Supporting Information

High-effective photocatalytic properties and interfacial transfer efficiencies of charge carriers for the novel Ag_2CO_3/AgX heterojunctions achieved by surface modification

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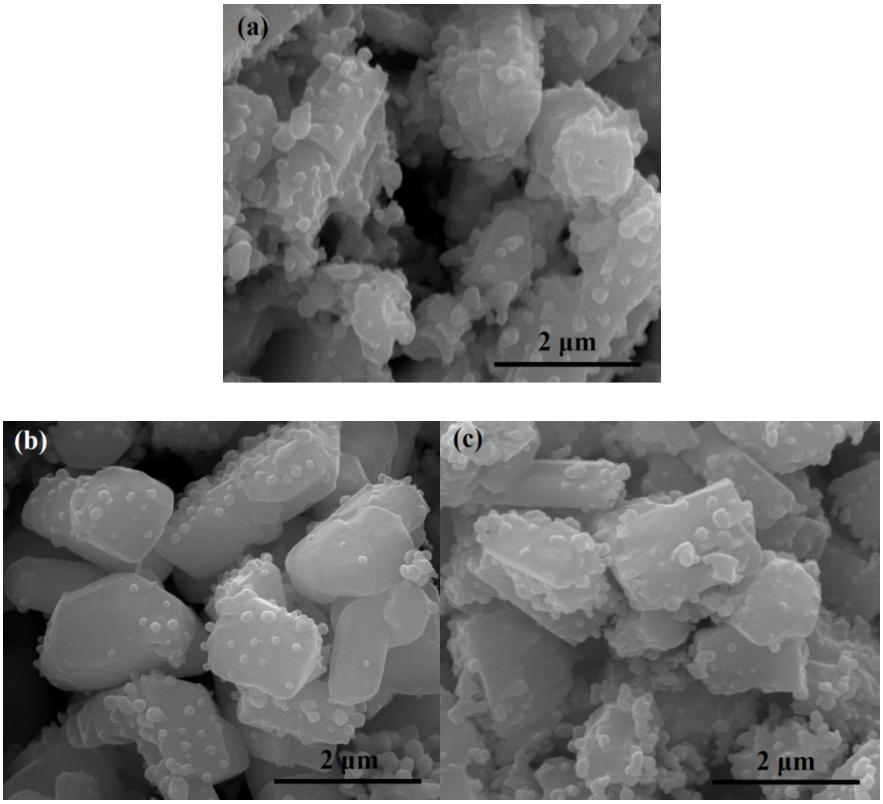

Fig. S1 High-resolution FESEM images of Ag_2CO_3/AgX (Cl (a), Br(b) and I (c)) samples

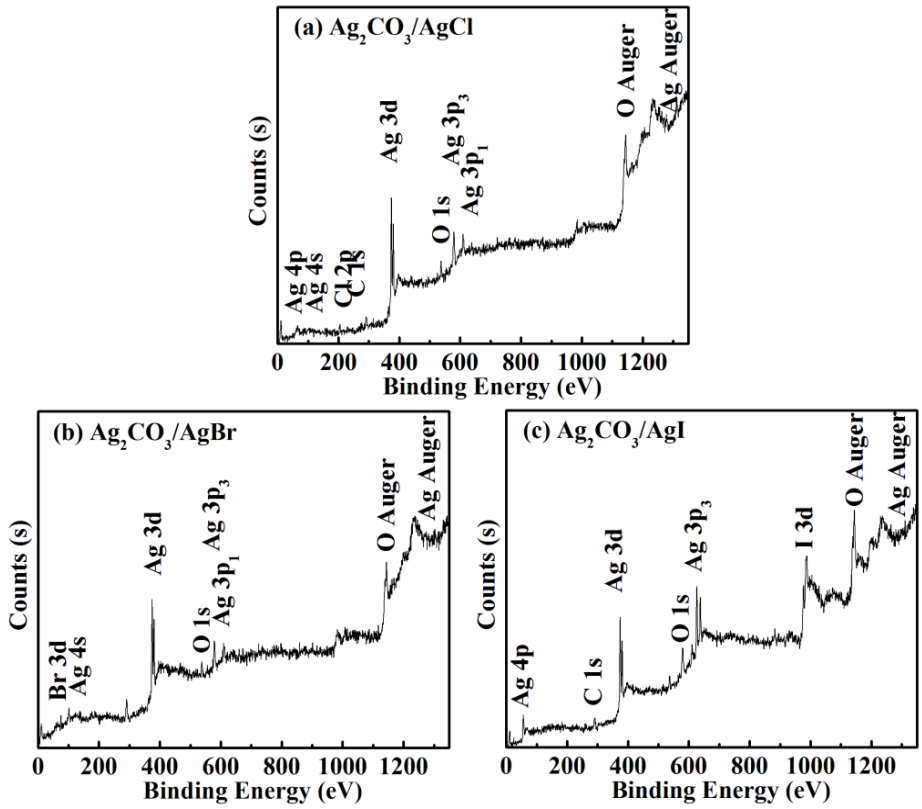

Fig. S2 Total XPS spectra of Ag_2CO_3/AgX samples

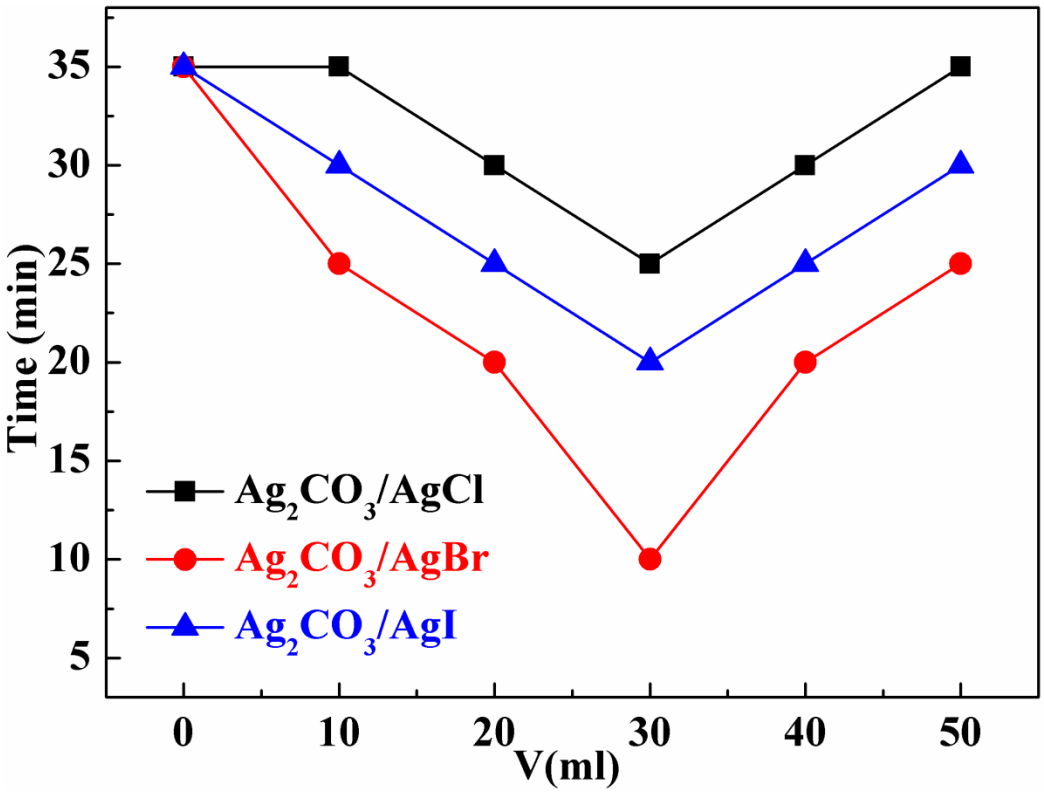

Fig. S3 Degradation time of RhB over Ag_2CO_3/AgX samples obtained by adding different volumes of KX solution

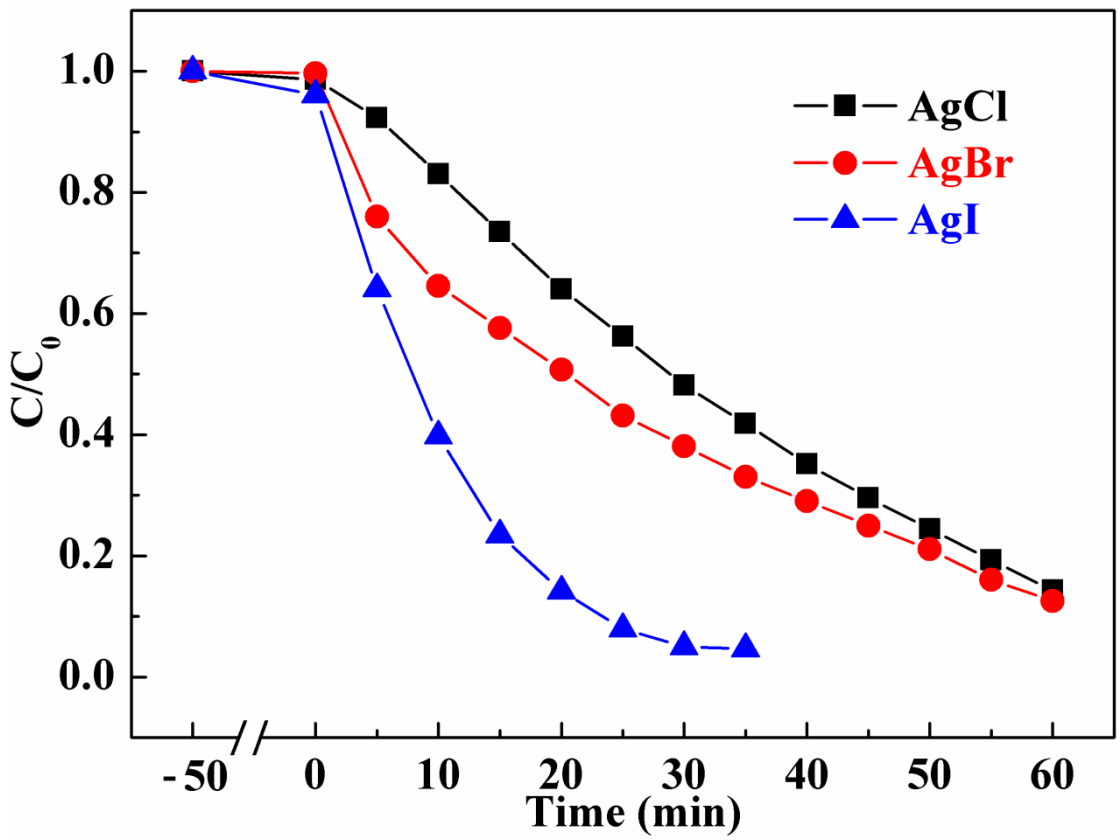

Fig. S4 Dynamic curves of RhB solutions over AgX samples.

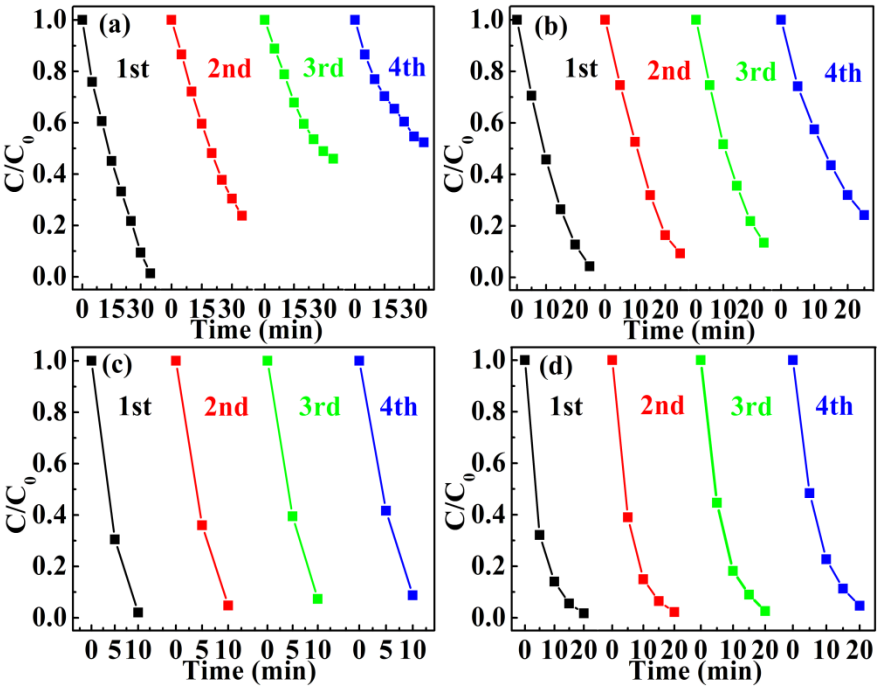

Fig. S5 Circle runs of RhB dyes over Ag_2CO_3 (a) and Ag_2CO_3/AgX (Cl (b), Br(c) and I (d)) samples.

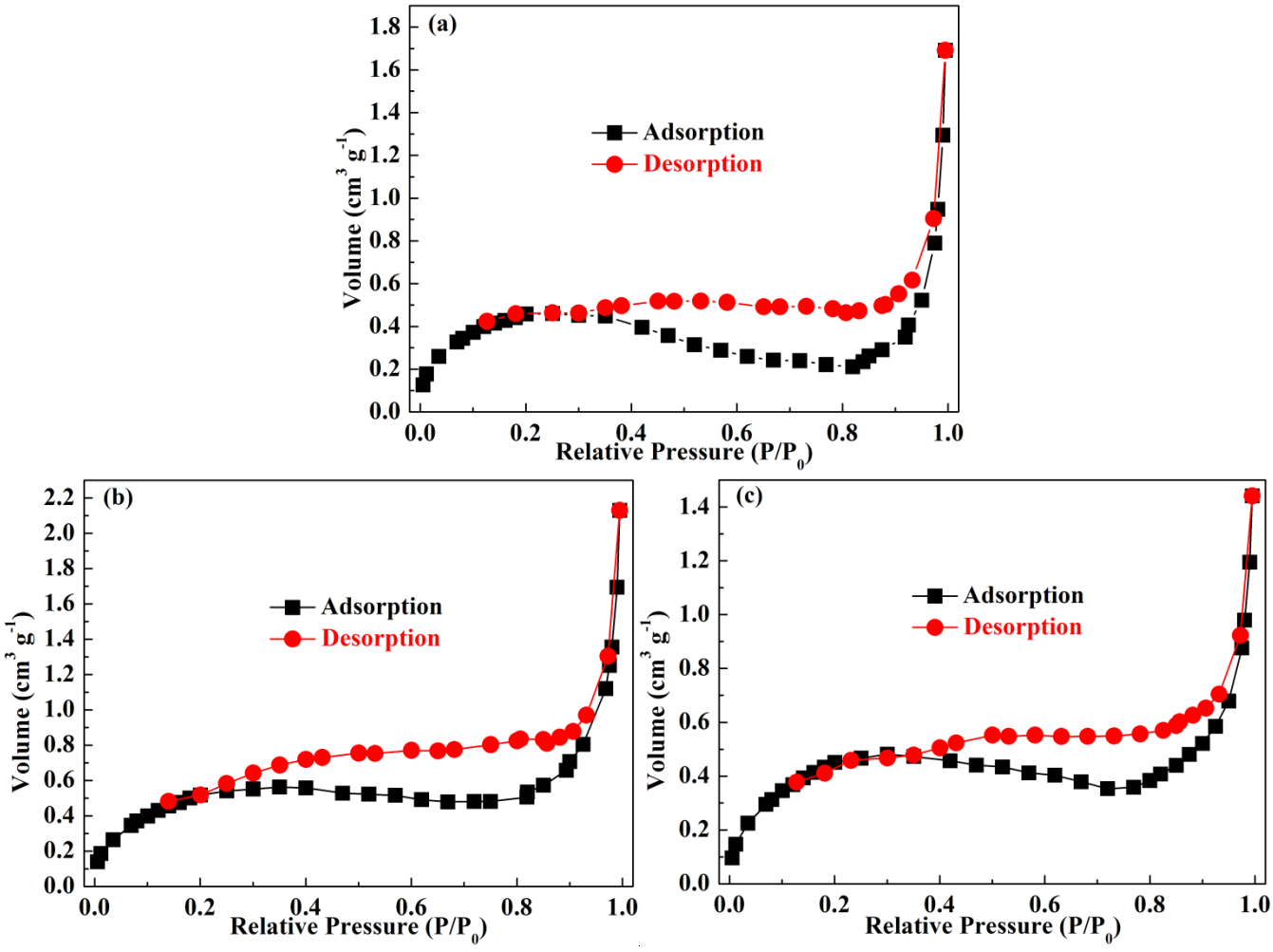

Fig. S6 N_2 adsorption and desorption isotherm of Ag_2CO_3/AgX (Cl (a), Br(b) and I (c)) samples

The band positions of AgCl, AgBr, AgI and Ag_2CO_3 can be calculated by the following empirical formulae:

$$E_{CB} = X - E_c - 1/2E_g$$

$$E_{VB} = E_{CB} + E_g$$

where X is the absolute electronegativity of the atom semiconductor, expressed as the geometric mean of the absolute electronegativity of the constituent atoms, which is defined as the arithmetic mean of the atomic electron affinity and the first ionization energy; E_c is the energy of free electrons of the hydrogenscale (4.5 eV); E_g is the band gap of the semiconductor; E_{CB} is the conduction band potential and E_{VB} is the valence band potential. The band gaps of AgCl, AgBr, AgI and Ag_2CO_3 are 3.25 eV [1], 2.60 eV [2, 3], 2.80 eV [4] and 2.46 eV [5], respectively. According to the above equation, the tops of the VB of them are calculated to be 3.31, 2.64, 2.38 and 2.75 eV, as well as the bottoms of the CB of them are calculated to be 0.06, 0.04, -0.42 eV and 0.29 eV, respectively, as shown in Table S1.

Table S1 X, E_g, E_{CB}, and E_{VB} of AgCl, AgBr, AgI and Ag_2CO_3 samples

Semiconductor	X(eV)	E_g(eV)	E_{CB}(eV)	E_{VB}(eV)
AgCl	6.07	3.25	0.06	3.31
AgBr	5.84	2.60	0.04	2.64
AgI	5.48	2.80	-0.42	2.38
Ag_2CO_3	6.02	2.46	0.29	2.75

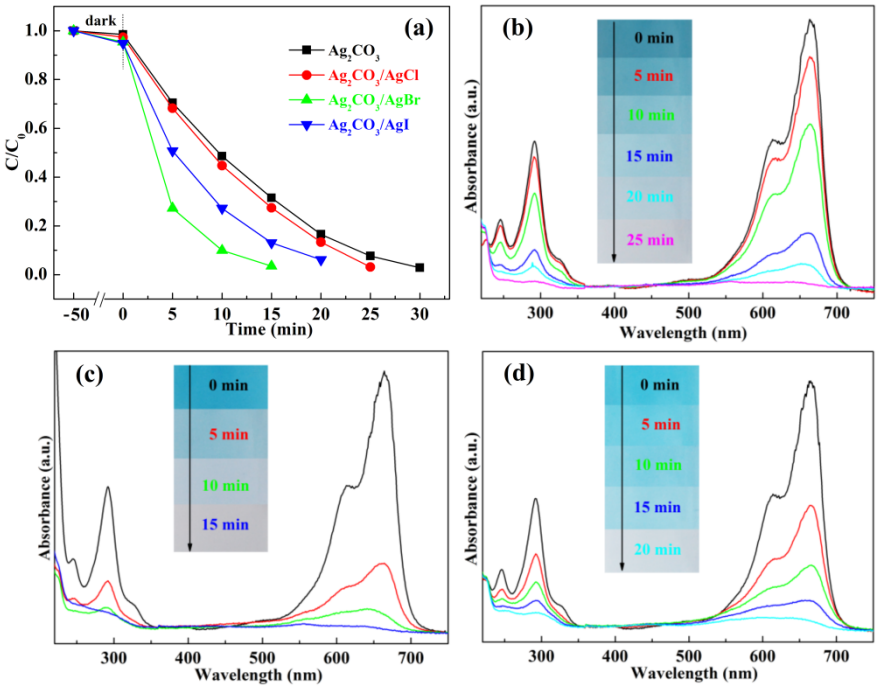

Fig. S7 Dynamic curves (a) and absorbency variations of MB solutions over Ag_2CO_3 and Ag_2CO_3/AgX (X = Cl (b), Br (c) and I (d)) under visible light.

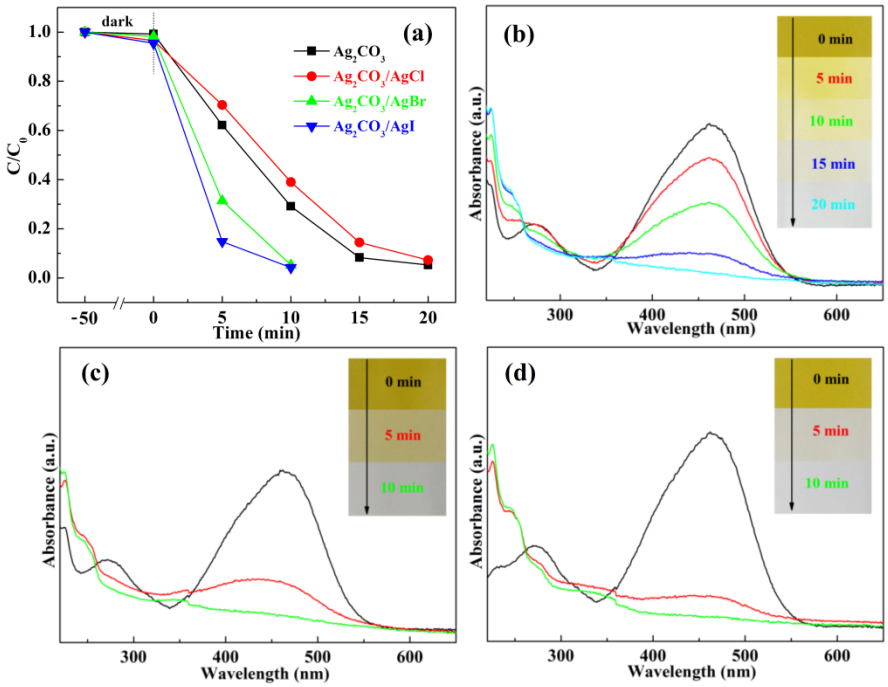

Fig. S8 Dynamic curves (a) and absorbency variations of MO solutions over Ag_2CO_3 and Ag_2CO_3/AgX (X = Cl (b), Br (c) and I (d)) under visible light.

Reference

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(3) H. Wang, J. T. Yang, X. L. Li, H. Z. Zhang, J. H. Li and L. Guo, *Small*, 2012, **8**, 2802-2806.
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