# Electronic Supplementary Information (ESI)

## High {001} facets dominated ultrathin BiOBr lamellas: facile hydrolysis preparation and selective visible-light photocatalytic activity

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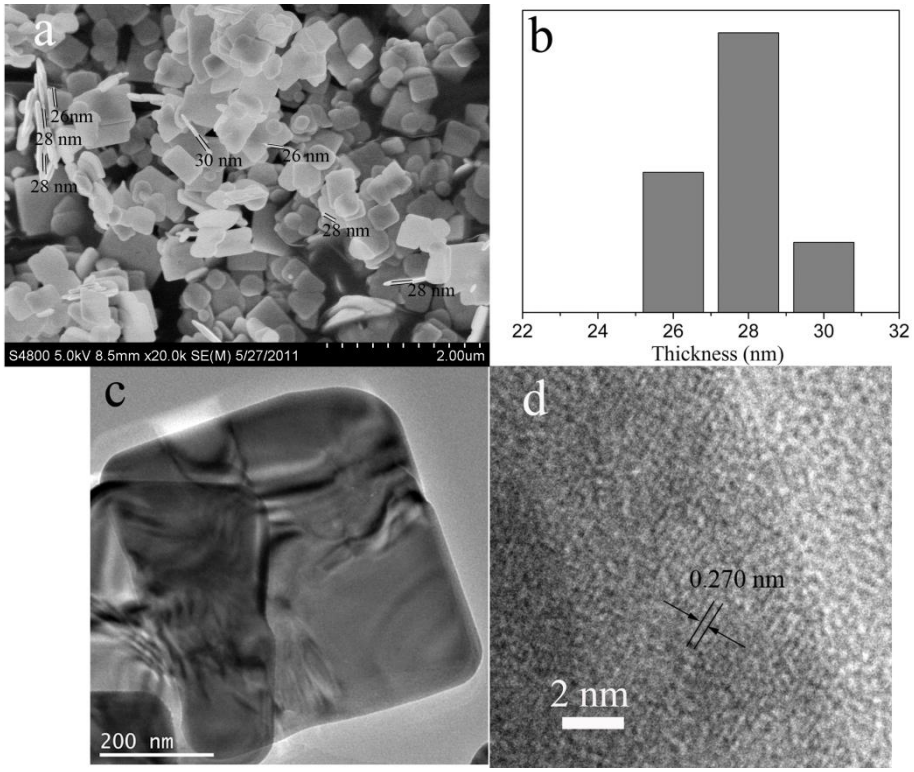


**Fig. S1** The SEM image, thickness distribution of 28 ± 1.4 nm, TEM and HRTEM images of the BiOBr-2 sample in the reaction solvent of water at a reaction temperature of 90 ℃.

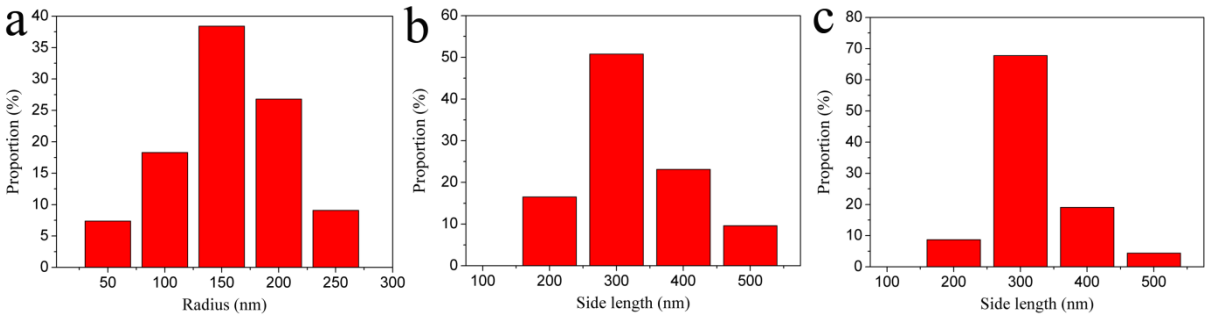


**Fig. S2** The size distribution histograms of three BiOBr samples: BiOBr-1 lamellas (a), BiOBr-2 nanosheets (b) and BiOBr-3 nanosheets (c).

**Table S1** The approximate calculation of the {001} facets ratio.

| Samples | morphology | size distribution/nm | approximate thickness /nm | {001} facets ratio |
|---|---|---|---|---|
| BiOBr-1 | circular | radius=156 ±52 | 9 | 94% |
| BiOBr-2 | quadrangular | side length=326 ±84 | 28 | 85% |
| BiOBr-3 | quadrangular | side length=319 ±64 | 32 | 83% |

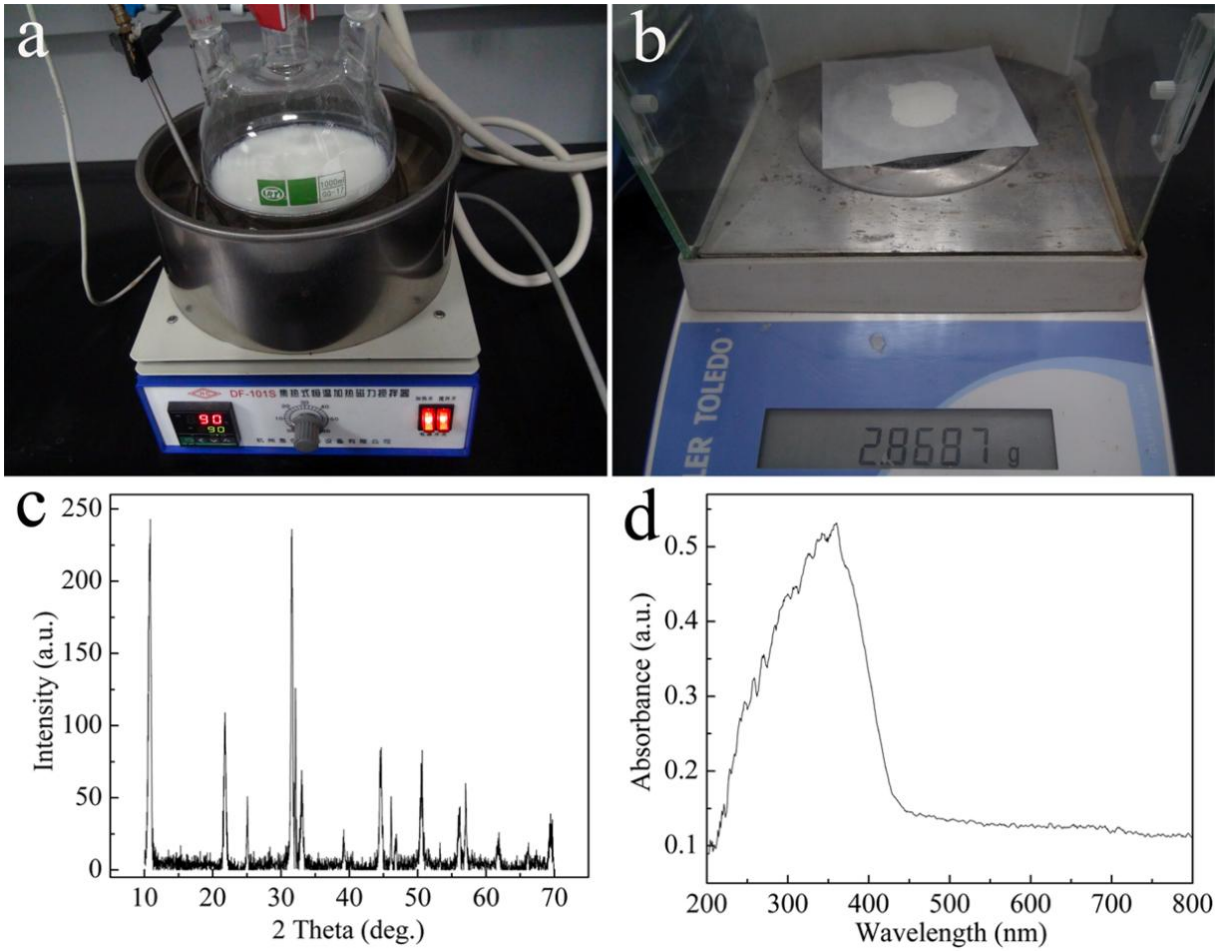


**Fig. S3** The photos of the magnified-up synthesis in a 1 L flask (a), the as-obtained BiOBr product of 2.8687 g (b) and the XRD (c), DRS (d) characterization of the product.

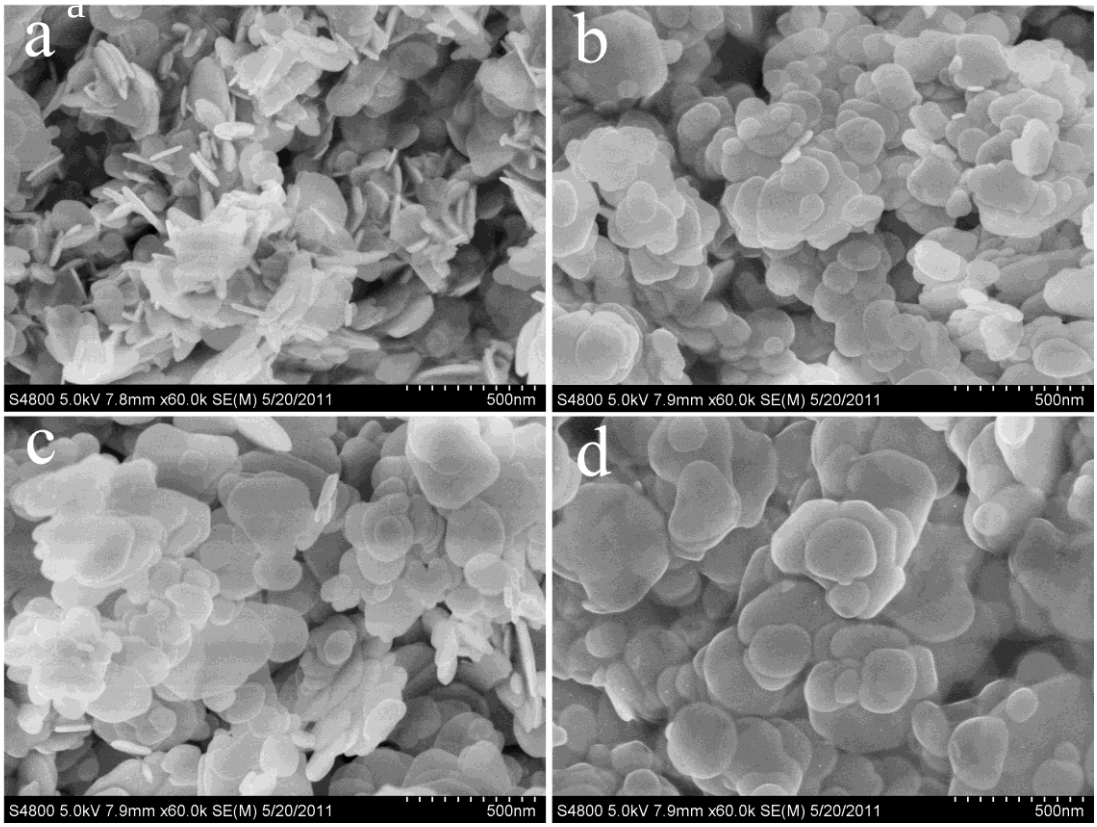


**Fig. S4** SEM images of the BiOBr-1nanosheets under different reaction time: 30 min (a), 1 h (b), 2 h (c) and 3 h (d).

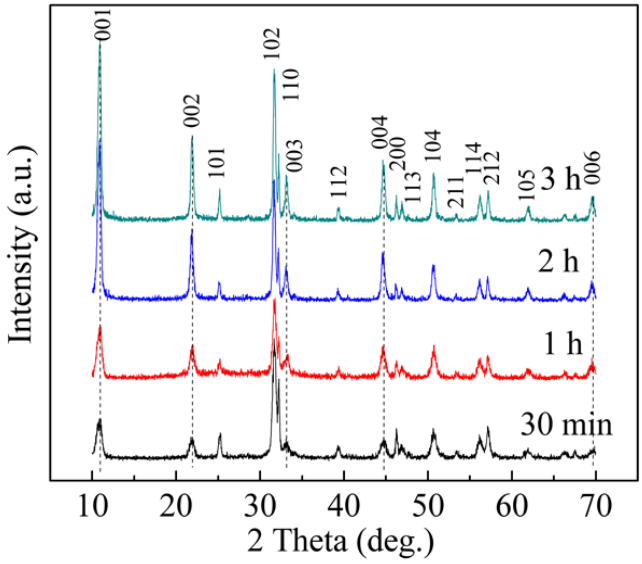


**Fig. S5** The XRD patterns of the BiOBr-1 products under different reaction time.

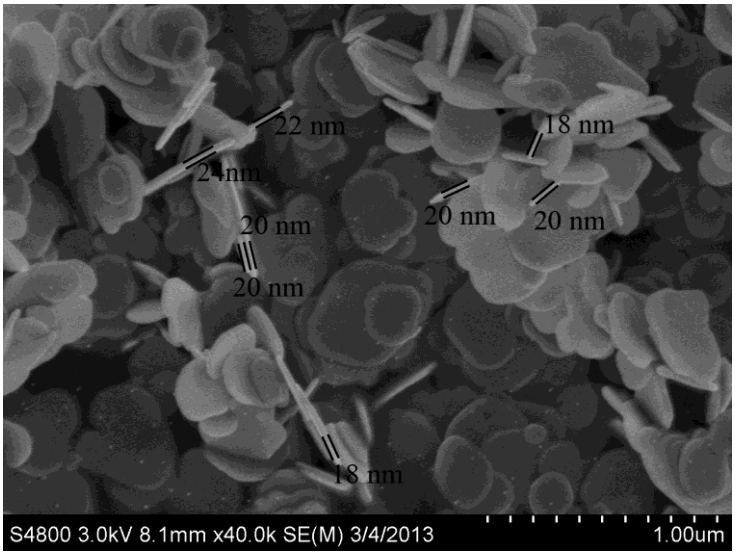


**Fig. S6** SEM image of the BiOBr nanosheets with a mixture of ethanol and water as solvent, under the reaction temperature of 60 ℃. The average thickness of the nanosheets is about 20 nm.

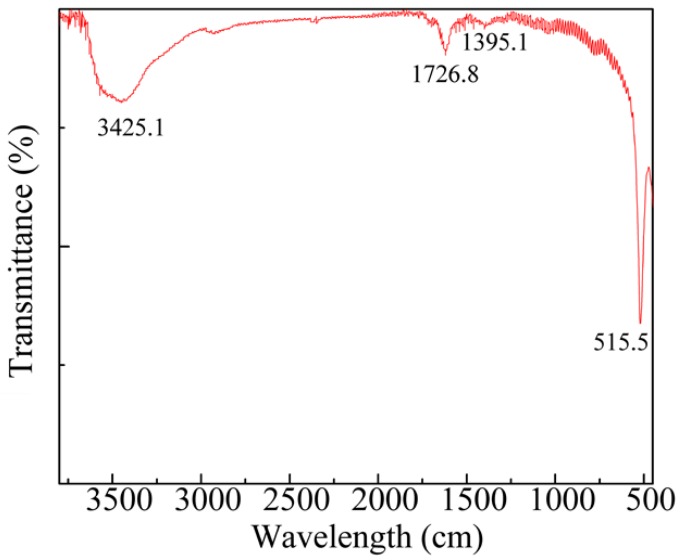


**Fig. S7** FT-IR spectrum of the BiOBr-1 sample. The peak at 3425.1 $cm^{-1}$ is assigned to the stretching vibration of O-H. The bands at 1726.8 $cm^{-1}$ and 1395.1 $cm^{-1}$ could be assigned to the asymmetry and symmetric vibration of Bi-Br. The Bi-O stretching adsorption is at 515.5 $cm^{-1}$.

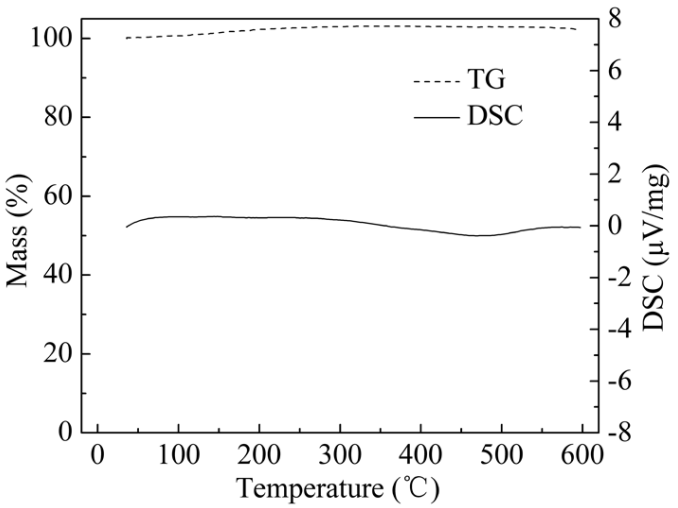


**Fig. S8** The TG-DSC curve of the BiOBr-1 sample. The thermal stability of BiOBr nanosheets obtained at 90 ℃ in ethanol/water is recorded by thermal analyses (TG/DSC) in $N_2$ flow. The TG and DSC curves show no change, indicating that the compound is very stable in the temperature range from 40 to 600 ℃. Because the $Br_2$ generated by the decomposition of BiOBr could damage the instrument according to literature, so the upper temperature limit is set to 600 ℃.

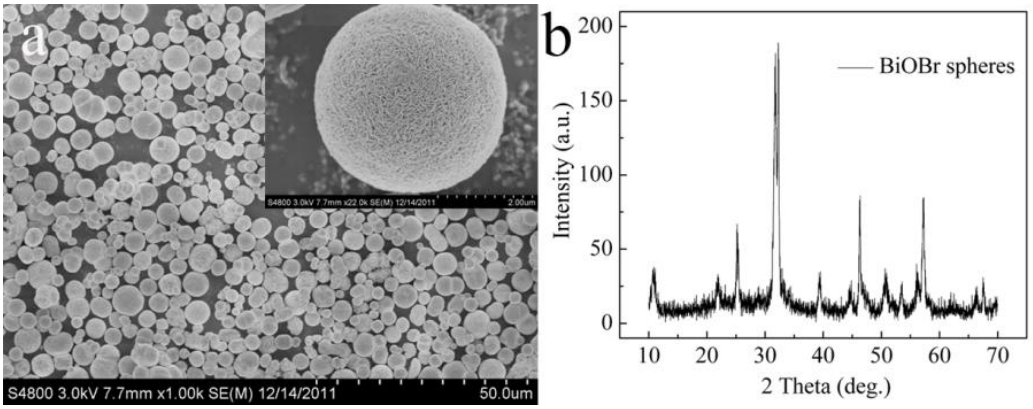


**Fig. S9** The SEM image (a), XRD (b) of 3D BiOBr spheres constructed with nanosheets. The 3D BiOBr spheres were synthesized using Zhang's method. 0.5 mmol of $Bi(NO_3)_3$ $5H_2O$, 0.5 mmol of NaBr, and 20 mL of ethylene glycol (EG) were mixed in a 25 mL of autoclave and sufficiently dispersed by an ultrasonic generator. The autoclave was sealed and maintained constantly at 160 ℃ for 12 h and then cooled to room-temperature naturally. Then the precipitation was separated by centrifugation, washed with deionized water and absolute ethanol and dried under vacuum at 60 ℃.

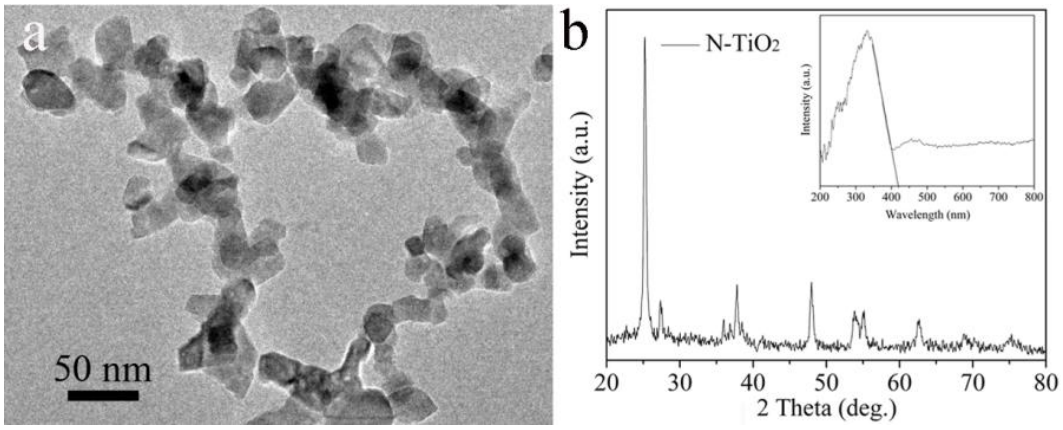


**Fig. S10** The TEM image (a), XRD (b) and DRS (inside b) of commercial N doped $TiO_2$ nanoparticles which was purchased from Shanghai Wei Nano Science and Technology Co., Ltd.

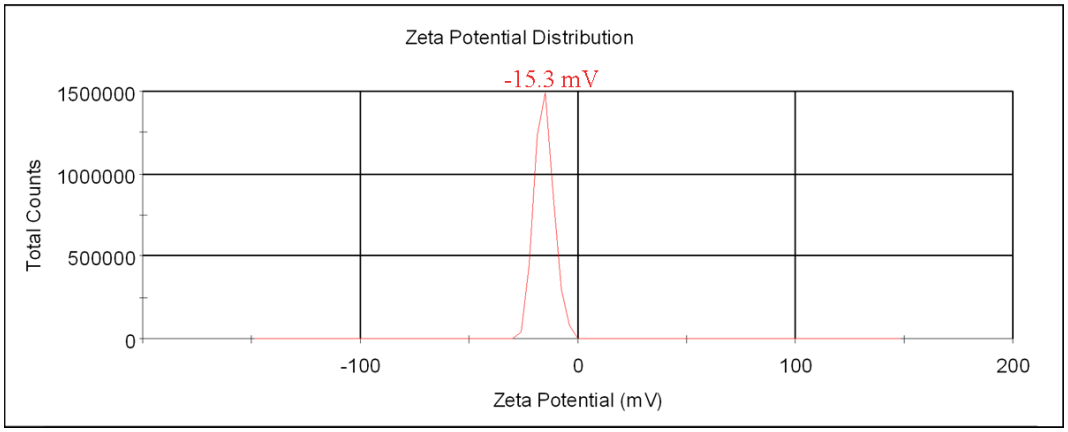


**Fig. S11** The Zeta petential result of BiOBr-1 sample in water.

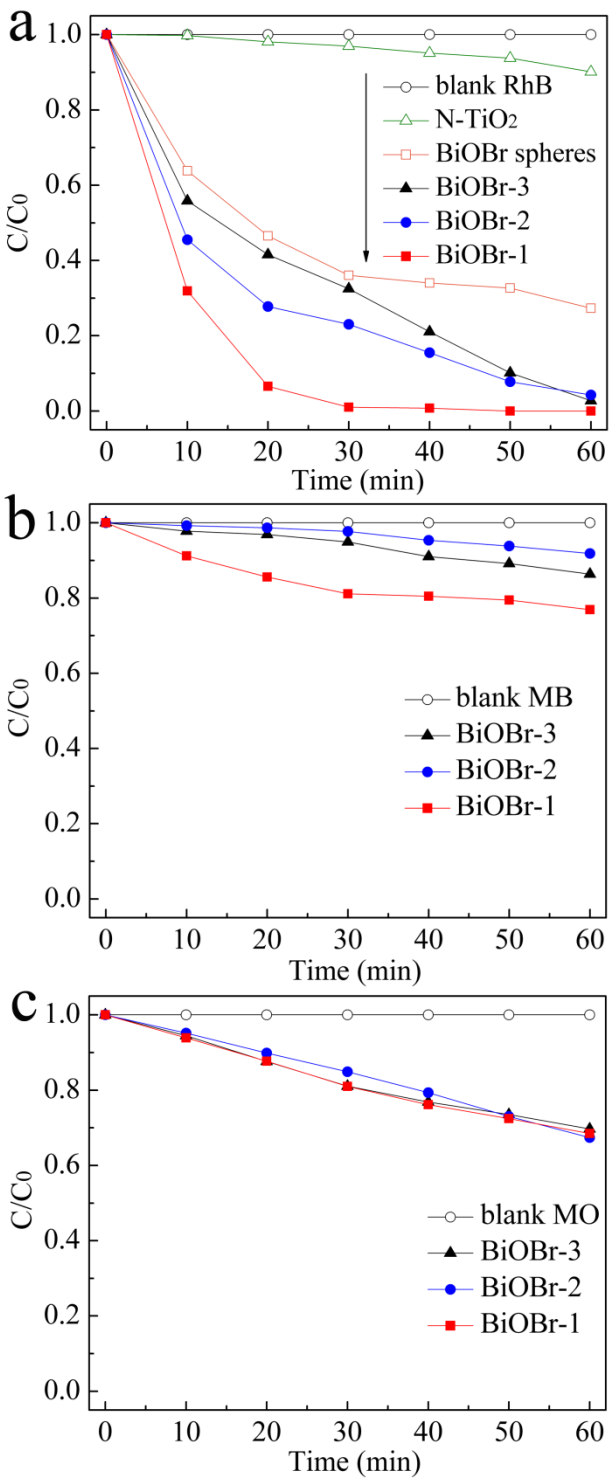


**Fig. S12** (a) The photodegradation efficiencies of RhB in the present of different catalysts under visible light. The photodegradation efficiencies of MB (b) and MO (c) in the present of different BiOBr catalysts under visible light.

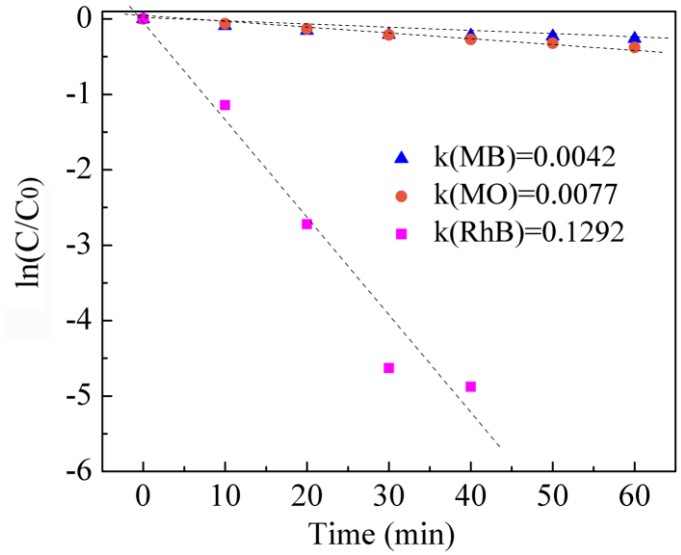


**Fig. S13** The rate constants (k) of three different dyes in the present of BiOBr-1 photocatalyst were calculated based on the dynamic equation of "$\ln(C/C_0)=-kt$". The k(RhB) is 17 times larger than k(MO), and 31 times larger than k(MB).