the surface is particularly smooth [1].

[1] Vonk V., et al., *ESRF Highlights*, 2004 (2005).

Keywords: laser ablation, superconductor films, synchrotron X-ray diffraction

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Crystallization of $RAl_3(BO_3)_4$ and $R:YAl_3(BO_3)_4$ Single Crystal Layers

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Current development in miniature optical components leads to extensive study of single crystal layers because of a number additional benefits such as ability to use materials with high doping levels or to obtain high gain with modest pump powers. New crystals of solid solutions based on the $YAl_3(BO_3)_4$-$RAl_3(BO_3)_4$ (YAB-RAB) systems are promising solids for self-frequency doubling lasers [1].

In this report, our recent results on liquid-phase epitaxy (LPE) of RAB and R:YAB single crystal layers are discussed. Variations of growth rates of these layers were determined, in order to control crystal growth mechanism. Relations between the growth rate V and relative supersaturation β were found. It is also shown that primarily volume and surface processes occur simultaneously although evidence is presented for kinetic limitation of the growth rate on the later stage.

Besides, growth spirals epilayers frequently exhibit irregularities such as cusps and corrugations, but flat areas may also present on the surface. Micromorphological features as well as growth kinetics greatly depend on the substrate perfection.

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Keywords: liquid epitaxy, epitaxial layers, kinetics and mechanism of crystal growth

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RHEED Observation of c-GaN on 3C-SiC/Si(001) Template Grown by RF-MBE

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Cubic gallium nitiride, c-GaN, can be used to grow on a cubic substrate with a suitable latice constant for lattice matching. Cubic silicon carbide, 3C-SiC, which was formed by the carbonation of Si surface using a C_2H_2 jet nozzle[1], was used as a substrate for the epitaxial growth of c-GaN. The grown c-GaN layer was analyzed by reflection high energy electron diffraction (RHEED), electron microscopic techniques, and X-ray diffraction (XRD) techniques.

For the growth of the GaN layer, a specially designed RF-ECR type N radical source of 13.56 MHz was used to efficiently eliminate N ions and electrons from the surface [2]. The initial carbonization and initial growth of a LT buffer layer of c-GaN were monitored using RHEED during growth. The GaN was found to have the (2x2) surface structure. A GaN layer 1.5-mm thick grew epitaxially on the (001) face. The relative intensity ratio between cubic (002) and hexagonal(h) (10-11) XRD peaks from the GaN was 0.95:0.05.

[1] Kikuchi T., et. al, *J. Crystal Growth*, 2005, **275**, *in press*. [2] Ohachi T., et. al., *J. Crystal Growth*, 2005, **275**, *in press*.

Keywords: epitaxial layers of c-GaN, in situ observations by RHEED, RF-MBE

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Photoluminescence Study of Selenium Doped GaSb Layers Grown by Liquid Phase Epitaxy

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We analyzed the photoluminescence spectra of selenium-doped GaSb grown by liquid phase epitaxy at several temperatures from 10-160 K. The growth was performed using the same solution on GaSb substrates at 450 °C. The obtained layers showed only a small variation of carrier concentration. Photoluminescence measurements at 10 K showed a dominant transition near 777 meV associated to the residual acceptor. The dominant residual acceptor has been attributed to the native defects caused by antimony deficiency, usually due to the Ga antisite or Ga antisite defect in combination with the Ga vacancy. Also at this temperature, there are observed several bands associated to the presence of selenium shallow donors. As the measurement temperature increases, the photoluminescence band associated to the GaSb energy bandgap dominates the spectrum and its temperature dependence agrees with those for the case of tellurium and sulphur doped GaSb.

Keywords: GaSb, photoluminescence, liquid phase epitaxy

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Substitutional and Interstitial Inclusions of Mn Additivies onto the KDP Lattice

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In this work, pure and Mn^{3+} doped potassium di-hydrogen phosphate (KDP and KDP:Mn) were studied through Rutherford back-scattering (RBS), Rietveld refinement (RR) and X-ray n-beam diffraction (nBD). RBS results allows the determination of KDP:Mn stoichometric formulae as $KH_2PO_{3.8}Mn_{0.4}$ while, from the RR results, it was possible to determine that the Mn^{3+} atoms are substitutional to the K ones. The lattice parameters were determined for both pure and KDP:Mn by using RR and nBD and, besides agreeing very well, they indicate the better accuracy of the results from nBD. This fact comes from the high sensitivity of the nBD technique in determine micro-crystallographic variation. According to the lattice parameter results, all values for KDP:Mn are smaller than those for KDP. Those results are also compared with a previous one, were it was determined that Mn^{3+} in concentration of 2-5 x 10^{-4} mol are occupying interstitial sites [1] and located 0.66 from (200) plane and 0.21 from (112) plane [2]. Rietveld refinement was performed from X-ray high-accuracy single crystal measurement and the nBD measurements were carried out at beam line XRD1 of the Brazilian Synchrotron Light Laboratory. All samples were grown at the same pH of 1.5.

[1] Lai X., Roberts K. J., Avanci L. H., Cardoso L. P., Sasaki J. M., *J. Appl. Cryst.*, 2003, **36**, 1230-1235. [2] Lai X., Roberts K. J., Sasaki J. M., Cardoso L. P., Bedzyk M., Lyman P. F., 2005, *in preparation*.

Keywords: X-ray difraction techniques, inclusion phenomena, Rietveld structure analysis

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New Routes in Carbon Nanotube Synthesis by Means of a Modified Hot Filament Chemical Vapor Deposition Technique

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