

Supporting Information

Phase controlled synthesis of SnSe and SnSe₂ hierarchical nanostructures made of single crystalline ultrathin nanosheets

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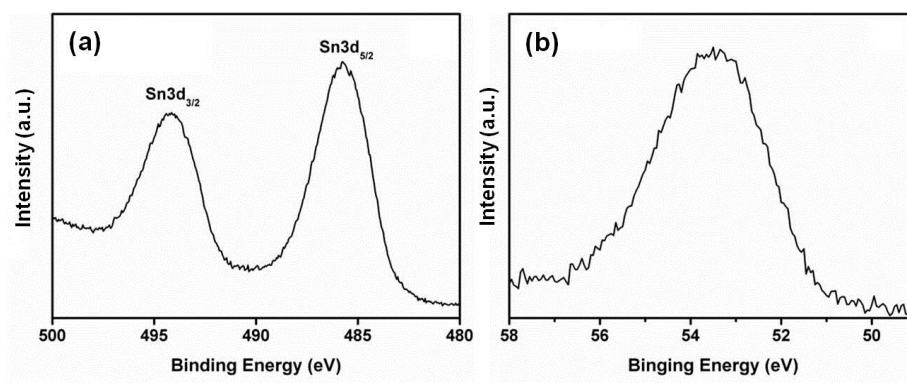


Fig. S1 XPS spectra of the Sn 3d orbital and the Se 3d orbital of SnSe HNs.

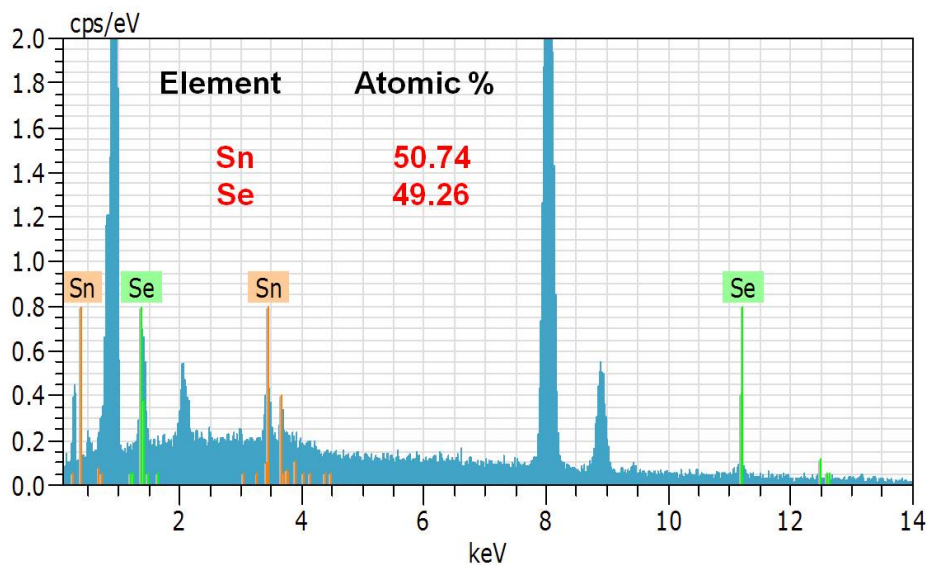


Fig. S2 EDS spectrum of SnSe HNs.

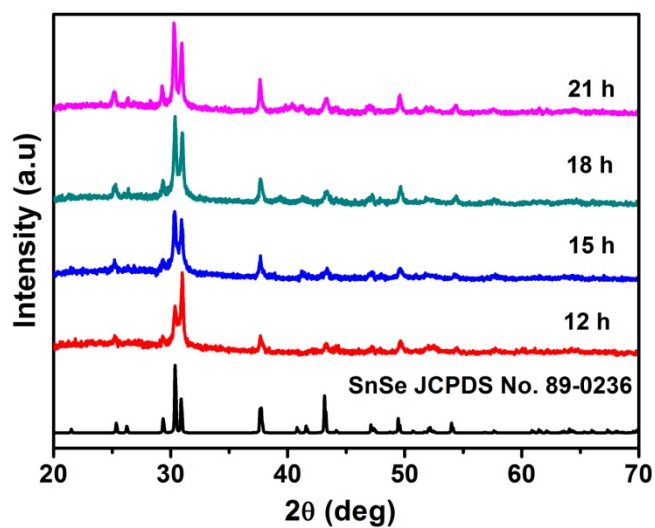


Fig. S3 XRD patterns of the synthesized SnSe HNs with different reaction times.

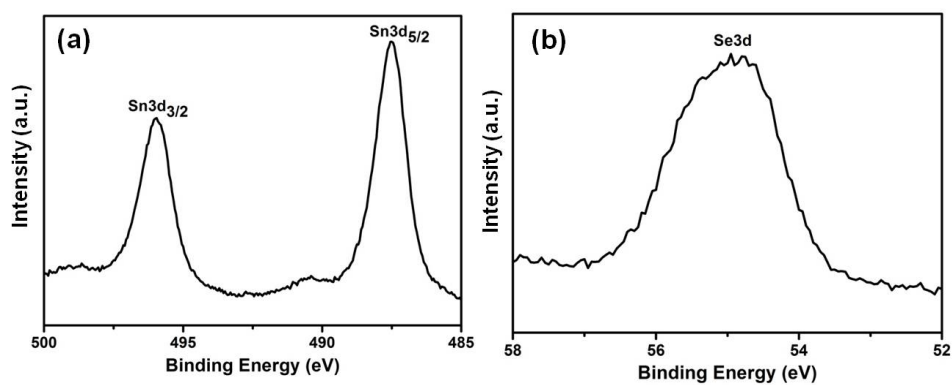


Fig. S4 XPS spectra of the Sn 3d orbital and the Se 3d orbital of SnSe_2 HNs.

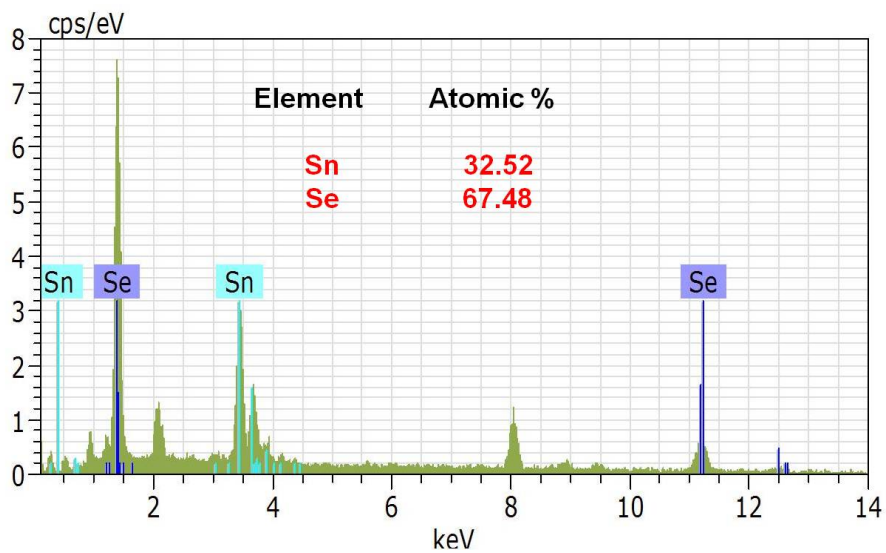


Fig. S5 EDS spectrum of SnSe₂ HNs.

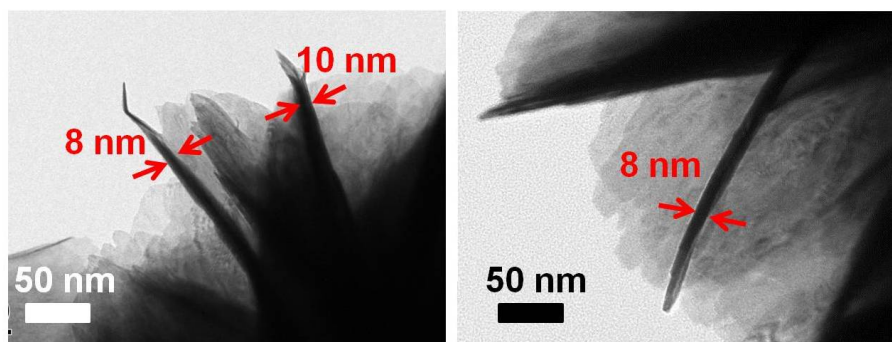


Fig. S6 TEM images of SnSe₂ HNs showing sheet thickness.

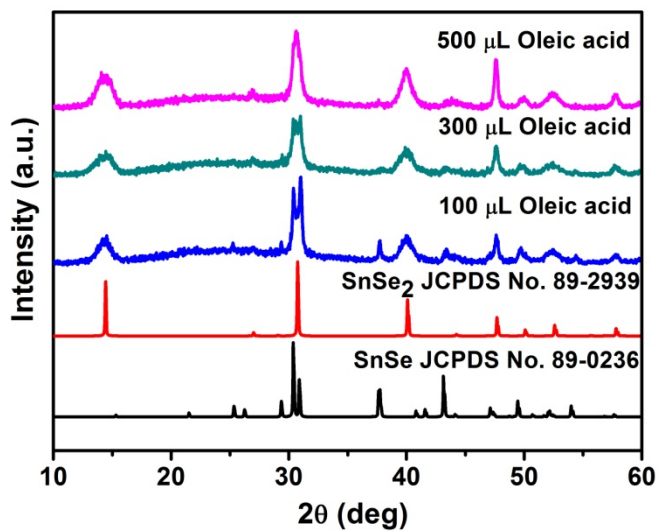


Fig. S7 XRD patterns of the products obtained with different amounts of oleic acid.

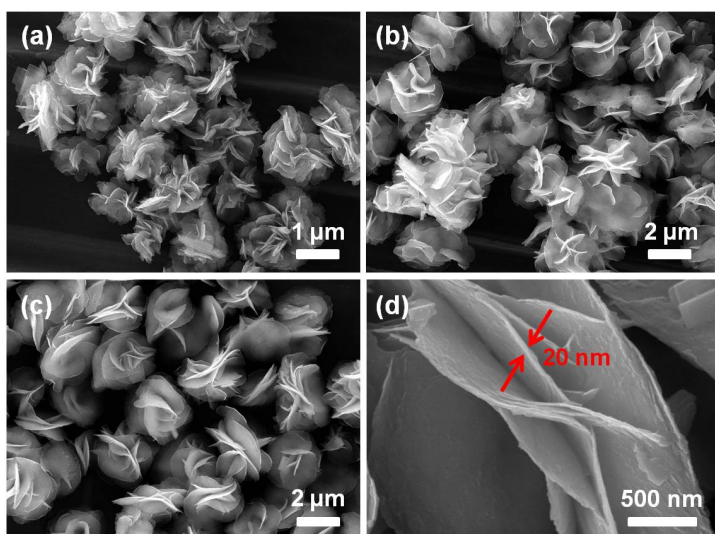


Fig. S8 SEM images the products obtained with different amounts of oleic acid (a) 100, (b) 300, and (c and d) 500 μL.

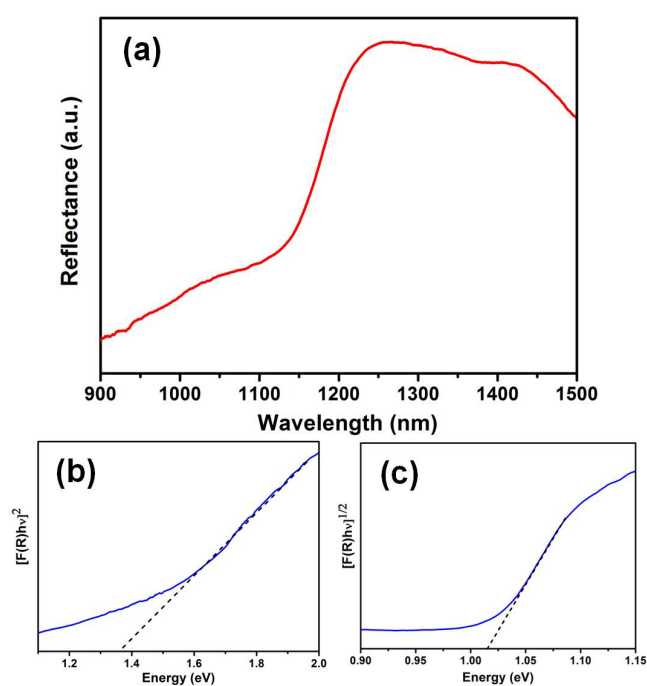


Fig. S9 (a) Diffuse reflectance spectrum for SnSe HNs. Direct and indirect bandgaps were calculated from plots of $[F(R)hv]^2$ and $[F(R)hv]^{1/2}$ vs energy, shown in panels b and c, respectively.

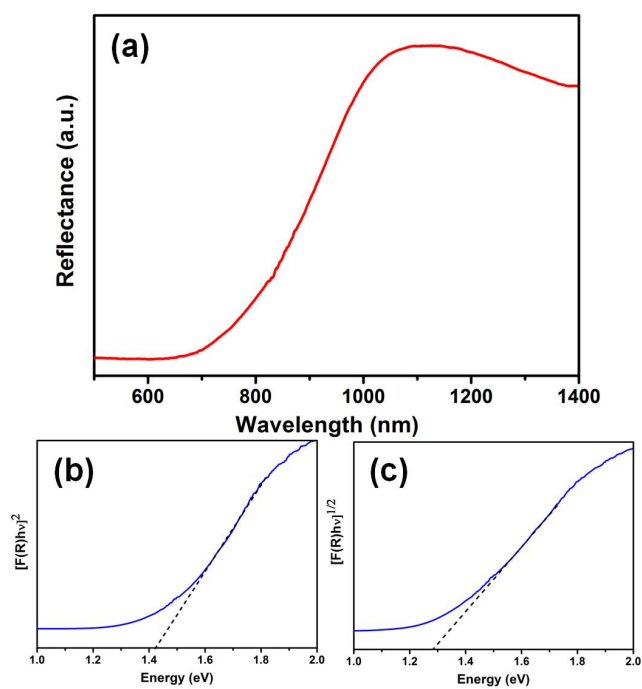


Fig. S10 (a) Diffuse reflectance spectrum for SnSe₂ HNs. Direct and indirect bandgaps were calculated from plots of $[F(R)hv]^2$ and $[F(R)hv]^{1/2}$ vs energy, shown in panels b and c, respectively.

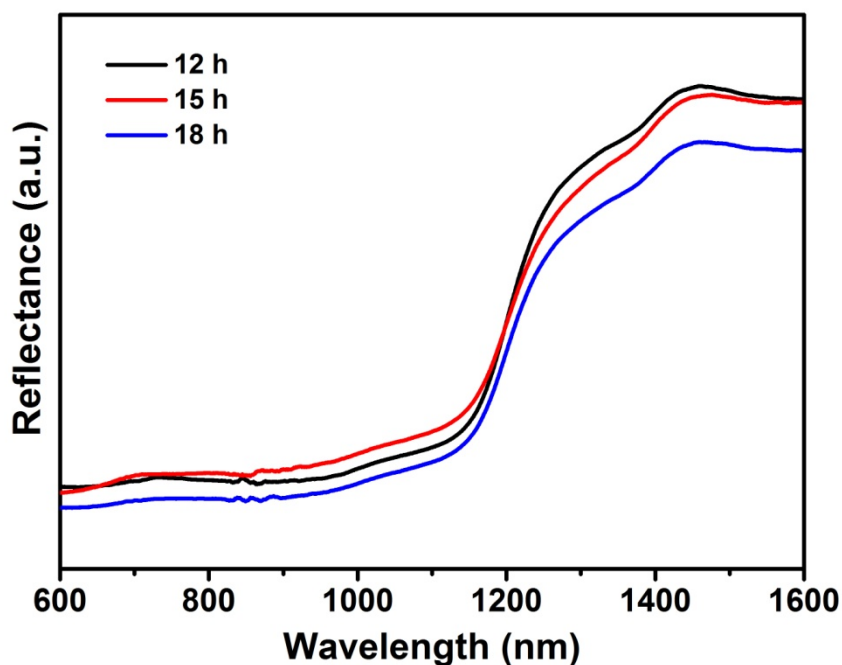


Fig. S11 Diffuse reflectance spectra of SnSe HNs as a function of reaction time.

Table S1. Calculated direct and indirect bandgaps of SnSe HNs as function of reaction time.

Reaction time (h)	Direct bandgap (eV)	Indirect bandgap (eV)
12	1.60	0.96
15	1.56	0.97
18	1.50	0.99

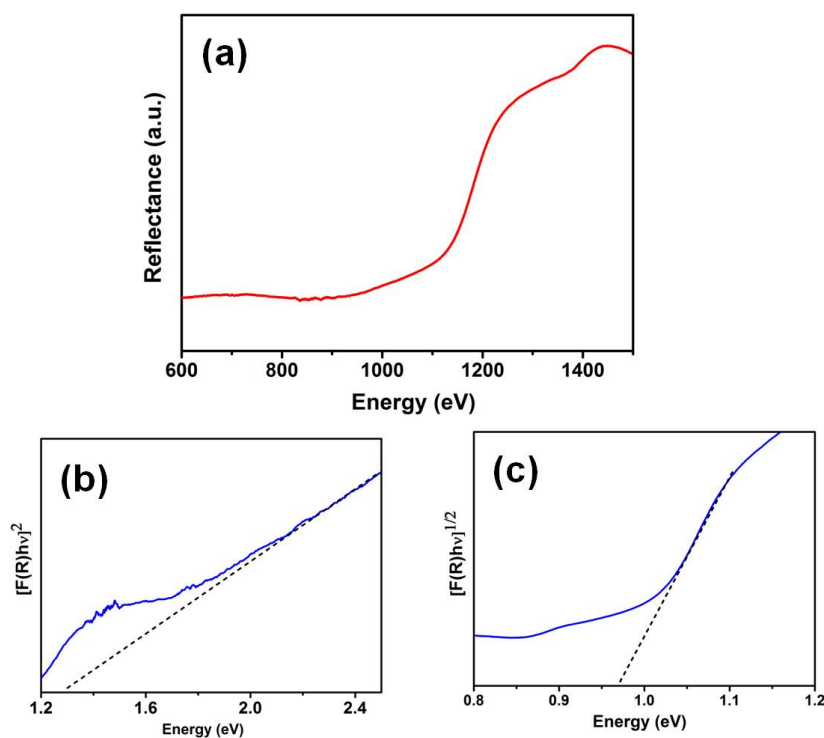


Fig. S12 (a) Diffuse reflectance spectrum for SnSe-SnSe₂ composite HNs. Direct and indirect bandgaps were calculated from plots of $[F(R)hv]^2$ and $[F(R)hv]^{1/2}$ vs energy, shown in panels b and c, respectively.

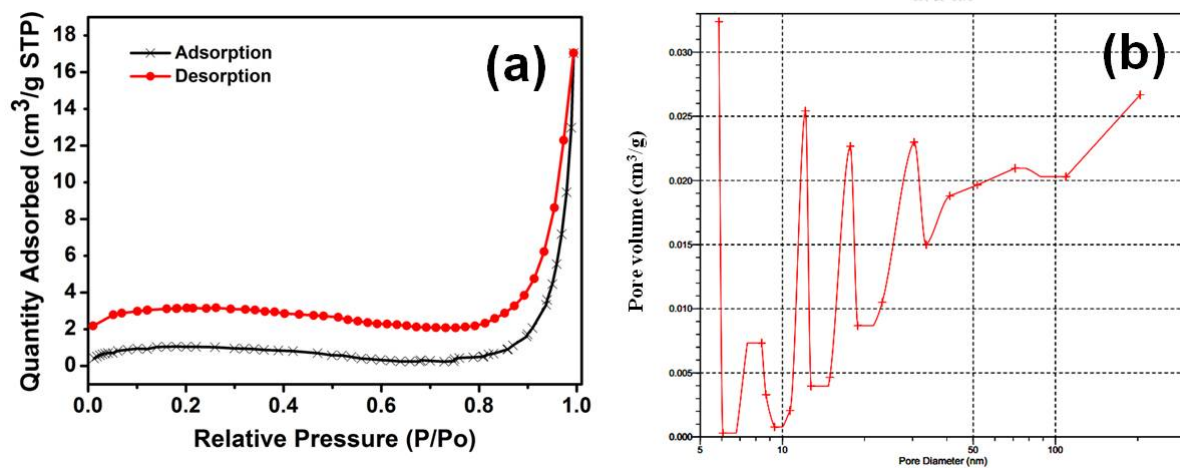


Fig. S13 N₂ adsorption-desorption isotherm and pore size distribution plots of SnSe HNs.

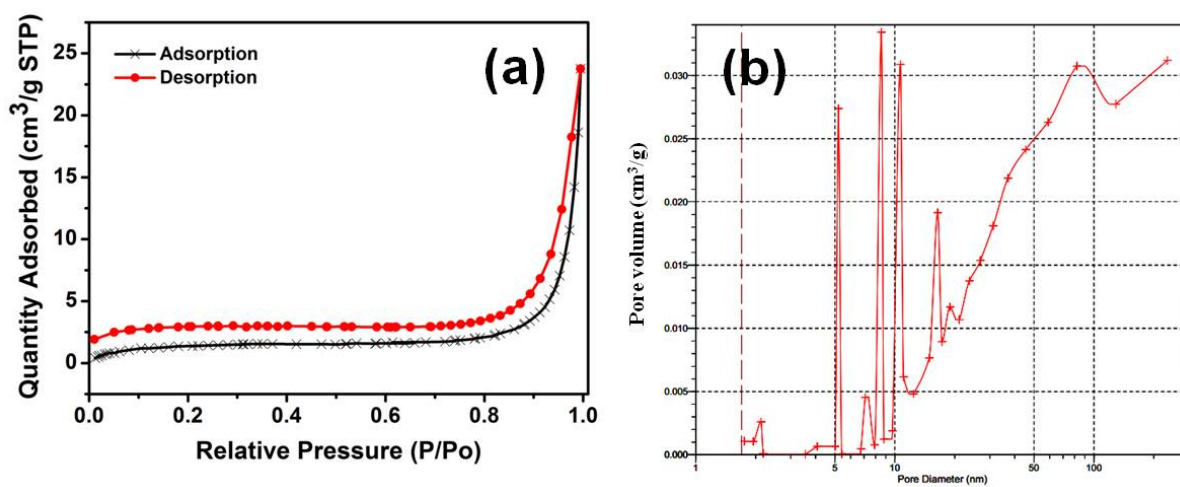


Fig. S14 N₂ adsorption-desorption isotherm and pore size distribution plots of SnSe₂ HNs.

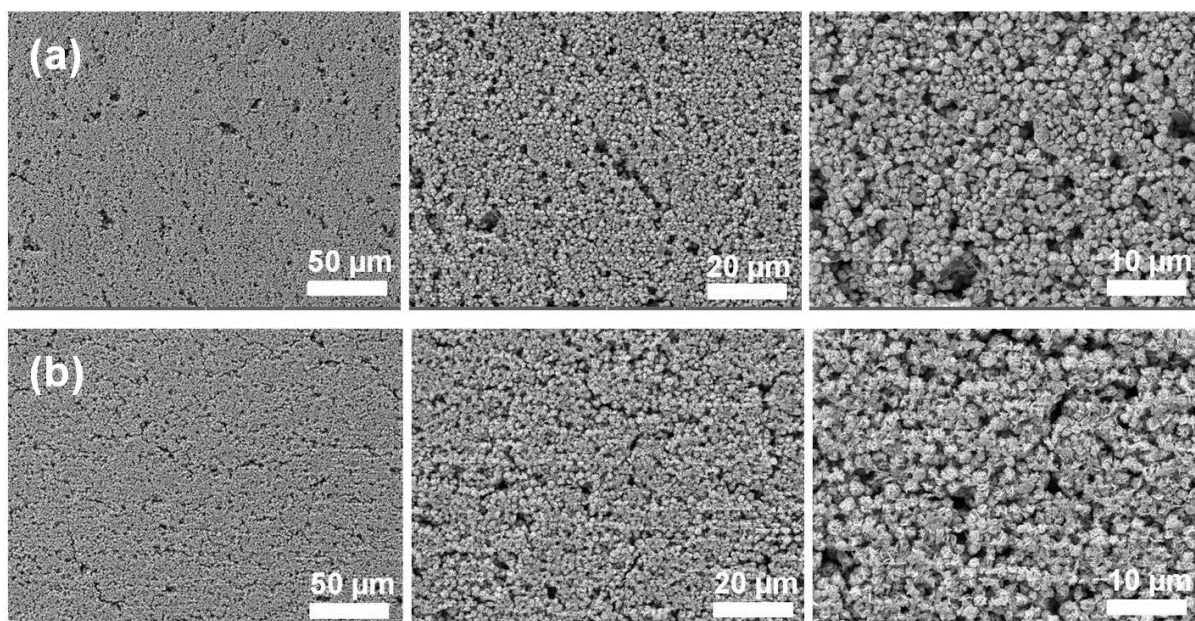


Fig. S15 SEM images of (a) SnSe, and (b) SnSe₂ HN counter electrodes annealed at 500 °C in N₂ atmosphere.

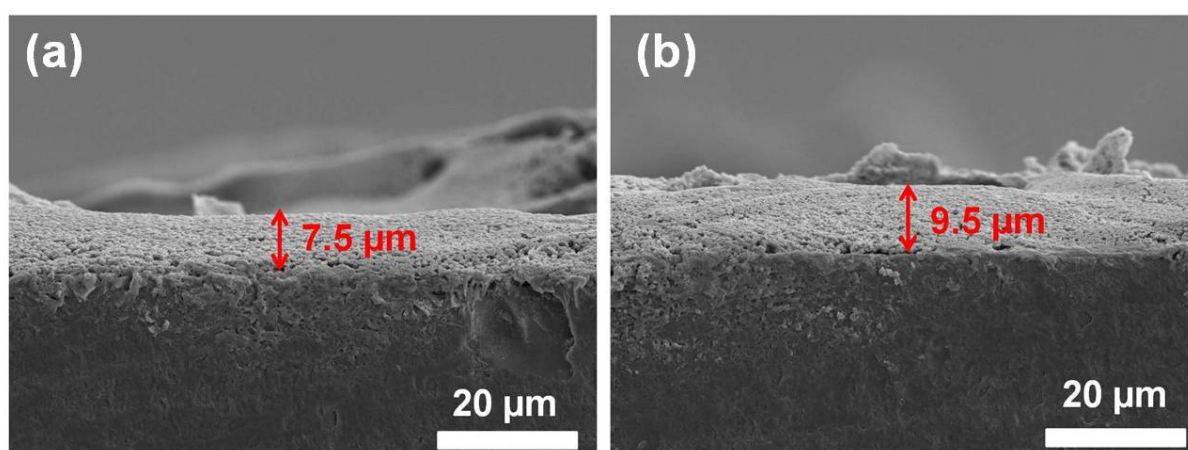


Fig. S16 Cross-sectional SEM images of (a) SnSe, and (b) SnSe₂ HN counter electrodes annealed at 500 °C in N₂ atmosphere.

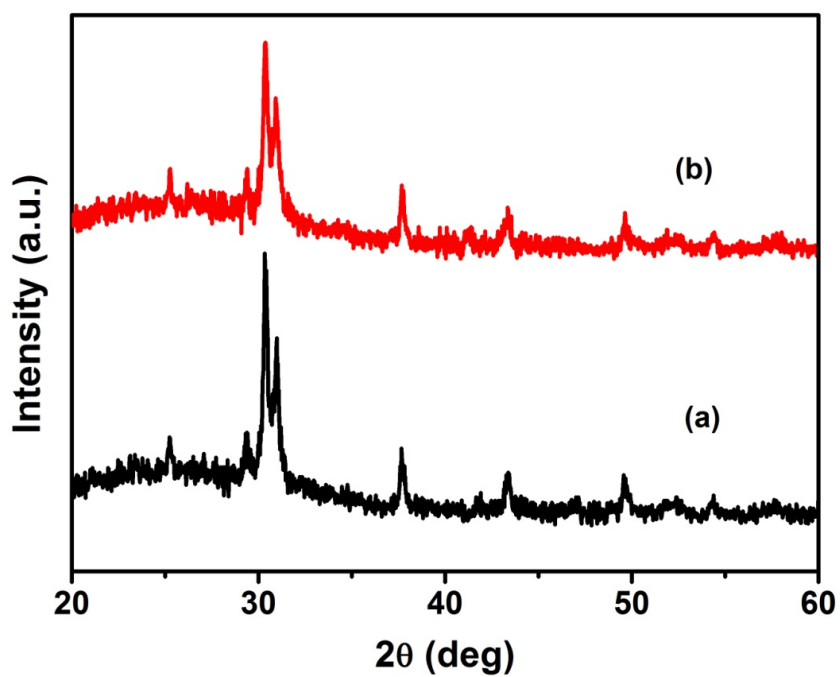


Fig. S17 XRD patterns of SnSe HNs counter electrodes (a) before, and (b) after annealed at 500 °C in N₂ atmosphere.

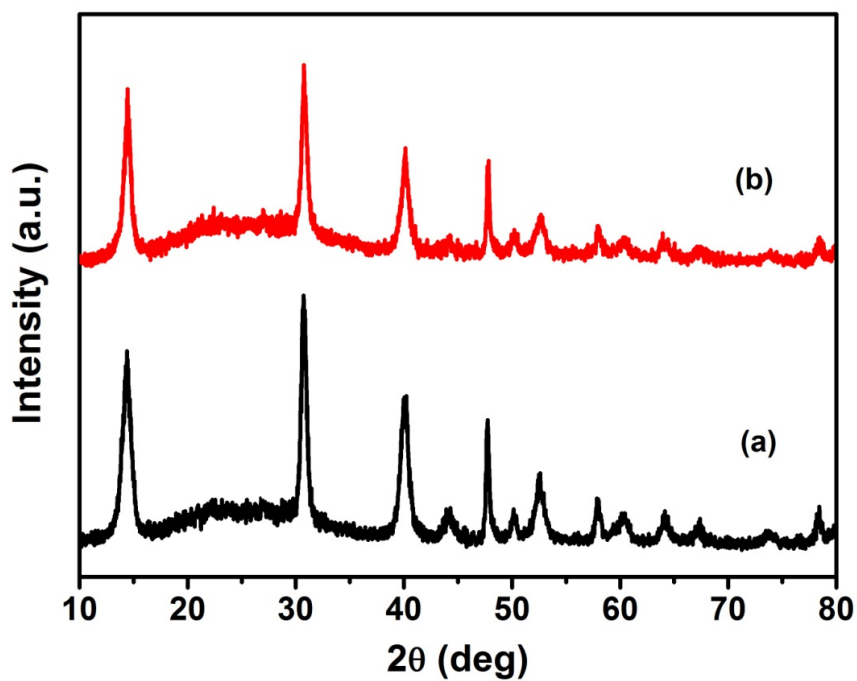


Fig. S18 XRD patterns of SnSe₂ HNs counter electrodes (a) before, and (b) after annealed at 500 °C in N₂ atmosphere.

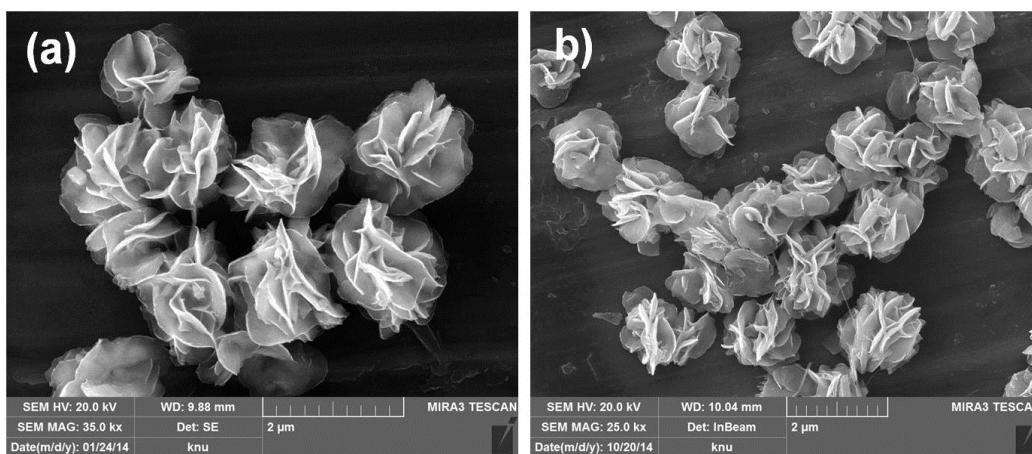


Fig. S19 SEM images of SnSe HNs (a) as synthesized (b) stored at ambient conditions for 9 months.