Supporting Information:

Enhancement of Photocatalytic Activity for $BiPO_4$ via Phase Junction

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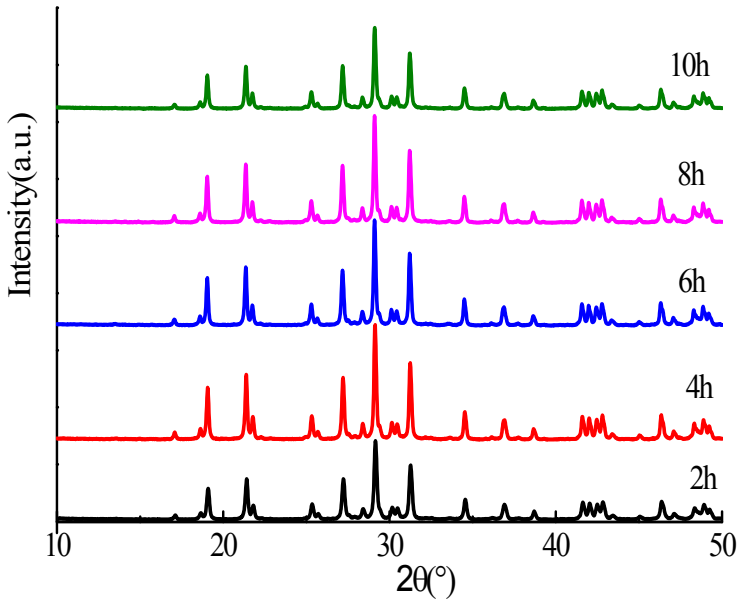

Fig.S1 XRD patterns of $BiPO_4$ synthesized by calcinating HBIP at 500 °C for different times

When calcination temperature was set at 500 °C, calcination time hardly affected the phase structures of $BiPO_4$(Fig.S1). The major peaks at 19.0°, 21.4°, 27.2° and 31.3°were ascribed to (011), (-111), (200) and (012) lattice plane of nMBIP (P21/n, JCPDS 089-0287), and a little quantity of peaks at 22.3° and 35.8°were ascribed to (110) and (-121) lattice plane of mMBIP (P21/m, JCPDS 077-2208).The phase structures of $BiPO_4$calcinated at 500 °C for different times were formed by nMBIP and nMBIP.

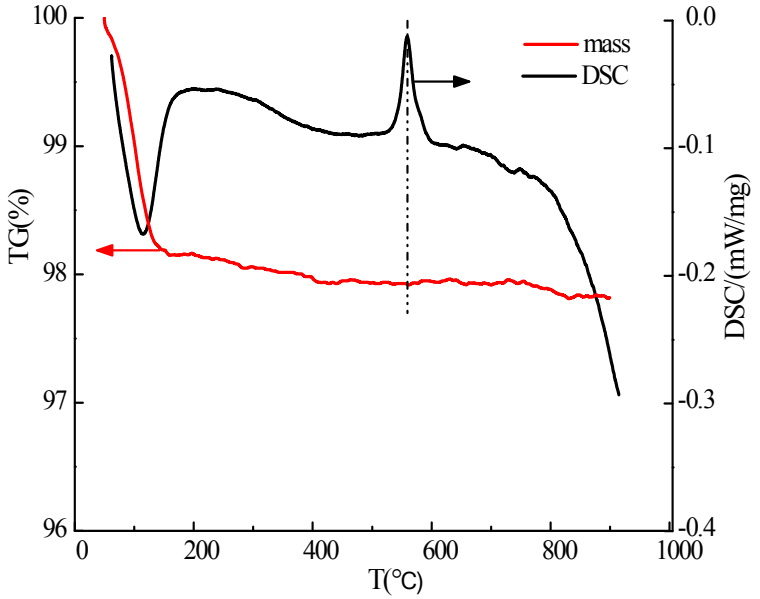

Fig.S2 TG and DSC of precursor HBIP

As can be seem from Fig.S2, the 2.0% obvious weight loss occurring from 90 °C to 150 °C could be attributed to the desorption of surface bound water, and an endothermic peak around 100 °C in the DSC curve consisted with that. Moreover, a sharp exothermic peak situated at 550 °C resulted from the phase transformation of $BiPO_4$. Because the analysis of TG and DSC were processed at continuous heating-up, so the information of measurement couldn't reflect the transformation details of three kinds of $BiPO_4$ phase structure.

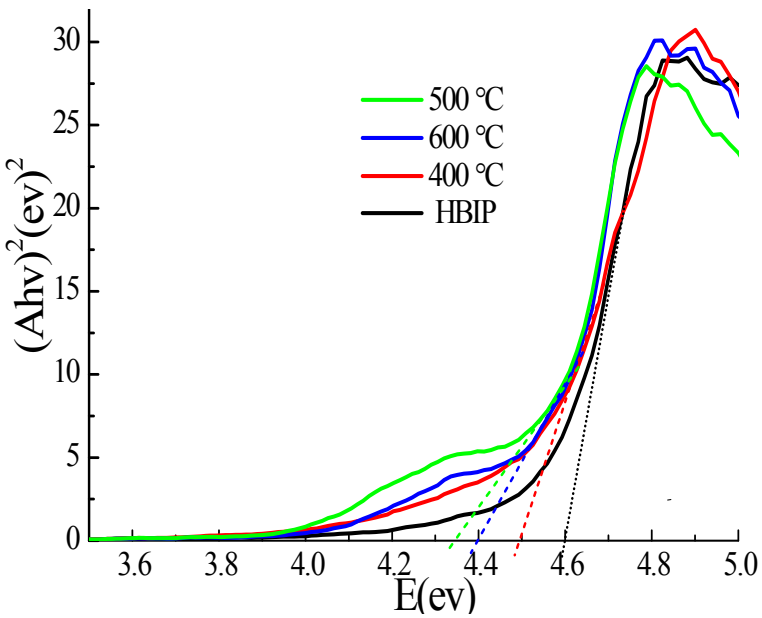

Fig.S3Tauc's plot of $(Ahv)^2$ versus photon energy for the optical band gap calculation for HBIP and $BiPO_4$calcinated at 400°C, 500°C and 600°C

The optical band gapfor $BiPO_4$can be calculated by Tauc's plot.Absorption$^{1/2}$ (or absorption^2) versus photo energy, which may helpto distinguish the direct or indirect transition of $BiPO_4$ crystalphases.From Tauc's plot

the calculated, the band gaps of HBIP and BiPO4calcinated at 400°C, 500°C and 600°C are 4.6 eV, 4.5 eV, 4.34 eV and 4.4 eV respectively.

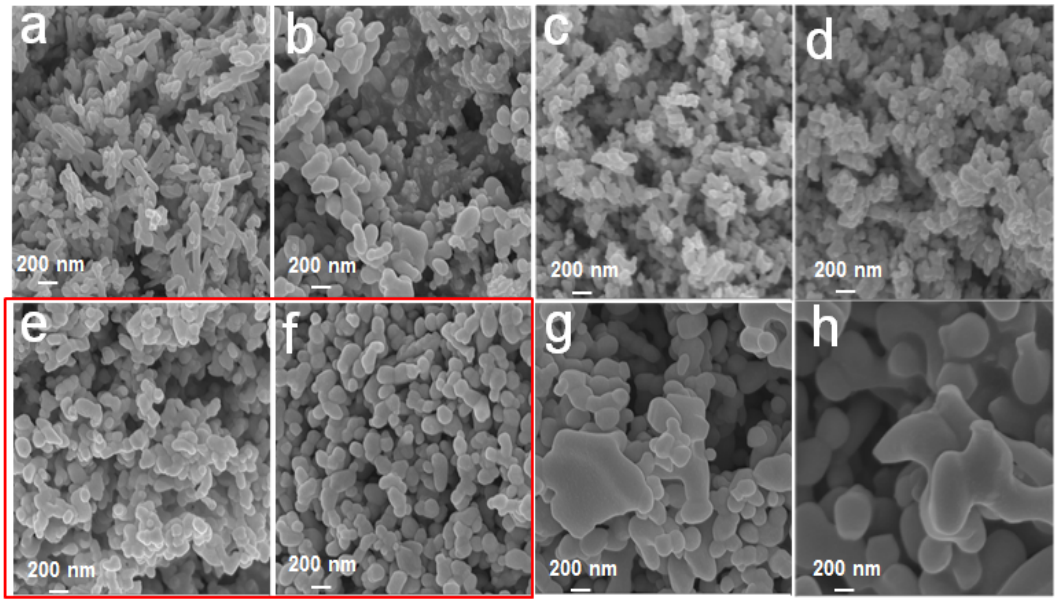

Fig.S4SEM images of $BiPO_4$calcinated at different temperatures for 4h

(a HBIP; b 350°C; c 400°C; d 450°C; e 500°C; f 550°C; g 600°C; h 650°C)

The HBIP precursor was totally composed of homogeneous rod-like particles (Fig.S3). The morphologies of $BiPO_4$ formed at different calcination temperatures in the range of 350～500 °Cwere basically the same, and their particles aggregated and became larger in size. The particles of $BiPO_4$ melted and became larger and larger with calcination temperature increasing above 550 °C.

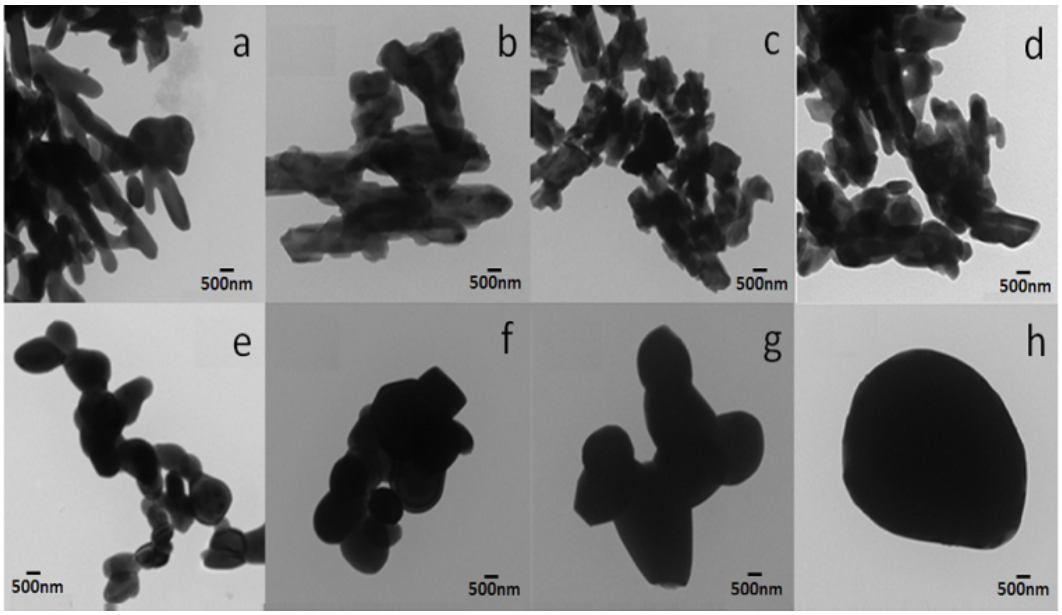

Fig.S5 TEM images of $BiPO_4$calcinated at different temperatures for 4h
(a HBIP; b 350°C; c 400°C; d 450°C; e 500°C; f 550°C; g 600°C; h 650°C)

The results of $BiPO_4$TEM images were the same as that of SEM (Fig.S4). The particles of $BiPO_4$ gradually became large in size under 500°C, which was melted into a sphere about several micrometres in diameter at 650 °C.

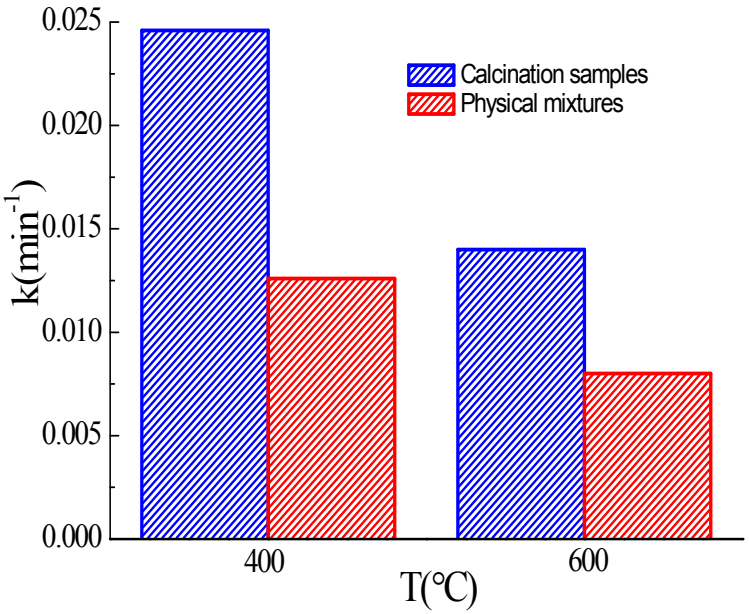

Fig.S6 The comparison of photocatalytic activity between $BiPO_4$ calcinated at 400 ℃, 600 ℃ and the physical mixture with corresponding phase ratios

The photocatalytic activities of $BiPO_4$ calcinated at 400 °C and 600 °C were both much higher than that of the physical mixed samples with corrresponding phase ratios, which further confirmed that phase junction formed and it could significantly improve the photocatalytic performace of $BiPO_4$.

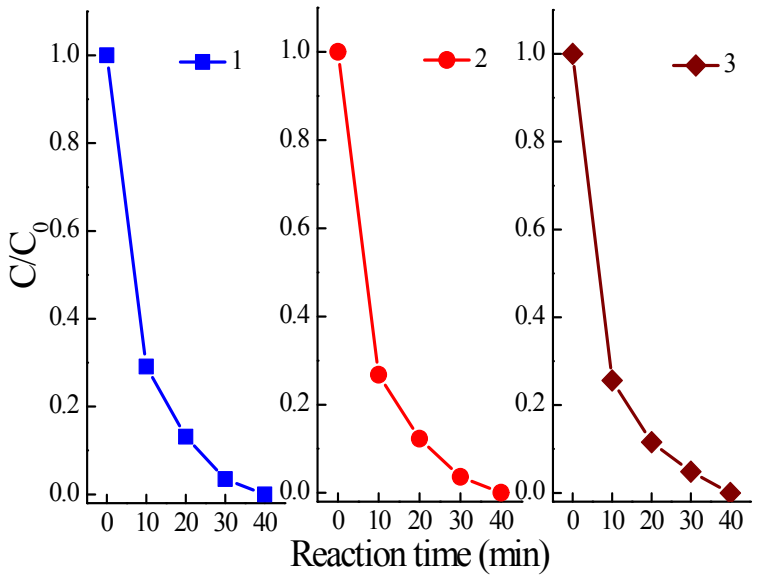

Fig.S7 Parallel experiments of $BiPO_4$ calcinated at 500 ℃ for 6.0 h and on the photocatalytic degradation of methlyene blue for three times

Parallel experiments of $BiPO_4$ calcinated at 500℃ for 6.0 h were performed. As can be seen from the result, the photocatalytic activities of these samples are almost the same, which reveals that the preparation method of $BiPO_4$ with phase junction via calcination is controllable and repeatable.