MS12.03.07 MEASUREMENTS OF ATOMIC ORDERING IN ROUGHNESS WITH GRAZING INCIDENCE X-RAY DIFFRACTION. S. A. Stepanov, E. A. Kondrashkina, M. Schmidbauer, R. Köhler, and U.-J. Pfeiffer, MPG-AG Röntgenbeugung, Hausvogteiplatz 5-7, Berlin 10117 Germany; T. Jach, National Institute of Standards and Technology, Gaithersburg, MD 20899; A. Yu. Souvorov European Synchrotron Radiation Facility, Grenoble Cedex 38043 France

The measurements of diffuse scattering (DS) in grazing incidence x-ray diffraction (GID) can provide information on atomic ordering in surface and interface roughness of crystals which is not accessible by usual specular and non-specular x-ray scattering. In contrast to the usual non-specular x-ray scattering which is proportional to the mean fluctuations of material density $\delta\chi_0$, the DS in GID is mainly determined by fluctuations of crystal polarizability $\delta\chi_h$, where **h** is the reciprocal lattice vector corresponding to GID.

A theory of DS on correlated and uncorrelated interface roughness under GID based on the matrix solution to GID in multilayers and the distorted wave Born approximation is applied to two GID experiments with an etched Ge surface and a GaAs/AlAs superlattice carried out at CHESS and ESRF, respectively. In both cases a good accordance between the theory and the experiment is observed. In the case of the etched Ge surface, an anti-Yoneda dip in the DS pattern at the Bragg peak and two symmetric shoulders on the Bragg curve wings have been found and explained. In the case of the GaAs/AlAs superlattice, the DS separated from the coherent GID by means of high-resolution measurements was compared to x-ray reflectivity data and it has been shown that the atomic ordering was preserved in the interface roughness, while it was partially destroyed in the surface roughness.

MS12.03.08 CORRELATED ROUGHNESS INFORMATION FROM DIFFUSE X-RAY SCATTERING OF STEPPED SURFACES. P. M. Reimer, Y. Yamaguchi, J.H. Li, H. Hashizume, Tokyo Institute of Technology

We discuss the problem of extracting useful information on interfacial roughness correlations from glancing angle diffuse scattering data. In recent years, the distorted wave Born approximation (DWBA) has been successfully applied to model diffuse scattering from fractally rough surfaces. However, many surfaces/interfaces of interest are often stepped due to small substrate miscut angles, and the fractal approach does not take into account such strong, periodic, correlated interface structures. We discuss how to extract information on roughness parameters and roughness correlations from the diffuse intensity under such circumstances, using Si/SiGe heterostructures and calcite surfaces as examples. (Applications will be found in related presentations by J.H. Li and Y. Yamaguchi).

PS12.03.09 IN-SITU X-RAY REFLECTIVITY MEASUREMENT OF THIN FILM GROWTH. Chih-Hao Lee and Sung-Yuh Tseng, Department of Nuclear Engineering and Engineering Physics, National Tsing Hua University, Hsinchu, Taiwan, 30043

X-ray reflectivity method was used to measure in-situ the thickness and surface roughness of a thin film during deposition growth. Intensity oscillation as function of time can be observed as the film thickness grows. The oscillation amplitude is damped as the surface roughness increase. The experiment procedure is similiar to ellipsometry or RHLEED. While only kinematic theory is needed to interpret the experiment data, the X-ray reflectivity method is much easier to fit the model. In this method, the measurement sensitivity of the film thickness can be selected by changing the specular angle. A higher incidence angle is more sensitive to thinner layer. As the specular angle approaches anti-Bragg angle, the measurement is sensitive to the monolayer growth of the thin film.

PS12.03.10 ORGANIZATION OF ORIENTED LAYERS OF Zn(II), Cd(II), Hg(II) DIETHYLDITHIOCARBAMATO-IODINE COMPLEXES. S.A. Gromilov, A.V. Ivanchenko*, S.A. Prokhorova, S.M. Zemskova. Institute of Inorganic Chemistry, Sib. Branch RAS, Novosibirsk, Russia; *Novosibirsk State University, Novosibirsk, Russia

A literature review on volatile Zn(II), Cd(II), Hg(II) dialkyldithiocarbamates has been made; their crystal structures, IR and UV spectra, thermal properties have been analyzed. A number of new dialkyldithiocarbamates with different alkyl substituents was synthesized.

The layers of up to 1 mkm from both homo- and heterometallic diethyeldithiocarbamato-iodine complexes ([MM'(Et_2NCS_2)$_2I_2$], M,M'= Zn, Cd, Hg) were obtained by means of evaporation in vacuum and further vapor deposition on silicon, quartz and glass substrates. An analysis of the X-ray powder patterns leads to the next conclusions:
the layers are the ideal oriented polycrystal films in all cases;
in the case of M=M'=Cd complexes, the crystal structure of the films obtained differs from the initial one;
for M=Cd, M'=Hg, the films obtained have both amorphous and crystal structures. The latters have the [001] texture axis. The structural organization of the layers in the following direction was analyzed: the scale of the location of these complexes and their orientation relative to the surface. It was shown that the film surface is formed by C_2H_5 terminal groups.

The films were subjected to thermolysis until the corresponding sulphides arose.

PS12.03.11 SURFACE DIFFRACTED WAVES OF GRAZING INCIDENT X-RAYS WITH THE PERIODICALLY MODULATED AMPLITUDE. A.P. Bezirganyan and S.E. Bezirganyan, Dep. of Solid State Physics, Faculty of Physics, Yerevan State University, No.1, Alex Manoogian st., Yerevan-49, 375049 Armenia.

The surface diffracted waves are theoretically investigated versus on the azimuth and pole angles of incidence of X-rays with the wave front amplitude periodically varying along the single crystal (SC) surface. The surface waves are attenuating on both sides across the vacuum-structure boundary. The following scheme of X-ray grazing incidence diffraction (GID) is investigated: The X-ray plane wave is reflected by the diffraction grating (DG). The reflected radiation's wave front amplitude is varying periodically along the same direction, at which the reflecting elements of DG are periodically deposited. Then the reflected wave falls at grazing angles onto a SC. The diffracting lattice planes of SC are normal to the entrance surface (symmetrical Laue case). Due to modern technologies the device performing elements' thicknesses are in nanometer ranges e.g. in the integrated circuits, solid state lasers etc., and if in particular the performing elements are deposited periodically on the substrate, one may consider the device surface layer as the reflecting DG for the X-rays. The reflection function of such DG may be used for the control and monitoring of device surface elements quality. The conditions at which the reflected from DG X-ray wave field has the narrow angular spectrum are investigated in detail. The method of investigation of such modulated incident waves by the GID technique is suggested.