MS38-O5 Nano- x-ray fluorescence of individual GaAs/InGaAs/GaAs core-shell nanowires grown by molecular beam epitaxy on silicon (111)

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The growth of GaAs/$In_xGa_{(1-x)}As$/GaAs core-shell nanowires (NWs) on silicon is a challenging route to combine opto-electronics with the silicon technology. Due to discrepancy in the lattice parameters of core (GaAs) and shell (InGaAs) materials, X-ray diffraction (XRD) measurements taken on NW ensembles with momentum transfer perpendicular to the NW axis show a shift in the InGaAs Bragg peak as shell thickness is varied. This shift can be the result of either a complex strain field or and in-homogenous indium distribution. As the composition of indium and the strain field cannot be distinguished by XRD, the spatial homogeneity of the Indium distribution in the shell layers of individual core-shell NWs was probed by means of X-ray fluorescence (XRF) analysis using a 50nm x 50nm sized white x-ray beam. For low indium contents within the InGaAs layer (nominal values of 15% and 25%), the Indium distribution along the six side facets and the NW axis is almost homogeneous (Figure 1, d,e) with slight Indium fluctuation (Figure 1, f). On the other hand, NWs with 60% of indium show the growth and random distribution of indium-rich aggregates (Figure 1, a) at the core circumference (Figure 1, b) with an approximated indium fluctuation of 33% (Figure 1, c).

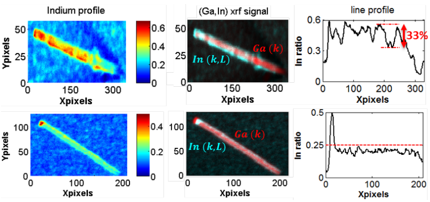

Figure 1. a) formation of In-rich aggregates for a NW with 60% of indium. b) distribution of the aggregates at the core circumference. c) Line profile through the aggregates. d,e) homogenous distribution of indium for NWs with 25% of indium content. e) Line profile along the NW presented in (d).

Keywords: Nano- x-ray fluorescence - single nanowire heterostructures - indium spatial distribution.

MS39 X-Ray diffraction on the µs to ps time scale

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MS39-O1 Time-resolved X-ray microdiffraction for ferroelectric heterostructures

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The responses of ferroelectric heterostructures to external electric fields provide intriguing functionalities including the switching of remnant polarization and electromechanical distortion. Especially these functionalities of ferroelectric thin films can be greatly modified by a misfit strain arising from a lattice mismatch between substrate and film substance over a wide range of timescale. In this presentation, I will discuss our recent studies to resolve the electromechanical responses of ferroelectric thin films using a synchrotron time-resolved x-ray microdiffraction technique (Fig. 1).[1-2]

Keywords: Time-resolved X-ray microdiffraction, Ferroelectric