Electronic Supplementary Information

Amidoxime functionalization of mesoporous silica and its high removal of U(VI)

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Experimental procedures

Kinetic experiments

For batch kinetic tests, the initial U(VI) concentrations was 0.2 mmol/L and the initial solution pH value was 5.0 (the solution pH was not adjusted during the sorption kinetic process). The centrifuge tubes were gently shaken on a rotating oscillator for a series of preselected contact time ranging from 5 to 360 min. The residual U(VI)concentrations were determined after centrifugation.

Regeneration experiments

For desorption experiments, the solid residue of sorption experiments was thoroughly rinsed with Milli-Q water and mixed with HCl solutions at 298 K under vibrating condition for 24 h. After centrifugation, the remaining U(VI) concentration in the supernatant was measured to evaluate the desorption percentage. The regenerated sorbent was washed thoroughly with Milli-Q water and then used for the next sorption-desorption cycle.

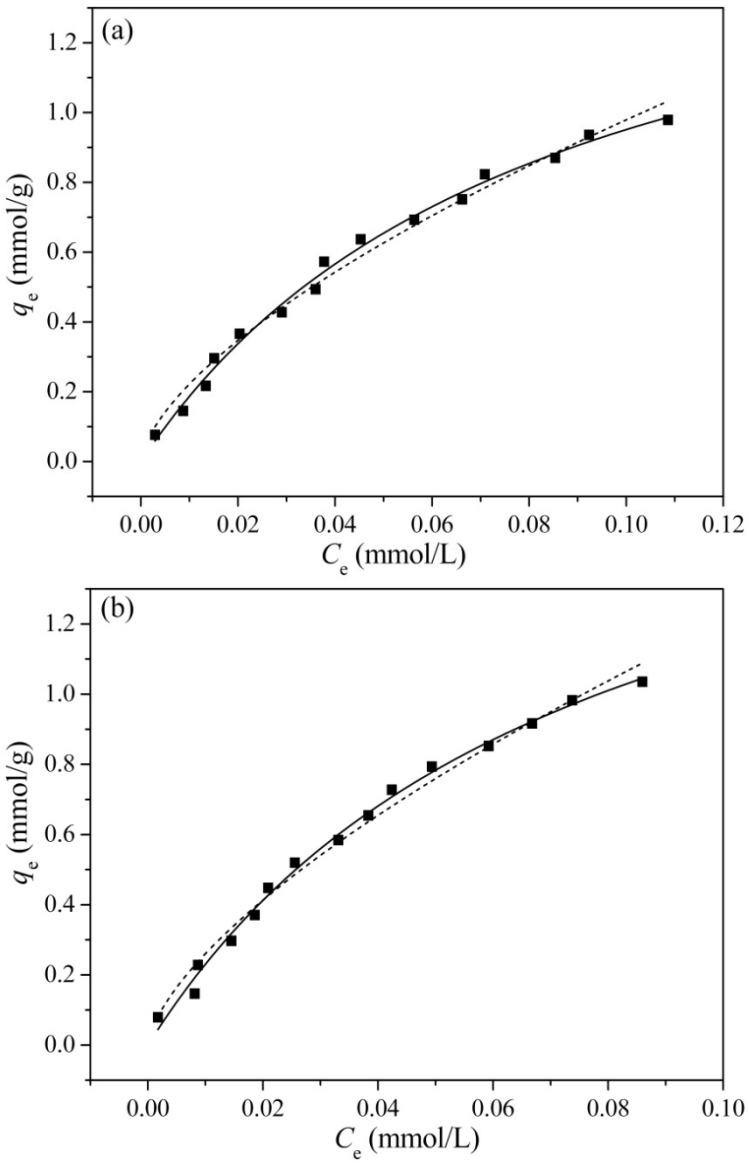

Fig. S1 Sorption isotherms of U(VI) on SBA-AO-0.4 at 313 K (a) and 333 K (b). The scattered points represent experiment data, the solid lines represent the Langmuir model and the dash lines represent the Freundlich model.

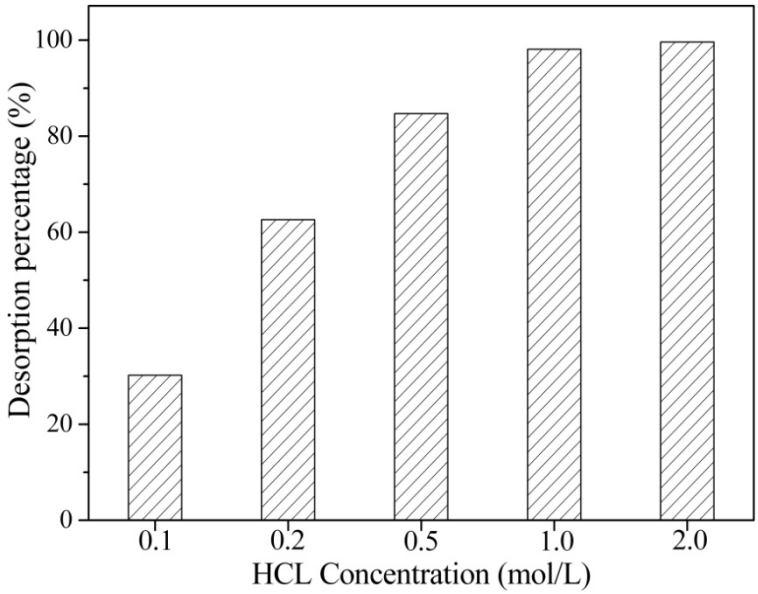

Fig. S2. Effect of HCl concentration on U(VI) desorption. T = 298 K, m/V = 0.2 g/L.

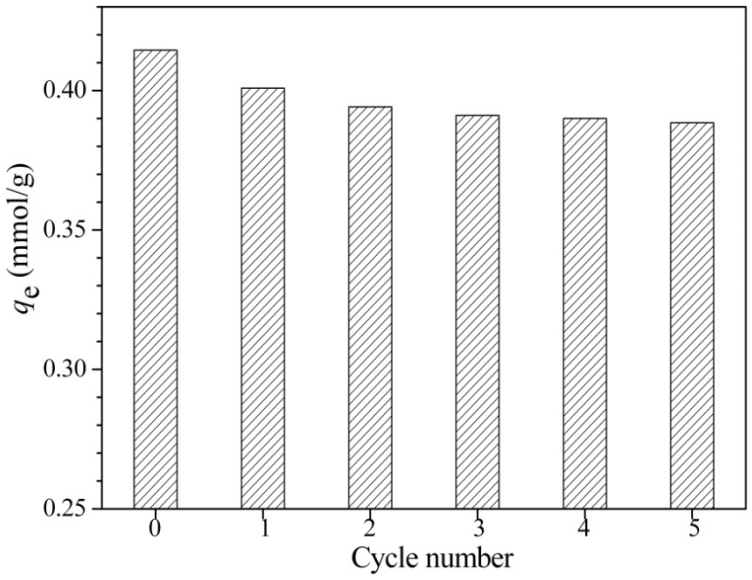

Fig. S3 Recycling of SBA-AO-0.4 in the sorption of U(VI). pH = 5.0±0.1, T = 298 K, I = 0.01 M $NaClO_4$, $C_{U(VI)\ initial}$ = 0.2 mmol/L, m/V = 0.2 g/L.

Table S1 Comparison of U(VI) sorption capacity of SBA-AO-0.4 with other sorbents

Sorbents	Experimental conditions	q_{max} (mg/g)	Ref
Colloidal magnetite	ambient temperature, pH = 7.0	1.4	1
Fe_3O_4/graphene oxide	T = 293K, pH = 5.5	69.5	2
Fe_3O_4@SiO_2-Salicylaldehyde	ambient temperature, pH = 7.0	49.0	3
Fe_3O_4@SiO_2-Quercetin	T = 298K, pH = 3.7	12.3	4
Fe_3O_4@SiO_2-Amidoxime	T = 298K, pH = 5.0	105.0	5
Polymeric-magnetite cryobead	T = 298K, pH = 5.0	120.5	6
Fe_3O_4@IIP	ambient temperature, pH = 4.0	71.5	7
Fe_3O_4@SiO_2	T = 298K, pH = 6.0	52.4	8
AOMGO	T =298 K, pH = 5.0	284.9	9
SBA-AO-0.4	T =298 K, pH = 5.0	386.8	This work

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Table S2 Thermodynamic parameters of U(VI) sorption on SBA-AO-0.4 at 298, 318, and 338 K.

T (K)	ΔG^0 (kJ/mol)	ΔH^0 (kJ/mol)	ΔS^0 (J/(K mol))
298	−25.853		
318	−28.054	9.548	118.619
338	−30.613		