Supporting Information

The synergy of N-doped and SPR-promoted photocatalytic removal of NO with graphene/Bi nanocomposite

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S1. Characterization

The XRD was used to phase analysis of the sample, which was conducted on PANalytical X'pert Pro powder diffractometer through Cu-Ka radiation (λ = 1.5418 Å) with a scan step of 0.013°. In order to analyze the morphology of the sample, SEM was conducted on a FEI F250 scanning electron microscope with acceleration voltage of 30 kV. HRTEM was carried out on a FEI Tecnai G2 F20 field-emission transmission electron microscope at an accelerating voltage of 200 kV. XPS was used to analyze the composition of the surface of the sample, and it was performed on an ESCALAB 250 Xi photoelectron spectrometer using a monochromatic Al Kα X-ray source (hν = 1486.6 eV). The UV-vis DRS was carried out on a Hitachi U-4100 UV-vis spectrophotometer using $BaSO_4$ as the reference specimen. For electron spin resonance (ESR) measurements, the product was prepared by mixing NG/Bi nanocomposites in a 50mL DMPO solution tank respectively (methanol dispersion for DMPO-$\cdot O_2^-$ and aqueous dispersion for DMPO-$\cdot$OH). In order to further explore the separation of electron–hole pairs after excited, we conducted PL and photoelectrochemical tests. PL was recorded on a HITACHI F-7000 to explore the optical properties of the obtained specimens. Photoelectrochemical measurements (EIS and photocurrent transient) were conducted

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using in a three electrodes quartz cell with 0.1 M Na_2SO_4 electrolyte solution on the electrochemical system (CHI-760E, Shanghai, China). Platinum wire was used as counter, saturated calomel electrode (SCE) used as reference electrodes and as-prepared photocatalysts film electrodes on ITO served as the working electrode. For photoelectrochemical measurements, the working electrode was illuminated from the as-prepared sample film side using UV lamp (280 nm). The photocurrent transient dependence of as-prepared samples at open circuit potential was measured in 0.1 M Na_2SO_4 under chopped irradiation with 30s light on/off cycles.

S2. Photodegradation test

To assess the photocatalytic activity of the photocatalysts, ppb-level NO removal was applied in a continuous flow reactor at room temperature. The rectangular reactor was made of stainless steel and safety glass with a volume of 4.5 L (30 cm × 15 cm × 10 cm). A 15W UV lamp with a wavelength 280 nm was mounted vertically at top of the reactor. The as-prepared sample (0.2 g) was distributed into 60 mL ultrapure water by ultrasonic and applied to the bottom of two dishes (made of glass, Diameter 12.0 cm). The glasses dishes were then vacuum dried at 60℃ and centered in the reactor. The NO gas was further diluted to 500 ppb by the air stream and fed from a compressed gas cylinder with a concentration of 100 ppb (N_2 balance). Sending zero gas flow through the humidification chamber controlled the relative humidity level required for NO flow to 50%. The gas streams premixed by the gas mixer and mass flow controller was used to subject the flow rate at 2.4L min^{-1}. After the adsorption and desorption equilibrium was completed, turn on the 280 nm UV lamp. The chemiluminescence NO analyzer (Thermo Environmental Instruments INC., 42i-TL) continuously measured the NO concentration at a sampling rate of 1.0 L·min^{-1}. The removal ratio (η) was calculated as $\eta\ (\%) = (1- C/C_0) \times 100\%$, where C and C_0 were the NO concentrations in the outlet and feed stream, respectively.