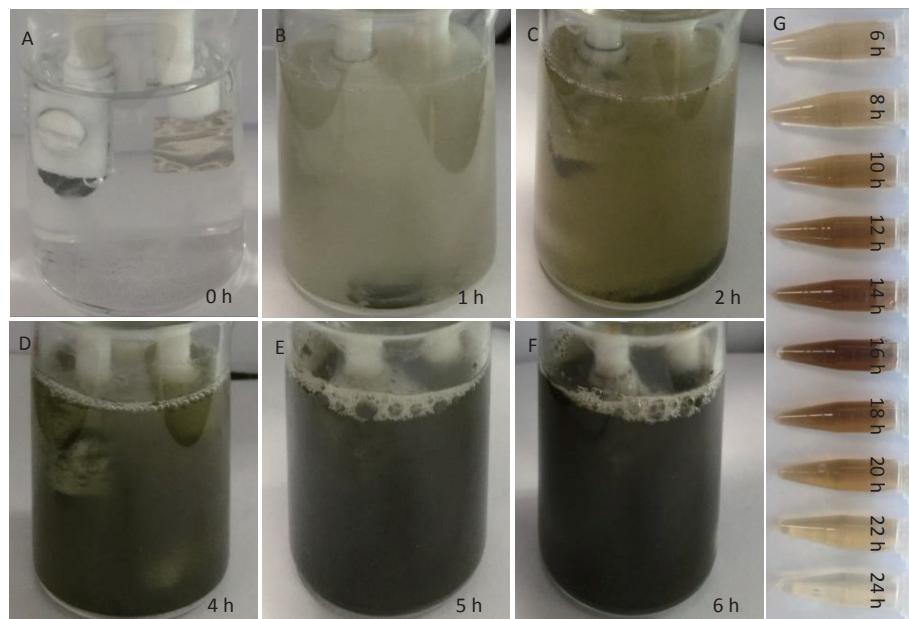
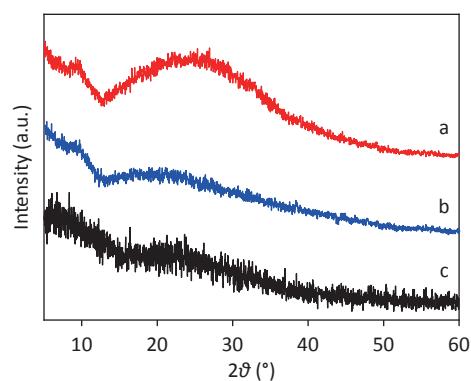


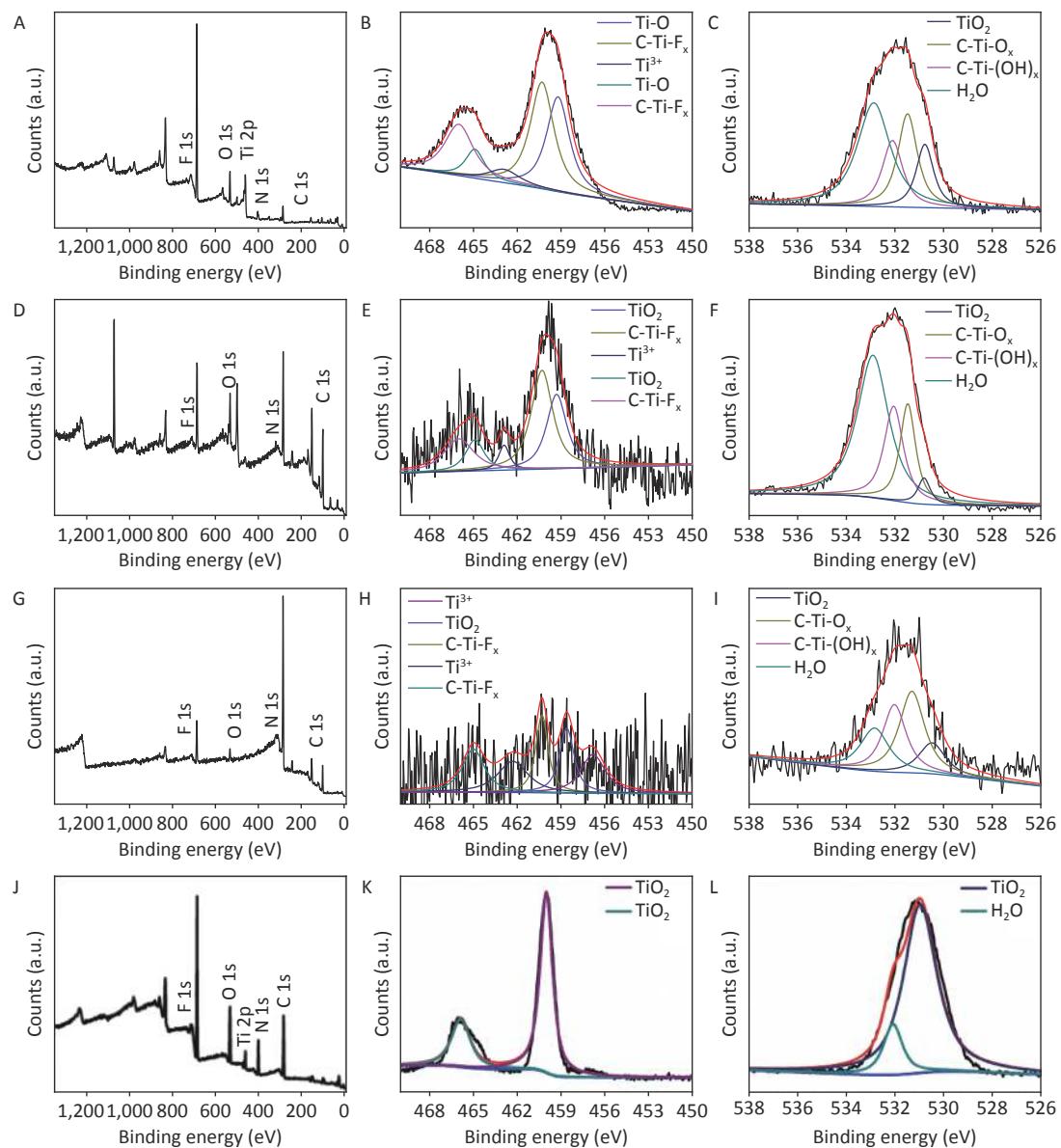
Supplementary Figure S1. The installation of positive electrode.



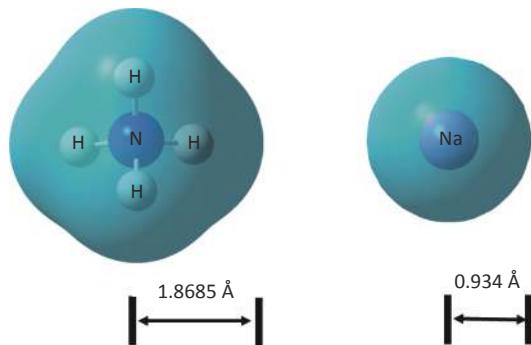
Supplementary Figure S2. Photographs of the reaction mixtures from the EC generation process at different time periods: (A) 0 h, (B) 1 h, (C) 2 h, (D) 4 h, (E) 5 h, and (F) 6 h, respectively; (G) The photographs of the supernatant upon different electrolytic time.



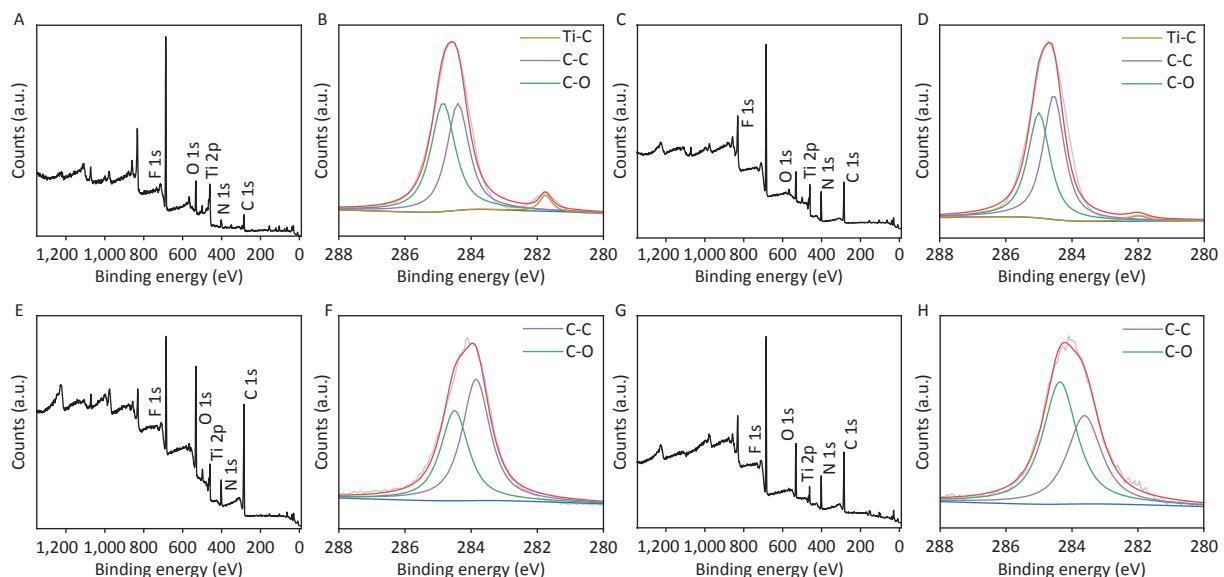
Supplementary Figure S3. XRD patterns of (a) CDCs- NH_4HF_2 -6h, (b) CDCs- NaHF_2 -6h, (c) CDCs- NH_4F -6h, respectively.



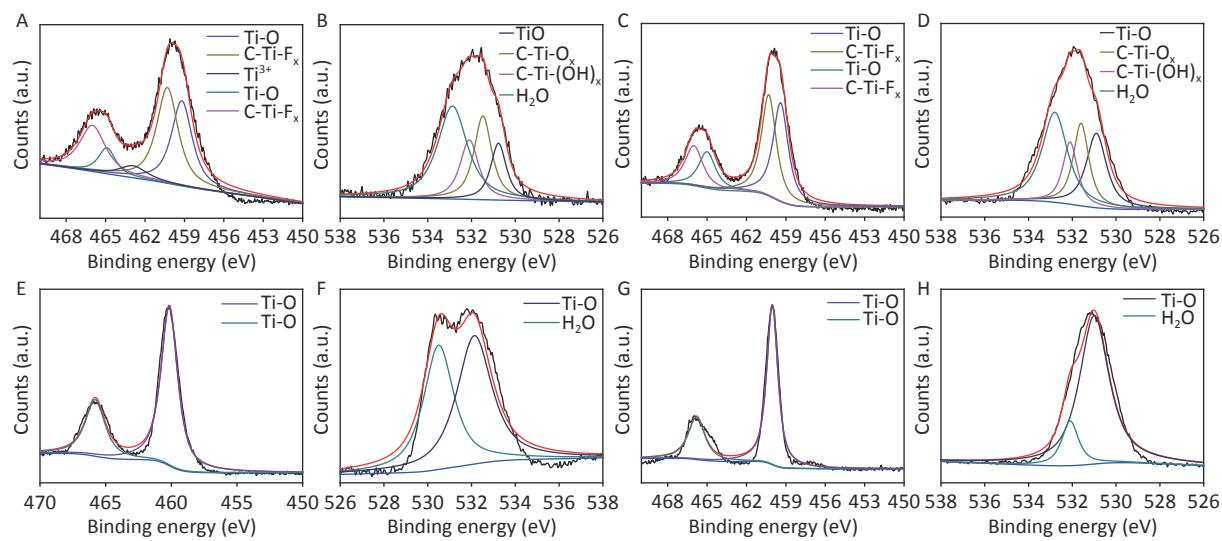
Supplementary Figure S4. The survey XPS spectra (A, D, and G), the narrow scan spectra of Ti 2p (B, E, and H) and O 1s (C, F, and I) of the CDCs-NH₄HF2-6h, CDCs-NaHF2-6h, and CDCs-NH₄F-6h, respectively.



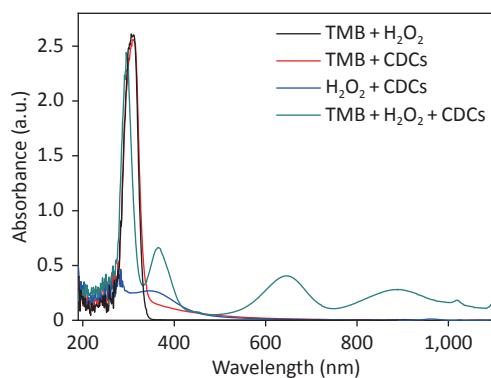
Supplementary Figure S5. The cation radius of NH_4^+ and Na^+ .



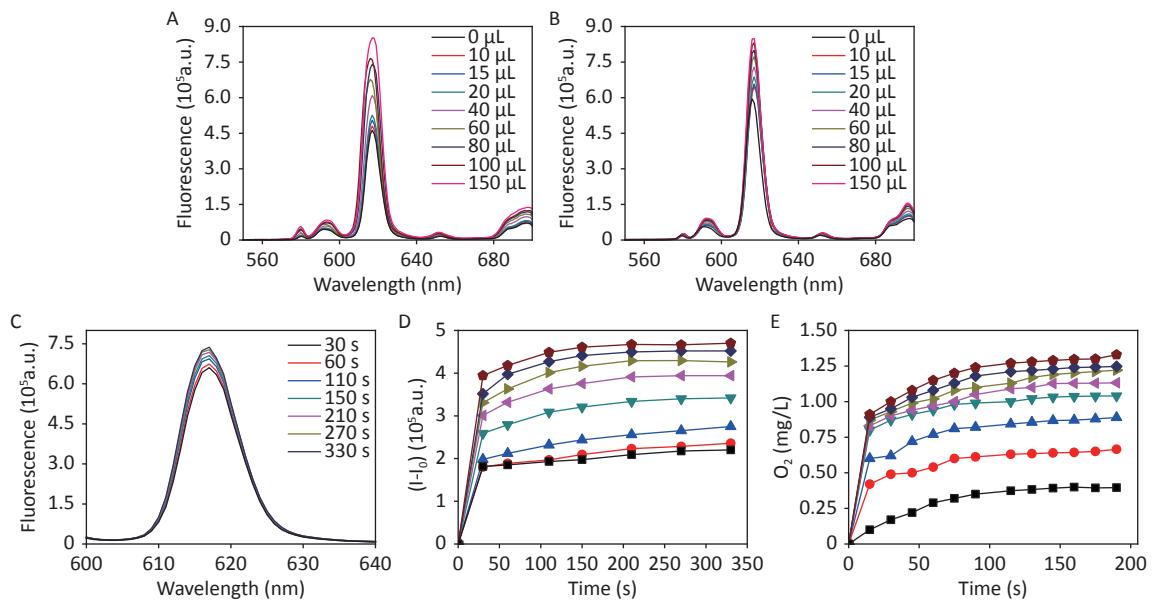
Supplementary Figure S6. The survey XPS spectra (A, C, E, and G) and the narrow scan spectra of C 1 s (B, D, F, and H) of the CDCs- $\text{NH}_4\text{HF2-6h}$, CDCs- $\text{NH}_4\text{HF2-10h}$, CDCs- $\text{NH}_4\text{HF2-16h}$, and CDCs- $\text{NH}_4\text{HF2-20h}$, respectively.



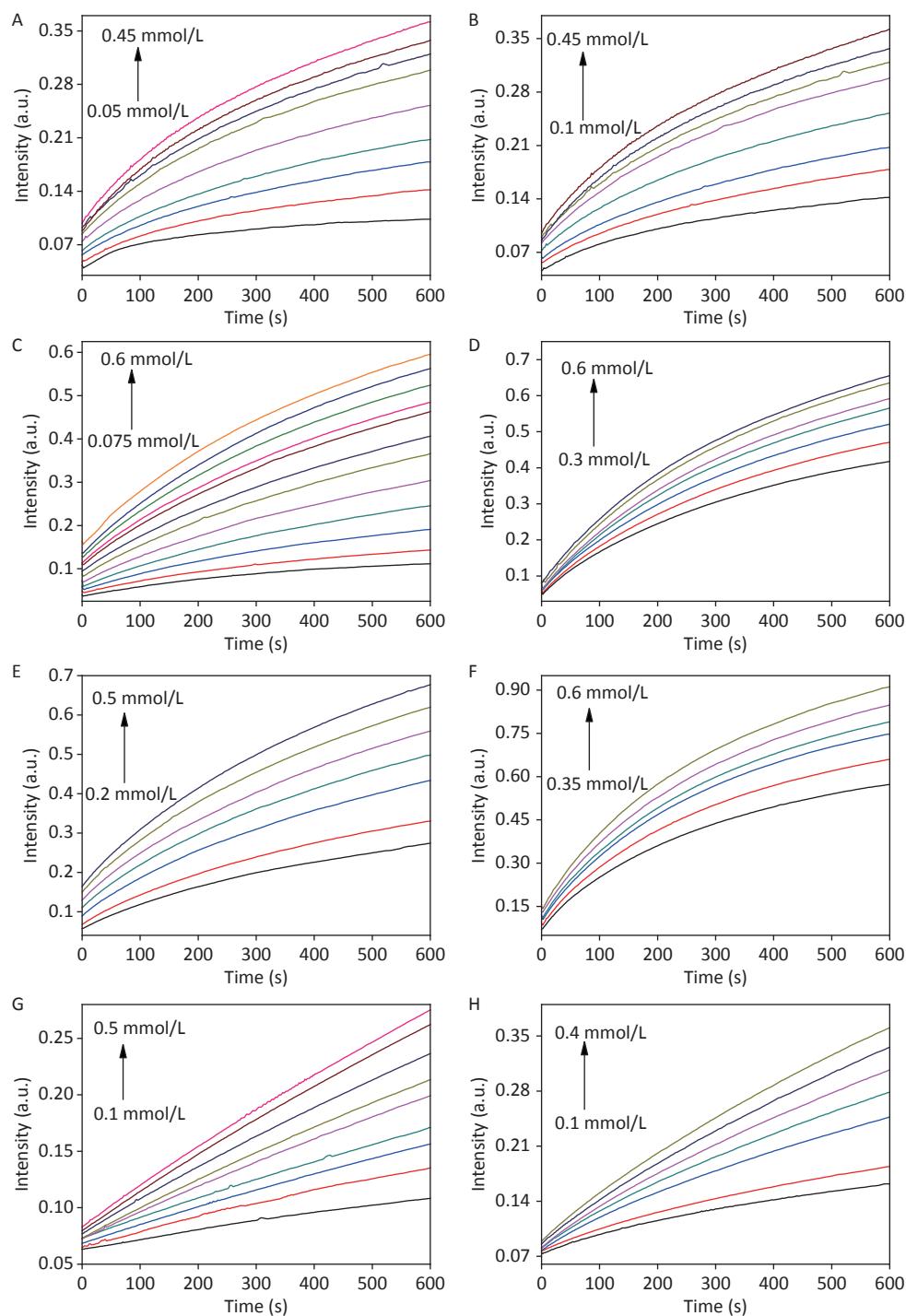
Supplementary Figure S7. The survey XPS spectra of Ti 2p (A, C, E, and G) and O 1s (B, D, F, and H) of the CDCs-NH₄HF₂-6h, CDCs-NH₄HF₂-10h, CDCs-NH₄HF₂-16h, and CDCs-NH₄HF₂-20h, respectively.



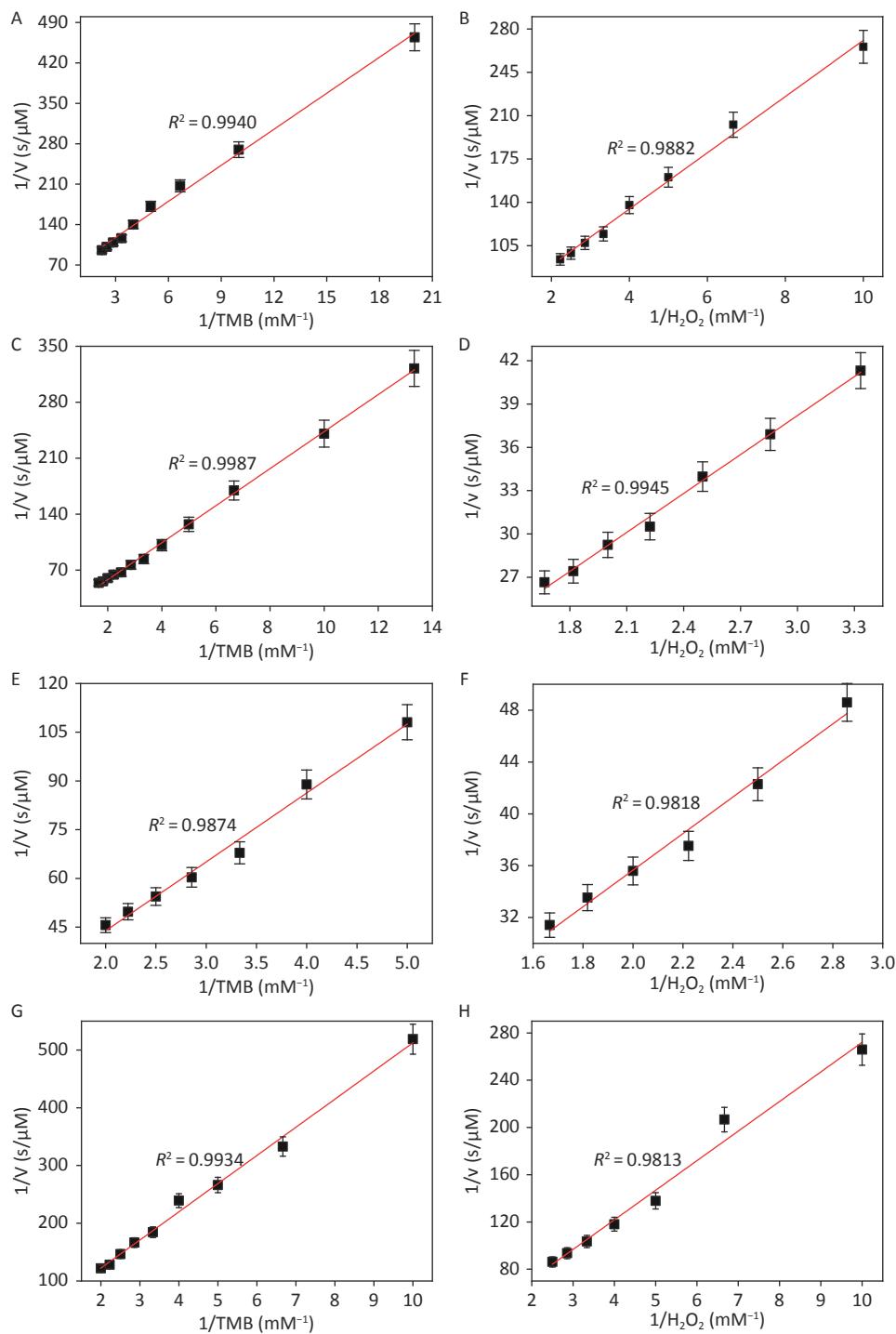
Supplementary Figure S8. UV-vis adsorption spectra of different reaction systems in a 50 mmol/L NaAc (pH = 5) at room temperature. (a) Photography of the mixture of TMB and H₂O₂ in the absence of CDCs. (b) Photography of the mixture of TMB and CDCs in the absence of H₂O₂. (c) Photography of the mixture of CDCs and H₂O₂ in the absence of TMB. (d) Photography of the mixture of TMB, H₂O₂ and CDCs. The H₂O₂ and TMB concentration were 50 mmol/L, 1 mg/mL, respectively.



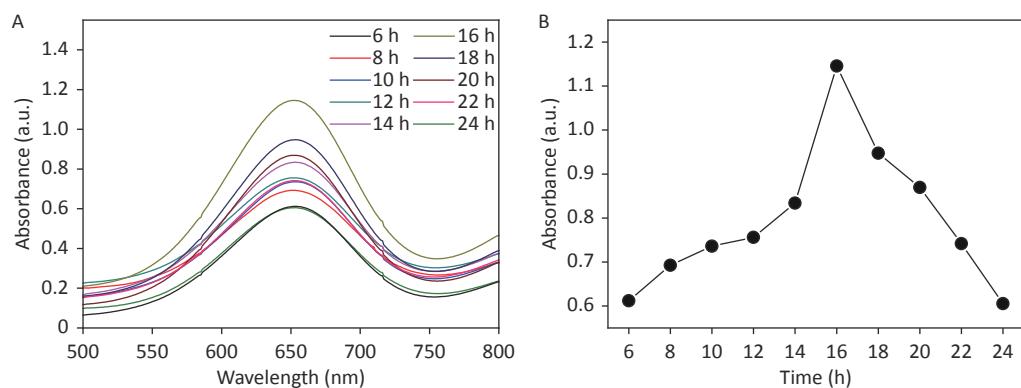
Supplementary Figure S9. The fluorescence spectra of EuTc solutions in the presence of different volumes of (A) H_2O_2 and (B) $\text{CDCs-NH}_4\text{HF}_2$ -16h in MOPS buffers, respectively. (C) The fluorescence spectra at different times of reaction with 20 μL $\text{CDCs-NH}_4\text{HF}_2$ -16h added. (D) The fluorescence intensity changes with the addition of different volumes of $\text{CDCs-NH}_4\text{HF}_2$ -16h of 10, 15, 20, 40, 60, 80, 100, 150 μL . (E) The O_2 emission catalyzed by $\text{CDCs-NH}_4\text{HF}_2$ -16h at different volumes range from 1 mL–8 mL (1 mL as a unit) in solution of 10 mL 50 mmol/L NaAc (pH = 5).



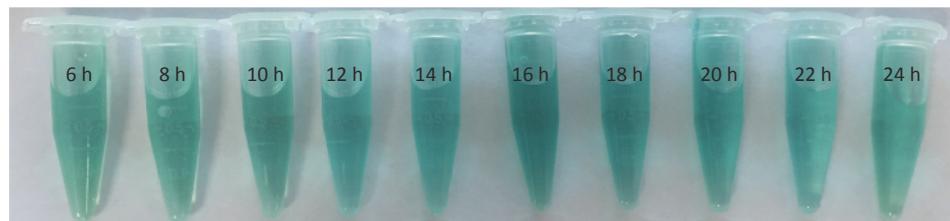
Supplementary Figure S10. Time-dependent absorbance changes of $\text{TMB}^{\bullet+}$, generated upon the oxidation of TMB with variable concentrations of TMB (A, C, E, and G) and H_2O_2 (B, D, F, and H) of CDCs- NH_4HF_2 -6h, CDCs- NH_4HF_2 -12h, CDCs- NH_4HF_2 -16h, and CDCs- NH_4HF_2 -20h, respectively.



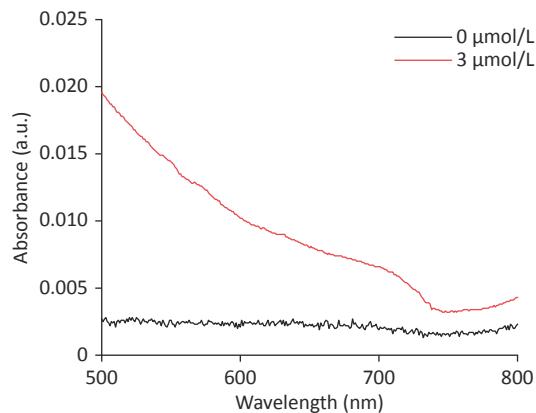
Supplementary Figure S11. Steady-state kinetic assay and catalytic mechanism of CDCs-NH₄HF₂-6h, CDCs-NH₄HF₂-12h, CDCs-NH₄HF₂-16h and CDCs-NH₄HF₂-20h. The double reciprocal plots of activity of CDCs-NH₄HF₂-6h, CDCs-NH₄HF₂-12h, CDCs-NH₄HF₂-16h and CDCs-NH₄HF₂-20h with the concentration of one substrate (H_2O_2 or TMB) fixed and the other varied. The error bars represent the standard deviation for three measurements.



Supplementary Figure S12. The UV absorption spectra of different electrolysis time from 6–24 h (2 h as a unit) after adding TMB (1 mmol/L) and H₂O₂ (50 mmol/L) for 30 min.



Supplementary Figure S13. The photograph of nanosheets with different electrolysis time from 6–24 h (2 h as a unit) after adding TMB (1 mmol/L) and H₂O₂ (50 mmol/L) for 30 min.



Supplementary Figure S14. UV-vis spectra of CDCs-NH₄HF₂-16h+TMB in the absence (the black line) and presence of 3 μmol/L cholesterol (the red line).

Supplementary Table S1. XPS peak fitting results for CDCs-NH₄HF₂-6h, CDCs-NaHF₂-6h, and CDCs-NH₄F-6h

	CDCs-NH₄HF₂-6h	CDCs-NaHF₂-6h	CDCs-NH₄F-6h	
Region	BE [eV]	BE [eV]	BE [eV]	Assigned to
Ti 2p	466	466		TiO ₂
	464.9	464.9	465	C-Ti-F _x
	462.9	462.9	462.3	Ti ³⁺
	460.3	460.3	460.3	TiO ₂
	459.3	459.3	458.6	C-Ti-F _x
			456.8	Ti ³⁺
O 1s	532.6	533.3	532.8	H ₂ O
	531.8	532.5	532	C-Ti-(OH) _x
	531	531.8	531.3	C-Ti-O _x
	530	531.1	530.5	TiO ₂

Supplementary Table S2. XPS peak fitting results for CDCs-NH₄HF₂-6h, CDCs-NH₄HF₂-10h, CDCs-NH₄HF₂-16h, and CDCs-NH₄HF₂-20h

	CDCs-NH₄HF₂-6h	CDCs-NH₄HF₂-10h	CDCs-NH₄HF₂-16h	CDCs-NH₄HF₂-20h	
Region	BE [eV]	BE [eV]	BE [eV]	BE [eV]	Assigned to
C 1s	281.75	282			Ti-C
	284.40	284.55	284.41	284.30	C-C
	284.85	285	285	284.99	C-O
	466	466	465.79	465.80	TiO ₂
Ti 2p	464.90	465			C-Ti-F _x
	462.90				Ti ³⁺
	460.25	460.30	460.15	460.03	TiO ₂
	459.15	459.40			C-Ti-F _x
	532.60	532.80	532.13	532.10	H ₂ O
	531.78	532.10			C-Ti-(OH) _x
O 1s	531	531.60			C-Ti-O _x
	530.03	530.90	530.50	531	TiO ₂

Supplementary Table S3. Comparison of the apparent Michaelis-Menten constant (K_m) and maximum reaction rate (V_{max}) between of CDCs and HRP

Sample	Substrate	Substrate fixed (mmol/L)	V_{max} (mM·s ⁻¹)	K_m (mmol/L)
CDCs-NH ₄ HF ₂ -6h	TMB	H ₂ O ₂ (50)	1.80×10 ⁻⁵	0.35
CDCs-NH ₄ HF ₂ -6h	H ₂ O ₂	TMB (1)	2.30×10 ⁻⁵	0.52
CDCs-NH ₄ HF ₂ -10h	TMB	H ₂ O ₂ (50)	8.50×10 ⁻⁵	1.98
CDCs-NH ₄ HF ₂ -10h	H ₂ O ₂	TMB (1)	6.00×10 ⁻⁵	0.86
CDCs-NH ₄ HF ₂ -16h	TMB	H ₂ O ₂ (50)	6.80×10 ⁻⁴	14.52
CDCs-NH ₄ HF ₂ -16h	H ₂ O ₂	TMB (1)	1.35×10 ⁻⁴	1.90
CDCs-NH ₄ HF ₂ -20h	TMB	H ₂ O ₂ (50)	4.00×10 ⁻⁵	1.96
CDCs-NH ₄ HF ₂ -20h	H ₂ O ₂	TMB (1)	4.60×10 ⁻⁵	1.20