Supplementing Information

Combined oxidation and *in-situ* coagulation in iron-activated sulfite process for tribromophenol removal in actual water matrix

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Captions:

Test S1 Tribromophenol detection method

The tribromophenol was achieved using liquid chromatography (LC) with an Agilent HC-C18 column (5 μm, 250 mm × 4.6 mm) operated at a column temperature of 25 °C, with a detection wavelength set at 290 nm and an injection volume of 50 μL. The mobile phase, comprising methanol, ultrapure water, and glacial acetic acid in a volume ratio of 85:15:1, respectively, facilitated precise separation and detection of tribromophenol compounds.

Tab. S1 Water quality parameters

parameter	unit	lake water	secondary sedimentation tank effluent
turbidity	NTU	19.8	2.22
pH	—	8.02	7.53
UV_{254}	cm^{-1}	0.078	0.089
DOC	mg/L	9.45	7.95

Tab. S2 XPS peak area ratios of different elements

Type	Characteristic peaks	Lake water (eV)		Ratio/%		Secondary sedimentation tank effluent (eV)		Ratio/%	
		Fe(III)/ Na_2SO_3	**Fe(III)**	**Fe(III)/ Na_2SO_3**	**Fe(III)**	**Fe(III)/ Na_2SO_3**	**Fe(III)**	**Fe(III)/ Na_2SO_3**	**Fe(III)**
Fe 2p	Fe(II)	710.6	710.6	29.32	21.90	710.7	710.6	27.12	19.50
		724.0	724.0	12.85	9.52	724.1	723.9	11.86	8.50
	Fe(III)	712.0	712.0	40.16	47.62	712.1	712.0	42.37	50.00
		725.7	725.7	17.67	20.95	725.6	725.6	18.64	22.00
O 1s	Fe–O	530.0	530.0	12.16	9.42	530.2	530.0	21.62	12.14
	Fe–OH	531.2	531.2	39.22	18.83	531.1	530.9	30.03	21.84
	C=O	532.0	532.0	27.84	44.84	531.9	531.9	21.02	48.54
	C–O	532.9	532.9	20.78	26.91	533.0	533.2	27.33	17.48

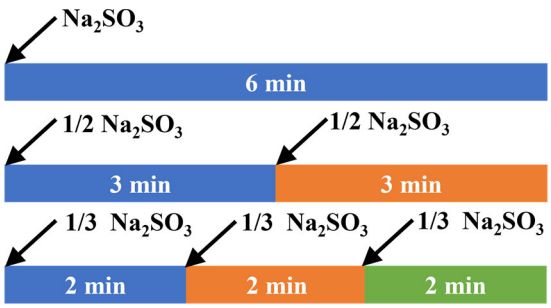

Fig. S1 Batch addition of S(IV) experimental procedure schematic

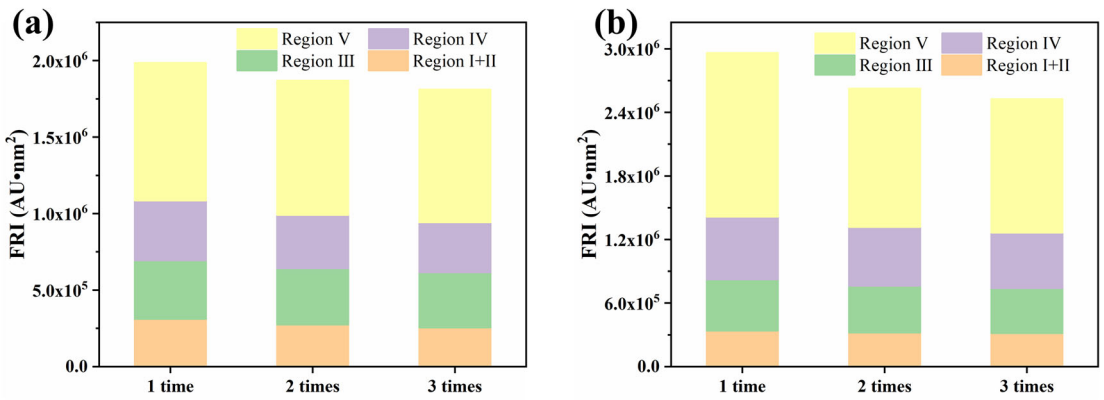

Fig. S2 Effects of the addition times of S(IV) on the removal of fluorescent organic matter in lake water (a) and secondary sedimentation tank effluent (b). Conditions: $[TBP]_0$ = 10 μM, $[Fe(III)]_0$ = 100 μM, $[S(IV)]_{Total}$ = 400 μM, initial pH 4.0, temperature 25 ± 1 °C.

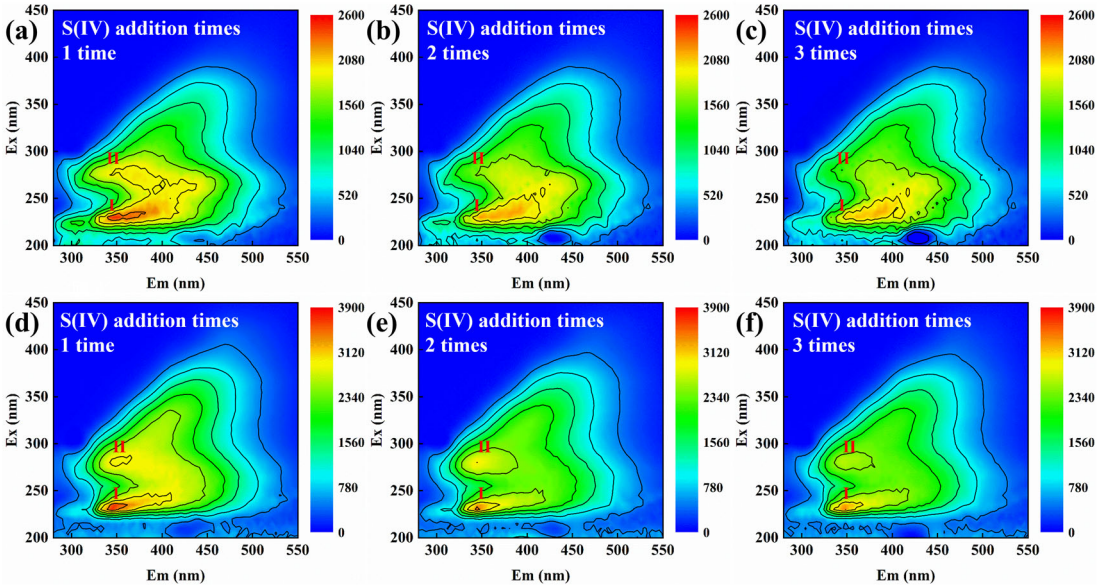

Fig. S3 Effects of S(IV) addition times on fluorescent organic matter removal in lake water (a-c) and secondary sedimentation tank effluent (d-f). Conditions: $[TBP]_0$ = 10 μM, $[Fe(III)]_0$ = 100 μM, $[S(IV)]_{Total}$ = 400 μM, initial pH 4.0, temperature 25 ± 1 °C.

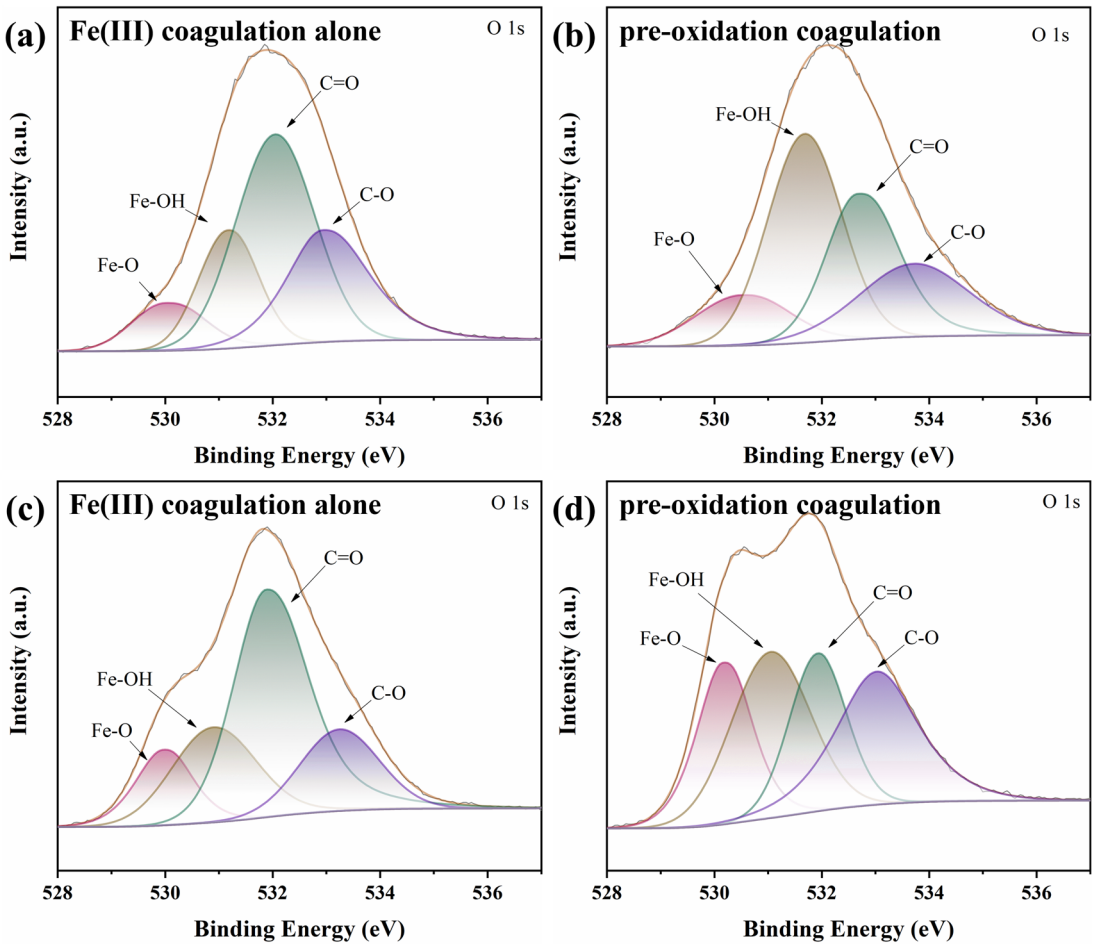

Fig. S4 XPS spectra of O 1s in flocs after treatment by Fe(III) coagulation alone and combined pre-oxidation and coagulation process of Fe(III)/S(IV) in lake water (a-b) and secondary sedimentation tank effluent (c-d). Conditions: $[TBP]_0$ = 10 μM, $[Fe(III)]_0$ = 100 μM, $[S(IV)]_{Total}$ = 400 μM, initial pH 4.0, the S(IV) addition times was 2, temperature 25 ± 1 °C.

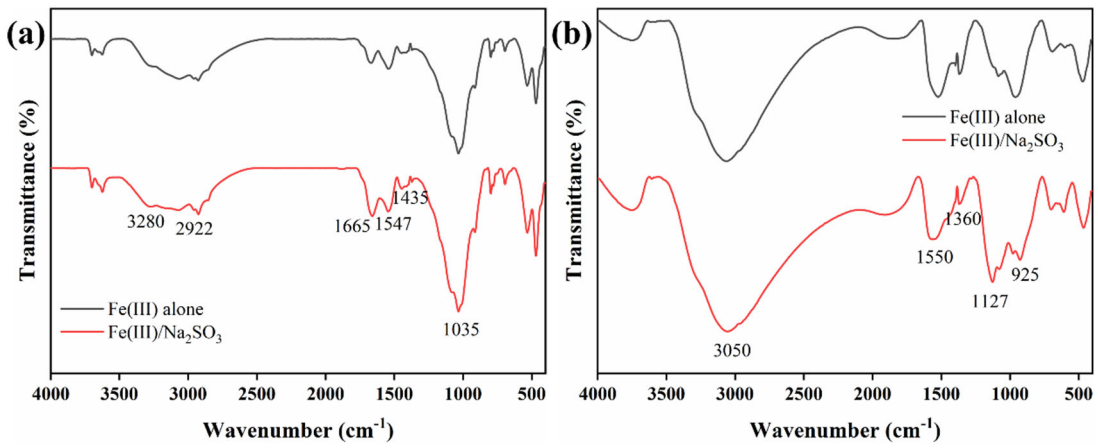

Fig. S5 FTIR spectra of flocs derived from Fe(III) coagulation alone and combined pre-oxidation and coagulation of Fe(III)/S(IV) in lake water (a) and secondary sedimentation tank effluent (b). Conditions: $[TBP]_0$ = 10 μM, $[Fe(III)]_0$ = 100 μM, $[S(IV)]_{Total}$ = 400 μM, initial pH 4.0, the S(IV) addition times was 2, temperature 25 ± 1 °C.

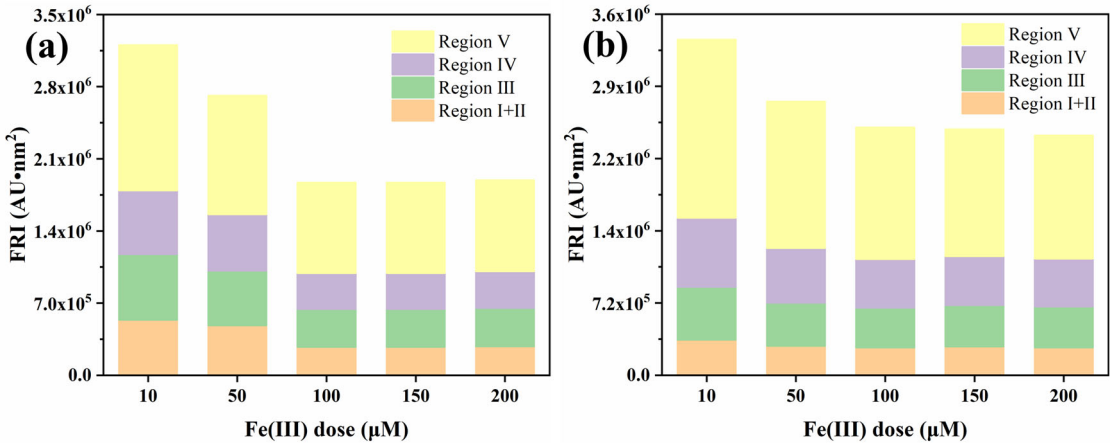

Fig. S6 Effects of initial Fe(III) dosage on the removal of fluorescent organic matter in lake water (a) and secondary sedimentation tank effluent (b). Conditions: $[TBP]_0$ = 10 μM, $[S(IV)]_{Total}$ = 400 μM, initial pH 4.0, the S(IV) addition times was 2, temperature 25 ± 1 °C.

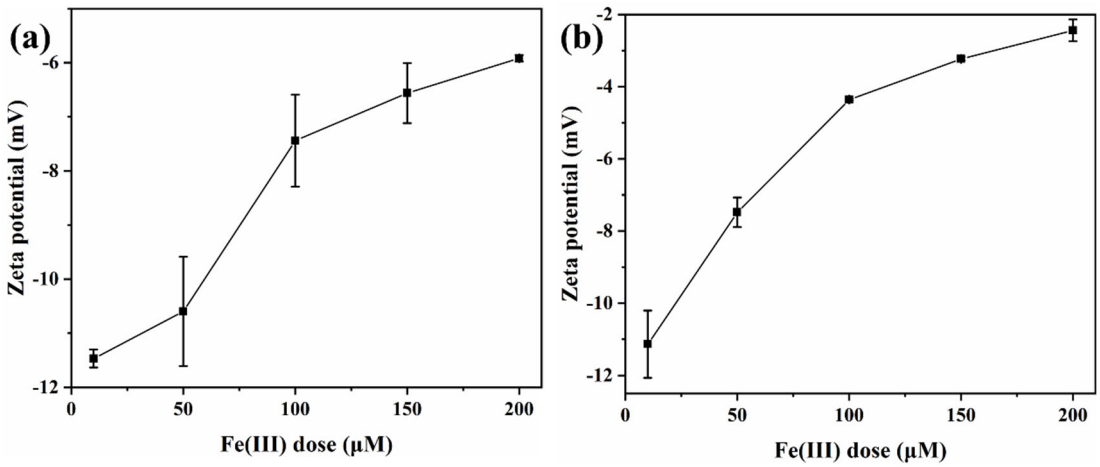

Fig. S7 Effects of Fe(III) concentration on zeta potential values in lake water (a) and secondary sedimentation tank effluent (b). Conditions: $[TBP]_0$ = 10 μM, $[S(IV)]_{Total}$ = 400 μM, initial pH 4.0, the S(IV) addition times was 2, temperature 25 ± 1 °C.

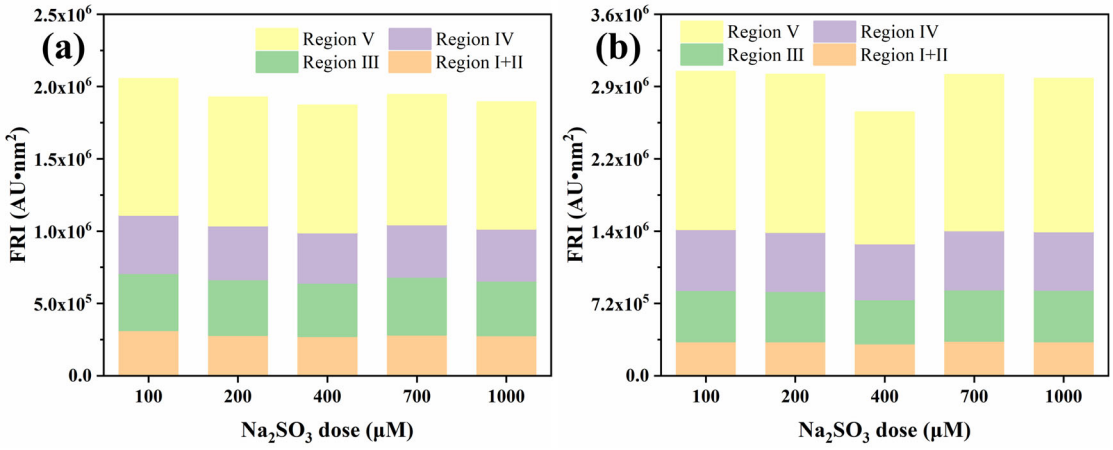

Fig. S8 Effects of initial S(IV) dosage on the removal of fluorescent organic matter in lake water (a) and secondary sedimentation tank effluent (b). Conditions: $[TBP]_0$ = 10 μM, $[Fe(III)]_0$ = 100 μM, initial pH 4.0, the S(IV) addition times was 2, temperature 25 ± 1 °C.

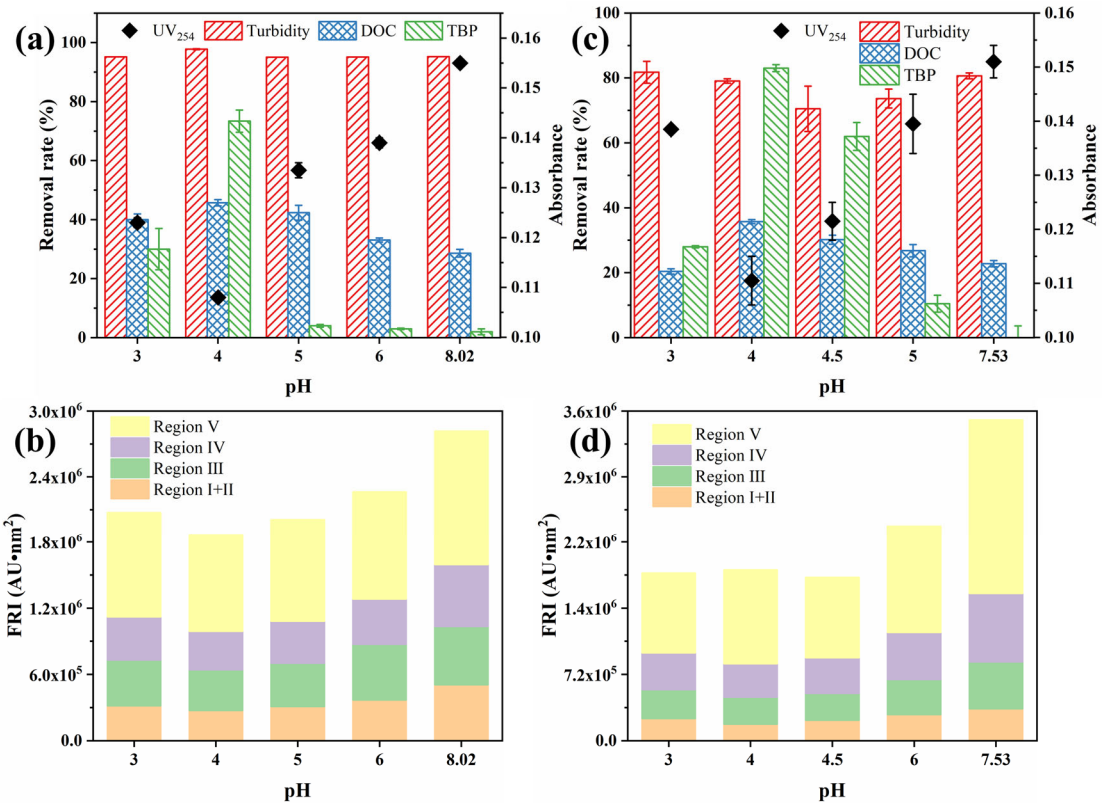

Fig. S9 Effects of initial pH on the removal of turbidity, DOC, TBP, UV_{254} and fluorescent organic matter in lake water (a-b) and secondary sedimentation tank effluent (c-d). Conditions: $[TBP]_0$ = 10 μM, $[Fe(III)]_0$ = 100 μM, $[S(IV)]_{Total}$ = 400 μM, initial pH 4.0, the S(IV) addition times was 2, temperature 25 ± 1 °C.