PS16.02.14 INSTABILITY OF FACETED CRYSTALS IN TWO DIMENSIONS. Mu Wang, Cheng Sun, and Nai-ben Ming, National Laboratory of Solid State Microstructures, Nanjing University, Nanjing 210093 & Center for Advanced Studies of Science and Technology of Microstructures, Nanjing 210093, China

We present here our recent studies on the instability of two-dimensional hexagonal faceted crystals in lipid monolayers. The experimental observations indicate that there exists a critical size for stable faceted growth, beyond which the two-dimensional faceted crystal may develop into dendrite or cellular pattern depending on the anisotropy of the amphiphilic molecules. For the dendritic growth in our experiments, the tip growth rate is extremely low and the product of the square of the tip curvature radius and the growth rate ρ^2V is a constant several orders of magnitude smaller than previous reports.

PR16.02.15 MODELS OF GROWTH ZONING IN CRYSTALS OF SOLID SOLUTIONS. P.Azimov (Inst. of Precambrian Geology and Geochronology, Russia), A.Shtukenberg (St.Petersburg State University, Russia).

We have suggested expression for the supersaturation of solution containing several isomorphically cocrystallizing salts. Based on it the mathematical models were constructed for formation of growth zoning in mixed crystals. In the models considered we assume kinetic regime of crystallization; influence of mass transfer is not taken into account. The growing crystal is considered to be a three-dimensional polyhedron.

Three models relate the arising zoning to partition of components between solution and crystal in the closed system.

Model of isothermic desupersaturation. Initial supersaturation decreases and asymptotically vanishes. This process produces monotonic zoning. Concentration of the more soluble salts increases, while that of the less soluble one drops from the core to rim of the crystal.

Model of isothermic solvent evaporation. Under the constant rate evaporation the supersaturation goes through two maxima and decreases with a limiting value above the equilibrium one. Salt molalities in the solution change nonmonotonically as well, thus producing complex zoning profiles.

Model of isohydric cooling of solution in closed system. The crystal growth goes simultaneously with the cooling. The time dependence of supersaturation for the exponentially slowing cooling has one maximum and asymptotically vanishes. Zoning is produced here by the partition between crystal and solution with changing distribution coefficient which temperature dependence strongly affects the zoning profiles.

Model of cooling of solution in open system. One more model considers crystallization in system having constant composition of the solution. Zoning is generated by variation of the distribution coefficient with temperature. Composition differences between core and rim of the crystal are small, but their trend may be opposite to the zoning trend of partition.

PR16.02.16 ANOMALOUS BIREFRINGENCE IN ALUMS ISOMORPHIC MIXTURES. A. Shtukenberg, O. Kovalev, Yu. Punin (St.Petersburg Univ., Russia)

Anomalous optical behavior is known for many natural and synthetic crystals. Their optical properties have strong connection with growth kinetics but their nature is vague. The aim of this work is study of optical anomalies in perfect isomorphic mixtures.

The systems investigated were three perfect isomorphic rows of alums. The crystals have been grown from aqueous solutions. Unlike the end members of isomorphic rows the mixed crystals display lower symmetry of optical properties then original ones (space group Pa3), i.e. dissymmetryzation takes place. In one crystal different growth sectors have different optical indicatrix orientation and birefringence. In <111> sectors optical indicatrix is almost unaxial with main axis nearly parallel to growth direction. Connection between indicatrix orientation and growth hillocks exist. The dependence of birefringence on the composition of crystals is parabolic with maximum ($8\cdot10^{-5}$) at the middle of the rows. In <100> and <110> growth sectors indicatrix orientation has complicated character and birefringence attain $1\cdot10^{-5}$. Calculations have shown that lattice misfit strains have no contribution to optical anomalies. These anomalies may be connected with ordering of isomorphic ions, because of nonequivalence of crystallographically equivalent lattice positions on growth surface. We have been investigated the influence of growth conditions on optical anomalies. Increasing of growth temperature leads to birefringence decreasing. High temperature annealing ($T=20\text{-}82\ ^\circ C$, $T_{melt}=95\ ^\circ C$) has shown decreasing of birefringence. The activation energy is about 118 ± 7 KJ/Mole. These facts correspond to a cation ordering mechanism. X-ray structure refinement is carried out now. Preliminary data (growth sector <111>) suggest symmetry decreasing to monoclinic (space group Pc) or even lower.

Crystal Growth III Methods/Materials

MS16.03.01 POLYCOMPONENT OXIDE CRYSTALS: GROWTH AND APPLICATION A.Pajaczkowska[1], A.Gloubokov[1], P.Reiche[2], R.Uecker[2], [1]Institute of Electronic Materials Technology, 01-919 Warsaw, Poland, [2]Institut of Crystal Growth, 12489 Berlin, Germany

Polycomponent oxides of $CaNdAlO_4$ (CNA), $SrLaAlO_4$ (SLA), $SrLaGaO_4$ (SLG), $NdGaO_3$ (NGO), $LiAlO_2$ (LAO), $LiGaO_2$ (LGO) have been found, recently, as attractive substrates for HTSC and GaN thin layers, respectively. Crystals are grown by Czochralski method and anisotropic properties of compounds play an important role in case of CNA, SLA and SLG in the growth of good quality crystals.

Morphology of these crystals depends on ionic-covalent character of bonding and crystal growth parameters. Point defects are observed in crystals and they are reflected in color changes (colorless, yellow, green). Point defects are detected in directions perpendicular to oxide planes and are connected with instability of oxygen position in lattice. Results of ESR and optical spectroscopy investigations are presented [1].

Most oxides of the same crystal structure form solid solutions which exist in solid state, however, crystal growth is only limited to very low solubility (0.1 mol% or less) of these cations in host lattice. The solubility does not only depend on ionic radii but it is assumed that electron structure of cations influences the stability of crystal structure.

It is pointed out that crystal growth process of polycomponent oxide crystals by Czochralski method depends on the preparation of melt and its stoichiometry, orientation of seed, gradient of temperature at crystal-melt interface, parameters of growth (rotation and pulling rate) and control of red-ox atmosphere during seeding and growth. Growth parameters have an influence on the morphology of crystal-melt interface, type and concentration of defects.

1. M.Drozdowski, J.Domagala, M.Kozielski, M.Szybowicz, A.Pajaczkowska, Solid State Comm. 96 (1995) 785.