Supporting Information

Accelerative charge transfer of $Cd_{0.5}Zn_{0.5}S$@ZnS core-shell nano-spheres via decoration of Ni_2P and g-C_3N_4 toward efficient visible-light-driven H_2 production

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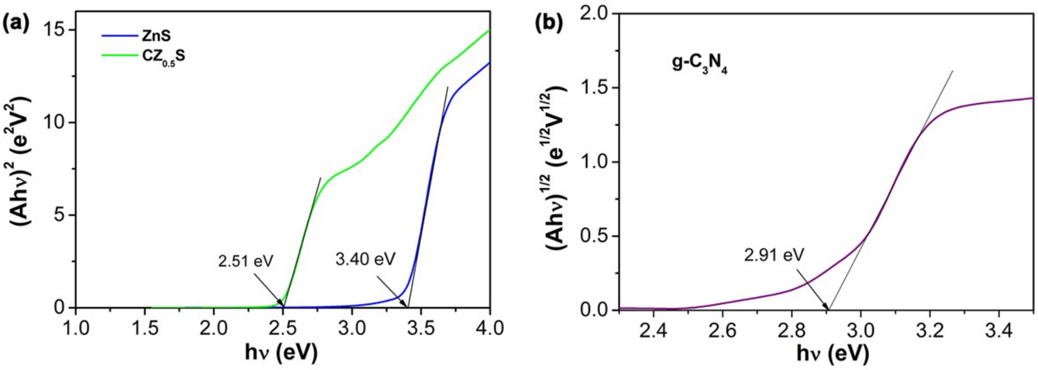

Fig. S1 Calculated bandgaps of (a) $CZ_{0.5}S$ and ZnS, (b) g-C_3N_4.

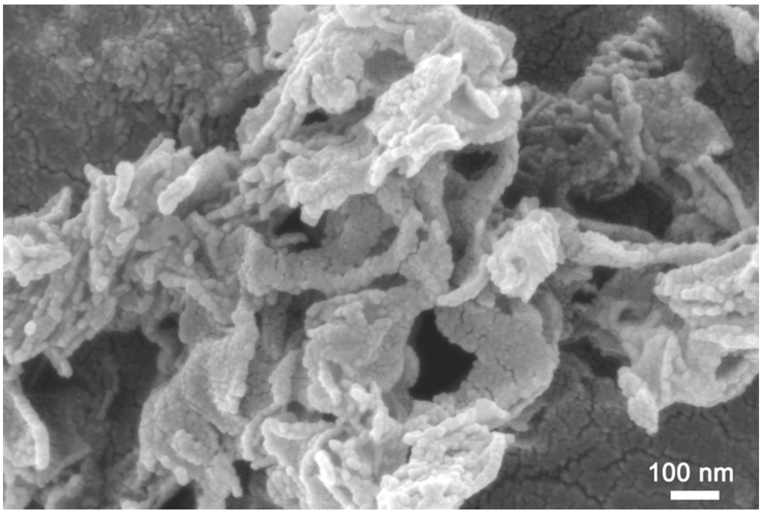

Fig. S2 SEM image of g-C_3N_4 nanosheets.

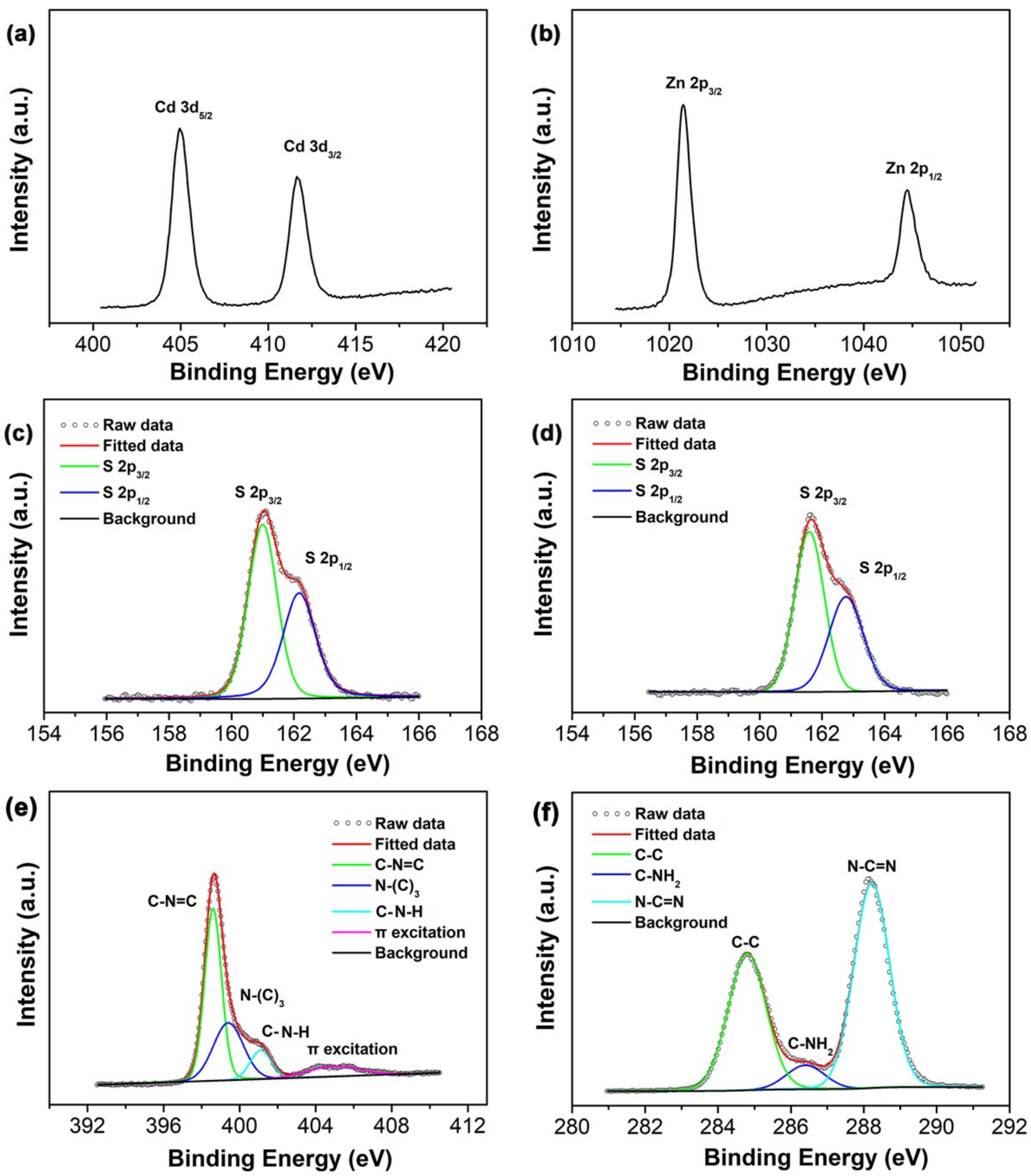

Fig. S3 (a) Cd 3d, (b) Zn 2p, and (c) S 2p XPS spectra of $CZ_{0.5}S$@50ZS. (d) S 2p XPS spectrum of $CZ_{0.5}S$@50ZS-6N/8CN. (e) N 1s and (f) C 1s XPS spectra of g-C_3N_4.

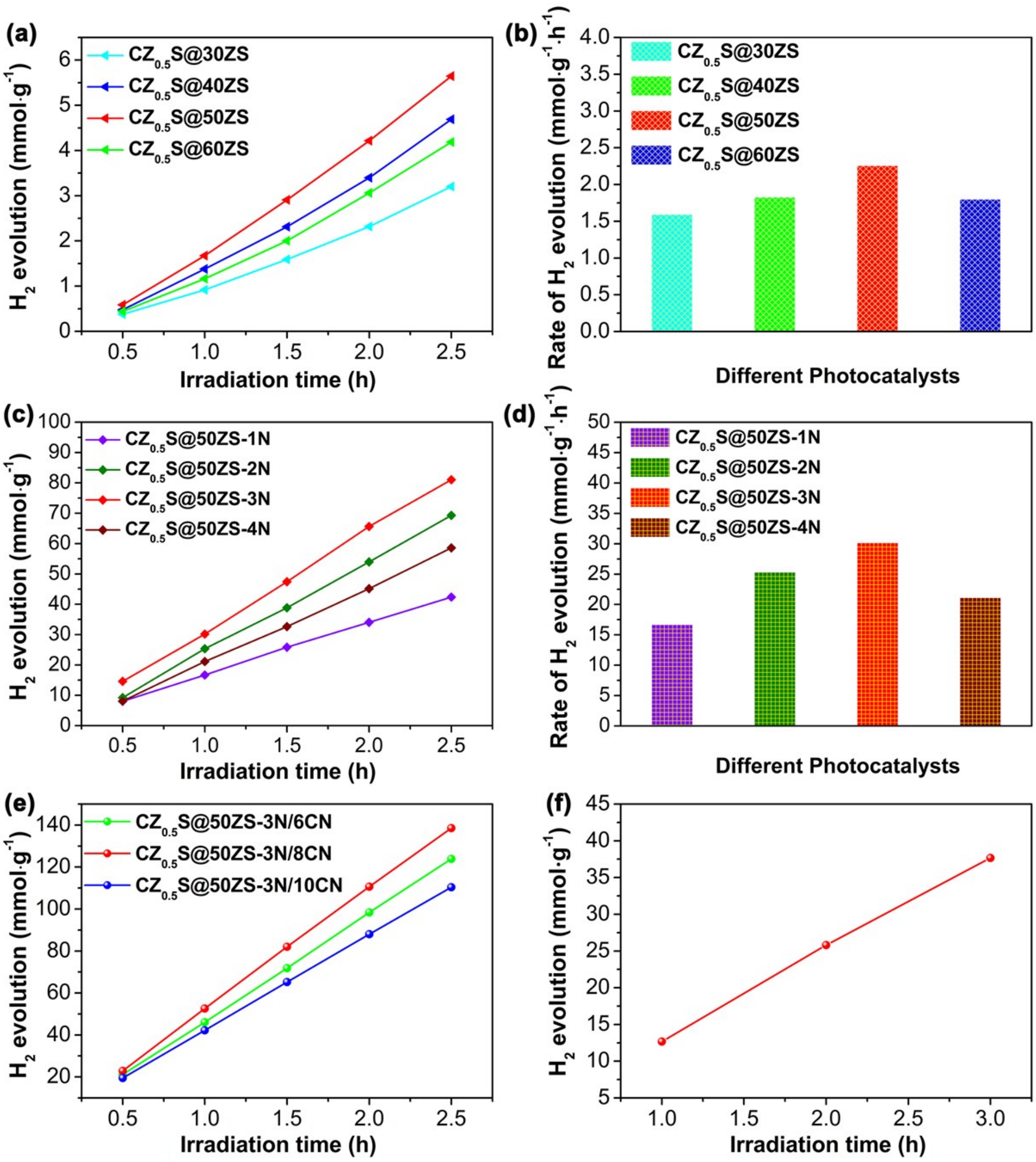

Fig. S4 (a) Visible-light-induced HER activities and (b) corresponding average rates of the $CZ_{0.5}S$@ZnS composites containing different ZnS contents. (c) H_2 generation activities and (d) corresponding average rates of the $CZ_{0.5}S$@50ZS-Ni_2P photocatalysts with varying Ni_2P concentrations. (e) The influence of g-C_3N_4 loading amount on the HER activity of $CZ_{0.5}S$@50ZS-3N/g-C_3N_4 hybrids. (f) Apparent quantum yield calculating curve of $CZ_{0.5}S$@50ZS-3N/8CN.

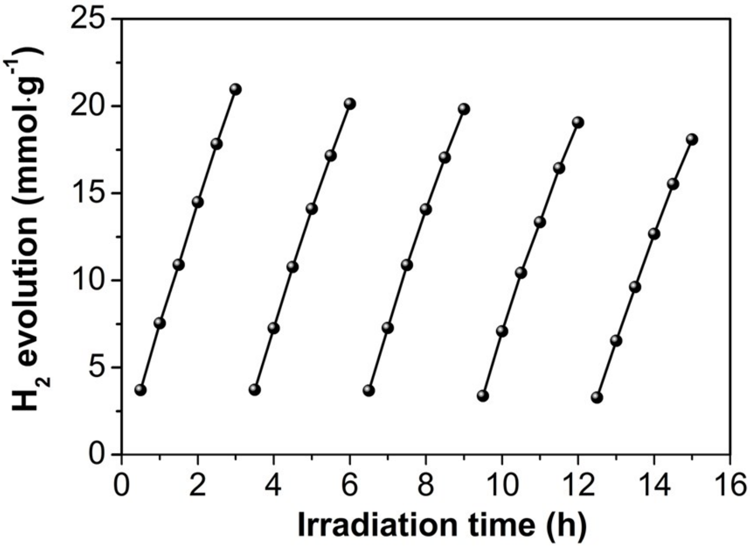

Fig. S5 Cycling H_2 evolution of the $CZ_{0.5}S$-3N/8CN composite.

Table S1 Comparison on the photocatalytic HER activities of CdS-based photocatalysts.

Photocatalyst	Hole scavenger (aqueous solution)	Light source (Xe lamp)	Maximum rate ($mmol \cdot h^{-1} \cdot g^{-1}$)	AQY (420 nm)	Reference
$CZ_{0.5}S$@ZS-Ni_2P/CN	Na_2S/Na_2SO_3	λ > 420 nm	55.43	21%	This work
MnOx@CdS@GR	Na_2S/Na_2SO_3	λ > 420 nm	5.45	12.4%	1
Ni_2P/MCdS-DETA	Na_2S/Na_2SO_3	λ > 420 nm	6.84	-	2
ZnO/CdS-T120	Na_2S/Na_2SO_3	λ > 420 nm	2.07	-	3
CdS/ZnS	Na_2S/Na_2SO_3	λ > 420 nm	0.79	-	4
MoS_2-NiS/CdS	Lactic acid	λ > 420 nm	25.25	-	5
CdS-Ag_2S	TEOA	λ > 420 nm	7.5	-	6
SiCN@2CdS	Triethanolamine	λ > 420 nm	2.73	-	7
CdS/VN	Lactic acid	λ > 420 nm	6.24	5.3%	8
CdS-Co_3O_4	Lactic acid	λ > 420 nm	10.14	9.7%	9
CoPe@CdS/rGO	Na_2S/Na_2SO_3	λ > 420 nm	29.4	-	10
CdS/Mo_2C@C	Lactic acid	λ > 420 nm	5.54	4.9%	11
$Cd_{0.5}Zn_{0.5}S/Ni_2P$	Na_2S/Na_2SO_3	λ > 420 nm	41.26	-	12
CDs/CdS	Lactic acid	λ > 420 nm	6.7	19.3%	13
CuS/CdS(H)/CdS(C)	Lactic acid	λ > 420 nm	2.03	-	14
CdS/CuS	Triethanolamine	λ > 420 nm	0.22	-	15
2D/2D Ni_2P/CdS	Lactic acid	λ ≥ 420 nm	17.95	4.2%	16
NiCd/CdS	Na_2S/Na_2SO_3	λ > 410 nm	11.57	-	17
NiCo-LDH/P-CdS	Lactic acid	λ > 420 nm	8.66	14%	18
CdS/WS_2	Lactic acid	λ > 420 nm	14.1	-	19
CdS/VC	Lactic acid	λ > 420 nm	14.2	8.7%	20

$Ni_2P/Zn_{0.5}Cd_{0.5}S$	Na_2S/Na_2SO_3	λ > 420 nm	5.33	18.1%	21
MoS_2/CdS	Na_2S/Na_2SO_3	λ > 420 nm	4.65	7.31%	22

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