Supplementary Materials of

Synergistic effects of sodium hypochlorite disinfection and iron-oxidizing bacteria on early corrosion in cast iron pipes

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Table S1 Characteristics of test water

Parameter	Value
pH	7.82
Turbidity (NTU)	< 1
Conductivity (μs/cm)	315
TDS (mg/L)	156.3
Temperature (°C)	26
AOC (μg/L)	128
TOC (mg/L)	0.95
Total Fe (mg/L)	< 0.05
Cu (mg/L)	< 0.01
Ca (mg/L)	18.07
Mg (mg/L)	3.77
Al (mg/L)	0.01
Mn (mg/L)	< 0.01
Hardness (mg/L, as $CaCO_3$)	105.1
Alkalinity (mg/L, as $CaCO_3$)	80.08

Table S2 The polarization curve parameters of cast iron electrodes at 7 d

Sample	Voltage (V)	Current (μA)	Anode slope (mV/dec)	Cathode slope (mV/dec)
A	-0.301	14.72	12.56	9.95
B	-0.313	14.60	12.51	10.25
C	-0.349	13.85	12.92	11.19
D	-0.359	13.40	14.08	8.89

Note: Sample A, B, C, D represent the electrodes with the NaOCl of 0, 0.25, 0.50, and 0.75 mg/L.

Table S3 The EIS parameters of cast iron electrodes with NaOCl.

	Time (h)	0	24	48	72	96	120	144
	R_u ($\Omega \cdot cm^2$)	106.7	107.7	109.3	102.6	108.8	101.4	103.5
A	C_d ($F \cdot cm^2$)	4.468	7.343	8.035	8.855	7.459	9.681	7.871
	R_{ct} ($\Omega \cdot cm^2$)	195.6	493.3	561.1	696.2	578.3	570.3	508.4
	R_u ($\Omega \cdot cm^2$)	103.2	102.1	104.1	108.2	109.2	106.2	100.1
B	C_d ($F \cdot cm^2$)	6.10E-11	2.88E-04	8.15E-09	4.15E-09	1.89E-07	5.50E-09	1.38E-04
	R_{ct} ($\Omega \cdot cm^2$)	4003	250.6	281.6	327.3	71.87	61.27	89.51
	R_u ($\Omega \cdot cm^2$)	105.6	107.5	108.8	106.3	109.2	105.9	105.6
C	C_d ($F \cdot cm^2$)	5.24E-11	1.97E-04	4.70E-04	2.38E-07	1.89E-07	2.64E-07	1.91E-07
	R_{ct} ($\Omega \cdot cm^2$)	3794	266.4	281.8	92.54	71.87	125	80.58
	R_u ($\Omega \cdot cm^2$)	104.3	103.6	104.3	102.9	108.2	103.5	105.6
D	C_d ($F \cdot cm^2$)	3.21E-11	2.56E-09	2.85E-09	4.29E-09	1.78E-08	6.24E-08	1.34E-07
	R_{ct} ($\Omega \cdot cm^2$)	4012	448.3	261.8	200.7	90.72	67.6	57.85

Table S4 The EIS parameters of cast iron electrodes with IOB.

Parameters / Time (h)	Initial impedance (Ω)	Final impedance (Ω)	Reduction rate
24	5153	1219	0.763
48	15590	13530	0.132
72	17680	433.8	0.975
96	28420	330.5	0.988
120	92810	165.2	0.998
144	14320	369.4	9.974

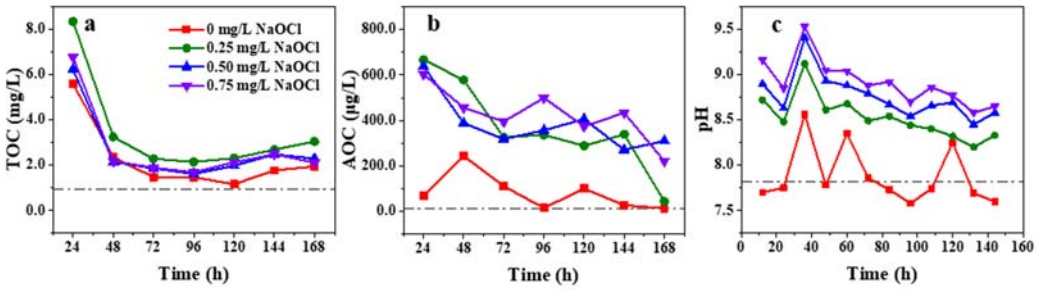

Fig. S1 Concentrations of (a) TOC and (b) AOC, and (c) the pH value during the experiment by NaOCl dosage. Dashed line represents the original water condition.

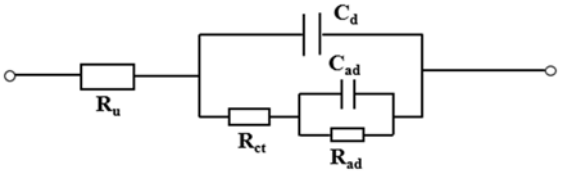

Fig. S2 Electrical equivalent circuit used to fit the impedance spectra. In the circuit, R_u is the electrolyte resistance, C_d represents the corrosion capacitance, R_{ct} is the film resistance, C_{ad} corresponds to the double layer capacitance, and R_{ad} is the Faradaic impedance.

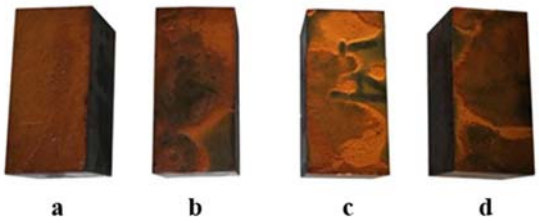

Fig. S3 The morphology of corrosion scale on the test pieces with different NaOCl dosages (a. 0, b. 0.25, c. 0.50, and d. 0.75 mg/L) after 168 h of stagnation.

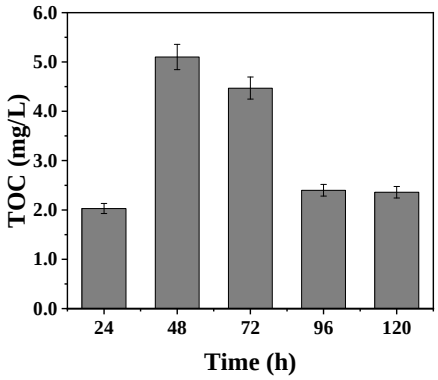

Fig. S4 The concentration of TOC during the test period with IOB.

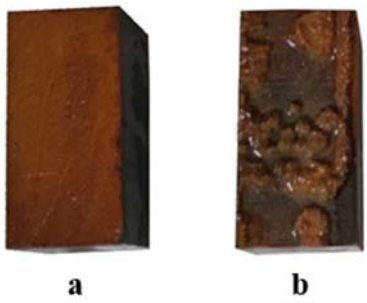

Fig. S5 The morphology of corrosion scale on test pieces with IOB.

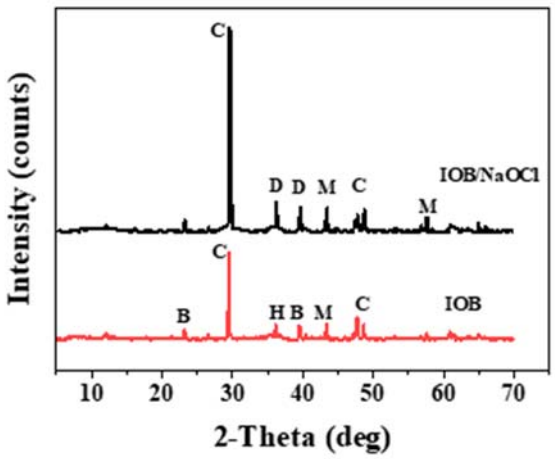

Fig. S6 X-ray diffraction (XRD) pattern of the corrosion scale on the surface of cast iron specimens with IOB merely and with IOB/NaOCl (B: brownmillerite, C: calcite, D: dolomite, H: Hematite, M: magnetite).

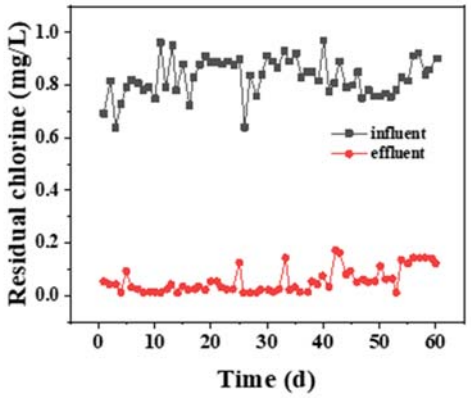

Fig. S7 Concentrations of residual chlorine in the influent and effluent in BAR during the test period.

Fig. S8 Photographs of coupons in BAR during the test period. (a), (b), (c) and (d) were taken in week 2, 4, 6, and 8.

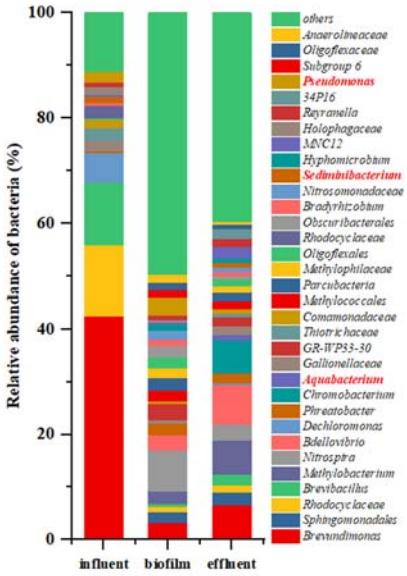

Fig. S9 Bacterial community profiles of the effluent, influent and biofilm samples at the class level. The total relative amounts of IOB (including *Pseudomonas, Sediminibacterium, Aquabacterium*) were 3.366%, 3.219%, 1.414% in biofilm, influent, and effluent, respectively.