

Supporting Information

Graphene-supported CoS_2 Particles: an Efficient Photocatalyst for Selective Hydrogenation of Nitroaromatics in Visible Light

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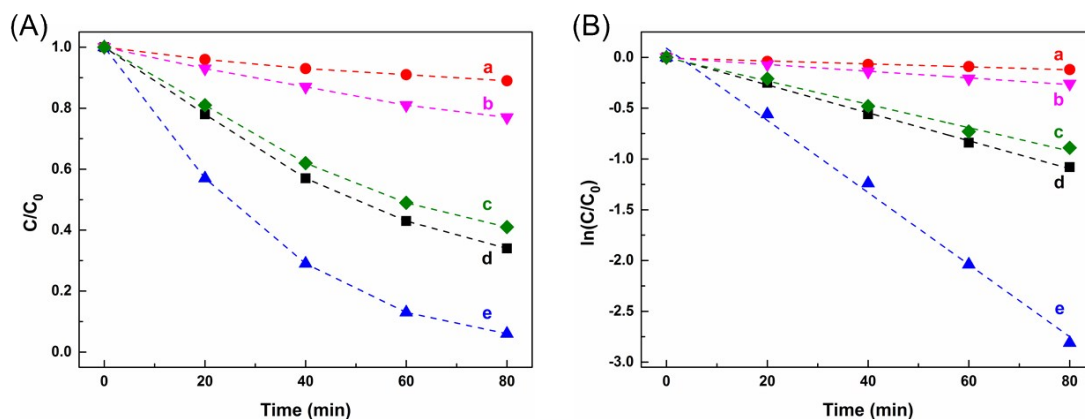


Figure S1 Plots of C_t/C_0 versus reaction time and $\ln(C_t/C_0)$ versus reaction time for the catalytic reduction of nitrobenzene to aniline over CoS_2 catalyst in the dark (a) and under light (d); $\text{CoS}_2/\text{graphene}$ in the dark (b), under light (e) and using water as solvent under light (c).

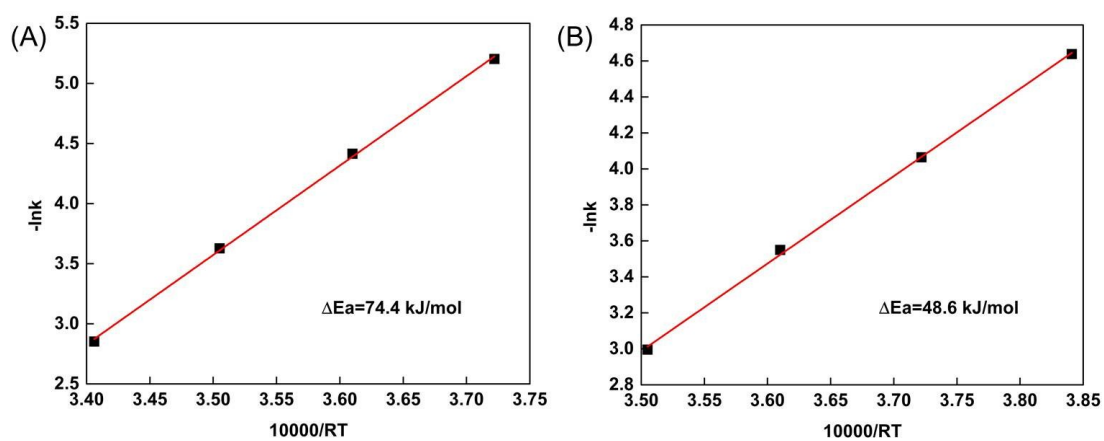


Figure S2 The activation energy determinations of CoS₂ (A) and CoS₂/graphene (B) under visible light based on the Arrhenius equation.

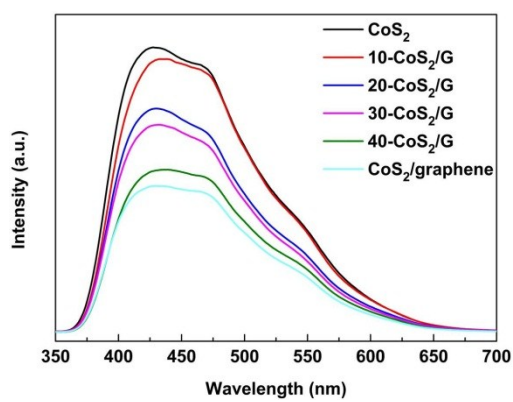


Figure S3 Photoluminescence spectra of CoS₂, 10-CoS₂/G, 20-CoS₂/G, 30-CoS₂/G, 40-CoS₂/G and CoS₂/graphene (excitation wavelength, 280 nm).

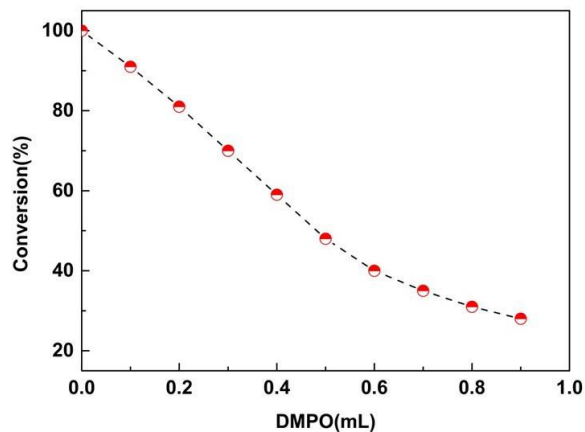
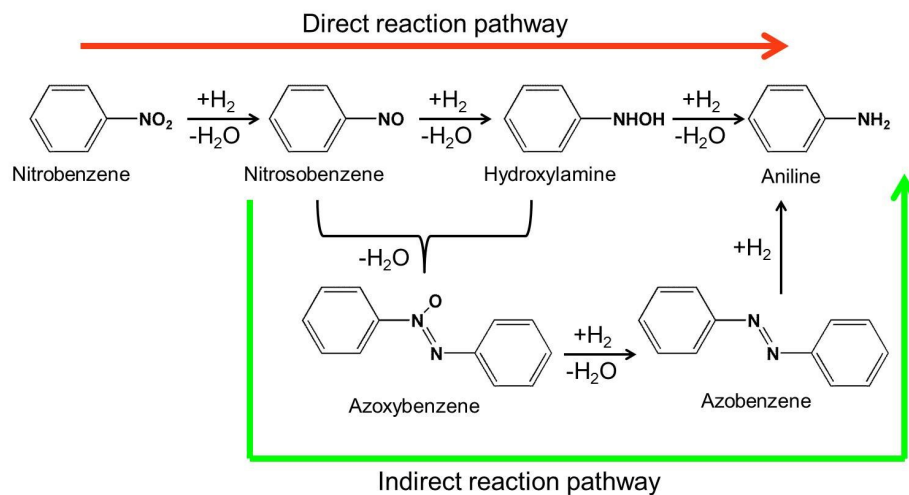


Figure S4 Dependence of nitrobenzene conversion on the volume of DMPO.



Scheme S1 Proposed mechanism for nitrobenzene reduction.

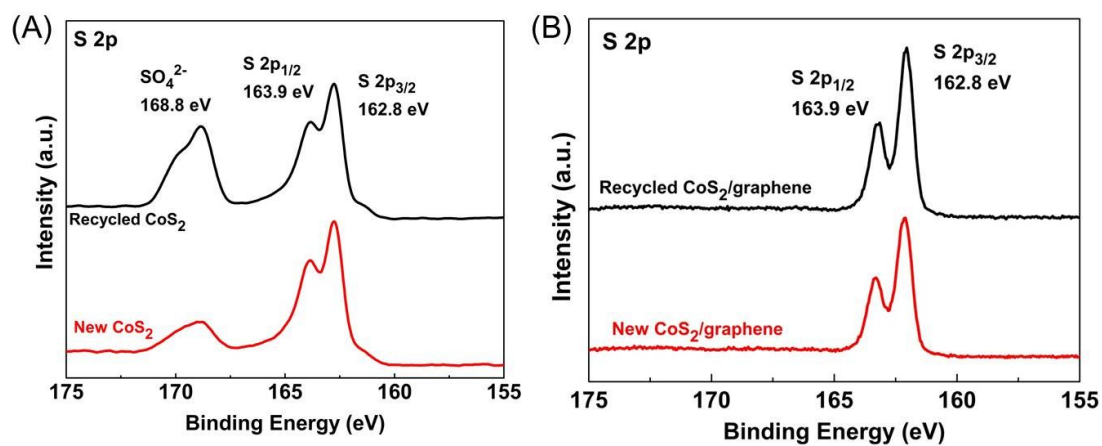


Figure S5 XPS profiles of recycled and new CoS₂ (A), and recycled and new CoS₂/graphene (B).

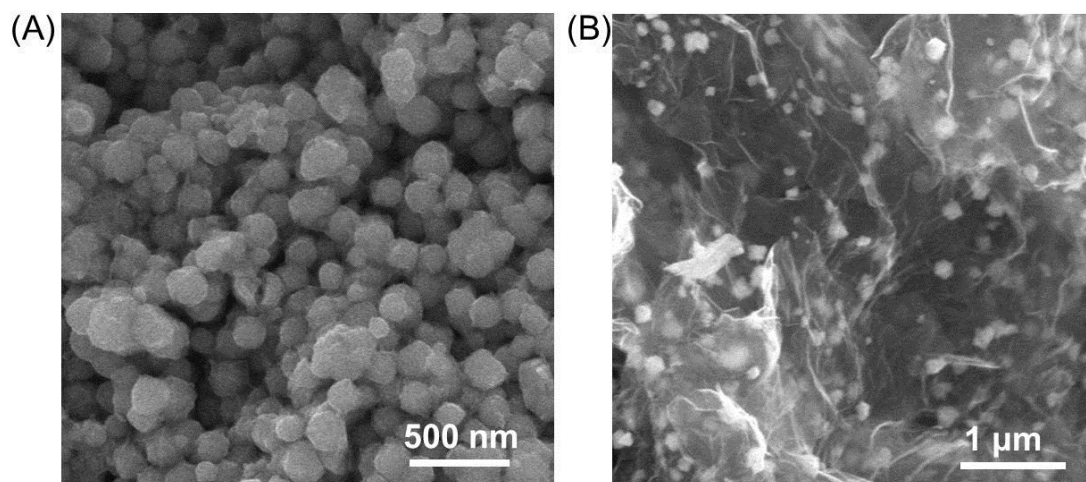


Figure S6 FESEM images of recycled CoS₂ (A) and CoS₂/graphene (B) catalysts.

Table S1. Hydrogenation of nitrobenzene to aniline on various catalysts.

Entry	Catalyst	t/h	T/°C	H ₂ /MPa	Conv. (%)	Select. (%)	Ref.
1 ^[a]	Au/TiO ₂ -Con	7	90	1.0	71.1	93.1	[1]
2 ^[b]	Ru@C ₆₀	48	80	0.3	100	80	[2]
3 ^[c]	Co@C	10	140	1.0	95	99	[3]
4 ^[d]	FeS ₂	6.5	90	1.0	52.2	99	[4]
5 ^[e]	CoS ₂ /graphene	1.5	30	0.25	99	100	Present work

^a Reaction condition: 40 mg of catalyst, 0.8 mmol nitrobenzene, 3 mL of ethanol solvent, 1.0 MPa of H₂. ^b Reaction condition: 5 mg of catalyst, 4.06 mmol nitrobenzene, 30 mL of ethanol, 0.3 MPa of H₂. ^c Reaction condition: 30 mg of catalyst, 0.5 mmol nitrobenzene, 2 mL of toluene solvent, 1.0 MPa of H₂. ^d Reaction condition: 80 mg of catalyst, 5.0 mmol nitrobenzene, 10 mL of isopropanol, 1.0 MPa of H₂. ^e Reaction condition: 40 mg of catalyst, 1.0 mmol nitrobenzene, 10 mL of neat ethanol, 0.25 MPa of H₂. And the reaction was carried out under Xe lamp irradiation (400–800 nm) with light intensity of 0.45 W/cm².

References

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- 2 F. Q. Leng, I. C. Gerber, P. Lecante, S. Moldovan, M. Girleanu, M. R. Axet and P. Serp, *ACS Catal.* **2016**, *6*, 6018-6024.
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