

Supporting Information

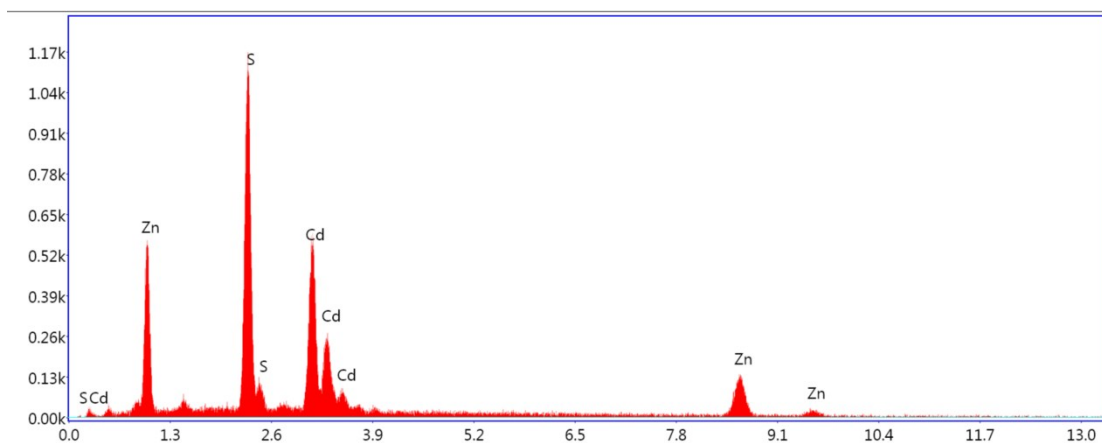


Fig. S1 EDX data of sample ZCS-2.

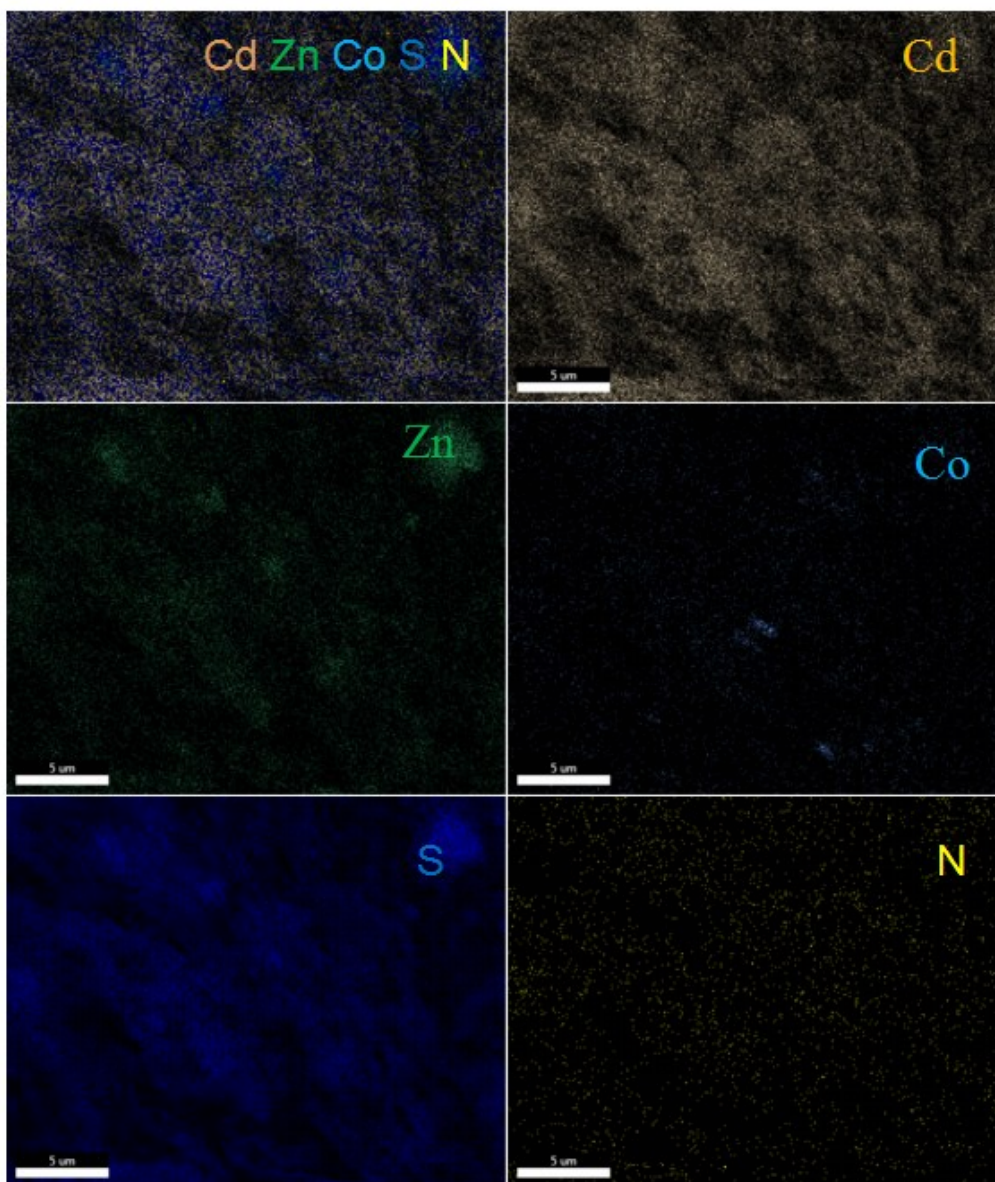


Fig. S2 SEM-Mapping images for cadmium, zinc, sulphur, cobalt, nitrogen.

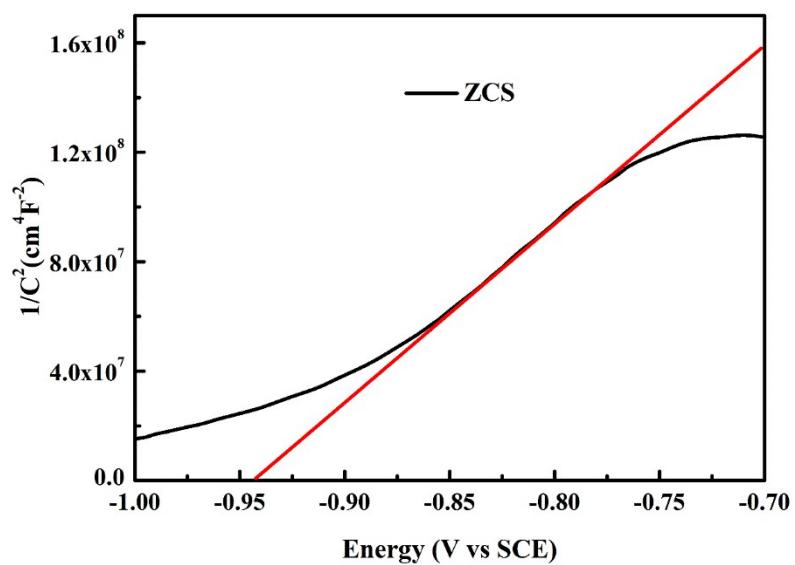


Fig S3. Mott-Schottky plot of ZCS.

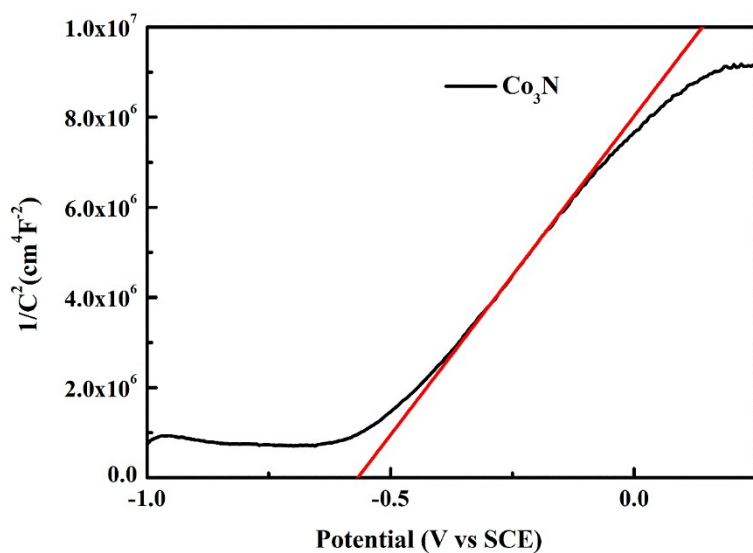


Fig S4. Mott-Schottky plot of Co₃N.

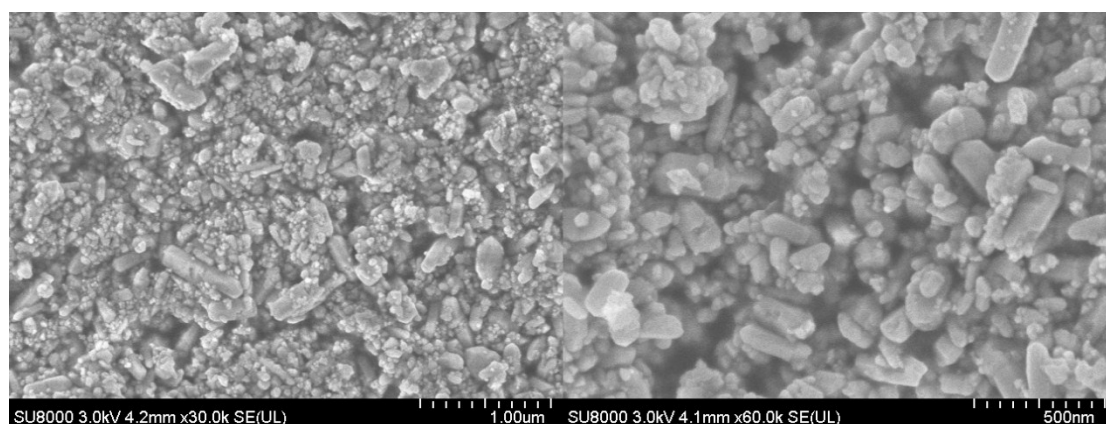


Fig. S5. SEM images of ZCS-2 after long-term photocatalytic production of H₂ for 15 h.

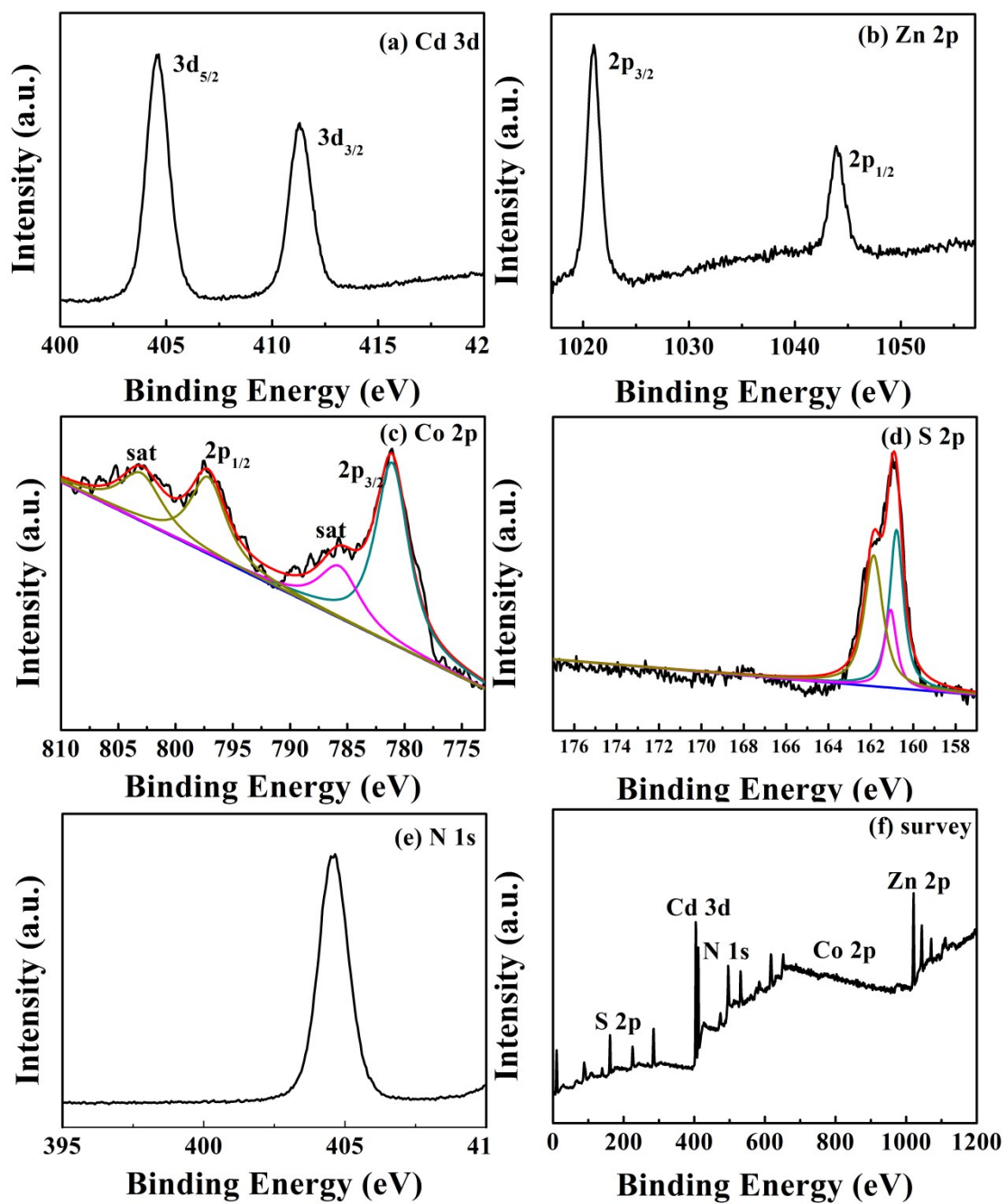
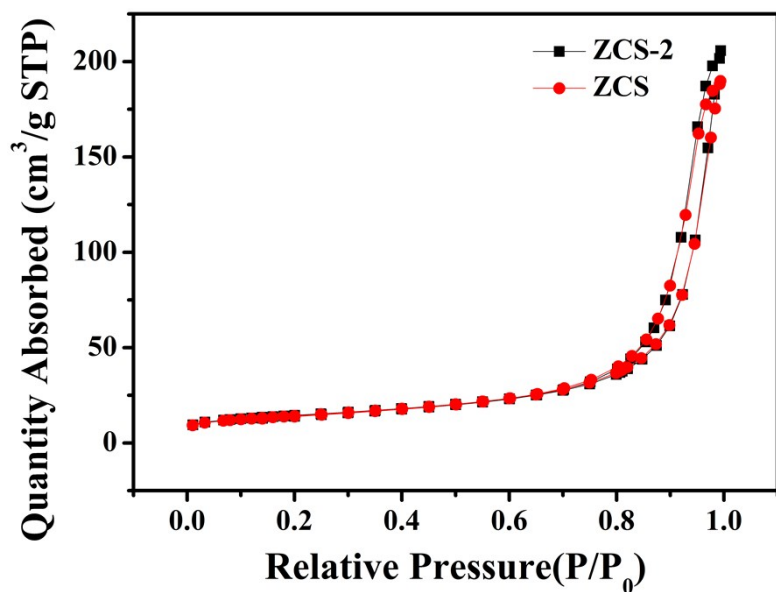
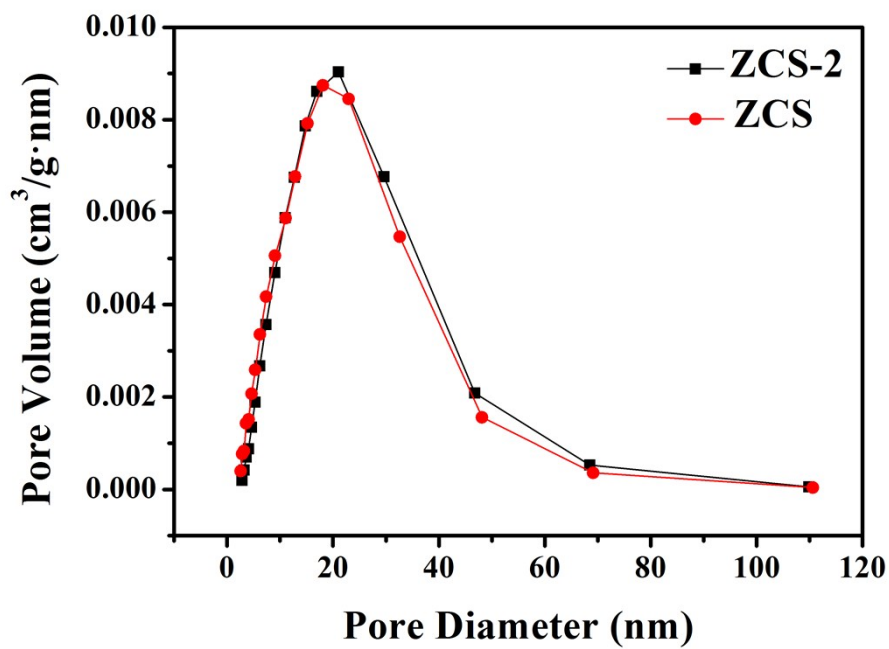


Fig. S6. XPS spectra of ZCS-2 after long-term photocatalytic production of H₂ for 15 h: (a) Cd 3d; (b) Zn 2p; (c) Co 2p; (d) S 2p; (e) N 1s; (f) survey.



(a)



(b)

Fig. S7. Nitrogen adsorption-desorption isotherms (a) and the corresponding pore-size distribution curves (b) of ZCS and ZCS-2.

Table S1 BET surface area and the pore size of ZCS and ZCS-2.

Sample	BET surface area (m ² /g)	BJH pore diameter (nm)
ZCS	49.25	19.60
ZCS-2	49.74	21.26

Table S2. The weight percentage of Co₃N loading on ZCS by ICP measurements.

	ZCS-0.5	ZCS-1	ZCS-1.5	ZCS-2	ZCS-3	ZCS-5
Theory values	0.5wt%	1wt%	1.5wt%	2wt%	3wt%	5wt%
ICP values	0.46wt%	0.93wt%	1.45wt%	1.96wt%	2.87wt%	4.89wt%

Table S3. Photocatalytic H₂ evolution activity over different ZCS photocatalysts.

Photocatalyst	Amount	Activity (value	Activity	A.Q.Y.(%)	Reference
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	of catalyst (mg)	reported in literature, $\mu\text{mol}\cdot\text{h}^{-1}$	($\times 1000$ $\mu\text{mol h}^{-1} \text{g}^{-1}$)		
$\text{Co}_3\text{N}/\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}$	1	218.8	218.8	30.2	This work
$\text{TiO}_2/\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}$	200	2640	13.2	38.1	1
$\text{Ni}_2\text{P}/\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}$	---	65.6	---	29	2
$\text{rGO}/\text{C}_3\text{N}_4/\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}$	100	3924	39.24	37	3
$\text{Cu}_{1.94}\text{S}-\text{Zn}_x\text{Cd}_{1-x}\text{S}$	20	270.66	13.53	26.4	4
$\text{FeP}/\text{Zn}_x\text{Zd}_{1-x}\text{S}-\text{P}$	10	244.5	24.45	10	5
$\text{Pt}/\text{Zn}_x\text{Cd}_{1-x}\text{S}-\text{P}$	10	188	18.8	---	5
$\text{NiS}/\text{Zn}_x\text{Cd}_{1-x}\text{S}-\text{MOF}$	50	839	16.78	---	6
$\text{Cd}_{0.5}\text{Zn}_{0.5}\text{S}$	100	179	1.79	43	7
$\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}$ porous nanosheets	300	500	1.667	---	8
$\text{Cd}_{0.5}\text{Zn}_{0.5}\text{S}$ nanorod	100	258	2.58	62	9
$\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}$	50	371	7.42	9.6	10
$\text{ZnS}/\text{Zn}_{1-x}\text{Cd}_x\text{S}/\text{CdS}$	5	532.5	106.5	---	11
$2\%\text{Cu}/\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}$	100	2140	21.4	18.8	12
$\text{Zn}_{0.8}\text{Cd}_{0.2}\text{S}/\text{rGO}$	50	91.2	1.82	23.4	13
1T- $1\text{Li}_x\text{MoS}_2/\text{Cd}_{0.5}\text{Zn}_{0.5}\text{S}$	100	769.9	7.70	---	14
$\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}/\text{PdP}_{\sim 0.33}\text{S}_{\sim 1.67}$	1	372.12	372.12	19.7	15
$\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}/\text{CoP}$	100	1217	12.17	45	16
$\text{NiS}_x/\text{Zn}_{0.8}\text{Cd}_{0.2}\text{S}/\text{rGO}$	50	392	7.84	20.88	17
$\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}/\text{CoP}$	50	734	14.68	---	18
$\text{Zn}_{0.5}\text{Cd}_{0.5}\text{S}$	50	971	19.42	---	19
$\text{Cd}_{0.5}\text{Zn}_{0.5}\text{S}/\text{C}_3\text{N}_4$	20	668.2	33.41	46.65	20

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