KR 9: Poster – Crystallography in Nanoscience

Time: Wednesday 15:00–17:30 Location: Poster E

KR 9.1 Wed 15:00 Poster E

Phase-distribution in GaAs nanowires on Si (111) — •Andreas Biermanns[1], Steffen Breuer[2], Anton Davydok[1], Achim Trampert[2], Lutz Geelhaar[2], and Ullrich Pietsch[1] — [1]Universität Siegen, Festkörperphysik, Germany — [2]Paul-Drude-Institut für Festkörperelektronik, Berlin, Germany

The growth of semiconductor nanowires (NWs) has attracted significant interest in recent years due to their unique properties for possible novel semiconductor devices. However, many details of the growth mechanisms are not well understood. One particular problem during NW growth is the control of crystal structure, as NWs often adapt the cubic zinc-blende (ZB) or hexagonal wurtzite (WZ) structure. In addition, ZB rotational twins and stacking faults are often observed along the NW. As the structural composition usually varies between different NWs, individual characterization of a large ensemble of as-grown wires is often desired, but experimentally challenging. In this contribution we present a x-ray diffraction study of the distribution of ZB and WZ domains in GaAs nanowires grown on Si(111) across a large surface area. The GaAs NWs were grown by the Ga-assisted growth mode in molecular beam epitaxy. Using a nanometer-sized x-ray beam at the ESRF synchrotron source, the spatial distribution of particular sensitive Bragg-reflections was monitored, showing that the NWs grow predominantly in one ZB orientation without rotational twins. Close to the bottom of the NWs, WZ inclusions can be observed, whose position along the growth axis can be determined from the diffraction profile of the corresponding NW.

KR 9.2 Wed 15:00 Poster E

Analysis of defects in GaAs/InAs core/shell nanowires by means of Moiré pattern — •Torsten Rieger[1,2], Mihail Ion Lepsa[1,2], Thomas Schäpers[1,2], and Detlev Grützmacher[1,2] — [1]Peter Grünberg Institute - 9, Forschungszentrum Jülich, 52425 Jülich, Germany — [2]JARA-Fundamentals of Future Information Technology

Semiconductor nanostructures containing heterostructures are promising for future (opto-) electronic devices. GaAs/InAs core/shell nanowires (NWs) are an example for such a self-assembled nanostructure having a high lattice mismatch. Apart from the usual mixture of the zinc blende and wurtzite crystal structure in III-V NWs, this lattice mismatch causes additional defects. Here, we present a detailed study about such defects observed in conventional bright field transmission electron microscopy (BF-TEM) and corresponding Moiré fringe pattern. Threading dislocations as well as different kinds of stacking faults are identified. The results are correlated with the growth mechanism of the InAs shell.