Electronic Supplementary Information for

Polypyrrole modified Fe^0-loaded graphene oxide for enrichment of uranium (VI) from simulated seawater

Yiming Zhang[a], Hongsen Zhang[a] *, Qi Liu[a] , Jingyuan Liu[a], Rongrong Chen[a], Jing Yu[a], Xiaoyan Jing[a], Milin Zhang[a] and Jun Wang[a, b, c] *

[a] *Key Laboratory of Superlight Material and Surface Technology, Ministry of Education, Harbin Engineering University, Harbin 150001, China. Fax: +86 451 8253 3026; Tel: +86 451 8253 3026; E-mail address: zhqw1888@sohu.com*

[b] *Institute of Advanced Marine Materials, Harbin Engineering University, 150001, China.*

[c] *Harbin Engineering University Assets Management Co., LTD, 150001, P. R. China.*

* Corresponding author: Tel.: +86 451 8253 3026; fax: +86 451 8253 3026.

E-mail address: zhqw1888@sohu.com; 15604515455@163.com; junwang@hrbeu.edu.cn

SI.1 Characterization

The morphology of the samples was characterized using a transmission electron microscope (TEM) on a FEI Tecnai G2 S-Twin with a 200 kV accelerating voltage. The spectra of Fourier transform infrared (FTIR) were recorded on a PerkinElmer Paragon 1000PC spectrometer as the background from 400–4000 cm-1. The structures of samples were analyzed using X-ray diffraction (XRD) with a Rigaku D/max-IIIB diffractometer with CuKa irradiation (Ka = 1.54178 Å). X-ray photoelectron spectroscopy (XPS) measurements were performed by a Thermo ESCALAB 250Xi spectrometer with monochromated Al Kα radiation (hν= 1846.6 eV). The binding energy scale of spectrometer was calibrated using metallic Cu 2p3/2 lines and Ag Fermi Edge of the respective reference metals.

Inductively coupled plasma-atomic emission spectroscope (ICP-AES, Optima-7000DV) was used to analyze the initial and equilibrium concentration of uranium (VI). The concentration of trace uranium (VI) was analyzed using inductively coupled plasma mass spectrometry (ICP-MS, Bruker 820-MS).

Table. S1: Kinetic parameters for the U (VI) adsorption on GO-PPy, rGO-Fe^0, rGO-PPy-Fe^0.

Materials	Pseudo-first order			Pseudo-second order		
	$Q_{e,cal}$ (mg/g)	R^2	K_1 (min^{-1})	$Q_{e,exp}$ (mg/g)	R^2	K_2 (g/mg·min)
GO-PPy	140.82	0.9656	0.0193	174.74	0.9822	1.14×10^{-4}
rGO-Fe^0	162.59	0.9513	0.0179	202.16	0.9678	9.17×10^{-5}
rGO-PPy-Fe^0	206.56	0.7758	0.0662	224.64	0.9498	4.86×10^{-4}

Table. S2: Isotherm models and parameters for U (VI) on rGO-PPy-Fe^0.

Materials	T(K)	Langmuir isotherm			Freundlich isotherm		
		Q_m ($mg\cdot g^{-1}$)	b ($L\cdot mg^{-1}$)	R^2	K_F ($L\cdot g^{-1}$)	n	R^2
rGO-PPy-Fe^0	298	384.243	0.0399	0.9635	75.043	3.5019	0.9543
	308	408.833	0.0496	0.9627	88.081	3.6607	0.9162
	318	465.763	0.0560	0.9522	110.388	3.8113	0.9422

Table. S3: Thermodynamic parameters of adsorption of U (VI) on rGO-PPy-Fe^0.

T(K)	ΔG (kJ mol^{-1})	ΔS (J $mol^{-1}\cdot k^{-1}$)	ΔH (kJ mol^{-1})
298	-15.16		
308	-16.54	168.59	36.143
318	-17.93		

Table. S4: The concentration of each metal ion before and after adsorption

Iron	C_0 (mg L^{-1})	C_e (mg L^{-1})	Q_e (mg g^{-1})	Removal(%)	K_d (mL g^{-1})
U	98.14	1.844562	194.650876	99.17	105526.88
V	66.3	0.031	0.122	66.3	3935.48
Ba	54.49	24.79	59.36	54.49	2394.51
Cu	30.06	0.6745	0.5798	30.06	859.60
Al	29.1	5.38	4.416	29.1	820.82
Cr	28.68	0.291	0.234	28.68	804.12
Ca	20.44	10.24	5.26	20.44	513.67
Na	16.46	9.29	3.66	16.46	393.97
Zn	2.59	24.48	1.3	2.59	53.10
Mg	1.09	10.91	0.24	1.09	22.00
Fe	48.55	238.9			