Supplementary Information

In situ construction and composition engineering of $PbBiO_2Br$/metal halide perovskite heterojunctions for enhanced interfacial charge transfer and photocatalytic activity

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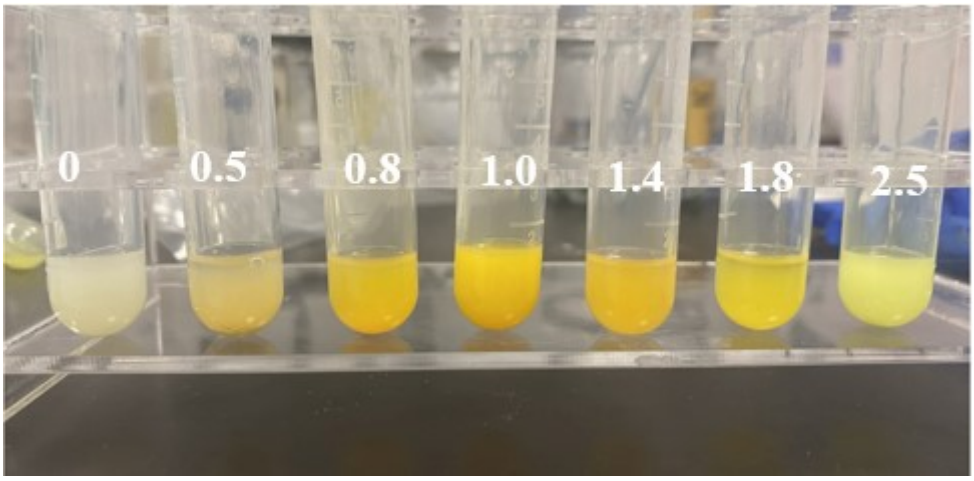

Fig. S1. Optical photos of heterojunctions prepared with different volumes of the HBr: 0, 0.5, 0.8, 1.0, 1.4, 1.8 and 2.5 μL of the HBr was added from left to right, respectively.

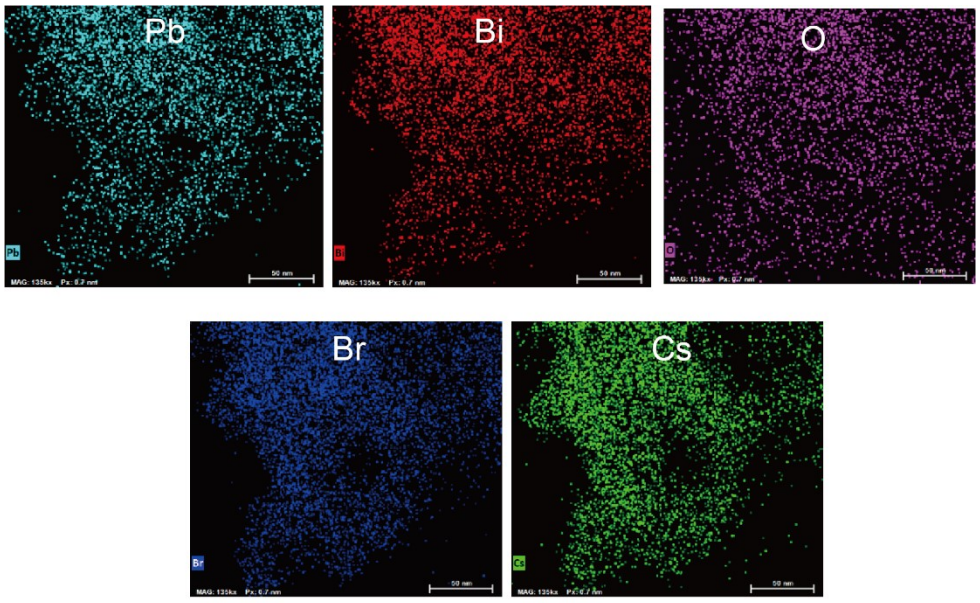

Fig. S2. Element mapping of $PbBiO_2Br$/MHPs (1.0).

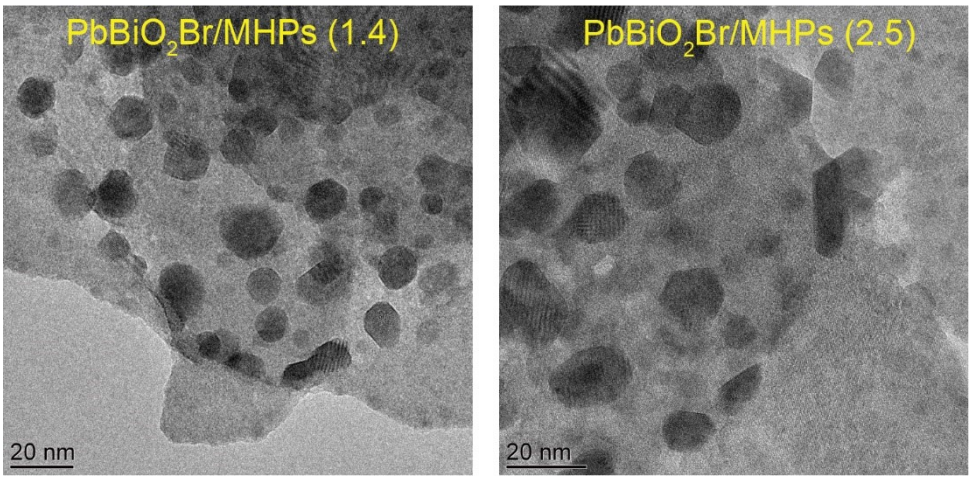

Fig. S3. Low-magnified TEM images of $PbBiO_2Br$/MHPs(1.4) and $PbBiO_2Br$/MHPs(2.5).

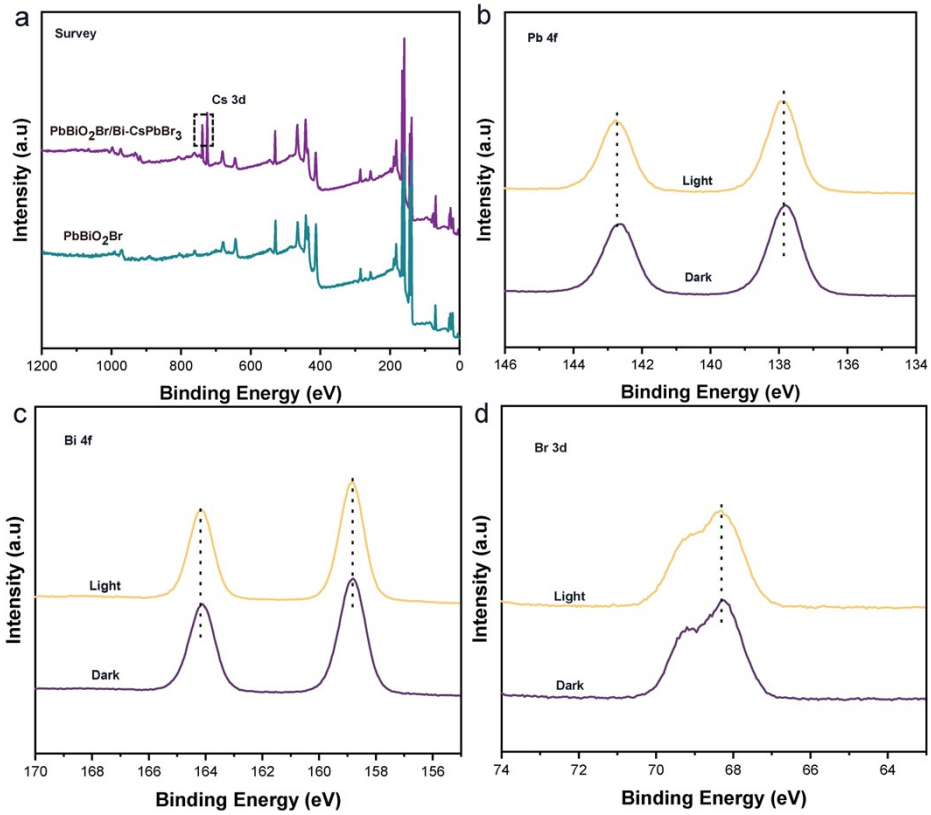

Fig. S4. *In situ* XPS spectra of $PbBiO_2Br$ and $PbBiO_2Br$/Bi-$CsPbBr_3$:(a) survey spectra; (b) Pb 4f; (c) Bi 4f; (d) Br 3d.

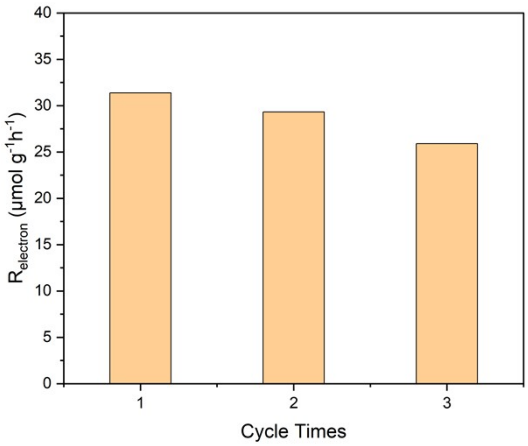

Fig. S5. Photocatalytic recycling tests of $PbBiO_2Br$/Bi-$CsPbBr_3$ heterojunction with the reaction system refreshed every 3 h.

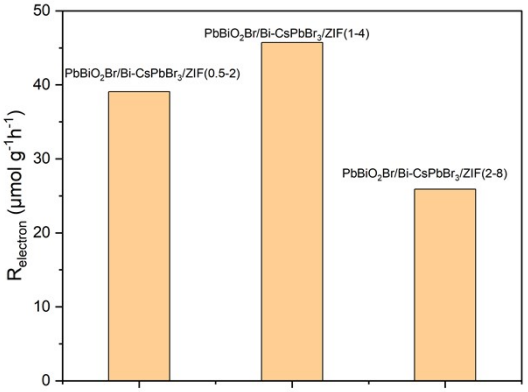

Fig. S6. Photocatalytic CO_2 reduction performances of $PbBiO_2Br$/Bi-$CsPbBr_3$/ZIF-67 heterojunction prepared by different ZIF-67 precursor concentration after irradiation for 3 h.

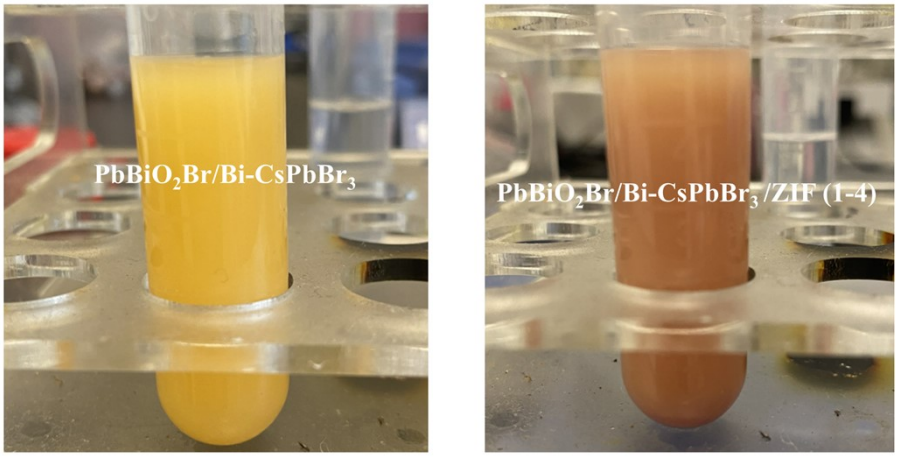

Fig. S7. Optical photos of $PbBiO_2Br/Bi\text{-}CsPbBr_3$ and $PbBiO_2Br/Bi\text{-}CsPbBr_3$/ZIF-67 sample.

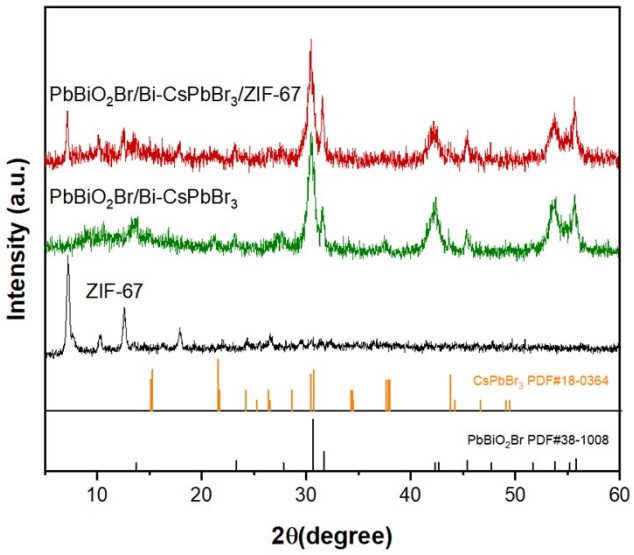

Fig. S8. XRD patterns of ZIF-67, $PbBiO_2Br/Bi\text{-}CsPbBr_3$ and $PbBiO_2Br/Bi\text{-}CsPbBr_3$/ZIF-67 samples.

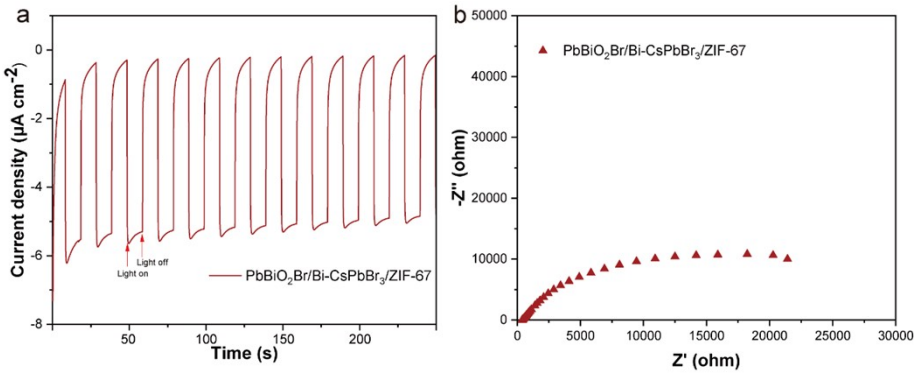

Fig. S9. (a) *I–t* curves and (b) Nyquist plots of $PbBiO_2Br/Bi\text{-}CsPbBr_3/ZIF\text{-}67$ film.

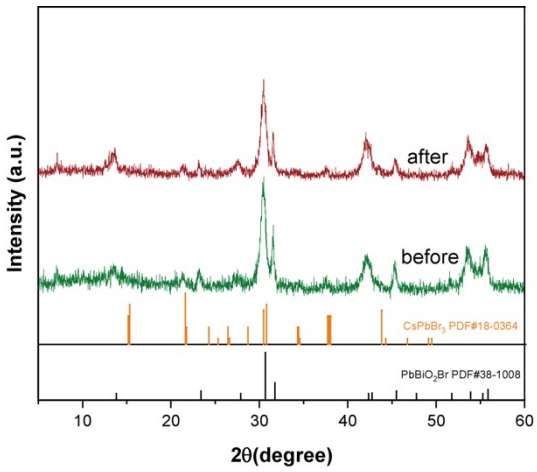

Fig. S10. The XRD patterns of $PbBiO_2Br/Bi\text{-}CsPbBr_3/ZIF\text{-}67$ heterojunction before and after five consecutive cycles of photocatalytic CO_2 reduction.