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Supporting Information

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Tetraethylenepentamine-Directed Controllable Synthesis of wurtzite ZnSe Nanostructures with Tunable Morphology**

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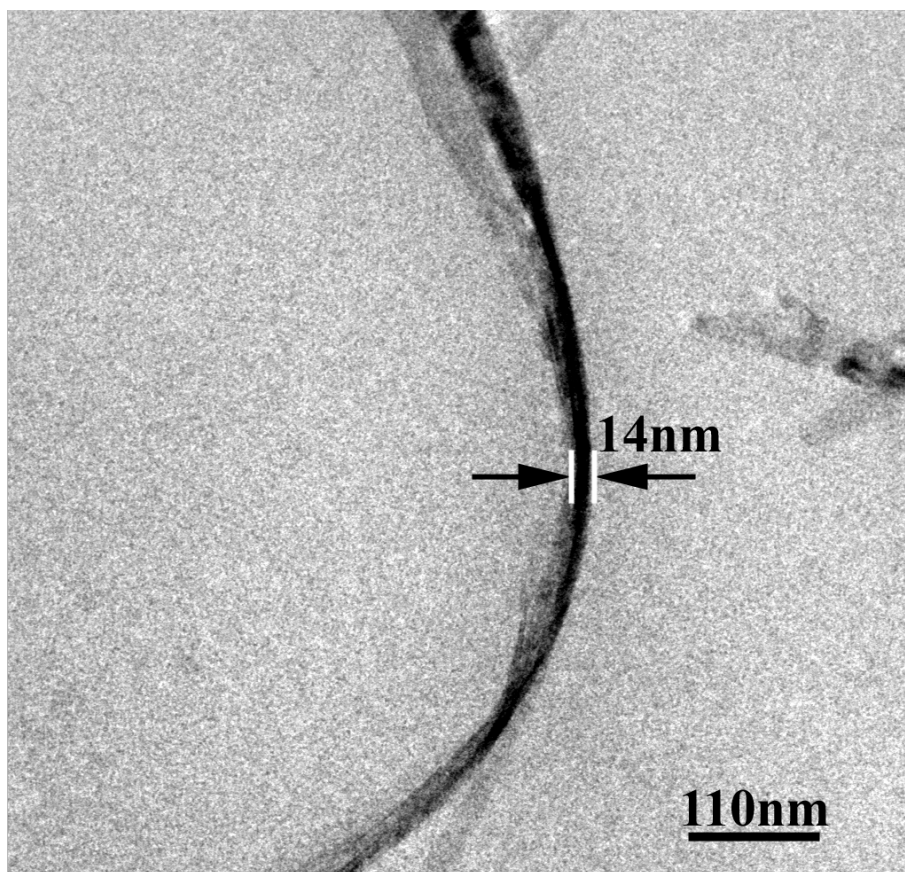


Figure S1. A high-magnification TEM image shows a flexible nanobelt with thickness of about 14 nm.

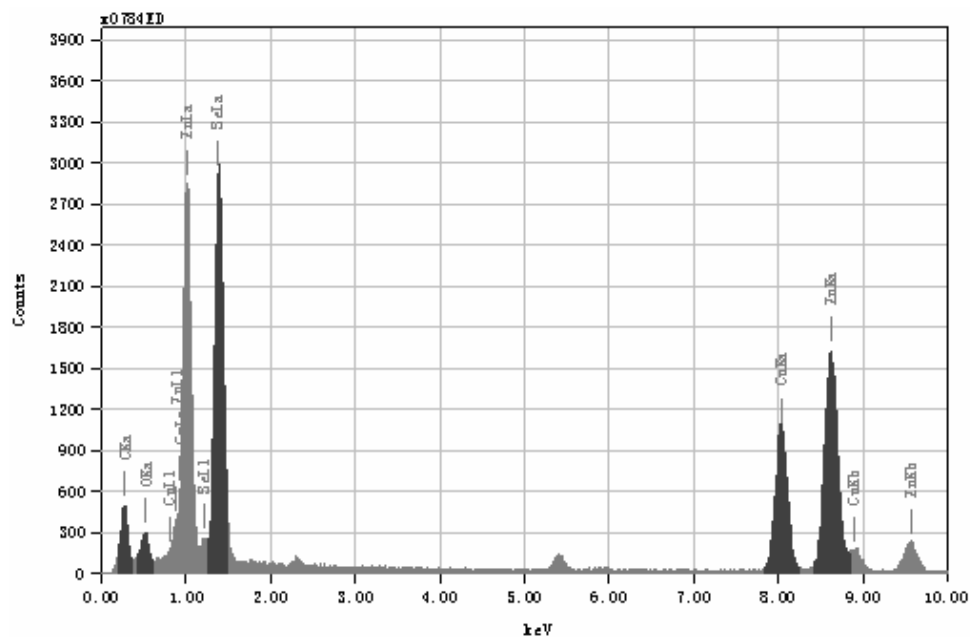


Figure S2. EDS spectrum of the as-prepared ZnSe nanobelts, demonstrating that the samples are composed of pure ZnSe. In the EDS spectrum, the detected copper and carbon signals arise from the carbon-coated copper grid on which the ZnSe samples were deposited. The EDS spectra of other ZnSe samples are similar.

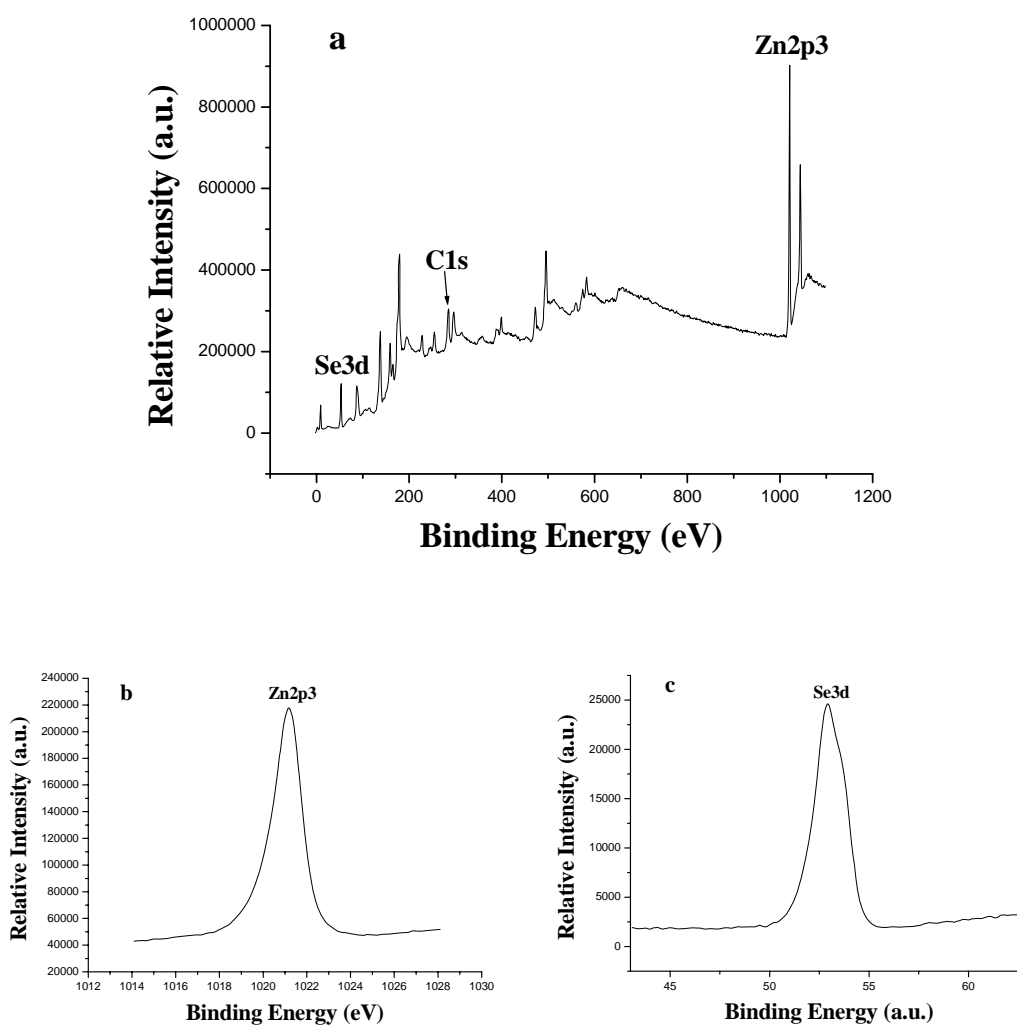


Figure S3. XPS spectra of ZnSe nanobelts prepared at 180 °C for 20 h. a) Survey spectrum, b) Zn 2p₃, c) Se 3d. The binding energies obtained in the XPS analysis were corrected for specimen charging by referencing the C 1s to 284.60 eV. The binding energy of Zn 2p₃ is identified at 1021.17 eV (Figure S5b), while Se 3d is found to be 52.92 eV (Figure S5c). The signal at 400.33 eV can be attributed to N1s, which comes from tetraethylenepentamine (TEPA) adsorbing in the nanobelts.

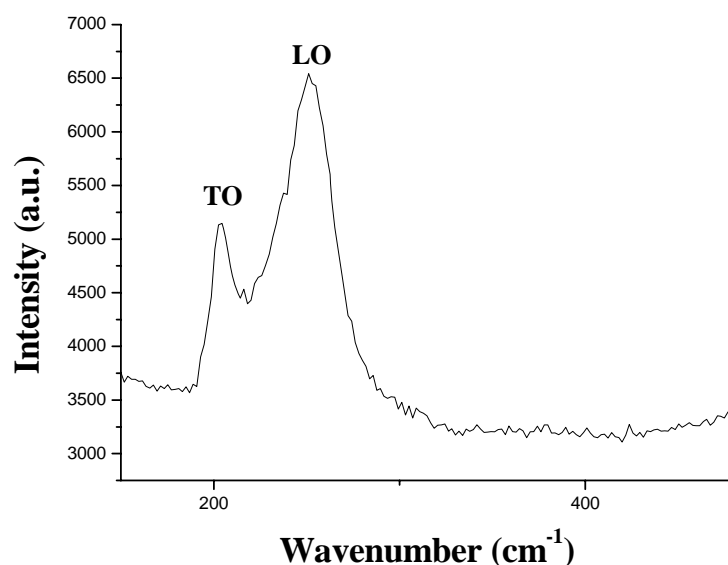


Figure S4. The typical room-temperature Raman spectrum of ZnSe nanoribbons shows two bands in the range 150–400 cm⁻¹. The peaks located at around 204.5, and 251.1 cm⁻¹, these correspond to the transverse optical (TO) and longitudinal optic (LO) phonon modes of ZnSe, respectively. No vibration modes owing to impurities are observed. According to previous results,^[S1-S4] the LO phonon frequency of a single-crystalline ZnSe film is 254 cm⁻¹ and that of a singlecrystal of ZnSe is 255 cm⁻¹ at room temperature. Both indicate a broad Raman peak, owing to the high surface-to-volume ratio of small particles. Compared to the above reports, the TO and LO phonon frequencies of the as-obtained ZnSe sample are both shifted towards a lower frequency, which may be an effect of small size and high surface area of the sample. The relatively sharp and symmetric Raman peaks of the ZnSe nanostructures imply that the ZnSe nanobelts are single crystalline.

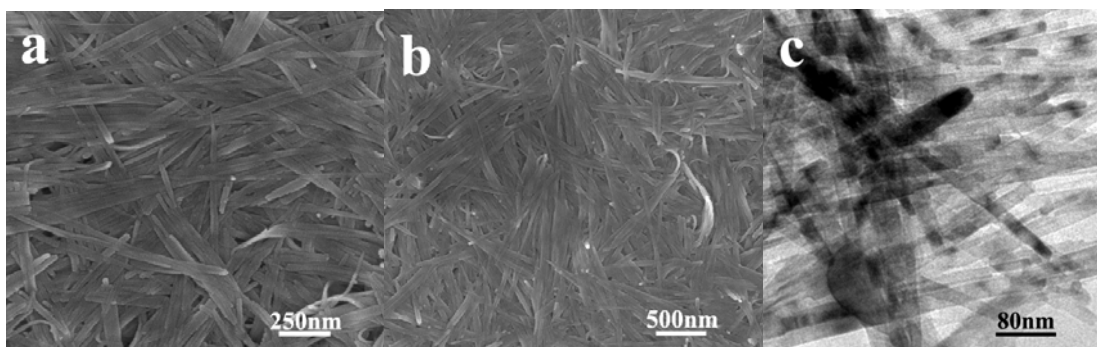


Figure S5. FESEM and TEM images of ZnSe nanobelts prepared at 180 °C for 20 h: (a) $V_{\text{H}_2\text{O}}/V_{\text{TEPA}}/ V_{\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}} = 30:20:5$, (b-c) $V_{\text{H}_2\text{O}}/V_{\text{TEPA}}/ V_{\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}} = 35:15:5$.

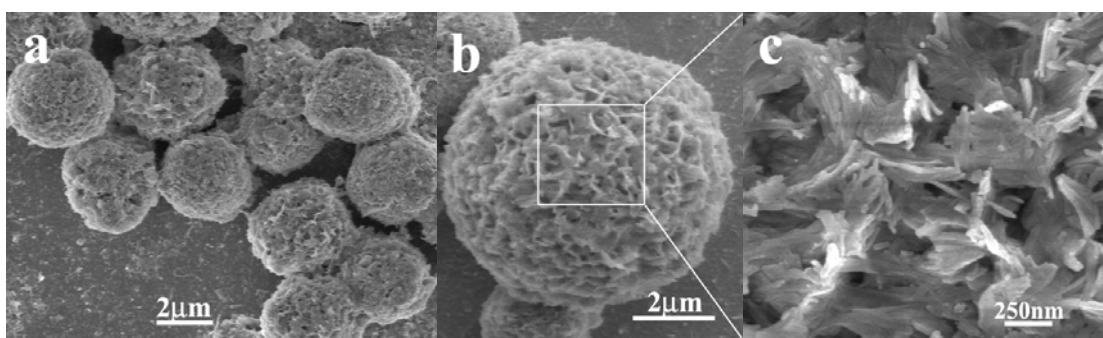


Figure S6. FESEM images of ZnSe microspheres prepared in a mixed solution with a volume ratio of $V_{\text{H}_2\text{O}}/V_{\text{TEPA}}/ V_{\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}} = 40:10:1$ at 160 °C for 20 h, indicating microspheres were constructed from the self-assembly of nanobelt bundles. x0768

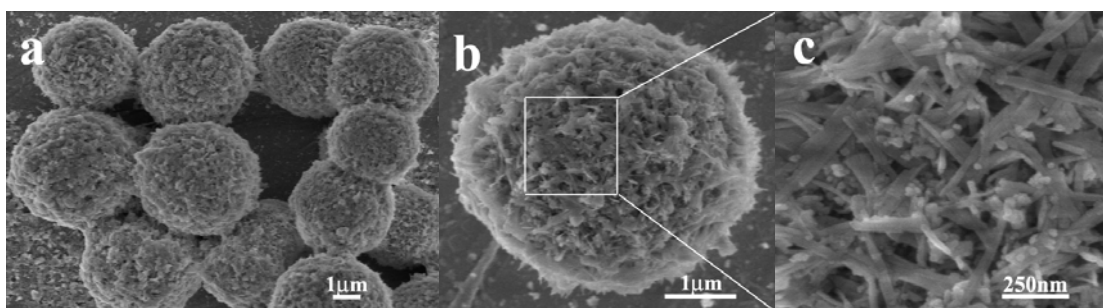


Figure S7. FESEM images of ZnSe microspheres prepared in a mixed solution with a volume ratio of $V_{\text{H}_2\text{O}}/V_{\text{TEPA}}/ V_{\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}} = 45:5:1$ at 160 °C for 20 h, indicating microspheres were constructed from the self-assembly of nanobelts. x0772

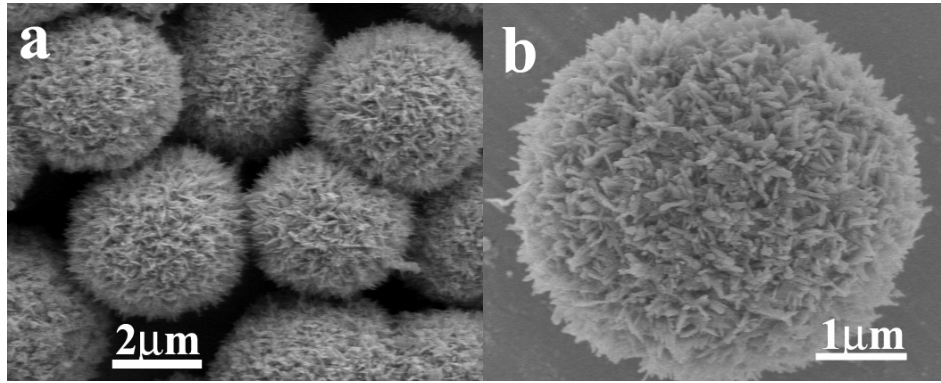


Figure S8. FESEM images of ZnSe microspheres prepared in a mixed solution with a volume ratio of $V_{\text{H}_2\text{O}}/V_{\text{TEPA}}/ V_{\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}} = 45:5:1$ at 200 °C for 36 h, indicating microspheres were constructed from the self-assembly of nanorod arrays.

Additional References:

[S1] D. Sarigiannis, J. D. Peck, G. Kioseoglou, A. Petrou, T. Mountziaris, *Appl. Phys. Lett.* **2002**, *80*, 4024.

[S2] B. Schreder, A. Materny, W. Kiefer, G. Bacher, A. Forchel, G. Landwehr, *J. Raman Spectrosc.* **2000**, *31*, 959.

[S3] G. Lermann, T. Bischof, A. Materny, W. Kiefer, T. Kummell, G. Bacher, A. Forchel, G. Landwehr, *J. Appl. Phys.* **1997**, *81*, 1446.

[S4] T. J. Mountaiaris, J. D. Peck, S. Stoltz, W. Y. Yu, A. Petrou, P. G. Mattocks, *Appl. Phys. Lett.* **1996**, *68*, 2270.

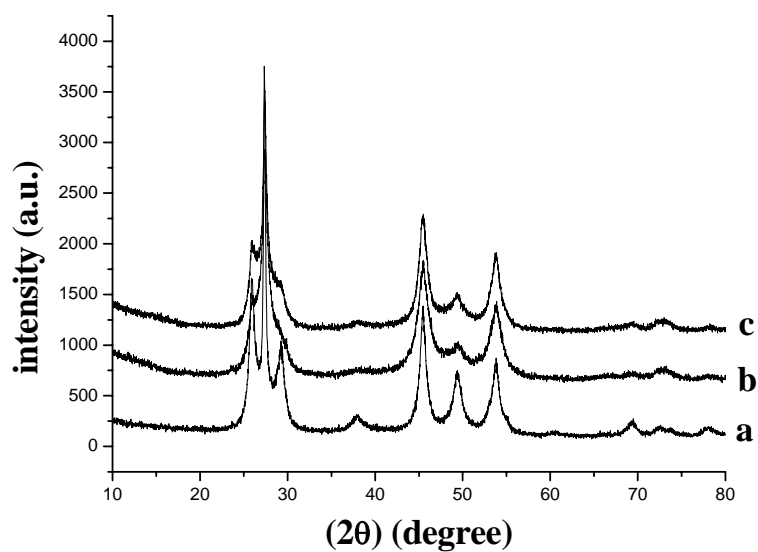


Figure S9. XRD pattern of the product obtained under different conditions: (a) $V_{\text{H}_2\text{O}}/V_{\text{TEPA}}/V_{\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}} = 35:15:5$, 200 °C for 20 h; (b) $V_{\text{H}_2\text{O}}/V_{\text{TEPA}}/V_{\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}} = 45:5:1$, 200 °C for 20 h; (c) $V_{\text{H}_2\text{O}}/V_{\text{TEPA}}/V_{\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}} = 45:5:1$, 240 °C for 20 h.

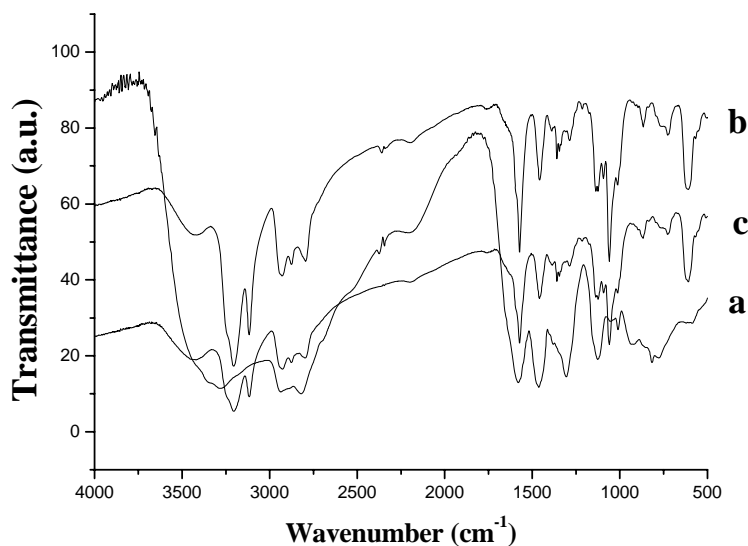


Figure S10. FTIR spectra of ZnSe nanobelts obtained at different growth stages: a) 30 min, b) 1 h, and c) pure tetraethylenepentamine (TEPA).

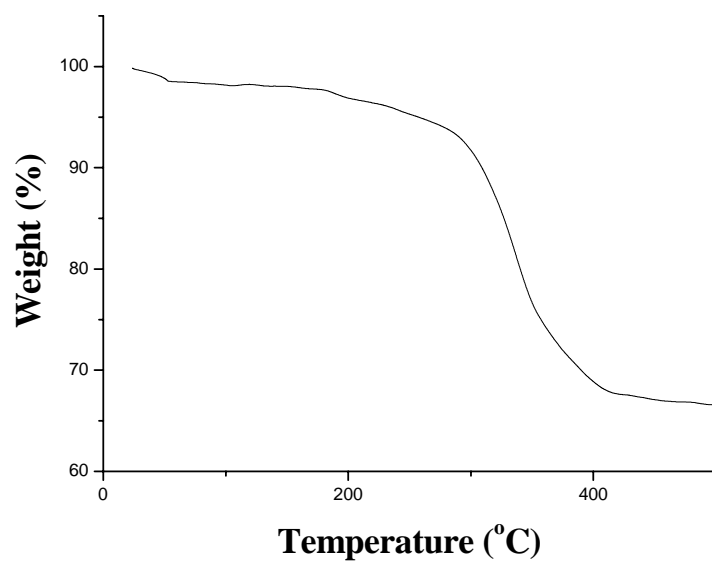


Figure S11. TGA curve of the sample obtained at 180 °C for 30 min. The weight loss before 110 °C could be attributed to the loss of surface H₂O molecules absorbed. The main weight loss starts at about 150 °C, up to 400 °C, the weight loss is at 22%. Based on the TEPA intercalated ZnSe, the ratio of ZnSe to TEPA is 1:0.5.