Electronic Supplementary Material (ESI) for RSC Advances.

BiOBr nanodots decorated hierarchical Bi_2WO_6 fabricating p-n heterostructure with enhanced photo-induced electric performance and photocatalytic degradation

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3. Result and discussion

3.1. Characterization of catalysts

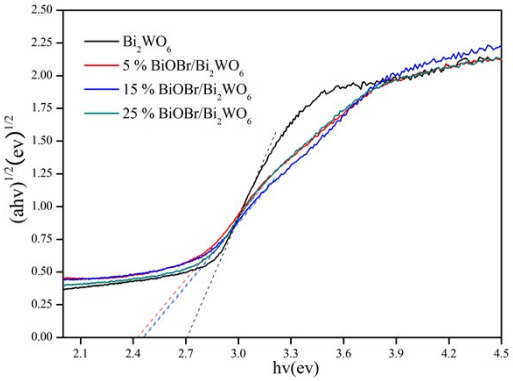

Fig.S1 plots of $(\alpha h\nu)^2$ versus energy ($h\nu$) for the band gap energy of Bi_2WO_6 and various $BiOBr/Bi_2WO_6$ composites

Fig. S1 shows that the band gaps of $BiOBr/Bi_2WO_6$ composites were about 2.4-2.5 eV. Therefore, when the composite material system was irradiated with visible light, the Bi_2WO_6 and BiOBr in the composite photocatalysts both absorbed photons, as well as excited electron and hole pairs.

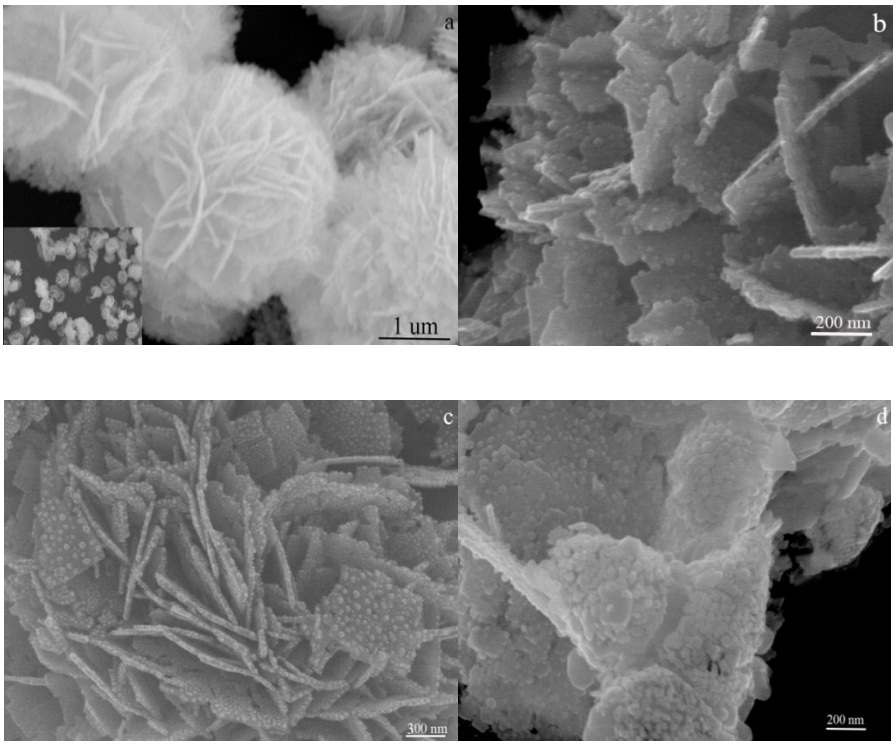

Fig.S2 SEM images of prepared photocatalysts (a) lower magnification SEM images of 15 %$BiOBr/Bi_2WO_6$ Bi_2WO_6; (b) 5 %$BiOBr/Bi_2WO_6$; (c) 15 %$BiOBr/Bi_2WO_6$; (d) 25 %$BiOBr/Bi_2WO_6$

The morphologies of 15 %BiOBr/Bi_2WO_6 Bi_2WO_6 were observed using lower magnification SEM, which was better to observe overall morphology. As shown in Fig.S2a, the 15 %BiOBr/Bi_2WO_6 Bi_2WO_6 composites exhibited the similar morphology with the pure Bi_2WO_6, indicating that the deposition of BiOBr nanodots did not affect the flower-like microspheres of the Bi_2WO_6. Meanwhile, the BiOBr nanodots were not observed due to the lower magnification. The 5 %BiOBr/Bi_2WO_6, 15 %BiOBr/Bi_2WO_6 and 25 %BiOBr/Bi_2WO_6 composites was observed as shown in Fig. S2(b, c, d). It was clearly observed that the BiOBr nanodots were uniformly dispersed on the surface of the Bi_2WO_6 nanosheets, and did not affect the flower-like microspheres of the Bi_2WO_6. Fig. S1b displays the SEM image of the 5 %BiOBr/Bi_2WO_6 composites, where the BiOBr assemble on the surface of the Bi_2WO_6 microsphere with low distribution density. Meanwhile, the density of BiOBr nanodots increased gradually with the enhancement of BiOBr content. From the Fig. S2c, the BiOBr nanodots were homogeneously coated on the surface of Bi_2WO_6 with an intimately contact. The nanosheet building blocks of Bi_2WO_6 microsphere acted as clapboards to separate BiOBr and could endow a higher surface-to-volume ratio and more reactive sites to the photocatalysts, which was favorable for its photocatalytic activity. From the 25 %BiOBr/Bi_2WO_6 composite (as seen in Fig. S2d), the overloading BiOBr tended to agglomerate to some extent and cover the surface of Bi_2WO_6.

Table S1

Photocatalysts	Bi_2WO_6	5% BiOBr/Bi_2WO_6	15% BiOBr/Bi_2WO_6	25% BiOBr/Bi_2WO_6
Surface area[m^2g^{-1}]	9.23	13.56	17.45	11.78

Table S3The specific surface area of as-prepared composite catalysts.

The specific surface area is an important factor to determine the adsorptive capability of the photocatalysts towards organic contaminant. From the results of the nitrogen sorption tests (as seen in Table S1), the specific surface area of pure Bi_2WO_6, 5 %BiOBr/Bi_2WO_6, 15 %BiOBr/Bi_2WO_6 and 25 %BiOBr/Bi_2WO_6 was calculated to be 9.23 m^2/g, 13.56 m^2/g, 17.45 m^2/g and 11.78 m^2/g, respectively. It is widely accepted that the larger specific surface areas could provide more reactive center sites and absorb more reactants, resulting in an improved photocatalytic activity. The 15 %BiOBr/Bi_2WO_6 possessed the larger specific surface areas than

that of 5 %BiOBr/Bi_2WO_6 and 25 %BiOBr/Bi_2WO_6 composite, which could explained as that the BET of the composites are increased with the content of BiOBr increased and suitable BiOBr content could be well dispersed on the surface of Bi_2WO_6 microsphere. The overloading content BiOBr nanodots were thought to agglomerate (seen in Fig. S1d) and shade the active sties on the surface of Bi_2WO_6, resulting in a lower degradation rates.

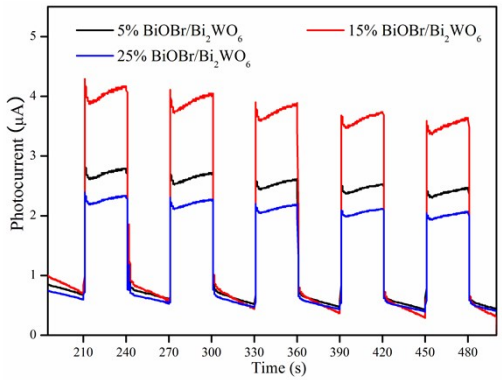

Fig.S3. Transient photocurrent response for 5 %BiOBr/Bi_2WO_6 and 15 %BiOBr/Bi_2WO_6 25 %BiOBr/Bi_2WO_6 omposites

The photo-responses of 5% BiOBr/Bi_2WO_6, 15% BiOBr/Bi_2WO_6 and 25% BiOBr/Bi_2WO_6 samples performed under several on/off sunlight irradiation cycles at a particular time period shown in Fig. S3. It was noted that the 15 % BiOBr/Bi_2WO_6 composites exhibited the highest photocurrent intensity of the three samples, which was about 1.49 and 1.78 times than that of 5% BiOBr/Bi_2WO_6 and 25% BiOBr/Bi_2WO_6, indicating that the recombination of electrons and holes was greatly inhibited and the separation of photogenerated charges, and thus improving the photocatalytic activity.