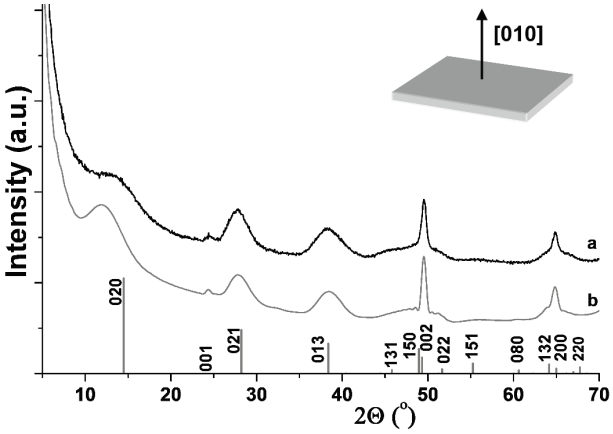

Figure 1. (a) - experimental XRD pattern of the aerogel sample (Al:Si=9:1); (b) – calculated diffraction pattern for AlO(OH) crystallites with dimensions of 14.0x1.2x14.5 nm (49x1x39 unit cells)

Keywords: nanostructure, alumina, pseudoboehmite, XRD, DSE

MS23-P11 Strain-relaxation in GaAs / InGaAs core-shell nanowire heterostructures grown by MBE onto Si(111)

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Semiconductor core-shell nanowires (NW) with different shell thickness can be grown onto [111] oriented silicon substrates without major structural defects due to the strain release towards the NW side planes [1]. This approach offers the possibility to form radial hetero-structures (HS) between highly lattice-mismatched materials but the process of strain relaxation is not fully understood.

We report on detailed investigations of anisotropic strain and strain relaxation mechanism in GaAs/$In_{0.25}Ga_{0.75}As$/GaAs NWHS grown by MBE onto Silicon (111) substrate. Independent from core-shell thickness ratio, x-ray diffraction measurements with scattering vector along the 111 growth direction shows no Bragg peak splitting but a single out-of plane lattice parameter explained by the strain balance between slightly expanded GaAs and compressed InGaAs shell. On the other hand, X-ray measurements along the NW side planes and edges show peak splitting between core and shell material confirming the appearance of in-plane lattice mismatch. The mismatch is different measuring along the (1-10) or the (2-1-1) directions that can be explained by a nominal In content of 22.5% and 18.5%, respectively. The difference can be related to strain induced segregation along the NW edges as it has been observed in AlGaAs/GaAs core-shell NWs [2]. Our data are interpreted in terms of finite element calculations revealing an insight into the complexity of strain relaxation mechanism in MBE grown core-shell nanowires.

Related publications

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Keywords: Strain relaxation, core-shell nanowires, finite element method, hetero-structures, x-ray diffraction.