PS12.02.08 FOCUSING COLLIMATORS FOR A MICROFOCUS X-RAY SOURCE. U.W. Arndt[1], A. Inneman[2] and L. Pina[3], [1]MRC LMB Cambridge CB2 2QH, UK, [2]Koma, K Lesu 965/4 14200 Prague 4, Czech Republic, [3]Czech Technical University, Bréhová 7, 11519 Prague 1, Czech Republic

We have constructed two types of specularly-reflecting focusing mirrors for 8keV X-rays: ellipsoidal mirrors made by an electroforming replication of appropriately shaped mandrels, and double Kirkpatrick-Baez-Franks mirror-blocks containing two pairs of orthogonal elastically-bent planar-elliptical mirrors. They are used with a magnetically focused X-ray tube, produced in collaboration with JVP Long and P Duncumb, which allows the mirrors to be mounted within 10 mm of the electron focus of which an image is formed on the specimen 600 mm from the source. This arrangement permits a large collecting angle at the source and a small crossfire at the sample: our best collimators produce a flux per unit tube power more than 100 times that obtained with a pinhole-collimated beam with the same cross-fire of about 0.001 radians. We have tested our system at low tube-power; we expect to be able to dissipate more than 25 watts in our X-ray tube, at which point we should exceed the X-ray intensity at the sample obtained with conventional collimation of a 2.5 kW rotating-anode X-ray generator beam.

PS12.02.09 DETERMINATION OF STRUCTURE DEFECTS IN MERCURY CADMIUM TELLURIDE MULTILAYER MATERIALS. Fuju Yu, Shanghai Institute of Technical Physics, Chinese Academy of Sciences, Shanghai 200083, China.

Some structure defects at heterojunction regions, such as microtwins, stacking faults, mismatch dislocations, and orientation differences between multilayer structures: mercury cadmium telluride/cadmium telluride and cadmium telluride/gallium arsenide as well, were studied by TEM (transmission electron microscopy). For the heterojunctions of mercury cadmium telluride/ cadmium telluride/gallium arsenide multilayers gown by MBE (molecular beam epitaxy) method, it is clearly shown that the buffer layer cadmium telluride acts as an effective barrier for mercury cadmium telluride epilayer for most of structure defects, and orientation differences between multilayer structures mercury cadmium telluride/cadmium telluride and cadmium telluride/gallium arsenide were found to be the more orientation difference accompanies the more lattice mismatch degree. There is a transient layer with intensive strain and a thickness at about 30 Angstrom, between buffer layer cadmium telluride and substrate. The transient layer distributed near homogeneously over a large area was just happened at the beginning of epitaxial growth of buffer layer due to large lattice mismatch as well as inappropriate growth rate (perhaps too fast) or other insufficient condition. It seems likely that the transient layer relaxes the lattice mismatch strain at heterojunction cadmium telluride/gallium arsenide, therefore no mismatch dislocation was created during the following growth of buffer layer and the epilayer could be smoothly grown afterwards. It is surprising to find that the epilayer can still be formed in an epitaxial orientation upon this transient layer, and this suggests either that the substrate can influence the overgrowing epilayer through the intervening layer, or that this layer forms interactively later, just similar to the case in the (cadmium, zinc)sulfide/gallium arsenide compounds.

PS12.02.10 INTERFACE EVOLUTION AFTER THERMAL TREATMENT OF TUNGSTEN/SILICON MULTILAYERS. M.Jergela, V.Holyb, Z. Bochnicekb, E.Majkovaa, S.Lubya, R.Senderaka a Institute of Physics of the Slovak Academy of Sciences, Dubravska cesta 9, 842 28 Bratislava, Slovakia b Faculty of Science, Masaryk University, Kotlarska 2, 611 37 Brno, Czech Republic

The X-ray reflectivity and diffuse scattering measurements at grazing incidence after a thermal treatment were performed on the [10x(2.65nmW/9.15nmSi)] and [9x(1.7nmW/5.4nmSi)] multilayers. The samples were prepared by electron-beam evaporation in the Balzers 500 UHV apparatus onto oxidized Si(100) substrates covered with 500 nm of SiO2. The measurements were performed on the Stoe high-resolution diffractometer equipped with a double-crystal GaAs monochromator using CuKα1 radiation. The rapid thermal annealing was performed in a halogen lamp furnace. The reflectivity was measured also in-situ during long-time linear and isothermal annealings using a laboratory-made apparatus. The results of the reflectivity and diffuse scattering measurements were simulated within the Fresnel optical computational code and distorted-wave Born approximation, respectively, using various interface conformity models. The rms interface roughness is unchanged or even decreases up to the 500°C/20s annealing, the sharpening of the interfaces being accompanied by a large shift exceeding 1 nm caused by the Si diffusion into W without disturbing the multilayer structure itself. The conformity of the interface profiles and fractal behaviour found in the as-deposited state is lost after the thermal treatment and the lateral interface correlation length increases by more than one order of magnitude. An extensive interdiffusion above 500°C is observed leading to the breakdown of the multilayer after the 750°C/40s annealing. Various dynamical scattering effects at grazing incidence are discussed, too.

PS12.02.11 THE DETERMINATION OF CRYSTAL STRUCTURE AND TEXTURE PARAMETERS OF POLYCRYSTALLINE THIN FILMS USING MULTIPLE DIFFRACTION DATASETS. H. Toraya, Ceramics Research Laboratory, Nagoya Institute of Technology Asahigaoka, Tajimi 507, Japan

Polycrystalline thin film/powder samples often exhibit the texture (preferred orientation) effect. The intensity correction for texture effect is, however, apt to induce the correlation with other parameters, and makes a result of crystal structure analysis less reliable. In the present study, a new procedure using multiple differaction datasest for the determination of crystal structure and texture parameters of polycrystalline thin films is proposed.

A sample used for the present study was a polycrystalline $Bi_3Fe_5O_{12}$ thin film. A wide-angle two-axis thin-film diffractometer based on a parallel-beam optics was used for data collection. Multiple diffraction datasets were obtained by using an asymmetric 2 θ scan technique at various fixed incident angles ranging from 1° to 30°. An individual profile fitting technique was used for pattern decomposition. In asymmetric diffraction, the scattering vector does not coincide with the polar axis of the specimen. Thus each of these datasets exhibited the different degree of texture effect. In previous studies, a Rietveld refinement technique was applied separately to individual diffraction datasets [1,2].

In the present study, all integrated intensity datasets observed at different incident angles were simultaneously used for the least-squares determination of crystal structure and texture parameters of the specimen.