

## **A study of Ni-bearing sulfides from the Parkin Offset, Sudbury, ON**

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The Parkin offset is a mineralized radial offset, which hosts pod-like bodies of Ni-Cu-PGE mineralization within quartz diorite, and is located in the north-eastern part of the Sudbury basin. The Milnet mine, which ceased operations in the mid-20th century, is situated within the offset. The presence of significant Ni mineralization has been revealed in new areas of the Parkin offset due to recent exploration. The mineralogy is relatively simple, consisting predominantly of pyrrhotite, pentlandite, and chalcopyrite, whereas the variations in mineral proportions, the textures present, the chemistry of these sulfides, etc. are not well established. Evaluating the distribution of Ni amongst the principle minerals (including pentlandite, and both hexagonal and monoclinic pyrrhotite) has direct implications for both understanding the formation of the mineralization and its viability as an economic resource. This study will thus focus on the Ni-concentration of Ni-dominant sulfides (e.g., pentlandite, pyrrhotite) and other more refractory minerals (e.g., polydymite-violarite, magnetite). A key focus will be on the distribution of Ni amongst the two main types of pyrrhotite (hexagonal, stable at  $T > 254$  °C; monoclinic, stable at  $T < 254$  °C) as this mineral is both an important repository for Ni and the principle mineral sent to tailings. The project will include analyses of drill-core samples from 12 holes (from depths of 17.00 m to 1666.70 m) with associated assay data collected by Wallbridge staff, and 4 surface samples. The analyses include reflected-light microscopy, scanning electron microscopy-energy dispersive spectrometer (SEM-EDS), X-ray powder diffraction, Rietveld refinement, and magnetic colloid treatment. These methods will be used to determine the distribution of pyrrhotite polymorphs, and to differentiate between the textures within the two types of pyrrhotite. Systematically documenting the crystal-chemical features of the Ni-bearing mineralogy (along with their chemical variations such as major, minor, and trace elements), the modal distribution of pyrrhotite polymorphs, and the geological features (textures, intergrowth features, relationships to other Ni-bearing minerals) will provide insights into the genesis and evolution of mineralization in the Parkin offset.