Supporting Information

Ultrasmall Single-Crystal Indium Antimonide Nanowires

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Experimental Section

1. Material synthesis

InSb nanowires were synthesized on oxidized silicon substrates (600 nm oxide) or InSb (100) substrates in a home-built chemical vapor deposition (CVD) system using In ingot (Alfa Aesar, 99.999%) and Sb powder (Alfa Aesar, 99.999%) as In and Sb sources, respectively. The CVD system features a three-heating-zone tube furnace, as shown in **Figure 1**. The In and Sb sources were placed at upstream, zone A and B, and the source temperatures were separately set to control the In and Sb vapor pressure and thereby the relative ratio of group V and III precursors. Gold colloidal nanoparticles with different sizes (30 nm, 20 nm, 10 nm, 5 nm), were deposited on the substrates and used as catalyst to control the diameter of InSb nanowires. The growth substrate coated with gold nanoparticles was placed in downstream, zone C, with the growth temperature in a range from 400 to 480 °C. The nanowire syntheses were carried out at 150 torr, hydrogen (100 sccm) was used as carrier gas and the typical growth time is 1 hour.

2. Material characterization

Scanning electron microscopy (SEM) images were collected in a Zeiss Ultra 60 field emission SEM. Nanowires were dispersed in ethanol solution and then transferred onto Cu/lacey-carbon transmission electron microscopy (TEM) grids. TEM images were collected in a FEI monochromated F20 UT Technai TEM operated under 200 kV. Electron Energy Loss Spectroscopy (EELS) spectra were collected by the Technai system in scanning TEM mode. Raman spectra were recorded with a Jobin-Yvon HR800 micro-Raman set-up with 1 cm^{-1} resolution, a 50x objective lens and a 633 nm laser excitation beam at 6 mW.

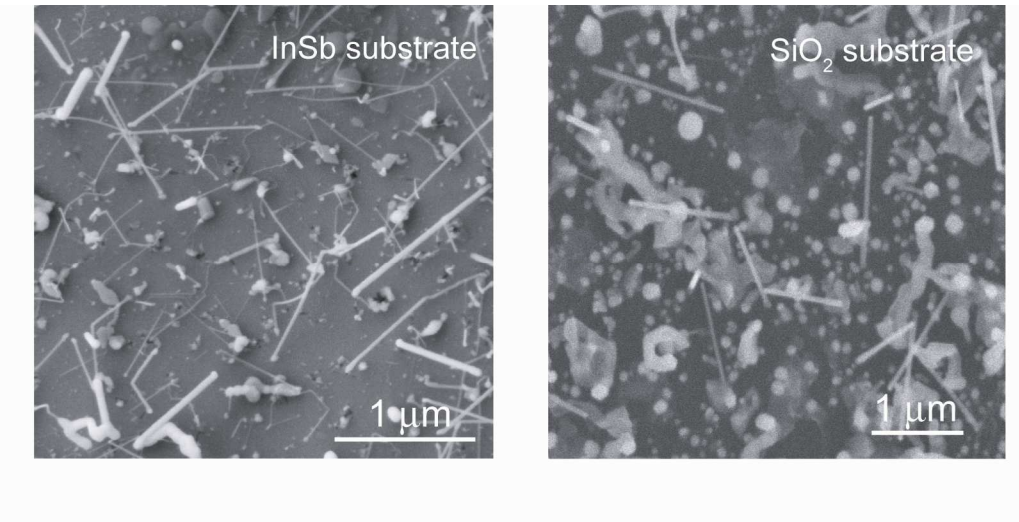

Figure S1. SEM images of InSb nanowires obtained on InSb(100) and SiO_2 substrates in hydrogen at III/V vapor pressure of 1:1, with substrate temperature of 400 ºC.

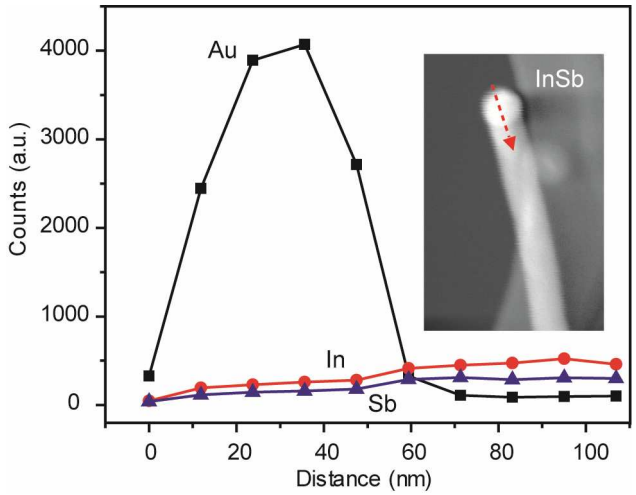

Figure S2. Energy dispersive X-ray spectroscopy line profiles for Au (black symbols), In (red symbols), and Sb (blue symbols), respectively, recorded along the red dashed arrow indicated in inset. Inset: Corresponding dark-field scanning TEM image of an InSb nanowire.

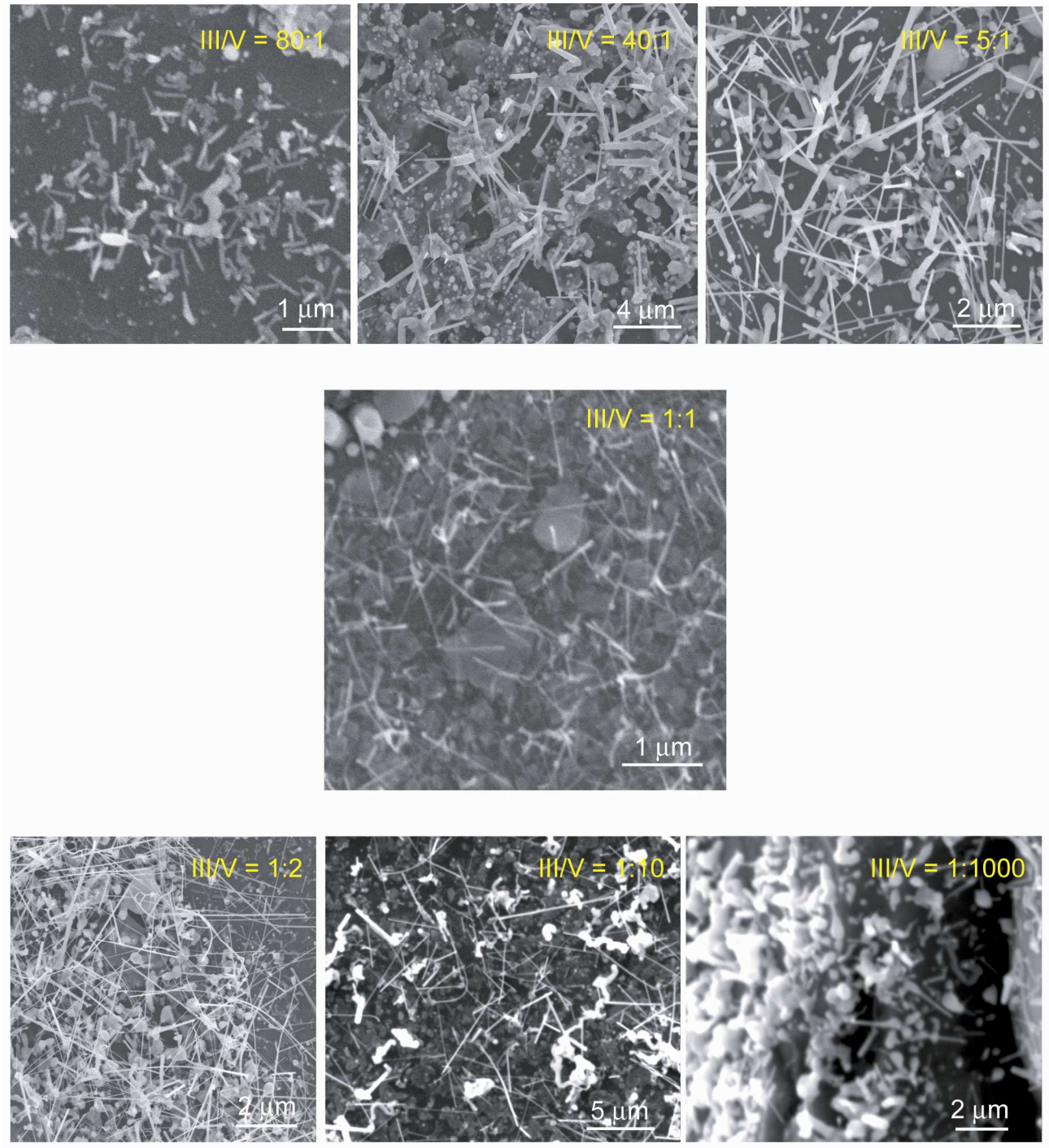

Figure S3. SEM images InSb nanowires obtained on SiO_2 substrates in hydrogen atmosphere at different III/V vapor pressures (temperature). The substrate temperatures were 400 ºC. The In source temperature were fixed at 900 ºC and the Sb source temperature vary from 410 ºC to 600 ºC.

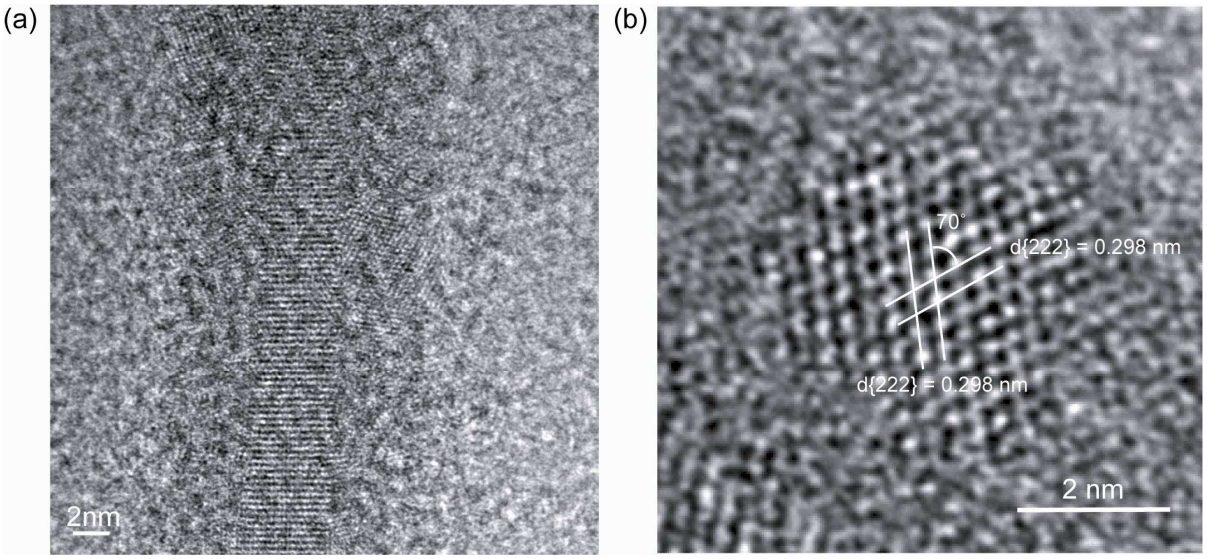

Figure S4. (a) Lattice-resolved TEM image of a 4.5 nm diameter InSb nanowire after exposing to high energy electron beam. We observed that the amorphous layer turns into polycrystalline quantum structures. (b) TEM image of the quantum structure on nanowire surface in (a). The lattice spacing of two sets of lattice planes are measured to be 0.298 nm (highlighted by white lines), with an interplanar angle of 70 degree. The lattice spacing and the angle are consistent with the d-spacing and the angle of between {222} planes of antimony oxide Sb_6O_{13}. These results suggest that the formed crystalline structures are Sb_6O_{13}.

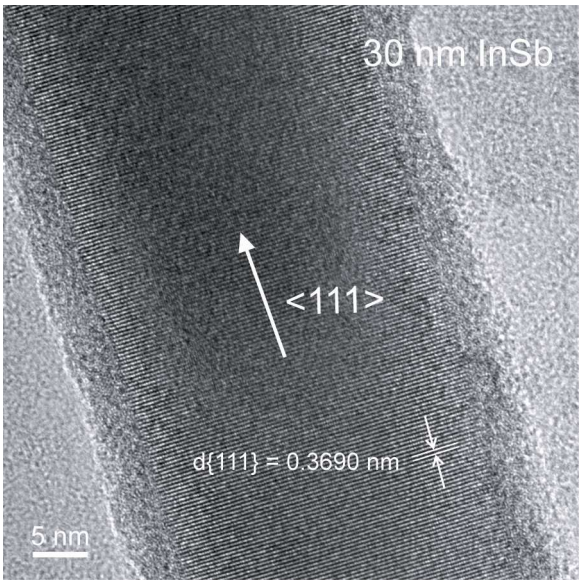

Figure S5. Lattice-resolved TEM images of a 30 nm diameter InSb nanowire. The white lines indicate the measured d-spacing, and the white arrow highlights the <111> growth direction.