diffraction technique, having like Te source a layer type-n is presented in this work. The samples were grown with structure GaSb-n/GaSb-p on GaSb-n substrate by LPE technique. The diffusion process was done through heat treatment to different temperatures and times. The results obtained with X-ray diffraction are in agreement with the photoluminescence measurement.

Keywords: diffusion, high resolution X-ray diffraction, LPE

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Density and Mobility of Carriers in AlGaSb and InGaAsSb Alloys Obtained by LPE

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The density of carriers and its mobility of AlGaSb and InGaAsSb alloys have been obtained by simulation. The Berreman technique was used in this work, which allows simulating the spectra of reflectivity in the far-infrared region. Liquid Phase Epitaxy (LPE) technique was used to growth several AlGaSb thin layers in the range of temperatures of 250 to 450 °C. The reflectivity spectra in the far infrared region show to bands, the first one near to 230 cm^{-1} which corresponds to TO and LO GaSb-like modes and other one near to 318 cm^{-1} which corresponds to TO AlSb-like mode and it confirms the presence of the ternary alloy. In the quaternary alloy case, the temperature of growth was 410 °CThe reflectivity spectra show the TO and LO modes in the region of 180 to 250 cm^{-1} and correspond to the binary combinations of the four present elements.

Keywords: liquid phase epitaxy, reflectivity spectra, ternary alloy

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XRD Study of Strongly Textured and Stressed Thin Films

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Determination of the residual stress in highly oriented thin films can be rather difficult. Since only certain grain orientations are present, conventional X-ray methods of stress evaluation cannot be applied. In some cases, the problem can be solved by the so-called crystallite group method [e.g. 1]. However, for investigation of microstructure the scan of significant part of reciprocal space is necessary. The method of reciprocal space mapping and Rietveld-type refinement of the maps was developed and tested on strongly textured TiB_2 coatings deposited on steel substrates. The maps were measured with modified conventional two-axis goniometer in parallel beam arrangement and some measurements were also performed with Eulerian cradle and polycapillary. The method is particularly useful for simultaneous analysis of stress and texture especially in non-cubic materials. It could also be used for the estimation of other parameters like film thickness, microstrain and domain size. Both the extreme elastic models (Voigt/Reuss) have been adopted for the case of fibre texture, often present in thin films. Residual stress could be estimated even for the strongest 001-texture with angular halfwidth of a few degrees. In the maps, the presence of stress is indicated by the inclination of elliptical spots. Expected increase of the residual compressive stress with substrate bias was observed and analyzed.

[1] Kužel R. Jr., Černý R., Valvoda V., Blomberg M., Merisalo M., *Thin Solid Films*, 1994, **247**, 64-78.

Keywords: powder diffraction, reciprocal space mapping, thin films

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Residual Stress in Tungsten Thin Films for Photon Counting Applications

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We report on tungsten thin films used for superconducting transition-edge-sensors (TES) that are capable of accurately counting the number of photons, which can be exploited in astronomical and quantum-information applications.

The superconducting transition temperature (*Tc*) of tungsten films was found to strongly depend on the deposition conditions and the existence of an underlayer or coating. For instance, a film with *Tc* of about 100 mK is under tensile stress when grown on bare Si wafers, whereas another film with *Tc* of 200 mK is under compressive stress when grown on in-situ sputtered amorphous Si. Furthermore, coating tungsten films with SiO_2 suppressed *Tc* below 60 mK. Sputtered tungsten thin films usually contain two crystallographic phases: α-W (bcc) with *Tc* of 15 mK, and β-W (A15) with *Tc* between 1 to 4 K. Thus, *Tc* might be influenced by both phase composition and stress associated with the deposition and neighboring layers.

We used laboratory and synchrotron (APS high-energy 6-ID-MU beamline) X-ray diffraction to assess both the phase composition and residual stress state in tungsten films at room and low (8 K) temperatures. Results indicate no significant changes in phase composition in this temperature range. Residual stress at room temperature did not strongly vary among the films, indicating that the changes in *Tc* are likely due to additional thermal stress induced by cooling to cryogenic temperatures.

Keywords: residual stress, thin films, tungsten

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Ordered SAMS of Peptide Nucleic Acids on Surfaces with DNA Recognition Capability

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Self-organisation of molecules have inspired new trends in nanotechnology based on a bottom-up approach. Self-assembled monolayers (SAMs) of alkanethiols were widely studied due to their relevant technological properties. Based on such knowledge, thiolated DNA has been immobilised on surfaces, although it forms disordered formless globular structures with reduced bioactivity.

We report on the formation and structural characterization of ordered SAMs of peptide nucleic acid (PNA) on mono- and polycrystalline gold surfaces. PNA is an achiral and uncharged DNA mimic of high biochemical stability which allows different applications in biotechnology. We show that, in spite of their length of up to 7 nm, cysteine-modified single-stranded (ss) PNA oligomers assemble by themselves standing-up on gold surfaces similarly to the SAMs of short alkanethiols. They stabilize on the surface by chain-chain interaction trough non-complementary H-bonding. BioSAMs of ssPNAs maintain their capability for recognizing ssDNA, and discriminate even a point mutation in target ssDNA. These structural and functional results have been obtained using label-free techniques for surface characterization such as synchrotron radiation based X-ray photoemission spectroscopy, X-ray absorption near-edge spectroscopy, atomic force microscopy and infra red spectroscopy.

Keywords: self-assembled monolayers, peptide nucleic acids, biosensors