ESRF	**Experiment title:** Wurtzite vs. zincblende lattice parameter and strain in InAs nanowires	**Experiment number**: SI-2143
Beamline: ID10B	**Date of experiment**: from: 27.10.2010 to: 02.11.2010	**Date of report**:
Shifts: 18	**Local contact(s)**: Oleg Konovalov	*Received at ESRF:*

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Report:

From the results obtained during this beamtime the following article was produced:

Unit cell parameters of wurtzite InP
nanowires determined by x-ray diffraction
Nanotechnology 22 (2011) 425704 (7pp)
D Kriegner, E Wintersberger, K Kawaguchi, J Wallentin,
M T Borgstrom and J Stangl

Abstract:
High resolution x-ray diffraction is used to study the structural properties of the wurtzite polytype of InP nanowires. Wurtzite InP nanowires are grown by metal–organic vapor phase epitaxy using S-doping. From the evaluation of the Bragg peak position we determine the lattice parameters of the wurtzite InP nanowires. The unit cell dimensions are found to differ from the ones expected from geometric conversion of the cubic bulk InP lattice constant. The atomic distances along the c direction are increased whereas the atomic spacing in the a direction is reduced in comparison to the corresponding distances in the zinc-blende phase. Using core/shell nanowires with a thin core and thick nominally intrinsic shells we are able to determine the lattice parameters of wurtzite InP with a negligible influence of the S-doping due to the much larger volume in the shell. The determined material properties will enable the ab initio calculation of electronic and optical properties of wurtzite InP nanowires.

In this article reciprocal space maps measured at beamline ID10B (as the one shown in Figure 1) were shown and lattice parameters of InP WZ deduced from those maps were discussed in great detail. Together with

those results a detailed discussion of the sources of error in such diffraction measurements is presented. For the first time the lattice parameters of InP in the WZ phase were determined. Related to this publication is also another recent publication were the lattice parameters of InAs and InSb in the WZ and 4H (another hexagonal phase with layer sequence ABCB) were measured [1]

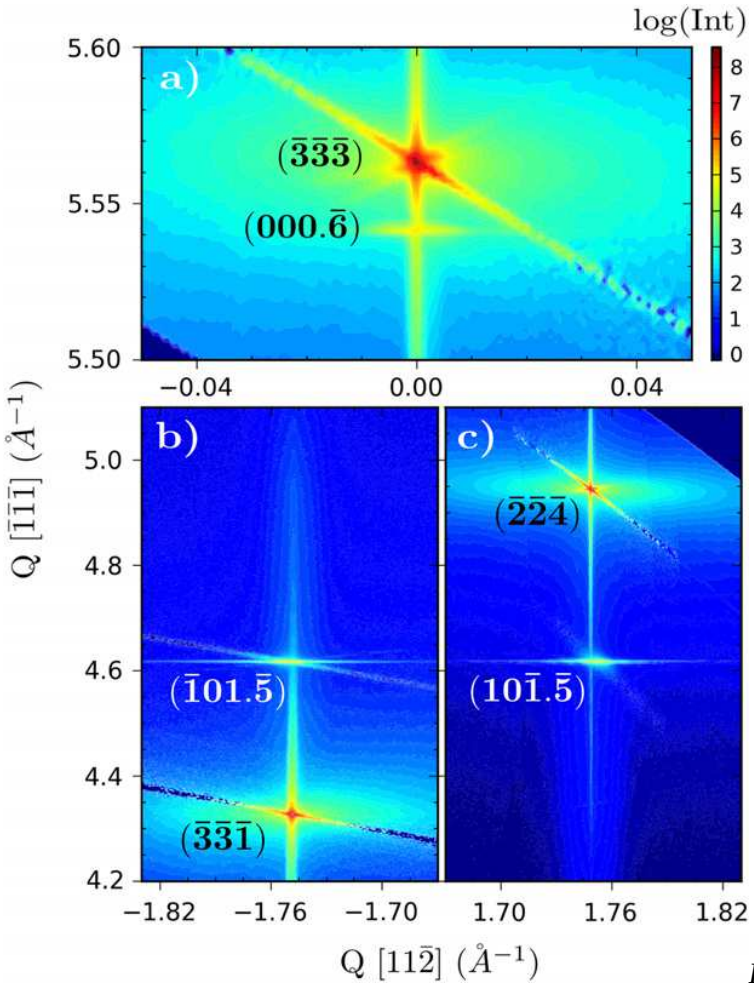

Figure 1: reciprocal space maps showing the logarithmic scattering intensity of InP nanowires grown in InP a color contour plot. In (a) the InP (333) substrate and InP WZ (000.6) Bragg peak can be seen. Pannels (b) and (c) show the InP (331) and (224) substrate as well as the InP WZ (101.5) and (101.5) nanowire Bragg peaks.

[1] D. Kriegner, C. Panse, B. Mandl, K.A. Dick, M. Keplinger, J.M. Persson, P. Caroff, D. Ercolani, L. Sorba, F. Bechstedt, J. Stangl, G. Bauer, Unit Cell Structure of Crystal Polytypes in InAs and InSb Nanowires, Nano Lett. 11 1483, 2011