

Figure S1. SEM-EDS spectrum and Fe-mapping images of HRM and HRM@nFe₃O₄: (a) Fe-mapping images of HRM, (b) Fe-mapping images of HRM@nFe₃O₄, (c) EDS spectrum images of HRM and (d) SEM-EDS spectrum images of HRM@nFe₃O₄.

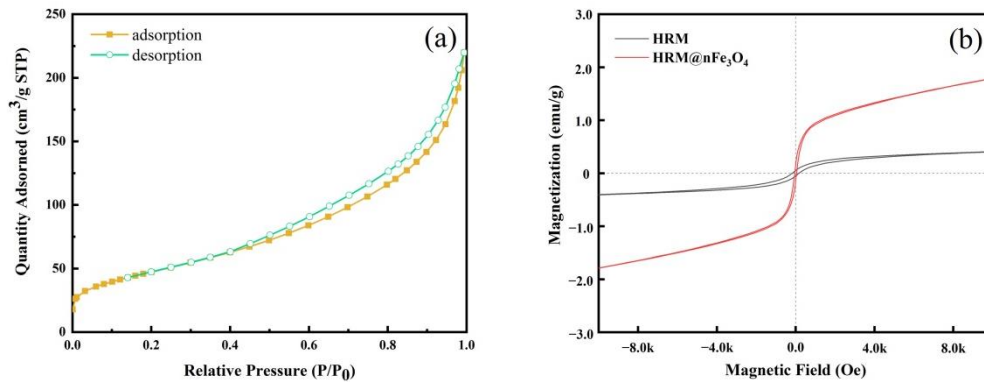


Figure S2. (a) N₂ adsorption-desorption isotherms of HRM@nFe₃O₄ and (b) magnetization versus applied magnetic field for HRM and HRM@nFe₃O₄.

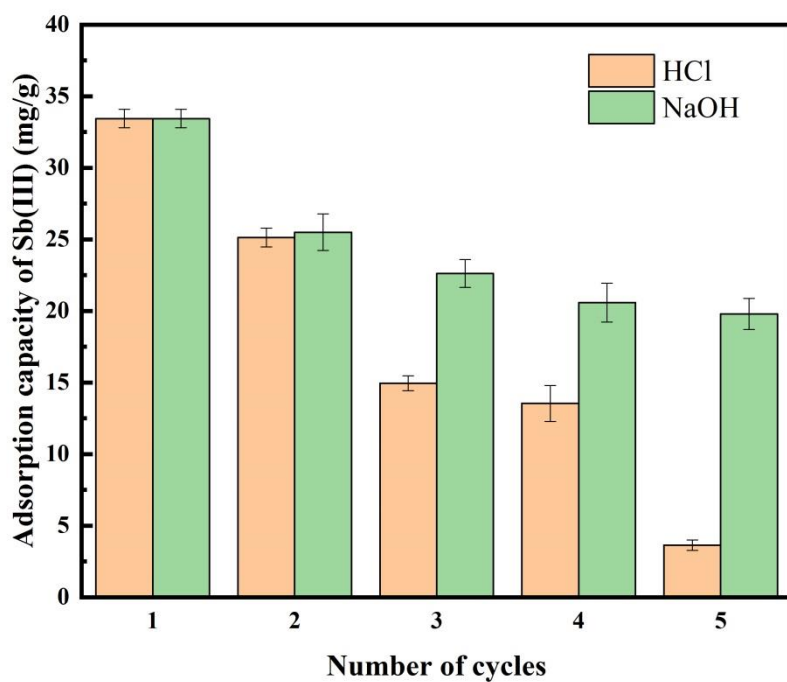


Figure S3. Sb(III) sorption and desorption in five consecutive cycles for HRM@nFe₃O₄. Sorption conditions: initial Sb(III) concentration = 10 mg·L⁻¹, sorbent dose = 0.2 g·L⁻¹, pH = 4.6 ± 0.1, T = 298 K and contact time = 4 h. Desorption conditions: regenerant = 0.5 mol·L⁻¹ HCl or NaOH, dose = 4 g·L⁻¹, T = 298 K and contact time = 4 h.

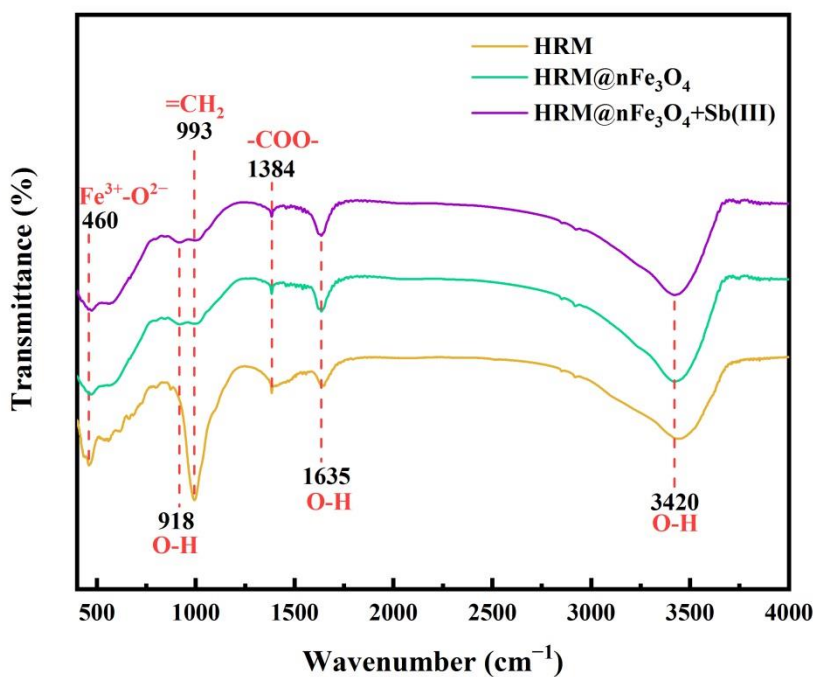


Figure S4. FTIR spectra of initial HRM, HRM@nFe₃O₄ and HRM@nFe₃O₄ after Sb(III) sorption.

Table S1. Compositional matrix of the red mud (X-ray fluorescence data).

Element	Compound Formula	Wt. Percent (%)
Fe	Fe ₂ O ₃	50.5
Si	SiO ₂	13.7
Al	Al ₂ O ₃	12.5
Ca	CaO	4.12
Ti	TiO ₂	3.28
S	SO ₃	1.47
K	K ₂ O	0.944
Cl	Cl	0.285
P	P ₂ O ₅	0.248
V	V ₂ O ₅	0.134
Zr	ZrO ₂	0.115
Cr	Cr ₂ O ₃	0.0957
Mn	MnO	0.0878
Others		12.5

Table S2. Comparison of adsorption capacity of Sb(III) by the synthesized HRM@nFe₃O₄ sorbent with different sorbents.

Absorbent	Maximum adsorption capacity of Concentration range, dose rate, equilibration time, Operational pH			Reference
	Sb(III) (mg·g ⁻¹)			
ZrO ₂ - MWCNT	70.83	10–500 mg·L ⁻¹ , 1.0 g·L ⁻¹ , 12 h, 7		[4]
Fe(0)-Zeolite	135.18	20–220 mg·L ⁻¹ , 2 g·L ⁻¹ , 0.5 h, 10		[63]
PAG composite sorbent	158.2	0–200 mg·L ⁻¹ , 1.5 g·L ⁻¹ , 0.5 h, 5		[65]
UiO-66(NH ₂)	61.8	10–600 mg·L ⁻¹ , 1 g·L ⁻¹ , 20 min, 1.5–12		[84]
Cu-MG	104.7	20–600 mg·L ⁻¹ , 1 g·L ⁻¹ , 1 h, 4		[48]
Fe ₃ O ₄ @TA@UiO ₆₆	49.5	1–40 mg·L ⁻¹ , 0.2 g·L ⁻¹ , 2 h, 7		[38]
NH ₂ -Fe ₃ O ₄ -NTA	51.1	10–60 mg·L ⁻¹ , 0.5 g·L ⁻¹ , 60 h, 4.6		[39]
Mn-coated biochar	0.94	0–50 mg·L ⁻¹ , 50 g·L ⁻¹ , 24 h, 2 - 10		[71]
ZCN	70.83	10–100 mg·L ⁻¹ , 1 g·L ⁻¹ , 12 h, 7		[4]
UAPAN	125.4	0–100 mg·L ⁻¹ , 2.5 g·L ⁻¹ , 200 h, 7		[67]
NU-1000	136.97	5–500 mg·L ⁻¹ , 0.8 g·L ⁻¹ , 10 h, 2.3–9.5		[51]
HRM@nFe ₃ O ₄	98.03	5–80 mg·L ⁻¹ , 0.2 g·L ⁻¹ , 4 h, 4.6		This work