Supplementary Information

CoS_2-decorated CdS nanorod for efficient degradation of organic pollutants

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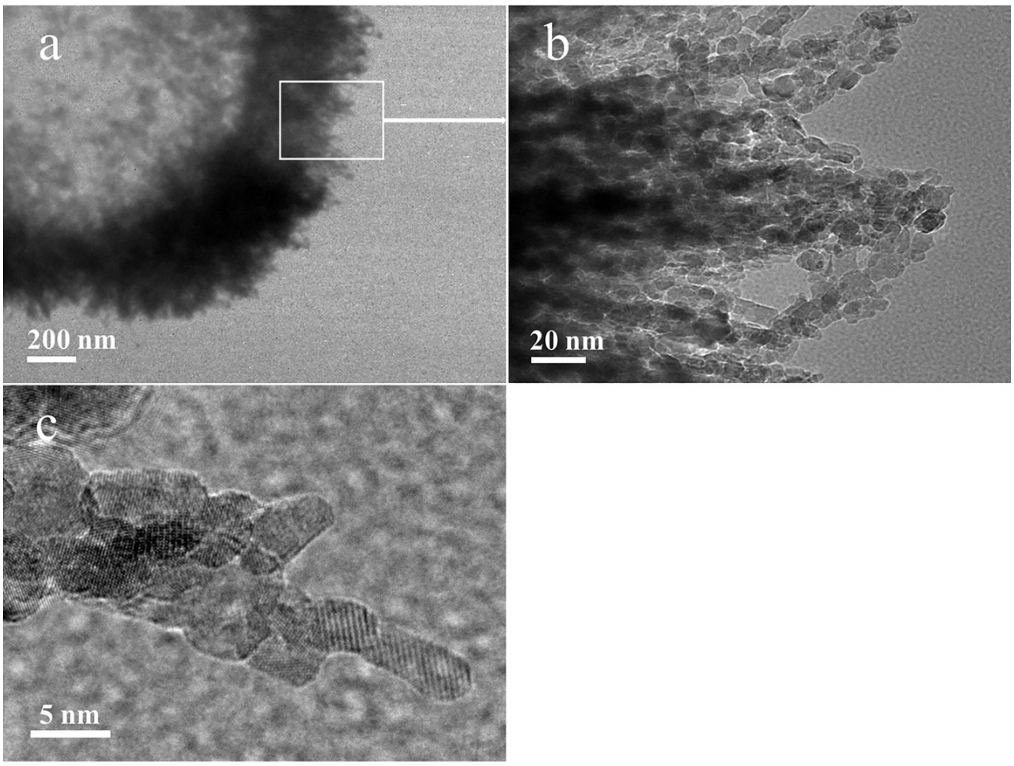

Fig. S1 TEM images of Co_3O_4 nanoflakes (a, b, c)

The TEM images (Fig. 1a–b) show that Co_3O_4 is flake-like with a width of about 10 nm, and the lattice fringes are clearly visible, indicating its good crystallinity.

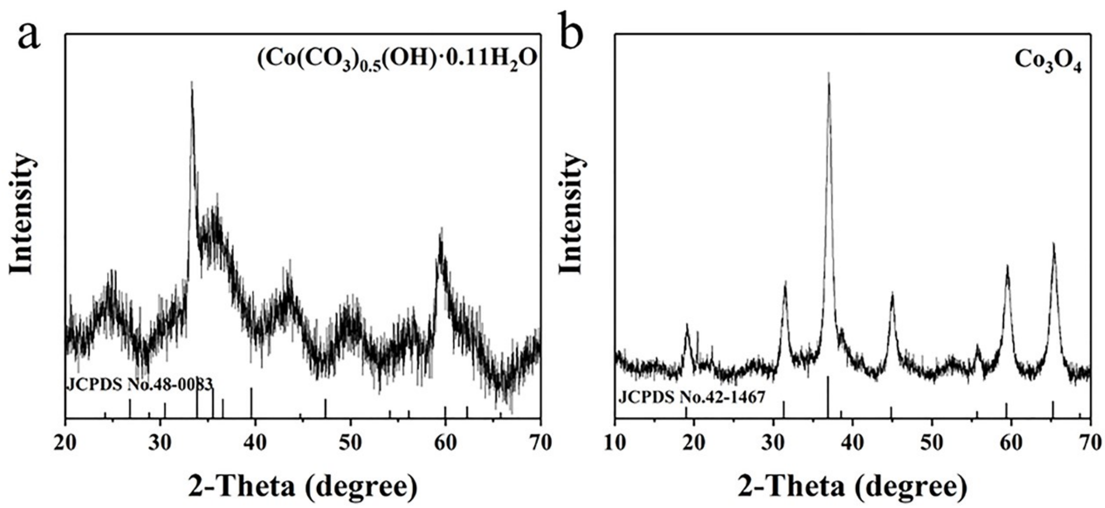

Fig. S2 XRD patterns of (Co $(CO_3)_{0.5}\cdot 0.11H_2O$ and Co_3O_4 (a, b).

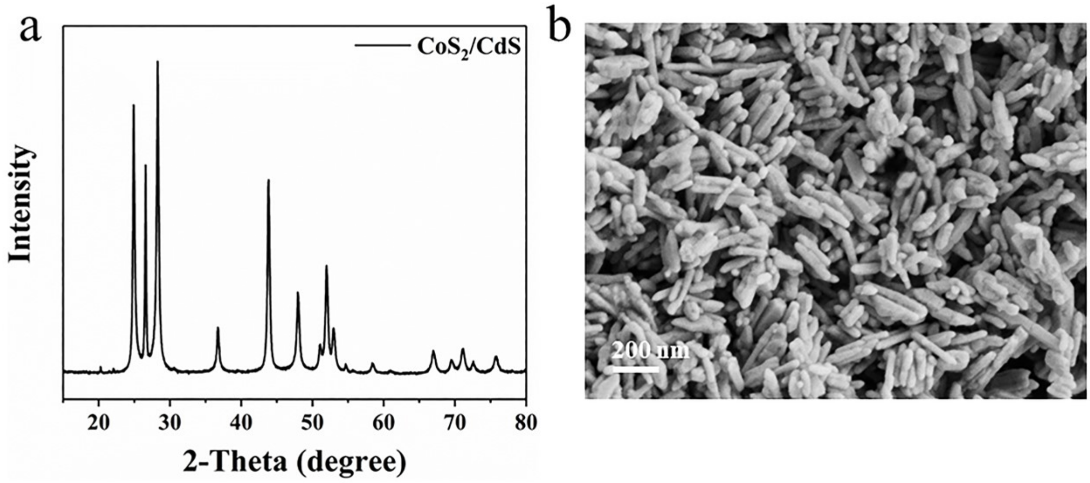

Fig. S3 XRD pattern and SEM image of the composite catalysts after five catalytic cycles (a, b).

The catalytic effect of the CoS_2/CdS composite photocatalyst remained high after five catalytic cycles. It can be seen from the above XRD spectrum and SEM image in **Fig. S3** that the morphology and structure of the catalyst do not change much after cycling, which indicates the high stability of the CoS_2/CdS composite photocatalyst.

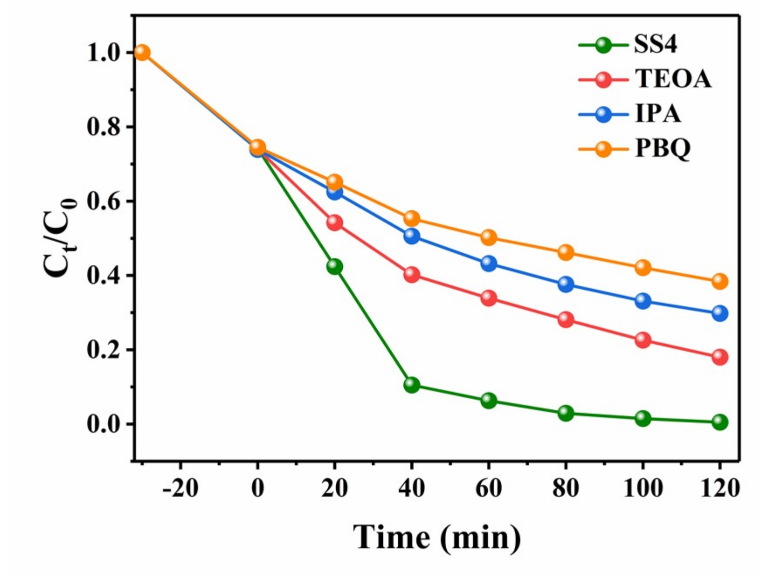

Fig. S4 capture experiment of SS4 for RhB degradation

The same conditions as in text 2.4, 1mL iso-propyl alcohol (IPA)(1mmol/L), Triethanolamine (TEOA)(1mmol/L), and p-Benzoquinone (PBQ)(1mmol/L) were added into thedispersed solutions respectively to research the photocatalytic active substances. The RhB solutions after reaction were detected by UV-Vis spectrophotometry. Compared with the degradation rates before and after addition of capture agent, we can know the main active species of photocatalyst for degradation of RhB. Simultaneously, aspresented in Fig. S4, the capture experiment result indicates that ·OH and $\cdot O_2^-$ act as main active substances in the experiment. This result is consistent with that in the main text Fig 7 analytical concordance.

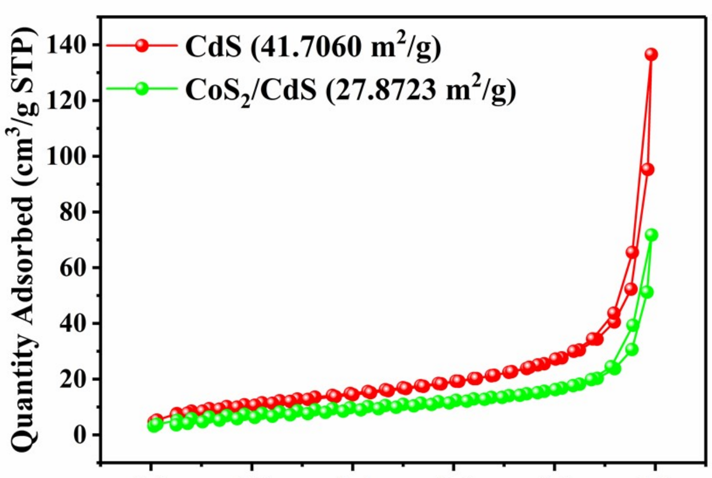

Fig. S5 nitrogen adsorption-desorption isotherms of CdS and CoS_2/CdS (SS4).

The N_2 adsorption-desorption isotherms exhibit a type IV mode with an adsorption-desorption hysteresis loop, which is of type H3 (based on the International Union of Pure and Applied Chemistry (IUPAC) classification). The specific surface areas (BET) of CdS and CoS_2/CdS are 41.7060 and 27.8723 m^2/g, respectively.

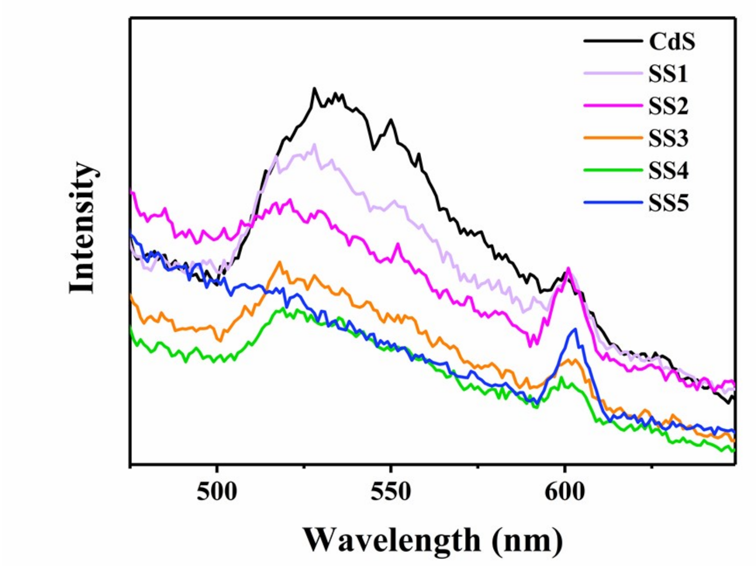

Fig. S6 photoluminescence spectra of CdS and composites under visible light. (λ=420 nm)

We measured the PL spectra of CdS and its composites under visible light excitation, and the conclusions obtained were consistent with those measured under CdS excitation light.

Notes and references

1 S. Zhang, X. Tan, Y. Zhou, J Liu, X. Liang, et al. Phys Chem Chem Phys: 2022, 24, 6193-6207.