Synergistic effect of dual p-n heterojunction in Co_3O_4-Ag_2O-$SrTiO_3$ ternary composite for enhancing photocatalytic degradation of toluene

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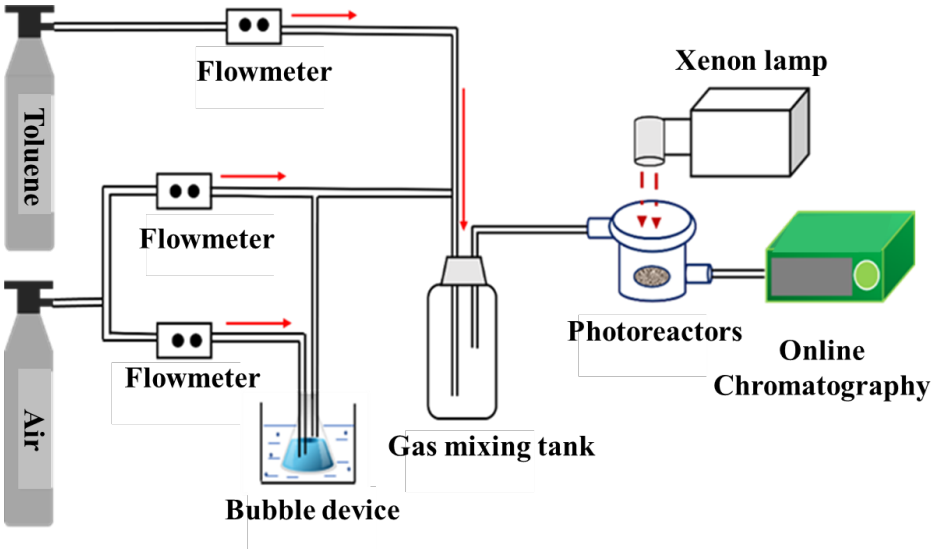


Fig. S1 The Evaluation device of photocatalytic activity.

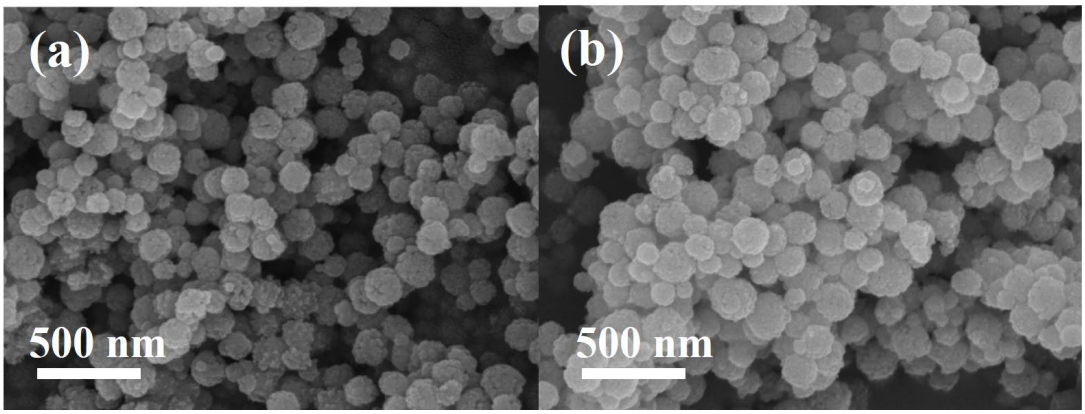
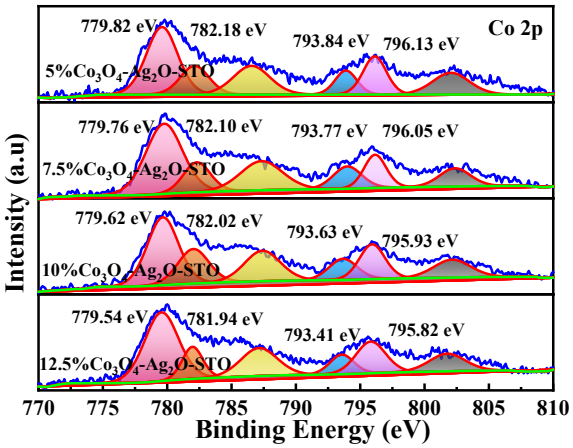


Fig. S2 SEM images of (a) STO and (b) Ag_2O-STO.



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26 **Fig. S3** XPS spectra of Co 2p in the Co_3O_4-Ag_2O-STO catalysts with varying contents.

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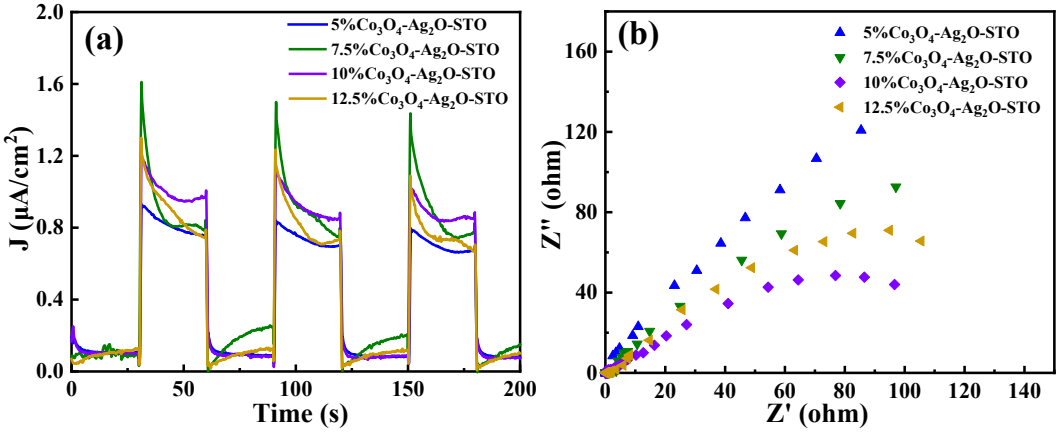

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29 **Fig. S4** (a) photocurrent diagram and (b) Nernst impedance diagram of the Co_3O_4-Ag_2O-STO

30 catalysts with varying contents.

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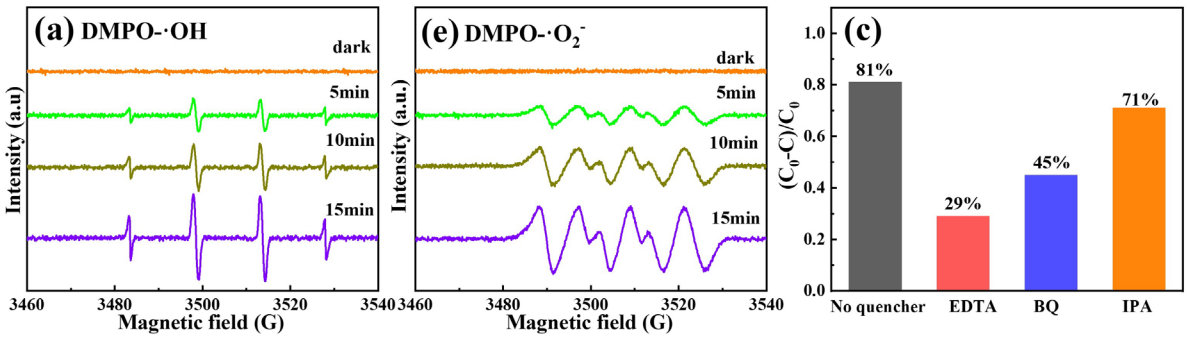

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33 **Fig. S5** DMPO spin-trapping ESR spectra of (a) ·OH and (b) $\cdot O_2^-$ for Co_3O_4-Ag_2O-STO and (c)

34 the removal rate of toluene over the Co_3O_4-Ag_2O-STO using different quenchers.

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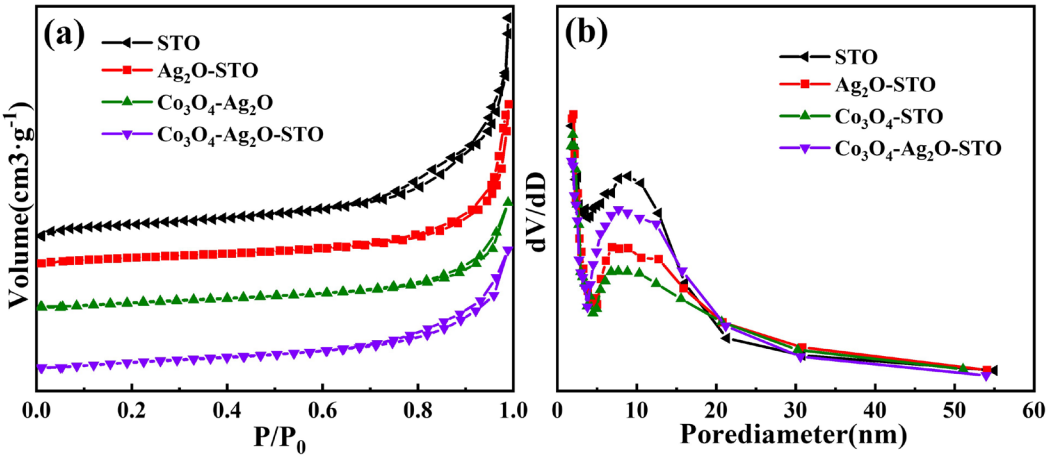

Fig. S6. N_2 adsorption-desorption isotherms and pore size distribution curves of STO, Ag_2O-STO, Co_3O_4-STO and Co_3O_4-Ag_2O-STO.

40 **Table S1** the ratio of Co^{2+} and Co^{3+}

Catalysts	Relative content of Co^{2+} (%)	Relative content of Co^{3+} (%)
5%Co_3O_4-Ag_2O-STO	63	37
7.5%Co_3O_4-Ag_2O-STO	56	44
10%Co_3O_4-Ag_2O-STO	41	59
12.5%Co_3O_4-Ag_2O-STO	35	66

41 Tested by XPS.

42 **Table S2**. Performance Comparison of Photocatalytic Toluene in Related Studies

Sample	Catalyst amount (mg)	Toluene	Conversion Rate	Reaction Rate (nmol/g/s)	Ref.
Co_3O_4-Ag_2O-STO	150	100 ppm Dynamic (100 mL/min)	81%	40.18	This work
$Zr_{10}Ti_1$-U6N-300@TiO_2	100	50 ppm Dynamic (100 mL/min)	94%	34.89	[1]
TiO_2-UiO-66-NH_2	100	25 ppm Dynamic (100 mL/min)	73%	10.82	[2]
Pd/TiO_2-N	50	50 ppm Dynamic (50 mL/min)	81%	30.13	[3]
Pt/TiO_2-C	200	40 ppm Dynamic (300 mL/min)	68%	30.36	[4]
BiOBr/Bi_2WO_6	100	30 ppm Static (2.5 L)	95%	4.41	[5]
Ag_3PO_4/TiO_2-10	100	1 μL Static	96%	17.42	[6]

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