EGU22-6717
https://doi.org/10.5194/egusphere-egu22-6717
EGU General Assembly 2022


# Formation conditions for magnetite of phoscorites of the Tomtor massif (NE, Russia)

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The Tomtor carbonatite complex with the area of 250 $km^2$ is confined to the Eastern framing of the Anabar Anteclise. It is located in the Udja province of ultrabasic alkaline rocks and carbonatites (Northeast of Siberian Platform). The Tomtor apatite-magnetite deposit is located on the Northeastern border of the carbonatite core. Apatite-magnetite ores (camaforites, phoscorites, nelsonites) form a series of ore steeply dipping (75-80$^o$) lenticular bodies of the Northwestern strike. The resources of the apatite-magnetite ores of the Tomtor massif are about 1 billion tons of iron (Tolstov, 1994).

The subject of research is magnetite with ilmenite decomposition structures, which composes up to 70% of phoscorite. The microprobe analysis established the compositions of 34 grains of magnetite isolated from the core of well No. 801; and ilmenite, which forms decomposition structures in these grains. Based on the compositions, the temperatures of their formation and oxygen fugacity were calculated.

Magnetite forms massive accumulations with hypidiomorphic crystals up to a few centimeters in size. Magnetite contains (in wt%): $TiO_2$ (1,21-4,72), MnO (0,48-1,9), MgO (0,08-0,41); $Cr_2O_3$ (до 0,14); BaO (до 0,32); ZnO (0,06-0,53); $V_2O_3$ (0,25-0,52).

Ilmenite varies within a wide range in the content of hematite minal (2.15 - 62.19%), corresponding to the ilmenite-hematite trend on the diagram in the coordinates $TiO_2$-$Fe_2O_3$-FeO. Ilmenite has a significant range of Mn contents (1.34-14); it may contain MgO (up to 1.57), $Cr_2O_3$ (up to 0.21), BaO (up to 1.09), ZnO (up to 0.2), $V_2O_3$ (up to 0.2).

It was established that the temperatures of magnetite formation create a continuous series from 459 to 914 ° C; oxygen fugacity ($fO_2$) varies respectively in the range from -10 to -24. These data confirm the magmatic nature of magnetite.

Magnetite is the main and one of the highest-temperature minerals of the Tomtor phoscorites. Accordingly, the upper limit of the obtained temperatures is the minimum for fractionation of the P-Fe melt and characterizes the onset of crystallization of phoscorites.

The obtained results confirm the magmatic nature of the phoscorites of the Tomtor massif from the initial P-Fe melt with the participation of the crystallization differentiation mechanism and

reaffirm the conclusions of previous studies based on the results of studies of the mineralogical-geochemical (thermo-barometric) and structural and textural features of apatite-magnetite ores (Baranov, 2018; Baranov, 2020).

References


- Baranov L.N., Tolstov A.V. Typomorphic features of magnetite from tomtor massif camaphorites. Proceedings of higher educational establishments. Geology and Exploration. 2020;63(5):96—106. https://doi.org/10.32454/0016-7762-2020-63-5-96-106 (in Russian).
- Baranov, L.N., Tolstov, A.V., Okrugin, A.V., & Sleptsov, A.P. (2018). New in mineralogy and geochemistry of apatite-magnetite ores of the Tomtor massif, northeast of the Siberian platform. Ores and metals, (2) (in Russian).
- Tolstov, A.V., 1994. Mineralogy and geochemistry of apatite-magnetite ores of the Tomtor Massif (NorthwesternYakutia). Russ.Geol. Geophys.35,76–84.