Electronic Supplementary Information (ESI)

Oleic acid-induced, controllable surface oxidation to enhance the photoresponse performance of Sb_2Se_3 nanorods

Fan Guan[a], Linjie Li[a], Yusong Cui[a], Tingting Wang[a,*], Shaopeng Li[a], Longhua Li[b], Junhao Zhang[c] and Junli Wang[a,*]

[a]*School of Materials Science & Engineering, Jiangsu University, Zhenjiang 212013, PR China. E-mail: wangjl@ujs.edu.cn; tingtingwang12@163.com.*
[b]*School of Chemistry & Chemical Engineering, Jiangsu University, Zhenjiang 212013, PR China*
[c]*School of Environmental and Chemical Engineering, Jiangsu University of Science and Technology, Zhenjiang 212003, PR China*

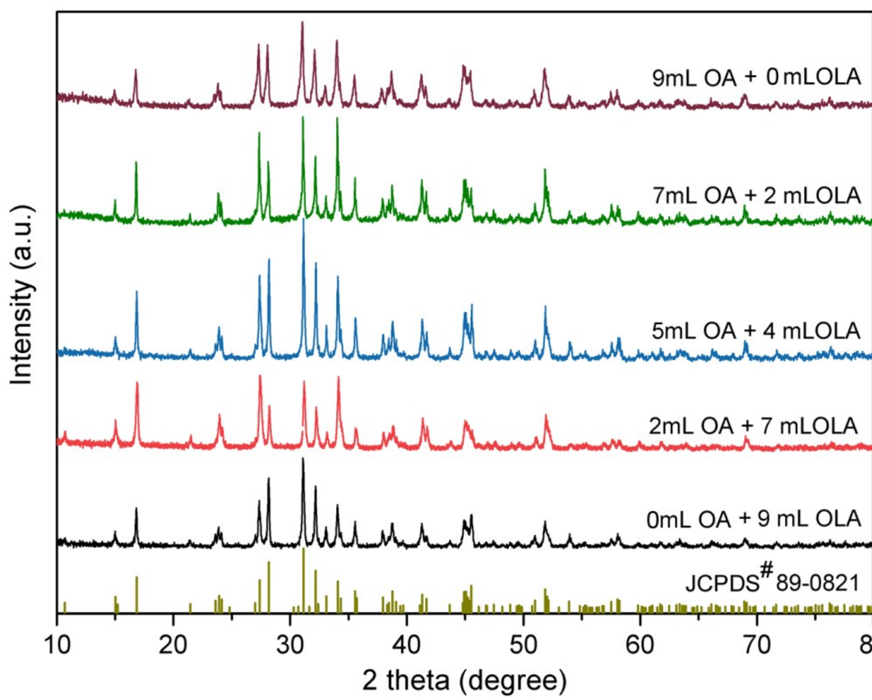

Fig. S1 XRD patterns of Sb_2Se_3 samples synthesized from different volume ratios of oleic acid (OA)/oleylamine (OLA) as labeled in the figure. The standard diffraction lines (JCPDS# 89-0821) are shown at the bottom for clear comparison.

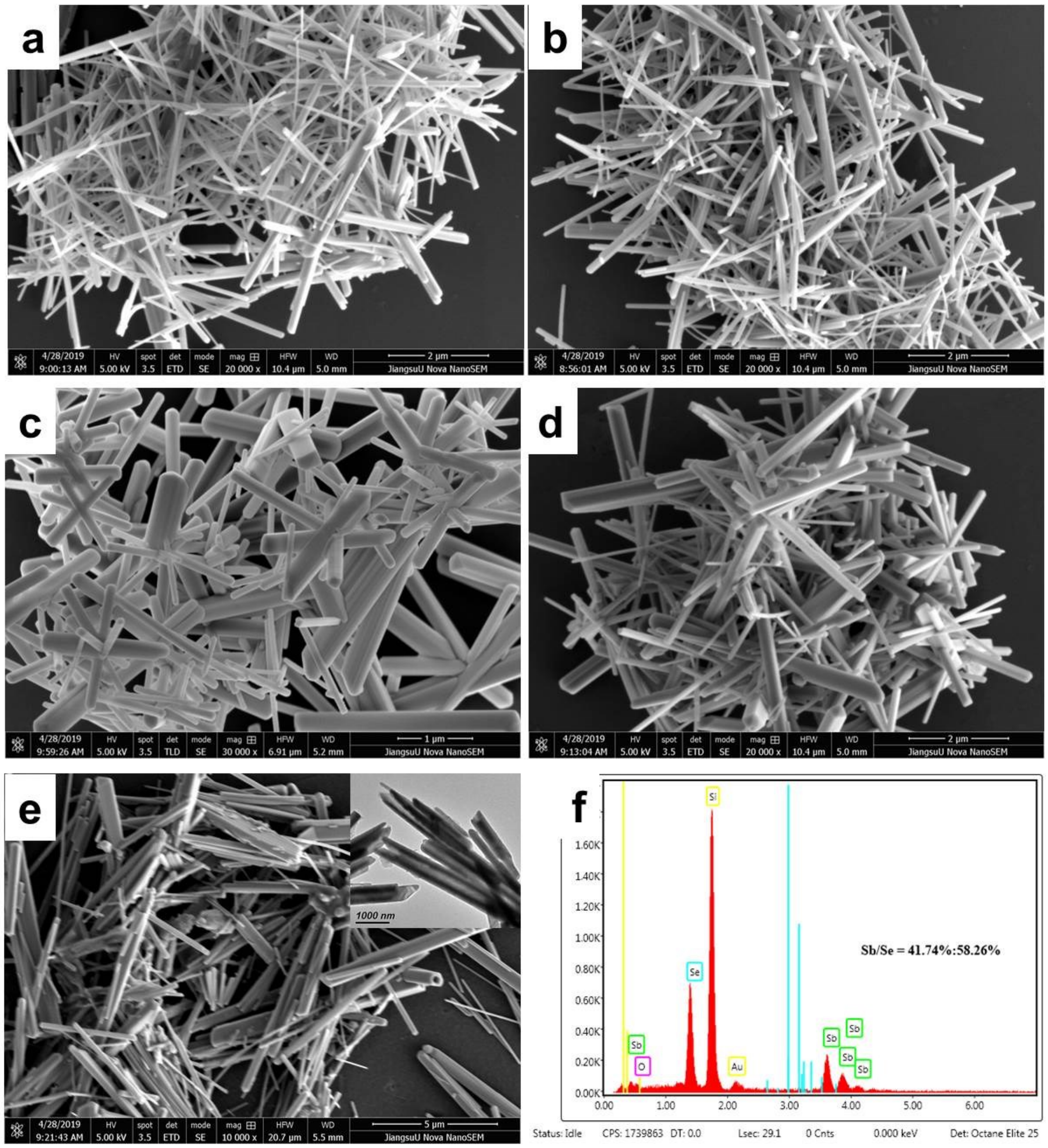

Fig.S2 SEM images of Sb_2Se_3 samples prepared using different OA/OLA volume ratios (the total volume of the solution was kept at 9 mL): (a) 0:9, (b) 2:7, (c) 5:4, (d) 7:2, and (e) 9:0; (f) EDS spectrum of Sb_2Se_3 NRs prepared using 5:4 OA/OLA ratio. Generally, all the samples synthesized in the pure oleylamine or the OA/oleylamine mixture are rod-like while the Sb_2Se_3 sample prepared in pure OA is a mixture of nanorods and nanotubes (panel e and the TEM image inserted).

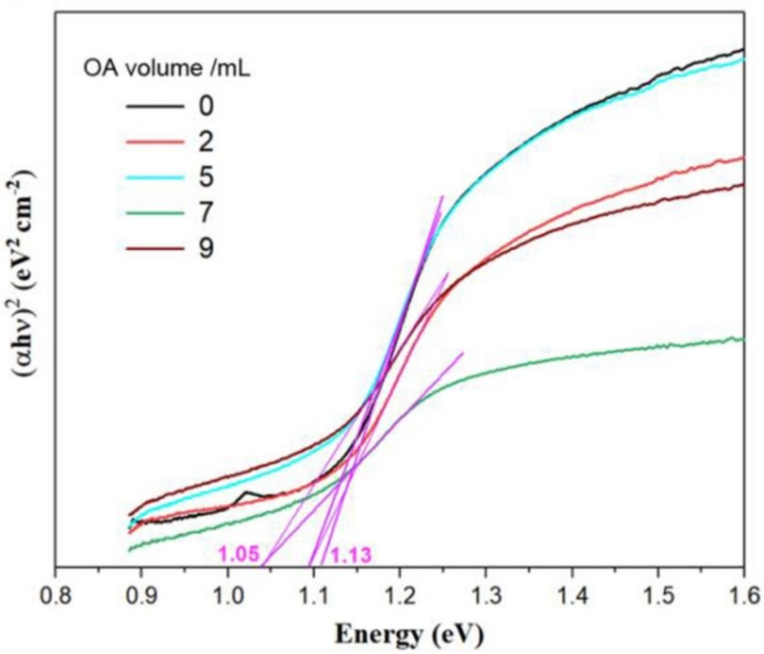

Fig. S3 Tauc fitting plots of UV-visible-NIR absorption spectra for Sb_2Se_3 NRs prepared using different OA/OLA volume ratios.

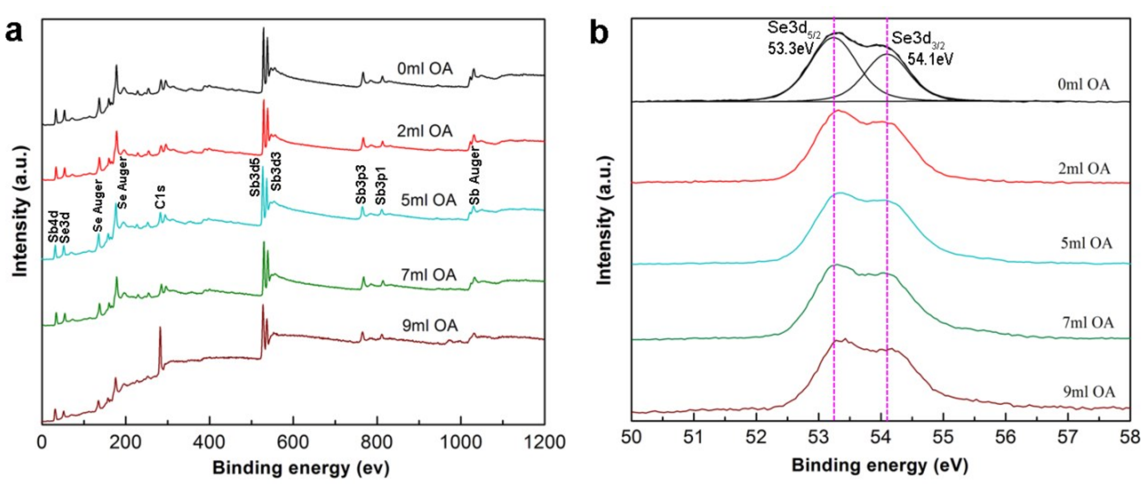

Fig. S4 (a) Survey XPS spectra and (b) High-resolution of Se 3d core-level XPS spectra of Sb_2Se_3 samples prepared using using different OA/OLA volume ratios.

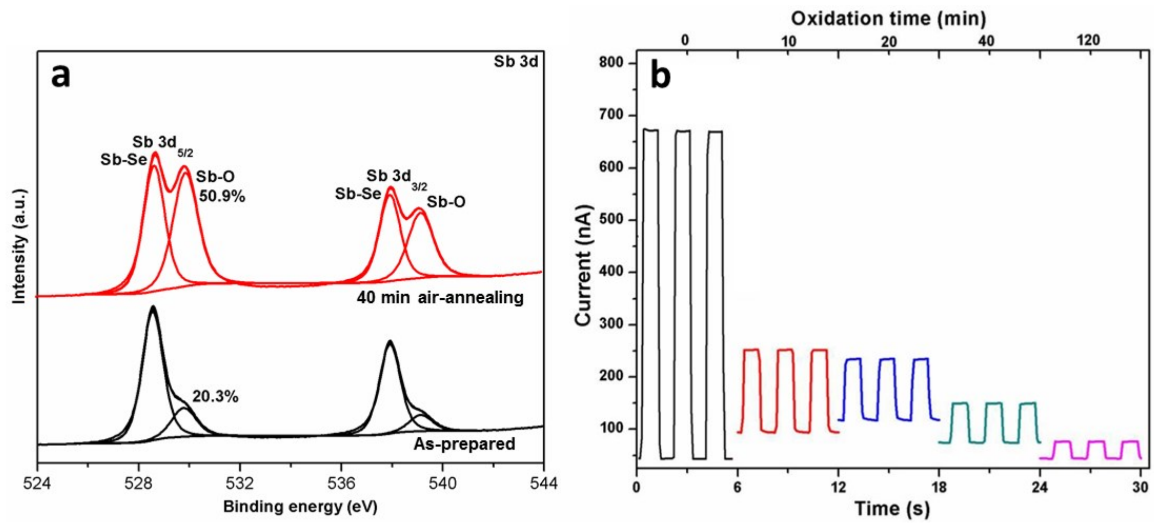

Fig. S5 (a) Sb 3d XPS spectra of as-prepared and 40-min air-annealed Sb_2Se_3 NRs; (b) Photoresponse I–t curves for Sb_2Se_3 NRs with different air-annealing oxidation times at 200 ^{o}C. I–t curves were recorded under white-light illumination at 1 V bias. The Sb_2Se_3 NRs were prepared at 5:4 OA/OLA volume ratio.

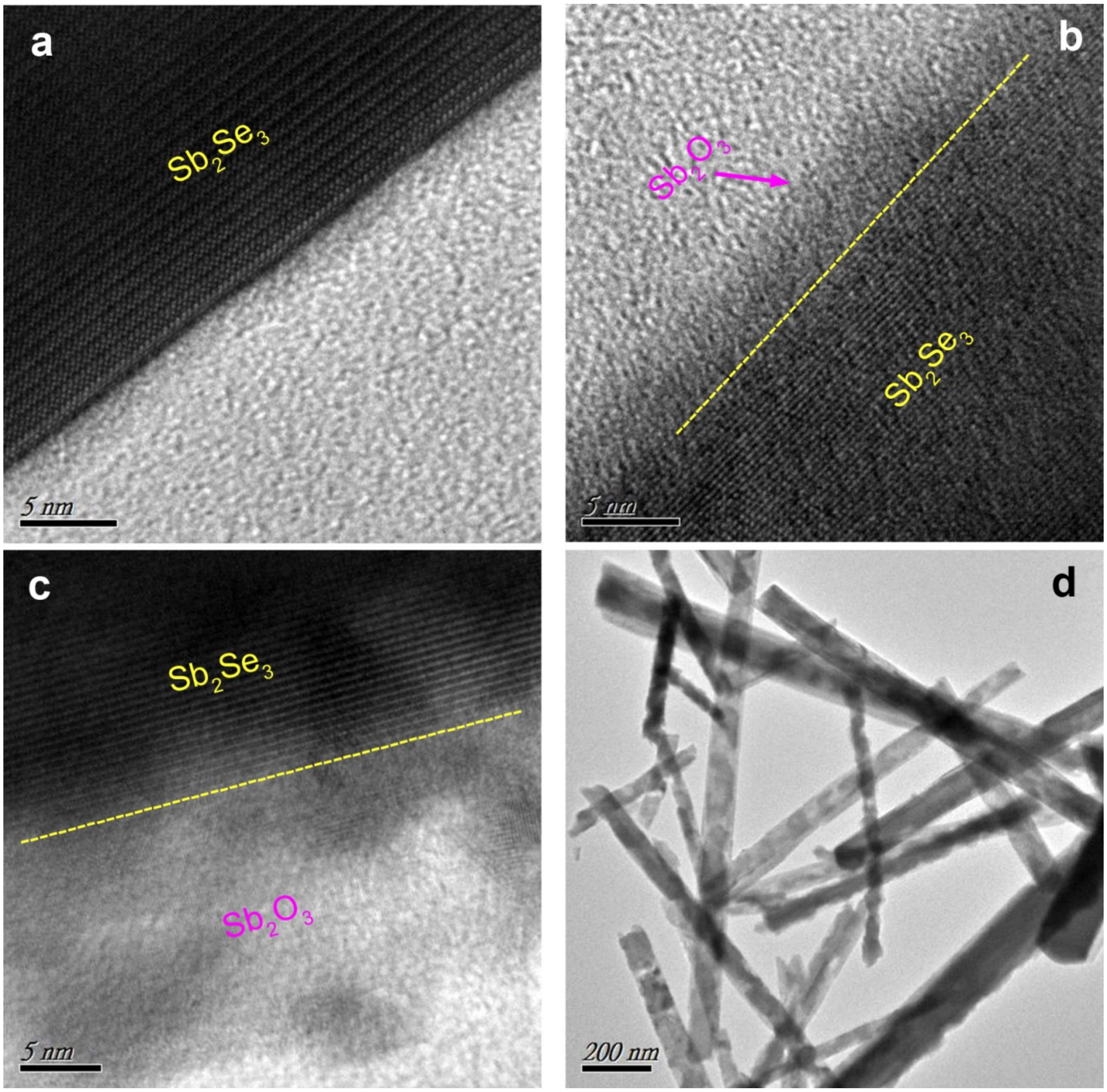

Fig. S6 (a–c) HRTEM images of Sb_2Se_3 NRs with different air-annealing times at 200 ^{o}C: (a) 0 min, (b) 40 min and (c) 2 h; an increase of the surface oxidation level or the formation of a surface oxide layer is clearly observed with the increase of air-annealing time. (d) TEM image of Sb_2Se_3 NRs obtained after 2 h air-annealing, showing some of the NRs begin to decompose. The Sb_2Se_3 NRs were prepared at 5:4 OA/OLA volume ratio.