

Major- and trace-element zoning in Cr-pyropes with spinel inclusions from the Internatsionalnaya kimberlite pipe, Siberian craton

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Five Cr-rich pyrope grains (INT-241, -269, -70, -289, and -263) collected from a heavy mineral concentrate of the Internatsionalnaya pipe (Mirnyi field) record remarkable chemical zoning of major- and trace-elements. All investigated pyropes contain tabular-shaped inclusions of chromian spinel (up to 100 μm in size).

EPMA elemental mappings and BSE images show a distinct core-rim texture; the rims are significantly enriched in Ca and depleted in Mg in contrast to the cores. In pyropes INT-241, -269, -263 the rims are also enriched in Fe. Trace element-zoning is less pronounced, with a more gradual increase of trace element composition from core to rim according to profiles made across the pyrope grains; notably HREEs in the rims are an one order of magnitude higher than those in the cores. Inclusions of chromian spinel in INT-70, -263, -289 contain ~50-55 wt % Cr_2O_3 . In contrast, chromian spinels in the rims of INT-241 and -269 show unusual compositions with ~22-32 wt% Cr_2O_3 , ~50-57% FeO, and ~4-5 wt % TiO_2 .

Obtained data suggest that the investigated Cr-rich pyropes underwent metasomatic chemical modification during a mantle metasomatic event, just prior to a timing of kimberlite eruption of the Internatsionalnaya pipe. Remarkable chemical zoning of pyropes, together with trace-element enrichment in the rims and unusual compositions of chromian spinel in the rims provide direct evidence of interaction between pyrope and deep metasomatic fluid/melt enriched in Fe, Ti and other incompatible elements. Our observation also confirms the metasomatic origin of Cr-rich pyrope garnets in the SCLM of the Siberian craton [1].

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[1] Malkovets *et al.* (2007) *Geology* **35**, 339–342.