Supplementary materials

1 Characterization

The crystal phase of samples were determined by powder X-ray diffraction (XRD) using a XRD-6000 X-ray diffractometer (SHIMADZU, Kyoto, Tapan). X-ray photoelectron spectroscopy (XPS) was performed to identify the chemical compositions and the chemical states of the catalysts on a PHI5000 Versa Probe spectrometer (ULVAC-PHI, Kanagawa, Japan).Field emission scanning electron microscope (FESEM) and corresponding energy-dispersive X-ray spectroscopy (EDS) were conducted on a QUANTA FEG 250 scanning electron microscope (FEI Company, Hillsboro, OR, USA). The transmission electron microscopy (TEM) and high-resolution transmission electron microscopy (HRTEM) images were obtained on a JEM-200CX instrument (JEOL, Tokyo, Japan). Both UV-Vis diffuse reflectance spectra (UV-Vis/DRS) and photoluminescence spectra (PL) were recorded to measure the optical properties of the samples by UV-Vis spectrometry (UV-3600, Shimadzu, Kyoto, Tapan) and Fluorescence Spectrometry (Horiba HJY FM-4P-TCSPC, Montpellier, France).The Brunauer-Emmett-Teller (BET) surface area of the samples was determined by nitrogen adsorption on a BET ASAP 2020 Micromeritics instrument (Norcross, GA, USA). The photoelectrochemical characterization was carried out on a CHI760E electrochemical workstation with a standard three-electrode system (Shanghai, China), the samples were loaded onto ITO electrode (1 cm × 2 cm squares) and acted as the working electrode. The counter and reference electrodes were Pt plate and Ag/AgCl electrode. The electrolyte was 0.2 M Na_2SO_4 aqueous solution and a 500 W xenon lamp was used to provide light source.

2 Analytical methods

The concentration of OTH in solution was determined by UV–vis spectroscopy. The concentration of Cr^{6+} in solution was also determined by UV–vis spectroscopy using diphenylcarbazide reagent as a developer. The photocatalytic oxidation efficiency of OTH and the reduction efficiency of Cr^{6+} were calculated from the following expression:

$\eta = (C_t - C_0)/ C_0 \times 100\%$

where η is the photocatalytic degradation efficiency; C_t and C_0 are the concentration of OTH (or Cr^{6+}) before and after photocatalytic reaction.

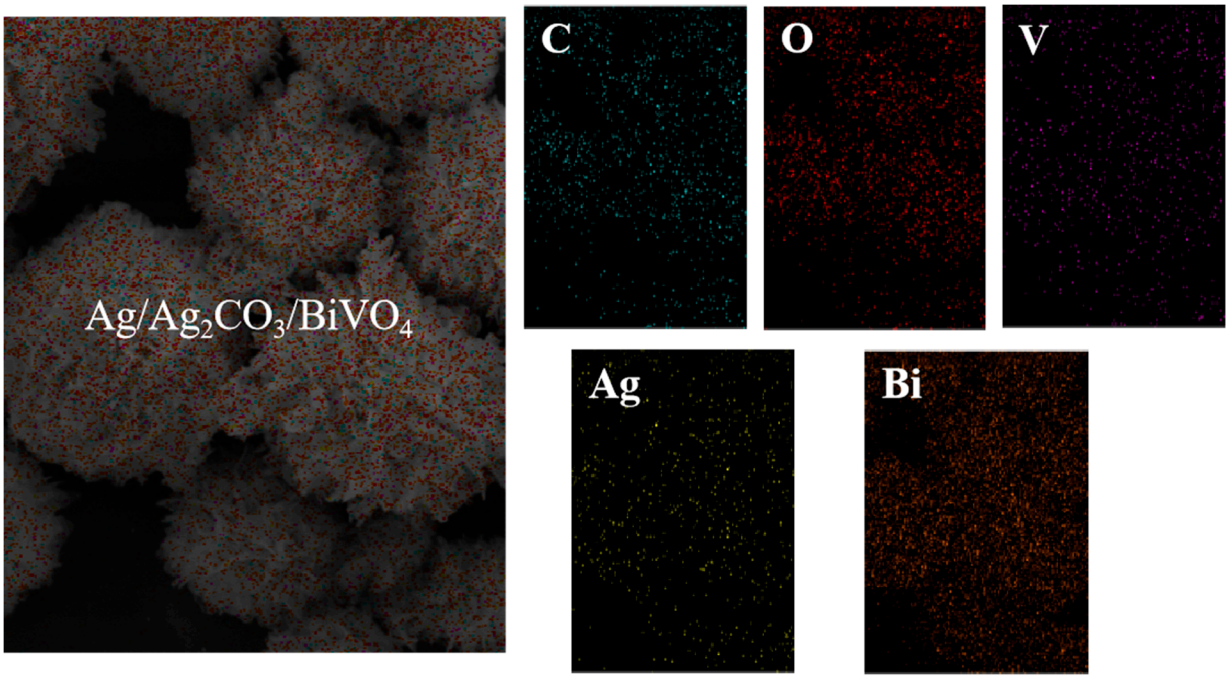

Figure S1. SEM-EDS elemental mapping of $Ag/Ag_2CO_3/BiVO_4$.

The SEM-EDS element mapping of $Ag/Ag_2CO_3/BiVO_4$ in Figure S1 shows that it is composed of Bi, O, C, Ag and V elements.

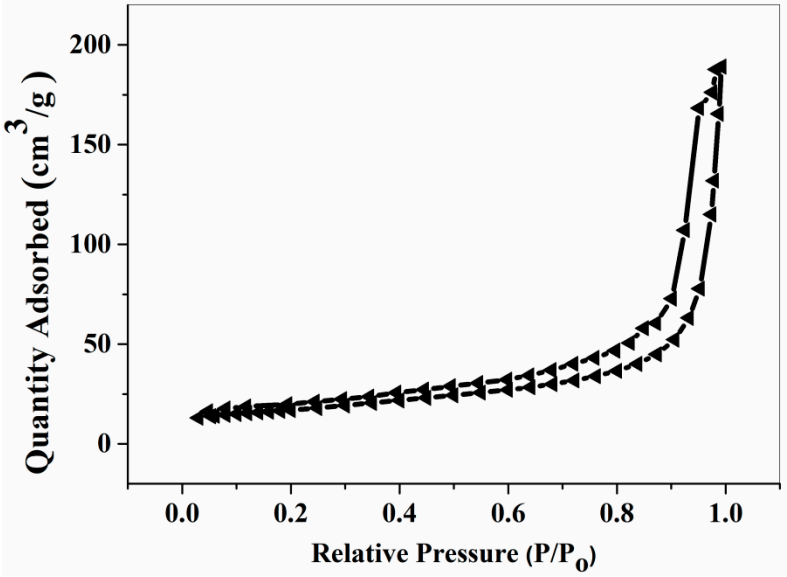

Figure S2. N_2-adsorption isotherms of $Ag/Ag_2CO_3/BiVO_4$

According to the measurement results, the specific surface area of $Ag/Ag_2CO_3/BiVO_4$ is large, and its value is 55.6 m^2/g.