

## **Mineralogy as a controlling factor on recoverable Ni-grade in the Minago Nickel Deposit, southwestern Thompson Nickel Belt**

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In the Thompson Nickel Belt (TNB), Manitoba, nickel deposits are genetically and spatially associated with Early Proterozoic ultramafic sills which intruded sulphur-rich Opswagan Group sedimentary rocks that unconformably overlie Archean Superior craton basement rocks. The Minago Nickel Deposit (MND) is considered to be part of a SW extension of a series of these ultramafic hosted nickel deposits in the TNB, consisting of a vertical to near vertical package of ultramafic rocks folded about a steeply SE- plunging synclinal axis. The deposit has resource estimates of 20.5 Mt at 1.02% Ni and is considered among Canada's largest unexploited nickel resources. However, nickel content among sulphide- and silicate-rich rocks throughout the deposit can be highly variable which has resulted in uncertainties in resource recovery estimates. Nickel recovery from the mineralized ultramafic rock is strongly influenced by the abundance and distribution of the type of nickel sulphide assemblage present and nickel tenor (Ni concentration in 100% sulfides) among the sulphides. This study shows a strong correlation between sulphide assemblages and depth in the MND. From the Precambrian -Ordovician interface (~70 m) to about 400 m depth, the dominant sulphide assemblage is millerite + violarite + pyrite ± polydymite sharply transitioning to a dominantly pentlandite + pyrite ± millerite ± heazlewoodite ± troilite assemblage at lower depth. This shift in Ni- sulphide assemblage corresponds with a vertical transition from strongly serpentinized ultramafic rocks above about 400 m to relatively fresh dunite and pyroxenite below. Ni- rich millerite + violarite ± polydymite assemblages in the "upper zone" (>400 m) are accompanied by a loss of nickel in secondary silicate minerals related to the serpentinization of olivine and pyroxene minerals. In addition, EMP analyses show strong variations in nickel content among Minago pentlandites (from 0.20–0.45 wt% Ni). The variability of nickel content in pentlandite appears to depend on the sulphide assemblage. The lowest nickel grade pentlandites are found associated with troilite ± pyrite. In contrast, pentlandite from the millerite + pyrite ± heazlewoodite assemblage is relatively enriched in nickel. These findings are important to recognize when considering extraction methods of nickel sulphides from MND mineralized rocks and the potential influences on final nickel concentrates.