

Electronic Supplementary Information

Synthesis of $\text{BiOCl}_{1-x}\text{Br}_x$ @AgBr heterostructure with enhanced photocatalytic activity under visible light

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Experimental

Synthesis of AgBr/BiOCl_{1-x}Br_x heterostructure

0.033g Silver nitrate (AgNO₃), and 0.1g BiOCl_{1-x}Br_x nanosheets were dispersed into 20 mL heated EG (105 °C), after cooling down to 50 °C, 10 mL ethanol was added drop by drop followed by vigorously stirring. Then 0.1 g CTAB was added to the mixture following by vigorously stirring for 20 min. The mixture was then transferred into 50 mL Teflon-lined autoclave and sealed into the oven under 160 °C for 5 h. After cooling down to room temperature, the precipitates were collected and washed with deionized water and ethanol alternately. After dried in oven at 60 °C for 8 h, the sample was collected and denoted as AgBr/BiOCl_{1-x}Br_x.

Results and discussion

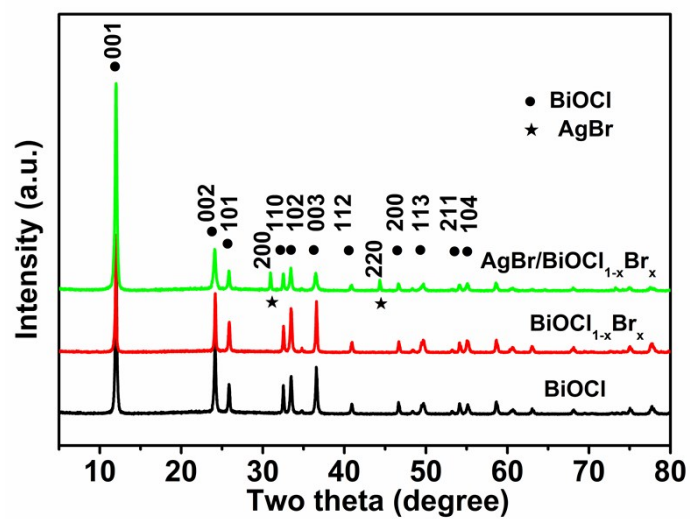


Fig. S1 XRD diffraction patterns of BiOCl, BiOCl_{1-x}Br_x and AgBr/BiOCl_{1-x}Br_x

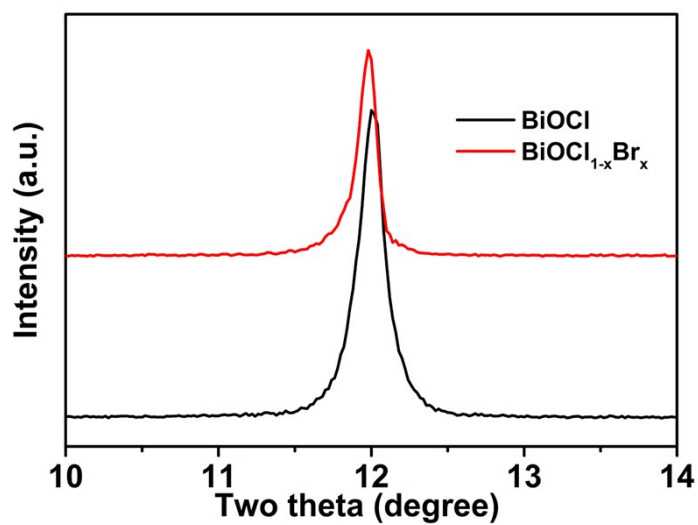


Fig. S2 The amplified XRD patterns of BiOCl and BiOCl_{1-x}Br_x

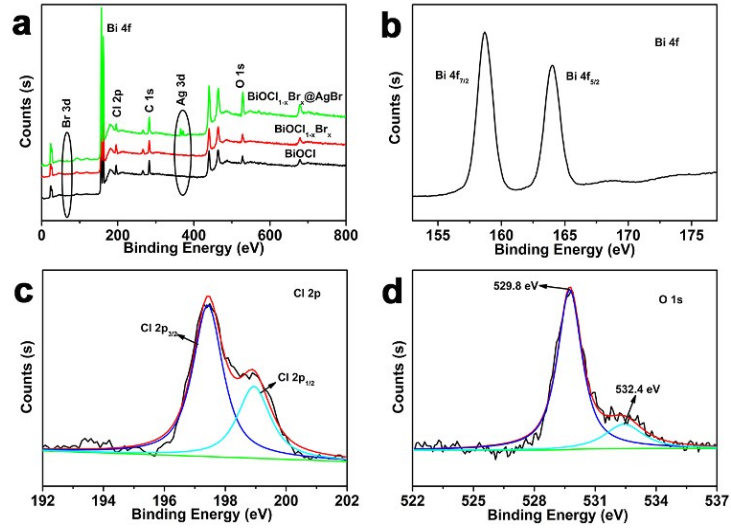


Fig. S3 XPS spectra of BiOCl: (a) survey spectra, (b) Bi, (c) Cl, (d) O

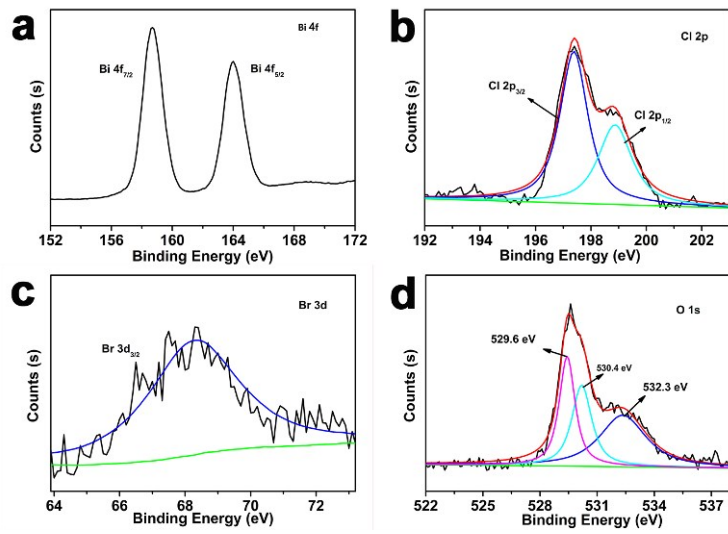


Fig. S4 XPS spectra of $\text{BiOCl}_{1-x}\text{Br}_x$: (a) Bi, (b) Cl, (c) Br, (d) O

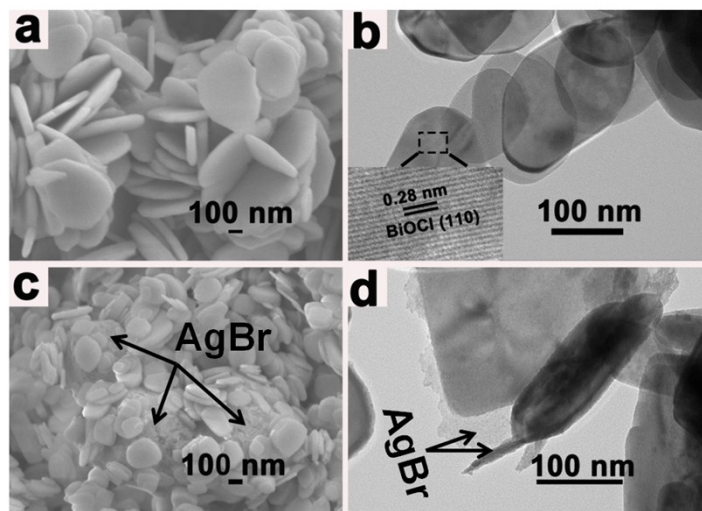


Fig. S5 (a) SEM image of $\text{BiOCl}_{1-x}\text{Br}_x$, (b) TEM image of $\text{BiOCl}_{1-x}\text{Br}_x$, (c) SEM image of $\text{AgBr}/\text{BiOCl}_{1-x}\text{Br}_x$, (d) TEM image of $\text{BiOCl}_{1-x}\text{Br}_x@\text{AgBr}$

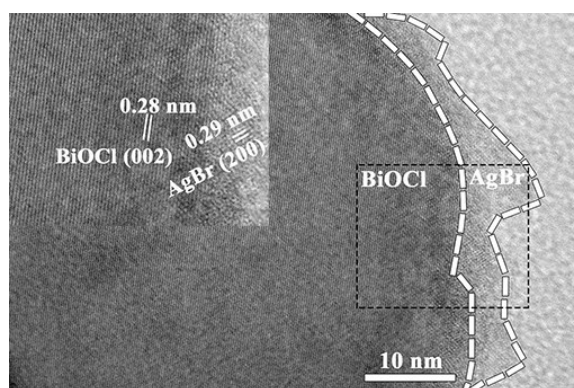


Fig. S6 HRTEM image of $\text{BiOCl}_{1-x}\text{Br}_x@\text{AgBr}$

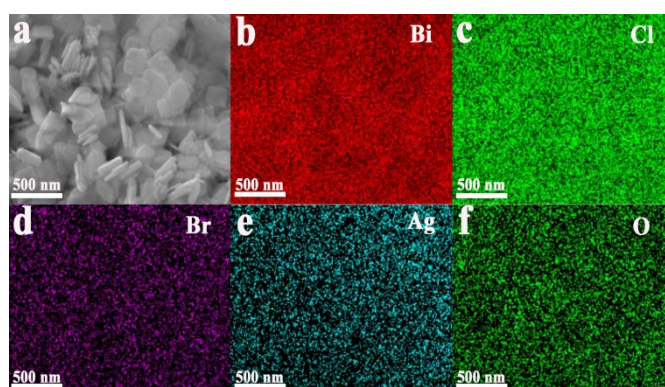


Fig. S7 EDS images of $\text{BiOCl}_{1-x}\text{Br}_x@AgBr$: (a) SEM image, (b) Bi, (c) Cl, (d) Br, (e) Ag, and (f) O

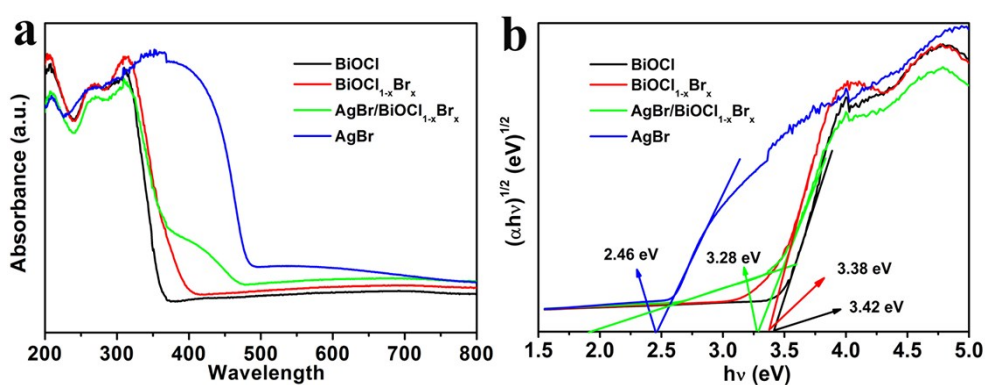


Fig. S8 (a) UV-Vis diffuse reflectance spectra and (b) band gap energies of the samples

Table. S1 the absorption edges, band gap energies, E_{CB} and E_{VB} of the samples

samples	absorption edge/nm	E_g /eV	E_{CB} /eV	E_{VB} /eV
BiOCl	359	3.42	0.15	3.57
AgBr	493	2.46	0.08	2.54
$\text{BiOCl}_{1-x}\text{Br}_x$	400	3.38	0.15	3.55
$\text{AgBr}/\text{BiOCl}_{1-x}\text{Br}_x$	430	3.28		
$\text{BiOCl}_{1-x}\text{Br}_x@AgBr$	450	3.26		

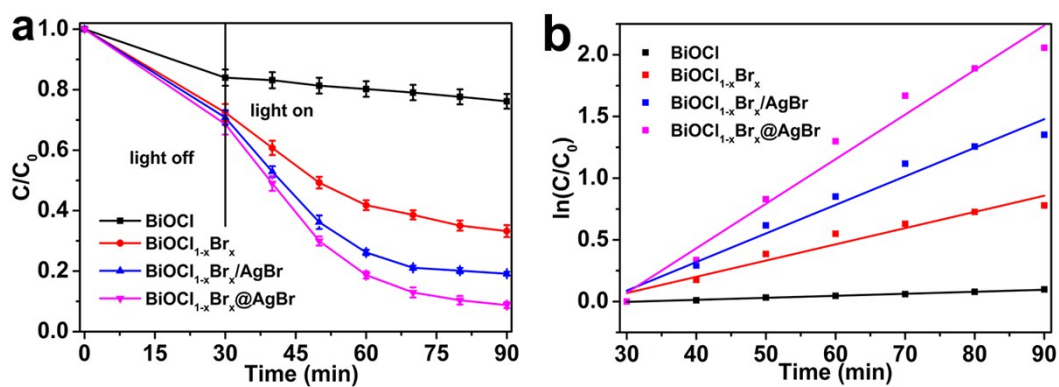


Fig. S9 (a) photocatalytic activities, (b) kinetic fit of degradation for dyes with different samples

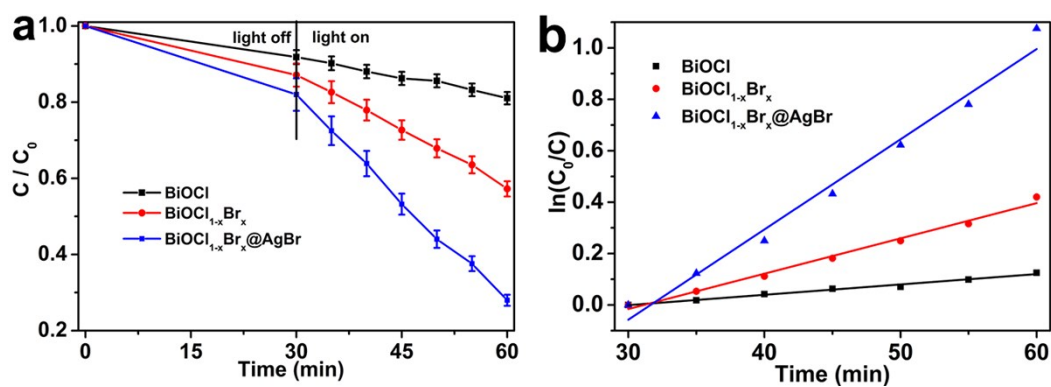


Fig. S10 (a) photocatalytic activities and (b) kinetic fit of BiOCl, BiOCl_{1-x}Br_x and BiOCl_{1-x}Br_x@AgBr for degrading Ofloxacin

Table. S2 The kinetic constants of different samples

samples	kinetic constant/min ⁻¹ (for KN-R degradation)	kinetic constant/min ⁻¹ (for OF degradation)
P25	8.2×10^{-5}	---
BiOCl	1.6×10^{-3}	4.0×10^{-3}
BiOCl _{1-x} Br _x	1.3×10^{-2}	1.5×10^{-2}
AgBr/BiOCl _{1-x} Br _x	2.3×10^{-2}	---
BiOCl _{1-x} Br _x @AgBr	3.6×10^{-2}	4.1×10^{-2}

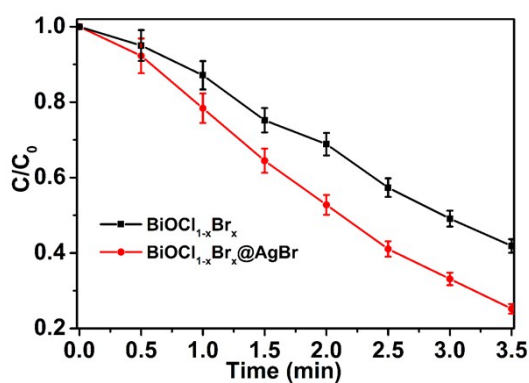


Fig. S11 Photodegradation of phenol over BiOCl_{1-x}Br_x and BiOCl_{1-x}Br_x@AgBr

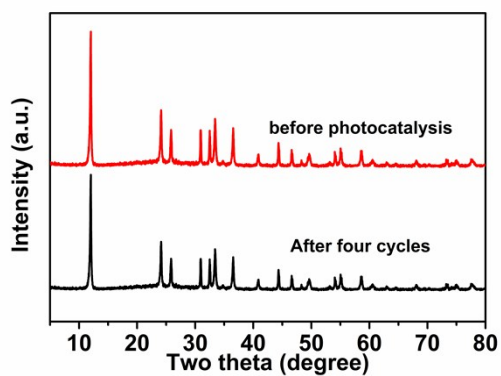


Fig. S12 XRD patterns of BiOCl_{1-x}Br_x@AgBr before and after photocatalytic experiments

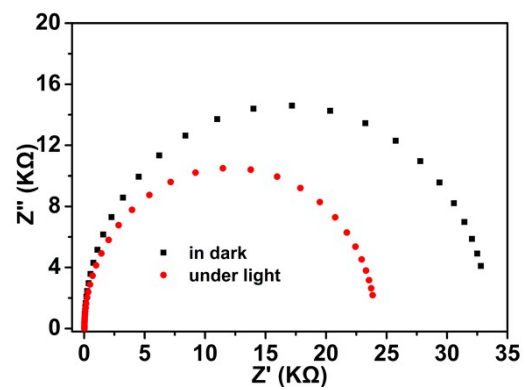


Fig. S13 Electrochemical impedance spectroscopy under light and dark conditions for BiOCl_{1-x}Br_x@AgBr