



Isotopic and geochemical characteristics of zircons from rocks of the Noril'sk-1 intrusion (Siberian Craton, Russia): preliminary results

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Economic platinum-group-element (PGE)-Cu-Ni deposits at Noril'sk-1, Talnakh and Kharaelakh are located in the northwestern corner of the Siberian craton, Russia. They occur in mafic-ultramafic intrusions that range up to 360 m in thickness and up to 25 km in length. These intrusions have been interpreted as being genetically related to 250 Ma Siberian flood-basalt volcanism (Lightfoot et al., 1994).

This report presents the preliminary results of uranium-lead dating of zircons (203 analyses) determined with secondary ion mass spectrometer SHRIMP-II at the Centre for Isotopic Research, VSEGEI. Isotope geochemical data were obtained for 150 zircon grains, which were extracted using *ppm-mineralogy* technique (NATI Research JSC) from all types of rocks from the Noril'sk-1 intrusion. The complete rock succession from top to bottom includes gabbro-diorite, leucogabbro, olivine-free gabbro, olivine-containing gabbro, olivine gabbro, melanotroctolite, plagiowehrlite, plagioclinitite, taxitic varieties of mafic rocks, and contact fine-grained dolerite.

1. Zircons occur as idiomorphic transparent and semi-transparent, sometimes fissured prism-shaped light beige crystals; length to width ratios varies from 1:1 to 3:1 (occasionally 6-7:1); and a significant number of gas-liquid and solid-phase transparent and opaque mineral inclusions occur in the central parts of the crystals.
2. Zircons are characterized by a fuzzy (smoky) cathode luminescence, with a virtual

total absence of zoning, which is characteristic of zircons from magmatic rocks.

3. Unusually high thorium and uranium concentrations in the zircons reach 3.0 and 0.6 wt.% respectively, which in combination with increased Th/U ratios (up to 10) may indicate a significant role of metasomatic processes, which increased the concentration of both elements during crystallization of zircons. Furthermore, a natural decrease of Th and U concentrations from olivine-free gabbro to ultramafic rocks represented by plagiowehrlite, plagioolivinite and melanotroctolite has been observed.

4. On the binary Th-U diagram the zircons at Noril'sk are clearly distinct from majority of zircons derived from various geological settings, but overlap with the fields of exotic mantle metasomatic derivatives (MARID, Kinny and Dawson, 1992).

5. The bimodality of U-Pb age distribution of zircons (250.7 ± 1.5 and 228.4 ± 1.4 Ma) implies that there were at least two crystallization events; "ancient" U-Pb ages are predominant in the ultramafic part of the intrusion.

Our new findings enable assumption about the prolonged duration of component fractionation in the magmatic system. Consequently, these processes could lead to high degrees of separation and concentration of ore elements and formation of specific ore magma of unique scales and concentrations. Finally, we propose that isotope-geochemical characteristics of zircons at Noril'sk may become a new criterion in the assessment of ore-bearing potential of Noril'sk-type intrusions.

References

Lightfoot, P.C. et al. (1994) Ontario Geol. Survey Spec. Publ. **5**, 283-312.

Kinny, P.D. & Dawson J.B. (1992) Nature **360**, 726-728.