DIAMONDS OF THE KUMDY-KOL DEPOSIT (KOKCHETAV MASSIF, KAZAKHSTAN): METASOMATIC ORIGIN WITH THE INITIAL IMPACT CONTRIBUTION. S. A. Vishnevsky[1], Inst. of Geology & Mineralogy SB RAS, Novosibirsk-90, 630090, 3 Koptug prospect, RUSSIA, <svish@igm.nsc.ru>

Introduction: Unique Kumdy–Kol deposit (Fig. 1) with its total diamond potential of ~600 tons [1] is past beyond compare with any other diamond deposits in this aspect (except for, perhaps, the Popigai impact occurrence). However, the origin of this very important diamond manifestation is still a matter of debates for a long time. Nevertheless, this problem is of a great concern both for the forecast of the new deposits of so kind and for the understanding of some evolution episodes of the Earth's crust. Below the brief review on the genetic problems of the Kumdy–Kol is presented, followed by our original interpretation in this aspect.

Current hypotheses proposed: Three main types of the hypotheses are present: A) "Mantle" one, referring to intrusions of deep-originated diamond-bearing melt [2]; B) "Mantle+Crustal" one – diamonds formed at high P–T conditions of the upper mantle in deeply-subducted crustal rocks, later exhumated to the surface [3, 4]; C) "Metasomatic" one – diamonds were formed by the fluid-metasomatic action at moderate P–T conditions in the crust [1, 5]. Types A and B hypotheses refer to the diamond as an exclusively high-pressure mineral, but the present data show that the diamond is a very polygenic mineral and can originate at the broad P–T conditions with the P ranging from semi-vacuum pressures to 100 Gap, and T ranging from room temperatures to 4000ºC [5]. To this, types A and B hypotheses meet a great number of tectonic, geological, mineralogical and other contradictions. Their critical review, starting from the serious geodynamic problems for the subduction–exhumation cycle and finishing by the problems of diamond survival during its travel to the crustal surface is presented in [1, 5, 6 and refs. therein]. Type C hypothesis satisfies the broad range of the known data on the deposit in a best way.

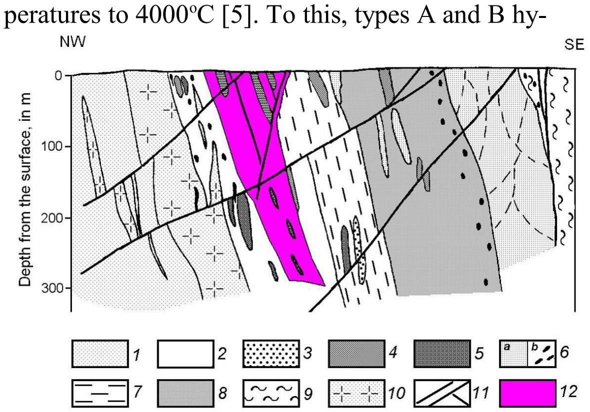

Fig. 1. Schematic geologic cross-section of the Kumdy–Kol diamond deposit across its strike after [1]. Legend: 1 – plagio-gneisses; 2 – garnet-biotite and two-mica gneisses; 3 – quartz rocks; 4 – carbonate rocks; 5 – garnet-pyroxene rocks; 6 – eclogites (a – large bodies; b – small bodies); 7 – migmatites; 8 – alternation of bi-mica gneisses and schists; 9 – schists; 10 – leucocrate garnet-bearing granites; 11 – conformal and cross-cutting faults undistinguished; 12 – zone of diamond mineralization.

The problem of diamond nuclei: In spite of the good agreement with the data observed, type C hypothesis meets a problem as far as initial diamond nuclei are concerned. The way of their origin by [1, 3, 5] seems to be exotic and unreal in order to explain the origin of the deposit. Nevertheless, as we say, the problem can be easily solved if one takes into account that there are at least two natural processes, which have a constant and unlimited worldwide presence: meteoritic falls and large impact events. A great number of nano-diamonds are found in meteorites [7–10, et al.]. Similar plenty of the nuclei are related to large impact events [10, 11, et al.]. Nano-diamond nuclei are resistant enough [12], able to survive even greenschist stage of regional metamorphism, and have to saturate the major part of the crustal rocks during all the geologic times.

Conclusion: Type C hypothesis, with the improving addition mentioned above, allow to consider that Kumdy–Kol type diamond deposits should have a broad extent in a number of the Earth's crust localities, both within the former USSR and worldwide, where the favorite combination of the tectonics and deep fluid "breath" had taken place at various geological times.

This abstract is extracted from my paper presented at: http://www.proza.ru/2011/12/28/522 (in Russian).

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