PS12.02.25 STATISTICAL APPROACH: TO COHERENT DIFFRACTION FROM A PERFECT CRYSTAL WITH A RANDOMLY DISTURBED LAYER. I. A. Vartanyants[1] and J. -P. Guigay[2], [1]Institute of Crystallography RAS, Moscow, Russia, [2]Laboratoire Louis Neel, CNRS,Grenoble, France

X-ray intensity diffracted by statistically deformed crystals is usually considered as the sum of a coherent I_{coh} and an incoherent I_{inc} components t [1], which can be separated experimentally by using the technique of triple-crystal diffractometry. The present work deals with numerical calculations of the angular distribution of I_{coh} from a crystal with a statistical distribution of microdefects located in a surface layer, in the frame of the theory developed in [2]. The lattice spacing of the layer was taken slightly different from the lattice spacing of the perfect substrate. The statistical layer deformation is defined, according to [1] by a static Debye-Waller factor E and a correlation function g(t). We have used different models for g(t): an exponential model and a model corresponding to spherical amorphous clusters. In our calculations of the coherent intensity, I^s_{coh} diffracted by the substrate and I^l_{coh} diffracted by the layer correspond to different angular ranges because of the microscopic deformation of the layer. Our results show that I^l_{coh} depends strongly on the value of Kato's correlation length τ_0 and on the value of E only and practically does not depend on the model of correlation function. There was found and explained nonmonotonic behavior of I^s_{coh} as a function of parameter τ_0. The possibilities of independent measurements of E and τ_0. with the help of synchrotron radiation are discussed.

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PS12.02.26 DIFFUSE X-RAY SCATTERING FROM ROUGH INTERFACES IN SPUTTERED W/Si MULTILAYERS. T. H. Metzger, T. Salditt, D. Lott, J. Peisl, Sektion Physik, University of Munich, D-80539 Munich, Germany

Amorphous W/Si multilayers (ML) have been produced by sputtering at varying Ar pressure. The evolving structure of the interfaces is investigated by diffuse x-ray scattering, specular reflectivity measurements and by transmission electron microscopy (TEM). We have adopted the technique of grazing incidence diffraction (GID) to measure the diffuse scattering at small angles, close to the plane of incidence [1]. We demonstrate the advantages of this new technique as compared to off-specular measurements in the plane of incidence. Using x-rays from a synchrotron radiation source (ESRF) we combine triple crystal diffractometry and grazing incidence and exit angles to achieve large lateral momentum transfer together with high resolution. Due to the onedimensional periodic structure of the ML the diffuse scattering intensity is found to be concentrated in "Bragg sheets" through the ML Bragg points.

The decay of the diffuse intensity as a function of lateral momentum transfer is used to determine the height-height self-correlation function. It is found to decay logarithmically (static exponent H=0) for ML grown at low Ar pressure. From the broadening of the "Bragg sheets" along the momentum transfer in growth direction as a function of the lateral momentum transfer the number of interfaces, N, which contribute coherently to the diffuse scattering on a given length scale is obtained. N can be related to the cross-correlation function and thus the dynamic exponent is determined (z=2 for low Ar pressure). The results are discussed in terms of theoretical predictions for various growth models. For low Ar pressure we find heightcorrelations (exponents H and z) expected from the Edwards-Wilkinson description of growth. For high Ar pressure the roughness morphology changes dramatically and can be described by the Huygens principle growth model [2]. The corresponding values for H and z compare well with our experimental results (H=0.7 and z=1.37). The real structure of the ML is demonstrated by TEM pictures. They support the results from the diffuse scattering study.

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PR12.02.27 X-RAY MULTILAYER MIRRORS WITH WIDE ANGULAR RANGE. V.A.Kalnov, V.V.Protopopov, K.A.Valiev, R.M.Imamov* .The Physical and Technical Inst., Russian Academy of Sciences 117218, Moscow, Krasikova St., 25a, *The Institute of Crystallography, Russian Academy of Sciences 117333, Moscow, Leninskii pr.,79

The multilayer mirrors with 0.4°-0.5° reflection region and reflectivity of 4030% at CuK_α radiation are developed for various applications, including focusing and scanning of X-ray beams. This is accomplished by forming a structure with continuously decreasing period from the substrate to the surface. Several pairs of materials were tested: W-C, W-Al, Cu-C. Adequate mathematical simulation was developed, taking into account the divergence of the beam, the roughness and real optical constants of the layers, that enabled to determine optimal structure parameters. The multilayer coating was formed with magnetron sputtering installation, calibrated thoroughly according to special procedure, providing the accuracy within 1-2Å of layers thickness. As a result a good agreement was achieved between experimental and theoretical results (fig. 1). The substrate and interfaces roughness were investigated with AFM and HREM methods (fig.2).

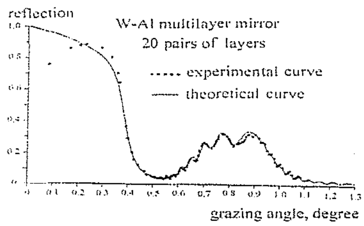

Fig.1. The reflection curve of a W-Al multilayer mirror with 20 bilayers

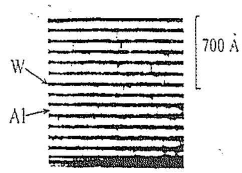

Fig.2. The HREM image of the W-Al multilayer structure

PS12.02.28 EFFECT OF BORDERING WATER FILMS ON STRUCTURAL PROPERTIES OF MICACOMPOSITION MATERIALS. L.A. Sherbachenko, B.S. Guterman, Y.V. Ezhova, L.F. Kuznetzova, Irkutsk State University, Irkutsk, Russia

A survey of experimental data on absorbtional processes in compositional materials is given on the basis of bispersed mica (micapaper, micapolymers), received by dielectric measurement me-methods.

The research was done at wide temperature and frequency dispason at various dampness of samples and environment.

Sufficient influence of electrically active fields of the surface of mica particles and participating surface forces on the process of creation bordering water films and electrical ability of these films and samples on the whole. A quantitative mark of this influence is given and calculations of tension of surface electric fields are done.