Electronic Supplementary Information (ESI)

Advance towards the utilization of Vis-NIR light energy by $YF_3:Yb^{3+}$, Er^{3+} coating over ZnS microspheres triggering hydrogen production and pollutants disposal

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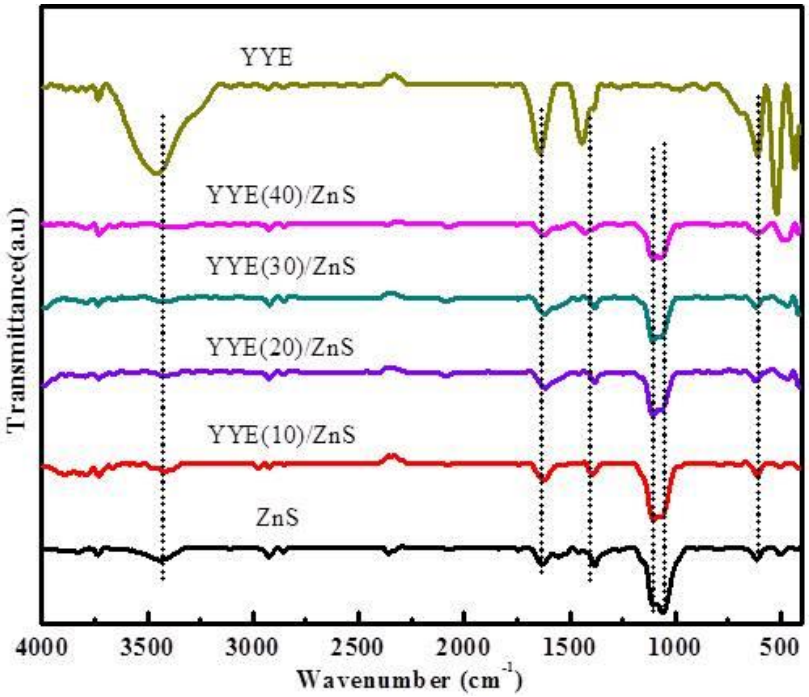

Fig.S1 FT-IR spectra of ZnS, YYE and YYE/ZnS composites.

The chemical bonds and functionalized groups in the material could be seen from FT-IR spectra. The FT-IR spectra of ZnS, YYE and YYE/ZnS composites are shown in Fig.S1. It is indicated that the peak in 3440 cm^{-1} belongs to the stretching vibrating of O–H mode from water adsorbed on material surface. In addition, another peak observed at 1620 cm^{-1}, corresponding to the different O–H vibrational mode of the physisorbed water.[1,2] The peak at 600 cm^{-1} could confirm the presence of Zn–S vibration.

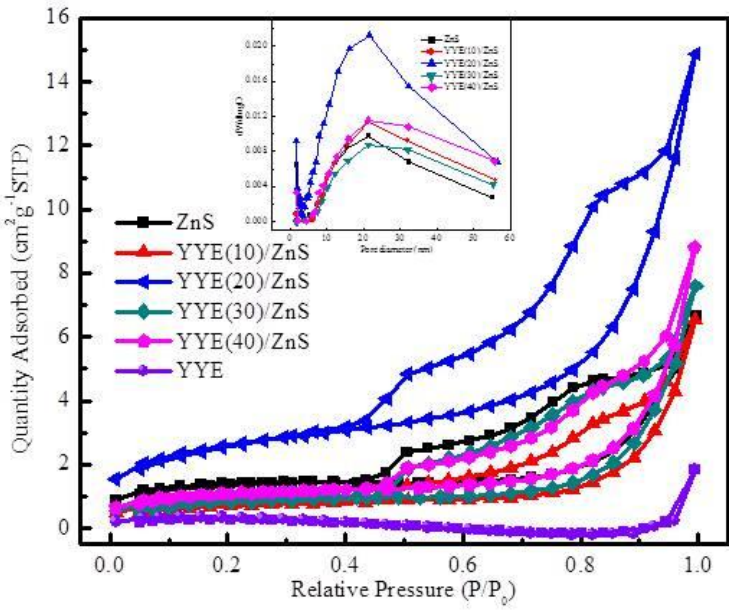

Fig.S2 N_2 adsorption-desorption isotherms and corresponding pore-size distribution curves (inset) for the ZnS, YYE and YYE/ZnS composites.

Table S1 BET surface areas, pore volume, and pore size over all the samples.

Samples	Surface Area (m^2 /g)	Pore Volume (cm^3 /g)	Average Pore Size (nm)
ZnS	4.4428	0.0103	9.2563
YYE(10)/ZnS	3.0334	0.0117	15.4703
YYE(20)/ZnS	8.8253	0.0230	10.4342
YYE(30)/ZnS	2.7034	0.0101	14.9209
YYE(40)/ZnS	3.5881	0.0136	15.1808

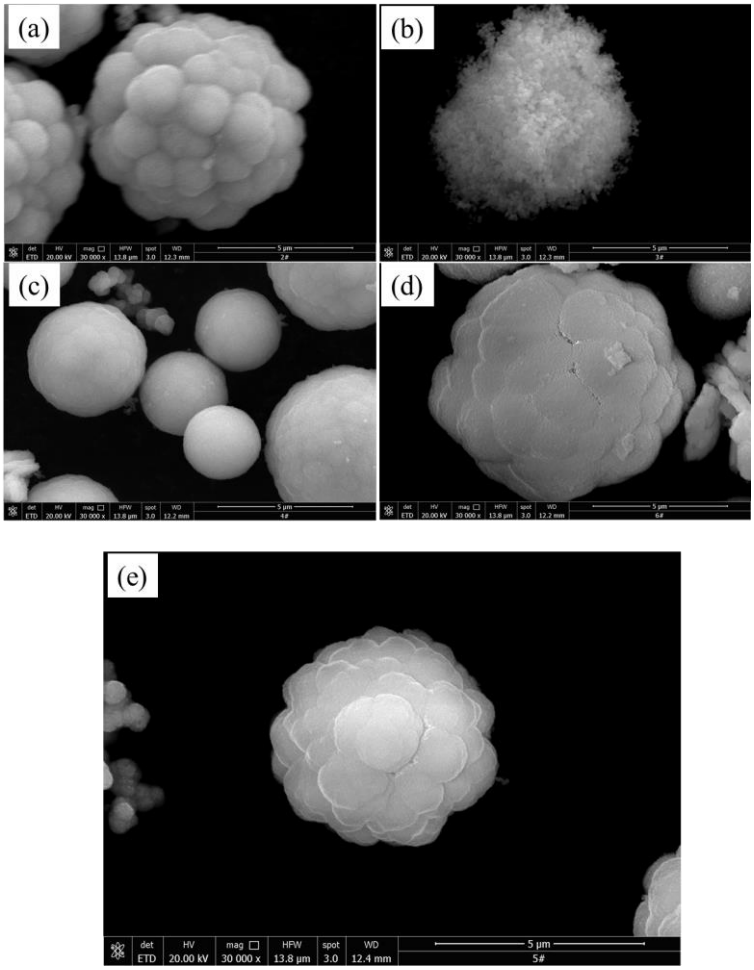

Fig.S3 SEM images of (a) ZnS; (b) YYE (c) YYE(10)/ZnS; (d) YYE(20)/ZnS; (e) YYE(30)/ZnS samples.

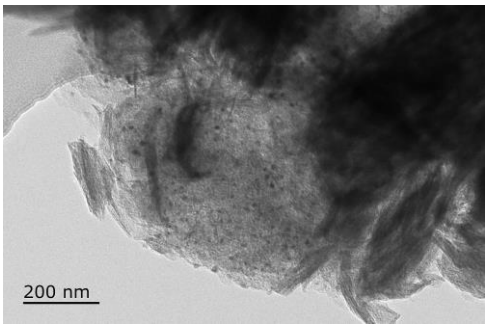

Fig. S4 TEM image ofYYE(20)/ZnS.

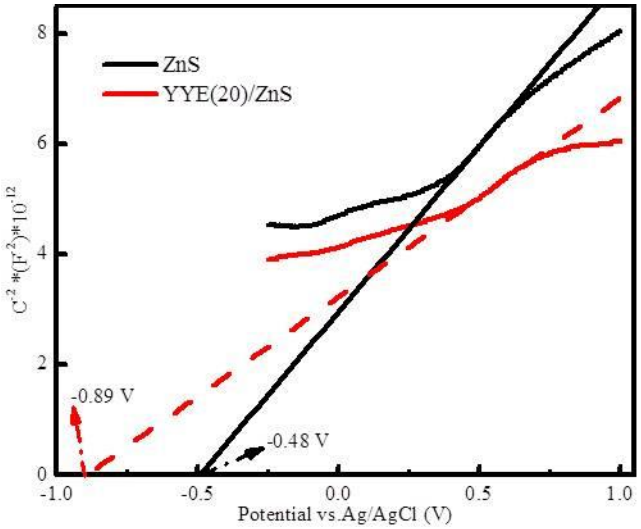

Fig. S5 Mott−Schottky plots of bare ZnS, and YYE(20)/ZnS samples (glassy carbon electrode as catalysts support).

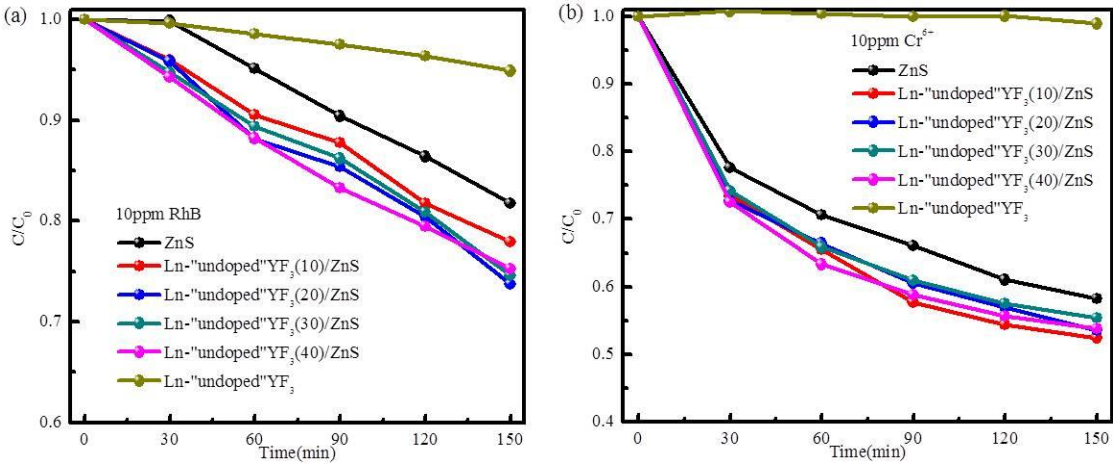

Fig. S6 Photocatalytic activities over Ln-"undoped" YF_3 /ZnS samples in the degradation of 10 ppm Cr^{6+} and RhB.

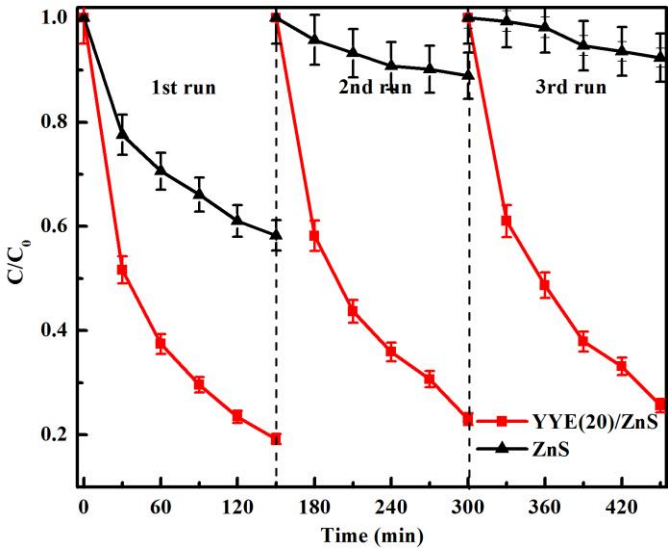

Fig. S7 Comparison of the photocatalytic stabilities of pristine ZnS and YYE(20)/ZnS in the photocatalytic reduction of Cr (VI).

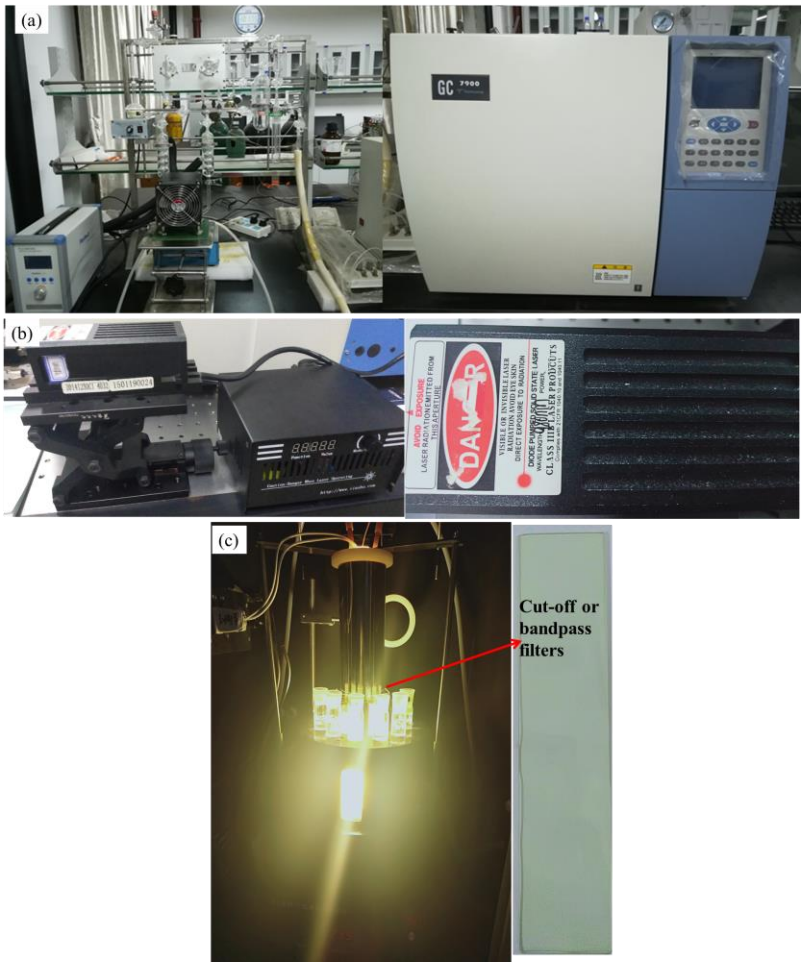

Fig. S8 Diagram of (a) photocatalytic hydrogen production; (b) 980 nm laser light; (c) 400 W metal halide lamp.

References

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