Supporting Information

A facile and green template-engaged synthesis of PbSe nanotubes with the assistance of Vc

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Experimental

2.1. Synthesis Se NWs

In a typical synthesis of Se NWs[1], SeO_2 (0.45 mmol) and β-cyclodextrin (0.045 mmol) were dissolved in 15 mL of distilled water, which was promptly poured into another glass beaker containing ascorbic acid (vitamin C, Vc) solution (15 mL, 0.028 M) under continuous stirring. After reacting for 4 h at room temperature, the product was collected by centrifugation, washed with distilled water and ethanol several times. Then the obtained sample was dispersed in ethanol (30 mL) to age, and the solution was kept in darkness for 2 h without stirring. The final products were naturally dried in air.

2.2. Synthesis PbSe NTs

The precursor solution was formed by mixing 2.25 mmol $Pb(CH_3COO)_2 \cdot 3H_2O$ and 0.225 mmol Vc in 50 mL distilled water under mild magnetic stirring. 0.225 mmol Se NWs, as both the Se source and the templates, were dissolved into 1 mL absolute alcohol and then were added into the precursor solution. The mixture were loaded into a borosilicate glass bottle and heated to 98 ^oC under mild magnetic stirring for 10 h. Then the products were separated out by centrifugation and washed by distilled water several times. Finally, the PbSe NTs were attained after the unreacted Se NWs were

completely removed through annealing (250 ^{o}C for 2 h) under argon protection.

Characterization

The morphologies and chemical composition of the as-synthesized samples were characterized by means of scanning electron microscope (SEM, Hitachi SU70). Transmission electron microscope (TEM) and high-resolution transmission electron microscope (HRTEM) were carried out on a transmission electron microscope (FEI, Tecnai G2 F20). The crystal structure of the products was explored by X-ray diffraction (XRD, Bruke D8 Advance, Cu Ka). The X-ray photoelectron spectra (XPS) measurements were performed on PHI 5700 ESCA System instrument using Al Kα as the exciting source. Raman spectroscopy was measured by a Jobin Yvon HR800 Raman microscope with an argon ion laser(λ, 488 nm). The UV-vis-NIR absorption optical properties were texted by UV-3150 double-beam spectrophotometer. The nitrogen adsorption and desorption isotherms were obtained with a Belsorp-mini II instrument at 77 K and the sample was degassed at 150 °C for 4 h under vacuum before measurements. Zeta potential of PbSe nanotubes was determined using a zeta meter (Nano-Z, Malvern, UK).

Photocatalytic activity

In a specific process, 2 mg of PbSe NTs were completely dispersed into 9 mL of MB solution (10 mg/L). It is stirred magnetically in the dark for 15 min to eliminate the influence of the adsorption of the photocatalyst. Then, 1 mL of H_2O_2 (30%) is added into the PbSe-MB solution, and irradiated by an xenon lamp (CEL-S500) under continuous stirring. At an interval of 15 min, 1.5 mL of the suspension was taken out for UV-vis absorption measurements (Phoenix, UV1700), and the characteristic absorption of MB at 664 nm was used to evaluate its photocatalytic degradation behavior. The degradation efficiency is described as C/C_0, where C is the absorption of MB solution at each irradiation time interval, C_0 is the absorption initial of the initial absorption.

Results and discussion

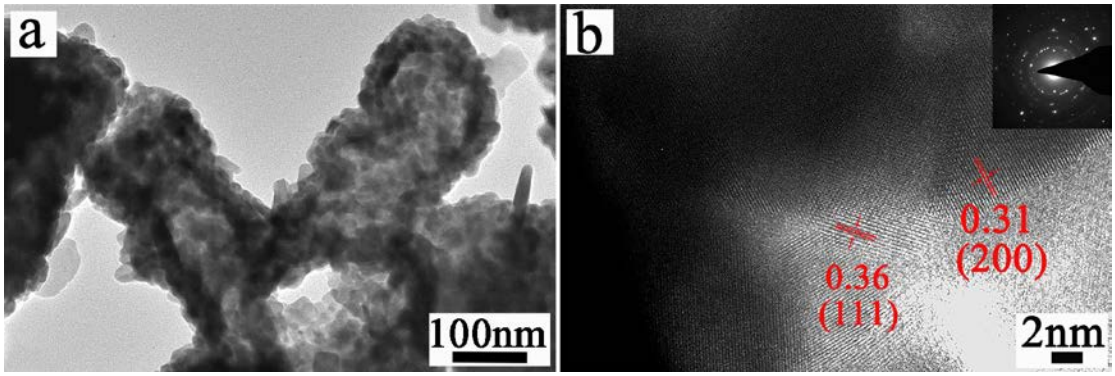

Fig. S1 TEM (a) and HRTEM images (b) of PbSe NTs, the inset (top-right) shows corresponding SEAD pattern.

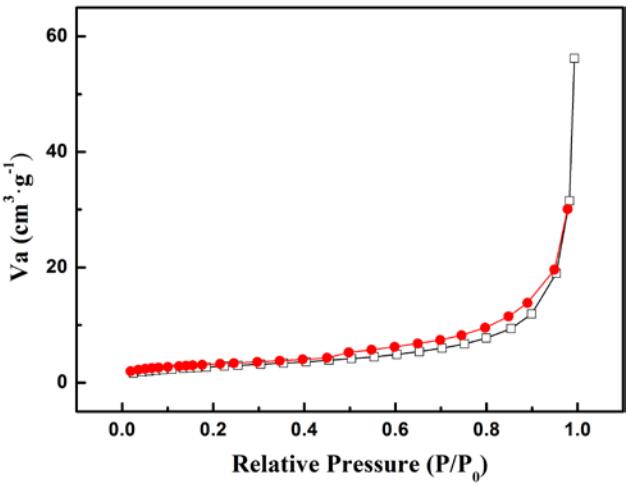

Fig. S2 N_2 adsorption-desorption isotherms of PbSe NTs.

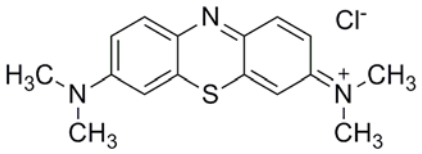

Fig. S3 Molecular structure of Methylene blue.

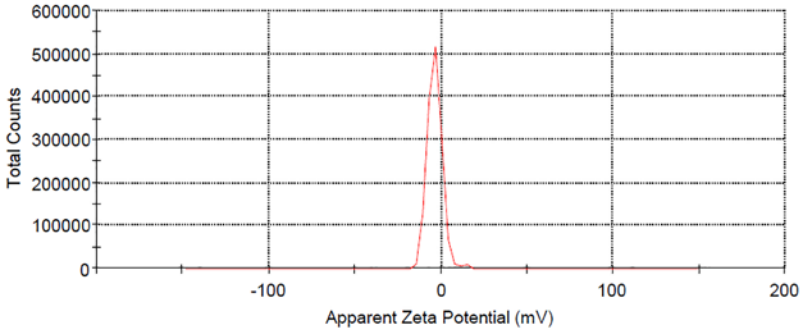

Fig. S4 Zeta potential of PbSe NTs.

References

1. Q. Li, V. W. Yam, *Chem. Commun.*, 2006, 1006–1008.