

## DIAMONDS IN METAMORPHIC ROCKS.

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Diamonds of a new type were found in metamorphic rocks. Small sizes (in average 20-50 mkm, maximal - up to 1,2 mm), dominating hexahedral (cubic) habit and yellow-green color differ them from kimberlite diamonds. Absence of lonsdalite apart from impact ones.

The crystals are usually semi-transparent, roughly-shaped without brilliant brightness. The only exclusions are sharp-edged plane-faced octahedra with smooth planes {111}. Since the features of epigenetic dissolution are absent a set of shape sculptures-hilly, bud-like, tiled-together with unfilled sectors of the crystals are accounted for the growth conditions only.

Along with prevailing yellow-green such colors of the crystals as greenish-grey, grey, dark and rare milk-white occur. All they could have different tints. Intensity of yellow-green color is defined by enrichment with the structural impurity of nitrogen in paramagnetic state, dark color - by syngenetic inclusions of graphite. Almost all varieties of diamonds display abnormal birefringence.

Based on crystallographic analysis with application of REM-technique main habit varieties were deduced: cubic, octahedral, skeletal, spheroidal. One more group includes plane-faced with sharp edges or plane-curve-faced crystals combining simple forms: cube-octahedra, cube-octahedra-rhombododecahedra, etc. Single varieties of cubic and skeletal crystals have no analogous among natural and artificial diamonds.

Complex instrumental studies of diamonds have been carried out. Thus, isotope analysis shows enrichment in light carbon with  $\delta^{13}\text{C}$  ranging from -1.75 to -1.71 ‰ for diamonds and from -1.84 to -1.74 ‰ for host rocks graphite. This fact indicates a common source of diamonds and graphite and, hence, their genetic closeness. The assumption is consistent with apparent similarity of the trace elements sets for the diamonds and graphite. On JNAA data content of such trace elements as Na, Al, Sb, As, Au is an order higher while amount of K, Cr, Mn, REE is two orders higher for studied diamonds than respective average values for kimberlite diamonds.

The excess of Cr, REE, and sometimes Co suggests in particular their probable catalytic role in crystallisation of diamonds. Optical properties of the crystals are defined by the content and distribution of major impurity of nitrogen and to less extent, by structural hydrogen. For the diamonds absence of X-ray luminescence and weak greenish, in single cases-bluish laser induced luminescence with nitrogen centers SI, H3, (N3) are typical.

IR-spectra show the presence of nitrogen in N - (absorption band at  $1282\text{ cm}^{-1}$ ) and in A-form (absorption band at  $1238\text{ cm}^{-1}$ ), in single "bulk" samples in - BI-form ( $1175\text{ cm}^{-1}$  and  $1010\text{ cm}^{-1}$ ) and structural hydrogen with absorption band at  $3107\text{ cm}^{-1}$  on data of H.Blinova.

With application of EPR - method contents of single and exchange - connected pairs and threes of nitrogen paramagnetic atoms were measured. They exceed respective values for kimberlite diamonds at least as two orders of magnitude.

X-ray section topography studies display internal structure of diamonds being zonal-sectoral, non-homogeneous, fine-crystalline or comprising different blocks. The blocks differ in degree of perfection and, hence, in crystal lattice parameters values. Maximal deflection of the value is noted for the most imperfect cubic crystals:  $a=3.557$  in comparison with  $a=3.567$  for variety III kimberlite diamonds using the terminology of Orlov (1977).

Diamonds with zonal-sectoral internal structure have weakly diversified lattice parameters in inner and outer zones of the crystal space. Two types of misorientation are measured: from 10 to 20 angle minutes between sectors and from 3 to 5 minutes between microcrystallites inside every sector. Microcrystallite sizes are estimated as up to ones of microns.

Unlike kimberlite diamonds growth in  $\langle 111 \rangle$ ,  $\langle 100 \rangle$  and  $\langle 110 \rangle$  directions, metamorphic diamonds show unfilled sectors of crystal space corresponding to those directions. Thus, absence of tangential growth features, the set of habit varieties typical for normal (fibrous) growth mechanism, absence of oxidation dissolution features; excess of trace elements, enrichment in non-transformed paramagnetic nitrogen and other structure dependent properties suggest that crystallisation of metamorphic diamonds proceeded in short period of time. It had impulse character in highly disbalanced environment supersaturated with carbon and enriched by strange impurities under relatively low temperatures and pressures.