Electronic Supplementary Material (ESI) for CrystEngComm

Supporting Information

One-Step Preparation of Hollow ZnO Core/ZnS Shell Structures with Enhanced Photocatalytic Properties

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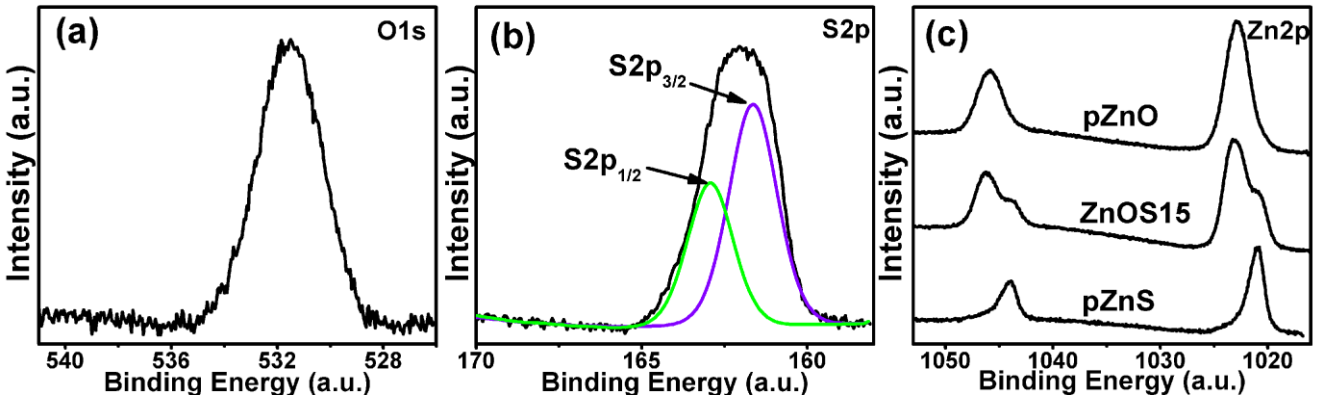

Fig. S1 XPS spectra of ZnOS15, pZnO and pZnS: (a) O1s spectrum of ZnOS15, (b) S2p spectrum of ZnOS15 and (c) Zn2p spectra of ZnOS15, pZnO and pZnS.

Experimental details of the reactions conducted at low temperatures

All of the nutrient solution used below was prepared as described in experimental section within the main text: 0.1854 g (1 mmol) dodecylamine (DDA) was added into 60 ml deionized water followed by vigorous stir for two hours of above. When it became suspension, 60 ml deionized water solution contained 5.9476 g (20 mmol) $Zn(NO_3)_2 \cdot 6H_2O$ was added. Then 40 ml of 0.75 M thiourea solution was added into the mixture above. Three samples were synthesized at 80 °C for 1, 3 and 5 min, respectively. And other samples were prepared at 85 °C (90 °C, 100 °C) for 20 s, 1 and 5 min, respectively.

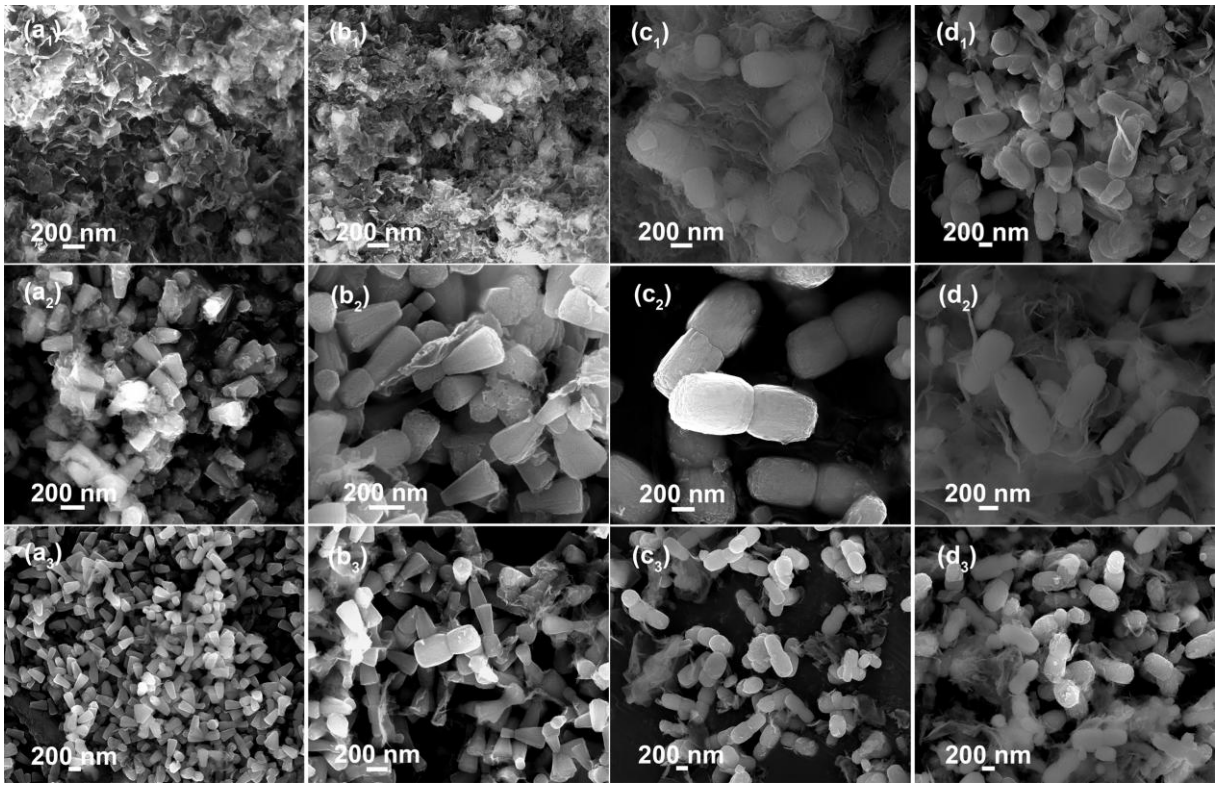

Fig. S2 The morphological evolution of bifid structures varies with time under different reaction temperatures. (a_1 ~ a_3) The samples obtained at 80 °C for 1, 3 and 5 min, respectively. (b_1 ~ b_3) The samples obtained at 85 °C for 20 s, 1 and 5 min, respectively. (c_1 ~ c_3) The samples obtained at 90 °C for 20 s, 1 and 5 min, respectively. (d_1 ~ d_3) The samples obtained at 100 °C for 20 s, 1 and 5 min, respectively.

Experimental details of the preparation of ZnOS NS

All of the reagents are analytical-grade and used without further purification. In a typical procedure, 5.95 g $Zn(NO_3)_2 \cdot 6H_2O$ was mixed with 0.76 g CH_4N_2S in 50 mL deionized water to form a clear solution. After that, 5 mL aqueous ammonia ($NH_3 \cdot H_2O$) was added to adjust the pH value of the solution to about 7.5. Then, the mixture was finally loaded into a 100 mL Teflon-lined autoclave and maintained at 120 °C for 4 h. After cooling to room temperature naturally, the product was collected, washed with deionized water and absolute ethyl alcohol several times, and finally dried in air at 80 °C.

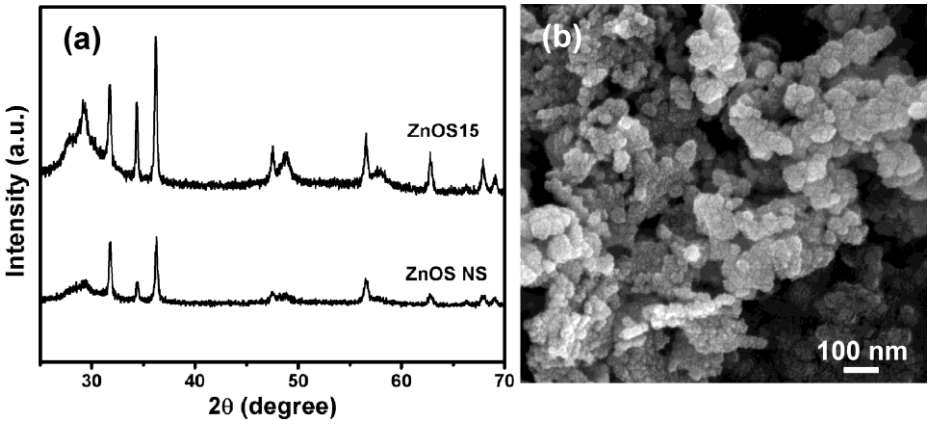

Fig. S3 XRD patterns of ZnOS15 and ZnOS NS (a) and FE-SEM image of ZnOS NS (b).

Experimental details of the photocatalytic degradation of MO

The photocatalytic degradations of MO (30 μmol L^{-1}) aqueous solution were conducted in a quartz tube with 4.6 cm inner diameter and 17 cm length. Four 4 W UV lamps with a wavelength centered at 254 nm (Philips, TUV 4W/G4 T5) were used as the irradiation source. A photocatalyst (40 mg) was suspended in 80 mL of MO solution and stirred for 30 min to ensure the establishment of adsorption-desorption equilibrium. An aliquot (3 mL) was taken at a certain time interval during the experiment and centrifuged (TDL-5-A) to remove the powders. The filtrates were analyzed on a Varian UV-vis spectrophotometer (Cary 50, Varian Co.). The percentage of degradation is reported as C/C_0. C is the absorption of pollutants at each irradiated time interval of the main peak of the absorption spectrum. C_0 is the absorption of the initial concentration when adsorption-desorption equilibrium was achieved.

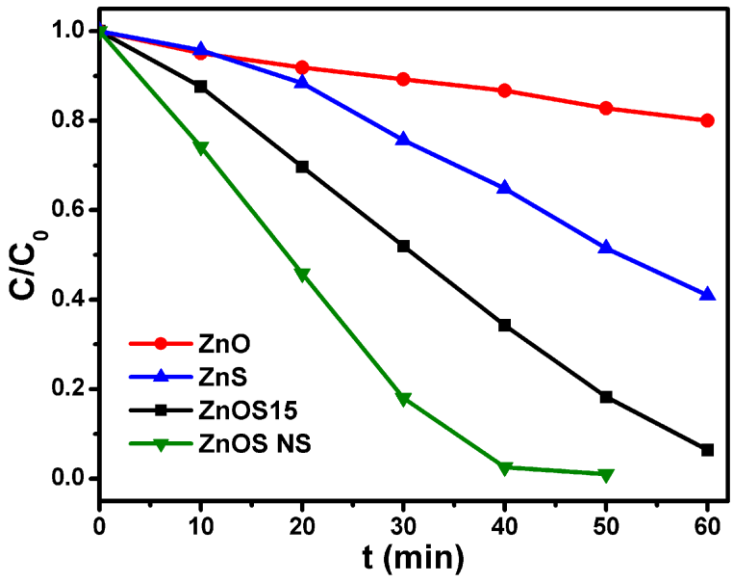

Fig. S4 Photocatalytic activities of the representative photocatalysts for the degradation of MO solution under 254 nm UV light irradiation.

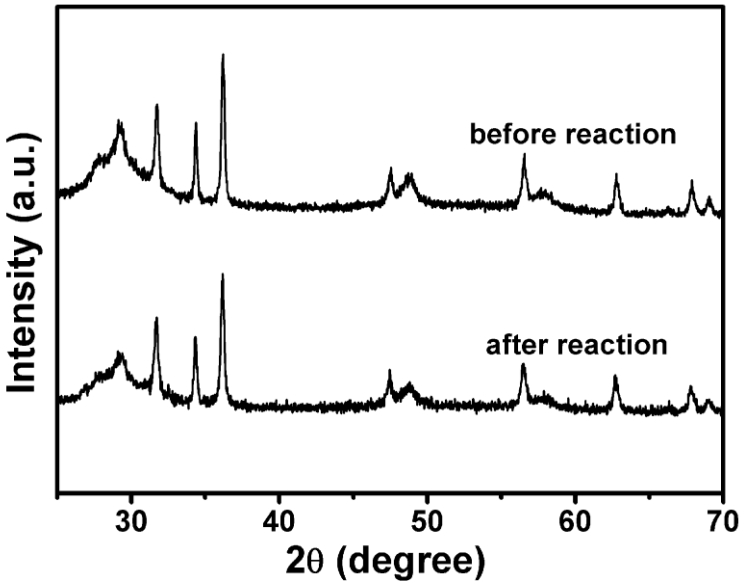

Fig. S5 XRD patterns of ZnOS15 before and after photocatalytic reaction.

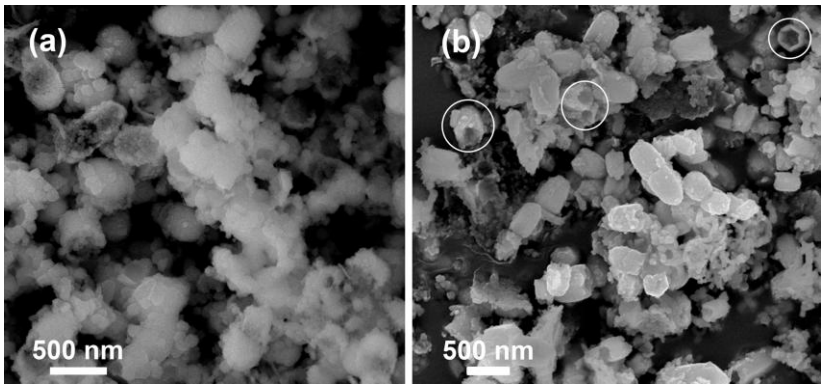

Fig. S6 FE-SEM images of ZnOS15 before (a) and after (b) photocatalytic reaction.

Table S1 The concentrations of Zn^{2+} in some reaction systems before and after different times of irradiation.

Sample		Before irradiation ($\mu g \cdot mL^{-1}$)	After 30 min irradiation ($\mu g \cdot mL^{-1}$)	After 90 min irradiation ($\mu g \cdot mL^{-1}$)	After 120 min irradiation ($\mu g \cdot mL^{-1}$)
p-CP solution	ZnOS15	9.700	108.900	110.325	112.400
	ZnO	9.000	147.000	179.950	191.050
Aqueous solution	ZnOS15	15.700	81.600	99.500	114.850