Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplementary data

Hollow ZnCdS Dodecahedral Cages for Highly Efficient Visible-Light-Driven Hydrogen Generation

Jianmin Chen, Junying Chen*, Yingwei Li*

*State Key Laboratory of Pulp and Paper Engineering, School of Chemistry and Chemical Engineering, South China University of Technology, Guangzhou 510640, China. *E-mail: cejychen@scut.edu.cn; liyw@scut.edu.cn*

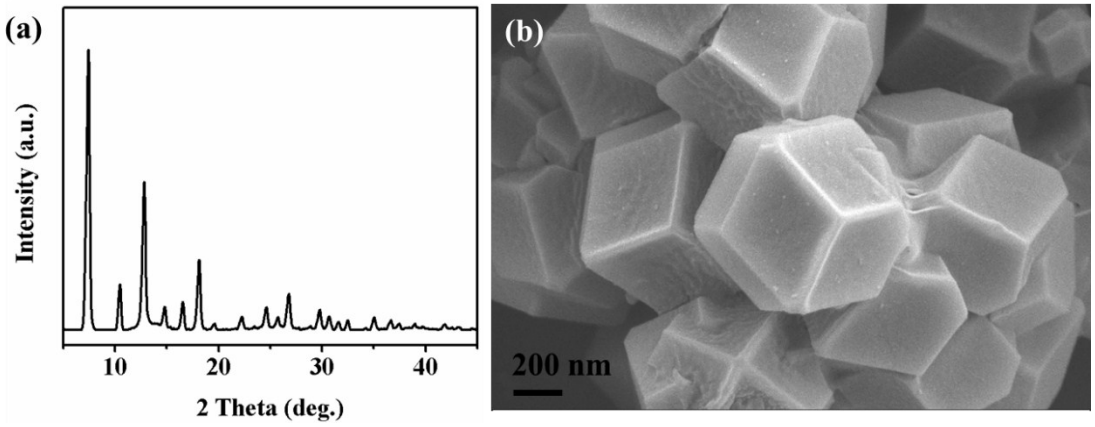

Fig. S1. (a) XRD pattern and (b) SEM image of ZIF-8 crystals.

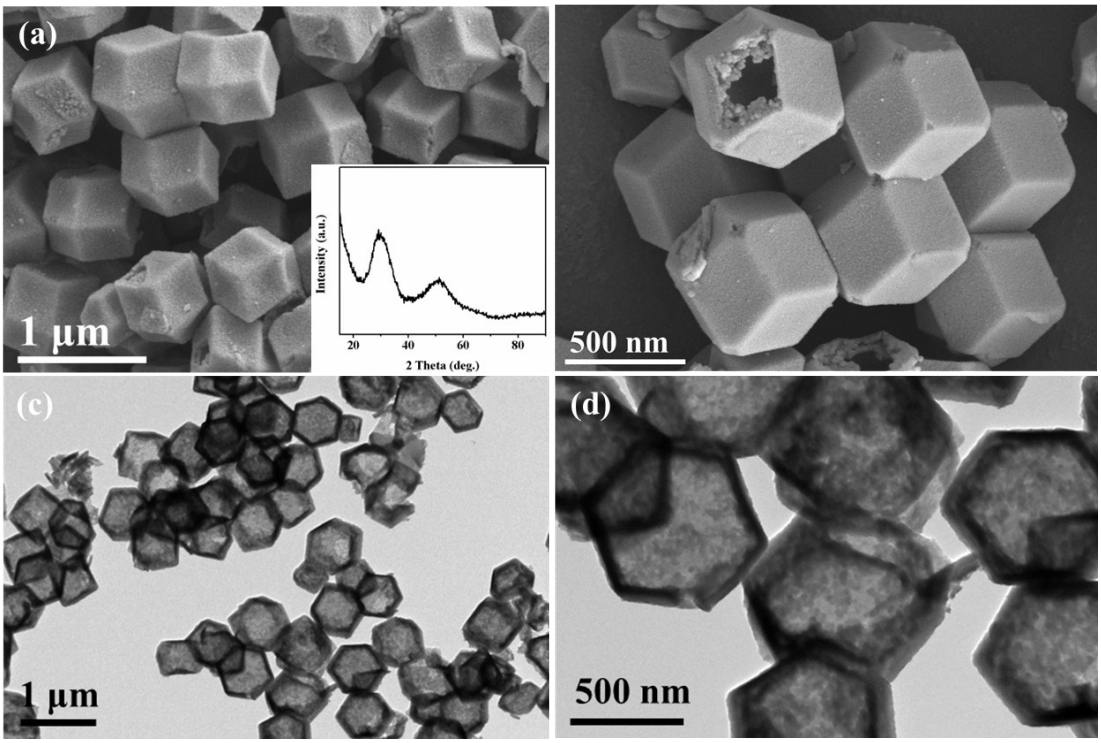

Fig. S2. (a-b) SEM and (c-d) TEM images of hollow ZnS cages. The inset in (a) shows the corresponding XRD pattern.

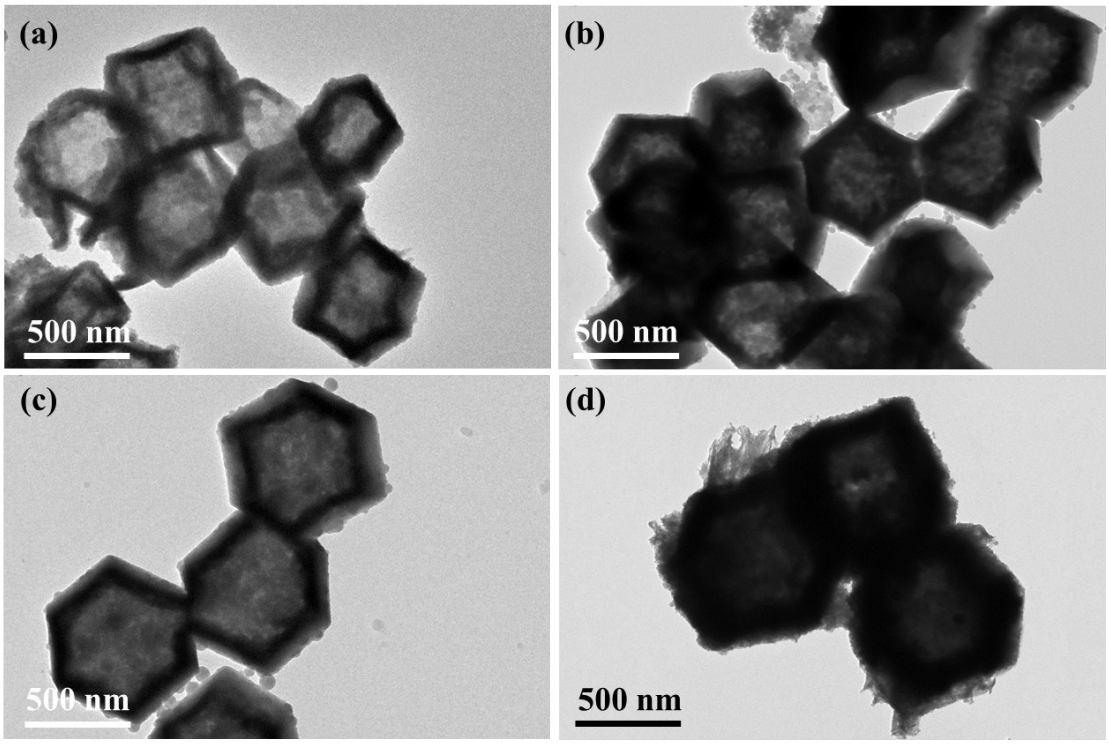

Fig. S3. TEM images of (a) $Zn_{0.8}Cd_{0.2}S$, (b) $Zn_{0.4}Cd_{0.6}S$, (c) $Zn_{0.2}Cd_{0.8}S$, and (d) CdS cages.

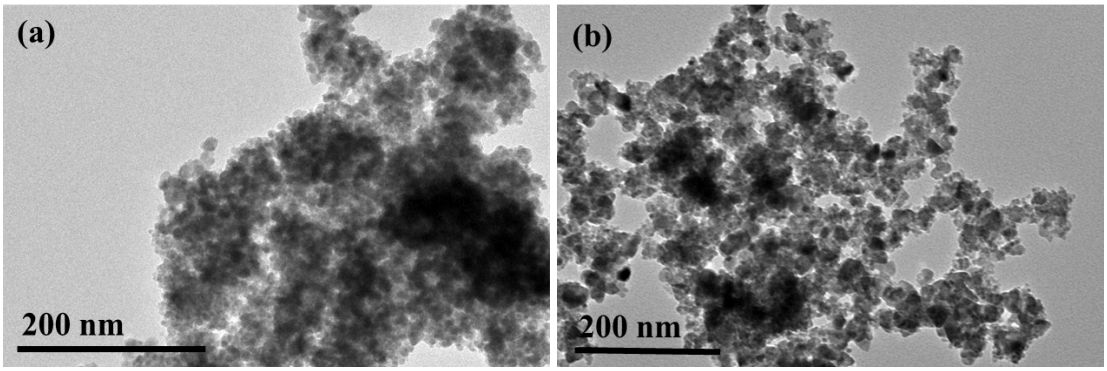

Fig. S4. (a) TEM images of solid (a) ZnS and (b) $Zn_{0.6}Cd_{0.4}S$.

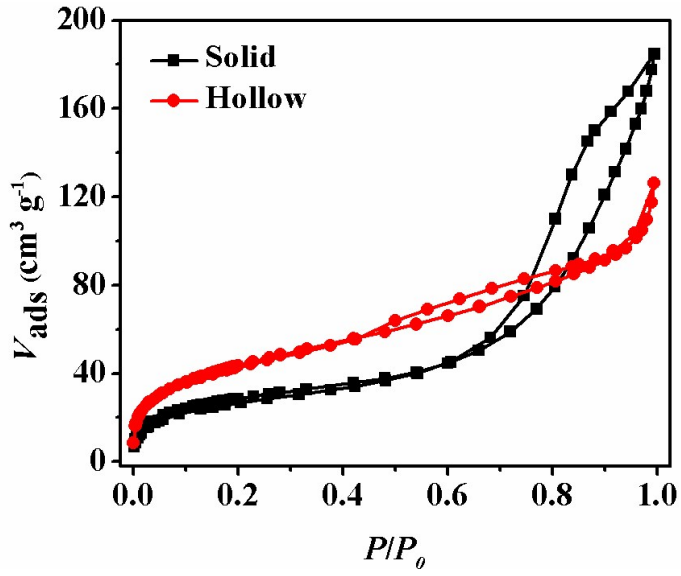

Fig. S5. Nitrogen isotherms recorded at 77 K for hollow and solid $Zn_{0.6}Cd_{0.4}S$, respectively.

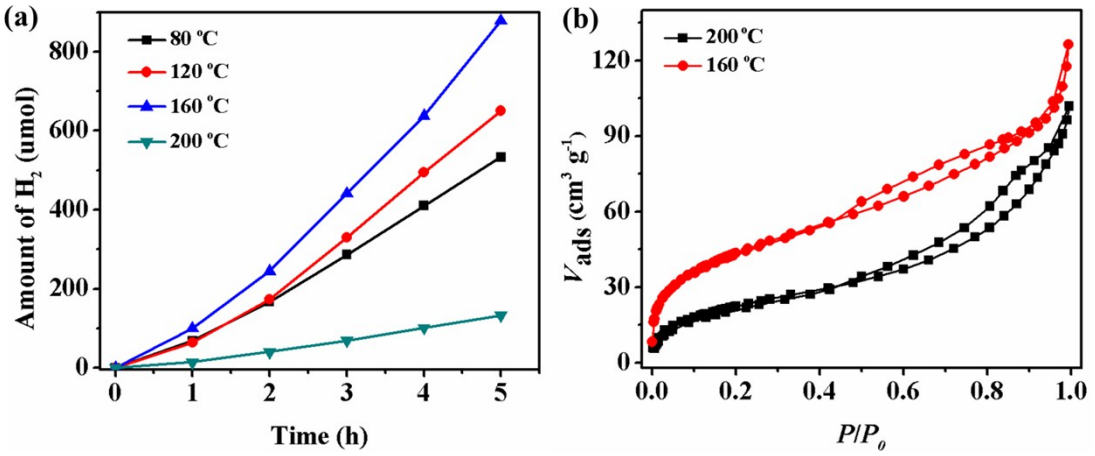

Fig. S6. (a) Photocatalytic hydrogen evolution curves of catalysts prepared at different temperatures under visible irradiation from a 300 W Xe lamp ($\lambda \geq 420$ nm, 0.75 M Na_2S, 1.05 M Na_2SO_3). (b) Nitrogen isotherms recorded at 77 K for hollow Zn_6Cd_4S cages prepared at different temperatures.

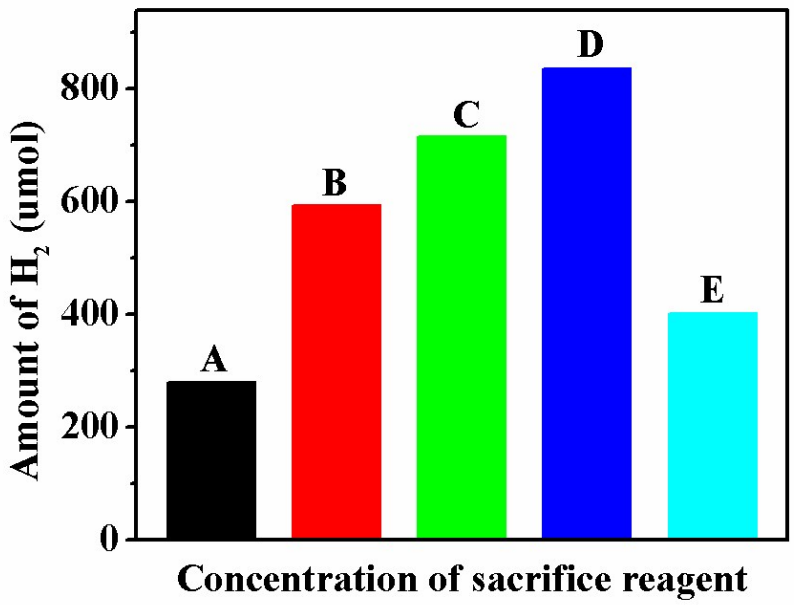

Fig. S7. Photocatalytic H_2 evolution on hollow $Zn_{0.6}Cd_{0.4}S$ cages in the presence of various concentrations of sacrificial reagents: **A**: 0.13 M Na_2S, 0.18 M Na_2SO_3; **B**: 0.25 M Na_2S, 0.35 M Na_2SO_3; **C**: 0.50 M Na_2S, 0.70 M Na_2SO_3; **D**: 0.75 M Na_2S, 1.05 M Na_2SO_3; **E**: 1.00 M Na_2S, 1.40 M Na_2SO_3.

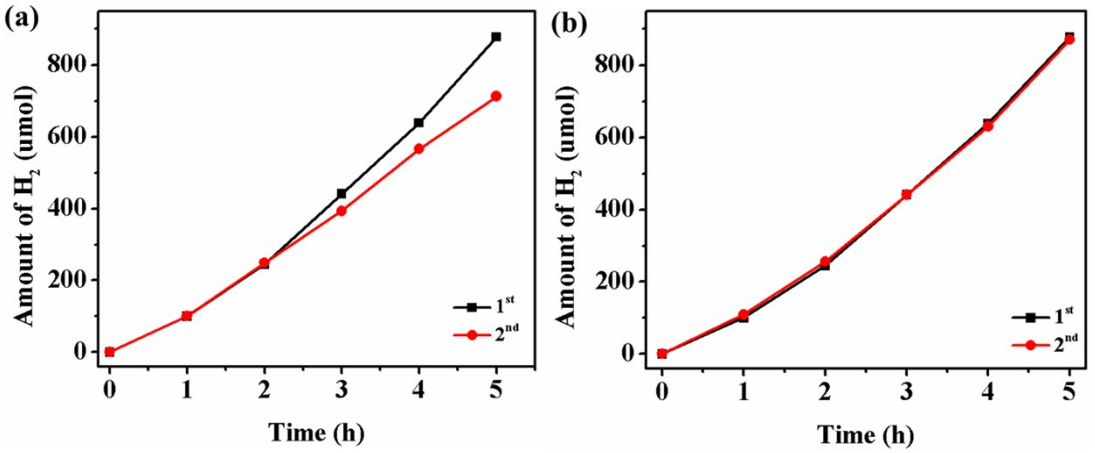

Fig. S8. Photocatalytic hydrogen generation as a function of irradiation time in two consecutive cycles for the $Zn_{0.6}Cd_{0.4}S$ cages.

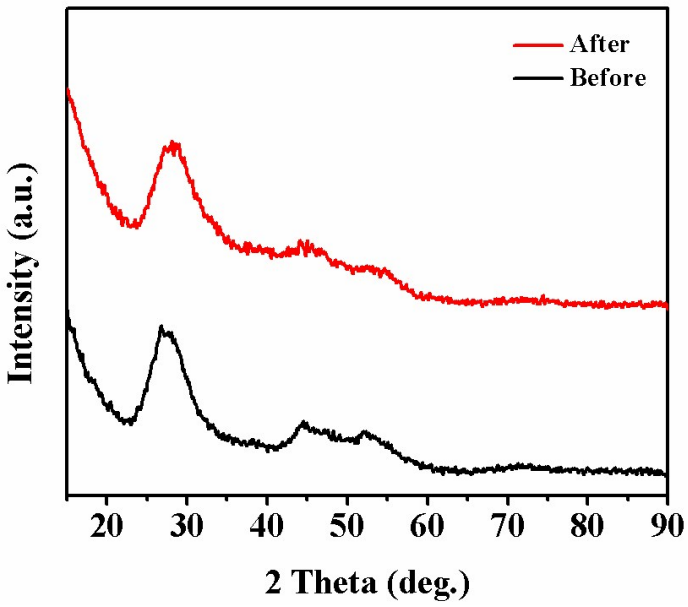

Fig. S9. XRD patterns of hollow $Zn_{0.6}Cd_{0.4}S$ cages before and after recycling tests.

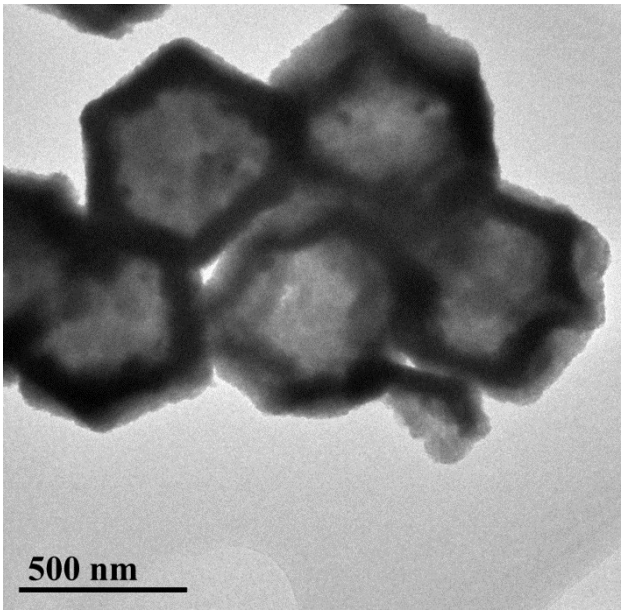

Fig. S10. TEM image of hollow $Zn_{0.6}Cd_{0.4}S$ cages after recycling tests.

Table S1. Comparison of the H_2-generation rates for various photocatalysts under visible light irradiation ($\lambda > 420$ nm).

Catalyst	Co-catalyst	Light source	TOF ($mmol_{H2}$ h^{-1} g^{-1})	Ref.
$Ni(OH)_2$-$Zn_{0.8}Cd_{0.2}S$	$Ni(OH)_2$	300 W Xe arc	7.16	58
Pt-$Zn_{0.8}Cd_{0.2}S$	Pt	300 W Xe arc	6.08	58
$Zn_{0.6}Cd_{0.4}S$ cages	**-**	**300 W Xe**	**5.68**	**This work**
CNUB-X	Pt	300 W Xe	5.56	7
CdS/g-C_3N_4	Pt	350 W Xe	4.15	14
CuS/ZnS	-	350 W Xe	4.14	59
$Zn_{0.4}Cd_{0.6}S$	-	300 W Xe	3.62	28
$Cd_{0.44}Zn_{0.56}S$	-	500 W Xe	2.64	27
g-C_3N_4-CdS-NiS	NiS	300 W Xe	2.56	22
MoO_2/$Zn_{0.5}Cd_{0.5}S$	MoO_2	300 W Xe	2.52	60
$CoPt_3$-ZnCdS	$CoPt_3$	300 W Xe	2.34	19
CdS QDs/$ZnCd_5S$	CdS QDs	350 W Xe	2.13	55
PdS/CdS@ZnS	PdS	300 W Xe	2.10	29
RGO-$Zn_{0.8}Cd_{0.2}S$	RGO	AM 1.5G	1.82	17
MoS_2/mpg-C_3N_4	-	300 W Xe	1.03	61
UiO-66/g-C_3N_4	Pt	300 W Xe	1.01	62
$(CuIn)_{0.2}Zn_{1.6}S_2$	-	300 W Xe	0.98	63
CdZnS@LDH	Pt	300 W Xe	0.92	64
NiS/C_3N_4	-	300 W Xe	0.48	65
$Cd_{0.7}Zn_{0.3}S$	-	300 W Xe	0.35	26
$Zn_{0.8}Cd_{0.2}S$	-	300 W Xe	0.19	66