TO THE PROBLEM OF DIAMOND GENESIS IN THE KUMDY-KUL DEPOSIT

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The deposit of finely dispersed diamonds from the Kumdy - Kul region, northern Kazakhstant is presently the only object investigated in detail. It is represented by so-called diamonds of the metamorphogenic type.

The deposit is localized in the range of the Kokchetavskaya block composed mainly of Proterozoic metamorphic rocks which are unconformably overlain by weakly metamorphosed Riphean sediments. In the range of the Kokchetavskaya block, the earth crust thickness varies from 40 to 50 km as judged from geophysical data of V.N.Lyuberetski (1988). In the region of the Kumdy-Kul deposit, it is about 45 km. Some linear uplifts and depressions are produced on the Moho surface. The Kumdy-Kul deposit occurs in the axial part of such linear thickening striking the north-east direction. The axial part is highly saturated with mantle rocks in the lower crust and at the crust-mantle boundary.

On the present erosional shear this zone is projected as the Chagninskaya zone of the deep fault with the bodies of eclogites, ultrabasic-alkaline rocks, carbonatites and high-carbonaceous tectonites confined to it. Investigation results of the Kokchetavskaya field work expedition indicate that the Kumdy-Kul deposit is localized in the zone of blastomylonites containing graphite and diamond. The maximum thickness of the ore zone is no more than 250 m. The zone of blastomylonites is found between two thick plates of eclogites which are schistose to a different degree and subjected to granitization and lower temperature metasomatic transformations.

The geological structure of the deposit and forming conditions of diamond contained must be considered as a complex of rocks in the fault which are exposed to deep-seated reduced high-carbonaceous fluids.

The discussion of the diamond genesis in the Kumdy-Kul deposit is based on the experimental data on the polymorphic graphite-diamond transition which required pressures to be in the range from 35 to 40 Kbar at T=8001000°C. The data on the diamond synthesis from graphite are not correspondent to T (450-700° C) and P (5-14 kbar) for mineral paragenesises in diamondcontaining rocks. Moreover, a wide range of methods of the diamond synthesis according to a gas phase, for example, are presently available which takes place at significantly lower pressures. Based on the investigation of the deposit, F.A.Letnikov (1983) proposed the metastable diamond growth in tectonites in zones of deep faults. Based on the proposal, the diamond structure was discussed and its forming conditions were investigated by V.A.Pechnikov (1993). The idea of the proposal lies in the following.

As early as 50 es P.Bridgman (1958) established in experiments using a piston-cylinder apparatus that sharp increase in reaction rates and T,P decreas of phase transitions take place in the presence of shift and shear forces.Inasmuch as blastomylonites are formed at simultaneously manifested shift and shear forces in the whole rock volume the diamonds can be produced here in the existing reduced conditions. The crystals grow not large according to the scheme, the rock is enriched by diamond dust. Thus, the formation of finely - dispersed diamonds in tectonic zones requires a long-term effect of two factors - the availability of the stressed state of tectonite and simultaneous action of high-carbonaceous reduced deep-seated fluids. In this manner high-carbonaceous blastomyloniytes were produced. Diamonds were formed locally against the background of the total granitization of blastomylonites with graphite content from 2 to 4 orders predominated the diamond content in the rock. Considering the experiments of P.Bridgman (1958) and X.B.Green (1972) wherein coesite crystals were obtained in similar experiments with quartz sand at a deformation rate 10-4 sec, 450-900° C and 5-20 kbar, it is believed that zones of deep faults and particularly contained in them blastomylonites are characterized by a wide manifestation of processes of metastable growth of high pressure phases at significantly lower T ant P compared to static conditions.

This work was supported by the Russian Foundation for Fundamental Researches under grant 93-05-9236.

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