

Supporting Information for

Highly Efficient Bi₂O₂CO₃ Single-Crystal Lamellas with Dominantly Exposed {001} Facets

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Experimental Section

1. Synthesis

$\text{Bi}_2\text{O}_2\text{CO}_3$ microsphere (BOC) and $\text{Bi}_2\text{O}_2\text{CO}_3$ nanoplates (BOC-001) were prepared by a facile hydrothermal method. All chemicals were in analytic grade, and used without further purification.

In a typical synthesis of $\text{Bi}_2\text{O}_2\text{CO}_3$ microsphere (BOC), 1mmol bismuth citrate and 1mmol of urea were dissolved in 30 mL deionized water under constant stirring to get a homogeneous solution. After that, the suspension was transferred into a Teflon-lined stainless steel autoclave. The autoclave was sealed and heated at 180 °C for 24 h. The product was collected by filtration, washed repeatedly with ethanol and distilled water, and then dried at 80 °C for 10 h.

In a typical synthesis of $\text{Bi}_2\text{O}_2\text{CO}_3$ nanoplates (BOC-001), 1mmol $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ and 3mmol of urea were dissolved in 30 mL deionized water under constant stirring to get a homogeneous solution. After that, the suspension was transferred into a Teflon-lined stainless steel autoclave. The autoclave was sealed and heated at 180 °C for 24 h. The product was collected by filtration, washed repeatedly with ethanol and distilled water, and then dried at 80 °C for 10 h.

2. Characterization

X-ray powder diffraction (XRD) patterns of samples were measured on a D8 Advance X-ray diffractometer (Bruker AXS, Germany) with Cu K α radiation. BET specific surface areas of as-synthesized samples were characterized by the nitrogen adsorption method with a Micromeritics 3020 instrument. A Cary 5000

UV–visible–NIR spectrophotometer was employed to record the UV-vis diffuse reflectance spectra (DRS). The morphology and microstructure of the products were investigated by a transmission electron microscopy (TEM), high resolution TEM (HRTEM) and S-4800 scanning electron microscope (SEM).

3. Photocatalytic experiment

Degradation of RhB: The photocatalytic performance of BOC and BOC-001 were evaluated by decomposition of (rhodamine B) RhB under UV (300W high-pressure lamp). In a typical procedure, 50 mg of photocatalyst was dispersed into 100 mL of RhB solution. Before photoreaction, the suspension was vigorously stirred in dark for 1 h to reach an adsorption-desorption equilibrium. Afterwards, about 3 ml of the mixture was taken at given time intervals, and separated through centrifugation. The concentration of upper centrifuged liquid was analyzed by using a U-3010 UV-vis spectrophotometer.

Removal of NO: The NO in gas phase was removed in a 4.5 L (30 cm × 15 cm × 10 cm) reactor with continuous NO flow. The photocatalyst (0.20 g) was ultrasonically dispersed in the deionized water (50 ml) and then covered on a glass dish of 12.0 cm in diameter. Then, it was placed at the center reactor of after drying. By mixing with flowing air, the NO concentration was diluted from 100 ppm (N₂ balance) to about 600 ppb. The air stream and NO were premixed via a three-way valve and the flow rates were set to be 2.4 mL min⁻¹ and 15 L min⁻¹, respectively. After equilibrium, the photocatalyst was illuminated by UV light (360 nm). The NO concentration was determined via recording the concentration of NO_x and NO₂ (NO_x

represents the total concentration of NO + NO₂) at every minute on a NO_x analyzer. Similar to RhB degradation, the NO (η) removal rates can be calculated by the equation $(\eta\%) = (1-C/C_0) \times 100\%$, where C and C₀ are the outlet and inlet NO concentrations, respectively.

4. Photoelectrochemical measurements

Photocurrent response and electrochemical impedance spectra were measured in three-electrode quartz cells by using an electrochemical system (CHI-660B, China) with a 0.1 M Na₂SO₄ electrolyte solution. Platinum wire was used as the counter electrode, and saturated calomel electrodes (SCE) were used as the reference electrodes, respectively. BOC and BiOC-001 film electrodes on ITO served as the working electrode. The intensity of light was 1 mW/cm². Potentials are given with reference to the SCE. The photocurrent response and electrochemical impedance spectra of the photocatalysts as UV light on and off were measured at 0.0 V.

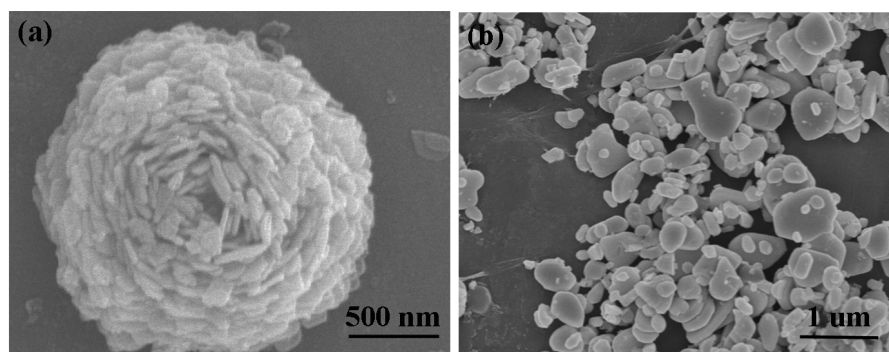


Fig. S1 SEM images of (a) BOC and (b) BOC-001 samples.

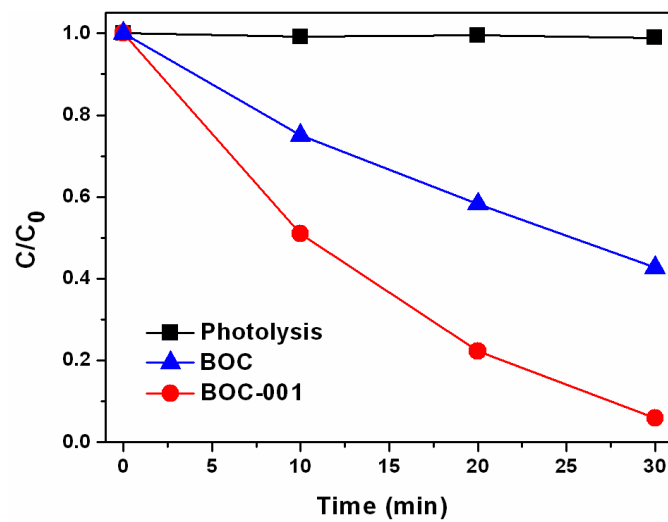


Fig. S2 Photodgradation curves of RhB over BOC and BOC-001 under UV light.

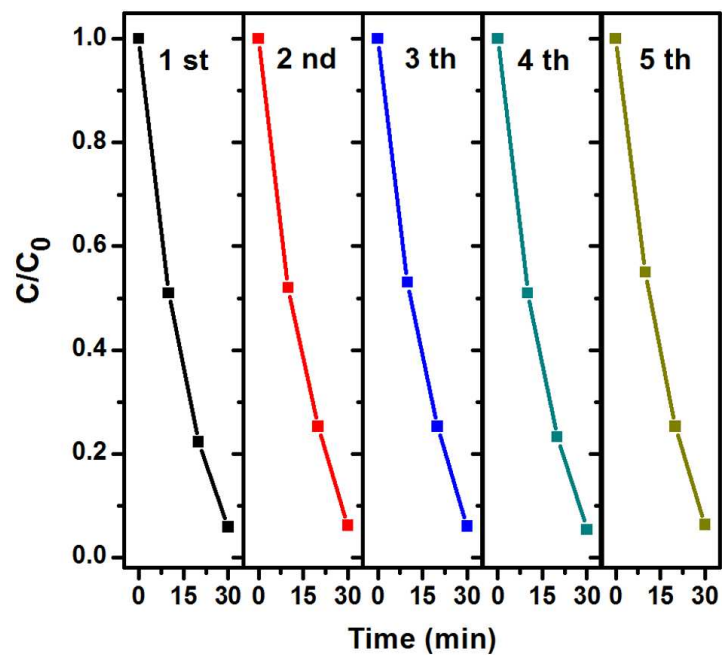


Fig. S3 Repeated photodegradation curves of RhB over BOC-001 for five recycling runs.

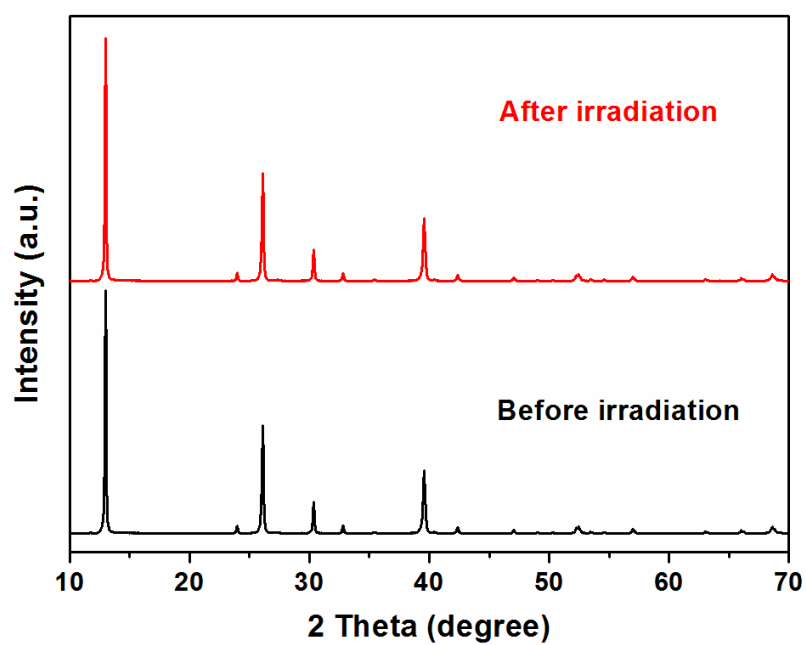


Fig. S4 XRD patterns of BOC-001 samples before and after irradiation.