Electronic Supplementary Information

Template-free and morphology-controlled hydrothermal growth of single-crystalline Bi$_{12}$TiO$_{20}$ with excellent simulated sunlight photocatalytic activity

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**Fig. S1** XRD patterns of bulk Bi$_{12}$TiO$_{20}$ prepared by the solid state reaction method (SSR) with different molar ratios of Bi/Ti in the starting reactants: (a) $n_{\text{Bi}:\text{Ti}}=4:1$; (b) $n_{\text{Bi}:\text{Ti}}=8:1$; (c) $n_{\text{Bi}:\text{Ti}}=12:1$. 
**Fig. S2** The plots of \((ahv)^{1/2}\) vs. \(hv\) for the band gap energies, corresponding to the Bi$_{12}$TiO$_{20}$ materials in different morphological structures: (a) the nanoflower; (b) the nanobelt; (c) the microtetrahedron.
Fig. S3 XRD patterns of the Bi$_{12}$TiO$_{20}$ microcrystals prepared by a hydrothermal approach at 180 °C for 24 h with different concentrations of NO$_3^-$ in the starting solution: (a) 0 mol L$^{-1}$; (b) 0.5 mol L$^{-1}$; (c) 1.5 mol L$^{-1}$. 
**Fig. S4** SEM images of the Bi$_{12}$TiO$_{20}$ microcrystals prepared by a hydrothermal approach at different concentrations of NO$_3^-$ in the starting solution: (a) 0.5 mol L$^{-1}$, (b) 1.5 mol L$^{-1}$, (c) EtOH + 0.5 mol L$^{-1}$, (d) EtOH + 1.5 mol L$^{-1}$.