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ZIF-67 - Derived Flower-like $ZnIn_2S_4$@CoS_2 Heterostructure for Photocatalytic Hydrogen Production

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# Equal contribution

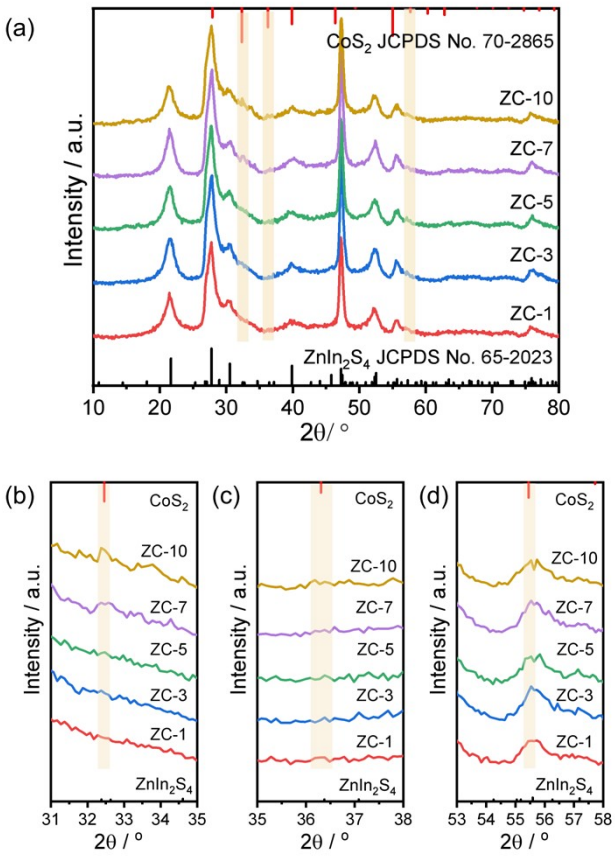

Figure S1. Enlarged XRD patterns of ZC-x at 2θ= (a) 31-35°, (b) 35-38°, and (c) 53-58°.

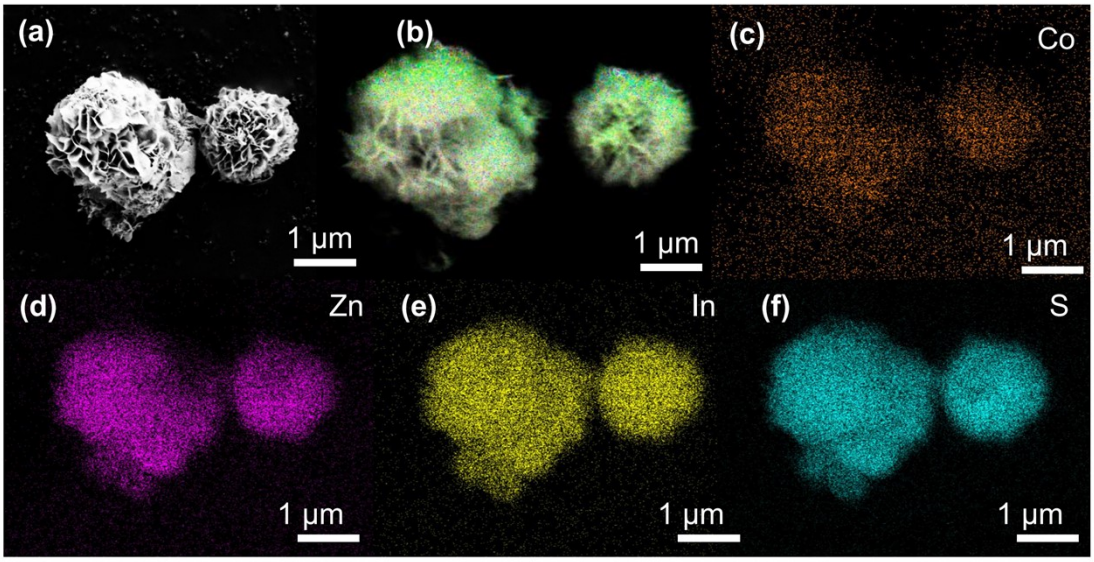

Figure S2. (a) SEM image and (b-f) element mappings of ZC-5.

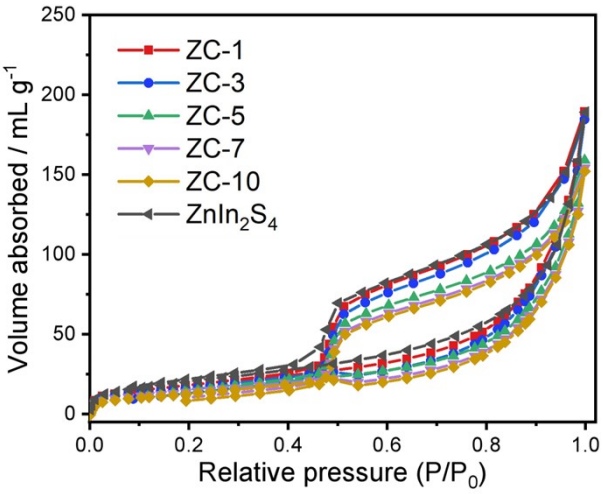

Figure S3. Brunauer-Emmet-Teller (BET) surface area of synthesized sample.

Table S1. BET surface area, mean pore size and pore volume of synthesized sample.

	S_{BET} (m^2/g)	Mean pore size (nm)	Pore volume (cm^3/g)
$ZnIn_2S_4$	75.7972	13.8633	0.2627
ZC-1	64.3987	16.5097	0.2658
ZC-3	57.8564	16.5461	0.2489
ZC-5	54.4725	16.2504	0.2213
ZC-7	51.5461	15.3542	0.2579
ZC-10	47.5694	16.1215	0.2148

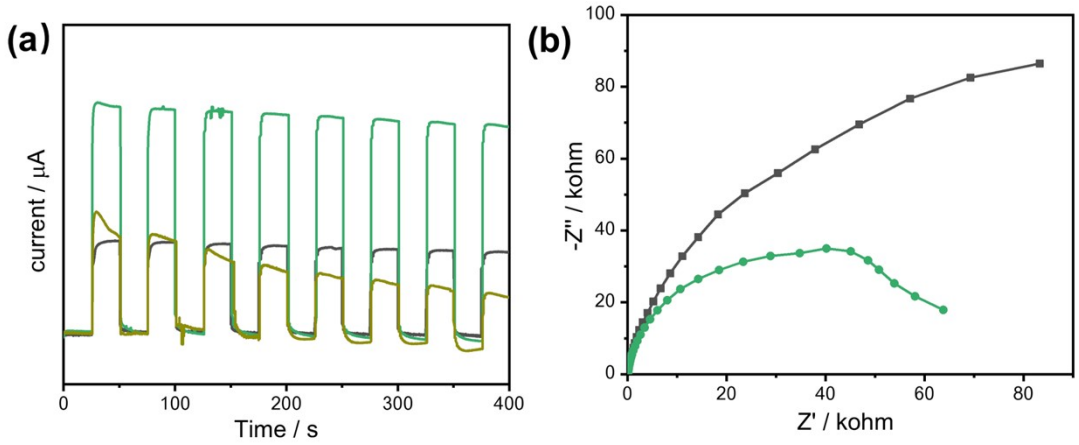

Figure S4. (a) Photocurrent response of $ZnIn_2S_4$ (grey), CoS_2 (brown), and ZC-5 (green) under the irradiation of simulated sunlight; (b) EIS curves of $ZnIn_2S_4$ (grey) and ZC-5 (green).

Table S2. ICP result for leaching amount of Zn^{2+} and Co^{2+}

Testing ion	Concentration of the testing ion in an aqueous solution (mg/L)
Co^{2+}	0.03524
Zn^{2+}	0.08142

Table S3 Summary of reported $ZnIn_2S_4$-based catalysts for photocatalytic hydrogen evolution.

Catalyst	Light source (W/nm)	Sacrificial reagent	Cocatalyst	H_2 evolution rate (μmol/h/g)	Reference
$ZnIn_2S_4$@CoS_2	300 Xe ⩾ 350	TEOA	-	879	This work
ZnS- $ZnIn_2S_4$	400 metal halide ＞ 420	Glucose	Pt	103	*Int. J. Hydrogen Energ.,* **2010**, 35, 7116.
Cu- $ZnIn_2S_4$	300 Xe ＞ 430	Na_2SO_3/Na_2S	Pt	757.5	*J. Phys. Chem. C,* **2008**, 112, 41, 16148.
RGO/ $ZnIn_2S_4$	300 Xe ＞ 420	lactic acid	-	817	*ACS Appl. Mater. Interfaces* **2014**, 6, 3483.
$ZnIn_2S_4$/Fluoropolymer	350 Xe ＞ 250	Na_2SO_3/Na_2S	-	398	*Int. J. Hydrogen Energ.,* **2010**, 35, 6525.
$ZnIn_2S_4$-MoS_2	150 Xe	Na_2SO_3/Na_2S	-	111.6	*Catal. Sci. Technol.*, **2020**, 10, 2838.