Supplementary materials

Text 1

In investigating the effects of various surfactants and CMC/SDBS modification on SiO_2/FeS (sample containing 35% mass solid, with 35% mass FeS), to ensure that surfactant concentrations do not affect slurry dispersion, this study initially determined an optimal surfactant-to-FeS ratio of 2:1. Iron elements exhibit a UV absorption peak at 508 nm. The concentrations of Fe, Fe^{2+}, Fe^{3+} and SO_4^{2-} were measured using the water quality-iron determination-ortho-phenanthroline spectrophotometric method (HJ/T 345-2007) and the barium sulfate turbidimetric method.

Figure captions

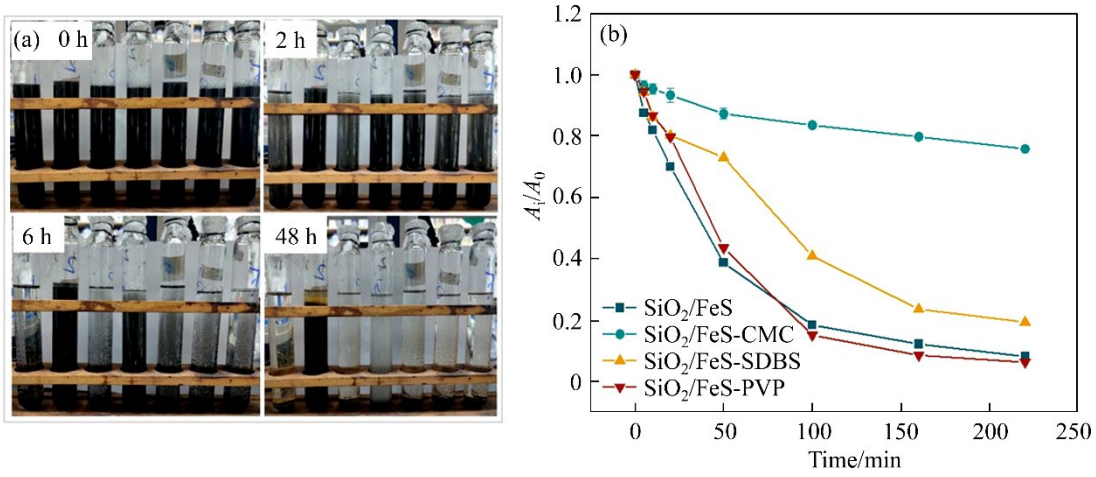

Figure S1 Different surfactant-modified SiO_2/FeS slurries: (a) Settling visual images (from left to right: CK, CMC, SDS, SDBS, PVP, Tween 20 and Tween 80); (b) UV settling comparison ([FeS]=200 mg/L; [Surfactant]=400 mg/L)

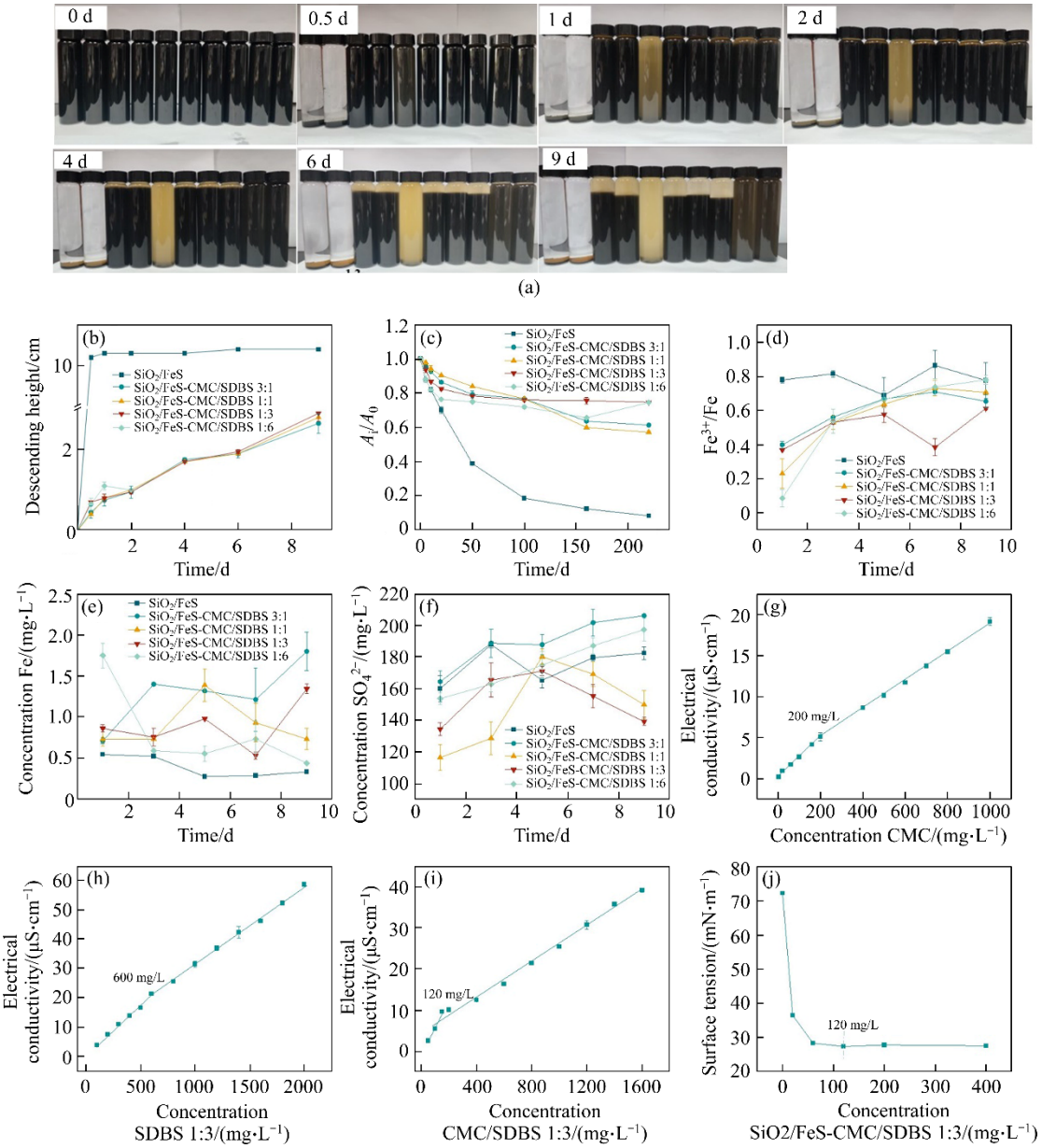

Figure S2 Proportion screening of CMC/SDBS co-modified SiO_2/FeS slurries: (a) Settling visual images (from left to right: CK, CMC/SDBS 3:1, CMC/SDBS 1:1, CMC/SDBS 1:3 and CMC/SDBS 1:6 (Two sample bottles per group); (b) Settling descent height comparison; (c) UV settling comparison; (d) Supernatant Fe^{3+}/Fe; (e) Supernatant Fe ion concentration; (f) Supernatant SO_4^{2-} concentration; (g–i) CMC, SDBS, and CMC/SDBS 1:3 conductivity graphs; (j) Surface tension graph of SiO_2/FeS-CMC/SDBS 1:3 ([FeS]=200 mg/L; [Surfactant]=400 mg/L)

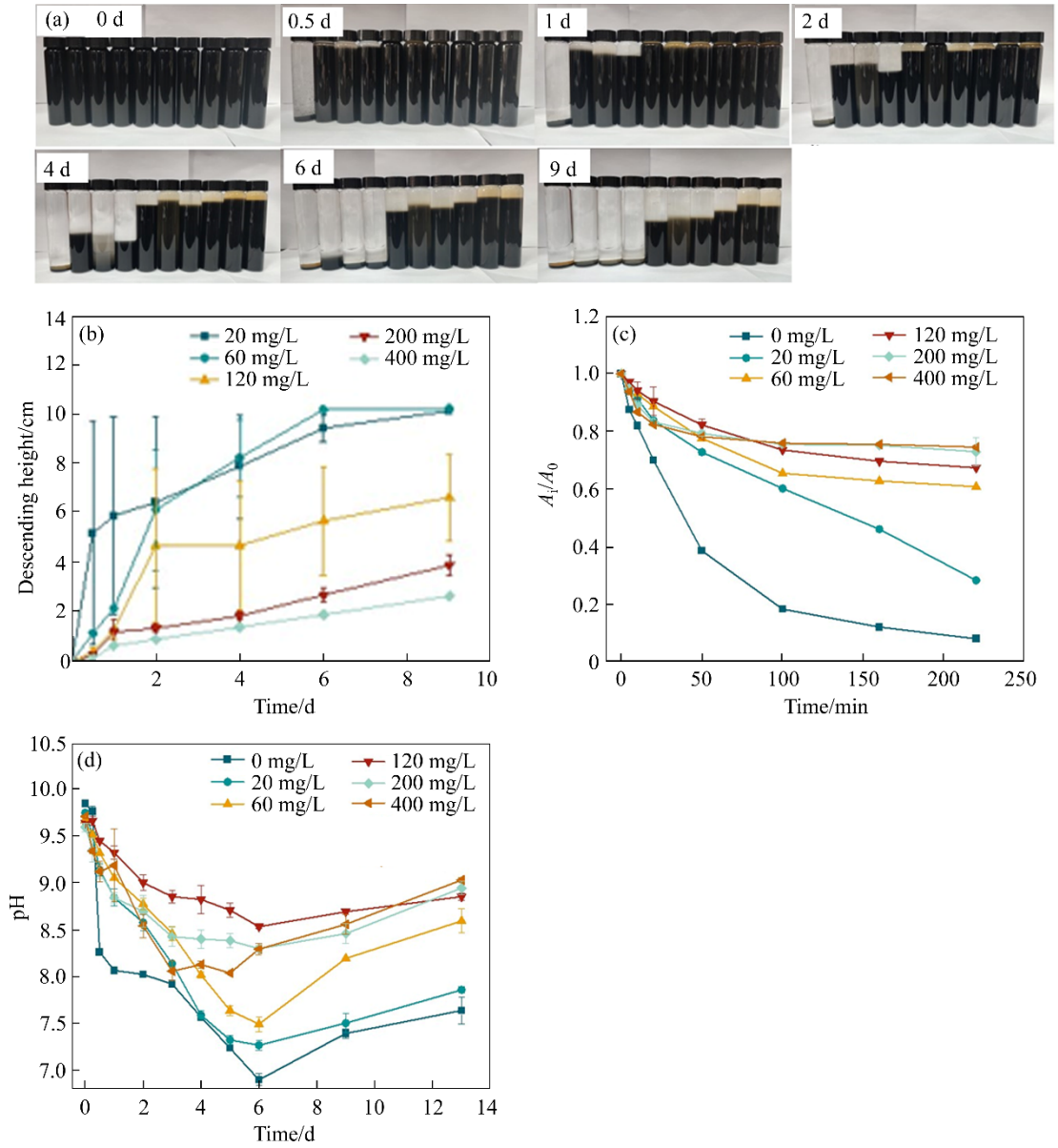

Figure S3 Different concentrations of CMC/SDBS 1:3 co-modified SiO_2/FeS slurries: (a) Settling visual images(Two sample bottles for every concentration); (b) Settling descent height comparison; (c) UV settling comparison; (d) pH change of the slurry ([FeS]=200 mg/L)

Table S1 Isotherm fitting results table of unmodified SiO_2/FeS and SiO_2/FeS-CMC/SDBS 1:3 slurries under different pH conditions

Adsorbent	Freundlich (q_e=K$C_e^{1/n}$)			
Governing equation	pH	K	1/n	R^2
SiO_2/FeS	3	3.554±1.021	0.606±0.043	0.990
	5	5.035±2.204	0.543±0.061	0.976
	7	4.668±2.046	0.570±0.066	0.974
	9	4.336±3.728	0.616±0.130	0.924
SiO_2/FeS-CMC/SDBS 1:3	3	6.940±3.88	0.474±0.086	0.936
	5	7.281±4.609	0.461±0.098	0.914
	7	8.281±5.325	0.439±0.100	0.901
	9	5.400±3.614	0.562±0.102	0.942
Adsorbent	Langmuir (q_e=bQC_e/(1+bC_e))			
Governing equation	pH	Q	b	R^2
SiO_2/FeS	3	361.764±31.561	0.002±3.009E-4	0.994
	5	303.833±12.524	0.003±2.818E-4	0.997
	7	333.880±28.161	0.002±4.031E-4	0.991
	9	465.314±129.498	0.002±9.939E-4	0.991
SiO_2/FeS-CMC/SDBS 1:3	3	212.735±16.414	0.004±9.936E-4	0.983
	5	200.582±21.739	0.005±0.002	0.964
	7	192.233±18.266	0.005±0.002	0.968
	9	315.170±48.343	0.002±8.229E-4	0.942

Note: q_e and Q represent the equilibrium and maximum adsorption capacities (mg/g) of the adsorbent for Cd(II), while C_e denotes the concentration of Cd(II) in the solution at equilibrium (mg/L). The parameters b and K correspond to the Langmuir and Freundlich adsorption constants, respectively, and n represents the surface heterogeneity factor.