

Supporting Information

Title: One-pot synthesis of multifunctional magnetic ferrite-MoS₂-carbon dots nanohybrid adsorbent for efficient Pb(II) removal

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S1. BET surface area measurement

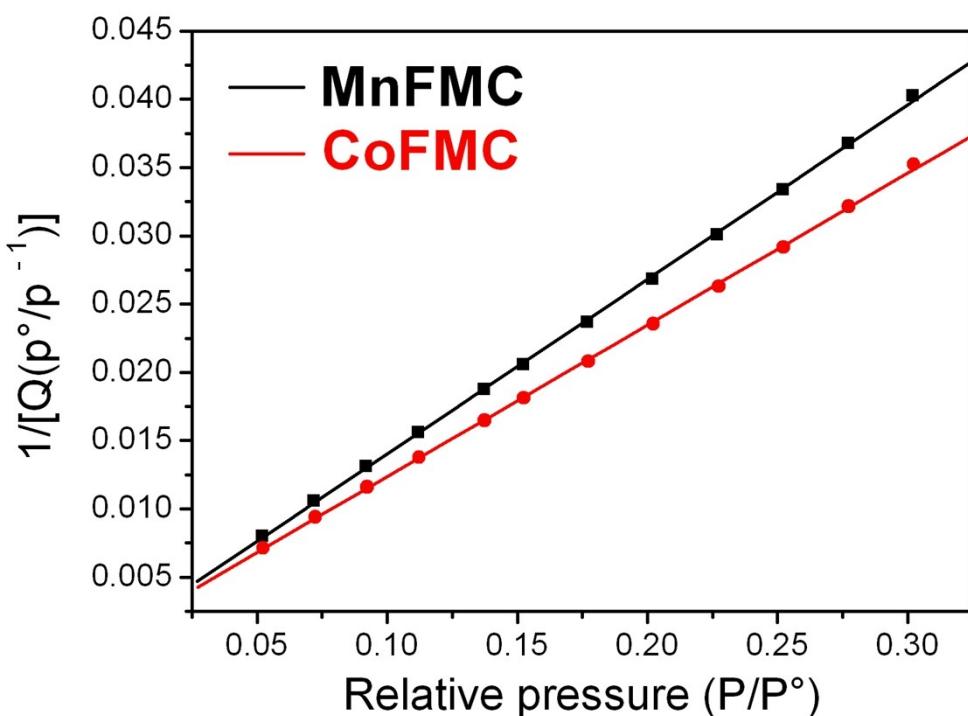


Figure S1. BET surface area measurement shows surface area of $38.7\text{m}^2/\text{g}$ for MnFMC

and $33.7\text{m}^2/\text{g}$ for CoFMC

S2. Magnetic properties of MnFMC and CoFMC

Table S1. Magnetic data of MnFMC and CoFMC at room temperature

material	M _s (emu/g)	H _c (Oe)	M _r (emu/g)
MnFMC	24.68	11.33	0.31
CoFMC	15.69	24.58	0.24

S3. pH values before and after adsorption

Table S2. Initial (before adsorption) and final (after adsorption) pH values

adsorbent	pH values						
	initial pH	1	2	3	4	5	6
MnFMC	final pH	0.95	1.55	2.62	3.56	4.48	4.89
CoFMC	final pH	0.97	1.85	2.03	3.73	4.82	5.44

S4. Adsorption kinetic parameters

Table S3. Kinetic parameters of Pb(II)adsorption on MnFMC and CoFMC

adsorbent	pesudo-second-order			pecudo-first-order			intra-particle diffusion			
	q_e, exp	k_2 (g/mg min)	q_e, cal (mg/g)	R^2	k_1 (min ⁻¹)	q_e (mg/g)	R^2	k_i	c_i	R^2
MnFMC	191.87	0.0033	192.31	0.9952	0.01068	146.85	0.9867	9.8717	-7.4384	0.9814
CoFMC	261.06	0.0023	270.27	0.9912	0.0089	218.33	0.9761	13.896	-10.504	0.9891

S5. Adsorption isotherm parameters**Table S4.** Isotherm parameters of Pb(II)adsorption on MnFMC and CoFMC

adsorbent	temperature(K)	Langmuir isotherm			Freundlich isotherm		
		q_m (mg g ⁻¹)	K_L (L mg ⁻¹)	R^2	K_f (mg g ⁻¹)	n	R^2
MnFMC	298	666.67	0.0082	0.9985	9.22	1.3951	0.9651
	308	625	0.0159	0.9967	18.31	1.617	0.9424
	318	588.24	0.0299	0.9927	33.37	1.8972	0.9.58
CoFMC	298	625	0.0064	0.9925	7.37	1.3887	0.9751
	308	588.24	0.0137	0.9936	14.66	1.5504	0.9456
	318	666.67	0.0282	0.9925	34.96	1.8567	0.9021

S6. Comparison of different adsorbents for Pb(II) adsorption

Table S5. Maximum Pb(II) adsorption capacities of different adsorbents

adsorbent	adsorption capacity (mg/g)	reference
GO/chitosan	99	1
GO	328	2
EDTA-GO	479	2
EDTA-RGO	204	2
GO-gelatin/chitosan	100	3
CoFe ₂ O ₄ -graphene	142.8	4
MnFe ₂ O ₄ /Mn-Co oxide	481.2	5
CoFe ₂ O ₄ -GO	81.3	6
MnFe ₂ O ₄	488	7
MnFe ₂ O ₄ -GO	673	7
porous MnFe ₂ O ₄ nanowires	131	8
magnetite-GO-LDH	173	9
MWCNTs-CoFe ₂ O ₄	140.1	10
acetoacetanilide-Fe ₃ O ₄	392.2	11
MnFMC	588.24	This work
CoFMC	660.67	This work

S7. Pb(II) adsorption capacity at different temperature

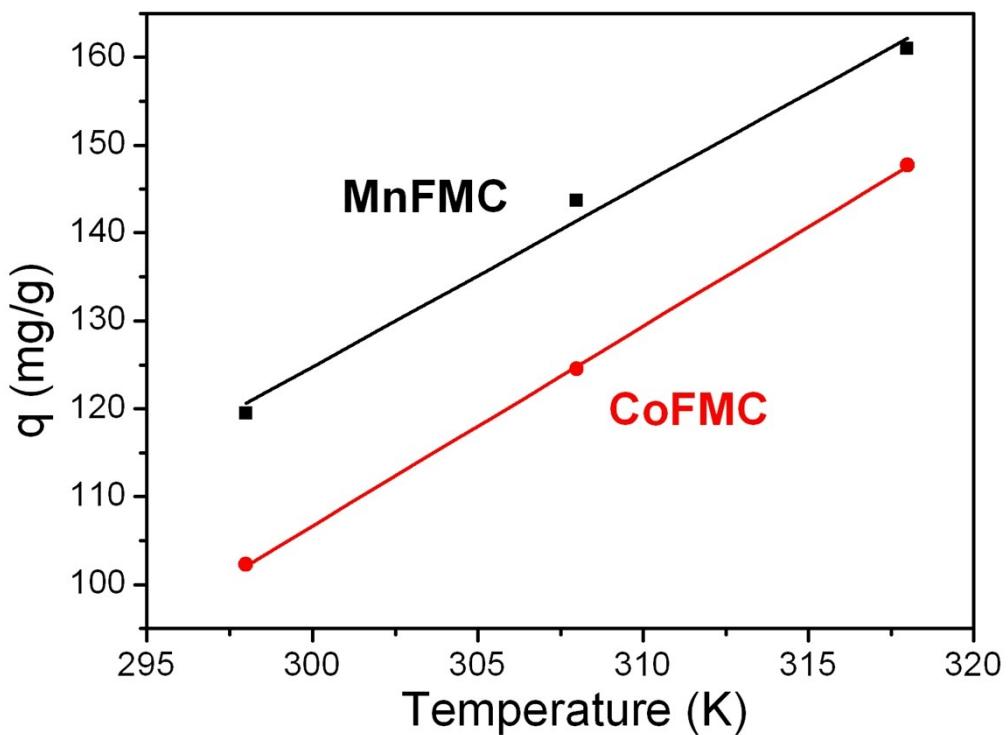


Figure S2. Pb(II) adsorption on MnFMC and CoFMC at 298K, 308K and 318K

88. Adsorption thermodynamic parameters

Table S6. Thermodynamic parameters of Pb(II)adsorption on MnFMC and CoFMC

nanohybrid adsorbents				
adsorbent	temperature(K)	ΔG^0	ΔH^0	ΔS^0
MnFMC	298	-3.66		
	308	-5.76	67.94	239.96
	318	-8.47		
CoFMC	298	-2.600		
	308	-4.17	53.78	188.83
	318	-6.39		

Reference

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