Electronic Supplementary Material (ESI) for RSC Advances.

Synthesis of $CoFe_2O_4$@SiO_2-NH_2 and its application in adsorption of trace lead

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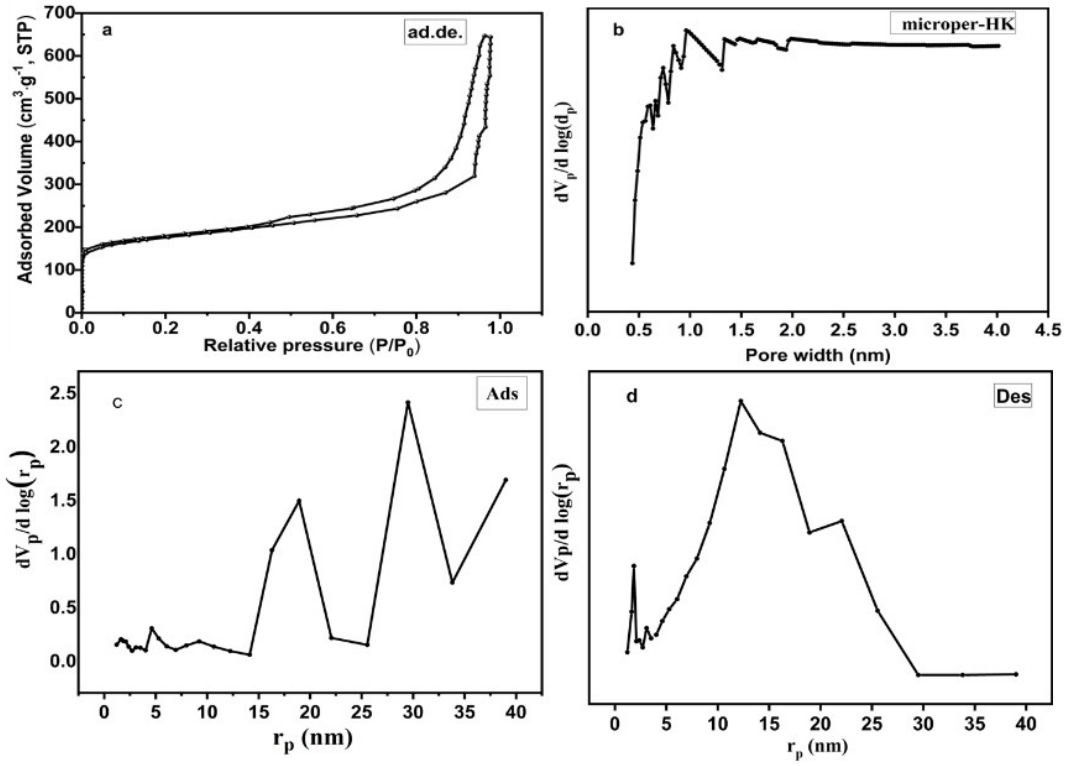
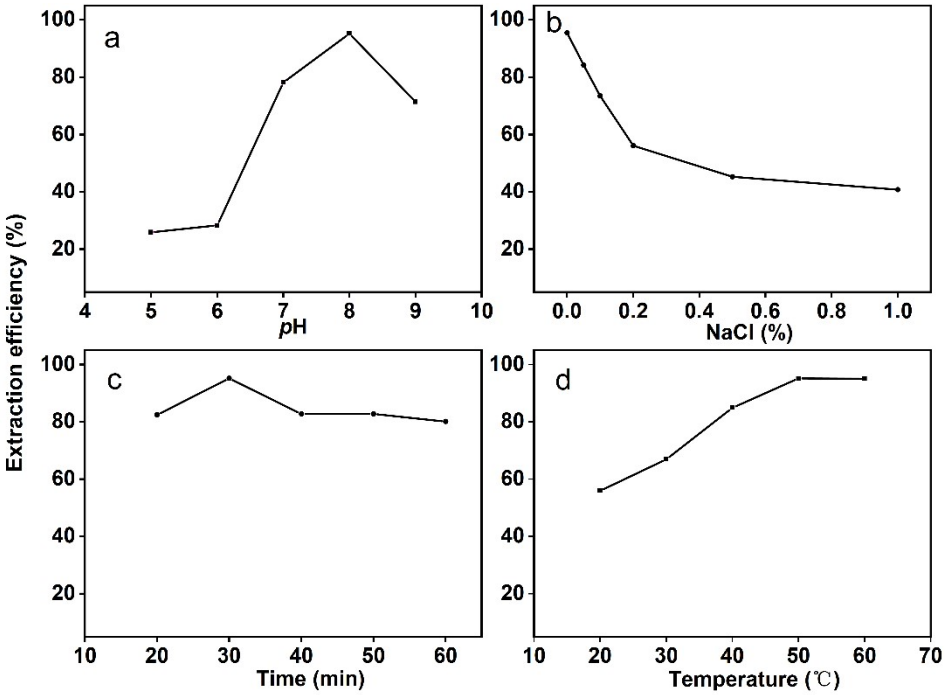


15 Fig. S1 Surface area analysis of $CoFe_2O_4@SiO_2$-NH_2



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17 Fig. S2 Effect of extraction condition on extraction efficiency. Conditions: C_0 = 4.0 μg·mL^{-1};

18 V_0=200 mL; $m_{extractant}$ =10mg

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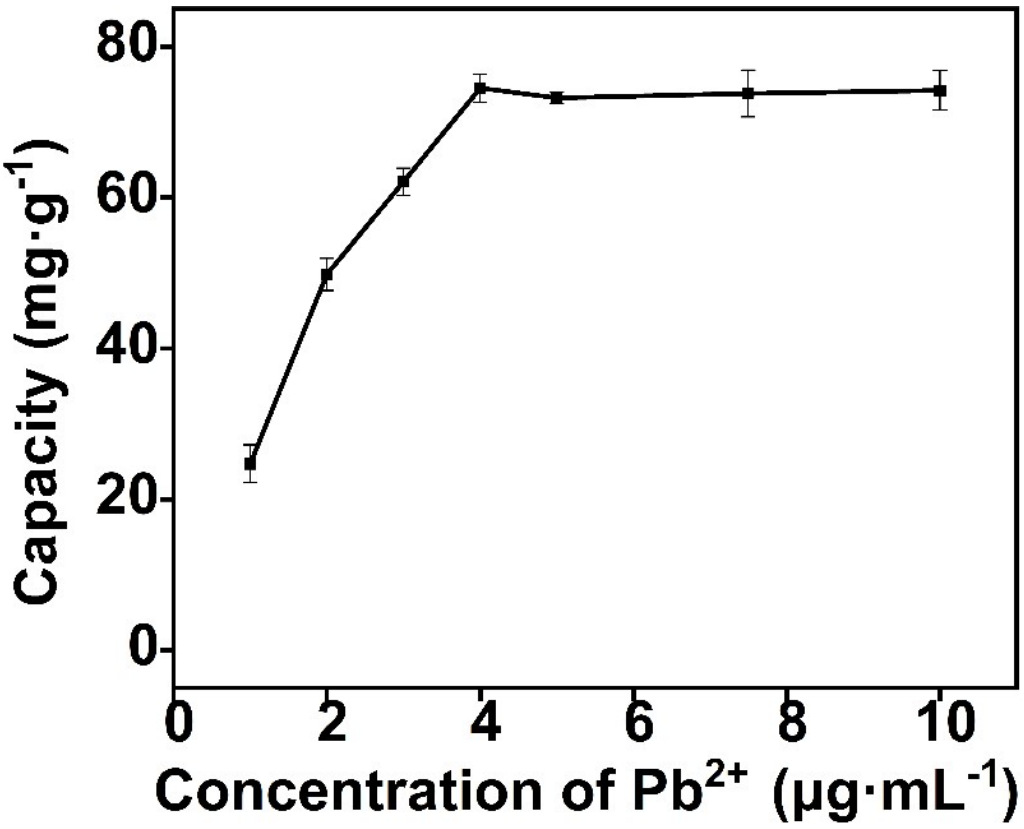

Fig. S3 Extraction capacity of $CoFe_2O_4$@SiO_2-NH_2 of Pb^{2+}

（Conditions: m(MSA)=10 mg; V_0=200.00mL; pH = 8.0; t = 30 min; T = 50℃）

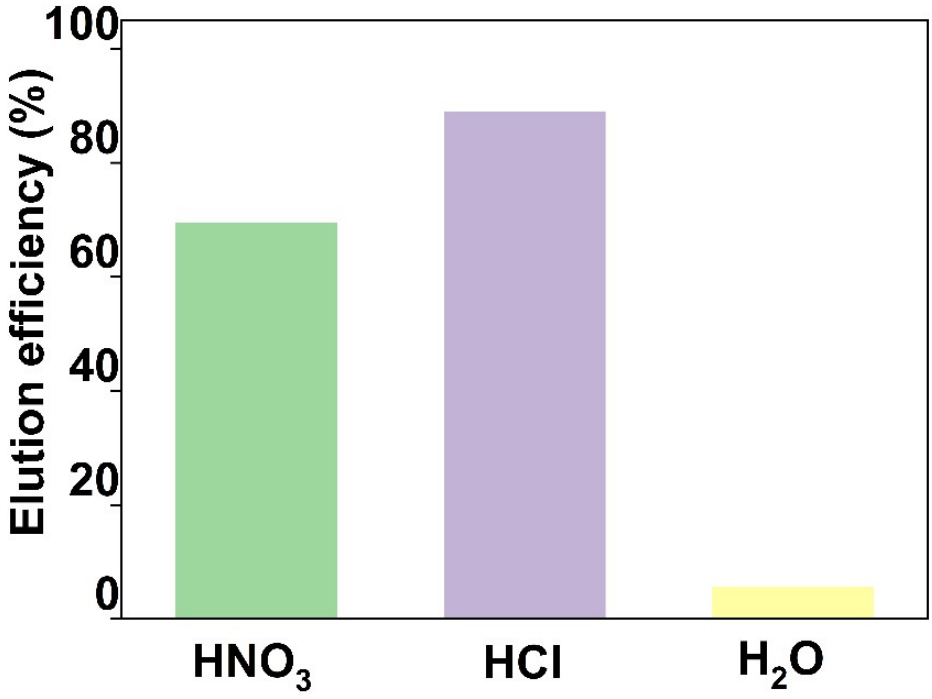

Fig. S4 Effect of eluent on extraction efficiency

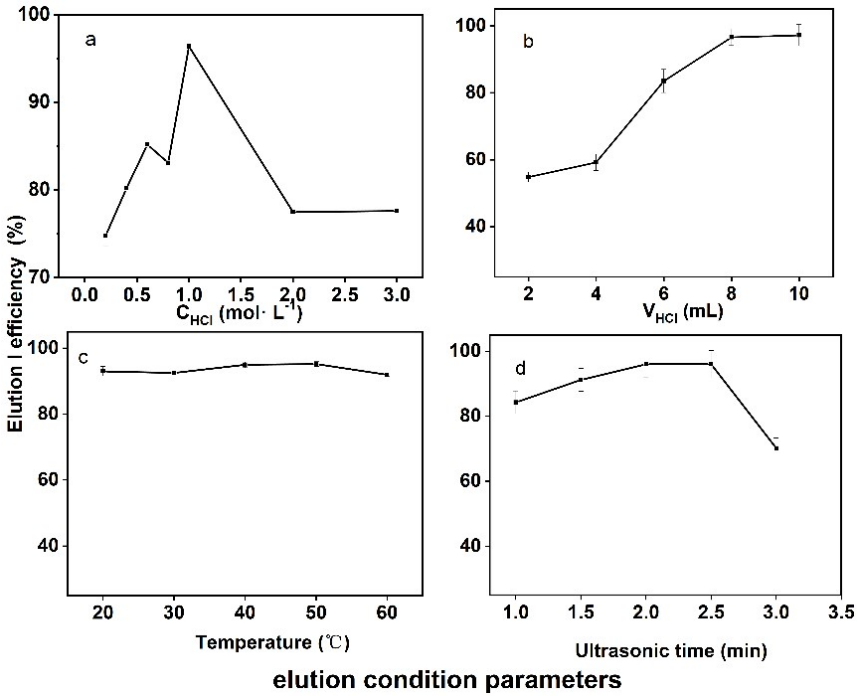

Fig. S5 Effect of elution condition parameters on elution efficiency (C_{HCl}(a), V_{HCl}(b),Temperature(c),Ultrasonic Time(d))

Table S1 Recovery test of determination of lead (II) content in water sample (n = 3)

Samples	Added (μg·L^{-1})	Found (μg·L^{-1})	Recovery (%)
Standard water sample[1]（GBW08608）	0	47.8	98.6
	2.00	49.2	97.4
	10.0	56.8	97.1
	50.0	93.2	94.6
Actual water sample (on campus)	0	0.68	/
	1.00	1.78	106
	2.00	2.78	104
	4.00	4.57	97.6

[1]Standard value 48.5 μg·L^{-1}

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40 Table S2 Determination of 丁 lead content in water samples in Lianyungang City (μg·L^{-1}, n=20)

Test results	Standard water samples	Locations							
		A	B	C	D	E	F	G	H
Content/μg·L^{-1}	48.5	1.0	0.82	0.90	1.1	1.5	1.2	1.3	0.68
RSD/%	3.2	1.5	1.8	1.7	0.50	3.2	2.8	1.6	2.8
Lead allowable standard					10				

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42 Table S3 Comparison with other methods for the determination of lead ion

Method	Extractant	LOD (μg·L^{-1})	Linear range (μg·L^{-1})	Ref.	
MSPE-ICP-MS	Fe_3O_4-GO@SiO_2	0.0076	0.05-60	[39]	
Electrochemical method	Fe_3O_4@PDA- DMSA	0.20	0.5-50	[40]	
MSPE-FAAS	Fe_3O_4@Ag-APT	10	33-1000	[41]	
MSPE-FAAS	$CoFe_2O_4$ @SiO_2@ PABA-functionalized GO	0.0054	0.013-0.235	[42]	
Ionic imprinting（IIMB）-FAAS	Serratia marcescens -CMC-Fe_3O_4	0.95	5~500	[43]	
MSPE-AAS	Fe_3O_4-PVP- SiO_2-P_4VP	0.9	3～1000	[44]	
MSPE-ICP-OES	$CoFe_2O_4$@SiO_2-NH_2	0.027	1.0～	This	

1.00×10 work

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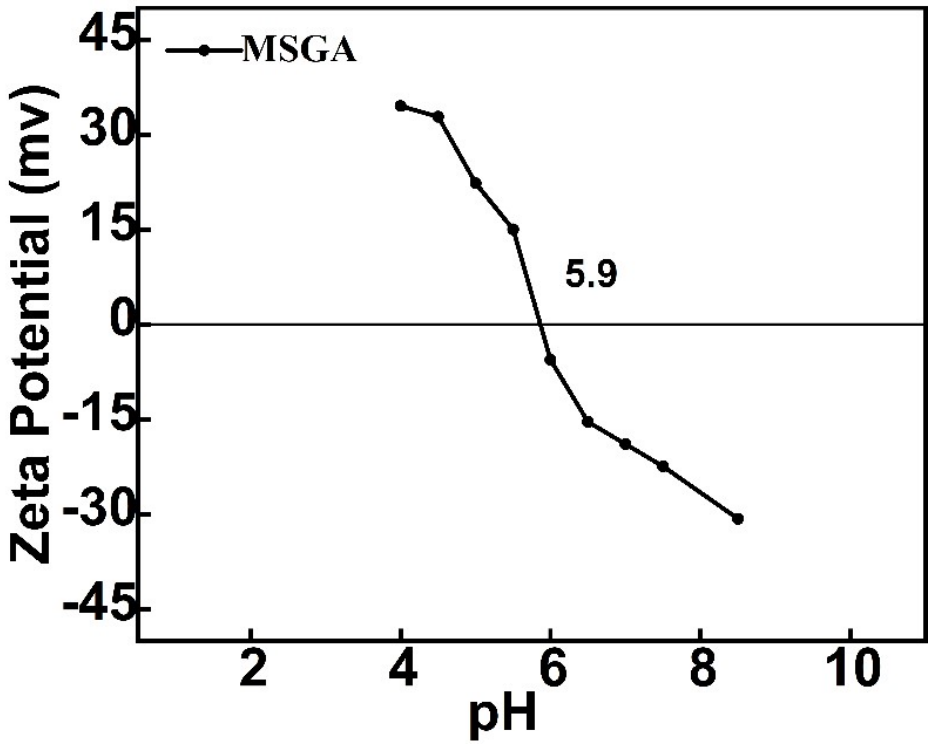

Fig. S6 Zeta potential of $CoFe_2O_4@SiO_2$-NH_2

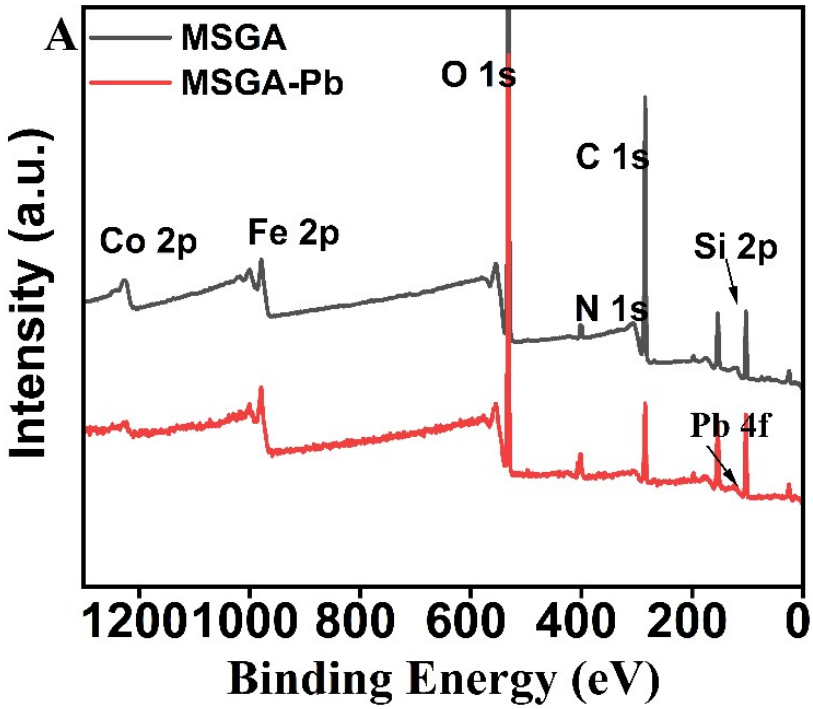

Fig. S7 XPS full l spectra of $CoFe_2O_4$@SiO_2-NH_2 of the samples before and after extraction

Table S4 Kinetic model fitting parameters

Pseudo-First Order				Pseudo-Second Order		
$Q_{e,\,exp}$	$Q_{e,\,cal}$	k_1	R^2	$q_{e,\,cal}$/(mg·g^{-1})	k_2/(g·mg^{-1}·min^{-1})	R^2
74.5	0.47	0.0083	0.5572	75.8	0.0858	0.9999

Table S5. Langmuir and Freundlich isotherms parameters

Langmuir			Freundlich		
Q_m (mg·g^{-1})	K_L(L·mg^{-1})	R^2	n	K_F	R^2
82.3	0.228	0.9867	2.19	32.1	0.7847