

PREDICTION OF KIMBERLITE PROVINCES, FIELDS, BODIES FROM THE CHEMICAL COMPOSITION OF PICROILMENITES

Selivanova, V.V.

State Research-production enterprise "Aerogeologia", Space-aero-geological expedition N 3, Moscow, 117292, RUSSIA

The distinctive features of composition of ilmenites of all kimberlite pipes (dikes) have been revealed from the relations between MgO and TiO₂ contents, the kimberlites of the Kuoika field were used as standard ones. These features do not depend on the position of the pipe (dike) about other kimberlite bodies (bodies are in the same bunch, they are in different bunches are close together, they are far removed, pipes are located along the same line). That is reflected in displacements of composition fields of ilmenites on the MgO-TiO₂ diagrams. The overlap of composition fields is variable from 5-10% to 80%. Displacements may be both parallel ones (the long axes of the composition fields are parallel) and those ones with changes in the direction of the long axes.

One can use emerged regularity for prediction and prospecting of kimberlites both in well-known kimberlite provinces where kimberlites are overlain by present deposits or traps and in poorly known regions by comparison the composition fields of ilmenites from different streams sites (more than 50 grains).

The prediction of a new kimberlite province in the Low-Lena diamond-bearing area is considered as an example. The composition of picroilmenites from Middle and Upper Triassic collectors consisting of nearshore deposits have been examined over the area of 60x60km.

On the basis of Cr₂O₃ contents in ilmenites the whole area has been divided into two mineralogical zones: the Tuorasis and Kharaulakh, associate minerals of diamond were transported to these zones from different kimberlite bodies. Such dividing conforms with the set of associate minerals, their relations and morphologic features of indicator minerals of kimberlites. A near-transport area has been revealed because there are intact minerals in the Upper Triassic collector in the Tuorasis zone where 90% of the ilmenite grains contain 1-6% of Cr₂O₃.

The Kharaulakh zone is characterized by low contents of Cr₂O₃ in ilmenites (<1%) both in the Middle Triassic collector and in the Upper Triassic one located 25 m higher in the section. Near-transport areas have been revealed in the Middle Triassic collector only, there are two of them. The assumption that there are two kimberlite bodies within the zone is supported by the distinctions between the diagrams of relations of Fe₂O₃ and TiO₂ in ilmenites from these two areas, the overlap is 0-1%.

The associate minerals from the Middle Triassic collector have been redeposited into the Upper Triassic one as evidenced by the composition similarity of picroilmenites as to Cr₂O₃ contents, higher degree of roundness of indicator minerals of kimberlite, the absence of grains with secondary formations (kelyphite borders, leucoxene covers), accrete minerals, pyrops and chrome-diopside with mineral inclusions which are characteristic of near-transport areas of the Middle Triassic collector.

The distinctive feature of these zones is that the collectors of the Kharaulakh zone contain magnetic ilmenites and those of the Tuorasis zone chrome-magnetites. This property along with the composition similarity of ilmenites of these two zones distinguishes the Low-Lena area from nearly northern kimberlite fields and allows the prediction of a new diamond-bearing kimberlite province there.

The distinctive features of the composition of ilmenites of all kimberlite bodies and the inherited composition similarity of ilmenites redeposited from the older collector into the

younger one were used for prediction a new kimberlite fields in one of the regions of the north-west frame of the Vilyui syncline where the Mesozoic sedimentary cover is widely developed (the river basins of Muna, Khakhchan, Tung, Kulenke, Linde). Ilmenites of Quaternary alluvial deposits (22 samples) from different sites of the area of 49 000 km² have been examined.

Seven areas with the definite composition similarity of picroilmenites have been revealed. These areas coincide with those which are characterized by associate minerals of I-II degrees of intactness and other features of kimberlite minerals: the set of minerals, their quantitative relations, the occurrence of kimberlite grains with the aggregate or monolithic structure, green pyrope-grossulars of the eclogite genesis, chrome—almandines and high-chrome magnetic picroilmenites.

Picroilmenites from the revealed areas have different composition fields, they differ in relations between MgO and TiO₂ and between Fe₂O₃ and TiO₂. They also differ in these relations from picroilmenites of well known kimberlite regions. That gives grounds to predict within the area under consideration new fields: Tung-Linde, Low-Kulenke, Low-Muna.