

DIAMONDS FROM LOMONOSOV MINE OF ARCHANGELSK REGION

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A broad set of investigations involving the examination of interrelations between different properties of diamonds has been carried out for diamonds from kimberlite pipes of Arkhangelsk region using a common representative collection of diamond crystals. The results of these investigations represent an important information as regards diamond genesis and diamond raw material quality characterization. The table N1 gives an account of the principal groups of diamonds from kimberlite pipes of the Lomonosov diamond deposit. These groups have been established as a result of multivariate studies, each individual group of diamonds being characterised by distinct morphological, photoluminescent and photoelectric properties of nitrogen (in various forms) and hydrogen, compositions of mineral inclusions and internal structures. Several hundred thousands of diamond crystals put at our disposal by Yuras prospecting expedition and Beiomor survey expeditions of "Arkhangelskgeologia" and by prospecting expedition No17 of "Nevskoye" GEA have been subjected to studies carried out in sufficient detail.

The studies of the morphology of diamond crystals have been performed with the use of Wild Heerbrugg M-400 binocular microscope and Hitachi-620 scanning electron microscope, which have been used for taking microphotographs. The internal morphology of diamonds has been studied by means of the polarization-optical method (examination of birefringence microscope) and chromatic cathodoluminescence (CCL) method; the CCL studies have been carried out with the use of a luminoscope made by Newclide Co. The characteristics of luminescence occurring by UV irradiation of diamonds have been studied using as a source of radiation for photoluminescence quartz mercury lamp at liquid nitrogen temperatures IR spectra, providing a means for the determination of nitrogen (in IaA, IaB and P forms) and hydrogen impurity contents in diamonds, were recorded by means of Specord IP 75 spectrometer (Karl Zeiss, Jena) with resolution of 4-6 cm⁻¹. Concentrations of nitrogen impurity in N form were determined by the electron paramagnetic resonance. Photocurrent spectra were recorded with the use of an apparatus involving spectrometer and a specially adapted sample holder. Isotopic analyses have been carried out by means of VARIAN-MAT-230 mass-spectrometer with an accuracy of 0.1 o/oo. The determination of chemical compositions of mineral inclusions in diamonds has been performed using Comebax Microbeam X-ray microanalyser at accelerating voltage of 15 kV and current of 15 mA.

The groups of diamonds, as they are classified herein, are commonly present in all the kimberlite pipes of Arkhangelsk region; at the same time, each pipe is characterised by its own proportional relationship between these groups. By this is meant that individual pipes show the individual character of distribution of diamonds by their different properties. This individuality may be thus considered as a typomorphic indicating character which might be useful in searching and prospecting diamond deposits.