Supporting Information for

Dense, regular GaAs nanowire arrays by catalyst-free vapour phase epitaxy for light harvesting

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1. Optical reflection of NW arrays

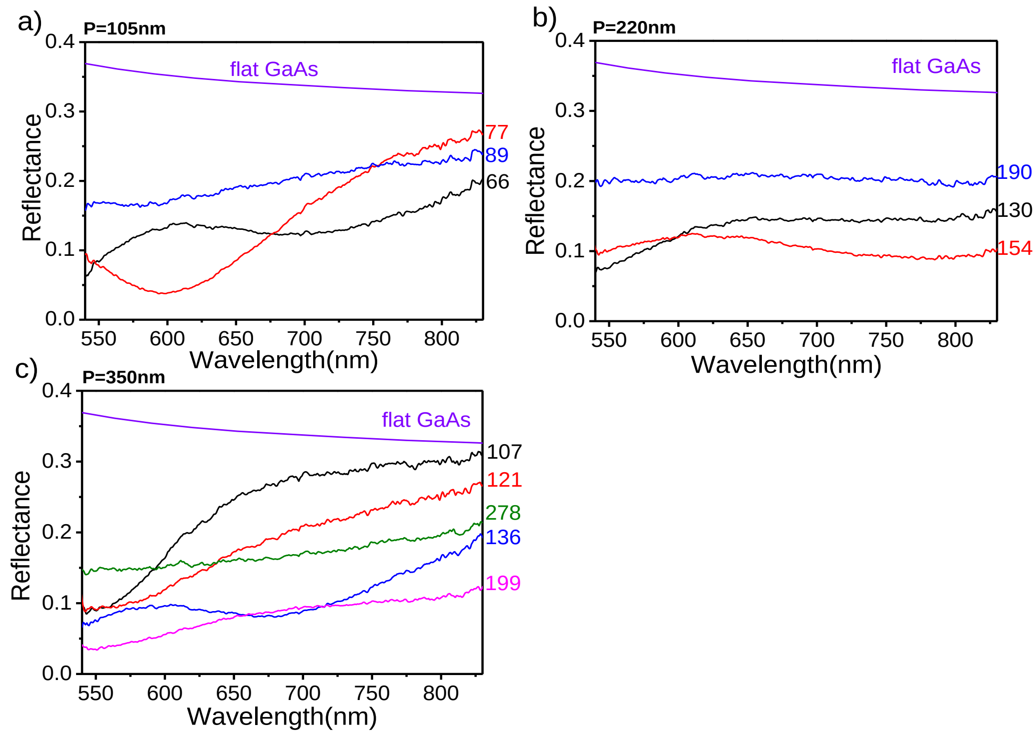

Figure S1 : Spectral reflectance at normal incidence measured on arrays with a) 105 nm, b) 220nm and c) 150 nm periods. The diameter of the nanowires is shown to the right of the respective curve. Reflectance of a flat GaAs sample is given as a reference.

2. Simulations

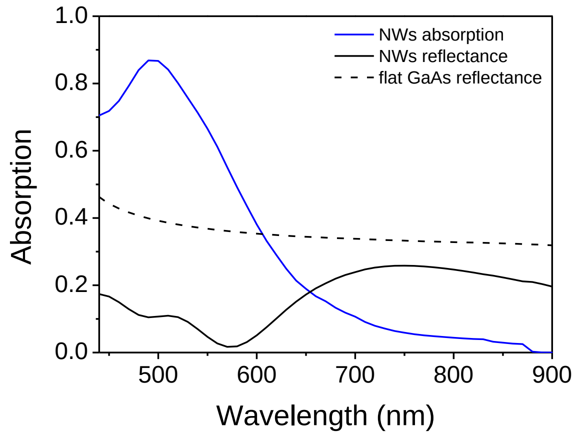

Figure S2. Absorption in a 150 nm period array in an extended wavelength scale to show the HE11 resonance at about 480 nm and antireflective properties of the array below the GaAs bandgap (λ>870nm).

3. Deconvolution of Raman Curves

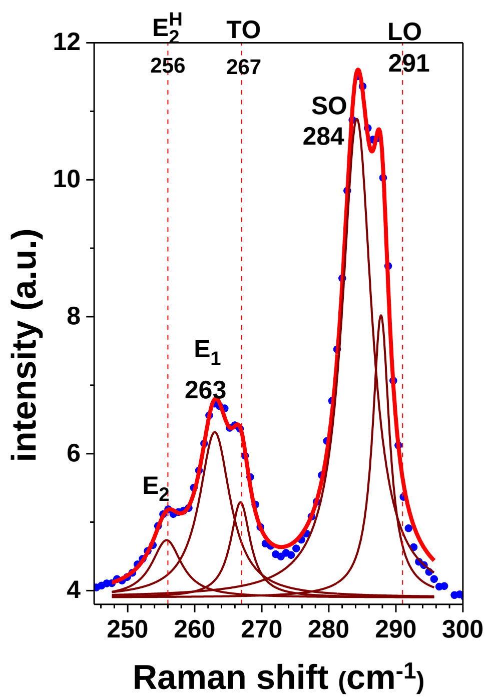

Figure S3. An example of Lorentzian deconvolution of Raman spectrum of an array with *p*=150 nm and NW diameter *d*=105 nm. The vertical dotted lines show the literature energy values of the main Raman modes.

4. TEM image of single NWs

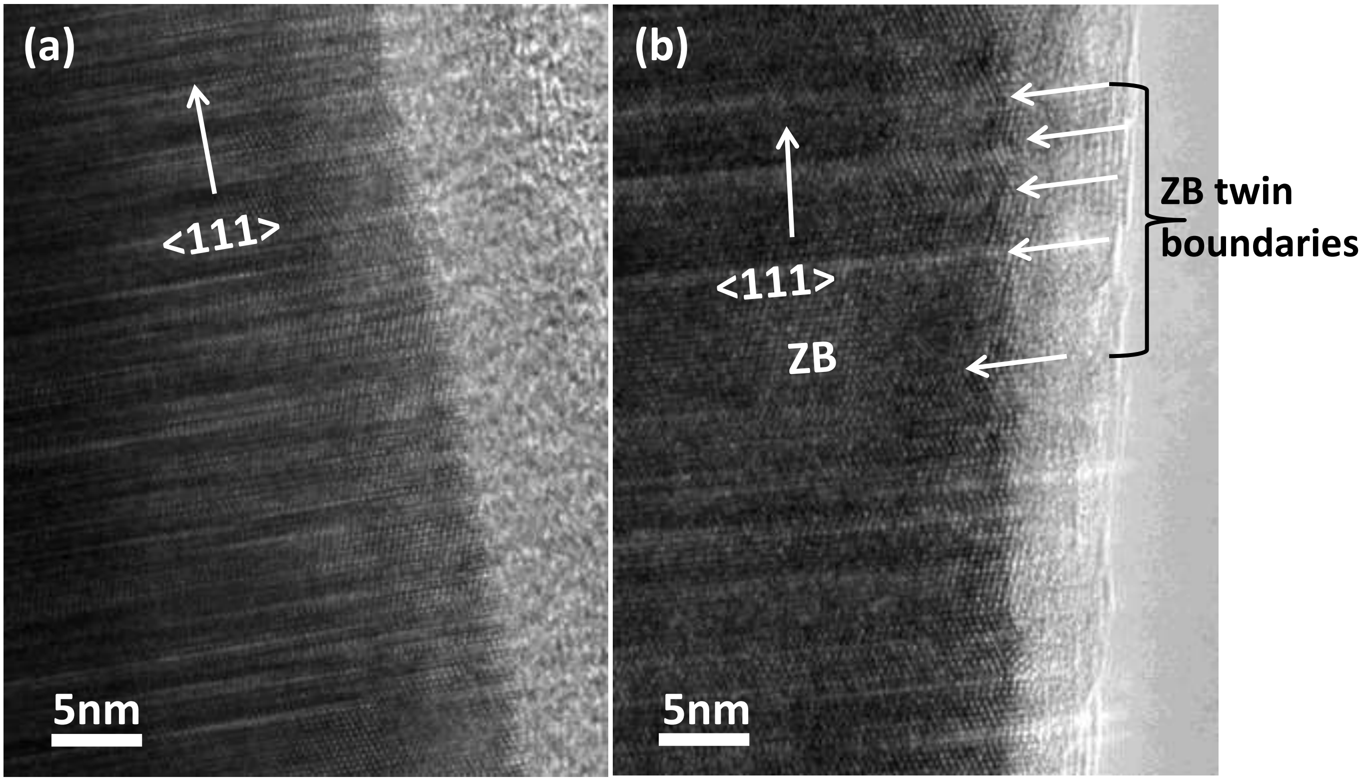

Figure S4. Transmission electron micrograph (TEM) of a GaAs wire from (a) an array with p = 150nm and d = 97nm (l = 223nm) and (b) an array with p = 350nm and d = 136nm (l = 131nm). The nanowire specimen was prepared by focused ion beam (FIB) milling using FEI Helios Nanolab 400S FIB-SEM. The images were acquired using FEI Tecnai F20 TEM operated at 200 keV. A ZB structure with stacking sequence ABCABC and number of twins were found in both kinds of NWs. Each twin boundary (ABC-**AB**-ABC) has a structure of two atomic layers of WZ phase (ABAB). Presence of a great number of twins causes roughness of the nanowire surface, which interrupts the translational symmetry of the NW surface. The shorter NW in (b), which grows more slowly than the NW in (a), has lower stacking faults density. It could results in weaker signal in E_2^H, E_1 and SO Raman peak.

5. Demonstration of SO peak

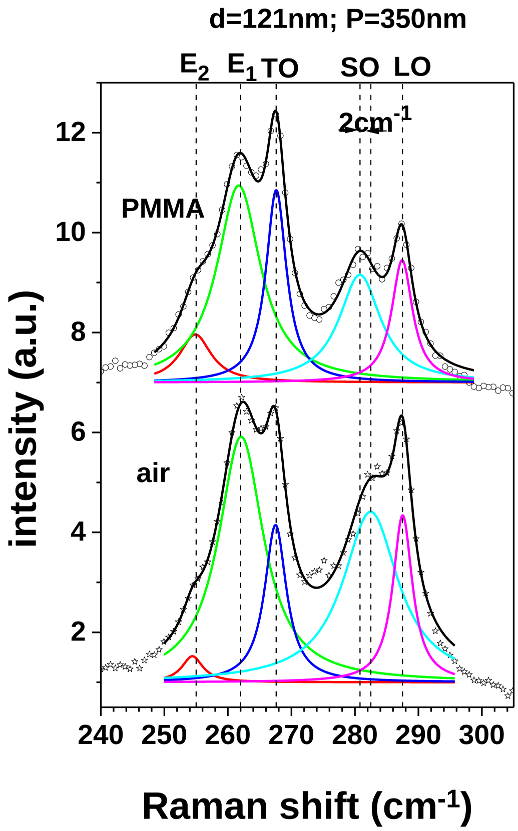

Figure S5. Effect of the surrounding medium (air or PMMA) in which the NWs are embedded, for an array with p=150nm and d = 121 nm.