Supporting information

Cobalt Doped Titania-Carbon Nanosheets with Induced Oxygen Vacancies for Photocatalytic Degradation of Complex Radioactive Waste

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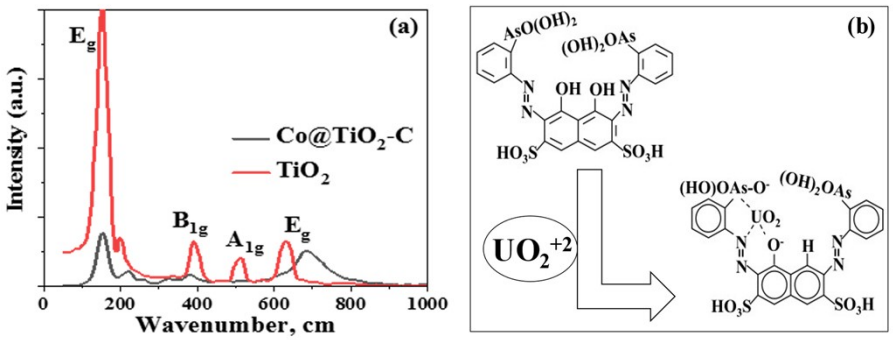

Fig. S1 (a) Raman spectrum of TiO_2 and Co@TiO_2-C, (b)the structure of arsenazo3 [ARZ3] and uranium/arsenaso3 [U(VI)-ARZ3] complex.

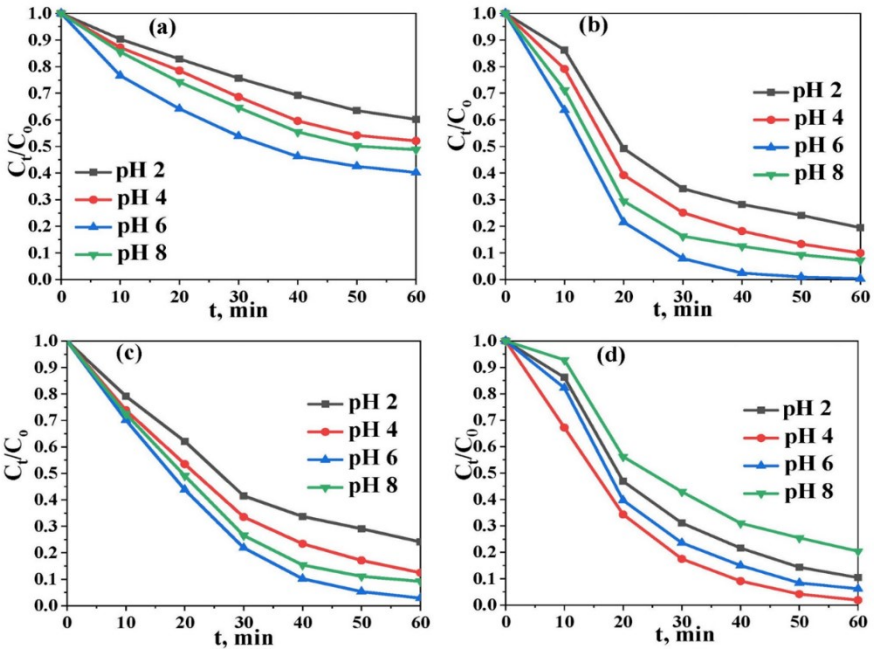

Fig. S2 The photocatalytic removal data using Co@TiO_2-C at varied pH values over a period of 60 min (v= 10 ml, m= 10mg) (a) 100 mgL^{-1} U(VI) aqueous solution, (b) 100 mgL^{-1} U(VI) in aqueous solution (10% ethanol), (c) 100 mgL^{-1} U(VI) + 50 mgL^{-1} arsenazo 3 and (d) 50 mgL^{-1} Arsenazo 3 in aqueous solution.

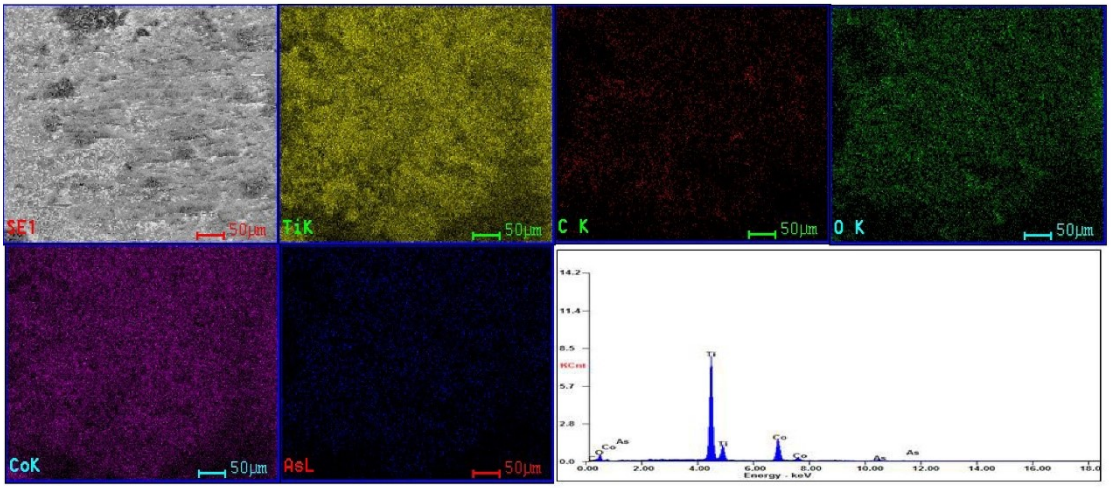

Fig. S3 SEM, EdX and element maping for ARZ3 degarded product

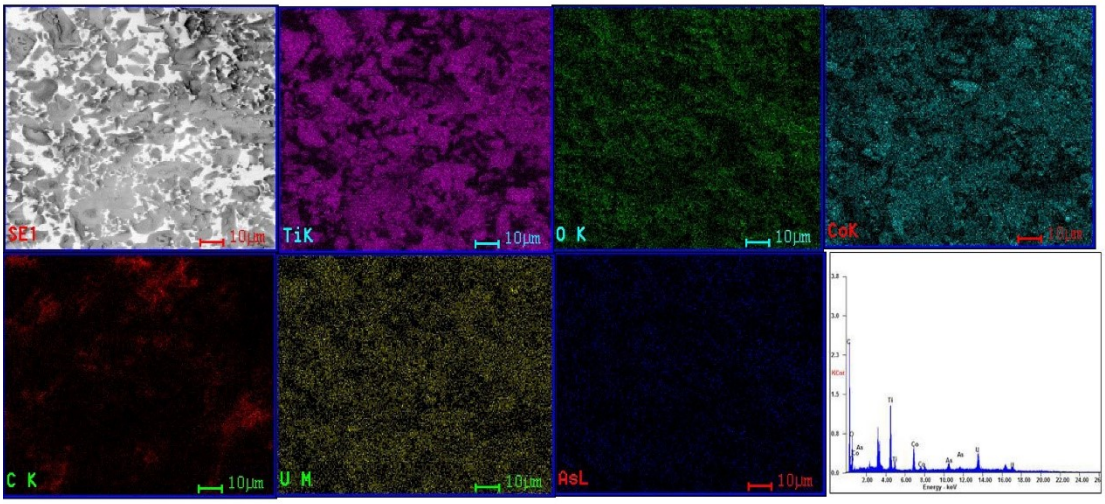

Fig. S4 SEM, EdX and element maping for U(VI)-ARZ3 complex degarded product.

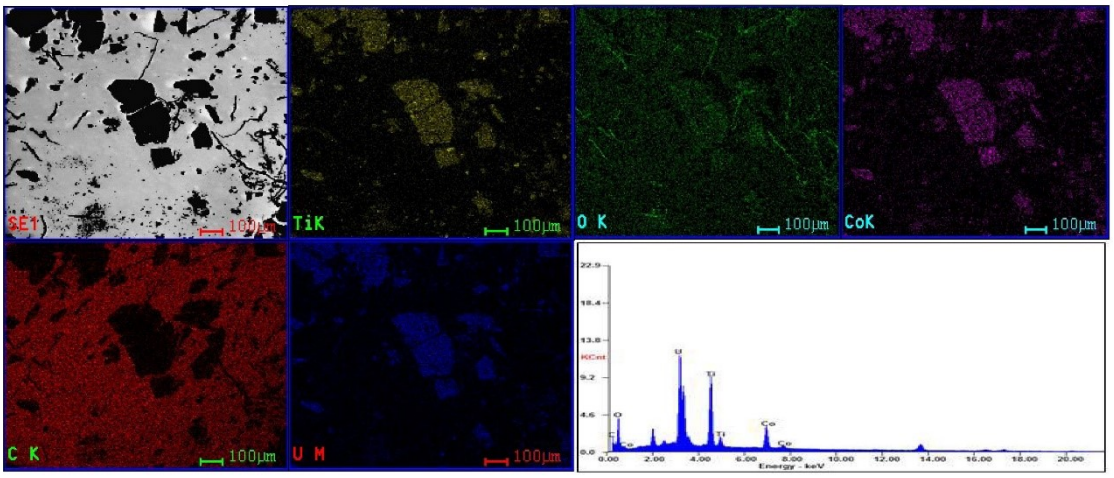

Fig. S5 SEM, EdX and element maping for uranium degarded product in 10% ethanol media.

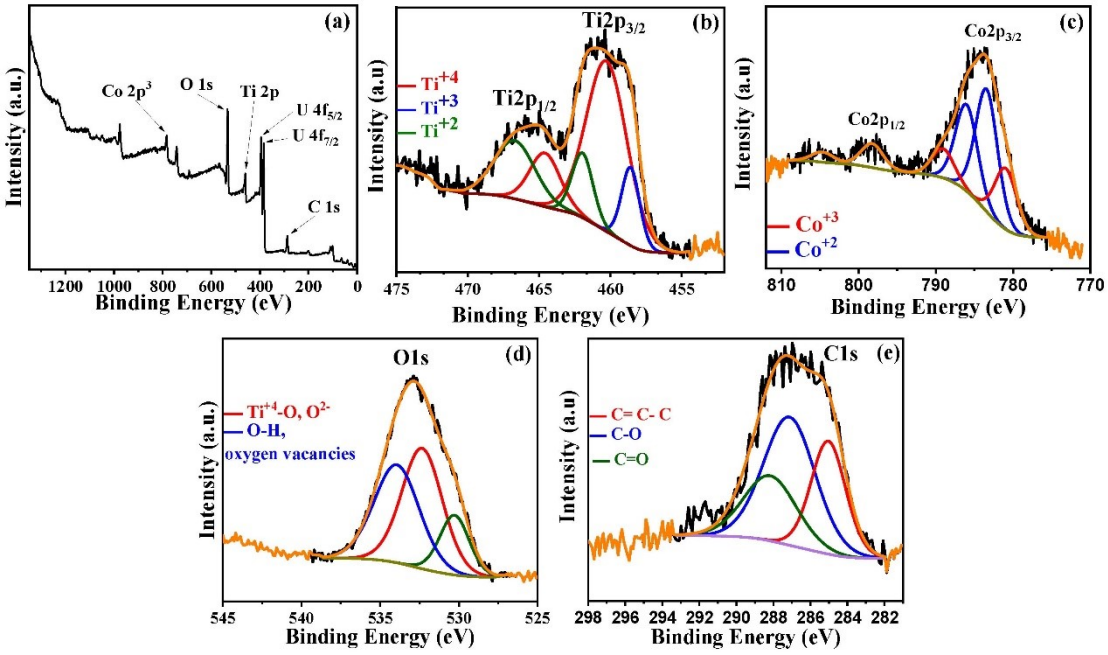

Fig. S6 : XPS spectra of Co@TiO_2-C after photocatalytic reduction of uranium in 10% ethanol. (a) Survey spectrum, (b) Ti 2p XPS spectra, (c) Co 2p XPS spectra, (d) O 1s XPS spectra and (e) C 1s XPS spectra.

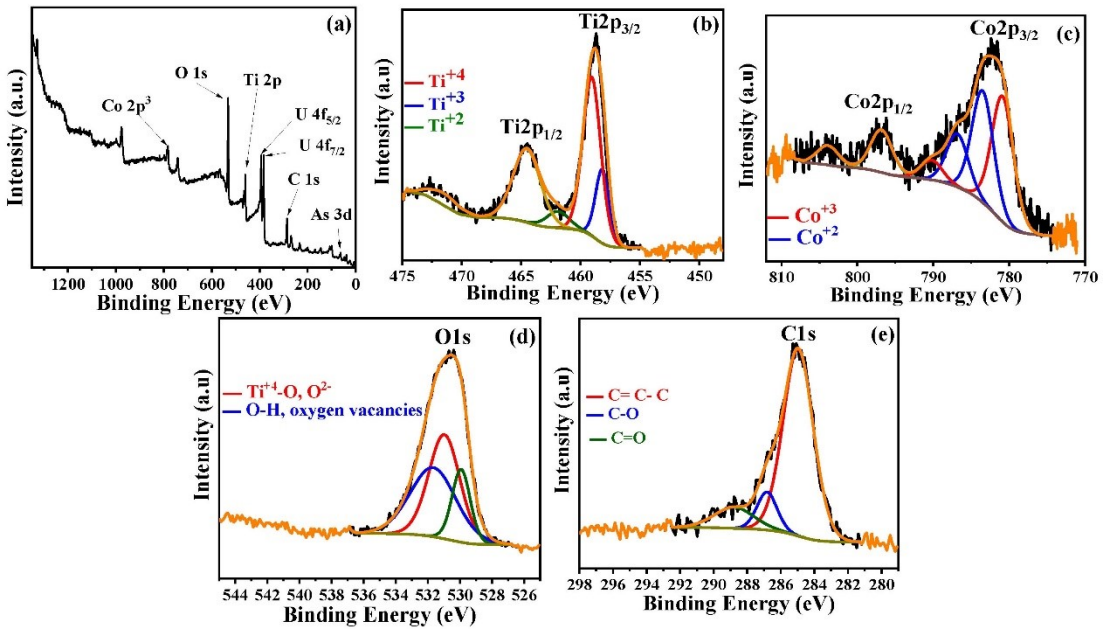

Fig. S7 : XPS spectra of Co@TiO_2-C after photocatalytic reduction of uranium in presence of arsenazo3. (a) Survey spectrum, (b) Ti 2p XPS spectra, (c) Co 2p XPS spectra, (d) O 1s XPS spectra and (e) C 1s XPS spectra.

Table S1: Pseudo- first-order parameters of Co@TiO_2-C catalysts (0.1 g of 100 mg/L U(VI) in 10 mL solution volum and (0.1 g of 50 mg/L arsenazo 3 in 10 mL solution volum.

pH	U(VI) in H_2O		U(VI) in 10% ethanol		U(VI)+Arsenazo3		Arsenazo3	
	K	R^2	K	R^2	K	R^2	K	R^2
2	8.6×10^{-3}	0.99	2.859×10^{-2}	0.95	2.458×10^{-2}	0.98	3.981×10^{-2}	0.99
4	1.136×10^{-2}	0.98	4.017×10^{-2}	0.97	3.57×10^{-2}	0.99	6.781×10^{-2}	0.99

6	1.151 x 10^{-2}	0.96	9.97 x 10^{-2}	0.99	6.155 x 10^{-2}	0.99	4.956x 10^{-2}	0.98
8	1.254 x 10^{-2}	0.97	4.579 x 10^{-2}	0.95	4.311 x 10^{-2}	0.98	2.839x 10^{-2}	0.98

Table S2: Comparison of photocatalytic efficiency of Co@TiO_2-C composites with other reported photocatalysts for uranium removal.

Catalyst	Active Compound Target	C_0 (mg/L)	Efficacy (%)	Time (min)	Ref.
ZIF-8/g-C_3N_4 (100mg)	(100 ml) U(VI)	10	90	60	[S1]
gC_3N_4/TiO_2 (200 mg)	(50 ml) U(VI)	10	99	30	[S2]
g-C_3N_4/$LaFeO_3$ (30 mg)	(15 ml) U(VI)	10	96.7	120	[S3]
mGO/g-C_3N_4 (50 mg)	(30 ml) U(VI)	20	96.02	30	[S4]
C_3N_5/RGO (10 mg)	(20 ml) U(VI)	10	94.9	100	[S5]
g-C_3N_4/TiO_2 (250 mg)	(100 ml) U(VI), As(III)	20 20	82.66%, 41.18%	240	[S6]
Sn-doped In_2S_3 (150 mg)	(100 ml) U(VI)	60	90	60	[S7]
Fe_2O_3-GO (400 mg)	(100 ml) U(VI)	5	76	180	[S8]
TiO_2(001) (200 mg)	(10 ml) U(VI)	24	100	180	[S9]
Ti_3C_2/$SrTiO_3$ (330 mg)	(60 ml) U(VI)	50	77	180	[S10]
Nb/TiNFs (200 mg)	(100 ml) U(VI)	50	46.5	240	[S11]
$ZnFe_2O_4$ (200 mg)	(12.5 ml) U(VI)	50	95	40	[S12]
Co/TiO_2@C (10 mg)	(10 ml) U(VI)	1000	96.4	60	This work
Co/TiO_2@C (10 mg)	(10 ml) U(VI)-ARZ3 complex	100 U(VI)/ 50 Arsenazo3	99.4	60	This work

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