



# Self-Catalyzed InSb/InAs Quantum Dot Nanowires

Omer Arif <sup>1</sup>, Valentina Zannier <sup>1,\*</sup>, Francesca Rossi <sup>2</sup>, Daniele Ercolani <sup>1</sup>, Fabio Beltram <sup>1</sup> and Lucia Sorba <sup>1</sup>

<sup>1</sup> NEST, Istituto Nanoscienze—CNR and Scuola Normale Superiore, Piazza San Silvestro 12, I-56127 Pisa, Italy; omer.arif@sns.it (O.A.); daniele.ercolani@sns.it (D.E.); fabio.beltram@sns.it (F.B.); lucia.sorba@nano.cnr.it (L.S.)

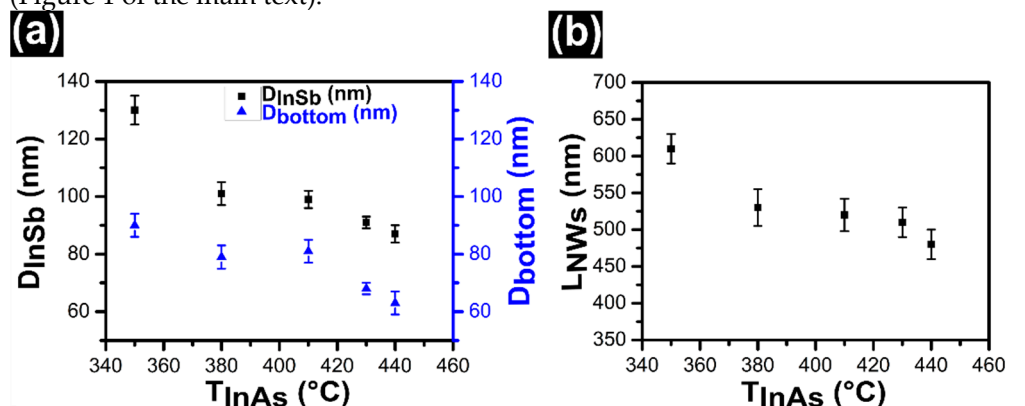
<sup>2</sup> IMEM—CNR, Parco Area delle Scienze 37/A, I-43124 Parma, Italy; francesca.rossi@imem.cnr.it

\* Correspondence: valentina.zannier@nano.cnr.it; Tel.: +39-050-509-123(474)

In order to measure the geometrical parameters, the nanowires (NWs) were mechanically transferred from the as-grown substrates onto a Si substrate and 90° projection SEM images were performed. We measured the following quantities for each sample (averaged over ~ 25 NWs): the length ( $L_{QD}$ ) and the diameter ( $D_{QD}$ ) of the InSb QD, the diameter of the NWs specifically around InSb QD ( $D_{InSb}$ ), the NW total length ( $L_{NWs}$ ), and its base diameter ( $D_{bottom}$ ), the base radius ( $R$ ), the height ( $H$ ), and contact angle ( $\beta$ ) of the nanoparticle (NP) on top of the NWs. In the case of InAs/InSb NWs (without InAs top segment), the measured values of  $D_{InSb}$ ,  $D_{bottom}$ , and  $L_{NWs}$  were  $70 \pm 4$  nm,  $50 \pm 4$  nm, and  $400 \pm 21$  nm, respectively. These values are applicable for all the samples of the series.

## S1. InAs Temperature Series

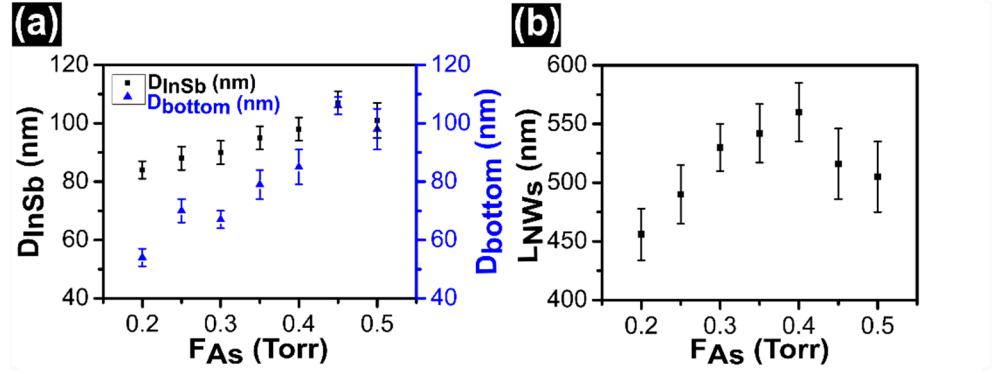
In Figure S1, we show the plots of  $D_{InSb}$ ,  $D_{bottom}$  and  $L_{NWs}$  as a function of  $T_{InAs}$  for the series of the sample in which we varied only the growth temperature of InAs top segment (Figure 1 of the main text).



**Figure S1.** (a) Evolution of the diameter of the NW around the InSb QD and at the bottom versus  $T_{InAs}$ . (b) Evolution of total length of NWs ( $L_{NWs}$ ) as a function of  $T_{InAs}$ . The symbols represent an average value of each sample obtained by measuring ~ 25 NWs and error bars represent the standard deviation of the average. .

## S2. As Line Pressure Series

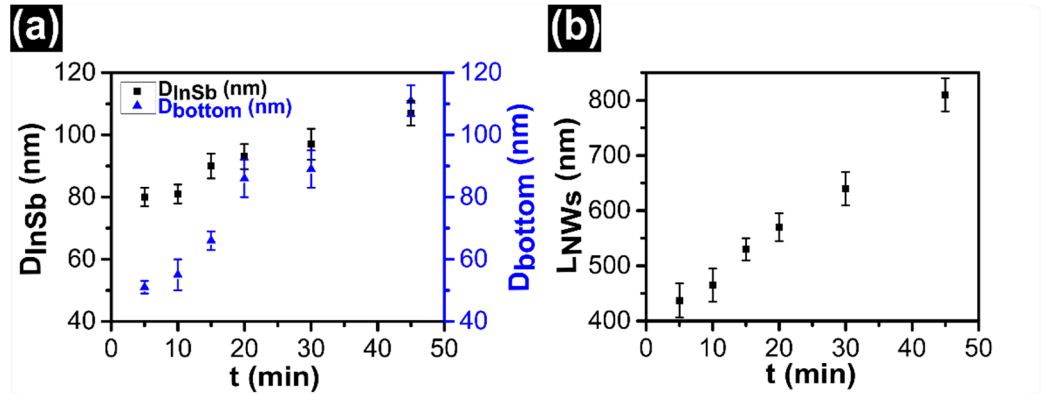
In Figure S2, we show the plots of  $D_{InSb}$ ,  $D_{bottom}$  and  $L_{NWs}$  as a function of As line pressure  $F_{As}$  for the series of the sample in which we varied only the As line pressure during the growth of InAs top segment (Figure 2 of the main text).



**Figure S2.** Morphological parameters of InSb/InAs QD NWs, obtained with fixed In line pressure  $F_{\text{In}} = 0.30$  Torr, growth time 15 min at  $T_{\text{InAs}} = 440$  °C, while  $F_{\text{As}}$  varies from 0.20 Torr to 0.50 Torr, (a) Expansion of NW diameter at the InSb QD position and at the bottom of NWs versus  $F_{\text{As}}$ . (b) Evolution of total length of NWs ( $L_{\text{NWs}}$ ) as a function of  $F_{\text{As}}$ . The symbols represent an average value of each sample obtained by measuring  $\sim 25$  NWs and error bars represent the standard deviation of the average.

### S3. Time Series

In Figure S3, we show the plots of  $D_{\text{InSb}}$ ,  $D_{\text{bottom}}$ , and  $L_{\text{NWs}}$  as a function of InAs growth time for the series of the sample in which we varied only the growth time of InAs top segment (Figure 3 of the main text).



**Figure S3.** Morphological parameters of InSb/InAs QD NWs, obtained with fixed line pressures  $F_{\text{In}} = 0.30$  Torr,  $F_{\text{As}} = 0.30$  Torr, at  $T_{\text{InAs}} = 440$  °C, while the growth time of top InAs segments varies from 5 min to 45 min. (a) Expansion of the NW diameter around the InSb QD and at the bottom of NWs as a function of growth time. (b) Evolution of total length of NWs as a function of growth time. The symbols represent an average value of each sample obtained by measuring  $\sim 25$  NWs and error bars represent the standard deviation of the average.