Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Dual-channel synthesis of H_2O_2 via photoelectrocatalytic water oxidation and oxygen reduction over $TaON/Ta_3N_5/CuI/Cu$ foam electrode

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Table S1 Comparison of the activity of different catalysts for the synthesis of H_2O_2 by different methods

Catalyst	Synthesis method	Reaction pathway	H_2O_2 production rate	reference
ZIF-8/C_3N_4	PC	2e$^-$ ORR and WOR	2641.0 μmol g^{-1} h^{-1}	1
Ni-CAT-CN_{60}	PC	1e$^-$ ORR and 4e$^-$ WOR	1801.0 μmol g^{-1} h^{-1}	2
C, N co-doped TiO_2	EC	2e$^-$ WOR	0.3 μmol L^{-1} cm^{-2} h^{-1}	3
α-Fe_2O_3-GDE	PEC	2e$^-$ ORR	58.8 μmol L^{-1} cm^{-2} h^{-1}	4
(1T-2H)-$MoSe_2$/TiO_2	PEC	1e$^-$ ORR	38.0 μmol cm^{-2} h^{-1}	5
SnO_{2-x}-$BiVO_4$	PEC	2e$^-$ and 4e$^-$ WOR	48.0 μmol cm^{-2} h^{-1}	6
Mo-doped $BiVO_4$	PEC	2e$^-$ ORR and 4e$^-$ WOR	9.6 μmol cm^{-2} h^{-1}	7
$NiFeO_x$/$BiVO_4$-pTTh	PEC	2e$^-$ ORR	1.1 mmol L^{-1} cm^{-2} h^{-1}	8
$CuWO_4$	PEC	2e$^-$ ORR and WOR	0.7 mmol cm^{-2} h^{-1}	9
WO_3/FPC	PEC	2e$^-$ ORR	0.2 mmol L^{-1} cm^{-2} h^{-1}	10

Table S2 The fitting parameters of the R(C(RW)) equivalent circuit model

Photoanodes	Rs (Ω cm^2)	CPE-T ($\Omega^{-1}S^n$ cm^{-2}) $\times 10^3$	CPE-P ($\Omega^{-1}S^n$ cm^{-2}) $\times 10^3$	R_p (Ω cm^2)
CuI/Cu	3.412	5.5718	468.41	39.792
TN/Cu	4.019	2.2699	539.27	37.817
CIT-1	3.6955	0.1342	41.517	16.892
CIT-2	4.940	2.383	494.01	70.398
CIT-3	3.397	13.899	409.91	22.542

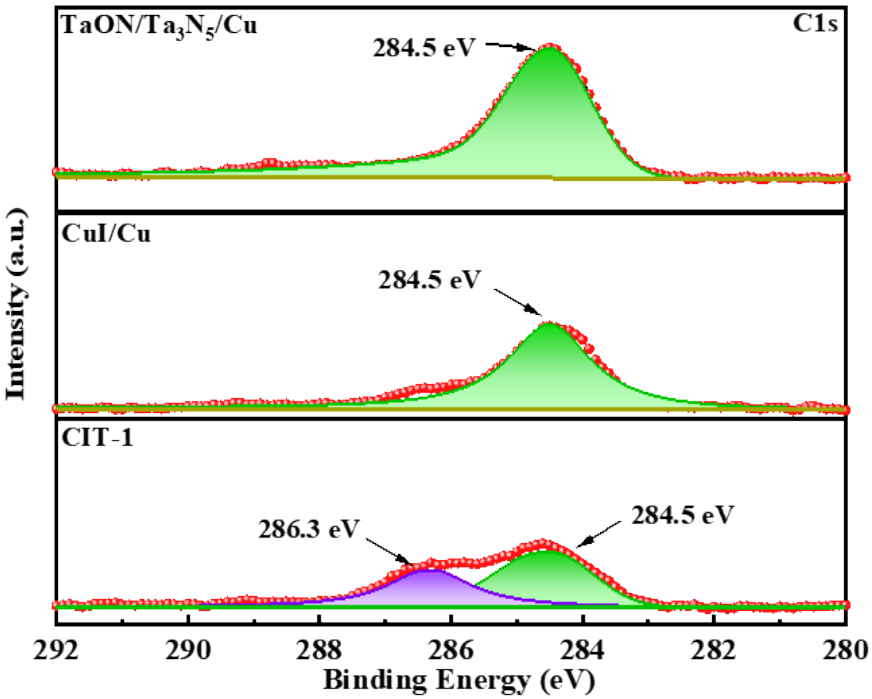

Fig. S1 C 1s high resolution XPS spectra of $TaON/Ta_3N_5/Cu$, CuI/Cu, and CIT-1.

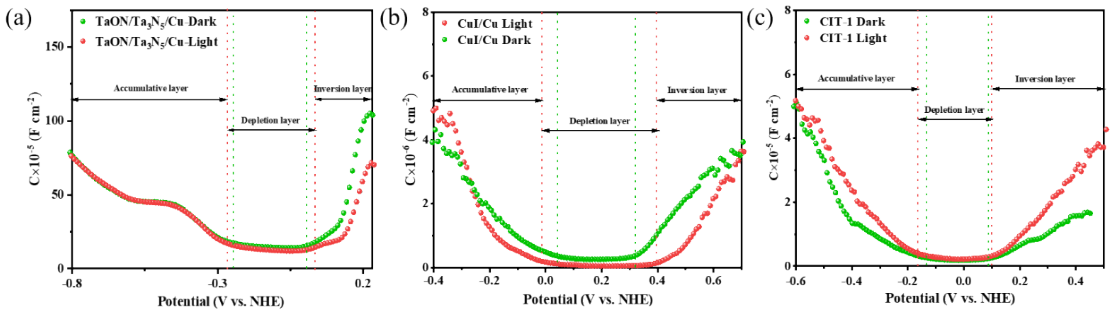

Fig. S2 The C-E curves of (a) TaON/Ta_3N_5/Cu, (b) CuI/Cu, and (c) CIT-1 under dark and light.

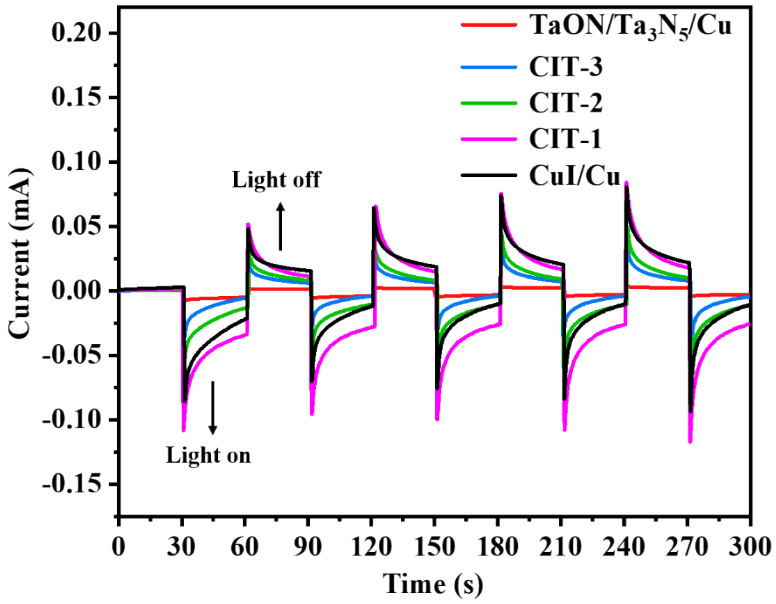

Fig. S3 The J-t curves of $TaON/Ta_3N_5/Cu$, CuI/Cu, CIT-1, CIT-2 and CIT-3.

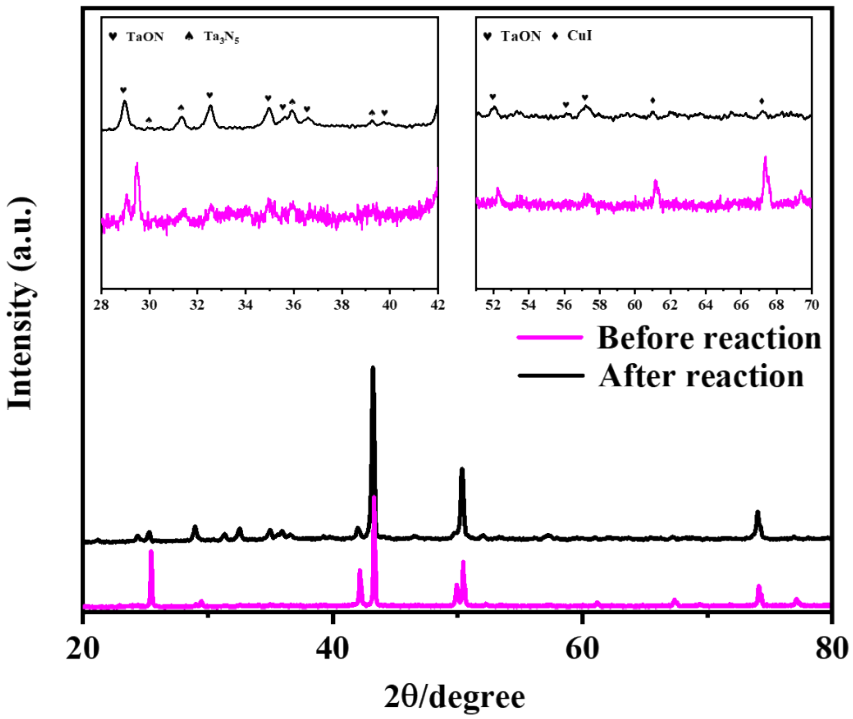

Fig. S4 The XRD patterns of CIT-1before and after reaction.

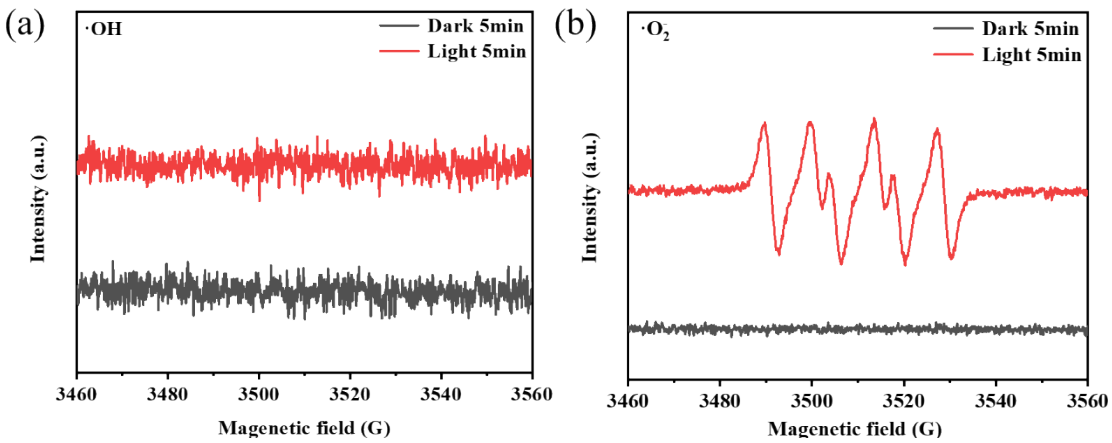

Fig. S5 EPR spectra of CIT-1 for (a) ·OH and (b) $\cdot O_2^-$ under dark and light.

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