



## **New prospects of Sm-Nd sulphide dating of the PGE-bearing layered intrusions in the NE Fennoscandian Shield**

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The Sm-Nd investigations steadily employ new minerals-geochronometers. Of these, sulphides of PGE-bearing layered intrusions are quite important in terms of dating the process of ore origin. Studying the REE distribution in the sulphides of MOR hydrothermal sources has shown possible REE presence in the sulphide lattice [Rimskaya-Korsakova et. al., 2003]. The isotope Sm-Nd investigations of sulphides have for the first time been done in Russia. These are difficult to carry out because the concentrations of Sm and Nd isotopes in sulphides are much lower than those in chondrites [Rimskaya-Korsakova et. al., 2003].

This investigation was aimed at determining Sm-Nd concentrations and Nd isotope compositions for the purpose of dating the ore genesis process of the PGE-bearing intrusions. The geochronological samples were taken from the Pt intrusions of the Fennoscandian Shield. These are the Fedorov-Pana intrusion (Russia) and the Nottrask intrusion (Sweden). It is known that the economic Pt-Pd mineralization is associated with sulphides.

The sulphides were chemically prepared for Sm-Nd dating using the following modified procedure: a portion of sulphides (50 mg) mixed with a solution of  $^{149}\text{Sm}/^{150}\text{Nd}$  tracer was dissolved in nitrohydrochloric acid and then in hydrogen chloride until fully dissolved. Following the fractional acid decomposition, REEs were separated from the solution by cation exchange chromatography using cation exchange resin, Dowex 50x8 (200-400 mesh). Other minerals and rocks were decomposed in accordance with the standard procedure [Zhuravlev et al., 1987]. The variation of the Nd isotope composition and Sm and Nd concentrations using the isotope dilution method was carried out at the seven-channel solid phase mass-spectrometer, Finnigan – MAT 262 (PRQ) in a static two-band mode at the collectors with Re+Re and Ta+Re bands.

The Pt-bearing Fedorov-Pana intrusion occurs in the NE Fennoscandian Shield, or in the centre of the Kola Peninsula, and is referred to as one of the major PGE-bearing Early Proterozoic intrusions. The gabbro of the Fedorova Tundra was sampled for isotope Sm-Nd investigations to yield the rock-forming minerals: orthopyroxene and clinopyroxene, plagioclase, sulphides and WR. The isotope Sm-Nd gabbro age was determined to be  $2475 \pm 37$  Ma;  $\epsilon_{\text{Nd}} = +0.8$  and Sm and Nd concentrations in the sulphides equal 0.400 ppm and 0.267 ppm respectively. The resultant Sm-Nd age well coincides with the U-Pb age of  $2491 \pm 5$  [Groshev, Nitkina, 2008], and reflects the origin time of the sulphides in the gabbro.

The Nottrask layered intrusion occurs in the north-eastern part of Sweden near Luleå. The intrusion formed in two stages. The first stage associates Ni mineralization; the second one composes the central part of the intrusion and is promising for Pt-Pd mineralization. The sulphide Pt-bearing olivine gabbro from the layered zone of the intrusion was sampled for isotope Sm-Nd dating. The following minerals were separated: orthopyroxene, mixed orthopyroxene and clinopyroxene, olivine, plagioclase, apatite, sulphides and WR. The isotope Sm-Nd age of the olivine gabbro was determined to be  $1748 \pm 76$  Ma;  $\epsilon_{\text{Nd}} = -1.5$ , and the Sm and Nd concentrations in the sulphides equalled 1.103 ppm and 6.178 ppm respectively. The data obtained reflect the origin age of the Pt-Pd sulphide horizon.

The sulphides of the PGE-bearing mafic rocks of the Fedorov-Pana layered intrusion (Russia) and Nottrask intrusion (Sweden) have for the first time been dated. The resultant Sm-Nd age is  $2475 \pm 37$  Ma and  $1745 \pm 76$  Ma respectively. The isotope Sm-Nd age on sulphides and rock-forming minerals reflects the time of the ore-forming processes. The application of sulphide minerals for Sm-Nd dating provides important information on the emplacement time and source of PGE-bearing intrusions.

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