

GEOLOGICAL STRUCTURE AND MINERALOGY OF THE KIMBERLITES OF THE ARCHANGELSK KIMBERLITE PROVINCE.

Kudrjavitseva⁽¹⁾, *G.P.*; *Bushueva*⁽¹⁾, *E.B.*; *Vasiljeva*⁽¹⁾, *E.R.*; *Verichev*⁽²⁾, *E.M.*; *Garanin*⁽¹⁾, *V.K.*; *Grib*⁽¹⁾, *V.P.*;
Laverova⁽¹⁾, *T.N.*; *Mikhailichenko*⁽²⁾, *O.A.*; *Posukhova*⁽¹⁾, *T.V.* and *Schepina*⁽¹⁾, *N.A.*

(1) *Geological Department of Moscow State University, 119899, Lenin's Hills, Moscow, USSR;*

(2) *PGO "Arkhangel'skgeologia", 163001, P. Vinogradova str., 168, Arkhangel'sk, USSR.*

New kimberlite diamond bearing province had been discovered on the Northern European part of the USSR at the end of 70-s. The main features of the craton geological structure are defined by its location in the zone of joint of the largest blocks of the Eastern European platform: Baltic Shield and Russian platform. Several kimberlite fields (Fig.1), in which the bodies are represented by pipes and sills, were discovered in the region. The formation time of the craton kimberlite pipes is Late Devon - Middle Carbon.

The kimberlite pipes of Arkhangel'sk kimberlite province are represented by tuffs, tuffites, tuffobreccias, autolithic breccias. The low degree of erosion of the presence of the clearly marked crater facie. All types of ore bearing rocks are practically completely composed of the minerals of light fraction, represented by serpentine, saponite, carbonates, hydromicas, minerals of palygorskite-sepiolite group. The quantity relation of minerals within the range of different bodies and parts vary considerably. The content of diamond minerals-satellites in the heavy fraction is considerably lower than in the kimberlite bodies of Jakutian and South African diamond bearing provinces. Chrome spinelides are the most widely spread. The minerals of high-aluminous eclogites and grosspyrites are completely absent.

The relation between the space position of diatremes and fields and between the peculiarities of the heavy fraction composition of the kimberlite rocks emphasizing the zonality of the kimberlite province had been revealed.

The rocks composing the diatremes can be divided into several groups according to the mineralogical peculiarities of these rocks.

The diatremes of the central (Zolotizkoje) field are characterized by the industrial diamond bearing. The sharp predomination of the chrome spinelides is characteristic for the heavy fraction of the kimberlites. Garnet, diopside occur in the subordinate amount, microilmenite was found in rare cases. The minerals of the diamond bearing paragenesis are widely spread: pyrope and chromite from dunite-harzburgites and high chromium lherzolites, pyrope-almandine from predominantly magnesian-iron eclogites. Magnesian Al-Ti-containing chrome spinelides ($> 55 \text{ wt.} \% \text{ Cr}_2\text{O}_3$) predominate in the ground mass of the kimberlite rocks. Sometimes the borders of the chrome ulvospinel are observed around the nuclei of this mineral; usually such formation are observed in the rocks of the lower horizons of the kimberlite pipes.

The series of signs, showing the resemblance of the composing pipes rocks with lamproites, were established. The most important of these signs are the morphological types of diamond (usually complex crystals of dodecahedron habitus, and considerably rarer of cubic and octahedron), the predomination of chrome spinelides in the heavy fraction; the wide spreading of Fe-Ti-oxides and barium mineralization in the ground

mass; small amount of xenolithes of the depth rocks; and practically complete absence of picroilmenite.

Diatremes of the north-eastern (Verkhotinskoje field) and eastern (Shochinskoje field) groups of bodies are distinguished by low and poor diamond bearing. Minerals of heavy fraction are represented by chrome spinelides, pyrope, chrome diopside with complete absence of picroilmenite. The content of the mentioned minerals is considerably less than in the kimberlite of Zolotizkoje field.

The main ore mineral of the ground mass of the kimberlites is Cr-Al-containing titanomagnetite at the clearly marked subordinate spreading of magnesian Al-Ti-containing chrome spinelide.

The diatremes of eastern (Sojanskoje field) and south-eastern (Kepinskoje field) group of bodies among minerals of heavy fraction picroilmenite and red-orange garnet predominate; chrome spinelides are considerably less spread. Ilmenite and sheared lherzolites are the most widely spread parageneses of the depth rocks. The diamond bearing of the rocks of the diatremes of these fields is very poor.

Rutile predominates in the ground mass of the kimberlites; titanomagnetite and picroilmenite with the increased content of manganese are widely represented. The grains of Al-Ti containing chrome spinelides and magnesian ulvospinel occur in the sharply subordinate amount.

The zonality of the new diamond bearing kimberlite province is emphasized by the development of the pipes of the non-diamond bearing basaltoids on the periphery of the eastern border of the province. In these pipes only isolated signs of the diamond minerals-satellites are revealed.

The mineralogical specialization of the kimberlite fields is facilitated by their geologico-tectonical position and correlates with the diamond bearing of the diatremes. The revealed geological and mineralogical peculiarities allow to carry out the regioning of the Archangelsk diamond bearing province, defining at the same time new diamond prospecting areas.

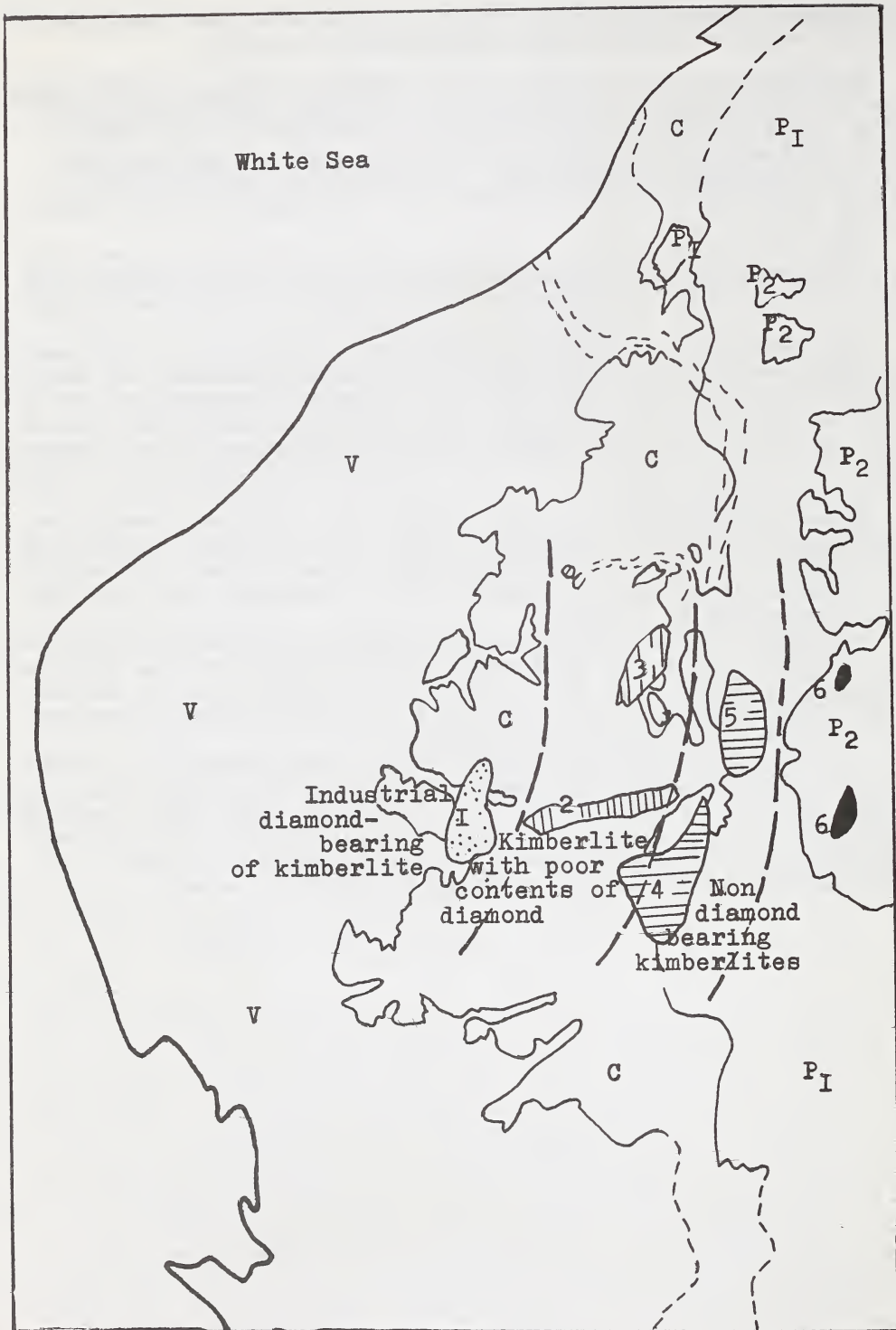


Fig. I. Distribution of kimberlite fields in Arhangelsk kimberlite province. Kimberlite field: 1-Zolotitskoe, 2-Shochinskoe, 3-Verhotinskoe, 4-Kepinskoe, 5-Soenskoe, 6-Turinskoe field of basaltoid pipes