

Supplementary Information

Ti₂O₃ film electrode for water treatment via electrochemical chlorine evolution

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Figure S1. FT-IR spectrum of 400EC30

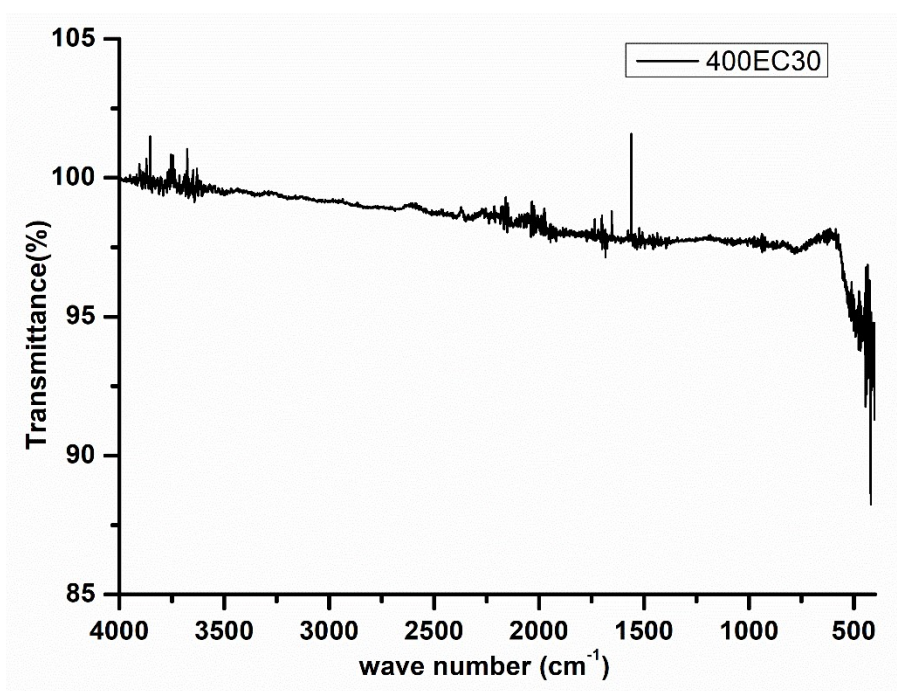


Figure S2. SEM images of (a) 450EC60 (b) 500EC30 (c) 500EC60

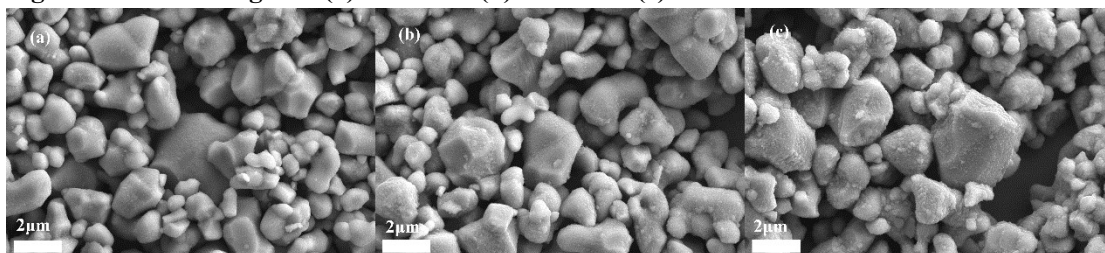


Figure S3. linear fit of DPD reagent UV absorption and NaClO concentration

Linear fit: $y=2553.74x$

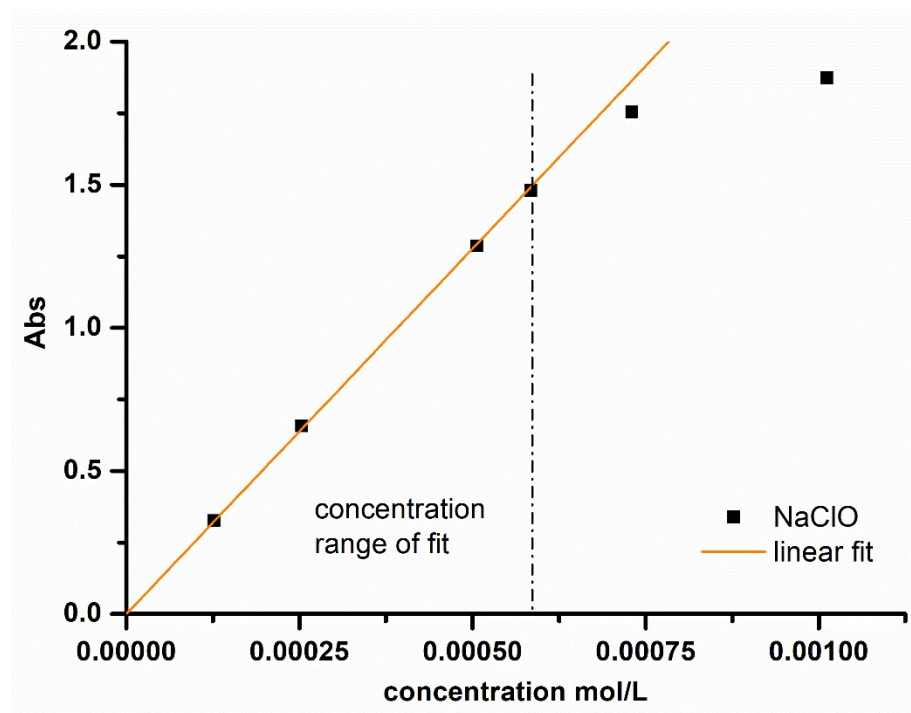
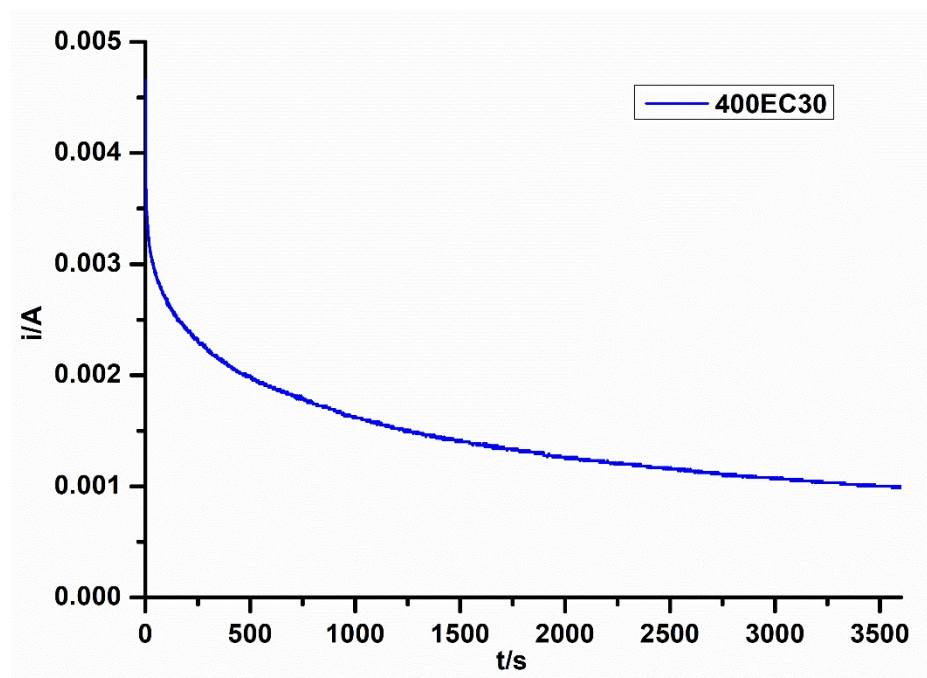


Figure S4. Current during free chlorine capture test of 400EC30



Example calculation of Faradaic yield:

The current during free chlorine capture test of 400EC30 was shown in Figure S4.

Calculate the area under curve ($0 \leq x \leq 3600$ s) by integration calculation. The value is the total charge which have gone through the electrode. For 400EC30, 5.29 C of charge have gone through it in 1 h.

The free chlorine concentration (5.56×10^{-4} mol/L) was calculated from the UV-vis spectra data.

The amount of substance of free chlorine (calculated as ClO^-):

$$n_{\text{ClO}^-} = c_{\text{ClO}^-} \times V_{\text{cell}} = 5.56 \times 10^{-4} \text{ mol} \cdot \text{L}^{-1} \times 0.025 \text{ L} = 1.39 \times 10^{-5} \text{ mol}$$

Charge used to produce free chlorine: (F is Faraday constant)

$$q_{\text{ClO}^-} = 2 \times n_{\text{ClO}^-} \times F = 2 \times 1.39 \times 10^{-5} \text{ mol} \times 96485 \text{ C} \cdot \text{mol}^{-1} = 2.68 \text{ C}$$

Faradaic yield:

$$\gamma = \frac{q_{\text{ClO}^-}}{q} \times 100\% = 50.7\%$$

Electrocatalytic tests

Pre-testing was carried out using Ti_2O_3 electrode and MO+KCl electrolyte in order to find a time for comparison between different electrocatalytic tests. Over 90% of MO was degraded after 1.5h, so times of all tests were then fixed to 1.5h.

The light absorption at characteristic absorption peak of MO/TC in UV-vis spectra is proportional to the concentration of MO/TC. The degradation efficiency (percentage) is calculated by the ratio of concentration before and after the test.

$$\frac{C}{C_0} = \frac{A}{A_0}$$

where C_0 is the concentration before the test, C is the concentration after the test, A_0 is the absorbance before the test, A is the absorbance after the test.

Table S1. Original UV-vis absorption data of MO degradation tests

Time (min)	UV-vis Absorption		
	400EC30-KCl	FTO-KCl	400EC30- Na_2SO_4
0	1.59	1.524	1.231
30	0.547	0.989	1.152
60	0.116	0.772	1.04
90	0.034	0.566	0.952

Table S2. Original UV-vis absorption data of TC degradation tests

Time (min)	UV-vis Absorption		
	400EC30-KCl	FTO-KCl	400EC30- Na_2SO_4
0	0.423	0.432	0.438
30	0.207	0.286	0.373
60	0.132	0.218	0.363

90	0.093	0.167	0.34
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