pyramid, and vice versa. According to the X-ray powder diffraction data (H2G-4, Ni – filter, CuKα, deformed beam; exposure time per frame, 15 s; scan step, 0.02°) and X-ray single crystals study (CAD-4, AgKα, ω scan mode) there are an additional reflections related to sp. gr. P3. ZnO1 and ZnO2 crystals have a \{[Zn(1)_{0.975}(Zn(2)_{0.465}\text{(6)})_{0.025}]_{0.975}(O_{1.025})_{0.025}O_{2.025}]_{0.975}\} and \{[Zn_{0.975}(O_{1.025})_{0.025}]_{0.975}(O_{2.025})_{0.025}O_{2.025}]_{0.975}\} refined compositions, respectively. The compositions are in good agreement with the results of X-ray microanalysis (INCA Penta FETX 3). Zinc and oxygen atoms occupy two positions Zn(1), Zn(2) and O(1), O(2) both completely, and partially. Besides, the presence of this type of symmetry is affected by the results of X-ray microanalysis.

Due to the fact that the X-ray microanalysis did not reveal the presence of impurity atoms and the compositions and light green samples differ only in the oxygen content, it can be assumed that the color of ZnO crystals is associated with the oxygen vacancies content: a decrease of oxygen vacancies leads to discoloration of the ZnO crystals.

Keywords: X-ray study, defects, color.

MS28.P07

Defect determination in epitaxial a-plane GaN Layers
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The technological application of (0001), i.e., c-oriented GaN is complicated by the piezoelectric effect along the [0001] direction and the presence of stacking faults (SF) so that a reliable method for the determination of the defect density becomes crucial. In this study, we investigated the relationship between the a-plane lattice parameter, was estimated directly from the symmetrical non-coplanar 10-10 diffraction from an a-GaN epitaxial layer. The axis \(g_{1}\) and \(g_{2}\) are parallel to the surface and to the (inclined) diffraction vector, respectively.

We investigated non-polar a-plane oriented GaN epitaxial layers with the (11-20) surface orientation. In these layers, two types of SFs occur with the displacement vectors \(R = 1/6(20-23)\) and \(1/3(1-100)\).

If \(g_{1} \neq n\) the diffuse x-ray scattering from the SFs has the form of \([0001]\)-oriented streaks perpendicular to the fault planes. We have measured the streaks in symmetric non-coplanar diffractions 10-10, 20-20 and 30-30, using a high-resolution x-ray diffraction setup in a series of a-GaN epitaxial layers with various densities of stacking faults (Fig. 1).

We compared in good agreement intensity distributions along the streaks with simulations supposing a random Markov-like sequence of stacking faults and kinematical approximation; from the comparison we determined the prevailing displacement vector \(R\) of the SFs and the fault density.

Keywords: Diffraction, Gallium, Nitride.

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High resolution x-ray diffraction analysis of AlGaSb/GaSb
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GaSb single crystals are the ideal substrates for the growth of InGaAsSb, AlGaAsSb, AlGaAs and AlGaSb heterostructures to fabricate optoelectronic devices. GaSb surfaces are highly reactive to oxidation, the oxides grown on their surface have poor conductivity \((10^{-7}\ \Omega^{-1}\ \text{cm}^{-1})\) and it produces high surface leak currents. Using the liquid phase epitaxy (LPE) technique under supercooling conditions we have grown AlGaSb layers doped with tellurium to (100) n-GaSb(0.05 < x < 0.2). Using Raman spectroscopy we characterized the structural quality. The Raman spectra show two main peaks located around 224 and 234 cm\(^{-1}\), which were deconvoluted by four Lorentzians. In order to assign the peaks use is made of the random-element isodisplacement (REI) model. Comparison of the experimental results with the values obtained by REI model allows us to confirm that the bands correspond to the LO-like and TO-like of the binary compounds, GaSb. High-resolution x-ray diffraction analysis (HRXRD) has been used to characterize these structures. The out-of-plane lattice parameter, was estimated directly from the symmetrical diffraction for (001) alloys. These results show that all the layers are relaxed.

Liquid phase epitaxy (LPE) growth was carried out in a single-zone isothermal furnace in hydrogen using the horizontal sliding boat technique. The boat was made from high purity graphite, AlGaSb layers were grown nominally lattice-matched to vicinal (100) n-GaSb substrate at a temperature of 673 K. Raman scattering experiments were performed at room temperature using 6328 Å line of a He-Ne laser at normal incidence for excitation. The nominal laser power used in these measurements was 20 mW. Structural characterization of the samples is carried out by means of HRXRD in a Bruker D8 Discover diffractometer, parallel beam geometry and monochromator of gibel mirror, CuKα radiation, 1.5406 Å operated at 40kV and 40mW, in the range of 20° <2θ <80° by step of 0.02°.

Keywords: GaSb, GaAs, AlGaAs, AlGaSb, GaSb, InGaAsSb, AlGaAsSb, AlGaAs.