Keywords: dynamical properties, diffraction theory, reverse Monte Carlo

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Space Shift between Relaxed Si and Strain-compensated SiGeC Epitaxial Layers

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Investigation method based on the high-resolution and non-destructive Grazing-Angle Incidence X-ray Backdiffraction (GIXB) technique [1, 2] is extremely sensitive for the measurements of the longitudinal space phase shifts stipulated by the misfit dislocations in interface planes of the epitaxial layers. Diffracting net planes of the epitaxial layers considered in presented theoretical paper have the same lattice constant, though there exist a longitudinal space shift between space periods of these layers. Carbon introduction into the SiGe films suppresses outdiffusion of boron, by which the parasitic barriers would be created, so the performance features of HBTs with SiGeC base layer practically do not change after the high temperature processing. Reflectivity coefficient of specular vacuum X-ray wave field is investigated depending on the values of the phase shift between space periods of the layers of Si/SiGeC heterostructure and of the Bragg angle in the case of GIXB technique.

[1] Bezirganyan H.P., Bezirganyan P.H., *Phys. Stat. Sol. (a)*, 1988, **105**, 345. [2] Bezirganyan H.P., *Phys. Stat. Sol. (a)*, 1988, **109**, 101.

Keywords: epitaxial semiconductor layers, grazing incidence x-ray diffraction, x-ray backscatter diffraction

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Crystal Relief Investigation under the X-ray Diffraction on Surface Acoustic Wave in Bragg-Laue Grazing Geometry

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The intensity of X-ray radiation diffracted from a monocrystal in Bragg-Laue grazing geometry when the reflecting planes slightly differ from surface normal, allows to carry out the topographical observation of crystalline defects in near-surface superfine layers [1]. In the case of crystal surface modulation by acoustic wave the sensitivity of the method may become much better. In the ordinary Bragg geometry Rayleigh surface acoustic waves (SAW) can focus the incident X-ray wave [2]. In the case of the standing SAW there is no need of a stroboscopic technique of synchronization.

In the present paper the influence of crystal relief on focused image forming under the diffraction of X-ray radiation in Bragg-Laue grazing geometry is studied. The analysis of the intensity distribution in the diffracted wave averaged by time for the standing SAW shows that in the nearest zone of diffraction a focusing from the SAW concave parts occurs. It is shown that separate regions of the crystal relief which are characterized by local sizes and curvature radius, essentially change the registered image in local part of the topogram. The sensitivity of he method is about nanometer. At the same time the focal image of SAW serves as a scale reference point for the crystal relief characteristics determination.

[1] Aleksandrov P.A., Afanasiev A.M., Stepanov S.A.. *Phys. Stat. Sol.(a)*, 1984, **86**, 143. [2] Cerva H., Graeff W., *Phys. Stat. Sol. (a)*, 1984, **82**, 35.

Keywords: X-ray glancing-angle scattering, crystal surfaces, ultrasonics

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X-ray Diffraction Image under the Grazing Angles of Incidence on a Surface Acoustic Wave

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The X-ray diffraction in noncomplanar symmetric Laue geometry under the total external reflection is characterized by the formation of both the specularly reflected and specular reflected diffracted waves [1]. The character of the intensity distribution of these beams depends on the value of the grazing angle of incidence which in the case of crystal surface modulation by surface acoustic wave (SAW) will locally change.

In the present paper the process of diffraction of X-ray radiation on the planes perpendicular to the crystal surface modulated by Rayleigh SAW under the total external reflection has been studied. The character of the diffracted image essentially depends on the crystal-detector distance. In the nearest diffraction zone a focusing from the SAW concave parts occurs, which may be observed for the standing SAW, but in the case of the running SAW a synchronization technique is needed. With the increase of the crystal-detector distance the focused beams are covered and observed on the same pedestal. In the farthest diffraction zone diffraction satellites are formed both for the standing and for the running SAW. The dependence of the focal distance from the amplitude and length of SAW, the grazing angle of observation, the deviations from Bragg orientation, etc. are found. It is shown that the change of the crystal surface curvature may be controlled both by the focusing in the nearest diffraction zone and by the process of formation of diffraction satellites and their focusing.

[1] Afanas'ev A.M., Melkonyan M.K., *Acta.Cryst.*, 1983, **A39**, 207.

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New Method of Solid State Structural and Composition Analysis

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In the present paper, in contradistinction to Debye, Laue and Fudji grammas, new gramma based on the phenomena of parametric X-ray radiation (PXR) of the relativistic charge particle in single crystals is offered. On the analogue of X-Ray Laue gramma due to X-Ray "white" beam diffraction on crystalline lattice, the relativistic charge particle interacting with crystalline lattice originated grammas of PXR, consisting of variety of dynamic yields with specific angular and energy distributions. Actually it is an analogue of X-ray "white" beam diffraction with a slite difference, that in the case of PXR the X-ray radiation sources are disposed in crystal along the trajectory of relativistic charged particle passage.

Several experimental investigations of the PXR phenomena of electrons with energies 855MeV [1] and 20MeV [2] in quartz and niobate lithium single crystals were conducted. Appropriate grammas for observed targets-radiators were obtained.

Hereby, on the basis of obtained results new simple and express method to analyze solids composition and structure with accuracy not worse then by existing methods is offered.

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