Electronic supporting information (ESI) for

The synthesis of Ag–ZnO nanohybrid with plasmonic photocatalytic activity under visible-light: the relationship between tunable optical absorption, defect chemistry and photocatalytic activity

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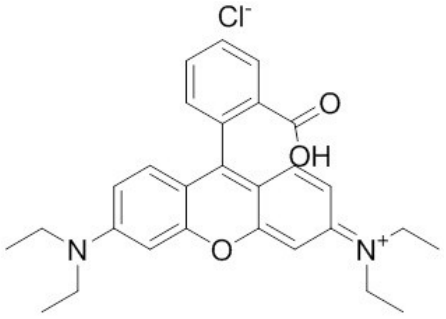
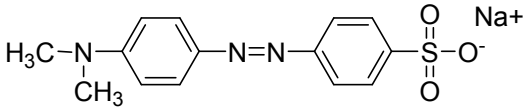
ESI-1

The chemical formula of Rhodamine B (RhB) and Methyl Orange (MO) are given in Scheme S1.



RhB



MO

Scheme S1: Chemical formula of Rhodamine B (RhB) and Methyl Orange (MO).

Prior to illumination, the suspension was magnetically stirred in the dark for 2 h to ensure the establishment of an absorption–desorption equilibrium of rhodamine B on the sample surface. 25 mg of the as prepared samples dissolve in a 50 mL of 2×10^{-5} M rhodamine B aqueous solution. C/C_0 vs t plot (Fig. S1) clearly shows that there was no significant change in concentration of RhB after 60 min.

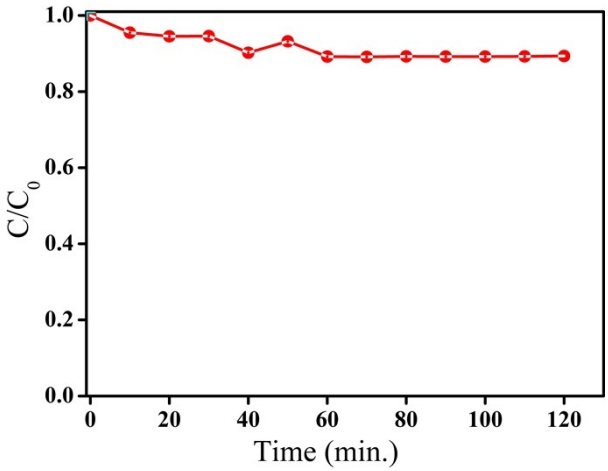


Fig. S1 Changes in the concentration of RhB in contact with Ag-ZnO (R=0.05) nanohybrid as a function of time in the dark.

ESI-2

N_2 sorption analysis

The N_2 adsorption-desorption of pure ZnO and Ag-ZnO (R=0.05) nanohybrid are shown in Fig. S2.

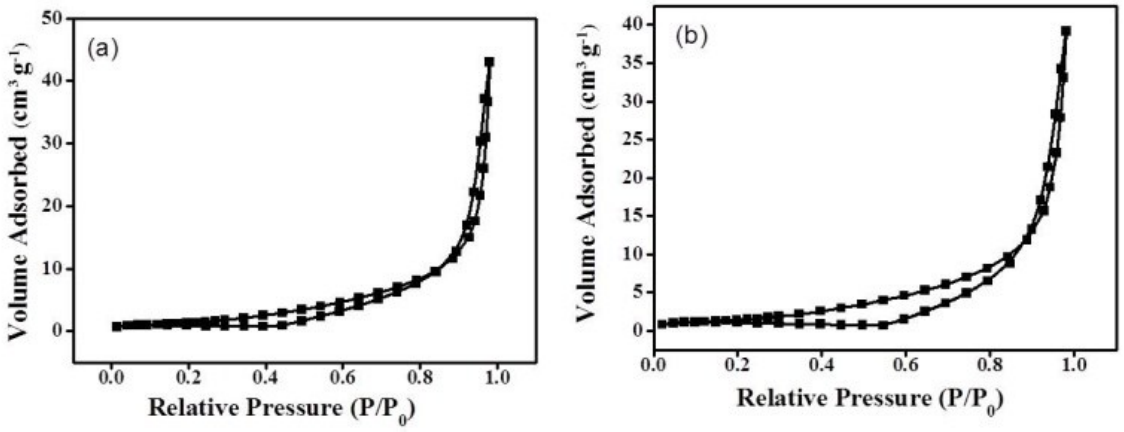


Fig. S2 N_2 adsorption-desorption of (a) pure ZnO and (b) Ag-ZnO (R=0.05) nanohybrid.

ESI-3

Photocatalytic studies

The photocatalytic activity of the ZnO and Ag-ZnO (R=0.05) nanohybrid in the decomposition of Methyl Orange (MO) has been studied. The corresponding data are reported in Fig. S3.

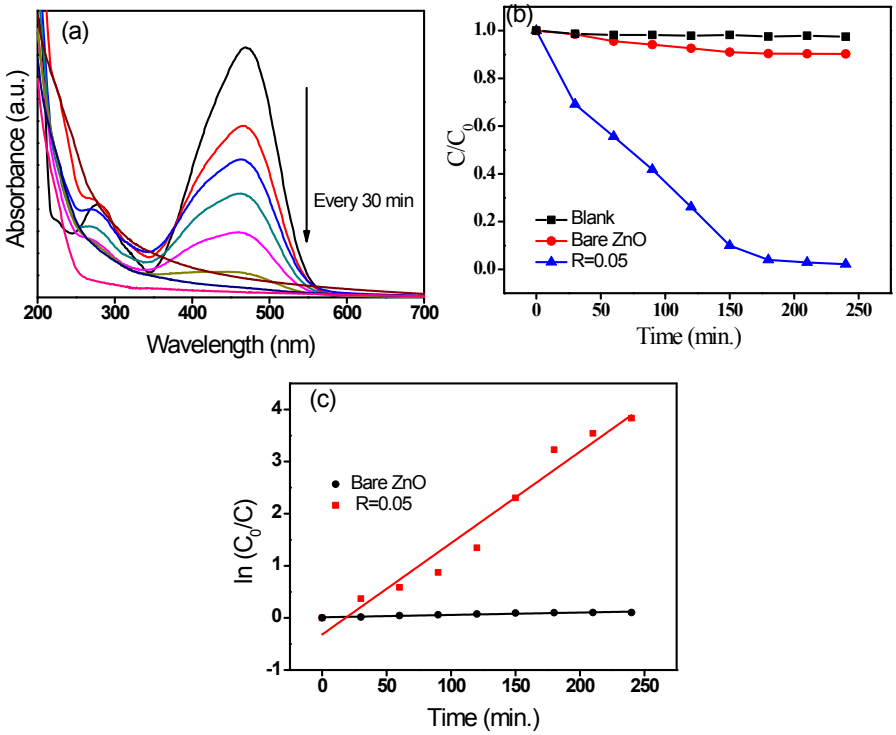


Fig. S3 (a) Absorbance changes of MO solution after different irradiation times in the presence of the Ag-ZnO (R=0.05) sample: equilibrium (black). (b) Kinetic of the degradation of MO. (c) ln[C_0/C] as a function of the irradiation time.

ESI-4

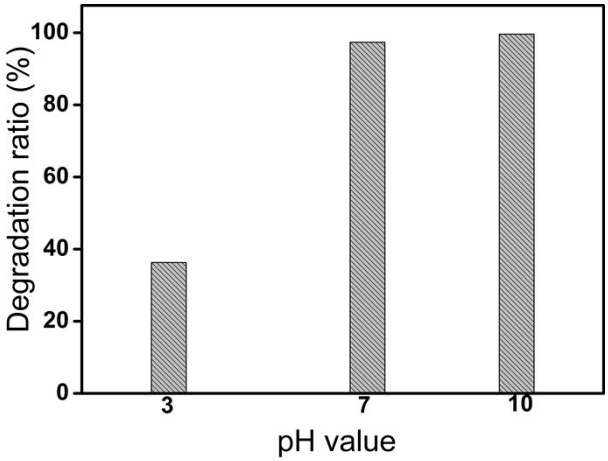


Fig. S4 Effect of pH values on the degradation ratio of RhB for Ag-ZnO (R=0.05).

ESI-5

Table. S1 The recycling data comparison of Ag-ZnO nanohybrid with those of other catalysts reported in literatures.

Number	Catalysts	Recyle times	Preserved activity	Literature
1	Ag-ZnO nanohybrid	5	80%	This work
2	Ag/ZnO nanocomposites	No reported		Reference[1]
3	Ag/ZnO nanorod	No reported		Reference[2]
4	Ag/ZnO heterostructure	4	95%	Reference[3]
5	Ag/ZnO heterostructures	No reported		Reference [4]
6	Ag/ZnO nanorods	No reported		Reference [5]
7	ZnO	3	90%	Reference[6]
8	SnO_2−ZnO Heterojunction	4	99%	Reference[7]
9	Ag/ZnO flower	3	80%	Reference[8]

ESI-6

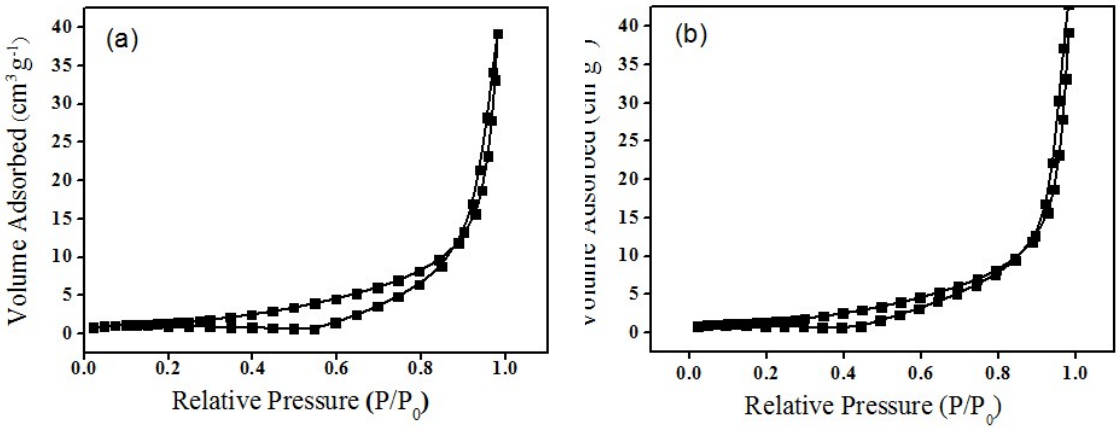


Fig. S5 N_2 adsorption-desorption of Ag-ZnO nanohybrid (R=0.05) before (a) and after (b) photocatalytic degradation reaction.

Table S2. BET values of Ag-ZnO (R=0.05) before and after photocatalytic degradation reaction.

Photocatalyst	S_{BET} (m^2 g^{-1})
Ag-ZnO (R=0.05) before photocatalytic degradation reaction	4.2±0.5
Ag-ZnO (R=0.05) after photocatalytic degradation reaction	4.3+0.5

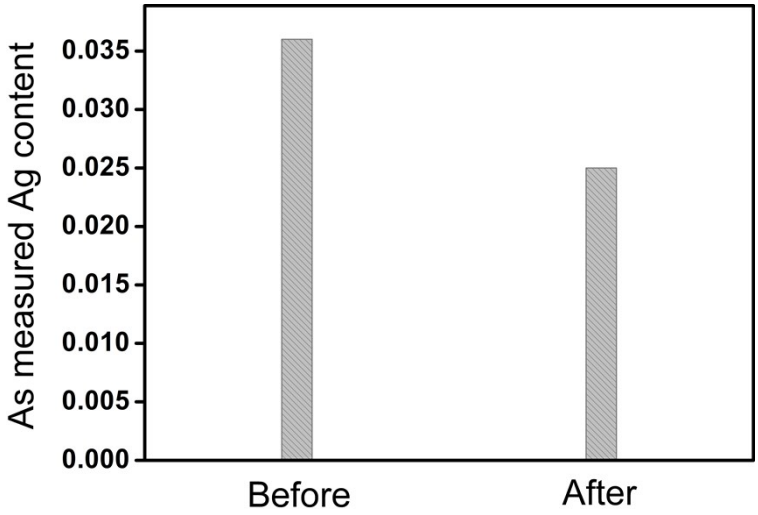


Fig. S6 Ag content of Ag-ZnO (R=0.05) nanohybrids measured by ICPAES before (a) and after (b) photocatalytic degradation reaction.

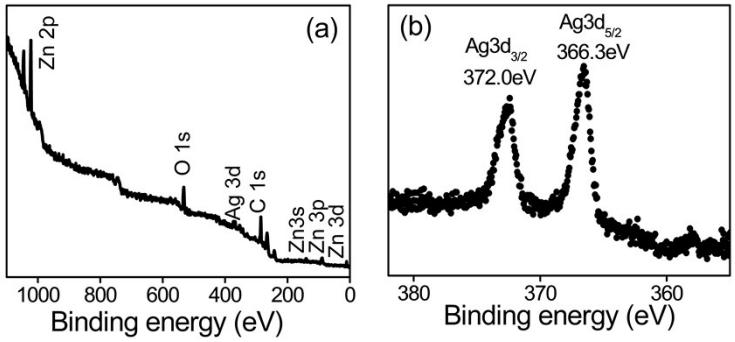


Fig. S7 XPS spectra of Ag-ZnO (R=0.05) after photocatalytic degradation reaction: whole scanning spectra (a) and high resolution regional spectra of Ag 3d (d).

Reference

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