

Mineralogical features for determining age of kimberlites from Siberian craton by kimberlite indicator minerals from placers.

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The history of kimberlite magmatism in the Siberian craton comprised the Middle Paleozoic (Late Devonian), Triassic, and Jurassic-Cretaceous events. The Middle Paleozoic event produced greatest amounts of diamond-bearing kimberlites; diamond contents in the Triassic rocks are much lower, while the Jurassic-Cretaceous kimberlites are actually barren [1].

Minerals derived from kimberlites of different ages often coexist in placers and dispersion trains, which poses problems to the use of mineralogical methods for diamond exploration. The problem can be solved by knowing the morphological features of kimberlite indicator minerals typical of each magmatic event [2].

Garnets from Middle Paleozoic kimberlites have the following features: a) chemistry corresponding to diverse parageneses, including those of diamond assemblage; b) weak to strong wear; predominant medium and high wear degrees; c) signatures of dissolution in Late Devonian laterite weathering profiles.

Garnets from Triassic kimberlites differ in a) lower paragenetic diversity; few or absent garnets of diamond assemblage; b) only low wear degree; strong wear restricted to garnets from Triassic kimberlites hosted by coastal sediments; c) no dissolution signatures.

Jurassic-Cretaceous ages of kimberlites can be inferred from a) changes in paragenetic diversity as a result of deep metasomatism and predominance of shallow lherzolite varieties; no diamond assemblage garnets; b) weak wear; c) no dissolution signatures.

The approach was used to estimate the ages of kimberlites in some kimberlite provinces. As a result, we inferred the existence of Middle Paleozoic kimberlites in the Kyutyungde graben, in the catchments of the Mayat, Billakh (Anabar area), and Muna rivers, in the Markha-Morkoka interfluvium, and in the Tychan diamond province (Krasnoyarsk region); Triassic kimberlites in the northern slope of the Olenek uplift and within the Bulkur uplift; and Late Jurassic-Early Cretaceous kimberlites in the Kenkeme catchment north of Yakutsk city.

[1] Afanas'ev et al. (2010) Geo, Novosibirsk [in Russian].

[2] Egorova et al. (2016) Dokl. Earth Sc. 470, 1023-1026.