Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supporting Information

Anchoring $Zn_{0.5}Cd_{0.5}S$ solid solution onto 2D porous Co-CoO nanosheets for highly improved photocatalytic H_2 generation

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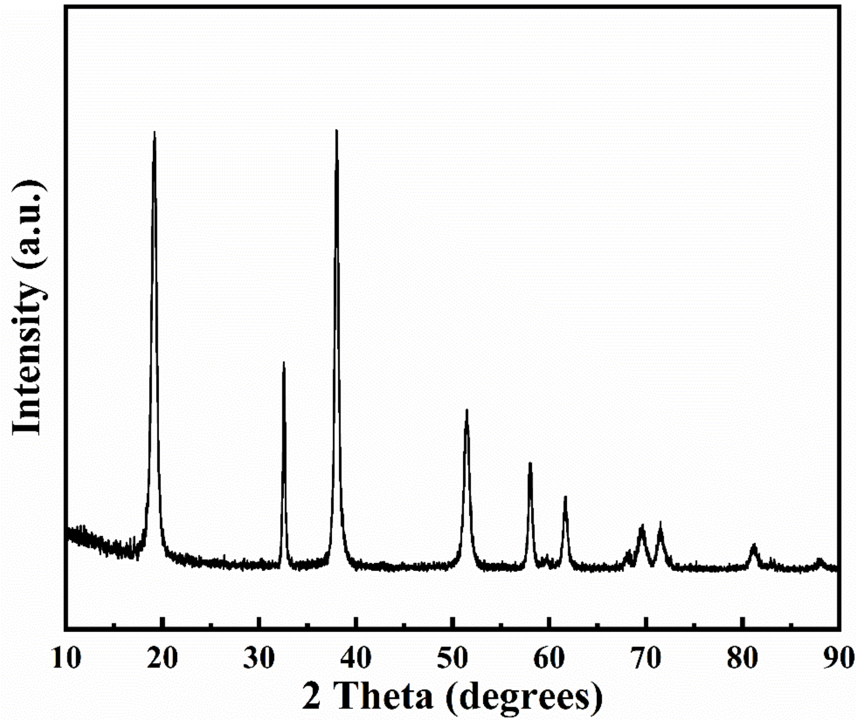

Fig. S1 XRD patterns of $Co(OH)_2$ nanosheets.

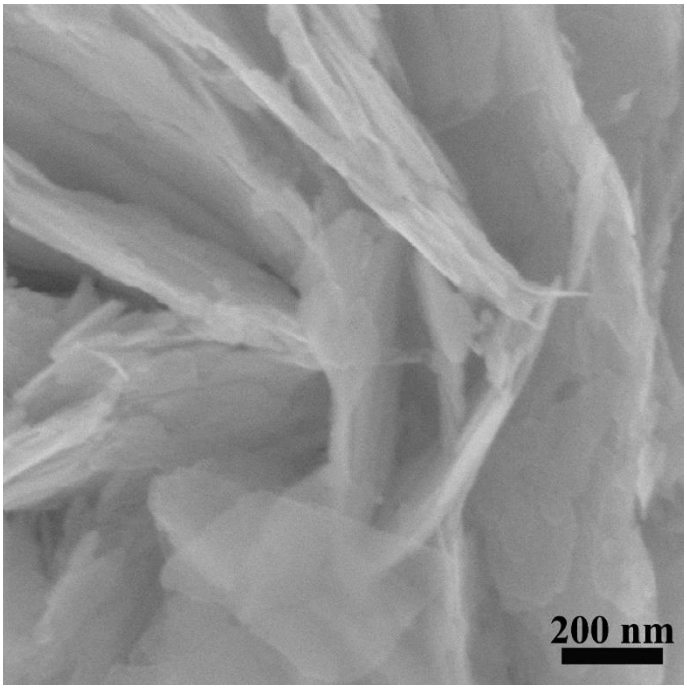

Fig. S2 SEM image of CC nanosheets.

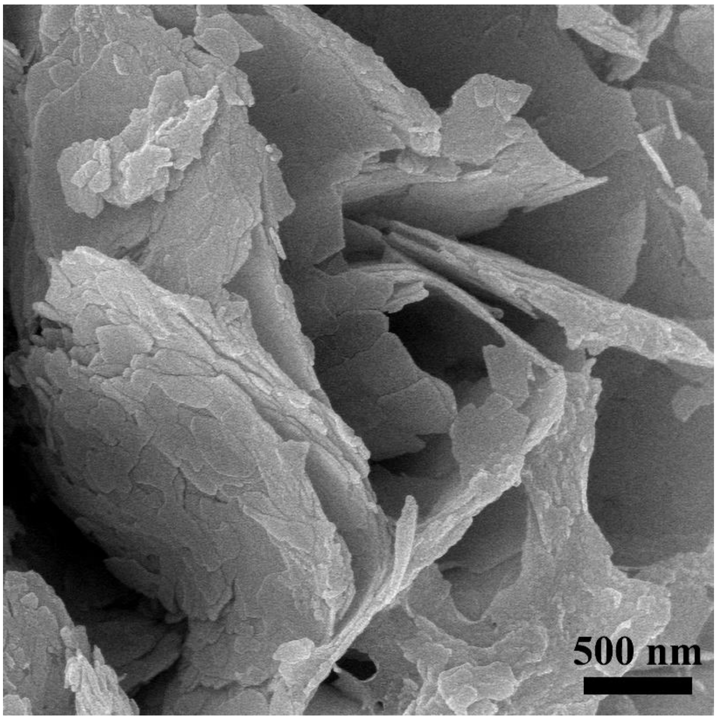

Fig. S3 SEM image of $Co(OH)_2$ nanosheets.

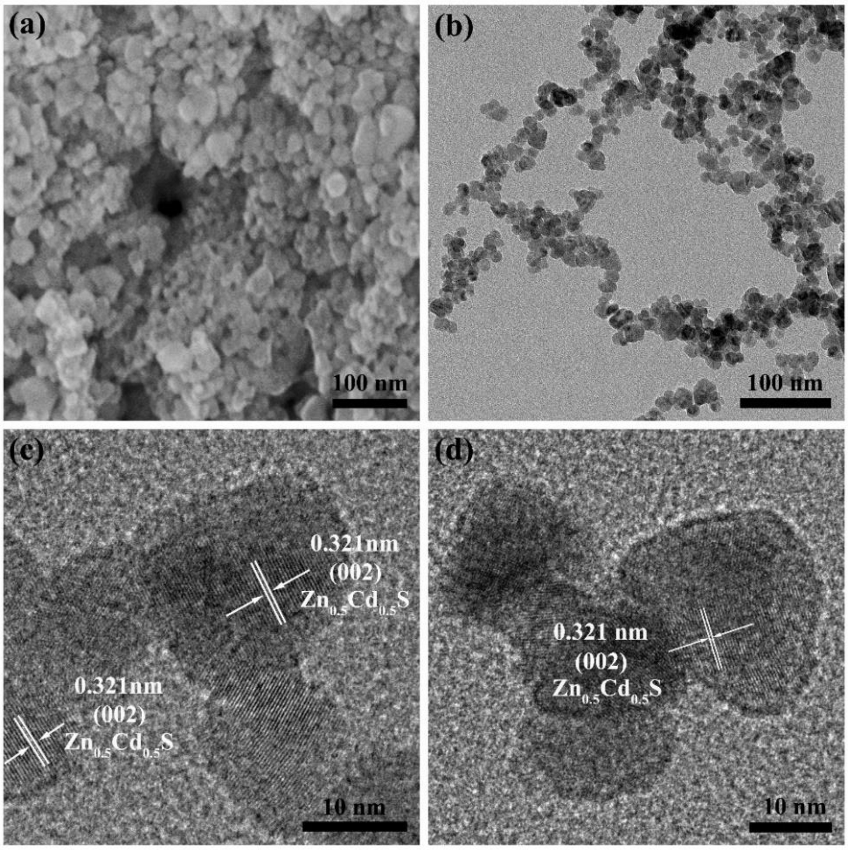

Fig. S4 (a) SEM image, (b) TEM image and (c and d) HRTEM image of $Zn_{0.5}Cd_{0.5}S$.

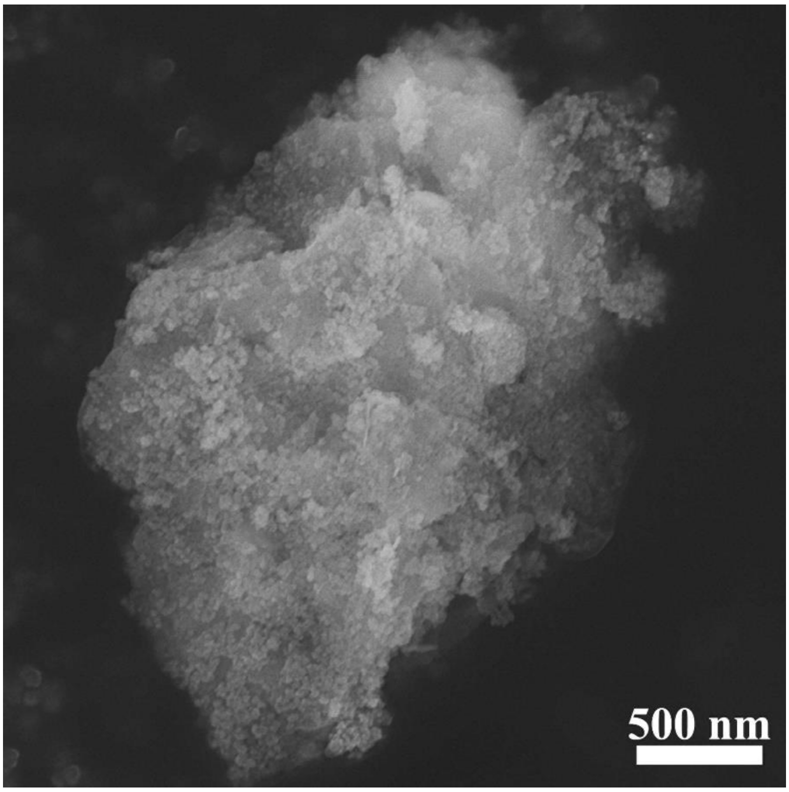

Fig. S5 SEM image of 5CC/ZCS sample

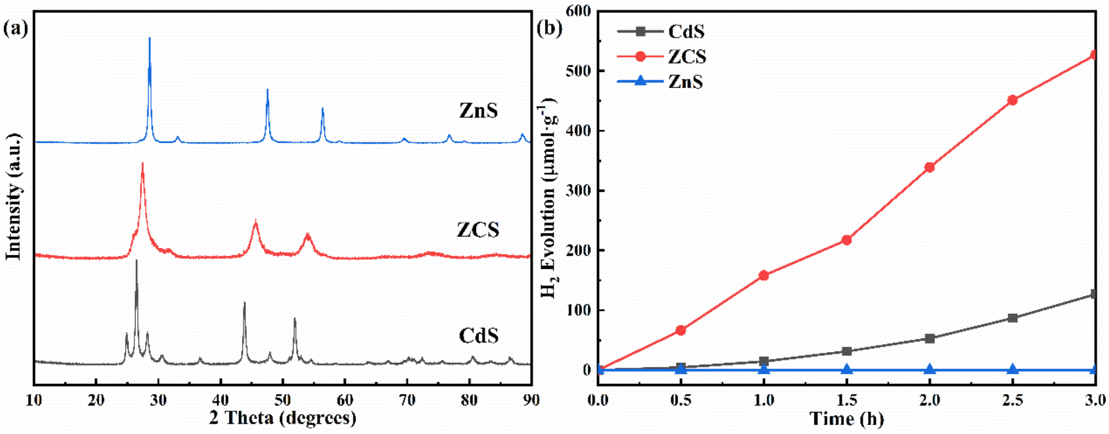

Fig. S6 XRD patterns (a) and photocatalytic activities (b) of ZnS, ZCS and CdS samples.

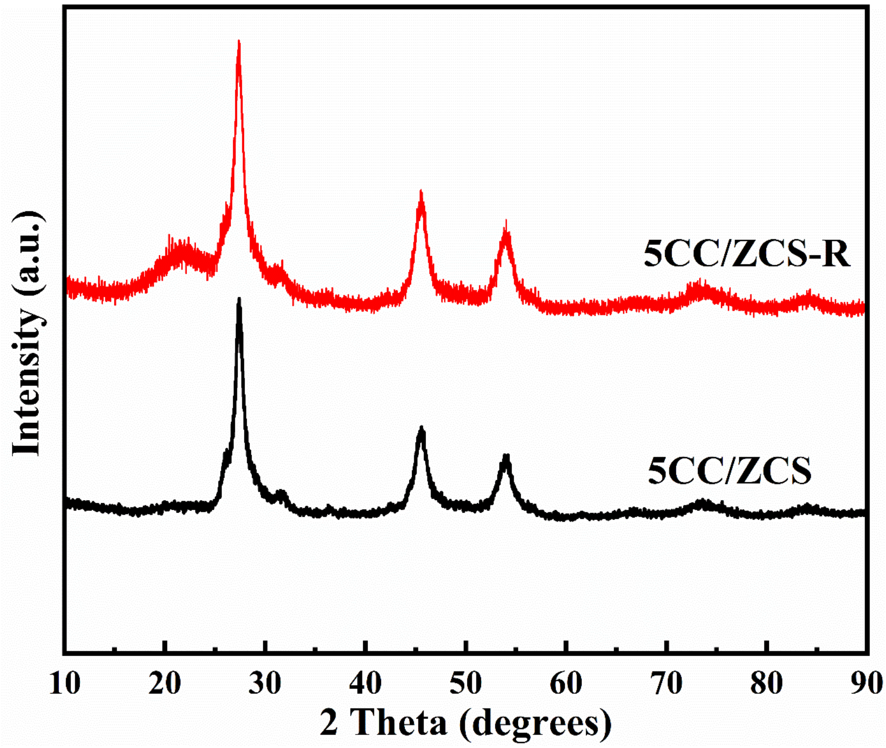

Fig. S7 XRD patterns of 5CC/ZCS before (5CC/ZCS) and after (5CC/ZCS-R) the long-time (24 h) photocatalytic reaction.

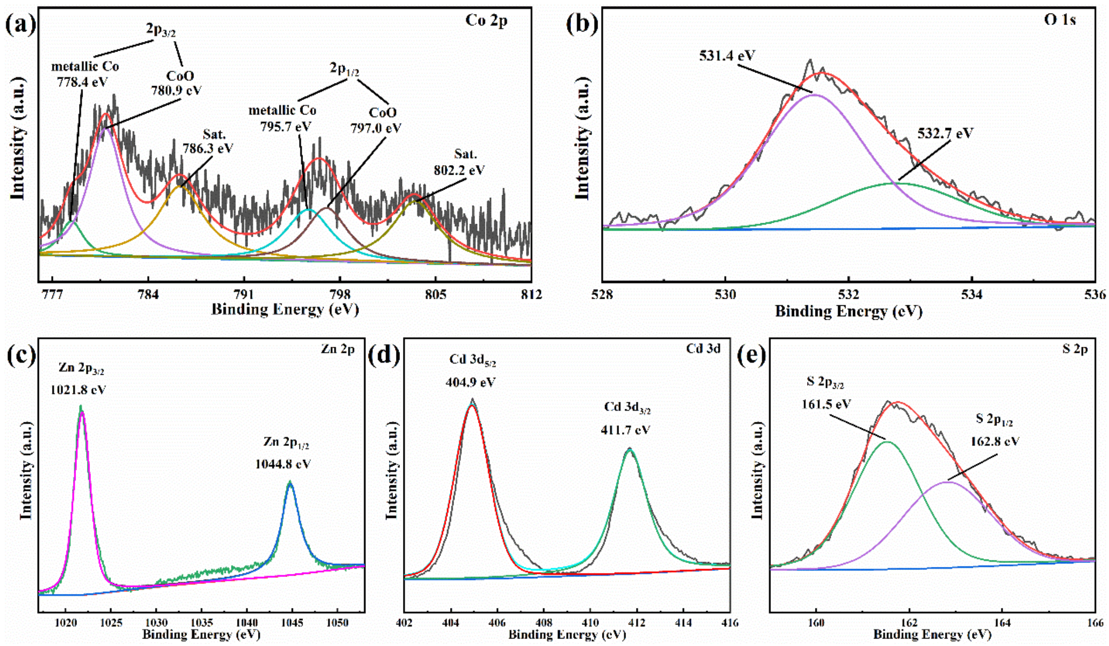

Fig. S8 High-resolution XPS spectra of (a) Co 2p, (b) O 1s, (b) Zn 2p, (d) Cd 3d and (e) S 2p for 5CC/ZCS after the long-time (24 h) photocatalytic reaction.

Table S1 Photocatalytic H_2 evolution activity of $Zn_xCd_{1-x}S$-based photocatalysts.

	Samples	Cocatalyst	Light source	Scavenger	Activity (μmol h^{-1} g^{-1})	Enhancement factor* (Reference)	Refs
1	$Zn_{0.5}Cd_{0.5}S$	MoS_2/RGO	/	Lactic acid	2310	_	S1
2	$Zn_{0.5}Cd_{0.5}S$	MnO_2	300 W Xe lamp (λ≥ 420 nm)	Na_2S /Na_2SO_3	2524	13 ($Zn_{0.5}Cd_{0.5}S$)	S2
3	$Zn_{0.5}Cd_{0.5}S$	$Cu_2(OH)_2CO_3$	300 W Xe lamp (λ≥ 420 nm)	Na_2S /Na_2SO_3	5514	3.04 ($Zn_{0.5}Cd_{0.5}S$)	S3
4	$Zn_{0.8}Cd_{0.2}S$	$Ni(OH)_2$	300 W Xe lamp (λ≥ 420 nm)	Triethanolamine	7160	25 ($Zn_{0.8}Cd_{0.2}S$) 1.2 (Pt/$Zn_{0.8}Cd_{0.2}S$)	S4
5	$Zn_{0.25}Cd_{0.75}S$	$Ni(OH)_2$	300 W Xe lamp	Na_2S /Na_2SO_3	3774	5 (CdS)	S5
6	ZnCdS	$Fe_{0.3}Pt_{0.7}$	300 W Xe lamp (λ> 420 nm)	Na_2S /Na_2SO_3	2265	3 (ZnCdS) 1.4 (Pt/ZnCdS)	S6
7	$Zn_{0.5}Cd_{0.5}S$	Pt	500 W Xe lamp (λ> 400 nm)	Ascorbic acid	5500	27.9 ($Zn_{0.5}Cd_{0.5}S$)	S7
8	$Zn_{0.5}Cd_{0.5}S$	Pt	500 W Xe lamp (λ> 400 nm)	Na_2S /Na_2SO_3	3810	4.9 ($Zn_{0.5}Cd_{0.5}S$)	S7
9	$Zn_{0.5}Cd_{0.5}S$	$CoPt_3$	300 W Xe lamp (λ> 420 nm)	Na_2S /Na_2SO_3	2340	4.7 ($Zn_{0.5}Cd_{0.5}S$) 1.2 (Pt/$Zn_{0.5}Cd_{0.5}S$)	S8
10	$Zn_{0.3}Cd_{0.7}S$	Ni_3C	300 W Xe lamp (λ≥ 420 nm)	Na_2S /Na_2SO_3	3310	6.4 ($Zn_{0.3}Cd_{0.7}S$)	S9
11	$Zn_xCd_{1-x}S$	Ni	300 W Xe lamp	Glycerol	2253	_	S10
12	$Zn_{0.5}Cd_{0.5}S$	Ni nanosheets	300 W Xe lamp (λ> 420 nm)	Na_2S /Na_2SO_3	5930	33.7 ($Zn_{0.5}Cd_{0.5}S$) 15.4 (Pt/$Zn_{0.5}Cd_{0.5}S$)	S11
13	ZnCdS	NiB	LED lamp	Lactic acid	8137	17 (ZnCdS)	S12

14	**$Zn_{0.5}Cd_{0.5}S$**	**Co-CoO nanosheets**	**300 W Xe lamp (λ> 420 nm)**	**Na_2S /Na_2SO_3**	**8152**	**46 ($Zn_{0.5}Cd_{0.5}S$)** 10 (3%Pt/$Zn_{0.5}Cd_{0.5}S$)	**This work**

Table S2 Decay parameters of pristine ZCS and 5CC/ZCS.

Samples	Lifetime, T (ns)	Rel (%)	T_{ave} (ns)
ZCS	T1=29.17	B1=12.17	2.69
	T2=242.84	B2=63.51	
	T3=0.67	B3=24.31	
5CC/ZCS	T1=27.32	B1=12.47	3.20
	T2=225.83	B2=67.54	
	T3=0.65	B3=19.99	

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