Epitaxial Growth, Doping & Imperfections

PS16.07.01 GROWTH AND CHARACTERISATION OF CdI_2 DOPED AND UNDOPED PbI_2 CRYSTALS. Alka Jain, G. C. Trigunayat, Department of Physics & Astrophysics, Delhi University, India

Both undoped and CdI_2-doped single crystals of lead iodide have been grown by vapour technique and characterised by X-ray diffraction to study their polytype formation. All undoped crystals are exclusively found to contain the stable high temperature modification ,viz, the polytype 12R while nearly one-third of the doped crystals are additionally found to consist of the polytype 4H. The CdI_2 -doping is held responsible for the formation of 4H at the prevalent high temperature of crystal growth. Further, unlike the undoped crystals, some of the doped crystals also show streaking and arcing on their X-ray photographs. The crystals were subsequently stored for nearly seven months and re-examined through XRD to study possible polytype transformation.

PS16.07.02 THE MBE GROWTH OF CdTe ON THE KC1 (100) SUBSTRATES. Alexander F. Sen'ko, Grodno State University, Grodno 230023, Belarus

The epitaxial growth of CdTe thin films by molecular beam epitaxy (MBE) relates both the practical interesting and the posibility to study the elemetary growth processes of thin films. The MBE growyth of CdTe on KCl (100) substrates was carried out. The deposition of the CdTe layers occured at the substrate temperature of 180°C and 200°C using the different molecular beam sources. The RHEED,AES and SEM are applied for researching growth processes, stechiometry and surface morphology. The diffraction patterns are the spotty patterns that shows the roughnees of the grown layers and the three-dimentional (3D) growth (island growth) mode takes place. However, CdTe layers grown in both cases are monocrystalls The island character of the grown layers are confirmed by scanning electron microscope too. Thus, the CdTe layers grown at the substrate temperatures of 180°C and 200°C are monocrystalls but the surface morphology is roughnees.

PS16.07.03 IMITATION OF GEMS SYNTHESIZED FROM CRYSTALLIZED GLASS. Shilova O.Yu., Petrovsky V.A., Shilov Yu.A.; Magistralnaya st. 31, apt. 17, Syktyvkar, 167022, Russia.

Imitations of gems synthesized by the method of crystallization of glass using different catalysts. The imitations of different colours and tints such as red, blue, light-blue, violet, green and emerald have been received. Chemical stability of imitations from glass-former was determined by dependence of chemical stability from degree of connectedness of elements is expressed by means of middle factor connectedness of structure framework Y. Corrosion processes of synthesized imitiations in agressive medium were investigated by the methods of laser interferometry and infrared spectroscopy.

It was determined that stability of imitations to the affect of agressive agents depends on stability of crystalline and amorphous phases and microstructure of crystal.

Chemical composition of initial glass on which depends the type of growing crystal and peculiarity of residual glass-phase was selected. The fundamental structure units of glass-phase are [BO_3], [BO_4] and [SiO_4] groups.

PS16.07.04 GROWTH AND X-RAY DIFFRACTION OF $BaTiO_3$ THIN FILMS. Y. Yoneda, T. Okabe, K. Sakaue and H. Terauchi, Dept. of Physics, Kwansei-Gakuin University, Nishinomiya, HYOGO 662, Japan

Thin films of $BaTiO_3$ single crystal on $SrTiO_3$ (001) substrate were prepared epitaxy by molecular beam epitaxy (MBE). $BaTiO_3$ films deposited around 700 °C and the deposition rate of these films was 30-70 sec/1 unit. The growth under the condition of the low deposition rate clarifies the growth mechanism of $BaTiO_3$ films. Our MBE method is different from laser ablation or sputtering. In these methods, radical ion beam is used to enhanced oxidation. However, in our case, molecular beam is neutral electric state.

The $BaTiO_3$ films, ranging from 5 ML-thick to 20 ML-thick, were investigated by *in-situ* monitoring of reflection high energy electron diffraction and *ex-situ* observation of X-ray diffraction. Most films were grown by alternate activated reactive evaporation (ARE). Since the $BaTiO_3$ film were island growth in co-evaporation, the intensity oscillation in the specularly reflected electron beam was observed only the beginning of growth. However, in alternate ARE, the intensity oscillation was observed throughout the growth. The epitaxial relationship was cube-on-cube. The rocking curve of $BaTiO_3$ (002) reflection from the 40-Å (10-ML)-thick film indicated that the $BaTiO_3$ thin films were strong *c*-axis oriented tetragonal phase.

Other

PS16.10.01 STEP BUNCHING ON VICINAL STEPPED FACES GROWING FROM SOLUTIONS AND MELTS. A. A. Chernov*, S. R. Coriell, B. T. Murray, G. B. McFadden, National Institute of Standards and Technology, Gaithersburg, MD 20899, USA

We try to answer the questions: Why and when does the equidistant train of elementary steps on a growing vicinal face reorganize itself into step bunches? These bunches are responsible for various crystal defects. The anisotropic interface kinetics, solution or melt flow, growth steps motion and capillarity are taken into account. Random perturbation of the growing vicinal face was analyzed in order to find out the range of the "resonance" wavelengths that cause step bunching, i.e., morphological instability. Detailed theory and some experiments show that liquid flow directed opposite to step flow results in stabilization while parallel flows cause step bunching. The tangential solution flow should influence the morphological stability of a growing interface if the rate of this flow at a distance of the order of the perturbation wavelength from the surface is comparable to the rate at which the step perturbations move. It was found that there are conditions of self-stabilization by the step flow only and conditions of absolute stability in the presence of liquid flow.

*Universities Space Research Association, 4950 Corporate Drive, Suite 100, Huntsville, AL 35806 and on leave from the Institute of Crystallography, Russian Academy of Sciences, 117333 Moscow, Leninsky Prosp 59, Russia