and c axes. The SR White Beam Topography experiment was carried out on 4W1A Beamline of National Synchrotron Radiation Laboratory of BEPC. The direction of incident X-ray was perpendicular to the slice surface and parallel to the a-axis. In order to obtain a dynamic information, a transmitted White Beam Topography was taken every 30 second. A $V_+ = 70$ Volts was applied to the C surfaces which were covered with silver paste for good electrical contact, this voltage corresponds to an average field strength $E_+ = 190$ V/cm.

From these topographs, one can see that:

1. Many dark straight lines parallel to the c—axis was found, these lines randomly distributed over all slice surface.
2. The longer the time of application of DC field, the darker and wider the lines.
3. When DC field was removed, these dark lines became light and narrow gradualy until they disappeared.

From all the above results, it follows that under the application of a DC field, the crystal lattices of KTP was distorted because of the space charge accumulation in KTP.

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PS-13.02.11 CZOCHRALSKI GROWTH AND X-RAY TOPOGRAPHIC INVESTIGATION OF SALOL SINGLE CRYSTALS. By H. Klapper and G. Neuroth, Mineralogisches Institut, Universität Bonn, W-5300 Bonn, Fed. Rep. Germany.

Salol, $C_{13}H_{10}O_3$, crystallizes in the orthorhombic space group Pcab with lattice parameters a = 11.258 Å, b = 23.402 Å, c = 7.961 Å. The melting temperature is 42°C. Until now large single crystals have been grown from solutions and from supercooled melts. These crystals exhibit a high growth anisotropy: They develop a plate-like habit with dominating {010} pinacoid.

In the present study crystals were grown by the Czochralski method by pulling along various crystallographic and non-crystallographic directions. The aim was to study the growth behaviour and the typical arrangements of grown-in dislocations for different growth directions. The salol melt was held at about 0.5°C above the crystallization temperature (at about 42,5°C). Due to the low thermal conductivity of salol and low heat radiation, an additional cooling of the growing crystal by the air circulating in the growth chamber was necessary. By decreasing the temperature of the cooling air from about 40 to about 35°C, the diameter of the crystal could be increased from 5 mm (seed crystal) to about 30 mm. Typical pulling and rotating rates were 0.6 mm/h and 8 rev./min. Crystals of up to 100 mm length and 30 mm diameter and of excellent optical perfection were obtained.

The crystals were cut into slices (thickness ca. 1 mm) parallel to the pulling direction. Thus the slices contain a part of the seed crystal, the region of first growth on the seed, the crystal cone and the grown crystal until the end of growth. This allows to follow - within one specimen - the development of grown-in defects from the start to the end of the growth.

The growth defects were imaged by using the X-ray topographic technique of A.R. LANG (CuKα radiation). They are mainly grown-in dislocations which originate from inclusions (gas bubbles) formed in the zone of first growth, in particular at the edges of the seed crystal. Other sources of dislocations are steps in the shoulder (cone) of the crystal boule. Such steps frequently appear when the diameter increase is too fast. The grown-in dislocation lines take a course roughly normal to the (local) growth front. Since this interface is (due to the air cooling mentioned above) concave against the melt, the dislocation lines do not grow out through the side faces, but are "focussed" towards the axis of the crystal boule. This leads to an increase of the dislocation density along the axis of the boule. Nearly dislocation-free crystals can be obtained by careful control of the seeding-in procedure and the diameter increase.

In a few cases reactions of crossing dislocation lines have been observed. Dislocation lines with opposite Burgers vectors annihilate in the crossing region. Dislocations with different Burgers vectors b (e.g. b = [100] and [$\bar{1}$01]) form two nodes connected by a new dislocation line segment (b = [00$\bar{1}$]) of lower energy per unit length. The sum of Burgers vectors of the dislocations entering the node is zero (theorem of F. C. Frank, Bristol).

PS-13.02.12 X-RAY STRUCTURE DIAGNOSIS OF SEMICONDUCTOR MQW AND SUPERLATTICES. BY Z.H.Mai*, C.F. Cui, J.H.Li and J.T.Ouyang, Institute of Physics, Chinese Academy of Sciences, Beijing 100080, China.

Semiconductor multi-quantum well(MQW) and superlattice(SL) systems are important materials for novel device applications. Recent studies have shown that the structural parameters and the perfection of the material systems are the key factors to improve the physical properties of devices. $Al_xGa_{1-x}As$/GaAs MQW, Ge_xSi_{1-x}/Si and $In_xGa_{1-x}As/GaAs$ superlattices grown by MBE method were systematically investigated by x-ray double-crystal diffraction, x-ray grazing incidence diffraction and x-ray topographic methods.

Both coherent and incoherent interfaces between the two components of the Ge_xSi_{1-x}/Si superlattices were observed. The experimental rocking curves of one sample having 15 periods shows that in addition to the substrate peak there is a family of periodic SL reflections due to the presence of a periodic strain in the epitaxial structure. Moreover, each satellite was accompanied by a set of interference fringes (Fig.1). By fitting computer-simulated double-crystal x-ray diffraction rocking curves to the experimental data, it is determined that there exist twice abrupt variations in both the component thicknesses ratio t_1/t_2 (t_1 and t_2 are the thickness of the Ge_xSi_{1-x} and the Si layers, respectively) and the fraction x,being analogous to ABA structure (Table 1.).

The structural parameters of 15 periods $In_{0.18}Ga_{0.82}As/GaAs$ strained layer superlattice were also determined by x-ray double-

Table1. Simulated parameters

	N	x	t_1(Å)	t_2(Å)
A	1-3	0.294	51	64
B	4-11	0.234	47	69
A	12-15	0.294	51	64

