

## **A New Type of PGE-Rich Sulfide Mineralization in the Lower Troctolites from the Yoko-Dovyren Layered Intrusion (Southern Siberia, Russia)**

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The Yoko-Dovyren layered intrusion (North-Baikal region) is a part of the Synnyr-Dovyren volcano-plutonic complex (~728 Ma). The complex also includes ultramafic sills, gabbro-dikes, and high- and low-Ti volcanic rocks. The latter are considered comagmatic with the intrusive rocks. The main intrusion is dipping very steeply, allowing for sampling of the entire cross section from the surface outcrops. The central cross section consists of marginal picrodolerite at the bottom, followed by plagioclase, dunite, troctolite, olivine gabbro, olivine gabbro, quartz gabbro, and pigeonite gabbro. At the upper margin, gabbropegmatites and quartz granophyres are common. The complex contains Cu-Ni sulfide mineralization within the bottom part of the main intrusion and the underlying ultramafic sills, and PGE-rich, sulfide-poor reefs within anorthosite layers at the troctolite/olivine gabbro boundary. We present new data which suggest the existence of Cu sulfide- and PGE-rich zones within the melanocratic lower troctolites.

Samples of sulfide and PGE-rich mineralization were collected from 2006 to 2013. Sulfide-rich areas of each sample were mounted in 1" epoxy mounts and polished for analysis of mineral compositions. Quantitative sulfide mineralogy, including mineral compositions and proportions, was determined at the Central Science Laboratory (CSL), University of Tasmania (UTAS), using an FEI Quanta 600 SEM with a mineral liberation analysis (MLA) capability. Approximately 10,000 individual measurements over a 12- $\mu$ m grid were performed on each sample. Identified sulfide minerals include pyrrhotite, pentlandite, chalcopyrite, and cubanite. Concentrations of Fe, Cu, Ni, Co, Zn, Ag, Re, Cd, PGEs, and Au were measured at the CODES LA-ICP-MS laboratory at UTAS, using established techniques.

A sample of PGE-rich troctolite collected ~120 m above the dunite/troctolite boundary in 2010 contains high Pd in pentlandite ( $91 \pm 84$  ppm,  $n = 7$ ; max 250 ppm), similar to the values found in the main PGE reef within anorthosites ( $235 \pm 84$  ppm,  $n = 10$ ). High-resolution SEM analysis revealed the presence of 12 grains of PGMs (mainly Pd bismuth tellurides, 1–9  $\mu$ m in size) and two grains of electrum (1 and 8  $\mu$ m in size). Also similar to the PGE reef, Cu-rich sulfide minerals accounted for ~75 to 80% of the total sulfide in this sample. Based on these results, a more detailed sampling of this horizon was undertaken in 2013. A range of sulfide-rich, olivine-plagioclase-bearing schlierens, 5 to 10 cm in size, were identified, and a number of sulfide-rich samples were collected. The sample with the largest schlieren was studied in detail by MLA, revealing the presence of 30 PGMs, reaching up to 30  $\mu$ m in size. Pentlandite from this sample also contained high concentrations of all PGEs but Pt (in ppm, Pd  $23.1 \pm 7.2$ , Rh  $23.1 \pm 7.2$ , Ru  $7.5 \pm 4.7$ , Os  $4.2 \pm 3.3$ , Ir  $6.7 \pm 4.0$ , Pt  $0.04 \pm 0.02$ ).

The PGE-rich horizon within the lower troctolites differs from the main PGE reef in high concentrations of Os and Ir in pentlandite, and higher Fo and An contents of olivine and plagioclase

within the silicate components of the rocks. This suggests that it is unlikely that the PGE-rich sulfide melts had migrated down the section from the main PGE reef. Instead, we believe that the new data reveal the existence of an additional PGE-rich horizon within the Yoko-Dovyren layered intrusion.