Supporting Information

Recovery of uranium from aqueous solutions by the modified honeycomb-like porous carbon material

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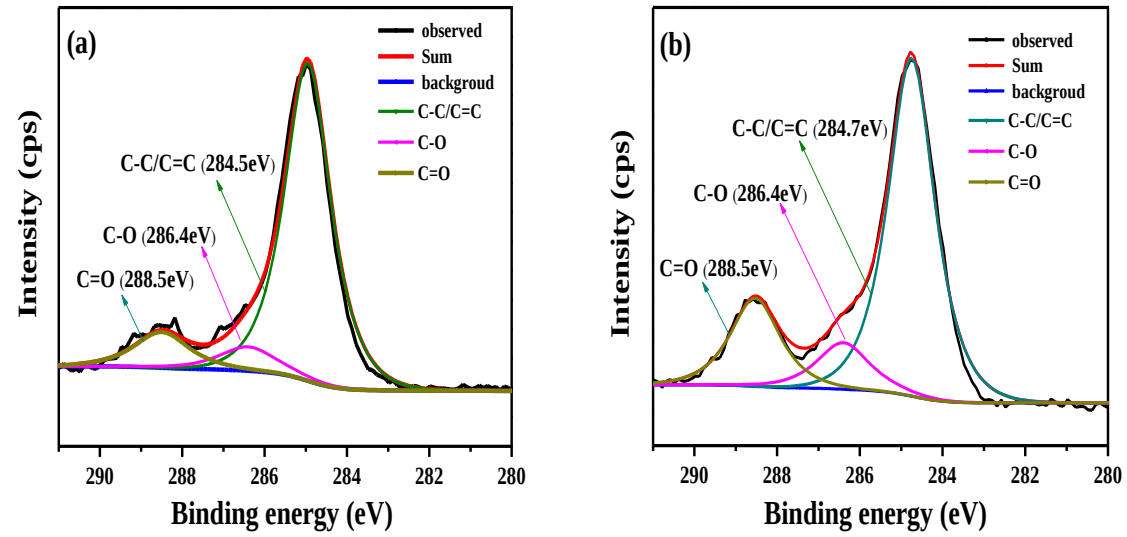

Fig. S1. The C1s spectra of HLPC/MnO_2 (a) and HLPC/MnO_2/U.

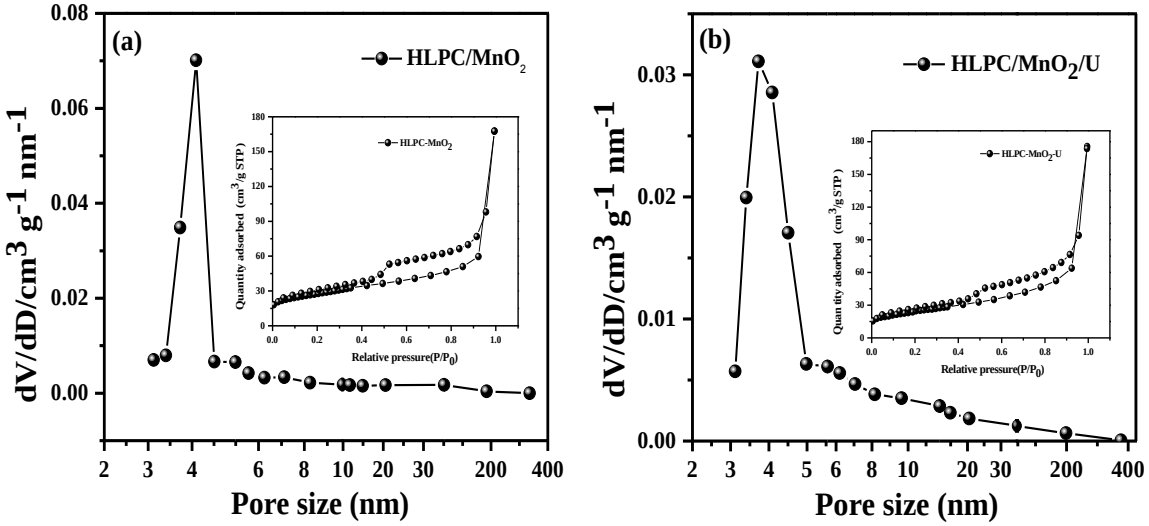

Fig. S2 (a) and (b) the pore size distributions of HLPC/MnO_2 and HLPC/MnO_2/U. The inset of (a) and (b) is N_2 adsorption/desorption isotherm of HLPC/MnO_2 and HLPC/MnO_2 /U.

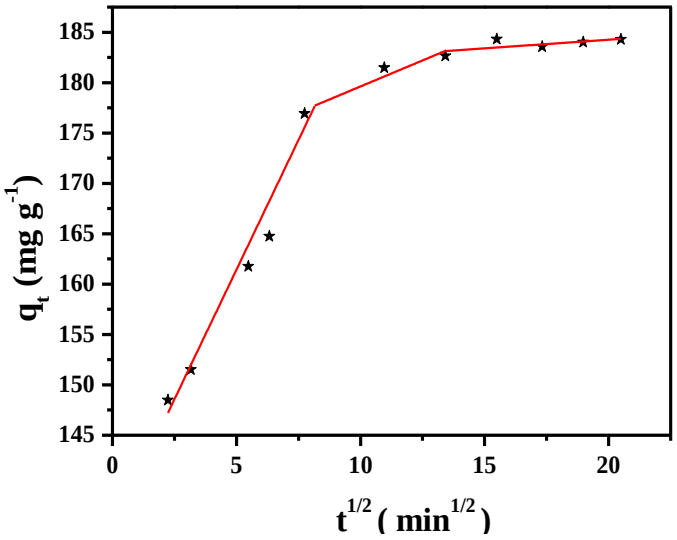

Fig. S3 Intra-particle diffusion kinetics for the adsorption of uranyl ions on HLPC/MnO_2

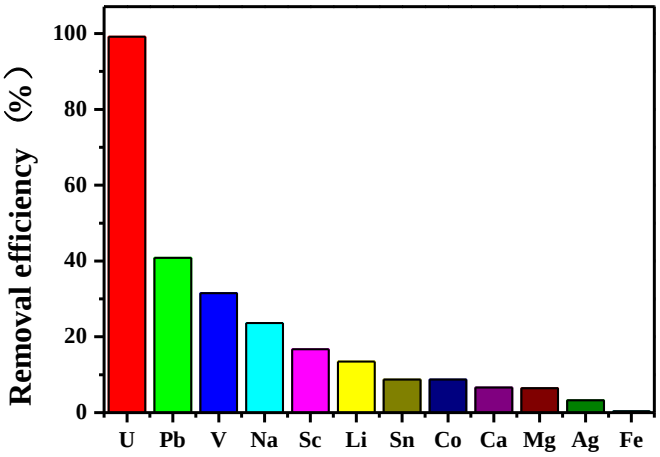

Fig. S4 Selected results of HLPC/MnO_2 for the extraction of uranyl ions from simulating seawater.

Table S1 Elemental composition of the HLPC/MnO_2 and HLPC/MnO_2/U samples determined by XPS spectra.

Sample	XPS				Binging energy			
	C	O	Mn	U	C	O	Mn	U
	at%	at%	at%	at%	ev	ev	ev	ev
HLPC/MnO_2	47.51	38.02	14.47	0	278.08	523.58	634.08	—
HLPC/MnO_2/U	32.92	49.58	16.47	1.03	284.74	530.22	642.11	381.85

Table S2 Parameters of the intra-particle diffusion model of uranium (VI) adsorption on HLPC/MnO_2

T(K)	$\mathbf{k_{p1}}$	$\mathbf{R_1^2}$	$\mathbf{k_{p2}}$	$\mathbf{R_2^2}$	$\mathbf{k_{p3}}$	$\mathbf{R_3^2}$
298	5.148	0.975	1.032	0.876	0.173	0.316

Table. S3 Isotherm constants and values of R^2 for HLPC/MnO_2.

T(K)	Langmuir isotherm			Freundich isotherm		
	q_m（mg • g^{-1}）	b（L mg^{-1}）	R^2	K（L g^{-1}）	n	R^2
298	238.09	0.3258	0.998	69.01	0.3248	0.896
308	262.47	0.2679	0.994	73.34	0.3320	0.667
318	271.74	0.6513	0.998	99.26	0.3024	0.919

Table. S4 The maximum adsorption capacity of different adsorbents for uranium (VI).

Adsorbents	Adsorption Capacity mg-U/g-adsorbent	Conditions	Ref.
MnO_2-coating of the cactus fibres	62	$C_{initial} = 9\times10^{-6} – 9\times10^{-4}$ mol L^{-1}, m = 10mg, V = 15 ml, T = 298 K, pH=6	[1]
Salicylideneimine-functionalized hydrothermal carbon	261	$C_{initial}$ = 0.2 - 1.3 mmol L^{-1}, m = 10 mg, V = 20 ml T = 288.15 K, pH=4.3	[2]
$CaCl_2$-modified Giant Kelp biomass	156.25	$C_{initial}$ = 20 – 100 mg L^{-1}, m = 50 mg, V = 100 ml, T = 293 K, pH =5	[3]
imine-functionalized carbon spheres	113.16	$C_{initial}$ = 1 – 100 mg L^{-1}, m = 50mg, V = 20 ml, T = 298K, pH=4	[4]
starch/SnO2	192	$C_{initial}$ = 10 – 150 mg L^{-1}, m = 100 mg, V = 250 ml T = 298 K, pH = 6	[5]
ion-imprinted magnetic chitosan resins	187.26	$C_{initial}$ = 15 – 420 mg L^{-1}, m = 50 mg, V = 50 ml T = 298 K, pH = 5	[6]
Graphene oxide-manganese dioxide	185.2	$C_{initial}$ = 22.5 – 70 mg L^{-1}, m = 10 mg, V = 20 ml T = 298 K, pH = 3.8	[7]
HLPC-MnO_2	238.09	$C_{initial}$ = 30 – 300 mg L^{-1}, m = 10 mg, V = 20 ml T = 298 K, pH = 5	this work

Table S5. Selected results for the extraction of uranyl ions from simulated seawater

Elements	Ion concentration (ug L^{-1})		Removal
	initial	final	(%)
U	3.131	0.026	99.16
Pb	0.424	0.251	40.8
V	0.489	0.335	31.49
Na	1.521×10^4	1.162×10^4	23.60
Sc	249.1	207.4	16.74
Li	17.61	15.24	13.46
Sn	12.35	11.27	8.74
Co	0.63	0.575	8.73
Mg	6.289×10^3	5.104×10^3	6.44
Ca	9.169×10^3	8.563×10^3	6.61
Ag	0.521	0.504	3.26
Fe	104.3	103.9	0.38

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