PETROLOGY AND ORE POTENTIAL OF LAYERED INTRUSIONS IN THE KARASJOK GREENSTONE BELT, NORTHERN NORWAY

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Palaeoproterozoic volcanic-sedimentary basins and greenstone belts of the Fennoscandian Shield are of great metallogenic interest. In particular, layered intrusions in such belts may host large resources of base metals and platinium group elements. An example is the mafic-ultramafic plutonic rocks of the Central Lapland Greenstone Belt (CLGB) in northern Finland, dated at 2.06 Ga, which comprises significant Ni/Cu-PGE resources that have been explored and studied in detail the last years (Makkonen et al. 2017).

The CLGB can be traced into northern Norway, where it links up with the Karasjok Greenstone Belt (KGB) (Braathen and Davidsen 2000). Several mafic-ultramafic intrusive systems are found in the KGB that show similar petrology and tectonic setting as the mineralized intrusions in CLGB (Hansen, 2008; Santaguida et al., 2015; Brownscombe et al., 2015). Several intrusion hosted Cu/Ni-PGE mineralizations has been found in KGB, but yet none of economic value (Often 1985). This project attempts to compare and test petrological similarities of the KGB and CLGB relevant for understanding geodynamic setting, and ore forming processes in the KGB.

The Coalbmejávri Layered Intrusion (CLI) of the KGB is located near Lakselv, Finnmark, and covers an area of approximately 2 km^2. The intrusion is conformable within the lower litho-stratigraphical formations of the KGB and is hosted by quartzites and interlayered amphibolites.

The CLI has been divided into four different layered sections, from base upwards: i) The lowest peridotitic section consists of olivine-(chromite) cumulates, ii) The pyroxenitic section, consisting of olivine, augite and bronzite cumulates, iii) The gabbroic sequence, with plagioclase-augite±magnetite cumulates, and the uppermost iv) anorthositic section, made up of plagioclase cumulates.

Most of the ferromagnesian minerals in the intrusions have been altered a mixture of serpentine, magnetite, chlorite and amphiboles but primary minerals are observed in a few samples. Primary olivine in the CLI shows a composition within the range of Fo80−83.

No significant sulphide mineralizations have been found in CLI, but it assumed that it is a part of the same intrusive system as the the mineralized Porsvann and Karihaugen intrusions further north in KGB.

The high contents of compatible elements and the low Pd/Ir ratios observed from whole-rock chemistry indicate a primitive ultramafic magma produced by high degree of partial melting of the mantle. The incompatible trace element patterns and the discrimination diagrams both point toward a subduction and/or island-arc related boninite-like parental magma for the intrusion.

The tectonic setting of the intrusions is interpreted to be related to a convergent regime where fluids from subducted oceanic crust interacts with an already depleted mantle diaper. Primitive and volatile rich magmas intruding into sulphide bearing supracrustal rocks is considered to have a high potential of producing Ni/Cu-PGE mineralizations which gives the ultramafic intrusions in KGB a high ore potential.

References

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