PS12.01.17 INFLUENCE OF ARGON BEAM IRRADIATION AT DIFFERENT TEMPERATURES ON THE STRUCTURAL PROPERTIES OF CU/FE BILAYERS. Echeverría, G.[1,3], Desimoni, J.[2], Mercader, R. C.[2], and Punte, G.[1], (1) PROFIMO, (2) TENAES, Departamento de Física, UNLP, CC 67, 1900 La Plata, (3) Facultad de Ingeniería, UNLP, La Plata, Argentina

Ion-beam mixing rates of bilayers of metals are presently the subject of intense research. Several mixing kinetics theories have been proposed that take into account the chemical driving force between the constituting elements. However, previous Rutherford Backscattering Spectrometry (RBS) results obtained after low temperature irradiation of Fe/Cu bilayers could not be fitted whith the models available in the literature [1]. In this work, Cu/Fe bilayers grown by alternate deposition of Cu and Fe layers of 1000 Å thickness, on a Si(111) substrate and irradiated with a 360 keV Ar^{2+} ion beam (at room temperature and at 180K) with doses from $2.0x10^{15}$ to $5.0x10^{16}$ ions/cm^2, were studied by means of a conventional X-ray powder diffractometer. Both sets of samples show an increase in the Fe layer cell parameter as a function of the doses. However, the evolutions of Fe line-widths and positions, and Cu line-widths differ in the samples irradiated at r.t. and at 180K. These results are compared with RBS studies performed on the same samples and discussed in the frame of current ion-beam mixing theories.

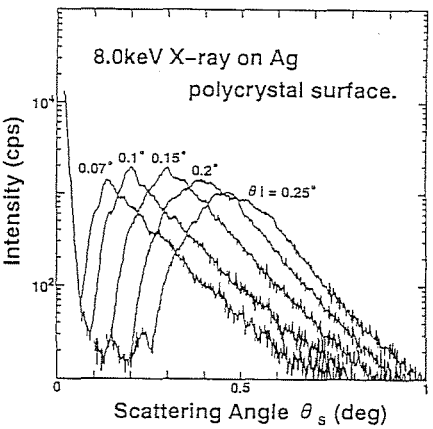
[1] B. Rauschenbach, M. Posselt, R. Grötschel, E. Brecht, G. Linker, and O. Meyer, Nucl.Instr.Meth. B69 (1992) 277.

PS12.01.18 ROUGHNESS ESTIMATION OF POLYCRYSTAL METAL SURFACES UNDER THE ULTRA HIGH VACUUM BY X-RAY GLANCING SCATTERING. Yoshikazu Fujii, Kenji Yoshida, Takeshi Nakamura and Kentaroh Yoshida, Department of Mechanical Engineering, Kobe University, Rokkodai, Nada, Kobe 657, Japan

We have constructed a new equipment for study of surface by x-ray glancing scattering. The equipment has a 18kW rotating-anode x-ray source, an incident monochromator and an ultra high vacuum chamber in which a specimen is mounted.

With use of this equipment we tried roughness estimation of polycrystal silver surfaces under the UHV by x-ray glancing scattering. The experiments were performed with use of Cu-Kα characteristic x-ray with λ=1.54Å.

At several glancing angle incidence of the x-ray beam on a polycrystal silver surface, angular distributions of the scattered x-ray intensity were measured as shown in the bellow.



The angular distributions of the scattered x-ray intensity were simulated with use of simple model of rumpled surface. Based on these results we propose a new method of roughness estimation of the surface.

PS12.01.19 DETERMINATION OF INTERFACE ROUGHNESS STATISTICAL PARAMETERS FROM ANGULAR SPECTRA OF X-RAY DIFFUSE SCATTERING A. V. Andreev, Yu. V. Ponomarev, Physics Department, M.V.Lomonosov Moscow State University, Russia Yu.Ya. Platonov, OSMIK, Troy, Michigan, USA, N.N. Salashchenko Institute for Physics of Microstructure, Nizhny Novgorod, Russia

The optimized algorithms for reconstruction of the statistical characteristics of the interface roughness from the angular spectra of the x-ray diffuse scattering have been theoretically developed and experimentally tested.

We report the results of the experimental and theoretical study on the x-ray diffuse scattering by multilayer nanostructures. The theory of the diffuse scattering based on the combination of the two-wave dynamic diffraction and distorted wave approximat ion is developed. In our experiments we have used the x-ray mirrors with the wide range of parameters (periods d=a+b from a few units up to twenty nanometers, consisting of the different pairs of materials and substrates, and different ratios of the lay ers thickness a/d=0.1-0.5).

We have experimentally observed a number of new phenomena which are due to the effects of the dynamic diffraction: effects of the forbidden reflection release, resonant rise of the background intensity, and appearance of the additional maxima of the dif fuse scattering corresponding to the excitation of the second sheet of the dispersion surface. The good agreement of the theoretical and experimental angular spectra of the diffuse scattering enables us to determine with the help of computer fitting the following statistical parameters of the investigated mirrors. The rms height of roughness, longitudinal and transversal correlation lengths.

PS12.01.20 ETCHING KINETICS OF FLUX GROWN RARE EARTH ALUMINATE CRYSTALS. Krishen Bamzai, K. K. Sharma, P. N. Kotru, Department of Physics, University of Jammu, Jammu-India, B. M. Wanklyn, Clarendon Laboratory, University of Oxford, Oxford UK

Results of experiments performed on etching of (110) and (001) surfaces of flux grown rare earth aluminate crystals (where R = Er, Dy, Gd, Tb) using H_3PO_4 and HNO3 as etchants are described and discussed. The etching kinetics were investigated using different concentrations of the same acid as well as different proportions of two combined acids and temperatures of the etchants. The lateral and vertical etch rates are worked out and their variations with temperature are recorded. From the data, the activation energies of rare earth aluminate for lateral extension (E_L) and depth of etch pits (E_D) are estimated. The optimum conditions of etching leading to well defined etch pits are found to be H_3PO_4 at 180°C keeping the etching time 10 minutes and H_3PO_4 : HNO_3 (1:1) at 150°C for 15 minutes. Results of experiments suggesting the formation of the point bottomed etch pits at the dislocation lines intersecting the crystal surfaces are described and discussed.