Supplementary Information

Magnetically separable Prussian blue analogue $Mn_3[Co(CN)_6]_2 \cdot nH_2O$ porous nanocubes as excellent absorbents for heavy metals ions

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Experimental Section

Figure.S1 The XRD patterns of S1 (black line) and S2 (red line)

Figure.S2 (a) Optical photograph of the mixture containing the absorbent and heavy metal ions. (b) Magnetic separation of the absorbent. The white precipitates were mainly located in the edge of glass bottle (the white box in the b)

Figure. S3 *M-H* plots of S1(a) and S2(b) at room temperature

Figure.S4 The SEM image of S1 after heavy metal ion removal

Figure.S5 The XPS spectrum of the Pb4f of Pb^{2+} ions adsorption on the S1

Figure.S6 EDS of single separated nanocube

Figure.S7 The SEM image of the $Co_3[Co(CN)_6]_2 \cdot nH_2O$ nanoparticles

Figure.S8 The pore size of $Mn_3[Co(CN)_6]_2 \cdot nH_2O$ porous framework

Experimental Section

Materials: Manganese acetate ($Mn(CH_3COO)_2 \cdot nH_2O$), potassium cobalticyanide ($K_3[Co(CN)_6]_2$), poly(vinylpyrrolidone) (PVP), lead nitrate and nitric acid cadmium were of analytic grade and used without further purification.

Synthesis of $Mn_3[Co(CN)_6]_2 \cdot nH_2O$ Porous Nanocubes:

The typical synthetic experiments were as follows, Solution A: 0.075 mmol of $Mn(CH_3COO)_2 \cdot nH_2O$ and 0.3 g PVP (K-30) were dissolved in 15 ml C_2H_5OH/ 5 ml H_2O system under agitated stirring to get a transparent solution. Solution B: 0.04 mmol $K_3[Co(CN)_6]_2$ was dissolved in 10 ml of distilled water. Solution B was added into solution A slowly and regularly using a syringe. The whole reaction process was kept at room temperature with agitated stirring. After 10 min, the reaction was aged at room temperature without any interruption for 24 hrs. The resulting white precipitation was filtered and washed several times with absolute ethanol and finally dried under oven at 60 ℃. And it is worth mentioning that controlling the ratio of C_2H_5OH/H_2O and amount of PVP in the reaction system can result in different sizes of products. $Mn(CH_3COO)_2 \cdot nH_2O$ (0.075 mmol) and 0.2 g PVP (K-30) were dissolved in 12 ml C_2H_5OH/ 8 ml H_2O, and then was added into 10 ml 0.04 mmol $K_3[Co(CN)_6]_2$ distilled water solution. The whole reaction process was kept at room temperature with agitated stirring. The nanocubes with the size of 1μm can obtain after the reaction was aged at room temperature without any interruption for 24 hrs.

Sample Characterization:

The powder X-ray diffraction (XRD) patterns were collected on a Japan Rigaku D/MAX-cAX-ray diffractometer equipped with Cu Ka radiation over the 2θ range of 10-70°. Field emission scanning electron microscopy (FE-SEM) images were performed on a JEOL JSM-6700M scanning electron microscope. Specific surface areas were computed from the results of N_2 physisorption at 77 K (Micromeritics

ASAP 2020) by using the BET (Brunauer–Emmet–Teller) and BJH (Barrett–Joyner–Halenda). The concentration of heavy metal ions was measured using indictive coupled plasma-atomic emission spectroscopy (Atomscan Advantage). X-ray photoemission spectroscopy (XPS) study was carried out with a spectrophotometer.

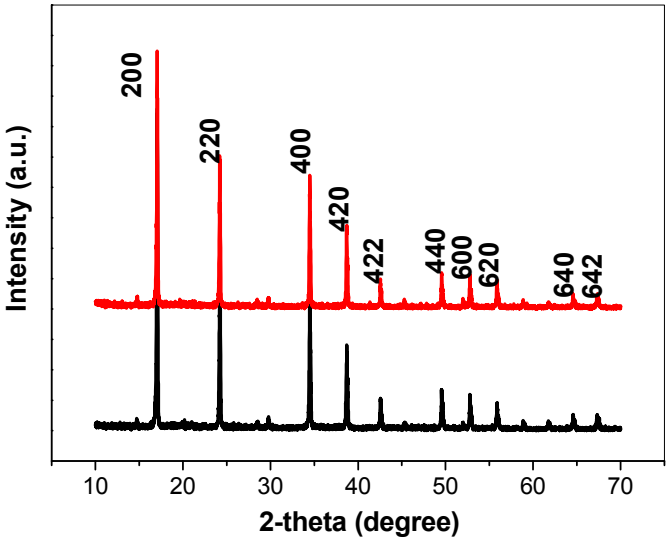

Figure. S1

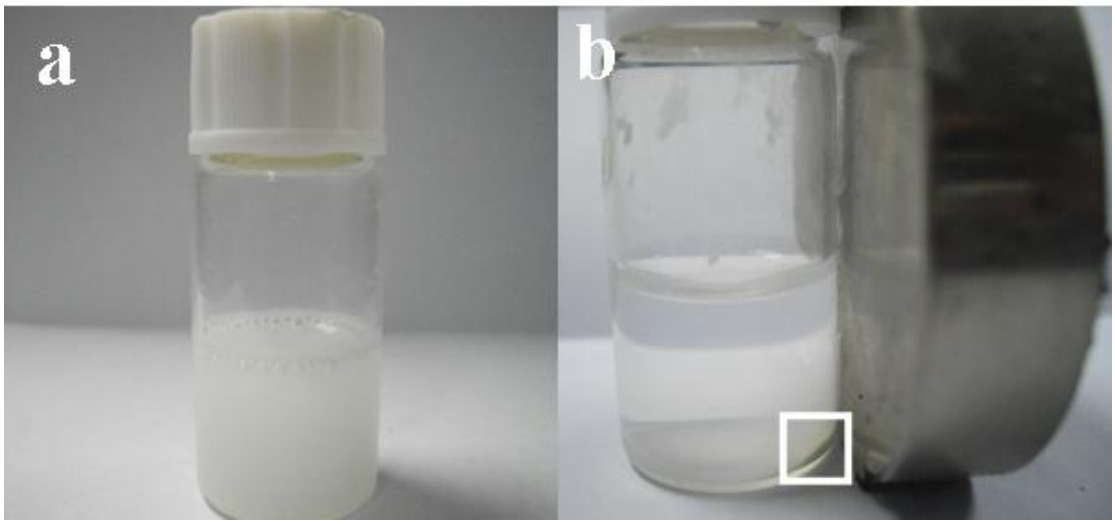

Figure. S2

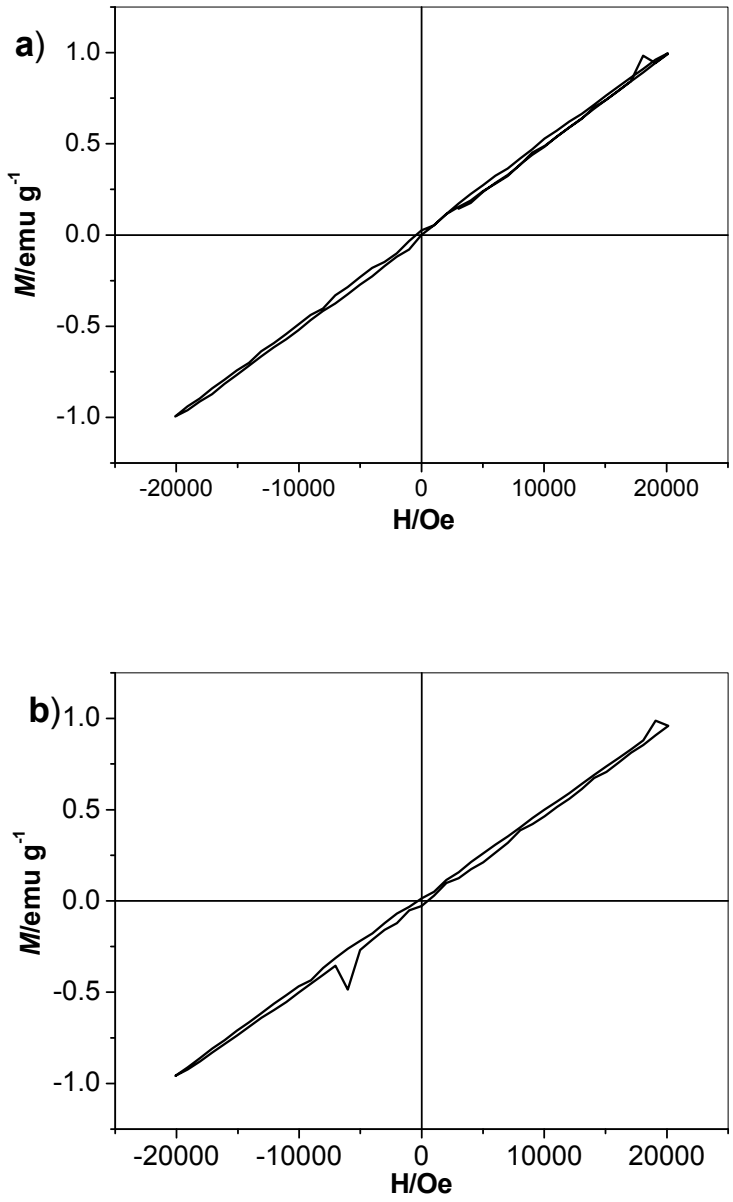

Figure. S3

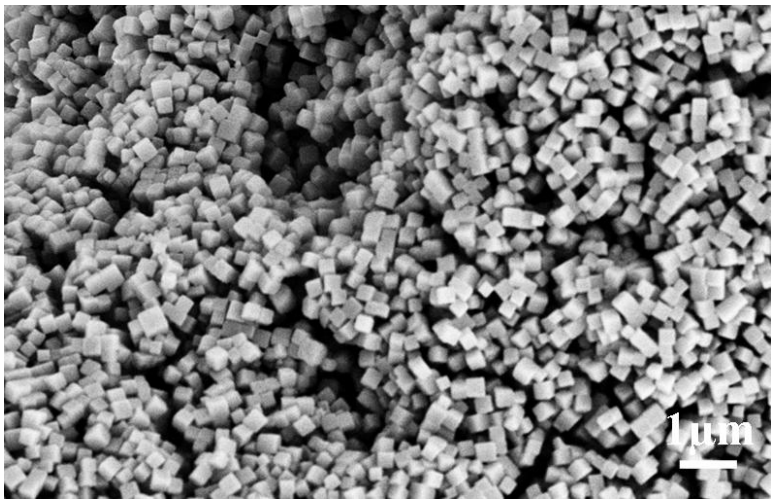

Figure. S4

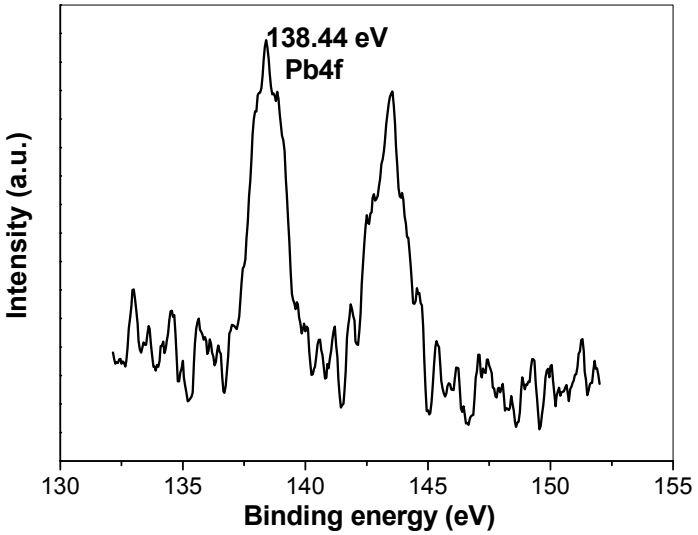

Figure.S5

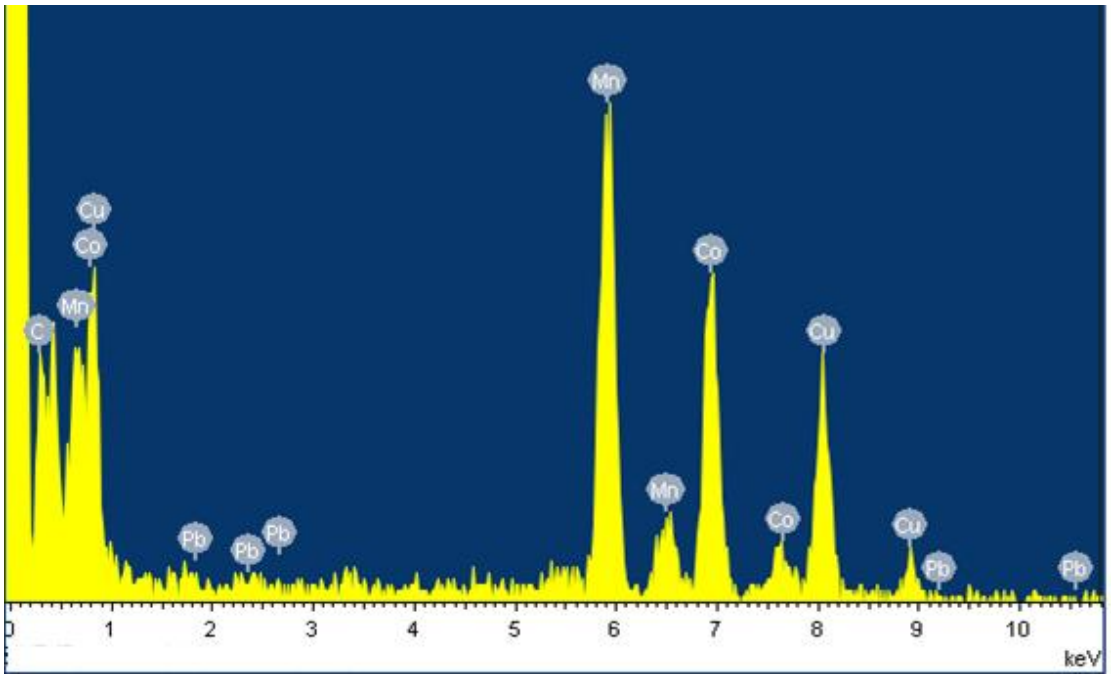

Figure S6

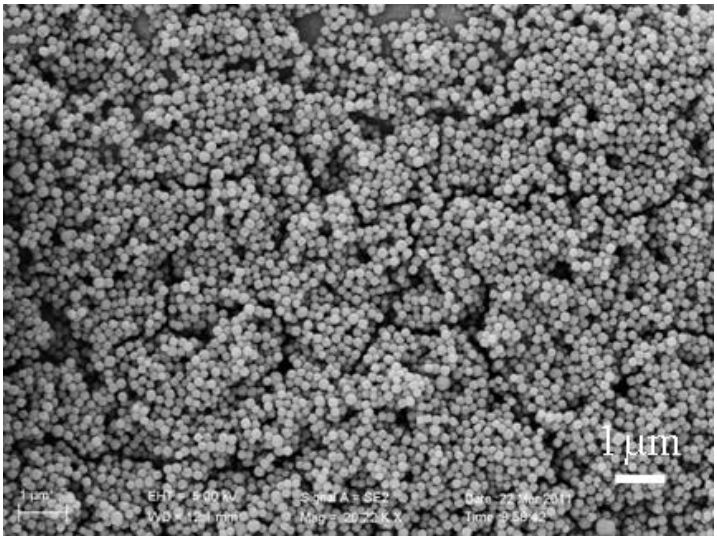

Figure. S7

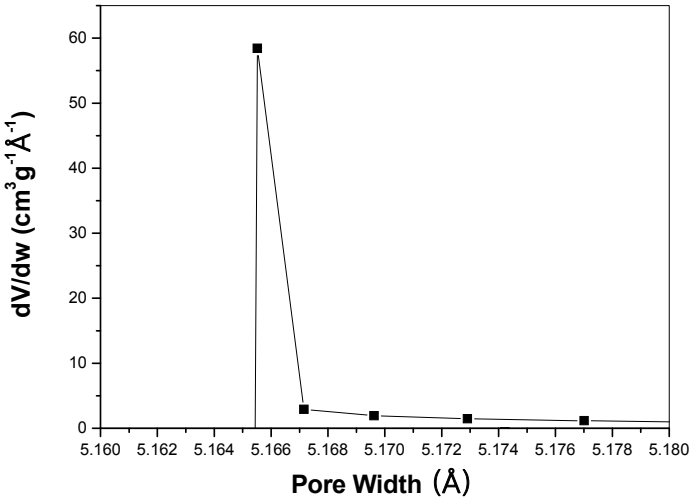

Figure. S8