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Abstract**Full Text**

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CRYSTALLOGRAPHY

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ON SECTORIAL GROWTH OF CRYSTALS OF CUBIC BORON NITRIDE*(Presented by Academician N. V. Belov, December 20, 1968)*

By microscopic analysis of immersion preparations of cubic boron nitride isolated from various zones of the reaction volume of a compression chamber, its light-colored platelets, often of pseudohexagonal form with sectorial coloration, were discovered; these crystals were very small, their transverse dimension not exceeding 0.06 mm. Therefore they could not serve as objects of morphological investigation. However, the authors suggested that crystallization of such crystals is possible only from a saturated gaseous phase of a very mobile melt located in the most highly heated parts of the reaction volume (¹).

In the present investigation, the objects of study were crystals of cubic boron nitride of platy and tabular form, 0.1–0.4 mm in transverse dimension, synthesized under conditions ensuring the formation of a mobile saturated gaseous phase of the melt in the reaction volume of the compression chamber of a high-pressure and high-temperature apparatus designed at the Institute of High Pressure Physics, USSR Academy of Sciences.*

The crystals of cubic boron nitride isolated during decomposition of the sinter were first examined under a stereoscopic microscope in transmitted and reflected light. All crystals had a tetrahedral habit and were represented by a combination of tetrahedra of opposite sign, mainly of shortened appearance, with false symmetry $3m$ or m . They differed from previously obtained crystals of cubic boron nitride (²) by their complete faceting. The crystals were brown in color and for the most part possessed a sectorial structure.

Investigation of the external and internal morphology (micromorphology) of cubic boron nitride crystals with a universal polarizing microscope (in reflected light) and a metallographic microscope (in bright and dark fields) revealed various manifestations of sectorial growth of cubic boron nitride crystals. To reveal details of the sectorial structure, after photographing their most developed faces (belonging to tetrahedra of opposite sign), the crystals were etched with molten KOH at 380° for 15, 30, and 45 min.; the thoroughly water-washed and alcohol-wiped faces were again examined and, when necessary, photographed with an MIM-8M.

Figure 1. Crystals of cubic boron nitride

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Examination of numerous (several hundred) crystals of cubic boron nitride showed that sectorial growth of the crystals is clearly traceable: by the different coloration of the growth pyramids of faces of tetrahedra of opposite sign (Fig. 1a), by the different rate of overgrowth of growth layers of the accretion pyramids of different tetrahedra (Fig. 1b), by the different distribution of impurities and defects in the accretion surfaces of edges of different tetrahedra (Fig. 1c, d, e), and in single crystals of isometric—

* The syntheses were carried out under the direction of V. N. Slesarev and L. I. Feldgun.

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Fig. 1. Crystals of cubic boron nitride. **a**—with sectorial coloration; **b**—with sectorial build-up of growth layers; **c, d, e**—with sectorial distribution of defects in the surfaces of edge accretion (etched in KOH for, respectively, 15, 30, and 45 min); **f**—with faintly colored accretion lines of the vertices of one of the tetrahedra.

...form along the lines of accretion of the vertices of the weakly colored tetrahedron (Fig. 1e) β -BN.

Thus, the example of crystals of the artificial mineral—cubic boron nitride—clearly illustrates the basic principles of sectorial growth of the structural elements (faces, edges, vertices) of real mineral crystals⁽³⁾.

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