Supplementary information

Growth and optical properties of axial hybrid III-V/Si nanowires

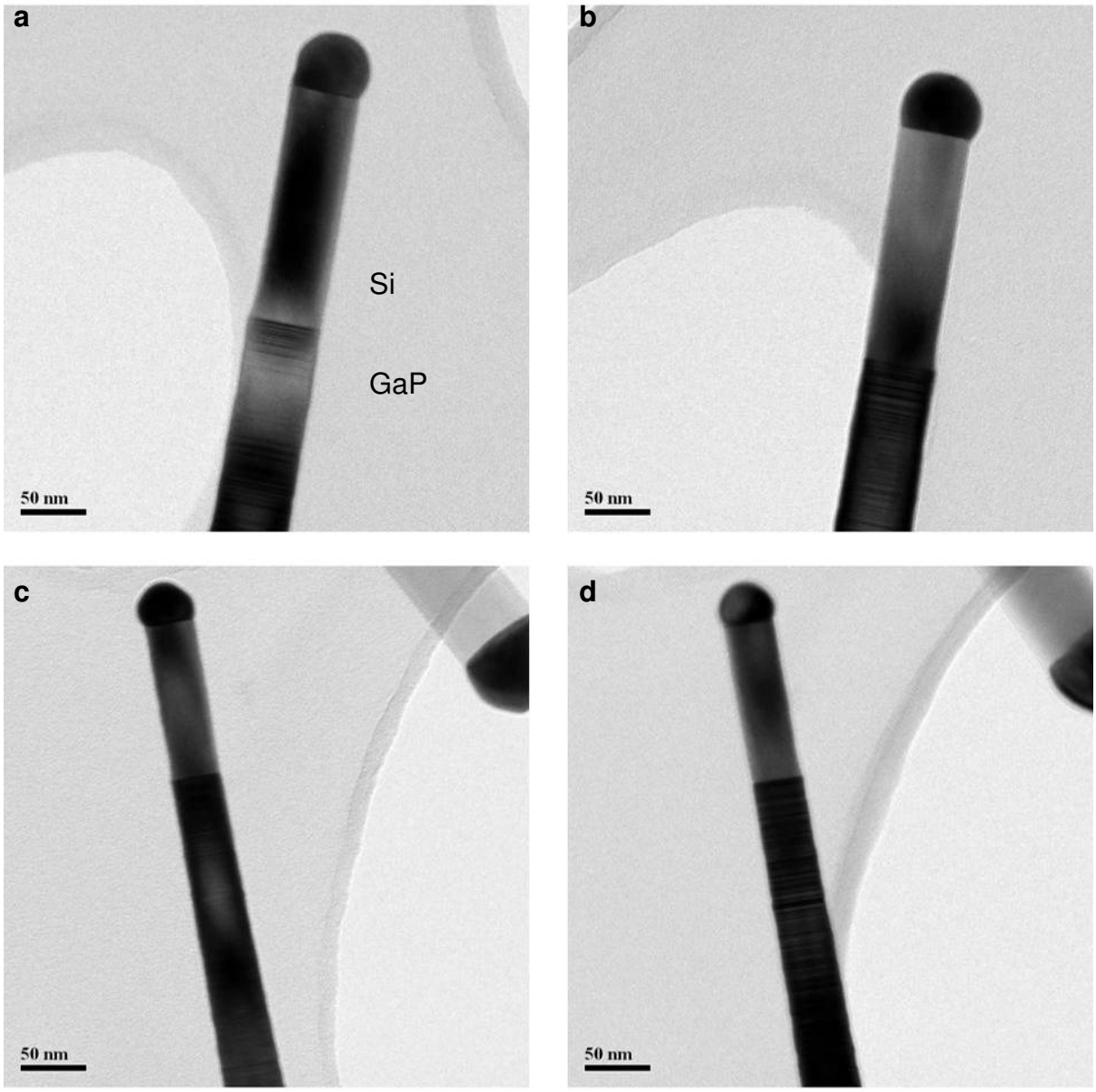
Moïra Hocevar[1], George Immink[2], Marcel Verheijen[2,3], Nika Akopian[1], Val Zwiller[1], Leo Kouwenhoven[1] and Erik Bakkers[1,3,*]

[1]*Kavli Institute of Nanoscience, Delft University of Technology, 2628CJ Delft, the Netherlands*

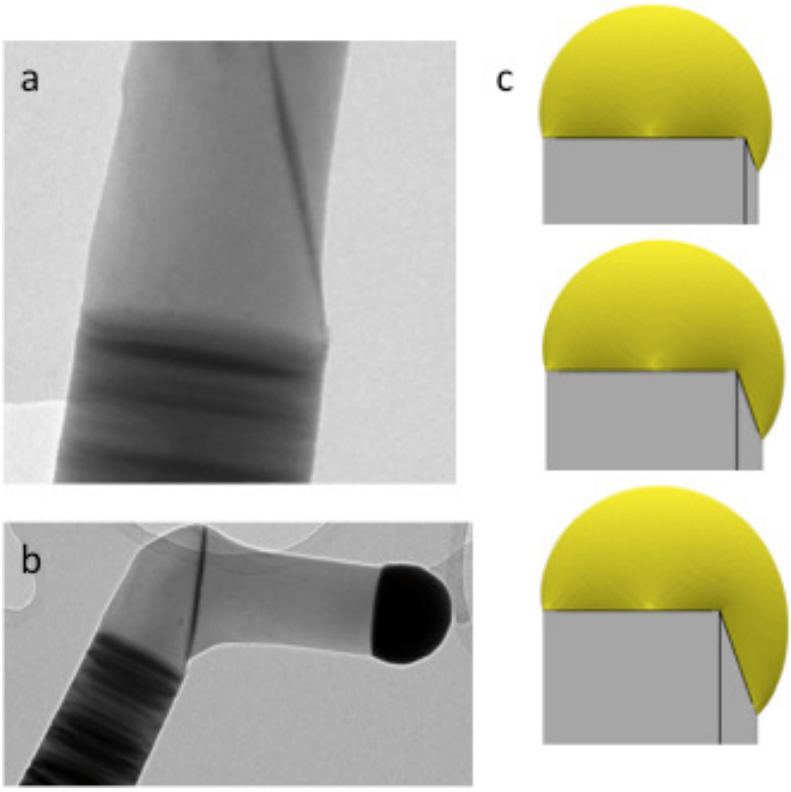
[2]*Philips Innovation Services Eindhoven, High Tech Campus 11, 5656AE Eindhoven, the Netherlands*

[3]*Department of Applied Physics, Eindhoven University of Technology, 5600 MB Eindhoven, the Netherlands*

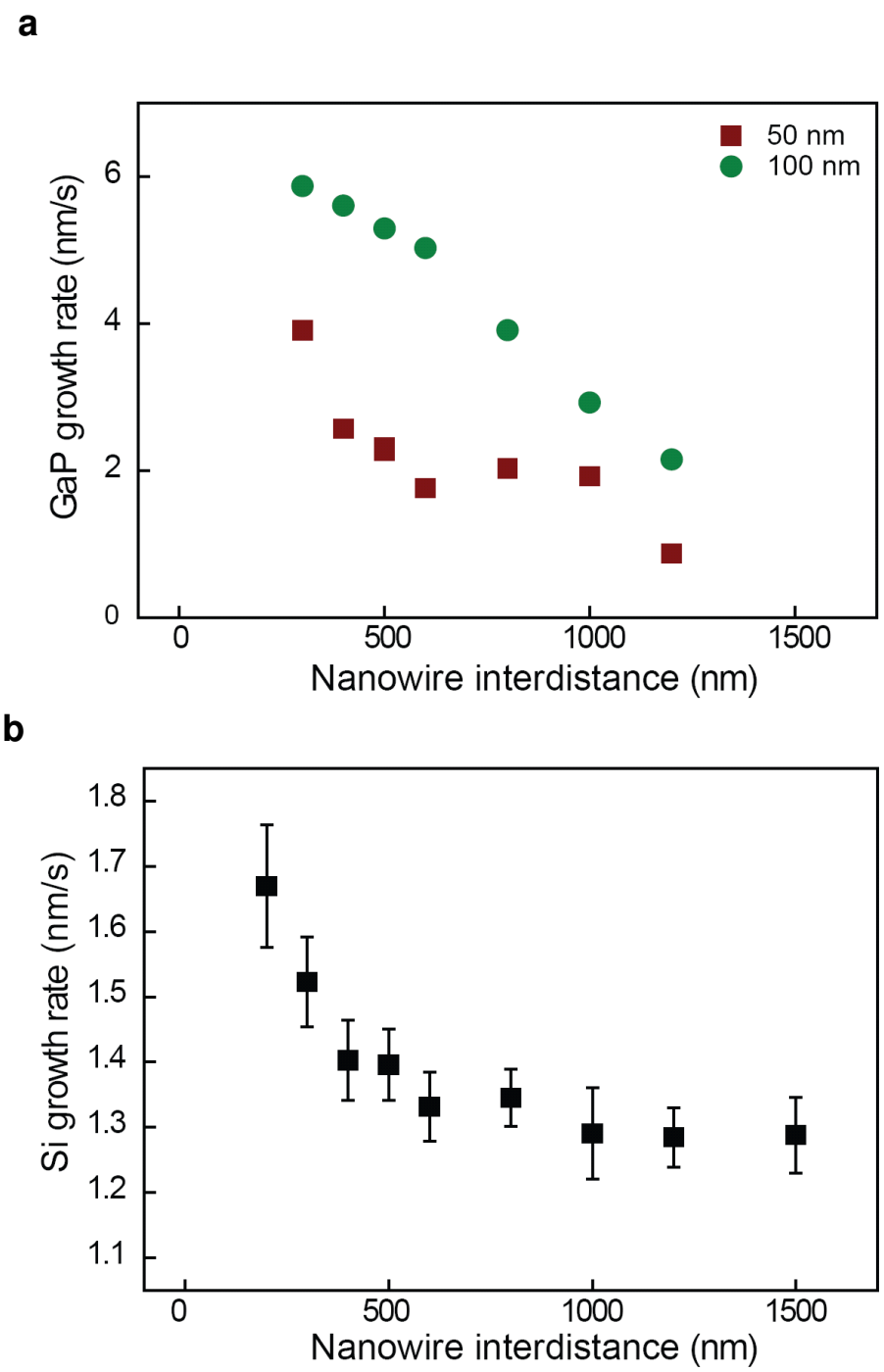
** Corresponding author: ebakkers@tue.nl*



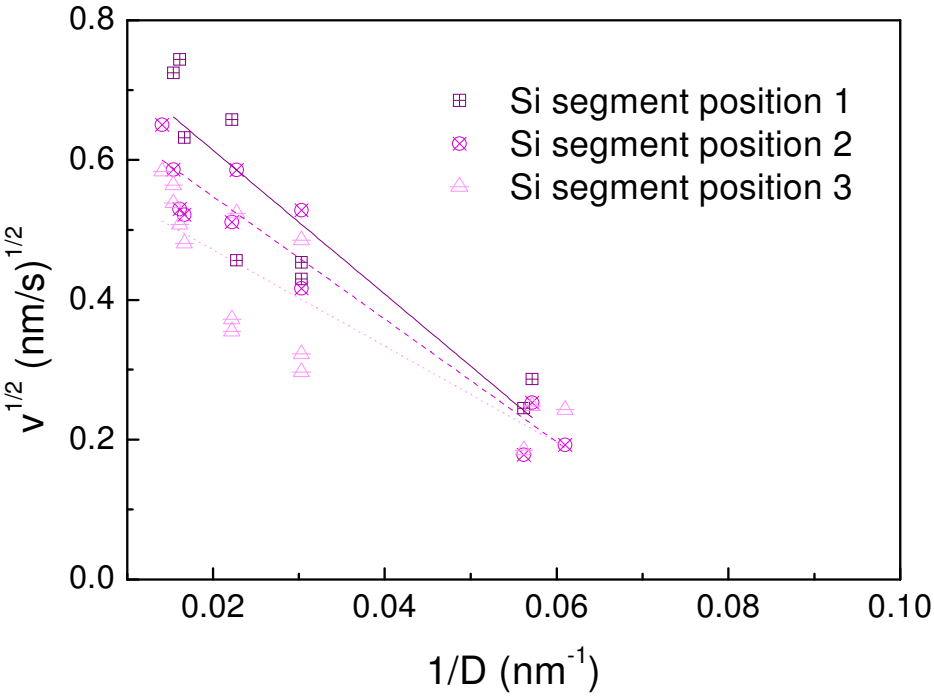
Supplementary Figure S1. Bright-field TEM images of two different GaP-Si nanowires along the two different <110> zone axes, differing by 120° in rotation around the long axis. The diameters of the nanowires are **a-b**, 50 nm and **c-d**, 38 nm. Clearly, the Si nanowires are free of planar stacking faults.



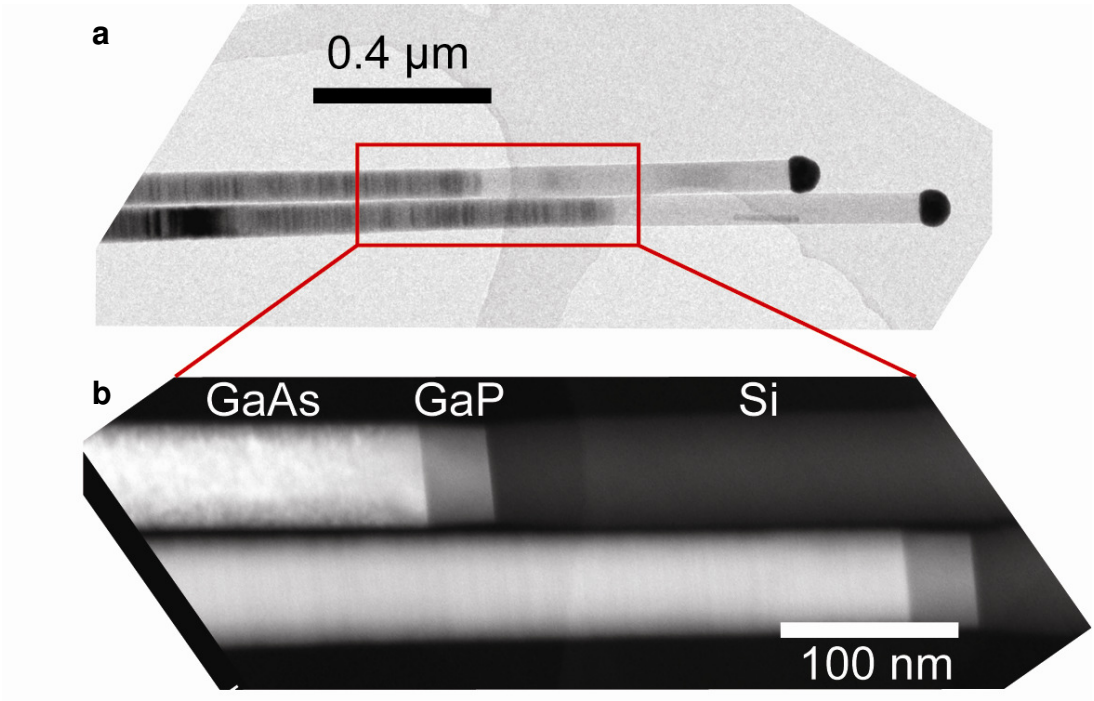
Supplementary Figure S2. a-b. typical bright-field TEM images of two different GaP-Si nanowires. Both wires have a set of 2 inclined twin boundaries. The wire in **(a)** is straight while the wire in **(b)** is kinked**.** Important to note is that all wires, which kinked have these inclined stacking faults. The kinked segment has nucleated from the inclined twin plane. **c.** The wetting of the catalyst particle is calculated by using 'Surface Evolver' in case such an inclined twin plane is formed. The particle wets two facets. Now nucleation can take place either on the top facet or on the inclined facet and depending on the contact angles one of the two will dominate.



Supplementary Figure S3. a. plot of the growth rate of **GaP** nanowires versus nanowire interdistance. It is clear from this plot that above 1 µm interdistance, the growth rate is constant, demonstrating independent growth between nanowires.[19] **b.** plot of the growth rate of **Si** nanowires versus interdistance between nanowires for a diameter of 100 nm. As shown on the figure, the maximal Si length variation (15%) occurs for 300 nm nanowire interdistance and is due to synergetic effects. At interdistances, above 1 µm, the synergetic effect is negligible.



Supplementary Figure S4. Plot of the square root of the Si growth rate as a function of inverse diameter. This data is obtained from wires grown with a 2 µm wire-to-wire spacing, such that the synergetic effect can be neglected. This plot illustrates the good agreement of Si nanowire growth with the Gibbs-Thomson effect for different positions along the superlattice GaP-Si nanowire.[31]



Supplementary Figure S5. Structural characterization of hybrid Si/GaAs nanowires. a. Bright field TEM image and **b.** HAADF image of hybrid Si/GaAs nanowires. From these two images we see a long GaAs segment with a mixture of wurtzite and zincblende phases.

	Critical diameter (nm)
Segment at position 1	12.6±3.0
Segment at position 2	12.1±1.3
Segment at position 3	11.3±2.7

Supplementary Table S1: values of the critical diameter extracted from the fits in **Supplementary Fig. S5**. Below these values Si nanowires will not grow.