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Supporting Information for

Hierarchical nanosheet-based Bi_2MoO_6 microboxes for efficient photocatalytic performance

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Additional Figures and Discussions

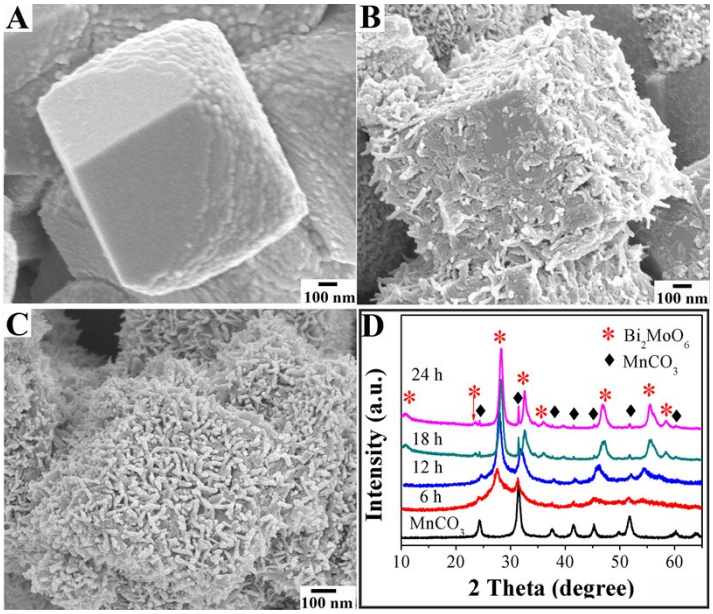

Fig. S1. SEM images of intermediate samples collected at (A) 6 h (B) 12 h and (B) 18 h, and the XRD pattern of the samples (D).

As shown in Figure S1A, the surface of $MnCO_3$ microcube was covered with small nanoparticles when the reaction was conducted for 6 h (denoted as MB-6). Besides, in the corresponding XRD pattern, the diffraction peak at 28.3º attributed to the (131) crystal plane of Bi_2MoO_6 appears, and the diffraction peaks of $MnCO_3$ exhibit lower intensity and broader width than that of pure $MnCO_3$ microcube. It is thought that only small Bi_2MoO_6 nanoparticles with low crystallinity can be formed on the surface of $MnCO_3$ microcube at 6 h. With the time continued, these nanoparticles grew into small nanosheets which dispersed on the whole microcube surface (Fig. S1B). Furthermore, the anisotropic growth of Bi_2MoO_6 nanosheets led to interconnected nanosheets. More importantly, the intensity of Bi_2MoO_6 peaks of samples reacted for 12 h (MB-12) demonstrates significant increase with respect to the MB-6, resulting in the broad diffraction peaks indexed to the Bi_2MoO_6 and $MnCO_3$. Interestingly, the sharp diffraction peaks can be easily distinguished and agree well with the Bi_2MoO_6 and $MnCO_3$ respectively in the XRD pattern of MB-18. As displayed in Fig. S1C, the well-defined hierarchical microbox consisting of microcube core and interconnected nanosheets can be clearly seen. It is well established that the Bi_2MoO_6 nanosheet grew in size with higher crystallinity

as increasing the reaction time.[1,2] Finally, the nanosheet-built Bi_2MoO_6 shell with uniform and perfect structure on $MnCO_3$ microcube surface was developed as a result of the hydrothermal reaction for 24 h.

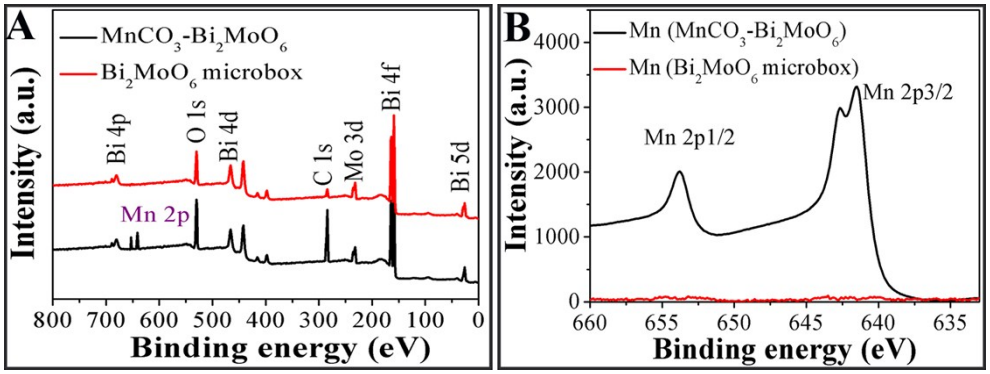

Fig. S2. XPS spectra of (A) survey and (B) Mn 2p of $MnCO_3$-Bi_2MoO_6 microcube and Bi_2MoO_6 microbox.

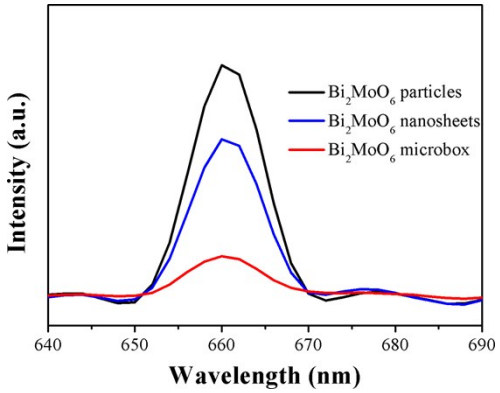

Fig. S3. Room temperature photoluminescence spectra of the samples with excitation wavelength at 440 nm.

Fig.S3 displays the PL spectra of Bi_2MoO_6 particles, Bi_2MoO_6 nanosheets and nanosheets-based Bi_2MoO_6 microbox, manifesting the charge recombination efficiency of photogenerated electrons and holes. The samples demonstrate emission peaks between 650-670 nm with an excitation wavelength of 440 nm. As typically, the weaker intensity of PL peak corresponds to the reduced electron-hole recombination and facilitated charge separation.[3,4] It is clearly that the as-prepared hierarchical Bi_2MoO_6 microbox shows the weakest photoluminescence peak among the samples, indicating that the recombination of photogenerated charge carriers have been dramatically decreased by constructing the hierarchical microbox structure.[5] It is confirmed that the nanosheets-built Bi_2MoO_6 microbox structure could greatly prevent the recombination of electrons and holes, thus leading to the excellent photocatalytic performance.

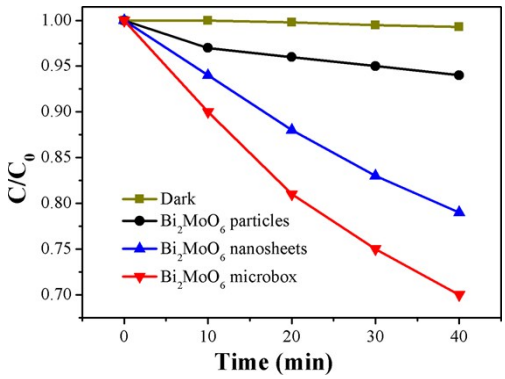

Fig. S4. Time-dependent phtocatalytic degradation efficiency curve of phenol (50 mL, 10^{-4} mol/L) by different photocatalysts under visible-light irradiation.

Reference

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