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Composition of pyroxenes and temperature their crystallization in the Chiney layered intrusion, South Siberia

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SE Siberian platform comprises many PR mafic-ultramafic intrusions formed in ancient plume system. These intrusions contain PGE-Cu-Ni and Fe-Ti-V deposits. The largest magmatic deposits are related to the Chiney layered gabbro pluton (2.5 km thick) in the Kodaro-Udokan depression. Its conditions of crystallizations and magmas compositions are important for reconstruction of magmatism evolution in this large igneous province and ore formation.

The Chiney intrusion consists of four rock groups [1]: 1) pyroxenite, gabbro, anorthosite; 2) high-Ti gabbroid, 3) low-Ti gabbroid, and 4) magmatic breccia and dykes. The main rock-forming minerals are following: clino- and orthopyroxenes, plagioclases, iron oxides (titanomagnetite and ilmenite). The composition of primary magma for the Chiney massif was estimated using the KOMAGMAT-3 computer model earlier [2]. This work is devoted to the detail pyroxenes compositions study by EPMA and LA-ICP-MS and calculation of their T crystallization.

Pyroxenes are represented mainly by subcalcium augites, pigeonites, and hypersthenes ($En_{62.2}Fs_{35.0}Wo_{2.8}$). Subcalcium augite ($En_{39.6}Fs_{16.6}Wo_{42.8}$) is displaced in the direction of decreasing wollastonite endpoint ($En_{42.6}Fs_{21.4}Wo_{35.0}$). Augite and hypersthene are the result of the decay of the primary protopyroxene - pigeonite. Their morphology is different: these are distinct augite lamellas in the hypersthene, or segregations of small augite grains along the boundaries of hypersthene crystals. Magnesian pigeonite ($En_{48}Fs_{32}Wo_{20}$) is characteristic of late dikes and sills, which rapidly crystallized in small volumes. The temperature range for the decomposition of primary pyroxene (pigeonite) is 843-876 °C. The T crystallization of orthopyroxene is almost stable (1135°C) while for clinopyroxene it changes from to 1195°C to 1126 according to [3].

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