Electronic Supplementary Material (ESI) for Environmental Science: Advances.

Polyamidoxime granules for solar-enhanced uranium extraction from seawater

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Supplemental Information, 5 Pages

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Table S1. Preparation conditions of $KMnO_4$@PAO.

	$KMnO_4$ (g)	PAN (g)
Fixed $KMnO_4$ series	0.20	1.00 2.00
Fixed PAN series	1.00 1.50	2.00

Table S2. Curve fitting results of XPS C 1s spectra.

	Peak	BE[a] (eV)	FWHM[b] (eV)	%
PAO	-C≡N	284.78	1.64	74.6
	C–OH	286.50	1.53	21.9
	-C=O	288.07	1.40	3.50
	-COOH	290.00	0.00	0.00
$KMnO_4$@PAO	-C≡N	284.68	1.70	61.6
	C–OH	286.50	2.14	29.4
	-C=O	288.12	1.27	6.40
	-COOH	288.99	0.95	2.60

a: Binding energy; b: Full width at half-maximum.

Table S3. Curve fitting results of XPS N 1s spectra.

	Peak	BE (eV)	FWHM (eV)	%
PAO	N-H	399.51	1.75	75.2
	H_2N-C=NOH	400.10	2.93	9.00
	$-N^+$	401.60	2.68	15.8
$KMnO_4$@PAO	N-H	399.50	2.12	78.5
	H_2N-C=NOH	400.00	3.93	19.0
	$-N^+$	401.60	0.54	2.50

Table S4. Curve fitting results of XPS O 1s spectra.

	Peak	BE (eV)	FWHM (eV)	%
PAO	-COOH	531.83	2.23	68.4
	C=O	532.85	2.23	24.5
	-OH	533.50	2.75	7.10
$KMnO_4$@PAO	-COOH	531.80	2.62	86.0
	C=O	532.81	3.94	13.7
	-OH	533.50	0.50	0.30

Table S5. Parameters for kinetic models of U(VI) adsorption on PAO and on $KMnO_4$@PAO at pH 8.2 and 298 K.

	Pseudo first order			Pseudo second order		
	k_1 (1/h)	q_e (mg/g)	R^2	k_2 (g/mg·h)	q_e (mg/g)	R^2
PAO	0.368	11.1	0.985	0.0382	13.1	0.988
$KMnO_4$@PAO	0.541	34.0	0.983	0.0184	38.4	0.995

Table S6. Parameters calculated from Langmuir and Freundlich models for U(VI) adsorption on $KMnO_4$@PAO at pH 8.2 and 298 K.

	Langmuir model			Freundlich model		
	q_{max} (mg/g)	b (L/mg)	R^2	K (mg/g)	1/n	R^2
$KMnO_4$@PAO	44.0	0.523	0.982	20.1	0.236	0.898

Table S7. Parameters calculated from Langmuir and Freundlich models for U(VI) adsorption on $KMnO_4$@PAO at pH 4.0.

T (K)	Langmuir model			Freundlich model		
	q_{max} (mg/g)	b (L/mg)	R^2	K (mg/g)	1/n	R^2
298	233	0.0255	0.906	35.8	0.323	0.752
308	239	0.0435	0.747	59.1	0.247	0.561
318	242	0.0947	0.824	92.4	0.177	0.577

Table S8. Thermodynamic parameters for U(VI) adsorption on $KMnO_4$@PAO at pH 4.0.

T (K)	$\ln K_d$	Thermodynamic parameters		
		ΔG° (KJ/mol)	ΔH° (KJ/mol)	ΔS° (J/mol·K)
298	8.41	-20.5		
308	8.86	-22.2	49.8	236
318	9.68	-25.2		

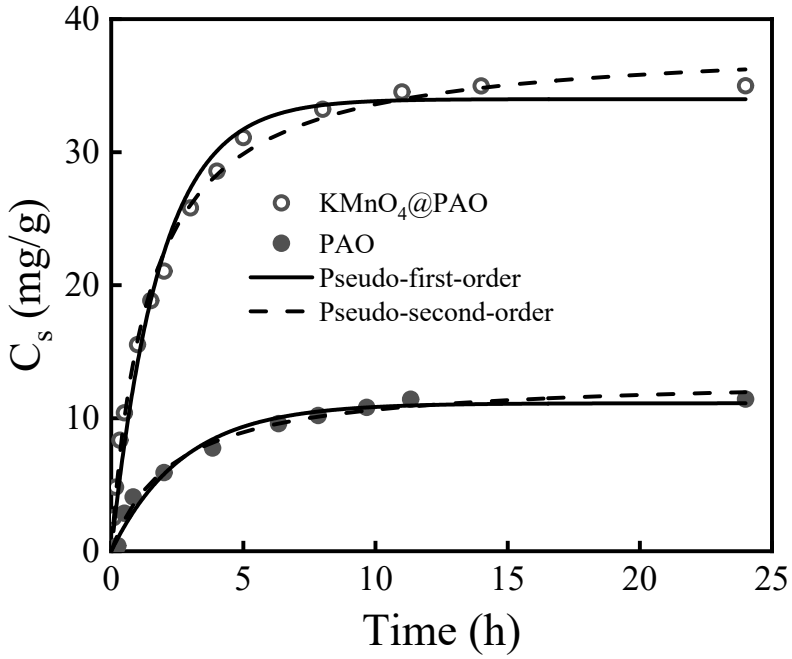
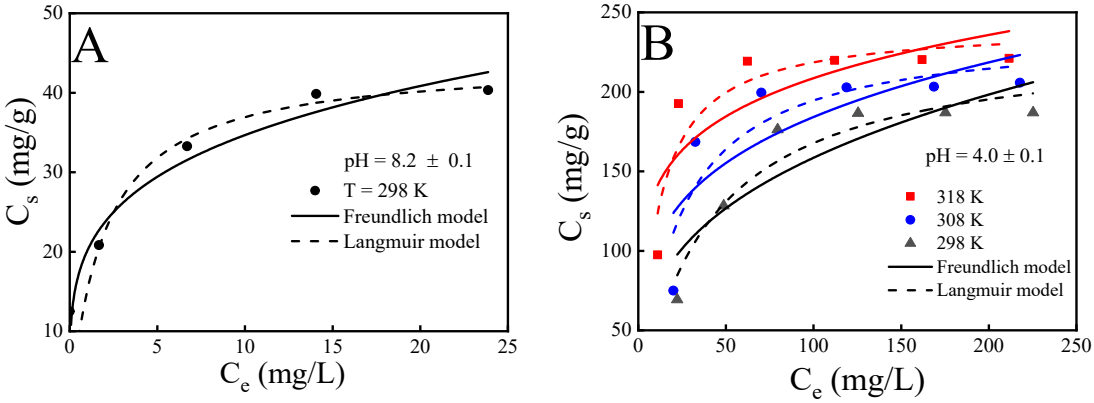


Fig. S1. Simulation results of U(VI) kinetic data. m/V = 0.4 g/L, I = 0.1 mol/L NaCl, T = 298 ± 1 K, pH = 8.2 ± 0.1, $C[U(VI)]_{initial}$ = 20.0 mg/L.



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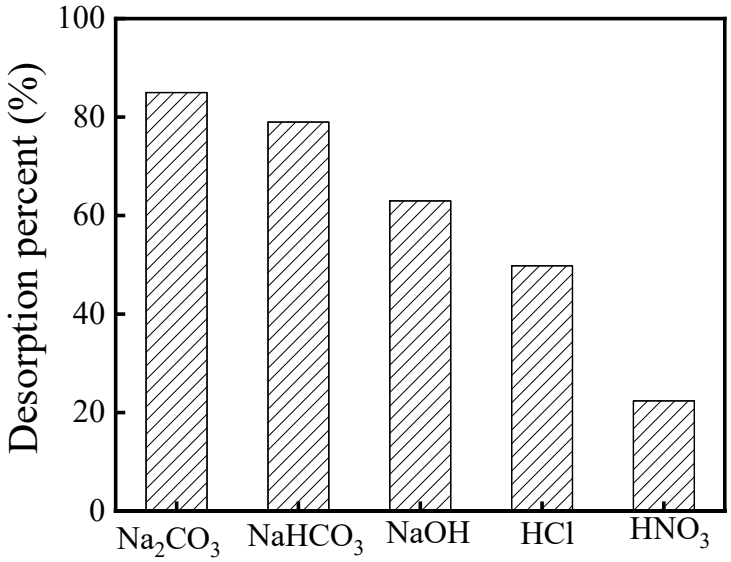
42 **Fig. S2.** Simulation results of U(VI) adsorption isotherms on $KMnO_4$@PAO. m/V =

43 0.40 g/L, I = 0.1 mol/L NaCl, contact time: 24 h. Fig. S3A: pH = 8.2 ± 0.1. Fig. S3B:

44 pH = 4.0 ± 0.1.



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46 **Fig. S3.** Effect of eluants on the desorption of U(VI) from $KMnO_4$@PAO. T = 298 ±

47 1 K, contact time: 24 h, $C[U(VI)]_{initial}$ = 20.0 mg/L, m/V = 0.40 g/L, pH = 8.2 ± 0.2, I

48 = 0.10 mol/L NaCl, C[eluant] = 0.10 mol/L.