

Nickel sulfide deposits related to 1.88 Ga mafic-ultramafic magmatism in Fennoscandian and Canadian Shields

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Nickel sulfide deposition took place in the Fennoscandian and Canadian Shields at 1.88 Ga. Examples include the Kotalahti and Vammala Nickel Belts in Finland, Västerbotten Nickel Belt in Sweden and Thompson and Cape Smith Nickel Belts in Canada. Most of the nickel-bearing mafic-ultramafic intrusions within the Finnish Svecofennian are found in the Kotalahti and Vammala Nickel Belts. The Kotalahti Nickel Belt lies close to the Archaean/Proterozoic boundary similarly with the Thompson Belt while the Vammala Belt occurs further to the west and possibly continues to Västerbotten. The Fennoscandian and also part of the Canadian deposits are associated with amphibolite to granulite facies metamorphism and related migmatitic country rocks. The magmatism that produced the Finnish Svecofennian ore-bearing intrusions was coeval with the Svecofennian orogeny and the emplacement of the magma took place during the maximum intensity of deformation and metamorphism. The composition of the parental magma was basaltic with a MgO content usually around 12 wt.% (max. 15 wt.%). This is lower than the value of around 18 wt.% for the Thompson and Cape Smith belts. Also in the Västerbotten Belt in Sweden parental magma had locally higher MgO than within the Finnish nickel belts.

The total pre-mining resource of all the Finnish Svecofennian deposits known to date is about 73 Mt at 0.7 % Ni. Compared to the Thompson and Cape Smith Nickel Belts the nickel grade is distinctly lower. This is partly due to the remarkable lower mining cut-off value for the Svecofennian deposits but also to the lower MgO and thus lower Ni in the parental magma. The Cape Smith Belt extrusions host economic nickel deposits but nickel deposits in Svecofennian picrites in Finland are rare. In Sweden, however some picrite-hosted nickel deposits are found. Picrites, if proven to be comagmatic with the nickel-bearing intrusions, represent a notable rock type. They can be used as a reference level for stratigraphic and geotectonic studies in and between the Fennoscandian and Canadian Shields. Also their regional distribution can guide nickel exploration.