Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

An Efficient Method to Enhance the Stability of Sulphide Semiconductor Photocatalysts: A Case Study of N-Doped ZnS

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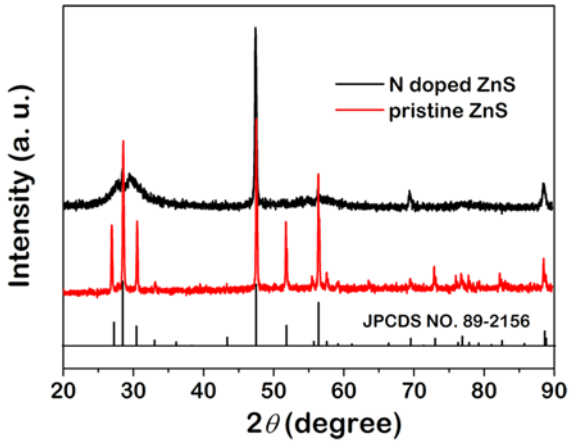

Fig. S1. XRD patterns of N-doped ZnS and pristine ZnS. The as-prepared N-doped ZnS and pristine ZnS show a character of hexagonal ZnS phase (JPCDS NO. 89-2156).

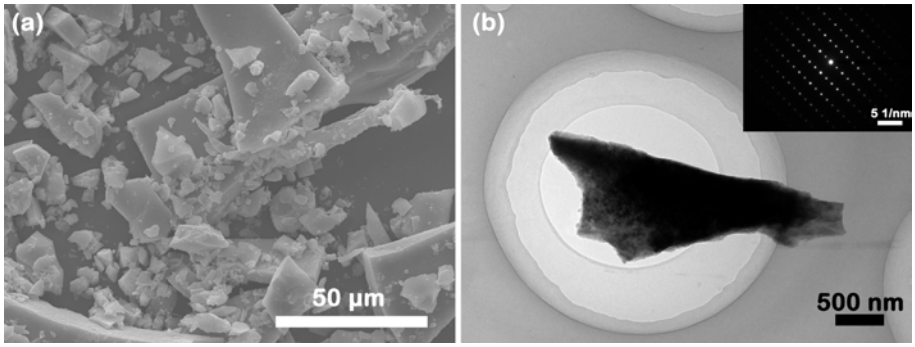

Fig. S2. SEM images of the as-prepared N-doped ZnS. (b) TEM image of a single bulk and its SADE patterns (the inset image).

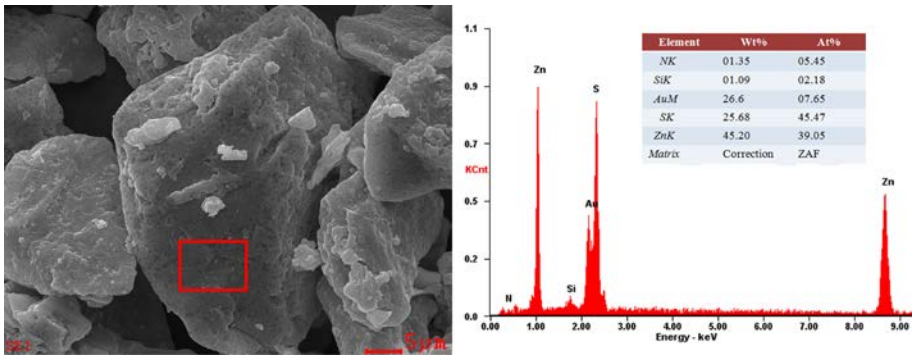

Fig. S3. EDX analysis of N-doped ZnS. The low doping concentration of N is revealed in the sample as a reason of the large expelling effect between Zn and impurity atoms.

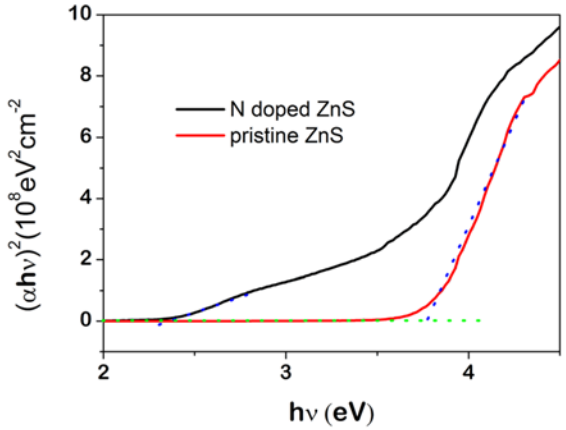

Fig. S4. Tauc plot corresponding to the pristine (red) and N-doped (green) ZnS. Remarkable decrease in bandgap was found after being doped with N.

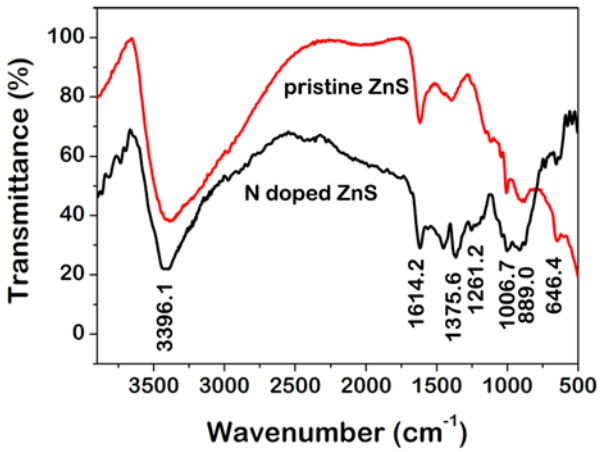

Fig. S5. IR spectra of pristine and N doped ZnS after photocatalytic reaction for 5 hours. The peaks at 3396.1 cm^{-1} and 1614.2 cm^{-1} corresponded to –OH group of the adsorbed water molecules.[1], [2] Peaks at 1375.6 cm^{-1}, 1261.2 cm^{-1}, 1006.7 cm^{-1} and 889.0 $cm^{-1}$are assigned to ZnS lattice,[3] which originate from the resonance interaction between vibrational modes of sulphide ions in the crystal[4]. The peaks at 646 cm^{-1} is assigned to the ZnS band.[5]

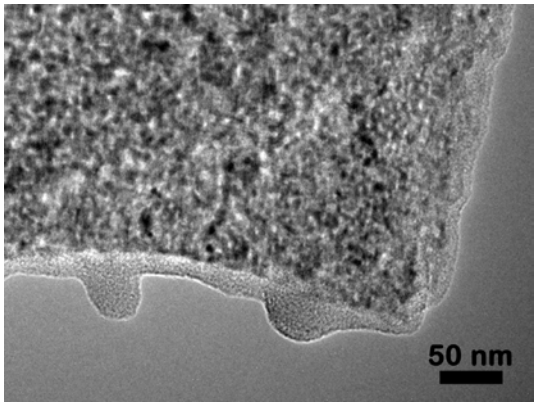

Fig. S6. TEM image of pristine ZnS after 5 h simulated sunlight irradiation.

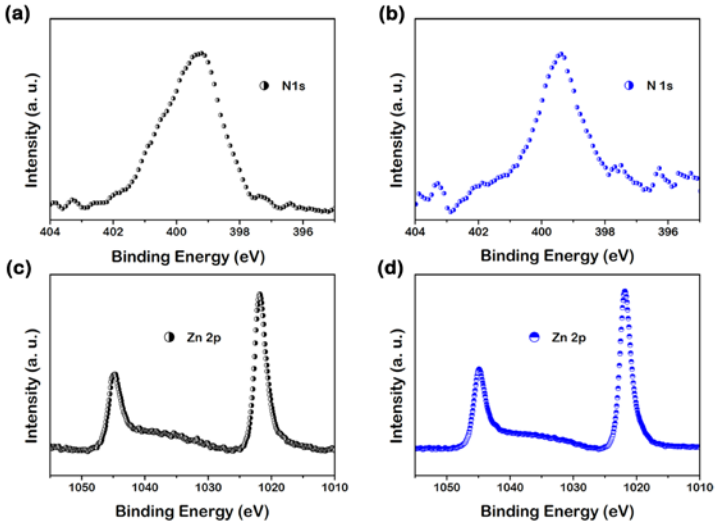

Fig. S7. XPS spectra of N 1s and Zn 2p of N doped ZnS before (black) and after (blue) 5h of illumination.

Table S1 Concentration of S and Zn in the solution for doped and undoped ZnS after photocalytic reaction for 5 hours measured by ICP-AES.

Samples	Concentration (mg/L)	
	Zn	S
Pristine ZnS	85.291	7.483
N doped ZnS	8.125	6.515

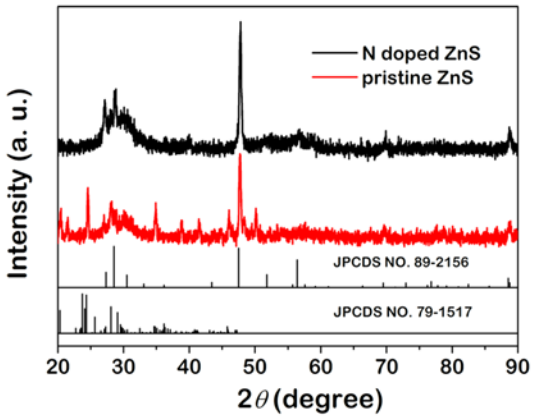

Fig. S8. XRD patterns of N-doped ZnS and pristine ZnS after photocatalytic reaction for 12h. No impurities and changes in crystal structure are observed indicating the high stability of N-doped ZnS during the photocatalytic process.

References

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