Electronic Supplementary Material (ESI) for Nanoscale.

Electronic Supplementary Information

A Simple Solution-phase Approach to Synthesize High-Quality Ternary $AgInSe_2$ and Band Gap Tunable Quaternary $AgIn(S_{1-x}Se_x)_2$ Nanocrystals

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Synthesis of copper stearate and indium stearate

In a typical synthesis of indium stearate, sodium stearate (1.84 g, 6 mmol.) was added in 400 mL of distilled water and the water was heated to dissolve the sodium stearate. Then, an aqueous solution containing indium nitrate hydrate (0.764 g, 2 mmol) was dropwise added into the above hot solution under stirring. When the reaction was completed, the hot mixture containing indium stearate was filtered and washed three times with hot water. After washing, the white precipitate was dried, resulting in indium stearate in a waxy solid from.

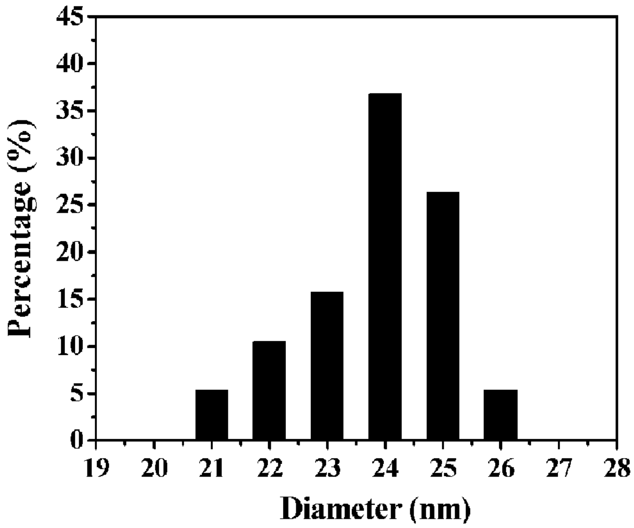
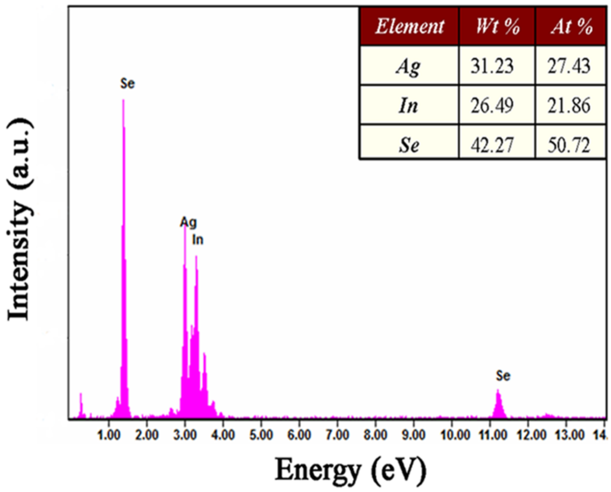


Fig. S1. Histogram of the length of the as-synthesized $AgInSe_2$ nanocrystals determined by Figure 1a.



Element	*Wt %*	*At %*
Ag	31.23	27.43
In	26.49	21.86
Se	42.27	50.72

Fig. S2 Element composition of a field of $AgInSe_2$ nanocrystals measured by EDX.

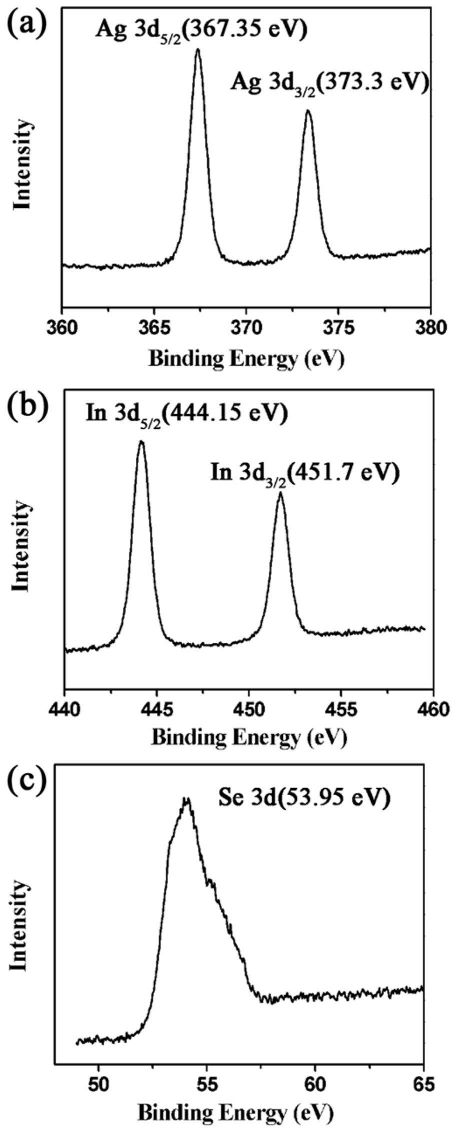


Fig. S3. XPS spectrum of the obtained $AgInSe_2$ nanocrystals: (a) Ag 3d, (b) In 3d, (c) Se 3d core levels.

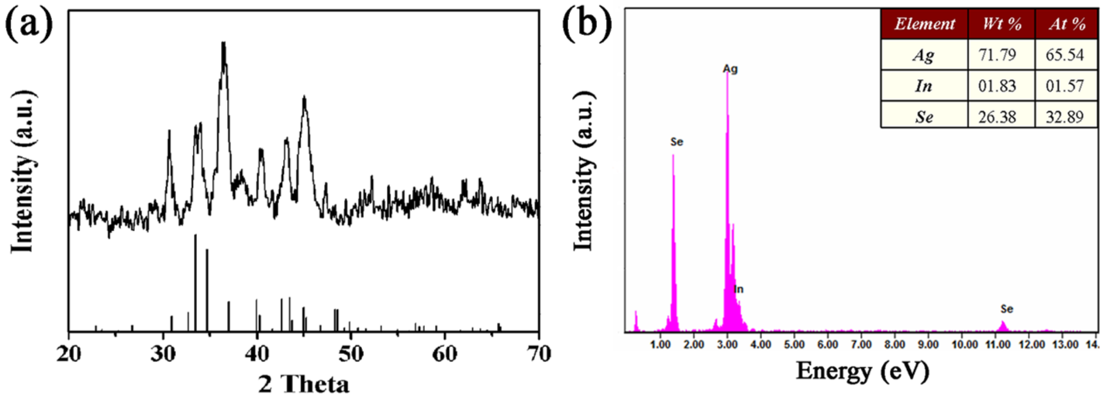


Fig. S4. (a) XRD patterns of the Ag_2Se nanocrystals (above) and stand (JCPDS, 24-1041) of Ag_2Se (below). The diffraction peaks of Ag_2Se present slight deviation from the orthorhombic phase Ag_2Se (JCPDS, 24-1041) since small amounts of In ions diffused into Ag_2Se. (b) Element composition of a field of Ag_2Se nanocrystals measured by EDS.

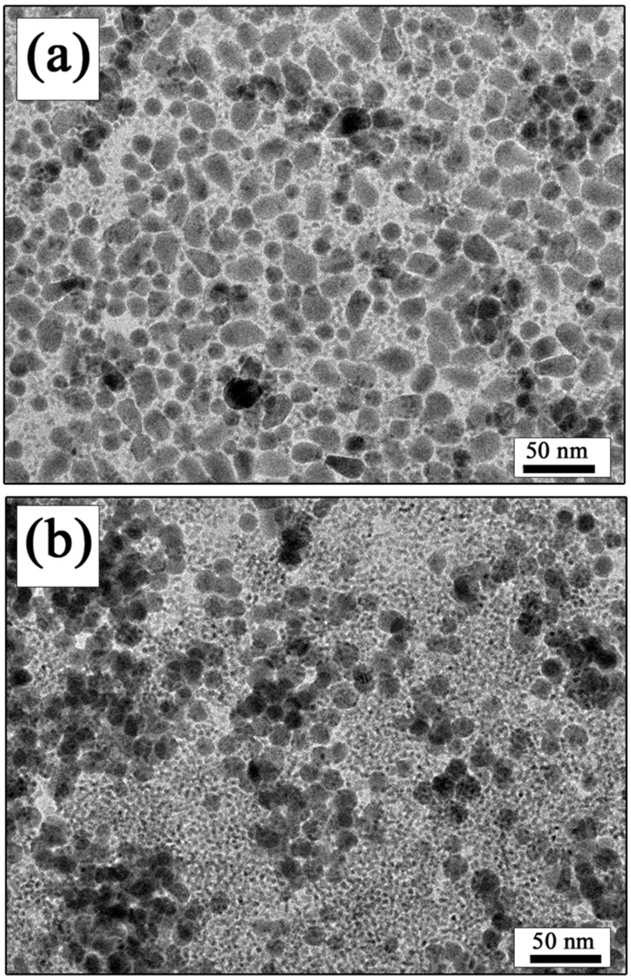


Fig. S5. The TEM images of the $AgInSe_2$ nanocrystals prepared with the various Ag/In/Se reactant mole ratios (a) 1:1:2, (b) 1:1:1.

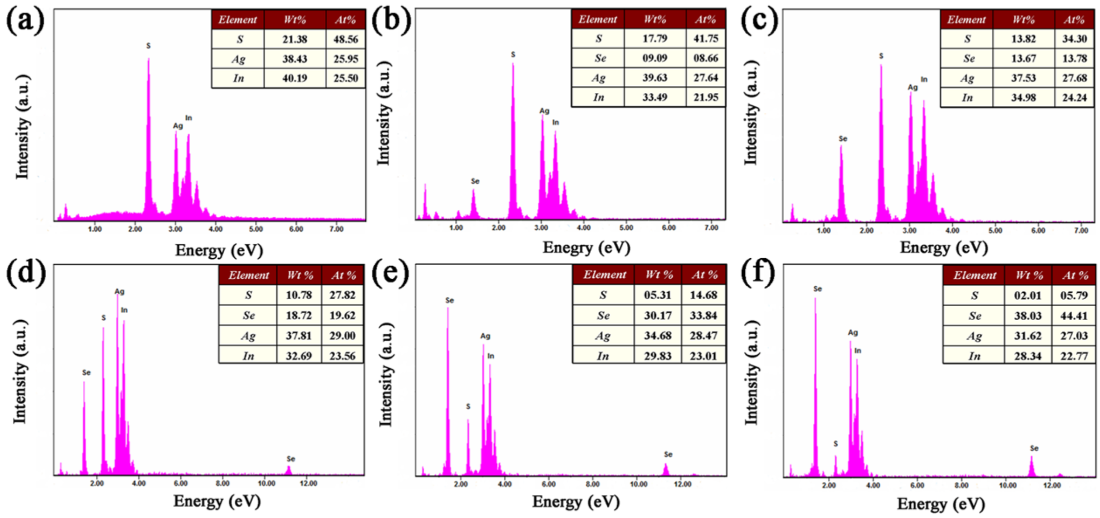


Fig. S6. Element composition of a field $AgIn(S_{1-x}Se_x)_2$ nanocrystals measured by EDX with different S/Se reactant mole ratios (a) 1:0, (b) 0.85:0.15, (c) 0.65:0.35, (d) 0.5:0.5, (e) 0.35:0.65, (f) 0.15:0.85.

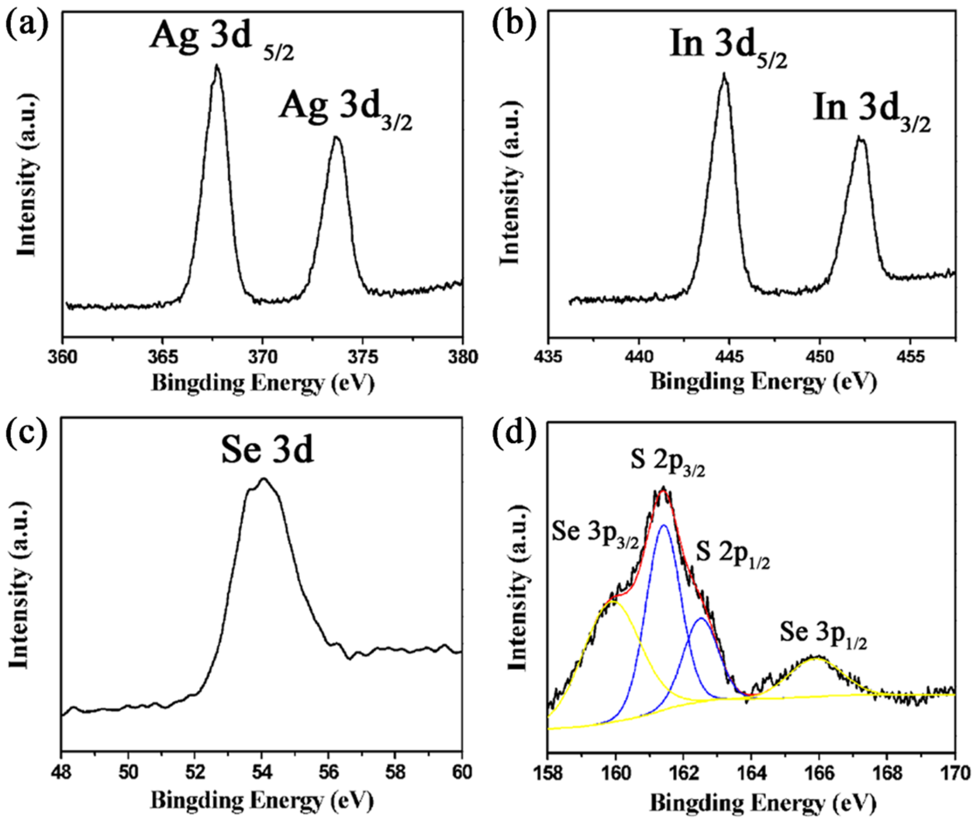


Fig. S7. XPS spectrum of the obtained $AgIn(S_{1-x}Se_x)_2$ nanocrystals: (a) Ag 3d, (b) In 3d, (c) Se 3d, (d) S 2p and Se 3p core levels. The blue lines are contributed from the S 2p orbital, and the yellow lines are contributed from the Se 3p orbital, respectively.

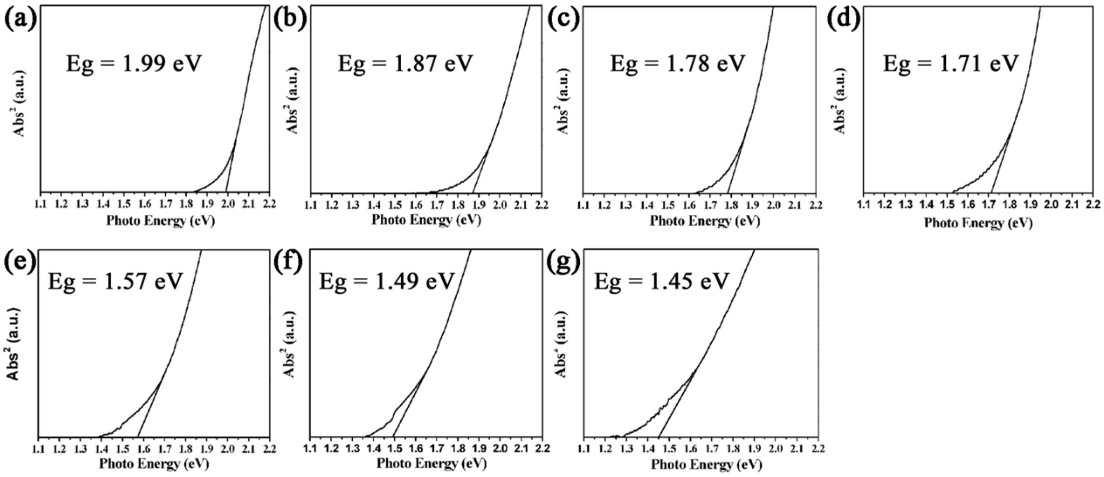


Fig. S8. An extrapolation of the spectra to identify the band edge of $AgIn(S_{1-x}Se_x)_2$ nanocrystals with x = (a) 0, (b) 0.15, (c) 0.35, (d) 0.5, (e) 0.65, (f) 0.85, (g) 1.