

Electronic Supplementary Material (ESI) for New Journal of Chemistry.

This journal is © The Royal Society of Chemistry and the Centre National de la Recherche Scientifique 2022

## Supplementary Information

### **Prussian blue analogue in-situ derived hierarchical flower-like ZnS/FeS<sub>2</sub> Z-scheme heterojunction for boosted visible-light responsive photocatalytic degradation of Rhodamine B with synergistic peroxydisulfate activation**

Hancheng Tan, Linger Feng, Haiyan Zhu, Wenxiu Gu\*

*International Joint Research Center for Photo-responsive Molecules and Materials,  
School of Chemical and Material Engineering, Jiangnan University, Wuxi 214122, P. R.  
China*

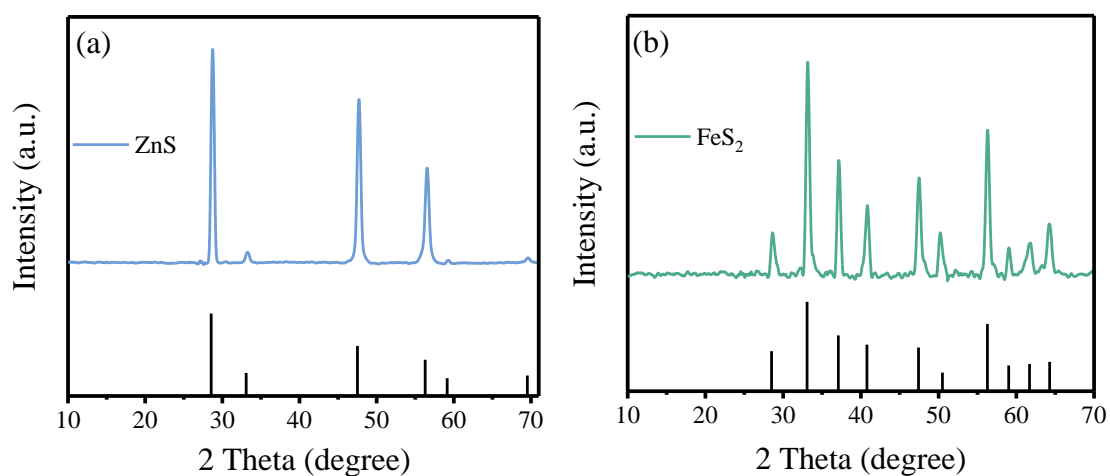
**Corresponding author:** Email: guwenxiu@jiangnan.edu.cn (Wenxiu Gu)

## Characterization

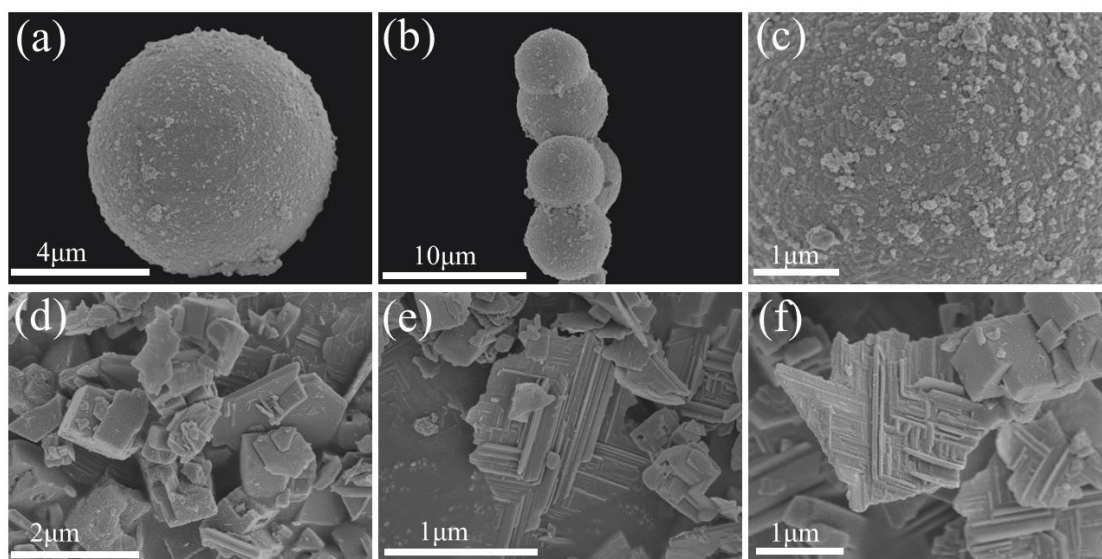
The crystal structures of the photocatalysts were analyzed by a D8 Advance X-ray diffractometer (Bruker AXS, Karlsruhe, Germany) with a scanning range of 5 to 70° and a scanning rate of 5° min<sup>-1</sup>. The morphologies and elemental distributions of the samples were observed by a scanning electron microscope (Hitachi, S-4800, Japan), operating at 3.0 kV. The TEM images of the samples were obtained by a transmission electron microscope (Hitachi, JEM-2100 plus, Japan), operating at 200 kV. The surface elemental compositions, chemical states, and the position of the valence band of the samples were tested by X-ray photoelectron spectroscopy (Kratos, Axis supra, UK). The optical absorption properties of the samples were obtained using a UV-vis spectrophotometer (Shimadzu, UV-3600 plus, Japan) with BaSO<sub>4</sub> as a reference. The fluorescence properties of the samples were characterized by a fluorescence spectrometer (Edinburgh, FS5, UK) with an excitation wavelength of 335 nm. All electrochemical experiments were carried out on an electrochemical workstation (CH Instruments, CHI 660D, China) with Na<sub>2</sub>SO<sub>4</sub> as the electrolyte. The as-prepared catalysts were used as working electrodes, and the counter and reference electrodes were Pt and Ag/AgCl electrodes respectively. The active species were detected by electron spin resonance spectrometry (Bruker, EMXplus-10/12, Germany).

**Preparation of ZnS:** 3 mmol  $\text{ZnCl}_2$  was sonicated and dispersed in 50 mL of deionized water as A. 3 mmol thioacetamide was sonicated and dissolved in 30 mL of deionized water as B. B was slowly added dropwise to A and stirred for 30 min, after which the mixture was transferred to a 100 mL Teflon-lined stainless-steel autoclave and heated at 200 °C for 12 h. After the reaction, the sample was collected by centrifugation and washed 3 times with ethanol and deionized water, and then dried under vacuum at 60 °C for 12 h to obtain the ZnS sample.

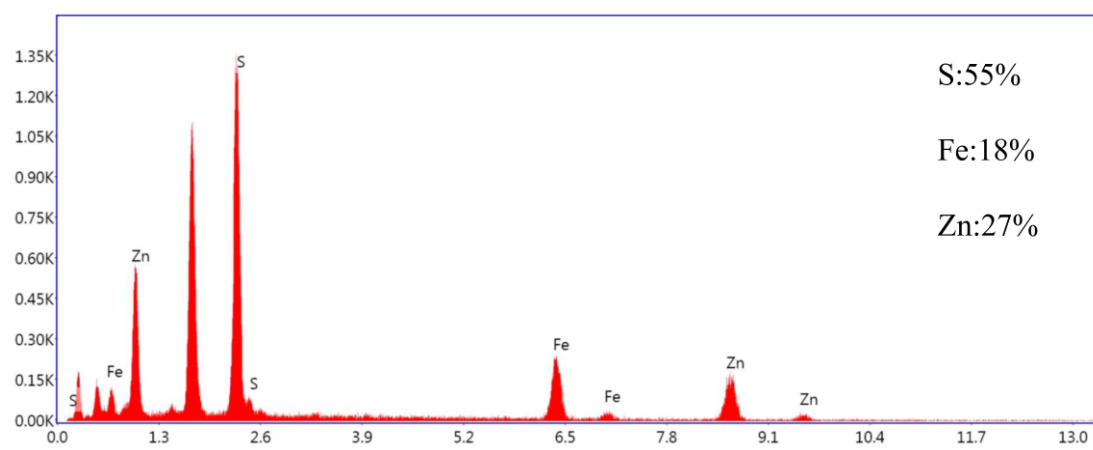
**Preparation of  $\text{FeS}_2$ :** 3 mmol  $\text{K}_4[\text{Fe}(\text{CN})_6] \cdot 3\text{H}_2\text{O}$  and 0.6 g PVP were dissolved in 50 mL of deionized water as C, 3 mmol thioacetamide was sonicated in 30 mL of deionized water as D. D was slowly added dropwise to C and stirred for 30 min, after which the mixture was transferred to a 100 mL Teflon-lined stainless-steel autoclave and heated at 200 °C for 12 h. After the reaction, the sample was collected by centrifugation and washed three times with ethanol and deionized water, and then dried under vacuum at 60 °C for 12 h to obtain  $\text{FeS}_2$ .



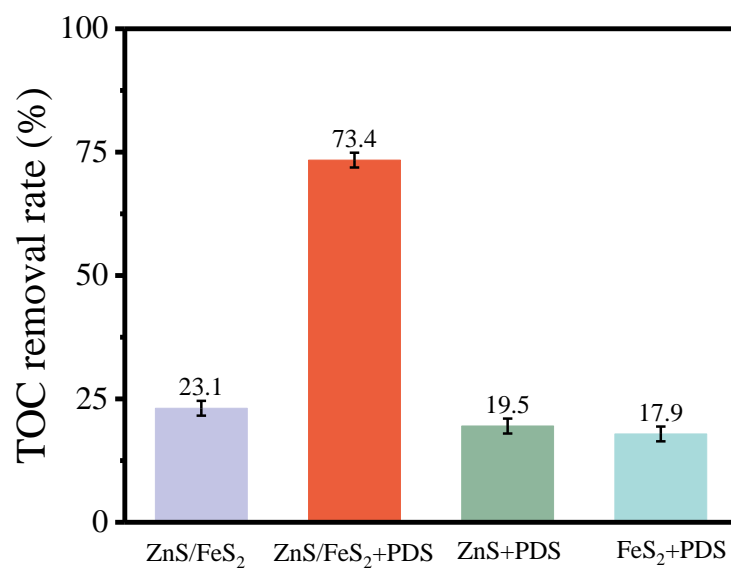
**Fig. S1.** The XRD patterns of (a) ZnS and (b)  $\text{FeS}_2$ .



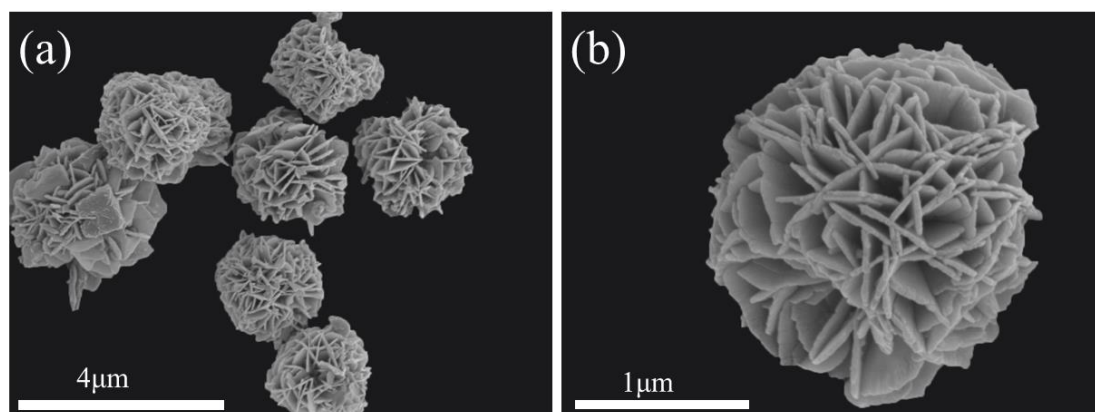
**Fig. S2.** The SEM images of (a-c) ZnS and (d-f) FeS<sub>2</sub>.



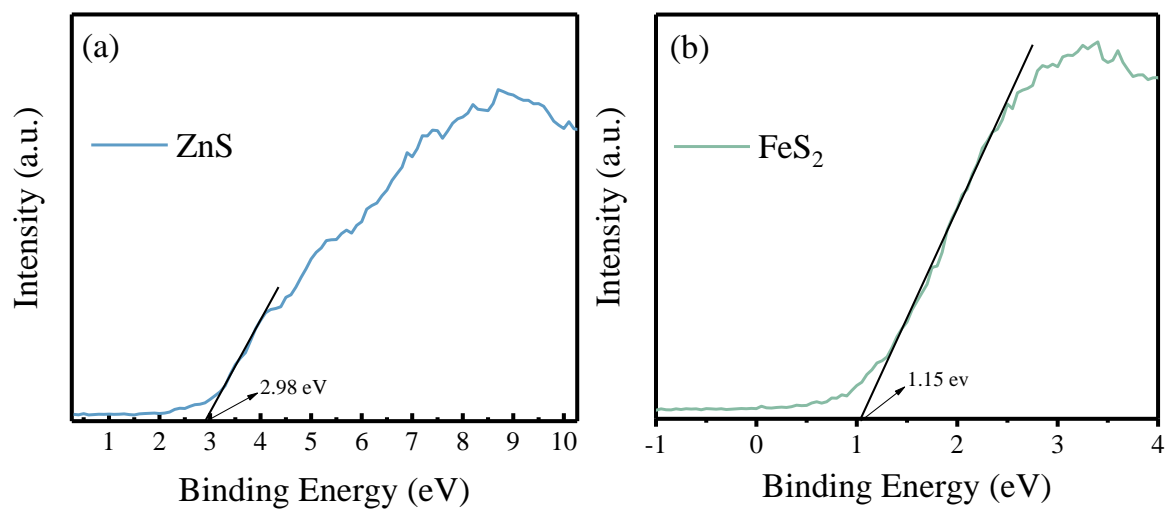
**Fig. S3.** The EDX spectra of ZnS/FeS<sub>2</sub>.



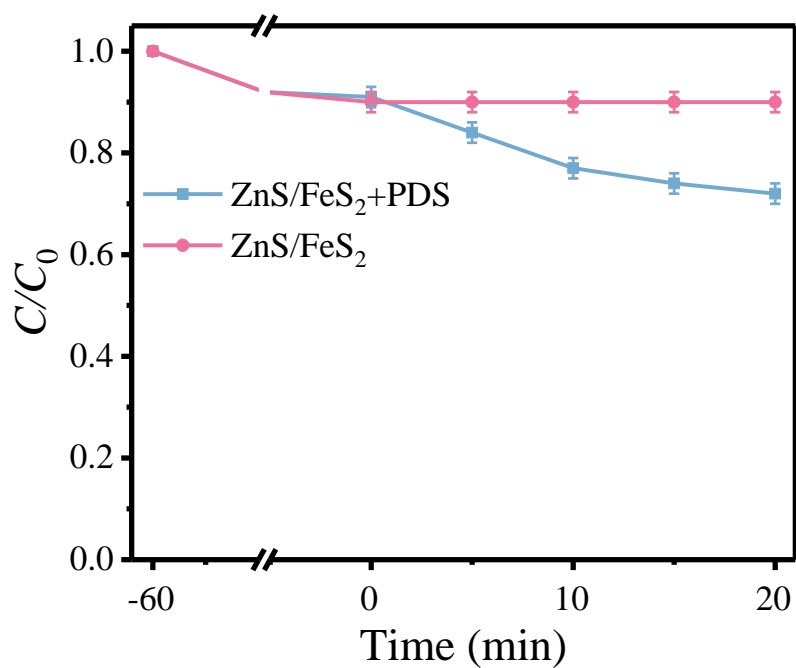
**Fig. S4.** TOC removal rates of ZnS/FeS<sub>2</sub>, ZnS/FeS<sub>2</sub>+PDS, ZnS+PDS and FeS<sub>2</sub>+PDS.



**Fig. S5.** The SEM images of (a-b) of ZnS/FeS<sub>2</sub> after 5 cycles.



**Fig. S6.** VB-XPS spectra of (a) ZnS and (b) FeS<sub>2</sub>.



**Fig. S7.** Degradation efficiency of RhB in a light-free environment by ZnS/FeS<sub>2</sub> and ZnS/FeS<sub>2</sub>+PDS.