

## Supporting Information

### Facile microwave and deposition method synthesis of magnetic biomass carbon based Bi<sub>2</sub>O<sub>3</sub> photocatalyst and mechanism insight

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## Photocatalytic degradation and trapping experiments

The photocatalytic activities of the as-prepared photocatalysts are measured by degradation of tetracycline (100 mL, 20 mg L<sup>-1</sup>) under visible-light (250 W Xenon lamp covered with a UV filter  $\lambda > 420$  nm) irradiation. Before irradiation start, 0.05 g photocatalyst is suspended in tetracycline solution to reach adsorption/desorption equilibration in dark. During illumination process, 4 mL suspension was withdrawn in 20 min interval. The trapping experiments are the same as photocatalytic experiment, additional add triethanolamine (TEOA, 1 mM), isopropanol (IPA, 1 mM) and benzoquinone (BQ, 1 mM) before the photocatalytic degradation process. The absorbance of tetracycline solution is monitored by UV-vis spectrophotometer. The degradation efficiency of Dr is calculated using  $C_0 - C / C_0$ , here,  $C_0$  and  $C$  are the initial and final concentrations of tetracycline, respectively.

## Photo-electrochemical measurements

The photo-electrochemical performance of the photocatalyst is investigated by the photocurrent response and electrochemical impedance spectroscopy (EIS) on a CHI 852C electrochemical station. Briefly, 0.005 g photocatalyst is dispersed in 1.5 mL ethanol and 1.0 mL ethanol glycol, the dispersion mixture is dipcoated onto FTO substrates (1.0 cm<sup>2</sup>) and used as corresponding working electrodes. A Pt electrode is used as the counter electrode and an Ag/AgCl electrode in saturated KCl solution is employed as the reference electrode.

## FT-IR spectra analysis

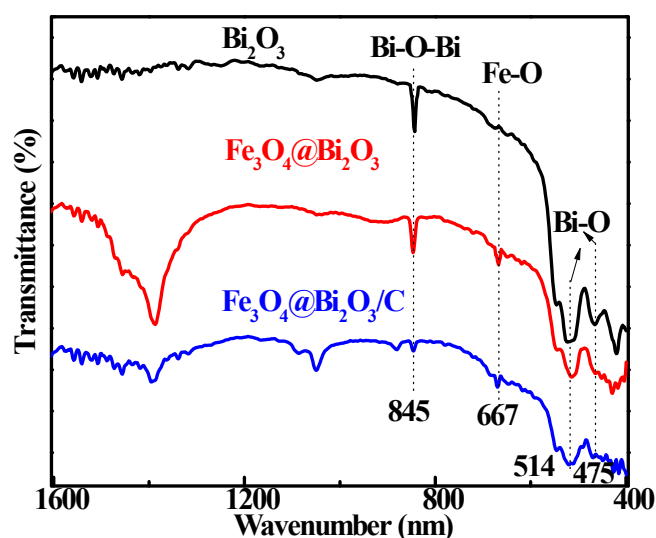


Fig. S1 FT-IR spectra of Bi<sub>2</sub>O<sub>3</sub>, Fe<sub>3</sub>O<sub>4</sub>@Bi<sub>2</sub>O<sub>3</sub>, and Fe<sub>3</sub>O<sub>4</sub>@Bi<sub>2</sub>O<sub>3</sub>/C.