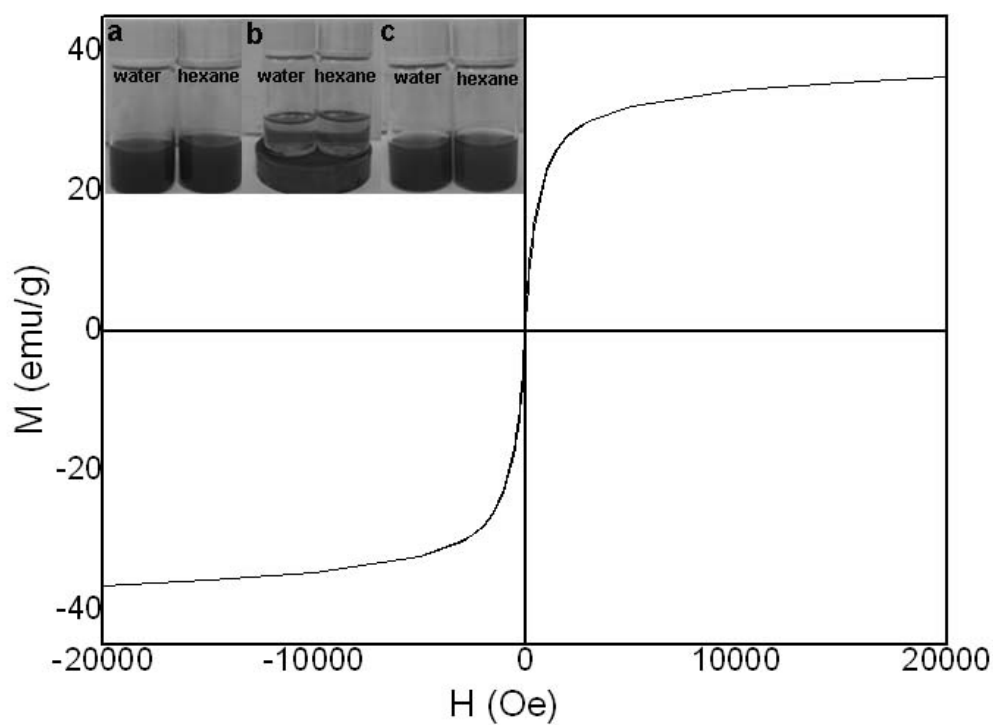


Figure S4. The morphology of the as-obtained products without the presence of the external magnetic field.



**Figure S5.** The hysteresis loops measured at room temperature for the pure colloidal nanoparticles. Insert: optical photographs of the solution (water and hexane) of the nanochains in a vial a) without magnetic field, b) with magnetic field for 1 min, and c) after the magnetic field is removed.