Supporting Information

Regulating Zn/Co bimetallic catalyst in metal-organic framework and oxyhydroxide for improved photoelectrochemical water oxidation

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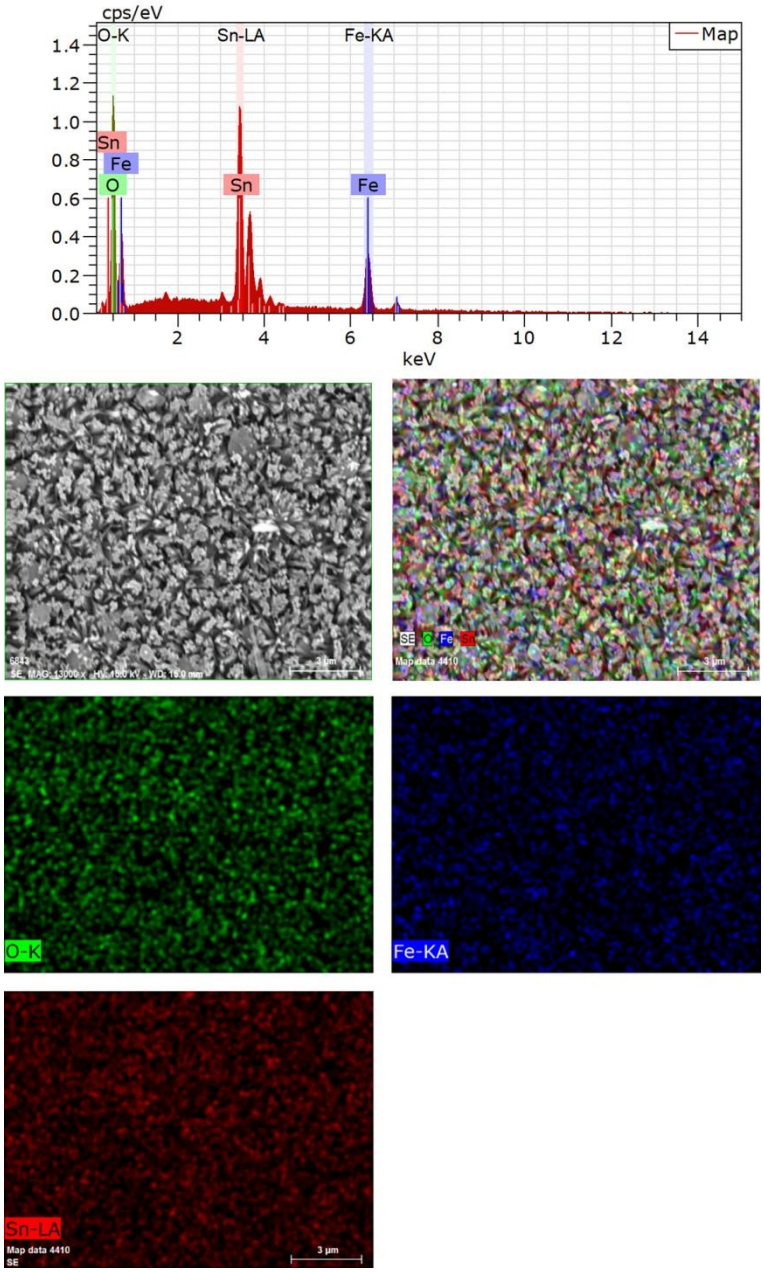

Figure S1. The EDS elements composition of FTO/Sn@α-Fe_2O_3 photoanode.

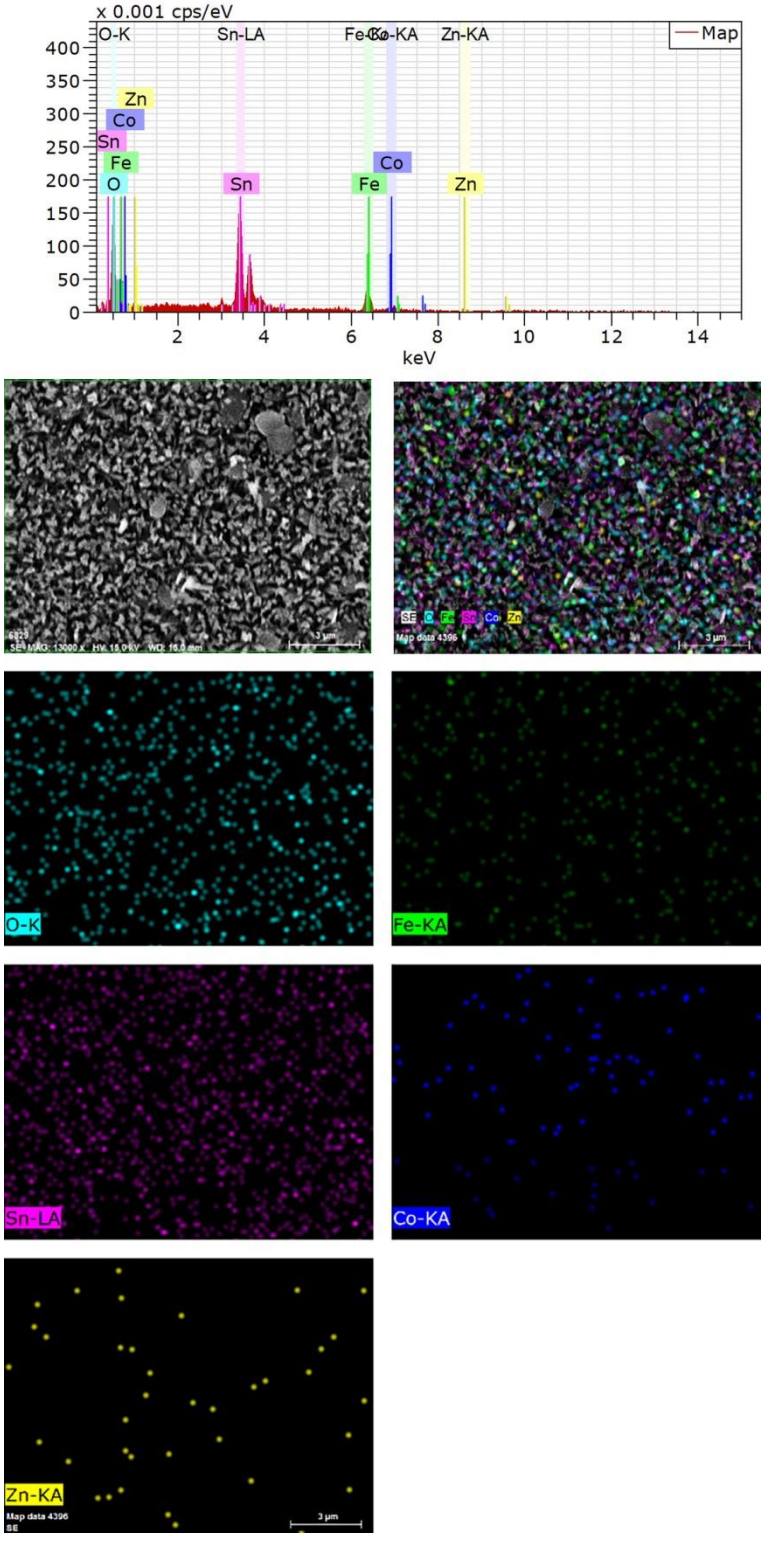

Figure S2. The EDS elements composition of FTO/Sn@α-Fe_2O_3/$Zn_{0.5}Co_{0.5}$-ZIF photoanode.

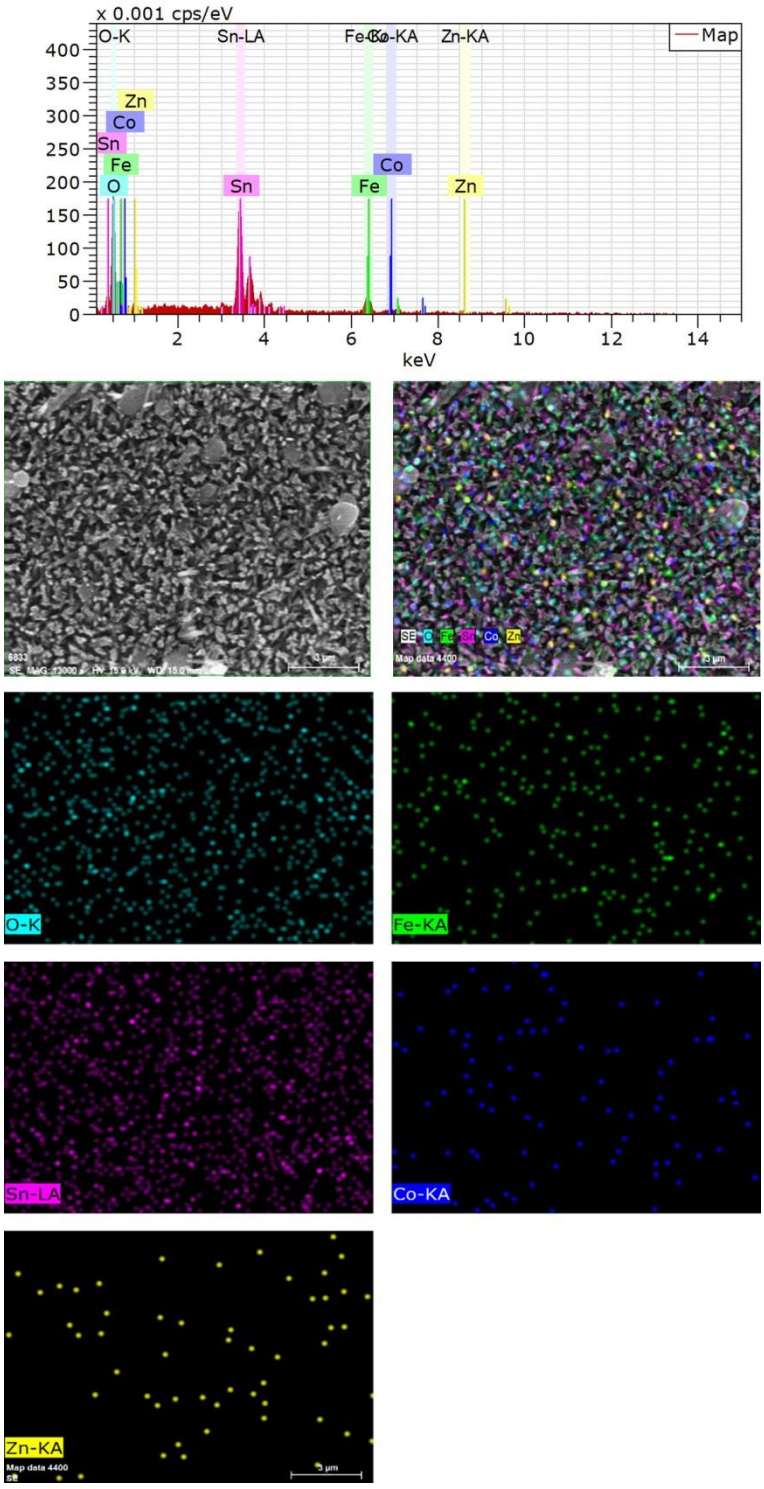

Figure S3. The EDS elements composition of FTO/Sn@α-Fe_2O_3/$Zn_{0.46}Co_{0.54}OOH$ photoanode.

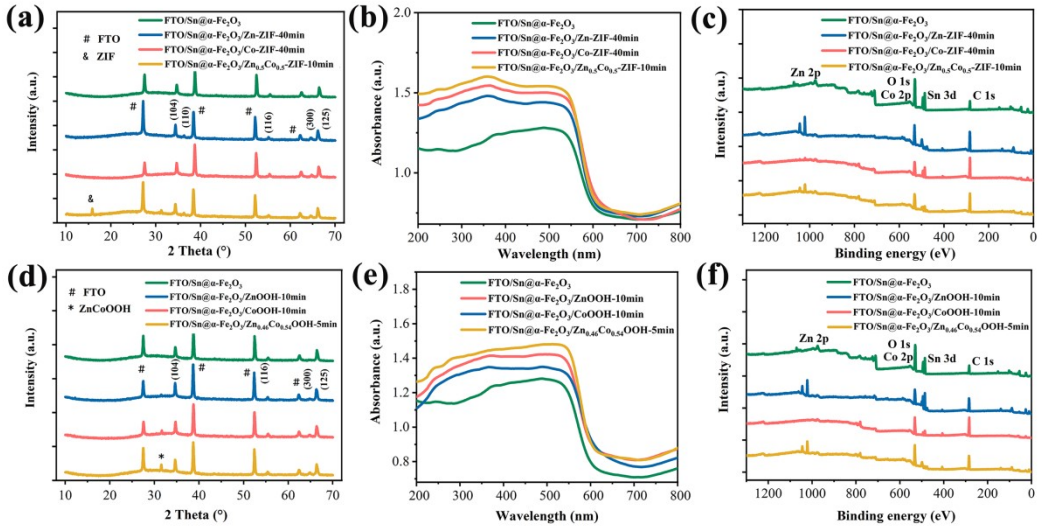

Figure S4. The (a and d) XRD patterns, (b and e) UV–vis reflectance spectra and (c and f) XPS survey spectra of α-Fe_2O_3 photoanodes decorated by ZnCo-ZIF and ZnCoOOH catalyst, respectively.

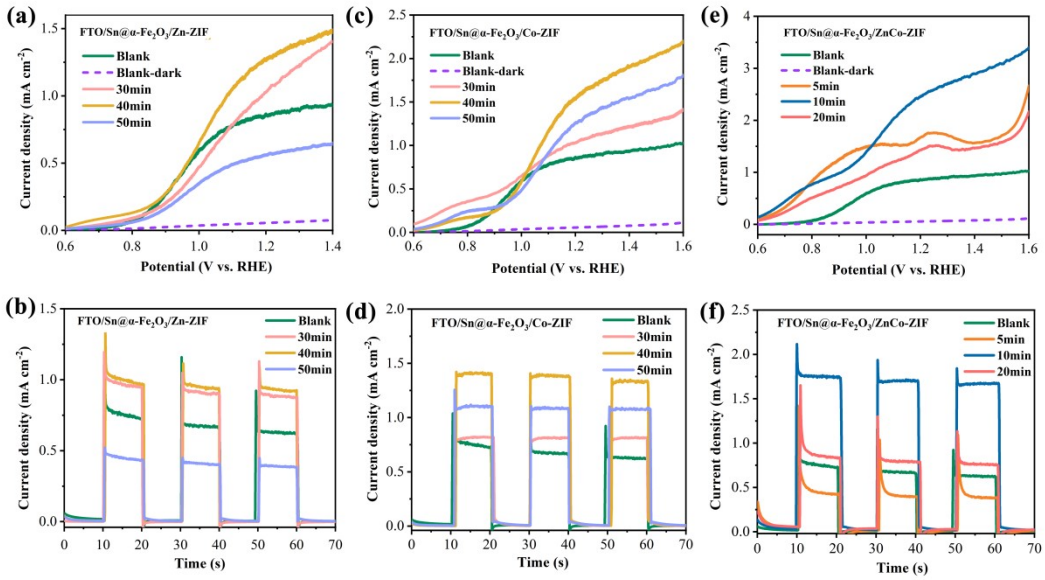

Figure S5. The *J-V* curves and transient photocurrent density curves of (a and b) FTO/Sn@α-Fe_2O_3/Zn-ZIF, (c and d) FTO/Sn@α-Fe_2O_3/Co-ZIF, (e and f) FTO/Sn@α-Fe_2O_3/ZnCo-ZIF photoanodes for different optimization time.

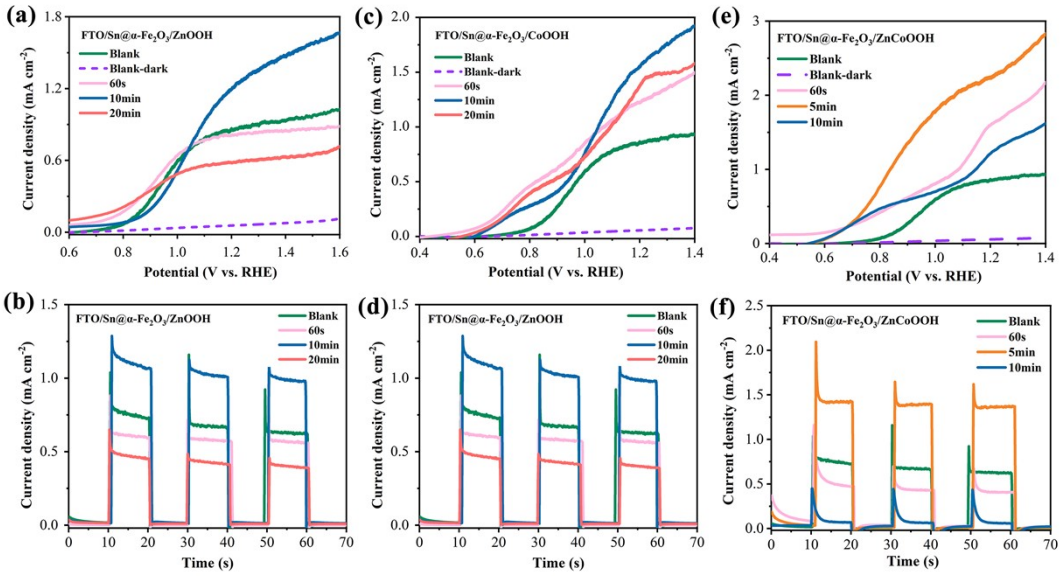

Figure S6. The *J-V* curves and transient photocurrent density curves of (a and b) FTO/Sn@α-Fe_2O_3/ZnOOH, (c and d) FTO/Sn@α-Fe_2O_3/CoOOH, (e and f) FTO/Sn@α-Fe_2O_3/ZnCoOOH photoanodes for different optimization time.

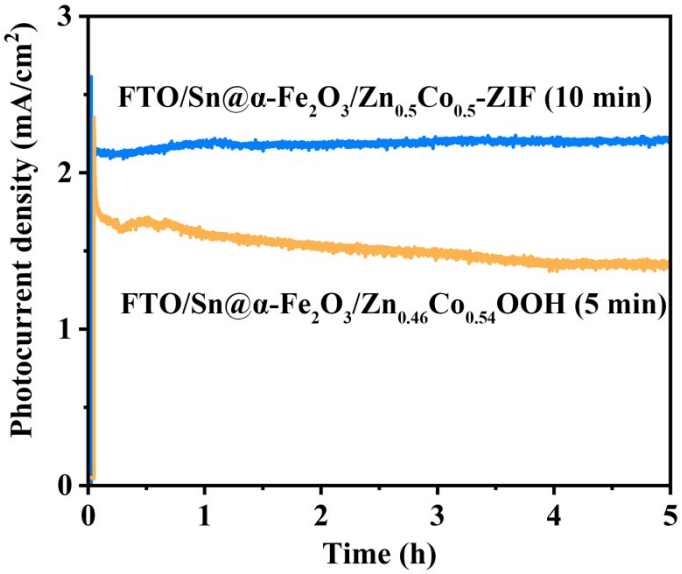

Figure S7. *J-t* curves of the α-Fe_2O_3 photoanode with ZnCo-ZIF and ZnCoOOH catalyst at 1.23 V_{RHE}.

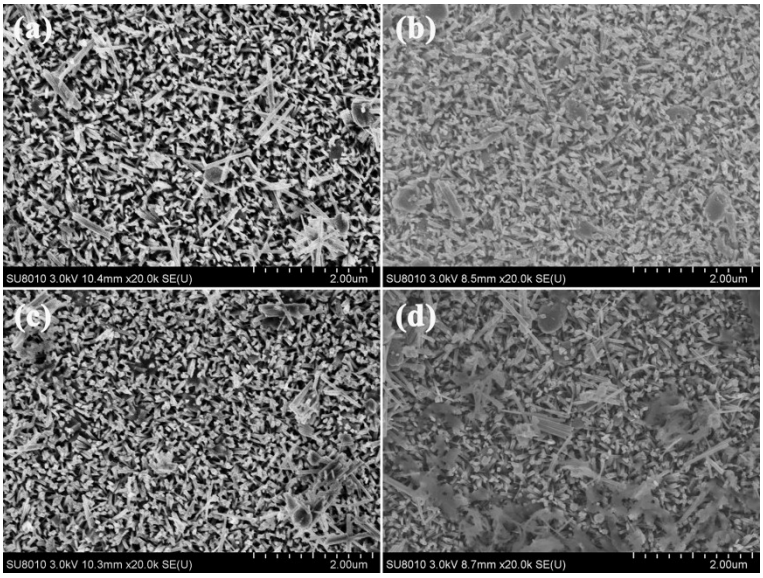

Figure S8. The SEM images before (a and c) and after (b and d) stability test of α-Fe_2O_3 photoanode with ZnCo-ZIF and ZnCoOOH catalyst for 5 hours.

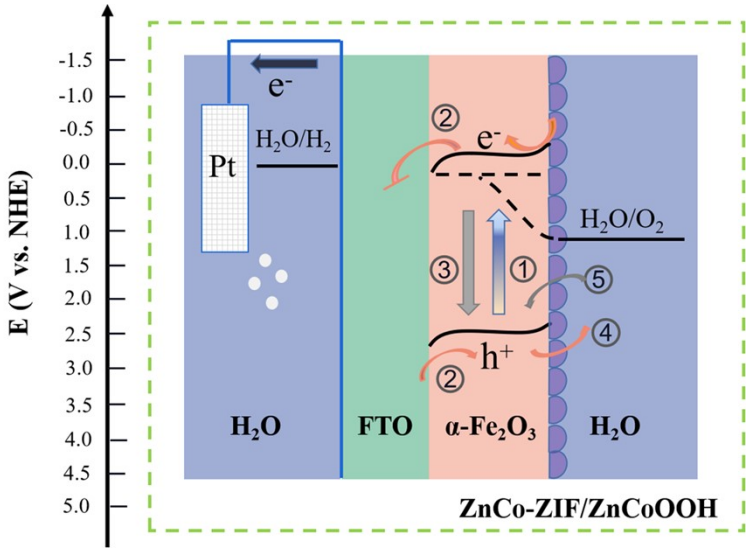

Figure S9. Schematic diagram of carriers transports in α-Fe_2O_3 photoanode with ZnCo-ZIF or ZnCoOOH catalyst.

Table S1. The ion contents of Fe, Zn and Co in FTO/Sn@α-Fe_2O_3/$Zn_{0.5}Co_{0.5}$-ZIF (10 min) and FTO/Sn@α-Fe_2O_3/$Zn_{0.46}Co_{0.54}$OOH (5 min) photoanodes.

Concentration	FTO/Sn@α-Fe_2O_3/$Zn_{0.5}Co_{0.5}$-ZIF (10 min)	FTO/Sn@α-Fe_2O_3/$Zn_{0.46}Co_{0.54}$OOH (5 min)
Fe (mol/cm^2)	2.97×10^{-6}	1.90×10^{-6}
Zn (mol/cm^2)	3.85×10^{-7}	5.0×10^{-7}
Co (mol/cm^2)	3.83×10^{-7}	5.83×10^{-7}

Table S2. The fitting EIS data of α-Fe_2O_3 photoanodes based on equivalent circuits.

	FTO/Sn@α-Fe_2O_3	FTO/Sn@α-Fe_2O_3/$Zn_{0.5}Co_{0.5}$-ZIF	FTO/Sn@α-Fe_2O_3/$Zn_{0.46}Co_{0.54}$OOH
R_s (Ω cm^2)	9.18	11.55	12.24
R_{trap} (Ω cm^2)	6.1	9.1	19.7
C_{bulk} (F/cm^2)	1.6×10^{-6}	1.4×10^{-6}	1.6×10^{-6}
R_{ct} (Ω cm^2)	2019.0	433.2	36.24
C_{ss} (F/cm^2)	3.6×10^{-6}	1.7×10^{-3}	1.1×10^{-3}