Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Chemically-initiated nucleation and growth of InSb quantum dots

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Scherrer analysis of the XRD reflections of InSb in Fig. 1 was performed using $x = K\lambda/(\beta\cos\theta)$, where *x* is the crystallite size, *K* is a shape factor (for simplicity set to unity but could vary with the shape of the QD), λ is the X-ray wavelength (0.154 nm for Cu Kα), β is the FWHM of the reflection in radians, and θ is the Bragg angle. Averaging the three main peaks leads to a crystal size of 16 nm.

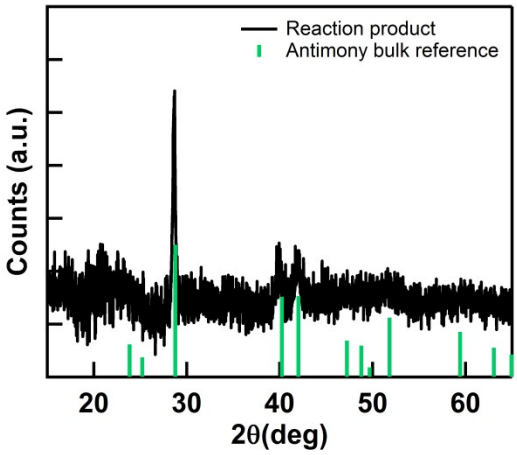
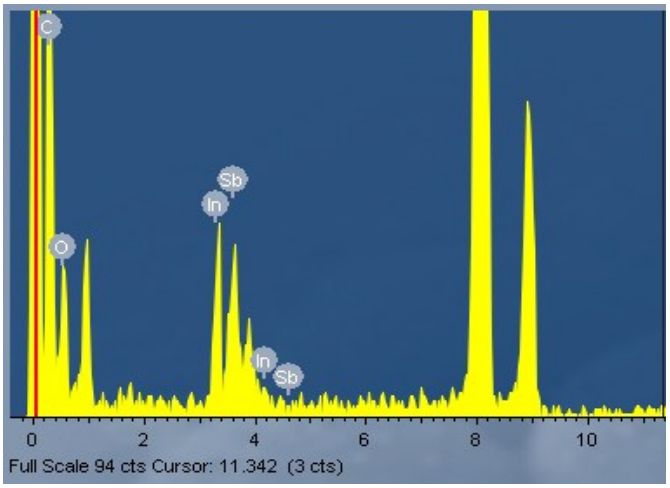


Figure S1. X-Ray diffraction pattern of the reaction product using BuLi and $Sb(NMe_2)_3$ indicating formation of antimony.



Element	Peak Area	Area Sigma	k factor	Abs Corrn.	Weight%	Weight% Sigma	Atomic%
In L	441	54	0.000	1.000	53.00	4.79	54.46
Sb L	358	53	0.000	1.000	47.00	4.79	45.54
Totals					100.00		

Figure S2. EDX spectra and table of the elemental ratio of the particles shown in Fig. 2.

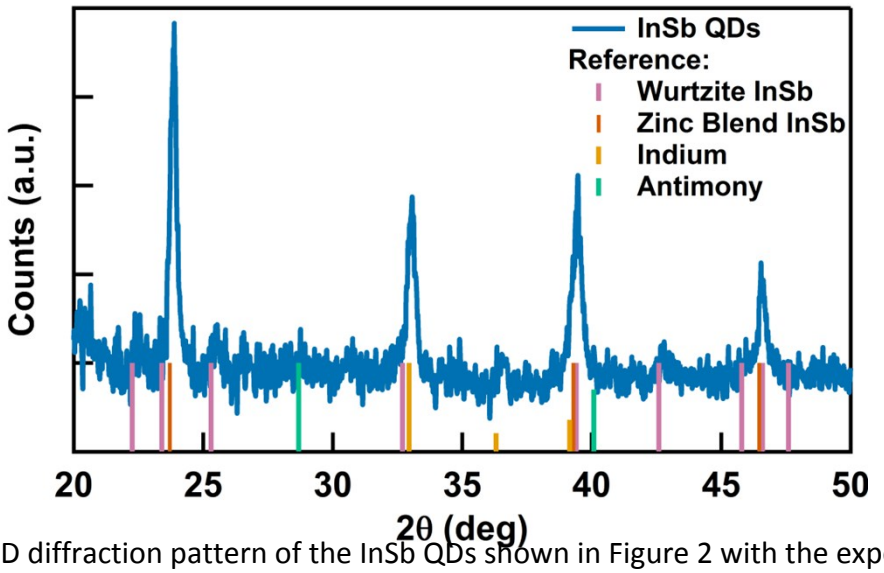


Figure S3. XRD diffraction pattern of the InSb QDs shown in Figure 2 with the expected reflections for In, Sb, wurtzite and zinc InSb shown as vertical bars. The pattern most closely matches wurtzite InSb.

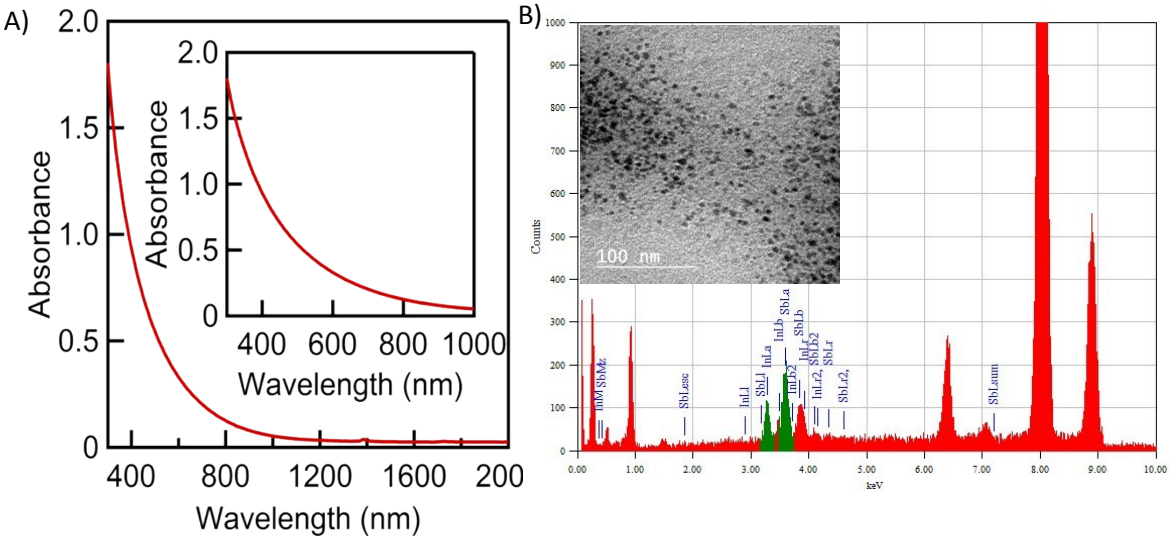


Figure S4. A) Featureless absorption at higher injection temperature of 200°C. Inset: zoom-in around 600nm. B) EDX spectral showing an In:Sb ratio of 1:2 and a broad size distribution (inset)

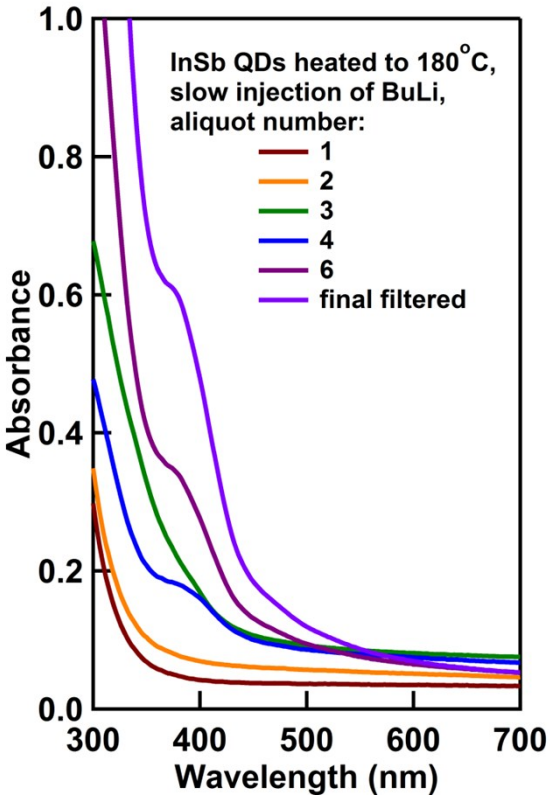


Figure S5. Absorption spectra of InSb QDs grown by stepwise injection of BuLi in 1 molar equivalents for aliquots 1-3 and 2 molar equivalents in aliquots 4-6. Note: aliquot 5 is not shown because it was exposed to air which lead to oxidation of the particles as indicated by the solution turning silver-coloured and the particles precipitating.

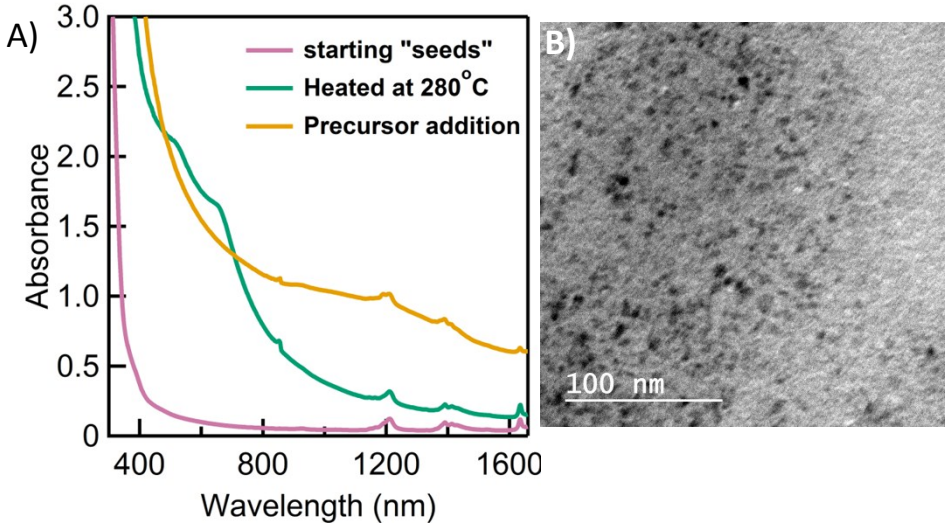


Figure S6. A) Absorption spectra of InSb seeds gown by injecting butylithium and $Sb(NMe_2)_3$ to ODE and In-oleate (pink trace). After filtering and heating to 280 °C the seeds grow in size as indicated by the redshift of the absorption spectra (green trace). Adding additional precursors ($In(N(TMS_3)_2)_3$ and $Sb(NMe_2)_3$) again leads to growth of the nanocrystals (gold trace). B) TEM image of solvent annealed QDs with an average size of 4.6 nm and standard deviation of 0.8 nm.

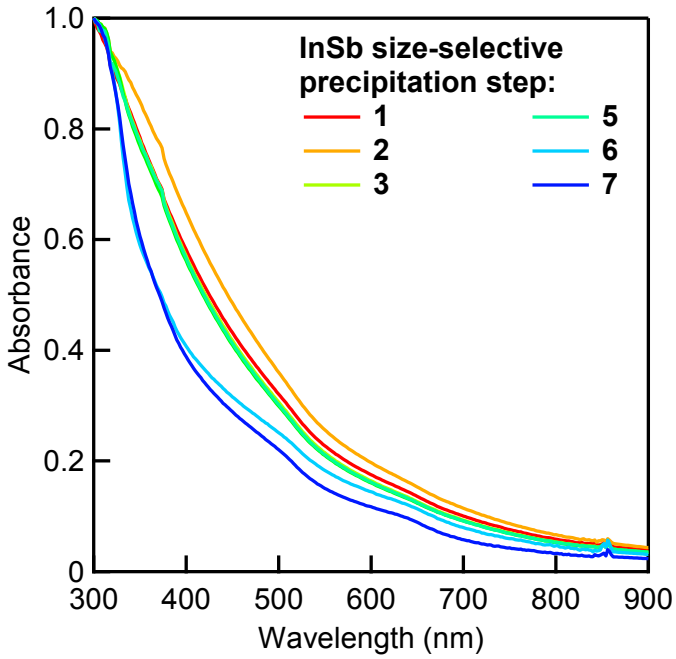


Figure S7. Size-selective precipitation of InSb particles with slight sharpening of the excitonic peak but still retaining broad peaks indicates are intrinsically broad for a specific size.

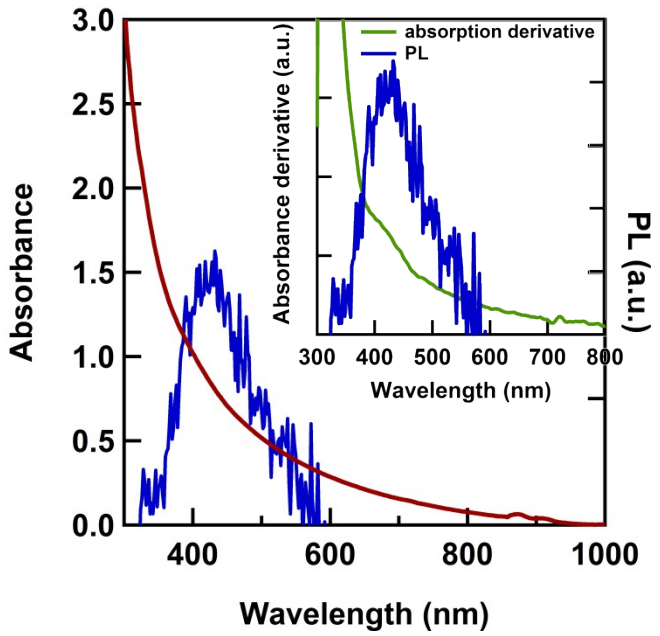


Figure S8. Photoluminescence (blue trace) and absorbance (red trace) spectra of InSb QDs. The derivative of the absorbance is shown in the inset (green trace) with a feature that matches the PL wavelength again shown in the blue trace.

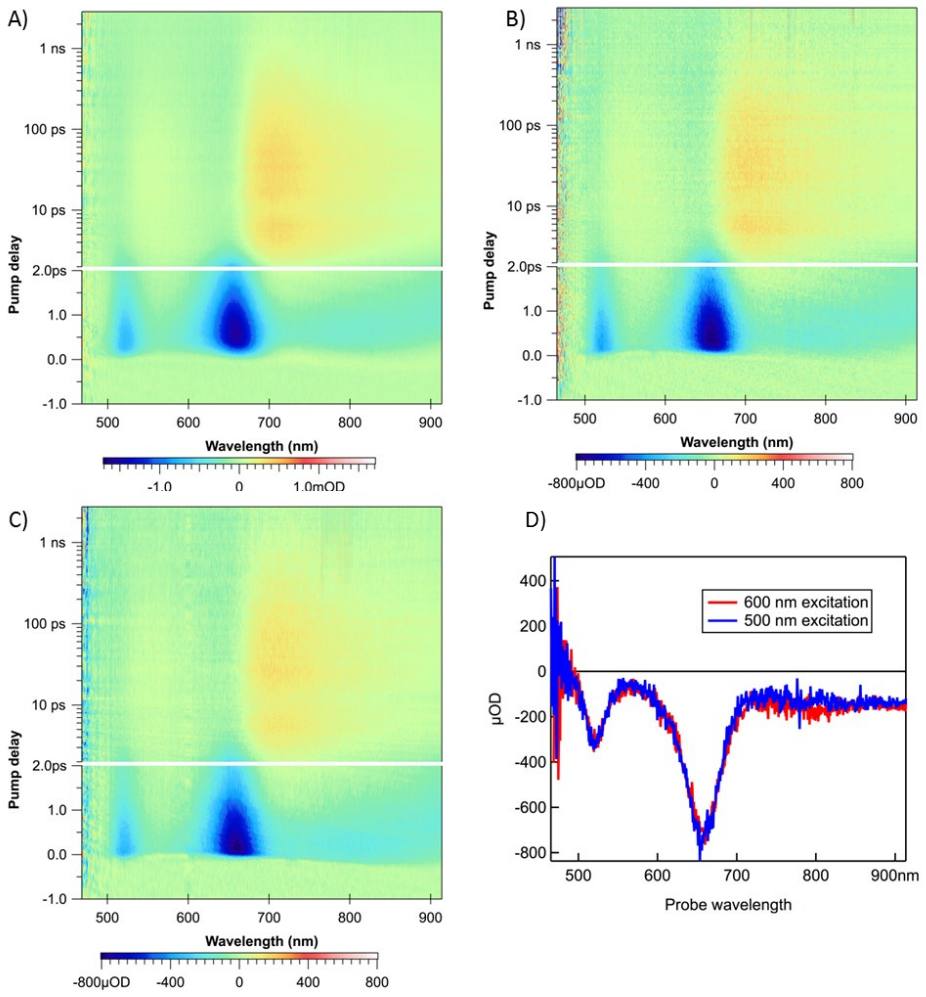


Figure S9. TA colormaps of InSb QDs excited at A) 400nm, B) 500 nm, and C) 600 nm that show similar spectral features indicating the feat at 510 nm is not a separate size population of QDs. D) Temporal cuts for 500 nm and 600 nm excitation more clearly showing identical spectral features exciting above and below the energy of the 510 nm feature.

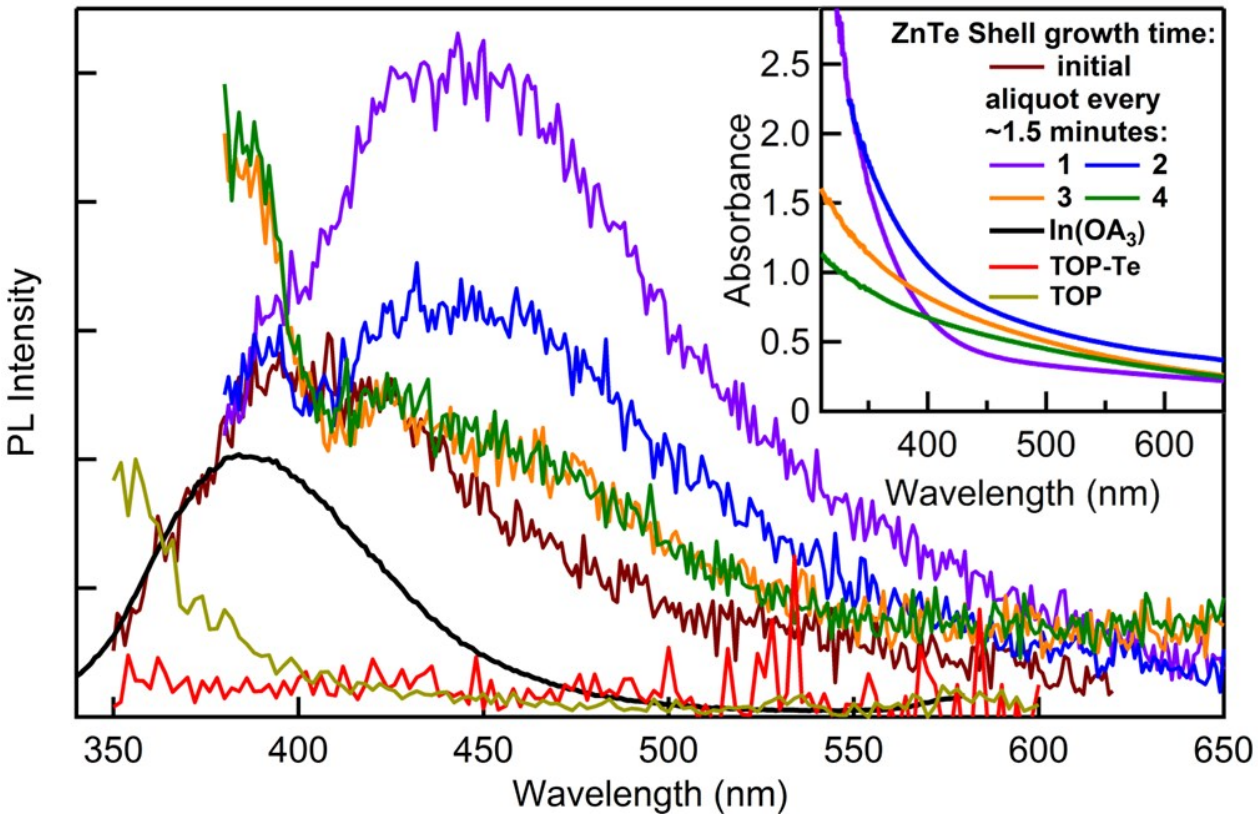


Figure S10. Photoluminescence spectra of starting InSb QDs (red trace) that closely matched the PL of In-oleate indicating there is no efficient PL form the QDs but upon addition of Zn-stearate and TOP-Te to grow a ZnTe shell, the PL redshifts and increases before disappearing again. Inset: Absorption spectra of InSb QDs during the ZnTe shelling process.

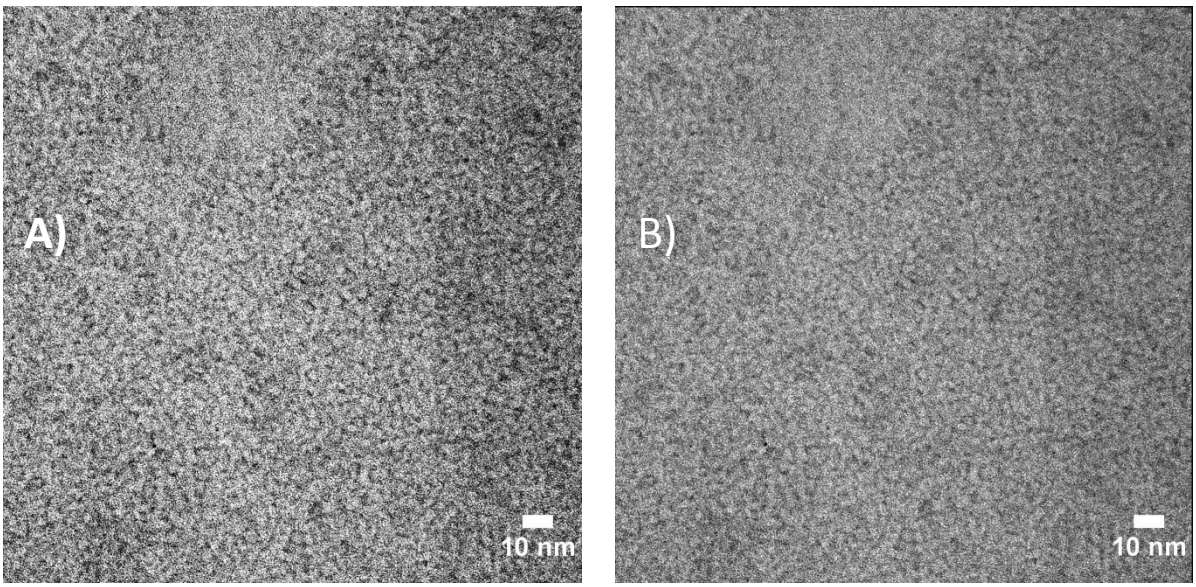


Figure S11. A) Contrast enhanced TEM image shown in Figure 2 and B) original image.