



The dating of ore genesis with using of sulfides: new opportunities of Sm-Nd method

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Within the Fennoscandian Shield only on the surface there are hundreds of mafic-ultramafic intrusions, and on geophysical data - more than a thousand. Existing estimates of the ore potential related to the very costly and time-consuming drilling and analytical work (Mitrofanov, 2006). One of the express-and relatively inexpensive methods is a Sm-Nd dating of rocks and minerals.

Feature of the Sm-Nd method is that it allows to use rock-forming minerals for the dating process. Our studies have shown that along with rock-forming, ore minerals (sulfides) can be used to determine the ore genesis time of industrially important geological sites, since exactly with the sulfides the industry Pt-Pd mineralization is closely connected.

Age determination on sulphides is a direct method, since in this case the time of mineralization is determined directly, which can consist with the time of crystallization of the parent magma (syngenetic ores), and do not match - epigenetic, redeposited ore. Within Fennoscandia the both types of syngenetic and epigenetic manifestation of ore are known and setting of milestones mineralization is essential for understanding the evolution of ore-bearing magmatic sources and assess the prospects for PGE of many mafic massifs. Studies have shown that Sm-Nd dating method is applicable to both types of ore and dates obtained agree well with the known U-Pb ages of zircon or with key scenes of Svekofennian metamorphic events (eg, Sm-Nd age of the redeposited ores Ahmavaary – about 1900 Ma).

One of the problems of Sm-Nd systematics of sulfides is the question of internal inclusions with high contents of REE. In this case, obtained isotope-geochronological features may not correspond to real geological events. To address this issue, the study of internal structure of sulfide minerals was carried out by CL high-local equipment - a scanning electron microscope LEO 1450 with cathodoluminescent attachment PanaCL. Studies have shown that these inclusions are not able to significantly influence on the results of Sm-Nd analysis.

For the first time with sulfide minerals as minerals-geochronometers in Sm-Nd method have been dated impregnated and brecciform ores of the following objects - Pilguyarvi Cu-Ni deposits, Pechenga (1965 ± 87 Ma); impregnated (2433 ± 83 Ma) and redeposited (1903 ± 24 Ma) ores of Ahmavaara intrusion; ore gabbronorites of Penikat intrusion (2426±38 Ma (Ekimova et.al., 2011); gabbro-anorthosite ore (2476 ± 41 Ma, which agrees well with the U-Pb zircon age - 2470 ± 9 Ma (Bayanova, 2004)) and gabbronorites (2483 ± 86 Ma) of Kievei deposit and Fedorova Tundra metagabbroids (2494 ± 54 Ma). For these ores, except redeposited Ahmavaara ore, justified their crystallization from the melt, the simultaneous crystallization of the bulk rock.

Thus, studies have shown quite correct, supported by other geochronological and instrumental methods, results, and given the opportunity to determine the time frames of the main ore genesis industrially important platinum metal objects.

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