Electronic Supplementary Information (ESI)

Facile one-step hydrothermal fabrication of single-crystalline ZnS nanobelts with narrow band-edge luminescence

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Experimental Section

Synthesis. The analytical grade chemicals of $N_2H_4 \cdot H_2O$(l), $C_2H_4(NH_2)_2$(l), $ZnCl_2$(s), and S(s) were used as purchased from Sigma-Aldrich. Deionized (DI) water with a resistivity of greater than 18 MΩ cm, from a Millipore Milli-Q system, was used throughout the experiments. For the typical preparation of single-crystalline wurtzite ZnS nanobelts, 7.5 mL of $C_2H_4(NH_2)_2$, 7.5 mL of DI water, 15 mL of $N_2H_4 \cdot H_2O$, 0.5 mmol of $ZnCl_2$, and 0.5 mmol of S were stirred vigorously for 30 min. The mixture solution was then loaded into a Teflon-lined stainless-steel autoclave of 50 mL capacity, placed in a preheated oven at 180 $^{\circ}$C for 6 h, and cooled to room temperature. A white precipitate produced in the reaction mixture was washed several times using DI water and ethanol separately, vacuum-dried, and kept for further characterization.

Characterization. While transmission electron microscopy (TEM) images were obtained with a JEOL JEM-2100 microscope, high-resolution TEM (HRTEM) images and fast Fourier transformation (FFT) patterns were measured using a JEOL JEM-3010 microscope. While scanning electron microscopy (SEM) images were recorded with a JEOL JSM-6700F microscope, high-angle annular dark-field scanning TEM (HAADF-STEM) images and energy-dispersive X-

ray (EDX) line-scanned elemental intensity profiles were measured using an FEI Tecnai F20 microscope. High-resolution X-ray diffraction (HRXRD) patterns were obtained with a Bruker D8 DISCOVER diffractometer using Cu Kα radiation (0.15418 nm), and X-ray photoelectron spectroscopy (XPS) spectra were monitored using a Kratos AXIS-HSi spectrometer with an excitation source of Mg Kα (1253.60 eV). Extinction spectra were obtained with a Scinco S3100 UV/vis spectrophotometer, and photoluminescence spectra were measured employing a Princeton Instruments ICCD576G CCD detector with excitation using 266 nm pulses from a Q-switched Quantel Brilliant Nd:YAG laser of 6 ns.

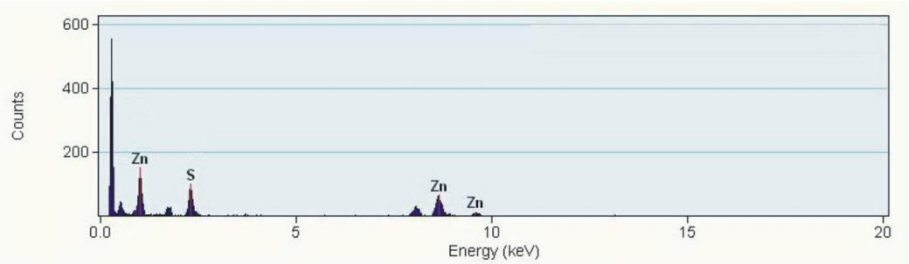

Fig. S1 EDX profile of ZnS nanobelts showing the atomic molar ratio of Zn:S to be 1:1.01, very close to the stoichiometric ratio of ZnS.

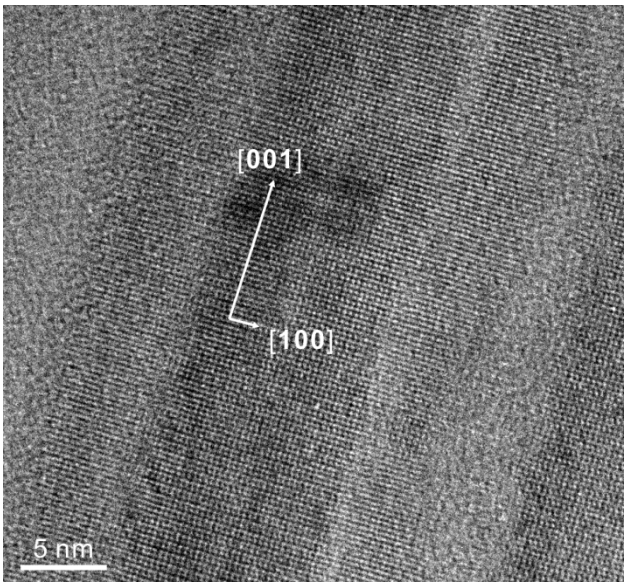

Fig. S2 HRTEM image of a ZnS nanobelt.

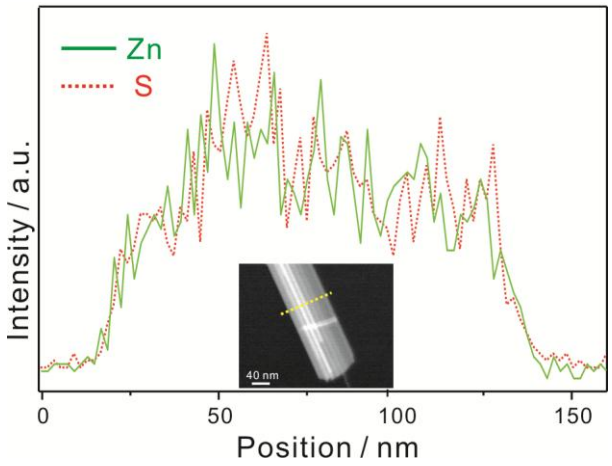

Fig. S3 EDX line-scanned profiles, measured along the indicated dashed line of the insetted HAADF-STEM image.

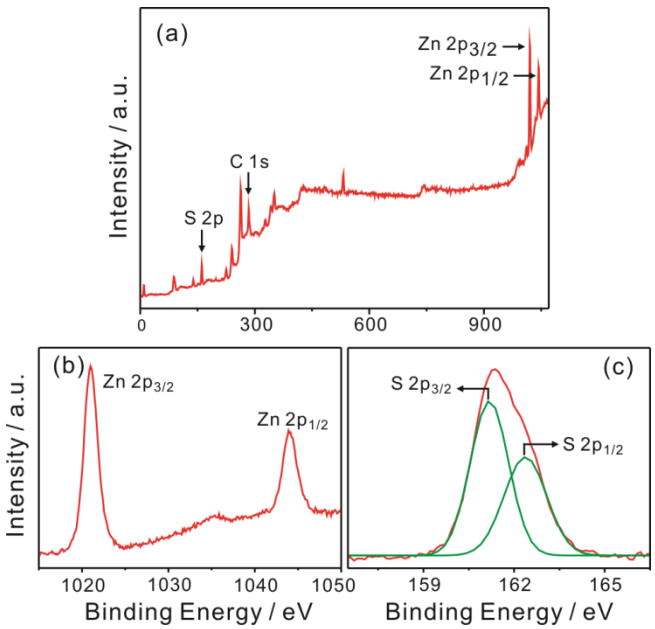

Fig. S4 Complete survery (a), Zn 2p (b), and S 2p (c) XPS spectra of ZnS nanobelts. Two green curves in c have been deconvoluted from the Gaussian fitting.