Supporting Information for

Non-stoichiometric low temperature grown GaAs nanowires

Adrian Díaz Álvarez,[†] Tao Xu,[†,ǀ] Gözde Tütüncüoglu,[‡] Thomas Demonchaux,[†] Jean-Philippe Nys,[†] Maxime Berthe,[†] Federico Matteini,[‡] Heidi A. Potts,[‡] D. Troadec,[†] Gilles Patriarche,[⊥] Jean-François Lampin,[†] Christophe Coinon,[†] Anna Fontcuberta i Morral,[‡] Rafal E. Dunin-Borkowski,[§] Philipp Ebert,[§] Bruno Grandidier[*,†]

[†]*Institut d'Electronique, de Microélectronique et de Nanotechnologies (IEMN), CNRS, UMR 8520, Département ISEN, 41 bd Vauban, 59046 Lille Cedex, France,*

[ǀ]*Key Laboratory of Advanced Display and System Application, Shanghai University, 149 Yanchang Road,Shanghai 200072, People's Republic of China*

[‡]*Laboratoire des Matériaux Semiconducteurs, Institut des Matériaux, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland*

[⊥]*CNRS-Laboratoire de Photonique et de Nanostructures (LPN), Route de Nozay, 91460 Marcoussis, France*

[§]*Peter Grünberg Institut, Forschungszentrum Jülich GmbH, 52425 Jülich, Germany*

[*] B. Grandidier. E-mail: bruno.grandidier@isen.iemn.univ-lille1.fr

1) TEM analyses of the nanowires

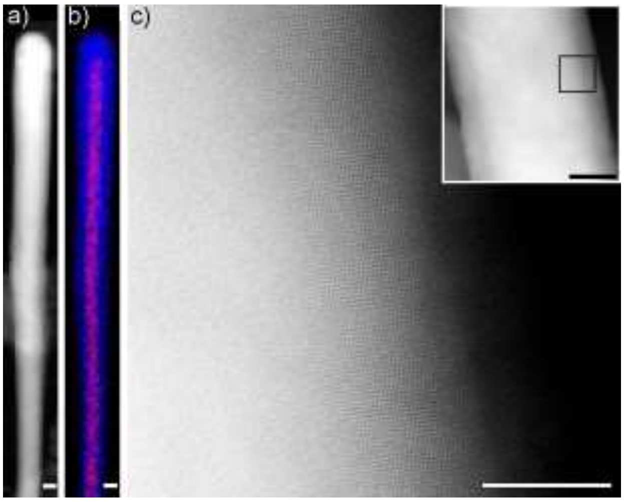

Figure S1: a) High angle annular dark field TEM image of a nanowire capped with an amorphous As layer. Scale bar: 100 nm. b) Elemental mapping of the same nanowire with Ga and As in red and blue respectively. Scale bar: 100 nm. c) High resolution TEM image of the LT-GaAs shell after encapsulation showing a zinc blende structure. Scale bar: 10 nm. Inset: TEM image of the NW showing the area where the high resolution was obtained. Scale bar: 50 nm.

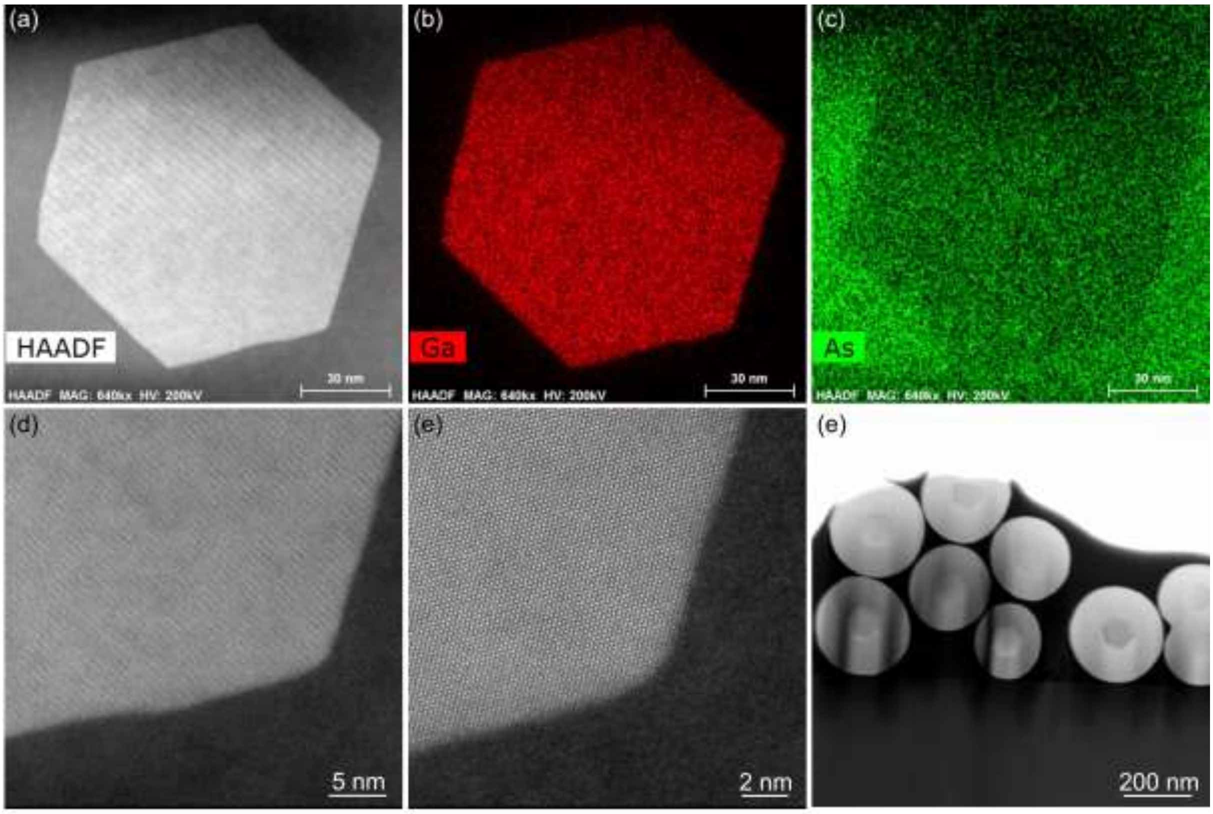

Figure S2: (a) HAADF STEM image of an As-capped GaAs/LT-GaAs core-shell NW cross-section and (b-c) corresponding EDX elemental mappings for gallium and arsenic. (d-e) High-magnified HAADF STEM images showing the corrugation of a {110} sidewall and the high quality of the interface between the NW and the As-capping layer. (e) SEM micrograph of the As-capped NW cross-sections. The cross-sections were obtained from the following processes: the NWs were first transferred onto a silicon susbtrate, then buried under a layer of hydrogen silsesquioxane (HSQ) and thin slices, perpendicular to the NW main axis, were milled with the use of a focused ion beam machine.

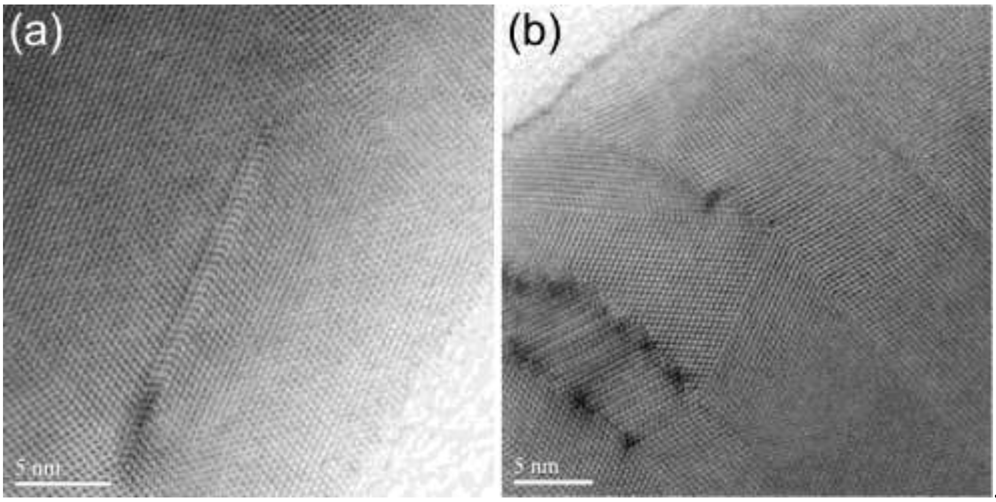

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Figure S3: (a) and (b) Dark-field images of rare dislocations that can be observed along the NW growth axis. We suspect the dislocations to be caused by excess of arsenic in the shell and to be generated at or close to the interface between the GaAs core and the LT-GaAs shell. From the distance between the sidewall and the end of the dislocations, a shell thickness of the order of ~10 nm can be deduced.

2) Pump-probe reflectivity experiments

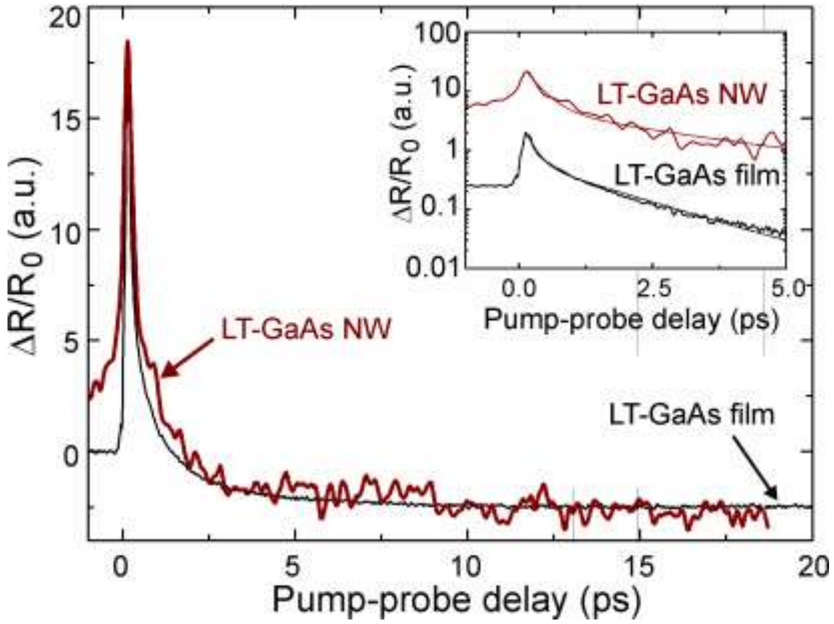

Figure S4. Comparison of the transient reflectivity signals (linear scale) measured for the LT-GaAs NW sample and a 1.5 µm-thick film of LT-GaAs grown on a GaAs substrate at 300°C with similar growth conditions.[1] Inset: Transient reflectivity signals (log scale) and their respective modeling based on two exponential decay functions. The $\Delta R/R_0$ signal rapidly increases as the pump injects electron-hole pairs and then rapidly decreases, due to the relaxation and cooling of the carriers within 180 and 300 fs for the thin film and NW samples respectively. Then, carrier trapping occurs, giving rise to charge carrier lifetime of 1.6 and 2.6 ps for the thin film and NW samples respectively. The lowest curve has been shifted for clarity.

REFERENCE

(1) Ortiz, V. ; Nagle, J. ; Lampin, J. F. ; Péronne, E. ; Alexandrou, A. *J. Appl. Phys*. **2007**, *102*, 043515.