07.1–4 CRYSTAL GROWTH OF GaN FROM SOLUTION IN Ga UNDER HIGH NITROGEN PRESSURE. By J.Karpiński, J.Jun and S. Porowski, High Pressure Research Center "Unipress", Sokolowska 29, Warsaw, Poland.

GaN, a direct, wide energy gap material /gap 3.5 eV/ is potentially suitable for optoelectronic devices. The main reason for limited applicability are technological difficulties. The high decomposition pressure of N_2 leads to the thermal instability at temperatures above 900°C under normal pressure. Another problem is a lack of good solvent for this material. The solubility of GaN in Ga at 1150°C is in order 10^{-3}% molar. Our studies of the thermodynamics of Ga–N_2 system show that the equilibrium pressure of N_2 over GaN is much lower then previously predicted. Therefore the equilibrium conditions for GaN in gas pressure chamber were obtained up to 1700°C, and the synthesis of GaN from Ga and N_2 in a temperature range 1200–1500°C at pressures 10–20 kbars were performed. At high temperature the solubility of GaN in Ga steeply increases, reaching 2% molar at 1500°C under pressure 16 kbars. Owing to this high solubility we were able to obtain crystals of GaN from solution in Ga under stable conditions. The monocrystalline layers obtained during such processes were smooth or were made of hexagonal prisms or pyramids, and grew at the rate of 1 to 10 µm/h. The crystals and layers grown under 16 kbars have a resistivity higher than $10^{8}\Omega$cm and they were colourless. X-ray analysis of the crystals has shown them to be of single-phase material with the wurtzite structure and with homogeneous lattice constants. The latter were: a=3.189±0.001 Å and c=5.182±0.001 Å, where c/a=1.625.

07.1–5 SUCROSE CRYSTAL GROWTH WITH INORGANIC SALTS OF DIFFERENT KINDS. By S. Ameneiro, M. Wong and R. Pomés, Cuban Institute for Sugar Research (ICINAZ) and Academy of Sciences of Cuba, Havana City, Cuba.

Sucrose crystal growth is affected by inorganic salts. The growth rate with sodium, potasium and calcium chlorides, sodium and potasium carbonates and sodium, potasium and calcium sulphates, decrease according to the law:

$$\log Vr = kI$$

where Vr is the relative growth rate referred to pure solution, k is a constant and I is the salt concentration using molality (Ameneiro, Cuban Journal of Physics, Vol 4, No 1, 1984; Ameneiro and Pomés, Latin American Simposium of Solid State Physics, Mexico, 1983).

In this work, the effect of these salts upon the growth rate in groups of two or three is studied. The experimental resuts shows a decreasing of the growth rate according to the law:

$$\log Vr = k_0 + \sum_i k_i I_i$$

that is to say, an additive effect of each of the salts without any interacion between them.

07.1–6 ANISOMETRIC GROWTH OF CRYSTALS WITH ISOMETRIC STRUCTURES. By I. Bonev, Geological Institute, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria.

The substances with isometric structure occasionally form anisometric crystals with lower symmetry. Such forms are often found together (e.g. whiskers, thin platelets, various skeletal forms, as well as mutual transitions), which suggests similarity in their genesis.

The detailed investigation of surface morphology of whiskers and thin platelets, particularly by SEM, do not confirm the perfection of their lateral faces, postulated by the dislocation growth model. Surface steps and roughnesses with reentrant angles are found, but they are only potential, not active layer sources. X-ray and particularly direct electron microscopic studies (HVEM) of the inner structure of whiskers in many cases do not establish the predicted axial screw dislocations as well. Being of a high perfection, some thicker whiskers, ribbon-like crystals and platelets, however, contain some volume defects - axial channels (not obligatory of a dislocation nature) and negative crystal vacuoles - inclusions with mother phase.

This real structure of the anisometric crystals is incompatible with the model of dislocation controlled growth under low supersaturation. It suggests, that whiskers and thin platelets, like the skeletal crystals, grow under high supersaturation through 2D-nucleation and in diffusion controlled regime. The conical basements are usually formed in the initial stage of whisker growth. The small cross section of the individuals enables their rapid growth towards the medium with higher supersaturation. Some singly growing whiskers correct their growth direction through kink formation always parallel to important crystal rows. Because of the mutual competition no kinks are formed during the simultaneous autoepitaxic growth of many parallel whiskers on a common substrate.

Anisotropy of the medium, according to the symmetry principle of P. Curie, decreases the external symmetry of crystals. The impurities raise the diffusional resistance of the medium. The critical analysis of the experimental data of many authors confirm the proposed model.

This growth mechanism is applicable in many cases of laboratory and natural crystallization, e.g.: growth of skeletal crystals, platelets and whiskers from vapour phase under high supersaturation (in inert atmosphere or in vacuum); whisker growth from the base, on a porous substrate, where the solution concentration increases owing to the evaporation; growth of whiskers in gels with high diffusional resistance; growth of skeletal and dendrite-like forms, platelets and whiskers in stagnate hydrothermal solutions or by drastic P and T gradients; VLS whisker growth, by which the high supersaturation is created into the melt drop on the frontal surface of the whisker, etc.

Texturated plan-parallel, radial-fibrous and spherulithic aggregates, composed of densely adhering needle-like individuals are formed under very high supersaturation.