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Supporting Information

Visible light driven high-efficient photocatalytic property of Cu_2ZnSnS_4 nanoparticles synthesized by hydrothermal method

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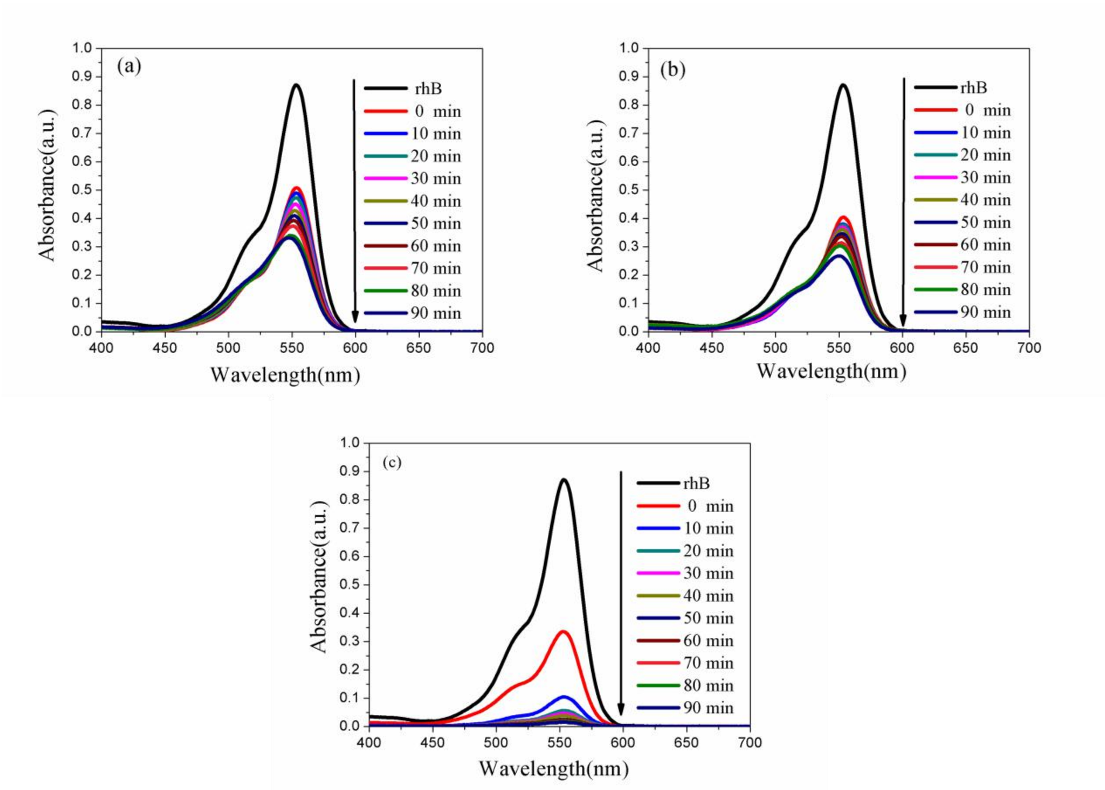

Fig.S1. Time-dependent UV-Vis absorption spectra of RhB solution under stimulated Vis irradiation of CZTS samples prepared at (a) 160°C, (b) 180°C and (c) 200°C.

Table S1. Pseudo first-order kinetics equation and coefficient constant of the catalytic photodecomposition of RhB pollutants.

Sample	First order kinetics equation	Coefficient constant（R^2）
rhB	y=0.000454t - 0.000323	0.93751
160℃-CZTS	y=0.00527t + 0.51297	0.97999
180℃-CZTS	y=0.00411t + 0.74867	0.91187
200℃-CZTS	y=0.02905t + 1.77020	0.82890

A 10mg/L BPA solution was prepared. For each photocatalysis experiment, 100 mL of BPA solution was measured, and then a 50 mg CZTS sample was added and stirred in a dark environment for 60 minutes. After starting the light, 6 mL of the solution was taken in the centrifuge tube every 30 minutes, and the light stopped after 120 minutes. Finally, the removed solution was centrifuged in an extractor at 10000rad/min for 3 minutes, and the supernatant was taken for UV-vis spectrum analysis. The results were shown in Fig. S2, Fig. S3 and table S2.

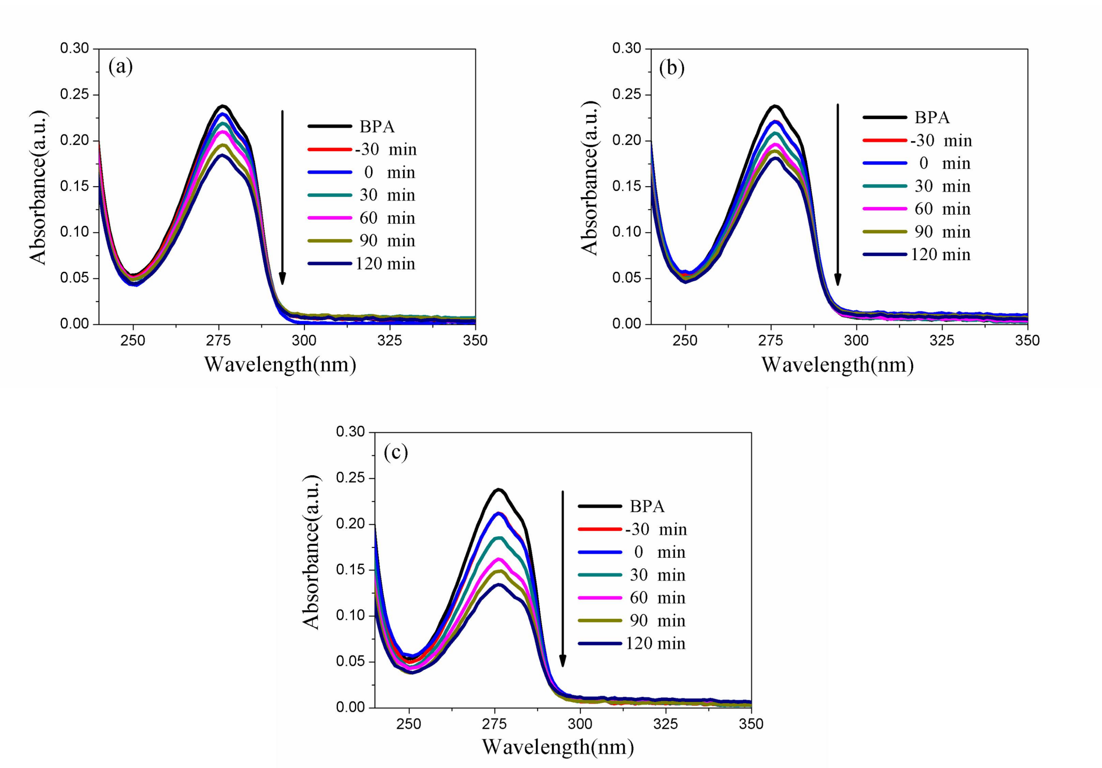

Fig.S2. Time-dependent UV-Vis absorption spectra of BPA solution under stimulated Vis irradiation of CZTS samples prepared at (a) 160°C, (b) 180°C and (c) 200°C.

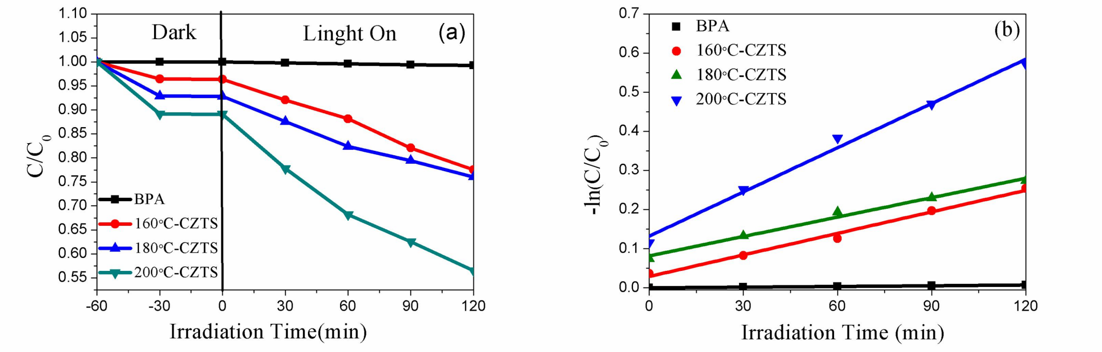

Fig.S3. Photocatalytic degradation rate of BPA by CZTS samples at different temperatures.

Table S2. Pseudo first-order kinetics equation and coefficient constant of the catalytic photodecomposition of BPA.

Sample	First order kinetics equation	Coefficient constant（R^2）
BPA	y=0.000031t - 0.000003	0.99789
160℃-CZTS	y=0.00184t + 0.02915	0.98869
180℃-CZTS	y=0.00166t + 0.08160	0.98595
200℃-CZTS	y=0.00377t + 0.13201	0.98860

Table S3. The TOC removal efficiency (Mineralization degree) of RhB in aqueous solution for the CZTS prepared at 200°C after visible light irradiation for 90 min.

Sample	TOC (mg/L)	IC(mg/L)	TC(mg/L)	Mineralization degree (%)
Before Photocatalysis	11.365	0.4100	11.775	61.37
After Photocatalysis	4.390	0.4902	4.880	

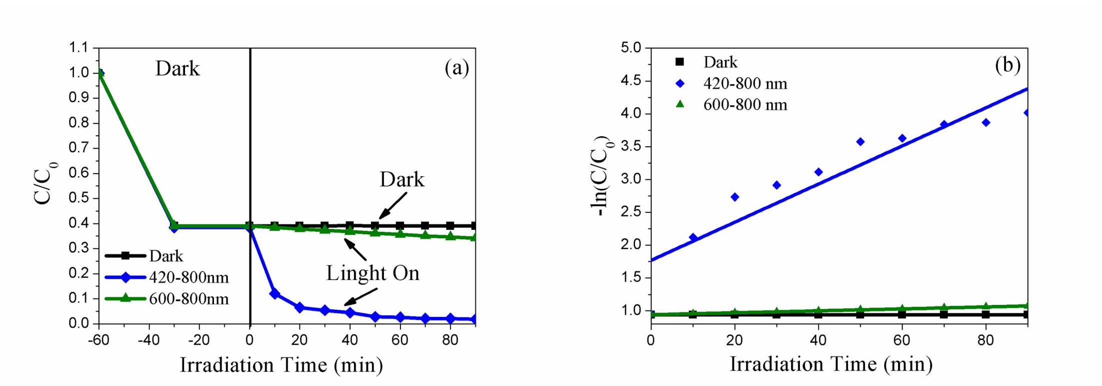

Fig.S4. Photocatalytic degradation rate of RhB by CZTS prepared at 200℃ under different wavelengths of light irradiation.

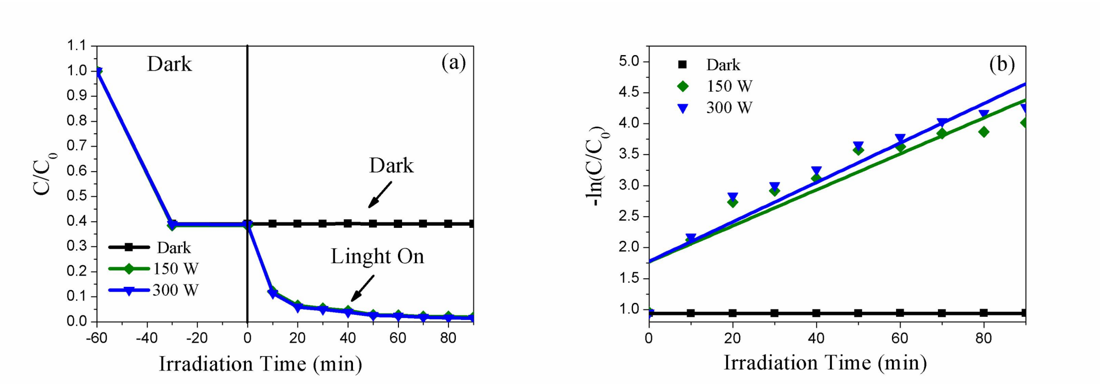

Fig.S5. Photocatalytic degradation rate of RhB by CZTS prepared at 200°C under different powers of light irradiation.

Table S4. Pseudo first-order kinetics equation and coefficient constant of the catalytic photodecomposition of RhB under different irradiation powers.

Power	First order kinetics equation	Coefficient constant（R^2）
150W	y=0.02905t + 1.77020	0.82890
300W	y=0.03185t + 1.77758	0.85349

Table S5. Data comparison of RhB photocatalysis with different catalysts.

Catalyst	$m_{Catalyst}$ (mg)	RhB (mg/L)	Solution (mL)	Time (min)	Degradation efficiency (%)	Degradation rate (min^{-1})	Ref
TiO_2-CZTS	0.1	7.2	50	80	100	1×10^{-2}	[1]
TiO_2-CZTS	40	20	40	60	94.1	5.551×10^{-2}	[2]
CZTS	40	4	100	100	83	1.72×10^{-2}	[3]
CZTS	10	10	20	100	99.8	4.97×10^{-2}	[4]
CZTS (thin film)	-	-	150	240	79	0.39 (h^{-1})	[5]
CZTS+TA	20	~24	50	240	51.66	0.11099 (h^{-1})	[6]
CZTS	10	10	50	360	98	4×10^{-2}	[7]
CZTS/$La_2Ti_2O_7$	50	~8	100	60	95	-	[8]
CZTS	30	10	100	90	98,2	2.905×10^{-2}	This work

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