Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supporting Information

(002) facets exposed and controllable thickness of CdS nanobelts drive desirable hydrogen-adsorption free energy (△G_H) for boosting visible-light photocatalytic performance

Dejian Yan[a, b], Zhiyong Xue [a]*, Feng Chen[b, c], Xia Liu[d], Zhenhua Yang[e], Yong Pei[d], Shaoxiong Zhou [a], Caixian Zhao[b,]*

[a] *Institute for Advanced Materials, North China Electric Power University, Beijing 10000, P.R. China*

[b] *School of Chemical Engineering, Xiangtan University, Xiangtan 411105, P.R. China*

[c] *College of Chemical Engineering, Guangdong University of Petrochemical Technology, Maoming 525000, China*

[d] *Key Laboratory of Environmentally Friendly Chemistry and Applications of Ministry of Education, School of Chemistry, Xiangtan University, Xiangtan 411105, China*

[e] *Key Laboratory of Low Dimensional Materials & Application Technology (Ministry of Education), School of Materials Science and Engineering, Xiangtan University, Xiangtan 411105, Hunan, China*

*Corresponding author.

E-mail address: xuezy@ncepu.edu.cn (Z. Xue), zcx@xtu.edu.cn (C. Zhao)

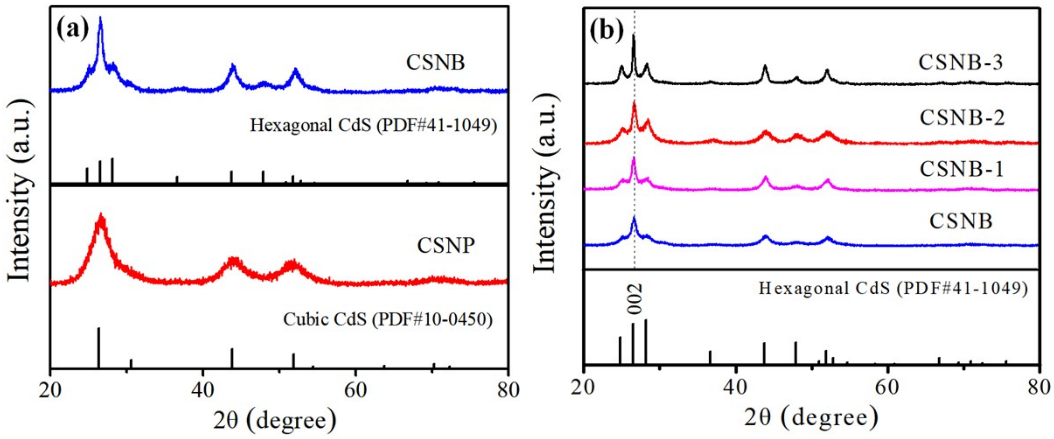

Figure S1. XRD patterns of the CdS nanobelt synthesized with different hydrothermal reaction temperature.

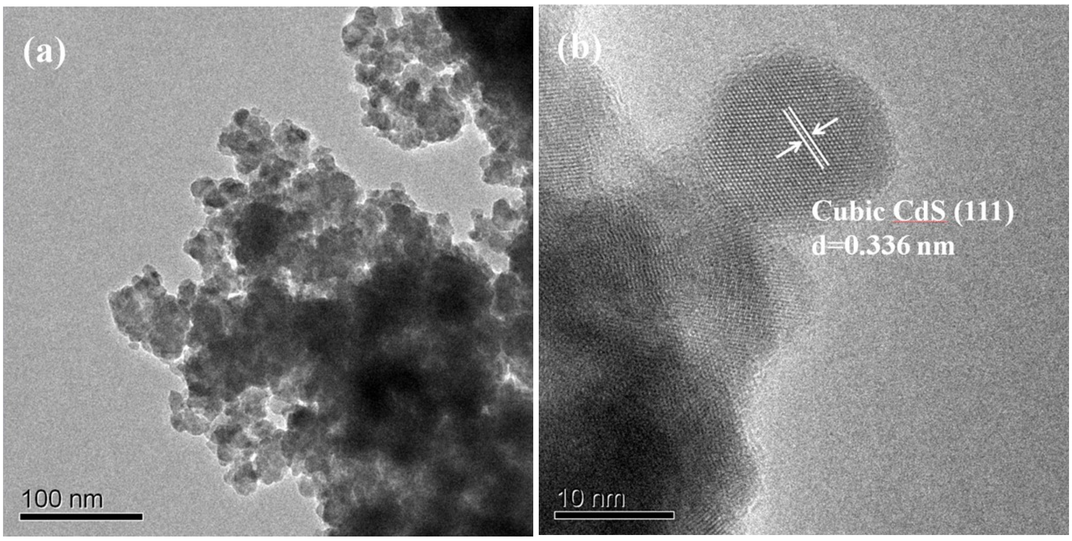

Figure S2. TEM and HRTEM image of the as-synthesized CSNP.

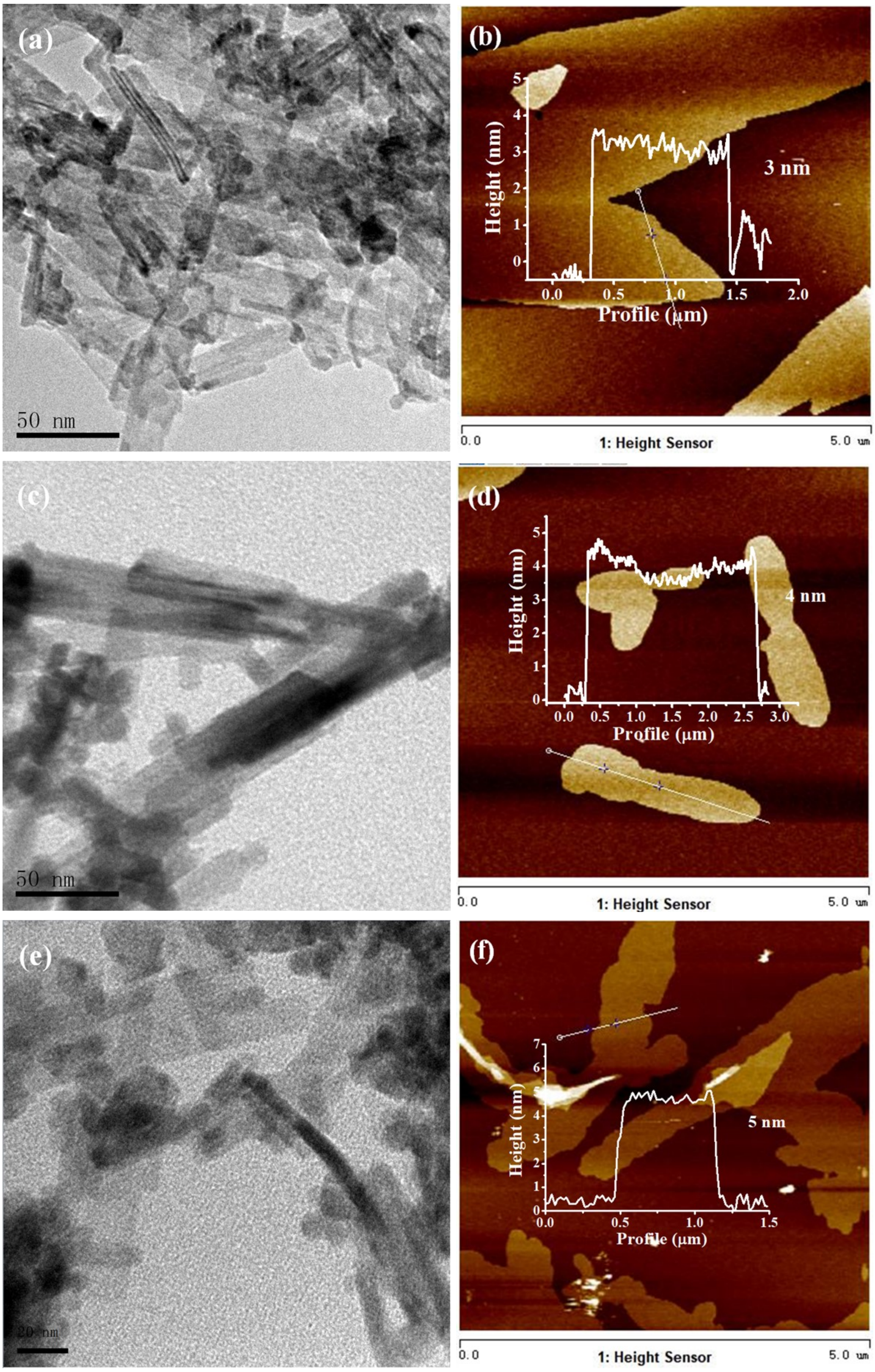

Figure S3. TEM and AFM images of the as-synthesized (a-b) CSNB-1, (c-d) CSNB-2 and (e-f) CSNB-3.

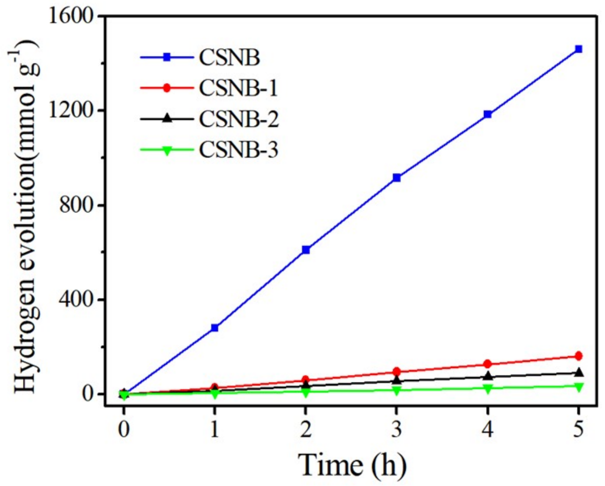

Figure S4. Time course for hydrogen evolution by the different thickness of CdS nanobelt samples under visible light irradiation.

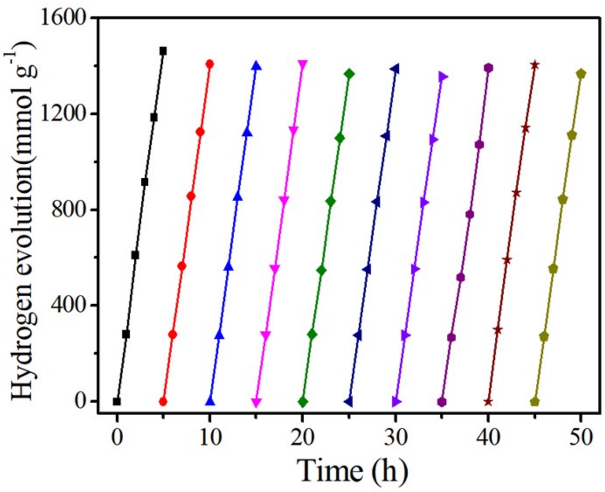

Figure S5. Recycle runs of hydrogen evolution over the CSNB under visible light illumination ($\lambda > 400$ nm).

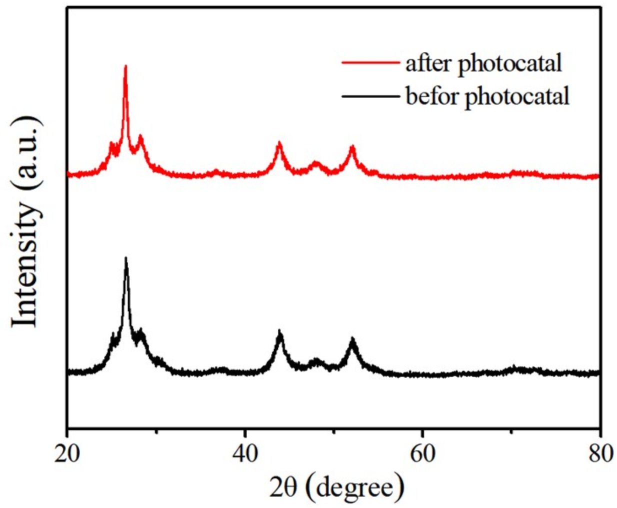

Figure S6.XRD patterns of CSNB before and after long-term photocatalytic reaction.

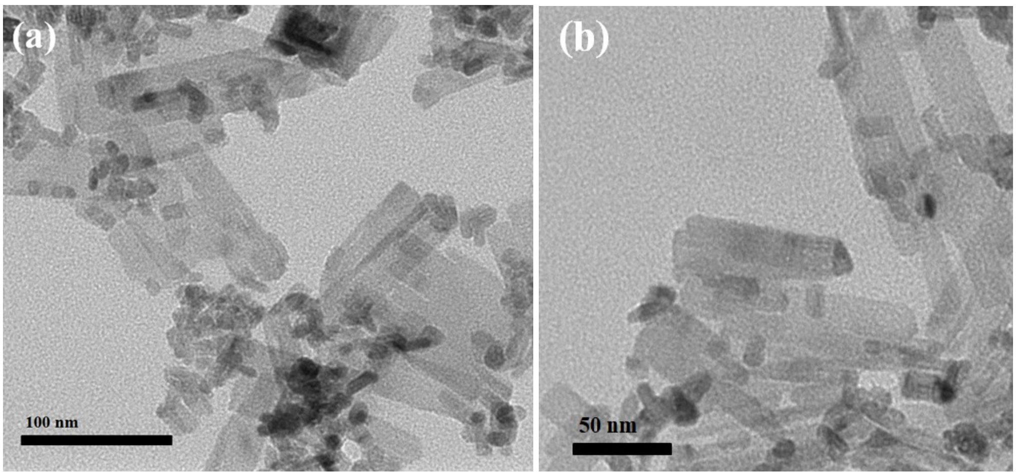

Figure S7. TEM images of the as-synthesized CSNB after long-term photocatalytic reaction.

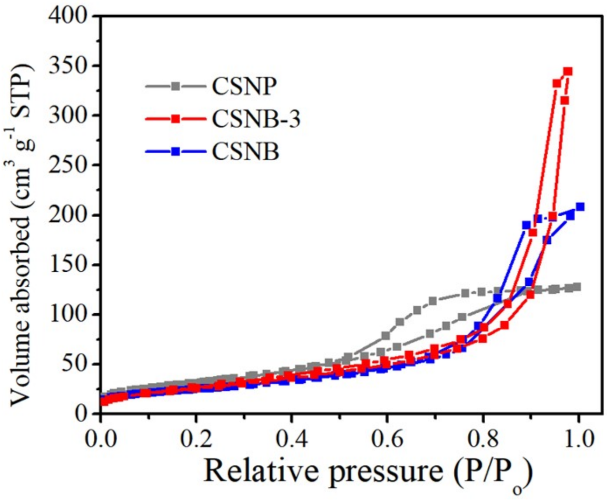

Figure S8. Nitrogen adsorption/desorption isotherm curves of the as-synthesized CSNP, CSNB-3 and CSNB.

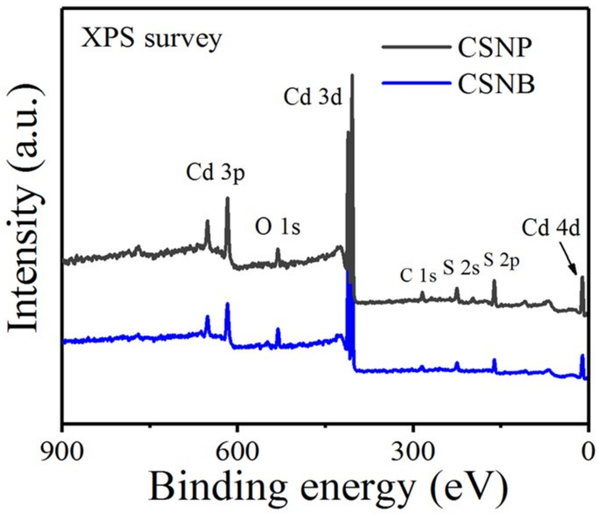

Figure S9. XPS survey spectra of the CSNP and CSNB.

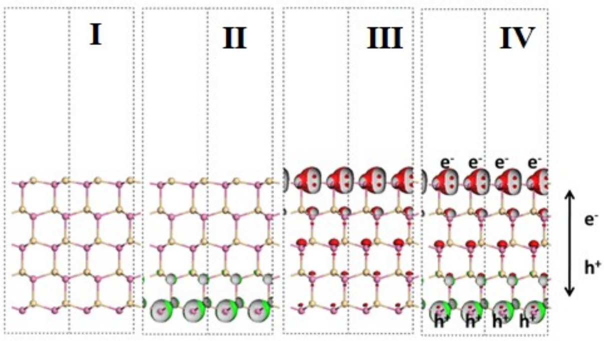

Figure S10. The distribution of electron clouds over the (001) surfaces hexagonal CdS (5 layers)

Table S1. Summary of CdS composites for photocatalytic H_2 production

Photocatalyst	Cocatalyst	Light source	Sacrificial reagent	H_2 evolution $mmol\cdot h^{-1}\cdot g^{-1}$	Ref
CdS NBs	No cocatalyst	300 W Xe lamp, λ>400 nm	Na_2S-Na_2SO_3	282.12	This work
CdS NSs	No cocatalyst	300 W Xe lamp, λ>420 nm	Lactic acid	41.1	1
CdS NPs	Pt	300 W Xe lamp, λ>420 nm	$(NH_4)_2SO_3$	33	2
CdS NPs	Pt-RGO	350 W Xe lamp, λ>420 nm	Lactic acid	56	3
CdS NPs	Pt-PdS	300 W Xe lamp, λ>420 nm	Na_2S-Na_2SO_3	29.23	4
CdS NRs	Pd-Pt	150 W Xe lamp	Lactic acid	130.33	5
CdS NRs	MoS_2	300 W Xe lamp, λ>420 nm	Lactic acid	49.80	6
CdS NWs	MoS_2	300 W Xe lamp, λ>420 nm	Lactic acid	95.70	7
CdS NRs	MoS_2	150 W Xe lamp	Lactic acid	238	8
CdS NRs	Cu_3P	300 W Xe lamp, λ>420 nm	Na_2S-Na_2SO_3	200	9
CdS NRs	CoP	300 W Xe lamp, λ>420 nm	Lactic acid	106	10
CdS NPs	FeP	LED: 30×3 W, λ>420nm	Lactic acid	202	11
CdS NRs	Co_xP	300 W Xe lamp, λ>420 nm	Na_2S-Na_2SO_3	500	12
CdS NRs	Ni_2P	300 W Xe lamp, λ>420 nm	Na_2S-Na_2SO_3	1200	13
CdS NRs	MoP	300 W Xe lamp, λ>420 nm	Lactic acid	163.2	14
CdS NRs	WS_2	300 W Xe lamp, λ>420 nm	Lactic acid	185.79	15
CdS NPs	Ni-TNDs	300 W Xe lamp, λ>420 nm	Ethanol	31.82	16
CdS NRs	Co_3N	300 W Xe lamp, λ>420 nm	Na_2S-Na_2SO_3	137.33	17
CdS NRs	NiSe	300 W Xe lamp, λ>420 nm	Na_2S-Na_2SO_3	170	18

*CdS NBs: CdS nanobelts; CdS NSs: CdS nanosheets; CdS NPs: CdS nanoparticles; CdS NRs: CdS nanorods; CdS NWs: CdS nanowires;

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Table S2. The lifetime datas of the as-synthesized CdS samples.

Samples	τ_1 (ns)	τ_2 (ns)	τ_3 (ns)	τ_{av} (ns)
CSNP	0.2938	1.39	5.4	1.71
CSNB-3	0.3483	1.48	7.2	2.63
CSNB	0.7965	3.65	9.75	6.3