

Supporting information

Interfacial Bi-S Bond Modulated Band Alignment for Efficient Solar Water Oxidation

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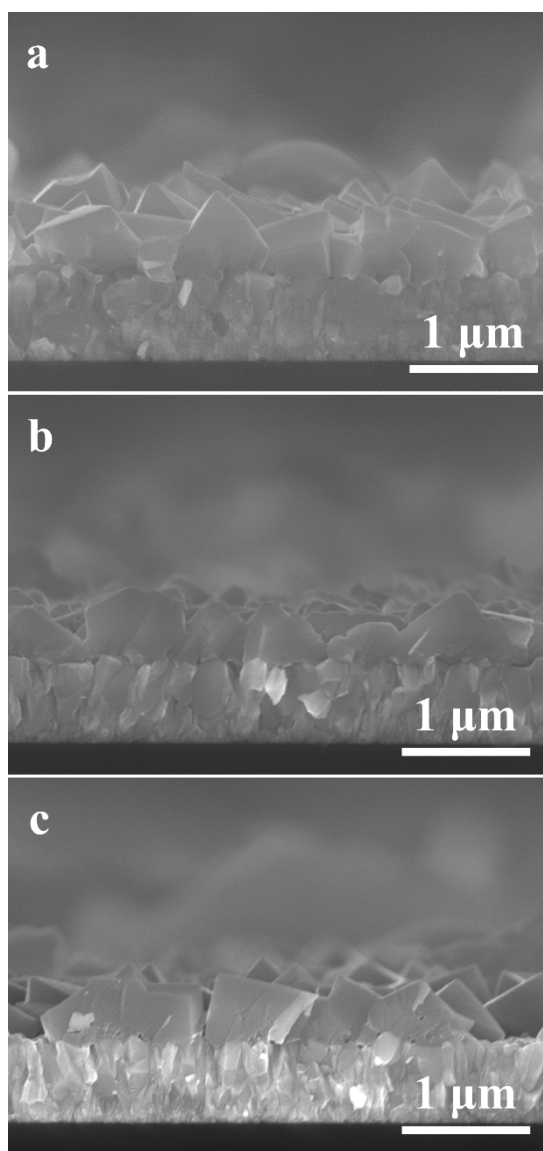


Fig. S1. Cross-sectional SEM images of (a) CIS, (b) CIS/BWO, and (c) CIS-BWO photoanodes.

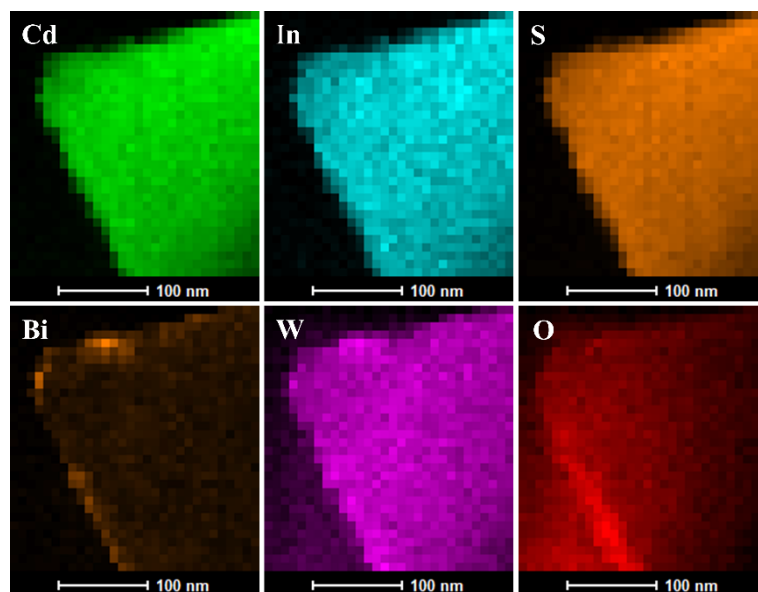


Fig. S2. EDX mapping of CIS/BWO photoanode.

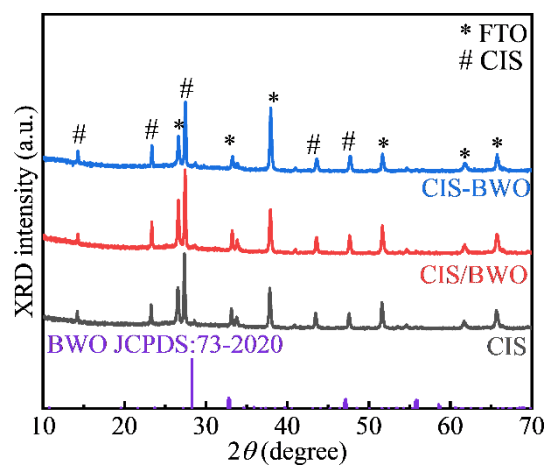


Fig. S3. XRD patterns of CIS, CIS/BWO, and CIS-BWO photoanodes.

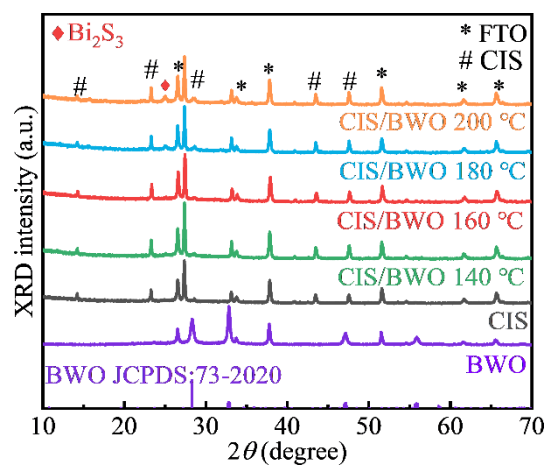


Fig. S4. XRD patterns of CIS/BWO composite photoanodes with different react temperature (140, 160, 180, and 200 °C).

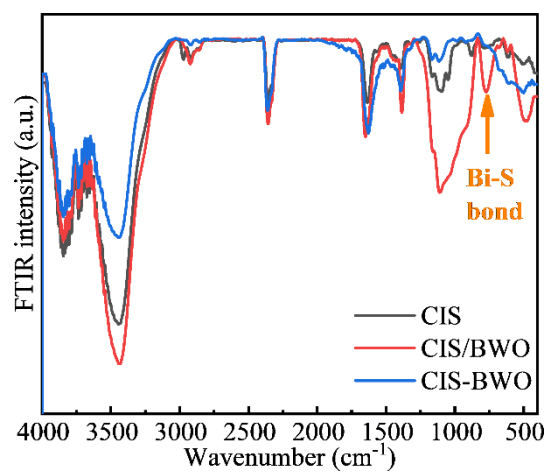


Fig. S5. FTIR plots of CIS, CIS/BWO, and CIS-BWO photoanodes.

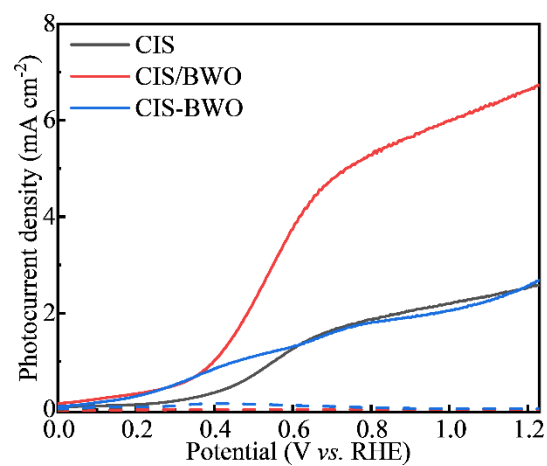


Fig. S6. LSV curves of CIS, CIS/BWO, and CIS-BWO photoanodes measured in hole scavenger (0.5 M Na_2SO_3 /0.5 M NaH_2PO_4 , pH = 7.5).

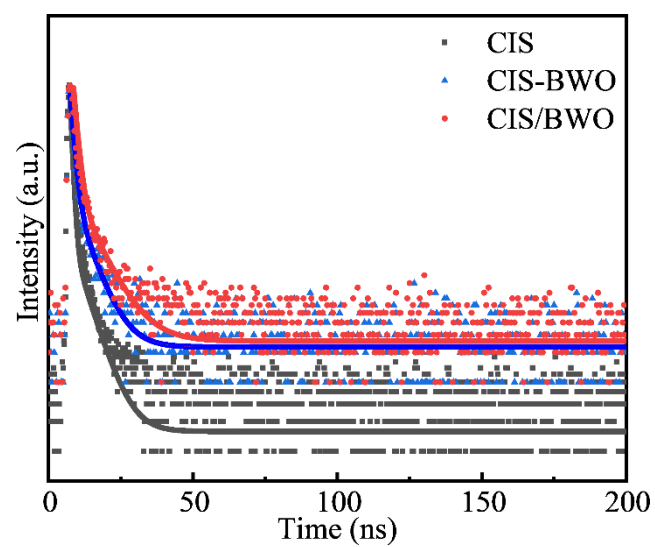


Fig. S7. TRPL spectra of CIS, CIS-BWO, and CIS/BWO photoanodes

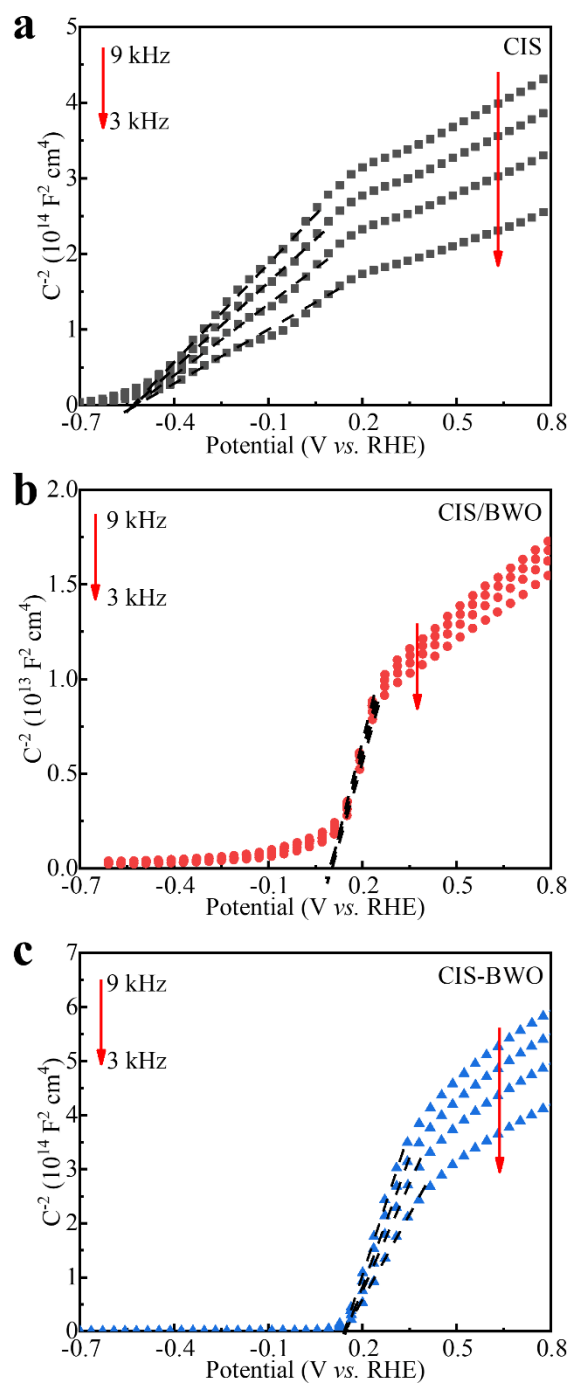


Fig. S8. M-S plots of (a) CIS, (b) CIS/BWO, and (c) CIS-BWO photoanodes.

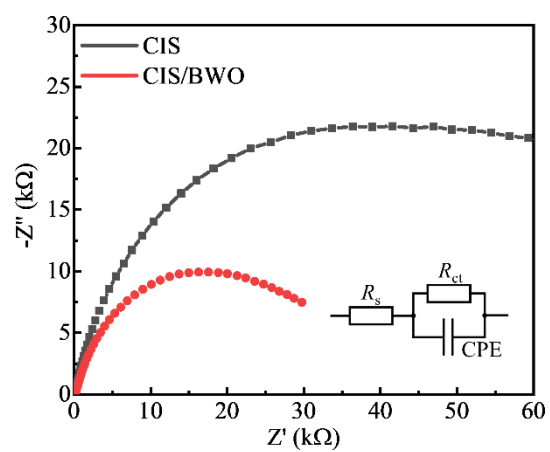


Fig. S9. EIS plots of CIS and CIS/BWO photoanodes.

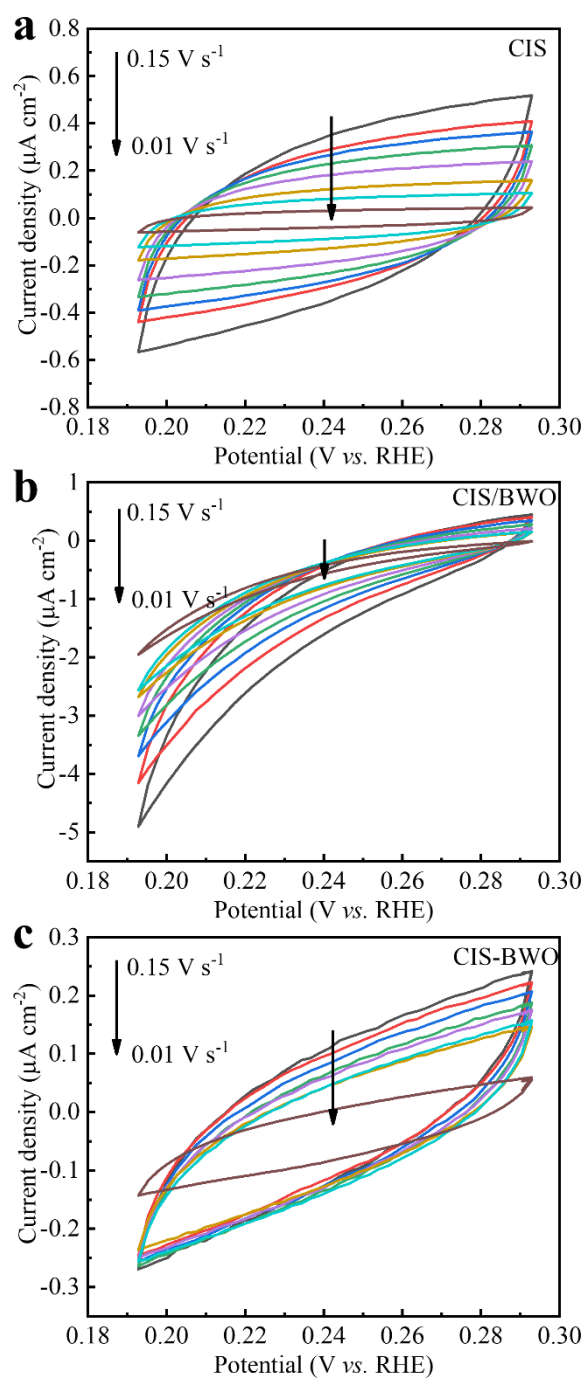


Fig. S10. Cyclic voltammograms plots of (a) CIS, (b) CIS/BWO, and (c) CIS-BWO, photoanodes measured in a non-Faradaic region (0.19-0.29 V_{RHE}) at the scan rate: 0.01, 0.03, 0.05, 0.07, 0.09, 0.11, 0.13, and 0.15 V s⁻¹.

Table S1. The band position of CIS and BWO.

	CIS	BWO
E_v (eV vs. NHE)	+1.51	+3.22
E_c (eV vs. NHE)	−0.58	+0.62

Table S2. The summary of PEC performance of state-of-the-art In-based metal sulfide photoanodes reported in recent years.

Photoelectrode	Electrolyte	Light source	V_{on} (V_{RHE})	J (mA cm^{-2} at $1.23 V_{\text{RHE}}$)	Reference
$\text{V}_5\text{-CdIn}_2\text{S}_4$	$\text{Na}_2\text{SO}_3/\text{Na}_2\text{S}$	AM 1.5G	~ -0.15	5.73	1
$\text{CdIn}_2\text{S}_4/\text{In}_2\text{S}_3/\text{SnO}_2$	Na_2SO_4	AM 1.5G	0.02	2.98	2
$\text{ZnIn}_2\text{S}_4/\text{CdS}/\text{ZnO}$	Na_2SO_4	AM 1.5G	-0.03	3.48	3
$\text{CIS}/\text{InO}_x/\text{NiFe-LDH}$	KOH	AM 1.5G	~ 0.10	5.47	4
$\text{CdS}@\text{CdIn}_2\text{S}_4$	$\text{Na}_2\text{S}/\text{Na}_2\text{SO}_3$	AM 1.5G	$-0.20 \text{ V vs. Ag/AgCl}$	~ 5.50	5
$\text{CdIn}_2\text{S}_4/\text{Ni-PPy}$	Na_2SO_4	AM 1.5G	~ 0.19	4.07	6
$\text{In}_2\text{O}_{3-x}/\text{In}_2\text{S}_3$	KOH	AM 1.5G	~ 0.7	1.28	7
$\text{In}_2\text{O}_3/\text{In}_2\text{S}_3$	$\text{Na}_2\text{S}/\text{Na}_2\text{SO}_3$	AM 1.5G	~ 0.02	8.20	8
$\text{WO}_3/\text{In}_2\text{S}_3$	Na_2SO_4	AM 1.5G	~ 0.10	1.61	9
$\text{Co-In}_2\text{S}_3$	KOH	300 W Xe lamp	~ 1.00	~ 0.20	10
CIS/BWO	Na_2SO_4	AM 1.5G	0.30	4.25	This work

Table S3. The summary of fitted lifetime from the TRPL spectra.

	A_1	τ_1 (ns)	A_2	τ_2 (ns)	τ (ns)
CIS	7058.77	0.66	202.05	4.67	1.33
CIS-BWO	1247.12	0.85	91.50	4.78	1.99
CIS/BWO	1196.01	1.21	105.48	6.79	3.06

Table S4. The summary of EIS fitted parameters of CIS and CIS/BWO samples under illumination.

	R_s (Ω)	R_{ct} ($k\Omega$)
CIS	73.1	71.4
CIS/BWO	81.8	34.7

References

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