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Effects of Post-Mineralization Metamorphism and Deformation on Sulfides and their Remobilization in the Hotinvaara Ni Prospect, Pulju Greenstone Belt, Northern Finland

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The Pulju Greenstone Belt (PGB), located on the northwesternmost edge of the Central Lapland Greenstone Belt in Finland, bears significant potential for Ni sulfide deposits. The Paleoproterozoic komatiites of the Mertavaara Formation host the Hotinvaara Ni prospect, which is the most economically promising mineralization to date within the PGB. The Mineral Resource Estimate (MRE) completed for the Hotinvaara Ni-prospect by Nordic Nickel Ltd. indicates 418 Mt @ 0.21% Ni, 0.01% Co, and 53ppm Cu for 862,800 t of contained Ni, 40,000 t of contained Co, and 22,100 t of contained Cu (Nordic Nickel Ltd. 2024). The Hotinvaara mineralization occurs in MgO-rich olivine cumulates as moderately to weakly interconnected sulfide dissemination and as larger pentlandite-pyrrhotite blebs. In addition, Ni sulfides occur locally as massive, 10's-of-cm- to m-scale sulfide veins containing up to 9.61% Ni, 0.17% Cu, and 0.36% Co. Chalcopyrite, pyrite, mackinawite, violarite, and cobaltite-gersdorffite are present in subordinate amounts (<5%). All mineralization types have been subject to multistage deformation events (D₁-D₄) at lower-amphibolite facies metamorphic conditions, which led to the development of deformation textures, recrystallization, and annealing of sulfides as well as paragenetic relationships indicating remobilization of sulfides. On average, the sulfide phase contains 12.5 wt.% Ni and 0.57 wt.% Co, which is reflected in the sulfide mineralogy, as Co-bearing pentlandite is a ubiquitous sulfide in Hotinvaara. Nickel contents of the sulfide phases are extremely variable (1-36 wt.%), even between closely spaced samples, and this most likely reflects the effect of post-mineralization metamorphism that has resulted in the loss of S. Electron probe microanalyser (EPMA) data implies that Co is strongly partitioned into pentlandite (0.19-5.42 wt.%) and trace cobaltite-gersdorffite. LA-ICP-MS analyses will be conducted to examine the trace element (e.g., As and Sb) content in sulfides, in order to further constrain their compositional changes during post-mineralization thermal history.