

Supplementary Information

Freezing-enhanced chlorination of organic pollutants for water treatment

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5 pages, 6 Fig.s, 1 Table

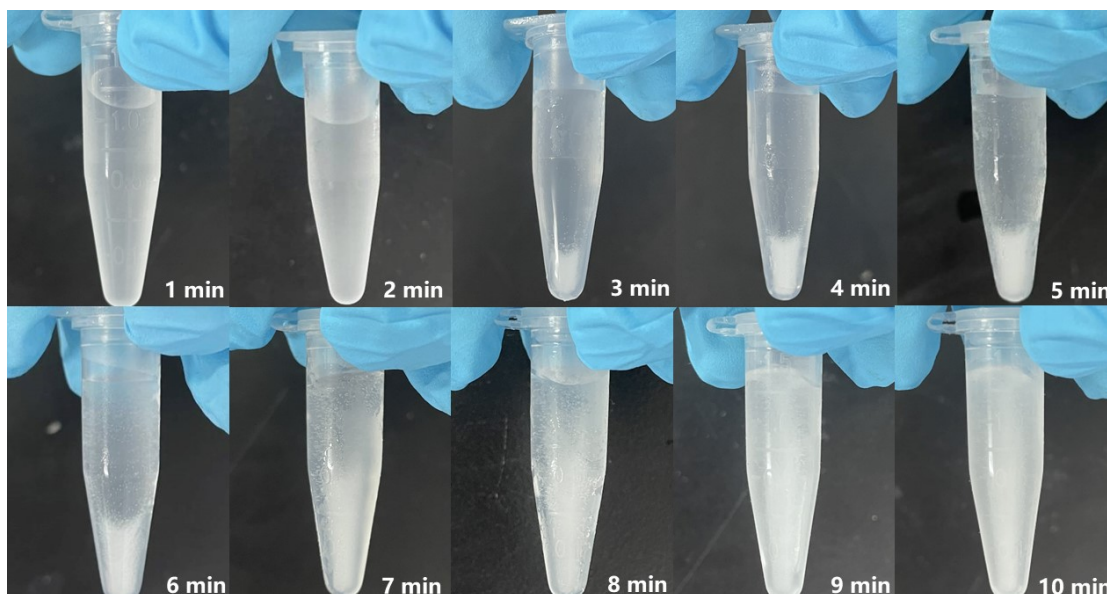


Fig. S1. Degree of solidification of the solution containing NaClO and CA in the first 10 minutes. Experimental conditions were as follows: Experimental conditions: $[\text{NaClO}] = 52 \mu\text{M}$, $[\text{CA}] = 20 \mu\text{M}$, pH 4 and freezing temperature = $-20 \text{ }^\circ\text{C}$.

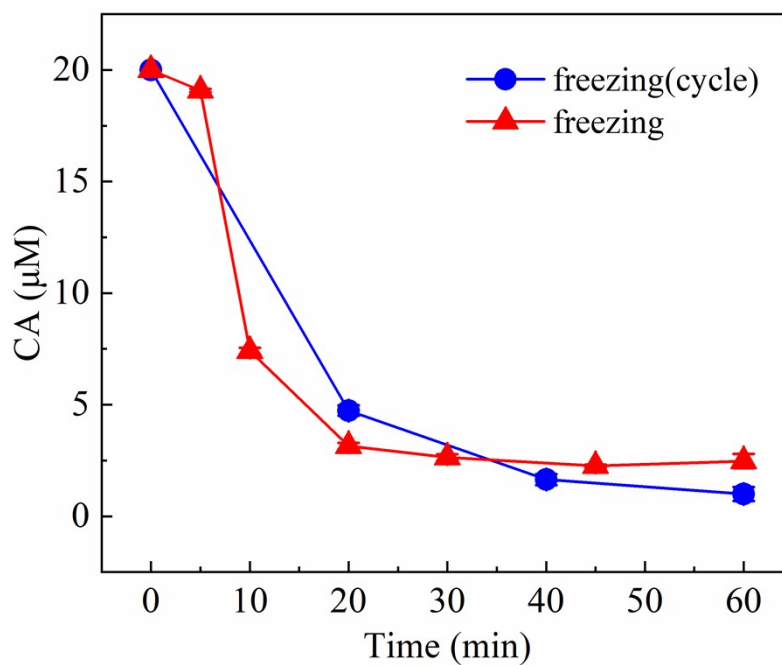


Fig. S2. Comparison of CA degradation by chlorine during freezing for 60 min and that under three repeated freezing-thaw cycles (each cycle lasting 20 minutes). Experimental conditions: $[\text{NaClO}] = 52 \mu\text{M}$, $[\text{CA}] = 20 \mu\text{M}$, pH 3, and freezing temperature = $-20 \text{ }^\circ\text{C}$.

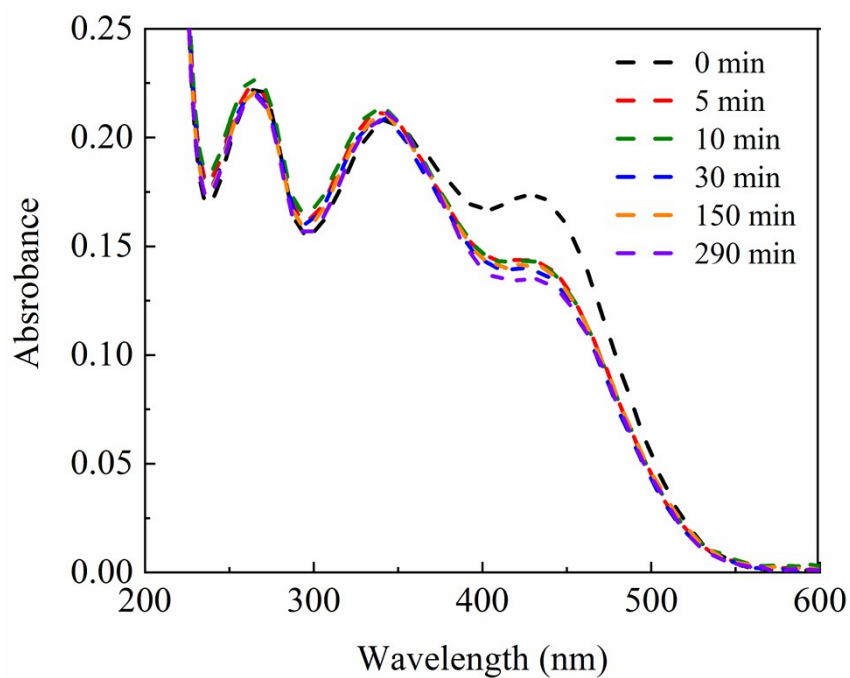


Fig. S3. The UV-vis absorption spectra of CR during the freezing procedure was monitored over a time span ranging from 0 to 290 minutes with the presence of Chlorine. Experimental conditions: $[\text{NaClO}] = 52 \mu\text{M}$, $[\text{CR}] = 20 \mu\text{M}$, $[\text{CA}] = 20 \mu\text{M}$, and freezing temperature = $-20 \text{ }^\circ\text{C}$.

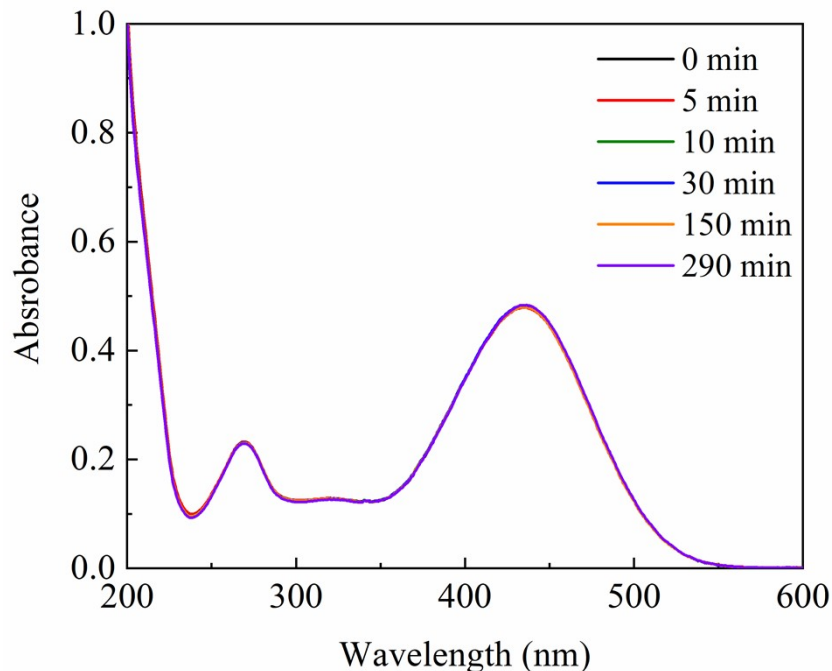


Fig. S4. The UV-vis absorption spectra of CR during the freezing procedure was monitored over a time span ranging from 0 to 290 minutes with the absence of Chlorine. Experimental conditions: $[\text{CR}] = 20 \mu\text{M}$, $[\text{CA}] = 20 \mu\text{M}$, and freezing temperature = $-20 \text{ }^\circ\text{C}$.

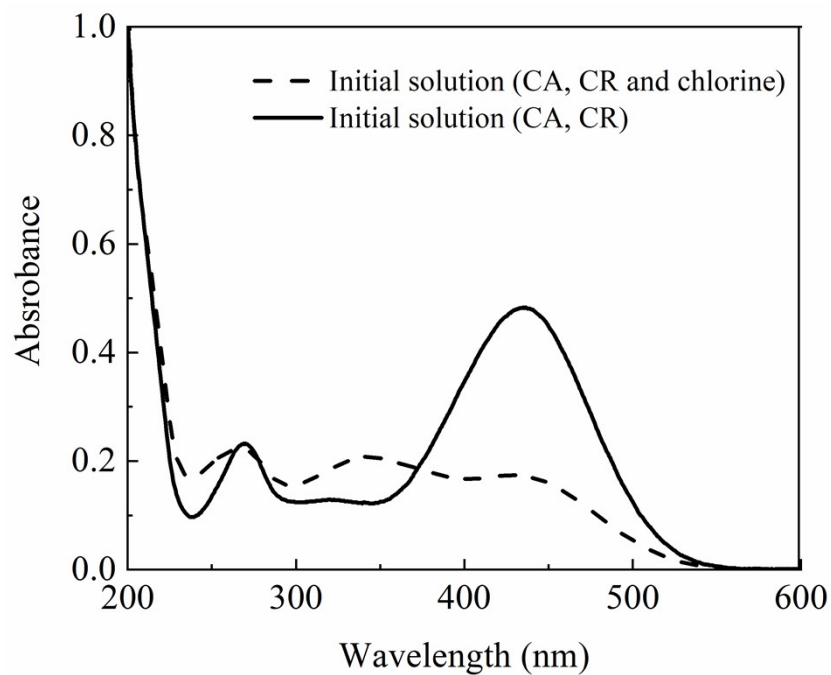


Fig. S5. The UV-vis absorption spectra of initial solution was been compared, which included CA and CR, under two distinct conditions: in the presence of chlorine and in its absence. Experimental conditions: $[CR] = 20 \mu\text{M}$, $[CA] = 20 \mu\text{M}$, and freezing temperature = $-20 \text{ }^\circ\text{C}$.

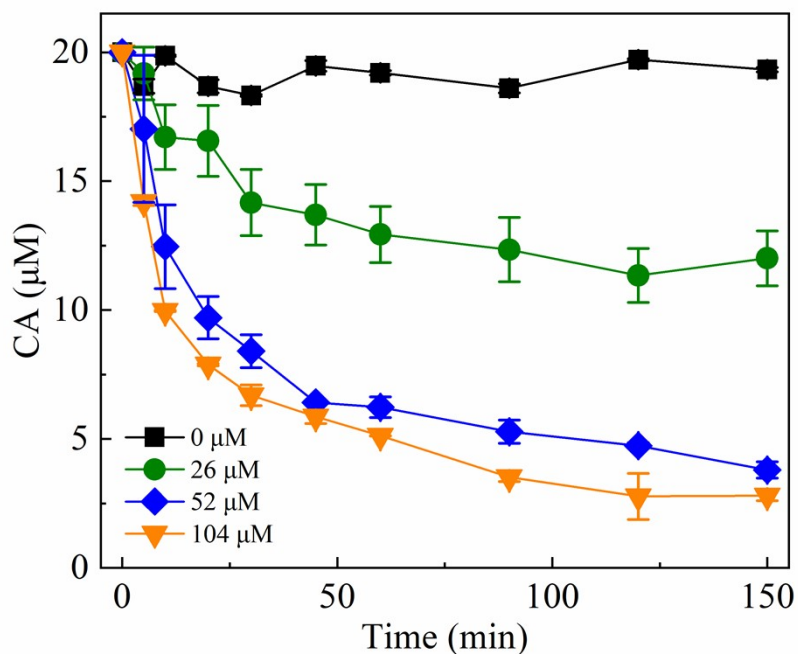


Fig. S6. Effect of NaClO concentration on the NaClO-mediated degradation of CA during freezing. Experimental conditions: $[\text{NaClO}] = 0\text{-}104 \mu\text{M}$, $[CA] = 20 \mu\text{M}$, pH 3, and freezing temperature = $-20 \text{ }^\circ\text{C}$.

Table S1. The detailed HPLC method of DMOB, PE, CBZ and CA.

Contaminants	Mobile Phase (v/v)	Wavelength
DMOB	water/acetonitrile=40/60	286 nm
PE	water/methanol=30/70	270 nm
CBZ	water/acetonitrile=40/60	280 nm
CA	water/acetonitrile(contain 0.1% formic acid)=60/40	230 nm