Electronic Supplementary Information (ESI)

Seed-Catalyzed Heteroepitaxial Growth of Zinc Selenide Nanowires

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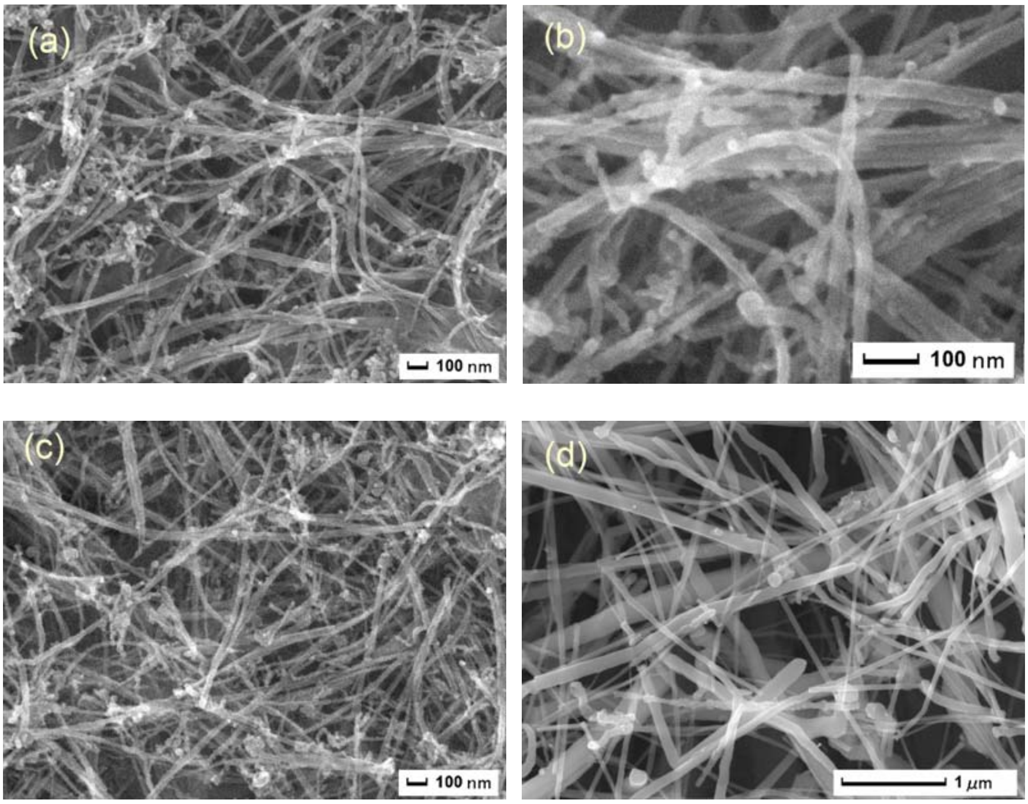

Fig. S1. SEM images of ZnSe nanowires synthesized under varying conditions: (a,b) 0.8 μmol $AgNO_3$, 0.2 g PVP K30; (c) 0.8 μmol $AgNO_3$, 0.2 g PVP K90; (d) 0.8 μmol $AgNO_3$, without PVP.

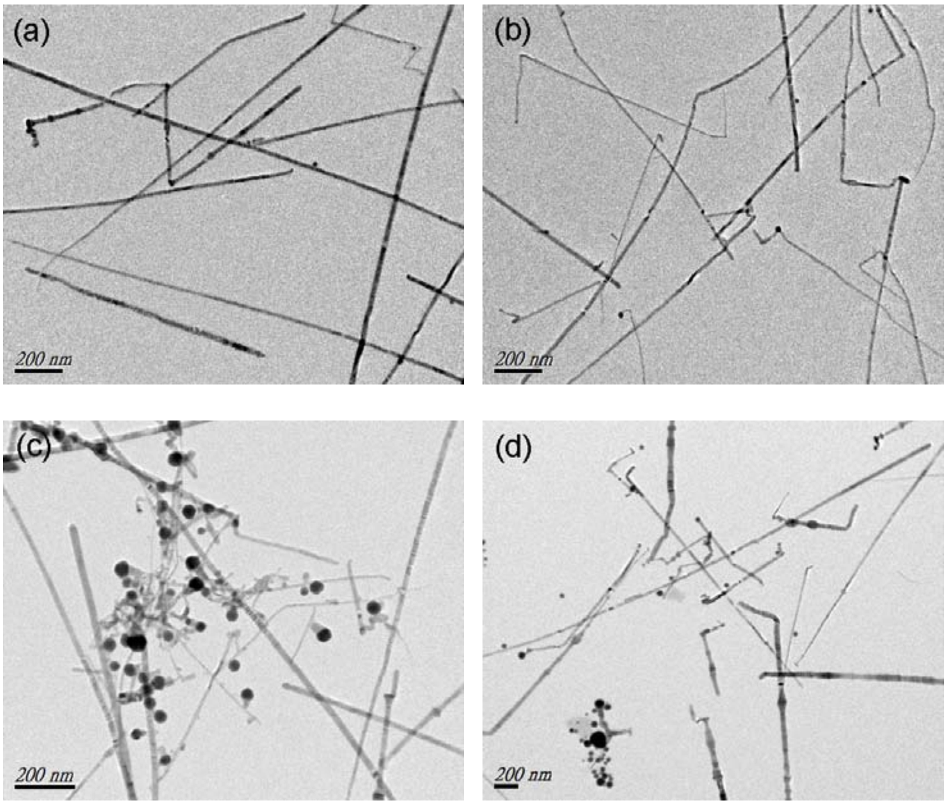

Fig. S2. TEM images of ZnSe nanowires fabricated by the addition of different amounts of $AgNO_3$ ethanol solution: (a) 0.4 μmol; (b) 1.6 μmol; (c) 4 μmol; (d) 12 μmol.

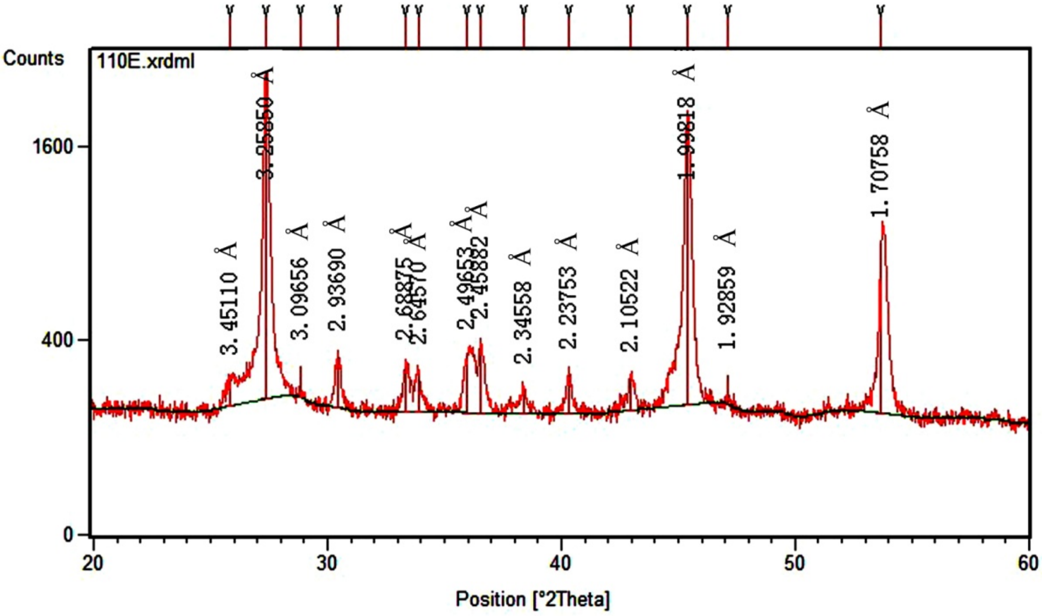

Fig. S3. XRD pattern of the ZnSe sample prepared by adding 12 μmol of $AgNO_3$.

(λ = 1.54178 Å)

2θ (°)	**$d_{(hkl)}$ detected (Å)**	**(hkl)**	**$d_{(hkl)}$ Ref. 19 (Å)**
28.833	**3.09656**	**120**	**3.110417**
30.437	**2.93690**	**201**	**2.940243**
33.324	**2.68875**	**211**	**2.667181**
33.833	**2.64570**	**?**	**–**
35.974	**2.49653**	**220**	**2.494685**
36.545	**2.45882**	**?**	**–**
38.377	**2.34558**	**102** **(300)**	**2.367861** **(2.353333)**
40.308	**2.23753**	**221** **(310)**	**2.24857** **(2.232568)**
42.963	**2.10522**	**301**	**2.122223**
47.124	**1.92859**	**212** **(320)**	**1.945014** **(1.958092)**

Table S1. XRD assignments for the Ag_2Se diffraction data [2θ = 28-50°] according to Reference 19 (in the text). These data agree closely with the diffractions of tetragonal phase Ag_2Se. The lattice parameters of tetragonal Ag_2Se are calculated as follows: $a = b$ = 7.05 Å and c = 4.98 Å. The peaks at 33.833° and 36.545° (2θ) cannot be assigned on the basis of Reference 19, and they may result from another crystalline phase that has not been identified.

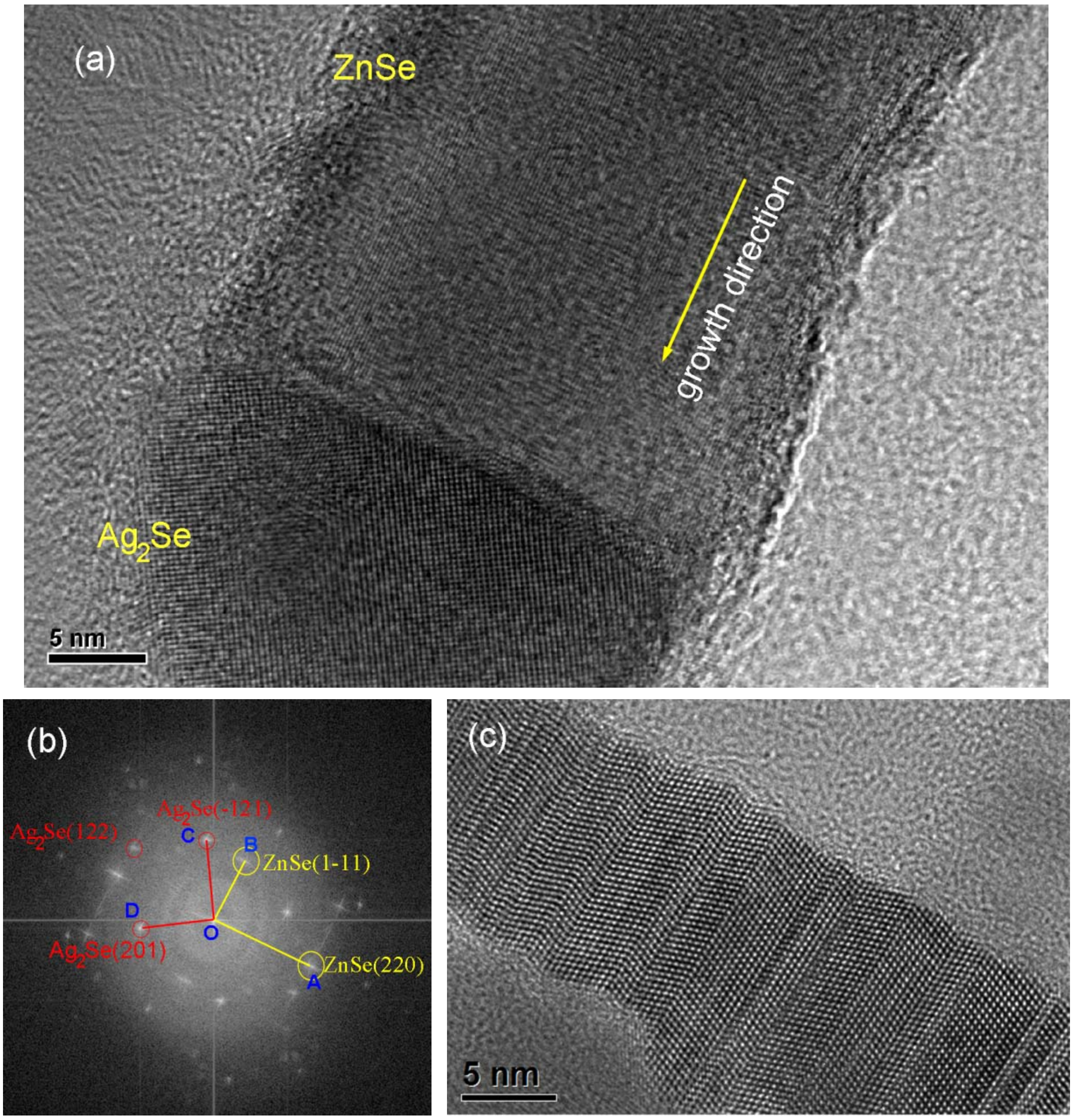

Fig. S4. (a) HRTEM image of the interface of the Ag_2Se tip and the ZnSe wire; (b) FFT pattern of the HRTEM image in (a); (c) HRTEM image of the ZnSe nanowire, showing the periodically twinned structure along the growth direction (i.e., the <111> direction).

In the FFT pattern shown in Figure S3b, the ratio of OA/OB is close to 1.63 and ∠AOB is 90°. As a result, the B diffraction spot can be assigned to the ZnSe(1-11) plane when the A diffraction spot is assigned to the (220) plane of cubic ZnSe. The (1-11) and (220) planes belong to the [-112] zone axis of cubic ZnSe. We therefore conclude that the <111> direction is the growth direction of the ZnSe nanowires.

From analysis of the HRTEM image and the corresponding FFT pattern, the D diffraction spot can be assigned to the Ag_2Se(201) plane (the measured *d*-value is 2.94

Å, consistent with the data in Table S1), with ∠COD = 90.46°. The *d*-value corresponding to the C diffraction spot is 2.67 Å, which could ordinarily be assigned to the $Ag_2Se(211)$ plane (Table S1). However, the dihedral angle between the (201) and (211) planes of tetragonal Ag_2Se (a = 7.05 Å and c = 4.98 Å) is far from 90°. The (121), (211), and (-121) planes are equivalent in a tetragonal structure and have the same interplanar spacing (*d*-value). The C diffraction spot can therefore be assigned to the (-121) plane, the ∠COD between the $Ag_2Se(201)$ and $Ag_2Se(-121)$ planes being very close to 90°.

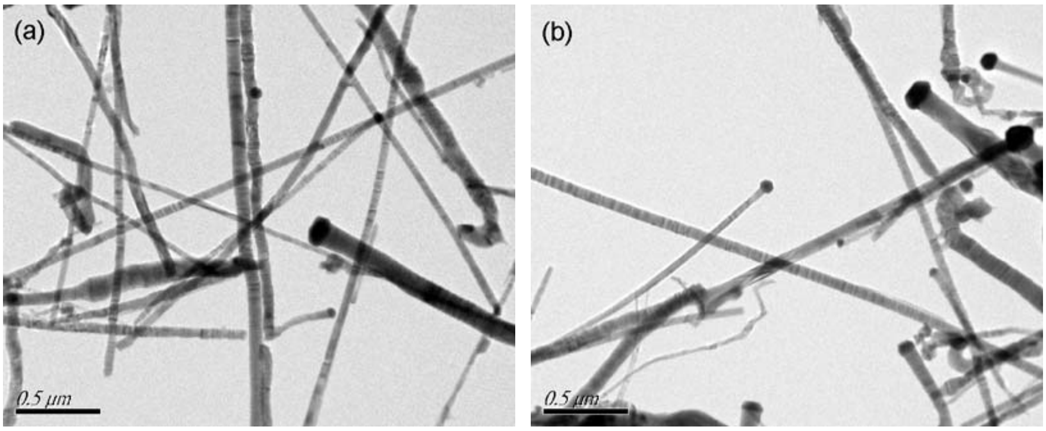

Fig. S5. TEM images of the ZnSe samples synthesized from (a) 0.8 μmol and (b) 2 μmol $AgNO_3$ using PVP K16-18.

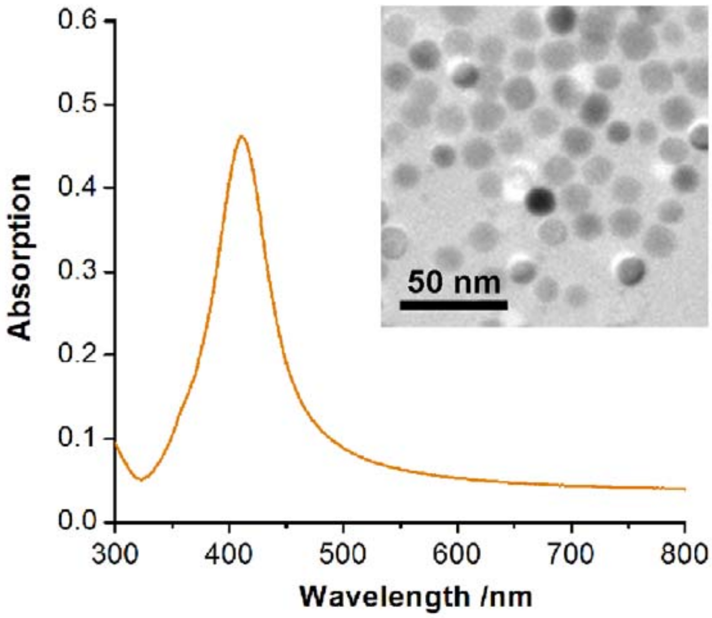

Fig. S6. UV-vis absorption spectrum and TEM image of Ag nanoparticles obtained by using PVP (K30, 0.2 g) and $AgNO_3$ (10 μmol) in a mixture of oleic acid and ethanol (7.5 mL) at 210 ^{o}C for 1 h. The absorption peak at 411 nm is attributed to the surface plasmon resonance (SPR) band of the Ag nanoparticles. The mean diameter of the Ag nanoparticles is about 16 nm. The Ag nanoparticles cannot be obtained on removing PVP while keeping the other conditions constant, and the corresponding SPR absorption cannot be detected in the UV-Vis spectrum.

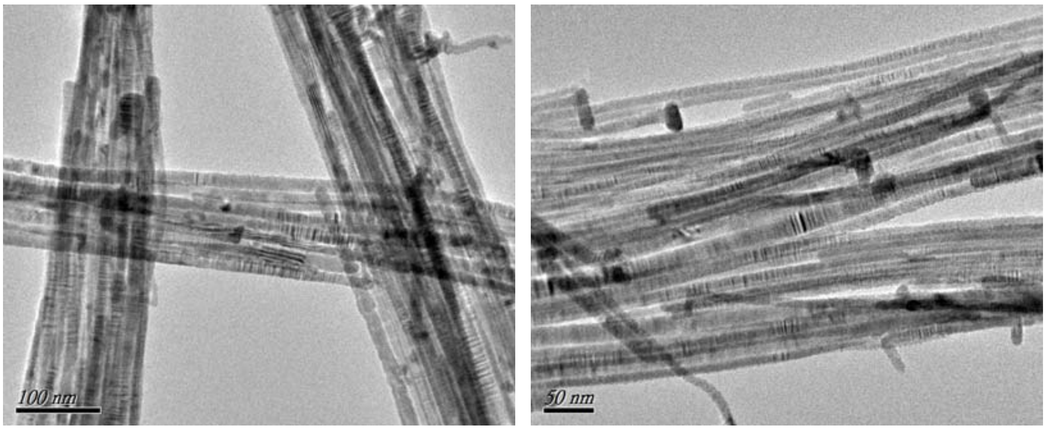

Fig. S7. TEM images of ZnSe nanowires synthesized from 0.8 μmol $AgNO_3$ and 2 mL oleylamine (OA) in a mixture of oleic acid and ethanol (8 mL). The high aspect-ratio wires display an ordered arrangement along the long axis.