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

GaN, a direct, wide energy gap material with a band gap of 3.4 eV, is potentially suitable for optoelectronic devices. The main reason for limited applicability are technological difficulties. The high decomposition pressure of GaN 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 10⁻² mol/L. Our studies of the thermodynamics of Ga-N, system show that the equilibrium pressure of N₂ over GaN is much lower than previously predicted. Therefor the salt concentration using molality would have to be of the order of 10⁻³ mol/L. 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 (HREM) of the inner structure of whiskers in many cases do not exhibit screw dislocations as well. Being of a high perfection, some thicker whiskers, ribbonlike crystals and platelets, however, contain experimental data - axial channels (not obligatory of a dislocation nature) and negative crystal vacuoles - inclusions with another 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 ZB-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 individual 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 growth of many parallel whiskers on a common substrate. Anisotropy of the medium, according to the symmetry principle of F. 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 confirms the proposed model.

This growth mechanism is applicable in many cases of laboratory and natural crystalization, 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 gases with high diffusion resistance; growth of skeletal and dendrite-like forms, platelets and whiskers in stagnant hydrothermal solutions or by drastic P and T gradients; VE 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.

07.1-5 SUCROSE CRYSTAL GROWTH WITH INORGANIC SALTS OF DIFFERENT KINDS. By G. Ameneiro, M. Wong and R. Fombé, 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, potassium, calcium chloride, sodium and potassium carbonates and sodium, potassium and calcium sulphates decreases according to the law:

\[ \log V_r = A_1 + \sum A_i I_i \]

where \( V_r \) is the relative growth rate referred to pure solution, \( A \) is a constant and \( I \) is the salt concentration using molality (Ameneiro, Cuban Journal of Physics, Vol 4, No 1, 1984; Ameneiro and Fombé, Latin American Symposium 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 results show a decreasing of the growth rate according to the law:

\[ \log V_r = A_0 + \sum A_i I_i \]

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

07.1-6 ANISOMETRIC GROWTH OF CRYSTALS WITH ISOMETRIC STRUCTURES. By I. Borov, 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 (HREM) of the inner structure of whiskers in many cases do not exhibit screw dislocations as well. Being of a high perfection, some thicker whiskers, ribbonlike crystals and platelets, however, contain experimental data - axial channels (not obligatory of a dislocation nature) and negative crystal vacuoles - inclusions with another 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 ZB-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 individual 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 growth of many parallel whiskers on a common substrate. Anisotropy of the medium, according to the symmetry principle of F. 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 confirms the proposed model.

This growth mechanism is applicable in many cases of laboratory and natural crystalization, 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 gases with high diffusion resistance; growth of skeletal and dendrite-like forms, platelets and whiskers in stagnant hydrothermal solutions or by drastic P and T gradients; VE 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.