Electronic Supplementary Information (ESI)

Selenium and sulfur inhomogeneity in free-standing ternary $Sb_2(Se,S)_3$ alloyed nanorods

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Fig. S1-S10

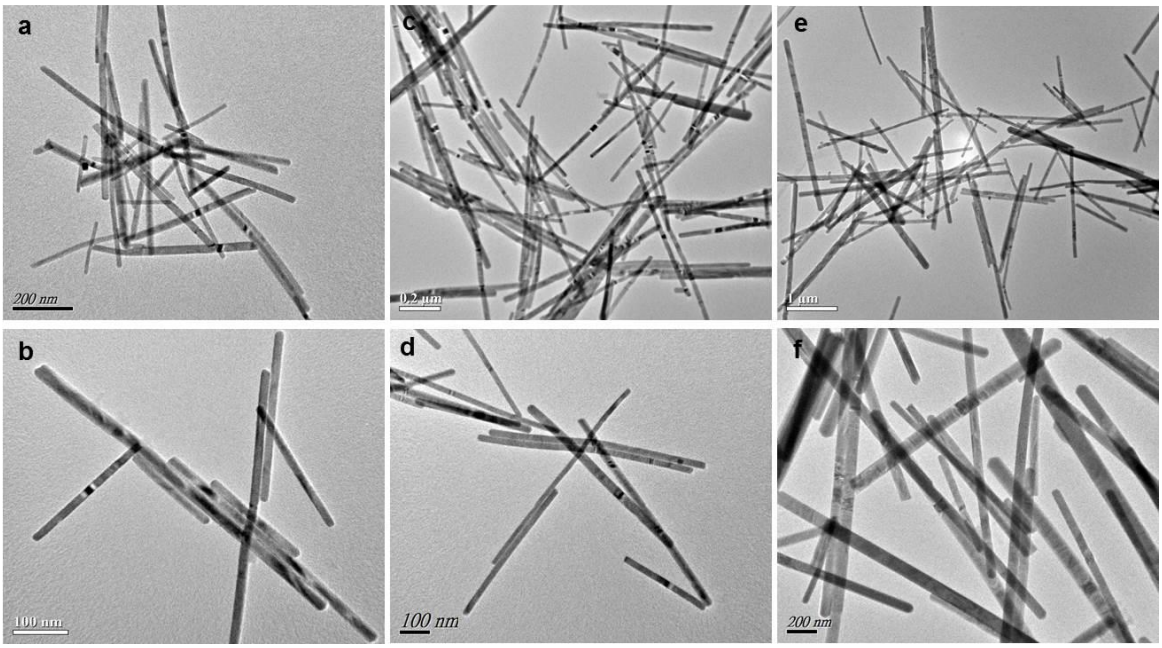

Fig. S1 TEM images of Sb–Se–S NRs prepared at different $SeS_2/SbCl_3$ ratios: (a,b) 0.5:1, (c,d) 1:1, and (e,f) 1.5:1.

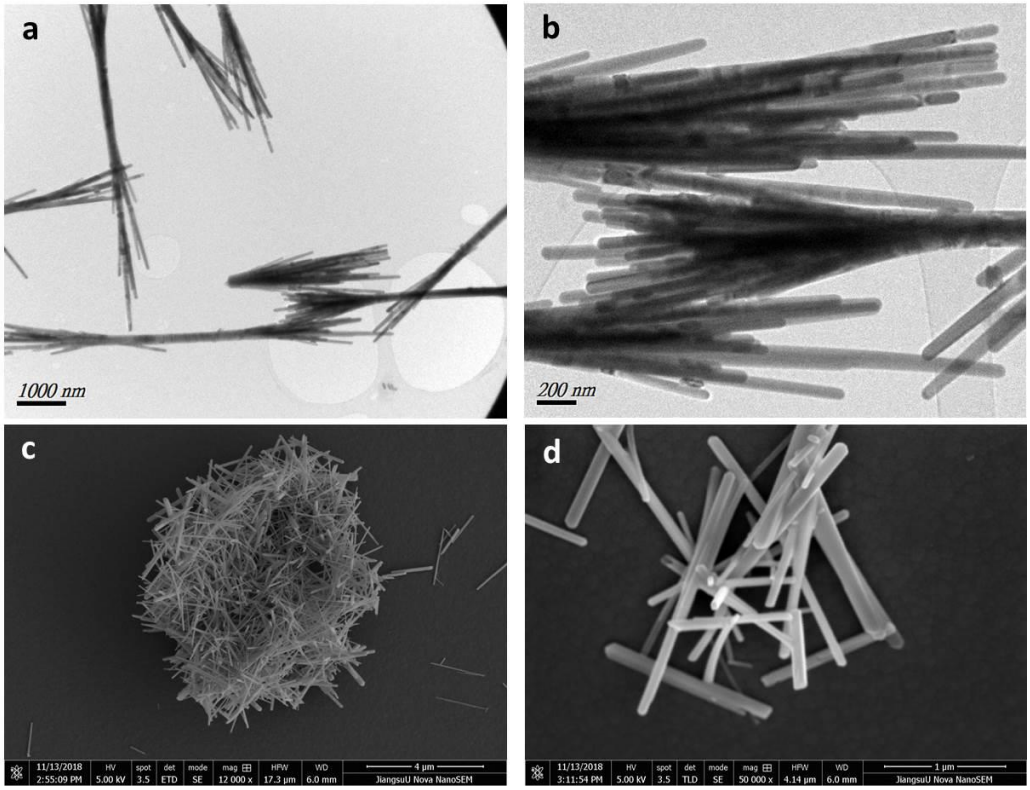

Fig. S2 (a,b) TEM images of Sb_2S_3 sheaf-like nanostructures composed of many secondary NRs (or rod-bundles, see Ref. 8 and 41 in the main text); (c,d) SEM images of Sb_2Se_3 NRs. They were produced respectively from the reactions of $SbCl_3$ elemental S and Se powder in oleylamine at 200 ^oC for 2 h.

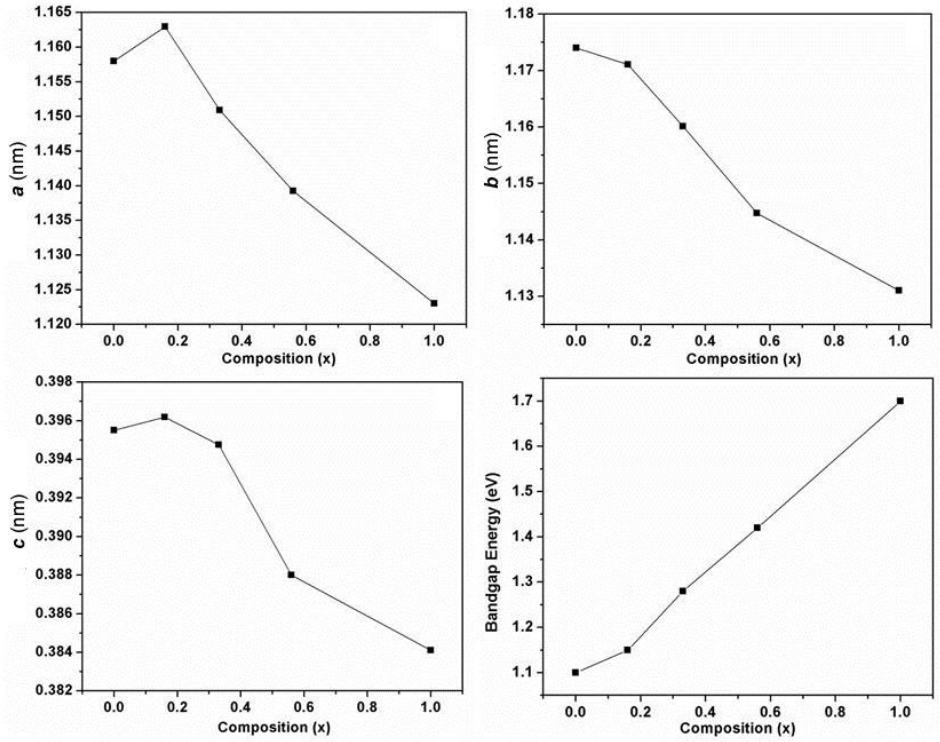

Fig. S3 Lattice parameters ***a, b, c*** and E_g values against the S composition change for $Sb_2(Se_{1-x}S_x)_3$ NRs prepared at 1.5:1, 1:1 and 0.5:1 $SeS_2/SbCl_3$ ratios. x represents the S fraction, that is, 0.16, 0.32 and 0.56 for three $SeS_2/SbCl_3$ ratios (Table 1).

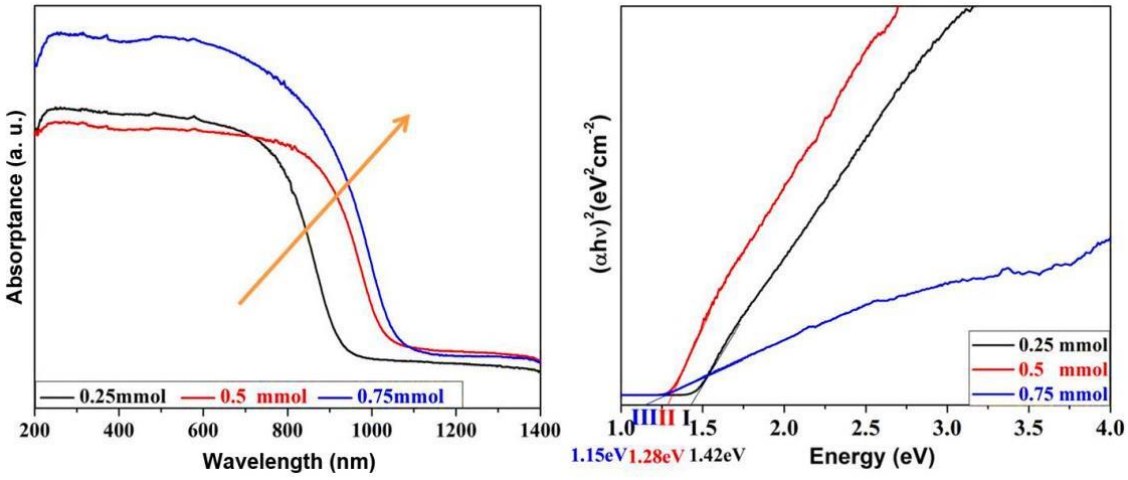

Fig. S4 UV-Vis absorption spectra and the corresponding Tauc fitting plots of prepared at different amounts of SeS_2 as labeled in the figure ($SeS_2/SbCl_3$ ratios = 0.5:1, 1:1 and 1.5:1).

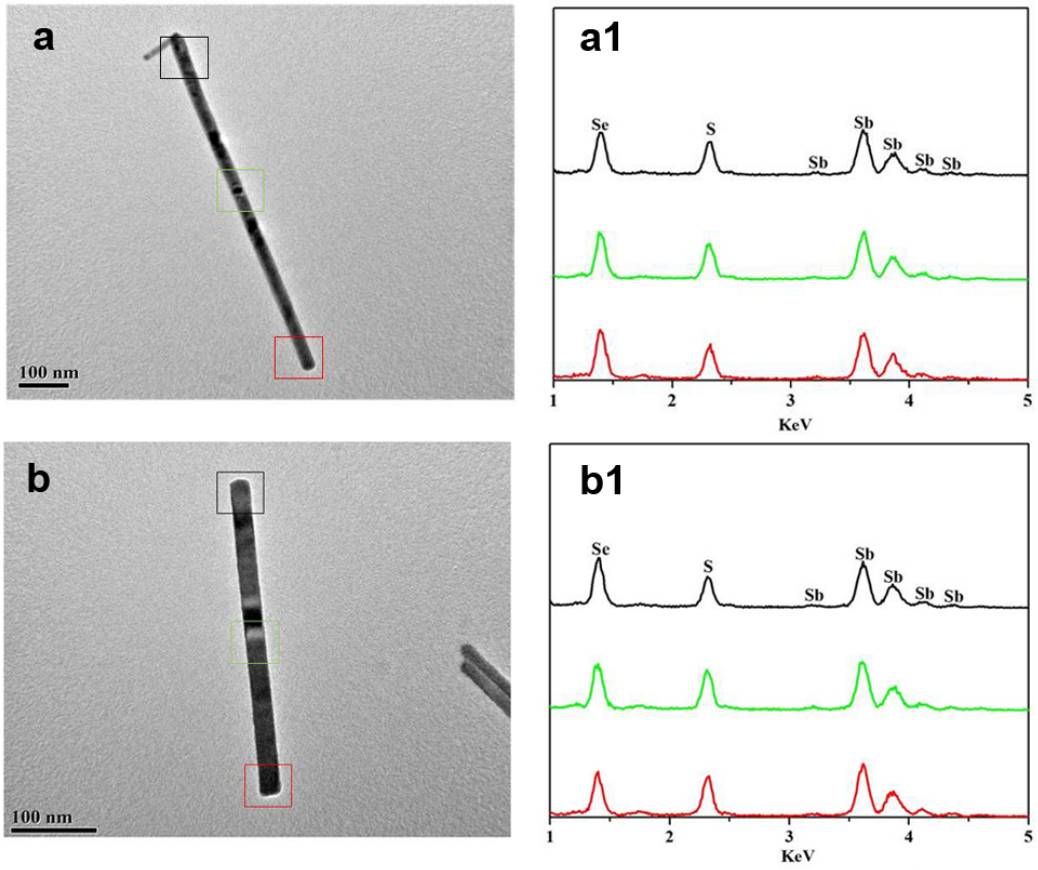

Fig. S5 TEM images and the corresponding EDS spectra of individual Sb–Se–S NRs prepared at 0.5:1 $SeS_2/SbCl_3$ ratio.

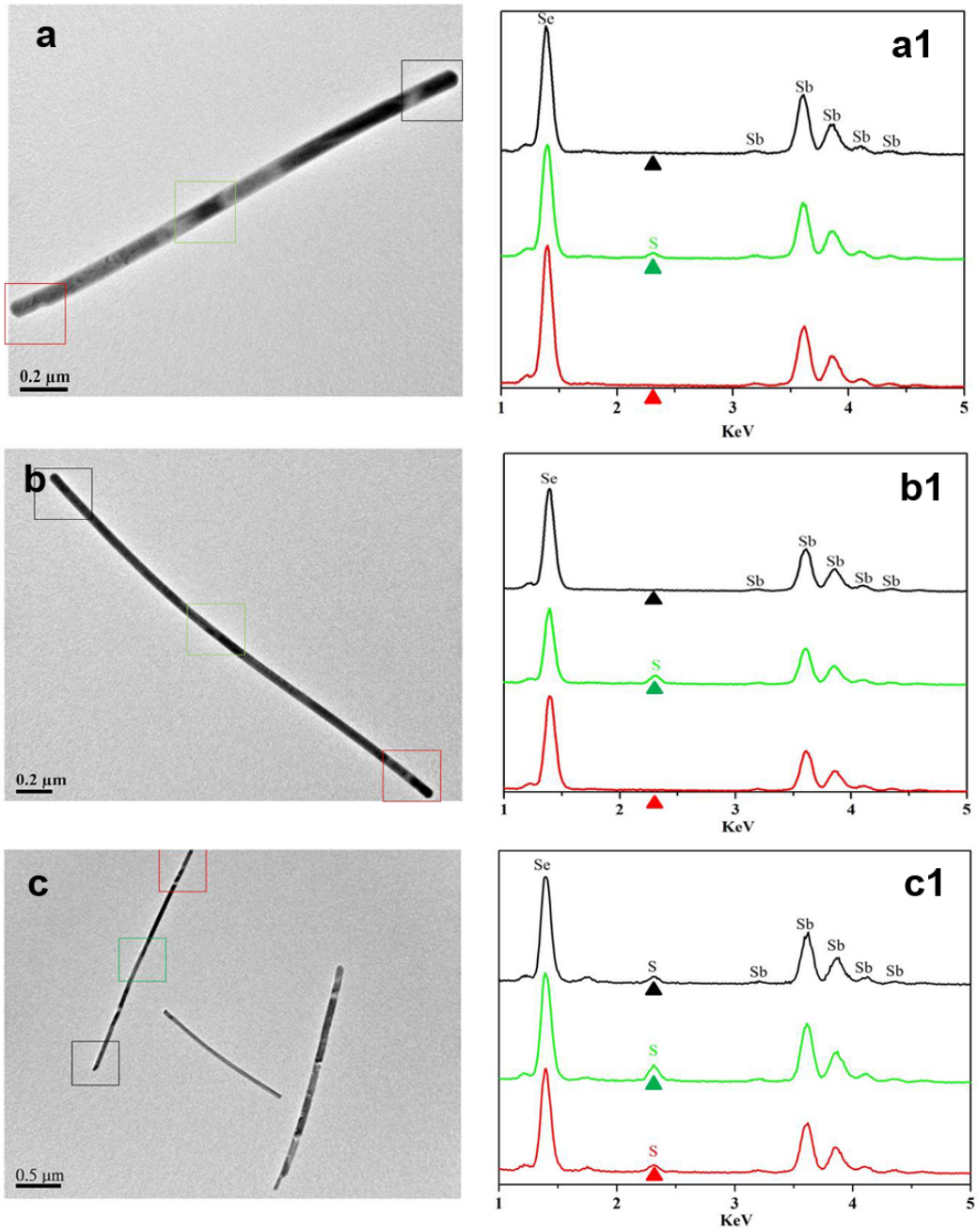

Fig. S6 TEM images and the corresponding EDS spectra of individual Sb–Se–S NRs prepared at 1.5:1 $SeS_2/SbCl_3$ ratio.

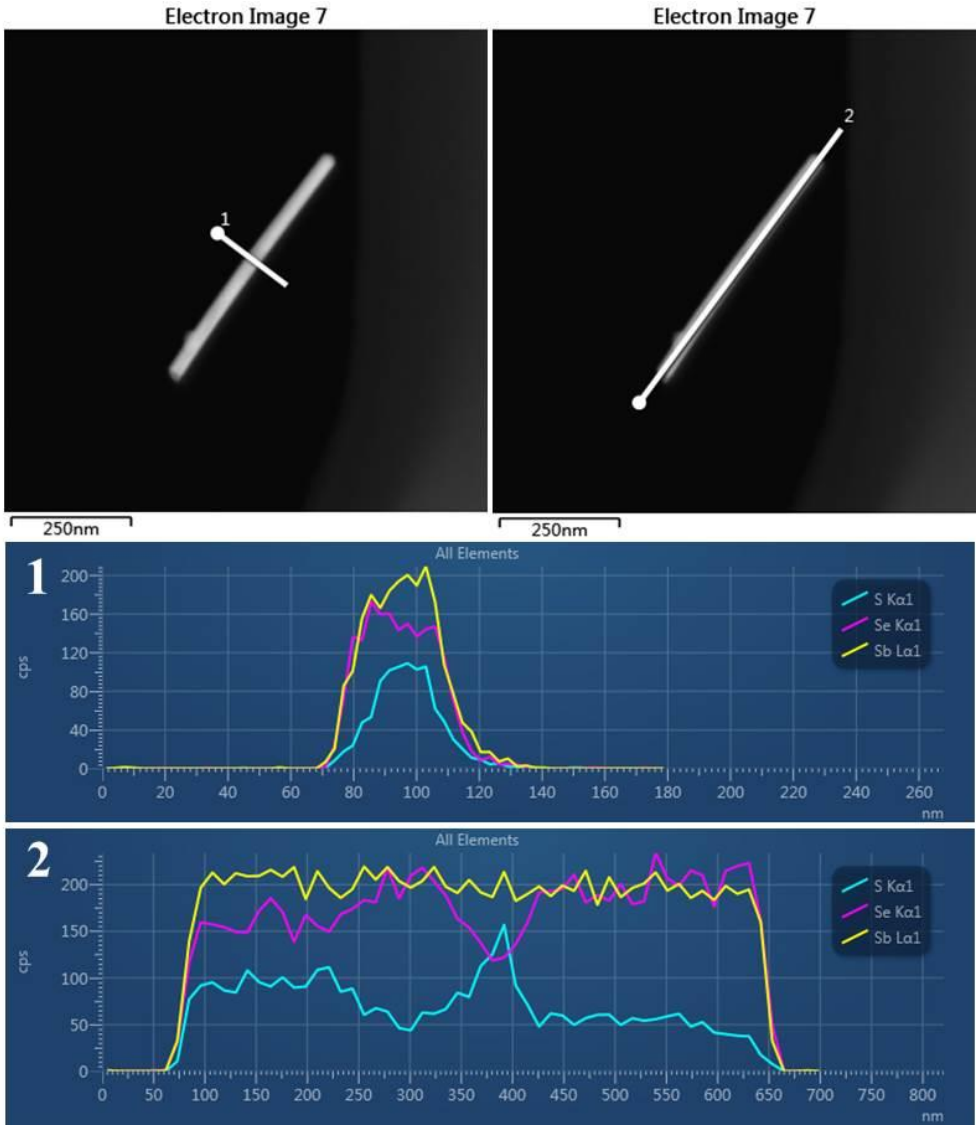

Fig. S7 HAADF-STEM images and EDS line-scan spectra of another Sb–Se–S NR synthesized at 1.5:1 $SeS_2/SbCl_3$ ratio. EDS line-scans were respectively recorded along the transverse and longitudinal directions of the NR marked with Line 1 and 2.

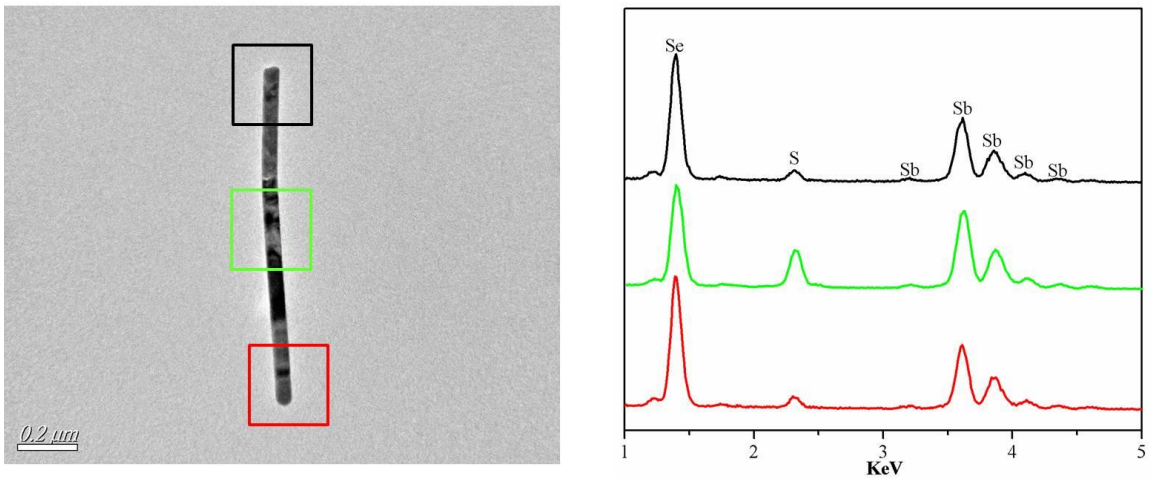

Fig. S8 TEM image and the corresponding EDS spectra of individual Sb–Se–S NR prepared from 1:1 $SeS_2/SbCl_3$ ratio.

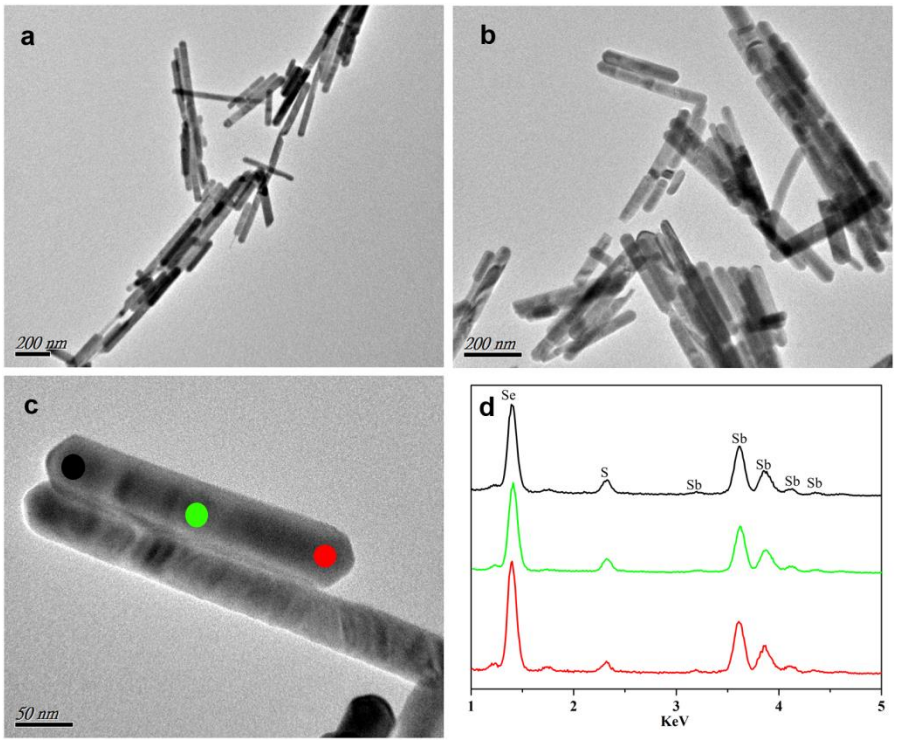

Fig. S9 (a-c) TEM images of NRs collected at the reaction time of 30 min in the synthesis with 1.5:1 $SeS_2/SbCl_3$ ratio; (d) EDS spot-mode analyses recorded on the middle and two ends of the NR (shown in panel c) marked with black, green and red spots.

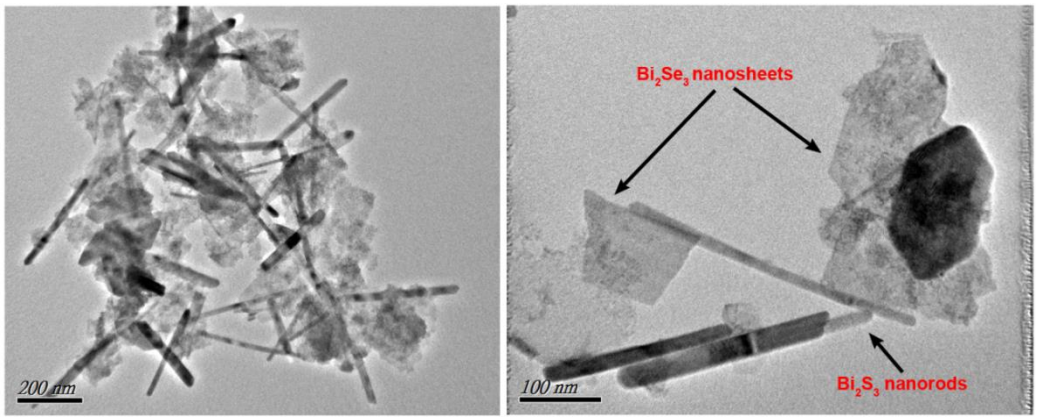

Fig. S10 TEM images of the mixture products of Bi_2S_3 nanorods and Bi_2Se_3 nanosheets, which were prepared by the reaction of $BiCl_3$ with SeS_2 in 10-mL oleylamine at 200 ^oC for 2.5 h.