Supporting Information for

Fe_2O_3-Modified Porous $BiVO_4$ Nanoplates with Enhanced Photocatalytic Activity

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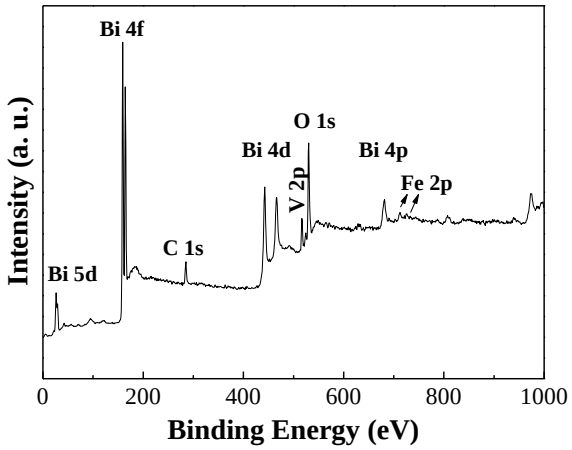

Fig. S1 Survey XPS spectrum of the as-obtained Fe_2O_3-modified $BiVO_4$ porous nanoplates

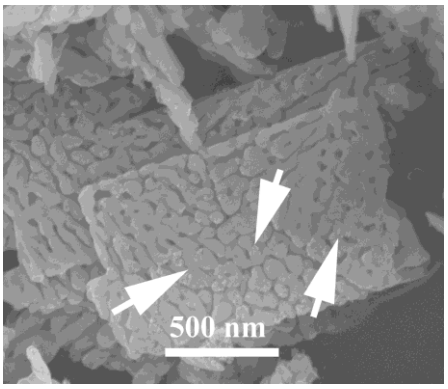

Fig. S2 FE-SEM image of the as-obtained Fe_2O_3-modified $BiVO_4$ porous nanoplates

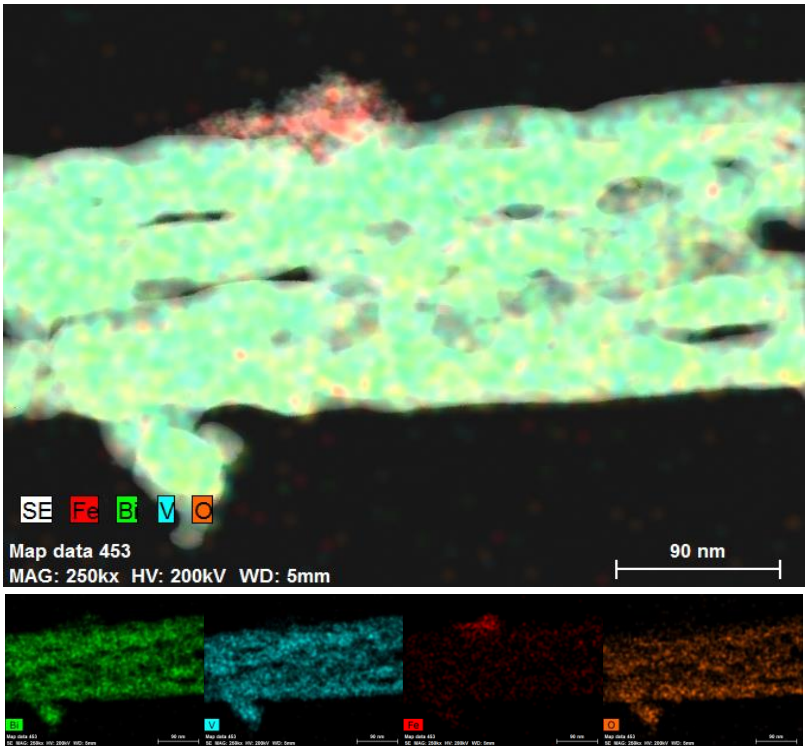

Fig. S3 Mapping images of an individual $Fe_2O_3/BiVO_4$ porous nanoplate

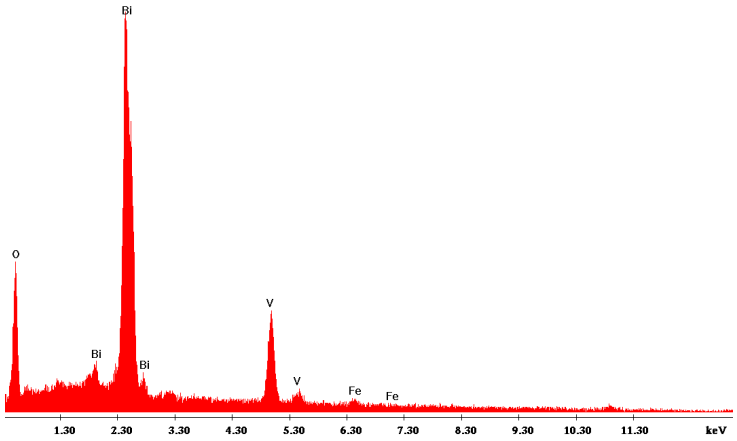

Fig. S4 EDX spectrum of the products

Preparation of Fe_2O_3 nanorods

The preparation of Fe_2O_3 adopted a modified method [1]. In a typical process, 10 mmol of $FeCl_3$ was dissolved in 40 mL of ultrapure water. Then 30 mmol of NaOH was added into the solution. The resultant precipitate was washed by ultrapure water for several times. Subsequently, the precipitate was dispersed in 40 mL of NaOH aqueous solution (2M) under stirring for 1 h. Then the suspension was put in a Teflon® lined stainless steel autoclave with 50 mL of capability and

heated at 160 ℃ for 20 h. After the autoclave was cooled to room temperature, the resultant products were separated via centrifugation and washed three times with ultrapure water and absolute ethanol, respectively. Finally, the products were dried under vacuum at 60 ℃ for 4 h.

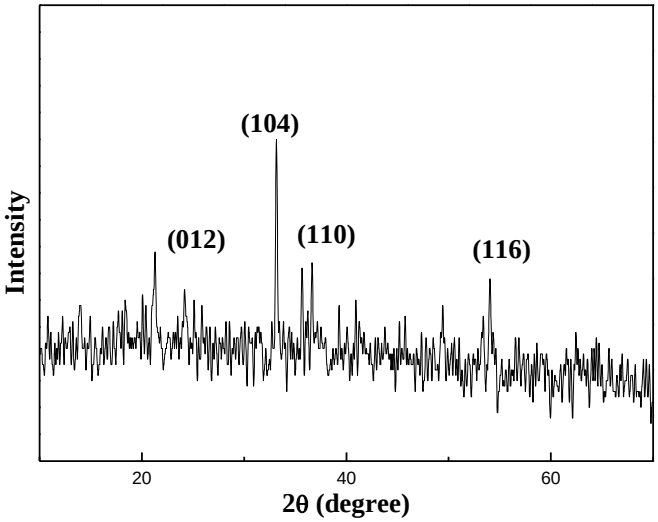

Fig. S5 XRD pattern of the products

Power XRD pattern of the products can be indexed as hexagonal Fe_2O_3 (JCPDS No. 89-0597).

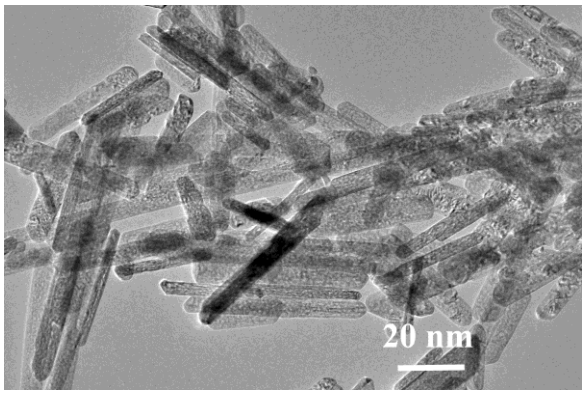

Fig. S6 TEM image of the products.

TEM image shows that the as-synthesized products are nanorods.

Preparation of ultrafine Fe_2O_3 nanoparticles loaded SiO_2 nanospheres

SiO_2 nanospheres were prepared through a modified Stober method [2]. In a typical process, 125 mL of ethanol and 6.25 mL of ammonia aqueous solution (28-30 %) were mixed under stir. Then 4.38 mL of TEOS was injected into the above mixture solution. The reaction was allowed to proceed at 25 °C for 24 h. The resultant products were collected, washed with distilled water and

ethanol for several times, and then vacuum-dried at 60 °C.

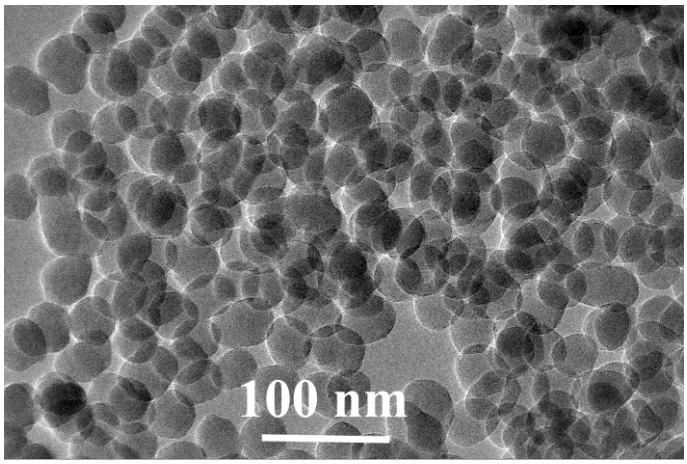

Fig. S7 TEM image of the products.

TEM image shows that the as-synthesized products are SiO_2 nanospheres.

For the synthesis of Fe_2O_3/SiO_2, similar to previous report [3], 0.4 mmol of $Fe(acac)_3$ (acac represents acetylancetone) was dissolved into the mixed solvents of ethanol (12 mL) and n-hexane (68 mL). Then 4 mmol of the as-obtained SiO_2 nanospheres were added into the mixed solvents. The solvents were allowed to stand at 25 °C for 24 h. After that, the solid precipitates were washed with the same solvent to remove physisorbed complexes and then washed with ethanol for several times. Subsequently, the sample was vacuum-dried at 60 °C, followed by heating in air at 500 °C for 2 h.

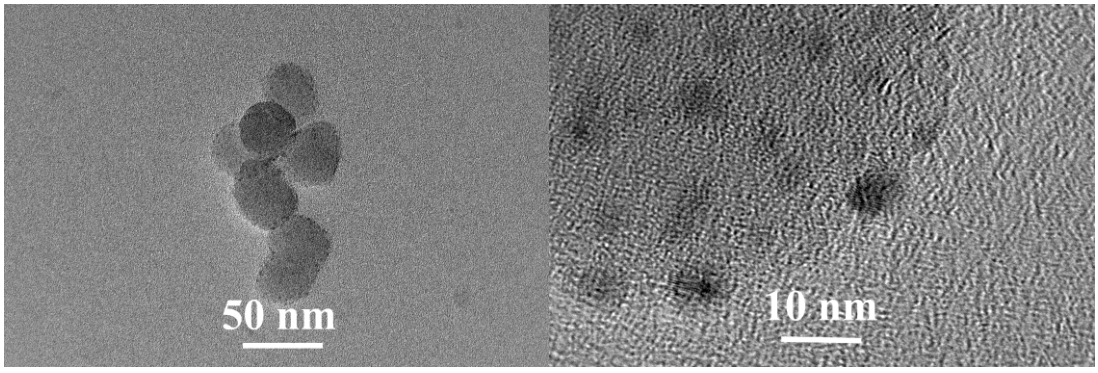

Fig. S8 TEM image of the products at different magnification

TEM images show that ultrasmall Fe_2O_3 nanoparticles were loaded on the surfaces of SiO_2 nanospheres.

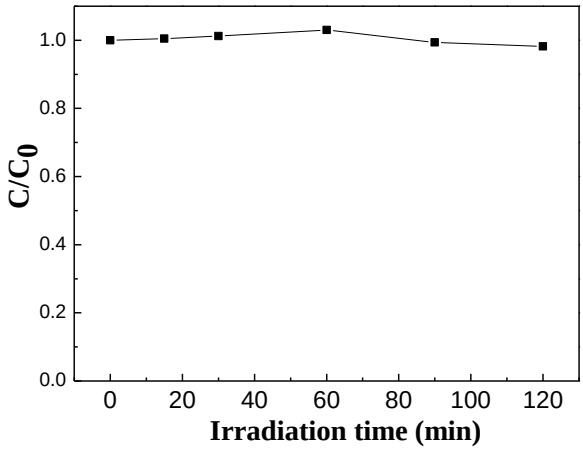

Fig. S9 Phenol concentration changes with irradiation time over ultrafine Fe_2O_3 nanopartices loaded SiO_2 nanospheres

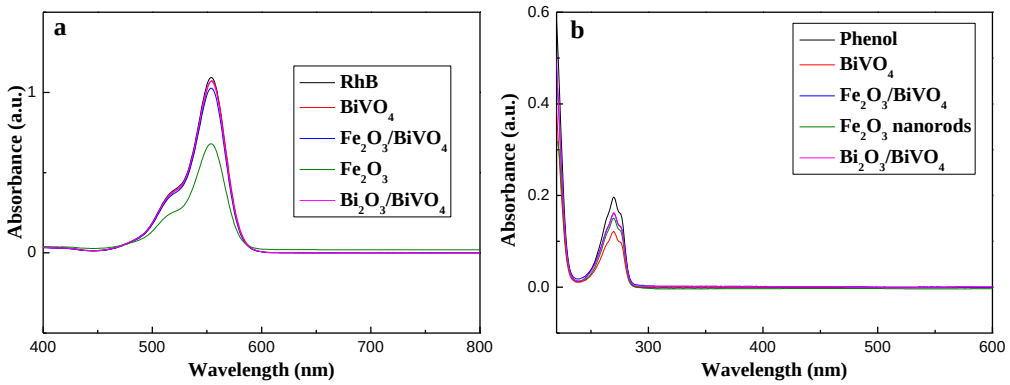

Fig. S10 The adsorption behavior of RhB (a) phenol (b) on $BiVO_4$, Fe_2O_3, $Bi_2O_3/BiVO_4$, and $Fe_2O_3/BiVO_4$

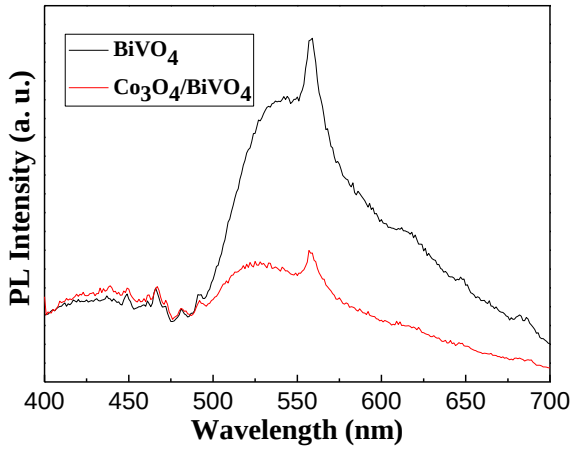

Fig. S11 PL emission spectra of $BiVO_4$ and $Co_3O_4/BiVO_4$ excited at λ = 400 nm at room temperature

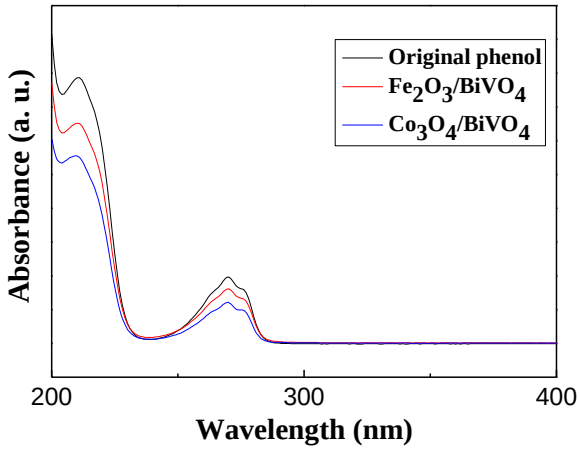

Fig. S12 The adsorption behavior of phenol on $Fe_2O_3/BiVO_4$ and $Co_3O_4/BiVO_4$

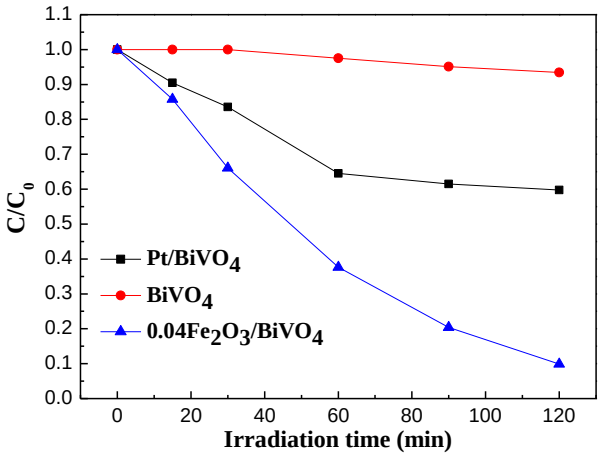

Fig. S13 Phenol concentration changes with irradiation time over $BiVO_4$, $Pt/BiVO_4$ and $Fe_2O_3/BiVO_4$

Preparation of $Pt/BiVO_4$

The preparation of Pt loaded porous $BiVO_4$ nanoplates adopted impregnation method [4]. In a typical process, 129.6 mg of the as-obtained porous $BiVO_4$ nanoplates was added into 5 mL of ultrapure water containing 7 mg of H_2PtCl_6 $6H_2O$ in a beaker. Then the suspension was stirred evenly and dried at 60 ℃ under vacuum. After that, the powder was calcined in air at 400 ℃ for 0.5 h.

References

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