PS12.03.12 X-RAY NONSPECULAR SCATTERING IN MULTILAYER STRUCTURE WITH NONUNIFORM INTERFACES
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Here we discuss the theory of the nonspecular scattering by arbitrary (periodic or nonperiodic) multilayer structure with nonuniform interfaces. To calculate the amplitudes of nonspecular scattered waves we have solved the boundary problem for single layer with two nonuniform boundaries and then we have used the recurrence procedure for determination of waves amplitudes. As a result the formulae for the intensity of the scattered radiation is obtained in the analytic form for the arbitrary number of layers. The general expression for the intensity of the scattered radiation and numerical calculation on the basis of recurrence formulae are used to study the two kind of problems. The first one is the diffuse scattering by three layer heterostructure with rough interfaces, the second problem is nonspecular scattering by periodic multilayer nanostructure which is subjected to the action of transverse ultrasonic surface wave. The considered heterostructure consists of two Fe layers which are separated by layer of C. Such a structure is used as a waveguide for X-rays with the wavelength of a few angstroms. We discuss the dependency of the angular spectrum of the diffuse scattering on the roughness interlayer correlation function. It is shown that the angular spectra of diffuse scattering depends on the field distribution inside the structure and it is determined primarily by the integral field at the interfaces. For the glancing incidence the integral field is a sum of the transmitted and reflected waves. As a result the angular spectrum of scattering depends drastically on the angle of incidence when it lies between the critical angles for C and Fe. It is shown that the waveguide modes are excited effectively by the diffuse scattering. The considered multilayer nanostructure is used in experiments to control the reflected X-ray beam by means of transverse ultrasonic wave field. We discuss the dependency of satellite intensities on an ultrasonic wave amplitude and glancing angle of primary beam.

PS12.03.13 THE EFFECT OF THE GROWTH TEMPERATURE ON THE STRUCTURE OF Co-Cr-Co TRILAYERS.
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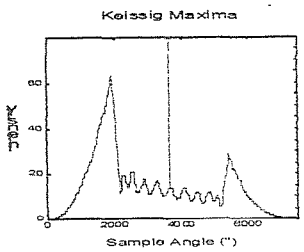
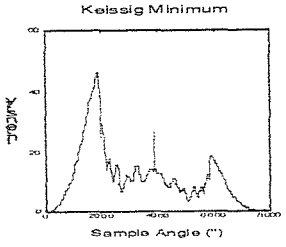
The effect of layer deposition temperature on the structure of a series of Si:Co(200Å)-Cr(10Å)-Co(212Å) trilayers grown by U.H.V. evaporation, has been investigated using grazing incidence x-ray reflectivity and MOKE. Specular and diffuse x-ray scattering studies were undertaken at the Daresbury SRS using wavelengths tuned close to and away from the Cr absorption edge. For the trilayer grown at room temperature, fits to both the specular and diffuse scatter have been possible with the same parameters (h=0.25±0.05, ξ=110±20Å), resulting in an accurate model of the surface structure. For samples with layers grown at higher temperatures, an increase in the amount of interdiffusion is evident. MOKE studies indicate that growing the first layer at elevated temperatures results in curves which are significantly different from those obtained from the room temperature sample. Completed trilayers show varying values of the transverse component of magnetisation with a notable lack of anisotropy for the sample grown with all layers hot.





PS12.03.14 X-RAY REFLECTIVITY AND DIFFUSE SCATTERING STUDY OF ROUGHNESS ANISOTROPY IN AlAs/GaAs SUPERLATTICES.
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The effect of misorientation of the substrate surface on interface roughness in AlAs/GaAs superlattices grown by MBE at different growth conditions has been studied by x-ray reflectivity and diffuse scattering as well as by atomic force microscopy. A distinct anisotropy of x-ray diffuse scattering from superlattices was revealed by measurements along and perpendicular to the misorientation direction. Towards the direction of misorientation, the distribution of diffuse scattering turned to possess a pronounced asymmetry. The symmetrical part of the diffuse scattering pattern has been well fitted with the correlation function [1] implying the dependence of interface-interface roughness correlation on the lateral frequency of roughness. For the simulations of the asymmetrical part of diffuse scattering, two models of interface roughness and corresponding correlation functions have been suggested and checked. The first model implies a lateral shift of the surface relief towards the direction of the misorientation in successive interfaces, while the second one takes into account the asymmetry of terrace-step structure of interfaces in this direction. Atomic force microscopy images have shown that the top GaAs surface of superlattices consists of step bunches with lateral sizes and asymmetry being in a good agreement with the parameters obtained from the fitting of x-ray data.

[1] V. M. Kaganer, S. A. Stepanov, and R. Köhler, Phys. Rev. **B52** (1995) 16369.

PS12.03.15 STRUCTURAL AND SOME PHYSICAL PROPERTIES OF THIN FILMS OF TRANSITION METAL OXIDES
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Thin films of the transition metal (IY-Y) oxides are the perspective materials of microelectronics and electron technique due to wide range of physical properties. At the same time study of the processes of oxidation of this metals, beginning mostly from the surface, has a great scientific and applied significance. The processes of oxidation of V, Nb, Ta have been investigated by EDSA in detail. In equilibriumconditions the diffusion processes take place only on the initial stages of oxides formation. In nonequilibrium conditions the oxidation of Nb, Ta the transition to the highest oxide is realized through a row of homologically tied together transitional structures, having in their construction separate fragments of structure which are common with the pentaoxide. The "chain" of structural reconstruction depends strongly on the initial conditions. Neglecting of this dependence brings to large throwing of results. The structural mechanism of oxidation of Ti, Zr, Hf is proposed on the basis of high- and low-temperature modifications of this metals. The possibilities of EDSA in investigation of defect phases and chemical composition are demonstrated. The phase transition semiconductor-metal in orientated films vanadium dioxide under influence IR-irradiation studied with using pulse photothermic deformation of surface. The concavity of film, arising during local phase transition, was explained by the directions of the crystallographic axes. UV-irradiation led to increasing of the phase transition temperature on 2 K and to forming of clusters of the tetragonal phase, which was preserved upon temperature lower than critical.